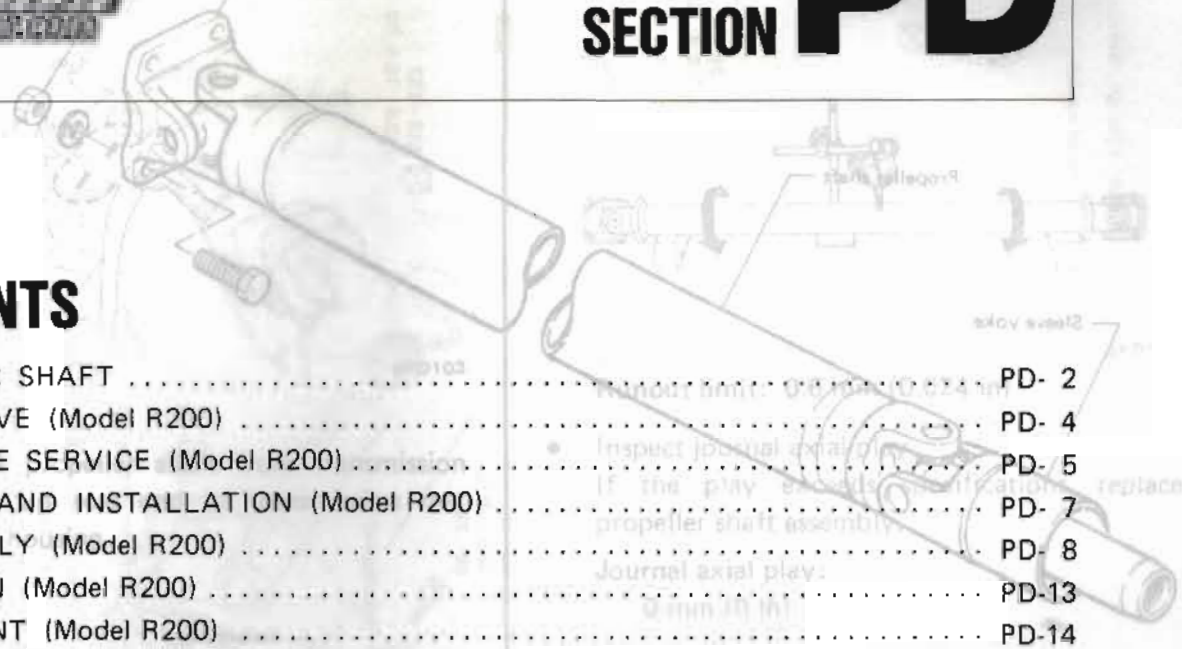
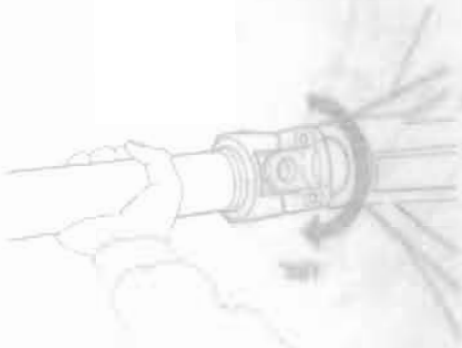
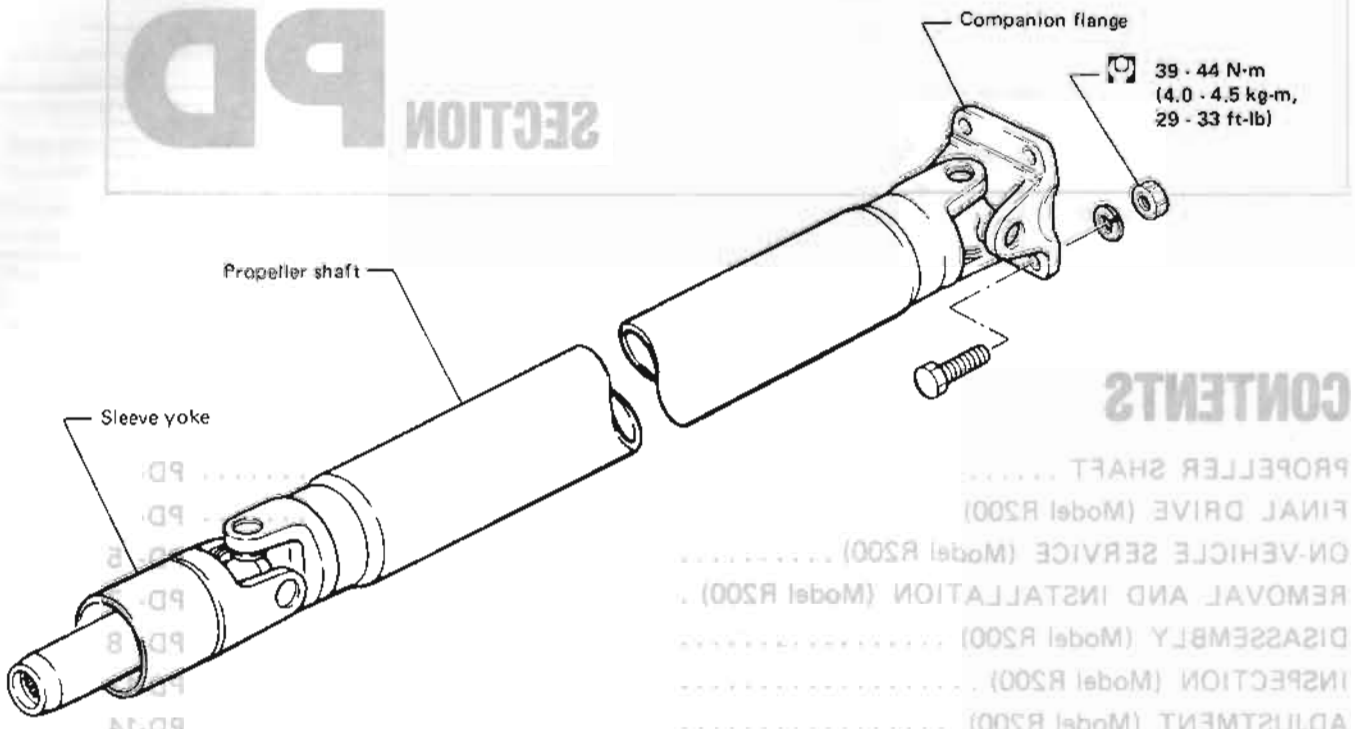
PROPELLER SHAFT & DIFFERENTIAL CARRIER

SECTION **PD**



CONTENTS





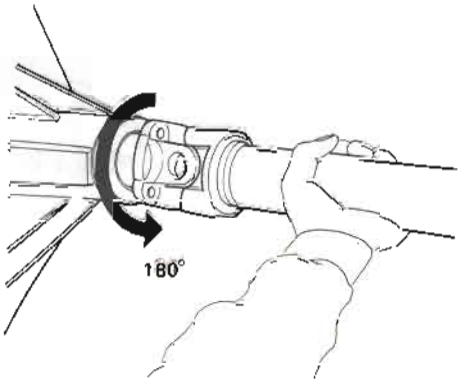
General Inspection

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

PROPELLER SHAFT VIBRATION

To check and correct an unbalanced propeller shaft, proceed as follows:

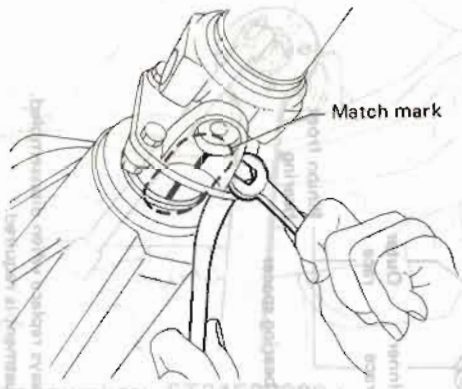
1. Remove undercoating and other foreign material which could upset shaft balance, and check shaft vibration by road test.
2. If shaft vibration is noted during road test, disconnect propeller shaft at differential carrier companion flange, rotate companion flange 180 degrees and reconnect propeller shaft.



3. Again check shaft vibration. If vibration still persists, replace propeller shaft assembly.

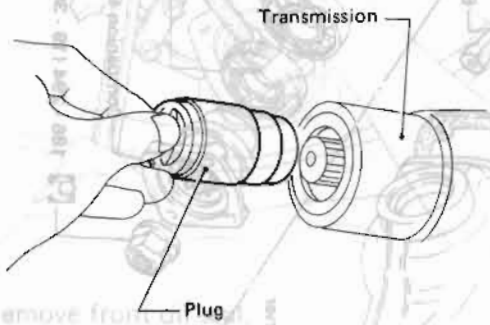
Removal and Installation

- Put match marks on flanges and separate propeller shaft from differential carrier.



SPD103

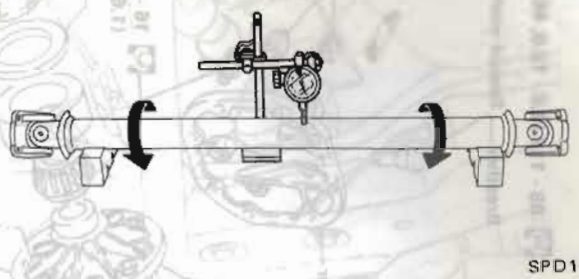
- Draw out propeller shaft from transmission and plug up rear end of transmission rear extension housing.



SPD359

Inspection

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



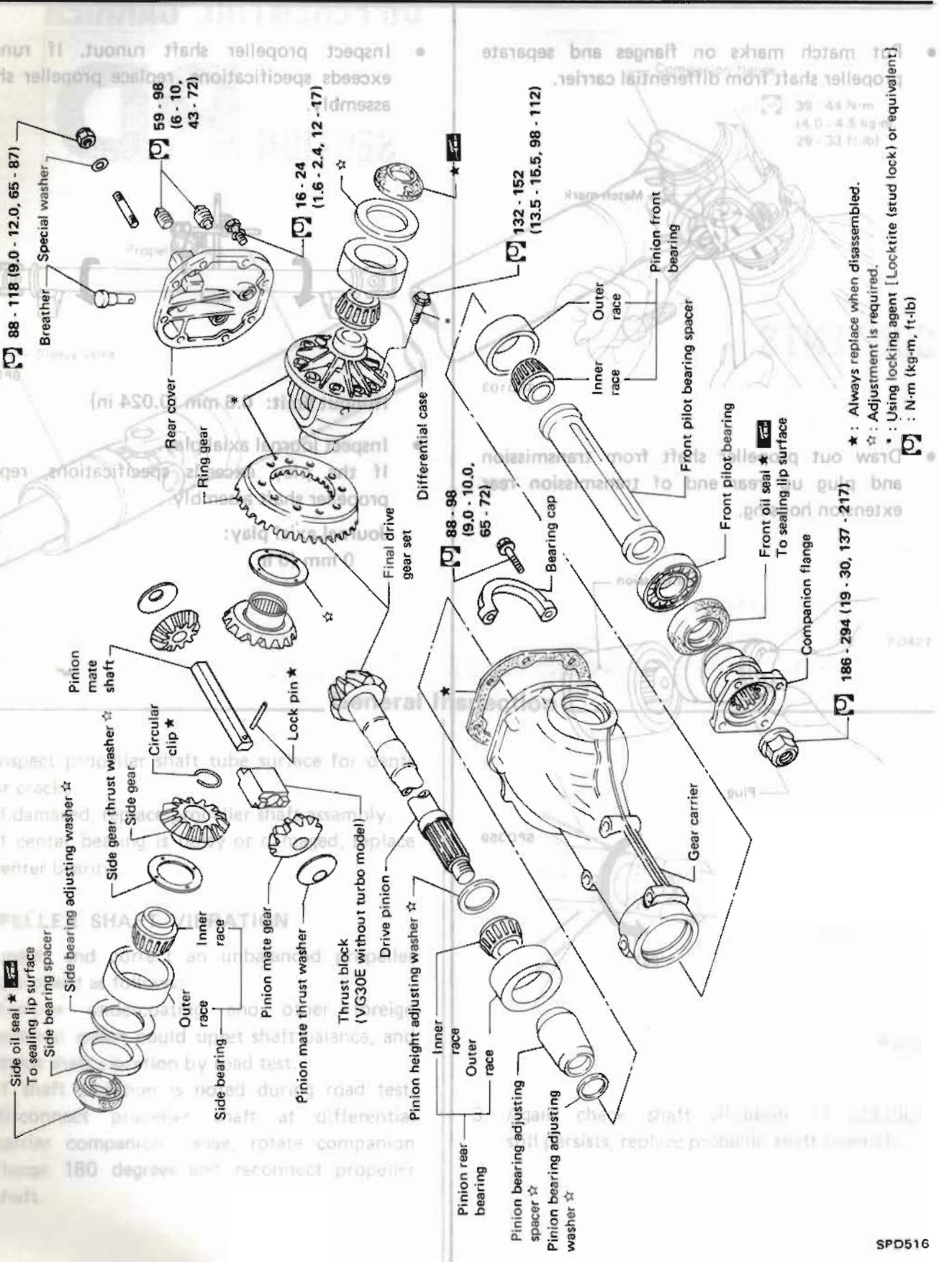
SPD106

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)

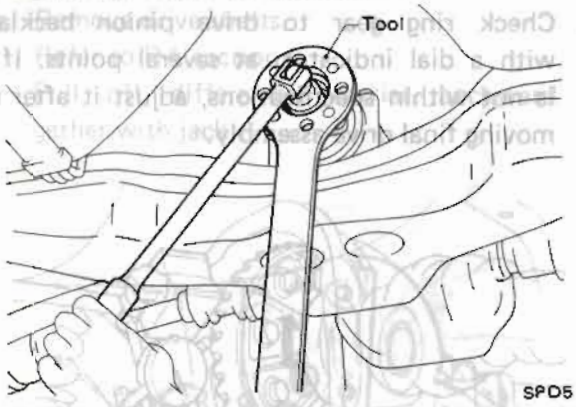
FINAL DRIVE (Model R200)



ON-VEHICLE SERVICE (Model R200)

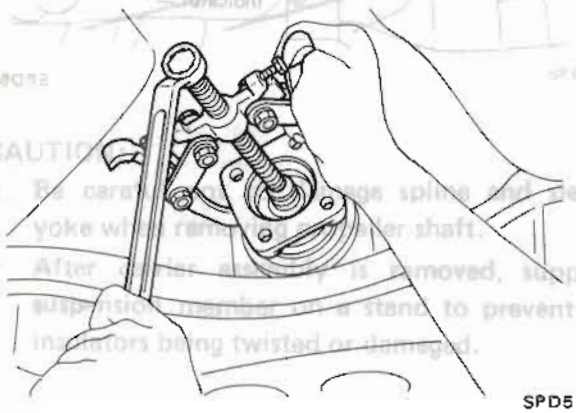
Front Oil Seal Replacement

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

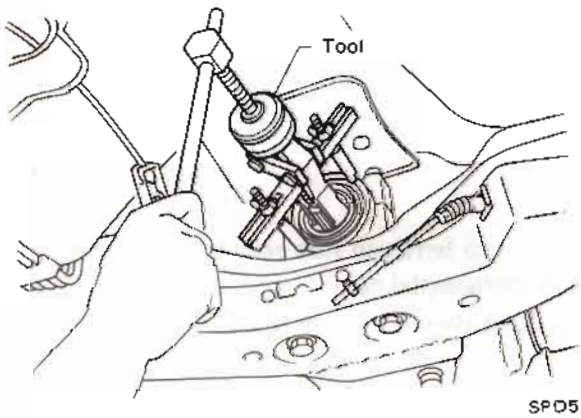


Tool number: ST31520000 (—)

3. Remove companion flange.

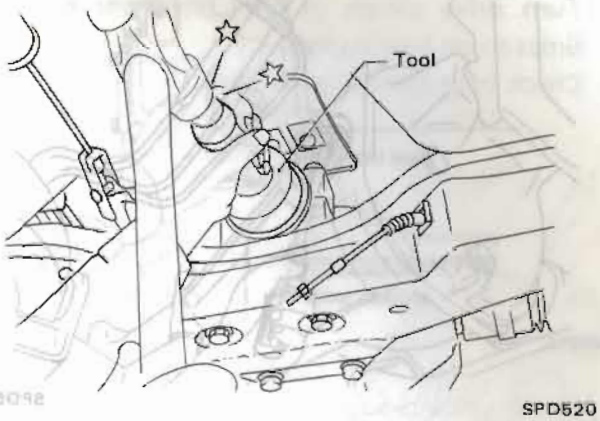


4. Remove front oil seal.



Tool number: ST33290001 (J25810-A)

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



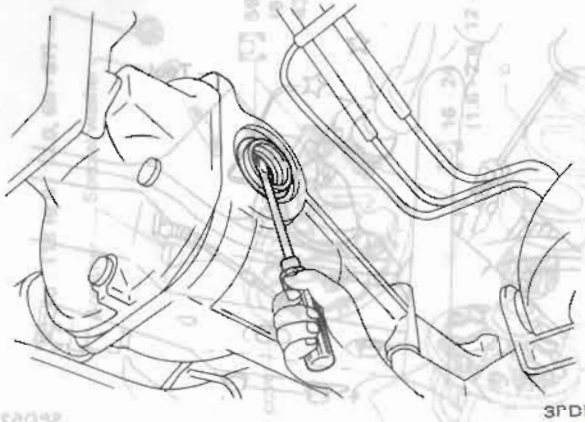
Tool number: KV38100500 (—)

6. Install companion flange and drive pinion nut.
7. Install propeller shaft.

ON-VEHICLE SERVICE (Model R200)

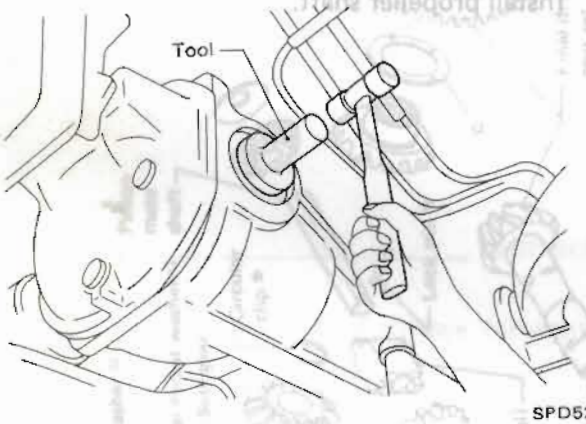
Side Oil Seal Replacement

1. Remove drive shafts.
   Refer to section RA.
2. Remove oil seal.



SPD521

3. Apply multi-purpose grease to cavity at sealing lips of oil seal.
   Press-fit oil seal into carrier.



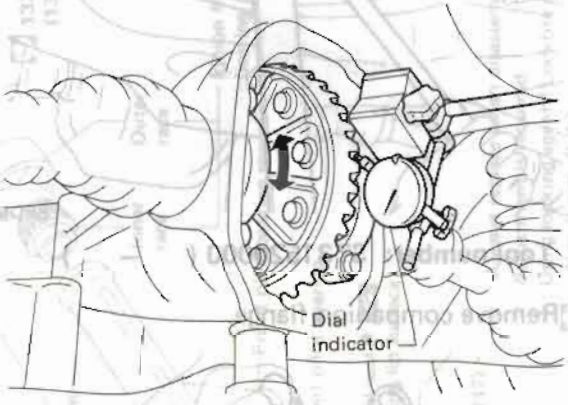
SPD522

Tool number: KV38100200 (–)

4. Install drive shafts.

Ring Gear to Drive Pinion Backlash

1. Support carrier with a jack.
2. Remove rear cover.
3. Check ring gear to drive pinion backlash with a dial indicator, at several points. If it is not within specifications, adjust it after removing final drive assembly.

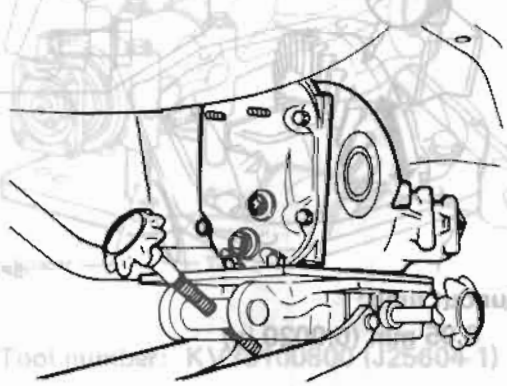


SPD523

REMOVAL AND INSTALLATION (Model R200)

Removal

- Remove propeller shaft.
  Refer to Propeller Shaft.
- Remove drive shafts.
  Refer to RA section.
- Pull off differential carrier backward together with jack.



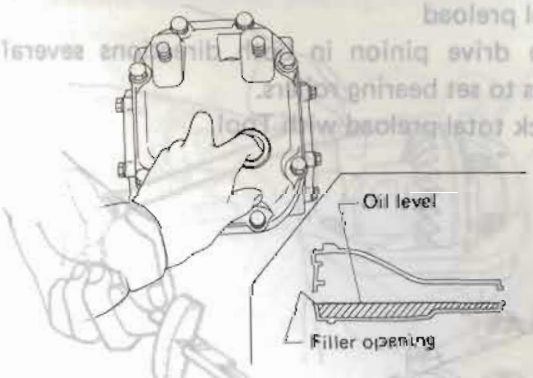
SPD511

CAUTION:

- Be careful not to damage spline and sleeve yoke when removing propeller shaft.
- After carrier assembly is removed, support suspension member on a stand to prevent its insulators being twisted or damaged.

Installation

- Full final drive with recommended gear oil.
  Refer to section GI.



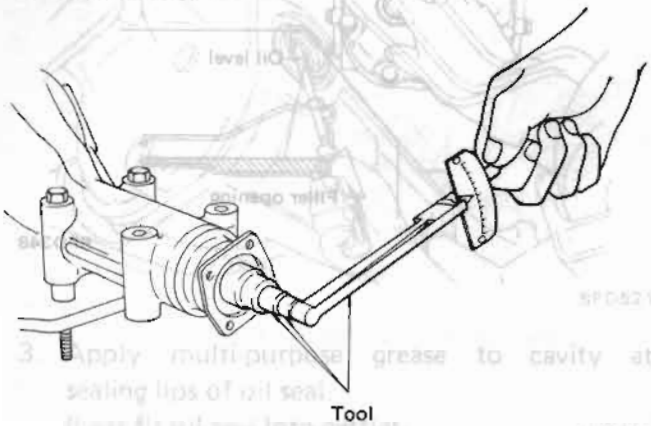
SPD348

Pre-inspection

Before disassembling final drive, perform the following inspection.

- Total preload

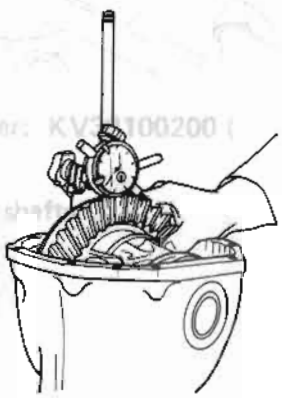
1) Turn drive pinion in both directions several times to set bearing rollers.
2) Check total preload with Tool.



PD245

Tool number: ST3127S000 (See J25765-A.)
Total preload:
1.23 - 2.30 N·m
(12.5 - 23.5 kg-cm, 10.9 - 20.4 in-lb)

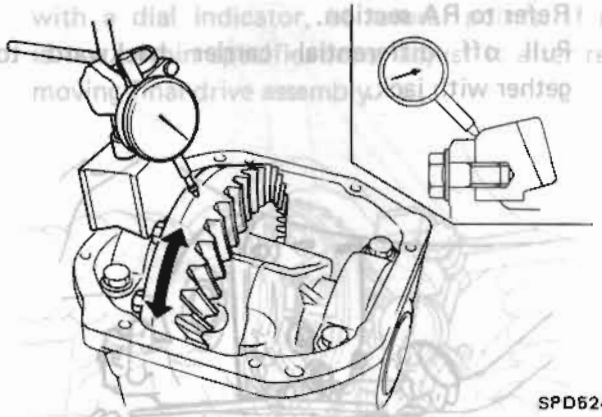
- Ring gear to drive pinion backlash.
  Check backlash of ring gear with a dial indicator at several points.



SPD513

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

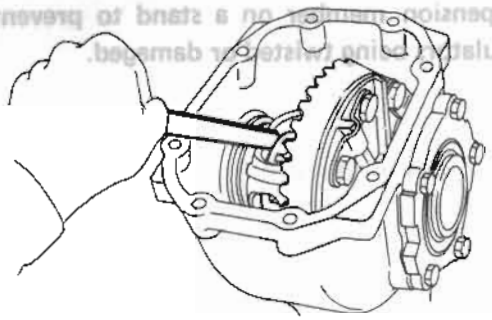
- Ring gear runout
  Check runout of ring gear with a dial indicator.



SPD524

Runout limit:
0.05 mm (0.0020 in)

- Tooth contact
  Check tooth contact, referring to Adjustment.
- Side gear to pinion mate gear backlash
  Measure clearance between side gear thrust washer and differential case with thickness gauge.



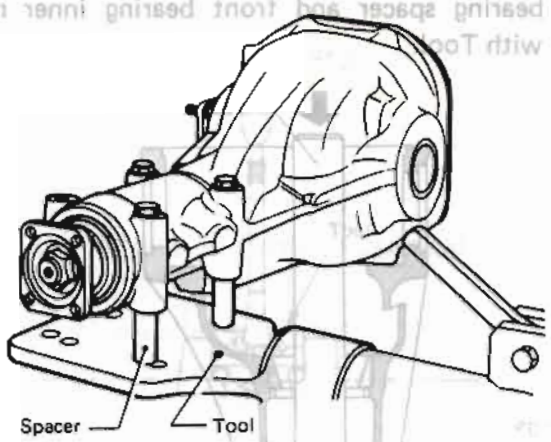
SPD370

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

DISASSEMBLY (Model R200)

Differential Carrier

1. Using three spacers [45 mm (1.77 in)], mount carrier on Tool.

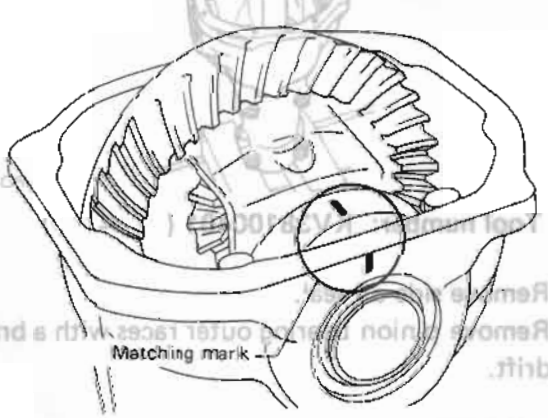


SPD525

Tool number: KV38100800 (J25604-1)

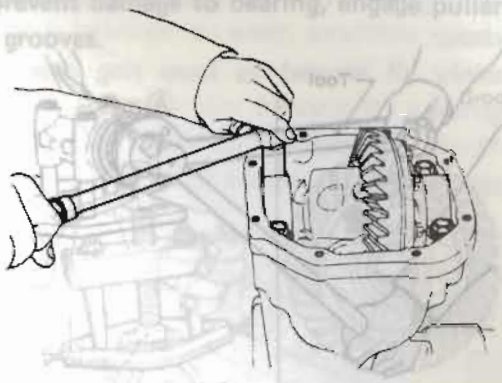
2. Put match marks on one side of side bearing cap and gear carrier with paint or punch to ensure that it is replaced in proper position during reassembly.

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



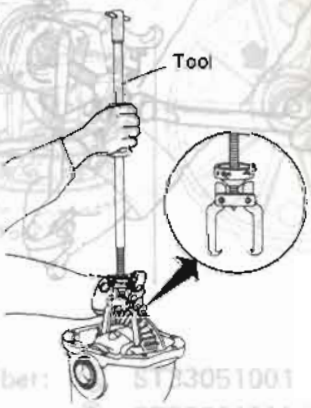
SPD526

3. Remove side bearing caps.



PD343

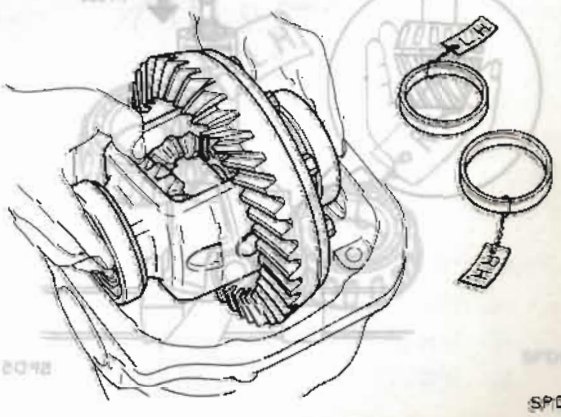
4. Using Tool, lift differential case assembly out.



PD344

Tool number: HT72400000 (–)

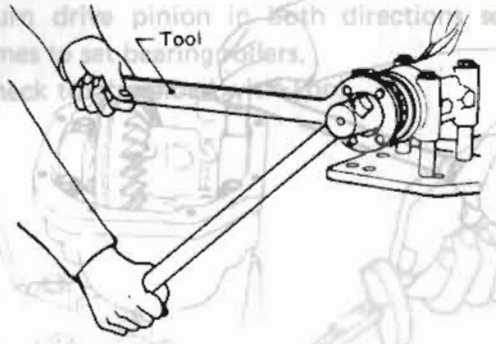
Be careful to keep the side bearing outer races together with inner race – do not mix them up.



SPD527

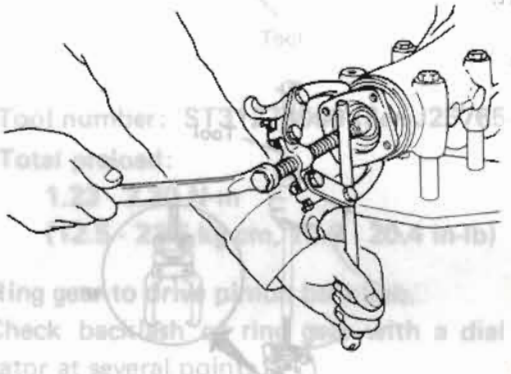
Differential Carrier (Cont'd)

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



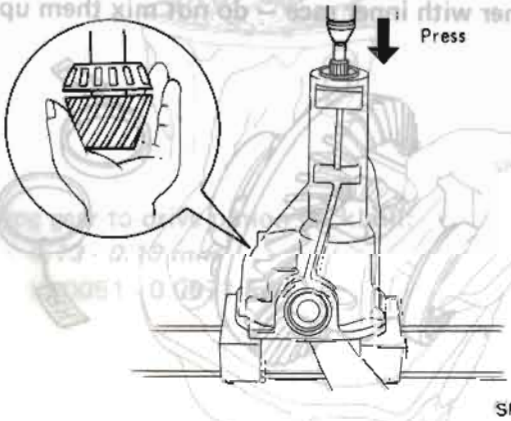
PD345

Tool number: ST31520000 (—)



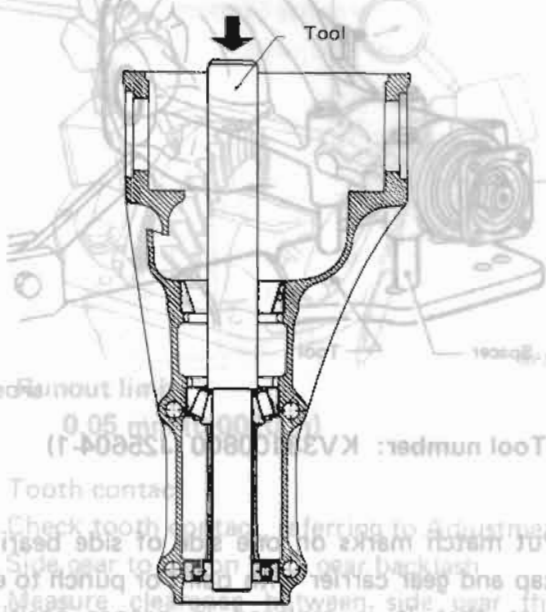
PD346

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



SPD528

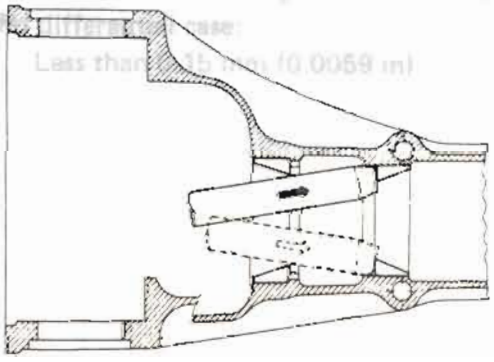
7. Remove oil seal.
8. Remove pilot bearing together with pilot bearing spacer and front bearing inner race with Tool.



PD348

Tool number: KV38100401 (—)

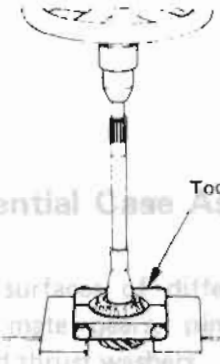
9. Remove side oil seal.
10. Remove pinion bearing outer races with a brass drift.



PD349

Differential Carrier (Cont'd)

11. Remove pinion rear bearing inner race and pinion height adjusting washer.



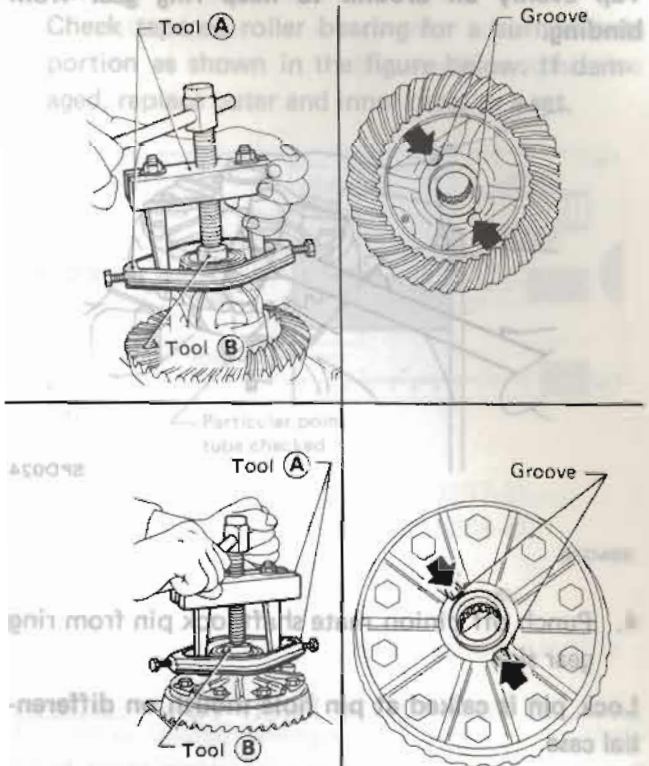
PD179

Tool number: ST30031000 (J22912-01)

Differential Case

1. Remove side bearing inner races.

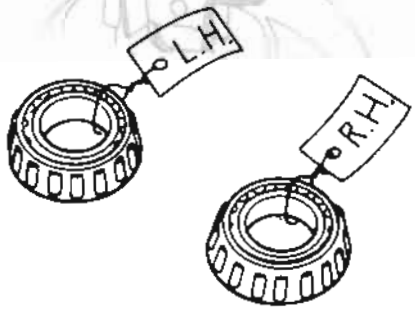
To prevent damage to bearing, engage puller paws with grooves.



SPD529

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

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

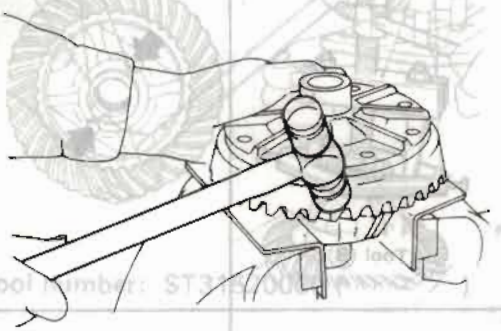


SPD022

Differential Case (Cont'd)

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

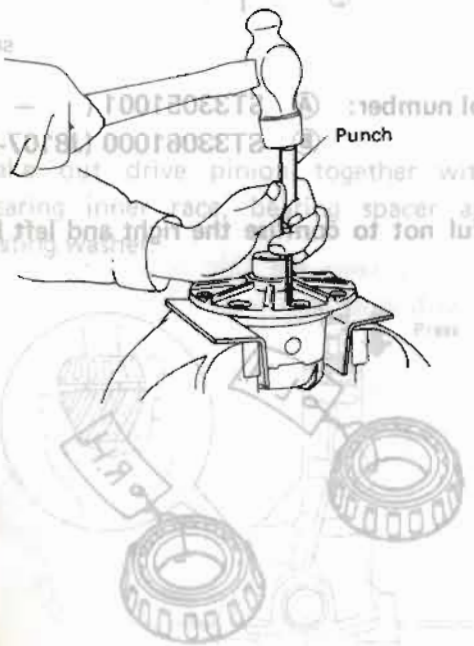
Tap evenly all around to keep ring gear from binding.



SPD024

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

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



SPD025

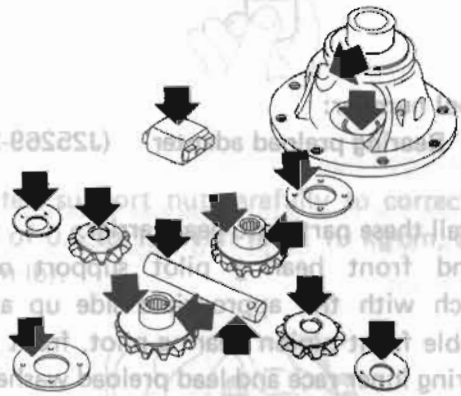
INSPECTION (Model R200)

Ring Gear and Drive Pinion

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

Differential Case Assembly

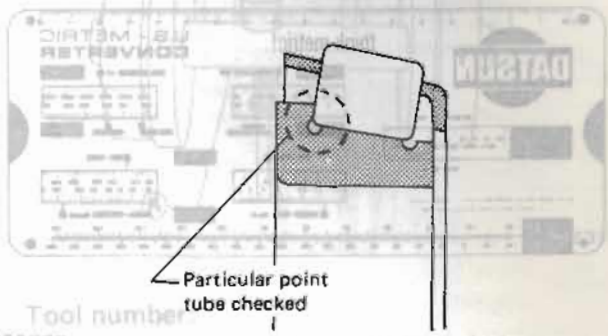
Check mating surfaces of differential case, side gears, pinion mate gears, pinion mate shaft, thrust block and thrust washers.



SPD584

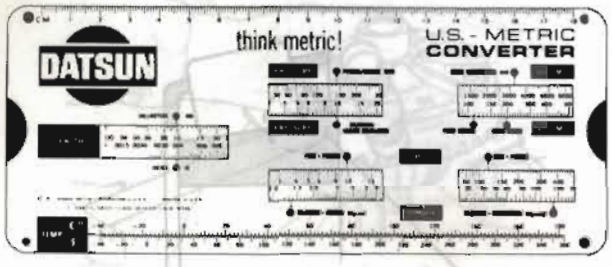
Bearing

1. Thoroughly clean bearing and dry with compressed air.
2. Check bearings for wear, scratches, pitching or flaking.
   Check tapered roller bearing for a burned out portion as shown in the figure below. If damaged, replace outer and inner races as a set.



SPD458

To avoid any 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. You can use a conversion chart or a calculator as illustrated.

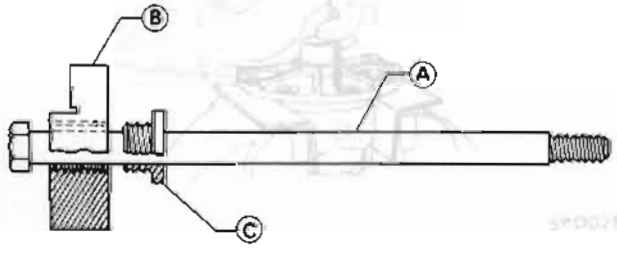


SPD531

Setting Up Each Tool

Set up each tool, rear pinion bearing and front pinion bearing before adjusting pinion height and drive pinion bearing preload.

1. Install rear pinion bearing pilot into gauge plate and slide over hex head long bolt.

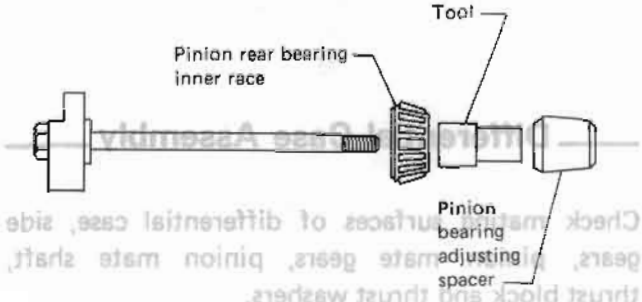


SPD532

Tool number:

Ⓐ Hex head long bolt (J25269-23)
Ⓑ Gauge plate (J25269-1)
Ⓒ Rear pinion bearing pilot (J25269-2)

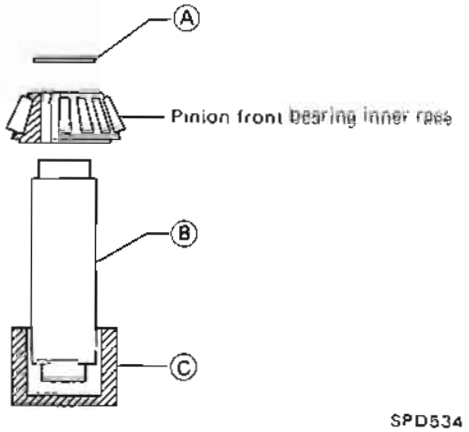
2. Slide pinion rear bearing inner race, bearing preload adapter and pinion bearing adjusting spacer over hex head long bolt.



SPD533

Tool number:
Bearing preload adapter (J25269-26)

3. Install these parts into gear carrier.
4. Stand front bearing pilot support on the bench with the appropriate side up and assemble front pinion bearing pilot, front pinion bearing inner race and lead preload washer. Ensure that all parts are seated.



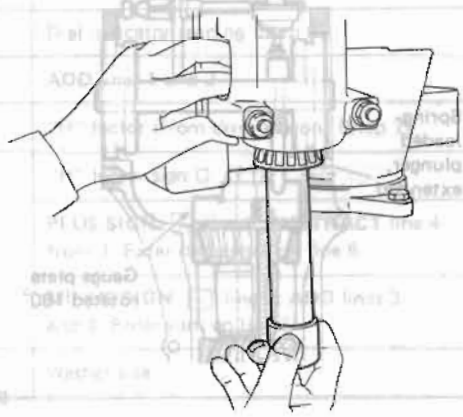
SPD534

Tool number:

Ⓐ Lead preload washer (J25269-25)
Ⓑ Front pinion bearing pilot (J25269-3)
Ⓒ Front bearing pilot support (J25269-29)

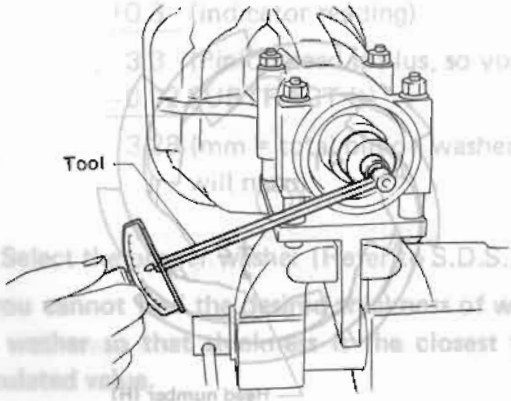
Setting Up Each Tool (Cont'd)

5. Holding these parts together, slide the assembly over hex head long bolt into gear carrier. Install support nut. Finger-tighten the nut and ensure that all parts turn freely and are properly aligned.



SPD535

6. Tighten support nut carefully to correct preload of 0.6 to 1.0 N·m (6 to 10 kg-cm, 5.2 to 8.7 in-lb).

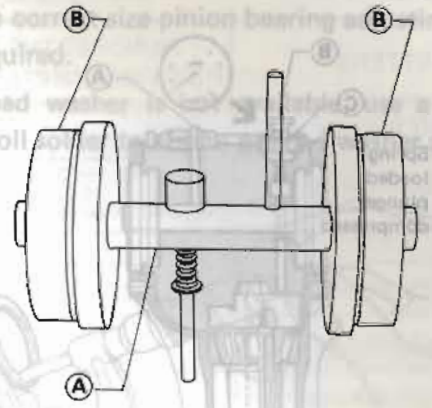


SPD536

Tool number: (J25765-A)

Drive Pinion Height

1. Install two side bearing discs with arbor assembly. Ensure that arbor turns freely.



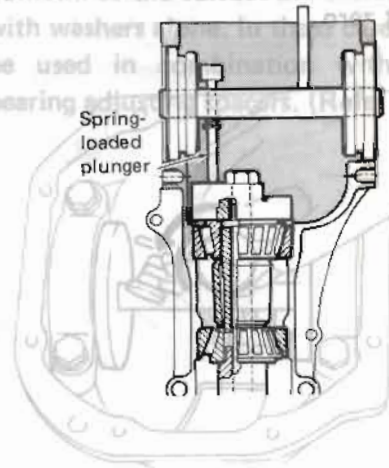
SPD537

Tool number:

Ⓐ	Arbor assembly	(J23597-1)
Ⓑ	Side bearing disc	(J25269-4)

2. Place side bearing discs with arbor assembly into differential carrier.

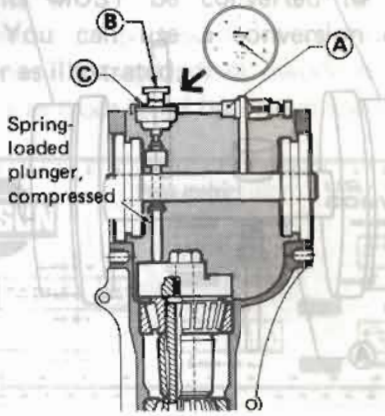
Lift spring loaded plunger and place it on the face of gauge plate.



SPD538

Drive Pinion Height (Cont'd)

3. Install bearing caps.
4. Install dial indicator and tighten hold down clamp.

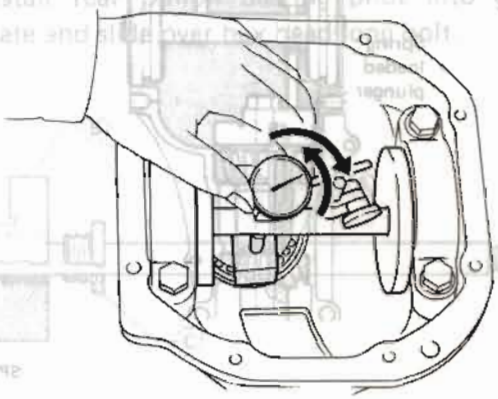


SPD539

Tool number:

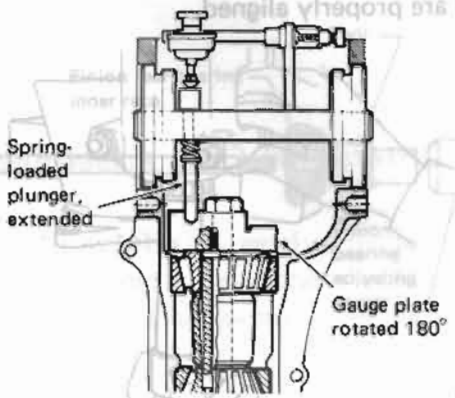
Ⓐ	Hold down clamp	(J8001-1)
Ⓑ	Dial indicator clamp	(J8001-2)
Ⓒ	Dial indicator	(J8001-6)

5. To zero dial indicator, rotate arbor and plunger back and forth and note highest deflection (the point where needle changes direction). Set dial indicator at zero.



SPD540

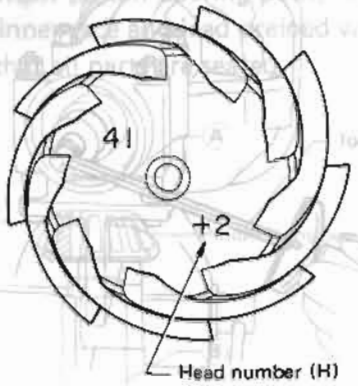
6. Rotate gauge plate until the plunger falls off gauge plate and read dial indicator (Read the dial indicator diectly).
   Repeat to ensure accuracy.



SPD541

7. Read head number (H) on drive pinion head.

The figure for H is a dimensional variation in units of 0.01 mm (0.0004 in) against a standard measurement.



SPD542

Drive Pinion Height (Cont'd)

8. Calculate washer thickness following the chart below.

LINE #	OPERATION	
1.	Standard number	3.00mm
2.	Dial indicator reading (Step 6)	
3.	**ADD** lines 1 and 2	
4.	"H" factor (from drive pinion) (Step 7)	
5.	"H" factor sign □	
	PLUS SIGN ⊞ line 5; **SUBTRACT** line 4 from 3. Enter difference on line 6	
	MINUS SIGN ⊟ line 5; **ADD** lines 3 and 4. Enter sum on line 6	
6.	Washer size	

Example: Dial Indicator Reading: 0.3 mm

Number on Pinion Head: +2

3.00 (standard measure)
+0.3 (indicator reading)
3.3 (Pinion head is plus, so you
−0.02 SUBTRACT it)
3.28 (mm = total pinion washer you will need)

9. Select the proper washer (Refer to S.D.S.).

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

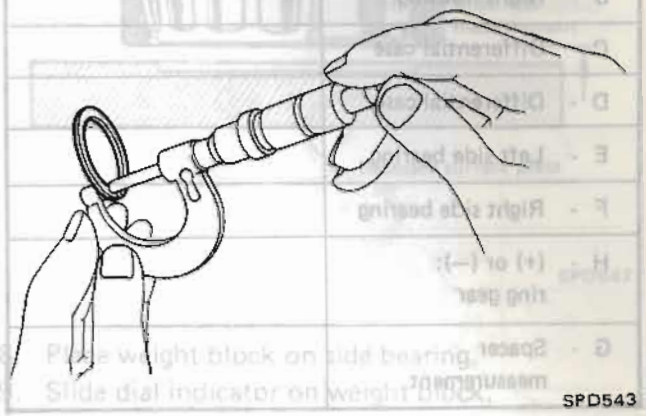
Example:
3.28 mm (Calculated total pinion washer in step 8)

The correct washer is 3.27 mm
(Part number 38154 P6023).

Drive Pinion Preload

1. To determine pinion bearing preload, disassemble pinion height/bearing preload tools and measure thickness of lead washer. This is the correct size pinion bearing adjusting washer required.

If a lead washer is not available, use a piece of thick roll solder to obtain preload washer size.


SPD543

2. Select the proper washer (Refer to S.D.S.).

- **If you cannot find shims with the desired thickness, use shims so that the total thickness is the closest to the calculated value.**
- **Sometimes the correct dimension cannot be set with washers alone. In these cases, washers may be used in combination with drive pinion bearing adjusting spacers. (Refer to S.D.S.)**

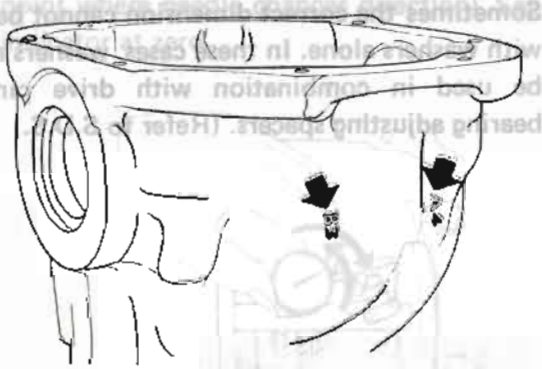
Side Bearing Preload

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

LETTERS	HUNDREDTHS OF A MILLIMETER
A - Left housing	
B - Right housing	
C - Differential case	
D - Differential case	
E - Left side bearing	
F - Right side bearing	
H - (+) or (−): ring gear	
G - Spacer measurement	

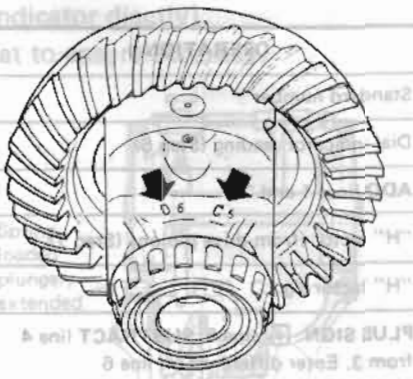
2. Write the following numbers down in the chart.

A & B: Figures marked on gear carrier



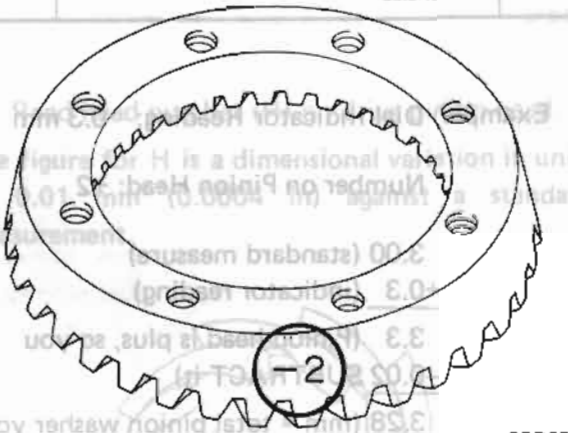
PD358

C & D: Figures marked on differential case



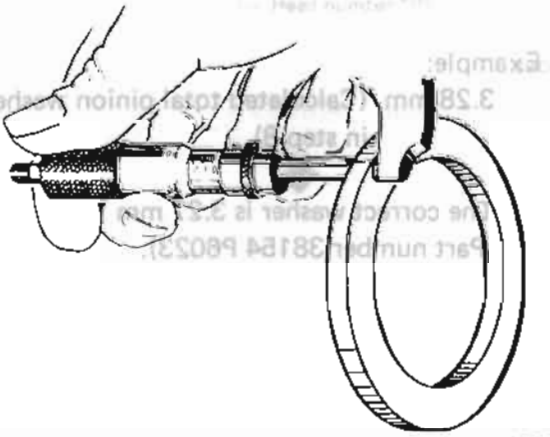
PD359

H: Figures marked on ring gear



SPD576

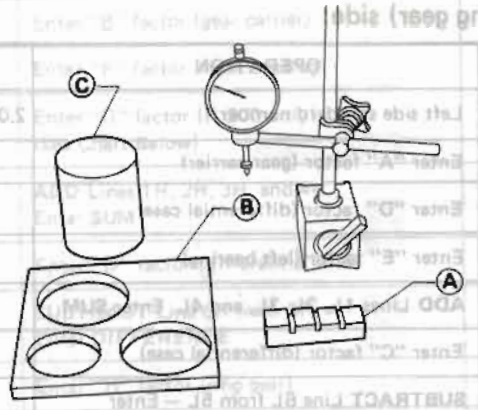
G: This is the difference in thickness of side spacer against standard width [8.10 mm (0.3189 in)]
(G = Standard spacer − Measured spacer).



SPD544

Side Bearing Preload (Cont'd)

3. Measure how far under the standard thickness [21 mm (0.83 in)] the side bearings are. It will require the tools shown below.

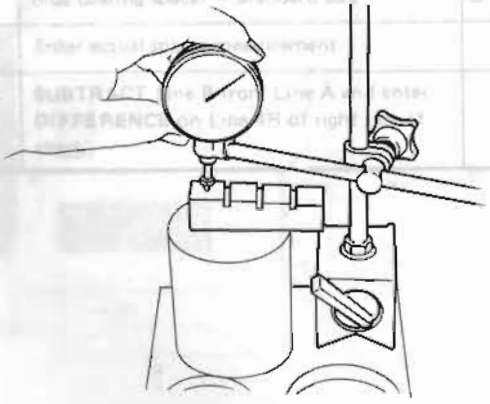


SPD545

Tool number:

Ⓐ 4-step gauge block (J25407-1)
Ⓑ Base plate (J25407-2)
Ⓒ Weight block (J25407-3)

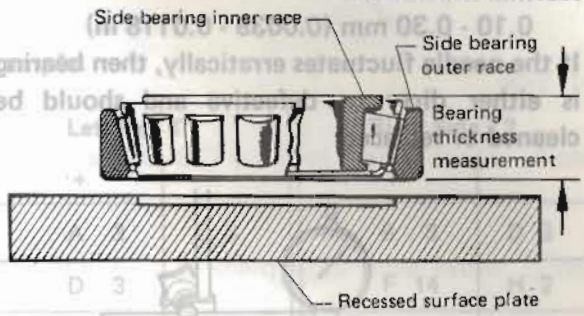
4. Set weight block, 4-step gauge block [21 mm (0.83 in)] and dial indicator on base plate.
5. Adjust dial indicator scale to zero.



SPD546

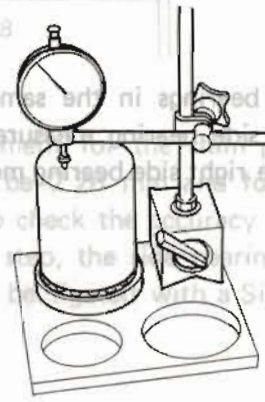
6. Carefully slide 4-step gauge block and weight block out from under dial indicator.
7. Lubricate side bearing and place side bearing on base plate.

Make sure that base plate has a recess in it and that bearing will turn freely when positioned over the recess as shown.



SPD547

8. Place weight block on side bearing.
9. Slide dial indicator on weight block.

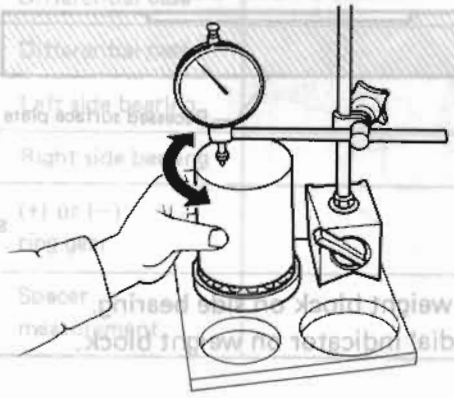


SPD548

Side Bearing Preload (Cont'd)

10. Turn weight block a few times to ensure that bearing is properly seated.
11. Read dial indicator.

- **Normal indication:**
  0.10 - 0.30 mm (0.0039 - 0.0118 in)
- **If the needle fluctuates erratically, then bearing is either dirty or defective and should be cleaned or replaced.**



SPD549

12. Measure both bearings in the same way and write the left side bearing measurement next to "E" and the right side bearing measurement next to "F".

13. Calculate washer thickness following the charts below.

Left (ring gear) side:

LINE #	OPERATION	
1L	Left side standard number	2.05 mm
2L	Enter "A" factor (gear carrier)	
3L	Enter "D" factor (differential case)	
4L	Enter "E" factor (left bearing)	
5L	ADD Lines 1L, 2L, 3L, and 4L. Enter SUM	
6L	Enter "C" factor (differential case)	
7L	SUBTRACT Line 6L from 5L — Enter DIFFERENCE	
8L	Enter "H" factor (ring gear)	
9L	Enter "H" factor's sign □	
	PLUS SIGN + Line 9L; SUBTRACT Line 8L from 7L. Enter difference on Line 10L.	
	MINUS SIGN − Line 9L; ADD Lines 7L and 8L. Enter sum on Line 10L.	
10L	Left side shim size "T_1"	

ADJUSTMENT (Model R200)

Side Bearing Preload (Cont'd)

Right side:

LINE #	OPERATION	
1R	Right side standard number	1.95 mm
2R	Enter "B" factor (gear carrier)	
3R	Enter "F" factor (right bearing)	
4R	Enter "G" factor (R 200 only) (See Chart Below)	
5R	**ADD** Lines 1R, 2R, 3R, and 4R. Enter **SUM**	
6R	Enter "D" factor (differential case)	
7R	**SUBTRACT** Line 6R from 5R. – Enter **DIFFERENCE**	
8R	Enter "H" factor (ring gear)	
9R	Enter "H" factor's sign □	
	PLUS SIGN + Line 9R; **ADD** Lines 7R and 8R. Enter sum on Line 10R.	
	MINUS SIGN – Line 9R; **SUBTRACT** Line 8R from 7R. Enter difference on line 10R.	
10R	Right side shim size "T_2"	

	G FACTOR CALCULATION R200 ONLY	
A.	Side bearing spacer – Standard size	8.10 mm
B.	Enter actual spacer measurement	
C.	**SUBTRACT** Line B from Line A and enter **DIFFERENCE** on Line 4R of right side of chart.	

The formulas are as follows:

$T_1 = A - C + D + E - H + 2.05$ (mm)

$T_2 = B - D + F + G + H + 1.95$ (mm)

Example:

Left Side T1		Right Side T2	
+	–	+	–
A 3	C 3	B 3	D 3
D 3		F 14	H 2
E 18		G 7	
H 2		std. shim 1.95	
std. shim 2.05		2.19	5
2.31	3		–5
–3			
2.28		2.14	

The measurement for the shim pack on the left (T1) should be 2.28 mm and for the right (T2) 2.14 mm. To check the accuracy of your work in the previous step, the side bearing shim measurement should be figured with a Side Bearing Shim Calculator.

Side Bearing Preload (Cont'd)

Follow the instructions for the sample given below:

EXAMPLE CALCULATOR

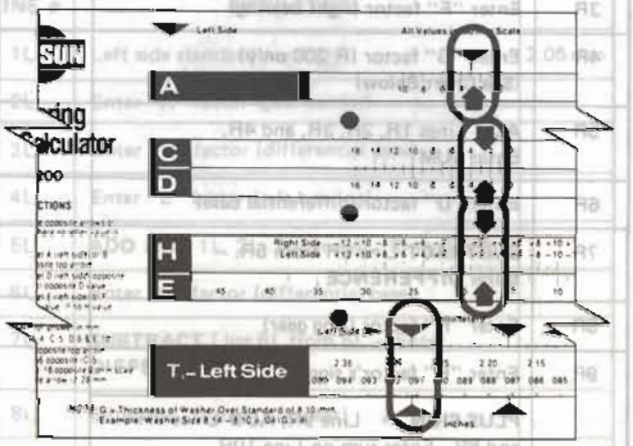
Left Side

Step 1. Move slide 1 to place C 3 in line with an arrow.

Step 2. Move slide 2 to place D 3 in line with C 3.

Step 3. Move slide 3 to place E 18 in line with H –2.

Step 4. Read answer at left side arrow, 2.28mm or close to .087 in.



SPD550

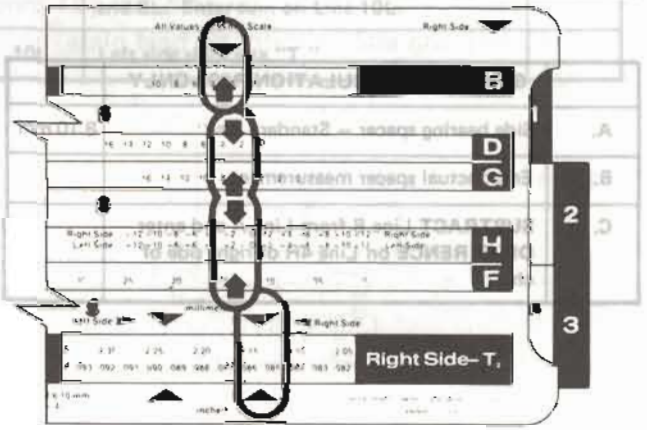
Right Side

Step 1. Move slide 1 to place B 3 in line with an arrow.

Step 2. Move slide 2 to place G 7 in line with D 3.

Step 3. Move slide 3 to place F 14 in line with H 2 (red scale for right side).

Step 4. Read answer at right side arrow 2.14mm or closer to .086 in.



SPD551

14. Compare these answers with the answers on the previous page. If both answers agree, proceed to the next step.
15. Select the proper washer (Refer to S.D.S.).

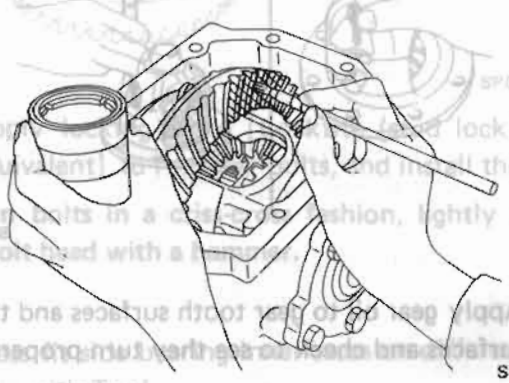
If you cannot find the desired thickness of washer, use washer so that thickness is the closest to the calculated value.

ADJUSTMENT (Model R200)

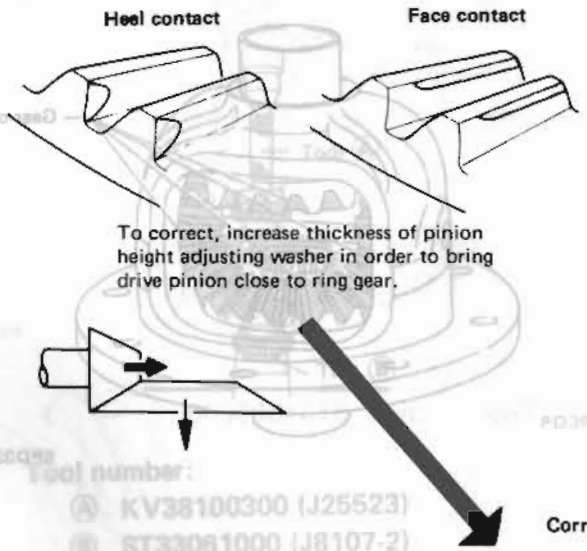
Tooth Contact

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

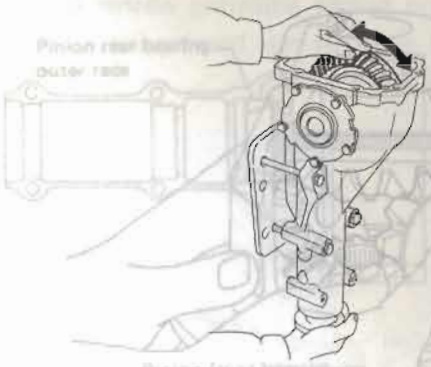
1. Thoroughly clean ring gear and drive pinion teeth.
2. Sparingly apply a mixture of powdered ferric oxide and oil or equivalent to 3 or 4 teeth of ring gear drive side.



SPD357

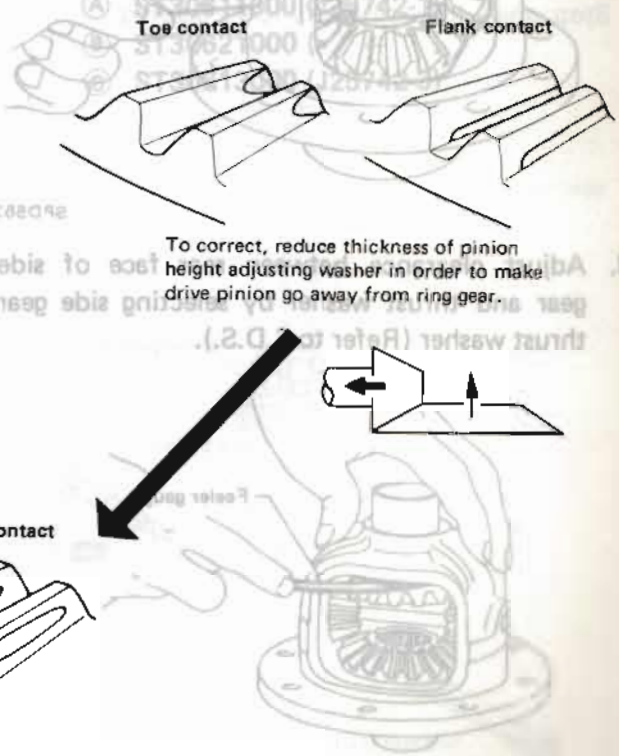


3. Hold companion flange steady by hand and rotate the ring gear in both directions.



SPD308

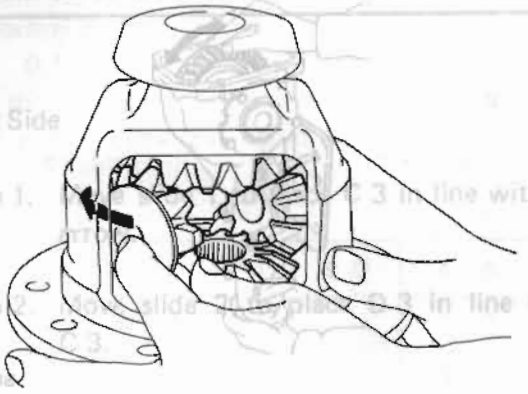
Usually the pattern will be correct if you have calculated the shims correctly and the backlash is correct.
However, in extremely rare cases you will have to use trial-and-error processes until you get a good tooth contact pattern.
The tooth pattern is the best indication of how well a differential has been set up.



SPD007

Differential Case

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

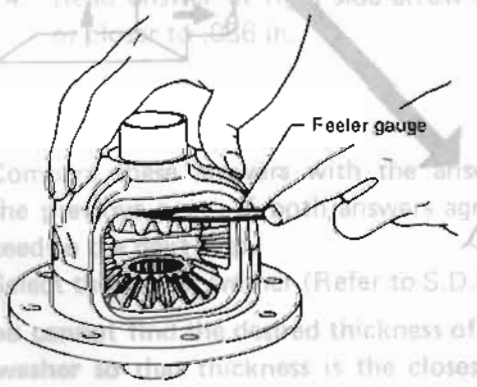


SPD552

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

SPD553

3. Adjust clearance between rear face of side gear and thrust washer by selecting side gear thrust washer (Refer to S.D.S.).

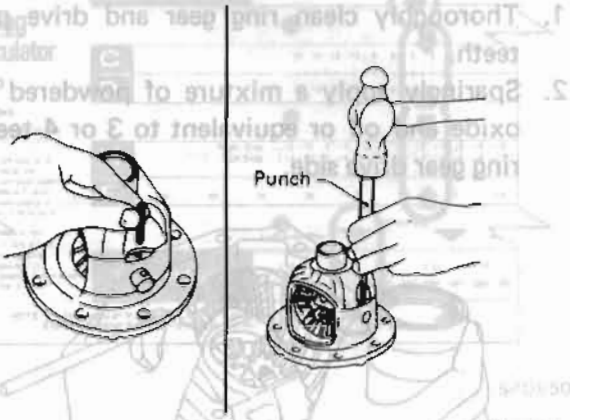


SPD029

Clearance between side gear thrust washer and differential case:
0.10 - 0.20 mm (0.0039 - 0.0079 in)

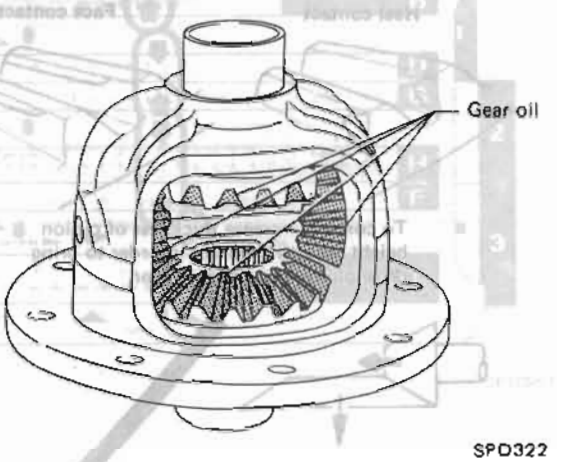
4. Install pinion mate shaft lock pin with a punch.

Make sure lock pin is flush with case.



SPD030

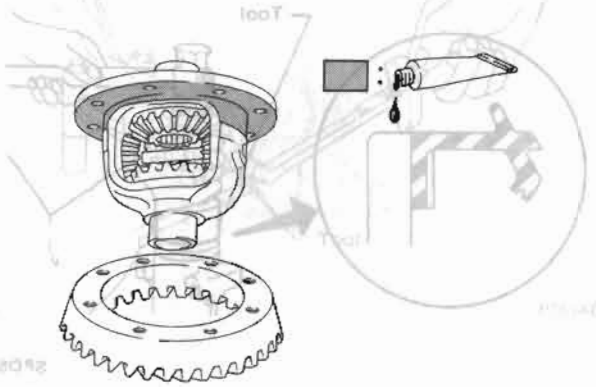
5. Apply gear oil to gear tooth surfaces and thrust surfaces and check to see they turn properly.



SPD322

Differential Case (Cont'd)

6. Apply locking agent [Locktite (stud lock) or equivalent] to contacting surfaces of ring gear and differential case, then place differential case on ring gear.



SPD600

7. Apply locking agent [Locktite (stud lock) or equivalent] to ring gear bolts, and install them.

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

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

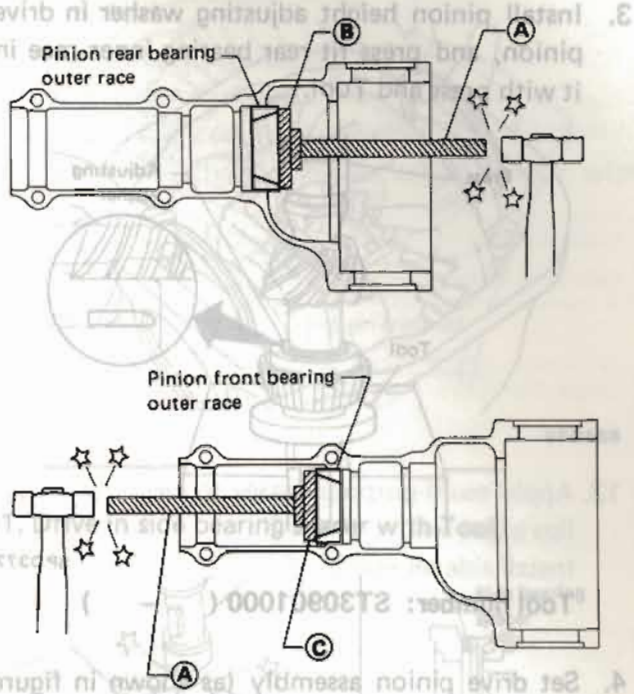
PD353

Tool number:

Ⓐ **KV38100300 (J25523)**
Ⓑ **ST33061000 (J8107-2)**

Differential Carrier

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



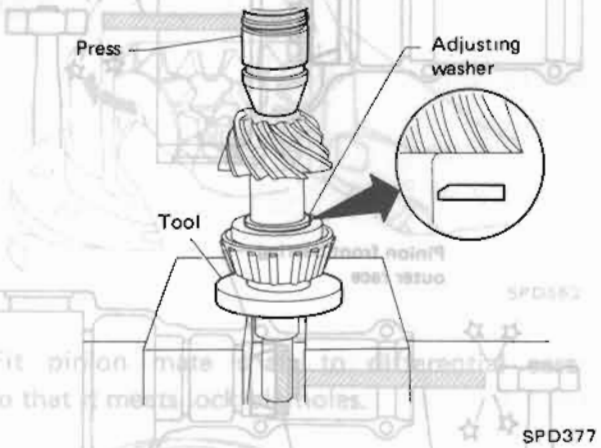
SPD555

Tool number:

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

Differential Carrier (Cont'd)

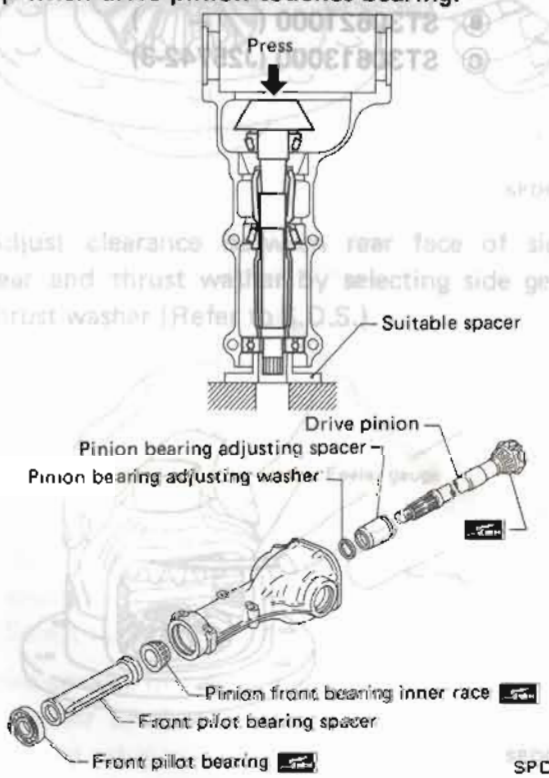
2. Select pinion height adjusting washer and pinion bearing adjusting washer spacer, referring to Adjustment.
3. Install pinion height adjusting washer in drive pinion, and press fit rear bearing inner race in it with press and Tool.



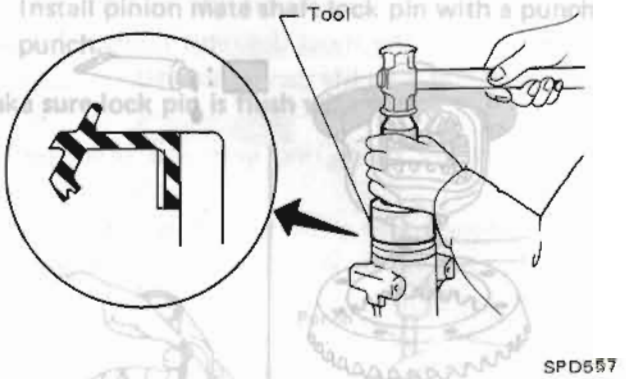
Tool number: ST30901000 (–)

4. Set drive pinion assembly (as shown in figure below) in differential carrier and install drive pinion with press and suitable tool.

Stop when drive pinion touches bearing.



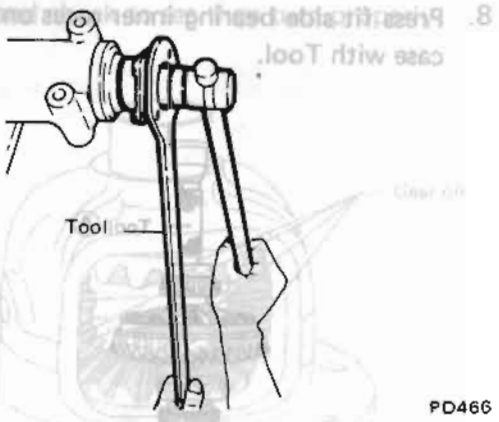
5. Apply multi-purpose grease to cavity at sealing lips of oil seal.
   Install front oil seal.



Tool number: KV38100500 (–)

6. Install companion flange, and tighten pinion nut to specified torque.

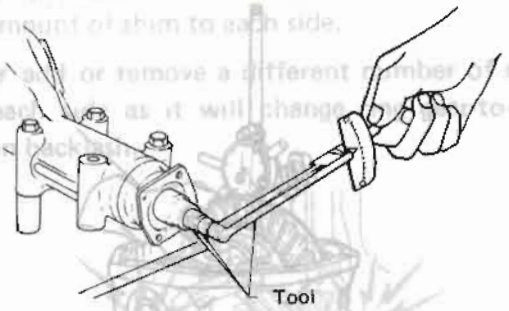
Ascertain that threaded portion of drive pinion and pinion nut are free from oil or grease.



Tool number: ST31520000 (–)

Differential Carrier (Cont'd)

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



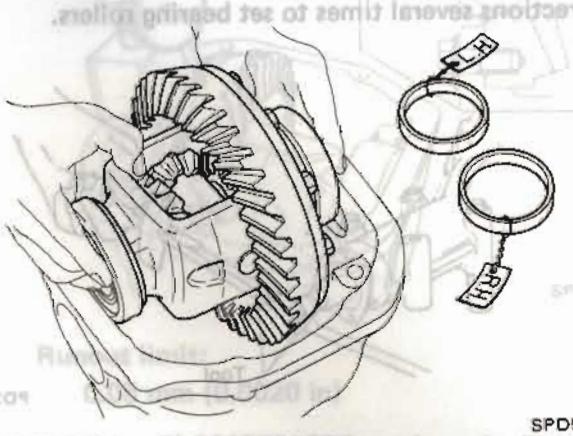
PD340

Tool number:
ST3127S000 (See J25765-A.)

Drive pinion preload (With front oil seal):
1.1 - 1.4 N·m
(11 - 14 kg-cm, 9.5 - 12.2 in-lb)

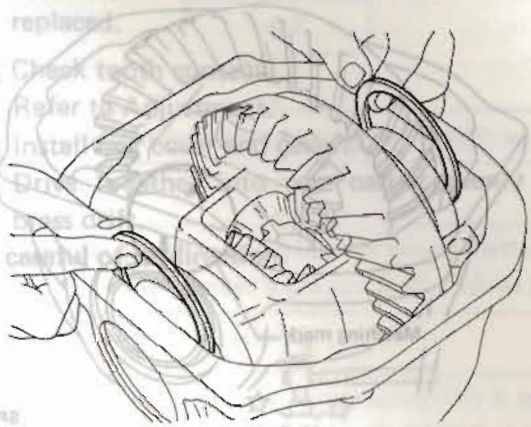
When drive pinion preload is outside the specifications, replace pinion bearing adjusting washer and spacer with a different thickness.

8. Select side bearing adjusting washer. Refer to Adjustment.
9. Install differential case assembly with side bearing outer races into gear carrier.



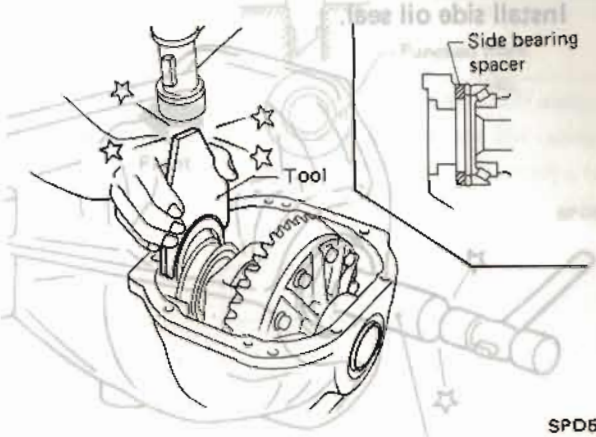
SPD527

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



SPD558

11. Drive in side bearing spacer with Tool.

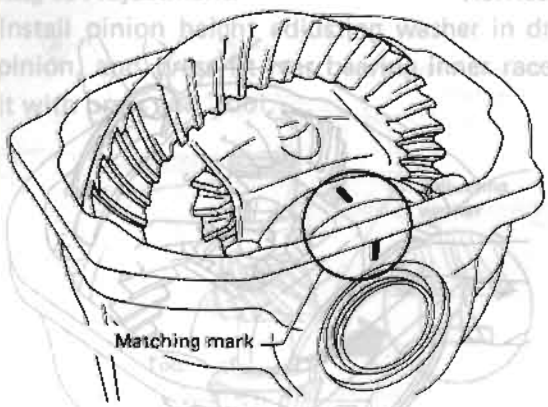


SPD559

Tool number: KV38100600 (J25267)

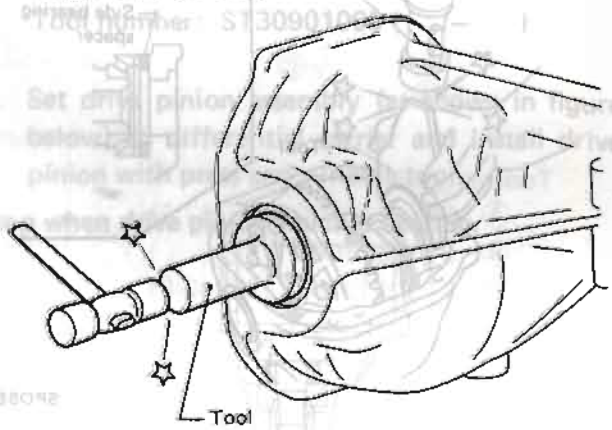
Differential Carrier (Cont'd)

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



SPD526

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



SPD560

Tool number: KV38100200 (—)

14. Measure ring gear-to-drive pinion backlash with a dial indicator.

SPD513

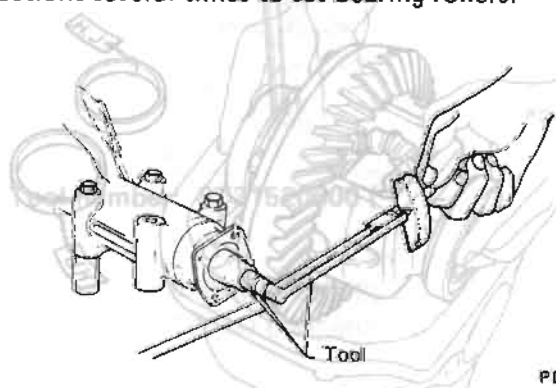
Ring gear-to-drive pinion backlash:
0.13 - 0.18 mm
(0.0051 - 0.0071 in)

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

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

15. Check total preload with Tool.

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



PD340

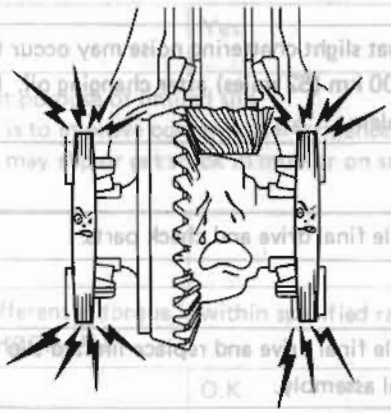
Tool number: ST3127S000 (See J25765-A.)

Total preload:
Measured drive pinion preload
+ 0.3 N·m (3 kg-cm, 2.6 in-lb)

Differential Carrier (Cont'd)

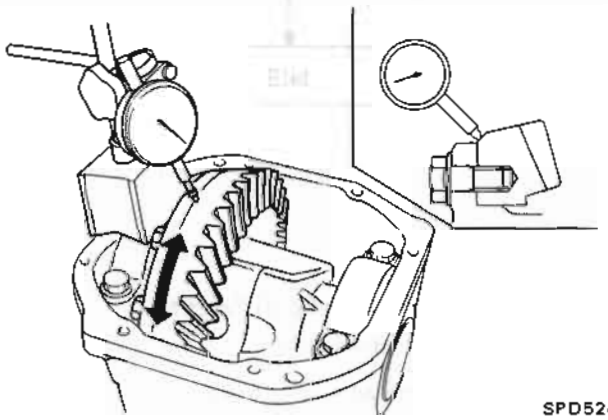
- If preload is too great, add the same amount of shim to each side.
- If preload is too small, remove the same amount of shim to each side.

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



SPD561

16. Recheck ring gear-to-drive pinion backlash because increase or decrease in thickness of shims will cause change of ring gear-to-pinion backlash.
17. Check runout of ring gear with a dial indicator.



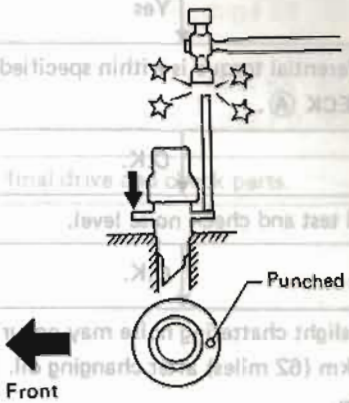
SPD524

Runout limit:
0.05 mm (0.0020 in)

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

18. Check tooth contact.
    Refer to Adjustment.
19. Install rear cover and gasket.
20. Drive breather into gear carrier evenly with brass drift.

Be careful of its direction.

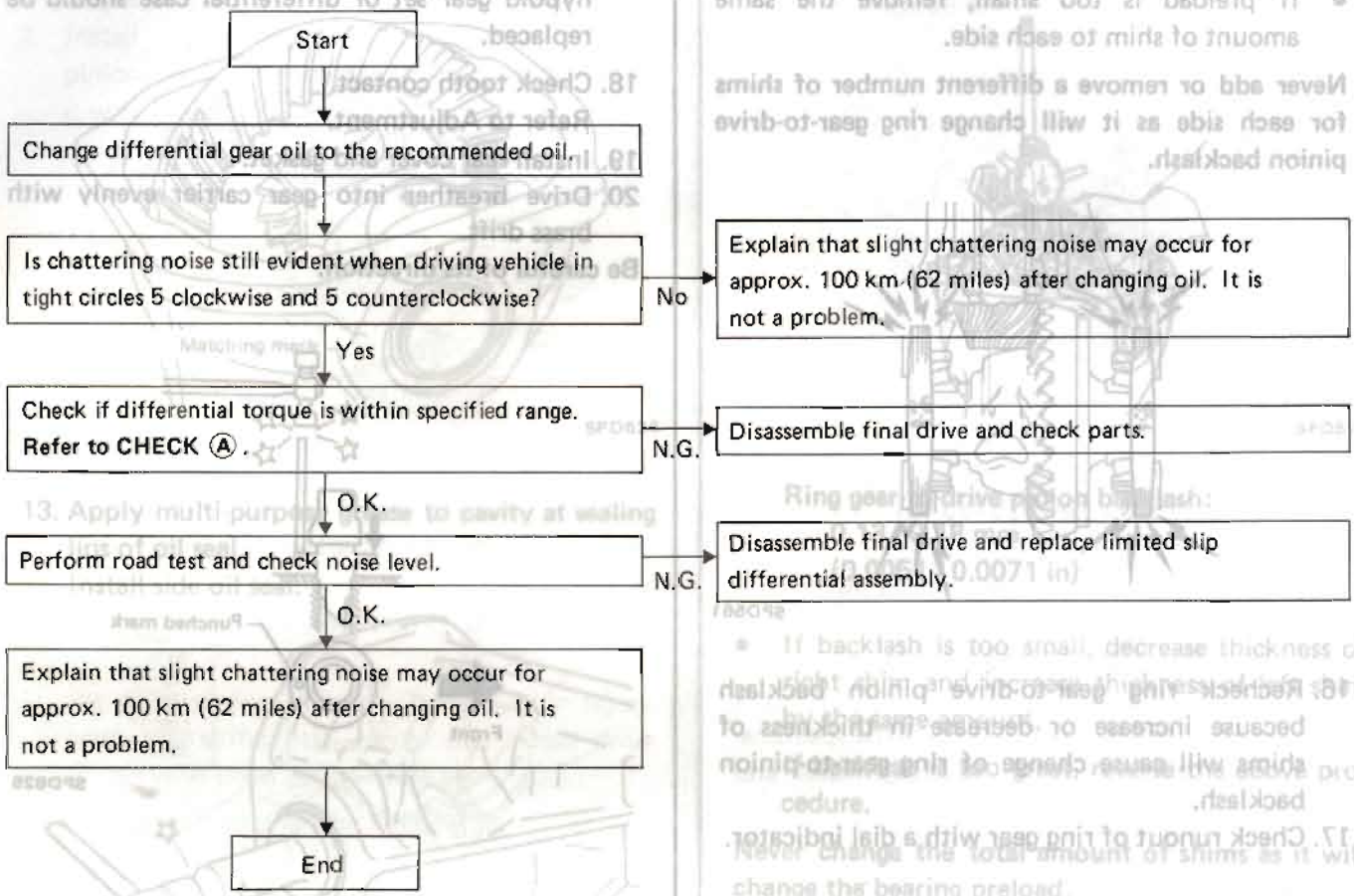


SPD825

LIMITED SLIP DIFFERENTIAL (Model R200)

Trouble-shooting and diagnoses

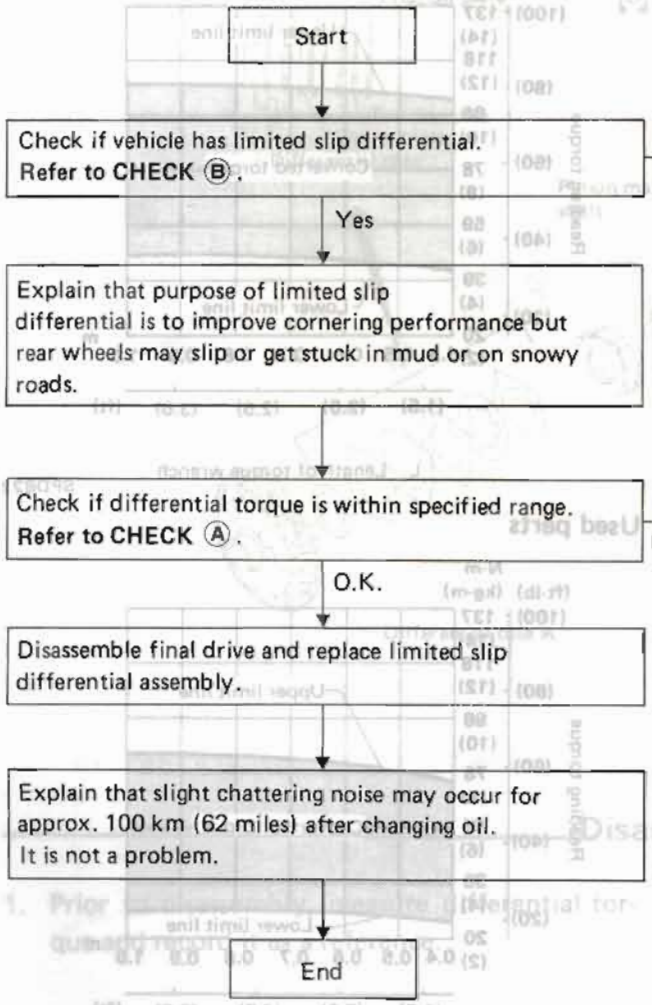
Customer complaint: Final drive has high-pitched chattering noise during turning maneuvers.



LIMITED SLIP DIFFERENTIAL (Model R200)

Trouble-shooting and diagnoses (Cont'd)

Customer complaint: Rear wheels slip and remain stuck in mud or on snowy roads.



Trouble-shooting and diagnoses (Cont'd)

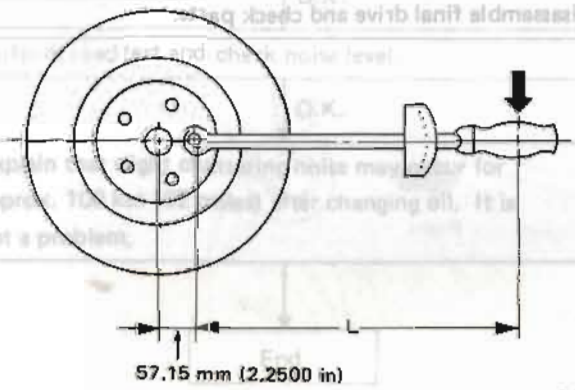
CHECK Ⓐ : Check differential torque.

1. Drive vehicle enough to warm up differential oil.
2. Lift both rear wheels off ground.
3. Shift transmission gear into 1st (M/T model) or P range (A/T model).
4. Release parking brake.
5. Check differential torque at wheel stud bolt.

Differential torque (on vehicle):

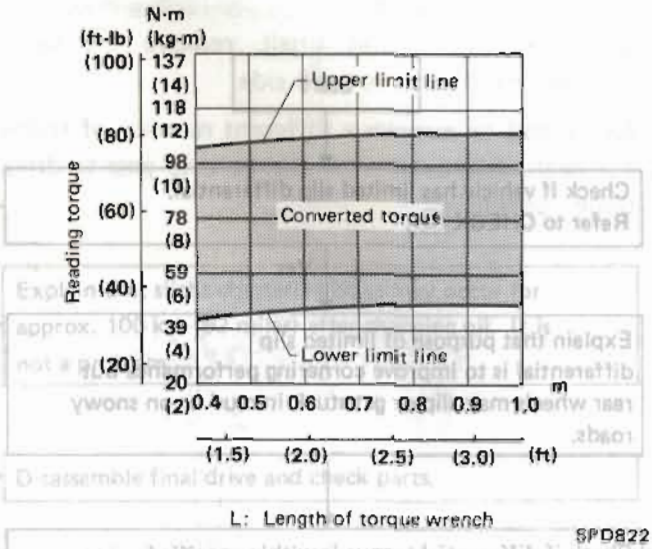
New parts:
49 - 118 N-m
(5 - 12 kg-m, 36 - 87 ft-lb)

Used parts:
29 - 88 N-m
(3 - 9 kg-m, 22 - 65 ft-lb)



SPD820

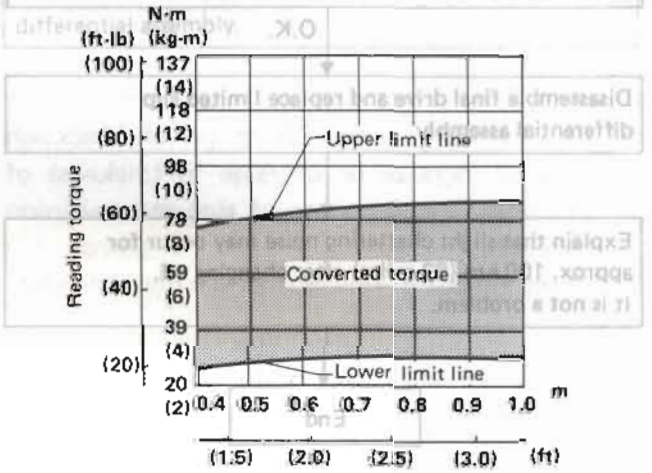
New parts



L: Length of torque wrench

SPD822

Used parts



L: Length of torque wrench

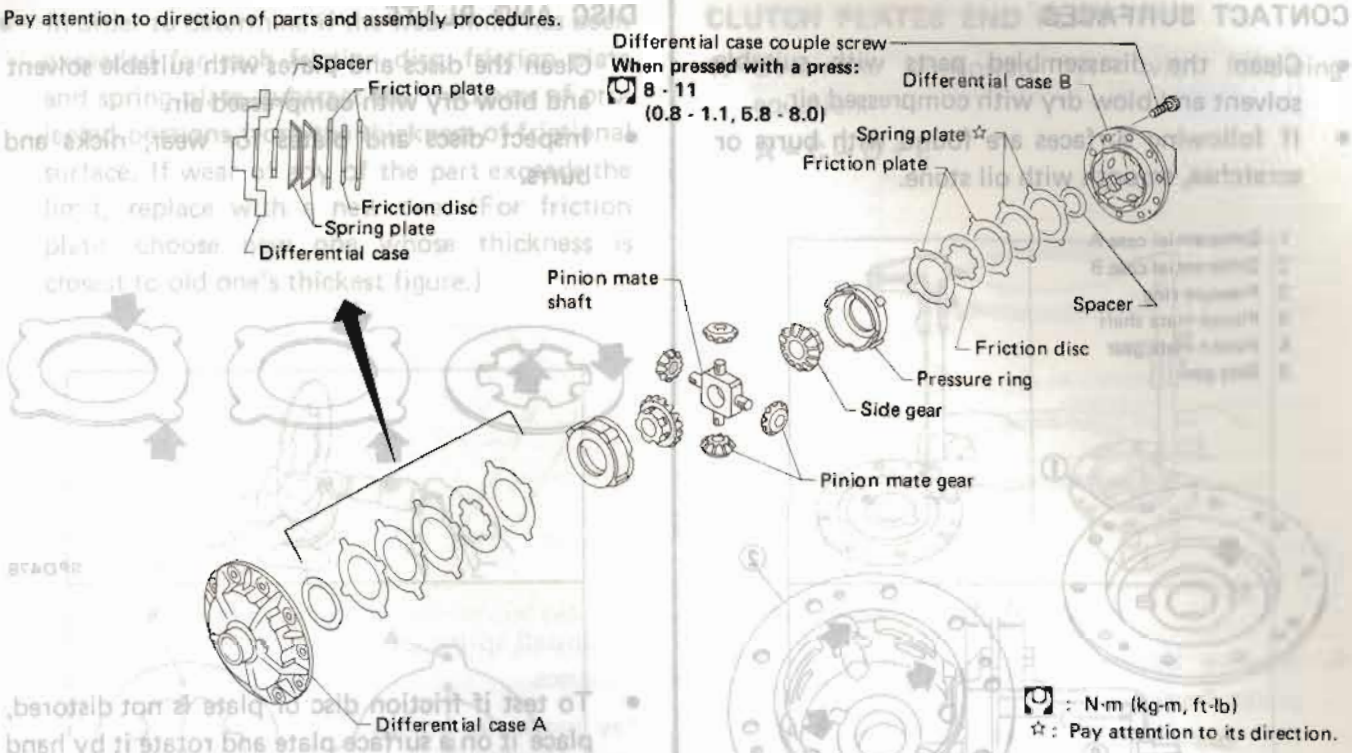
SPD823

CHECK Ⓑ : Limited slip differential identification.

1. Lift both rear wheels off ground.
2. Turn one rear wheel by hand.
3. If both rear wheels turn in the same direction simultaneously, vehicle is equipped with limited slip differential.

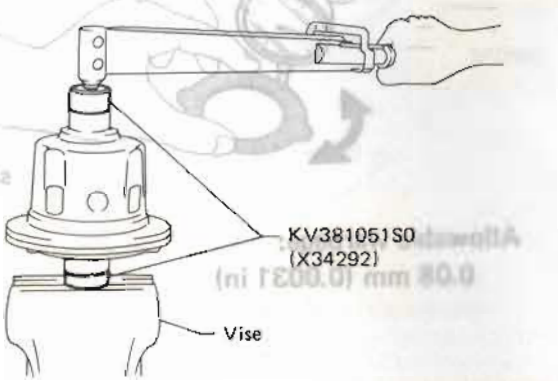
LIMITED SLIP DIFFERENTIAL (Model R200)

Pay attention to direction of parts and assembly procedures.



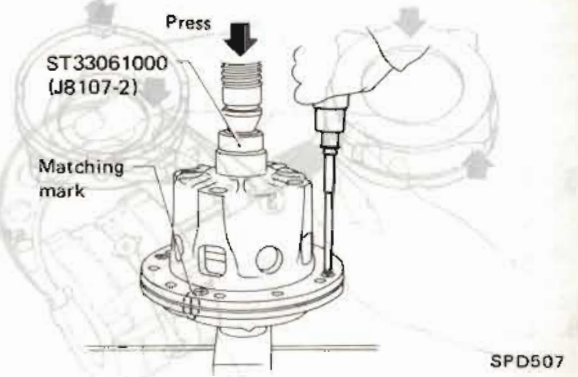
Disassembly

1. Prior to disassembly, measure differential torque and record it as a reference.



Differential torque:
New parts
25 - 49 N·m
(2.5 - 5 kg-m, 18 - 36 ft-lb)

2. Loosen screws on differential cases A and B using a press.



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

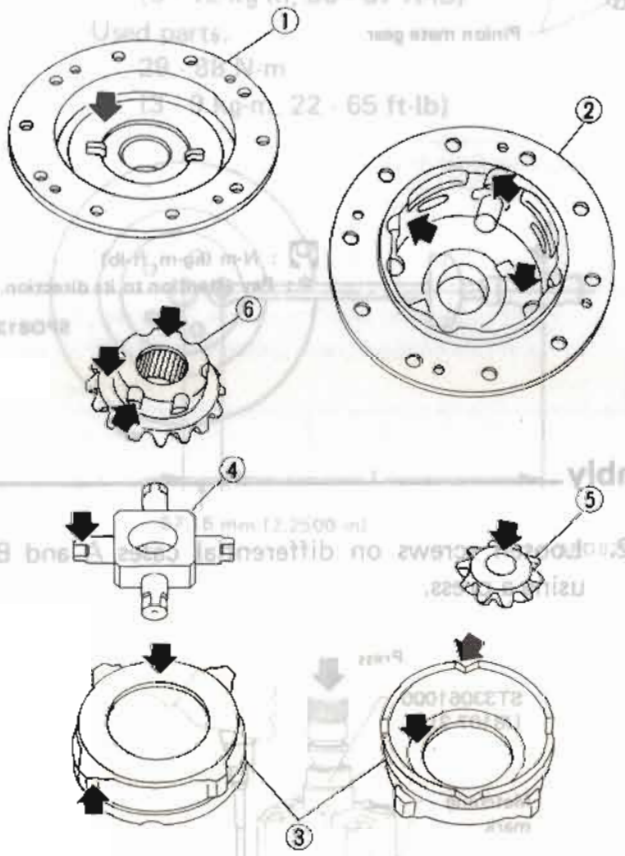
Put marks on gears and pressure rings so that they can be reinstalled in their original positions.

Inspection and Adjustment

CONTACT SURFACES

- Clean the disassembled parts with suitable solvent and blow dry with compressed air.
- If following surfaces are found with burrs or scratches, smooth with oil stone.

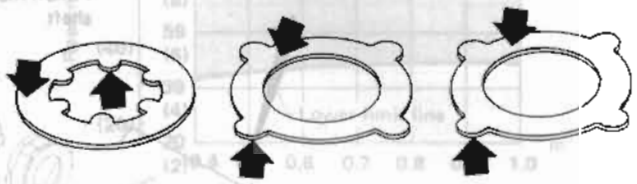
1 Differential case A
2 Differential case B
3 Pressure ring
4 Pinion mate shaft
5 Pinion mate gear
6 Side gear



SPD621

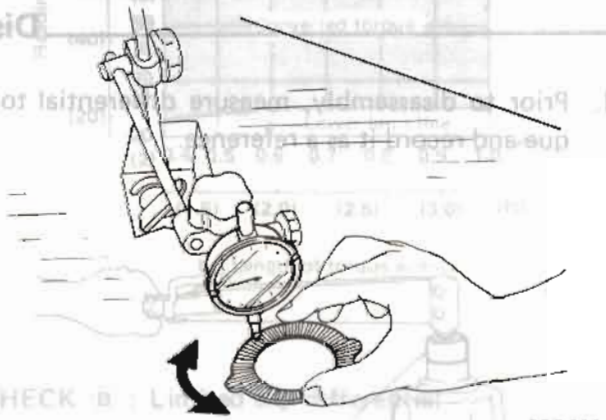
DISC AND PLATE

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



SPD478

- To test if friction disc or plate is not distored, place it on a surface plate and rotate it by hand with indicating finger of dial gauge resting against disc or plate surface.
  If it exceeds limits, replce with a new plate.



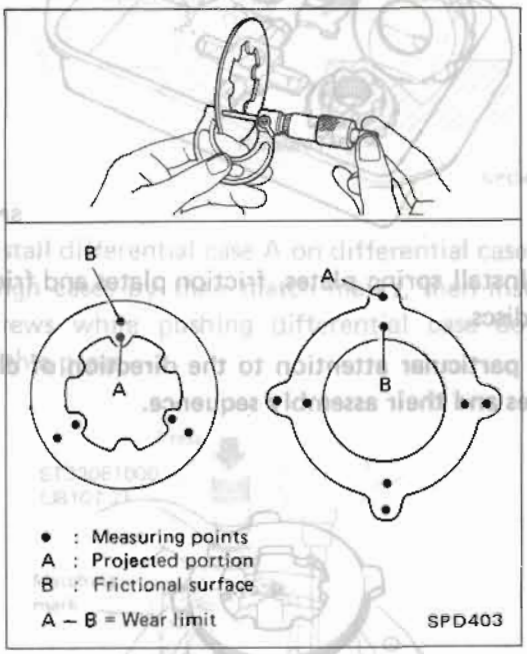
SPD622

Allowable warpage:
0.08 mm (0.0031 in)

LIMITED SLIP DIFFERENTIAL (Model R200)

Inspection and Adjustment (Cont'd)

- In order to determine if the wear limit has been exceeded for each friction disc, friction plate and spring plate, subtract the thickness of projected portions from the thickness of frictional surface. If wear of any of the part exceeds the limit, replace with a new one. (For friction plate, choose new one whose thickness is closest to old one's thickest figure.)

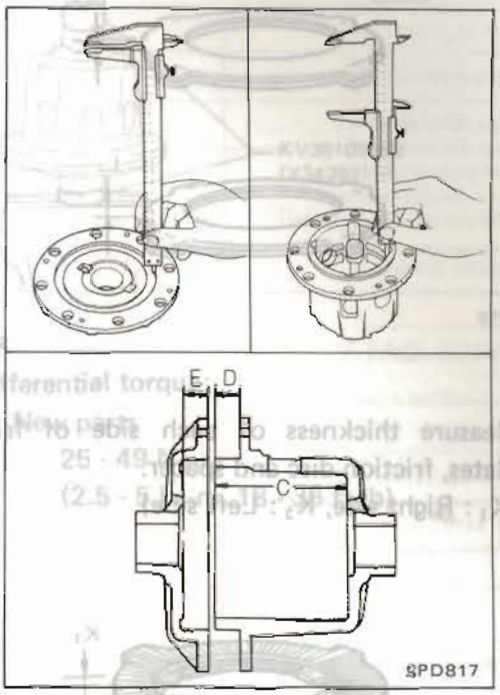


Wear limit:
0.1 mm (0.004 in)

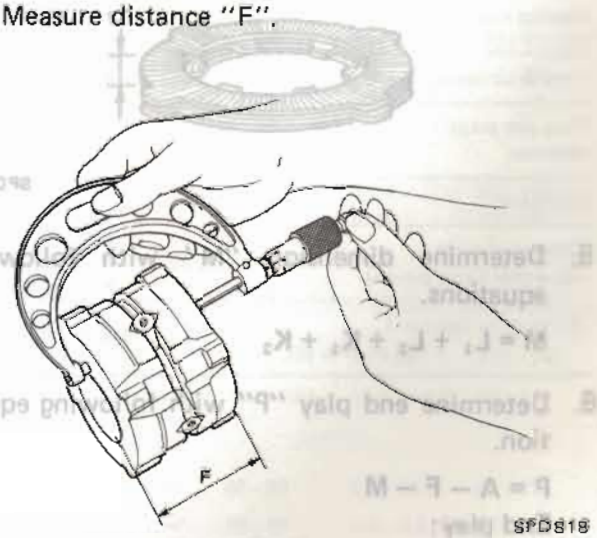
CLUTCH PLATES END PLAY

1. Determine dimension "A" with following equation.

   $A = C - D + E$

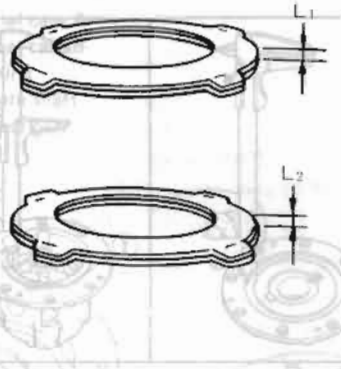


2. Measure distance "F".



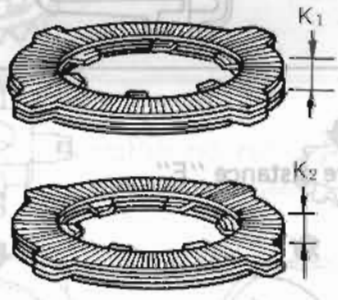
Inspection and Adjustment (Cont'd)

3. Measure thickness of each side of spring plates. (L_1 : Right side, L_2 : Left side)



SPD814

4. Measure thickness of each side of friction plates, friction disc and spacer. (K_1 : Right side, K_2 : Left side)



SPD815

5. Determine dimension "M" with following equations.

   $M = L_1 + L_2 + K_1 + K_2$

6. Determine end play "P" with following equation.

   $P = A - F - M$

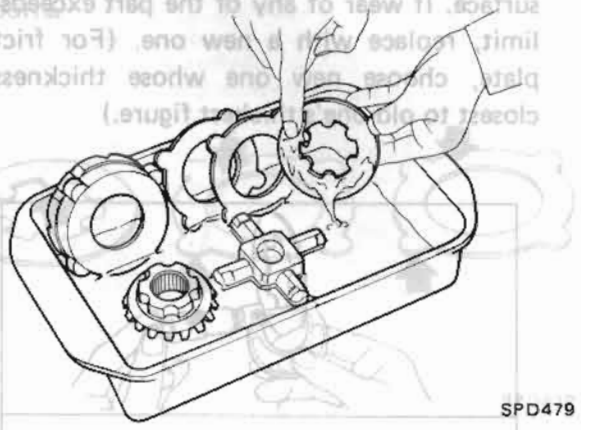
   End play:

   0.05 - 0.20 mm (0.0020 - 0.0079 in)

7. If not within specification, select discs and plates to adjust correctly.

Assembly

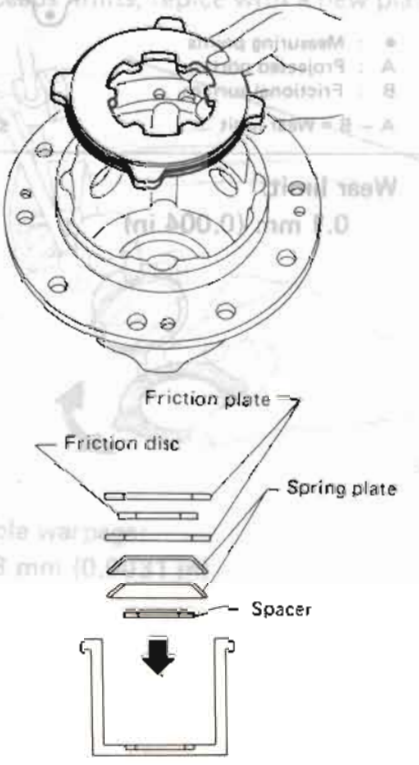
- As an aid to installation, apply sufficient amounts of recommended L.S.D. gear oil (Refer to MA section) to the faces of pressure rings, discs and plates to be assembled together.



SPD479

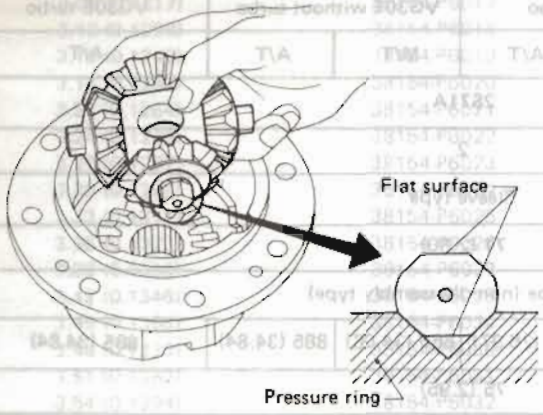
- Install spring plates, friction plates and friction discs.

Pay particular attention to the direction of clutch plates and their assembly sequence.



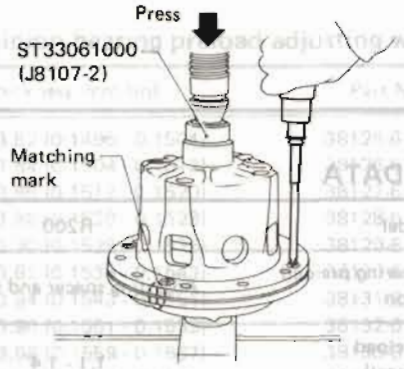
SPD623

- **Always attach pinion mate shaft to "V" groove in pressure ring with flat surfaces facing up and down.**



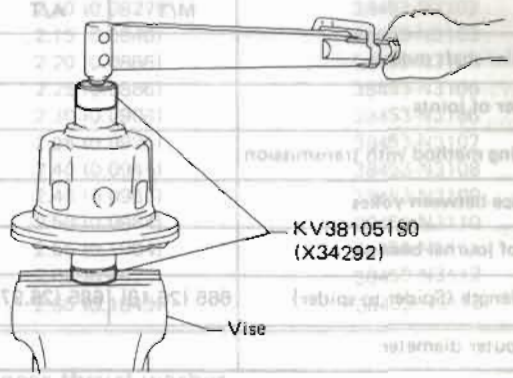
SPD483

- Install differential case A on differential case B. Align cases by their match marks, then install screws while pushing differential case down with a press.



SPD507

- After assembly, measure differential torque. If it is not within the specification, adjust it by selecting friction disc (Refer to S.D.S.).



SPD620

Differential torque:

New parts

25 - 49 N·m

(2.5 - 5 kg-m, 18 - 36 ft-lb)

SERVICE DATA AND SPECIFICATIONS (S.D.S.)

Propeller Shaft

GENERAL SPECIFICATIONS

Unit: mm (in)

Applied model	2 seater				2+2 seater		
	VG30E without turbo		VG30E turbo		VG30E without turbo		VG30E turbo
	M/T	A/T	M/T	A/T	M/T	A/T	A/T
Propeller shaft model	2S71A						
Number of joints	2						
Coupling method with transmission	Sleeve type						
Distance between yokes	71 (2.80)						
Type of journal bearing	Shell type (non-disassembly type)						
Shaft length (Spider to spider)	665 (26.18)	685 (26.97)	665 (26.18)	685 (26.97)	865 (34.06)	885 (34.84)	885 (34.84)
Shaft outer diameter	75 (2.95)						

SERVICE DATA

Unit: mm (in)

Model	2S71A
Propeller shaft runout limit	0.6 (0.024)
Journal axial play	0 (0)

TIGHTENING TORQUE

Unit	N·m	kg-m	ft-lb
Shaft to companion flange bolts	39 - 44	4.0 - 4.5	29 - 33

Differential Carrier

GENERAL SPECIFICATIONS

Applied model	VG30E without turbo	VG30E turbo
Final drive model	R200	
Ring gear pitch diameter mm (in)	200 (7.87)	
Gear ratio	3.900	3.700
Number of teeth (Ring gear/Drive pinion)	39/10	37/10
Oil capacity (approx.) ℓ (US pt, Imp pt)	1.3 (2-3/4, 2-1/4)	

SERVICE DATA

Final drive model	R200
Drive pinion bearing preload adjusting method	Adjusting spacer and washer
Drive pinion preload (With front oil seal) N·m (kg-cm, in-lb)	1.1 - 1.4 (11 - 14, 9.5 - 12.2)
Total preload N·m (kg-cm, in-lb)	Measured drive pinion preload +0.3 (3, 2.6)
Side bearing adjusting method	Shim
Backlash Drive pinion to ring gear mm (in)	0.13 - 0.18 (0.0051 - 0.0071)
Side gear to pinion mate gear (Clearance between side gear to differential case) mm (in)	0.10 - 0.20 (0.0039 - 0.0079)
Ring gear runout limit mm (in)	0.05 (0.0020)

Differential Carrier (Cont'd)

Pinion height adjusting washer

Thickness mm (in)	Part No.
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 bearing preload adjusting washer

Thickness mm (in)	Part No.
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

Drive pinion bearing preload adjusting spacer

Length mm (in)	Part No.
55.10 (2.1693)	38165-B4002
55.40 (2.1811)	38165-B4003
55.70 (2.1929)	38165-B4004
56.00 (2.2047)	38165-61001
56.25 (2.2146)	38166-61001

Side bearing adjusting washer

Thickness mm (in)	Part No.
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

Side gear thrust washer

Thickness mm (in)	Part No.
0.75 - 0.80 (0.0295 - 0.0315)	38424-N3100
0.80 - 0.85 (0.0315 - 0.0335)	38424-N3101
0.85 - 0.90 (0.0335 - 0.0354)	38424-N3102
0.90 - 0.95 (0.0354 - 0.0374)	38424-N3103

TIGHTENING TORQUE

Type	R200		
Unit	N·m	kg-m	ft-lb
Final drive installation			
Drive shaft to rear axle			
VG30E without turbo	39 - 49	4 - 5	29 - 36
VG30E turbo	59 - 69	6 - 7	43 - 51
Rear cover to mounting insulator	88 - 118	9.0 - 12.0	65 - 87
Mounting insulator to body			
Bolt	29 - 39	3 - 4	22 - 29
Nut	59 - 78	6 - 8	43 - 58
Differential carrier to suspension member	59 - 78	6 - 8	43 - 58
Final drive assembly			
Drive pinion nut	186 - 294	19 - 30	137 - 217
Ring gear bolt [using Locktite (stud lock) or equivalent]	132 - 152	13.5 - 15.5	98 - 112
Side bearing cap bolt	88 - 98	9.0 - 10.0	65 - 72
Rear cover fixing bolt	16 - 24	1.6 - 2.4	12 - 17
Companion flange to propeller shaft fixing bolt	39 - 44	4.0 - 4.5	29 - 33
Filler and drain plug	59 - 98	6 - 10	43 - 72

Final Drive

SERVICE DATA

Differential torque (on-vehicle) N·m (kg-m, ft-lb)	
New parts	49 - 118 (5 - 12, 36 - 87)
Used parts	29 - 88 (3 - 9, 22 - 65)
Differential torque N·m (kg-m, ft-lb)	
New parts	25 - 49 (2.5 - 5, 18 - 36)
Wear limit of friction disc, friction plate and spring plate mm (in)	0.1 (0.004)
Allowable warpage of friction disc and friction plate mm (in)	0.08 (0.0031)
End play mm (in)	0.05 - 0.20 (0.0020 - 0.0079)

Friction plate

Thickness mm (in)	Part number
1.75 (0.0689)	38432-N9000
1.85 (0.0728)	38432-N9001

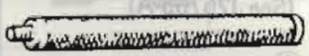
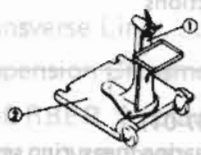
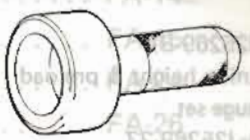
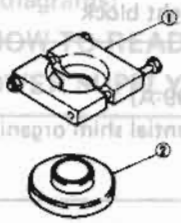
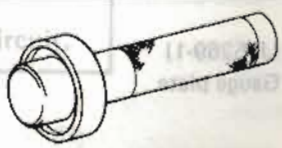
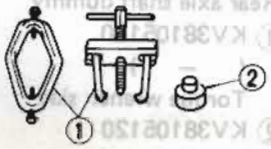
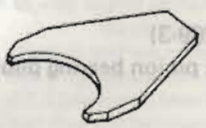
Friction disc

Thickness mm (in)	Part number
1.75 (0.0689)	38433-N9000

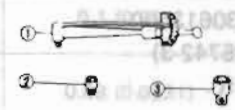
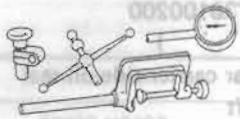
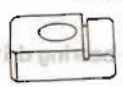
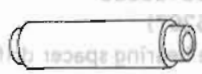
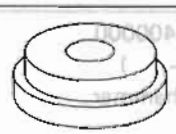
TIGHTENING TORQUE

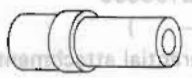
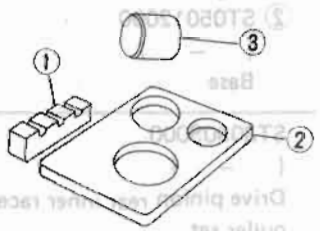
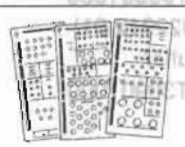
Unit	N·m	kg-m	ft-lb
Differential case couple screw	8 - 11	0.8 - 1.1	5.8 - 8.0

SPECIAL SERVICE TOOLS

Tool number (Kent-Moore No.) Tool name	Tool	Tool number (Kent-Moore No.) Tool name	Tool
ST31520000 (–) Drive pinion flange wrench		ST30611000 (J25742-1) Drift	
KV38100800 (–) Differential attachment Equivalent tool (J25604-01)		ST30613000 (J25742-3) Drift	
		ST30621000 (–) Drift	
ST0501S000 (J26023) Engine stand ① ST05011000 (–) Engine stand ② ST05012000 (–) Base		KV38100200 (–) Gear carrier side oil seal drift	
		KV38100500 (–) Gear carrier front oil seal drift	
ST3090S000 (–) Drive pinion rear inner race puller set ① ST30031000 (J22912-01) Puller ② ST30901000 (–) Base		ST33290001 (J25810-A) Side bearing outer race puller	
		KV38100300 (J25523) Diff. side bearing drift	
		KV38100401 (–) Pilot bearing drift	
ST3306S001 Diff. side bearing puller set ① ST33051001 (–) Body ② ST33061000 (J8107-2) Adapter		KV38100600 (J25267) Side bearing spacer drift	
		HT72400000 (–) Slide hammer	

SPECIAL SERVICE TOOLS

Tool number (Kent-Moore No.) Tool name	Tool
ST3127S000 (See J25765-A) Preload gauge ① GG91030000 (J25765-A) Torque wrench ② HT62940000 (—) Socket adapter ③ HT62900000 (—) Socket adapter	
(J8001-M) Metric dial indicator set (J8001-6 dial indicator only)	
(J25269-B) Pinion height & preload gauge set ① J25269-23 Bolt & nut ② J23597-1 Arbor (Long plunger) Use with J23597-1	
(J25269-1) Gauge plate	
(J25269-2) Rear pinion bearing pilot	
(J25269-3) Front pinion bearing pilot	
(J25269-4) Side bearing discs (2 Req'd)	

Tool number (Kent-Moore No.) Tool name	Tool
(J25269-25) Lead preload washers (Pkg. of 5)	
(J25269-26) Bearing preload adapter	
(J25269-29) Front bearing pilot support	
(J25269-32) Instructions	
(J25407-01) Side bearing measuring set consists of: ① J25407-1 4-step gauge block ② J25407-2 Base plate ③ J25407-3 Weight block	
(J26099-A) Differential shim organizer	
(J26335) Differential filler plug wrench	
KV38105150 (X34292) Rear axle shaft dummy ① KV38105110 (—) Torque wrench side ② KV38105120 (—) Vise side