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# FRONT AXLE

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120002201

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## GENERAL INFORMATION

120002202

## 2WD

The front hub assembly which uses a double taper roller bearing is mounted on the knuckle spindle. For vehicles with ABS, a rotor for detecting the wheel speed is press-fitted into the front hub.

## 4WD

The front axle consists of the hub assembly, drive shaft, inner shaft, front differential, free-wheeling clutch assembly and actuator. The features are:

- The wheel bearing uses a double taper roller bearing. For vehicles with ABS, a rotor for detecting the wheel speed is bolted to the brake disc.

- Drive shafts of almost identical length reduce torque steer. In addition, a D.O.J.-B.J.-type constant velocity ball joint has high power transmission efficiency and reduces vibration and noise.
- A vacuum-type free-wheeling clutch has been adopted in the free-wheeling mechanism. Its solenoid valve and actuator switch powertrain between 2WD and 4WD.

## 2WD

Item		Specifications
Wheel bearing	Type	Double taper roller bearing
	Inner bearing (O.D.×I.D.) mm	65×35
	Outer bearing (O.D.×I.D.) mm	50×18

## 4WD

Item		Specifications
Wheel bearing	Type	Double taper roller bearing
	Inner bearing (O.D.×I.D.) mm	80×50
	Outer bearing (O.D.×I.D.) mm	73×45
Drive shaft	Joint type	Outer-B.J. Inner-D.O.J.
	Shaft length (joint to joint) mm	Right-310 Left-302
Inner shaft	O.D.×Length mm	31.5×304.2
	Bearing (O.D.×I.D.) mm	62×35

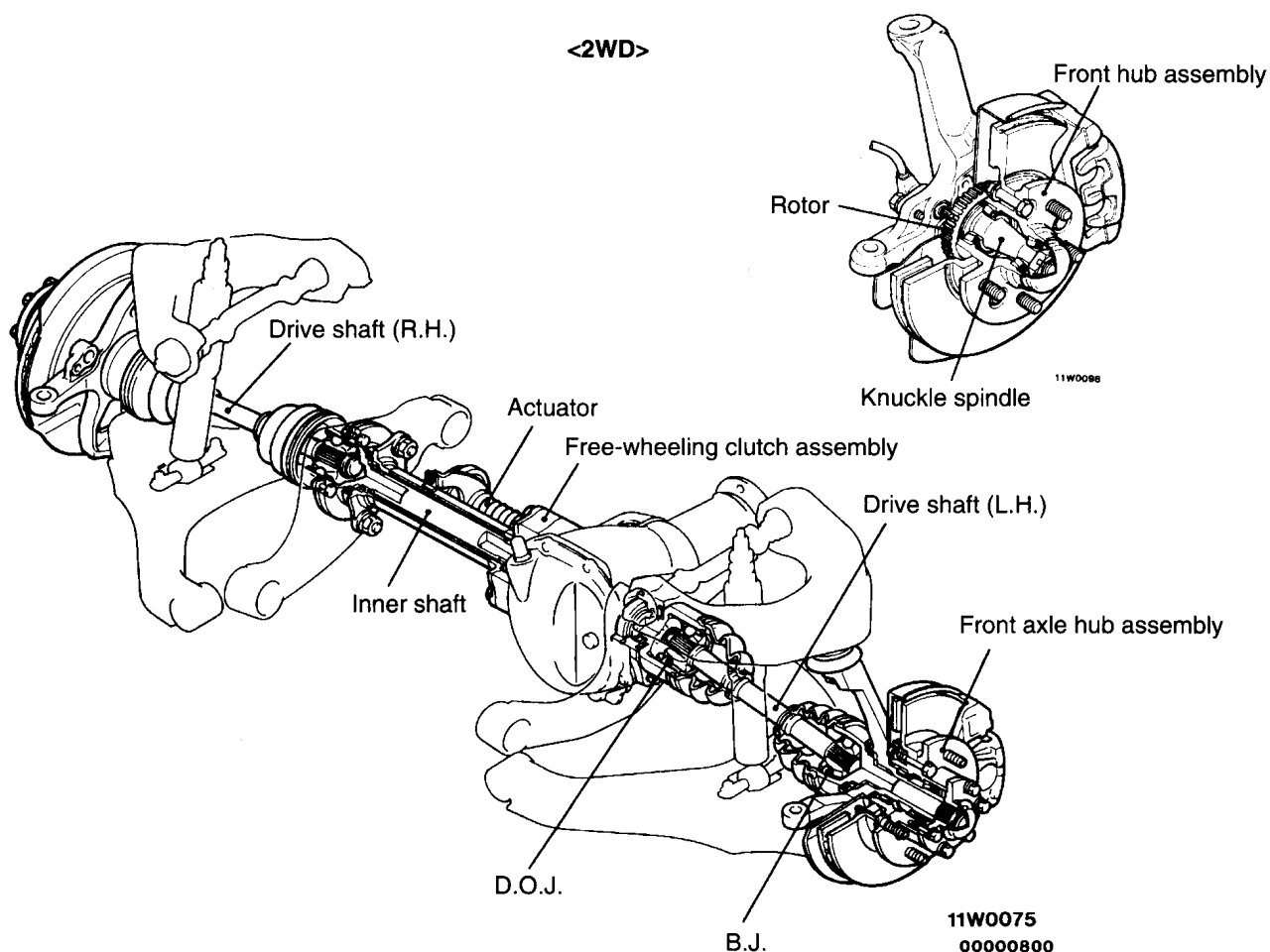
Item			4D56 – Wagon	Except 4D56 – Wagon
Reduction gear type			Hypoid gear type	Hypoid gear type
Reduction ratio			4.875	4.875
Differential	Differential gear type (type×piece)	Side gear	Straight bevel gear×2	Straight bevel gear×2
		Pinion gear	Straight bevel gear×2	Straight bevel gear×4
	Number of teeth	Drive gear	39	39
		Drive pinion	8	8
		Side gear	14	14
		Pinion gear	10	10
	Bearing (O.D.×I.D.) mm	Side	80.0×45.2	80.0×45.2
		Front	64.3×30.2	64.3×30.2
		Rear	76.2×36.5	76.2×36.5

## CONSTRUCTION DIAGRAM

120000169

<4WD>

<2WD>



## SERVICE SPECIFICATIONS

120000170

Item		Standard value	Limit
Drive shaft axial play   mm		0.4–0.7	—
Solenoid valve resistance   Ω		36–46	—
Hub rotary sliding resistance   N		7–26	—
(Hub rotation starting torque)   Nm		0.5–1.8	—
Amount of movement of wheel bearing in an axial direc- tion   mm		0.05 or less	—
Setting of D.O.J. boot length   mm		80±3	—
Clutch gear play (bearing axial play)   mm		0.05–0.30	—
Drive gear backlash   mm		0.11–0.16	—
Differential gear backlash   mm	2-pinion differential	0–0.076	—
	4-pinion differential	0.01–0.25	—
Drive pinion rotation torque Nm	Without oil seal	When replacing (with anti-rust agent) 0.3–0.5	—
		When replacing or reusing (with gear oil applied) 0.15–0.25	—
	With oil seal	When replacing (with anti-rust agent) 0.5–0.7	—
		When replacing or reusing (with gear oil applied) 0.3–0.4	—
Drive gear runout   mm		—	0.05
Differential gear backlash <2 pinion differential>   mm		—	0.2

## LUBRICANTS

120000171

Items	Specified lubricants	Quantity
Front differential gear oil	Hypoid gear oil API classification GL-5 or higher SAE viscosity No.90, 80W	0.9 ℓ
D.O.J. boot grease	Repair kit grease	100 g

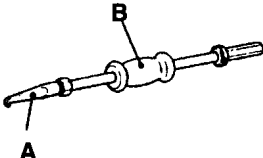

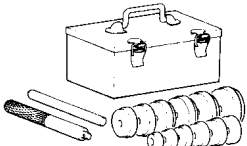
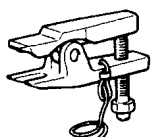
# SEALANTS

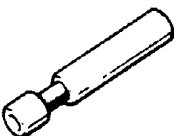
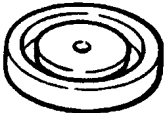
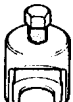



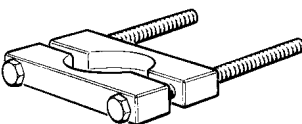
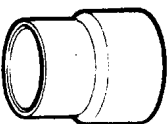

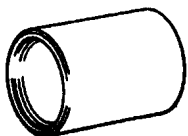
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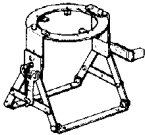
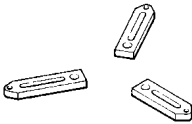



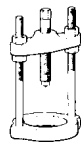

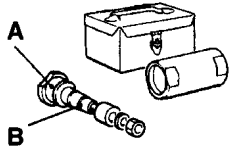

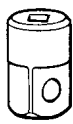
Items	Specified sealants	Characteristics
Contact surface of drive flange or free-wheeling hub and front axle hub	3M ATD Part No.8663 or equivalent	Semi-drying sealant
Contact surface of hub cap and drive flange		
Contact surface of differential cover and differential carrier		
Vent plug		
Free-wheeling clutch assembly		
Drive gear threaded hole	3M Stud Locking 4170 or equivalent	Anaerobic sealant


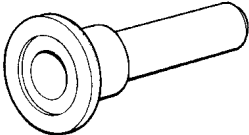

# SPECIAL TOOLS

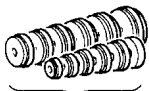

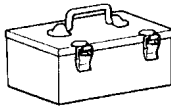
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Tool	Number	Name	Use
	MB990590 A: MB990212 B: MB990211	Rear axle shaft oil seal remover A: Adapter B: Sliding hammer	<ul style="list-style-type: none"> <li>Removal of differential carrier oil seal</li> <li>Removal and installation of inner shaft (Used together with MB990906)</li> </ul>
	MB990954	Lock nut wrench	Removal and adjustment of lock nut <4WD>
	MB990925	Bearing and oil seal installer set	<ul style="list-style-type: none"> <li>Press-out and press-fitting of wheel bearing outer race</li> <li>Press-fitting of oil seal (front hub)</li> <li>Press-fitting of needle bearing (knuckle)</li> <li>Press-fitting of bearing (free-wheeling clutch)</li> <li>Press-fitting of oil seal (free-wheeling clutch)</li> <li>Press-out and press-fitting of drive pinion front bearing outer race</li> <li>Press-out and press-fitting of drive pinion rear bearing outer race</li> <li>Press-fitting of drive shaft</li> <li>Tapping in of side bearing outer race</li> <li>Inspection of drive gear tooth contact</li> </ul>
	MB991113 or MB990635	Steering linkage puller	<ul style="list-style-type: none"> <li>Disconnection of tie rod</li> <li>Disconnection of upper ball joint</li> <li>Disconnection of lower ball joint</li> </ul>

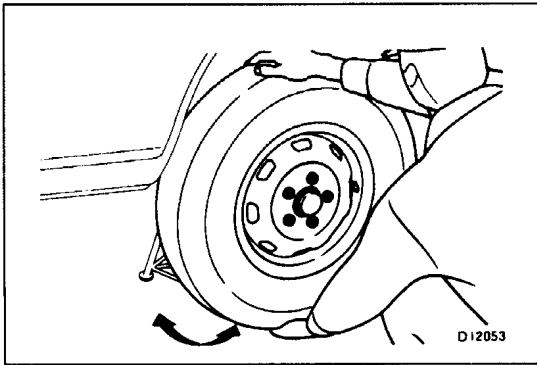
Tool	Number	Name	Use
	MB990804	Knuckle arm puller	Disconnection of upper, lower ball joint and knuckle <2WD>
	MB990955	Oil seal installer	<ul style="list-style-type: none"> <li>• Press-fitting of housing tube dust seal</li> <li>• Press-fitting of front axle hub oil seal (Used together with MB990938)</li> <li>• Press-fitting of rotor &lt;2WD&gt; (Used together with MB990938)</li> </ul>
	MB990809	Pitman arm puller	Removal of upper ball joint, lower ball joint and knuckle <4WD>
	MB990956	Needle bearing installer	Press-fitting of knuckle needle bearing (Used together with MB990938)
	MB990985	Oil seal installer	Press-fitting of knuckle oil seal (Used together with MB990938)
	MB990906	Drive shaft attachment	Removal and installation of inner shaft (Used together with MB990211)
	MB990560	Bearing remover	Removal and press-fitting of inner shaft bearing
	MB990799	Ball joint remover and installer	Installation of free-wheel clutch bearing
	MB991168	Differential oil seal installer	Installation of free-wheel clutch oil seal
	MB990890 or MB990891	Rear suspension bushing base	Installation of free-wheel clutch bearing

Tool	Number	Name	Use
	MB990909	Working base	Support of front differential carrier assembly
	MB991116	Adapter	Support of front differential carrier assembly
	MB990810	Side bearing puller	Removal of side bearing inner race
	MB990811	Differential side bearing cap	
	MB990850	End yoke holder	Removal and installation of companion flange
	MB990339	Bearing puller	Removal of drive pinion front bearing inner race
	MB990648	Bearing remover	
	MB990901 A: MB990904 B: MB990903	Pinion height gauge set A: Drive pinion gauge assembly B: Drive pinion gauge	<ul style="list-style-type: none"> <li>• Inspection of drive pinion rotation starting torque</li> <li>• Measurement of drive pinion height</li> </ul>
	MB990685	Torque wrench	Measurement of drive pinion preload
	MB990326	Preload socket	

Tool	Number	Name	Use
	MB990802	Bearing installer	<ul style="list-style-type: none"> <li>Press-fitting of drive pinion front bearing inner race</li> <li>Press-fitting of side bearing inner race</li> </ul>
	MB990031 or MB990699	Drive pinion oil seal installer	Press-fitting of drive pinion oil seal
	MB990813	Tap	Removal of adhesive

<div> <div>  <p>A Installer adapter</p> </div> <div> <p>Brass bar</p>  <p>B C Bar (snap-in type)</p> </div> <div>  <p>Tool box 11W0113</p> </div> </div>					
	Contents of tool (MB990925)	O.D. mm		Contents of tool (MB990925)	O.D. mm
A	MB990926	39	A	MB990933	63.5
	MB990927	45		MB990934	67.5
	MB990928	49.5		MB990935	71.5
	MB990929	51		MB990936	75.5
	MB990930	54		MB990937	79
	MB990931	57	B	MB990938	–
	MB990932	61	C	MB990939	–





## SERVICE ADJUSTMENT PROCEDURES

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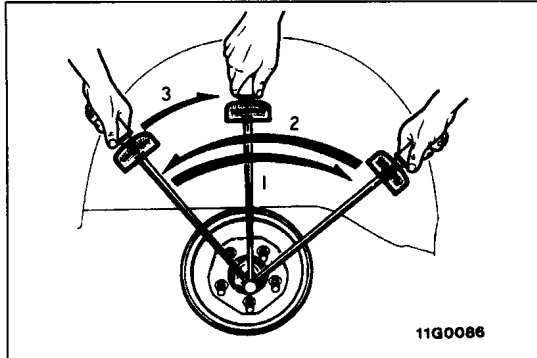
### <2WD>

#### WHEEL BEARING PLAY INSPECTION

1. Inspect the play of the bearings while the vehicle is jacked up.

#### Caution

**Do not confuse this play with the ball joint play.**



2. If there is some play in the bearings, tighten the wheel bearing nuts to 29 Nm, and then turn the front hub assembly to run in the bearings.
3. Loosen the nuts to 0 Nm.
4. Re-tighten the nuts to 8 Nm.
5. If the split pin hole in the wheel bearing nut is not aligned with that in the knuckle, turn the nut back within 30°. Then install the split pin.

### <4WD>

#### FRONT AXLE TOTAL BACKLASH CHECK

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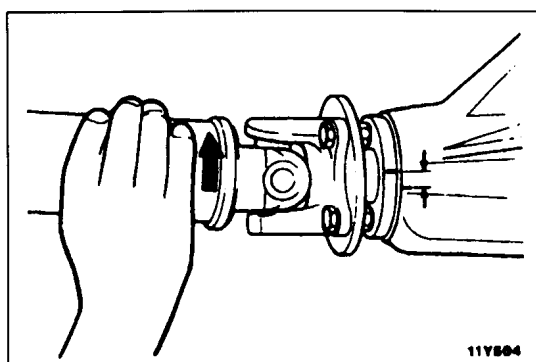
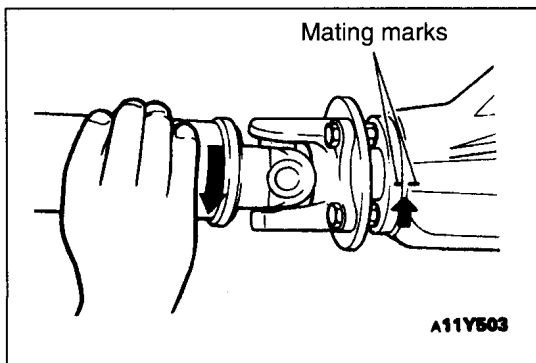
Observe the following procedure in order to switch powertrain to 4WD.

1. Turn the ignition switch off, and then put the transfer shift lever to the 2H position.

#### Caution

**Do not jack up the vehicle.**

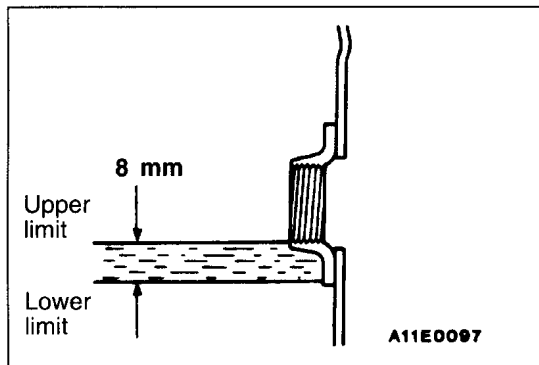
2. Turn the propeller shaft until a click is heard.
3. Turn the companion flange clockwise until all play is removed. Mate mark on the dust cover of the companion flange with that on the differential carrier.



4. Turn the companion flange counterclockwise until all play is removed and measure the amount of distance through which the mating marks moved.

**Limit: 11mm**

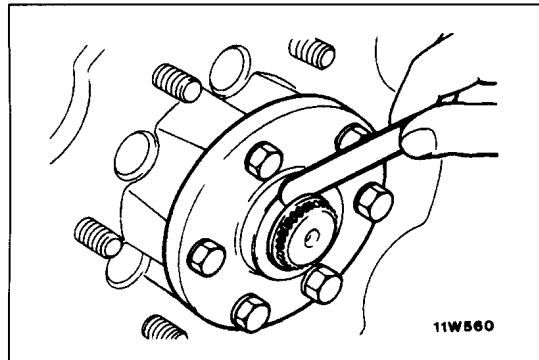
5. If the amount of backlash exceeds the limit value, check the following.
  - (1) Drive gear backlash
  - (2) Differential gear backlash
  - (3) Play in the serrations and splines of the side gears, drive shaft, inner shaft and drive flange



## FRONT AXLE GEAR OIL LEVEL CHECK 120000176

Remove the filler plug, and check the gear oil level. Check that gear oil level is not 8 mm below the bottom of filler plug hole.

**Specified gear oil:** Hypoid gear oil API classification GL-5 or higher, SAE viscosity No. 90, 80W [Quantity: 0.9 ℓ]

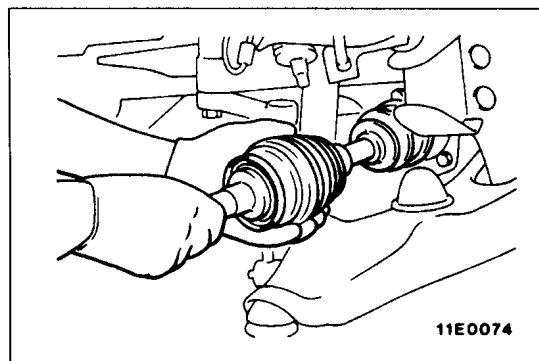


## DRIVE SHAFT AXIAL PLAY CHECK 120000177

1. Jack the vehicle up and remove the front wheels.
2. Remove the hub cap.
3. Manually push the drive shaft in the direction in which it will closely contact the knuckle.
4. As shown in the figure, use a thickness gauge to measure the clearance between the drive flange and snap ring.

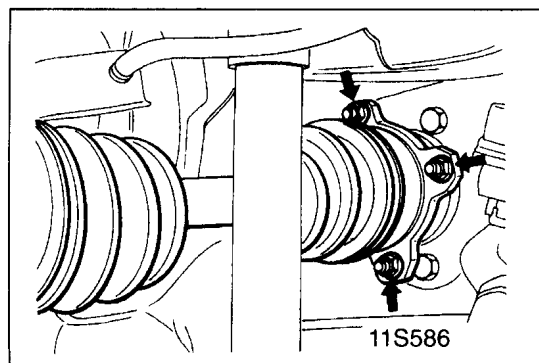
**Standard value: 0.4–0.7 mm**

5. If the play is out of standard value, adjust by adding or removing shims.

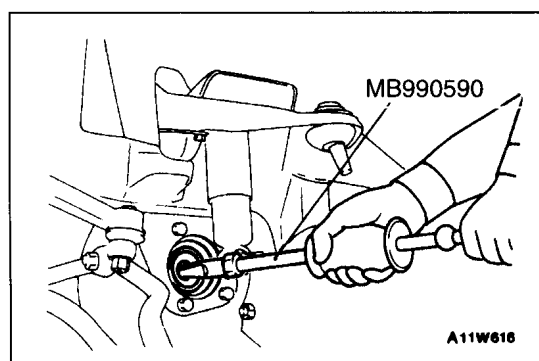


## DIFFERENTIAL CARRIER OIL SEAL REPLACEMENT 120000178

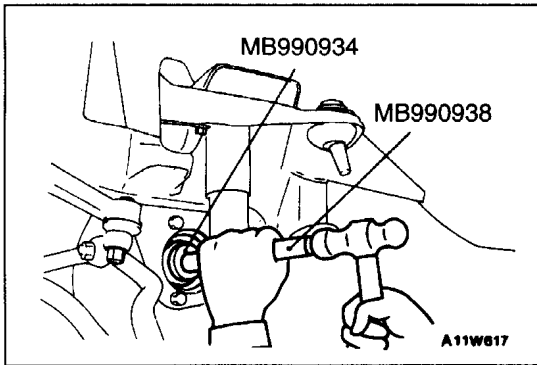
1. Remove the under cover.
2. Remove the shock absorber lower mounting bolts at the right and left.
3. Remove the front hub and knuckle assembly.
4. Remove the left drive shaft.



5. Remove the right drive shaft from the inner shaft assembly.
6. Remove the inner shaft.
7. Remove the actuator mounting bolt from the housing tube and remove the harness from the clamp.
8. Remove the differential mounting bracket (R.H.) and housing tube.



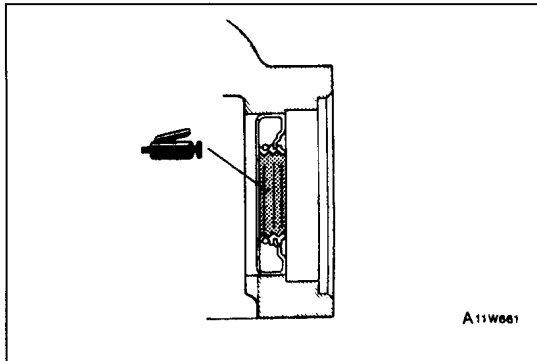
9. Use the special tool to remove the oil seal.



10. Press-fit the oil seal positively by using the special tools.

**NOTE**

For vehicles with 4-pinion type differential, there is a white painted identification mark on the metal ring of the oil seal.



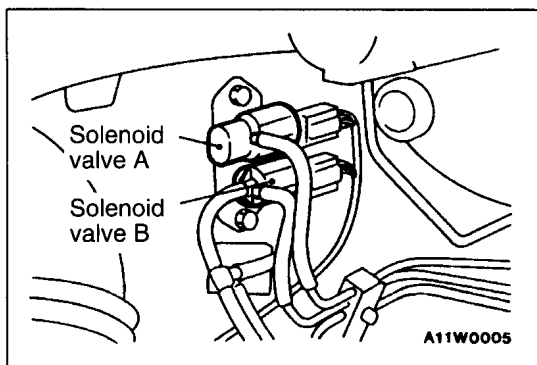
11. Apply multi-purpose grease to the lip of the oil seal and install it to the drive shaft (L.H.). For the right side, apply multi-purpose grease to the lip of the oil seal and install to the housing tube and differential mounting bracket (R.H.).

12. Install the inner shaft and drive shaft (R.H.).

**Caution**

1. Do not damage the lip of the oil seal.
2. The circlip attached to the B.J. side of the drive shaft should be replaced with a new clip.

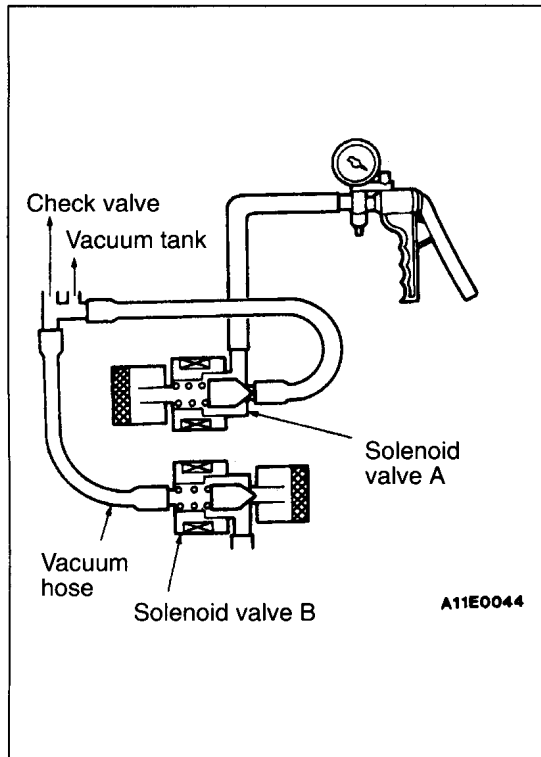
13. Install the actuator and secure the harness with the clamp.  
 14. Install the shock absorber.  
 15. Install the hub and knuckle assembly.  
 16. Install the under cover.



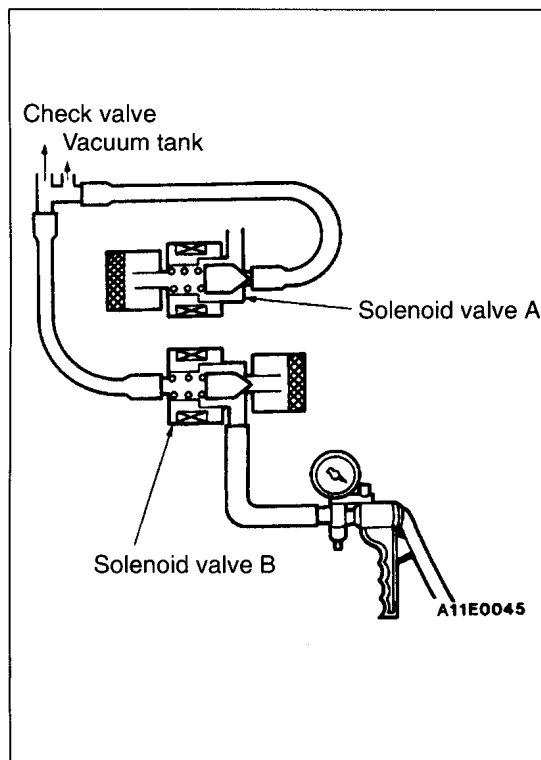
**SOLENOID VALVE OPERATION CHECK**

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1. Remove the vacuum hoses (blue stripe, yellow stripe) from the solenoid valves.
2. Disconnect the harness connectors.

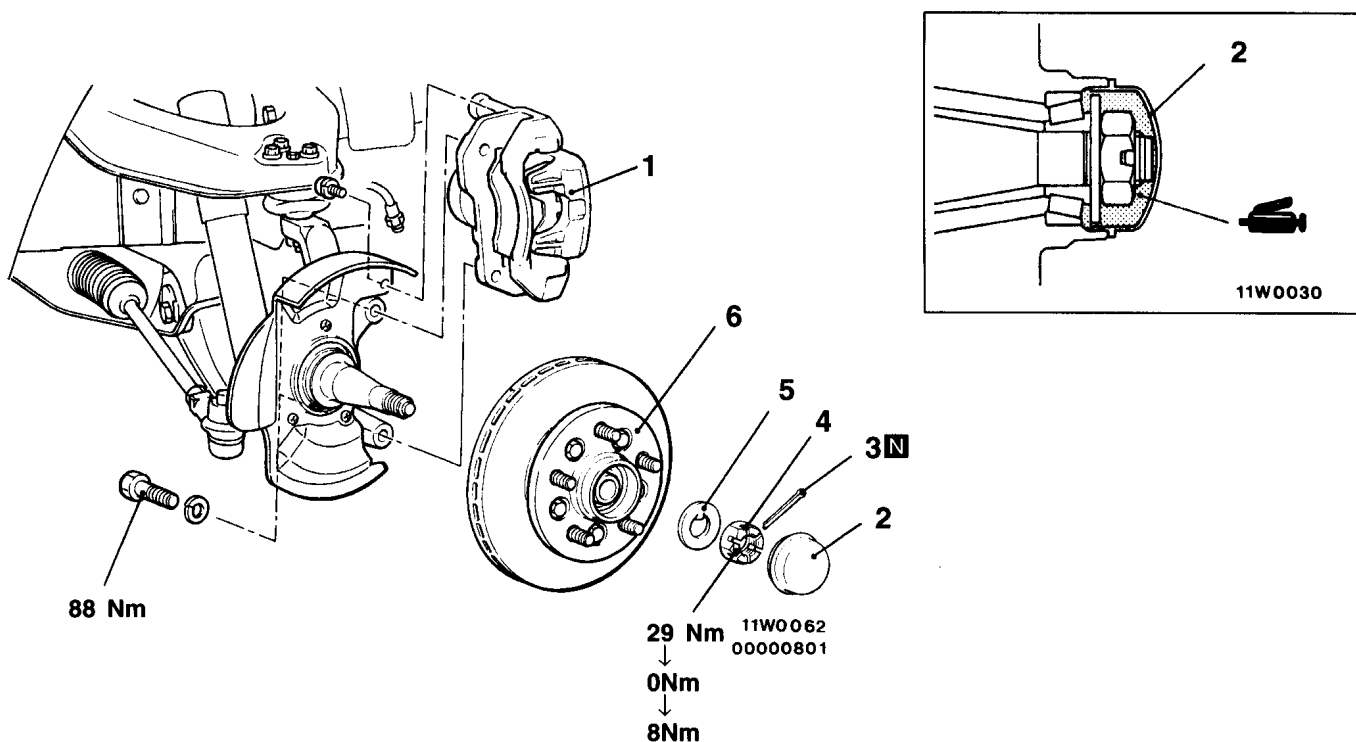


3. Connect a hand vacuum pump to solenoid valve A and carry out the following inspections.
  - (1) Even if the hand pump is operated with no other operation, no negative pressure develops.
  - (2) Negative pressure does not develop when battery voltage is applied to solenoid valve A. Meanwhile, negative pressure is maintained when the vacuum hose of solenoid valve B is blocked by bending.
  - (3) When battery voltage is applied to solenoid valves A and B, negative pressure is maintained.



4. Connect the hand vacuum pump to solenoid valve B. Apply negative pressure and carry out the following inspections.
  - (1) With no other operation, negative pressure is maintained.
  - (2) When battery voltage is applied to solenoid valve B, negative pressure equalizes.
  - (3) When battery voltage is applied to solenoid valve A, negative pressure equalizes.
5. Measure the resistance of the solenoid valves.

**Standard value: 36–46  $\Omega$**

**FRONT HUB ASSEMBLY <2WD>****REMOVAL AND INSTALLATION****Removal steps**

1. Caliper assembly
2. Hub cap
3. Split pin

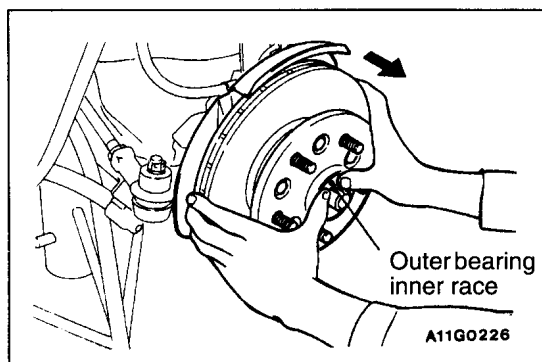
4. Wheel bearing nut
5. Washer
6. Front hub assembly

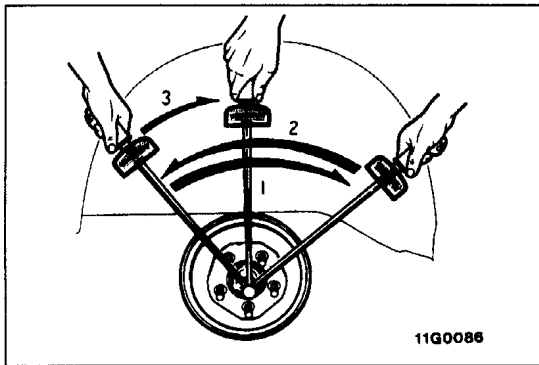
**REMOVAL SERVICE POINTS****◀A▶ CALIPER ASSEMBLY REMOVAL**

Secure the removed caliper assembly with wire so that it does not fall.

**◀B▶ FRONT HUB ASSEMBLY REMOVAL**

Do not drop the outer bearing inner race.





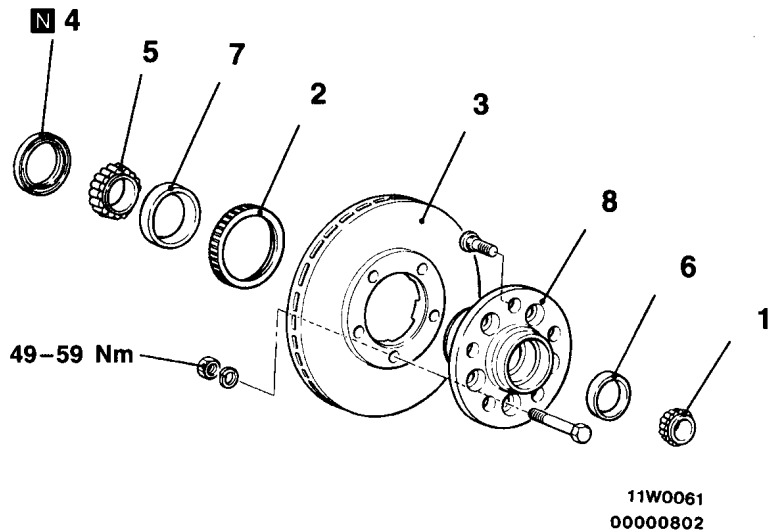
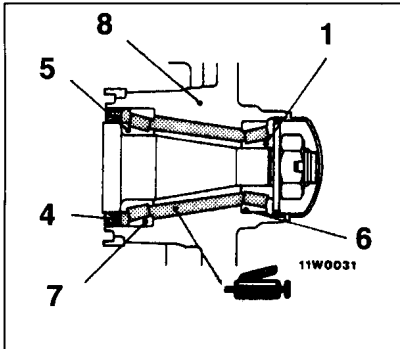
## INSTALLATION SERVICE POINT

### ►A◄ WHEEL BEARING NUT INSTALLATION

1. Tighten the wheel bearing nuts to 29 Nm, and then turn the front hub assembly to run in the bearings.
2. Loosen the nuts to 0 Nm.
3. Re-tighten the nuts to 8 Nm.
4. If the split pin hole in the wheel bearing nut is not aligned with that in the knuckle, turn the nut back within 30°. Then install the split pin.

## DISASSEMBLY AND REASSEMBLY

120000181



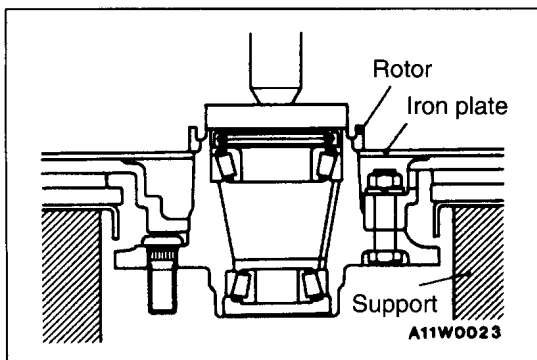
### Disassembly steps



1. Outer bearing inner race
2. Rotor (Vehicles with ABS)
3. Brake disc
4. Oil seal
5. Inner bearing inner race



6. Outer bearing outer race
7. Inner bearing outer race
8. Front hub



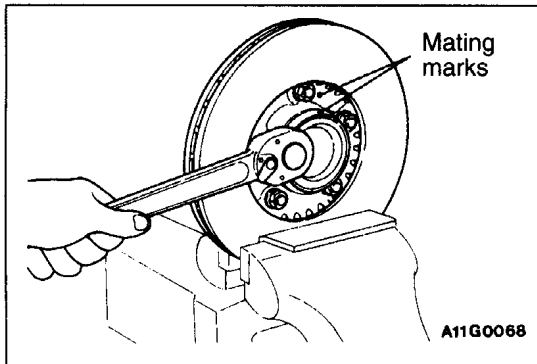
## DISASSEMBLY SERVICE POINTS

### ◄A► ROTOR REMOVAL

Insert an iron plate of approximately 4 mm width between the rotor assembly and the brake disc, and use a press to remove the rotor.

### Caution

Put a piece of copper or aluminium sheeting between the brake disc and a support.

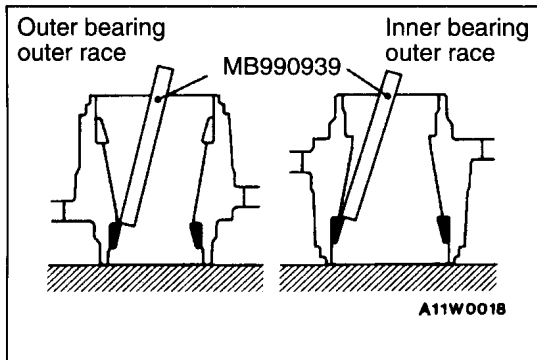


### ◀B▶ BRAKE DISC REMOVAL

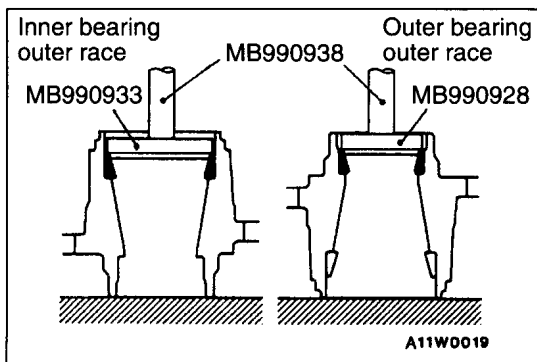
Make the mating marks on the brake disc and front hub, and then separate the front hub and brake disc, if necessary.

#### Caution

Lock disc in vise and grip with copper or aluminum board.



### ◀C▶ OUTER BEARING OUTER RACE / INNER BEARING OUTER RACE

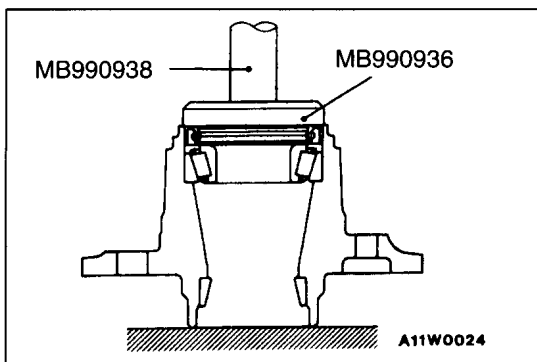


### INSTALLATION SERVICE POINTS

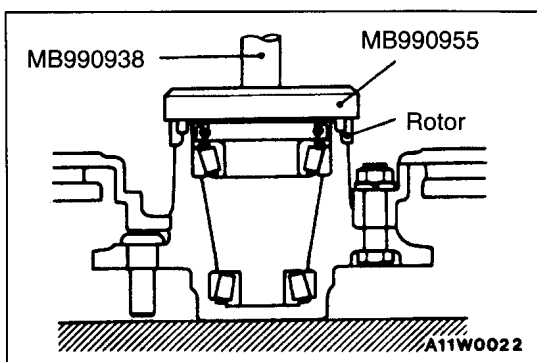
#### ▶A◀ INNER BEARING OUTER RACE / OUTER BEARING OUTER RACE

#### NOTE

To replace the bearing, replace the inner race and outer race assembly as a set.



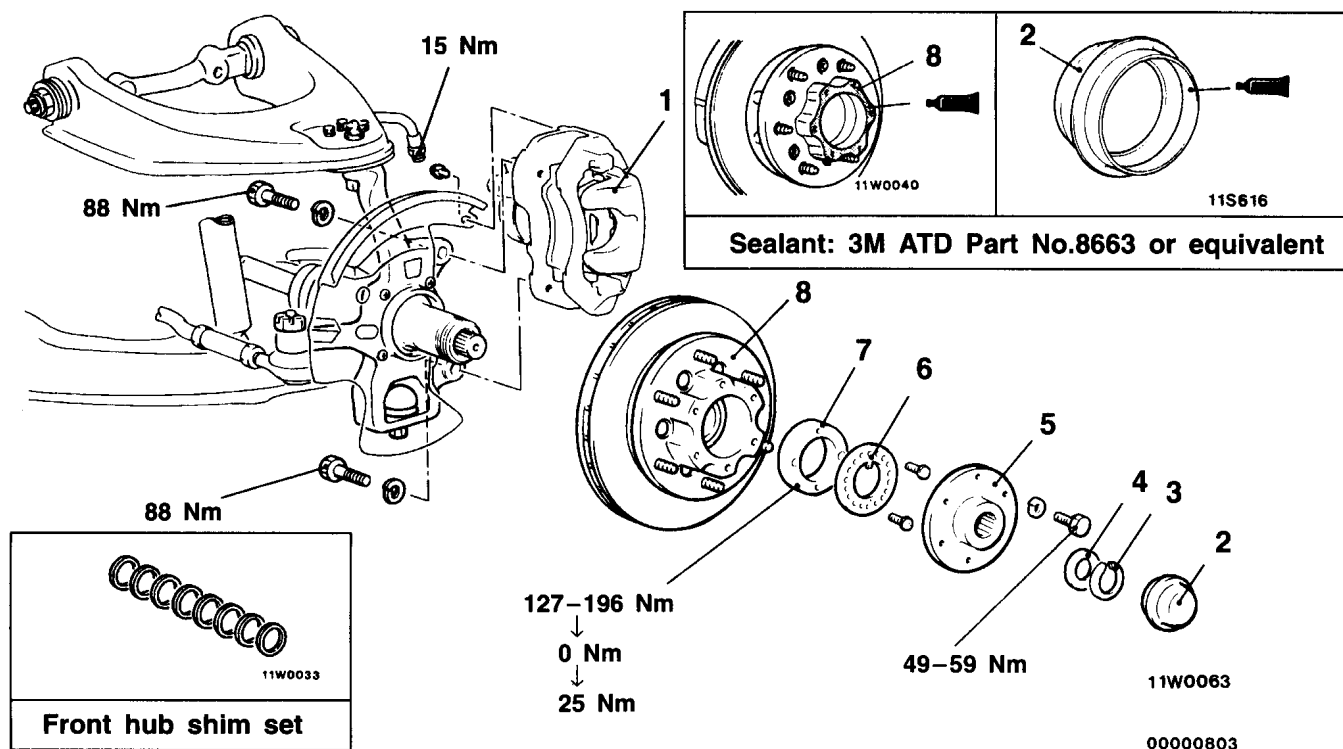
#### ▶B◀ OIL SEAL INSTALLATION



#### ▶C◀ ROTOR INSTALLATION

## FRONT HUB ASSEMBLY &lt;4WD&gt;

## REMOVAL AND INSTALLATION



## Removal steps

1. Caliper assembly
2. Hub cap
- ▶D◀ • Drive shaft axial play adjustment
3. Snap ring
4. Shim
5. Drive flange

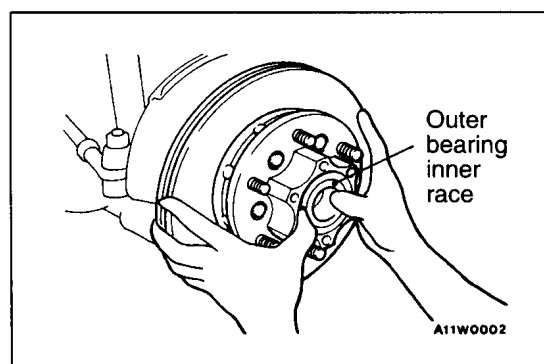
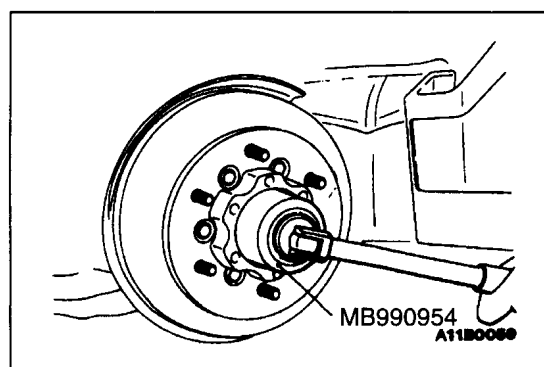
- ▶C◀ • Hub rotary sliding resistance and wheel bearing axial movement adjustment
- ▶B◀ 6. Lock washer
- ◀A◀ 7. Lock nut
- ◀B◀ 8. Front hub assembly

## REMOVAL SERVICE POINTS

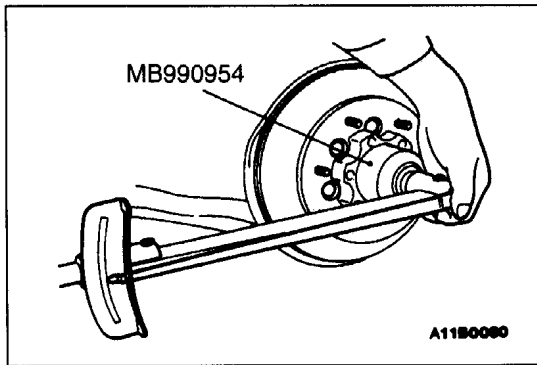
## ◀A▶ LOCK NUT REMOVAL

## ◀B▶ FRONT HUB ASSEMBLY REMOVAL

Do not drop the outer bearing inner race.







## INSTALLATION SERVICE POINTS

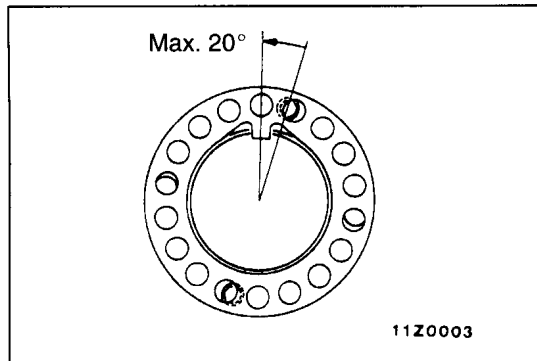
### ►A◄ LOCK NUT INSTALLATION

Using the special tool, tighten the lock nut by the following procedures.

- (1) Tighten the lock nut to 127–196 Nm, and then turn the front hub assembly to run in the bearings.
- (2) Loosen the nuts to 0 Nm.
- (3) After re-tightening to 25 Nm, loosen the lock nuts by approximately 30°.

### ►B◄ LOCK WASHER INSTALLATION

Install the lock washer. If the hole position is not aligned with the lock nut, loosen it within a range of 20° until the holes are aligned.



### ►C◄ HUB ROTARY SLIDING RESISTANCE AND WHEEL BEARING AXIAL MOVEMENT ADJUSTMENT

1. Use a spring balance to measure the hub rotary sliding resistance (hub rotation starting torque) as shown in the illustration.

**Standard value: 7–26 N (0.5–1.8 Nm)**

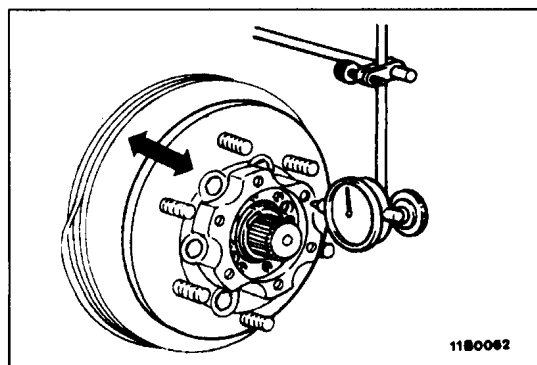
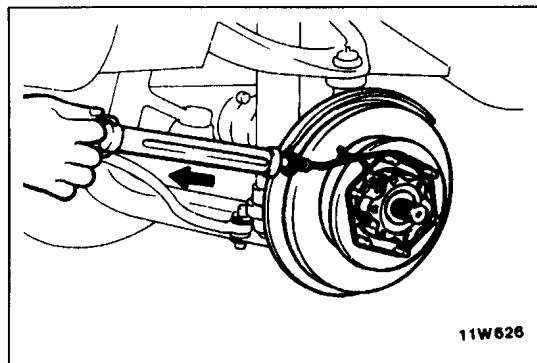
2. If the rotary sliding resistance is not within the standard value, remove the lock washer and adjust by the following procedures.

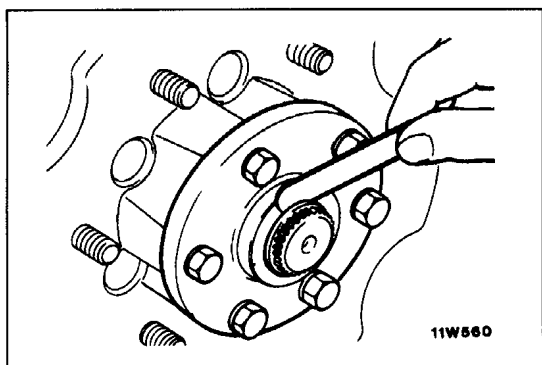
- (1) If the rotary sliding resistance is lower than the standard value, use the special tool (MB990954) to tighten the lock nut.
- (2) If the rotary sliding resistance is higher than the standard value, use the special tool (MB990954) to loosen the lock nut.

3. Install a dial gauge as shown in the illustration, and then move the hub in the axial direction and measure how far the front wheel bearing moves.

**Standard value: 0.05 mm or less**

4. If the distance exceeds the standard value, remove the lock washer and use the special tool (MB990954) to tighten the lock nut.
5. If adjustment is not possible, disassemble the hub and inspect each part.





### ►D◄ DRIVE SHAFT AXIAL PLAY ADJUSTMENT

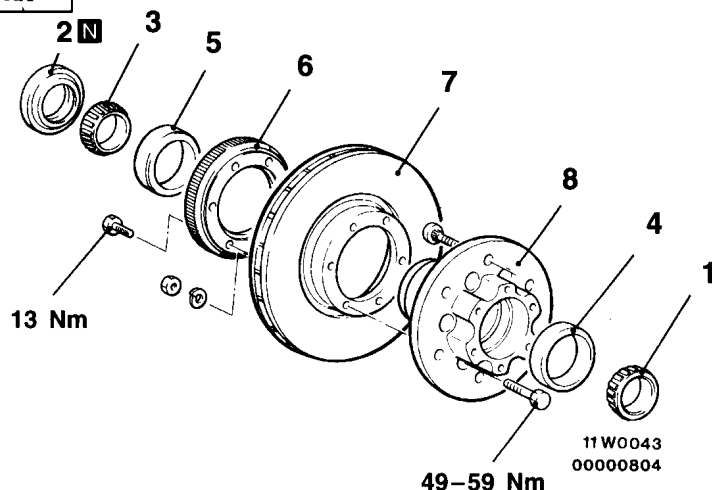
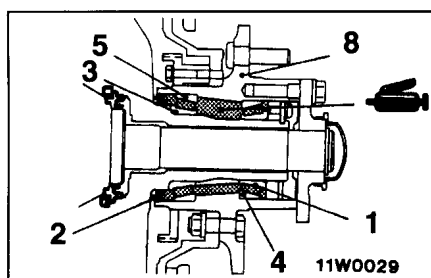
1. Push the drive shaft in by hand towards the knuckle until they touch.
2. Measure the clearance between the drive flange and the spacer with a thickness gauge as shown in the illustration.

**Standard value: 0.4–0.7 mm**

3. If the amount of play is outside the standard value, adjust by selecting a shim that will bring the play to the standard value.

## DISASSEMBLY AND REASSEMBLY

120000183

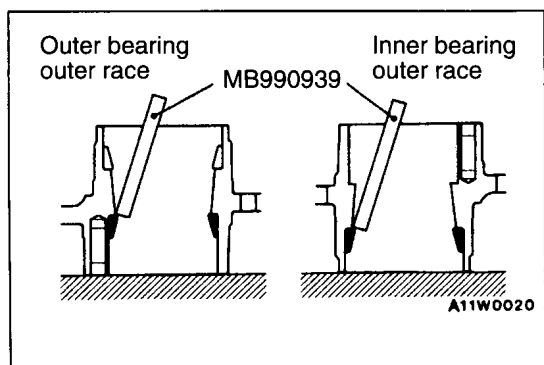


### Disassembly steps

- B◄
1. Outer bearing inner race
  2. Oil seal
  3. Inner bearing inner race
  4. Outer bearing outer race
  5. Inner bearing outer race
- ◄A► ◄A► ◄A►

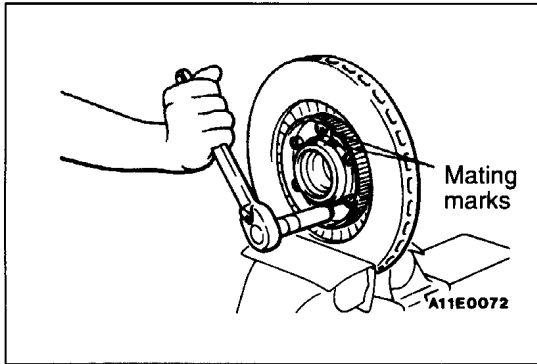


6. Rotor <Vehicles with ABS>
7. Brake disc
8. Front hub assembly



## REMOVAL SERVICE POINTS

### ◄A► OUTER BEARING OUTER RACE / INNER BEARING OUTER RACE REMOVAL

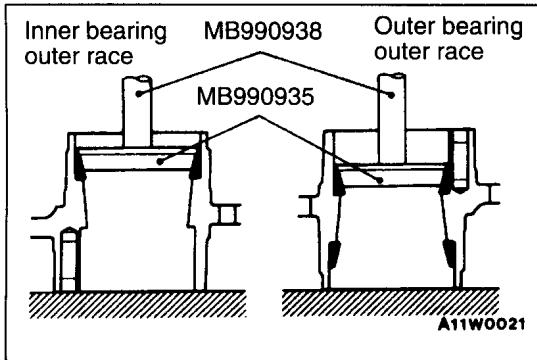


### ◀B▶ BRAKE DISC REMOVAL

Make the mating marks on the brake disc and front hub, and then separate the front hub and brake disc, if necessary.

#### Caution

Lock disc in vise and grip with copper or aluminium board.

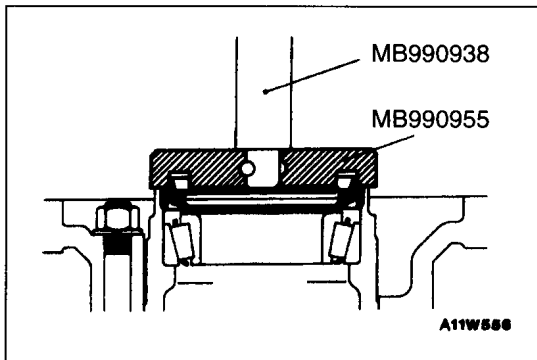


### REASSEMBLY SERVICE POINTS

#### ▶A◀ INNER BEARING OUTER RACE / OUTER BEARING OUTER RACE

#### NOTE

To replace the bearings, replace the inner race and outer race assembly as a set.



#### ▶B◀ OIL SEAL INSTALLATION

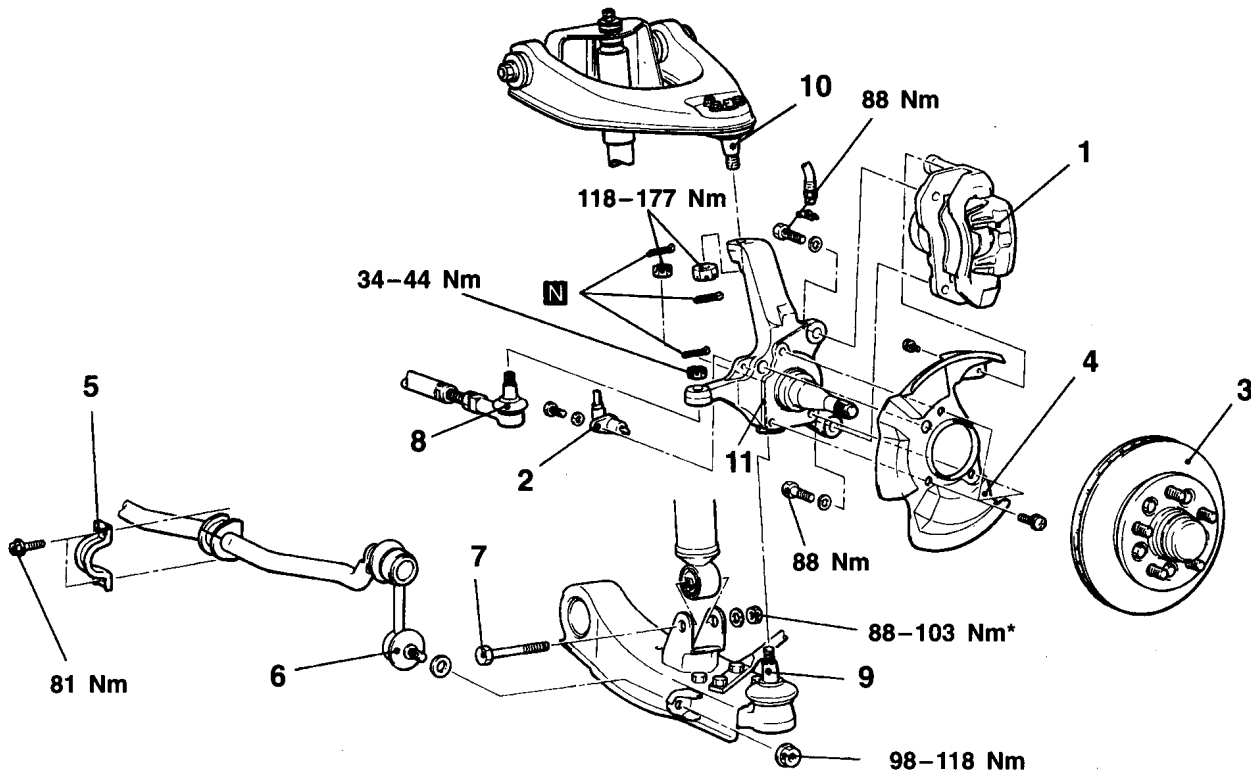
# **KNUCKLE <2WD>**

120000184

## **REMOVAL AND INSTALLATION**

### **Pre-removal and Post-installation Operation**

- Removal and Installation of Under Cover  
(Refer to GROUP 42 – Under Cover.)



11W0072

### **Removal steps**



1. Caliper assembly
2. Front speed sensor <Vehicles with ABS> (Refer to GROUP 35B – Wheel Speed Sensor.)
3. Hub assembly
4. Dust shield
5. Clamp
6. Stabilizer link
7. Shock absorber lower mounting bolt



8. Tie rod end connection
9. Lower arm connection
10. Upper arm connection
11. Knuckle

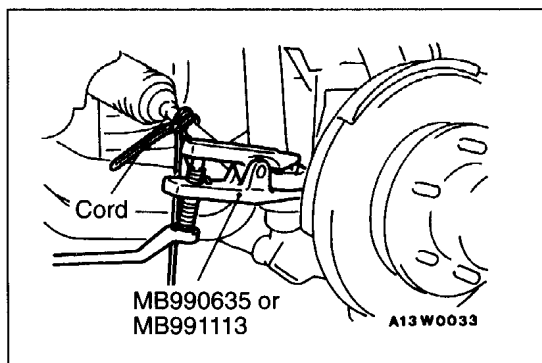
### **Caution**

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

## **REMOVAL SERVICE POINTS**

### **◀A▶ CALIPER ASSEMBLY REMOVAL**

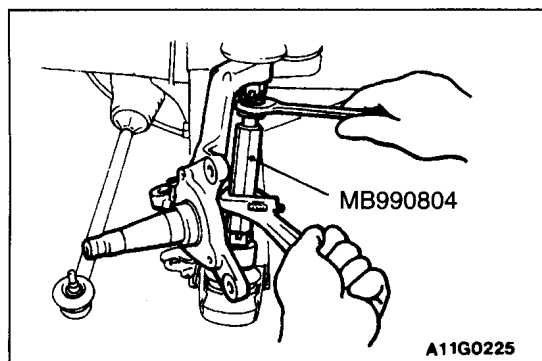
Secure the removed caliper assembly with wire so that it does not fall.



### ◀B▶ TIE ROD END DISCONNECTION

#### Caution

1. Use the special tool to loosen the nut only; do not remove it from the ball joint.
2. Tie the special tool with a cord not to let it fall off.



### ◀C▶ LOWER ARM/UPPER ARM DISCONNECTION

#### Caution

Use the special tool to loosen the nut only; do not remove it from the ball joint.

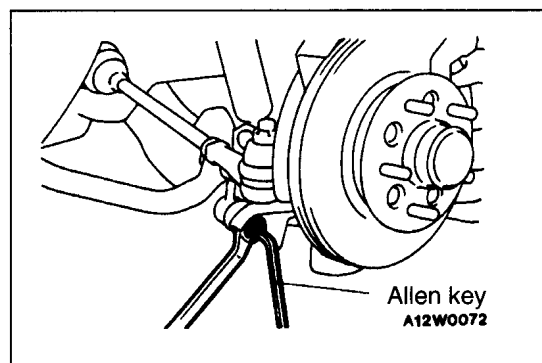
## INSTALLATION SERVICE POINTS

### ▶A◀ SHOCK ABSORBER LOWER MOUNTING BOLT INSTALLATION

Insert the shock absorber lower mounting bolt from the front of the vehicle.

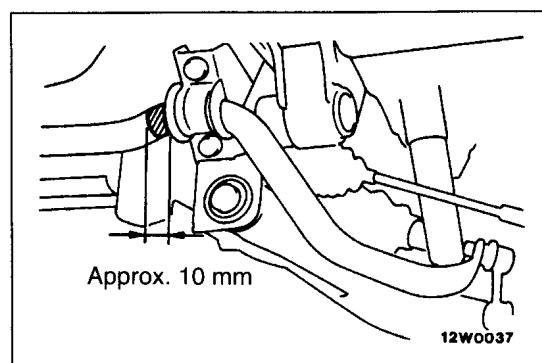
#### NOTE

Never insert from the rear of the vehicle, or the bolt may touch the stabilizer bar.



### ▶B◀ STABILIZER LINK INSTALLATION

Use an Allen key to tighten the nut while making sure that the stud on the stabilizer link does not turn as well.



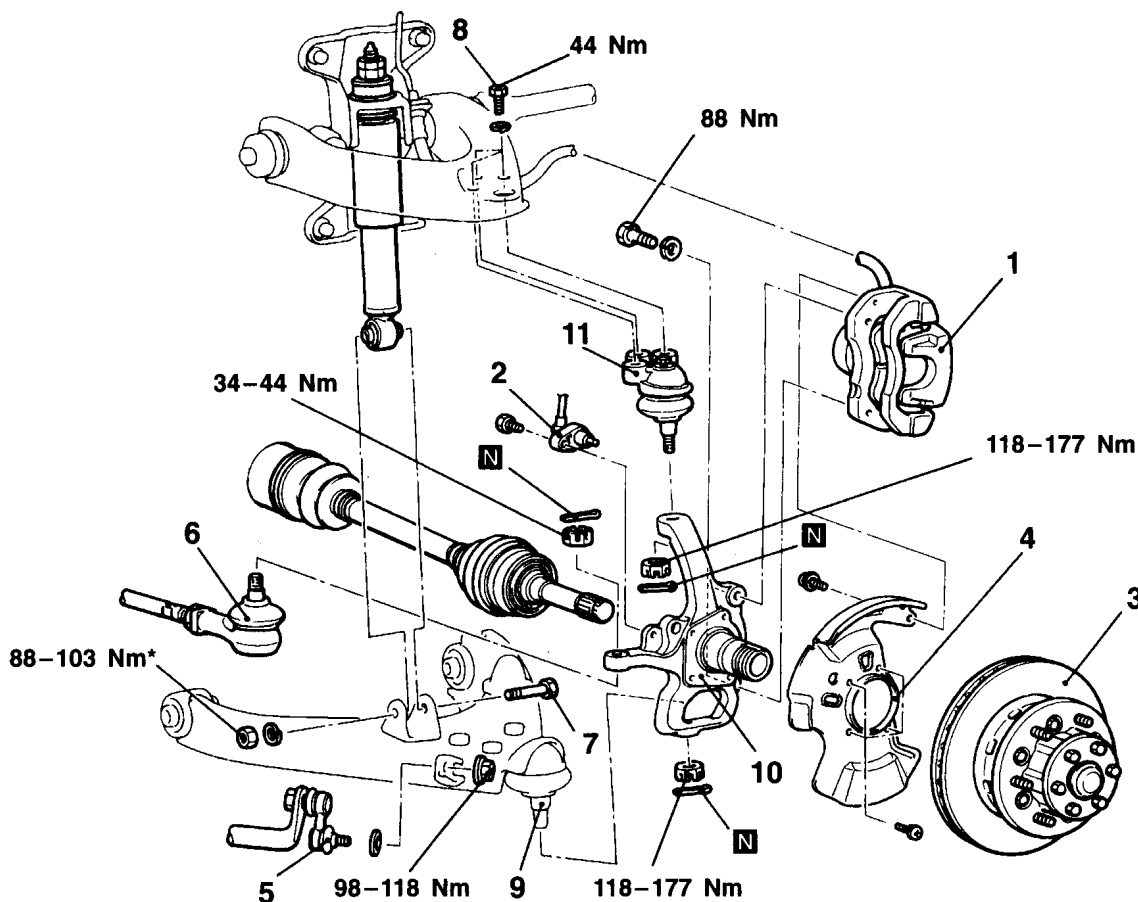
### ▶C◀ CLAMP INSTALLATION

1. Install the stabilizer bar so that the identification colour is on the left side.
2. Position the stabilizer bar so that its identification colour extends as shown in the illustration. Then tighten the clamp.

## KNUCKLE &lt;4WD&gt;

120000185

## REMOVAL AND INSTALLATION



11W0099

## Removal steps

◀A▶

1. Caliper assembly
2. Front speed sensor <Vehicles with ABS> (Refer to GROUP 35B – Wheel Speed Sensor.)
3. Hub assembly
4. Dust shield
- ▶C◀ 5. Stabilizer link connection
- ▶B◀ 6. Tie rod end connection
- ▶B◀ 7. Shock absorber lower mounting bolt

 ▶C◀  
 ▶D◀  
 ▶E◀

8. Upper ball joint mounting bolt
9. Lower ball joint connection
- ▶A◀ 10. Knuckle
11. Upper ball joint

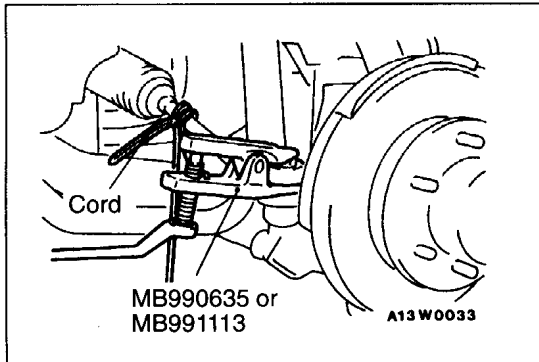
## Caution

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

## REMOVAL SERVICE POINTS

## ◀A▶ CALIPER ASSEMBLY REMOVAL

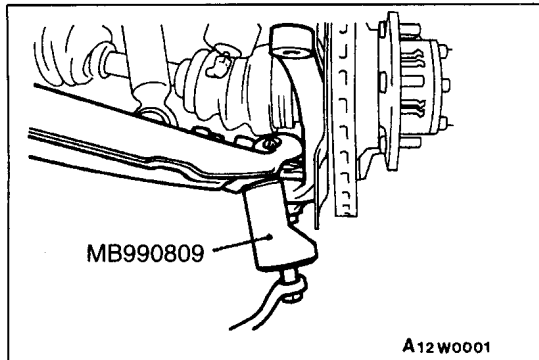
Secure the removed caliper assembly with wire so that it does not fall.



#### ◀B▶ TIE ROD END DISCONNECTION

##### Caution

1. Use the special tool to loosen the nut only; do not remove it from the ball joint.
2. Tie the special tool with a cord not to let it fall off.



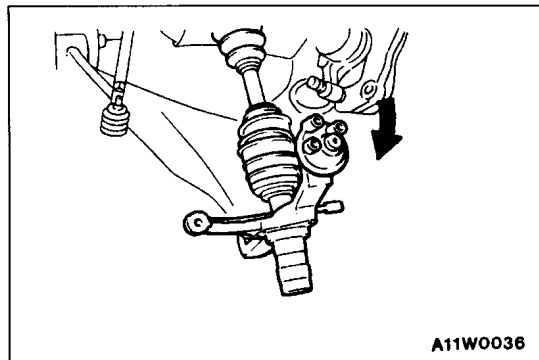
#### ◀C▶ LOWER BALL JOINT DISCONNECTION

##### Caution

The nut should be loosened only, not removed.

##### NOTE

Leave nut on lower ball joint until knuckle and upper arm are disconnected.

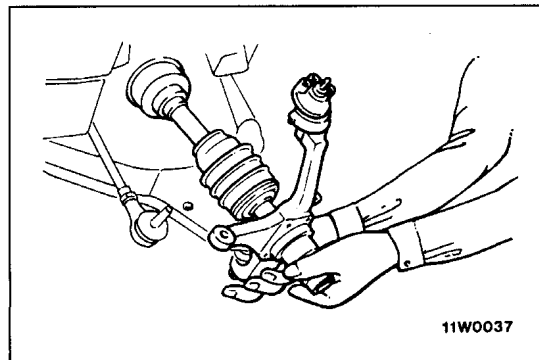


#### ◀D▶ KNUCKLE REMOVAL

1. Press down lower arm and remove upper knuckle towards you.

##### Caution

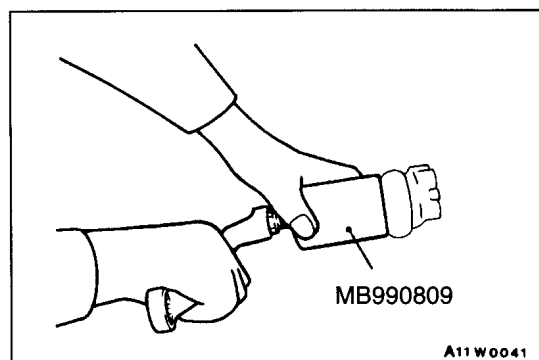
Do not damage upper ball joint nipple with upper arm.



2. Slightly back off drive shaft from knuckle. Remove lower ball joint and knuckle holding nut.
3. Disconnect knuckle and lower ball joint.
4. Remove knuckle and front hub assembly from drive shaft assembly.

##### Caution

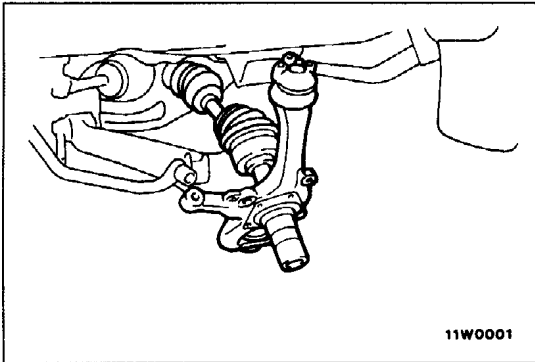
Do not damage knuckle oil seals with drive shaft spline.



#### ◀E▶ UPPER BALL JOINT DISCONNECTION

##### Caution

The nut should be loosened only, not removed.



## INSTALLATION SERVICE POINTS

### ►A◄ KNUCKLE INSTALLATION

1. Install upper ball joint on knuckle. Temporarily tighten slotted nut.
2. Insert knuckle into drive shaft.

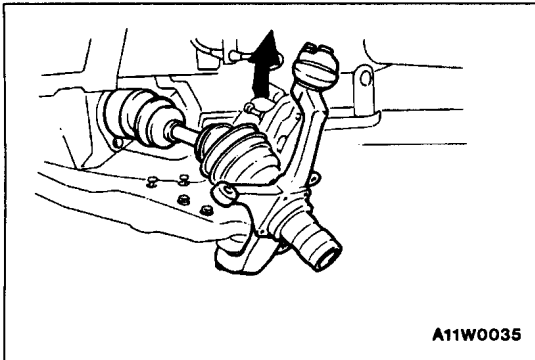
#### Caution

**Do not damage oil seal with drive shaft spline.**

3. Assemble knuckle and lower ball joint. Temporarily tighten slotted nut.

4. Push up lower arm to lock upper ball joint to upper arm.
5. Tighten upper and lower ball joint connecting nut to specified torque.

**Tightening torque: 118–177 Nm**

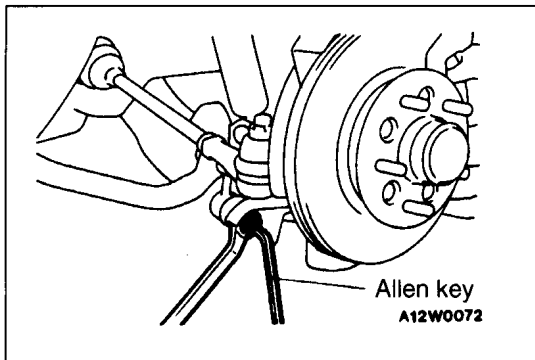


### ►B◄ SHOCK ABSORBER LOWER MOUNTING BOLT INSTALLATION

Insert the shock absorber lower mounting bolt from the rear of the vehicle.

#### NOTE

Do not insert from the front of the vehicle, or you may have trouble tightening the nut.



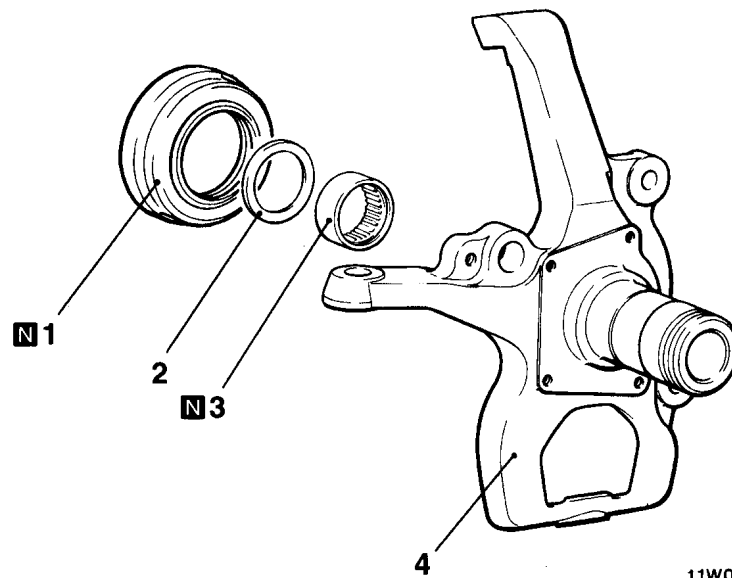
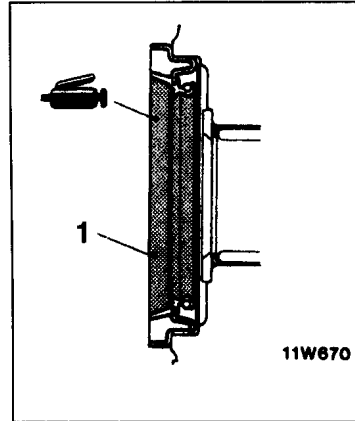
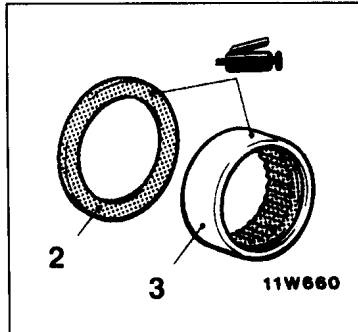
### ►C◄ STABILIZER LINK INSTALLATION

Use an Allen key to tighten the nut while making sure that the stud on the stabilizer link does not turn as well.



DISASSEMBLY AND REASSEMBLY

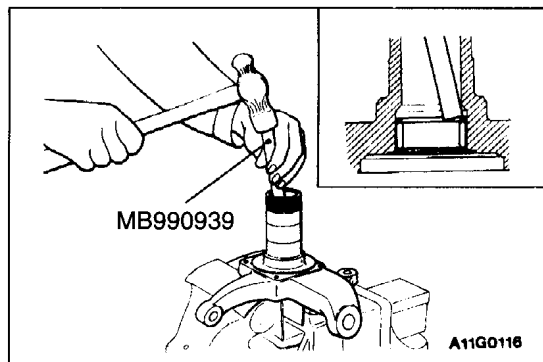
120000186



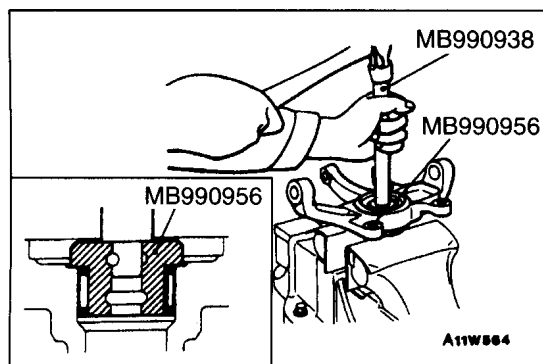
Disassembly steps



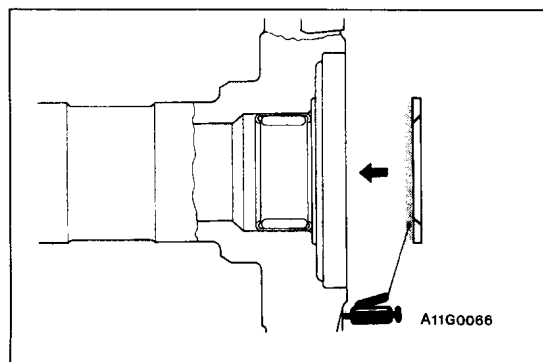
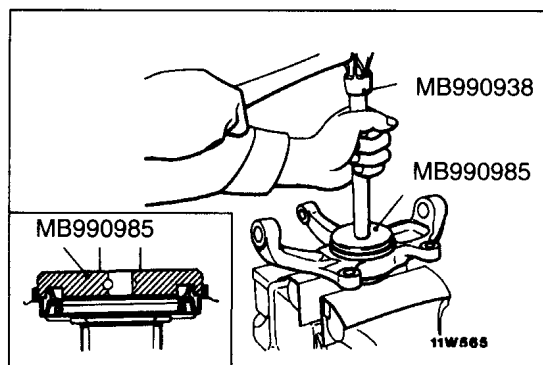
1. Oil seal
2. Spacer
3. Needle bearing
4. Knuckle

**DISASSEMBLY SERVICE POINT****◀A▶ NEEDLE BEARING REMOVAL****REASSEMBLY SERVICE POINTS****▶A▶ NEEDLE BEARING INSTALLATION****Caution**

Be careful to prevent driving the needle bearing too far in.

**▶B▶ SPACER INSTALLATION**

Install the spacer to the knuckle with the chamfered side toward the centre of vehicle.

**▶C▶ OIL SEAL INSTALLATION**

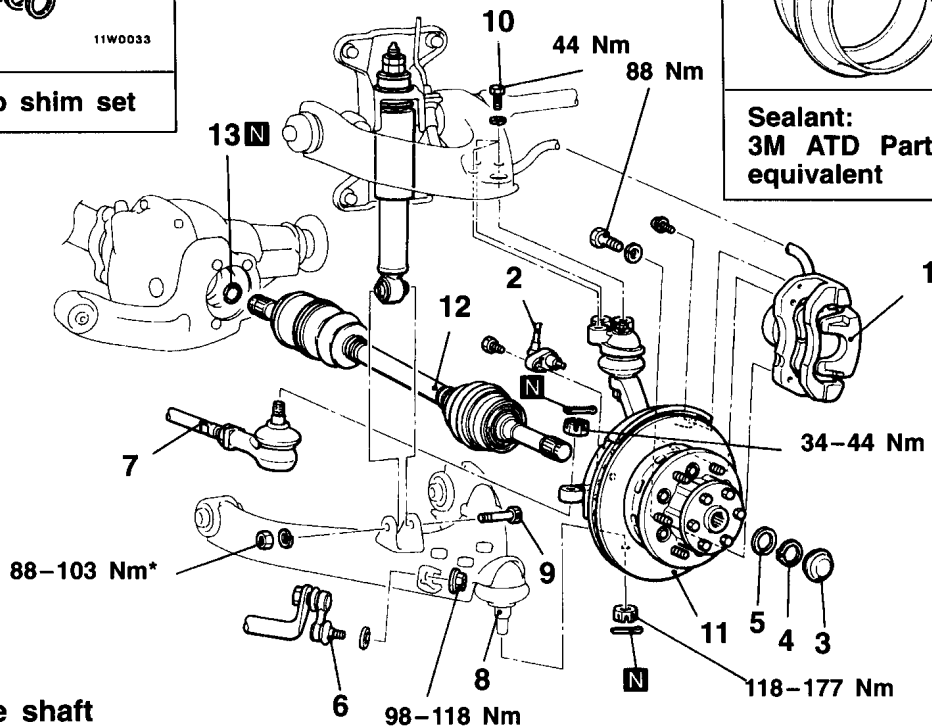
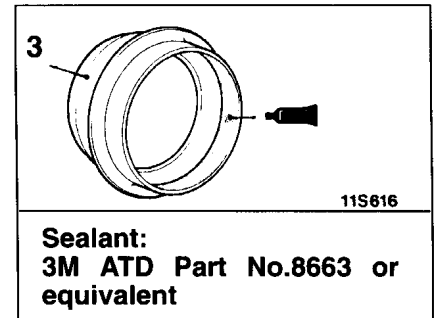
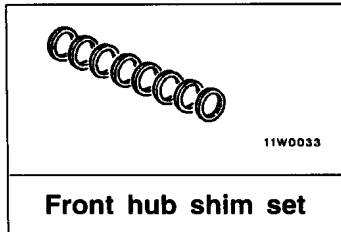
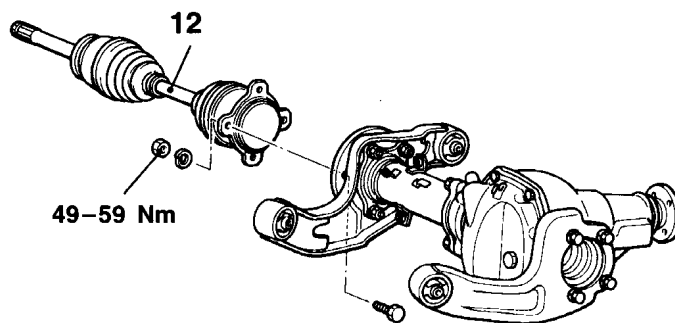
## DRIVE SHAFT

120000187

## REMOVAL AND INSTALLATION

**Pre-removal and Post-installation Operation**

- Removal and Installation of Under Cover  
(Refer to GROUP 42 – Under Cover.)

**Left-side drive shaft****Right-side drive shaft**

11W0100  
00000808

**Removal steps**

- |   |   |
|---|---|
| <p>◀A▶ 1. Caliper assembly</p> <p>▶E▶ 2. Front speed sensor &lt;Vehicles with ABS&gt; (Refer to GROUP 35B – Wheel Speed Sensor.)</p> <p>▶D▶ 3. Hub cap</p> <p>▶B▶ 4. Drive shaft axial play adjustment</p> <p>5. Snap ring</p> <p>6. Shim</p> <p>7. Stabilizer link connection</p> <p>8. Tie rod end connection</p> | <p>◀C▶ 8. Lower ball joint connection</p> <p>▶C▶ 9. Shock absorber lower mounting bolt</p> <p>▶D▶ 10. Upper ball joint mounting bolt</p> <p>▶B▶ 11. Knuckle and front hub assembly</p> <p>▶E▶ 12. Drive shaft assembly</p> <p>▶A▶ 13. Circlip</p> |
|---|---|

**Caution**

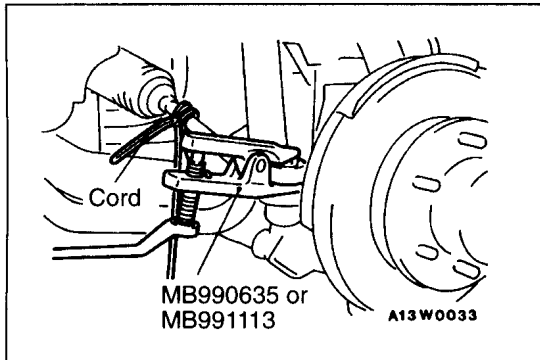
\*: Indicates parts which should be temporarily tightened, and then fully tightened with the vehicle on the ground in the unladen condition.

**REMOVAL SERVICE POINTS****◀A▶ CALIPER ASSEMBLY REMOVAL**

Secure the removed caliper assembly with wire so that it does not fall.

**◀B▶ TIE ROD END DISCONNECTION****Caution**

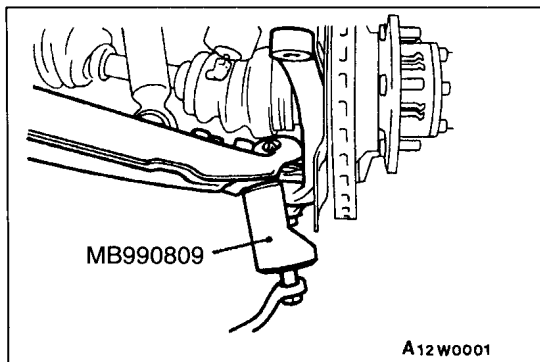
1. Use the special tool to loosen the nut only; do not remove it from the ball joint.
2. Tie the special tool with a cord not to let it fall off.

**◀C▶ LOWER BALL JOINT DISCONNECTION****Caution**

Use the special tool to loosen the nut only; do not remove it from the lower ball joint.

**NOTE**

Do not remove it until disassembling the upper arm and knuckle.

**◀D▶ KNUCKLE AND FRONT HUB ASSEMBLY REMOVAL**

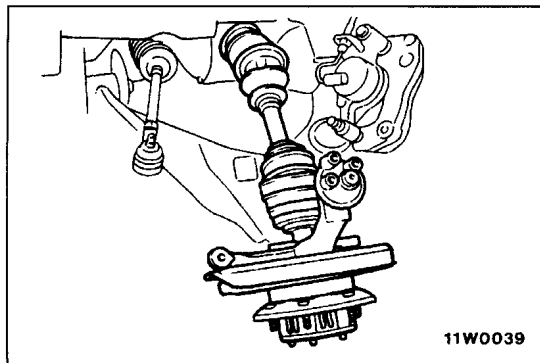
1. Press down lower arm and remove upper knuckle towards you.

**Caution**

Do not damage upper ball joint nipple with upper arm.

**NOTE**

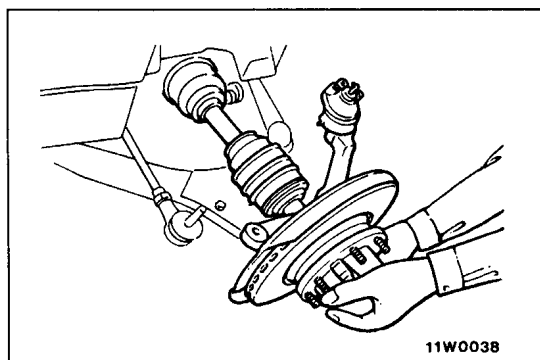
Pull the D.O.J. side of the drive shaft assembly out slightly from the front differential carrier.

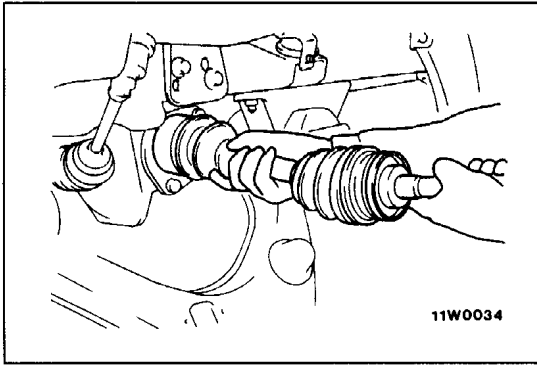


2. Slightly back off drive shaft from knuckle. Remove lower ball joint and knuckle holding nut.
3. Disconnect knuckle and lower ball joint.
4. Remove knuckle and front hub assembly from drive shaft assembly.

**Caution**

Do not damage knuckle oil seals with drive shaft spline.





### ◀E▶ DRIVE SHAFT (LEFT SIDE) REMOVAL

#### Caution

When pulling the drive shaft out from the differential carrier, be careful that the spline part of the drive shaft does not damage the oil seal.

### INSPECTION

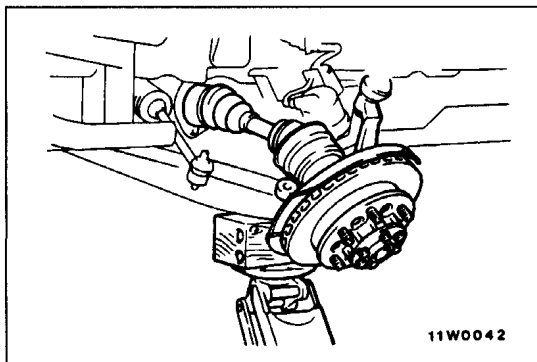
- Check the boot for damage or deterioration.
- Check the ball joint for operating condition and excessive looseness.
- Check the splines for wear or damage.
- Check the differential carrier oil seal (L.H.) for damage.

### INSTALLATION SERVICE POINTS

#### ▶A◀ DRIVE SHAFT (LEFT SIDE) INSTALLATION

#### Caution

Do not damage the oil seal of the differential carrier by the drive shaft splines.



#### ▶B◀ KNUCKLE AND FRONT HUB ASSEMBLY INSTALLATION

1. Insert knuckle and front hub assembly to drive shaft.

#### Caution

Do not damage knuckle oil seal with drive shaft spline.

2. Assemble knuckle and lower ball joint and temporarily tighten slotted nut.
3. Press up lower arm and lock upper ball joint onto upper arm.
4. Tighten lower ball joint mounting nuts to specified torque.

**Tightening torque: 118–177 Nm**

#### ▶C◀ SHOCK ABSORBER LOWER MOUNTING BOLT INSTALLATION

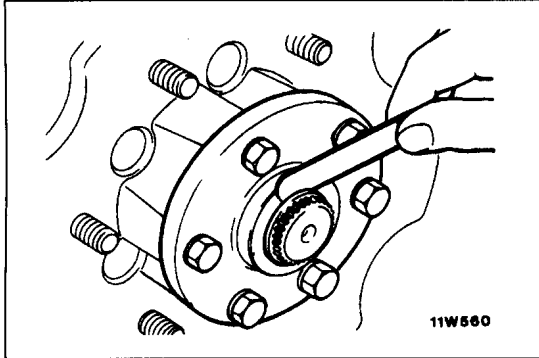
Insert the shock absorber lower mounting bolt from the rear of the vehicle.

#### NOTE

Do not insert from the front of the vehicle, or you may have trouble when tightening the nut.

**►D◄ STABILIZER LINK INSTALLATION**

Use an Allen key to tighten the nut while making sure that the stud on the stabilizer link does not turn as well.

**►E◄ DRIVE SHAFT AXIAL PLAY ADJUSTMENT**

1. Push the drive shaft in by hand towards the knuckle until they touch.
2. Measure the clearance between the drive flange and the spacer with a thickness gauge as shown in the illustration.

**Standard value: 0.4–0.7 mm**

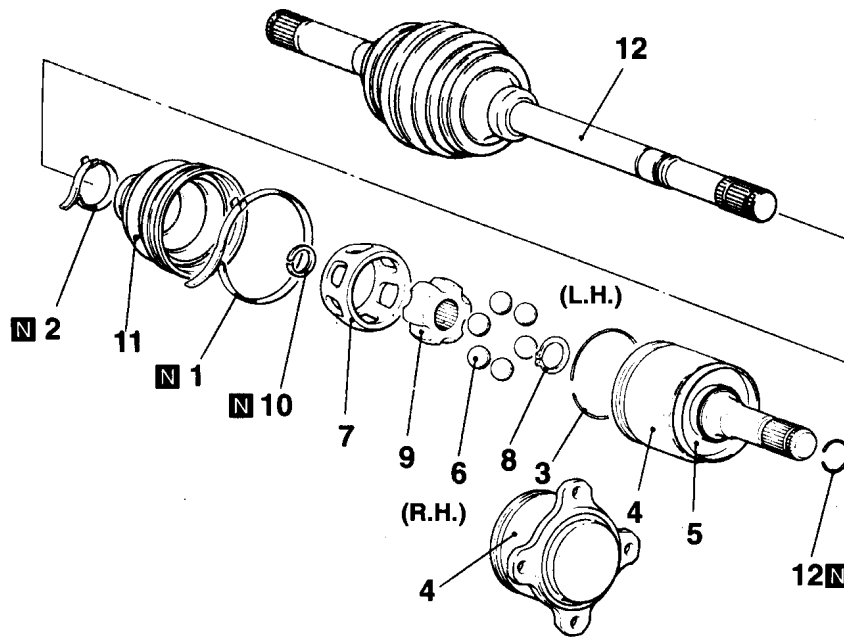
3. If the amount of play is outside the standard value, adjust by selecting a shim that will bring the play to the standard value.

**NOTE**

The shims available range from 0.3 mm thick to 0.6 mm thick in steps of 0.1 mm, and from 0.9 mm thick to 1.8 mm thick in steps of 0.3 mm.

DISASSEMBLY AND REASSEMBLY

120002203



11E0078

00002679

<p>11E0095</p>	<p>11E0096</p>	<p>11W673</p>
<p>B.J. repair kit L.H.</p>	<p>D.O.J. repair kit</p>	<p>Boot repair kit (D.O.J.)</p>

Disassembly steps

1. D.O.J. boot band (large)
2. D.O.J. boot band (small)
3. Circlip
4. D.O.J. outer race
5. Dust cover
6. Balls
7. D.O.J. cage
8. Snap ring
9. D.O.J. inner race
10. Snap ring <4D56 Wagon>
11. D.O.J. boot
12. B.J. assembly
13. Circlip

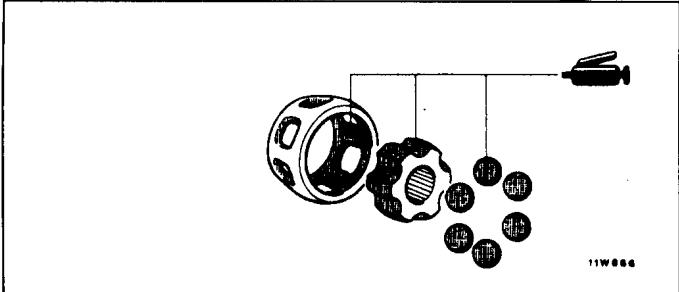
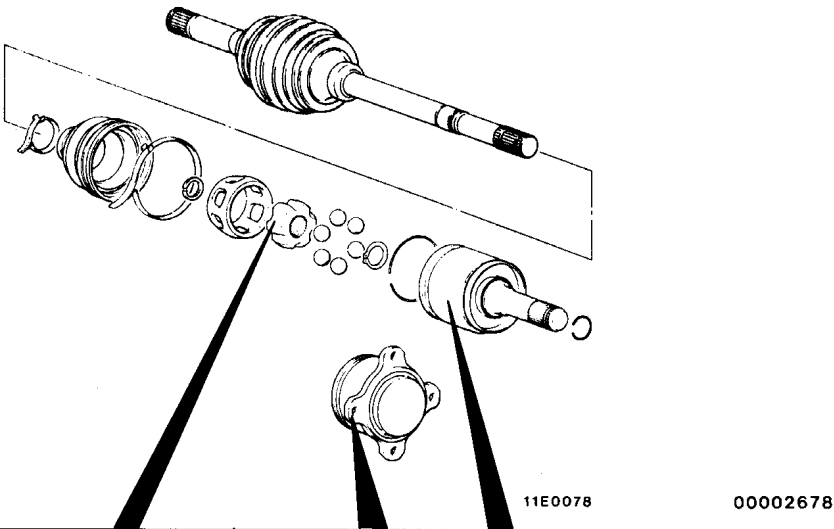
Reassembly steps

13. Circlip
12. B.J. assembly
10. Snap ring
9. D.O.J. inner race
8. Snap ring
7. D.O.J. cage
6. Balls
4. D.O.J. outer race
5. Dust cover
3. Circlip
11. D.O.J. boot
2. D.O.J. boot band (small)
1. D.O.J. boot band (large)

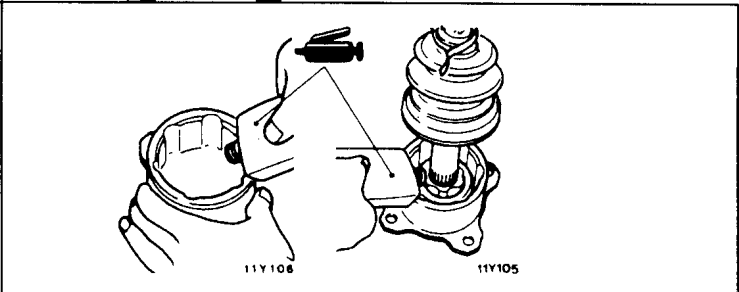
◀A▶  
◀B▶

◀C▶

Lubrication Points

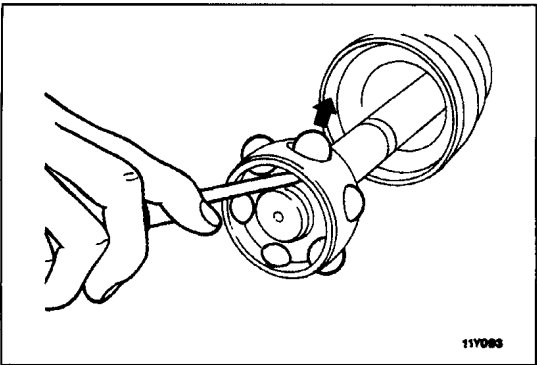


Grease: Repair kit grease



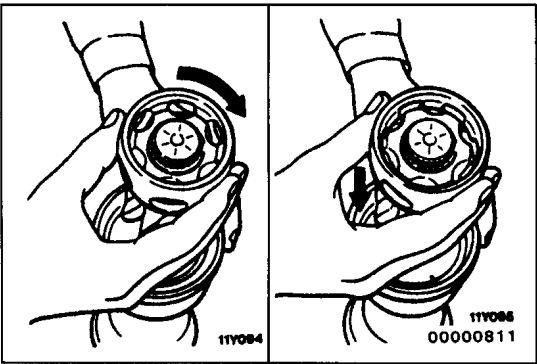
Grease: Repair kit grease 100g (60g inside joint, 40g inside boot)

**Caution**  
Do not mix old and new or different types of grease, as a special grease is used in the joint.



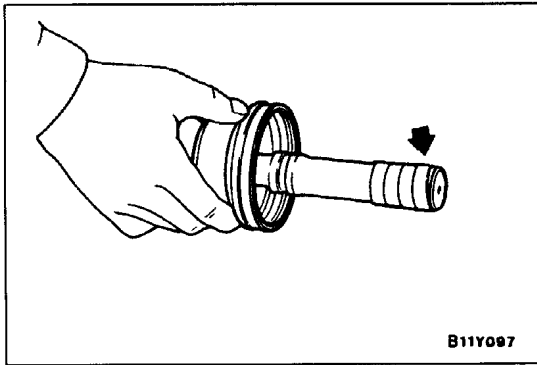
DISASSEMBLY SERVICE POINTS

◀A▶ BALLS REMOVAL



◀B▶ D.O.J. CAGE REMOVAL





### ◀C▶ D.O.J. BOOT REMOVAL

Wrap plastic tape around the spline part on the D.O.J. side of the drive shaft so that D.O.J. boot is not damaged when they are removed.

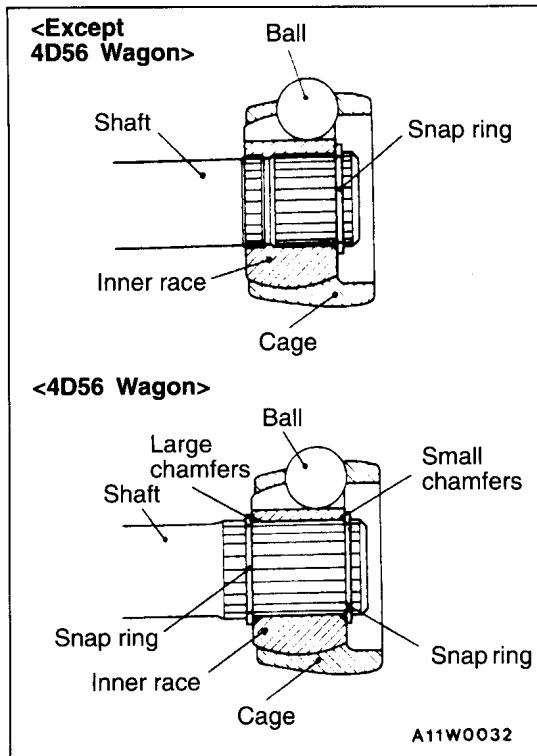
## REASSEMBLY SERVICE POINTS

### ▶A◀ D.O.J. INNER RACE/SNAP RING/D.O.J. CAGE /BALLS INSTALLATION

Install the cage, balls and inner race to the drive shaft, and fit the snap ring securely to the groove in the drive shaft.

#### Caution

Install the inner race so that the large chamfers on the spline section are on the drive shaft side. <4D56 Wagon>



### ▶B◀ D.O.J. OUTER RACE INSTALLATION

Fill the inside of the D.O.J. outer race and D.O.J. boot with the specified grease.

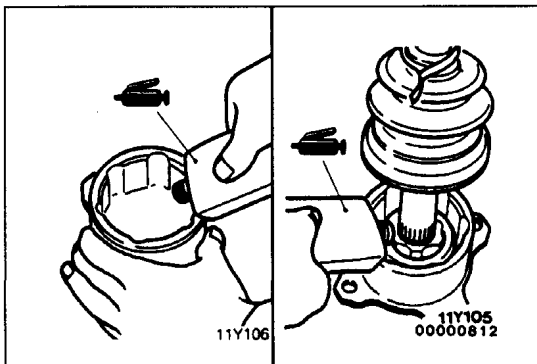
**Specified grease: Repair kit grease 100g**

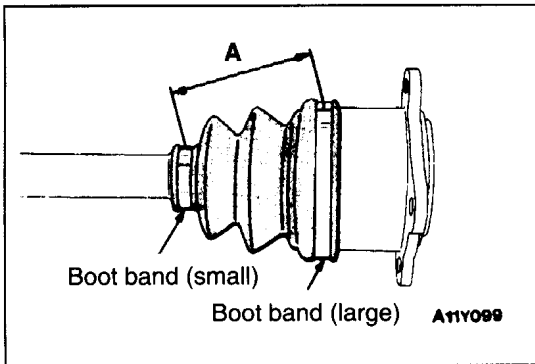
#### NOTE

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.



**►◄ D.O.J. BOOT / D.O.J. BOOT BAND INSTALLATION**

1. Position the D.O.J. outer race so that the distance between the boot bands is at the standard value.

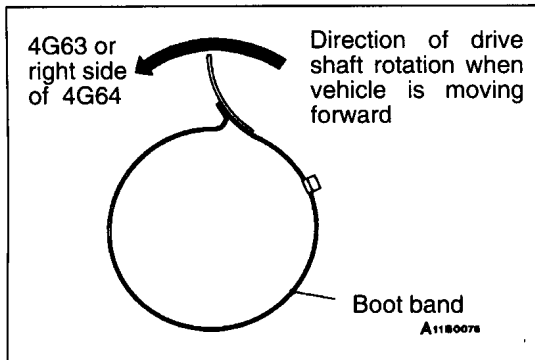
**Standard value (A):  $80 \pm 3$  mm**

2. Remove part of the D.O.J. boot from the D.O.J. outer race to release the air pressure inside the boot.

3. Secure the boot band (large) on D.O.J. boot.

**Caution**

**For 4G63 or right side of 4G64 engine, be careful about the shown direction when installing the boot bands to the right-side drive shaft**



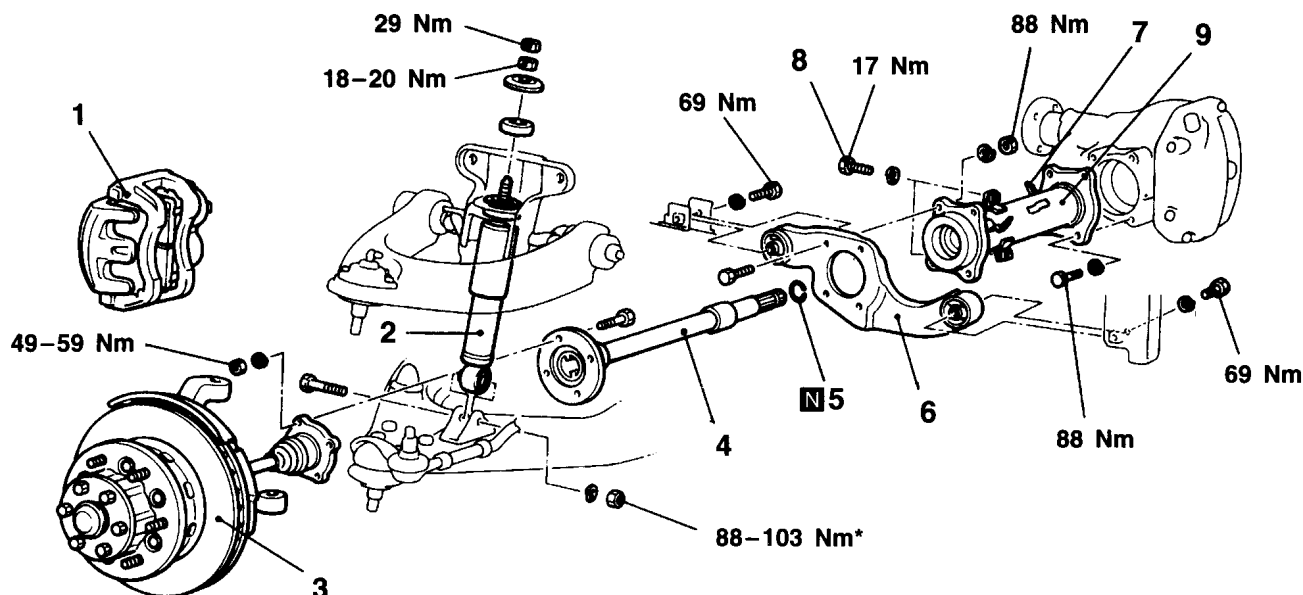
## INNER SHAFT

120000189

## REMOVAL AND INSTALLATION

**Pre-removal and Post-Installation Operation**

- Removal and Installation of Under Cover (Refer to GROUP 42 – Under Cover.)



11W0101

**Removal steps**

◀A▶

1. Caliper assembly
2. Shock absorber
3. Hub assembly, knuckle, drive shaft  
(Refer to P.26-27.)

◀B▶ ▶A▶

4. Inner shaft

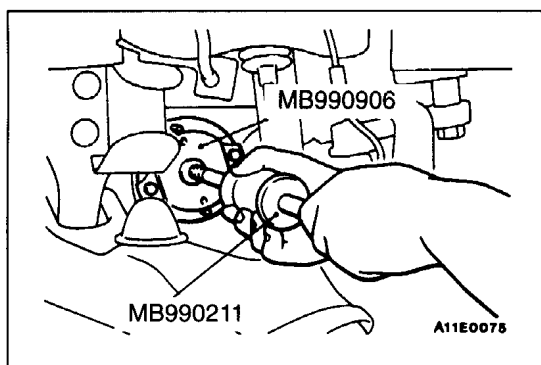
5. Circlip
6. Differential mounting bracket (R.H.)
7. Free-wheeling engage switch connector
8. Actuator mounting bolts
9. Housing tube assembly

**Caution**

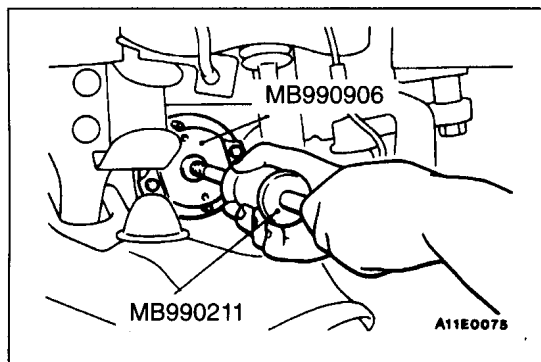
\*: Indicates parts which should be temporarily tightened, and then fully tightened with the vehicle on the ground in the unladen condition.

**REMOVAL SERVICE POINTS****◀A▶ CALIPER ASSEMBLY REMOVAL**

Secure the removed caliper assembly with wire so that it does not fall.

**◀B▶ INNER SHAFT REMOVAL****Caution**

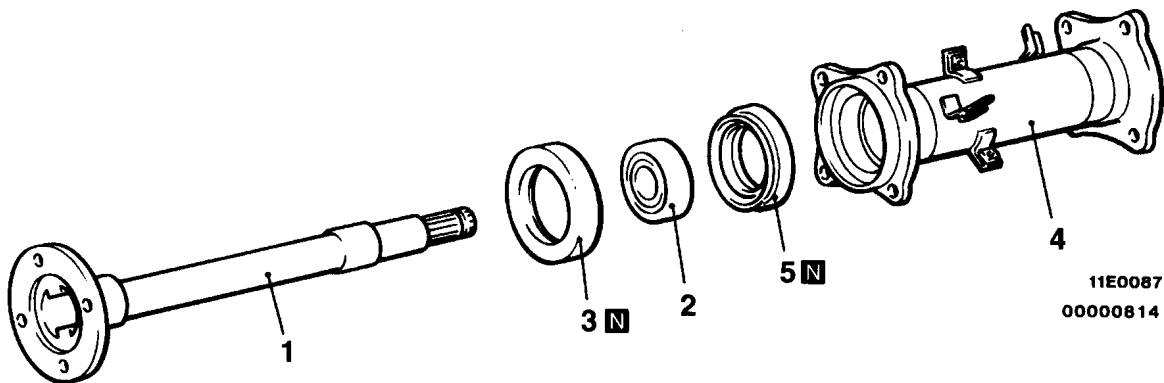
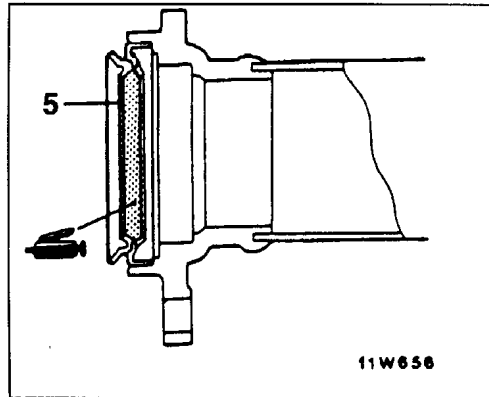
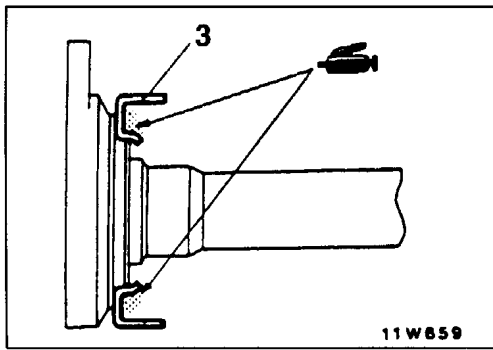
When pulling the inner shaft out from the front differential carrier, be careful that the spline part of the inner shaft does not damage the oil seal.

**INSTALLATION SERVICE POINT****▶A◀ INNER SHAFT INSTALLATION****Caution**

Be careful not to damage the lip of the dust seal and oil seal.

DISASSEMBLY AND REASSEMBLY

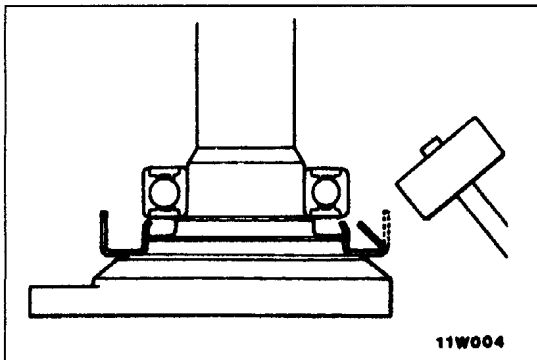
120000190



Disassembly steps

- ◀A▶ ▶C▶  
▶B▶
1. Inner shaft
  2. Bearing
  3. Dust cover

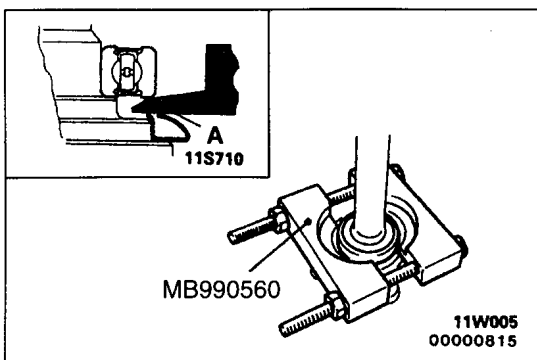
- ▶A▶
4. Housing tube
  5. Dust seal

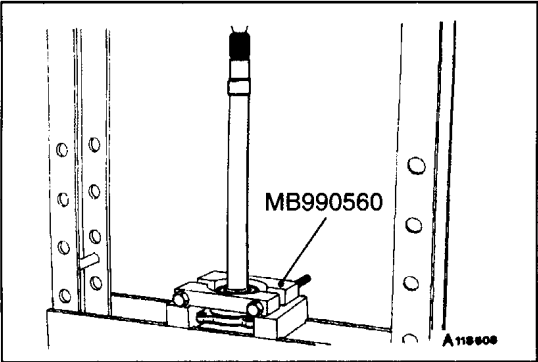


DISASSEMBLY SERVICE POINT

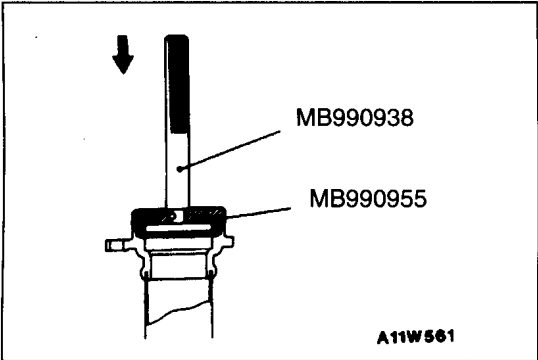
◀A▶ BEARING REMOVAL

1. Bend the outside periphery of dust cover inward with a hammer.
2. After the special tool has been installed as shown, tighten the nut of the special tool until the portion "A" of the special tool touches the bearing outer race.





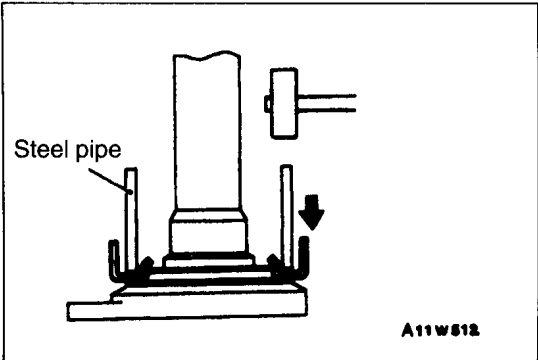
3. Press out the inner shaft from the bearing.



**REASSEMBLY SERVICE POINTS**

**►A◄ DUST SEAL INSTALLATION**

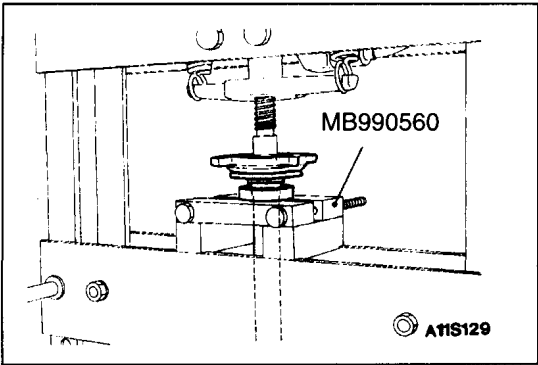
Press-fit the new dust seal into the housing tube by using the special tools, until it is flush with the housing tube end face.



**►B◄ DUST COVER INSTALLATION**

Using a steel pipe, force a new dust cover onto the inner shaft.

Steel pipe	mm
Overall length	50
Outside diameter	75
Wall thickness	4



**►C◄ BEARING INSTALLATION**

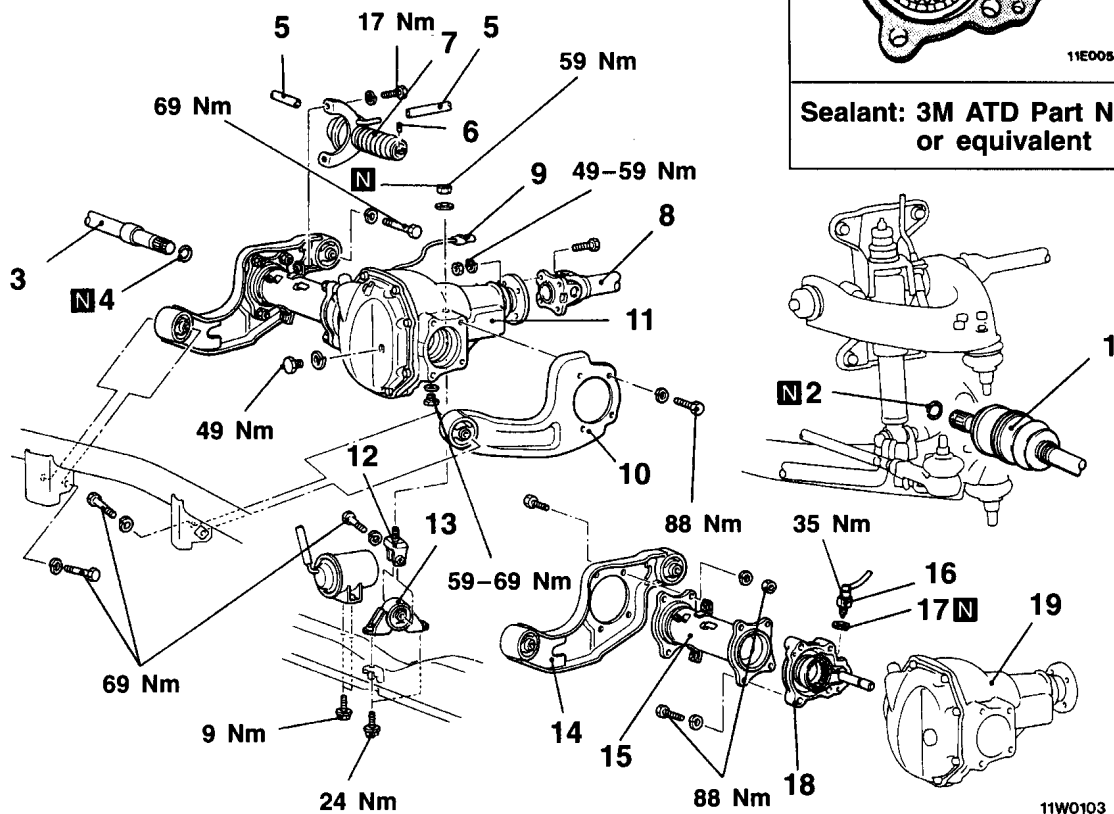
# DIFFERENTIAL CARRIER

120002470

## REMOVAL AND INSTALLATION

### Pre-removal and Post-installation Operations

- (1) Removal and Installation of Under Cover (Refer to GROUP 42 – Under Cover.)
- (2) Draining and Supplying of Gear Oil (Refer to P.26-10.)



Sealant: 3M ATD Part No.8663  
or equivalent

00000816

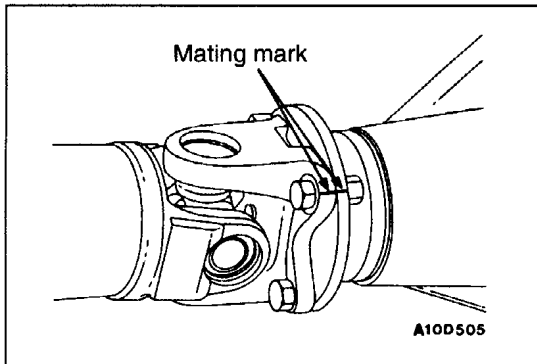
### Removal steps

1. Drive shaft (Refer to P.26-27.)
2. Circlip
3. Inner shaft (Refer to P.26-34.)
4. Circlip
5. Vacuum hose connection
6. Pin
7. Actuator assembly
8. Front propeller shaft connection
9. Free-wheeling engage switch connector
10. Differential mounting bracket (L.H.)
11. Front differential, housing tube, differential bracket (R.H.)
12. Differential support bracket
13. Differential mount insulator assembly
14. Differential mounting bracket (R.H.)
15. Housing tube
16. Free-wheeling engage switch
17. Gasket
18. Free-wheeling clutch assembly
  - Clutch gear bearing axial play inspection
19. Front differential carrier assembly

►C◄

◄A► ►B◄

►A◄



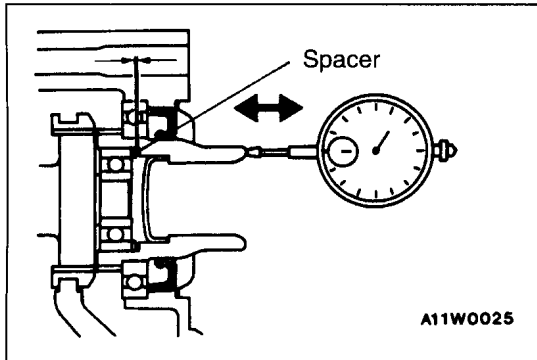
## REMOVAL SERVICE POINT

### ◀▶ FRONT PROPELLER SHAFT REMOVAL

Make the mating marks on the companion flange and flange yoke, disconnect the propeller shaft from the companion flange.

#### Caution

**Suspend the propeller shaft from the body with wire, etc. to prevent it from falling.**



## INSTALLATION SERVICE POINTS

### ▶▶ CLUTCH GEAR BEARING AXIAL PLAY INSPECTION

Check the axial play of the clutch gear bearing by the following procedure before installing the free-wheeling clutch assembly.

- (1) Insert flat washers of the same thickness as the housing tube (9.0 mm) onto the bolt, and then temporarily install the free-wheeling clutch assembly to the front differential.

- (2) Place a dial gauge against the end of the clutch gear and check the axial play of the clutch gear bearing.

**Standard value: 0.05–0.30 mm**

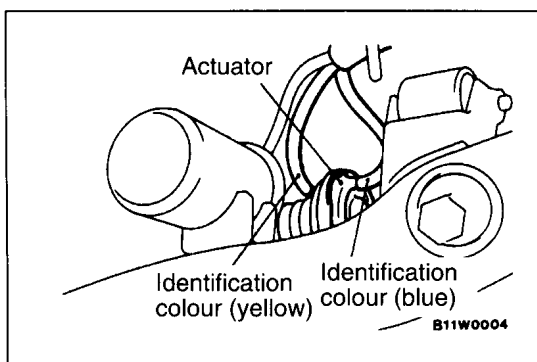
- (3) If the play is not within the standard value, disassemble the bearing and insert a spacer of the appropriate thickness.

#### NOTE

The thicknesses of the spacers vary in steps of 0.25 mm.

### ▶▶ FRONT PROPELLER SHAFT INSTALLATION

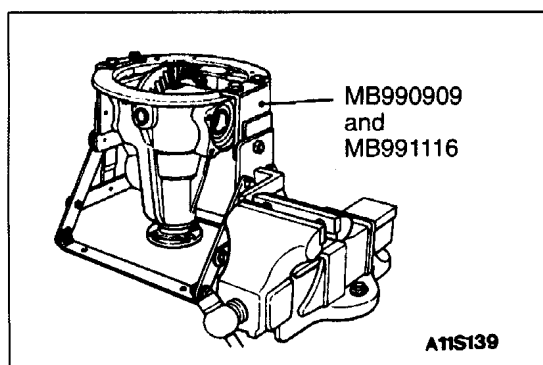
Install the front propeller shaft so that the mating marks of the flange yoke and the differential carrier companion flange are aligned.



### ▶▶ VACUUM HOSE INSTALLATION

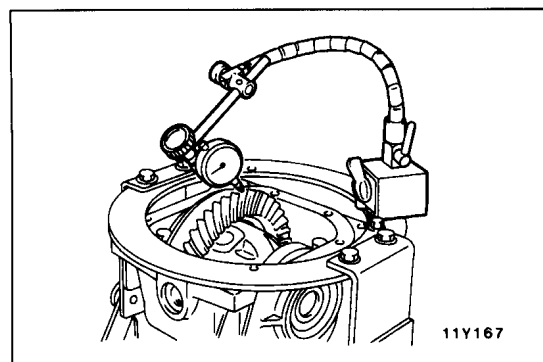
Install the vacuum hoses so that they match the identification colours of the actuator assembly nipple.





## INSPECTION BEFORE DISASSEMBLY

1. Remove the cover and gasket.
2. Hold the special tool in a vise, and install the differential carrier assembly to the special tool.

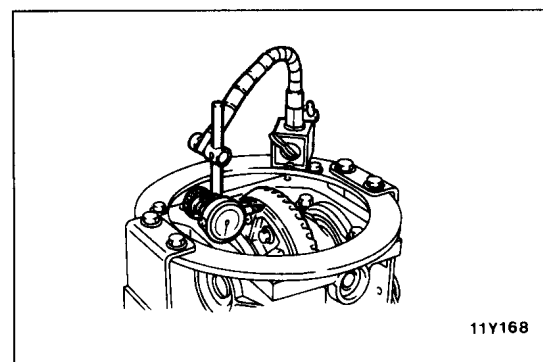


## DRIVE GEAR BACKLASH

1. With the drive pinion locked in place, use a dial gauge to measure the drive gear backlash in four or more places on the drive gear.

**Standard value: 0.11–0.16 mm**

2. If the backlash is not within the standard value, insert side bearing adjustment spacers, and then inspect the drive gear tooth contact.

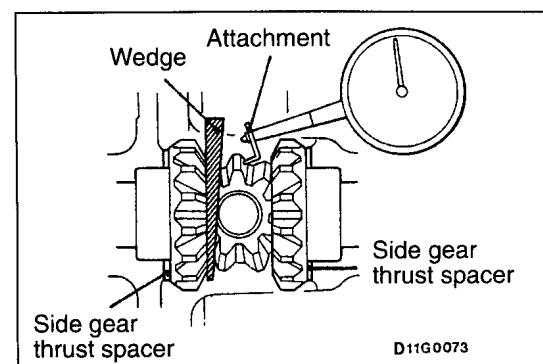


## DRIVE GEAR RUNOUT

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

**Limit: 0.05 mm**

2. When runout exceeds the limit value, check for foreign object between drive gear rear side and differential case, or for loose drive gear installation bolts.
3. When check (2) gives normal results, reposition drive gear and differential case and remeasure.
4. If adjustment is impossible, replace differential case, or replace drive gear and pinion as a set.



## DIFFERENTIAL GEAR BACKLASH (EXCLUDING 4 PINION DIFFERENTIAL)

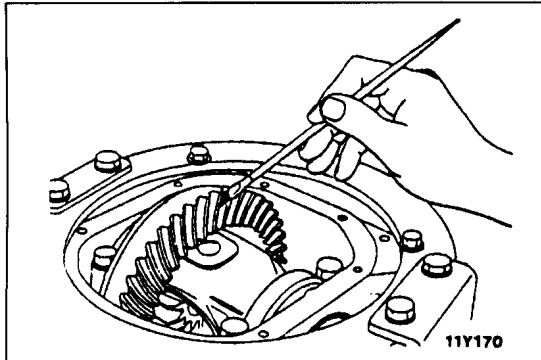
1. While locking the side gear with the wedge, measure the differential gear backlash with a dial indicator on the pinion gear.

**Standard value: 0–0.076 mm**

**Limit: 0.2 mm**

Repeat the same procedure for both pinion gears.

2. If the backlash exceeds the limit, adjust by using the side gear thrust spacers.
3. If adjustment is impossible, replace the side gear and pinion gear as a set.



### DRIVE GEAR TOOTH CONTACT

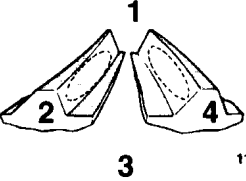
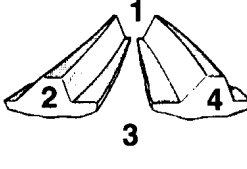
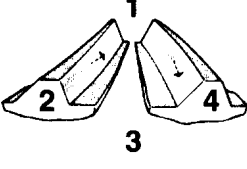
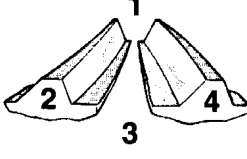
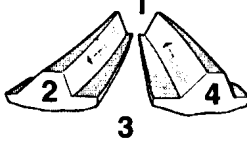
Check the tooth contact of drive gear by following the steps below.

1. Apply a thin, uniform coat of machine blue to both surfaces of the drive gear teeth.
2. Insert the brass 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 (approximate 250–300 Ncm) 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	Problem	Solution
<p>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)</p>  <p>11W0115</p>	<p>Tooth contact pattern resulting from excessive pinion height</p>  <p>11W0116</p> <p>The drive pinion is positioned too far from the centre of the drive gear.</p> <p>Tooth contact pattern resulting from insufficient pinion height</p>  <p>11W0117</p> <p>The drive pinion is positioned too close to the centre of the drive gear.</p>	 <p>11W0118</p> <p>Increase the thickness of the drive pinion rear 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.</p>  <p>11W0119</p> <p>Decrease the thickness of the drive pinion rear 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.</p>

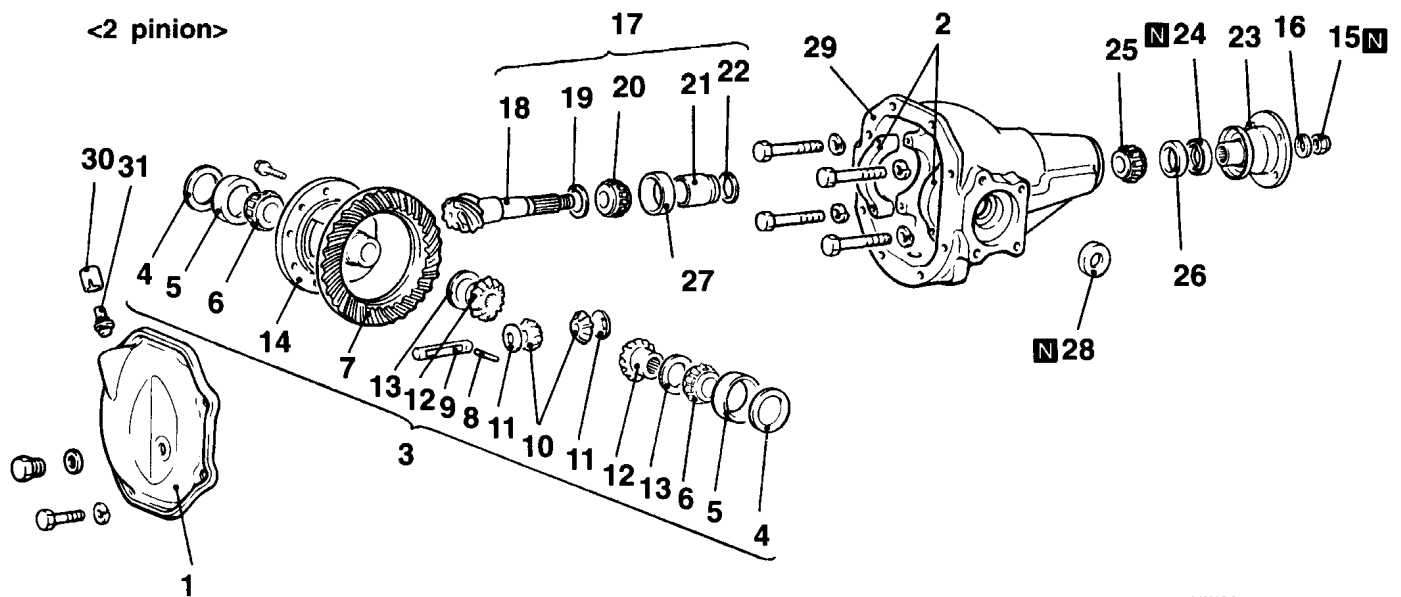
**NOTE**

Checking the tooth contact pattern is the way to confirm that the adjustments of the pinion height and backlash have been done properly. Continue to adjust the pinion height and backlash until the tooth contact pattern resembles the standard pattern.

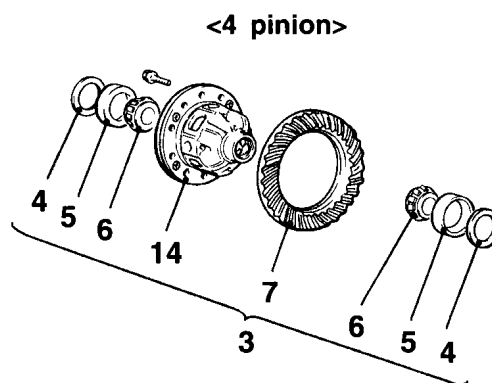
If, even after adjustments have been made, the correct tooth contact pattern cannot be obtained, it means that the drive gear and the drive pinion have become worn beyond the allowable limit. Replace the gear set.

## DISASSEMBLY

120002204



11W0071



11E0091

00000817

## Disassembly steps

- Inspection before disassembly (Refer to P.26-41.)

◀G▶

◀A▶

◀B▶

◀C▶

◀D▶

◀E▶

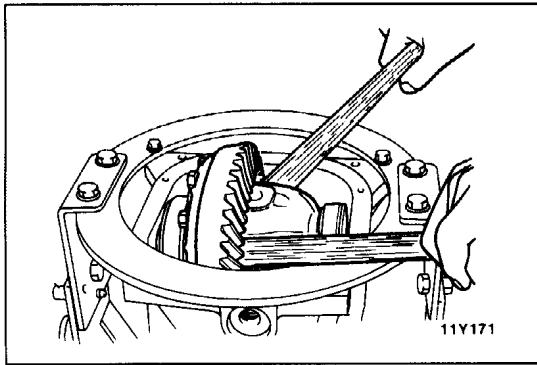
◀F▶

1. Cover
2. Bearing cap
3. Differential case assembly
4. Side bearing spacer
5. Side bearing outer race
6. Side bearing inner race
7. Drive gear
8. Lock pin
9. Pinion shaft
10. Pinion gear
11. Pinion washer
12. Side gear
13. Side gear spacer
14. Differential case
15. Self-locking nut
16. Washer
17. Drive pinion assembly
18. Drive pinion

◀H▶

◀I▶

19. Drive pinion front shim (for pinion height adjustment)
20. Drive pinion front bearing inner race
21. Drive pinion spacer
22. Drive pinion rear shim (for turning torque adjustment)
23. Companion flange
24. Oil seal
25. Drive pinion rear bearing inner race
26. Drive pinion rear bearing outer race
27. Drive pinion front bearing outer race
28. Oil seal
29. Gear carrier
30. Plug cover
31. Vent plug



## DISASSEMBLY SERVICE POINTS

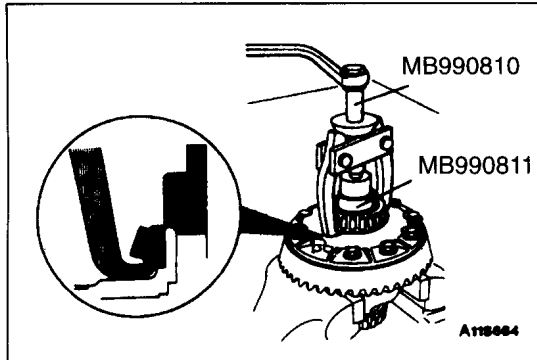
### ◀A▶ DIFFERENTIAL CASE ASSEMBLY REMOVAL

#### Caution

When taking out the differential case assembly, be careful not to drop and damage the side bearing outer races.

#### NOTE

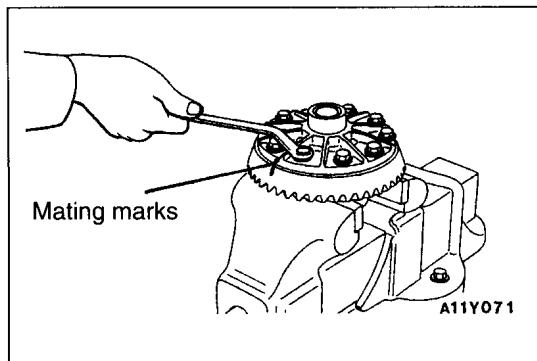
Keep the right and left side bearings and side bearing adjusting spacers separately, so that they do not become mixed at the time of reassembly.



### ◀B▶ SIDE BEARING INNER RACE REMOVAL

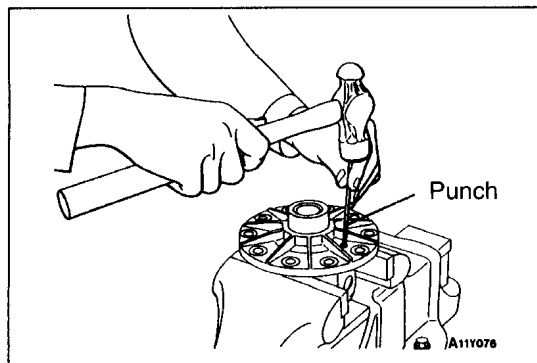
#### NOTE

There are two notches provided (at the differential case side) for the claw part of the special tool; be sure to set the legs of special tool at these places.

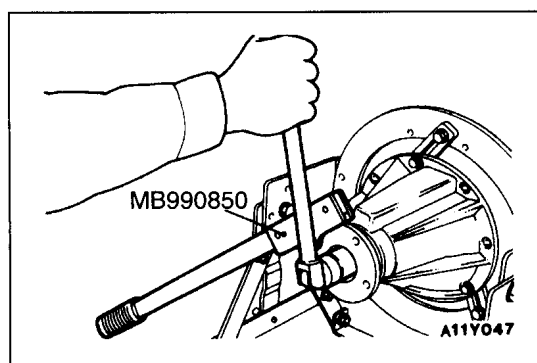


### ◀C▶ DRIVE GEAR REMOVAL

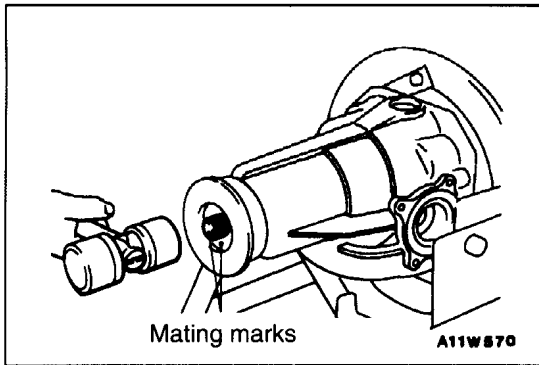
1. Make the mating marks to the differential case and the drive gear.
2. Loosen the drive gear attaching bolts in diagonal sequence to remove the drive gear.



### ◀D▶ LOCK PIN REMOVAL



### ◀E▶ SELF-LOCKING NUT REMOVAL



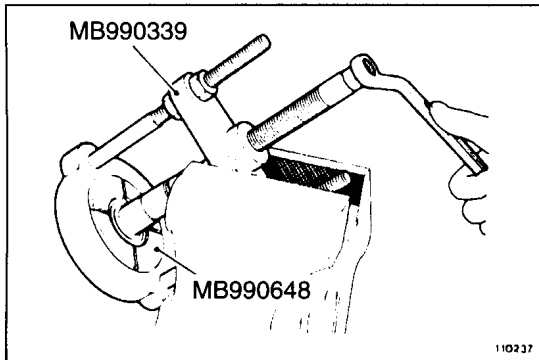
### ◀F▶ DRIVE PINION ASSEMBLY REMOVAL

1. Make mating marks on the drive pinion and companion flange.

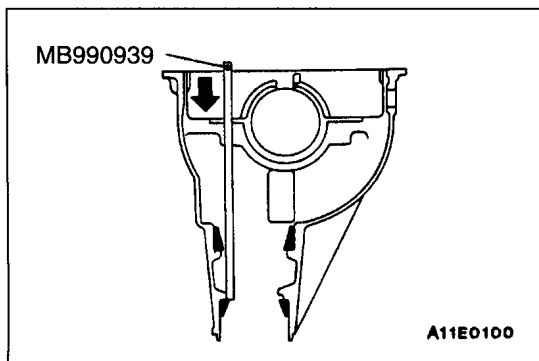
#### Caution

The mating mark made on the companion flange must not be on the coupling surface of the flange yoke and the front propeller shaft.

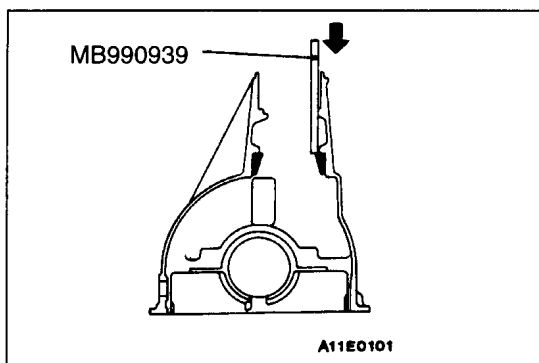
2. Drive out the drive pinion together with the drive pinion spacer and drive pinion shims.



### ◀G▶ DRIVE PINION FRONT BEARING INNER RACE REMOVAL



### ◀H▶ DRIVE PINION REAR BEARING OUTER RACE REMOVAL



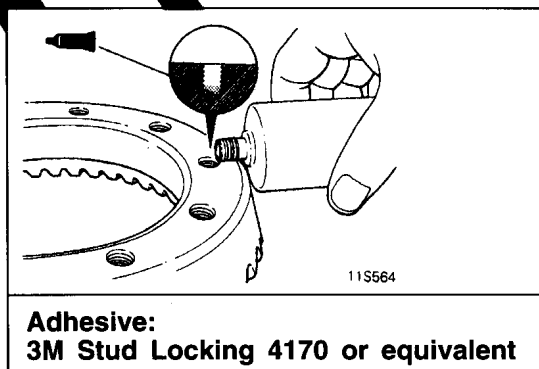
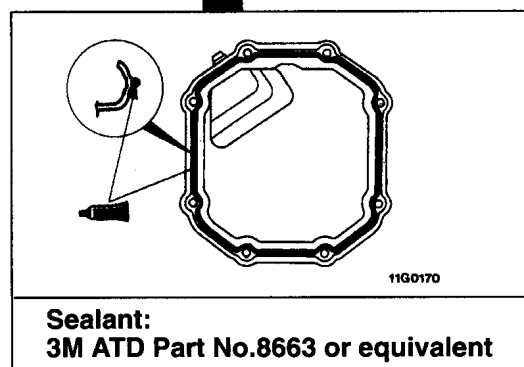
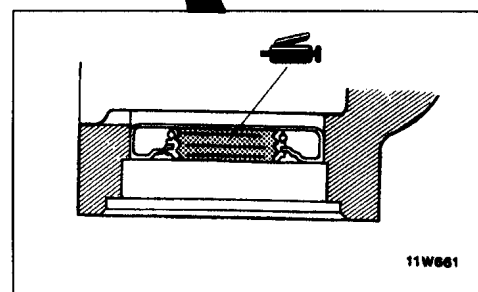
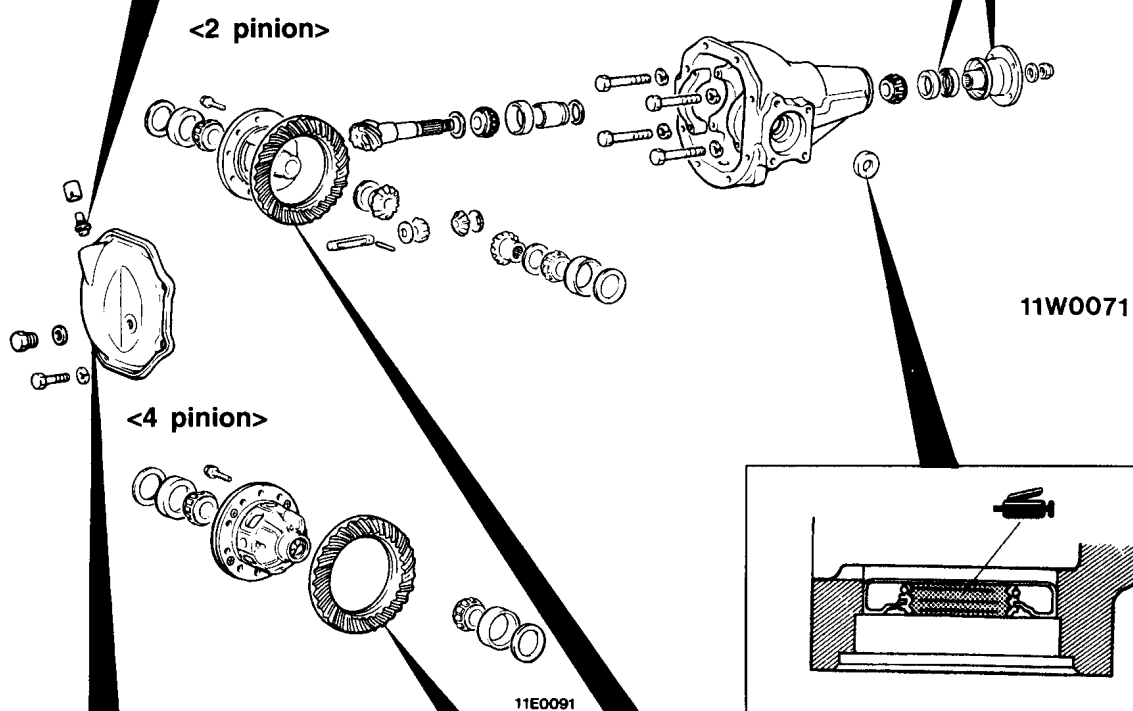
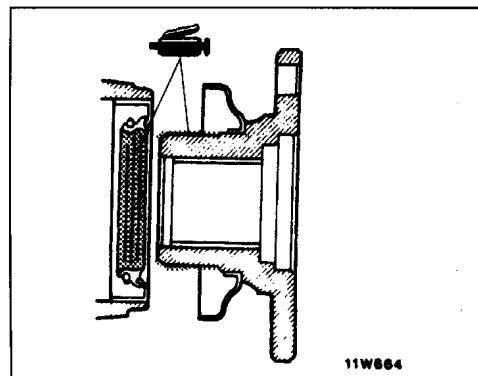
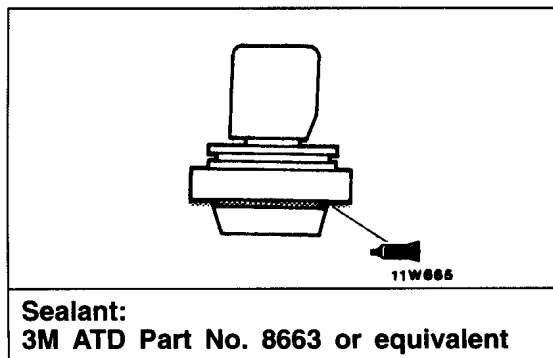
### ◀I▶ DRIVE PINION FRONT BEARING OUTER RACE REMOVAL

**120002205**

00000818

	1. Vent plug		17. Self-locking nut
	2. Plug cover		18. Differential case
	3. Gear carrier		19. Side gear spacer
▶A◀	4. Oil seal		20. Side gear
▶B◀	5. Drive pinion front bearing outer race		21. Pinion washer
▶C◀	6. Drive pinion rear bearing outer race	▶F◀	• Differential gear backlash adjustment <2 pinion>
▶D◀	• Pinion height adjustment		23. Pinion shaft
	7. Drive pinion	▶G◀	24. Lock pin
	8. Drive pinion front shim (for pinion height adjustment)	▶H◀	25. Drive gear
	9. Drive pinion front bearing inner race	▶I◀	26. Side bearing inner race
▶E◀	• Drive pinion turning torque adjustment		27. Side bearing outer race
	10. Drive pinion rear bearing inner race	▶J◀	• Drive gear backlash adjustment
	11. Oil seal		28. Side bearing adjusting spacer
	12. Drive pinion rear shim (for turning torque adjustment)		29. Differential case assembly
	13. Drive pinion spacer		30. Bearing cap
	14. Drive pinion assembly		31. Cover
	15. Companion flange		
	16. Washer		

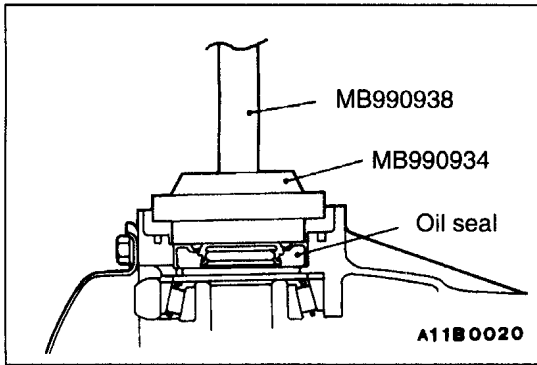
## Lubrication, Sealing and Adhesive Points



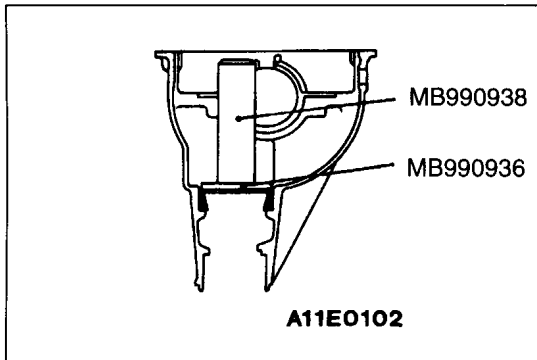


## REASSEMBLY SERVICE POINTS

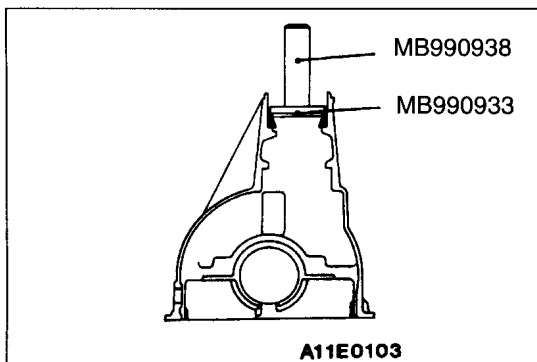
### ►A◄ OIL SEAL INSTALLATION



### ►B◄ DRIVE PINION FRONT BEARING OUTER RACE INSTALLATION



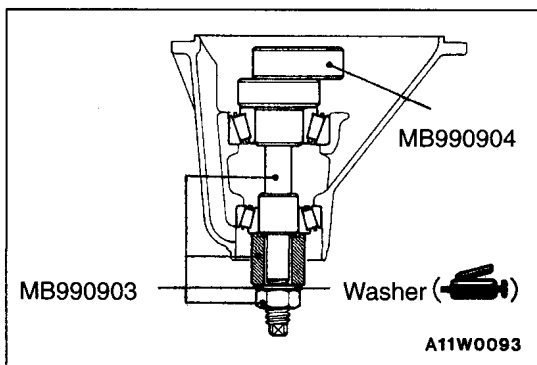
### ►C◄ DRIVE PINION REAR BEARING OUTER RACE INSTALLATION



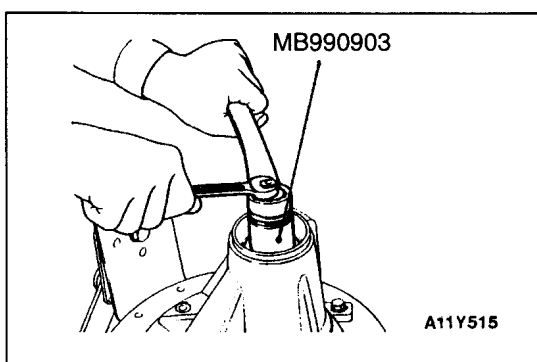
### ►D◄ PINION HEIGHT ADJUSTMENT

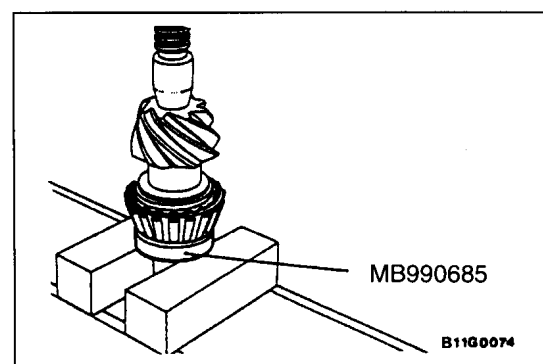
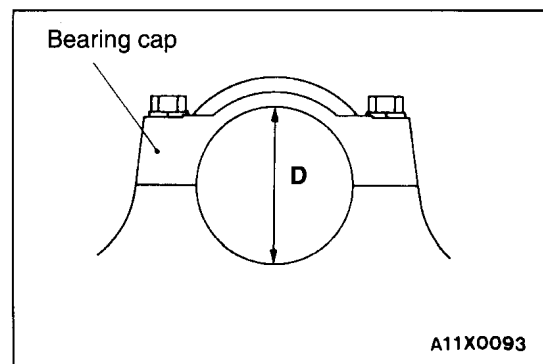
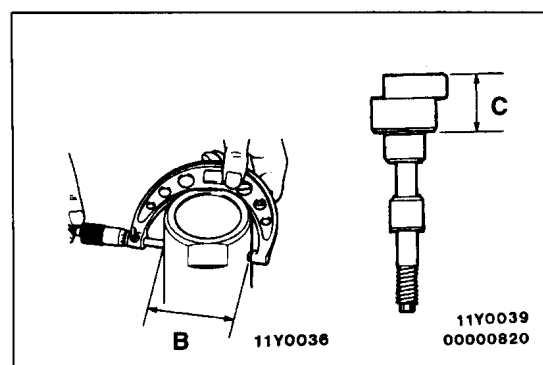
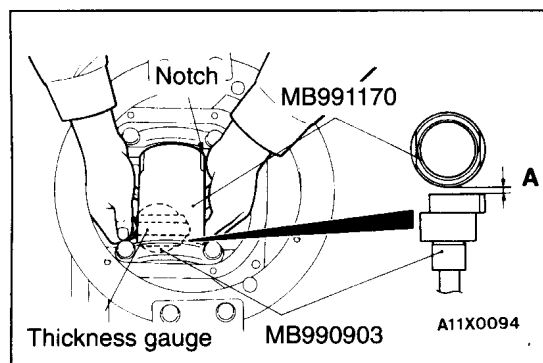
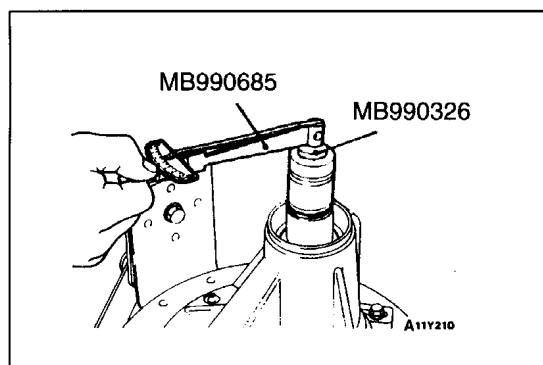
Adjust the drive pinion height by the following procedures.

- (1) Apply multipurpose grease to the washer of the special tool.
- (2) Install the special tool, drive pinion front and rear bearing inner races to the gear carrier.



- (3) Tighten the nut of the special tool while measuring the rotation torque of the drive pinion. Carefully tighten the nut of the special tool until the rotation torque of the drive pinion (without oil seal) reaches at the standard value.



**Standard value:**

Bearing division	Bearing lubrication	Rotation torque
New	None (With anti-rust agent)	0.5–0.7 Nm
New or reusing	Gear oil applied	0.3–0.4 Nm

**NOTE**

The special tool cannot be turned a full revolution, so turn it several times within the range of movement to run in the bearing, and then measure the rotation torque.

- (4) Clean the side bearing hub.
- (5) Install the special tools to the side bearing hub of the gear carrier, and then install the bearing cap.

**NOTE**

Always check that the notch is in the shown position and that the special tools are touching firmly against the side bearing hub.

- (6) Use a thickness gauge to measure the clearance (A) between the special tools.
- (7) Remove the special tools (MB991170, MB990903).
- (8) Use a micrometer to measure the special tool in the places (B, C) shown in the illustration.

- (9) Install the bearing cap, and then use a cylinder gauge and micrometer to measure the inside diameter (D) of the bearing cap as shown in the illustration.
- (10) Calculate the thickness (E) of the required drive pinion rear shim by the following formula, and then select a spacer which most closely matches this thickness.

$$E = A + B + C - 1/2D - 91.0$$

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

# ►E◄ DRIVE PINION TURNING TORQUE ADJUSTMENT

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

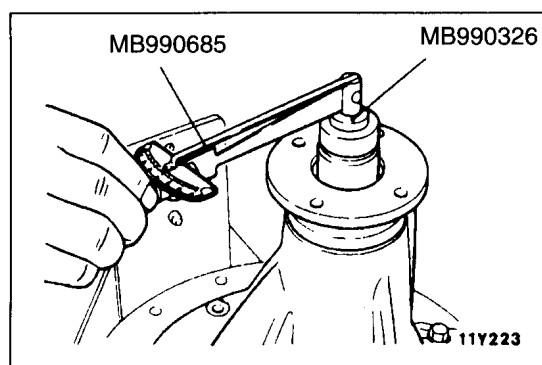
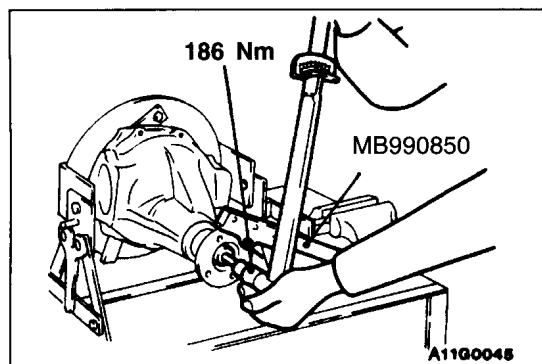
## Without Oil Seal

- (1) Insert the drive pinion into the gear carrier, and then install, from the front side of the carrier, then install the drive pinion spacer, drive pinion rear shim, drive pinion rear bearing inner race, and companion flange in that order.

### NOTE

Do not install the oil seal.

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



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

### Standard value:

Bearing division	Bearing lubrication	Rotation torque
New	None (With anti-rust agent)	0.3–0.5 Nm
New/reusing	Gear oil applied	0.15–0.25 Nm

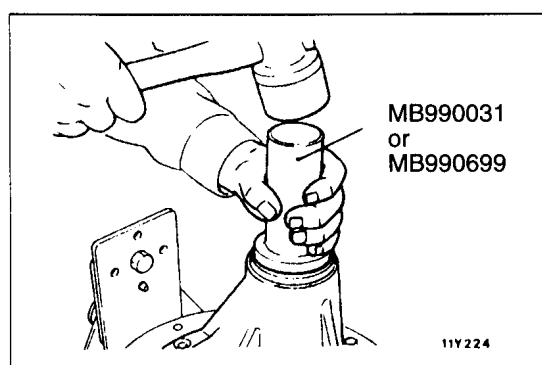
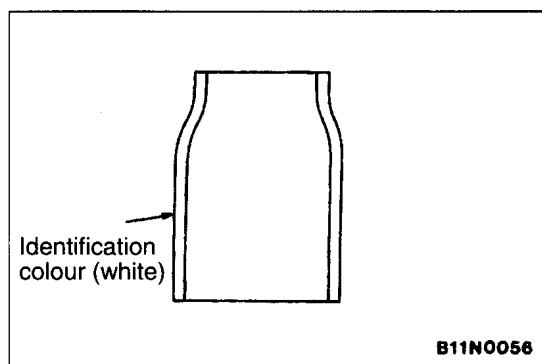
- (4) If the drive pinion rotation torque is not within the range of the standard value, adjust the preload by replacing the drive pinion front shim(s) or the drive pinion spacer.

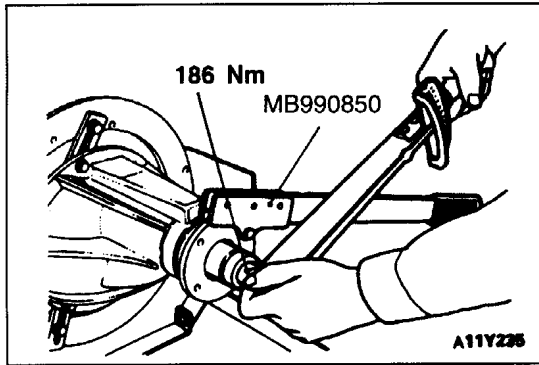
### NOTE

When selecting the drive pinion rear shims, if the number of shims is large, reduce the number of shims to a minimum by selecting the drive pinion spacers. Also, select the drive pinion spacer from the following two types.

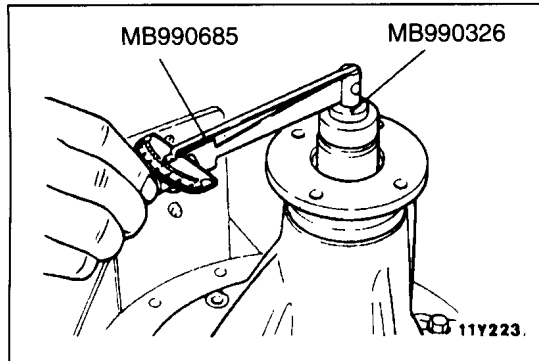
Drive pinion height (mm)	Identification colour
46.67	White
47.01	—

- (5) Remove the companion flange and drive pinion again. Then, after inserting the drive pinion rear bearing inner race into the gear carrier, use the special tool to press-fit the oil seal.





- (6) 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.

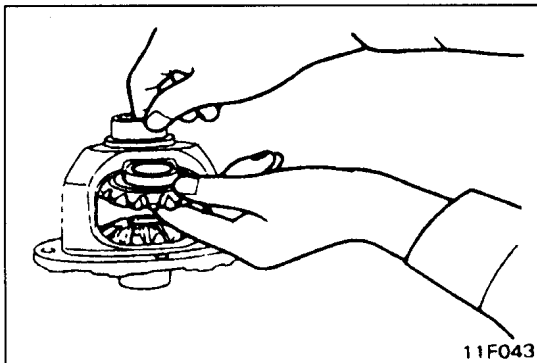


- (7) Measure the drive pinion rotation torque (with the oil seal) by using the special tools.

**Standard value:**

Bearing division	Bearing lubrication	Rotation torque
New	None (With anti-rust agent)	0.5–0.7 Nm
New/reusing	Gear oil applied	0.3–0.4 Nm

- (8) If the drive pinion rotation torque is not within the standard value, check the tightening torque of the companion flange self-locking nut and the oil seal.

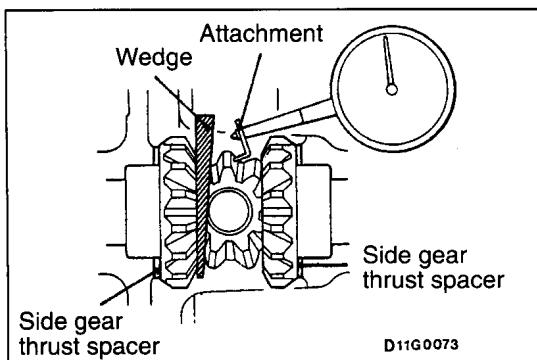


**►F◀ DIFFERENTIAL GEAR BACKLASH ADJUSTMENT  
<2 PINION>**

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.



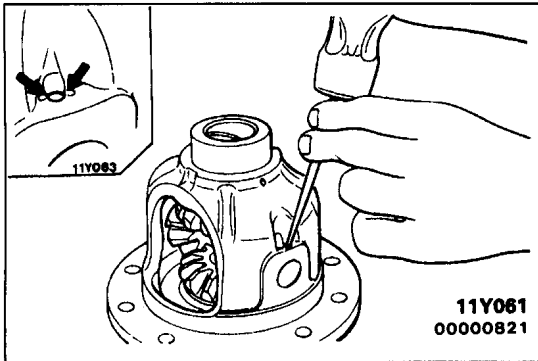
3. Insert a wedge between the side gear and the pinion shaft to lock the side gear.
4. Measure the differential gear backlash with a dial indicator on the pinion gear.

**Standard value: 0–0.076 mm**

**Limit: 0.2 mm**

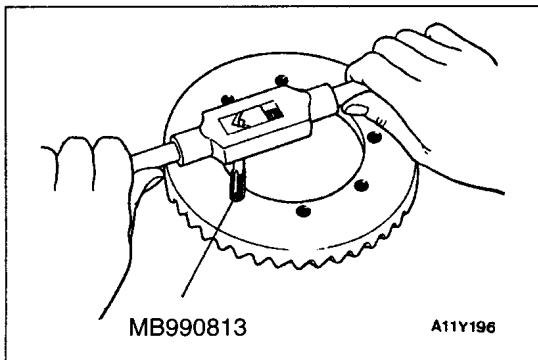
5. If the differential gear backlash exceeds the limit, adjust the backlash by installing thicker side gear spacers.

6. If adjustment is not possible, replace the side gears and pinion gears as a set.
7. Measure the differential gear backlash once again, and confirm that it is within the limit. If adjustment is not possible, replace the side gears and pinion gears as a set.



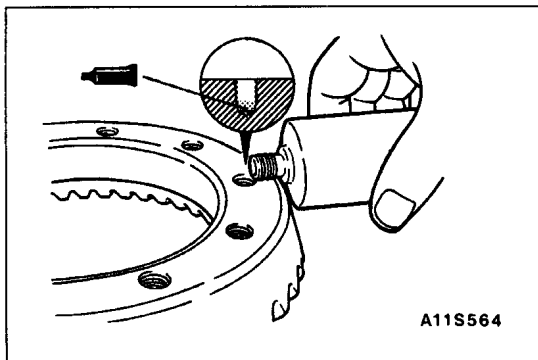
#### ►G◄ LOCK PIN INSTALLATION

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.



#### ►H◄ DRIVE GEAR INSTALLATION

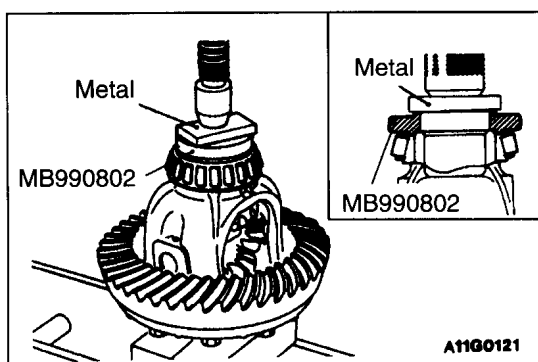
1. Clean the drive gear attaching bolts.
2. Remove the adhesive adhered to the threaded holes of the drive gear by using the special tool (tap M10 x 1.25), and then clean the threaded holes by applying compressed air.



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

**Specified adhesive: 3M Stud Locking 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 in a diagonal sequence.



#### ►I◄ SIDE BEARING INNER RACE INSTALLATION

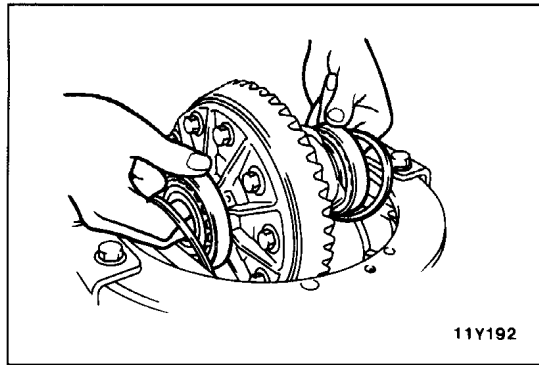
### ►J◄ DRIVE GEAR BACKLASH ADJUSTMENT

Adjust the drive gear backlash by the following procedures:

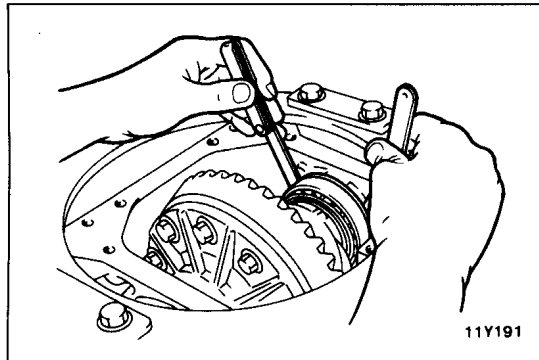
- (1) Install the side bearing spacers, which are thinner than those removed, to the side bearing outer races, and then mount the differential case assembly into the gear carrier.

#### NOTE

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

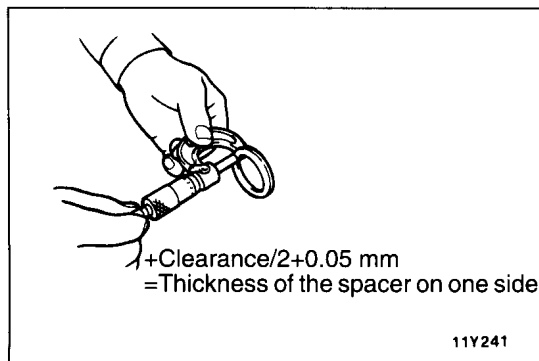


11Y192



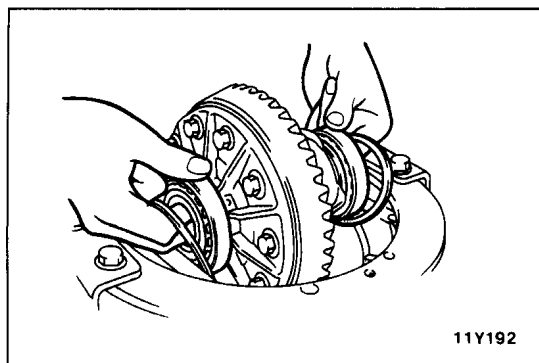
11Y191

- (2) Push the differential case assembly to one side, and measure the clearance between the gear carrier and the side bearing adjusting spacer with a thickness gauge.



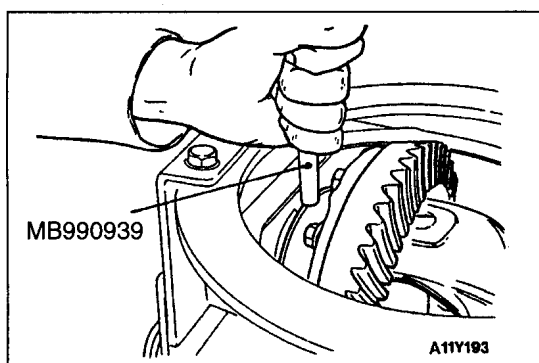
11Y241

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



11Y192

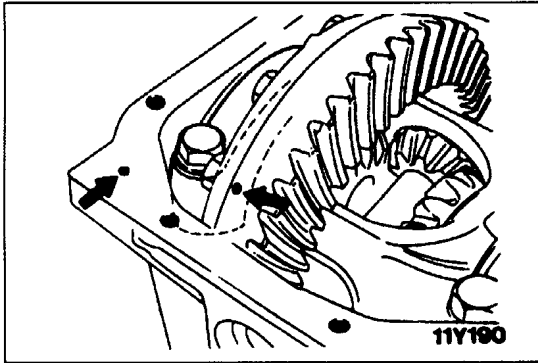
- (4) Install the side bearing adjusting spacers and differential case assembly, as shown in the illustration, to the gear carrier.



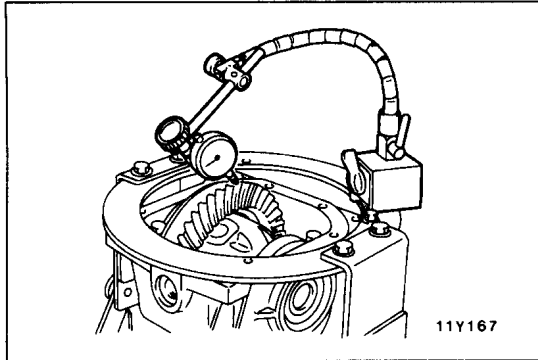
MB990939

A11Y193

- (5) Tap the side bearing adjusting spacers with the special tool 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.

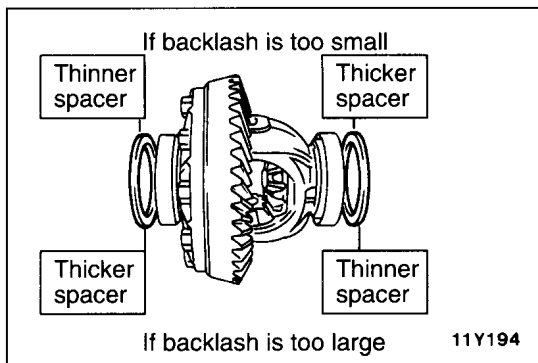


- (7) With the drive pinion locked in place, measure the drive gear backlash with a dial indicator on the drive gear.

**NOTE**

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

**Standard value: 0.11–0.16 mm**

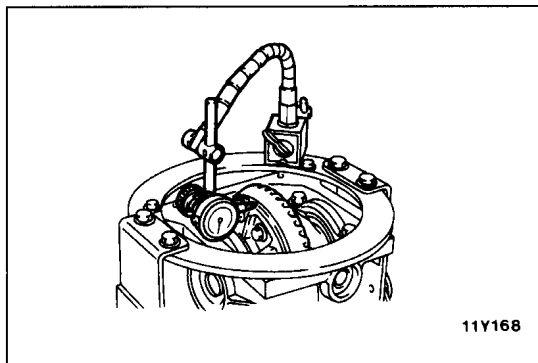


- (8) Change the side bearing adjusting spacers as illustrated, and then adjust the drive gear backlash between the drive gear and the drive pinion.

**NOTE**

When increasing the number of side bearing adjusting 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.26-42.)



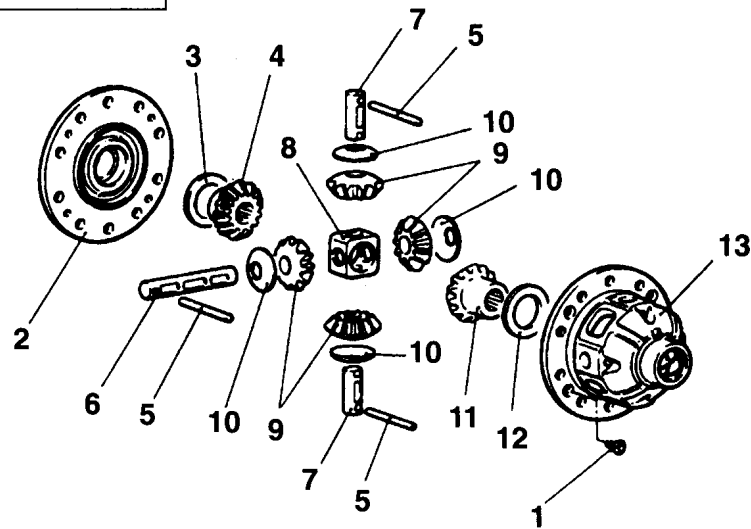
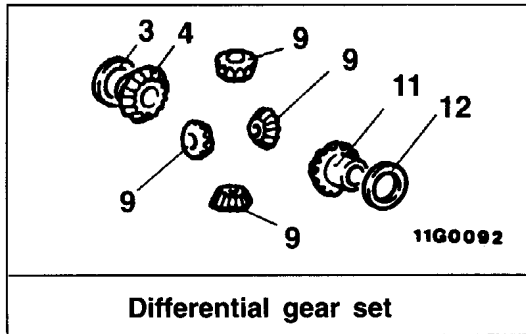
- (10) Measure the drive gear runout at the shoulder on the reverse side of the drive gear.

**Limit: 0.05 mm**

- (11) If the drive gear runout exceeds the limit, reinstall by changing the phase of the drive gear and differential case, and remeasure.  
(12) If adjustment is not possible, replace the differential case or replace the drive gear and drive pinion as a set.

## OVERHAUL (4 PINION CASE ASSEMBLY)

120000195



**11G0011**  
00000822

**Disassembly steps**

◀A▶

1. Screw
2. Case A
3. Side gear spacer (R.H.)
4. Side gear (R.H.)

▶B◀

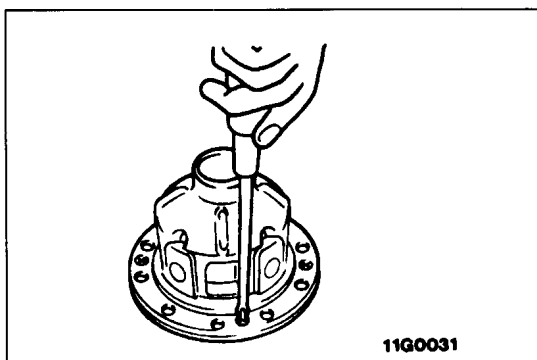
- Backlash adjustment on differential gear case A side

◀B▶

- Differential gear backlash check
5. Lock pin
  6. Pinion shaft-A
  7. Pinion shaft-B
  8. Pinion shaft holder
  9. Pinion gear
  10. Washer
  11. Side gear (L.H.)
  12. Side gear spacer (L.H.)

▶A◀

- Backlash adjustment on differential gear case B side
13. Case B

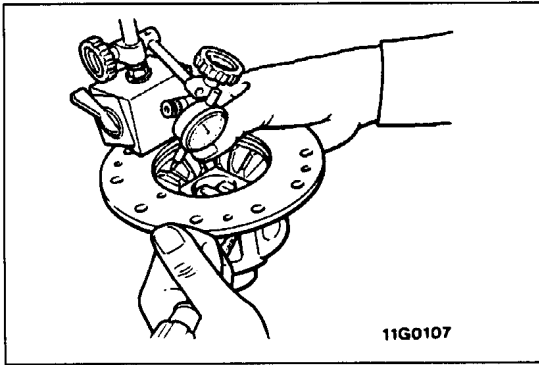
**DISASSEMBLY SERVICE POINTS****◀A▶ SCREW REMOVAL**

1. Evenly loosen 4 screws on case A and B to remove.
2. Set case B downward and remove case A, side gear spacer (R.H.) and side gear (R.H.).

**NOTE**

Check differential gear backlash to determine necessity of disassembling side gear (R.H.) and onward.





### ◀B▶ DIFFERENTIAL GEAR BACKLASH CHECK

Check differential gear backlash as follows.

- (1) Insert cloth wrapped screwdriver through side of case B and lock side gear (L.H.) and pinion gear. (one piece)
- (2) Contact dial gauge on pinion gear facing the locked pinion gear and measure backlash within the standard value.

#### NOTE

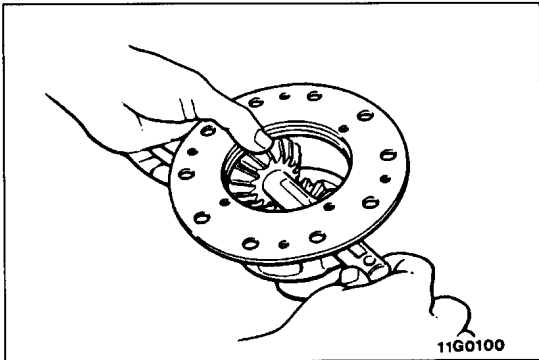
Measure 2 pinion gears.

**Standard value: 0.01–0.25 mm**

- (3) When backlash exceeds the standard value, adjust side gear spacer (L.H.).

#### NOTE

If backlash is within the standard value, assure appropriate gear spacer (R.H.) thickness and assemble 4 pinion case assembly.



### REASSEMBLY SERVICE POINTS

#### ▶A◀ BACKLASH ADJUSTMENT ON DIFFERENTIAL GEAR CASE B SIDE

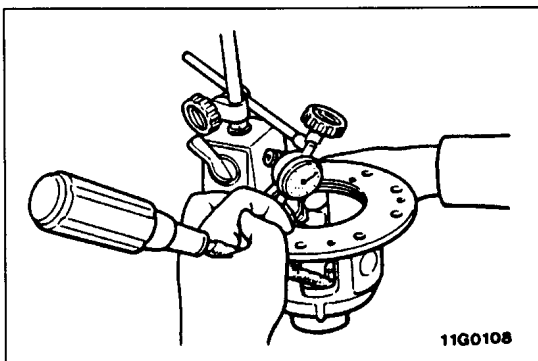
Adjust backlash on differential gear case B side as follows.

- (1) Temporarily install side gear spacer (L.H.), side gear (L.H.), washers, 2 pinion gears and pinion shaft A on case B.

#### NOTE

Do not assemble pinion shaft holder, pinion shaft-B or the remaining pinion gears (2).

- (2) Insert wrapped screwdriver through side of case B to lock one side of pinion gear and side gear (L.H.).



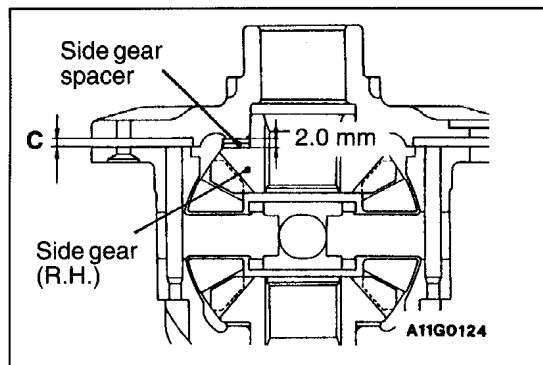
- (3) Place dial gauge on unlocked pinion gear and measure differential gear backlash within the standard value.

#### NOTE

Measure 2 pinion gears.

**Standard value: 0.01–0.25 mm**

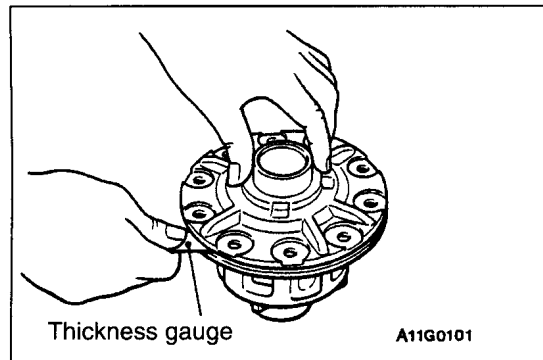
- (4) When backlash exceeds the standard value, adjust with selected side gear spacer (L.H.).
- (5) Install washers, pinion gears, pinion shaft holder and pinion shaft-A and B. Lock with lock pin through case B.



### ►B◄ BACKLASH ADJUSTMENT ON DIFFERENTIAL GEAR CASE A SIDE

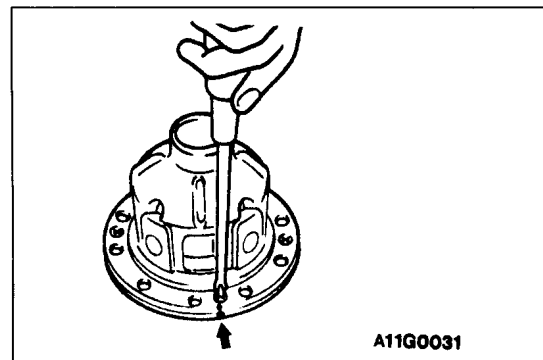
Adjust backlash as follows.

- (1) Install side gear (R.H.) and 2 side gear spacers (1.0 mm thick). Press differential case A to differential case B.



- (2) Measure flange space (C) between differential case A and B with thickness gauge.
- (3) Calculate side gear spacer (R.H.) thickness (D) as follows:  

$$D = 2.0 \text{ mm} - (C + 0.2 \text{ mm})$$
- (4) Choose spacer with a thickness nearest D in (3) and adjust differential gear backlash on the right side.



- (5) Align the mating marks and assemble cases A and B.
- (6) Check the inner shaft for smooth rotation.

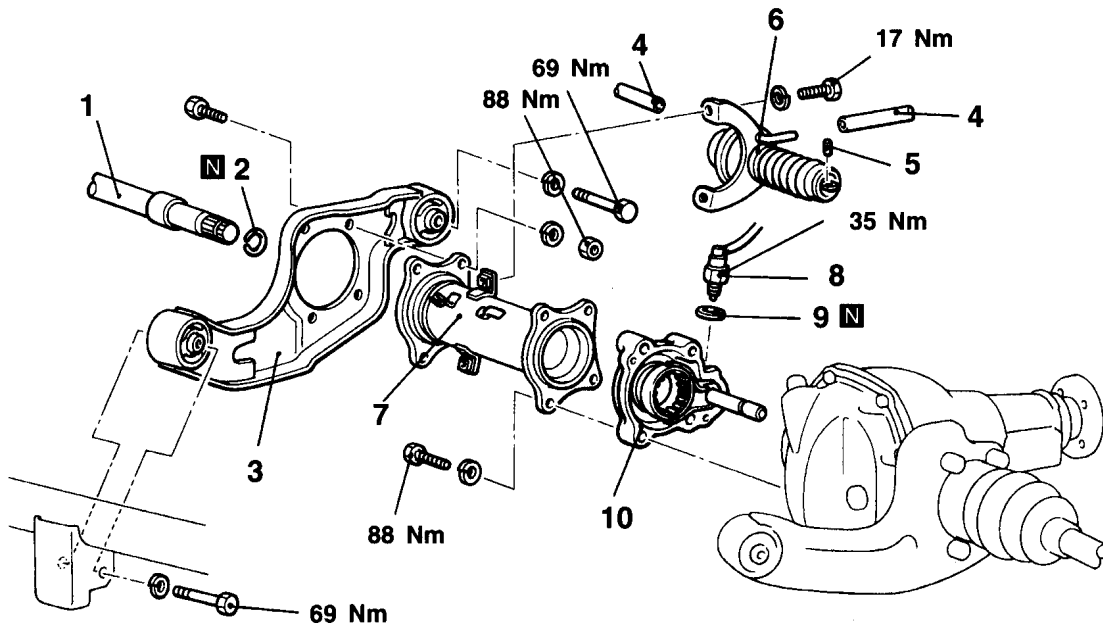
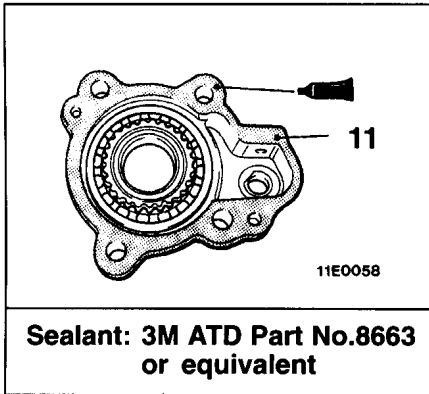
# FREE-WHEELING CLUTCH

120002206

## REMOVAL AND INSTALLATION

### Pre-removal and Post-Installation Operations

- (1) Removal and Installation of Under Cover  
(Refer to GROUP 42 – Under Cover.)
- (2) Draining and Supplying of Gear Oil (Refer to P.26-10.)

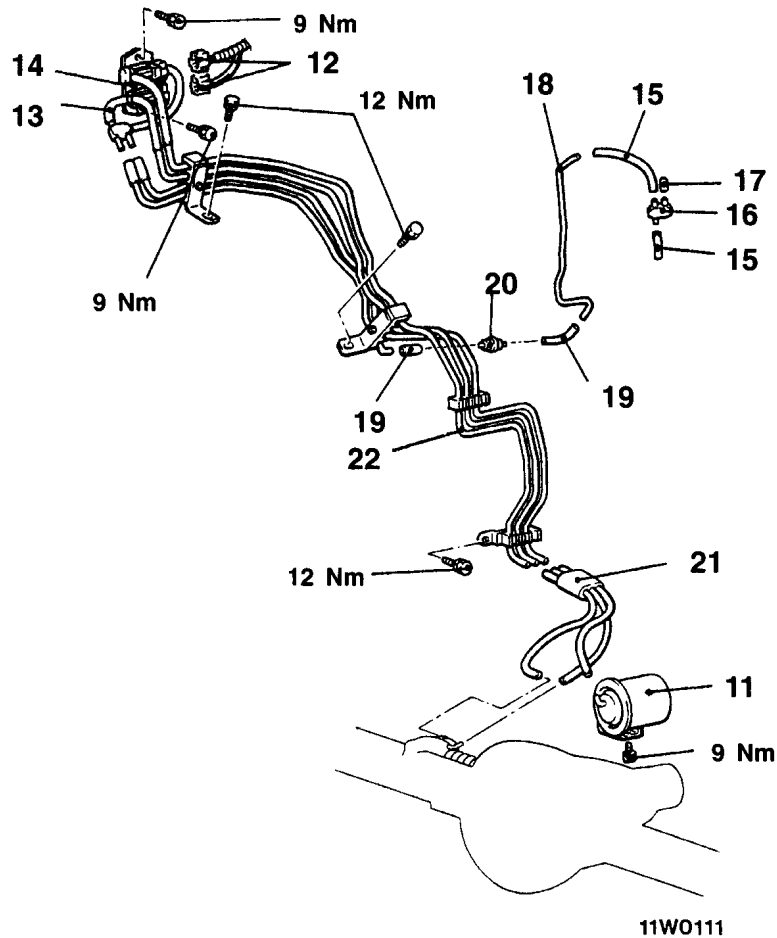


11W0102

00000823

### Free-wheeling clutch removal steps

- |   |   |
|---|---|
| <p>►E◄</p> <ol style="list-style-type: none"> <li>1. Inner shaft (Refer to P.26-35.)</li> <li>2. Circlip</li> <li>3. Differential mounting bracket (L.H.)</li> <li>4. Vacuum hose</li> <li>5. Pin</li> <li>6. Actuator assembly</li> <li>7. Housing tube</li> </ol> | <p>►D◄</p> <ol style="list-style-type: none"> <li>8. Free-wheeling engage switch</li> <li>9. Gasket</li> <li>10. Free-wheeling clutch assembly</li> <li>• Clutch gear bearing axial play inspection</li> <li>11. Vacuum tank</li> </ol> |
|---|---|







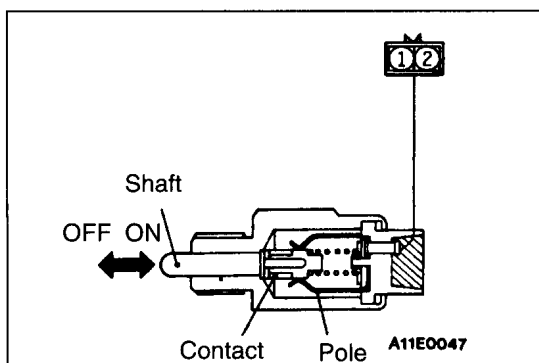
## Solenoid valve assembly removal

12. Solenoid valve connector  
13. Vacuum hose  
▶C◀ 14. Solenoid valve assembly

### Vacuum pipe assembly removal steps



15. Vacuum hose (Vehicles with 4D56)
16. Vacuum terminal (Vehicles with 4D56)
17. Cap (Vehicles with 4D56)
18. Vacuum pipe

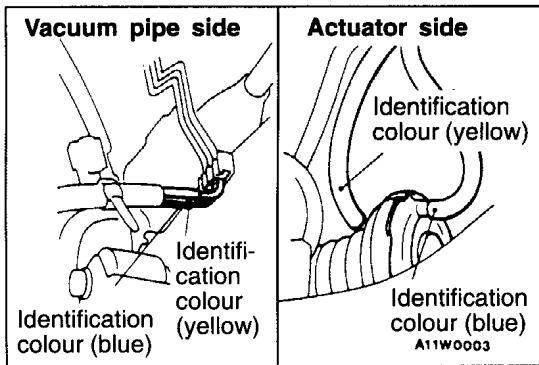
-  19. Vacuum hose  
 20. Check valve  
 21. Vacuum hose  
 22. Vacuum pipe assembly



## INSPECTION

## FREE-WHEELING ENGAGE SWITCH

Shaft (switch) position	Terminal No.1	Terminal No.2
Pressed (ON)		
Released (OFF)		



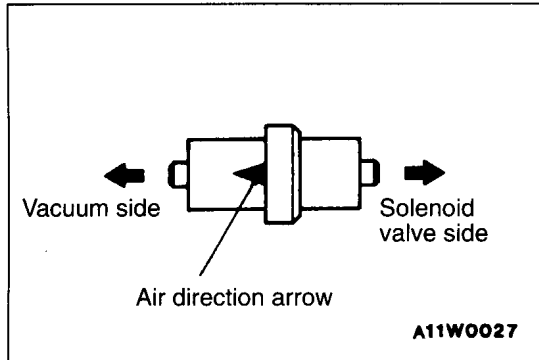
## INSTALLATION SERVICE POINTS

### ►A◀ VACUUM PIPE ASSEMBLY / VACUUM HOSE INSTALLATION

Install the vacuum hoses so that the identification colours of the vacuum pipe assembly match those of the actuators. Note that there is no identification colour for the vacuum hose which is to be connected to the vacuum tank.

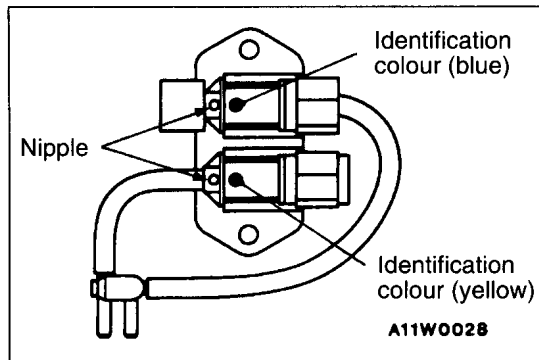
### ►B◀ CHECK VALVE INSTALLATION

Install so that the air direction arrow points to the vacuum side.



### ►C◀ SOLENOID VALVE ASSEMBLY INSTALLATION

Install so that the identification colours of the vacuum hoses match those of the solenoid valve assembly.



### ►D◀ CLUTCH GEAR BEARING AXIAL PLAY INSPECTION

Check the axial play of the clutch gear bearing by the following procedure before installing the free-wheeling clutch assembly.

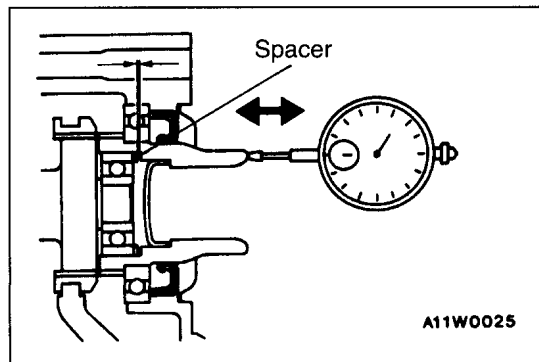
- (1) Insert flat washers of the same thickness as the housing tube (9.0 mm) onto the bolt, and then provisionally install the free-wheeling clutch assembly to the front differential.
- (2) Place a dial gauge against the end of the clutch gear and check the axial play of the clutch gear bearing.

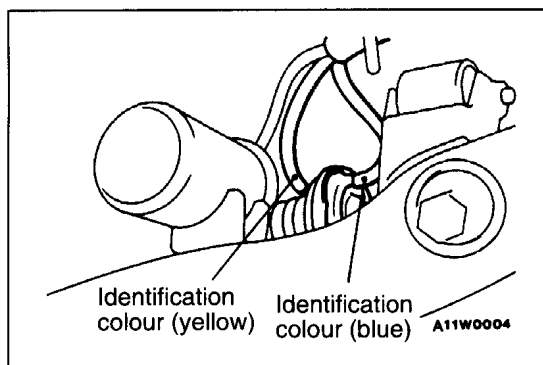
**Standard value: 0.05–0.30 mm**

- (3) If the axial play of the clutch gear bearing is not within the standard value, disassemble the bearing and insert a spacer of the appropriate thickness.

#### NOTE

The thicknesses of the spacers vary in steps of 0.25 mm.



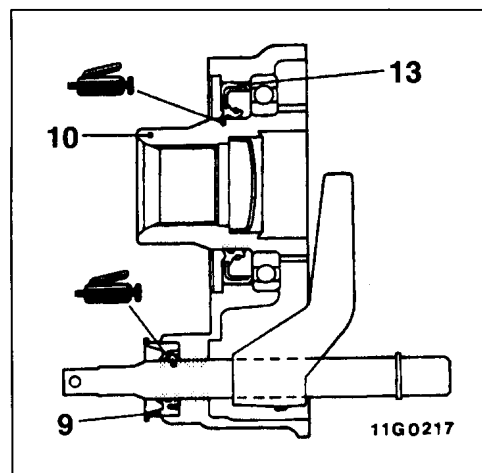
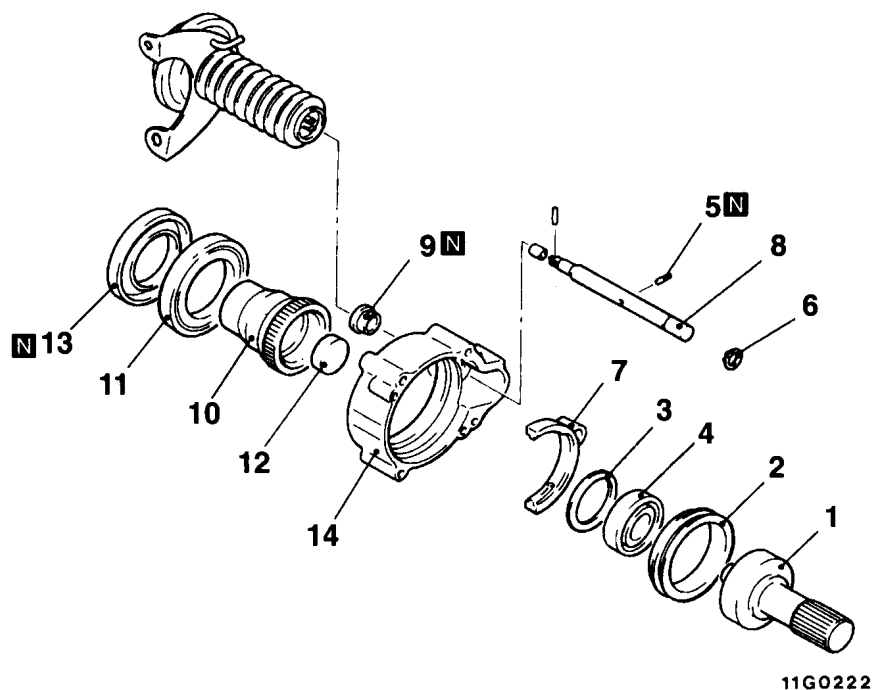


### ►E◄ VACUUM HOSE INSTALLATION

Connect the vacuum hoses so that the identification colours match those of the actuator assembly nipples.

## DISASSEMBLY AND REASSEMBLY

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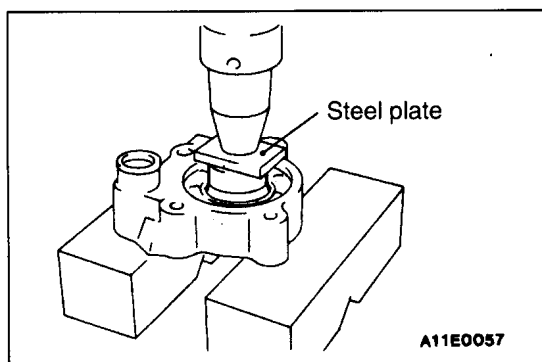


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### Removal steps

- E◄
1. Main shaft
  2. Clutch sleeve
  3. Spacer
  4. Bearing
  5. Spring pin
  6. Snap ring

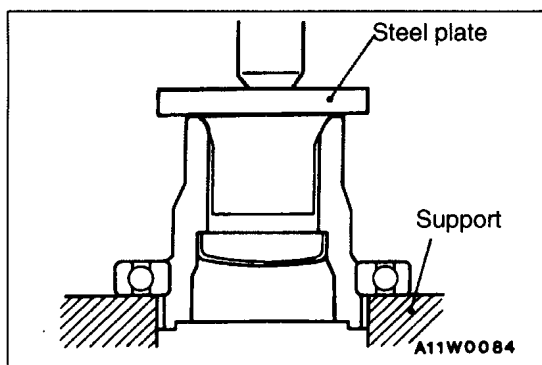
- D◄
- ◄A►
- ◄B►
- C◄
- B◄
- A◄
7. Shift fork
  8. Shift rod
  9. Oil seal
  10. Clutch gear
  11. Bearing
  12. Cap
  13. Oil seal
  14. Clutch housing



## DISASSEMBLY SERVICE POINTS

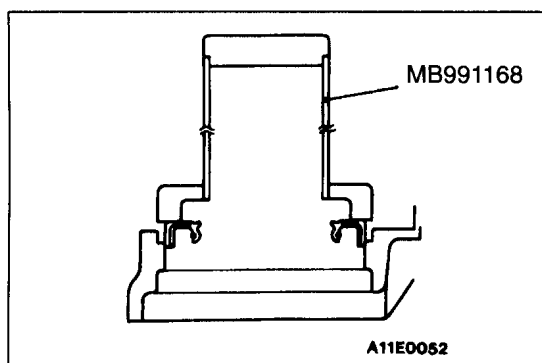
### ◄A► CLUTCH GEAR REMOVAL

Use a press and steel plate to remove the clutch gear and bearing together.



## ◀B▶ BEARING REMOVAL

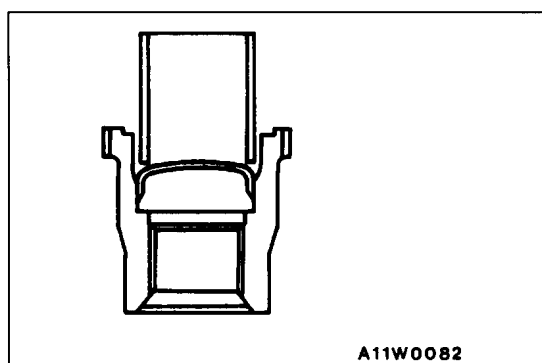
Use a press to hold the supports against the bearing inner race, and separate the clutch gear and bearing.



## REASSEMBLY SERVICE POINTS

### ▶A◀ OIL SEAL INSTALLATION

Use the special tool to tap the oil seal until it is flush with the clutch housing.

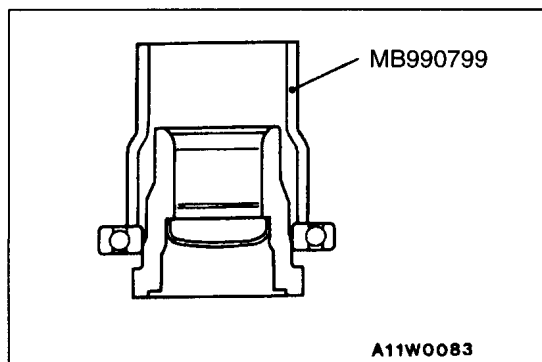


### ▶B◀ CAP INSTALLATION

Use an iron bar with an outside diameter of approximate 30–35 mm to push in the sealing cap.

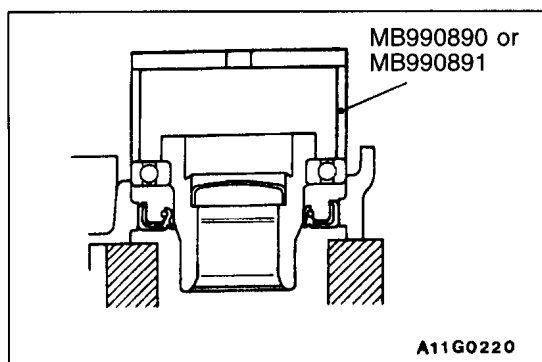
#### Caution

Be careful not to make a dent in the curved surface of the cylinder cap.



### ▶C◀ BEARING INSTALLATION

1. Use the special tool to press-fit the bearing to the shoulder of the clutch gear.

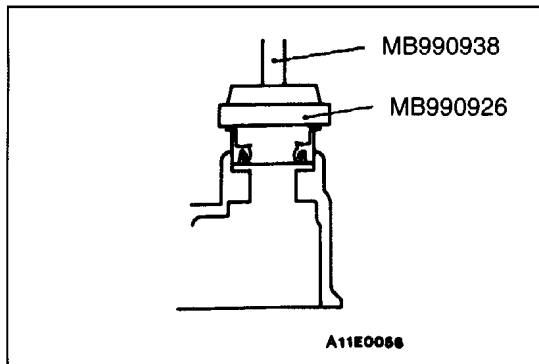


2. Use the special tool to press-fit the bearing to the side of the clutch housing.

#### Caution

Place the special tool against the outer race of the bearing.

## ►D◄ OIL SEAL INSTALLATION



## ►E◄ BEARING INSTALLATION

Use the special tool to press-fit the bearing until it is flush with the clutch gear (surface A).

