

SECTION **FFD**  
FRONT FINAL DRIVE

A  
B  
C

FFD

CONTENTS

E

<b>PRECAUTIONS</b> .....	<b>2</b>	BEARING AND OIL SEAL REPLACEMENT .....	18	F
Precautions .....	2	EXTENSION TUBE REPLACEMENT .....	19	
<b>PREPARATION</b> .....	<b>3</b>	PRE-DISASSEMBLY INSPECTION .....	19	
Special Service Tools .....	3	DISASSEMBLY AND ASSEMBLY .....	21	G
Commercial Service Tools .....	5	Differential Case Assembly .....	24	
<b>NOISE, VIBRATION AND HARSHNESS (NVH)</b>		Installation Drive Pinion Assembly .....	26	
<b>TROUBLESHOOTING</b> .....	<b>6</b>	DIFFERENTIAL CASE INSTALLATION .....	28	H
NVH Troubleshooting Chart .....	6	TOOTH CONTACT INSPECTION .....	30	
<b>FRONT OIL SEAL</b> .....	<b>7</b>	TOOTH CONTACT PATTERN AND HEIGHT		
Removal and Installation .....	7	ADJUSTING WASHER SELECTION .....	31	I
REMOVAL .....	7	TOOTH CONTACT ADJUSTMENT .....	31	
INSTALLATION .....	8	TOTAL PRELOAD INSPECTION .....	33	
<b>SIDE OIL SEAL</b> .....	<b>9</b>	DRIVE PINION PRELOAD ADJUSTMENT .....	33	
Removal and Installation .....	9	After Inspection .....	35	J
REMOVAL .....	9	Carrier Cover Installation .....	36	
INSTALLATION .....	9	<b>SERVICE DATA AND SPECIFICATIONS (SDS)</b> .....	<b>37</b>	K
<b>FRONT FINAL DRIVE ASSEMBLY</b> .....	<b>10</b>	General Specifications .....	37	
Removal and Installation (VQ35DE) .....	10	Drive Gear Runout .....	37	
REMOVAL .....	10	Side Gear Adjustment .....	37	
INSTALLATION .....	10	AVAILABLE SIDE GEAR THRUST WASHERS...	37	L
Removal and Installation (VK45DE) .....	11	Side Bearing Preload Adjusting Shims .....	37	
REMOVAL .....	11	SIDE RETAINER SIDE: .....	37	
INSTALLATION .....	11	DIFFERENTIAL CASE TO SIDE BEARING: .....	37	M
Front Final Drive Breather Hose .....	12	Drive Pinion Height Adjustment .....	38	
REMOVAL AND INSTALLATION (VQ35DE) .....	12	AVAILABLE PINION HEIGHT ADJUSTING		
REMOVAL AND INSTALLATION (VK45DE) .....	13	WASHERS .....	38	
Components .....	14	Drive Pinion Preload Adjustment .....	38	
COMPONENTS (VQ35DE) .....	14	AVAILABLE PINION PRELOAD ADJUSTING		
COMPONENTS (VK45DE) .....	16	WASHERS .....	38	
Side Shaft .....	18	Total Preload Adjustment .....	38	

# PRECAUTIONS

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## PRECAUTIONS

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### Precautions

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#### **CAUTION:**

- Before starting diagnosis of the vehicle, understand symptoms well. Perform correct and systematic operations.
- Check for the correct installation status prior removal or disassembly. When mating marks are required, be sure they do not interfere with the function of the parts they are applied to.
- Carry out an overhaul in a clean work place, Using a dust proof room is recommended.
- Before disassembly, using steam or white gasoline, completely remove sand and mud from the exterior the unit, preventing them from entering into the unit during disassembly or assembly.
- Check appearance of the disassembled parts for damage, deformation, and abnormal wear. If a malfunction is detected, replace it with a new one.
- Normally replace lock pins, oil seals, and bearings with new ones every times they are removed.
- In principle, tighten bolts or nuts gradually in several steps working diagonally from inside to outside. If tightening sequence is specified, observe it.
- Clean and flush the parts sufficiently and blow them dry.
- Be careful not to damage the sliding surfaces and mating surface.
- When applying sealant, remove the old sealant from the mounting surface; then remove any moisture, oil, and foreign materials from the application and mounting surfaces.
- Always use shop paper for cleaning the inside of components.
- Avoid using cotton gloves or a shop cloth to prevent entering of lint.
- During assembly, observe the specified tightening torque, and new differential oil, Vaseline, or multi-purpose grease, as specified for each vehicle, when necessary.

# PREPARATION

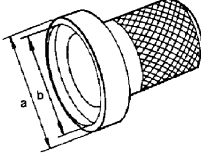
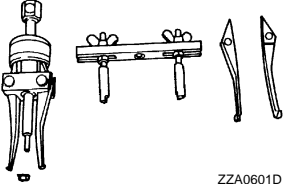
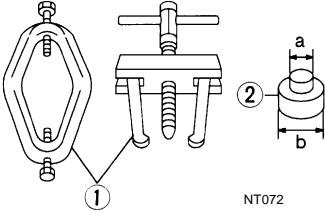
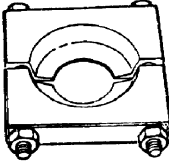
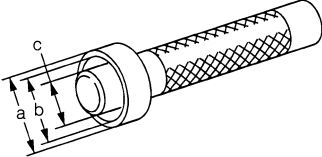

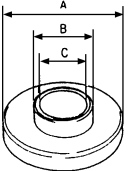
## PREPARATION

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### Special Service Tools

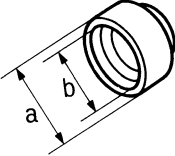
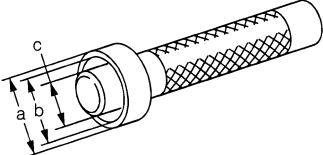
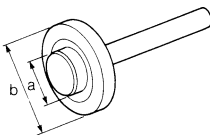
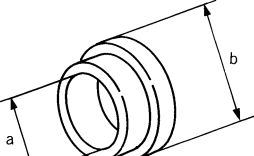
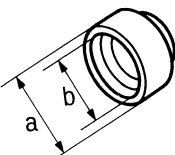
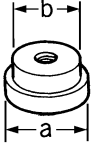
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The actual shapes of Kent-Moore tools may differ from those of special service tools illustrated here.

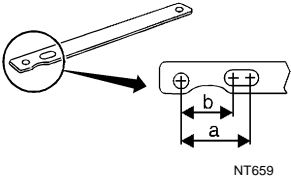
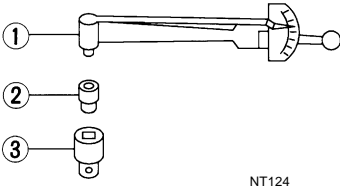
Tool number (Kent-Moore No.) Tool name	Description
ST33400001 (J-26082) a: 60 mm (2.36 in) dia. b: 47 mm (1.85 in) dia. Drift  <p style="text-align: right;">ZZA0702D</p>	<ul style="list-style-type: none"> <li>● Installing front oil seal.</li> <li>● Installing right side oil seal.</li> </ul>
ST33290001 (J-34286) Outer race puller  <p style="text-align: right;">ZZA0601D</p>	<ul style="list-style-type: none"> <li>● Removing side oil seal.</li> <li>● Removing front oil seal.</li> </ul>
ST3306S001 ( - ) ST33051001 (J-22888-20) body ST33061000 (J-8107-2) adapter. a: 28.5 mm (1.122 in) dia. b: 38 mm (1.50 in) dia. Puller set  <p style="text-align: right;">NT072</p>	Removing side bearing.
ST30031000 (J-22912-01) Puller  <p style="text-align: right;">ZZA0700D</p>	Removing drive pinion bearing.
ST33230000 ( - ) a: 51 mm (2.01 in) dia. b: 41 mm (1.61 in) dia. c: 28mm (1.10 in) dia. Drift  <p style="text-align: right;">ZZA1046D</p>	Installing side bearing inner race.
KV31100300 ( - ) Pin punch  <p style="text-align: right;">ZZA0515D</p>	Removing and installing pinion mate shaft lock pin.
ST30032000 ( - ) A: 80mm (3.15 in) dia. B: 38 mm (1.50 in) dia. C: 31 mm (1.22 in) dia. Inner race adaptor  <p style="text-align: right;">SDIA0217J</p>	<ul style="list-style-type: none"> <li>● Installing drive pinion bearing inner race.</li> <li>● Installing bearing inner race.</li> <li>● installing side shaft bearing.</li> </ul>

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# PREPARATION

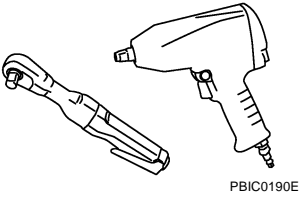
Tool number (Kent-Moore No.) Tool name	Description
KV38102510 ( - ) a: 71 mm (2.80 in) dia. b: 65 mm (2.56 in) dia. Drift <div style="text-align: center;">  <p style="margin-top: 5px;">ZZA0838D</p> </div>	Installing front oil seal.
ST33210000 ( - ) a: 44 mm (1.73 in) dia. b: 34.5 mm (1.36 in) dia. c: 22 mm (0.87 in) dia. Drift <div style="text-align: center;">  <p style="margin-top: 5px;">ZZA1046D</p> </div>	Installing left side oil seal.
ST37820000 ( - ) a: 39 mm (1.54 in) dia. b: 72 mm (2.83 in) dia. Drift <div style="text-align: center;">  <p style="margin-top: 5px;">ZZA0836D</p> </div>	Installing drive pinion bearing outer race.
KV31103000 ( - ) a: 49 mm (1.93 in) dia. b: 70 mm (2.76 in) dia. Drift <div style="text-align: center;">  <p style="margin-top: 5px;">ZZA1113D</p> </div>	Installing side bearing outer race.
ST1982000 ( - ) a: 70 mm (2.76 in) dia. b: 50 mm (1.97 in) dia. Drift <div style="text-align: center;">  <p style="margin-top: 5px;">ZZA0838D</p> </div>	Installing side shaft oil seal.
ST35321000 ( - ) a: 49 mm (1.93 in) dia. b: 41 mm (1.61 in) dia. Drift <div style="text-align: center;">  <p style="margin-top: 5px;">ZZA1000D</p> </div>	Installing side bearing inner race.

# PREPARATION

Tool number (Kent-Moore No.) Tool name	Description	
KV40104000 ( - ) a: 85 mm (3.35 in) dia. b: 65 mm (2.56 in) dia. Drive pinion flange wrench		A B C
ST3127S000 (J-25765-A) 1. GG91030000 Torque wrench (J-25765) 2. HT62940000 ( - ) Socket adapter (1/2") 3. HT62900000 ( - ) Socket adapter (3/8") Preload gauge		FFD E

## Commercial Service Tools

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Tool name	Description	
Power tool		F G H I J K L M

# NOISE, VIBRATION AND HARSHNESS (NVH) TROUBLESHOOTING

## NOISE, VIBRATION AND HARSHNESS (NVH) TROUBLESHOOTING

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### NVH Troubleshooting Chart

ADS000N6

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

Symptom	Differential	Noise	Possible cause and suspected parts	Reference page
x			Rough gear tooth	Refer to <a href="#">FFD-23, "Inspection"</a> .
x			Improper gear contact	Refer to <a href="#">FFD-30, "TOOTH CONTACT INSPECTION"</a> .
x			Tooth surfaces worn	Refer to <a href="#">FFD-23, "Inspection"</a> .
x			Incorrect backlash	Refer to <a href="#">FFD-13, "Pre-Inspection"</a> .
x			Companion flange excessive runout	—
x			Improper gear oil	Refer to <a href="#">MA-32, "Checking Differential Gear Oil"</a> .
x			Propeller shaft	NVH in PR section.
x			Axle and suspension	NVH in FAX, RAX, FSU and RSU sections.
x			Tires	NVH in WT section.
x			Road wheel	NVH in WT section.
x			Drive shaft	NVH in FAX section.
x			Brakes	NVH in BR section.
x			Steering	NVH in PS section.

x: Applicable

# FRONT OIL SEAL

## FRONT OIL SEAL

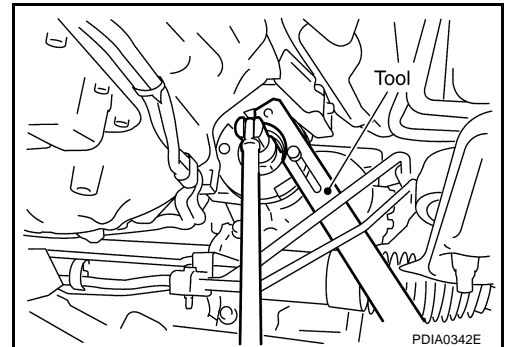
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### Removal and Installation

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1. Remove the front propeller shaft. Refer to [PR-4, "Removal and Installation"](#).
2. Remove drive pinion lock nut with tool.

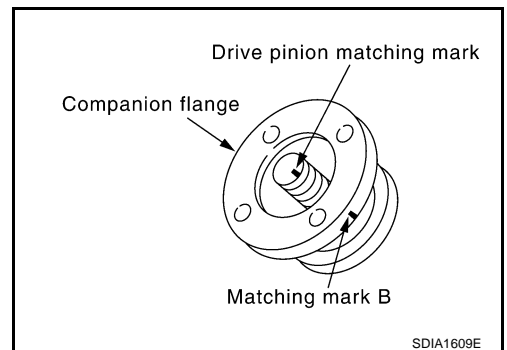
**Tool number** : KV40104000 ( - )



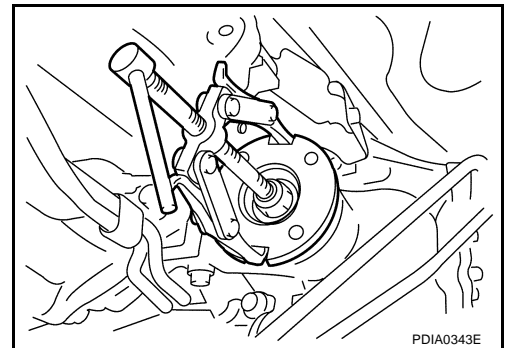
3. Put a matching mark on the end of the drive pinion corresponding to the B position matching mark on the final drive companion flange.

**CAUTION:**

- For matching mark, use paint. Never damage drive pinion.
- The matching mark B on the final drive companion flange indicates the maximum vertical runout position.

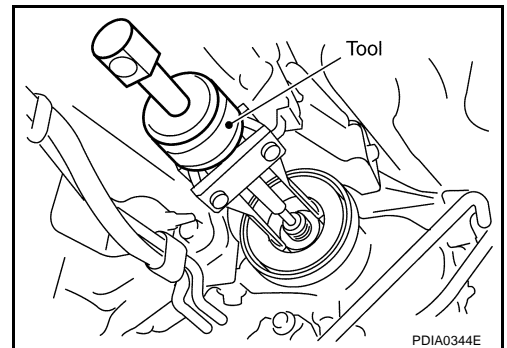


4. Remove the companion flange using puller (commercial service tool)



5. Remove the front oil seal with tool.

**Tool number** : ST33290001 (J-34286)



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# FRONT OIL SEAL

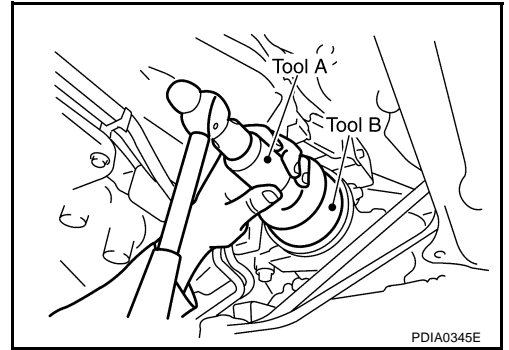
## INSTALLATION

1. Apply multi-purpose grease to sealing lips of the oil seal. Drive the oil seal into the differential case using special service tool so that the oil seal flush with the gear carrier end.

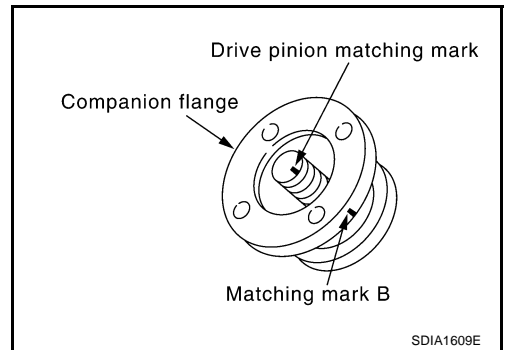
**Tool number**            **A : ST33400001 (J-26082)**  
                                 **B : KV38102510 ( - )**

### NOTE:

- When installing the front oil seal, be careful not to get it inclined.
- Do not reuse the front oil seal. Always replace it with a new one.



2. Install the companion flange while align the matching mark of the drive pinion with the matching mark B of the companion flange.
3. Apply oil to the drive pinion threads and the seating surface of drive pinion lock nut.



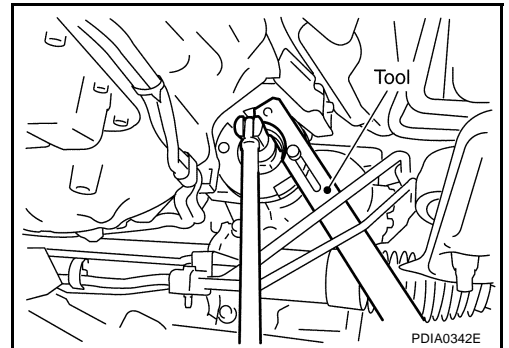
4. Install drive pinion lock nut with tool.

**Tool number**            **: KV40104000 ( - )**

### CAUTION:

**Do not reuse the drive pinion lock nut. Always replace it with a new one.**

5. Install the front propeller shaft. Refer to [PR-4, "Removal and Installation"](#) .





# SIDE OIL SEAL

## SIDE OIL SEAL

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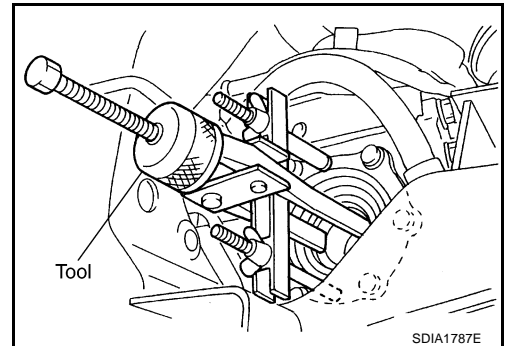
### Removal and Installation REMOVAL

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#### Right side:

1. Remove the front drive shaft. Refer to [FAX-13, "Removal and installation \(Right Side\)"](#).
2. Remove the side oil seal using puller.

**Tool number** : ST33290001 (J-34286)



#### Left side:

1. Remove the front drive shaft. Refer to [FAX-12, "Removal and Installation \(Left Side\)"](#).
2. Remove the side shaft assembly.
3. Remove the front final drive assembly from vehicle. Refer to [FFD-10, "Removal and Installation \(VQ35DE\)"](#) or [FFD-11, "Removal and Installation \(VK45DE\)"](#).
4. Remove the side oil seal using puller.

**Tool number** : ST33290001 (J-34286)

## INSTALLATION

#### Right side:

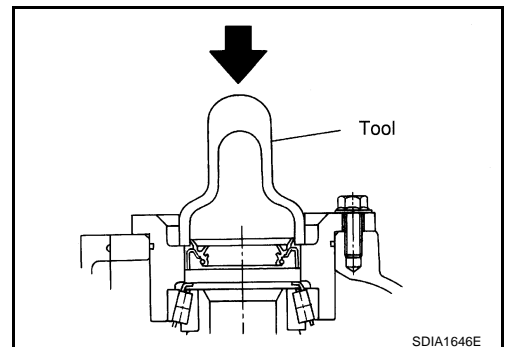
1. Apply multi-purpose grease to sealing lips of side oil seal.
2. Using the drift, press-fit side oil seal so that its surface comes face to face with the end surface of the case.

**Tool number** : ST33400001 (J-26082)

#### CAUTION:

- When installing the side oil seal, be careful not to get it inclined.
- Do not reuse the side oil seal. Always replace the oil seal with a new ones.

3. Install the front drive shaft. Refer to [FAX-13, "Removal and installation \(Right Side\)"](#).



#### Left side:

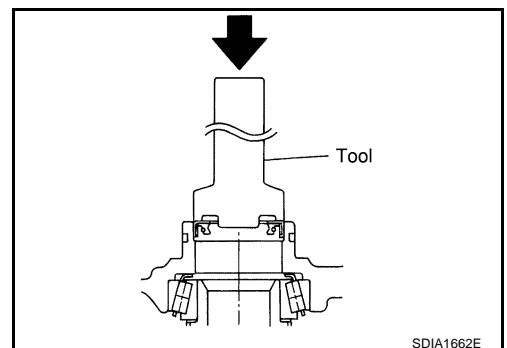
1. Apply multi-purpose grease to sealing lips of side oil seal.
2. Using the drift, press-fit side oil seal so that its surface comes face to face with the end surface of the case.

**Tool number** : ST33210000 ( - )

#### CAUTION:

- When installing the side oil seal, be careful not to get it inclined.
- Do not reuse the side oil seal. Always replace the oil seal with a new ones.

3. Install the front drive shaft. Refer to [FAX-12, "Removal and Installation \(Left Side\)"](#).



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# FRONT FINAL DRIVE ASSEMBLY

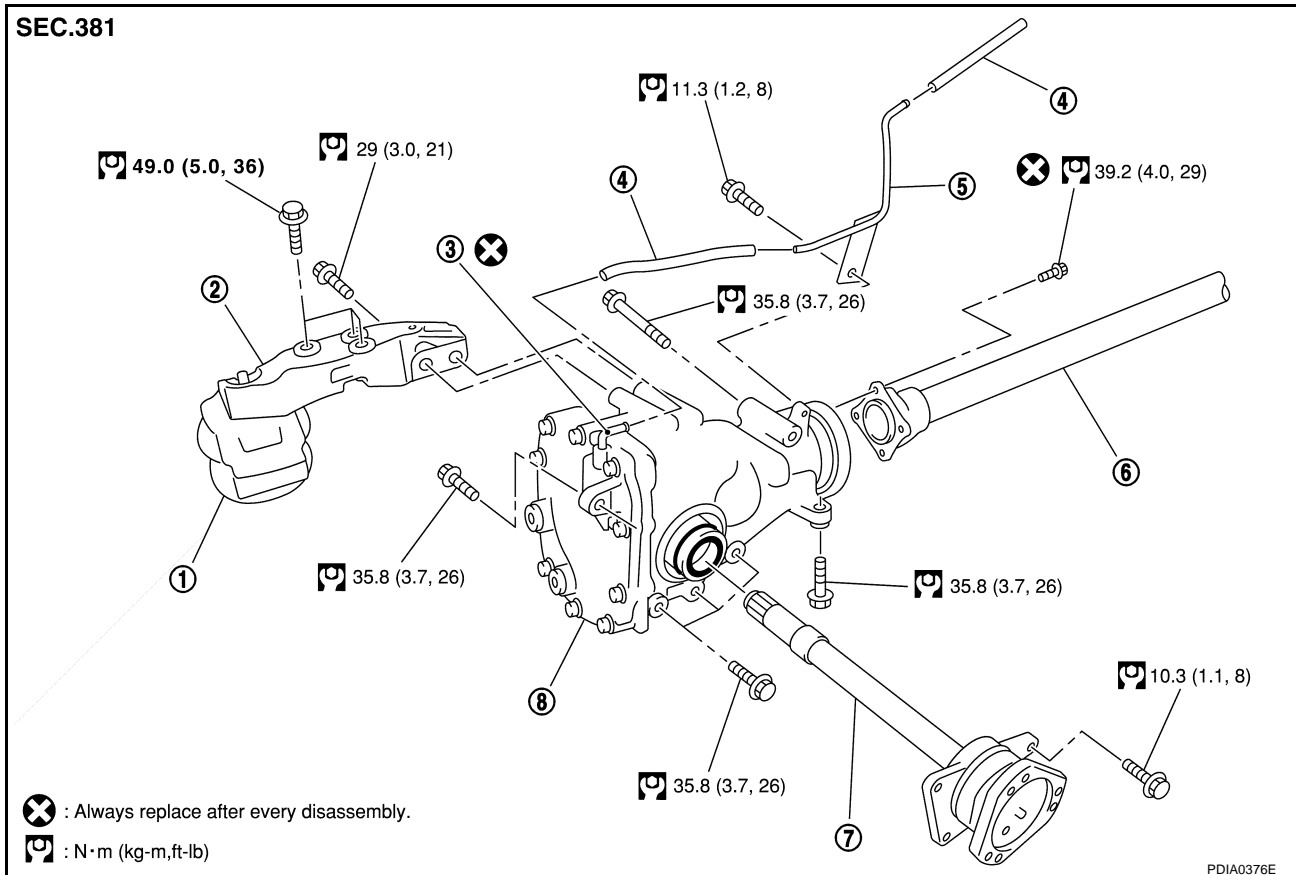
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ADS000N9

## FRONT FINAL DRIVE ASSEMBLY

### Removal and Installation (VQ35DE)

#### REMOVAL



- |                  |                               |                    |
|------------------|-------------------------------|--------------------|
| 1. Insulator     | 2. Engine mounting bracket    | 3. Breather joint  |
| 4. Breather hose | 5. Breather tube              | 6. Propeller shaft |
| 7. Side shaft    | 8. Front final drive assembly |                    |

1. Remove the three engine mounting bracket upper bolts.
2. Remove the right bank catalytic converter. Refer to [EM-26, "Removal and Installation"](#) .
3. Remove the stabilizer assembly. Refer to [FSU-16, "STABILIZER BAR"](#) .
4. Remove the steering gearbox mounting bolts. Refer to [PS-19, "POWER STEERING GEAR AND LINK-AGE"](#) .
5. Remove the front drive shaft both. Refer to [FAX-12, "FRONT DRIVE SHAFT"](#) .
6. Remove the side shaft assembly.
7. Remove the front propeller shaft. Refer to [PR-4, "FRONT PROPELLER SHAFT"](#) .
8. Remove the front suspension member. Refer to [FSU-17, "FRONT SUSPENSION MEMBER"](#) .
9. Remove the differential breather hose clamp bolt. Refer to [FFD-12, "REMOVAL AND INSTALLATION \(VQ35DE\)"](#) .
10. Remove the mounting bolts and front final drive assembly from the vehicle.

#### INSTALLATION

Install in the reverse order of removal.

#### CAUTION:

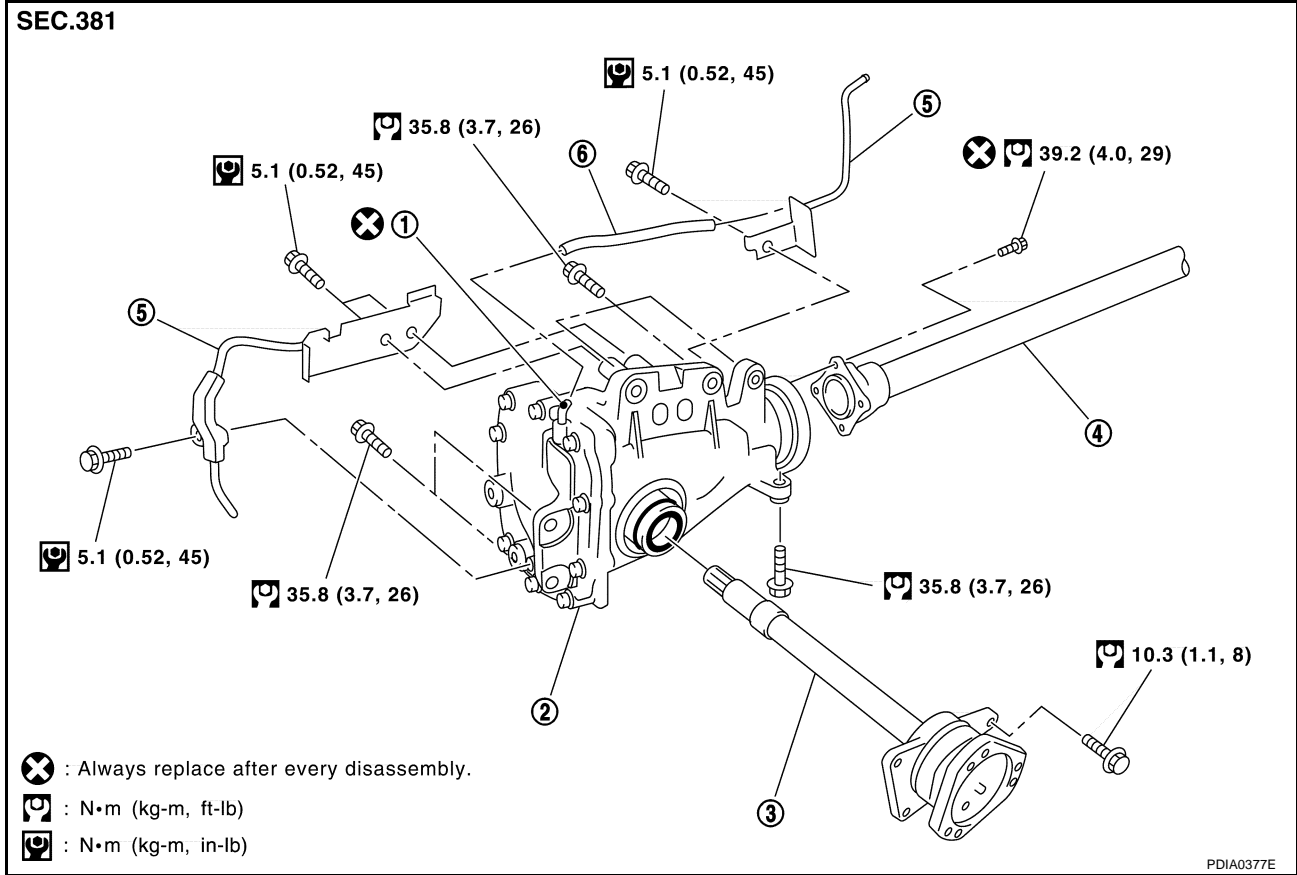
- When installing the side shaft, apply multi-purpose grease to contact surface of side shaft and side shaft oil seal.
- After installation, check the final drive oil level. Refer to [MA-33, "Changing Differential Gear Oil"](#) .

# FRONT FINAL DRIVE ASSEMBLY

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## Removal and Installation (VK45DE)

### REMOVAL



- |                    |                               |                  |
|--------------------|-------------------------------|------------------|
| 1. Breather joint  | 2. Front final drive assembly | 3. Side shaft    |
| 4. Propeller shaft | 5. Breather tube              | 6. Breather hose |

1. Remove the right bank catalytic converter. Refer to [EM-179, "Removal and Installation"](#) .
2. Remove the stabilizer assembly. Refer to [FSU-16, "STABILIZER BAR"](#) .
3. Remove the steering gearbox mounting bolts. Refer to [PS-19, "POWER STEERING GEAR AND LINK-AGE"](#) .
4. Remove the front drive shaft both. Refer to [FAX-12, "FRONT DRIVE SHAFT"](#) .
5. Remove the side shaft assembly.
6. Remove the front propeller shaft. Refer to [PR-4, "FRONT PROPELLER SHAFT"](#) .
7. Remove the front suspension member. Refer to [FSU-17, "FRONT SUSPENSION MEMBER"](#) .
8. Remove the engine wire harness clamp bolts from front final drive.
9. Remove the differential breather hose clamp bolt. Refer to [FFD-13, "REMOVAL AND INSTALLATION \(VK45DE\)"](#) .
10. Remove the mounting bolts and front final drive assembly from the vehicle.

### INSTALLATION

Install in the reverse order of removal.

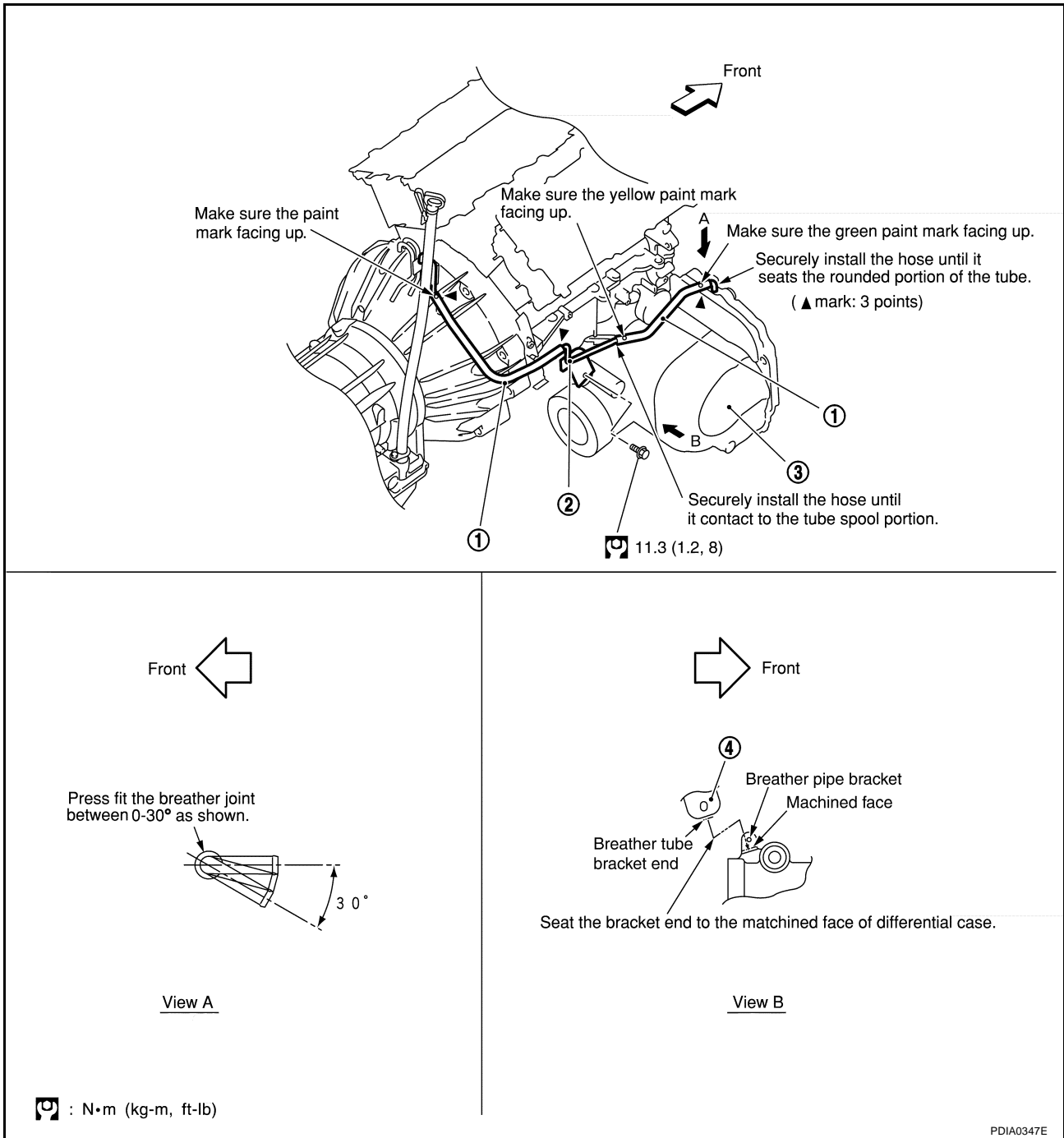
#### CAUTION:

- When installing side shaft, apply multi-purpose grease to contact surface of side shaft and side shaft oil seal.
- After installation, check the final drive oil level. Refer to [MA-33, "Changing Differential Gear Oil"](#) .

# FRONT FINAL DRIVE ASSEMBLY

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## Front Final Drive Breather Hose REMOVAL AND INSTALLATION (VQ35DE)

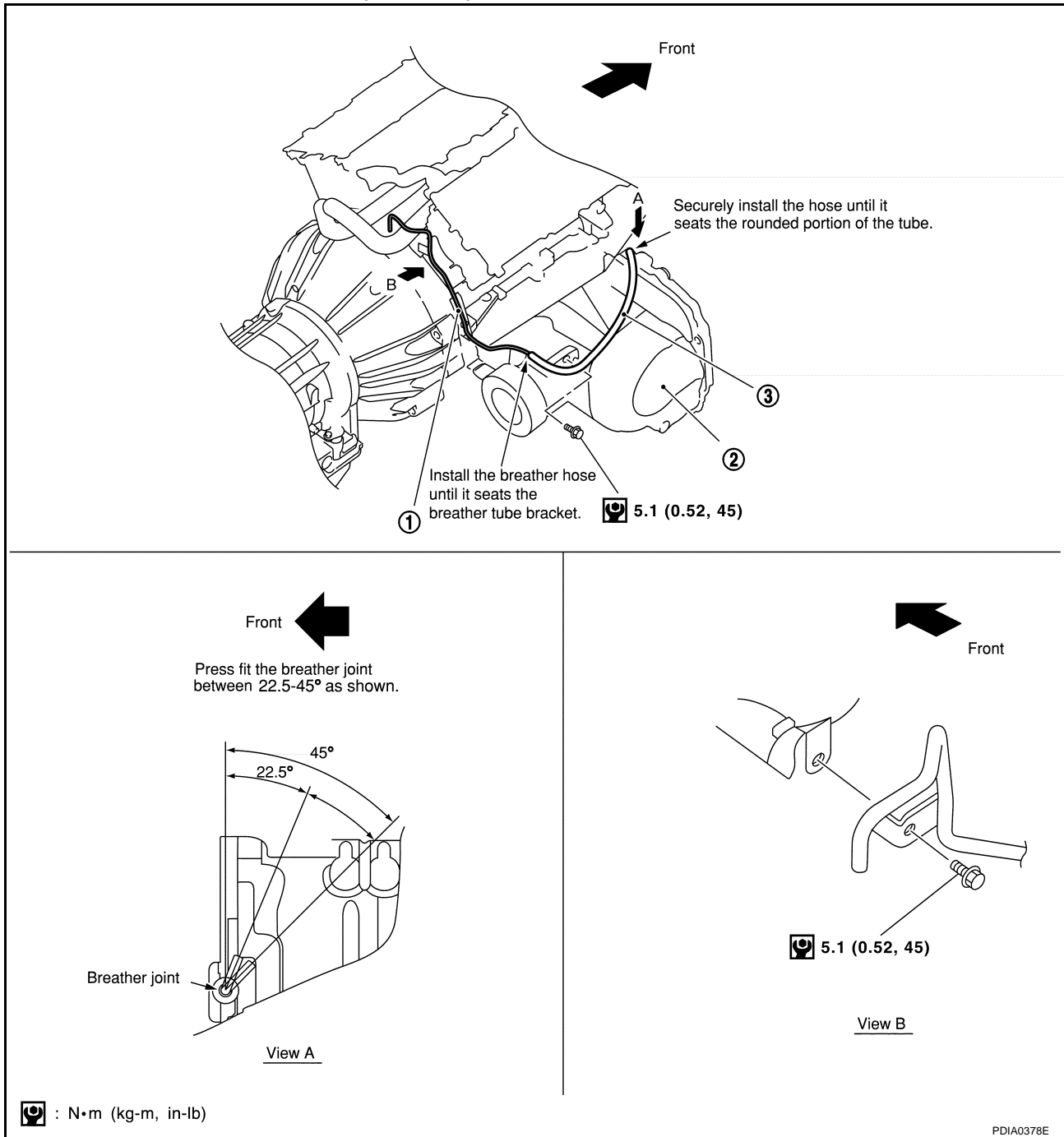


- 1. Breather hose
- 2. Breather tube
- 3. Front final drive assembly
- 4. Breather pipe bracket

**NOTE:**  
Refer to illustration above for front final drive breather hose routing.

# FRONT FINAL DRIVE ASSEMBLY

## REMOVAL AND INSTALLATION (VK45DE)



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- 1. Breather tube
- 2. Front final drive assembly
- 3. Breather hose

**NOTE:**

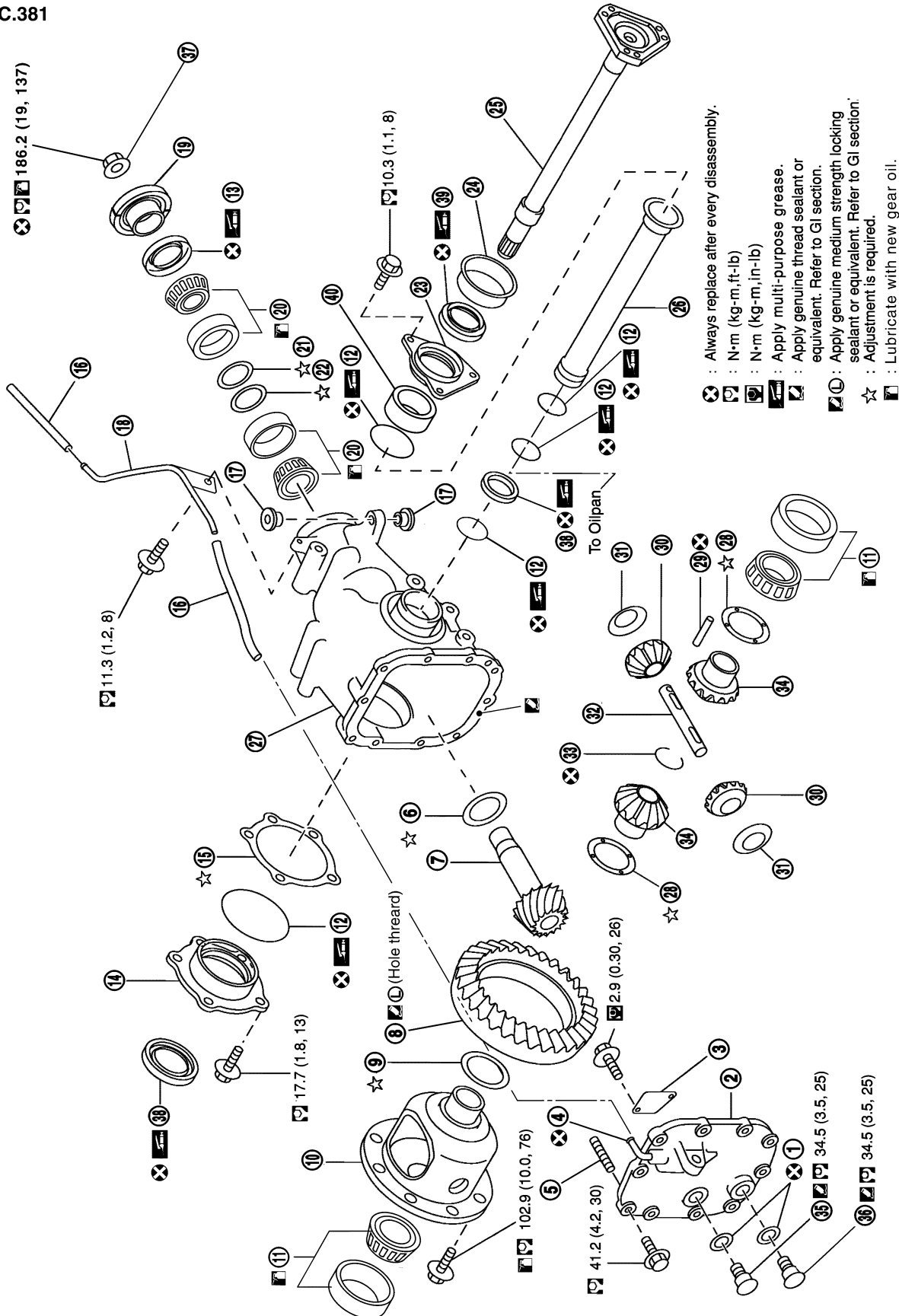
Refer to illustration above for front final drive breather hose routing.

# FRONT FINAL DRIVE ASSEMBLY

## Components COMPONENTS (VQ35DE)

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PDIA0372E

# FRONT FINAL DRIVE ASSEMBLY

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1. Washer	2. Carrier cover	3. Gear oil defence
4. Breather joint	5. Dowel pin	6. Drive pinion height adjusting washer
7. Drive pinion	8. Drive gear	9. Side bearing adjusting washer
10. Differential case	11. Side bearing	12. O-ring
13. Front oil seal	14. Side retainer	15. Side bearing adjusting shim
16. Air breather hose	17. Bushing	18. Breather tube
19. Companion flange	20. Drive pinion bearing	21. Drive pinion bearing adjusting washer
22. Drive pinion adjusting washer	23. Extension tube retainer	24. Dust sealed
25. Side shaft	26. Extension tube	27. Carrier case
28. Side gear thrust washer	29. Lock pin	30. Pinion mate gear
31. Pinion mate thrust washer	32. Pinion mate shaft	33. Circlip
34. Side gear	35. Filler plug	36. Drain plug
37. Drive pinion lock nut	38. Side oil seal	39. Side shaft oil seal
40. Bearing		

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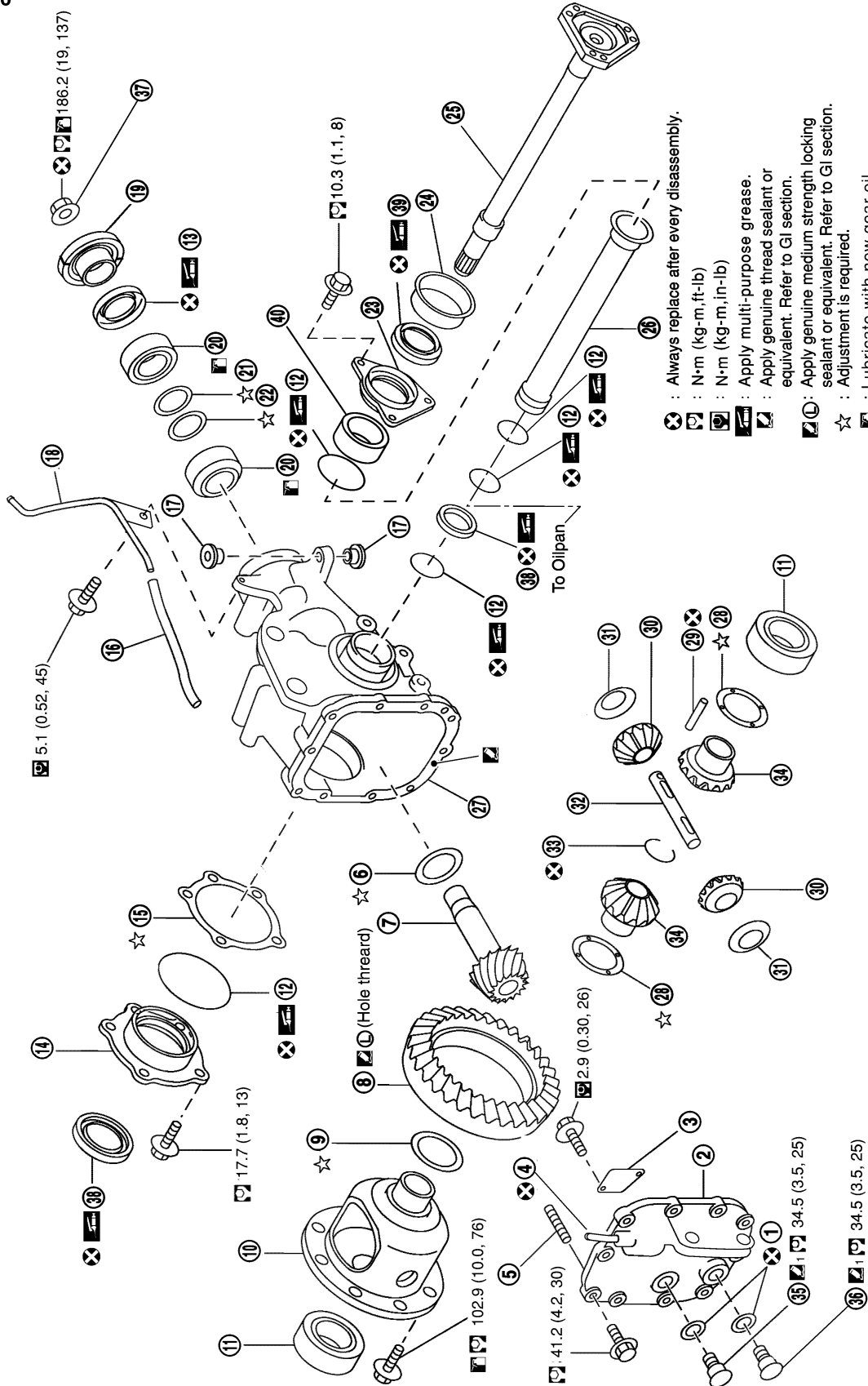
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# FRONT FINAL DRIVE ASSEMBLY

## COMPONENTS (VK45DE)

SEC.380



- |                   |                  |                                         |
|-------------------|------------------|-----------------------------------------|
| 1. Washer         | 2. Carrier cover | 3. Gear oil defence                     |
| 4. Breather joint | 5. Dowel pin     | 6. Drive pinion height adjusting washer |

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# FRONT FINAL DRIVE ASSEMBLY

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7. Drive pinion	8. Drive gear	9. Side bearing adjusting washer
10. Differential case	11. Side bearing	12. O-ring
13. Front oil seal	14. Side retainer	15. Side bearing adjusting shim
16. Air breather hose	17. Bushing	18. Breather tube
19. Companion flange	20. Drive pinion bearing	21. Drive pinion bearing adjusting washer
22. Drive pinion adjusting washer	23. Extension tube retainer	24. Dust sealed
25. Side shaft	26. Extension tube	27. Carrier case
28. Side gear thrust washer	29. Lock pin	30. Pinion mate gear
31. Pinion mate thrust washer	32. Pinion mate shaft	33. Circlip
34. Side gear	35. Filler plug	36. Drain plug
37. Drive pinion lock nut	38. Side oil seal	39. Side shaft oil seal
40. Bearing		

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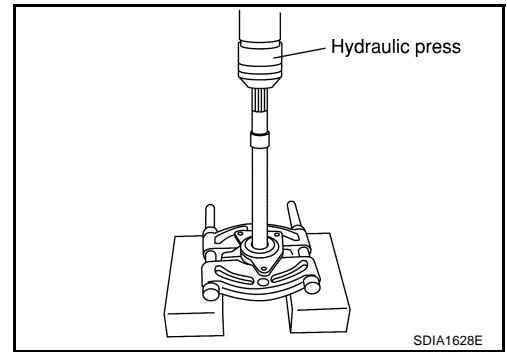
# FRONT FINAL DRIVE ASSEMBLY

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## Side Shaft

### BEARING AND OIL SEAL REPLACEMENT

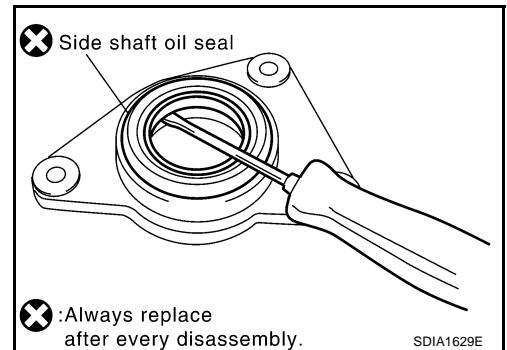
1. Hold the extension tube retainer with commercial service tool, then press out the side shaft using a press.



2. Remove the side shaft oil seal from the extension tube retainer with a flat blade screwdriver.

**CAUTION:**

**Be careful not to damage the extension tube retainer.**

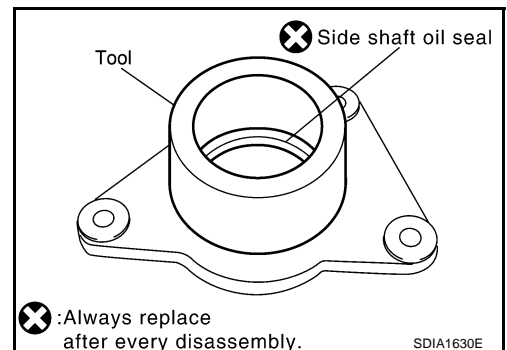


3. Apply multi-purpose grease to the side shaft oil seal lips, then install it into the extension tube retainer using tool.

**CAUTION:**

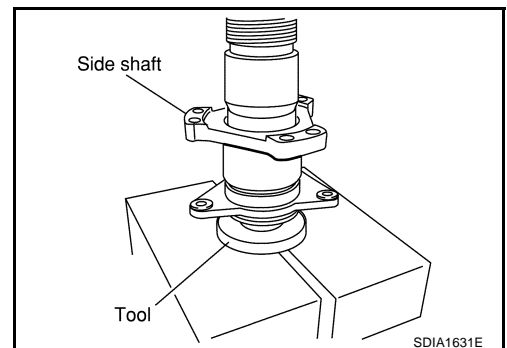
- When installing the side shaft oil seal, be careful not to get it inclined.
- Do not reuse the side shaft oil seal. Always replace the oil seal with new ones.

**Tool number : ST19820000 ( - )**



4. Support the new bearing inner race with special service tool, then press the side shaft into the bearing using a press.

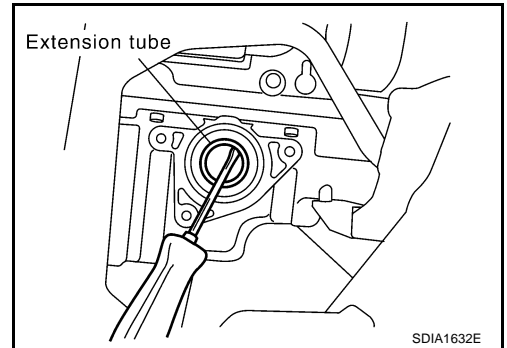
**Tool number : ST30032000 ( - )**



# FRONT FINAL DRIVE ASSEMBLY

## EXTENSION TUBE REPLACEMENT

1. Drain engine oil. Refer to [MA-18. "Changing Engine Oil"](#) (VQ35DE) or [MA-25. "Changing Engine Oil"](#) (VK45DE).
2. Ply out the extension tube from the engine oil pan.

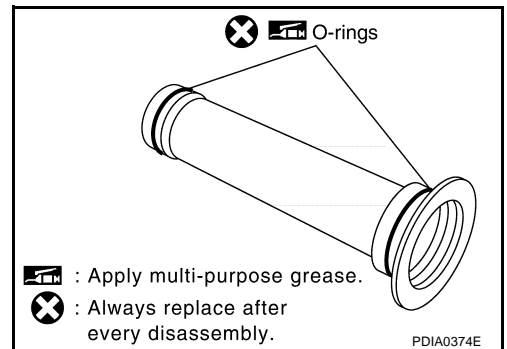


3. Remove the O-rings from the extension tube and replace them with new ones.

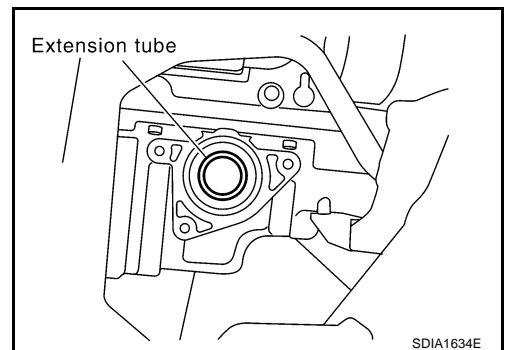
### CAUTION:

**Do not reuse the O-ring. Always replace the O-ring with new one.**

4. Apply grease to the new extension tube O-rings.



5. Install the extension tube into the engine oil pan.



## PRE-DISASSEMBLY INSPECTION

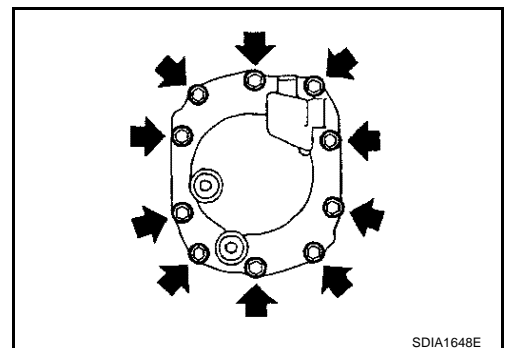
Before disassembling the front final drive, perform the following inspection.

### Total Preload

1. Place the front final drive onto the attachment and secure it.
2. Drain the final drive oil.
3. Remove the carrier cover.

### CAUTION:

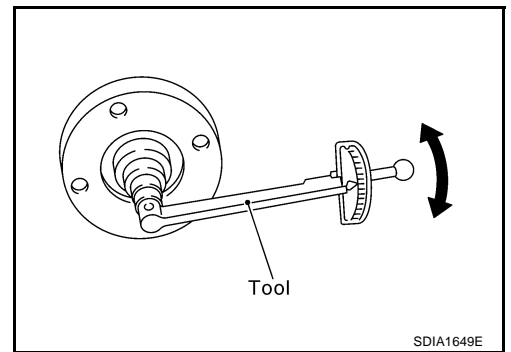
**When the carrier case is damaged, replace the final drive assembly.**



# FRONT FINAL DRIVE ASSEMBLY

- Turn the companion flange in both direction 20 times or more to seat the bearing rollers.
- Check total preload with special service tool.

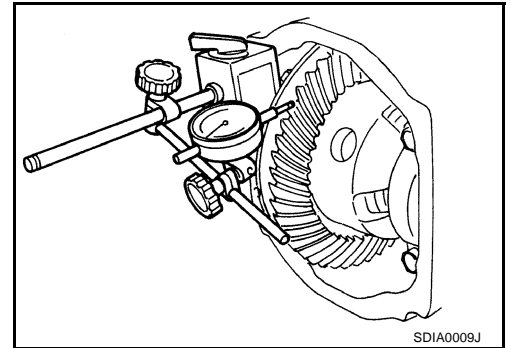
**Tool number** : ST3127S000 (J-25765-A)  
**Total preload** : 1.56 - 2.65 N-m  
(0.16 - 0.27 kg-m, 14 - 23 in-lb)



## Drive Gear To Drive Pinion Backlash

Check drive gear to drive pinion backlash with a dial gauge at several points.

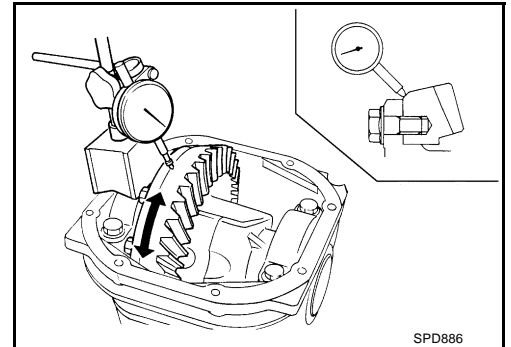
**Drive gear to drive pinion backlash**  
: 0.10 - 0.15 mm(0.0039 - 0.0059 in)



## Drive Gear Runout

Check runout of drive gear with a dial gauge.

**Runout limit** : 0.05 mm (0.0020 in)



## Companion Flange Runout

- Set the dial gauge to the companion flange face and measure runout.

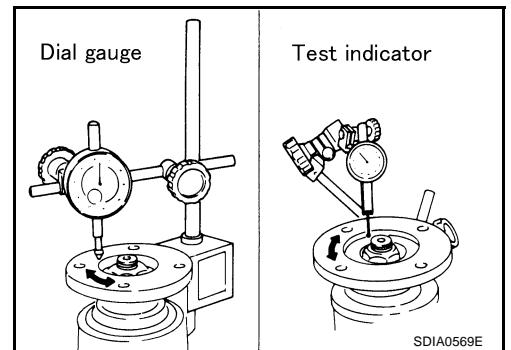
**Runout limit** : 0.18 mm (0.007 in)

- Set the test indicator to the inside face of the companion flange and measure the runout.

**Runout limit** : 0.13 mm (0.005 in)

### CAUTION:

Clean inside face of companion flange before measuring runout.



## Tooth Contact

Check tooth contact. Refer to [FFD-30, "TOOTH CONTACT INSPECTION"](#).

# FRONT FINAL DRIVE ASSEMBLY

## DISASSEMBLY AND ASSEMBLY

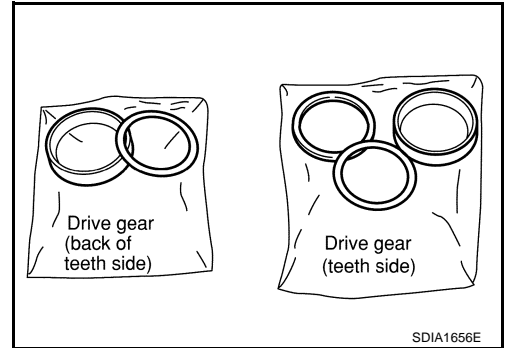
### Removal of Drive Gear and Differential Case Assembly

1. Remove the side retainer mounting bolt.
2. Remove the side retainer by pulling it and tapping carrier case using a plastic hammer.
3. Remove the differential case assembly from the carrier case.

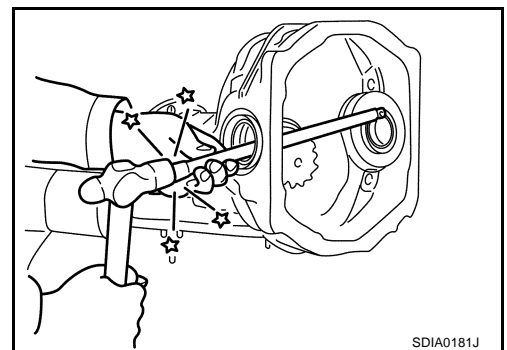
**CAUTION:**

**Be careful not to damage the carrier cover mating surface.**

4. Remove the side bearing outer race using puller.
5. Keep the side bearing outer races together with inner race. Do not mix them up. Also, keep adjusting washers together with bearings.



6. Drive out the side oil seals from the carrier case.



### Removal of Drive Pinion Assembly

1. Hold the companion flange using drive pinion flange wrench, remove the drive pinion lock nut.

**Tool number : KV40104000 ( - )**

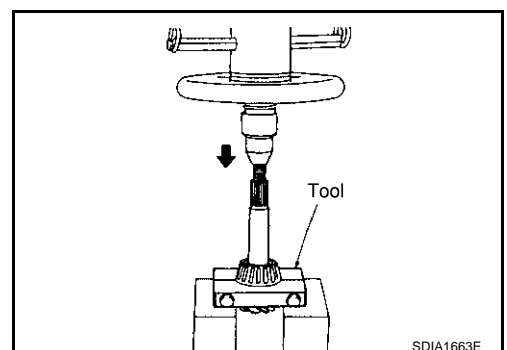
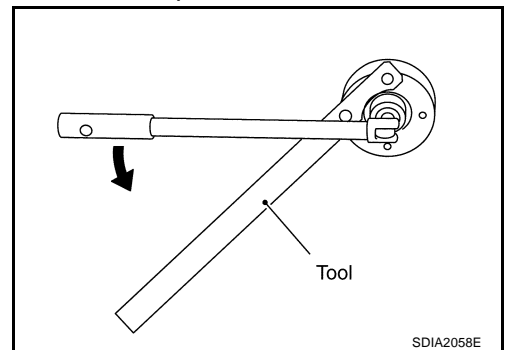
2. Remove the companion flange using puller.
3. Temporarily install drive pinion lock nut.

**CAUTION:**

**Install the drive pinion lock nut until it flash with the drive pinion end.**

4. Remove the drive pinion from the carrier case.
5. Remove the bearing outer race by tapping the race evenly.
6. On companion flange side, remove the bearing outer race with bearing and oil seal.
7. Press out the drive pinion bearing from the drive pinion using puller.

**Tool number : ST30031000 (J-22912-01)**



# FRONT FINAL DRIVE ASSEMBLY

## Differential Case Disassembly

1. Remove side bearing inner race.  
To prevent damage to bearing, engage puller jaws in groove.

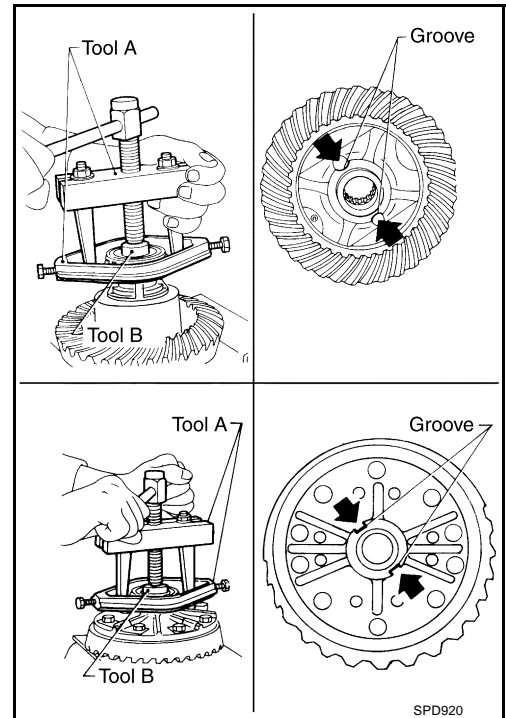
**Tool number**

**A: ST33051001 (J-22888-20 )**

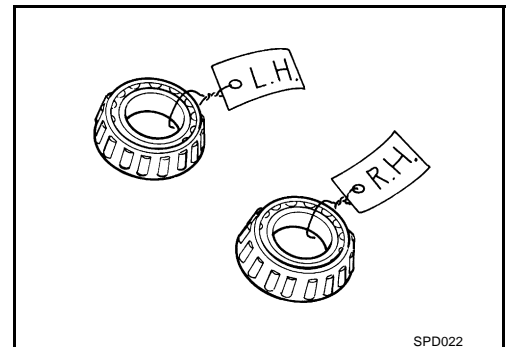
**B: ST33061000(J-8107-2)**

### CAUTION:

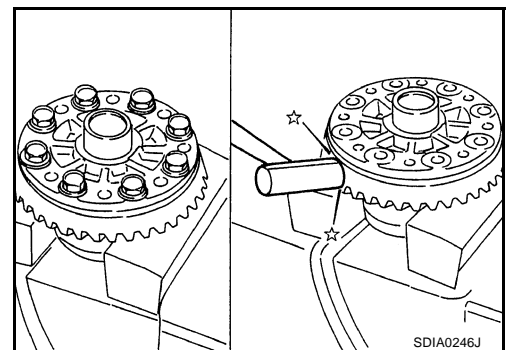
- To prevent damage to the side bearing and drive gear, place copper plates between these parts and vise.
- If is not necessary to remove side bearing except it is replaced.



- Be careful not to confuse left-hand and right-hand parts. Keep bearing and bearing race for each side together.



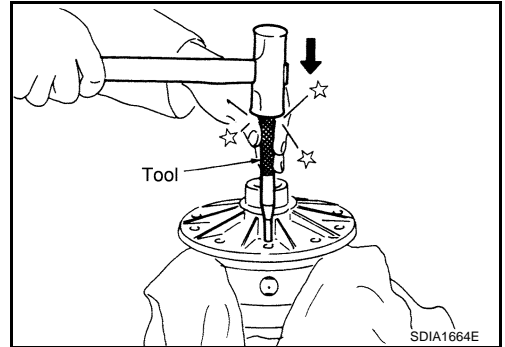
2. Loosen drive gear mounting bolt in a crisscross fashion.
3. Tap drive gear off the differential case with a soft hammer.
  - Tap evenly all around to keep the drive gear from binding.



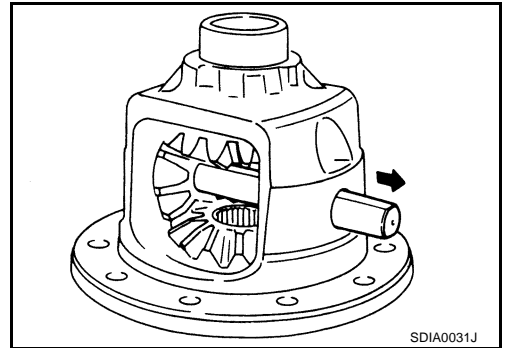
# FRONT FINAL DRIVE ASSEMBLY

4. Disassembly the differential case.
  - a. Drive out the pinion mate shaft lock pin using punch.

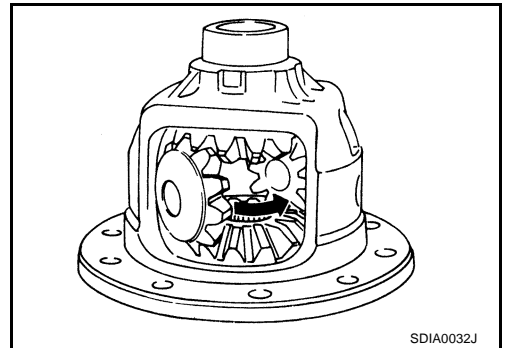
**Tool number** : KV31100300 ( - )



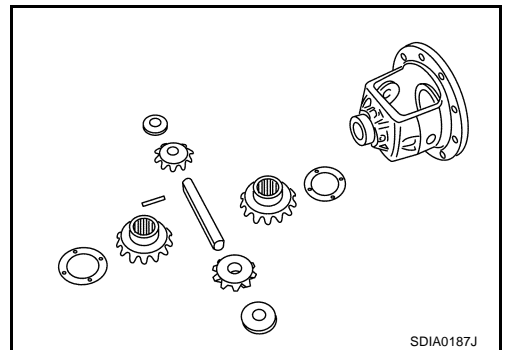
- b. Remove the pinion mate shaft.



- c. 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.



- d. Check mating surfaces of differential case, side gears, pinion mate gears, pinion mate shaft and thrust washers.



## Inspection

- Clean up the disassemble parts. Then, inspect if the parts are wear or damaged. If so, follow the measures below.

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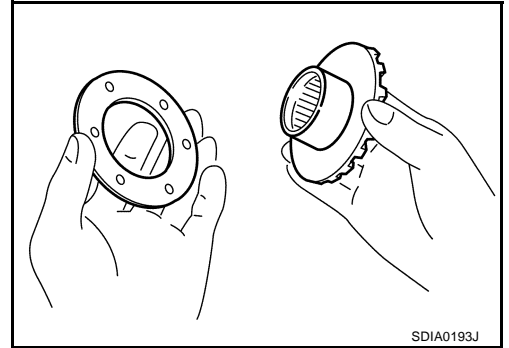
# FRONT FINAL DRIVE ASSEMBLY

Content	Measures
Drive gear and drive pinion	<ul style="list-style-type: none"> <li>● If the gear teeth do not mesh or line-up correctly, determine the cause and adjust, repair, or replace as necessary.</li> <li>● If the gear are worn, cracked, damaged, pitted or chipped (by friction) noticeably, replace with new gears.</li> </ul>
Bearing	<ul style="list-style-type: none"> <li>● If found any chipped (by friction), pitted, worn, rusted, scratched mark, or unusual noise from the bearing, replace with new bearing assembly (as a new set).</li> </ul>
Side gear and pinion mate gear	<ul style="list-style-type: none"> <li>● Replace with a new one if found any cracks or damage on the surface of the tooth.</li> <li>● Replace with a new one if found any worn or chipped mark on the contact sides of the thrust washer.</li> </ul>
Side gear thrust washer and pinion mate thrust washer	<ul style="list-style-type: none"> <li>● Replace with a new one if found that it is chipped (by friction), damaged, or unusual worn.</li> </ul>
Oil seal	<ul style="list-style-type: none"> <li>● Oil seals must be replaced with a new one whenever disassembled.</li> </ul>
Differential case	<ul style="list-style-type: none"> <li>● Replace with a new one if found any wear or cracks on the contact sides of the differential case.</li> </ul>
Companion flange	<ul style="list-style-type: none"> <li>● Replace with a new one if found any chipped marks (about 0.10 mm, 0.0038 in) or other damage on the contact sides of the lip of the companion flange.</li> </ul>

## Differential Case Assembly

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1. Apply gear oil to contact surfaces of each gear, thrust washers and differential case.
2. Install the removed thrust washer or same thickness washer to side gear.

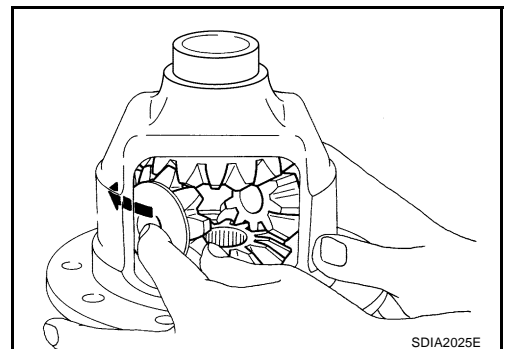


3. Install the side gear, thrust washers, pinion mate gears and thrust washers to differential case.

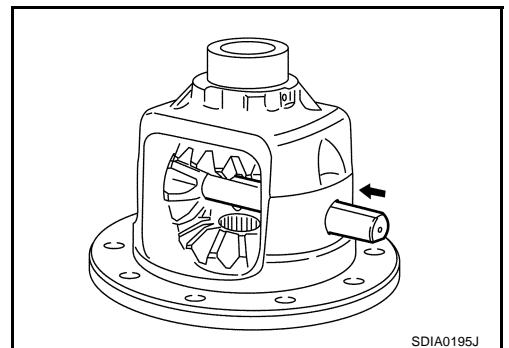
**CAUTION:**

**Install the circlip equipped side gear to the side retainer side.**

4. Install pinion mate gears by placing the pair of gear facing each other, and turning them.



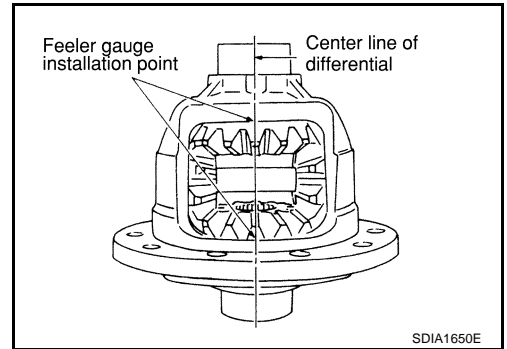
5. Install the pinion mate shaft while aligning the lock pin holes between the differential case and pinion mate shaft.





# FRONT FINAL DRIVE ASSEMBLY

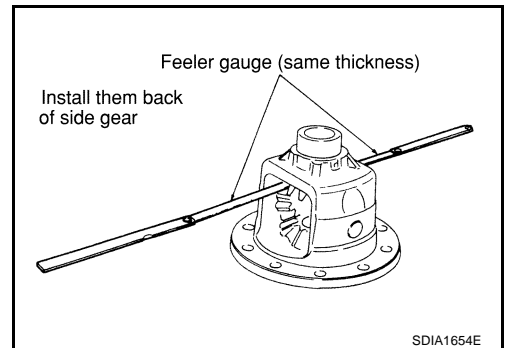
6. Place the differential gear case so that measurement point facing up as shown.



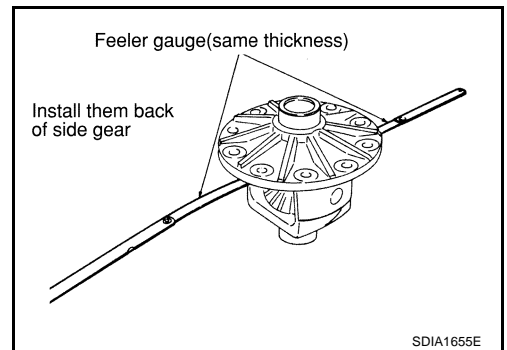
7. Use two feeler gauges to prevent leaning of side gear as shown.  
 8. Measure the clearance at 3 points by turning the side gear.  
 9. Select side gear thrust washer so that the clearance is within standard.

**Rear face of side gear and differential case clearance : 0.20 mm (0.0079 in) or less**

**CAUTION:**  
 Check the smooth gear movement.



10. Place the differential gear case upside down, and measure the opposite side clearance.

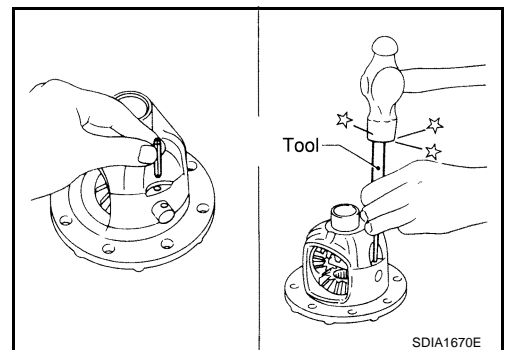


11. If clearance exceed limit, adjust the clearance by selecting adjusting shim.
- If clearance too large, increase thrust washer thickness.
  - If clearance too small, decrease thrust washer thickness.

12. Drive the lock pin into the pinion mate shaft using punch.

**Tool number : KV31100300 ( - )**

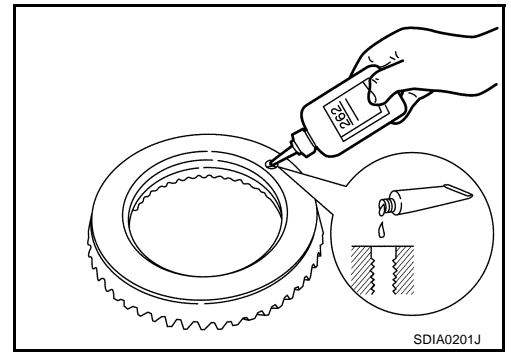
**CAUTION:**  
 Do not reuse the lock pin. Always replace the with a new one.



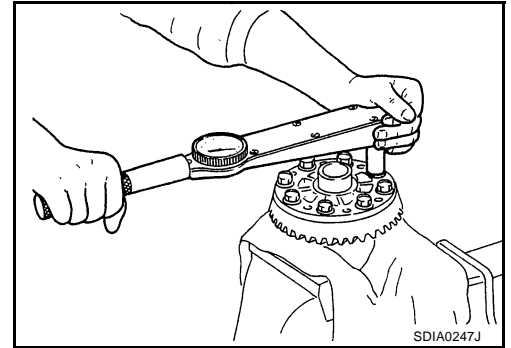
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## FRONT FINAL DRIVE ASSEMBLY

13. Apply genuine medium strength locking sealant or equivalent to the drive gear bolt hole thread. Refer to [GI-48, "Recommended Chemical Products and Sealants"](#) .

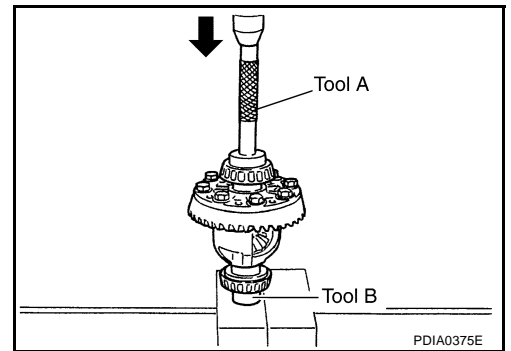


14. Assemble the drive gear and differential case.  
15. Apply gear oil to the mounting bolt seating surface, tighten the bolt in criss-cross fashion to specified torque. Refer to [FFD-16, "COMPONENTS \(VK45DE\)"](#) or [FFD-14, "COMPONENTS \(VQ35DE\)"](#) .



16. Press-fit side bearing inner race on differential case with tool.

**Tool number**            **A: ST33230000 ( - )**  
                                 **B: ST35321000 ( - )**



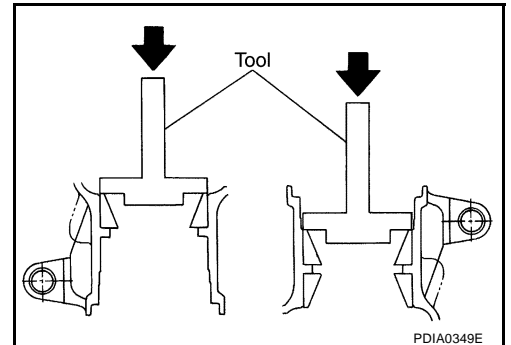
### Installation Drive Pinion Assembly

1. Press-fit the drive pinion bearing outer race into the carrier case with tool.

**Tool number**            **: ST37820000 ( - )**

**CAUTION:**

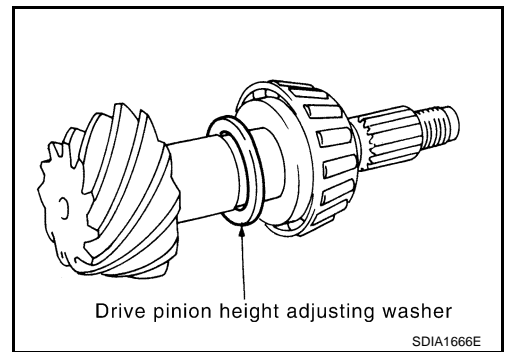
First lightly tap outer race using a hammer, place the carrier case and outer race parallel. Then press-fit outer race with press.



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# FRONT FINAL DRIVE ASSEMBLY

2. Temporarily install the removed drive pinion height adjusting washer or same thickness washer to drive pinion.



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3. If the hypoid gear set has been replaced, select the adjusting washer.

**Washer selection equation:**

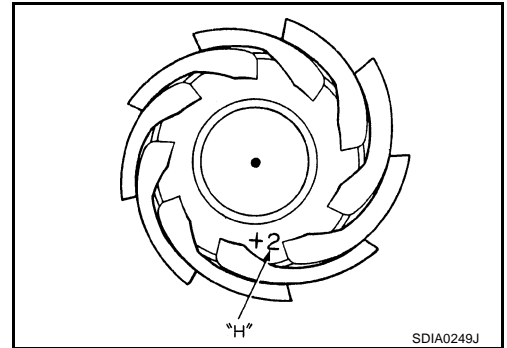
$$T = T_0 + (t_1 - t_2)$$

**T = Correct washer thickness**

**T<sub>0</sub> = Removed washer thickness**

**t<sub>1</sub> = Old drive pinion head letter  
(machined tolerance 1/100 mm x 100)**

**t<sub>2</sub> = New drive pinion head letter  
(machined tolerance 1/100 mm x 100)**



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**Example:**

In case the **T<sub>0</sub> = 3.21, t<sub>1</sub> = +2, t<sub>2</sub> = -1**

$$T = 3.21 + ((2 \times 0.01) - (-1 \times 0.01)) = 3.24$$

Temporarily install washer to the drive pinion.

**CAUTION:**

Select the washer form the drive pinion height adjusting washer selecting table. Refer to [FFD-38, "AVAILABLE PINION HEIGHT ADJUSTING WASHERS"](#) .

4. Press-fit the drive pinion bearing onto the drive pinion using drift and press.

**Tool number : ST30032000 ( - )**

**NOTE:**

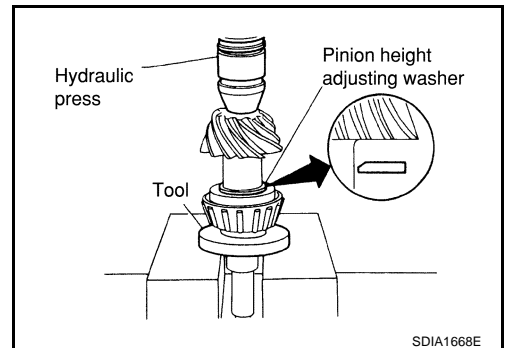
Note the direction of washer.

5. Install the drive pinion and drive pinion bearing as follows:
  - a. Apply gear oil to the bearing portion.
  - b. Install the drive pinion and drive pinion bearing (front side) into the carrier case.

**CAUTION:**

**Do not install the drive pinion adjusting washer and drive pinion bearing adjusting washer at this time.**

- c. Install the companion flange without installing oil seal.
- d. Apply oil drive pinion lock nut threads and seating surface, then temporarily install it.



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## FRONT FINAL DRIVE ASSEMBLY

- e. Tighten the drive pinion lock nut until it reach standard preload.

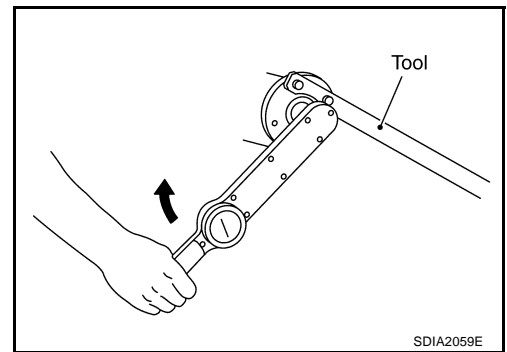
**Tool number** : KV40104000 ( - )

**Pinion bearing preload without oil seal**

: 0.78 - 1.57 N-m (0.08 - 0.16 kg-m, 7 - 13 in-lb)

**CAUTION:**

Tighten the drive pinion nut by very small degrees until the specified preload is achieved. Do not tighten nut more than necessary.



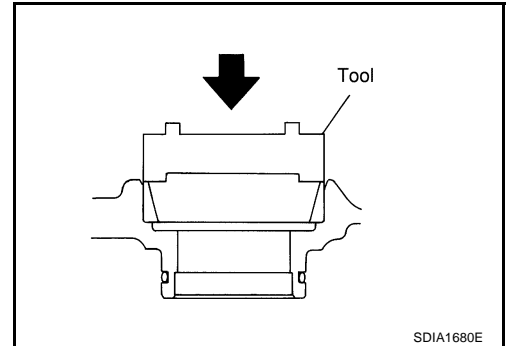
### DIFFERENTIAL CASE INSTALLATION

1. Install side bearing outer race to the carrier case with tool.

**Tool number** : KV31103000 ( - )

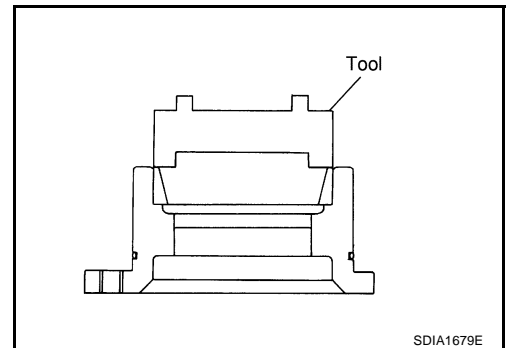
**CAUTION:**

Do not apply excessive force to the race.



2. Install side bearing outer race to the side retainer with tool.

**Tool number** : KV31103000 ( - )



3. Apply gear oil to the bearing portion.  
4. Install the differential case assembly to the carrier case.

**CAUTION:**

Be careful not to damage the carrier cover mating surface.

5. Install the side bearing adjusting shim to the side retainer, tighten the bolt to specified torque. Refer to [FFD-14, "COMPONENTS \(VQ35DE\)"](#), [FFD-16, "COMPONENTS \(VK45DE\)"](#).

**CAUTION:**

Install removed adjusting shim or same thickness shim.

**NOTE:**

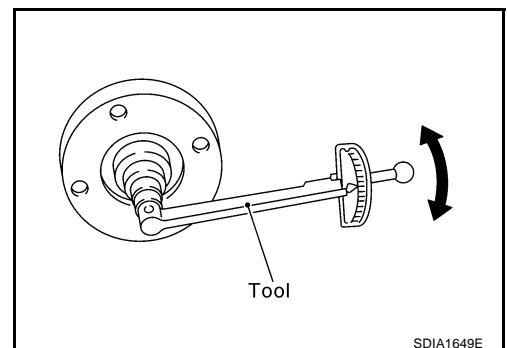
Do not install O-ring.

6. Turn the companion flange more than 20 times, measure the preload using preload gauge.

**Tool number** : ST3127S000 (J-25765-A)

**Total preload standard**

: 1.56 - 2.65 N-m (0.16 - 0.27 kg-m, 14 - 23 in-lb)



## FRONT FINAL DRIVE ASSEMBLY

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- If the preload value is out of standard, adjust preload by changing adjusting shim thickness (side retainer side).

**If preload too large, decrease side bearing adjusting shim thickness.**

**If preload too small, increase side bearing adjusting shim thickness.**

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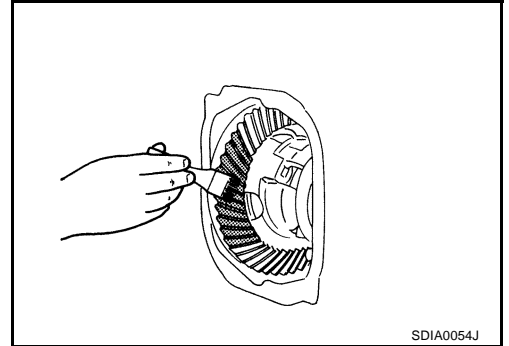
# FRONT FINAL DRIVE ASSEMBLY

## TOOTH CONTACT INSPECTION

Checking gear tooth contact pattern is necessary to verify correct relationship between drive gear and drive pinion.

Hypoid gears which are not positioned in proper arrangement may be noisy and/or have a short life. Check gear tooth contact pattern to obtain the best contact for low noise and long life.

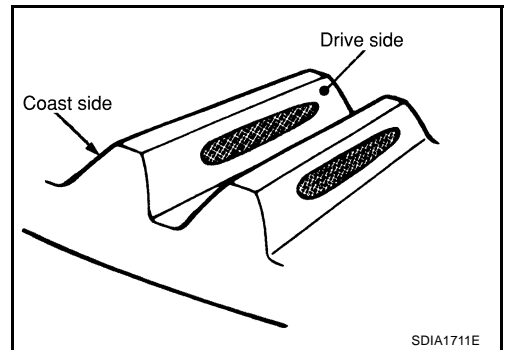
1. Thoroughly clean drive gear and drive pinion teeth.
2. Lightly apply a mixture of powdered ferric oxide and oil or the equivalent. Apply it to 3 or 4 teeth on the drive side of drive gear.
3. Hold companion flange steady by hand and rotate the drive gear in both directions.



4. Check the tooth contact on both sides (drive side and coast side).

**NOTE:**

Refer to [FFD-31, "TOOTH CONTACT PATTERN AND HEIGHT ADJUSTING WASHER SELECTION"](#) for detail of tooth contact pattern.



# FRONT FINAL DRIVE ASSEMBLY

## TOOTH CONTACT PATTERN AND HEIGHT ADJUSTING WASHER SELECTION

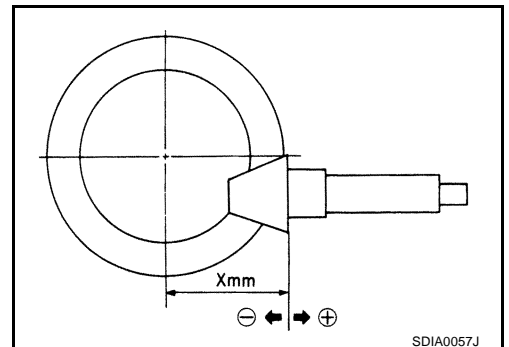
Tooth contact pattern				Pinion height adjusting washer selection value (unit:mm)	Adjustment requirement
Coast side		Drive side			
Heel side	Toe side	Toe side	Heel side	+0.15	Yes
Heel side	Toe side	Toe side	Heel side	+0.12	↑
Heel side	Toe side	Toe side	Heel side	+0.09	↑
Heel side	Toe side	Toe side	Heel side	+0.06	No
Heel side	Toe side	Toe side	Heel side	+0.03	↑
Heel side	Toe side	Toe side	Heel side	0	↑
Heel side	Toe side	Toe side	Heel side	-0.03	↑
Heel side	Toe side	Toe side	Heel side	-0.06	↑
Heel side	Toe side	Toe side	Heel side	-0.09	Yes
Heel side	Toe side	Toe side	Heel side	-0.12	↑
Heel side	Toe side	Toe side	Heel side	-0.15	↑

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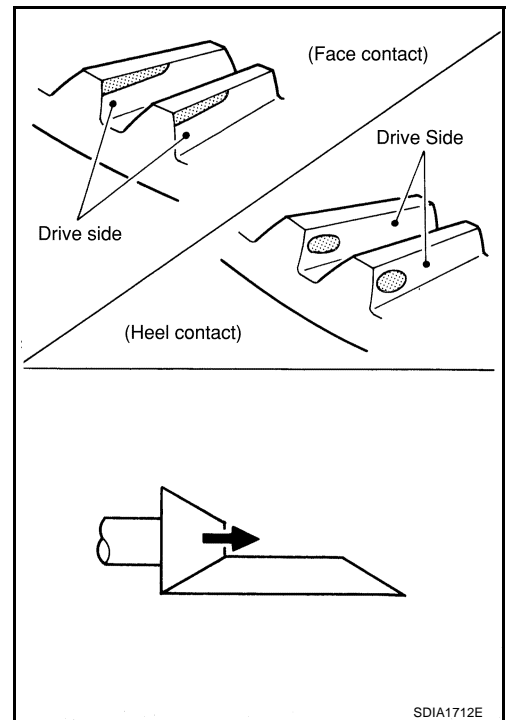
### TOOTH CONTACT ADJUSTMENT

1. If tooth contact is incorrect, adjust tooth contact by replacing drive pinion height adjusting washer.

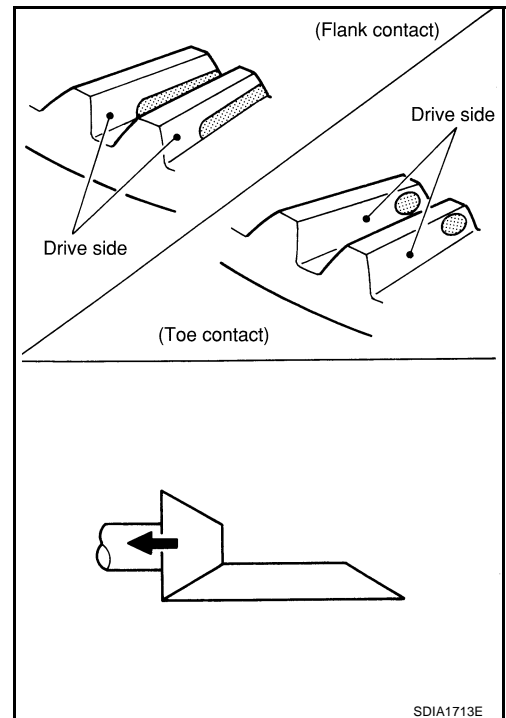


## FRONT FINAL DRIVE ASSEMBLY

2. If there is heel contact or face contact, increase point height adjusting washer in order to bring drive pinion close to drive gear.



3. If there is toe contact or flank contact, decrease pinion adjusting washer in order to make drive pinion go away from drive gear.

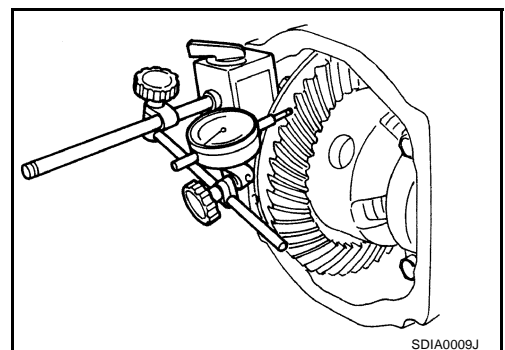


4. Set dial gauge to the drive gear face and measure the backlash.

### Standard drive gear backlash

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

- If the measured value out of standard, adjust the backlash by replacing the side bearing adjusting shim (carrier case side).
- If backlash too large, decrease side bearing adjusting shim thickness.
- If backlash too small, increase side bearing adjusting shim thickness.





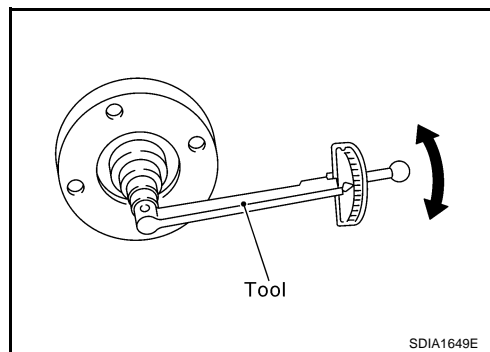
# FRONT FINAL DRIVE ASSEMBLY

## TOTAL PRELOAD INSPECTION

1. Turn companion flange in both directions 20 times or more to set bearing rollers, then check total preload with special service tool.

**Tool number** : ST3127S000 (J-25765-A)  
**Total preload** : 1.56 - 2.65 N-m  
(0.16 - 0.27 kg-m, 14 - 23 in-lb)

- If the preload value is out of standard, adjust by changing side bearing adjusting shim thickness (side retainer side).
- If preload value too large, increase the side bearing adjusting shim thickness.
- If preload value too small, decrease the side bearing adjusting shim thickness.



A  
B  
C

FFD

## DRIVE PINION PRELOAD ADJUSTMENT

### Removal of differential case assembly

1. Unfasten the retainer tab using a flat blade screwdriver.
2. Remove the retainer by pulling it and tapping carrier case using a plastic hammer.
3. Remove the differential case assembly from the carrier case.

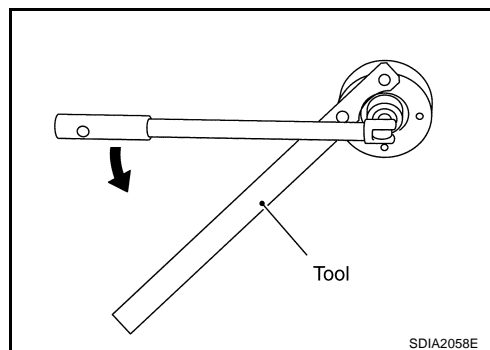
#### **CAUTION:**

**Be careful not to damage the carrier cover mating surface.**

### Removal of drive pinion assembly

1. Hold the companion flange using cam sprocket wrench or flange wrench, remove the drive pinion lock nut.

**Tool number** : KV40104000 ( - )



E  
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2. Remove the companion flange using puller.
3. Temporarily install drive pinion lock nut.

#### **CAUTION:**

**Avoid damaging drive pinion threads, install the drive pinion lock nut unit it flash with drive pinion end.**

4. Remove the drive pinion from the carrier case using a copper hammer.

### Preload Adjustment

1. Install drive pinion adjusting washer and drive pinion bearing adjusting washer onto the drive pinion, then install drive pinion into the carrier case.

#### **CAUTION:**

**Install the removed pinion height adjusting washer and drive pinion bearing adjusting washer or same thickness washers to drive pinion.**

2. Apply gear oil to the bearing portion.
3. Install drive pinion and drive pinion bearing into the carrier case.
4. Install the companion flange without installing oil seal.
5. Apply oil to drive pinion nut threads and seating surface, then temporarily install it.
6. Turn companion flange several times to seat the bearing.
7. Tighten the drive pinion nut while measuring preload using preload gauge.
8. Select drive pinion adjusting washer and drive pinion bearing adjusting washer so that standard preload is obtain when the drive pinion nut is tightened to specified torque.

# FRONT FINAL DRIVE ASSEMBLY

## CAUTION:

- Tighten the drive pinion nut by very small degrees until the specified preload is achieved. Do not tighten nut more than necessary.
- First select the thicker washer, then gradually select thinner one.
- Do not apply preload more than necessary.

Drive pinion lock nut torque : 186.2 N-m (19 kg-m, 137 ft-lb)  
Pinion bearing preload : 0.78 - 1.57 N-m (0.08 - 0.16 kg-m, 7 - 13 in-lb)

When the washer thickness is increased : Preload will decrease.

When the washer thickness is decreased : Preload will increase.

## Reassembly of drive pinion assembly

1. The standard preload is obtain when the drive pinion nut is tightened to specified toque, remove the pinion.
2. Remove the companion flange using puller.
3. Drive out the drive pinion from carrier case using copper hammer.
4. Apply gear oil to bearing portion.
5. Install the drive pinion with selected drive pinion adjusting washer and drive pinion bearing adjusting washer into the carrier case, then install bearing.
6. Apply multi-purpose grease to oil seal lips.
7. Drive front oil seal into the final drive using drift.

Tool number A: ST33400001 (J-26082)  
B: KV38102510 ( - )

8. Install companion flange.
9. Apply oil to new drive pinion lock nut threads and seating surface, then install it onto the drive pinion.

## CAUTION:

Do not reuse drive pinion lock nut. Always replace nut with new one.

10. Turn the companion flange more than 20 times to seat bearing.
11. Tighten the drive pinion lock nut to specified torque.

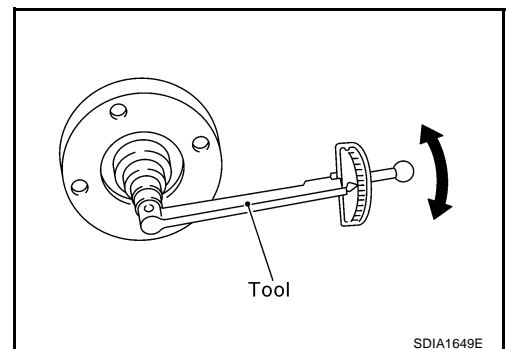
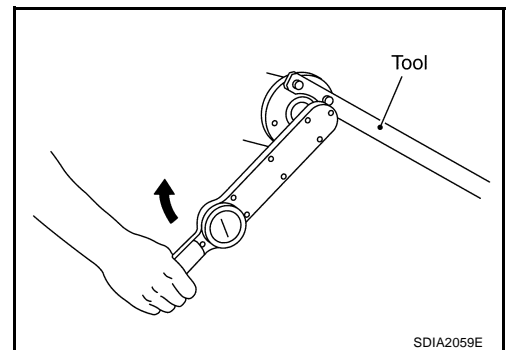
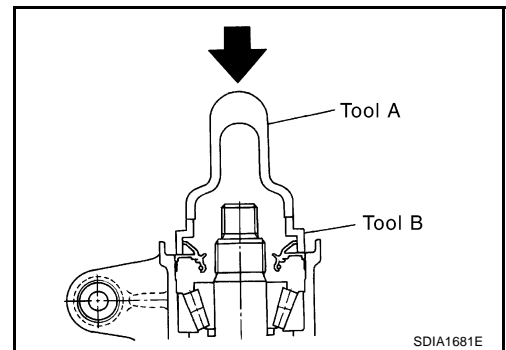
Tool number : KV40104000 ( - )

## CAUTION:

Do not overtighten the nut.

12. Measure the preload using preload gauge.

Tool number : ST3127S000 (J-25765-A)  
Pinion bearing preload : 0.78 - 1.57 N-m (0.08 - 0.16 kg-m, 7 - 13 in-lb)



# FRONT FINAL DRIVE ASSEMBLY

## Installation of differential case assembly

1. Apply gear oil to side bearing, then install the differential case assembly into carrier case.

### CAUTION:

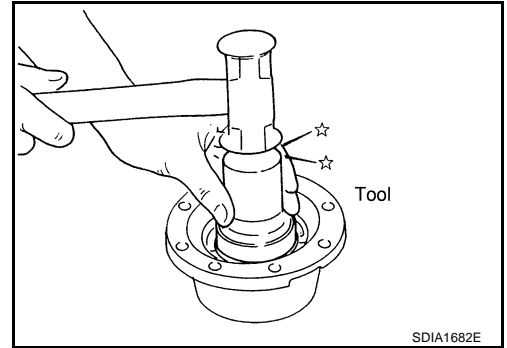
Be careful not damage the carrier cases mating surface.

2. Apply multi-purpose grease to the oil seal lips.
3. Install oil seal into the side retainer using drift.

**Tool number : ST33400001 (J-26082)**

### CAUTION:

After tightening the bolt, wipe off excess sealant from inside of case.



4. Apply liquid sealant to side retainer mounting hole of carrier case.
5. Install selected side bearing adjusting shim and O-ring to the side retainer, then install it to carrier case.

### CAUTION:

After installing adjusting shim onto side retainer, apply gear oil to O-ring and install it.

6. Tighten side retainer mounting bolt to specified torque. Refer to [FFD-14, "COMPONENTS \(VQ35DE\)"](#) or [FFD-16, "COMPONENTS \(VK45DE\)"](#).

## After Inspection

1. Turn drive pinion and drive gear several times.  
Set dial gauge to the drive gear face and measure the backlash.

**Standard drive gear backlash : 0.10 - 0.15 mm  
(0.0039 - 0.0059 in)**

- If the measured value out of standard, adjust the backlash by replacing the side bearing adjusting shim (carrier case side.)
  - If backlash too large, decrease side bearing adjusting shim thickness.
  - If backlash too small, increase side bearing adjusting shim thickness.

2. Check the back face of drive gear runout.

**Runout limit : 0.05 mm (0.0020 in)**

3. Set dial gauge to back of drive gear and measure the drive gear runout.

- If the runout is exceed limit, check for drive gear assembly:
  - any object between the drive gear and differential case.
  - deformed differential case.
  - deformed drive gear
- if drive gear is deformed, replace the hypoid gear as an assembly. If the differential case is deformed, replace the differential case.

4. Check the companion flange face and inside diameter runout.

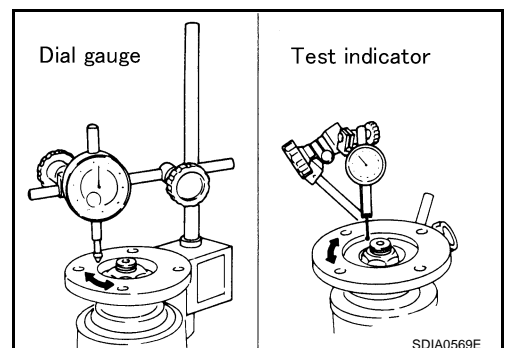
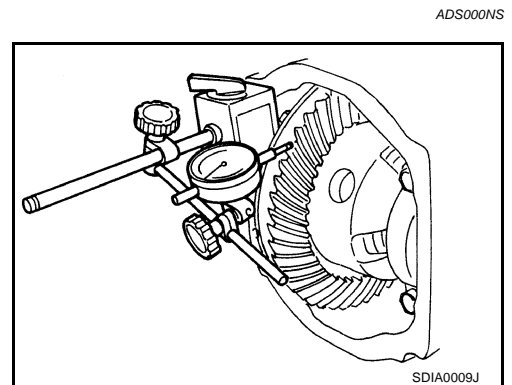
- a. Set the dial gauge to the companion flange face and measure runout.

**Runout limit : 0.18 mm (0.007 in)**

- b. Set the teat indicator to the inside diameter of the companion flange and measure the runout.

**Runout limit : 0.13 mm (0.005 in)**

Mark paint to maximum runout position.



# FRONT FINAL DRIVE ASSEMBLY

## CAUTION:

**Clean inside of companion flange before measuring runout.**

- If runout is exceed limit, remove the companion from the drive pinion. Turn the companion flange position 90° each, and measure the runout again.
  - If runout still exceed limit, replace companion flange.
  - If runout still exceed limit after replacing companion flange, check pinion bearing and drive pinion assembly, and pinion bearing damage.
- c. If runout is out side limit, remove the companion from the drive pinion. Turn the companion flange position 90° each, and measure the runout again.
- d. If runout valve still out side of the limit, replace companion flange.
- e. If runout valve still out side of limit after replacing companion flange, check pinion bearing and drive pinion assembly, and pinion bearing damage.
5. Turn companion flange in both directions 20 times to more, check total preload with tool.

**Tool number : ST3127S000 (J-25765-A)**

**Total preload**

**: 1.56 - 2.65 N·m (0.16 - 0.27 kg·m, 14 - 23 in·lb)**

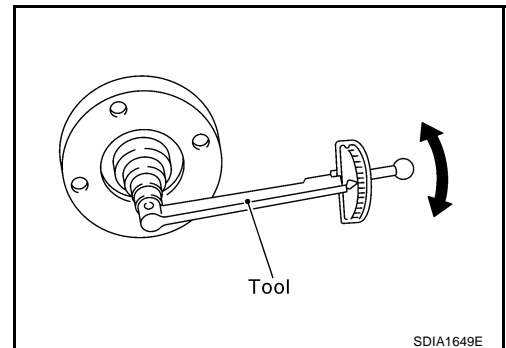
- If the preload value is out of standard, adjust pinion bearing preload and side bearing preload.

If preload value too large:

- Decrease the drive pinion bearing adjusting washer thickness.
  - Decrease the drive pinion adjusting washer thickness.
  - Increase the side bearing adjusting shim thickness.
- If preload value too small:

If preload value to small:

- Increase the drive pinion bearing adjusting washer thickness.
- Increase the drive pinion adjusting washer thickness.
- Decrease the side bearing adjusting shim thickness.



## Carrier Cover Installation

1. Apply sealant to mating surface of carrier cover and carrier case as shown.

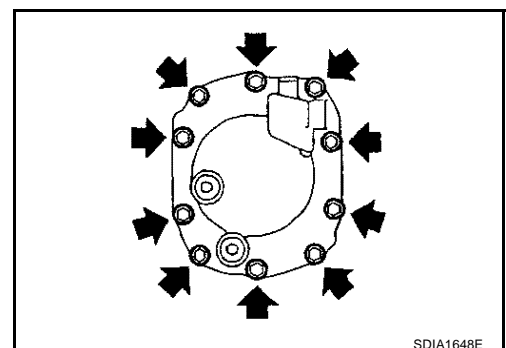
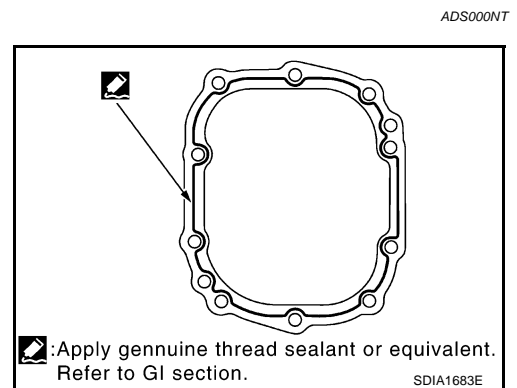
### CAUTION:

**Clean any residual gasket material off from mating surface before applying sealant.**

2. Install the carrier cover to carrier case, tighten the bolts to specified torque. Refer to [FFD-14, "COMPONENTS \(VQ35DE\)"](#) or [FFD-16, "COMPONENTS \(VK45DE\)"](#).
3. Apply sealant to drain plug and filler plug threads. Install and tighten the plugs to specified torque. Refer to [FFD-14, "COMPONENTS \(VQ35DE\)"](#), [FFD-16, "COMPONENTS \(VK45DE\)"](#).

### NOTE:

After installing front final drive on vehicle, fill it with specified amount of gear oil. Refer to [FFD-14, "COMPONENTS \(VQ35DE\)"](#) or [FFD-16, "COMPONENTS \(VK45DE\)"](#).



# SERVICE DATA AND SPECIFICATIONS (SDS)

## SERVICE DATA AND SPECIFICATIONS (SDS)

PPF:00030

### General Specifications

ADS000NE

Applied model	VQ35DE engine	VK45DE engine
		5A/T
Final drive model	F160A (2-pinion)	
Gear ratio	3.692	
Number of teeth (Drive gear/drive pinion)	48/13	
Oil capacity (Approx.) ℓ (US qt, Imp qt)	0.65 (0.7,0.6)	

### Drive Gear Runout

ADS000NF

Unit: mm (in)

Type	F160 A
Drive gear runout limit	0.05 mm (0.002 in)

### Side Gear Adjustment

ADS000NG

Unit: mm (in)

Type	F160A
Clearance limit between side gear and differential case	0.20 mm (0.0079 in) or less

### AVAILABLE SIDE GEAR THRUST WASHERS

Unit: mm (in)

Type	F160A			
	Thickness	Part number	Thickness	Part number
Thrust washer	0.68 (0.0268)	38424 W1010	0.86 (0.0339)	38424 W1016
	0.71 (0.0280)	38424 W1011	0.89 (0.0350)	38424 W1017
	0.74 (0.0291)	38424 W1012	0.92 (0.0362)	38424 W1018
	0.77 (0.0303)	38424 W1013	0.95 (0.0374)	38424 W1019
	0.80 (0.0315)	38424 W1014	0.98 (0.0386)	38424 W1020
	0.83 (0.0327)	38424 W1015	1.01 (0.0398)	38424 W1021

### Side Bearing Preload Adjusting Shims

ADS000ZZ

#### SIDE RETAINER SIDE:

Type	F160A			
	Thickness	Part number	Thickness	Part number
Adjusting shims	0.20 (0.0079)	38453 AR000	0.40 (0.0157)	38453 AR003
	0.25 (0.0098)	38453 AR001	0.50 (0.0197)	38453 AR004
	0.30 (0.0118)	38453 AR002		

#### DIFFERENTIAL CASE TO SIDE BEARING:

Type	F160A			
	Thickness	Part number	Thickness	Part number
Adjusting shims	0.10 (0.0040)	38453 AR010	0.25 (0.0098)	38453 AR015
	0.12 (0.0047)	38453 AR011	0.30 (0.0118)	38453 AR016
	0.15 (0.0059)	38453 AR012	0.40 (0.0157)	38453 AR017
	0.17 (0.0067)	38453 AR013	0.50 (0.0197)	38453 AR018
	0.20 (0.0079)	38453 AR014	-	-

# SERVICE DATA AND SPECIFICATIONS (SDS)

## Drive Pinion Height Adjustment AVAILABLE PINION HEIGHT ADJUSTING WASHERS

ADS000NH

Unit: mm (in)

Type	F160A			
	Thickness	Part number	Thickness	Part number
Adjusting washers	3.09 (0.1217)	38154 U1500	3.39 (0.1335)	38154 U1510
	3.12 (0.1228)	38154 U1501	3.42 (0.1346)	38154 U1511
	3.15 (0.1240)	38154 U1502	3.45 (0.1358)	38154U1512
	3.18 (0.1252)	38154 U1503	3.48 (0.1370)	38154 U1513
	3.21 (0.1264)	38154 U1504	3.51 (0.1382)	38154 U1514
	3.24 (0.1276)	38154 U1505	3.54 (0.1394)	38154 U1515
	3.27 (0.1283)	38154 U1506	3.57 (0.1406)	38154 U1516
	3.30 (0.1299)	38154 U1507	3.60 (0.1429)	38154 U1517
	3.33 (0.1323)	38154 U1508	3.63 (0.1429)	38154 U1518
	3.36 (0.1323)	38154 U1509	3.66 (0.1441)	38154 U1519

## Drive Pinion Preload Adjustment

ADS000NI

Type	F160A
Drive pinion preload without front oil seal	0.78 – 1.57 N·m (0.08 – 0.16 kg–m, 7 – 13 in-lb)

## AVAILABLE PINION PRELOAD ADJUSTING WASHERS

Unit: mm (in)

Type	F160A			
	Thickness	Part number	Thickness	Part number
Adjusting washers	3.81 (0.1500)	38125 61001	4.01 (0.1579)	38135 61001
	3.83 (0.1508)	38126 61001	4.03 (0.1587)	38136 61001
	3.85 (0.1516)	38127 61001	4.05 (0.1594)	38137 61001
	3.87 (0.1524)	38128 61001	4.07 (0.1602)	38138 61001
	3.89 (0.1531)	39129 61001	4.09 (0.1610)	38139 61001
	3.91 (0.1539)	38130 61001	5.19 (0.2043)	38151 AR000
	3.93 (0.1547)	38131 61001	5.49 (0.2161)	38151 AR001
	3.95 (0.1555)	38132 61001	5.79 (0.2280)	38151 AR002
	3.97 (0.1563)	38133 61001	6.09 (0.2398)	38151 AR003
	3.99 (0.1571)	38134 61001	6.39 (0.2516)	38151 AR004

## Total Preload Adjustment

ADS000NK

Type	F160A
Total preload	1.56 – 2.65 N·m (0.16 – 0.27 kg–m, 14 – 23 in-lb)
Drive gear to drive pinion backlash	0.10 – 0.15 mm (0.0039 – 0.0059 in)