

PROPELLER SHAFT & DIFFERENTIAL CARRIER

SECTION PD

CONTENTS

PROPELLER SHAFT	2	On-vehicle Service.....	12
Preparation	2	CHECKING DIFFERENTIAL GEAR OIL	12
SPECIAL SERVICE TOOLS	2	CHANGING DIFFERENTIAL GEAR OIL.....	12
Noise, Vibration and Harshness (NVH)		FRONT OIL SEAL REPLACEMENT.....	12
Troubleshooting	3	SIDE OIL SEAL REPLACEMENT	13
NVH TROUBLESHOOTING CHART	3	Components.....	15
Components.....	4	Removal and Installation	16
On-vehicle Service.....	4	REMOVAL.....	16
CHECKING PROPELLER SHAFT	4	INSTALLATION.....	16
PROPELLER SHAFT VIBRATION	5	Disassembly.....	16
APPEARANCE CHECKING	5	PRE-INSPECTION	16
Removal and Installation	5	DIFFERENTIAL CARRIER	17
Inspection.....	7	DIFFERENTIAL CASE.....	19
Disassembly.....	7	Inspection.....	19
CENTER BEARING.....	7	RING GEAR AND DRIVE PINION	19
Assembly	8	DIFFERENTIAL CASE ASSEMBLY	19
CENTER BEARING.....	8	BEARING	20
Service Data and Specifications (SDS).....	9	Adjustment.....	20
GENERAL SPECIFICATIONS	9	DRIVE PINION HEIGHT	21
SERVICE DATA.....	9	SIDE BEARING PRELOAD	23
R200		TOOTH CONTACT	26
REAR FINAL DRIVE	10	Assembly	27
Preparation	10	DIFFERENTIAL CASE	27
SPECIAL SERVICE TOOLS	10	DIFFERENTIAL CARRIER	28
Noise, Vibration and Harshness (NVH)		Service Data and Specifications (SDS).....	32
Troubleshooting	12	R200H AND R200V.....	32

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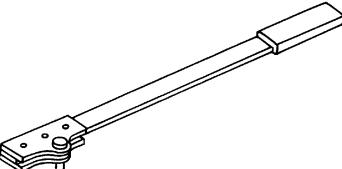
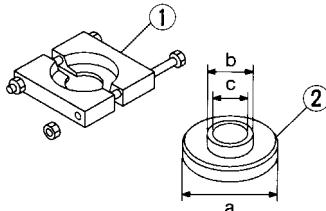
PROPELLER SHAFT

Preparation

Preparation

SPECIAL SERVICE TOOLS

NMPD0001

Tool number Tool name	Description
KV38108300 Companion flange wrench	 <p>NT771</p> <p>Removing and installing propeller shaft lock nut, and drive pinion lock nut</p>
ST3090S000 Drive pinion rear inner race puller set 1 ST30031000 Puller 2 ST30901000 Base	 <p>NT527</p> <p>Removing center bearing a: 79 mm (3.11 in) dia. b: 45 mm (1.77 in) dia. c: 35 mm (1.38 in) dia.</p>

PROPELLER SHAFT

Noise, Vibration and Harshness (NVH) Troubleshooting

Noise, Vibration and Harshness (NVH) Troubleshooting

=NMPD0049

NMPD0049S01

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			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	Axes	SU-PEN-SION	TIRES	ROAD WHEEL	BRAKES	STEERING
Possible cause and SUSPECTED PARTS			—	PD-5	—	—	PD-5	PD-5	PD-19	PD-26	PD-19	PD-16	—	—	—	—	AX-3	AX-3	SU-4	SU-4	SU-4	BR-5	ST-5		
Symptom	PROPEL-LER SHAFT	Noise	x x x x x x x x	x x x x x x x x	x x x x x x x x	x x x x x x x x	x x x x x x x x	x x x x x x x x	x x x x x x x x	x x x x x x x x	x x x x x x x x	x x x x x x x x	x x x x x x x x	x x x x x x x x	x x x x x x x x	x x x x x x x x	x x x x x x x x	x x x x x x x x	x x x x x x x x	x x x x x x x x	x x x x x x x x	x x x x x x x x	x x x x x x x x	x x x x x x x x	
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		Vibration	x x x x x x x x	x x x x x x x x	x x x x x x x x	x x x x x x x x	x x x x x x x x	x x x x x x x x	x x x x x x x x	x x x x x x x x	x x x x x x x x	x x x x x x x x	x x x x x x x x	x x x x x x x x	x x x x x x x x	x x x x x x x x	x x x x x x x x	x x x x x x x x	x x x x x x x x	x x x x x x x x	x x x x x x x x	x x x x x x x x	x x x x x x x x	x x x x x x x x	x x x x x x x x
	DIFFER-ENTIAL	Noise																							

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PROPELLER SHAFT

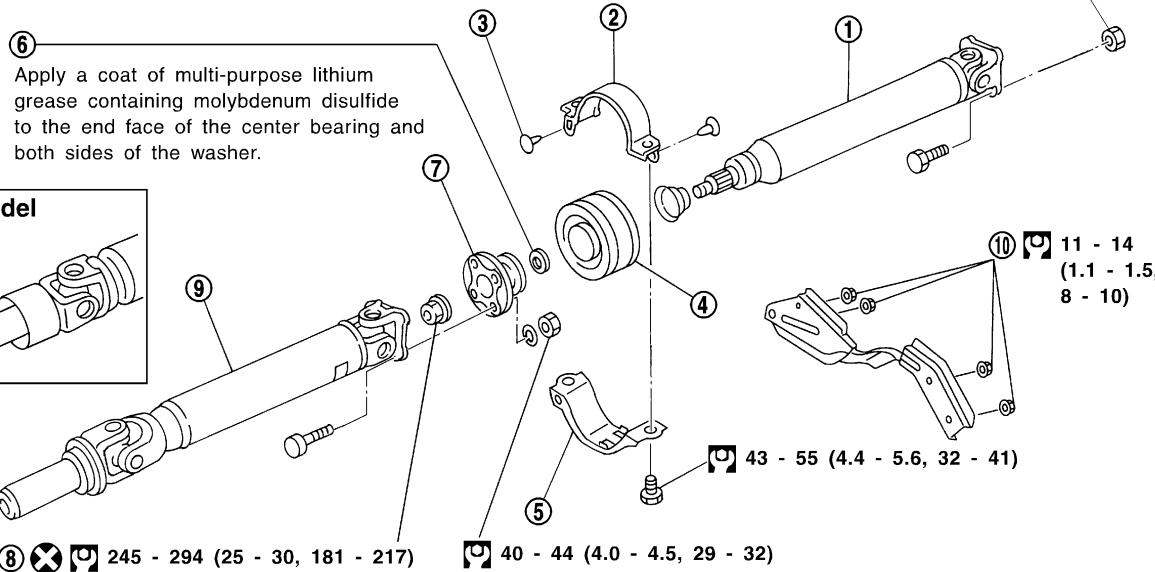
Components

NMPD0002

SEC. 370

3S71A

M/T model

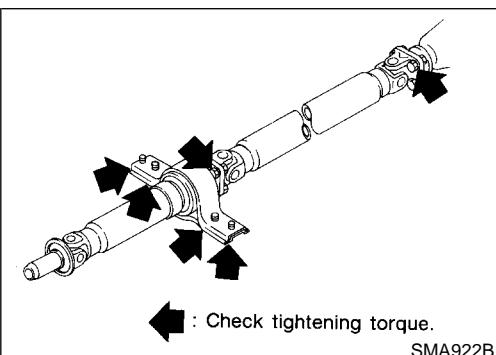


A/T model

□ : N·m (kg-m, ft-lb)

SPD530A

- | | | |
|--|--|-----------------------------|
| 1. Propeller shaft 2nd tube | 4. Center bearing | 7. Companion flange |
| 2. Center bearing upper mounting bracket | 5. Center bearing lower mounting bracket | 8. Lock nut |
| 3. Clip | 6. Washer | 9. Propeller shaft 1st tube |
| | | 10. Floor tunnel stay |



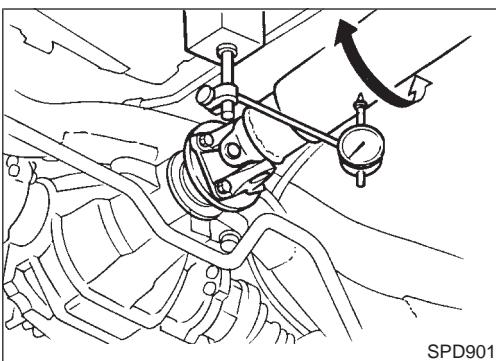
On-vehicle Service CHECKING PROPELLER SHAFT

NMPD0053

Check propeller shaft and center bearing for damage, looseness or grease leakage. If greasing points are provided, supply grease as necessary.

PROPELLER SHAFT

On-vehicle Service (Cont'd)

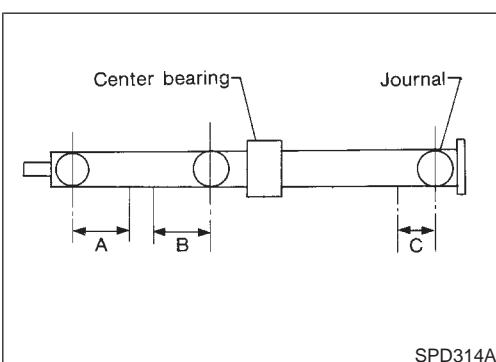


PROPELLER SHAFT VIBRATION

NMPD0003
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)



Propeller shaft runout measuring points:

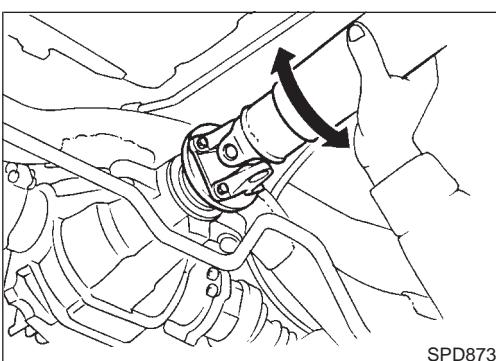
Distance:

- "A" 192 mm (7.56 in)
- "B" 172 mm (6.77 in)
- "C" 162 mm (6.38 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.

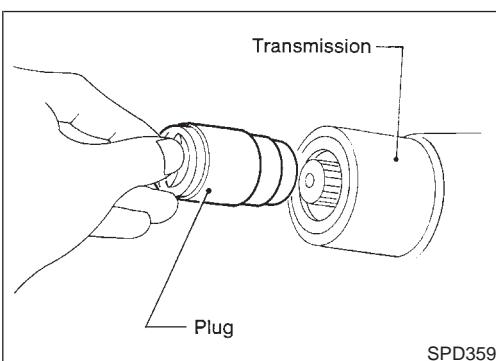
Runout limit: 0.6 mm (0.024 in)

4. Check runout again. If runout still exceeds specifications, replace propeller shaft assembly.
5. Perform road test.



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.

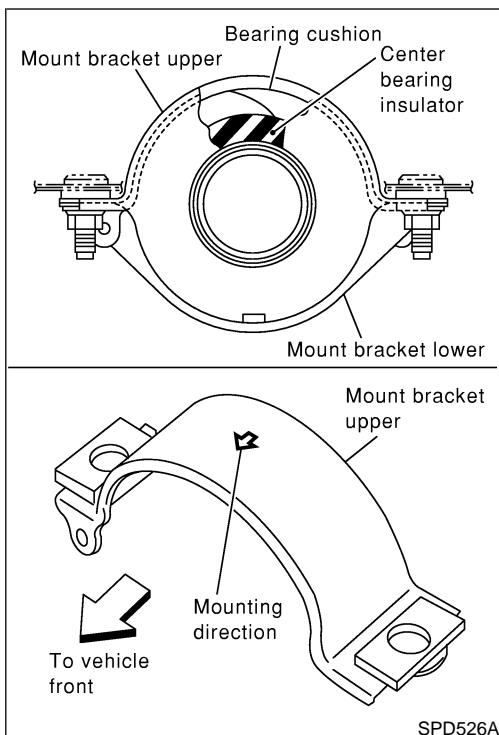


Removal and Installation

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

PROPELLER SHAFT

Removal and Installation (Cont'd)

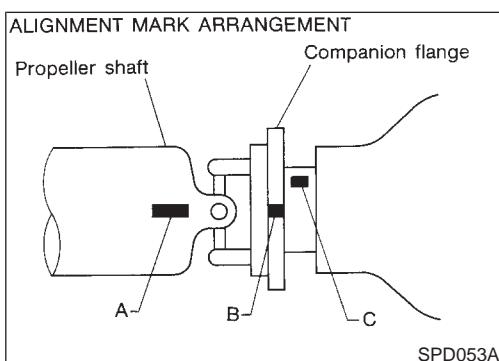


When installing the center bearing, use caution and pay attention to the following procedures.

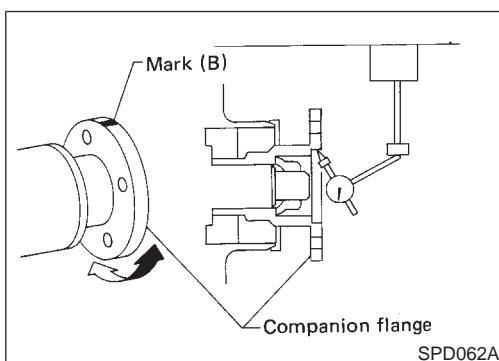
- Install by aligning both matching marks on propeller shaft (put on during removal) and on final drive companion flange.
- Rotate bearing and make sure center bearing's bearing cushion connection part is always UP as shown in left figure. And install it to vehicle by adjusting mounting bracket back-forth position for not to give deflection of vehicle front to rear direction to insulator.

CAUTION:

Align the arrow of the upper mounting bracket face the front of the vehicle as shown in left figure.



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.

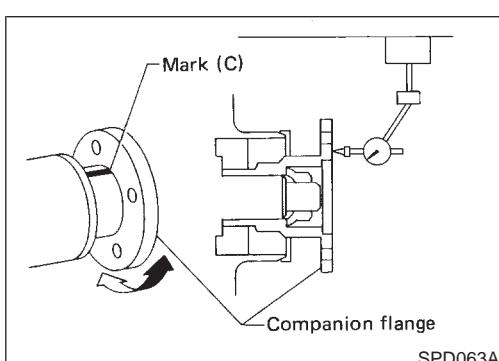


1. Erase original marks B and C from companion flange with suitable solvent.

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.

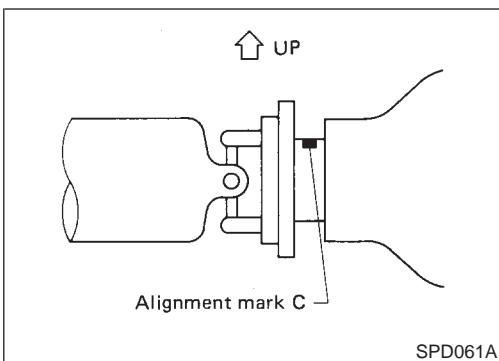
3. Mark (C)

- 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.



PROPELLER SHAFT

Removal and Installation (Cont'd)



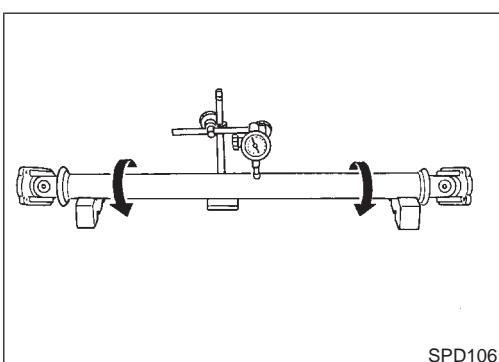
4. Position companion flange and propeller shaft using alignment marks A and B. Set the marks A and B as close to each other as possible. Temporarily attach bolts and nuts.
5. Press down propeller shaft with alignment mark C facing upward. Then tighten the lower nut to specified torque.
6. Tighten remaining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

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LC



Inspection

- Inspect propeller shaft runout. If runout exceeds specifications, replace propeller shaft assembly.

Runout limit: 0.6 mm (0.024 in)

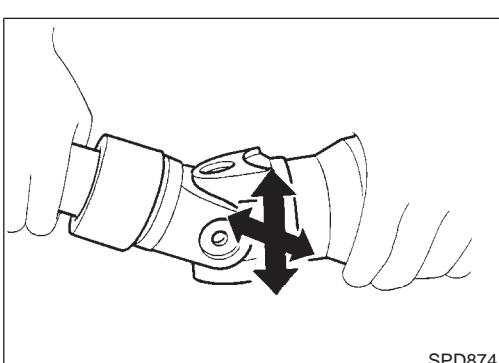
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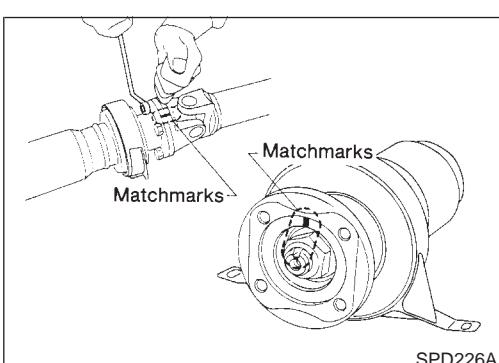
- If the play exceeds specifications, replace propeller shaft assembly.

Journal axial play:
0 mm (0 in) or less

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Disassembly

CENTER BEARING

NMPD0007

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

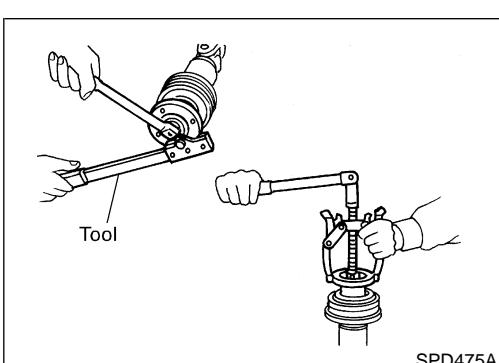
BR

ST

RS

BT

HA



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

Tool number: HT72400000

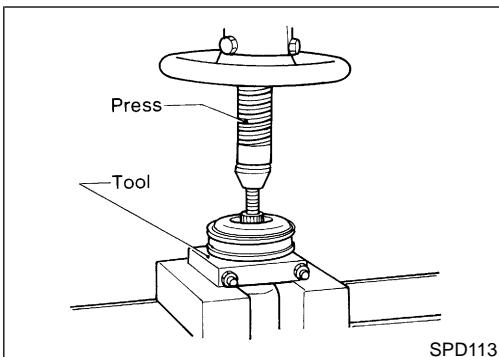
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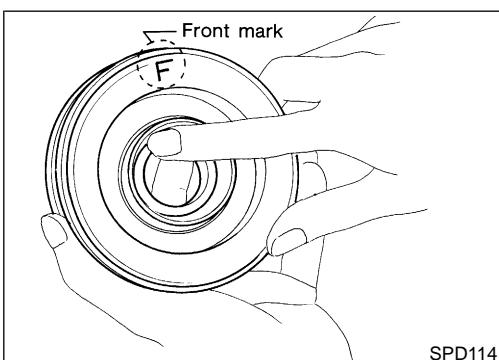
PROPELLER SHAFT

Disassembly (Cont'd)



5. Remove center bearing with Tool and press.

Tool number: ST30031000

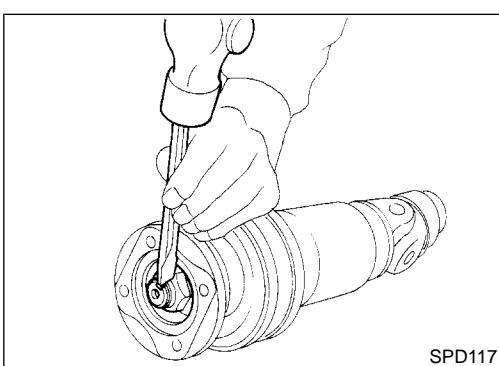


Assembly

CENTER BEARING

NMPD0008

- NMPD0008S01
- 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.



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

PROPELLER SHAFT

Service Data and Specifications (SDS)

Service Data and Specifications (SDS)

GENERAL SPECIFICATIONS

=NMPD0009
Unit: mm (in)

Applied model	M/T	A/T
Propeller shaft model	3S71A	
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	416 (16.38)
	2nd	633 (24.92)
Shaft outer diameter	1st	75.0 (2.953)
	2nd	57 (2.24)

SERVICE DATA

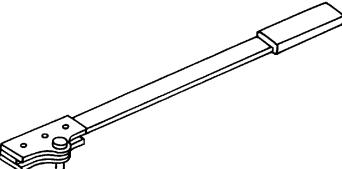
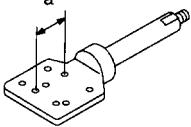
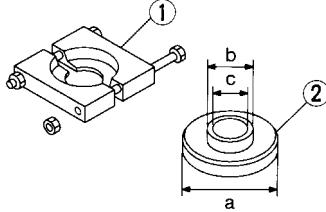
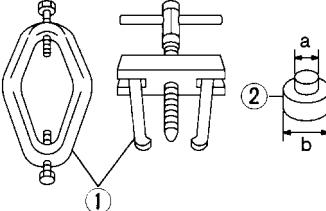
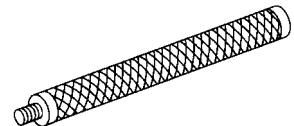
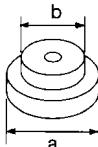
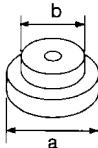
=NMPD0010
Unit: mm (in)

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

Preparation

Preparation SPECIAL SERVICE TOOLS

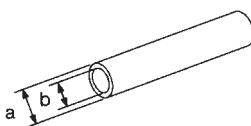
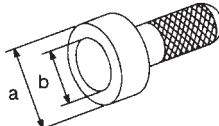
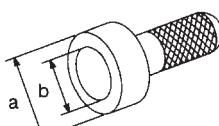
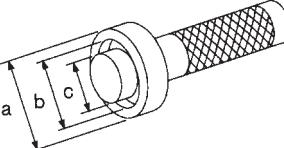
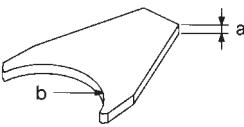
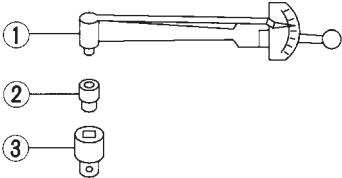
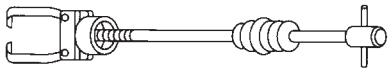
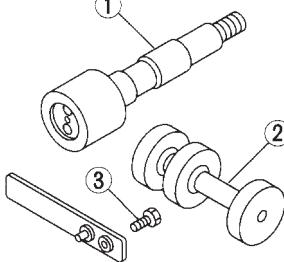
NMPD0029

Tool number Tool name	Description
KV38108300 Companion flange wrench	 <p>NT771</p> <p>Removing and installing propeller shaft lock nut, and drive pinion lock nut</p>
KV38100800 Differential attachment	 <p>NT119</p> <p>Mounting final drive (To use, make a new hole.) a: 152 mm (5.98 in)</p>
ST3090S000 Drive pinion rear inner race puller set 1 ST30031000 Puller 2 ST30901000 Base	 <p>NT527</p> <p>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.</p>
ST3306S001 Differential side bearing puller set 1 ST3305S001 Body 2 ST33061000 Adapter	 <p>NT072</p> <p>Removing and installing differential side bearing inner cone a: 28.5 mm (1.122 in) dia. b: 38 mm (1.50 in) dia.</p>
ST30611000 Drift	 <p>NT090</p> <p>Installing pinion rear bearing outer race</p>
ST30613000 Drift	 <p>NT073</p> <p>Installing pinion front bearing outer race a: 72 mm (2.83 in) dia. b: 48 mm (1.89 in) dia.</p>
ST30621000 Drift	 <p>NT073</p> <p>Installing pinion rear bearing outer race a: 79 mm (3.11 in) dia. b: 59 mm (2.32 in) dia.</p>

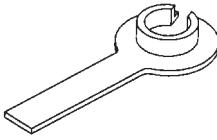
REAR FINAL DRIVE

R200

Preparation (Cont'd)

Tool number Tool name	Description	
ST23800000 Drift	 <p>NT065</p>	<p>Installing side oil seal a: 44 mm (1.73 in) dia. b: 31 mm (1.22 in) dia.</p>
KV38100200 Gear carrier side oil seal drift	 <p>NT115</p>	<p>Installing side oil seal a: 65 mm (2.56 in) dia. b: 49 mm (1.93 in) dia.</p>
KV38100500 Gear carrier front oil seal drift	 <p>NT115</p>	<p>Installing front oil seal a: 85 mm (3.35 in) dia. b: 60 mm (2.36 in) dia.</p>
KV38100300 Differential side bearing inner cone	 <p>NT085</p>	<p>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.</p>
KV38100600 Side bearing spacer drift	 <p>NT528</p>	<p>Installing side bearing spacer a: 8 mm (0.31 in) b: R42.5 mm (1.673 in)</p>
ST3127S000 Preload gauge 1 GG91030000 Torque wrench 2 HT62940000 Socket adapter 3 HT62900000 Socket adapter	 <p>NT124</p>	<p>Measuring pinion bearing preload and total preload</p>
HT72400000 Slide hammer	 <p>NT125</p>	<p>Removing differential case assembly</p>
KV381039S0 Drive pinion height setting gauge 1 KV38103910 Dummy shaft 2 KV38100120 Height gauge 3 KV38100140 Stopper	 <p>NT226</p>	<p>Selecting pinion height adjusting washer</p>

Preparation (Cont'd)

Tool number Tool name	Description
KV38107900 Side oil seal protector	 NT129

Noise, Vibration and Harshness (NVH) Troubleshooting

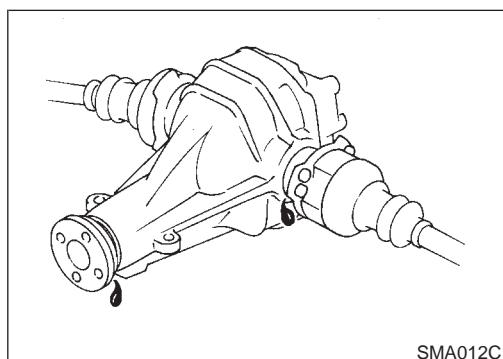
Refer to "NVH TROUBLESHOOTING CHART", PD-3.

NMPD0051

NMPD0054

NMPD0055

NMPD0030



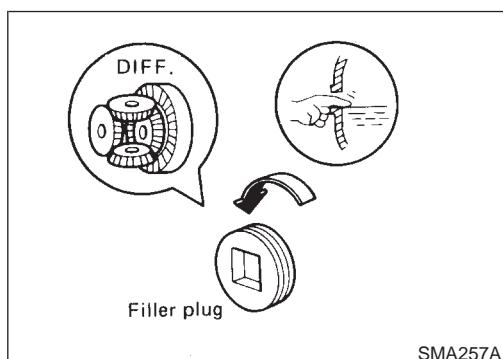
On-vehicle Service

CHECKING DIFFERENTIAL GEAR OIL

- Check oil level and for oil leakage.

Filler plug:

 : 39 - 59 N·m (4 - 6 kg-m, 29 - 43 ft-lb)



CHANGING DIFFERENTIAL GEAR OIL

- Drain oil from drain plug and refill with new gear oil.
- Check oil level.

Oil grade: API GL-5

Viscosity:

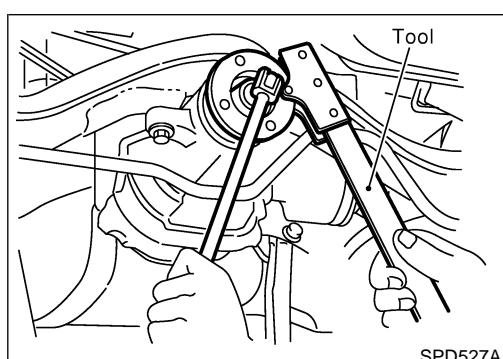
See "RECOMMENDED FLUIDS AND LUBRICANTS".

Capacity:

1.2 - 1.4ℓ (2-1/2 - 3 US pt, 2-1/8 - 2-1/2 Imp pt)

Drain plug:

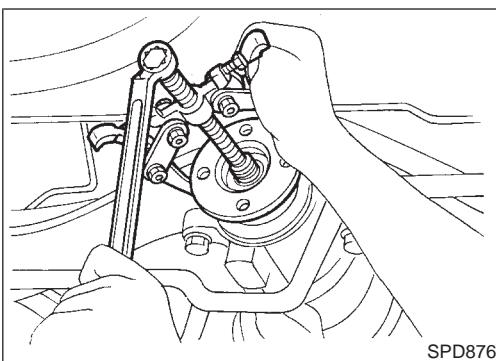
 : 39 - 59 N·m (4 - 6 kg-m, 29 - 43 ft-lb)



FRONT OIL SEAL REPLACEMENT

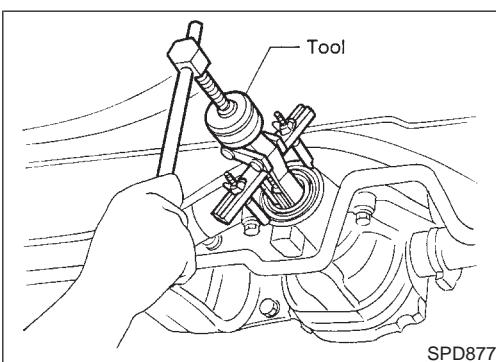
- Remove ABS sensor.
- Remove propeller shaft.
- Loosen drive pinion nut with tool.

Tool number: KV38108300



4. Remove companion flange.

GI



5. Remove front oil seal.

MA

EM

LC

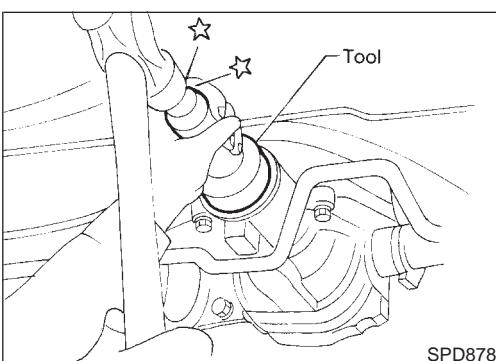
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6. Apply multi-purpose grease to sealing lips of oil seal. Press front oil seal into carrier.

Tool number: ST30720000

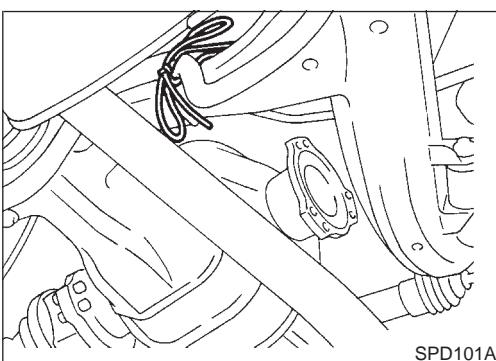
7. Install companion flange and drive pinion nut.

8. Install propeller shaft.

PD

AX

SU



SIDE OIL SEAL REPLACEMENT

NMPD0056

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

BR

ST

RS

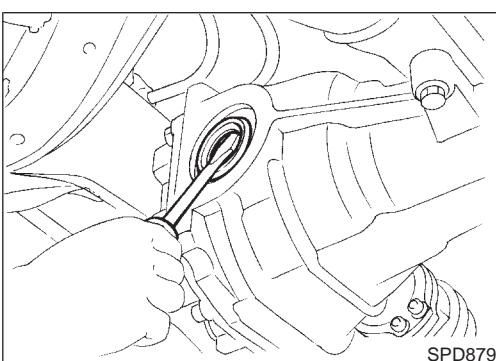
BT

HA

SC

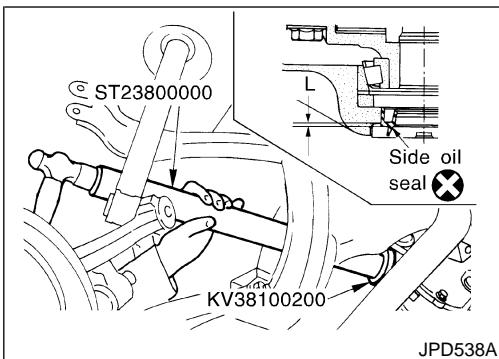
EL

IDX



3. Remove oil seal.

On-vehicle Service (Cont'd)



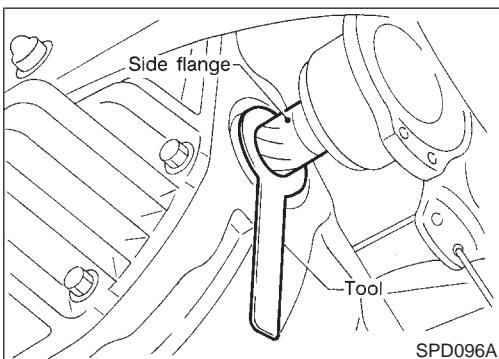
4. Apply multi-purpose grease to sealing lips of oil seal. Press-fit oil seal into carrier with Tool.

Tool number:

KV38100200

ST23800000

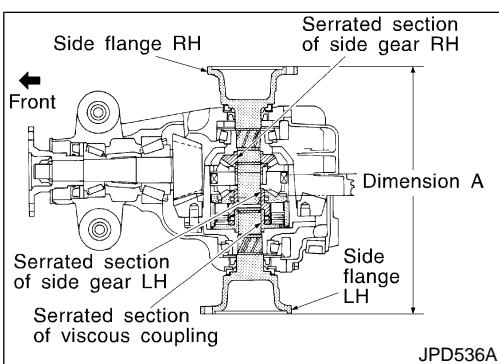
Length "L": Less than 0.5 mm (0.020 in)



5. Install final drive side flange RH.
6. Install final drive side flange LH.
Use Tool to prevent side oil seal from being damaged by spline portion of side flange.

Tool number: KV38107900

7. Install drive shaft.



8. After installing final drive side flange, measure length A.

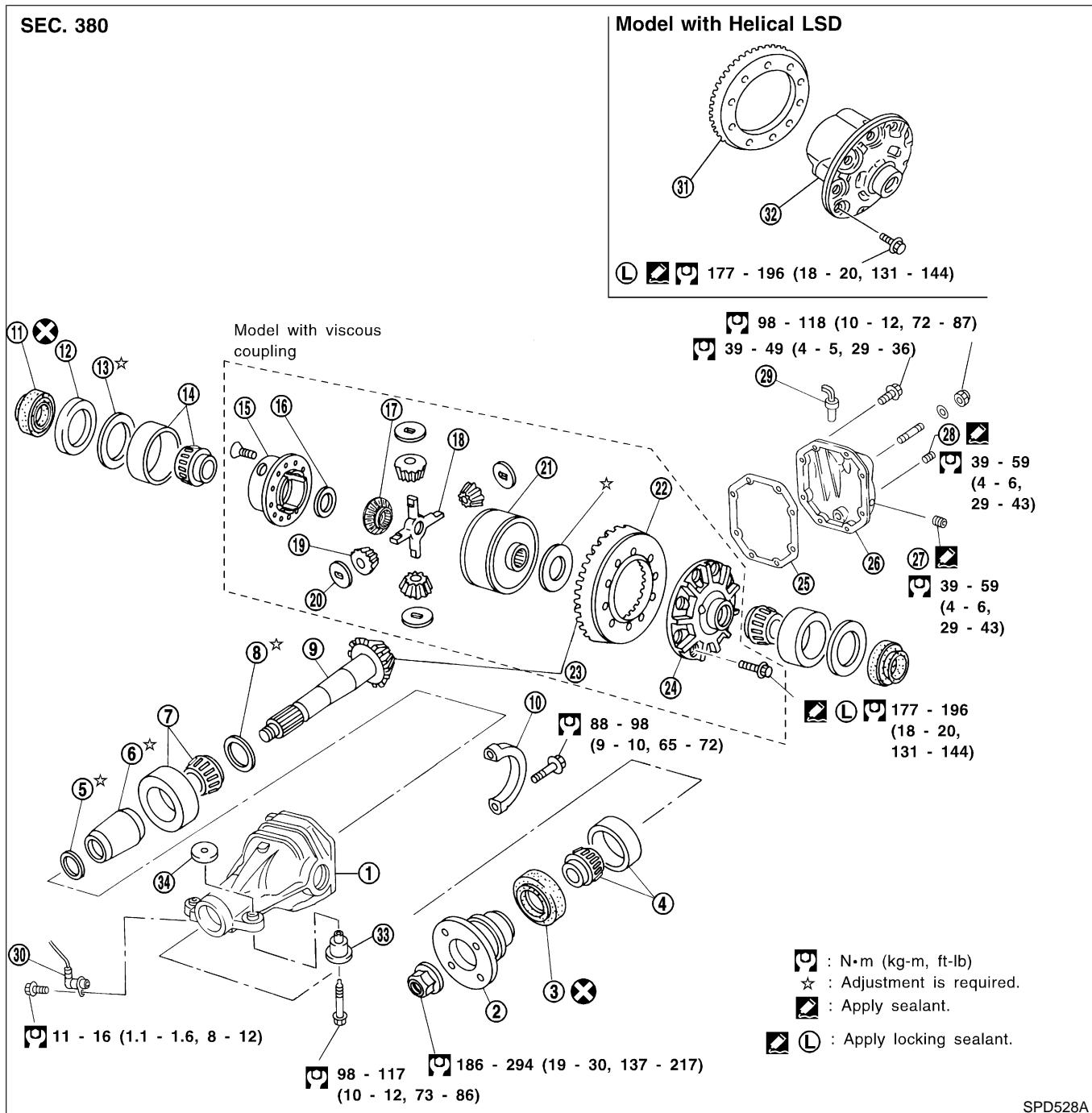
Length A:

Approx. 316 - 318 mm (12.44 - 12.52 in)

Components

R200V, R200H

GI
MA
EM
LC
EC
FE
CL
MT
AT
PD
AX
SU
BR
ST
RS
BT

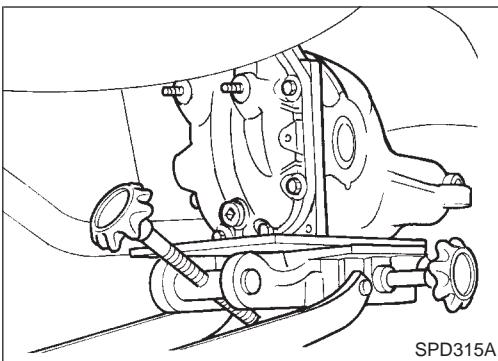


SPD528A

- | | | |
|------------------------------------|-----------------------------------|---------------------------|
| 1. Gear carrier | 13. Side bearing adjusting washer | 24. Differential case A |
| 2. Companion flange | 14. Side bearing | 25. Gasket |
| 3. Front oil seal | 15. Differential case B | 26. Rear cover |
| 4. Pinion front bearing | 16. Side gear thrust washer | 27. Filler plug |
| 5. Pinion bearing adjusting washer | 17. Side gear (RH) | 28. Drain plug |
| 6. Pinion bearing adjusting spacer | 18. Pinion mate shaft | 29. Breather |
| 7. Pinion rear bearing | 19. Pinion mate gear | 30. ABS sensor |
| 8. Pinion height adjusting washer | 20. Pinion mate thrust washer | 31. Ring gear |
| 9. Drive pinion | 21. Side gear (LH) | 32. Differential assembly |
| 10. Bearing cap | 22. Ring gear | 33. Insulator |
| 11. Side oil seal | 23. Hypoid gear set | 34. Upper stopper |
| 12. Side bearing spacer | | |

HA
SC
EL
IDX

Removal and Installation



Removal and Installation

REMOVAL

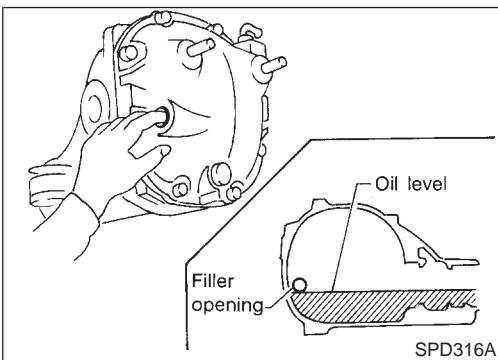
CAUTION:

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.

- Remove propeller shaft.
Plug up rear end of transmission rear extension housing.
- Remove drive shafts.
Refer to "Removal", "Drive Shaft", AX-15.
- Remove nuts securing final drive rear cover to suspension member.
- Support weight of final drive using jack.
- Remove final drive mounting member from front of final drive.
- Move final drive forward together with jack. Remove rear cover stud bolts from suspension member.
- Lower final drive using jack. Remove jack from rear of vehicle.

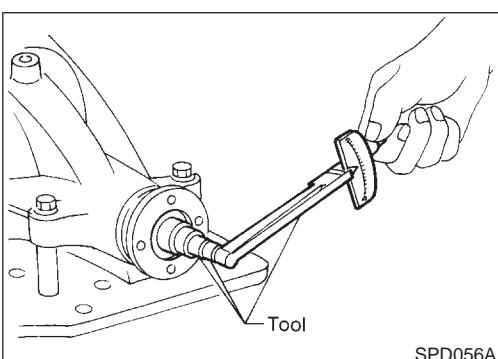
CAUTION:

- 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.



Disassembly

PRE-INSPECTION

NMPD0033S01

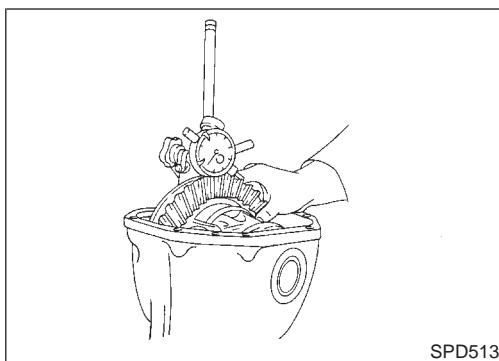
Before disassembling final drive, perform the following inspection.

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

Tool number: ST3127S000

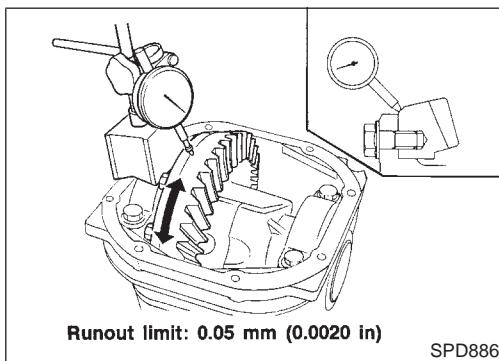
Total preload:

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

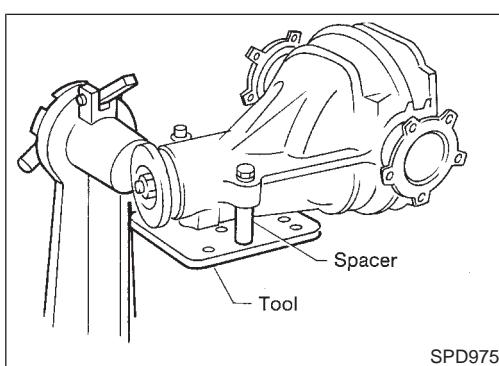


- Ring gear to drive pinion backlash
Check ring gear-to-drive pinion backlash with a dial indicator at several points.

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).

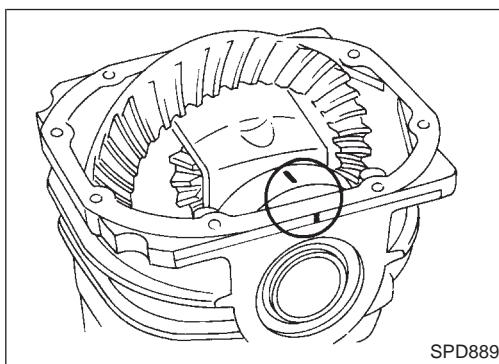


DIFFERENTIAL CARRIER

NMPD0033S02

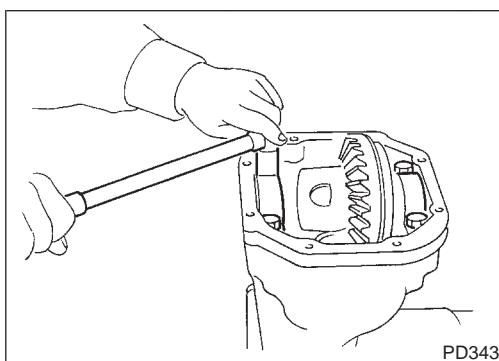
1. Using two 45 mm (1.77 in) spacers, mount carrier on Tool.

Tool number: KV38100800



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.



3. Remove side bearing caps.

GI

MA

EM

LC

EC

FE

CL

MT

AT

PD

AX

SU

BR

ST

RS

BT

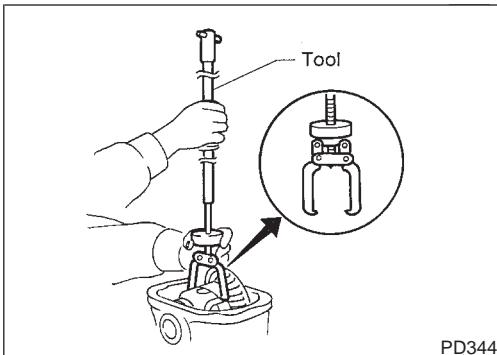
HA

SC

EL

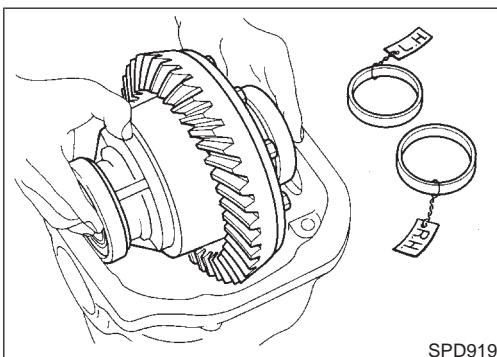
IDX

Disassembly (Cont'd)



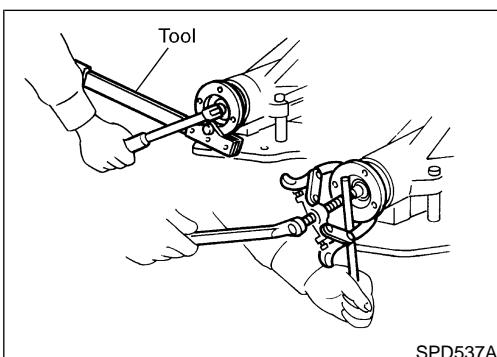
4. Lift differential case assembly out with Tool.

Tool number: HT72400000

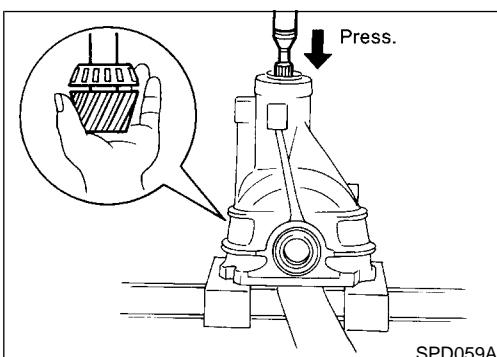


Keep the side bearing outer races together with inner cone — do not mix them up.

Also, keep side bearing spacer and adjusting shims together with bearings.



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

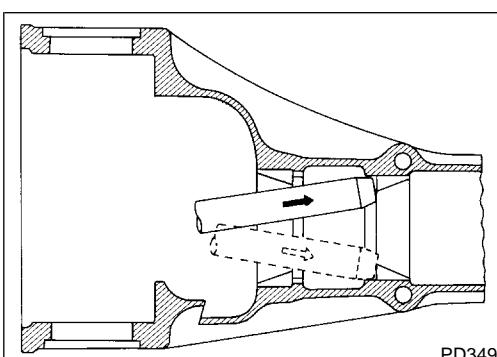


6. Take out drive pinion (together with rear bearing inner race, bearing spacer and adjusting washer).

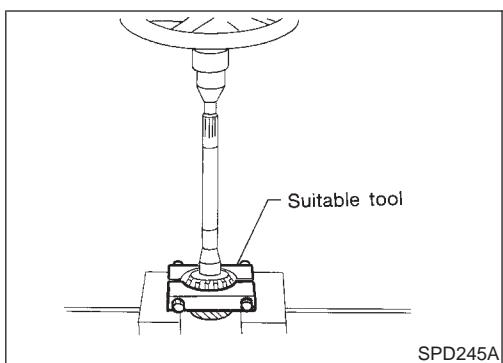
7. Remove oil seal.

8. Remove front bearing inner race.

9. Remove side oil seal.

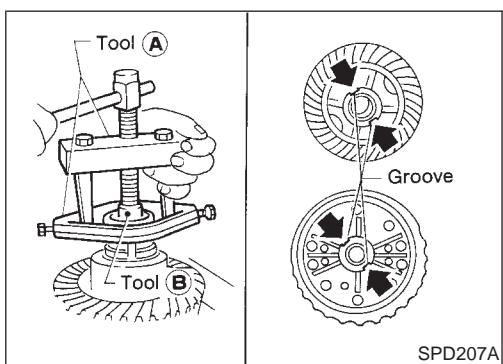


10. Remove pinion bearing outer races with a brass drift.



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

GI



DIFFERENTIAL CASE

NMPD0033S03

1. Remove side bearing inner cones.

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

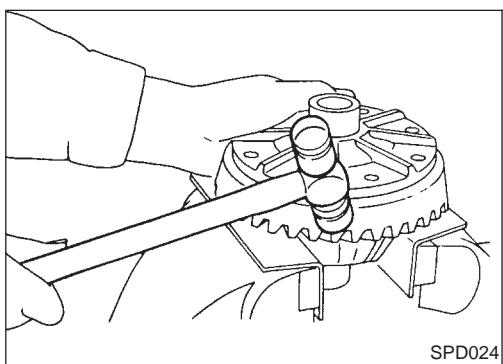
Tool number:

A ST3305S001
B ST33061000

EC

FE

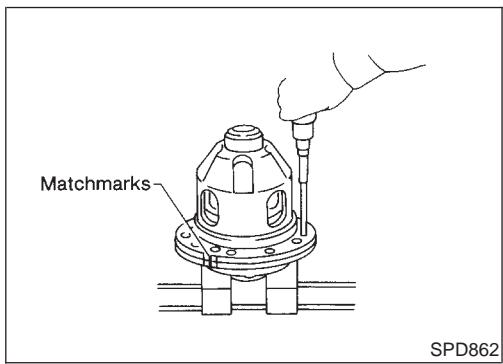
CL



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.

MT

AT



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

PD

AX

SU

BR

ST

RS

BT

HA

Inspection

RING GEAR AND DRIVE PINION

NMPD0034

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).

NMPD0034S01

SC

DIFFERENTIAL CASE ASSEMBLY

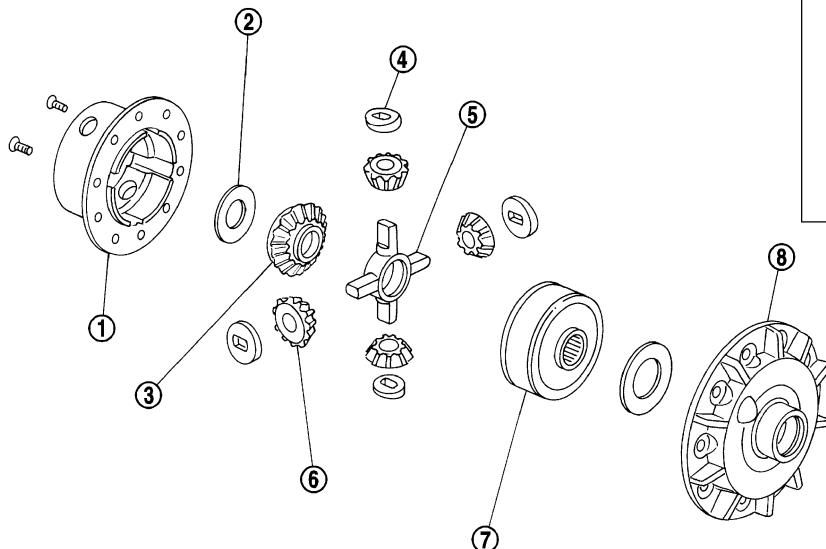
NMPD0034S02

EL

- Check mating surfaces of differential case, side gears, pinion mate gears, pinion mate shaft and thrust washers.
- Check viscous coupling for oil leakage. If necessary, replace it with new one.

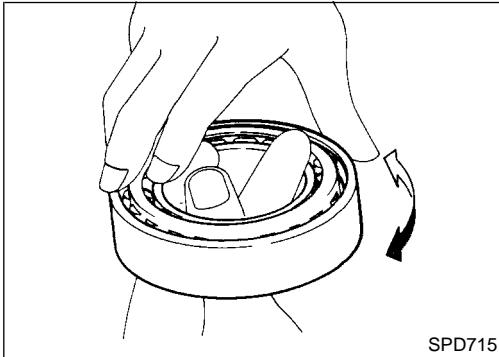
IDX

Inspection (Cont'd)

Model with viscous coupling**Model with Helical LSD**

SPD529A

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
9. Differential assembly

**BEARING**

NMPD0034S03

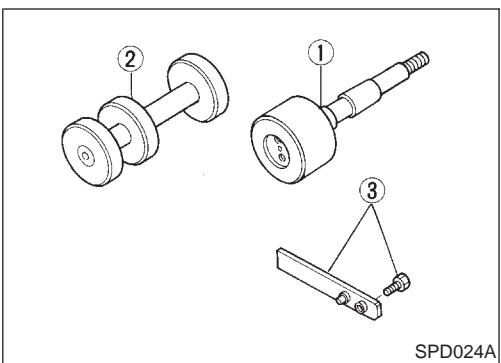
1. Thoroughly clean bearing.
2. Check bearings for wear, scratches, pitting or flaking. Check tapered roller bearing for smooth rotation. If damaged, replace outer race and inner cone as a set.

Adjustment

NMPD0040

To avoid confusion while calculating bearing shims, it is absolutely necessary to stay with the metric system. If you measure anything in inches, **the results must be converted to the metric system.**

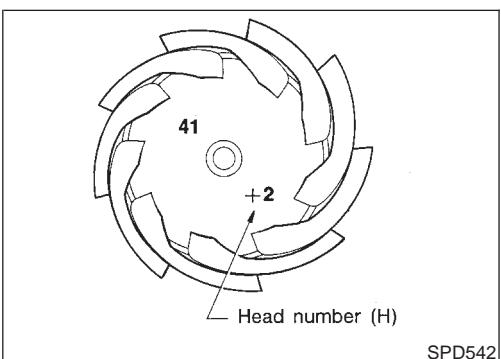
NMPD0040S01



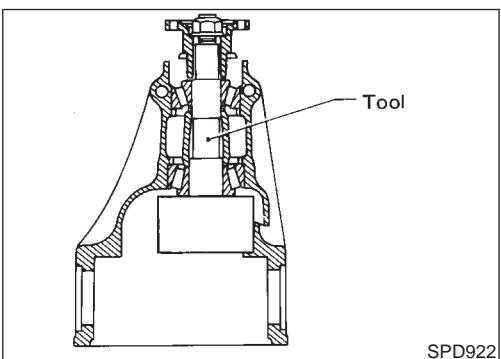
DRIVE PINION HEIGHT

- First prepare Tools for pinion height adjustment.
1 Dummy shaft (KV38103910)
2 Height gauge (KV38100120)
3 Stopper (KV38100140)
- To simplify the job, make a chart, like the one below, to organize your calculations.

LETTERS	HUNDREDTHS OF A MILLIMETER
H: Head number	
N: Measuring clearance	

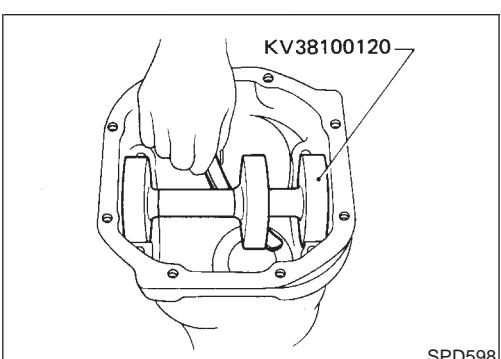


- Write the following numbers down the chart.
H: Head number



- Set Tool (Dummy shaft) as shown below and tighten drive pinion nut carefully to correct preload of 1.0 to 1.3 N·m (10 to 13 kg·cm, 8.7 to 11.3 in-lb).

Tool number: KV38103910



- Attach Tool (Height gauge) to gear carrier, and measure the clearance between the height gauge and the dummy shaft face.
- Substitute these values into the equation to calculate the thickness of the washer.

If value signifying H is not given, regard it as zero and calculate.

T (Thickness of washer) = N - (H x 0.01) + 3.00
Example:

$$N = 0.23$$

$$H = 1$$

$$T = N - (H \times 0.01) + 3.00$$

$$= 0.23 - (1 \times 0.01) + 3.00$$

(1)	H	1
			+1
(2)			+1
		x 0.01	
			+
			0.01
(3)	N	0.23
		- (+0.01)	
			0.22
(4)			0.22
		+ 3.00	
			3.22
			∴ T = 3.22

SPD531A

- #### **7. Select the proper pinion height washer.**

Drive pinion height adjusting washer:

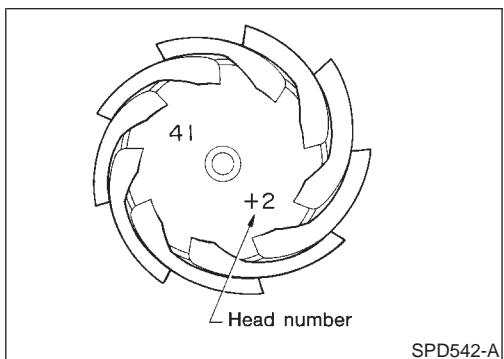
Refer to SDS (PD-32).

If you cannot find the desired thickness of washer, use washer with thickness closest to the calculated value.

Example:

Calculated value ... T = 3.22 mm

Used washer ... $T = 3.21 \text{ mm}$



— Washer selection when replacing hypoid gear set —

Drive pinions may be different in height due to the manufacturing process. Use a washer of proper thickness to adjust the height of new drive pinion. Select the washer as follows:

$$T = (t_1 - t_2) \times 0.01 + T_0$$

where T : thickness of the washer to select

T_0 : thickness of the washer used

t_1 : old drive pinion head number

t_2 : new drive pinion head number

Example:

$$T_0 = 3.21, t_1 = +2, t_2 = -1$$

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

$$= 3 \times 0.01 + 3.21$$

$$= 0.03 + 3.21$$

$$= 3.24$$

$$T = 3.24 \text{ mm}$$

GI

MA

EM

SPD532A

LC

EC

Drive pinion height adjusting washer:
Refer to SDS (PD-33).

SIDE BEARING PRELOAD

1. To simplify the job, make a chart like the one below to organize your calculations.

LETTERS	VALUE
A: Left housing	
B: Right housing	
C: Differential case	
D: Differential case	
H: (+) or (-): ring gear	
E: Left side bearing (= 21 – Measured height)	
F: Right side bearing (= 21 – Measured height)	
G: Side bearing spacer (= 8.1 – Measured thickness)	
X:	1.97
Y:	2.07

FE

CL

MT

AT

PD

AX

SU

BR

ST

RS

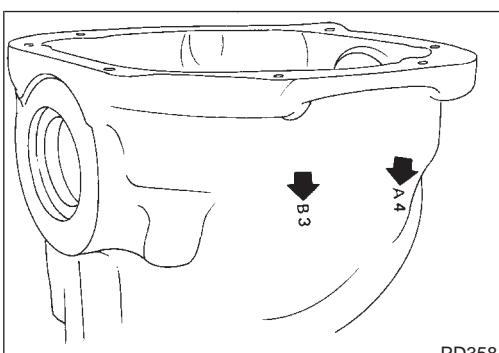
BT

HA

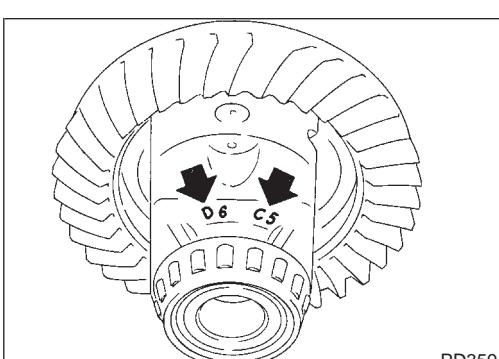
SC

EL

IDX

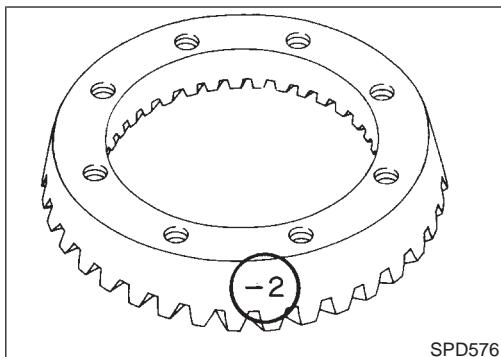


2. Write the following numbers down in the chart.
If numbers for A, B, C, D and H are not given, regard them as zero.
A & B: Figures marked on gear carrier

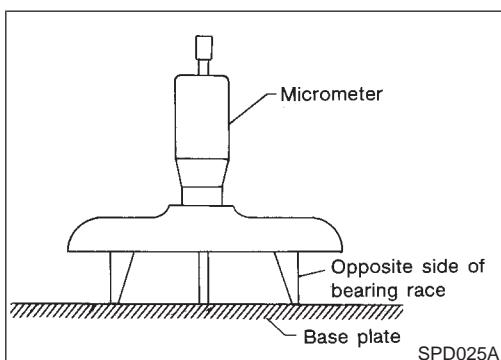


C & D: Figures marked on differential case

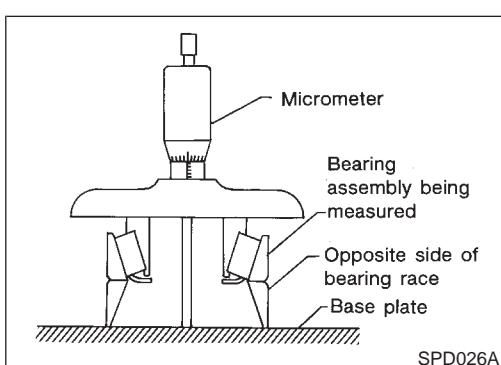
Adjustment (Cont'd)



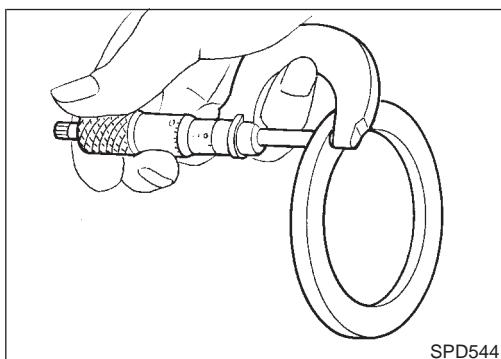
H: Figure marked on ring gear
Do not confuse negative and positive values.



3. Calculate "E" and "F" as follows:
 $E \& F = 21 \text{ mm (0.83 in)}$ – Measured bearing height
Bearing height can be measured as follows:
- a. Measure height of bearing race which will be used as a base for the opposite side of a side bearing assembly.



- b. Set bearing assembly to be measured on the base race and measure the total height.
Lubricate bearing assembly and turn it several times to settle it on the base for accurate measurement.
- c. Subtract base race height from total height.



4. Calculate "G".
G: This is the difference in thickness of side spacer from standard width [8.10 mm (0.3189 in)].
 $G = 8.10 \text{ mm (0.3189 in)}$ – Measured thickness

LETTERS	VALUE
A: Left housing	
B: Right housing	
C: Differential case	
D: Differential case	
H: (+) or (-): ring gear	
E: Left side bearing (= 21 – Measured height)	

REAR FINAL DRIVE

R200

Adjustment (Cont'd)

LETTERS	VALUE
F: Right side bearing (= 21 – Measured height)	
G: Side bearing spacer (= 8.1 – Measured thickness)	
X:	1.97
Y:	2.07

Calculation:

Side bearing spacer is used on the right	Left side washer thickness	$T_1 = (A - C + D - H) \times 0.01 + E + Y$
	Right side washer thickness	$T_2 = (B - D + H) \times 0.01 + F + G + X$
Side bearing spacer is used on the left	Left side washer thickness	$T_1 = (A - C + D - H) \times 0.01 + E + G + X$
	Right side washer thickness	$T_2 = (B - D + H) \times 0.01 + F + Y$

Examples for R200V and R200H which have a side bearing spacer on the right:

A = 4	E = 0.18
B = 3	F = 0.15
C = 5	G = 0.08
D = 6	X = 1.97
H = -2	Y = 2.07

Left side washer thickness (without spacer)

$$T_1 = (A - C + D - H) \times 0.01 + E + Y$$

4	A	
– 5	– C	
= –1	+ D	
+ 6		
= 5	– H	
– (–2)		
= 7	x 0.01	
x 0.01		
= 0.07	+ E	
+ 0.18		
= 0.25	+ Y	
+ 2.07		
= 2.32		
T₁ = 2.32 mm		

Right side washer thickness (with spacer)

$$T_2 = (B - D + H) \times 0.01 + F + G + X$$

3	B	
– 6	– D	
= –3	+ H	
+ (–2)		
= –5	x 0.01	
x 0.01		
= –0.05	+ F	
+ 0.15		
= 0.10	+ G	
+ 0.08		
= 0.18	+ X	
+ 1.97		
= 2.15		
T₂ = 2.15 mm		

SPD533A

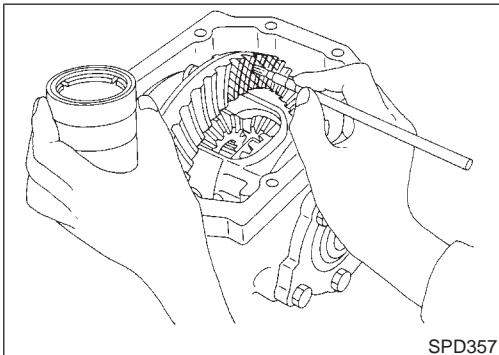
5. Select the proper shims. Refer to SDS (PD-33).
If you cannot find the desired thickness of shims, use shims with the total thickness closest to the calculated value.

Adjustment (Cont'd)

TOOTH CONTACT

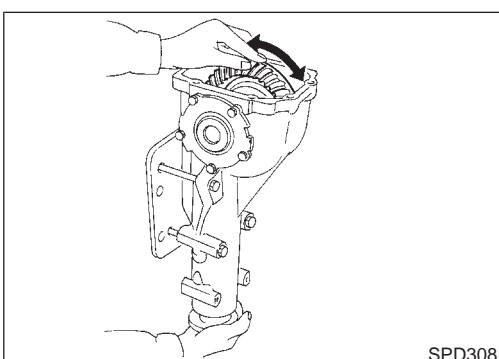
NMPD0040S02

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.

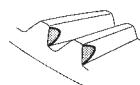


SPD308

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

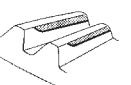
Usually the pattern will be correct if shims are correctly calculated and the backlash is correct. However, in rare cases, trial and error processes may be employed to obtain a correct pattern. The tooth pattern is the best indication of how well a differential has been set up.

Heel contact



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

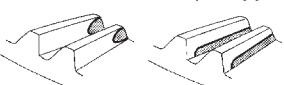
Face contact



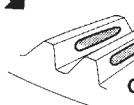
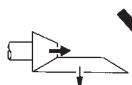
Toe contact



Flank contact



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

Assembly

NMPD0041

DIFFERENTIAL CASE

NMPD0041S01

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.

GI

MA

EM

LC

EC

FE

CL

MT

AT

PD

AX

SU

BR

ST

RS

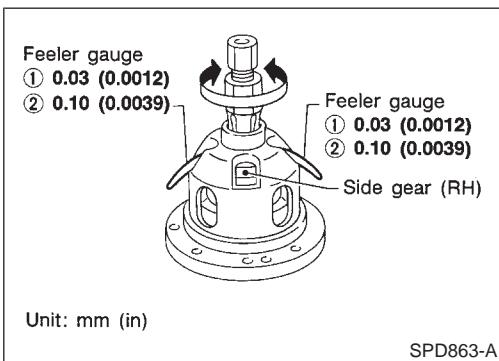
BT

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**Thrust Washer Selection**

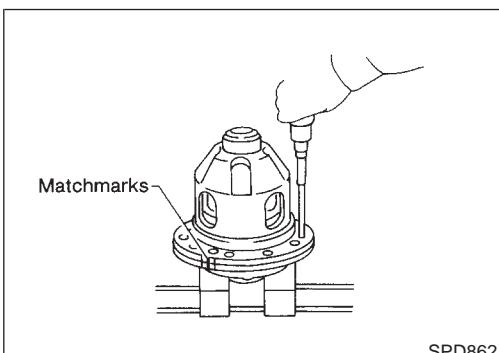
NMPD0041S0101

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.

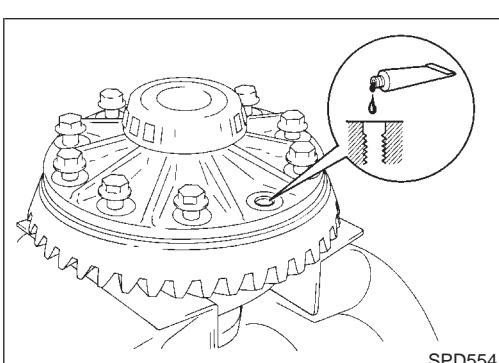
Do not insert feeler gauge in oil groove portion of differential case.

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.

**Assembly**

NMPD0041S0102

1. Install differential case A and B.

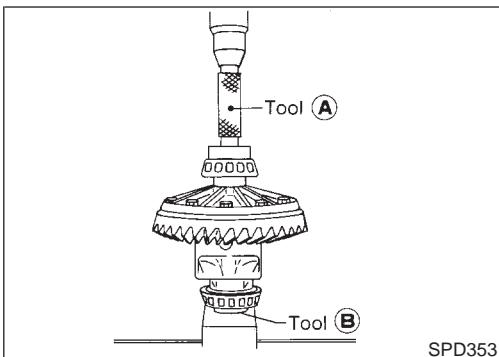


2. Place differential case on ring gear.

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.

Assembly (Cont'd)

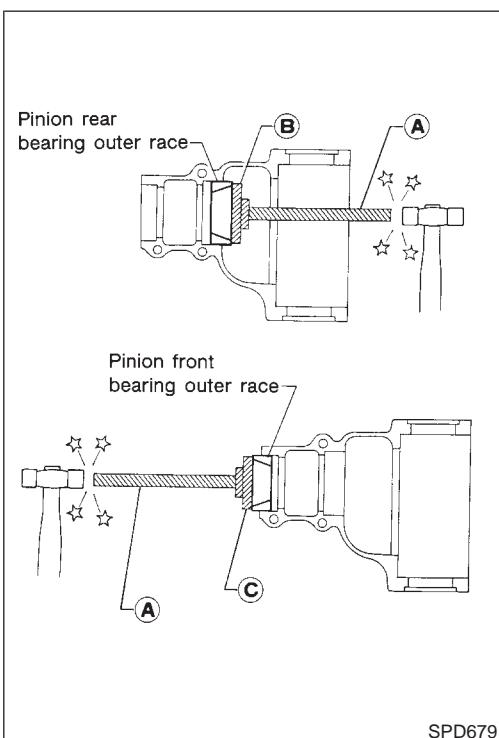


4. Press-fit side bearing inner cones on differential case with Tool.

Tool number:

A KV38100300

B ST33061000



DIFFERENTIAL CARRIER

NMPD0041S02

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

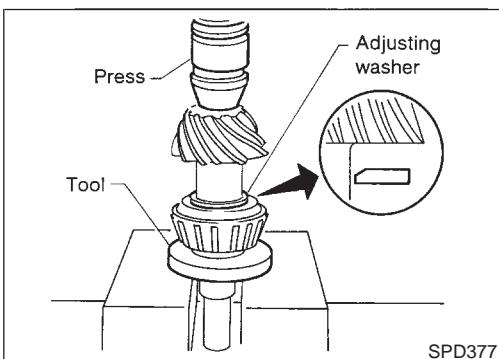
Tool number:

A ST30611000

B ST30621000

C ST30613000

2. Select pinion bearing adjusting washer and drive pinion bearing spacer. Refer to ADJUSTMENT (PD-20).

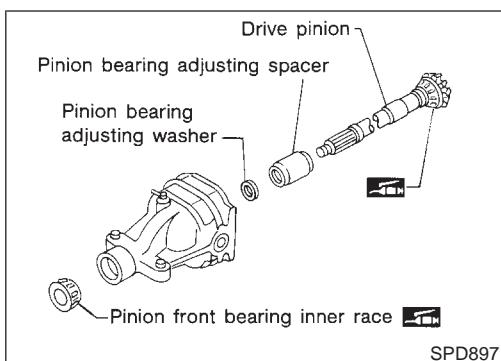


3. Install selected drive pinion height adjusting washer in drive pinion. Using press and Tool, press-fit pinion rear bearing inner cone into it.

Tool number: ST30901000



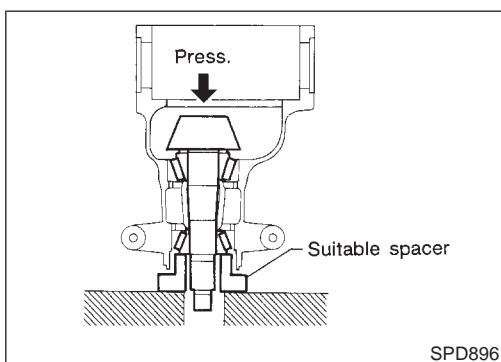
4. Place pinion front bearing inner cone in final drive housing.



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

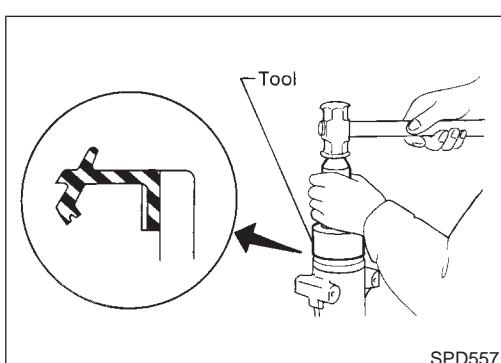
Stop when drive pinion touches bearing.

Apply multi-purpose grease to pinion rear bearing inner race, pinion front bearing inner race.



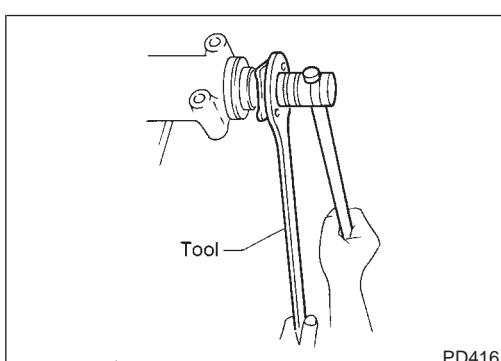
- Apply multi-purpose grease to cavity at sealing lips of oil seal. Install front oil seal with Tool.

Tool number: KV38100500



- 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.

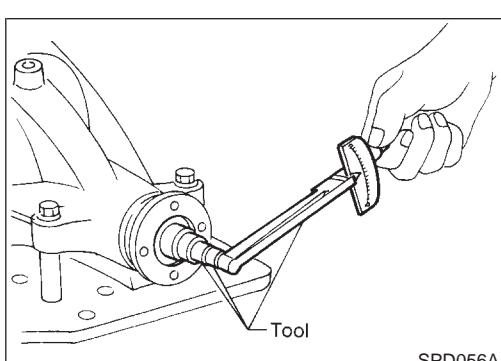


- Turn drive pinion in both directions several times, and measure pinion bearing preload.

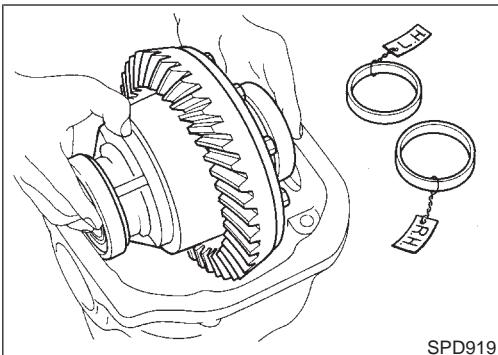
Pinion bearing preload:

1.1 - 1.4 N·m (11 - 14 kg·cm, 9.5 - 12.2 in·lb)

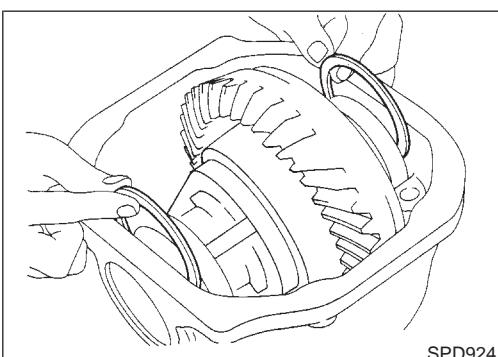
When pinion bearing preload is outside specifications, replacement is required for pinion bearing adjusting washer and spacer. Replace with those of different thickness.



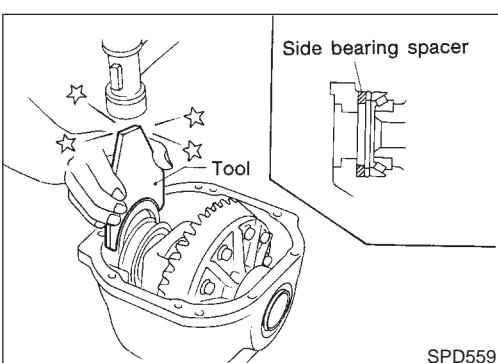
Assembly (Cont'd)



9. Select side bearing adjusting washer. Refer to ADJUSTMENT (PD-23).
10. Install differential case assembly with side bearing outer races into gear carrier.



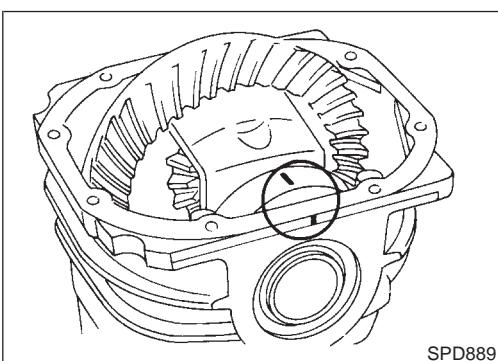
11. Insert left and right side bearing adjusting washers in place between side bearings and carrier.



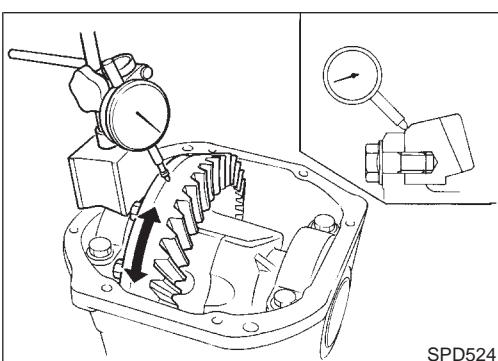
12. Drive in side bearing spacer with Tool.

Tool number: KV38100600

Spacer location: Right side

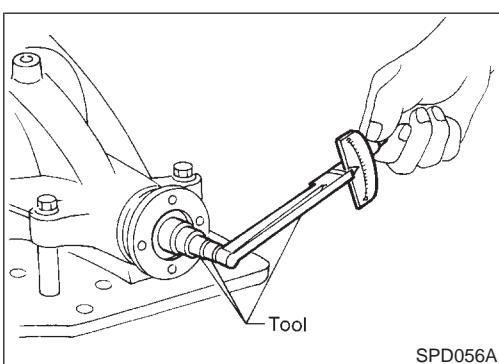
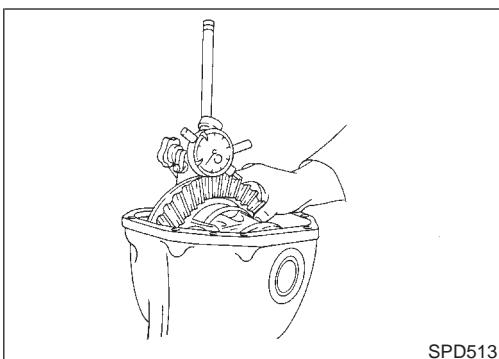


13. Align mark on bearing cap with that on gear carrier and install bearing cap on gear carrier.



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

Runout limit: 0.05 mm (0.0020 in)



15. 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.

GI

MA

EM

LC

EC

FE

CL

MT

AT

PD

AX

SU

BR

ST

RS

BT

16. Check total preload with Tool.

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

Total preload:

1.4 - 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.

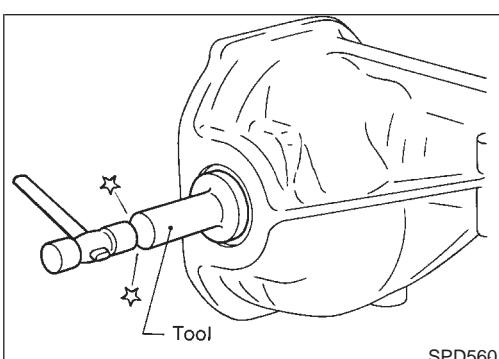
Never add or remove a different number of shims for each side. Difference in number of shims will change ring gear to drive pinion backlash.

17. 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.

18. Check tooth contact.

Refer to ADJUSTMENT (PD-26).



19. Apply multi-purpose grease to cavity at sealing lips of oil seal. Install side oil seal.

Tool number: KV38100200

20. Install rear cover and gasket.

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Service Data and Specifications (SDS)**R200H AND R200V
General Specifications**

NMPD0042

NMPD0042S01

Applied model	M/T	A/T
Final drive model	R200H	R200V
Gear ratio	3.692	3.916
Number of teeth (Ring gear/drive pinion)	48/13	47/12
Oil capacity (Approx.) ℓ (US pt, Imp pt)	1.2 - 1.4 (2-1/2 - 3, 2-1/8 - 2-1/2)	
Number of pinion gears	—	4

Ring Gear Runout

NMPD0042S02

Ring gear runout limit mm (in)	0.05 (0.0020)
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Side Gear Adjustment

NMPD0042S03

Side gear backlash (Clearance between side gear and differential case) mm (in)	0.03 - 0.09 (0.0012 - 0.0035)
	Thickness mm (in)
Available side gear thrust washers	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

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

Total Preload Adjustment

NMPD0042S05

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

REAR FINAL DRIVE

R200

Service Data and Specifications (SDS) (Cont'd)

Available Side Bearing Adjusting Washers

NMPD0042S08

Thickness mm (in)	Part number	
2.00 (0.0787)	38453-N3100	
2.05 (0.0807)	38453-N3101	
2.10 (0.0827)	38453-N3102	GI
2.15 (0.0846)	38453-N3103	MA
2.20 (0.0866)	38453-N3104	
2.25 (0.0886)	38453-N3105	
2.30 (0.0906)	38453-N3106	EM
2.35 (0.0925)	38453-N3107	
2.40 (0.0945)	38453-N3108	
2.45 (0.0965)	38453-N3109	LC
2.50 (0.0984)	38453-N3110	
2.55 (0.1004)	38453-N3111	
2.60 (0.1024)	38453-N3112	EC
2.65 (0.1043)	38453-N3113	

Drive Pinion Height Adjustment

NMPD0042S06

Thickness mm (in)	Part number*	
3.09 (0.1217)	38154-P6017	
3.12 (0.1228)	38154-P6018	CL
3.15 (0.1240)	38154-P6019	
3.18 (0.1252)	38154-P6020	
3.21 (0.1264)	38154-P6021	
3.24 (0.1276)	38154-P6022	MT
3.27 (0.1287)	38154-P6023	
3.30 (0.1299)	38154-P6024	
3.33 (0.1311)	38154-P6025	AT
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	SU
3.66 (0.1441)	38154-P6036	

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

REAR FINAL DRIVE

R200

Service Data and Specifications (SDS) (Cont'd)

Drive Pinion Preload Adjustment

NMPD0042S07

Drive pinion bearing preload adjusting method	Adjusting washer and spacer	
Drive pinion preload without 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 front drive pinion bearing adjusting washer	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
	Length mm (in)	Part number*
Available drive pinion bearing adjusting spacers	46.5 (1.831)	38165-10V00
	46.8 (1.843)	38165-10V01
	45.6 (1.795)	38165-10V05
	46.2 (1.819)	38165-10V06 38165-10V07

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