PROPELLER SHAFT & DIFFERENTIAL CARRIER

SECTION PD

CONTENTS

PREPARATION 2
Special Service Tools 2
Commercial Service Tool 4
NOISE, VIBRATION AND HARSHNESS (NVH) TROUBLESHOOTING 5
NVH Troubleshooting Chart 5

PROPELLER SHAFT

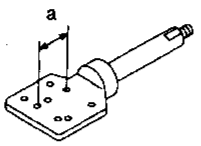
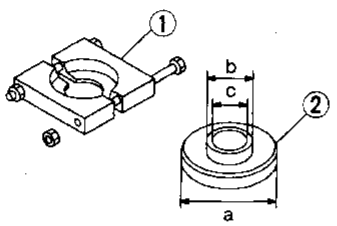
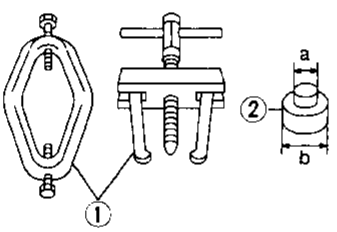
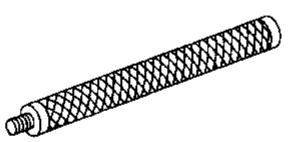
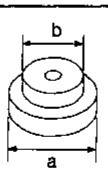
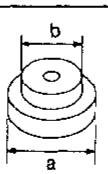
PROPELLER SHAFT 6
On-vehicle Service 7
Removal 7
Installation 7
Inspection 8
Disassembly 9
Assembly 9

FINAL DRIVE

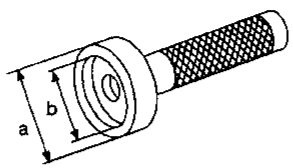
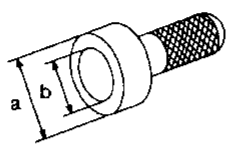
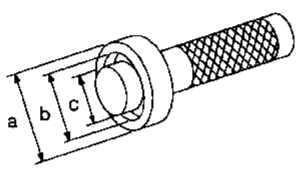
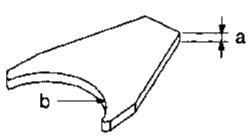
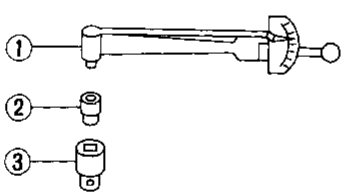
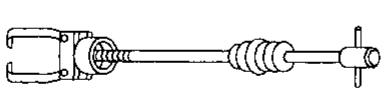
ON-VEHICLE SERVICE/REMOVAL AND INSTALLATION 10
Front Oil Seal Replacement 10
Side Oil Seal Replacement 10
Removal 11
Installation 12
FINAL DRIVE 13
DISASSEMBLY 15
Pre-inspection 15
Differential Carrier 15
Differential Case 17
INSPECTION 19
Ring Gear and Drive Pinion 19
Bearing 19
Differential Case Assembly 19
ADJUSTMENT 20
Side Bearing Preload 20
Pinion Gear Height and Pinion Bearing Preload 21
Tooth Contact 26
ASSEMBLY 27
Differential Case 27
Differential Carrier 29
SERVICE DATA AND SPECIFICATIONS (SDS) 33
Propeller Shaft 33
Final Drive 33

Special Service Tools

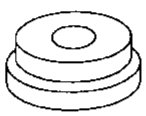
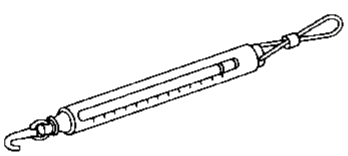
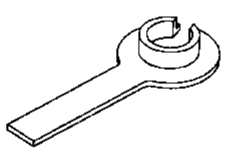
The actual shapes of Kent-Moore tools may differ from those of special service tools illustrated here.

Tool number (Kent-Moore No.) Tool name	Description	
KV38100800 (J25604-01) Differential attachment	 NT119	Mounting final drive (To use, make a new hole.) **a: 152 mm (5.98 in)**
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 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) Equivalent tool (J26010-01) 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.**
ST30611000 (J25742-1) Drift	 NT090	Installing pinion rear bearing outer race
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.**
ST30621000 (J25742-2) Drift	 NT073	Installing pinion rear bearing outer race **a: 79 mm (3.11 in) dia.** **b: 59 mm (2.32 in) dia.**

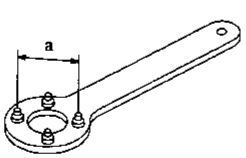
Special Service Tools (Cont'd)

Tool number (Kent-Moore No.) Tool name	Description	
KV38100200 (J26233) Gear carrier side oil seal drift	 NT367	Installing side oil seal **a: 65 mm (2.56 in) dia.** **b: 49 mm (1.93 in) dia.**
KV38100500 (—) 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.**
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.**
KV38100600 (J25267) Side bearing spacer drift	 NT528	Installing side bearing spacer **a: 8 mm (0.31 in)** **b: R42.5 mm (1.673 in)**
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
HT72400000 (—) Slide hammer	 NT125	Removing differential case assembly

Special Service Tools (Cont'd)

Tool number (Kent-Moore No.) Tool name	Description
(J34309) Differential shim selector	Adjusting bearing preload and gear height  NT134
(J25269-4) Side bearing discs (2 Req'd)	Selecting pinion height adjusting washer  NT136
(J8129) Spring gauge	Measuring carrier turning torque  NT127
KV38107900 (J39352) Side oil seal protector	Installing final drive side flange  NT129

Commercial Service Tool

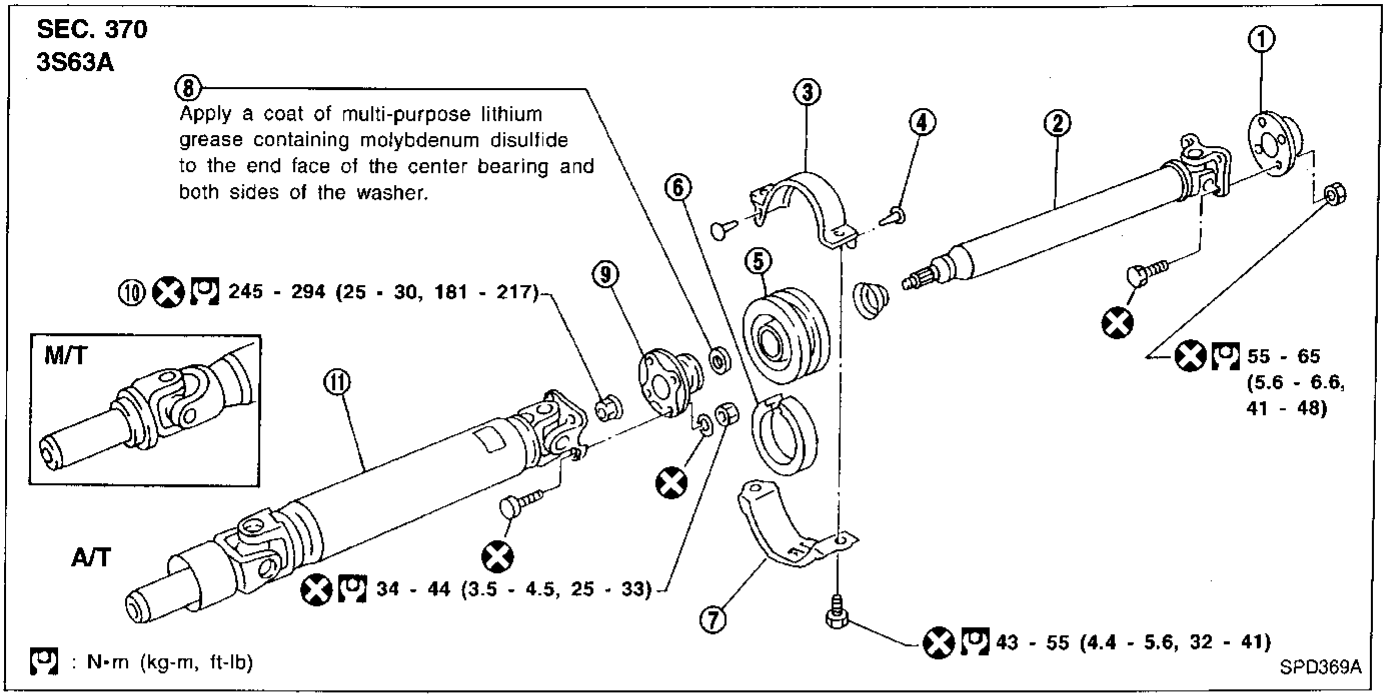
Tool name	Description
Drive pinion flange wrench	Removing and installing propeller shaft lock nut, and drive pinion lock nut.  NT355 **a: 81.25 mm (3.1988 in)**

NVH Troubleshooting Chart

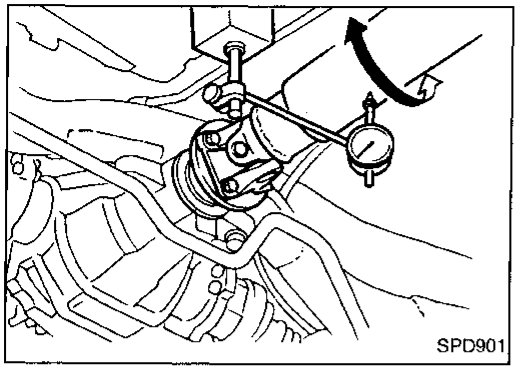
Use the chart below to help you find the cause of the symptom. If necessary, repair or replace these parts.

			Reference page	—	PD-6	—	PD-7	—	PD-7	PD-8	PD-19	PD-26	PD-19	PD-15	—	Refer to MA section.	Refer to PROPELLER SHAFT in this chart.	Refer to DIFFERENTIAL in this chart.	NVH in FA, RA section	NVH in FA section	NVH in FA section	NVH in RA section	NVH in BR section	NVH in ST section
			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	AXLE AND SUSPENSION	TIRES	ROAD WHEEL	DRIVE SHAFT	BRAKES	STEERING
Symptom	PROPELLER SHAFT	Noise		X	X	X	X	X	X	X								X	X	X	X	X	X	X
		Shake			X			X											X	X	X	X	X	X
		Vibration		X	X	X	X	X	X	X									X	X		X		X
	DIFFERENTIAL	Noise									X	X	X	X	X	X	X		X	X	X	X	X	X

X: Applicable



① Final drive companion flange
② Propeller shaft 2nd tube
③ Center bearing upper mounting bracket
④ Clip
⑤ Center bearing
⑥ Center bearing cushion
⑦ Center bearing lower mounting bracket
⑧ Washer
⑨ Companion flange
⑩ Lock nut
⑪ Propeller shaft 1st tube

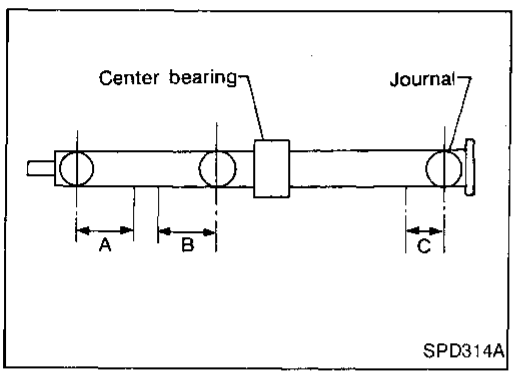

SPD901

On-vehicle Service

PROPELLER SHAFT VIBRATION

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

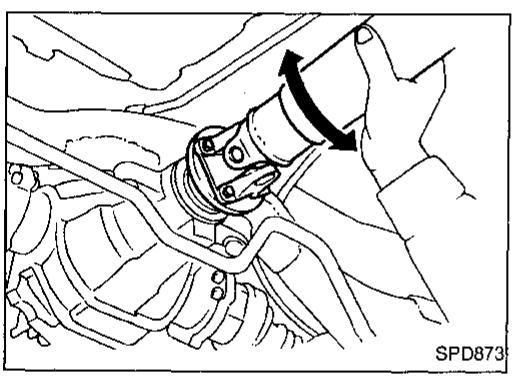
1. Raise rear wheels.
2. Measure propeller shaft runout at indicated points by rotating final drive companion flange with hands.
   Runout limit:
   0.6 mm (0.024 in)



SPD314A

Propeller shaft runout measuring points:
Distance:
"A" 155 mm (6.10 in)
"B" 165 mm (6.50 in)
"C" 185 mm (7.28 in)

3. If runout exceeds specifications, disconnect propeller shaft at final drive companion flange. Then rotate companion flange 90, 180 or 270 degrees and reconnect propeller shaft.
   Runout limit: 0.6 mm (0.024 in)
4. Check runout again. If runout still exceeds specifications, replace propeller shaft assembly.
5. Perform road test.

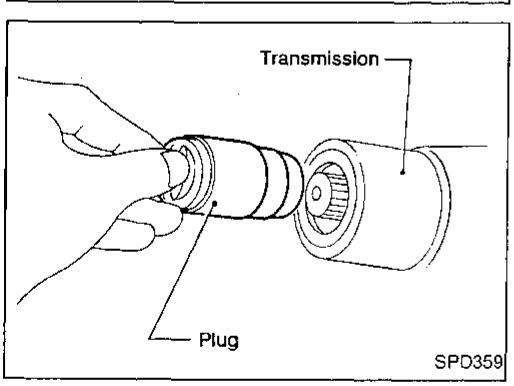

SPD873

APPEARANCE CHECKING

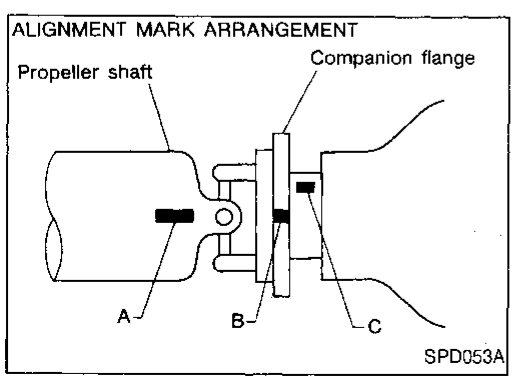
- Inspect propeller shaft tube surface for dents or cracks. If damaged, replace propeller shaft assembly.
- If center bearing is noisy or damaged, replace it.

Removal

- Draw out propeller shaft from transmission and plug up rear end of transmission rear extension housing.



SPD359

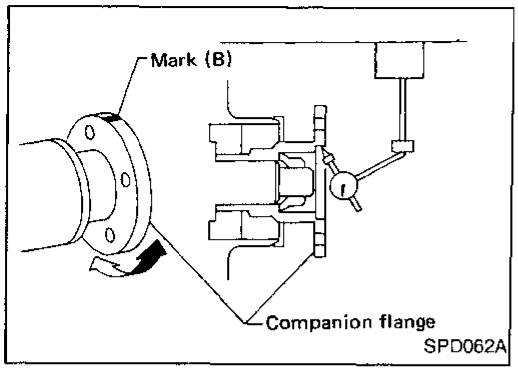


SPD053A

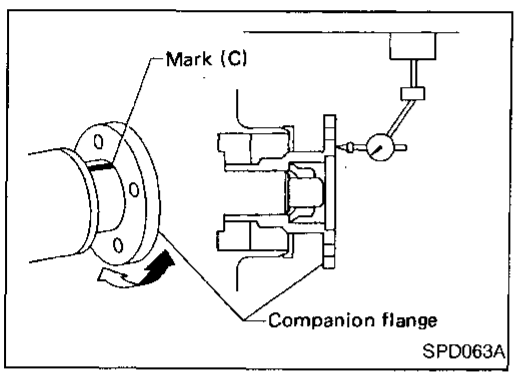
Installation

If companion flange has been removed, put new alignment marks B and C on it. Then reassemble using the following procedure. Perform step 4 when final drive and propeller shaft are separated from each other. Also perform step 4 when either of these parts is replaced with a new one.

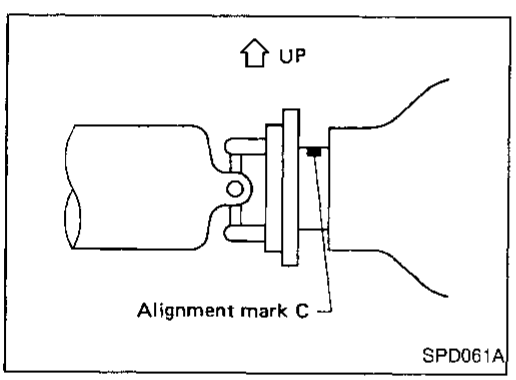
Installation (Cont'd)



1. Erase original marks B and C from companion flange with suitable solvent.
2. Mark (B)
   A. Measure companion flange vertical runout.
   B. Determine the position where maximum runout is read on dial gauge. Put mark (shown by B in figure at left) on flange perimeter corresponding to maximum runout position.

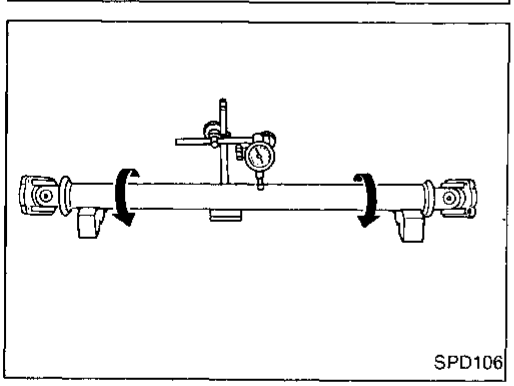


3. Mark (C)
   A. Measure companion flange surface runout.
   B. Determine the position where maximum runout is read on dial gauge. Put mark (shown by C in figure at left) on flange perimeter corresponding to maximum runout position.

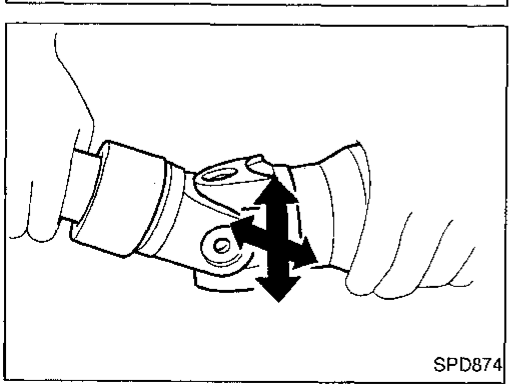


4. Position companion flange and propeller shaft using alignment marks A and B. Set the marks A and B as close to each other as possible. Temporarily attach bolts and nuts.
5. Press down propeller shaft with alignment mark C facing upward. Then tighten the lower nut to specified torque.
6. Tighten remaining nuts to specified torque.

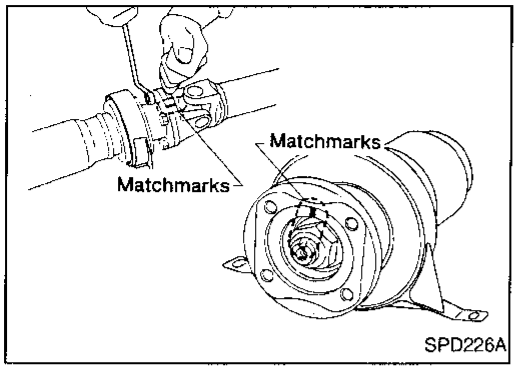
Inspection



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



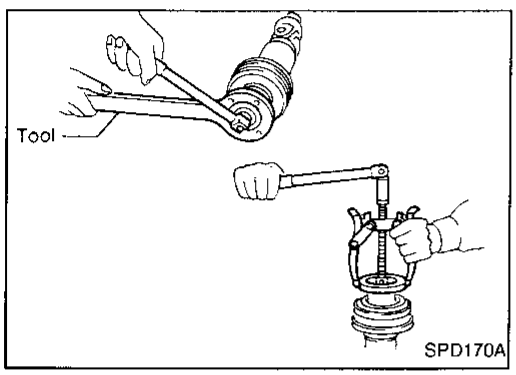
- Inspect journal axial play.
  If the play exceeds specifications, replace propeller shaft assembly.
  Journal axial play:
  0 mm (0 in)



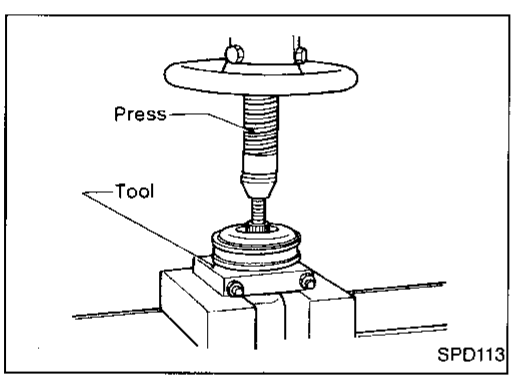
Disassembly

CENTER BEARING

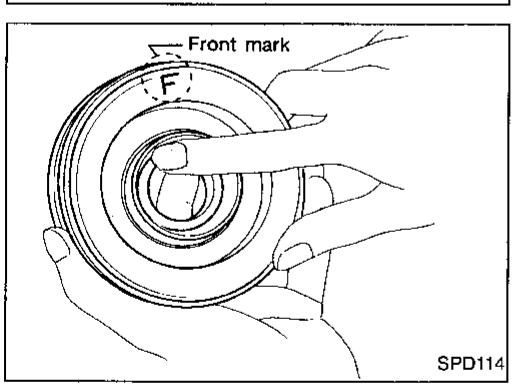
1. Put matchmarks on flanges, and separate 2nd tube from 1st tube.
2. Put matchmarks on the flange and shaft.



3. Remove locking nut with suitable tool.
4. Remove companion flange with puller.



5. Remove center bearing with Tool and press.
   Tool number:
   ST30031000 (J22912-01)

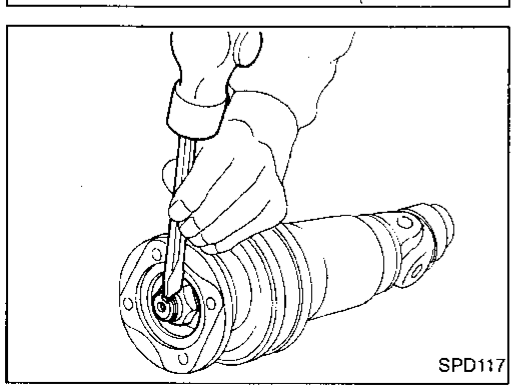


Assembly

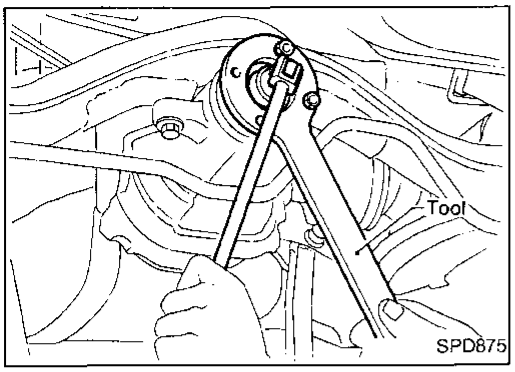
CENTER BEARING

1. When installing center bearing, position the "F" mark on center bearing toward rear of vehicle.

- **Apply a coat of grease to the end face of center bearing and both sides of washer.**
  Use multi-purpose lithium grease that contains molybdenum disulfide.

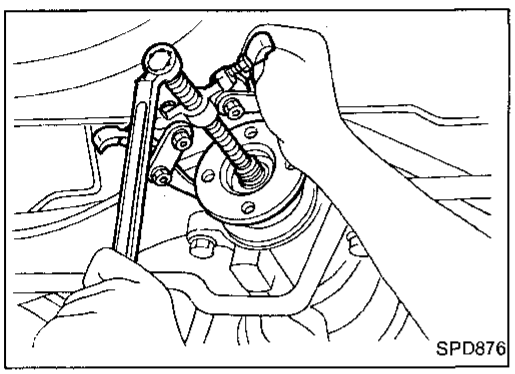


2. Stake the nut. Always use new one.
3. Align matchmarks when assembling tubes.

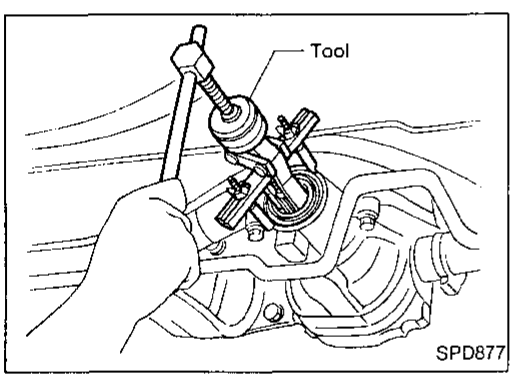


Front Oil Seal Replacement

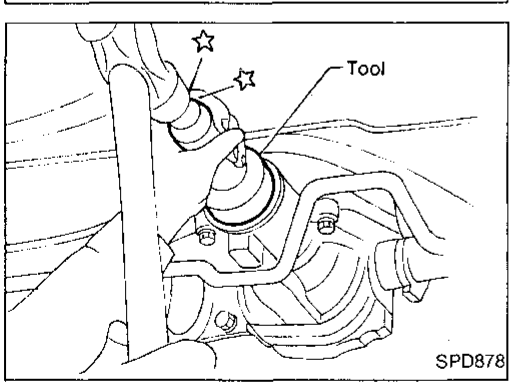
1. Remove propeller shaft.
2. Loosen drive pinion nut with suitable tool.



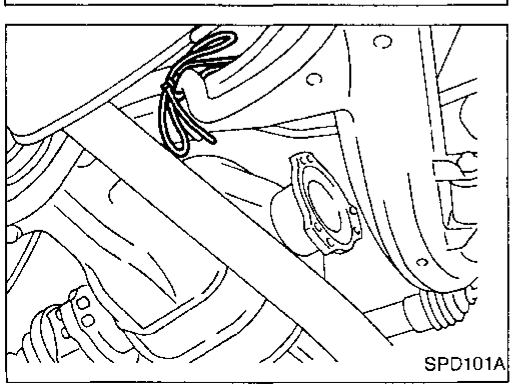
3. Remove companion flange.



4. Remove front oil seal.



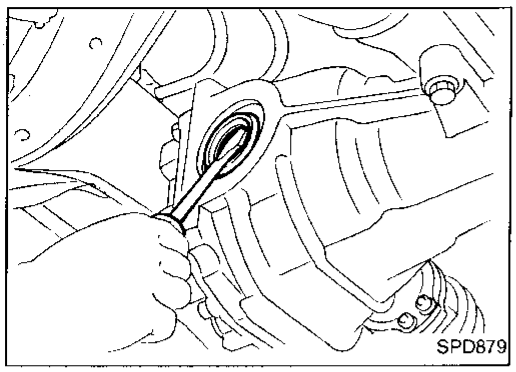
5. Apply multi-purpose grease to sealing lips of oil seal. Press front oil seal into carrier.
6. Install companion flange and drive pinion nut.
7. Install propeller shaft.



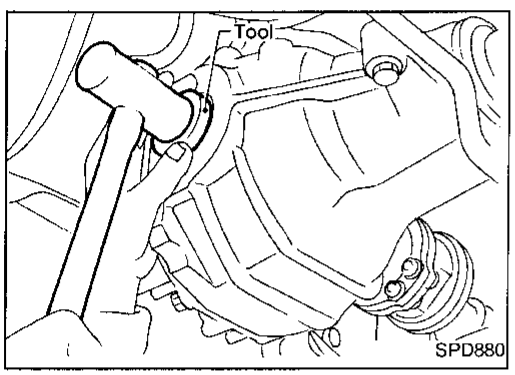
Side Oil Seal Replacement

1. Disconnect final drive side flange and drive shaft flange and suspend drive shaft flange with wire.
2. Remove final drive side flange.

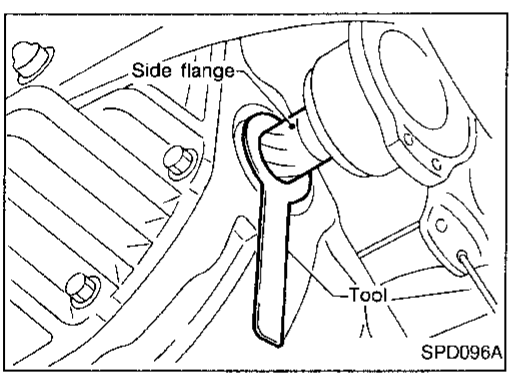
Side Oil Seal Replacement (Cont'd)



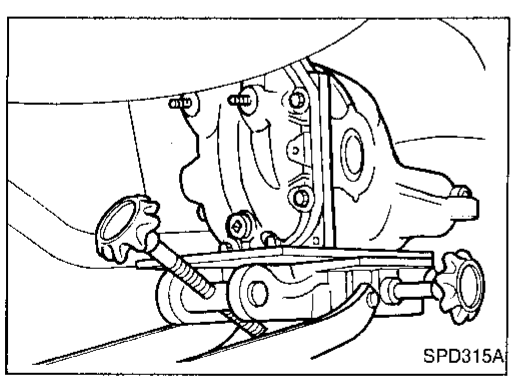
3. Remove oil seal.



4. Apply multi-purpose grease to sealing lips of oil seal. Press-fit oil seal into carrier with Tool.
   Tool number:
   KV38100200 (J26233)



5. Install final drive side flange.
   Use Tool to prevent side oil seal from being damaged by spline portion of side flange.
   Tool number:
   KV38107900 (J39352)
6. Install drive shaft.



Removal

CAUTION:
Before removing the final drive assembly, disconnect the ABS sensor from the assembly. Then move it away from the final drive assembly. Failure to do so may result in damage to the sensor wires and the sensor becoming inoperative.

1. Remove propeller shaft.

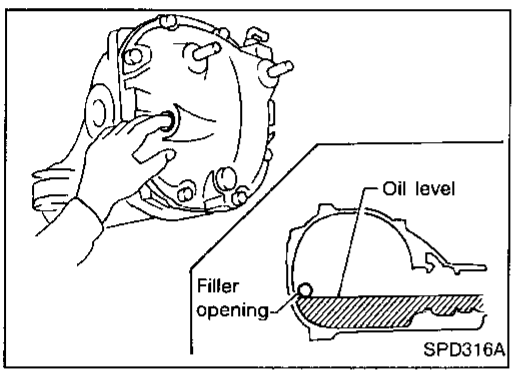
Plug up rear end of transmission rear extension housing.

2. Remove drive shafts.
   Refer to "Drive Shaft" of "REAR AXLE" in RA section.
3. Remove nuts securing final drive rear cove to suspension member.
4. Support weight of final drive using jack.
5. Remove final drive mounting member from front of final drive.
6. Move final drive forward together with jack. Remove rear cover stud bolts from suspension member.
7. Lower final drive using jack. Remove jack from rear of vehicle.

Removal (Cont'd)

CAUTION:

- **Be careful not to damage spline, sleeve yoke and front oil seal, when removing propeller shaft.**
- **After removal, support suspension member on a stand to prevent its insulators from being twisted or damaged.**

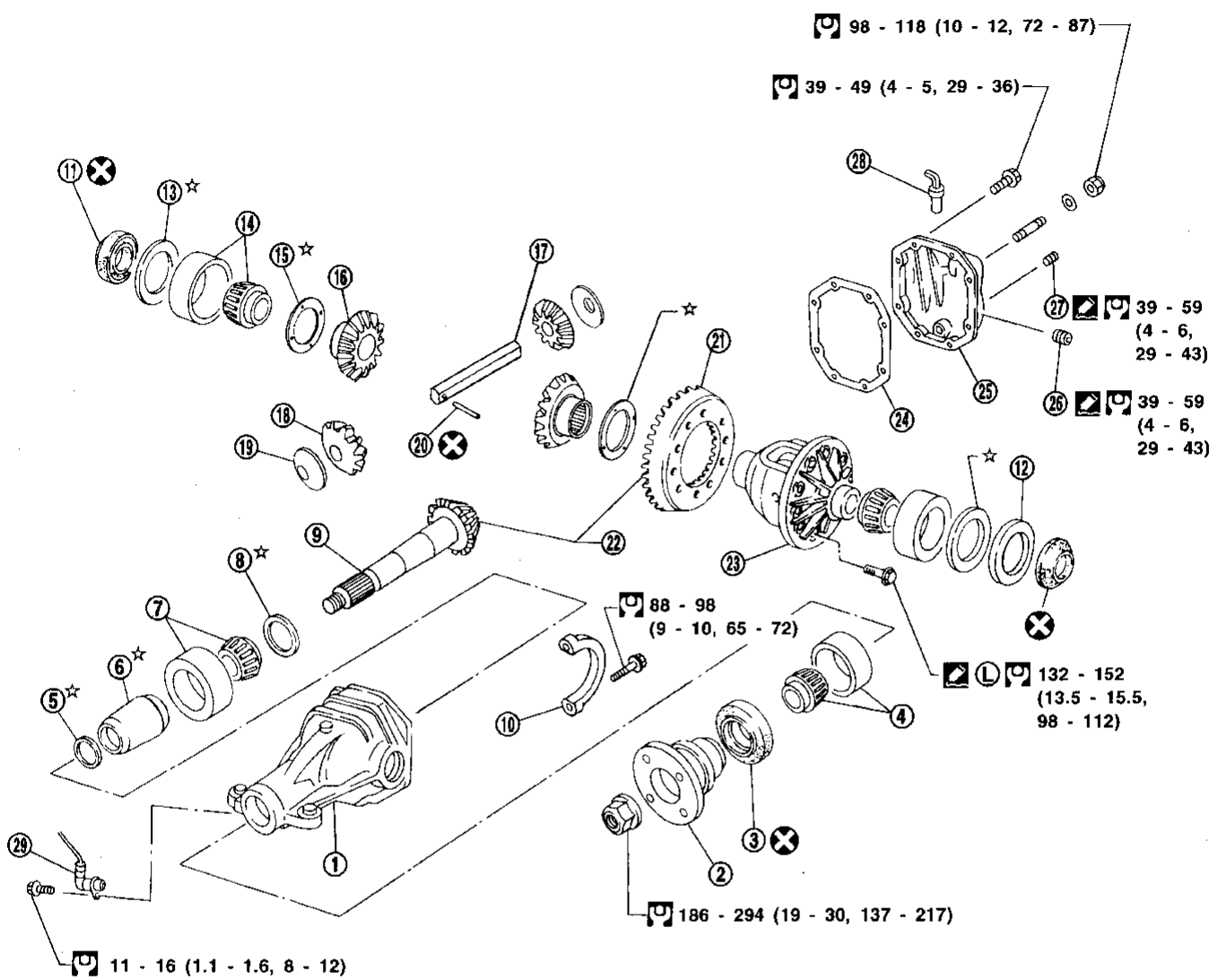


Installation

- Fill final drive with recommended gear oil.

R200

SEC. 380



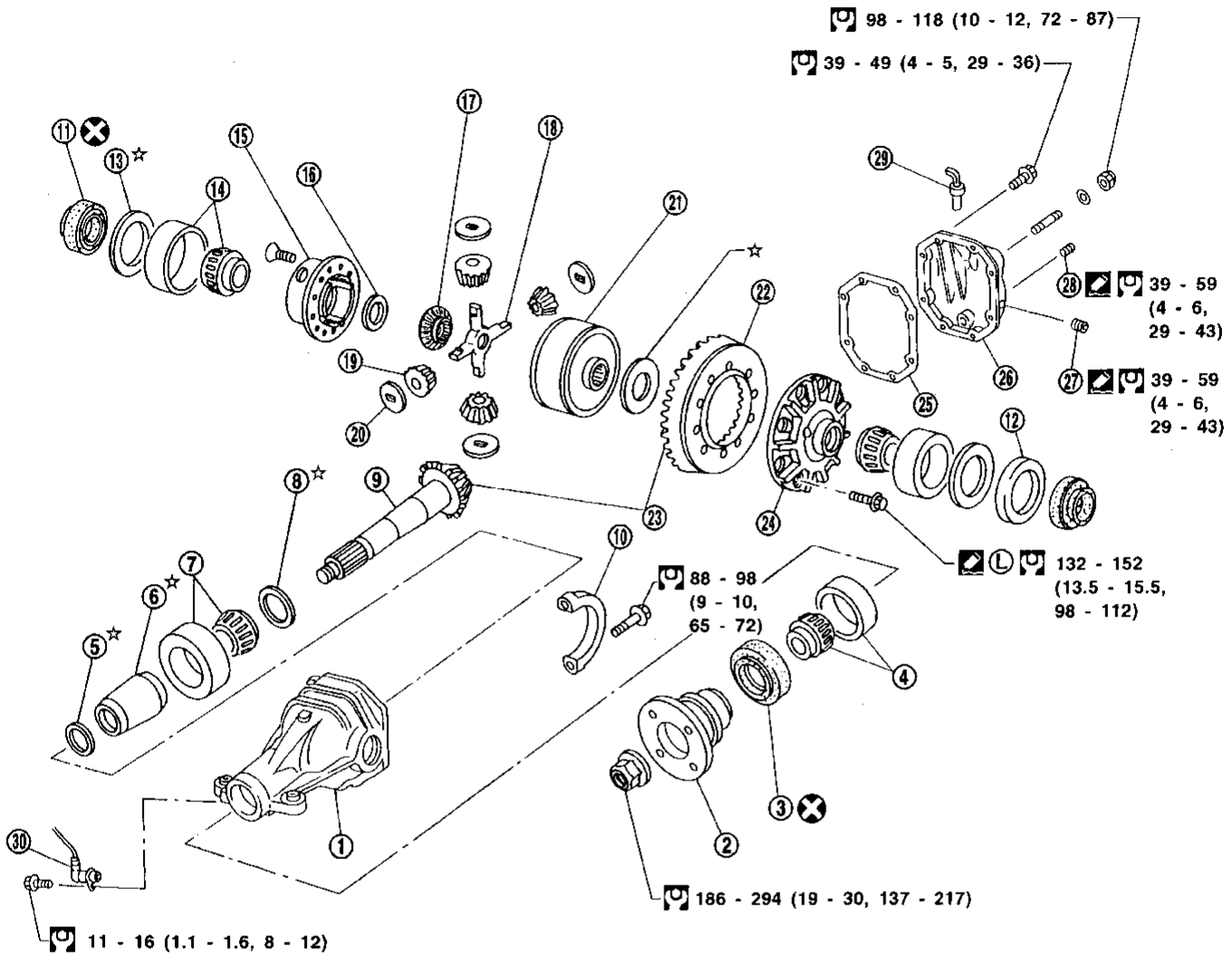
☆ : Adjustment is required.
: N·m (kg-m, ft-lb)
: Apply sealant.
Ⓛ : Apply locking sealant.

SPD367A

① Gear carrier
② Companion flange
③ Front oil seal
④ Pinion front bearing
⑤ Pinion bearing adjusting washer
⑥ Pinion bearing adjusting spacer
⑦ Pinion rear bearing
⑧ Pinion height adjusting washer
⑨ Drive pinion
⑩ Bearing cap
⑪ Side oil seal
⑫ Side bearing spacer
⑬ Side bearing adjusting washer
⑭ Side bearing
⑮ Side gear thrust washer
⑯ Side gear
⑰ Pinion mate shaft
⑱ Pinion mate gear
⑲ Pinion mate thrust washer
⑳ Lock pin
㉑ Ring gear
㉒ Hypoid gear set
㉓ Differential case
㉔ Gasket
㉕ Rear cover
㉖ Filler plug
㉗ Drain plug
㉘ Breather
㉙ ABS sensor

R200V

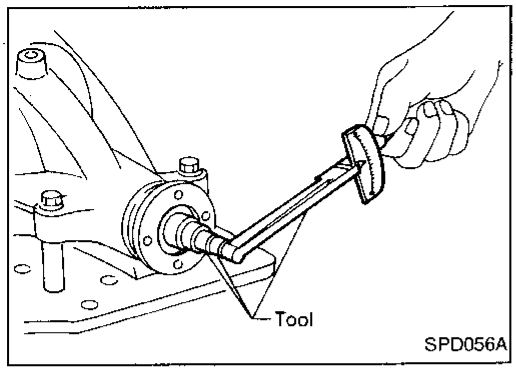
SEC. 380



: N·m (kg-m, ft-lb)
☆ : Adjustment is required.
: Apply sealant.
Ⓛ : Apply locking sealant.

SPD368A

① Gear carrier
② Companion flange
③ Front oil seal
④ Pinion front bearing
⑤ Pinion bearing adjusting washer
⑥ Pinion bearing adjusting spacer
⑦ Pinion rear bearing
⑧ Pinion height adjusting washer
⑨ Drive pinion
⑩ Bearing cap
⑪ Side oil seal
⑫ Side bearing spacer
⑬ Side bearing adjusting washer
⑭ Side bearing
⑮ Differential case B
⑯ Side gear thrust washer
⑰ Side gear (RH)
⑱ Pinion mate shaft
⑲ Pinion mate gear
⑳ Pinion mate thrust washer
㉑ Side gear (LH) with viscous coupling
㉒ Ring gear
㉓ Hypoid gear set
㉔ Differential case A
㉕ Gasket
㉖ Rear cover
㉗ Filler plug
㉘ Drain plug
㉙ Breather
㉚ ABS sensor

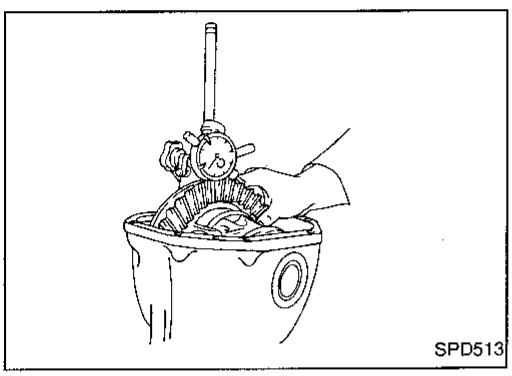


Pre-inspection

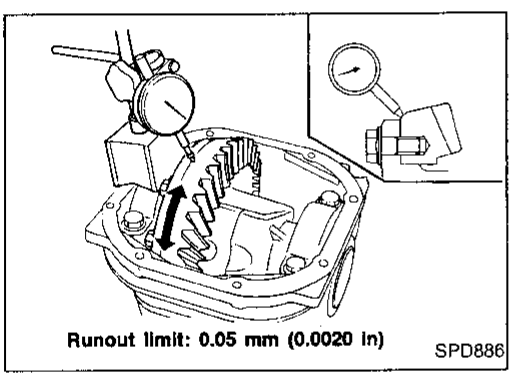
Before disassembling final drive, perform the following inspection.

- Total preload

1) Turn drive pinion in both directions several times to set bearing rollers.
2) Check total preload with Tool.
   Tool number:
   ST3127S000 (J25765-A)
   Total preload:
   1.4 - 3.1 N·m (14 - 32 kg-cm, 12 - 28 in-lb)



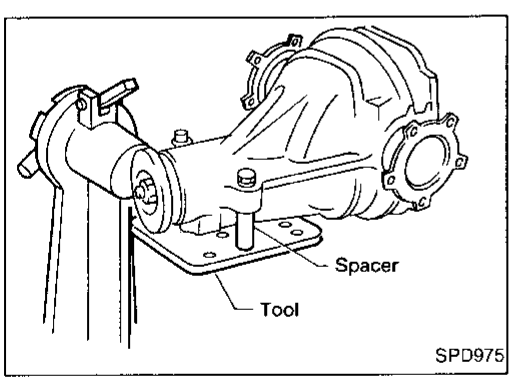
- Ring gear to drive pinion backlash
  Check ring gear-to-drive pinion backlash with a dial indicator at several points.
  Ring gear-to-drive pinion backlash:
  0.10 - 0.15 mm (0.0039 - 0.0059 in)



- 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 ADJUSTMENT (PD-26).

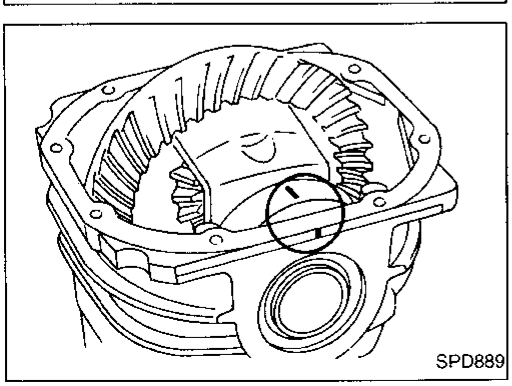
Differential Carrier

1. Using two 45 mm (1.77 in) spacers, mount carrier on Tool.
   Tool number:
   KV38100800 (J25604-01)

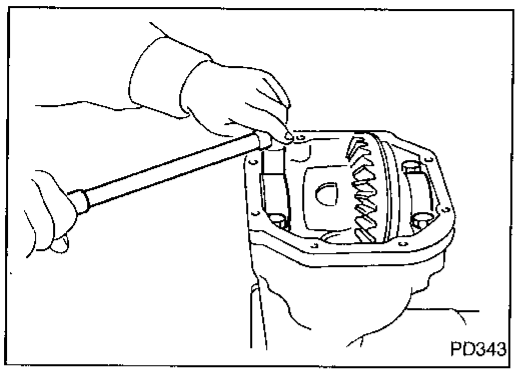


2. For proper reinstallation, paint or punch matchmarks on one side of the side bearing cap.

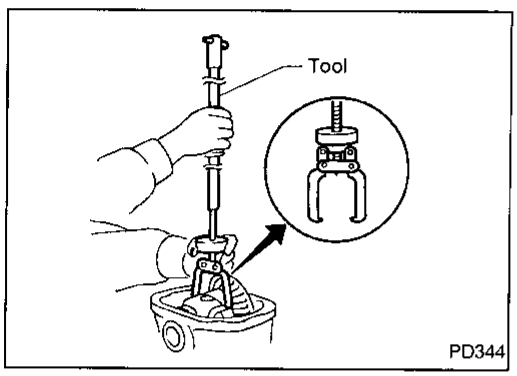
Bearing caps are line-board during manufacture. Replace them in their proper positions.



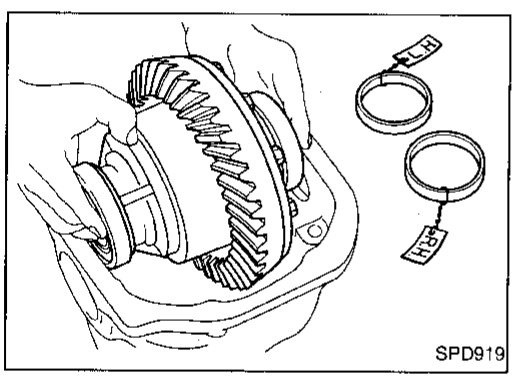
Differential Carrier (Cont'd)



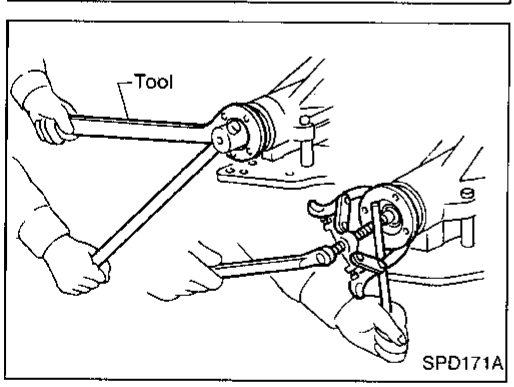
3. Remove side bearing caps.



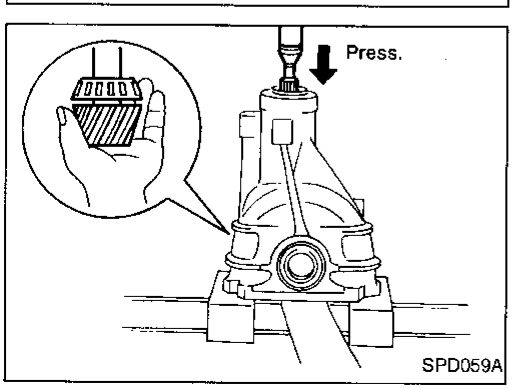
4. Lift differential case assembly out with Tool.
   Tool number:
   HT72400000 (—)



Keep the side bearing outer races together with inner cone — do not mix them up.
Also, keep side bearing spacer and adjusting shims together with bearings.

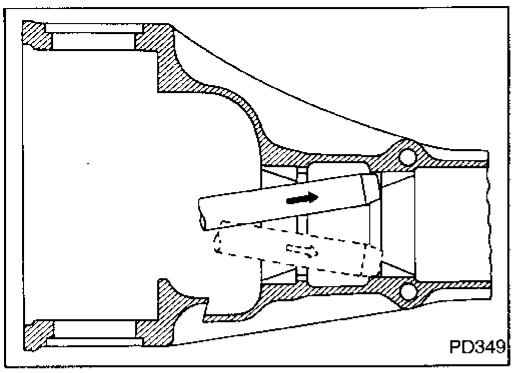


5. Loosen drive pinion nut and pull off companion flange.

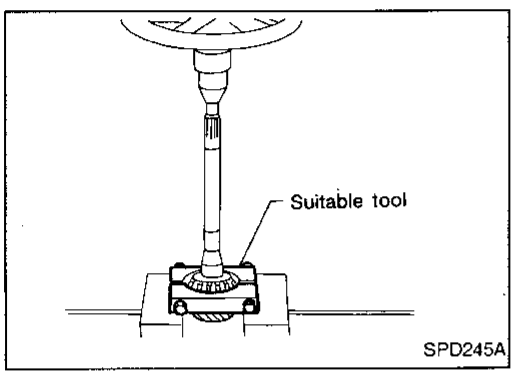


6. Take out drive pinion (together with rear bearing inner race, bearing spacer and adjusting washer).
7. Remove oil seal.
8. Remove front bearing inner race.
9. Remove side oil seal.

Differential Carrier (Cont'd)

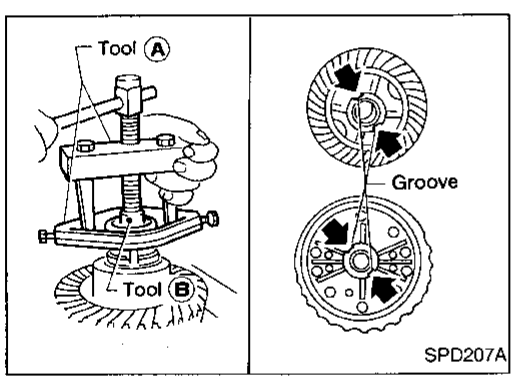


10. Remove pinion bearing outer races with a brass drift.



11. Remove pinion rear bearing inner race and drive pinion height adjusting washer with suitable tool.

Differential Case



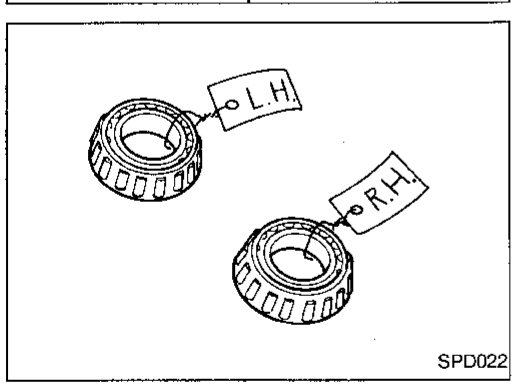
1. Remove side bearing inner cones.

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

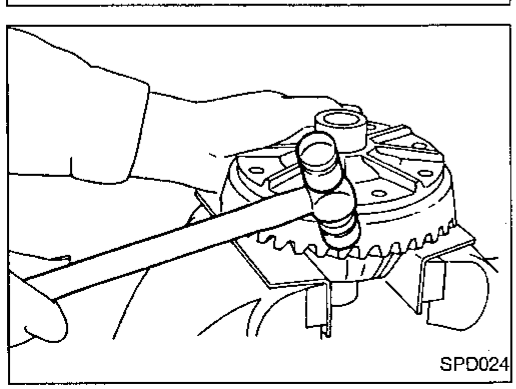
Tool number:

Ⓐ ST33051001 (J22888-20)

Ⓑ ST33061000 (J8107-2)



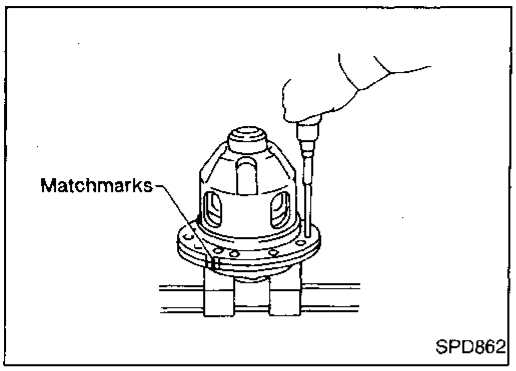
Be careful not to confuse left- and right-hand parts. Keep bearing and bearing race for each side together.



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

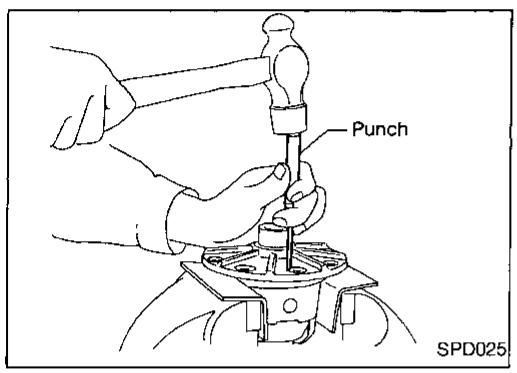
Tap evenly all around to keep ring gear from binding.

Differential Case (Cont'd)



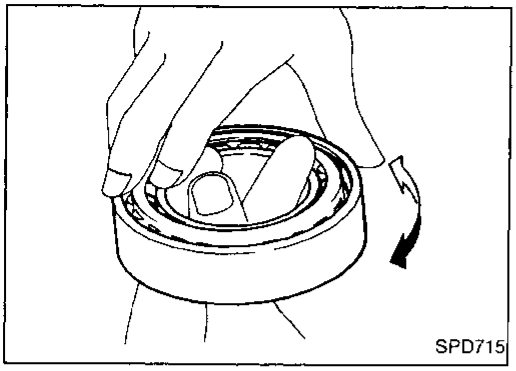
R200V ONLY

4. Loosen screws on differential cases A and B.
5. Separate differential cases A and B.



R200 ONLY

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

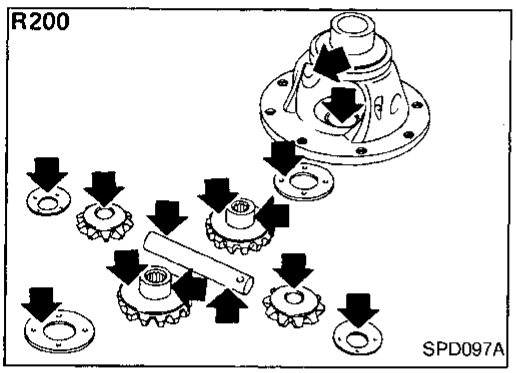

SPD715

Ring Gear and Drive Pinion

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

Bearing

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.



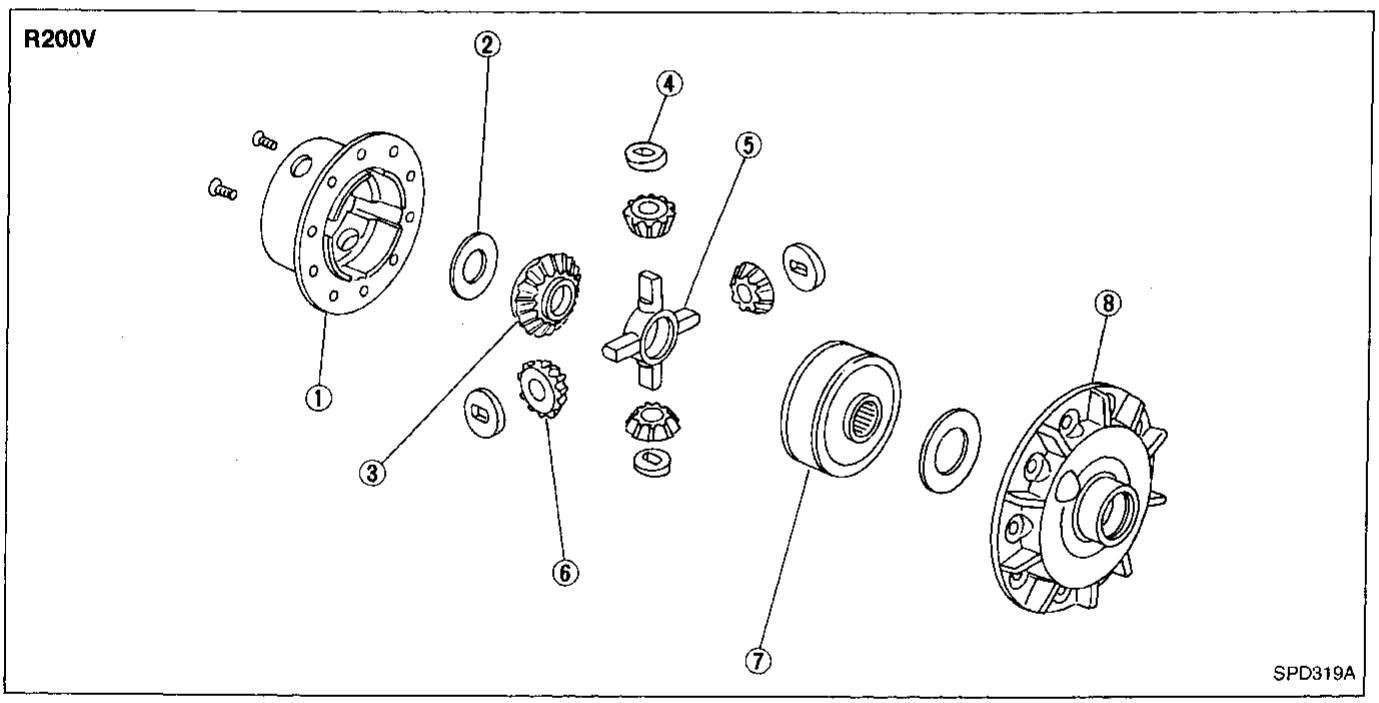
SPD097A

Differential Case Assembly

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

R200V ONLY

In addition, check viscous coupling for oil leakage. If necessary, replace it with new one.



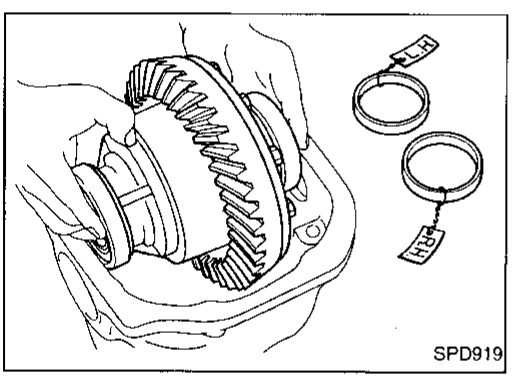
① Differential case B
② Side gear thrust washer
③ Side gear (RH)
④ Pinion mate thrust washer
⑤ Pinion mate shaft
⑥ Pinion mate gear
⑦ Side gear (LH) with viscous coupling
⑧ Differential case A

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

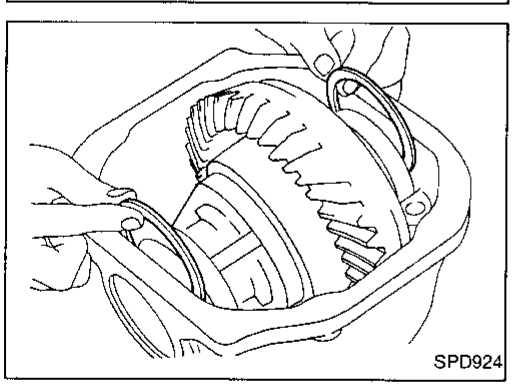
1. Side bearing preload
2. Pinion gear height
3. Pinion bearing preload
4. Ring gear to pinion backlash. Refer to ASSEMBLY (PD-31).
5. Ring and pinion gear tooth contact pattern

Side Bearing Preload

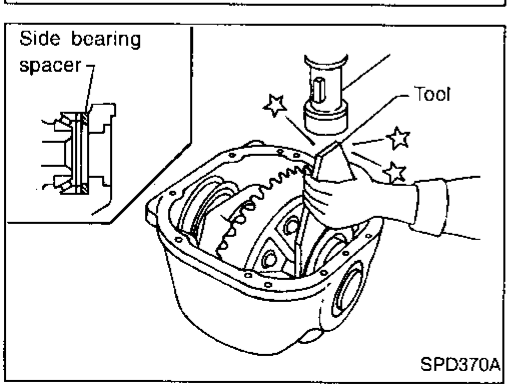
A selection of side bearing adjusting washers is required for successful completion of this procedure.



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

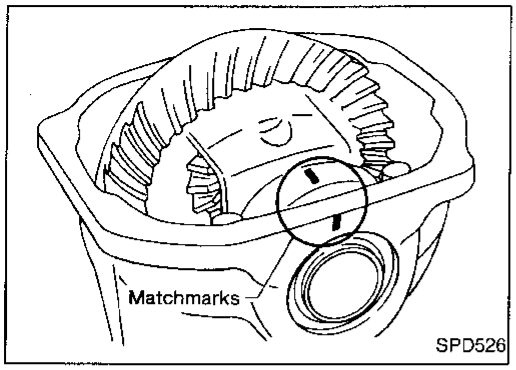


3. Insert left and right original side bearing adjusting washers in place between side bearings and carrier.

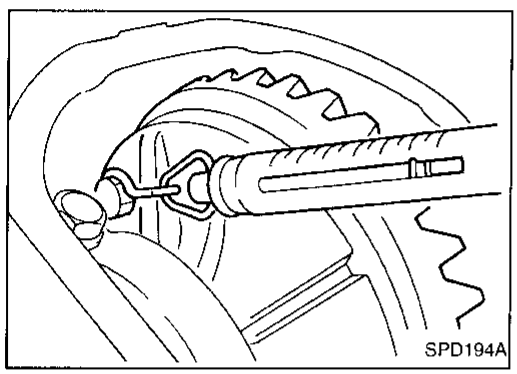


4. Using Tool, drive in side bearing spacer in place between side bearing adjusting washer in left side and carrier.

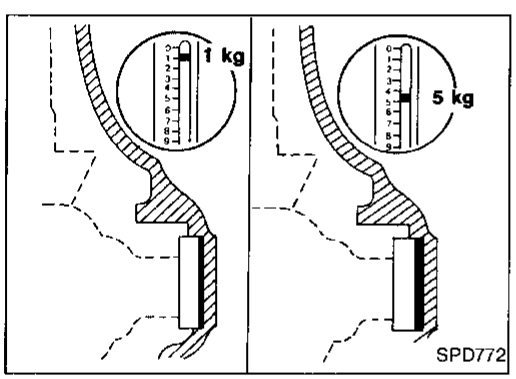
Side Bearing Preload (Cont'd)



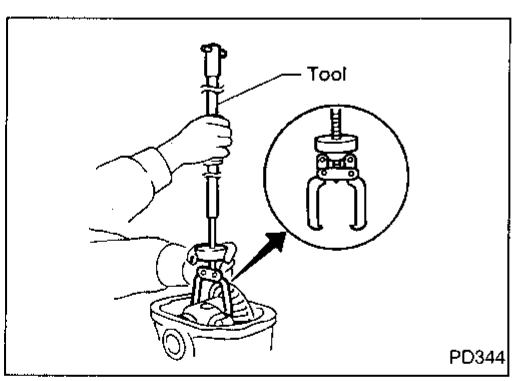
5. Install the side bearing caps in their correct locations and torque the bearing cap retaining bolts.
   Specification:
   88 - 98 N·m
   (9 - 10 kg-m, 65 - 72 ft-lb)
6. Turn the carrier several times to seat the bearings.



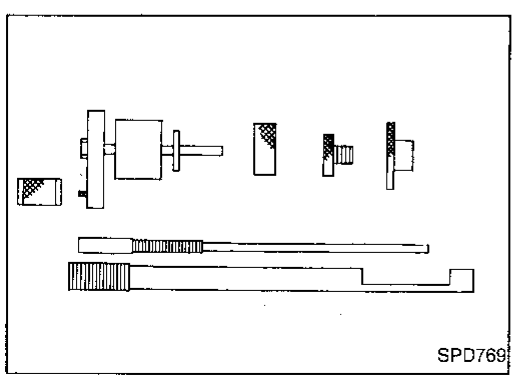
7. Measure the turning torque of the carrier at the ring gear retaining bolts with a spring gauge, J8129.
   Specification:
   34.3 - 39.2 N
   (3.5 - 4.0 kg, 7.7 - 8.8 lb)
   of pulling force at the ring gear bolt



8. If the 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.



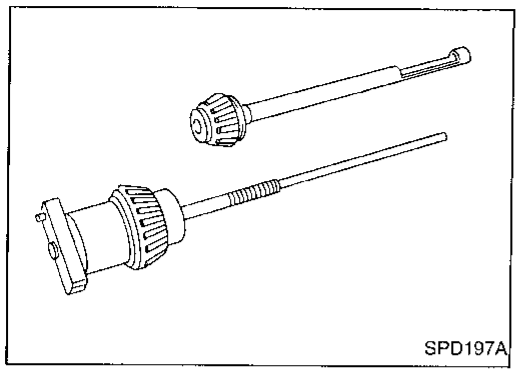
10. Remove the carrier from the final drive housing. Save the selected preload washers for later use during the assembly of the final drive unit.



Pinion Gear Height and Pinion Bearing Preload

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.

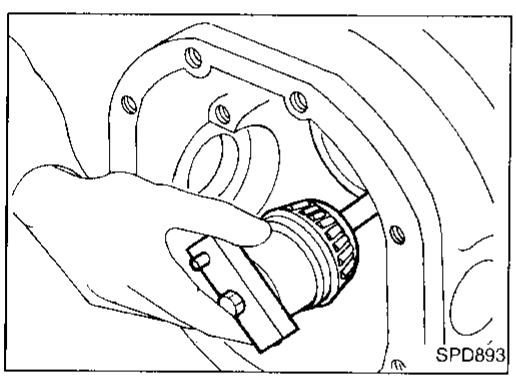
Pinion Gear Height and Pinion Bearing Preload (Cont'd)


SPD197A

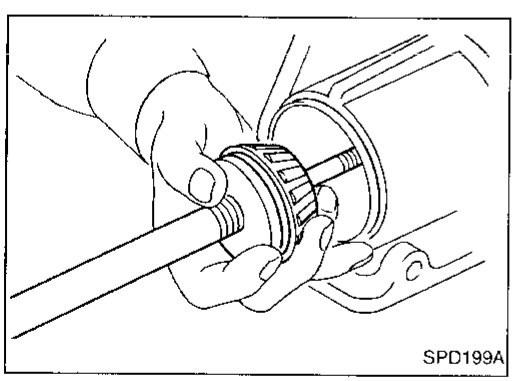
- **Front pinion bearing** — make sure the J34309-3 front pinion bearing seat is secured tightly against the J34309-2 gauge anvil. Then turn the front pinion bearing pilot, J34309-5, to secure the bearing in its proper position.
- **Rear pinion bearing** — the rear pinion bearing pilot, J34309-8, is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

R200V ONLY

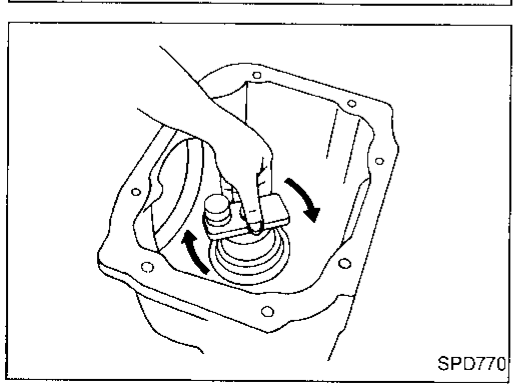
- **Installation of J34309-9 and J34309-16** — place a suitable 2.5 mm (0.098 in) thick plain washer between J34309-9 and J34309-16. Both surfaces of J34309-9 and J34309-16 must be parallel with a clearance of 2.5 mm (0.098 in).


SPD893

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

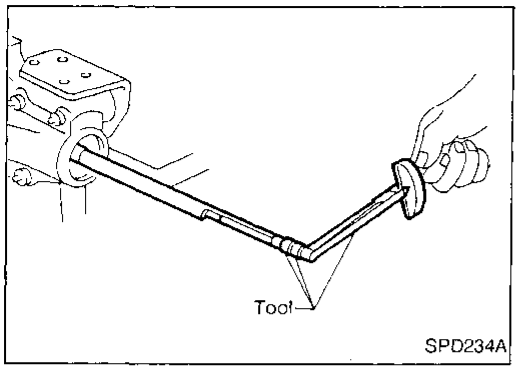

SPD199A

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.

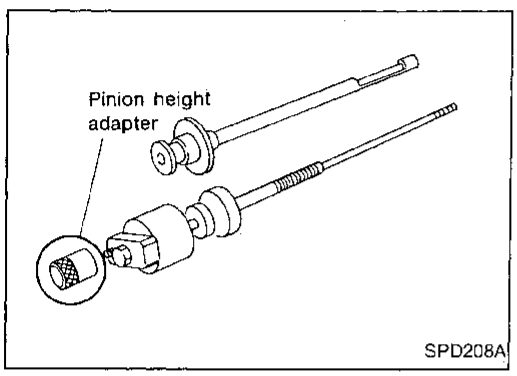

SPD770

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

Pinion Gear Height and Pinion Bearing Preload (Cont'd)

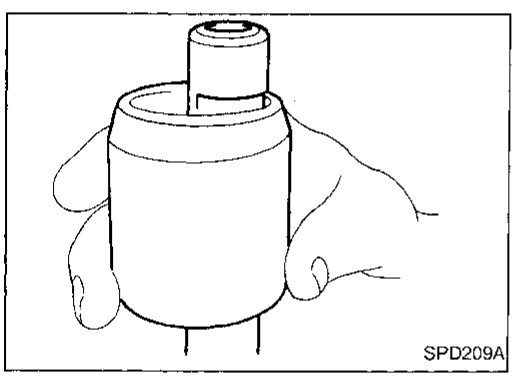


6. Measure the turning torque at the end of the J34309-2 gauge anvil using torque wrench J25765A.
   Turning torque specification:
   1.0 - 1.3 N·m
   (10 - 13 kg-cm, 8.7 - 11.3 in-lb)



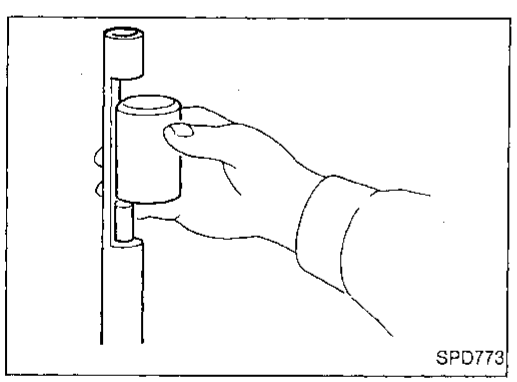
7. Place the J34309-11 "R200A" pinion height adapter onto the gauge plate and tighten it by hand.

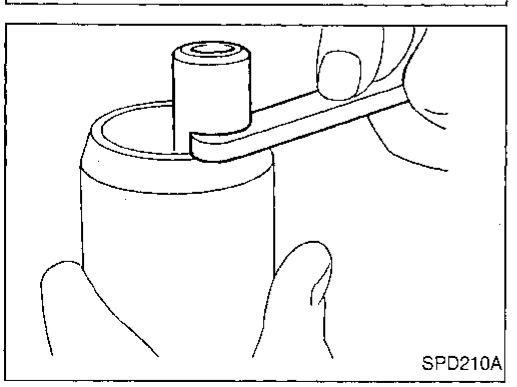
CAUTION:
Make sure all machined surfaces are clean.



— PINION BEARING PRELOAD WASHER SELECTION —

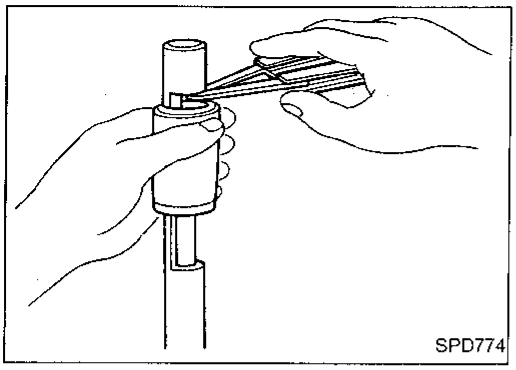
8. Place the solid pinion bearing spacer, small end first, over the J34309-2 gauge anvil. Seat the small end squarely against the tip of the J34309-1 gauge screw in the tool recessed portion.



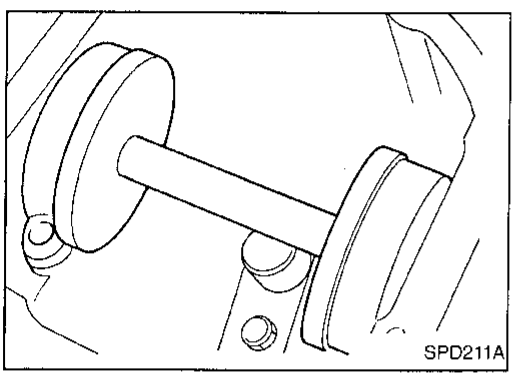


9. Select the correct thickness of pinion bearing preload adjusting washer. Select by using a standard gauge of 3.5 mm (0.138 in) and your J34309-101 feeler gauge. The exact measure you get with your gauges is the thickness of the adjusting washer required. Select the correct washer from the following chart.
   Drive pinion bearing preload adjusting washer:
   Refer to SDS (PD-34).

Pinion Gear Height and Pinion Bearing Preload (Cont'd)

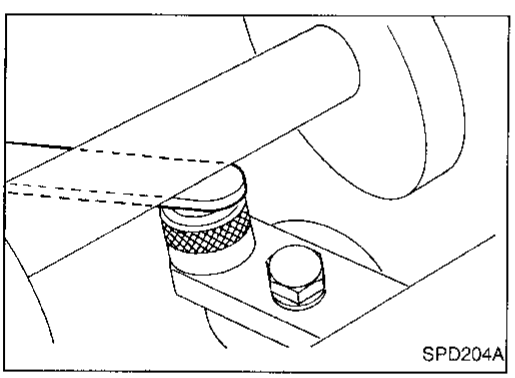

SPD774

10. Set aside the selected correct pinion bearing preload adjusting washer. Use it when assembling the pinion gear and bearings into the final drive.

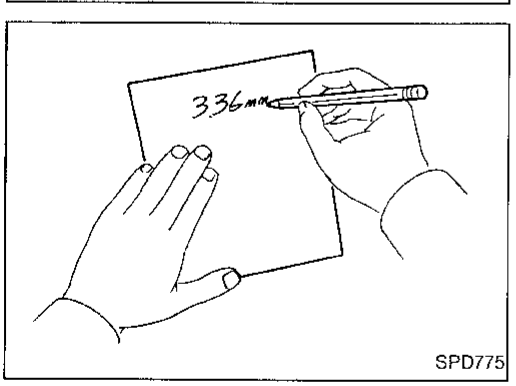

SPD211A

— PINION HEIGHT ADJUSTING WASHER SELECTION —

11. 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.

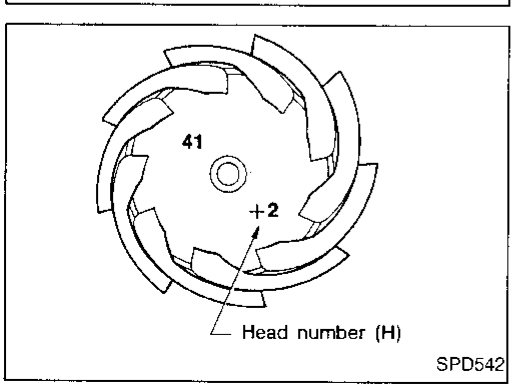

SPD204A

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



SPD775

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



SPD542

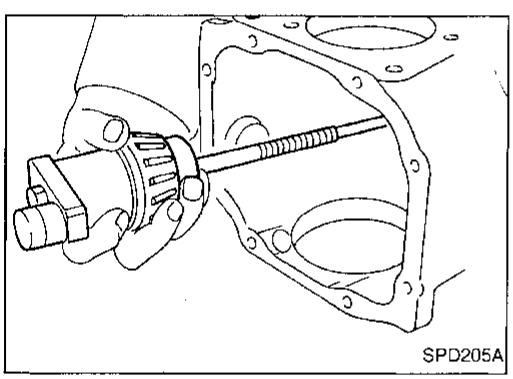
14. Correct the pinion height washer size by referring to the "pinion head number".

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.

Pinion Gear Height and Pinion Bearing Preload (Cont'd)

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)

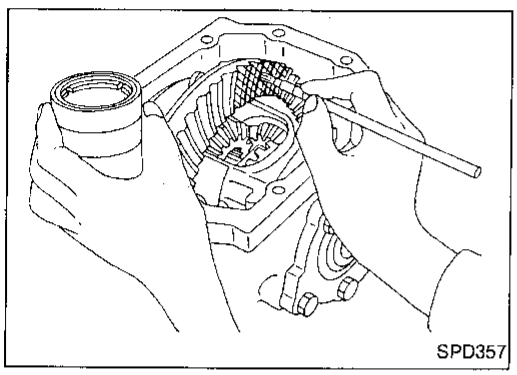
15. Select the correct pinion height washer from the following chart.
    Drive pinion height adjusting washer:
    Refer to SDS (PD-34).


SPD205A

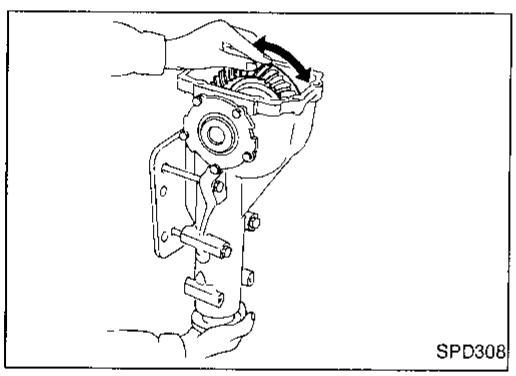
16. Remove the J34309 pinion preload shim selector Tool from the final drive housing. Then disassemble to retrieve the pinion bearings.

Tooth Contact

Checking gear tooth contact pattern is necessary to verify correct relationship between ring gear and drive pinion.
Hypoid gears which are not positioned in proper arrangement may be noisy and/or have a short life. Check gear tooth contact pattern to obtain the best contact for low noise and long life.

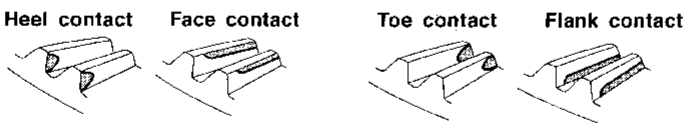

SPD357

1. Thoroughly clean ring gear and drive pinion teeth.
2. Lightly apply a mixture of powdered titanium oxide and oil or the equivalent. Apply it to 3 or 4 teeth of ring gear drive side.


SPD308

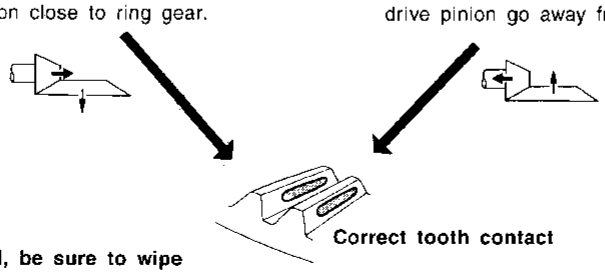
3. Hold companion flange steady by hand and rotate the ring gear in both directions.

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.



To correct, increase thickness of pinion height adjusting washer in order to bring drive pinion close to ring gear.

To correct, reduce thickness of pinion height adjusting washer in order to make drive pinion go away from ring gear.



Correct tooth contact

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

SPD007-B

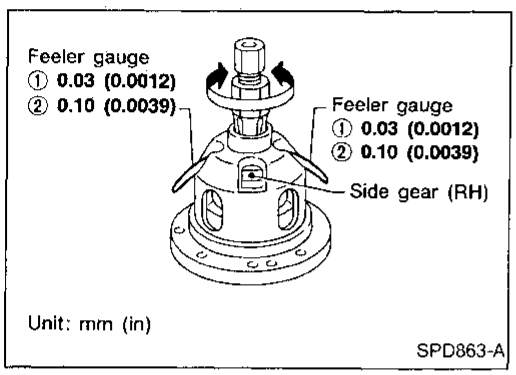
Differential Case

Whenever side gears or pinion mate gears are replaced, selection of thrust washers should be carried out.
Before selecting thrust washers, make sure all parts are clean and well lubricated with hypoid gear oil.

THRUST WASHER SELECTION

R200V ONLY

1. Install the previously removed thrust washer on right side gear. On left side gear, install a suitable thrust washer. Temporarily tighten differential cases using two screws.
2. Position differential assembly so that right side gear is on the upper side. Place two feeler gauges of 0.03 mm (0.0012 in) thickness between right side gear and thrust washer as shown.

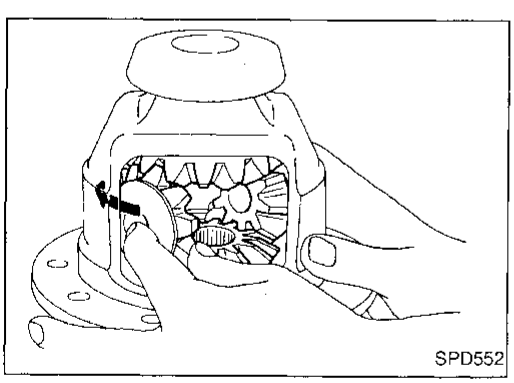


Do not insert feeler gauge in oil groove portion of differential case.

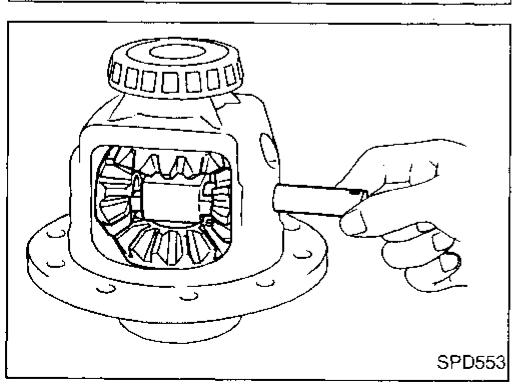
3. Rotate right side gear with a suitable tool attached to splines. If hard to rotate, replace thrust washer on left side gear with a thinner one.
4. Replace both 0.03 mm (0.0012 in) feeler gauges with 0.10 mm (0.0039 in) gauges. At this point, make sure right side gear does not rotate. If it rotates, replace thrust washer on left side gear with a thicker one to prevent rotation.

R200 ONLY

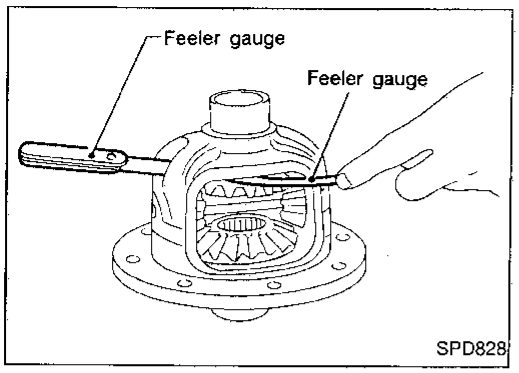
1. Install side gears, pinion mate gears, thrust washers and thrust block into differential case.



2. Fit pinion mate shaft to differential case so that it meets lock pin holes.

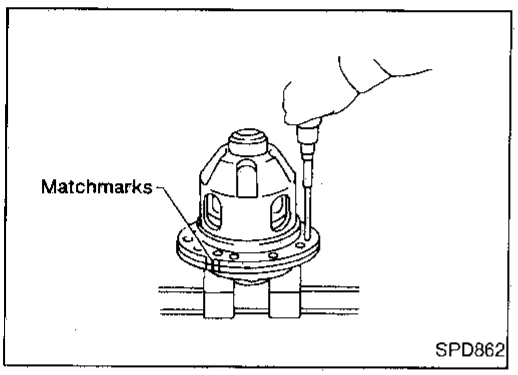


Differential Case (Cont'd)



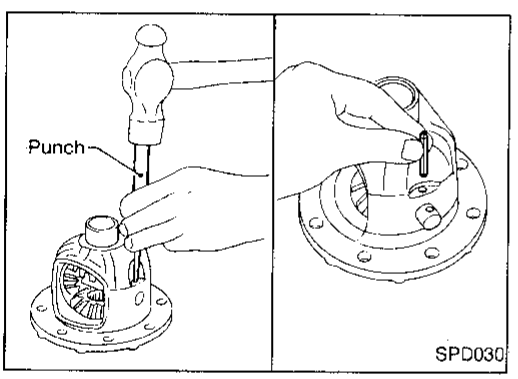
3. Adjust clearance between rear face of side gear and thrust washer by selecting side gear thrust washer. Refer to SDS (PD-34).

Clearance between side gear thrust washer and differential case:
0.15 mm (0.0059 in) or less



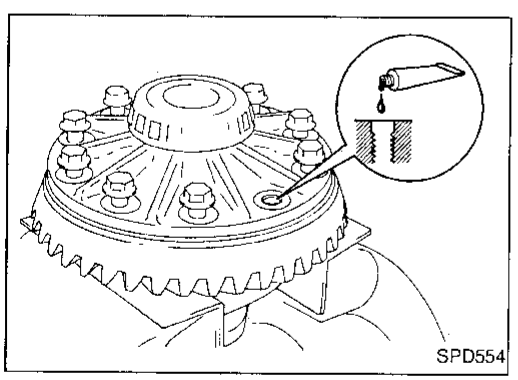
ASSEMBLY

1. Install differential case A and B. —R200V ONLY—



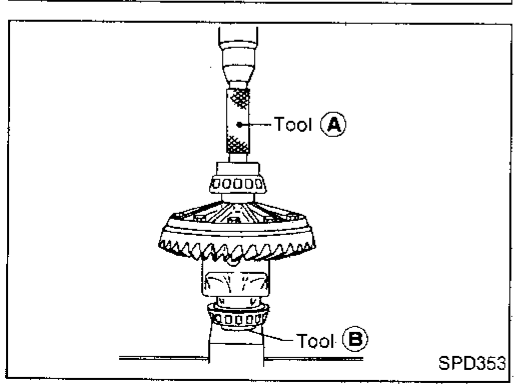
1. Install pinion mate shaft lock pin with a punch. —R200 ONLY—

Make sure lock pin is flush with case.



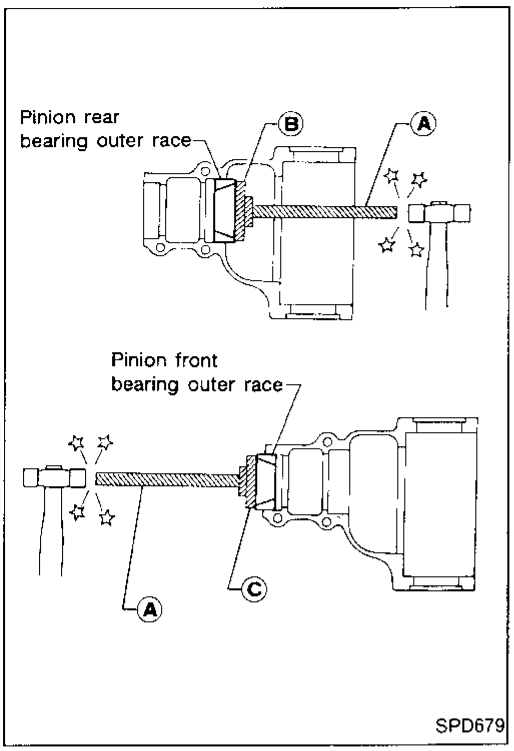
2. Place differential case on ring gear.
3. Apply locking sealant to ring gear bolts, and install them.

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



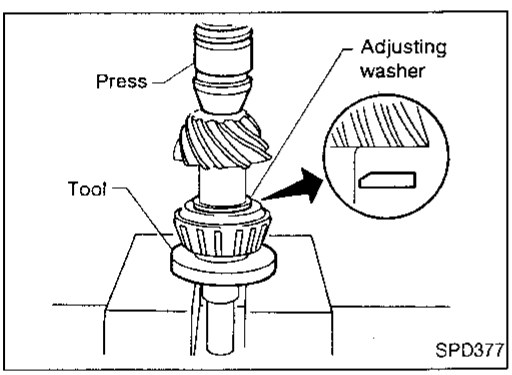
4. Press-fit side bearing inner cones on differential case with Tool.

Tool number:
Ⓐ KV38100300 (J25523)
Ⓑ ST33061000 (J8107-2)

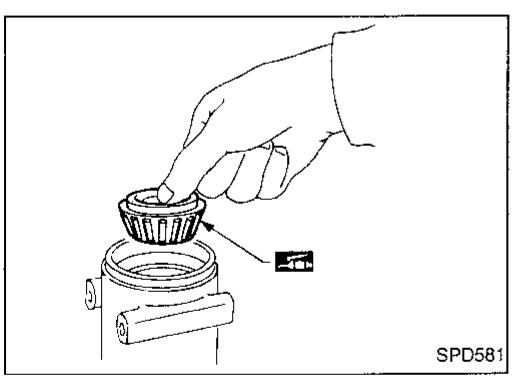


Differential Carrier

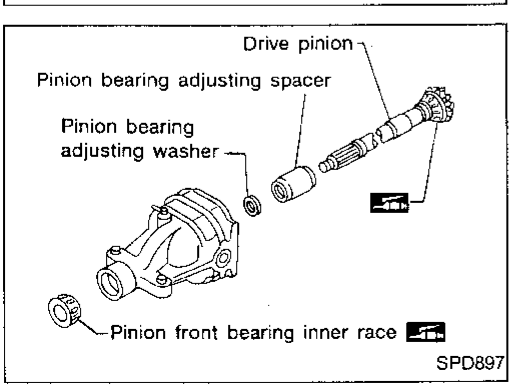
1. Press-fit front and rear bearing outer races with Tools.
   Tool number:
   Ⓐ ST30611000 (J25742-1)
   Ⓑ ST30621000 (J25742-2)
   Ⓒ ST30613000 (J25742-3)
2. Select pinion bearing adjusting washer and drive pinion bearing spacer. Refer to ADJUSTMENT (PD-21).



3. Install selected drive pinion height adjusting washer in drive pinion. Using press and Tool, press-fit pinion rear bearing inner cone into it.
   Tool number:
   ST30901000 (J26010-01)



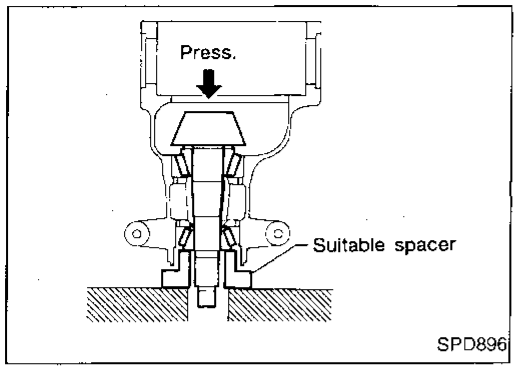
4. Place pinion front bearing inner cone in final drive housing.

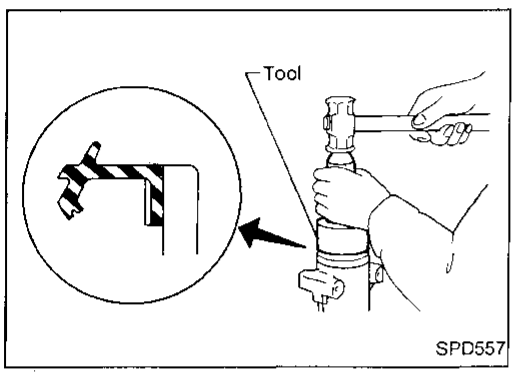


5. Set drive pinion assembly (as shown in figure at left) in differential carrier and install drive pinion, with press and suitable tool.

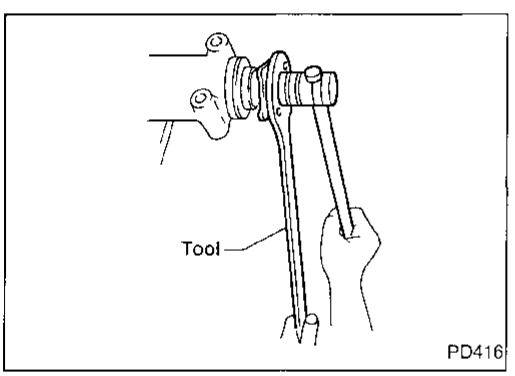
Stop when drive pinion touches bearing.
Apply multi-purpose grease to pinion rear bearing inner race, pinion front bearing inner race.

Differential Carrier (Cont'd)



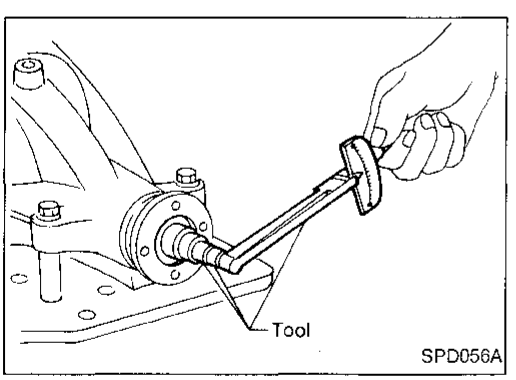


6. Apply multi-purpose grease to cavity at sealing lips of oil seal. Install front oil seal with Tool.
   Tool number:
   KV38100500 (—)



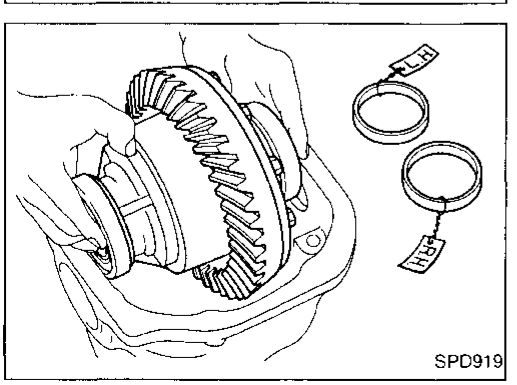
7. Install companion flange, and tighten pinion nut to specified torque with suitable tool.

Make sure that threaded portion of drive pinion and pinion nut are free from oil or grease.



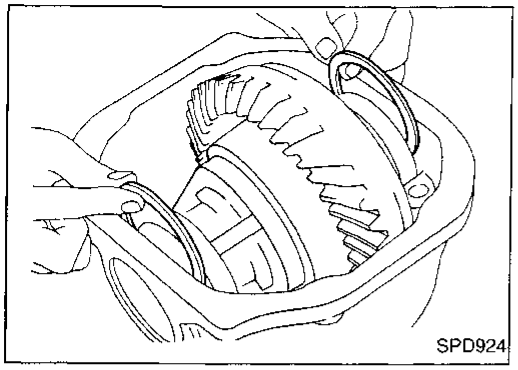
8. Turn drive pinion in both directions several times, and measure pinion bearing preload.
   Pinion bearing preload:
   1.1 - 1.4 N·m
   (11 - 14 kg-cm, 9.5 - 12.2 in-lb)

When pinion bearing preload is outside specifications, replacement is required for pinion bearing adjusting washer and spacer. Replace with those of different thickness.

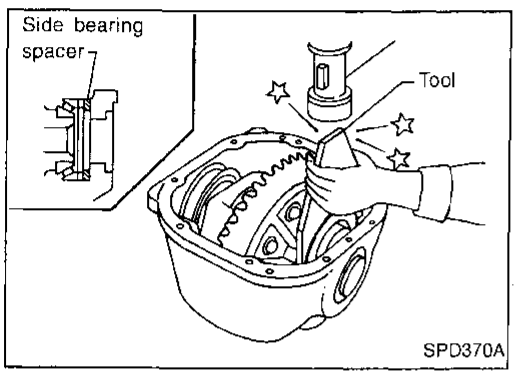


9. Install differential case assembly with side bearing outer races into gear carrier.

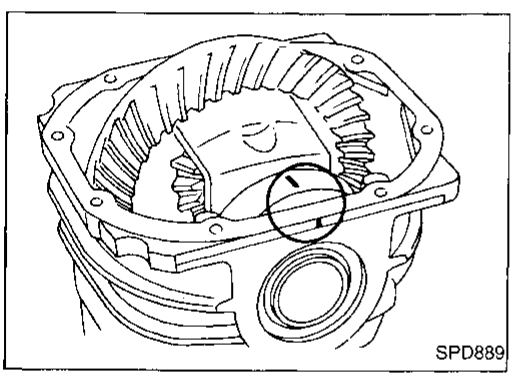
Differential Carrier (Cont'd)



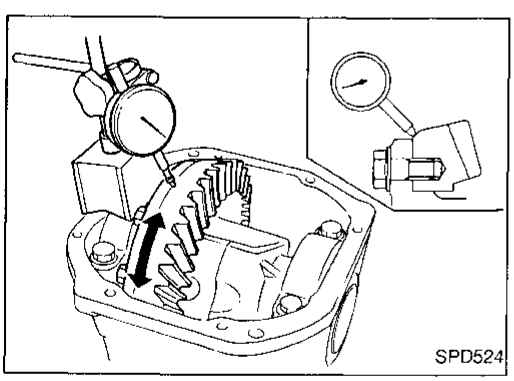
10. Insert original left and right side bearing adjusting washers in place between side bearings and carrier.



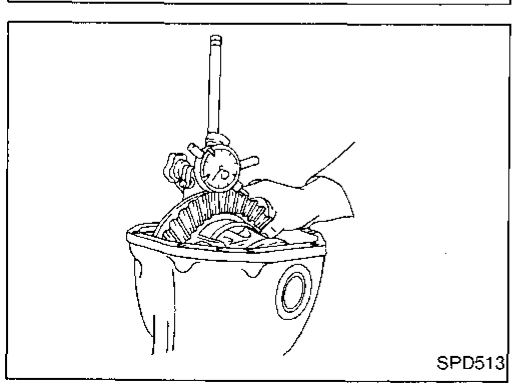
11. Using Tool, drive in side bearing spacer in place between side bearing adjusting washer in left side and carrier.
    Tool number:
    KV38100600 (J25267)



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



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

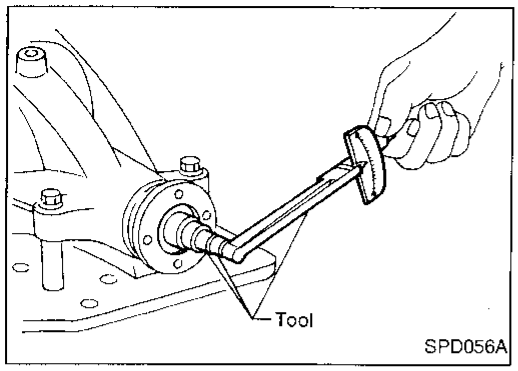


14. Measure ring gear to drive pinion backlash with a dial indicator.
    Ring gear to drive pinion backlash:
    0.10 - 0.15 mm (0.0039 - 0.0059 in)

- If backlash is too small, adjustment of shim thickness is required. Decrease thickness of left shim and increase thickness of right 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.

Differential Carrier (Cont'd)



15. Check total preload with Tool.

When checking preload, turn drive pinion in both directions several times to seat bearing rollers correctly.

Total preload:

1.4 - 3.1 N·m (14 - 32 kg-cm, 12 - 28 in-lb)

- 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. Difference in number of shims will change ring gear to drive pinion backlash.

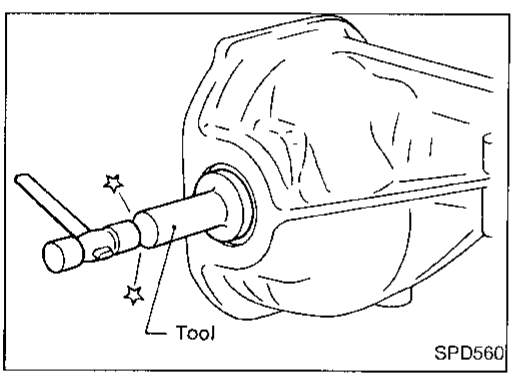
16. Recheck ring gear to drive pinion backlash. Increase or decrease in thickness of shims will cause change to ring gear to pinion backlash.
- Check whether the backlash varies excessively in different places. Foreign matter may be caught between the ring gear and the differential case causing the trouble.
- The backlash can vary greatly even when the ring gear runout is within a specified range. In that case, replace the hypoid gear set or differential case.

17. Check tooth contact.
Refer to ADJUSTMENT (PD-26).
18. Apply multi-purpose grease to cavity at sealing lips of oil seal. Install side oil seal.

Tool number:

KV38100200 (J26233)

19. Install rear cover and gasket.



Propeller Shaft

GENERAL SPECIFICATIONS

Unit: mm (in)

Transmission	M/T	A/T
Propeller shaft model	3S63A	
Number of joints	3	
Coupling method with transmission	Sleeve type	
Type of journal bearings	Shell type (Non-disassembly type)	
Distance between yokes	63.0 (2.480)	
Shaft length (Spider to spider)		
1st	421.0 (16.57)	441.0 (17.36)
2nd		
Without ABS	650.0 (25.59)	
With ABS	636.0 (25.04)	
Shaft outer diameter		
1st	75.0 (2.953)	
2nd	50.8 (2.000)	

INSPECTION AND ADJUSTMENT

Unit: mm (in)

Propeller shaft model	3S63A
Propeller shaft runout limit	0.6 (0.024)
Journal axial play	0 (0)

Final Drive

GENERAL SPECIFICATIONS

Final drive model	R200V	R200
Ring gear pitch diameter mm (in)	205 (8.07)	
Gear ratio	4.083	
Number of teeth (Ring gear/drive pinion)	49/12	
Oil capacity ℓ (US pt, Imp pt)	1.2 - 1.4 (2-1/2 - 3, 2-1/8 - 2-1/2)	
Number of pinion gears	4	2
Side gear bearing spacer location	Left	

INSPECTION AND ADJUSTMENT

Ring gear runout

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

Side gear adjustment —R200V—

Clearance between side gear and differential case mm (in)	0.03 - 0.09 (0.0012 - 0.0035)

Available side gear thrust washers (R200V)

Thickness mm (in)	Part number
0.80 (0.0315)	38424-40F60
0.83 (0.0327)	38424-40F61
0.86 (0.0339)	38424-40F62
0.89 (0.0350)	38424-40F63
0.92 (0.0362)	38424-40F64
0.95 (0.0374)	38424-40F65
0.98 (0.0386)	38424-40F66
1.01 (0.0398)	38424-40F67
1.04 (0.0409)	38424-40F68
1.07 (0.0421)	38424-40F69
1.10 (0.0433)	38424-40F70
1.13 (0.0445)	38424-40F71
1.16 (0.0457)	38424-40F72
1.19 (0.0469)	38424-40F73
1.22 (0.0480)	38424-40F74
1.25 (0.0492)	38424-40F75
1.28 (0.0504)	38424-40F76
1.31 (0.0516)	38424-40F77
1.34 (0.0528)	38424-40F78
1.37 (0.0539)	38424-40F79
1.40 (0.0551)	38424-40F80
1.43 (0.0563)	38424-40F81
1.46 (0.0575)	38424-40F82
1.49 (0.0587)	38424-40F83

Final Drive (Cont'd)

Side gear adjustment —R200—

Clearance between side gear and differential case mm (in)	0.15 (0.0059) or less

Available side gear thrust washers (R200)

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

Drive pinion height adjustment

Available pinion height adjusting washers

Thickness mm (in)	Part number
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

Drive pinion preload adjustment

Drive pinion bearing adjusting method	Pinion bearing 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)

Available drive pinion bearing preload adjusting washers

Thickness mm (in)	Part number
3.80 - 3.82 (0.1496 - 0.1504)	38125-61001
3.82 - 3.84 (0.1504 - 0.1512)	38126-61001
3.84 - 3.86 (0.1512 - 0.1520)	38127-61001
3.86 - 3.88 (0.1520 - 0.1528)	38128-61001
3.88 - 3.90 (0.1528 - 0.1535)	38129-61001
3.90 - 3.92 (0.1535 - 0.1543)	38130-61001
3.92 - 3.94 (0.1543 - 0.1551)	38131-61001
3.94 - 3.96 (0.1551 - 0.1559)	38132-61001
3.96 - 3.98 (0.1559 - 0.1567)	38133-61001
3.98 - 4.00 (0.1567 - 0.1575)	38134-61001
4.00 - 4.02 (0.1575 - 0.1583)	38135-61001
4.02 - 4.04 (0.1583 - 0.1591)	38136-61001
4.04 - 4.06 (0.1591 - 0.1598)	38137-61001
4.06 - 4.08 (0.1598 - 0.1606)	38138-61001
4.08 - 4.10 (0.1606 - 0.1614)	38139-61001

Available drive pinion bearing preload adjusting spacers

Length mm (in)	Part number
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

Total preload adjustment

Drive pinion to ring gear backlash mm (in)	0.10 - 0.15 (0.0039 - 0.0059)
Total preload N·m (kg-cm, in-lb)	1.4 - 3.1 (14 - 32, 12 - 28)
Side bearing adjusting method	Adjusting washer

Side bearing adjustment

Side bearing preload measured at ring gear retaining bolt 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
2.65 (0.1043)	38453-N3113