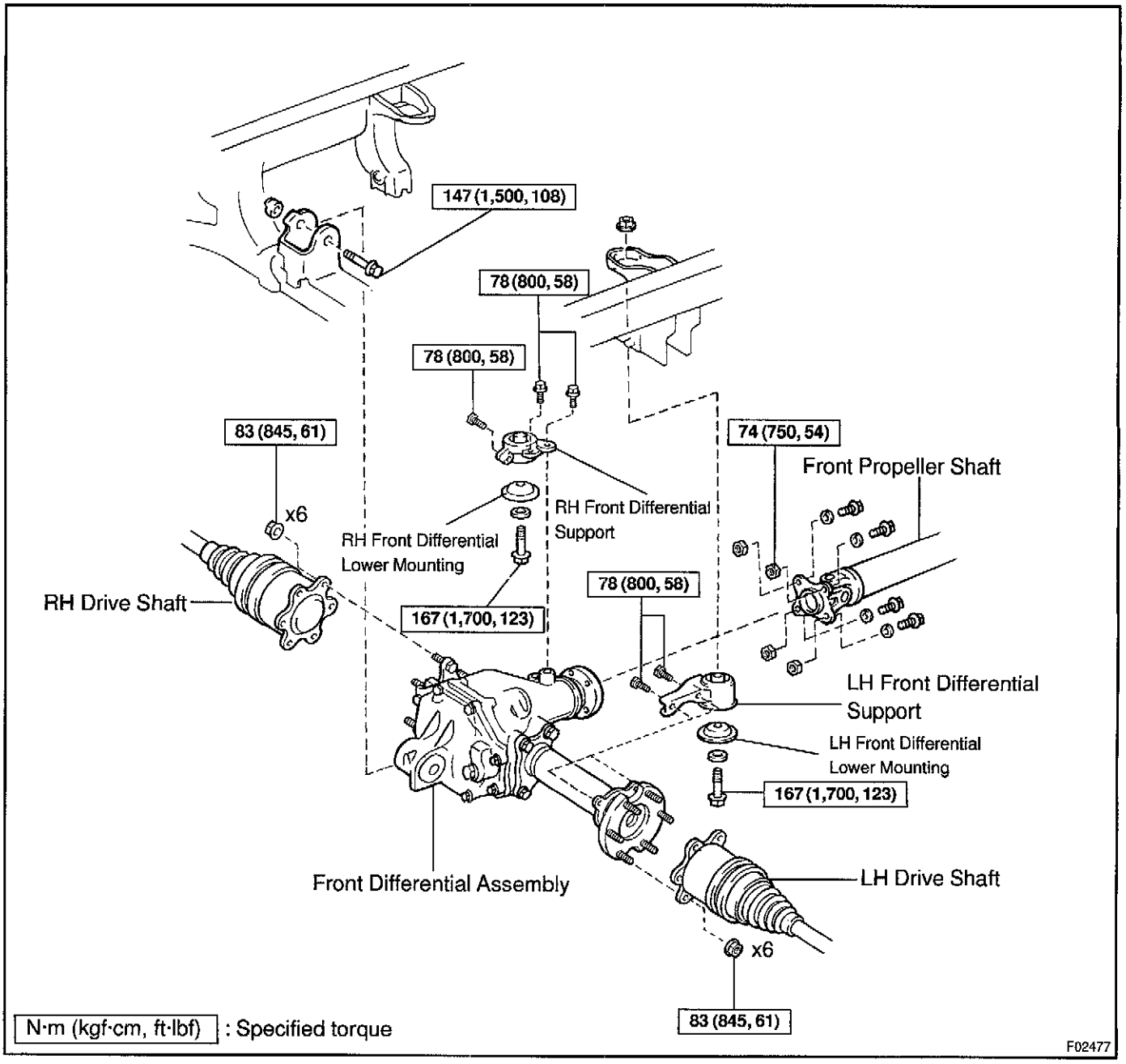
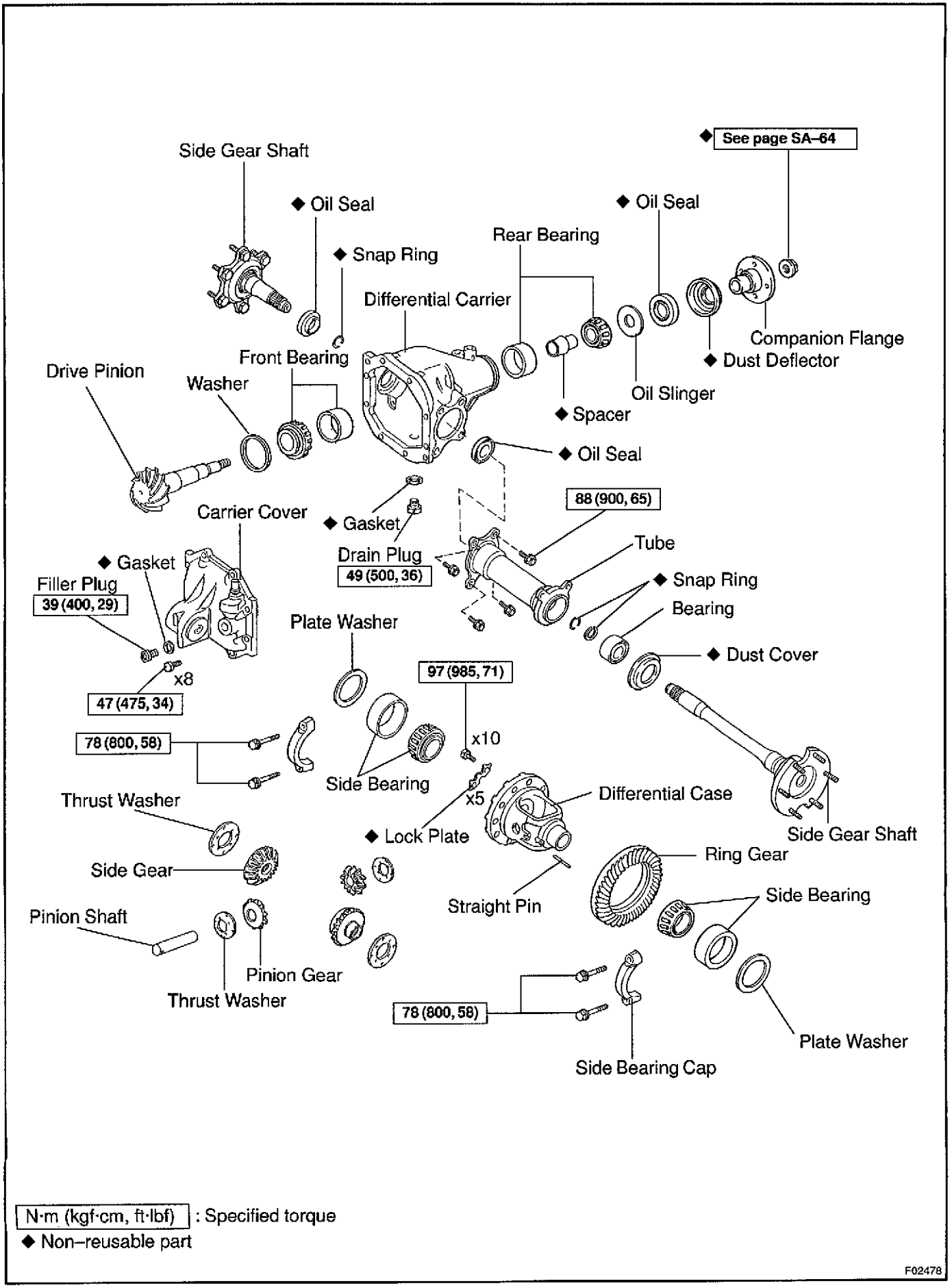
FRONT DIFFERENTIAL CARRIER

COMPONENTS

SA0M4-01





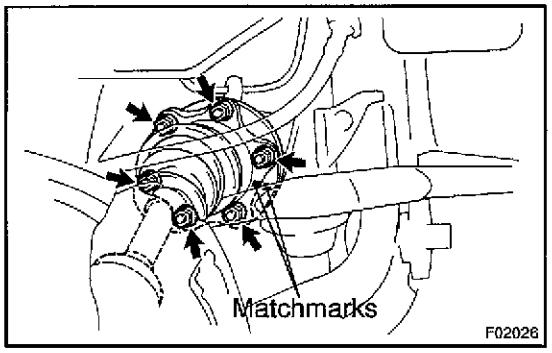
N·m (kgf·cm, ft·lbf) : Specified torque
◆ Non–reusable part

F02478

SA0M5-01

REMOVAL

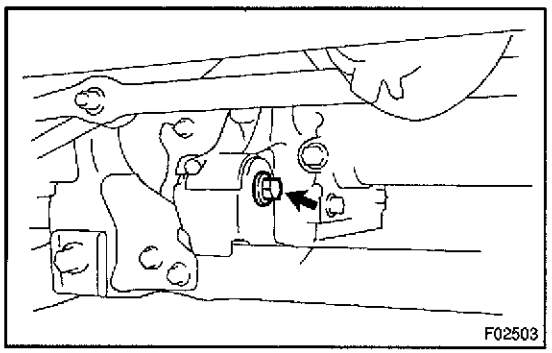
1. **REMOVE ENGINE UNDER COVER AND DRAIN HYPOID GEAR OIL**
2. **REMOVE FRONT PROPELLER SHAFT**
(See page PR–11)



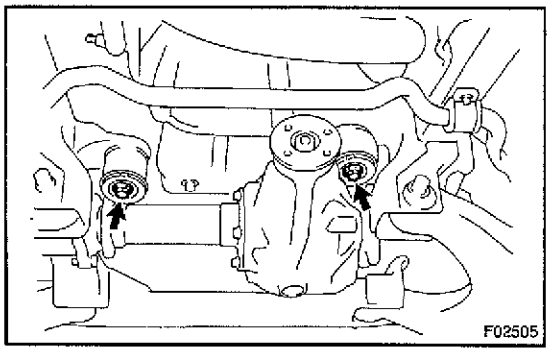
3. **REMOVE DRIVE SHAFT NUTS**

(a) Place matchmarks on the drive shaft and side gear shaft, and remove the 6 nuts holding the drive shaft and side gear shaft.
Torque: 83 N·m (845 kgf·cm, 61 ft·lbf)

(b) Employ the same manner described above to the other side.



4. **REMOVE DIFFERENTIAL FRONT MOUNTING BOLT AND NUT**
Torque: 147 N·m (1,500 kgf·cm, 108 ft·lbf)



5. **REMOVE FRONT DIFFERENTIAL ASSEMBLY**

(a) Support the front differential with a jack.

(b) Remove the 2 bolts, washers, front differential lower mounting and nut.
Torque: 167 N·m (1,700 kgf·cm, 123 ft·lbf)

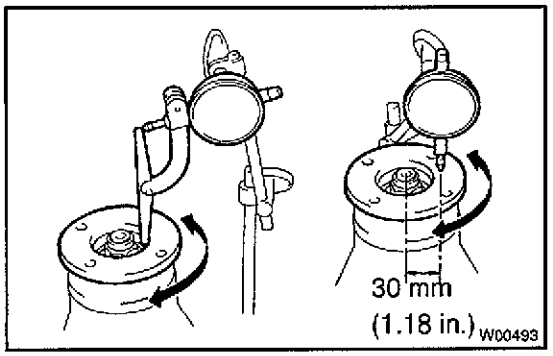
(c) Lower the jack and remove the front differential assembly.

6. **REMOVE LH AND RH FRONT DIFFERENTIAL SUPPORTS**

(a) Remove the 3 bolts and LH front differential support from the front differential assembly.
Torque: 78 N·m (800 kgf·cm, 58 ft·lbf)

(b) Remove the 2 bolts and RH front differential support from the front differential assembly.
Torque: 78 N·m (800 kgf·cm, 58 ft·lbf)

SA0M6-01



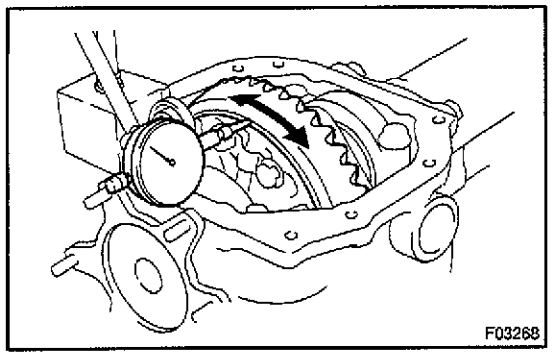
DISASSEMBLY

1. CHECK RUNOUT OF COMPANION FLANGE

Using a dial indicator, measure the vertical and lateral runout of the companion flange.

Maximum:
Vertical runout: 0.10 mm (0.0039 in.)
Lateral runout: 0.10 mm (0.0039 in.)

If the runout is greater than the maximum, replace the companion flange.



2. REMOVE DIFFERENTIAL CARRIER COVER

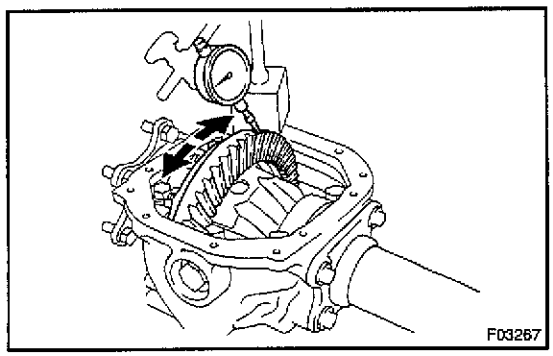
Remove the 8 bolts and tap out the cover with a plastic hammer.

3. CHECK RING GEAR RUNOUT

Using a dial indicator, measure the ring gear runout.

Maximum runout: 0.07 mm (0.0028 in.)

If the runout is greater than the maximum, replace the ring gear and drive pinion as a set.



4. CHECK RING GEAR BACKLASH

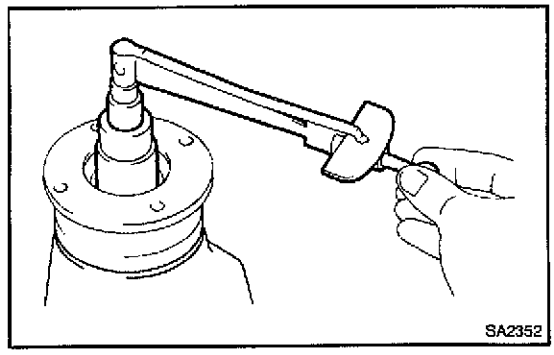
(a) Fix the dial indicator on the tooth surface at a 90° angle.
(b) Using a dial indicator, with holding the drive pinion flange and measure the ring gear backlash.

Backlash: 0.13 – 0.18 mm (0.0051 – 0.0070 in.)

If the backlash is not within the specification, adjust the side bearing preload or repair as necessary.

HINT:

Measure from 3 or more places on the circumference of the ring gear.



5. MEASURE DRIVE PINION PRELOAD

Using a torque wrench, measure the drive pinion preload using the backlash of the drive pinion and ring gear.

Preload (at starting):
0.6 – 1.0 N·m (6 – 10 kgf·cm, 5.2 – 8.7 in.·lbf)

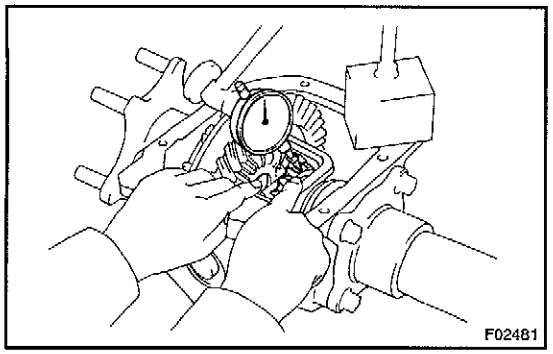
6. CHECK TOTAL PRELOAD

Using a torque wrench, measure the total preload.

Total preload (at starting):
Drive pinion preload plus
0.4 – 0.6 N·m (4 – 6 kgf·cm, 3.5 – 5.2 in.·lbf)

If necessary, disassemble and inspect the differential.

7. INSPECT TOOTH CONTACT BETWEEN RING GEAR AND DRIVE PINION (See page SA–64)

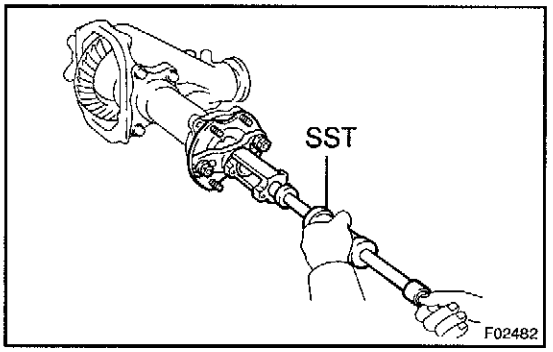


8. CHECK SIDE GEAR BACKLASH

Using a dial indicator, measure the side gear backlash with holding one pinion gear toward the differential case.

Backlash: 0.05 – 0.20 mm (0.0020 – 0.0079 in.)

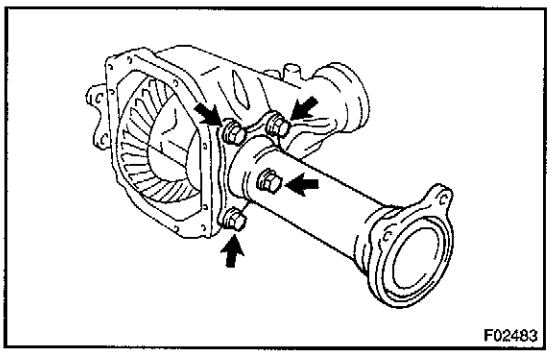
If the backlash is out of the specification, install the correct thrust washers (See page SA–64).



9. REMOVE SIDE GEAR SHAFTS

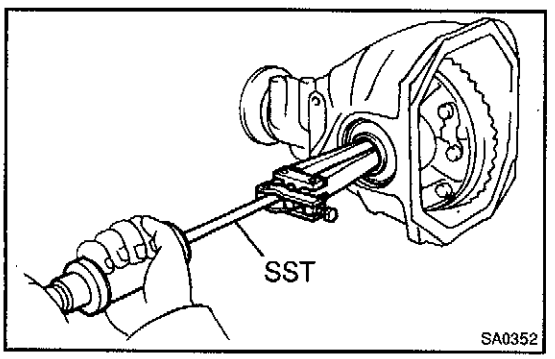
(a) Using SST, remove the 2 side gear shafts.
SST 09910–00015 (09911–00011, 09912–00010, 09914–00011)

(b) Using a screwdriver, remove the 2 snap rings.



10. REMOVE DIFFERENTIAL TUBE

Remove the 4 bolts and using a plastic hammer, hit the differential tube to remove it.

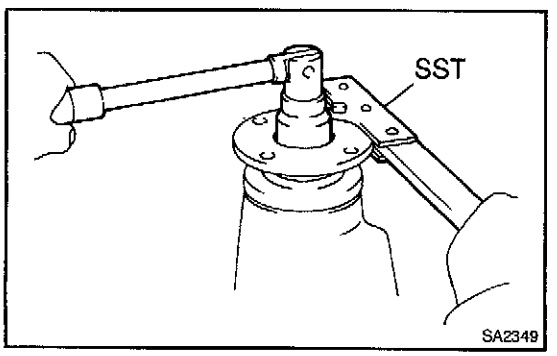


11. REMOVE SIDE GEAR SHAFT OIL SEALS

Using SST, remove the 2 side gear shaft oil seals.
SST 09308–00010

Maximum runout: 0.07 mm (0.0028 in.)

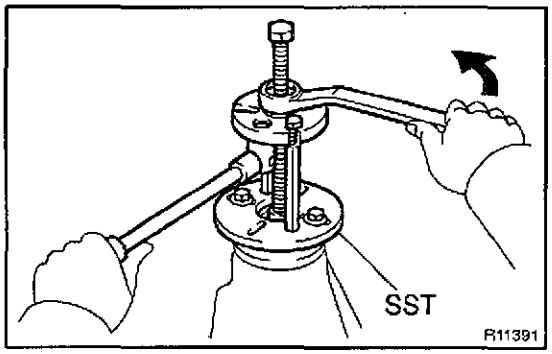
If the runout is greater than the maximum, replace the ring gear and drive pinion as a set.



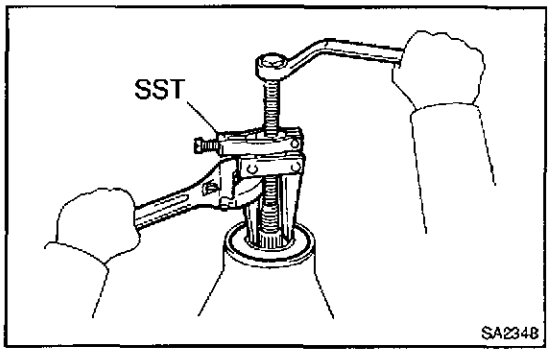
12. REMOVE COMPANION FLANGE

(a) Using a chisel and hammer, unstake the nut.

(b) Using SST to hold the flange, remove the nut.
SST 09330–00021



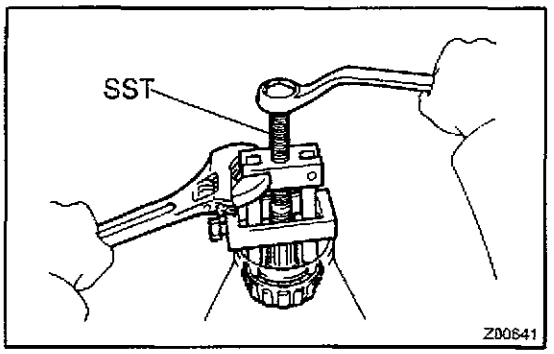
(c) Using SST, remove the companion flange.
SST 09950–30010 (09951–03010, 09953–03010, 09954–03010, 09955–03030, 09956–03020)



13. REMOVE OIL SEAL AND OIL SLINGER

(a) Using SST, remove the oil seal from the differential carrier.
SST 09308–10010

(b) Remove the oil slinger.

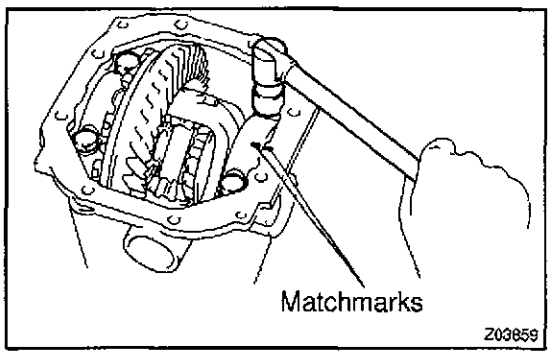


14. REMOVE REAR BEARING AND BEARING SPACER

(a) Using SST, remove the rear bearing from the drive pinion.
SST 09556–30010

If the rear bearing is damaged or worn, replace the rear bearing.

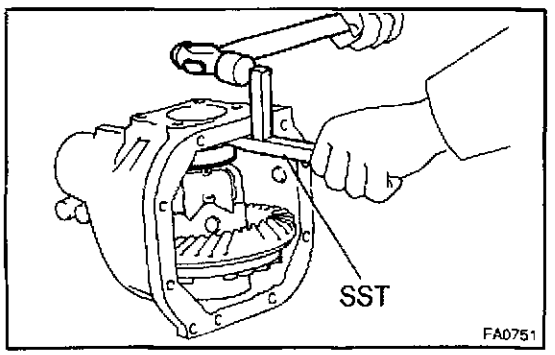
(b) Remove the bearing spacer.



15. REMOVE DIFFERENTIAL CASE ASSEMBLY

(a) Place matchmarks on the bearing cap and differential carrier.

(b) Remove the 4 bolts and 2 bearing caps.

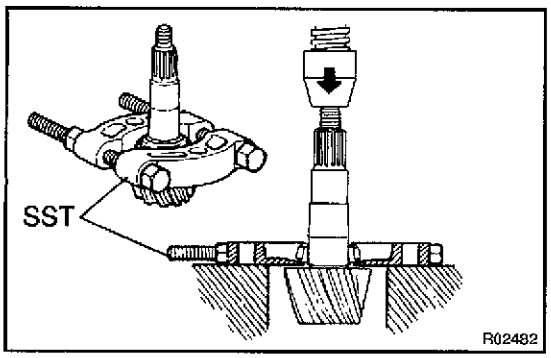


(c) Using SST and a hammer, remove the 2 side bearing plate washers.
SST 09504–22011

HINT:
Measure the plate washer and note down the thickness.

(d) Remove the differential case with the bearing outer races from the differential carrier.

HINT:
Tag the bearing outer races to show the location for reassembling.



16. REMOVE DRIVE PINION FROM DIFFERENTIAL CARRIER

17. REMOVE DRIVE PINION FRONT BEARING

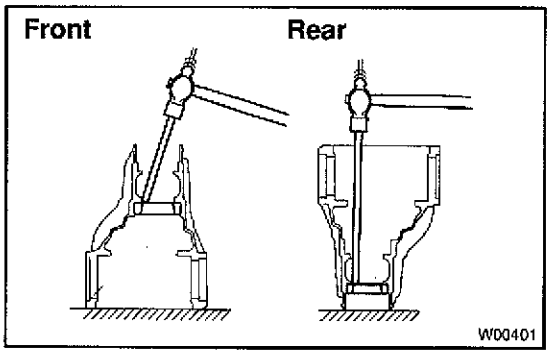
(a) Using SST and a press, remove the front bearing from the drive pinion.

SST 09950–00020

HINT:

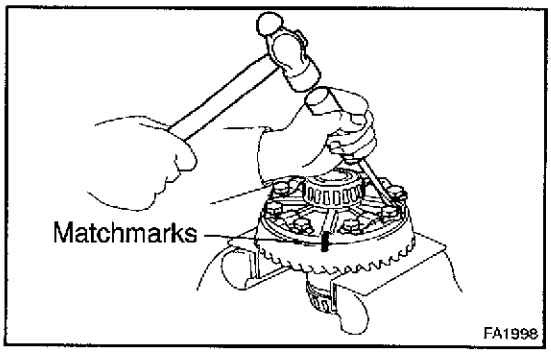
If the drive pinion or ring gear is damaged, replace them as a set.

(b) Remove the washer.



18. REMOVE DRIVE PINION BEARING OUTER RACES

Using a brass bar and hammer, remove the 2 outer races from the differential carrier.



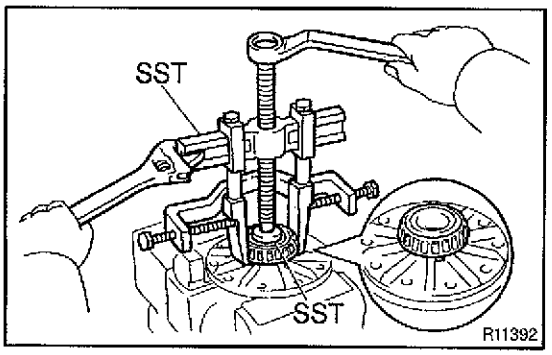
19. REMOVE RING GEAR

(a) Place matchmarks on the ring gear and differential case.

(b) Using a screwdriver and hammer, unstake the lock plates.

(c) Remove the 10 bolts and 5 lock plates.

(d) Using a plastic hammer, tap on the ring gear to separate it from the differential case.



20. REMOVE SIDE BEARINGS

Using SST, remove the 2 side bearings from the differential case.

SST 09950–40010 (09951–04020, 09952–04010, 09953–04030, 09954–04010, 09955–04060, 09957–04010, 09958–04010), 09950–60010 (09951–00480)

HINT:

Fix the claws of SST to the notch in the differential case.

21. DISASSEMBLE DIFFERENTIAL CASE ASSEMBLY

(a) Using a pin punch and hammer, remove the straight pin.

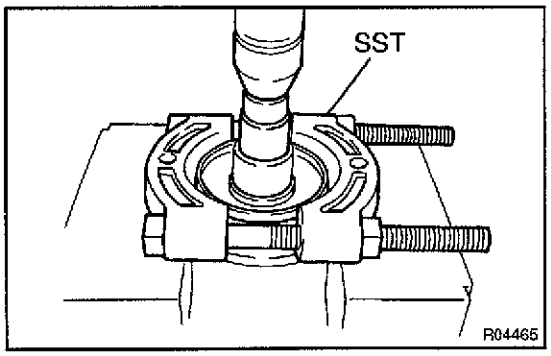
(b) Remove these parts from the differential case:

- Pinion shaft
- 2 pinion gears
- 2 pinion gear thrust washers
- 2 side gears
- 2 side gear thrust washers

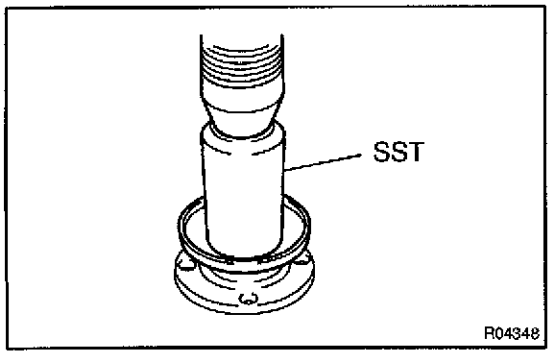
SA0M7–01

REPLACEMENT

1. REPLACE COMPANION FLANGE DUST DEFLECTOR, IF NECESSARY

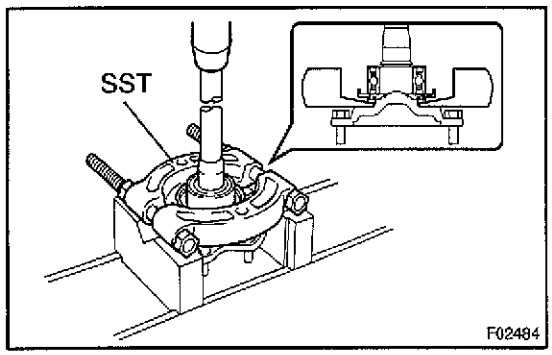


(a) Using SST and a press, remove the dust deflector.
SST 09950–00020

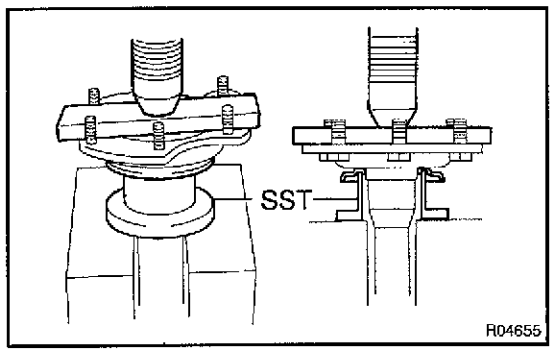


(b) Using SST and a press, install a new dust deflector.
SST 09223–00010

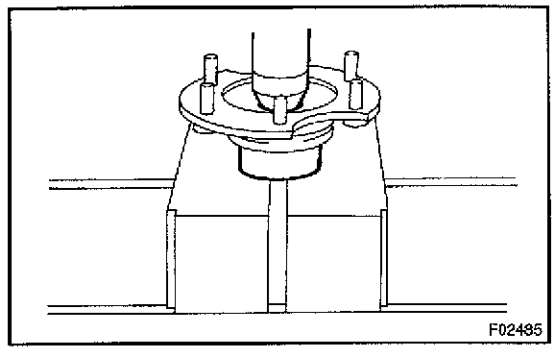
2. REPLACE LH SIDE GEAR SHAFT, IF NECESSARY



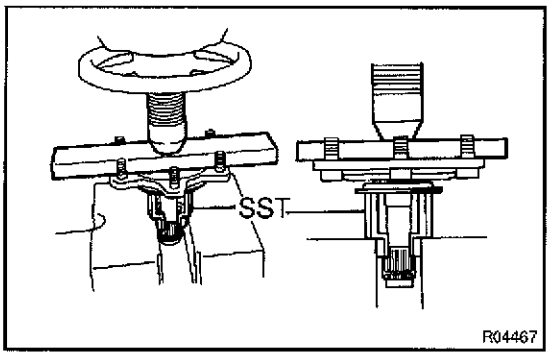
(a) Replace the LH side gear shaft bearing and dust cover.
(1) Using a snap ring expander, remove the snap ring.
(2) Using SST and a press, remove the bearing and dust cover.
SST 09555–55010



(3) Using SST and a press, install a new dust cover.
SST 09316–20011



(4) Using a press, install a new bearing.
(5) Using a snap ring expander, install a new snap ring.



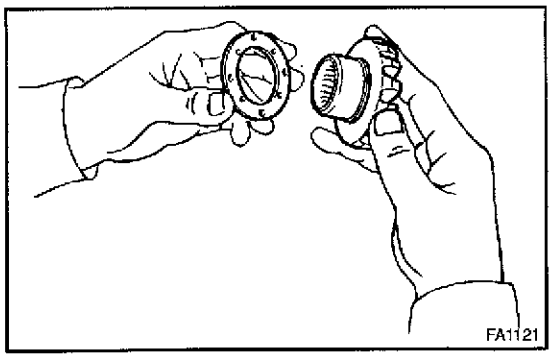
3. REPLACE RH SIDE GEAR SHAFT, IF NECESSARY

(a) Using a screwdriver and hammer, remove the dust cover.

(b) Using SST and a press, install a new dust cover.

SST 09710–30055

SA0MB-01



REASSEMBLY

1. ASSEMBLE DIFFERENTIAL CASE

(a) Install the 2 proper thrust washers on the 2 side gears.

HINT:

Refer to the table below to select thrust washers which will ensure that the backlash is within the specification.

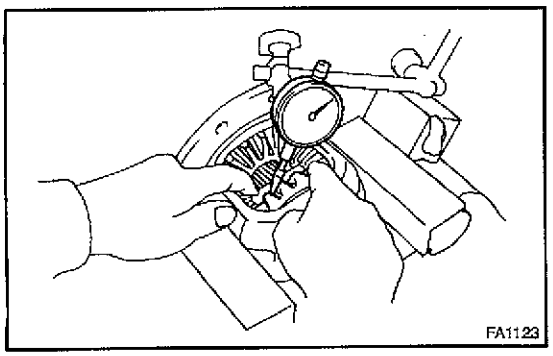
Washer thickness

Thickness mm (in.)	Thickness mm (in.)
0.96 – 1.04 (0.0378 – 0.0409)	1.16 – 1.24 (0.0457 – 0.0488)
1.06 – 1.14 (0.0417 – 0.0449)	1.26 – 1.34 (0.0496 – 0.0528)

(b) Install the 2 side gears, pinion gears, pinion gear thrust washers and pinion shaft in the differential case.

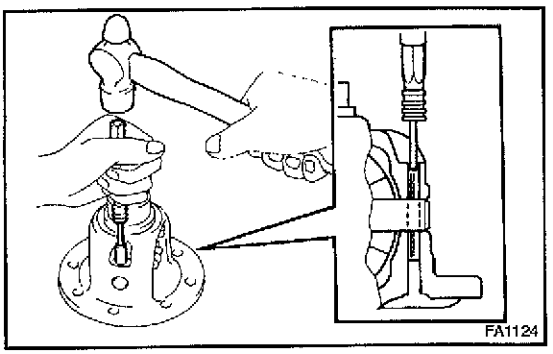
HINT:

Align the holes of the differential case and pinion shaft.



(c) Using a dial indicator measure the side gear backlash with holding one pinion gear toward the differential case.
Backlash: 0.05 – 0.20 mm (0.0020 – 0.0079 in.)

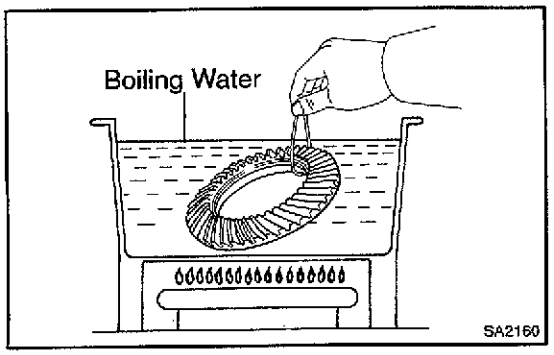
If the backlash is not within the specification, install side gear thrust washers with different thicknesses.



2. INSTALL STRAIGHT PIN AND STAKE DIFFERENTIAL CASE

(a) Using a pin punch and hammer, install the straight pin through the differential case and hole of the pinion shaft.

(b) Using a chisel and hammer, stake the outside of the differential case pin hole.



3. INSTALL RING GEAR ON DIFFERENTIAL CASE

(a) Clean the contact surfaces of the differential case and ring gear.

(b) Heat the ring gear to approx. 100°C (212°F) in boiling water.

(c) Carefully take the ring gear out of the boiling water.

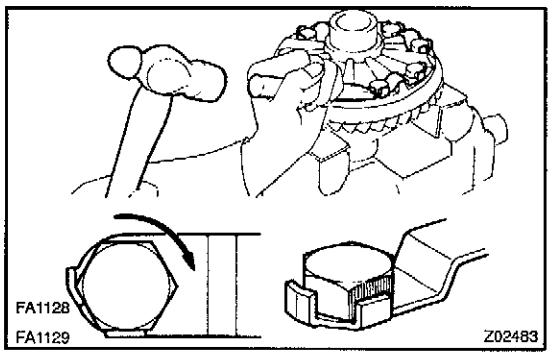
(d) After the moisture on the ring gear has completely evaporated, quickly install the ring gear to the differential case.

HINT:

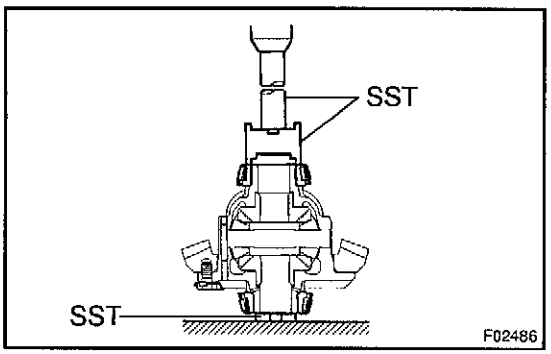
Align the matchmarks on the ring gear and differential case.

(e) Temporarily install 5 new lock plates and 10 bolts so that the bolt holes in the ring gear and differential case are not misaligned.

(f) After the ring gear has cooled sufficiently, torque the 10 ring gear set bolts.
Torque: 97 N·m (985 kgf·cm, 71 ft·lbf)



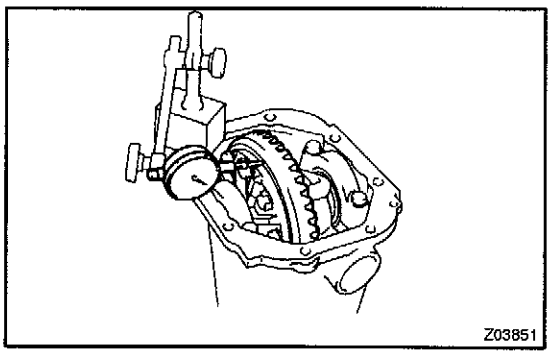
(g) Using a chisel and hammer, stake the 5 lock plates.
HINT:
Stake the claws of the lock plates to fix the bolts. For the claw contacting the protruding portion of the bolt, stake only the half of it along the tightening direction.



4. INSTALL SIDE BEARINGS

Using SST and a press, install the 2 bearings into the differential case.

SST 09710–30050, 09950–60010 (09951–00480), 09950–70010 (09951–07100)

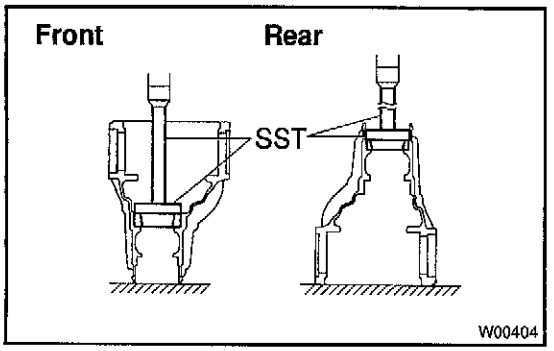


5. CHECK RING GEAR RUNOUT

(a) Install the differential case onto the carrier and install the 2 plate washers to fill the play in the bearing
(See page SA–64).

(b) Install 2 bearing caps (See page SA–64).

(c) Using a dial indicator, measure the runout of ring gear.
Maximum runout: 0.07 mm (0.0028 in.)



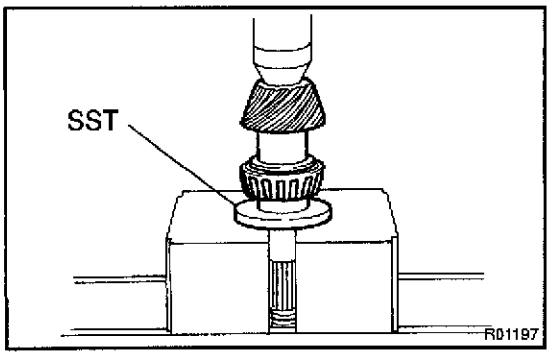
6. INSTALL DRIVE PINION FRONT AND REAR BEARING OUTER RACES

(a) Using SST and a press, install the front side of the outer race.

SST 09950–60020 (09951–00710), 09950–70010 (09951–07150)

(b) Using SST and a press, install the rear side of the outer race.

SST 09950–60020 (09951–00790), 09950–70010 (09951–07150)



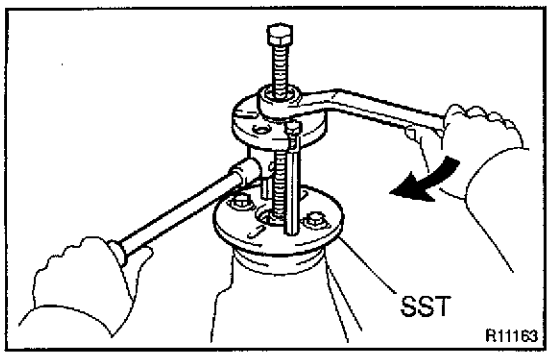
7. INSTALL DRIVE PINION FRONT BEARING

(a) Install the washer on the drive pinion.

HINT:

First fit a washer with the same thickness as the washer which was removed, then after checking the tooth contact pattern, replace the washer with one of a different thickness if necessary.

(b) Using SST, install the front bearing onto the drive pinion.
SST 09506–30012



8. TEMPORARILY ADJUST DRIVE PINION PRELOAD

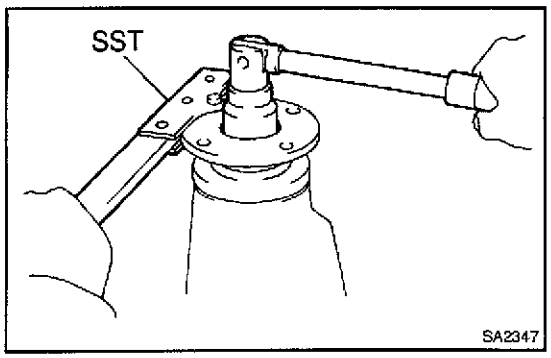
(a) Install the drive pinion, rear bearing and oil slinger.

HINT:

Assemble the spacer and oil seal after adjusting the gear contact pattern.

(b) Using SST, install the companion flange.
SST 09950–30010 (09951–03010, 09953–03010, 09954–03010, 09955–03030, 09956–03020)

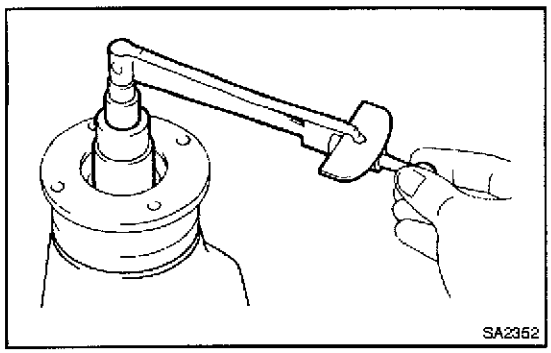
(c) Coat the threads of the nut with hypoid gear oil.



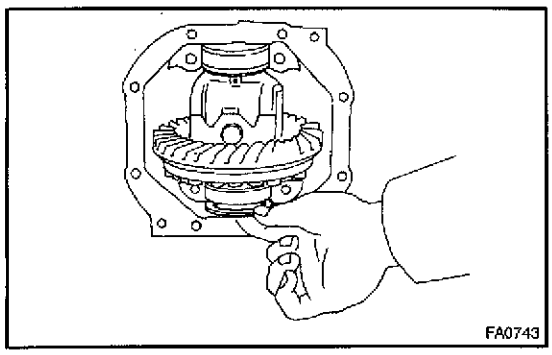
(d) Adjust the drive pinion preload by tightening the companion flange nut.
Using SST to hold the flange, tighten the nut.
SST 09330–00021

NOTICE:

As there is no spacer, tighten the nut a little at a time, being careful not to overtighten it.



(e) Using a torque wrench, measure the preload.
Preload (at starting):
New bearing:
1.2 – 1.9 N·m (12 – 19 kgf·cm, 10.4 – 16.5 in.·lbf)
Reused bearing:
0.6 – 1.0 N·m (6 – 10 kgf·cm, 5.2 – 8.7 in.·lbf)



9. INSTALL DIFFERENTIAL CASE IN DIFFERENTIAL CARRIER

(a) Place the 2 bearing outer races on their respective bearings. Check that the left and right outer races are not interchanged.

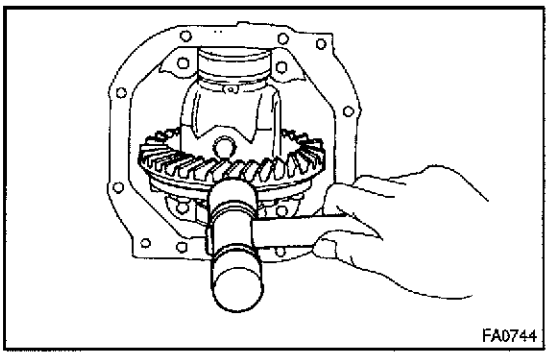
(b) Install the differential case in the differential carrier.

10. ADJUST RING GEAR BACKLASH

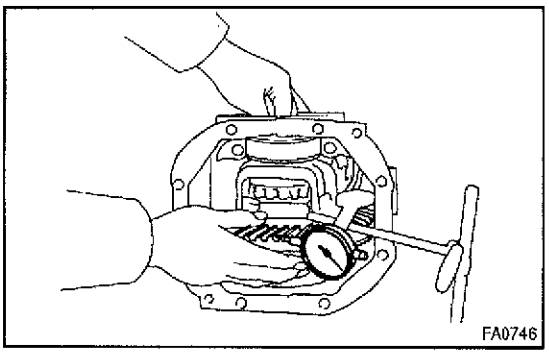
(a) Only install the plate washer on the ring gear back side.

HINT:

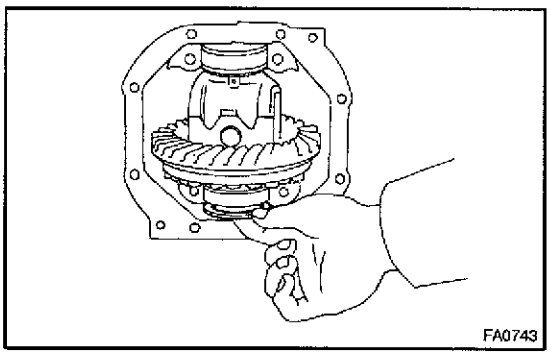
Make sure that the ring gear has backlash.



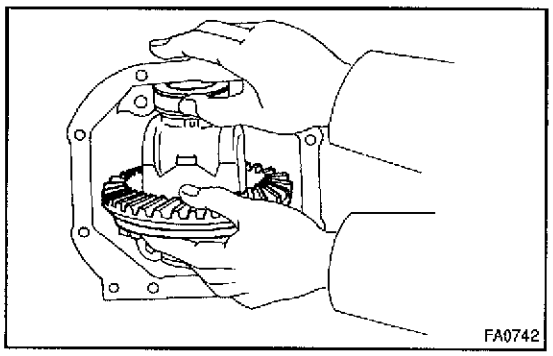
(b) Tap on the ring gear with a plastic hammer so that the washer fits to the bearing.



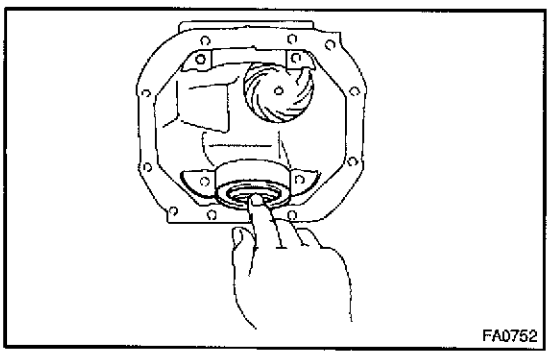
(c) Using a dial indicator, measure the side gear backlash with holding one pinion gear toward the differential case.
Backlash (reference): 0.13 mm (0.0051 in.)



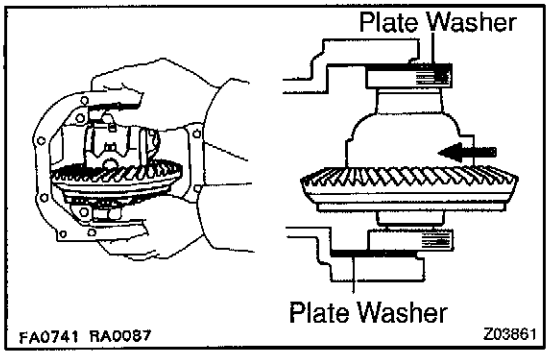
(d) Select a plate washer for back side ring gear, using the backlash as reference (See page SA–64).



(e) Select a ring gear teeth side plate washer with a thickness which eliminates any clearance between the outer race and case.

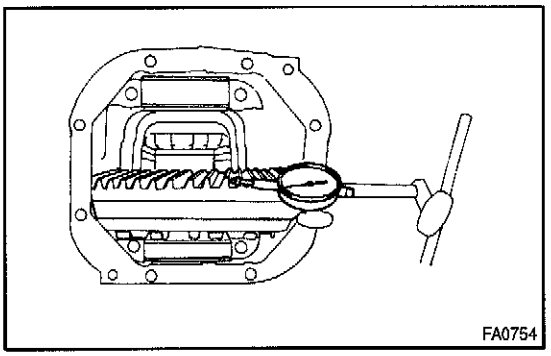


(f) Remove the plate washers and differential case.
(g) Install the plate washer into the ring gear back side of the carrier.

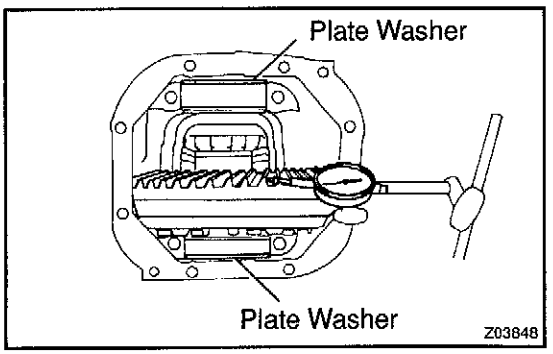


(h) Place the other plate washer onto the differential case together with the outer race, and install the differential case with the outer race into the carrier.

(i) Tap on the ring gear with a plastic hammer so that the washers fit to the bearing.

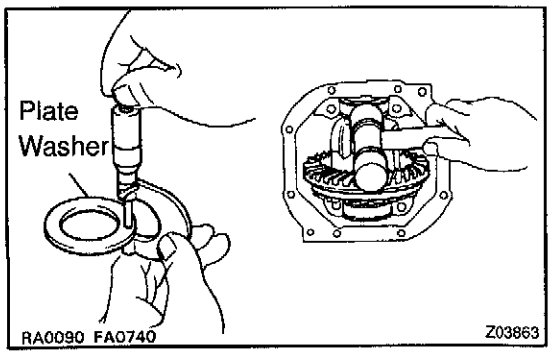


(j) Using a dial indicator, measure the ring gear backlash.
Backlash: 0.13 – 0.18 mm (0.0051 – 0.0070 in.)



(k) If not within the specification, adjust by either increasing or decreasing the thickness of washers on both sides by an equal amount.

HINT:
There should be no clearance between the plate washer and case.
Make sure that there is ring gear backlash.



11. ADJUST SIDE BEARING PRELOAD

(a) Remove the ring gear teeth side plate washer and measure the thickness.

(b) Using the backlash as a reference, install a new washer of 0.06 – 0.09 mm (0.0024 – 0.0035 in.) thicker than the washer removed.

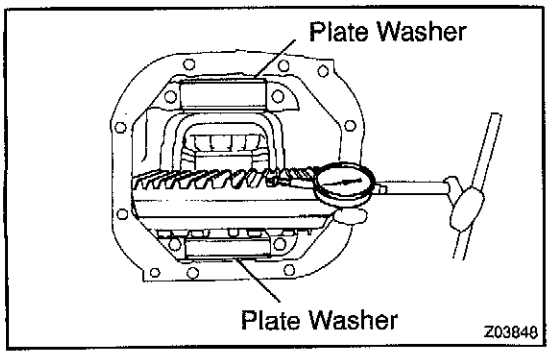
HINT:
Select a washer which can be pressed in 2/3 of the way with your finger.

(c) Using a plastic hammer, install the plate washer.

(d) Recheck the ring gear backlash.
Backlash: 0.13 – 0.18 mm (0.0051 – 0.0070 in.)

(e) If not within specification, adjust by either increasing or decreasing the thickness of washers on both sides by an equal amount.

HINT:
The backlash will change by about 0.02 mm (0.0008 in.) with every 0.03 mm (0.0012 in.) change in the plate washer.



Washer thickness

Thickness mm (in.)	Thickness mm (in.)	Thickness mm (in.)
2.57 – 2.59 (0.1012 – 0.1020)	2.81 – 2.83 (0.1106 – 0.1114)	3.05 – 3.07 (0.1201 – 0.1209)
2.60 – 2.62 (0.1024 – 0.1031)	2.84 – 2.86 (0.1118 – 0.1126)	3.08 – 3.10 (0.1213 – 0.1220)
2.63 – 2.65 (0.1035 – 0.1043)	2.87 – 2.89 (0.1130 – 0.1138)	3.11 – 3.13 (0.1224 – 0.1232)
2.66 – 2.68 (0.1047 – 0.1055)	2.90 – 2.92 (0.1142 – 0.1150)	3.14 – 3.16 (0.1236 – 0.1244)
2.69 – 2.71 (0.1059 – 0.1067)	2.93 – 2.95 (0.1154 – 0.1161)	3.17 – 3.19 (0.1248 – 0.1256)
2.72 – 2.74 (0.1071 – 0.1079)	2.96 – 2.98 (0.1165 – 0.1173)	3.20 – 3.22 (0.1260 – 0.1268)
2.75 – 2.77 (0.1083 – 0.1091)	2.99 – 3.01 (0.1177 – 0.1185)	3.23 – 3.25 (0.1272 – 0.1280)
2.78 – 2.80 (0.1094 – 0.1102)	3.02 – 3.04 (0.1189 – 0.1197)	–

12. INSTALL BEARING CAPS

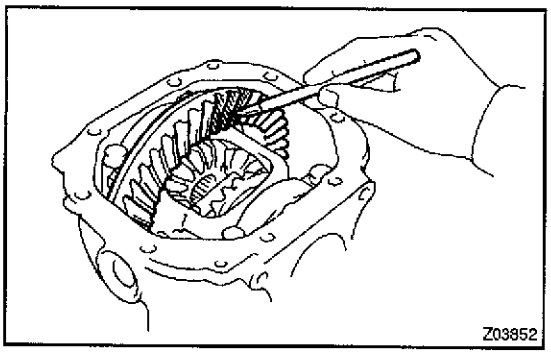
Align the matchmarks on the 2 caps and carrier.

Torque: 78 N·m (800 kgf·cm, 58 ft·lbf)

13. MEASURE TOTAL PRELOAD

Using a torque wrench, measure the total preload.

Total preload (at starting):
Drive pinion preload plus
0.4 – 0.6 N·m (4 – 6 kgf·cm, 3.5 – 5.2 in.·lbf)

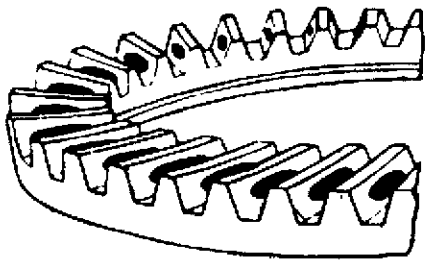


14. INSPECT TOOTH CONTACT BETWEEN RING GEAR AND DRIVE PINION

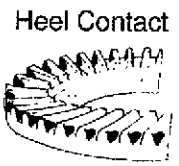
(a) Coat 3 or 4 teeth at three different positions on the ring gear with red lead primer.

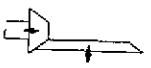
(b) Hold the companion flange firmly and rotate the ring gear in both directions.

(c) Inspect the tooth contact pattern.

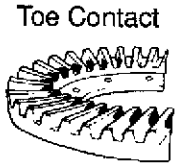


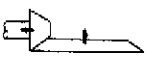
Proper Contact





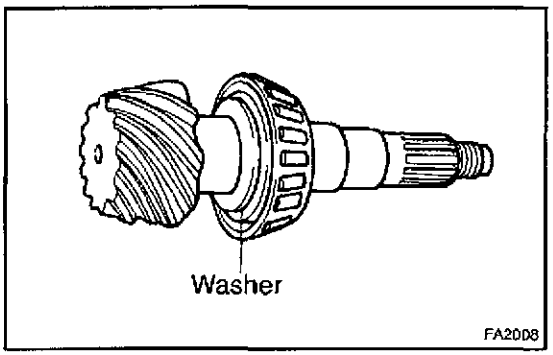
Select an adjusting shim that will bring the drive pinion closer to the gear.





Select an adjusting shim that will shift the drive pinion gear away from the ring gear.

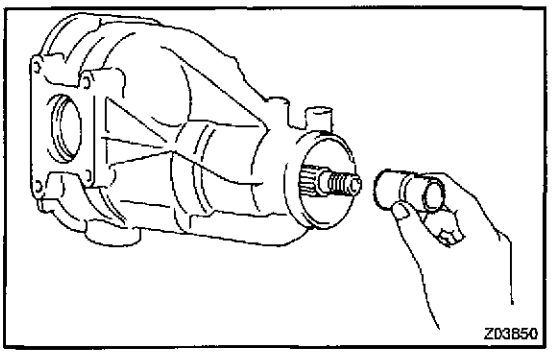
R02495



If the teeth are not contacting properly, use the following table to select a proper washer for correction.

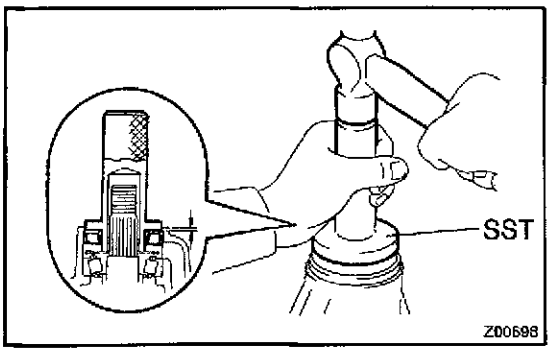
Washer thickness

Thickness mm (in.)	Thickness mm (in.)
2.23 – 2.25 (0.0878 – 0.0886)	2.50 – 2.52 (0.0984 – 0.0992)
2.26 – 2.28 (0.0890 – 0.0898)	2.53 – 2.55 (0.0996 – 0.1003)
2.29 – 2.31 (0.0902 – 0.0909)	2.56 – 2.58 (0.1008 – 0.1016)
2.32 – 2.34 (0.0913 – 0.0921)	2.59 – 2.61 (0.1020 – 0.1028)
2.35 – 2.37 (0.0925 – 0.0933)	2.62 – 2.64 (0.1031 – 0.1039)
2.38 – 2.40 (0.0937 – 0.0945)	2.65 – 2.67 (0.1043 – 0.1051)
2.41 – 2.43 (0.0949 – 0.0957)	2.68 – 2.70 (0.1055 – 0.1063)
2.44 – 2.46 (0.0961 – 0.0969)	2.71 – 2.73 (0.1067 – 0.1075)
2.47 – 2.49 (0.0972 – 0.0980)	–



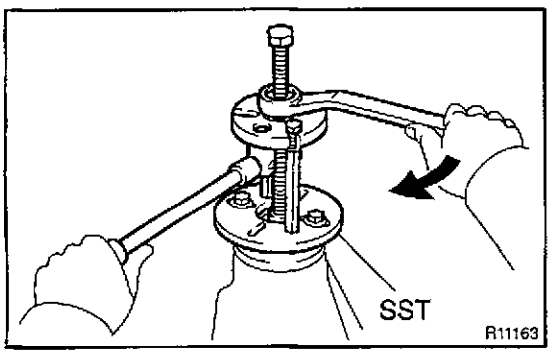
15. INSTALL BEARING SPACER

(a) Remove the companion flange, oil slinger and rear bearing (See page SA–58).
(b) Install a new bearing spacer.
(c) Install the rear bearing and oil slinger.



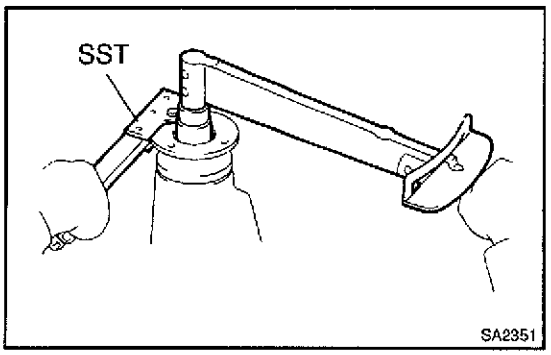
16. INSTALL OIL SEAL

(a) Using SST and a hammer, install a new oil seal.
SST 09554–30011
Oil seal drive in depth: 1.5 mm (0.059 in.)
(b) Apply MP grease to the oil seal lip.



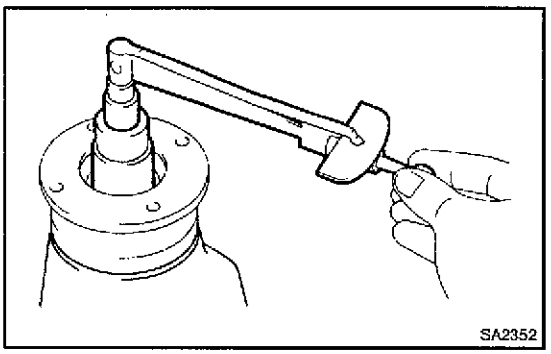
17. INSTALL COMPANION FLANGE

(a) Using SST, install the companion flange.
SST 09950–30010 (09951–03010, 09953–03010, 09954–03010, 09955–03030, 09956–03020)



(b) Coat the threads of a new nut with hypoid gear oil install it.

(c) Using SST to hold the flange, tighten the nut.
SST 09330–00021
Torque: 108 N·m (1,100 kgf·cm, 80 ft·lbf)

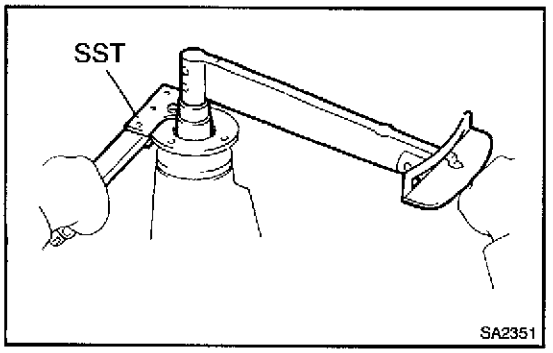


18. ADJUST DRIVE PINION PRELOAD

Using a torque wrench, measure the drive pinion preload using the backlash of the drive pinion and the ring gear.

Preload (at starting):
New bearing:
1.2 – 1.9 N·m (12 – 19 kgf·cm, 10.4 – 16.5 in.·lbf)
Reused bearing:
0.6 – 1.0 N·m (6 – 10 kgf·cm, 5.2 – 8.7 in.·lbf)

- If the preload is greater than the specification, replace the spacer.
- If the preload is less than the specification, retighten the nut a little at a time with a torque of 13 N·m (130 kgf·cm, 9 ft·lbf) until the specified preload is reached.



Maximum torque: 235 N·m (2,400 kgf·cm, 173 ft·lbf)

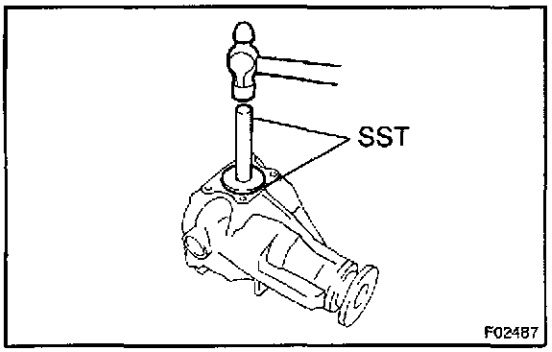
If the maximum torque is exceeded while retightening the nut, replace the spacer and repeat the preload procedure. Do not loosen the nut to reduce the preload.

19. RECHECK RING GEAR BACKLASH
(See page SA–58)

20. RECHECK TOOTH CONTACT BETWEEN RING GEAR AND DRIVE PINION (See page SA–64)

21. CHECK RUNOUT OF COMPANION FLANGE
(See page SA–58)

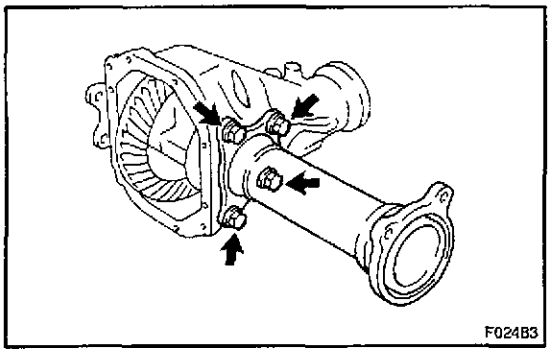
22. STAKE DRIVE PINION NUT



23. INSTALL SIDE GEAR SHAFT OIL SEALS

(a) Using SST and a hammer, install 2 new oil seals until its surface is flush with the differential carrier end.
SST 09550–00032, 09950–70010 (09951–07150)

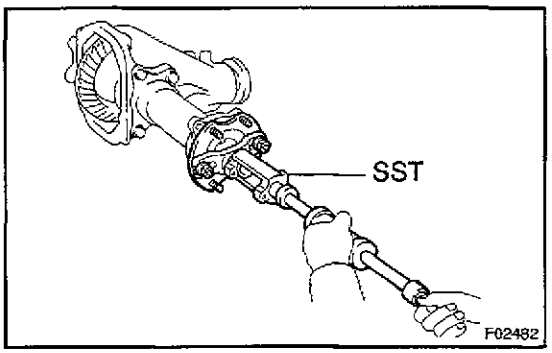
(b) Apply MP grease to the oil seal lip.



24. INSTALL DIFFERENTIAL TUBE

Install the differential tube to the differential carrier with the 4 bolts

Torque: 88 N·m (900 kgf·cm, 65 ft·lbf)



25. INSTALL SIDE GEAR SHAFTS

(a) Install 2 new snap rings to the side gear shafts.

(b) Using SST, install the side gear shaft to the differential case.
SST 09910–00015 (09911–00011, 09912–00010, 09914–00011)

26. CHECK INSTALLATION OF SIDE GEAR SHAFT

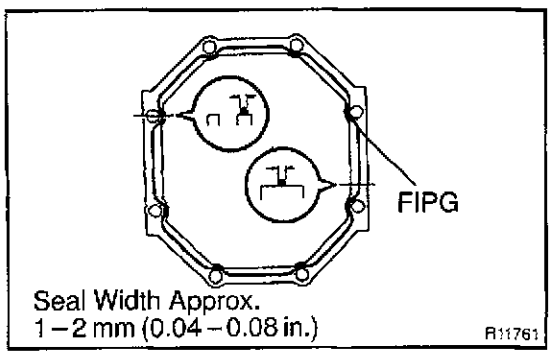
(a) Check that there is play of 2 – 3 mm (0.08 – 0.12 in.) in axial direction.

(b) Check that the side gear shaft will not come out by pulling it completely out by hand.

27. INSTALL DIFFERENTIAL CARRIER COVER

(a) Remove any old FIPG material and be careful not to drop oil on the contact surfaces of the differential carrier and carrier cover.

(b) Clean surfaces with FIPG material attached to using gasoline or alcohol.



(c) Apply FIPG to the carrier cover, as shown.
FIPG:
Part No. 08826–00090, THREE BOND 1281 or equivalent

HINT:
Install the carrier cover within 10 minutes after applying FIPG.

(d) Install the differential carrier cover with the 8 bolts.
Torque: 47 N·m (475 kgf·cm, 34 ft·lbf)

SA0M9-01

INSTALLATION

Installation is in the reverse order of removal (See page SA–57).
AFTER INSTALLATION, FILL DIFFERENTIAL WITH HYPOID GEAR OIL (See page SA–53)