PROPELLER SHAFT & DIFFERENTIAL CARRIER

SECTION **PD**

CONTENTS

PROPELLER SHAFT 3
- Preparation 3
  - SPECIAL SERVICE TOOLS 3
- Noise, Vibration and Harshness (NVH) Troubleshooting 4
  - NVH TROUBLESHOOTING CHART 4
- Components....5
  - FRONT PROPELLER SHAFT 5
  - REAR PROPELLER SHAFT 6
- On-vehicle Service....7
  - PROPELLER SHAFT VIBRATION 7
  - APPEARANCE CHECKING 7
- Removal and Installation 7
- Inspection....7
- Disassembly....8
  - CENTER BEARING....8
  - JOURNAL 9
- Assembly 9
  - CENTER BEARING....9
  - JOURNAL 10
- Service Data and Specifications (SDS)....11
  - GENERAL SPECIFICATIONS 11
  - SERVICE DATA....11

R200A

FRONT FINAL DRIVE 12
- Preparation 12
  - SPECIAL SERVICE TOOLS 12
- Noise, Vibration and Harshness (NVH) Troubleshooting 14
- On-vehicle Service....14
  - FRONT OIL SEAL REPLACEMENT....14
  - REAR COVER GASKET REPLACEMENT....15
- Components....16
- Removal and Installation 17
  - REMOVAL....17
  - INSTALLATION....17
- Disassembly....18
  - PRE-INSPECTION 18
  - FINAL DRIVE HOUSING 18
  - DIFFERENTIAL CASE....21
  - DIFFERENTIAL SIDE SHAFT 21
- Inspection....22
  - RING GEAR AND DRIVE PINION 22
  - DIFFERENTIAL CASE ASSEMBLY 23
  - BEARING 23
- Adjustment 23
  - SIDE BEARING PRELOAD....23
  - PINION GEAR HEIGHT AND PINION BEARING PRELOAD 25
  - TOOTH CONTACT....29
- Assembly 30
  - DIFFERENTIAL SIDE SHAFT 30
  - DIFFERENTIAL CASE....31
  - FINAL DRIVE HOUSING 32
- Service Data and Specifications (SDS)....36
  - R200A....36

C200

REAR FINAL DRIVE 38
- Preparation 38
  - SPECIAL SERVICE TOOLS 38
- Noise, Vibration and Harshness (NVH) Troubleshooting 40
- On-vehicle Service....40
  - REAR COVER GASKET REPLACEMENT....40
- Components....41
- Removal and Installation 42
  - REMOVAL....42
  - INSTALLATION....42
- Disassembly....42
  - PRE-INSPECTION 42
  - DIFFERENTIAL CARRIER 43
  - DIFFERENTIAL CASE....45
- Inspection....46
  - RING GEAR AND DRIVE PINION 46
  - DIFFERENTIAL CASE ASSEMBLY 46
  - BEARING 46
- Adjustment 46
  - SIDE BEARING PRELOAD....47

CONTENTS (Cont'd)

PINION GEAR HEIGHT 48
TOOTH CONTACT 52
Assembly 53
DIFFERENTIAL CASE 53
DIFFERENTIAL CARRIER 54
Service Data and Specifications (SDS) 58
C200 58

H233B

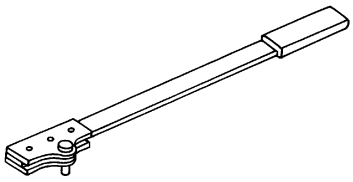
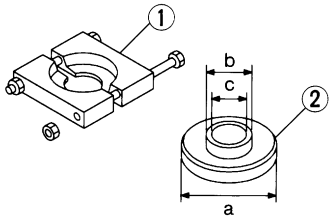
REAR FINAL DRIVE 60
Preparation 60
SPECIAL SERVICE TOOLS 60
Noise, Vibration and Harshness (NVH) Troubleshooting 62
On-vehicle Service 62
FRONT OIL SEAL REPLACEMENT 62
Components 64
Removal and Installation 65
REMOVAL 65
INSTALLATION 65
Disassembly 65
PRE-INSPECTION 65
DIFFERENTIAL CARRIER 66
DIFFERENTIAL CASE 68
Inspection 69
RING GEAR AND DRIVE PINION 69
DIFFERENTIAL CASE ASSEMBLY 69
BEARING 69
Limited Slip Differential 70
PREPARATION FOR DISASSEMBLY 70
DISASSEMBLY 70
INSPECTION 71
ADJUSTMENT 72
ASSEMBLY 74
Adjustment 75
PINION GEAR HEIGHT 75
TOOTH CONTACT 78
Assembly 79
DIFFERENTIAL CASE 79
DIFFERENTIAL CARRIER 81
Service Data and Specifications (SDS) 84
H233B 84

Preparation

SPECIAL SERVICE TOOLS

NGPD0001

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	
KV38108300 (J44195) Companion flange wrench	 NT771	Removing and installing propeller shaft lock nut, and drive pinion lock nut
ST3090S000 (—) Drive pinion rear inner race puller set 1 ST30031000 (J22912-01) Puller 2 ST30901000 (J26010-01) Base	 NT527	Removing and installing drive pinion rear inner cone **a: 79 mm (3.11 in) dia.** **b: 45 mm (1.77 in) dia.** **c: 35 mm (1.38 in) dia.**

Noise, Vibration and Harshness (NVH) Troubleshooting

=NGPD0049

NVH TROUBLESHOOTING CHART

NGPD0049S01

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

Reference page			—	PD-6	—	—	—	PD-7	PD-7	PD-22, 69	PD-29, 78	PD-22, 69	PD-18, 65	—	—	Refer to PROPELLER SHAFT in this chart.	Refer to DIFFERENTIAL in this chart.	NVH, ***AX-3***	NVH, ***AX-3***	NVH, ***SU-3***	NVH, ***SU-3***	NVH, ***SU-3***	NVH, ***SU-3***	NVH, ***BR-5***	NVH, ***ST-5***
Possible cause and SUSPECTED PARTS			Uneven rotation torque	Center bearing improper installation	Excessive center bearing axial end play	Center bearing mounting (insulator) cracks, damage or deterioration	Excessive joint angle	Rotation imbalance	Excessive runout	Rough gear tooth	Improper gear contact	Tooth surfaces worn	Incorrect backlash	Companion flange excessive runout	Improper gear oil	PROPELLER SHAFT	DIFFERENTIAL	DRIVE SHAFT	AXLE	SUSPENSION	TIRES	ROAD WHEEL	BRAKES	STEERING
Symptom	PROPELLER SHAFT	Noise	×	×	×	×	×	×	×								×	×	×	×	×	×	×	×
		Shake		×			×											×	×	×	×	×	×	×
		Vibration	×	×	×	×	×	×	×									×	×	×	×			×
	DIFFERENTIAL	Noise								×	×	×	×	×	×	×		×	×	×	×	×	×	×

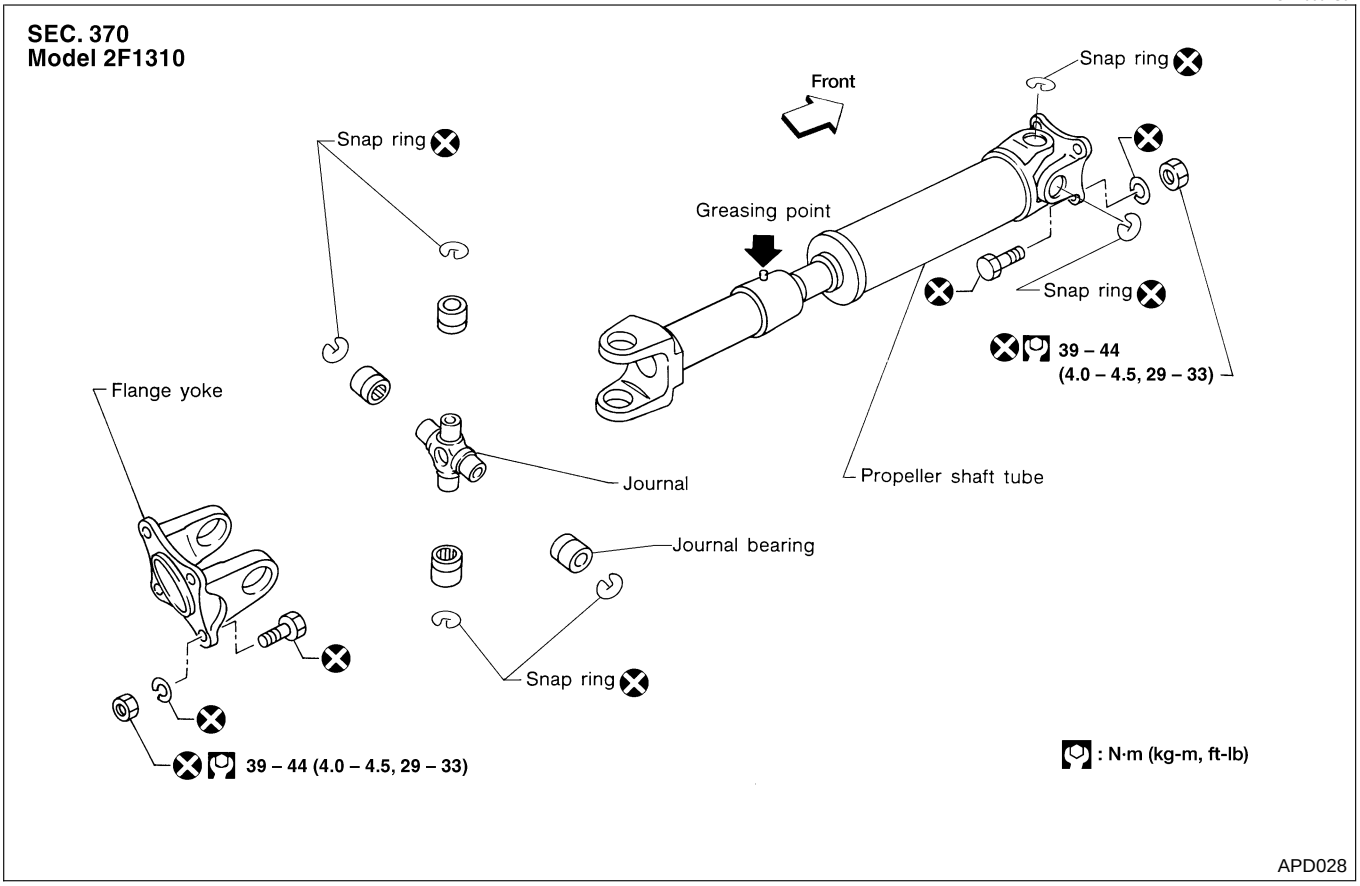
×: Applicable

Components

NGPD0002

FRONT PROPELLER SHAFT

NGPD0002S01

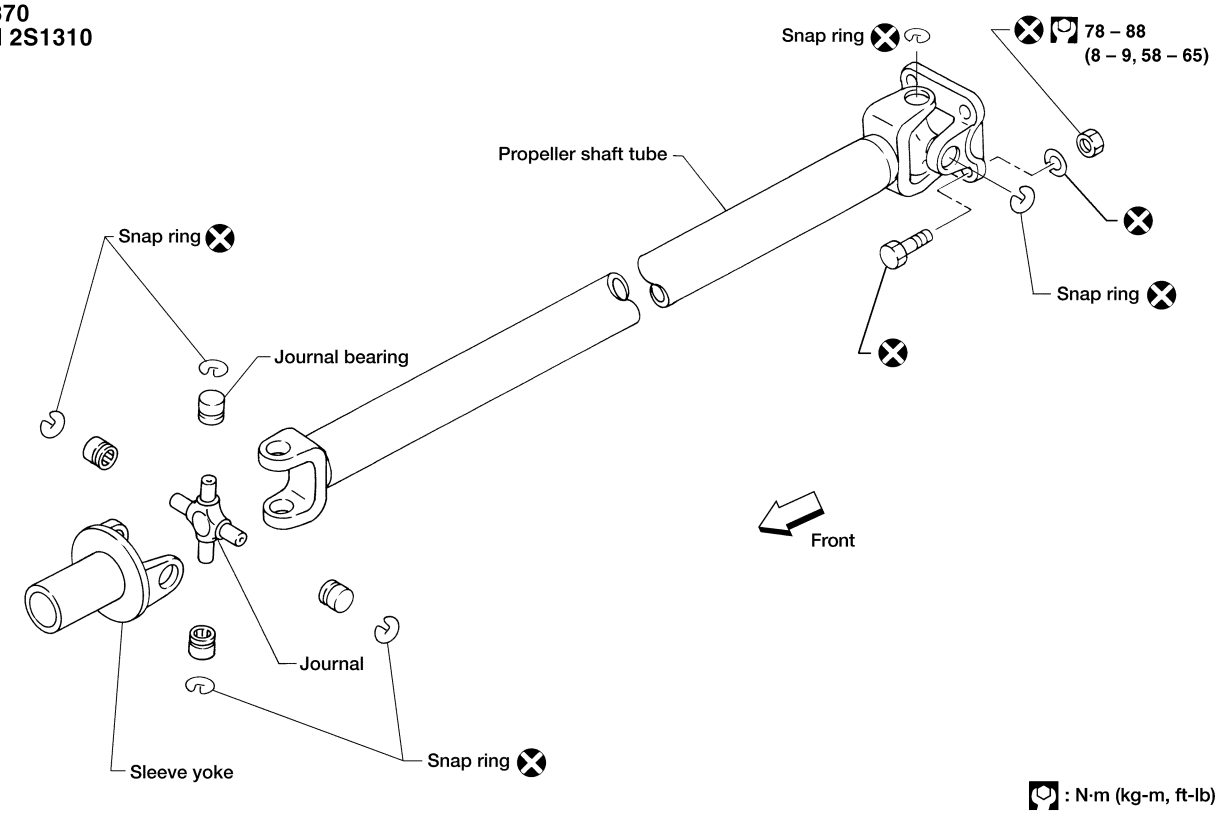


Components (Cont'd)

REAR PROPELLER SHAFT

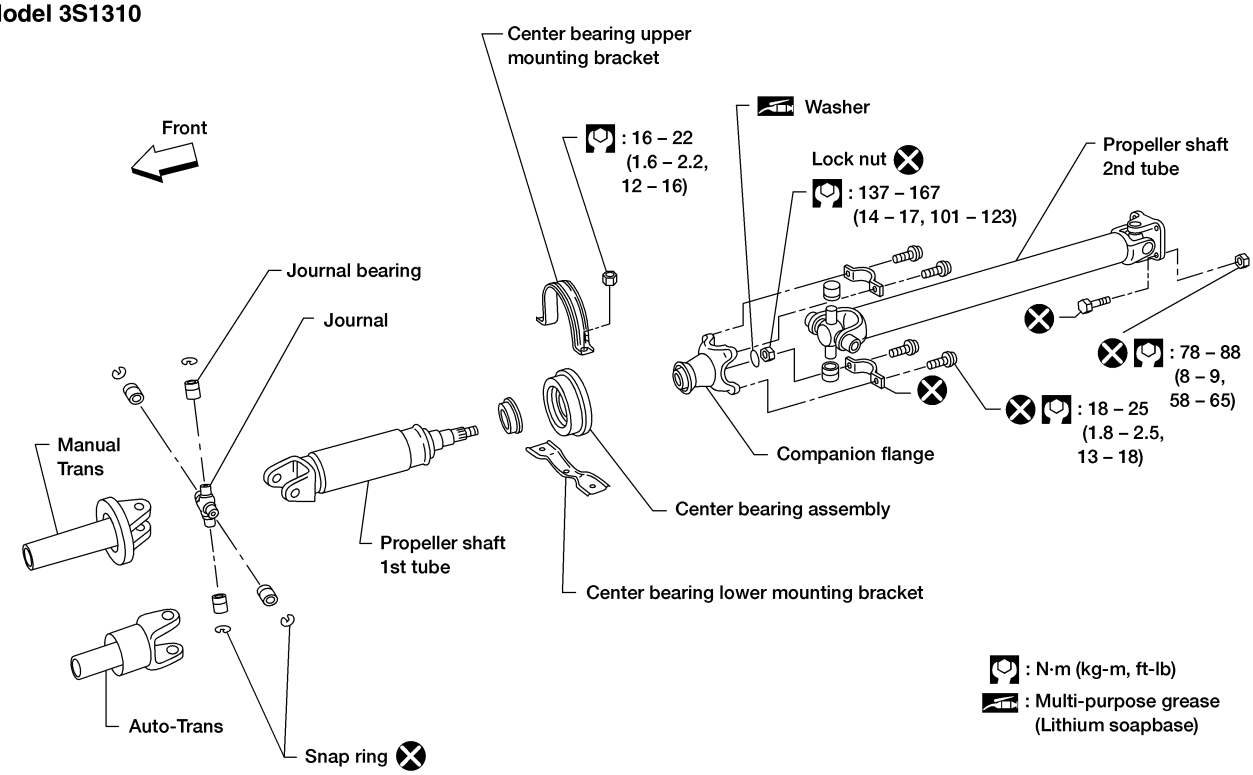
NGPD0002S02

SEC 370
Model 2S1310

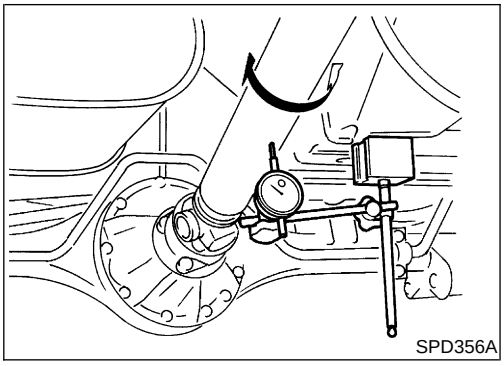


APD029

SEC. 370
Model 3S1310



WPD017


SPD356A

On-vehicle Service

PROPELLER SHAFT VIBRATION

NGPD0003

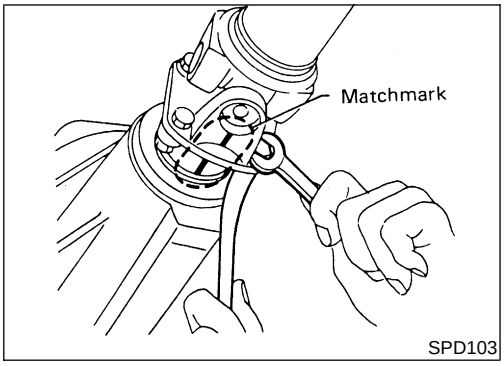
If vibration is present at high speed, inspect propeller shaft runout first.

1. Raise rear end of vehicle until wheels are clear of the ground.
2. Measure propeller shaft runout at several points along propeller shaft by rotating final drive companion flange with hands.
   Runout limit: 0.6 mm (0.024 in)
3. If runout exceeds specifications, disconnect propeller shaft at final drive companion flange; then rotate companion flange 180 degrees and reconnect propeller shaft.
4. Check runout again. If runout still exceeds specifications, replace propeller shaft assembly.
5. Perform road test.

APPEARANCE CHECKING

NGPD0004

- Inspect propeller shaft tube surface for dents or cracks. If damaged, replace propeller shaft assembly.
- If center bearing is noisy or damaged, replace center bearing.

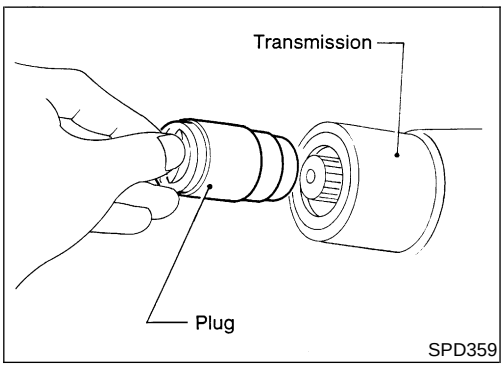


SPD103

Removal and Installation

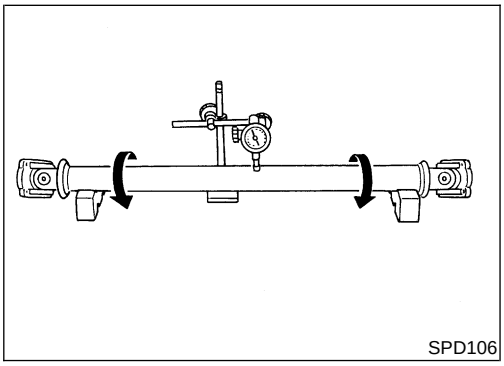
NGPD0005

1) Put match marks on flanges and separate propeller shaft from final drive.



SPD359

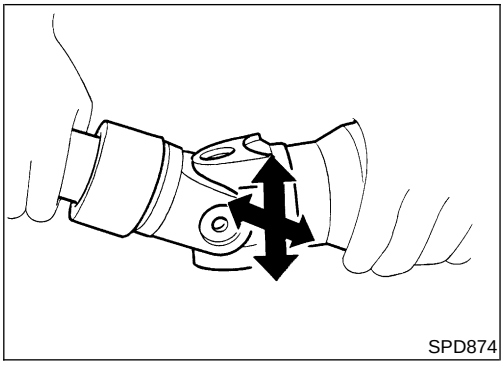
2) Remove propeller shaft.
   Insert plug into rear oil seal after removing rear propeller shaft.


SPD106

Inspection

NGPD0006

- Inspect propeller shaft runout. If runout exceeds specifications, replace propeller shaft assembly.
  Runout limit: 0.6 mm (0.024 in)


SPD874

- If the play exceeds specifications, replace propeller shaft assembly.

  Journal axial play:

  0.02 mm (0.0008 in) or less

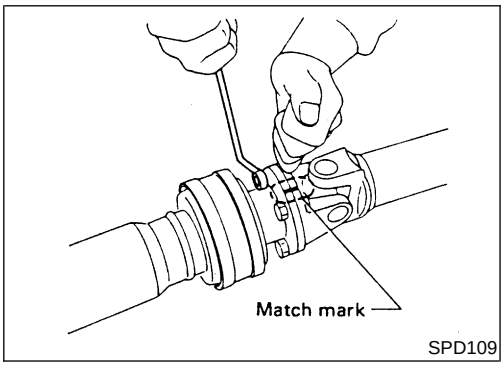
Disassembly

NGPD0007

CENTER BEARING

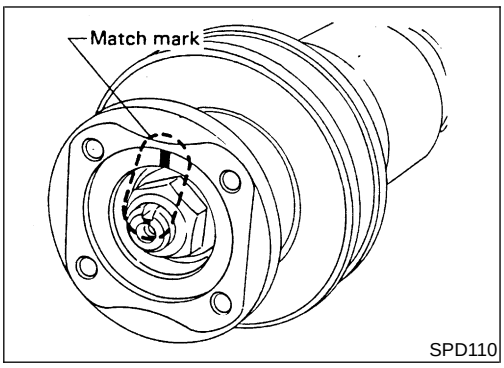
NGPD0007S01

1. Put match marks on flanges, and separate 2nd tube from 1st tube.



SPD109

2. Put match marks on the flange and shaft.



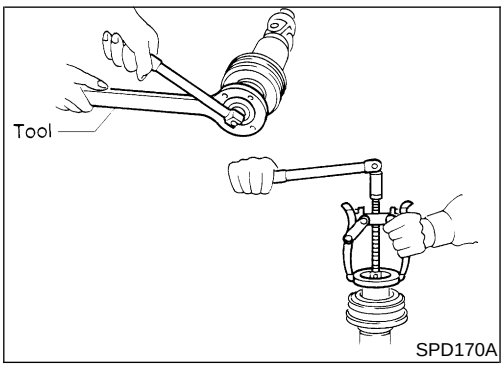
SPD110

3. Remove locking nut with Tool.

   Tool number:

   KV38108300 (J44195)

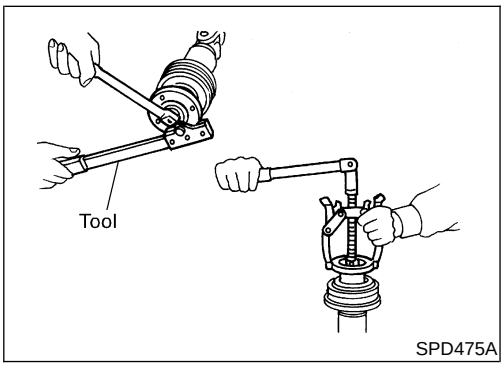
4. Remove companion flange with puller.



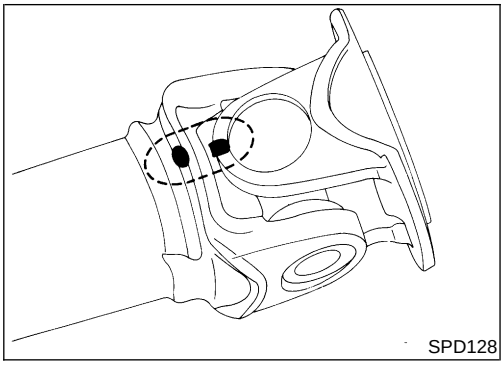
SPD170A

5. Remove center bearing with Tool and press.

   Tool number: ST30031000 (J22912-01)



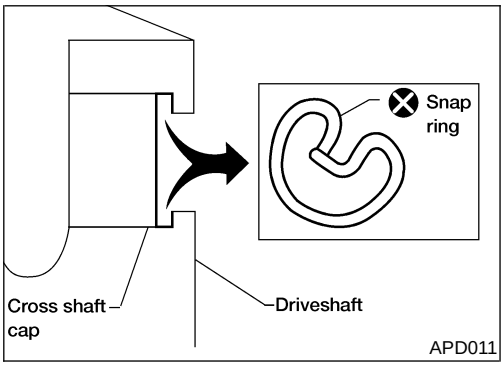
SPD475A


SPD128

JOURNAL

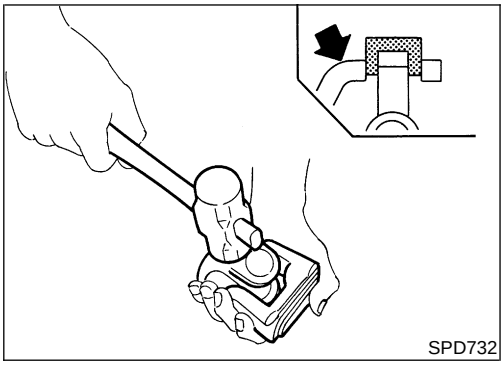
NGPD0007S02

1. Put match marks on shaft and flange or yoke.

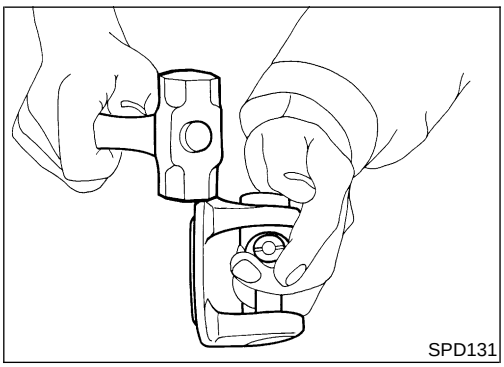


APD011

2. Remove snap ring.

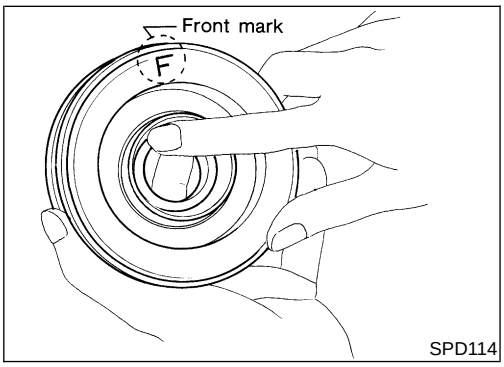

SPD732

3. Remove pushed out journal bearing by lightly tapping yoke with a hammer, taking care not to damage journal and yoke hole.


SPD131

4. Remove bearing at opposite side in above operation.

Put marks on disassembled parts so that they can be reinstalled in their original positions from which they were removed.



SPD114

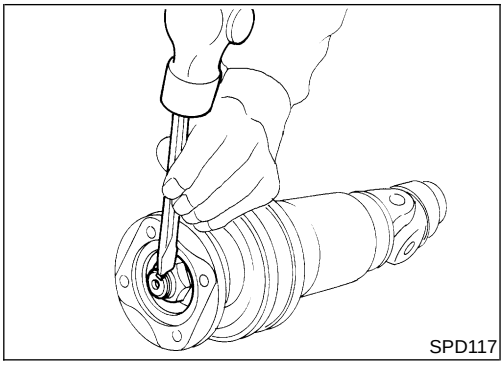
Assembly

NGPD0008

CENTER BEARING

NGPD0008S01

- When installing center bearing, position the "F" mark on center bearing toward front of vehicle.
- **Apply a coat of multi-purpose lithium grease containing molybdenum disulfide to the end face of the center bearing and both sides of the washer.**


SPD117

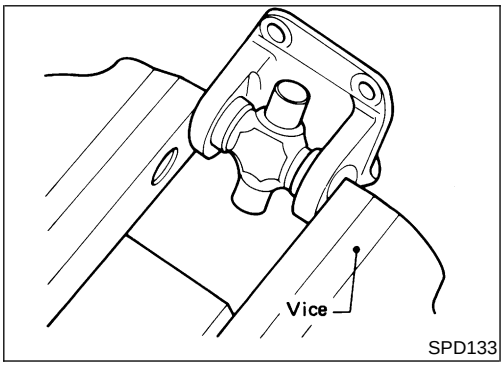
- Stake the nut. Always use new one.
- Align match marks when assembling tubes.

JOURNAL

NGPD0008S02

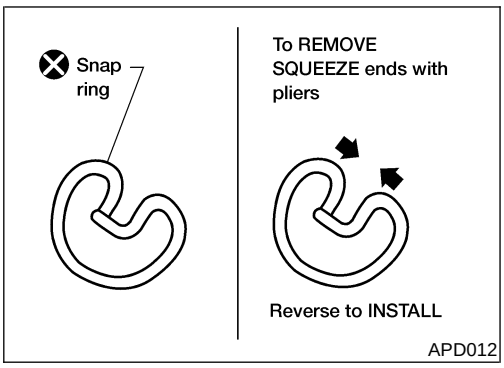
1. Assemble journal bearing. Apply recommended multi-purpose grease on bearing inner surface.

When assembling, be careful that needle bearing does not fall down.



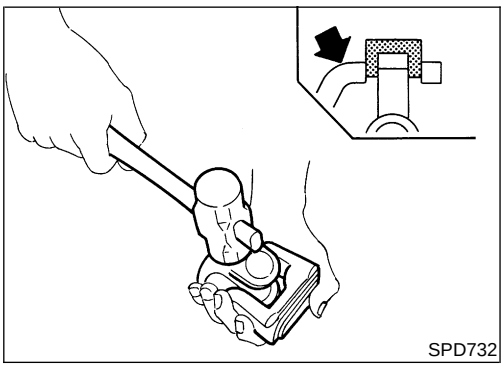
SPD133

2. Install new snap rings.



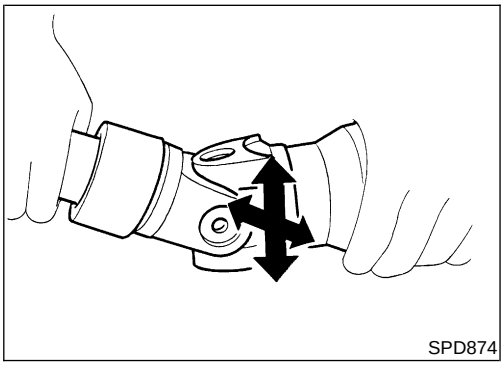
APD012

3. Adjust thrust clearance between bearing and snap ring to zero by tapping yoke.


SPD732

4. Check to see that journal moves smoothly and check for axial play.

   Axial play: 0.02 mm (0.0008 in) or less


SPD874

Service Data and Specifications (SDS)

GENERAL SPECIFICATIONS

=NGPD0009

2WD Model

NGPD0009S01

Enigne		KA24DE	VG33E	
Transmission		M/T	M/T	A/T
Propeller shaft model		3S1310		
Number of joints		3		
Coupling method with transmission		Sleeve type		
Type of journal bearings		Solid type (disassembly type)		
Distance between yokes mm (in)		71 (2.80)	80 (3.15)	
Shaft length (Spider to spider) mm (in)	1st	637 (25.08)	665 (26.18)	570 (22.44)
	2nd	683 (26.89)	675.5(26.59)	
Shaft outer diameter mm (in)	1st	63.5 (2.50)		
	2nd	63.5 (2.50)		

4WD Model

NGPD0009S02

Location	Front	Rear
Propeller shaft model	2F1310	2S1310
Number of joints	2	2
Coupling method with transmission	Flange type	Sleeve type
Type of journal bearings	Solid type (disassembly type)	
Distance between yokes mm (in)	71 (2.80)	80 (3.15)
Shaft length (Spider to spider) mm (in)	522 (20.6)	948.3 (37.3)
Shaft outer diameter mm (in)	50.8 (2.0)	76.2 (3.0)

SERVICE DATA

NGPD0010

Unit: mm (in)

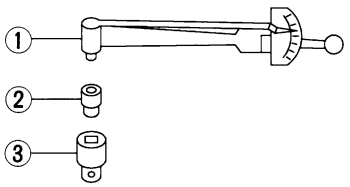
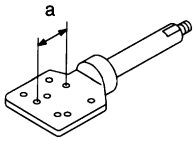
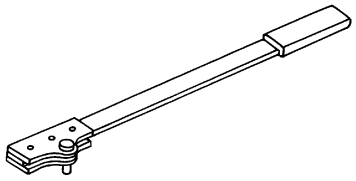
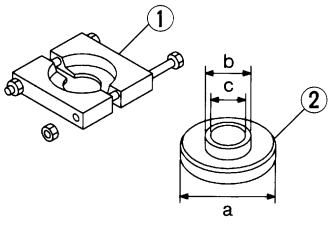
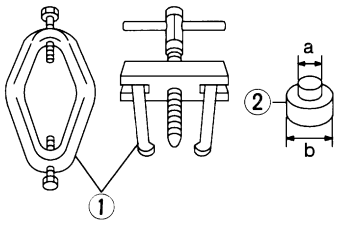
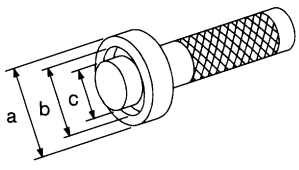
Propeller shaft runout limit	0.6 (0.024)
Journal axial play	0.02 (0.0008) or less

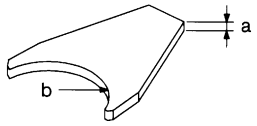
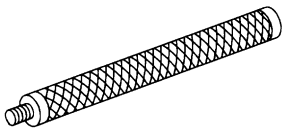
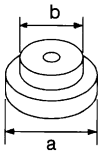
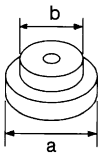
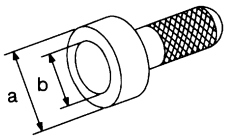
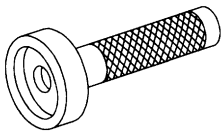
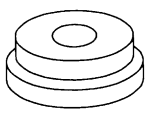
Preparation

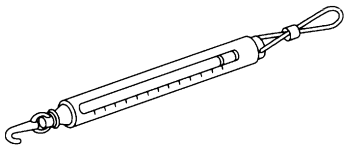
SPECIAL SERVICE TOOLS

NGPD0013

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	
ST3127S000 (See J25765-A) Preload gauge 1 GG91030000 (J25765) Torque wrench 2 HT62940000 (—) Socket adapter 3 HT62900000 (—) Socket adapter	 NT124	Measuring pinion bearing preload and total preload
KV38100800 (J34310, J25604-01) Differential attachment	 NT119	Mounting final drive (To use, make a new hole.) **a: 152 mm (5.98 in)**
KV38108300 (J44195) Companion flange wrench	 NT771	Removing and installing propeller shaft lock nut, and drive pinion lock nut
ST3090S000 (—) Drive pinion rear inner race puller set 1 ST30031000 (J22912-01) Puller 2 ST30901000 (J26010-01) Base	 NT527	Removing and installing drive pinion rear inner cone **a: 79 mm (3.11 in) dia.** **b: 45 mm (1.77 in) dia.** **c: 35 mm (1.38 in) dia.**
ST3306S001 Differential side bearing puller set 1 ST33051001 (J22888-20) Body 2 ST33061000 (J8107-2) Adapter	 NT072	Removing and installing differential side bearing inner cone **a: 28.5 mm (1.122 in) dia.** **b: 38 mm (1.50 in) dia.**
KV38100300 (J25523) Differential side bearing drift	 NT085	Installing side bearing inner cone **a: 54 mm (2.13 in) dia.** **b: 46 mm (1.81 in) dia.** **c: 32 mm (1.26 in) dia.**

Tool number (Kent-Moore No.) Tool name	Description	
KV38100600 (J25267) Side bearing spacer drift	 NT528	Installing side bearing spacer **a: 8 mm (0.31 in)** **b: R42.5 mm (1.673 in)**
ST30611000 (J25742-1) Drift	 NT090	Installing pinion rear bearing outer race (Use with ST30621000 or ST30613000)
ST30621000 (J25742-5) Drift	 NT073	Installing pinion rear bearing outer race (Use with ST30611000) **a: 79 mm (3.11 in) dia.** **b: 59 mm (2.32 in) dia.**
ST30613000 (J25742-3) Drift	 NT073	Installing pinion front bearing outer race (Use with ST30611000) **a: 72 mm (2.83 in) dia.** **b: 48 mm (1.89 in) dia.**
KV38100500 (J25273) Gear carrier front oil seal drift	 NT115	Installing front oil seal **a: 85 mm (3.35 in) dia.** **b: 60 mm (2.36 in) dia.**
KV38100200 (J26233) Gear carrier side oil seal drift	 NT120	Installing side oil seal
(J34309) Differential shim selector	 NT134	Adjusting bearing pre-load and gear height
(J25269-4) Side bearing discs (2 Req'd)	 NT136	Selecting pinion height adjusting washer

Tool number (Kent-Moore No.) Tool name	Description
(J8129) Spring gauge	Measuring carrier turning torque  NT127

Noise, Vibration and Harshness (NVH) Troubleshooting

NGPD0050

Refer to "NVH TROUBLESHOOTING CHART", PD-4.

On-vehicle Service

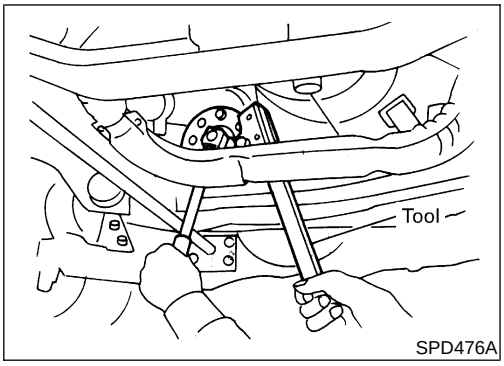
FRONT OIL SEAL REPLACEMENT

NGPD0014

(Front final drive: Model R200A)

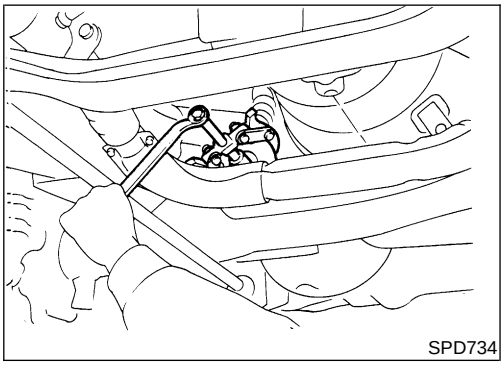
1. Remove front propeller shaft.
2. Loosen drive pinion nut.

Tool number: KV38108300 (J44195)

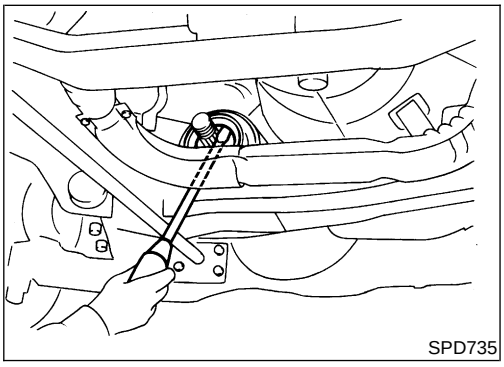


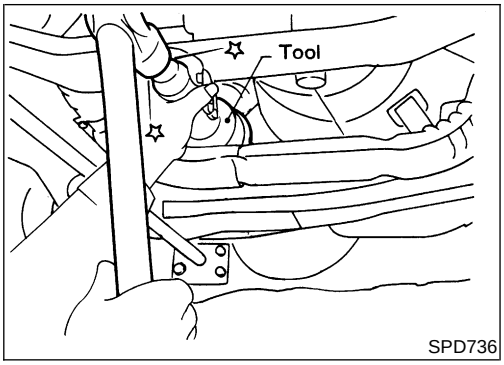
SPD476A

3. Remove companion flange.


SPD734

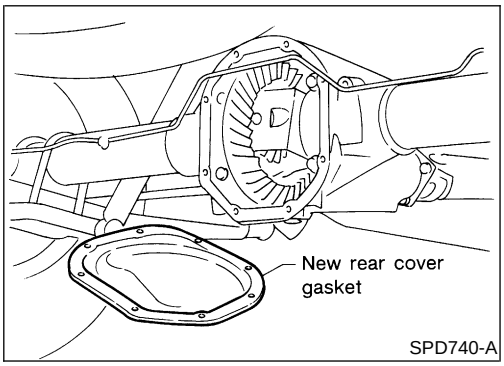
4. Remove front oil seal.


SPD735



5. Apply multi-purpose grease to cavity at sealing lips of oil seal. Press front oil seal into carrier.
6. Install companion flange and drive pinion nut.
7. Install propeller shaft.

Tool number:
KV38100500 (J25273)



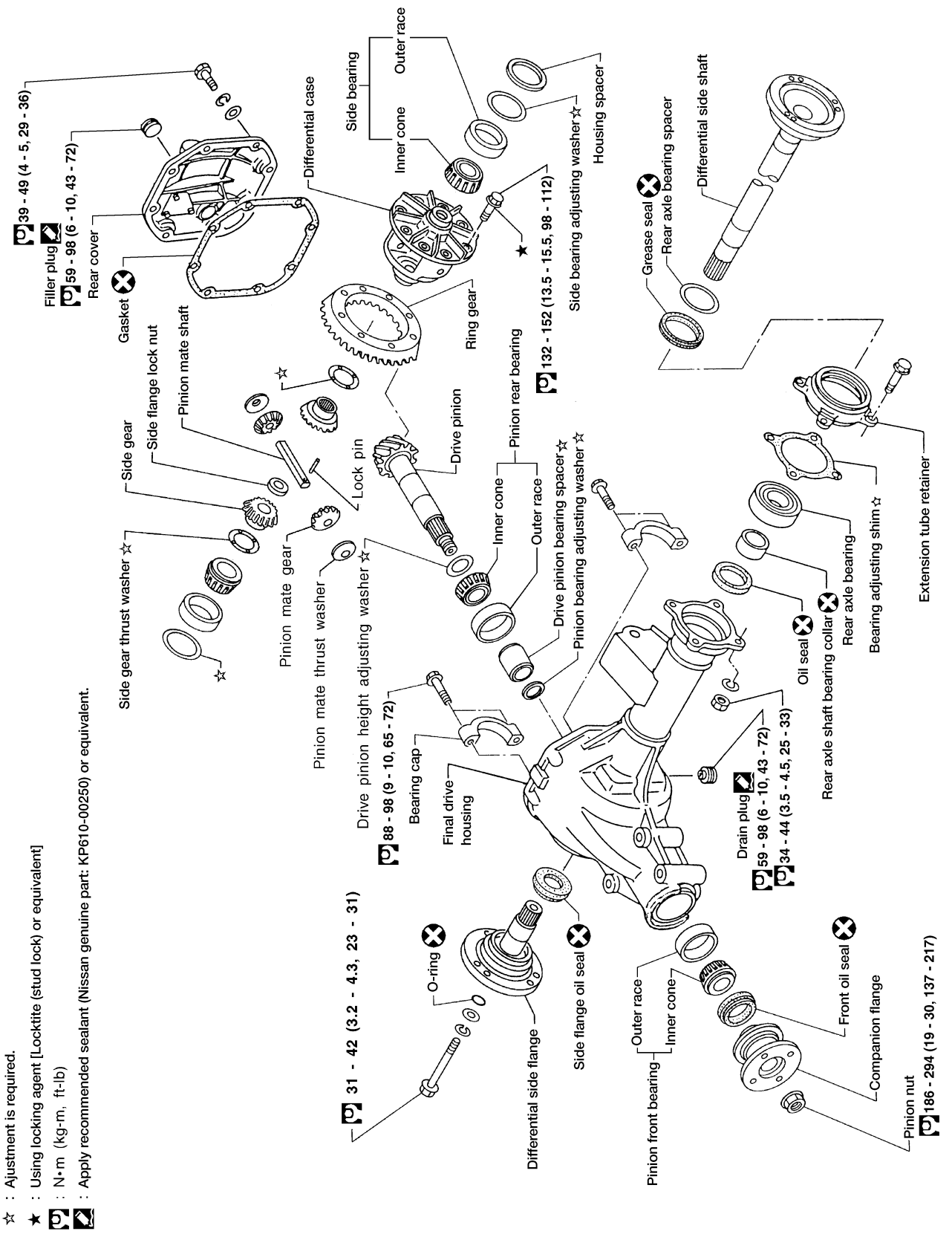
REAR COVER GASKET REPLACEMENT

NGPD0015

1. Drain gear oil.
2. Remove rear cover and rear cover gasket.
3. Install new rear cover gasket and rear cover.
4. Fill final drive with recommended gear oil.

Components

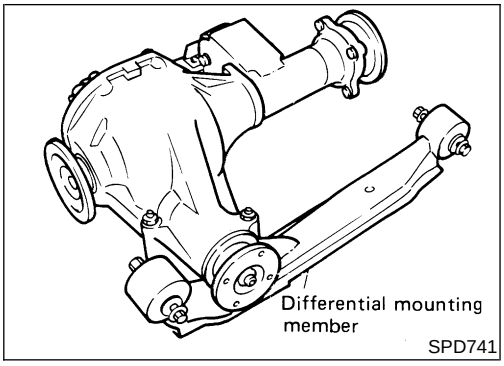
NGPD0016



SEC. 381

☆ : Ajustment is required.
★ : Using locking agent [Locktite (stud lock) or equivalent]
: N•m (kg-m, ft-lb)
: Apply recommended sealant (Nissan genuine part: KP610-00250) or equivalent.

APD020



SPD741

Removal and Installation

NGPD0017

REMOVAL

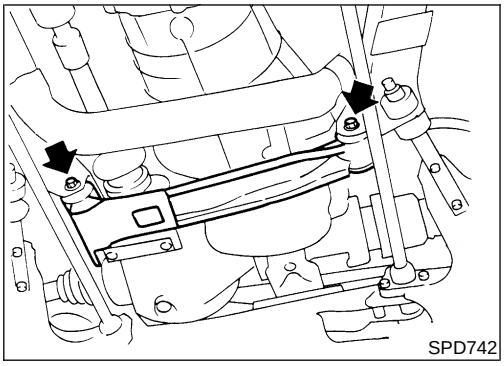
NGPD0017S01

1) Remove front of propeller shaft.
2) Separate drive shaft from front final drive. Refer to “Drive Shaft”, ***AX-15***.
3) Remove engine mounting bolts and raise up engine.
4) Remove front final drive together with differential mounting member.

CAUTION:

Be careful not to damage spline, sleeve yoke and front oil seal when removing propeller shaft.

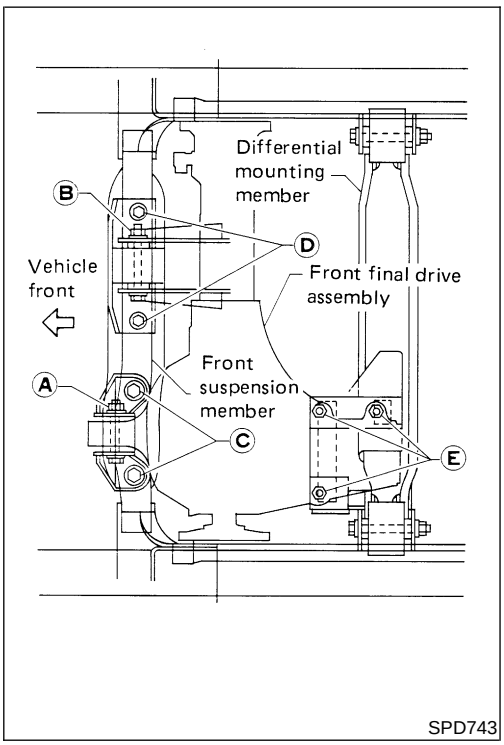
Before removing the final drive assembly or rear axle assembly, disconnect the ABS sensor harness connector from the assembly and move it away from the final drive/rear axle assembly area. Failure to do so may result in the sensor wires being damaged and the sensor becoming inoperative.


SPD742

INSTALLATION

NGPD0017S02

1) Install front final drive assembly together with differential mounting member.

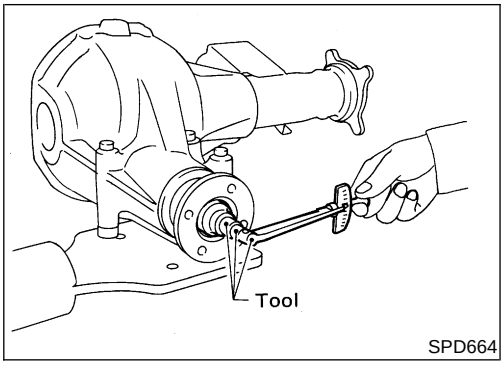


SPD743

2) Tighten front final drive securing bolts and nuts by following the procedure to prevent drive train vibration.

a) Temporarily tighten nut **A**.
b) Temporarily tighten nut **B**.
c) Tighten bolt **C** to the torque of 68 to 87 N·m (6.9 to 8.9 kg-m, 50 to 64 ft-lb).
d) Tighten bolt **D** to the torque of 68 to 87 N·m(6.9 to 8.9 kg-m, 50 to 64 ft-lb).
e) Tighten bolt **A** to the torque of 68 to 87 N·m (6.9 to 8.9 kg-m, 50 to 64 ft-lb).
f) Tighten bolt **B** to the torque of 68 to 87 N·m (6.9 to 8.9 kg-m, 50 to 64 ft-lb).
g) Tighten bolt **E** to the torque of 68 to 87 N·m (6.9 to 8.9 kg-m, 50 to 64 ft-lb).

3) Install drive shaft. Refer to “Drive Shaft”, ***AX-19***.
4) Install front propeller shaft.



Disassembly

NGPD0018

PRE-INSPECTION

NGPD0018S01

Before disassembling final drive, perform the following inspection.

- Total preload

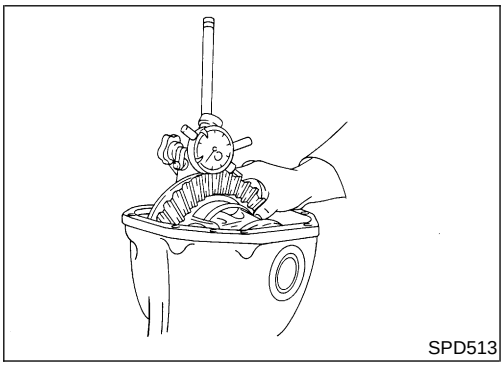
a) Turn drive pinion in both directions several times to set bearing rollers.

b) Check total preload with Tool.

Tool number: ST3127S000 (J25765-A)

Total preload:

1.4 - 1.7 N·m (14 - 17 kg-cm, 12 - 15 in-lb)

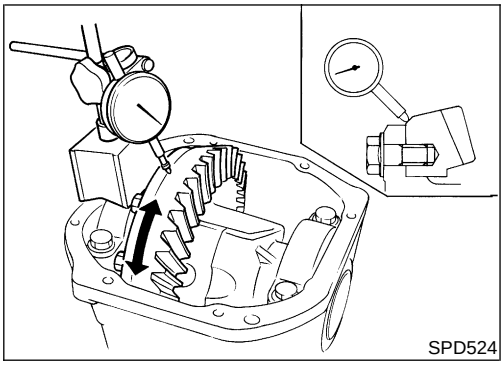


- Ring gear to drive pinion backlash

Check backlash of ring gear with a dial indicator at several points.

Ring gear-to-drive pinion backlash:

0.10 - 0.15 mm (0.0039 - 0.0059 in)



- Ring gear runout

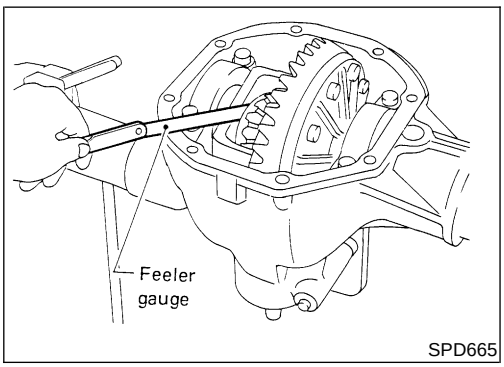
Check runout of ring gear with a dial indicator.

Runout limit:

0.05 mm (0.0020 in)

- Tooth contact

Check tooth contact. Refer to “TOOTH CONTACT”, PD-29.



- Side gear to pinion mate gear backlash

Using a feeler gauge, measure clearance between side gear thrust washer and differential case.

Clearance between side gear thrust washer and differential case:

Less than 0.15 mm (0.0059 in)

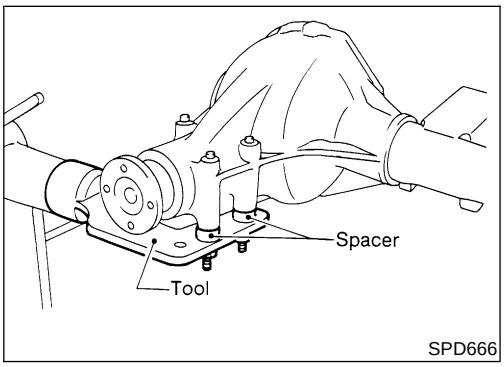
FINAL DRIVE HOUSING

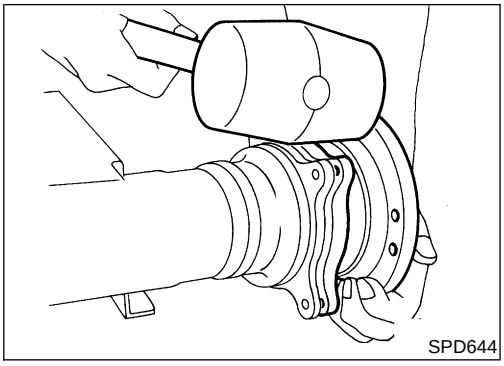
NGPD0018S02

1. Using three spacers [20 mm (0.79 in)], mount final drive assembly on Tool.

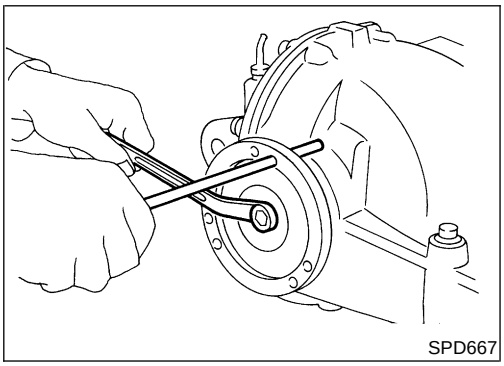
Tool number:

KV38100800 (J34310, J25604-01)

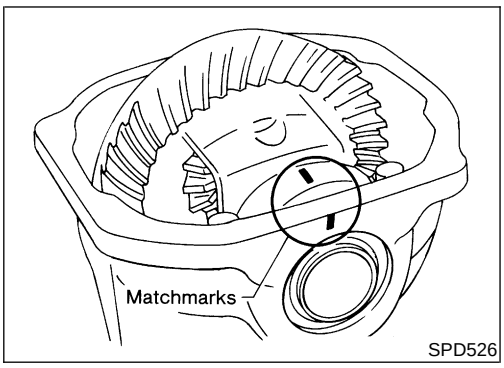



SPD644

2. Remove differential side shaft assembly.


SPD667

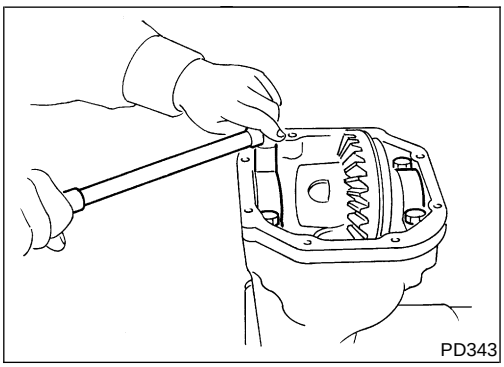
3. Remove differential side flange.



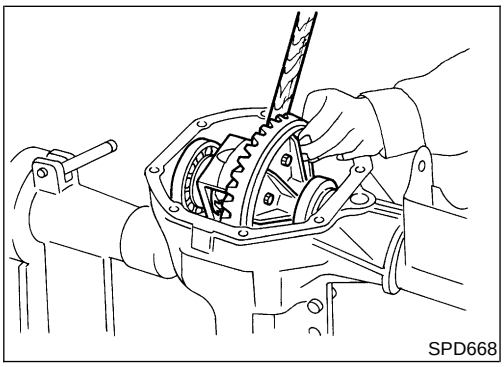
SPD526

4. Put match marks on one side of side bearing cap with paint or punch to ensure that it is replaced in proper position during reassembly.

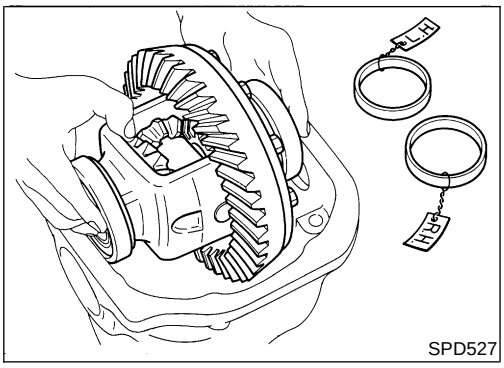
Bearing caps are line-bored during manufacture and should be put back in their original places.


PD343

5. Remove side bearing caps.


SPD668

6. Remove differential case assembly with a pry bar.

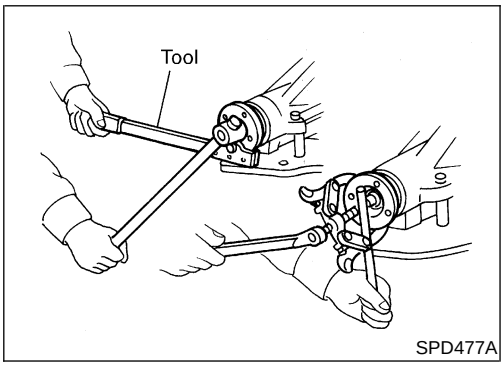


SPD527

Be careful to keep the side bearing outer races together with their respective inner cones — do not mix them up.

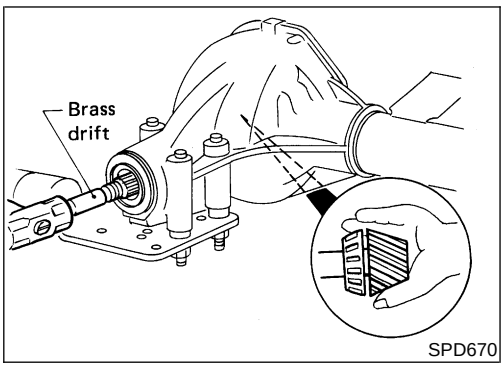
CAUTION:

Side bearing spacer is placed on either the left or right depending upon final drive gear ratio. It should be labeled so that it may be replaced correctly.



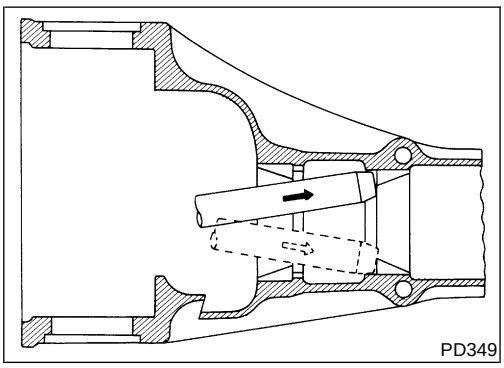
SPD477A

7. Loosen drive pinion nut.
   Tool number: KV38108300 (J44195)
8. Remove companion flange with puller.

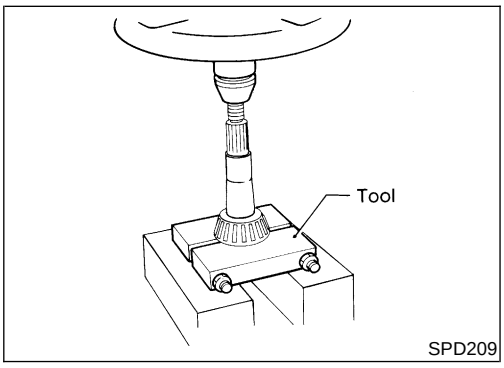


SPD670

9. Take out drive pinion together with rear bearing inner cone, drive pinion bearing spacer and pinion bearing adjusting washer.
10. Remove front oil seal and pinion front bearing inner cone.

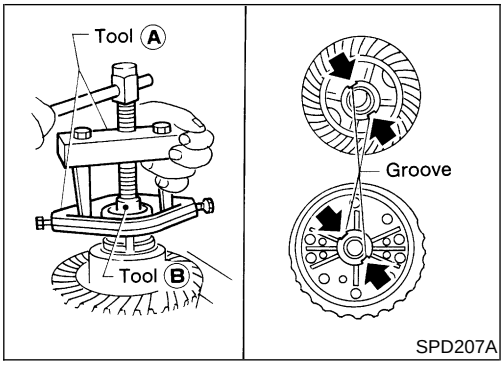

PD349

11. Remove pinion bearing outer races with a brass drift.



SPD209

12. Remove pinion rear bearing inner cone and drive pinion height adjusting washer.
    Tool number: ST30031000 (J22912-01)



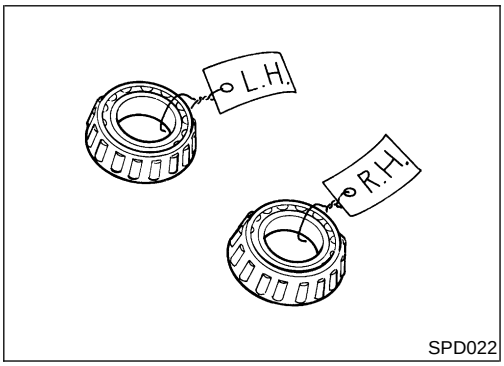
DIFFERENTIAL CASE

NGPD0018S03

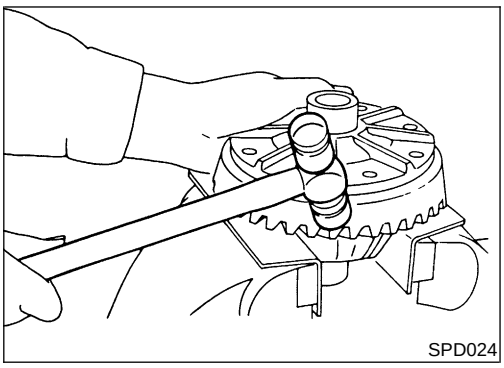
1. Remove side bearing inner cones.

To prevent damage to bearing, engage puller jaws in grooves.

Tool number:
A ST33051001 (J22888-20)
B ST33061000 (J8107-2)

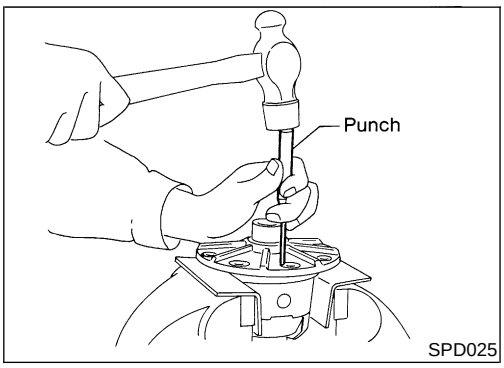


Be careful not to confuse the right and left hand parts.
Keep bearing and bearing race for each side together.

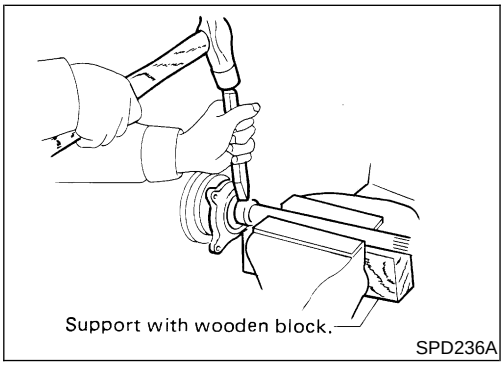


2. Loosen ring gear bolts in a criss-cross pattern.
3. Tap ring gear off the differential case with a soft hammer.

Tap evenly all around to keep ring gear from binding.



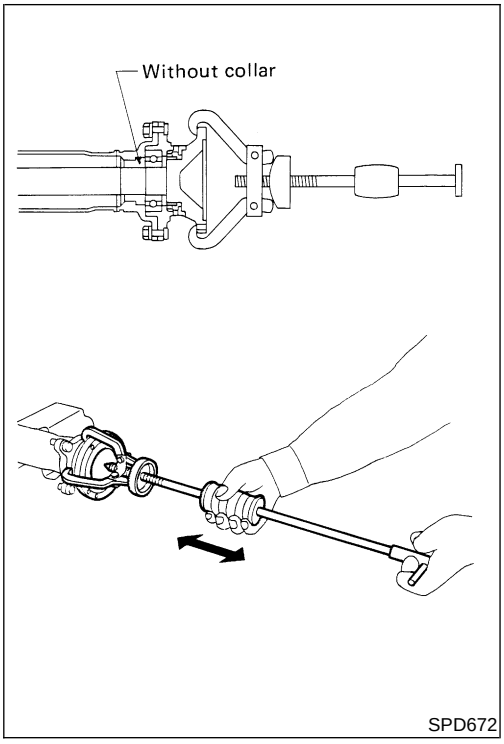
4. Punch off pinion mate shaft lock pin from ring gear side.



DIFFERENTIAL SIDE SHAFT

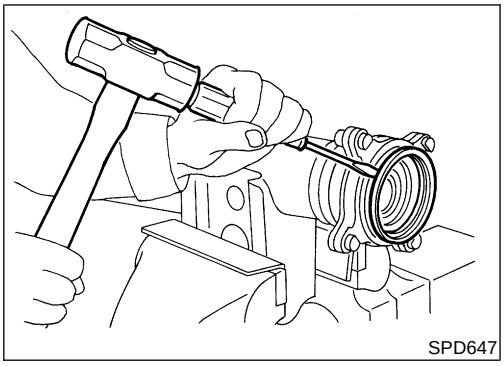
NGPD0018S04

1. Cut collar with cold chisel. Be careful not to damage differential side shaft.

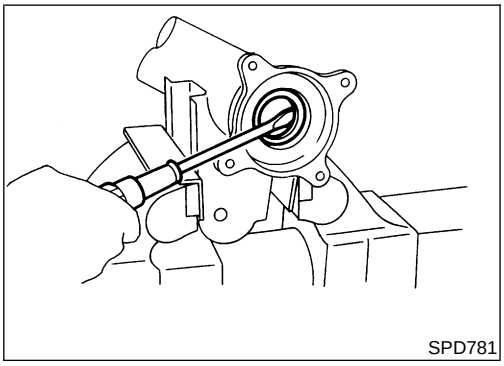


SPD672

2. Reinstall differential side shaft into extension tube and secure with bolts. Remove rear axle bearing by drawing out differential side shaft from rear axle bearing with puller.


SPD647

3. Remove grease seal and oil seal.


SPD781

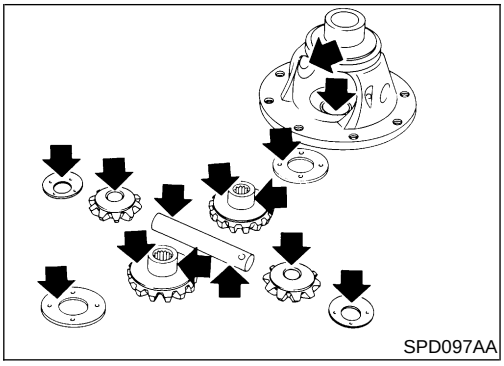
Inspection

NGPD0019

RING GEAR AND DRIVE PINION

NGPD0019S01

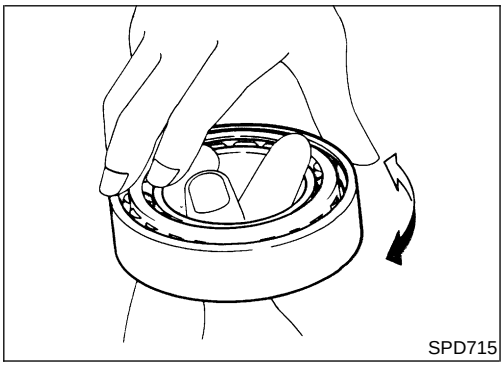
Check gear teeth for scoring, cracking or chipping.
If any damaged part is evident, replace ring gear and drive pinion as a set (hypoid gear set).


SPD097AA

DIFFERENTIAL CASE ASSEMBLY

NGPD0019S02

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


SPD715

BEARING

NGPD0019S03

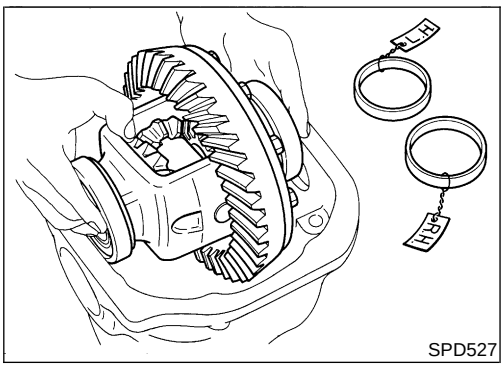
1. Thoroughly clean bearing.
2. Check bearing for wear, scratches, pitting or flaking.
   Check tapered roller bearing for smooth rotation. If damaged, replace outer race and inner cone as a set.

Adjustment

NGPD0020

For quiet and reliable final drive operation, the following five adjustments must be made correctly:

1. Side bearing preload
2. Pinion gear height
3. Pinion bearing preload
4. Ring gear-to-pinion backlash. Refer to SDS, PD-36.
5. Ring and pinion gear tooth contact pattern



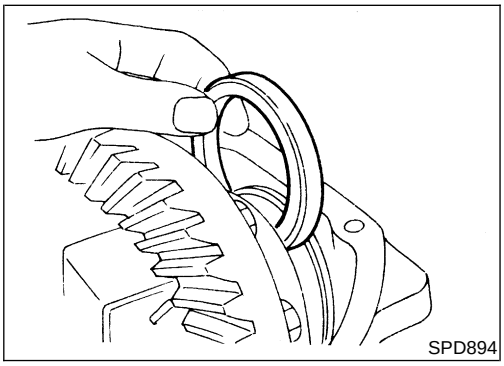
SPD527

SIDE BEARING PRELOAD

NGPD0020S01

A selection of carrier side bearing adjusting washer is required for successful completion of this procedure.

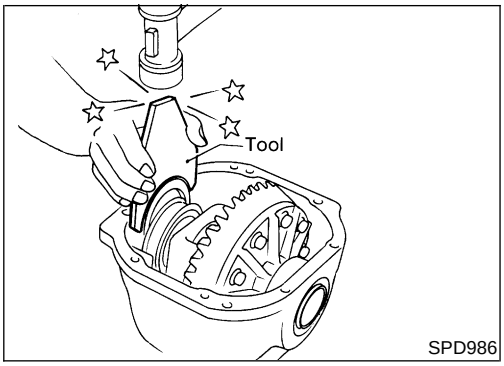
1. Make sure all parts are clean and that the bearings are well lubricated with light oil or "DEXRON™" type automatic transmission fluid.
2. Place the differential carrier, with side bearings and bearing races installed, into the final drive housing.


SPD894

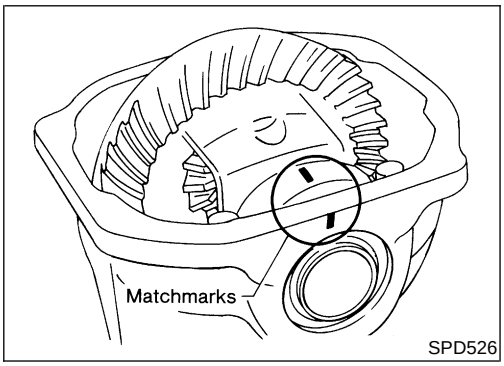
3. Put the side bearing spacer in place.

CAUTION:

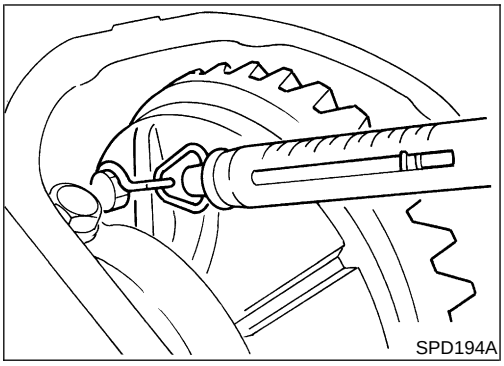
Side bearing spacer is placed on either the right or left depending upon final drive gear ratio. Be sure to replace it on the correct side.



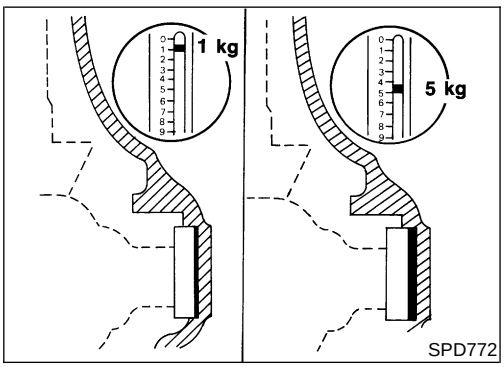
4. Using Tool, install original carrier side bearing preload shims on the carrier end, opposite the ring gear.
   Tool number: KV38100600 (J25267)



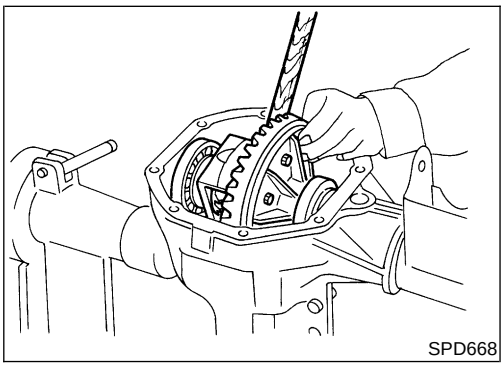
5. Install the side bearing caps in their correct locations and torque the bearing cap retaining bolts.
   Specification:
   88 - 98 N·m (9 - 10 kg-m, 65 - 72 ft-lb)
6. Turn the carrier several times to seat the bearings.



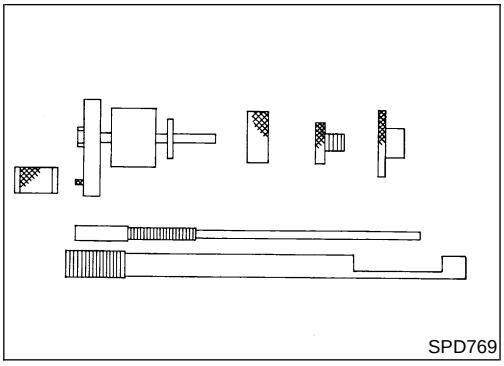
7. Measure the turning torque of the carrier at the ring gear retaining bolts with a spring gauge, J8129.
   Specification:
   34.3 - 39.2 N (3.5 - 4.0 kg, 7.7 - 8.8 lb) of pulling force at the ring gear bolt



8. If the carrier turning torque is not within the specification range, increase or decrease the total thickness of the side bearing adjusting washers until the turning torque is correct. If the turning torque is less than the specified range, install washers of greater thickness; if the turning torque is greater than the specification, install thinner washers. See the SDS section for washer dimensions and part numbers.
9. Record the total amount of washer thickness required for the correct carrier side bearing preload.



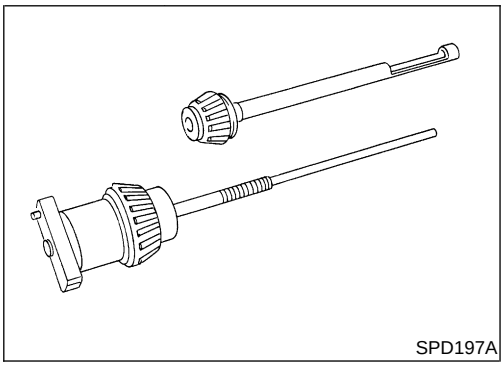
10. Remove the carrier from the final drive housing, saving the selected preload washers for later use during the assembly of the final drive unit.


SPD769

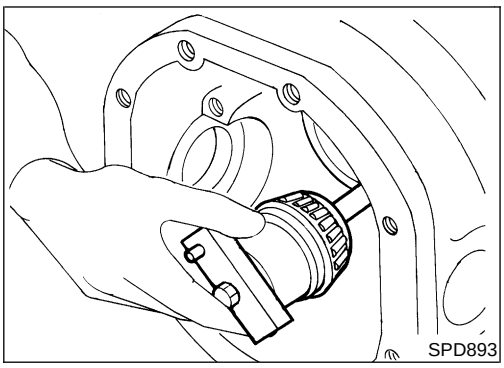
PINION GEAR HEIGHT AND PINION BEARING PRELOAD

NGPD0020S02

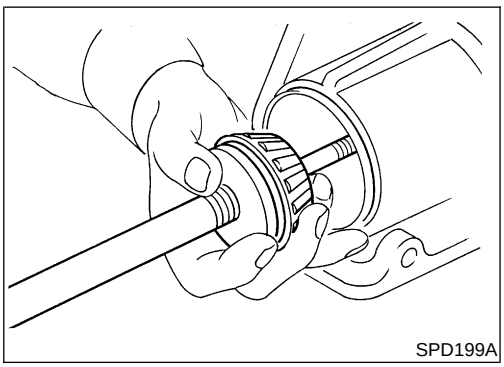
1. Make sure all parts are clean and that the bearings are well lubricated.
2. Assemble the pinion gear bearings into the pinion pre-load shim selector Tool, J34309.


SPD197A

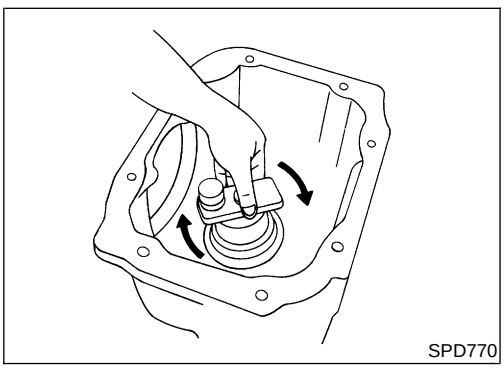
- **Front Pinion Bearing** — make sure the J34309-3 front pinion bearing seat is secured tightly against the J34309-2 gauge anvil. Then turn the front pinion bearing pilot, J34309-5, to secure the bearing in its proper position.
- **Rear Pinion Bearing** — the rear pinion bearing pilot, J34309-15, is used to center the rear pinion bearing only. The rear pinion bearing locking seat, J34309-4, is used to lock the bearing to the assembly.


SPD893

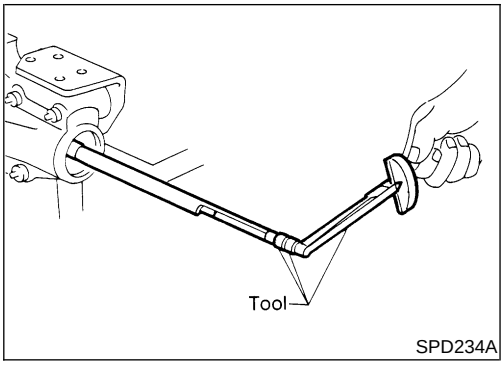
3. Place the pinion preload shim selector Tool, J34309-1, gauge screw assembly with the pinion rear bearing inner cone installed into the final drive housing.


SPD199A

4. Assemble the front pinion bearing inner cone and the J34309-2 gauge anvil together with the J34309-1 gauge screw in the final drive housing. Make sure that the pinion height gauge plate, J34309-16, will turn a full 360 degrees, and tighten the two sections together by hand.


SPD770

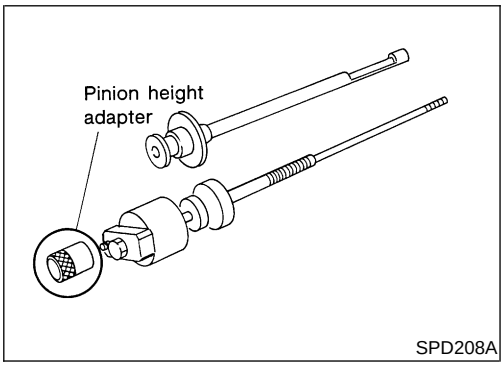
5. Turn the assembly several times to seat the bearings.



6. Measure the turning torque at the end of the J34309-2 gauge anvil using torque wrench J25765A.

Turning torque specification:

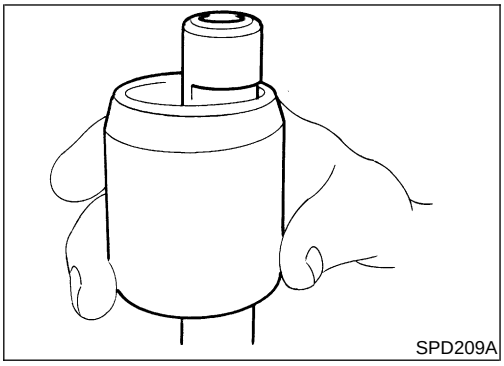
1.0 - 1.3 N·m (10 - 13 kg-cm, 8.7 - 11.3 in-lb)



7. Place the J34309-1 "R200A" pinion height adapter onto the gauge plate and tighten it by hand.

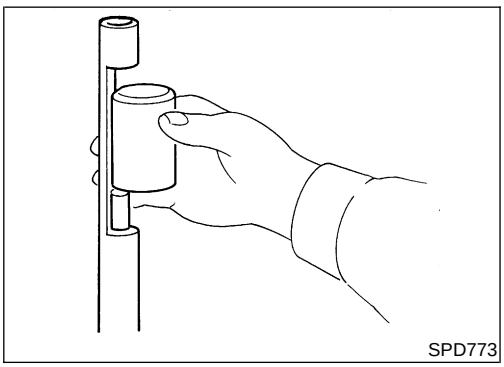
CAUTION:

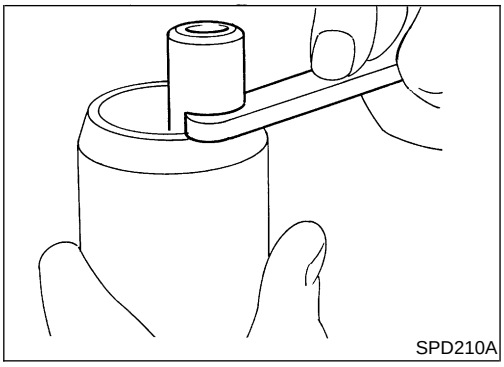
Make sure all machined surfaces are clean.



PINION BEARING PRELOAD WASHER SELECTION

8. Place the solid pinion bearing spacer, small end first, over the J34309-2 gauge anvil and seat the small end squarely against the tip of the J34309-1 gauge screw in the tool recessed portion.

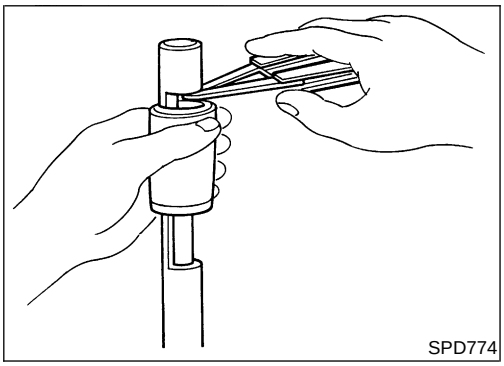



SPD210A

9. Select the correct thickness of pinion bearing preload adjusting washer using a standard gauge of 3.5 mm (0.138 in) and your J34309-101 feeler gauge. The exact measure you get with your gauges is the thickness of the adjusting washer required. Select the correct washer.

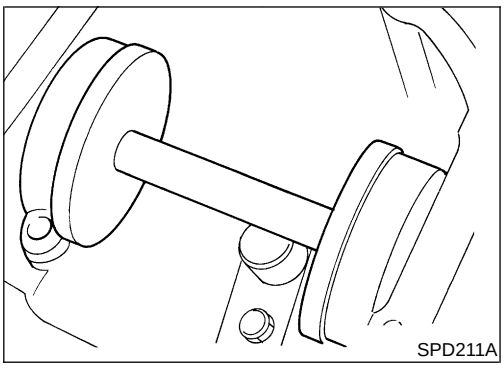
Drive pinion bearing preload adjusting washer:
Refer to SDS, PD-37.

10. Set your selected, correct pinion bearing preload adjusting washer aside for use when assembling the pinion gear and bearings into the final drive.


SPD774

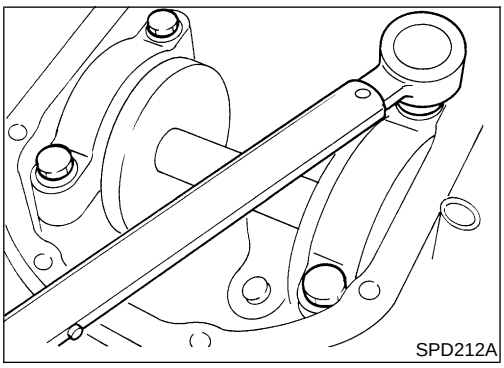
PINION HEIGHT ADJUSTING WASHER SELECTION

11. Now, position the side bearing discs, J25269-4, and arbor firmly into the side bearing bores.

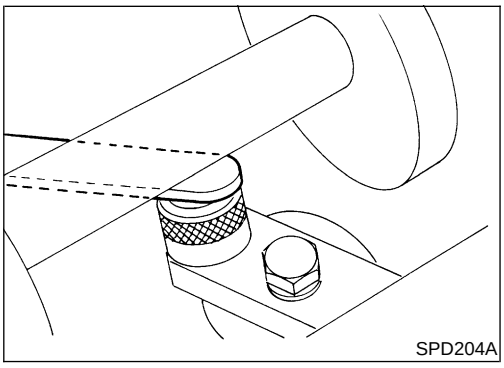

SPD211A

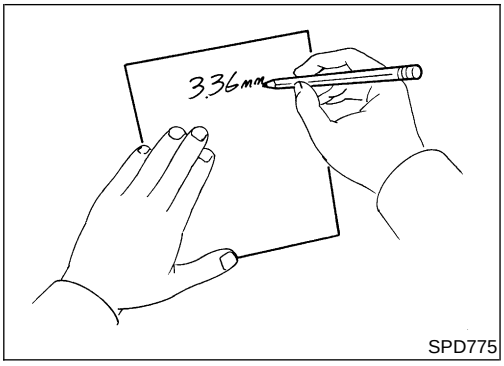
12. Install the side bearing caps and tighten the cap bolts.

Specification:
88 - 98 N·m (9 - 10 kg-m, 65 - 72 ft-lb)


SPD212A

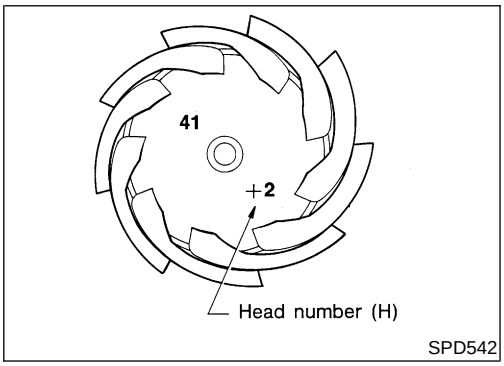
13. Select the correct standard pinion height adjusting washer thickness by using a standard gauge of 3.0 mm (0.118 in) and your J34309-101 feeler gauge. Measure the gap between the J34309-11 "R200A" pinion height adapter and the arbor.


SPD204A



SPD775

14. Write down your exact total measurement.



SPD542

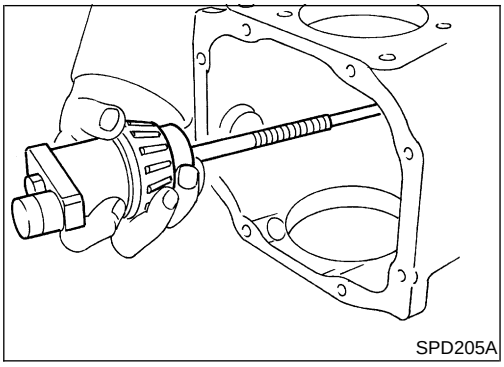
15. Correct the pinion height washer size by referring to the "pinion head number".

There are two numbers painted on the pinion gear. The first one refers to the pinion and ring gear as a matched set and should be the same as the number on the ring gear. The second number is the "pinion head height number", and it refers to the ideal pinion height from standard for quietest operation. Use the following chart to determine the correct pinion height washer. Refer to SDS, PD-37.

Pinion Head Height Number	Add or Remove from the Standard Pinion Height 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)

16. Select the correct drive pinion height washer.

Drive pinion height adjusting washer:
Refer to SDS PD-37.

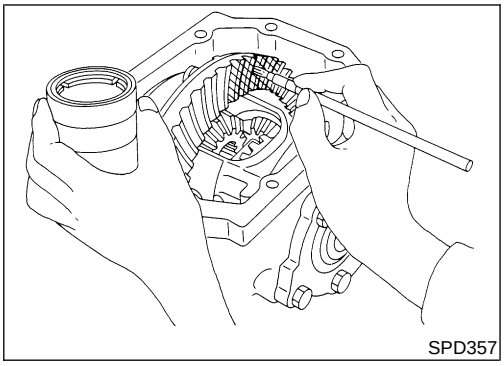

SPD205A

17. Remove the J34309 pinion preload shim selector tool from the final drive housing and disassemble to retrieve the pinion bearings.

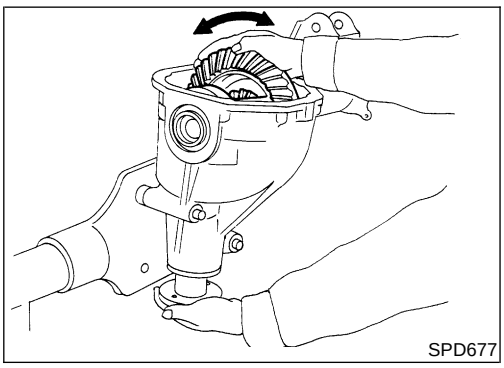
TOOTH CONTACT

NGPD0020S03

Gear tooth contact pattern check is necessary to verify correct relationship between ring gear and drive pinion.
Hypoid gear sets which are not positioned properly in relation to one another may be noisy, or have short life, or both. With a pattern check, the most desirable contact for low noise level and long life can be assured.

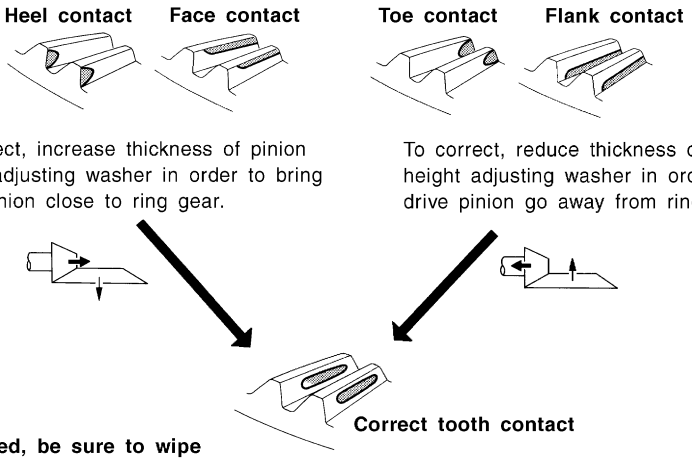

SPD357

1. Thoroughly clean ring gear and drive pinion teeth.
2. Sparingly apply a mixture of powdered ferric oxide and oil or equivalent to 3 or 4 teeth of ring gear drive side.


SPD677

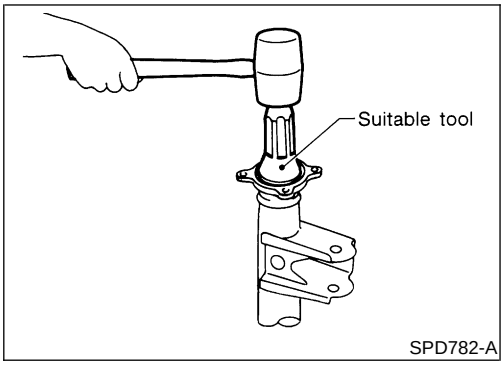
3. Hold companion flange steady by hand and rotate the ring gear in both directions.

Usually the pattern will be correct if shims are correctly calculated and the backlash is correct. However, in rare cases, trial and error processes may be employed to obtain a correct pattern. The tooth pattern is the best indication of how well a differential has been set up.

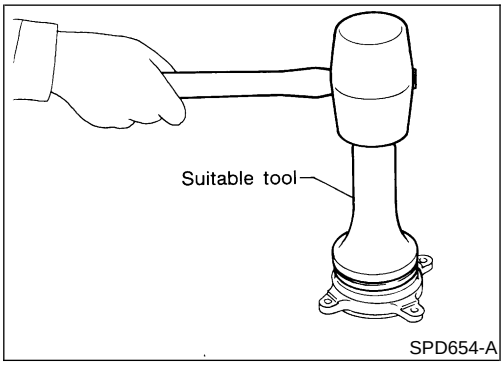


When adjustment is completed, be sure to wipe off completely the ferric oxide and oil or their equivalent.

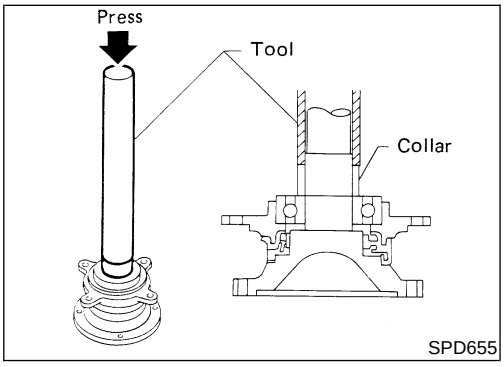
SPD007-B



SPD782-A



SPD654-A



SPD655

Assembly

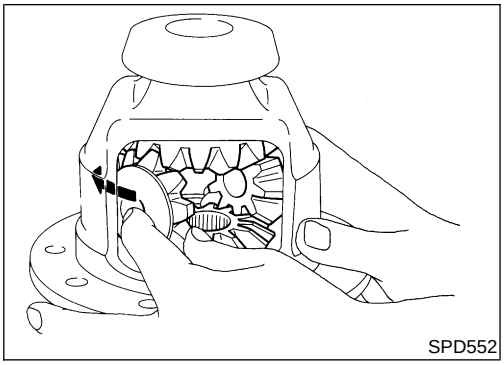
NGPD0021

DIFFERENTIAL SIDE SHAFT

NGPD0021S01

1. Install oil seal and grease seal.

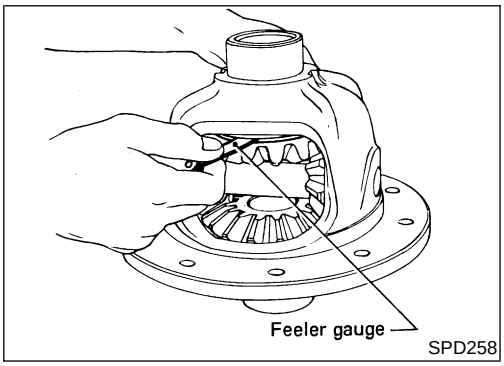
2. Install extension tube retainer, rear axle bearing and rear axle shaft bearing collar on differential side shaft.


SPD552

DIFFERENTIAL CASE

NGPD0021S02

1. Install side gears, pinion mate gears and thrust washers into differential case.

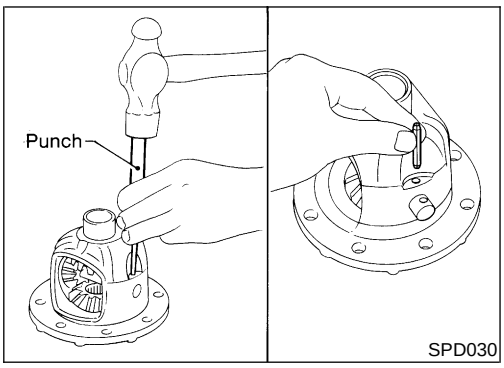


SPD258

2. Fit pinion mate shaft to differential case so that it meets lock pin holes.
3. Adjust backlash between side gear and pinion mate gear by selecting side gear thrust washer.
   Refer to SDS, PD-36.

Backlash between side gear and pinion mate gear (Clearance between side gear thrust washer and differential case):

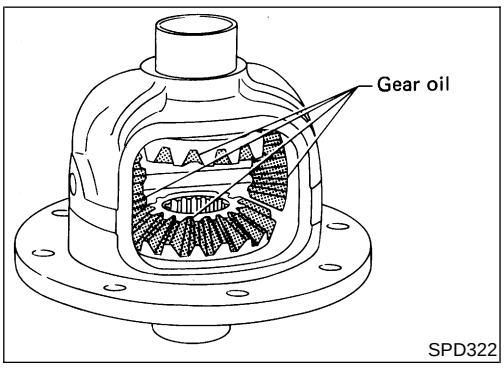
Less than 0.15 mm (0.0059 in)



SPD030

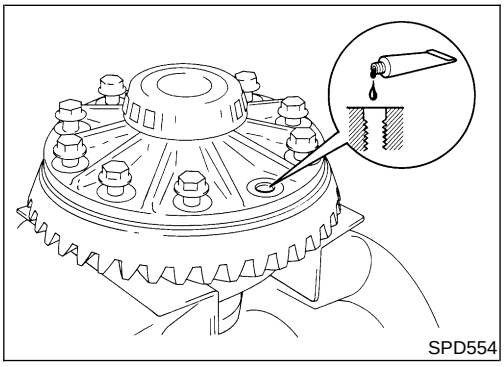
4. Install pinion mate shaft lock pin with a punch.

Make sure lock pin is flush with case.



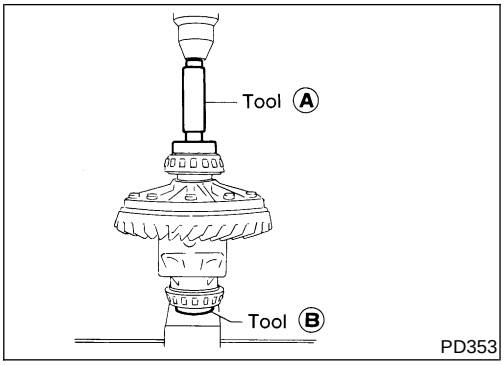
SPD322

5. Apply gear oil to gear tooth surfaces and thrust surfaces and check to see they turn properly.


SPD554

6. Install differential case assembly on ring gear.
7. Apply locking agent [Locktite (stud lock) or equivalent] to ring gear bolts, and install them.

Tighten bolts in a criss-cross pattern, lightly tapping bolt head with a hammer.



8. Press-fit side bearing inner cones on differential case with Tool.

Tool number:

A KV38100300 (J25523)

B ST33061000 (J8107-2)

FINAL DRIVE HOUSING

NGPD0021S03

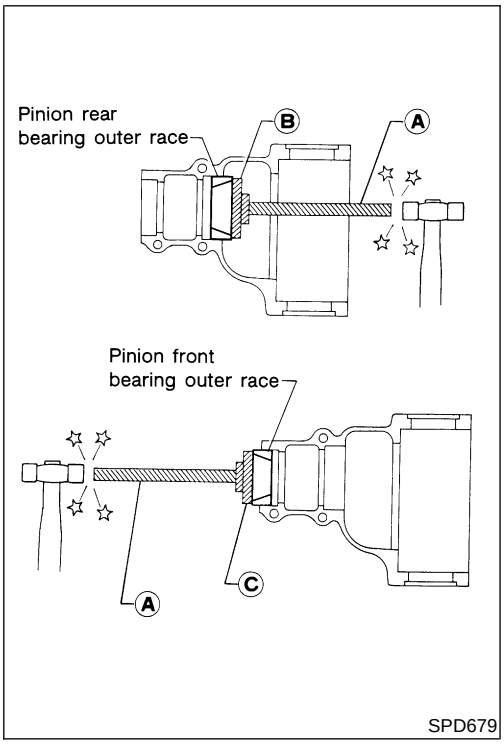
1. Press-fit front and rear bearing outer races with Tools.

Tool number:

A ST30611000 (J25742-1)

B ST30621000 (J25742-5)

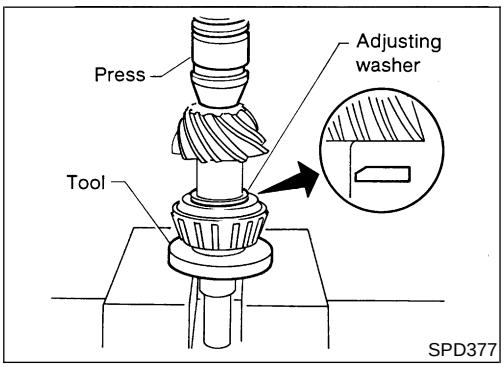
C ST30613000 (J25742-3)



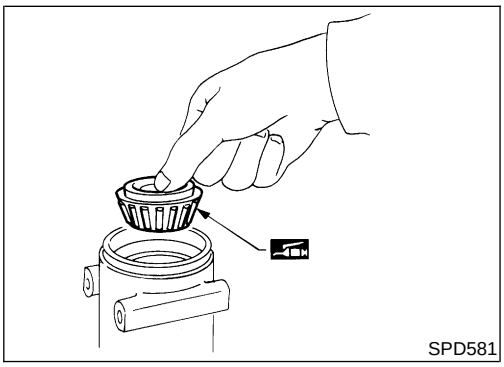
2. Select drive pinion height adjusting washer and pinion bearing adjusting washer. Refer to "PINION GEAR HEIGHT AND PINION BEARING PRELOAD", PD-25.
3. Install drive pinion height adjusting washer in drive pinion, and press-fit pinion rear bearing inner cone in it, using press and Tool.

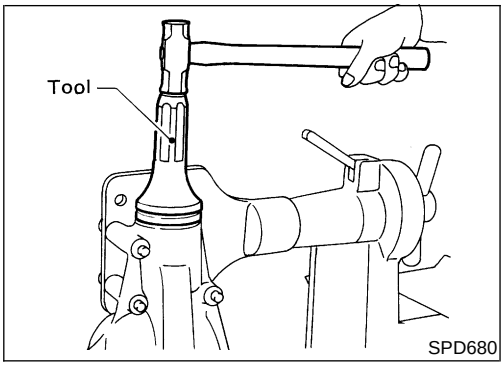
Tool number:

ST30901000 (J26010-01)



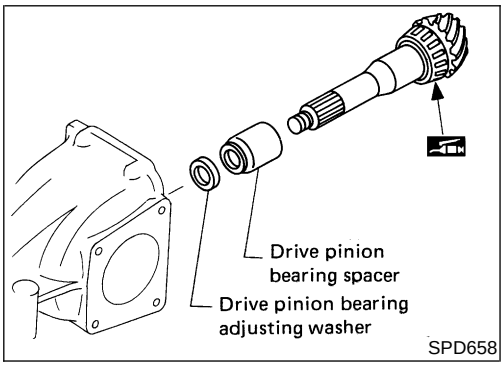
4. Place pinion front bearing inner cone in final drive housing.



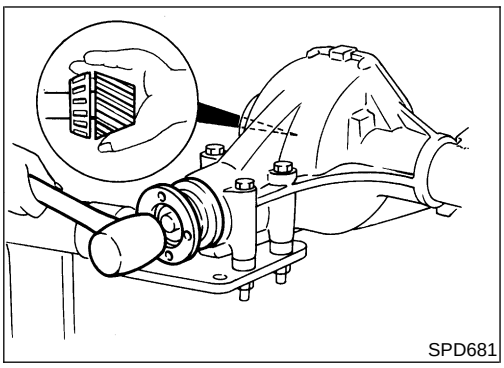


5. Apply multi-purpose grease to cavity at sealing lips of oil seal. Install front oil seal.

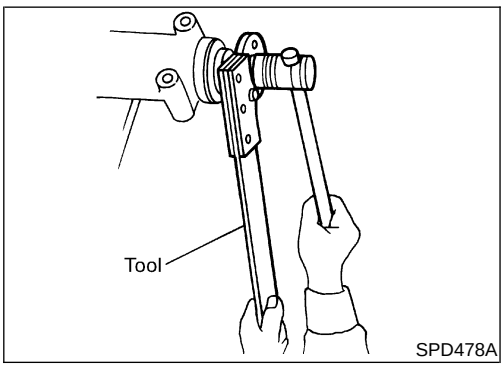
Tool number:
KV38100500 (J25273)



6. Place drive pinion bearing spacer, drive pinion bearing adjusting washer and drive pinion in final drive housing.



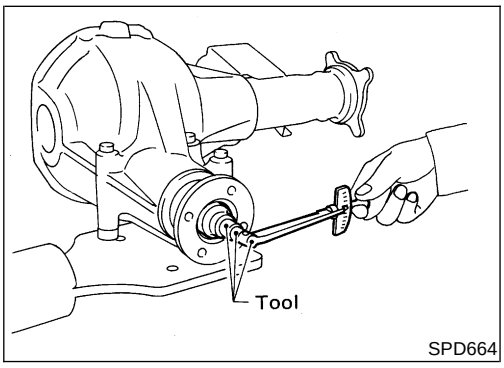
7. Insert companion flange into drive pinion by tapping the companion flange with a soft hammer.



8. Tighten pinion nut to the specified torque.

The threaded portion of drive pinion and pinion nut should be free from oil or grease.

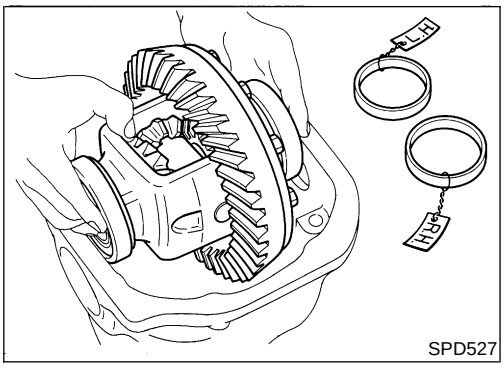
Tool number: KV38108300 (j44195)



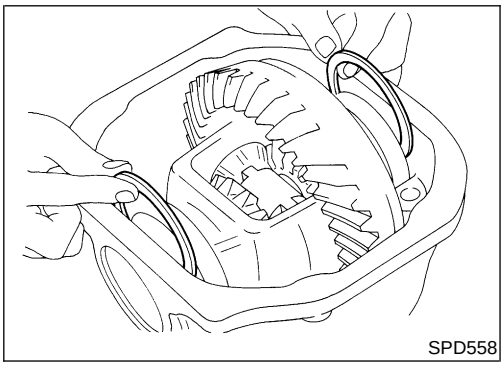
9. Turn drive pinion in both directions several revolutions, and measure pinion bearing preload.

Tool number: ST3127S000 (J25765-A)
Pinion bearing preload:
1.1 - 1.4 N·m (11 - 14 kg-cm, 9.5 - 12.2 in-lb)

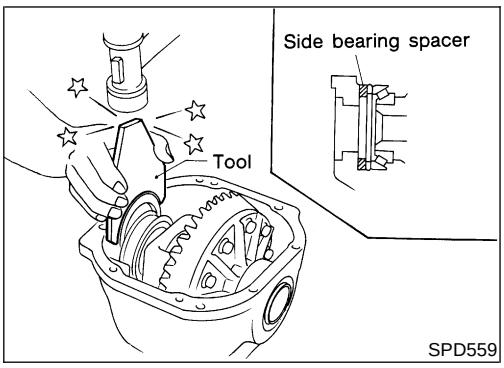
When pinion bearing preload is outside the specifications, replace pinion bearing adjusting washer and spacer with a different thickness.



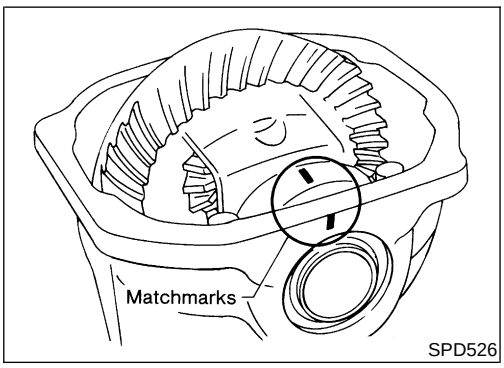
10. Select side bearing adjusting washer.
    Refer to "SIDE BEARING PRELOAD", PD-23.
11. Install differential case assembly with side bearing outer races into final drive housing.



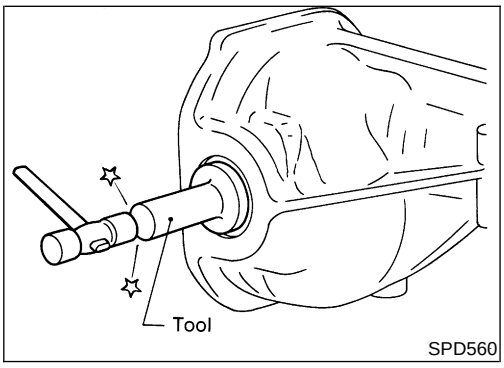
12. Insert left and right side bearing adjusting washers in place between side bearings and final drive housing.



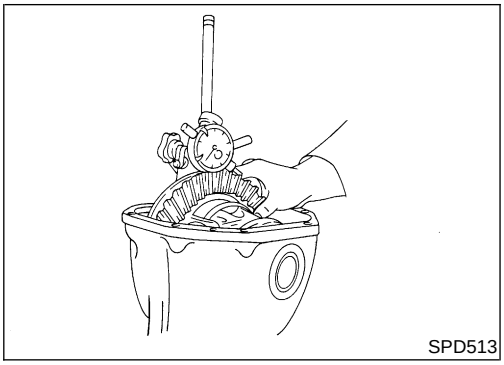
13. Drive in side bearing spacer with Tool.
    Tool number: KV38100600 (J25267)



14. Align mark on bearing cap with that on final drive housing and install bearing cap on final drive housing.

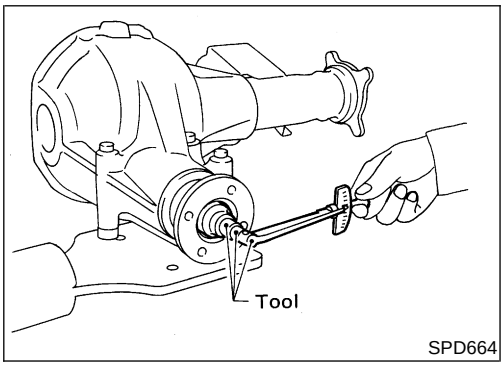


15. Apply multi-purpose grease to cavity at sealing lips of oil seal. Install side oil seal.
    Tool number: KV38100200 (J26233)


SPD513

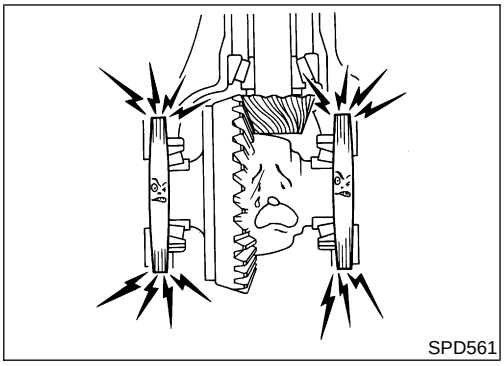
16. Measure ring gear to drive pinion backlash with a dial indicator.
    Ring gear-to-drive pinion backlash:
    0.10 - 0.15 mm (0.0039 - 0.0059 in)
- If backlash is too small, decrease thickness of right shim and increase thickness of left shim by the same amount.
  If backlash is too great, reverse the above procedure.

Never change the total amount of shims as it will change the bearing preload.



SPD664

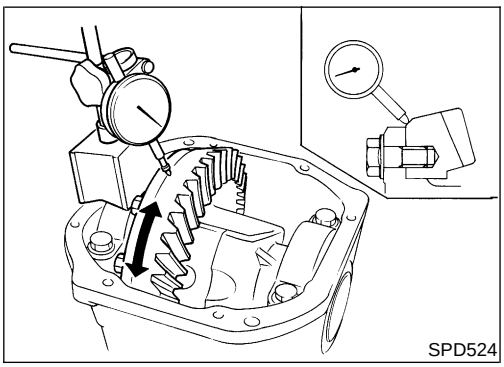
17. Check total preload with Tool.
    When checking preload, turn drive pinion in both directions several times to set bearing rollers.
    Tool number: ST3127S000 (J25765-A)
    Total preload:
    1.4 - 1.7 N·m (14 - 17 kg-cm, 12 - 15 in-lb)


SPD561

- If preload is too great, remove the same amount of shim from each side.
- If preload is too small, add the same amount of shim to each side.

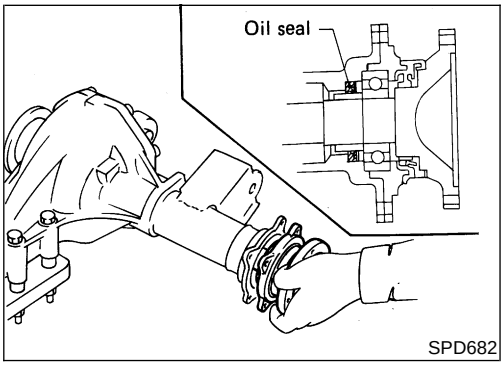
Never add or remove a different number of shims for each side as it will change ring gear to drive pinion backlash.

18. Recheck ring gear to drive pinion backlash because increase or decrease in thickness of shims will cause change of ring gear-to-pinion backlash.


SPD524

19. Check runout of ring gear with a dial indicator.
    Runout limit:
    0.05 mm (0.0020 in)
- If backlash varies excessively in different places, the variance may have resulted from foreign matter caught between the ring gear and the differential case.
- If the backlash varies greatly when the runout of the ring gear is within a specified range, the hypoid gear set or differential case should be replaced.

20. Check tooth contact. Refer to "TOOTH CONTACT", PD-29.
21. Install rear cover and gasket.
22. Install differential side shaft assembly.



SPD682

Service Data and Specifications (SDS)

R200A

General Specifications

=NGPD0022

Engine	VG33E		
Vehicle grade	XE		SE
Front final drive	Standard	Optional	Standard
	R200A		
	2-pinion		
Gear ratio	4.363	4.636	4.636
Number of teeth (Ring gear/drive pinion)	48/11	51/11	51/11
Oil capacity (Approx.) ℓ (US pt, Imp pt)	1.5 (3-1/8, 3-5/8)		

Ring Gear Runout

NGPD0023

Ring gear runout limit mm (in)	0.05 (0.0020)

Side Gear Adjustment

NGPD0024

Side gear backlash (Clearance between side gear and differential case) mm (in)		Less than 0.15 (0.0059)
Available side gear thrust washers	Thickness mm (in)	Part number*
	0.75 (0.0295)	38424-N3110
	0.78 (0.0307)	38424-N3111
	0.81 (0.0319)	38424-N3112
	0.84 (0.0331)	38424-N3113
	0.87 (0.0343)	38424-N3114
	0.90 (0.0354)	38424-N3115
	0.93 (0.0366)	38424-N3116

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

Side Bearing Adjustment

NGPD0025

Differential carrier assembly turning resistance N (kg, lb)		34.3 - 39.2 (3.5 - 4.0, 7.7 - 8.8)
Available side bearing adjusting washers	Thickness mm (in)	Part number*
	2.00 (0.0787)	38453-N3100
	2.05 (0.0807)	38453-N3101
	2.10 (0.0827)	38453-N3102
	2.15 (0.0846)	38453-N3103
	2.20 (0.0866)	38453-N3104
	2.25 (0.0886)	38453-N3105
	2.30 (0.0906)	38453-N3106
	2.35 (0.0925)	38453-N3107
	2.40 (0.0945)	38453-N3108
	2.45 (0.0965)	38453-N3109
	2.50 (0.0984)	38453-N3110
	2.55 (0.1004)	38453-N3111
	2.60 (0.1024)	38453-N3112

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

Total Preload Adjustment

NGPD0026

Total preload N·m (kg-cm, in-lb)	1.4 - 1.7 (14 - 17, 12 - 15)
Ring gear backlash mm (in)	0.10 - 0.15 (0.0039 - 0.0059)

Drive Pinion Height Adjustment

NGPD0027

	Thickness mm (in)	Part number*
Available pinion height adjusting washers	3.09 (0.1217)	38154-P6017
	3.12 (0.1228)	38154-P6018
	3.15 (0.1240)	38154-P6019
	3.18 (0.1252)	38154-P6020
	3.21 (0.1264)	38154-P6021
	3.24 (0.1276)	38154-P6022
	3.27 (0.1287)	38154-P6023
	3.30 (0.1299)	38154-P6024
	3.33 (0.1311)	38154-P6025
	3.36 (0.1323)	38154-P6026
	3.39 (0.1335)	38154-P6027
	3.42 (0.1346)	38154-P6028
	3.45 (0.1358)	38154-P6029
	3.48 (0.1370)	38154-P6030
	3.51 (0.1382)	38154-P6031
	3.54 (0.1394)	38154-P6032
	3.57 (0.1406)	38154-P6033
	3.60 (0.1417)	38154-P6034
	3.63 (0.1429)	38154-P6035
	3.66 (0.1441)	38154-P6036

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

Drive Pinion Preload Adjustment

NGPD0028

Drive pinion bearing preload adjusting method		Adjusting washer and spacer
Drive pinion preload with front oil seal N·m (kg-cm, in-lb)		1.1 - 1.4 (11 - 14, 9.5 - 12.2)
	Thickness mm (in)	Part number*
Available drive pinion bearing preload adjusting washers	3.81 (0.1500)	38125-61001
	3.83 (0.1508)	38126-61001
	3.85 (0.1516)	38127-61001
	3.87 (0.1524)	38128-61001
	3.89 (0.1531)	38129-61001
	3.91 (0.1539)	38130-61001
	3.93 (0.1547)	38131-61001
	3.95 (0.1555)	38132-61001
	3.97 (0.1563)	38133-61001
	3.99 (0.1571)	38134-61001
	4.01 (0.1579)	38135-61001
	4.03 (0.1587)	38136-61001
	4.05 (0.1594)	38137-61001
	4.07 (0.1602)	38138-61001
	4.09 (0.1610)	38139-61001
	Length mm (in)	Part number*
Available drive pinion bearing preload adjusting spacers	54.50 (2.1457)	38165-B4000
	54.80 (2.1575)	38165-B4001
	55.10 (2.1693)	38165-B4002
	55.40 (2.1811)	38165-B4003
	55.70 (2.1929)	38165-B4004
	56.00 (2.2047)	38165-61001

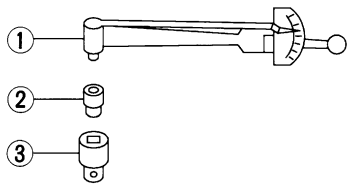
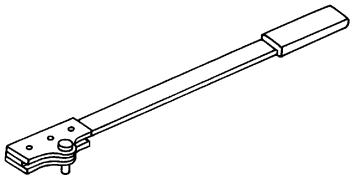
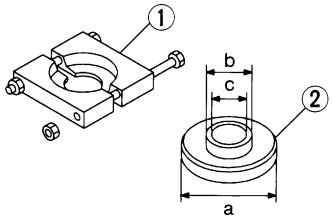
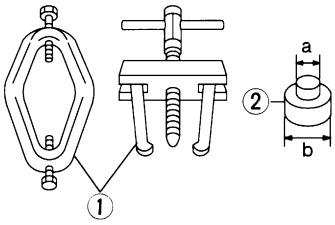
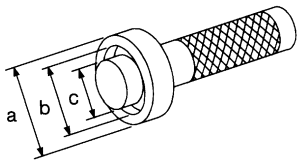
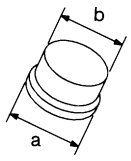
*Always check with the Parts Department for the latest parts information.

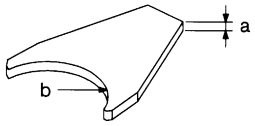
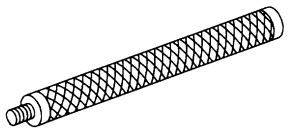
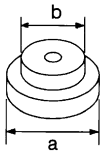
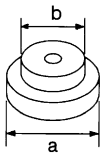
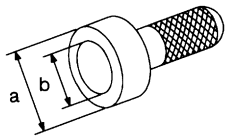
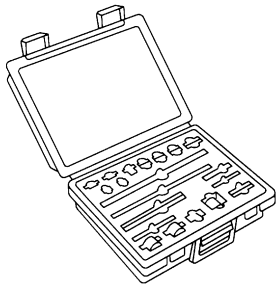
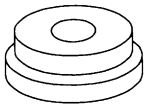
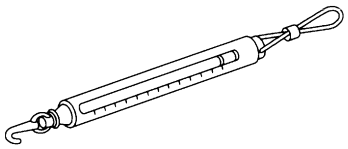
Preparation

SPECIAL SERVICE TOOLS

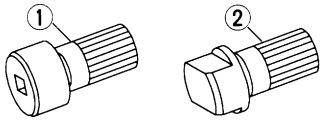
NGPD0052

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	
ST3127S000 (See J25765-A) Preload gauge 1 GG91030000 (J25765) Torque wrench 2 HT62940000 (—) Socket adapter 3 HT62900000 (—) Socket adapter	 NT124	Measuring pinion bearing preload and total preload
KV38108300 (J44195) Companion flange wrench	 NT771	Removing and installing propeller shaft lock nut and drive pinion lock nut
ST3090S000 (—) Drive pinion rear inner race puller set 1 ST30031000 (J22912-01) Puller 2 ST30901000 (J26010-01) Base	 NT527	Removing and installing drive pinion rear inner cone **a: 79 mm (3.11 in) dia.** **b: 45 mm (1.77 in) dia.** **c: 35 mm (1.38 in) dia.**
ST3306S001 Differential side bearing puller set 1 ST33051001 (J22888-20) Body 2 ST33061000 (J8107-2) Adapter	 NT072	Removing and installing differential side bearing inner cone **a: 28.5 mm (1.122 in) dia.** **b: 38 mm (1.50 in) dia.**
ST33230000 (J25805-01) Differential side bearing drift	 NT085	Installing side bearing inner cone **a: 51 mm (2.01 in) dia.** **b: 41 mm (1.61 in) dia.** **c: 28.5 mm (1.122 in) dia.**
ST33081000 (—) Side bearing puller adapter	 NT431	Installing side bearing inner cone **a: 43 mm (1.69 in) dia.** **b: 33.5 mm (1.319 in) dia.**

Tool number (Kent-Moore No.) Tool name	Description	
KV38100600 (J25267) Side bearing spacer drift	 NT528	Installing side bearing spacer **a: 8 mm (0.31 in)** **b: R42.5 mm (1.673 in)**
ST30611000 (J25742-1) Drift	 NT090	Installing pinion rear bearing outer race
ST30621000 (J25742-5) Drift	 NT073	Installing pinion rear bearing outer race **a: 79 mm (3.11 in) dia.** **b: 59 mm (2.32 in) dia.**
ST30613000 (J25742-3) Drift	 NT073	Installing pinion front bearing outer race **a: 72 mm (2.83 in) dia.** **b: 48 mm (1.89 in) dia.**
KV38100500 (J25273) Gear carrier front oil seal drift	 NT115	Installing front oil seal **a: 85 mm (3.35 in) dia.** **b: 60 mm (2.36 in) dia.**
(J34309) Differential shim selector	 NT134	Adjusting bearing pre-load and gear height
(J25269-4) Side bearing discs (2 Req'd)	 NT136	Selecting pinion height adjusting washer
(J8129) Spring gauge	 NT127	Measuring carrier turning torque

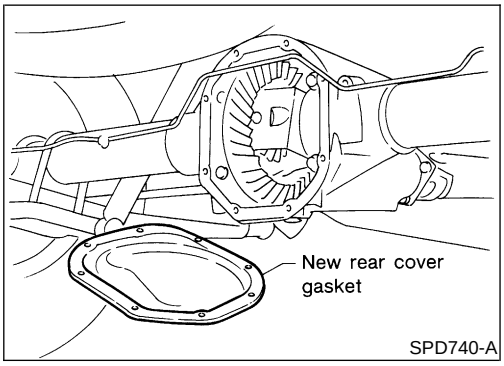
GI MA EM LC EC FE CL MT AT TF PD AX SU BR ST RS BT HA SC EL IDX

Tool number (Kent-Moore No.) Tool name	Description
KV381051S0 (—) Rear axle shaft dummy 1 KV38105110 (—) Torque wrench side 2 KV38105120 (—) Vice side	 NT142 Checking differential torque on limited slip differential

Noise, Vibration and Harshness (NVH) Troubleshooting

NGPD0053

Refer to "NVH TROUBLESHOOTING CHART", PD-5.



SPD740-A

On-vehicle Service

REAR COVER GASKET REPLACEMENT

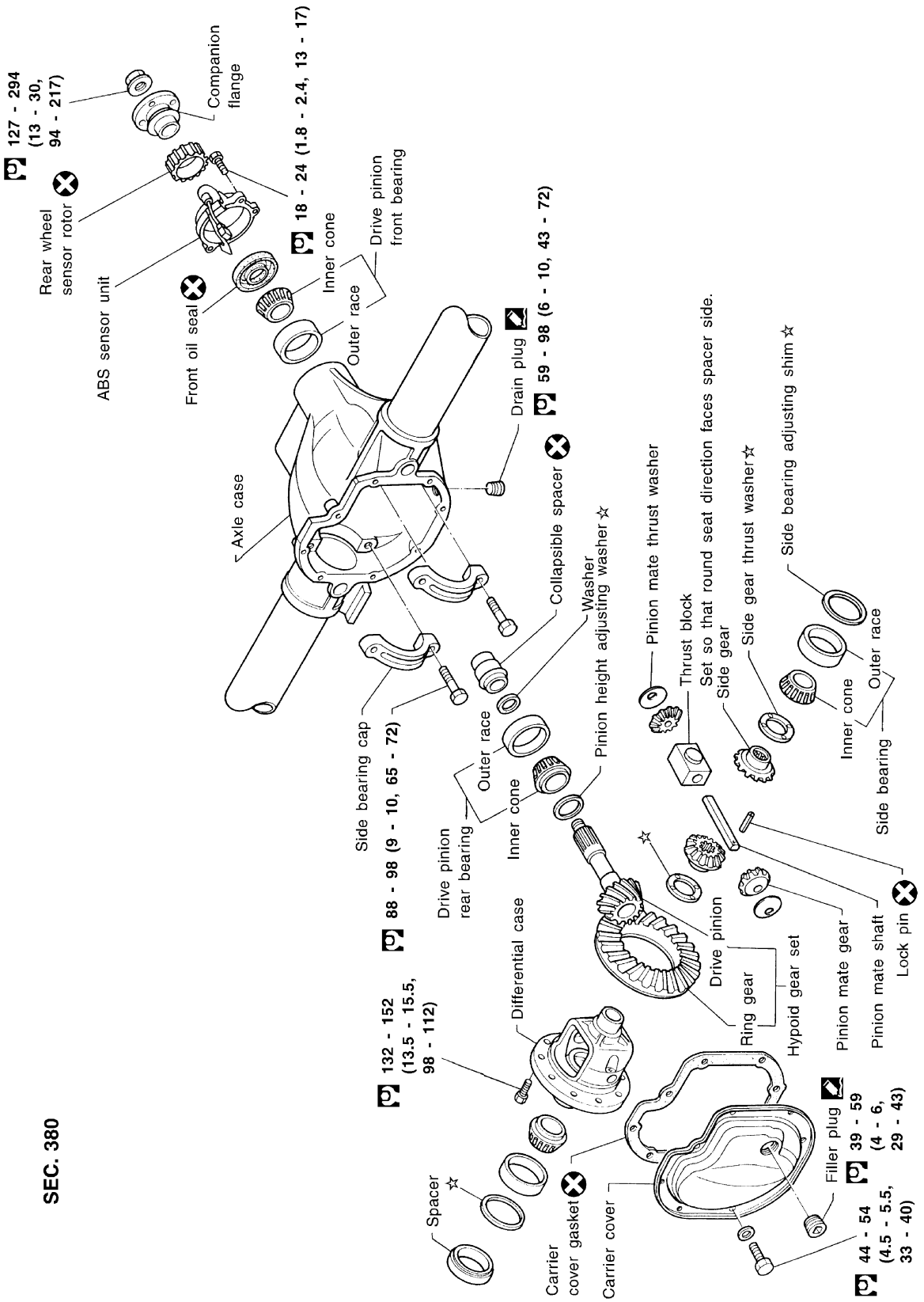
NGPD0054

(Rear final drive: Model C200)

1. Drain gear oil.
2. Remove rear cover and rear cover gasket.
3. Install new rear cover gasket and rear cover.
4. Fill final drive with recommended gear oil.

Components

NGPD0055



SEC. 380

SPD425A

Removal and Installation

NGPD0056

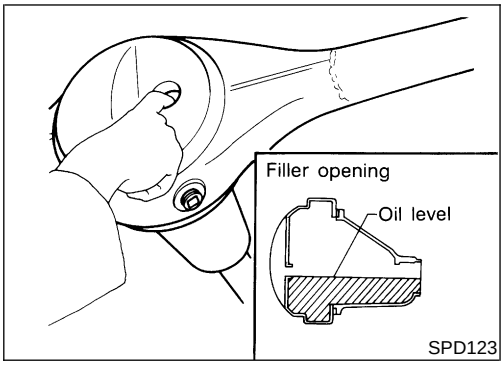
REMOVAL

NGPD0056S01

- Remove propeller shaft.
  Plug front end of transfer.
- Remove axle shaft.
  Refer to “REAR AXLE”, ***AX-26***.

CAUTION:

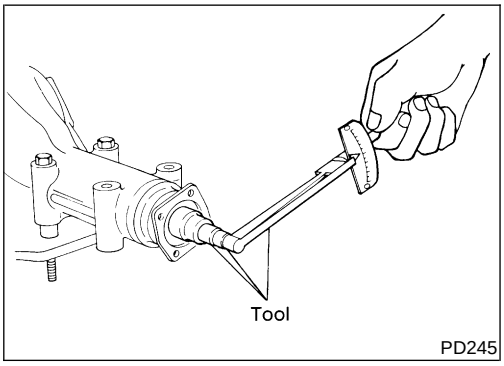
- **Be careful not to damage spline, sleeve yoke and front oil seal when removing propeller shaft.**
- **Before removing the final drive assembly or rear axle assembly, disconnect the ABS sensor harness connector from the assembly and move it away from the final drive/ rear axle assembly area. Failure to do so may result in the sensor wires being damaged and the sensor becoming inoperative.**



INSTALLATION

NGPD0056S02

- Fill final drive with recommended gear oil.



Disassembly

NGPD0057

PRE-INSPECTION

NGPD0057S01

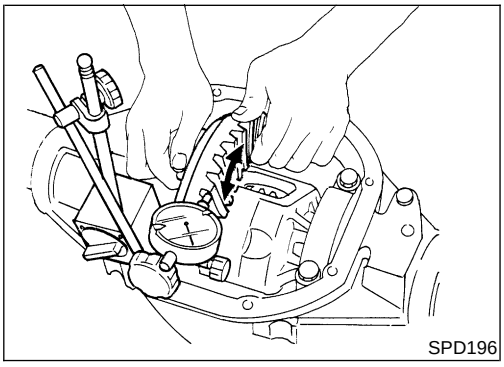
Before disassembling final drive, perform the following inspection.

- Total preload

a) Turn drive pinion in both directions several times to set bearing rollers.

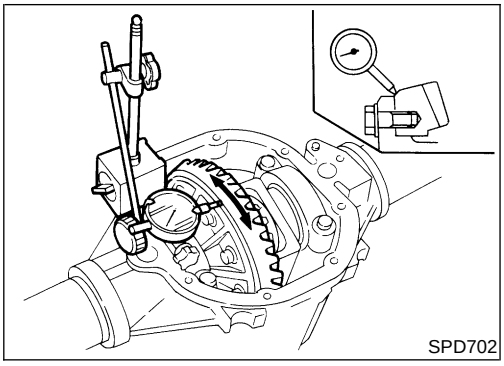
b) Check total preload with Tool.

Tool number: ST3127S000 (J25765-A)
Total preload:
1.2 - 2.3 N·m (12 - 23 kg-cm, 10 - 20 in-lb)

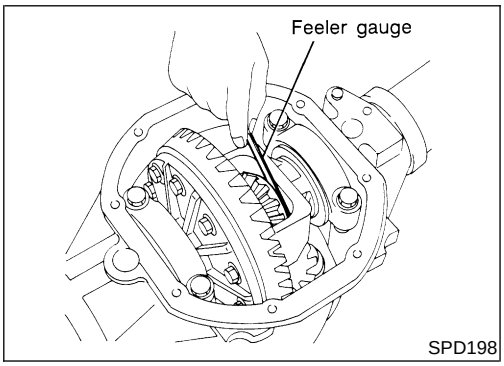


- Ring gear-to-drive pinion backlash.
  Check backlash of ring gear with a dial indicator at several points.

Ring gear-to-drive pinion backlash:
0.13 - 0.18 mm (0.0051 - 0.0071 in)


SPD702

- Ring gear runout
  Check runout of ring gear with a dial indicator.
  Runout limit: 0.05 mm (0.0020 in)



SPD198

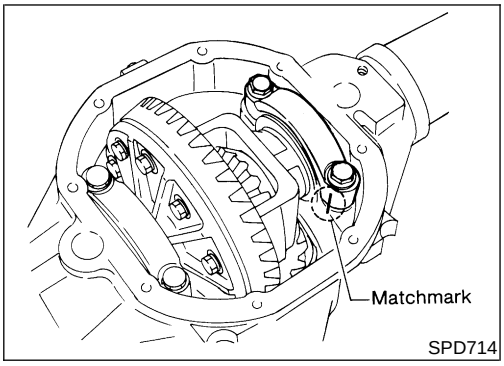
- Tooth contact
  Check tooth contact. Refer to "ADJUSTMENT", PD-52.
- Side gear-to-pinion mate gear backlash
  Measure clearance between side gear thrust washer and differential case with a feeler gauge.
  Clearance between side gear thrust washer and differential case:
  Less than 0.15 mm (0.0059 in)

DIFFERENTIAL CARRIER

NGPD0057S02

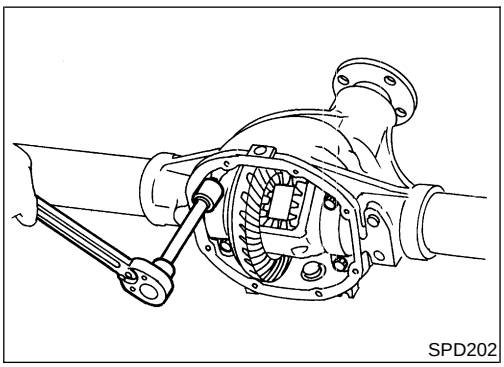
1. Remove rear cover and rear cover gasket.
2. Put match marks on one side of side bearing cap with paint or punch to ensure that it is replaced in proper position during reassembly.

Bearing caps are line-bored during manufacture and should be put back in their original places.

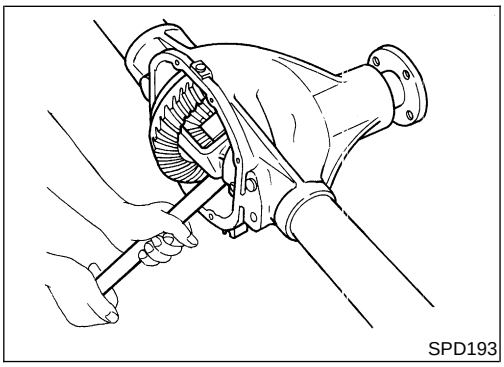


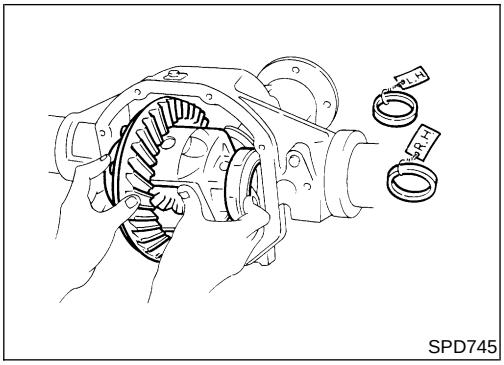
SPD714

3. Remove side bearing caps.


SPD202

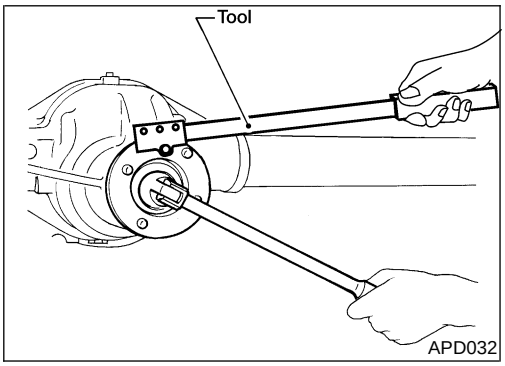
4. Remove differential case assembly with pry bar.


SPD193



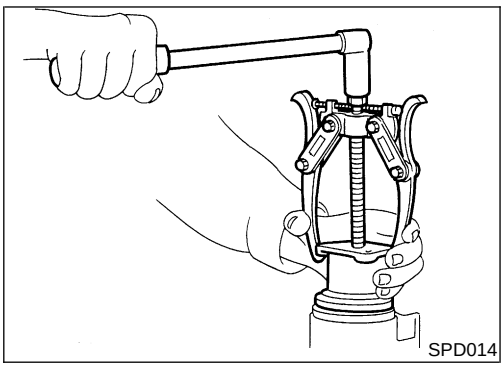
SPD745

Keep the side bearing outer races together with their respective inner cones — do not mix them up.

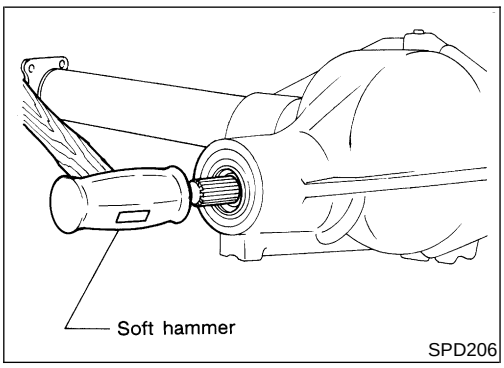


APD032

5. Remove pinion nut with Tool.
   Tool number: KV38108300 (J44195)

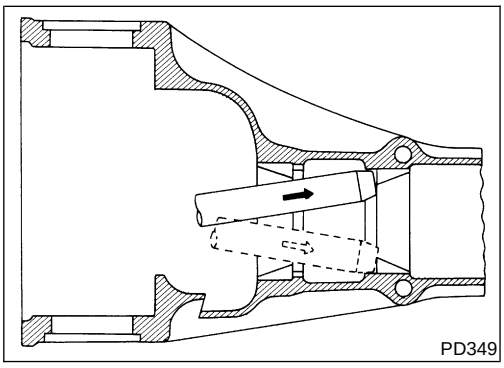

SPD014

6. Remove companion flange with puller.

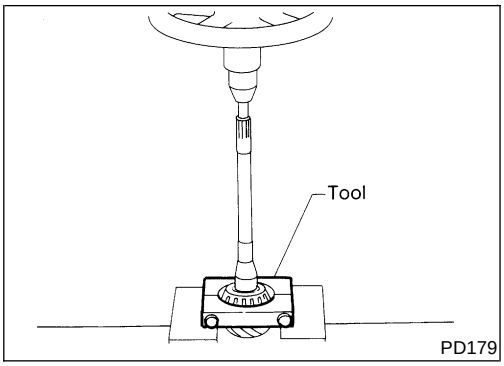


SPD206

7. Remove drive pinion with soft hammer.
8. Remove front oil seal and pinion front bearing inner cone.


PD349

9. Remove pinion bearing outer races with a brass drift.

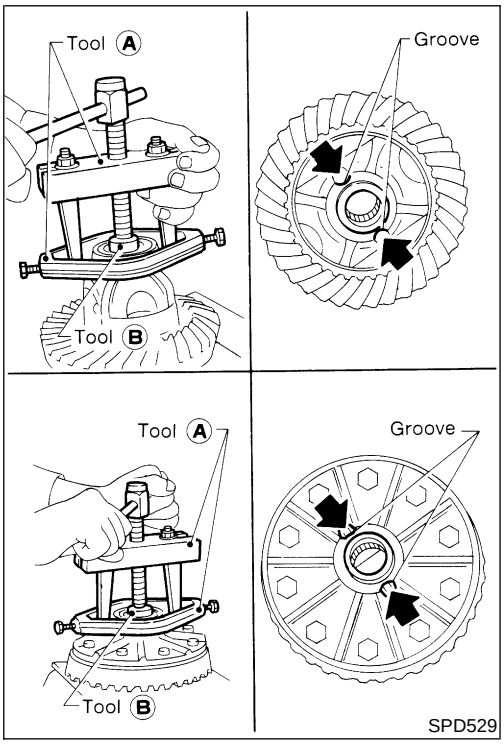


10. Remove pinion rear bearing inner cone and pinion height adjusting washer.
    Tool number: ST30031000 (J22912-01)

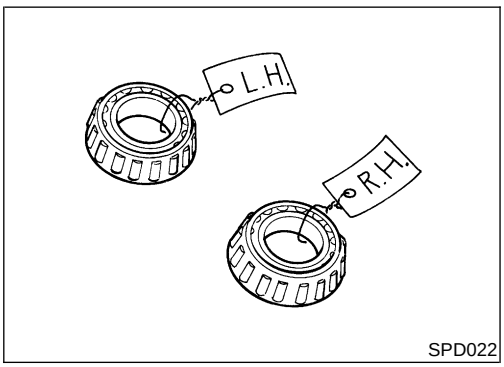
DIFFERENTIAL CASE

NGPD0057S03

1. Remove side bearing inner cones.
   To prevent damage to bearing, engage puller jaws in grooves.
   Tool numbers:
   A ST33051001 (J22888-20)
   B ST33061000 (J8107-2)

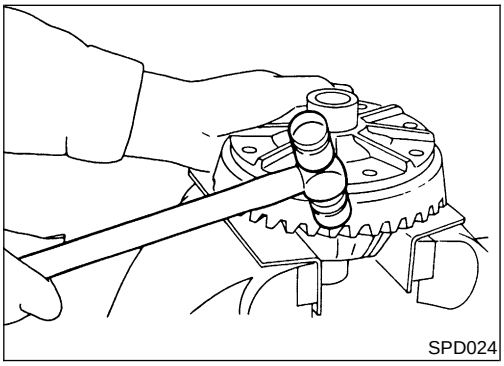


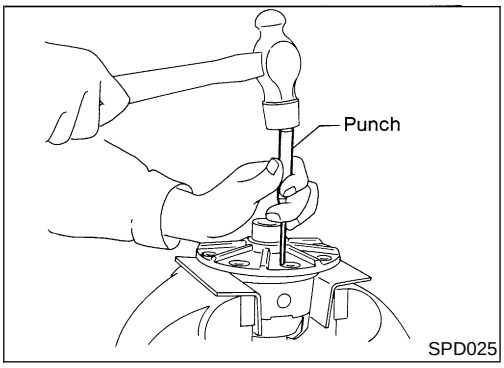
Be careful not to confuse the right and left hand parts.



2. Loosen ring gear bolts in a criss-cross fashion.
3. Tap ring gear off the differential case with a soft hammer.

Tap evenly all around to keep ring gear from binding.





4. Punch off pinion mate shaft lock pin from ring gear side.

Lock pin is calked at pin hole mouth on differential case.

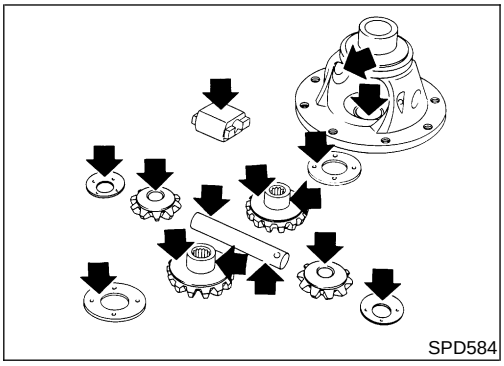
Inspection

NGPD0058

RING GEAR AND DRIVE PINION

NGPD0058S01

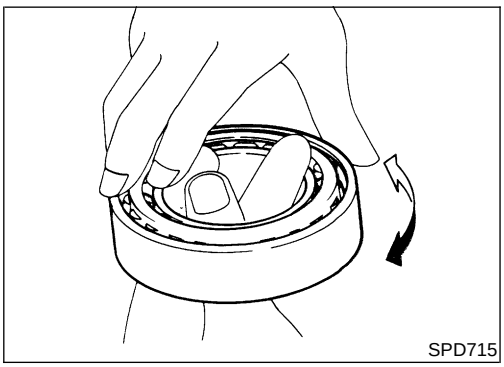
Check gear teeth for scoring, cracking or chipping. If any damaged part is evident, replace ring gear and drive pinion as a set (hypoid gear set).



DIFFERENTIAL CASE ASSEMBLY

NGPD0058S02

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



BEARING

NGPD0058S03

1. Thoroughly clean bearing.
2. Check bearings for wear, scratches, pitting or flaking.
   Check tapered roller bearing for smooth rotation. If damaged, replace outer race and inner cone as a set.

Adjustment

NGPD0059

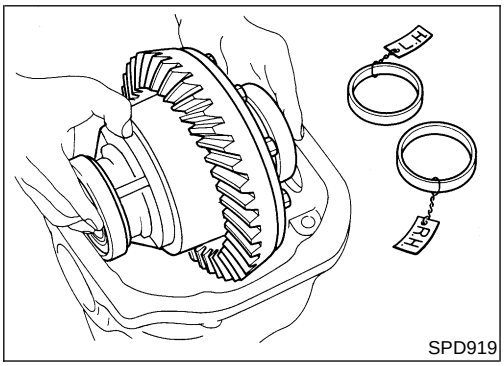
For quiet and reliable final drive operation, the following five adjustments must be made correctly.

1. Side bearing preload
2. Pinion gear height
3. Pinion bearing preload. Refer to "ASSEMBLY", PD-54.
4. Ring gear-to-pinion backlash. Refer to "ASSEMBLY", PD-54.
5. Ring and pinion gear tooth contact pattern

SIDE BEARING PRELOAD

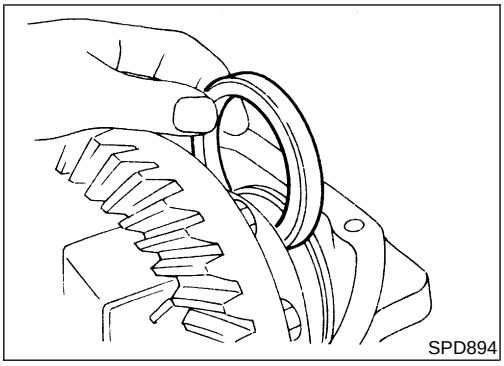
NGPD0059S01

A selection of carrier side bearing preload shims is required for successful completion of this procedure.



SPD919

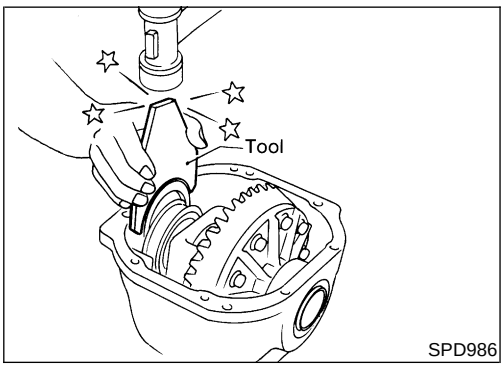
1. Make sure all parts are clean. Make sure, also, the bearings are well lubricated with light oil or type "DEXRON™" automatic transmission fluid.
2. Place the differential carrier, with side bearings and bearing races installed, into the final drive housing.


SPD894

3. Put the side bearing spacer in place.

CAUTION:

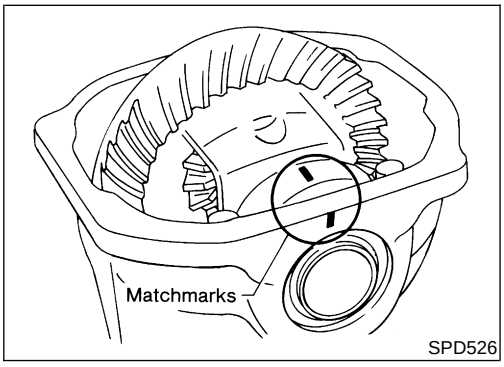
Side bearing spacer is placed on either the right or left depending upon final drive gear ratio. Be sure to replace it on the correct side.



SPD986

4. Use Tool to place original carrier side bearing preload shims on the carrier end, opposite the ring gear.

Tool number: KV38100600 (J25267)



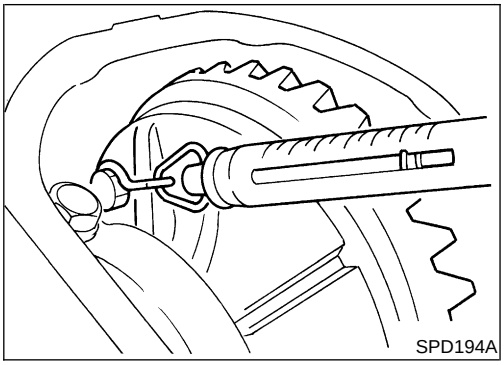
SPD526

5. Install the side bearing caps in their correct locations and torque the bearing cap retaining bolts.

Specification:

88 - 98 N·m (9.0 - 10.0 kg-m, 65 - 72 ft-lb)

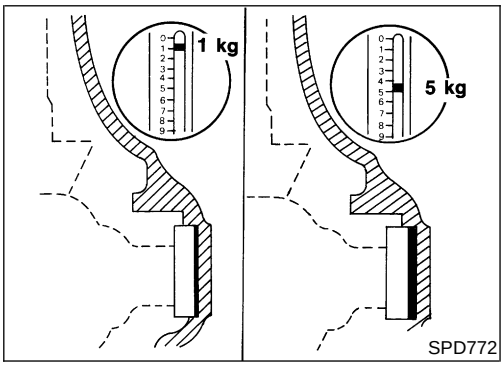
6. Turn the carrier several times to seat the bearings.


SPD194A

7. Measure the turning torque of the carrier at the ring gear retaining bolts with a spring gauge, J8129.

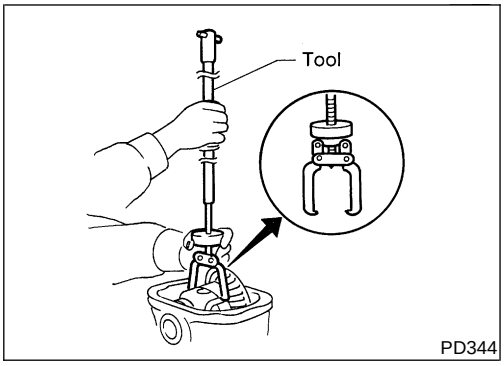
Specification:

34.3 - 39.2 N (3.5 - 4.0 kg, 7.7 - 8.8 lb) of pulling force at the ring gear bolt



SPD772

8. If the turning torque is not within the specifications, correct the torque as follows:
- If the turning torque is less than the specified range, install washers of greater thickness.
- If the turning torque is greater than the specification, install thinner washers.
- See the SDS section for washer dimensions and part numbers.
9. Record the total amount of washer thickness required for the correct carrier side bearing preload.



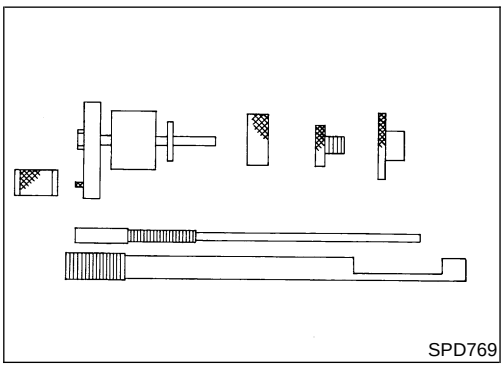
PD344

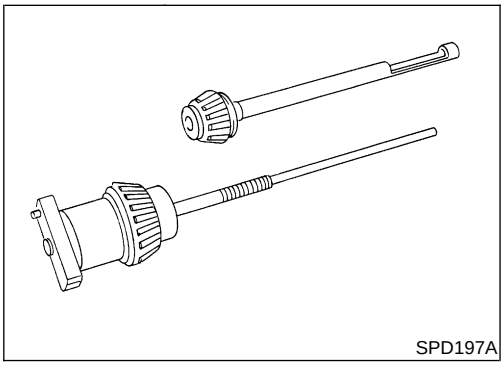
10. Remove the carrier from the final drive housing. Save the selected preload washers for later use during the assembly of the final drive unit.

PINION GEAR HEIGHT

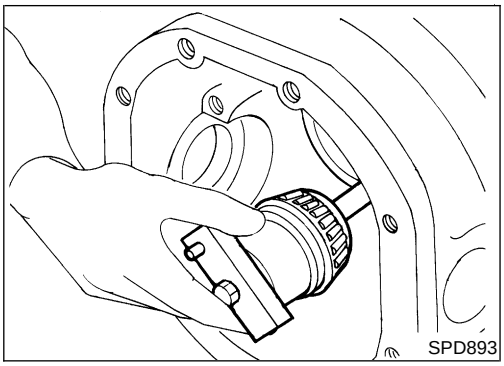
NGPD0059S02

1. Make sure all parts are clean and that the bearings are well lubricated.
2. Assemble the pinion gear bearings into the pinion preload shim selector Tool, J34309.

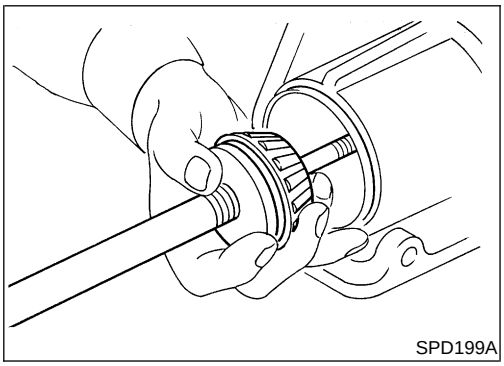

SPD769


SPD197A

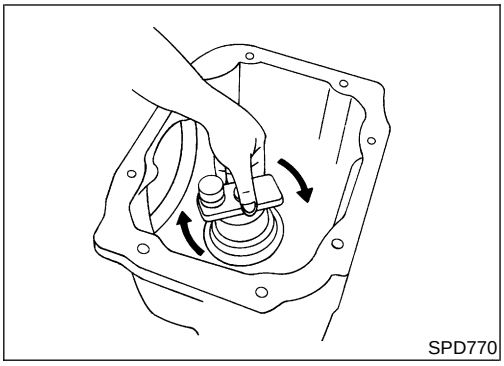
- **Front pinion bearing** — make sure the J34309-3 front pinion bearing seat is secured tightly against the J34309-2 gauge anvil. Then turn the front pinion bearing pilot, J34309-5, to secure the bearing in its proper position.
- **Rear pinion bearing** — the rear pinion bearing pilot, J34309-8, is used to center the rear pinion bearing only. The rear pinion bearing locking seat, J34309-4, is used to lock the bearing to the assembly.


SPD893

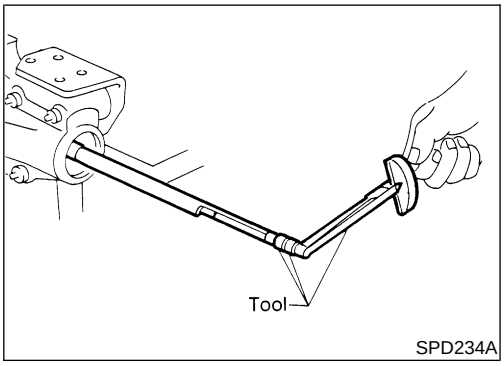
3. Install the pinion rear bearing inner cone into the final drive housing. Then place the pinion preload shim selector Tool, J34309-1, on gauge screw assembly.


SPD199A

4. Assemble the front pinion bearing inner cone and the J34309-2 gauge anvil. Assemble them together with the J34309-1 gauge screw in the final drive housing. Make sure that the pinion height gauge plate, J34309-16, will turn a full 360 degrees. Tighten the two sections together by hand.


SPD770

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



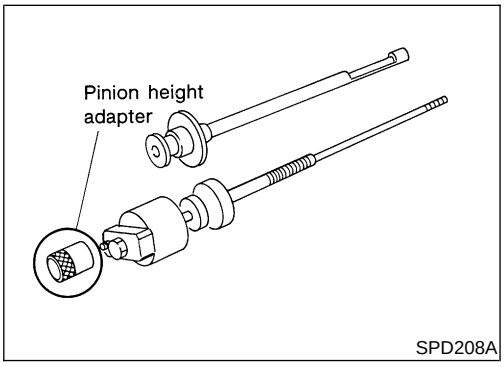
SPD234A

6. Measure the turning torque at the end of the J34309-2 gauge anvil using Tool.

Tool number: ST3127S000 (J25765-A)

Turning torque specification:

1.0 - 1.3 N·m (10 - 13 kg-cm, 8.7 - 11.3 in-lb)

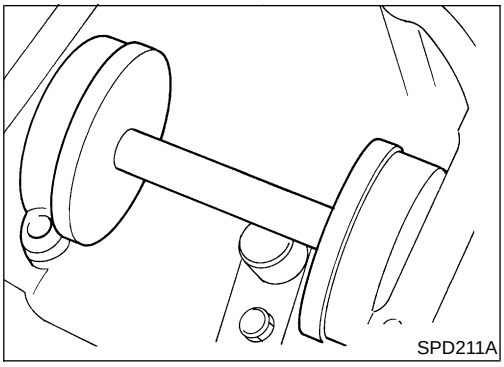


SPD208A

7. Place the J34309-11 pinion height adapter onto the gauge plate and tighten it by hand.

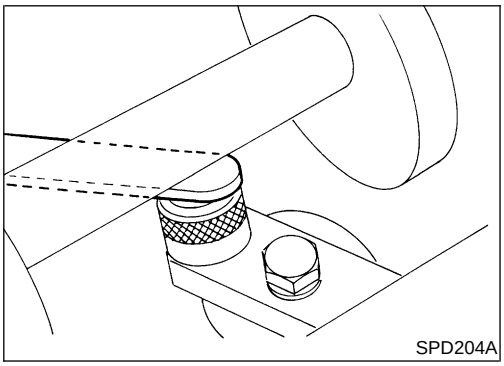
CAUTION:

Make sure all machined surfaces are clean.

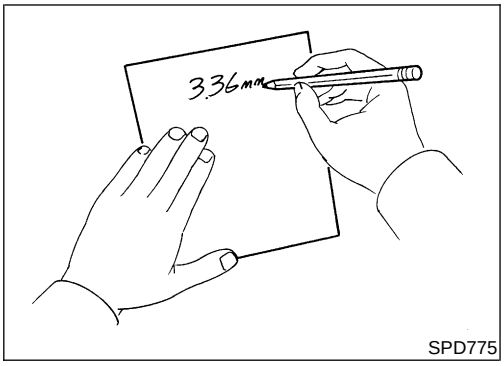

SPD211A

PINION HEIGHT ADJUSTING WASHER SELECTION

8. Now, position the side bearing discs, J25269-4, and arbor firmly into the side bearing bores.
   Install the side bearing caps and tighten the cap bolts to proper torque.

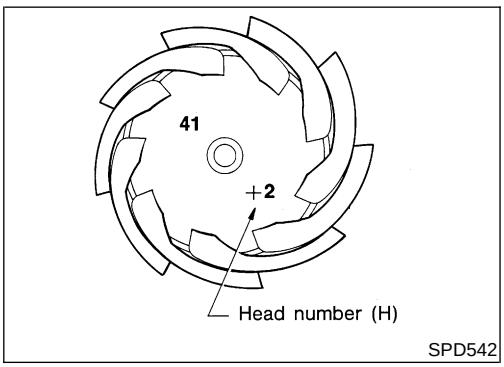

SPD204A

9. Select the correct standard pinion height adjusting washer thickness. Select by using a standard gauge of 3 mm (0.12 in) and J34309-101 feeler gauge. Measure the distance between the J34309-11 pinion height adapter including the standard gauge and the arbor.



SPD775

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



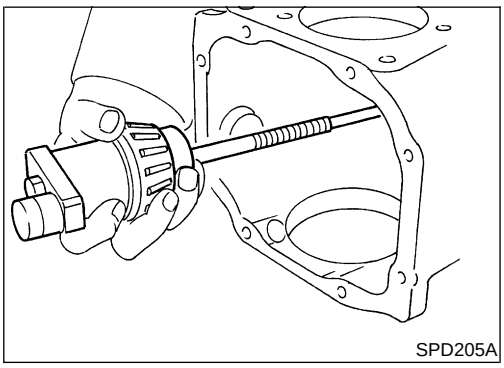
SPD542

11. Correct the pinion height washer size by referring to the "pinion head number".
    There are two numbers painted on the pinion gear. The first one refers to the pinion and ring gear as a matched set. This number should be the same as the number on the ring 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.

Use the following chart to determine the correct pinion height washer:

Pinion head height number	Add or remove from the standard pinion height 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)

12. Select the correct pinion height washer.
Drive pinion height adjusting washer:
Refer to SDS, PD-59.

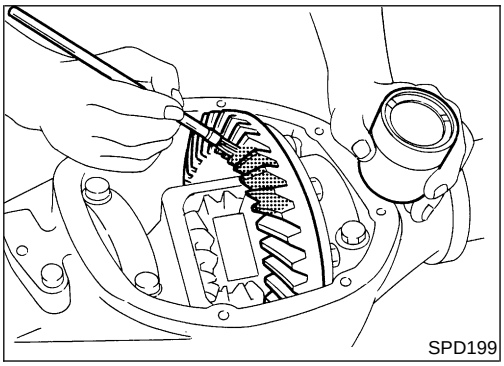

SPD205A

13. Remove the J34309 pinion preload shim selector Tool from the final drive housing. Then disassemble to retrieve the pinion bearings.

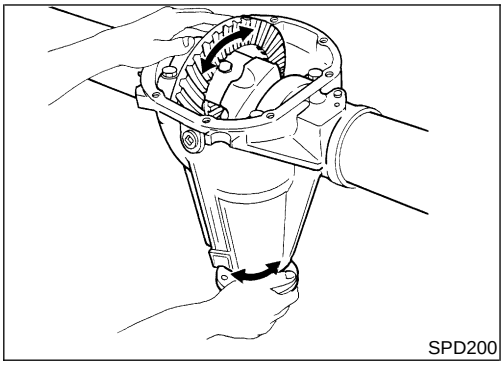
TOOTH CONTACT

=NGPD0059S03

Checking gear tooth contact pattern is necessary to verify correct relationship between ring gear and drive pinion.
Hypoid gear set which is not positioned properly may be noisy, or have short life or both. With the checking or gear tooth contact pattern, the most desirable contact for low noise level and long life can be assured.

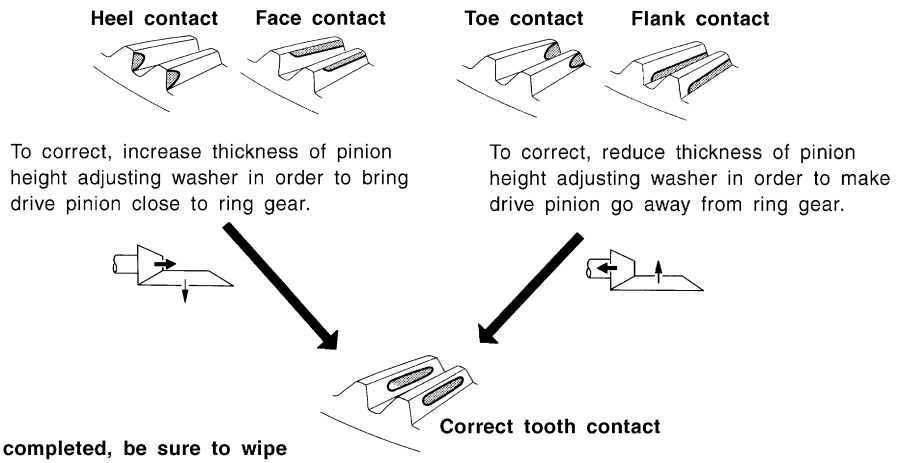

SPD199

1. Thoroughly clean ring gear and drive pinion teeth.
2. Sparingly apply a mixture of powdered ferric oxide and oil or equivalent to 3 or 4 teeth of ring gear drive side.


SPD200

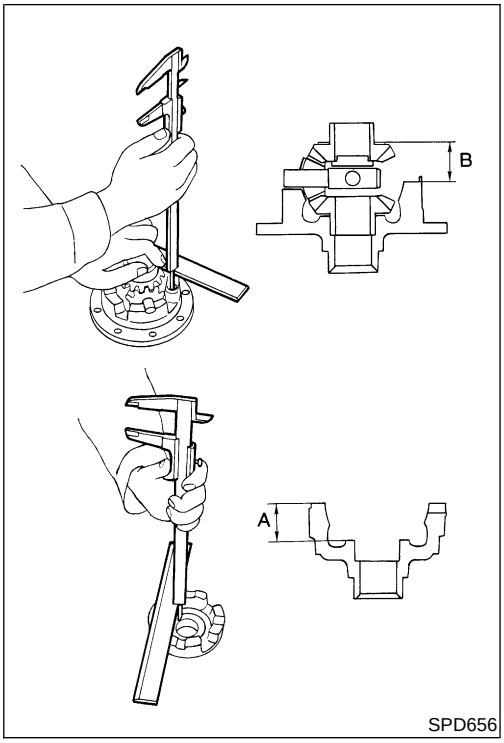
3. Hold companion flange steady and rotate the ring gear in both directions.

Usually the pattern will be correct if shims are correctly calculated and the backlash is correct. However, in rare cases, trial and error processes may be employed to obtain a correct pattern. The tooth pattern is the best indication of how well a differential has been set up.



When adjustment is completed, be sure to wipe off completely the ferric oxide and oil or their equivalent.

SPD007-B



Assembly

NGPD0060

DIFFERENTIAL CASE

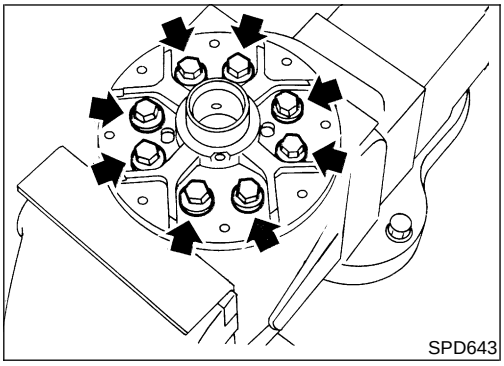
NGPD0060S01

1. Measure clearance between side gear thrust washer and differential case.

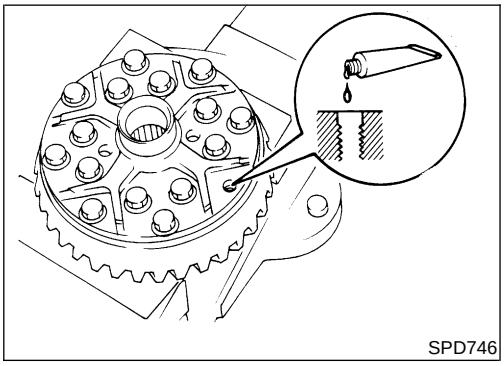
   Clearance between side gear thrust washer and differential case (A – B):

   Less than 0.15 mm (0.0059 in)

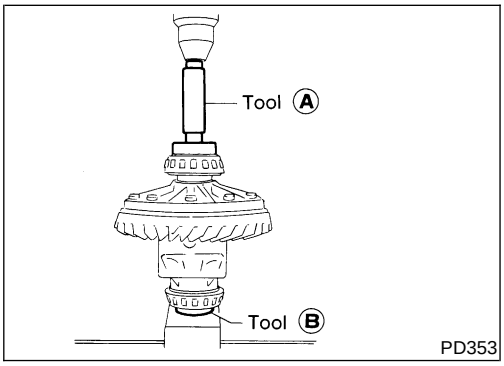
   The clearance can be adjusted with side gear thrust washer. Refer to SDS, PD-58.
2. Apply gear oil to gear tooth surfaces and thrust surfaces and check to see that they turn properly.



3. Install differential case LH and RH.



4. Place differential case on ring gear.
5. Apply locking agent [Locktite (stud lock) or equivalent] to ring gear bolts, and install them.
   Tighten bolts in a criss-cross pattern, lightly tapping bolt head with a hammer.



6. Press-fit side bearing inner cones on differential case with Tool.

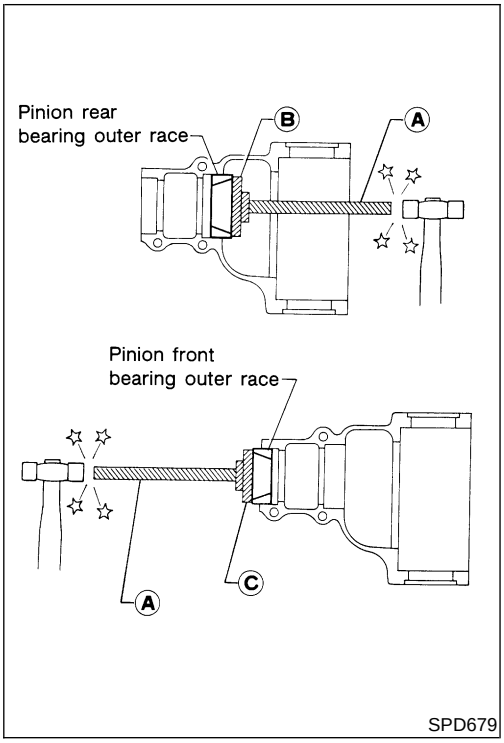
   Tool numbers:

   A ST33230000 (J25805-01)

   B ST33061000 (J8107-2)

DIFFERENTIAL CARRIER

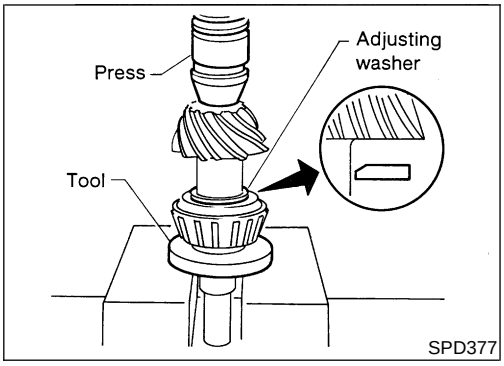
NGPD0060S02



1. Press-fit front and rear bearing outer races with Tools.

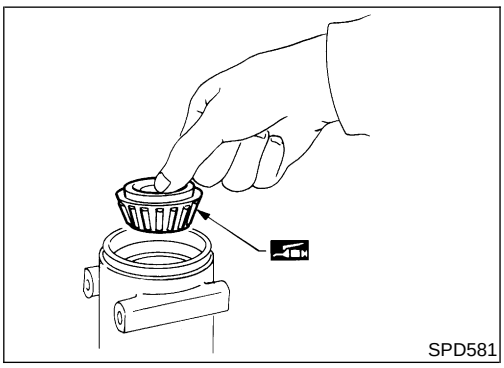
   Tool numbers:

   A ST30611000 (J25742-1)
   B ST30621000 (J25742-5)
   C ST30613000 (J25742-3)

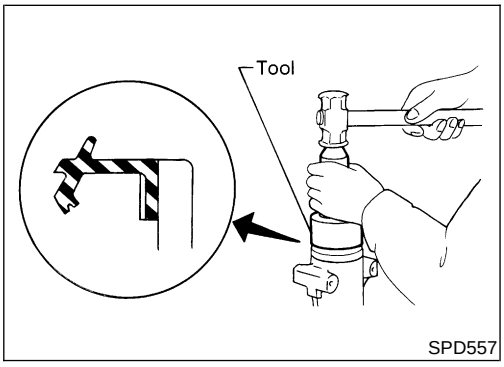


2. Select pinion height adjusting washer. Refer to "ADJUSTMENT", PD-48.
3. Install pinion height adjusting washer in drive pinion, and press-fit rear bearing inner cone in it, with press and Tool.

   Tool number: ST30901000 (J26010-01)

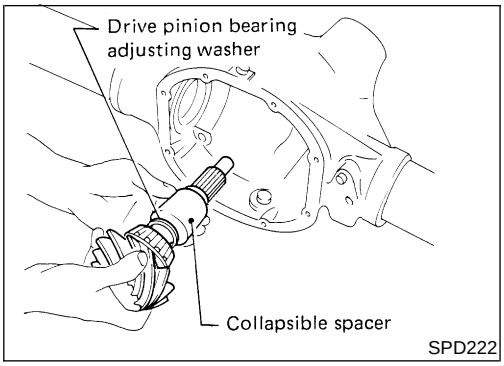


4. Place pinion front bearing inner cone in gear carrier.



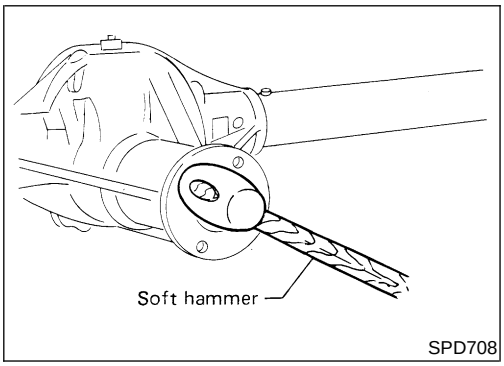
5. Apply multi-purpose grease to cavity at sealing lips of oil seal. Install front oil seal.

   Tool number: KV38100500 (J25273)



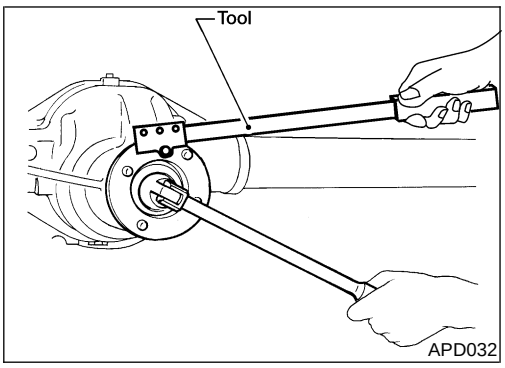
SPD222

6. Place drive pinion bearing spacer, drive pinion bearing adjusting washer and drive pinion in gear carrier.



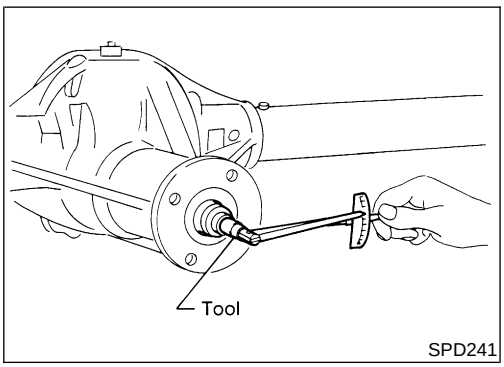
SPD708

7. Insert companion flange into drive pinion by tapping the companion flange with a soft hammer.



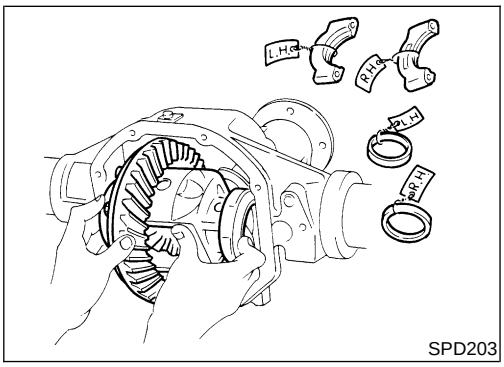
APD032

8. Tighten pinion nut to 127 N·m (13 kg-m, 94 ft-lb).
The threaded portion of drive pinion and pinion nut should be free from oil or grease.
Tool number: KV38108300 (J44195)



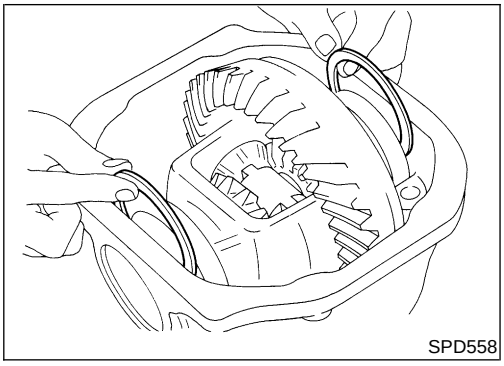
SPD241

9. Tighten the pinion nut by very small degrees until the specified preload is achieved. When checking the preload, turn the drive pinion in both directions several times to set the bearing rollers.
Tool number: ST3127S000 (J25765-A)
Pinion bearing preload:
1.1 - 1.7 N·m (11 - 17 kg-cm, 9.5 - 14.8 in-lb)
This procedure will have to be repeated if:
- **Maximum preload is achieved before the minimum pinion nut torque is reached.**
- **Minimum preload is not achieved before maximum pinion nut torque is reached.**

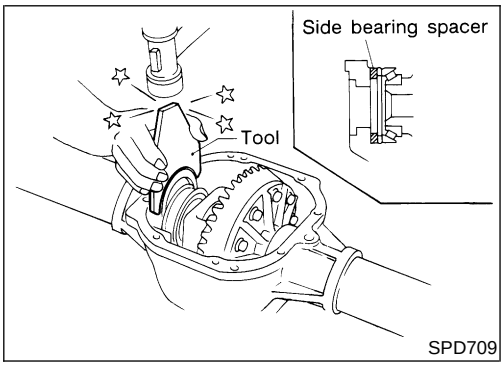


SPD203

10. Select side bearing adjusting washer.
Refer to Adjustment, PD-47.
11. Install differential case assembly with side bearing outer races into gear carrier.

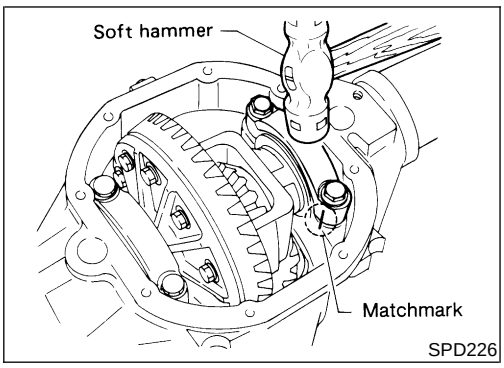

SPD558

12. Insert left and right side bearing adjusting washers in place between side bearing and carrier.



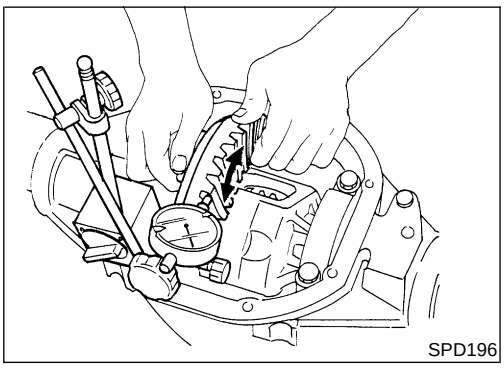
SPD709

13. Drive in side bearing spacer with Tool.
Tool number: KV38100600 (J25267)



SPD226

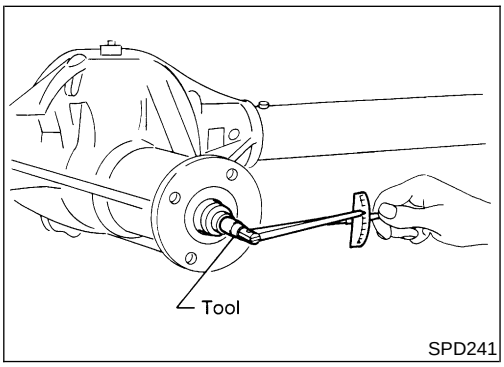
14. Align mark on bearing cap with that on gear carrier and install bearing cap on gear carrier.


SPD196

15. Measure ring gear-to-drive pinion backlash with a dial indicator.
Ring gear-to-drive pinion backlash:
0.13 - 0.18 mm (0.0051 - 0.0071 in)

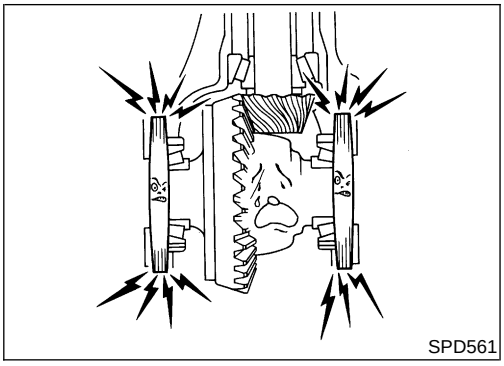
- If backlash is too small, decrease thickness of right shim and increase thickness of left shim by the same amount.
If backlash is too great, reverse the above procedure.

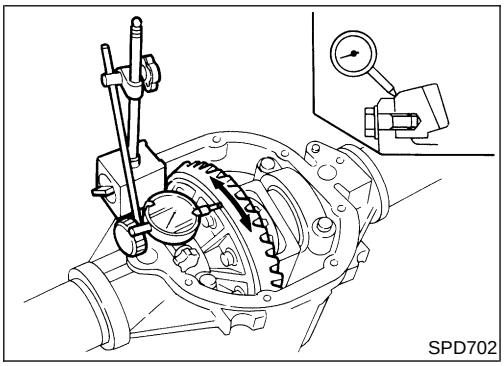
Never change the total amount of shims as it will change the bearing preload.



SPD241

16. Check total preload with Tool.
When checking preload, turn drive pinion in both directions several times to seat bearing rollers correctly.
Total preload:
1.2 - 2.3 N·m (12 - 23 kg-cm, 10 - 20 in-lb)
Tool number: ST3127S000 (J25765-A)


SPD561


SPD702

- If preload is too great, remove the same amount of shim from each side.
- If preload is too small, add the same amount of shim to each side.

Never add or remove a different number of shims for each side as it will change ring gear-to-drive pinion backlash.

17. Recheck ring gear-to-drive pinion backlash because increase or decrease in thickness of shims will cause change of ring gear-to-pinion backlash.
18. Check runout of ring gear with a dial indicator.
    Runout limit: 0.05 mm (0.0020 in)
    - If backlash varies excessively in different places, the variance may have resulted from foreign matter caught between the ring gear and the differential case.
    - If the backlash varies greatly when the runout of the ring gear is within a specified range, the hypoid gear set or differential case should be replaced.
19. Check tooth contact.
    Refer to "ADJUSTMENT", PD-52.
20. Install rear cover and gasket.

Service Data and Specifications (SDS)

C200

General Specifications

=NGPD0061

NGPD0061S01

Engine	KA24DE
Vehicle grade	XE
Rear final drive	Standard
	C200
	2-pinion
Gear ratio	4.625
Number of teeth (Ring gear/drive pinion)	37/8
Oil capacity (Approx.) ℓ (US pt, Imp pt)	1.3 (2-3/4, 2-1/4)

Ring Gear Runout

NGPD0061S02

Ring gear runout limit mm (in)	0.05 (0.0020)

Side Gear Adjustment

NGPD0061S03

Side gear backlash (Clearance between side gear and differential case) mm (in)		Less than 0.15 (0.0059)
Available side gear thrust washers	Thickness mm (in)	Part number*
	0.75 (0.0295)	38424-N3110
	0.78 (0.0307)	38424-N3111
	0.81 (0.0319)	38424-N3112
	0.84 (0.0331)	38424-N3113
	0.87 (0.0343)	38424-N3114
	0.90 (0.0354)	38424-N3115
	0.93 (0.0366)	38424-N3116

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

Side Bearing Adjustment

NGPD0061S04

Differential carrier assembly turning resistance N (kg, lb)		34.3 - 39.2 (3.5 - 4.0, 7.7 - 8.8)
Available side bearing adjusting washers	Thickness mm (in)	Part number*
	2.00 (0.0787)	38453-N3100
	2.05 (0.0807)	38453-N3101
	2.10 (0.0827)	38453-N3102
	2.15 (0.0846)	38453-N3103
	2.20 (0.0866)	38453-N3104
	2.25 (0.0886)	38453-N3105
	2.30 (0.0906)	38453-N3106
	2.35 (0.0925)	38453-N3107
	2.40 (0.0945)	38453-N3108
	2.45 (0.0965)	38453-N3109
	2.50 (0.0984)	38453-N3110
	2.55 (0.1004)	38453-N3111
	2.60 (0.1024)	38453-N3112

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

Total Preload Adjustment

NGPD0061S05

Total preload N·m (kg-cm, in-lb)	1.2 - 2.3 (12 - 23, 10 - 20)
Ring gear backlash mm (in)	0.13 - 0.18 (0.0051 - 0.0071)

Drive Pinion Height Adjustment

NGPD0061S06

	Thickness mm (in)	Part number*
Available pinion height adjusting washers	3.09 (0.1217)	38154-P6017
	3.12 (0.1228)	38154-P6018
	3.15 (0.1240)	38154-P6019
	3.18 (0.1252)	38154-P6020
	3.21 (0.1264)	38154-P6021
	3.24 (0.1276)	38154-P6022
	3.27 (0.1287)	38154-P6023
	3.30 (0.1299)	38154-P6024
	3.33 (0.1311)	38154-P6025
	3.36 (0.1323)	38154-P6026
	3.39 (0.1335)	38154-P6027
	3.42 (0.1346)	38154-P6028
	3.45 (0.1358)	38154-P6029
	3.48 (0.1370)	38154-P6030
	3.51 (0.1382)	38154-P6031
	3.54 (0.1394)	38154-P6032
	3.57 (0.1406)	38154-P6033
	3.60 (0.1417)	38154-P6034
	3.63 (0.1429)	38154-P6035
	3.66 (0.1441)	38154-P6036

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

Drive Pinion Preload Adjustment

NGPD0061S07

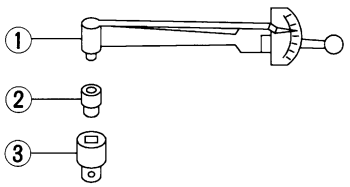
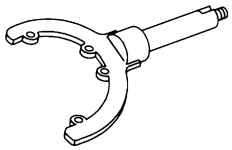
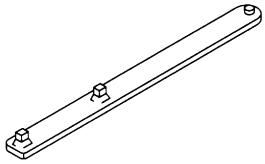
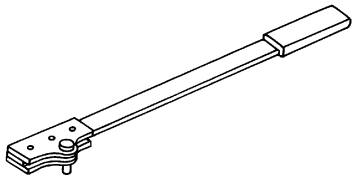
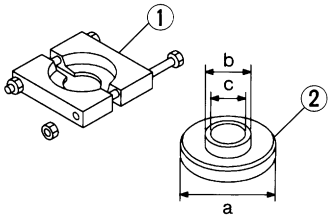
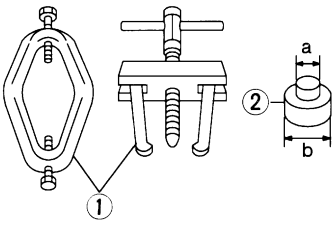
Drive pinion bearing preload adjusting method	Collapsible spacer
Drive pinion preload with front oil seal N·m (kg-cm, in-lb)	1.1 - 1.7 (11 - 17, 9.5 - 15)
Drive pinion preload without front oil seal N·m (kg-cm, in-lb)	1.0 - 1.6 (10 - 16, 8.7 - 14)

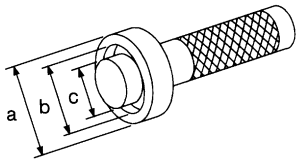
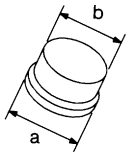
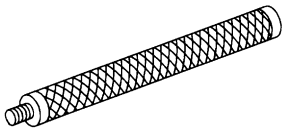
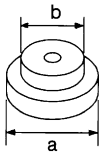
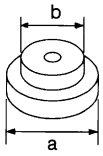
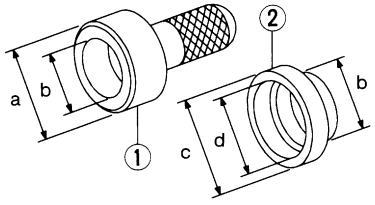
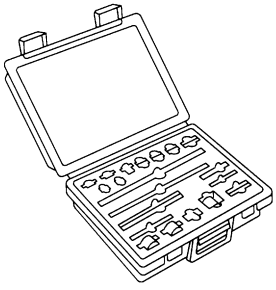
Preparation

SPECIAL SERVICE TOOLS

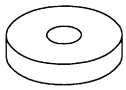
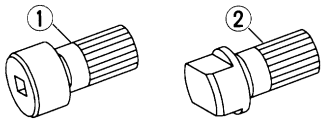
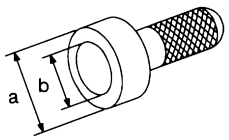
NGPD0029

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	
ST3127S000 (See J25765-A) Preload gauge 1 GG91030000 (J25765) Torque wrench 2 HT62940000 (—) Socket adapter 3 HT62900000 (—) Socket adapter	 NT124	Measuring pinion bearing preload and total preload
ST06340000 (J24310, J34310) Differential attachment	 NT140	Mounting final drive
ST32580000 (J34312) Differential side bearing adjusting nut wrench	 NT141	Adjusting side bearing preload and backlash (ring gear-drive pinion)
KV38108300 (J44195) Companion flange wrench	 NT771	Removing and installing propeller shaft lock nut, and drive pinion lock nut
ST3090S000 (—) Drive pinion rear inner race puller set 1 ST30031000 (J22912-01) Puller 2 ST30901000 (J26010-01) Base	 NT527	Removing and installing drive pinion rear inner cone **a: 79 mm (3.11 in) dia.** **b: 45 mm (1.77 in) dia.** **c: 35 mm (1.38 in) dia.**
ST3306S001 Differential side bearing puller set 1 ST33051001 (J22888-20) Body 2 ST33061000 (J8107-2) Adapter	 NT072	Removing and installing differential side bearing inner cone **a: 28.5 mm (1.122 in) dia.** **b: 38 mm (1.50 in) dia.**

Tool number (Kent-Moore No.) Tool name	Description	
ST33190000 (J25523) Differential side bearing drift	 NT085	Installing side bearing inner cone **a: 52 mm (2.05 in) dia.** **b: 45.5 mm (1.791 in) dia.** **c: 34 mm (1.34 in) dia.**
ST33081000 (—) Side bearing puller adapter	 NT431	Installing side bearing inner cone **a: 43 mm (1.69 in) dia.** **b: 33.5 mm (1.319 in) dia.**
ST30611000 (J25742-1) Drift	 NT090	Installing pinion rear bearing outer race (Use with ST30621000 or ST30613000)
ST30621000 (J25742-5) Drift	 NT073	Installing pinion rear bearing outer race **a: 79 mm (3.11 in) dia.** **b: 59 mm (2.32 in) dia.**
ST30613000 (J25742-3) Drift	 NT073	Installing pinion front bearing outer race (Use with ST30611000) **a: 72 mm (2.83 in) dia.** **b: 48 mm (1.89 in) dia.**
KV381025S0 (—) Oil seal fitting tool 1 ST30720000 (J25405) Drift bar 2 KV38102510 (—) Drift	 NT525	Installing front oil seal **a: 77 mm (3.03 in) dia.** **b: 55 mm (2.17 in) dia.** **c: 71 mm (2.80 in) dia.** **d: 65 mm (2.56 in) dia.**
(J34309) Differential shim selector	 NT134	Adjusting bearing pre-load and gear height

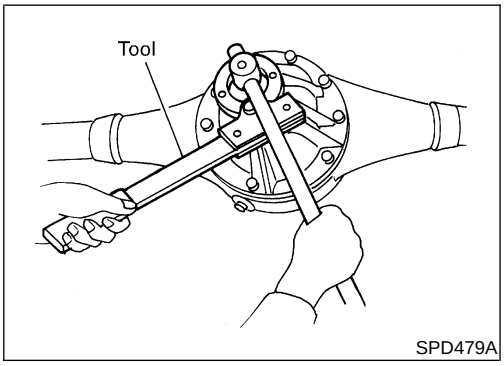
Preparation (Cont'd)

Tool number (Kent-Moore No.) Tool name	Description	
(J25269-18) Side bearing discs (2 Req'd)	 NT135	Selecting pinion height adjusting washer
KV381052S0 (—) Rear axle shaft dummy 1 KV38105210 (—) Torque wrench side 2 KV38105220 (—) Vice side	 NT142	Checking differential torque on limited slip differential
KV38100500 (J25273) Gear carrier front oil seal drift	 NT115	Installing front oil seal **a: 85 mm (3.35 in) dia.** **b: 60 mm (2.36 in) dia.**

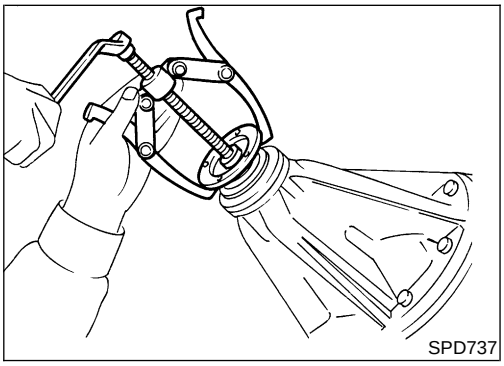
Noise, Vibration and Harshness (NVH) Troubleshooting

NGPD0051

Refer to "NVH TROUBLESHOOTING CHART", PD-4.



SPD479A


SPD737

On-vehicle Service

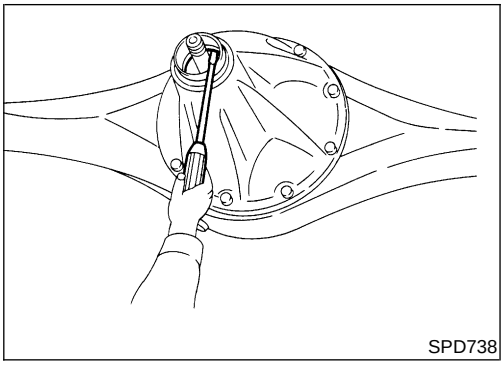
FRONT OIL SEAL REPLACEMENT

NGPD0030

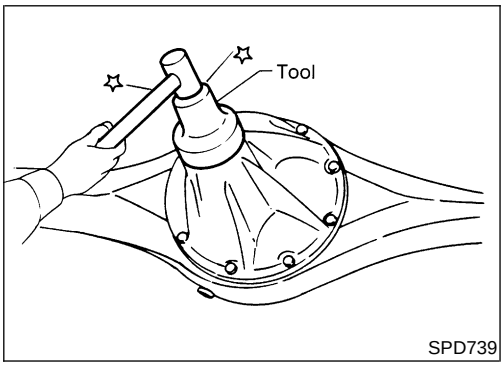
1. Remove propeller shaft.
2. Loosen drive pinion nut.

Tool number: KV38108300 (J44195)

3. Remove companion flange.


SPD738

4. Remove front oil seal.

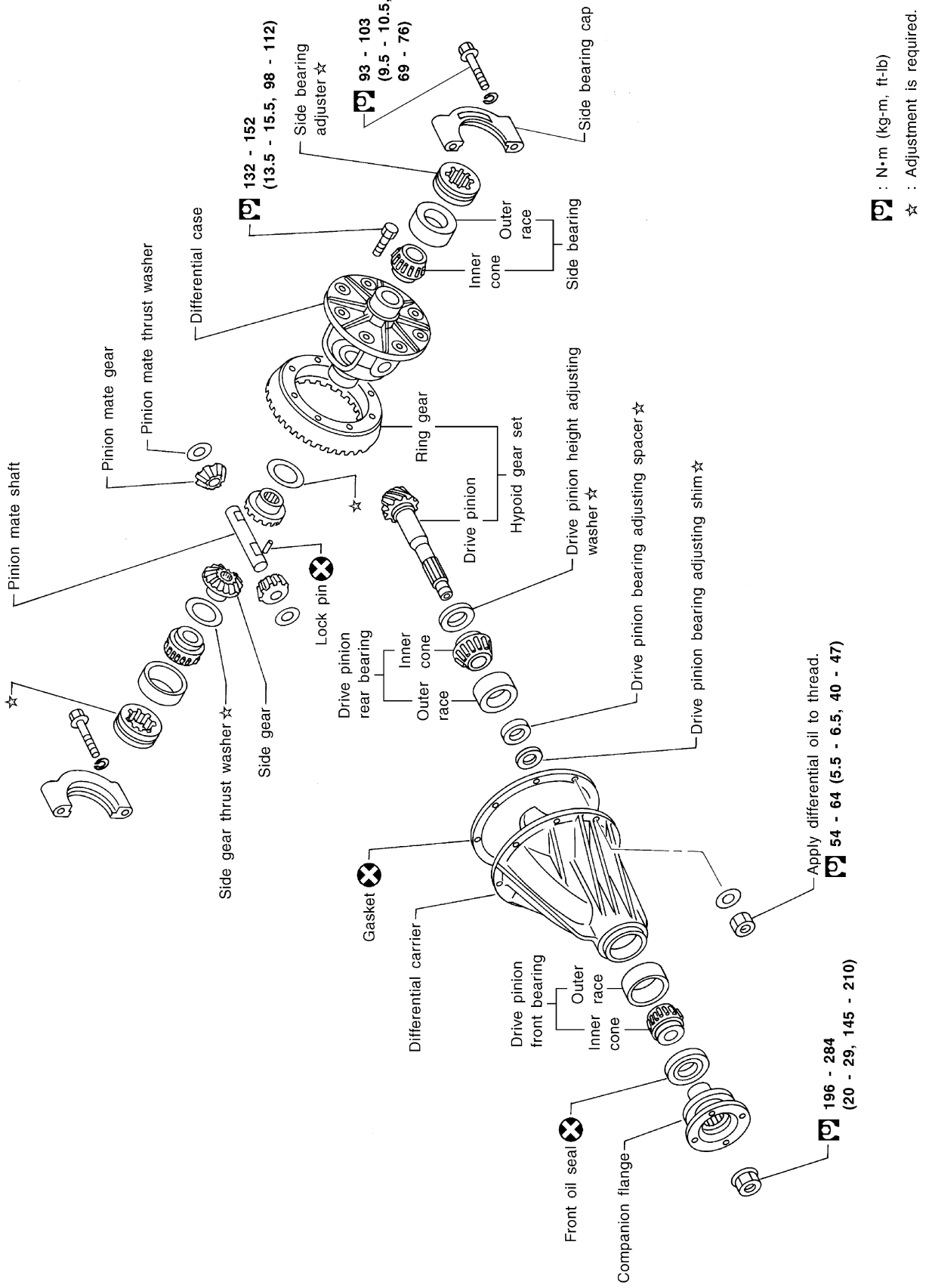


SPD739

5. Apply multi-purpose grease to cavity at sealing lips of oil seal. Press front oil seal into carrier.
   Tool number:
   KV38100500 (J25273)
6. Install companion flange and drive pinion nut.
7. Install rear propeller shaft.

Components

NGPD0031



SEC. 380

SPD362A

Removal and Installation

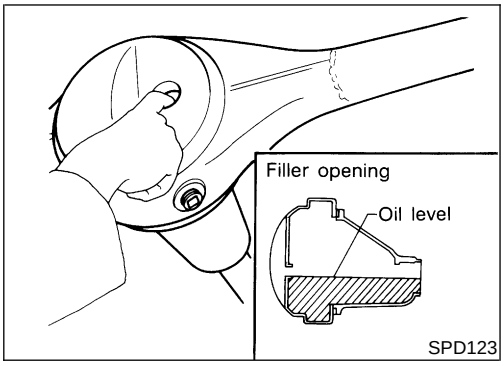
NGPD0032

REMOVAL

NGPD0032S01

- Remove rear of propeller shaft.
  Plug front end of transfer.
- Remove axle shaft.
  Refer to “REAR AXLE”, ***AX-26***.
- Remove rear final drive mounting bolts.

CAUTION:
Be careful not to damage spline, sleeve yoke and front oil seal when removing propeller shaft.
Before removing the final drive assembly or rear axle assembly, disconnect the ABS sensor harness connector from the assembly and move it away from the final drive/rear axle assembly area. Failure to do so may result in the sensor wires being damaged and the sensor becoming inoperative.

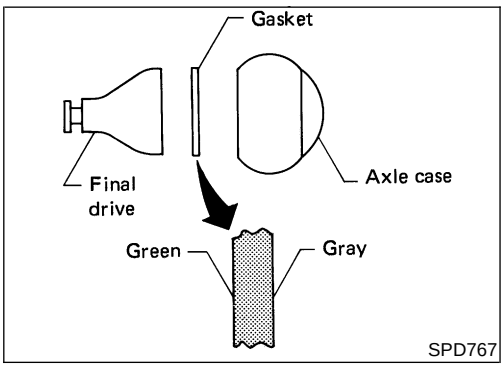


SPD123

INSTALLATION

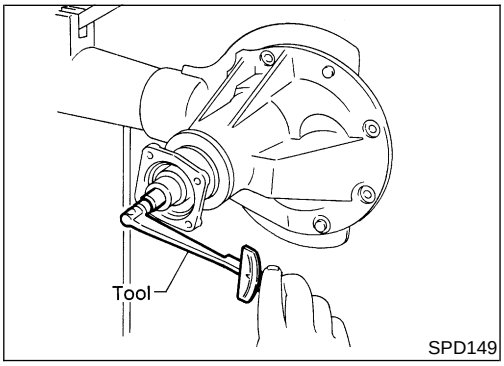
NGPD0032S02

- Fill final drive with recommended gear oil.



SPD767

- Pay attention to the direction of gasket.



SPD149

Disassembly

NGPD0033

PRE-INSPECTION

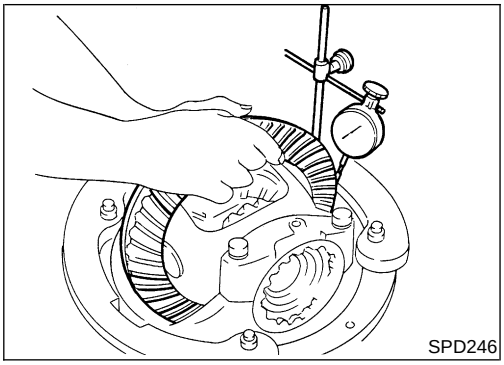
NGPD0033S01

Before disassembling final drive, perform the following inspection.

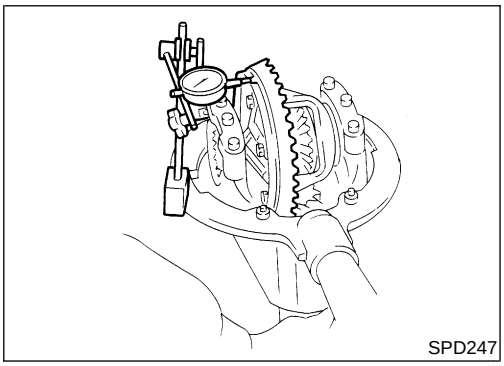
- Total preload

a) Turn drive pinion in both directions several times to seat bearing rollers correctly.
b) Check total preload with Tool.

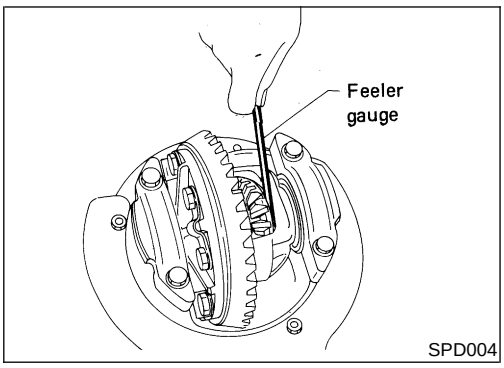
Tool number: ST3127S000 (J25765-A)
Total preload:
1.7 - 2.5 N·m (17 - 25 kg-cm, 15 - 22 in-lb)


SPD246

- Ring gear to drive pinion backlash
  Check backlash of ring gear with a dial indicator at several points.
  Ring gear-to-drive pinion backlash:
  0.13 - 0.18 mm (0.0051 - 0.0071 in)


SPD247

- Ring gear runout
  Check runout of ring gear with a dial indicator.
  Runout limit:
  0.08 mm (0.0031 in)

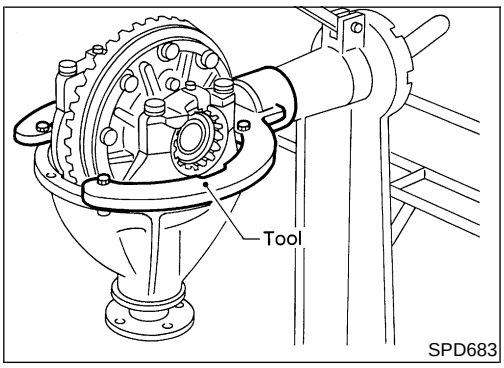


SPD004

- Tooth contact
  Check tooth contact. Refer to "TOOTH CONTACT", PD-78.
- Side gear to pinion mate gear backlash
  Measure clearance between side gear thrust washer and differential case with a feeler gauge.
  Clearance between side gear thrust washer and differential case:
  0.10 - 0.20 mm (0.0039 - 0.0079 in)

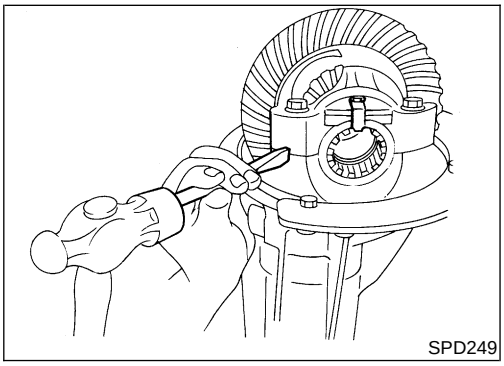
DIFFERENTIAL CARRIER

NGPD0033S02



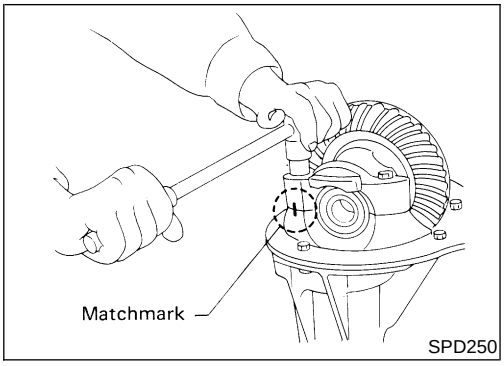
SPD683

1. Mount final drive assembly on Tool.
   Tool number:
   ST06340000 (J24310, J34310)


SPD249

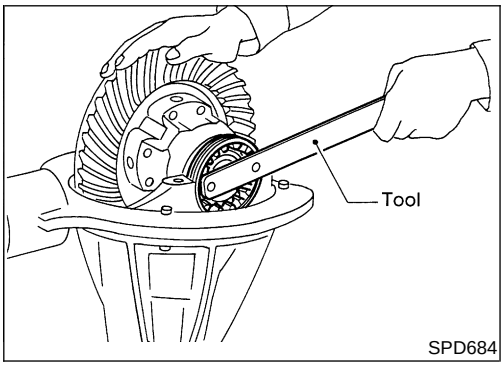
2. Put match marks on one side of side bearing cap with paint or punch to ensure that it is replaced in proper position during reassembly.

Bearing caps are line-bored during manufacture and should be put back in their original places.



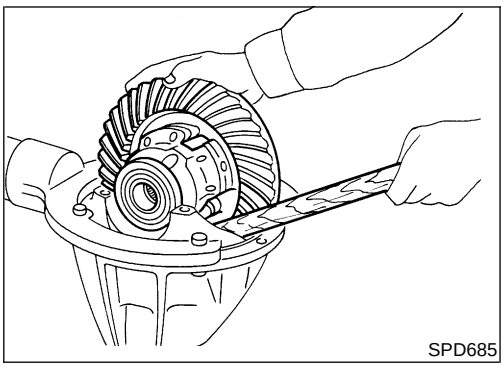
SPD250

3. Remove side lock fingers and side bearing caps.

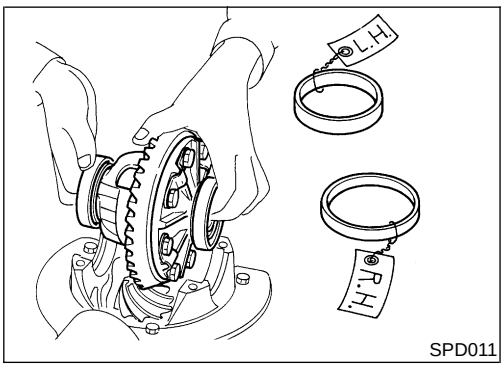


SPD684

4. Remove side bearing adjuster with Tool.
   Tool number: ST32580000 (J34312)

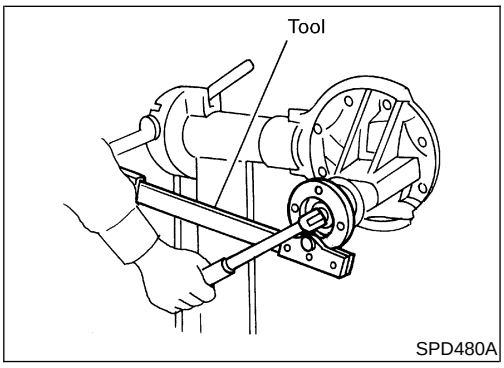

SPD685

5. Remove differential case assembly with a pry bar.



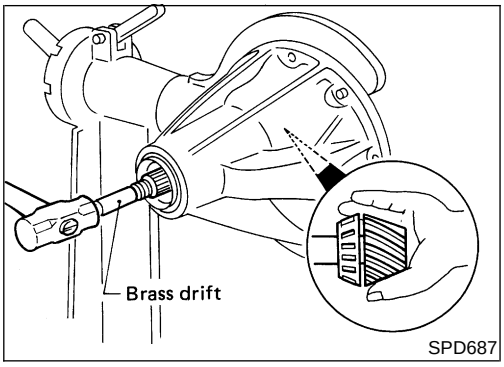
SPD011

Keep the side bearing outer races together with their respective inner cones — do not mix them up.

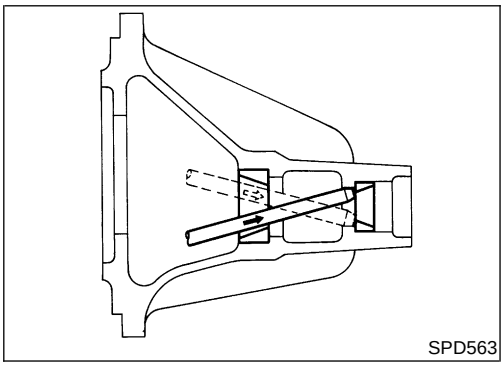


SPD480A

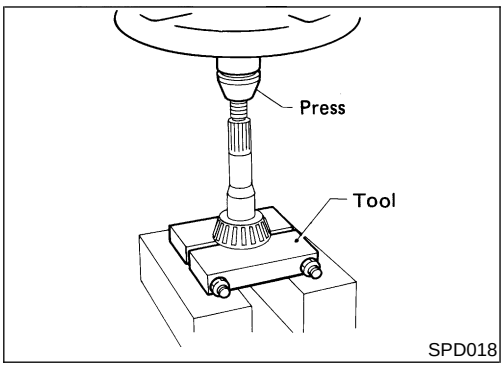
6. Remove drive pinion nut with Tool.
   Tool number: KV38108300 (J44195)
7. Remove companion flange with puller.
8. Remove ABS sensor.



9. Take out drive pinion together with pinion rear bearing inner cone, drive pinion bearing spacer and pinion bearing adjusting shim.



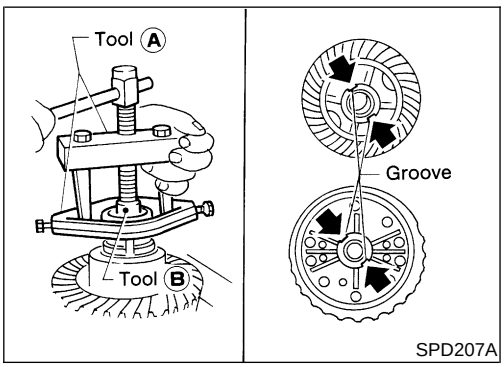
10. Remove front oil seal and pinion front bearing inner cone.
11. Remove pinion bearing outer races with a brass drift.



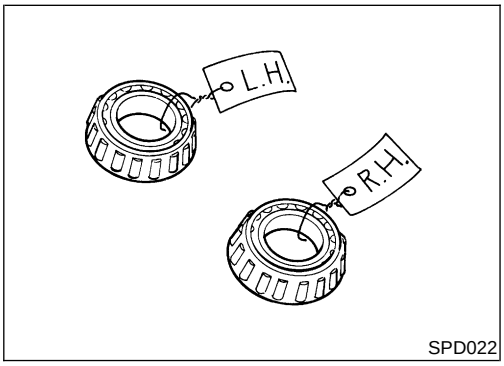
12. Remove pinion rear bearing inner cone and drive pinion adjusting washer.
    Tool number: ST30031000 (J22912-01)

DIFFERENTIAL CASE

NGPD0033S03

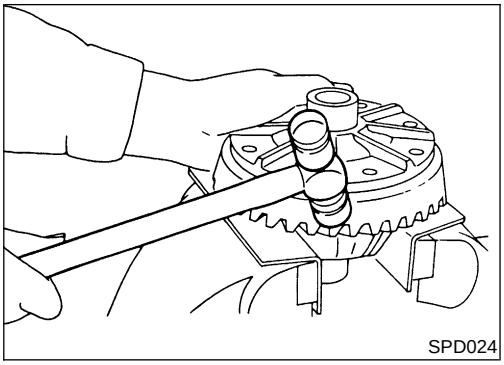


1. Remove side bearing inner cones.
   To prevent damage to bearing, engage puller jaws in groove.
   Tool number:
   A ST33051001 (J22888-20)
   B ST33061000 (J8107-2)



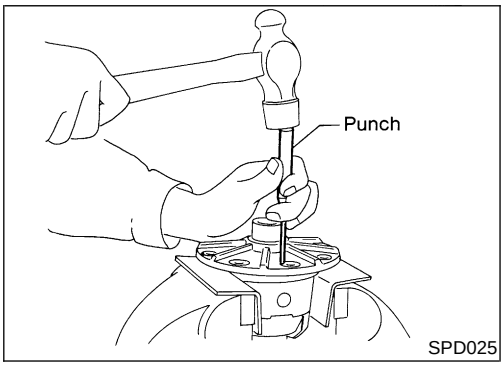
Be careful not to confuse the left and right hand parts.
Keep bearing and bearing race for each side together.

2. Loosen ring gear bolts in a crisscross pattern.


SPD024

3. Tap ring gear off differential case with a soft hammer.

Tap evenly all around to keep ring gear from binding.



SPD025

4. Drive out pinion mate shaft lock pin, with punch from ring gear side..

Lock pin is calked at pin hole mouth on differential case.

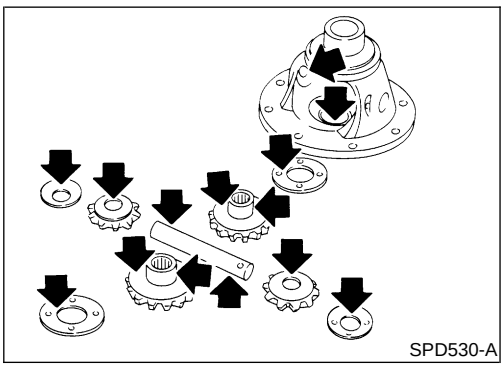
Inspection

RING GEAR AND DRIVE PINION

NGPD0034

NGPD0034S01

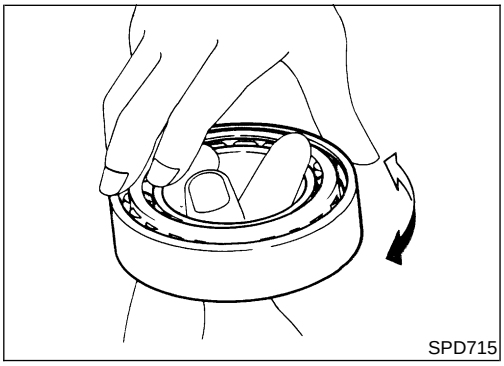
Check gear teeth for scoring, cracking or chipping.
If any damaged part is evident, replace ring gear and drive pinion as a set (hypoid gear set).


SPD530-A

DIFFERENTIAL CASE ASSEMBLY

NGPD0034S02

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


SPD715

BEARING

NGPD0034S03

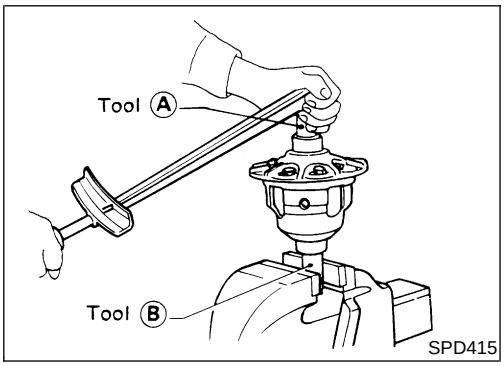
1. Thoroughly clean bearing.
2. Check bearings for wear, scratches, pitting or flaking.
   Check tapered roller bearing for smooth rotation. If damaged, replace outer race and inner cone as a set.

Limited Slip Differential

PREPARATION FOR DISASSEMBLY

NGPD0035

CAUTION:
Do not run engine when only one wheel (rear) is off the ground.



Checking Differential Torque

NGPD0035S01

Measure differential torque with Tool.
If it is not within the specifications, inspect components of limited slip differential.

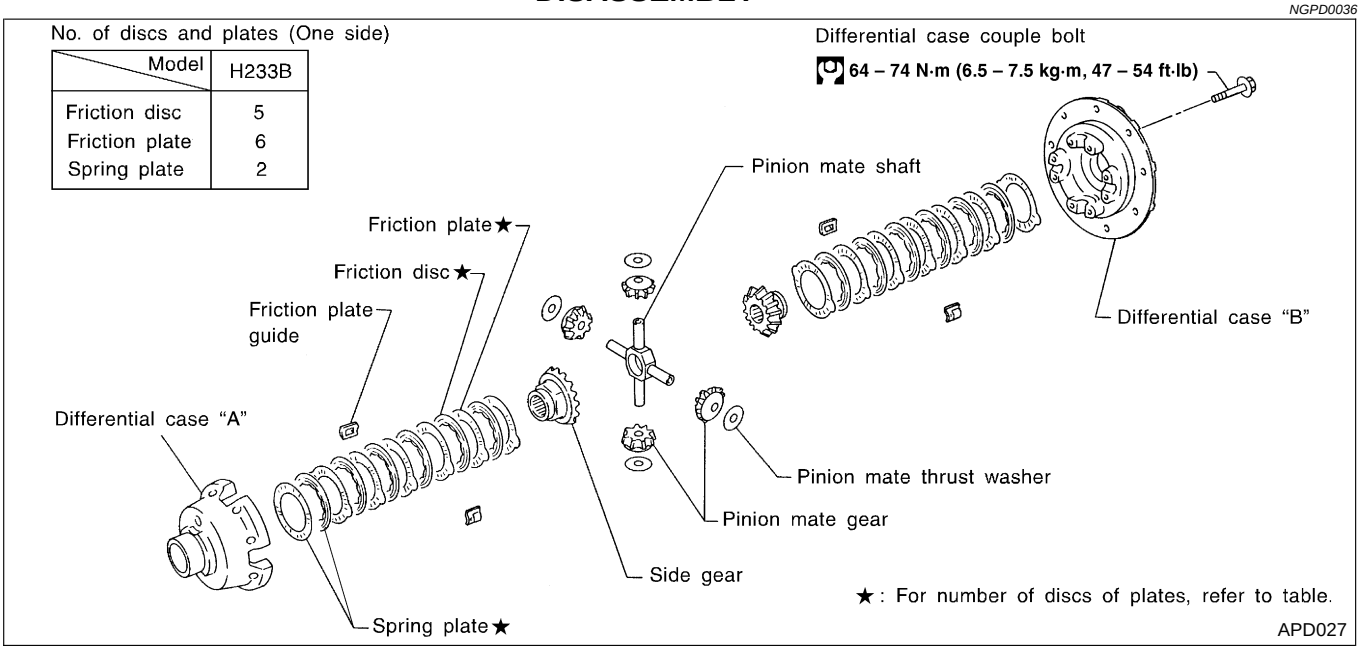
Differential torque:
187 - 245N·m (19 - 25 kg-m, 138 - 180 ft-lb)
Tool number: A KV38105210 (—)
Tool number: B KV38105220 (—)

DISASSEMBLY

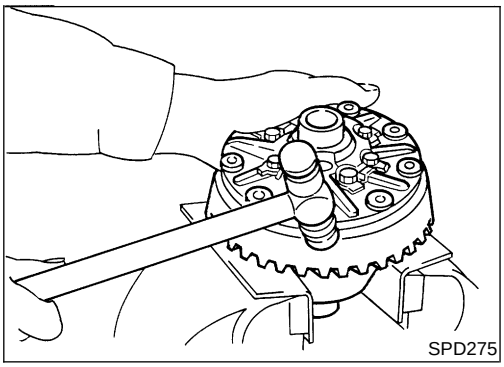
NGPD0036

No. of discs and plates (One side)

Model	H233B
Friction disc	5
Friction plate	6
Spring plate	2

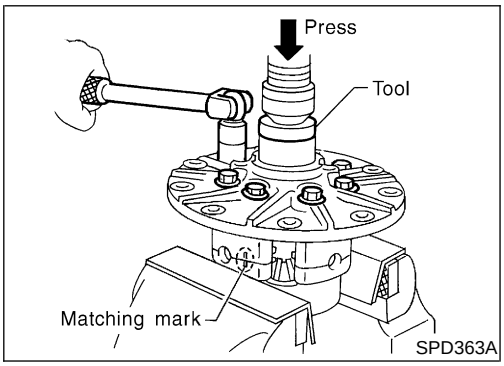


CAUTION:
Do not run engine when one wheel (rear) is off the ground.


SPD275

1. Remove side bearing inner cone with Tool.
2. Loosen ring gear bolts in a criss-cross pattern.
3. Tap ring gear off gear case with a soft hammer.

Tap evenly all around to keep ring gear from binding.



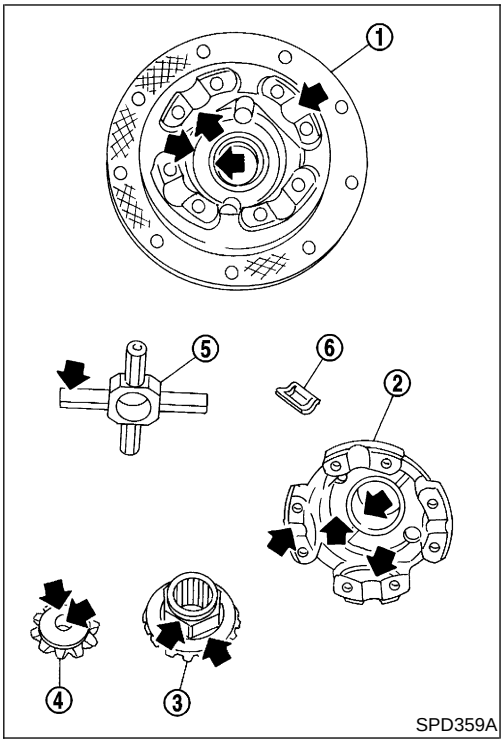
SPD363A

4. Remove couple bolts on differential cases A and B with a press.

Tool number: ST33081000 (—)

5. Separate differential case A and B.
   Draw out component parts (discs and plates, etc.).

Put marks on gears and pressure rings so that they can be reinstalled in their original positions from which they were removed.



SPD359A

INSPECTION

Contact Surfaces

NGPD0037

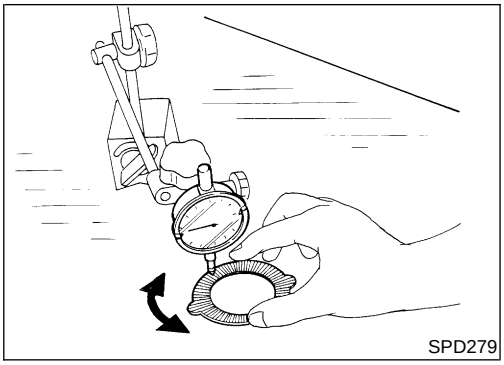
NGPD0037S01

1. Clean the disassembled parts in suitable solvent and blow dry with compressed air.
2. If following surfaces are found with burrs or scratches, smooth with oil stone.
   1 Differential case B
   2 Differential case A
   3 Side gear
   4 Pinion mate gear
   5 Pinion mate shaft
   6 Friction plate guide

Disc and Plate

NGPD0037S02

1. Clean the discs and plates in suitable solvent and blow dry with compressed air.
2. Inspect discs and plates for wear, nicks and burrs.

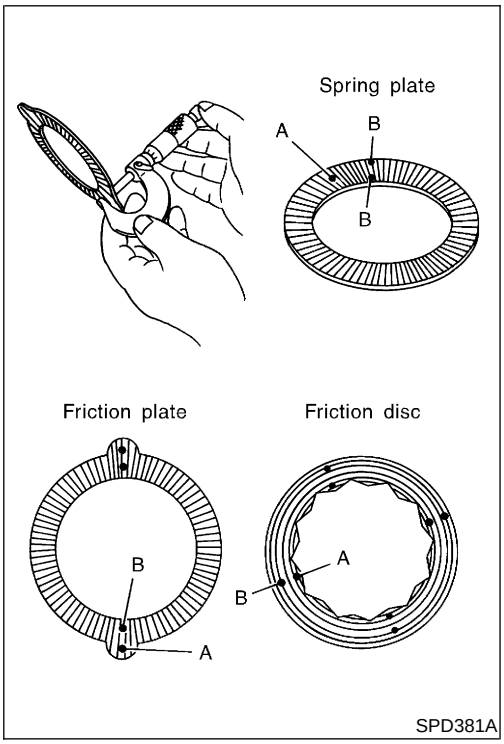

SPD279

3. Check friction discs or plates for warpage.

Allowable warpage:

0.08 mm (0.0031 in)

If it exceeds limits, replace with a new plate to eliminate possibility of clutch slippage or sticking.



SPD381A

4. Measure frictional surfaces and projected portions of friction disc, friction plate, spring plate, and determine each part's differences to see if the specified wear limit has been exceeded.

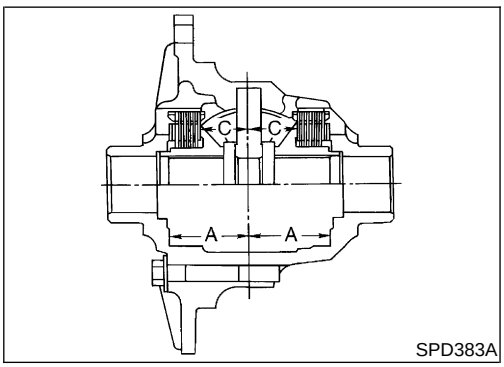
If any part has worn beyond the wear limit, and deformed or fatigued, replace it with a new one that is the same thickness as the projected portion.

Wear limit:

0.1 mm (0.004 in) or less

A − B = Wear limit mm (in)

●: Measuring points
A: Projected portion
B: Frictional surface



SPD383A

ADJUSTMENT

NGPD0038

Friction Disc and Friction Plate End Play

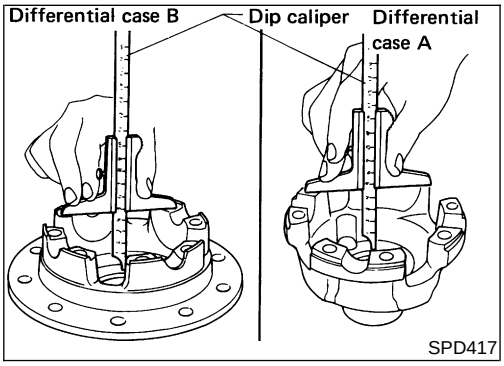
NGPD0038S01

End play of friction disc and friction plate can be calculated by using following equation and should be adjusted within following range. Adjustment can be made by selecting friction disc having two different thicknesses.

End play E:

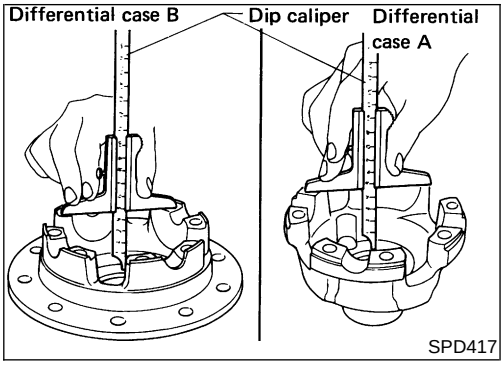
0.05 - 0.15 mm (0.0020 - 0.0059 in)

E = A − (B + C)

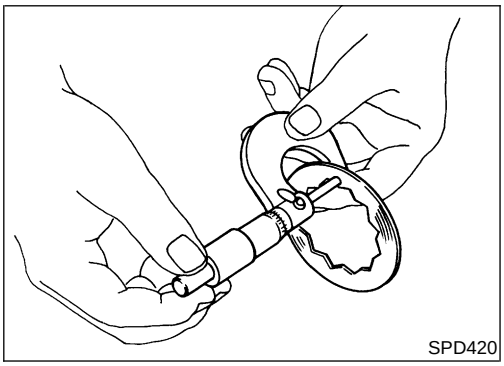


SPD417

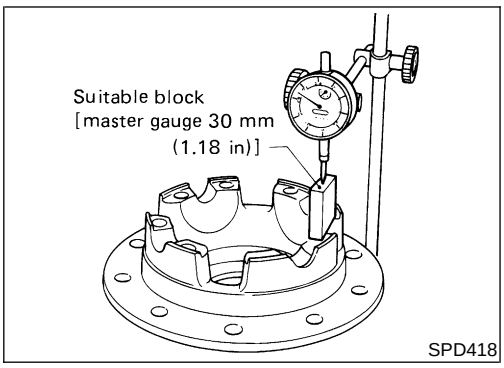
A: Length of differential case contact surface to differential case inner bottom.
B: Total thickness of friction discs, friction plates, spring disc and spring plate in differential case on one side.
C: Length of differential case contact surface to back side of side gear.



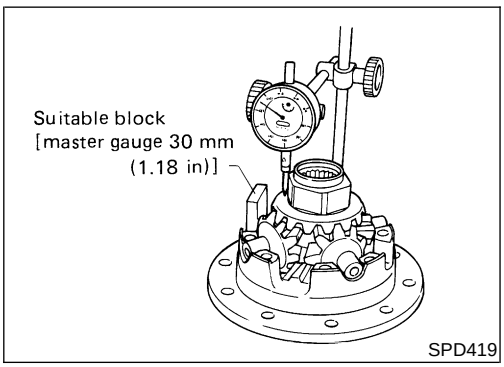
1. Measure values of "A".
   Standard length A:
   49.50 - 49.55 mm (1.9488 - 1.9508 in)



2. Measure thickness of each disc and plate.
   Total thickness "B":
   19.24 - 20.26 mm (0.7575 - 0.7976 in)
   No. of discs and plates (One side):
   Friction disc 5
   Friction plate 6
   Spring plate 2

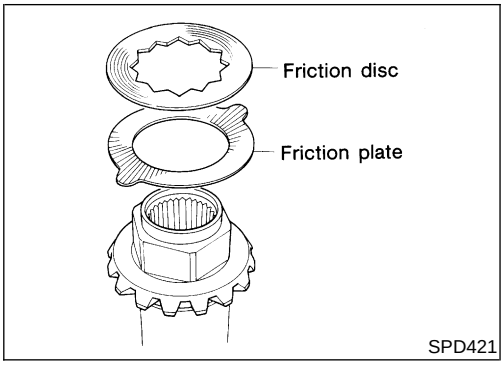


3. Measure values of "C".
   a. Attach a dial indicator to the base plate.
   b. Place differential case B on the base plate, and install a master gauge on case B.
   Then adjust the dial indicator scale to zero with its tip on the master gauge.



   c. Install pinion mate gears, side gears and pinion mate shaft in differential case B.
   d. Set dial indicator's tip on the side gear, and read the indication.
   Example:
   E = A − D = A − (B + C) = 0.05 to 0.15 mm
   A = 49.52 mm
   B = 19.45 mm
   C = 29.7 mm
   D = B + C
   49.15 (D) = 19.45 (B) + 29.7 (C)
   E = A − D
   0.37 (E) = 49.52 (A) − 49.15 (D)

From the above equation, end play of 0.37 mm exceeds the specified range of 0.05 to 0.15 mm.
Select suitable discs and plates to adjust correctly.



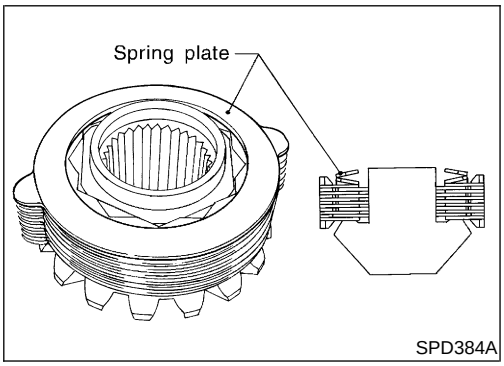
ASSEMBLY

NGPD0039

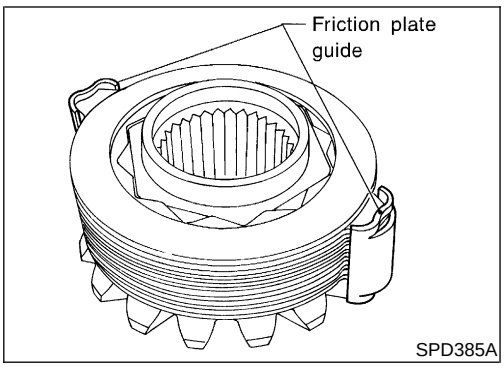
Prior to assembling discs and plates, properly lubricate them by dipping them in limited slip differential oil.

1. Alternately position specified number of friction plates and friction discs on rear of side gear.

Always position a friction plate first on rear of side gear.

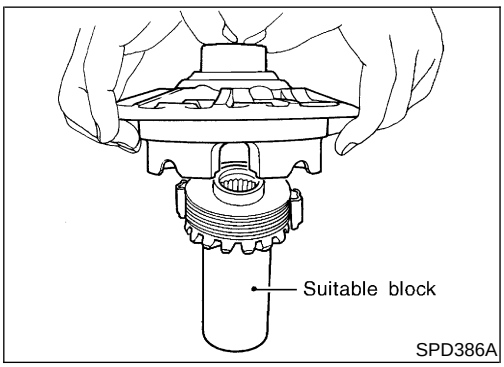


2. Install spring plate.



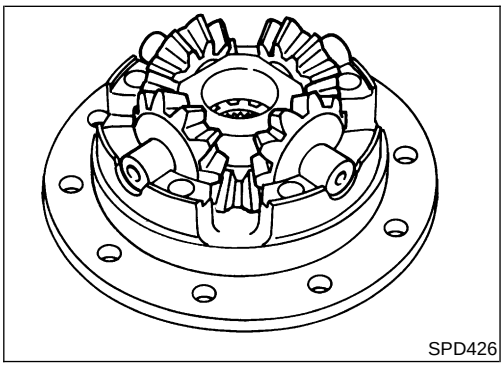
3. Install friction plate guides.

Correctly align the raised portions of friction plates, and apply grease to inner surfaces of friction plate guides to prevent them from falling.

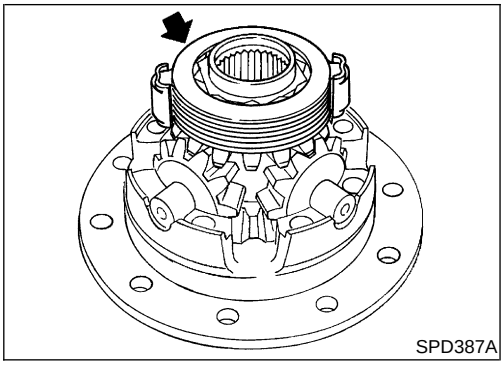


4. Install differential case B over side gear, discs, plates and friction plate guide assembly.

- **Install differential case B while supporting friction plate guides with your middle finger inserted through oil hole in differential case.**
- **Be careful not to detach spring disc from the hexagonal part of the side gear.**

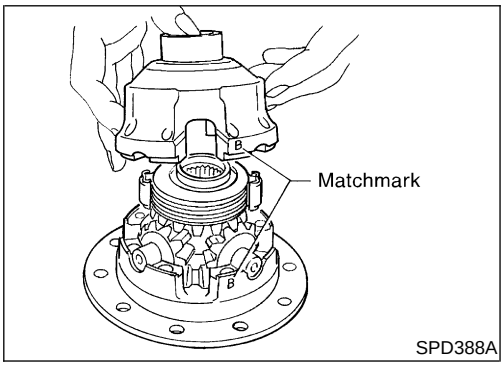


5. Install pinion mate gears and pinion mate thrust washers on pinion mate shaft, then install pinion mate shaft in differential case B.


SPD387A

6. Install side gear to pinion mate gears.
7. Install each disc and plate.

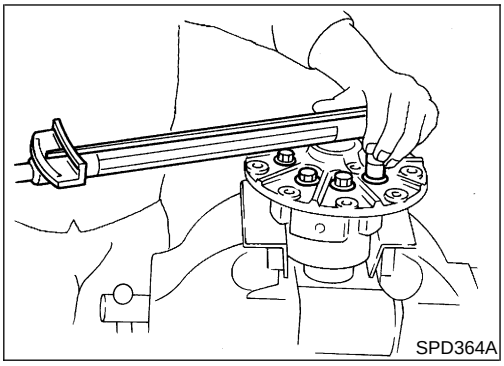
Use same procedures as outlined in steps 1 through 4 above.



SPD388A

8. Install differential case A.

Position differential cases A and B by correctly aligning marks stamped on cases.


SPD364A

9. Tighten differential case couple bolts.
10. Place ring gear on differential case and tighten ring gear bolts.

Tighten bolts in a criss-cross pattern, lightly tapping bolt head with a hammer.
Then bend up lock straps to lock the bolts in place.

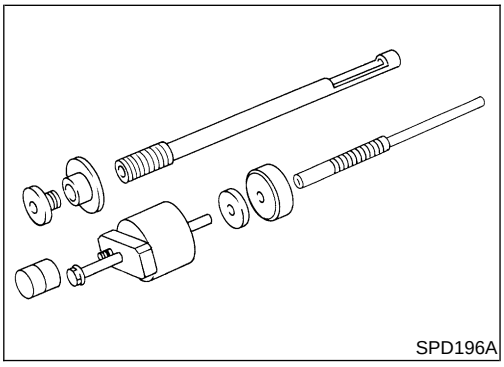
11. Install side bearing inner cone.
12. Check differential torque.

Adjustment

NGPD0040

For quiet and reliable final drive operation, the following five adjustments must be made correctly:

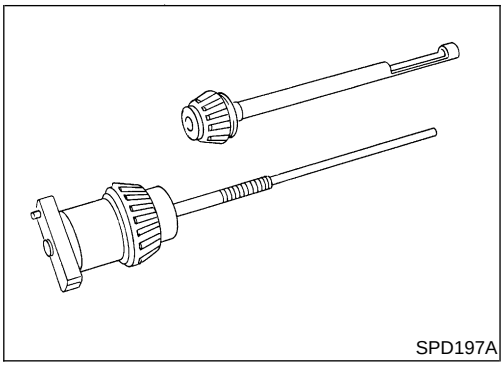
1. Side bearing preload
2. Pinion gear height
3. Side bearing preload
4. Ring gear-to-pinion backlash. Refer to SDS, PD-84.
5. Ring and pinion gear tooth contact pattern


SPD196A

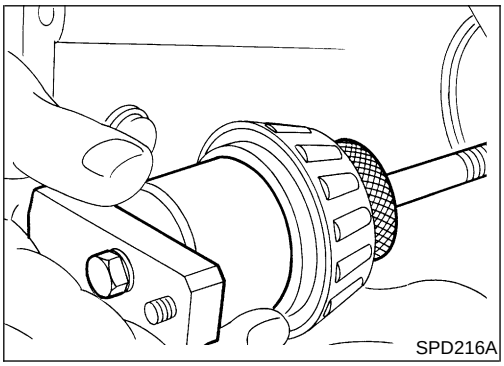
PINION GEAR HEIGHT

NGPD0040S01

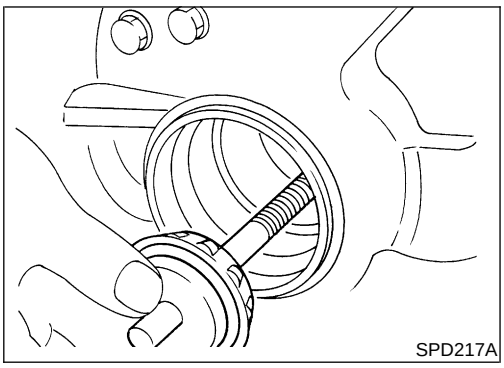
1. Make sure all parts are clean and that the bearings are well lubricated.
2. Assemble the pinion gear bearings into the pinion pre-load shim selector tool, J34309.


SPD197A

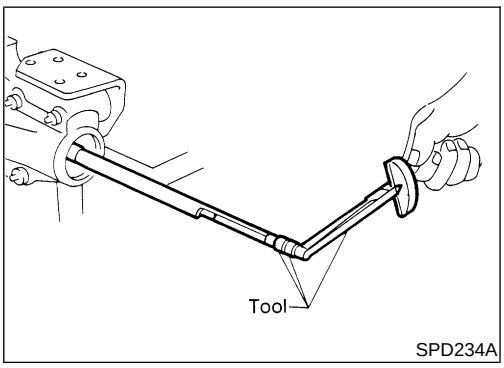
- **Rear Pinion Bearing** — the rear pinion bearing pilot, J34309-8, is used to center the rear pinion bearing only. The rear pinion bearing locking seat, J34309-4, is used to lock the bearing to the assembly.
- **Front Pinion Bearing** — make sure the J34309-3, front pinion bearing seat is secured tightly against the J34309-2 gauge anvil. Then turn the front pinion bearing pilot, J34309-5, to secure the bearing in its proper position.


SPD216A

3. Place the pinion preload shim selector tool gauge screw assembly, J34309-1, with the pinion rear bearing inner cone installed, into the final drive housing.


SPD217A

4. Install the J34309-2 gauge anvil with the front pinion bearing into the final drive housing and assemble it to the J34309-1 gauge screw. Make sure that the J34309-16 gauge plate will turn a full 360 degrees, and tighten the two sections by hand to set bearing pre-load.
5. Turn the assembly several times to seat the bearings.

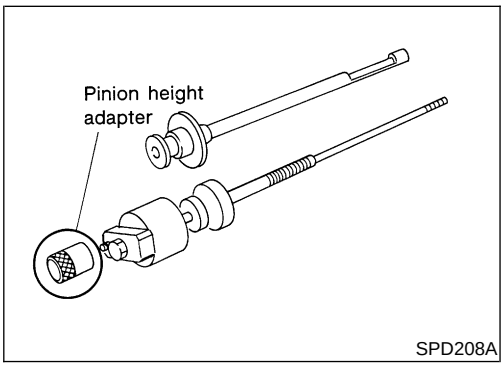


SPD234A

6. Measure the turning torque at the end of the J34309-2 gauge anvil using torque wrench J25765-A.

Turning torque specification:

0.4 - 0.9 N·m (4 - 9 kg-cm, 3.5 - 7.8 in-lb)

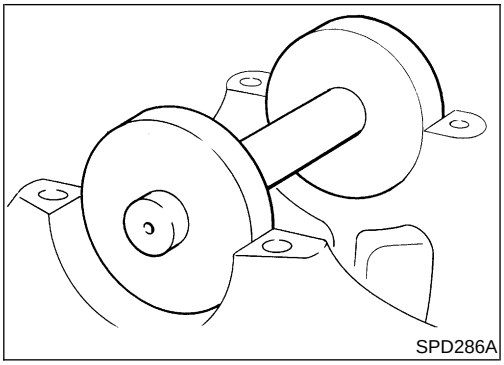


SPD208A

7. Place the J34309-12 "H233B" pinion height adapter onto the gauge plate and tighten it by hand.

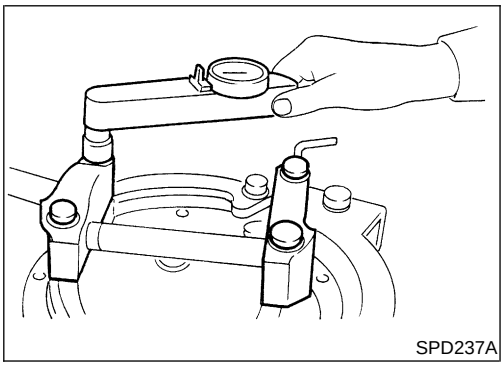
CAUTION:

Make sure all machined surfaces are clean.

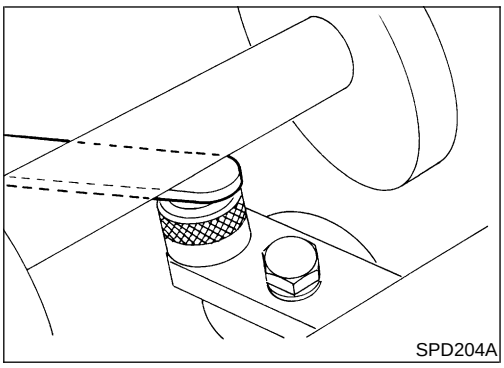

SPD286A

PINION HEIGHT ADJUSTING WASHER SELECTION

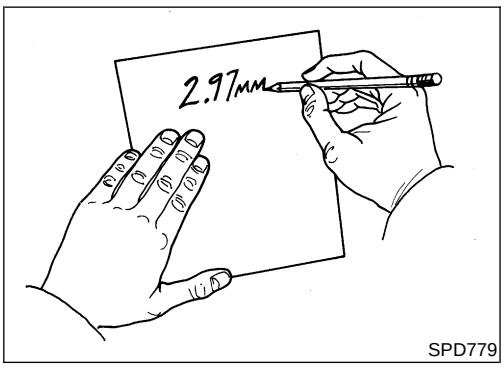
8. Position the J25269-18 side bearing discs and the arbor into the side bearing bores.


SPD237A

9. Install the bearing caps and torque the bolts.
   Specification:
   93 - 103 N·m (9.5 - 10.5 kg-m, 69 - 76 ft-lb)

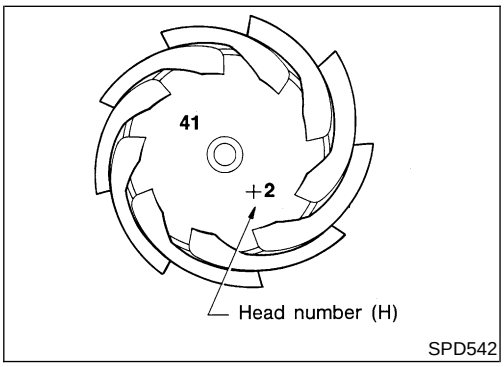

SPD204A

10. Select the correct standard pinion height adjusting washer thickness using a standard gauge of 2.5, 3.0, or 3.5 mm (0.098, 0.118, or 0.138 in) and your J34309-101 feeler gauge. Measure the distance between the J34309-12 "H233B" pinion height adapter and the arbor.



SPD779

11. Write down your exact total measurement.



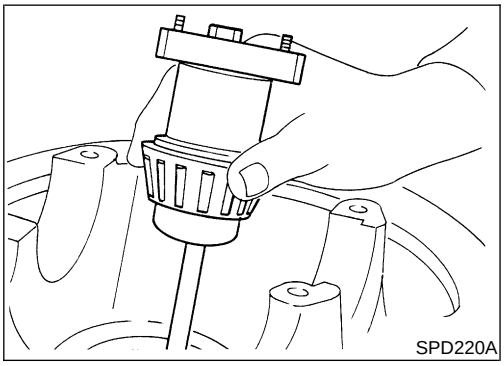
SPD542

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

There are two numbers painted on the pinion gear. The first one refers to the pinion and ring gear as a matched set and should be the same as the number on the ring gear. The second number is the "pinion head height number", and it refers to the ideal pinion height from standard for the quietest operation. Use the following chart to determine the correct pinion height washer. Refer to SDS, PD-85.

Pinion Head Height Number	Add or Remove from the Selected Standard Pinion Height 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)

13. Select the correct pinion height washer.
Drive pinion height adjustment:
Refer to SDS, PD-84

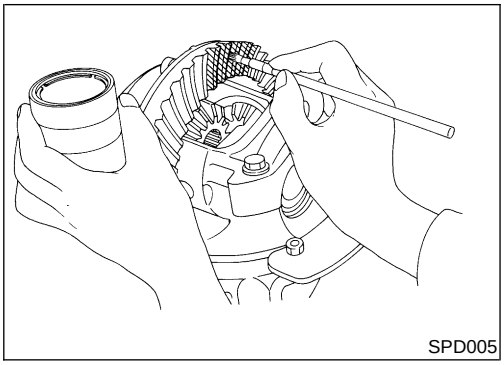

SPD220A

14. Remove the J34309 pinion preload shim selector tool from the final drive housing and disassemble to retrieve the pinion bearings.

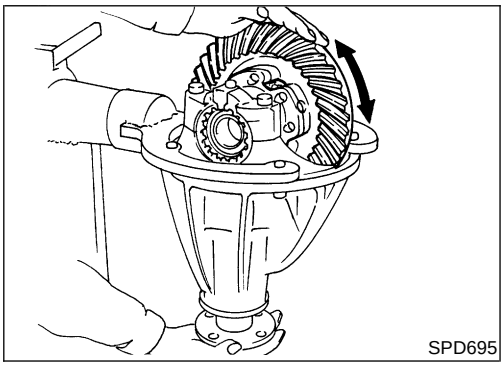
TOOTH CONTACT

NGPD0040S02

Gear tooth contact pattern check is necessary to verify correct relationship between ring gear and drive pinion.
Hypoid gear sets which are not positioned properly in relation to one another may be noisy, or have short life or both. With a pattern check, the most desirable contact for low noise level and long life can be assured.

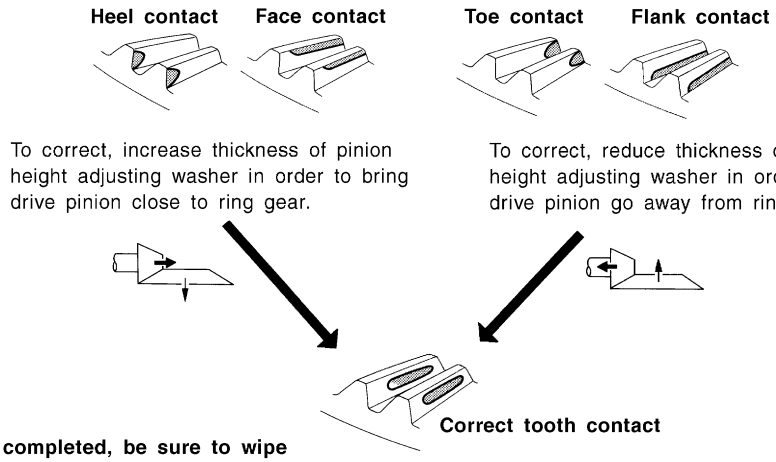

SPD005

1. Thoroughly clean ring gear and drive pinion teeth.
2. Sparingly apply a mixture of powdered ferric oxide and oil or equivalent to 3 or 4 teeth of ring gear drive side.


SPD695

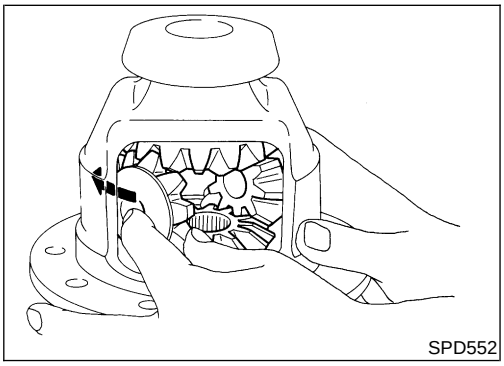
3. Hold companion flange steady by hand and rotate the ring gear in both directions.

Usually the pattern will be correct if shims are correctly calculated and the backlash is correct. However, in rare cases, trial and error processes may be employed to obtain a correct pattern. The tooth pattern is the best indication of how well a differential has been set up.



When adjustment is completed, be sure to wipe off completely the ferric oxide and oil or their equivalent.

SPD007-B


SPD552

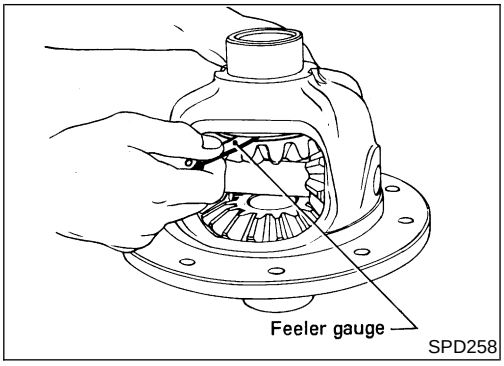
Assembly

NGPD0041

DIFFERENTIAL CASE

NGPD0041S01

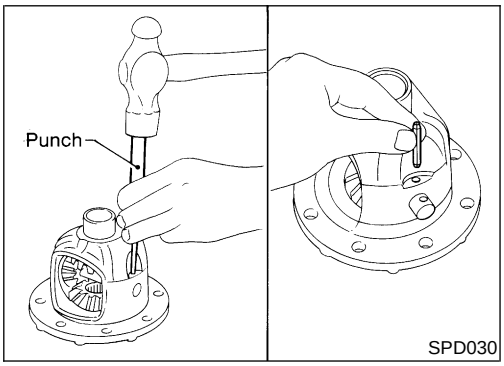
1. Install side gears, pinion mate gears and thrust washers into differential case.
   The clearance can be adjusted with side gear thrust washer. Refer to SDS, PD-84



2. Fit pinion mate shaft to differential case so that it meets lock pin holes.
3. Adjust backlash between side gear and pinion mate gear by selecting side gear thrust washer.

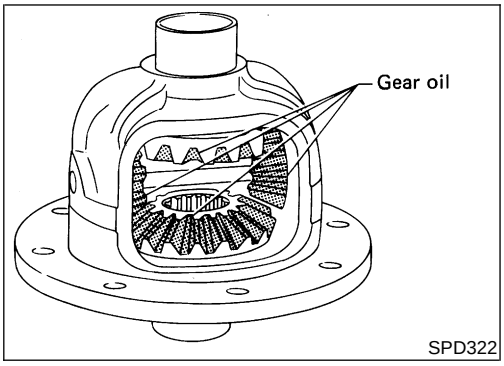
Backlash between side gear and pinion mate gear (Clearance between side gear thrust washer and differential case:

0.10 – 0.20 mm (0.0039 – 0.0079 in)



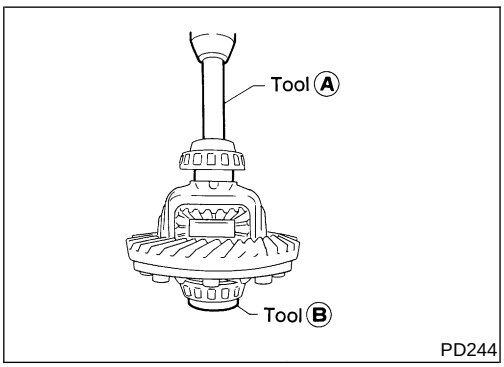
4. Install pinion mate shaft lock pin with a punch.

Make sure lock pin is flush with case.



5. Apply gear oil to gear tooth surfaces and thrust surfaces and check to see that they turn properly.
6. Install differential case assembly on ring gear.

Tighten bolts in a criss-cross pattern, lightly tapping bolt head with a hammer.



7. Press-fit side bearing inner cones on differential case with Tool.

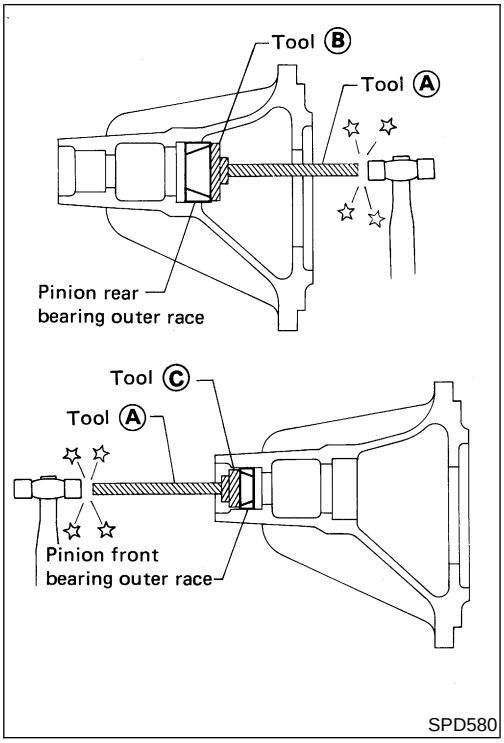
Tool number:

A ST33190000 (J25523)

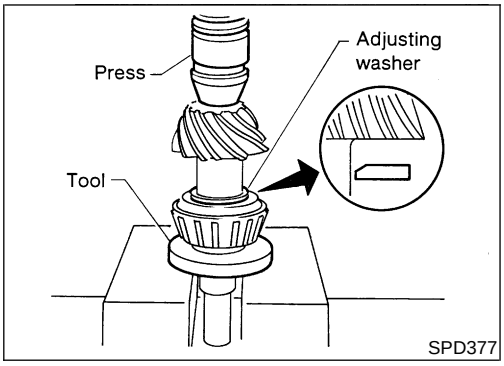
B ST33081000 (—)

DIFFERENTIAL CARRIER

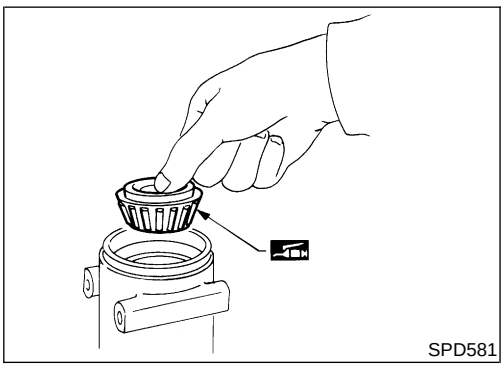
NGPD0041S02



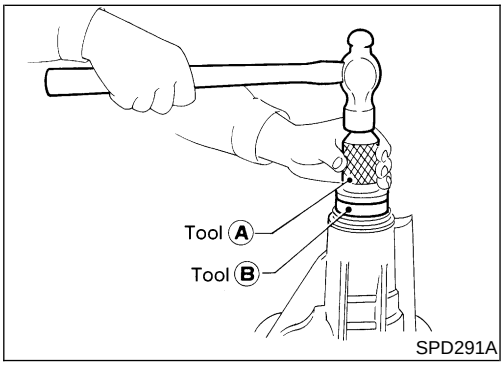
1. Press-fit front and rear bearing outer races with Tools.
   Tool number:
   A ST30611000 (J25742-1)
   B ST30621000 (J25742-5)
   C ST30613000 (J25742-3)



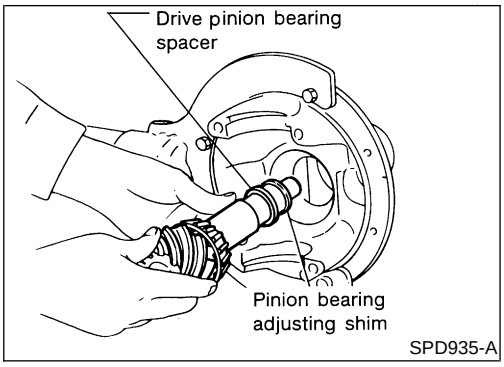
2. Select drive pinion height adjusting washer. Refer to "Adjustment", PD-75.
3. Install drive pinion adjusting washer in drive pinion, and press-fit pinion rear bearing inner cone in it, with press and Tool.
   Tool number:
   ST30901000 (J26010-01)



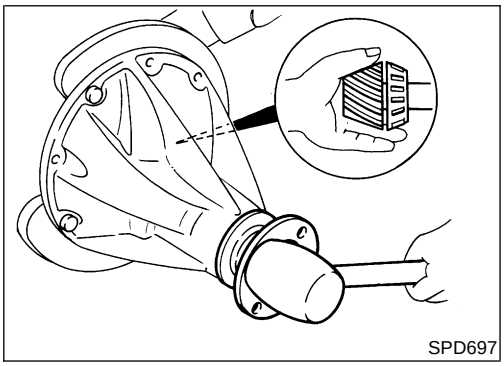
4. Place pinion front bearing inner cone in gear carrier.



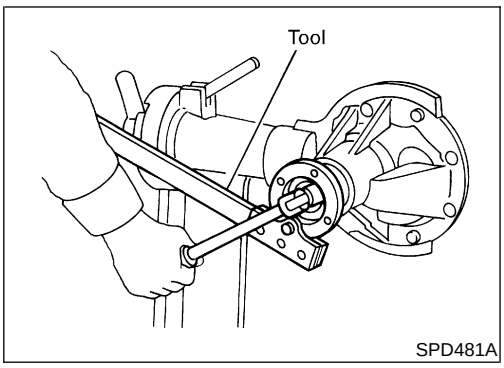
5. Apply multi-purpose grease to cavity at sealing lips of oil seal. Install front oil seal.
   Tool number:
   A ST30720000 (J25405)
   B KV38102510 (—)



6. Install drive pinion bearing spacer, pinion bearing adjusting shim and drive pinion in gear carrier.



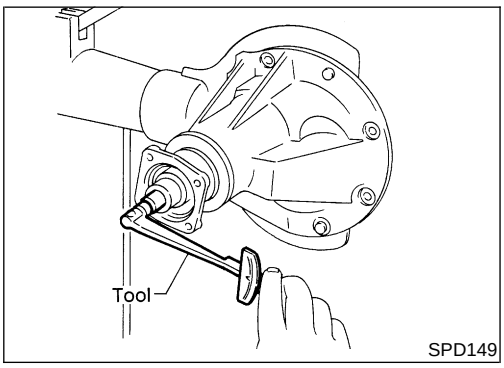
7. Insert companion flange into drive pinion by tapping the companion flange with a soft hammer.



8. Tighten pinion nut to the specified torque.

The threaded portion of drive pinion and pinion nut should be free from oil or grease.

Tool number: KV38108300 (J44195)



9. Turn drive pinion in both directions several times, and measure pinion bearing preload.

Tool number: ST3127S000 (J25765-A)

Pinion bearing preload (With front oil seal):

1.4 - 1.7 N·m (14 - 17 kg-cm, 12 - 15 in-lb)

Pinion bearing preload (Without front oil seal):

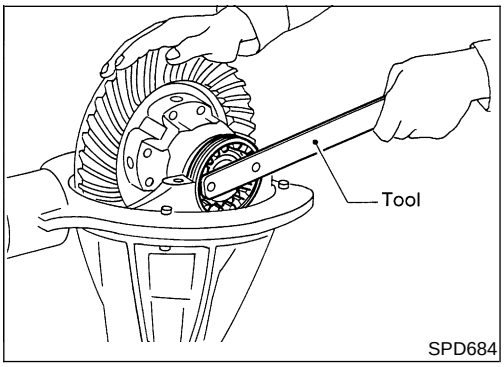
1.2 - 1.5 N·m (12 - 15 kg-cm, 10 - 13 in-lb)

If preload is out of specification, adjust the thickness of spacer and shim combination by replacing shim and spacer with thinner one.

- Start from the combination of thickest spacer and shim.
- Combine each spacer and shim thickness one by one until the correct specification are achieved.

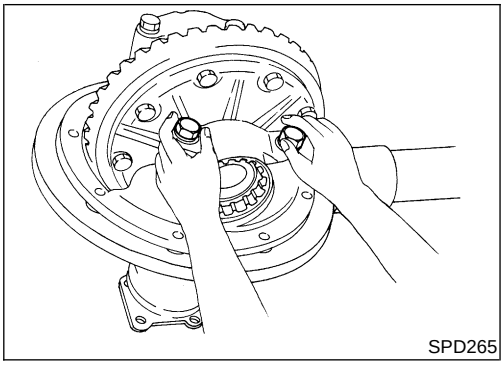
Drive pinion bearing preload adjusting spacer and shim:

Refer to SDS, PD-86.

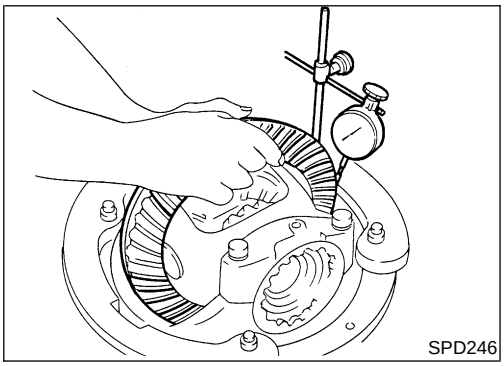


10. Install differential case assembly with side bearing outer races into gear carrier.
11. Position side bearing adjusters on gear carrier with threads properly engaged; screw in adjusters lightly at this stage of assembly.

Tool number: ST32580000 (J34312)

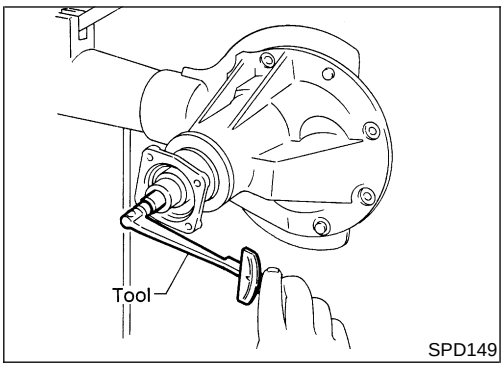

SPD265

12. Align mark on bearing cap with that on gear carrier and install bearing cap on gear carrier.
- Do not tighten at this point. This allows further tightening of side bearing adjusters.


SPD246

13. Tighten both right and left side bearing adjusters alternately and measure ring gear backlash and total preload at the same time. Adjust right and left side bearing adjusters by tightening them alternately so that proper ring gear backlash and total preload can be obtained.

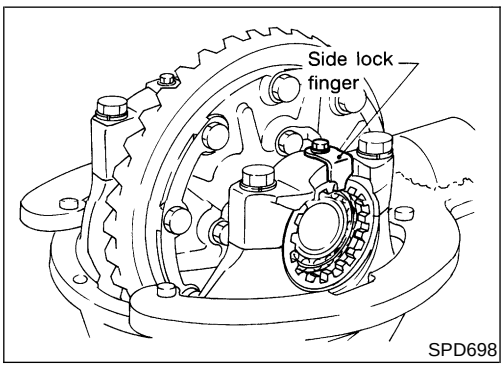
Ring gear-to-drive pinion backlash:
0.13 - 0.18 mm (0.0051 - 0.0071 in)



SPD149

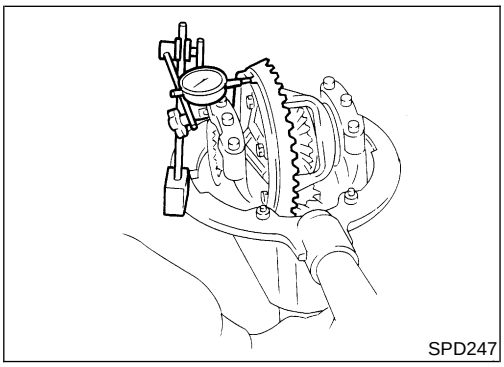
- **When checking preload, turn drive pinion in both directions several times to set bearing rollers.**

Tool number: ST3127S000 (J25765-A)
Total preload:
1.7 - 2.5 N·m (17 - 25 kg-cm, 15 - 22 in-lb)



SPD698

14. Tighten side bearing cap bolts.
15. Install side lock finger in place to prevent rotation during operation.


SPD247

16. Check runout of ring gear with a dial indicator.

Runout limit: 0.08 mm (0.0031 in)

- If backlash varies excessively in different places, the variance may have resulted from foreign matter caught between the ring gear and the differential case.
- If the backlash varies greatly when the runout of the ring gear is within a specified range, the hypoid gear set or differential case should be replaced.

17. Check tooth contact. Refer to "TOOTH CONTACT", PD-78.

Service Data and Specifications (SDS)

H233B

General Specifications

2WD & 4WD Model

=NGPD0042

NGPD0042S02

Engine	VG33E			
Vehicle grade	XE			SE
Rear final drive	Standard	Optional		Standard
	235/70R15	265/70R15	235/70R15	265/70R15
	H233B			
	2-pinion	LSD		LSD
Gear ratio	4.363	4.636	4.363	4.636
Number of teeth (Ring gear/drive pinion)	48/11	51/11	48/11	51/11
Oil capacity (Approx.) ℓ (US pt, Imp pt)	2.8 (5-7/8, 4-7/8)			

Ring Gear Runout

NGPD0043

Ring gear runout limit mm (in)	0.08 (0.0031)

Side Gear Adjustment

NGPD0044

Side gear backlash (Clearance between side gear and differential case) mm (in)		0.10 - 0.20 (0.0039 - 0.0079)
Available side gear thrust washers	Thickness mm (in)	Part number*
	1.75 (0.0689) 1.80 (0.0709) 1.85 (0.0728)	38424-T5000 38424-T5001 38424-T5002

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

Differential Torque Adjustment (LSD Models)

NGPD0045

Differential torque N·m (kg-m, ft-lb)		187 - 245 (19 - 25, 138 - 180)
Number of discs and plates (One side)	Friction disc	5
	Friction plate	6
	Spring plate	2
Wear limit of plate and disc mm (in)		0.1 (0.004)
Allowable warpage of friction disc and plate mm (in)		0.08 (0.0031)

Available discs and plates	Plate name	Thickness mm (in)	Part number*
	Friction disc	1.48 - 1.52 (0.0583 - 0.0598) 1.38 - 1.42 (0.0543 - 0.0559) 1.58 - 1.62 (0.0622 - 0.0638)	38433-C6002 (Standard type) 38433-C6004 (Adjusting type) 38433-C6003 (Adjusting type)
	Friction plate	1.48 - 1.52 (0.0583 - 0.0598)	38432-C6001
	Spring plate	1.48 - 1.52 (0.0583 - 0.0598)	38435-S9200

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

Total Preload Adjustment

NGPD0046

Total preload N·m (kg-cm, in-lb)	1.7 - 2.5 (17 - 25, 15 - 22)
Ring gear backlash mm (in)	0.13 - 0.18 (0.0051 - 0.0071)
Side bearing adjusting method	Side adjuster

Drive Pinion Height Adjustment

NGPD0047

	Thickness mm (in)	Part number*
Available pinion height adjust washers	2.58 (0.1016)	38151-01J00
	2.61 (0.1028)	38151-01J01
	2.64 (0.1039)	38151-01J02
	2.67 (0.1051)	38151-01J03
	2.70 (0.1063)	38151-01J04
	2.73 (0.1075)	38151-01J05
	2.76 (0.1087)	38151-01J06
	2.79 (0.1098)	38151-01J07
	2.82 (0.1110)	38151-01J08
	2.85 (0.1122)	38151-01J09
	2.88 (0.1134)	38151-01J10
	2.91 (0.1146)	38151-01J11
	2.94 (0.1157)	38151-01J12
	2.97 (0.1169)	38151-01J13
	3.00 (0.1181)	38151-01J14
	3.03 (0.1193)	38151-01J15
	3.06 (0.1205)	38151-01J16
	3.09 (0.1217)	38151-01J17
	3.12 (0.1228)	38151-01J18
	3.15 (0.1240)	38151-01J19
	3.18 (0.1252)	38151-01J60
	3.21 (0.1264)	38151-01J61
	3.24 (0.1276)	38151-01J62
	3.27 (0.1287)	38151-01J63
	3.30 (0.1299)	38151-01J64
	3.33 (0.1311)	38151-01J65
	3.36 (0.1323)	38151-01J66
	3.39 (0.1335)	38151-01J67
	3.42 (0.1346)	38151-01J68
	3.45 (0.1358)	38151-01J69
	3.48 (0.1370)	38151-01J70
	3.51 (0.1382)	38151-01J71
	3.54 (0.1394)	38151-01J72
	3.57 (0.1406)	38151-01J73
	3.60 (0.1417)	38151-01J74
	3.63 (0.1429)	38151-01J75
	3.66 (0.1441)	38151-01J76

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

Drive Pinion Preload Adjustment

NGPD0048

Drive pinion bearing preload adjusting method		Adjusting shim and spacer
Drive pinion preload without front oil seal N·m (kg-cm, in-lb)		1.4 - 1.7 (14 - 17, 12 - 15)
Available front drive pinion bearing adjusting shims	Thickness mm (in)	Part number*
	2.31 (0.0909)	38125-82100
	2.33 (0.0917)	38126-82100
	2.35 (0.0925)	38127-82100
	2.37 (0.0933)	38128-82100
	2.39 (0.0941)	38129-82100
	2.41 (0.0949)	38130-82100
	2.43 (0.0957)	38131-82100
	2.45 (0.0965)	38132-82100
	2.47 (0.0972)	38133-82100
	2.49 (0.0980)	38134-82100
	2.51 (0.0988)	38135-82100
	2.53 (0.0996)	38136-82100
	2.55 (0.1004)	38137-82100
	2.57 (0.1012)	38138-82100
	2.59 (0.1020)	38139-82100
Available drive pinion bearing adjusting spacers	Thickness mm (in)	Part number*
	4.50 (0.1772)	38165-76000
	4.75 (0.1870)	38166-76000
	5.00 (0.1969)	38167-76000
	5.25 (0.2067)	38166-01J00
	5.50 (0.2165)	38166-01J10

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