REAR AXLE

CONTENTS

E27AA--

REAR AXLE <2WD>

SPECIFICATIONS

GENERAL SPECIFICATIONS

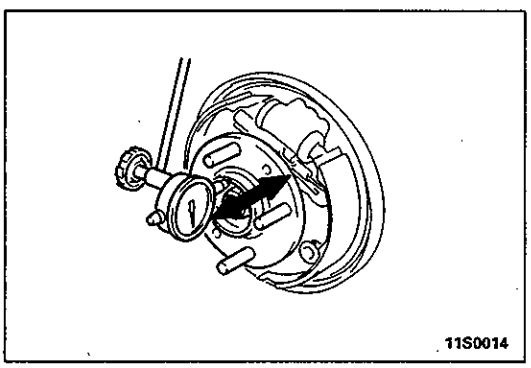
E27CA-1

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.)	0.3–0.9 (0.012–0.035)
Limit		
Wheel bearing axial play	mm (in.)	0.05 (0.0020)
Wheel bearing rotary-sliding resistance	N (kg, lbs.)	19 (1.9, 4) or less



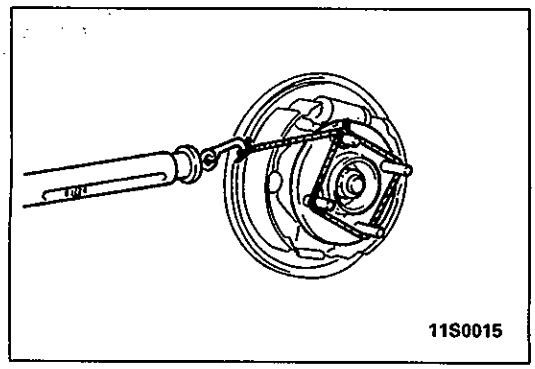
SERVICE ADJUSTMENT PROCEDURES

WHEEL BEARING AXIAL PLAY CHECK

E27FHAD

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

   Limit: 0.05 mm (0.0020 in.)
5. If the axial play exceeds the limit, the flange nut should be tightened to the specified torque [180 Nm (18 kgm, 130 ft.lbs.)] and check the axial play again.
6. Replace the rear hub assembly if an adjustment cannot be made to within the limit.



REAR HUB ROTARY-SLIDING RESISTANCE CHECK

E27FMAC

1. Release the parking brake.
2. Remove the brake drum.
3. For vehicles with rear disc brake, remove the caliper assembly and the brake disc.
4. After turning the hub a few times to seat the bearing, wind a rope around the hub bolt and turn the hub by pulling at a 90° angle with a spring balance. Measure to determine whether or not the rotary-sliding resistance of the rear hub is at the limit value.

   Limit: 19 N (1.9 kg, 4 lbs.) or less
5. If the limit value is exceeded, loosen the flange nut and then tighten it to the specified torque [180 Nm (18 kgm, 130 ft.lbs.)] and check the rear hub rotary sliding resistance again.
6. Replace the rear hub assembly if an adjustment cannot be made to within the limit.

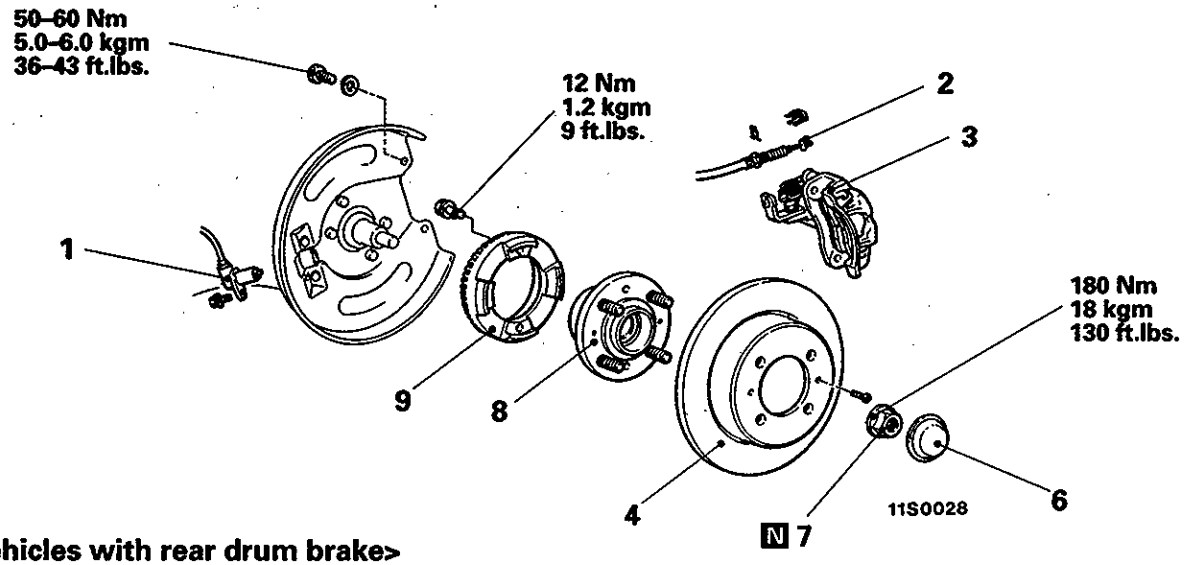
REAR AXLE HUB

E27GA-1

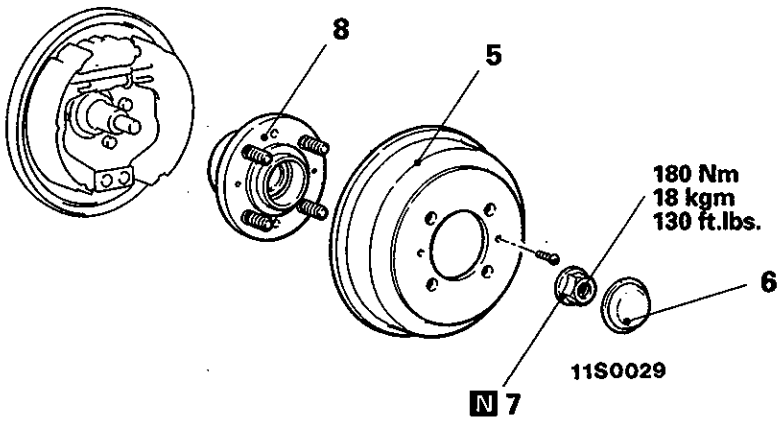
REMOVAL AND INSTALLATION

Post-installation Operation
- Adjustment of Parking Brake <Vehicles with rear disc brake> (Refer to GROUP 36 – Service Adjustment Procedures.)

<Vehicles with rear disc brake>



<Vehicles with rear drum brake>



Removal steps

- ◆◆ 1. Rear speed sensor <Vehicles with ABS>
- 2. Parking brake cable connection
- ◆◆ 3. Caliper assembly
- 4. Brake disc
- 5. Brake drum
- 6. Hub cap
- 7. Flange nut
- 8. Rear hub assembly
- 9. Rotor <Vehicles with ABS>

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.

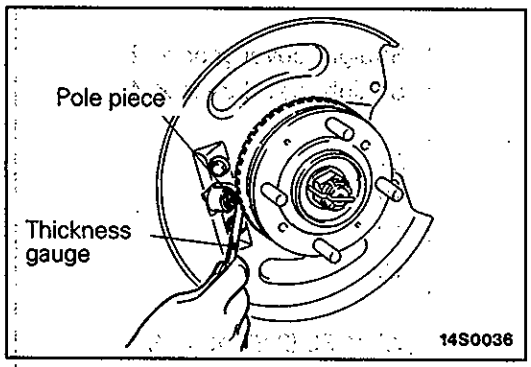
SERVICE POINTS OF REMOVAL E27GBAH

3. REMOVAL OF CALIPER ASSEMBLY

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

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

(1) Provisionally install the speed sensor to the sensor bracket.

(2) With the caliper assembly and brake disc removed, 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 sensor bracket at the position where the clearance at all places is within the standard value.

Standard value: 0.3–0.9 mm (0.012–0.035 in.)

REAR AXLE <4WD>

SPECIFICATIONS

GENERAL SPECIFICATIONS

Hatchback and sedan

E27CA-2

Items		Vehicles with conventional differential	Vehicles with VCU type limited slip differential
Wheel bearing			
Type		Double-row angular contact bearing	Double-row angular contact bearing
O.D. × I.D.	mm (in.)	70 × 40 (2.76 × 1.57)	70 × 40 (2.76 × 1.57)
Drive shaft			
Joint type			
Outer		B.J.	B.J.
Inner		T.J.	T.J.
Length (joint to joint)	mm (in.)	518 (20.39)	516 (20.31)
Differential			
Reduction gear type		Hypoid gear	Hypoid gear
Reduction ratio		2.846	2.846
Differential gear type and configuration			
Side gear		Straight bevel gear × 2	Straight bevel gear × 2*
Pinion gear		Straight bevel gear × 2	Straight bevel gear × 4
Number of teeth			
Drive gear		37	37
Drive pinion		13	13
Side gear		14	16
Pinion gear		10	10
Bearing (O.D. × I.D.)	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
*: L.H. side gear is integral with VCU.

Wagon

E27CA-2

Items	Vehicles with conventional differential	Vehicles with mechanical type limted slip differential
Axle housing type	Banjo type	Banjo type
Axle shaft		
Supporting type	Semi-floating type	Semi-floating type
Shaft dimension		
Bearing portion × center portion × overall mm (in.)	35 × 27.5 × 756 (1.38 × 1.08 × 29.76)	35 × 27.5 × 756 (1.38 × 1.08 × 29.76)
Bearing		
O.D. × I.D. mm (in.)	72 × 35 (2.83 × 1.38)	72 × 35 (2.83 × 1.38)
Differential		
Reduction gear type	Hypoid gear	Hypoid gear
Reduction ratio	2.846	2.846
Differential gear type and configuration		
Side gear	Straight bevel gear × 2	Straight bevel gear × 2
Pinion gear	Straight bevel gear × 2	Straight bevel gear × 4
Number of teeth		
Drive gear	37	37
Drive pinion	13	13
Side gear	14	14
Pinion gear	10	10
Bearing (O.D. × I.D.) 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)

NOTES

SERVICE SPECIFICATIONS

E27CB-2

Items	Vehicles with conventional differention	Vehicles with limited slip differential	
		Mechanical type	VCU type
Standard value			
Setting of T.J. boot length mm (in.)	85 ± 3 (3.35 ± 0.12)	–	85 ± 3 (3.35 ± 0.12)
Rotation torque of the limited slip differential (Vehicle in the laden condition) Nm (kgm, ft.lbs.)			
Using the special tool	–	2.5 (0.25, 1.8)	–
Without using the special tool	–	5 (0.5, 3.6)	–
Final drive gear backlash mm (in.)	0.11–0.16 (0.0043–0.0063)	0.11–0.16 (0.0043–0.0063)	0.11–0.16 (0.0043–0.0063)
Differential gear backlash mm (in.)	0–0.076 (0–0.0030)	–	–
Drive pinion turning torque			
Without oil seal Nm (kgcm, in.lbs.)			
New bearing, without lubricating oil	0.9–1.2 (9.0–12.0, 8–10)	0.9–1.2 (9.0–12.0, 8–10)	0.9–1.2 (9.0–12.0, 8–10)
New bearing, or reused bearing with gear oil	0.4–0.5 (4.0–5.0, 3–4)	0.4–0.5 (4.0–5.0, 3–4)	0.4–0.5 (4.0–5.0, 3–4)
With oil seal Nm (kgcm, in.lbs.)			
New bearing, without lubricating oil	1.0–1.3 (10.0–13.0, 9–11)	1.0–1.3 (10.0–13.0, 9–11)	1.0–1.3 (10.0–13.0, 9–11)
New bearing, or reused bearing with gear oil	0.5–0.6 (5.0–6.0, 4–5)	0.5–0.6 (5.0–6.0, 4–5)	0.5–0.6 (5.0–6.0, 4–5)
Rotation torque of the limited slip differential (With all connections removed) Nm (kgm, ft.lbs.)			
When a new clutch plate is used	–	20–40 (2.0–4.0, 14–29)	–
When an old clutch plate is used	–	5–40 (0.5–4.0, 4–29)	–
Allowable difference in total thickness between the left and right clutch plates mm (in.)	–	0.05 (0.002) or less	–
Clearance between spring plate and differential case mm (in.)	–	0.06–0.25 (0.0024–0.0098)	–
Differential gear backlash <VCU type LSD> mm (in.)	–	–	0.03–0.09 (0.0012–0.0035)
Protruding length of stabilizer bar mounting bolt mm (in.)	19–21 (0.75–0.83)	19–21 (0.75–0.83)	–

Items	Vehicles with conventional differential	Vehicles with limited slip differential	
		Mechanical type	VCU type
Limit			
Rear axle total backlash mm (in.)	5 (0.2)	5 (0.2)	5 (0.2)
Rear wheel bearing axial play mm (in.)			
<COLT,LANCER–Sedan>	0.05 (0.002)	–	0.05 (0.002)
<LANCER–Wagon>	0.80 (0.031)	0.80 (0.031)	–
Wheel bearing starting torque Nm (kgcm, in.lbs.)	1.1 (10.5, 9) or less	–	1.1 (10.5, 9) or less
Drive gear runout mm (in.)	0.05 (0.0019)	0.05 (0.0019)	0.05 (0.0019)
Differential gear backlash mm (in.)	0.2 (0.008)	–	–
Friction plate and friction disc warping (flatness) mm (in.)	–	0.08 (0.0031)	–
Friction plate and friction disc wear (difference in the thickness of the friction surfaces and the projections) mm (in.)	–	0.1 (0.0039)	–

LUBRICANTS

Items	Quantity	Specified lubricant
Rear axle gear oil		
Conventional differential, Limited slip differential (VCU type)	1.0 dm^3 (1.2 U.S. qts., 1.0 Imp. qts.)	Hypoid gear oil SAE No. 90 conforming to API classification GL-5
Limited slip differential (mechanical type)	1.0 dm^3 (1.2 U.S. qts., 1.0 Imp. qts.)	MITSUBISHI Genuine Gear Oil Part No. 8149630EX, CASTROL HYPOY LS (GL-5, SAE 90), SHELL-LSD (GL-5, SAE 80W-90) or equivalent
T.J. boot grease	95 g (3.35 oz.) <Vehicles without LSD>	Repair kit grease
	105 g (3.70 oz.) <Vehicles with LSD>	
B.J. boot grease	75 g (2.65 oz.) <Vehicles without LSD>	Repair kit grease
	85 g (3.00 oz.) <Vehicles with LSD>	

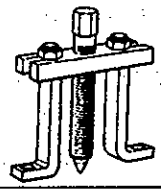
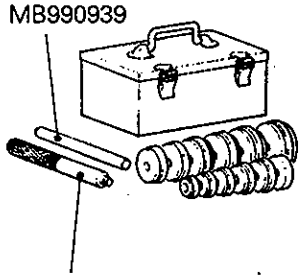
SEALANTS AND ADHESIVES

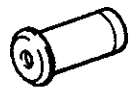
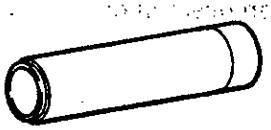
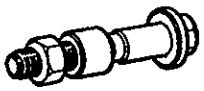
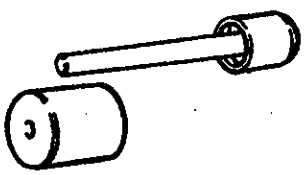
E27CE--

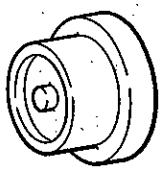
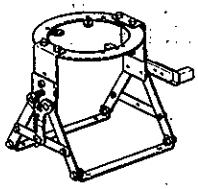
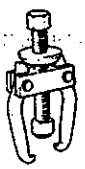
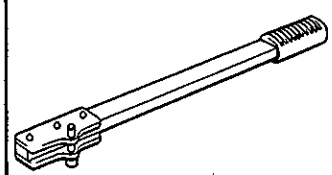
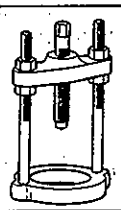
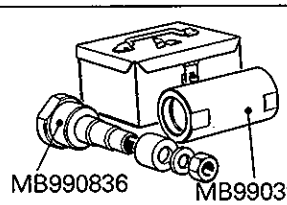
Items	Specified sealants and adhesives	Remarks
Threaded holes of the drive gear	3M Stud Locking Part No. 4170 or equivalent	Anaerobic adhesive
Vent plug installation surface	3M ATD Part No. 8661 or equivalent	Semi-drying sealant
Differential cover installation surface <Hatchback and sedan>	3M ATD Part No. 8661 or equivalent	Semi-drying sealant

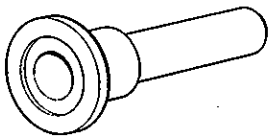
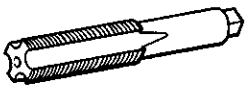
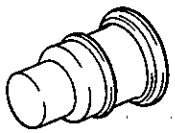
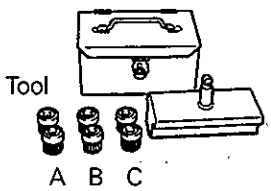
SPECIAL TOOLS

E27DA-

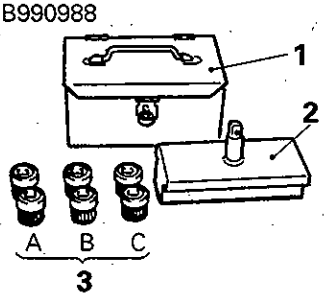
Tool	Number	Name	Use
	MB990241	Rear axle shaft puller	• Driving-out of the rear hub assembly (Use in conjunction with MB990211) • Driving-out of the drive shaft • Removal of axle shaft assembly (Use in conjunction with MB990211)
	MB990211	Sliding hammer	• Driving-out of the rear hub assembly (Use in conjunction with MB990241) • Removal of rear axle oil seal (Use in conjunction with MB990212)
	MB990212	Adapter	Removal of rear axle oil seal (Use in conjunction with MB990211)
	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 of ABS rotor
MB990939  MB990938	MB990925	Bearing and oil seal installer set	• Driving-out of the wheel bearing MB990938, MB990934 • Press-fitting of rear axle oil seal MB990935, MB990938 <Vehicles without ABS for wagon> MB990930, MB990938 <Vehicles with ABS for wagon> • 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 MB990939 Refer to GROUP 26.

Tool	Number	Name	Use
	MB991400	Rear wheel bearing and hub installer	• Press-fitting of the rear wheel bearing MB991400, MB991401 • Press-fitting of the rear hub assembly MB991400 (Use in conjunction with MB991411)
	MB991401	Rear wheel bearing and hub installer base	
	MB991411	Rear wheel bearing and hub installer joint	Press-fitting of the rear hub assembly (Use in conjunction with MB991400)
	MB990998	Front hub remover and installer	• Measurement of the starting torque of the wheel bearing • Provisional holding of the wheel bearing
	MB990685 or MB991151	Torque wrench	• Measurement of the starting torque of the wheel bearing • Measurement of the drive pinion preload
	MB990326	Preload socket	
	MB990767	End yoke holder	• Fixing of the hub • Inspection of limited slip differential (mechanical type) rotation torque
	MB990628	Snap ring pliers	To remove and install the snap ring of the drive shaft
	MB990641	Lower arm bushing (A) remover & installer	Driving-out and press fitting of the differential support member bushing

Tool	Number	Name	Use
	MB991439	Bushing remover & installer	Driving-out and press fitting of differential support arm bushing
	MB991357	Side gear holding tool	Inspection of the limited slip differential (VCU type) gear backlash
	MB990909	Working base	Supporting of the differential carrier
	MB991116	Working 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	
 MB990836 MB990392	MB990835	Drive pinion setting gauge set	Measurement of the drive pinion height

Tool	Number	Name	Use
	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 drive gear sealant
	MB991460	Plug	Prevention of entry of foreign objects into the differential carrier
	MB991284	Rear axle shaft bearing puller	Removal of the axle shaft bearing
	MB990988	Side gear holding tool set	Inspection of limited slip differential torque (mechanical type) MB990989, MB990990

MB990988



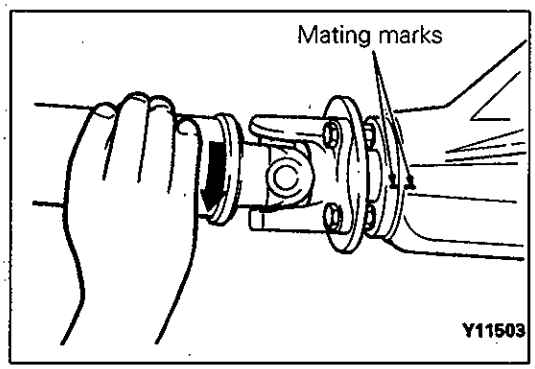
Tool number		Name	O.D. mm (in.)
1	MB990551	Box	–
2	MB990989	Base	–
3	(MB990990)	Tool A	25 (0.98)
	(MB990991)	Tool B	28 (1.10)
	(MB990992)	Tool C	31 (1.22)

SERVICE ADJUSTMENT PROCEDURES

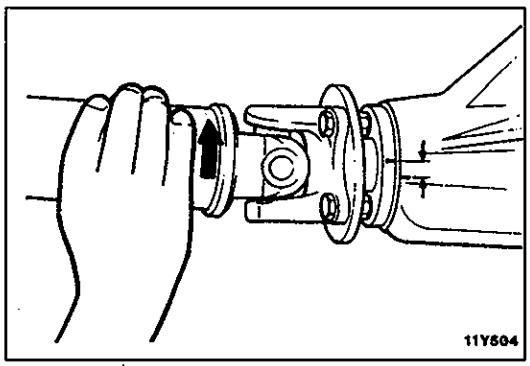
REAR AXLE TOTAL BACKLASH CHECK E27FCAG

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.



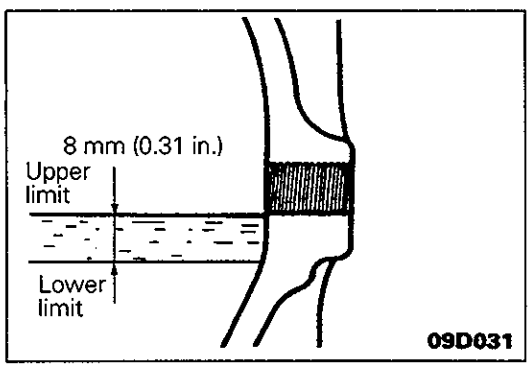
(2) Manually turn the propeller shaft clockwise as far as it will go and make mating marks on the companion flange dust cover and the differential carrier.



(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.27-31 and 32.)



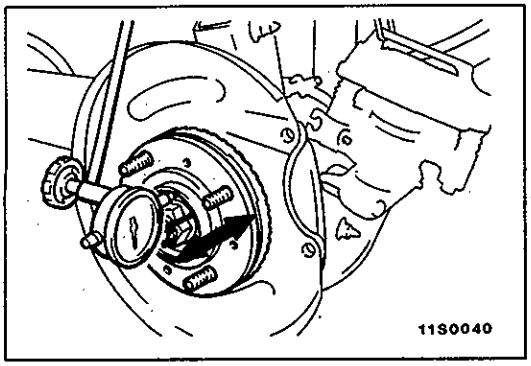
GEAR OIL LEVEL CHECK E27FGAG

(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:

<Conventional differential, limited slip differential (VCU Type>
Hypoid gear oil SAE No. 90 conforming to API classification GL-5
[1.0 dm^3 (1.2 U.S. qts., 1.0 Imp. qts.)]

<Limited slip differential (mechanical type)>
MITSUBISHI Genuine Gear Oil Part No. 8149630EX, CASTROL HYPOY LS (GL-5, SAE90), SHELL-LSD (GL-5 SAE 80W–90) or equivalent
[1.0 dm^3 (1.2 U.S. qts., 1.0 Imp. qts.)]

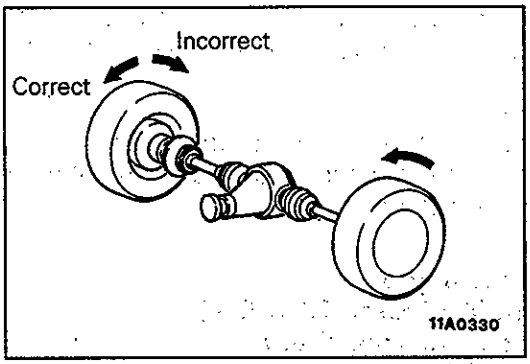


WHEEL BEARING AXIAL PLAY CHECK E27FHAE

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

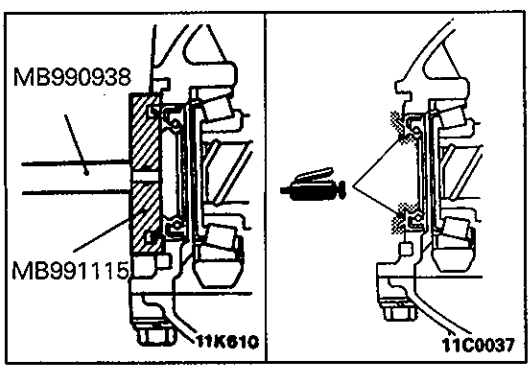
Limit: 0.05 mm (0.002 in.) <Hatchback and sedan>
0.80 mm (0.031 in.) <Wagon>

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



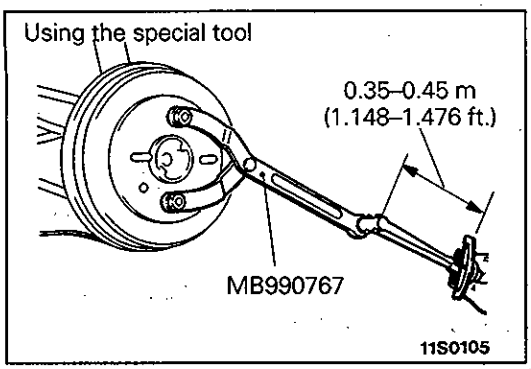
LIMITED SLIP DIFFERENTIAL CONDITION CHECK (VCU TYPE) E27FPAA

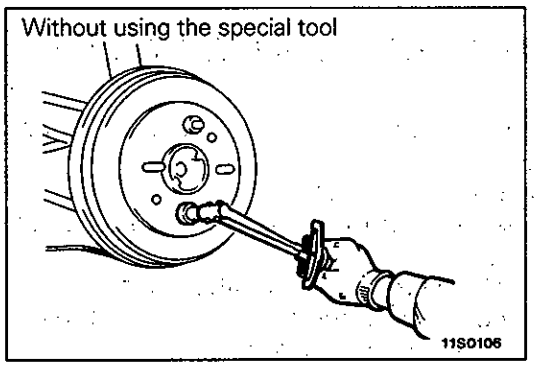
(1) Place the shift lever in the neutral position and block the front wheels with chocks.
(2) Release the parking brake lever fully.
(3) Jack up the rear wheels and apply rigid racks to the specified positions of the side sills.
(4) Disconnect the propeller shaft from the differential.
(5) While turning 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. (Refer to P.27-17.)
(2) Remove the oil seal of the differential carrier.
(3) Use the special tool to tap on a new oil seal as far as the end of the differential carrier.
(4) Apply multipurpose grease to the lip section of the oil seal and to the oil seal contact surface of the drive shaft.
(5) Replace the circlip on the drive shaft with a new one, and then install the drive shaft onto the differential carrier.
(6) Check the wheel alignment. (Refer to GROUP 34 – Service Adjustment Procedures.)





ROTATION TORQUE CHECK OF LIMITED SLIP DIFFERENTIAL (MECHANICAL TYPE)

(1) Place the gearshift lever in the neutral position and block the front wheels with chocks.
(2) Disconnect the propeller shaft from the differential.
(3) With the parking brake lever fully released, jack up only one rear wheel and leave the opposite rear wheel on the ground.

(4) Using the following procedure, measure the limited slip differential rotation torque at the rear wheel raised from the ground.
① Remove the wheel.
② Tighten the hub nut to the hub bolt of the wheel.
③ Use torque wrench to measure the axle shaft rotation torque in the forward direction.

Standard value:
Using the special tool
2.5 Nm (0.25 kgm, 1.8 ft.lbs.)
Without using the special tool
5 Nm (0.5 kgm, 3.6 ft.lbs.)

NOTE
(1) Turn the hub to warm it up before measuring the torque value whole in rotation.
(2) Install the torque wrench so that the center of the wheel may be in a straight lime with the wheel nut.

④ If the rotation torque is below the standard value, disassemble the limited ship differential and check each part.

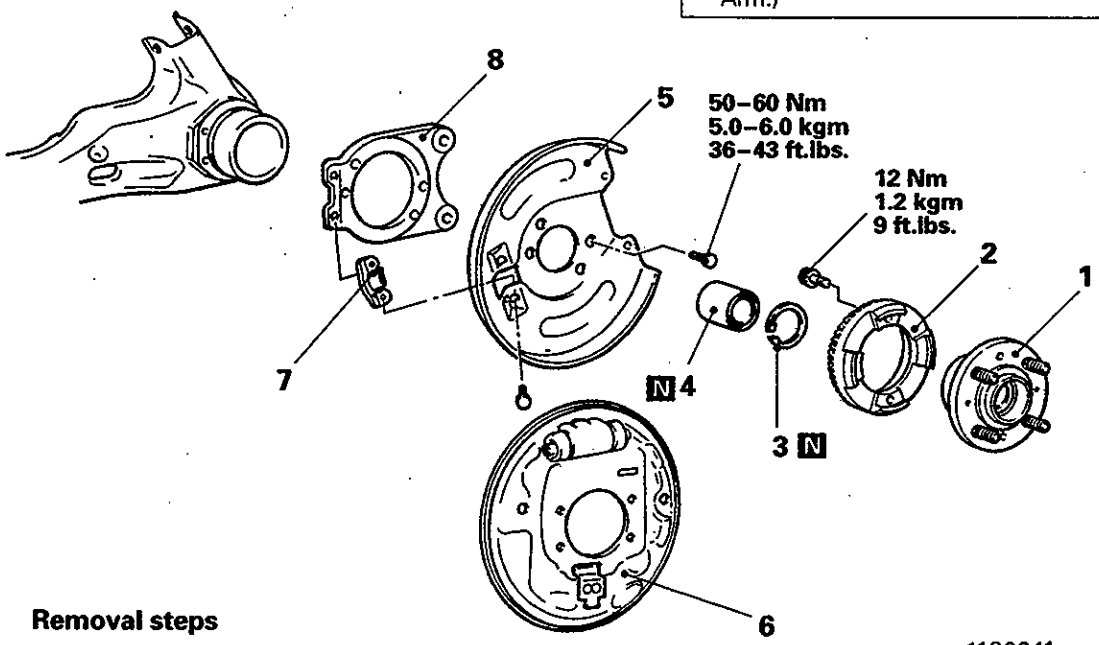
NOTES

REAR AXLE HUB

E27GA-2

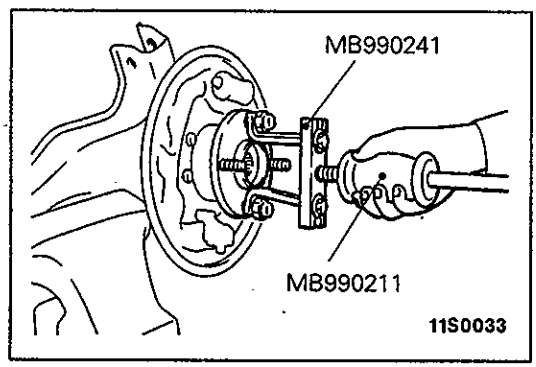
REMOVAL AND INSTALLATION

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



Removal steps

- ◆◆ ● Inspection of rear hub axial play
- ◆◆ ● Inspection of wheel bearing starting torque
- ◆◆ ◆◆ 1. Rear hub assembly
- 2. Rotor <Vehicles with ABS>
- 3. Snap ring
- ◆◆ ◆◆ 4. Rear wheel bearing
- 5. Dust shield <Vehicles with rear disc brake>
- 6. Backing plate <Vehicles with rear drum brake>
- 7. Sensor bracket <Vehicles with ABS>
- 8. Disc brake adapter <Vehicles with rear disc brake>

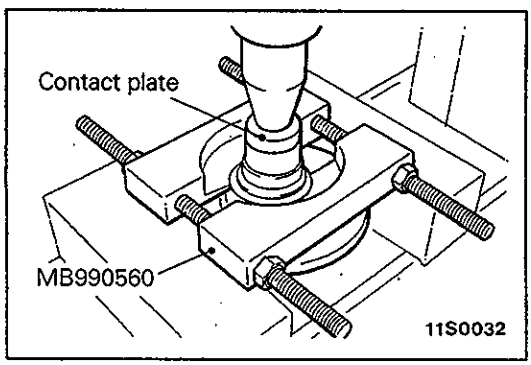


SERVICE POINTS OF REMOVAL

E27GBAI

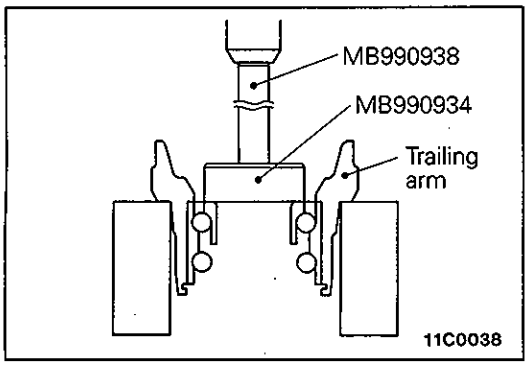
1. REMOVAL OF REAR HUB ASSEMBLY

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



4. REMOVAL OF REAR WHEEL BEARING

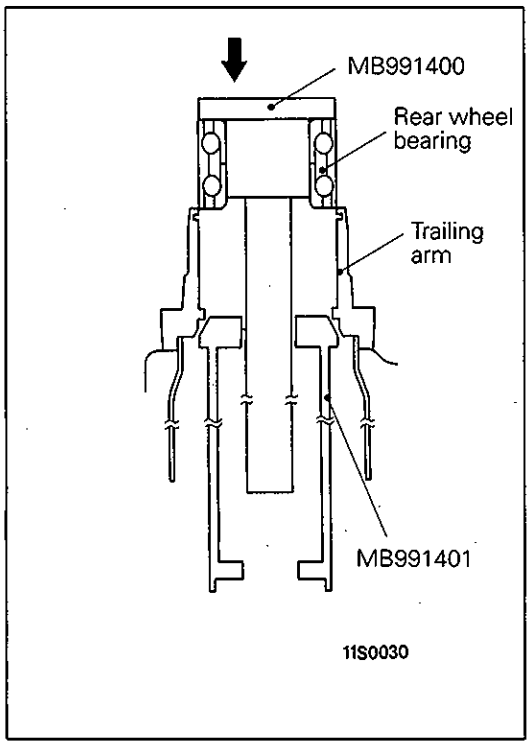
(1) Use the special tool to remove the rear wheel bearing inner race from the rear hub assembly.



(2) Use the special tool to remove the rear wheel bearing from the trailing arm.

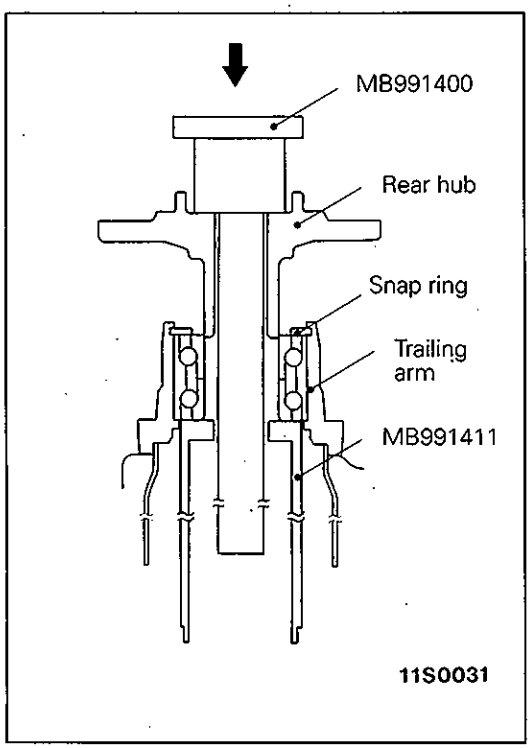
INSPECTION E27GCAE

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

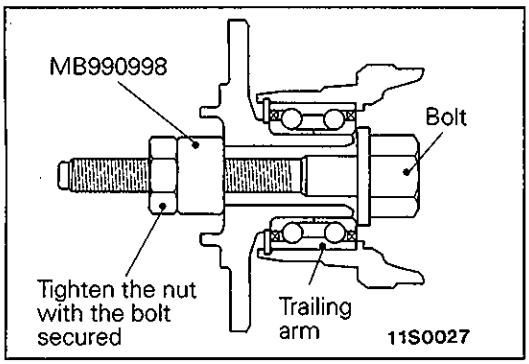


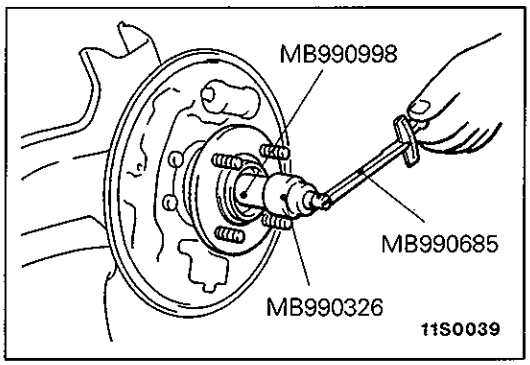
SERVICE POINTS OF INSTALLATION E27GDAJ

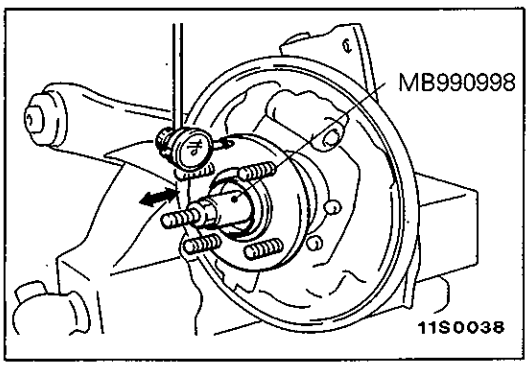
4. INSTALLATION OF REAR WHEEL BEARING



1. INSTALLATION OF REAR HUB ASSEMBLY







- **INSPECTION OF WHEEL BEARING STARTING TORQUE**

(1) Use the special tool to mount the rear hub onto the trailing 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 axial play.

Limit: 0.05 mm (0.0020 in.)

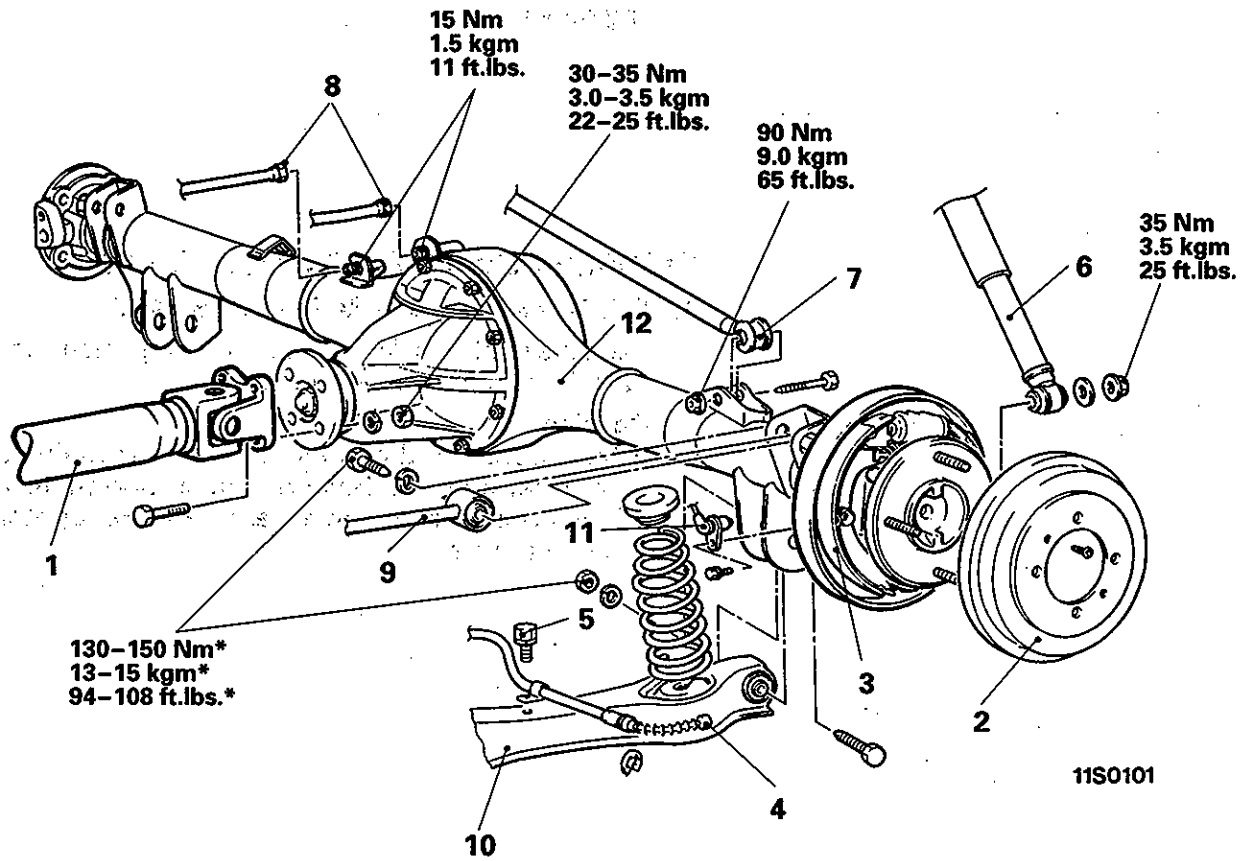
(2) If the starting torque and rear hub axial play are not within the limit, with the nut is tightened to 200–260 Nm (20–26 kgm, 145–188 ft.lbs.), the bearing, rear hub and/or trailing arm have probably not been installed correctly. Replace the bearing and repeat the assembly procedure.

AXLE ASSEMBLY

REMOVAL AND INSTALLATION

Pre-removal Operation
- Draining Brake Fluid
- Draining Differential Gear Oil

Post-installation Operation
- Filling of Brake Fluid and Air Bleeding (Refer to GROUP 35 – Service Adjustment Procedures.)
- Adjustment of Parking Brake Lever Stroke (Refer to GROUP 36 – Service Adjustment Procedures.)
- Filling of Differential Gear Oil (Refer to P.27-13.)

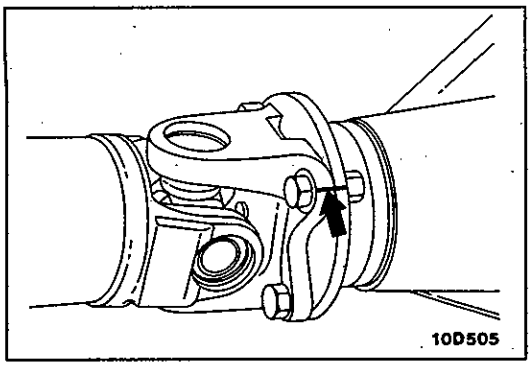


Removal steps

1. Propeller shaft
2. Brake drum
3. Shoe and lining assembly (Refer to GROUP 35 – Rear drum brake)
4. Parking brake cable connection
5. Parking brake cable attaching bolt
6. Shock absorber connection
7. Lateral rod connection
8. Brake pipe connection
9. Upper control arm connection
10. Lower control arm connection
11. Rear speed sensor
12. Axle assembly

NOTE
*: Indicates parts which should be temporarily tightened, and then fully tightened with the vehicle in the unladen condition.

Caution
When removing and installing the speed sensor in vehicles with ABS, be careful that the pole piece at the end does not contact other parts.



1. REMOVAL OF PROPELLER SHAFT

Put mating marks on the flange yoke and the differential companion flange before removing the propeller shaft.

7. REMOVAL OF LATERAL ROD AND REAR AXLE ASSEMBLY

Disconnect the lateral rod from the rear axle assembly and hold the lateral rod with wire or the like to prevent it from falling down.

SERVICE POINTS OF INSTALLATION

1. INSTALLATION OF PROPELLER SHAFT

Align the marks on flange yoke and companion flange and attach them with bolts and nuts.

Caution
If the threads of the bolts and nuts are stained with oil or grease, they can become loose. Completely remove oil or grease from the threads before tightening the bolts and nuts.

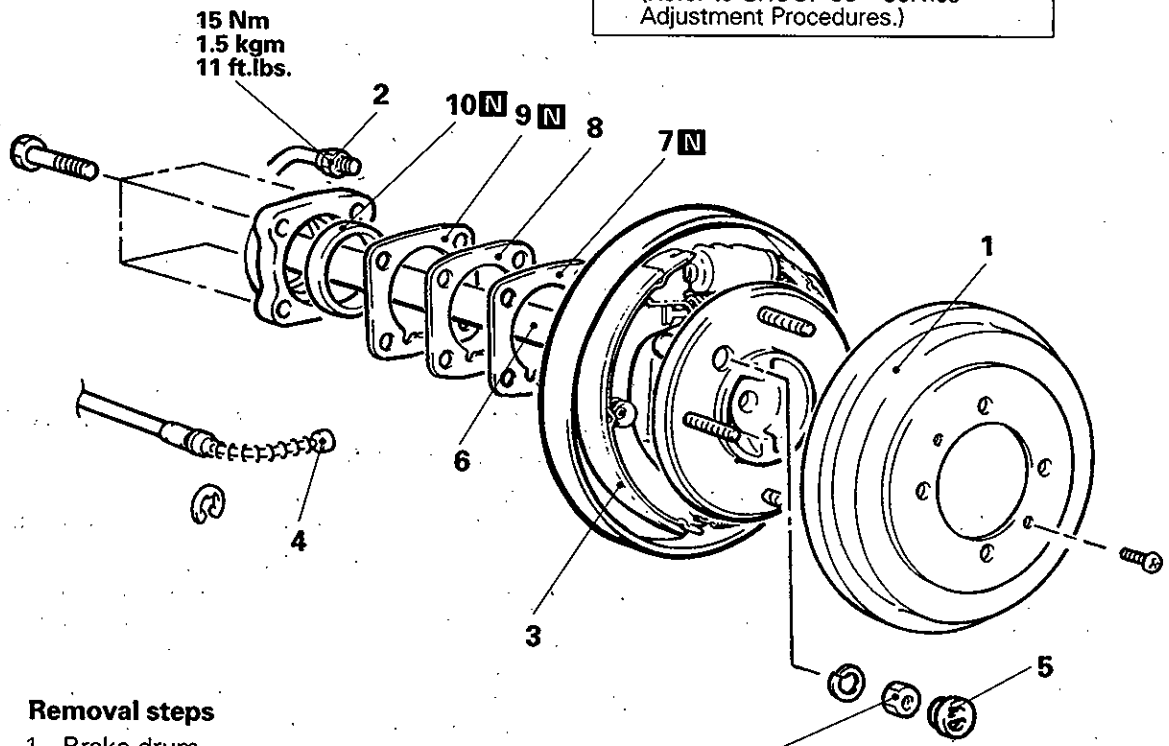
AXLE SHAFT

E27HA--

REMOVAL AND INSTALLATION

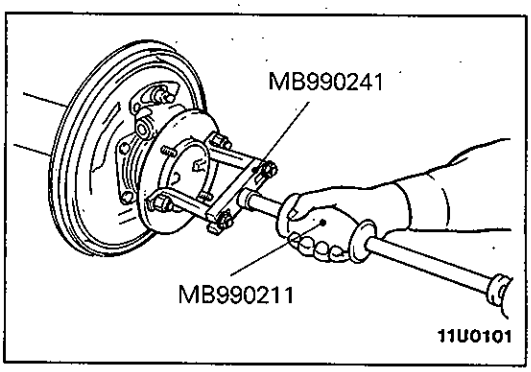
Pre-removal Operation
- Draining Brake Fluid

Post-installation Operation
- Filling of Brake Fluid and Air Bleeding (Refer to GROUP 35 – Service Adjustment Procedures.)
- Adjustment of Parking Brake Lever Stroke (Refer to GROUP 36 – Service Adjustment Procedures.)



Removal steps

1. Brake drum
2. Rear brake pipe connection
3. Shoe and lining assembly (Refer to GROUP 35 – Rear drum brake)
4. Parking brake cable connection
5. Plug
6. Axle shaft assembly
7. Packing
8. Shim
9. Packing
   - Adjustment of the outer bearing retainer tightening margin
10. Oil seal

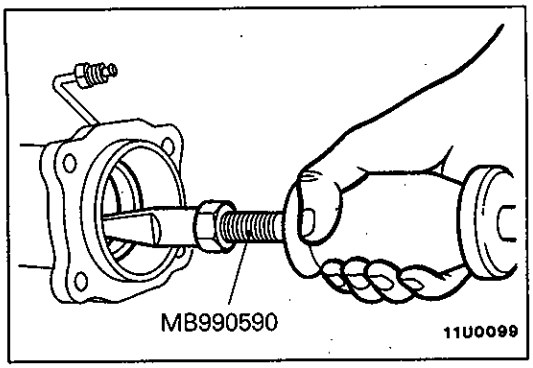


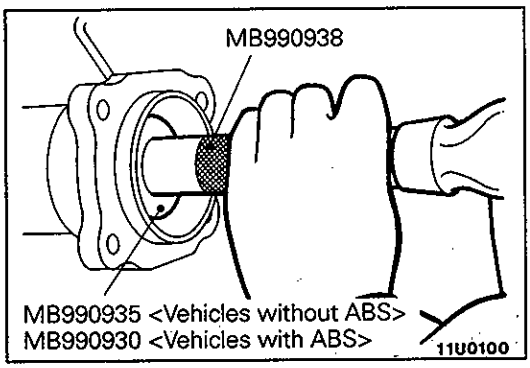
SERVICE POINTS OF REMOVAL

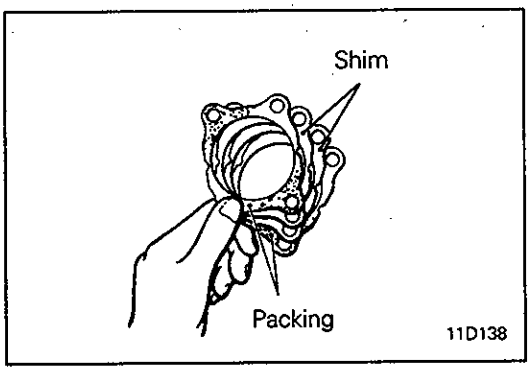
6. REMOVAL OF AXLE SHAFT ASSEMBLY

Pull the axle shaft out of the axle housing by using the special tools.

Caution
Do not damage the oil seal during removal of the axle shaft.







Selection of packings and shims		
Clearance mm (in.)	Number of packings	Number of shims
Less than 0.2 (0.008)	0	0
0.2 – 0.5 (0.008 – 0.02)	1	0
0.5 – 0.75 (0.02 – 0.03)	2	0
0.75 – 1.00 (0.03 – 0.04)	2	1
1.00 – 1.25 (0.04 – 0.05)	2	2

10. REMOVAL OF OIL SEAL

Remove the oil seal from the rear axle housing end by using the special tools.

INSPECTION

- Check the backing plate for deformation or damage.
- Check the oil seal for damage.
- Check the wheel bearing for discoloration or wear.
- Check the axle shaft for cracks, wear or damage.

SERVICE POINTS OF INSTALLATION

10. INSTALLATION OF OIL SEAL

(1) Apply multipurpose grease to the oil seal fitting area of the rear axle housing.
(2) Drive the new oil seal into the rear axle housing end by using the special tools.
(3) Apply multipurpose grease to the oil seal lip.

- **ADJUSTMENT OF THE OUTER BEARING RETAINER TIGHTENING MARGIN**

This adjustment is required when axle shafts or wheel bearings are replaced, but not required when the axle shafts are removed and reinstalled without replacement of parts. In the latter case, use the packings and shims of the same numbers and thickness as those having been installed before removal.

(1) Assemble the axle shaft assembly in the axle housing without installing the packings and shims. Temporarily tighten the nuts to about half the specified torque until the bearing outer race comes in close contact with the axle housing.

NOTE
Tighten the nuts evenly in diagonal sequence and in two steps.

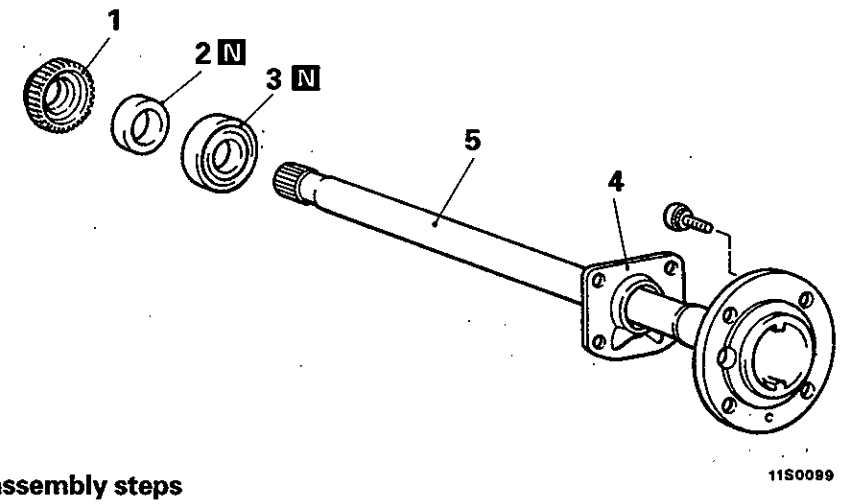
(2) Measure the clearance between axle housing and backing plate using a thickness gauge.
(3) From the clearance measurement, determine the number and thickness of the packings and shims to be used.

NOTE
The replacement packing is available in two thickness, 0.27 and 0.33 mm (0.010 and 0.013 in.) and the shim in one thickness 0.3 mm (0.012 in.). If a multiple number of packings and shims are used, the outermost ones should be the packings as shown in the illustration.

(4) Install the axle shaft assembly.

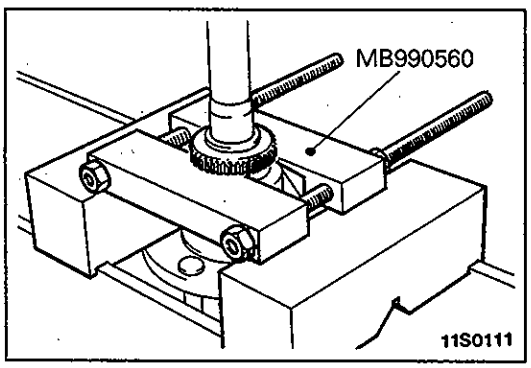
NOTE
Tighten the nuts in diagonal sequence to the specified torque.

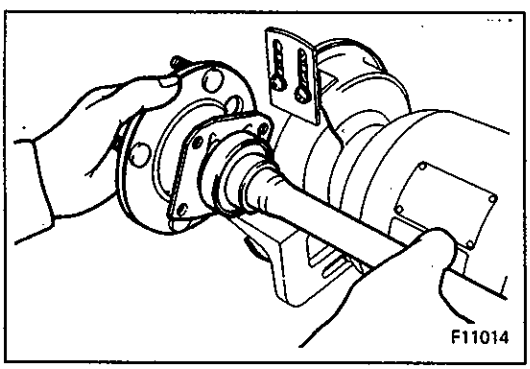
DISASSEMBLY AND REASSEMBLY



Disassembly steps

1. Rotor <Vehicles with ABS>
2. Bearing inner retainer
3. Wheel bearing
4. Bearing outer retainer
5. Axle shaft





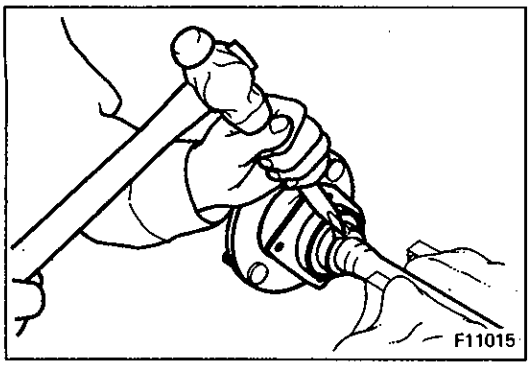
SERVICE POINTS OF DISASSEMBLY

1. REMOVAL OF ROTOR <VEHICLES WITH ABS>

2. REMOVAL OF BEARING INNER RETAINER

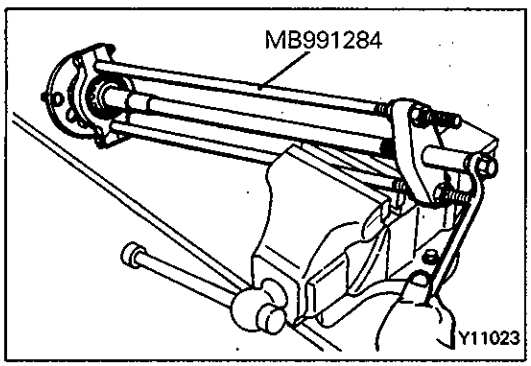
(1) Using a grinder, partially grind the bearing inner retainer at one area until the thickness becomes 1.0 to 1.5 mm (0.04 to 0.06 in.)

Caution
Do not use an oxy-acetylene cutter or similar tool to remove the bearing retainer; the resultant heat will weaken the axle shaft, and might cause it to break.



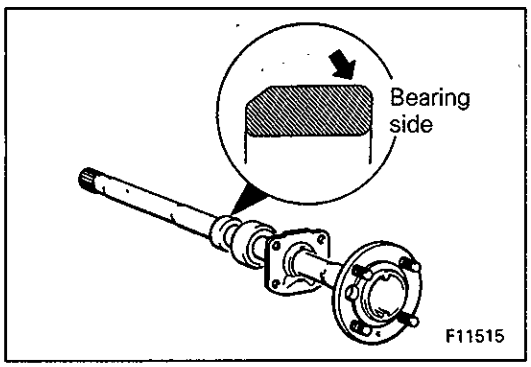
(2) Using a chisel, make a cut in the ground section of the bearing inner retainer.

Caution
Be careful not to damage the axle shaft.



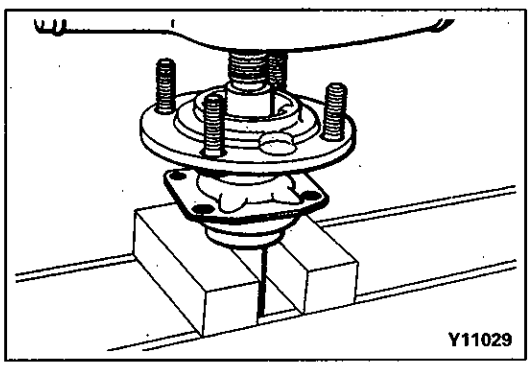
3. REMOVAL OF WHEEL BEARING

SERVICE POINTS OF REASSEMBLY

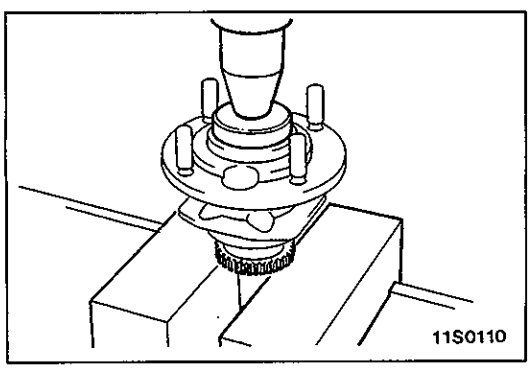


4. INSTALLATION OF BEARING OUTER RETAINER/ 3. WHEEL BEARING/2. BEARING INNER RETAINER

(1) Install the bearing outer retainer, wheel bearing and bearing inner retainer to the axle shaft in that order, as shown in the illustration.



(2) Press-fit the bearing and bearing retainer onto the axle shaft.



1. INSTALLATION OF ROTOR <VEHICLES WITH ABS>

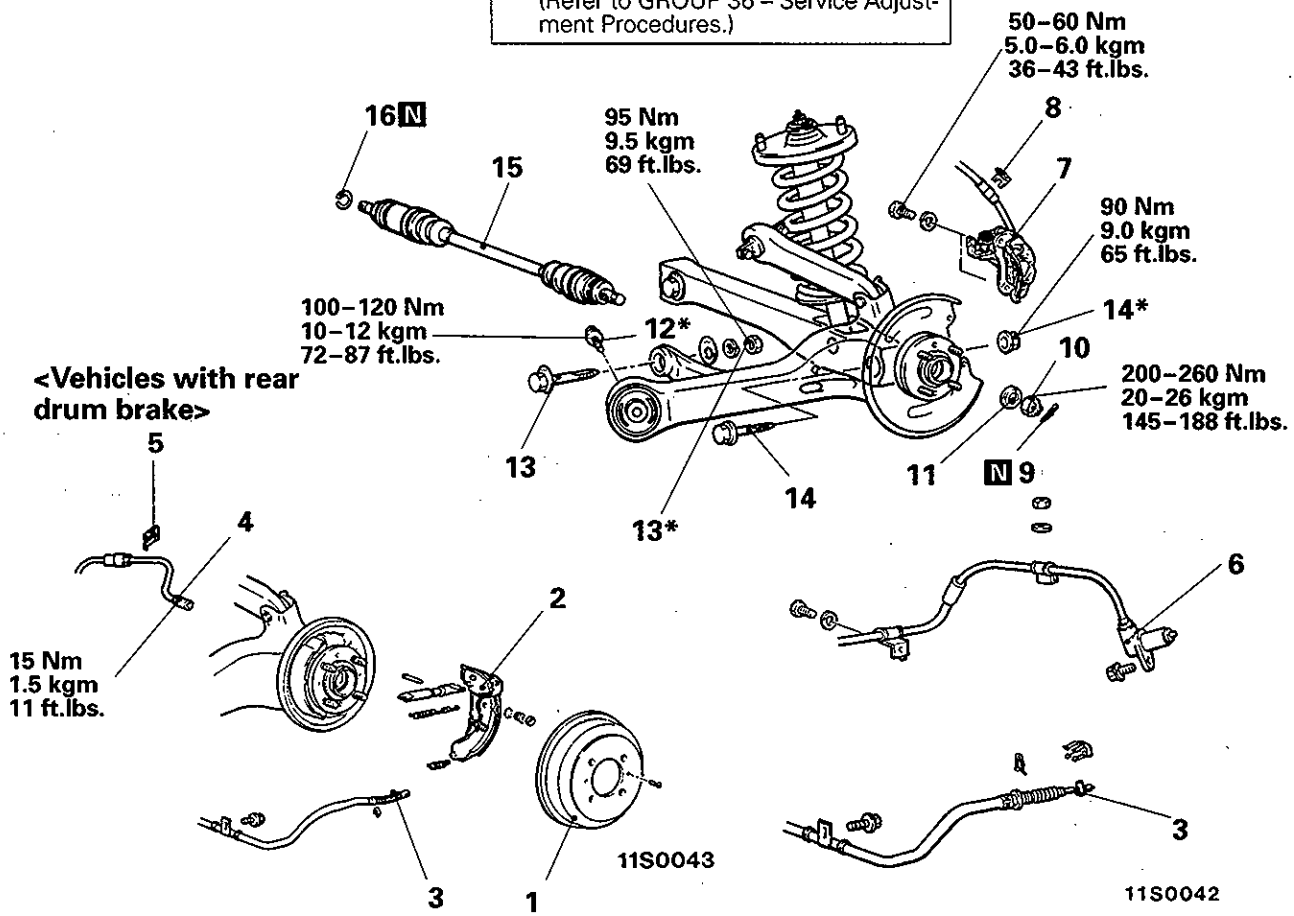
DRIVE SHAFT

E27KA--

REMOVAL AND INSTALLATION

Pre-removal Operation
- Draining of Brake Fluid

Post-installation Operation
- Supplying Brake Fluid
  Bleeding Brake Lines
  (Refer to GROUP 35 – Service Adjustment Procedures.)
- Wheel Alignment Check
  (Refer to GROUP 34 – Service Adjustment Procedures.)
- Parking Brake Adjustment
  (Refer to GROUP 36 – Service Adjustment Procedures.)

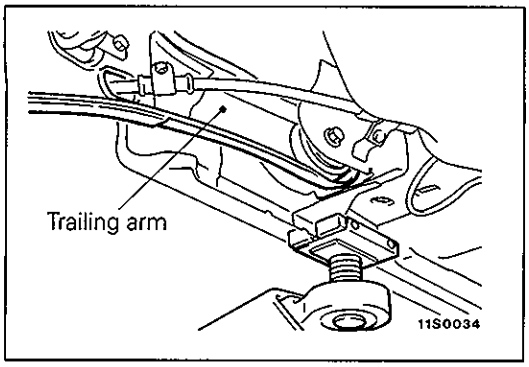


Removal steps

1. Brake drum
2. Trailing shoe
3. Parking brake cable connection
4. Brake pipe connection
5. Clip
6. Rear speed sensor <Vehicles with ABS>
7. Caliper assembly
8. Clip
9. Split pin
10. Drive shaft nut
11. Washer
12. Trailing arm mounting bolt
13. Control link mounting bolt and nut (for toe adjustment)
14. Trailing arm mounting bolt and nut
15. Drive shaft
16. Circlip

NOTE
*: Indicates parts which should be temporarily tightened, and then fully tightened with the vehicle in the unladen condition.

Caution
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.



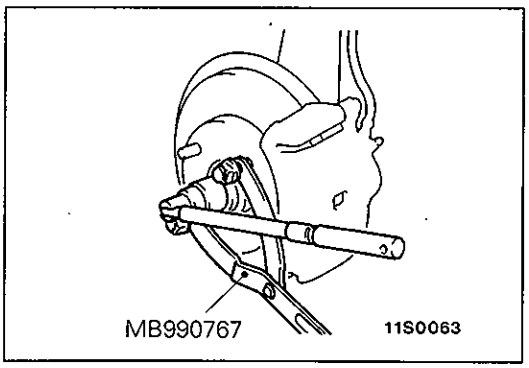
SERVICE POINTS OF REMOVAL E27KBAC

- **LIFTING POINT**

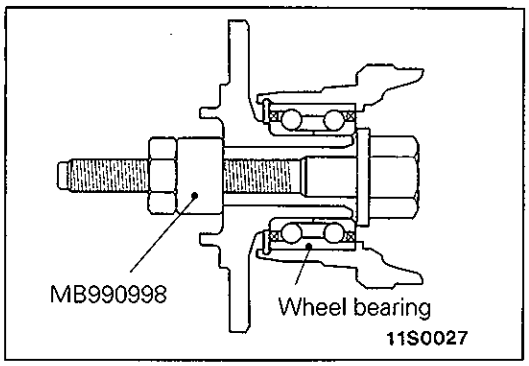
When separating the front section of the trailing arm from the body, move the lift arm slightly towards the front of the vehicle so that it will not be in the way.

7. REMOVAL OF CALIPER ASSEMBLY

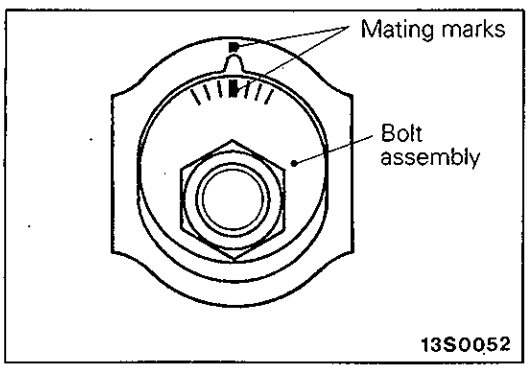
Suspend the removed caliper assembly with wire, etc., so that it will not drop down.



10. REMOVAL OF DRIVE SHAFT NUT

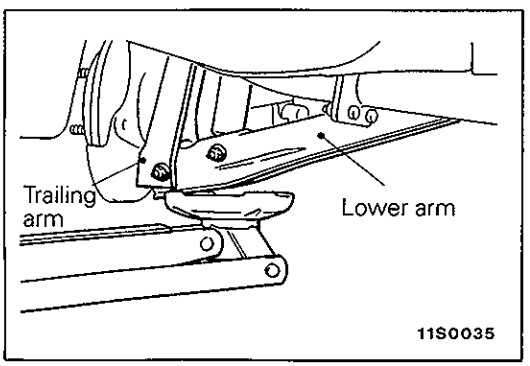


Caution
Do not apply the vehicle weight to the wheel bearing while loosening the drive shaft nut. If, however, the vehicle weight must be applied to the bearing (because of moving the vehicle), temporarily secure the wheel bearing by using the special tool, MB990998, etc.



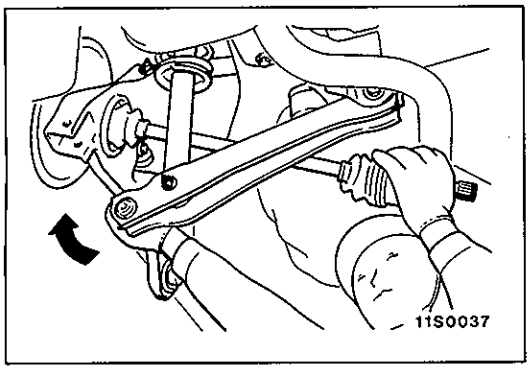
13. SEPARATION OF CONTROL LINK AND BODY

Before separating the control link from the body, make mating marks on the bolt assembly and the body.



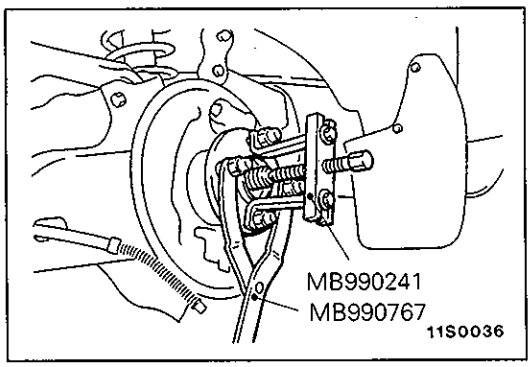
14. SEPARATION OF TRAILING ARM AND LOWER ARM

After supporting the lower arm with a garage jack, separate the trailing arm and lower arm.

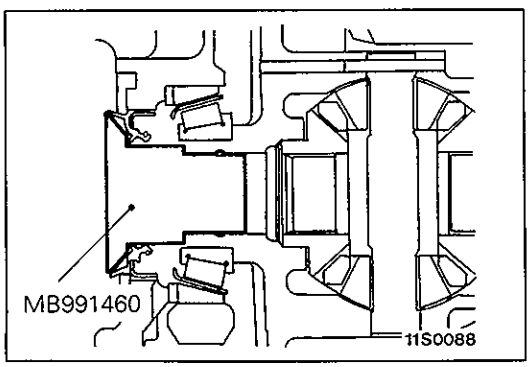


15. REMOVAL OF DRIVE SHAFT

(1) Push the lower section of the trailing arm towards the outside of the vehicle, and then remove the drive shaft from the differential carrier.
At this time, use a tyre lever or similar tool to remove the drive shaft.



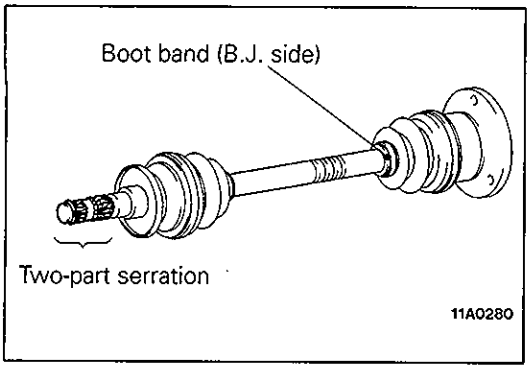
(2) Use the special tool to remove the drive shaft from the rear hub.



(3) Use the special tool provided as a cover to prevent the entry of foreign objects into the differencial carrier.

INSPECTION E27KCAA

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



SERVICE POINTS OF INSTALLATION E27KDAA

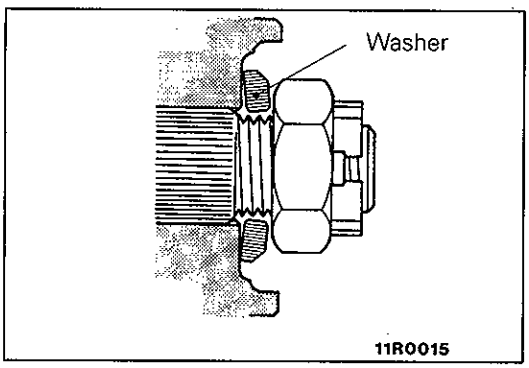
15. INSTALLATION OF DRIVE SHAFT

Caution

1. **Be cautious to ensure that the differential carrier oil seal is not damaged by the drive shaft spline.**
2. **The right drive shaft for models equipped with the LSD having a VCU has a two-part serration. Be very careful to install each one on the correct side.**

NOTE
The left and right drive shafts can also be distinguished from each other by the identification color of boot band (B.J. side).

Item	Drive shaft	
	LH	RH
Boot band (B.J. side) identification color	Yellow	Orange



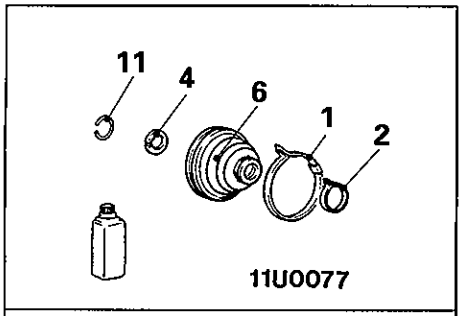
10. INSTALLATION OF DRIVE SHAFT NUT

(1) Be sure to install the washer and drive shaft nut in the specified direction.
(2) Use the special tool (MB990767), tighten the drive shaft nut.
(3) If the position of the split pin holes does not match, tighten the nut up to 260 Nm (26 kgm, 188 ft.lbs.) in maximum.
(4) Install the split pin in the first matching holes and bend it securely.

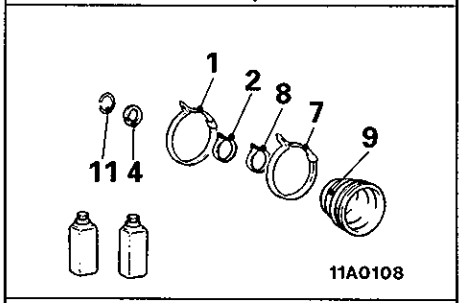
Caution
Before securely tightening the drive shaft nuts, make sure there is no load on the wheel bearings.

DISASSEMBLY AND REASSEMBLY

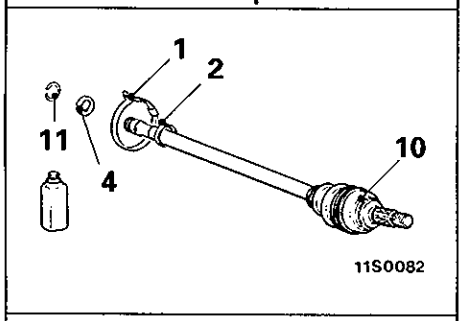
E27KE--



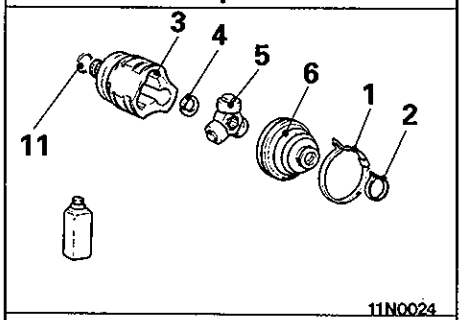
TJ boot repair kit



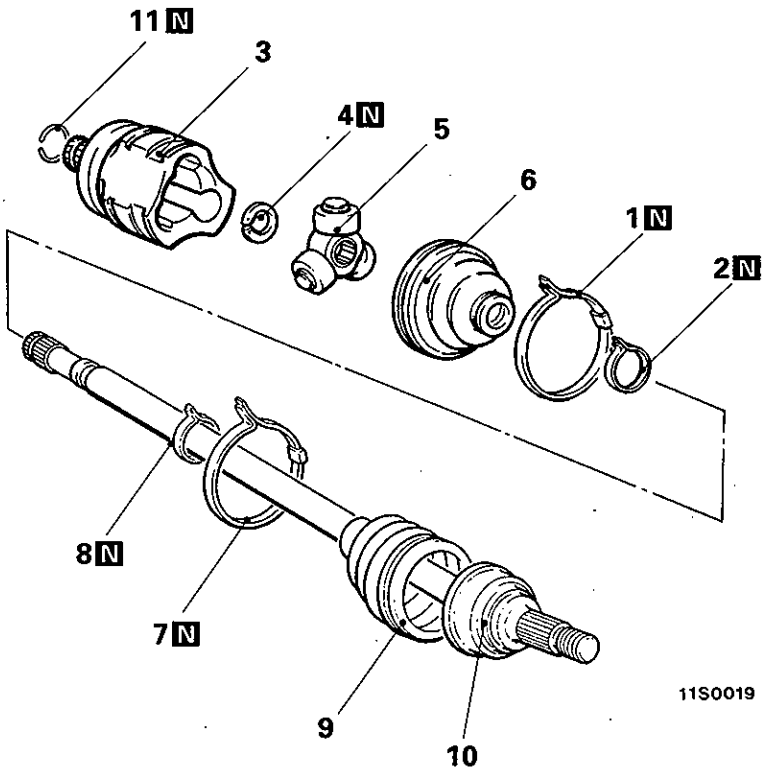
BJ boot repair kit



BJ repair kit



TJ repair kit

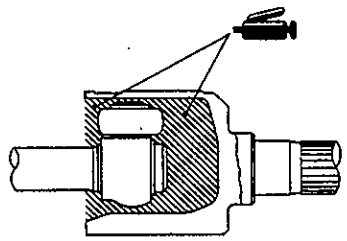


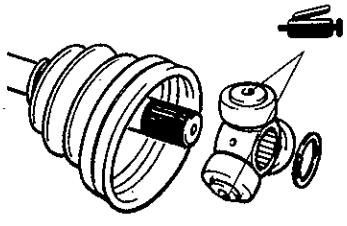
Disassembly steps

- 1. TJ boot band
- 2. Boot band (small)
- 3. TJ case
- 4. Snap ring
- 5. Spider assembly
- 6. TJ boot
- 7. BJ boot band
- 8. Boot band (small)
- 9. BJ boot
- 10. BJ assembly
- 11. Circlip

Caution
Do not disassemble the B.J. assembly.

LUBRICATION POINTS

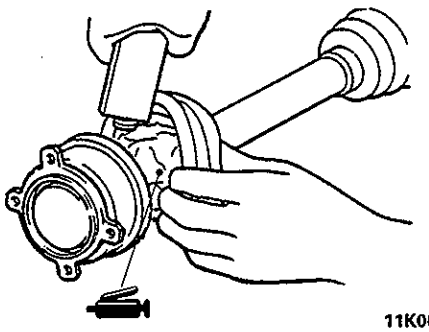




Grease: Repair kit grease11A0084

Amount of grease to be used: 95 g (3.35 oz.) <Vehicles without LSD>
105 g (3.70 oz.) <Vehicles with LSD>

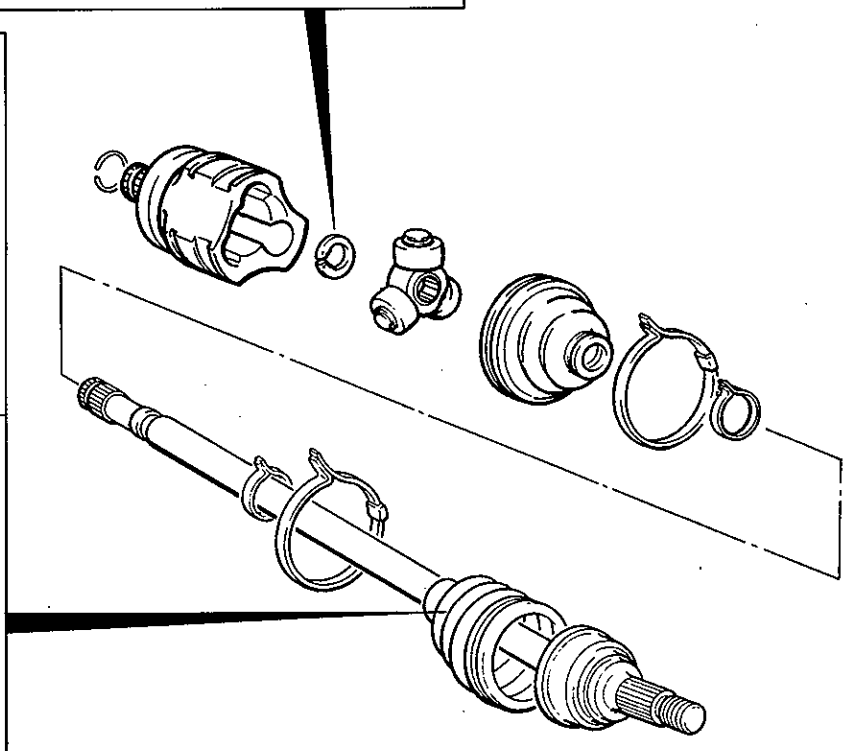
Caution
A special type of grease is used on the joint. Be cautious to ensure that no other grease is allowed to come in contact with the joint.



Grease: Repair kit grease

Amount of grease to be used:
75 g (2.65 oz.) <Vehicles without LSD>
85 g (3.00 oz.) <Vehicles with LSD>

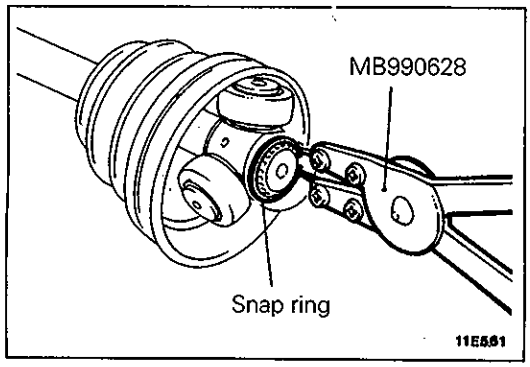
Caution
A special type of grease is used on the joint. Be cautious to ensure that no other grease is allowed to come in contact with the joint.



SERVICE POINTS OF DISASSEMBLY E27KFAG

4. DISASSEMBLY OF SNAP RING / 5. SPIDER ASSEMBLY

(1) Wipe out the grease in the TJ case.

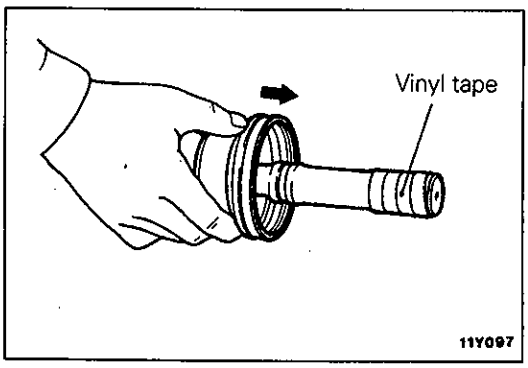


(2) Remove the snap ring with the special tool and then remove the spider assembly.

Caution
Do not disassemble the spider assembly.

(3) In case foreign objects such as water or dust is mixed in the grease, be sure to wash the spider assembly.

Caution
In case of having washed the spider assembly, when assembling it, make sure to push enough grease between the spider axle and the roller so that grease may not run out.



6. REMOVAL OF T.J. BOOT / 9. B.J. BOOT

(1) Wipe the grease off of the spline portion.
(2) Remove the T.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.

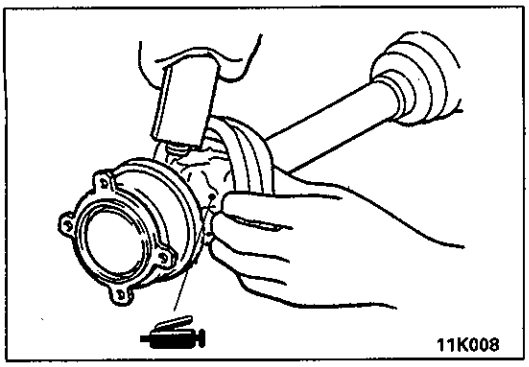
INSPECTION E27KGAD

- Check the drive shaft for damage, bending or corrosion.
- Check the drive shaft spline part for wear or damage.
- Check for entry of water and/or foreign material into B.J.
- Check the spider assembly for roller rotation, wear or corrosion.
- Check the groove inside T.J. case for wear or corrosion.
- Check the dynamic damper for damage or cracking.
- Check the boots for deterioration, damage or cracking.

SERVICE POINTS OF REASSEMBLY E27KHAG

9. INSTALLATION OF B.J. BOOT / 6. T.J. BOOT

(1) Wrap vinyl tape around the drive shaft spline.
(2) Insert the drive shaft in B.J. boot, T.J. boot in that sequence.

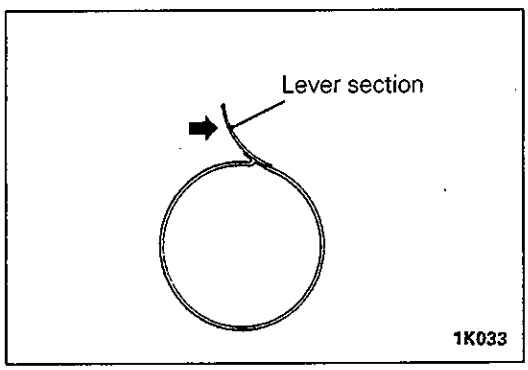


(3) Fill the inside of the B.J. and B.J. boot with the specified grease.

Specified grease: Repair kit grease
75 g (2.65 oz.) <Vehicles without LSD>
85 g (3.00 oz.) <Vehicles with LSD>

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

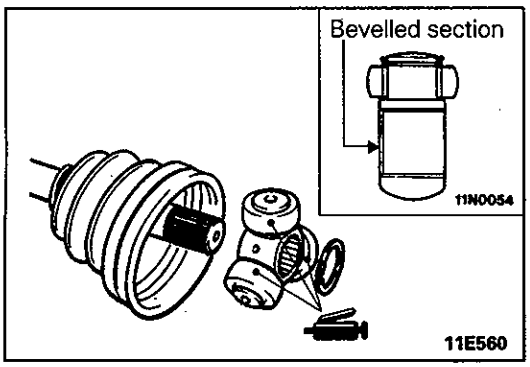
Caution
A special type of grease is used on the joint. Be cautious to ensure that no other grease is allowed to come in contact with the joint.



(4) Tighten the boot band.

Caution
1. **In order to fill the BJ boot with a specified amount of air, installation should be made with the drive shaft having 0 degree bending angle.**
2. **Distinguish the difference between BJ boot band and TJ boot band by the identification numbers stamped on their lever sections, and be careful not to make an erroneous installation.**

Items \ Models	Vehicles without VCU type LSD	Vehicles with VCU type LSD
BJ boot band	20-110#BJ87	20-113#BJ87L
TJ boot band	20-98#BJ82	20-110#BJ87



5. INSTALLATION OF SPIDER ASSEMBLY/3. T.J. CASE

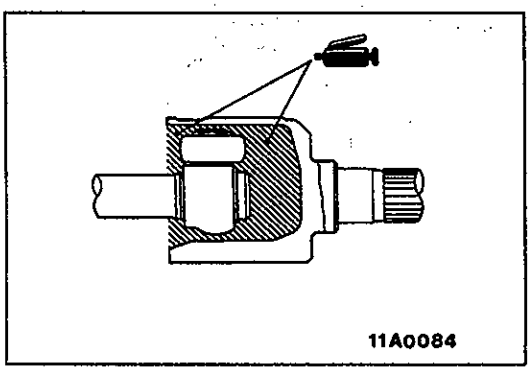
(1) Apply the specified grease furnished in the repair kit to the spider assembly between the spider axle and the roller.

Specified grease: Repair kit grease

Caution

1. **The drive shaft joint uses special grease. Do not mix old and new or different types of grease.**
2. **If the spider assembly has been cleaned, take special care to apply the specified grease.**

(2) Install the spider assembly to the shaft from the direction of the spline bevelled section.

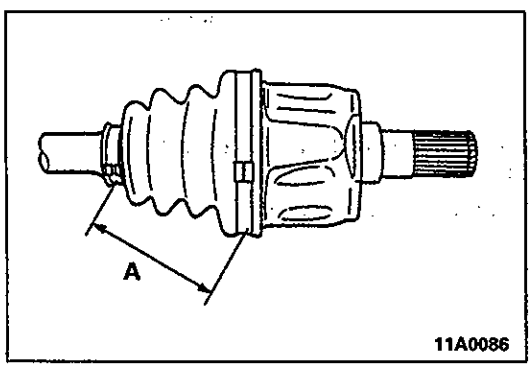


(3) After applying specified grease to the T.J. case, insert the drive shaft and apply grease one more time.

Specified grease: Repair kit grease
<Vehicles without LSD> 95 g (3.35 oz.)
<Vehicles with LSD> 105 g (3.70 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.



2. INSTALLATION OF BOOT BAND (SMALL)/1. T.J. BOOT BAND

Set the T.J. boot bands at the specified distance in order to adjust the amount of air inside the T.J. boot, and then tighten the T.J. boot bands securely.

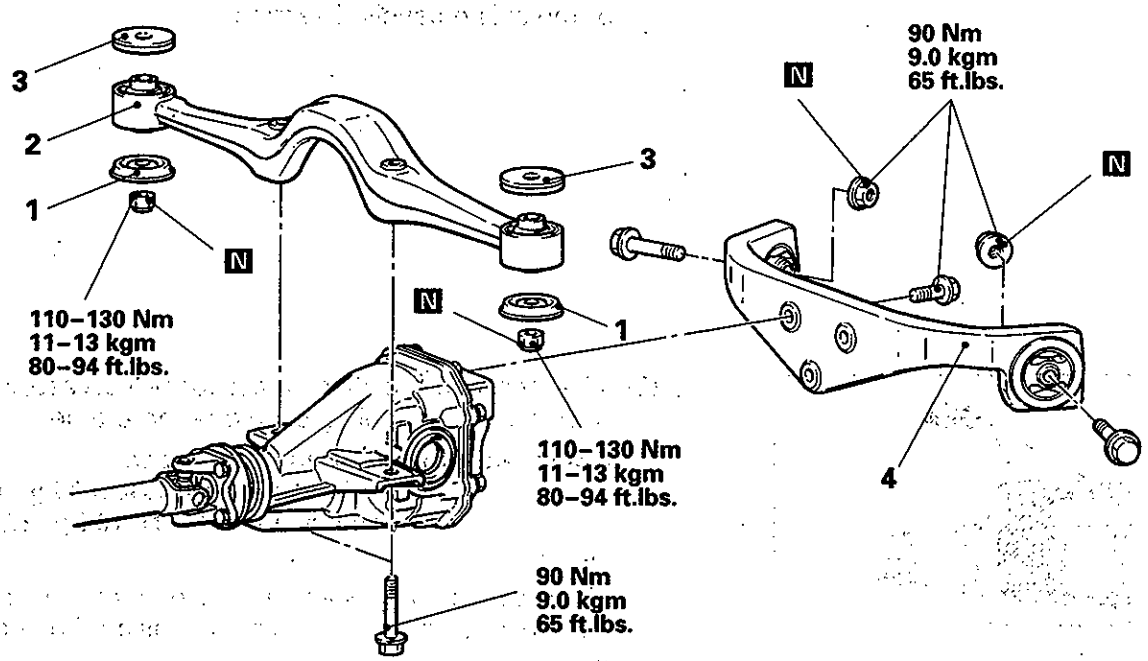
Standard value (A): 85 ± 3 mm (3.35 ± 0.12 in.)

DIFFERENTIAL MOUNT

E270A–

REMOVAL AND INSTALLATION

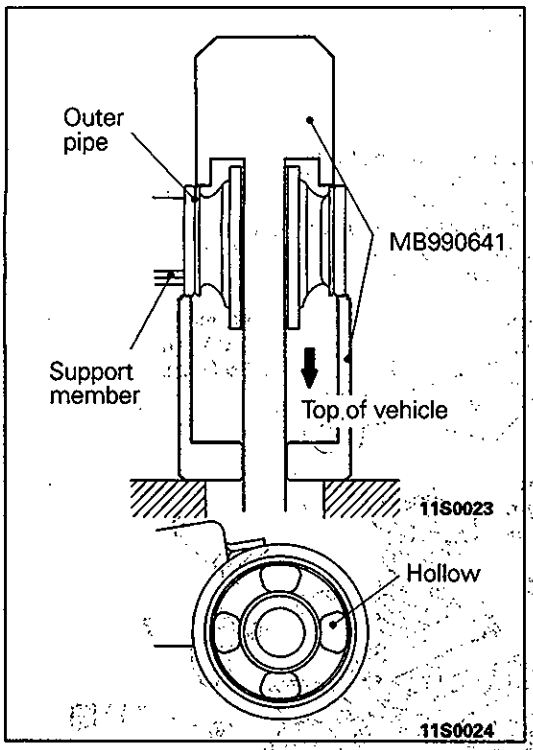
Pre-removal and Post-installation Operation
- Removal and Installation of Stabilizer Bar
(Refer to GROUP 34 – Stabilizer Bar.)



11S0070

Differential support member removal steps
- ◆◆ 1. Lower stopper
- 2. Differential support member
- ◆◆ 3. Upper stopper

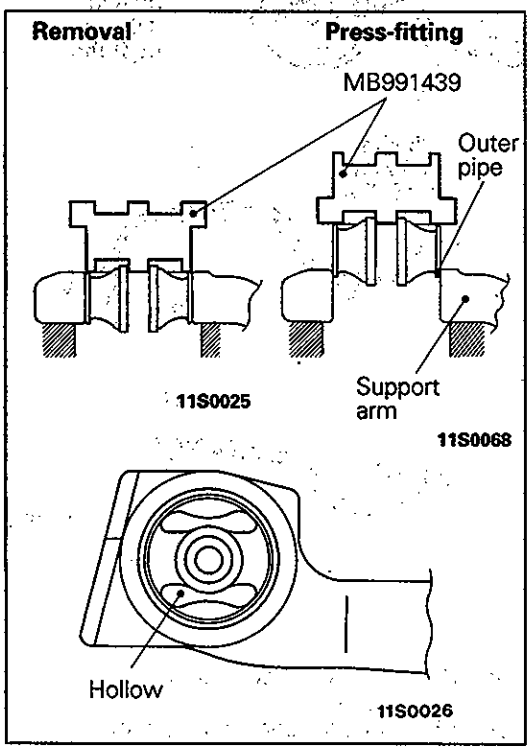
Differential support arm removal steps
- 4. Differential support arm



BUSHING REPLACEMENT

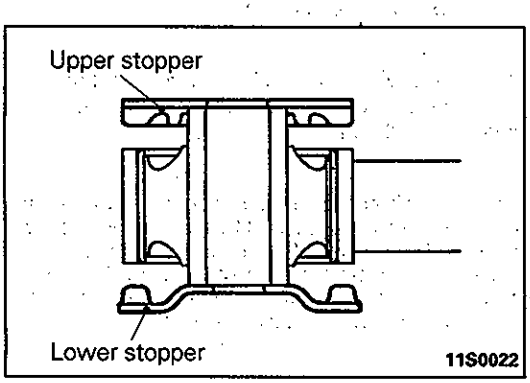
DIFFERENTIAL SUPPORT MEMBER BUSHING E270EAA

(1) Use the special tool to carry out removal and press-fitting of the bushing.
(2) The bushing should be press-fitted so that the position of the hollows and the installation direction are as shown in the illustration.
(3) Press-fit until the edge of the outer cylinder of the bushing and the surface of the support member are flush.



DIFFERENTIAL SUPPORT ARM BUSHING

(1) Use the special tool to carry out removal and press-fitting of the bushing.
(2) The bushing should be press-fitted so that the hollows are in the positions shown in the illustration.
(3) Press-fit until the edge of the outer cylinder of the bushing and the surface of the support arm are flush.



SERVICE POINTS OF INSTALLATION E270DAA

3. INSTALLATION OF UPPER STOPPER/1. LOWER STOPPER

Install the upper stopper and lower stopper as shown in the illustration.

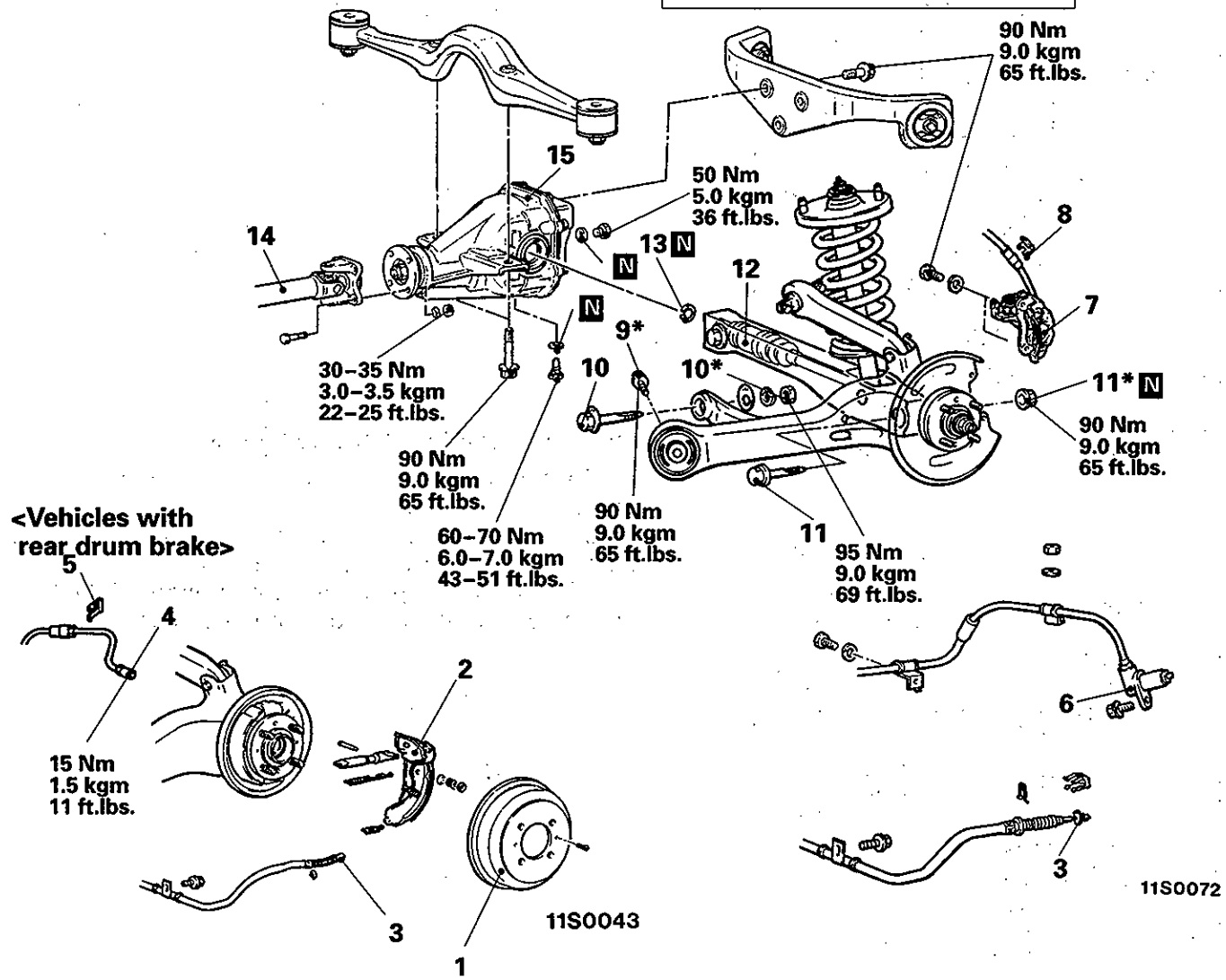
DIFFERENTIAL CARRIER <INDEPENDENT TYPE>

E27OA--

REMOVAL AND INSTALLATION

Pre-removal Operation
- Draining of Differential Gear Oil

Post-installation Operation
- Filling of Differential Gear Oil (Refer to P. 27-13.)
- Adjustment of Wheel Alignment (Refer to GROUP 34 – Service Adjustment Procedures.)

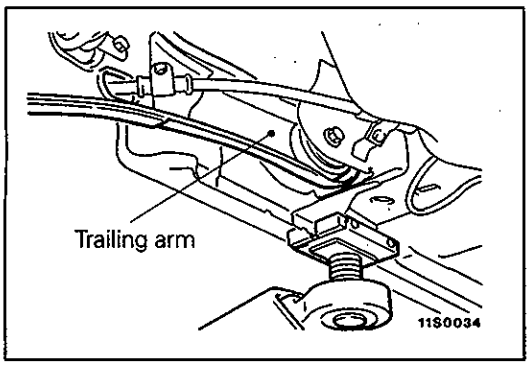


Removal steps

1. Brake drum
2. Trailing shoe
3. Parking brake cable connection
4. Brake pipe connection
5. Clip
6. Rear speed sensor <Vehicles with ABS>
7. Caliper assembly
8. Clip
9. Trailing arm mounting bolt
10. Control link mounting bolt and nut (for toe adjustment)
11. Trailing arm mounting bolt and nut
12. Drive shaft connection
13. Circlip
14. Propeller shaft connection
15. Differential carrier

NOTE
*: Indicates parts which should be temporarily tightened, and then fully tightened with the vehicle in the unladen condition.

Caution
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.



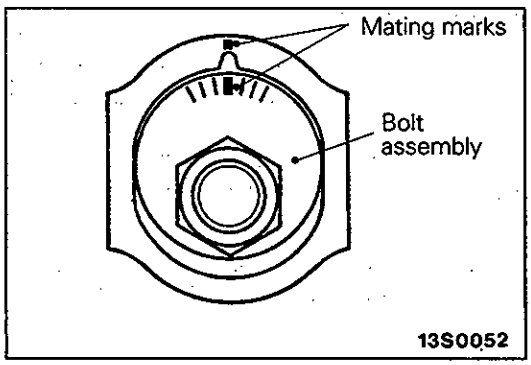
SERVICE POINTS OF REMOVAL E27QBAL

- **LIFTING POINT**

When separating the front section of the trailing arm from the body, move the lifting arm slightly towards the front of the vehicle so that it will not be in the way.

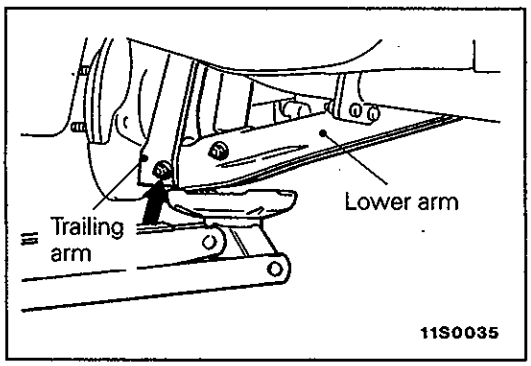
7. REMOVAL OF CALIPER ASSEMBLY

Suspend the removed caliper assembly with wire, etc., so that it will not drop down.



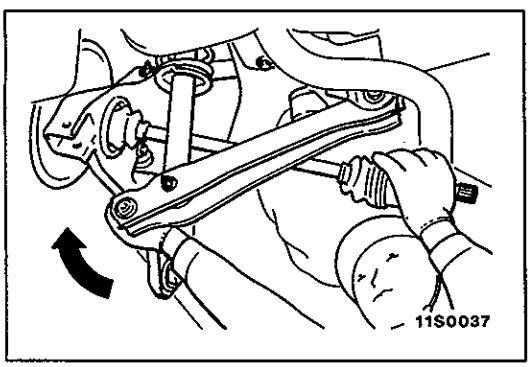
10. REMOVAL OF CONTROL LINK MOUNTING BOLT AND NUT

Before separating the control link from the body, make mating marks on the bolt assembly and the body.



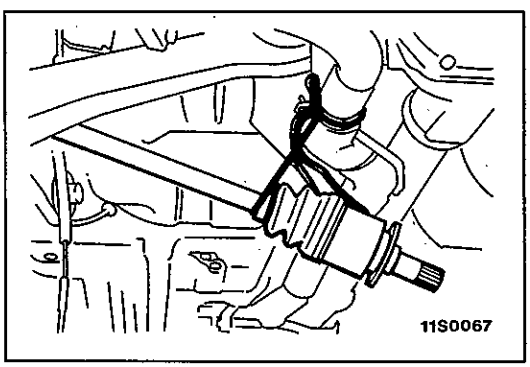
11. REMOVAL OF TRAILING ARM MOUNTING BOLT AND NUT

After supporting the lower arm with a garage jack, separate the trailing arm and lower arm.

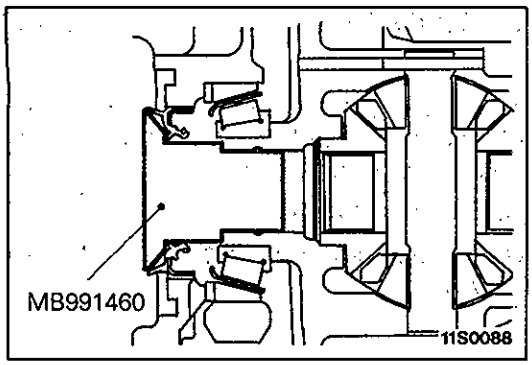


12. SEPARATION OF DRIVE SHAFT

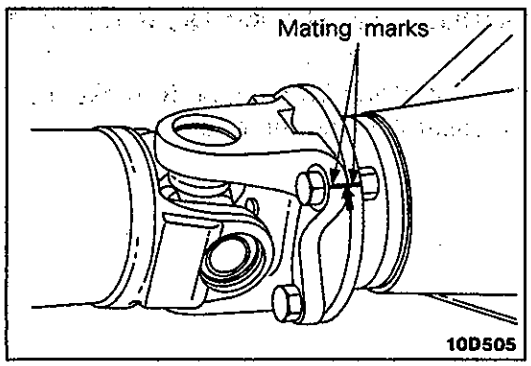
(1) Push the lower section of the trailing arm towards the outside of the vehicle, and then separate the drive shaft from the differential carrier.
At this time, use a tire lever or similar tool to separate the drive shaft connection.



(2) Support the removed drive shaft with wire, etc., so as not to damage the joint boot.



(3) Use the special tool provided as a cover to prevent the entry of foreign objects into the differential carrier.



14. SEPARATION OF PROPELLER SHAFT

(1) Make mating marks on the differential companion flange and flange yoke, and then separate the differential carrier assembly and the propeller shaft.
(2) Suspend the propeller shaft from the body with wire, etc., so that there are no sharp bends.

Caution
Be careful that there are no sharp bends in the propeller shaft, as they may damage the Löbro joint.

15. REMOVAL OF DIFFERENTIAL CARRIER

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

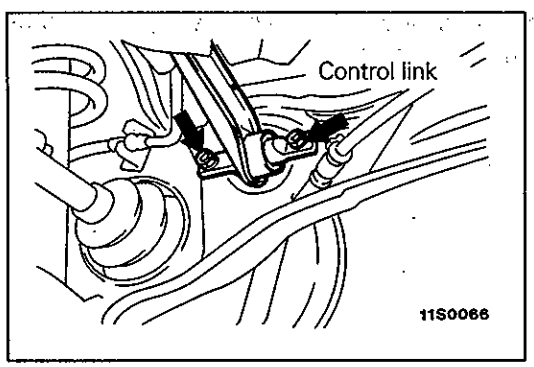
SERVICE POINTS OF INSTALLATION E27QCAM

14. INSTALLATION OF PROPELLER SHAFT

Install the propeller shaft so that the mating marks on the differential companion flange and the flange yoke are aligned.

12. INSTALLATION OF DRIVE SHAFT

Caution
Do not damage the differential carrier oil seal.

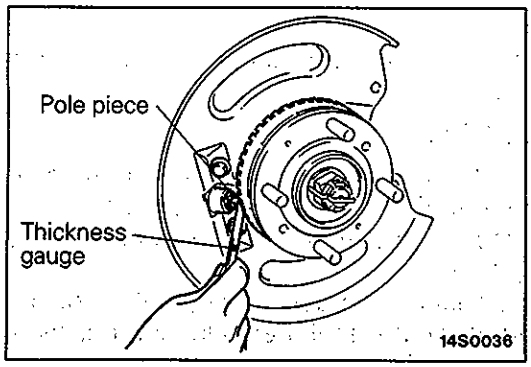


11. INSTALLATION OF TRAILING ARM AND LOWER ARM

If the trailing arm and lower arm are difficult to install, loosen the control link mounting bolt on the vehicle side.

10. INSTALLATION OF CONTROL LINK AND BODY CONNECTING BOLT AND NUT (FOR TOE ADJUSTMENT)

Align the mating marks of the toe adjustment bolt assembly and the body, and then install the nut.



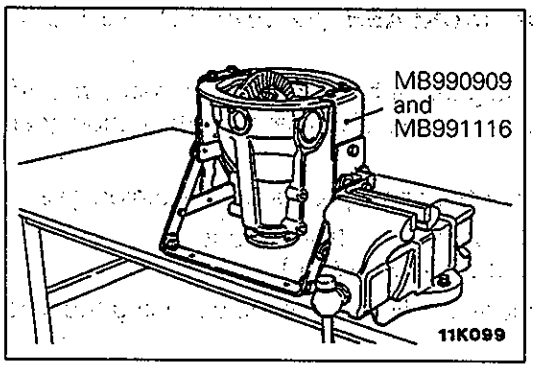
6. INSTALLATION OF REAR SPEED SENSOR <VEHICLES WITH ABS>

(1) Provisionally install the speed sensor to the sensor bracket.

Caution
Be careful that the pole piece at the end of the speed sensor and the rotor teeth do not become damaged by striking them against the metal parts.

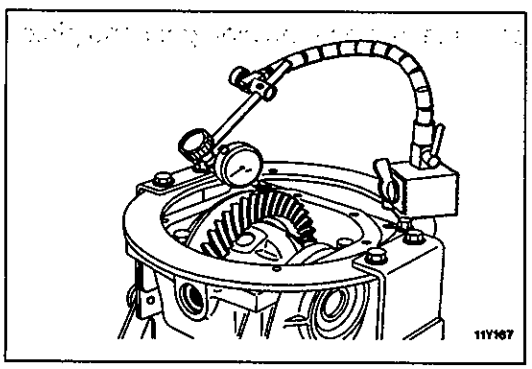
(2) With the caliper assembly and brake disc removed, fully tighten the sensor bracket at the position where the clearance between the pole piece at the end of the speed sensor and the surface of the rotor teeth around the entire circumference is at the standard value.

Standard value: 0.3–0.9 mm (0.012–0.035 in.)



INSPECTION BEFORE DISASSEMBLY E27QDAM

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



FINAL DRIVE GEAR BACKLASH

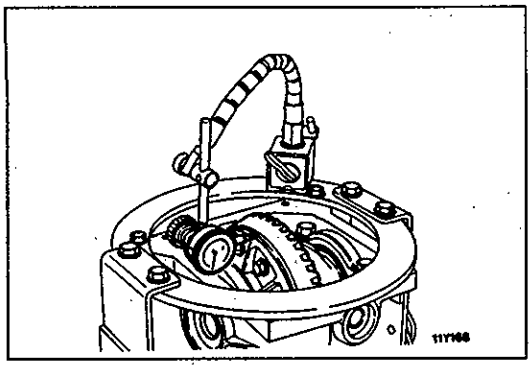
(1) With the drive pinion locked in place, measure the final drive gear backlash with a dial indicator on the drive gear.

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

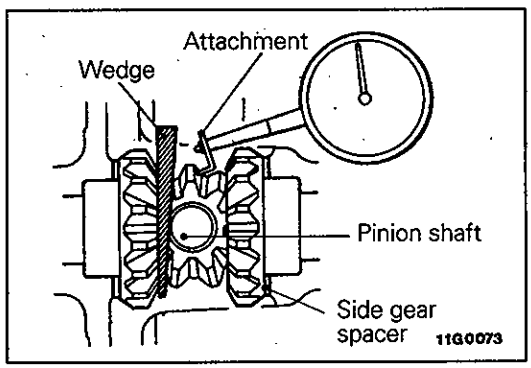
(1) Measure the drive gear runout at the shoulder on the reverse side of the drive gear.

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 (EXCEPT LIMITED SLIP DIFFERENTIAL)

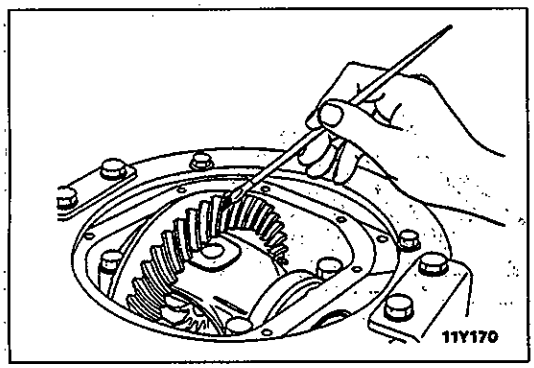
(1) While locking the side gear with the wedge, measure the differential gear backlash with a dial indicator on the pinion gear.

NOTE
Take the measurements at two places 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.

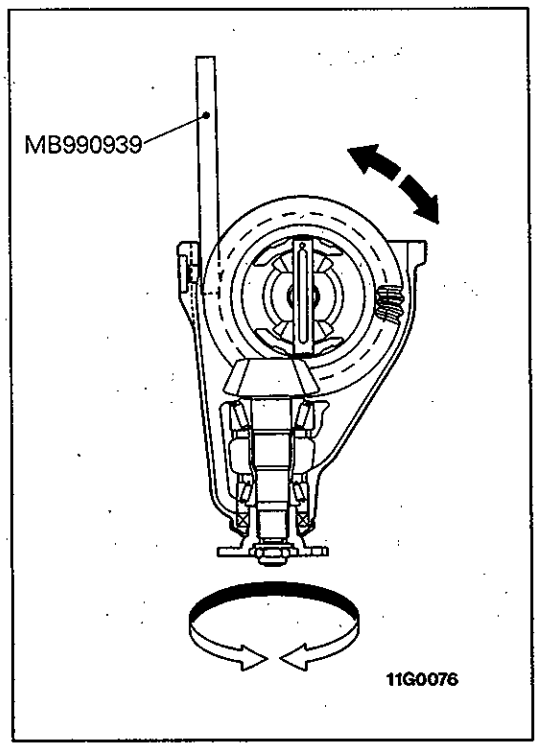
NOTE
If adjustment is impossible, replace the side gear and pinion gear as a set.



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.



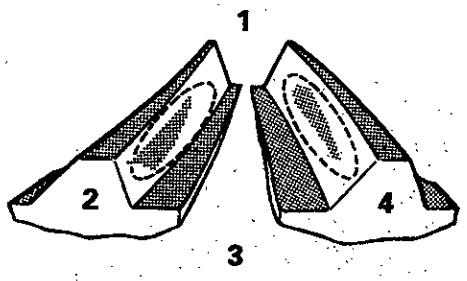
(2) Insert a special tool between the differential carrier and the differential case, and then rotate the companion flange by hand (once in the normal direction, and then once in the reverse direction) while applying a load to the drive gear, so that the revolution torque [approximately 2.5–3.0 Nm (25–30 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.

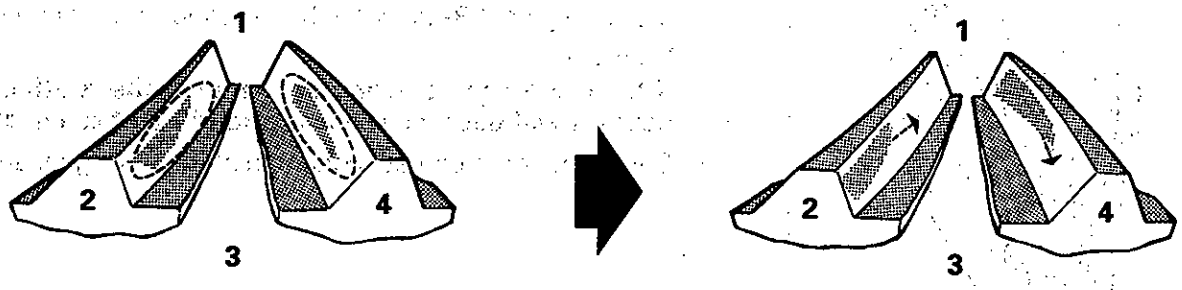
Standard tooth contact pattern

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

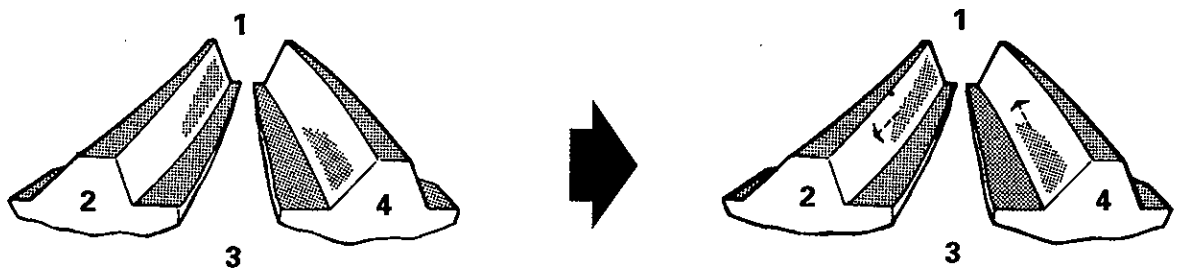
Tooth contact pattern resulting from excessive pinion height



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.

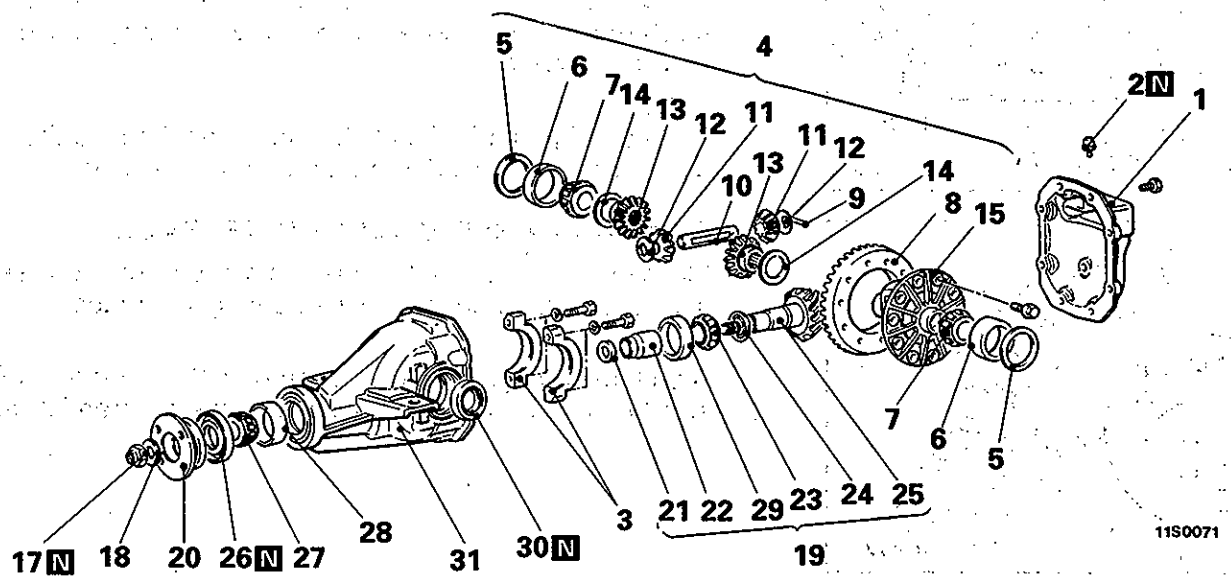
11S642

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 height 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.

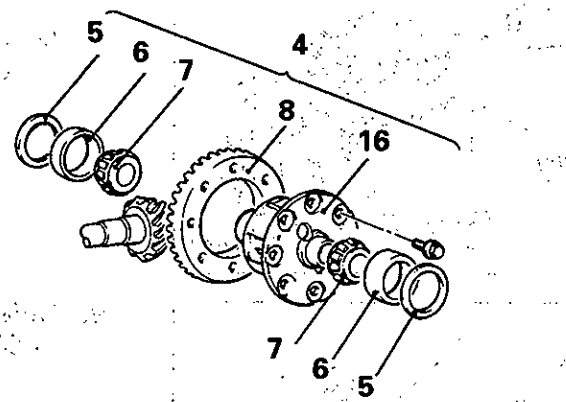
DISASSEMBLY

E27QI–

<Conventional differential>



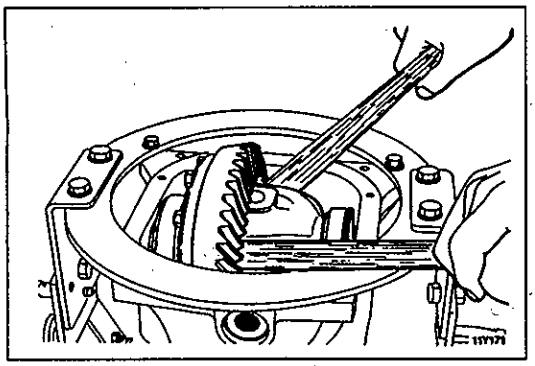
<Limited slip differential VCU type>



Pre-disassembly Inspections
- Inspection of Final Drive Gear backlash (Refer to P.27-31)
- Inspection of Drive Gear Run-out (Refer to P.27-32)
- Inspection of Differential Gear Backlash <Conventional Differential> (Refer to P.27-32)
- Inspection of Final Drive Gear Tooth Contact (Refer to P.27-33)

Disassembly steps

1. Differential cover assembly
2. Vent plug
3. Bearing cap
4. ◆◆ Differential case assembly
5. Side bearing spacer
6. Side bearing outer race
7. ◆◆ Side bearing inner race
8. ◆◆ Drive gear
9. ◆◆ Lock pin <for conventional differential>
10. Pinion shaft
11. Pinion gear
12. Pinion washer
13. Side gear
14. Side gear spacer
15. Differential case
16. Limited slip differential case assembly (Refer to P. 27-47.)
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

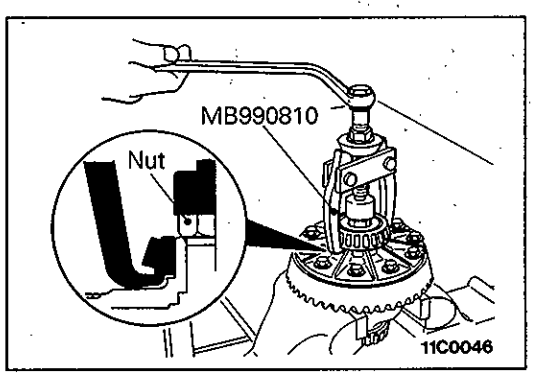


SERVICE POINTS OF DISASSEMBLY E27QFBF

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.

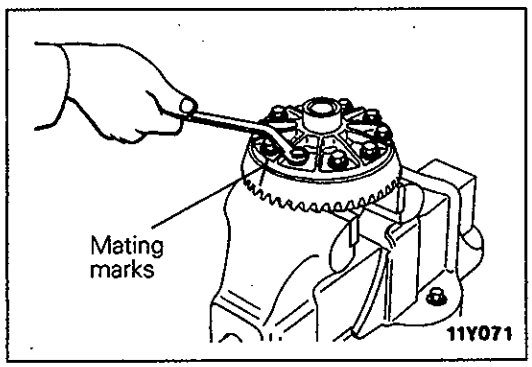
NOTE
Keep the right and left side bearings separate, so that they do not become mixed at the time of reassembly.



7. REMOVAL OF SIDE BEARING INNER RACES

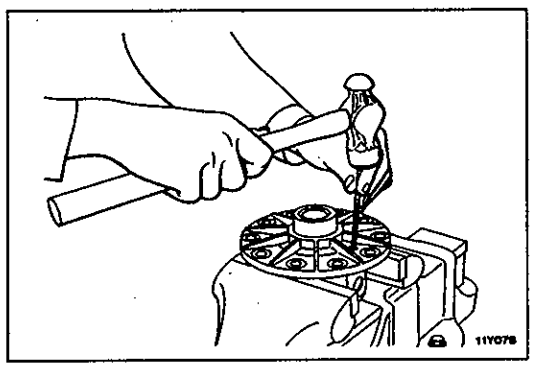
Place the nut on top of the differential case, and then use the special tool to remove the side bearing inner race.

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

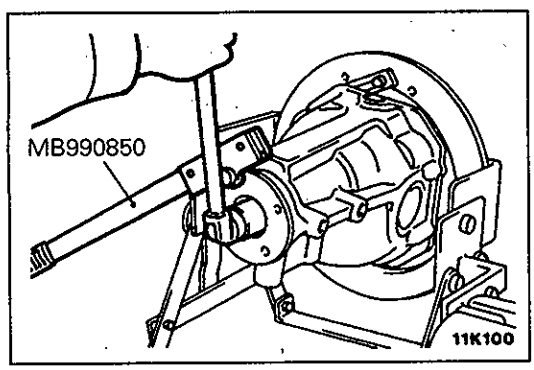


8. REMOVAL OF DRIVE GEAR

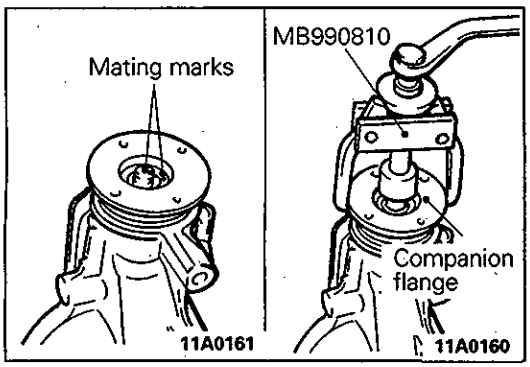
(1) Make the mating marks to the differential case and the drive gear.
(2) Loosen the drive gear attaching bolts in diagonal sequence to remove the drive gear.



9. REMOVAL OF LOCK PIN <FOR CONVENTIONAL DIFFERENTIAL>



17. REMOVAL OF SELF-LOCKING NUT

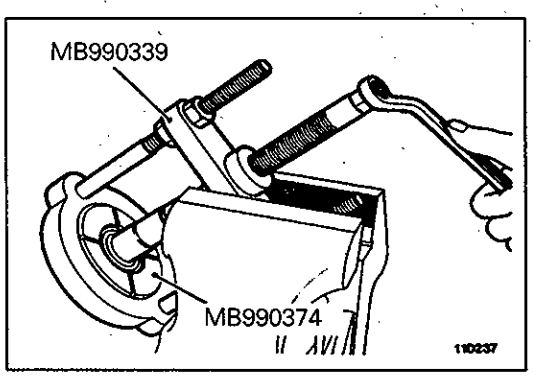


19. REMOVAL OF DRIVE PINION

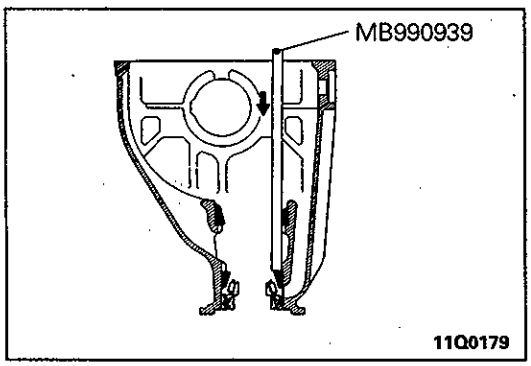
(1) Make the mating marks to the drive pinion and companion flange.

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

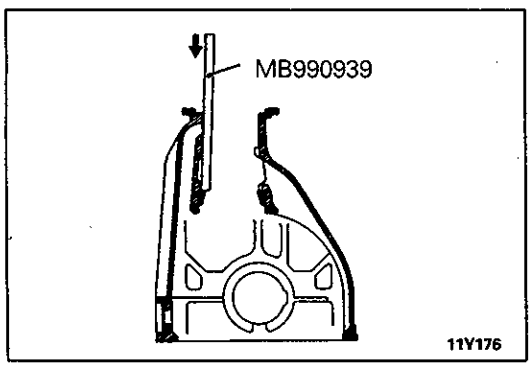
(2) Drive out the drive pinion together with the drive pinion spacer and drive pinion front shims.



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

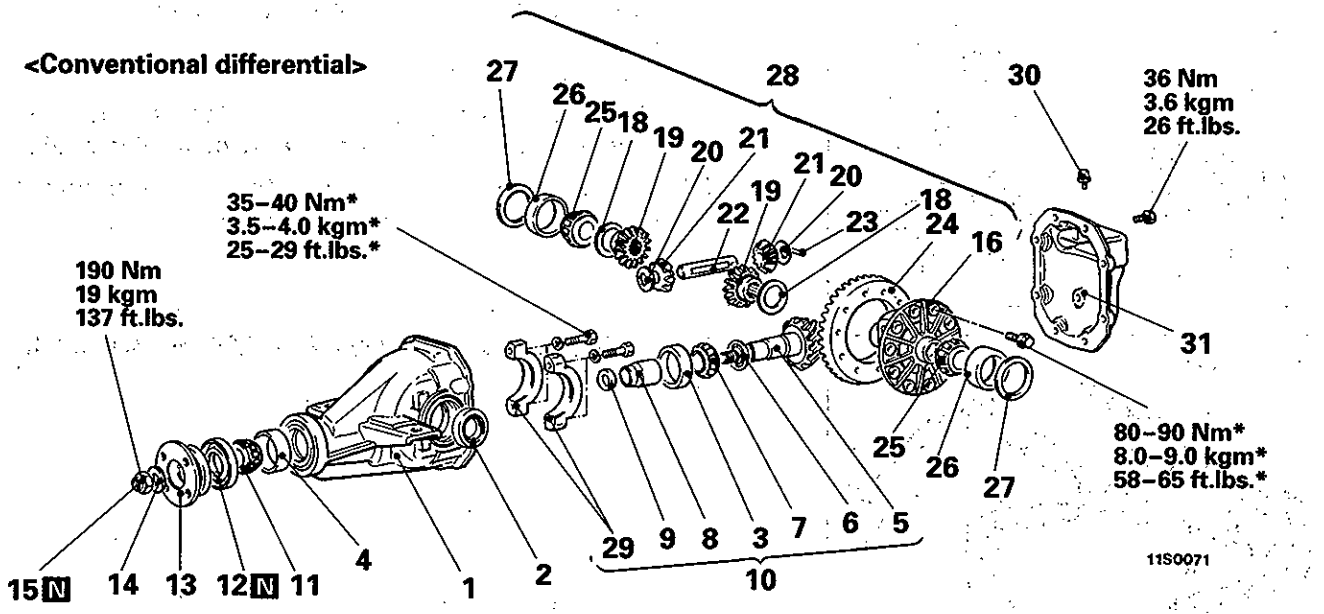
INSPECTION

E27QGAF

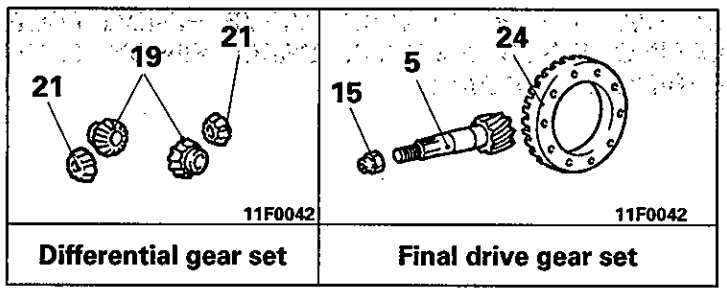
- Check the companion flange for wear or damage.
- Check the oil seal for wear or deterioration.
- Check the bearings for wear or discoloration.
- Check the gear carrier for cracks.
- Check the drive pinion and drive gear for wear or cracks.
- Check the side gears, pinion gears and pinion shaft for wear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

REASSEMBLY

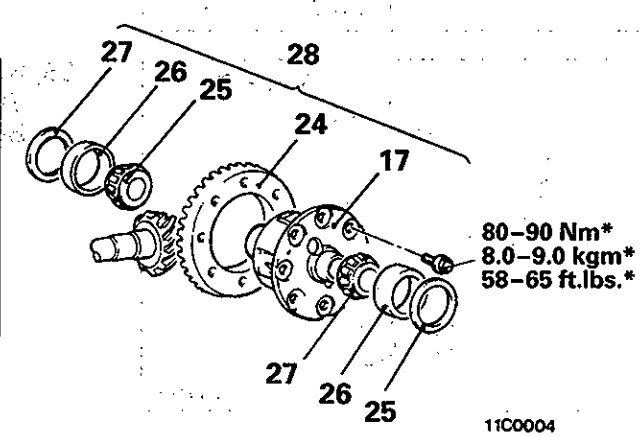
E27OJ–



<Limited slip differential VCU type>



Differential gear set | Final drive gear set

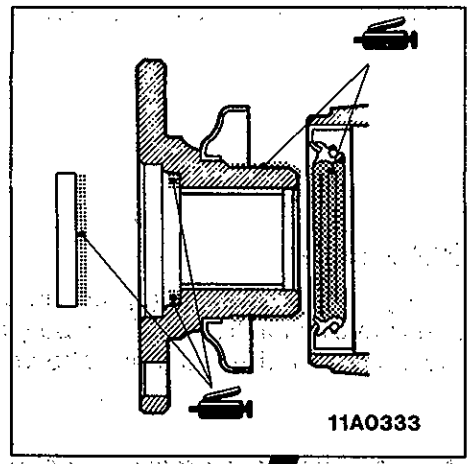


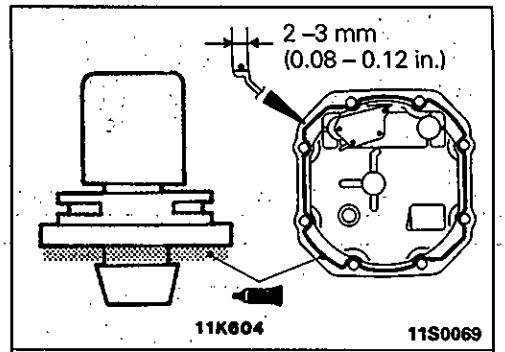
Reassembly steps

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. 27-47.)
- Adjustment of differential gear backlash
18. Side gear spacer
19. Side gear
20. Pinion washer
21. Pinion gear
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 spacer
28. Differential case assembly
29. Bearing cap
30. Vent plug
31. Differential cover assembly

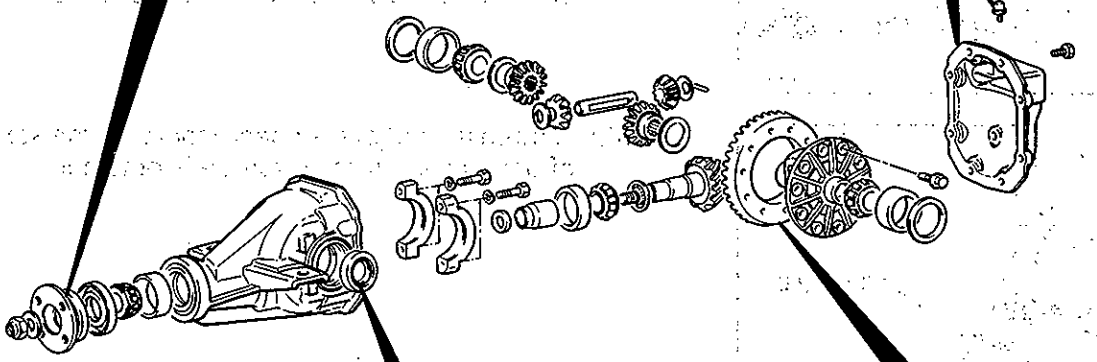
NOTE
*: Tightening torque with gear oil applied

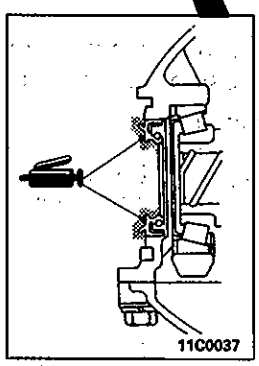
LUBRICATION AND ADHESION POINTS

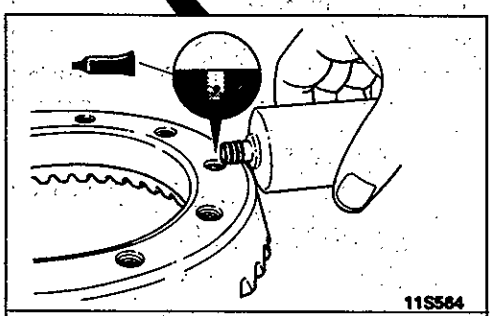




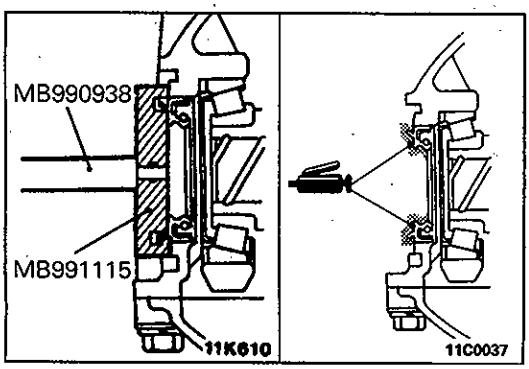
Sealant: 3M ATD Part No. 8663 or equivalent







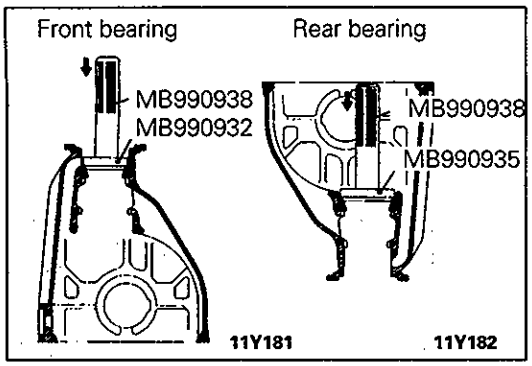
Adhesive: 3M Stud Locking Part No. 4170 or equivalent



SERVICE POINTS OF REASSEMBLY E27QHBE

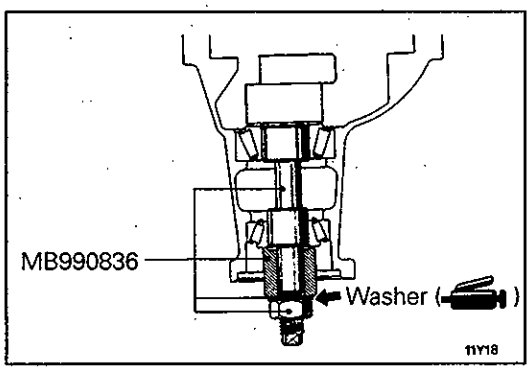
2. PRESS FITTING OF OIL SEAL

(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

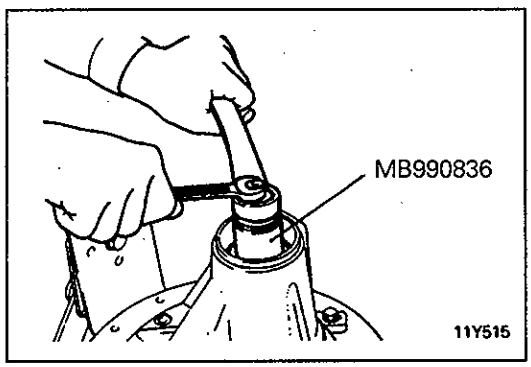
Caution
Be careful not to press in the outer race at an angle.



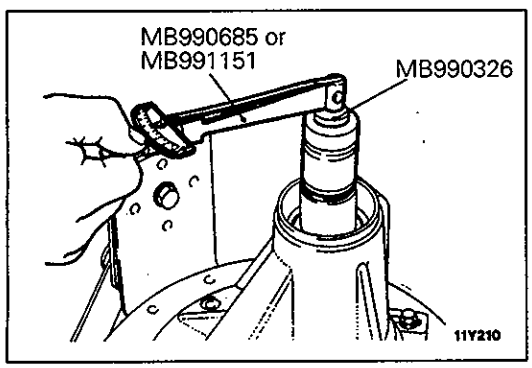
- **ADJUSTMENT OF PINION HEIGHT**

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.

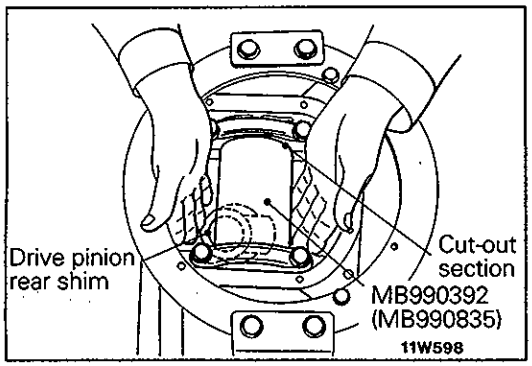


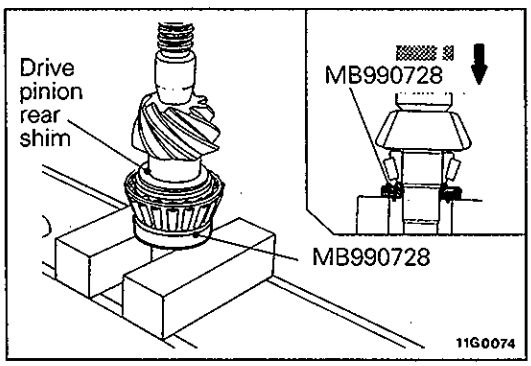
(3) Measure the drive pinion turning torque (without the oil seal) by using the special tools.

Standard value:

Bearing classification	Bearing lubrication	Turning 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	Gear 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.

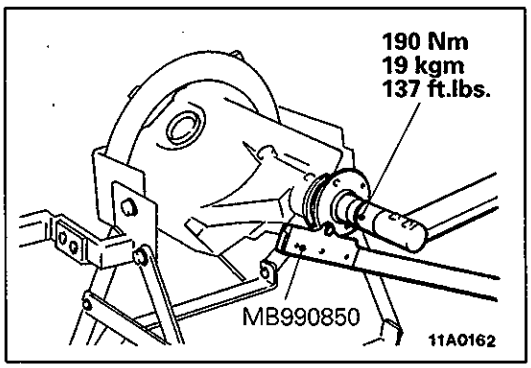




(4) Position the special tool in the side bearing seat of the gear carrier, and then select a drive pinion rear shim of a thickness which corresponds to the gap between the special tools.

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

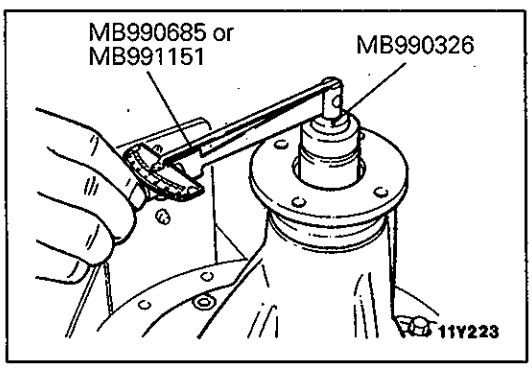
Adjust the drive pinion turning torque by using the following procedures:

Without Oil Seal

(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.

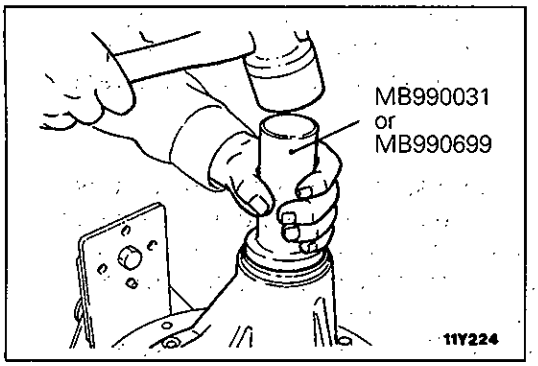
NOTE
Do not install the oil seal.



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

Standard value:

Bearing classification	Bearing lubrication	Turning 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	Gear oil application	0.4–0.5 (4.0–5.0, 3–4)



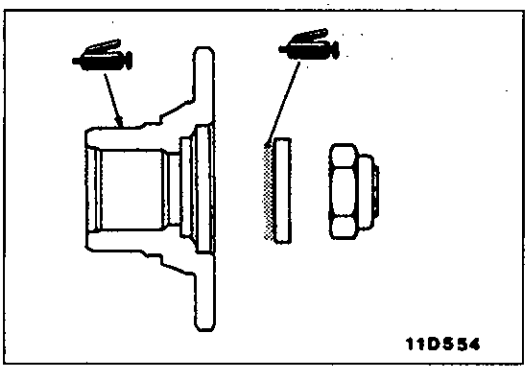
(4) If the drive pinion turning torque is not within the range of the standard value, adjust the turning torque by replacing the drive pinion front shim(s) or the drive pinion spacer.

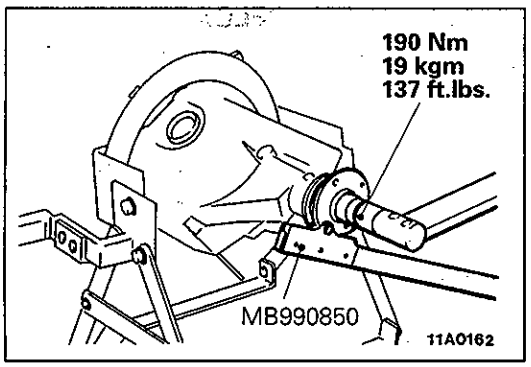
NOTE
When selecting the drive pinion front shims, if the number of shims is large, reduce the number of shims to a minimum by selecting the drive pinion spacers.

(5) Remove the companion flange and drive pinion once again.

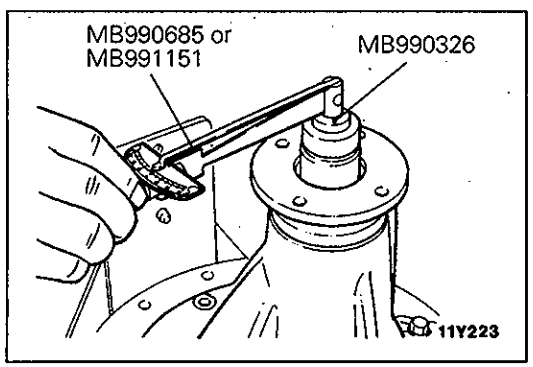
With Oil Seal

(1) Drive the oil seal into the gear carrier front lip by using the special tool.
(2) Apply multipurpose grease to the oil seal lip.
(3) 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.





(4) 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.

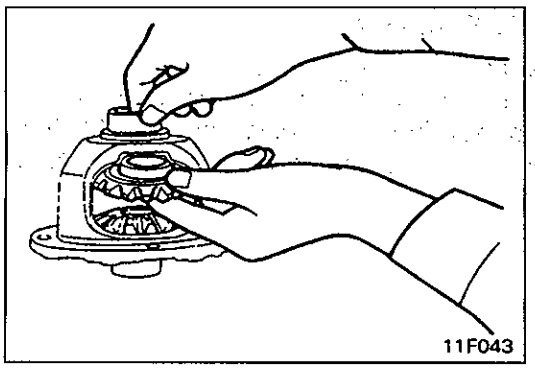


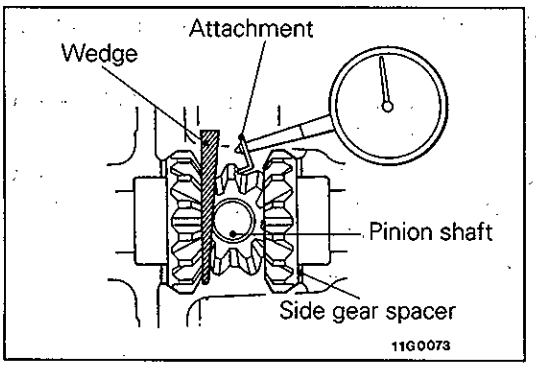
(5) Measure the drive pinion turning torque (with oil seal) by using the special tools to verify that the drive pinion turning torque complies with the standard value.

Standard value:

Bearing classification	Bearing lubrication	Turning 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	Gear 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.

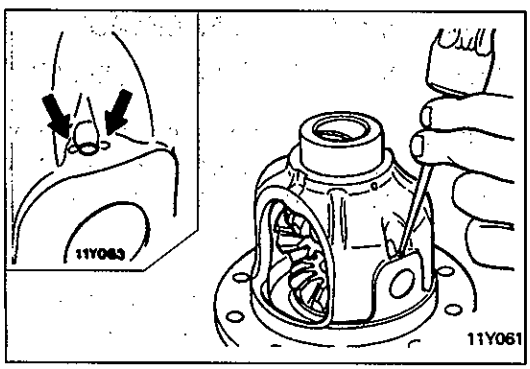
(3) While locking the side gear with the wedge, measure the differential gear backlash with a dial indicator on the pinion gear.

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.)

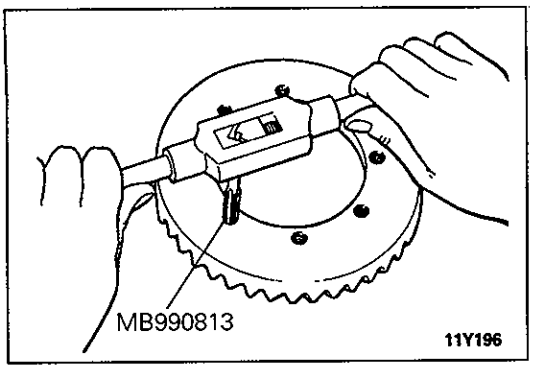
(4) If the differential gear backlash exceeds the limit, adjust the backlash by installing thicker side gear spacers.
(5) Measure the differential gear backlash once again, and confirm that it is within the limit.

NOTE
(1) After adjustment, check that the backlash is 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.



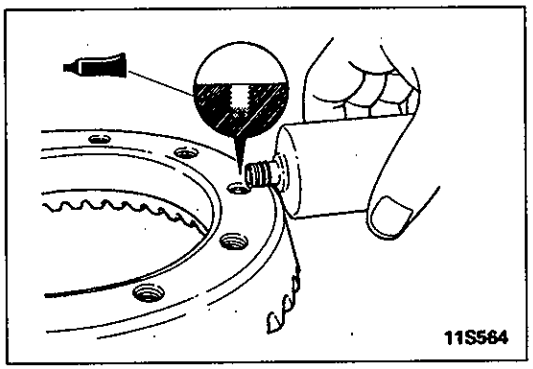
23. INSTALLATION OF LOCK PIN

(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

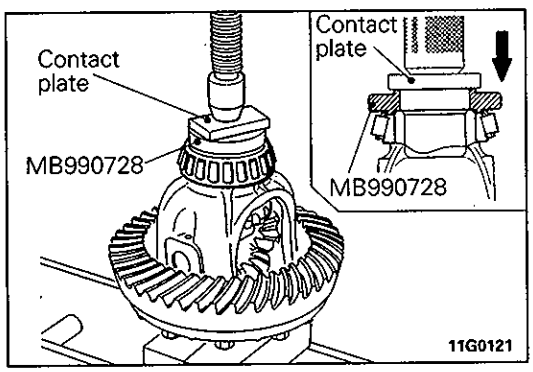
(1) Clean the drive gear attaching bolts.
(2) Remove the adhesive adhering to the threaded holes of the drive gear by turning the special tool (tap M10 × 1.25), and then clean the threaded holes by applying compressed air.



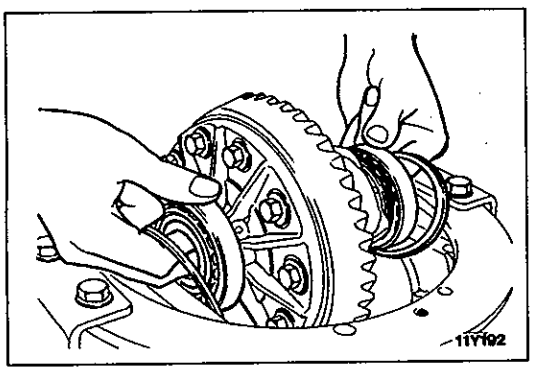
(3) Apply the specified adhesive to the threaded holes of the drive gear.

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

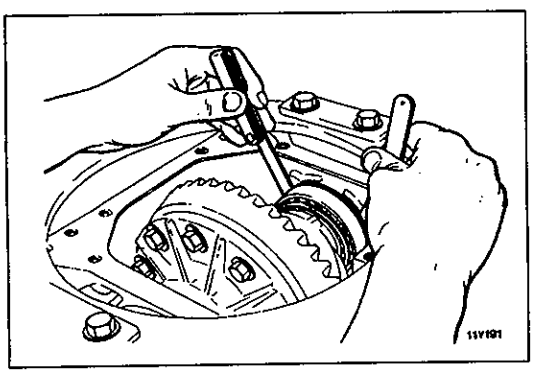


• ADJUSTMENT OF FINAL DRIVE GEAR BACKLASH

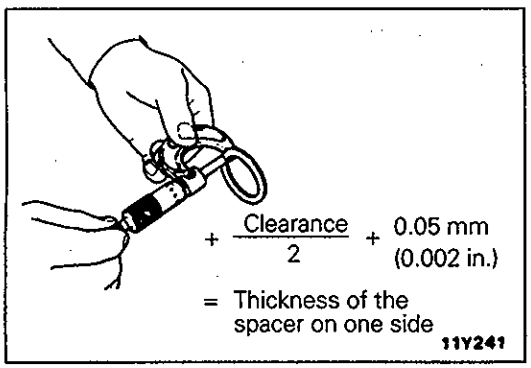
Adjust the final drive gear backlash by the following procedures:

(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.

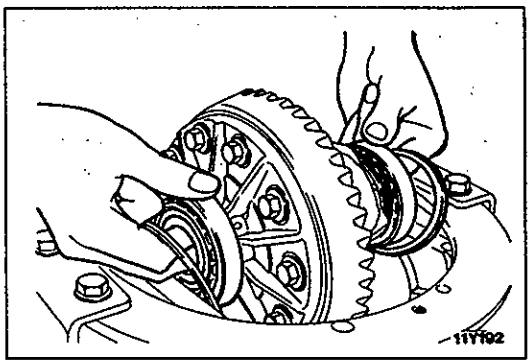
NOTE
Select side bearing spacers with the same thickness for both the drive pinion side and the drive gear side.



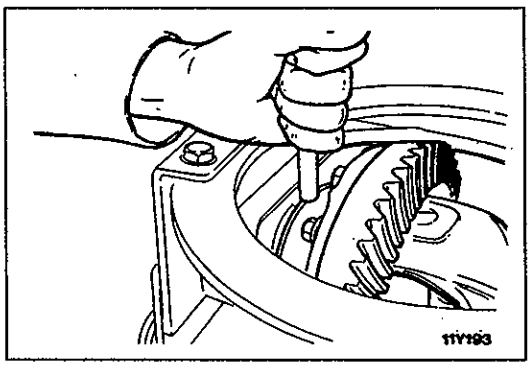
(2) Push the differential case to one side, and measure the clearance between the gear carrier and the side bearing.



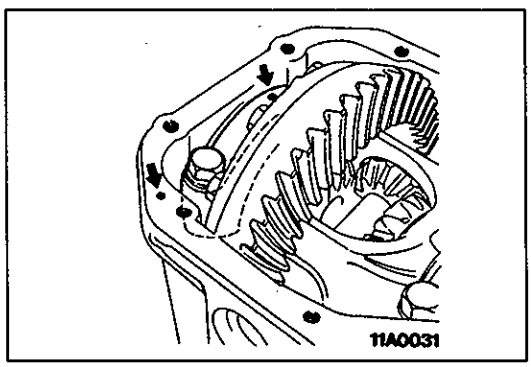
(3) Measure the thickness of the side bearing spacers on one side, select two pairs of spacers which correspond to that thickness plus one half of the clearance plus 0.05 mm (0.002 in.), and then install one pair each to the drive pinion side and the drive gear side.



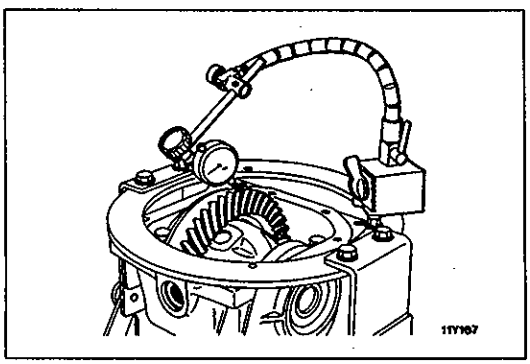
(4) Install the side bearing spacers and differential case assembly, as shown in the illustration, to the gear carrier.



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



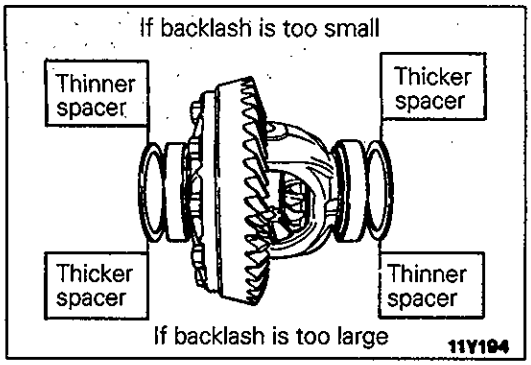
(6) Align the mating marks on the gear carrier and the bearing cap, and then tighten the bearing cap.



(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.

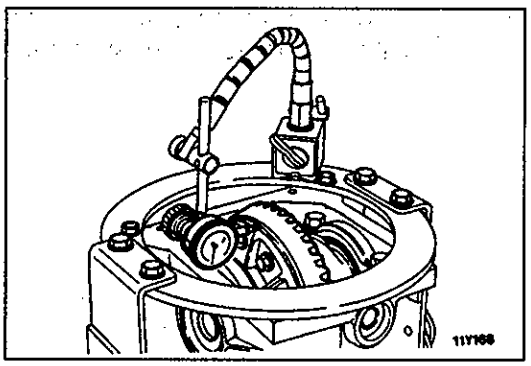
Standard value: 0.11–0.16 mm (0.004–0.006 in.)



(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.27-34.)



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

Limit: 0.05 mm (0.002 in.)

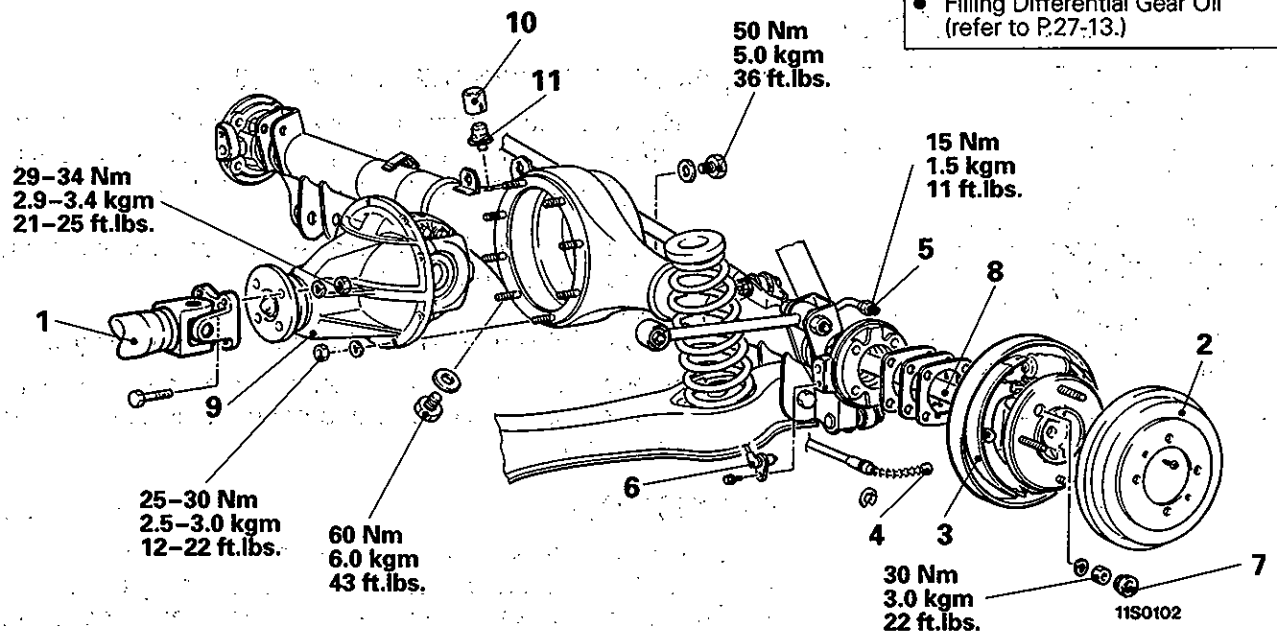
(11) If the drive gear runout exceeds the limit, reinstall by changing the phase of the drive gear and differential case, and remeasure.

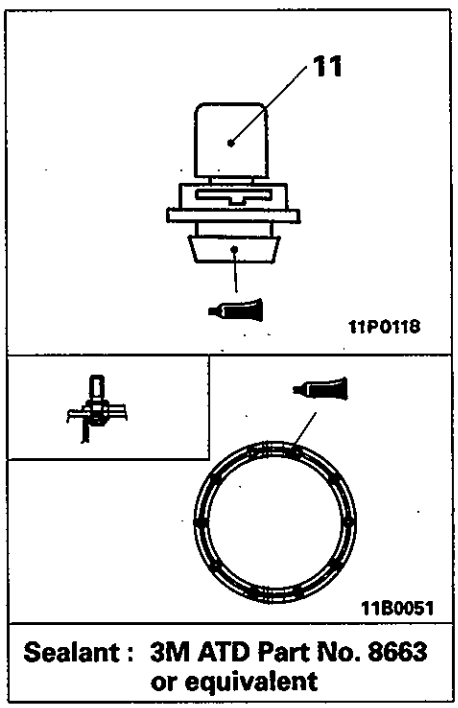
DIFFERENTIAL CARRIER <RIGID TYPE>

REMOVAL AND INSTALLATION

Pre-removal Operation
- Draining Brake Fluid
- Drainage of Differential Gear Oil

Pre-installation Operation
- Filing of Brake Fluid and Air Bleeding (Refer to GROUP 35 – Service Adjustment Procedures.)
- Adjusting Parking Brake Lever Stroke (Refer to GROUT 36 – Service Adjustment Procedures.)
- Filling Differential Gear Oil (refer to P.27-13.)

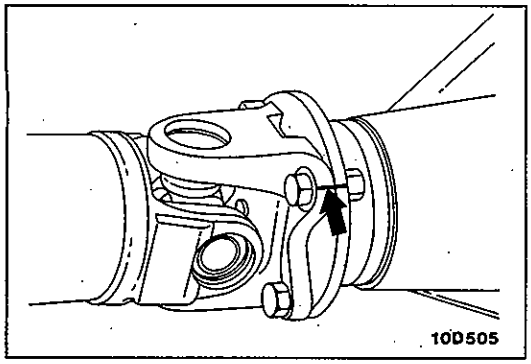




Sealant : 3M ATD Part No. 8663 or equivalent

Removal steps
1. Propeller shaft
2. Brake drum
3. Shoe and lining assembly (Refer to GROUP 35 – Rear drum brake)
4. Parking brake cable connection
5. Brake pipe connection
6. Rear speed sensor <Vehicles with ABS>
7. Plug
8. Axle shaft assembly (Refer to P.27-16-3)
9. Differential carrier assembly
10. Plug cover
11. Vent plug

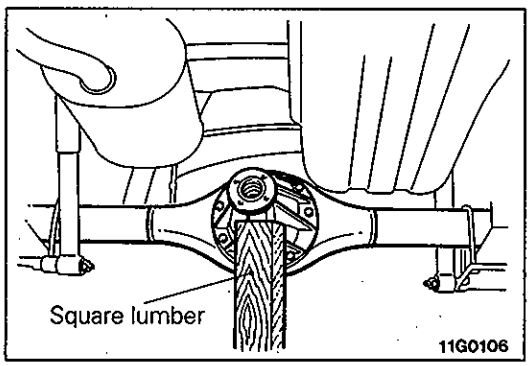
Caution
When removing and installing the speed sensor in vehicles with ABS, be careful that the pole piece at the end does not contact other parts.



SERVICE POINTS OF REMOVAL

1. REMOVAL OF PROPELLER SHAFT

Put mating marks on the flange yoke and the differential companion flange before removing the propeller shaft.



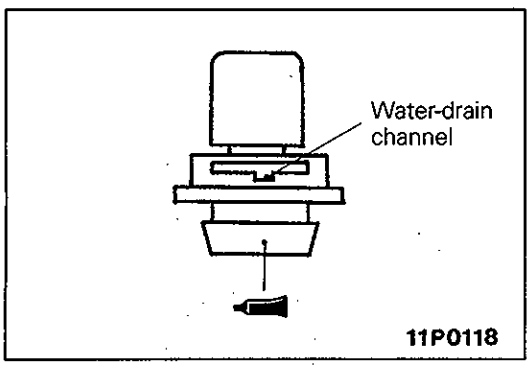
9. REMOVAL OF DIFFERENTIAL CARRIER

(1) Remove the attaching nuts and strike the lower part of differential carrier assembly with a piece of square lumber several times to remove the assembly.
NOTE
Do not remove the uppermost nut but keep it loosened all the way to the stud bolt end.
Caution
Be careful not to strike the companion flange.

(2) Support the differential carrier assembly with a jack. Then remove the nuts and remove the differential carrier assembly

INSPECTION E27QCAA

- Check for oil leakage from the vent plug.
- Check for cracking or deterioration of the plug cover.
- Check for oil leakage from the differential carrier companion flange.
- Check for oil leakage from the coupling of the differential carrier and the axle housing

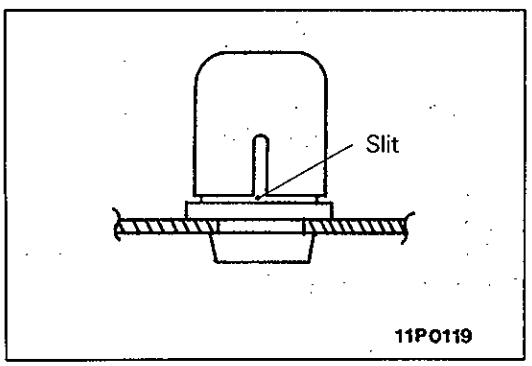


SERVICE POINTS OF INSTALLATION E27QCAJ

11. INSTALLATION OF VENT PLUG

(1) Apply a coating of specified sealant where shown in the illustration.
Specified sealant : 3M ATD Part No.8663 or equivalent

(2) Face the water-drain channel toward the wheel side and tap the vent plug into the axle housing.



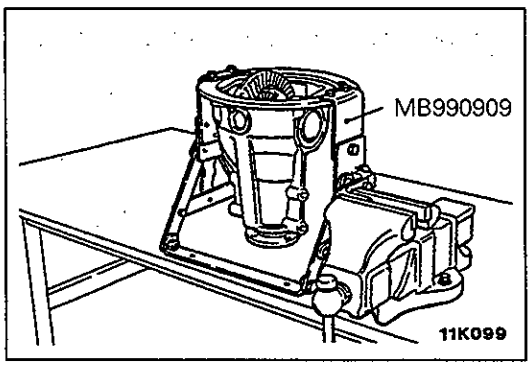
10. INSTALLATION OF PLUG COVER

Install with the slit of the plug cover facing toward the rear of the vehicle.

1. INSTALLATION OF PROPELLER SHAFT

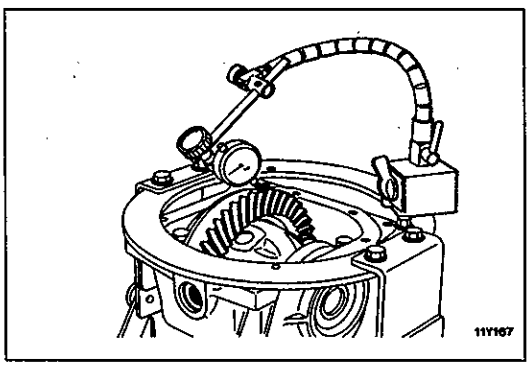
Align the marks on flange yoke and companion flange and attach them with bolts and nuts.

Caution
If the threads of the bolts and nuts are stained with oil or grease, they can become loose. Completely remove oil or grease from the threads before tightening the bolts and nuts.



INSPECTION BEFORE DISASSEMBLY E27ODAJ

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



FINAL DRIVE GEAR BACKLASH

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

(1) Measure at four points or more on the circumference of the drive gear.

Standard value: 0.11–0.16 mm (0.0043–0.0063 in.)

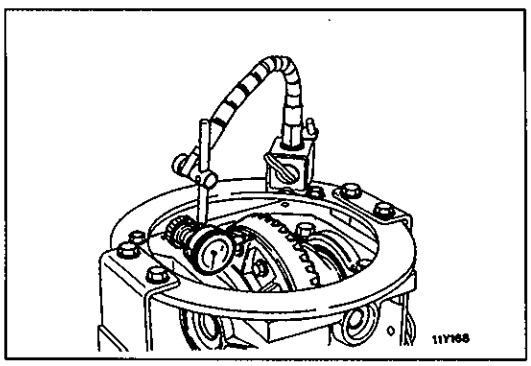
(2) If the backlash deviates from the standard value, adjust by using a side bearing spacer.

NOTE
After making the adjustment, check the contact of the teeth 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.

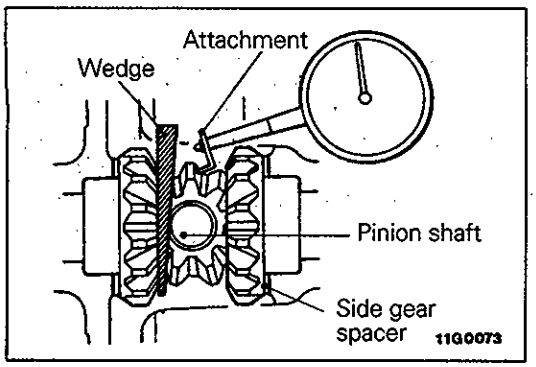
Limit: 0.05 mm (0.0019 in.)



(2) If the runout exceeds the limit value, check for either foreign material between the rear surface of the drive gear and the differential case, or for looseness of the drive gear installation bolt.

(3) If no problem is found when checking as described in (2), change the relative meshing position of the drive gear and the differential case, and then measure once again.

NOTE
If an adjustment cannot be made, replace either the differential case, or the drive gear and drive pinion as a set.



DIFFERENTIAL GEAR BACKLASH (EXCEPT LIMITED SLIP DIFFERENTIAL)

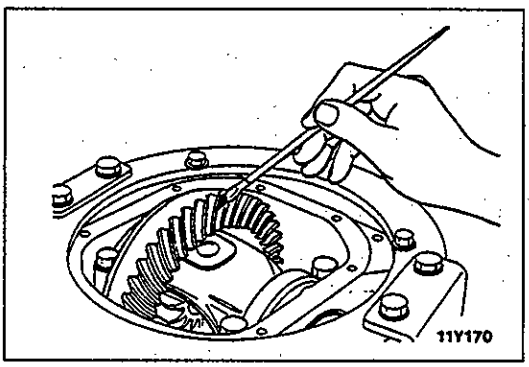
(1) While locking the side gear with the wedge, measure the differential gear backlash with a dial indicator on the pinion gear.

NOTE
Make the measurement for both of the pinion gears.

Standard value: 0–0.076 mm (0–0.0030 in.)
Limit: 0.2 mm (0.0079 in.)

(2) If the backlash exceeds the limit value, adjust by using a side gear spacer.

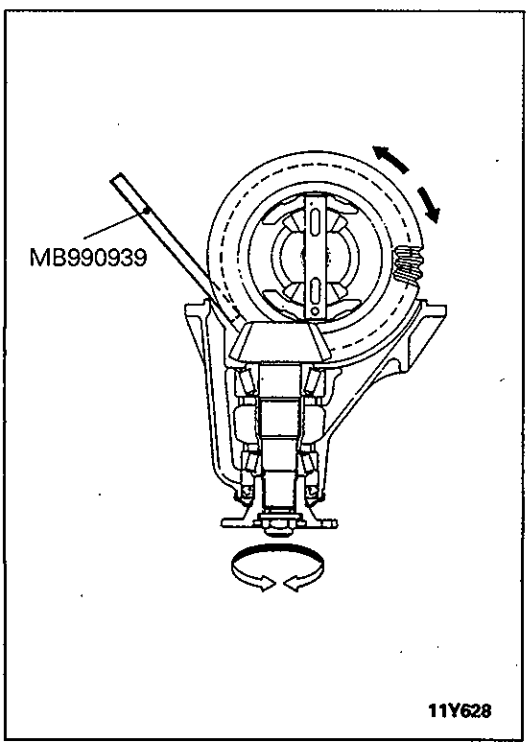
NOTE
If the adjustment cannot be made, replace the side gear and pinion gear as a set.



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.



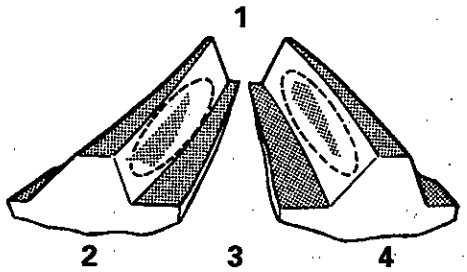
(2) Insert a special tool between the differential carrier and the differential case, and then rotate the companion flange by hand (once in the normal direction, and then once in the reverse direction) while applying a load to the drive gear, so that the revolution torque [approximately 250–300 Ncm (25–30 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.

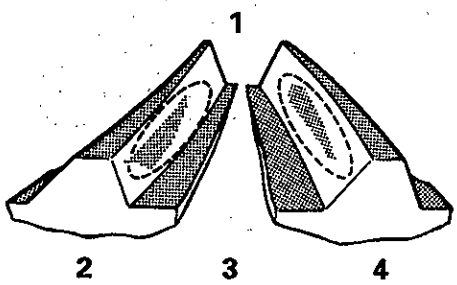
Standard tooth contact pattern

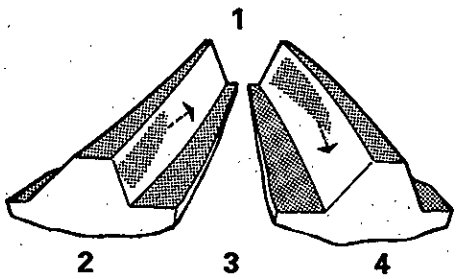
1 Narrow tooth side
2 Drive-side tooth surface (the side applying power during forward movement)
3 Wide tooth side
4 Coast-side tooth surface (the side applying power during reverse movement)



Problem	Solution

Tooth contact pattern resulting from excessive pinion height

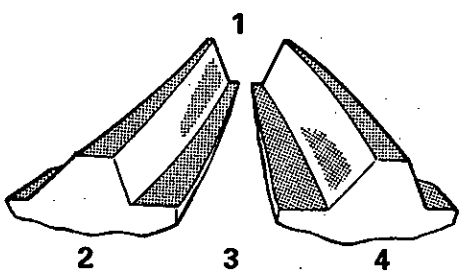


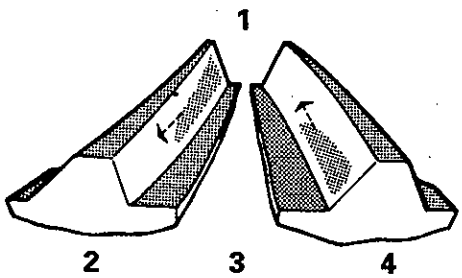


The drive pinion is positioned too far from the centre of the drive gear.

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

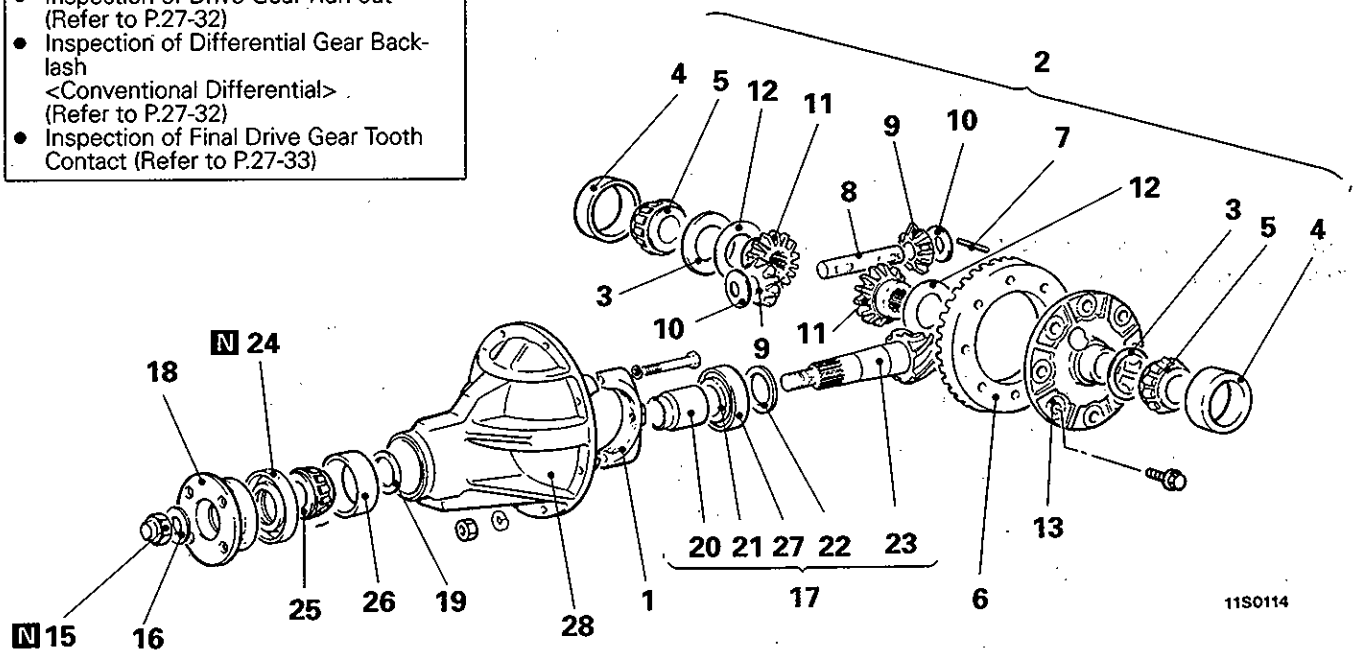
NOTE
(1) Tooth contact pattern is a method for judging the result of the adjustment of drive pinion height and final drive gear backlash. The adjustment of drive pinion height and final drive gear backlash should be repeated until tooth contact patterns bear a similarity to the standard tooth contact 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.

DIFFERENTIAL CARRIER

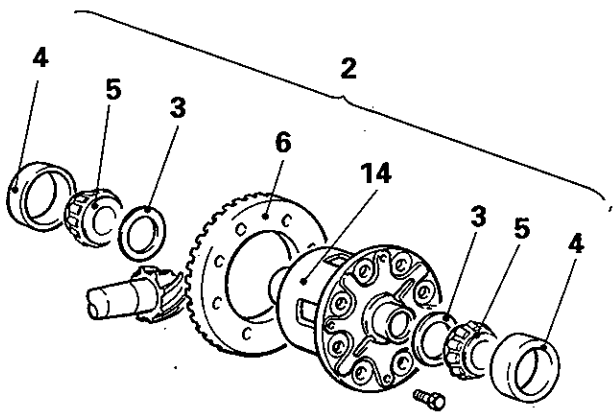
DISASSEMBLY

Inspection before disassembly
- Inspection of Final Drive Gear Backlash (Refer to P.27-31)
- Inspection of Drive Gear Run-out (Refer to P.27-32)
- Inspection of Differential Gear Backlash <Conventional Differential> (Refer to P.27-32)
- Inspection of Final Drive Gear Tooth Contact (Refer to P.27-33)

<Conventional differential>

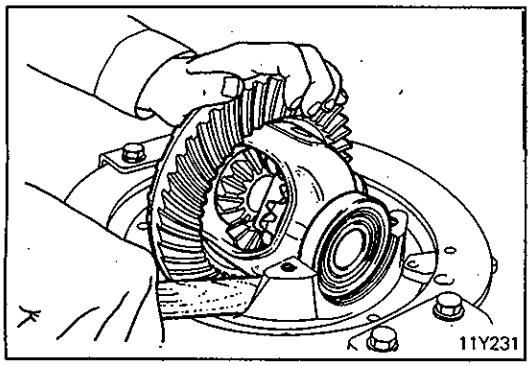


<Limited slip differential mechanical type>



Disassembly steps

1. Bearing cap
2. ◆◆ Differential case assembly, Side bearing
3. Side bearing spacer
4. Side bearing outer race
5. ◆◆ Side bearing inner race
6. ◆◆ Drive gear
7. ◆◆ Lock pin <for conventional differential>
8. Pinion shaft
9. Pinion gear
10. Pinion washer
11. Side gear
12. Side gear spacer
13. Differential case
14. Limited slip differential case assembly (Refer to P.27-52.)
15. ◆◆ Self-locking nut
16. Washer
17. ◆◆ Drive pinion assembly
18. Companion flange
19. Drive pinion front shim (for preload adjustment)
20. Drive pinion spacer
21. ◆◆ Drive pinion rear bearing inner race
22. Drive pinion rear shim (for pinion height adjustment)
23. Drive pinion
24. ◆◆ Oil seal
25. ◆◆ Drive pinion front bearing inner race
26. ◆◆ Drive pinion front bearing outer race
27. ◆◆ Drive pinion rear bearing outer race
28. Gear carrier

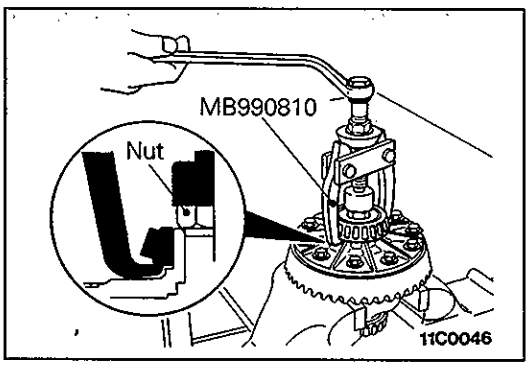


SERVICE POINTS OF DISASSEMBLY E27QFBF

2. 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.

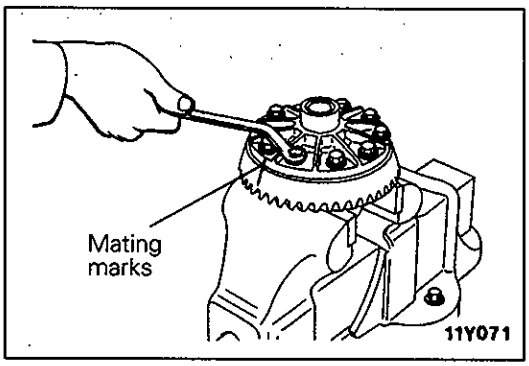
NOTE
Keep the right and left side bearings separate, so that they do not become mixed at the time of reassembly.



5. REMOVAL OF SIDE BEARING INNER RACES

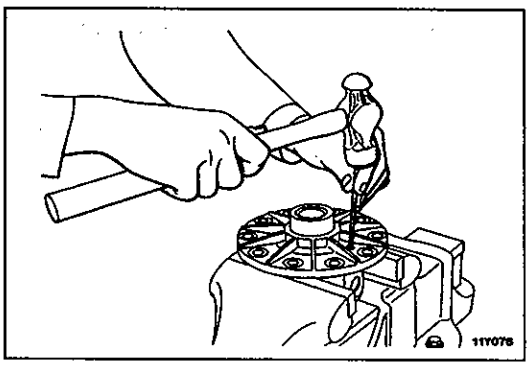
Place the nut on top of the differential case, and then use the special tool to remove the side bearing inner race.

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

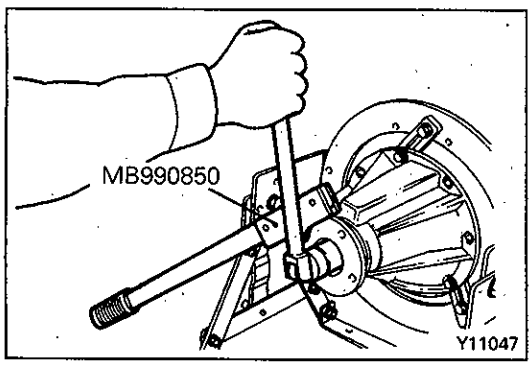


6. REMOVAL OF DRIVE GEAR

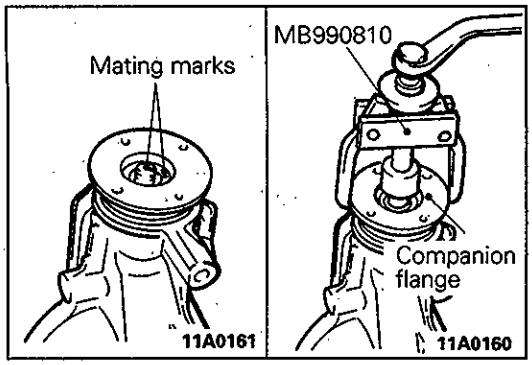
(1) Make the mating marks to the differential case and the drive gear.
(2) Loosen the drive gear attaching bolts in diagonal sequence to remove the drive gear.



7. REMOVAL OF LOCK PIN <FOR CONVENTIONAL DIFFERENTIAL>



15. REMOVAL OF SELF-LOCKING NUT

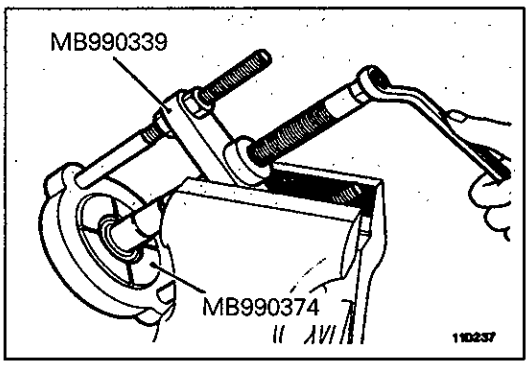


17. REMOVAL OF DRIVE PINION ASSEMBLY

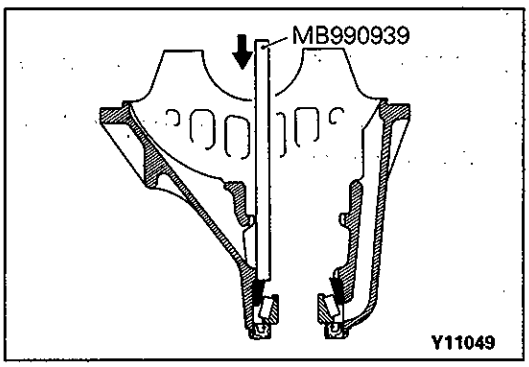
(1) Make matching marks on the drive pinion and companion flange for reference during assembly.

Caution
Mating marks most not be made on the companion flange and propeller shaft coupling surfaces.

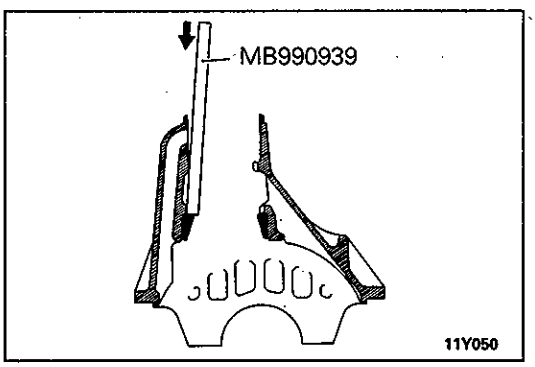
(2) Drive out the drive pinion together with the drive pinion spacer and drive pinion front shims.



21. REMOVAL OF DRIVE PINION REAR BEARING INNER RACE



24. REMOVAL OF OIL SEAL/25. DRIVE PINION FRONT BEARING INNER RACE/26. DRIVE PINION FRONT BEARING OUTER RACE



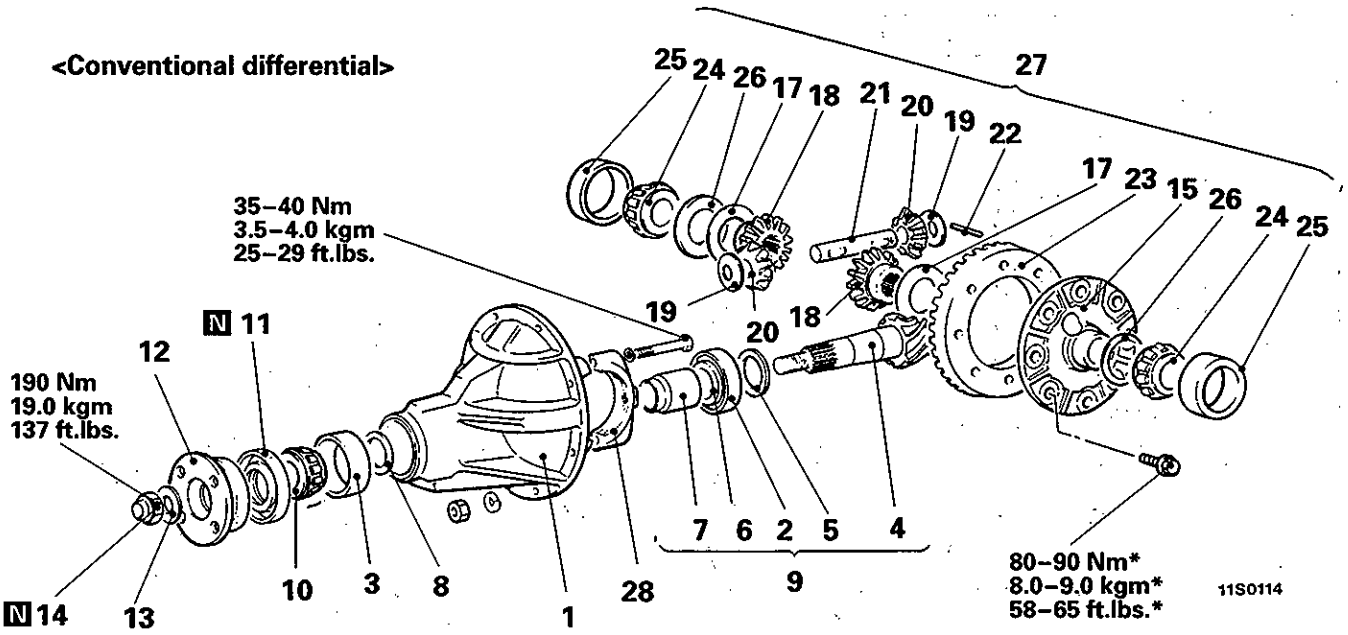
27. REMOVAL OF DRIVE PINION REAR BEARING OUTER RACE

INSPECTION E27QGAF

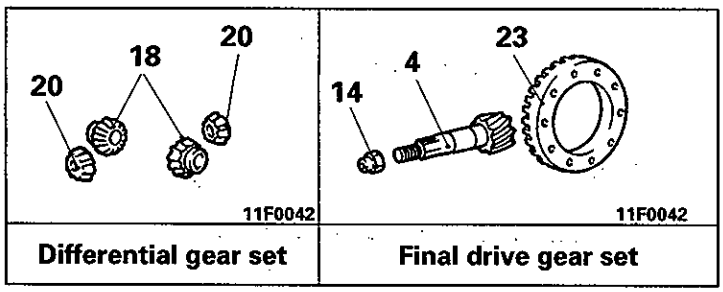
- Check the companion flange for wear or damage.
- Check the oil seal for wear or deterioration.
- Check the bearings for wear or discoloration.
- Check the gear carrier for cracks.
- Check the drive pinion and drive gear for wear or cracks.
- Check the side gears, pinion gears and pinion shaft for wear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

REASSEMBLY

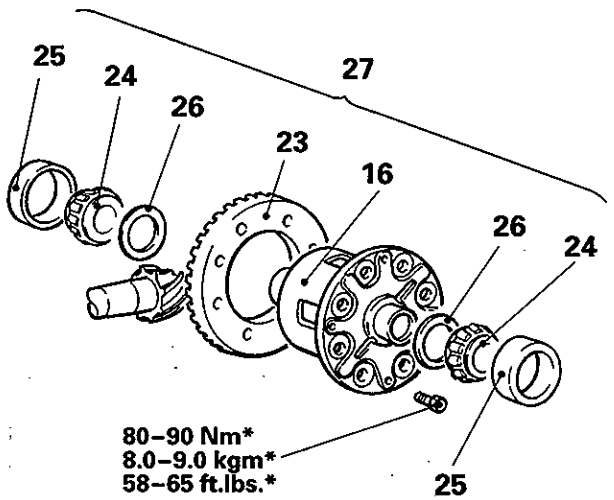
<Conventional differential>



<Limited slip differential mechanical type>



Differential gear set	Final drive gear set

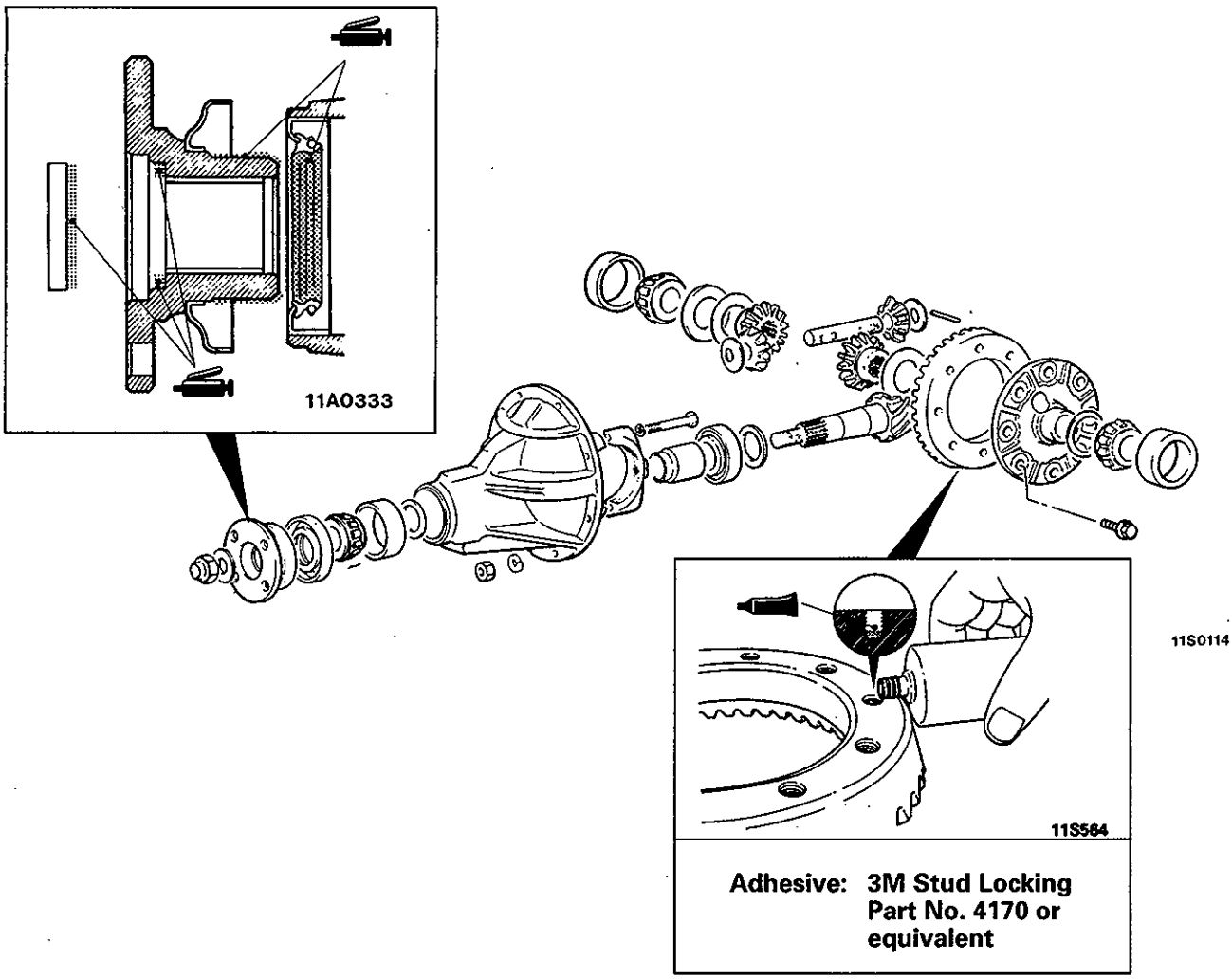


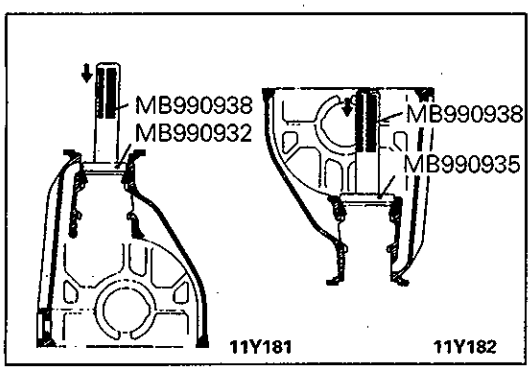
Reassembly steps

1. Gear carrier
2. ◆◆ Drive pinion rear bearing outer race
3. ◆◆ Drive pinion front bearing outer race
4. ◆◆ ● 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
9. ◆◆ ● Adjustment of drive pinion preload
10. Drive pinion front shim (for preload adjustment)
11. Drive pinion assembly
12. Drive pinion front bearing inner race
13. Oil seal
14. Companion flange
15. Washer
16. Self-locking nut
17. Differential case
18. Limited slip differential case assembly (Refer to P. 27-47.)
19. ◆◆ ● Adjustment of differential gear backlash
20. Side gear spacer
21. Side gear
22. Pinion washer
23. Pinion gear
24. Pinion shaft
25. ◆◆ Lock pin (for conventional differential)
26. ◆◆ Drive gear
27. ◆◆ Side bearing inner race
28. ◆◆ Side bearing outer race
29. ◆◆ ● Adjustment of final drive gear backlash
30. Side bearing spacer
31. Differential case assembly,Side bearing
32. Bearing cap

NOTE
*: Tightening torque with gear oil applied

LUBRICATION AND SEALING POINTS

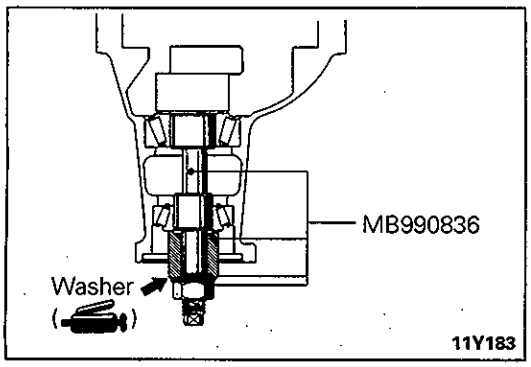


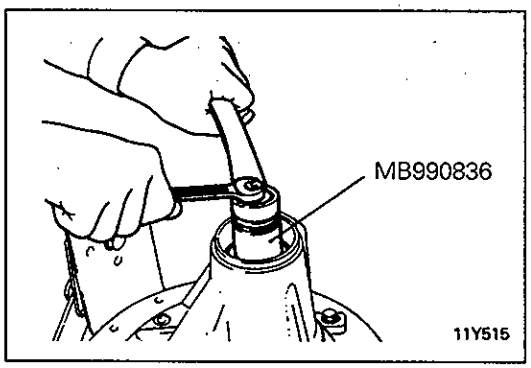


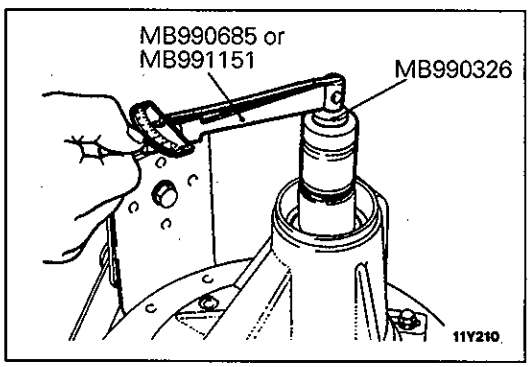
SERVICE POINTS OF REASSEMBLY E27QHBE

2. INSTALLATION OF DRIVE PINION REAR BEARING OUTER RACE/3. 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.

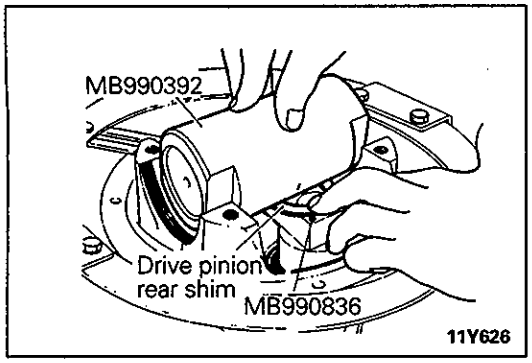
(2) Tighten the nut of the special tool until the standard value of drive pinion turning torque is obtained.

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

Standard value:

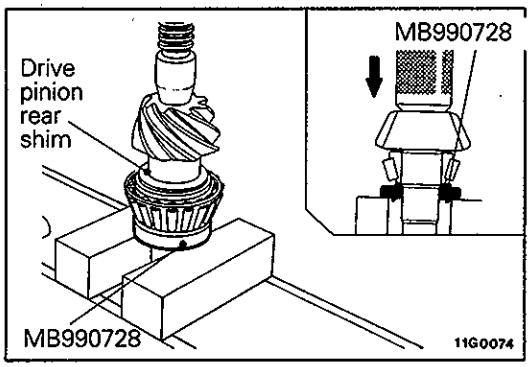
Bearing classification	Bearing lubrication	Turning torque (starting friction torque) Nm (kgcm, in. lbs.)
New	None (with rust-prevention oil)	0.9–1.2 (9.0–12.0, 8–10)
New/ reused	Gear oil application	0.4–0.5 (4.0–5.0, 3–4)

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.

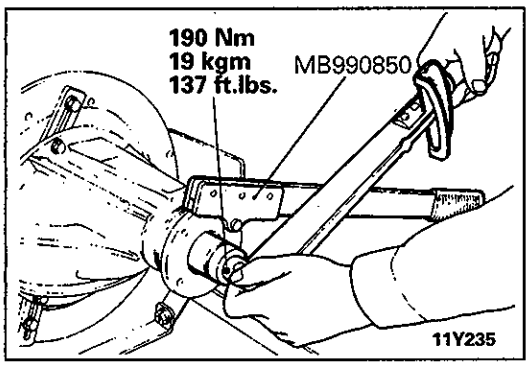


(4) Position the special tool in the side bearing seat of the gear carrier, and then select a drive pinion rear shim of a thickness which corresponds to the gap between the special tools.

NOTE
Be sure to 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

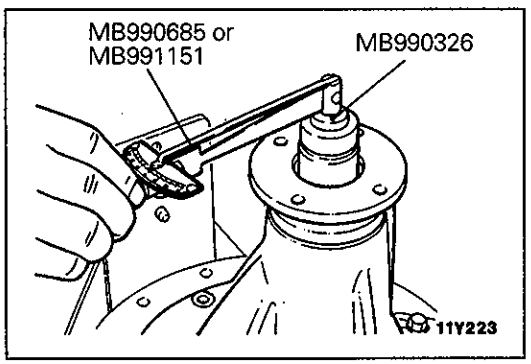
Adjust the drive pinion turning torque by using the following procedures:

Without Oil Seal

(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.



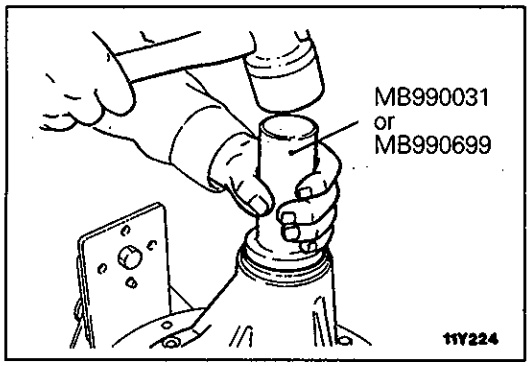
(3) Measure the drive pinion turning torque (without the oil seal) by using the special tools.

Standard value:

Bearing classification	Bearing lubrication	Turning 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	Gear 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.

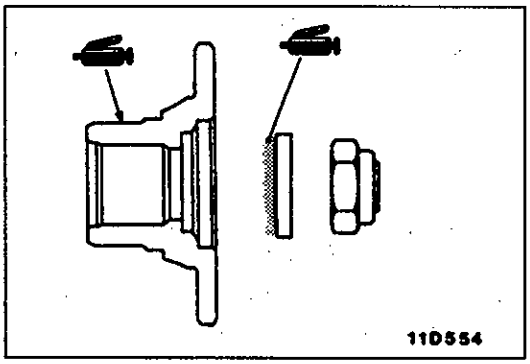
NOTE
When selecting the drive pinion front shims, if the number of shims is large, reduce the number of shims to a minimum by selecting the drive pinion spacers.



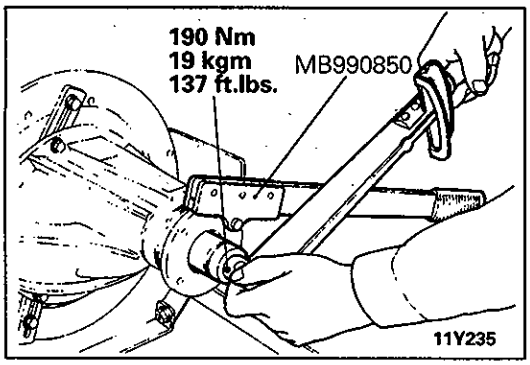
(5) Remove the companion flange and drive pinion once again.

With Oil Seal

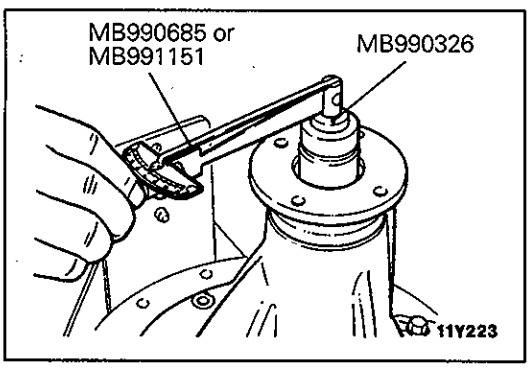
(1) Drive the oil seal into the gear carrier front lip by using the special tool.



(2) Apply multipurpose grease to the oil seal lip.
(3) Apply a thin coat of multipurpose grease to the companion flange contacting surface of the oil seal before installing drive pinion assembly.



(4) 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.

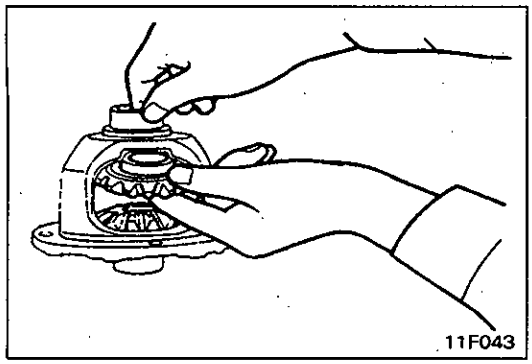


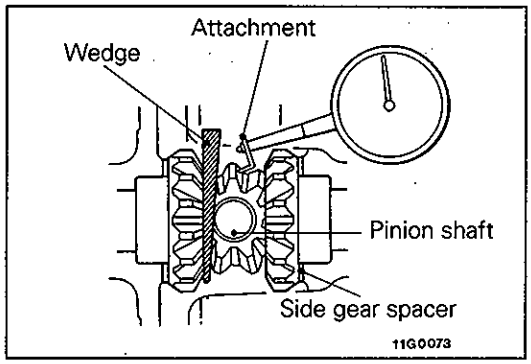
(5) Measure the drive pinion turning torque (with oil seal) by using the special tools to verify that the drive pinion turning torque complies with the standard value.

Standard value:

Bearing classification	Bearing lubrication	Turning 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	Gear 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 thrust spacers, pinion gears, and pinion washers in the differential case.
(2) Temporarily install the pinion shaft.

NOTE
Do not drive in the lock pin yet.

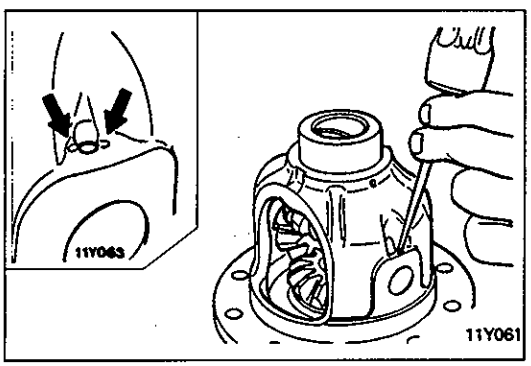
(3) While locking the side gear with the wedge, measure the differential gear backlash with a dial indicator on the pinion gear.

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.)

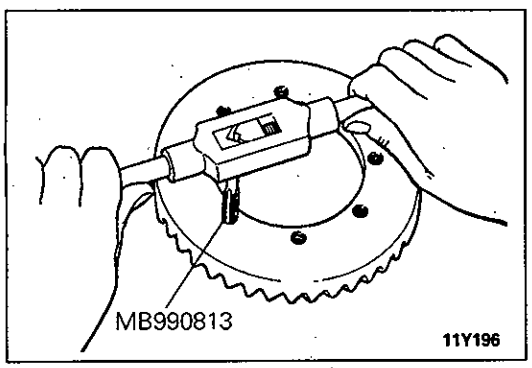
(4) If the differential gear backlash exceeds the limit, adjust the backlash by installing thicker side gear thrust spacers.
(5) Measure the differential gear backlash once again, and confirm that it is within the limit.

NOTE
(1) After adjustment, check that the backlash is 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.



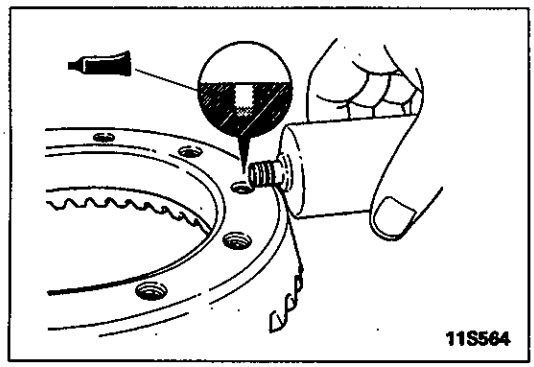
22. INSTALLATION OF LOCK PIN

(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.



23. INSTALLATION OF DRIVE GEAR

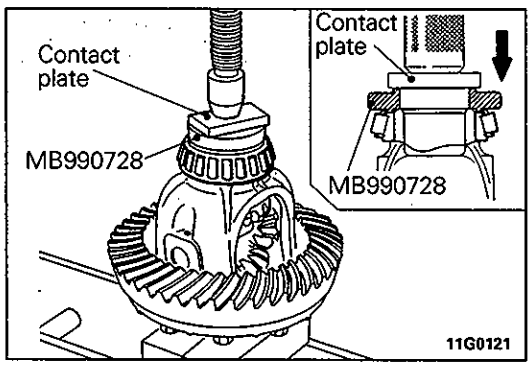
(1) Clean the drive gear attaching bolts.
(2) Remove the adhesive adhering to the threaded holes of the drive gear by turning the special tool (tap M10 × 1.25), and then clean the threaded holes by applying compressed air.



(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. Be sure to tighten the bolts to the specified torque [80–90 Nm (8.0–9.0 kgm, 58–65 ft.lbs.)] in a diagonal sequence.



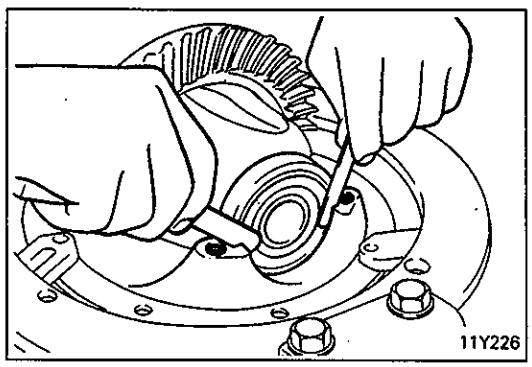
24. PRESS-FIT OF SIDE BEARING INNER RACE

• ADJUSTMENT OF FINAL DRIVE GEAR BACKLASH

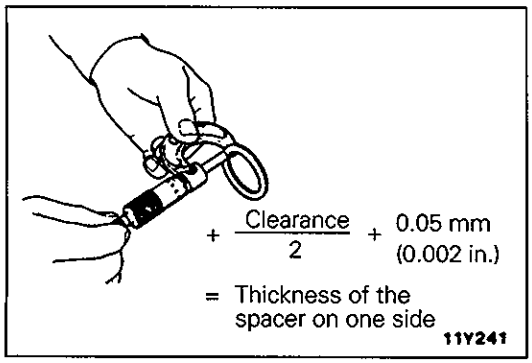
Adjust the final drive gear backlash by the following procedures:

(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.

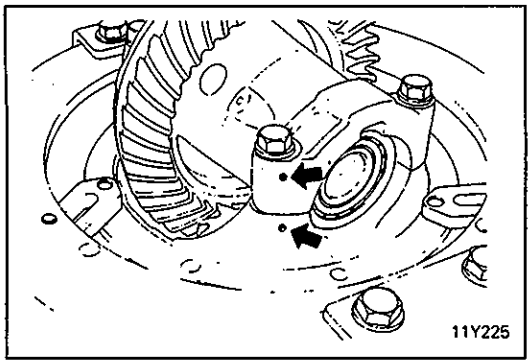


(2) Push the differential case to one side, and measure the clearance between the gear carrier and the side bearing.

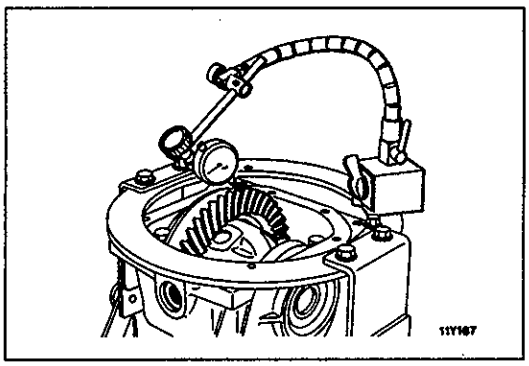


(3) Use the special tool (MB990810) to remove the side bearing, and measure the thickness of the side bearing spacer installed at one side. Select two side bearing spacers of a thickness which is equal to 1/2 of the measured spacer thickness plus a preload of 0.05 mm (0.0019 in.).

(4) Install the selected side bearing spacers and the side bearing outer races to the gear carrier.



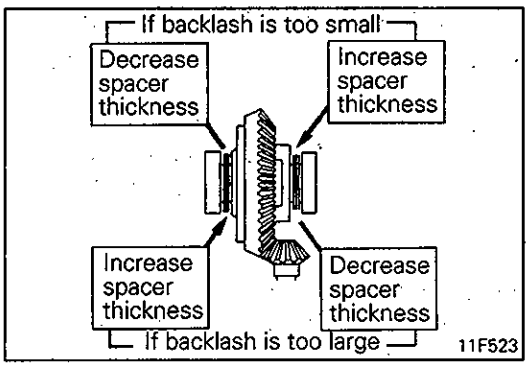
(5) Align the mating marks on the gear carrier and the bearing cap, and then tighten the bearing cap.



(6) 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.

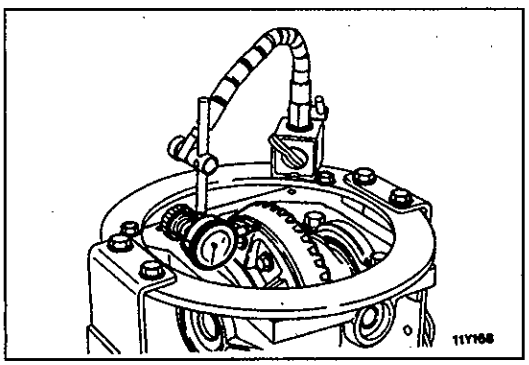
Standard value: 0.11–0.16 mm (0.004–0.006 in.)



(7) 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.27-46-5.)



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

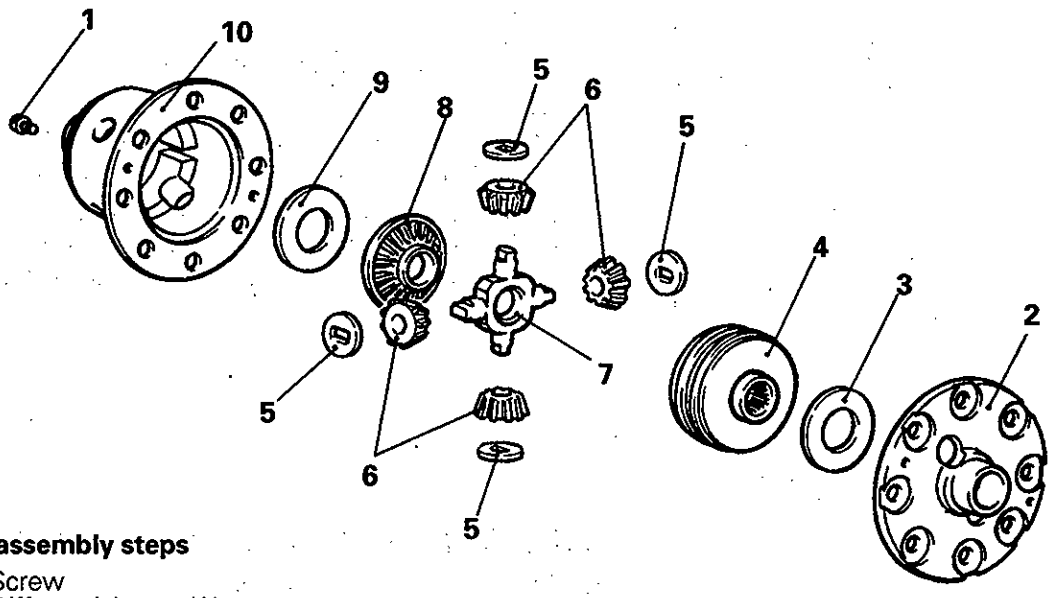
Limit: 0.05 mm (0.002 in.)

(10) 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 (VCU TYPE)

DISASSEMBLY AND REASSEMBLY

E27TI–

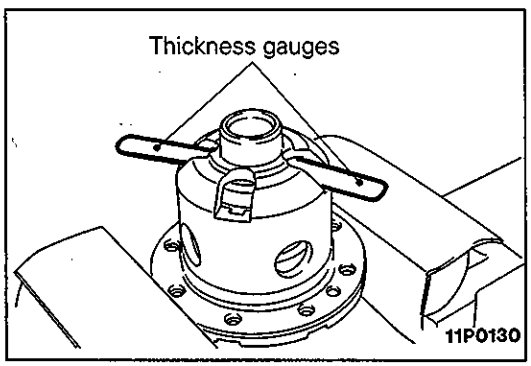


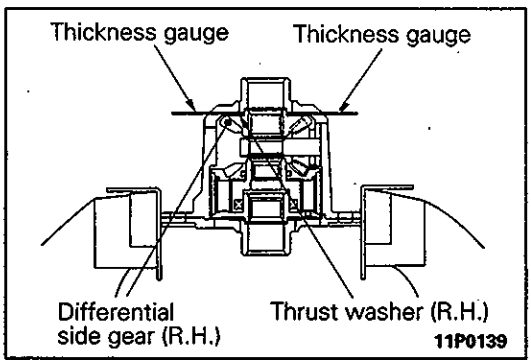
11P0127

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

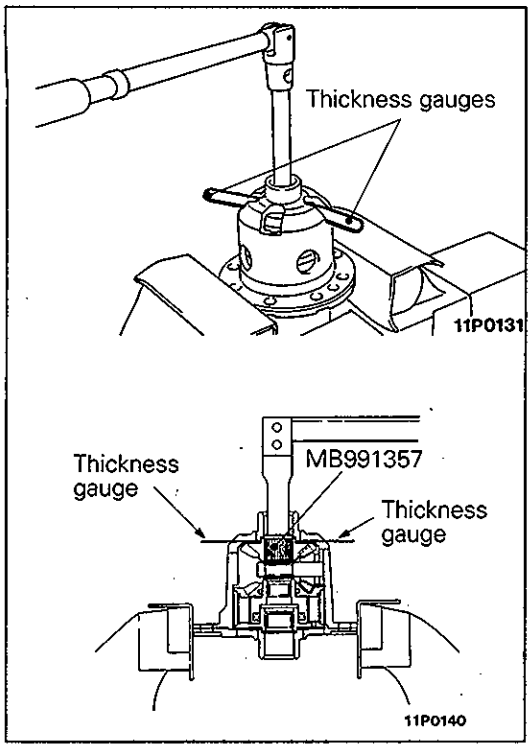
DIFFERENTIAL GEAR BACKLASH

(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.)

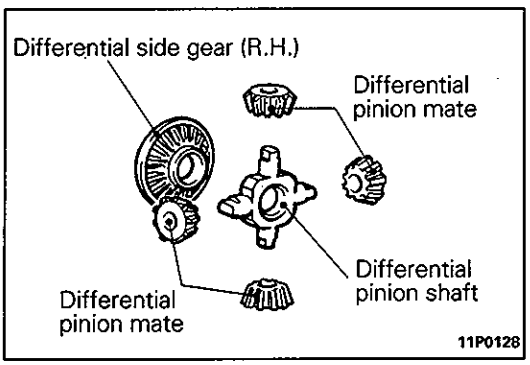
NOTE
The differential gear backlash is normal if the side gear clearance in the direction of thrust is within the standard value.

(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 E27TJAM

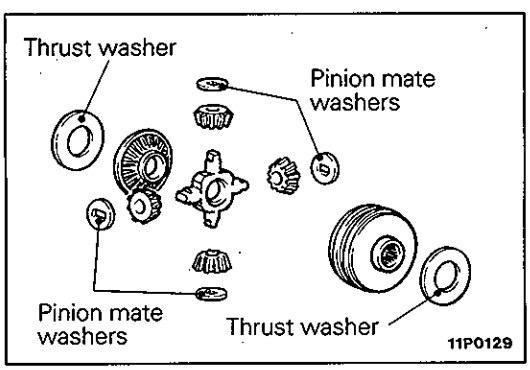
3. REMOVAL OF THRUST WASHER (L.H.)/9. THRUST WASHER (R.H.)

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

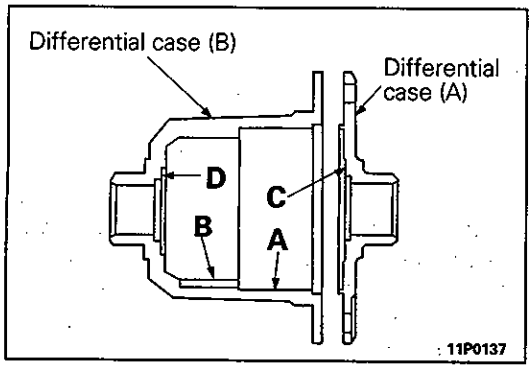


INSPECTION E27TKAF

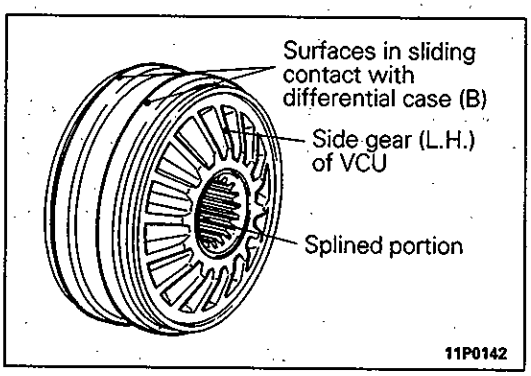
(1) Check each gear and the differential pinion shaft for wear and damage.
(2) Check the splined portion of the differential side gear (R.H.) for damage and shoulder.



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

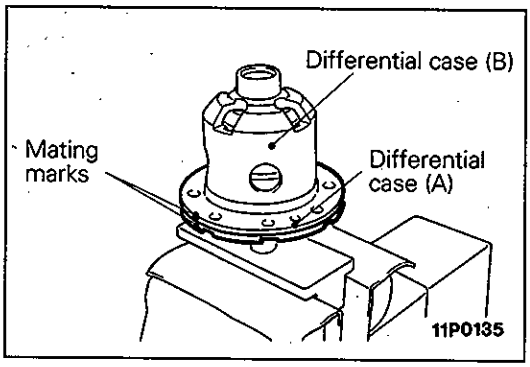


(4) Check the sliding surfaces of the differential cases (A) and (B) for wear, seizure and damage.
A. Surface in sliding contact with VCU
B. Surface in sliding contact with pinion mate washer
C. Surface in sliding contact with thrust washer
D. Surface in sliding contact with thrust washer



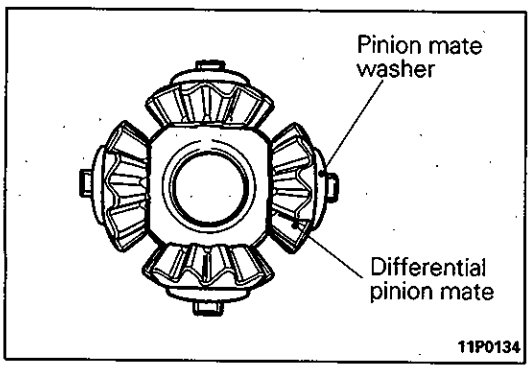
(5) Check the spline of VCU for damage and shoulder and check the surface in sliding contact with the differential case (B).
(6) Check the side gear (L.H.) of VCU for wear and damage.

SERVICE POINTS OF REASSEMBLY E27TLAJ



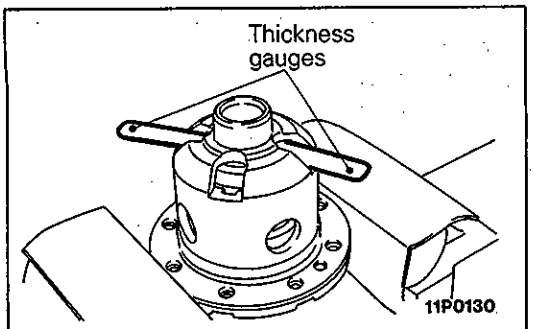
10. INSTALLATION OF DIFFERENTIAL CASE (B)/2. DIFFERENTIAL CASE (A)

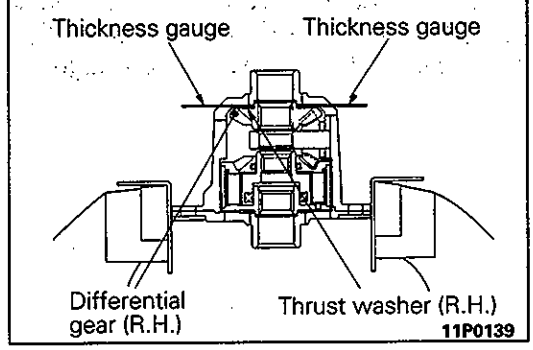
Install the differential cases (A) and (B) with their mating marks in alignment.

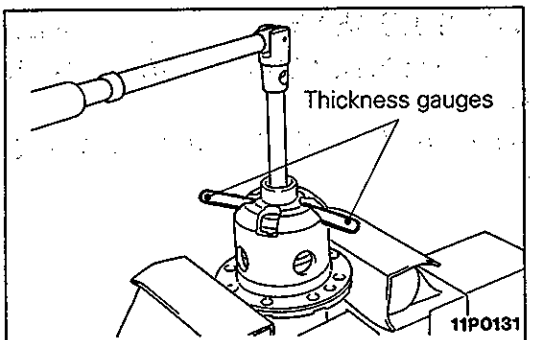


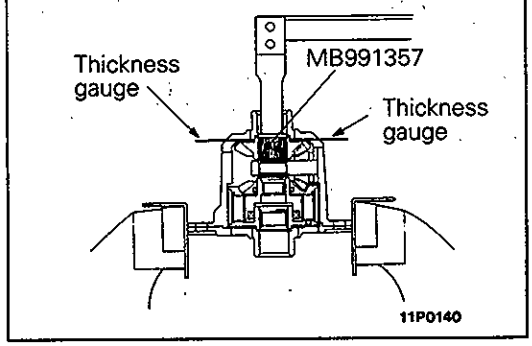
6. INSTALLATION OF DIFFERENTIAL PINION MATE/5. PINION MATE WASHER

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.

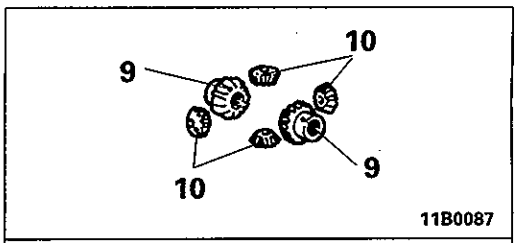
⑧ If the side gear clearance in the direction of thrust is not within the standard value, remove the differential case (A) and make adjustment according to the thickness of the thrust washer (L.H.).

Thrust washer thickness mm (in.)	
L.H.	R.H. (Reference)
0.8 (0.032)	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)	

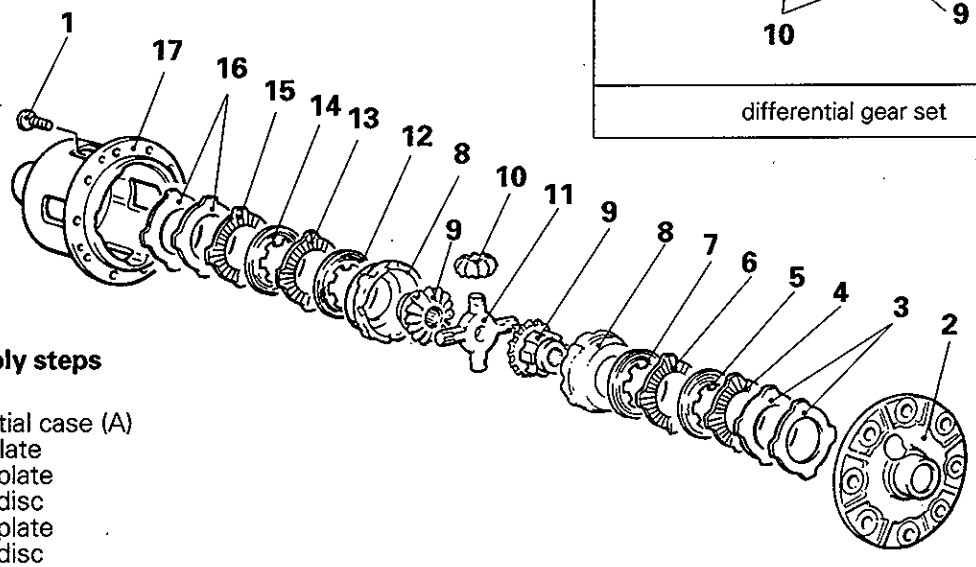
NOTE
The thrust washers (L.H.) are available in a kit. Select one appropriate thrust washer from among 11 washers.

LSD CASE ASSEMBLY (MECHANICAL TYPE)

DISASSEMBLY AND REASSEMBLY



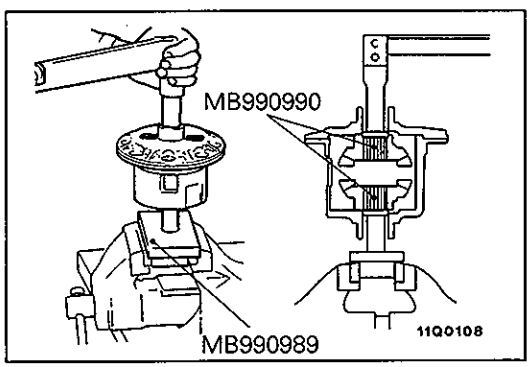
differential gear set



Disassembly steps

- ◆◆ ◆◆ 1. Screw
- 2. Differential case (A)
- 3. Spring plate
- 4. Friction plate
- 5. Friction disc
- 6. Friction plate
- 7. Friction disc
- 8. Pressure ring
- 9. Side gear
- 10. Differential pinion gear
- 11. Differential pinion shaft
- 12. Friction disc
- 13. Friction plate
- 14. Friction disc
- 15. Friction plate
- 16. Spring plate
- ◆◆ 17. Differential case (B)

NOTE
LSD: Limited slip differential



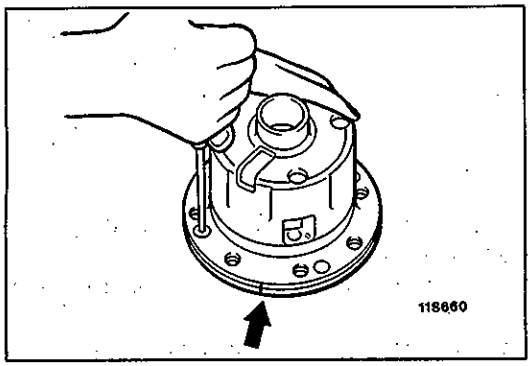
INSPECTION BEFORE DISASSEMBLY

INSPECTION OF ROTATION TORQUE OF LIMITED SLIP DIFFERENTIAL

(1) Check the rotation torque, using a special tool.

Standard value:
When a new clutch plate is used
20 – 40 Nm (2.0 – 4.0 kgm, 14 – 29 ft.lbs.)
When an old clutch plate is used
5 – 40 Nm (0.5 – 4.0 kgm, 4 – 29 ft.lbs.)

(2) If the rotation torque is out of the standard limits shown above, disassemble the differential case assembly and correct or replace parts.



SERVICE POINT OF DISASSEMBLY

1. REMOVAL OF SCREW

(1) Loosen screws of the differential cases (A) and (B) uniformly a little at a time.
(2) After checking the mating marks on differential case (A) and differential case (B), separate differential case (A) from differential case (B).
(3) Remove the components from differential case (B).

NOTE
Keep the right and left spring plates, friction plates, and friction discs separate in order to be able to distinguish them for reassembly.

INSPECTION

- Check the side gears, pinion gears and pinion shaft for wear or damage.
- Check the side gear spline for wear or damage.

INSPECTION OF THE CONTACT AND SLIDING SURFACES OF PARTS

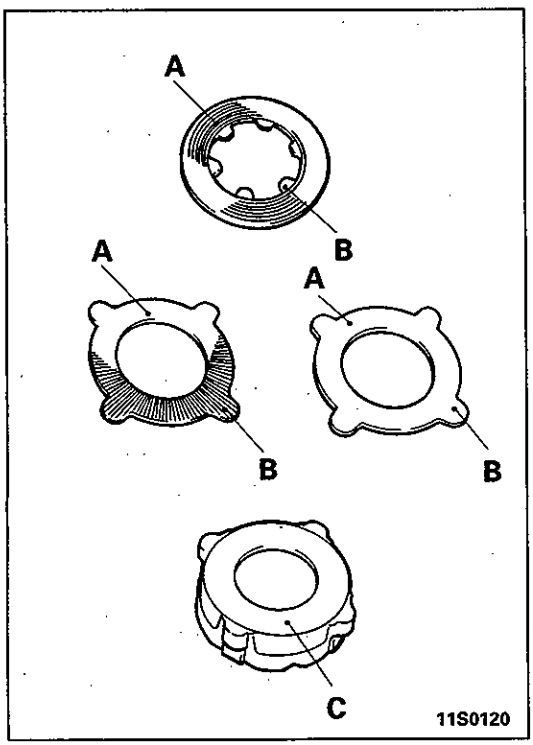
(1) Clean the separated components in cleaning oil, and dry by using compressed air.
(2) Inspect the friction plate, friction disc, spring plate, and pressure ring.

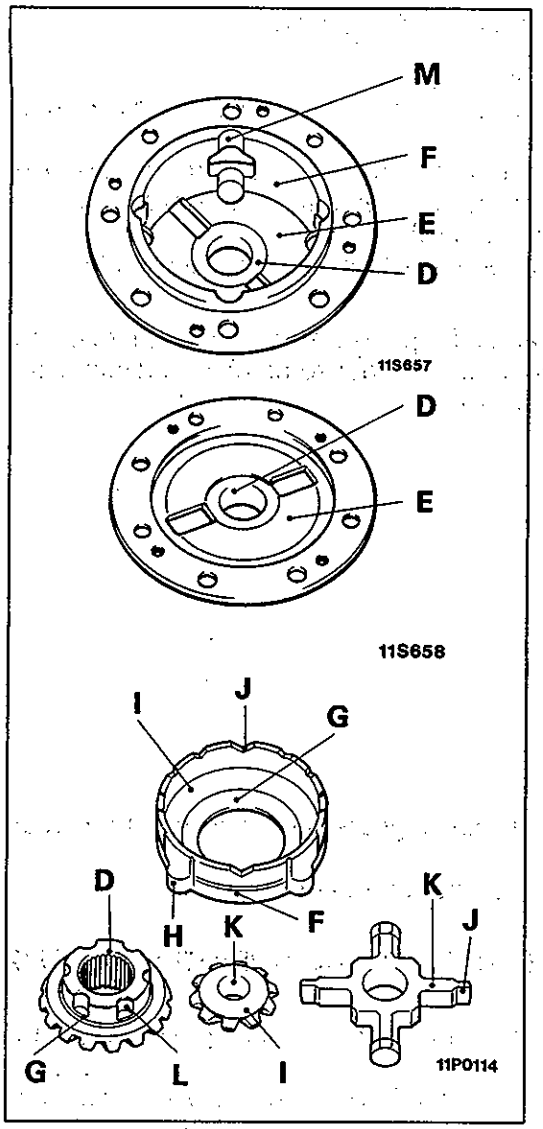
A. The friction surfaces of the friction plate, friction disc, and spring plate.
If there are any signs of seizure,severe friction, or colour change from the heat, it will adversely affect the locking performance; replace the part with a new one.

NOTE
The strong contact on the inner circumference of the friction surfaces is caused by the spring plate, friction plate and friction disc; this wear is not abnormal.

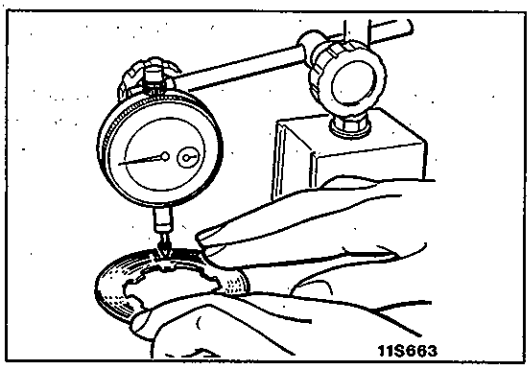
B. The internal or external projections of the friction disc, friction plate and spring plate If crack or damage is found, replace the part with a new one.
C. The friction and sliding surfaces of the pressure ring and friction disc.
If there are cracks or damage, correct them by grinding with oil stone and lapping with compound on the surface plate.

NOTE
Heavy contact at the inner periphery of the friction surface is caused by the spring of each plate, disc, etc. Do not confuse it with abnormal wear.





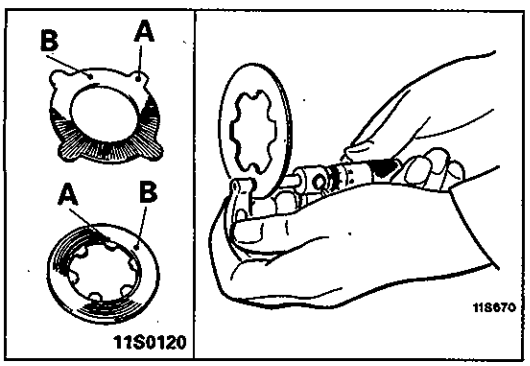
(3) Check the following contact and sliding surfaces (D through M) and use oil stone to remove burrs and dents.
   D. Sliding surfaces of side gear and case
   E. Contacting surface of spring plate and differential case
   F. Contact surfaces of pressure spring and differential case inner
   G. Sliding surfaces of hole in pressure ring and side gear
   H. External projection of pressure ring
   I. Pressure ring inner surface and differential pinion gear spherical surface
   J. V-grooves in pressure ring and ends of pinion shaft
   K. Sliding surfaces of pinion shaft and hole in differential pinion gear
   L. External grooves of side gear
   M. Internal grooves of differential



INSPECTION FOR WARPING OF THE FRICTION PLATE AND FRICTION DISC

Using a dial indicator, measure the amount of warping (the flatness) of the friction plate and the friction disc on a surface plate by turning the friction plate or disc.

Limit: 0.08 mm (0.0031 in.)



INSPECTION FOR WEAR OF THE FRICTION PLATE AND FRICTION DISC

(1) In order to measure the wear, measure the thickness of the friction surfaces and projections of the friction disc and plate, and then find the difference.

Limit: 0.1 mm (0.0039 in.)

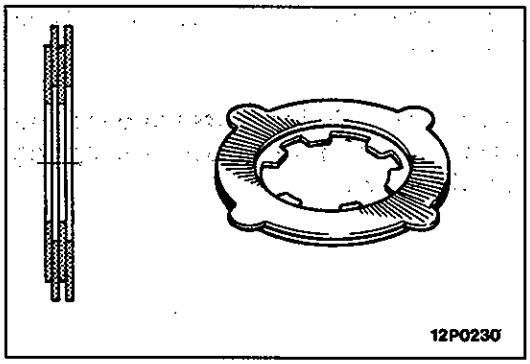
NOTE
Make the measurement at several different points.

(2) If the parts are worn beyond the allowable limit, replace them with new parts.

SERVICE POINTS OF REASSEMBLY

17. INSTALLATION OF DIFFERENTIAL CASE (B)

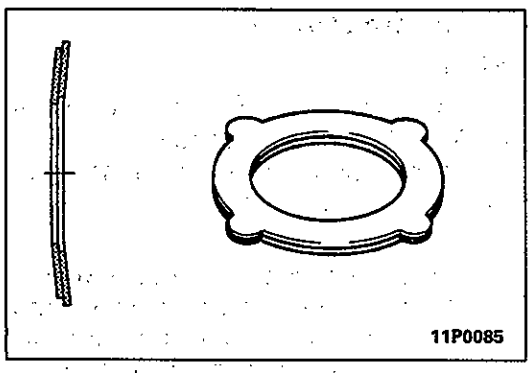
Before assembly, use the following method to adjust the clearance between the spring plates and differential cases (for adjustment of the clutch plate friction force), and to adjust the end play of the side gear when installing the internal components into the differential case.



(1) Arrange the two (each) friction discs and friction plates for each side, one on top of another, as shown in the figure, combining them so that the difference in thickness between the left and the right is the standard value.

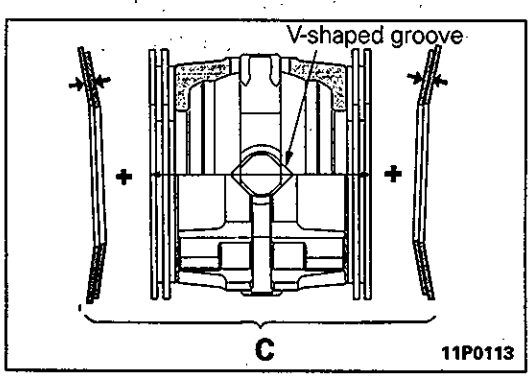
Standard value: 0.05 mm (0.0020 in.) or less

NOTE
If a new friction disc is to be used, select from either of two types: 1.6 mm (0.063 in.) and 1.7 mm (0.067 in.)



(2) Arrange one spring plate and one spring plate for each side, one on top of the other, so that the difference between the left and the right thickness is minimized.

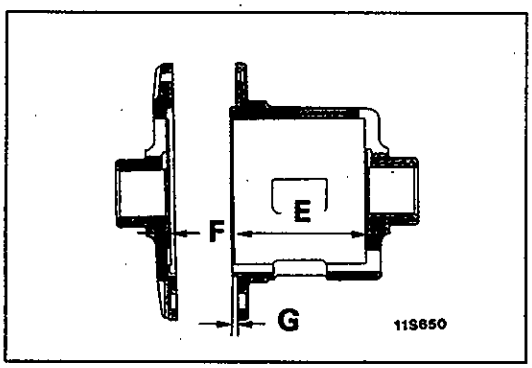
NOTE
When new spring plate is used, its thickness is 1.6 mm (0.063 in.).



(3) Assemble the pressure ring's internal components (differential pinion shaft and pressure ring) and the friction discs and friction plates, and then as shown in the figure, measure the overall width.

(4) Calculate the total value (C) of the thickness of the two sets of spring plate(s) plus the value measured in (3) above.

NOTE
Measure while pushing from both sides so that the V-shaped groove of the pressure ring is securely contacting the pinion shaft.



(5) Obtain the dimension (D) between the spring plate contact surfaces when differential cases (A) and (B) are combined.
(D = E + F – G)

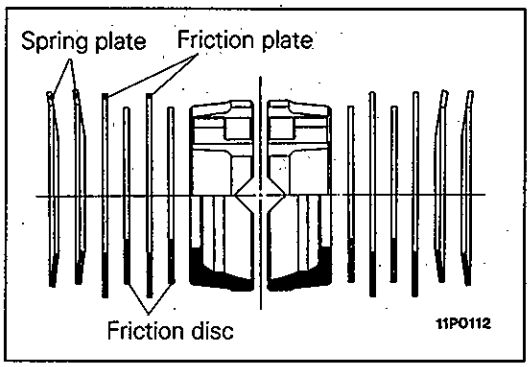
(6) Change the thickness of the friction disc so that the clearance (D – C) between the differential case and the spring plate becomes the standard value.

Standard value: 0.06–0.25 mm (0.0024–0.0098 in.)

NOTE
If a new friction disc is to be used, select from either of two types: 1.6 mm (0.063 in.) and 1.7 mm (0.067 in.).

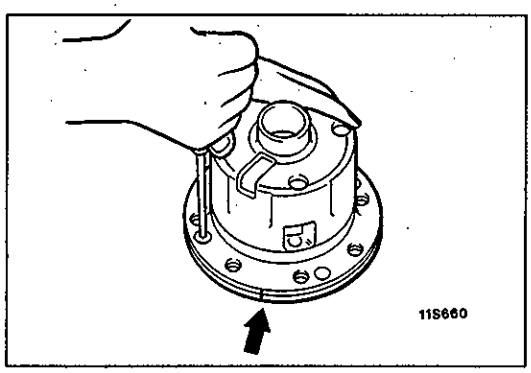
(7) Apply specified gear oil to each plate and disc, pinion shaft, side gear and differential pinion gear.

Specified gear oil:
MITSUBISHI Genuine Gear Oil Part No. 8149630EX, CASTROL HYPOY LS (GL-5, SAE 90), SHELL-LSD (GL-5, SAE 80W-90) or equivalent



(8) Place the each part in the differential case (B) as directions shown in the figure.

Caution
Be careful not to insert the friction plates and friction discs in the incorrect order and to install the spring plates in incorrect direction.



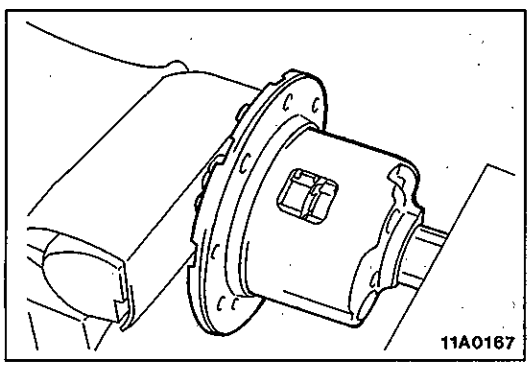
SERVICE POINTS OF REASSEMBLY

1. INSTALLATION OF SCREW

(1) Align the mating marks (the same numeral on each case) of differential case (A) and differential case (B).
(2) Turning the screwdriver slowly several times, tighten the screw so that the cases are in close contact.

Caution
If, even though the screw is tightened, the end surfaces of case (A) and case (B) do not come into close contact, probably the spring plate are not fit correctly into the groove, so make the assembly again.

(3) Secure differential cases A and B in a vise, and install the remaining screws.



(4) After assembly, in order to check the frictional force of the clutch plate, use the special tools to measure the rotation torque.

Standard value:
When a new clutch plate is used
20 – 40 Nm (2.0 – 4.0 kgm, 14 – 29 ft.lbs.)
When an old clutch plate is used
5 – 40 Nm (0.5 – 4.0 kgm, 4 – 29 ft.lbs.)

NOTE
To measure the rotation torque, turn the differential pinion gear to set it properly, and then take the measurement while turning the differential pinion gear.