

SECTION **FFD**
FRONT FINAL DRIVE

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FFD

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PRECAUTIONS

PRECAUTIONS

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Precautions for Servicing Front Final Drive

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- Before starting diagnosis of the vehicle, understand the symptoms well. Perform correct and systematic operations.
- Check for the correct installation status prior to removal or disassembly. When matching marks are required, be certain they do not interfere with the function of the parts they are applied to.
- Overhaul should be done in a clean work area, a dust proof area is recommended.
- Before disassembly, completely remove sand and mud from the exterior of the unit, preventing them from entering into the unit during disassembly or assembly.
- Always use shop paper for cleaning the inside of components.
- Avoid using cotton gloves or a shop cloth to prevent the entering of lint.
- Check appearance of the disassembled parts for damage, deformation, and abnormal wear. Replace them with new ones if necessary.
- Gaskets, seals and O-rings should be replaced any time the unit is disassembled.
- Clean and flush the parts sufficiently and blow them dry.
- Be careful not to damage sliding surfaces and mating surfaces.
- When applying sealant, remove the old sealant from the mating surface; then remove any moisture, oil, and foreign materials from the application and mating surfaces.
- In principle, tighten nuts or bolts gradually in several steps working diagonally from inside to outside. If a tightening sequence is specified, observe it.
- During assembly, observe the specified tightening torque.
- Add new differential gear oil, petroleum jelly, or multi-purpose grease, as specified.

PREPARATION

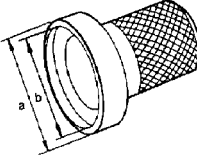
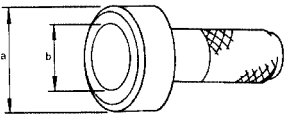
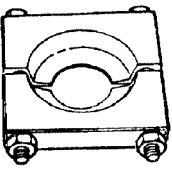
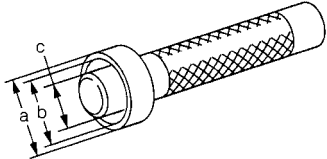
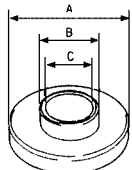
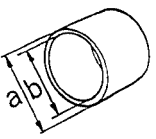
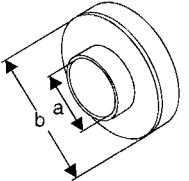
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PREPARATION

Special Service Tools

The actual shapes of Kent-Moore tools may differ from those of special service tools illustrated here.

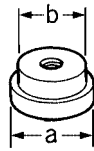
Tool number (Kent-Moore No.) Tool name	Description
ST35271000 (—) Drift	 <p>ZZA0702D</p> Installing drive pinion front bearing outer race. a: 72 mm (2.83 in) dia. b: 36 mm (1.42 in) dia.
KV38100500 (J-25273) Drift	 <p>ZZA0811D</p> Installing front oil seal. a: 80 mm (3.15 in) dia. b: 60 mm (2.36 in) dia.
ST30021000 (—) Puller	 <p>ZZA0700D</p> <ul style="list-style-type: none"> ● Removing side bearing inner race. ● Removing drive pinion rear bearing inner race.
KV38100300 (J-25523) Drift	 <p>ZZA1046D</p> Installing side bearing inner race. a: 54 mm (2.13 in) dia. b: 46 mm (1.81 in) dia. c: 32 mm (1.26 in) dia.
ST30901000 (—) Drift	 <p>SDIA0217J</p> Installing drive pinion rear bearing outer race. A: 79 mm (3.11 in) dia. B: 45 mm (1.77 in) dia. C: 35.2 mm (1.39 in) dia.
KV40104810 (—) Drift	 <p>ZZA1003D</p> Installing drive pinion front bearing outer race. a: 68 mm (2.68 in) dia. b: 55 mm (2.17 in) dia.
KV38102200 (—) Drift	 <p>NT660</p> Installing front oil seal. a: 90 mm (3.54 in) dia. b: 55.3 mm (2.18 in) dia.

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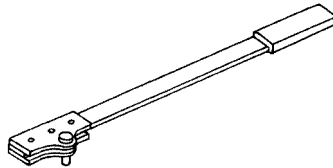
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PREPARATION

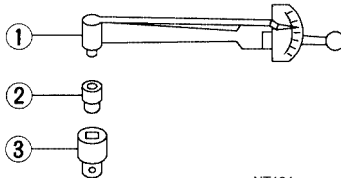
Tool number (Kent-Moore No.) Tool name	Description
ST33081000 (—) Adapter	Removing and installing side bearing inner race. a: 43 mm (1.69 in) dia. b: 33.5 mm (1.32 in) dia.
KV38108300 (J-44195) Companion flange wrench	Removing and installing drive pinion nut.
ST3127S000 (J-25765-A) Preload gauge 1. GG91030000 (J-25765) Torque wrench 2. HT62940000 (—) Socket adapter (1/2") 3. HT62900000 (—) Socket adapter (3/8")	Inspecting drive pinion bearing preload and total preload
— (C-4040) Installer	Installing drive pinion rear bearing inner race.
KV40105230 (—) Drift	Installing drive pinion rear bearing outer race. a: 92 mm (3.62 in) dia. b: 85.5 mm (3.37 in) dia.
— (C-4171) Handle	<ul style="list-style-type: none"> ● Removing drive pinion front bearing outer race ● Removing drive pinion rear bearing outer race



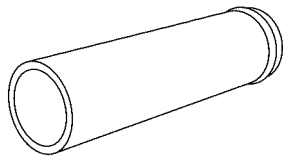
ZZA1000D



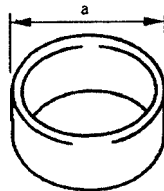
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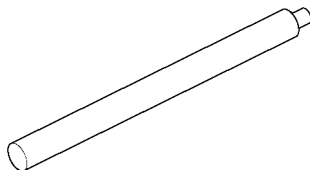
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SDIA2607E



ZZA0898D



LDIA0134E

PREPARATION

Tool number (Kent-Moore No.) Tool name	Description	
— (D-103) Remover	Removing drive pinion front bearing outer race	A B C
— (C-4307) Remover	Removing drive pinion rear bearing outer race	FFD E

Commercial Service Tools

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(Kent-Moore No.) Tool name	Description	
(SP8P) Slide hammer	<ul style="list-style-type: none"> ● Removing front oil seal ● Removing side oil seal 	G H I
Power tool	Loosening bolts and nuts	J K L M

NOISE, VIBRATION AND HARSHNESS (NVH) TROUBLESHOOTING

NOISE, VIBRATION AND HARSHNESS (NVH) TROUBLESHOOTING

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NVH Troubleshooting Chart

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Use the chart below to help you find the cause of the symptom. If necessary, repair or replace these parts.

Symptom		Possible cause and SUSPECTED PARTS											Reference page			
Noise		Gear tooth rough	Gear contact improper	Tooth surfaces worn	Incorrect backlash	Companion flange excessive runout	Gear oil improper	PROPELLER SHAFT	FRONT AXLE	FRONT SUSPENSION	TIRES	ROAD WHEEL	DRIVE SHAFT	BRAKES	STEERING	
		x	x	x	x	x	x	x	x	x	x	x	x	x	x	FFD-23 FFD-16 FFD-16 FFD-17 FFD-17 FFD-7 PR-3, "NVH Troubleshooting Chart" FAX-4, "NVH Troubleshooting Chart" FSU-4, "NVH Troubleshooting Chart" WT-4, "NVH Troubleshooting Chart" WT-4, "NVH Troubleshooting Chart" FAX-4, "NVH Troubleshooting Chart" BR-5, "NVH Troubleshooting Chart" PS-5, "NVH Troubleshooting Chart"

x: Applicable

DIFFERENTIAL GEAR OIL

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DIFFERENTIAL GEAR OIL

Changing Differential Gear Oil DRAINING

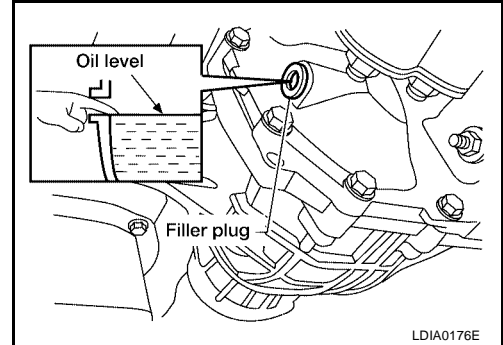
1. Stop the engine.
2. Remove the drain plug from the front final drive assembly to drain the differential gear oil.
3. Install the drain plug with sealant applied on the threads to the front final drive assembly. Tighten to the specified torque. Refer to [FFD-14, "COMPONENTS"](#).
 - Use High Performance Thread Sealant or equivalent. Refer to [GI-47, "Recommended Chemical Products and Sealants"](#).

FILLING

1. Remove the filler plug from the front final drive assembly.
2. Fill the front final drive assembly with new differential gear oil until the level reaches the specified level near the filler plug hole.

Differential gear oil grade and capacity : Refer to [MA-11, "Fluids and Lubricants"](#).

3. Install the filler plug with sealant applied on the threads to the front final drive assembly. Tighten to the specified torque. Refer to [FFD-14, "COMPONENTS"](#).
 - Use High Performance Thread Sealant or equivalent. Refer to [GI-47, "Recommended Chemical Products and Sealants"](#).



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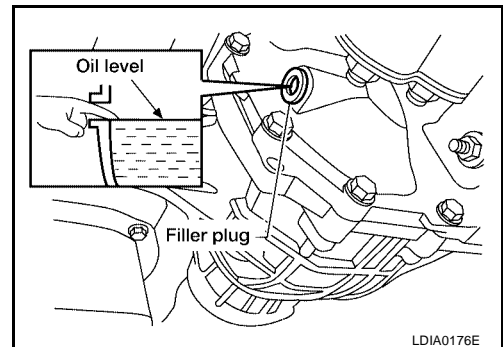
Checking Differential Gear Oil DIFFERENTIAL GEAR OIL LEAKAGE AND LEVEL

1. Make sure that differential gear oil is not leaking from the front final drive assembly or around it.
2. Check the differential gear oil level from the filler plug hole as shown.

CAUTION:

Do not start engine while checking differential gear oil level.

3. Install the filler plug with sealant applied on the threads to the front final drive assembly. Tighten to the specified torque. Refer to [FFD-14, "COMPONENTS"](#).
 - Use High Performance Thread Sealant or equivalent. Refer to [GI-47, "Recommended Chemical Products and Sealants"](#).



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FRONT OIL SEAL

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FRONT OIL SEAL

Removal and Installation REMOVAL

1. Remove the drive shafts from the front final drive assembly. Refer to [FAX-7, "Removal and Installation"](#) .
2. Remove the front propeller shaft from the front final drive assembly. Refer to [PR-4, "Removal and Installation"](#) .
3. Measure the total preload torque. Refer to [FFD-15, "Total Preload Torque"](#) .

NOTE:

Record the total preload torque measurement.

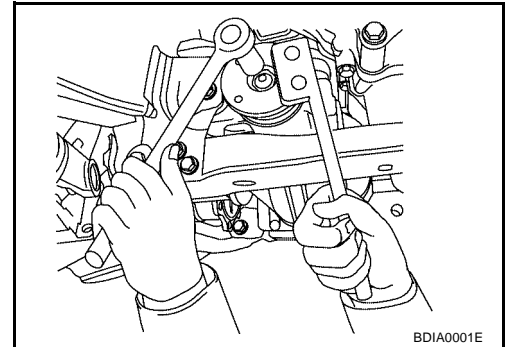
4. Remove the drive pinion lock nut using Tool.

Tool number : KV38108300 (—)

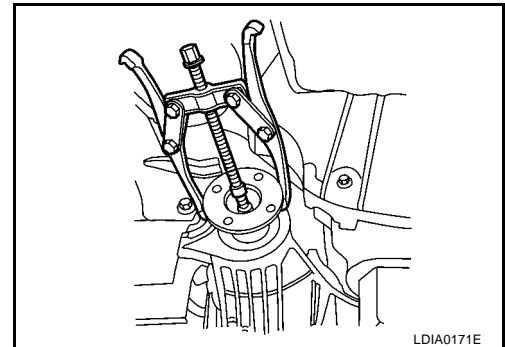
5. Put matching marks on the companion flange and drive pinion using paint.

CAUTION:

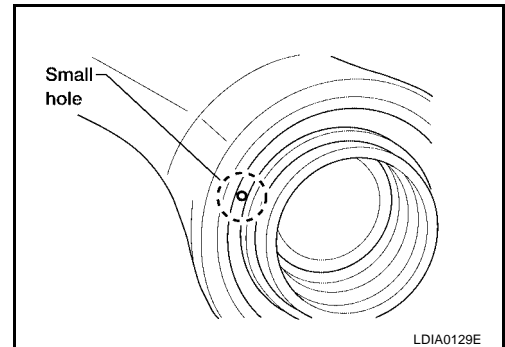
Use paint to make the matching marks. Do not damage the companion flange or drive pinion.



6. Remove companion flange using suitable tool.

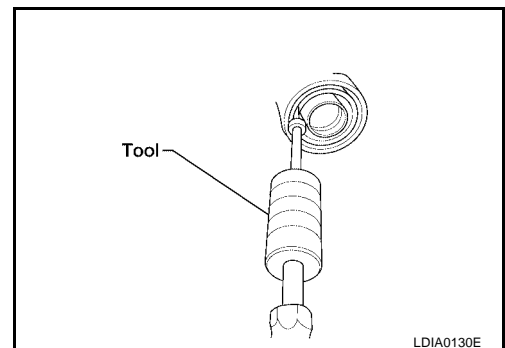


7. Place a small hole in the front oil seal case using suitable tool.



8. Remove the front oil seal using Tool as shown.

Tool number : SP8P



SIDE OIL SEAL

SIDE OIL SEAL

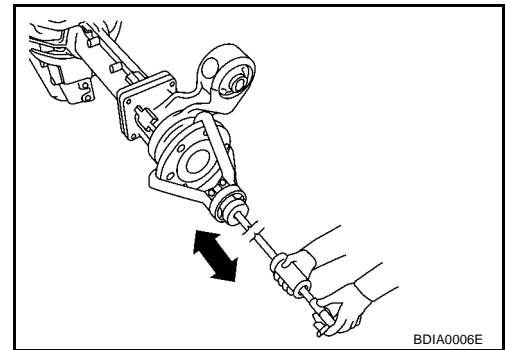
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Removal and Installation

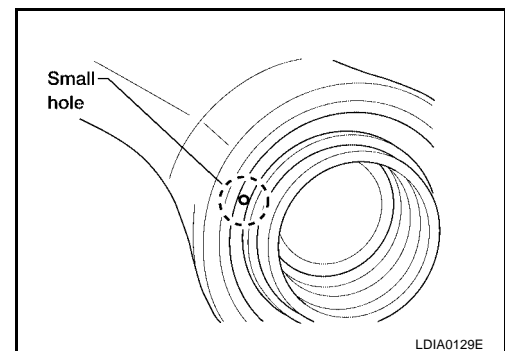
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REMOVAL

1. Remove the front final drive assembly. Refer to [FFD-12, "REMOVAL"](#).
2. Remove the differential side shaft and differential side flange using suitable tool.

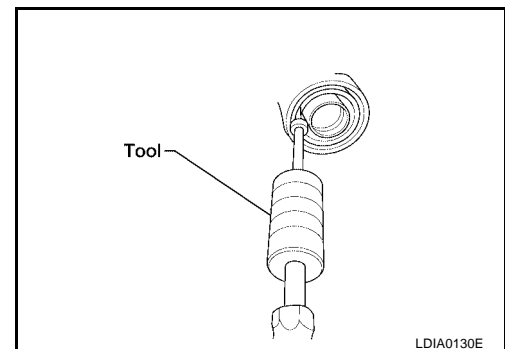


3. Place a small hole in the side oil seal case using suitable tool.



4. Remove the side oil seal using Tool as shown.

Tool number : **SP8P**



INSTALLATION

1. Apply multi-purpose grease to the lips of the new side oil seal. Then drive the new side oil seal in evenly to the gear carrier using suitable tool.

CAUTION:

- Do not reuse side oil seal.
- Do not incline the new side oil seal when installing.
- Apply multi-purpose grease to the lips of the new side oil seal.

2. Installation of the remaining components is in the reverse order of removal.

CAUTION:

Check the differential gear oil level after installation. Refer to [FFD-7, "DIFFERENTIAL GEAR OIL"](#).

CARRIER COVER

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CARRIER COVER

Removal and Installation

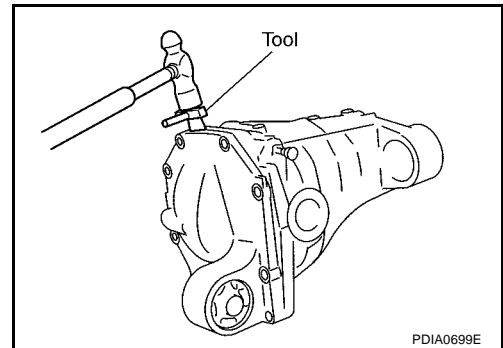
REMOVAL

1. Remove the front final drive assembly. Refer to [FFD-12, "Removal and Installation"](#) .
2. Remove the carrier cover bolts and separate the carrier cover from the gear carrier using Tool.

Tool number : KV10111100 (J-37228)

CAUTION:

- Do not damage the mating surface.
- Do not insert flat-bladed screwdriver, this will damage the mating surface.



INSTALLATION

1. Apply 3 mm (0.12 in) bead of sealant to the mating surface of the carrier cover as shown.

- Use Genuine Silicone RTV or equivalent. Refer to [GI-47, "Recommended Chemical Products and Sealants"](#) .

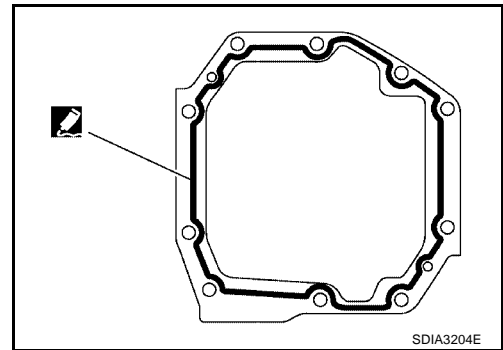
CAUTION:

Remove any old sealant adhering to the mating surfaces. Also remove any moisture, oil, or foreign material adhering to the application and mating surfaces.

2. Install the carrier cover to the gear carrier. Tighten the bolts to the specified torque. Refer to [FFD-14, "COMPONENTS"](#) .
3. Install the front final drive assembly. Refer to [FFD-12, "Removal and Installation"](#) .

CAUTION:

Fill the front final drive assembly with recommended differential gear oil. Refer to [FFD-7, "DIFFERENTIAL GEAR OIL"](#) .



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FRONT FINAL DRIVE ASSEMBLY

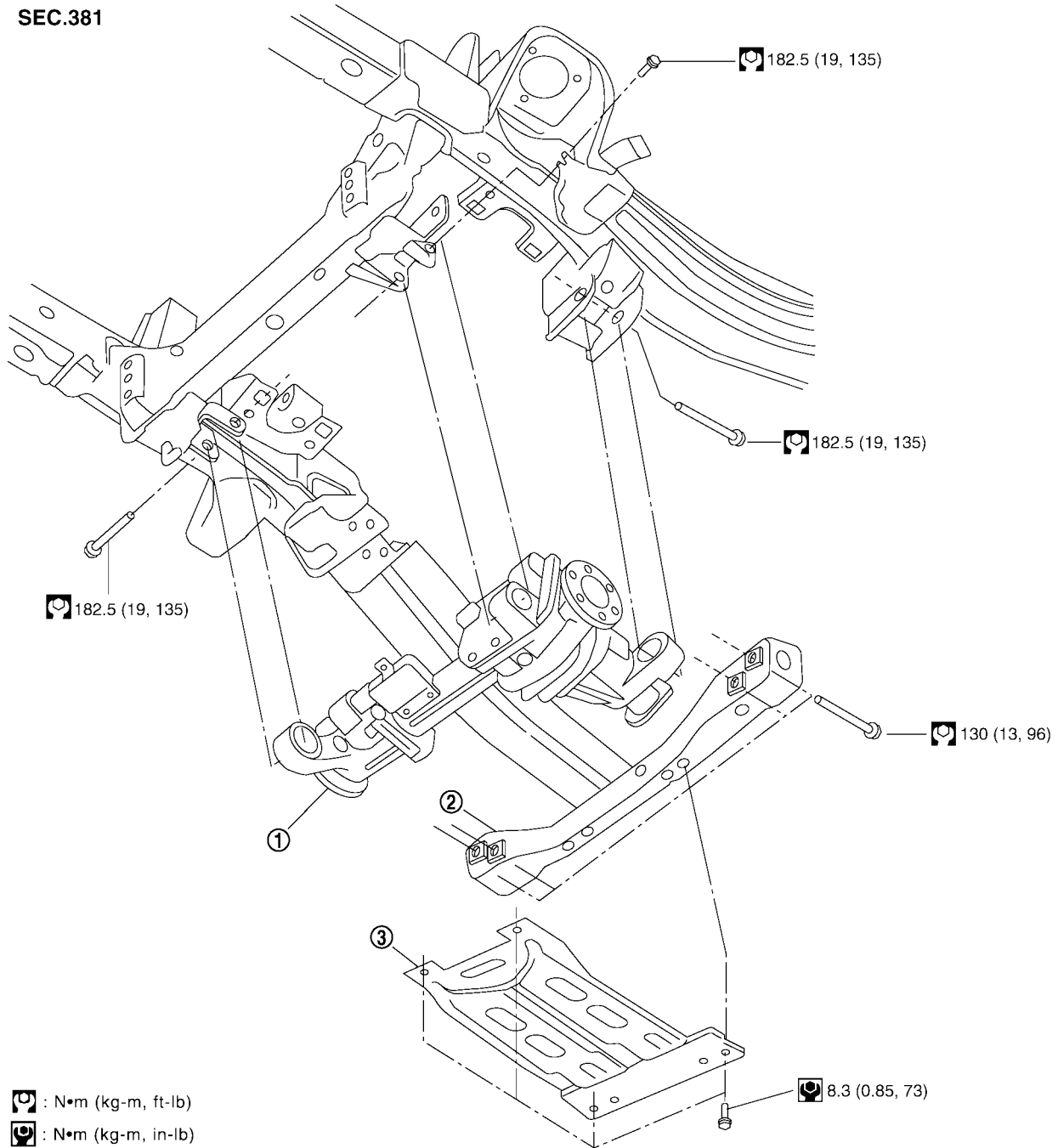
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FRONT FINAL DRIVE ASSEMBLY

Removal and Installation

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1. Front final drive assembly 2. Front cross member 3. Skid plate (if equipped)

REMOVAL

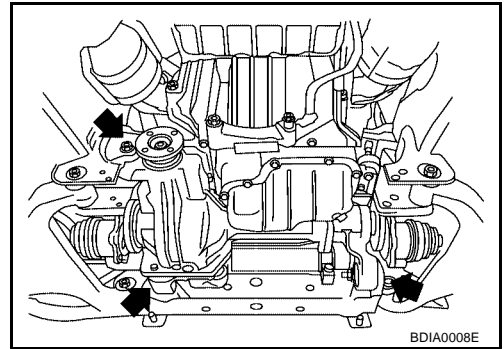
1. Drain the differential gear oil. Refer to [FFD-7, "DIFFERENTIAL GEAR OIL"](#).
2. Remove the drive shafts from the front final drive assembly. Refer to [FAX-7, "Removal and Installation"](#).
3. Remove the front cross member.
4. Remove the front propeller shaft from the front final drive assembly. Refer to [PR-4, "Removal and Installation"](#).
5. Disconnect the vent hose from the front final drive assembly.
6. Support the front final drive assembly using a suitable jack.

FRONT FINAL DRIVE ASSEMBLY

- Remove the front final drive assembly bolts, then remove the front final drive assembly.

CAUTION:

Support the front final drive assembly while removing using a suitable jack.



INSTALLATION

Installation is in the reverse order of removal.

CAUTION:

- Make sure there are no pinched or restricted areas on the breather hose caused by folding or bending when installing it.
- Fill the front final drive assembly with differential gear oil after installation. Refer to [FFD-7, "DIFFERENTIAL GEAR OIL"](#).

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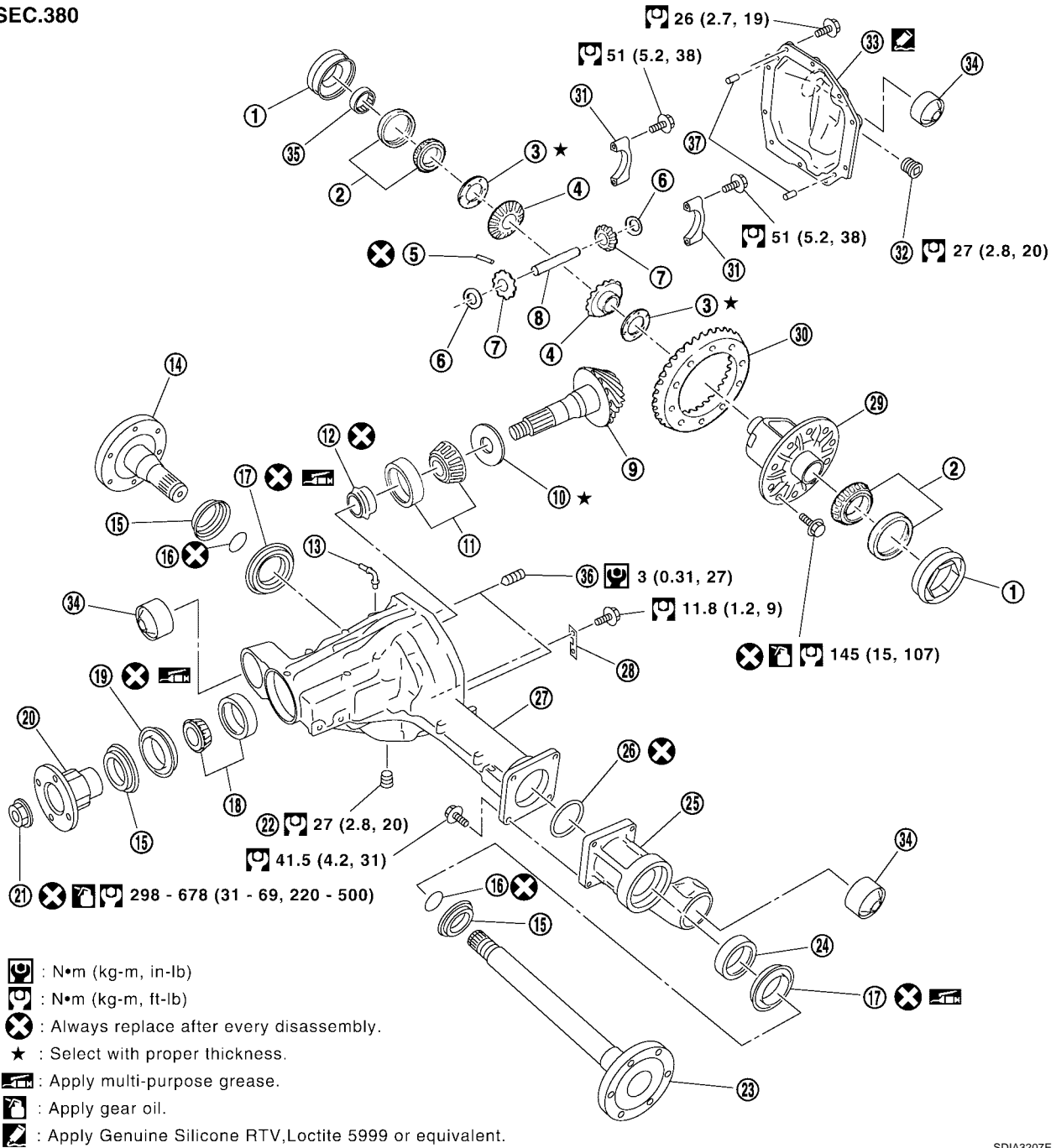
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FRONT FINAL DRIVE ASSEMBLY

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Disassembly and Assembly COMPONENTS

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- | | | |
|--|-------------------------------|-------------------------------------|
| 1. Side bearing adjuster | 2. Side bearing | 3. Side gear thrust washer |
| 4. Side gear | 5. Lock pin | 6. Pinion mate thrust washer |
| 7. Pinion mate gear | 8. Pinion mate shaft | 9. Drive pinion |
| 10. Drive pinion height adjusting washer | 11. Drive pinion rear bearing | 12. Collapsible spacer |
| 13. Breather tube | 14. Differential side flange | 15. Dust shield |
| 16. Circular clip | 17. Side oil seal | 18. Drive pinion front bearing |
| 19. Front oil seal | 20. Companion flange | 21. Drive pinion lock nut |
| 22. Drain plug | 23. Differential side shaft | 24. Differential side shaft bearing |
| 25. Extension tube | 26. O-ring | 27. Gear carrier |
| 28. Plate | 29. Differential case | 30. Drive gear |
| 31. Side bearing cap | 32. Filler plug | 33. Carrier cover |

FRONT FINAL DRIVE ASSEMBLY

34. Bushing

35. Bearing

36. Screw

37. Dowel pin

ASSEMBLY INSPECTION AND ADJUSTMENT

- Drain the differential gear oil before inspection and adjustment. Refer to [FFD-7, "DIFFERENTIAL GEAR OIL"](#).
- Remove and install the carrier cover as necessary for inspection and adjustment. Refer to [FFD-11, "CARRIER COVER"](#).

Total Preload Torque

1. Install the differential side shaft and differential side flange if necessary.

CAUTION:

The differential side shaft and differential side flange must be installed in order to measure total preload torque.

2. Rotate the drive pinion back and forth 2 to 3 times to check for unusual noise and rotation malfunction.
3. Rotate the drive pinion at least 20 times to check for smooth operation of the bearings.
4. Measure total preload torque using Tool.

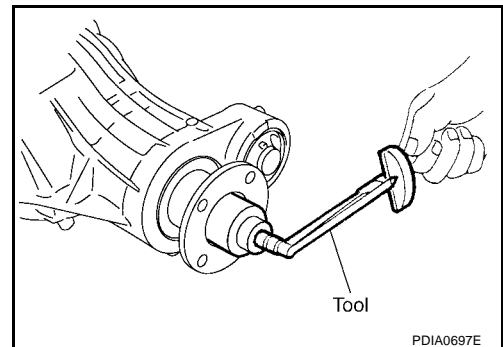
Tool number : ST3127S000 (J-25765-A)

Total preload torque:

2.98 - 4.76 N·m (0.31 - 0.48 kg·m, 27 - 42 in·lb)

NOTE:

Total preload torque = Drive pinion bearing preload torque + Side bearing preload torque



- If the measured value is out of the specification, check and adjust each part. Adjust the drive pinion bearing preload torque first, then adjust the side bearing preload torque.

If the total preload torque is greater than specification

On drive pinion bearings: Replace the collapsible spacer.

On side bearings: Loosen the side bearing adjuster by the same amount on each side.

If the total preload torque is less than specification

On drive pinion bearings: Tighten the drive pinion lock nut.

On side bearings: Tighten the side bearing adjuster by the same amount on each side.

Drive Gear Runout

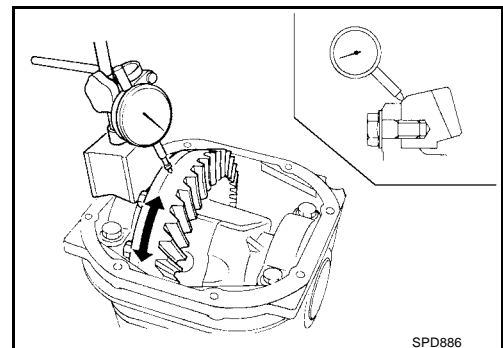
1. Fit a dial indicator to the drive gear back face.
2. Rotate the drive gear to measure runout.

Runout limit: 0.08 mm (0.0031 in) or less

- If the runout is outside of the limit, check the condition of the drive gear assembly. Foreign material may be caught between the drive gear and differential case, or the differential case or drive gear may be deformed.

CAUTION:

Replace drive gear and drive pinion as a set.



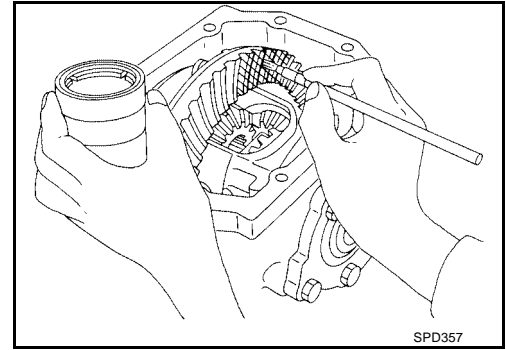
FRONT FINAL DRIVE ASSEMBLY

Tooth Contact

1. Apply red lead to the drive gear.

NOTE:

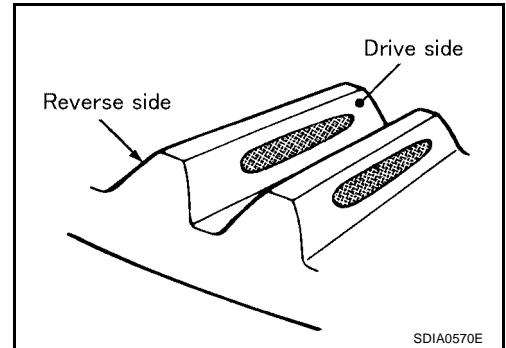
Apply red lead to both faces of three to four gears, at four locations evenly spaced on the drive gear.



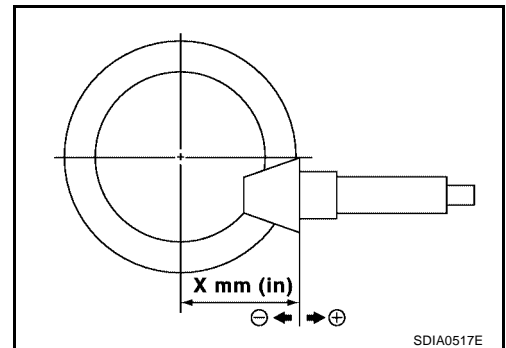
2. Rotate the drive gear back and forth several times. Then check for correct drive pinion to drive gear tooth contact as shown.

CAUTION:

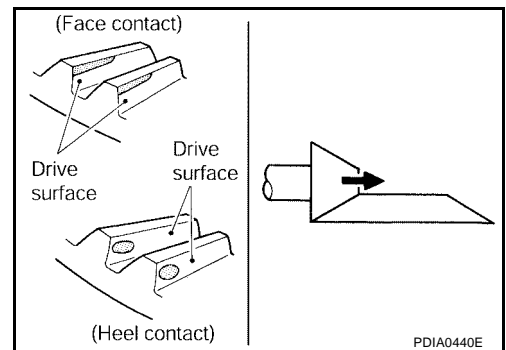
Check tooth contact on drive side and reverse side.



3. If the tooth contact is improperly adjusted, follow the procedure below to adjust the drive pinion height (dimension X).

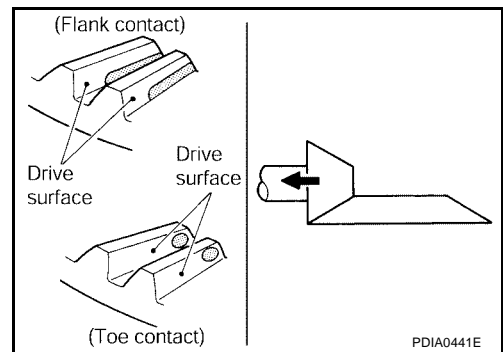


- If the tooth contact is near the face (face contact), or near the heel (heel contact), use a thicker drive pinion height adjusting washer to move drive pinion closer to the drive gear. Refer to [FFD-32, "Drive Pinion Height Adjusting Washer"](#).



FRONT FINAL DRIVE ASSEMBLY

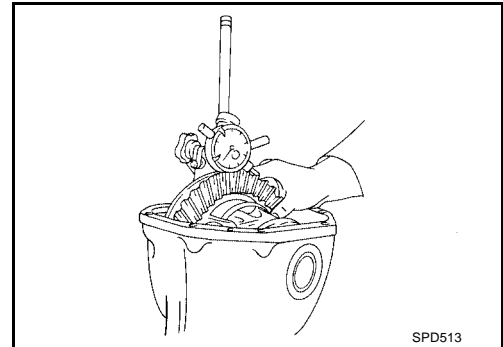
- If the tooth contact is near the flank (flank contact), or near the toe (toe contact), use a thinner drive pinion height adjusting washer to move the drive pinion farther from the drive gear. Refer to [FFD-32, "Drive Pinion Height Adjusting Washer"](#).



Backlash

1. Fit a dial indicator to the drive gear face to measure the backlash.

Backlash: 0.13 - 0.18 mm (0.0051 - 0.0071 in)



- If the backlash is outside of the specification, adjust each side bearing adjuster.

If the backlash is greater than specification:

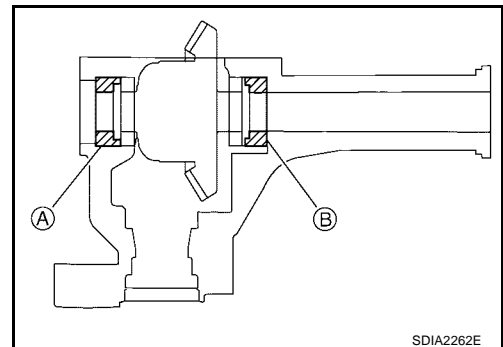
Loosen side bearing adjuster A and tighten side bearing adjuster B by the same amount.

If the backlash is less than specification:

Loosen side bearing adjuster B and tighten side bearing adjuster A by the same amount.

CAUTION:

Do not change the side bearing adjusters by different amounts as it will change the side bearing preload torque.



Companion Flange Runout

1. Rotate companion flange and check for runout on the companion flange face (inner side of the bolt holes) and companion flange inner side (socket diameter) using suitable tool.

Runout limit

Companion flange face: 0.10 mm (0.0039 in)

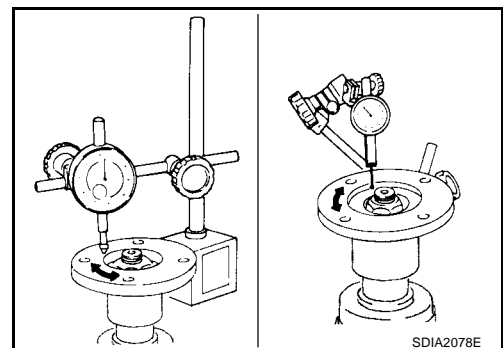
Companion flange inner side: 0.13 mm (0.0051 in)

2. If the runout is outside the runout limit, follow the procedure below to adjust.

- a. Rotate the companion flange on the drive pinion by 90°, 180° and 270° while checking for the position where the runout is minimum.

- b. If the runout is still outside of the runout limit after the companion flange has been rotated on the drive pinion, possible cause could be an assembly malfunction of drive pinion and drive pinion bearing or a malfunctioning drive pinion bearing.

- c. If the runout is still outside of the runout limit after repair of the assembly of drive pinion and drive pinion bearing or drive pinion bearing, replace the companion flange.

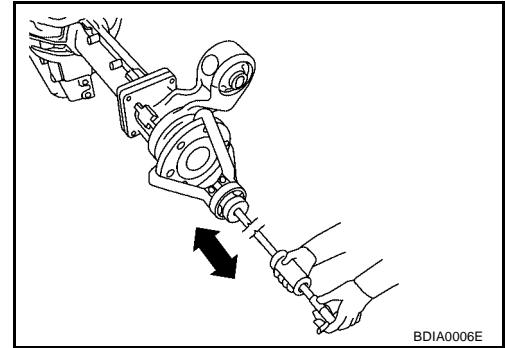


FRONT FINAL DRIVE ASSEMBLY

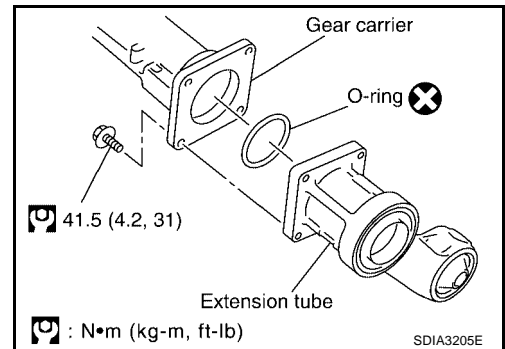
DISASSEMBLY

Differential Assembly

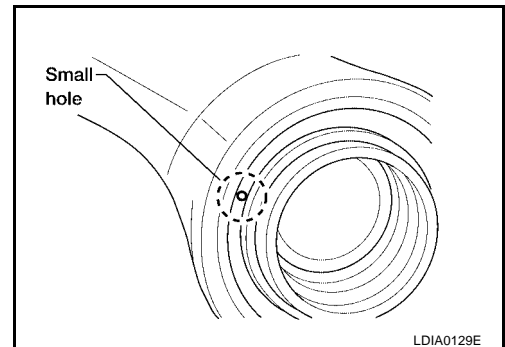
1. Drain the differential gear oil if necessary.
2. Remove the differential side shaft and differential side flange using suitable tool.



3. Remove the extension tube and O-ring from the gear carrier.

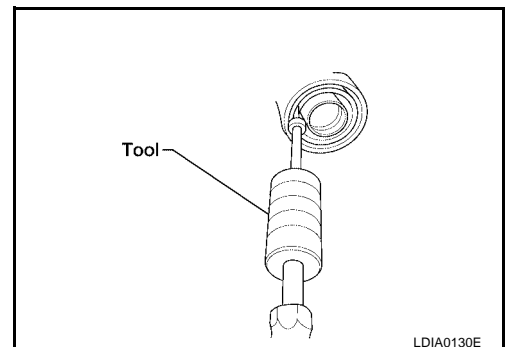


4. Place a small hole in the side oil seal case using suitable tool.



5. Remove the side oil seal using Tool as shown.

Tool number : SP8P



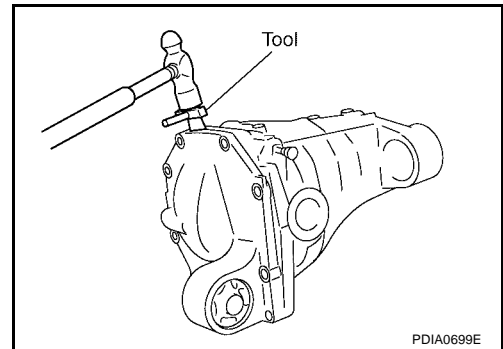
FRONT FINAL DRIVE ASSEMBLY

6. Remove the carrier cover bolts and separate the carrier cover from the gear carrier using Tool.

Tool number : KV10111100 (J-37228)

CAUTION:

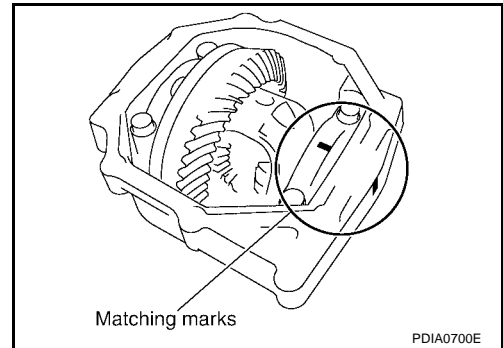
- Do not damage the mating surface.
- Do not insert flat-bladed screwdriver, this will damage the mating surface.



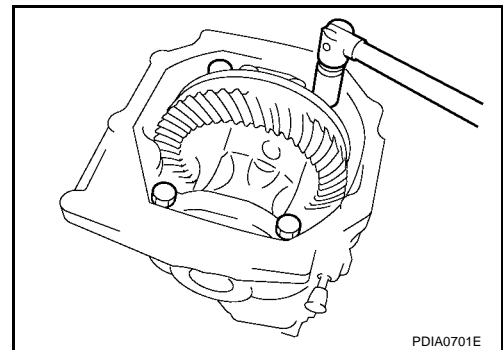
7. For proper reinstallation, paint matching marks on one side of the side bearing cap and gear carrier.

CAUTION:

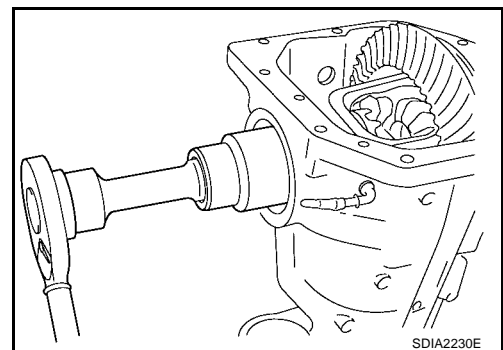
- For matching marks, use paint. Do not damage side bearing cap or gear carrier.
- Side bearing caps are line-board during manufacture. The matching marks are used to reinstall them in their original positions.



8. Remove the side bearing caps.



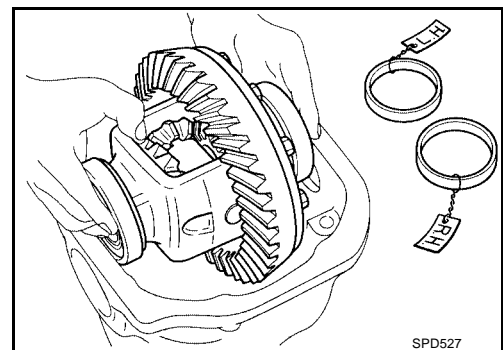
9. Remove the side bearing adjuster.



10. Lift the differential case assembly out of the gear carrier.

CAUTION:

Keep side bearing outer races together with side bearing inner races. Do not mix them up.



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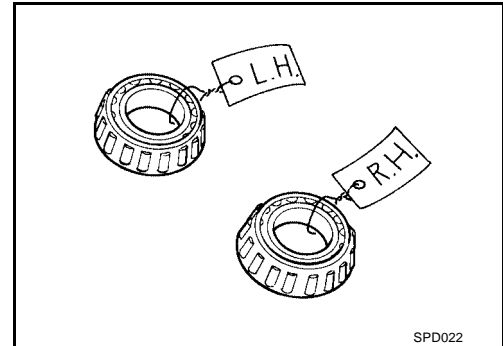
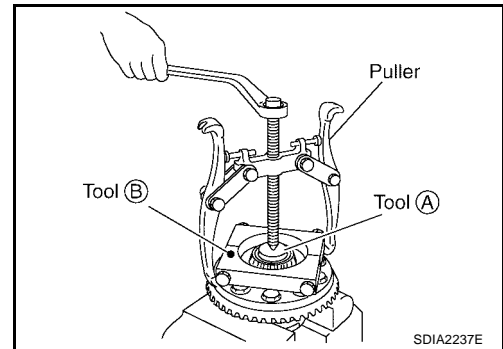
FRONT FINAL DRIVE ASSEMBLY

11. Remove side bearing inner race using Tools as shown.

Tool number **A: ST33081000 (—)**
 B: ST30021000 (—)

CAUTION:

- Do not remove side bearing inner race unless it is being replaced.
- Place copper plates between the vise and the side bearing inner race and drive gear to prevent damage.
- Engage puller jaws in groove to prevent damage to bearing.
- Keep side bearing outer races together with side bearing inner races. Do not mix them up.



12. For proper reinstallation, paint matching marks on the differential case and drive gear.

CAUTION:

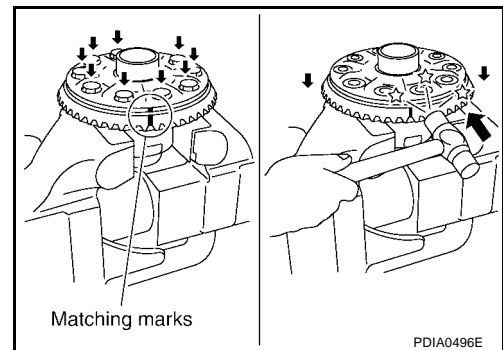
Use paint for matching marks. Do not damage differential case or drive gear.

13. Remove the drive gear bolts.

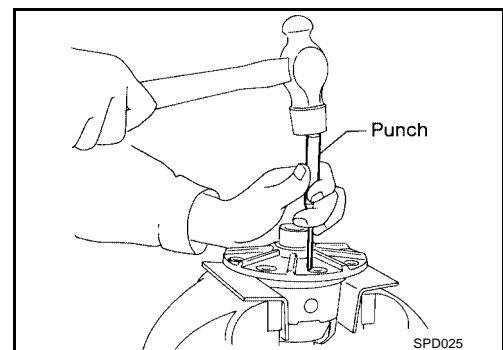
14. Tap the drive gear off the differential case using suitable tool.

CAUTION:

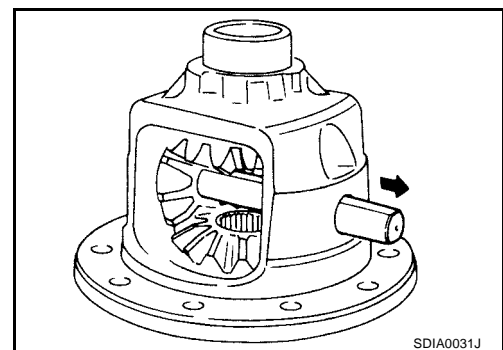
Tap evenly all around to keep drive gear from bending.



15. Remove the lock pin of the pinion mate shaft from the drive gear side using suitable tool.

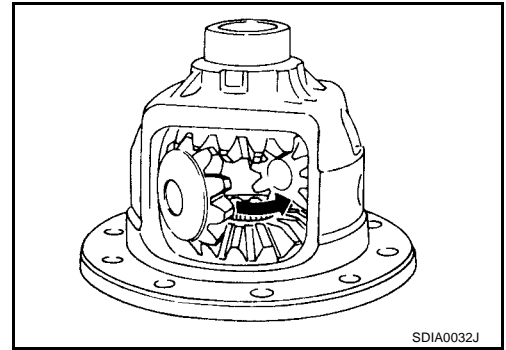


16. Remove the pinion mate shaft.



FRONT FINAL DRIVE ASSEMBLY

17. Turn the pinion mate gear, then remove the pinion mate gear, pinion mate thrust washer, side gear and side gear thrust washer from the differential case.



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Drive Pinion Assembly

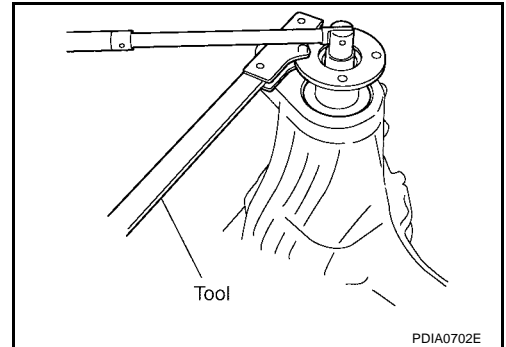
1. Remove the differential assembly. Refer to [FFD-18, "Differential Assembly"](#).
2. Remove the drive pinion lock nut using Tool.

Tool number : KV38108300 (J-44195)

3. Put matching marks on the companion flange and drive pinion using paint.

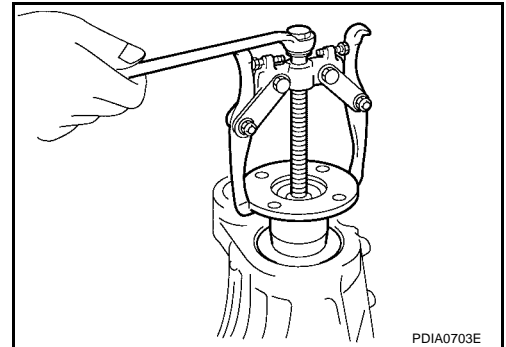
CAUTION:

Use paint to make the matching marks. Do not damage the companion flange or drive pinion.



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4. Remove the companion flange using suitable tool.

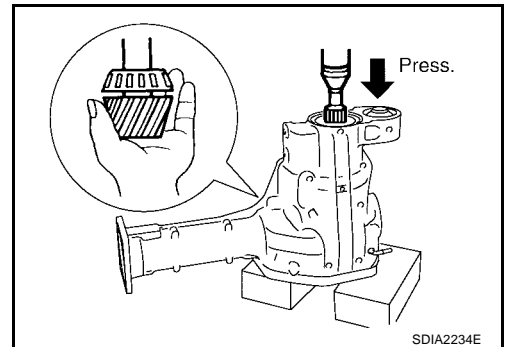


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5. Press the drive pinion assembly (with rear inner bearing race and collapsible spacer) out of the gear carrier.

CAUTION:

Do not drop drive pinion assembly.

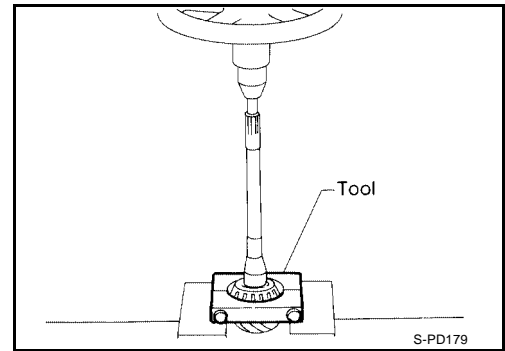


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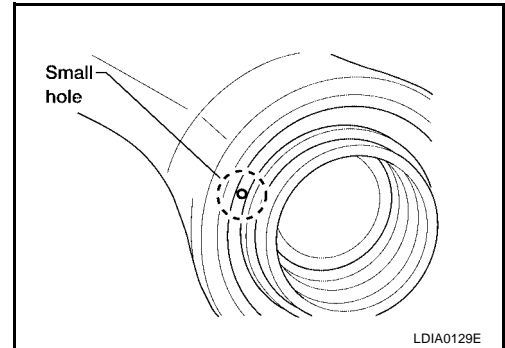
FRONT FINAL DRIVE ASSEMBLY

6. Remove the drive pinion rear bearing inner race and drive pinion height adjusting washer using Tool.

Tool number : ST30021000 (—)

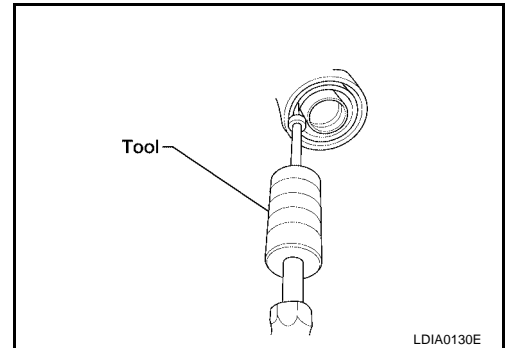


7. Place a small hole in the front oil seal case using suitable tool.



8. Remove the front oil seal using Tool as shown.

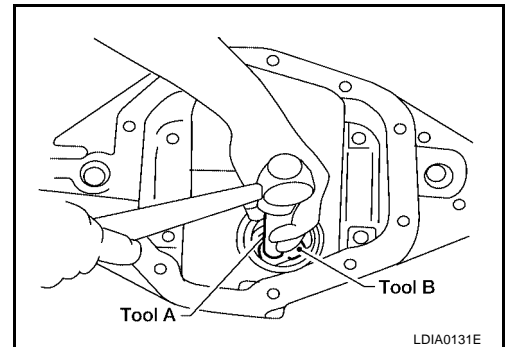
Tool number : SP8P



9. Remove the drive pinion front bearing inner race.
10. Remove the drive pinion front bearing outer race using Tool as shown. Locate the driver on the back edge of the drive pinion front bearing outer race, then drive the drive pinion front bearing outer race out.

Tool number **A: C-4171**
 B: D-103

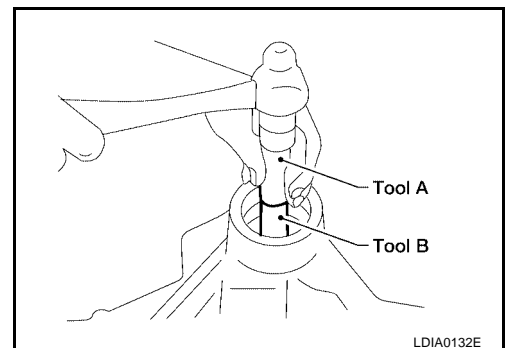
CAUTION:
Do not damage gear carrier.



11. Remove the drive pinion rear bearing outer race using Tool as shown. Locate the driver on the back edge of the drive pinion rear bearing outer race, then drive the drive pinion rear bearing outer race out.

Tool number **A: C-4171**
 B: C-4307

CAUTION:
Do not damage gear carrier.



FRONT FINAL DRIVE ASSEMBLY

INSPECTION AFTER DISASSEMBLY

Clean the disassembled parts. Then inspect the parts for wear or damage. If wear or damage are found, follow the measures below.

Drive Pinion and Drive Gear

- If the drive pinion and drive gear teeth do not mesh or line-up correctly, determine the cause and adjust, repair, or replace as necessary.
- If the drive pinion or drive gear are worn, cracked, damaged, pitted or chipped (by friction) noticeably, replace with new drive pinion and drive gear.
- Drive pinion and drive gear are supplied in matched sets only. Matching numbers on both drive pinion and drive gear are etched for verification. If a new drive pinion and drive gear set are being used, verify the numbers of each drive pinion and drive gear before proceeding with assembly.

Bearing

- If bearings are chipped (by friction), pitted, worn, rusted, scratched, or unusual noise is coming from bearing, replace with new bearing assembly (as a new set).
- Bearing must be replaced with a new one whenever disassembled.

Side Gear and Pinion Mate Gear

- If any cracks or damage are found on the surface of the teeth, replace with new one.
- If any worn or chipped marks are found on the side of the side gear and pinion mate gear which contact the thrust washer, replace with new one.
- Replace both side gear and pinion mate gear as a set when replacing side gear or pinion mate gear.

Side Gear Thrust Washer and Pinion Mate Thrust Washer

- If any chips (by friction), damage, or unusual wear are found, replace with new one.

Gear Carrier

- If any wear or cracks are found on the contact sides of gear carrier, replace with new one.

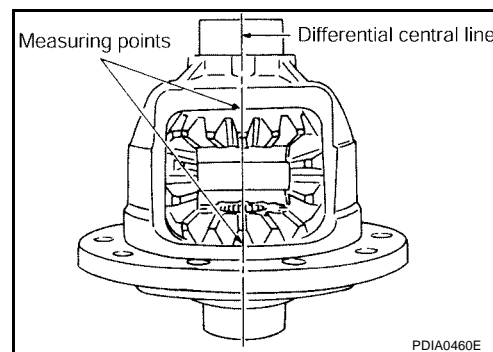
Companion Flange

- If any chips (about 0.1mm, 0.004 in) or other damage on the companion flange surface which contacts the front oil seal lips are found, replace with new one.

ADJUSTING AND SELECTING WASHERS

Side Gear Back Clearance

- Assemble the differential parts if they are disassembled. Refer to [FFD-27, "Differential Assembly"](#).
1. Place the differential case straight up so that the side gear to be measured is upward.



FRONT FINAL DRIVE ASSEMBLY

2. Using feeler gauges, measure the clearance between the side gear back and differential case at three different points, while rotating the side gear. Average the three readings to calculate the clearance. (Measure the clearance of the other side as well.)

Side gear back clearance: 0.20 mm (0.0079 in) or less

- If the side gear back clearance is outside of the specification, use a thicker or thinner side gear thrust washer to adjust. Refer to [FFD-32, "Side Gear Thrust Washer"](#).

If the side gear back clearance is greater than specification:

Use a thicker side gear thrust washer.

If the side gear back clearance is less than specification:

Use a thinner side gear thrust washer.

CAUTION:

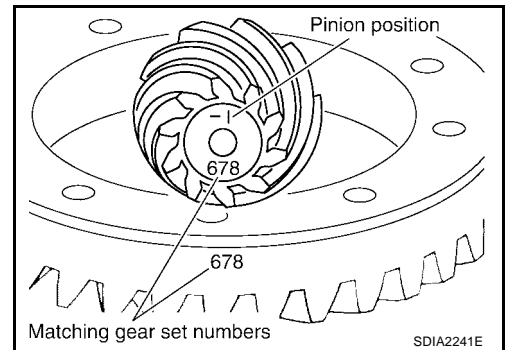
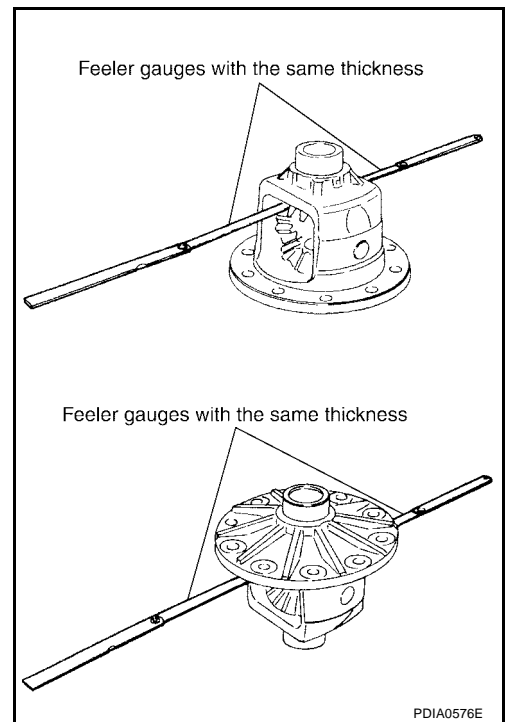
- Insert feeler gauges with the same thickness on both sides to prevent side gear from tilting.
- Each gear should rotate smoothly without excessive resistance during differential motion.
- Select a side gear thrust washer for right and left individually.

NOTE:

Side gear back clearance is clearance between side gear and differential case for adjusting side gear backlash.

Drive Pinion Height

- Drive gear and drive pinion are supplied in matched sets only. Matching numbers on both drive pinion and drive gear are etched for verification. If a new gear set is being used, verify the numbers of each drive pinion and drive gear before proceeding with assembly.



- The mounting distance from the centerline of the drive gear to the back face of the drive pinion for the M205 final drive assembly is 103.5 mm (4.0748 inches).
On the button end of each drive pinion, there is etched a plus (+) number, a minus (-) number, or a zero (0), which indicates the best running position for each particular gear set. This dimension is controlled by a selective drive pinion height adjusting washer between the drive pinion rear bearing inner race and drive pinion.
For example: If a drive pinion is etched m+8 (+3), it would require 0.08 mm (0.003 inch) less drive pinion height adjusting washer than a drive pinion etched "0". This means decreasing drive pinion height adjusting washer thickness; increases the mounting distance of the drive pinion to 103.6 mm (4.0778 inches). If a drive pinion is etched m-8 (-3), it would require adding 0.08mm (0.003 inch) more to the drive pinion height adjusting washer than would be required if the drive pinion were etched "0". By adding 0.08 mm (0.003 inch), the mounting distance of the drive pinion was decreased to 103.4 mm (4.0718 inches) which is just what a m-8 (-3) etching indicated.
- To change the drive pinion height, use different drive pinion height adjusting washers which come in different thickness.
- Use the following tables as a guide for selecting the correct drive pinion height adjusting washer thickness to add or subtract from the old drive pinion height adjusting washer.

FRONT FINAL DRIVE ASSEMBLY

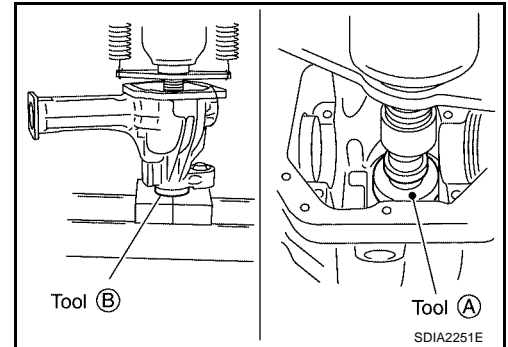
OLD DRIVE PINION MARKING	NEW DRIVE PINION MARKING mm (in)								
	-10 (-4)	-8 (-3)	-5 (-2)	-3 (-1)	0 (0)	+3 (+1)	+5 (+2)	+8 (+3)	+10 (+4)
+10 (+4)	+0.20 (+0.008)	+0.18 (+0.007)	+0.15 (+0.006)	+0.13 (+0.005)	+0.10 (+0.004)	+0.08 (+0.003)	+0.05 (+0.002)	+0.02 (+0.001)	0 (0)
+8 (+3)	+0.18 (+0.007)	+0.15 (+0.006)	+0.13 (+0.005)	+0.10 (+0.004)	+0.08 (+0.003)	+0.05 (+0.002)	+0.02 (+0.001)	0 (0)	-0.02 (-0.001)
+5 (+2)	+0.15 (+0.006)	+0.13 (+0.005)	+0.10 (+0.004)	+0.08 (+0.003)	+0.05 (+0.002)	+0.02 (+0.001)	0 (0)	-0.02 (-0.001)	-0.05 (-0.002)
+3 (+1)	+0.13 (+0.005)	+0.10 (+0.004)	+0.08 (+0.003)	+0.05 (+0.002)	+0.02 (+0.001)	0 (0)	-0.02 (-0.001)	-0.05 (-0.002)	-0.08 (-0.003)
0 (0)	+0.10 (+0.004)	+0.08 (+0.003)	+0.05 (+0.002)	+0.02 (+0.001)	0 (0)	-0.02 (-0.001)	-0.05 (-0.002)	-0.08 (-0.003)	-0.10 (-0.004)
-3 (-1)	+0.08 (+0.003)	+0.05 (+0.002)	+0.02 (+0.001)	0 (0)	-0.02 (-0.001)	-0.05 (-0.002)	-0.08 (-0.003)	-0.10 (-0.004)	-0.13 (-0.005)
-5 (-2)	+0.05 (+0.002)	+0.02 (+0.001)	0 (0)	-0.02 (-0.001)	-0.05 (-0.002)	-0.08 (-0.003)	-0.10 (-0.004)	-0.13 (-0.005)	-0.15 (-0.006)
-8 (-3)	+0.02 (+0.001)	0 (0)	-0.02 (-0.001)	-0.05 (-0.002)	-0.08 (-0.003)	-0.10 (-0.004)	-0.13 (-0.005)	-0.15 (-0.006)	-0.18 (-0.007)
-10 (-4)	0 (0)	-0.02 (-0.001)	-0.05 (-0.002)	-0.08 (-0.003)	-0.10 (-0.004)	-0.13 (-0.005)	-0.15 (-0.006)	-0.18 (-0.007)	-0.20 (-0.008)

ASSEMBLY

Drive Pinion Assembly

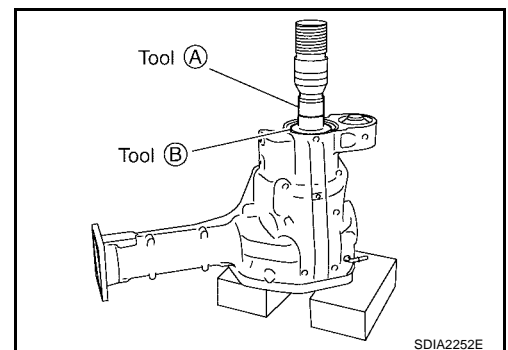
1. Install drive pinion rear bearing outer race using Tools.

Tool number **A: ST30901000**
 B: KV40105230



2. Install drive pinion front bearing outer race using Tools.

Tool number **A: ST35271000**
 B: KV40104810



3. Select drive pinion height adjusting washer. Refer to [FFD-24, "Drive Pinion Height"](#).

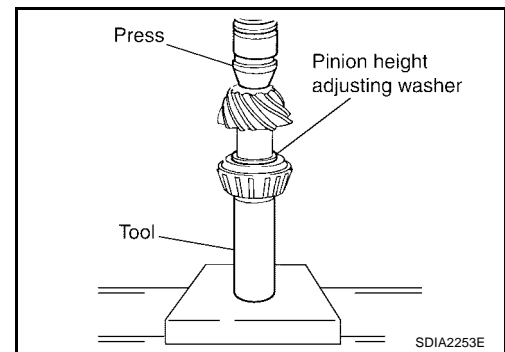
FRONT FINAL DRIVE ASSEMBLY

4. Install the selected drive pinion height adjusting washer to the drive pinion. Press the drive pinion rear bearing inner race to it using Tool.

Tool number : C-4040

CAUTION:

Do not reuse drive pinion rear bearing inner race.



5. Install the collapsible spacer to the drive pinion.

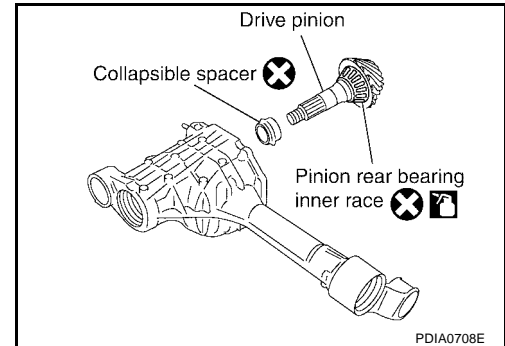
CAUTION:

Do not reuse collapsible spacer.

6. Apply differential gear oil to the drive pinion rear bearing, and install the drive pinion assembly to the gear carrier.
7. Apply differential gear oil to the drive pinion front bearing, and install the drive pinion front bearing inner race to the drive pinion assembly.

CAUTION:

Do not reuse drive pinion front bearing inner race.



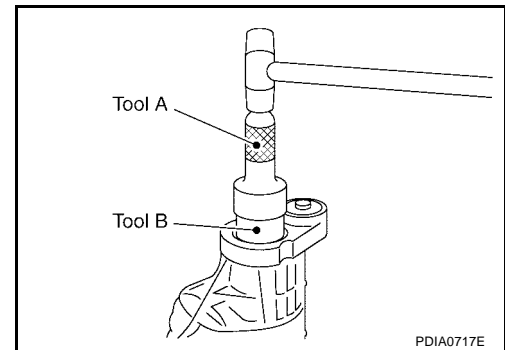
8. Apply multi-purpose grease to the lips of the new front oil seal. Then drive the new front oil seal in evenly using Tools.

Tool number A: KV38100500 (J-25273)

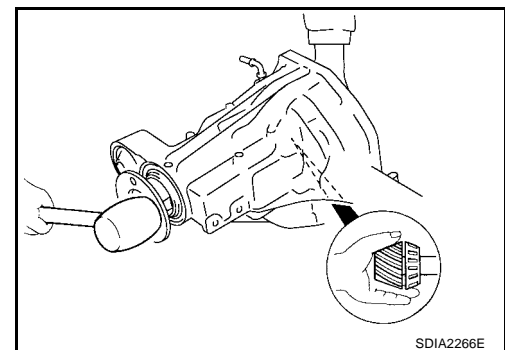
B: KV38102200 (—)

CAUTION:

- Do not reuse front oil seal.
- Do not incline the new front oil seal when installing.
- Apply multi-purpose grease to the lips of the new front oil seal.



9. Install the companion flange to the drive pinion while aligning the matching marks. Tap the companion flange until fully seated using suitable tool.



FRONT FINAL DRIVE ASSEMBLY

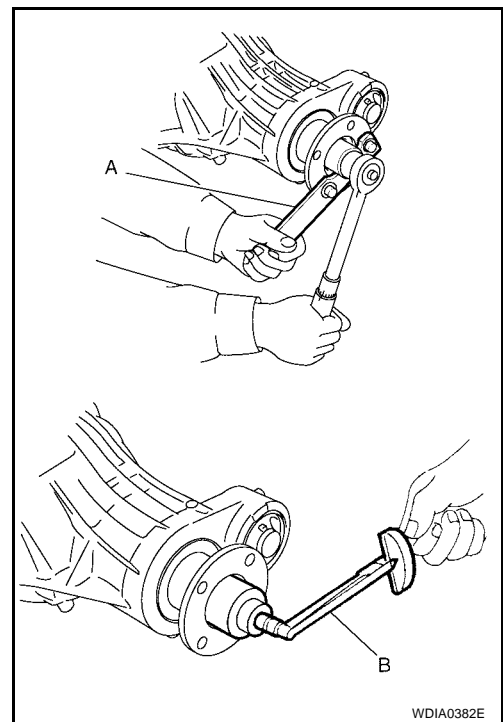
10. Apply anti-corrosive oil to the threads of the drive pinion and the seating surface of the new drive pinion lock nut. Then adjust the drive pinion lock nut tightening torque using Tool A, and check the drive pinion bearing preload torque using Tool B.

Tool number **A: KV38108300 (J-44195)**
 B: ST3127S000 (J-25765-A)

Drive pinion bearing preload torque:
2.3 - 3.4 N·m (24 - 34 kg·cm, 21 - 30 in·lb)

CAUTION:

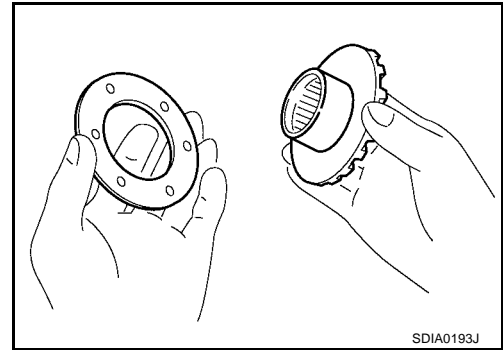
- Do not reuse drive pinion lock nut.
- Apply anti-corrosive oil to the threads of the drive pinion and the seating surface of the new drive pinion lock nut.
- Adjust the drive pinion lock nut tightening torque to the lower limit first. Do not exceed the drive pinion lock nut specified torque. Refer to [FFD-14, "COMPONENTS"](#).
- If the drive pinion bearing preload torque exceeds the specified value, replace collapsible spacer and tighten it again to adjust. Do not loosen drive pinion lock nut to adjust the drive pinion bearing preload torque.
- After adjustment, rotate drive pinion back and forth 2 to 3 times to check for unusual noise, rotation malfunction, and other malfunctions.



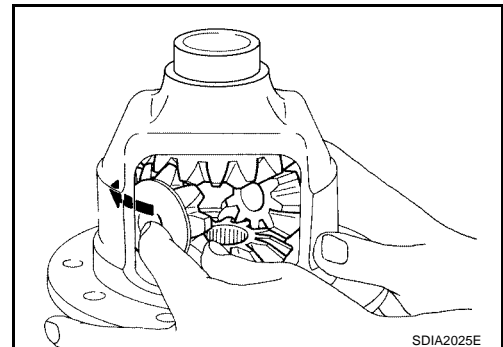
11. Check companion flange runout. Refer to [FFD-17, "Companion Flange Runout"](#).
12. Install the differential case assembly. Refer to [FFD-27, "Differential Assembly"](#).

Differential Assembly

1. Install side gear thrust washers with the same thickness as the ones installed prior to disassembly, or reinstall the old ones on the side gears.



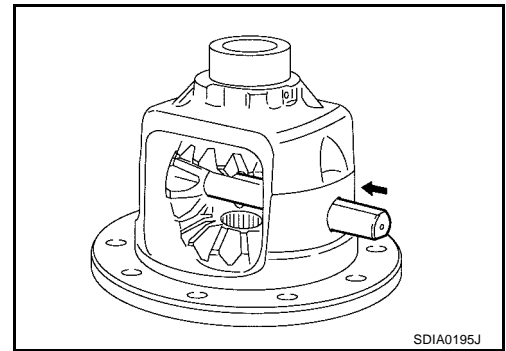
2. Install the side gears and side gear thrust washers into the differential case.
3. Install the pinion mate thrust washers to the two pinion mate gears. Then install the pinion mate gears with the pinion mate thrust washers by aligning them in diagonally opposite positions and rotating them into the differential case.



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FRONT FINAL DRIVE ASSEMBLY

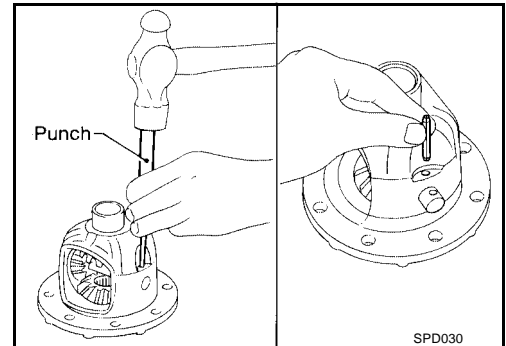
4. Install the pinion mate shaft and align the lock pin hole on the pinion mate shaft with the lock pin hole on the differential case.
5. Measure the side gear end play. If necessary, select the appropriate side gear thrust washers. Refer to [FFD-23, "Side Gear Back Clearance"](#).



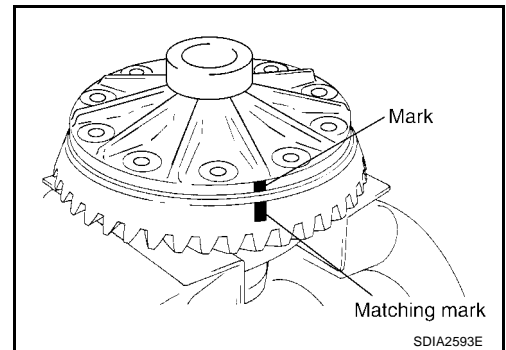
6. Drive a new lock pin into the pinion mate shaft until it is flush with the differential case using suitable tool.

CAUTION:

Do not reuse lock pin.



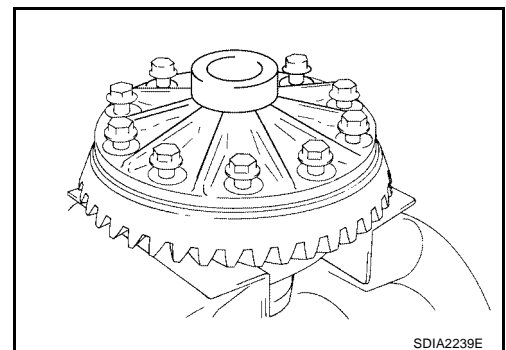
7. Align the matching mark of the differential case with the mark of the drive gear, then place the drive gear onto the differential case.



8. Install and tighten the new drive gear bolts to the specified torque. Refer to [FFD-14, "COMPONENTS"](#).

CAUTION:

- Make sure the drive gear back and threaded holes are clean.
- Do not reuse drive gear bolts.
- Tighten new drive gear bolts in a crisscross pattern.

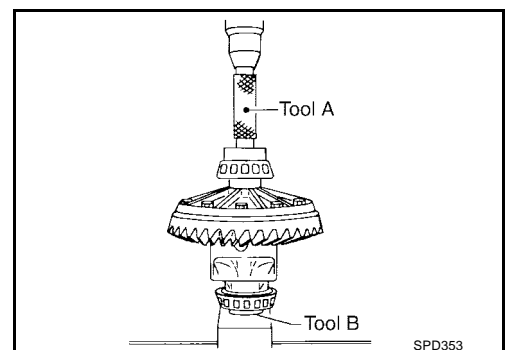


9. Press the new side bearing inner races to the differential case using Tools.

Tool number **A: KV38100300 (J-25523)**
 B: ST33081000

CAUTION:

Do not reuse side bearing inner races.

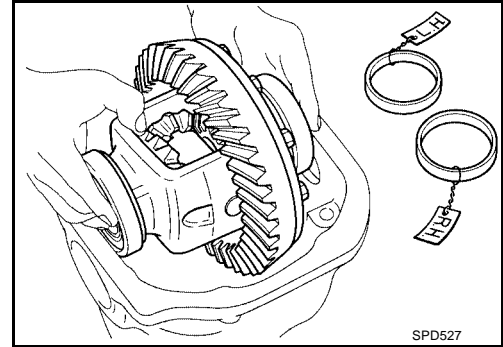


FRONT FINAL DRIVE ASSEMBLY

10. Install side bearing adjusters into gear carrier.
11. Apply differential gear oil to the side bearings, and install the differential case assembly with the side bearing outer races into the gear carrier.

CAUTION:

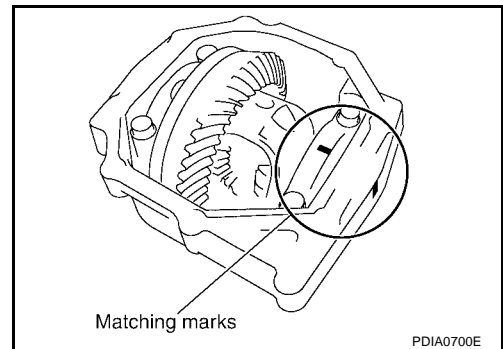
Do not reuse side bearing outer race when replacing side bearing inner race (replace as a set).



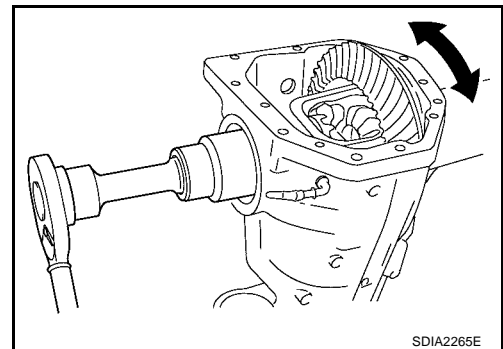
12. Install the side bearing caps with the matching marks aligned.

NOTE:

Do not tighten at this step. This allows further tightening of side bearing adjusters.



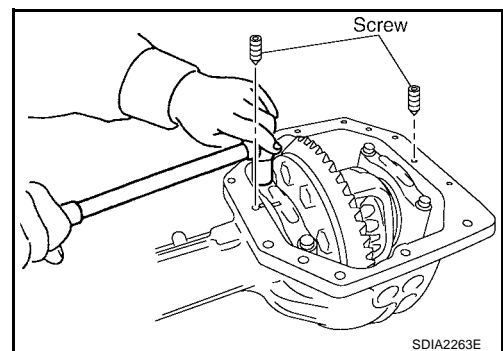
13. Tighten each side bearing adjuster alternately turning drive gear.



14. Check and adjust tooth contact, backlash, drive gear runout and total preload torque. Refer to [FFD-16, "Tooth Contact"](#) , [FFD-17, "Backlash"](#) , [FFD-15, "Drive Gear Runout"](#) and [FFD-15, "Total Preload Torque"](#)

Recheck above items.

- After adjusting tooth contact and backlash secure side bearing adjuster with screws and tighten side bearing cap bolt to the specified torque. Refer to [FFD-14, "COMPONENTS"](#) .



15. Apply multi-purpose grease to the lips of the new side oil seal. Then drive the new side oil seal in evenly to the gear carrier using suitable tool.

CAUTION:

- Do not reuse side oil seal.
- Do not incline the new side oil seal when installing.

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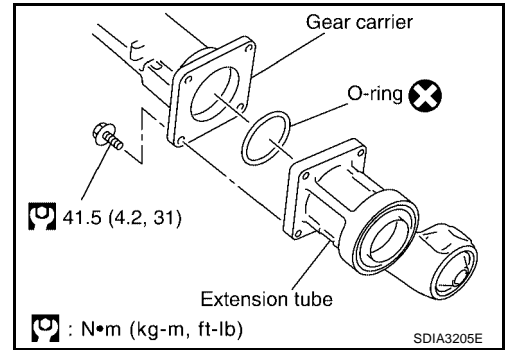
FRONT FINAL DRIVE ASSEMBLY

- Apply multi-purpose grease to the lips of the new side oil seal.

16. Install the extension tube with a new O-ring.

CAUTION:

- Do not reuse O-ring.
- If the extension tube is being replaced, install a new axle shaft bearing.



17. Apply 3 mm (0.12 in) bead of sealant to the mating surface of the carrier cover as shown.

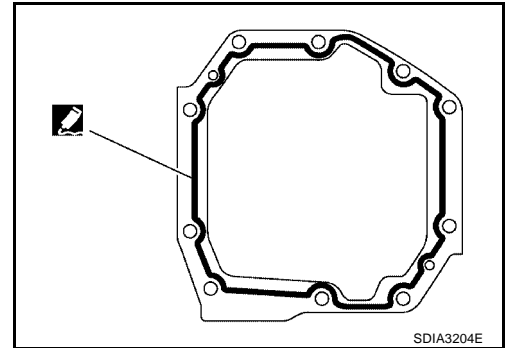
- Use Genuine Silicone RTV or equivalent. Refer to [GI-47, "Recommended Chemical Products and Sealants"](#).

CAUTION:

Remove any old sealant adhering to the mating surfaces. Also remove any moisture, oil, or foreign material adhering to the application and mating surfaces.

18. Install the carrier cover to the gear carrier. Tighten the bolts to the specified torque. Refer to [FFD-14, "COMPONENTS"](#).

19. Install side shaft and side flange.



SERVICE DATA AND SPECIFICATIONS (SDS)

SERVICE DATA AND SPECIFICATIONS (SDS)

PF0:00030

General Specifications

EDS0042I

Applied model	VK56E
Final drive model	M205
Gear ratio	3.357
Number of teeth (Drive gear/Drive pinion)	47/14
Differential gear oil capacity (Approx.)	1.6 ℓ (3 3/8 US pt, 2 7/8 Imp pt)
Number of pinion gears	2
Drive pinion adjustment spacer type	Collapsible

Inspection and Adjustment DRIVE GEAR RUNOUT

EDS0042J

Unit: mm (in)

Item	Runout limit
Drive gear back face	0.08 (0.0031) or less

SIDE GEAR CLEARANCE

Unit: mm (in)

Item	Specification
Side gear back clearance (Clearance between side gear and differential case for adjusting side gear backlash)	0.20 (0.0079) or less (Each gear should rotate smoothly without excessive resistance during differential motion.)

PRELOAD TORQUE

Unit: N·m (kg·m, in·lb)

Item	Specification
Drive pinion bearing preload torque	2.3 - 3.4 (0.23 - 0.35, 21 - 31)
Total preload torque (Total preload torque = drive pinion bearing preload torque + side bearing preload torque).	2.98 - 4.76 (0.31 - 0.48, 27 - 42)

BACKLASH

Unit: mm (in)

Item	Specification
Drive gear to drive pinion backlash	0.13 - 0.18 (0.0051 - 0.0071)

COMPANION FLANGE RUNOUT

Unit: mm (in)

Item	Runout limit
Companion flange face	0.10 (0.0039) or less
Companion flange inner side	0.13 (0.0051) or less

SERVICE DATA AND SPECIFICATIONS (SDS)

SELECTIVE PARTS

Drive Pinion Height Adjusting Washer

Unit: mm (in)

Thickness	Package part number*
1.22 (0.048) 1.24 (0.049) 1.27 (0.050) 1.30 (0.051) 1.32 (0.052)	38154 8S111
1.35 (0.053) 1.37 (0.054) 1.40 (0.055) 1.42 (0.056) 1.45 (0.057)	38154 8S112
1.47 (0.058) 1.50 (0.059) 1.52 (0.060) 1.55 (0.061) 1.57 (0.062)	38154 8S113
1.60 (0.063) 1.63 (0.064) 1.65 (0.065) 1.68 (0.066) 1.70 (0.067)	38154 8S114
1.73 (0.068) 1.75 (0.069) 1.78 (0.070) 1.80 (0.071) 1.83 (0.072)	38154 8S115

*Always check with the Parts Department for the latest parts information.

Side Gear Thrust Washer

Unit: mm (in)

Thickness	Package part number*
0.76 (0.030) 0.79 (0.031) 0.81 (0.032) 0.84 (0.033) 0.87 (0.034)	38424 8S111
0.89 (0.035) 0.91 (0.036) 0.94 (0.037) 0.97 (0.038) 0.99 (0.039)	38424 8S112

*: Always check with the Parts Department for the latest parts information.