

SECTION **FFD**
FRONT FINAL DRIVE

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FFD

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PRECAUTIONS

PRECAUTIONS

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Service Notice or Precautions

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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

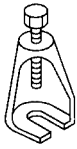
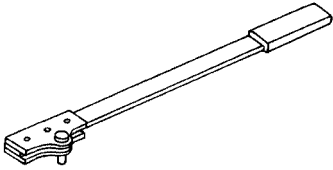
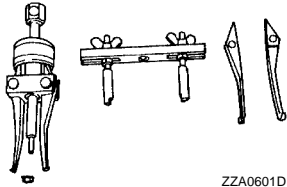
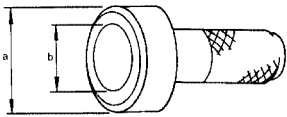
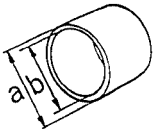
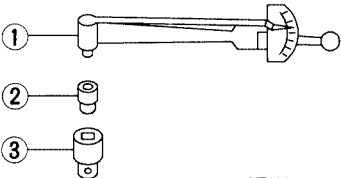
PREPARATION

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Special Service Tools

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

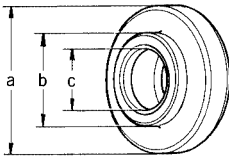
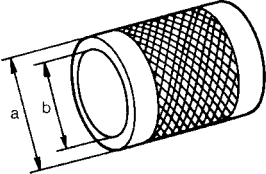
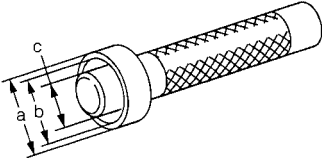


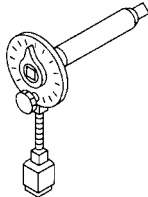
Tool number (Kent-Moore No.) Tool name	Description
ST29020001 (J-24319-01) Puller  NT143	Separating the upper link ball joint stud
KV38108300 (J-44195) Flange wrench  NT771	Removing and installing drive pinion lock nut
KV381054S0 (J-34286) Puller  ZZA0601D	Removing front oil seal
ST30720000 (J-25405) Drift  ZZA0811D	<ul style="list-style-type: none"> ● Installing front oil seal ● Installing side oil seal a: 77 mm (3.03 in) dia. b: 55.5 mm (2.185 in) dia.
ST27863000 (—) Drift  ZZA1003D	<ul style="list-style-type: none"> ● Installing front oil seal ● Installing side oil seal a: 74.5 mm (2.933 in) dia. b: 62.5 mm (2.461 in) dia.
ST3127S000 (J-25765-A) Preload gauge 1: GG91030000 (J-25765) Torque wrench 2: HT62940000 (—) Socket adapter (1/2") 3: HT62900000 (—) Socket adapter (3/8")  NT124	Measuring pinion bearing preload and total preload

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PREPARATION

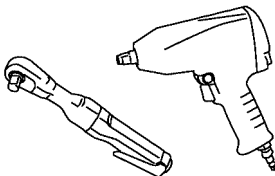
Tool number (Kent-Moore No.) Tool name	Description
KV10111100 (J-37228) Seal cutter	Removing rear cover
ST3306S001 (—) Differential side bearing puller set 1: ST33051001 (J-22888-20) Puller 2: ST33061000 (J-8107-2) Base	Removing and installing side bearing inner race a: 28.5 mm (1.122 in) dia. b: 38 mm (1.50 in) dia.
ST30031000 (J-22912-01) Replacer	Removing pinion rear bearing inner race
KV38100600 (J-25267) Drift	Installing side bearing adjusting shim
ST30613000 (J-25742-3) Drift	Installing pinion rear bearing outer race a: 72 mm (2.83 in) dia. b: 48 mm (1.89 in) dia.
ST30611000 (J-25742-1) Drift bar	Installing pinion rear bearing outer race (Use with ST30613000)
KV38100200 (J-26233) Drift	Installing pinion front bearing outer race a: 65 mm (2.56 in) dia. b: 49 mm (1.93 in) dia.

PREPARATION

Tool number (Kent-Moore No.) Tool name		Description	
ST30901000 (J-26010-01) Drift		Installing pinion rear bearing inner race a: 79 mm (3.11 in) dia. b: 45 mm (1.77 in) dia. c: 35.2 mm (1.386 in) dia.	A B C
ST33200000 (J-26082) Drift		Installing pinion front bearing inner race a: 60 mm (2.36 in) dia. b: 44.5 mm (1.752 in) dia.	FFD E
ST33230000 (J-35867) Drift		Installing side bearing inner race a: 51 mm (2.01 in) dia. b: 41 mm (1.61 in) dia. c: 28 mm (1.10 in) dia.	F G H
(—) (J-34309) Differential shim selector tool		Adjusting bearing preload and pinion gear height	I J
(—) (J-25269-18) Side bearing disc (2 Req'd)		Selecting pinion height adjusting washer	K L
KV10112100 (BT-8653-A) Angle wrench		Tightening bolts for drive gear	M

Commercial Service Tools

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Tool name		Description	
Power tool		Loosening nuts and bolts	

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		Noise	Reference page	Possible cause and SUSPECTED PARTS
		x	Refer to FFD-25, "INSPECTION AFTER DISASSEMBLY" .	Gear tooth rough
		x	Refer to FFD-18, "Tooth Contact" .	Gear contact improper
		x	Refer to FFD-25, "INSPECTION AFTER DISASSEMBLY" .	Tooth surfaces worn
		x	Refer to FFD-19, "Backlash" .	Backlash incorrect
		x	Refer to FFD-20, "Companion Flange Runout" .	Companion flange excessive runout
		x	Refer to FFD-8, "Checking Differential Gear Oil" .	Gear oil improper
		x	NVH in PR section.	PROPELLER SHAFT
		x	NVH in FAX, RAX, FSU and RSU sections.	AXLE AND SUSPENSION
		x	NVH in WT section.	TIRES
		x	NVH in WT section.	ROAD WHEEL
		x	NVH in FAX and RAX section.	DRIVE SHAFT
		x	NVH in BR section.	BRAKES
		x	NVH in PS section.	STEERING

x: Applicable

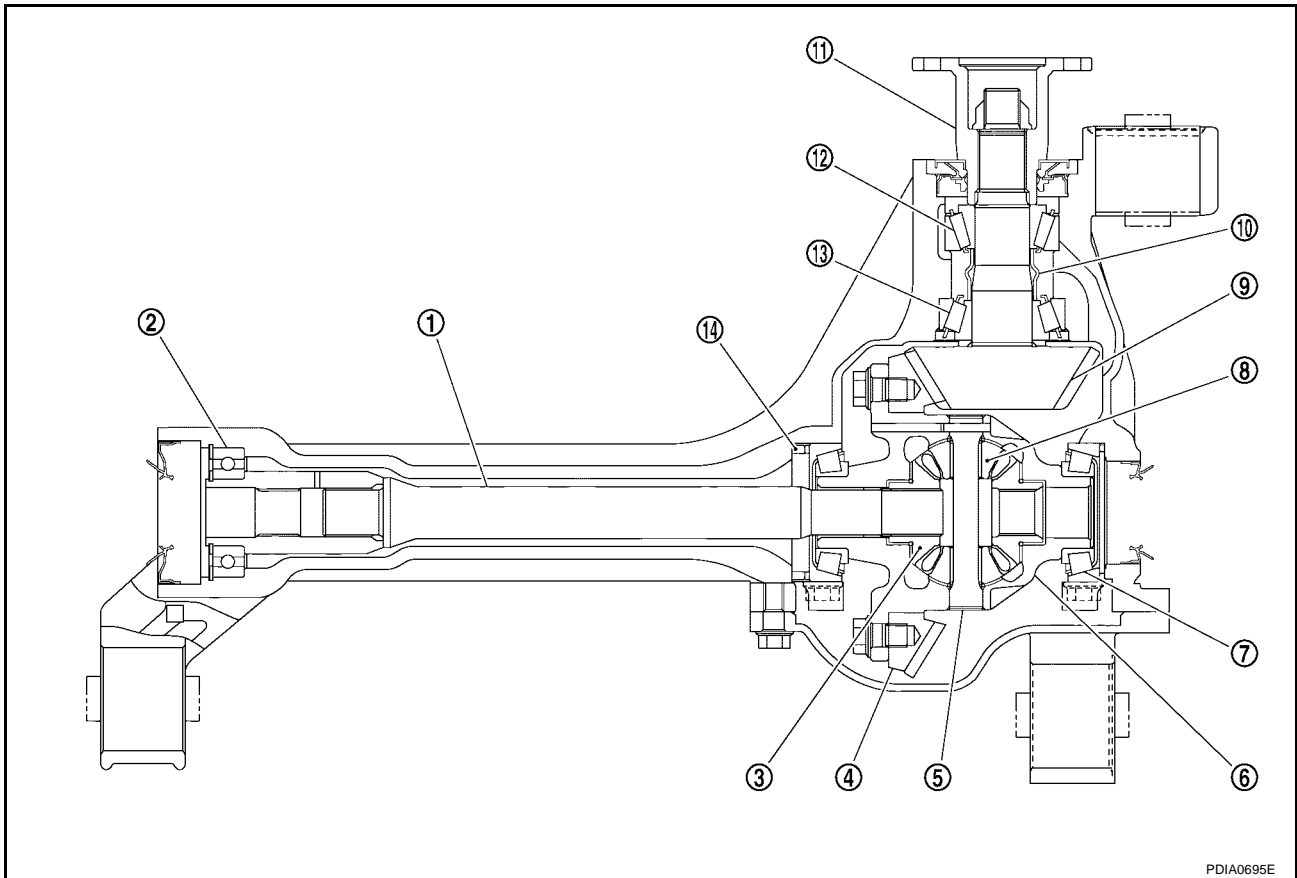
DESCRIPTION

DESCRIPTION

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Cross-Sectional View

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- | | | |
|-------------------------|-----------------------|--------------------------|
| 1. Side shaft | 2. Side shaft bearing | 3. Side gear |
| 4. Drive gear | 5. Pinion mate shaft | 6. Differential case |
| 7. Side bearing | 8. Pinion mate gear | 9. Drive pinion |
| 10. Collapsible spacer | 11. Companion flange | 12. Pinion front bearing |
| 13. Pinion rear bearing | 14. Housing spacer | |

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DIFFERENTIAL GEAR OIL

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DIFFERENTIAL GEAR OIL

Changing Differential Gear Oil

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CAUTION:

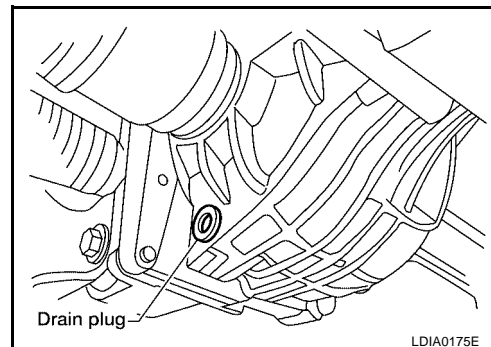
If using the vehicle for towing, the final drive oil must be replaced as specified. Refer to [MA-7, "PERIODIC MAINTENANCE"](#).

DRAINING

1. Stop the engine.
2. Remove the drain plug and gasket. Drain the gear oil.
3. Install the drain plug with a new gasket to the final drive assembly. Tighten to the specified torque. Refer to [FFD-16, "COMPONENTS"](#).

CAUTION:

Do not reuse gasket.



FILLING

1. Remove the filler plug and gasket. Fill with new gear oil until the oil level reaches the specified level near the filler plug hole.

Oil grade and Viscosity:

Refer to [MA-11, "Fluids and Lubricants"](#).

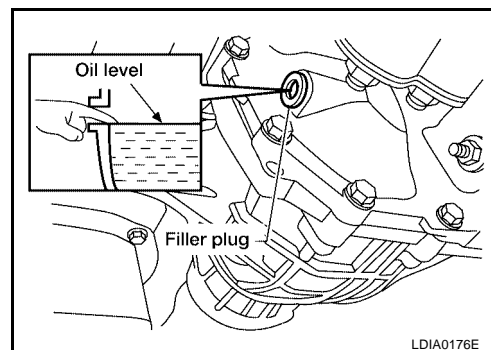
Oil capacity:

Refer to [MA-11, "Fluids and Lubricants"](#).

2. After refilling oil, check the oil level. Install the filler plug with a new gasket on it to the final drive assembly. Tighten to the specified torque. Refer to [FFD-16, "COMPONENTS"](#).

CAUTION:

Do not reuse gasket.



Checking Differential Gear Oil

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CAUTION:

If using the vehicle for towing, the final drive oil must be replaced as specified. Refer to [MA-7, "PERIODIC MAINTENANCE"](#).

OIL LEAKAGE AND OIL LEVEL

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

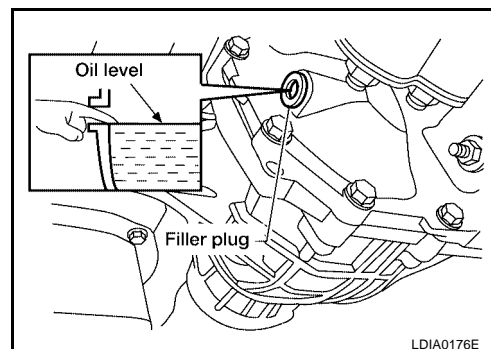
CAUTION:

Do not start engine while checking oil level.

3. Install the filler plug with a new gasket on it to the final drive assembly. Tighten to the specified torque. Refer to [FFD-16, "COMPONENTS"](#).

CAUTION:

Do not reuse gasket.



FRONT OIL SEAL

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Removal and Installation

REMOVAL

1. Remove the front wheels and tires using power tool.
2. Without disassembling the hydraulic lines, remove the caliper torque member bolts using power tool. Then reposition the brake caliper aside using suitable wire. Refer to [BR-25, "Removal and Installation of Brake Caliper and Disc Rotor"](#).

CAUTION:

Do not press the brake pedal while brake caliper is removed.

3. Remove the ABS sensor harness from the mount on the knuckle.

CAUTION:

Do not pull on the ABS sensor harness.

4. Support the lower link using a suitable jack.
5. Separate the upper link ball joint stud from the steering knuckle using Tool.

Tool number : ST29020001 (J-24319-01)

CAUTION:

Support the lower link using a jack.

6. Remove the engine undercover using power tool.
7. Remove the RH and LH drive shafts from the front final drive using suitable tool.

CAUTION:

Do not reuse the front final drive side oil seals.

8. Disconnect the front propeller shaft from the front final drive. Then reposition the front propeller shaft aside using suitable wire. Refer to [PR-5, "Removal and Installation"](#).
9. Measure the drive pinion bearing preload with the front oil seal resistance using Tool.

Tool number : ST3127S000 (J-25765-A)

NOTE:

Record the preload measurement.

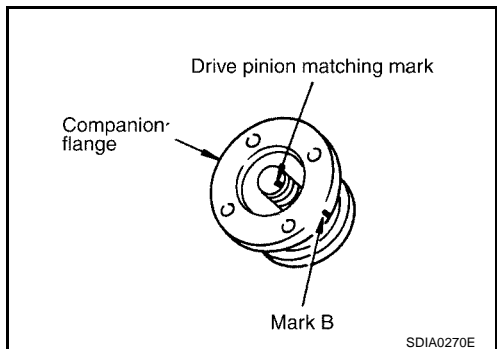
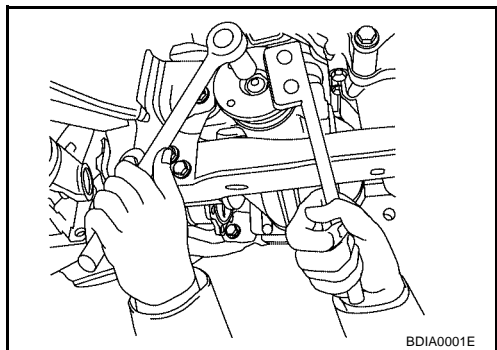
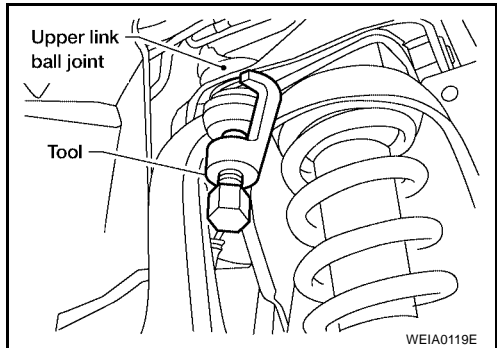
10. Remove the drive pinion lock nut using Tool.

Tool number : KV38108300 (J-44195)

11. Put a matching mark on the end of the drive pinion in line with the matching mark B on the companion flange.

CAUTION:

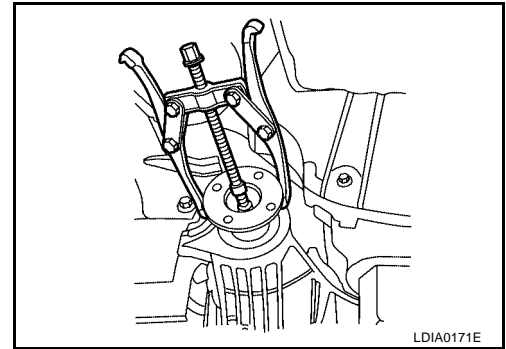
Use paint to make the matching mark on the drive pinion. Do not damage the companion flange or drive pinion.



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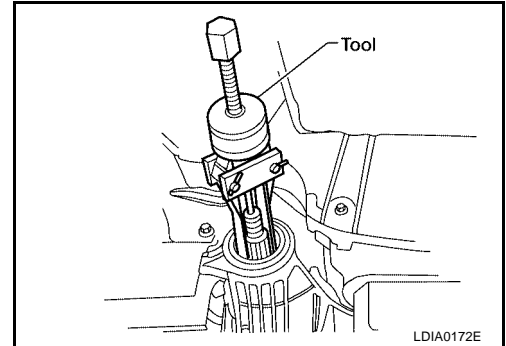
FRONT OIL SEAL

12. Remove the companion flange using suitable tool.



13. Remove the front oil seal using Tool.

Tool number : KV381054S0 (J-34286)



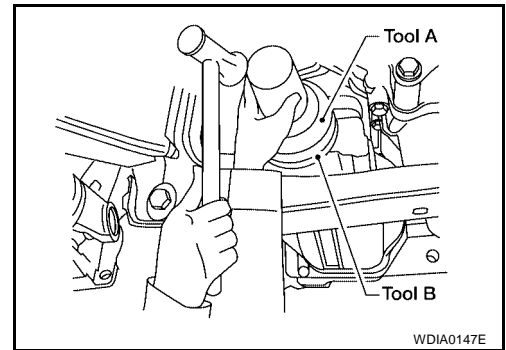
INSTALLATION

1. Apply multi-purpose grease to the front oil seal lips and gear oil onto the circumference of the new oil seal.
2. Drive the front oil seal in evenly using Tools.

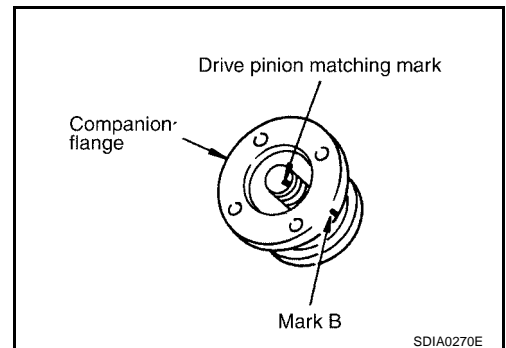
Tool number A: ST30720000 (J-25405)
B: ST27863000 (—)

CAUTION:

- Do not reuse oil seal.
- Do not incline oil seal when installing.
- Apply multi-purpose grease onto oil seal lips and gear oil onto the circumference of oil seal.



3. Align the matching mark of the drive pinion with the matching mark B of the companion flange, then install the companion flange.
4. Apply gear oil on the threads of the drive pinion and the seating surface of the new drive pinion lock nut.



FRONT OIL SEAL

5. Install the new drive pinion lock nut. Tighten to the specified torque using Tool. Refer to [FFD-16, "COMPONENTS"](#) .

Tool number : KV38108300 (J-44195)

CAUTION:

Do not reuse drive pinion lock nut.

6. Measure the drive pinion bearing preload with the front oil seal resistance using Tool.

Tool number : ST3127S000 (J-25765-A)

NOTE:

- Drive pinion bearing preload should equal the measurement taken during removal plus an additional 0.56 N-m (0.06 Kg-m, 5 in-lb).
- If the drive pinion bearing preload is low, tighten the drive pinion lock nut in 6.8 N-m (0.69 Kg-m, 5ft-lb) increments until the drive pinion preload is met.

CAUTION:

Never loosen the drive pinion nut to decrease drive pinion bearing preload. Do not exceed specified preload. If preload torque is exceeded a new collapsible spacer must be installed. If maximum torque is reached prior to reaching the required preload, the collapsible spacer may have been damaged. Replace the collapsible spacer.

Drive pinion lock nut : 186 - 294 N-m (19 - 29 kg-m, 138 - 216 ft-lb)

7. Install new side oil seals into the front final drive assembly. Refer to [FFD-12, "Removal and Installation"](#) .
8. Install the RH and LH drive shafts to the front final drive.

CAUTION:

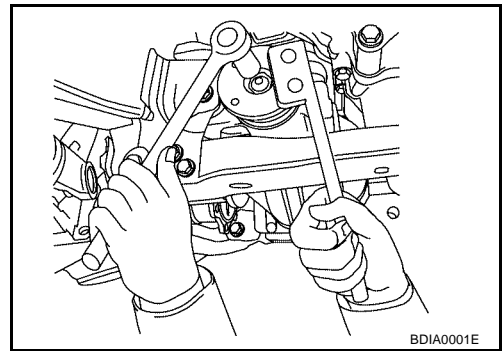
When installing the drive shaft assembly into the front final drive assembly, do not damage the side oil seal.

9. Install the remaining components in the reverse order of removal.

CAUTION:

Check the final drive gear oil level after installation. Refer to [FFD-8, "Checking Differential Gear Oil"](#) .

- Tighten the upper link ball joint stud nut to specifications. Refer to [FSU-5, "Components"](#) .
- Tighten the wheel nuts to specification. Refer to [WT-7, "Rotation"](#) .



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SIDE OIL SEAL

Removal and Installation REMOVAL

1. Remove the front wheels and tires using power tool.
2. Without disassembling the hydraulic lines, remove the caliper torque member bolts using power tool. Then reposition the brake caliper aside using suitable wire. Refer to [BR-25, "Removal and Installation of Brake Caliper and Disc Rotor"](#) .

CAUTION:

Do not press the brake pedal while brake caliper is removed.

3. Remove the ABS sensor harness from the mount on the knuckle.

CAUTION:

Do not pull on the ABS sensor harness.

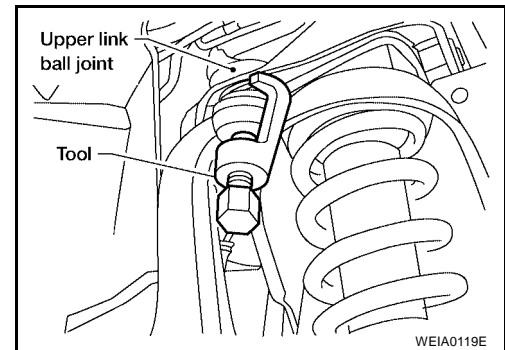
4. Support the lower link using a suitable jack.
5. Separate the upper link ball joint stud from the steering knuckle using Tool.

Tool number : ST29020001 (J-24319-01)

CAUTION:

Support the lower link using jack.

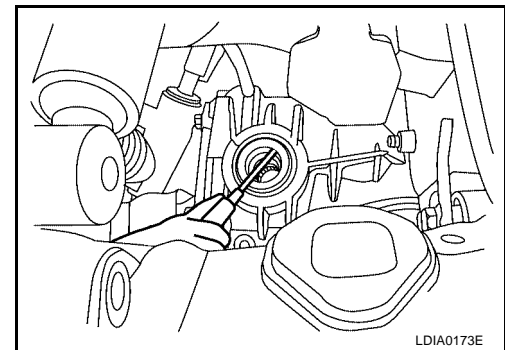
6. Remove the engine undercover using power tool.
7. Remove the RH and LH drive shafts from the front final drive using suitable tool.



8. Remove the side oil seal using suitable tool.

CAUTION:

Do not reuse the oil seal.



INSTALLATION

Installation is the reverse order of removal.

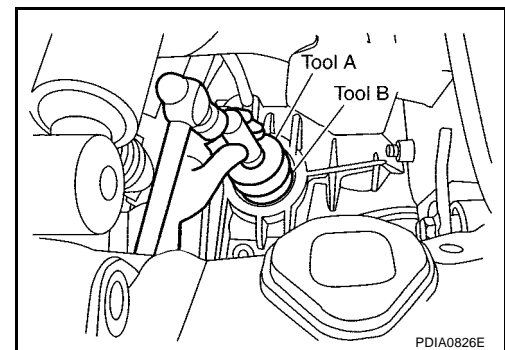
- Drive the side oil seal in evenly until it becomes flush with the case end using Tools.

Tool number A: ST30720000 (J-25405)

B: ST27863000 (—)

CAUTION:

- Do not reuse oil seal.
 - Do not incline oil seal when installing.
 - Apply multi-purpose grease onto oil seal lips and gear oil onto the circumference of oil seal.
 - When installing the drive shaft assembly into the front final drive assembly, do not damage the side oil seal.
 - Check the final drive gear oil level. Refer to [FFD-8, "Checking Differential Gear Oil"](#) .
- Tighten the upper link ball joint stud nut to specifications. Refer to [FSU-5, "Components"](#) .
 - Tighten the wheel nuts to specification. Refer to [WT-7, "Rotation"](#) .



REAR COVER GASKET

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REAR COVER GASKET

Removal and Installation

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REMOVAL

1. Remove front final drive. Refer to [FFD-14, "Removal and Installation"](#) .
2. Remove the rear cover bolts, then remove the rear cover from the gear carrier.

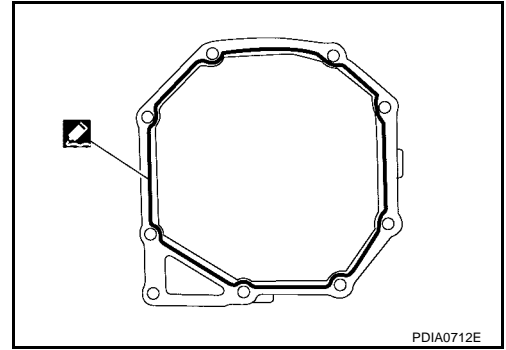
INSTALLATION

1. Apply a 3 mm (0.12 in) bead of sealant to the mating surface of the rear cover. 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 rear cover to the gear carrier. Tighten the bolts to the specified torque. Refer to [FFD-16, "COMPONENTS"](#) .
3. Install the front final drive assembly. Refer to [FFD-14, "Removal and Installation"](#) .
4. Fill the final drive with recommended gear oil. Refer to [FFD-8, "Checking Differential Gear Oil"](#) .



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FRONT FINAL DRIVE ASSEMBLY

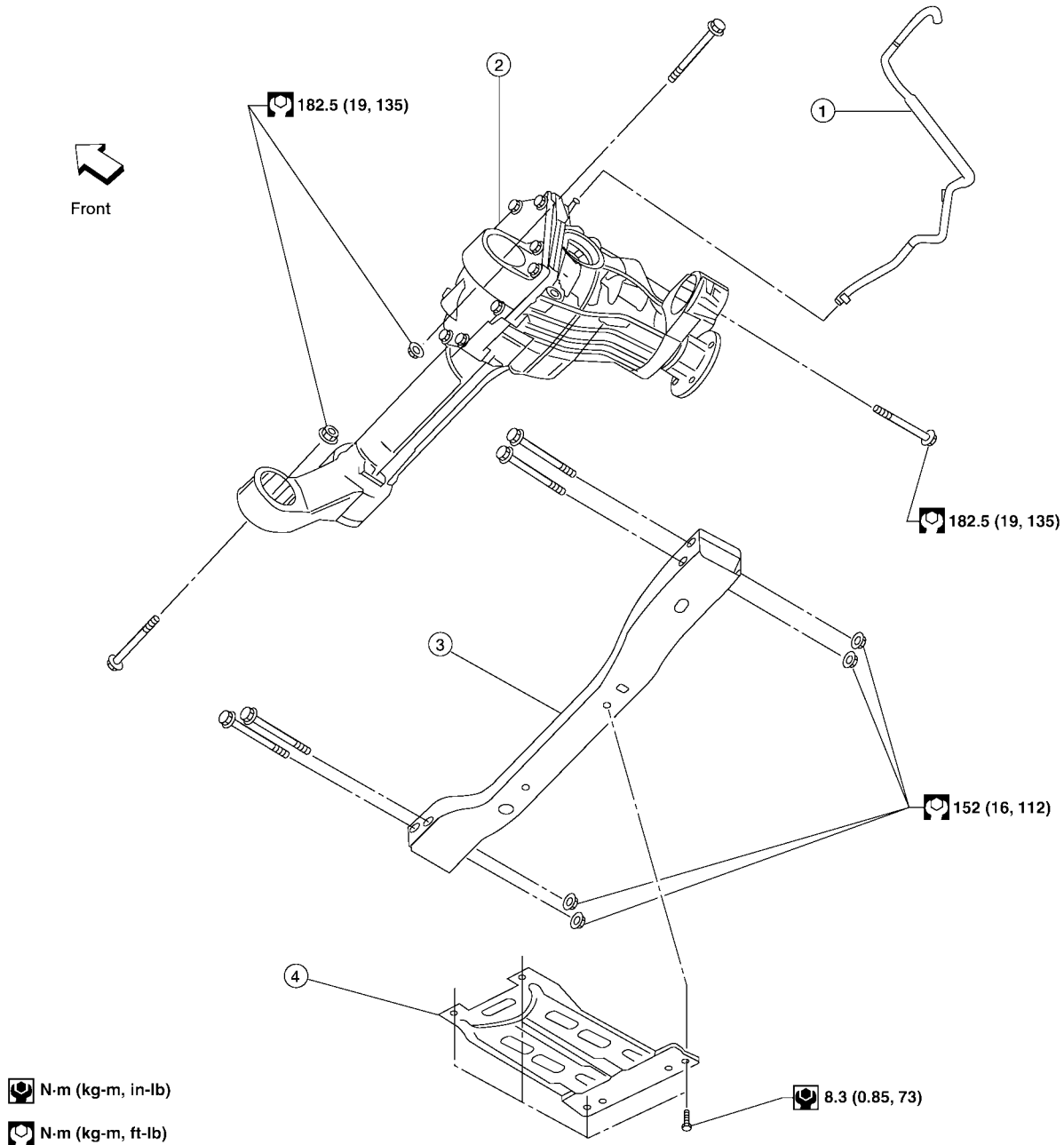
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FRONT FINAL DRIVE ASSEMBLY

Removal and Installation

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1. Breather hose
2. Front final drive assembly
3. Front crossmember
4. Engine under cover

REMOVAL

1. Remove the front wheels and tires using power tool.
2. Without disassembling the hydraulic lines, remove the caliper torque member bolts using power tool. Then reposition the brake caliper aside using suitable wire. Refer to [BR-25, "Removal and Installation of Brake Caliper and Disc Rotor"](#).

CAUTION:

Do not press the brake pedal while brake caliper is removed.

3. Remove the ABS sensor harness from the mount on the knuckle.

FRONT FINAL DRIVE ASSEMBLY

CAUTION:

Do not pull on the ABS sensor harness.

- Support the lower link using a suitable jack.
- Separate the upper link ball joint stud from the steering knuckle using Tool.

Tool number : ST29020001 (J-24319-01)

CAUTION:

Support the lower link using a jack.

- Remove the engine under cover using power tool.
- Drain the front final drive fluid. Refer to [FFD-8, "Changing Differential Gear Oil"](#).
- Remove the RH and LH drive shafts from the front final drive using suitable tool.

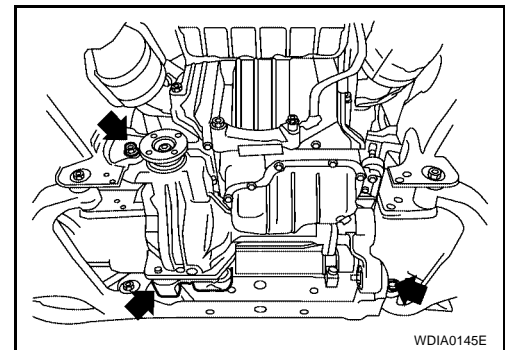
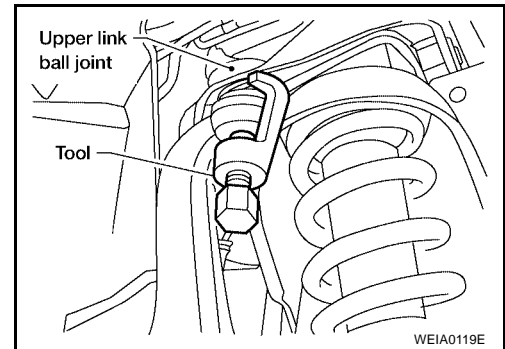
CAUTION:

Do not reuse the front final drive side oil seals.

- Remove the front crossmember.
- Disconnect the front propeller shaft from the front final drive. Then reposition the front propeller shaft aside using suitable wire. Refer to [PR-5, "Removal and Installation"](#).
- Disconnect the vent hose from the front final drive.
- Support the front final drive using a suitable jack.
- Remove the front final drive bolts, then remove the front final drive assembly.

CAUTION:

Support the front final drive using a jack.



INSTALLATION

Installation is the reverse order of removal.

- Install new side oil seals into the front final drive assembly. Refer to [FFD-12, "Removal and Installation"](#).

CAUTION:

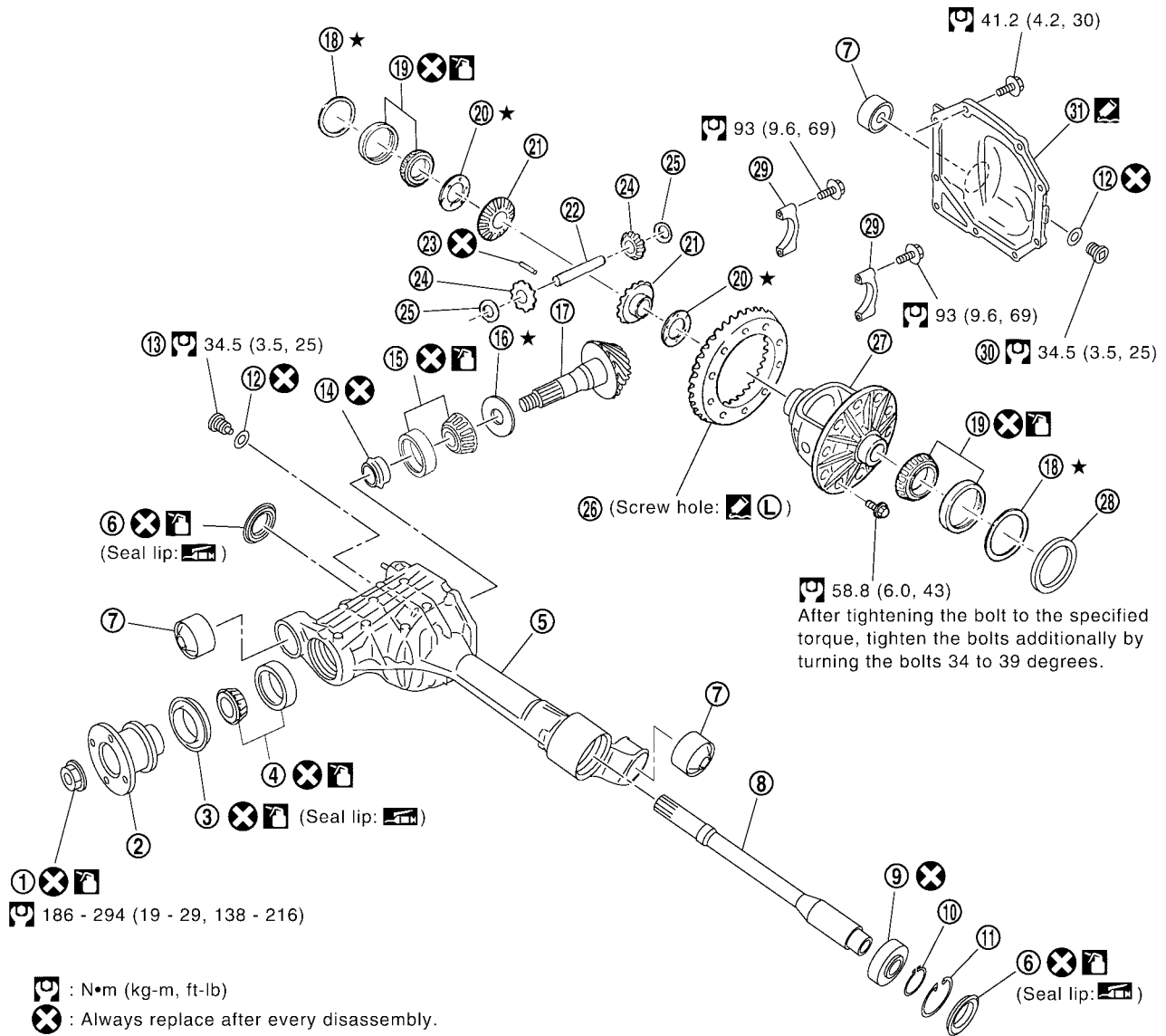
- When installing the drive shaft assembly into the front final drive assembly, do not damage the side oil seal.**
- Make sure there are no pinched or restricted areas on the breather hose caused by bending or winding when installing it.**
- Fill the final drive with recommended gear oil after installation. Refer to [FFD-8, "Changing Differential Gear Oil"](#).**
- Tighten the upper link ball joint stud nut to specifications. Refer to [FSU-5, "Components"](#).
- Tighten the wheel nuts to specification. Refer to [WT-7, "Rotation"](#).

FRONT FINAL DRIVE ASSEMBLY

EDS0039R

Disassembly and Assembly COMPONENTS

SEC. 380



- : N•m (kg-m, ft-lb)
- : Always replace after every disassembly.
- ★ : Select with proper thickness.
- : Apply multi-purpose grease.
- : Apply gear oil.
- : Apply Genuine Silicone RTV or equivalent. Refer to GI section.
- (L) : Apply Genuine High Strength Thread Locking Sealant or equivalent. Refer to GI section.

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- | | | |
|------------------------------------|-----------------------------|-----------------------------------|
| 1. Drive pinion lock nut | 2. Companion flange | 3. Front oil seal |
| 4. Pinion front bearing | 5. Gear carrier | 6. Side oil seal |
| 7. Bushing | 8. Side shaft | 9. Side shaft bearing |
| 10. Snap ring | 11. Snap ring | 12. Gasket |
| 13. Drain plug | 14. Collapsible spacer | 15. Pinion rear bearing |
| 16. Pinion height adjusting washer | 17. Drive pinion | 18. Side bearing adjusting washer |
| 19. Side bearing | 20. Side gear thrust washer | 21. Side gear |
| 22. Pinion mate shaft | 23. Lock pin | 24. Pinion mate gear |
| 25. Pinion mate thrust washer | 26. Drive gear | 27. Differential case |
| 28. Housing spacer | 29. Bearing cap | 30. Filler plug |
| 31. Rear cover | | |

FRONT FINAL DRIVE ASSEMBLY

ASSEMBLY INSPECTION AND ADJUSTMENT

- Before inspection and adjustment, drain gear oil.

Total Preload Torque

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

Tool number : ST3127S000 (J-25765-A)

Total preload torque (With oil seal):

1.67 - 2.74 N·m (0.17 - 0.27 kg·m, 15 - 24 in·lb)

NOTE:

Total preload torque = Pinion bearing torque + Side bearing torque

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

When the preload torque is greater than specification

On pinion bearings: Replace the collapsible spacer.

On side bearings: Use thinner side bearing adjusting washers by the same amount to each side. Refer to [FFD-37, "Side Bearing Adjusting Washer"](#) .

When the preload torque is less than specification

On pinion bearings: Tighten the drive pinion nut.

On side bearings: Use thicker side bearing adjusting washers by the same amount to each side. Refer to [FFD-37, "Side Bearing Adjusting Washer"](#) .

CAUTION:

Select a side bearing adjusting washer for right and left individually.

Drive Gear Runout

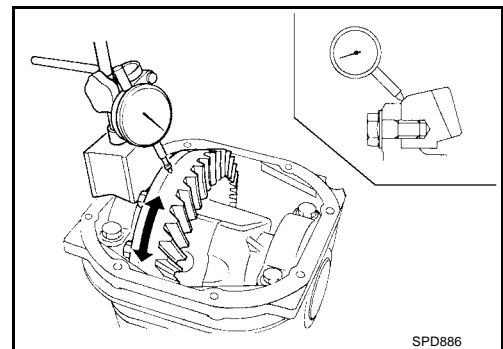
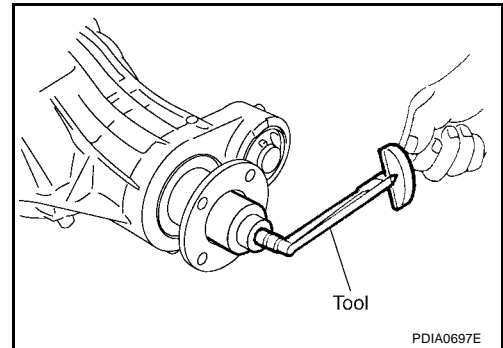
1. Remove rear cover. Refer to [FFD-21, "Differential Assembly"](#) .
2. Fit a dial indicator to the drive gear back face.
3. Rotate the drive gear to measure runout.

Runout limit: 0.08 mm (0.0031 in) or less

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

CAUTION:

Replace drive gear and drive pinion gear as a set.



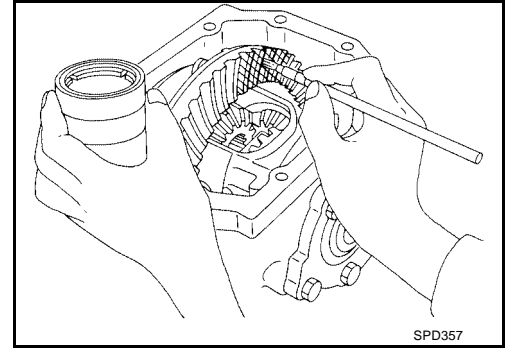
FRONT FINAL DRIVE ASSEMBLY

Tooth Contact

1. Remove rear cover. Refer to [FFD-21, "Differential Assembly"](#).
2. Apply red lead to drive gear.

CAUTION:

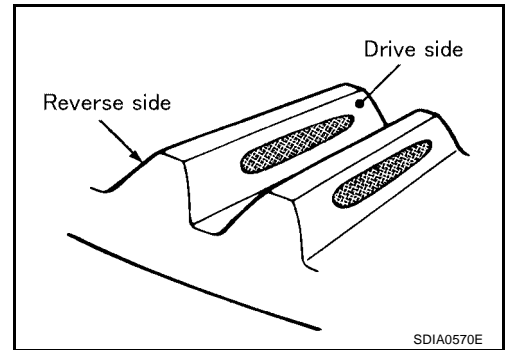
Apply red lead to both the faces of 3 to 4 gears at 4 locations evenly spaced on drive gear.



3. Rotate drive gear back and forth several times, check drive pinion gear to drive gear tooth contact.

CAUTION:

Check tooth contact on drive side and reverse side.

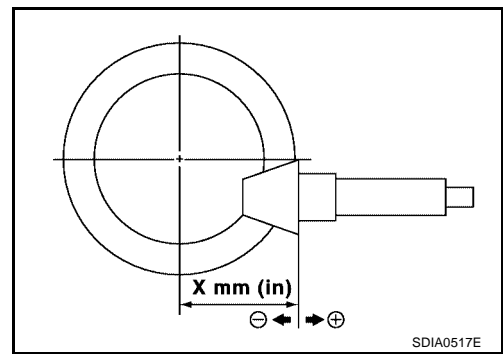


Tooth contact condition		Drive pinion adjusting shim selection value [mm (in)]	Adjustment (Yes/No)	Possible cause	
Drive side	Back side				
Heel side Toe side 	Toe side Heel side 	↑ Thicker	Yes	Occurrence of noise and scoring sound in all speed ranges.	
				+0.09 (+0.0035)	Occurrence of noise when accelerating.
				+0.06 (+0.0024)	
		+0.03 (+0.0012)	No	—	
		0			
		-0.03 (-0.0012)			
		↓ Thinner	Yes	Occurrence of noise at constant speed and decreasing speed.	
				-0.06 (-0.0024)	Occurrence of noise and scoring sound in all speed ranges.
				-0.09 (-0.0035)	

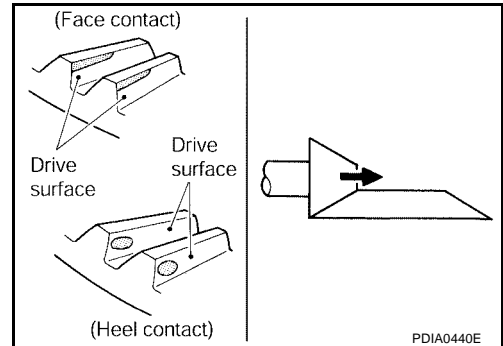
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FRONT FINAL DRIVE ASSEMBLY

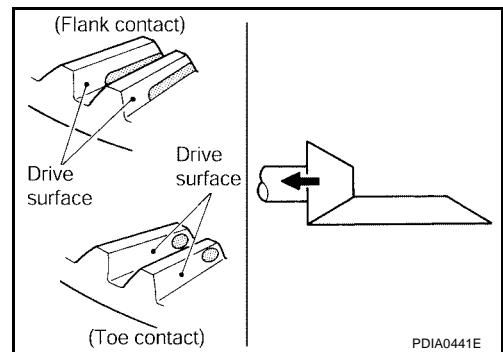
- If tooth contact is improperly adjusted, follow the procedure below to adjust the pinion height (dimension X).



- If the tooth contact is near the face (face contact), or near the heel (heel contact), thicken pinion height adjusting washers to move drive pinion closer to drive gear. Refer to [FFD-37, "Pinion Height Adjusting Washer"](#).



- If the tooth contact is near the flank (flank contact), or near the toe (toe contact), thin pinion height adjusting washers to move drive pinion farther from drive gear. Refer to [FFD-37, "Pinion Height Adjusting Washer"](#).



Backlash

- Remove rear cover. Refer to [FFD-21, "Differential Assembly"](#).
- Fit a dial indicator to the drive gear face to measure the backlash.

Backlash: 0.10 - 0.15 mm (0.0039 - 0.0059 in)

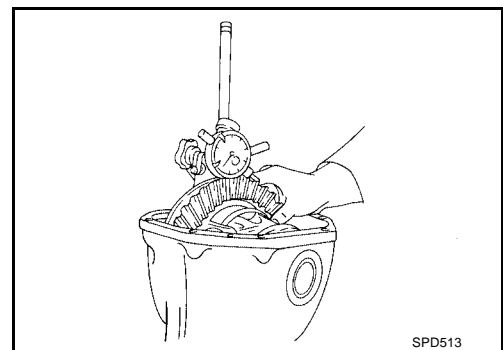
- If the backlash is outside of the specified value, change the thickness of side bearing adjusting washer.

When the backlash is greater than specification:

Make drive gear back side adjusting washer thicker, and drive gear tooth side adjusting washer thinner by the same amount. Refer to [FFD-37, "Side Bearing Adjusting Washer"](#).

When the backlash is less than specification:

Make drive gear back side adjusting washer thinner, and drive gear tooth side adjusting washer thicker by the same amount. Refer to [FFD-37, "Side Bearing Adjusting Washer"](#).



CAUTION:

Do not change the total amount of washers as it will change the bearing preload.

FRONT FINAL DRIVE ASSEMBLY

Companion Flange Runout

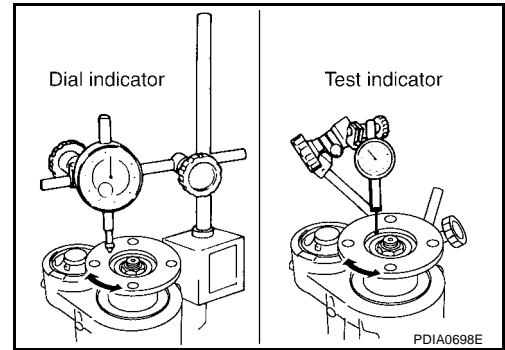
1. Fit a dial indicator onto the companion flange face (inner side of the propeller shaft bolt holes).
2. Rotate companion flange to check for runout.

Runout limit: 0.1 mm (0.004 in) or less

3. Fit a test indicator to the inner side of companion flange (socket diameter).
4. Rotate companion flange to check for runout.

Runout limit: 0.1 mm (0.004 in) or less

5. If the runout value 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 value is still outside of the limit after the phase has been changed, possible cause will be an assembly malfunction of drive pinion and pinion bearing or a malfunctioning pinion bearing.
 - c. If the runout value is still outside of the limit after repair of the assembly of drive pinion and pinion bearing or pinion bearing, replace the companion flange.



DISASSEMBLY

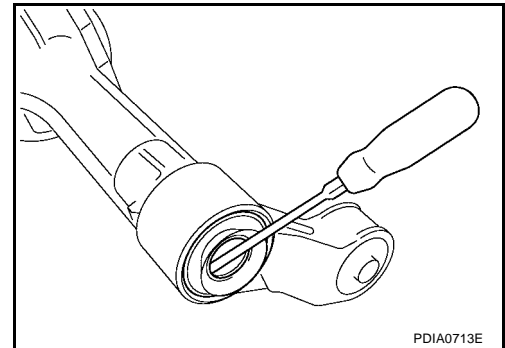
Side Shaft

1. Drain gear oil, if necessary.
2. Remove side oil seal.

CAUTION:

Do not damage gear carrier.

3. Remove snap ring (hole side) using suitable tool.

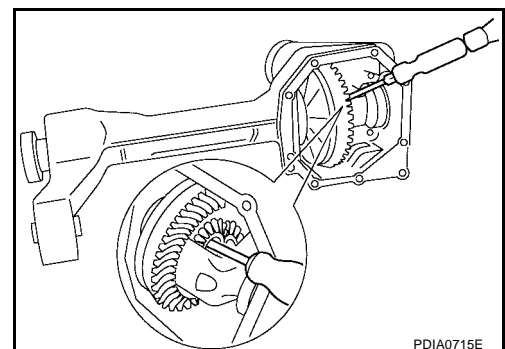
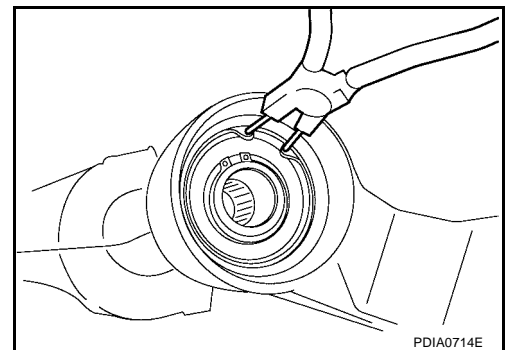


4. Remove side shaft assembly out of gear carrier using suitable tool.

NOTE:

Tap on side shaft assembly from side gear side.

5. Remove snap ring (shaft side).

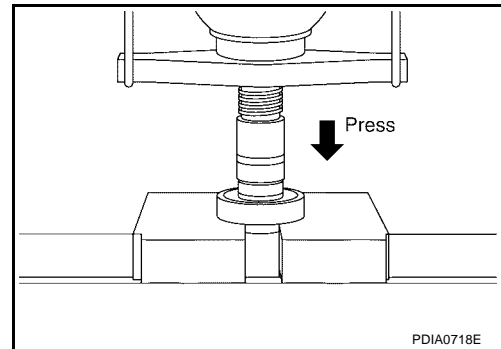


FRONT FINAL DRIVE ASSEMBLY

6. Press side shaft out of side shaft bearing.

CAUTION:

Do not drop side shaft.



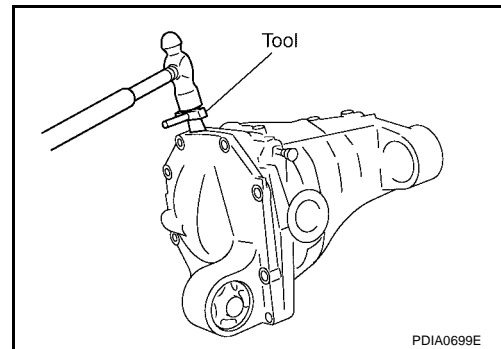
Differential Assembly

1. Remove side shaft assembly. Refer to [FFD-20, "Side Shaft"](#).
2. Remove rear cover bolts.
3. Separate the rear cover from the gear carrier using Tool.

Tool number : KV10111100 (J-37228)

CAUTION:

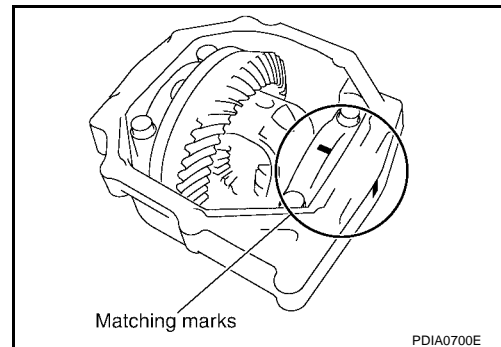
- Do not damage the mating surface.
- Do not insert flat-bladed screwdriver, this will damage the mating surface.



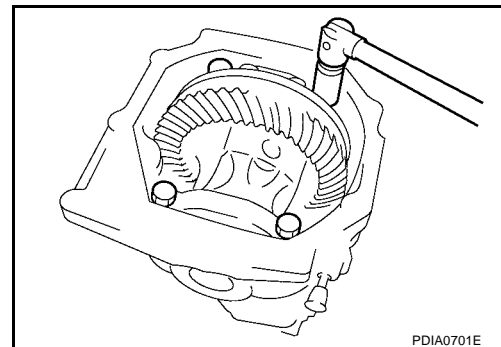
4. For proper reinstallation, paint matching marks on one side of the bearing cap.

CAUTION:

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



5. Remove bearing caps.

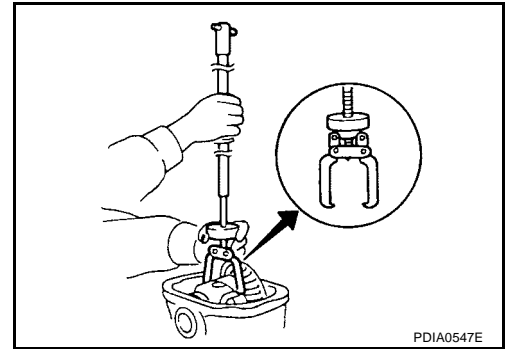


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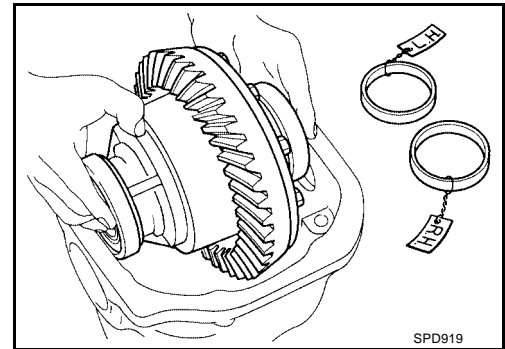
FRONT FINAL DRIVE ASSEMBLY

6. Lift differential case assembly out using suitable tool.



CAUTION:

- Keep side bearing outer races together with inner race. Do not mix them up.
- Keep side bearing adjusting washers together with bearings.

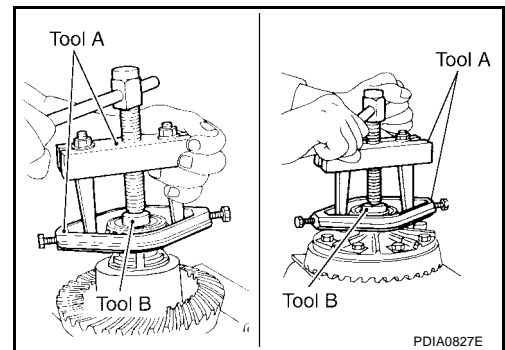


7. Remove housing spacer.
8. Remove side bearing inner races, using Tools.

Tool number **A: ST33051001 (J-22888-20)**
 B: ST33061000 (J-8107-2)

CAUTION:

- Place copper plates between the side bearing and drive gear and the vise to prevent damage.
- Do not remove side bearing inner race unless it is being replaced.



9. For proper reinstallation, paint matching mark on one side of differential case assembly.

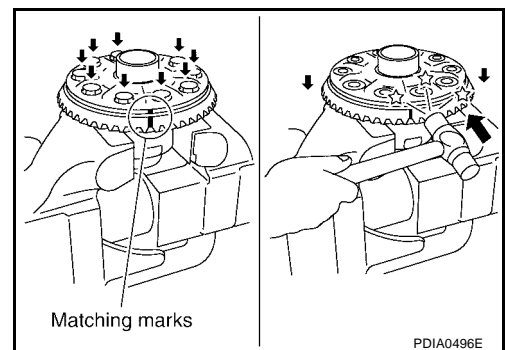
CAUTION:

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

10. Remove drive gear bolts.
11. Tap drive gear off differential case assembly using suitable tool.

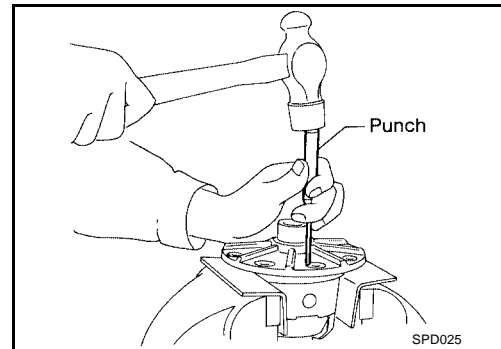
CAUTION:

Tap evenly all around to keep drive gear from bending.

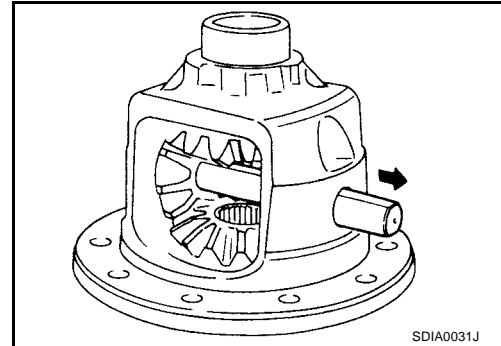


FRONT FINAL DRIVE ASSEMBLY

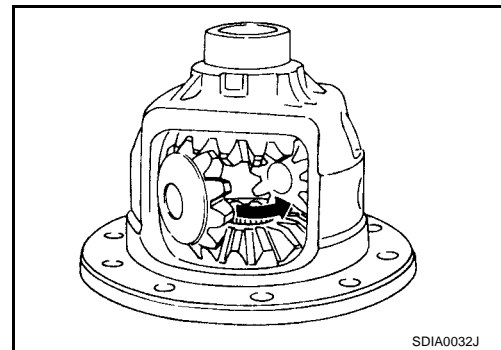
12. Remove lock pin of pinion mate shaft from drive gear side using suitable tool.



13. Remove pinion mate shaft.



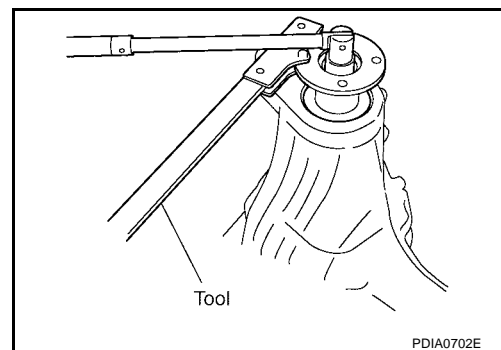
14. Turn pinion mate gear, then remove pinion mate gear, pinion mate thrust washer, side gear and side gear thrust washer from differential case.



Drive Pinion Assembly

1. Remove side shaft assembly. Refer to [FFD-20, "Side Shaft"](#) .
2. Remove differential assembly. Refer to [FFD-21, "Differential Assembly"](#) .
3. Remove drive pinion lock nut using Tool.

Tool number : KV38108300 (J-44195)



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FRONT FINAL DRIVE ASSEMBLY

- Put matching mark on the end of drive pinion. The matching mark should be in line with the matching mark A on companion flange.

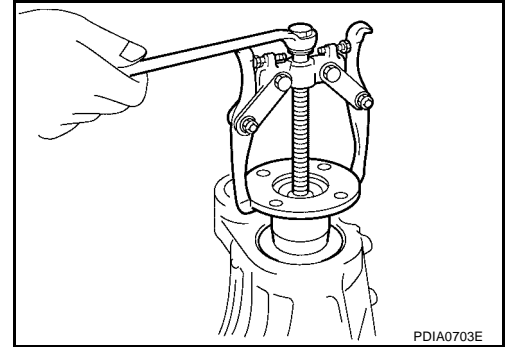
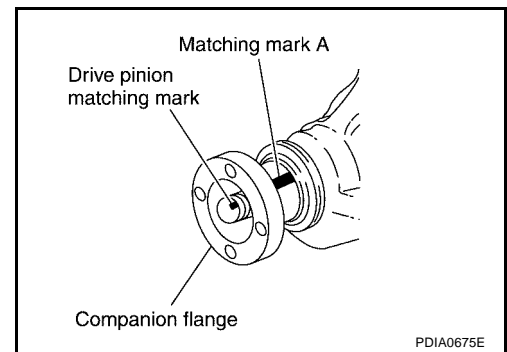
CAUTION:

Use paint for matching mark. Do not damage companion flange or drive pinion.

NOTE:

The matching mark A on the final drive companion flange indicates the maximum vertical runout position. When replacing companion flange, matching mark is not necessary.

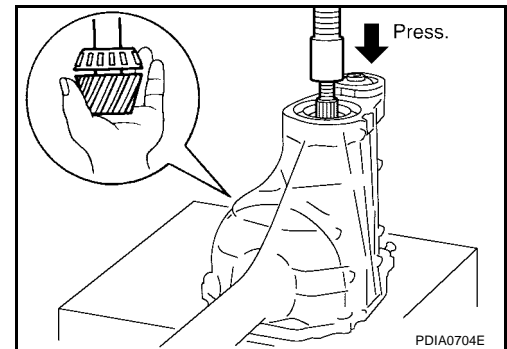
- Remove companion flange using suitable tool.



- Press drive pinion assembly out of gear carrier. (Together with collapsible spacer.)

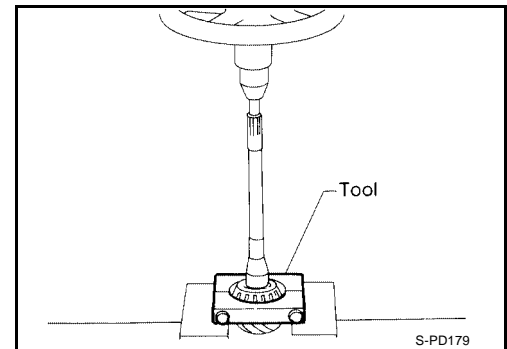
CAUTION:

Do not drop drive pinion assembly.



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

Tool number : ST30031000 (J-22912-01)

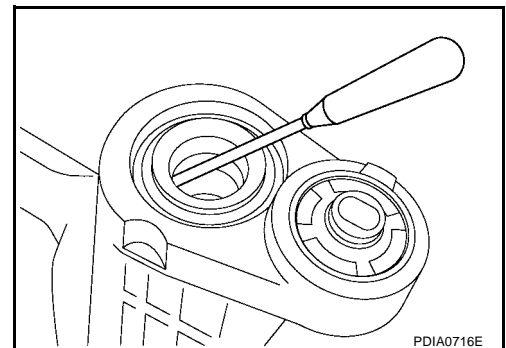


- Remove front oil seal using suitable tool.

CAUTION:

Do not damage gear carrier.

- Remove pinion front bearing inner race.
- Remove collapsible spacer.

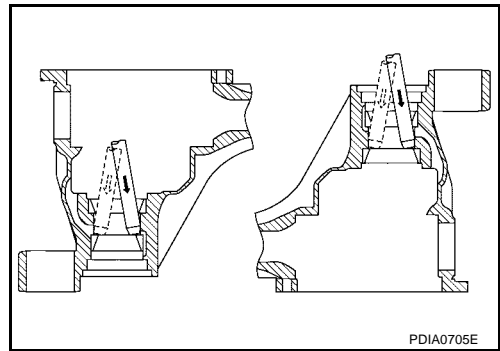


FRONT FINAL DRIVE ASSEMBLY

11. Tap pinion front/rear bearing outer races uniformly to remove them, using suitable tool.

CAUTION:

Do not damage gear carrier.



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INSPECTION AFTER DISASSEMBLY

Clean up the disassembled parts. Then, inspect if the parts are worn or damaged. If parts are worn or damaged, follow the measures below.

Content	Conditions and Measures
Hypoid gear	<ul style="list-style-type: none"> ● If the gear teeth do not mesh or line-up correctly, determine the cause and adjust or replace as necessary. ● If the gears are worn, cracked, damaged, pitted or chipped (by friction) noticeably, replace with new drive gear and drive pinion as a set.
Bearing	<ul style="list-style-type: none"> ● If any chipped (by friction), pitted, worn, rusted or scratched mark, or unusual noise from the bearing is observed, replace as a bearing assembly (as a new set).
Side gear and Pinion mate gear	<ul style="list-style-type: none"> ● If any cracks or damage on the surface of the tooth is found, replace. ● If any worn or chipped mark on the contact sides of the thrust washer is found, replace.
Side gear thrust washer and pinion mate thrust washer	<ul style="list-style-type: none"> ● If it is chipped (by friction), damaged, or unusually worn, replace.
Oil seal	<ul style="list-style-type: none"> ● Whenever disassembled, replace. ● If wear, deterioration of adherence (sealing force lips), or damage is detected on the lips, replace them.
Differential case	<ul style="list-style-type: none"> ● If any wear or crack on the contact sides of the differential case is found, replace.
Companion flange	<ul style="list-style-type: none"> ● If any chipped mark (about 0.1 mm, 0.004 in) or other damage on the contact sides of the lips of the companion flange is found, replace.

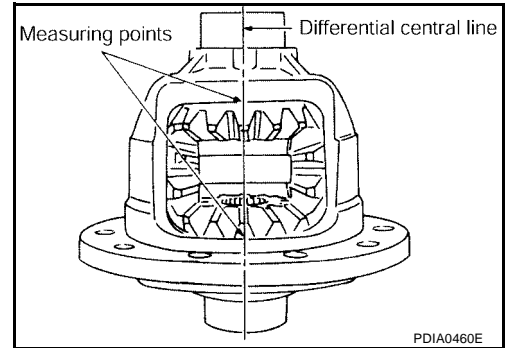
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FRONT FINAL DRIVE ASSEMBLY

ADJUSTMENT AND SELECTION ADJUSTING WASHERS

Differential Side Gear Clearance

- Assemble the differential parts if they are disassembled. Refer to [FFD-32, "Differential Assembly"](#).
- Place differential case straight up so that side gear to be measured comes upward.



- Using feeler gauge, measure the clearance between side gear back and differential case at 3 different points, while rotating side gear. Average the 3 readings, and then measure the clearance. (Measure the clearance of the other side as well.)

Side gear back clearance specification:

0.1 mm (0.004 in) or less.

(Each gear should rotate smoothly without excessive resistance during differential motion.)

CAUTION:

To prevent side gear from tilting, insert feeler gauges with the same thickness from both sides.

- If the back clearance is outside the specification, use a thicker/thinner side gear thrust washer to adjust. Refer to [FFD-36, "Side Gear Thrust Washer"](#).

When the back clearance is greater than specification:

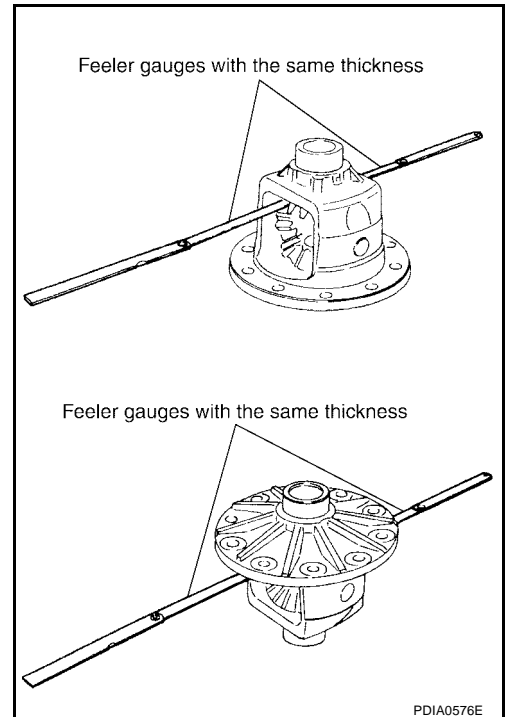
Use a thicker thrust washer.

When the back clearance is less than specification:

Use a thinner thrust washer.

CAUTION:

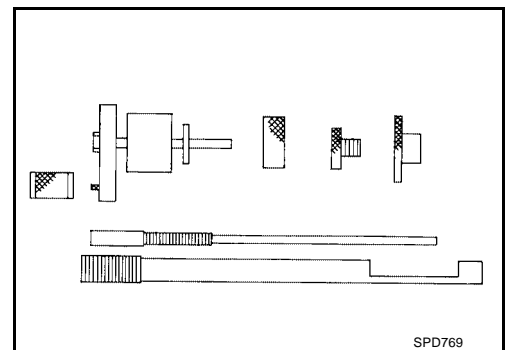
Select a side gear thrust washer for right and left individually.



Pinion Gear Height

- Make sure all parts are clean and that the bearings are well lubricated.
- Assemble the pinion gear bearings into the Tool.

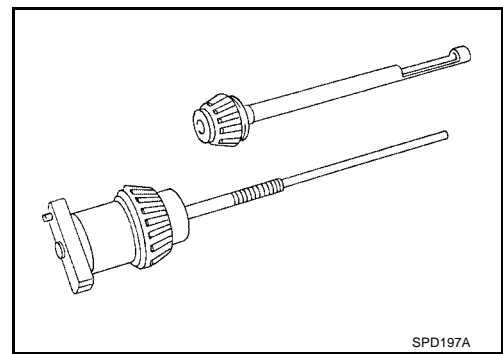
Tool number : — (J-34309)



FRONT FINAL DRIVE ASSEMBLY

- **Pinion front bearing;** make sure the J-34309-3 pinion front bearing seat is secured tightly against the J-34309-2 gauge anvil. Then turn the pinion front bearing pilot, J-34309-7, to secure the bearing in its proper position.
- **Pinion rear bearing;** the pinion rear bearing pilot, J-34309-8, is used to center the pinion rear bearing only. The pinion rear bearing locking seat, J-34309-4, is used to lock the bearing to the assembly.
- **Installation of J-34309-9 and J-34309-16;** place a suitable 2.5 mm (0.098 in) thick plain washer between J-34309-9 and J-34309-16. Both surfaces of J-34309-9 and J-34309-16 must be parallel with a clearance of 2.5 mm (0.098 in).

3. Install the pinion rear bearing inner race into gear carrier. Then place the pinion preload shim selector tool, J-34309-1, gauge screw assembly.



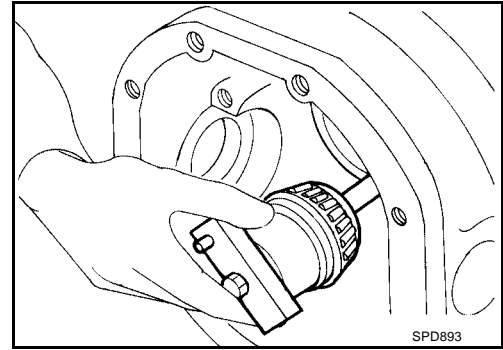
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4. Assemble the pinion front bearing inner race and the J-34309-2 gauge anvil. Assemble them together with the J-34309-1 gauge screw in gear carrier. Make sure that the pinion height gauge plate, J-34309-16, will turn a full 360 degrees. Tighten the two sections together by hand.

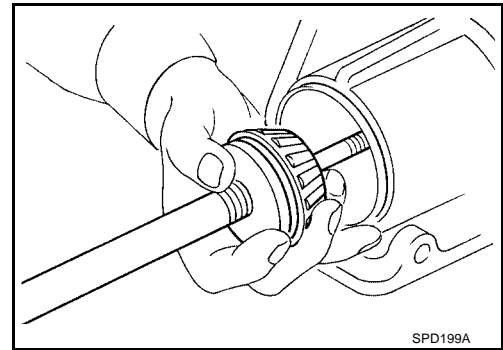


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5. Turn the assembly several times to seat the bearings.



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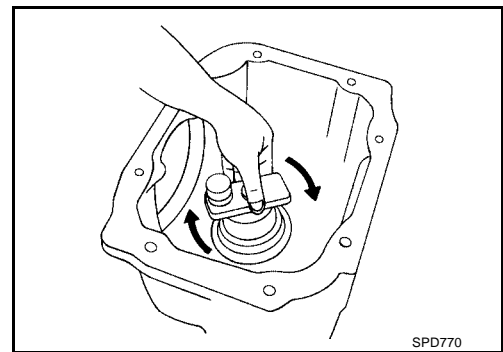
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6. Measure the turning torque at the end of the J-34309-2 gauge anvil using Tool.

Tool number : ST3127S000 (J-25765- A)

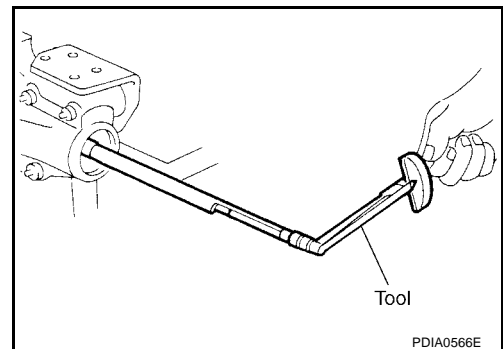
Turning torque specification:

1.0 - 1.6 N·m (0.11 - 0.16 kg·m, 9 - 14 in·lb)



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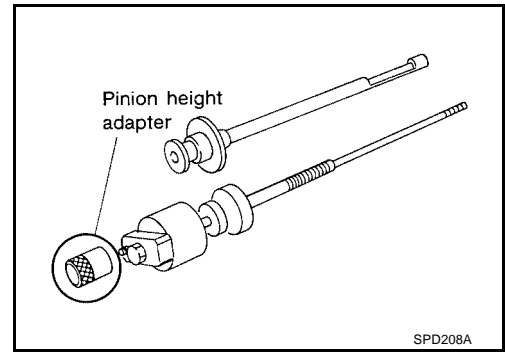


FRONT FINAL DRIVE ASSEMBLY

7. Place the J-34309-10 "R180A" pinion height adapter onto the gauge plate and tighten it by hand.

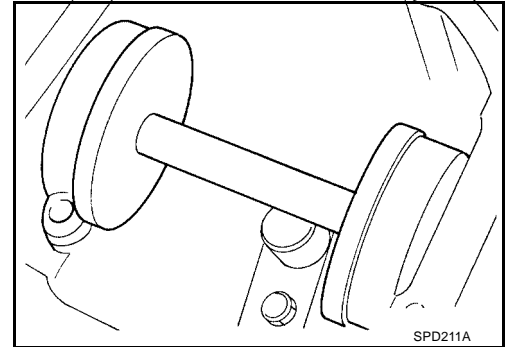
CAUTION:

Make sure all machined surfaces are clean.

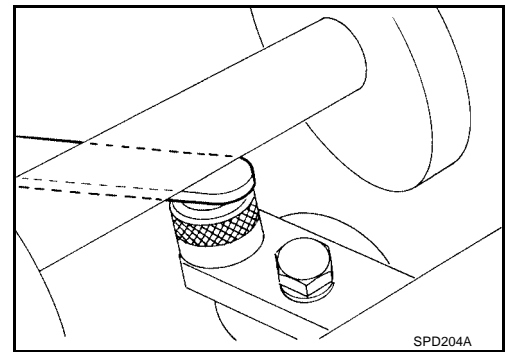


8. Position the side bearing discs, Tool, and arbor firmly into the side bearing bores. Install the bearing caps and tighten bearing cap bolts to the specified torque. Refer to [FFD-16, "COMPONENTS"](#).

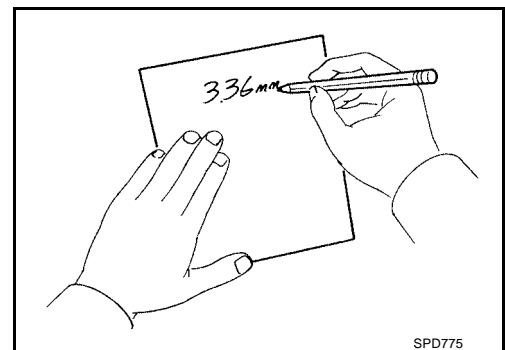
Tool number : — (J-25269-18)



9. Select the correct standard pinion height adjusting washer thickness. Select by using a standard gauge of 3 mm (0.12 in) and your J-34309-101 feeler gauge. Measure the distance between the J-34309-10 pinion height adapter including the standard gauge and the arbor.

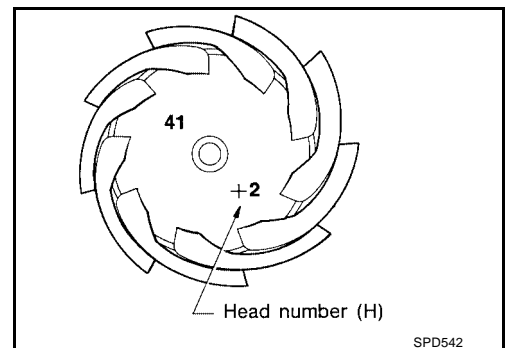


10. Write down exact measurement (the value of feeler gauge).



11. Correct the pinion height washer size by referring to the "pinion head number".

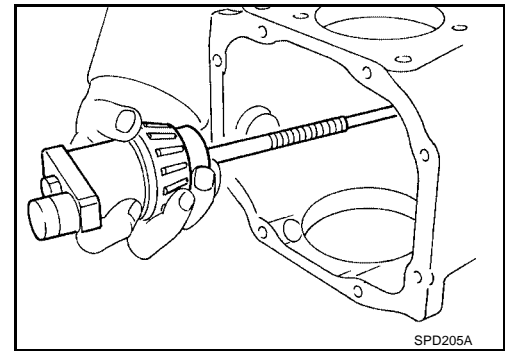
There are two numbers painted on the drive pinion. The first one refers to the drive pinion and drive gear as a matched set. This number should be the same as the number on the drive gear. The second number is the "pinion head height number". It refers to the ideal pinion height from standard for quietest operation. Use the following chart to determine the correct pinion height washer.



FRONT FINAL DRIVE ASSEMBLY

Pinion head height number	Add or remove from the standard pinion height adjusting washer thickness measurement
- 6	Add 0.06 mm (0.0024 in)
- 5	Add 0.05 mm (0.0020 in)
- 4	Add 0.04 mm (0.0016 in)
- 3	Add 0.03 mm (0.0012 in)
- 2	Add 0.02 mm (0.0008 in)
- 1	Add 0.01 mm (0.0004 in)
0	Use the selected washer thickness
+1	Subtract 0.01 mm (0.0004 in)
+2	Subtract 0.02 mm (0.0008 in)
+3	Subtract 0.03 mm (0.0012 in)
+4	Subtract 0.04 mm (0.0016 in)
+5	Subtract 0.05 mm (0.0020 in)
+6	Subtract 0.06 mm (0.0024 in)

- Select the correct pinion height adjusting washer. Refer to [FFD-37, "Pinion Height Adjusting Washer"](#) .
- Remove the J-34309 differential shim selector tool from the final drive housing. Then disassemble to retrieve the pinion bearings.



ASSEMBLY

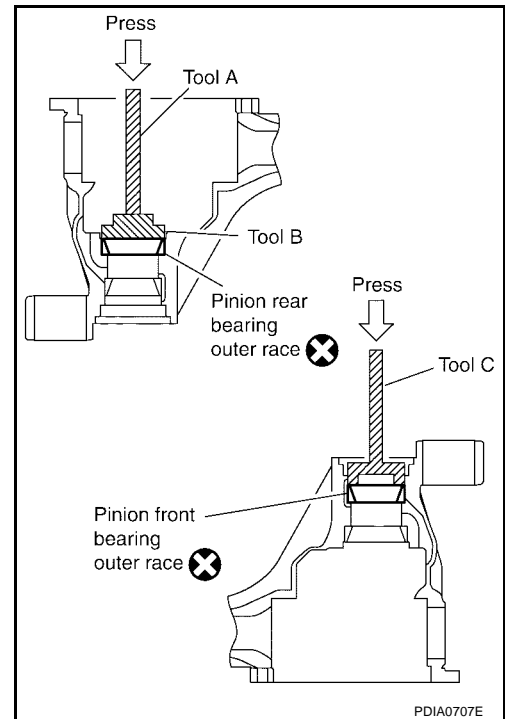
Drive Pinion Assembly

- Install front and rear bearing outer races using Tools.

Tool number **A: ST30611000 (J-25742-1)**
 B: ST30613000 (J-25742-3)
 C: KV38100200 (J-26233)

CAUTION:

- First tap the bearing outer race until it becomes flat to the gear carrier.
 - Do not reuse pinion front and rear bearing outer race.
- Select drive pinion height adjusting washer. Refer to [FFD-26, "Pinion Gear Height"](#) .



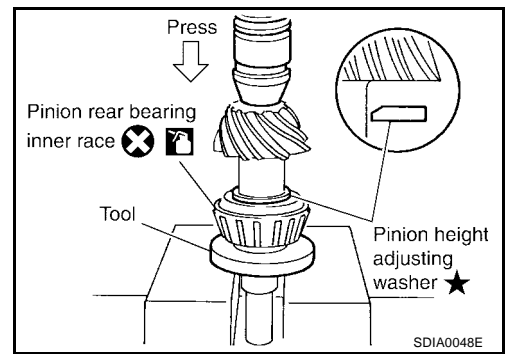
FRONT FINAL DRIVE ASSEMBLY

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

Tool number : ST30901000 (J-26010-01)

CAUTION:

- Install the pinion height adjusting washer in the proper direction as shown.
- Do not reuse pinion rear bearing inner race.

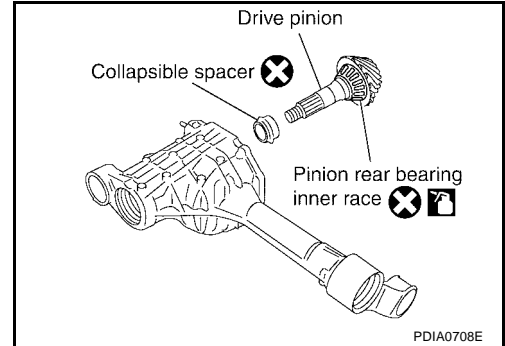


4. Assemble collapsible spacer to drive pinion.

CAUTION:

Do not reuse collapsible spacer.

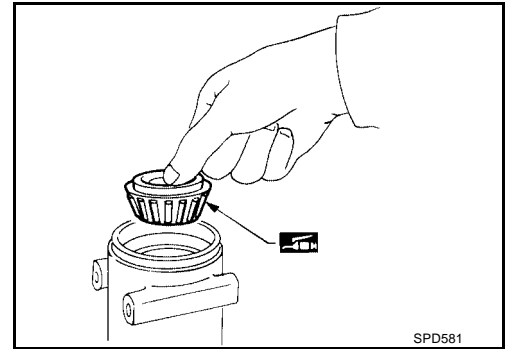
5. Apply gear oil to pinion rear bearing, and assemble drive pinion into gear carrier.



6. Apply gear oil to pinion front bearing, and assemble pinion front bearing inner race to drive pinion assembly.

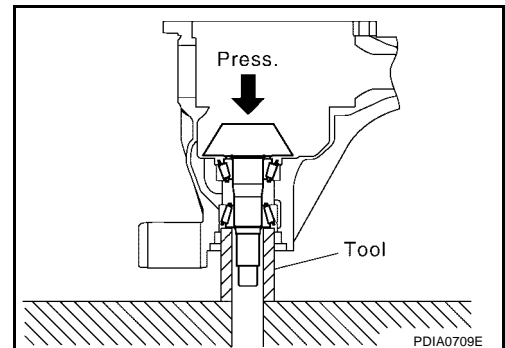
CAUTION:

Do not reuse pinion front bearing inner race.



7. Press the pinion front bearing inner race to drive pinion as far as drive pinion lock nut can be tightened using Tool.

Tool number : ST33200000 (J-26082)



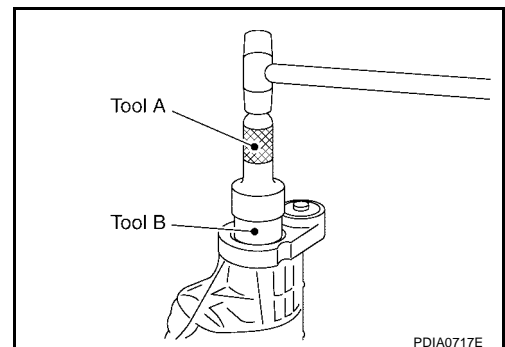
8. Install front oil seal until it becomes flush with the case end using Tools.

Tool number A: ST30720000 (J-25405)

B: ST27863000 (—)

CAUTION:

- Do not reuse oil seal.
- Do not incline oil seal when installing.
- Apply multi-purpose grease onto oil seal lips, and gear oil onto the circumference of oil seal.

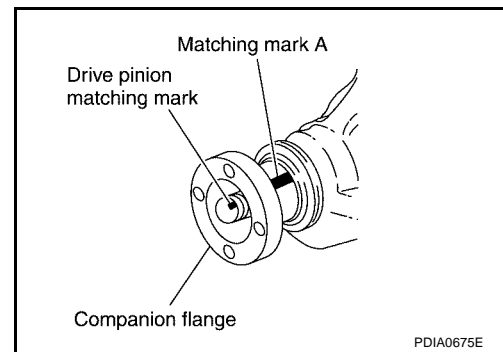


FRONT FINAL DRIVE ASSEMBLY

9. Install companion flange.

NOTE:

When reusing drive pinion, align the matching mark of drive pinion with the matching mark A of companion flange, then install companion flange.



10. Apply gear oil to the thread and seat of new drive pinion lock nut, and temporarily tighten new drive pinion lock nut to drive pinion.

CAUTION:

Do not reuse drive pinion lock nut.

11. Adjust the drive pinion lock nut tightening torque and pinion bearing preload torque using Tools.

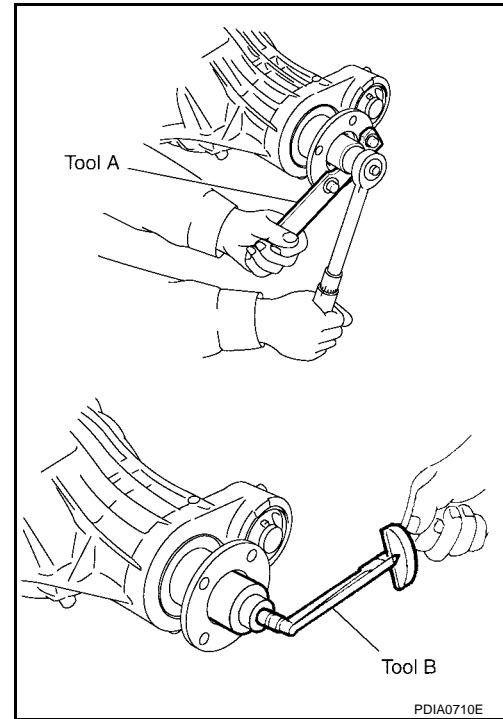
Tool number **A:** KV38108300 (J-44195)
 B: ST3127S000 (J-25765-A)

Drive pinion lock nut tightening torque:
186 - 294 N·m (19 - 29 kg·m, 138 - 216 ft·lb)

Drive pinion bearing preload:
1.08 - 1.66 N·m (0.11 - 0.16 kg·m, 10 - 14 in·lb)

CAUTION:

- Adjust the lower limit of the drive pinion lock nut tightening torque first.
- If the 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 preload torque.
- After adjustment, rotate drive pinion back and forth 2 to 3 times to check for unusual noise, rotation malfunction, and other malfunctions.



12. Install differential case assembly. Refer to [FFD-32, "Differential Assembly"](#) .

CAUTION:

Do not install rear cover yet.

13. Check and adjust drive gear runout, tooth contact, drive gear to drive pinion backlash, and companion flange runout. Refer to [FFD-17, "Drive Gear Runout"](#) , [FFD-18, "Tooth Contact"](#) , [FFD-19, "Backlash"](#) , [FFD-20, "Companion Flange Runout"](#) .

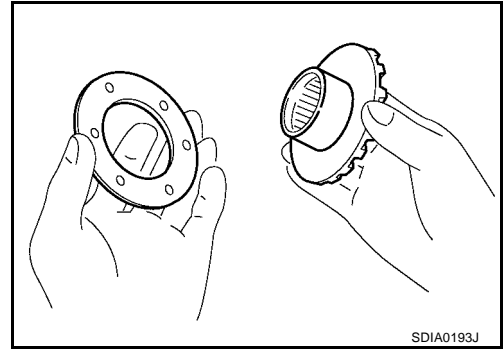
Recheck above items. Readjust the above description, if necessary.

14. Check total preload torque. Refer to [FFD-17, "Total Preload Torque"](#) .
15. Install rear cover. Refer to [FFD-32, "Differential Assembly"](#) .
16. Install side shaft assembly. Refer to [FFD-35, "Side Shaft"](#) .

FRONT FINAL DRIVE 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.

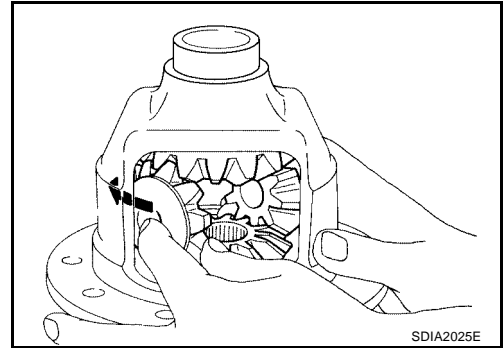


2. Install side gears and thrust washers into differential case.

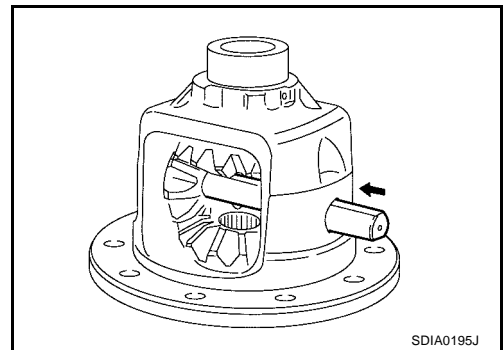
CAUTION:

Make sure that the circular clip is installed to side gears.

3. Align 2 pinion mate gears in diagonally opposite positions, then rotate and install them into differential case after installing thrust washer to pinion mate gear.



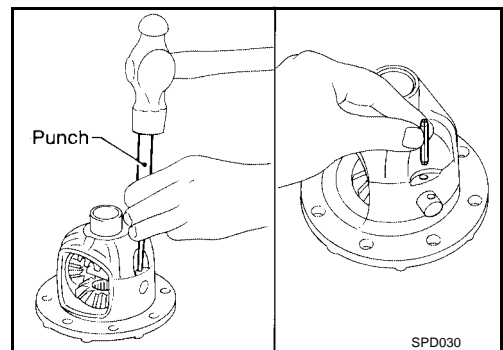
4. Align the lock pin holes on differential case with shaft, and install pinion mate shaft.
5. Measure side gear end play. If necessary, select the appropriate side gear thrust washers. Refer to [FFD-26, "Differential Side Gear Clearance"](#).



6. Drive a lock pin into pinion mate shaft, using suitable tool. Make sure lock pin is flush with differential case.

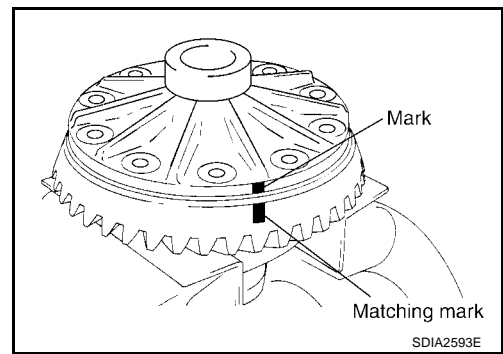
CAUTION:

Do not reuse lock pin.



FRONT FINAL DRIVE ASSEMBLY

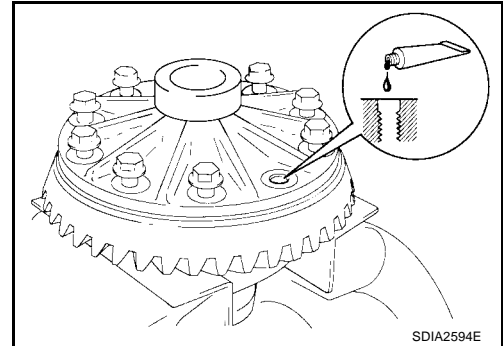
7. Align the matching mark of differential case with the mark of drive gear, then place drive gear.



8. Apply thread locking sealant into the thread hole of drive gear.
- Use Genuine High Strength Thread Locking Sealant or equivalent. Refer to [GI-47, "Recommended Chemical Products and Sealants"](#).

CAUTION:

Make sure the drive gear back and threaded holes are clean.

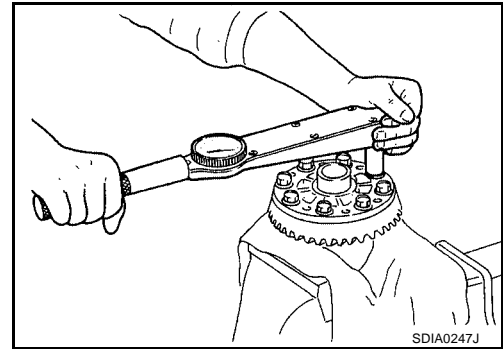


9. Install drive gear bolts, and then tighten to the specified torque. Refer to [FFD-16, "COMPONENTS"](#). After tightening the bolts to the specified torque, tighten the bolts an additional 31 to 36 degrees using Tool.

Tool number : KV10112100-A (BT-8653-A)

CAUTION:

- Always use Tool. Avoid tightening based on visual check alone.
- Tighten bolts in a crisscross pattern.



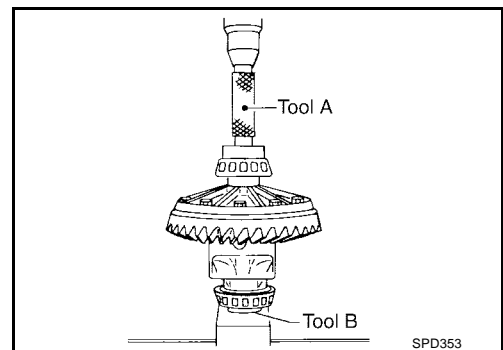
10. Press side bearing inner races to differential case, using Tools.

Tool number A: ST33230000 (J-35867)

Tool number B: ST33061000 (J-8107-2)

CAUTION:

Do not reuse side bearing inner race.

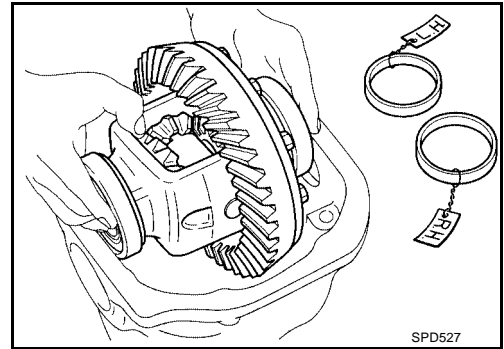


11. Install housing spacer.

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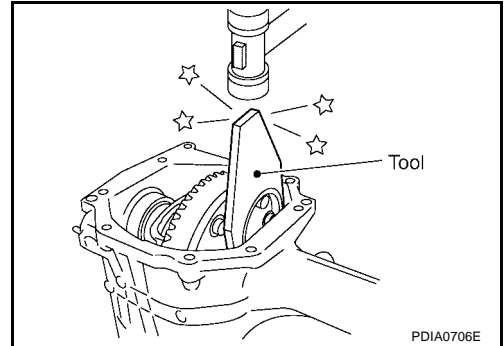
FRONT FINAL DRIVE ASSEMBLY

12. Apply gear oil to side bearings, and install differential case assembly with side bearing outer races into gear carrier.

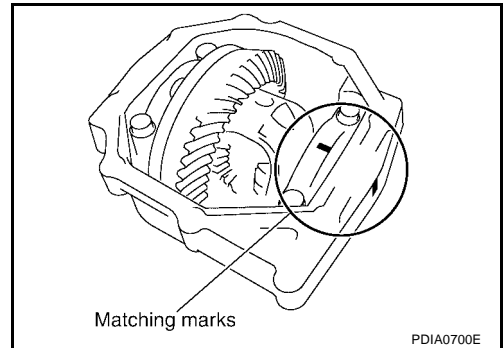


13. Insert left and right original side bearing adjusting washers in place between side bearings and gear carrier, using Tool.

Tool number : KV38100600 (J-25267)



14. Align matching mark on bearing cap with that on gear carrier.
15. Install bearing caps and tighten bearing cap bolts to the specified torque. Refer to [FFD-16, "COMPONENTS"](#) .



16. Drive side oil seal until it becomes flush with the case end using Tools.

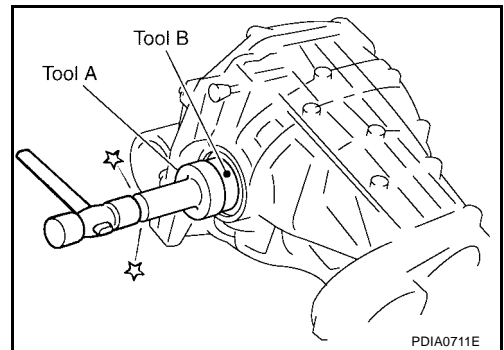
Tool number A: ST30720000 (J-25405)

B: ST27863000 (—)

CAUTION:

- Do not reuse oil seal.
- Do not incline oil seal when installing.
- Apply multi-purpose grease onto oil seal lips, and gear oil onto the circumference of oil seal.

17. Check and adjust drive gear runout, tooth contact, drive gear to drive pinion backlash, and total preload torque. Refer to [FFD-17, "Drive Gear Runout"](#) , [FFD-18, "Tooth Contact"](#) , [FFD-19, "Backlash"](#) , [FFD-17, "Total Preload Torque"](#) .
Recheck above items. Readjust the above description, if necessary.



FRONT FINAL DRIVE ASSEMBLY

18. Apply sealant to mating surface of rear cover.

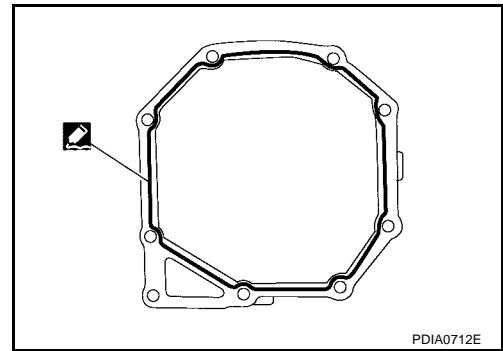
- Use Genuine Silicone RTV or equivalent. Refer to [GI-47, "Recommended Chemical Products and Sealants"](#) .

CAUTION:

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

19. Install rear cover on gear carrier and tighten bolts with the specified torque. Refer to [FFD-16, "COMPONENTS"](#) .

20. Install side shaft assembly. Refer to [FFD-35, "Side Shaft"](#) .



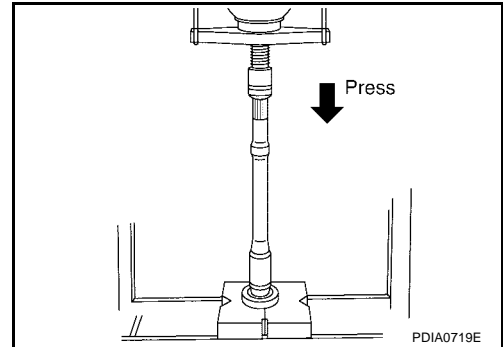
Side Shaft

1. Press side shaft bearing to side shaft.

CAUTION:

Do not reuse bearing.

2. Install snap ring (shaft side).
3. Install side shaft assembly into gear carrier.
4. Install snap ring (hole side).

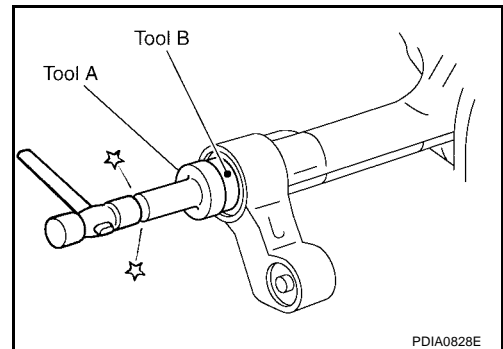


5. Drive side oil seal until it becomes flush with the case end using Tools.

Tool number **A: ST30720000 (J-25405)**
 B: ST27863000 (—)

CAUTION:

- Do not reuse oil seal.
- Do not incline oil seal when installing.
- Apply multi-purpose grease onto oil seal lips, and gear oil onto the circumference of oil seal.



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SERVICE DATA AND SPECIFICATIONS (SDS)

SERVICE DATA AND SPECIFICATIONS (SDS)

PFP:00030

General Specifications

EDS0039S

Applied model	VQ40DE
Final drive model	R180A
Gear ratio	3.357
Number of teeth (Drive gear/Drive pinion)	47/14
Oil capacity (Approx.)	ℓ (US pt, Imp pt) 0.85 (1-3/4, 1-1/2)
Number of pinion gears	2
Drive pinion adjustment spacer type	Collapsible

Inspection and Adjustment DRIVE GEAR RUNOUT

EDS0039T

Unit: mm (in)

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

DIFFERENTIAL SIDE GEAR CLEARANCE

Unit: mm (in)

Item	Specification
Side gear backlash (Clearance between side gear and differential case)	0.1 (0.004) or less (Each gear should rotate smoothly without excessive resistance during differential motion.)

PRELOAD TORQUE

Unit: N·m (kg·m, in·lb)

Item	Specification
Pinion bearing (P1)	1.08 - 1.66 (0.11 - 0.16, 10 - 14)
Side bearing (P2)	0.59 - 1.08 (0.06 - 0.11, 6 - 9)
Side bearing to pinion bearing (Total preload) (Total preload = P1 + P2)	1.67 - 2.74 (0.17 - 0.27, 15 - 24)

BACKLASH

Unit: mm (in)

Item	Specification
Drive gear to drive pinion gear	0.10 - 0.15 (0.0039 - 0.0059)

COMPANION FLANGE RUNOUT

Unit: mm (in)

Item	Runout limit
Companion flange face	0.1 (0.004) or less
Inner side of the companion flange	0.1 (0.004) or less

SELECTIVE PARTS

Side Gear Thrust Washer

Unit: mm (in)

Thickness	Part number*	Thickness	Part number*
0.75 (0.0295)	38424 W2010	0.87 (0.0343)	38424 W2014
0.78 (0.0307)	38424 W2011	0.90 (0.0354)	38424 W2015
0.81 (0.0319)	38424 W2012	0.93 (0.0366)	38424 W2016
0.84 (0.0331)	38424 W2013	0.96 (0.0378)	38424 W2017

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

SERVICE DATA AND SPECIFICATIONS (SDS)

Pinion Height Adjusting Washer

Unit: mm (in)

Thickness	Part number*	Thickness	Part number*
3.09 (0.1217)	38154 EA000	3.39 (0.1335)	38154 EA010
3.12 (0.1228)	38154 EA001	3.42 (0.1346)	38154 EA011
3.15 (0.1240)	38154 EA002	3.45 (0.1358)	38154 EA012
3.18 (0.1252)	38154 EA003	3.48 (0.1370)	38154 EA013
3.21 (0.1264)	38154 EA004	3.51 (0.1382)	38154 EA014
3.24 (0.1276)	38154 EA005	3.54 (0.1394)	38154 EA015
3.27 (0.1287)	38154 EA006	3.57 (0.1406)	38154 EA016
3.30 (0.1299)	38154 EA007	3.60 (0.1417)	38154 EA017
3.33 (0.1311)	38154 EA008	3.63 (0.1429)	38154 EA018
3.36 (0.1323)	38154 EA009	3.66 (0.1441)	38154 EA019

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

Side Bearing Adjusting Washer

Unit: mm (in)

Thickness	Part number*	Thickness	Part number*
1.95 (0.0768)	38453 EA000	2.35 (0.0925)	38453 EA008
2.00 (0.0787)	38453 EA001	2.40 (0.0945)	38453 EA009
2.05 (0.0807)	38453 EA002	2.45 (0.0965)	38453 EA010
2.10 (0.0827)	38453 EA003	2.50 (0.0984)	38453 EA011
2.15 (0.0846)	38453 EA004	2.55 (0.1004)	38453 EA012
2.20 (0.0866)	38453 EA005	2.60 (0.1024)	38453 EA013
2.25 (0.0886)	38453 EA006	2.65 (0.1043)	38453 EA014
2.30 (0.0906)	38453 EA007		

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

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SERVICE DATA AND SPECIFICATIONS (SDS)
