

DAIHATSU

F300

FRONT/REAR DIFFERENTIAL

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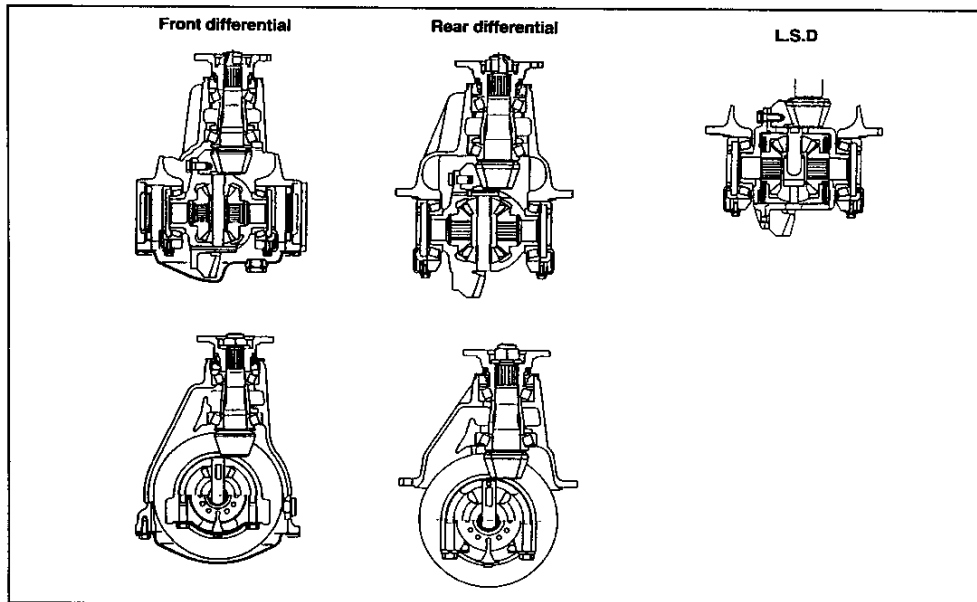
WFE90-DF001

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.



WFE90-DF002

Differential specifications

Item		Kind	Front	Rear	Rear (LSD)
Final reduction gear ration			5.285	5.285	5.285
Differential ring gear	Number of teeth		37	37	37
	Outer diameter	mm	170	180	180
	Gear type		Hypoid gear	Hypoid gear	Hypoid gear
Final reduction gear	Number of teeth		7	7	7
	Outer diameter	mm	55	57	57
	Gear type		Hypoid pinion	Hypoid pinion	Hypoid pinion
Differential side gear	Number of teeth		18	14	14
	Number of inner spline teeth		25	27	27
Number of differential pinion teeth			10	10	10
Pinion shaft outer diameter		mm	φ16	φ18	φ18

WFE90-DF003

FRONT/REAR DIFFERENTIAL

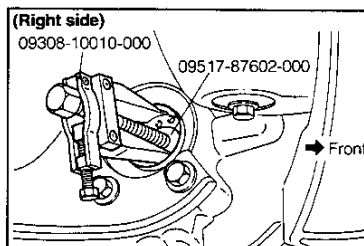
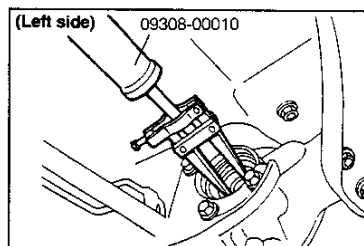
IN-VEHICLE REPLACEMENT PROCEDURES FOR OIL SEAL FRONT FRONT DIFFERENTIAL (Drive Shaft Oil Seal)

REMOVAL

1. Remove the drive shaft from the front differential. (Refer front axle and suspension).
2. Remove the oil seal at the drive shaft installation section, in conjunction with the following SSTs.
SST: 09517-87602-000
09308-10010-000

NOTE:

- Never reuse the removed oil seal.



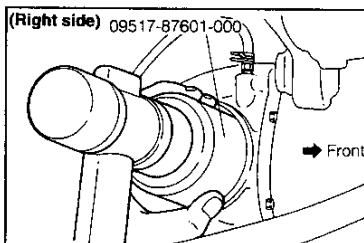
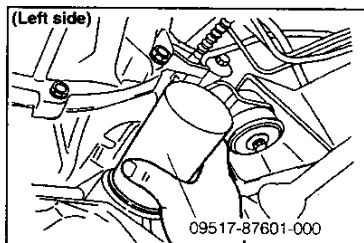
WFE90-DF004

INSTALLATION

1. Drive the oil seal at the drive shaft installation section into position, using the following SST.
SST: 09517-87601-000

NOTE:

- Apply the lithium base multi purpose grease to the oil seal lip section, prior to install.
2. Install the drive shaft to the front differential. (Refer front axle and suspension section).



WFE90-DF005

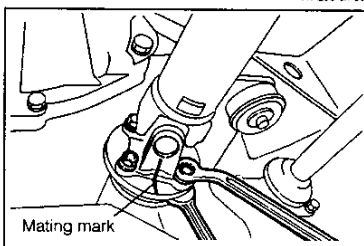
FRONT DIFFERENTIAL (Drive Pinion Oil Seal)

REMOVAL

1. Remove the propeller shaft.

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.



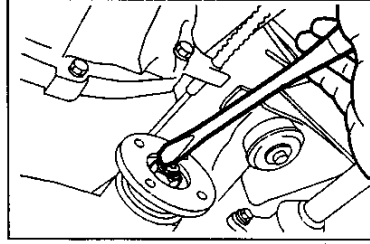
WFE90-DF006

FRONT/REAR DIFFERENTIAL

2. Release the staking of the lock nut of the drive pinion.

NOTE:

- Insufficient releasing of the staking of the lock nut may cause the threaded portion of the drive pinion to be damaged.



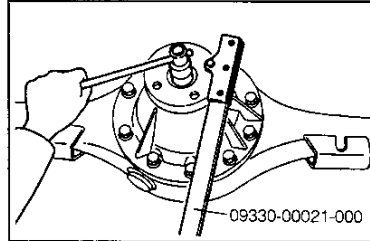
WFE90-DF007

3. Remove the lock nut and plate washer using the following SST.

SST: 09330-00021-000

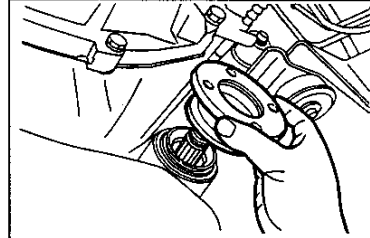
NOTE:

- Never reuse the removed lock nut.



WFE90-DF008

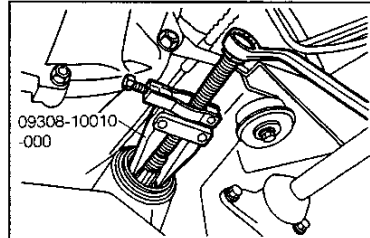
4. Remove the companion flange.



WFE90-DF009

5. Remove the oil seal, using the following SST.

SST: 09517-87602-000



WFE90-DF010

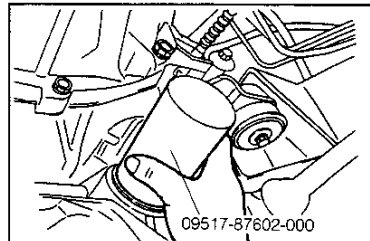
INSTALLATION

1. Drive the oil seal into position, using the following SST.

SST: 09517-87602-000

NOTE:

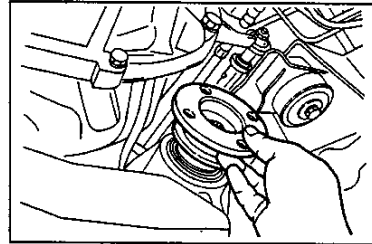
- Apply the lithium base multi purpose grease to the oil seal lip section, prior to install.



WFE90-DF011

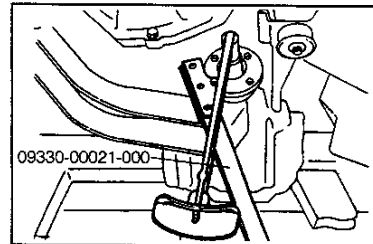
FRONT/REAR DIFFERENTIAL

2. Install the companion flange.



WFE90-DF012

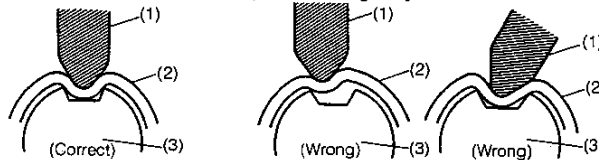
3. Install the plate washer and a new lock nut. Tighten the nut, using the following SST.
SST: 09330-00021-000
Tightening Torque:
157.0 - 196.0 N·m (16.0 - 20.0 kgf·m)



NOTE:

- When staking the lock nut, point a suitable staking tool toward the drive pinion axis center and stake the lock nut securely, as shown in the figure below. (Poor staking may cause abnormal noise.)

- (1) Suitable staking tool
- (2) New nut
- (3) Drive pinion

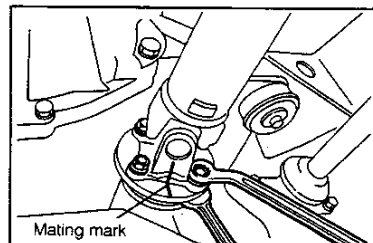


WFE90-DF013

4. Install the propeller shaft.

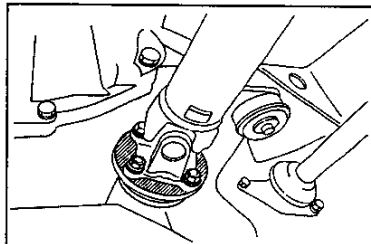
CAUTION:

- 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)



WFE90-DF014

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



WFE90-DF244

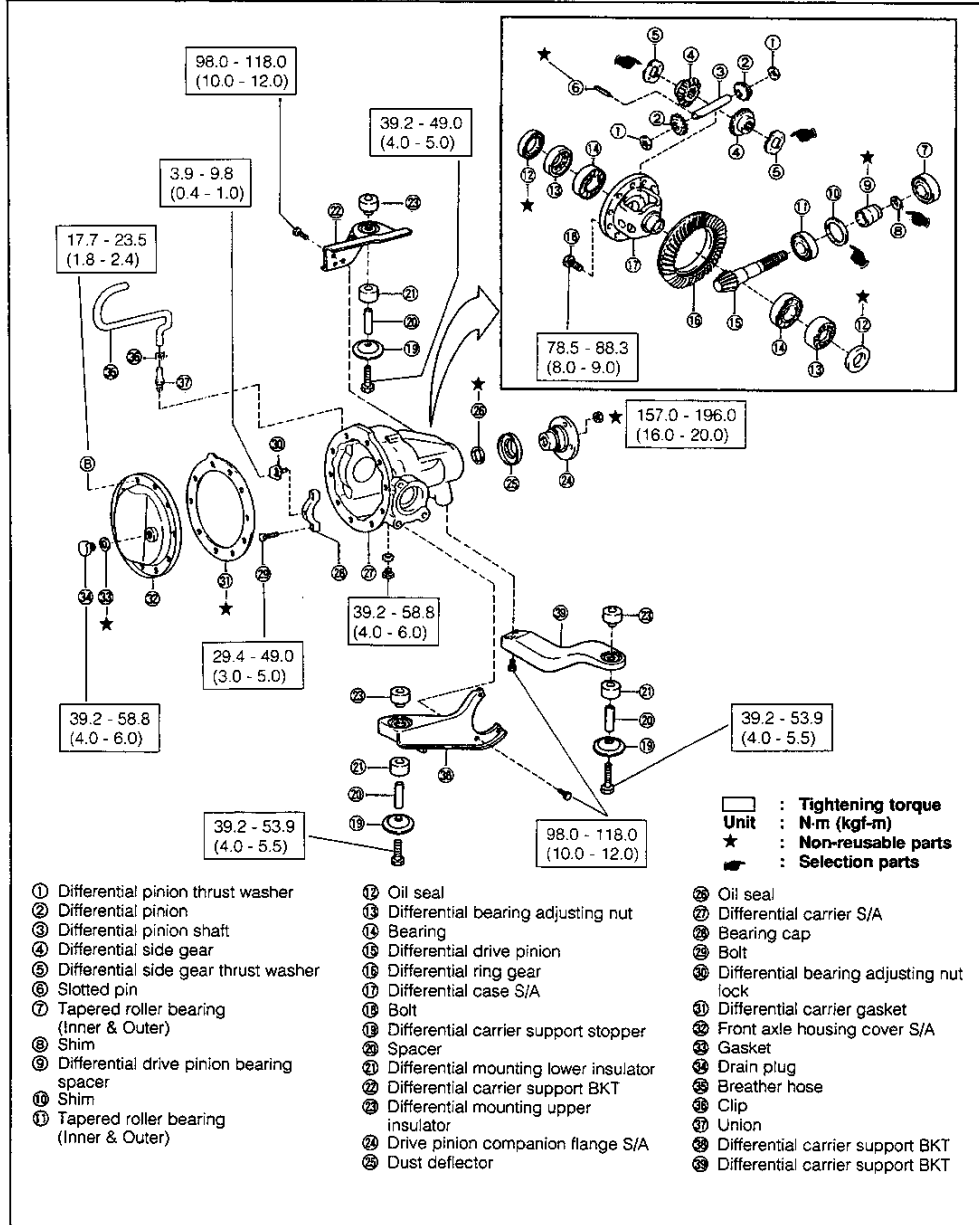
FRONT/REAR DIFFERENTIAL

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 clunk noise	The same above	The same above
	Differential clonking 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.

WFE80-DF015

FRONT DIFFERENTIAL COMPONENTS

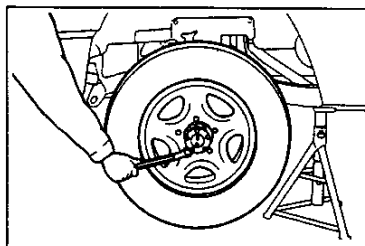


WFE90-DF016

FRONT/REAR DIFFERENTIAL

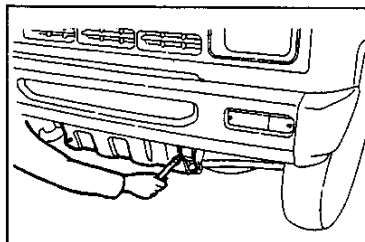
REMOVAL

1. Jack up the vehicle and support it with safety stands. (As for the jacking-up points and support points for safety stands, refer GI-section.)
2. Remove the front wheel.
3. Drain the oil from the differential.



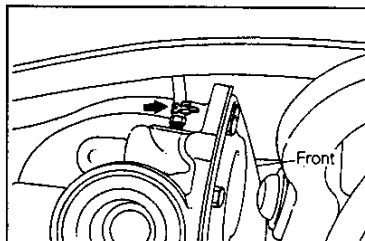
WFE90-DF017

4. Remove the engine undercover by removing the four bolts.
5. Remove the front drive shafts and stabilizer. (Refer Front Axle & Suspension section.)



WFE90-DF018

6. Disconnect the breather hose by removing the clamp.



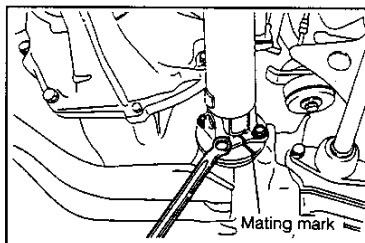
WFE90-DF019

7. Remove the propeller shaft.

NOTE:

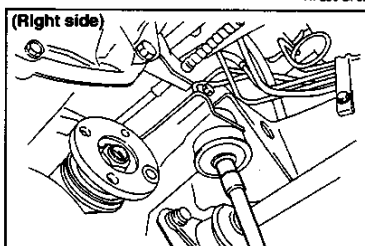
- Before the propeller shaft is removed, be sure to put a mating mark as a guide during the installation.

8. Hold the propeller shaft in a suspended state.



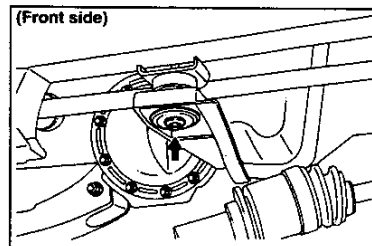
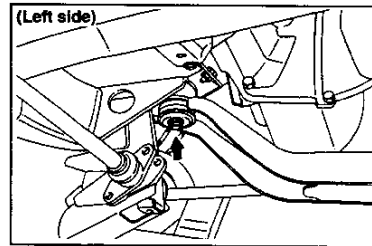
WFE90-DF020

9. Remove the differential mounting. Temporarily loosen the three bolts of the differential mounting brackets.



WFE90-DF021

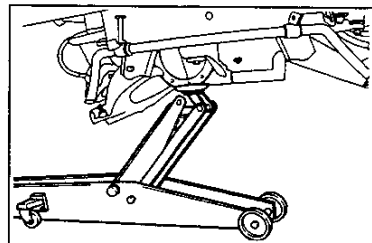
FRONT/REAR DIFFERENTIAL



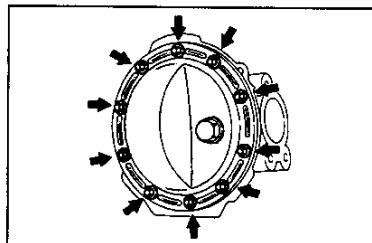
10. Support the differential with a transmission jack or the like.
11. Remove the differential from the chassis frame by removing the three bolts of the differential mounting brackets.
12. Remove the differential from the vehicle, while supporting the differential with a jack.

WARNING:

Be sure to slowly lower the differential, while holding it by your hands, for the differential is in an unstable state.



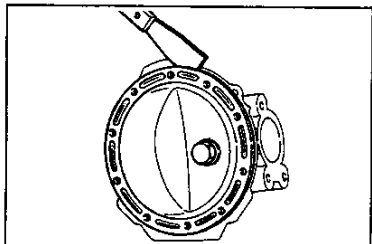
13. Remove the ten bolts of the front axle housing cover sub-assembly.



14. Remove the front axle housing cover subassembly, using the standard tool of the scraper.

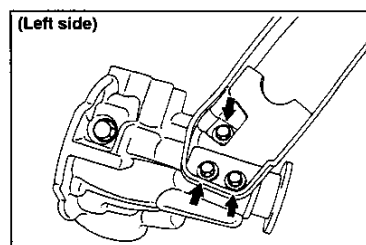
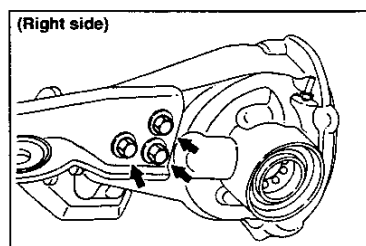
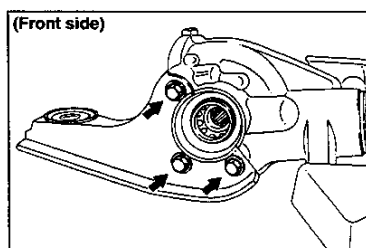
NOTE:

- Never reuse the removed gasket.



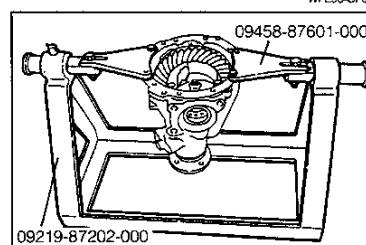
FRONT/REAR DIFFERENTIAL

15. Remove the three differential carrier support brackets from the differential by removing the three bolts.



16. Install the differential assembly removed from the vehicle on the following SSTs.

SSTs: 09219-87202-000
09458-87601-000



PRE-INSPECTION

NOTE:

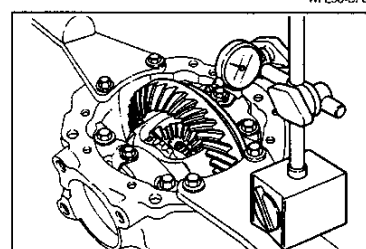
- Prior to the disassembling of the differential, be sure to check the following items and record the values. (These values are used as reference which assures the correct assembling.)

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

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

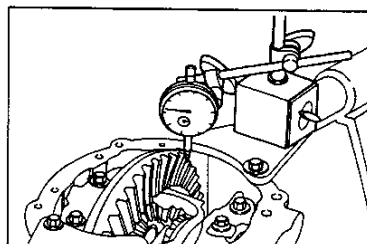


FRONT/REAR DIFFERENTIAL

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: 0.07 - 0.17 mm

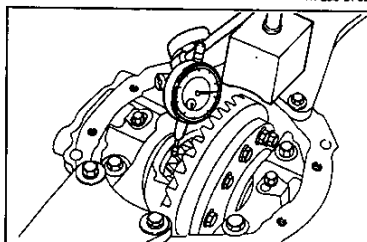


WFE90-DF029

3. Side gear backlash check

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

Specified Value: 0.03 - 0.15 mm

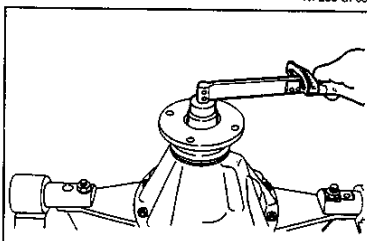


WFE90-DF030

4. 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.

Specified Value: 0.58 - 3.0 N (0.06 - 0.31 kgf)



WFE90-DF031

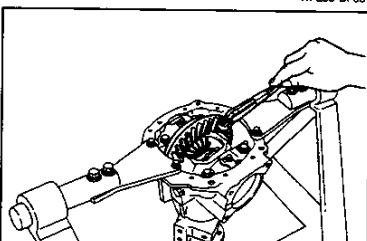
5. Check of tooth contact between ring gear and drive pinion

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

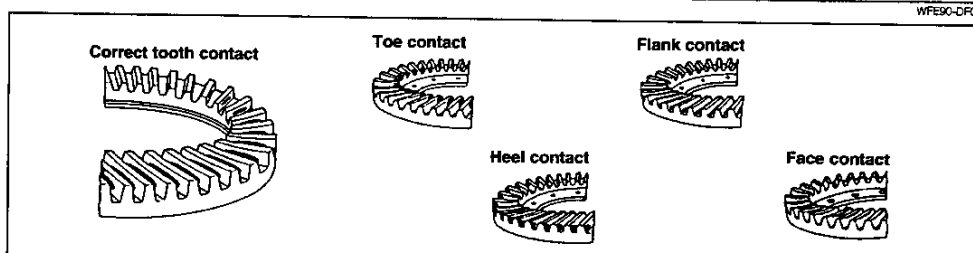
NOTE:

- 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.



WFE90-DF032



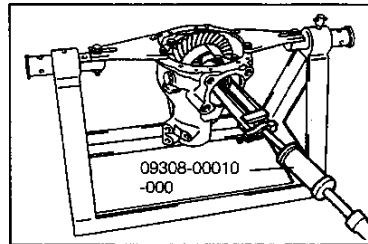
WFE90-DF033

FRONT/REAR DIFFERENTIAL

DISASSEMBLY

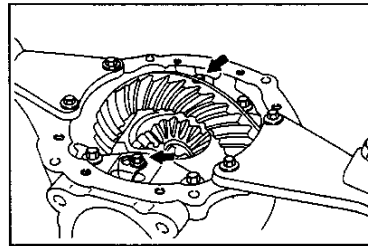
1. Remove the oil seal at the drive shaft side, using the following SST.

SST: 09308-00010-000



WFE90-DF034

2. Remove the adjusting lock nut.

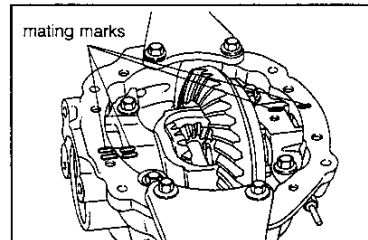


WFE90-DF035

3. 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.

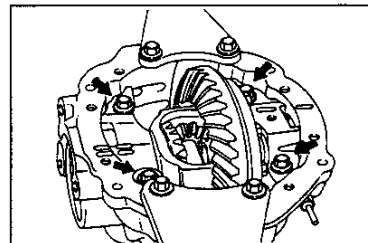


WFE90-DF036

4. 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.

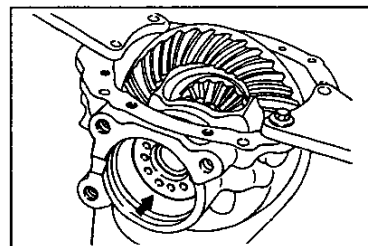


WFE90-DF037

5. Remove the differential bearing adjusting nut on both left and right sides.

NOTE:

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



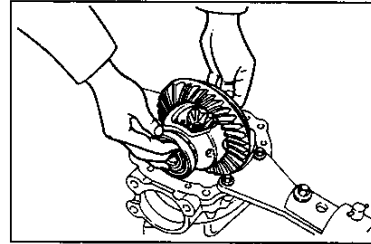
WFE90-DF038

FRONT/REAR DIFFERENTIAL

6. Remove the differential case from the carrier.

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.



WFE90-DF039

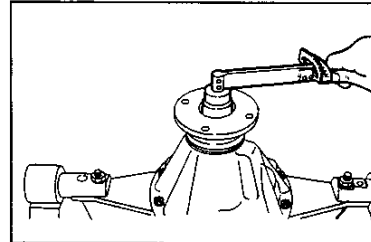
7. Drive pinion preload measurement

Measure the starting torque within the range of the backlash between the drive pinion and the ring gear, using torque gauge.

Specified Value: 0.39 - 2.45 N (0.04 - 0.25 kgf)

NOTE:

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

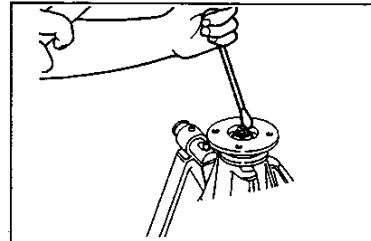


WFE90-DF040

8. Release the staking of the lock nut, using a chisel and a hammer.

NOTE:

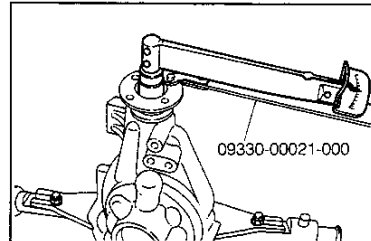
- Never reuse the removed lock nut.



WFE90-DF041

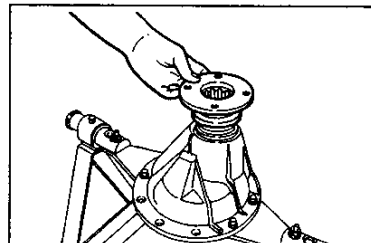
9. Secure the companion flange, using the following SST. Proceed to the remove the lock nut.

SST: 09330-00021-000



WFE90-DF042

10. Remove the companion flange.



WFE90-DF043

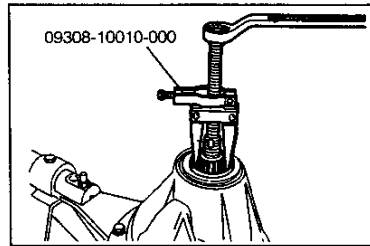
FRONT/REAR DIFFERENTIAL

11. Remove the oil seal of the drive pinion, using the following SST.

SST: 09308-10010-000

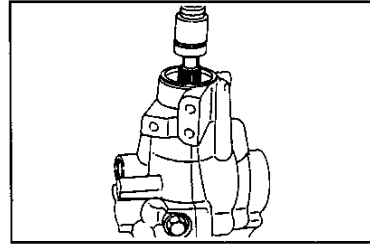
NOTE:

- Never reuse the removed oil seal.



WFE90-DF044

12. Remove the drive pinion by pressing the press.



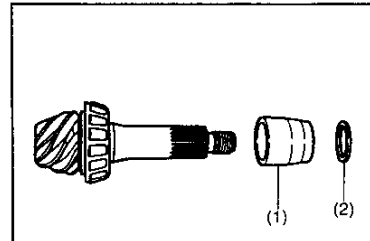
WFE90-DF045

13. Remove the following parts from the drive pinion.

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

NOTE:

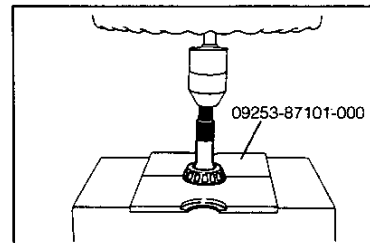
- Never reuse the removed spacer as it's crash type



WFE90-DF046

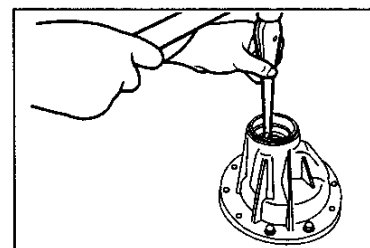
14. Remove the rear bearing and the drive pinion mounting distance adjusting shim from the drive pinion, in conjunction with a press and the following SST.

SST: 09253-87101-000



WFE90-DF047

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



WFE90-DF048

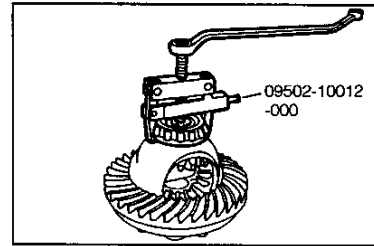
FRONT/REAR DIFFERENTIAL

16. Set the differential case into the vice.
17. Remove the side bearings from the differential case, using the following SST.

SST: 09502-10012-000

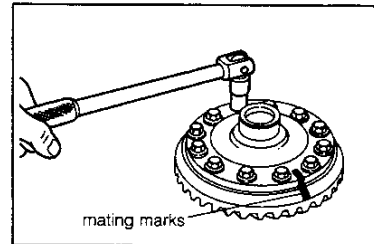
NOTE:

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



WFE90-DF049

18. Stamp mating marks (painted with white or the like) on the differential case and ring gear. Proceed to remove the ring gear.

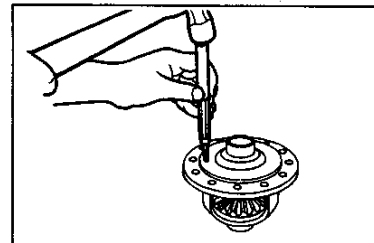


WFE90-DF050

19. Pull out the slotted spring pins of the pinion gear. Remove the following parts from the differential case.
 - (1) Differential side gear
 - (2) Differential side gear thrust washer
 - (3) Differential pinion shaft
 - (4) Differential pinion
 - (5) Differential pinion thrust washer

NOTE:

- Never reuse the removed slotted spring pin.

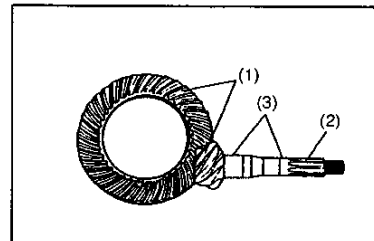


WFE90-DF051

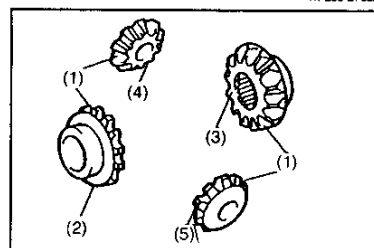
INSPECTION

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 (1)
 - (2) Spline portion (2) of drive pinion
 - (3) Bearing fitting section (3)
2. Side gear & pinion
 - (1) Gear teeth (1)
 - (2) Side gear boss section (2)
 - (3) Side gear serrated section (3)
 - (4) Pinion shaft fitting hole (4)
 - (5) Differential case contact section (5)



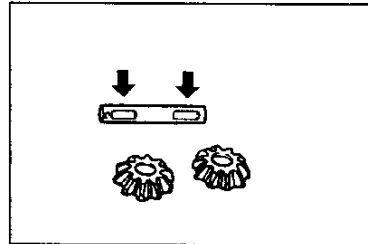
WFE90-DF052



WFE90-DF053

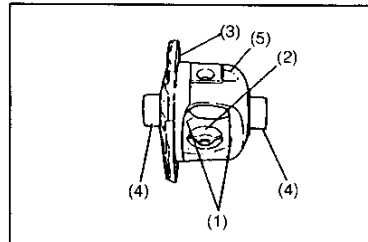
FRONT/REAR DIFFERENTIAL

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



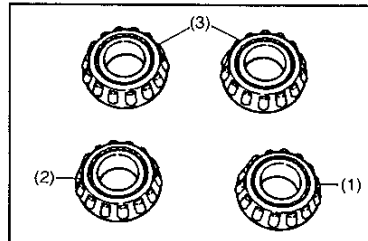
WFE90-DF054

4. Inspection of differential case for wear or damage
 - (1) Side gear boss contact sections (1)
 - (2) Pinion contact section (2)
 - (3) Ring gear attaching section (3)
 - (4) Side bearing press-fitting section (4)
 - (5) The differential case proper (5)



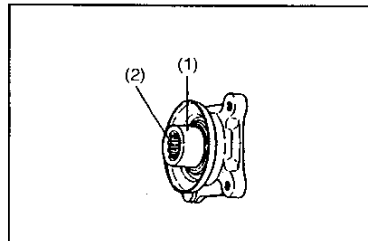
WFE90-DF055

5. Bearings
 - (1) Front bearing (1)
 - (2) Rear bearing (2)
 - (3) Side bearings (3)
 - 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.



WFE90-DF056

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



WFE90-DF057

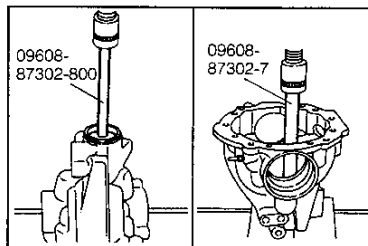
ASSEMBLY

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

SSTs: (1) Front...09608-87302-800

(2) Rear...09608-87302-7

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



WFE90-DF058

FRONT/REAR DIFFERENTIAL

2. Selecting procedures for drive pinion mounting distance adjusting shims

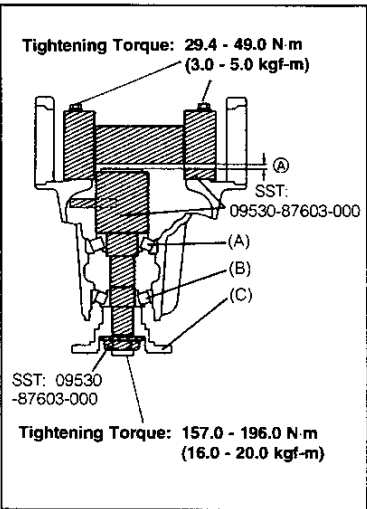
- (1) Assemble the SST and following parts on the front differential. Tighten the bolt to the tightening torque shown in the figure right.

SST: 09530-87603-000

- (A)...Rear bearing
(B)...Front bearing
(C)...Companion flange

NOTE:

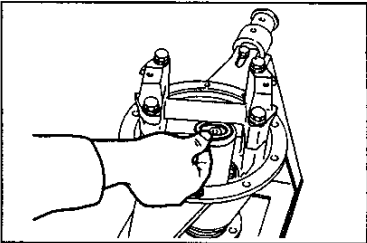
- Do not install the oil seal at this stage.



WFE90-DF059

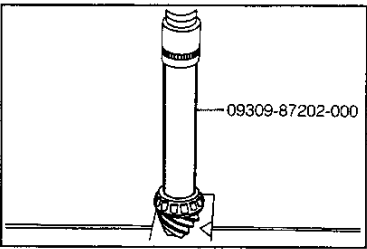
- (2) Measure the dimension (A) shown in the figure above. Select a suitable shim from the table below.

Adjusting Shim Availability	Unit: mm
3.60	
3.65	
3.70	
3.75	
3.80	
3.85	
0.30	



- (3) 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.

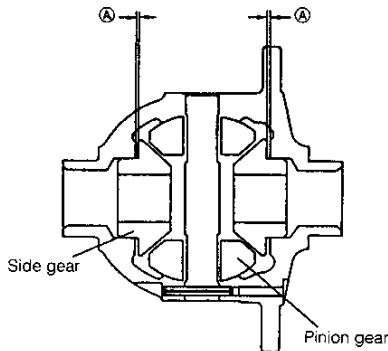
SST: 09309-87202-000



WFE90-DF061

FRONT/REAR DIFFERENTIAL

3. Selecting procedures for side gear backlash thrust washer



Availability of Adjusting Thrust Washer for Section A

Units: mm

1.00
1.05
1.10
1.15
1.20

(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) Differential pinion thrust washer

(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: 0.03 - 0.15 mm

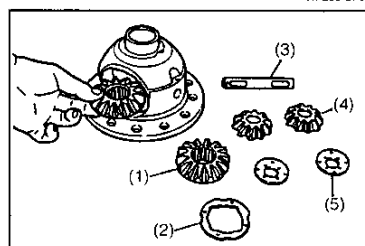
NOTE:

- The same size of the thrust washer should be installed at both the right and left sides.

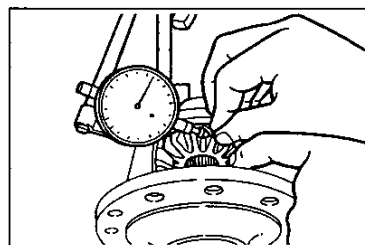
4. Drive the new slotted spring pin into position, after completion of the backlash measurement.

NOTE:

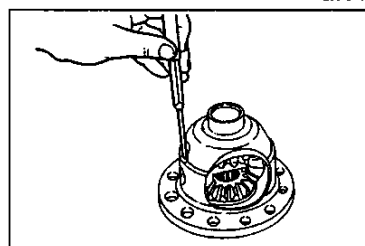
- Stake the differential case with a chisel or the like so as to secure the slotted spring pin.



WF090-DF062



WF090-DF063

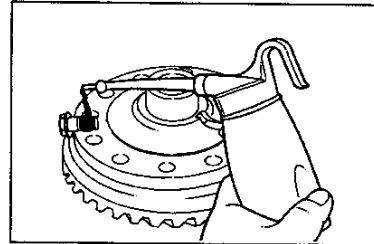


WF090-DF064

WF090-DF065

FRONT/REAR DIFFERENTIAL

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



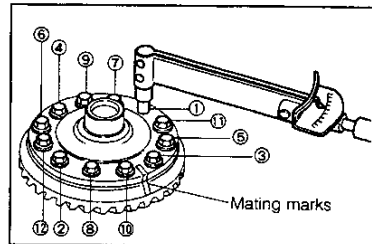
WF890-DF066

7. Install the ring gear in the differential case and tighten the bolts.

Tightening Torque: 78.5 - 88.3 N·m (8.0 - 9.0 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.)



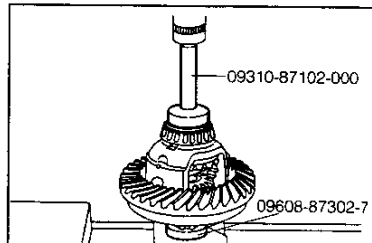
WF890-DF067

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

SST: 09310-87102-000

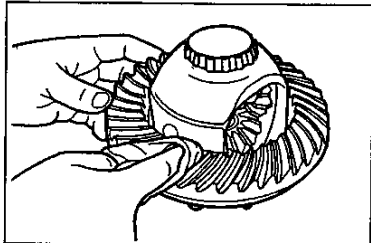
09608-87302-7

that is a part of 09608-87302-000 set



WF890-DF068

9. Clean the ring gear tooth surfaces.

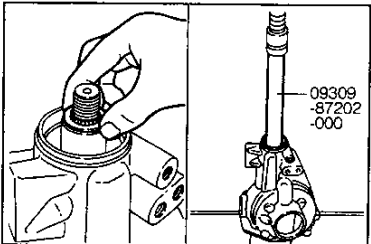


WF890-DF069

10. Install the drive pinion, new drive pinion bearing spacer and shim (one that was measured at time of selection) to the differential carrier.

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

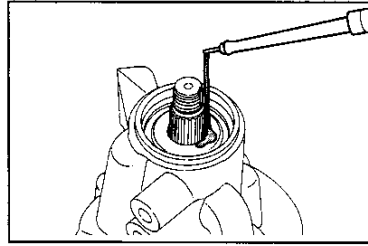
SST: 09309-87202-000



WF890-DF070

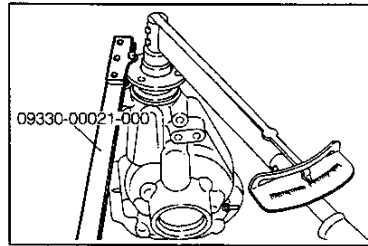
FRONT/REAR DIFFERENTIAL

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



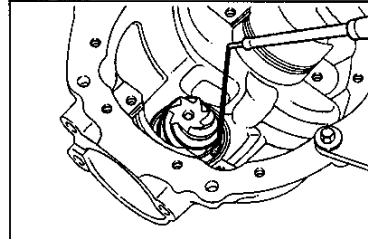
WF890-DF071

13. Install the companion flange.
14. Tighten the nut (use for 09530-87603-000), using the following SST:
SST: 09330-00021-000
Tightening Torque:
157.0 - 196.0 N·m (16.0 - 20.0 kgf·m)



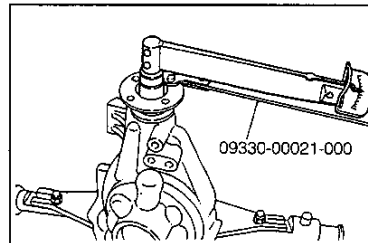
WF890-DF072

15. Apply the gear oil to the front bearing tapered roller sections.



WF890-DF073

16. Rotated the companion flange for several times in clock and counter clockwise.
17. Measure the preload of the drive pinion, using a torque gauge.
Specified Value:
New Bearing:
0.39 - 2.45 N (0.04 - 0.25 kgf)
Bearing Reused:
0.39 - 1.27 N (0.04 - 0.13 kgf)

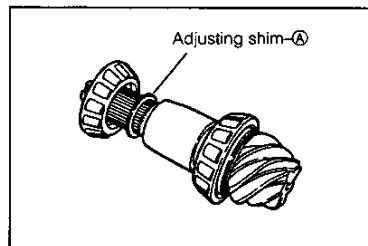


WF890-DF074

18. 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 on the item of 19.



WF890-DF075

FRONT/REAR DIFFERENTIAL

19. Availability of adjusting shim for section (A)

Units: mm

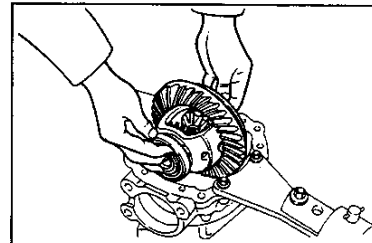
1.600	1.850	2.100
1.625	1.875	2.125
1.650	1.900	2.150
1.675	1.925	2.175
1.700	1.950	2.200
1.725	1.975	2.225
1.750	2.000	2.250
1.775	2.025	2.275
1.800	2.050	2.300
1.825	2.075	2.325

WFE90-DF076

20. Install the differential case on the differential carrier.

NOTE:

- Make sure that the outer races of the side bearings are assembled correctly in the respective original positions.

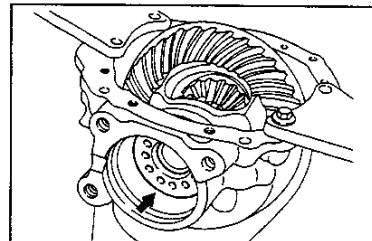


WFE90-DF077

21. Install the adjusting nut in such a way that it is aligned with the threaded portion of the differential carrier.

NOTE:

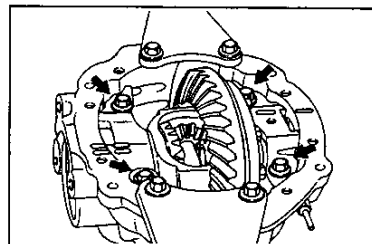
- Apply gear oil to the bearing and adjusting nut.



WFE90-DF078

22. Temporarily tighten the bearing cap to the following specified torque.

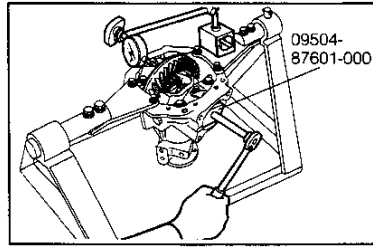
Tightening Torque: 19.6 N·m (2.0 kgf·m)



WFE90-DF079

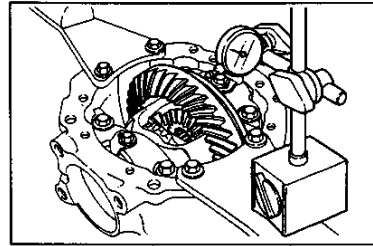
FRONT/REAR DIFFERENTIAL

23. Lightly tighten the right and left adjusting nuts, using the SST, until the backlash between the drive pinion and the ring gear becomes about 0.2 mm
SST: 09504-87601-000



WFE90-DF080

24. Ring gear preload adjusting procedure
(1) Install a dial gauge normally to the back surface of the ring gear.

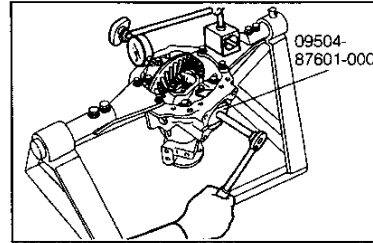


WFE90-DF081

- (2) Using the SST, tighten the adjusting nut at the tooth surface side of the ring gear, until the dial gauge registers no fluctuation in the reading.

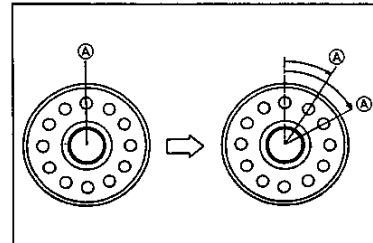
NOTE:

- The side bearing preload becomes zero when the dial gauge no longer registers fluctuation.



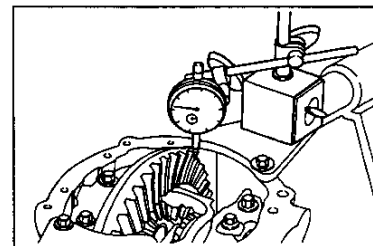
WFE90-DF082

- (3) Tighten further the adjusting nut at the ring gear tooth surface side to the specified preload.
Specified Side Bearing Preload: 1 - 2 notches



WFE90-DF083

25. Adjusting procedure for backlash between ring gear and drive pinion
(1) Install a dial gauge at right angles with the ring gear tooth surface. Measure the backlash.
Specified Value: 0.07 - 0.17 mm



WFE90-DF084

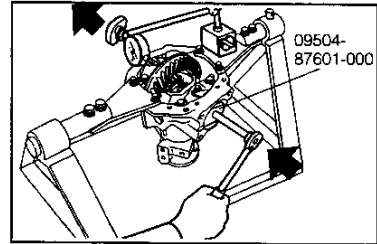
FRONT/REAR DIFFERENTIAL

- (2) If the backlash does not conform to the specification, adjust the backlash by moving the bearing by means of the right and left adjusting nuts, using the following SST.
SST: 09504-87601-000

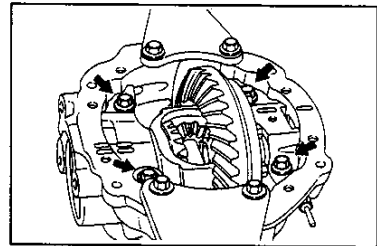
NOTE:

- The right and left bearings should be moved in the same direction and by the same amount. For example, if the left bearing is loosen one notch, the right bearing should be tightened one notch.

26. Tighten the bearing cap to the specified torque.
Tightening Torque: 29.4 - 49.0 N·m (3.0 - 5.0 kgf·m)



WF890-DF085

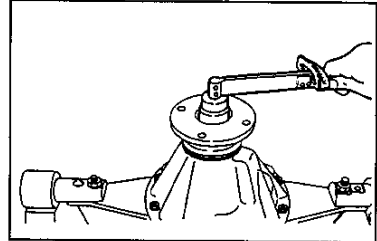


WF890-DF086

27. Total preload:
With the drive pinion brought in contact with the ring gear, measure the total preload, using a torque gauge.
New Bearing: 0.58 - 3.0 N (0.06 - 0.31 kgf)
Bearing Reused: 0.58 - 1.8 N (0.06 - 0.19 kgf)

NOTE:

- If the total preload does not conform to the specification, adjust the total preload by means of the adjusting nut at the ring gear tooth surface side.

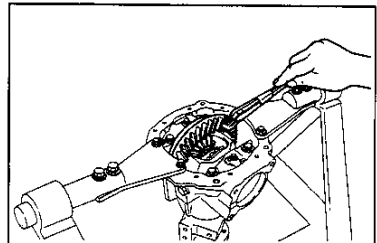


WF890-DF087

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:

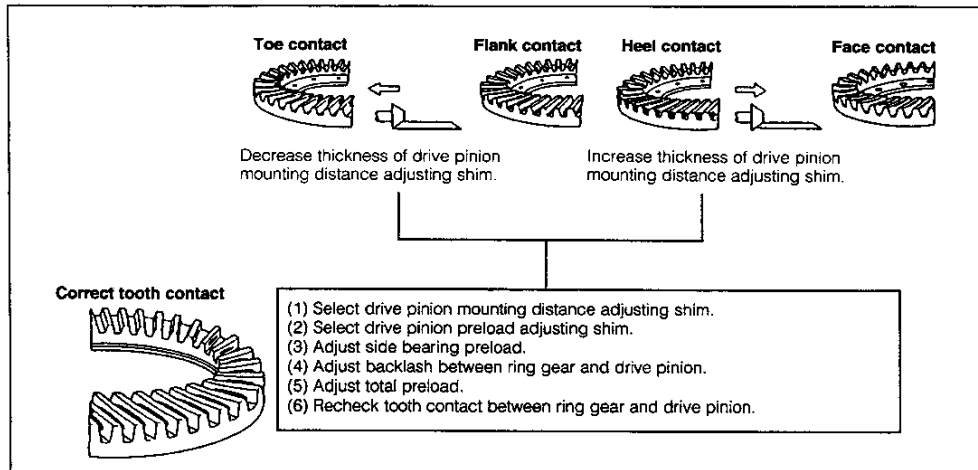
- Perform the tooth contact check at four points of the ring gear.



WF890-DF088

FRONT/REAR DIFFERENTIAL

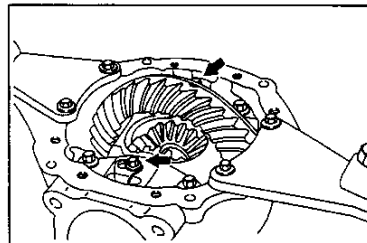
(3) Ensure that the correct tooth contact has been attained, as shown in the figure below.



WFEB0-DF069

29. Install the adjusting nut lock to the bearing cap and tighten the bolts.

Tightening Torque: 3.9 - 9.8 N·m (0.4 - 1.0 kgf·m)



WFEB0-DF090

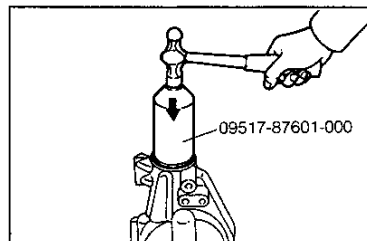
30. Remove the companion flange by removing the nut for 09530-87603-000

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

SST: 09517-87601-000

NOTE:

- Apply gear oil to the oil seal lip section.



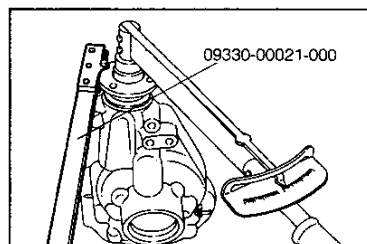
WFEB0-DF091

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

SST: 09330-00021-000

Tightening Torque:

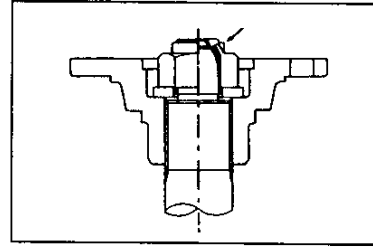
157.0 - 196.0 N·m (16.0 - 20.0 kgf·m)



WFEB0-DF092

FRONT/REAR DIFFERENTIAL

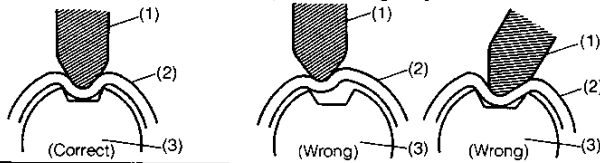
33. Stake the lock section of nut securely, using a chisel or the like.



NOTE:

- When staking the lock nut, point a suitable staking tool toward the drive pinion axis center and stake the lock nut securely, as shown in the figure below. (Poor staking may cause abnormal noise.)

- (1) Suitable staking tool
(2) New nut
(3) Drive pinion

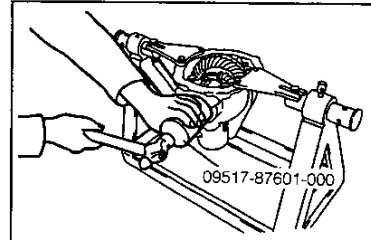


WFE90-DF093

34. Drive a new oil seal into the drive shaft side up to the edge surface, using the following SST.

NOTE:

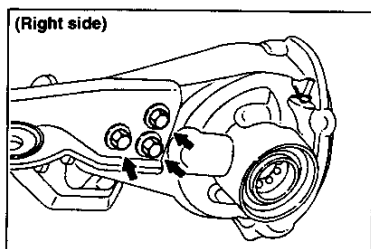
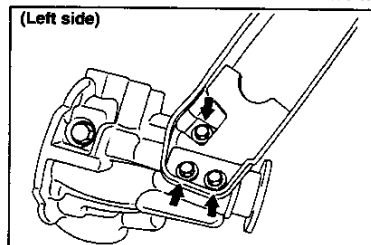
- Apply gear oil to the oil seal lip section.
- SST: 09517-87601-000



WFE90-DF094

35. Remove the differential assembly from the overhaul stand.
36. Tighten the three differential carrier support brackets by means of the bolts.

Tightening Torque:
98.0 - 118.0 N·m (10.0 - 12.0 kgf·m)



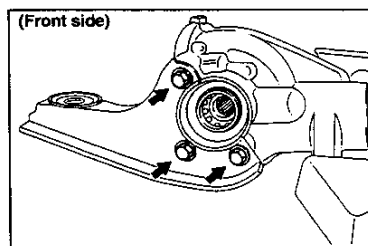
FRONT/REAR DIFFERENTIAL

37. With a new gasket interposed, tighten the front axle housing cover subassembly by means of the bolts.

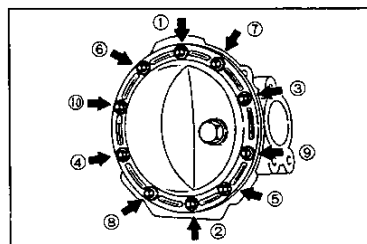
Tightening Torque: 17.7 - 23.5 N·m (1.8 - 2.4 kgf·m)

NOTE:

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



WFE90-DF096



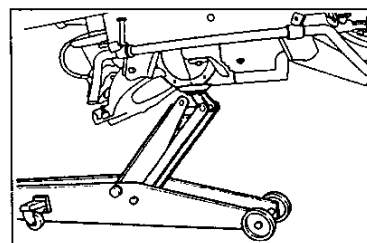
WFE90-DF096

INSTALLATION

1. Install the differential assembly, while supporting with a transmission jack or the like.

WARNING:

Be sure to slowly install the differential, while holding it by your hands, for the differential is in an unstable state.

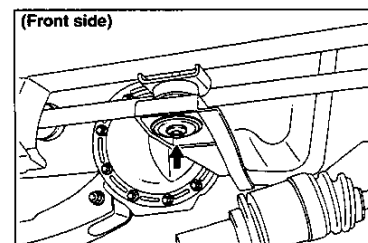


WFE90-DF097

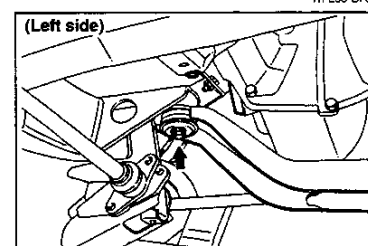
2. Temporarily tighten the three bolts of the differential mounting brackets to the chassis frame.
3. Proceed to tighten the bolts.

Tightening Torque:

39.2 - 53.9 N·m (4.0 - 5.5 kgf·m)



WFE90-DF098

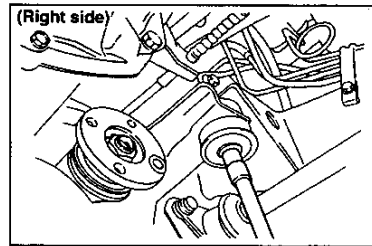


WFE90-DF099

FRONT/REAR DIFFERENTIAL

Tightening Torque:
39.2 - 49.0 N·m (4.0 - 5.0 kg·m)

4. Remove the jack from the vehicle.



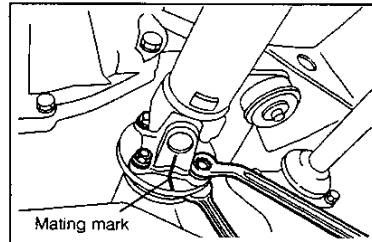
WFE90-DF100

5. Install the propeller shaft.

CAUTION:

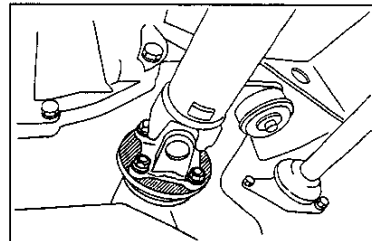
- While installing the propeller shaft, align the mating marks put during the removal with each other. If this operation should fail to be performed correctly, the propeller shaft may emit abnormal noise or vibration during the running.

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



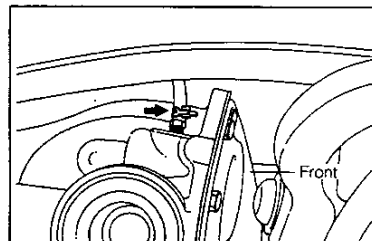
WFE90-DF101

6. 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.



WFE90-DF102

7. Connect the breather hose with the clamp.



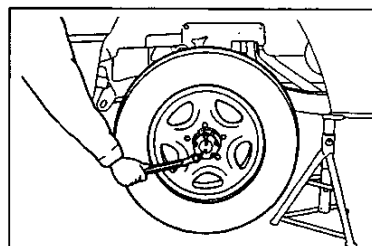
WFE90-DF103

8. Install the front drive shaft (Refer front axle and suspension).
9. Tighten the front wheel by means of a hub nuts.

Tightening Torque:
88.3 - 118.0 N·m (9.0 - 12.0 kgf·m)

NOTE:

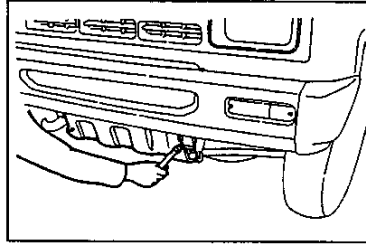
- Be sure to tighten the hub nut alternately and diagonally.



WFE90-DF104

FRONT/REAR DIFFERENTIAL

10. Jack down the vehicle.
11. Install the front stabilizer (Refer front axle and suspension section).
12. Fill the differential oil.
Oil to be Used: API GL-5, SAE 90 or 80W-90
Oil Capacity: 0.9 L
13. Install the engine undercover with the four bolts.



WFE90-DF105

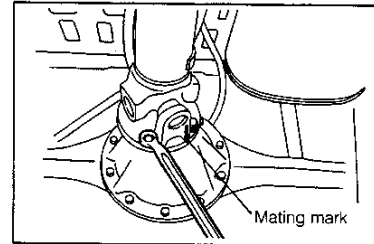
IN-VEHICLE REPLACEMENT PROCEDURES FOR OIL SEAL (REAR)

REMOVAL

1. Remove the drive shaft.

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.

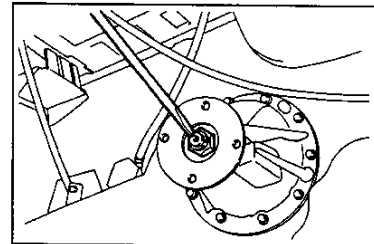


WFE90-DF107

2. Release staking of the lock nut of the drive pinion.

NOTE:

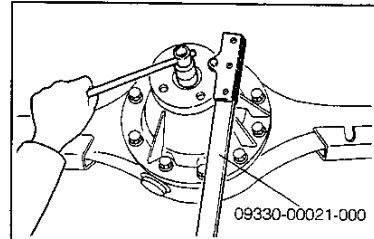
- Insufficient releasing of the staking of the lock nut may cause the threaded portion of the drive pinion to be damaged.



WFE90-DF108

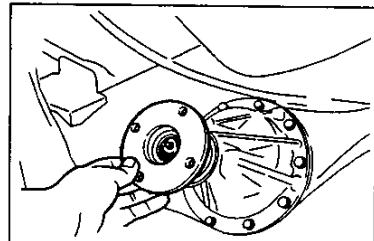
3. Remove the lock nut and plate washer, using the following SST.

SST: 09330-00021-000



WFE90-DF109

4. Remove the companion flange.



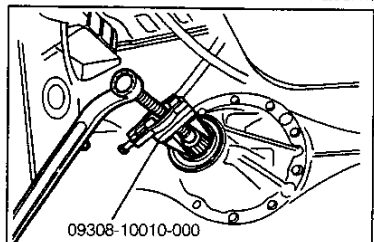
WFE90-DF110

5. Remove the oil seal, using the following SST.

SST: 09308-10010-000

NOTE:

- Never reuse the removed oil seal.



WFE90-DF111

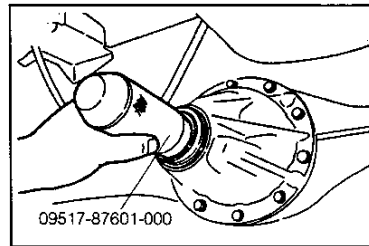
FRONT/REAR DIFFERENTIAL

INSTALLATION

1. Drive a new oil seal into position, using the following SST.
SST: 09517-87601-000

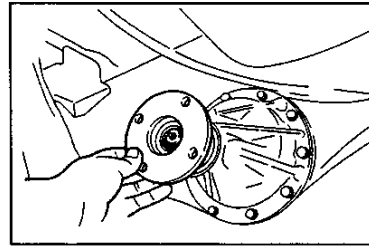
NOTE:

- Apply the gear oil to the oil seal lip section, prior to install.



WFE90-DF112

2. Install the companion flange.

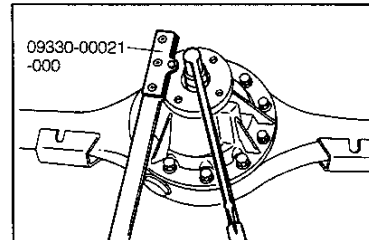


3. Install the plate washer and new lock nut, using the following SST.

SST: 09330-00021-000

Tightening Torque:

186.0 - 226.0 N·m (19.0 - 23.0 kgf·m)

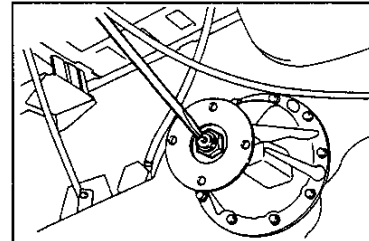


WFE90-DF114

4. Stake the lock nut of the drive pinion.

NOTE:

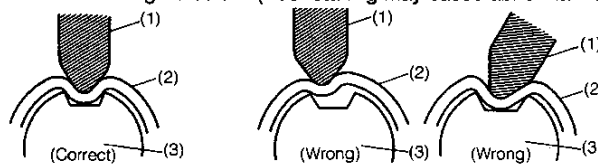
- Never reuse the removed lock nut.



NOTE:

- When staking the lock nut, point a suitable staking tool toward the drive pinion axis center and stake the lock nut securely, as shown in the figure below. (Poor staking may cause abnormal noise.)

- (1) Suitable staking tool
(2) New nut
(3) Drive pinion



WFE90-DF115

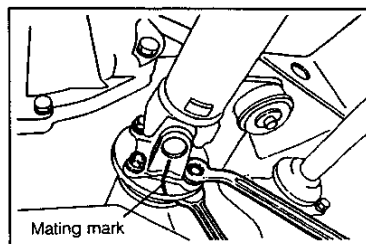
FRONT/REAR DIFFERENTIAL

5. Install the propeller shaft.

CAUTION:

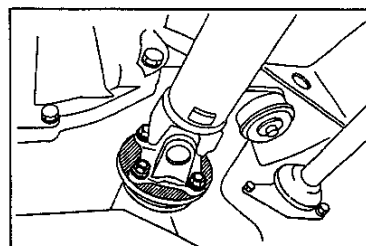
- While installing the propeller shaft, align the mating marks put during the removal with each other. If this operation should fail to be performed correctly, the propeller shaft may emit abnormal noise or vibration during the running.

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



WFE30-DF116

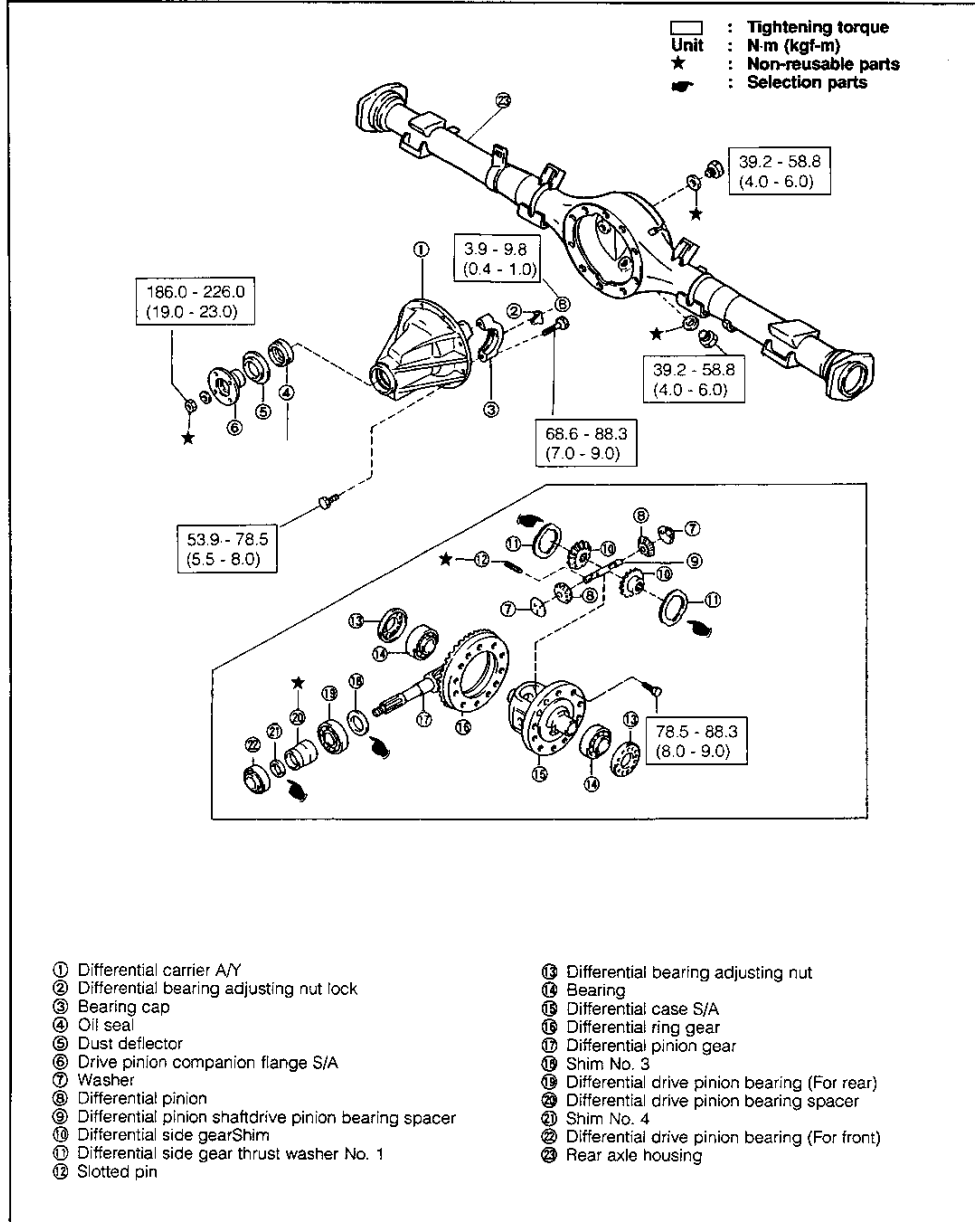
6. After the propeller shaft has been installed, apply black paint to the exposed machined surface (slant line section in the right figure) of the differential companion flange.



WFE30-DF117

FRONT/REAR DIFFERENTIAL

REAR DIFFERENTIAL COMPONENTS

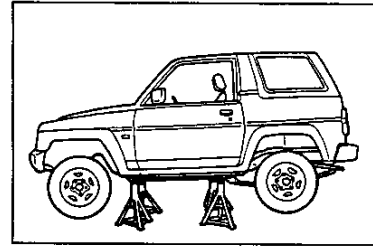


WFE90-DF118

FRONT/REAR DIFFERENTIAL

REMOVAL

1. Jack up the vehicle and support it with safety stands (As for the jacking-up points and support points for safety stands, refer GI-section).

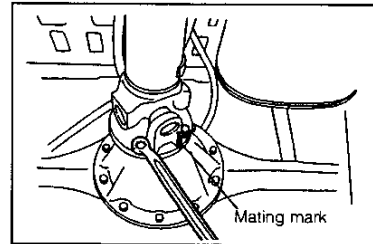


WFE90-DF119

2. Remove the propeller shaft.

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.



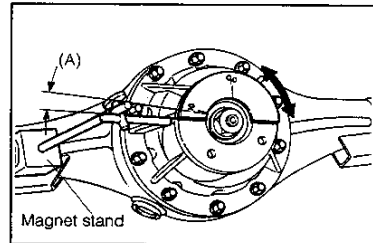
WFE90-DF120

3. Rock the rear wheel by pulling up the parking brake lever.
4. Drain the oil from the differential.

5. Remove the speed sensor only for rear A.B.S equipped vehicle (Refer BR-section).

6. Measurement of total backlash of rear axle assembly
 - (1) Install a protractor and a magnet stand equipped with a pointer on the differential companion flange surface.
 - (2) Move the differential companion flange to the right or to the left by the backlash (A).

Specified Value: Less than 5.5°



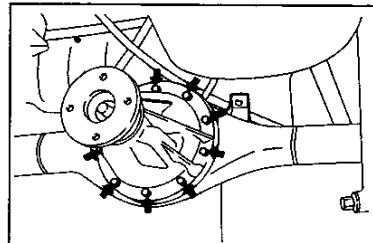
Magnet stand

WFE90-DF121

NOTE:

- If the total backlash exceeds the specified value, adjust the ring gear-to-drive pinion backlash and side gear-to-pinion gear backlash to the minimum value, respectively.

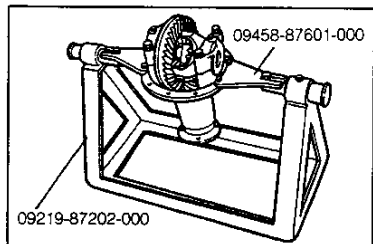
7. Remove the differential carrier assembly by removing the ten bolts.



WFE90-DF122

8. Install the differential assembly removed from the vehicle on the following SSTs.

SSTs: 09219-87202-000
09458-87601-000



09219-87202-000

WFE90-DF123

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

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: 0.07 - 0.17 mm

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: 0.03 - 0.15 mm

4. Total preload measurement

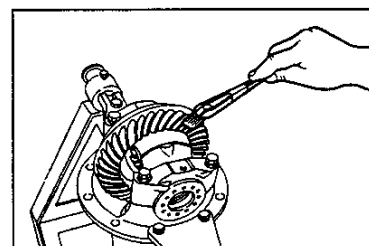
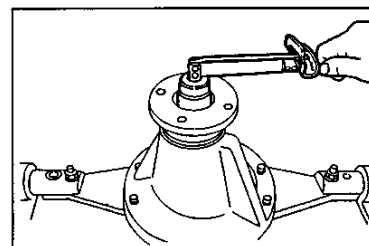
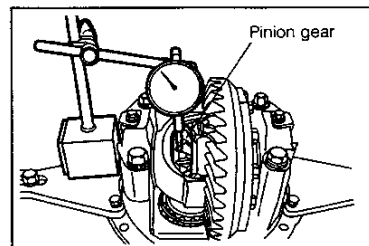
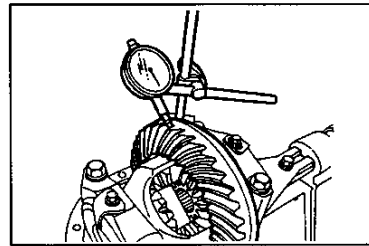
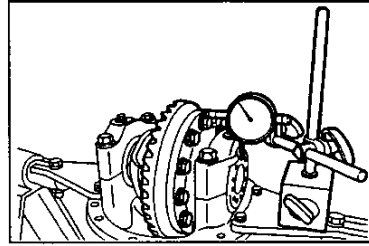
Measure the starting torque with the drive pinion brought into contact with the tooth surface of the ring gear, using a torque gauge.

Specified Value: 0.58 - 3.2 N (0.06 - 0.33 kgf)

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.

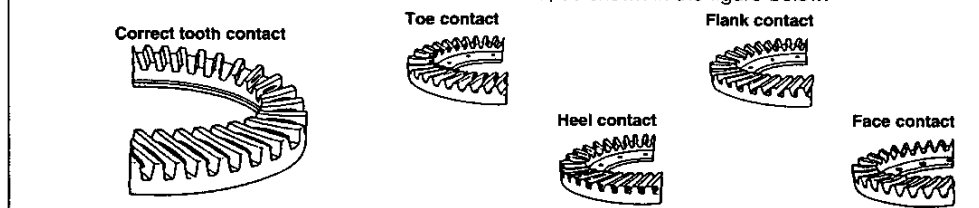
NOTE:

- 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.



FRONT/REAR DIFFERENTIAL

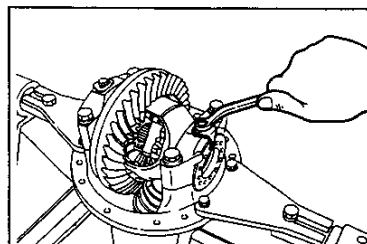
— Ensure that correct tooth contact has been attained, as shown in the figure below.



WFE90-DF129

DISASSEMBLY

1. Remove the adjusting lock nut.

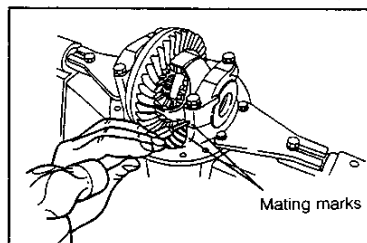


WFE90-DF130

2. Put mating marks 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.



Mating marks

WFE90-DF131

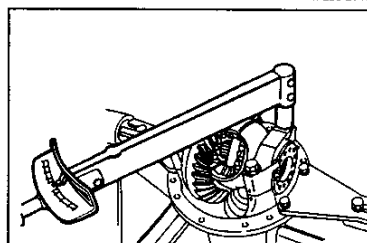
3. Remove the bearing cap.

NOTE:

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

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.

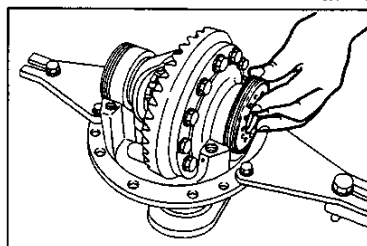


WFE90-DF132

4. Remove the adjusting nut.

NOTE:

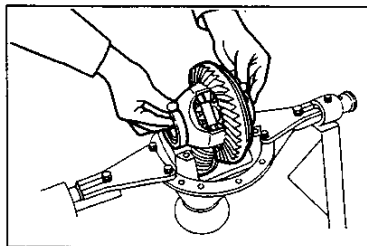
- Arrange the removed adjusting nut in order, separating the right nut from the left nut.



WFE90-DF133

FRONT/REAR DIFFERENTIAL

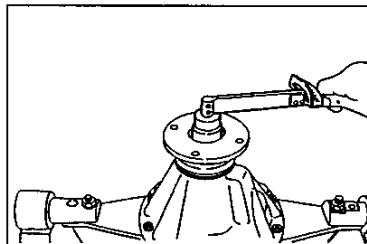
5. Remove the differential case from the carrier.



6. Drive pinion preload measurement
Measure the starting torque using a torque gauge.
Specified Value: 0.49 - 2.9 N (0.05 - 0.3 kgf)

NOTE:

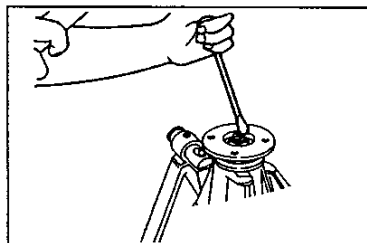
- This step should be performed after the differential case has been removed from the carrier.



7. Release the staking of the lock nut, using a chisel and a hammer.

NOTE:

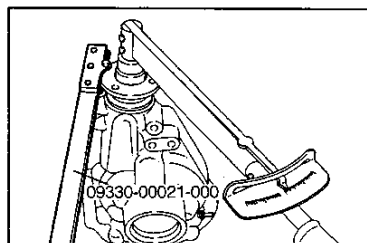
- Never reuse the removed lock nut.



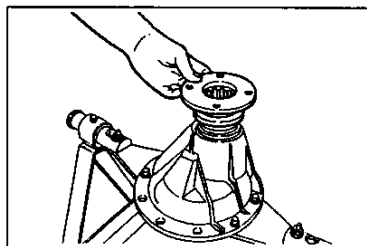
8. Secure the companion flange, using the following SST.
Proceed to the remove the lock nut.
SST: 09330-00021-000

NOTE:

- Never reuse the removed lock nut.



9. Remove the companion flange and plate washer



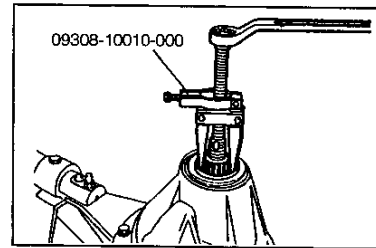
FRONT/REAR DIFFERENTIAL

10. Remove the oil seal of the drive pinion, using the following SST.

SST: 09308-10010-000

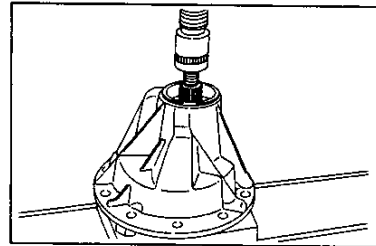
NOTE:

- Never reuse the removed oil seal



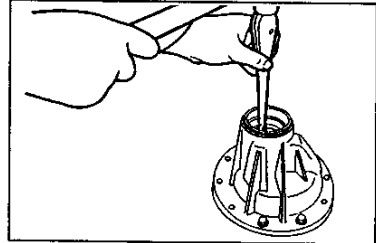
WFE90-DF138

11. Remove the drive pinion, using a press.



WFE90-DF139

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

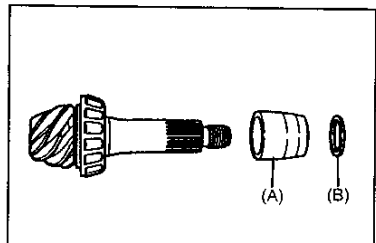


WFE90-DF140

13. Remove the following parts from the drive pinion.
(A) Spacer
(B) Shim for drive pinion preload

NOTE:

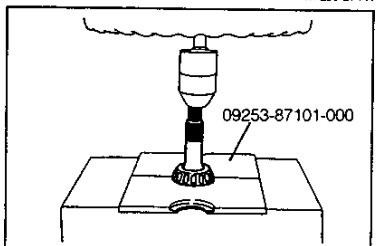
- Never reuse the spacer as it's crush type



WFE90-DF141

14. Remove the rear bearing and the drive pinion mounting distance adjusting shim from the drive pinion, using the following SST.

SST: 09253-87101-000



WFE90-DF142

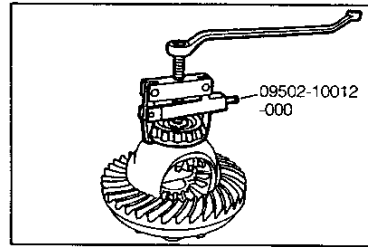
FRONT/REAR DIFFERENTIAL

15. Set the differential case in a vice.
16. Remove the side bearing from the differential case, using the following SST.

NOTE:

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

SST: 09502-10012-000

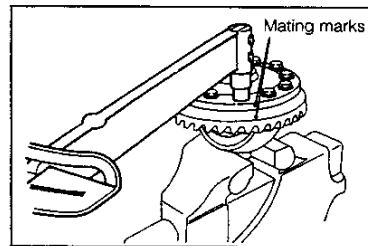


WFE90-DF143

17. Stamp mating marks on the differential case and ring gear. Proceed to remove the ring gear.

NOTE:

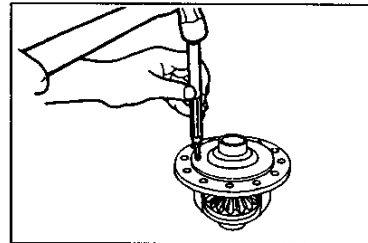
- For easier removal, lightly tap the ring gear at its back surface, using a plastic hammer.



WFE90-DF144

18. Pull out the slotted spring pins of the pinion gear. Remove the following parts from the differential case.

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



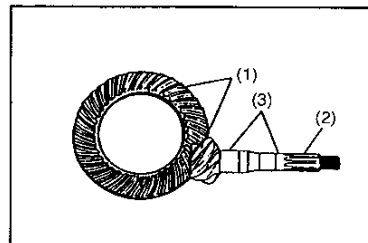
WFE90-DF145

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

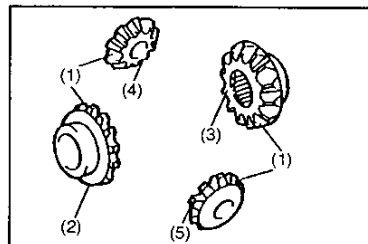
- (1) Gear teeth (1)
- (2) Spline portion (2) of drive pinion
- (3) Bearing fitting section (3)



WFE90-DF146

2. Side gear & pinion

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



WFE90-DF147

FRONT/REAR DIFFERENTIAL

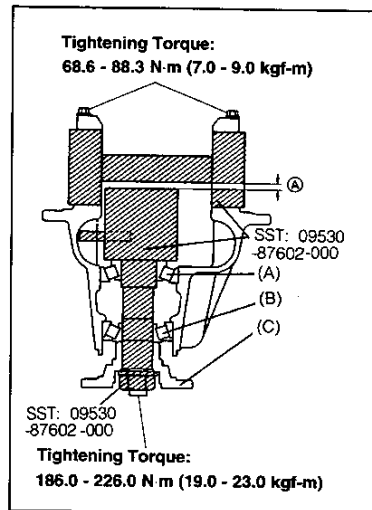
2. Selecting procedures for drive pinion mounting distance adjusting shims

(1) Assemble the SST and following parts on the front differential. Tighten the bolt to the tightening torque shown in the figure above.
SST: 09530-87602-000

- (A)...Rear bearing
(B)...Front bearing
(C)...Companion flange

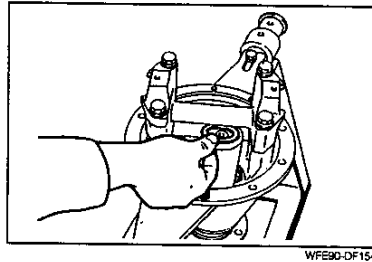
NOTE:

- Do not install the oil seal at this stage.

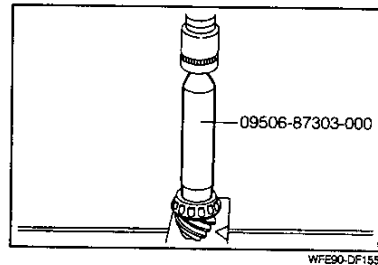


- (2) Measure the dimension (A) shown in the figure above. Select a suitable shim from the table below.

Adjusting Shim Availability	Unit: mm
2.10	
2.15	
2.20	
2.25	
2.30	
2.35	
0.30	

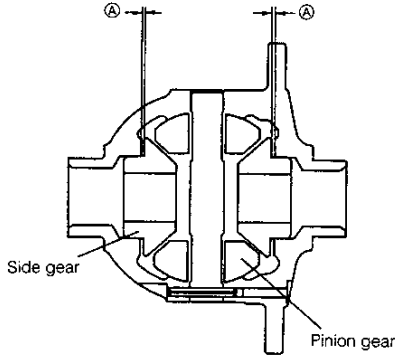


3. Place the drive pinion mounting distance adjusting shim that was selected in the previous step in the drive pinion. Press the rear bearing, using the following SST.
SST: 09506-87303-000



FRONT/REAR DIFFERENTIAL

4. Selecting procedures for side gear backlash thrust washer



Availability of Adjusting Thrust Washer for Section (A)

Units: mm

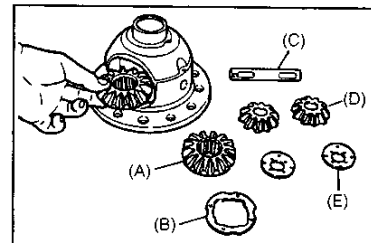
1.00
1.05
1.10
1.15
1.20

(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

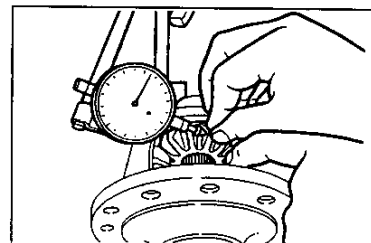
(2) Assemble the following parts in the differential case.

- (A) Differential side gear
- (B) Differential side gear thrust washer
- (C) Differential pinion shaft
- (D) Differential pinion
- (E) Differential pinion thrust washer



(3) Measure the backlash with the pinion gear pushed against the differential case side. Select the 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: 0.03 - 0.15 mm



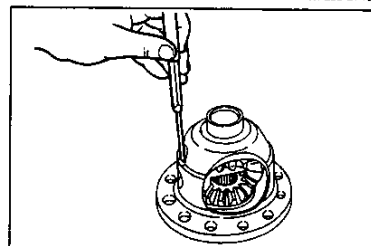
NOTE:

- The same size of the thrust washer should be installed at both the right and left sides.

(4) Drive the slotted spring pin into position after completion of the backlash measurement.

NOTE:

- Stake the differential case so as to secure the slotted spring pin.



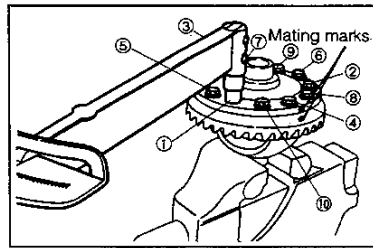
FRONT/REAR DIFFERENTIAL

5. Apply the gear oil to the threaded portions of the tightening bolts and ring gear.
6. Align the matching marks put during the disassembly with each other.
7. Install the ring gear in the differential case and tighten the bolts.

Tightening Torque: 78.5 - 88.3 N·m (8.0 - 9.0 kgf·m)

NOTE:

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

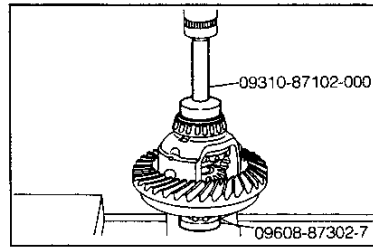


8. Press the side bearing into the differential case, using the following SSTs.

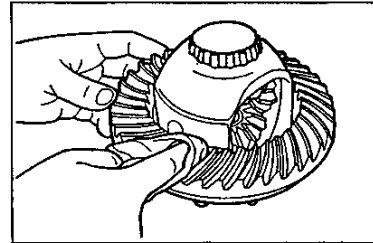
SST: 09310-87102-000

09608-87302-7

that is a part of 09608-87302-000



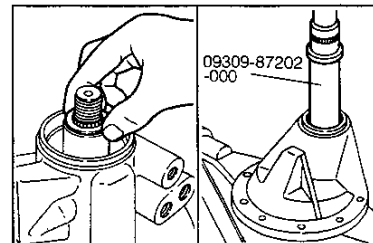
9. Clean the ring gear tooth surfaces.



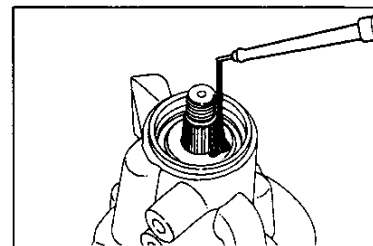
10. Install the drive pinion, new drive pinion bearing spacer and shim (one that was measured at time of selection) to the differential carrier.

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

SST: 09309-87202-000

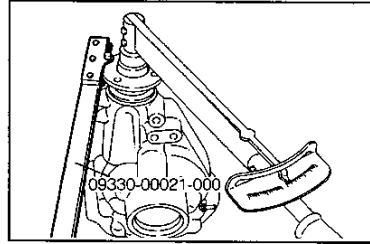


12. Apply the gear oil to the rear bearing tapered roller sections.



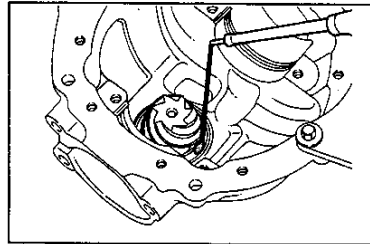
FRONT/REAR DIFFERENTIAL

13. Install the companion flange.
14. Tighten the nut (use for 09530-87603-000), using the following SST.
 SST: 09330-00021-000
 Tightening Torque:
 186.0 - 226.0 N·m (19.0 - 23.0 kgf·m)



WFE90-DF165

15. Apply the gear oil to the front bearing tapered roller sections.



WFE90-DF166

16. Rotates the companion flange for several times in clock and counter clockwise.
17. Measure the preload of the drive pinion, using a torque gauge.

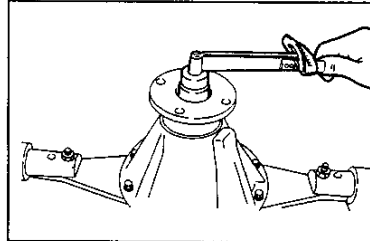
Specified Value:

New Bearing:

0.49 - 2.9 N (0.05 - 0.3 kgf)

Bearing Reused:

0.49 - 1.7 N (0.05 - 0.17 kgf)

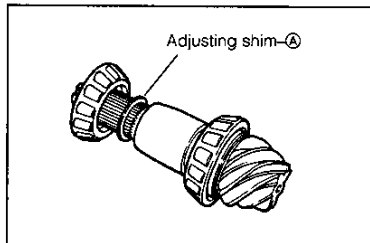


WFE90-DF167

18. 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 on the item of 19.



WFE90-DF168

FRONT/REAR DIFFERENTIAL

19. Availability of adjusting shim for section A

Units: mm

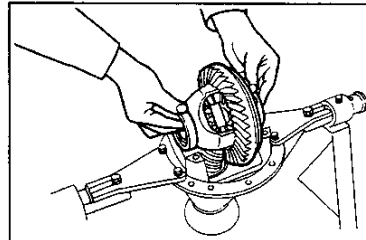
1.600	1.850	2.100
1.625	1.875	2.125
1.650	1.900	2.150
1.675	1.925	2.175
1.700	1.950	2.200
1.725	1.975	2.225
1.750	2.000	2.250
1.775	2.025	2.275
1.800	2.050	2.300
1.825	2.075	2.325

WFE90-DF169

20. Install the differential case on the differential carrier.

NOTE:

- Make sure that the outer races of the side bearings are assembled correctly in the respective original positions.

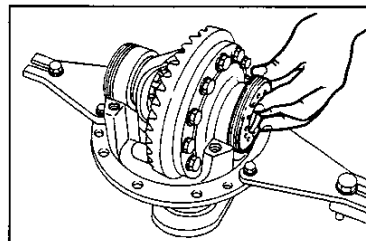


WFE90-DF170

21. Install the adjusting nut in such a way that it is aligned with the threaded portion of the differential carrier.

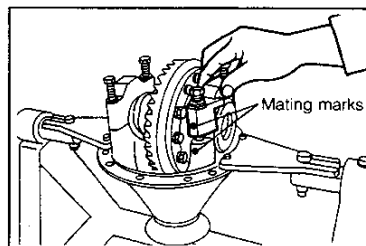
NOTE:

- Apply gear oil to the bearing and adjusting nut.



WFE90-DF171

22. Install the bearing cap to the differential carrier, while aligning the mating marks put during the disassembly with each other.

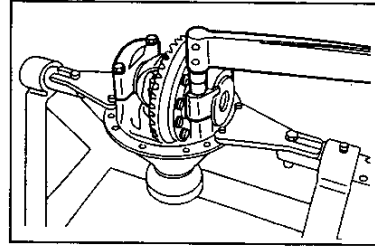


WFE90-DF172

FRONT/REAR DIFFERENTIAL

23. Temporarily tighten the bearing cap to the following specified torque. Then, loosen the bearing cap to such an extent that the adjusting nut can be turned with the SST.

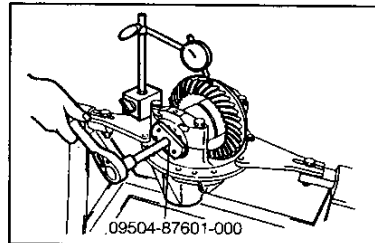
Tightening Torque: 19.6 N·m (2.0 kgf·m)



WFE90-DF173

24. Lightly tighten the right and left adjusting nuts, using the SST, until the backlash between the drive pinion and the ring gear becomes about 0.2 mm

SST: 09504-87601-000

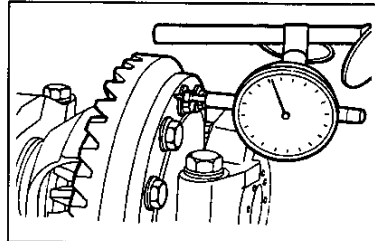


09504-87601-000

WFE90-DF174

25. Ring gear preload adjusting procedure

- (1) Install a dial gauge normally to the back surface of the ring gear.

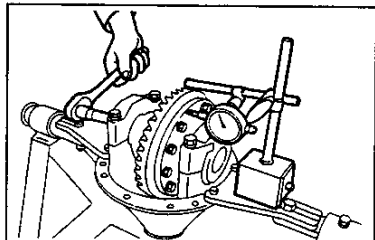


WFE90-DF175

- (2) Using the SST, tighten the adjusting nut at the tooth surface side of the ring gear, until the dial gauge registers no fluctuation in the reading.

NOTE:

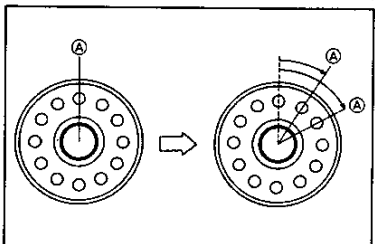
- The side bearing preload becomes zero when the dial gauge no longer registers fluctuation.



WFE90-DF176

- (3) Tighten further the adjusting nut at the ring gear tooth surface side to the specified preload.

Specified Side Bearing Preload: 1 - 2 notches

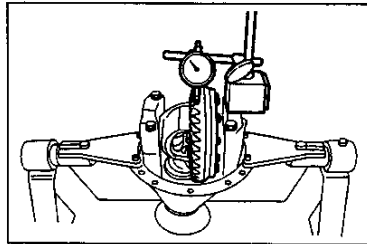


WFE90-DF177

FRONT/REAR DIFFERENTIAL

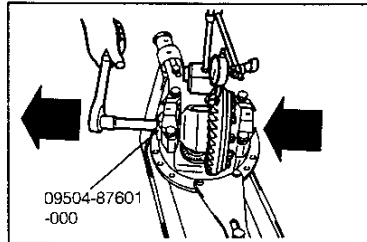
26. Adjusting procedure for backlash between ring gear and drive pinion

(1) Install a dial gauge at right angles with the ring gear tooth surface. Measure the backlash.
Specified Value: 0.07 - 0.17 mm



WFE90-DF175

(2) If the backlash does not conform to the specification, adjust the backlash by moving the bearing by means of the right and left adjusting nuts, using the following SST.
SST: 09504-87601-000

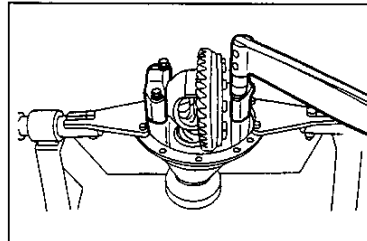


WFE90-DF179

NOTE:

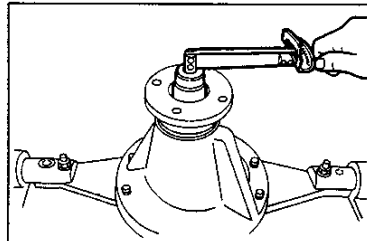
- The right and left bearings should be moved in the same direction and by the same amount. For example, if the left bearing is loosen one notch, the right bearing should be tightened one notch.

27. Tighten the bearing cap to the specified torque.
Tightening Torque: 68.6 - 88.3 N·m (7.0 - 9.0 kgf·m)



WFE90-DF180

28. Total Preload
With the drive pinion brought in contact with the ring gear, measure the total preload, using a torque gauge.
New Bearing: 0.58 - 3.2 N (0.06 - 0.33 kgf)
Bearing Reused: 0.58 - 1.9 N (0.06 - 0.2 kgf)



WFE90-DF181

NOTE:

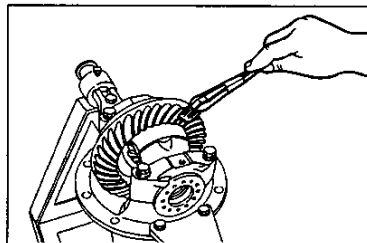
- If the total preload does not conform to the specification, adjust the total preload by means of the adjusting nut at the ring gear tooth surface side.

29. 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:

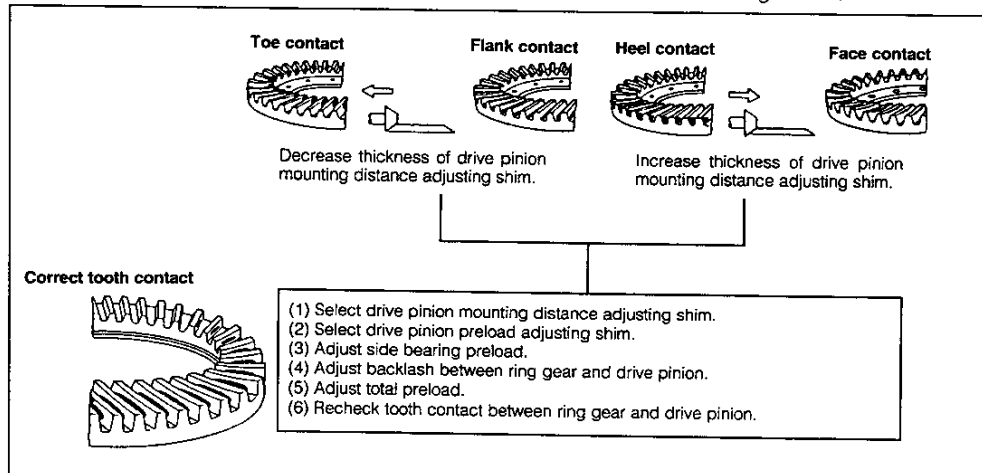
- Perform the tooth contact check at four points of the ring gear.



WFE90-DF182

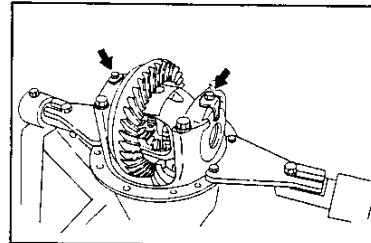
FRONT/REAR DIFFERENTIAL

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



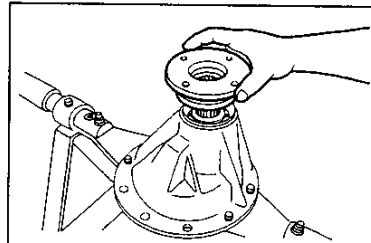
WFE90-DF163

30. Install the adjusting nut lock to the bearing cap.
Tightening Torque: 3.9 - 9.8 N·m (0.4 - 1.0 kgf-m)



WFE90-DF164

31. Remove the companion flange by removing the lock nut for 09530-87602-000.

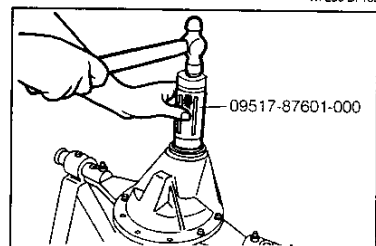


WFE90-DF165

32. Drive a new oil seal up to the edge surface of the differential carrier, using the following SST.
SST: 09517-87601-000

NOTE:

- Apply gear oil to the oil seal lip section.



WFE90-DF186

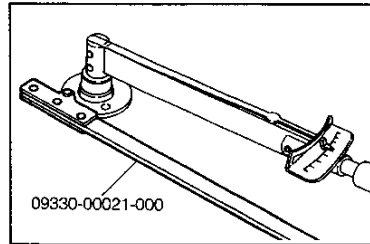
FRONT/REAR DIFFERENTIAL

33. Tighten the companion flange by means of a new lock nut, using the following SST.

SST: 09330-00021-000

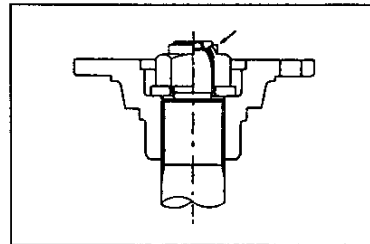
Tightening Torque:

186.0 - 226.0 N·m (19.0 - 23.0 kgf·m)



WF890-DF187

34. Stake lock section of the nut securely, using a chisel or the like.

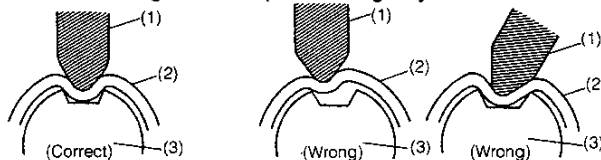


WF890-DF188

NOTE:

- When staking the lock nut, point a suitable staking tool toward the drive pinion axis center and stake the lock nut securely, as shown in the figure below. (Poor staking may cause abnormal noise.)

- (1) Suitable staking tool
(2) New nut
(3) Drive pinion

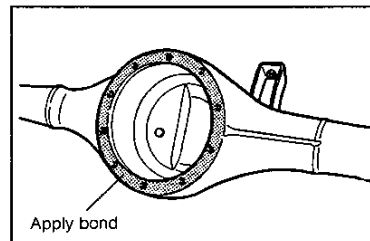


WF890-DF189

INSTALLATION

1. Apply the following bond to the differential installation surface of the rear axle housing.

Bond to Be Used: Three bond 1104
(Three bond made)

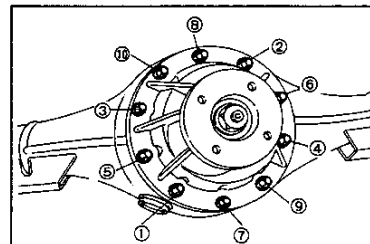


WF890-DF190

2. Remove the differential carrier from the SSTs
3. Tighten the differential carrier by means of the bolts.
Tightening Torque: 53.9 - 78.5 N·m (5.5 - 8.0 kgf·m)

NOTE:

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



WF890-DF191

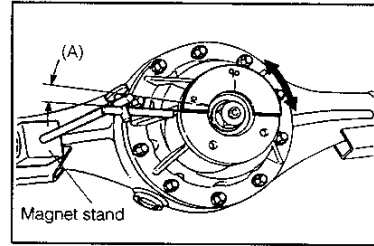
FRONT/REAR DIFFERENTIAL

4. Install the rear axle shaft (Refer RS-section)
5. Measurement of total backlash of rear axle assembly
 - (1) Install a protractor and a magnet stand equipped with a pointer on the differential companion flange surface.
 - (2) Move the differential companion flange to the right or to the left by the backlash.

Specified Value: Less than 5.5°

NOTE:

- If the total backlash exceeds the specified value, adjust the ring gear-to-drive pinion backlash and side gear-to-pinion gear backlash to the minimum value, respectively.
- If the total backlash exceeds the specified value even if the respective backlashes (ring gear-to-drive pinion backlash and side gear-to-pinion gear backlash) are set to the minimum values, replace the rear axle shaft and side gear with new ones.



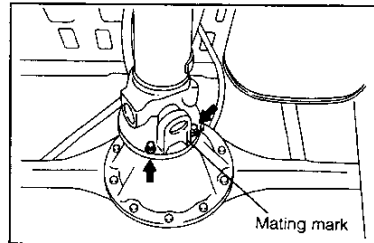
WFE90-DF192

6. Install the propeller shaft.

CAUTION:

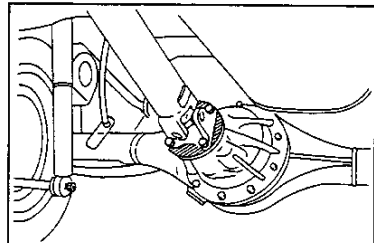
- Align the mating marks put during the removal with each other.
- If this operation should fail to be performed correctly, the propeller shaft may emit abnormal noise or vibration during the running.

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



WFE90-DF193

7. On the rear ABS-equipped vehicle only, install the speed sensor. (Refer to RS section.)
8. Apply black paint to the exposed machined surface (slant line section in the right figure) of the differential companion flange.



WFE90-DF194

9. Fill the differential oil.

Oil to Be Used:

Standard	API GL-5, SAE 90 or 80W-90
L.S.D.	API GL-5 (Oil exclusively used for L.S.D. SAE 90 or 80W-90)

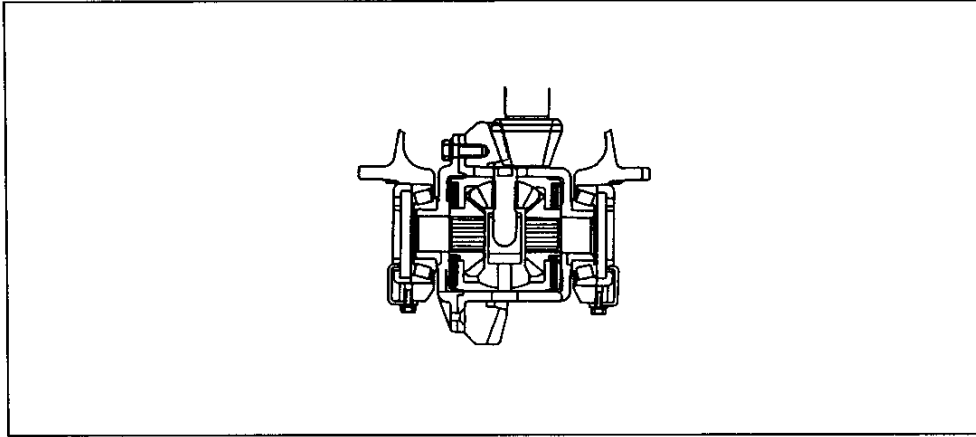
Oil Capacity: 1.95 L

10. Jack down the vehicle.

WFE90-DF195

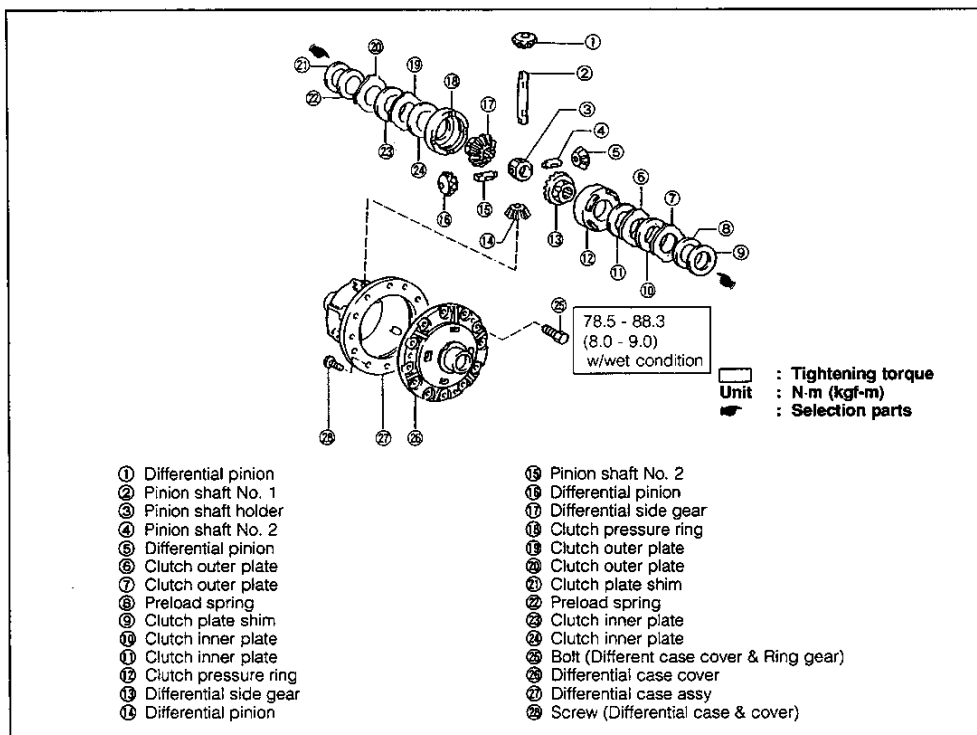
FRONT/REAR DIFFERENTIAL

L.S.D. (Limited Slip Differential) SECTIONAL VIEW



WFE90-DF196

COMPONENTS



WFE90-DF197

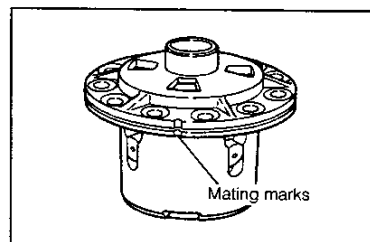
REMOVAL

1. Remove the rear differential carrier assembly.
(See pages DF-32 through DF-34.)
2. Remove the differential case assembly from the differential carrier.
(See pages DF-34 through DF-37.)

WFE90-DF198

DISASSEMBLY

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

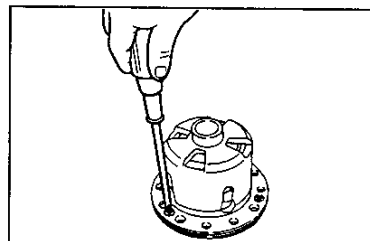


WFE90-DF199

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

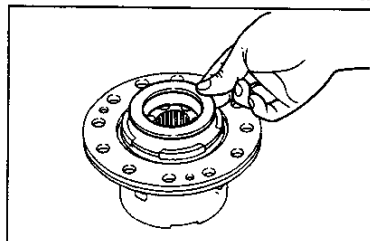
NOTE:

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



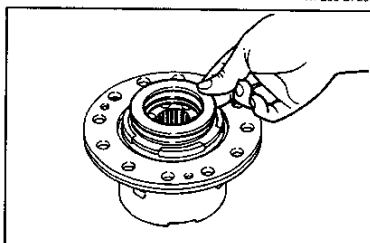
WFE90-DF200

3. Remove the clutch plate shim.



WFE90-DF201

4. Remove the preload spring.

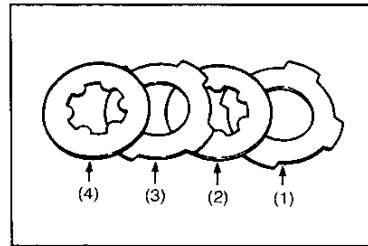


WFE90-DF202

FRONT/REAR DIFFERENTIAL

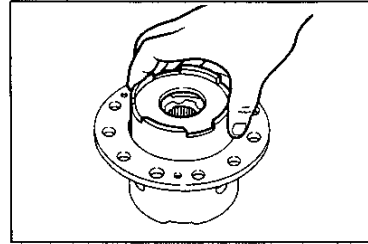
5. Remove the following parts in this sequence from the differential case.

- (1) Clutch outer plate
- (2) Clutch inner plate
- (3) Clutch outer plate
- (4) Clutch inner plate



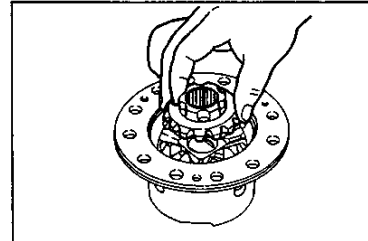
WFE90-DF203

6. Remove the clutch pressure ring.



WFE90-DF204

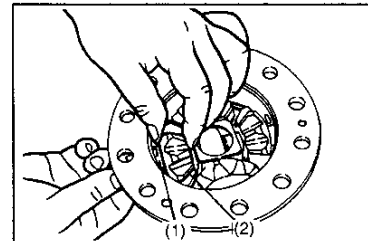
7. Remove the side gear.



WFE90-DF205

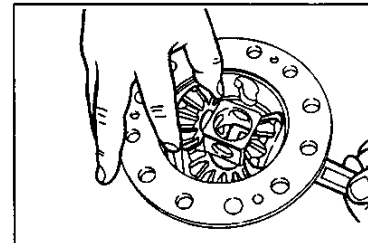
8. Remove the following parts, while floating the pinion shaft No. 1.

- (1) Pinion shaft No. 2 (2 pcs.)
- (2) Differential pinion (2 pcs.)



WFE90-DF206

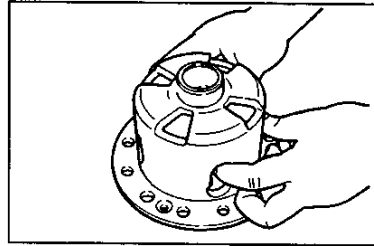
9. Remove the pinion No. 1 and two differential pinions.



WFE90-DF207

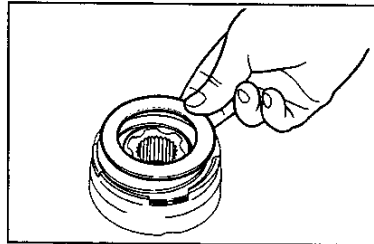
FRONT/REAR DIFFERENTIAL

10. Remove each inner part from the differential case.



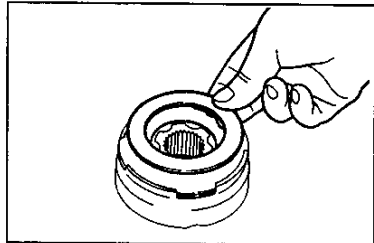
WFE90-DF208

11. Remove the clutch plate shim.



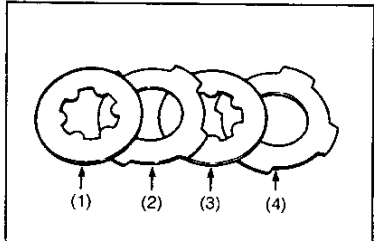
WFE90-DF209

12. Remove the preload spring.



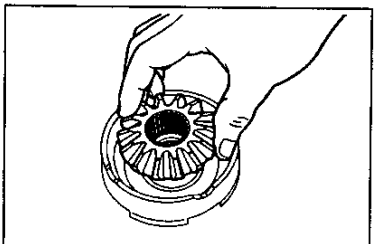
WFE90-DF210

13. Remove the following parts in this sequence from the differential side gear.
- (1) Clutch inner plate
 - (2) Clutch outer plate
 - (3) Clutch inner plate
 - (4) Clutch outer plate



WFE90-DF211

14. Remove the differential side gear.



WFE90-DF212

FRONT/REAR DIFFERENTIAL

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 side gear and clutch inner plate are to be replaced, also replace the clutch outer plate and preload spring that are in contact with the replaced parts.

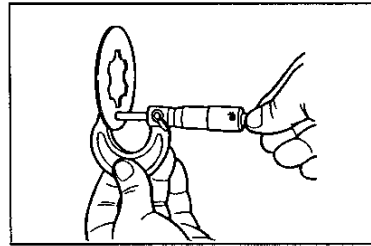
WFE90-DF213

1. Check of clutch inner plate

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

NOTE:

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



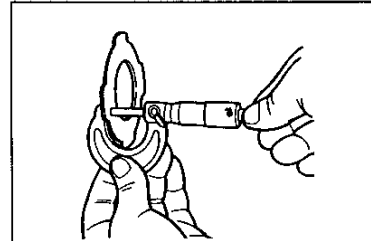
WFE90-DF214

2. Check of clutch outer plate

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

NOTE:

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



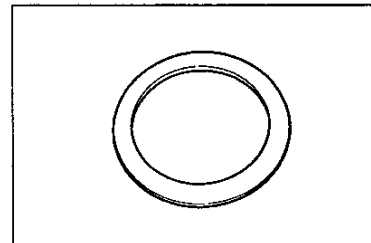
WFE90-DF215

3. Preload spring check

- (1) Ensure that the preload spring exhibits no excessive wear.

REFERENCE:

- The spring load should be 480 - 580 kgf as assembled.



WFE90-DF216

ASSEMBLY

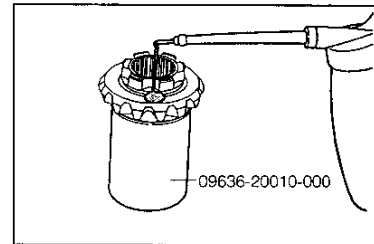
NOTE:

- (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

WFE90-DF217

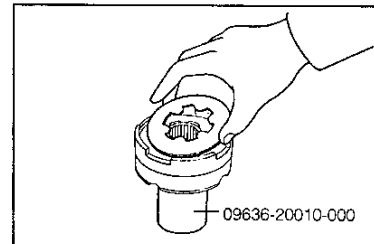
FRONT/REAR DIFFERENTIAL

1. Install the clutch pressure ring to the differential gear, using the following SST or a cylindrical base.
SST: 09636-20010-000



WFE90-DF218

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



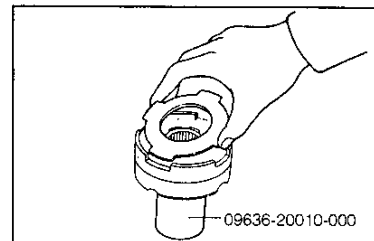
WFE90-DF219

3. Install the clutch inner plate.

NOTE:

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

4. Apply the L.S.D. oil to the upper periphery of the clutch inner plate.



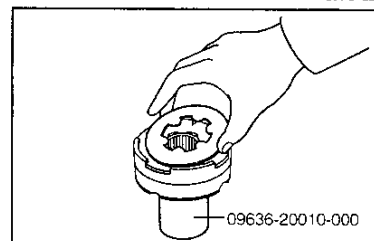
WFE90-DF220

5. Install the clutch outer plate.

NOTE:

• There is no specific installation direction for the clutch outer plate.

6. Apply the L.S.D. oil to the upper periphery of the clutch outer plate.



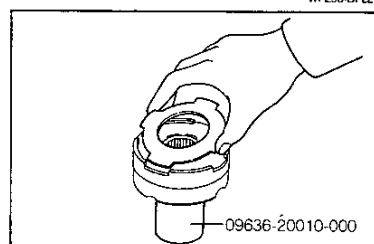
WFE90-DF221

7. Install the clutch inner plate.

NOTE:

• There is no specific installation direction for the clutch inner plate.

8. Apply the L.S.D. oil to the upper periphery of the clutch inner plate.



WFE90-DF222

9. Install the clutch outer plate.

NOTE:

• There is no specific installation direction for the clutch outer plate.

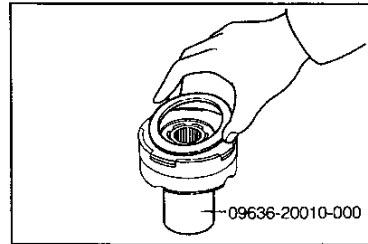
10. Apply the L.S.D. oil to the upper periphery of the clutch outer plate.

FRONT/REAR DIFFERENTIAL

11. Install the preload spring.

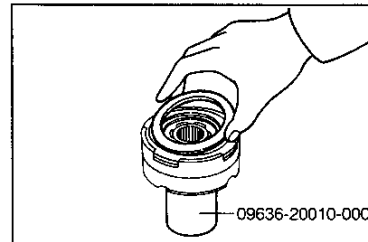
NOTE:

- The preload spring should be installed in such a direction that the enlarged section of the preload spring may come at the clutch plate side.



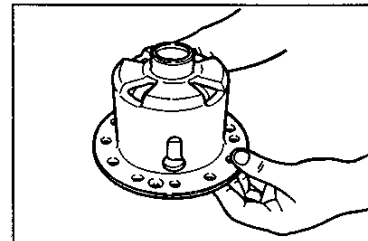
WFE90-DF223

12. Install the 0.5 mm thick plate shim.



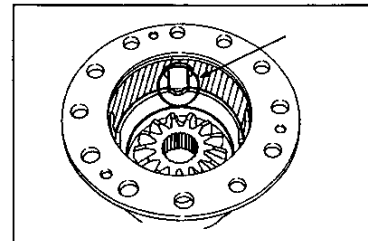
WFE90-DF224

13. Install the differential case subassembly.



WFE90-DF225

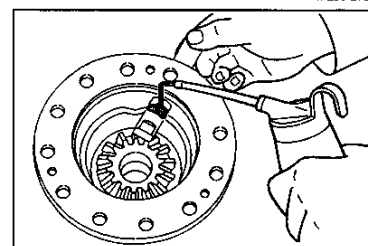
14. Align the groove of the clutch pressure ring with that of the differential case.



WFE90-DF226

15. Apply the L.S.D. oil to the outer periphery of the differential pinion shaft.

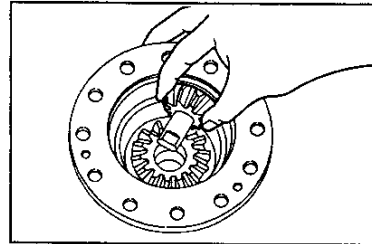
16. Insert the differential pinion shaft to the differential case.



WFE90-DF227

FRONT/REAR DIFFERENTIAL

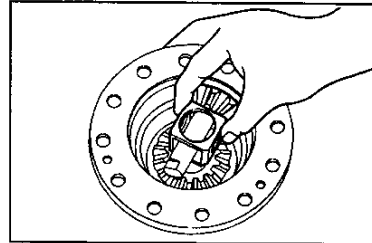
17. Install the pinion gear in the differential pinion shaft.



WFE90-DF228

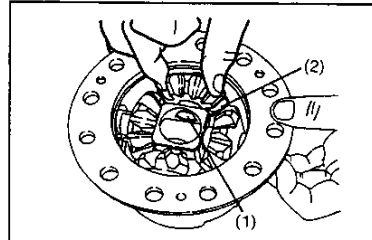
18. Install the differential pinion shaft No. 1 in the differential pinion shaft.

19. Install the pinion gear in the differential pinion shaft.



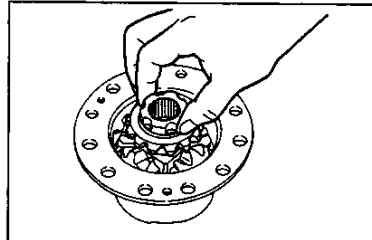
WFE90-DF229

20. Apply the L.S.D. oil to the outer periphery of the pinion shaft No. 2 and then, install the following parts in differential case, while floating the pinion shaft No. 1.
 (1) Pinion shaft No. 2 (2 pcs.)
 (2) Differential pinion (2 pcs.)



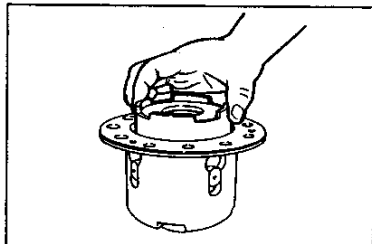
WFE90-DF230

21. Assemble the differential side gear in the clutch pressure ring.



WFE90-DF231

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

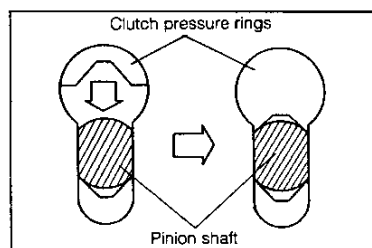


WFE90-DF232

FRONT/REAR DIFFERENTIAL

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.



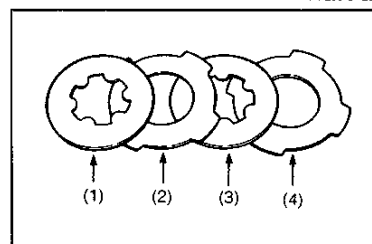
WFE90-DF233

23. Assemble the following parts in this sequence in the clutch pressure ring.

- (1) Clutch inner plate
- (2) Clutch outer plate
- (3) Clutch inner plate
- (4) Clutch outer plate

NOTE:

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

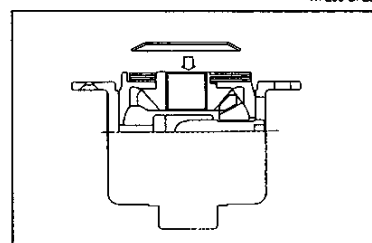


WFE90-DF234

24. Assemble the preload spring in the differential case.

NOTE:

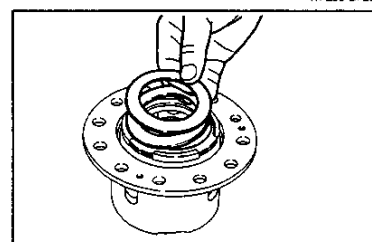
- The preload spring should be installed in such a direction that the enlarged section of the preload spring may come at the clutch plate side.



WFE90-DF235

25. Selecting procedure for clutch plate shim

- (1) Install the two 0.5 mm thick clutch plate shims in the differential case.

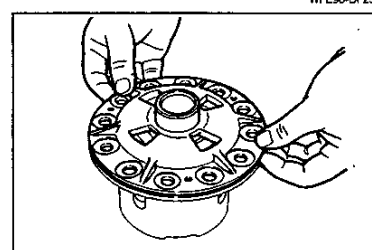


WFE90-DF236

- (2) Install the differential case cover on the differential case subassembly.

NOTE:

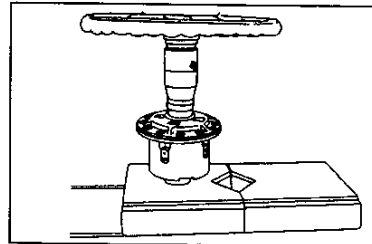
- Do not install the screws at this stage.



WFE90-DF237

FRONT/REAR DIFFERENTIAL

- (3) Apply the following specified load to the differential case cover, using a press.
Specified Load: 1000 kgf

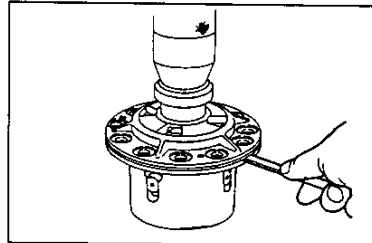


WFE90-DF238

- (4) Measure the clearance between the differential case subassembly and the differential cover, using a thickness gauge.

NOTE:

- Perform this clearance check at three points.
Specified Load: 0.05 - 0.2 mm

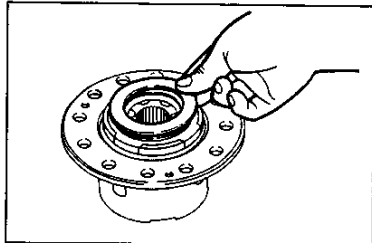


WFE90-DF239

If the clearance exceeds the specified value, decrease the thickness of the clutch plate shim. Conversely, if the clearance is less than the specified value, increase the shim thickness.

Select a suitable clutch plate shim from the table below.

Clutch Plate Shim Availability:	mm
	0.2
	0.3
	0.5



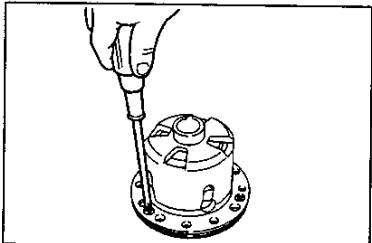
WFE90-DF240

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

NOTE:

- Tighten the screws evenly.

27. Assemble the differential case assembly.
(See page DF-41 through DF-47.)



WFE90-DF241

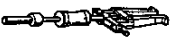
INSTALLATION

1. Install the differential carrier to the rear axle housing (See page DF-48 through DF-49.)

WFE90-DF243

FRONT/REAR DIFFERENTIAL

SSTs

Figure	Parts No.	Parts Name
	09219-87202-000	Engine overhaul stand
	09253-87101-000	Water pump bearing anvil
	09308-10010-000	Oil seal puller
	09308-00010-000	Oil seal puller
	09309-87202-000	Transmission bearing replacer
	09330-00021-000	Companion flange holding tool
	09458-87601-000	Attachment differential overhol
	09502-10012-000	Differential side bearing puller
	09504-87601-000	Differential side bearing adjust nut wrench
	09517-87601-000	Replacer oil seal
	09517-87602-000	Attachment oil seal puller
	09530-87602-000	Rear differential drive pinion adjust gauge set
	09530-87603-000	Front differential drive pinion adjust gauge set
	09506-87303-000	Differential drive pinion bearing cone front replacer
	09608-87302-000	Axle hub & drive pinion bearing tool set
	09636-20010-000	Upper ball joint dust cover replacer

WFE90-DF244

FRONT/REAR DIFFERENTIAL

SERVICE SPECIFICATIONS

FRONT

Unit: mm

Item		Specified value	Allowable limit	Remarks
Ring gear runout		—	0.1	
Backlash	Ring gear	0.07 - 0.17	—	
	Pinion gear × Side gear	0.03 - 0.15	—	
Preload	Total	New bearing	0.58 - 3.0 N (0.06 - 0.31 kgf)	—
		Bearing reused	0.58 - 1.8 N (0.06 - 0.19 kgf)	—
	Drive pinion	New bearing	0.39 - 2.45 N (0.04 - 0.25 kgf)	—
		Bearing reused	0.39 - 1.27 N (0.04 - 0.13 kgf)	—

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REAR

Unit: mm

Item		Specified value	Allowable limit	Remarks
Total backlash of rear axle A/Y		—	Not to exceed 5.5°	
Ring gear runout		—	0.1	
Backlash		Ring gear	0.07 - 0.17	—
		Side gear	0.03 - 0.17	—
Preload	Total	New bearing	0.58 - 3.2 N (0.06 - 0.33 kgf)	—
		Bearing reused	0.58 - 1.9 N (0.06 - 0.21 kgf)	—
	Drive pinion	New bearing	0.49 - 2.9 N (0.05 - 0.31 kgf)	—
		Bearing reused	0.49 - 1.7 N (0.05 - 0.17kgf)	—
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		Differential case cover shored be 1000 kgf

WFE90-DF246

FRONT/REAR DIFFERENTIAL

TIGHTENING TORQUE

FRONT

Tightening Components	Tightening Torque		
	N-m	kgf-m	ft-lb
Differential carrier support BKT (only right side) × Chassis frame	39.2 - 49.0	4.0 - 5.0	28.9 - 36.2
Differential carrier support BKT × Chassis frame	39.2 - 53.9	4.0 - 5.5	28.9 - 39.8
Front axle housing S/A × Filler plug	39.2 - 58.8	4.0 - 6.0	28.9 - 43.4
Differential carrier S/A × Drain plug	39.2 - 58.8	4.0 - 6.0	28.9 - 43.4
Front axle housing S/A × Differential carrier S/A	17.7 - 23.5	1.8 - 2.4	13.0 - 17.4
Differential adjusting nut lock × Bearing cap	3.9 - 9.8	0.4 - 1.0	2.9 - 7.2
Bearing cap × Differential carrier S/A	29.4 - 49.0	3.0 - 5.0	21.7 - 36.9
Differential case cover × Differential case S/A	78.5 - 88.3	8.0 - 9.0	57.9 - 65.1
Drive pinion × Lock nut	157.0 - 196.0	16.0 - 20.0	116.0 - 145.0
Differential carrier support BKT × Differential carrier S/A	98.0 - 118.0	10.0 - 12.0	72.0 - 87.0

WFE90-DF247

REAR

Tightening Components	Tightening Torque		
	N-m	kgf-m	ft-lb
Rear axle housing × plugs (filler, drain)	39.2 - 58.8	4.0 - 6.0	28.9 - 43.4
Rear axle housing × Differential carrier A/Y	53.9 - 78.5	5.5 - 8.0	39.8 - 57.9
Differential bearing adjusting lock nut × Bearing cap	3.9 - 9.8	0.4 - 1.0	2.9 - 7.2
Bearing cap × Differential carrier A/Y	68.6 - 88.3	7.0 - 9.0	50.6 - 65.1
Differential case S/A × Differential case cover	78.5 - 88.3	8.0 - 9.0	57.9 - 65.1
Drive pinion × Lock nut	186.0 - 226.0	19.0 - 23.0	137.0 - 166.0

WFE90-DF248