SECTION RFD
REAR FINAL DRIVE

CONTENTS

PRECAUTIONS

PFP:00001

Service Notice or Precautions

EDS001YY

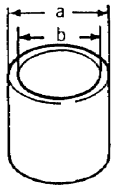
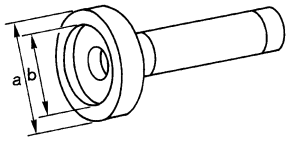
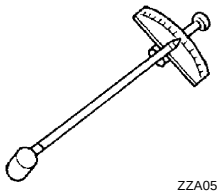
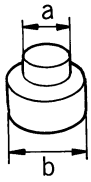
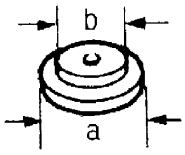
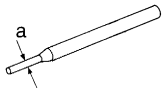
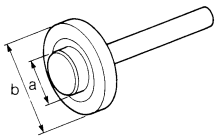
- Check for the correct installation status prior to removal or disassembly. If matching marks are required, be certain they do not interfere with the function of the parts when applied.
- Overhaul should be done in a clean work area, it is preferable to work in dustproof area.
- Before disassembly, using steam or white gasoline, completely remove sand and mud from the exterior of the unit, preventing them from entering into the unit during disassembly or assembly.
- Check appearance of the disassembled parts for damage, deformation, and unusual wear. Replace them with a new ones if necessary.
- Gaskets, seals and O-rings should be replaced any time when the unit is disassembled.
- In principle, tighten bolts or nuts gradually in several steps working diagonally from inside to outside. If tightening sequence is specified, observe it.
- Clean and flush the parts sufficiently and blow-dry them.
- Be careful not to damage sliding surfaces and mating surfaces.
- When applying sealant, remove the old sealant from the mounting surface; then remove any moisture, oil, and foreign materials from the application and mounting surfaces.
- Always use shop paper for cleaning the inside of components.
- Avoid using cotton gloves or shop rags to prevent entering of lint.
- During assembly, observe the specified tightening torque, and apply new differential oil, petroleum jelly, or multi-purpose grease as specified for each vehicle, if necessary.

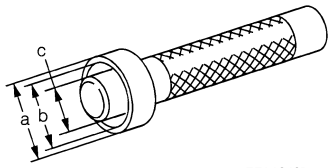
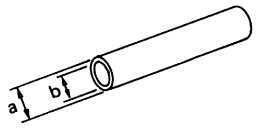
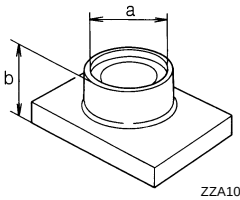
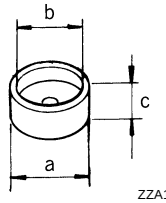
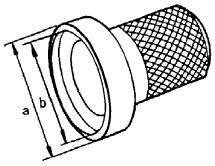
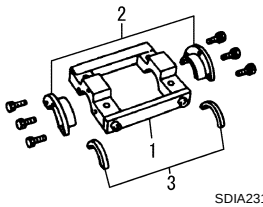
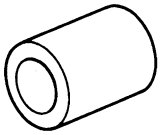
PREPARATION

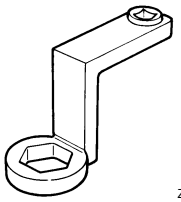
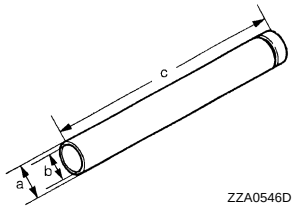
PFP:00002

Special Service Tools

EDS001YZ

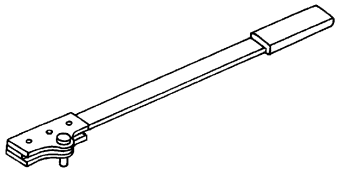
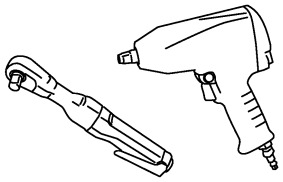
Tool number Tool name		Description
ST27861000 Drift a: 62 mm (2.44 in) dia. b: 52 mm (2.05 in) dia.	 ZZA0832D	● Installing final drive front oil seal ● Installing final drive side oil seal
KV38100200 Drift a: 65 mm (2.56 in) dia. b: 49 mm (1.93 in) dia.	 ZZA1143D	● Installing final drive front oil seal ● Installing final drive side oil seal
ST3127S000 Preload gauge	 ZZA0503D	Measuring preload torque
ST33052000 Drift a: 22 mm (0.87 in) dia. b: 28 mm (1.10 in) dia.	 ZZA1023D	Removing side bearing inner race
KV40100610 Drift a: 63 mm (2.48 in) dia. b: 54.3 mm (2.138 in) dia.	 ZZA0810D	● Removing and installing gear carrier and rear cover (2 pieces are used) ● Installing pinion front bearing inner race
ST23550000 Pin punch a:4.5 mm (0.177 in) dia.	 NT410	Removing and installing lock pin
ST17130000 Drift a: 31.8 mm (1.252 in) dia. b: 58 mm (2.28 in) dia.	 ZZA0836D	Installing pinion rear bearing outer race

Tool number Tool name		Description
ST33230000 Drift a: 51 mm (2.01 in) dia. b: 41 mm (1.61 in) dia. c: 28.5 mm (1.122 in) dia.	 ZZA1046D	Installing pinion front bearing outer race
ST23860000 Drift a: 38 mm (1.50 in) dia. b: 33 mm (1.30 in) dia.	 ZZA0534D	● Installing pinion rear bearing inner race ● Installing pinion front bearing inner race
ST38220000 Press stand a: 63 mm (2.48 in) dia. b: 65 mm (2.56 in)	 ZZA1058D	Installing pinion front bearing inner race
KV40105020 Drift a: 39.7 mm (1.563 in) dia. b: 35 mm (1.38 in) dia. c: 15 mm (0.59 in)	 ZZA1133D	Installing side bearing inner race
ST35271000 Drift a: 72 mm (2.83 in) dia. b: 63 mm (2.48 in) dia.	 ZZA0814D	Installing center oil seal
KV381086S1 Dummy cover set 1. KV38108610 Dummy cover 2. KV38108621 Dummy cap spacer 3. KV38108630 Dummy cap shim	 SDIA2313E	● Checking backlash ● Checking drive gear runout ● Checking tooth contact
KV38108500 Drive pinion gear socket	 ZZA1205D	● Measuring preload ● Removing and installing drive pinion nut

Tool number Tool name	Description
KV38108400 Pinion nut wrench  ZZA1206D	Measuring preload
ST22360002 (J-25679-01) Drift a: 29 mm (1.14 in) dia. b: 23 mm (0.91 in) dia. c: 150 mm (5.91 in)  ZZA0546D	Installing coupling front bearing

Commercial Service Tools

EDS0027I

Tool name	Description
Flange wrench  NT771	Removing and installing companion flange lock nut
Power tool  PBIC0190E	Loosening nuts and bolts

NOISE, VIBRATION AND HARSHNESS (NVH) TROUBLESHOOTING

PFP:00003

NVH Troubleshooting Chart

EDS001Z1

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

Possible cause and SUSPECTED PARTS		Gear tooth rough	Gear contact improper	Tooth surfaces worn	Backlash incorrect	Companion flange excessive runout	Gear oil improper	PROPELLER SHAFT	AXLE AND SUSPENSION	TIRES	ROAD WHEEL	DRIVE SHAFT	BRAKES	STEERING
Reference page		—	Refer to RFD-19, "TOOTH CONTACT" .	—	Refer to RFD-18, "DRIVE GEAR TO DRIVE PINION BACKLASH" .	Refer to RFD-19, "COMPANION FLANGE RUNOUT" .	Refer to RFD-8, "Checking Differential Gear Oil" .	NVH in PR section.	NVH in FAX, RAX, FSU and RSU sections.	NVH in WT section.	NVH in WT section.	NVH in FAX and RAX section.	NVH in BR section.	NVH in PS section.
Symptom	Noise	×	×	×	×	×	×	×	×	×	×	×	×	×

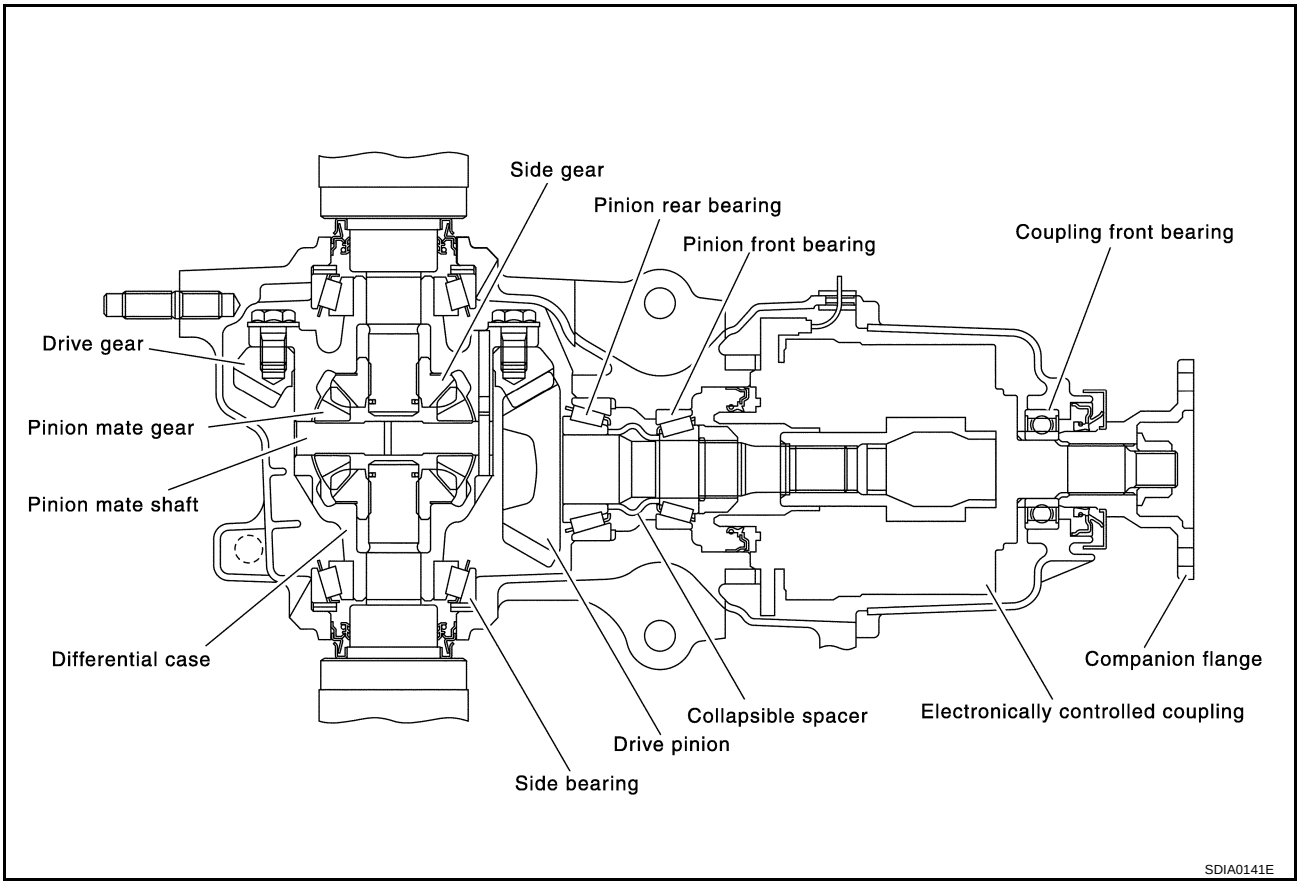
×: Applicable

REAR FINAL DRIVE SYSTEM

PFP:38300

Sectional View

EDS001ZL



DIFFERENTIAL GEAR OIL

PFP:KLD30

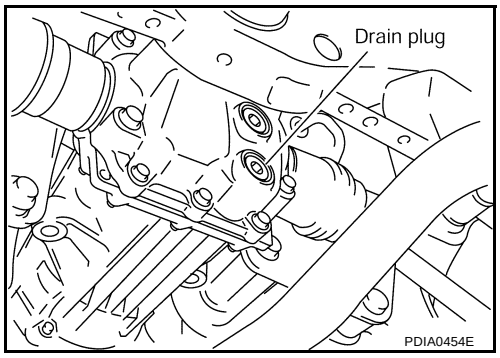
Changing Differential Gear Oil

EDS0027G

DRAINING

1. Stop engine.
2. Remove drain plug and drain oil.
3. Set a gasket on drain plug and install it to final drive assembly and tighten to the specified torque. Refer to RFD-16, "Components" .

CAUTION:
Do not reuse gasket.



FILLING

1. Remove filler plug. Fill with new oil until oil level reaches the specified level near filler plug mounting hole.

Oil grade and Viscosity:

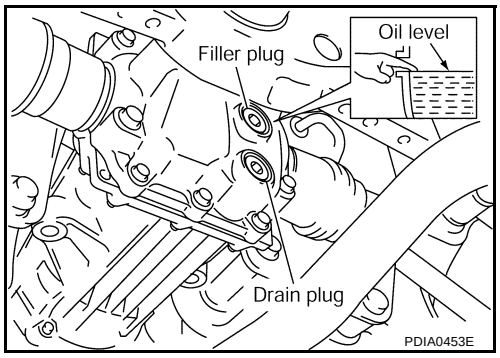
Refer to MA-17, "Fluids and Lubricants" .

Oil capacity:

Approx. 0.55 ℓ (1 Imp pt)

2. After refilling oil, check oil level. Set a gasket to filler plug, then install it to final drive assembly. Refer to RFD-16, "Components" .

CAUTION:
Do not reuse gasket.



Checking Differential Gear Oil

EDS0027H

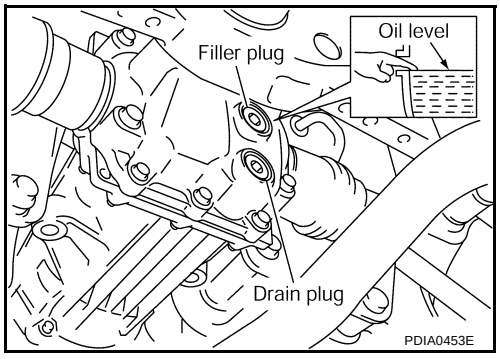
OIL LEAKAGE AND OIL LEVEL

- Make sure that oil is not leaking from final drive assembly or around it.
- Check oil level from filler plug mounting hole as shown in the figure.

CAUTION:
Do not start engine while checking oil level.

- Set a gasket on filler plug and install it on final drive assembly. Refer to RFD-16, "Components" .

CAUTION:
Do not reuse gasket.



FRONT OIL SEAL

PFP:38189

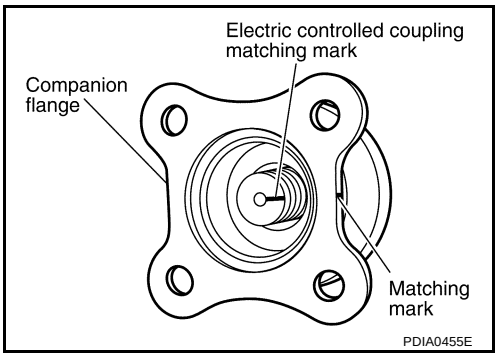
Removal and Installation

EDS001Z2

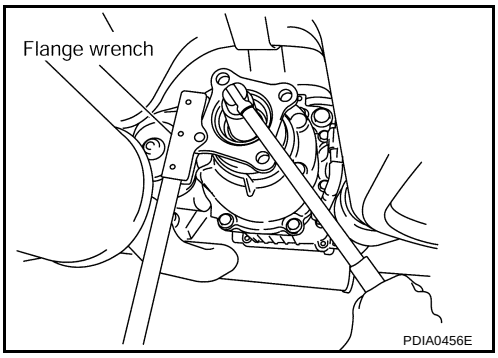
REMOVAL

1. Remove propeller shaft. Refer to PR-4, "Removal and Installation" .
2. Put matching mark on the thread edge of electric controlled coupling. The matching mark should be in line with the matching mark on companion flange.

   CAUTION:
   For matching mark, use paint. Do not damage electric controlled coupling.

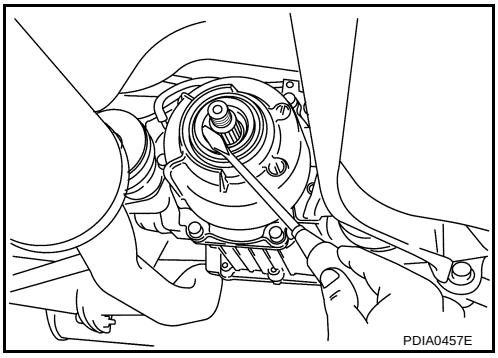


3. Remove companion flange lock nut, using a flange wrench. Then remove companion flange.



4. Remove front oil seal from coupling cover, using a flat-bladed screwdriver.

   CAUTION:
   Be careful not to damage coupling cover.

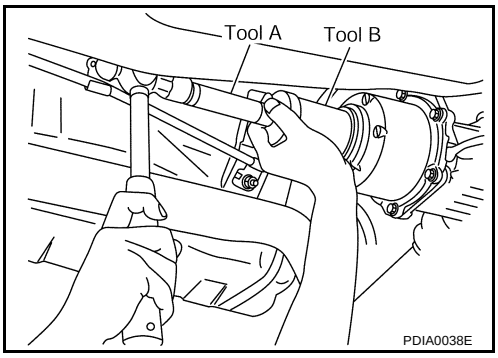


INSTALLATION

1. Apply multi-purpose grease to front oil seal lips.
2. Install front oil seal until it becomes flush with the case end, using the drifts.

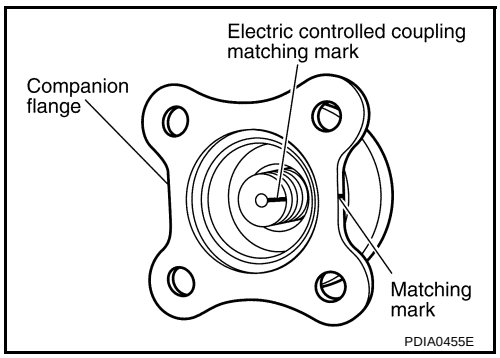
   Tool number **A: KV38100200**
   B: ST27861000

   CAUTION:
   - **Do not reuse oil seal.**
   - **When installing, do not incline oil seal.**



3. Align the matching mark of electric controlled coupling with the matching mark of companion flange, then install the companion flange.
4. Install companion flange lock nut with a flange wrench, tighten the to the specified torque. Refer to RFD-16, "Components" .

   CAUTION:
   Do not reuse companion flange lock nut.
5. Install propeller shaft. Refer to PR-4, "Removal and Installation" .



SIDE OIL SEAL

PFP:38343

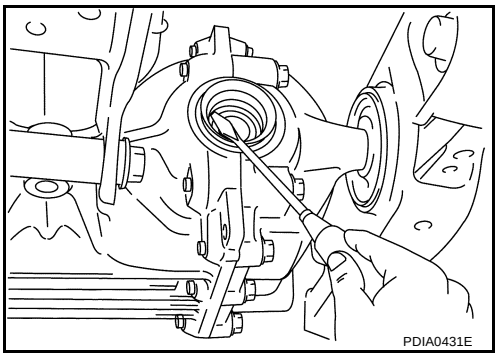
Removal and Installation

EDS001Z3

REMOVAL

1. Remove rear drive shaft with power tool. Refer to RAX-10, "REAR DRIVE SHAFT" .
2. Remove side oil seal, using a flat-bladed screwdriver.

CAUTION:
Be careful not to damage gear carrier and rear cover.



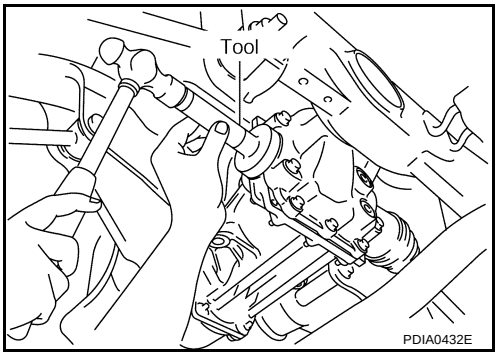
INSTALLATION

1. Apply multi-purpose grease to side oil seal lips.
2. Install side oil seal until it becomes flush with the case end, using the drift.

Tool number : KV38100200

CAUTION:
- **Do not reuse oil seal.**
- **When installing, do not incline oil seal.**

3. Install rear drive shaft. Refer to RAX-10, "REAR DRIVE SHAFT" .



ELECTRIC CONTROLLED COUPLING

PFP:38760

Removal and Installation

EDS0027J

REMOVAL

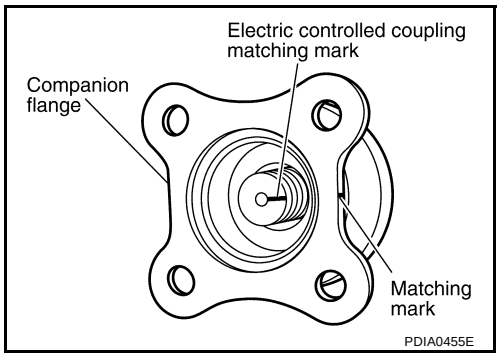
1. Remove propeller shaft. Refer to PR-4, "Removal and Installation" .
2. Put matching mark on the thread edge of electric controlled coupling. The matching mark should be in line with the matching mark on the companion flange.

   CAUTION:

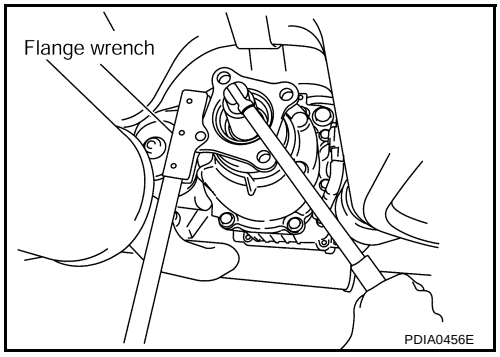
   For matching mark, use paint. Do not damage electric controlled coupling.

   NOTE:

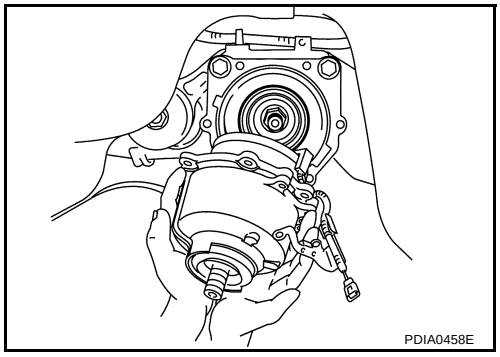
   When replacing electric controlled coupling, matching mark is not necessary.



3. Remove companion flange lock nut, using a flange wrench.
4. Remove companion flange.
5. Disconnect electric controlled coupling connector and remove connector bracket.
6. Remove electric controlled coupling breather hose from coupling cover.



7. Remove coupling cover with electric controlled coupling from gear carrier.
8. Remove electric controlled coupling from coupling cover.

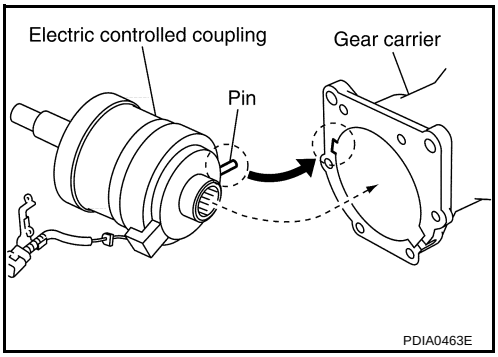


INSTALLATION

1. Install electric controlled coupling to spline of drive pinion inside gear carrier.

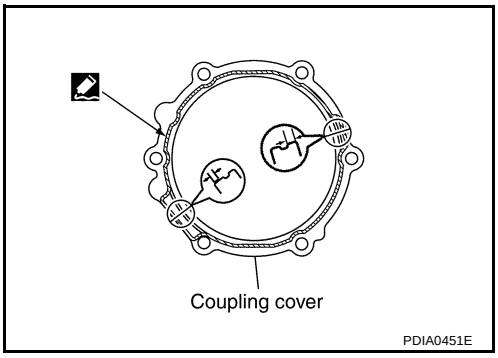
   CAUTION:
   - **Align the pin on electric controlled coupling with the groove of gear carrier.**
   - **Be careful not to damage center oil seal.**

2. Set electric controlled coupling harness guide to gear carrier.



3. Apply liquid gasket to mating surface of coupling cover. Overlap both ends of the bead for at least 3 mm (0.12 in).
   - **Use sealant (Three bound 1217 or equivalent).**

   CAUTION:
   Remove old sealant adhering to the mounting surfaces. Also remove any moisture, oil, or foreign material adhering to the mounting surfaces.



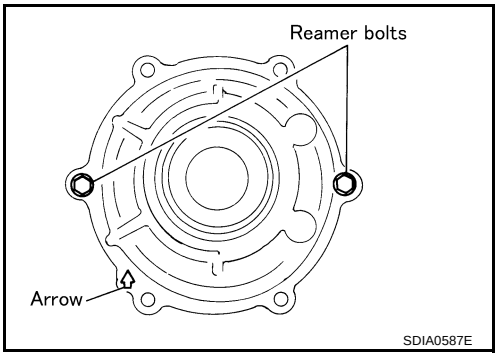
4. Install coupling cover to gear carrier with arrow facing upward, temporarily tighten reamer bolts to the positions shown in the figure.
5. Tighten reamer bolts and coupling cover mounting bolts to the specified torque. Refer to RFD-16, "Components" .
6. Install electric controlled coupling breather hose to coupling cover.
7. Install connector bracket and connect electric controlled coupling connector.
8. Install companion flange.

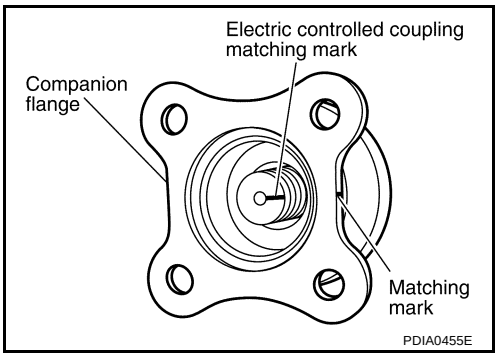
   NOTE:
   When reusing electric controlled coupling, align the matching mark of electric controlled coupling with the matching mark of companion flange, then install companion flange.

9. Install companion flange lock nut with flange wrench, tighten to the specified torque. Refer to RFD-16, "Components" .

   CAUTION:
   Do not reuse companion flange lock nut.

10. Install propeller shaft. Refer to PR-4, "Removal and Installation" .



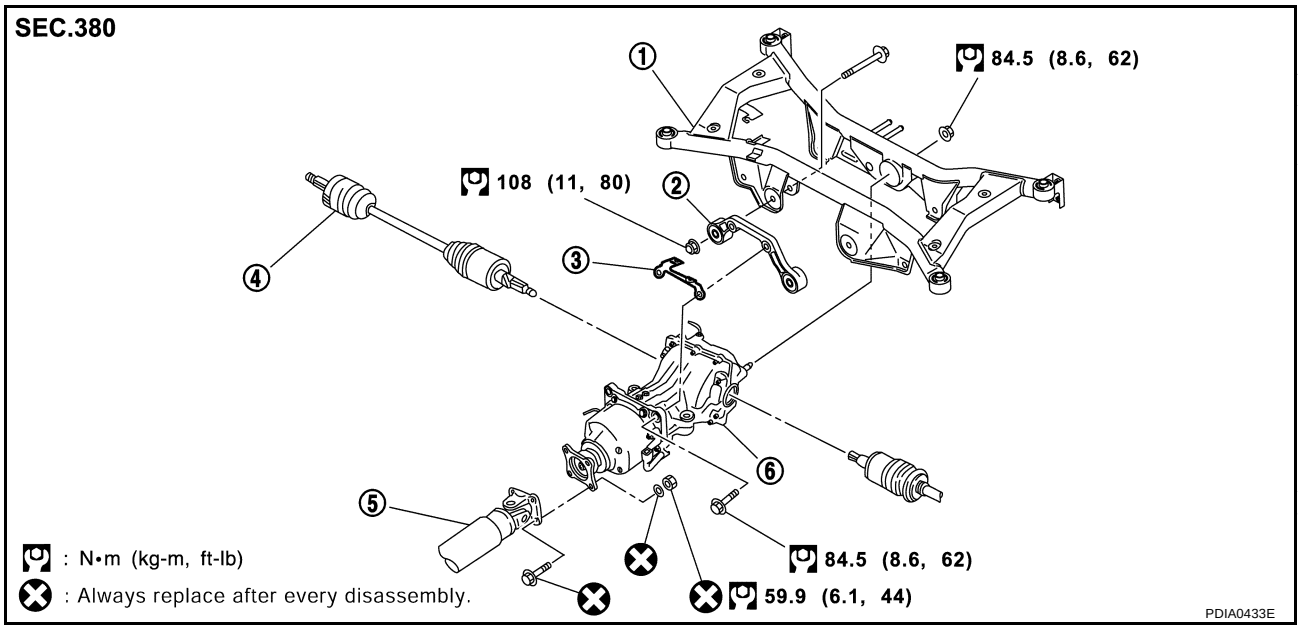


REAR FINAL DRIVE ASSEMBLY

PFP:38300

Removal and Installation

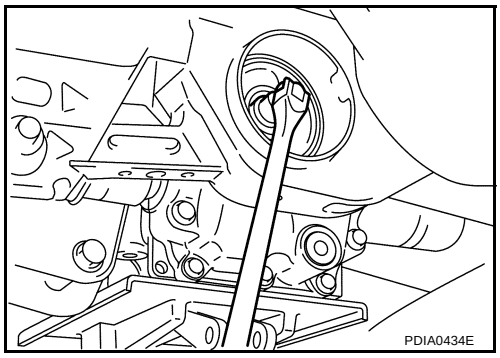
EDS001ZA



1. Rear suspension member
2. Final drive mounting bracket
3. Harness bracket
4. Drive shaft
5. Propeller shaft
6. Rear final drive assembly

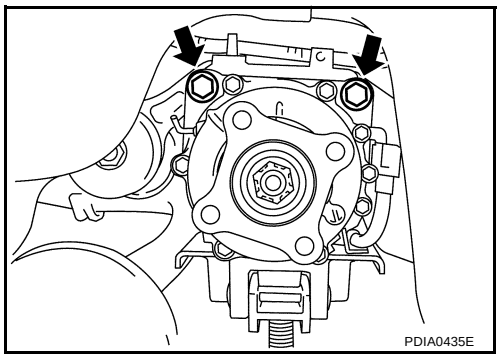
REMOVAL

1. Remove propeller shaft. Refer to PR-4, "Removal and Installation" .
2. Remove drive shaft with power tool. Refer to RAX-10, "Removal and Installation" .
3. Disconnect electric controlled coupling connector.
4. Remove rear final drive breather hose and electric controlled coupling breather hose.
5. Support rear final drive assembly with a suitable jack.
6. Remove rear final drive mounting nut at rear suspension member.



7. Remove rear final drive mounting bolts at final drive mounting bracket, and then remove rear final drive assembly.
   If necessary, remove final drive mounting bracket.

   CAUTION:
   Secure rear final drive assembly to a suitable jack while removing it.



INSTALLATION

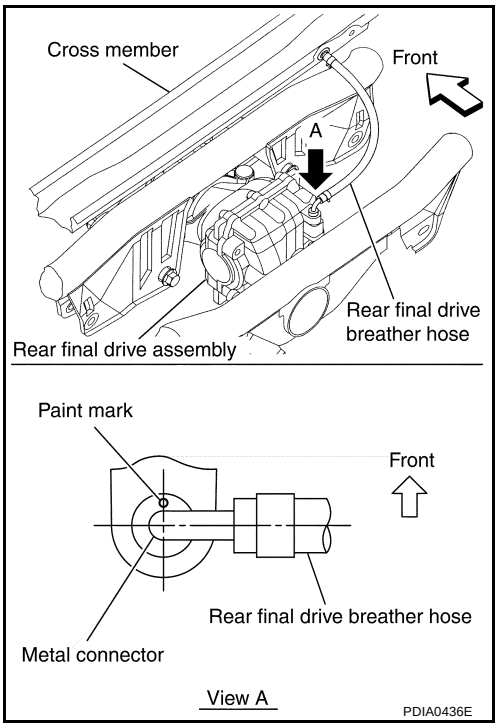
Note the following, and install in the reverse order of removal.

- Refer to RFD-16, "Components" about each tightening torque.
- When installing breather hoses, refer to the figure and following.

CAUTION:

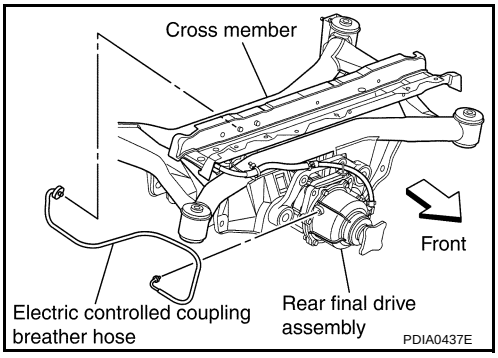
Make sure there are no pinched or restricted areas on the breather hose caused by bending or winding when installing it.

– For installation of rear final drive breather hose, the vehicle side end shall be inserted to cross member. Install metal connector side of this hose to rear cover by inserting it with aiming painted marking to the front of vehicle.



– For installation of electric controlled coupling breather hose, the vehicle side end shall be inserted to cross member. Install its metal tube to rear final drive assembly and direct the metal tube hose side end to the front of vehicle.

- When oil leaks while removing final drive assembly, check oil level after the installation. Refer to RFD-8, "Checking Differential Gear Oil" .



Components

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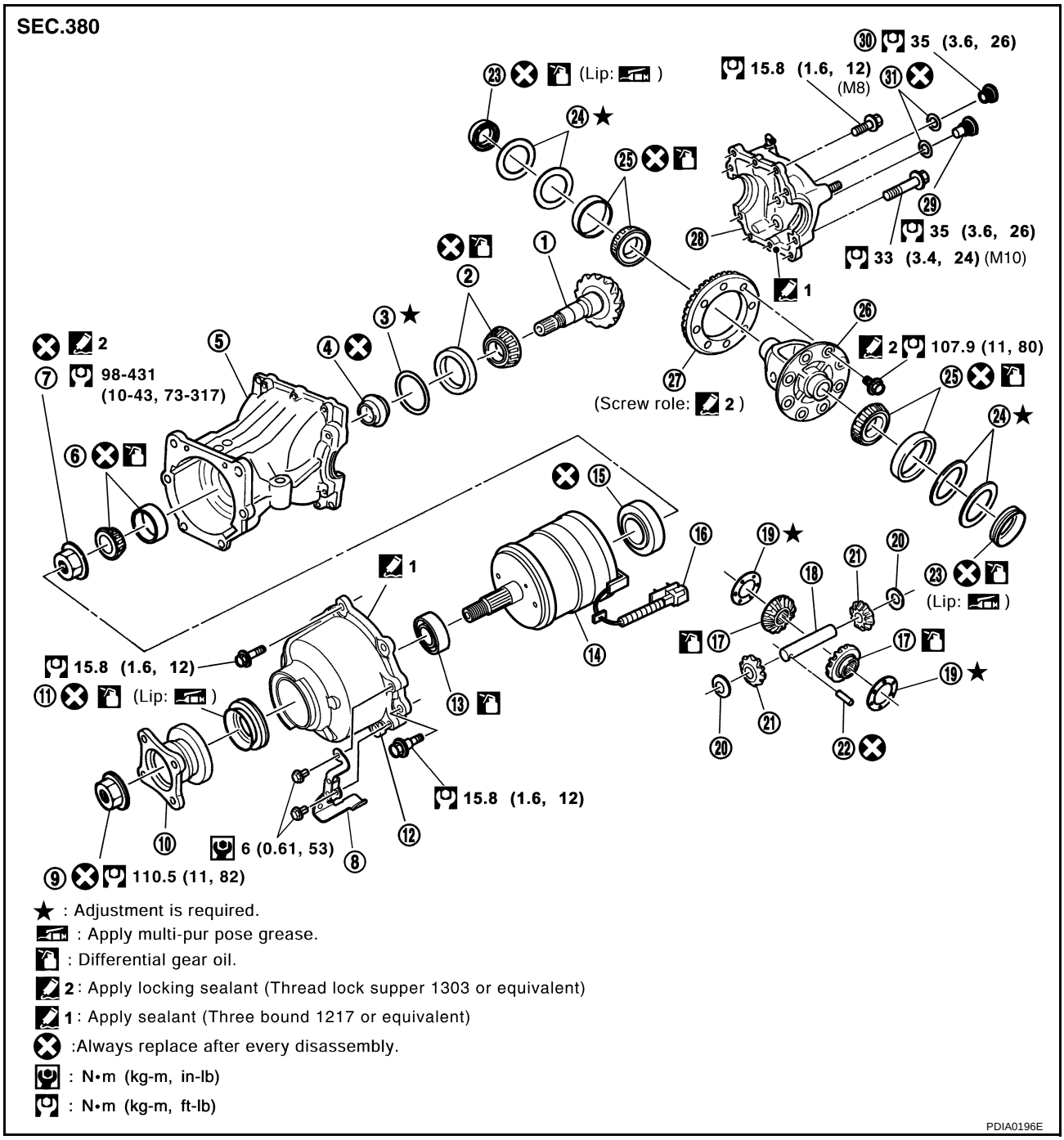


1. Drive pinion	2. Pinion rear bearing	3. Drive pinion adjusting shim
4. Collapsible spacer	5. Gear carrier	6. Pinion front bearing
7. Drive pinion nut	8. Electric controlled coupling connector bracket	9. Companion flange lock nut
10. Companion flange	11. Front oil seal	12. Coupling cover
13. Coupling front bearing	14. Electric controlled coupling	15. Center oil seal
16. Electric controlled coupling connector	17. Side gear	18. Pinion mate shaft
19. Side gear thrust washer	20. Pinion mate thrust washer	21. Pinion mate gear
22. Lock pin	23. Side oil seal	24. Side bearing adjusting shim
25. Side bearing	26. Differential case	27. Drive gear

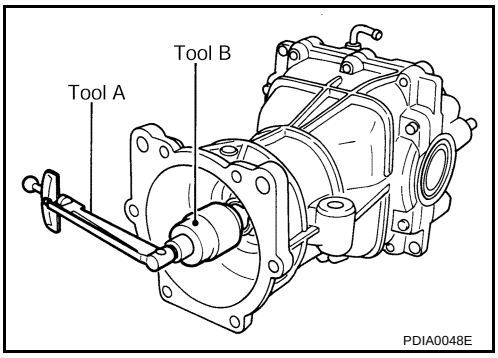
28. Rear cover
29. Drain plug
30. Filler plug
31. Gasket

Pre-inspection

EDS001ZC

TOTAL PRELOAD

1. Drain the oil.
2. Remove electric controlled coupling assembly. Refer to RFD-22, "Removal of Electric Controlled Coupling Assembly" .
3. Rotate the drive pinion back and forth in 2 to 3 times to check for unusual noise and rotation malfunction.
4. Rotate the drive pinion at least 20 times to check for smooth operation of the bearing.
5. Fit the drive pinion socket onto the drive pinion spline. Using the preload gauge below, measure the total preload.



Tool number **A: ST3127S000**
B: KV38108500

Total preload
:1.33 - 2.15 N·m (0.14 - 0.21 kg-m, 12 - 19 in-lb)

- If outside the standard, disassemble, check, and adjust each part. Adjust the pinion bearing and side bearing preload.
  Adjust the pinion bearing preload first, then adjust the side bearing preload.

Side bearing preload
: 0.64-0.98 N·m (0.07 - 0.09 kg-m, 6 - 8 in-lb)

When the preload torque is large
On pinion bearings : Replace the collapsible spacer.
On side bearings : Use thinner side bearing adjusting shims.

When the preload is small
On pinion bearings : Tighten the pinion nut.
On side bearings : Use thicker side bearing adjusting shims.

Side bearing adjusting shims

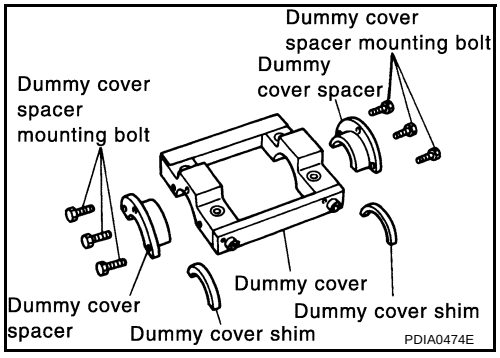
Thickness	Part No.	Thickness	Part No.	Thickness	Part No.
1.85 mm (0.0728 in)	38453 4N200	2.05 mm (0.0807 in)	38453 4N204	2.25 mm (0.0886 in)	38453 4N208
1.90 mm (0.0748 in)	38453 4N201	2.10 mm (0.0827 in)	38453 4N205	2.30 mm (0.0906 in)	38453 4N209
1.95 mm (0.0768 in)	38453 4N202	2.15 mm (0.0854 in)	38453 4N206	2.35 mm (0.0925 in)	38453 4N210
2.00 mm (0.0787 in)	38453 4N203	2.20 mm (0.0866 in)	38453 4N207		

DRIVE GEAR TO DRIVE PINION BACKLASH

1. Drain the oil.
2. Remove the rear cover. Refer to RFD-22, "Removal of Differential Assembly" .
3. Following the procedure below, install a dummy cover set to the gear carrier.

Tool Number : KV381086S1

a. Fit dummy cover shims to the right and left side bearing adjusting shims.



b. Temporarily tighten a dummy cover to the gear carrier.
c. Position a dummy cover spacer to the dummy cover.
d. Tighten rear cover mounting bolts to the specified torque. Refer to RFD-16, "Components" .
e. Tighten dummy cover spacer mounting bolts evenly to the specified torque.

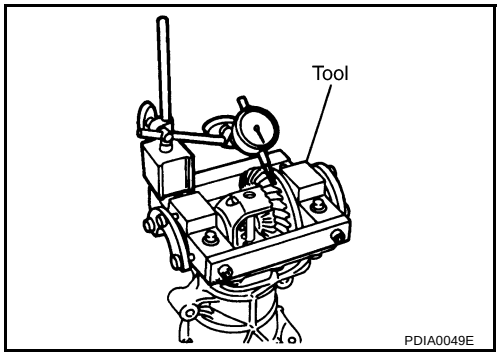
: 5.9 N·m (0.6 kg-m, 52 in-lb)

4. Fit a dial gauge to the drive gear face to measure the backlash.

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

- If outside the standard, change the thickness of the side bearing adjusting shims.

Tool number : KV381086S1



When the backlash is large:

Make the drive gear back adjusting shims thicker, and the drive gear front adjusting shims thinner.

When the backlash is small:

Make the drive gear back adjusting shims thinner, and the drive gear front adjusting shims thicker.

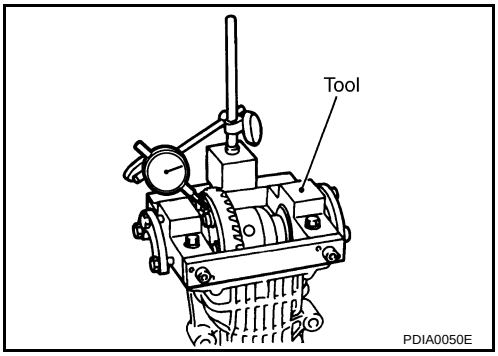
Side bearing adjusting shims

Thickness	Part No.	Thickness	Part No.	Thickness	Part No.
1.85 mm (0.0728 in)	38453 4N200	2.05 mm (0.0807 in)	38453 4N204	2.25 mm (0.0886 in)	38453 4N208
1.90 mm (0.0748 in)	38453 4N201	2.10 mm (0.0827 in)	38453 4N205	2.30 mm (0.0906 in)	38453 4N209
1.95 mm (0.0768 in)	38453 4N202	2.15 mm (0.0854 in)	38453 4N206	2.35 mm (0.0925 in)	38453 4N210
2.00 mm (0.0787 in)	38453 4N203	2.20 mm (0.0866 in)	38453 4N207		

DRIVE GEAR RUNOUT

1. Drain the oil.
2. Remove the rear cover.Refer to RFD-22, "Removal of Differential Assembly" .
3. Attach dummy cover set. Refer to RFD-18, "DRIVE GEAR TO DRIVE PINION BACKLASH" .

Tool Number : KV381086S1



4. Fit a dial gauge to the drive gear back face.
5. Rotate the drive gear to measure runout.

Runout limit : 0.05 mm (0.0020 in)

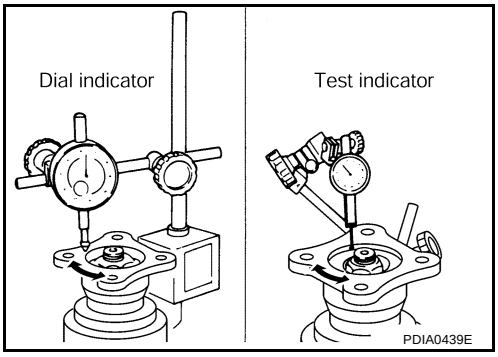
- If outside the repair limit, check drive gear assembly condition; foreign material may be caught between drive gear and differential case, or differential case or drive gear may be deformed, etc.

CAUTION:
Replace the drive gear and drive pinion gear as a set.

COMPANION FLANGE RUNOUT

1. Fit a dial gauge onto the companion flange face (inner side of the propeller shaft mounting bolt holes).
2. Rotate the companion flange to check for runout.

Runout limit : 0.13 mm (0.0051 in)



3. Fit a test indicator to the inner side of the companion flange (socket diameter).
4. Rotate the companion flange to check for runout.

Runout limit : 0.19 mm (0.0075 in)

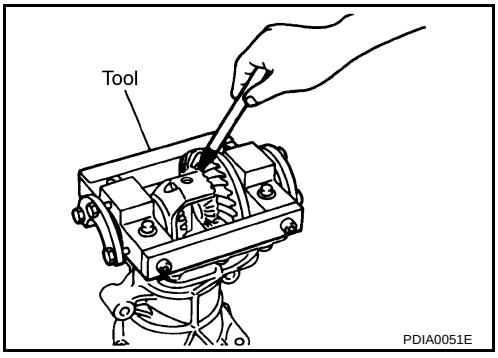
5. If the runout value is outside the repair limit, follow the procedure below to adjust.

a. Check for runout while changing the phase between companion flange and drive pinion gear by 90° step, and search for the point where the runout is the minimum.
b. If the runout value is still outside of the limit after the phase has been changed, replace the companion flange.
c. If the runout value is still outside of the limit after the companion flange has been replaced, possible cause will be an assembly malfunction of the drive pinion gear and the electronically controlled coupling, malfunctioning coupling bearing, or malfunctioning of electronically controlled coupling.

TOOTH CONTACT

1. Drain the oil.
2. Remove the rear cover. Refer to RFD-22, "Removal of Differential Assembly" .
3. Attach dummy cover set. Refer to RFD-18, "DRIVE GEAR TO DRIVE PINION BACKLASH" .

Tool Number : KV381086S1

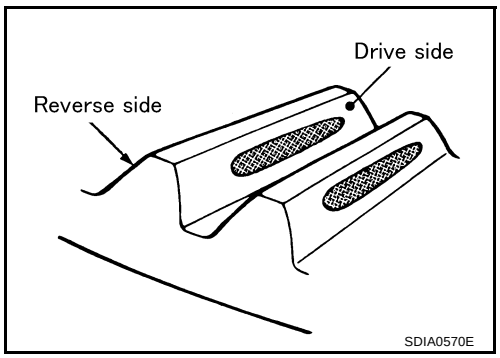


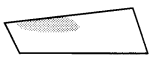
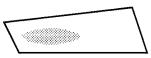
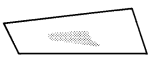
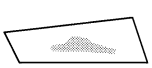
4. Thoroughly clean drive gear and drive pinion teeth.
5. Lightly apply a mixture of powdered ferric oxide and oil or the equivalent. Apply it to 3 to 4 teeth of drive gear drive side.

6. Rotate the drive gear back and forth in several times, check drive pinion gear to drive gear tooth contact.

CAUTION:

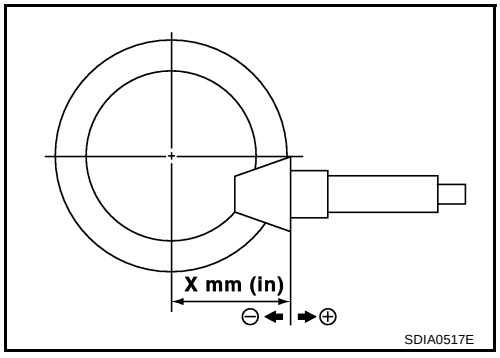
Check tooth contact on drive side and reverse side.



Tooth contact condition		Drive pinion adjusting shim selection value [mm (in)]		Adjustment (Yes/No)	Possible cause
Drive side	Back side				
Heel side Toe side 	Toe side Heel side 	Thicker ↑	+0.09 (+0.0035)	Yes	Occurrence of noise and scoring sound in all speed ranges.
			+0.06 (+0.0024)		Occurrence of noise when accelerating.
			+0.03 (+0.0012)	No	–
			0		
		Thinner ↓	−0.03 (−0.0012)		
			−0.06 (−0.0024)	Yes	Occurrence of noise at constant speed and decreasing speed.
			−0.09 (−0.0035)		Occurrence of noise and scoring sound in all speed ranges.

SDIA2549E

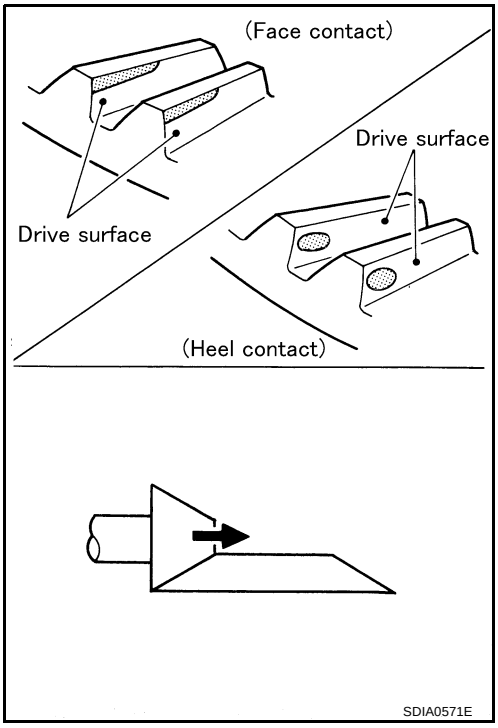
7. If the tooth contact is improperly adjusted, follow the procedure below to adjust the pinion height (dimension X in the figure).



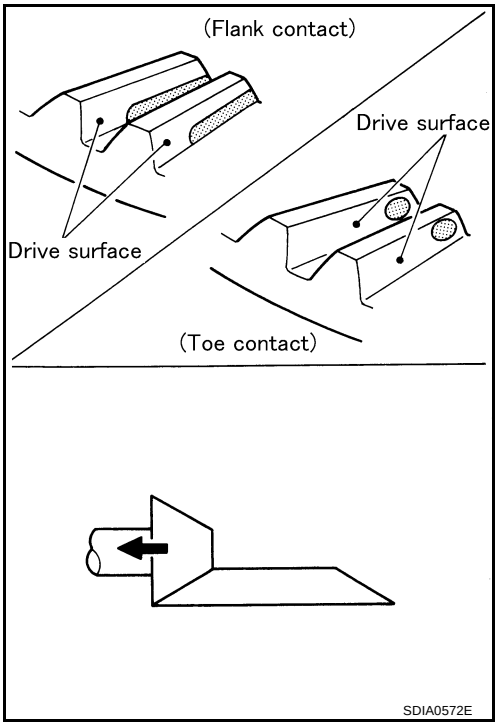
Drive pinion adjusting shim

Thickness	Part No.	Thickness	Part No.
1.70 mm (0.0669 in)	38154 4N200	2.00 mm (0.0787 in)	38154 4N210
1.73 mm (0.0681 in)	38154 4N201	2.03 mm (0.0799 in)	38154 4N211
1.76 mm (0.0693 in)	38154 4N202	2.06 mm (0.0811 in)	38154 4N212
1.79 mm (0.0705 in)	38154 4N203	2.09 mm (0.0823 in)	38154 4N213
1.82 mm (0.0717 in)	38154 4N204	2.12 mm (0.0835 in)	38154 4N214
1.85 mm (0.0728 in)	38154 4N205	2.15 mm (0.0846 in)	38154 4N215
1.88 mm (0.0740 in)	38154 4N206	2.18 mm (0.0858 in)	38154 4N216
1.91 mm (0.0752 in)	38154 4N207	2.21 mm (0.0870 in)	38154 4N217
1.94 mm (0.0764 in)	38154 4N208	2.24 mm (0.0882 in)	38154 4N218
1.97 mm (0.0776 in)	38154 4N209		

- In case of face contact or heel contact, thicken the drive pinion gear adjusting shims to move the drive pinion gear closer to the drive gear.



- In case of flank contact or toe contact, thin the drive pinion gear adjusting shims to move the drive pinion gear farther from the drive gear.



Disassembly and Assembly

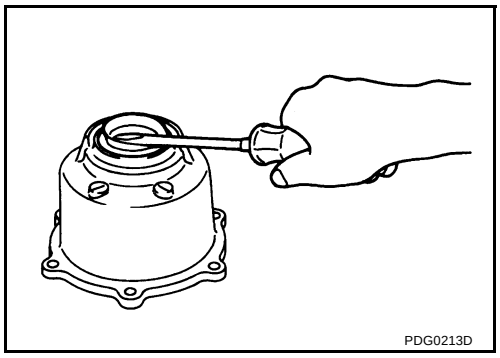
EDS001ZD

DISASSEMBLY

Removal of Electric Controlled Coupling Assembly

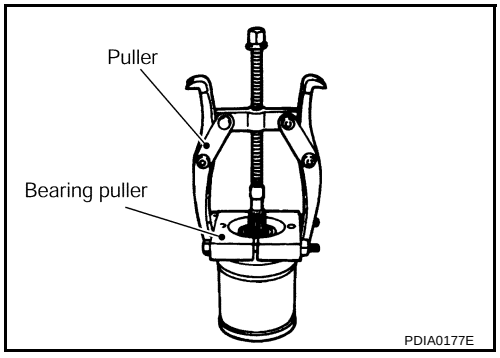
1. Using a drive pinion flange wrench, remove companion flange lock nut.
2. Using a puller, remove the companion flange.
3. Remove coupling cover.
4. Using flat tip screwdriver, remove front oil seal from the coupling cover.

   CAUTION:
   Be careful not to damage the coupling cover.



5. Remove electric controlled coupling assembly from the gear carrier.
6. Using a puller, remove coupling front bearing from the electronically controlled coupling.

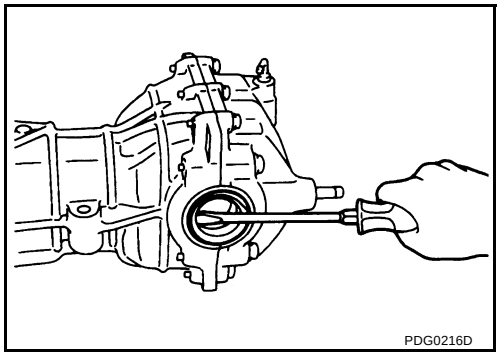
   CAUTION:
   When the bearing is replaced with new one, readjust the shim between bearing and the coupling.



Removal of Differential Assembly

1. Using flat tip screwdriver, remove side oil seal from the gear carrier assembly.

   CAUTION:
   Be careful not to damage the gear carrier and rear cover.
2. Remove rear cover mounting bolts.

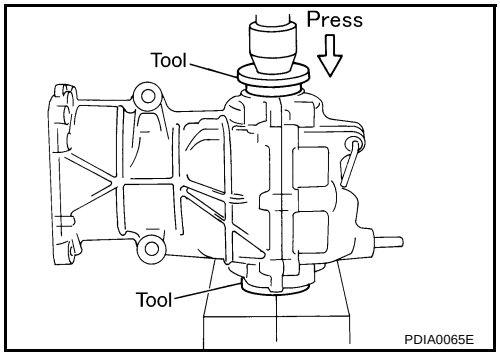


3. Fit a drift to the right and left side bearing adjusting shims individually. Press differential case assembly and side bearing to remove gear carrier assembly and rear cover.

   Tool number : KV40100610

   CAUTION:
   The pressure shall be as low as possible to remove gear carrier assembly and rear cover. The maximum pressure shall be 10 kN (1 ton, 1.1 US ton, 1.0 Imp ton).

   NOTE:
   Differential case assembly, side bearings, and adjusting shims are compressed and integrated in the gear carrier and rear cover.

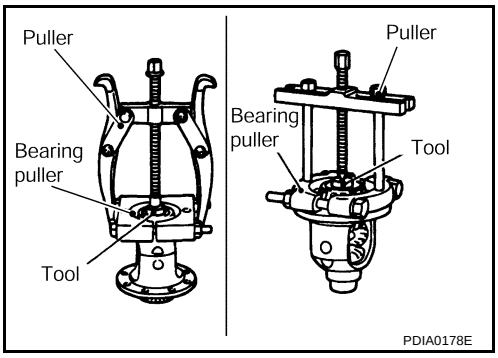


4. Remove side bearing adjusting shims and side bearing outer race.

CAUTION:
Mark the side bearing adjusting shims so that the original mounting positions (right/left) can be identified later.

5. Remove drive gear mounting bolts, and remove drive gear from the differential case.
6. Using a puller and the drift below, remove side bearing inner race.

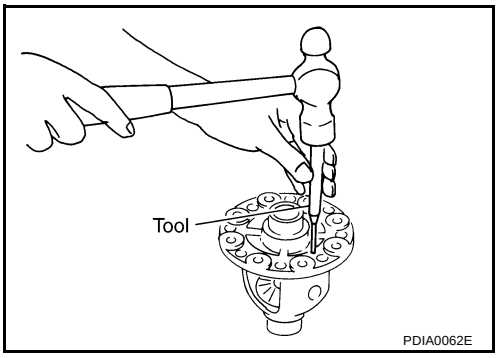
Tool number : ST33052000



7. Using the pin punch below, pull the lock pin out of the pinion mate shaft.

Tool number : ST23550000

8. Remove pinion mate shaft, pinion mate gears, pinion mate thrust washers, side gears, side gear thrust washers from the differential case.

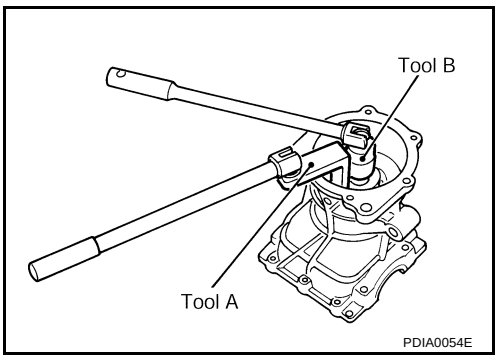


Removing Drive Pinion Assembly

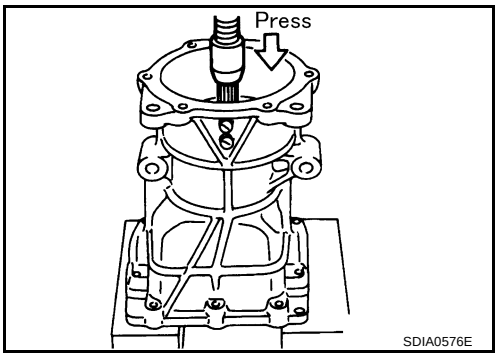
1. Remove Electric controlled coupling assembly. Refer to RFD-22, "Removal of Electric Controlled Coupling Assembly" .
2. Remove differential case assembly. Refer to RFD-22, "Removal of Differential Assembly" .
3. Fit the drive pinion socket onto the drive pinion spline. Using the pinion nut wrench, remove drive pinion nut.

Tool number A: KV38108400
B: KV38108500

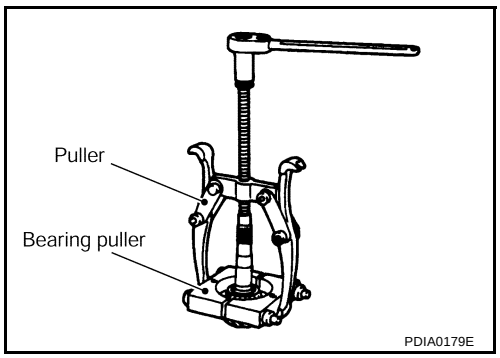
4. Remove center oil seal.



5. Press the drive pinion gear assembly out of the gear carrier.
6. Remove pinion front bearing inner race.
7. Remove collapsible spacer.



8. Using a puller, remove pinion rear bearing inner race from the drive pinion.

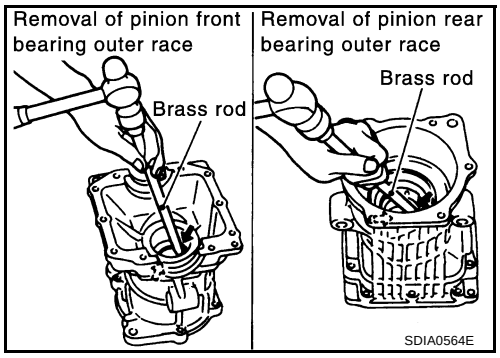


9. Using a brass rod, tap the pinion front bearing outer race evenly from the 2 cutouts on the gear carrier and remove pinion front bearing outer race.

   CAUTION:
   Be careful not to damage the gear carrier.

10. Using a brass rod, tap the drive pinion adjusting shim evenly from the 2 cutouts on the gear carrier and remove drive pinion adjusting shims and pinion rear bearing outer race.

    CAUTION:
    Be careful not to damage the gear carrier.



INSPECTION

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

Content	Measures
Hypoid gear	● If the gear teeth do not mesh or line-up correctly, determine the cause and adjust, repair, or replace as necessary. ● If the gear are worn, cracked, damaged, pitted or chipped (by friction) noticeably, replace with a new gears.
Bearing	● If found any chipped (by friction), pitted, worn, rusted, scratched mark, or unusual noise from the bearing, replace with a new bearing ASSY (as new set).
Side gear thrust washer and Pinion mate thrust washer	● Replace with a new one if found any cracks or damage on the surface of the tooth. ● Replace with a new one if found any worn or chipped mark on the contact sides of the thrust washer.
Side gear and Pinion mate thrust washer	● Replace with a new one if found that it chipped (by friction), damaged, or unusual worn.
Oil seal	● Oil seals must be replaced with a new one whenever disassembled.
Differential case	● Replace with a new one if found any wear or cracks on the contact sides of the Differential case.
Companion flange	● Replace with a new one if found any chipped marks (about 0.10mm, 0.0039in) or other damage on the contact sides of the lips of the companion flange.

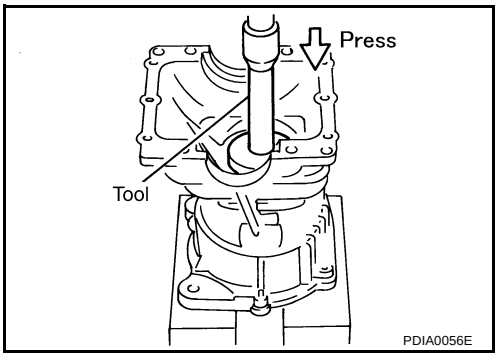
ASSEMBLY

Assembly of Drive Pinion Assembly

1. Assemble with a drive pinion adjusting shim of the same thickness as was installed prior to disassembly. Using the drift below, press a pinion rear bearing outer race into the gear carrier.

   Tool number : ST17130000

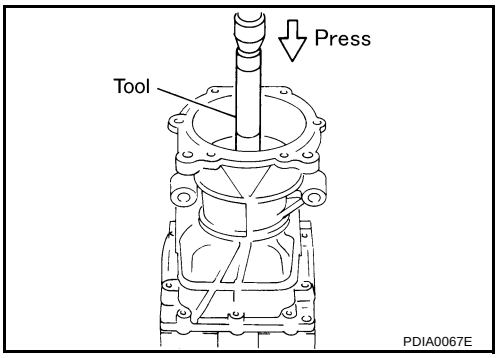
   CAUTION:
   - **At first, using a hammer, tap the bearing outer race until it becomes square to the gear carrier.**
   - **Do not reuse the pinion rear bearing outer race.**



2. Using the drift below, press a pinion front bearing outer race into the gear carrier.

   Tool number : ST33230000

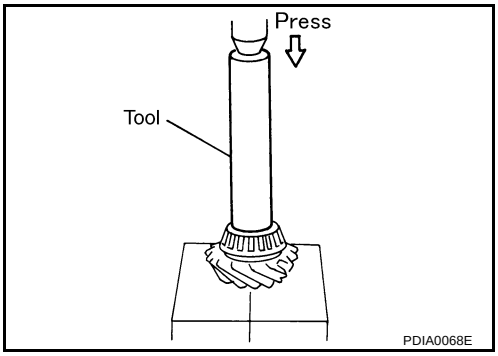
   CAUTION:
   - **At first, using a hammer, tap the bearing outer race until it becomes square to the gear carrier.**
   - **Do not reuse the pinion front bearing outer race.**



3. Using the drift below, press a pinion rear bearing inner race into the drive pinion.

   Tool number : ST23860000

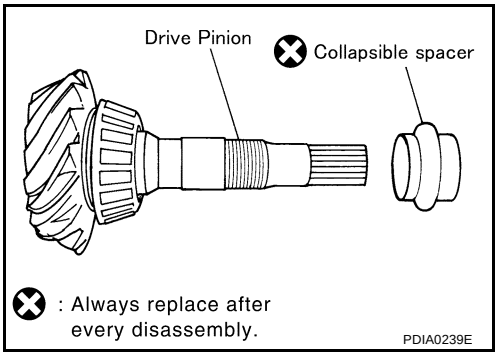
   CAUTION:
   Do not reuse the pinion rear bearing inner race.



4. After checking and adjusting the tooth contact and backlash of the hypoid gear following the procedure below, assemble a collapsible spacer to the drive pinion.

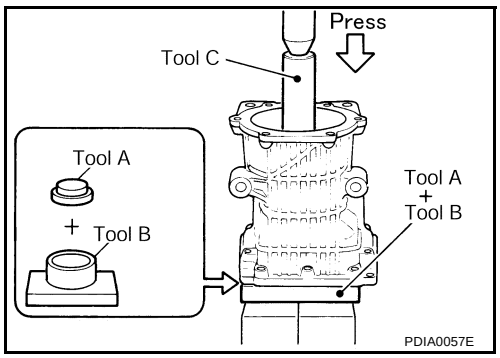
   CAUTION:
   - **Be careful of the mounting direction of the collapsible spacer.**
   - **Do not reuse the collapsible spacer.**

a. Apply differential oil to the pinion rear bearing, and assemble the drive pinion to the gear carrier.



b. Assemble a pinion front bearing inner race to the drive pinion. Using the drifts and press stand, press the pinion nut as far as it can be tightened.

Tool number	A: KV40100610
	B: ST38220000
	C: ST23860000



c. Temporarily tighten the removed pinion nut to the drive pinion.

NOTE:
Use the removed pinion nut only for the preload measurement.

d. Fit the drive pinion gear socket onto the drive pinion spline. Using the pinion nut wrench, tighten the pinion nut to the specified preload torque.

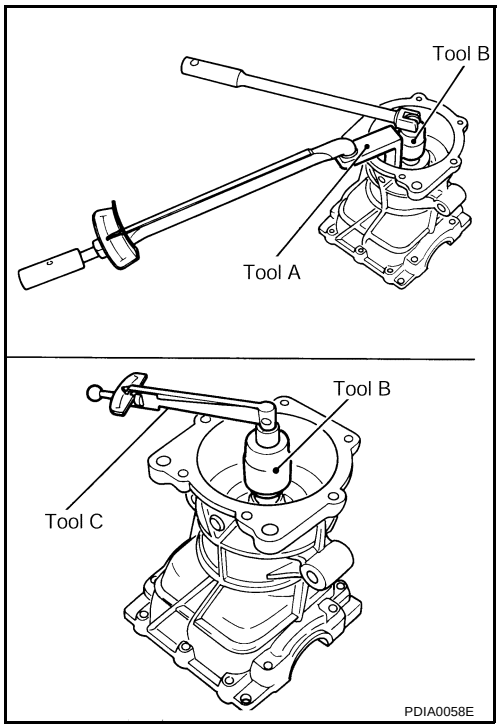
Tool number	A: KV38108400
	B: KV38108500
	C: ST3127S000

CAUTION:
The pinion nut is tightened with no collapsible spacer. Be careful not to overtighten it. While measuring the preload, tighten it by 5° to 10°.

e. Apply differential oil to the side bearings, and install new side bearing adjusting shims with the same thickness or re-install the old ones to the same mounting position they were in prior to disassembly. Install the differential case assembly to the gear carrier. Refer to RFD-28, "Installation of Differential Assembly" .

f. Install a dummy cover set to check and adjust the tooth contact. Refer to RFD-19, "TOOTH CONTACT" .

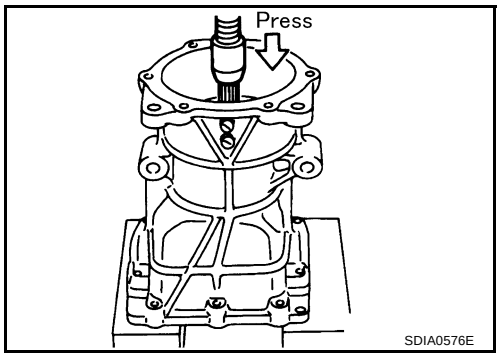
g. Check and adjust the backlash. Refer to RFD-18, "DRIVE GEAR TO DRIVE PINION BACKLASH" .



h. Remove dummy cover set, and remove differential case assembly.

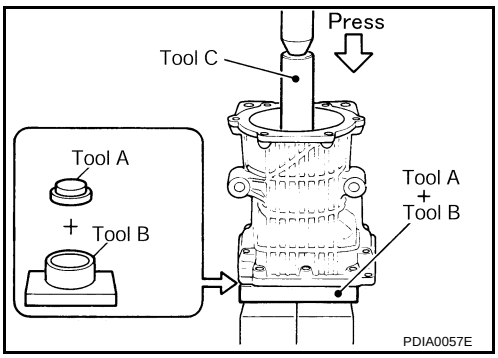
i. Remove pinion nut, pinion front bearing inner race, and remove drive pinion gear.

5. Install the drive pinion gear with a collapsible spacer to the gear carrier.



6. Using the drifts and press stand, press the pinion front bearing inner race to the drive pinion as far as a pinion nut can be tightened.

Tool number **A: KV40100610**
B: ST38220000
C: ST23860000



7. Apply anti-corrosive oil to the thread and seat of the pinion nut, and temporarily tighten the pinion nut to the drive pinion.

CAUTION:
Do not reuse the pinion nut.

8. Fit the drive pinion gear socket onto the drive pinion gear spline. Using the pinion nut wrench, adjust the pinion nut tightening torque and pinion bearing preload torque.

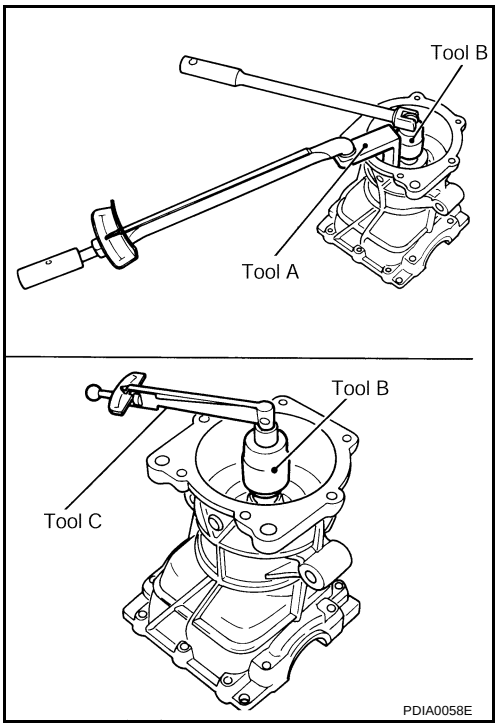
Tool number **A: KV38108400**
B: KV38108500
C: ST3127S000

Pinion nut tightening torque

: 98 - 431 N·m (10 - 43 kg-m, 73 - 317 ft-lb)

Pinion bearing preload

: 0.69 - 1.17 N·m (0.07 - 0.11 kg-m, 7 - 10 in-lb)

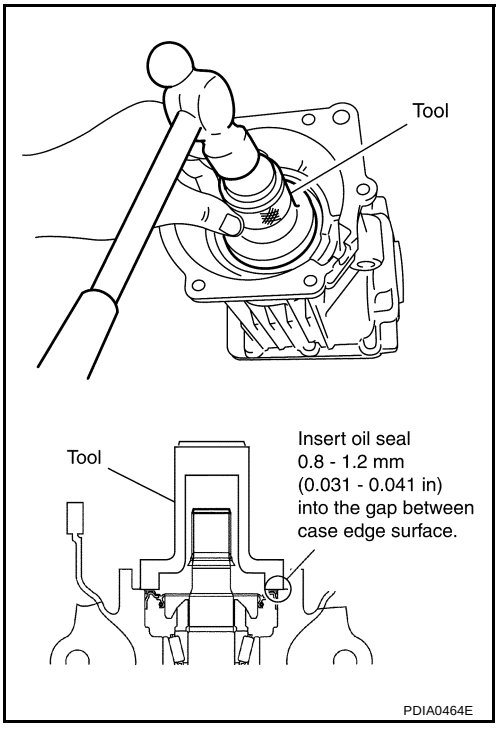


CAUTION:

- **Do not reuse the pinion nut.**
- **Adjust the lower limit of the pinion nut tightening torque first.**
- **If the preload torque exceeds the specified value, replace the collapsible spacer and tighten it again to adjust. Never loosen the pinion nut to adjust the preload torque.**
- **After adjustment, rotate the drive pinion gear back and forth 2 to 3 times to check for abnormal noise, rotation malfunction, and other malfunctions.**

9. Install center oil seal as shown in the right figure.

Tool number : ST35271000



10. Install the differential case assembly. Refer to RFD-28, "Installation of Differential Assembly" .

CAUTION:
Do not install the rear cover.

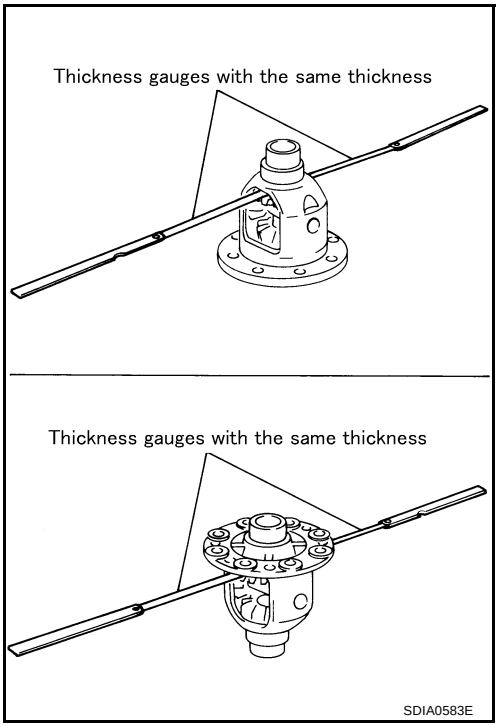
11. Install the dummy cover set, and check backlash, drive gear back runout, and tooth contact. Refer to RFD-19, "TOOTH CONTACT" .
12. Remove the dummy cover, then install the rear cover, and drive in the oil seal. Refer to.RFD-28, "Installation of Differential Assembly" .
13. Check overall preload torque. Refer to RFD-17, "TOTAL PRELOAD" .
14. Connect electric controlled coupling assembly. Refer to RFD-30, "Installation of Electric Controlled Coupling Assembly" .
15. Check companion flange runout. Refer to RFD-19, "COMPANION FLANGE RUNOUT" .

Installation of Differential Assembly

1. Assemble new side gear thrust washers with the same thickness as the ones installed prior to disassembly or reinstall the old ones on the side gears.
2. Assemble the side gears, side gear thrust washers, pinion mate gears, and pinion mate thrust washers to the differential case, and temporarily assemble the pinion mate shaft.
3. Measure the side gear end play following the procedure below, and select the appropriate side gear thrust washers.
   - Using a thickness gauge, measure the clearance between side gear back and the differential case at 3 different points, while rotating the side gear. Average the 3 readings, and select the appropriate side gear thrust washer so that the mean value is within specifications below. (Measure the clearance of the other side as well.)

Side gear end play standard:

0.2 mm (0.008 in) or less. Every gear shall rotate smoothly with no abnormal feeling of drag.



Thickness	Part No.	Thickness	Part No.
0.74 mm (0.0291 in)	38424 4N200	0.83 mm (0.0327 in)	38424 4N203
0.77 mm (0.0303 in)	38424 4N201	0.86 mm (0.0339 in)	38424 4N204
0.80 mm (0.0315 in)	38424 4N202		

CAUTION:

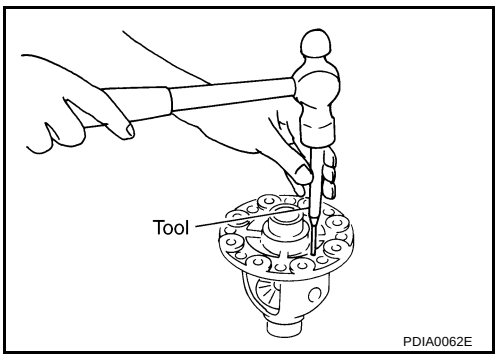
- **Before measurement, place differential case straight up so that side gear to be measured comes upward. To prevent the side gear from tilting, insert thickness gauges with the same thickness from both sides.**
- **Select a side gear thrust washer for right and left individually.**

4. Assemble the selected side gear thrust washer to the differential case.

5. Using the pin punch below, drive a lock pin into the pinion mating shaft.

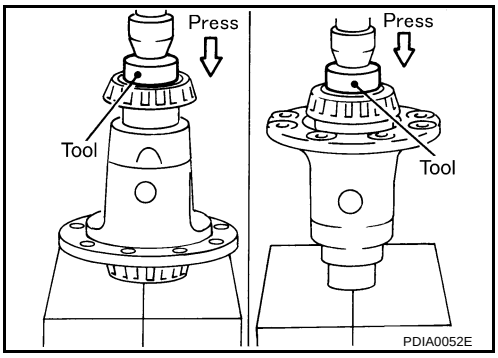
Tool number : ST23550000

CAUTION:
Do not reuse the lock pin.



6. Using the drift below, press a side bearing inner race into the differential case.

Tool number : KV40105020



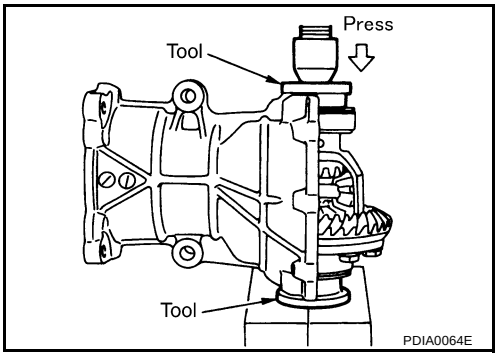
7. Apply locking sealant onto the thread of the drive gear.

CAUTION:
The drive gear back, threaded holes, and drive gear bolts shall be cleaned and decreased sufficiently.

8. Assemble the drive gear to the differential case, and tighten it with drive gear bolt. Refer to RFD-16, "Components" .
9. Apply differential oil to the side bearings, and assemble new side bearing adjusting shims (2 pieces for one side) with the same thickness as the ones installed prior to disassembly or re-install the old ones, with a side bearing outer race to the differential case.
If the side bearing adjusting shims have been already selected, use them.
10. Fit the drift below to the right and left side bearing adjusting shims individually. Compress differential case assembly and side bearing to install the gear carrier assembly to differential case assembly.

Tool number : KV40100610

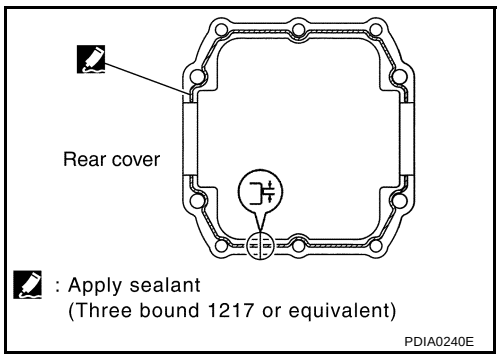
CAUTION:
- **The drift shall be placed on the center of the adjusting shims.**
- **The pressure shall be as low as possible to install the gear carrier assembly into the differential assembly. The maximum pressure shall be 1 ton.**
- **If the adjusting shims are installed by tapping, the gear carrier may be damaged. Avoid tapping.**



11. Install a dummy cover set, check and adjust the backlash, drive gear back runout, tooth contact, and overall preload torque. Refer to RFD-17, "Pre-inspection" .
12. Remove dummy cover set.

13. Apply a continuos bead of sealant around the gear carrier mating surface on the rear cover as shown in the figure. Overlap both ends of the bead for at least 3 mm (0.12 in).

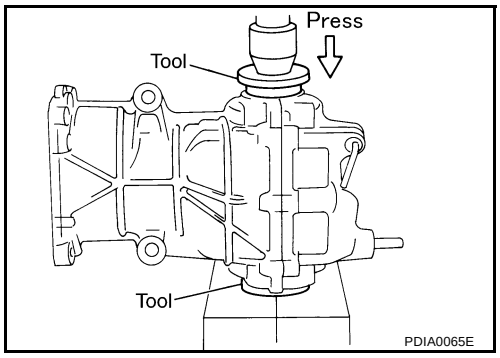
CAUTION:
Remove old sealant on the mounting surface, then remove any moisture, oil, and foreign material on the application and mounting surfaces.



14. Fit the drift below to the right and left side bearing adjusting shims individually. Compress differential case assembly and side bearing to install the rear cover.

Tool number : KV40100610

CAUTION:
- **The drift shall be placed on the center of the adjusting shims.**
- **The pressure shall be as low as possible to install the rear cover. The maximum pressure shall be 10 kN (1 ton, 1.1 US ton, 1.0 Imp ton)**
- **If the rear cover is forced in by tapping, the rear cover may be damaged by the adjusting shims. Avoid tapping.**

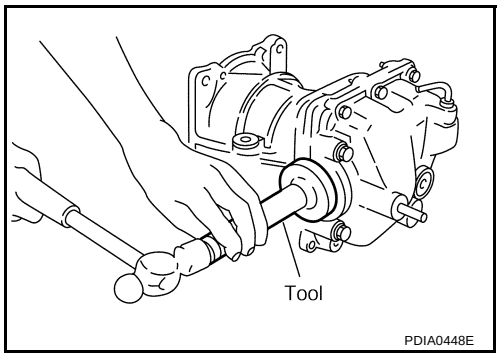


15. Tighten rear cover mounting bolts to the specified torque. Refer to RFD-16, "Components" .
16. Using both drift, drive the oil seal until it becomes flush with the case end.

Tool number : KV38100200

CAUTION:
- **Do not reuse oil seals.**
- **Apply multi-purpose grease onto the oil seal lips, and differential oil onto the circumference of the oil seal.**

17. Check overall preload torque. Refer to RFD-17, "TOTAL PRELOAD" .

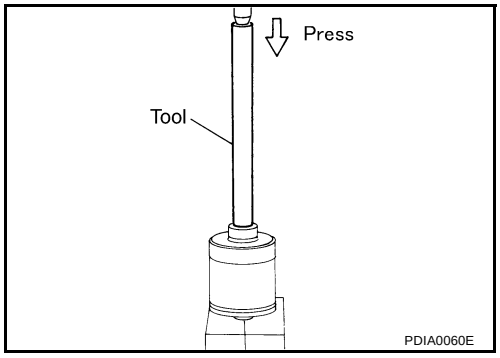


Installation of Electric Controlled Coupling Assembly

1. Using the drift below, install the coupling front bearing to the electric controlled coupling.

Tool number : ST22360002

CAUTION:
At disassembly, be sure to install shim between electric controlled coupling and bearing. Chamfering side of shim should be coupled to install.

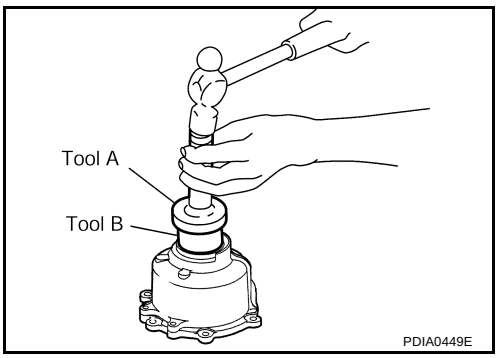


2. Assemble the electric controlled coupling assembly to the drive pinion gear.

3. Using the drift below, drive an oil seal until it becomes flush with the case end.

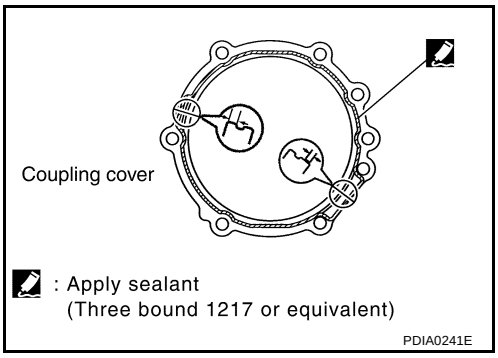
Tool number **A: KV38100200**
B: ST27861000

CAUTION:
- **Do not reuse oil seals.**
- **Apply multi-purpose grease onto the oil seal lips, and differential oil onto the circumference of the oil seal.**



4. Apply a continuous bead sealant around the gear carrier mating surface on the coupling cover as shown in the figure. Overlap both ends of the bead for at least 3 mm (0.12 in).

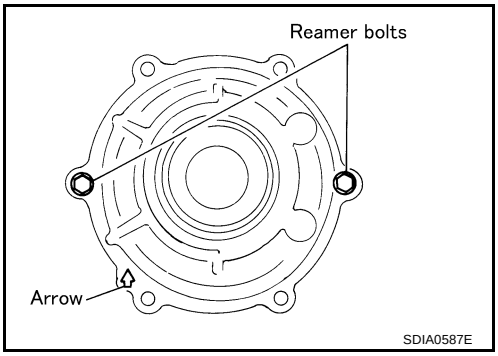
CAUTION:
Remove old sealant on the mounting surface, then remove any moisture, oil, and foreign material from the application and mounting surfaces.



5. Assemble the coupling cover to the gear carrier assembly with the arrow facing upward, temporarily tighten reamer bolts to the positions shown in the figure.
6. Tighten the reamer bolts and coupling cover mounting bolts to the specified torque.
7. Assemble the companion flange.
8. Using a flange wrench, tighten the companion flange nut to the specified torque.

CAUTION:
Do not reuse the companion flange nut.

9. Check companion flange runout. Refer to RFD-19, "COMPANION FLANGE RUNOUT" .



SERVICE DATA AND SPECIFICATIONS (SDS)

PFP:00030

General Specification

EDS001ZE

Applied model	QR20DE, QR25DE, YD22DDTi
Final drive model	R145
Drive gear pitch diameter	145
Gear ratio	2.466
Number of teeth (Drive gear/Drive pinion)	37/15
Oil capacity (approx.)	0.55 ℓ (1 lamp pt.)
Number of pinion gears	2
Drive pinion adjustment spacer type	Collapsible

Drive Gear Vibration

EDS001ZF

Type	R145
Vibration limit at drive gear back	0.05 mm (0.0020 in) or less

Side Gear Clearance Adjustment

EDS001ZG

Type	R145
Side gear back clearance	0.2 mm (0.008 in) or less. Every gear shall rotate smoothly with no abnormal feeling of drag.

THRUST WASHER FOR ADJUSTMENT OF SIDE GEAR BACK CLEARANCE

	Thickness	Part No.	Thickness	Part No.
Thrust washer	0.74 mm (0.0291 in) 0.77 mm (0.0303 in) 0.80 mm (0.0315 in)	38424 4N200 38424 4N201 38424 4N202	0.83 mm (0.0327 in) 0.86 mm (0.0339 in)	38424 4N203 38424 4N204

Drive Pinion Gear Preload Adjustment

EDS001ZH

Adjustment of drive pinion gear	Collapsible spacer
Drive pinion gear preload	0.69 - 1.17 N·m (0.07 - 0.11 kg-m,7 - 10 in-lb)

DRIVE PINION GEAR PRELOAD ADJUSTING SHIM

	Thickness	Part No.	Thickness	Part No.
Adjusting shim	1.70 mm (0.0669 in) 1.73 mm (0.0681 in) 1.76 mm (0.0693 in) 1.79 mm (0.0705 in) 1.82 mm (0.0717 in) 1.85 mm (0.0728 in) 1.88 mm (0.0740 in) 1.91 mm (0.0752 in) 1.94 mm (0.0764 in) 1.97 mm (0.0776 in)	38154 4N200 38154 4N201 38154 4N202 38154 4N203 38154 4N204 38154 4N205 38154 4N206 38154 4N207 38154 4N208 38154 4N209	2.00 mm (0.0787 in) 2.03 mm (0.0799 in) 2.06 mm (0.0811 in) 2.09 mm (0.0823 in) 2.12 mm (0.0835 in) 2.15 mm (0.0846 in) 2.18 mm (0.0858 in) 2.21 mm (0.0870 in) 2.24 mm (0.0882 in)	38154 4N210 38154 4N211 38154 4N212 38154 4N213 38154 4N214 38154 4N215 38154 4N216 38154 4N217 38154 4N218

Side Bearing Preload Adjustment

EDS001ZI

Adjustment of side bearing	Adjusting shim
Side bearing preload	0.64 - 0.98 N·m (0.07 - 0.09 kg-m,6 - 8 in-lb)

ADJUSTING SHIM FOR SIDE BEARING PRELOAD

	Thickness	Part No.	Thickness	Part No.
Adjusting shim	1.85 mm (0.0728 in) 1.90 mm (0.0748 in) 1.95 mm (0.0768 in) 2.00 mm (0.0787 in)	38453 4N200 38453 4N201 38453 4N202 38453 4N203	2.05 mm (0.0807 in) 2.10 mm (0.0827 in) 2.15 mm (0.0854 in) 2.20 mm (0.0866 in)	38453 4N204 38453 4N205 38453 4N206 38453 4N207

Total Preload

EDS001ZJ

Total preload with oil seal installed	1.33 - 2.15 N·m (0.14 - 0.21 kg-m,12 - 19 in-lb)
Drive gear backlash	0.10 - 0.15 mm (0.0039 - 0.0059 in)