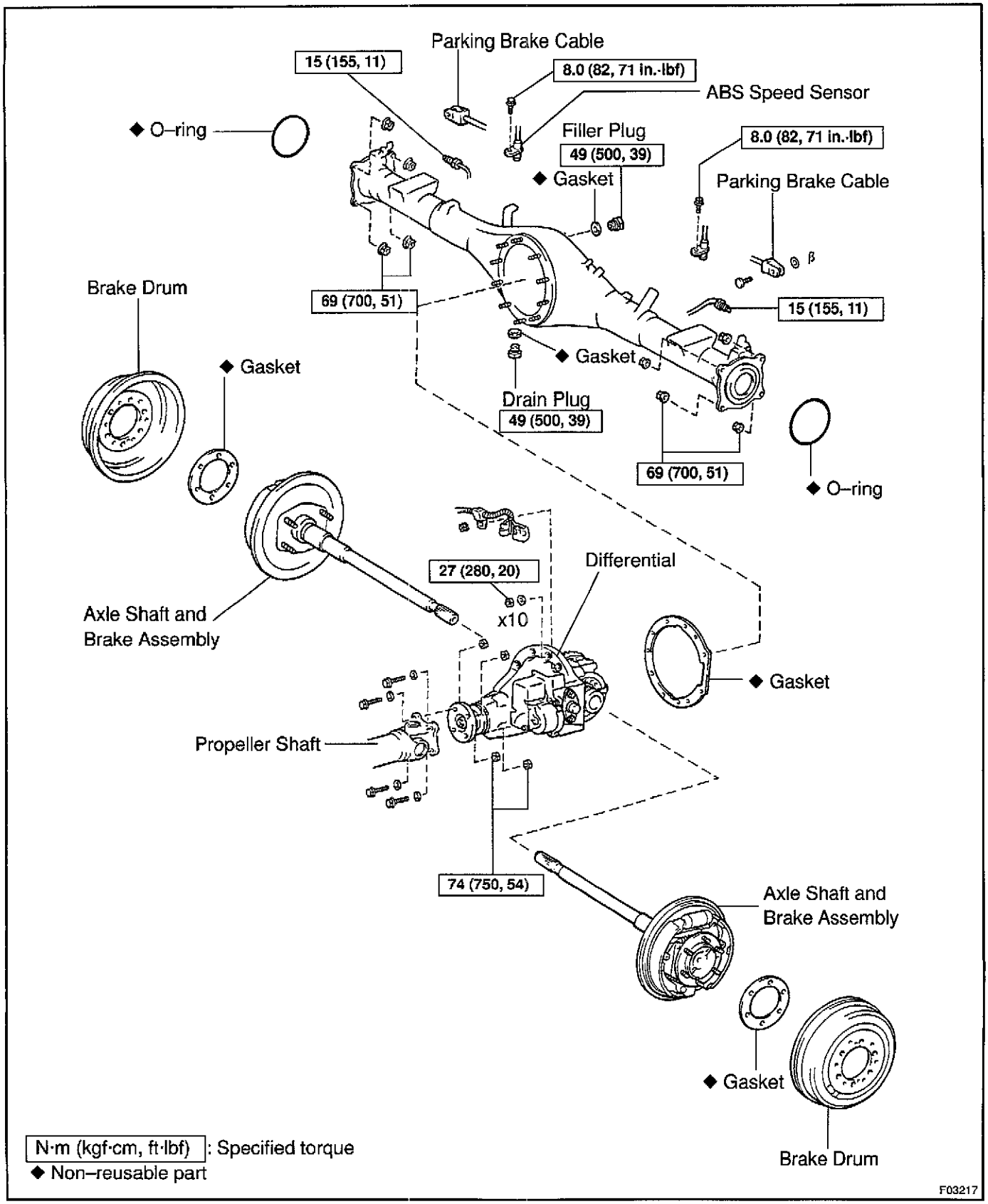
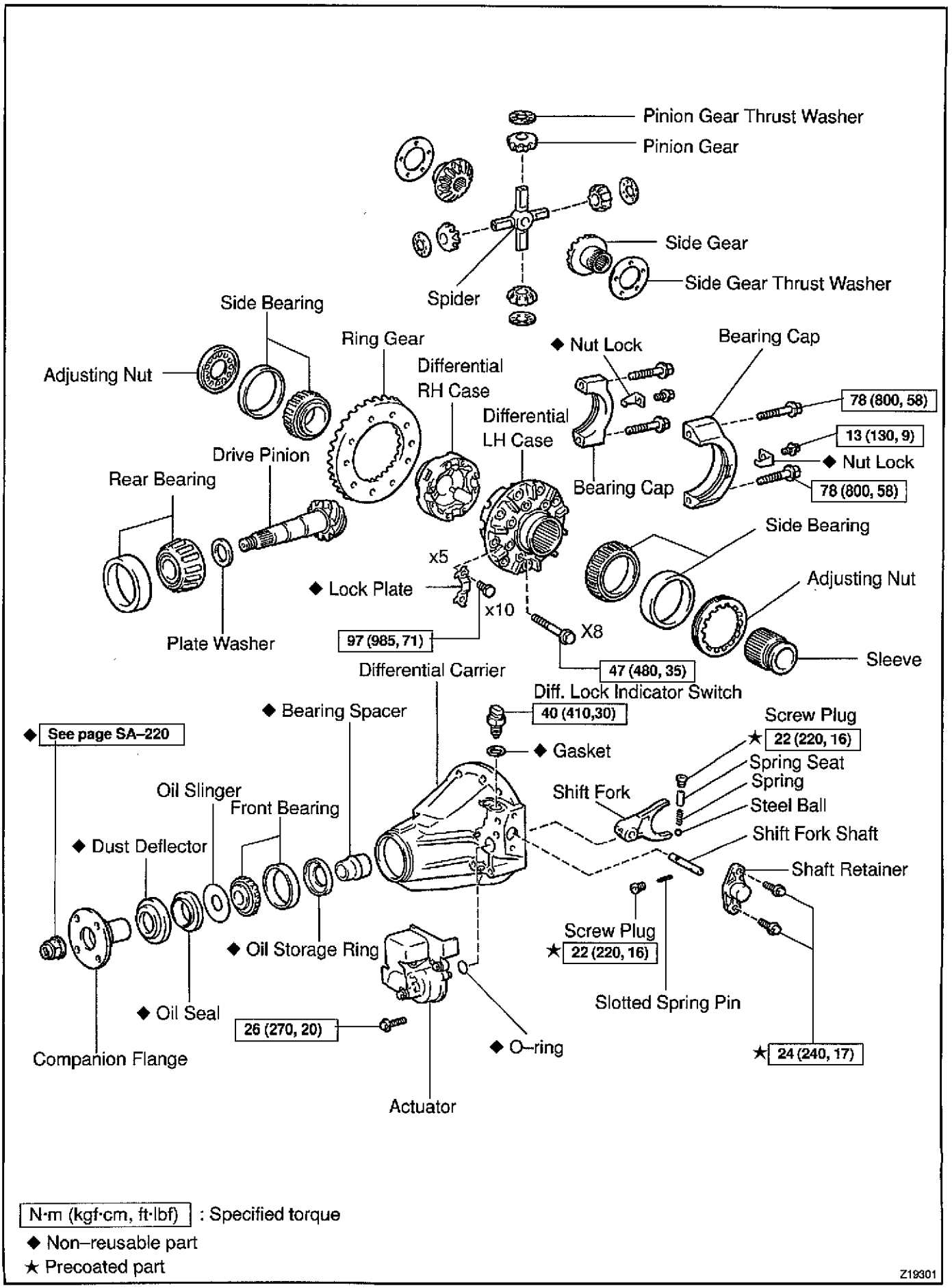
REAR DIFFERENTIAL CARRIER (w/ Diff. Lock)

COMPONENTS

SA09T–02





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

Z19301

SA09U–02

REMOVAL

1. SHIFTING DIFF. LOCK POSITION

(a) Turn the ignition switch to ON position.

(b) Push the differential lock control switch to ON position and lock the rear differential.

Rotating the tires, check they are in the differential lock condition.

(c) Disconnect the cable from the negative terminal of the battery.

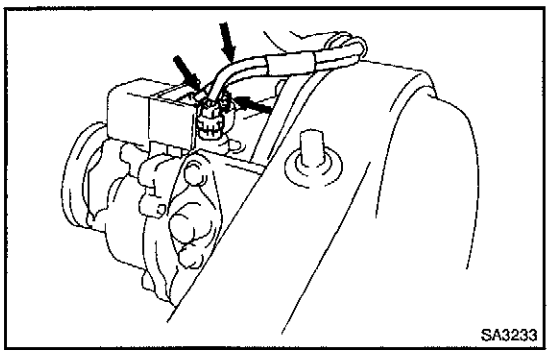
HINT:

After installation, check that the breather plug at the end of the breather tube (inside of the LH frame) is not damaged or worn.

2. DRAIN HYPOID GEAR OIL

3. REMOVE REAR AXLE SHAFTS (See page SA–165)

4. DISCONNECT REAR PROPELLER SHAFT (See page PR–11)

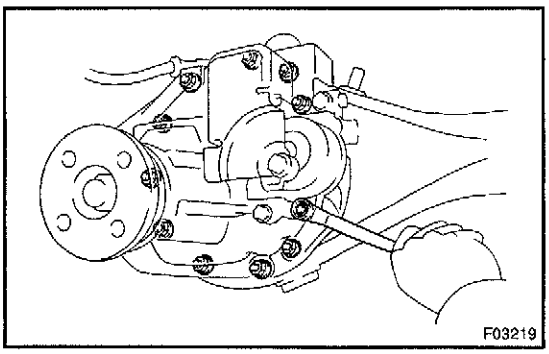

SA3233

5. DISCONNECT CONNECTORS AND TUBE

HINT:

At the time of installation, please refer to the following items.

- When connecting the tube on the harness side to the hose on the actuator side, its depth of insertion is 15 mm (0.59 in.).
- Take care that water or equivalent dose not adhere to the connector and hose.


F03219

6. REMOVE DIFFERENTIAL CARRIER ASSEMBLY

(a) Remove the 10 nuts, washers and differential carrier assembly.

NOTICE:

Be careful not to damage the installation surface.

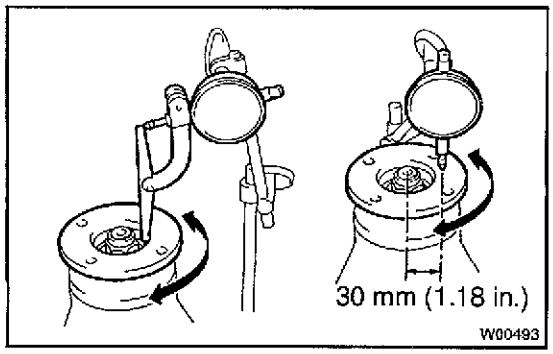
Torque: 27 N·m (280 kgf·cm, 20 ft·lbf)

(b) Remove the gasket.

HINT:

At the time of installation, please refer to the following items.

- Connect the connector of the actuator to the connector of the vehicle side to check differential lock operation.
- Before installation, check that the sleeves operate by switching over the differential lock control switch. After checking, lock the rear differential.



SA09V-02

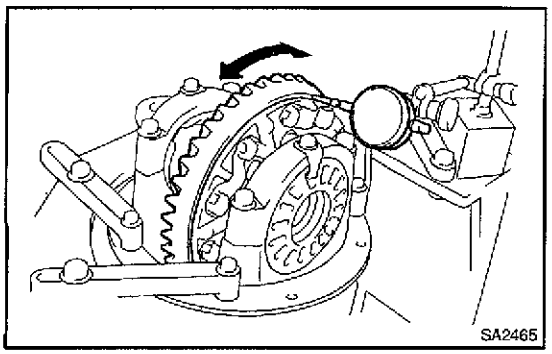
DISASSEMBLY

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 not within the specification, replace the companion flange.

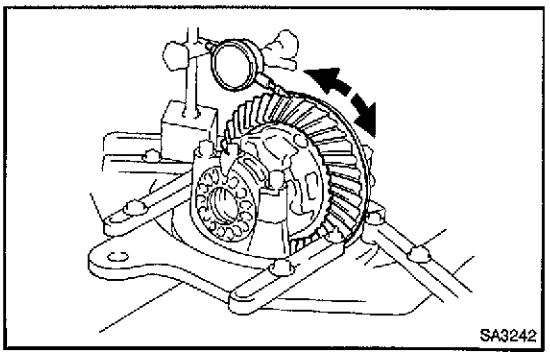


2. CHECK RING GEAR RUNOUT

Using a dial indicator, measure the ring gear runout.

Maximum runout: 0.10 mm (0.0039 in.)

If the runout is not within the specification, replace the ring gear.

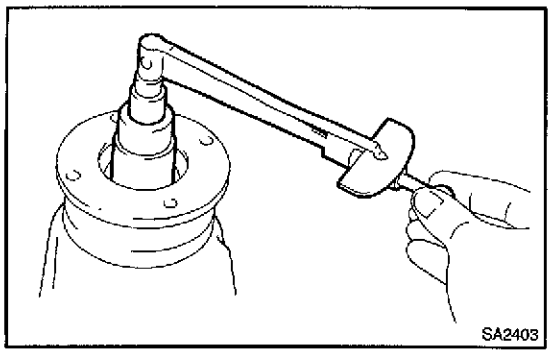


3. CHECK RING GEAR BACKLASH

Using a dial indicator, measure the ring gear backlash.

Backlash: 0.13 – 0.18 mm (0.0051 – 0.0071 in.)

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



4. MEASURE DRIVE PINION PRELOAD

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

Preload (at starting):
0.5 – 0.8 N·m (5 – 8 kgf·cm, 4.3 – 6.9 in.·lbf)

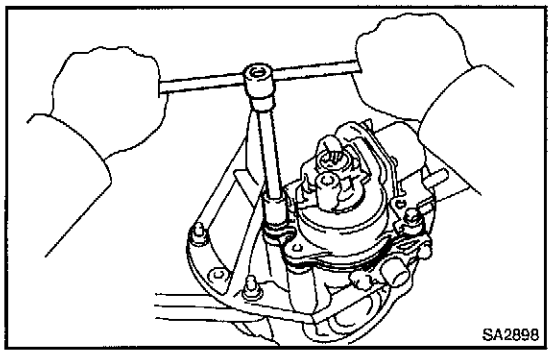
5. CHECK TOTAL PRELOAD

Using a torque wrench, measure the preload with the teeth of the drive pinion and ring gear in contact.

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

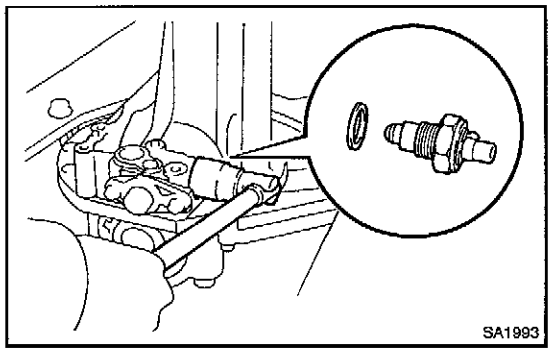
If necessary, disassemble and inspect the differential.

6. CHECK TOOTH CONTACT BETWEEN RING GEAR AND DRIVE PINION (See page SA–220)



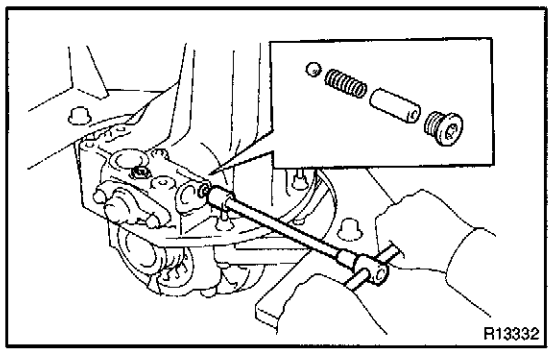
7. REMOVE ACTUATOR

(a) Remove the bolt and actuator from the differential carrier.
(b) Remove the O–ring.



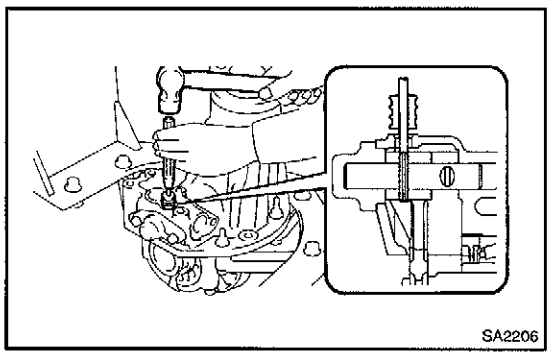
8. REMOVE INDICATOR SWITCH

Remove the indicator switch and gasket.

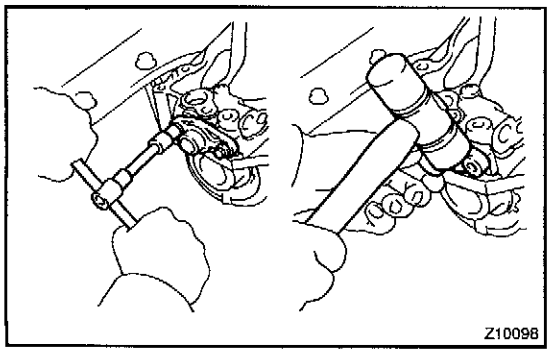


9. REMOVE SHIFT FORK SHAFT

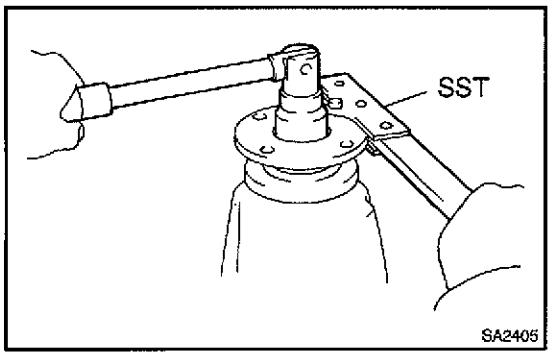
(a) Using a 6 mm hexagon wrench, remove the 2 straight screw plugs.
(b) Remove the spring seat, spring and steel ball.



(c) Using a 5 mm pin punch and hammer, remove the slotted spring pin.



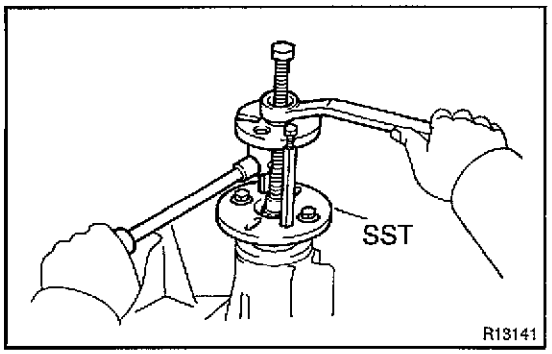
(d) Remove the 2 bolts from the shaft retainer.
(e) Using a plastic hammer, remove the shaft retainer.
(f) Remove the shift fork shaft.



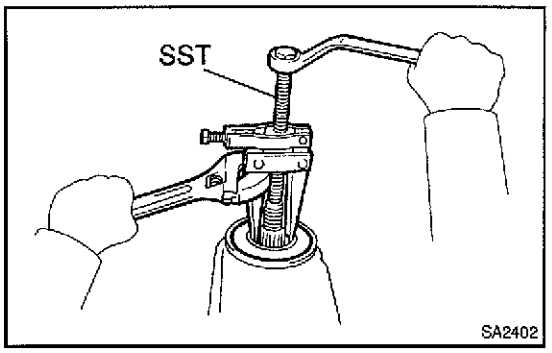
10. REMOVE COMPANION FLANGE

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

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



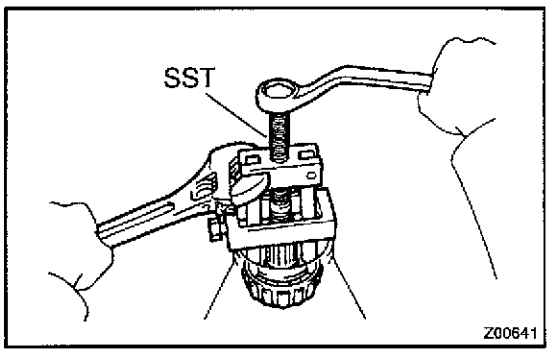
(c) Using SST, remove the companion flange.
SST 09950–30010 (09951–03010, 09953–03010, 09954–03010, 09955–03030, 09956–03030)



11. REMOVE OIL SEAL AND OIL SLINGER

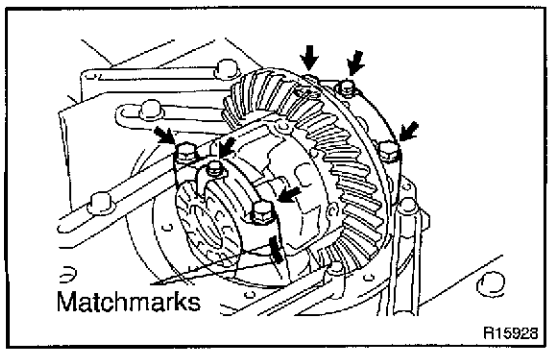
(a) Using SST, remove the oil seal from the differential carrier.
SST 09308–10010

(b) Remove the oil slinger.



12. REMOVE FRONT BEARING

Using SST, remove the front bearing from the drive pinion.
SST 09556–22010

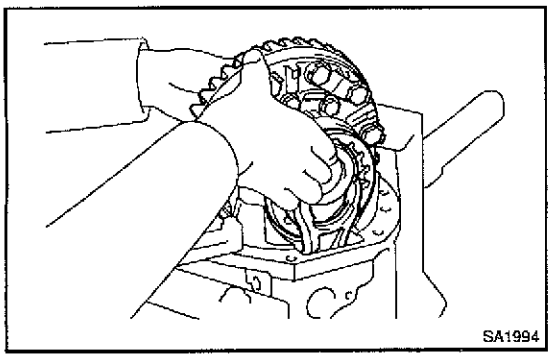


13. REMOVE DIFFERENTIAL CASE

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

(b) Remove the 2 adjusting nut locks.

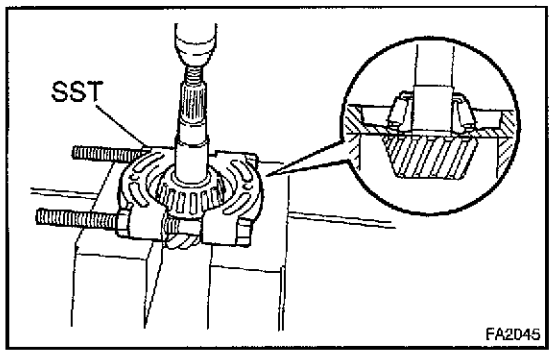
(c) Remove the 4 bolts and 2 bearing caps.


SA1994

(d) Remove the differential case with side bearing outer race, adjusting nuts and sleeve from the differential carrier.
(e) Remove the shift fork.

14. REMOVE DRIVE PINION AND BEARING SPACER

(a) Remove the drive pinion with the rear bearing.
(b) Remove the bearing spacer.



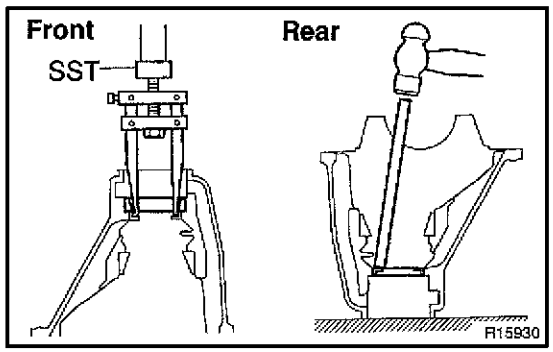
FA2045

15. REMOVE DRIVE PINION REAR BEARING

(a) Using SST and a press, remove the bearing from the drive pinion.
SST 09950–00020

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

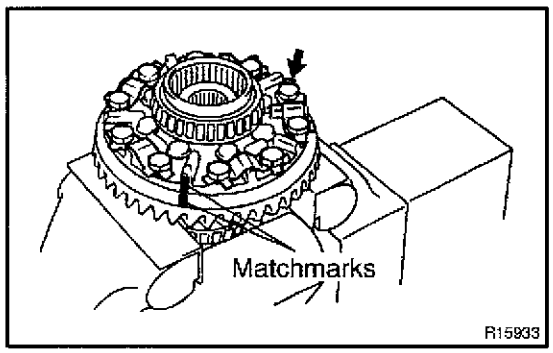
(b) Remove the plate washer from the drive pinion.



R15930

16. REMOVE FRONT AND REAR BEARING OUTER RACES AND OIL STORAGE RING

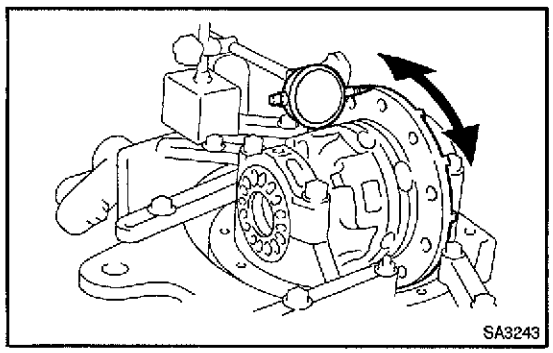
(a) Using SST, remove the front bearing outer race.
SST 09308–00010
(b) Using a brass bar and hammer, remove the oil storage ring.
(c) Using a brass bar and hammer, remove the bearing.



R15933

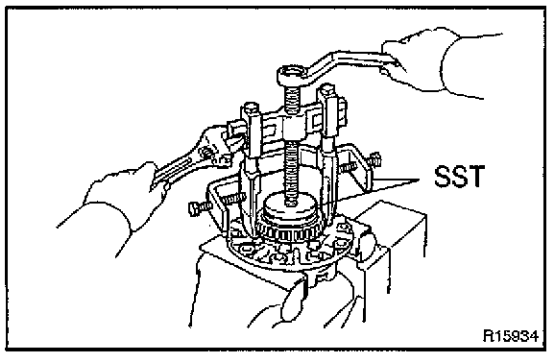
17. REMOVE RING GEAR

(a) Place matchmarks on the ring gear and differential case.
(b) Using a screwdriver and hammer, unstake the lock plate.
(c) Remove the 10 ring gear set bolts and 5 lock plates.
(d) Using a plastic hammer, tap on the ring gear to separate it from the differential case.


SA3243

18. CHECK DIFFERENTIAL CASE RUNOUT

(a) Install the differential case in the differential carrier and tighten the adjusting nut just to make sure there is no play in the bearing.
(b) Using a dial indicator, measure the differential case runout.
Maximum case runout: 0.07 mm (0.0028 in.)
(c) Remove the differential case.



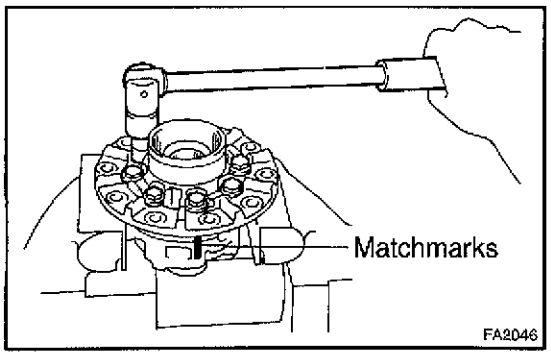
19. REMOVE SIDE BEARING FROM DIFFERENTIAL CASE

Using SST, remove the side bearing from the differential case.

SST 09950–40010 (09951–04010, 09952–04010, 09953–04020, 09954–04010, 09955–04060, 09957–04010, 09958–04010), 09950–60010 (09951–00480), 09950–60020 (09951–00730)

HINT:

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



20. DISASSEMBLE DIFFERENTIAL CASE

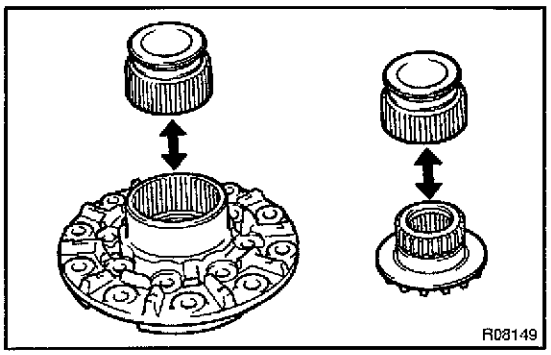
(a) Place matchmarks on the LH and RH cases.

(b) Remove the 8 bolts uniformly, a little at a time.

(c) Using a plastic hammer, separate the LH and RH cases.

(d) Remove these parts from the differential case:

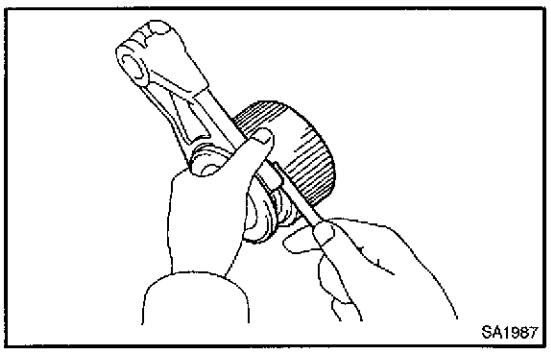
- 2 side gears
- 2 side gear thrust washers
- Spider
- 4 pinion gears
- 4 pinion gear thrust washers



21. INSPECT SLEEVE

(a) Install the sleeve to the differential case (LH) and check it moves smoothly.

(b) Install the sleeve to the side gear and check it moves smoothly.

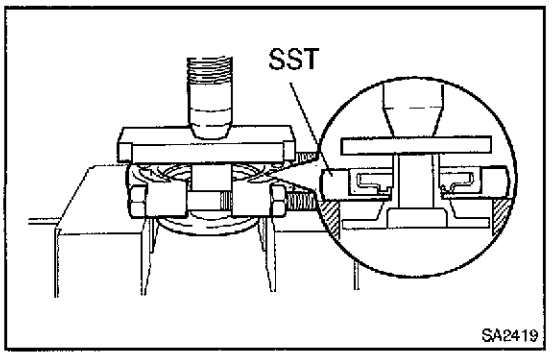


22. MEASURE CLEARANCE OF SHIFT FORK AND SLEEVE

Using a feeler gauge, measure the clearance between the shift fork and sleeve.

Clearance (Reference):
0.15 – 0.35 mm (0.006 – 0.014 in.)

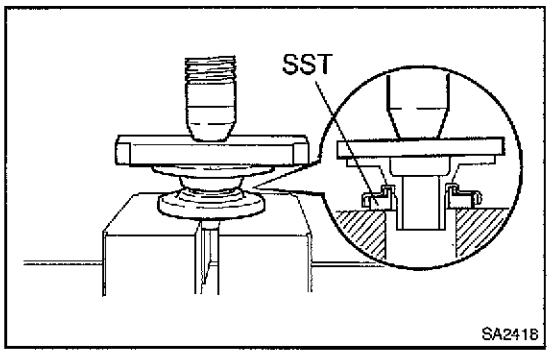
SA09W–02



REPLACEMENT

REPLACE COMPANION FLANGE DUST DEFLECTOR

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

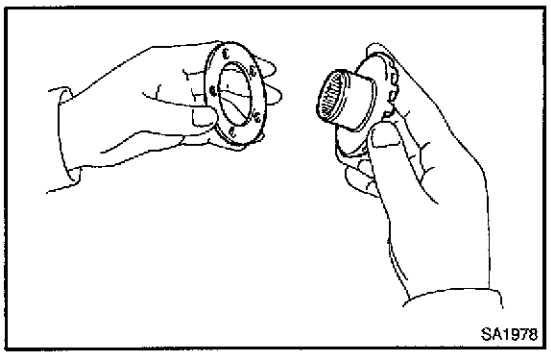


(b) Using SST and a press, install a new dust deflector.
SST 09726–40010

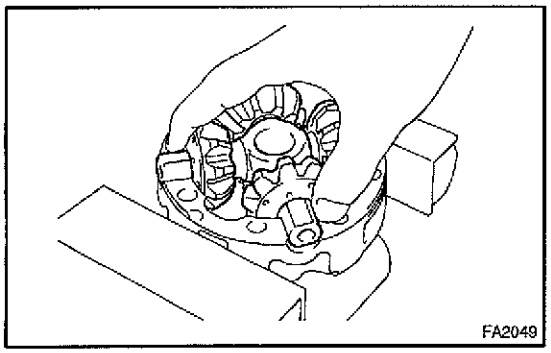
SA09X–02

REASSEMBLY

1. ASSEMBLE DIFFERENTIAL CASE



(a) Apply all of the sliding and rotating surfaces with gear oil.
(b) Install the side gear thrust washer to the side gear.
(c) Install the side gear to the RH case.



(d) Install the 4 pinion gears and pinion gear thrust washers to the spider.
(e) Install the pinion gear with spider to the RH case.
(f) Using a dial indicator, measure the side gear backlash with holding the side gear and spider.

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

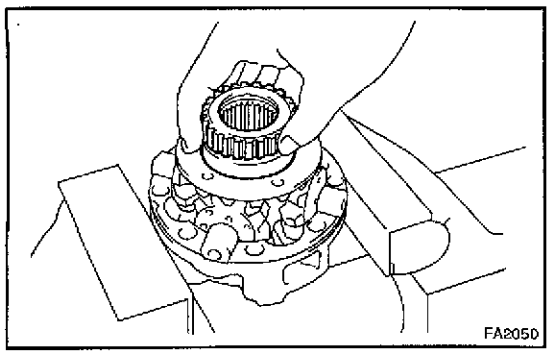
HINT:

- Measure at all 4 locations.
- Measure the backlash at the RH case and the LH case.

If the backlash is not within the specification, install a thrust washer of a different thickness.

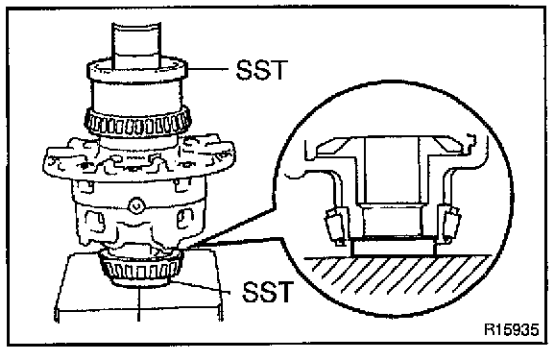
Thrust washer thickness

Thickness mm (in.)	Thickness mm (in.)
0.88 – 0.92 (0.0346 – 0.0362)	1.18 – 1.22 (0.0465 – 0.0480)
0.98 – 1.02 (0.0386 – 0.0402)	1.28 – 1.32 (0.0504 – 0.0521)
1.08 – 1.12 (0.0425 – 0.0441)	–



(g) Install the side gear and side gear thrust washer to the RH case.
(h) Install the pinion gears and spider to the RH case.
(i) Install the side gear and side gear thrust washer to the RH case.
(j) Align the matchmarks on the LH and RH cases.
(k) Torque the 8 bolts uniformly, a little at a time.

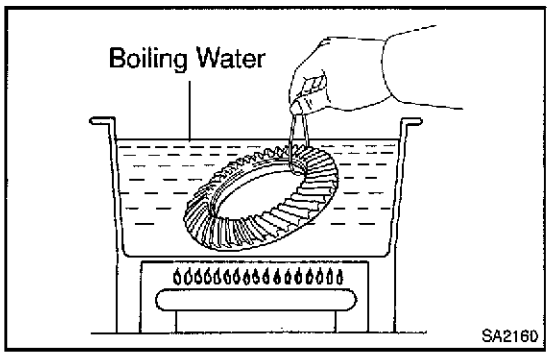
Torque: 47 N·m (480 kgf·cm, 35 ft·lbf)



2. INSTALL SIDE BEARINGS

Using SST and a press, install the side bearings on the differential case.

SST 09950–60010 (09951–00480, 09951–00550), 09950–60020 (09951–00730)



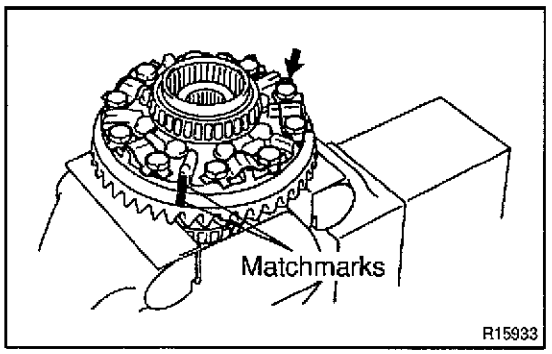
3. INSTALL RING GEAR ON DIFFERENTIAL CASE

(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.

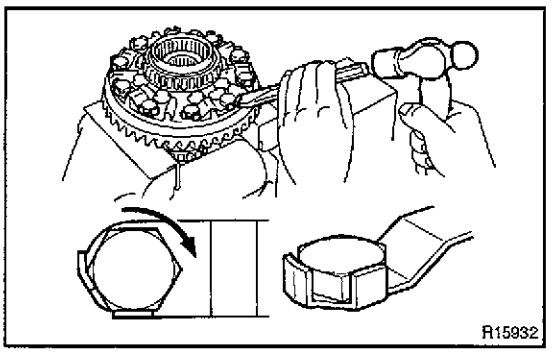
(d) After the moisture on the ring gear has completely evaporated, quickly install the ring gear to the differential case.



(e) Align the matchmarks on the ring gear and differential case.

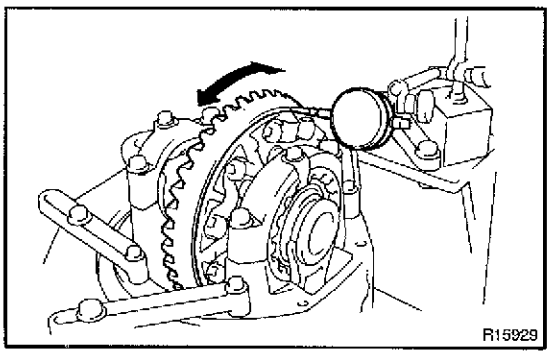
(f) Temporarily install 5 new lock plates and 10 set bolts.

(g) After the ring gear cools down enough, tighten the set bolts uniformly and a little at a time.
Torque: 97 N·m (985 kgf·cm, 71 ft·lbf)



(h) Using a chisel and hammer, stake the 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.

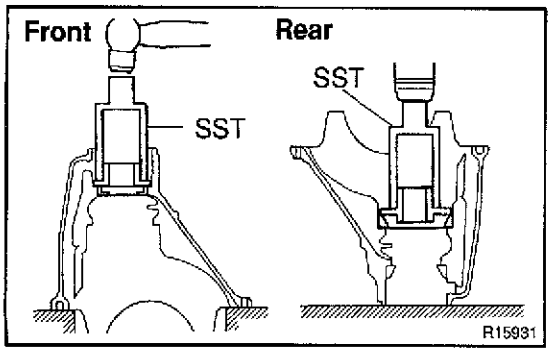


4. CHECK RING GEAR RUNOUT

(a) Install the differential case onto the carrier and tighten the adjusting nut just to fill the play in the bearing.

(b) Using a dial indicator, check the ring gear runout.
Maximum runout: 0.10 mm (0.0039 in.)

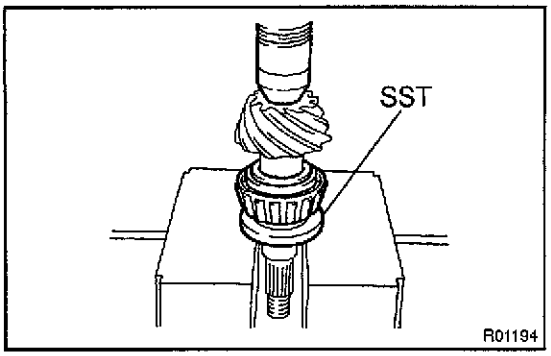
(c) Remove the differential case.



5. INSTALL NEW OIL STORAGE RING AND DRIVE PINION FRONT AND REAR BEARING OUTER RACES

(a) Using SST and a hammer, install new oil storage ring.
SST 09316–60011 (09316–00011, 09316–00021)

(b) Using SST and a press, install the outer races.
SST 09316–60011 (09316–00011, 09316–00021, 09316–00051)

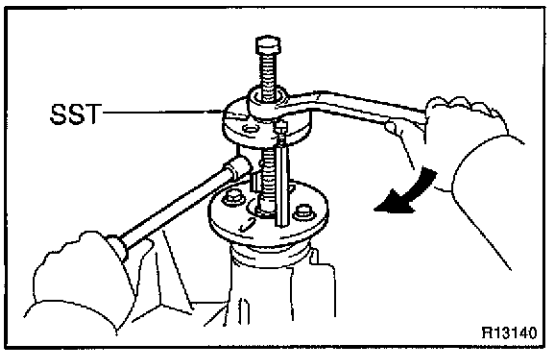


6. INSTALL DRIVE PINION FRONT BEARING

(a) Install the plate washer on the drive pinion.

(b) Using SST and a press, install the rear bearing onto the drive pinion.

SST 09506–30012



7. TEMPORARILY ADJUST DRIVE PINION PRELOAD

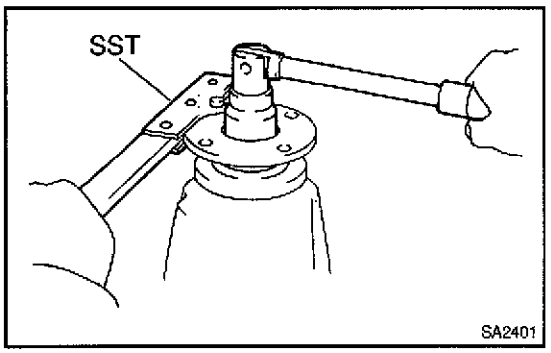
(a) Install the drive pinion, front bearing and oil slinger.

HINT:

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

(b) Install the companion flange with SST.

SST 09950–30010 (09951–03010, 09953–03010, 09954–03010, 09955–03030, 09956–03030)



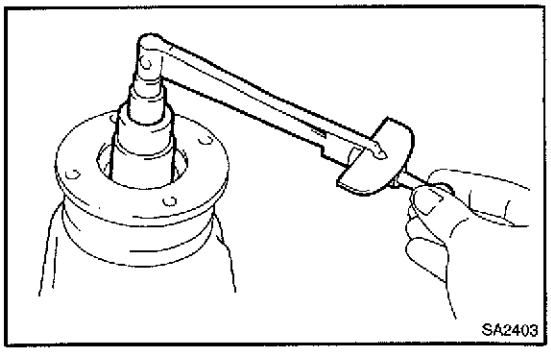
(c) Adjust the drive pinion preload by tightening the companion flange nut.

Using SST to hold the flange, tighten the nut.

SST 09330–00021

NOTICE:

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



(d) Using a torque wrench, measure the preload.

Preload (starting):

New bearing:

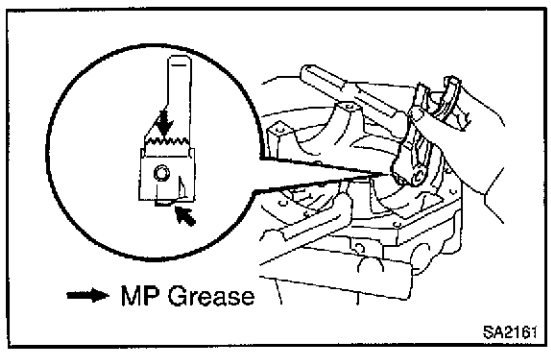
0.9 – 1.6 N·m (10 – 16 kgf·cm, 8.7 – 13.9 in.·lbf)

Reused bearing:

0.5 – 0.8 N·m (5 – 8 kgf·cm, 4.3 – 6.9 in.·lbf)

HINT:

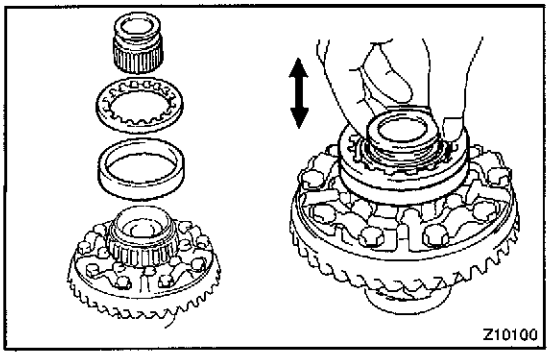
Measure the total preload after first turning the bearing clockwise and counterclockwise several times to make the bearing smooth.



8. INSTALL DIFFERENTIAL CASE IN CARRIER

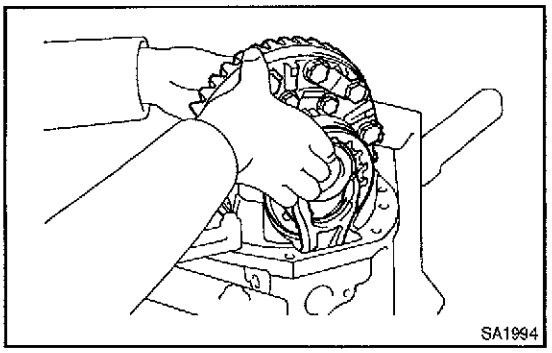
(a) Apply MP grease on the rack of the shift fork and connecting part of the indicator switch.

(b) Insert the shift fork into the differential carrier, as shown in the illustration.



(c) Place the outer race, adjusting nut on the left side of sleeve.

HINT:
Check that the sleeve moves smoothly.



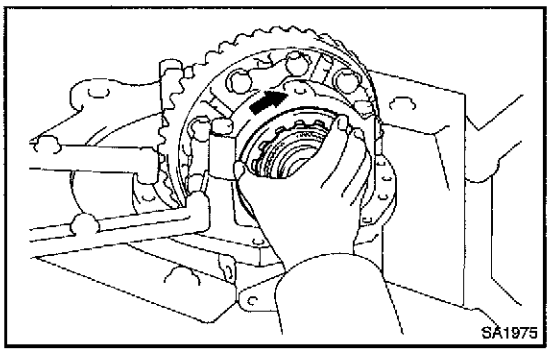
(d) Install the shift fork in the groove of the sleeve holding it by hand and install the case in the carrier.

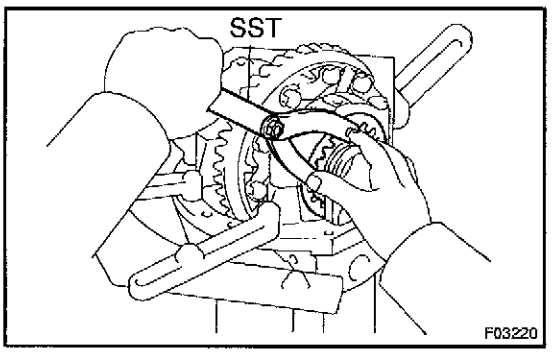
HINT:
Make sure that there is a backlash between the ring gear and drive pinion.

9. INSTALL BEARING CAPS

Align the matchmarks on the cap and carrier. Screw in the 2 bearing cap bolts 2 or 3 turns and press down the bearing cap by hand.

HINT:
If the bearing cap does not fit tightly on the carrier, the adjusting nuts are not threaded properly.
Reinstall the adjusting nuts if necessary.



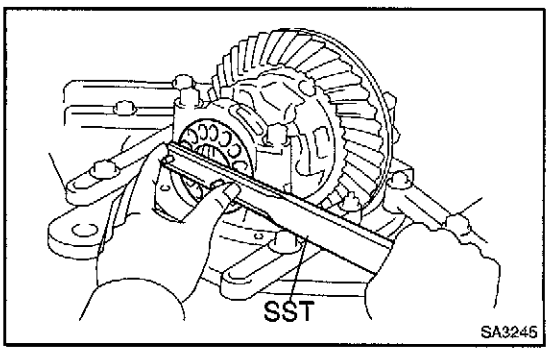


10. ADJUST SIDE BEARING PRELOAD

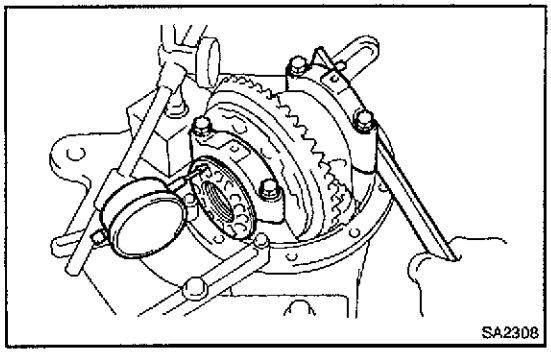
(a) Torque the 4 bearing cap bolts to the specified torque, then loosen them to the point where the adjusting nuts can be turned by hand.
Torque: 78 N·m (800 kgf·cm, 58 ft·lbf)

(b) Fully tighten the 4 bearing cap bolts by hand.

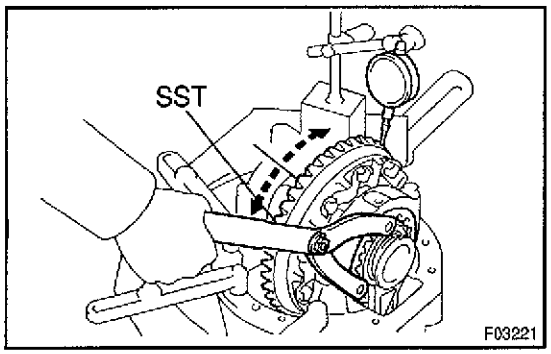
(c) Using the SST, torque the adjusting nut on the ring gear side until the ring has a backlash of approx. 0.2 mm (0.008 in.).
SST 09960–10010 (09962–01000, 09963–00700)



(d) With turning the ring gear, use the SST to fully tighten the adjusting nut on the drive pinion side. After the bearings are settled, loosen the adjusting nut on the drive pinion side.
SST 09504–00011



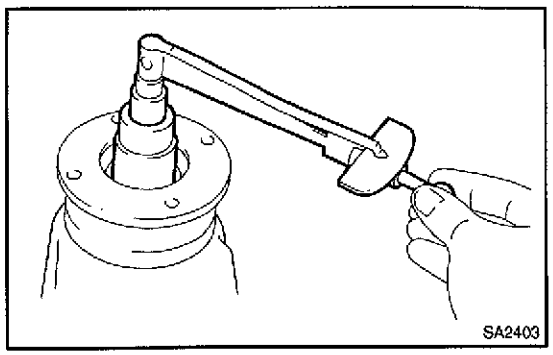
(e) Place a dial indicator on the top of the adjusting nut on the ring gear side.
(f) Adjust the side bearing to zero preload by tightening the other adjusting nut until the pointer on the indicator begins to move.
(g) Torque the adjusting nut 1 – 1.5 notches from the zero preload position.



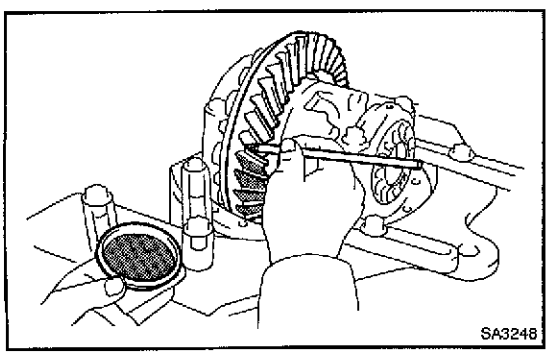
(h) Using a dial indicator, adjust the ring gear backlash until it is within specification.
Backlash: 0.13 – 0.18 mm (0.0051 – 0.0071 in.)

HINT:
The backlash is adjusted by turning the left and right adjusting nuts by an equal amount. For example, loosen the nut on the left side one notch and torque the nut on the right side one notch.

(i) Torque the bearing cap bolts.
Torque: 78 N·m (800 kgf·cm, 58 ft·lbf)
(j) Recheck the ring gear backlash.
Backlash: 0.13 – 0.18 mm (0.0051 – 0.0071 in.)

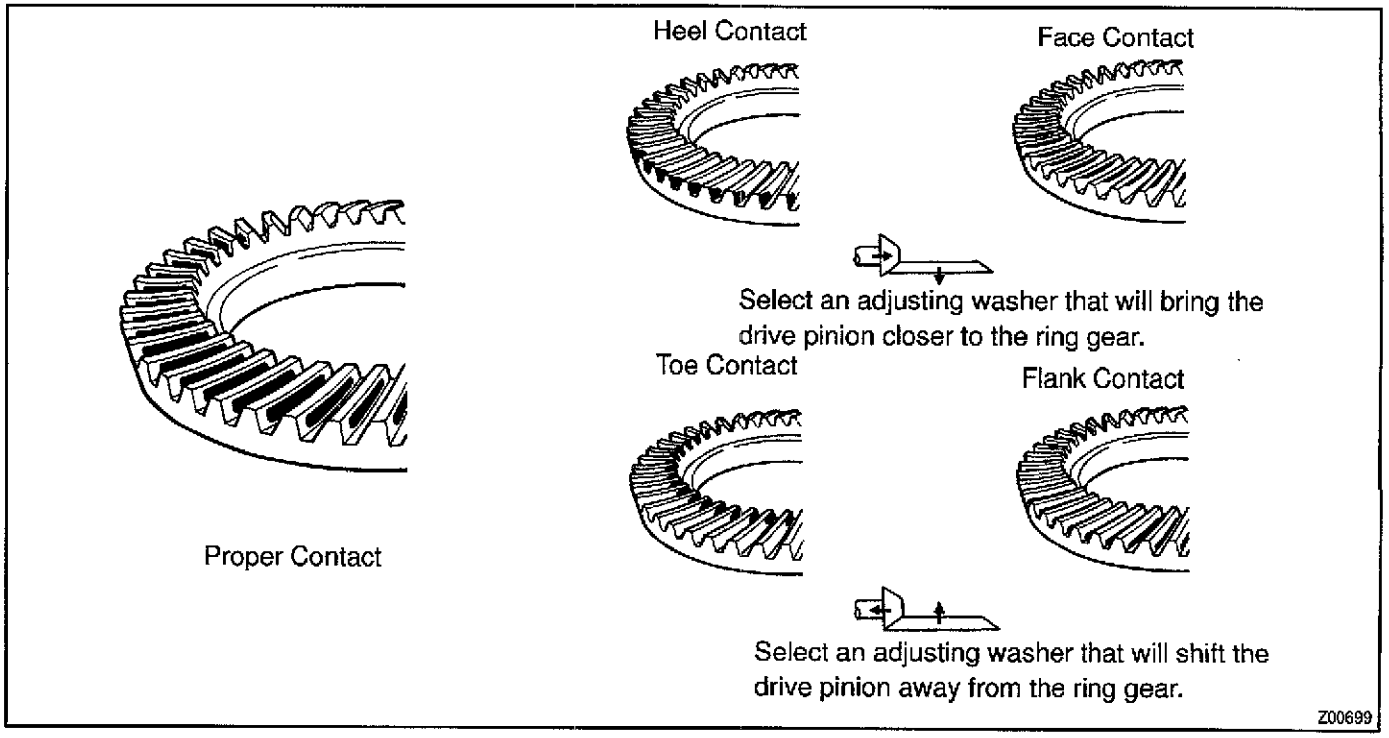


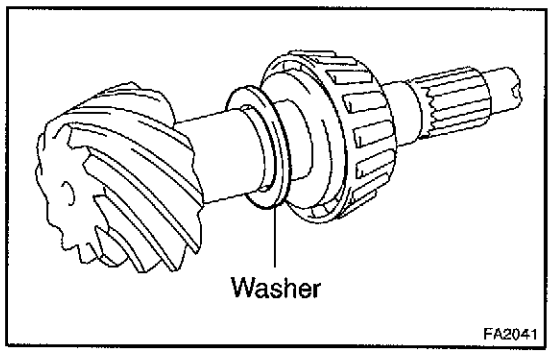
(k) Using a torque wrench, measure the preload with the teeth of the drive pinion and ring gear in contact.
Total preload (at starting):
Drive pinion preload plus
0.4 – 0.6 N·m (4 – 6 kgf·cm, 3.5 – 5.2 in.·lbf)



11. INSPECT TOOTH CONTACT BETWEEN RING GEAR AND DRIVE PINION

(a) Coat 3 or 4 teeth at 3 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 pattern.



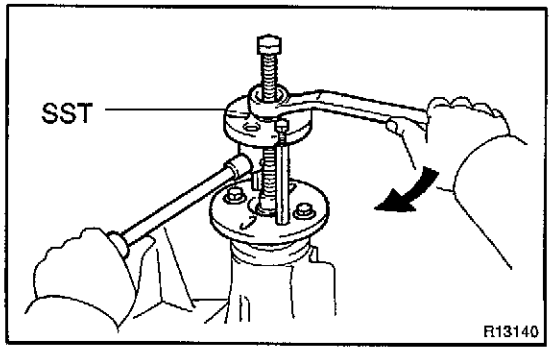


If the teeth are not contacting properly, use the following table to select a proper washer for correction.

Thickness mm (in.)	Thickness mm (in.)
1.69 – 1.71 (0.0665 – 0.0673)	2.02 – 2.04 (0.0795 – 0.0803)
1.72 – 1.74 (0.0677 – 0.0685)	2.05 – 2.07 (0.0807 – 0.0815)
1.75 – 1.77 (0.0689 – 0.0697)	2.08 – 2.10 (0.0819 – 0.0827)
1.78 – 1.80 (0.0701 – 0.0709)	2.11 – 2.13 (0.0831 – 0.0839)
1.81 – 1.83 (0.0713 – 0.0720)	2.14 – 2.16 (0.0843– 0.0850)
1.84 – 1.86 (0.0724 – 0.0732)	2.17 – 2.19 (0.0854 – 0.0862)
1.87 – 1.89 (0.0736 – 0.0744)	2.20 – 2.22 (0.0866 – 0.0874)
1.90 – 1.92 (0.0748 – 0.0756)	2.23 – 2.25 (0.0878 – 0.0886)
1.93 – 1.95 (0.0760 – 0.0768)	2.26 – 2.28 (0.0890 – 0.0898)
1.96 – 1.98 (0.0772 – 0.0780)	2.29 – 2.31 (0.0902 – 0.0909)
1.99 – 2.01 (0.0783 – 0.0791)	2.32 – 2.34 (0.0913 – 0.0921)

12. REMOVE COMPANION FLANGE (See page SA–214)

13. REMOVE OIL SLINGER AND FRONT BEARING (See page SA–214)



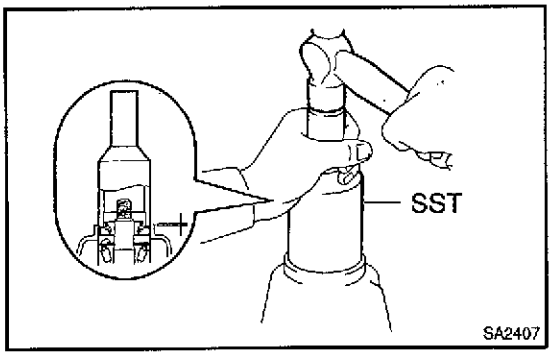
14. INSTALL BEARING SPACER AND FRONT BEARING

(a) Place a new bearing spacer on the shaft.

(b) Place the front bearing and oil slinger.

(c) Using SST and the companion flange, install the front bearing then remove the companion flange.

SST 09950–30010 (09951–03010, 09953–03010, 09954–03010, 09955–03030, 09956–03030)



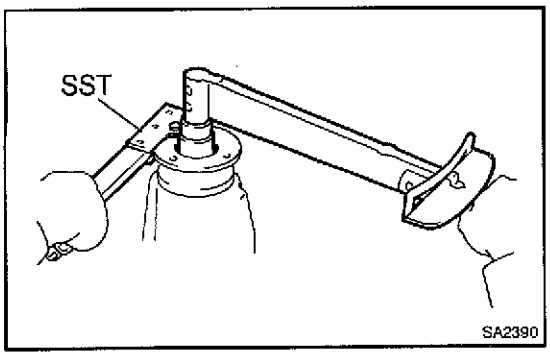
15. INSTALL OIL SEAL

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

(b) Using SST and hammer, install a new oil seal.

SST 09214–76011

Oil seal drive in depth: 1.0 mm (0.039 in.)



16. INSTALL COMPANION FLANGE

(a) Place the companion flange on the drive pinion.

(b) Install a new nut.

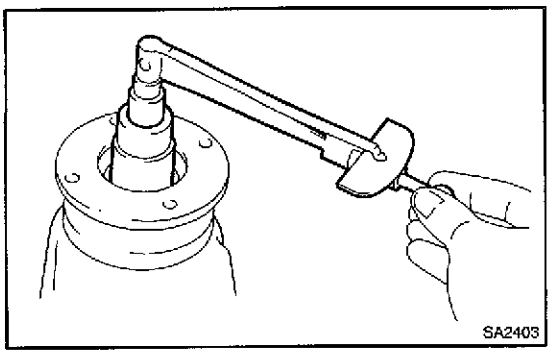
HINT:

Coat the threads of a new nut with hypoid gear oil.

(c) Using SST to hold the flange, tighten the nut.

SST 09330–00021

Torque: 196 N·m (2,000 kgf·cm, 145 ft·lbf)



17. ADJUST DRIVE PINION PRELOAD

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

Preload (at starting):

New bearing :

0.9 – 1.6 N·m (10 – 16 kgf·cm, 8.7 – 13.9 in.·lbf)

Reuse bearing :

0.5 – 0.8 N·m (5 – 8 kgf·cm, 4.3 – 6.9 in.·lbf)

- If preload is larger than the specification, replace the bearing spacer.
- If 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.

Torque: 343 N·m (3,500 kgf·cm, 253 ft·lbf) or less

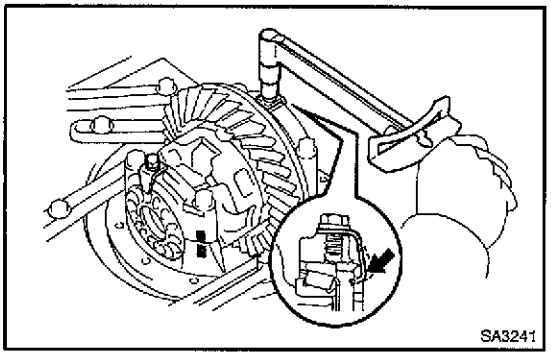
If the maximum torque is exceeded while retightening the nut, replace the bearing spacer and repeat the preload adjusting procedure. Do not loosen the pinion nut to reduce the preload.

18. RECHECK RING GEAR BACKLASH
(See page SA–214)

19. RECHECK TOOTH CONTACT BETWEEN RING GEAR AND DRIVE PINION
(See page SA–220)

20. CHECK RUNOUT OF COMPANION FLANGE
(See page SA–214)

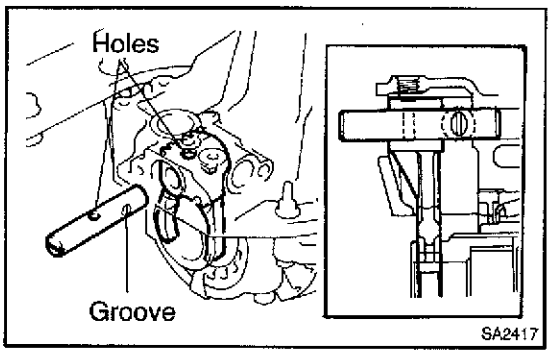
21. STAKE DRIVE PINION NUT



22. INSTALL ADJUSTING NUT LOCKS

(a) Install 2 new nut locks on the bearing caps.
Torque: 13 N·m (130 kgf·cm, 9 ft·lbf)

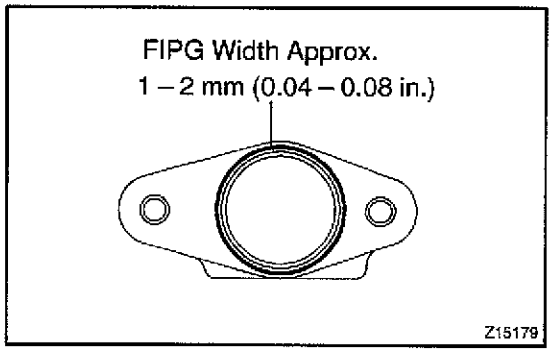
(b) After tightening bolts, bend the nut locks.



23. INSTALL SHIFT FORK SHAFT

(a) Apply MP grease onto the outer circuit of the fork shaft.

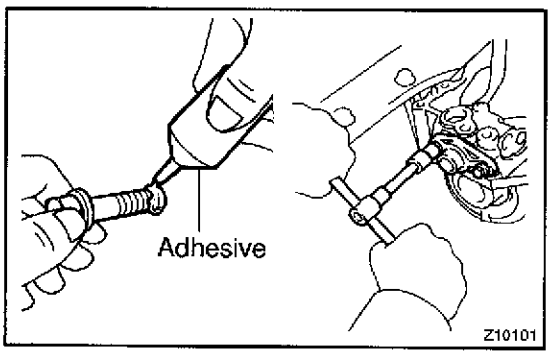
(b) Install the fork shaft to match the hole of the shift fork and that of the shift fork shaft.



(c) Remove any FIPG material and be careful not to drop oil on the contacting surface of the differential carrier and shaft retainer.

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

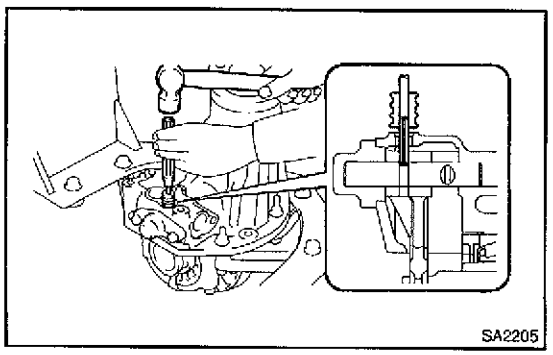
HINT:
Install the shaft retainer within 10 minutes after applying FIPG.



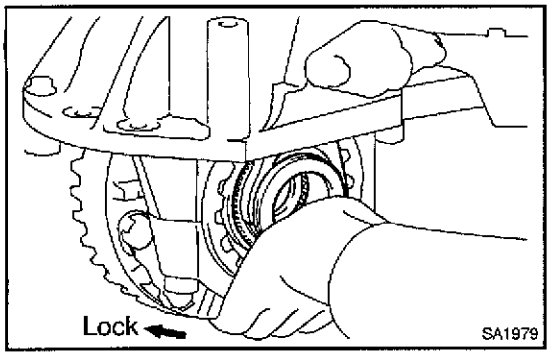
(e) Clean the threads of the bolts and retainer bolts holes with toluene or trichlorethylene.

(f) Apply adhesive to 2 or 3 threads of the mount bolt end.
Adhesive:
Part No. 08833–00080, THREE BOND 1344, LOCTITE 242 or equivalent

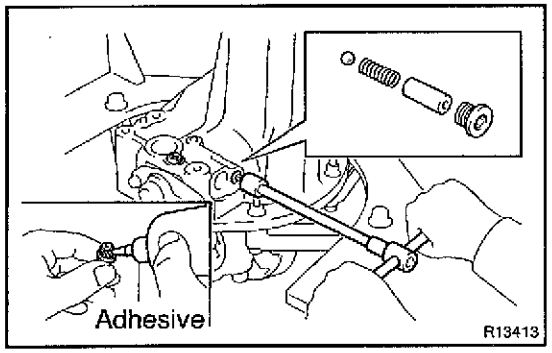
(g) Tighten the shaft retainer with the 2 bolts.
Torque: 24 N·m (240 kgf·cm, 17 ft·lbf)



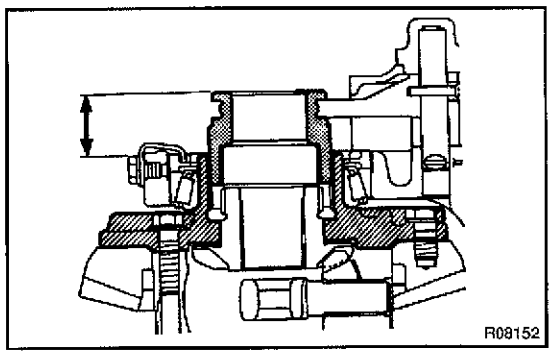
(h) Using a 5 mm pin punch and hammer, install the slotted spring pin to the shift fork.



(i) Shift the fork deeply and keep the differential lock condition

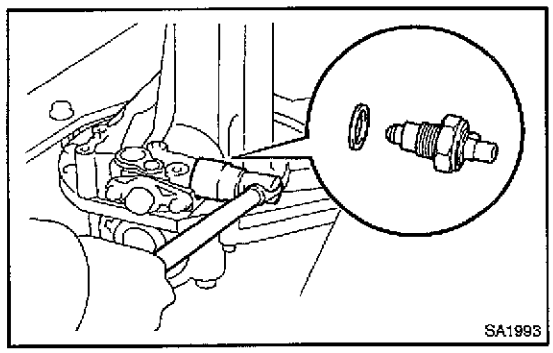


(j) Install the steel ball, spring and spring seat.
(k) Clean the threads of 2 plugs and plug holes with toluene or trichlorethylene.
(l) Apply adhesive to the plug threads.
Adhesive:
Part No. 08833–00080, THREE BOND 1344, LOCTITE 242 or equivalent
(m) Using a 6 mm hexagon wrench, install and tighten the screw plugs.
Torque: 22 N·m (220 kgf·cm, 16 ft·lbf)



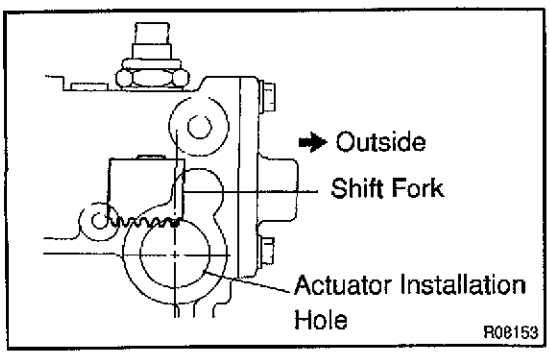
24. MEASURE DISTANCE BETWEEN SLEEVE AND DIFFERENTIAL CASE END SIDE

Measure distance between the sleeve and tip of the differential case when differential is free and locked respectively.
Standard distance:
LOCK: 17.44 – 18.86 mm (0.6866 – 0.7425 in.)
FREE: 32.40 – 33.90 mm (1.2756 – 1.3346 in.)



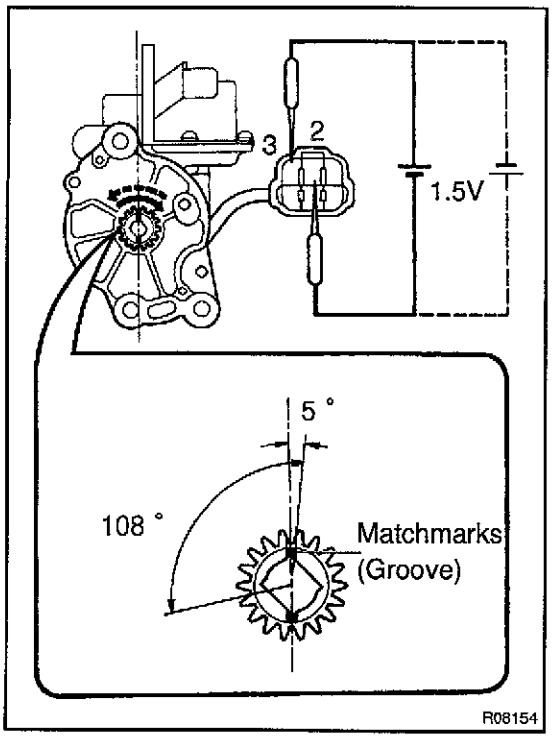
25. INSTALL INDICATOR SWITCH

Install the indicator switch with a new gasket.
Torque: 40 N·m (410 kgf·cm, 30 ft·lbf)



26. INSTALL ACTUATOR

(a) Check that the outermost rack tooth of the shift fork is virtually above the center line of the actuator installation hole.



(b) Ensure that the matchmarks on the pinion of the actuator are in the extent between zero and 5 degrees clockwise above the center line of the actuator.

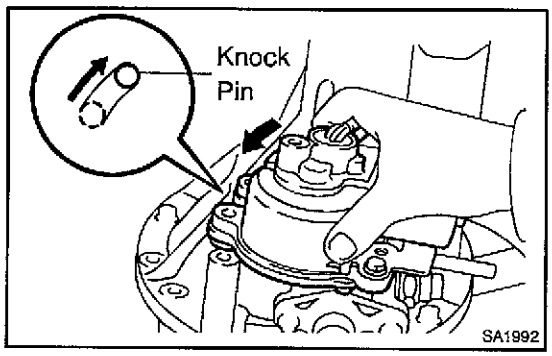
NOTICE:

- **If the matchmarks are not in this extent, rotate the pinion to be matched.**
- **Don't supply the battery positive voltage directly between terminals.**
- **If the matchmarks come to the extension limit of the rotation, don't electrify moreover.**

(c) Install a new O–ring to the actuator.

(d) Apply a light coat of gear oil to the O–ring.

(e) Apply MP grease to the gear part.



(f) Ensure that the outer most rack tooth of the shift fork fits the matchmarks on the pinion of the actuator.

(g) Insert the actuator so that the long hole on the actuator side fits with the knock pin on the carrier side.

HINT:

Don't damage the O–ring of the actuator.

(h) Align the actuator with the long hole and rotate the actuator counterclockwise when the knock pin is set to the right–hand side.

(i) Install and tighten the bolts.

Torque: 26 N·m (270 kgf·cm, 20 ft·lbf)

SA09Y–02

INSTALLATION

Installation is in the reverse order of removal (See page SA–213).

AFTER INSTALLATION, FILL DIFFERENTIAL WITH HYPOID GEAR OIL (See page SA–172) AND CHECK DIFF. LOCK OPERATION (See page SA–254)