

DAIHATSU

F73, F78

(F70, F75, F77)

☆ FRONT & REAR DIFFERENTIAL

GENERAL DESCRIPTION	DF- 2
TROUBLE SHOOTING	DF- 3
IN-VEHICLE REPLACEMENT	
PROCEDURES	
FOR OIL SEAL (FRONT)	DF- 4
IN-VEHICLE REPLACEMENT	
PROCEDURES	
FOR OIL SEAL (REAR)	DF- 7
FRONT DIFFERENTIAL	DF- 9
REAR DIFFERENTIALS	DF-28
L.S.D. (Limited Slip Differential)	DF-46
SSTs (FRONT & REAR)	DF-55
SERVICE SPECIFICATIONS	DF-56
TIGHTENING TORQUE	DF-57

DF

R7DF00001-00000

In the sections bearing "☆" marks, the model codes "F70, 75, 77" should read as "F73 and F78".
After checking the contents of the relevant sections of the F73, F78 manual, we found that the contents remained the same.
Therefore, we are using the sections as they are in this manual.

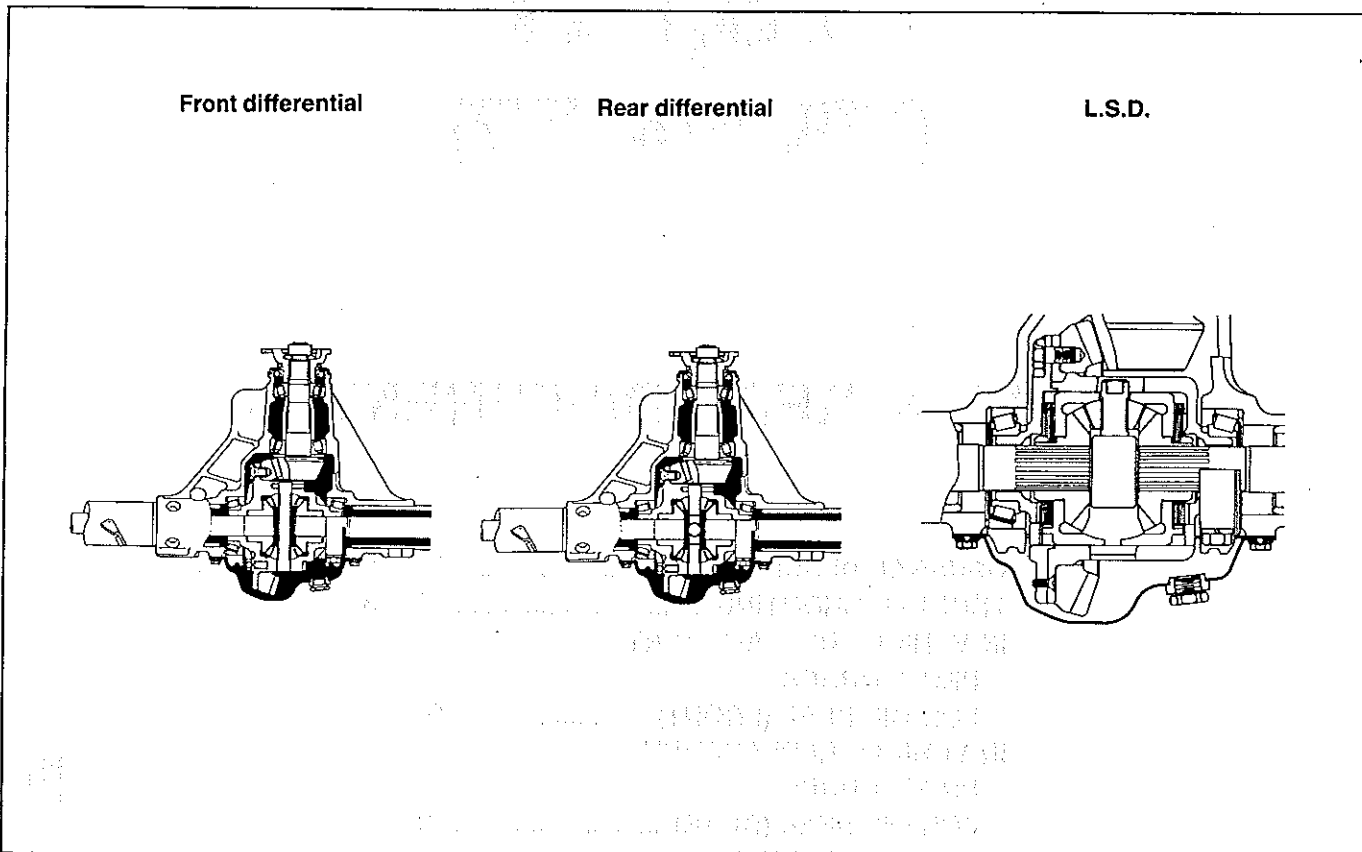
NO. 9705

FRONT & REAR DIFFERENTIAL

GENERAL DESCRIPTION DIFFERENTIALS

The differential at both the front and rear employs a hypoid gear type.

In the case of ordinary differentials, there will be cases where the traction is lost when the wheel at one side is rotating idly on muddy roads or during a rapid cornering. To solve those problems, an L.S.D. (Limited Slip Differential) is available as optional equipment on the rear differential.



WRE91-DF002

Differential specifications

Item		Kind	Front	Rear	Rear (LSD)
Final reduction gear ratio			3.363	3.363	3.363
Differential ring gear	Number of teeth		37	37	37
	Outer diameter	mm	204	204	204
	Gear type		Hypoid gear	Hypoid gear	Hypoid gear
Final reduction gear	Number of teeth		11	11	11
	Outer diameter	mm	85	85	85
	Gear type		Hypoid pinion	Hypoid pinion	Hypoid pinion
Differential side gear	Number of teeth		18	18	18
	Number of inner spline teeth		30	30	30
Number of differential pinion teeth			10	10	10
Pinion shaft outer diameter			mm 18	18	18

WRE91-DF003

TROUBLE SHOOTING

Symptoms		Possible causes	Checking points
Abnormal noise	Differential tapping noise	Improper backlash of hypoid gear	Check backlash between drive pinion and ring gear.
	Differential clank noise	The same above	The same above
	Differential clocking noise	Drive pinion improperly adjusted	Check preload. Check backlash.
	Differential chuckle noise	Abnormal wear in side gear and differential case	Check side gear. Check differential case.
	Differential noise	Improper tooth contact at hypoid gear	Check tooth contact between drive pinion and ring gear.
Oil leakage		Faulty oil seal	Check each oil seal.
		Oil leakage at differential carrier installation section	Check installation surface with rear axle housing.

WRE91-DF004

A label showing the production year, month and date of the axle housing has been affixed on each of the cover surfaces of the front and rear axle housings. At its upper column, the label indicates the specifications of the axle housing in a form of alphanumeric letters (e.g. F-1F, F40, F3A, R20 and R10).

Label

Example:

F-1F (A)
J01091 (B)

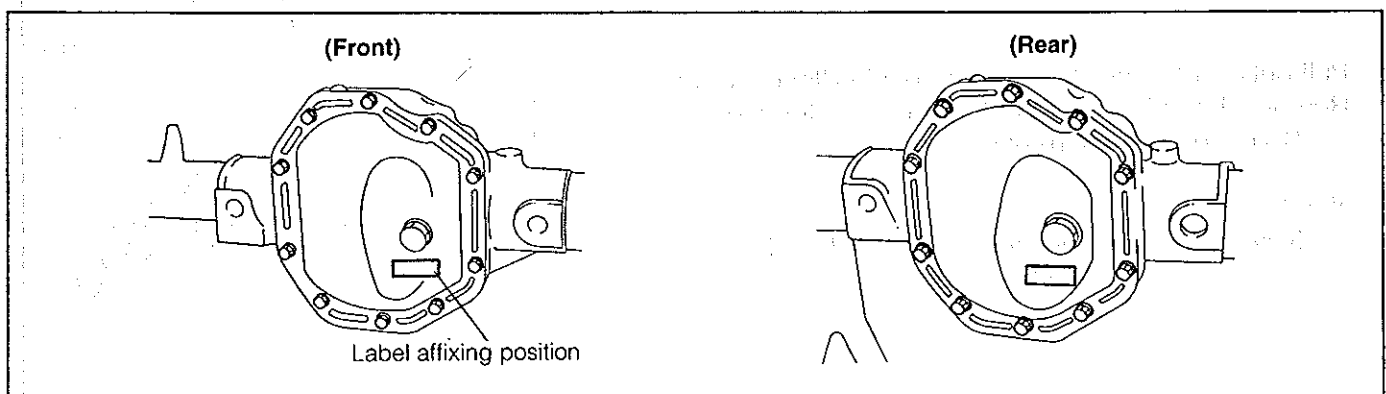
- (A) Axle housing specifications
(B) Production date, month and year

Front

Model		Standard	F-W-H	MANUAL F-W-H
F70R/LV-R	RHD	F10	F1A	F1F
	LHD	F20	F2A	F2F
F70R/LV-MDTW2	RHD	F30	F3A	F3F
	LHD	F40	F4A	F4F

Rear

Model	Standard	W/L-S-D
F70RV-R	R10	R11
F75R-R	R20	R21
F77R-PR	R30	



WRE91-DF005

FRONT & REAR DIFFERENTIAL

IN-VEHICLE REPLACEMENT PROCEDURES FOR OIL SEAL (FRONT)

REMOVAL

1. Jack up the vehicle.

NOTE:

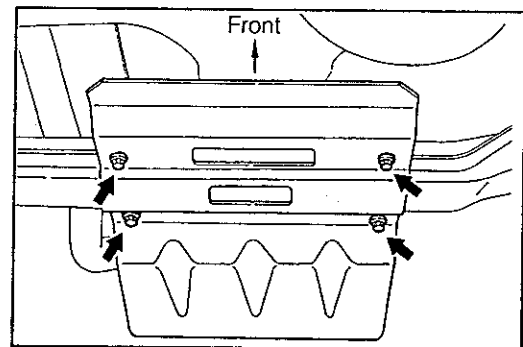
- Be sure to support the vehicle with safety stands. (As for the jacking up points, refer GI-section).

2. Remove the transmission undercover by removing the four bolts.

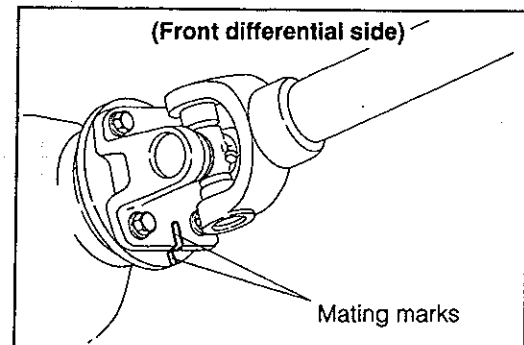
3. Remove the front propeller shaft by removing the four bolts.

CAUTION:

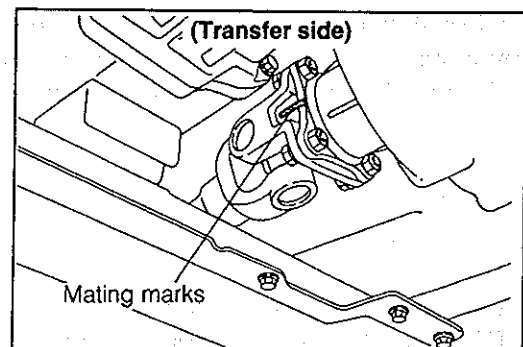
- Prior to the removal, mating marks should be put on each of the flange yoke and companion flange of the front differential.
- If this operation should fail to be performed, the propeller shaft may emit abnormal noise or vibration during the running.



WRE91-DF006



WRE91-DF007



WRE91-DF008

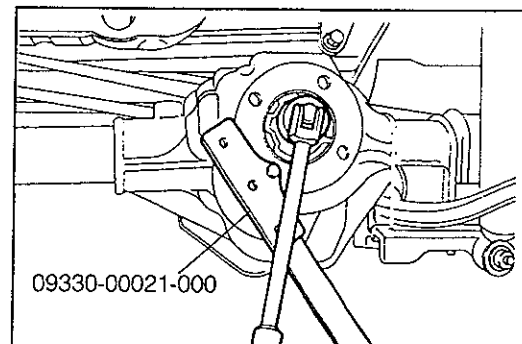
4. Raise the lock section of the lock washer, using the standard tool of the chiesel or the like.

NOTE:

- Never reuse the removed lock washer.

5. Remove the nut, using the following SST.

SST: 09330-00021-000



WRE91-DF009

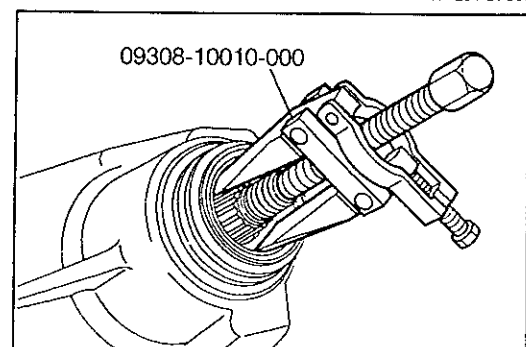
6. Pull-out the plate washer and companion flange toward you.

7. Remove the "T" type oil seal, using the following SSTs.

SST: 09308-10010-000

NOTE:

- Never reuse the removed "T" type oil seal.



WRE91-DF010

INSTALLATION

1. Install the "T" type oil seal into position, using the following SST.

SST: 09515-87601-000

NOTE:

- Apply the lithium base multi purpose grease to the oil seal lip section, prior to install.

2. Place the companion flange and plate washer.

3. Install the new lock washer.

4. Tighten the nut, using the following SST.

SST: 09330-00021-000

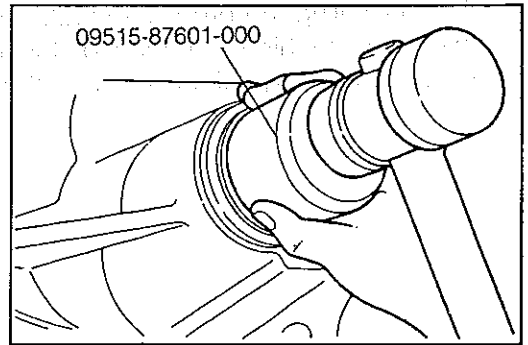
Tightening Torque: 196.0 - 245.0 N·m
(20.0 - 25.0 kgf-m)

5. Stake the lock washer, using the standard tool of the chiesel or the like securely.

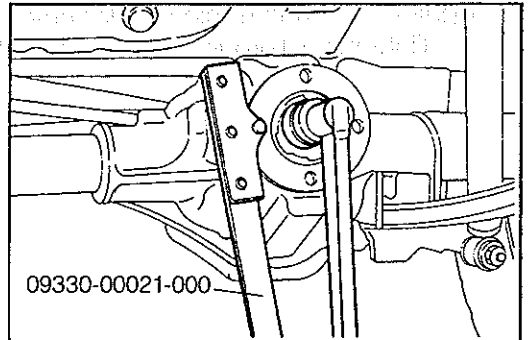
6. Install the propeller shaft.

CAUTION:

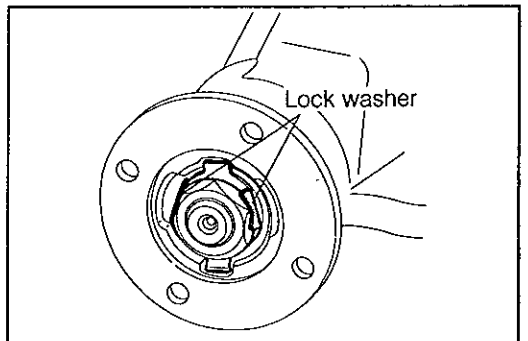
- While installing the propeller shaft, align the mating marks put during the removal with each other. If this operation should fail to be performed, the propeller shaft may emit abnormal noise or vibration during the running.
- Tightening Torque: 58.8 - 78.5 N·m (6.0 - 8.0 kgf-m)



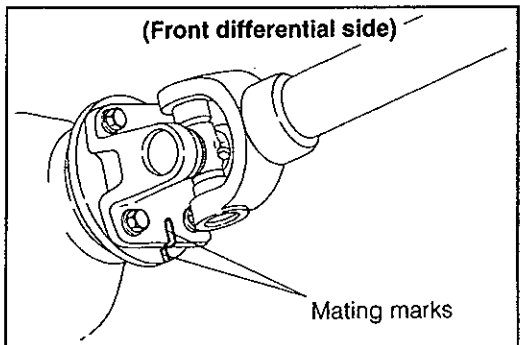
WRE91-DF011



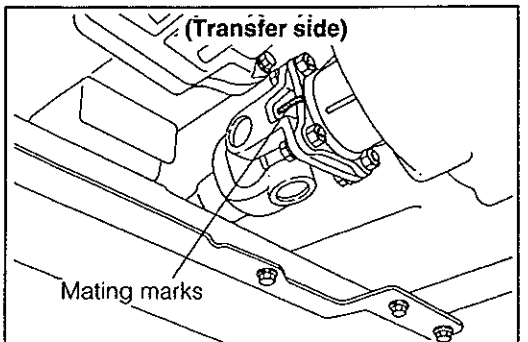
WRE91-DF012



WRE91-DF013



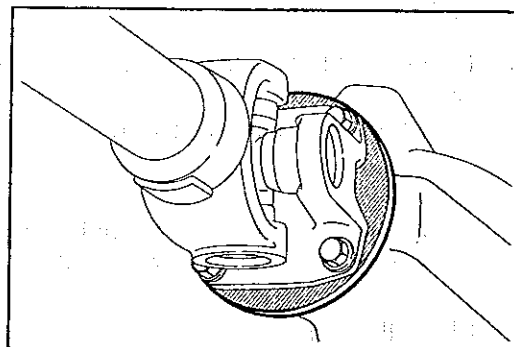
WRE91-DF014



WRE91-DF015

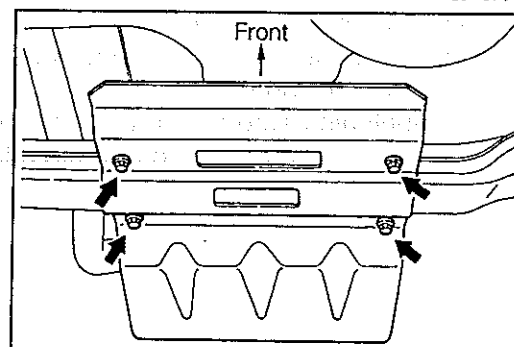
FRONT & REAR DIFFERENTIAL

7. After installing the propeller shaft, apply black paint to the exposed machined surface of the differential (slant line section in the right figure) as a rust preventive measure.



WRE91-DF016

8. Tighten the transmission under cover with the four bolts.
Tightening Torque: 15.7 - 23.5 N·m (1.6 - 2.4 kgf-m)



WRE91-DF017

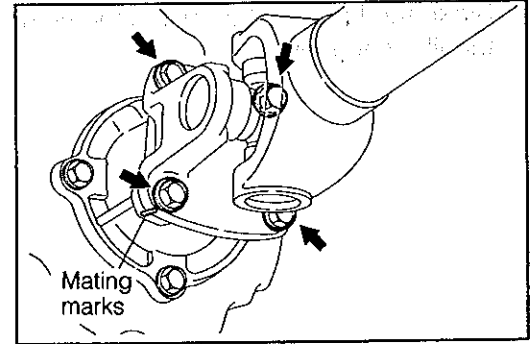
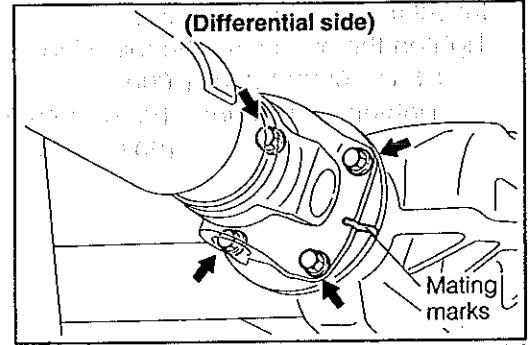
IN-VEHICLE REPLACEMENT PROCEDURES FOR OIL SEAL (REAR)

REMOVAL

1. Remove the rear propeller shaft assembly by removing the four bolts.

CAUTION:

- Prior to the removal, be sure to put a mating mark. If this operation should fail to be performed, the propeller shaft may emit abnormal noise or vibration during the running.



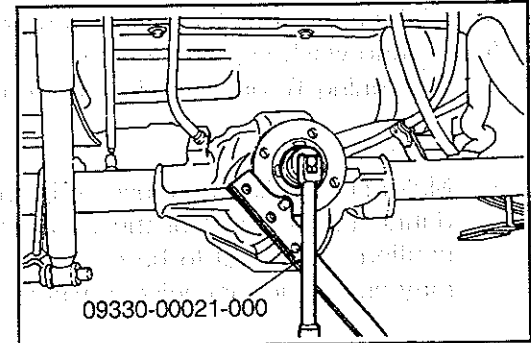
2. Raise the lock section of the lock washer, using the standard tool of chisel or the like.

NOTE:

- Never reuse the removed lock washer.

3. Remove the nut, using the following SST.

SST: 09330-00021-000



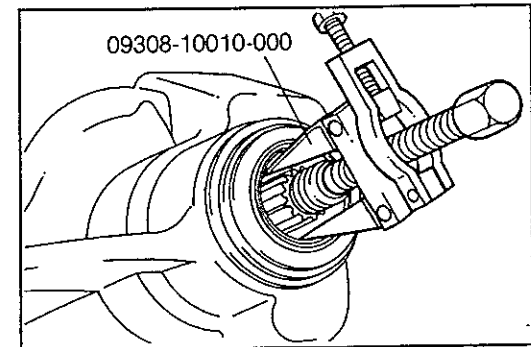
4. Pull-out the plate washer and companion flange toward you.

5. Remove the "T" type oil seal, using the following SST.

SST: 09308-10010-000

NOTE:

- Never reuse the removed "T" type oil seal.



INSTALLATION

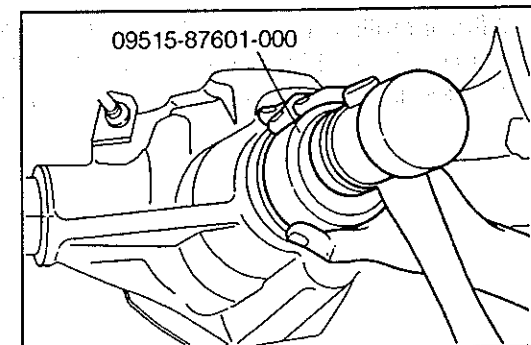
1. Install the "T" type oil seal, using the following SST.

SST: 09515-87601-000

NOTE:

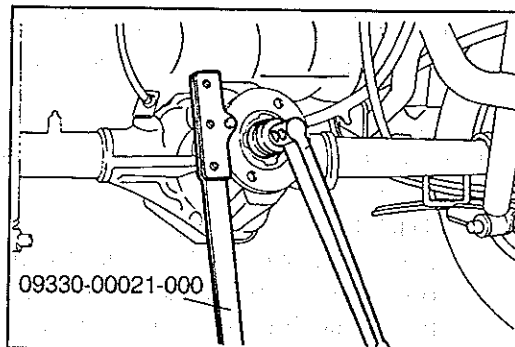
- Apply lithium base multi purpose grease to the oil seal lip section, prior to install.

2. Place the companion flange and plate washer.



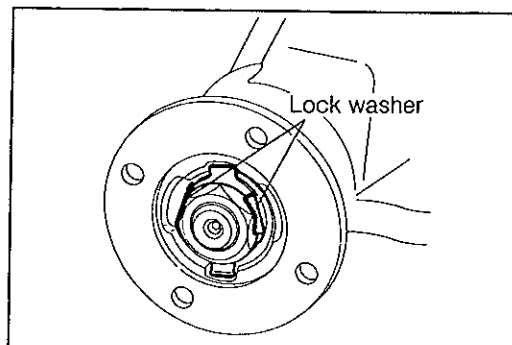
FRONT & REAR DIFFERENTIAL

3. Install the new lock washer.
4. Tighten the nut, using the following SST.
SST: 09330-00021-000
Tightening Torque: 196.0 - 245.0 N·m
(20.0 - 25.0 kgf·m)



WRE91-DF023

5. Stake the lock washer, using the standard tool of chisel or the like securely.

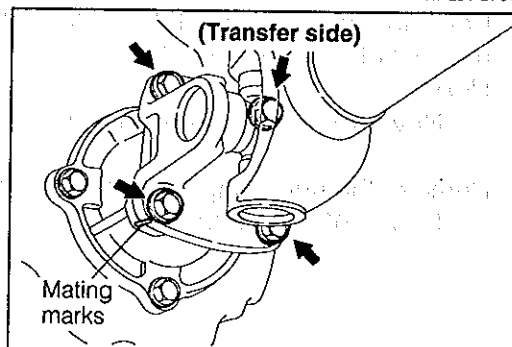


WRE91-DF013

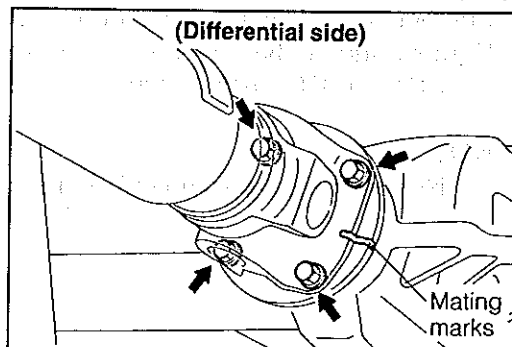
6. Install the rear propeller shaft assembly with the four bolts, four spring washers, four nuts then, tighten the nuts.
Tightening Torque: 58.8 - 78.5 N·m (6.0 - 8.0 kgf·m)

CAUTION:

- Make sure to line up those scribing lines that were put during the removal of the rear propeller shaft. If this caution should fail to be observed, the propeller shaft may emit abnormal noise or vibration.

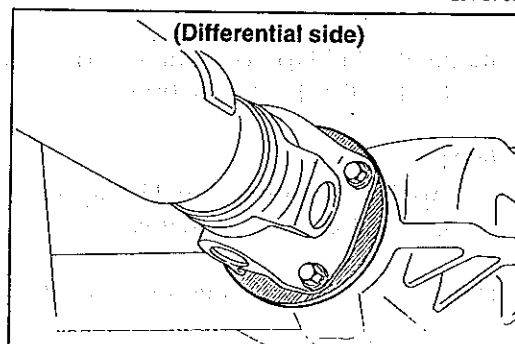


WRE91-DF025



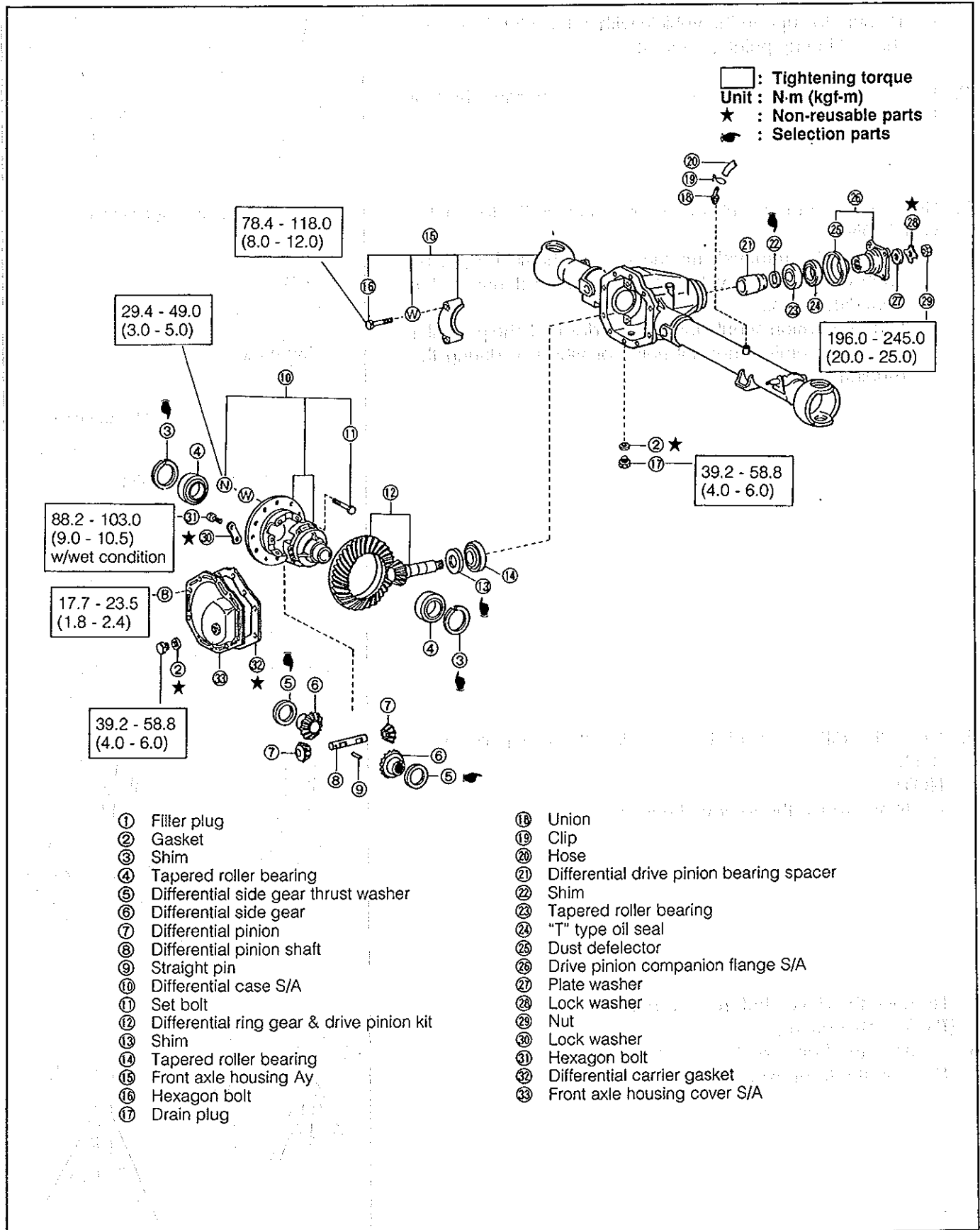
WRE91-DF026

7. After installing the propeller shaft, apply black paint to the exposed machined surface of the differential (slant line section in the right figure) as a rust preventive measure.



WRE91-DF027

FRONT DIFFERENTIAL COMPONENTS



WRE91-CF028

FRONT & REAR DIFFERENTIAL

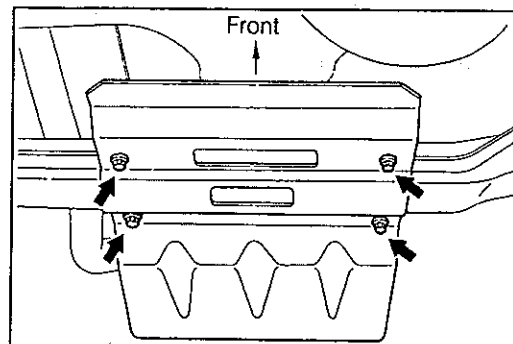
REMOVAL

1. Jack up the vehicle.

NOTE:

- Be sure to support the vehicle with safety stands. (As for the jacking up points, refer GI-section).

2. Remove the transmission undercover by removing the four bolts.

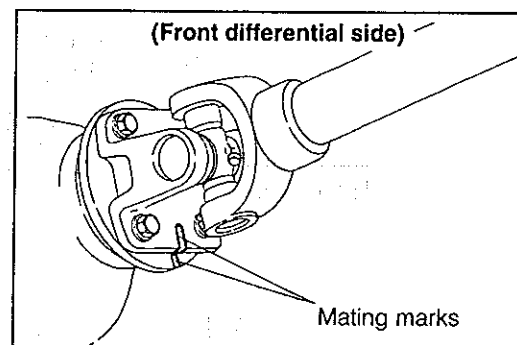


WRE91-DF029

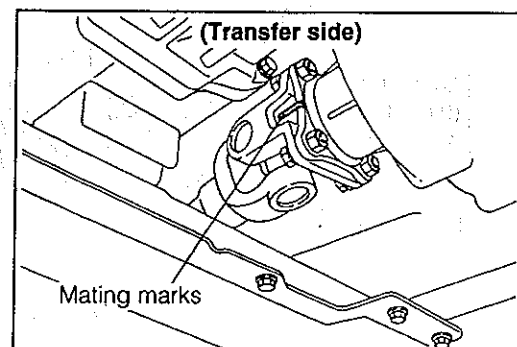
3. Remove the front propeller shaft by removing the four bolts.

CAUTION:

- Prior to the removal, mating marks should be put on each of the flange yoke and companion flange of the front differential.
- If this operation should fail to be performed, the propeller shaft may emit abnormal noise or vibration during the running.



WRE91-DF030

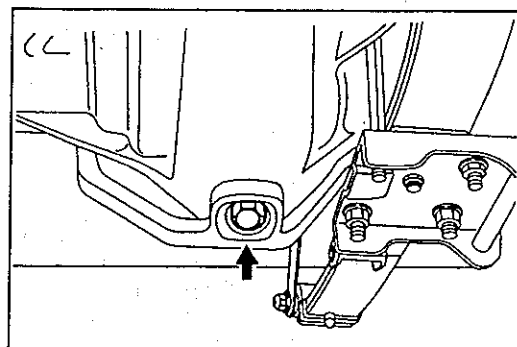


WRE91-DF031

4. Drain the differential oil by removing the drain plug with gasket.

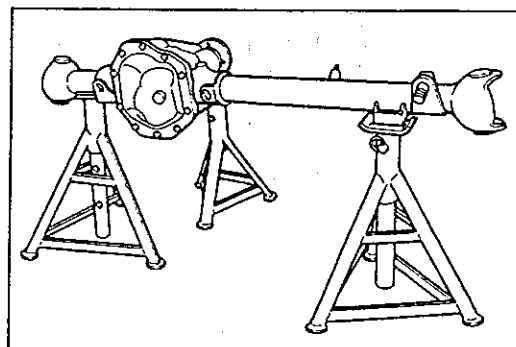
NOTE:

- Never reuse the removed gasket.



WRE91-DF032

5. Remove the drive shaft related parts.
(Refer FS-section.)
6. Remove the front axle housing from the vehicle.
7. Support the front axle housing with safety stands securely.

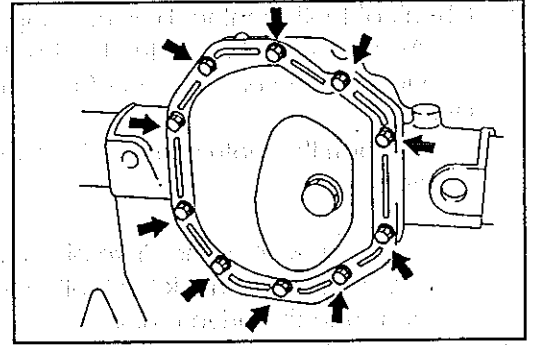


WRE91-DF033

8. Remove the front axle housing cover S/A with gasket by removing the ten bolts.

NOTE:

- Never reuse the removed gasket.



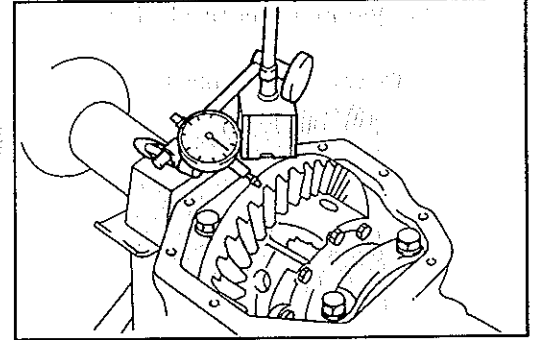
WRE91-DF034

PRE-INSPECTION

NOTE:

- Prior to the disassembling of the differential, be sure to check the following items and record the values. (These values are used as reference which assures the correct assembling.)

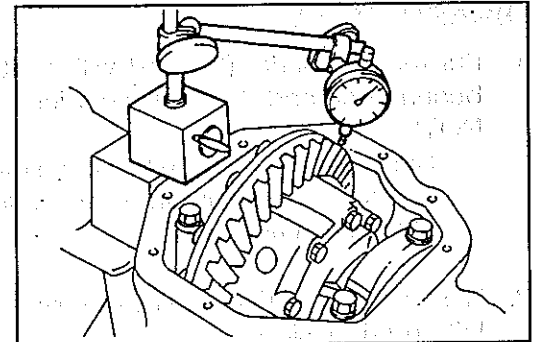
1. Ring gear runout check
Measure the runout at the back surface of the ring gear, using a dial gauge.
Allowable Limit: 0.1 mm



WRE91-DF035

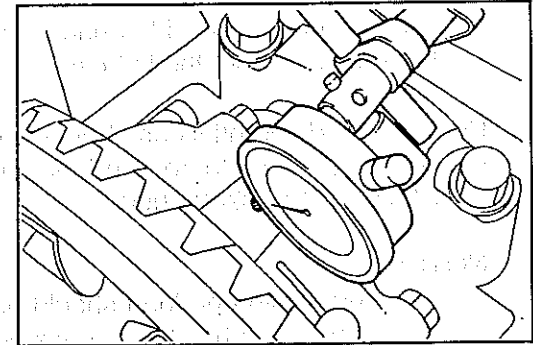
If the runout exceeds the allowable limit, replace the final gear as a set.

2. Ring gear backlash check
Secure the drive pinion in such a way that a dial gauge may make contact with the forward end of the tooth surface of the ring gear at right angles. Measure the backlash by moving the ring gear.
Specified Value: 0.10 - 0.20 mm



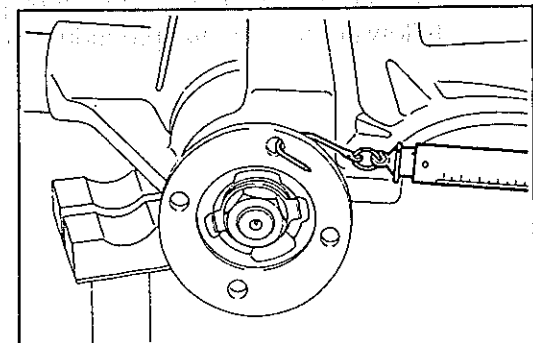
WRE91-DF036

3. Side gear backlash check
Measure the backlash with the pinion gear pushed against the differential case side.
Specified Value: 0.05 - 0.25 mm



WRE91-DF037

4. Total preload measurement
(Including the oil seal resistance)
Measure the starting torque with the drive pinion brought into contact with the tooth surface of the ring gear, using a torque gauge or spring scale.
Specified Value: 0.01 - 2.45 N·m (1.0 - 25.0 kgf·cm)



WRE91-DF038

FRONT & REAR DIFFERENTIAL

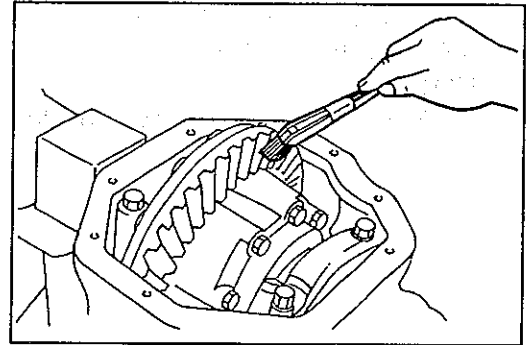
5. Check of tooth contact between ring gear and drive pinion.
Apply a thin film of blue lead or the like evenly to both sides of five or six teeth of the ring gear.

NOTE:

- Perform the tooth contact check at four points of the ring gear.

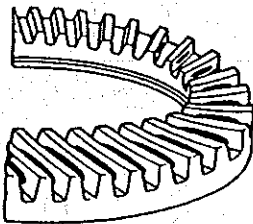
Apply braking to the drive pinion and turn the ring gear several times. Check the tooth contact between the ring gear and the drive pinion.

Ensure that correct tooth contact has been attained, as shown in the figure below.

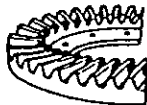


WRE91-DF039

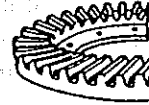
Correct tooth contact



Toe contact



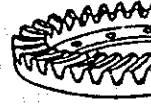
Flank contact



Heel contact



Face contact



WRE91-DF040

DISASSEMBLY

1. Put mating marks (Painted with white or the like) on the bearing cap and differential carrier.

NOTE:

- Since the bearing cap has been manufactured integrally with the differential carrier, never disturb the combination of these components.

2. Remove the bearing cap by removing the two bolts on both left and right sides.

NOTE:

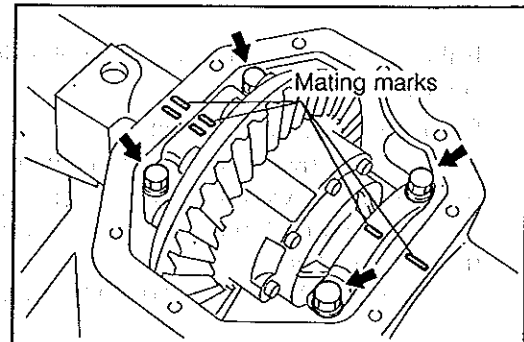
- Arrange the removed bearing caps in order, separating the right cap from the left cap.

3. Remove the differential case from the carrier in conjunction with the suitable metal rod and the following SST.

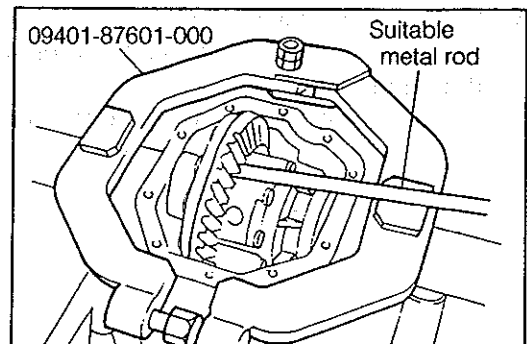
SST: 09401-87601-000

NOTE:

- The drive pinion preload should be measured after the differential case has been removed.
- After completion of measurement, perform disassembly, following the removal procedures given below.



WRE91-DF041



WRE91-DF042

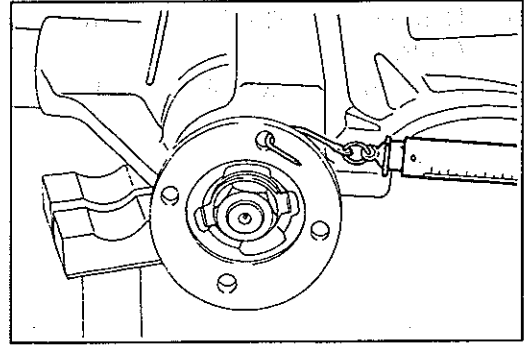
FRONT & REAR DIFFERENTIAL

4. Drive pinion preload measurement
(Including the oil seal resistance)
Measure the starting torque within the range of the backlash between the drive pinion and the ring gear, using torque gauge or spring scale.

Specified Value: 0.78 - 2.06 N·m (8.0 - 21 kgf-cm)

NOTE:

- This step should be performed after the differential case has been removed from the carrier.



WRE91-DF043

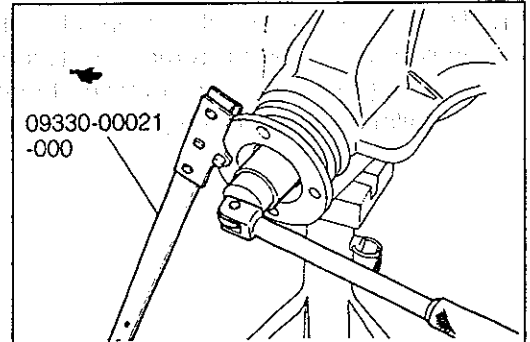
5. Raise the lock section of the lock washer, using a chisel and a hammer.

NOTE:

- Never reuse the removed lock washer.

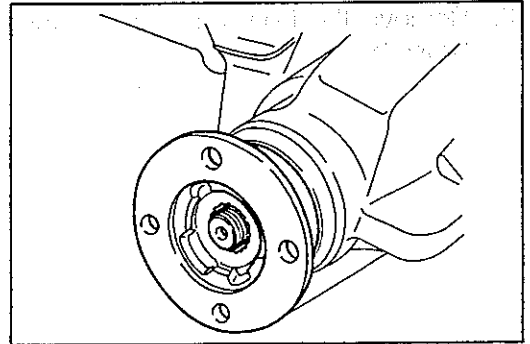
6. Remove the lock nut, using the following SST.

SST: 09330-00021-000



WRE91-DF044

7. Remove the companion flange.



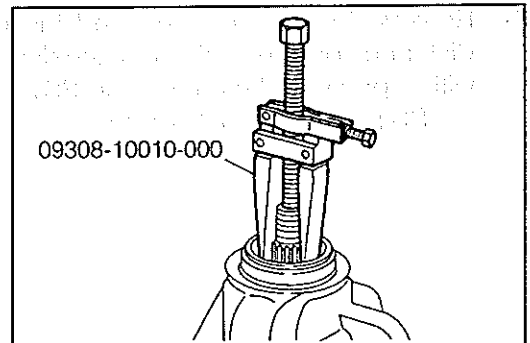
WRE91-DF045

8. Remove the "T" type oil seal of the drive pinion, using the following SST.

SST: 09308-10010-000

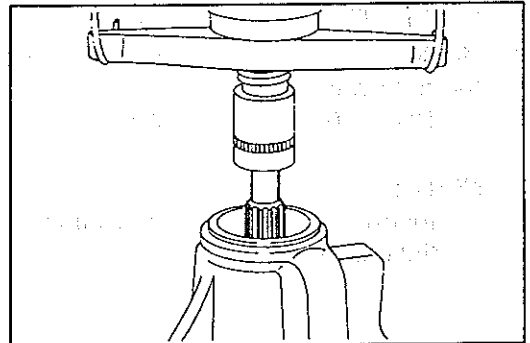
NOTE:

- Never reuse the removed oil seal.



WRE91-DF046

9. Remove the drive pinion by pressing the press.

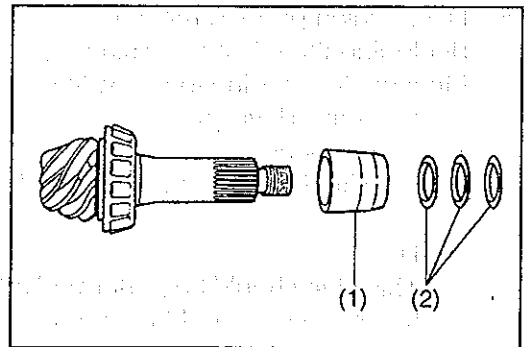


WRE91-DF047

FRONT & REAR DIFFERENTIAL

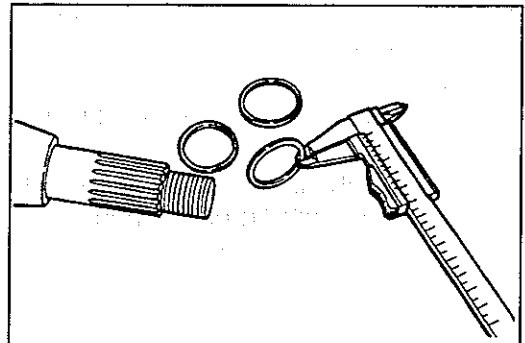
10. Remove the following parts from the drive pinion.

- (1) Spacer
- (2) Shim for drive pinion preload



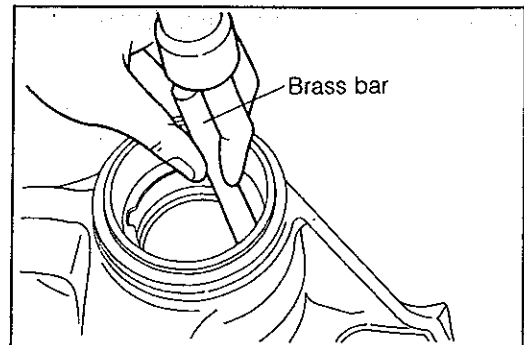
WRE91-DF048

11. Measure the respective shims for preload adjustment use which have been removed. Record the measurement results (for the purpose of using them as a guide during the installation of the drive pinion and ring gear).



WRE91-DF049

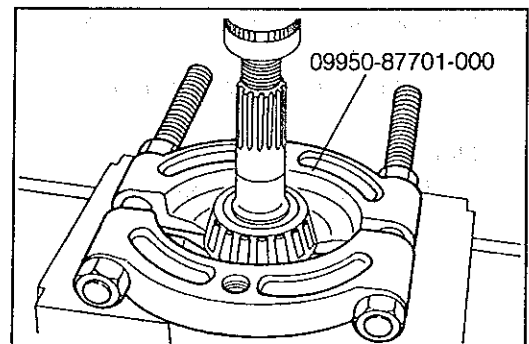
12. Remove the front and rear bearing outer races, using a brass bar.



WRE91-DF050

13. Remove the rear bearing and the drive pinion mounting distance adjusting shim from the drive pinion, in conjunction with a press and the following SST.

SST: 09950-87701-000



WRE91-DF051

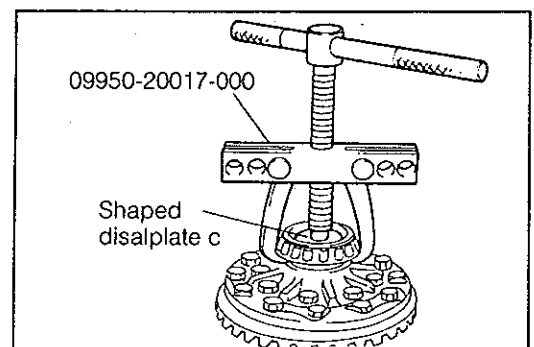
14. Set the differential case into the vice.

15. Remove the side bearings from the differential case, using the following SST.

SST: 09950-20017-000

NOTE:

- Insert the pawl of the SST into the groove of the differential carrier.



WRE91-DF052

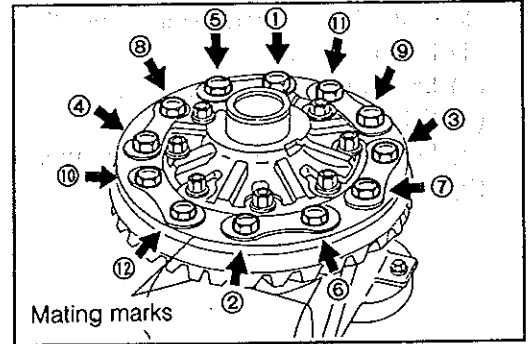
FRONT & REAR DIFFERENTIAL

16. Put mating marks between the differential case subassembly and the ring gear, if the ring gear is reused, for the purpose of using them as a guide during the installation.
17. Raise the lock section of the lock washer.

NOTE:

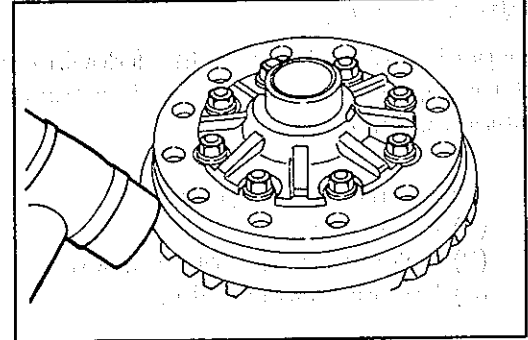
- Never reuse the removed lock washer.

18. Remove the twelve bolts of the ring gear.



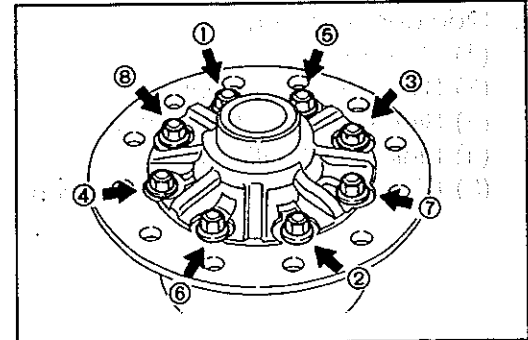
WRE91-DF053

19. Separate the ring gear by tapping with a standard tool of the plastic hammer lightly.



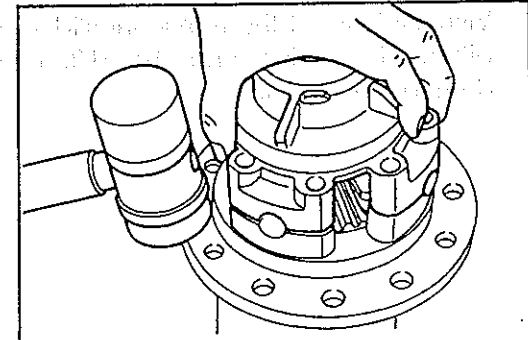
WRE91-DF054

20. Remove the eight nuts and eight washers from the set bolts of the differential case.



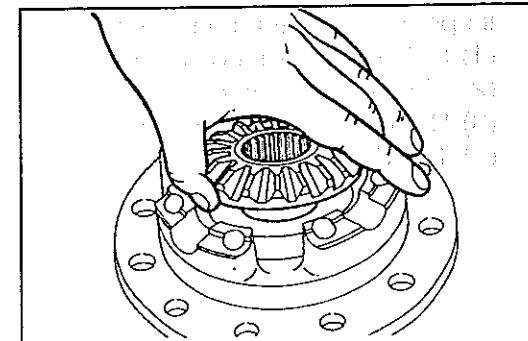
WRE91-DF055

21. Separate the differential case S/A by tapping with a standard tool of the plastic hammer lightly.



WRE91-DF056

22. Remove the differential side gear and differential side gear thrust washer No. 1.

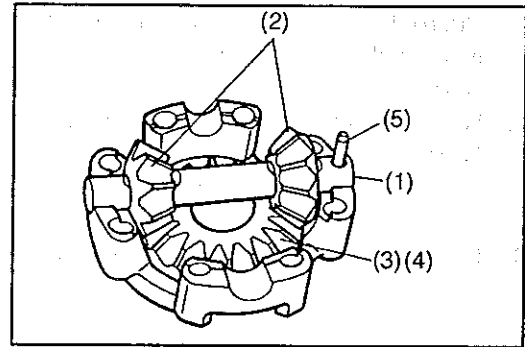


WRE91-DF057

FRONT & REAR DIFFERENTIAL

23. Remove the following parts from the differential case.

- (1) Pinion shaft
- (2) Differential pinion (2 pcs)
- (3) Differential side gear
- (4) Differential side gear thrust washer No. 1
- (5) Straight pin



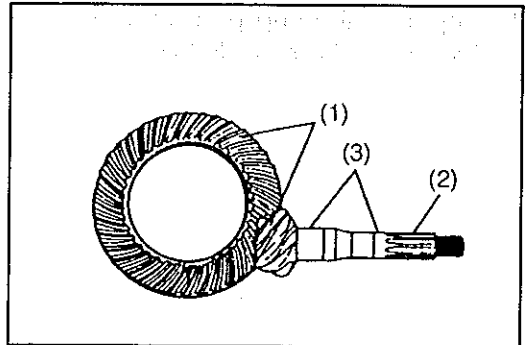
WRE91-DF058

INSPECTION

Inspect each section of the following parts for any sign of damage, wear or excessive looseness. Replace any parts which exhibit defects.

1. Drive pinion & ring gear

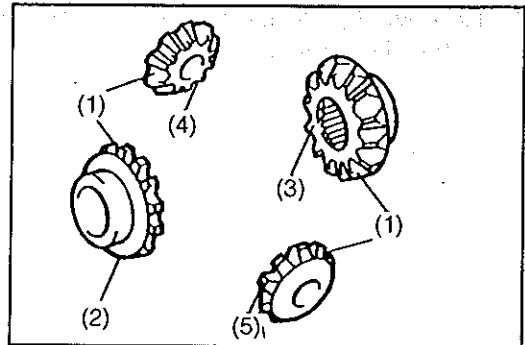
- (1) Gear teeth
- (2) Spline portion of drive pinion
- (3) Bearing fitting section



WRE91-DF059

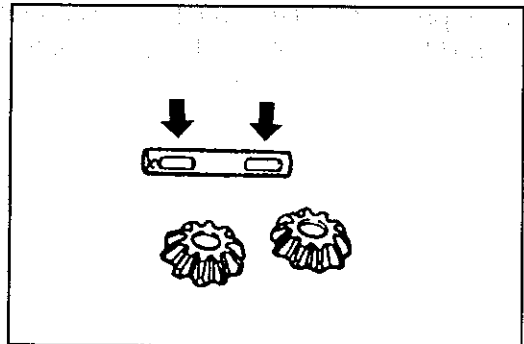
2. Side gear & pinion

- (1) Gear teeth
- (2) Side gear boss section
- (3) Side gear serrated section
- (4) Pinion shaft fitting hole
- (5) Differential case contact section



WRE91-DF060

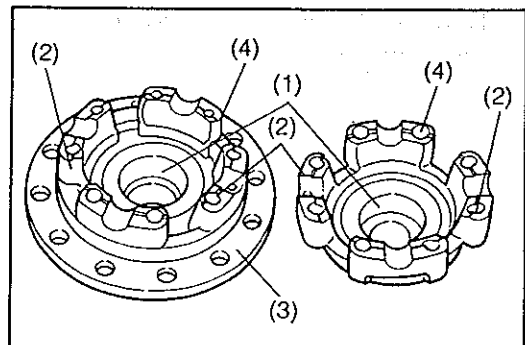
3. Visually inspect the rotational sliding section between the differential pinion and the differential pinion shaft for damage and wear.



WRE91-DF061

4. Inspection of differential case for wear or damage

- (1) Side gear boss contact sections
- (2) Pinion contact section
- (3) Ring gear attaching section
- (4) The differential case proper



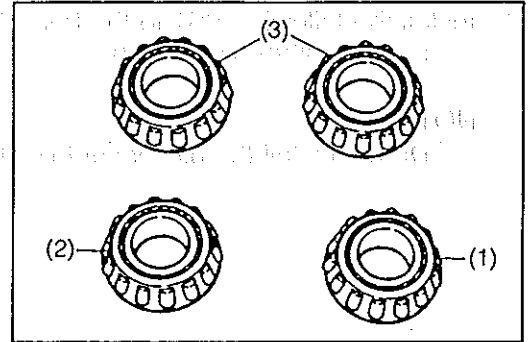
WRE91-DF062

FRONT & REAR DIFFERENTIAL

5. Bearings

- (1) Front bearing
- (2) Rear bearing
- (3) Side bearings

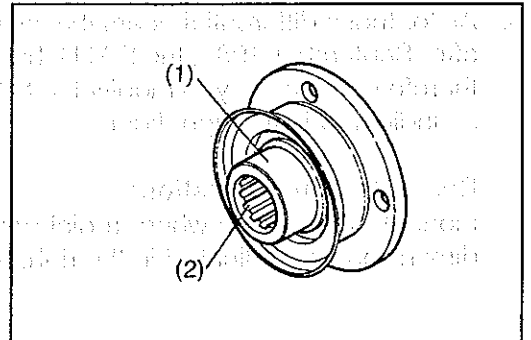
- Turn the bearings lightly. Ensure that they rotate smoothly without any binding or abnormal noise.
- While tracing the outer peripheral section of the taper roller with your nails, check to see if any binding exists there.



WRE91-DF063

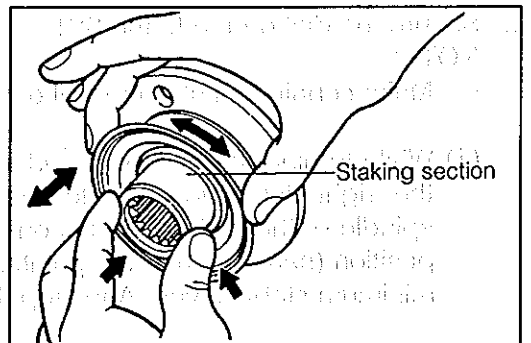
6. Companion flange

- (1) Oil seal contact section
- (2) Spline section



WRE91-DF064

7. Check that the three dust deflector staked sections of the companion flange exhibit no excessive play by turning it in a right-&-left direction, as indicated in the right figure.



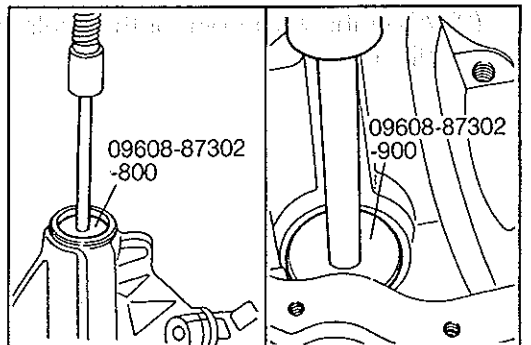
WRE91-DF065

ASSEMBLY

1. Press the front and rear outer races into the differential carriers, using the following SSTs.

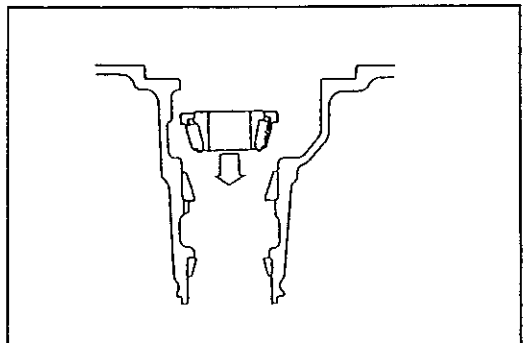
- SSTs: (1) Front...09608-87302-800
(2) Rear...09608-87302-900

Both above SSTs are included in the 09608-87302-000.



WRE91-DF066

- (1) Install the bearing on the outer race. To get bedding-in of the inner race, turn the bearing several times so that it may be settled.



WRE91-DF073

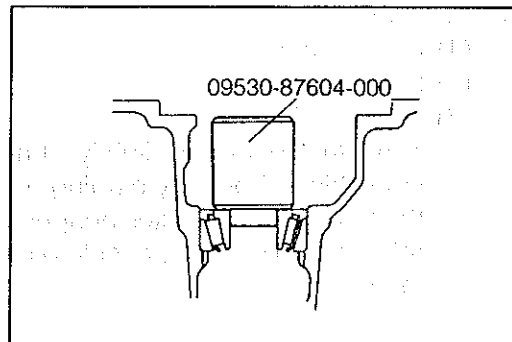
FRONT & REAR DIFFERENTIAL

2. Install the following SST to the front differential.

SST: 09530-87604-000

NOTE:

- Do not install the oil seal at this stage.

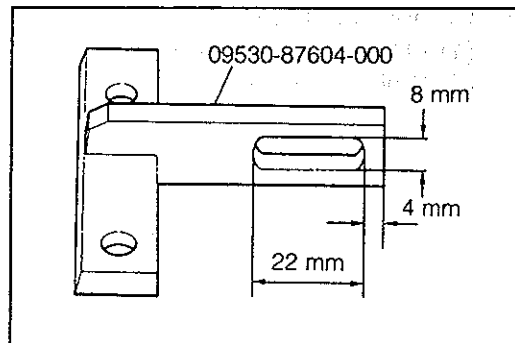


WRE91-DF074

3. As for those differential gears that were manufactured in or after September 1987, the P.M.D. has been extended. It is, therefore, necessary to modify the SST (09530-87604-000) as indicated in the right figure.

Contents of modification:

Elongate the groove where a dial gauge is installed to the dimensions as indicated in the right figure.



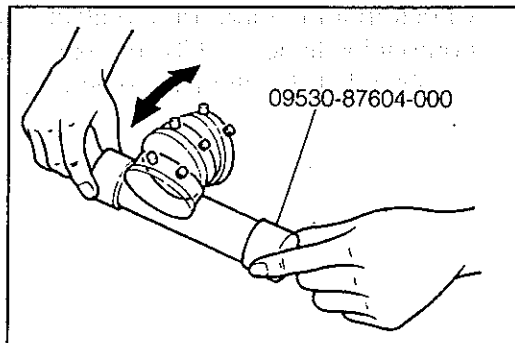
WRE91-DF231

4. Secure the dial gauge to the SST.

NOTE:

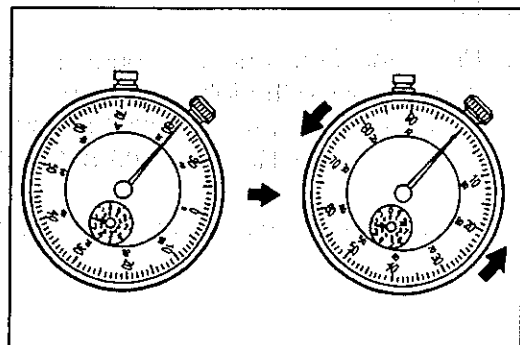
- Make certain to install the dial gauge securely.

- (1) While turning the SST on a surface plate, as shown in the right illustration, locate the position where the spindle of the dial gauge is contracted to the shortest position (namely when the pointer's runout becomes a minimum stable level). And stop the SST at this point.



WRE91-DF232

- (2) Align the zero-point of the scale with the needle of the dial gauge.

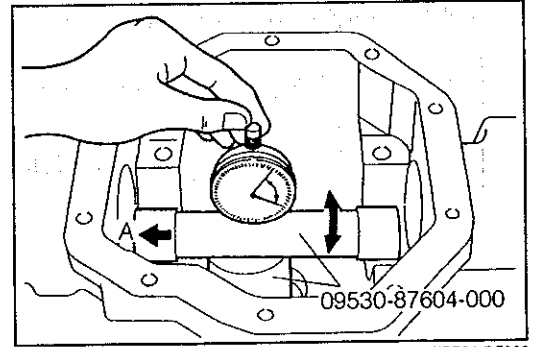


WRE91-DF067

- (3) Place the SST in the differential carrier.
- (4) While turning the attaching surface of the side bearing outer race lightly by their own weights of the SST and dial gauge, as shown in the right illustration, locate the position where the pointer registers the stablest reading.

NOTE:

- During the operation above, keep one end surface of the SST in contact with the attaching surface of the side bearing outer race (in the arrowheaded direction (A)).



WRE91-DF068

- (5) Perform the calculation, using the thickness of the following standard shim.

Thickness of standard shim = (B + C) - P. M. D.

(A): P. M. D. + Thickness of standard shim (108.0 mm)

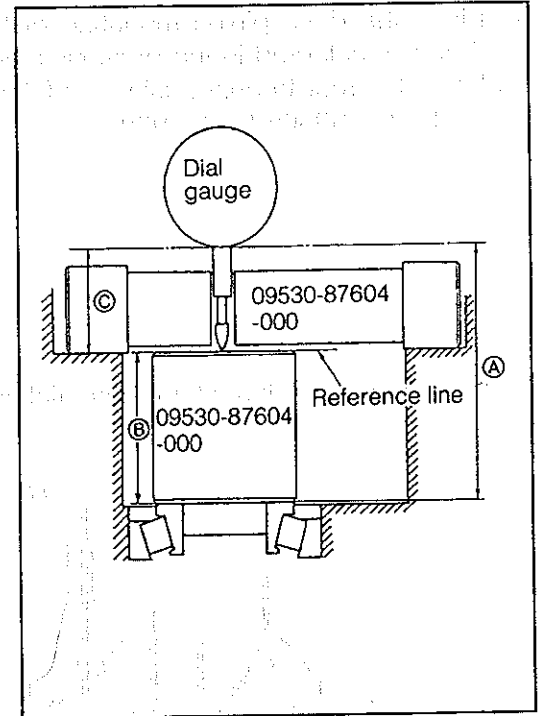
(B): Height of drive pinion adjusting gauge (62.75 mm)

(C): Radius of attaching surface of side bearing outer race (42.5 mm)

$$108 \text{ mm} - (62.75 \text{ mm} + 42.5 \text{ mm}) = 2.75 \text{ mm}$$

With regard to the SST mounted on the dial gauge, its zero-point adjustment has been already conducted on the surface plate.

As a result, the reference line is established as indicated in the right figure. Therefore, the thickness of the standard shim can be determined, using the formula given above.



WRE91-DF069

Therefore, after the needle of the dial gauge has been aligned with the zero-point, subtract 2.75 mm from the displacement of the spindle section of the dial gauge. The thus-calculated value becomes the installation thickness of the adjusting shim.

WRE91-DF070

Calculating Formula:

Thickness of adjusting shim =
Displacement of spindle section of dial gauge - 2.75 mm
(Standard value)

<Example>

After the needle of the dial gauge had been set to the zero-point, the spindle section of the dial gauge dropped. Thus, the needle of the dial gauge turned counterclockwise 5.25 mm.

$$5.25 \text{ mm} - 2.75 \text{ mm} = 2.50 \text{ mm}$$

Because of availability of adjusting shims, use a 2.20 mm thick shim together with a 0.30 mm thick shim.

WRE91-DF071

FRONT & REAR DIFFERENTIAL

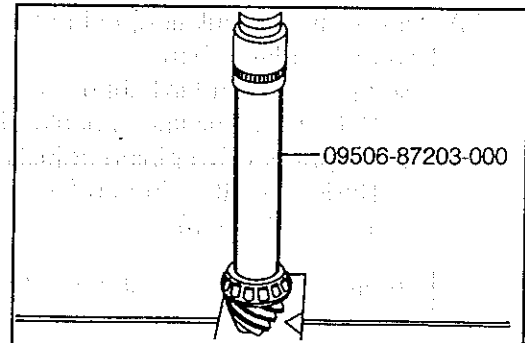
5. Table showing relationship between availability of replacement shims and readings of dial gauge

Thickness of adjusting shims mm	2.10	2.15	2.20	2.25	2.30	2.35	0.30 (for fine adjustment)
Reading of dial gauge mm	+0.15	+0.10	+0.05	±0	-0.05	-0.10	

WRE91-DF075

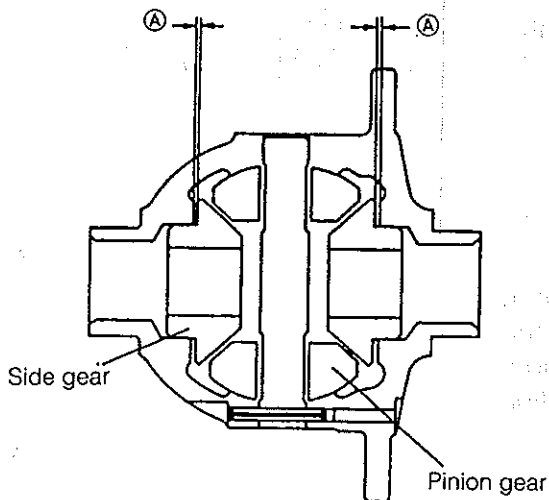
6. Place the drive pinion mounting distance adjusting shim that was selected in the previous step in the drive pinion. Press the rear bearing, using the following SST.

SST: 09506-87203-000



WRE91-DF076

7. Selecting procedures for differential side gear backlash thrust washer



Availability of Adjusting Thrust Washer for Section A

Unit: mm

0.8
0.9
1.0

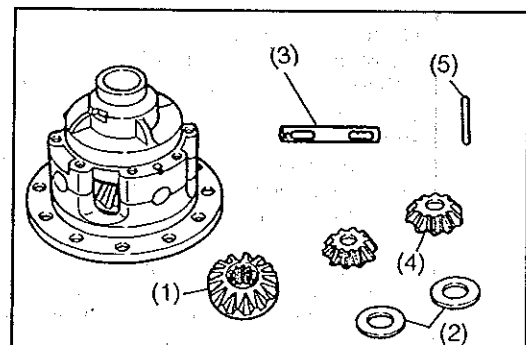
WRE91-DF077

- (1) Prior to assembling, apply the gear oil to the following rotating sections.

- Outer periphery (side and pinion gear)
- Inner periphery of side and pinion gear in differential case

- (2) Assemble the following parts in the differential case.

- (1) Differential side gear
- (2) Differential side gear thrust washer
- (3) Differential pinion shaft
- (4) Differential pinion
- (5) Straight pin

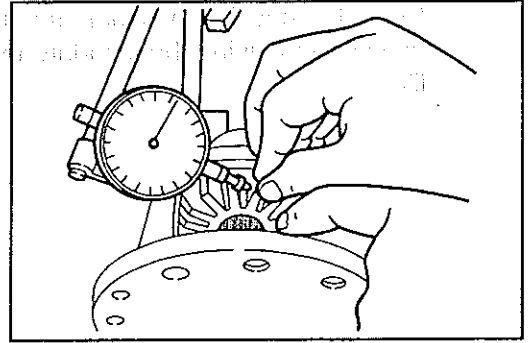


WRE91-DF078

FRONT & REAR DIFFERENTIAL

- (3) Measure the backlash with the pinion gear pushed against the differential case side. Select a thrust washer in such a way that the backlash between the differential pinion and the differential side gear may conform to the specified value given below. Here, the backlash is the mean value of measurements over four teeth. Place the selected thrust washer.

Specified Value: 0.05 - 0.25 mm

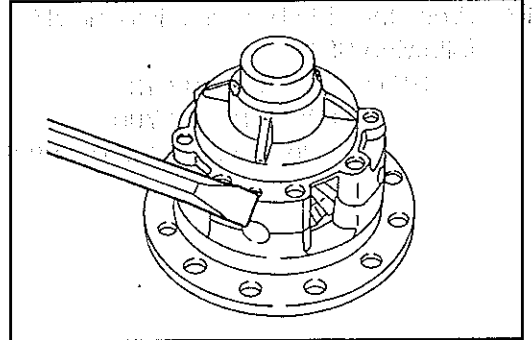


WRE91-DF079

8. Install the straight pin into position.

NOTE:

- Stake the differential case with a chisel or the like so as to secure the straight pin.



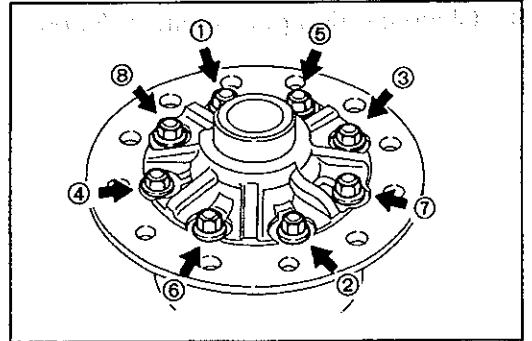
WRE91-DF080

9. Tighten the differential case cover by means of the eight hexagon bolts, washers and nuts.

Tightening Torque: 29.4 - 49.0 N·m (3.0 - 5.0 kgf·m)

NOTE:

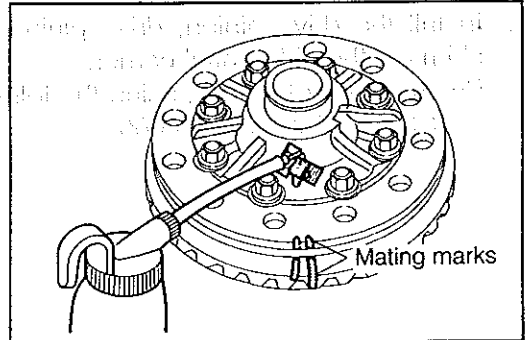
- Be sure to tighten the bolts alternately and diagonally. (The illustration at the right figure indicates a typical example of the tightening sequence.)



WRE91-DF081

10. Align the mating marks put during the disassembly with each other.

Apply gear oil to the threaded portions of the tightening bolts and the ring gear.



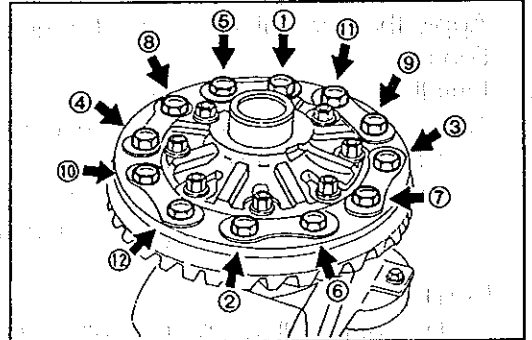
WRE91-DF082

11. Install the ring gear in the differential case S/A and tighten the twelve set bolts with new lock washers.

Tightening Torque: 88.3 - 103.0 N·m
(9.0 - 10.5 kgf·m)

NOTE:

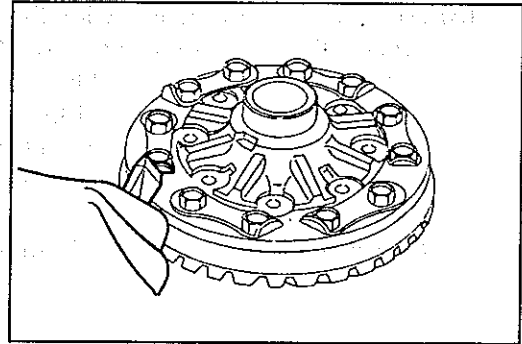
- Be sure to tighten the set bolt alternately and diagonally. (The right figure illustration indicates a typical example of the tightening sequence.)



WRE91-DF083

FRONT & REAR DIFFERENTIAL

- Stake the new lock washers securely along with the set bolt shaped, using the standard tool of the chiesel or the like.



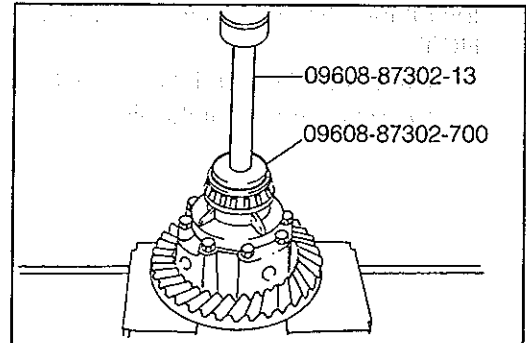
WRE91-DF034

12. Press the side bearings into the differential case, using the following SSTs.

SST: 09608-87302-13

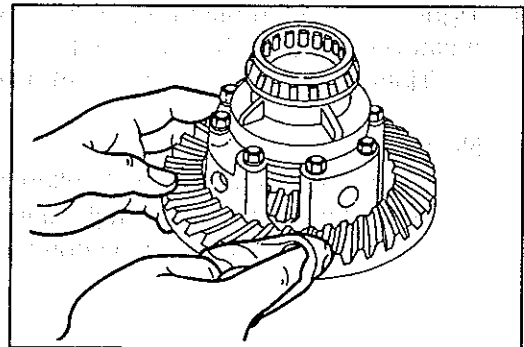
09608-87302-700

that is a part of 09608-87302-000 set



WRE91-DF035

13. Clean the ring gear tooth surfaces.

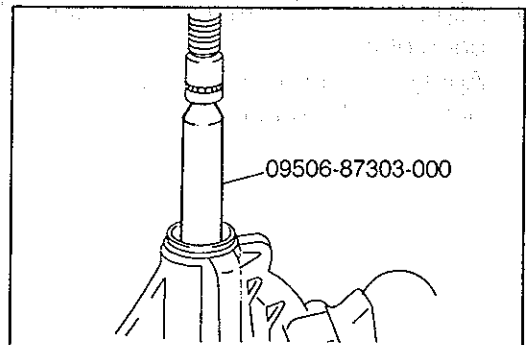


WRE91-DF036

14. Install the drive pinion, drive pinion bearing spacer and shims to the differential carrier.

15. Press the rear bearing, using the following SST.

SST: 09506-87303-000



WRE91-DF037

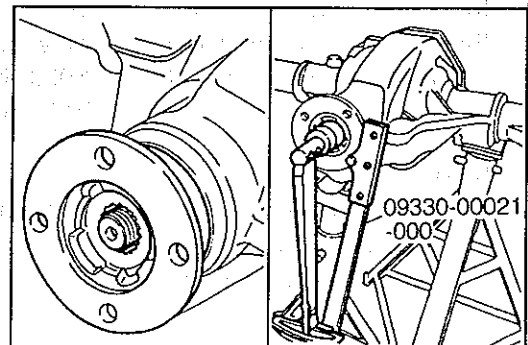
16. Apply the gear oil to the rear bearing tapered roller sections.

17. Install the companion flange.

18. Tighten the nut, using the following SST.

SST: 09330-00021-000

Tightening Torque: 196.0 - 245.0 N·m
(20.0 - 25.0 kgf·m)



WRE91-DF038

NOTE:

- Do not install the "T" type oil seal at this stage.

FRONT & REAR DIFFERENTIAL

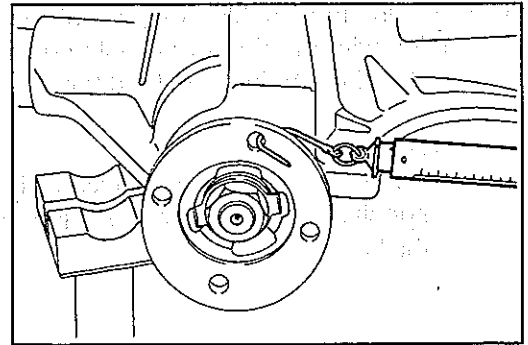
19. Apply the gear oil to the front bearing tapered roller sections.
20. Rotated the companion flange for several times in clock and counter clockwise.
21. Measure the starting torque of the drive pinion, using a torque gauge or spring scale.

Specified Value:

New Bearing: 0.06 - 1.96 N·m (7.0 - 20.0 kgf·cm)

Bearing Reused:

0.06 - 1.96 N·m (7.0 - 20.0 kgf·cm)



WRE91-DF089

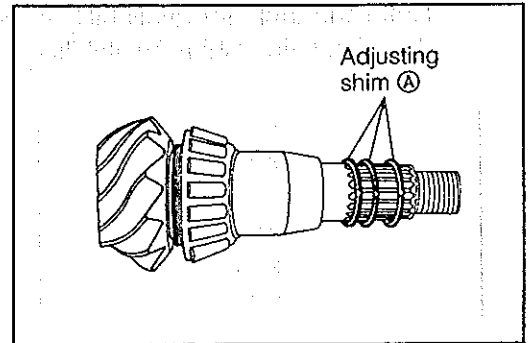
22. When the preload is greater than the specified value, decrease the adjusting shim thickness. Conversely, when the preload is less than the specified value, increase the adjusting shim thickness.

NOTE:

- Refer the table for availability of adjusting shim ① as follows.

Unit: mm

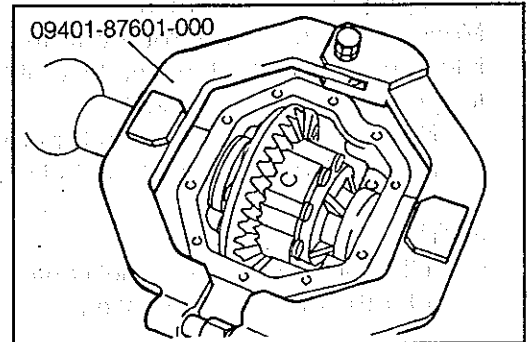
Thickness	0.25	0.30	0.40
	0.50	0.08	



WRE91-DF090

23. Install the differential case S/A to the front axle housing, using the following SST.

SST: 09401-87601-000



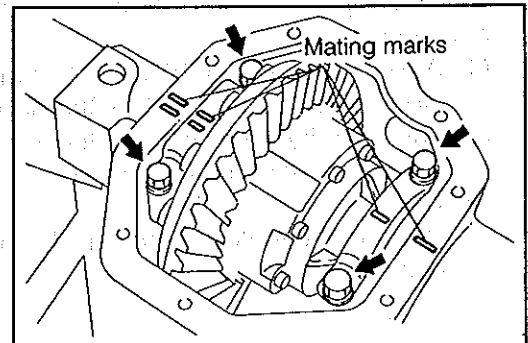
WRE91-DF091

24. Tighten the bearing caps.

Tightening Torque: 78.5 - 118.0 N·m
(8.0 - 12.0 kgf·m)

NOTE:

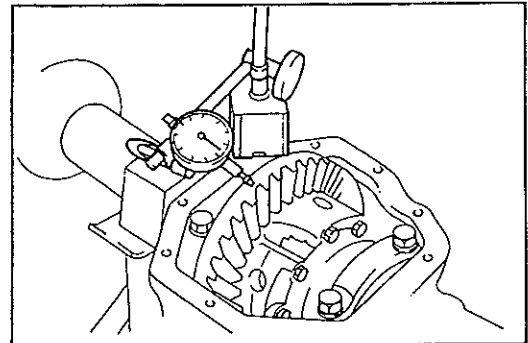
- Ensure that the mating marks put during the disassembly should be line-uped each others.



WRE91-DF093

25. Measure the run-out for ring gear by installing a dial gauge normally to the back surface of the ring gear.

Specified Value: 0.1 mm



WRE91-DF094

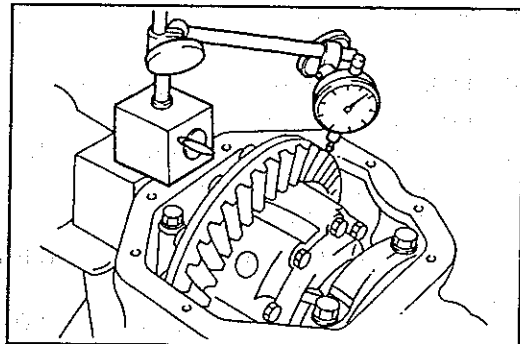
FRONT & REAR DIFFERENTIAL

26. Measure the backlash by installing a dial gauge at right angles with the ring gear tooth surface.

Specified Value: 0.1 - 0.2 mm

NOTE:

- When the ring gear backlash is greater or less than specified value, decrease or increase the adjusting shim thickness.



WRE91-DF095

- Refer the table for availability of adjusting shims ① as follows.

①: Adjusting Shim Availability

Unit: mm

2.45	2.75	3.05
2.50	2.80	3.10
2.55	2.85	3.15
2.60	2.90	3.20
2.65	2.95	3.25
2.70	3.00	3.30

WRE91-DF096

27. Total preload measurement

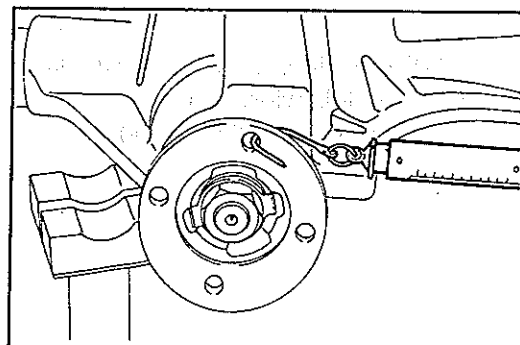
Measure the starting torque with the drive pinion brought into contact with the tooth surface of the ring gear, using a torque gauge or spring scale.

New Bearing: 0.89 - 2.35 N·m (9.0 - 24.0 kgf·cm)

Bearing Reused: 0.89 - 2.35 N·m (9.0 - 24.0 kgf·cm)

NOTE:

- If the total preload does not conform to the specification, refer the aforesaid operation.



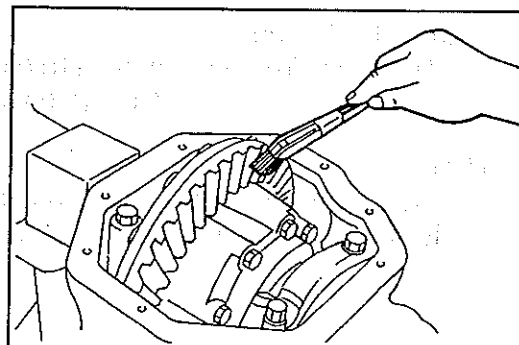
WRE91-DF097

28. Checking procedure for tooth contact between ring gear and drive pinion

- Apply a thin film of blue lead or the like evenly to both sides of five or six teeth of the ring gear.
- Turn the ring gear several times by applying a load to the drive pinion by one hand.

NOTE:

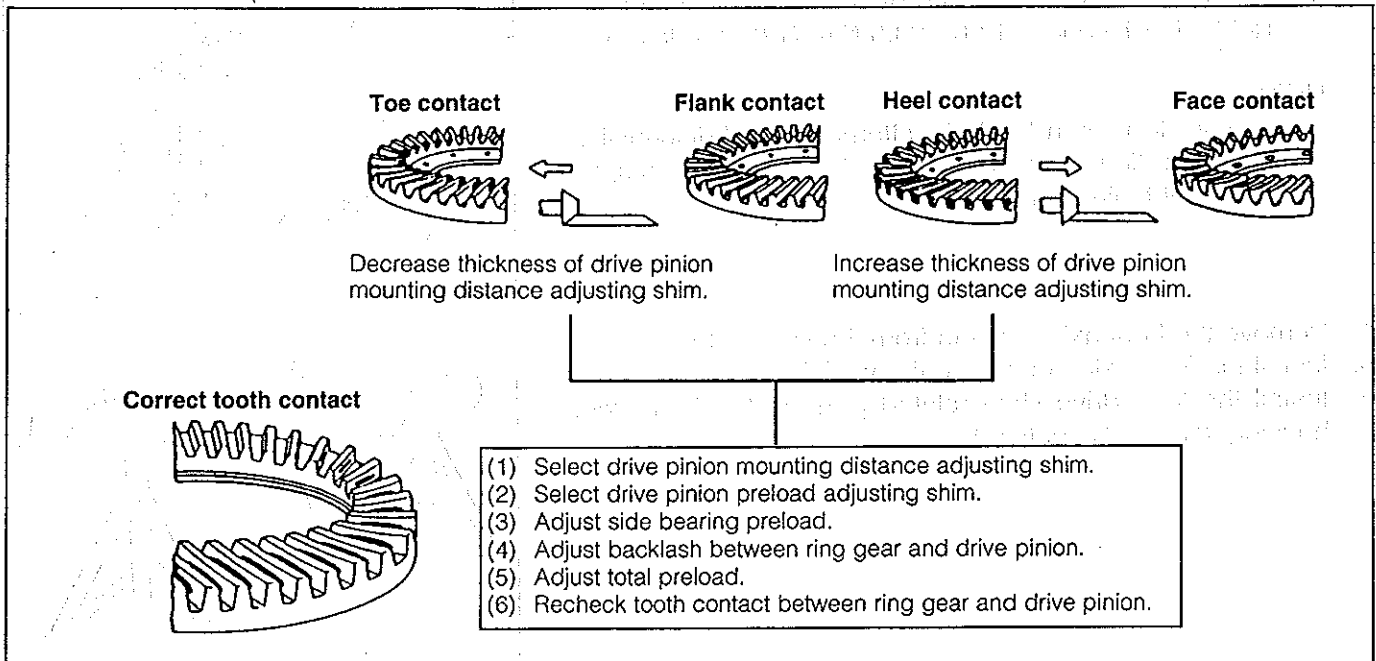
- Perform the tooth contact check at four points of the ring gear.



WRE91-DF098

FRONT & REAR DIFFERENTIAL

(3) Ensure that the correct tooth contact has been attained, as shown in the figure below.



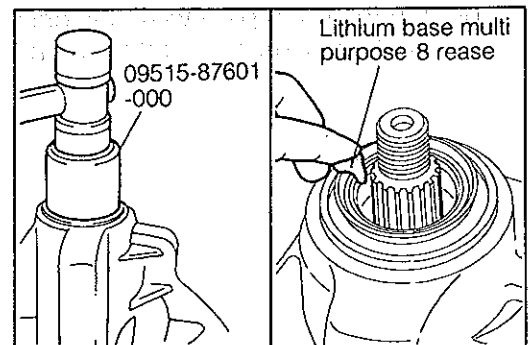
WRE91-DF099

29. Remove the companion flange by removing the nut.
30. Drive a new oil seal up to the edge surface of the differential carrier, using the following SST.

SST: 09515-87601-000

NOTE:

- Apply lithium base multi purpose grease to the oil seal lip section.

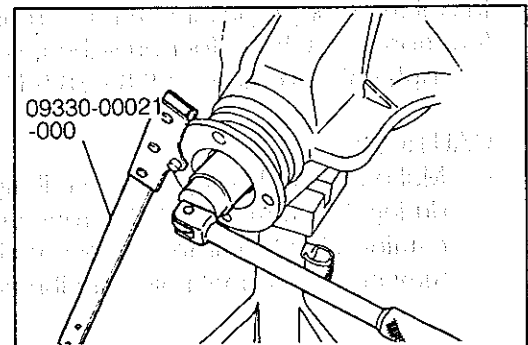


WRE91-DF100

31. Install the companion flange, lock washer, nut and tighten the companion flange by means of a new lock nut, using the following SST.

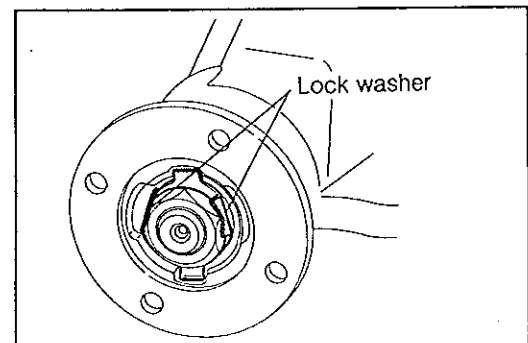
SST: 09330-00021-000

Tightening Torque: 196.0 - 245.0 N·m
(22.0 - 25.0 kgf·m)



WRE91-DF101

32. Stake the new lock washer to the nut securely, using a chisel or the like.



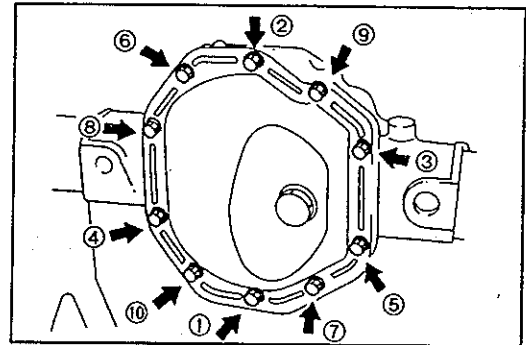
WRE91-DF102

FRONT & REAR DIFFERENTIAL

33. With the new differential carrier gasket interposed, tighten the front axle housing cover S/A by means of the ten bolts.
Tightening Torque: 17.6 - 23.5 N·m (1.8 - 2.4 kgf-m)

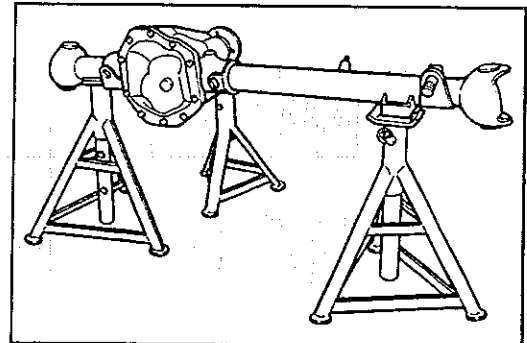
NOTE:

- Be sure to tighten the bolts alternately and diagonally. (The right figure illustration indicates a typical example of the tightening sequence.)



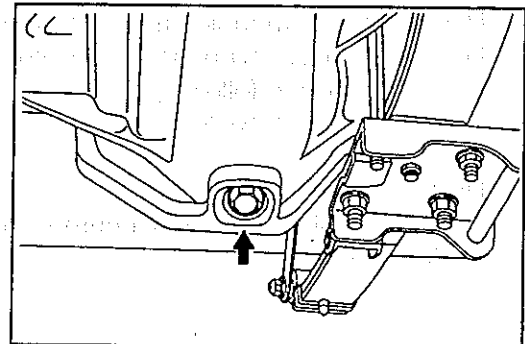
WRE91-DF103

34. Remove the front axle housing from the safety stands.
35. Install the front axle housing to the vehicle.
36. Install the front drive shaft related parts to the front axle housing. (Refer FS-section.)



WRE91-DF104

37. Tighten the drain plug with new gasket.
Tightening Torque: 39.2 - 58.8 N·m (4.0 - 6.0 kgf-m)

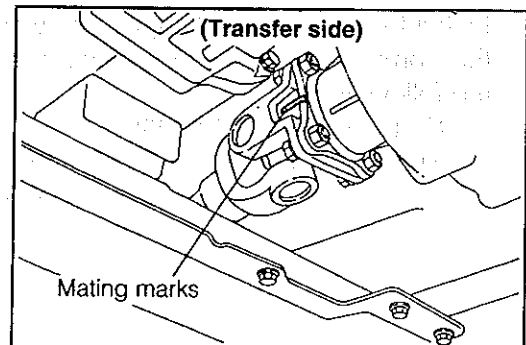


WRE91-DF105

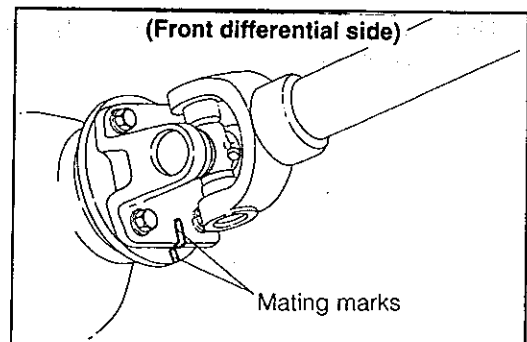
38. Install the rear propeller shaft assembly with the four bolts, four spring washers, four nuts then, tighten the nuts.
Tightening Torque: 58.8 - 78.5 N·m (6.0 - 8.0 kgf-m)

CAUTION:

- Make sure to line up those scribing lines that were put during the removal of the rear propeller shaft. If this caution should fail to be observed, the propeller shaft may emit abnormal noise or vibration.



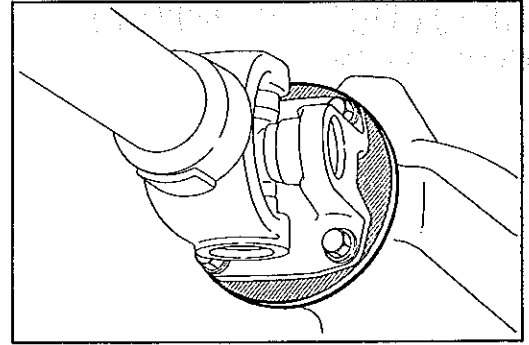
WRE91-DF106



WRE91-DF107

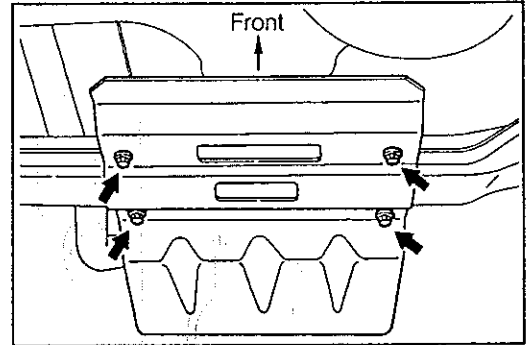
FRONT & REAR DIFFERENTIAL

39. After installing the propeller shaft, apply black paint to the exposed machined surface of the differential (slant line section in the right figure) as a rust preventive measure.



WRE91-DF108

40. Tighten the transmission under cover with the four bolts.
Tightening Torque: 15.7 - 23.5 N·m (1.6 - 2.4 kgf-m)

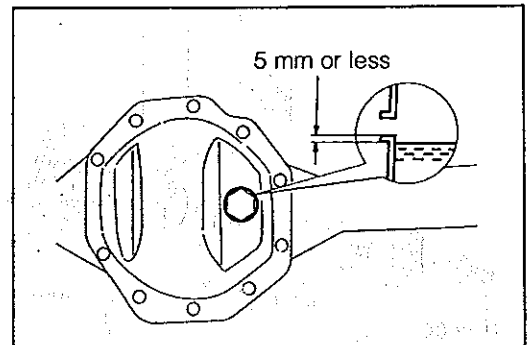


WRE91-DF109

41. Fill the differential oil.

		Grade/Viscosity	liter
Differential	Front	API GL-5/SAE 80W-90 or 90	1.5

42. Tighten the filler plug with new gasket.
Tightening Torque: 39.2 - 58.8 N·m (4.0 - 6.0 kgf-m)

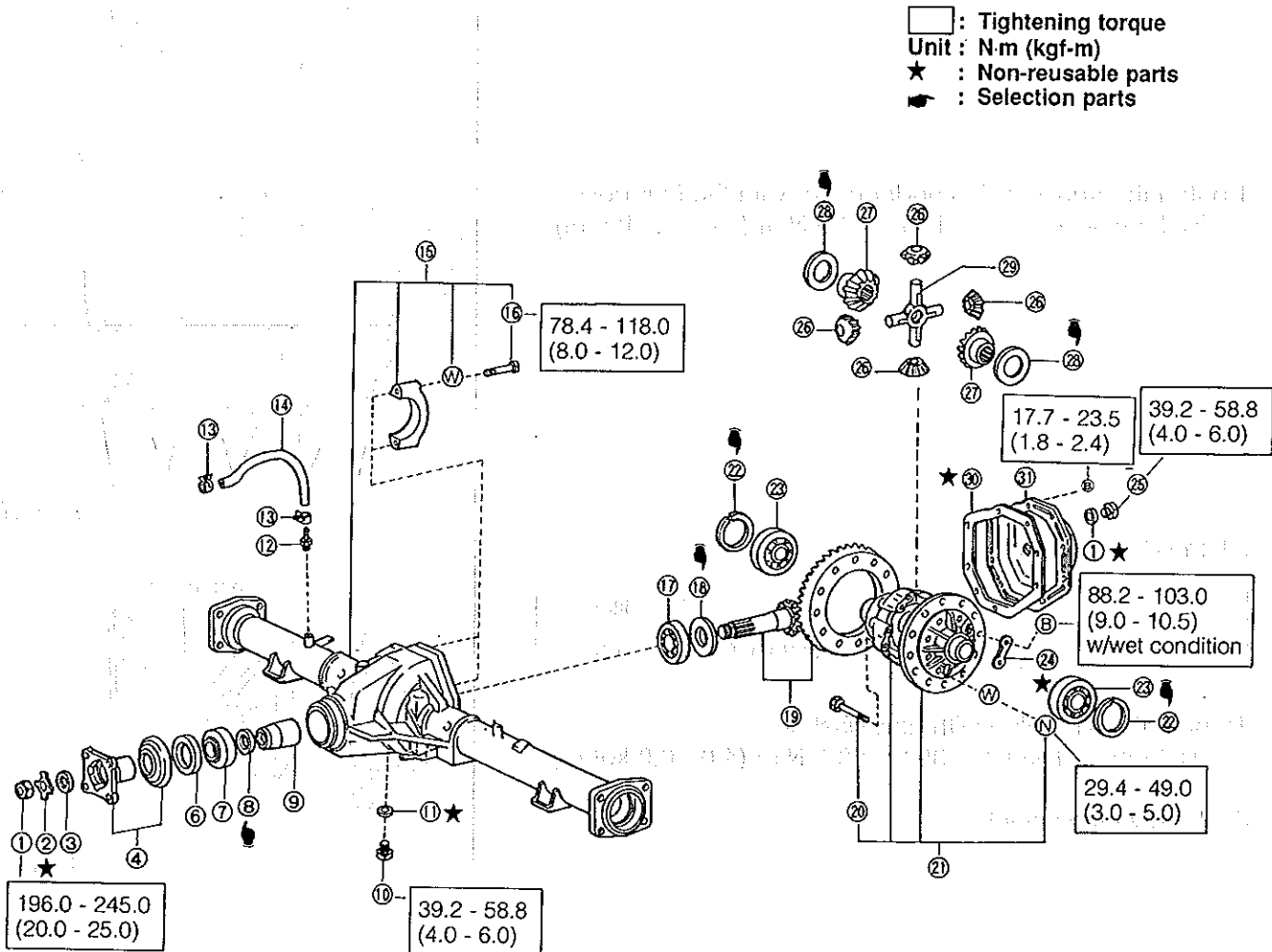


WRE91-DF110

43. Jack down the vehicle.

FRONT & REAR DIFFERENTIAL

REAR DIFFERENTIALS COMPONENTS



- ① Nut
- ② Lock washer
- ③ Plate washer
- ④ Drive pinion companion flange S/A
- ⑤ Dust deflector
- ⑥ "T" type oil seal
- ⑦ Differential drive pinion bearing (for front)
- ⑧ Shim
- ⑨ Differential drive pinion bearing spacer
- ⑩ Drain plug
- ⑪ Gasket
- ⑫ Union
- ⑬ Clip
- ⑭ Hose
- ⑮ Rear axle housing Ay
- ⑯ Hexagon bolt

- ⑰ Differential drive pinion bearing (for rear)
- ⑱ Shim
- ⑲ Differential final gear kit
- ⑳ Set bolt
- ㉑ Differential case S/A
- ㉒ Shim No. 3
- ㉓ Bearing (for side)
- ㉔ Lock washer
- ㉕ Filler plug
- ㉖ Differential pinion
- ㉗ Differential side gear
- ㉘ Differential side gear thrust washer No. 1
- ㉙ Differential spider
- ㉚ Differential carrier gasket
- ㉛ Rear axle housing cover S/A

REMOVAL

1. Jack up the vehicle.

NOTE:

- Be sure to support the vehicle with safety stands securely. (As for the jacking up points, refer GI-section).

2. Drain the differential oil by removing the drain plug with gasket.

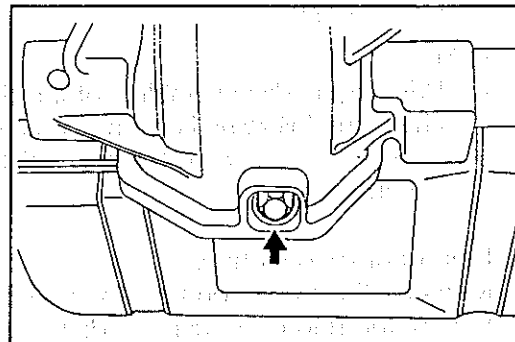
NOTE:

- Never reuse the removed gasket.

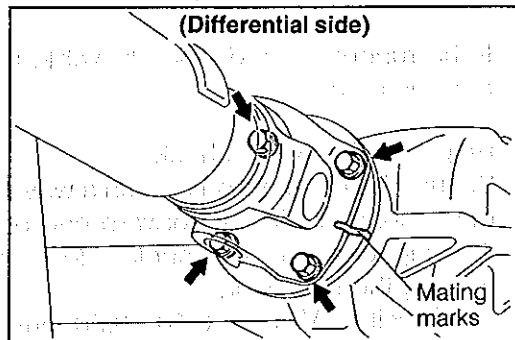
3. Remove the rear propeller shaft by removing the four bolts both at the rear differential side and at the transfer side.

CAUTION:

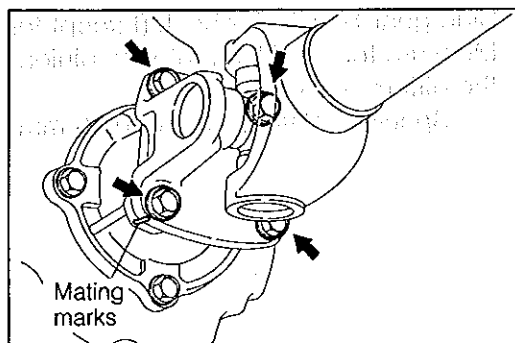
- Prior to the removal, mating marks should be put on each of the flange yoke and companion flange of the front differential.
- If this operation should fail to be performed, the propeller shaft may emit abnormal noise or vibration during the running.



WRE91-DF112



WRE91-DF113



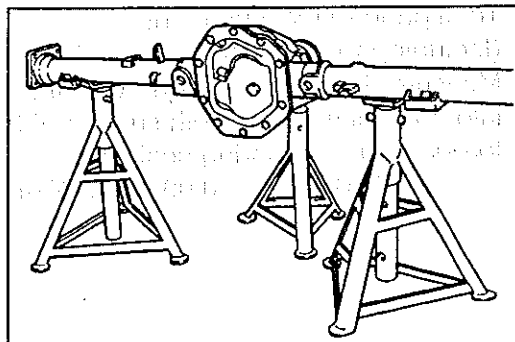
WRE91-DF114

4. Remove the L.S.P.V bracket. (only for pick up models) (Refer BR-section.)

5. Remove the rear axle shafts related parts. (Refer, BR and RS-section.)

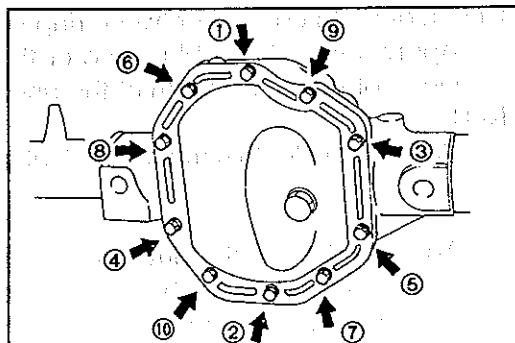
6. Remove the rear axle housing from the vehicle.

7. Support the rear axle housing with safety stands securely.



WRE91-DF115

8. Remove the rear axle housing cover S/A with gasket by removing the ten bolts.



WRE91-DF116

FRONT & REAR DIFFERENTIAL

PRE-INSPECTION

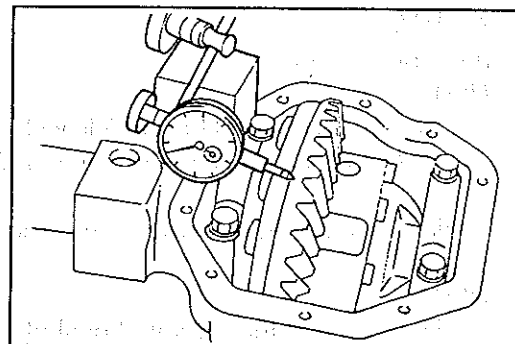
NOTE:

- Prior to the disassembling of the differential, be sure to check the following items and record the values. (These values are used as reference which assures the correct assembling.)

1. Ring gear runout check

Measure the runout on the several points at the back surface of the ring gear, using a dial gauge.

Allowable Limit: 0.1 mm



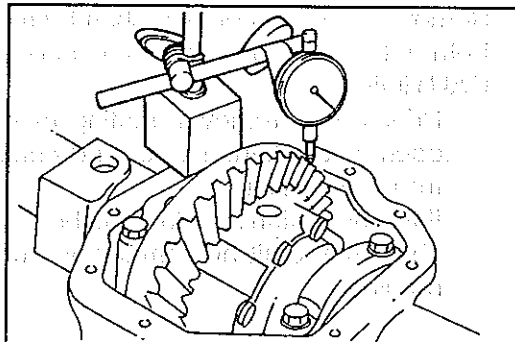
WRE91-DF117

If the runout exceeds the allowable limit, replace the final gear as a set.

2. Ring gear backlash check

Secure the drive pinion in such a way that a dial gauge may make contact with the forward end of the tooth surface of the ring gear at right angles. Measure the backlash by moving the ring gear.

Specified Value: 0.10 - 0.20 mm

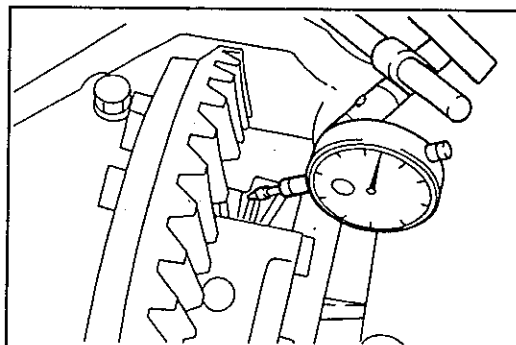


WRE91-DF118

3. Side gear backlash check (Except for L.S.D.)

Measure the backlash with the pinion gear pushed against the differential case side.

Specified Value: 0.05 - 0.25 mm



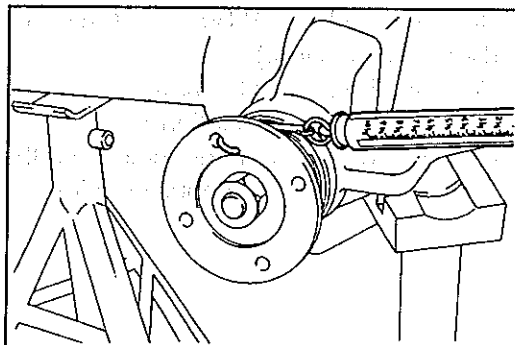
WRE91-DF119

4. Total preload measurement

(Including the oil seal resistance)

Measure the starting torque with the drive pinion brought into contact with the tooth surface of the ring gear, using a torque gauge or spring scale like.

Specified Value: 0.09 - 2.45 N·m (1.0 - 25.0 kgf·cm)



WRE91-DF120

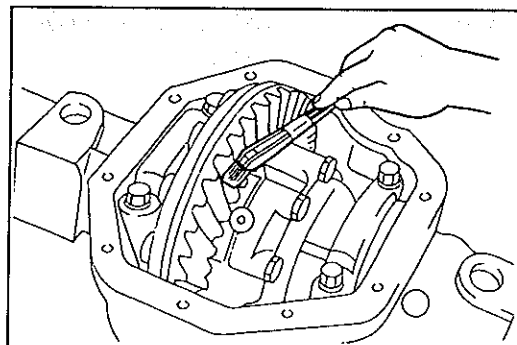
5. Check of tooth contact between ring gear and drive pinion

— Apply a thin film of blue lead or the like evenly to both sides of five or six teeth of the ring gear.

NOTE:

- Perform the tooth contact check at four points of the ring gear.

— Apply braking to the drive pinion and turn the ring gear several times. Check the tooth contact between the ring gear and the drive pinion.

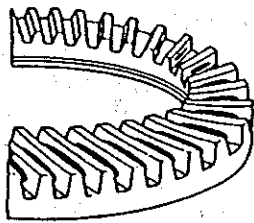


WRE91-DF121

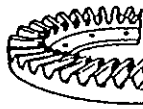
FRONT & REAR DIFFERENTIAL

— Ensure that correct tooth contact has been attained, as shown in the figure below.

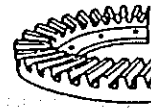
Correct tooth contact



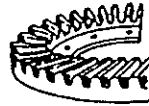
Toe contact



Flank contact



Heel contact



Face contact



WRE91-DF122

DISASSEMBLY

1. Put mating marks (Painted with white or the like) on the bearing cap and differential carrier.

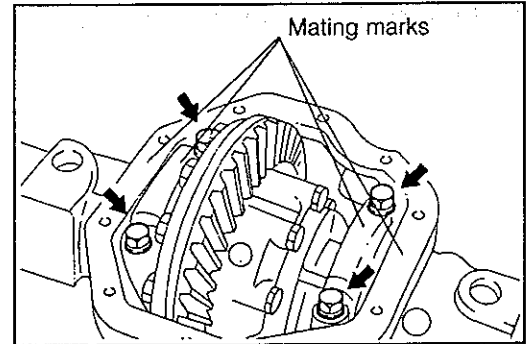
NOTE:

- Since the bearing cap has been manufactured integrally with the differential carrier, never disturb the combination of these components.

2. Remove the bearing cap by removing the two bolts on both left and right sides.

NOTE:

- Arrange the removed bearing caps in order, separating the right cap from the left cap.



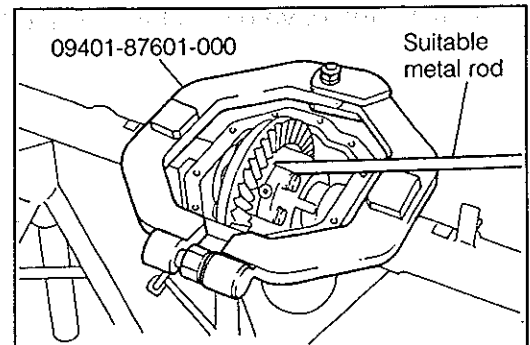
WRE91-DF123

3. Remove the differential case from the carrier in conjunction with the suitable metal rod and the following SST.

SST: 09401-87601-000

NOTE:

- The drive pinion preload should be measured after the differential case has been removed.
- After completion of measurement, perform disassembly, following the removal procedures given below.



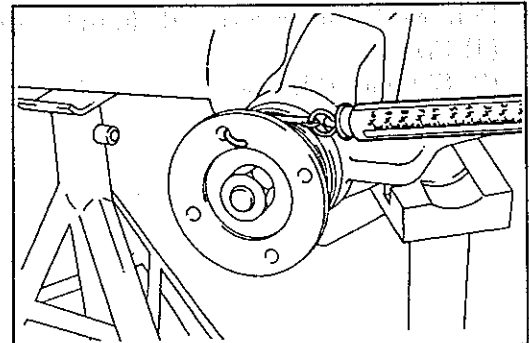
WRE91-DF124

4. Drive pinion preload measurement (Including the oil seal resistance)
Measure the starting torque within the range of the backlash between the drive pinion and the ring gear, using torque gauge or spring scale like.

Specified Value: 0.78 - 2.0 N·m (8.0 - 21.0 kgf·cm)

NOTE:

- This step should be performed after the differential case has been removed from the carrier.



WRE91-DF125

FRONT & REAR DIFFERENTIAL

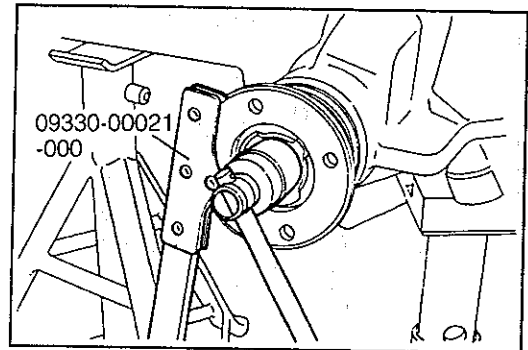
5. Raise the lock section of the lock washer, using a chisel and a hammer.

NOTE:

- Never reuse the removed lock washer.

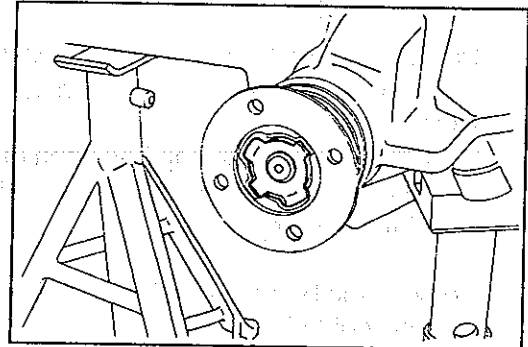
6. Remove the lock nut, using the following SST.
Proceed to the remove the lock nut.

SST: 09330-00021-000



WRE91-DF126

7. Remove the companion flange.



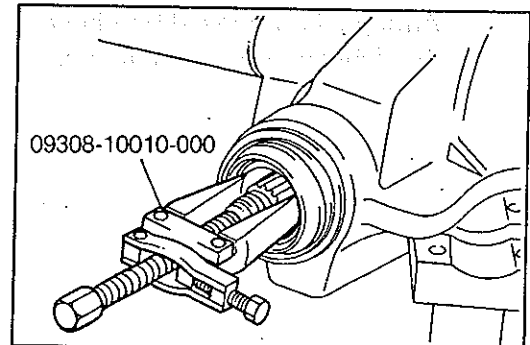
WRE91-DF127

8. Remove the "T" type oil seal of the drive pinion, using the following SST.

SST: 09308-10010-000

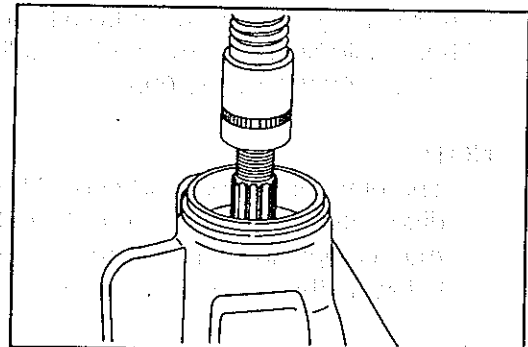
NOTE:

- Never reuse the removed oil seal.



WRE91-DF128

9. Remove the drive pinion by pressing the press.

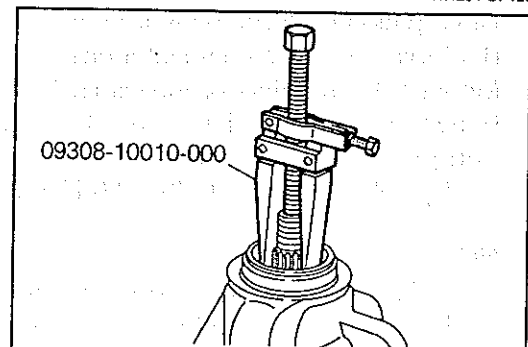


WRE91-DF129

10. Remove the following parts from the drive pinion.

(1) Spacer

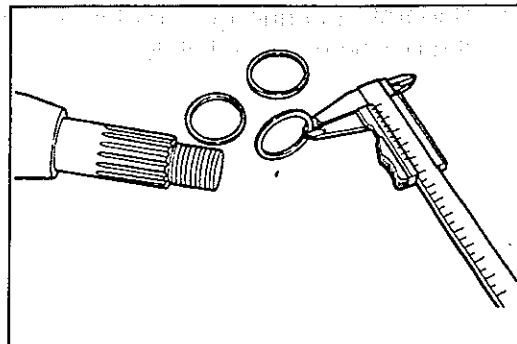
(2) Shim for drive pinion preload



WRE91-DF130

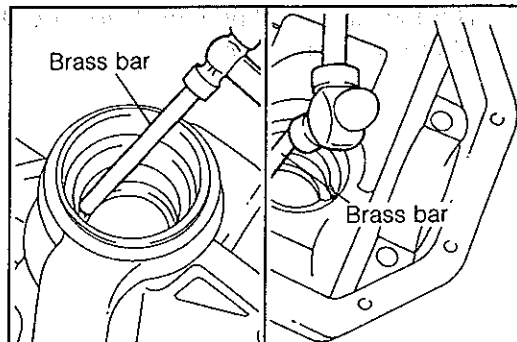
FRONT & REAR DIFFERENTIAL

11. Measure the respective shims for preload adjustment use which have been removed. Record the measurement results (for the purpose of using them as a guide during the installation of the drive pinion and ring gear).



WRE91-DF131

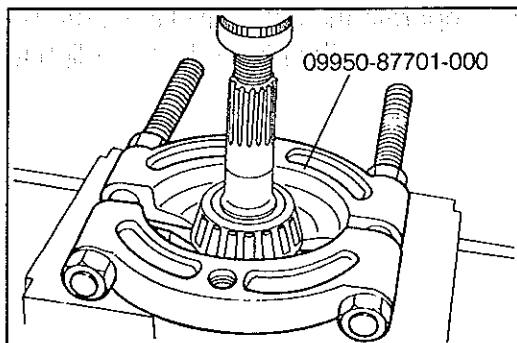
12. Remove the front and rear bearing outer races, using a brass bar.



WRE91-DF132

13. Remove the rear bearing and the drive pinion mounting distance adjusting shim from the drive pinion, in conjunction with a press and the following SST.

SST: 09950-87701-000



WRE91-DF133

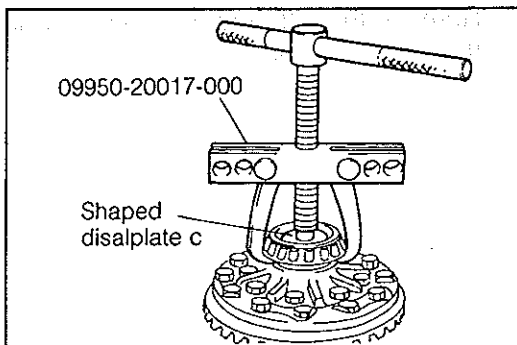
14. Set the differential case into the vice.

15. Remove the side bearings from the differential case, using the following SST.

SST: 09950-20017-000

NOTE:

- Insert the pawl of the SST into the groove of the differential carrier.



WRE91-DF134

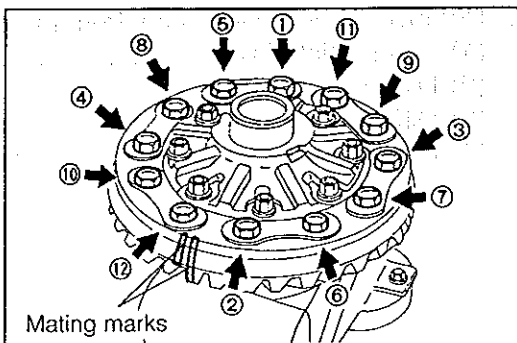
16. Put a mating marks between differential case S/A and ring gear as guide during the installation, if the ring gear is reusing.

17. Raise the lock section of the lock plate.

NOTE:

- Never reuse the removed lock plate.

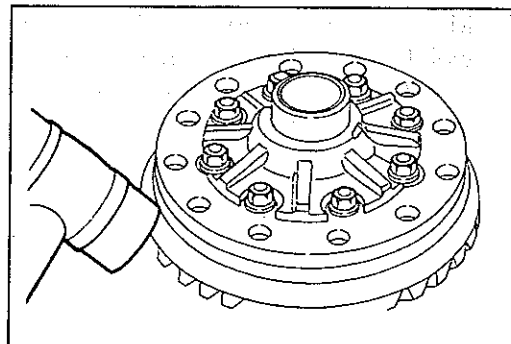
18. Remove the twelve bolts of the ring gear.



WRE91-DF135

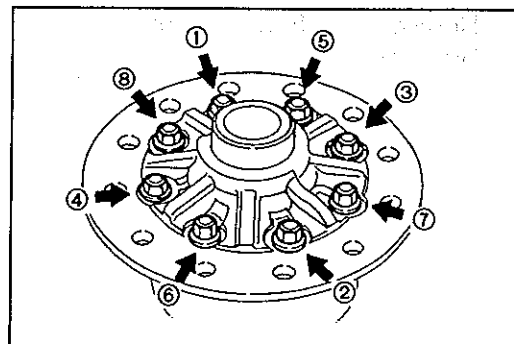
FRONT & REAR DIFFERENTIAL

19. Separate the ring gear by tapping with a standard tool of the plastic hammer lightly.



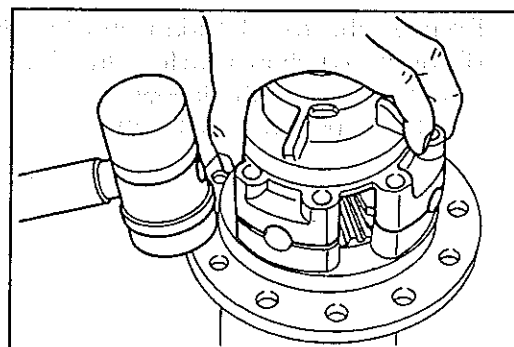
WRE91-DF136

20. Remove the eight nuts and eight washers from the set bolts of the differential case.



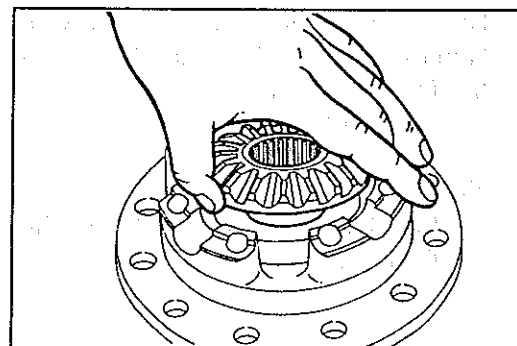
WRE91-DF137

21. Separate the differential case S/A by tapping with a standard tool of the plastic hammer lightly.



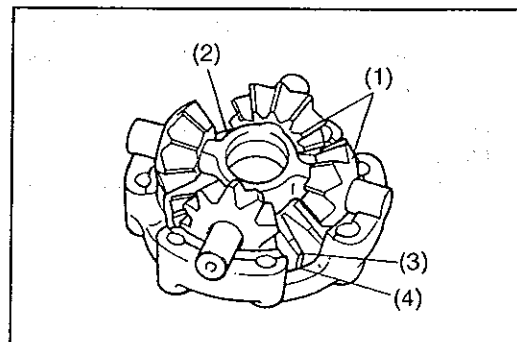
WRE91-DF138

22. Remove the differential side gear and differential side gear thrust washer No. 1.



WRE91-DF139

23. Remove the following parts from the differential case.
- (1) Differential pinion (4 pcs)
 - (2) Differential spider
 - (3) Differential side gear
 - (4) Differential side gear thrust washer No. 1



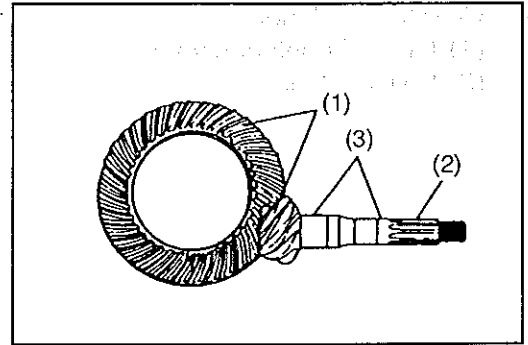
WRE91-DF140

INSPECTION

Inspect each section of the following parts for any sign of damage, wear or excessive looseness. Replace any parts which exhibit defects.

1. Drive pinion & ring gear

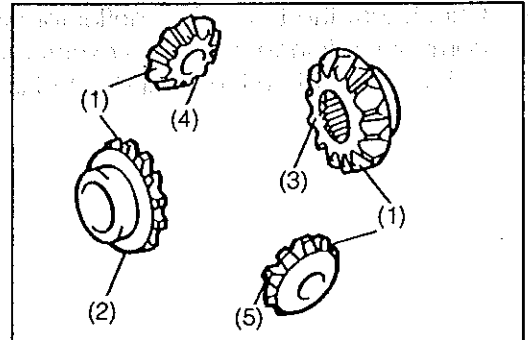
- (1) Gear teeth
- (2) Spline portion (2) of drive pinion
- (3) Bearing fitting section



WRE91-DF141

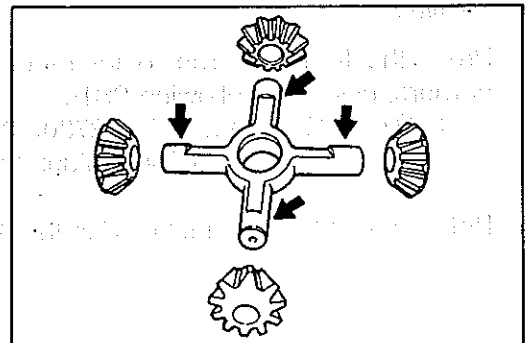
2. Side gear & pinion

- (1) Gear teeth
- (2) Side gear boss section
- (3) Side gear serrated section
- (4) Pinion shaft fitting hole
- (5) Differential case contact section



WRE91-DF142

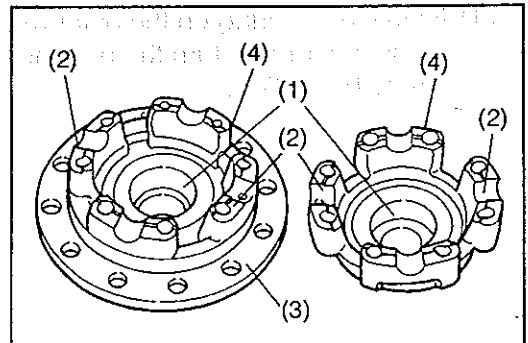
3. Visually inspect the rotational sliding section between the differential pinion and the differential pinion shaft for damage and wear.



WRE91-DF143

4. Inspection of differential case for wear or damage

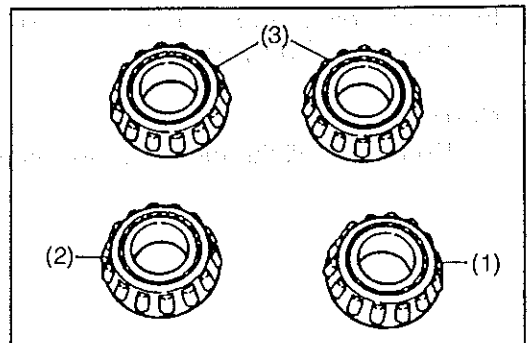
- (1) Side gear boss contact sections
- (2) Pinion contact section
- (3) Ring gear attaching section
- (4) The differential case proper



WRE91-DF144

5. Bearings

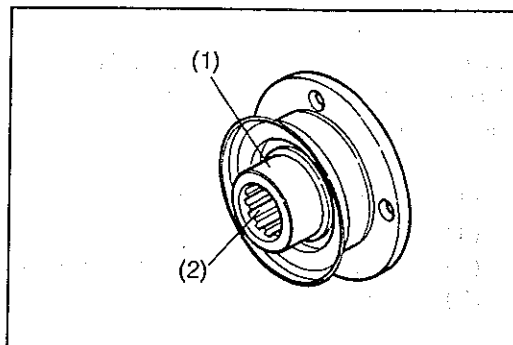
- (1) Front bearing
- (2) Rear bearing
- (3) Side bearings
- Turn the bearings lightly. Ensure that they rotate smoothly without any binding or abnormal noise.
- While tracing the outer peripheral section of the taper roller with your nails, check to see if any binding exists there.



WRE91-DF145

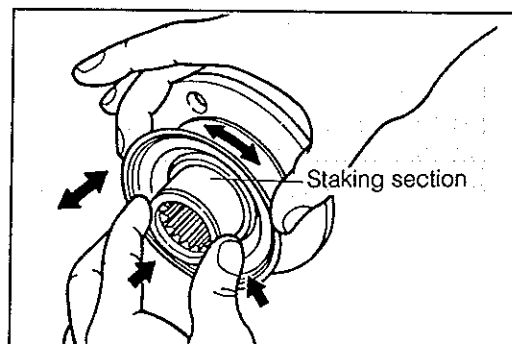
FRONT & REAR DIFFERENTIAL

6. Companion flange
(1) Oil seal contact section
(2) Spline section



WRE91-DF146

7. Check that the three dust deflector staked sections of the companion flange exhibit no excessive play by turning it in a right-&-left direction, as indicated in the right figure.



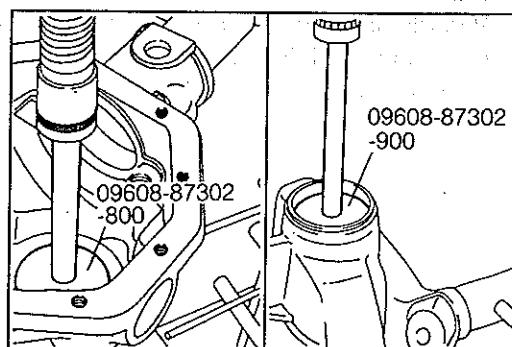
WRE91-DF147

ASSEMBLY

1. Press the front and rear outer races into the differential carriers, using the following SSTs.

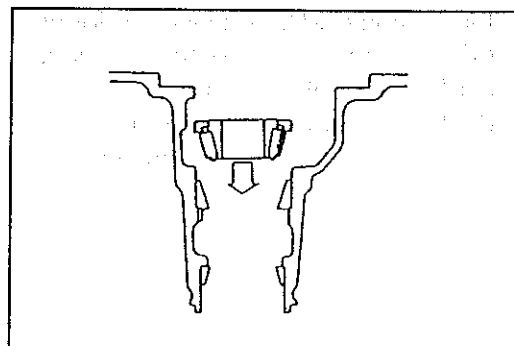
SSTs: (1) Front...09608-87302-800
(2) Rear...09608-87302-900

Both above SSTs are included in the 09608-87302-000.



WRE91-DF148

- (1) Install the bearing on the outer race. To get bedding-in of the inner race, turn the bearing several times so that it may be settled.

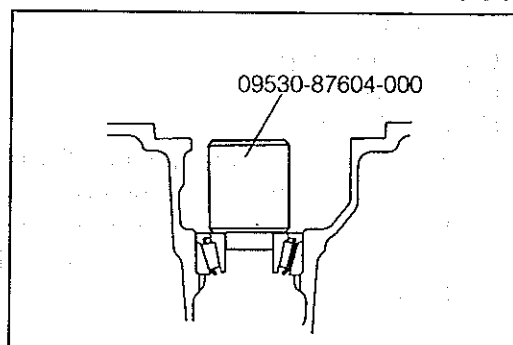


WRE91-DF073

2. Install the following SST to the front differential.
SST: 09530-87604-000

NOTE:

- Do not install the oil seal at this stage.

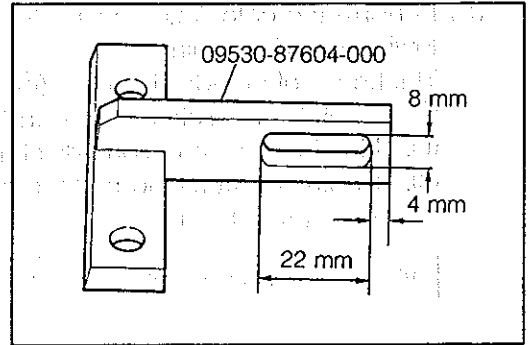


WRE91-DF074

3. As for those differential gears that were manufactured in or after September 1987, the P.M.D. has been extended. It is, therefore, necessary to modify the SST (09530-87604-000) as indicated in the right figure.

Contents of modification:

Elongate the groove where a dial gauge is installed to the dimensions as indicated in the right figure.



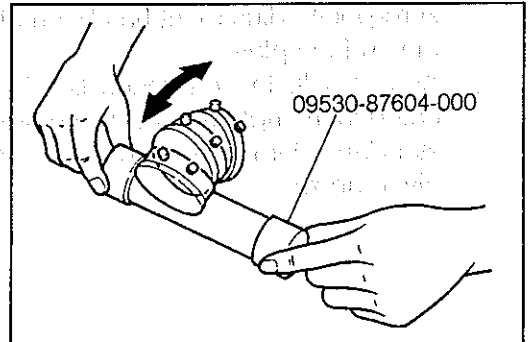
WRE91-DF231

4. Secure the dial gauge to the SST.

NOTE:

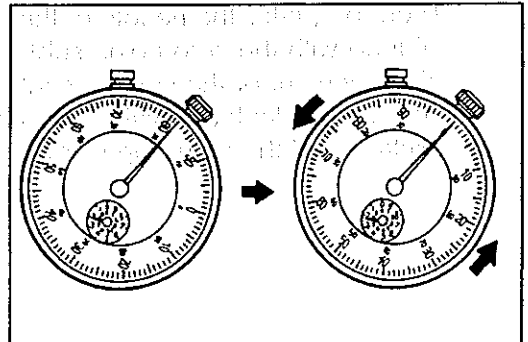
- Make certain to install the dial gauge securely.

- (1) While turning the SST on a surface plate, as shown in the right illustration, locate the position where the spindle of the dial gauge is contracted to the shortest position (namely when the pointer's runout becomes a minimum stable level). And stop the SST at this point.



WRE91-DF232

- (2) Align the zero-point of the scale with the needle of the dial gauge.

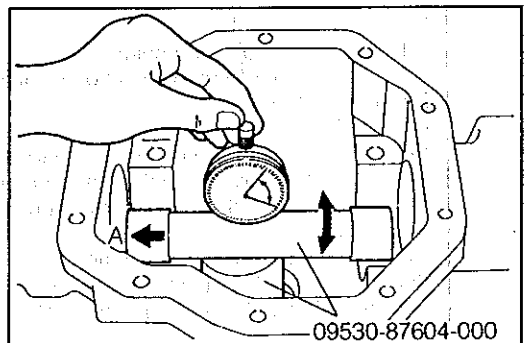


WRE91-DF067

- (3) Place the SST in the differential carrier.
- (4) While turning the attaching surface of the side bearing outer race lightly by their own weights of the SST and dial gauge, as shown in the right illustration, locate the position where the pointer registers the stablest reading.

NOTE:

- During the operation above, keep one end surface of the SST in contact with the attaching surface of the side bearing outer race (in the arrowheaded direction (A)).



WRE91-DF068

FRONT & REAR DIFFERENTIAL

- (5) Perform the calculation, using the thickness of the following standard shim.

Thickness of standard shim = (B) + (C) - P. M. D.

(A): P. M. D. + Thickness of standard shim (108.0 mm)

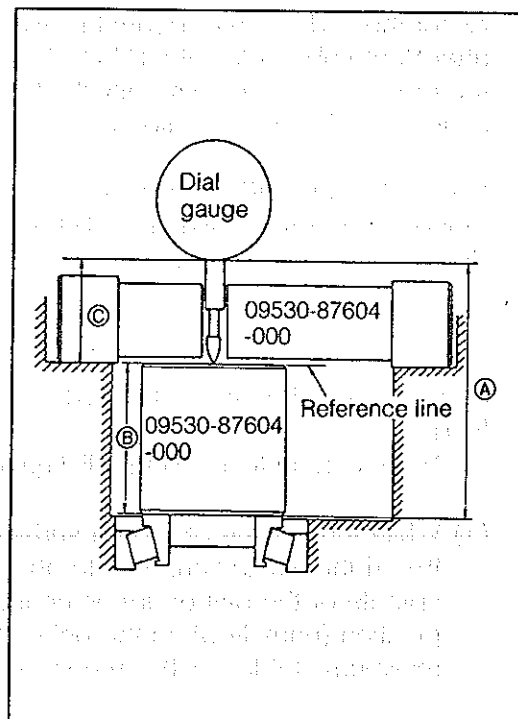
(B): Height of drive pinion adjusting gauge (62.75 mm)

(C): Radius of attaching surface of side bearing outer race (42.5 mm)

$$108 \text{ mm} - (62.75 \text{ mm} + 42.5 \text{ mm}) = 2.75 \text{ mm}$$

With regard to the SST mounted on the dial gauge, its zero-point adjustment has been already conducted on the surface plate.

As a result, the reference line is established as indicated in the right figure. Therefore, the thickness of the standard shim can be determined, using the formula given above.



WRE91-DF069

Therefore, after the needle of the dial gauge has been aligned with the zero-point, subtract 2.75 mm from the displacement of the spindle section of the dial gauge. The thus-calculated value becomes the installation thickness of the adjusting shim.

WRE91-DF070

Calculating Formula:

Thickness of adjusting shim =

Displacement of spindle section of dial gauge - 2.75 mm
(Standard value)

<Example>

After the needle of the dial gauge had been set to the zero-point, the spindle section of the dial gauge dropped. Thus, the needle of the dial gauge turned counterclockwise 5.25 mm.

$$5.25 \text{ mm} - 2.75 \text{ mm} = 2.50 \text{ mm}$$

Because of availability of adjusting shims, use a 2.20 mm thick shim together with a 0.30 mm thick shim.

WRE91-DF071

5. Table showing relationship between availability of replacement shims and readings of dial gauge

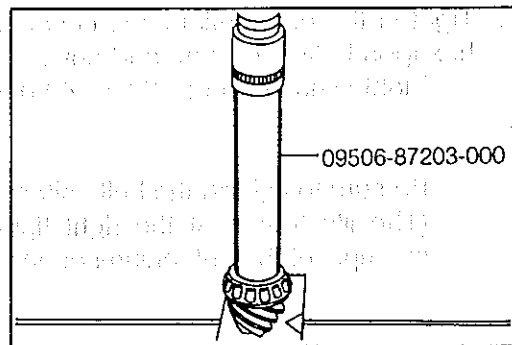
Thickness of adjusting shims mm	2.10	2.15	2.20	2.25	2.30	2.35	0.30 (for fine adjustment)
Reading of dial gauge mm	+0.15	+0.10	+0.05	±0	-0.05	-0.10	

WRE91-DF157

FRONT & REAR DIFFERENTIAL

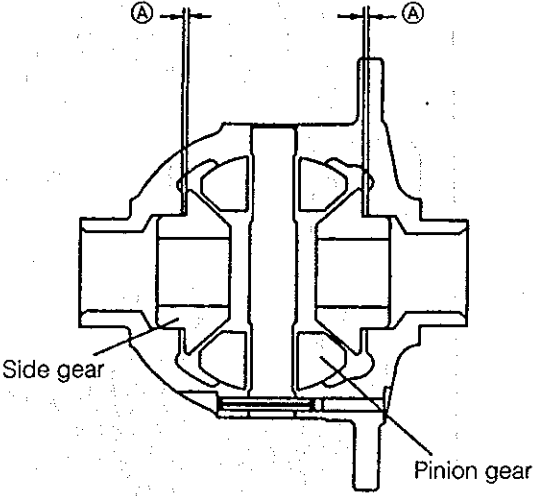
6. Place the drive pinion mounting distance adjusting shim that was selected in the previous step in the drive pinion. Press the rear bearing, using the following SST.

SST: 09506-87203-000



WRE91-DF158

7. Selecting procedures for differential side gear backlash thrust washer



Availability of Adjusting Thrust Washer for Section A

Unit: mm

0.8
0.9
1.0

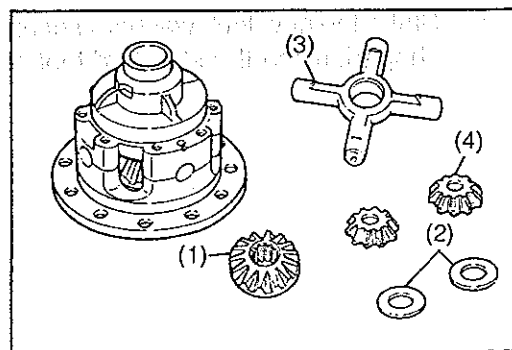
WRE91-DF159

- (1) Prior to assembling, apply the gear oil to the following rotating sections.

- Outer periphery (side and pinion gear)
- Inner periphery of side and pinion gear in differential case

- (2) Assemble the following parts in the differential case.

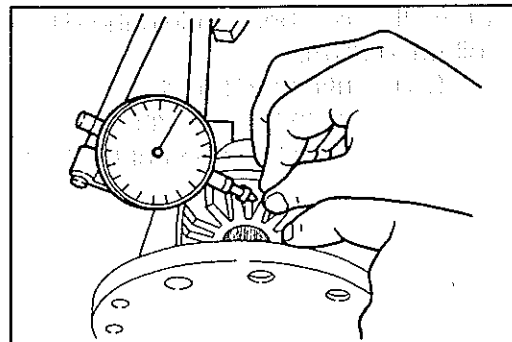
- (1) Differential side gear
- (2) Differential side gear thrust washer
- (3) Differential pinion shaft
- (4) Differential pinion



WRE91-DF160

- (3) Measure the backlash with the pinion gear pushed against the differential case side. Select a thrust washer in such a way that the backlash between the differential pinion and the differential side gear may conform to the specified value given below. Here, the backlash is the mean value of measurements over four teeth. Place the selected thrust washer.

Specified Value: 0.05 - 0.25 mm



WRE91-DF161

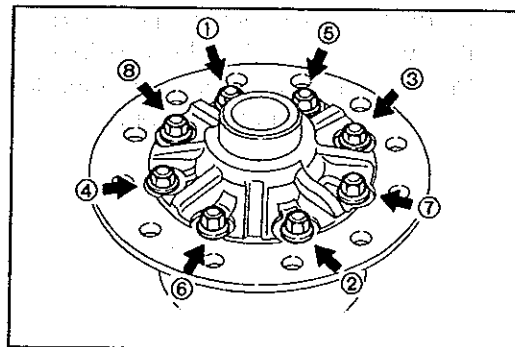
FRONT & REAR DIFFERENTIAL

8. Tighten the differential case cover by means of the eight hexagon bolts, washers and nuts.

Tightening Torque: 29.4 - 49.0 N·m (3.0 - 5.0 kgf·m)

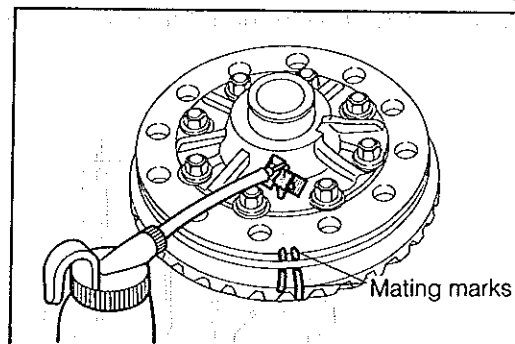
NOTE:

- Be sure to tighten the bolts alternately and diagonally. (The illustration at the right figure indicates a typical example of the tightening sequence.)



WRE91-DF162

9. Align the mating marks put during the disassembly with each other.
10. Apply gear oil to the threaded portions of the tightening bolts and the ring gear.



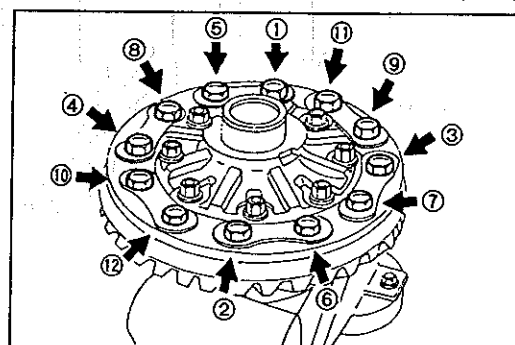
WRE91-DF163

11. Install the ring gear in the differential case S/A and tighten the twelve set bolts with new lock washers.

Tightening Torque: 88.3 - 103.0 N·m
(9.0 - 10.5 kgf·m)

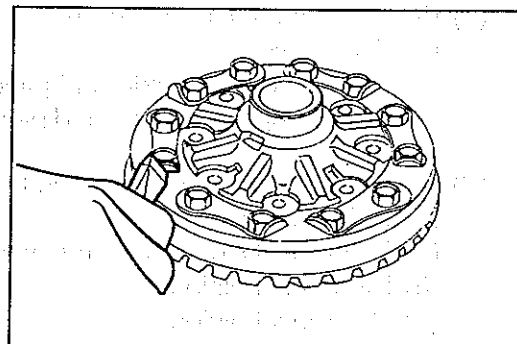
NOTE:

- Be sure to tighten the bolts alternately and diagonally. (The right figure illustration indicates a typical example of the tightening sequence.)



WRE91-DF164

- Stake the new lock washers securely along with the bolt shaped, using the standard tool of the chisel or the like.



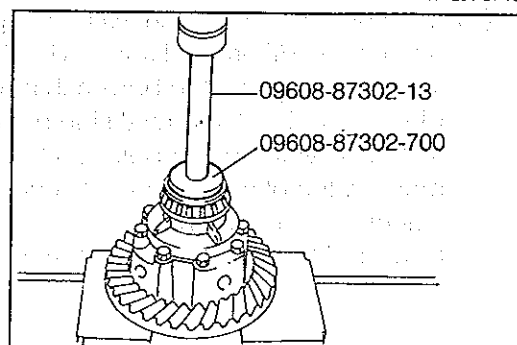
WRE91-DF165

12. Press the side bearing into the differential case, using the following SSTs.

SST: 09608-87302-13

09608-87302-700

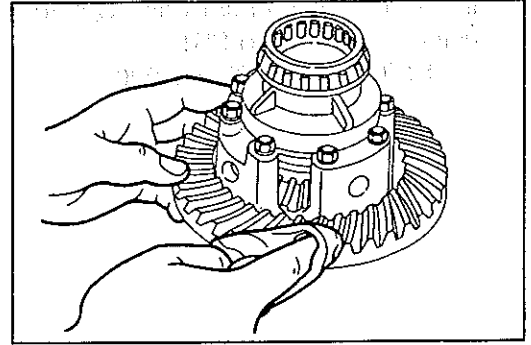
that is a part of 09608-87302-000 set



WRE91-DF166

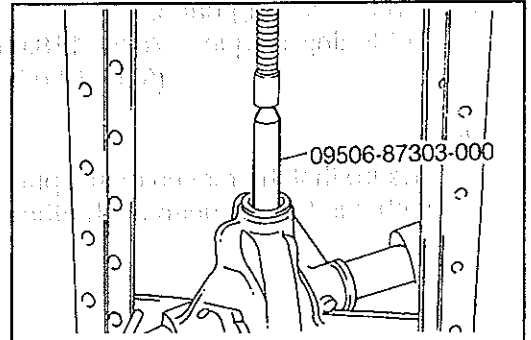
FRONT & REAR DIFFERENTIAL

13. Clean the ring gear tooth surfaces.



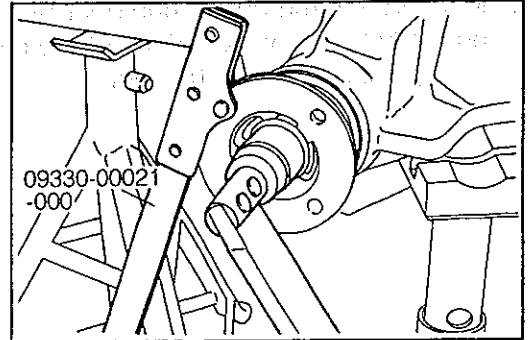
WRE91-DF167

14. Install the drive pinion, drive pinion bearing spacer and shim to the differential carrier.
 15. Press the rear bearing, using the following SST.
 SST: 09506-87303-000



WRE91-DF168

16. Apply the gear oil to the rear bearing tapered roller sections.
 17. Install the companion flange.
 18. Tighten the nut, using the following SST.
 SST: 09330-00021-000
 Tightening Torque: 196.0 - 245.0 N·m
 (20.0 - 25.0 kgf·m)



WRE91-DF169

NOTE:

- Do not install the "T" type oil seal at this stage.

19. Apply the gear oil to the front bearing tapered roller sections.
 20. Rotated the companion flange for several times in clock and counter clockwise.
 21. Measure the starting torque of the drive pinion, using a torque gauge or spring scale like.

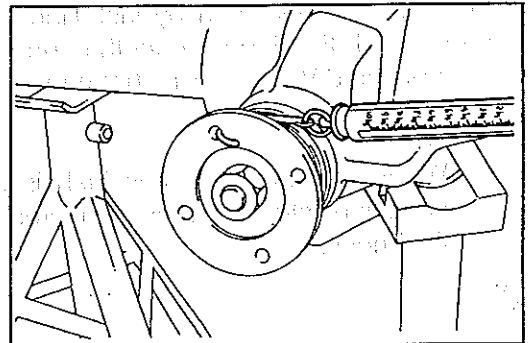
Specified Value:

New Bearing:

0.06 - 1.96 N·m (7.0 - 20.0 kgf·cm)

Bearing Reused:

0.06 - 1.96 N·m (7.0 - 20.0 kgf·cm)



WRE91-DF170

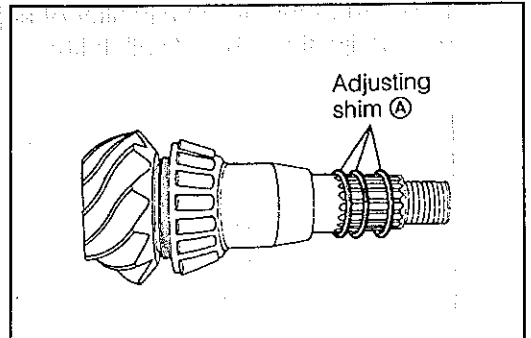
22. When the preload is greater than the specified value, increase the adjusting shim thickness. Conversely, when the preload is less than the specified value, decrease the adjusting shim thickness.

NOTE:

- Refer the table for availability of adjusting shim ① as follows.

Unit: mm

Thickness	0.25	0.30	0.40
	0.50	0.08	

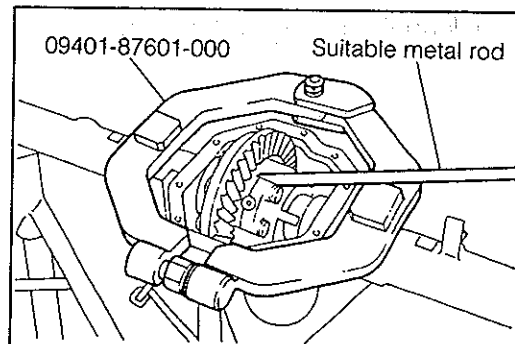


WRE91-DF171

FRONT & REAR DIFFERENTIAL

23. Install the differential case S/A to the rear axle housing, using the following SST.

SST: 09401-87601-000



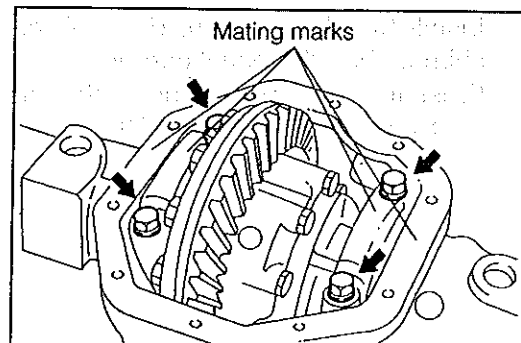
WRE91-DF172

24. Tighten the bearing caps.

Tightening Torque: 78.5 - 118.0 N·m
(8.0 - 12.0 kgf·m)

NOTE:

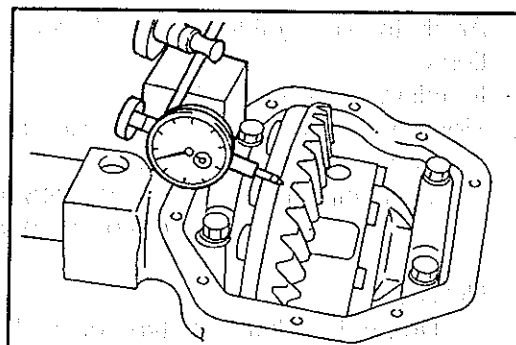
- Ensure that the mating marks put during the disassembly should be line-uped each others.



WRE91-DF174

25. Measure the run-out for ring gear by installing a dial gauge normally to the back surface of the ring gear.

Specified Value: 0.1 mm



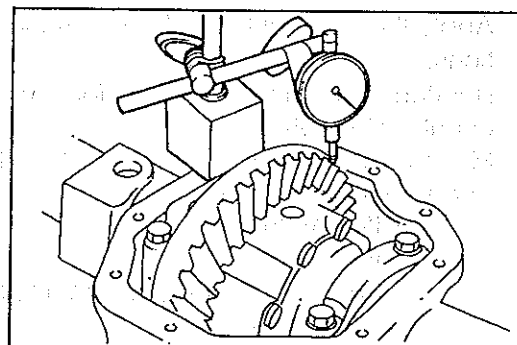
WRE91-DF175

26. Measure the backlash by installing a dial gauge at right angles with the ring gear tooth surface.

Specified Value: 0.1 - 0.2 mm

NOTE:

- When the ring gear backlash is greater or less than specified value, decrease or increase the adjusting shim thickness.



WRE91-DF176

- Refer the table for availability of adjusting shim ①.

①: Adjusting Shim Availability

Unit: mm

2.45	2.75	3.05
2.50	2.80	3.10
2.55	2.85	3.15
2.60	2.90	3.20
2.65	2.95	3.25
2.70	3.00	3.30

WRE91-DF177

FRONT & REAR DIFFERENTIAL

27. Total preload measurement

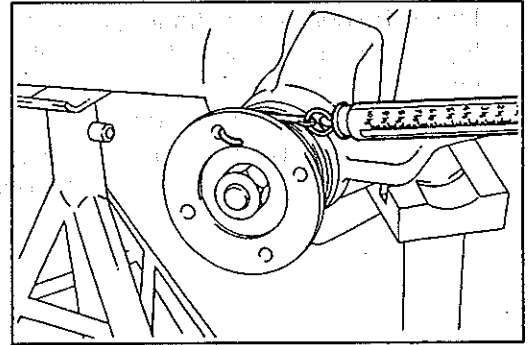
Measure the starting torque with the drive pinion brought into contact with the tooth surface of the ring gear, using a torque gauge or spring scale like.

New Bearing: 0.89 - 2.35 N·m (9.0 - 24.0 kgf·cm)

Bearing Reused: 0.89 - 2.35 N·m (9.0 - 24.0 kgf·cm)

NOTE:

- If the total preload does not conform to the specification, Adjust the thickness of the adjusting shim(s).



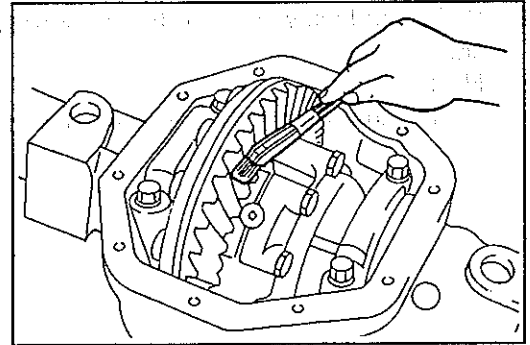
WRE91-DF178

28. Checking procedure for tooth contact between ring gear and drive pinion

- (1) Apply a thin film of blue lead or the like evenly to both sides of five or six teeth of the ring gear.
- (2) Turn the ring gear several times by applying a load to the drive pinion by one hand.

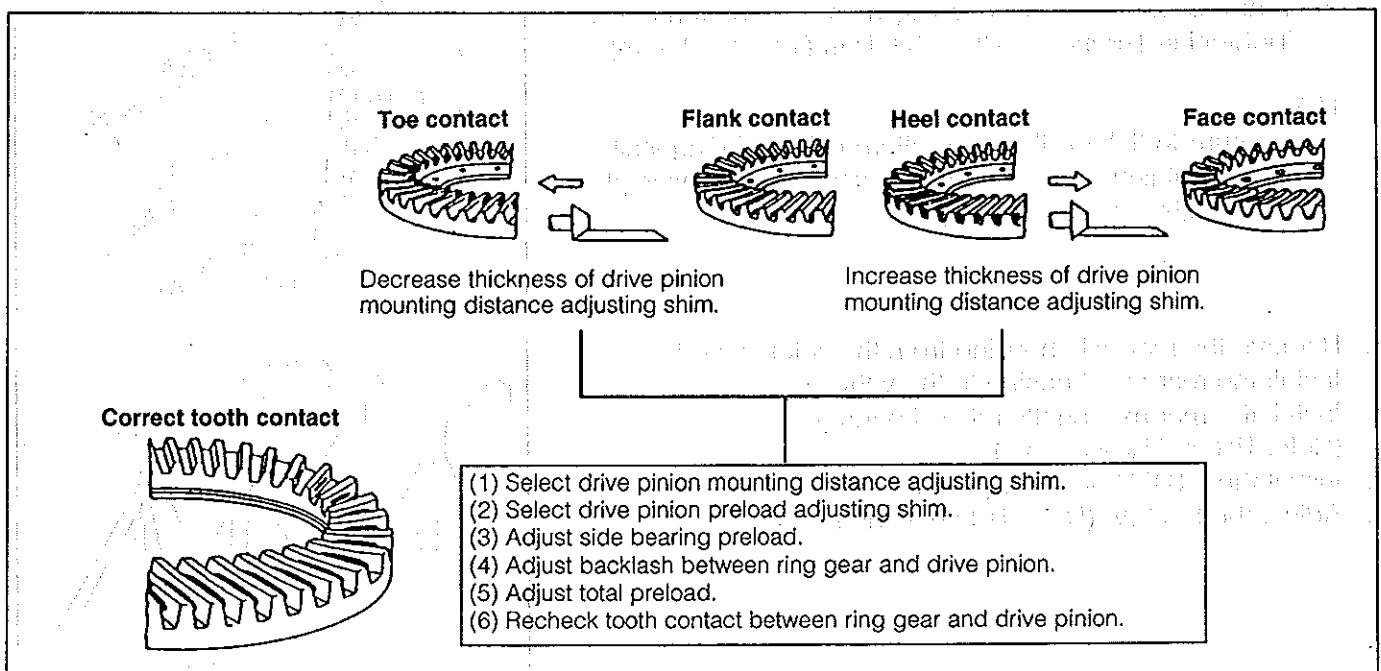
NOTE:

- Perform the tooth contact check at four points of the ring gear.



WRE91-DF179

- (3) Ensure that the correct tooth contact has been attained, as shown in the figure below.



WRE91-DF180

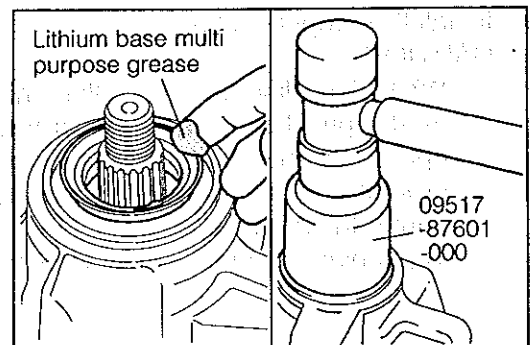
29. Remove the companion flange by removing the nut.

30. Drive a new oil seal up to the edge surface of the differential carrier, using the following SST.

SST: 09517-87601-000

NOTE:

- Apply lithium base multi purpose grease to the oil seal lip section.



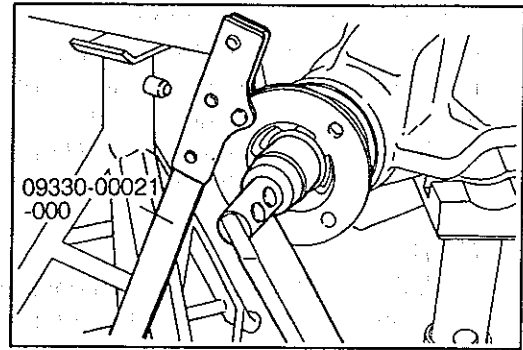
WRE91-DF181

FRONT & REAR DIFFERENTIAL

31. Install the companion flange, plate washer and new nut and tighten the companion flange by means of a new lock nut, using the following SST.

SST: 09330-00021-000

Tightening Torque: 196.0 - 245.0 N·m
(22.0 - 25.0 kgf·m)

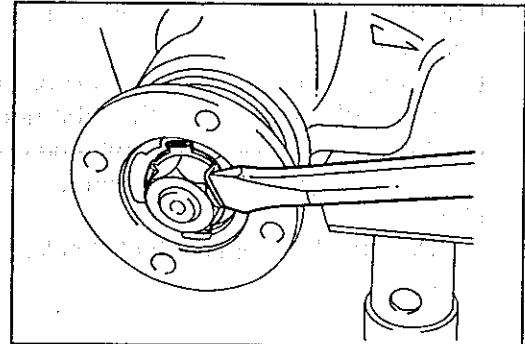


WRE91-DF182

32. Stake the lock washer to the securely, using a chisel or the like.

NOTE:

- Be sure to stake the lock washer along with the nut side.



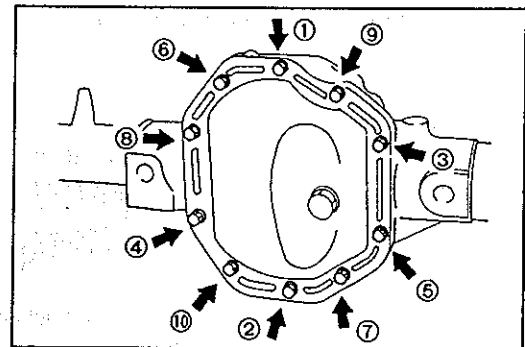
WRE91-DF183

33. With the new differential carrier gasket interposed, tighten the rear axle housing cover S/A by means of the ten bolts.

Tightening Torque: 17.6 - 23.5 N·m (1.8 - 2.4 kgf·m)

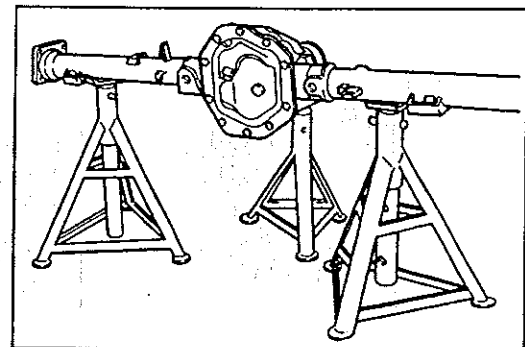
NOTE:

- Be sure to tighten the bolts alternately and diagonally. (The right figure illustration indicates a typical example of the tightening sequence.)



WRE91-DF184

34. Remove the rear axle housing from the safety stands.
35. Install the rear axle housing to the vehicle.
36. Install the rear axle shafts related parts. (Refer BR and RS-section.)
37. Install the L.S.P.V bracket. (only for pick up models)
38. Adjust the L.S.P.V. (Refer BR-sections.)



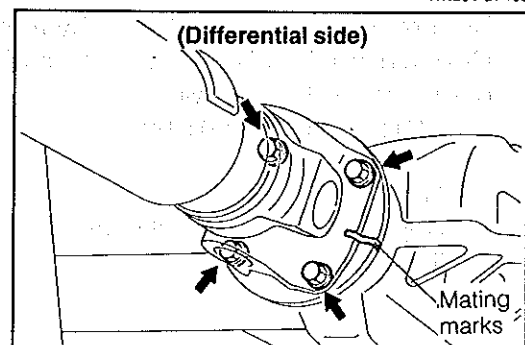
WRE91-DF185

39. Install the propeller shaft.

CAUTION:

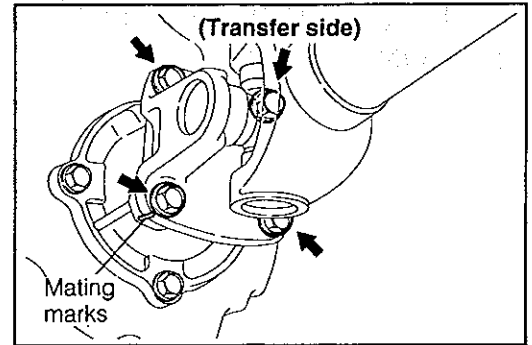
- While installing the propeller shaft, align the mating marks put during the removal with each other. If this operation should fail to be performed correctly, the propeller shaft may emit abnormal noise or vibration during the running.

Tightening Torque: 58.8 - 78.5 N·m (6.0 - 8.0 kgf·m)



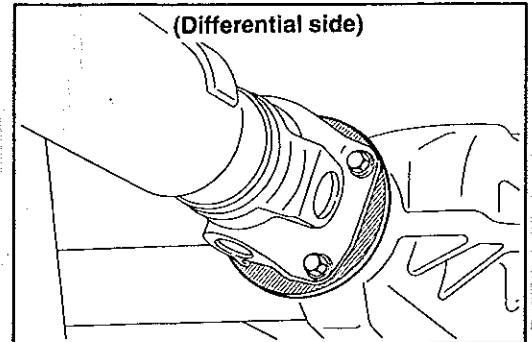
WRE91-DF186

FRONT & REAR DIFFERENTIAL



WRE91-DF187

40. After the propeller shaft has been installed, apply black paint to the exposed machined surface (slant line section in the right figure) of the differential companion flange.

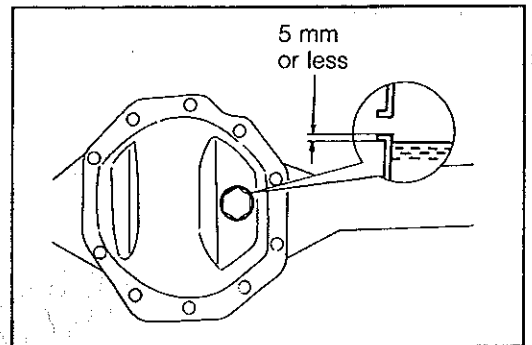


WRE91-DF188

41. Fill the differential oil.

		Grade/Viscosity	liter
Differential	Rear	API GL-5/SAE 80W-90 or 90	1.5

42. Tighten the filler plug with new gasket.
Tightening Torque: 39.2 - 58.8 N·m (4.0 - 6.0 kgf·m)
43. Jack down the vehicle.

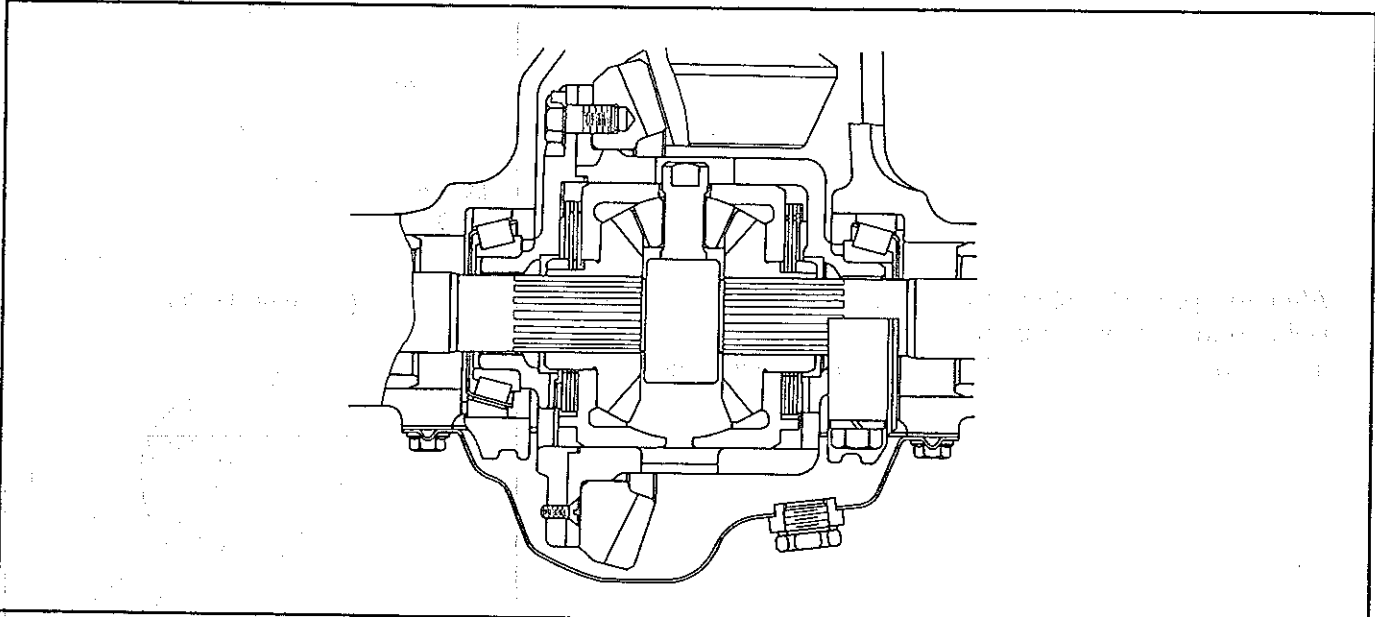


WRE91-DF189

FRONT & REAR DIFFERENTIAL

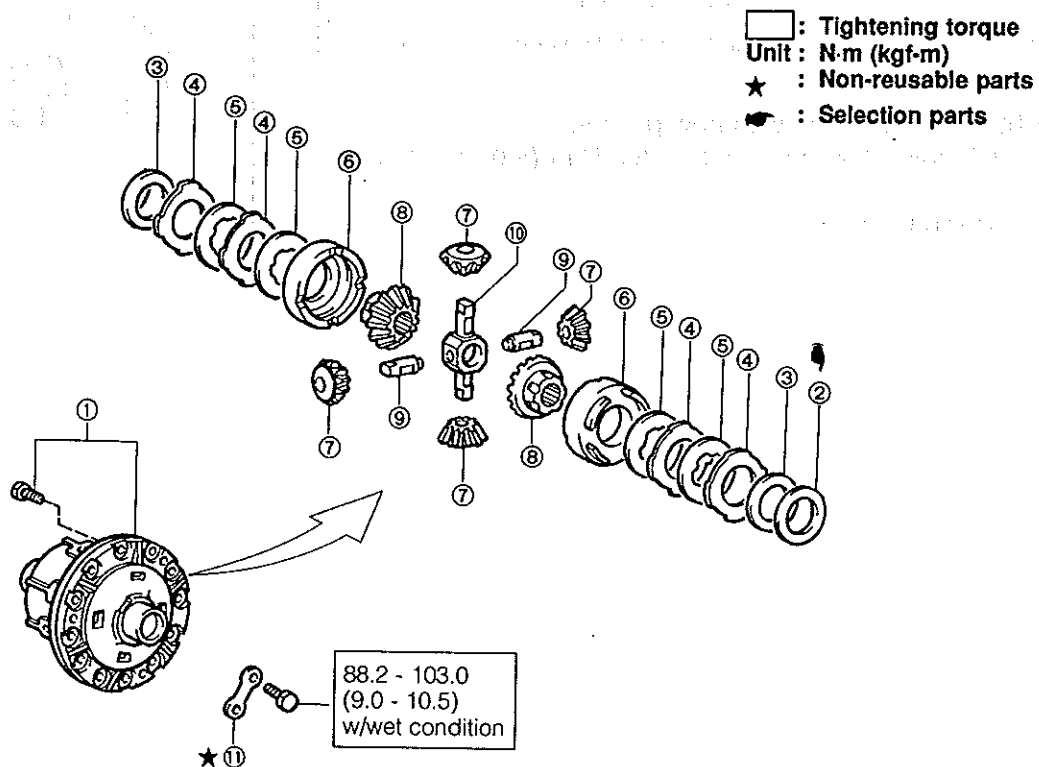
L.S.D. (Limited Slip Differential)

SECTIONAL VIEW



WRE91-DF190

COMPONENTS



- ① Differential case Ay
- ② Shim No. 4
- ③ Conical spring washer
- ④ Differential side gear thrust washer No. 1
- ⑤ Clutch plate
- ⑥ Clutch pressure ring

- ⑦ Differential pinion
- ⑧ Differential side gear
- ⑨ Differential pinion shaft (No. 2)
- ⑩ Differential pinion shaft (No. 1)
- ⑪ Lock washer

WRE91-DF191

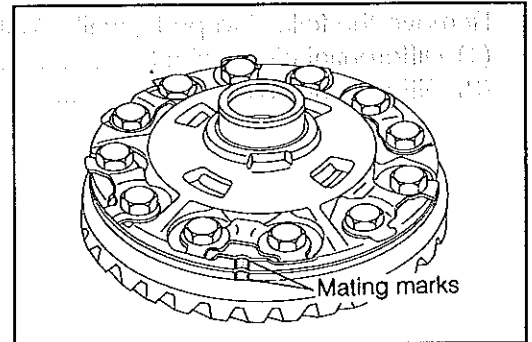
REMOVAL

1. Remove the rear differential carrier assembly.
(See pages DF-28 through DF-29.)
2. Remove the differential case assembly from the differential carrier.
(See pages DF-30 through DF-33.)

WRE91-DF192

DISASSEMBLY

1. Ensure that the mating marks on the differential case subassembly and the differential case cover are aligned with each other.

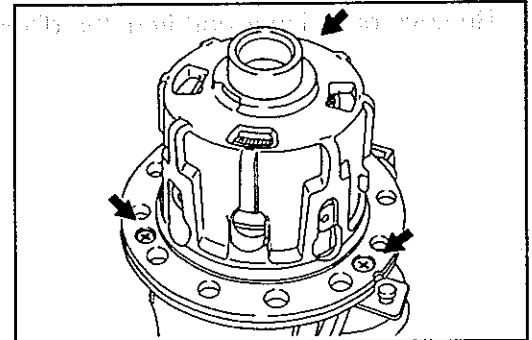


WRE91-DF193

2. Separate the differential case subassembly from the differential case cover by removing the three screws.

NOTE:

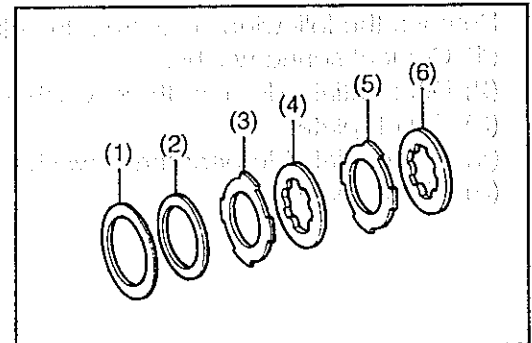
- When removing the three screws, loosen them evenly over several stages.



WRE91-DF194

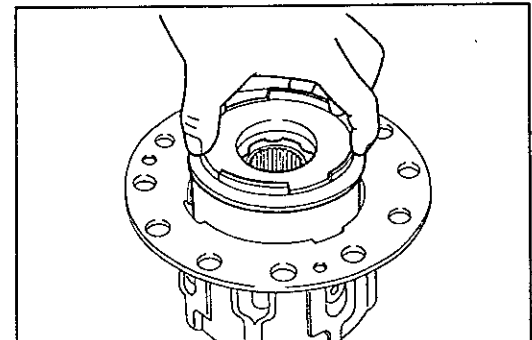
3. Remove the following parts in this sequence from the differential case.

- (1) Shim No. 4
- (2) Conical spring washer
- (3) Differential side gear thrust washer No. 1
- (4) Clutch plate
- (5) Differential side gear thrust washer No. 1
- (6) Clutch plate



WRE91-DF195

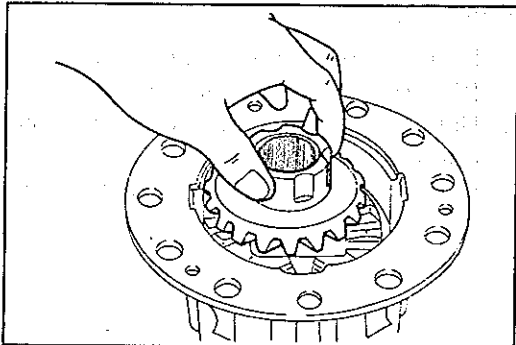
4. Remove the clutch pressure ring.



WRE91-DF196

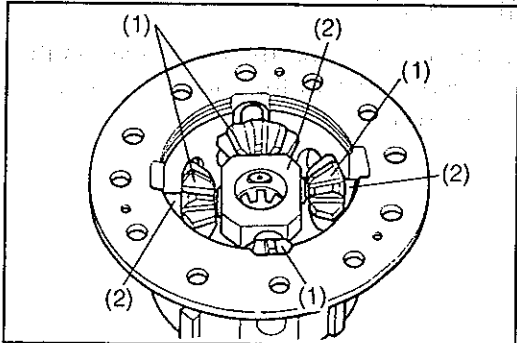
FRONT & REAR DIFFERENTIAL

5. Remove the side gear.



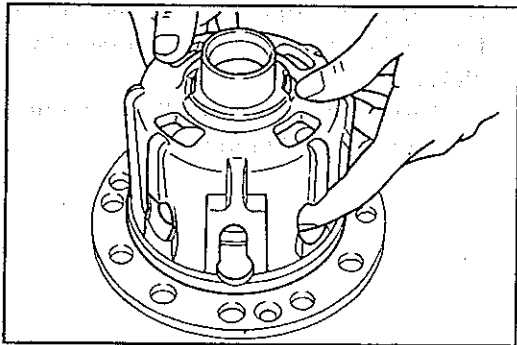
WRE91-DF197

6. Remove the following parts, while floating the pinion shaft
(1) Differential pinion shaft (3 pcs.)
(2) Differential pinion (4 pcs.)



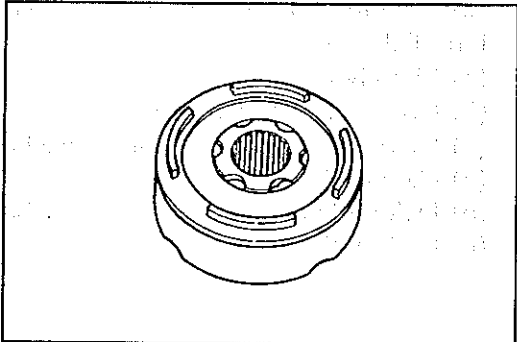
WRE91-DF198

7. Remove each inner part from the differential case.

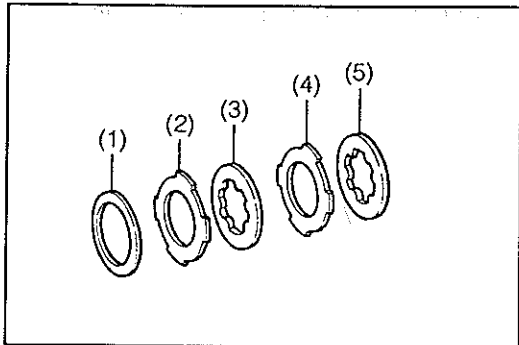


WRE91-DF199

8. Remove the following parts from the clutch pressure ring.
(1) Conical spring washer
(2) Differential side gear thrust washer No. 1
(3) Clutch plate
(4) Differential side gear thrust washer No. 1
(5) Clutch plate



WRE91-DF200



WRE91-DF201

INSPECTION

NOTE:

- (1) Clean each of the disassembled parts. Check each part for cracks, wear at fitting sections, damage, deformation or seizure. Replace any faulty part.
- (2) When the differential side gear and clutch plate are to be replaced, also replace the differential side gear thrust washer No. 1 and shim No. 4 that are in contact with the replaced parts.

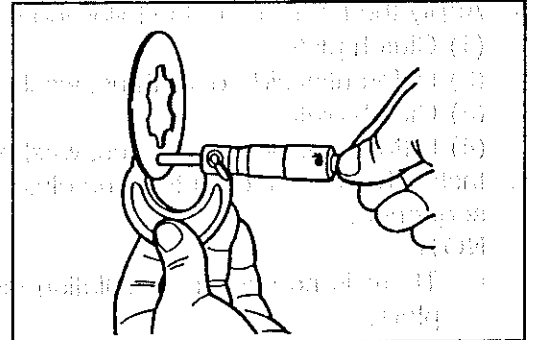
WRE91-DF202

1. Check of clutch plate

- (1) Ensure that the clutch plate exhibits no excessive uneven wear.
- (2) Measure the clutch plate thickness.
Specified Value: 1.6 mm
Allowable Limit: 1.4 mm

NOTE:

- The allowable wear limit for the clutch plate at one side is 0.1 mm.



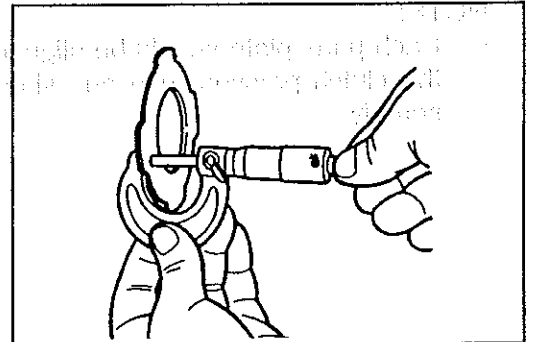
WRE91-DF203

2. Check of differential side gear thrust washer No. 1

- (1) Ensure that the differential side gear thrust washer No. 1 exhibits no excessive uneven wear.
- (2) Measure the differential side gear thrust washer No. 1 thickness.
Specified Value: 1.6 mm
Allowable Limit: 1.4 mm

NOTE:

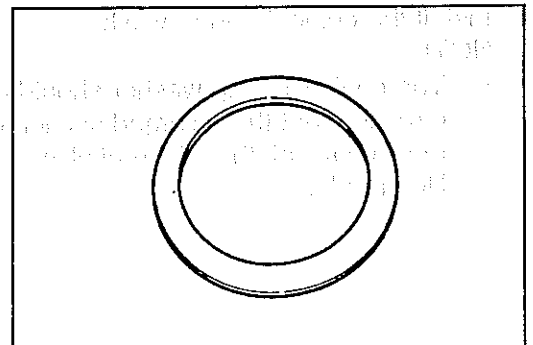
- The allowable wear limit for the differential side gear thrust washer No. 1 at one side is 0.1 mm.



WRE91-DF204

3. Shim No. 4 check

- (1) Ensure that the shim No. 4 exhibits no excessive wear.



WRE91-DF205

ASSEMBLY

NOTE:

- (1) When assembling each part, make sure that no dust nor chip gets to the part.
- (2) Liberally apply the designated oil to each of the sliding and rotating sections.
Designated Oil: SAE 90 L.S.D. Oil

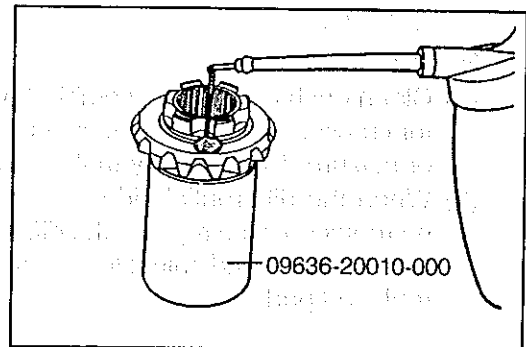
WRE91-DF206

FRONT & REAR DIFFERENTIAL

1. Install the clutch pressure ring to the differential gear, using the following SST or a cylindrical base.

SST: 09636-20010-000

2. Apply the L.S.D. oil, as shown in the right figure.



WRE91-DF207

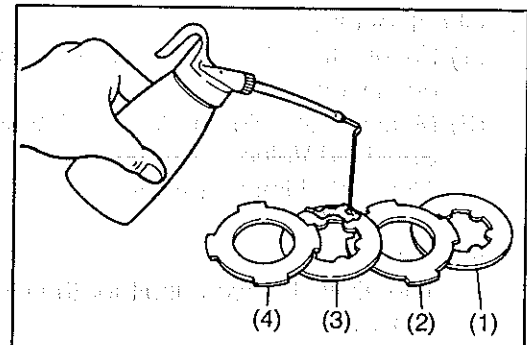
3. Apply the L.S.D. oil to the following parts.

- (1) Clutch plate
- (2) Differential side gear thrust washer No. 1
- (3) Clutch plate
- (4) Differential side gear thrust washer No. 1

4. Install the aforesaid parts to the clutch pressure ring in this sequence.

NOTE:

- There is no specific installation direction for the clutch plate.



WRE91-DF208

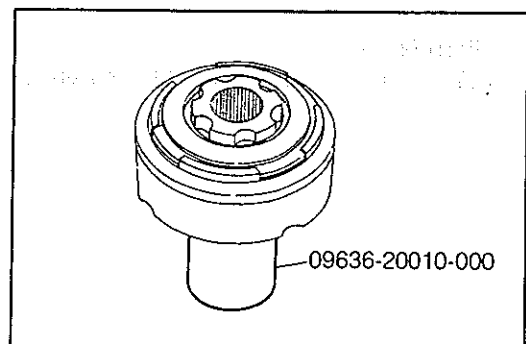
NOTE:

- Each parts plate should be aligned with the grooves of the clutch pressure ring and side gear during the assembly.

5. Install the conical spring washer.

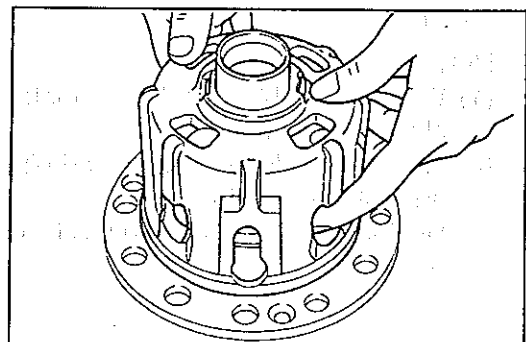
NOTE:

- The conical spring washer should be installed in such a direction that the enlarged section of the preload spring may come at the differential side gear thrust washer No. 1 side.



WRE91-DF209

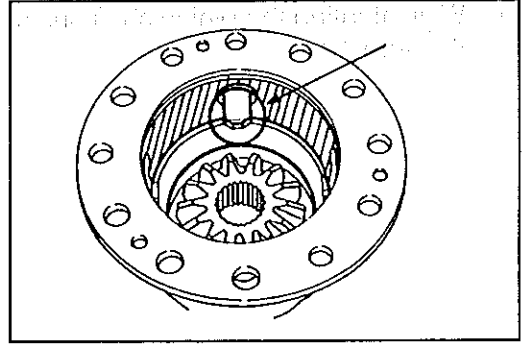
6. Install the differential case subassembly.



WRE91-DF211

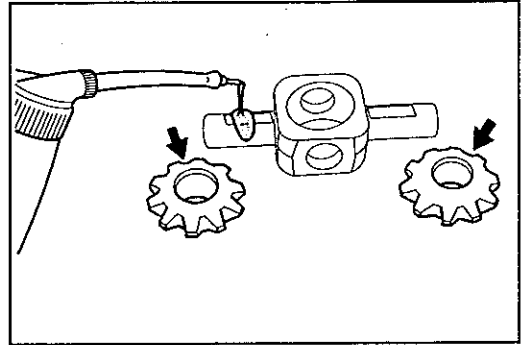
FRONT & REAR DIFFERENTIAL

7. Align the groove of the clutch pressure ring with that of the differential case.



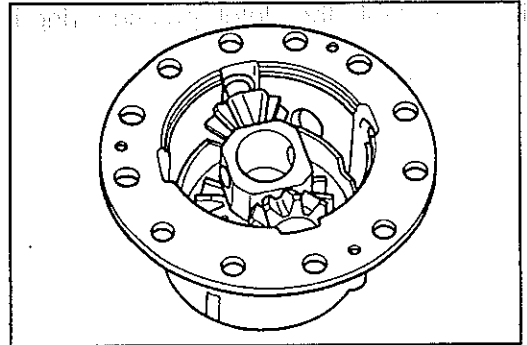
WRE91-DF212

8. Apply L.S.D. oil to the outer periphery of the pinion shaft and the rotating sections of the pinion gear.



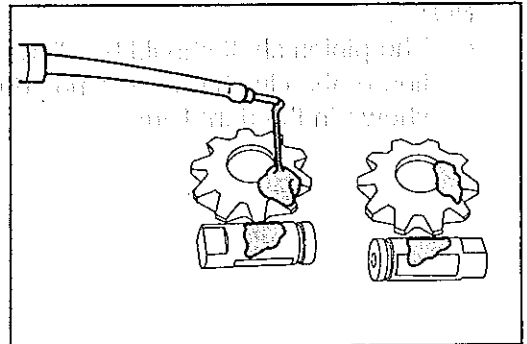
WRE91-DF213

9. Install the pinion shaft and the pinion gears to the differential case cover.



WRE91-DF214

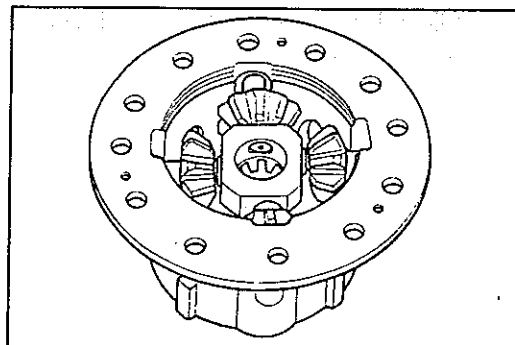
10. Apply L.S.D. oil to the outer periphery of the pinion shaft and the rotating sections of the pinion gears.



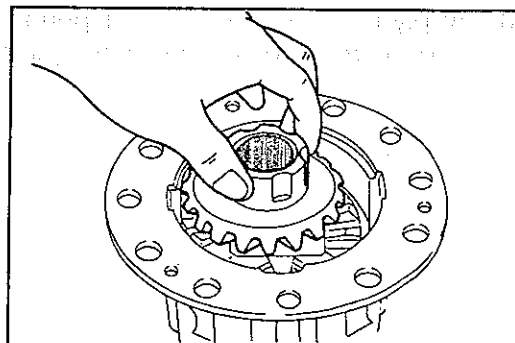
WRE91-DF215

FRONT & REAR DIFFERENTIAL

11. While floating the pinion shaft, install the aforesaid parts on the item 10.

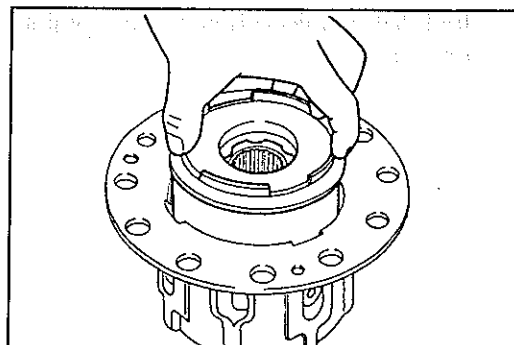


WRE91-DF216



WRE91-DF217

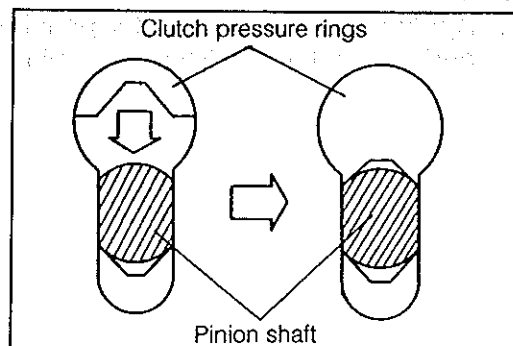
12. Assemble the clutch pressure ring in the differential case.



WRE91-DF218

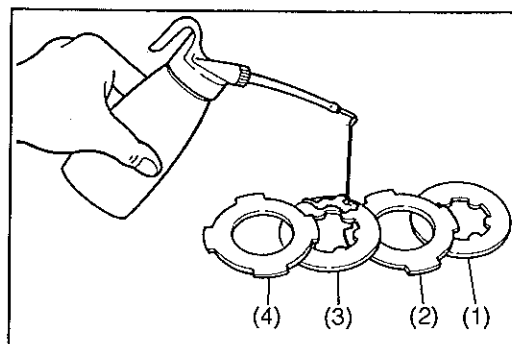
NOTE:

- The pinion shaft should be aligned with the groove section of the clutch pressure ring during the assembly, as shown in the right figure.



WRE91-DF219

13. Apply L.S.D. oil to the following parts.
- (1) Clutch plate
 - (2) Differential side gear thrust washer No. 1
 - (3) Clutch plate
 - (4) Differential side gear thrust washer No. 1
14. Install the aforesaid parts to the clutch pressure ring in this sequence.



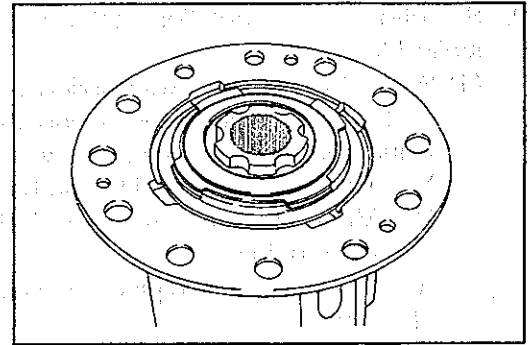
WRE91-DF220

FRONT & REAR DIFFERENTIAL

15. Install the conical spring washer.

NOTE:

- The washer should be installed in such a direction that the enlarged section of the preload spring may come at the differential side gear thrust washer No. 1 side.



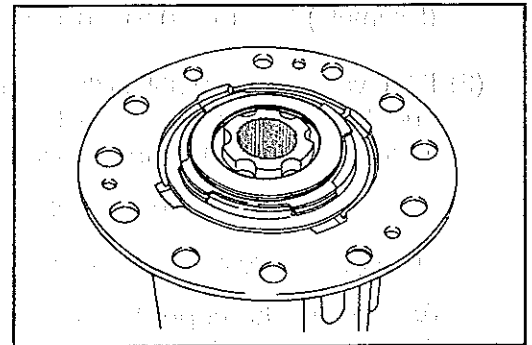
WRE91-DF221

16. Install the two pieces of 0.5 mm thick shims No. 4 in the differential case.

Shim No. 4 Availability;

Unit: mm

	0.1
	0.2
	0.5

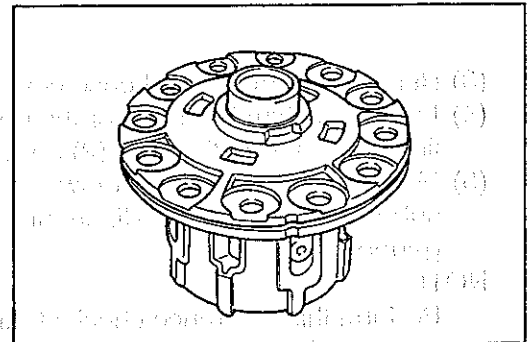


WRE91-DF222

17. Install the differential case cover on the differential case subassembly.

NOTE:

- Do not install the screws at this stage.



WRE91-DF223

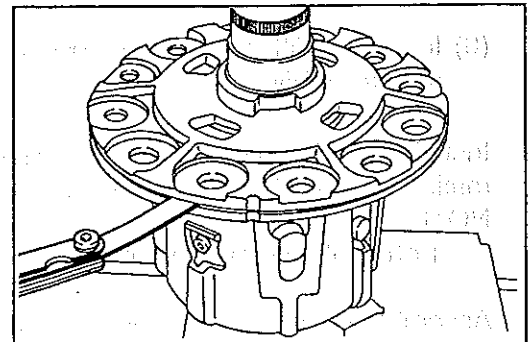
18. Apply the following specified load to the differential case cover, using a press.

Specified Load: 1000 kgf

19. Measure the clearance between the differential case subassembly and the differential cover, using a filler gauge.

NOTE:

- Perform this clearance check at three points.
- Be sure to record and keep the actually measured values.



WRE91-DF224

FRONT & REAR DIFFERENTIAL

20. Selection and calculation method of shim No.4 to be installed to section C

(1) With a load of 1000 kgf applied in the previous step 19, perform the calculation, using the following constant value and formula given below.

X: Thickness of shim No.4 to be installed

C: Mean clearance measured at previous step 19 at three points

A: Thickness of two pieces of shims No.4 (T = 1.0 mm)

<Formula>

$$X = A - C - 0.125 \text{ (constant value)}$$

(Example) $X = 1.0 - 0.51 - 0.125$

(2) If the value of X is 0.365 in the step (1) above, the upper and lower limit values can be calculated, using the tolerance (± 0.075) for the constant value, as follows.

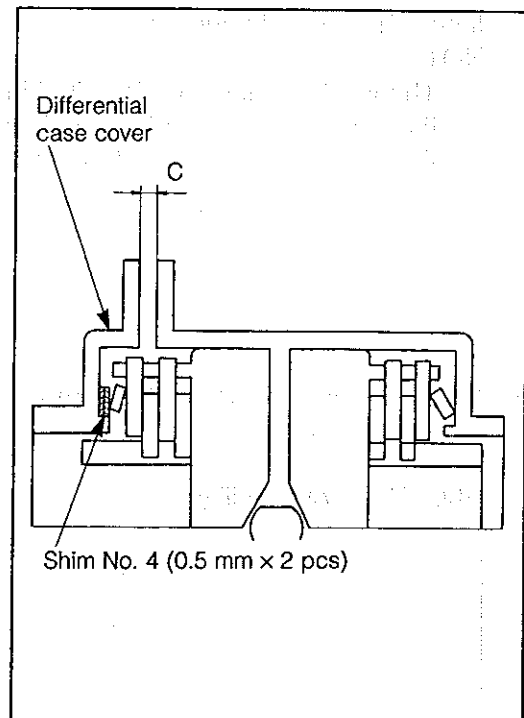
Upper limit (0.4 mm)

Lower limit (0.3 mm)

Example: $0.365 + 0.075 = 0.44$

$0.365 - 0.075 = 0.29$

As a result, the upper limit or the lower limit becomes the thickness of the shim No. 4.



WRE91-DF225

(3) Remove the differential case cover.

(4) Install the shim No.4 (either the upper limit or the lower limit) selected in the step (2) above.

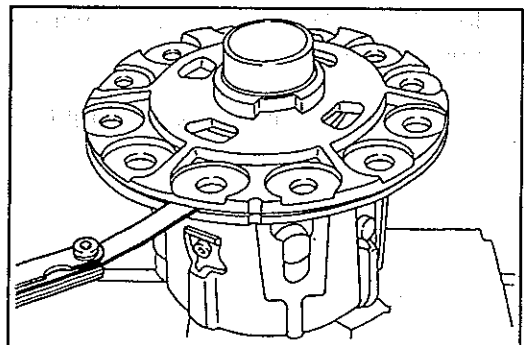
(5) Measure the clearance between the differential case subassembly and the differential cover, using a filler gauge.

NOTE

- Perform this clearance check at three points.

Specified Value: 0.05 - 0.2 mm

(6) Install the differential case cover on the differential case subassembly.



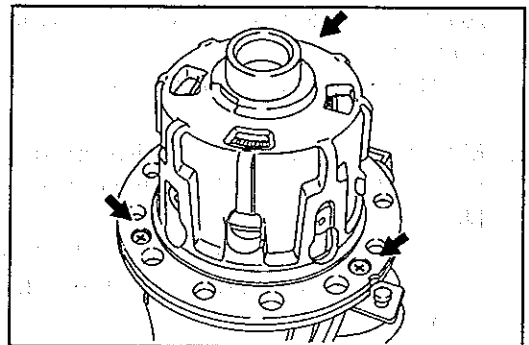
WRE91-DF226

21. Install the differential case cover, while aligning it with the mating mark of the differential case subassembly.

NOTE:

- Tighten the screws evenly.

22. Assemble the differential case assembly.
(See page DF-39 through DF-40.)



WRE91-DF227

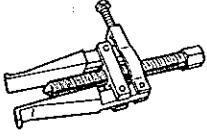
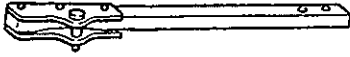
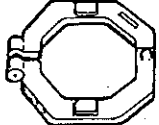
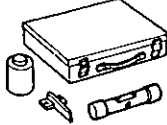
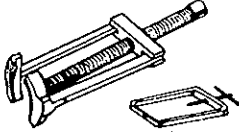
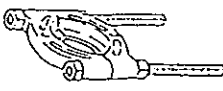
INSTALLATION

1. Install the differential carrier to the rear axle housing.
(See page DF-41 through DF-44.)

WRE91-DF233

FRONT & REAR DIFFERENTIAL

SSTs

Shape	Part Number	Part Name
	09308-10010-000	Oil seal puller
	09330-00021-000	Companion flange holding tool
	09401-87601-000	Differential gear case expander
	09506-87303-000	Differential drive pinion bearing cone front replacer
	09515-87601-000	Replacer oil seal
	09530-87604-000	Differential drive pinion adjust gauge set
	09602-87301-000	Counter gear bearing puller
	09608-87302-000	Axle hub & drive pinion bearing tool set
	09950-20017-000	Universal puller
	09950-87701-000	Bearing remover

WRE91-DF228

FRONT & REAR DIFFERENTIAL

SERVICE SPECIFICATIONS

FRONT

Unit: mm

Item		Specified value	Allowable limit	Remarks
Ring gear runout		—	0.1	
Backlash	Ring gear	0.10 - 0.20	—	
	Pinion gear x Side gear	0.05 - 0.25	—	
Preload	Total	New bearing	0.89 - 2.35 N·m (9.0 - 24.0 kgf-cm)	—
		Bearing reused	0.89 - 2.35 N·m (9.0 - 24.0 kgf-cm)	—
	Drive pinion	New bearing	0.06 - 1.96 N·m (7.0 - 20.0 kgf-cm)	—
		Bearing reused	0.06 - 1.96 N·m (7.0 - 20.0 kgf-cm)	—

WRE91-DF229

REAR

Unit: mm

Item		Specified value	Allowable limit	Remarks
Ring gear runout		—	0.1	
Backlash		Ring gear	0.10 - 0.20	
		Side gear	0.05 - 0.25	
Preload	Total	New bearing	0.89 - 2.35 N·m (9.0 - 24.0 kgf-cm)	—
		Bearing reused	0.89 - 2.35 N·m (9.0 - 24.0 kgf-cm)	—
	Drive pinion	New bearing	0.69 - 1.96 N·m (7.0 - 20.0 kgf-cm)	—
		Bearing reused	0.69 - 1.96 N·m (7.0 - 20.0 kgf-cm)	—
Clutch inner & outer plate thickness (L.S.D only)		1.6	1.4	Allowable wear limit at one side is 0.1
Clearance (differential case S/A x differential cover) (L.S.D only)		0.05 - 0.2	—	See page DF-53, 54

WRE91-DF230

FRONT & REAR DIFFERENTIAL

TIGHTENING TORQUE

FRONT

Tightening Components	Tightening Torque		
	N·m	kgf-m	ft-lb
Front axle housing cover S/A × Filler plug	39.2 - 58.8	4.0 - 6.0	28.9 - 43.4
Front axle housing cover S/A × Front axle housing	17.7 - 23.5	1.8 - 2.4	13.0 - 17.4
Front axle housing × Drain plug	39.2 - 58.8	4.0 - 6.0	28.9 - 43.4
Front axle housing × Bearing cap	78.5 - 118.0	8.0 - 12.0	57.9 - 87.0
Differential case S/A × Ring gear (w/wet condition)	88.3 - 103.0	9.0 - 10.5	65.1 - 75.9
Differential case × Differential case cover	29.4 - 49.0	3.0 - 5.0	21.7 - 36.2
Drive pinion × Lock nut	196.0 - 245.0	20.0 - 25.0	145.0 - 180.0

WRE91-DF231

REAR

Tightening Components	Tightening Torque		
	N·m	kgf-m	ft-lb
Rear axle housing cover S/A × Filler plug	39.2 - 58.8	4.0 - 6.0	28.9 - 43.4
Rear axle housing cover S/A × Rear axle housing	17.7 - 23.5	1.8 - 2.4	13.0 - 17.4
Rear axle housing × Drain plug	39.2 - 58.8	4.0 - 6.0	28.9 - 43.4
Rear axle housing × Bearing cap	78.5 - 118.0	8.0 - 12.0	57.9 - 87.0
Differential case S/A × Ring gear (w/wet condition)	88.3 - 103.0	9.0 - 10.5	65.1 - 75.9
Differential case × Differential case cover	29.4 - 49.0	3.0 - 5.0	21.7 - 36.2
Drive pinion × Lock nut	196.0 - 245.0	20.0 - 25.0	145.0 - 180.0

WRE91-DF232