REAR AXLE

CONTENTS

E27AA--

<2WD>

SPECIFICATIONS 2
- General Specifications 2
- Service Specifications 2

SERVICE ADJUSTMENT PROCEDURES 2
- Wheel Bearing End Play Check 2
- Rear Hub Rotary-Sliding Resistance (Torque) Check 3

REAR AXLE HUB 4

<4WD>

SPECIFICATIONS 6
- General Specifications 6
- Service Specifications 7
- Lubricants 7
- Sealants and Adhesives 7

SPECIAL TOOLS 8

SERVICE ADJUSTMENT PROCEDURES 12
- Rear Axle Total Backlash Check 12
- Gear Oil Level Check 12
- Wheel Bearing End Play Check 12
- Limited Slip Differential Condition Check (VCU type) 13
- Replacement of Differential Carrier Oil Seal 13

REAR AXLE HUB 14

DRIVE SHAFT 17

DIFFERENTIAL CARRIER 24

LSD CASE ASSEMBLY 42

REAR AXLE <2WD>

SPECIFICATIONS

GENERAL SPECIFICATIONS

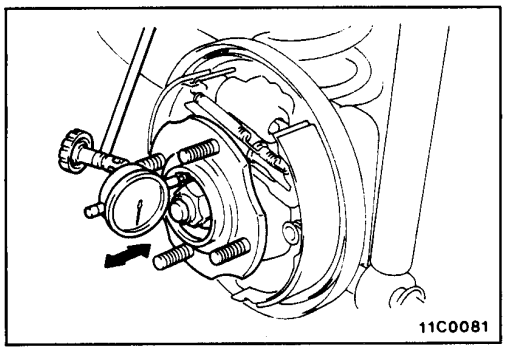
E27CA-1

Items	Specifications
Wheel bearing Type	Unit ball bearing

SERVICE SPECIFICATIONS

E27CB-1

Items		Specifications
Standard value		
Clearance of the rear speed sensor's pole piece and rotor	mm (in.)	0.2–0.7 (0.008–0.028)
Limit		
Wheel bearing end play	mm (in.)	0.05 (0.0020)
Wheel bearing rotary-sliding resistance	N (kg, lbs.)	18 (1.8, 4) or less
Wheel bearing rotary-sliding torque	Nm (kgcm, ft.lbs.)	1.0 (10, 0.72) or less



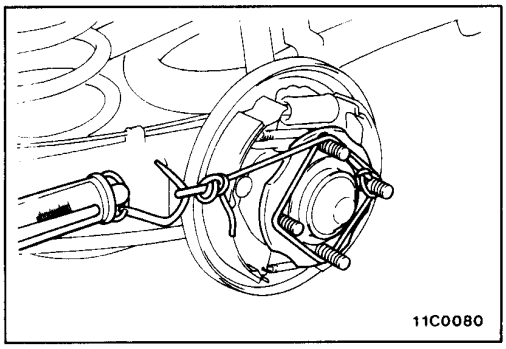
SERVICE ADJUSTMENT PROCEDURES

WHEEL BEARING END PLAY CHECK

E27FHAD

1. Remove the hub cap and then release the parking brake.
2. Remove the brake drum.
3. For vehicles with ABS, remove the caliper assembly and the brake disc.
4. Check the bearing's end play.
   Place a dial gauge against the hub surface; then move the hub in the axial direction and check whether or not there is end play.

   Limit: 0.05 mm (0.0020 in.)
5. If the end play exceeds the limit, the lock nut should be tightened to the specified torque and check the end play again.
6. Replace the rear hub bearing unit if an adjustment cannot be made to within the limit.



REAR HUB ROTARY-SLIDING RESISTANCE (TORQUE) CHECK

E27FMAC

1. Release the parking brake.
2. Remove the brake drum.
3. For Vehicles with ABS, remove the caliper assembly and the brake disc.
4. After turning the hub a few times to seat the bearing, attach a spring balance to the hub bolt, and, pulling at a 90° angle from the hub bolt, measure to determine whether or not the rotary-sliding resistance of the rear hub (the rotary-sliding torque of the rear hub) is the limit value.

   Limit:

   Rear hub rotary-sliding resistance
   18 N (1.8 kg, 4 lbs.) or less
   Rear hub rotary-sliding torque
   1.0 Nm (10 kgcm, 0.72 ft.lbs.) or less

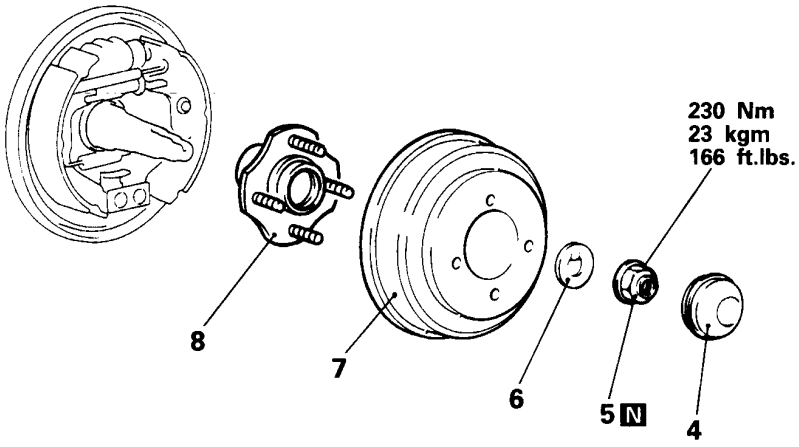
5. If the limit value is exceeded, loosen the nut and then tighten it to the specified torque, and check the rear hub rotary sliding torque again.
6. Replace the rear hub bearing unit if an adjustment cannot be made to within the limit.

REAR AXLE HUB

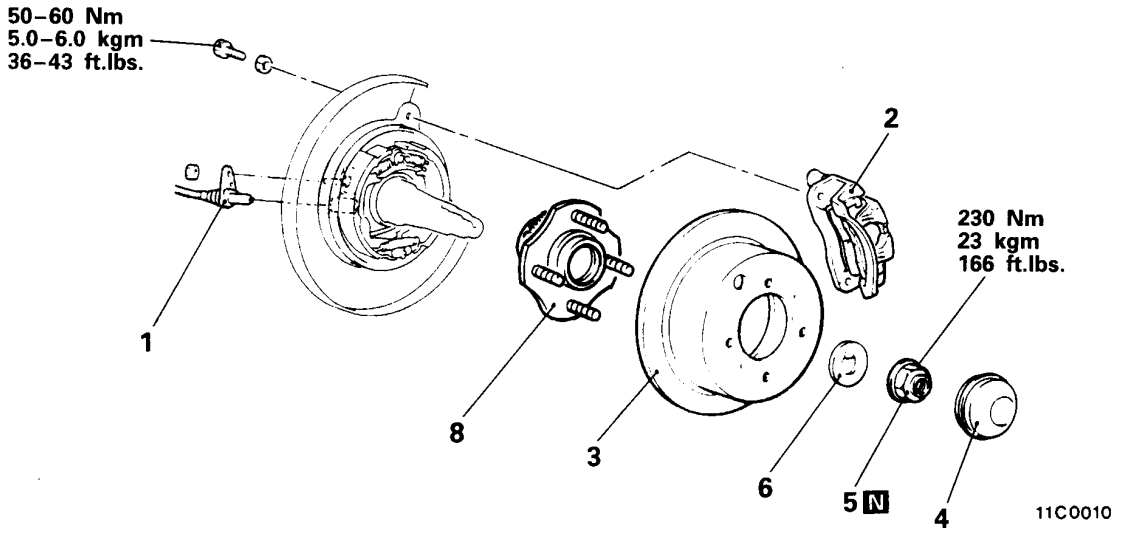
REMOVAL AND INSTALLATION

E27GA-1

<Vehicles without ABS>



<Vehicles with ABS>



Removal steps

- 1. Rear speed sensor
- 2. Caliper assembly
- 3. Brake disc

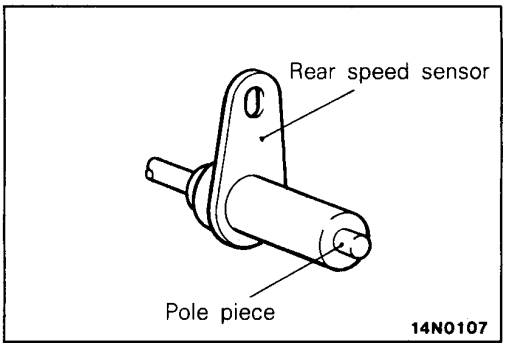
} <Vehicles with ABS>

- 4. Hub cap
- 5. Flange nut
- 6. Tongued washer
- 7. Brake drum <Vehicles without ABS>
- 8. Rear hub assembly

Caution

The rear hub unit bearing should not be dismantled.

Care must be taken not to scratch or otherwise damage the teeth of the rotor. The rotor must never be dropped. If the teeth of the rotor are chipped, resulting in a deformation of the rotor, it will not be able to accurately detect the wheel rotation speed, and the system will not function normally.



SERVICE POINTS OF REMOVAL E27GBAH

1. REMOVAL OF REAR SPEED SENSOR <VEHICLES WITH ABS>

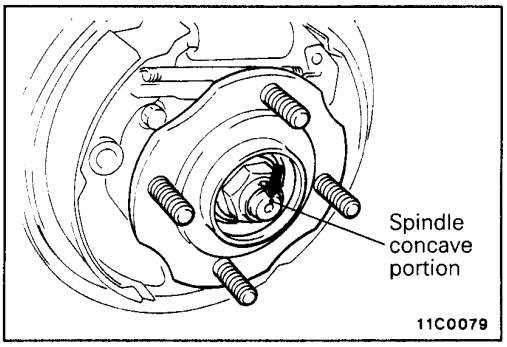
Caution
When removing the speed sensor from the adapter, be careful that the end pole piece does not strike the teeth of the rotor or other parts.

2. REMOVAL OF CALIPER ASSEMBLY <VEHICLES WITH ABS>

Remove the caliper assembly and suspend it.

INSPECTION E27GCAD

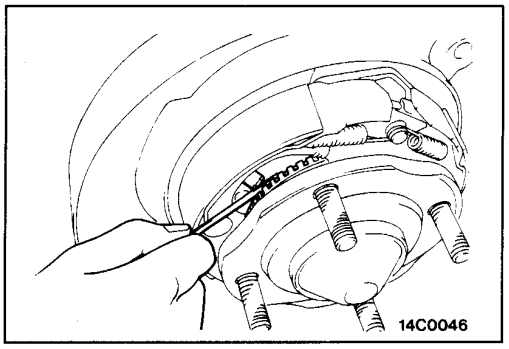
- Check the oil seal for crack or damage.
- Check the rear hub unit bearing for wear or damage.
- Check the rear rotor for chipped teeth.



SERVICE POINTS OF INSTALLATION E27GDAH

5. INSTALLATION OF FLANGE NUT

After tightening the flange nut, crimp the nut to meet the concave portion of the spindle.



1. INSTALLATION OF REAR SPEED SENSOR <VEHICLES WITH ABS>

Insert a thickness gauge into the space between the speed sensor's pole piece and the rotor's toothed surface, and then tighten the speed sensors at the position where the clearance at all places is within the standard value.

Standard value: 0.2–0.7 mm (0.008–0.028 in.)

REAR AXLE <4WD>

SPECIFICATIONS

GENERAL SPECIFICATIONS

Axle, Drive Shaft

E27CA--2

Items			Specifications
Rear axle supporting method			Semi-floating type
Wheel bearing	Type		Double-row angular contact ball bearing
	O.D. × I.D. mm (in.)		70 × 40 (2.76 × 1.57)
Drive shaft	Joint type	Outer	B.J.
		Inner	D.O.J.
	Length (joint to joint) mm (in.)		498 (19.60) vehicles without A.B.S. 473 (18.62) vehicles with A.B.S.

Differential

Items		Conventional differential		Viscous coupling type limited slip differential	
		M/T	A/T	M/T	A/T
Reduction gear type (size)		Hypoid gear (No. 3.8)	Hypoid gear (No. 4.2)	Hypoid gear (No. 3.8)	Hypoid gear (No. 4.2)
Reduction ratio		2.846	3.545	2.846	3.545
Differential gear type (Type × number of gears)	Side gear	Straight bevel gear × 2	Straight bevel gear × 2	Straight bevel gear × 2*	Straight bevel gear × 2*
	Pinion gear	Straight bevel gear × 2	Straight bevel gear × 2	Straight bevel gear × 4	Straight bevel gear × 4
Number of teeth	Drive gear	37	39	37	39
	Drive pinion	13	11	13	11
	Side gear	14	14	16	16
	Pinion gear	10	10	10	10
Bearing (outside diameter × inside diameter) mm (in.)	Side	72 × 35 (2.83 × 1.38)		72 × 35 (2.83 × 1.38)	
	Front	62 × 25 (2.44 × 0.98)		62 × 25 (2.44 × 0.98)	
	Rear	72 × 35 (2.83 × 1.38)		72 × 35 (2.83 × 1.38)	

NOTE
*: Left side gears are incorporated with the viscous coupling

SERVICE SPECIFICATIONS

E27CB-2

Items		Specifications
Standard value		
Setting of D.O.J. boot length	mm (in.)	75±3 (2.95±0.23)
Final drive gear backlash	mm (in.)	0.11–0.16 (0.004–0.006)
Differential gear backlash <Conventional type>	mm (in.)	0–0.076 (0–0.003)
Drive pinion turning torque	Nm (kgcm, in.lbs.)	
Without oil seal	New bearing	0.9–1.2 (9.0–12.0, 8–10)*1
	New/reused bearing	0.4–0.5 (4.0–5.0, 3–4)*2
With oil seal	New bearing	1.0–1.3 (10.0–13.0, 9–11)*1
	New/reused bearing	0.5–0.6 (5.0–6.0, 4–5)*2
Differential gear backlash <VCU type>	mm (in.)	0.03–0.09 (0.0012–0.0035)
Limit		
Rear axle total backlash	mm (in.)	5 (0.2)
Rear wheel bearing axial play	mm (in.)	0.05 (0.002)
Wheel bearing starting torque	Nm (kgcm, in.lbs.)	1.1 (10.5, 9) or less
Differential gear backlash <Conventional type>	mm (in.)	0.2 (0.008)

NOTE
(1) *1 When replacing with a new bearing (with rust-prevention oil)
(2) *2 When using a new bearing or when reusing (oil application)

LUBRICANTS

E27CD--

Items	Specified lubricant	Quantity
Rear axle gear oil	Hypoid gear oil SAE No. 90 conforming to API classification GL-5 or higher	0.7 dm^3 (0.74 U.S.qt., 0.62 Imp.qt.)
D.O.J. boot grease	Repair kit grease	85 g (3.0 oz)
B.J. boot grease	Repair kit grease	75 g (2.6 oz) <Vehicles without ABS> 125 g (4.4 oz) <Vehicles with ABS>

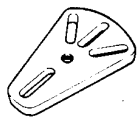
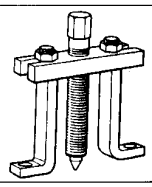
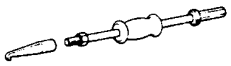
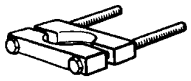
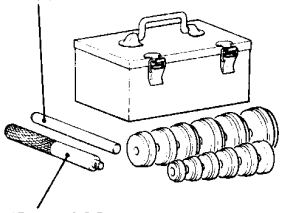
SEALANTS AND ADHESIVES

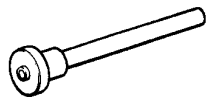
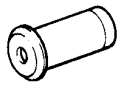
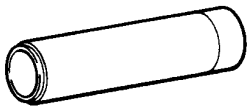
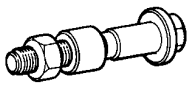
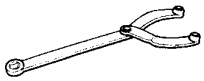
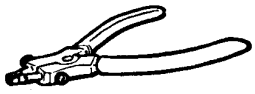
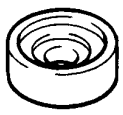
E27CE--

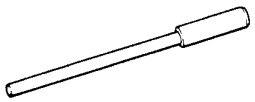
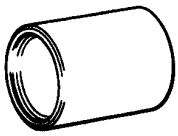
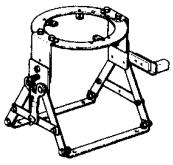
Items	Specified sealants and adhesives	Characteristics
Threaded holes of the drive gear	3M Stud Locking Part No. 4170 or equivalent	Anaerobic adhesive
Vent plug installation surface (to differential carrier)	3M ATD Part No. 8663, 8661 or equivalent	Semi-drying sealant
Differential cover installation surface (to gear carrier)	3M ATD Part No. 8663, 8661 or equivalent	Semi-drying sealant

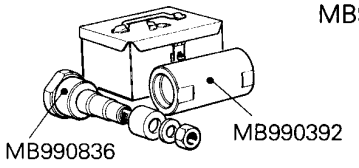
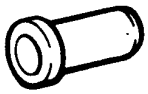
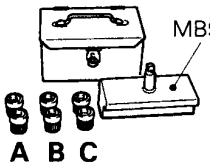
SPECIAL TOOLS

E27DA--

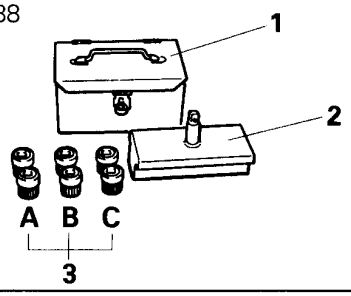
Tool	Number	Name	Use
	MB991354	Puller body	Driving-out of the companion shaft MB990211, MB991354 Driving-out of the axle hub MB990211, MB990241 Driving-out of the drive shaft MB990241
	MB990241	Rear axle shaft puller	
	MB990211	Sliding hammer	
	MB991115	Oil seal installer	Press-fitting of the differential side oil seal (Use in conjunction with MB990938)
	MB990560	Bearing remover	Driving-out of the outer wheel bearing inner race Driving-out and press-fitting of the rotor
MB990939  MB990938	MB990925	Bearing and oil seal installer set	Driving-out of the wheel bearing MB990938, MB990934 Press-fitting of the drive pinion rear bearing outer race MB990935, MB990938 Press-fitting of the drive pinion front bearing outer race MB990932, MB990938 Press-fitting of the differential side oil seal MB990938 (Use in conjunction with MB991115) Measurement of the tooth contact of differential final gear, Driving-out the oil seal, drive pinion front bearing and drive pinion rear bearing outer-race, Press-fitting the side bearing outer race MB990939

Tool	Number	Name	Use
	MB991400	Rear wheel bearing and hub installer	Press-fitting of the rear wheel bearing
	MB991401	Rear wheel bearing and hub installer base	
	MB991411	Rear wheel bearing and hub installer joint	
	MB990998	Front hub remover and installer	Measurement of the starting torque of the hub Provisional holding of the wheel bearing
	MB990685	Torque wrench	Measurement of the starting touque of the hub Measurement of the drive pinion preload
	MB990326	Preload socket	
	MB990767	End yoke holder	Fixing of the hub
	MB990628	Snap ring pliers	To remove and install the snap ring of the drive shaft
	MB991407	Differential rear support arbor	Driving-out and press-fitting of the differential support member bushing

Tool	Number	Name	Use
	MB991318	Lower arm bushing arbor	Driving-out and press fitting of the differential support member bushing
	MB990884	Rear suspension bushing ring	
	MB990890	Rear suspension bushing base	
	MB990909	Warking base	Supporting of the differential carrier
MB991116 	MB991116	Warking base adapter	
	MB990810	Side bearing puller	Removal of the side bearing inner race Removal of the companion flange
	MB990850	End yoke holder	Removal and installation of the companion flange
	MB990339	Bearing puller	Removal of the drive pinion rear bearing inner race
	MB990374	Pinion bearing remover	

Tool	Number	Name	Use
	MB990835	Drive pinion setting gauge set	Measurement of the drive pinion height
	MB990728	Bearing installer	Press-fitting of the drive pinion rear bearing inner race Press-fitting of the side bearing inner race
	MB990031 or MB990699	Drive pinion oil seal installer	Press-fitting of the drive pinion oil seal
	MB990813	Tap	Removal of sealant
	MB990988	Side gear holding tool set	Inspection of the limited slip differential gear backlash MB990990 (A)

MB990988



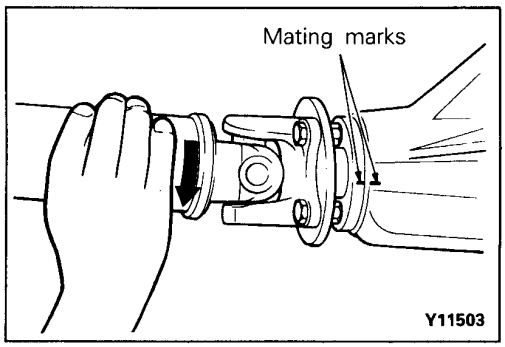
Tool number		Name	O.D. mm (in.)
1	MB990551	Box	–
2	MB990989	Base	–
3	(MB990990)	Tool A	25 (0.98)
	(MB990991)	Tool B	28 (1.10)
	(MB990992)	Tool C	31 (1.22)

SERVICE ADJUSTMENT PROCEDURES

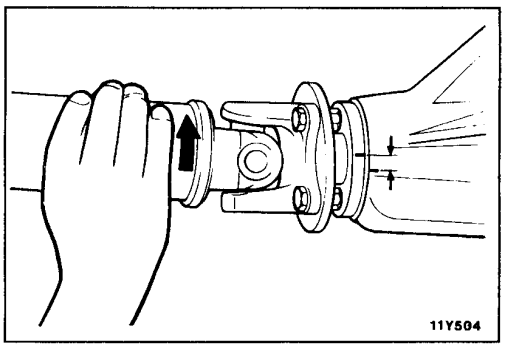
REAR AXLE TOTAL BACKLASH CHECK E27FCAG

If the vehicle vibrates and produces a booming sound due to an imbalance of the driving system, measure the rear axle total backlash by the following procedures to see if the differential carrier assembly requires removal.

(1) Place the gearshift lever in the neutral position, apply the parking brake and jack up the vehicle.



(2) Manually turn the propeller shaft clockwise as far as it will go and make mating marks on the companion flange dust cover and the differential carrier.

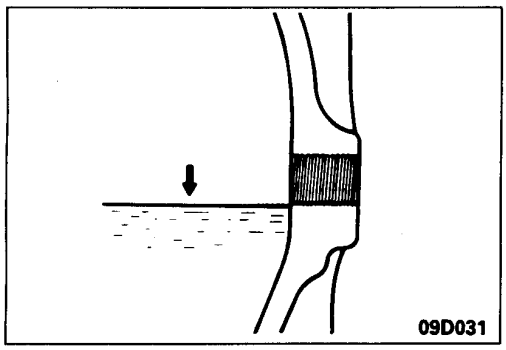


(3) Manually turn the propeller shaft counterclockwise as far as it will go and measure the movement of the mating marks.

Limit: 5 mm (0.2 in.)

(4) If the backlash exceeds the limit, remove the differential carrier assembly and adjust the backlash. (Refer to P.27-27 and 28.)

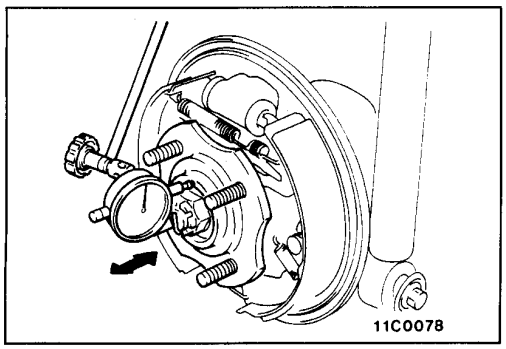
GEAR OIL LEVEL CHECK E27FGAG



1. Remove the filler plug, and check the oil level.
2. The oil level is sufficient if it reaches the filler plug hole.

Specified gear oil: Hypoid gear oil SAE No. 90 conforming to API GL-5 or higher [0.7 dm³(0.74 U.S.qts., 0.62 Imp.qts.)]

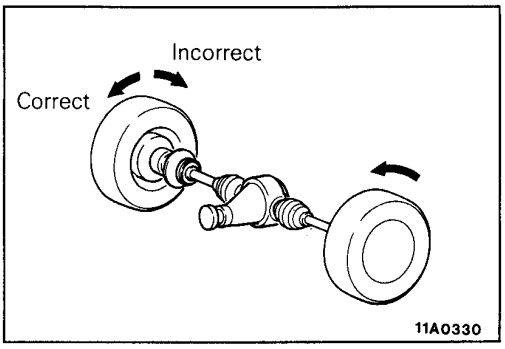
WHEEL BEARING END PLAY CHECK E27FHAE



(1) Release the parking brake.
(2) Remove the brake drum.
(3) For vehicles with ABS, remove the caliper assembly and brake disc.
(4) Place a dial gauge as shown in the figure and then measure the end play when the axle hub is moved in the axial direction.

Limit: 0.05 mm (0.002 in.)

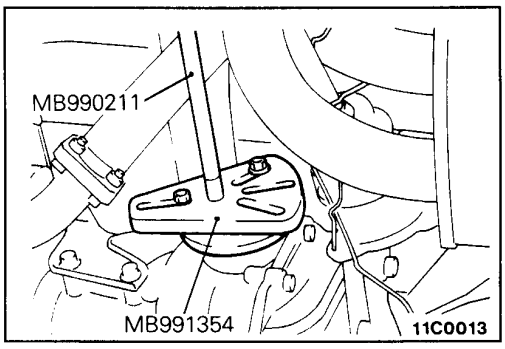
(5) If the play exceeds the limit, replace the wheel bearing.



LIMITED SLIP DIFFERENTIAL CONDITION CHECK (VCU TYPE)

E27FPAA

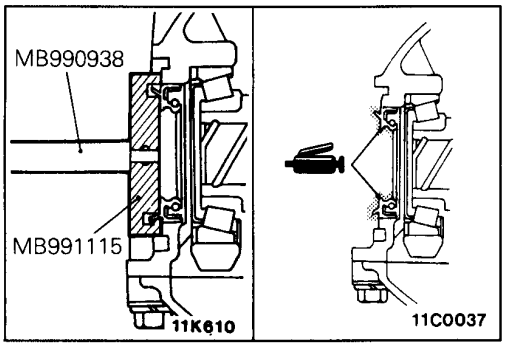
(1) Place the shift lever in the neutral position and block the front wheels with chocks.
(2) Release the parking brake lever fully.
(3) Jack up the rear wheels and apply rigid racks to the specified positions of the side sills.
(4) Disconnect the propeller shaft from the differential.
(5) While turning one wheel slowly and make sure that the opposite wheel turns in the same direction.
(6) If the opposite wheel turns in reverse, disassemble the limited slip differential with VCU and replace the VCU.



REPLACEMENT OF DIFFERENTIAL CARRIER OIL SEAL

E27FNAB

(1) Remove the drive shaft and companion shaft connection and suspend the drive shaft from the vehicle body with wire.
(2) Use the special tool to remove the companion shaft from the differential carrier.



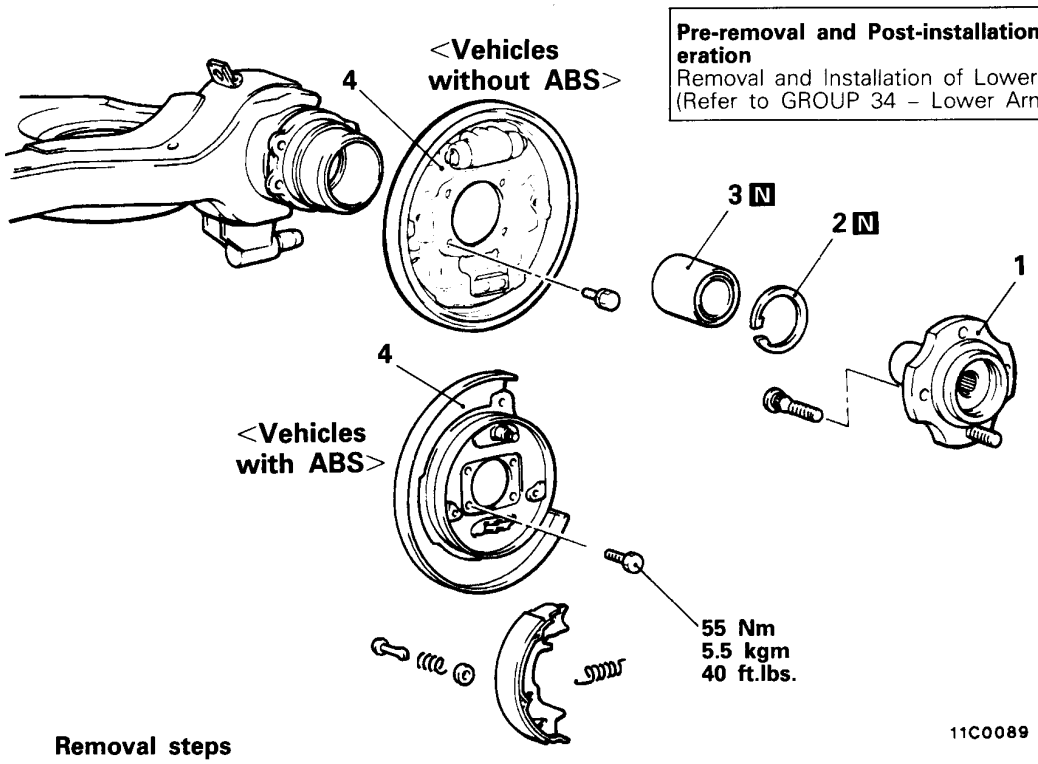
(3) Remove the oil seal of the differential carrier.
(4) Use the special tool to tap on a new oil seal as far as the end of the differential carrier.
(5) Apply multipurpose grease to the lip section of the oil seal and to the oil seal contact surface of the companion shaft.

(6) Replace the circlip on the companion shaft with a new one, and then tap the companion shaft onto the differential carrier.
(7) Install the drive shaft onto the companion shaft at the specified torque [55–65 Nm (5.5–6.5 kgm, 40–47 ft.lbs.)].

REAR AXLE HUB

E27GA-2

REMOVAL AND INSTALLATION

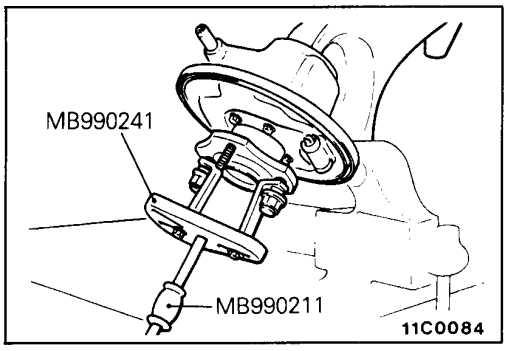


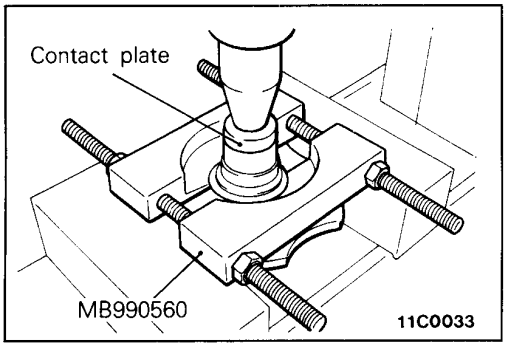
Pre-removal and Post-installation Operation
Removal and Installation of Lower Arm
(Refer to GROUP 34 – Lower Arm.)

Removal steps

- Inspection of wheel bearing starting torque
- Inspection of rear hub end play

◆◆ ▶◀ 1. Rear hub
2. Snap ring
◆◆ ▶◀ 3. Wheel bearing
4. Dust shield





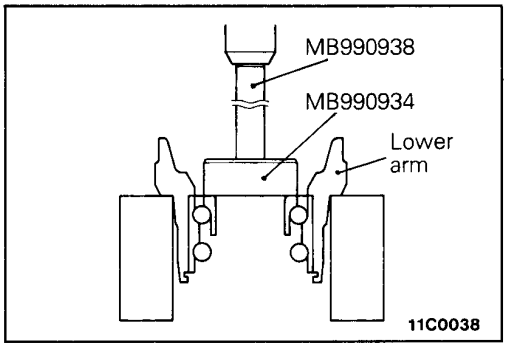
SERVICE POINTS OF REMOVAL

E27GBAI

1. REMOVAL OF REAR HUB

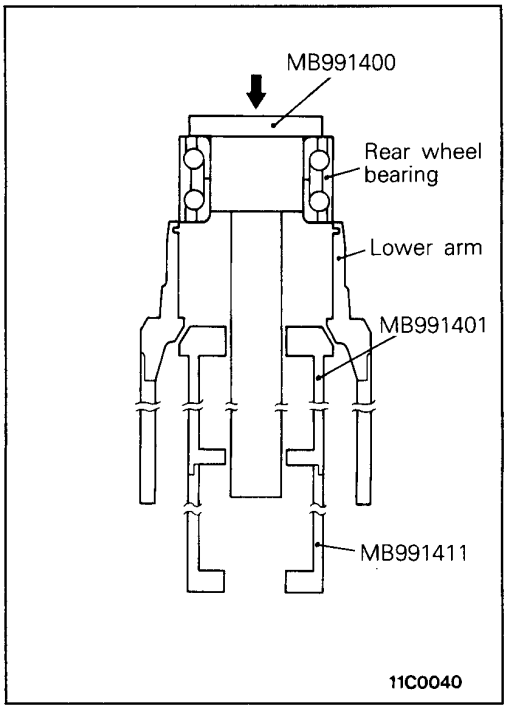
Caution
When taking off the rear hub, the wheel bearing should always be replaced.

3. REMOVAL OF WHEEL BEARING



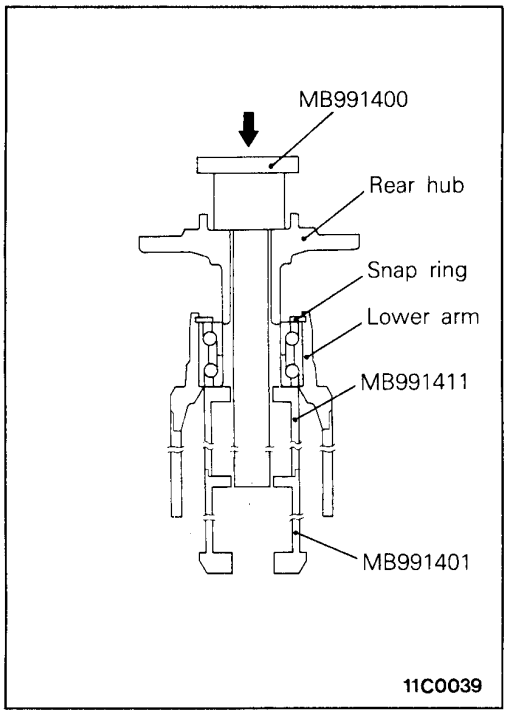
INSPECTION E27GCAE

- Check the rear hub spline for wear or damage.
- Check the dust shield for deformation or damage.

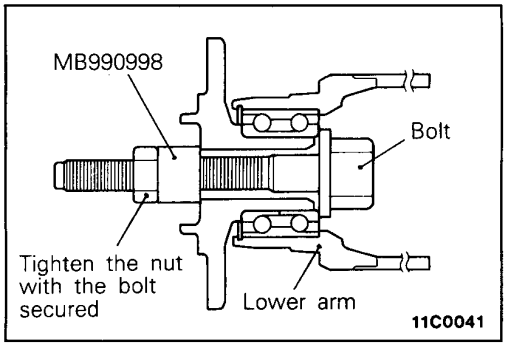


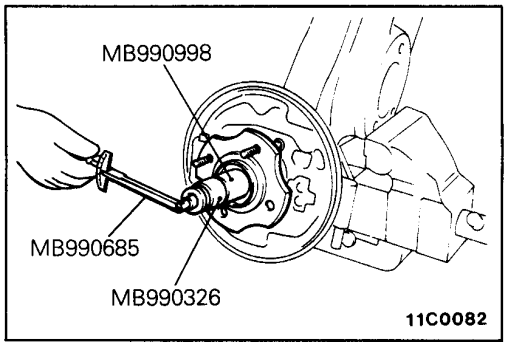
SERVICE POINTS OF INSTALLATION E27GDAJ

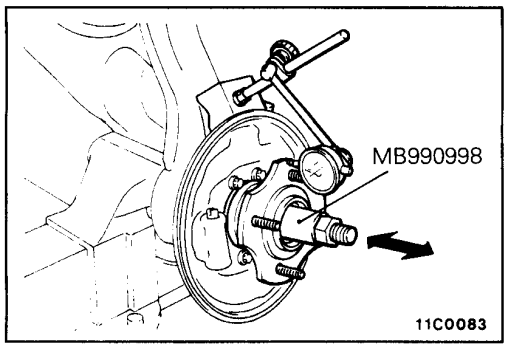
3. INSTALLATION OF WHEEL BEARING



1. INSTALLATION OF REAR HUB







- **INSPECTION OF WHEEL BEARING STARTING TORQUE**

(1) Use the special tool to mount the rear hub onto the lower arm.
(2) Tighten the nut of the special tool to 200–260 Nm (20–26 kgm, 145–188 ft.lbs.).
(3) Rotate the rear hub in order to seat the bearing.
(4) Leave the special tool in place and take the measurements described below.

Measure the wheel bearing starting torque (rear hub starting torque) by using the special tools.

Limit: 1.1 Nm (10.5 kgcm, 9 in.lbs.) or less

NOTE
The starting torque must be within the limit and, in addition, the bearing must not feel rough when rotated.

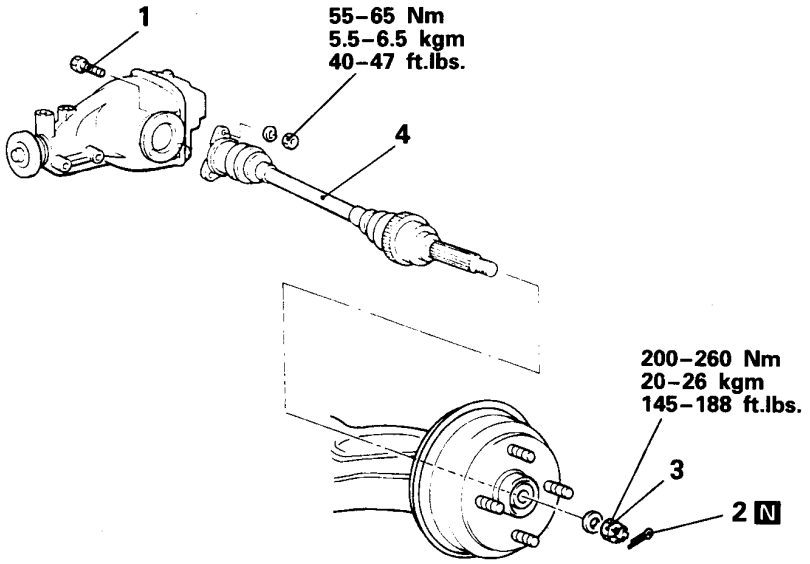
- **INSPECTION OF REAR HUB END PLAY**

(1) Measurement of rear hub to determine end play.
Limit: 0.05 mm (0.0020 in.)
(2) If the starting torque and rear hub end play are not within the limit, with the nut is tightened to 200–260 Nm (20–26 kgm, 145–188 ft.lbs.), the bearing, rear hub and/or lower arm have probably not been installed correctly. Replace the bearing and repeat the assembly procedure.

DRIVE SHAFT

E27KA–

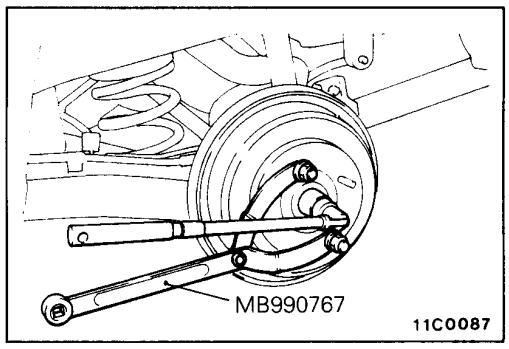
REMOVAL AND INSTALLATION



Removal steps

1. Bolt
2. Split pin
3. Drive shaft nut
4. Drive shaft

11C0092

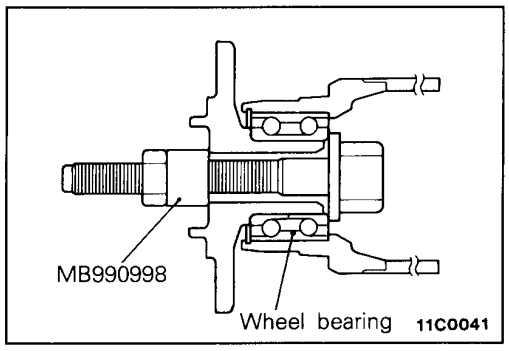


11C0087

SERVICE POINTS OF REMOVAL

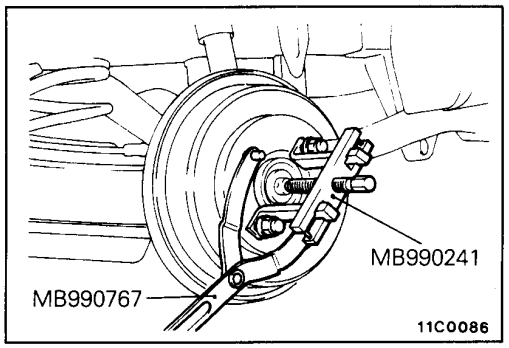
E27KBAC

3. REMOVAL OF DRIVE SHAFT NUT



11C0041

Caution
Do not apply the vehicle weight to the wheel bearing while-loosening the drive shaft nut. If, however, the vehicle weight must be applied to the bearing (because of moving the vehicle), temporarily secure the wheel bearing by using the special tool, MB990998, etc.



11C0086

4. REMOVAL OF DRIVE SHAFT

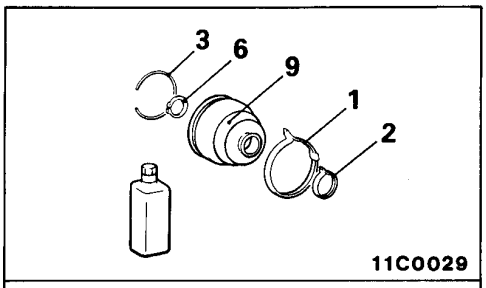
INSPECTION

E27KCAA

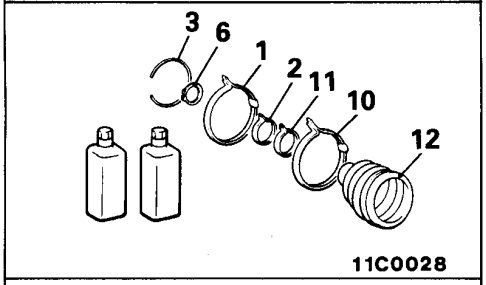
- Check the drive shaft boots for damage or deterioration.
- Check the ball joints (B.J. and D.O.J.) for excessive play or check operation.
- Check the drive shaft spline for wear or damage.

DISASSEMBLY AND REASSEMBLY

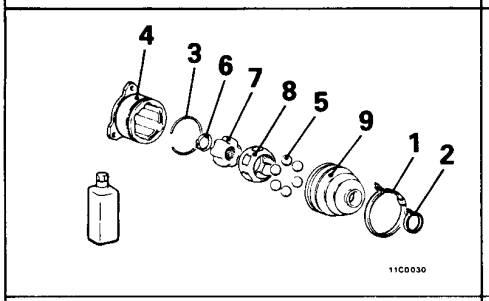
E27KE--



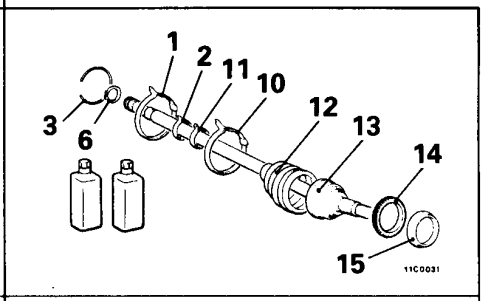
D.O.J. boot repair kit



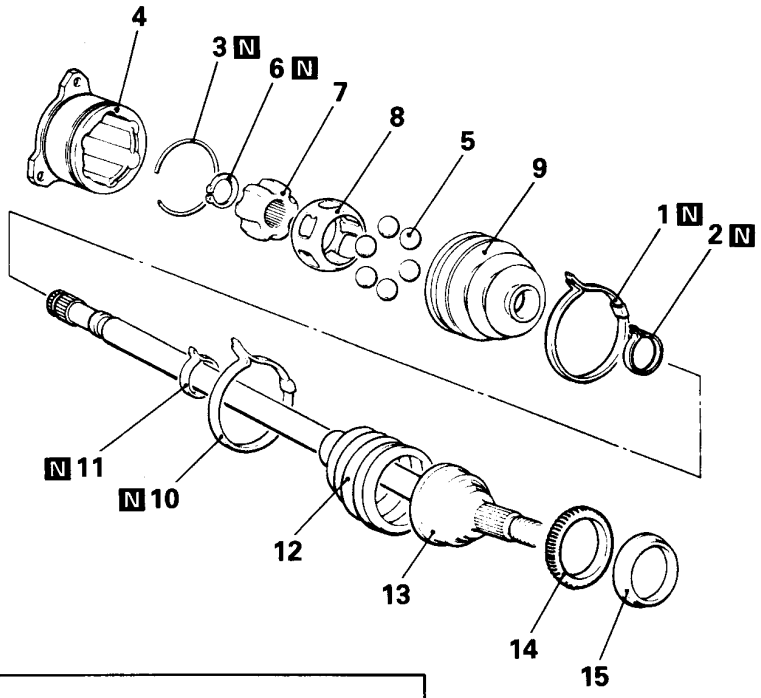
B.J. boot repair kit



D.O.J. kit



Drive shaft and B.J. kit



Disassembly steps

1. Boot band (B)
2. Boot band (C)
3. Circlip
4. D.O.J. outer race
5. Balls
6. Snap ring
7. D.O.J. inner race
8. D.O.J. cage
9. D.O.J. boot
10. Boot band (A)
11. Boot band (C)
12. B.J. boot
13. B.J. assembly
14. Rear rotor <Vehicles with ABS>
15. Dust cover

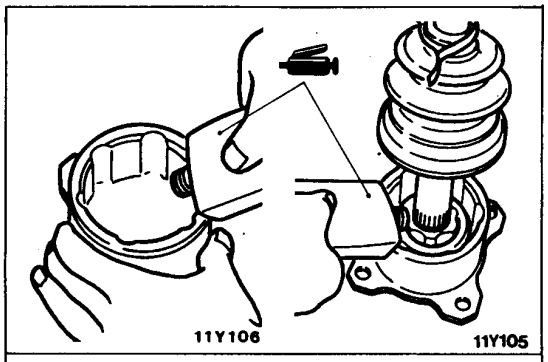
Reassembly steps

13. B.J. assembly
14. Rear rotor <Vehicles with ABS>
15. Dust cover
12. B.J. boot
10. Boot band (A)
11. Boot band (C)
2. Boot band (C)
1. Boot band (B)
9. D.O.J. boot
8. D.O.J. cage
7. D.O.J. inner race
6. Snap ring
5. Balls
4. D.O.J. outer race
3. Circlip

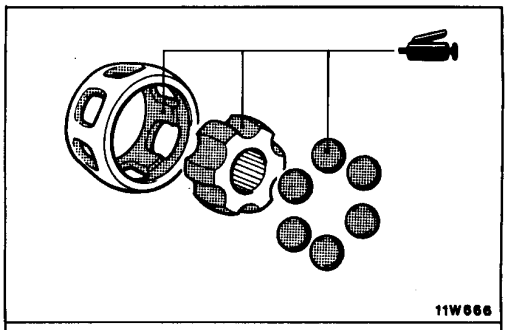
NOTE
(1) B.J.: Birfield Joint
(2) D.O.J.: Double Offset Joint

Caution
Do not disassemble the B.J. assembly.

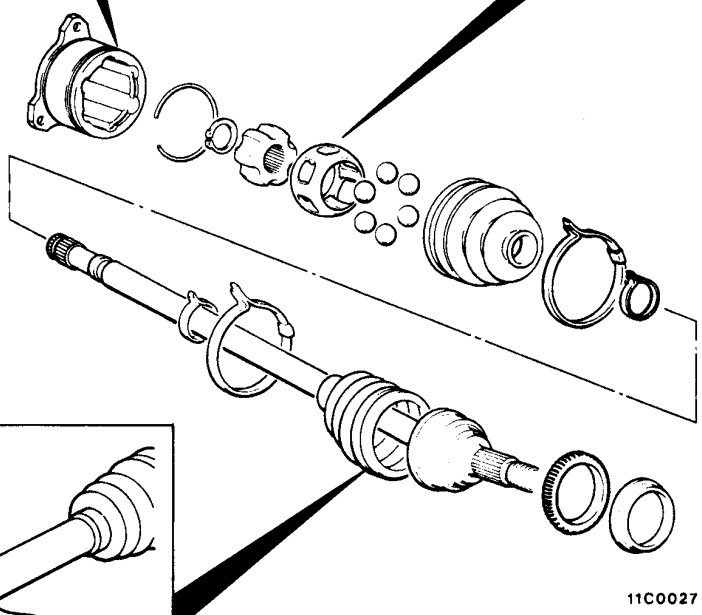
LUBRICATION POINTS

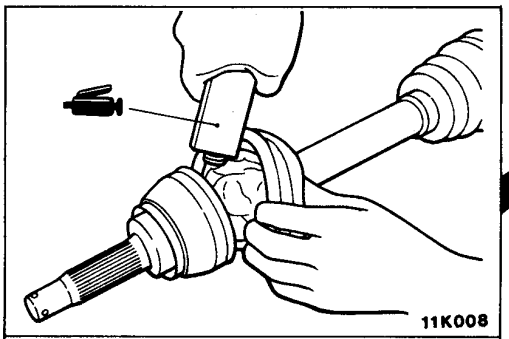


Grease: Repair kit grease 85 g (3.0 oz)



Grease: Repair kit grease





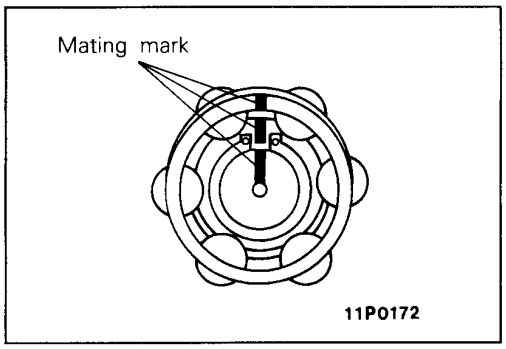
Grease: Repair kit grease
<Vehicles without ABS> 75 g (2.6 oz)
<Vehicles with ABS> 125 g (4.4 oz)

Caution
The drive shaft joint uses special grease. Do not mix old and new or different types of grease.

SERVICE POINTS OF DISASSEMBLY E27KFAF

4. REMOVAL OF D.O.J. OUTER RACE

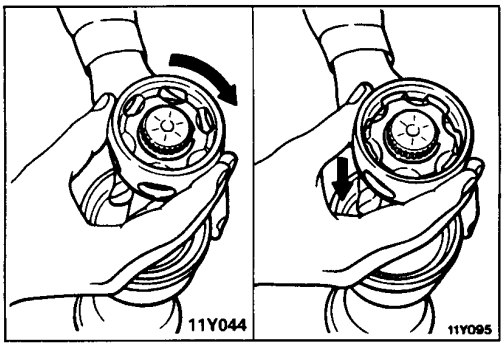
After removing the D.O.J. outer race from the B.J. assembly, wipe off the grease on the D.O.J. outer race.



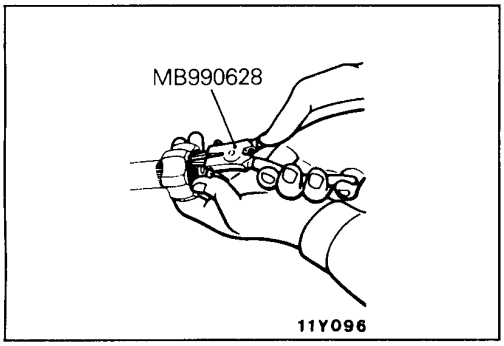
5. REMOVAL OF BALLS/6. SNAP RING/7. D.O.J. INNER RACE/8. D.O.J. CAGE

(1) Make mating marks on the drive shaft, D.O.J. inner race and D.O.J. cage.
(2) Remove the balls from the D.O.J. cage.

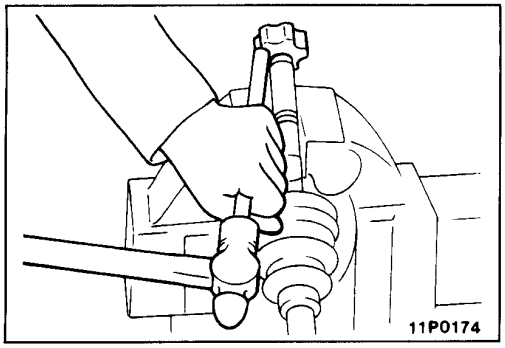
Caution
Do not use a screwdriver or similar tool.



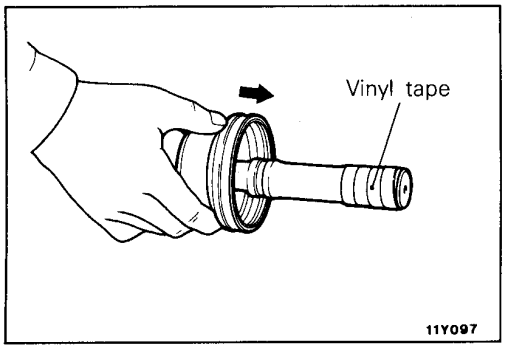
(3) Remove the D.O.J. cage from the D.O.J. inner race in the direction of the B.J.



(4) Remove the snap ring from the drive shaft with special tool, and then withdraw the D.O.J. inner race and D.O.J. cage from the drive shaft.



(5) Use a brass bar to lightly and evenly tap the D.O.J. inner race in order to remove it from the shaft.

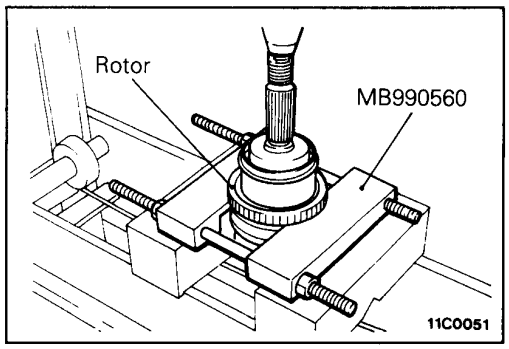


9. REMOVAL OF D.O.J. BOOT/12. B.J. BOOT

(1) Wipe the grease off of the spline portion.
(2) Remove the D.O.J. boot and B.J. boot.

NOTE
If the boots are reused, wrap vinyl tape around the drive shaft spline so that the boots are not damaged when they are removed.

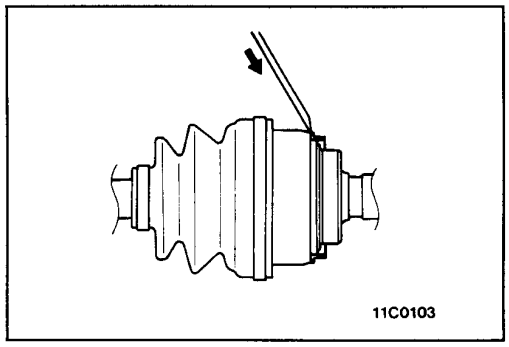
(3) Wipe the grease off of the B.J. assembly.



14. REMOVAL OF REAR ROTOR/15. DUST COVER

(1) For vehicles with ABS, use the special tool to remove the dust cover together with the rotor.

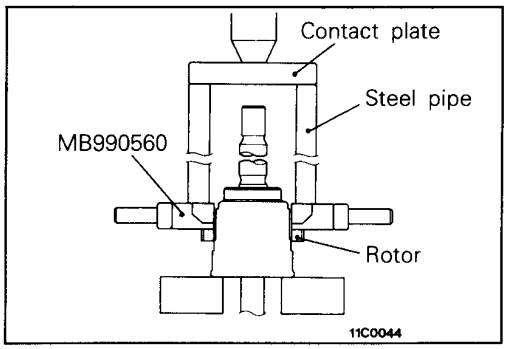
Caution
Do not damage the teeth of the rotor. Also, never drop the rotor. If the rotor teeth become chipped, or if the rotor is deformed, correct wheel speed cannot be detected, or the system will not operate correctly.



(2) For vehicles without ABS, use a flat-tipped screwdriver to remove the dust cover.

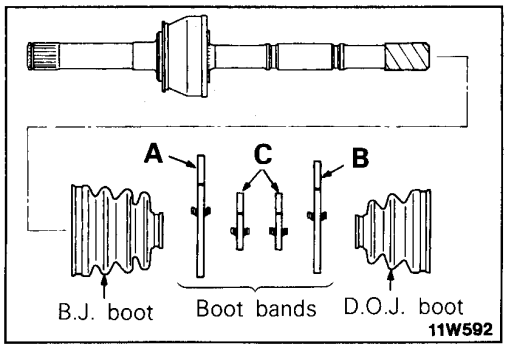
INSPECTION E27KGAC

- Check the drive shaft for damage, bending or corrosion.
- Check the drive shaft spline for wear or damage.
- Check the B.J. for entry of water and/or foreign material.
- Check the D.O.J. outer race for damage or corrosion.
- Check the D.O.J. cage, balls and D.O.J. inner race for damage, corrosion or wear.



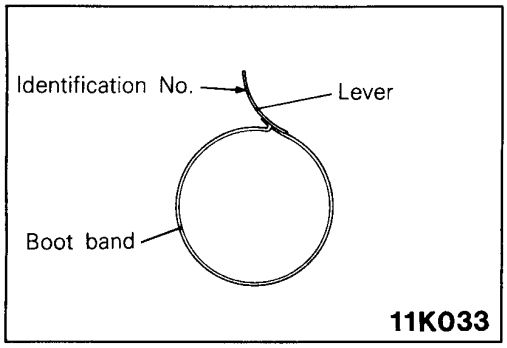
SERVICE POINTS OF REASSEMBLY E27KHAF

14. INSTALLATION OF REAR ROTOR



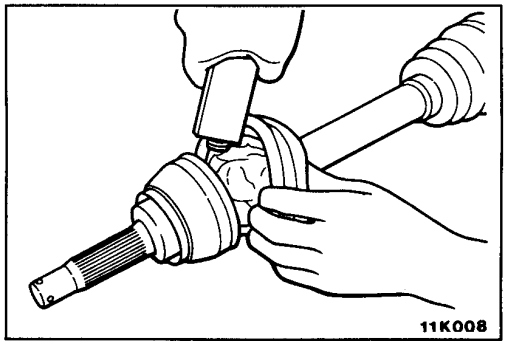
12. INSTALLATION OF B.J. BOOT/10. BOOT BAND (A)/11. BOOT BAND (C)/2. BOOT BAND (C)/1. BOOT BAND (B)/9. D.O.J. BOOT

(1) Wrap vinyl tape around the drive shaft spline.
(2) Insert the drive shaft in B.J. boot, boot band (A), (C), (C), (B), D.O.J. boot in that sequence.



Boot bands A, B identification No.

D.O.J.	B.J.
20–82	20–110



(3) Fill the inside of the B.J. and B.J. boot with the specified grease.

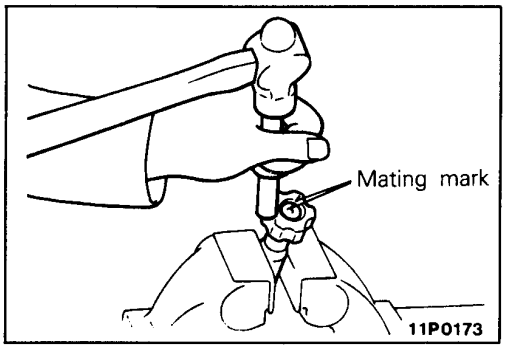
Specified grease:
Repair kit grease
<Vehicles without ABS> 75 g (2.6 oz)
<Vehicles with ABS> 125 g (4.4 oz)

NOTE
The grease in the repair kit should be divided in half for use, respectively, at the joint and inside the boot.

Caution
The drive shaft joint use special grease. Do not mix old and new or different types of grease.

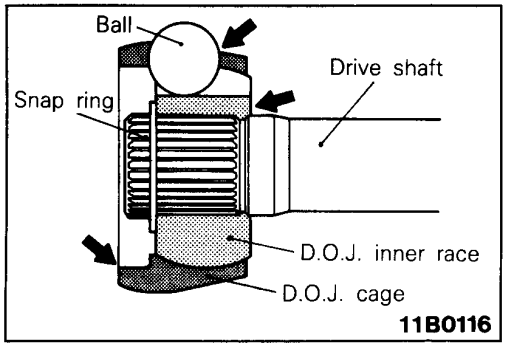
(4) Secure the B.J. boot with boot bands (A) and (C) to the drive shaft and B.J.

Caution
Ensure that the B.J. is at a zero angle with the drive shaft to ensure the boot contains the specified amount of air.



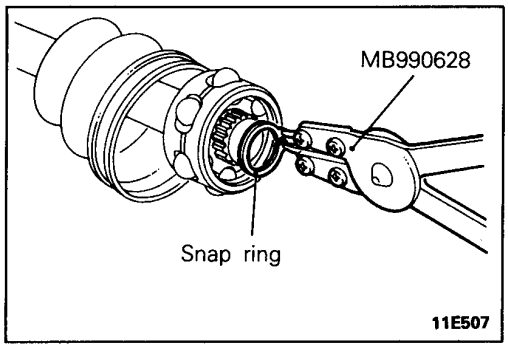
8. INSTALLATION OF D.O.J. CAGE/7. D.O.J. INNER RACE 6. SNAP RING/5. BALLS

(1) Install the D.O.J. cage to the shaft and slide it across to the B.J. assembly.
(2) Align the mating marks on the D.O.J. inner race and the shaft.
(3) Use a brass bar to press fit the inner race by lightly and evenly tapping it until it touches the shaft projection.

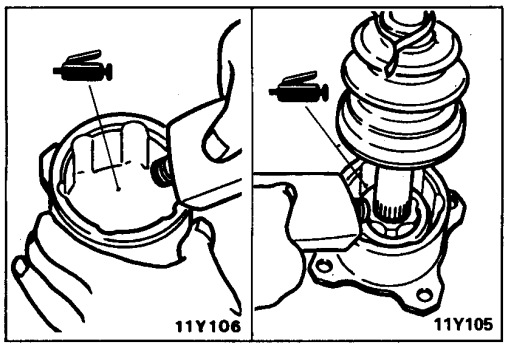


(4) Apply the specified grease to the D.O.J. cage, the balls and the D.O.J. inner race.

Specified grease: Repair kit grease (As required)



(5) Install the cage, balls and inner race to the drive shaft, then, using the snap ring pliers or the special tool, fit the snap ring securely into the groove in the shaft.



4. APPLICATION OF GREASE TO D.O.J. OUTER RACE/3. CIRCLIP

(1) Fill the specified grease to the D.O.J. outer race, fit the drive shaft into the D.O.J. outer race, and then fill more grease to the D.O.J. outer race.

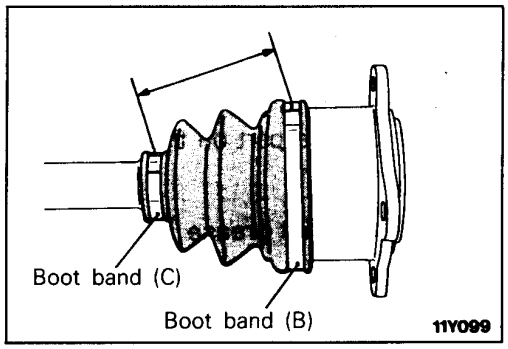
Specified grease: Repair kit grease 85 g (3.0 oz.)

NOTE
The grease in the repair kit should be divided in half for use, respectively, at the joint and inside the boot.

Caution
The drive shaft joint uses special grease. Do not mix old and new or different types of grease.

(2) Install the circlip to the D.O.J. outer race.
(3) Assemble the D.O.J. boot to the D.O.J. outer race, then secure the boot to the drive shaft with boot band (C).
(4) Place boot band (B) on the D.O.J. boot.

NOTE
Do not secure boot band (B).



(5) Set the D.O.J. boot bands at the specified distance in order to adjust the amount of air inside the D.O.J. boot, and then tighten the D.O.J. boot band securely.

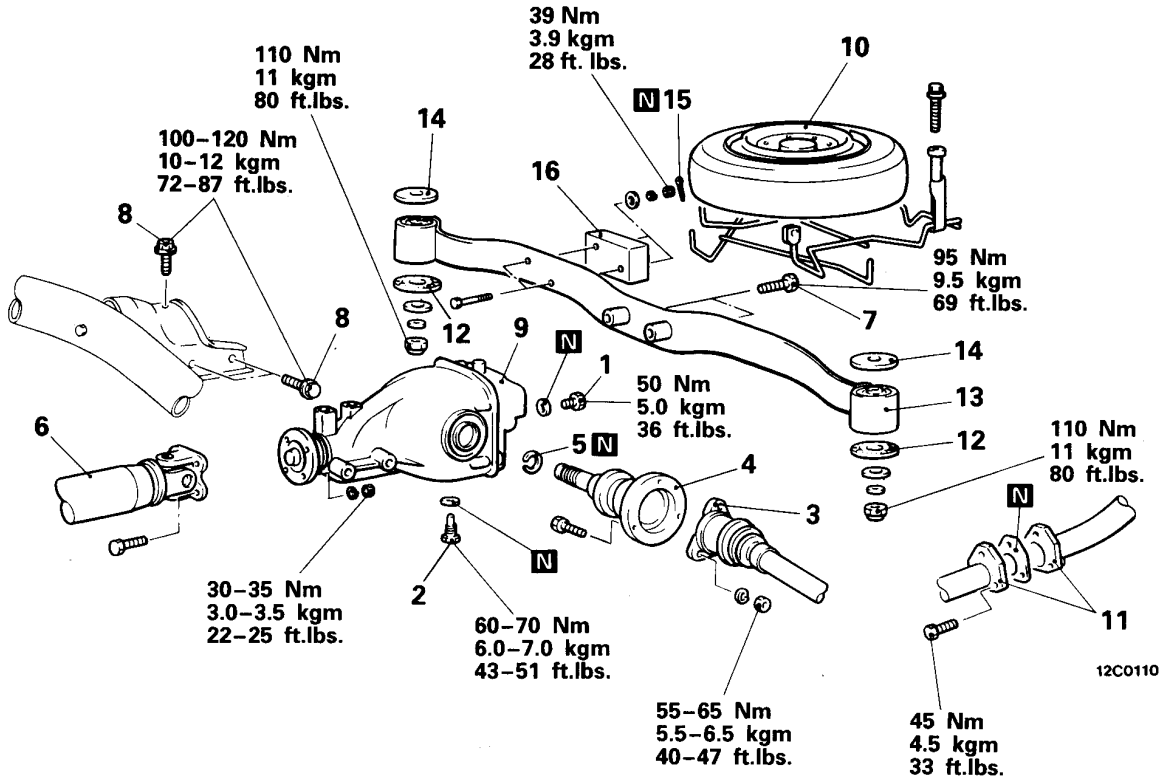
Standard value: 75±3 mm (2.95±0.23 in.)

(6) Release a part of the D.O.J. boot from the D.O.J. outer race to allow pressure to escape from the boot.
(7) Tighten boot band (B) and secure the D.O.J. boot.

DIFFERENTIAL CARRIER

E27QA–

REMOVAL AND INSTALLATION



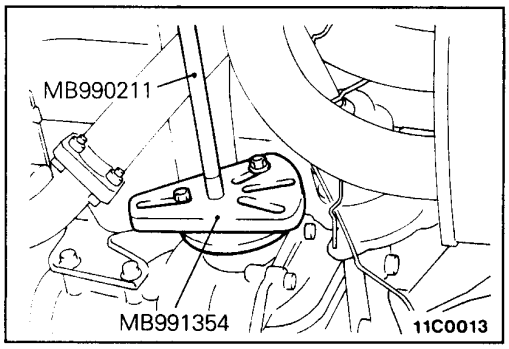
Differential carrier removal steps

- 1. Filler plug
- 2. Drain plug
- 3. Drive shaft connection
- 4. Companion shaft
- 5. Circlip
- 6. Propeller shaft connection
- 7. Bolts
- 8. Bolts
- 9. Differential Carrier

Differential support member removal steps

- 7. Bolts
- 10. Spare tyre <SPACE RUNNER>
- 11. Connection for main muffler and center exhaust pipe
- 12. Differential mount lower stopper
- 13. Differential support member
- 14. Differential mount upper stopper
- 15. Split pin <SPACE WAGON-A/T> (Vehicles built from May 1993)
- 16. Weight <SPACE WAGON-A/T> (Vehicles built from May 1993)

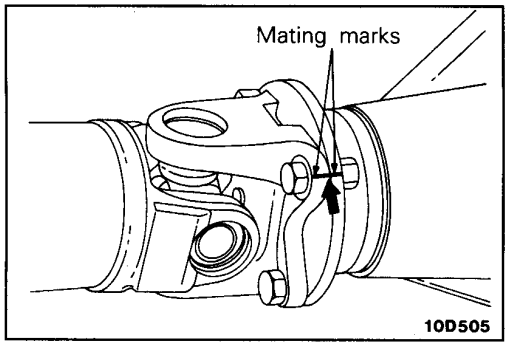
Caution
If the thread section of the mounting bolts and nuts for the drive shaft and propeller shaft and the companion shaft have any oil or grease on them, there is a possibility that they may loosen, even if they are tightened to the specified torque, so the threads should always be cleaned before tightening.



SERVICE POINTS OF REMOVAL E27QBAK

3. REMOVAL OF DRIVE SHAFT CONNECTION/4. COMPANION SHAFT

(1) Remove the nuts and bolts from drive shaft and companion shaft connection.
(2) Support the drive shaft with wire.



6. DISCONNECTION OF PROPELLER SHAFT

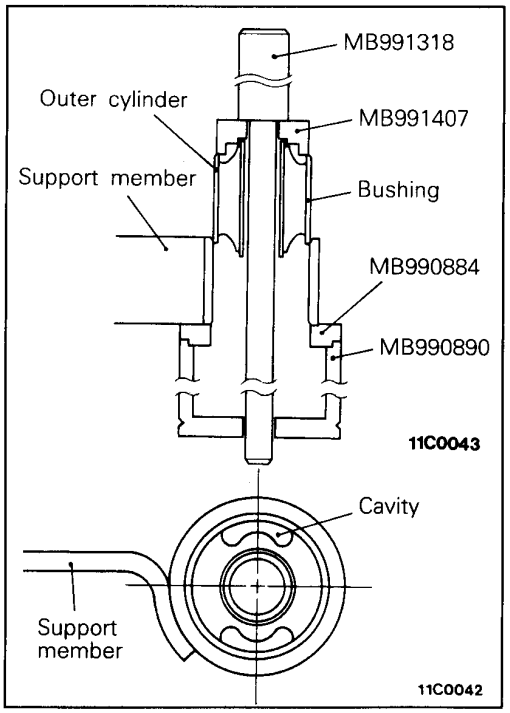
(1) After making mating marks on the differential companion flange and flange yoke for reference during reassembly.
(2) Remove the differential carrier and propeller shaft connection.
(3) Support the propeller shaft with wire.

7. REMOVAL OF BOLTS

Support the lower section of the differential carrier with a jack, and remove the differential support member bolt.

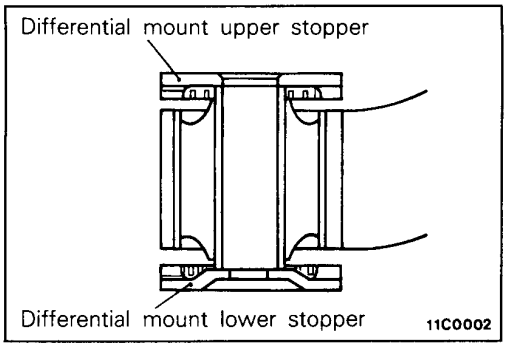
11. DISCONNECTION OF MAIN MUFFLER AND CENTER EXHAUST PIPE

(1) Remove the main muffler and center exhaust pipe connection.
(2) Support the main muffler with wire.



DIFFERENTIAL SUPPORT MEMBER BUSHING REPLACEMENT E27QKAB

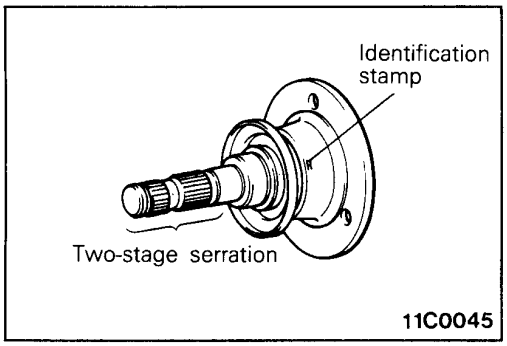
(1) Use the special tool to pull out and press in the differential support member bushing.
(2) The bushing should be pressed in so that the cavities face in the same direction as shown in the illustration.
(3) Press in until the end surface of the bushing outer cylinder is flush with the support member.



SERVICE POINTS OF INSTALLATION E27QCAL

14./12. INSTALLATION OF DIFFERENTIAL MOUNT STOPPER

Install the mount stopper as shown in the illustration.



4. INSTALLATION OF COMPANION SHAFT

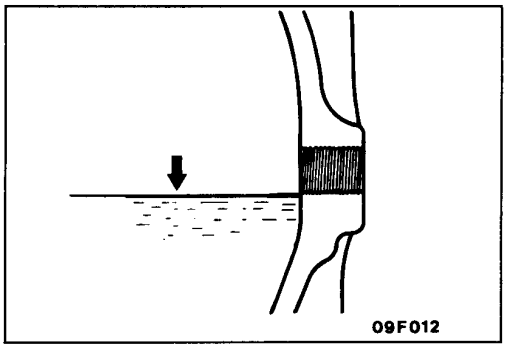
Caution

(1) Be careful not to damage the oil seal of the differential carrier with the spline section of the companion shaft.

(2) The companion shaft (RH) on vehicles that have LSD with VCU has a two-stage serration, so do not mistake the left and right ends when installing.

NOTE

The left and right ends can be determined from the identification stamps on the companion shaft (Right: R, Left: L).



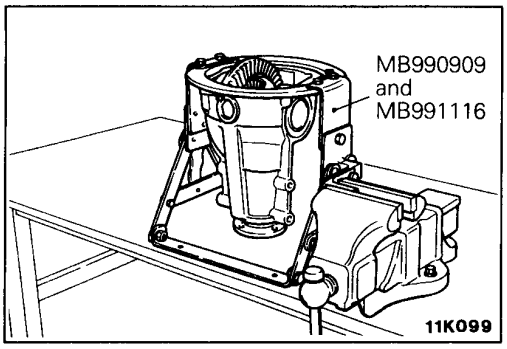
1. INSTALLATION OF FILLER PLUG

Apply specified gear oil to the lower surface of the filler plug.

Specified gear oil:

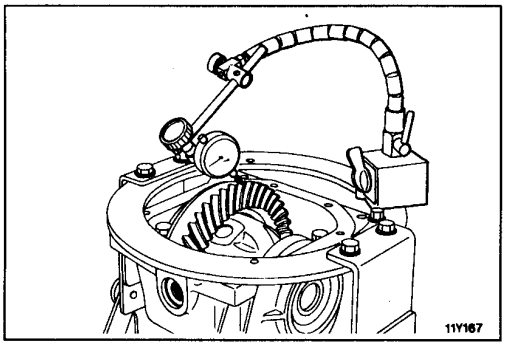
Hypoid gear oil SAE No. 90 conforming to API GL-5 or higher

[0.7 dm^3(0.74 U.S.qt., 0.62 Imp.qt.)]



INSPECTION BEFORE DISASSEMBLY E27QDAM

Hold the special tool in a vice, and attach the differential carrier to the special tool.



FINAL DRIVE GEAR BACKLASH

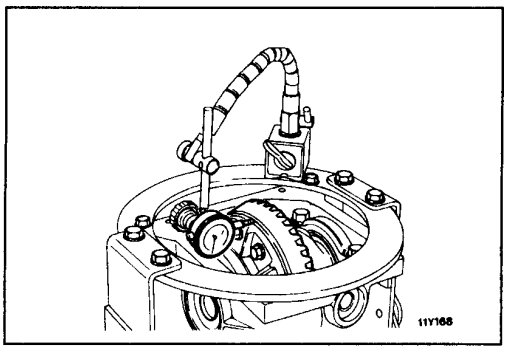
(1) With the drive pinion locked in place, measure the final drive gear backlash with a dial indicator on the drive gear.

NOTE
Measure at four points or more on the circumference of the drive gear.

Standard value: 0.11–0.16 mm (0.004–0.006 in.)

(2) If the backlash is outside the standard value, adjust using the side bearing spacer.

NOTE
After adjustment, inspect the contact of the final drive gear.



DRIVE GEAR RUNOUT

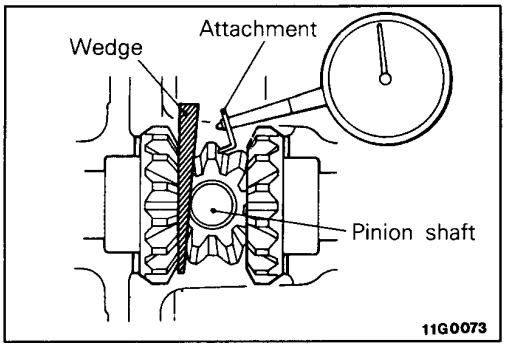
(1) Measure the drive gear runout at the shoulder on the reverse side of the drive gear.

Limit: 0.05 mm (0.002 in.)

(2) If the runout exceeds the limit value, check that there is no foreign material between the reverse side of the drive gear and the differential case, or that there is no looseness in the drive gear mounting bolt.

(3) If step (2) is normal, change the assembly position of the drive gear and differential case, and then take another measurement.

NOTE
If adjustment is impossible, replace the differential case or the drive gear and drive pinion as a set.



DIFFERENTIAL GEAR BACKLASH

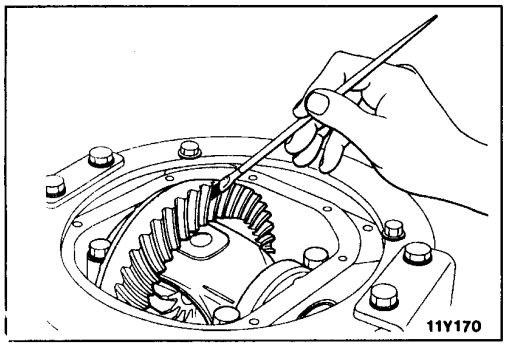
(1) While locking the side gear with the wedge, measure the differential gear backlash with a dial indicator on the pinion gear.

NOTE
Take the measurements at two places (4 places for LSD) on the pinion gear.

Standard value: 0–0.076 mm (0–0.003 in.)
Limit: 0.2 mm (0.008 in.)

(2) If the backlash exceeds the limit value, adjust using the side bearing spacer.

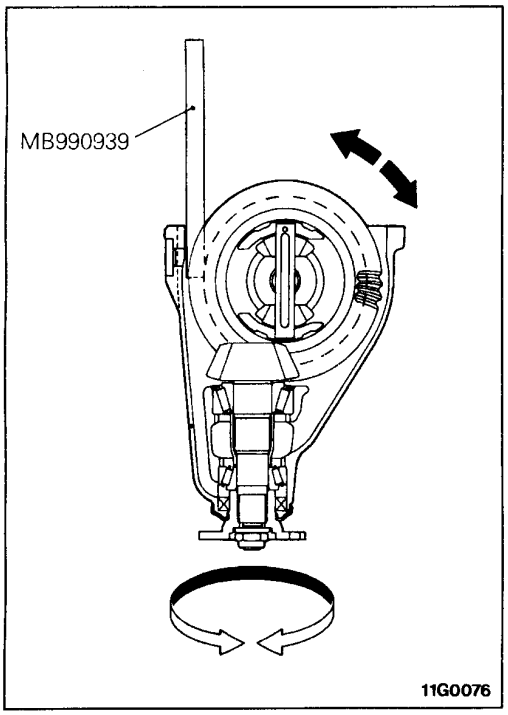
NOTE
If adjustment is impossible, replace the side gear and pinion gear as a set.



FINAL DRIVE GEAR TOOTH CONTACT

Check the final drive gear tooth contact by following the steps below.

(1) Apply a thin, uniform coat of machine blue to both surfaces of the drive gear teeth.



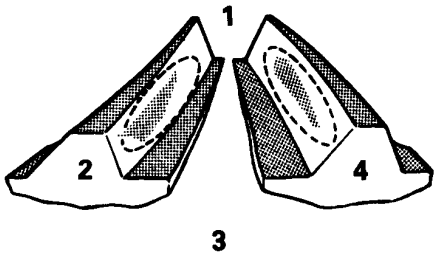
(2) Insert a brass rod between the differential carrier and the differential case, and then rotate the companion flange by hand (once in the normal direction, and then once in the reverse direction) while applying a load to the drive gear, so that the revolution torque [approximately 2.5–3.0 Nm (25–30 kgcm, 28–33 in.lbs.)] is applied to the drive pinion.

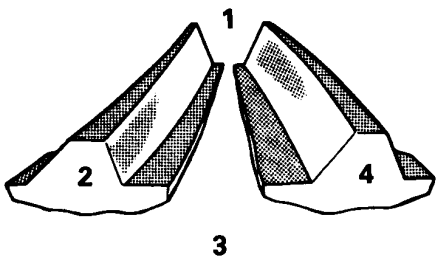
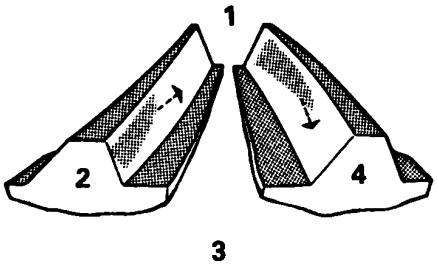
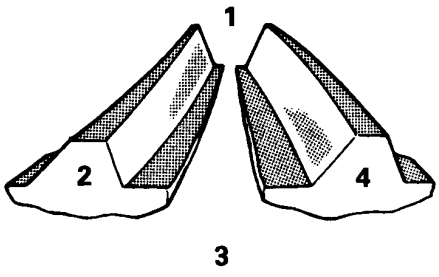
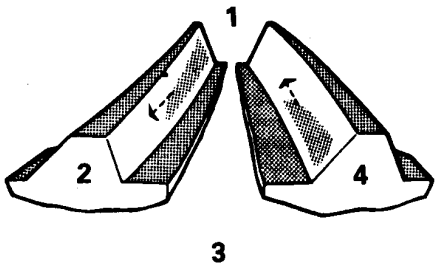
Caution
If the drive gear is rotated too much, the tooth contact pattern will become unclear and difficult to check.

(3) Check the tooth contact condition of the drive gear and drive pinion.

Standard tooth contact pattern

1 Narrow tooth side
2 Drive-side tooth surface (the side applying power during forward movement)
3 Wide tooth side
4 Coast-side tooth surface (the side applying power during reverse movement)



Problem	Solution
Tooth contact pattern resulting from excessive pinion height  The drive pinion is positioned too far from the centre of the drive gear.	 Increase the thickness of the pinion height adjusting shim, and position the drive pinion closer to the centre of the drive gear. Also, for backlash adjustment, position the drive gear farther from the drive pinion.
Tooth contact pattern resulting from insufficient pinion height  The drive pinion is positioned too close to the centre of the drive gear.	 Decrease the thickness of the pinion height adjusting shim, and position the drive pinion farther from the centre of the drive gear. Also, for backlash adjustment, position the drive gear closer to the drive pinion.

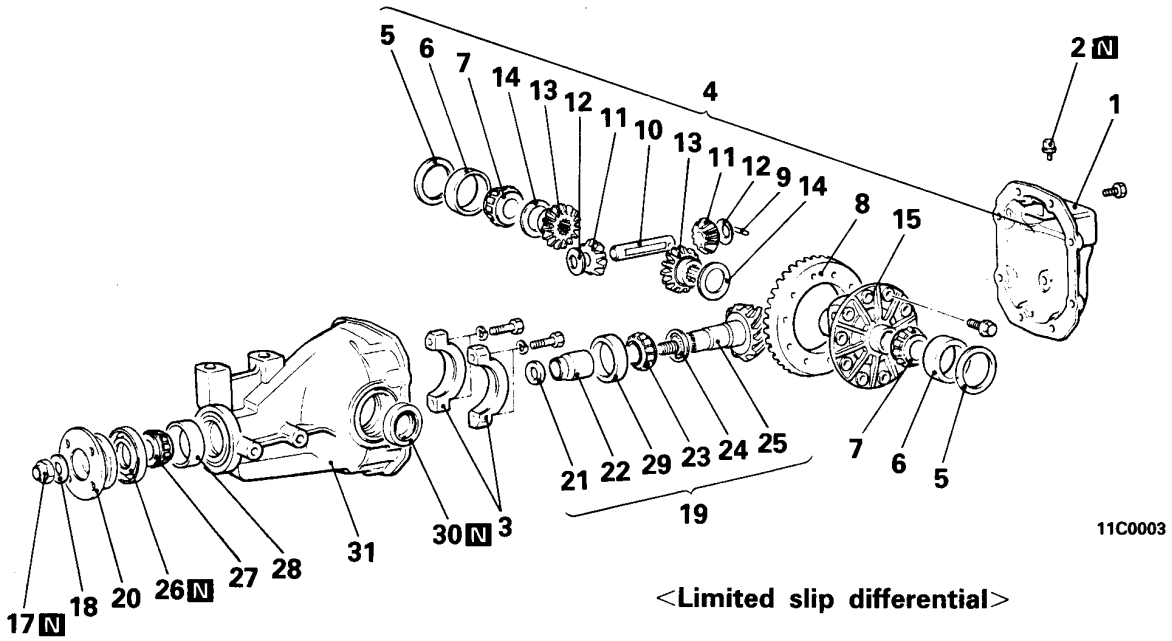
11S642

NOTE
(1) Tooth contact pattern is a method for judging the result of the adjustment of drive pinion height and final drive gear backlash. The adjustment of drive pinion hight and final drive gear backlash should be repeated until tooth contact patterns bear a similarity to the standard tooth contact pattern.
(2) When adjustment is not able to obtain a correct pattern, it may be judged that the drive gear and drive pinion have exceed their usage limits and both gears should be replaced as a set.

DISASSEMBLY

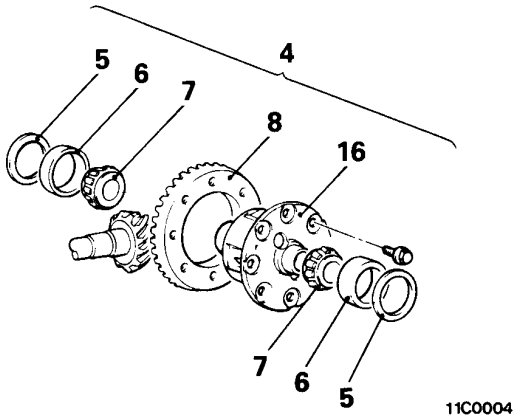
E27QI--

<Conventional differential>



11C0003

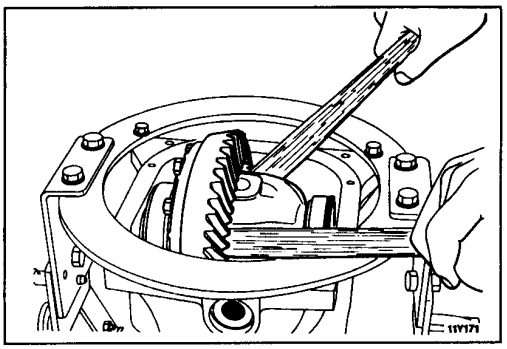
<Limited slip differential>



11C0004

Disassembly steps

1. Differential cover
2. Vent plug
3. Bearing caps
4. ◆◆ Differential case assembly
5. Side bearing spacers
6. Side bearing outer race
7. ◆◆ Side bearing inner race
8. ◆◆ Drive gear
9. ◆◆ Lock pin <for conventional differential>
10. Pinion shaft
11. Pinion gears
12. Pinion washers
13. Side gears
14. Side gear spacers
15. Differential case
16. ◆◆ Limited slip differential case assembly (Refer to P.27-42.)
17. ◆◆ Self-locking nut
18. Washer
19. ◆◆ Drive pinion assembly
20. Companion flange
21. Drive pinion front shim (for preload adjustment)
22. Drive pinion spacer
23. ◆◆ Drive pinion rear bearing inner race
24. Drive pinion rear shim (for pinion height adjustment)
25. Drive pinion
26. ◆◆ Oil seal
27. ◆◆ Drive pinion front bearing inner race
28. ◆◆ Drive pinion front bearing outer race
29. ◆◆ Drive pinion rear bearing outer race
30. Oil seal
31. Gear carrier

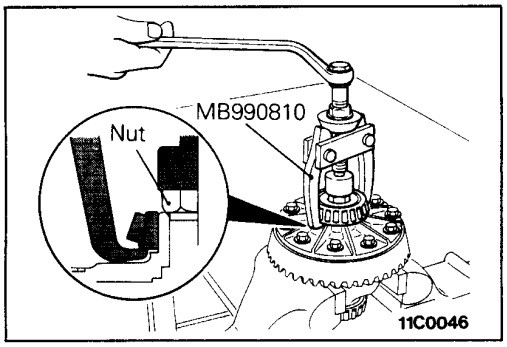


SERVICE POINTS OF DISASSEMBLY E27QFBF

4. REMOVAL OF DIFFERENTIAL CASE ASSEMBLY

Caution
When removing the differential case assembly, the removal should be accomplished slowly and carefully and caution paid to ensure that the side bearing outer race is not dropped.

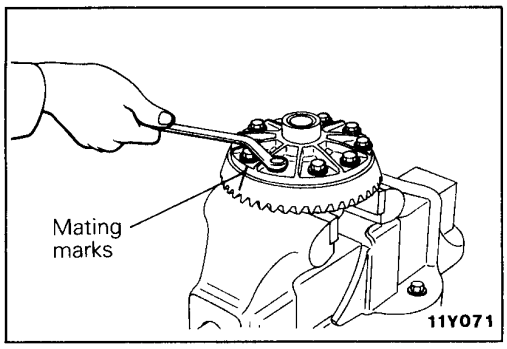
NOTE
Keep the right and left side bearings separate, so that they do not become mixed at the time of reassembly.



7. REMOVAL OF SIDE BEARING INNER RACES

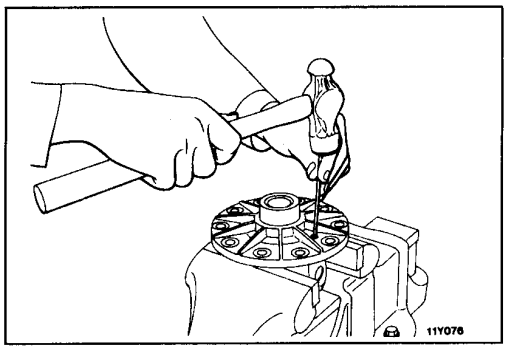
Place the nut on top of the differential case, and then use the special tool to remove the side bearing inner race.

NOTE
Attach the prongs of the special tool to the inner race of the side bearing through the openings in the differential case.

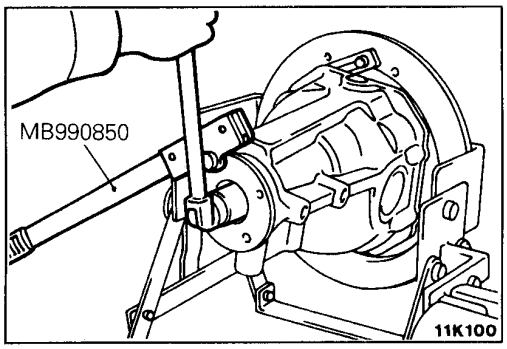


8. REMOVAL OF DRIVE GEAR

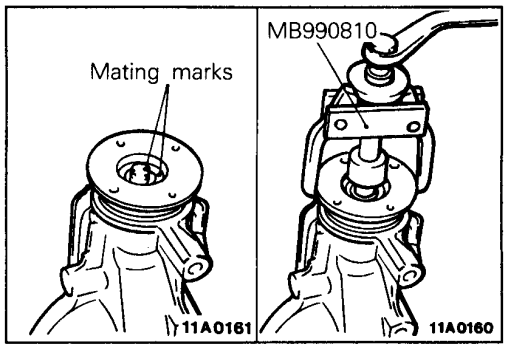
(1) Make the mating marks to the differential case and the drive gear.
(2) Loosen the drive gear attaching bolts in diagonal sequence to remove the drive gear.



9. REMOVAL OF LOCK PIN <FOR CONVENTIONAL DIFFERENTIAL>



17. REMOVAL OF SELF-LOCKING NUT

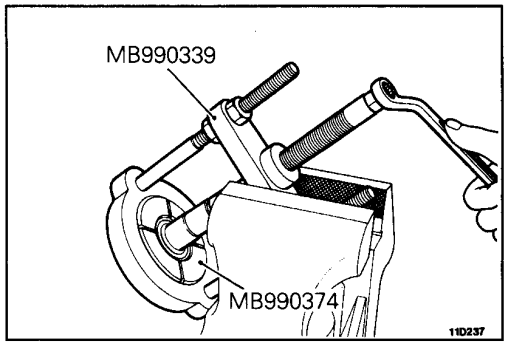


19. REMOVAL OF DRIVE PINION

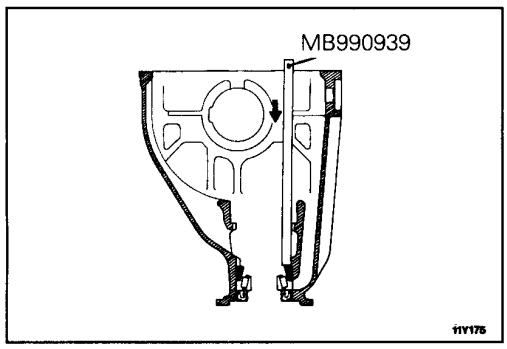
(1) Make the mating marks to the drive pinion and companion flange.

Caution
Mating marks should not be made to the contact surfaces of companion flange and propeller shaft.

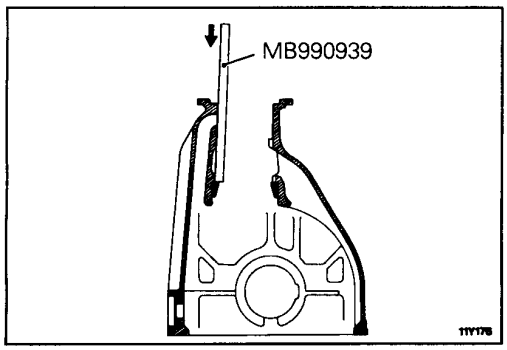
(2) Drive out the drive pinion together with the drive pinion spacer and drive pinion front shims.



23. REMOVAL OF DRIVE PINION REAR BEARING INNER RACE



26. REMOVAL OF OIL SEAL/27. DRIVE PINION FRONT BEARING INNER RACE/28. DRIVE PINION FRONT BEARING OUTER RACE



29. REMOVAL OF DRIVE PINION REAR BEARING OUTER RACE

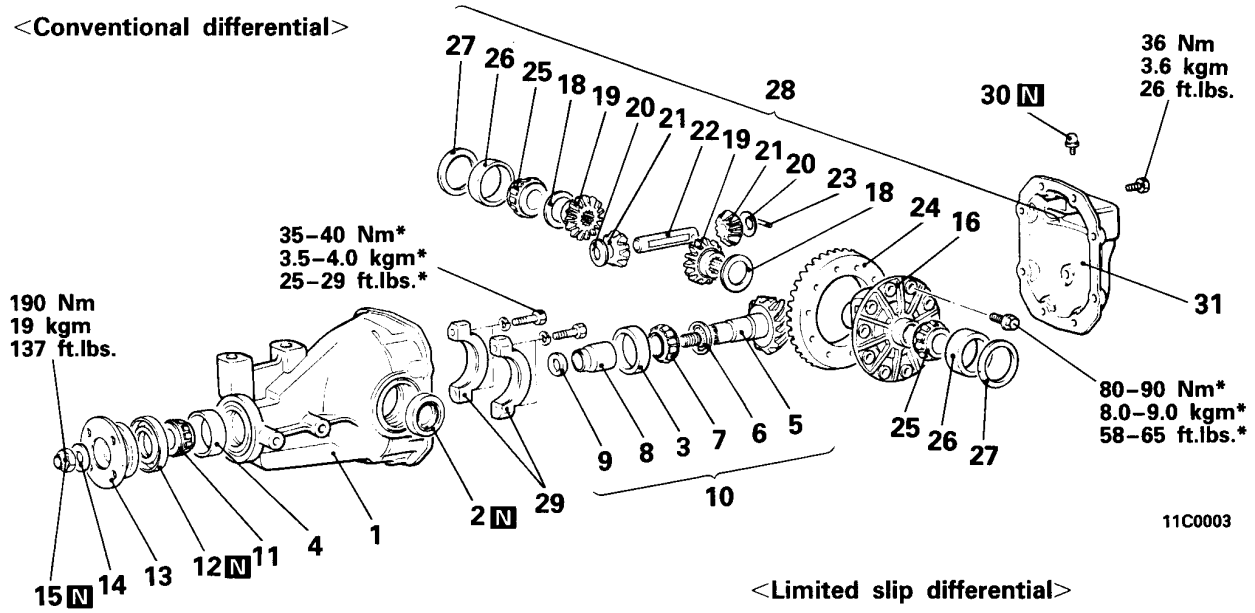
INSPECTION E27QGAF

- Check the companion flange for wear or damage.
- Check the bearings for wear or discoloration.
- Check the gear carrier for cracks.
- Check the drive pinion and drive gear for wear or cracks.
- Check the side gears, pinion gears and pinion shaft for wear or damage.
- Check the side gear spline for wear or damage.

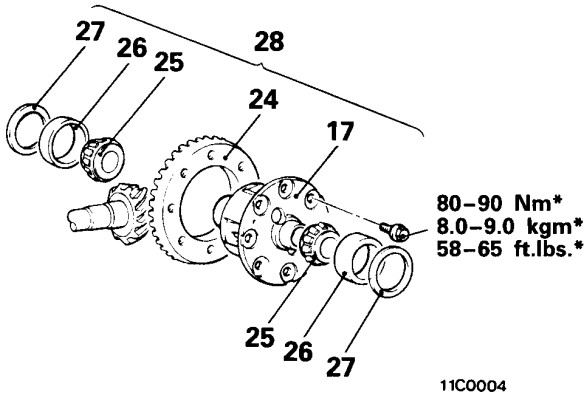
REASSEMBLY

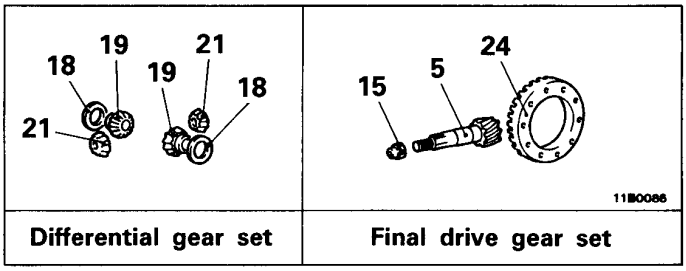
E27QJ–

<Conventional differential>



<Limited slip differential>





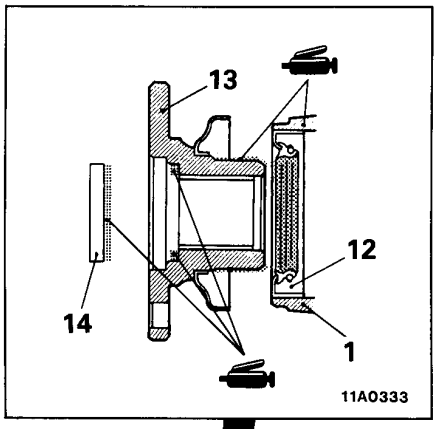
Differential gear set	Final drive gear set

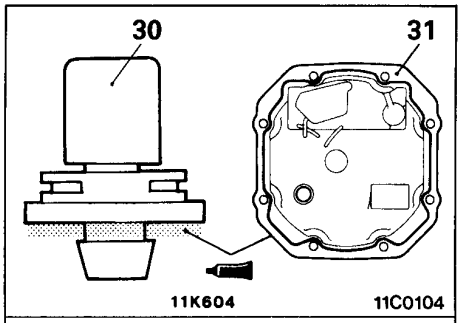
Reassembly steps

1. Gear carrier
2. Oil seal
3. Drive pinion rear bearing outer race
4. Drive pinion front bearing outer race
- Adjustment of pinion height
5. Drive pinion
6. Drive pinion rear shim (for pinion height adjustment)
7. Drive pinion rear bearing inner race
8. Drive pinion spacer
- Adjustment of drive pinion preload
9. Drive pinion front shim (for preload adjustment)
10. Drive pinion assembly
11. Drive pinion front bearing inner race
12. Oil seal
13. Companion flange
14. Washer
15. Self-locking nut
16. Differential case
17. Limited slip differential case assembly (Refer to P.27-42.)
- Adjustment of differential gear backlash
18. Side gear spacers
19. Side gears
20. Pinion washers
21. Pinion gears
22. Pinion shaft
23. Lock pin (for conventional differential)
24. Drive gear
25. Side bearing inner race
26. Side bearing outer race
- Adjustment of final drive gear backlash
27. Side bearing spacers
28. Differential case assembly
29. Bearing caps
30. Vent plug
31. Differential cover

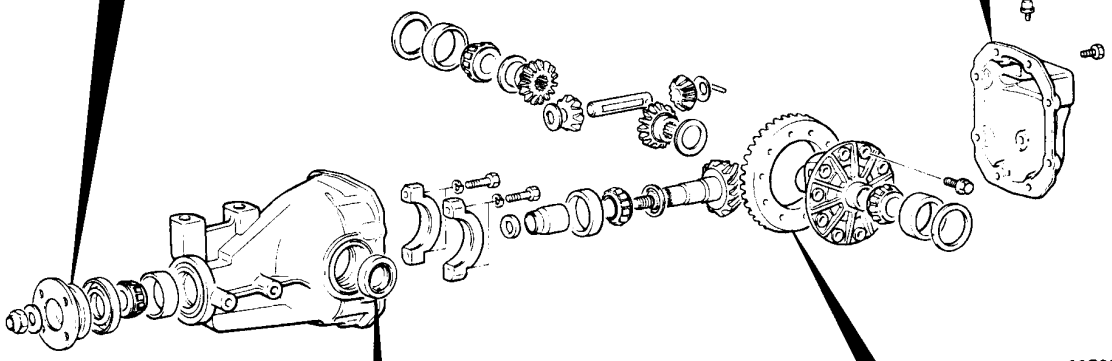
NOTE
*: Tightening torque with oil applied.

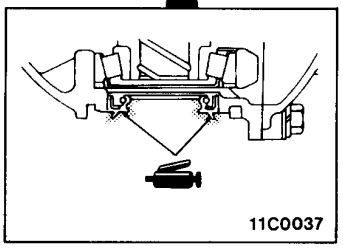
LUBRICATION AND ADHESION POINTS

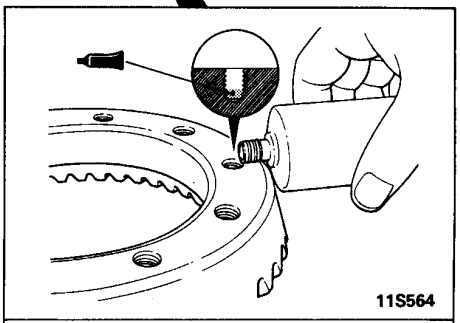




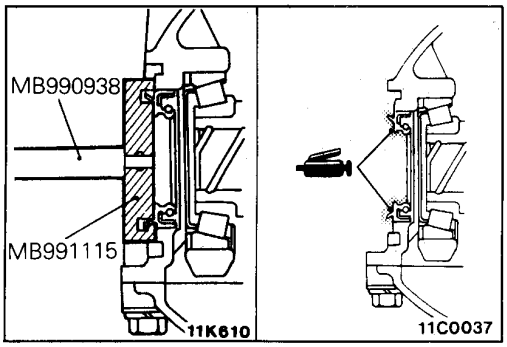
Sealant: 3M ATD Part No. 8663, 8661 or equivalent







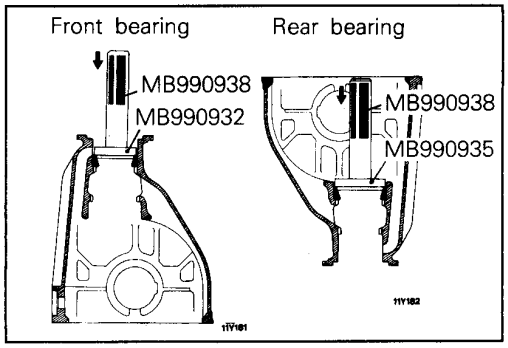
Adhesive: 3M Stud Locking Part No. 4170 or equivalent



SERVICE POINTS OF REASSEMBLY E27QHBE

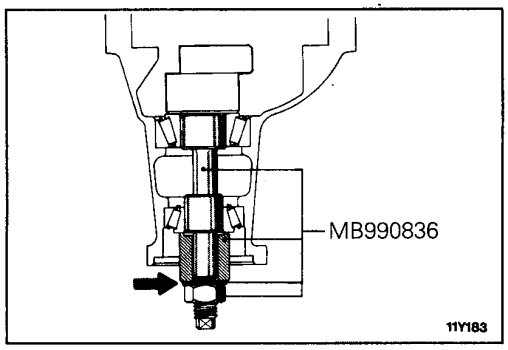
2. PRESS FITTING OF OIL SEAL

(1) With the special tool, press fit the oil seal until it is flush with the end of the gear carrier.
(2) Apply multipurpose grease to the oil seal lip.



3. INSTALLATION OF DRIVE PINION REAR BEARING OUTER RACE/4. DRIVE PINION FRONT BEARING OUTER RACE

Caution
Be careful not to press in the outer race at an angle.

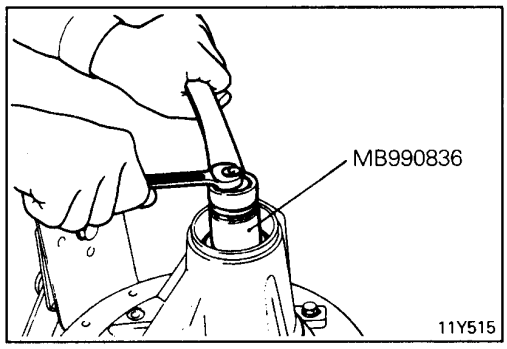


- **ADJUSTMENT OF PINION HEIGHT**

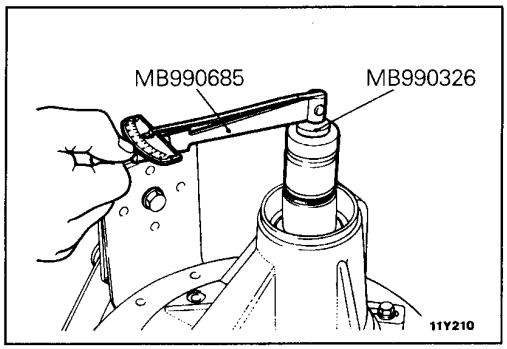
Adjust the drive pinion height by the following procedures:

(1) Install special tools and drive pinion front and rear bearing inner races on the gear carrier in the sequence shown in the illustration.

NOTE
Apply a thin coat of the multipurpose grease to the mating face of the washer of the special tool.



(2) Tighten the nut of the special tool until the standard value of drive pinion turning torque is obtained.

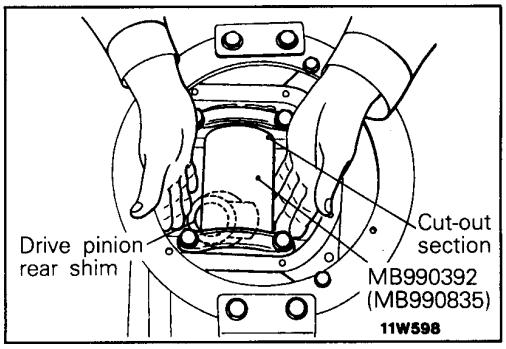


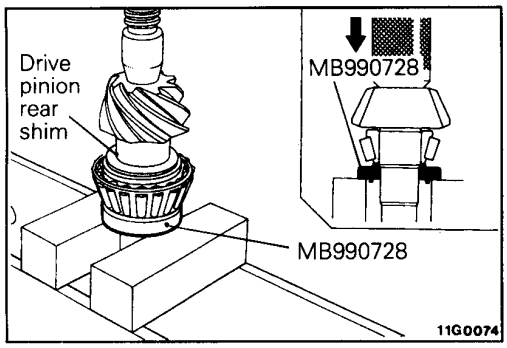
(3) Measure the drive pinion turning torque (without the oil seal) by using the special tools.

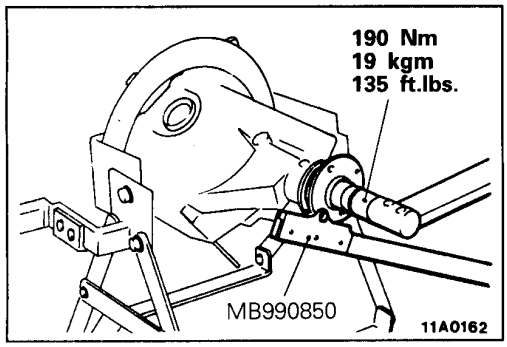
Standard value:

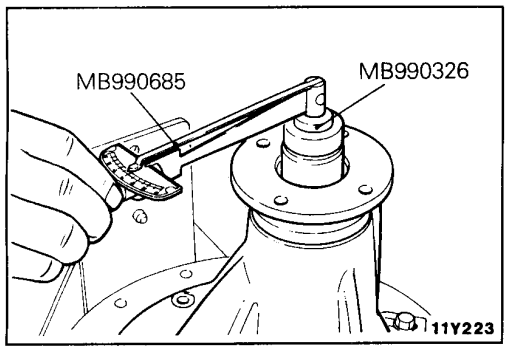
Bearing classification	Bearing lubrication	Rotation torque (starting friction torque) Nm (kgcm, in.lbs.)
New	None (with rust-prevention oil)	0.9–1.2 (9.0–12.0, 8–10)
New/reused	Oil application	0.4–0.5 (4.0–5.0, 3–4)

NOTE
(1) Gradually tighten the nut of the special tool while checking the drive pinion turning torque.
(2) Because the special tool cannot be turned one turn, turn it several times within the range that it can be turned; then, after fitting to the bearing, measure the rotation torque.









(4) Position the special tool in the side bearing seat of the gear carrier, and then select a drive pinion rear shim of a thickness which corresponds to the gap between the special tools.

NOTE
Clean the side bearing seat thoroughly. When positioning the special tool, be sure that the cut-out sections of the special tool are in the position shown in the illustration, and also confirm that the special tool is in close contact with the side bearing seat.
When selecting the drive pinion rear shims, keep the number of shims to a minimum.

(5) Fit the selected drive pinion rear shim(s) to the drive pinion, and press-fit the drive pinion rear bearing inner race by using the special tool.

- **ADJUSTMENT OF DRIVE PINION PRELOAD**

Adjust the drive pinion turning torque by using the following procedures:

(1) Fit the drive pinion front shim(s) between the drive pinion spacer and the drive pinion front bearing inner race.

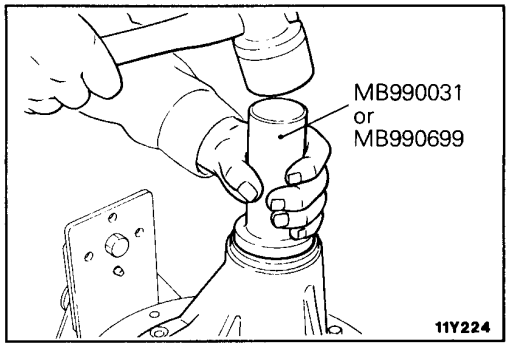
(2) Tighten the companion flange to the specified torque by using the special tools.

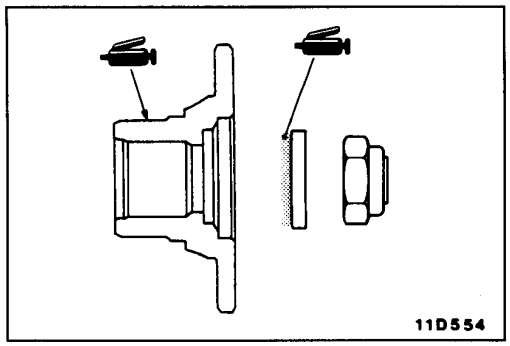
NOTE
Do not install the oil seal.

(3) Measure the drive pinion turning torque (without the oil seal) by using the special tools.

Standard value:

Bearing classification	Bearing lubrication	Rotation torque (starting friction torque) Nm (kgcm, in.lbs.)
New	None (with rust-prevention oil)	0.9–1.2 (9.0–12.0, 8–10)
New/reused	Oil application	0.4–0.5 (4.0–5.0, 3–4)



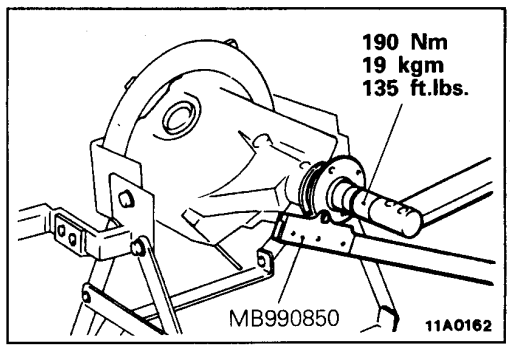


(4) If the drive pinion turning torque is not within the range of the standard value, adjust the turning torque by replacing the drive pinion front shim(s) or the drive pinion spacer.

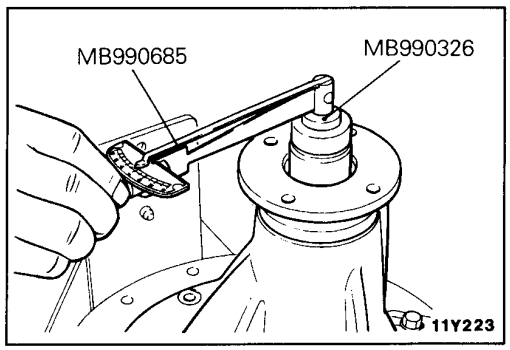
NOTE
When selecting the drive pinion front shims, if the number of shims is large, reduce the number of shims to a minimum by selecting the drive pinion spacers.

(5) Remove the companion flange and drive pinion once again.
Drive the oil seal into the gear carrier front lip by using the special tool.
Apply multipurpose grease to the oil seal lip.

(6) Apply a thin coat of multipurpose grease to the companion flange contacting surface of the washer and oil seal contacting surface before installing drive pinion assembly.



(7) Install the drive pinion assembly and companion flange with mating marks properly aligned, and tighten the companion flange self-locking nut to the specified torque by using the special tools.

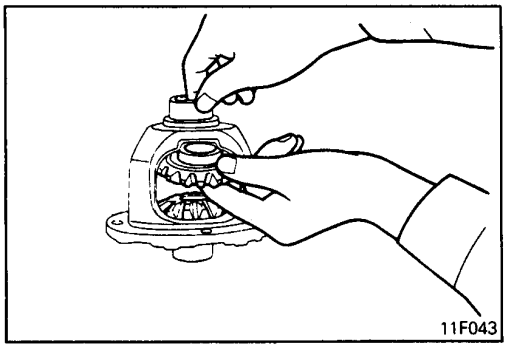


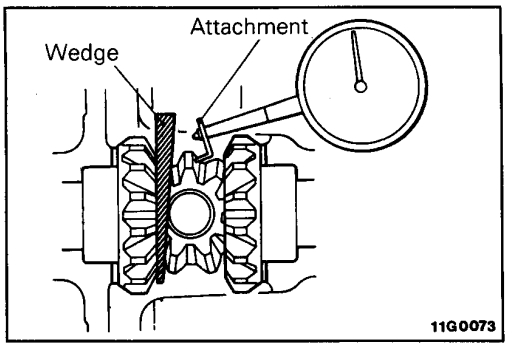
(8) Measure the drive pinion turning torque (with oil seal) by using the special tools to verify that the drive pinion turning torque complies with the standard value.

Standard value:

Bearing classification	Bearing lubrication	Rotation torque (starting friction torque) Nm (kgcm, in.lbs.)
New	None (with rust-prevention oil)	1.0–1.3 (10.0–13.0, 9–11)
New/reused	Oil application	0.5–0.6 (5.0–6.0, 4–5)

If there is a deviation from the standard value, check whether or not there is incorrect tightening torque of the companion flange tightening self-lock nut, or incorrect fitting of the oil seal.





- **ADJUSTMENT OF DIFFERENTIAL GEAR BACKLASH**

Adjust the differential gear backlash by the following procedures:

(1) Assemble the side gears, side gear spacers, pinion gears, and pinion washers into the differential case.
(2) Temporarily install the pinion shaft.

NOTE
Do not drive in the lock pin yet.

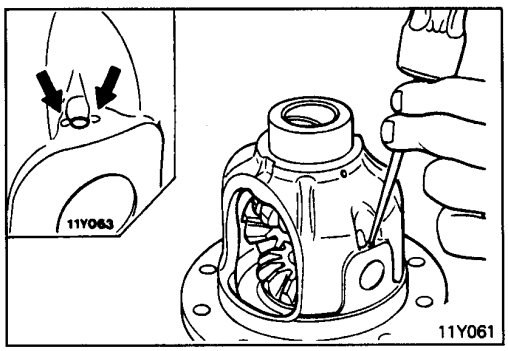
(3) Adjust the differential gear backlash by the following procedures:
① While locking the side gear with the wedge, measure the differential gear backlash with a dial indicator on the pinion gear.

NOTE
The measurement should be made for both pinion gears individually.

Standard value: 0–0.076 mm (0–0.003 in.)
Limit: 0.2 mm (0.008 in.)

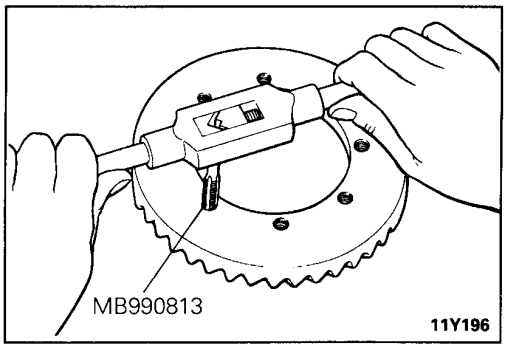
② If the differential gear backlash exceeds the limit, adjust the backlash by installing thicker side gear spacers.
③ Measure the differential gear backlash once again, and confirm that it is within the limit.

NOTE
(1) After adjustment, check that the backlash is the less than the limit and differential gear rotates smoothly.
(2) When adjustment is impossible, replace the side gear and the pinion gear as a set.



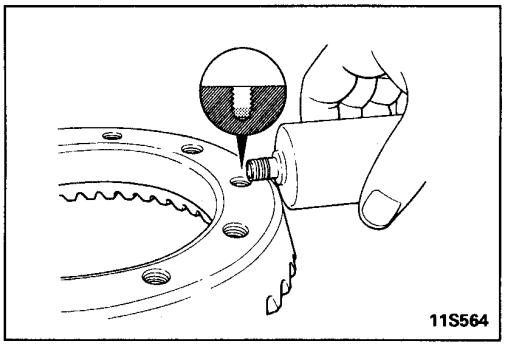
23. INSTALLATION OF LOCK PIN

(1) Align the pinion shaft lock pin hole with the differential case lock pin hole, and drive in the lock pin.
(2) Stake the lock pin with a punch at two points.



24. INSTALLATION OF DRIVE GEAR

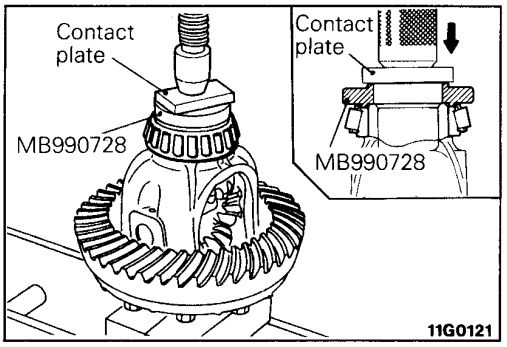
(1) Clean the drive gear attaching bolts.
(2) Remove the adhesive adhering to the threaded holes of the drive gear by turning the special tool (tap M10 x 1.25), and then clean the threaded holes by applying compressed air.



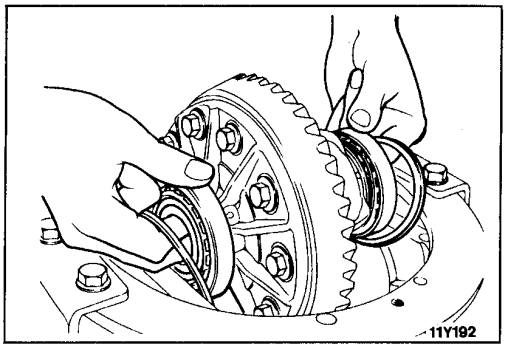
(3) Apply the specified adhesive to the threaded holes of the drive gear.

Specified adhesive: 3M Stud Locking Part No. 4170 or equivalent

(4) Install the drive gear onto the differential case with the mating marks properly aligned. Tighten the bolts to the specified torque [80–90 Nm (8.0–9.0 kgm, 58–65 ft.lbs.)] in a diagonal sequence.



25. PRESS-FITTING OF SIDE BEARING INNER RACE

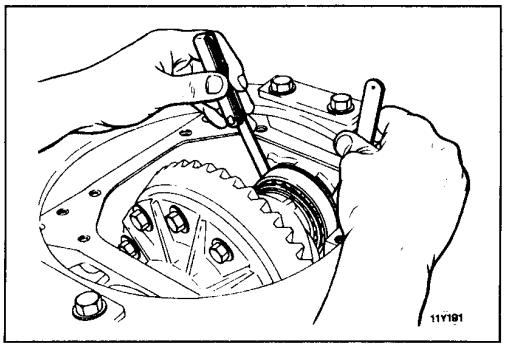


• ADJUSTMENT OF FINAL DRIVE GEAR BACKLASH

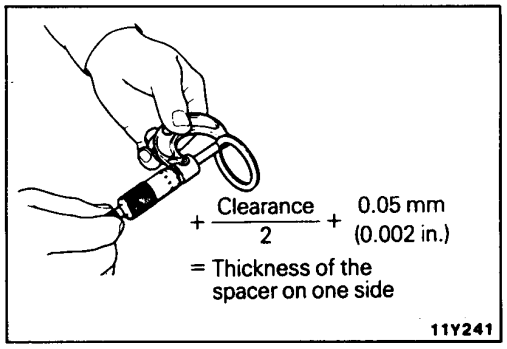
Adjust the final drive gear backlash by the following procedures:

(1) Install the side bearing spacers, which are thinner than those removed, to the side bearing outer races, and then mount the differential case assembly into the gear carrier.

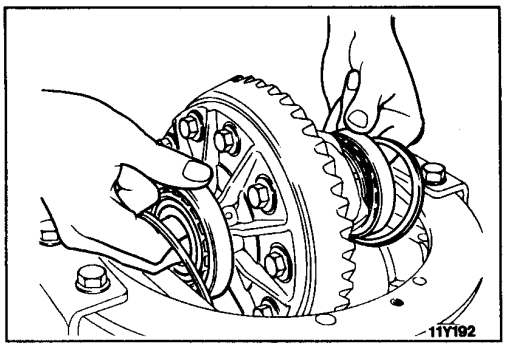
NOTE
Select side bearing spacers with the same thickness for both the drive pinion side and the drive gear side.



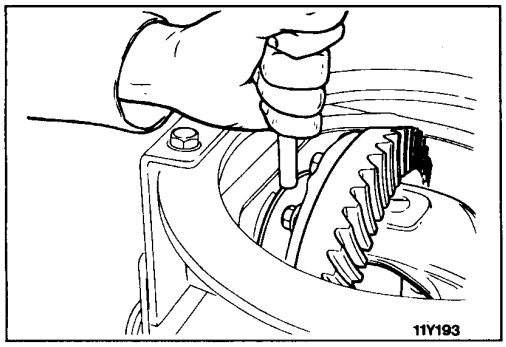
(2) Push the differential case to one side, and measure the clearance between the gear carrier and the side bearing.



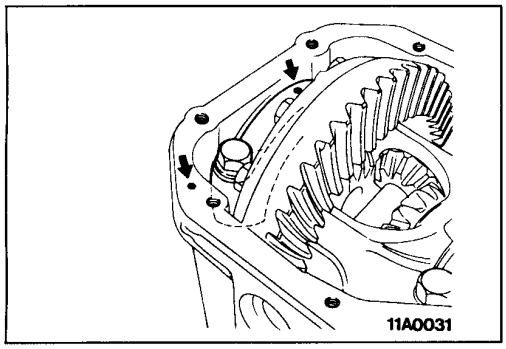
(3) Measure the thickness of the side bearing spacers on one side, select two pairs of spacers which correspond to that thickness plus one half of the clearance plus 0.05 mm (0.002 in.), and then install one pair each to the drive pinion side and the drive gear side.



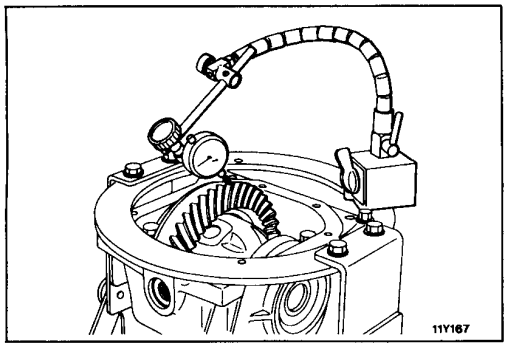
(4) Install the side bearing spacers and differential case assembly, as shown in the illustration, to the gear carrier.



(5) Tap the side bearing spacers with a brass far to fit them to the side bearing outer race.



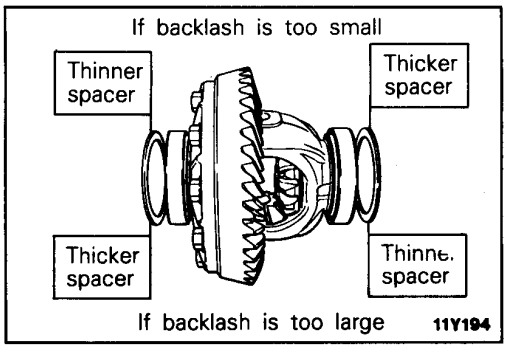
(6) Align the mating marks on the gear carrier and the bearing cap, and then tighten the bearing cap.

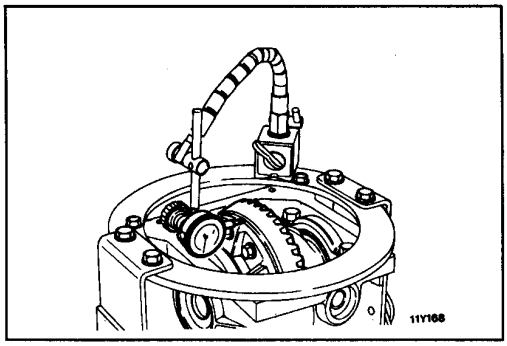


(7) With the drive pinion locked in place, measure the final drive gear backlash with a dial indicator on the drive gear.

NOTE
Measure at four points or more on the circumference of the drive gear.

Standard value: 0.11–0.16 mm (0.004–0.006 in.)





(8) Change the side bearing spacers as illustrated, and then adjust the final drive gear backlash between the drive gear and the drive pinion.

NOTE
When increasing the number of side bearing spacers, use the same number for each, and as few as possible.

(9) Check the drive gear and drive pinion for tooth contact. If poor contact is evident, make adjustment. (Refer to P.27-29.)

(10) Measure the drive gear runout at the shoulder on the reverse side of the drive gear.

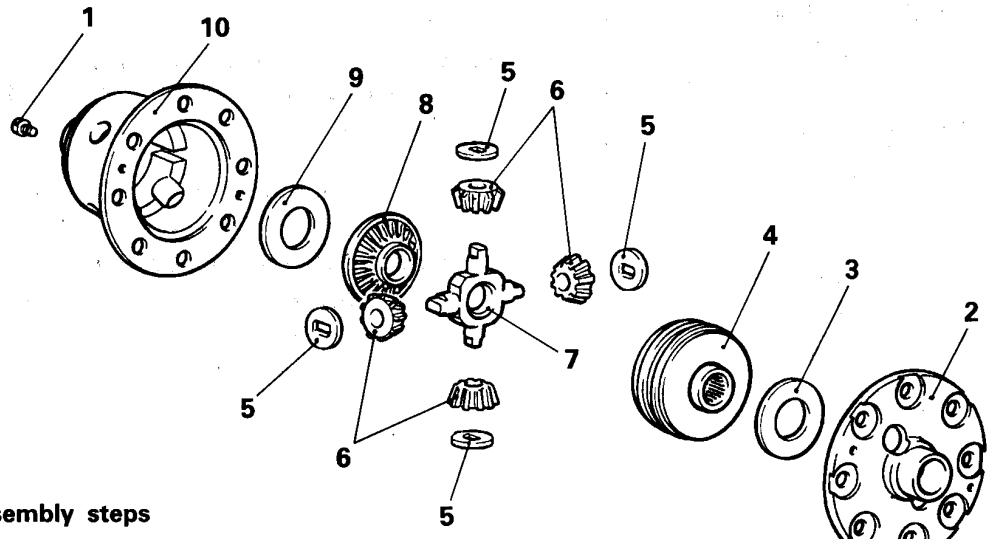
Limit: 0.05 mm (0.002 in.)

(11) If the drive gear runout exceeds the limit, reinstall by changing the phase of the drive gear and differential case, and remeasure.

LSD CASE ASSEMBLY

DISASSEMBLY AND REASSEMBLY

E27TI–

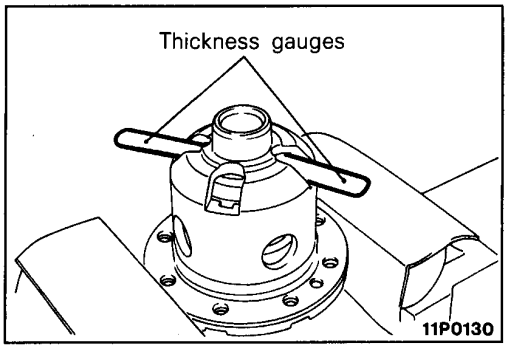


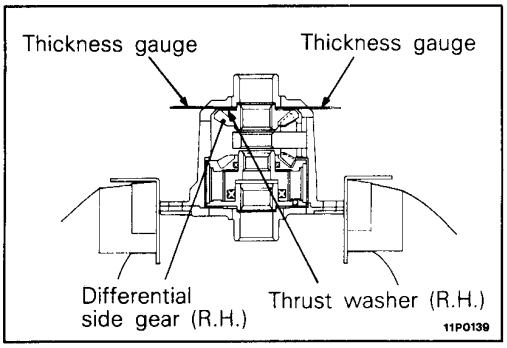
11P0127

Disassembly steps

1. Screw
2. Differential case (A)
3. Thrust washer (L.H.)
4. Viscous coupling (with differential side gear: L.H.)
5. Pinion mate washer
6. Differential pinion mate
7. Differential pinion shaft
8. Differential side gear (R.H.)
9. Thrust washer (R.H.)
10. Differential case (B)

NOTE
LSD: Limited slip differential





INSPECTION BEFORE DISASSEMBLY

E27TMAA

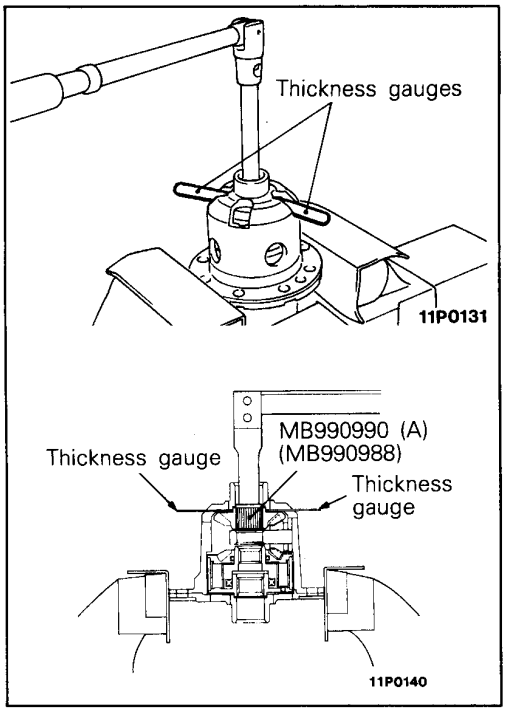
DIFFERENTIAL GEAR BACKLASH

(1) Hold the limited slip differential case assembly in a vice with the differential side gear (R.H.) up.

Caution
When the limited slip differential case is held in a vice, do not tighten excessively.

(2) Install two 0.03 mm (0.0012 in.) thickness gauges diagonally between the differential case (B) and the thrust washer (R.H.).

Caution
Do not insert the thickness gauge in the oil groove provided in the differential case (B).



(3) Insert the special tool in the splined portion of the differential side gear (R.H.) and make sure that the side gear (R.H.) turns.
(4) Replace the thickness gauges with 0.09 mm (0.0035 in.) thickness gauges.
(5) Insert the special tool in the splined portion of the differential side gear (R.H.) and make sure that the side gear (R.H.) does not turn.

Standard value:
Differential gear backlash
0.03–0.09 mm (0.0012–0.0035 in.)

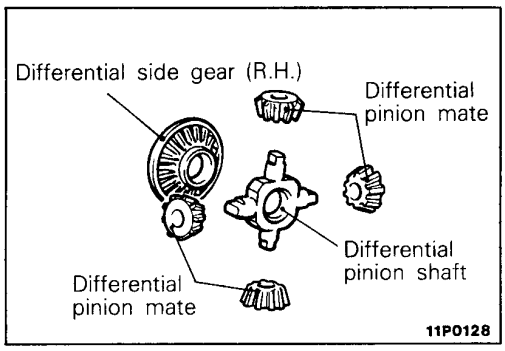
NOTE
The differential gear backlash is normal if the side gear clearance in the direction of thrust is within the standard value.

(6) If the side gear clearance in the direction of thrust is not within the standard value, remove the differential case (A) and make adjustment by means of thrust washer (L.H.).

SERVICE POINTS OF DISASSEMBLY E27TJAH

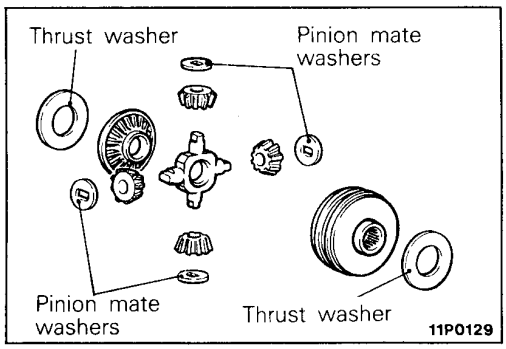
3. REMOVAL OF THRUST WASHER (L.H.)/9. THRUST WASHER (R.H.)

The thrust washer (L.H.) differs from the thrust washer (R.H.) in thickness.
Keep them separately from each other for reference in assembly.

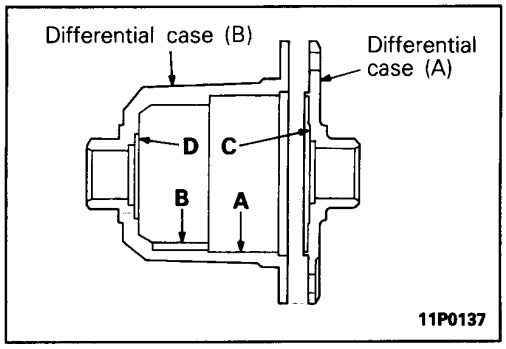


INSPECTION E27TKAF

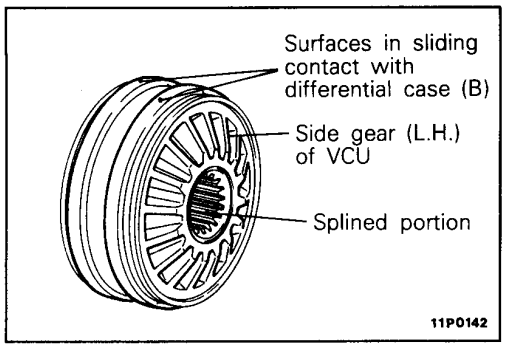
(1) Check each gear and the differential pinion shaft for wear and damage.
(2) Check the splined portion of the differential side gear (R.H.) for damage and shoulder.



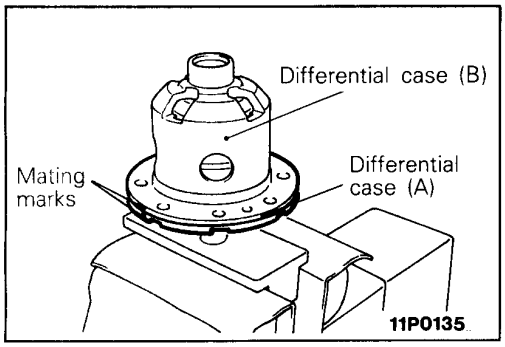
(3) Check the sliding surfaces of the thrust washer and pinion mate washer for wear, seizure and damage.



(4) Check the sliding surfaces of the differential cases (A) and (B) for wear, seizure and damage.
A. Surface in sliding contact with VCU
B. Surface in sliding contact with pinion mate washer
C. Surface in sliding contact with thrust washer
D. Surface in sliding contact with thrust washer



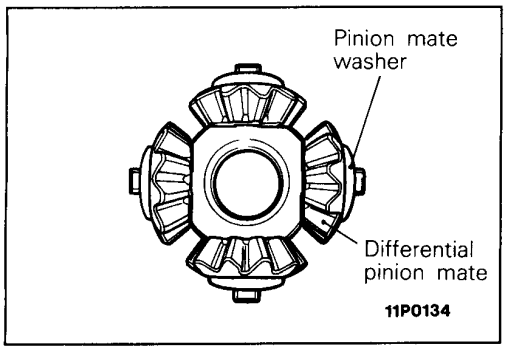
(5) Check the spline of VCU for damage and shoulder and check the surface in sliding contact with the differential case (B).
(6) Check the side gear (L.H.) of VCU for wear and damage.



SERVICE POINTS OF REASSEMBLY E27TLAJ

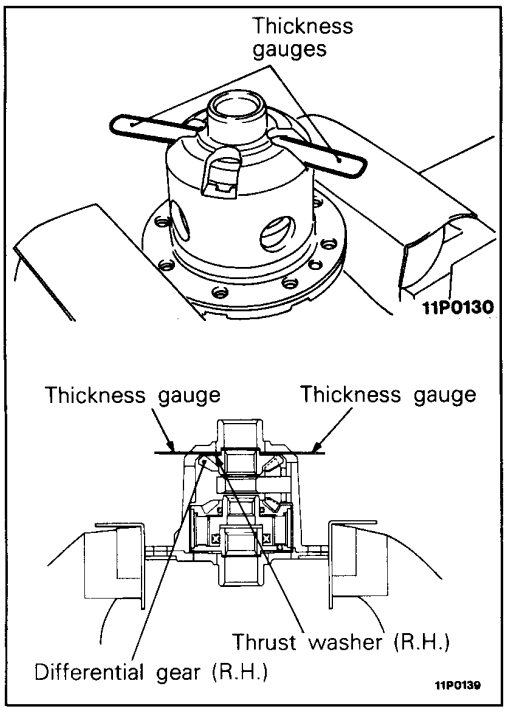
10. INSTALLATION OF DIFFERENTIAL CASE (B)/2. DIFFERENTIAL CASE (A)

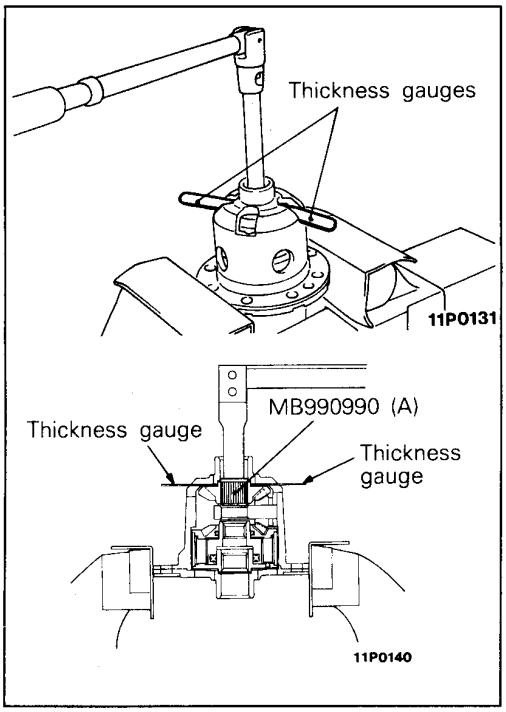
Install the differential cases (A) and (B) with their mating marks in alignment.



6. INSTALLATION OF DIFFERENTIAL PINION MATE/5. PINION MATE WASHER

Attach the differential pinion mate to the pinion shaft with the pinion washers directed as shown, then assemble them into the differential case (B).





3. SELECTION OF THRUST WASHER (L.H.)

(1) When the differential side gear and pinion mate gear have been replaced, select the thrust washer (L.H.) by the following procedure.

① Wash the differential side gear and pinion mate gear with unleaded gasoline and degrease.

② Assemble the thrust washers so far used, without confusing the R.H. part with the L.H. part and together with each gear, VCU, pinion mate washer and pinion shaft, to the differential cases (A) and (B), and loosely tighten the screws.

③ Hold the limited slip differential case assembly in a vice with the differential side gear (R.H.) up.

Caution
When holding the limited slip differential case in a vice, do not tighten the assembly excessively.

④ Insert two 0.03 mm (0.0012 in.) thickness gauges diagonally between the differential case (B) and the thrust washer (R.H.).

Caution
Do not insert the thickness gauge in the oil groove provided in the differential case (B).

⑤ Insert the special tool in the spline of the differential side gear (R.H.) and make sure that the side gear (R.H.) turns.

⑥ Then replace the thickness gauge with a 0.09 mm (0.0035 in.) thickness gauge.

⑦ Insert the special tool in the spline of the differential side gear (R.H.) and make sure that the side gear (R.H.) does not turn.

Standard value:
Differential gear backlash
0.03–0.09 mm (0.0012–0.0035 in.)

NOTE
If the side gear clearance in the direction of thrust is within the standard value, the differential side gear backlash is normal.

⑧ If the side gear clearance in the direction of thrust is not within the standard value, remove the differential case (A) and make adjustment according to the thickness of the thrust washer (L.H.).

Thrust washer (L.H.)	
Part No.	Thickness mm (in.)
MB569243	0.8 (0.032)
	0.9 (0.035)
	1.0 (0.039)
	1.1 (0.043)
	1.15 (0.045)
	1.2 (0.047)
	1.25 (0.049)
	1.3 (0.051)
	1.35 (0.053)
	1.4 (0.055)
	1.5 (0.059)

Thrust washer (R.H.) [Reference]	
Part No.	Thickness mm (in.)
MB569528	0.8 (0.032)

NOTE
The thrust washers (L.H.) are available in a kit. Select one appropriate thrust washer from among 11 washers.