
REAR AXLE - 27

PARTS CATALOG,
SERVICE MANUAL &
SERVICE TIME
SCHEDULE CODE

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Rear Axle

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SPECIFICATIONS – Up to Early 1978

Type	semi-floating
Pinion and ring gear set	hypoid
Ratio	4.3 to 1 (10/43)
Pinion bearings	two
Bearing type	taper roller
Bearing preload adjustment	by collapsible spacer and pinion nut tightening
Thickness range of pinion adjustment shims100-.102-.104-.106-.108-.110- .112-.114-.116-.118-.120-.122- .124-.126-.128-.130-.132 in. (2.55- 2.60-2.65-2.70-2.75-2.80- 2.85-2.90-2.95-3.00-3.05-3.10- 3.15-3.20-3.25-3.30-3.35 mm)
Pinion rolling torque	14 to 17.40 in. lb. (16 to 20 kgcm)
Differential bearings	two
Bearing type	taper roller
Adjustment	by threaded adjusters
Bearing preload: differential carrier caps spread005 to .007 in. (0.14 to 0.18 mm)
Side gear adjustment (not for self-locking differential)	by thrust washers
Thickness range of side gear thrust washers071-.073-.075-.077-.079-.081- .083 in. (1.80-1.85-1.90-1.95- 2.00-2.05-2.10 mm)
Pinion and ring gear backlash003 to .005 in. (.08 to 0.13 mm)
Axle shaft type	semi-floating
Axle shaft bearings	ball
Track, rear	51.81 in. (1316 mm)
Lubricant -- SAE 80 W/90 EP	1.3 LT 1.2 KG 1.4 QT

SPECIFICATIONS – 1978 and On

Type	semi-floating
Pinion and ring gear set	hypoid
Ratio	Manual Trans. 3.90 to 1 (10/39) Auto. Trans. 3.58 to 1 (12/43)
Pinion bearings	two
Bearing type	taper roller
Bearing preload adjustment	by tightening pinion nut
Thickness range of pinion nut adjustment shims	0.105, 0.108, 0.110, 0.112, 0.114, 0.116, 0.118, 0.120, 0.122, 0.124, 0.126, 0.128, 0.130, 0.132 in. (2.55, 2.60, 2.65, 2.70, 2.75, 2.80, 2.90, 2.95, 3.00, 3.05, 3.10, 3.15, 3.20, 3.25, 3.30, 3.35 mm)
Pinion rolling torque	14 to 17 in. lbs. (16 to 30 kg cm)
Differential bearings	two
Bearing type	taper roller
Adjustment	by shims
Thickness range of differential adjustment shims	From 6.52 to 7.48 mm in 0.02 mm steps
Differential bearing preload	0.004 in. (0.10 mm)
Differential side gear adjustment	by shims
Thickness range of side gear adjustment shims033, .035, .037, .039, .041, .043, .045, .047, .049, .051, .071, .073, .075, .077, .079, .081, .083 in. (.85, .90, .95, 1.00, 1.05, 1.10, 1.15, 1.20, 1.25, 1.30, 1.80, 1.85, 1.90, 1.95, 2.00, 2.05, 2.10 mm)
Rolling torque of one side gear with differential case free and other side gear blocked	22 to 36 ft. lbs. (3 to 5 kgm)
Pinion and ring gear	matched set
Pinion and ring gear backlash	0.00315 to 0.00511 in. (0.08 to 0.13 mm)
Axle shaft type	semi-floating
Axle shaft bearings	ball
Track, rear	51.934 inches (1320 mm)
Lubricant – SAE 80 W/90 EP	1.3 LT 1.2 KG 1.4 QT

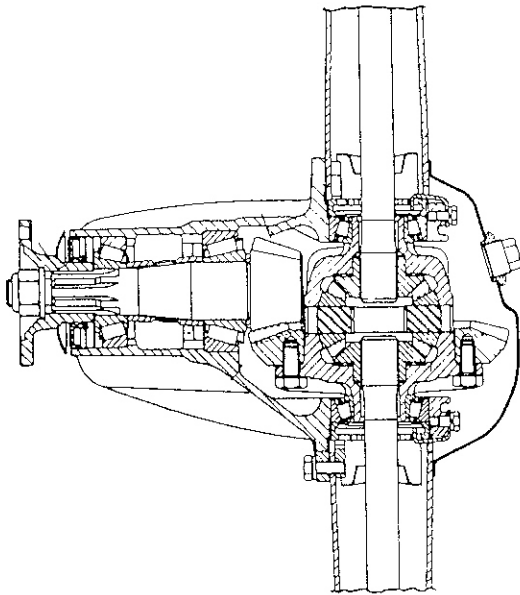
Rear Axle

27

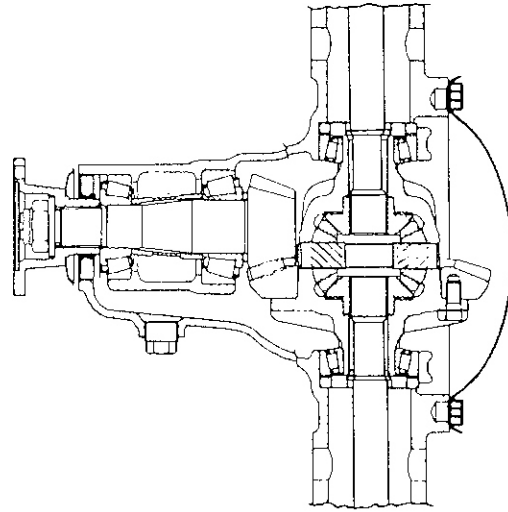
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TORQUE SPECIFICATIONS

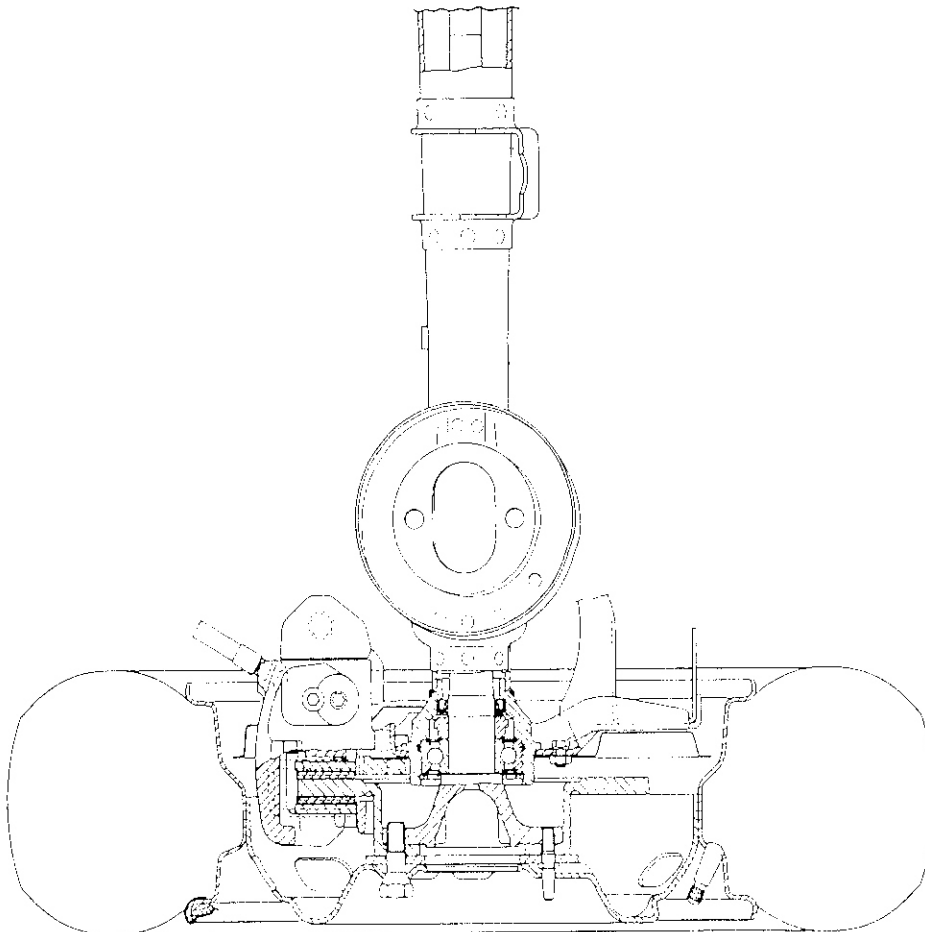
DESCRIPTION (Up to Early 1978)	THREAD (METRIC)	MATERIAL	TORQUE		
			FT. LB.	Kgm	N·m
Bolt, differential carrier-to-axle housing	M 8	R 120 Fosf	33	4.5	44
Bolt, cap-to-differential carrier	M 10 x 1.25	R 80	36	5	51
Bolt, ring gear	M 10 x 1.25	40 Ni Cr Mo 2 R 120 to 135	72	10	98
Wheel stud	M 12 x 1.25	C 35 R Bon Znt	65	9	86
DESCRIPTION (1978 and On)					
Bolt, axle shaft retaining plate to housing	M 10 x 1.25	R 80 Znt	36	5	51
Bolt, differential cover to housing	M 8	R 80 Znt	18	2.5	25
Bolt, caps to differential carrier	M 10 x 1.25	R 80	36	5	51
Bolt, ring gear to carrier	M 10 x 1.25	40 Ni Cr Mo 2 R 120 to 135	72	10	98
Wheel stud	M 12 x 1.25	C 34 R Bon Znt	65	9	86



ALL VEHICLES UP TO EARLY 1978



1978 AND ON



CROSS SECTION OF REAR AXLE

REAR AXLE

REMOVAL AND INSTALLATION

NOTE: Rear axle need not be removed to overhaul differential. Overhaul can be accomplished with axle in place on vehicle. Refer to Suspension Section for removal and installation of rear axle.

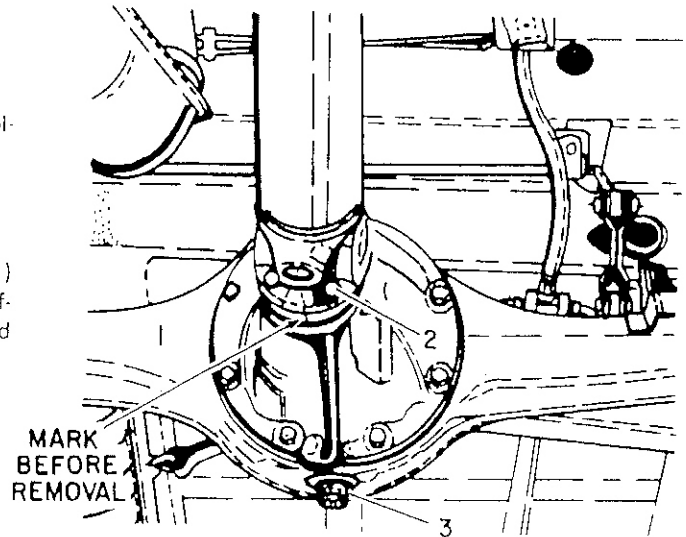
REAR AXLE AND AXLE SHAFTS (VEHICLES UP TO EARLY 1978 ONLY)

DISASSEMBLY

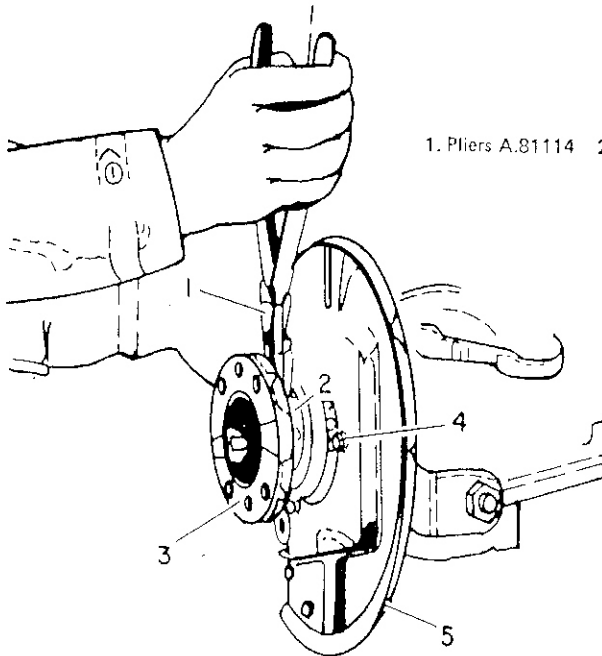
If differential is to be overhauled on vehicle, perform the following:

- Drain oil.
- Remove wheels.
- Remove four bolts (2) and nuts holding drive shaft flange (1) to differential flange. Mark shaft flange in relation to differential flange so that upon installation it will be assembled in same position. Secure drive shaft up, out of way.
- Remove brake calipers and discs (refer to Brakes Section).

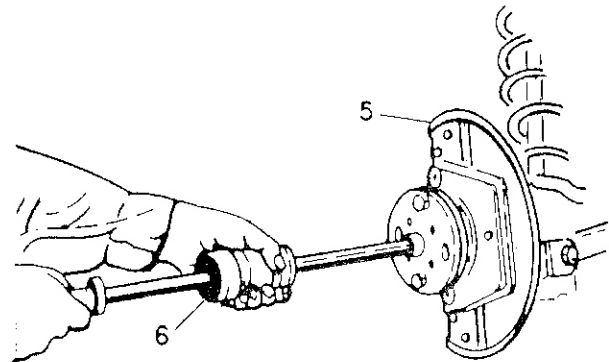
1. Drive shaft flange 2. Bolt 3. Oil drain



Remove four bolts (4) securing brake shield (5). Remove axle shaft snap ring with pliers A.81114 as shown. Attach axle puller A.47017 (6) to axle shaft flange and pull shaft out.

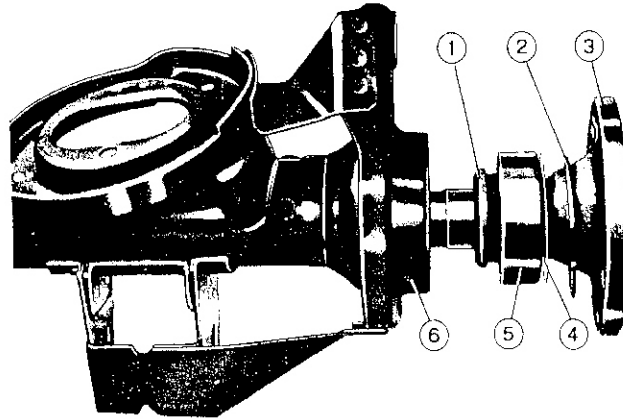


1. Pliers A.81114 2. Snap ring 3. Axle shaft flange 4. Bolt 5. Brake shield 6. Puller A.47017



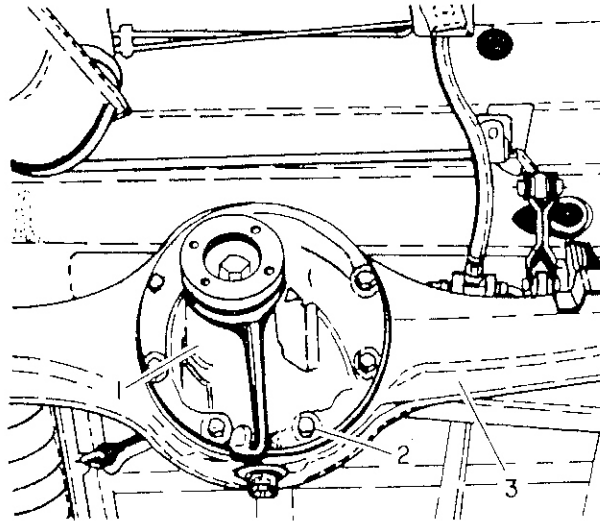
Unless axle shaft service is required, it is only necessary to disengage shafts from differential side gears and not completely remove them.

- 1. Bearing retaining collar
- 2. Snap ring
- 3. Axle shaft
- 4. Dust shield
- 5. Ball bearing
- 6. Axle housing



Support differential assembly (1) and remove eight bolts (2) securing it to axle housing (3). Carefully withdraw differential from housing.

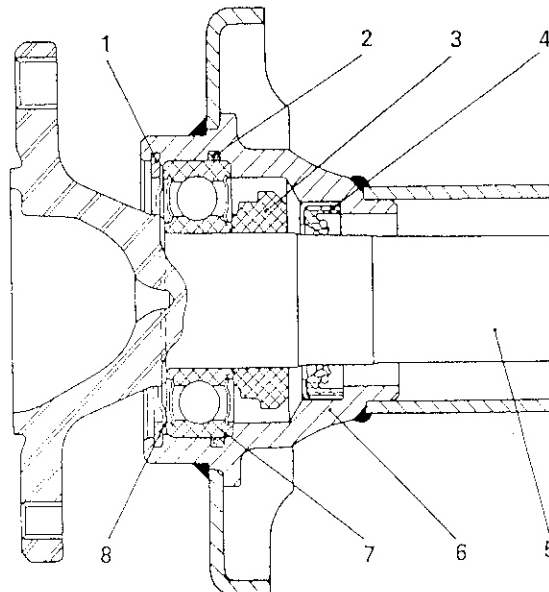
- 1. Differential assembly
- 2. Bolt
- 3. Axle housing



AXLE SHAFT INSPECTION AND OVERHAUL

After removing axle shaft (5) as described earlier, remove axle shaft oil seal (4) and "O" ring (2) from their seats in housing.

- 1. Snap ring
- 2. "O" ring
- 3. Bearing retainer collar
- 4. Oil seal
- 5. Axle shaft
- 6. Axle housing
- 7. Ball bearing
- 8. Dust shield



Check condition of axle shaft and components to make sure that:

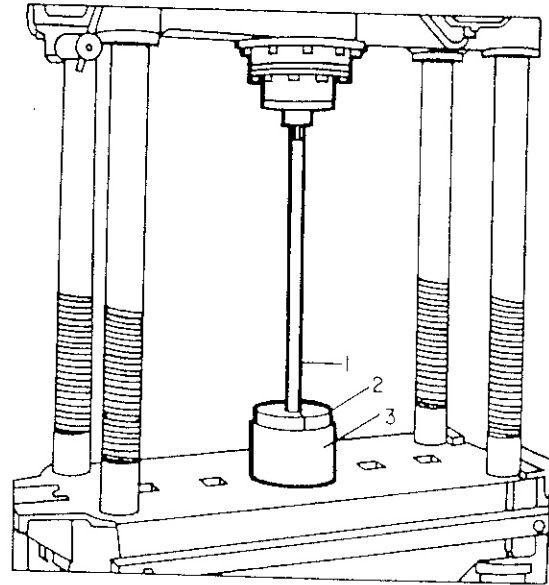
- Shaft is not bent or damaged.
- Ball bearing is not worn or damaged.
- Retaining collar and bearing have not moved from their position on shaft.
- Snap ring, oil seal and "O" ring on bearing seat is not damaged or worn.

Damaged or worn parts must be replaced.

Place shaft (1), with half-rings (2) around retaining collar, in press as shown and press collar off. Check that seating face of collar on shaft is not scored or damaged. Replace shaft if damaged.

Remove bearing, dust shield and snap ring.

1. Axle shaft 2. Half-rings 3. Mounting base

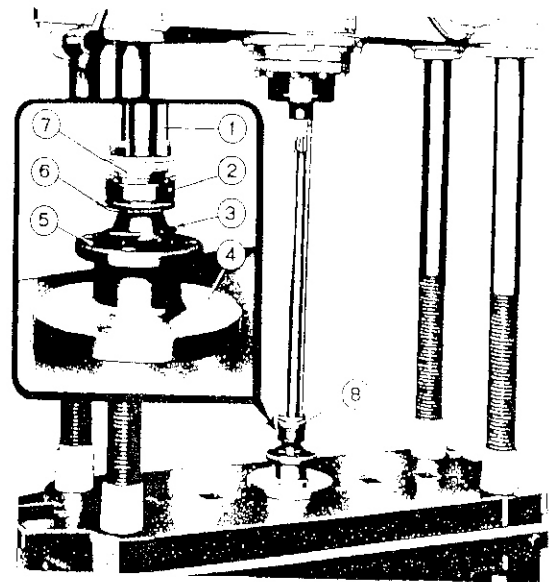


To replace axle shaft components, place shaft in press as shown. Install snap ring (3), dust shield (6) and bearing (2).

Place collar and holder on shaft. Place sleeve (1) in position over shaft onto collar and press down so that inner race of bearing is locked between collar and shaft shoulder.

Check that collar and bearing are tight on shaft (no movement).

1. Sleeve 2. Ball bearing 3. Snap ring 4. Base plate 5. Axle shaft
6. Dust shield 7. Retaining collar 8. Collar holder



Installation of axle shaft is reverse of removal with special attention to the following:

- Fit oil seal with driver A.70157.
- Install "O" ring in its seat in axle housing.
- After inserting axle shaft in axle housing, fit snap ring with pliers A.81114.

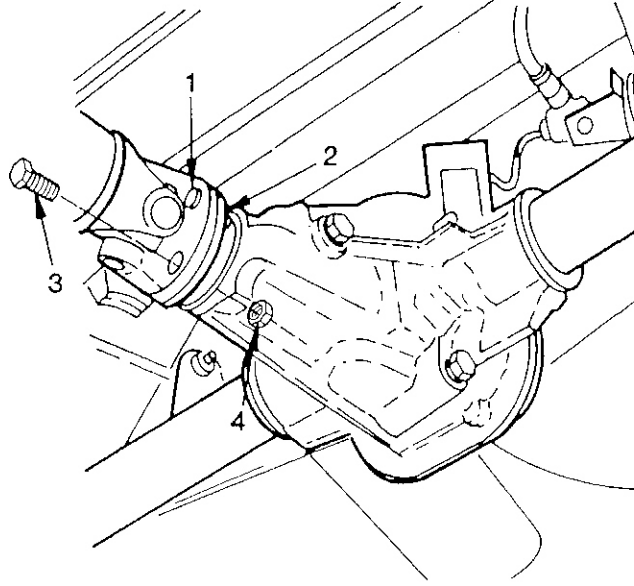
REAR AXLE AND AXLE SHAFTS (1978 AND ON)

DISASSEMBLY

If differential is to be overhauled on vehicle, perform the following:

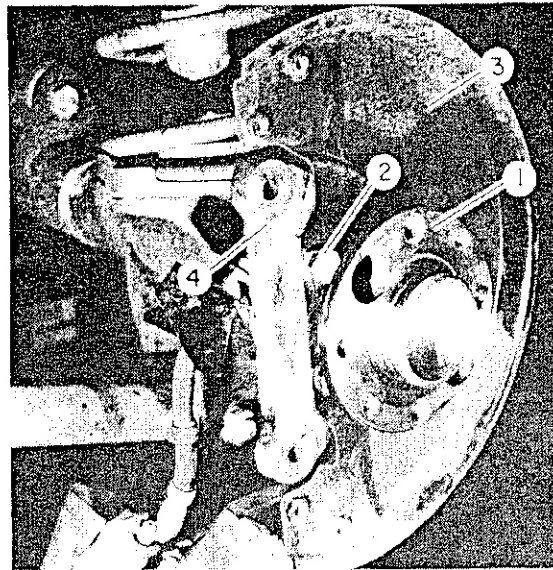
- Drain oil.
- Remove wheels.
- Remove four bolts (3) and nuts (4) holding drive shaft flange (1) to differential flange (2). Mark shaft flange in relation to differential flange so that upon installation it will be assembled in same position. Secure drive shaft up, out of way.
- Remove brake calipers and discs (refer to Brakes Section).

1. Drive shaft flange 2. Differential flange 3. Bolt 4. Nut



Working thru large holes in axle shaft flange (1), remove four bolts (2) and lockwashers holding brake shield (3) and caliper mounting bracket (4) to axle flange.

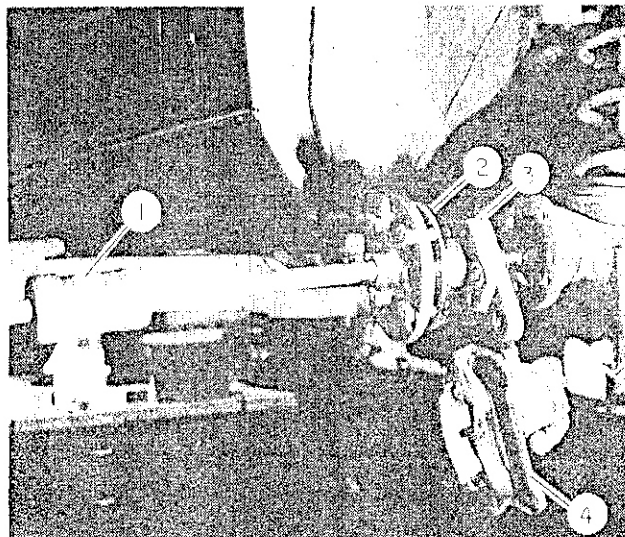
1. Axle shaft flange 2. Bolt 3. Brake shield 4. Caliper mounting bracket



Attach axle puller A.47017 (1) to axle shaft flange (2) and pull shaft out.

NOTE: Unless axle shaft service is required, it is only necessary to disengage shafts from differential side gears and not completely remove them.

1. Axle puller A.47017 2. Axle shaft flange 3. Caliper mounting bracket 4. Brake caliper



AXLE SHAFT

INSPECTION AND OVERHAUL

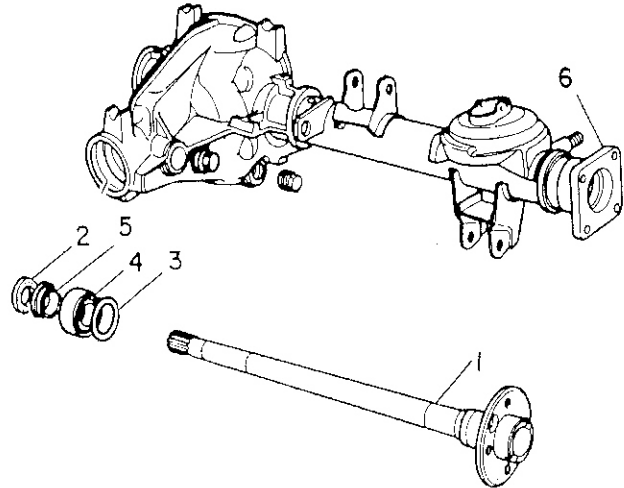
After removing axle shaft (1), remove shaft oil seal (2) and axle housing "O"-ring (3) from their seats in housing.

Check condition of axle shaft and components to make sure that:

- Shaft is not bent or damaged.
- Ball bearing is not worn or damaged.
- Retainer collar and bearing have not moved from their position on shaft.
- Oil seal and "O"-ring is not damaged.

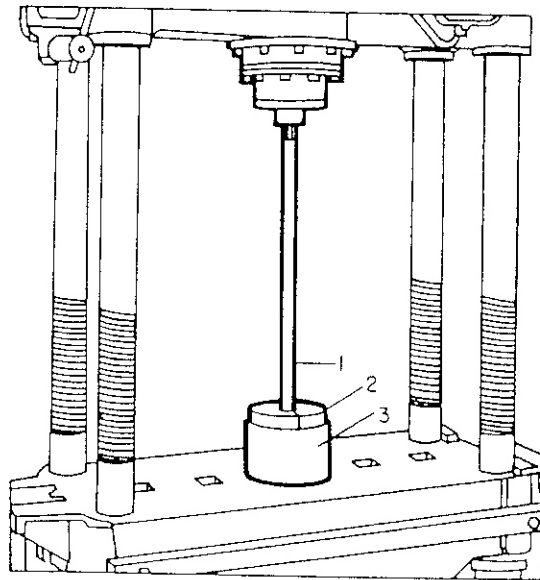
Damaged or worn parts must be replaced.

1. Axle shaft 2. Oil seal 3. "O"-ring 4. Ball bearing 5. Bearing retainer collar 6. Axle housing



Place shaft (1), with half-rings (2) around retainer collar, in press as shown and press collar off. Check that seating face of collar on shaft is not scored or damaged. Replace shaft if damaged. Remove bearing and caliper mounting bracket.

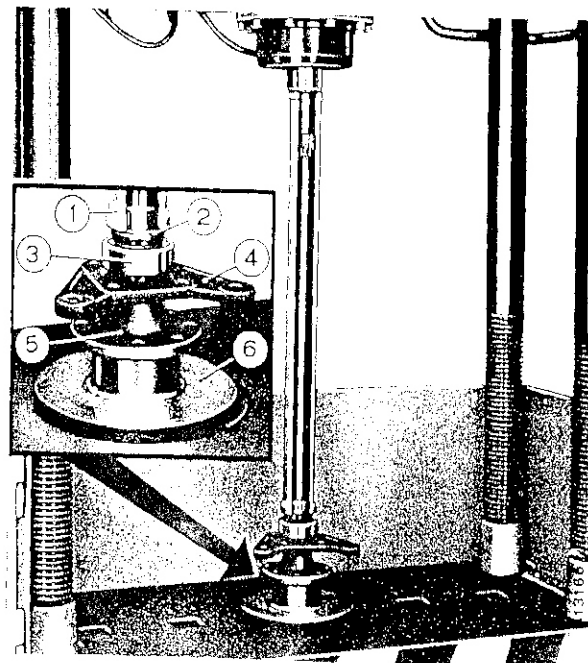
1. Axle shaft 2. Half-rings 3. Mounting base



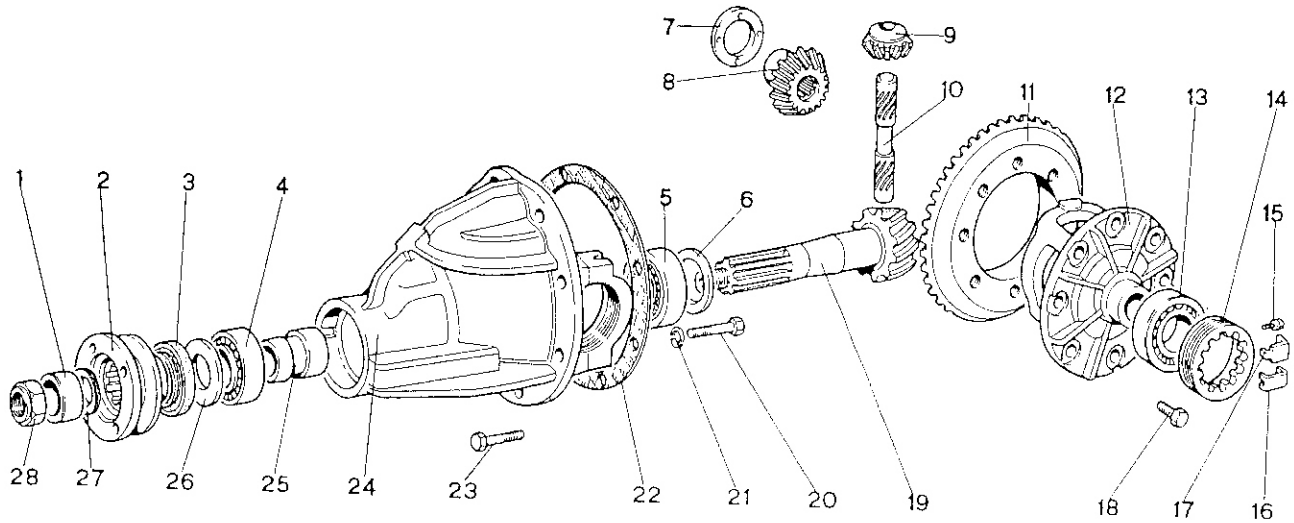
To replace axle shaft components, place shaft in press as shown. Install caliper mounting bracket (4), roller bearings (3) and retaining collar (2). Place sleeve (1) in position over shaft onto collar and press down so that inner race of bearing is locked between collar and shaft shoulder. Check that collar and bearing are tight on shaft (no movement).

Installation of shaft is reverse of removal.

1. Sleeve 2. Retaining collar 3. Roller bearing 4. Caliper mounting bracket 5. Axle flange 6. Mounting base



DIFFERENTIAL (VEHICLES UP TO EARLY 1978)



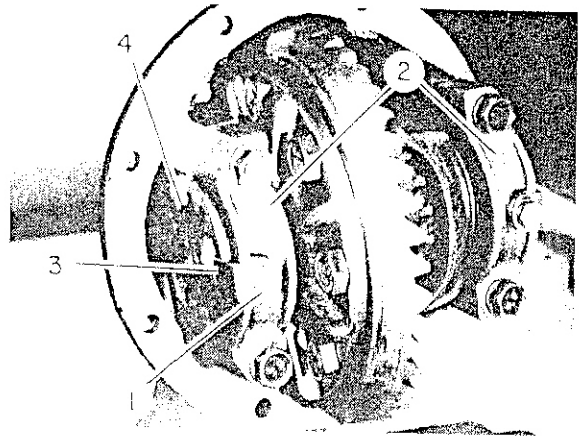
1. Spacer 2. "U" joint sleeve 3. Oil seal 4. Front roller bearing 5. Rear roller bearing 6. Pinion shaft rear roller bearing thrust washer 7. Side gear thrust washer 8. Side gear 9. Pinion gear 10. Pinion gear shaft 11. Ring gear 12. Differential case 13. Differential case roller bearing 14. Bearing adjuster ring 15. Locking plate bolt 16 and 17. Locking plates 18. Bolt fixing ring gear to differential case 19. Bevel pinion 20. Carrier cap bolt 21. Lockwasher 22. Gasket 23. Differential carrier to axle housing bolt 24. Differential carrier 25. Collapsible spacer 26. Oil slinger 27. Plain washer 28. Bevel pinion nut

DIFFERENTIAL CARRIER ASSEMBLY (VEHICLES UP TO EARLY 1978 ONLY)

DISASSEMBLY

Place differential assembly in a vise or stand as shown. Remove two bolts (1) and lockwashers from each bearing cap (2). These secure lock plates (3) which hold adjuster rings (4) in position. Remove lock plates.

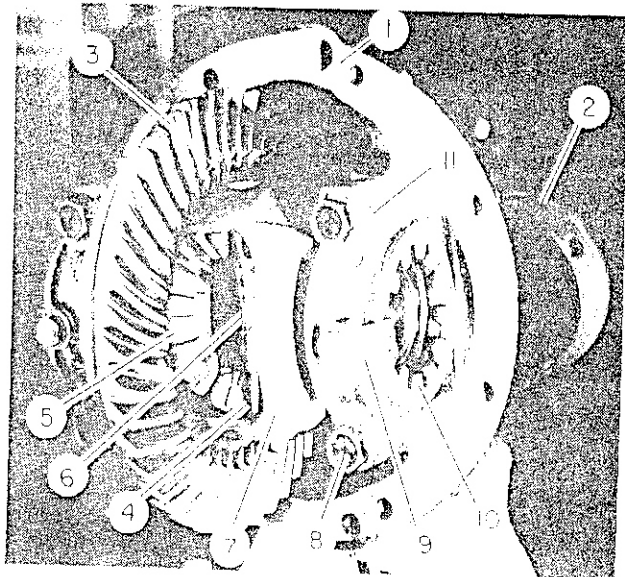
1. Bolt 2. Bearing cap 3. Lock plate 4. Adjuster ring



Remove two bolts and lockwashers from both differential case bearing caps. Remove caps, adjuster rings (10) and roller bearing cups.

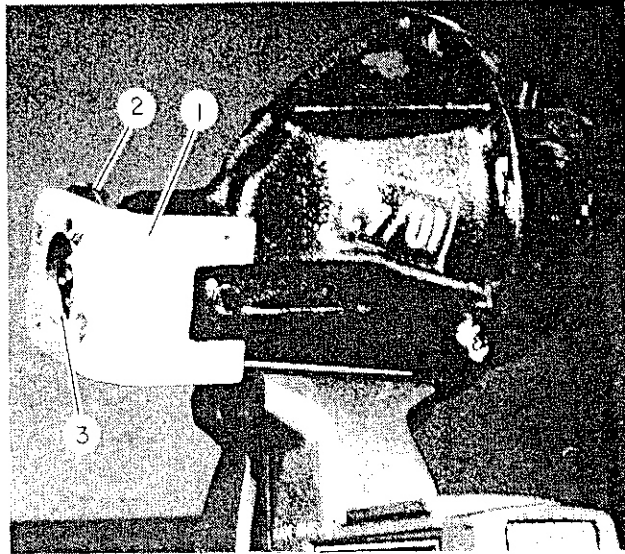
Withdraw differential case (7) from carrier housing (1), complete with gears and bearings.

1. Differential carrier housing 2. Drive pinion flange 3. Ring gear 4. Pinion gear 5. Side gear 6. Pinion gear shaft 7. Differential case 8. Bearing cap bolt 9. Adjuster lock plate 10. Bearing adjuster 11. Differential case bearing cap



Lock bevel pinion with tool A.70341 (1) or A.70345 as shown. Remove self-locking nut (3) securing "U"-joint sleeve (2) to bevel pinion. Remove sleeve.

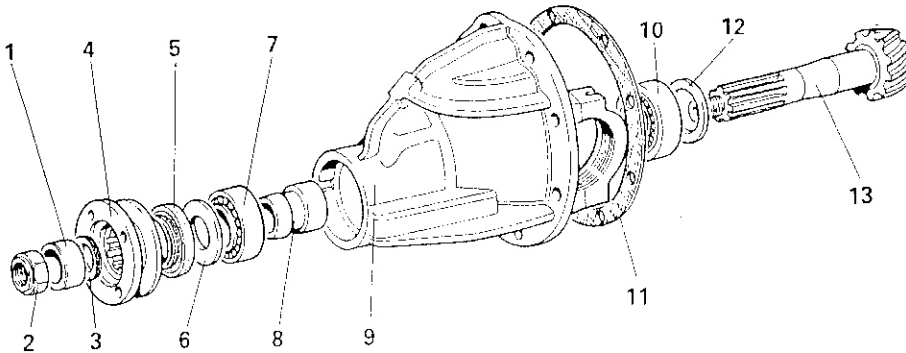
1. Bevel pinion 2. "U"-joint sleeve 3. Self-locking nut



Withdraw bevel pinion (13) complete with thrust washer (12), rear roller bearing (10) and collapsible spacer (8). Remove oil seal (5), oil slinger (6) and front roller bearing (7) from differential carrier.

To remove cup of rear roller bearing, use a drift pin. To remove cup of front roller bearing, use driver A.70198.

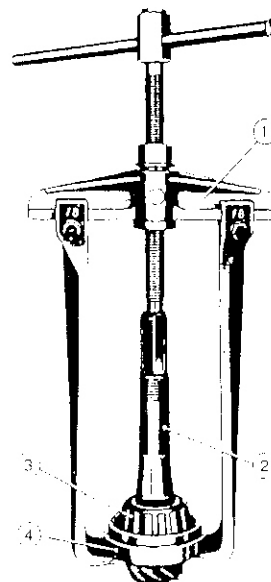
1. Spacer 2. Bevel pinion nut 3. Plain washer 4. "U"-joint sleeve 5. Oil seal 6. Oil slinger 7. Front roller bearing 8. Collapsible spacer 9. Differential carrier 10. Rear roller bearing 11. Gasket 12. Thrust washer 13. Bevel pinion



Slide collapsible spacer off bevel pinion (2).

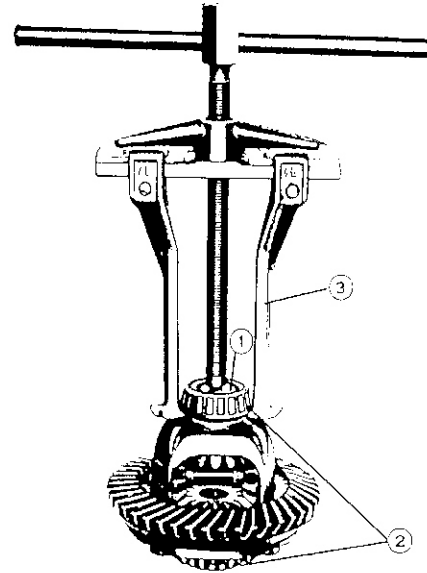
With a universal puller (1) and tool A.45008 (4), remove rear roller bearing (3). Thrust washer can then be removed.

1. Universal puller 2. Bevel pinion 3. Roller bearing 4. Tool A.45008



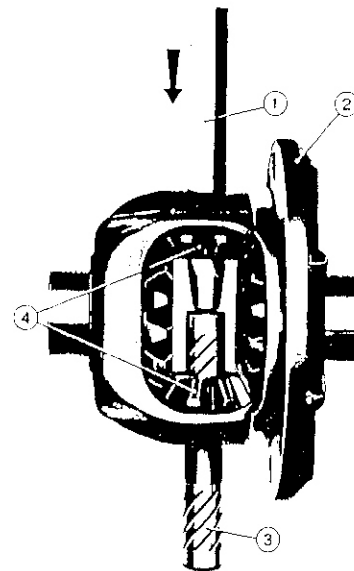
With a universal puller (3) and tool A.45028 (1), remove both differential roller bearings (2).

1. Tool A.45028 2. Roller bearing 3. Universal puller



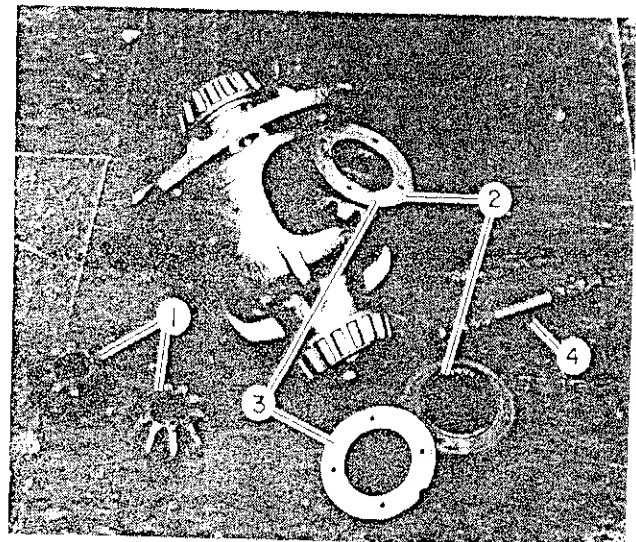
Mark position of ring gear in relation to case and remove eight bolts holding ring gear to differential case (2). With a drift pin (1), drive pinion gears shaft (3) from case.

1. Drift pin 2. Differential case 3. Pinion gear shaft 4. Pinion gears



Turn gears to bring pinion gears (1) opposite openings in case, and withdraw gears. Then remove side gears (2) with their thrust rings (3).

1. Pinion gears 2. Side gears 3. Thrust rings 4. Pinion gears shaft



INSPECTION

Before inspecting components, clean them thoroughly, as this will enable faults and wear to be more easily detected.

Check that teeth are not worn or damaged and that they make contact over their entire faces. If excessive wear is found, change parts affected. If teeth are not making correct contact, check for cause. Should any gears have chipped teeth, they must be changed.

NOTE: Bevel pinion and ring gear are supplied in matched pairs; if one is damaged, both must be changed.

Check that surface of pinion gear shaft and bores of pinion gears are not damaged. If damage is slight, polish surfaces with very fine abrasive paper, otherwise replace them. This also applies to side gears.

Inspect roller bearings of pinion and case; they should be in perfect condition. If there is any doubt about condition, replace them since incorrect bearing operation will cause noise and damage to teeth.

Inspect surfaces of side gear thrust washers; if they are only slightly defective, polish them. If necessary, replace them using standard or oversize parts. Washers are supplied in the following thicknesses: .070, 0.72, 0.74, 0.76, 0.78, 0.80 and 0.82 in. (1.80, 1.85, 1.90, 1.95, 2.00, 2.05 and 2.10 mm).

Check that differential carrier and case are not deformed or cracked. If so, replace them.

ASSEMBLY

Assemble side gears (2) with their thrust washers, in case. Insert pinion gears (3) thru openings in case and engage them with side gears. Turn the four gears so as to bring holes in pinion gears in line with corresponding holes in case. Insert pinion gears shaft.

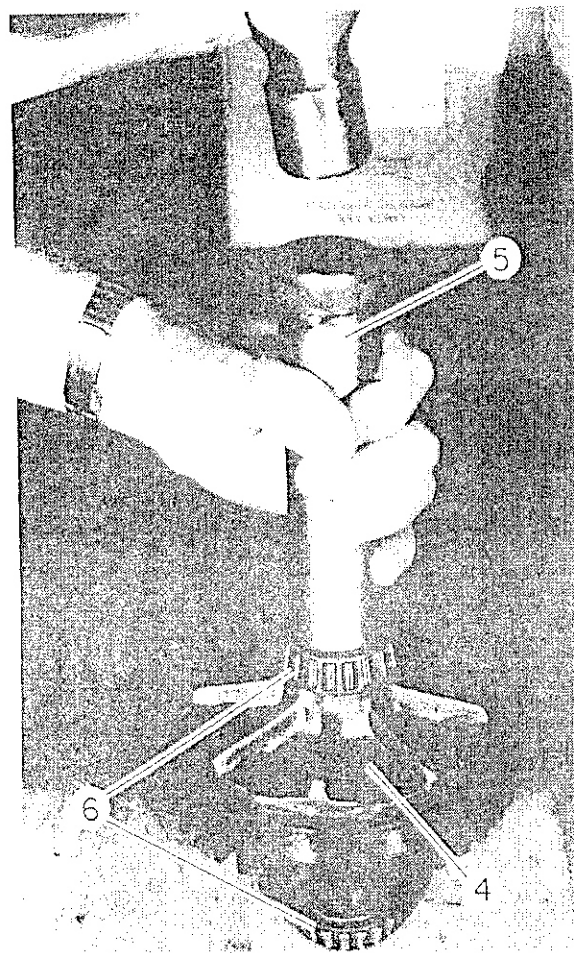
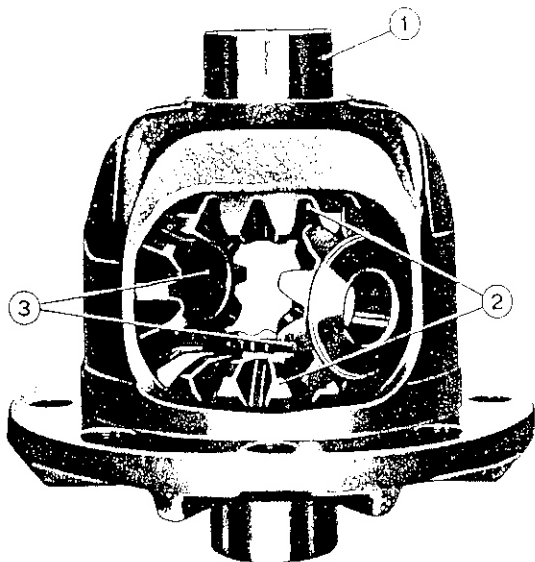
Check axial play in each side gear; it should not exceed .004 in. (0.10 mm). If it is more than this, there is excessive wear between gear pairs, and side gear thrust washers must be replaced with thicker ones.

After changing thrust washers, measure clearance again. If correct clearance is not obtained, gear teeth are excessively worn and must be replaced.

Install ring gear to case (with alignment marks aligned) with eight bolts (4) and torque to 72 ft. lb. (10 kgm).

Using driver A.70152 (5) install both roller bearings (6) on case.

1. Differential case 2. Side gears 3. Pinion gears
4. Bolt 5. Driver A.70152 6. Roller bearing

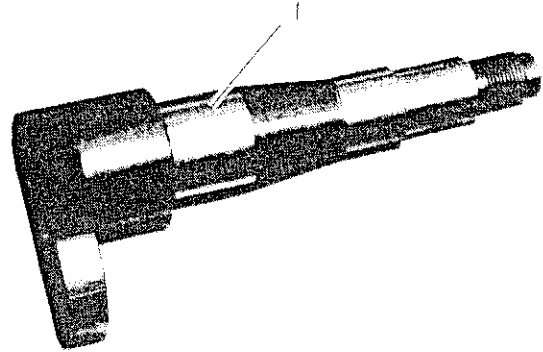


Bevel Pinion Assembly and Adjustment

To ensure correct meshing between ring gear and pinion, a thrust washer of suitable thickness must be placed between pinion and rear roller bearing, to compensate for any difference in machining between pinion and differential carrier.

Dummy pinion A.70184 (1) and a dial indicator are needed to determine thickness of washer.

NOTE: Pinion roller bearing thrust washers are supplied for service in the following thicknesses: .100, .102, .104, .106, .108, .110, .112, .114, .116, .118, .120, .122, .124, .126, .128, .130, and .132 in. (2.55, 2.60, 2.65, 2.70, 2.75, 2.80, 2.85, 2.90, 2.95, 3.00, 3.05, 3.10, 3.15, 3.20, 3.25, 3.30, and 3.35 mm).

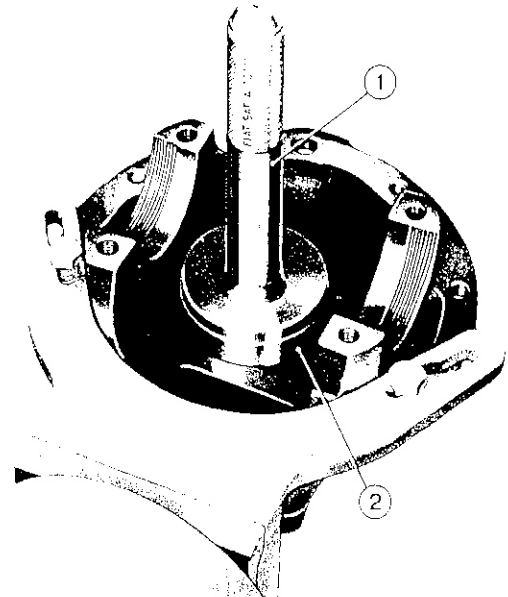


1. Dummy pinion A.70184

Mount differential carrier on suitable stand.

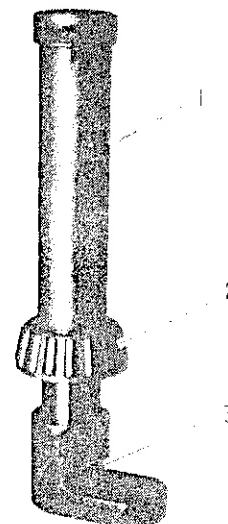
Place front and rear roller bearing cups of bevel pinion in their seats. Using driver A.70185 for front and driver A.70171 for rear, install cups in seats as shown.

1. Driver A.70171 2. Roller bearing cup



Using tool A.70152, fit rear roller bearing (2) to dummy pinion A.70184 (3). Insert dummy pinion into its seat in differential carrier.

1. Tool A.70152 2. Rear roller bearing 3. Dummy pinion A.70184

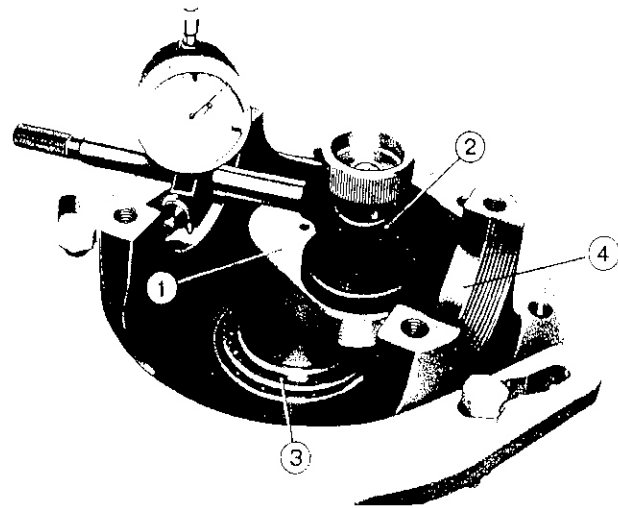


Install front roller bearing on dummy pinion. Install "U"-joint sleeve, pinion nut and washer, turn nut a few times to seat bearings. Then tighten nut firmly.

Zero dial indicator on a surface plate. Mount it to dummy pinion (1) with plunger in contact with one of roller bearing seats (4) as shown. Move dial indicator right and left horizontally and when minimum reading is obtained, make note of it. Repeat operation for other seat.

Average out the two readings and this will be (a) (refer to next page).

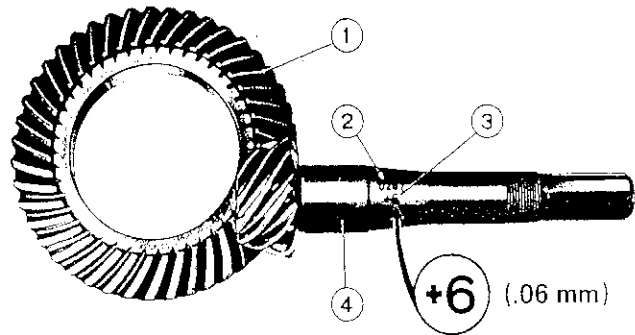
1. Dummy pinion A.70184 2. Dial indicator base 3. Rear roller bearing 4. Differential case bearing seat



Thickness(s) of thrust washer to be inserted between pinion head and shoulder of rear roller bearing is obtained by adding or subtracting value stamped at factory on bevel pinion (4), from value (a). If number is preceded by a plus (+), subtract it from (a). If number is preceded by a minus (-) add it to (a) (refer to next page).

Remove dummy pinion and parts mounted on it.

1. Ring gear 2. Serial production and matching number, stamped on pinion shank and ring gear 3. Value of difference between actual and nominal distance 4. Bevel pinion

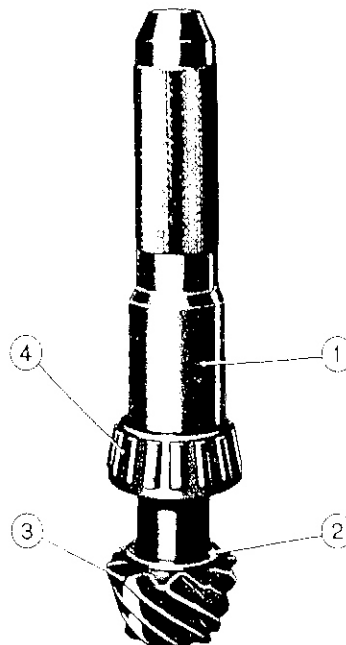


Install thrust washer (2) to correct thickness on pinion (3). Using tool A.70152 (1), install rear roller bearing (4) as shown. Install collapsible spacer and then insert pinion assembly into carrier.

NOTE: If bevel pinion, pinion bearings and differential carrier are not changed, the collapsible spacer can be used again. If any of these parts are changed, a new spacer must be used.

From forward end of carrier, install front roller bearing, oil slinger, oil seal and "U"-joint sleeve.

1. Tool A.70152 2. Thrust washer 3. Bevel pinion 4. Rear roller bearing



HOW TO DETERMINE THICKNESS OF BEVEL PINION REAR BEARING THRUST WASHER

If $\ll a \gg$ is mean reading obtained by dial gauge measurements on two bearing seats and $\ll b \gg$ the value stamped on pinion at factory, thickness $\ll S \gg$ of required new thrust washer is given by the following formula:

$$S = a - (+ b) = a - b$$

$$\text{or } S = a - (- b) = a + b$$

In other words:

- if number stamped on pinion is preceded by a **plus** sign, thickness of washer is to be obtained by **subtracting** this number from dial gauge reading;
- if number stamped on pinion is preceded by a **minus** sign, thickness of washer is obtained by **adding** this to dial gauge reading.

Example:

let $\ll a \gg$ be 2.90 (dial gauge reading)
 and let $\ll b \gg$ be - 5 (number stamped on pinion)
 then $\ll S \gg = a - (- b)$

$$S = 2.90 - (- 0.05) \quad .114'' - (- .002'')$$

$$S = 2.90 + 0.05 \quad .114'' + .002''$$

$$S = 2.95 \quad .116''$$

In this case a thrust washer .116" (2.95 mm) thick will be needed.

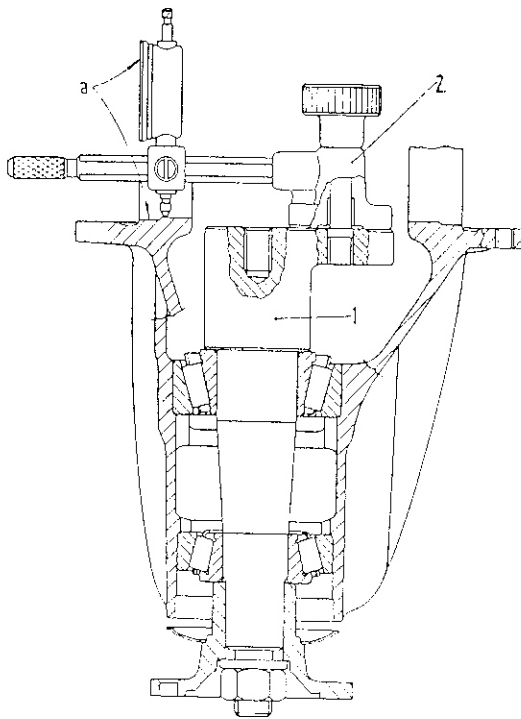


Diagram showing how to fit dummy pinion and support with dial gauge to determine thickness of thrust washer required for rear bearing of bevel pinion.

1. Dummy pinion A.70184 2. Dial gauge a. Mean value of both measurements taken with dial gauge on bearing seats.

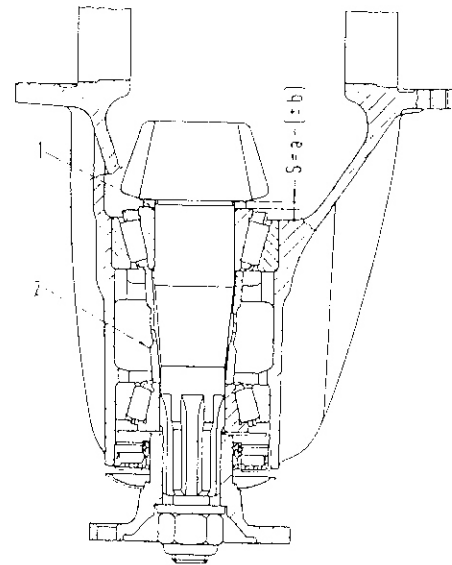


Diagram showing how to fit bevel pinion.

S = Thickness of rear bearing thrust washer.
 a = Dial gauge reading.
 b = Value stamped on bevel pinion.

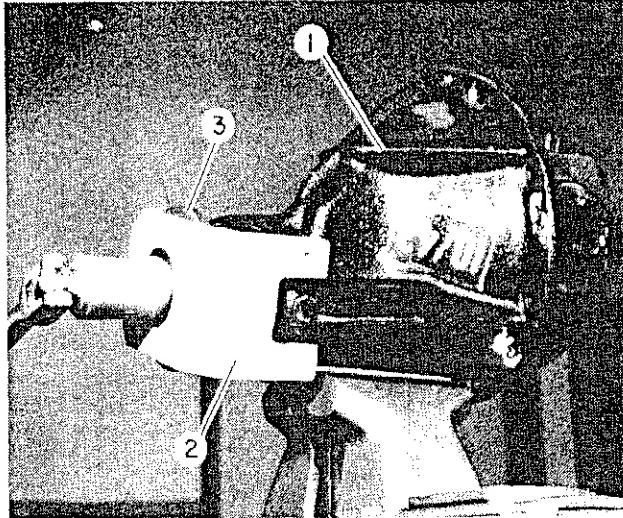
1. Rear bearing thrust washer 2. Collapsible spacer between roller bearings

Install washer and self-locking nut on pinion shaft.

With carrier (1) mounted in suitable stand, install holding tool A.70341 (2) or A.70345 on "U"-joint sleeve (3).

With a torque wrench, gradually in stages, tighten nut to a torque of between 87 and 166 ft. lb. (12 to 23 kgm), checking turning torque of pinion itself as this is done (next step). Once the turning torque of bevel pinion is between 14 and 17 in. lb. (16 to 20 kgcm), do not torque any further.

1. Differential carrier 2. Holding tool A.70341 3. "U"-joint sleeve



To check turning torque proceed as follows:

Remove holding tool from "U"-joint sleeve.

Attach dynamometer A.95697 (1) and socket (2) to pinion nut. Move pointer to 17 in. lb. (20 kgcm) graduation on scale.

With lever, rotate dynamometer thru a few turns. As pinion turns, check that moving pointer does not pass pointer set at 17 in. lb. (20 kgcm), and is not below 14 in. lb. (16 kgcm) mark.

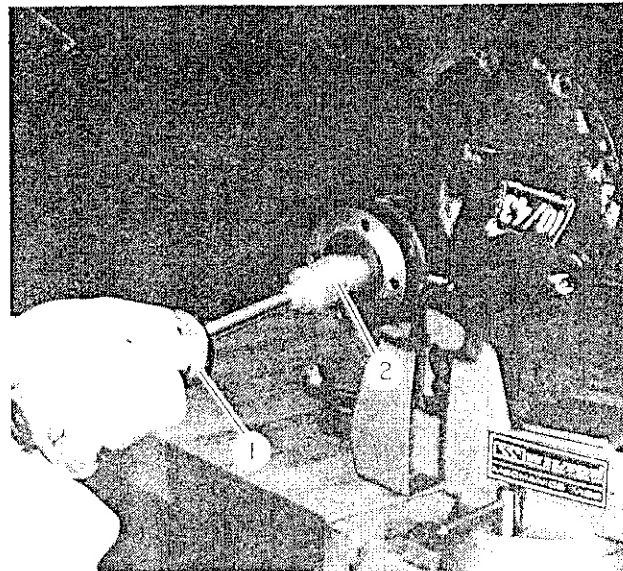
If turning torque is more than 17 in. lb. (20 kgcm), bearing preload is too high.

NOTE: Do not loosen nut to obtain preload. Pinion must be removed and new collapsible spacer installed, then repeat operation.

If turning torque is less than 14 in. lb. (16 kgcm), pinion nut must be tightened further without exceeding maximum torque of 166 ft. lb. (23 kgm), and turning torque checked again.

If prescribed turning torque cannot be obtained, change spacer, as it will have been compressed to a point of being unserviceable.

1. Dynamometer A.95697 2. Socket



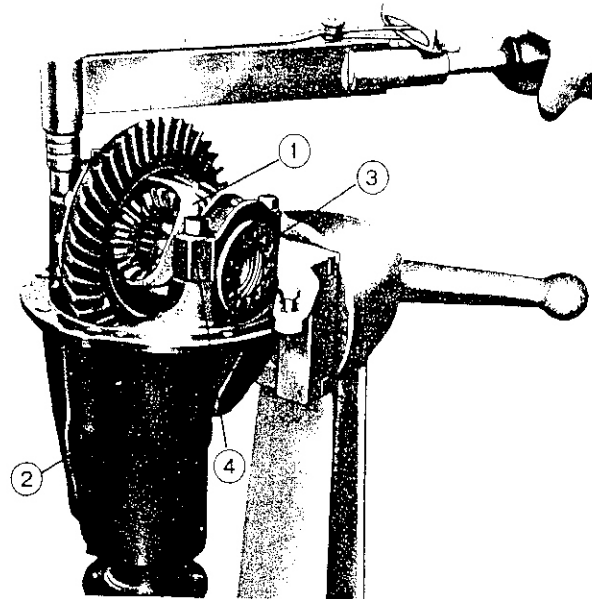
Differential Case Installation Into Carrier

Place differential case (1), complete with bearings, in carrier (2).

Install two bearing retaining and adjusting rings (3). Screw them into contact with bearings.

Fit bearing caps (4) and torque cap bolts to 36 ft. lb. (5 kgm).

1. Differential case 2. Carrier 3. Adjusting rings 4. Bearing caps



Preloading Differential Case Bearings and Adjusting Bevel Gears Backlash

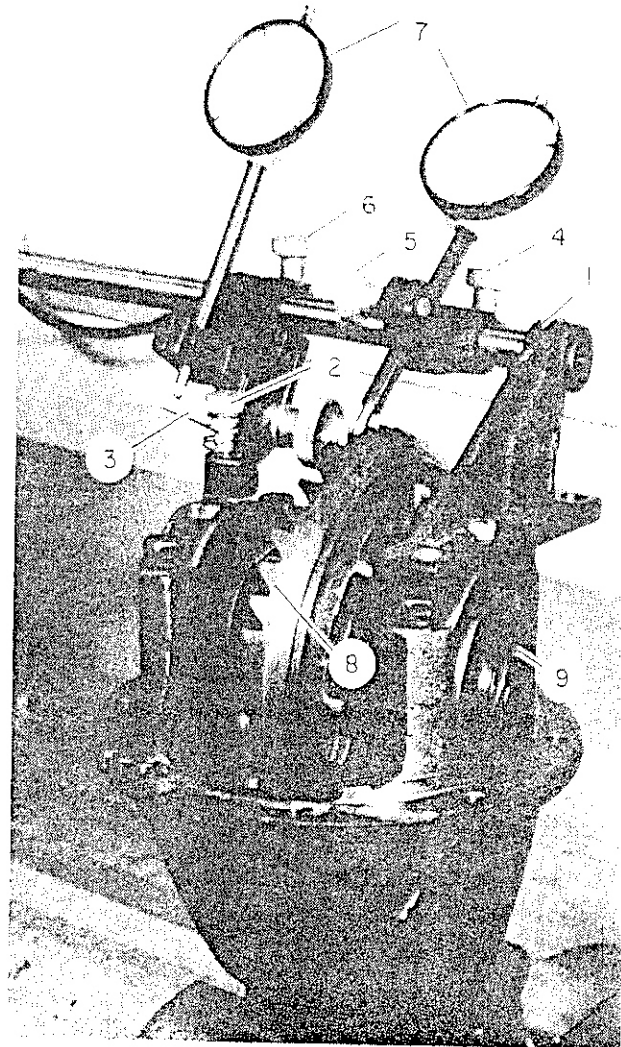
These two operations must be carried out at the same time, using tool A.95688 and wrench A.55025. Install Tool A.95688 (1) into differential carrier locking plate bolt holes with bolt and clamping knob (2).

Move support to bring lever (3) into contact with outer side face of cap, then tighten knob (6).

Unscrew knobs (4) and (5) and adjust support so that plunger of dial indicator (7) bears on side face of one tooth of ring gear (8). Tighten knobs.

Adjust backlash between ring gear and pinion temporarily to .0031 to .0051 in. (.08 to .13 mm) by means of adjusting rings (9). This must be done so that bearings are not preloaded to any extent, the rings must just be in contact with bearings, otherwise the subsequent preloading measurements will be incorrect.

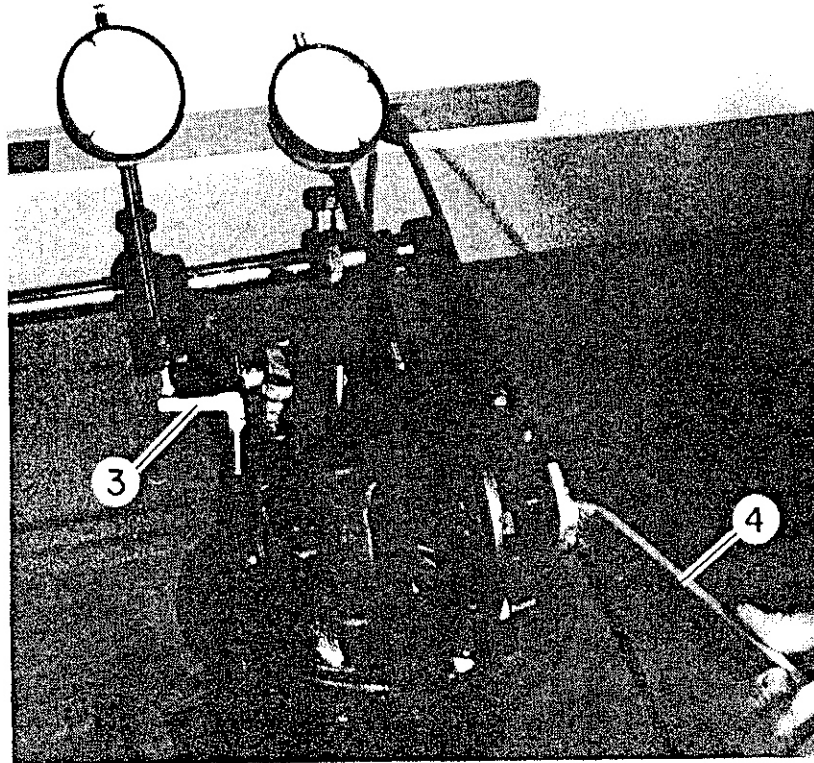
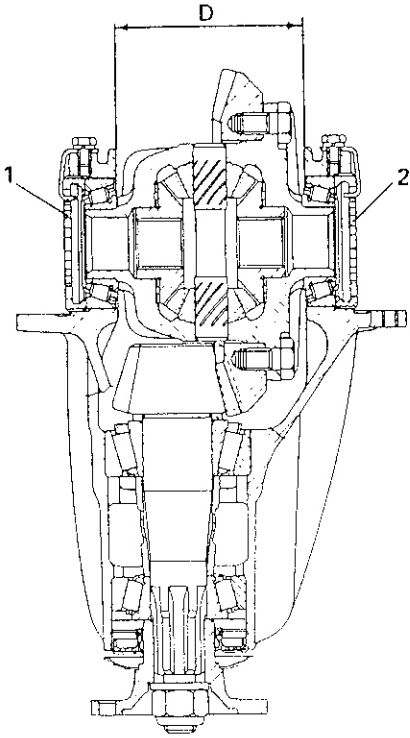
1. Tool A.95688 2. Clamping knob 3. Lever 4, 5, & 6. Adjusting knobs 7. Dial indicator 8. Ring gear 9. Adjusting rings



With wrench A.55025 (4), tighten two bearing adjustment rings (1 and 2) alternately the same number of turns; in this way, differential case caps will be moved slightly apart and distance "D" increased. This increased spacing will be shown by dial indicator thru lever (3).

NOTE: Differential case bearing adjusting rings must be tightened until an increase of .0055 to .0071 in. (0.14 to 0.18 mm) in distance "D" is obtained.

1 & 2. Adjusting rings 3. Lever 4. Wrench A.55085



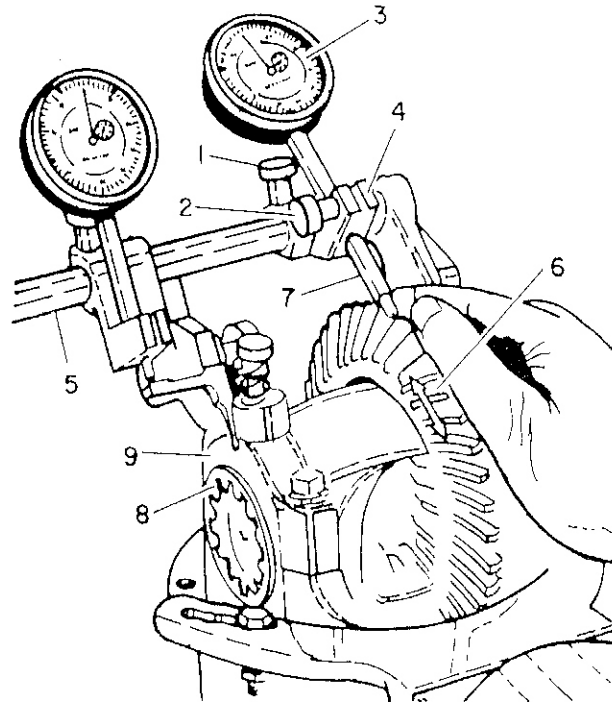
When exact preloading of differential case bearings has been accomplished, make a final check of backlash, .0031 to .0051 in. (.08 to .13 mm) as follows: clamp pinion so that it will not move. Bring teeth into contact, and place dial indicator plunger (7) against flank of one of ring gear (6) teeth. Zero dial indicator (3). Turn ring gear in opposite direction and read amount of movement on dial gauge. It should be between .0031 and .0051 in. (.08 and .13 mm). If it is more or less than this, ring gear must be moved nearer to or farther from pinion by tightening one adjustment ring (8) and slackening the other.

NOTE: It is very important that when one of the rings is turned, the other should be turned the same amount so as not to alter preloading already obtained.

Set dial indicator to zero. After one ring has been tightened, bearing cap (9) spacing will increase and indicator will reflect it. Now slacken other ring until indicator reading returns to zero. Check again on dial indicator that correct backlash has been obtained; if not, repeat operation.

Remove gauges and tool A.75688 (5). Install adjusting ring locking plates and bolts.

NOTE: Adjusting ring locking plates are supplied in two different patterns, with one tooth or two teeth, and are fitted according to final position of rings.



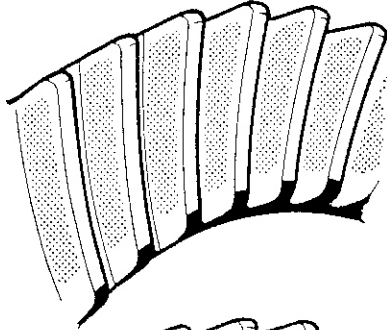
1 & 2. Adjusting knobs 3. Dial indicator 4. Dial indicator support
5. Tool A.95688 6. Ring gear 7. Plunger 8. Adjustment ring
9. Bearing cap

Gear Teeth Pattern Check

Coat ring gear teeth with red lead or prussian blue. Rotate ring gear about 15 turns in each direction while applying a load to drive pinion flange. If pattern is uniformly distributed over both tooth faces, adjustment is correct.

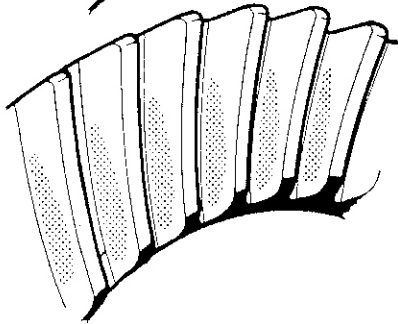
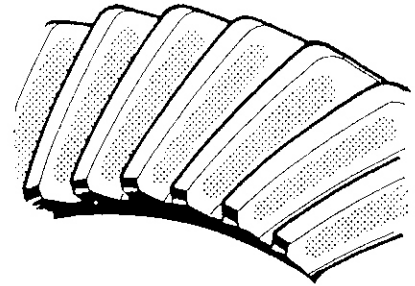
Drive Side

Coast Side



Correct mesh.

The contact pattern is uniformly distributed over both tooth faces, drive and coast.

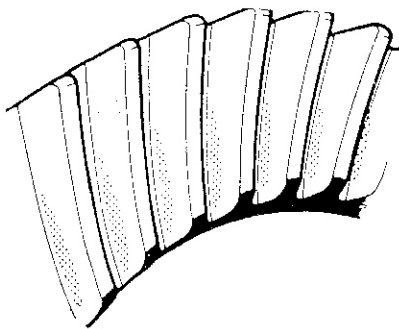
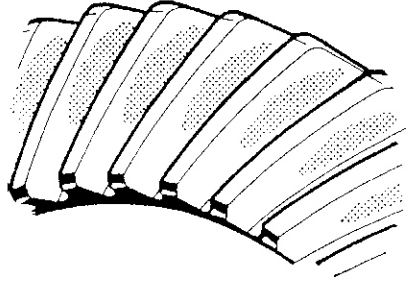


Incorrect mesh.

Drive side: contact on toe of tooth and towards center.

Coast side: contact on heel of tooth and towards center.

Move pinion away from ring gear, using thinner thrust washer.

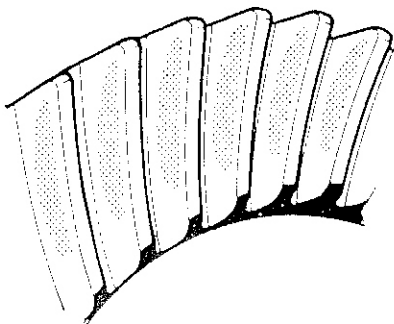
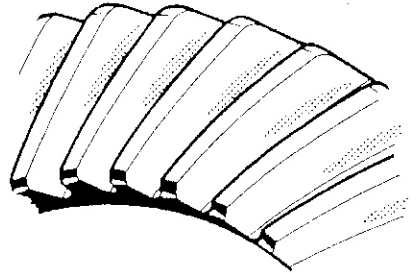


Incorrect mesh.

Drive side: Toe contact, localized at root.

Coast side: Heel contact, localized at root.

Move pinion away from ring gear, using thinner thrust washer.

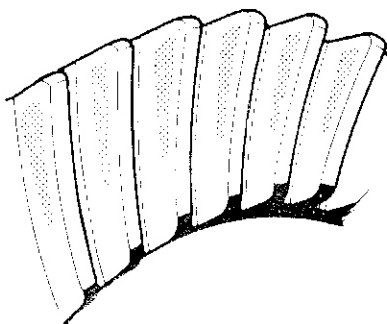
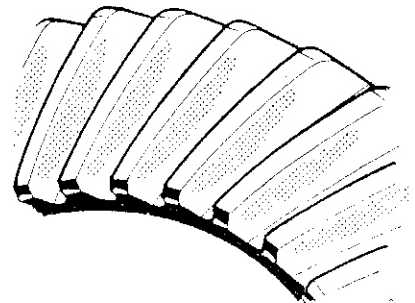


Incorrect mesh.

Drive side: Heel contact, toward center of tooth.

Coast side: Toe contact, towards center of tooth.

Move pinion closer to ring gear, using thicker thrust washer.

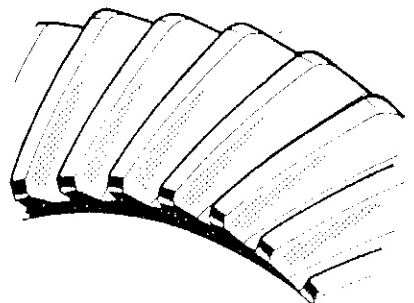


Incorrect mesh.

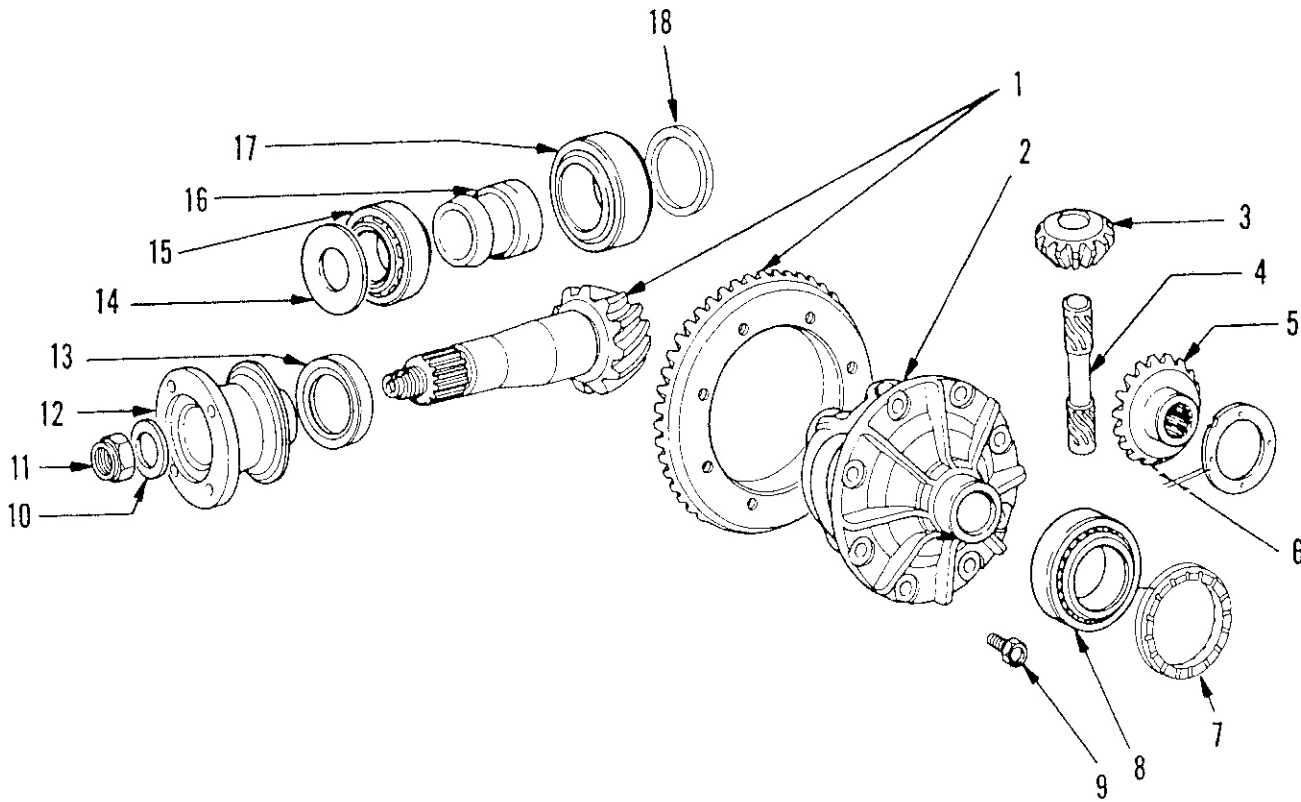
Drive side: Heel contact, localized on crest of tooth.

Coast side: Toe contact, localized on crest of tooth.

Move pinion closer to ring gear, using thicker thrust washer.



DIFFERENTIAL (1978 AND ON)



- | | | |
|--------------------|------------|------------------------|
| 1. Ring and pinion | 7. Shim | 13. Oil seal |
| 2. Carrier | 8. Bearing | 14. Washer |
| 3. Pinion gear | 9. Bolt | 15. Bearing |
| 4. Pinion shaft | 10. Washer | 16. Collapsible spacer |
| 5. Side gear | 11. Nut | 17. Bearing |
| 6. Shim | 12. Flange | 18. Shims |

DIFFERENTIAL ASSEMBLY

DISASSEMBLY

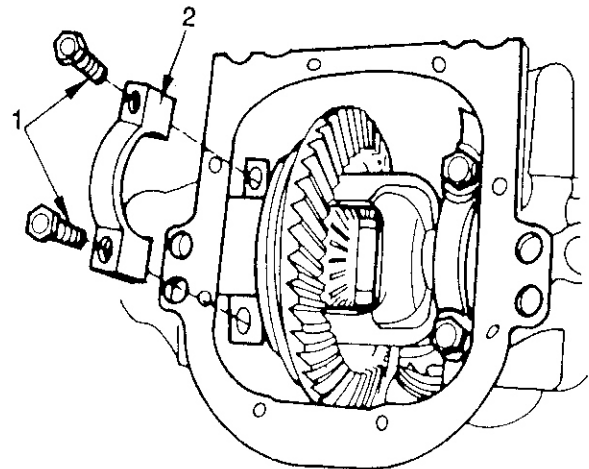
Remove eight bolts and washers holding cover on axle housing.

Before disassembling, the following checks should be made:

- ring gear runout and backlash
- tooth contact pattern.

Remove two bolts (1) and washers holding side bearing caps (2). Note markings on caps and housing. Do not mix caps.

1. Bolts 2. Side bearing cap



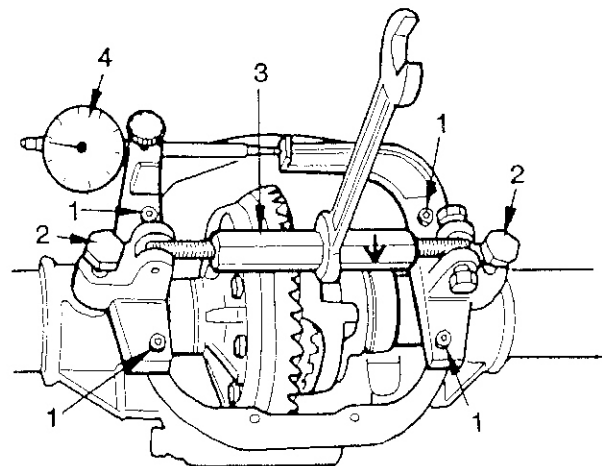
Install differential housing spreader (Kent Moore No. 28294) as follows:

- secure spreader to housing with four bolts (1)
- torque side bolts (2) of tool to 1 kgm (7.23 ft. lbs.)
- calibrate dial indicator (4) by preloading indicator until needle travels half full travel. Set indicator dial to zero at needle.
- rotate turnbuckle (3) in direction of arrow until indicator reads 0.6 to 0.8 mm (0.024 to 0.031 inch).

CAUTION: Spreading case more than 0.8 mm (0.031 inch) could cause permanent distortion.

- return turnbuckle to starting position
- check tightness of anchor bolts and side bolts.

1. Anchor bolts 2. Side bolts 3. Turnbuckle 4. Dial indicator



Reset dial indicator (1) to zero. Rotate turnbuckle (2) until indicator reads 0.6 to 0.8 mm (0.024 to 0.031 inch).

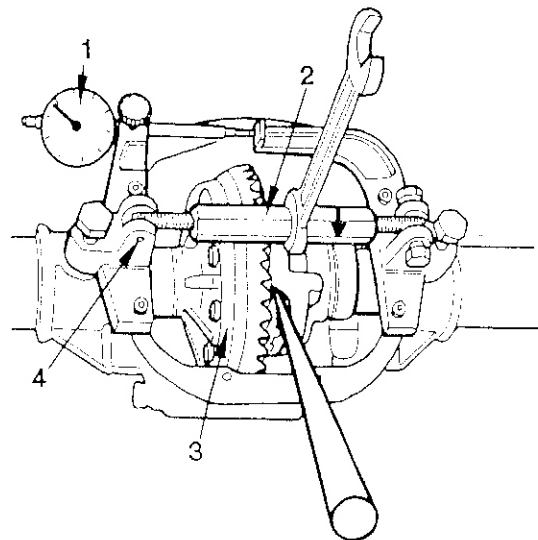
Using a suitable lever, remove differential case (3) from housing.

Loosen turnbuckle to relieve force from housing. Remove turnbuckle bolt (4).

NOTE: Make sure dial indicator returns to zero.

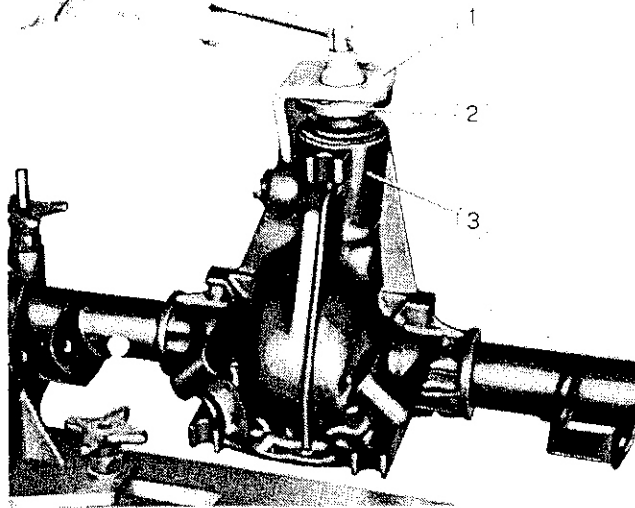
Remove differential case, shims and bearings. Do not mix up adjusting shims and bearings. Keep caps, bearings, and shims of same side together.

1. Dial indicator 2. Turnbuckle 3. Differential case 4. Turnbuckle bolt



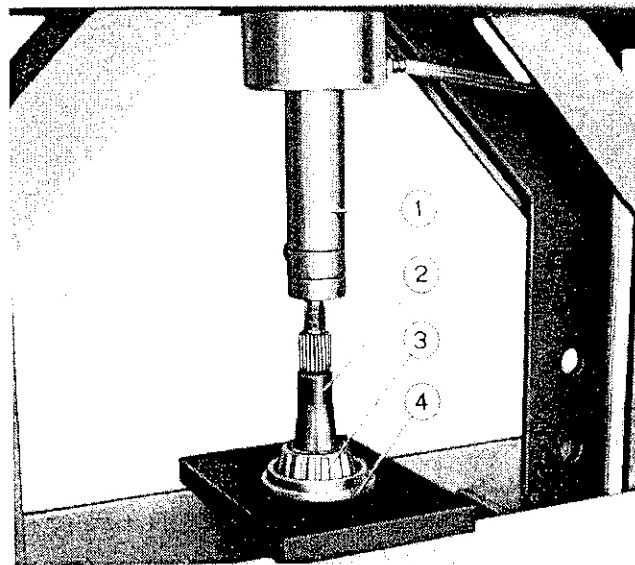
Install holding tool (1) (Kent Moore No. 28115) on pinion flange (2). Remove nut, washer, and flange from pinion shaft. Push drive pinion gear out rear of housing (3). Remove collapsible spacer from pinion.

1. Holding tool 2. Pinion flange 3. Axle housing



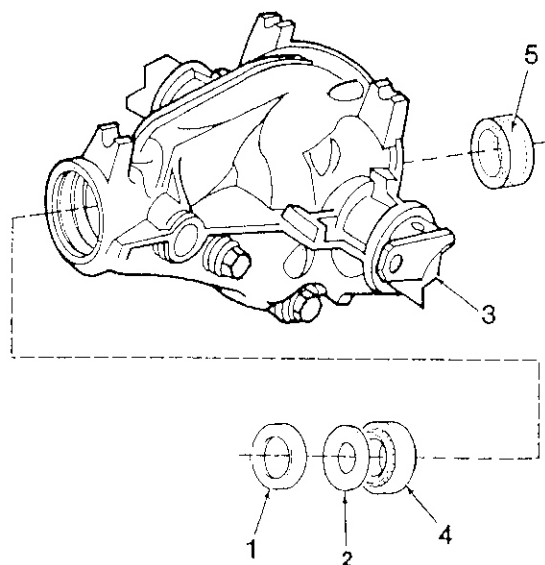
Place drive pinion shaft in press. Press rear bearing (3) off shaft (2). Remove and retain shim from under pinion bearing.

1. Press 2. Pinion shaft 3. Rear bearing 4. Plate



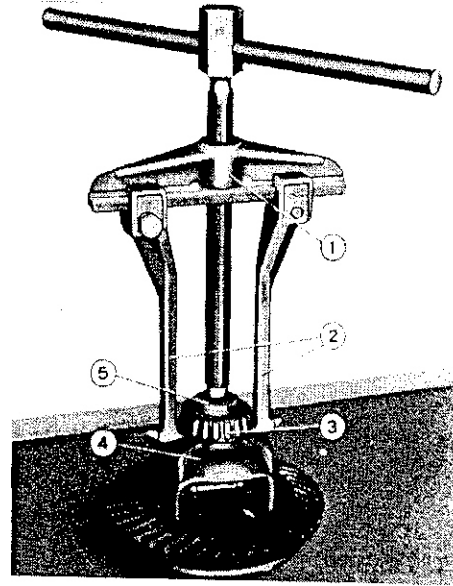
Remove oil seal (1) and dust shield (2) from housing (3). Remove front pinion bearing (4) from housing. Remove rear pinion bearing outer race (5) from housing.

1. Oil seal 2. Dust shield 3. Axle housing 4. Front pinion bearing 5. Rear pinion bearing outer race



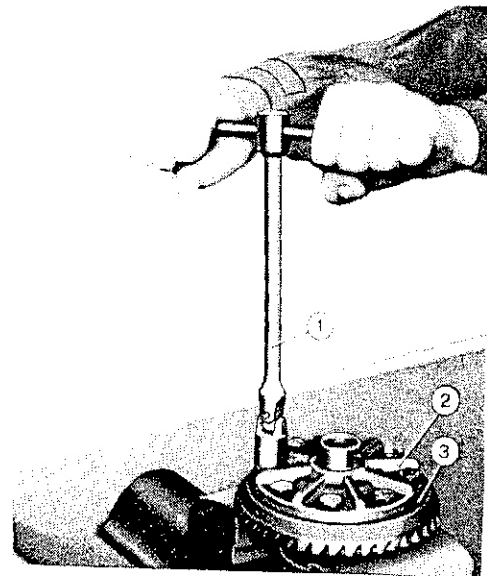
Using a puller, remove side bearings (3) from carrier (4).
Keep bearings with outer race, cap, and shims from same side.
Do not mix bearings and outer races.

1. Puller 2. Puller arms 3. Bearing 4. Carrier 5. Adapter



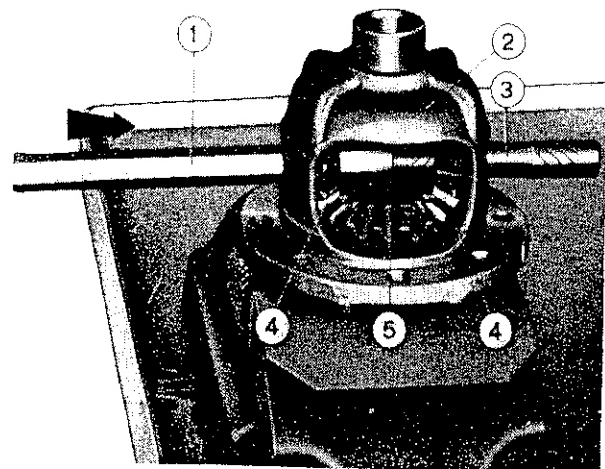
Put locating reference marks on ring gear and carrier.
Remove eight bolts holding ring gear (3) to carrier (2).
NOTE: Drive ring gear from carrier using a soft mallet.

1. Wrench 2. Carrier 3. Ring gear



Using a soft drift, drive pinion gear shaft (3) out of carrier (2).
Remove pinion gears (4), side gears (5) and side gear thrust washers.

1. Soft drift 2. Carrier 3. Pinion gear shaft 4. Pinion gears
5. Side gears



INSPECTION

Wash all parts in a suitable cleaning solvent.

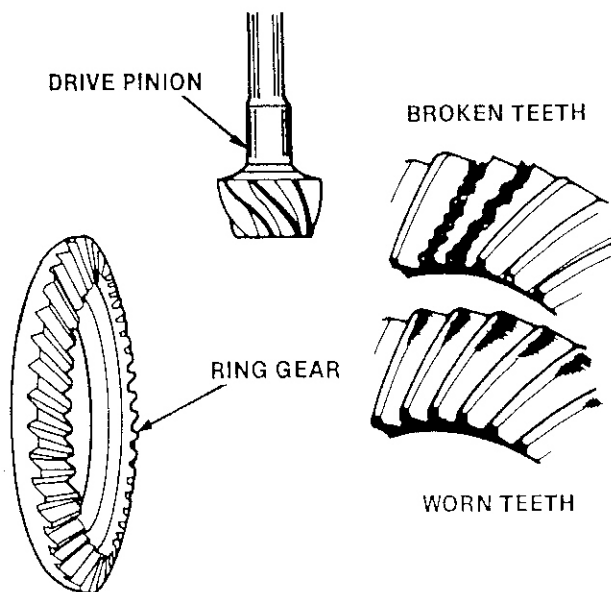
With the exception of the bearings, dry with compressed air.

Gears

Make sure teeth on gears are not excessively worn. Replace as necessary.

Check gears for irregular wear pattern and investigate causes.

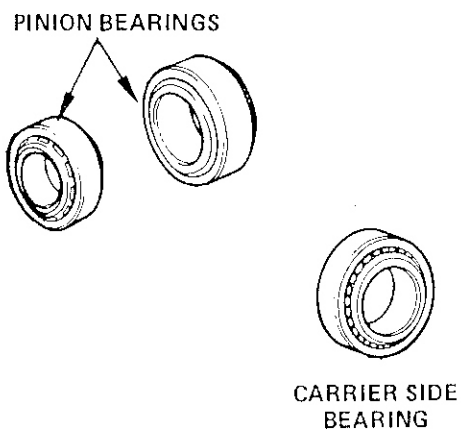
Make sure there are not chipped teeth.



Check bearings for wear or damage.

Determine the cause.

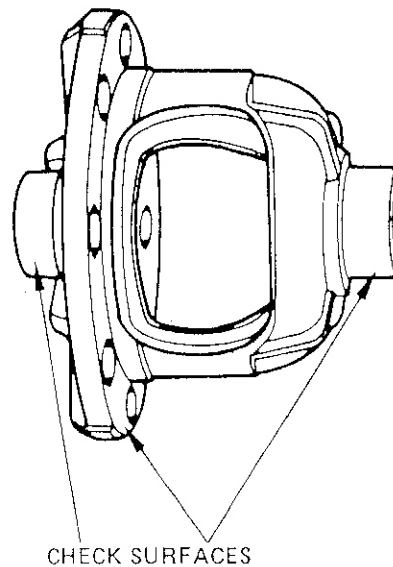
Make all repairs, following recommended procedures.



Check that all machined contact surfaces are smooth and free of any raised edges.

Check for cracks and distortions.

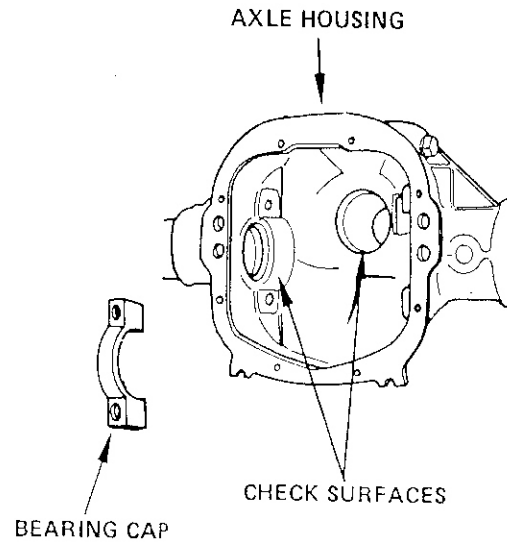
Check thrust washers for damage or excessive wear.



Check that all machined contact surfaces in housing and bearing caps are smooth and free of any raised edges.

Check condition of oil seal contact surfaces on pinion flange.

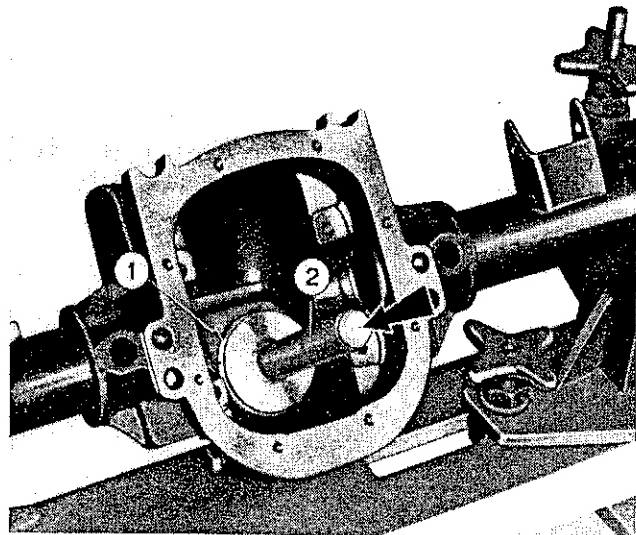
Check for distortions or cracks.



ASSEMBLY

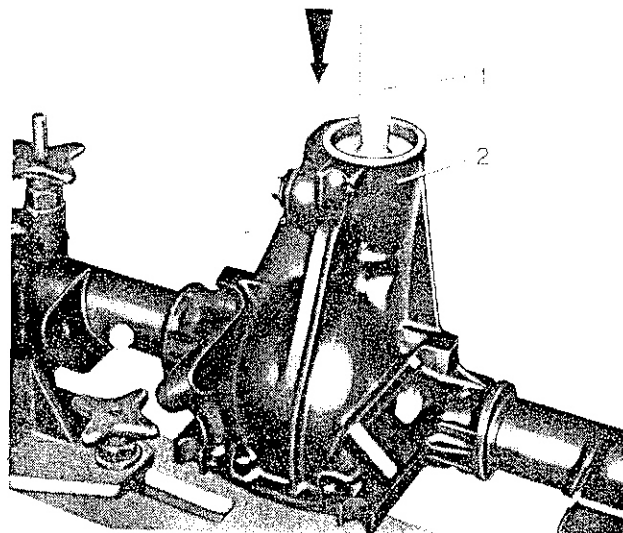
Install outer race (1) for pinion shaft rear bearing in housing. Use installer (Kent Moore No. 28105).

1. Outer race 2. Installer



Install outer race for pinion shaft rear bearing in housing (2). Use installer (Kent Moore No. 28248).

1. Installer 2. Housing

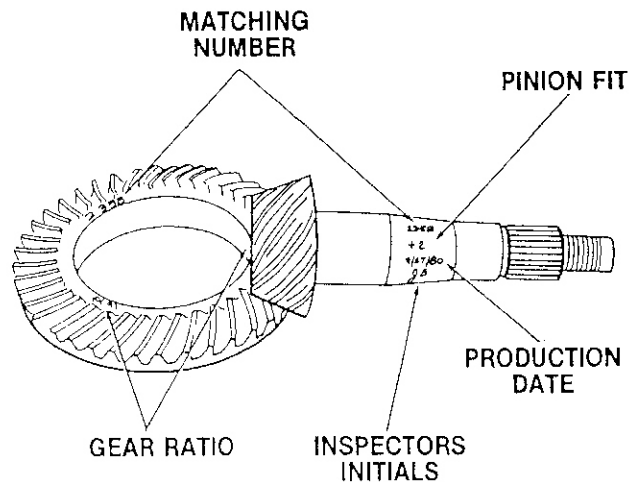


NOTE: Drive pinion and ring gear are supplied in matched pairs; if one is damaged, both must be replaced.

The drive pinion is marked on the shaft with the following:

- production date
- Inspector's initials
- gear ratio — also on ring gear
- production number — same number on ring gear, mating ring gear to pinion
- pinion fit — value in hundreds of mm showing difference between actual and ideal pinion fit.

NOTE: Subtract positive values and add negative values to shim size.



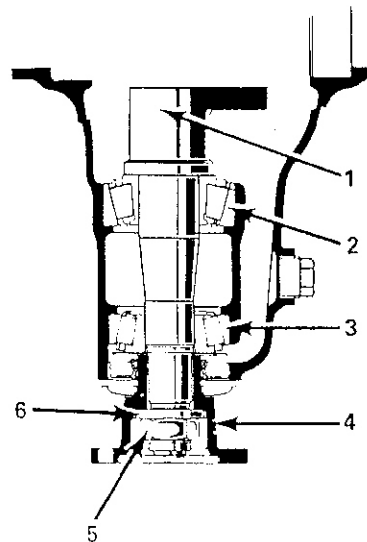
Calculating Pinion Depth

Install dummy pinion (1) (Kent Moore No. 28249) with bearings (2 and 3).

Install flange (4), flatwasher (6), and nut (5).

Tighten nut. Rotate dummy pinion a few times to seat bearings and retighten nut.

1. Dummy pinion 2. Bearing 3. Bearing 4. Drive flange 5. Nut
6. Flat washer



Zero dial indicator on a flat surface.

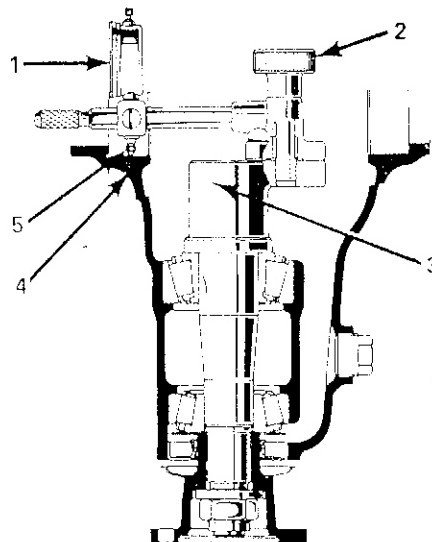
Install dial indicator (1) (Kent Moore No. 28193) on dummy pinion (3) with plunger (5) on carrier bearing seat (4). Tighten knurled bolt (2).

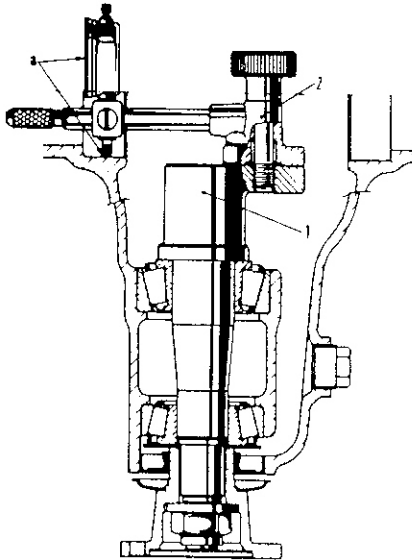
Note reading on dial indicator.

Note markings on new drive pinion.

Determine size of shim necessary to obtain proper pinion depth as shown on next page.

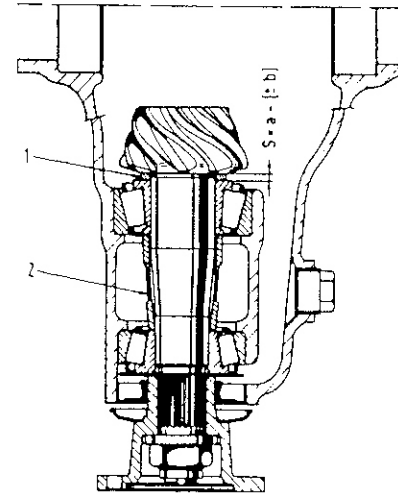
1. Dial indicator 2. Knurled bolt 3. Dummy pinion 4. Carrier bearing seat 5. Plunger





1. Dummy pinion 2. Dial indicator

a = Dial indicator reading from which factory marking on pinion must be subtracted.



1. Rear pinion bearing shim 2. Collapsible spacer

s = Thickness of rear pinion bearing mounting shim.
 a = Dial indicator reading.
 b = Factory marking on pinion.

HOW TO DETERMINE THICKNESS OF REAR PINION BEARING SHIM

If (a) is dial indicator reading and (b) factory marking (in hundredths of a millimeter), thickness (S) of shim is determined as follows:

$$S = a - (+b) = a - b$$

$$\text{or } S = a - (-b) = a + b$$

in other words

- If factory marking on pinion is preceded by PLUS (+), subtract this number from dial indicator reading to obtain shim thickness.
- If factory marking on pinion is preceded by MINUS (-), add this number to dial indicator reading to obtain shim thickness.

Example:

If a = 2.90 (indicator reading)
 and b = -5 (marking on pinion)
 then $S = a - (-b)$
 $S = 2.90 - (-0.05)$
 $S = 2.90 + 0.05$
 $S = 2.95$

In this case a shim 2.95 mm thick must be used.

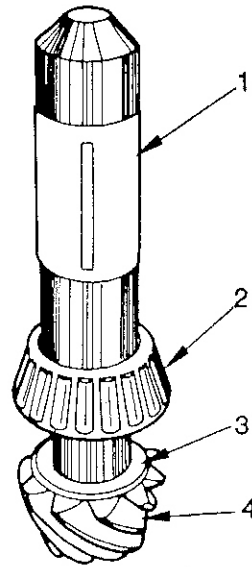
NOTE: Shims are available from 2.55 mm to 3.35 mm in graduations of 0.5 mm.

Place shim (3) previously calculated on pinion (4).

NOTE: If original ring and pinion gears will be used for reassembly, and ring to drive pinion gear tooth contact pattern is satisfactory, use original shims.

Install inner race (2) of pinion bearing on pinion. Use drift (Kent Moore No. 28101).

1. Drift 2. Pinion bearing inner race 3. Shim 4. Drive pinion

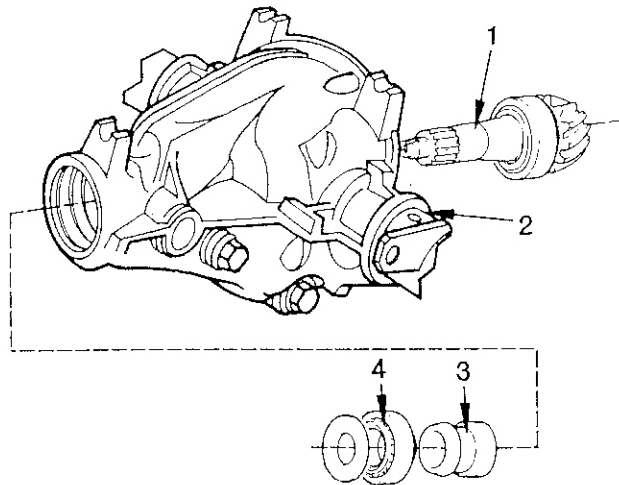


Pinion Installation

Lubricate the bearings with oil.

Place pinion (1) in housing (2). Install collapsible spacer (3), bearing (4), and plate on drive pinion.

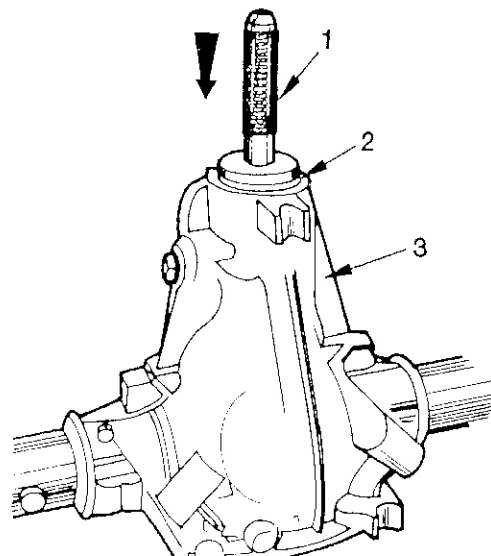
1. Pinion 2. Housing 3. Collapsible spacer 4. Bearing



Hold drive pinion in housing.

Place oil seal on housing and install with tool (1) (Kent Moore No. J28252).

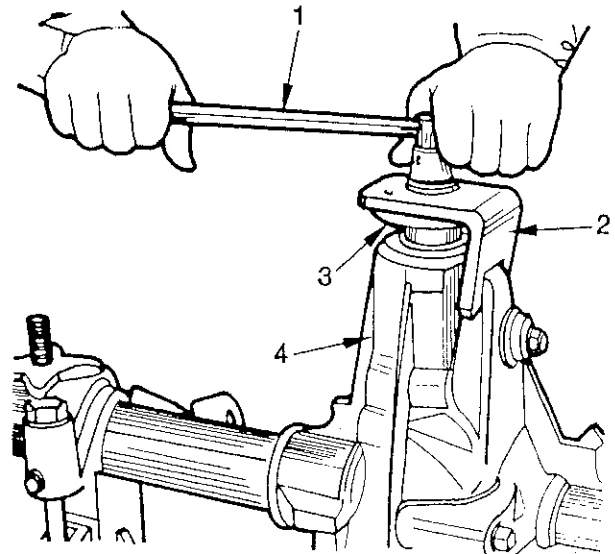
1. Tool 2. Oil seal 3. Housing



Install flange (3), washer, and nut on pinion shaft.

Install holding tool (2) on pinion flange (3). Tighten nut down gradually and check rolling torque of pinion.

1. Wrench 2. Holding tool 3. Pinion flange 4. Housing

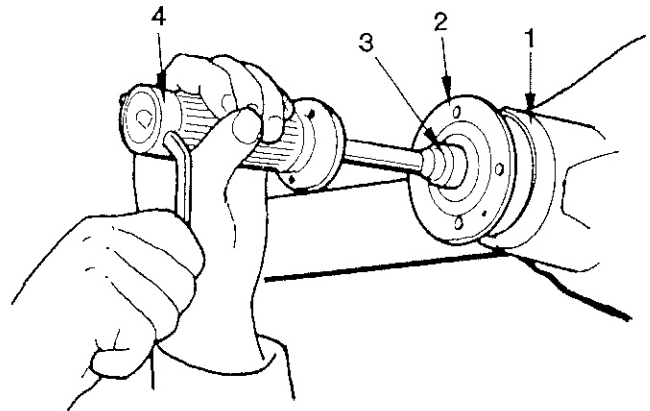


The nut is tightened sufficiently when the rolling torque of the pinion is 14 to 17 in. lbs. (16 to 20 kgcm).

NOTE: If rolling torque is exceeded, start procedure over using a new collapsible spacer. Do not loosen nut to obtain preload.

Using a punch, burr collar of nut securing flange of drive pinion.

1. Housing 2. Pinion flange 3. Socket 4. Rolling torque wrench (Kent Moore No. 28194)



Differential Carrier Assembly

Place thrust washers under side gears (2). Install side gears (2) in carrier (1).

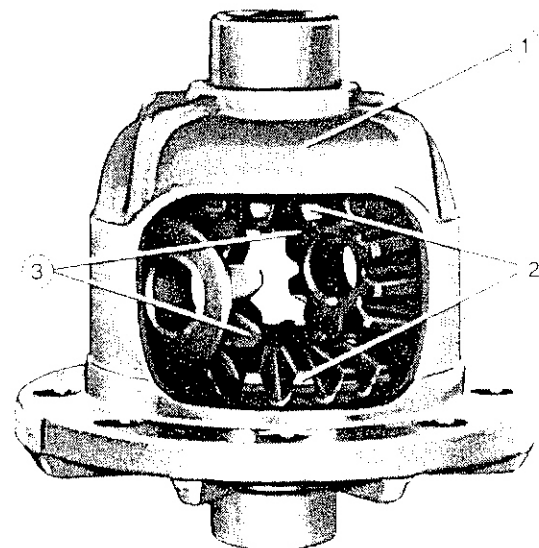
Mesh pinion gears (3) with side gears. Rotate pinion gears on side gears until aligned with hole in carrier. Install pinion shaft.

Block one side gear and check rolling torque on other side gear. Use rolling torque wrench (Kent Moore No. 28194).

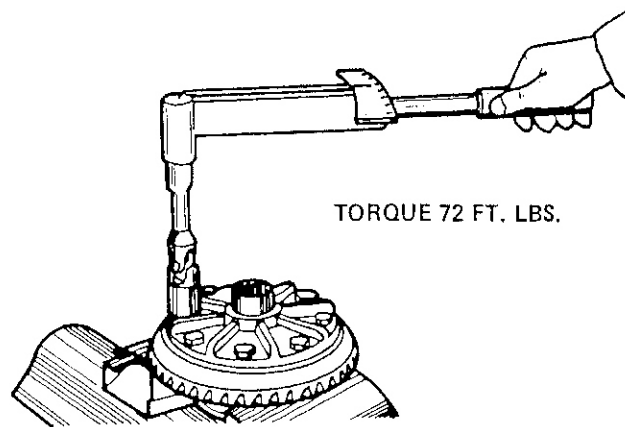
Rolling torque = 22 to 36 ft. lbs. (3 to 5 kgm).

If torque is not within specifications, install new thrust washers.

1. Carrier 2. Side gears 3. Pinion gears



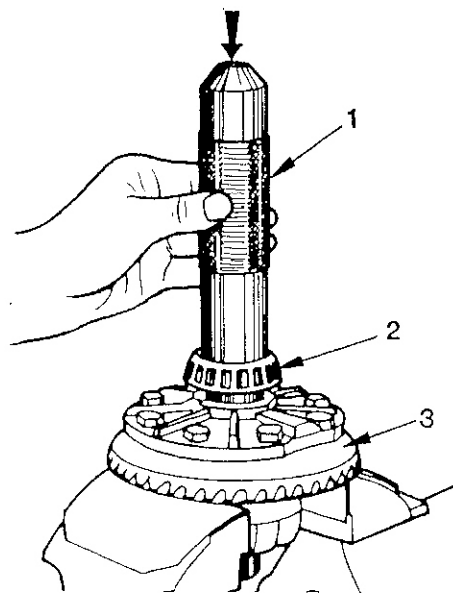
Align reference mark on ring gear with mark on carrier. Install eight bolts through carrier into ring gear. Torque bolts to 72 ft. lbs. (10 kgm).



Press side bearings (2) onto carrier (3) using installer (Kent Moore No. 28101).

If using old bearings, make sure they are installed on same side from which they were removed.

1. Installer 2. Bearing 3. Carrier



Reinstall carrier into housing. Make sure side bearing outer races are seated.

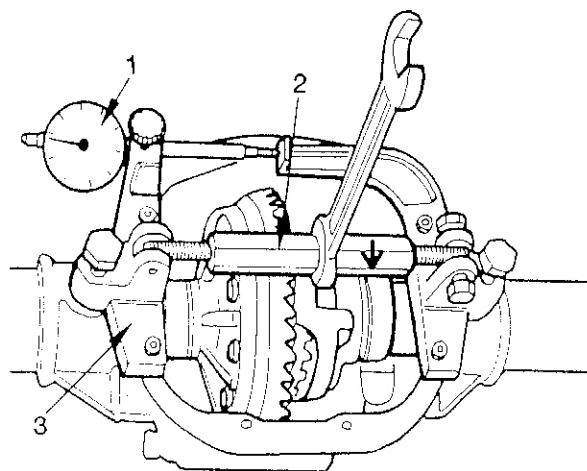
Reinstall turnbuckle (2) in spreader (3).

Calibrate dial indicator (1) by

- preloading indicator until needle travels 1/2 full travel
- set indicator dial to zero at needle.

Rotate turnbuckle (2) to spread housing 0.6 to 0.8 mm (0.024 to 0.031 inch) to facilitate side shim adjustment.

1. Dial indicator 2. Turnbuckle 3. Differential spreader



Shim Selection

Use original shims if:

- Incorrect backlash or gear wear pattern was not a problem
- Old side bearings and races are reused.
- Shims, side bearings and races were kept separate during removal and can be installed on same side from which they were removed.

Select new shims if:

- Wear pattern indicates incorrect backlash.
- New side bearings were used.
- Shims were mixed up during disassembly.

Make sure side bearing outer races are seated properly.

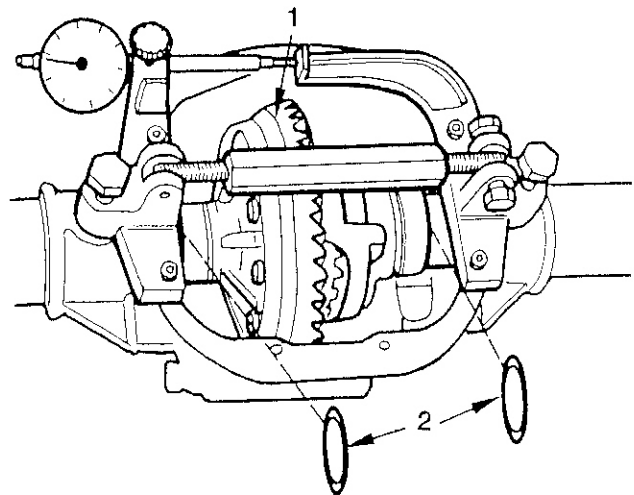
Move ring gear (1) against drive pinion to obtain zero backlash.

Fit largest shim (2) on ring gear side that will just take up clearance.

Install shim (2) on opposite side to take up clearance plus desired preload.

NOTE: This is only a starting point. Shim sizes may have to be changed to obtain desired preload and backlash.

1. Ring gear 2. Shim

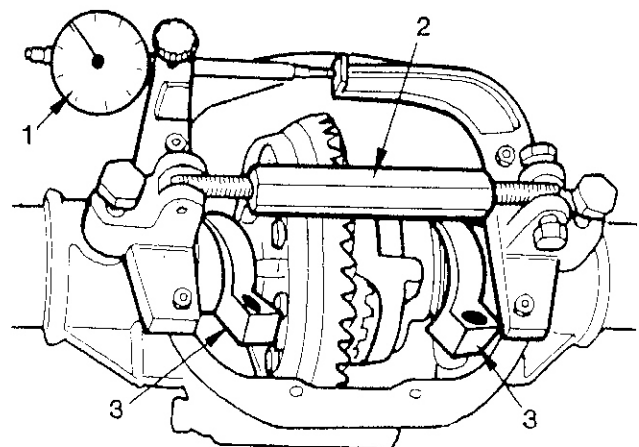


Loosen turnbuckle to the rest position. Check that dial indicator reading is 0.10 mm (0.004 inch). This is the bearing preload.

If necessary, adjust shims to obtain correct preload.

Install side bearing caps on same side from which they were removed. Torque bolts to 36 ft. lbs. (5 kgm).

1. Dial indicator 2. Turnbuckle 3. Side bearing caps



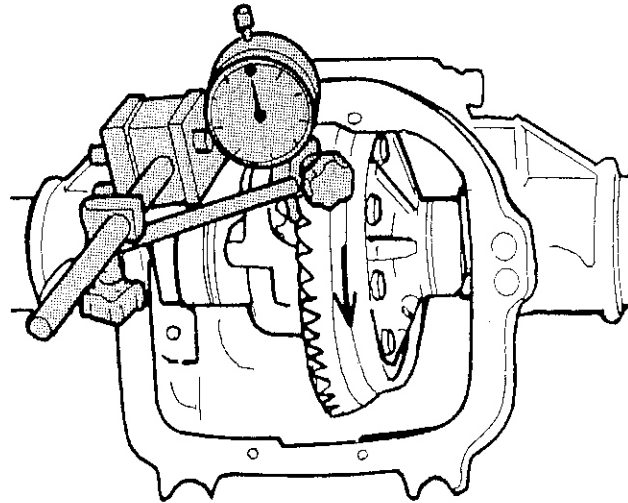
NOTE: Correct backlash is required for normal gear life and quiet operation.

Make sure bearing preload is adjusted correctly and caps are installed.

Install holding tool on pinion flange to block it from turning.

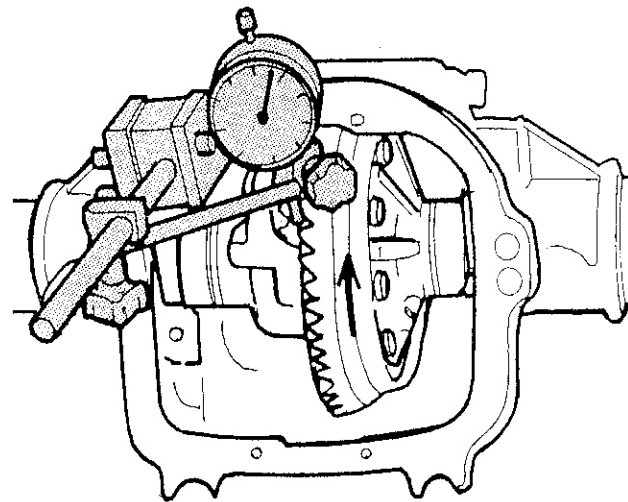
Mount dial indicator on housing with plunger contacting ring gear at right angle to teeth.

Rotate ring gear in one direction as far as it will go. Preload indicator until needle travels half full travel. Set indicator dial to zero at needle.



Rotate ring gear in other direction as far as it will go and read indicator. Backlash reading = 0.08 to 0.13 mm (0.003 to 0.005 inch).

Repeat check at two more different points on the ring gear circumference.

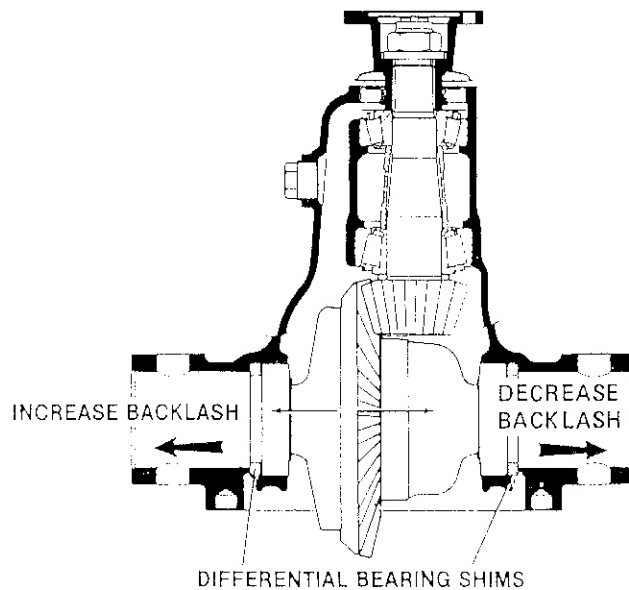


Adjust backlash by changing the size of the shims.

– To increase backlash, increase the size of the shim on pinion side of carrier and decrease size of shim on ring gear side.

– To decrease backlash, increase size of shim on ring gear side and decrease size of shim on pinion side.

CAUTION: Make sure you increase one side and decrease other side the same amount to maintain preload.



TOOTH CONTACT PATTERN CHECK

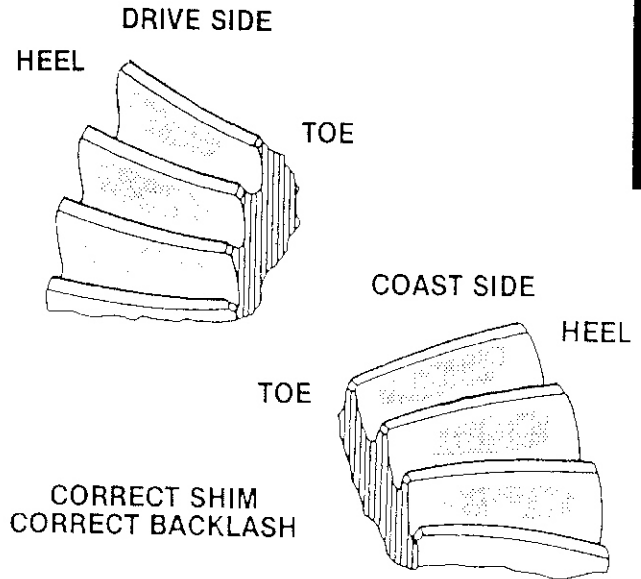
Coat ring gear teeth with red lead or Prussian blue.

Rotate ring gear about 15 turns in each direction while applying a load to the drive pinion flange.

If pattern is uniformly distributed over both tooth faces, the adjustment is correct.

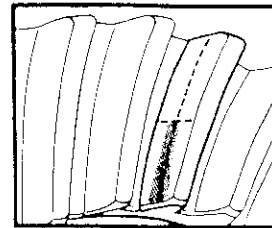
If readjustment is necessary, move ring gear or pinion in small amounts. Before rechecking the pattern, be sure

- bearings are properly preloaded
- cap bolts are torqued
- backlash is correct.



Toe Contact

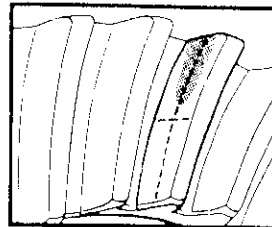
Too little backlash. Move ring gear away from pinion to increase backlash.



TOE CONTACT
INCREASE BACKLASH

Heel Contact

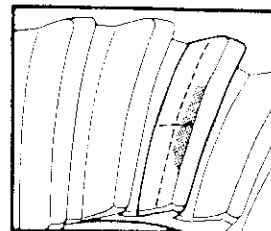
Too much backlash. Move ring gear toward pinion to decrease backlash.



HEEL CONTACT
DECREASE BACKLASH

High Face Contact

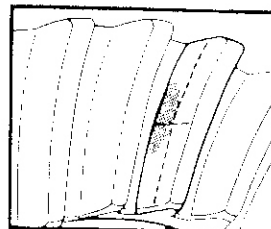
Pinion too far from ring gear. Increase pinion shim to move pinion toward ring gear.



HIGH FACE CONTACT
INCREASE PINION SHIM

Low Flank Contact

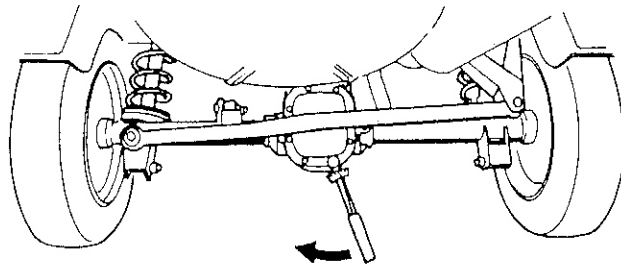
Pinion too close to ring gear. Decrease pinion shim to move pinion away from ring gear.



LOW FLANK CONTACT
DECREASE PINION SHIM

Install new gasket and cover. Torque cover bolts to 18 ft. lbs. (2.5 kgm).

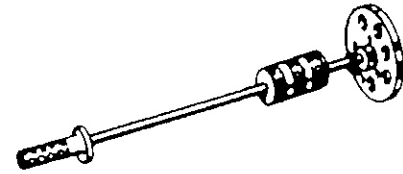
Fill differential with hypoid gear oil, SAE 80 W/90 EP to MIL-L-2105B (1.4 quarts).



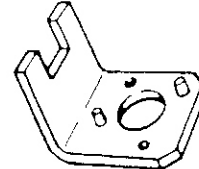
TORQUE 18 FT. LBS.

NOTE: Number given in parentheses is Kent Moore catalogue number.

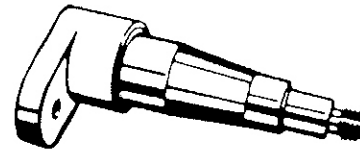
A.47017 (J28010) Axle puller



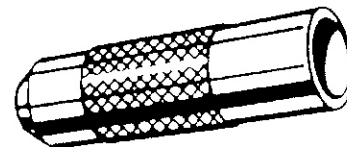
A.70341 (J28115) Pinion flange holding tool



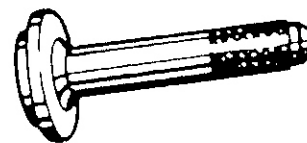
A.70184 (J28106) Dummy pinion



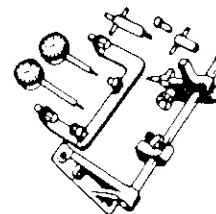
A.70152 (J28101) Side bearing and rear pinion bearing installer



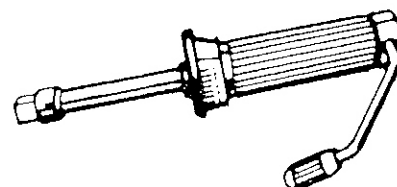
A.70171 (J28105) Rear pinion bearing outer race installer



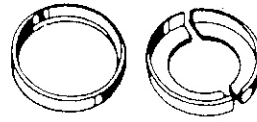
A.95688 (J28192) Pinion height and side bearing preload gage set



A.95697 (J28194) Dynamometer (rolling torque wrench)



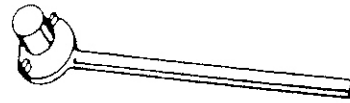
A.45008 (J28005) Rear pinion bearing remover



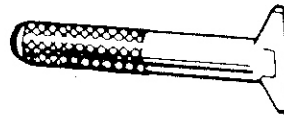
A.45028 (J28007) Side bearing puller pilot



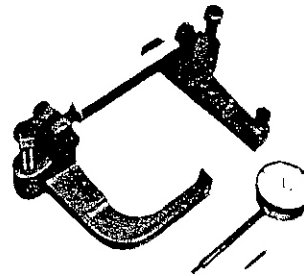
A.55015 (J28041) Side bearing lockring adjusting wrench



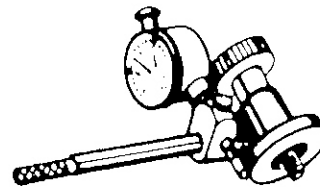
A.70198 (J28107) Pinion bearing outer race remover



A.95753 (J28294) Differential housing spreader



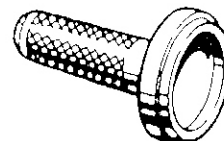
A.95690 (J28193) Dial indicator



A.81114 (J28148) Snap ring pliers



A.70157 (J28252) Axle housing seal installer



A.70185 (J28248) Pinion bearing outer race installer

