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This file was not scanned to deprive Mazda of any money – it was scanned due to the rareness of the original manuals and the overwhelming need of the RX-7 owner to have this information so that they can accurately troubleshoot problems. Perhaps if Mazda's dealerships could support the Rotary Engine it wouldn't be so necessary for the owners to do so.



Many thanks to Anh Diep for scanning this file.

# FRONT AND REAR AXLES

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# 9 OUTLINE

## OUTLINE

### SPECIFICATIONS

<b>Front axle</b>				
Bearing play axial direction		mm (in)	0 (0)	
Bearing preload	Pull scale reading	N (kg, lb)	3.9—9.8 (0.4—1.0, 0.9—2.2)	
<b>Rear axle</b>				
Bearing end play		mm (in)	0.1 (0.004)	
<b>Differential</b>				
Reduction gear		Hypoid gear		
Differential gear		Straight bevel gear		
Reduction ratio		(A/T)	4.100 (3.909)	
Number of teeth	Ring gear		(A/T) 41 (43)	
	Drive pinion gear		(A/T) 10 (11)	
Rear axle oil	Standard diff.	Grade		API GL-5
		Viscosity	Above -18°C (0°F)	SAE 90
			Below -18°C (0°F)	SAE 80W
	Amount: liters (U.S. qts., Imp. qts)		1.3 (1.4, 1.1)	
	LSD	Grade		API GL-5 Special lubricant for LSD
		Viscosity		SAE 90
Amount: liters (U.S. qts., Imp. qts)		1.3 (1.4, 1.1)		
<b>Driveshaft</b>				
Type		Constant velocity joint		

67U09X-002

## TROUBLESHOOTING GUIDE

### Front Axle

Problem	Possible Cause	Remedy	Page
<b>Steering wheel vibration</b>	Improperly adjusted wheel bearing	Adjust	9— 4
	Worn or damaged wheel bearing	Replace	9— 7
<b>Pulls or one-sided braking</b>	Improperly adjusted wheel bearing	Adjust	9— 4
	Worn or damaged wheel bearing	Replace	9— 7
<b>Excessive steering wheel play</b>	Improperly adjusted wheel bearing	Adjust	9— 4

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**Rear Axle**

Problem	Possible Cause	Remedy	Page
<b>Abnormal noise</b>	Bent bearing housing	Replace	—
	Bent driveshaft	Replace	9—19
	Worn or damaged wheel bearing	Replace	9—14
	Worn driveshaft spline	Replace	9—19
<b>Oil leakage</b>	Worn or damaged oil seal	Replace	9—13

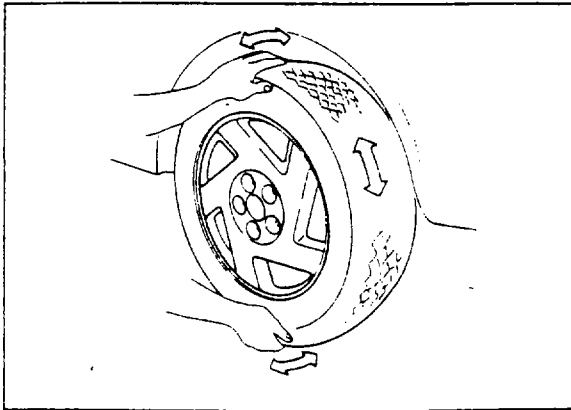
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**Differential**

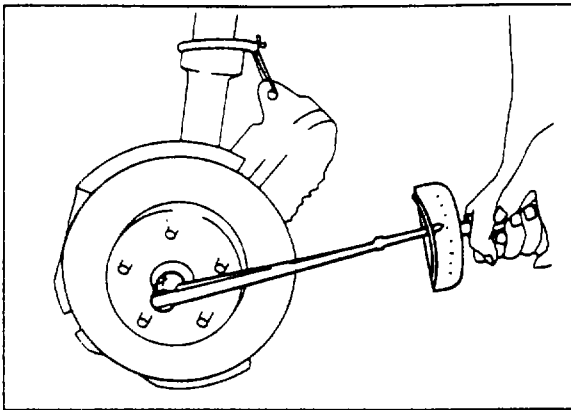
Problem	Possible Cause	Remedy	Page
<b>Abnormal noise</b>	Insufficient differential oil	Add oil	—
	Incorrect differential oil	Replace	—
	Improperly adjusted ring gear backlash	Adjust	9—43
	Poor contact of ring gear teeth	Adjust	9—44
	Worn or damaged side bearing	Replace	9—32
	Worn or damaged ring gear	Replace	9—32
	Worn or damaged drive pinion bearing	Replace	9—32
	Worn or damaged pinion and side gear	Replace	9—32
	Seizure of side gear and case	Replace	9—32
	Worn side gear spline	Replace	9—32
	Worn pinion shaft	Replace	9—32
	Loose companion flange nut	Tighten	9—36
	Worn thrust washer	Replace	9—33
	Improperly adjusted side bearing preload	Adjust	9—43
	Improperly adjusted drive pinion bearing preload	Adjust	9—36
Worn spline output shaft spline	Replace	9—33	
<b>Heat build-up</b>	Insufficient differential oil	Add oil	—
	Insufficient gear backlash	Adjust	9—38, 43
	Excessive bearing preload	Adjust	9—36
<b>Oil leakage</b>	Excessive differential oil	Remove oil	—
	Clogged air breather	Repair	—
	Poorly tightened differential carrier	Tighten or repair	9—45
	Worn or damaged oil seal	Replace	9—22, 23
<b>No differential operation</b>	Misassembled friction disc plate or conical spring	Repair	9—38
	Incorrect clearance No. 1	Adjust	9—39
<b>No LSD operation</b>	Insufficient differential oil	Replace	—
	Misassembled friction disc plate, conical spring	Repair	9—38
	Excessive clearance No. 1	Adjust	9—39
	Worn friction disc plate, conical spring or pressure ring	Replace	9—33

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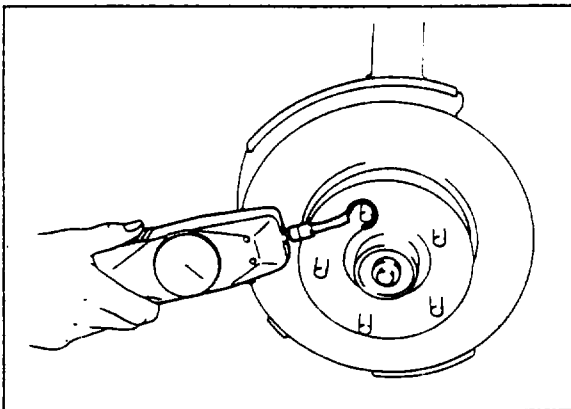
## 9 FRONT AXLE



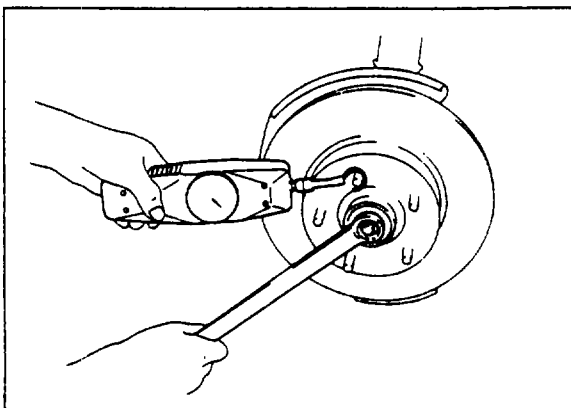
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67U09X-008



67U09X-009

## FRONT AXLE

### WHEEL BEARING PLAY

#### Inspection

1. Jack up the vehicle and support it with safety stands. Check if there is noticeable bearing play with the hands held at the top and bottom of the tire.

**Axial play: 0 mm (0 in)**

2. Check whether the tire rotates smoothly when rotated, and whether there is a rough feeling or abnormal noise from the bearing.
3. Replace the wheel bearing or adjust the wheel bearing preload, if necessary.

#### Adjustment

1. Remove the wheel and tire.
2. Remove the disc brake caliper assembly, and suspend it using a rope.
3. Remove the hub cap, the cotter pin, and remove the set cover.
4. Loosen the lock nut.
5. Tighten the lock nut and turn the hub 2 or 3 times to seat the bearing.

#### Tightening torque:

**20—29 N·m (2.0—3.0 m·kg, 14—22 ft·lb)**

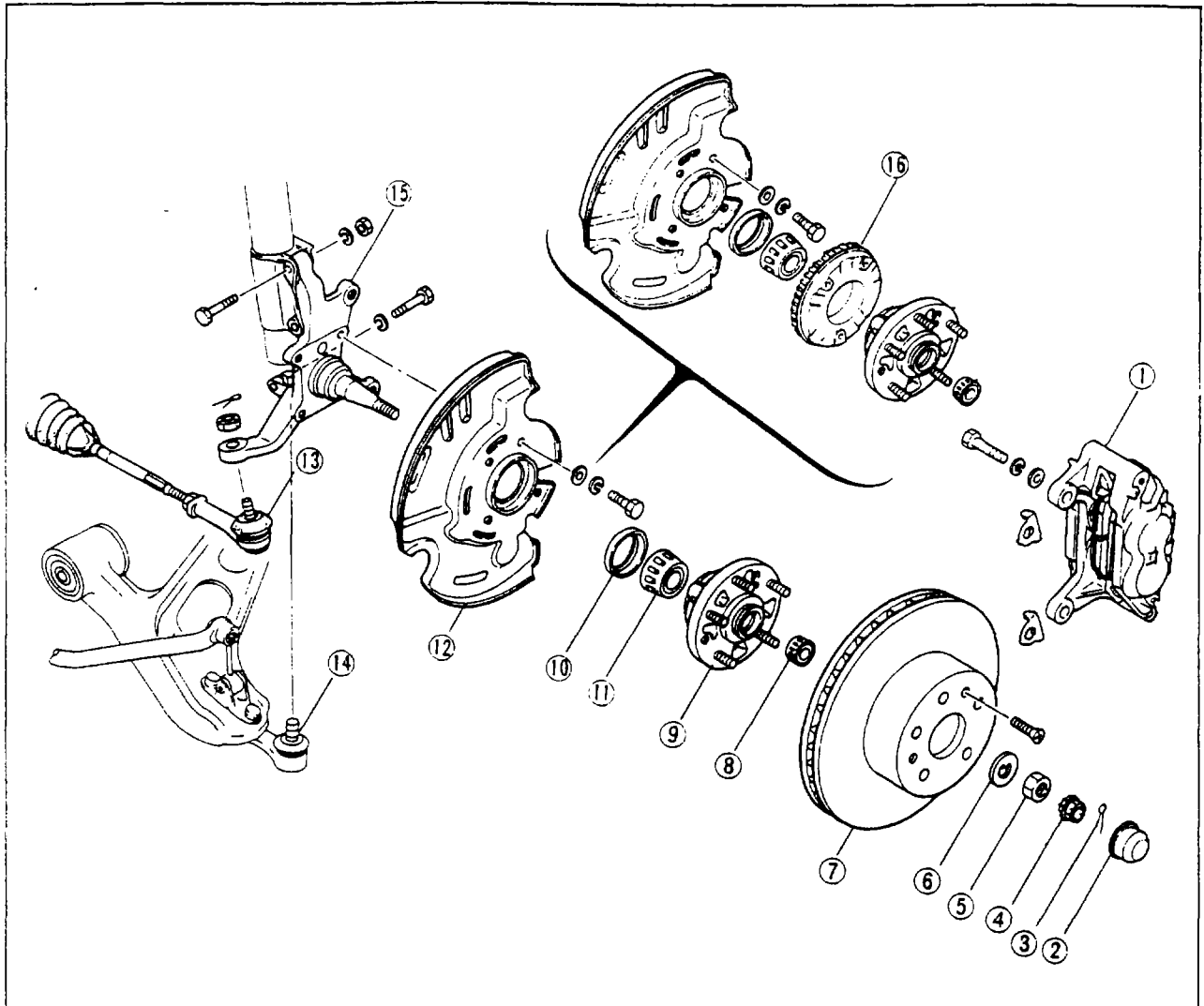
6. Loosen the lock nut until it can be turned by hand.
7. Attach a pull scale to a wheel lug bolt and measure the frictional force.

8. Tighten the lock nut until the reading (initial turning torque) reaches the specified amount. Insert set cover, and secure with a cotter pin.

#### Preload: Frictional force plus

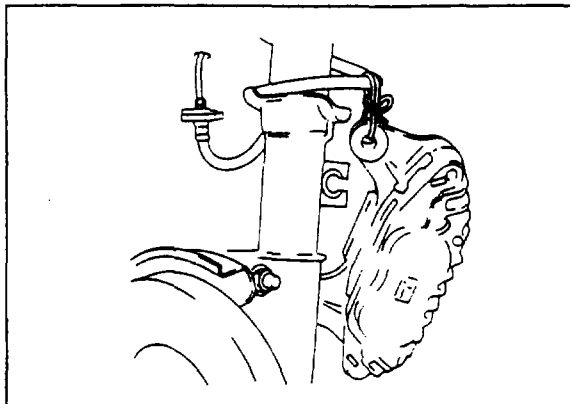
**3.9—9.8 N (0.4—1.0 kg, 0.9—2.2 lb)**

## REMOVAL



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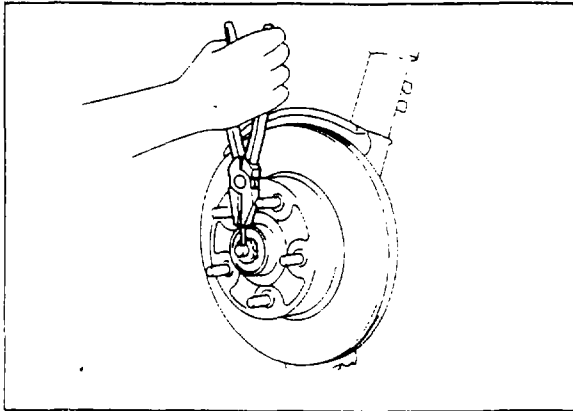
- |               |                    |                            |
|---------------|--------------------|----------------------------|
| 1. Caliper    | 6. Washer          | 11. Bearing (inner)        |
| 2. Hub cap    | 7. Disc plate      | 12. Dust cover             |
| 3. Cotter pin | 8. Bearing (outer) | 13. Tie-rod end            |
| 4. Set cover  | 9. Wheel hub       | 14. Lower arm ball joint   |
| 5. Hub nut    | 10. Oil seal       | 15. Knuckle spindle        |
|               |                    | 16. Sensor rotor (for ABS) |



67U09X-011

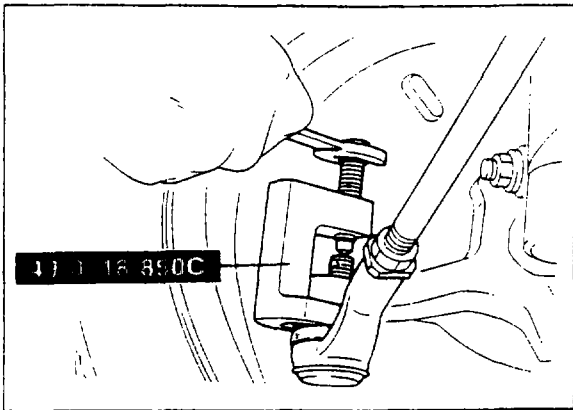
1. Jack up the front of the vehicle and support it with safety stands.
2. Remove the wheel and tire.
3. Remove the caliper assembly and suspend it using a rope.

## 9 FRONT AXLE



67U09X-012

4. Remove the hub cap, the cotter pin, the set cover and the nut.
5. Remove the hub and plate so that the washer and bearing do not fall.
6. Remove the dust cover.

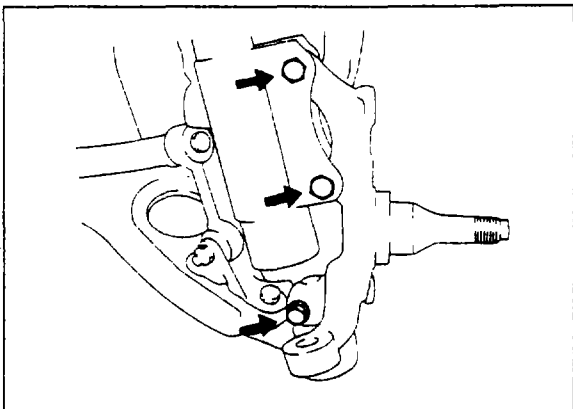


67U09X-013

7. After removing the cotter pin and tie-rod end nut, use **ball joint puller** (49 0118 850C) to separate the tie-rod end from the knuckle.

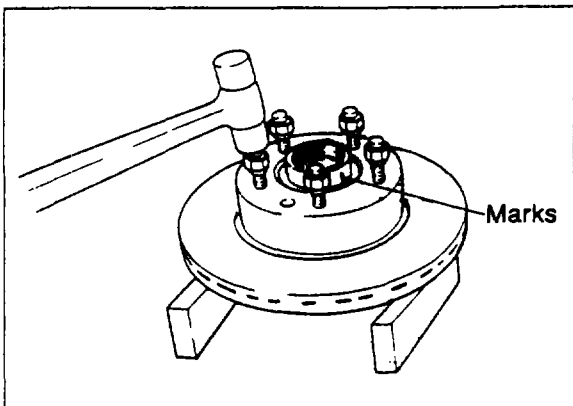
### Note

If removal is difficult, lightly tap the ball joint coupling of the knuckle with a hammer.



67U09X-014

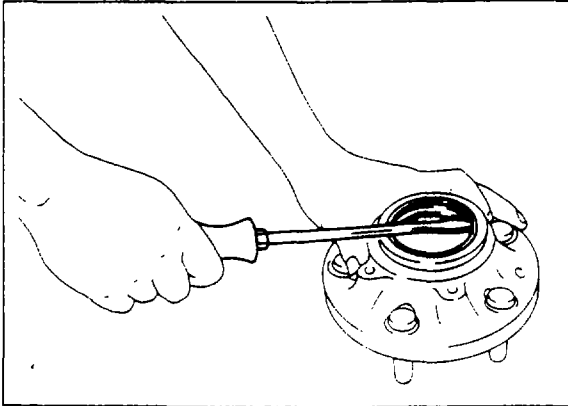
8. Remove the bolt and nut which couple the knuckle and the ball joint, and then push the lower arm downward to uncouple the knuckle and the ball joint.
9. Remove the bolt and nut which couple the knuckle and the shock absorber.



67U09X-015

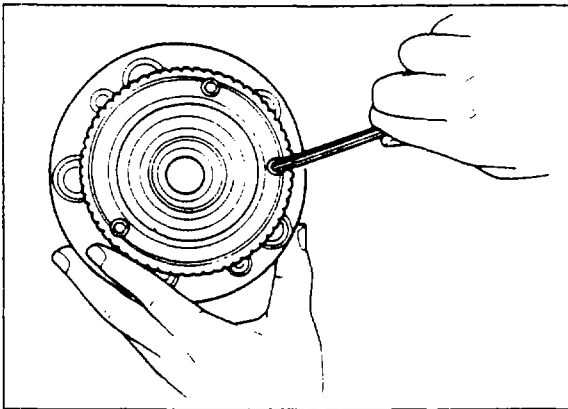
### DISASSEMBLY

1. After making matching marks on the disc plate and the wheel hub, remove the set screws.
2. Install the lug nuts, and tap the lug nuts with a copper hammer to remove the hub.



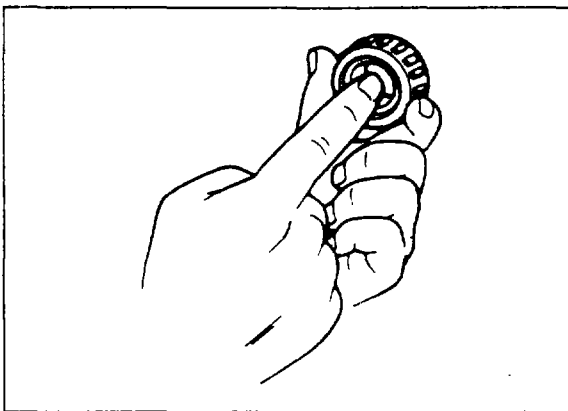
67U09X-016

3. Remove the oil seal and the bearing.



77U09X-002

4. Remove the sensor rotor using a hexagon wrench.



67U09X-017

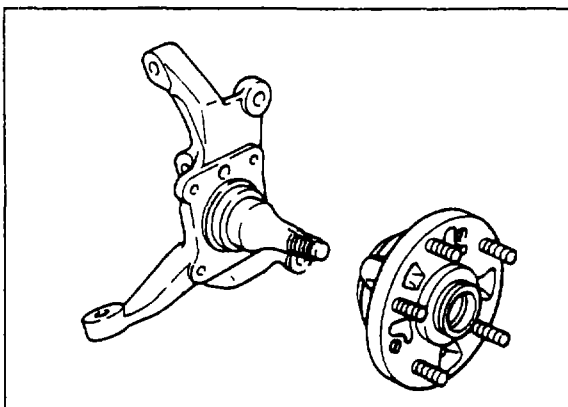
### INSPECTION

Check as described below, replace parts if necessary.

1. Check the bearings for wear, damage or seizure.

#### Caution

**If replacement is necessary, replace the inner bearing, outer bearing and front hub at the same time.**

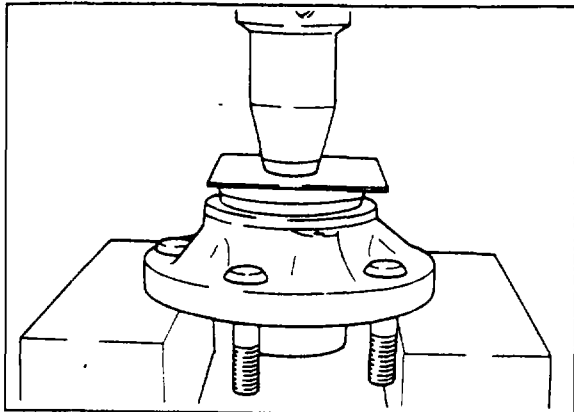


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2. Check the hub for cracking or damage.
3. Check the knuckle spindle for cracking or damage, and the oil seal friction surface for wear or rust.
4. Check the knuckle and knuckle arm for damage.
5. Check the dust cover for deformation.
6. Check the hub cap for deformation.



## 9 FRONT AXLE



67U09X-018

### ASSEMBLY

1. Pack the bearing cone and roller assemblies with wheel bearing grease (lithium base, NLGI No. 2).
2. After inserting the inner bearing in the hub, use a suitable plate to press or drive in the oil seal.

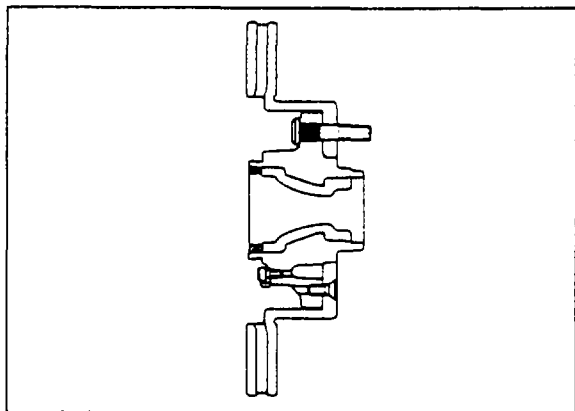
### Caution

**Install the oil seal so that it is flush with the hub end surface.**

3. Apply grease (lithium base, NLGI No. 2) to the oil seal lip.

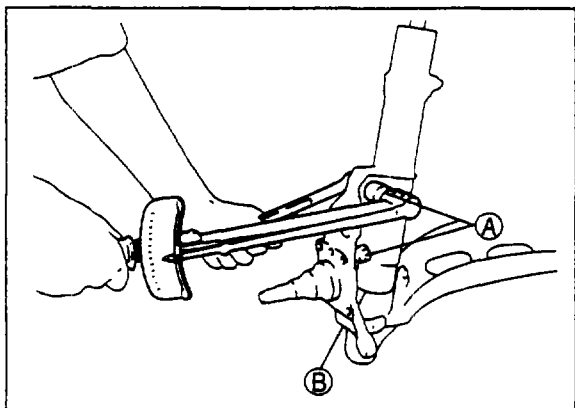
4. Align the matching marks of the wheel hub and the disc plate, and drive the wheel hub on using a plate and hammer.

67U09X-019



67U09X-020

5. Apply grease (lithium base, NLGI NO. 2) to the shaded areas as shown in the figure.



67U09X-021

6. Install the knuckle.

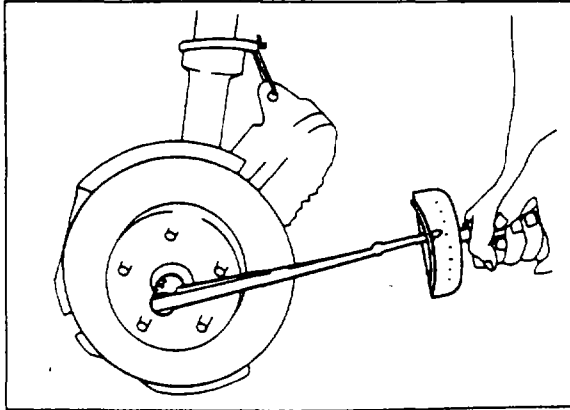
### Tightening torque:

**"A" bolt:**

**93—117 N-m (9.5—11.9 m-kg, 68—86 ft-lb)**

**"B" bolt:**

**36—54 N-m (3.7—5.5 m-kg, 27—40 ft-lb)**

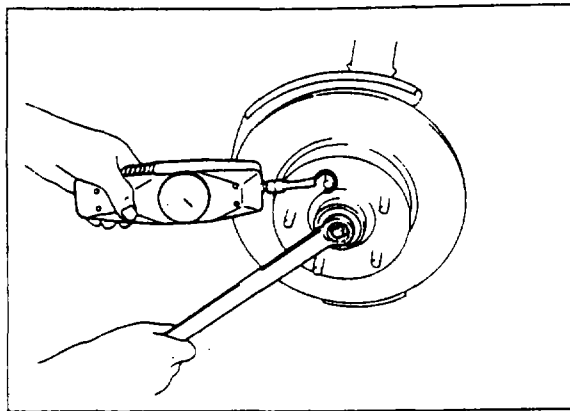


77U09X-003

7. After installing the dust cover, install the hub and plate, and adjust the bearing preload.
- (1) Tighten the nut and then turn the hub and plate 2 or 3 times to seat the bearing.

**Tightening torque:**  
**20—29 N·m (2.0—3.0 m·kg, 14—22 ft·lb)**

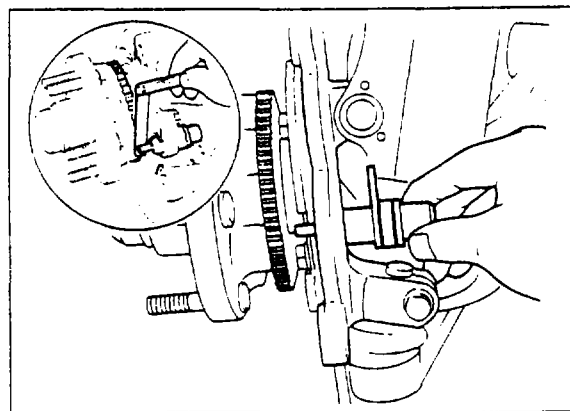
- (2) Loosen the nut until it can be turned by hand.



77U09X-004

- (3) Attach a pull scale to a wheel lug bolt and measure the frictional force.
- (4) Tighten the lock nut until the reading (initial turning torque) reaches the specified amount. Then insert the set cover, and secure with a new cotter pin.

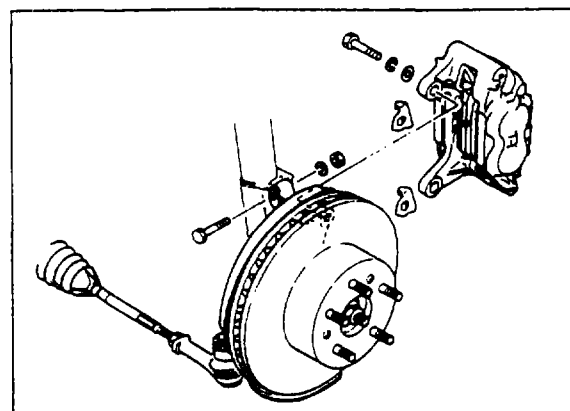
**Preload: Frictional force plus**  
**3.9—9.8 N (0.4—1.0 kg, 0.9—2.2 lb)**



77U09X-005

8. Install the speed sensor, and check the clearance between the sensor rotor and speed sensor.

**Standard clearance: 0.4—1.0 mm**  
**(0.016—0.039 in)**



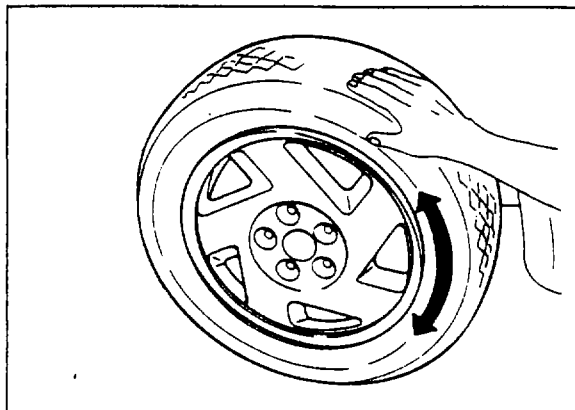
77U09X-006

9. Install the caliper.

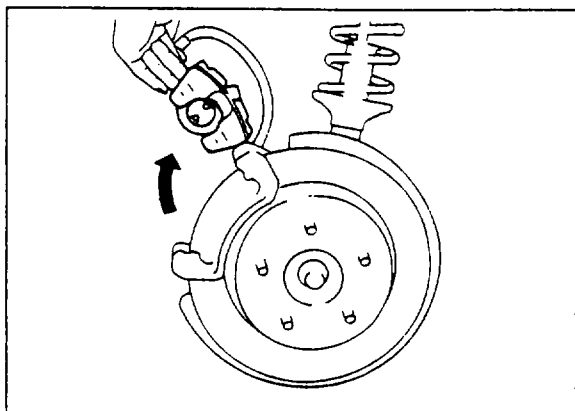
**Tightening torque:**  
**78—98 N·m (8—10 m·kg, 58—72 ft·lb)**

10. Mount the wheel and tire.
11. Lower the vehicle.

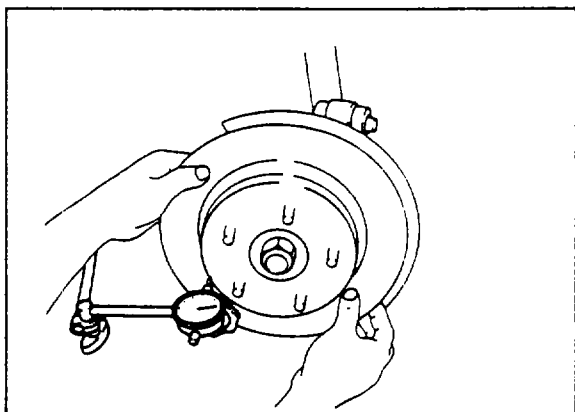
## 9 REAR AXLE



67U09X-026



67U09X-027



67U09X-028

### REAR AXLE

#### WHEEL BEARING PLAY

##### Inspection

1. Jack up the rear of the vehicle and support it with safety stands.
2. Check that there is no abnormal noise and that the tire rotates smoothly when rotated by hand.

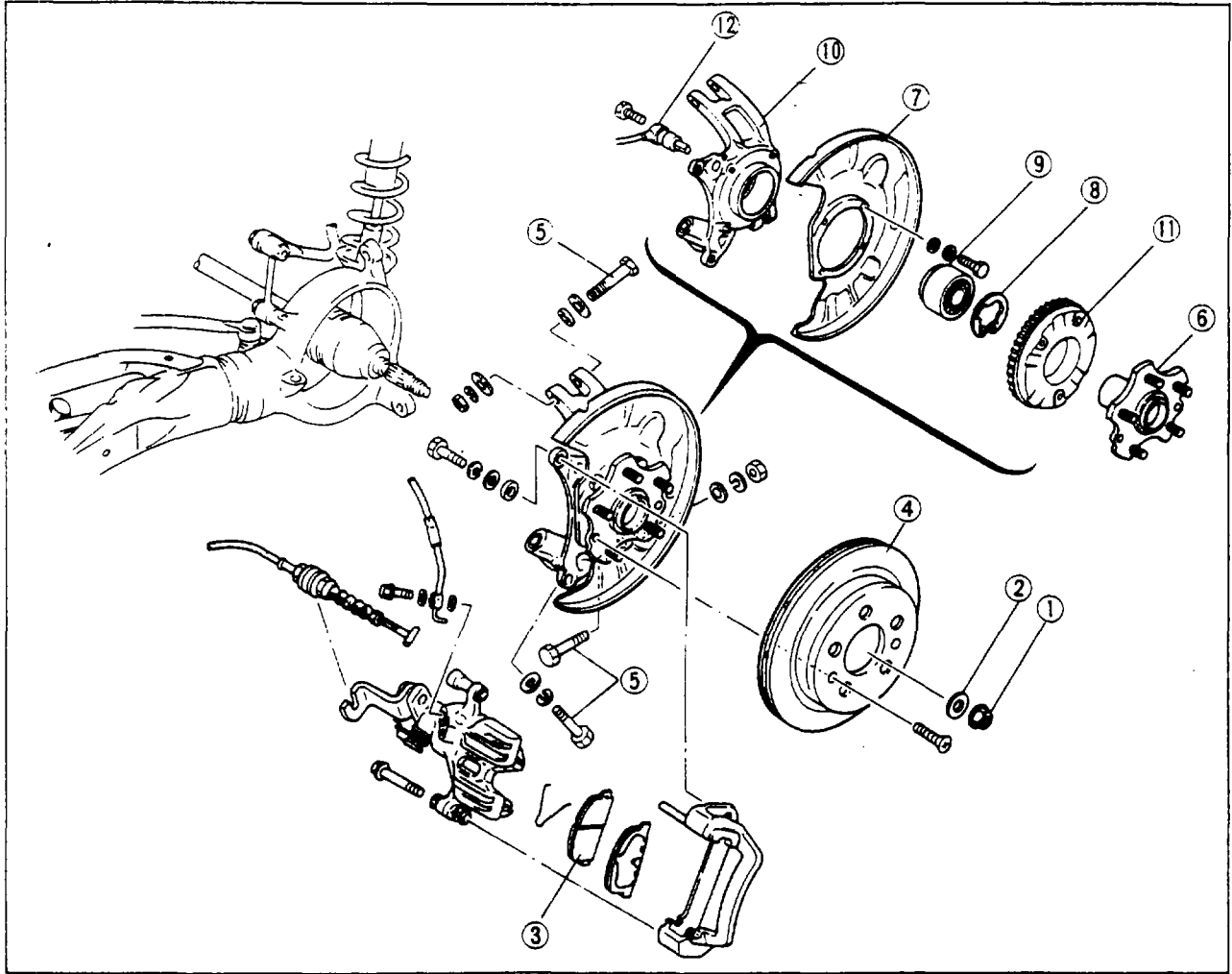
3. After removing the wheel, remove the lower caliper slide pin, and then, using the upper slide pin as an axis, raise the caliper.

4. Attach a dial gauge to the axle flange. Then push and pull the axle hub by hand in the axial direction, and measure the end play of the wheel bearing.  
If the end play exceeds the standard value, replace the wheel bearing.

**End play: 0.1 mm (0.004 in) max.**

## REMOVAL

1. Remove in the sequence shown in the figure.
2. Install in the reverse order of removal.

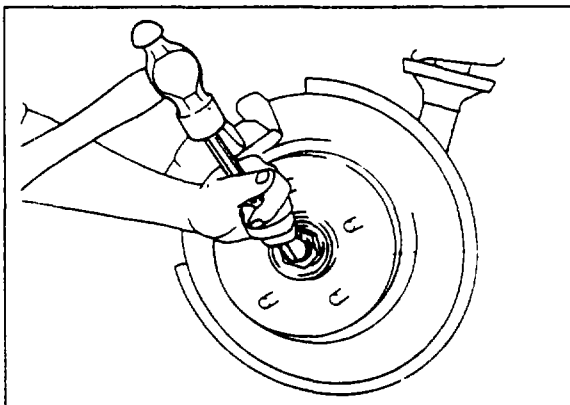


87U09X-001

1. Lock nut
2. Washer
3. Caliper assembly
4. Disc plate

5. Bolts
6. Wheel hub
7. Dust cover
8. Retaining ring

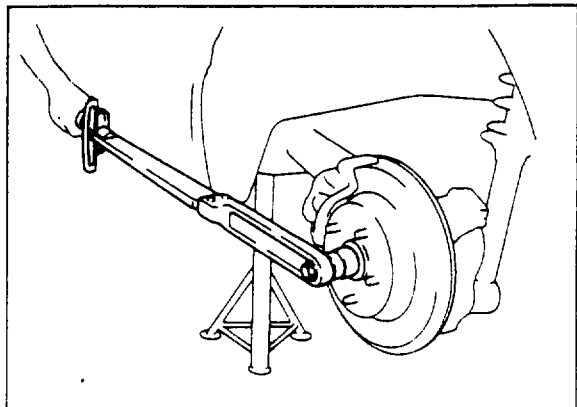
9. Wheel bearing
10. Toe control hub
11. Sensor rotor (for ABS)
12. Speed sensor (for ABS)



67U09X-031

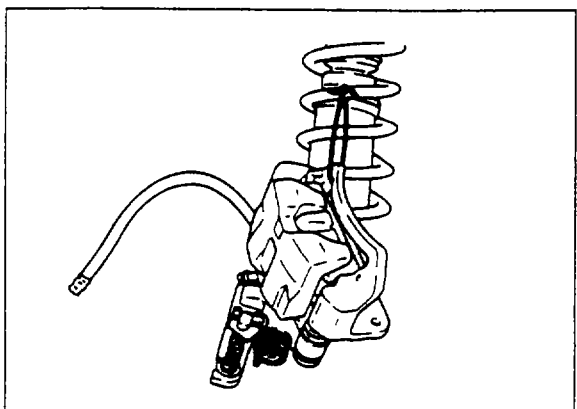
1. Jack up the rear of the vehicle, and support it with safety stands.
2. Remove the wheel and tire.
3. Uncrimp the lock nut.

# 9 REAR AXLE



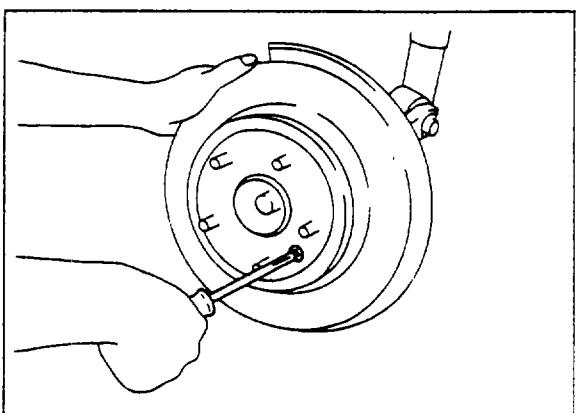
67U09X-032

4. Depress the brake pedal to hold the hub secure, and then remove the hub nut.



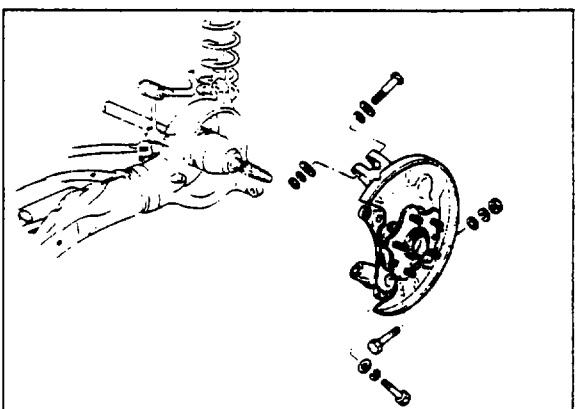
67U09X-033

5. Remove the caliper assembly and suspend it using a rope.



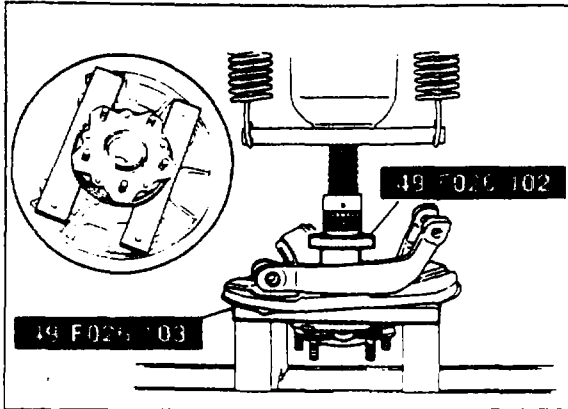
67U09X-034

6. Remove the set screws and disc plate.



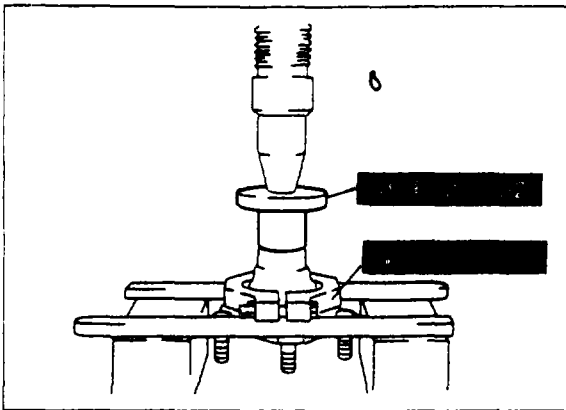
67U09X-035

7. Remove the knuckle assembly.



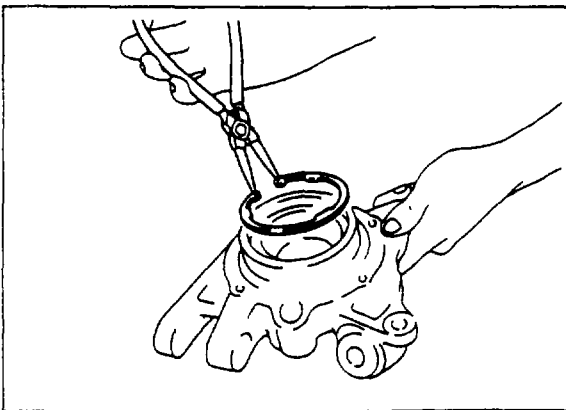
77U09X-008

8. Loosen the dust cover.
9. Press the wheel hub using **bearing installer** (49 F026 102) and **wheel hub puller** (49 F026 103) to remove it.



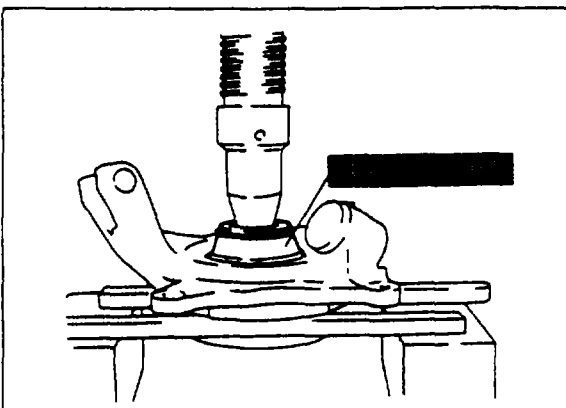
67U09X-037

10. Press the wheel hub using **bearing installer** (49 F026 102) and **fan pulley boss puller** (49 0636 145) and remove the wheel bearing inner race.



87U09X-002

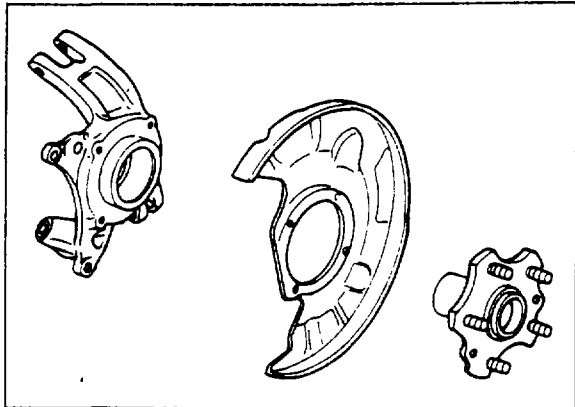
11. Remove the retaining ring from the toe control hub using snap ring pliers.



67U09X-039

12. Remove the wheel bearing outer race using **attachment** (49 F027 007).

# 9 REAR AXLE

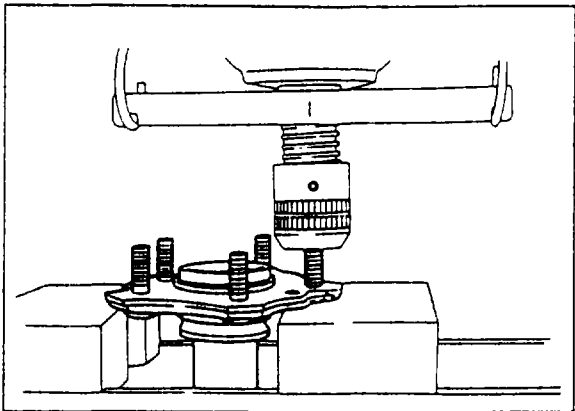


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## INSPECTION

Check as described below. Replace parts if necessary.

1. Check the wheel hub for cracking or damage.
2. Check the toe control hub for cracking or damage.
3. Check the dust cover for deformation.

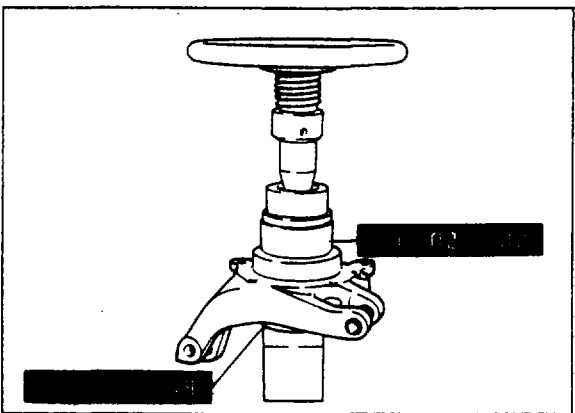


67U09X-041

4. Check the wheel lug bolts for wear or damage. Replace the wheel lug bolts using a press, if necessary.

## Caution

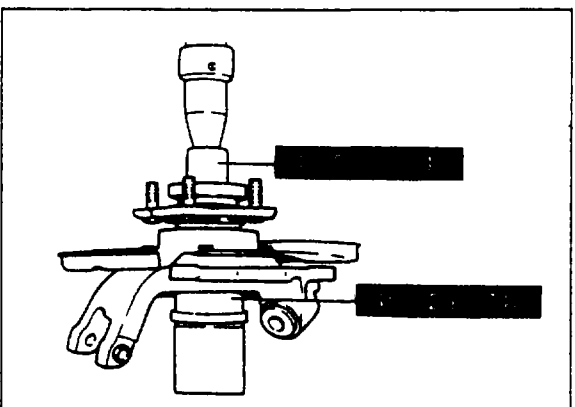
**Do not reuse the wheel lug bolts once they have been removed.**



87U09X-004

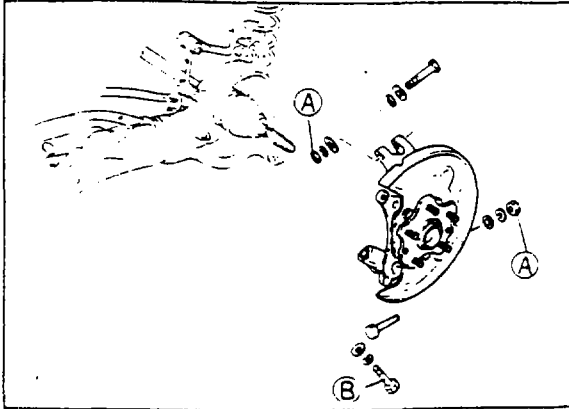
## ASSEMBLY

1. Press the new wheel bearing into the toe control hub using **bearing installer** (49 F026 102) and **bearing separator attachment** (49 0259 748).
2. Install the retaining ring using snap ring pliers.
3. Install the dust cover.



67U09X-043

4. Press the wheel hub in using **bearing installer** (49 F026 102).



67U09X-044

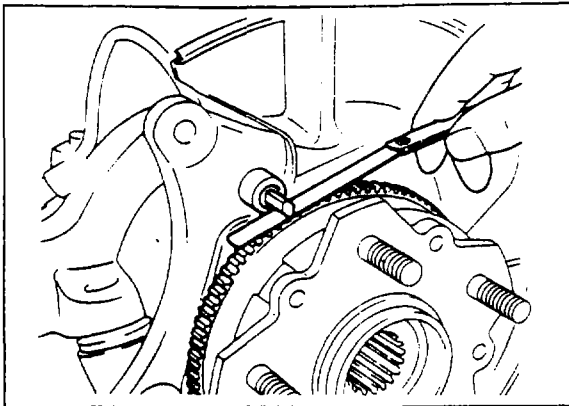
## INSTALLATION

1. Mount the wheel hub and knuckle to the driveshaft, and mount the knuckle to the rear axle casing.

### Tightening torque:

**A: 63—93 N·m (6.4—9.5 m·kg, 46—69 ft·lb)**

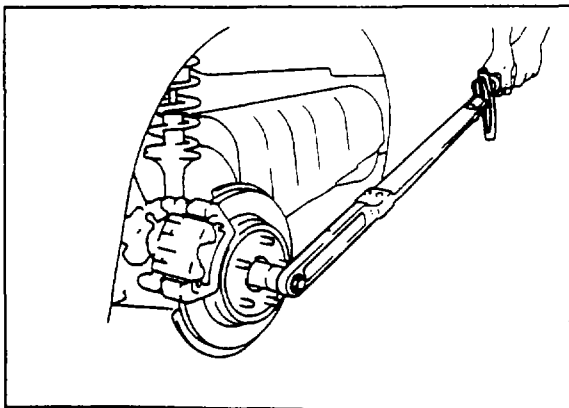
**B: 112—151 N·m  
(11.4—15.4 m·kg, 82—111 ft·lb)**



77U09X-009

2. Install the speed sensor, and check the clearance between the speed sensor and sensor rotor.

**Standard clearance: 0.4—1.0 mm  
(0.016—0.039 in)**



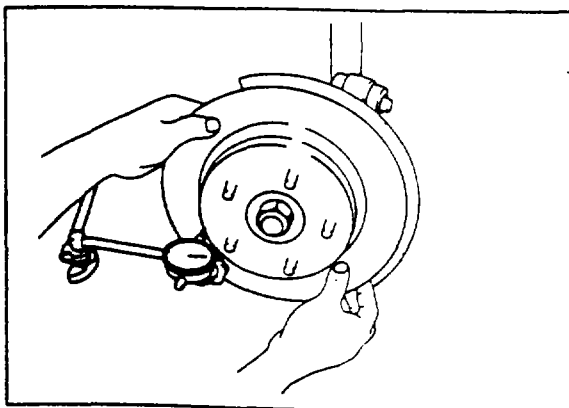
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3. Depress the brake pedal to secure the disc plate, and tighten the lock nut.

### Tightening torque:

**235—314 N·m**

**(24—32 m·kg, 174—231 ft·lb)**



67U09X-047

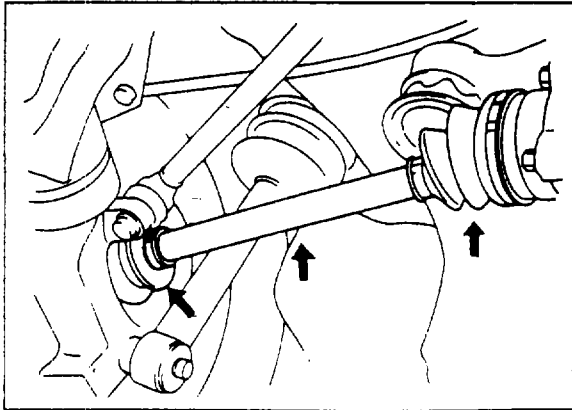
4. Measure the play of the wheel bearing. If the end play exceeds the standard value, replace the wheel bearing.

**End play: 0.1 mm (0.004 in) max.**

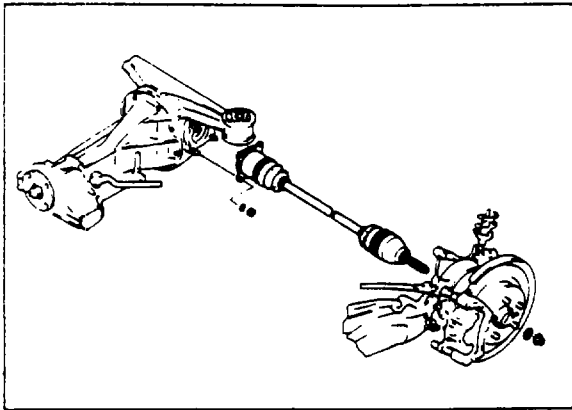
5. Crimp the driveshaft lock nut to the driveshaft groove.



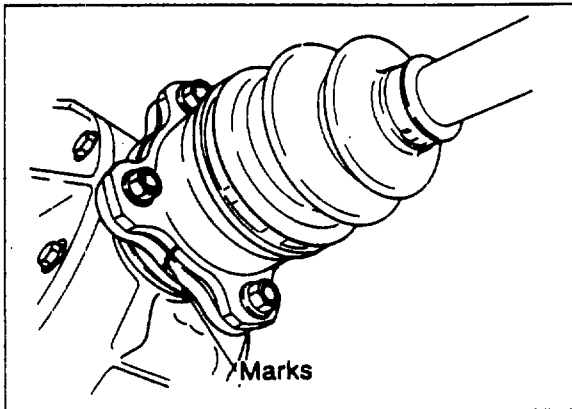
## 9 DRIVESHAFT



67U09X-048



67U09X-049



67U09X-050

### DRIVESHAFT

#### ON-VEHICLE INSPECTION

1. Check the dust boot on the driveshaft for cracks, damage, leaking grease, or a loose boot band. Replace parts if necessary.
2. Check the driveshaft for bending or cracking, or for wear of joints or splines. Replace the driveshaft if necessary.

#### REMOVAL

1. Jack up the rear of the vehicle, and support it with safety stands.
2. Remove the wheel and tire.
3. Remove the lock nut.  
(Refer to page 9—11)

#### Note

**Before removing the driveshaft, put mating marks on the driveshaft and output shaft.**

4. Remove the driveshaft.

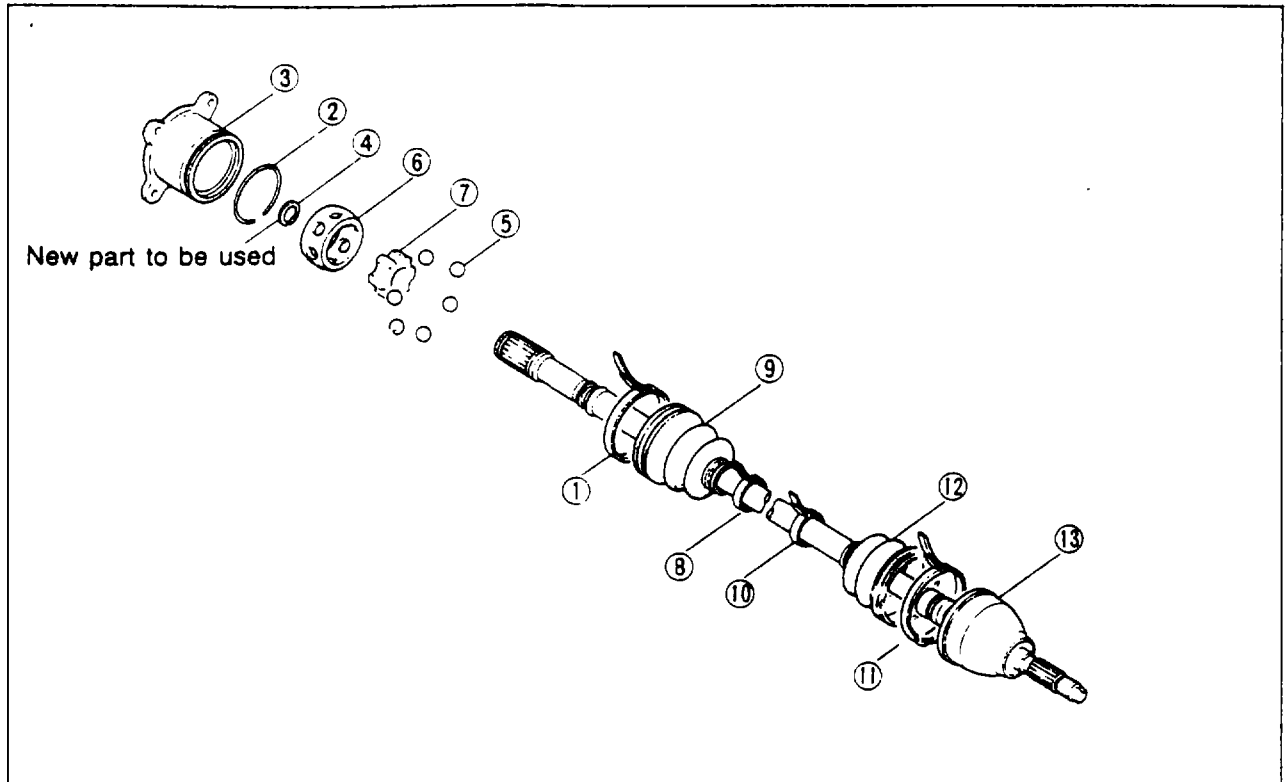
## DISASSEMBLY

1. Disassemble in the sequence shown in the figure.
2. Assemble in the reverse order of removal

### Caution

- a) Secure the driveshaft in a vise with protective material (such as copper plates) on the vise jaws.
- b) Be careful that dust or other foreign material does not enter the ball joint while the work is being performed.
- c) Do not disassemble the wheel side ball joint.
- d) Do not wash the ball joint unless it is being disassembled.

67U09X-051

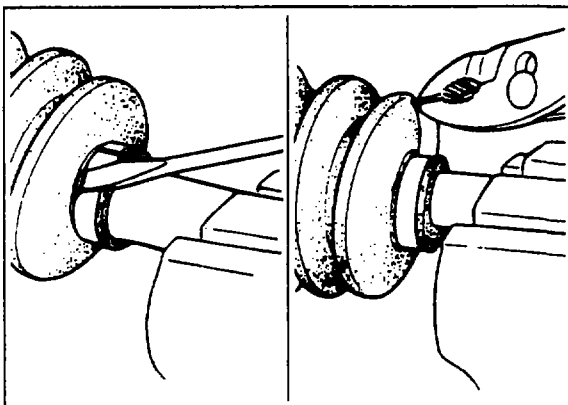


67U09X-052

1. Boot band
2. Clip
3. Outer ring
4. Snap ring
5. Balls

6. Inner ring
7. Cage
8. Boot band
9. Boot
10. Boot band

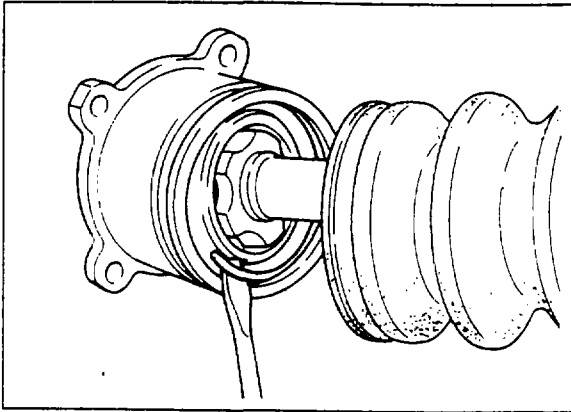
11. Boot band
12. Boot
13. Shaft and ball joint assembly



67U09X-053

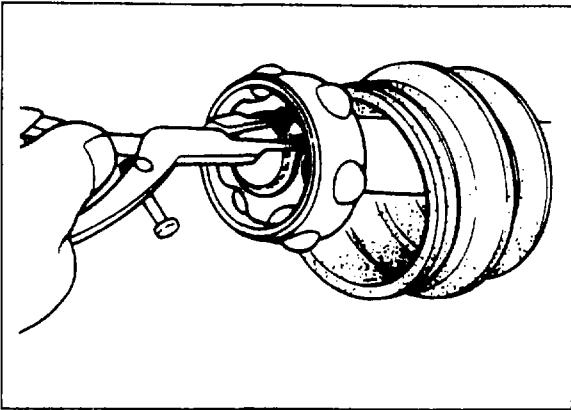
1. Pry up the locking clip with a screwdriver and remove band with pliers.
2. Slide the boot along the shaft to expose the ball joint.

## 9 DRIVESHAFT



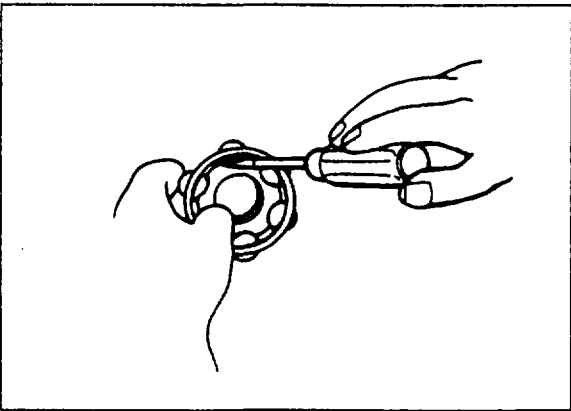
67U09X-054

2. Remove the clip with a screwdriver.



67U09X-055

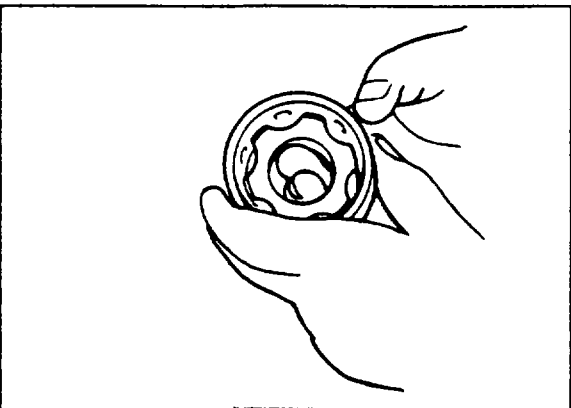
3. Remove the snap ring using snap ring pliers.



67U09X-056

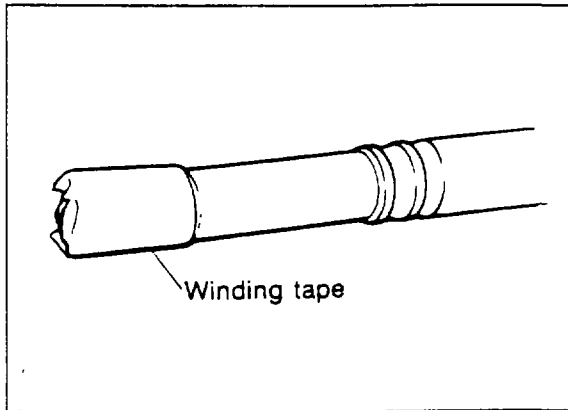
4. Remove the balls, inner ring, and cage from the shaft as a complete assembly.

5. Insert a screwdriver between the inner ring and the cage to remove the balls.



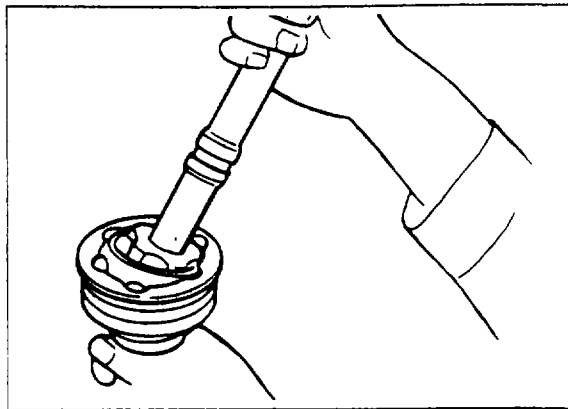
67U09X-057

6. Turn the cage about 30°, and separate it from the inner ring.



67U09X-05E

7. Wrap the spline of the shaft with tape to prevent damaging the boot, remove the boot.

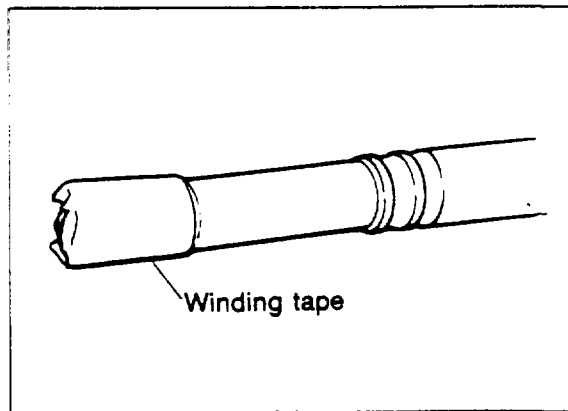


67U09X-059

### INSPECTION

Check as described below, replace parts if necessary.

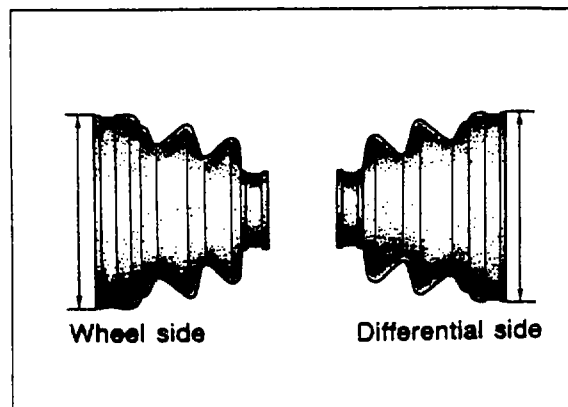
1. Check the shaft for bending, twisting or damage.
2. Check the shaft splines for wear.
3. Check the joint on the differential side for wear, excessive play, corrosion or damage.
4. Check the joint on the wheel side for excessive play, wear, corrosion or damage.



67U09X-06C

### ASSEMBLY

1. Wrap the splines of the wheel side of the shaft with tape and install the boot and a new boot band.



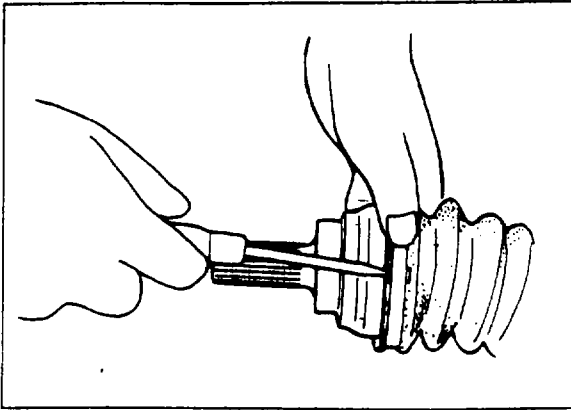
77U09X010

### Caution

The wheel side and differential side boots are different, as shown in the figure.

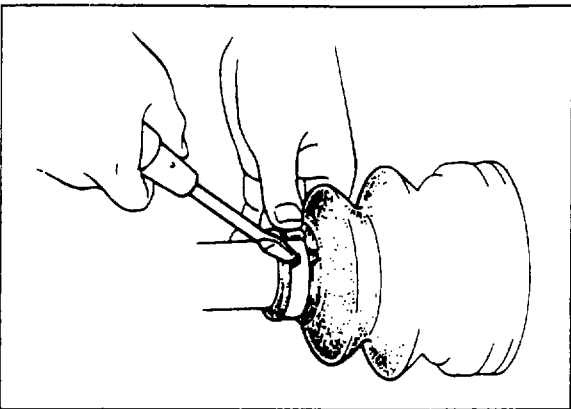
	Wheel side	Diff. side
Turbo model	103 mm (4.06 in)	99 mm (3.90 in)
Non-turbo model	98.5 mm (3.88 in)	95.5 mm (3.76 in)

## 9 DRIVESHAFT



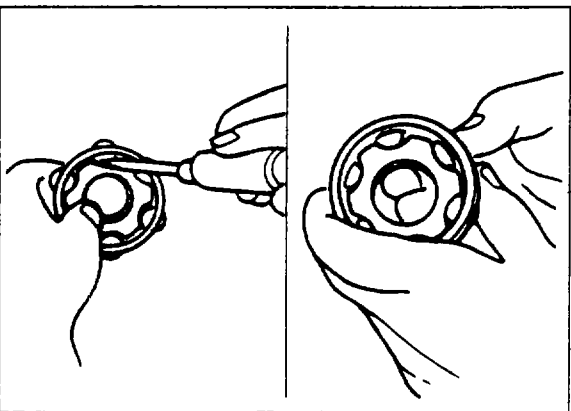
67U09X-062

2. Fold the band back over itself while pulling on the end of the clip with pliers.  
Lock the end of the band by bending the locking clip.



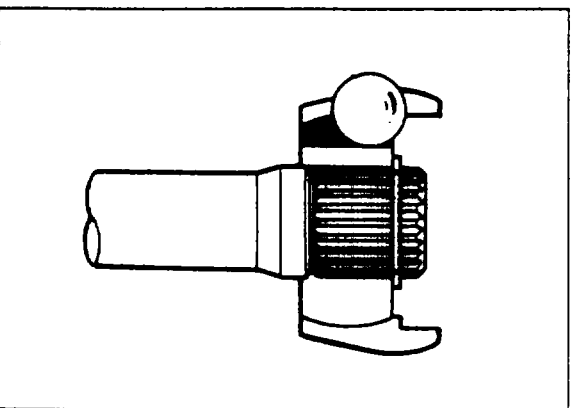
67U09X-063

3. Install the differential side boot with a new boot band (the part with the smaller diameter).
4. Attach the clip to the clip groove in the shaft.



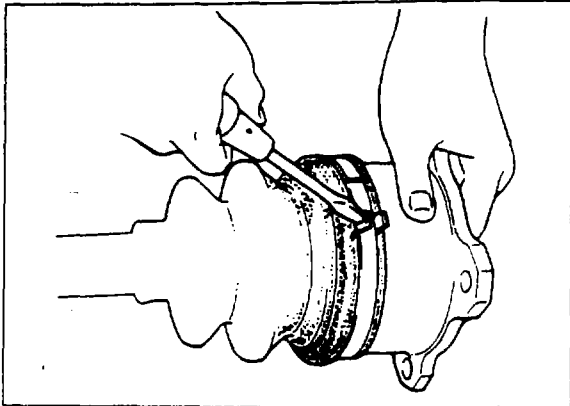
67U09X-064

5. Assemble the cage, inner race and balls in the following order.
  - a) Insert the inner race into the cage, and turn the cage approximately  $30^\circ$  with respect to the inner race.



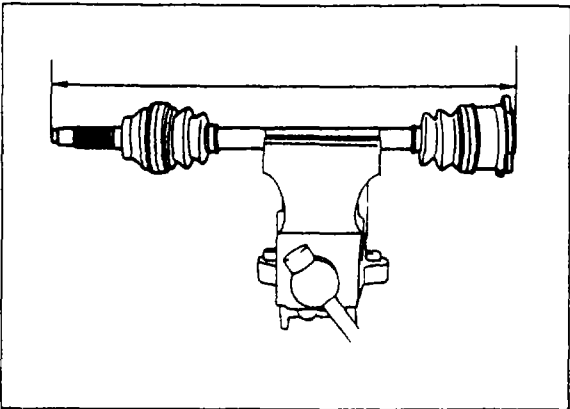
67U09X-065

- b) Fit the balls through the cage into the ball groove of the inner race.
  - c) Fill the inside of the ball joint assembly with the specified grease included in the repair kit.
6. Install the cage (assembled in step 5) to the shaft.
  7. Fit the new snap ring into the snap ring groove in the shaft.



67U09X-066

8. Fit the differential side boot onto the outer race and the boot groove of the shaft.
9. Secure the boot with a new boot band.



77U09X-011

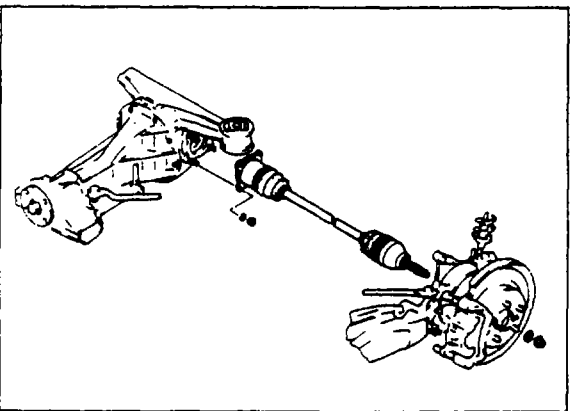
**Standard length:**

**Non-turbo model**

630—666 mm (24.80—26.22 in)

**Turbo model**

614—651 mm (24.17—25.63 in)



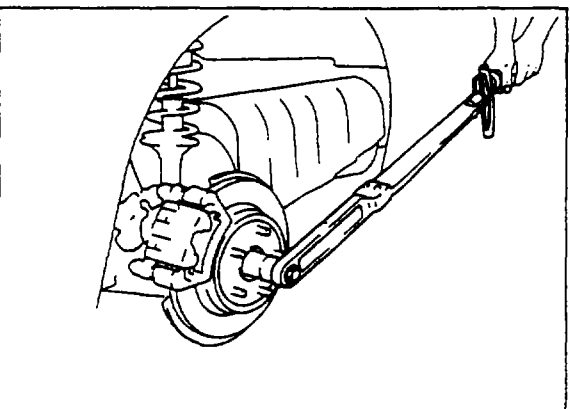
67U09X-068

**INSTALLATION**

1. Insert the wheel side of the driveshaft to the axle flange and then install the differential side of the driveshaft.

**Tightening torque:**

54—64 N·m (5.5—6.5 m·kg, 40—47 ft·lb)



67U09X-069

2. Tighten the lock nut. Measure the end play of the wheel bearing. (Refer to page 9—15)

# 9 DIFFERENTIAL

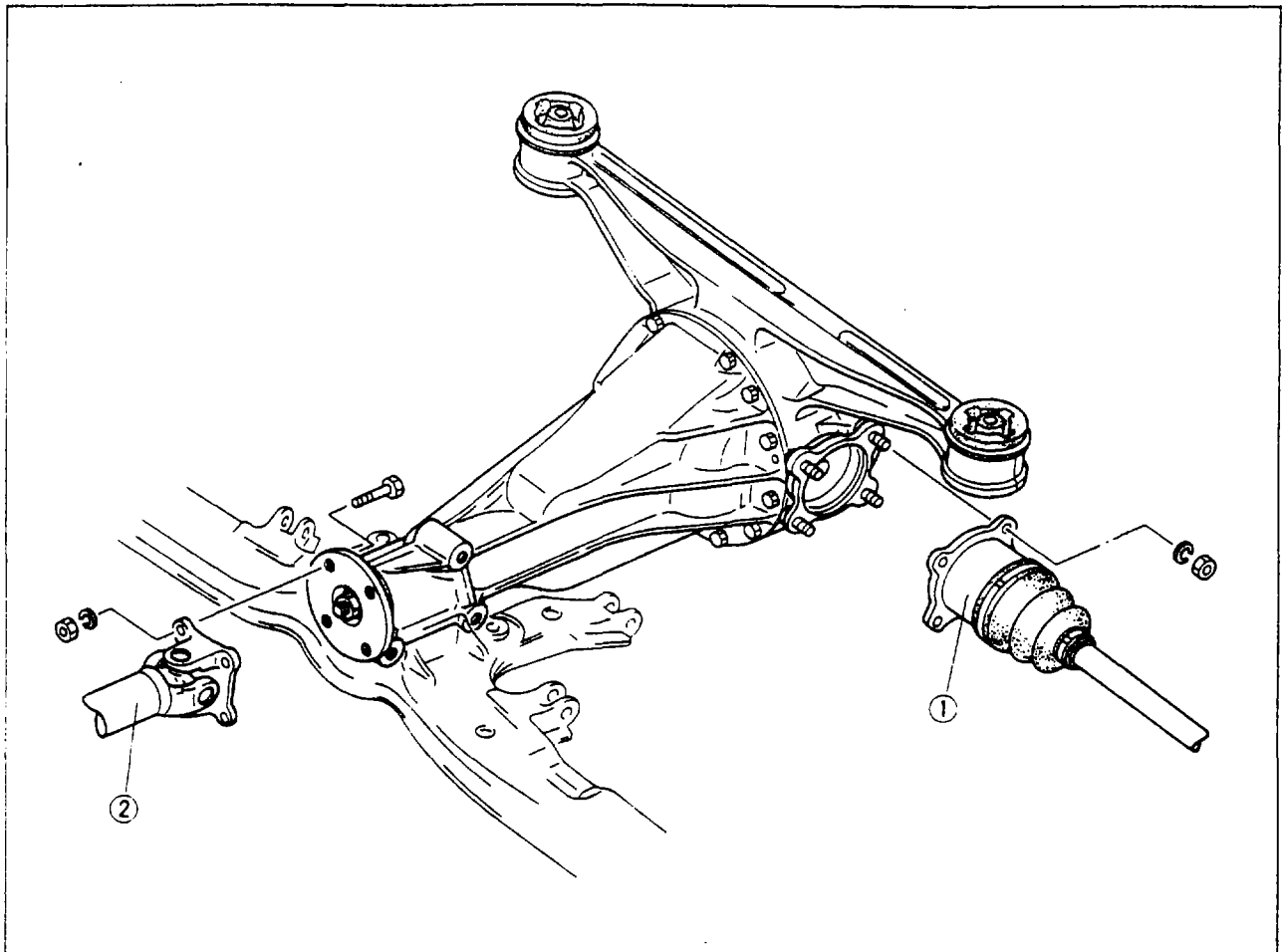
## DIFFERENTIAL

### ON-VEHICLE MAINTENANCE

#### Replacement of Output Shaft Oil Seal and Companion Flange Oil Seal

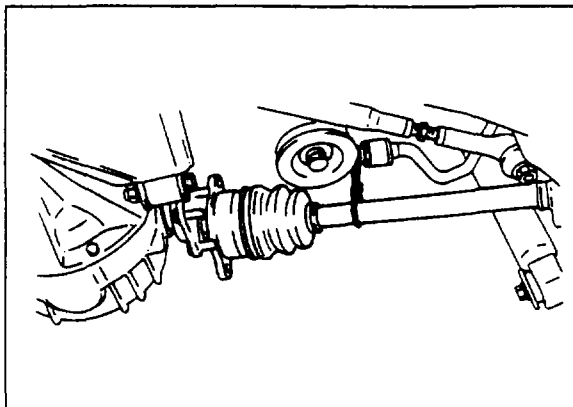
1. Jack up the rear of the vehicle and support it with safety stands.
2. Drain the differential gear oil.

67U09X-070



67U09X-071

1. Driveshaft
2. Propeller shaft



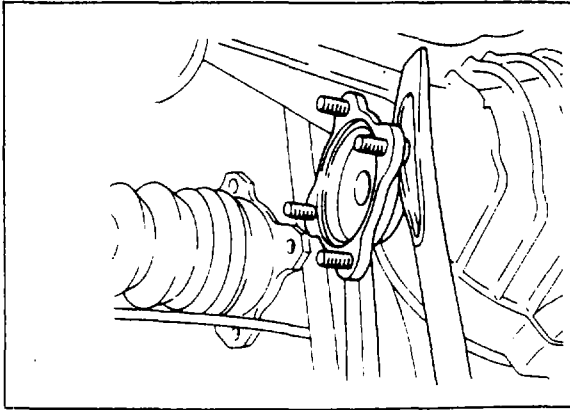
87U09X-006

#### Output shaft oil seal

1. Separate the driveshaft from the differential, and suspend it as shown in the figure.

#### Note

Put mating marks on the driveshaft and output shaft flange for proper reassembly.

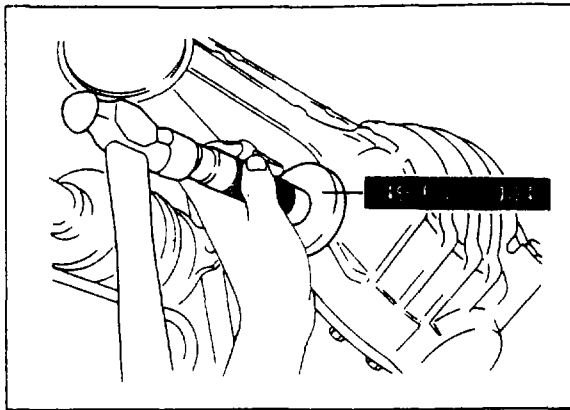


87U09X-007

2. Insert two pry bars between the differential case and the output shaft, remove the output shaft by applying pressure to the pry bars.

**Note**

Use caution during the removal operation, because the shaft may suddenly jump out.

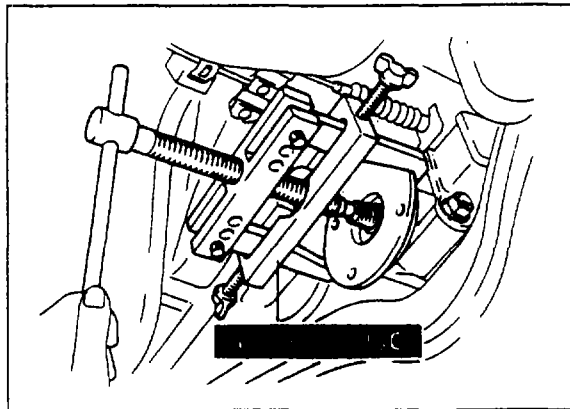


67U09X-072

3. Replace the oil seal. Install the oil seal, using **attachment** (49 F027 004).

**Note**

Apply a thin coat of grease (lithium base, NLGI No. 2) to the oil seal lip.



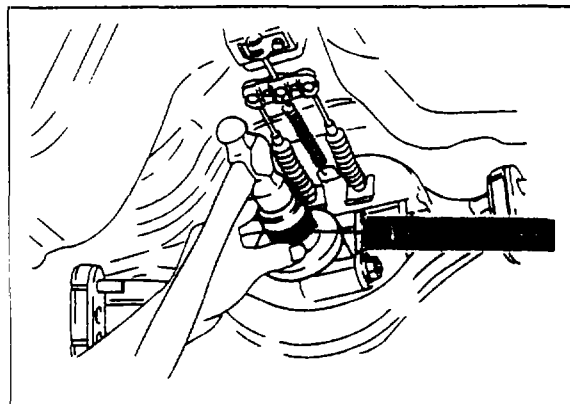
67U09X-073

**Companion flange oil seal**

1. Remove the exhaust pipe and covers.
2. Put matching marks on the propeller shaft and companion flanges.
3. Remove the propeller shaft.
4. Remove the companion flange using **bearing puller shaft** (49-0839 425C).

**Note**

Before loosening the lock nut, measure the rotation starting torque of the drive pinion. At the time of installation, tighten the lock nut to obtain this value.



67U09X-074

5. Replace the oil seal. Install the oil seal, using **oil seal installer** (49 V001 795).

**Note**

Apply a thin coat of grease (lithium base, NLGI No. 2) to the oil seal lip.

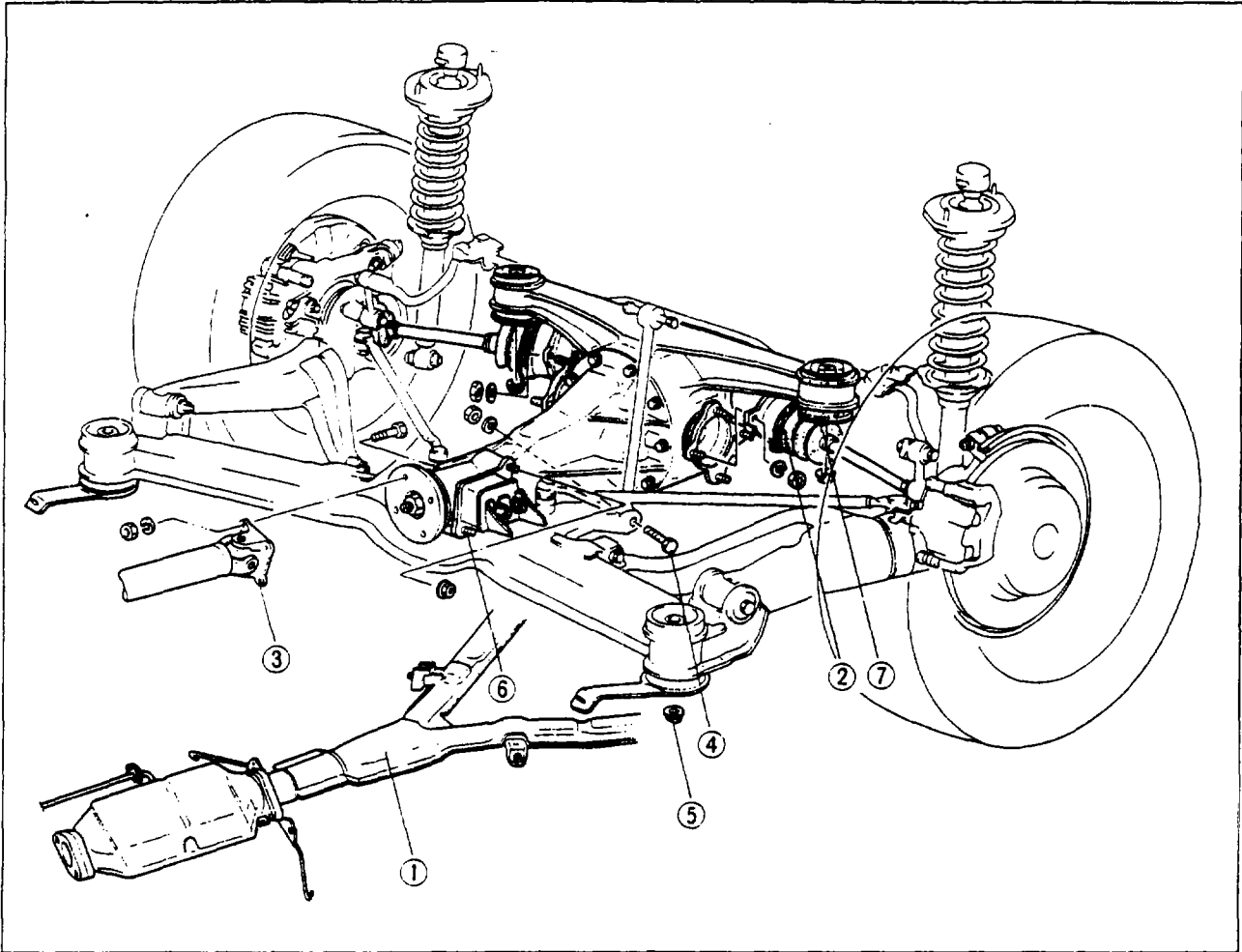


# 9 DIFFERENTIAL

## REMOVAL

1. Jack up the rear of the vehicle and support it with safety stands.
2. Drain the differential gear oil.
3. Remove in the sequence shown in the figure.

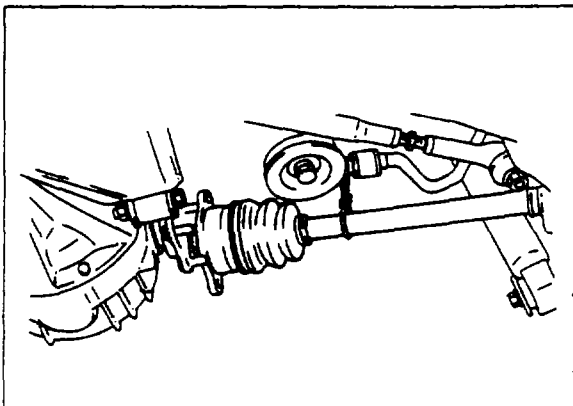
67U09X-075



67U09X-076

1. Exhaust pipe
2. Driveshaft
3. Propeller shaft
4. Bolt (Sub-link)

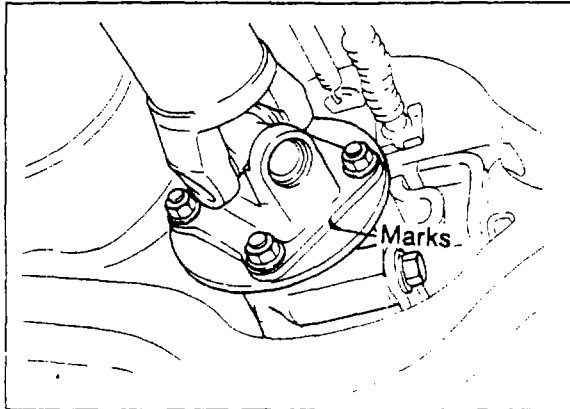
5. Nut (Differential member)
6. Nut (Differential carrier)
7. Nut (Differential case)



1. Raise the vehicle.
2. Drain the differential oil.
3. Separate the driveshafts from the differential, and suspend them as shown in the figure.

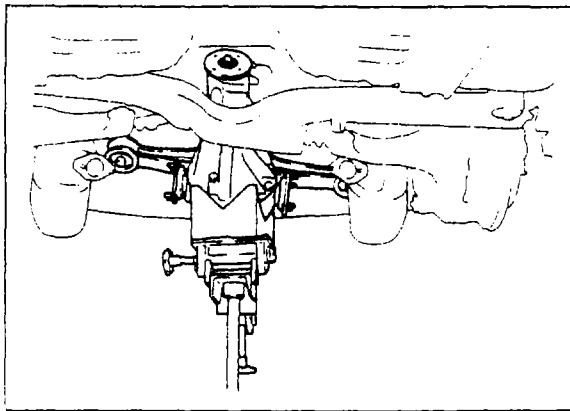
**Note**  
Put mating marks on the driveshafts for proper reassembly.

67U09X-077



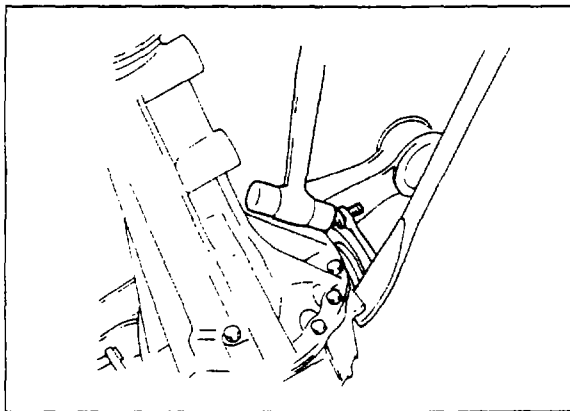
67U09X-078

4. Before removing the propeller shaft, put mating marks on the flanges.
5. Remove the bolts and nuts.



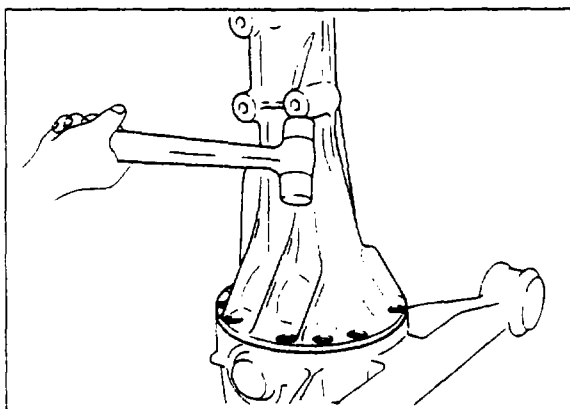
67U09X-079

6. Remove the mounting nut from the left side of the differential member and let the member hang down.
7. Disconnect the sub-link assembly.
8. Support the differential assembly with a jack, and remove the assembly.



67U09X-080

9. Tap the output shaft with a plastic hammer as shown in the figure to remove the output shaft.



67U09X-081

10. Hit the differential carrier with a copper hammer to separate the carrier from the housing.

**Caution**  
Do not hit the differential case because the case is made of aluminum alloy.

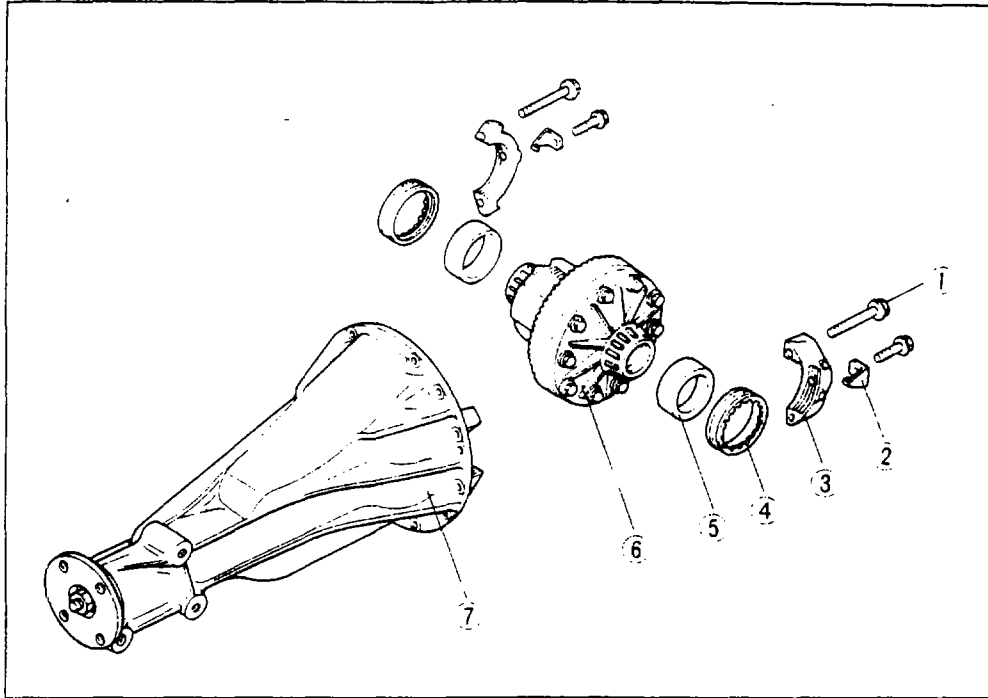
# 9 DIFFERENTIAL

## DISASSEMBLY

1. Attach the differential assembly to **engine stand** (49 0107 680A) and **carrier hanger** (49 M005 561).
2. Disassemble in the sequence shown in the figure.

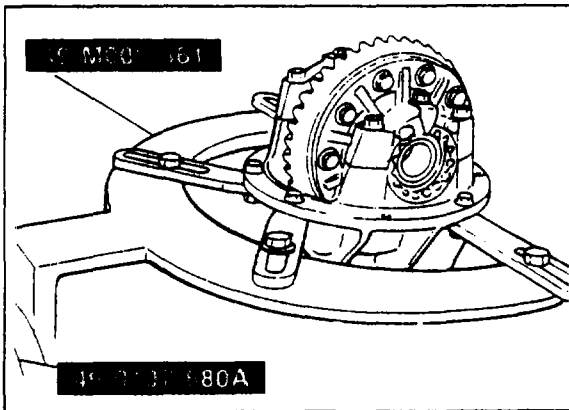
## Removal Related to Differential Gear Assembly

67U09X-082



1. Bolt
2. Lock plate
3. Bearing cap
4. Adjust screw
5. Bearing outer race
6. Differential gear
7. Differential carrier assembly

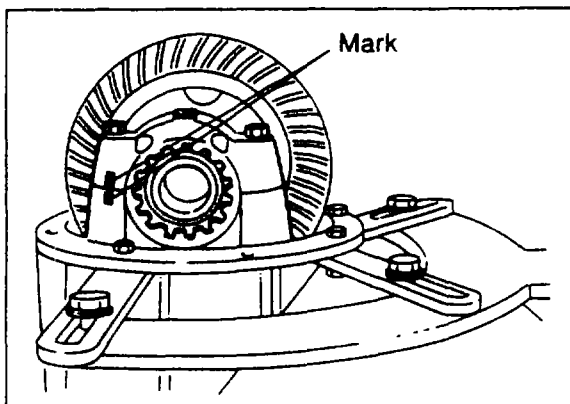
67U09X-083



## Engine stand and differential carrier hanger

Mount the differential gear assembly on **engine stand** (49 0107 680A) and **differential carrier hanger** (49 M005 561).

67U09X-084

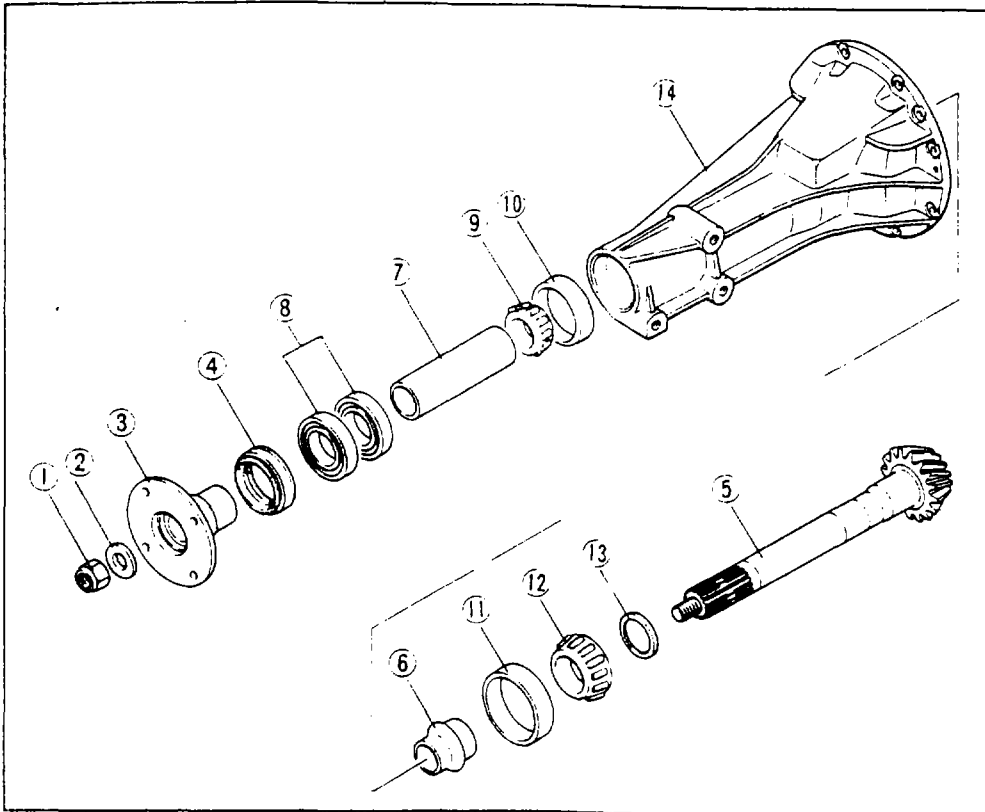


## Bearing cap

Mark the carrier and one bearing cap and the adjust screw for proper reassembly.

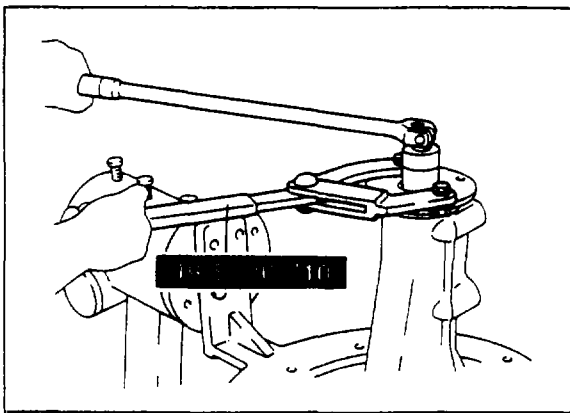
67U09X-085

## Disassembly Related to Drive Pinion



1. Lock nut
2. Washer
3. Companion flange
4. Oil seal
5. Drive pinion
6. Collapsible spacer
7. Long collar
8. Bearings (front)
9. Bearing (center)
10. Bearing outer race
11. Bearing outer race
12. Bearing (rear)
13. Spacer
14. Differential carrier

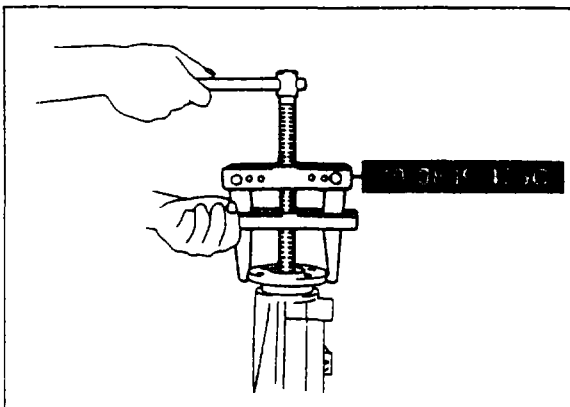
67U09X-086



67U09X-087

### Lock nut

Hold the companion flange using **flange holder** (49 S120 710) and remove the lock nut.

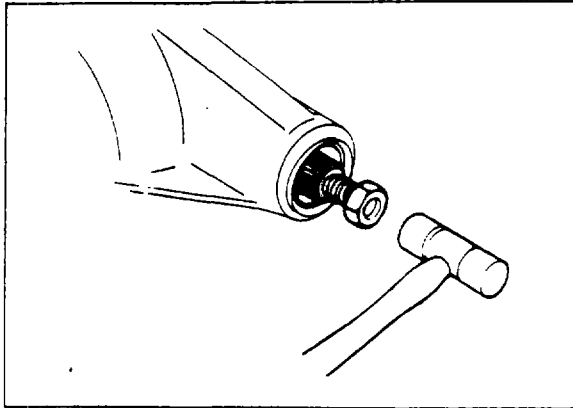


67U09X-088

### Companion flange

Pull the companion flange off using **bearing puller set** (49 0839 425C).

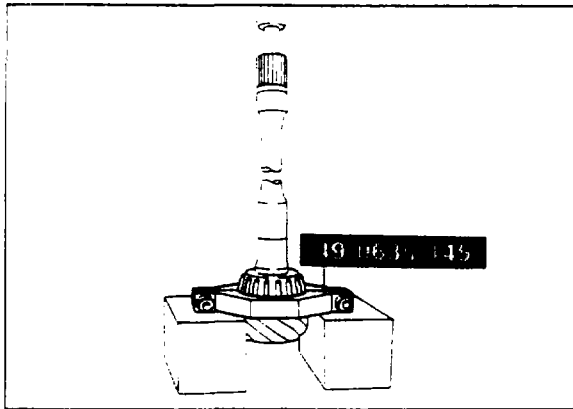
## 9 DIFFERENTIAL



67U09X-089

### Drive pinion

The drive pinion can be pushed out by attaching a miscellaneous lock nut to the drive pinion, and tapping it with a copper hammer.



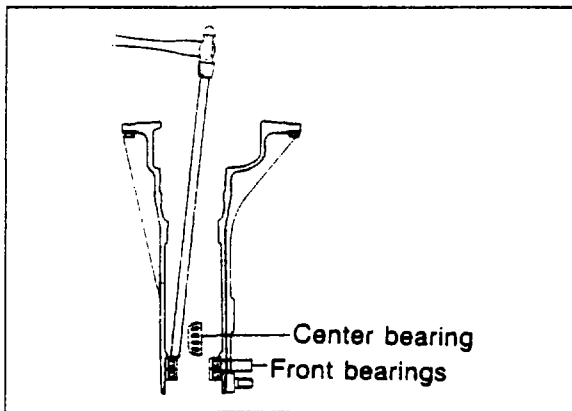
67U09X-090

### Rear bearing

Remove the bearing using **water pump boss puller** (49 0636 145).

#### Note

**Support the drive pinion by hand so that it will not fall.**

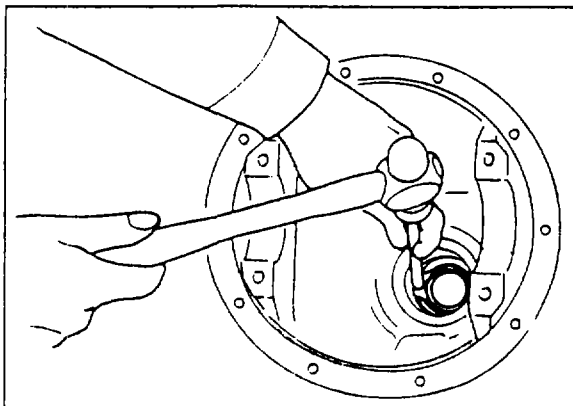


67U09X-091

### Front and center bearing

Drive out the front bearings using a brass drift and hammer.

Remove the center bearing.

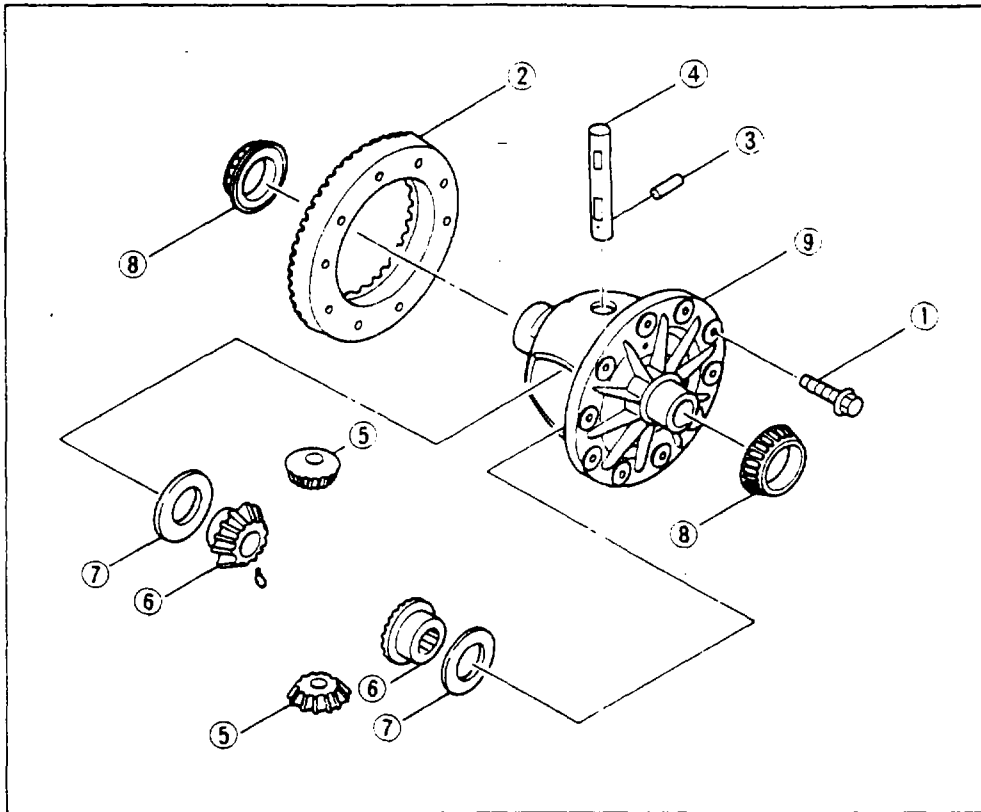


67U09X-092

### Bearing outer race

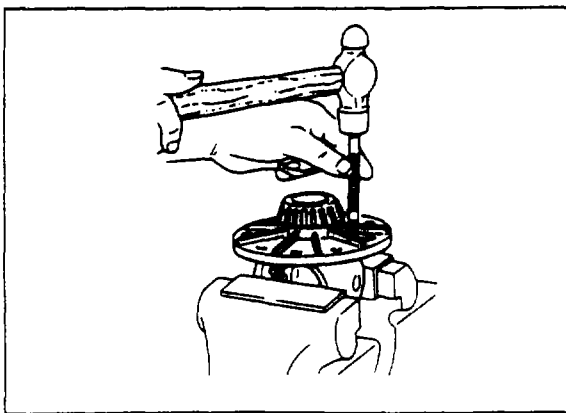
Remove the bearing outer races using the two grooves in the carrier and tapping the races alternately.

## Disassembly of Differential (Standard Differential)



1. Bolt
2. Ring gear
3. Knock pin
4. Pinion shaft
5. Pinion gears
6. Side gears
7. Thrust washer
8. Bearing
9. Gear case

67U09X-093



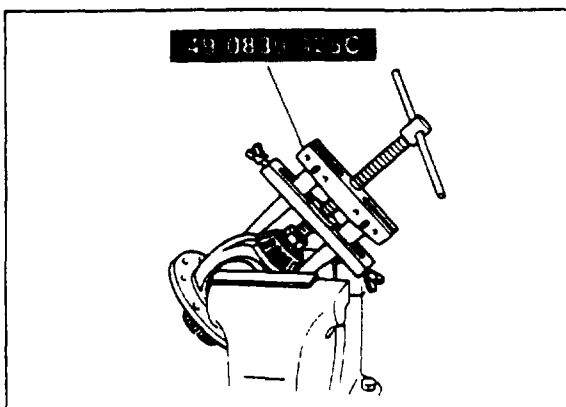
67U09X-094

### Knock pin

Secure the gear case in a vise and remove the knock pin.

### Caution

Insert the punch from the knock pin hole at the opposite side of where the ring gear is installed.



67U09X-095

### Side bearing

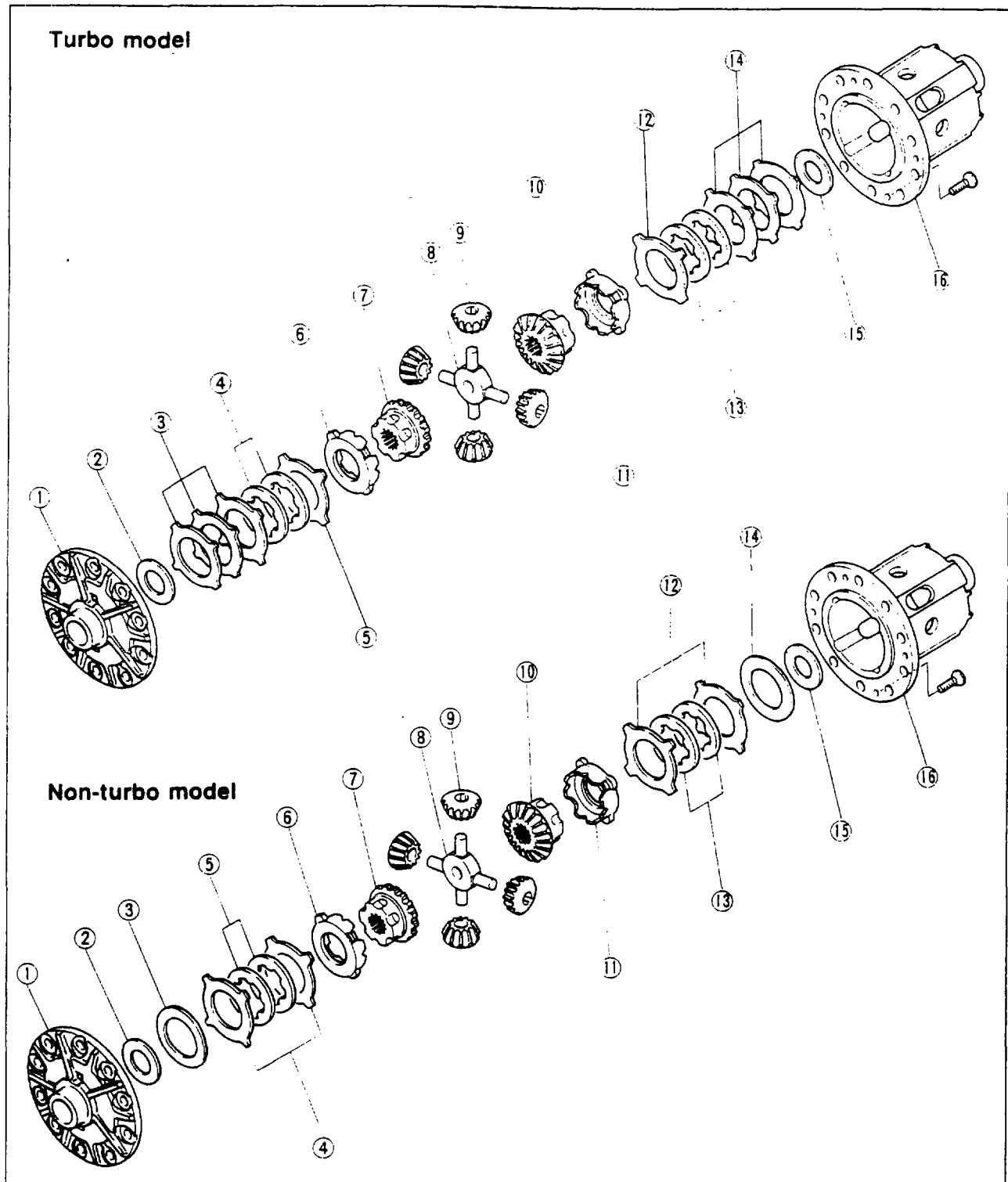
Using parts in bearing puller set (49 0839 425C), remove the side bearings from the gear case.

### Caution

Identify each one of the bearings so that they can later be re-installed in the same positions.

# 9 DEFFERENTIAL

## Disassembly of Differential (Limited Slip Defferential...LSD)

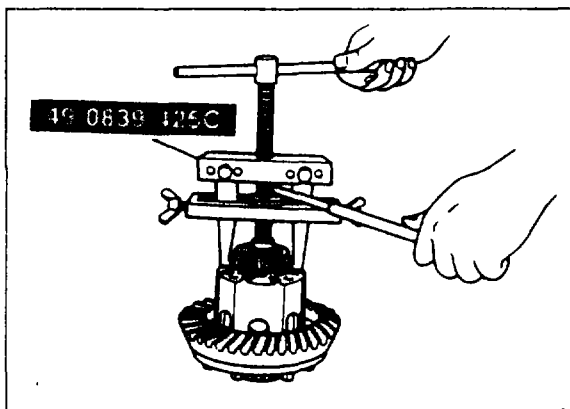


77U09X-051

- 1. Differential case (left)
- 2. Thrust washer
- 3. Conical spring
- 4. Friction plates
- 5. Friction discs
- 6. Pressure ring

- 7. Side gear
- 8. Spider
- 9. Pinion gear
- 10. Side gear
- 11. Pressure ring

- 12. Frictin plates
- 13. Friction discs
- 14. Plate spring (for turbo)  
Conical spring  
(for non-turbo)
- 15. Thrust washer
- 16. Differential case (right)



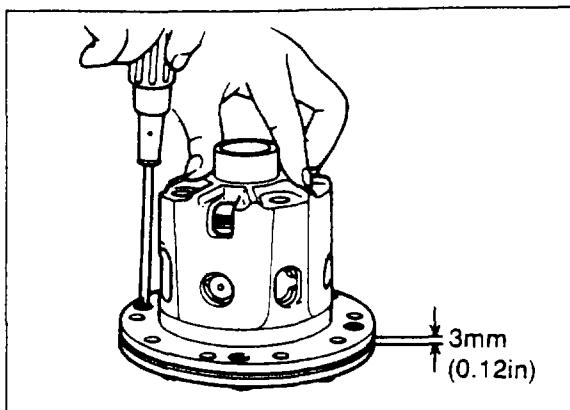
67U09X-097

### Side bearing

Using parts in **bearing puller set** (49 0839 425C), remove the side bearings from the gear case.

#### Caution

**Identify the bearings so that they can later be re-installed in the same positions.**



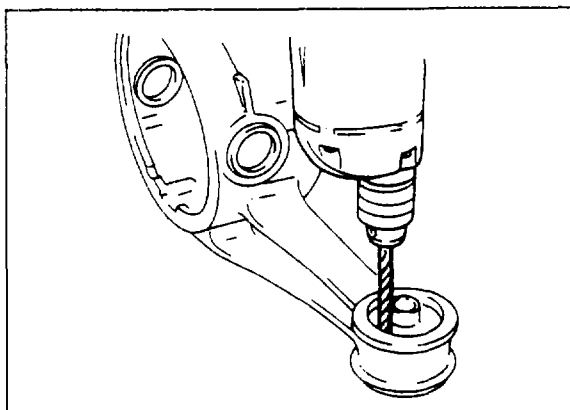
67U09X-098

### Attaching screws

Loosen the attaching screws gradually until the distance between the differential cases is about 3 mm (0.12 in), then remove the screws.

#### Note

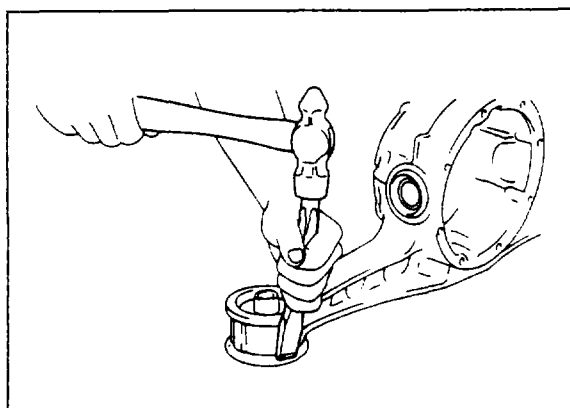
**Make matching marks on the cover and case for proper reassembly.**



67U09X-100

### Differential mounting rubber

1. Make holes around the differential mounting rubber using a drill.



67U09X-101

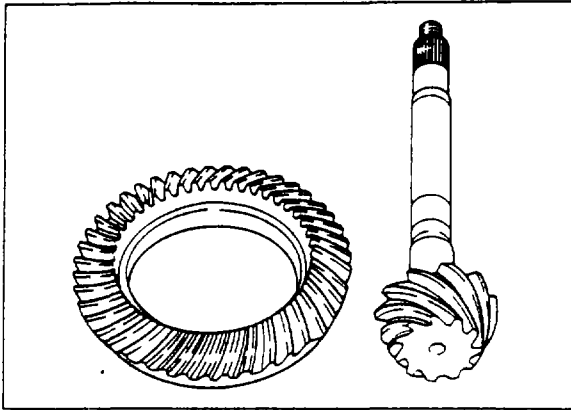
2. Hit the edge of the differential mounting rubber, to remove it.

#### Note

**Use a new mounting rubber when reassembling.**



## 9 DIFFERENTIAL

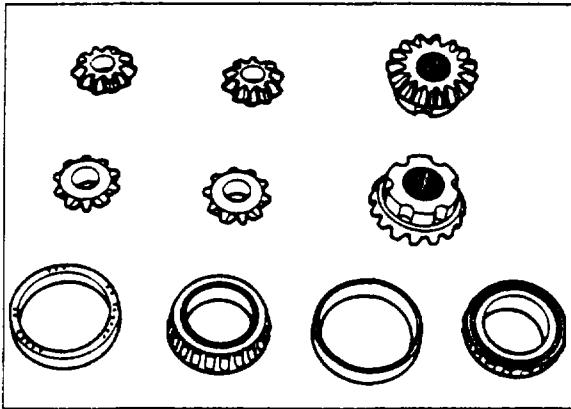


67U09X-102

### INSPECTION

Check the following points, if a problem is found, replace the part.

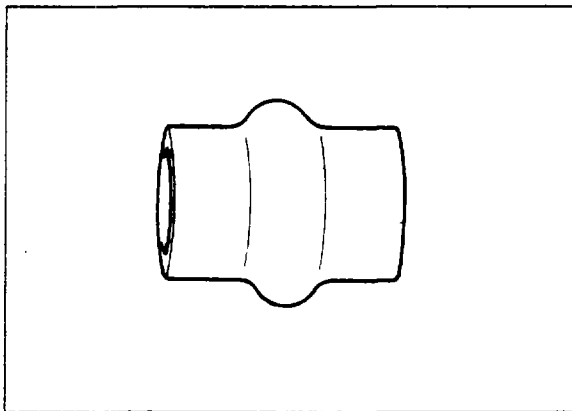
1. Drive pinion and ring gear.
2. Poor meshing, wear or damage.



67U09X-103

### Differential Gear

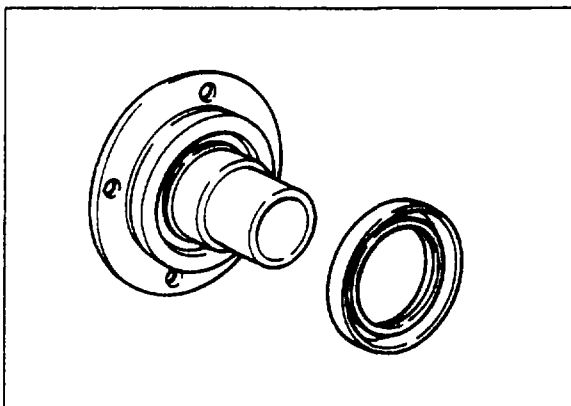
1. Check the differential side gears and pinion gears for cracks, chipped teeth or damage.
2. Check the differential bearings and pinion bearings for weakness, flaking or damage.



77U09X-015

### Collapsible Spacer

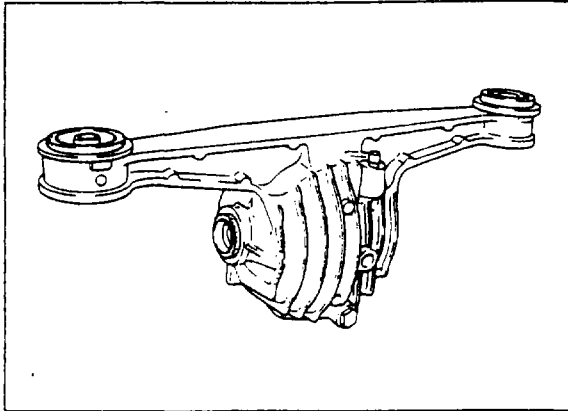
When assembling the differential, replace the collapsible spacer with a new one.



67U09X-105

### Companion Flange and Oil Seal

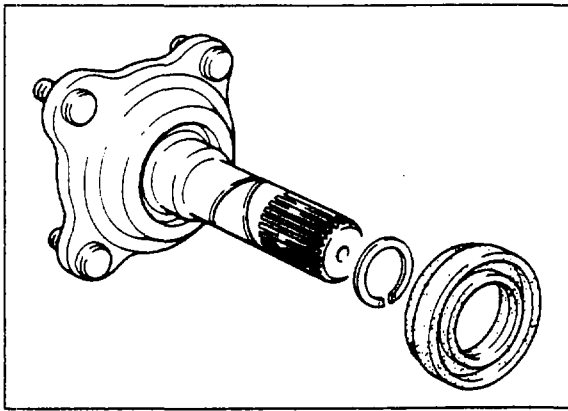
1. Check the oil seal for wear or damage.
2. Check the companion flange for cracks, worn splines, or worn oil seal friction surface.



67U09X-106

### Differential Case

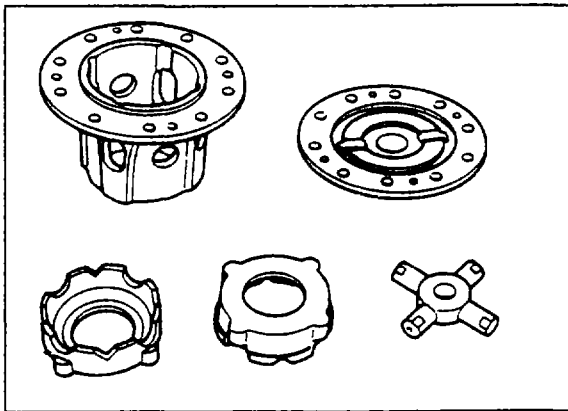
Check for cracks or damage.



67U09X-107

### Output Shaft and Oil Seal

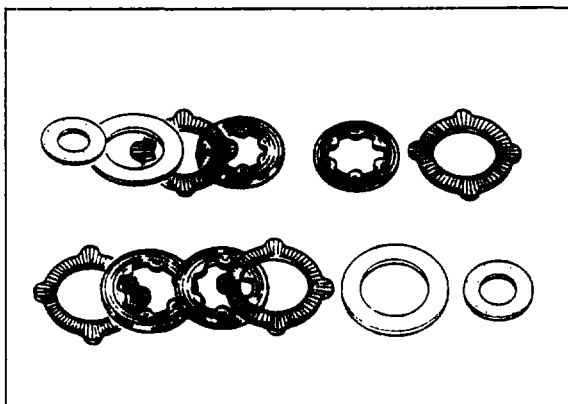
1. Check the oil seal for wear or damage.
2. Check the output shaft for cracks or worn splines.



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### Differential Case, Pressure Ring and Spider (LSD)

Check the differential cases, pressure rings, and spider for wear or damage.



67U09X-109

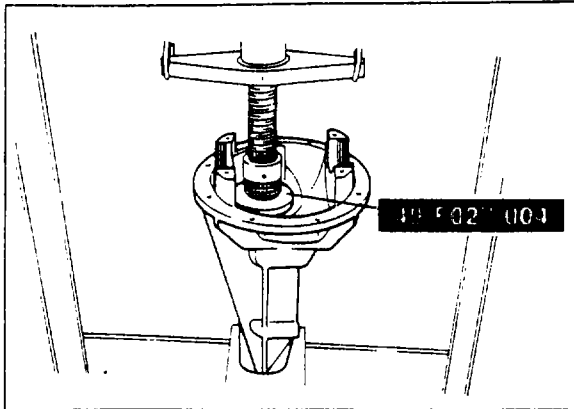
### Friction Plate, Friction Disc, Conical Spring and Thrust Washer (LSD)

1. Check the friction plates, friction discs, conical springs, and thrust washers for wear or damage.
2. Measure the thickness of each part.

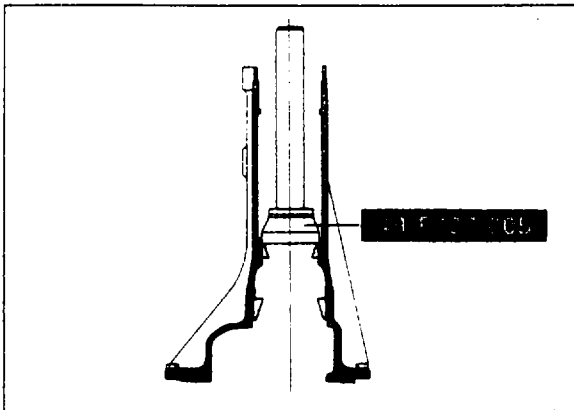
#### Thickness

	Standard	Limit	Over size
Friction plate	2.0 mm (0.0787 in)	1.9 mm (0.0748 in)	—
Friction disc	2.0 mm (0.0787 in)	1.9 mm (0.0748 in)	2.1 mm (0.0827 in)
Thrust washer	1.6 mm (0.0630 in)	1.4 mm (0.0551 in)	1.8 mm (0.0709 in)

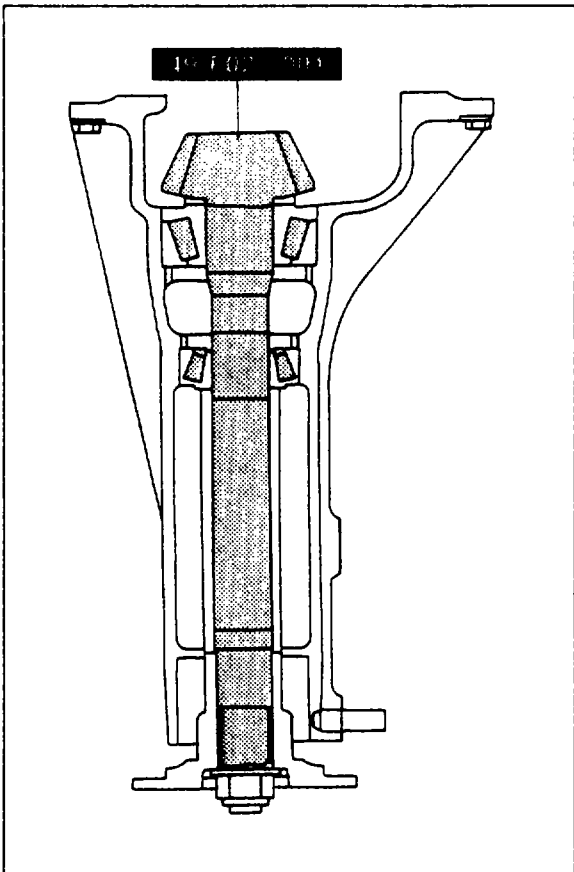
## 9 DIFFERENTIAL



67U09X-110



67U09X-111

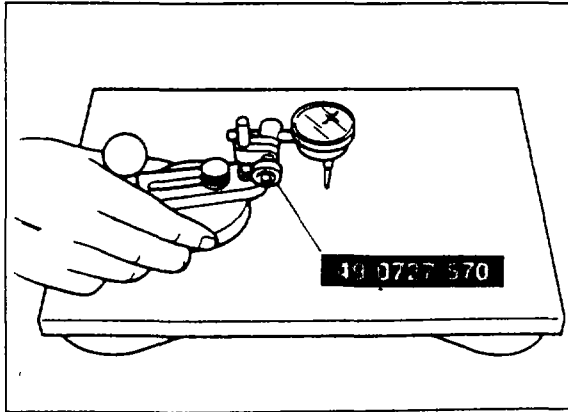


67U09X-112

### ASSEMBLY

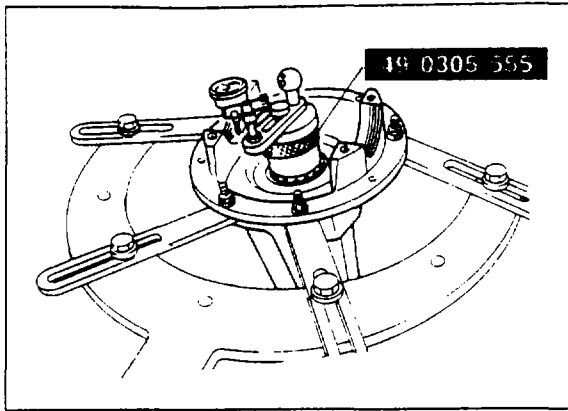
#### Adjustment of Pinion Height

1. Make certain that the differential bearing support bores are free of dirt and burrs.
2. Install the rear bearing race using **attachment** (49 F027 004).
3. Install the center bearing race using **attachment** (49 F027 005).
4. Install the rear bearing, spacer and **drive pinion model** (49 F027 001).
5. Install the center bearing, long collar, companion flange, washer and nut.
6. Tighten the nut enough so that the drive pinion model can still be turned by hand.



67U09X-113

7. Place the **pinion height adjust gauge body** (49 0727 570) on the surface plate and set the dial indicator to "Zero".



77U09X-013

8. Place **gauge block** (49 0305 555...non-turbo, 49 0660 555...turbo) on top of the drive pinion model, and then set the **pinion height adjust gauge body** on top of the gauge block.

9. Place the measure probe of the dial indicator so that it contacts the place where the side bearing is installed in the carrier, and measure the lowest position. Measure both the left and the right sides.

10. Add the two (left and right) values obtained by the measurements taken in step 9 and divide the total by 2.

**Standard: 0 mm (0 in)**

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Mark	Thickness	Mark	Thickness
08	3.08 mm (0.1213 in)	29	3.29 mm (0.1295 in)
11	3.11 mm (0.1224 in)	32	3.32 mm (0.1307 in)
14	3.14 mm (0.1224 in)	35	3.35 mm (0.1319 in)
17	3.17 mm (0.1248 in)	38	3.38 mm (0.1331 in)
20	3.20 mm (0.1260 in)	41	3.41 mm (0.1343 in)
23	3.23 mm (0.1271 in)	44	3.44 mm (0.1354 in)
26	3.26 mm (0.1283 in)	47	3.47 mm (0.1366 in)

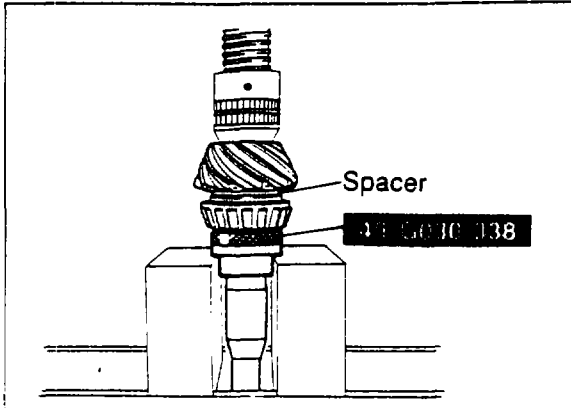
77U09X-015

11. If not within specification, adjust the pinion height with a spacer.

**Note**

**The spacer thicknesses are available in increments of 0.03 mm. Select the spacer thickness that is closest to that necessary.**

## 9 DIFFERENTIAL



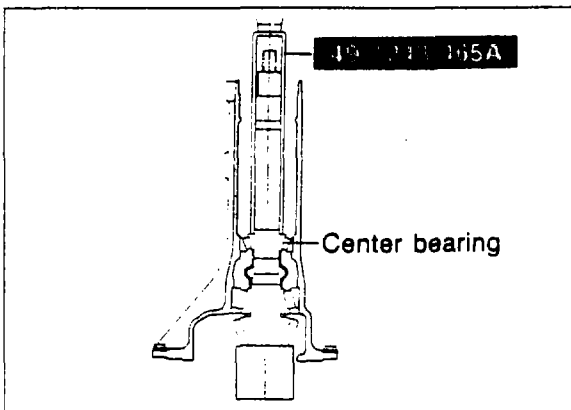
67U09X-116

### Adjustment of Drive Pinion Preload

1. Install the spacer.
2. Press the rear bearing on by using **attachment E** (49 G030 338).

#### Caution

- a) Press on until the force required suddenly increases.
- b) Install the spacer selected for the pinion height adjustment, taking care that the installation direction is correct.



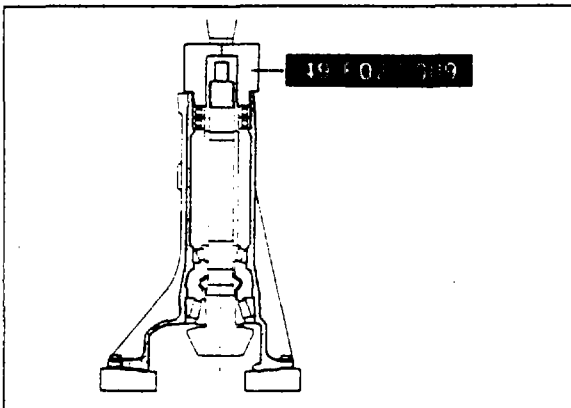
67U09X-117

3. Install the drive pinion assembly.
4. Press the center bearing on using **main shaft lock nut wrench** (49 1243 465A).

**Press force: 1,000 kg (1 ton)**

#### Caution

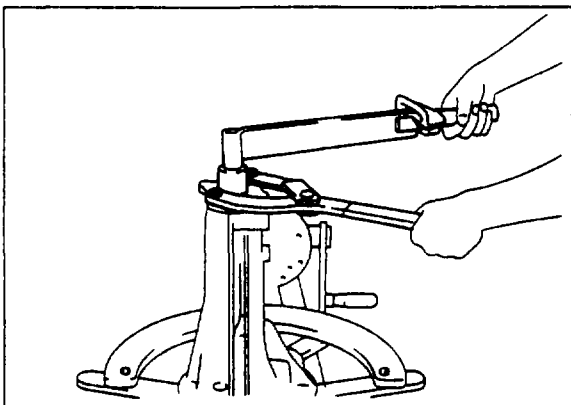
**Do not press to more than 1,000 kg (1 ton), because the collapsible spacer will bend.**



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5. Support the differential carrier, and press the front bearing on using **attachment** (49 F027 009).

**Press force: 2,000—3,000 kg (2—3 ton)**



67U09X-119

6. Install the companion flange, and tighten the lock nut.

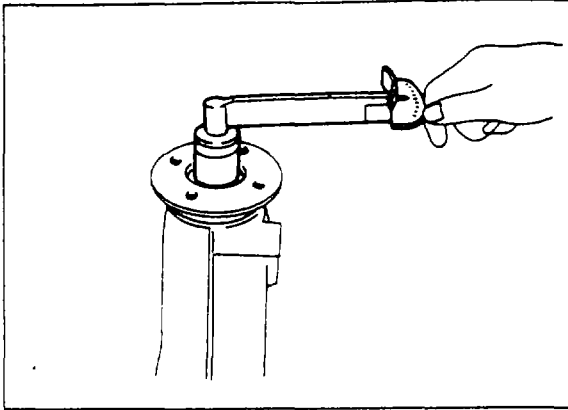
#### Tightening torque:

**128—177 N·m**

**(13.0—18.0 m·kg, 94—130 ft·lb)**

#### Note

**Do not install the oil seal.**



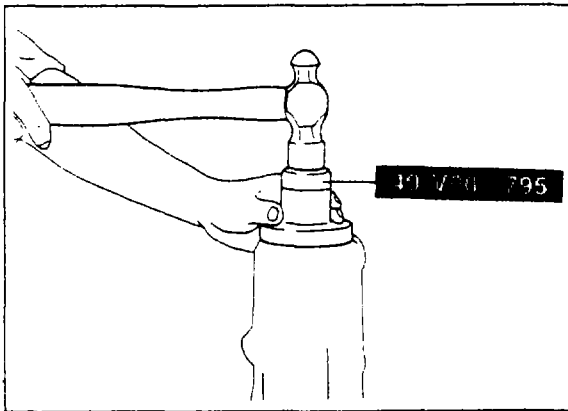
67U09X-120

4. Turn the companion flange by hand to seat the bearing.
5. Measure the drive pinion preload. If the specified preload can not be obtained, replace the collapsible spacer with a new one and check again.

**Preload:**

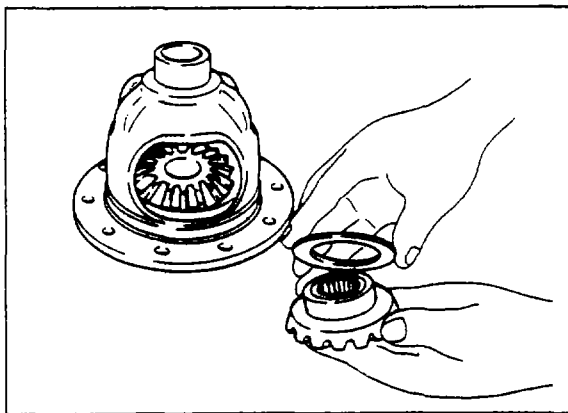
0.9—1.4 N·m

(9—14 cm·kg, 7.8—12.2 in·lb)



67U09X-121

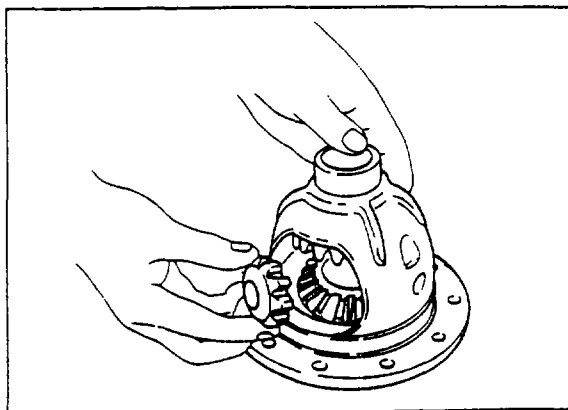
6. Remove the nut, washer and companion flange.
7. Tap the oil seal into the differential carrier using **oil seal installer** (49 V001 795).



67U09X-122

**Differential (Standard)**

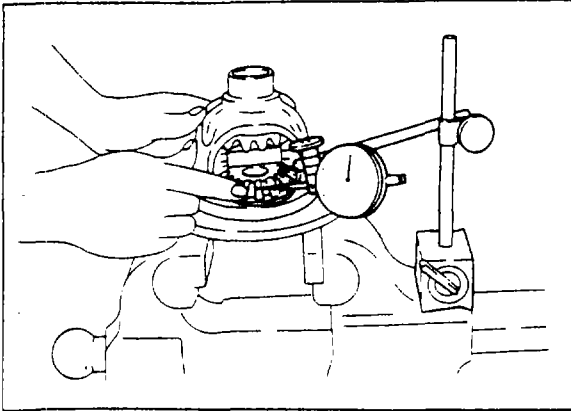
1. Install the thrust washers on the differential side gears and install them in the gear case.



67U09X-123

2. Through the openings of the gear case, insert the pinion gears exactly **180°** opposite each other.
3. Rotate the gears **90°** so that the pinion gears align with the pinion shaft holes in the gear case
4. Insert the pinion shaft.

# 9 DIFFERENTIAL



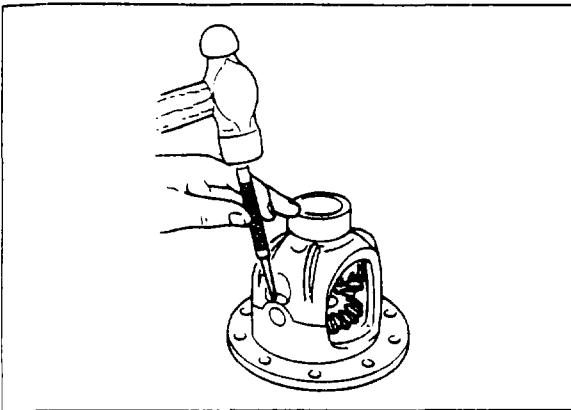
67U09X-124

5. Check the backlash of the side gear and pinion gear. Adjust by inserting a thrust washer of proper thickness.

**Standard backlash: 0—0.1 mm (0—0.004 in)**

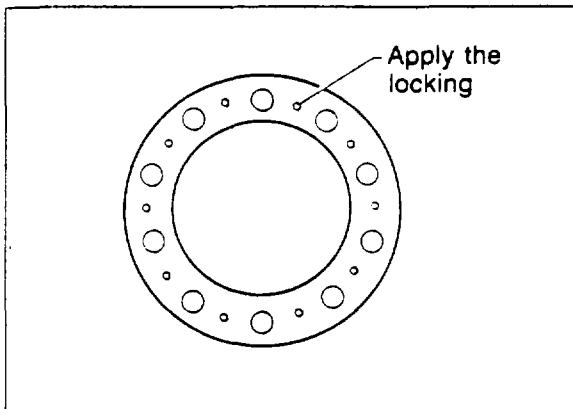
**Thrust washer thickness:**

Identification mark	Thickness
0	2.00 mm (0.0787 in)
05	2.05 mm (0.0807 in)
1	2.10 mm (0.0827 in)
15	2.15 mm (0.0846 in)
2	2.20 mm (0.0866 in)



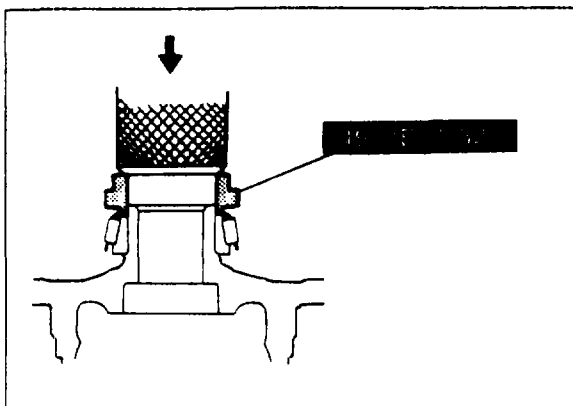
67U09X-125

6. Install the lock pin to secure the pinion shaft. Stake the lock pin into position with a punch to prevent it from coming out.



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7. Apply locking compound to the rear face of the ring gear as shown in the figure.



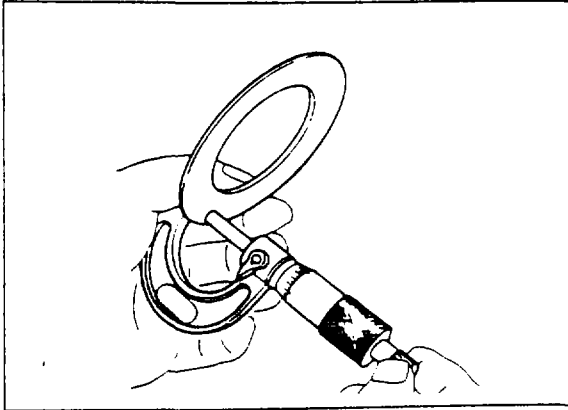
67U09X-127

8. Install the ring gear.

**Tightening torque:**

**69—83 N·m (7.0—8.5 m·kg, 51—61 ft·lb)**

9. Press the side bearings on using **bearing installer** (49 UB71 525).



77U09X-025

## Adjustment, Differential Gears (LSD)

### Clearance No. 1

1. Measure the thickness of the conical springs or plate springs and add the values.

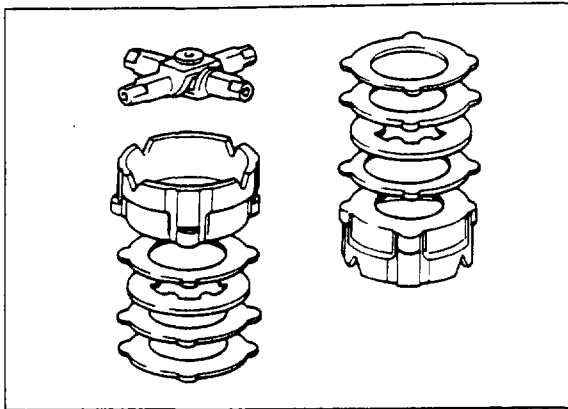
#### Non-turbo model

2 (two) conical springs.

#### Turbo model

6 (six) plate springs.

Total value.....A



77U09X-016

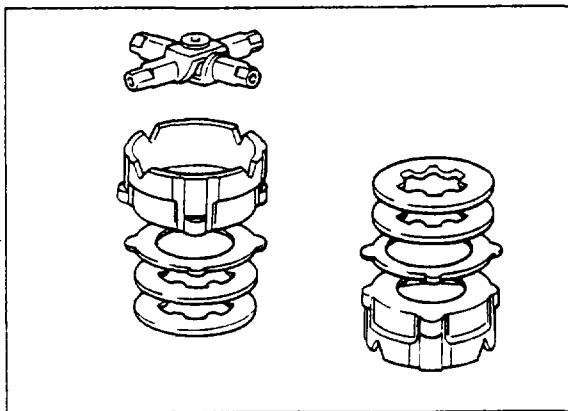
2. Assemble the following parts:

#### Non-turbo model

- a) Spider.
- b) 2 pressure rings.
- c) 4 friction plates.
- d) 4 friction disc.

#### Turbo model

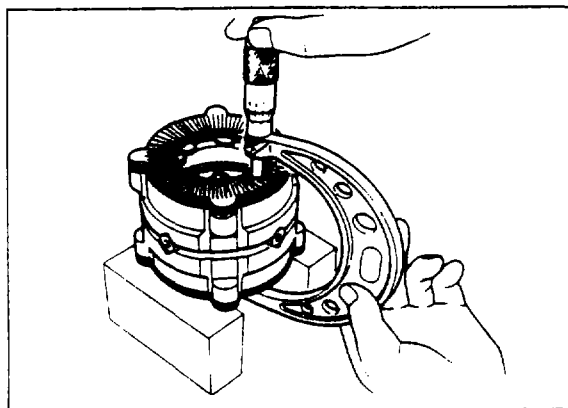
- a) Spider.
- b) 2 pressure rings.
- c) 2 friction plate.
- d) 4 friction disc.



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3. Measure the dimension with a micrometer.

Measured dimension.....L1



77U09X-018



# 9 DEFFERENTIAL

4. Calculate clearance No.1.

**Non-turbo model**

**Clearance No. 1 = 84.0 mm (3.3070 in)-A-L1**

**Standard clearance No. 1:**

**0.05—0.20 mm (0.0020—0.0079 in)**

**Turbo model**

**Clearance No. 1 = 91.0 mm (3.5827 in)-A-L1**

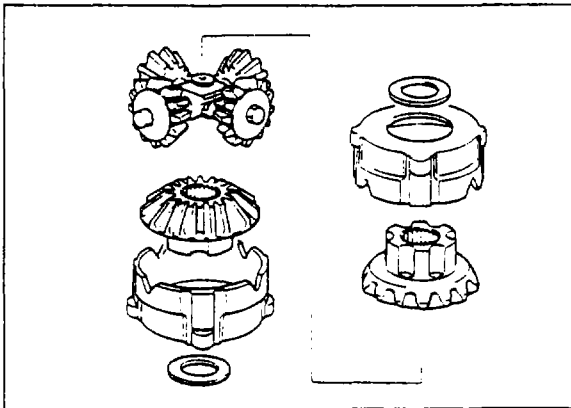
**Standard clearance No. 1:**

**0.1—0.25 mm (0.0039—0.0098 in)**

5. If the clearance is not within specification, adjust with oversize friction discs.

**Oversize thickness: 2.1 mm (0.0827 in)**

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67U09X-131

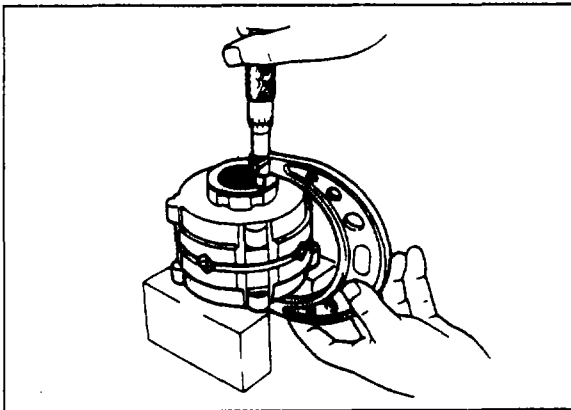
**Clearance No. 2**

1. Assemble the following parts:

- Pressure rings.
- Side gears.
- Spider with pinion gears.
- Thrust washers.

2. Measure the dimension with a micrometer.

**Measured dimension.....B**



77U09X-020

3. Calculate clearance No. 2.

**Non-turbo model**

**Clearance No. 2 = 88.2 mm (3.4724 in)-B**

**Standard clearance:**

**0.16—0.48 mm (0.0063—0.0189 in)**

**Turbo model**

**Clearance No. 2 = 94.0 mm (3.7008 in)-B**

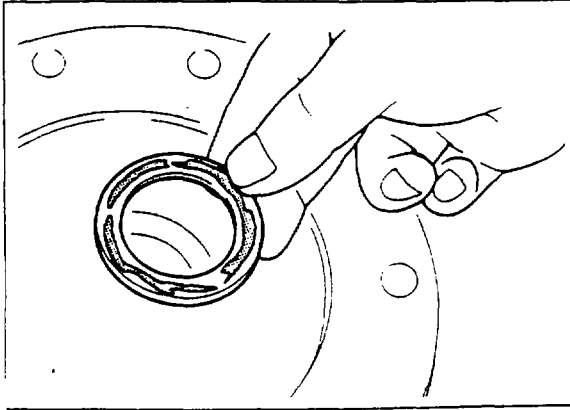
**Standard clearance:**

**0.10—0.40 mm (0.0039—0.0157 in)**

4. If the clearance is not within specification, adjust with oversize thrust washers.

**Oversize thickness: 1.8 mm (0.0709 in)**

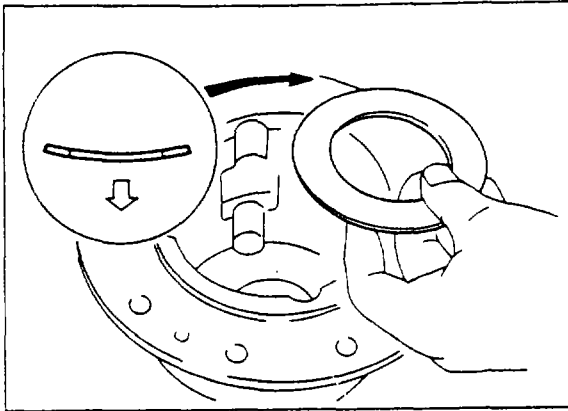
77U09X-021



67U09X-133

## Assemble Differential (LSD)

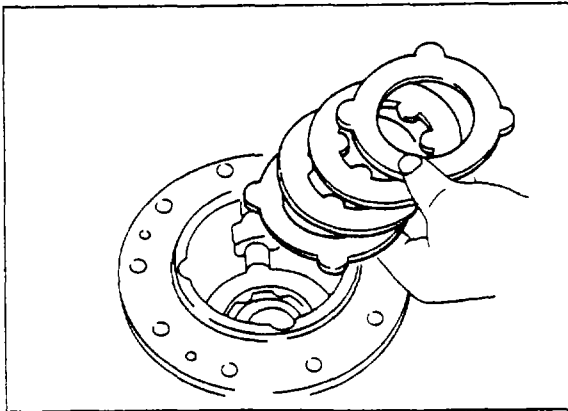
1. Coat the thrust washer with grease and install it in the differential case.



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2. Install the conical springs.

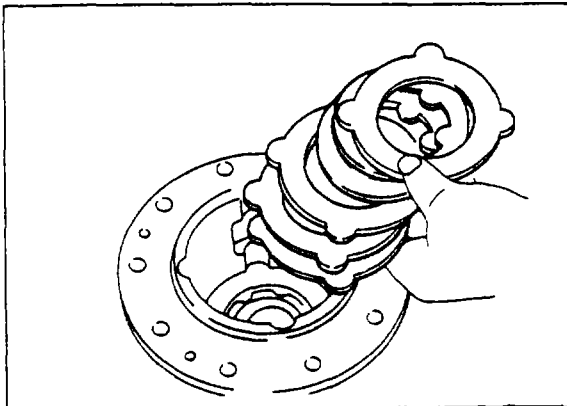
**Caution**  
Be sure that the installation direction is correct.



77U09X-022

3. Install the friction plates and disc.

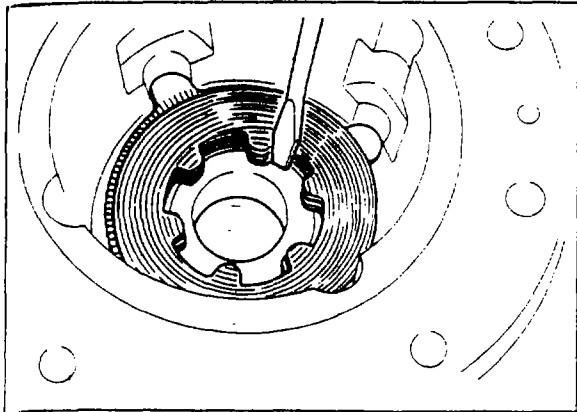
**Caution**  
Installation order:  
Non-turbo model  
Plate — Disc — Disc — Plate



77U09X-023

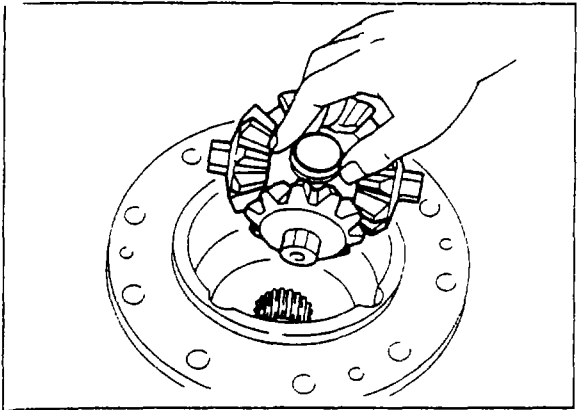
**Turbo model**  
Spring — Spring — Spring — Disc — Disc  
— Plate

## 9 DIFFERENTIAL



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4. Arrange the friction discs so that the splines of the side gear can be inserted.

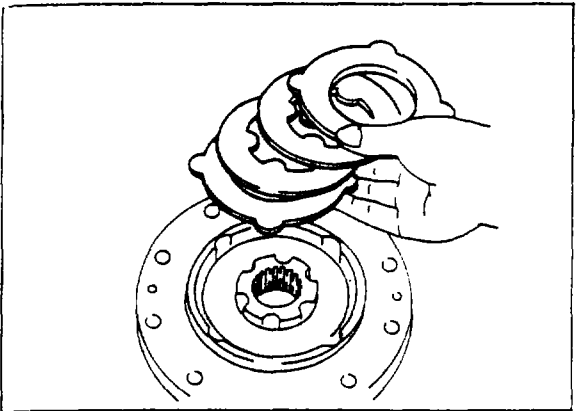


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5. Install the pressure ring.
6. Install the side gear.
7. Install the pinion gears and spider assembly.

### Caution

Be sure the spider is installed flat in the case and not cocked to one side or the other.



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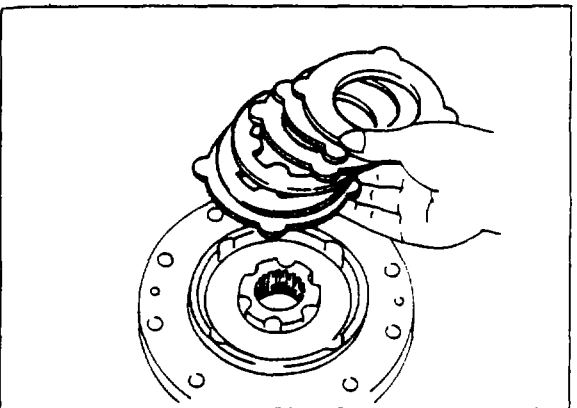
8. Install the side gear and pressure ring.
9. Install the friction discs and plates.

### Caution

Installation order:

Non-torbo model

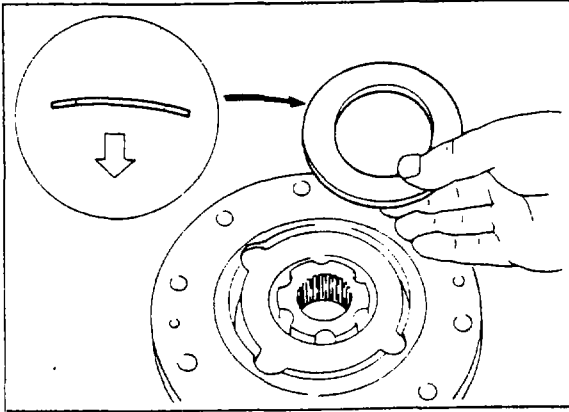
Plate — Disc — Disc — Plate



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Turbo model

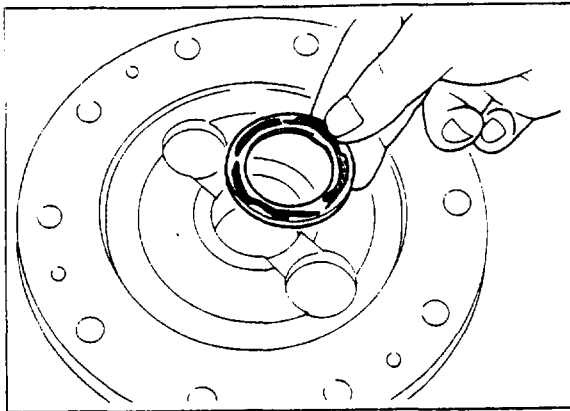
Plate — Disc — Disc — Spring — Spring —  
Spring



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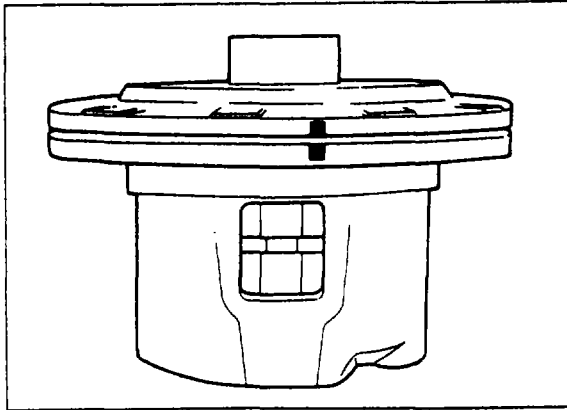
10. Install the conical springs.

**Caution**  
Be sure that the installation direction is correct.



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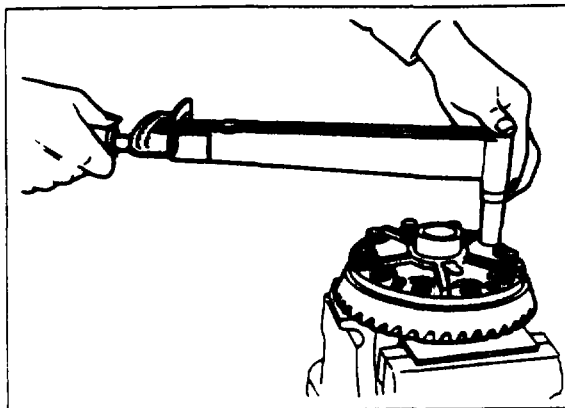
11. Coat the thrust washer with grease and install it in the differential cover.



67U09X-141

### Differential cover

1. Align the marks on the differential case and cover.



67U09X-142

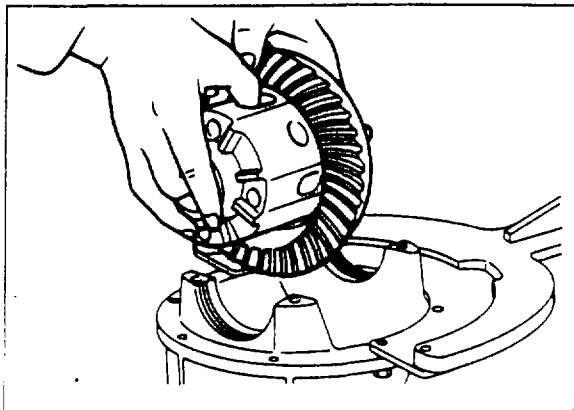
2. Tighten the attachment screws gradually, evenly and securely.

3. Install the ring gear to the differential case.

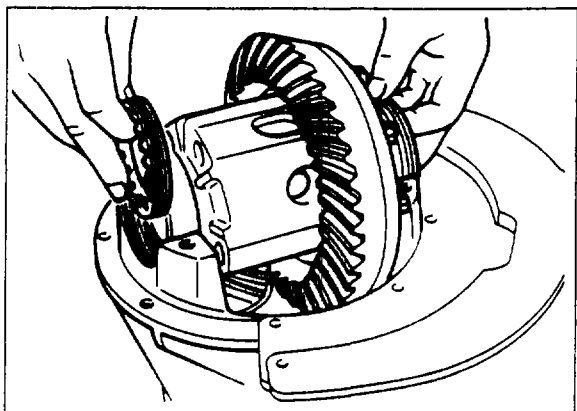
### Tightening torque:

69—83 N·m (7.0—8.5 m·kg, 51—61 ft·lb)

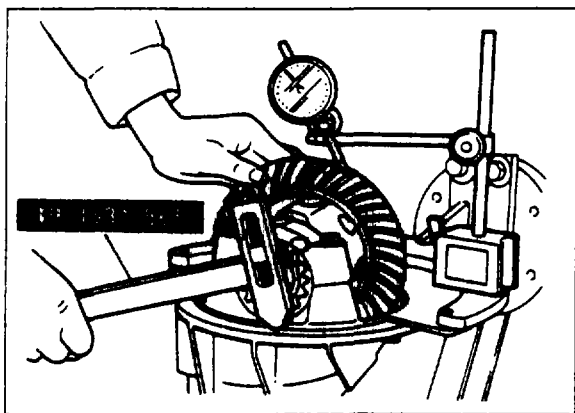
## 9 DIFFERENTIAL



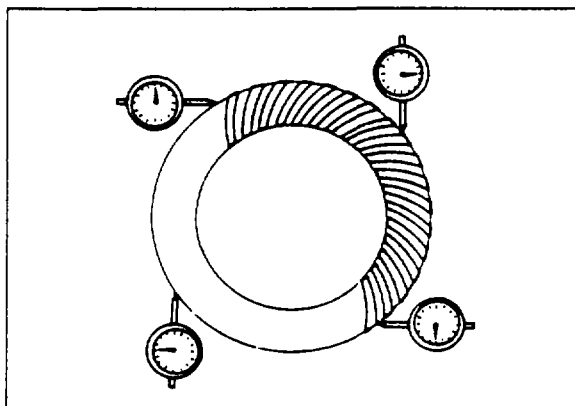
67U09X-143



67U09X-144



67U09X-145



67U09X-146

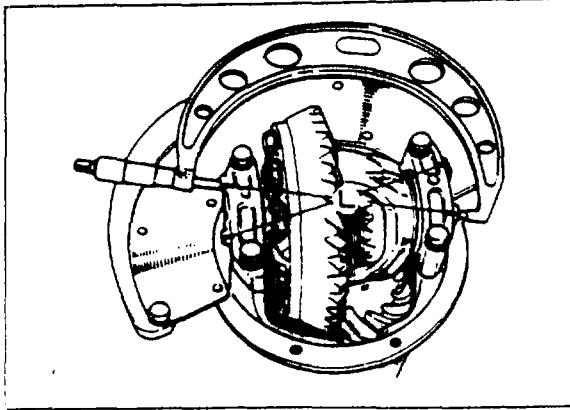
### Installation of Differential

1. Install the differential gear assembly in the carrier.

2. Note the identification marks on the adjust screws and install each one to its respective side.
3. Install the differential bearing caps making sure that the identification marks on the caps correspond with those on the carrier.
4. Loosely tighten the bearing cap bolts on each side and adjust the backlash, as instructed in the following paragraph.

### Adjustment of Backlash

1. Mark the ring gear at four points at approx. 90° intervals. Mount a dial indicator to the carrier so that the feeler comes in contact at a right angle with one of the ring gear teeth.
2. Turn both bearing adjusters equally until the backlash is **0.09—0.11 mm (0.0035—0.0043 in)** using **differential wrench (49 0259 720)**.
3. Check the backlash at the three other marked points and check that the minimum backlash is more than **0.05 mm (0.002 in)**, and the difference between the maximum and minimum backlash noted is less than **0.07 mm (0.0028 in)**.



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4. Tighten the adjust screws equally until the distance between the pilot sections on the bearing caps are as follows.

**Non-turbo model**

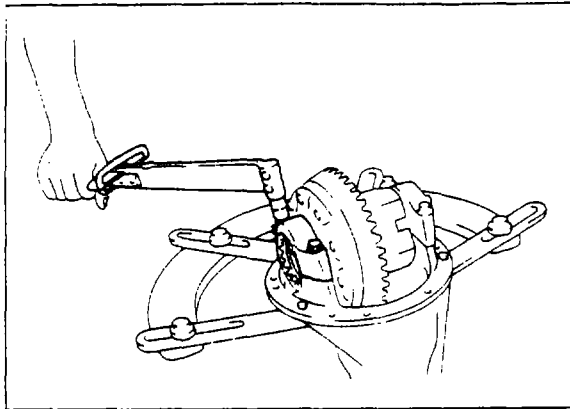
185.43—185.50 mm (7.3004—7.3033 in)

**Turbo model**

204.43—204.50 mm (8.048—8.051 in)

**Note**

When adjusting the differential bearing preload, care must be taken not to affect the backlash of the drive pinion and ring gear.



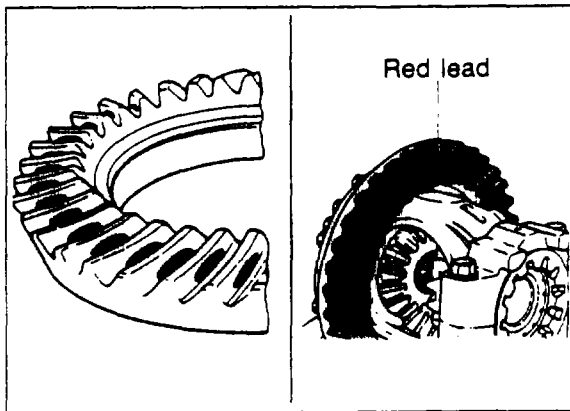
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5. Tighten the bearing cap bolts.

**Tightening torque:**

37—52 N·m (3.8—5.3 m·kg, 27—38 ft·lb)

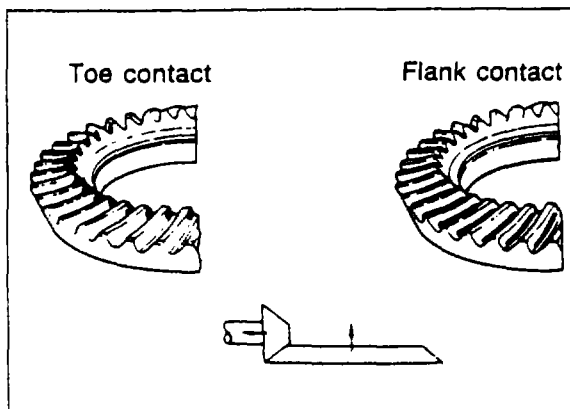
6. Install the adjust screw lock plates on the bearing caps to prevent them from loosening.



67U09X-149

**Inspection and Adjustment of Teeth Contact**

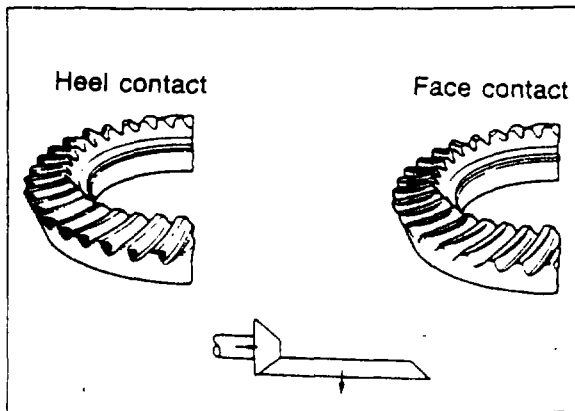
1. Coat both surfaces of 6—8 teeth of the ring gear uniformly with a thin coat of red lead.
2. While moving the ring gear back and forth by hand, rotate the drive pinion several times and check the tooth contact.
3. If the tooth contact is good, wipe off the red lead.
4. If it is not good, adjust the pinion height, and then adjust the backlash.



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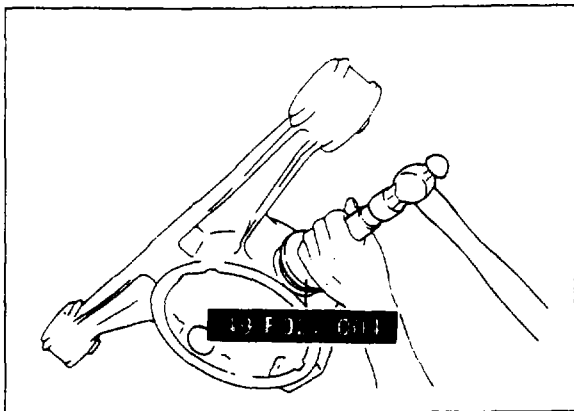
- (1) Toe and flank contact  
Replace the spacer with a thinner one, and move the drive pinion outward.

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- (2) Heel and face contact  
Replace the spacer with a thicker one, and bring the drive pinion closer in.

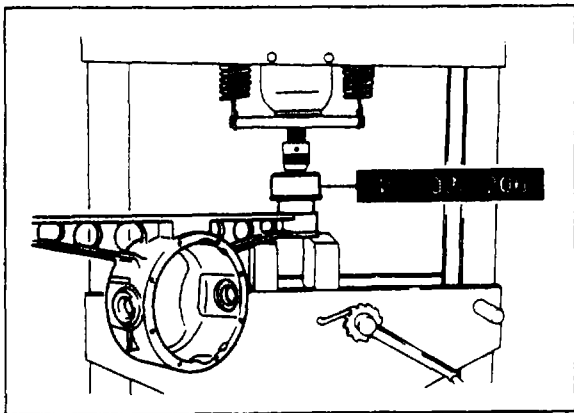


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## Assembly of Differential Case

### Oil seal

Install the new oil seal using **attachment** (49 F027 004).



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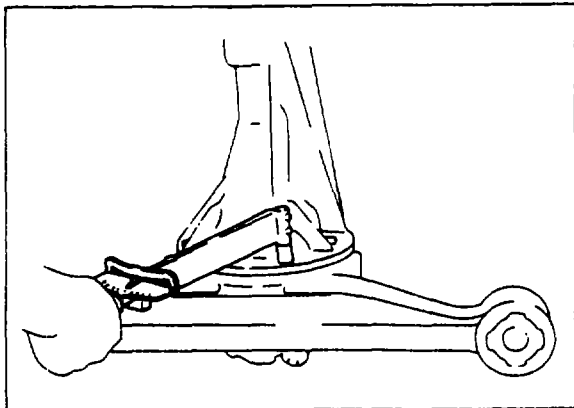
### Differential mounting rubber

Press on the new differential mounting rubber using **mounting rubber installer** (49 F028 206).

**Press force: 2,000 kg (2 tons)**

### Note

**Install the mounting rubber with the voids in front and rear directions.**



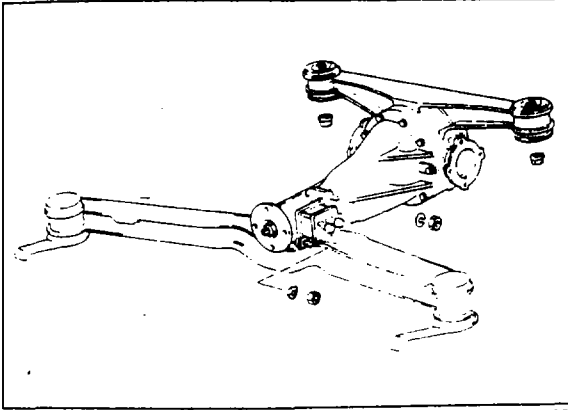
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### Differential carrier

Coat the carrier mounting surface with sealing compound, and install the differential.

### Tightening torque:

**23—26 N·m (2.3—2.7 m·kg, 17—20 ft·lb)**



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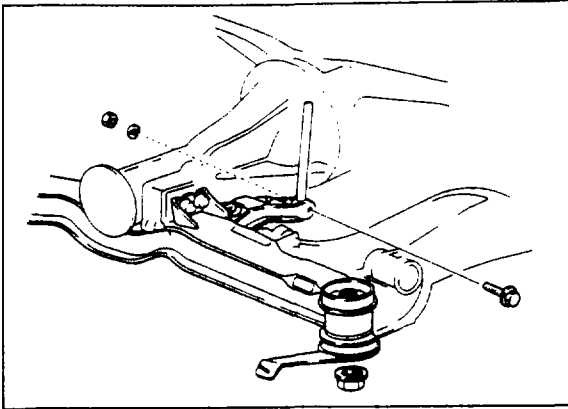
## INSTALLATION

1. Install the differential assembly.

### Tightening torque:

**Diff. Carrier: 88—105 N·m**  
(9.0—10.7 m·kg, 65—77 ft·lb)

**Diff. case: 74—93 N·m**  
(7.5—9.5 m·kg, 54—69 ft·lb)



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2. Tighten the left differential member.

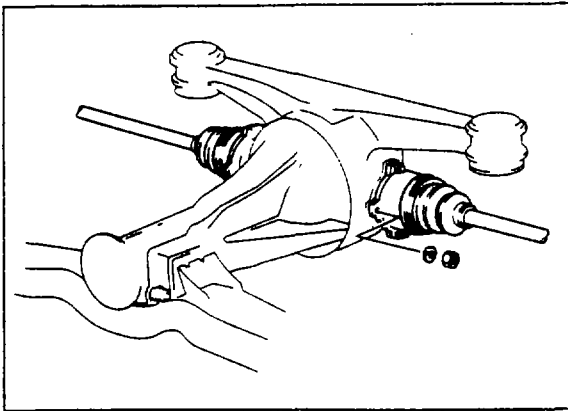
### Tightening torque:

**74—93 N·m (7.5—9.5 m·kg, 54—69 ft·lb)**

3. Tighten the sub-link assembly.

### Tightening torque:

**74—93 N·m (7.5—9.5 m·kg, 54—69 ft·lb)**



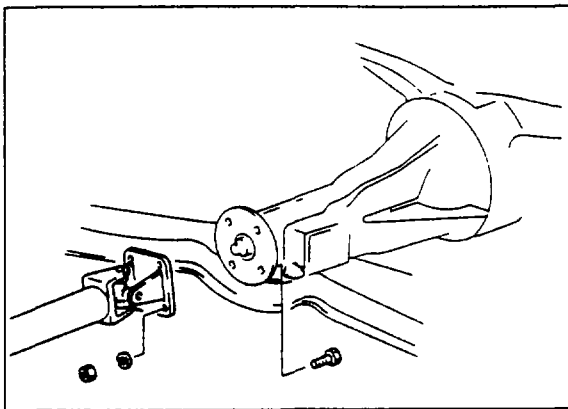
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3. Install the driveshafts.

Before installing the driveshafts, align the mating marks.

### Tightening torque:

**54—64 N·m (5.5—6.5 m·kg, 40—47 ft·lb)**



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4. Install the propeller shaft.

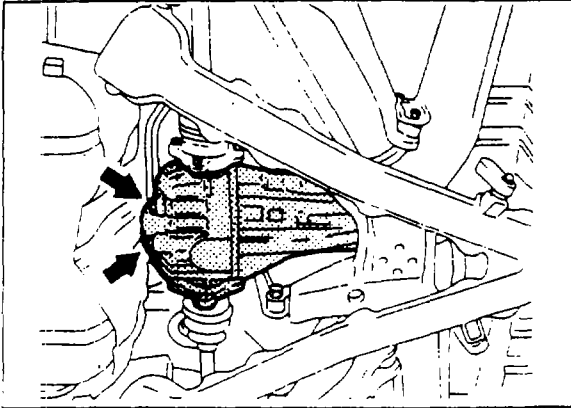
Before installing the propeller shaft, match the matching marks.

### Tightening torque:

**49—59 N·m (5.0—6.0 m·kg, 36—43 ft·lb)**



## 9 DIFFERENTIAL



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5. Install the drain plug and add the specified oil.
6. Install the fill plug.

**Tightening torque:**

**39—54 N·m (4.0—5.5 m·kg, 29—40 ft·lb)**

**Capacity:**

**Standard diff. and LSD**

**1.3 liters (1.4 US qt, Imp qt)**