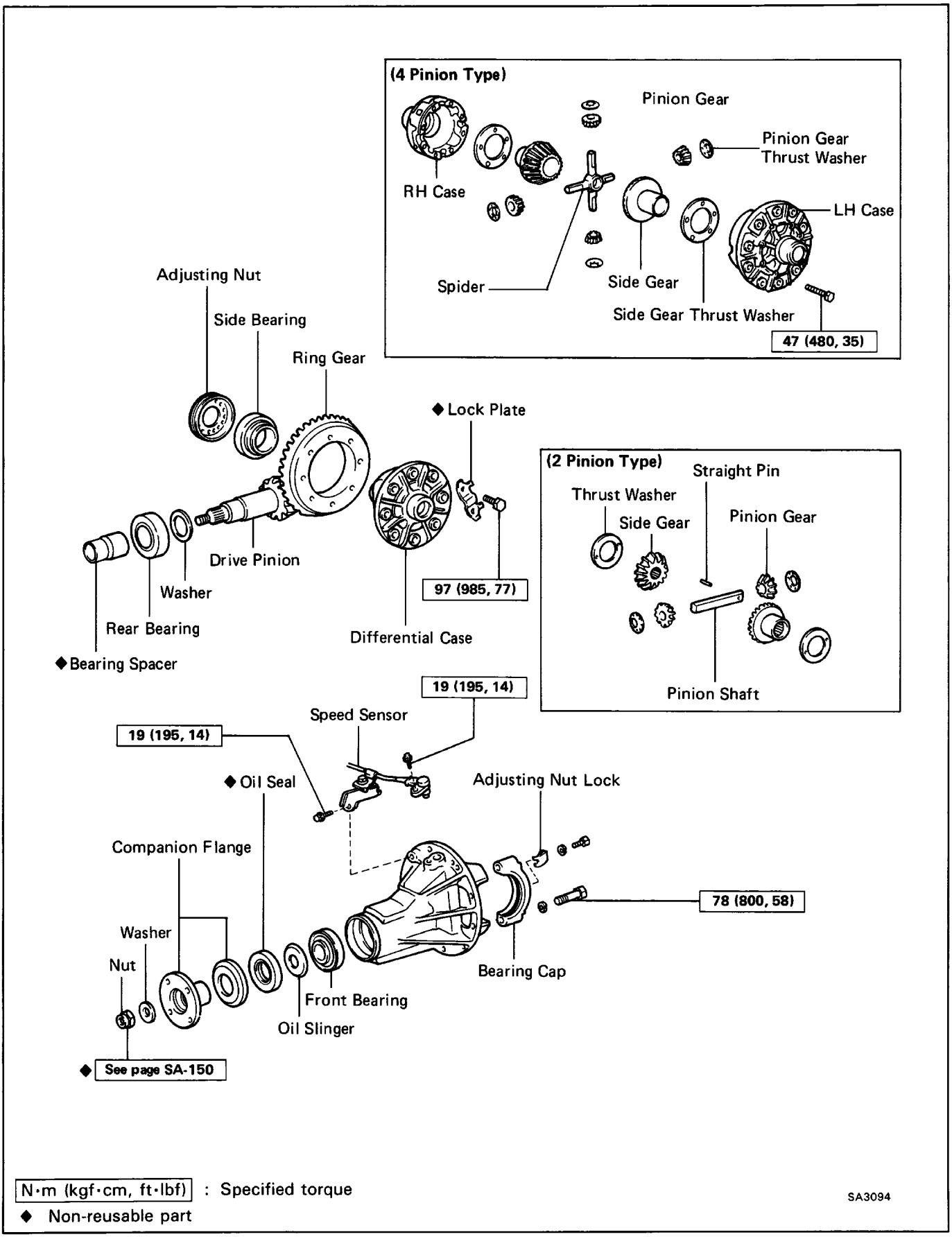
DIFFERENTIAL

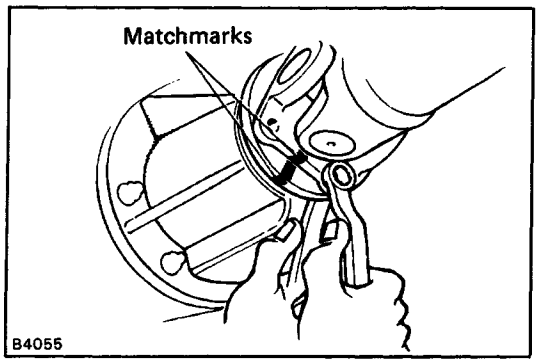
COMPONENTS



N·m (kgf·cm, ft·lbf) : Specified torque

◆ Non-reusable part

SA3094



ON–VEHICLE REPLACEMENT OF OIL SEAL

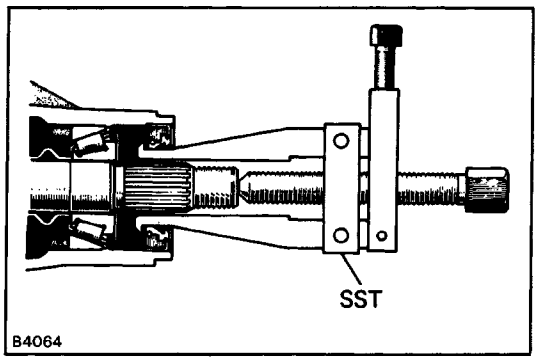
1. DISCONNECT PROPELLER SHAFT FROM DIFFERENTIAL

(a) Place matchmarks on the flanges.

(b) Remove the four bolts and nuts.

2. REMOVE COMPANION FLANGE

(See step 7 on page SA–138)



3. REMOVE OIL SEAL AND OIL SLINGER

(a) Using SST, remove the oil sea! from the housing.

SST 09308–10010

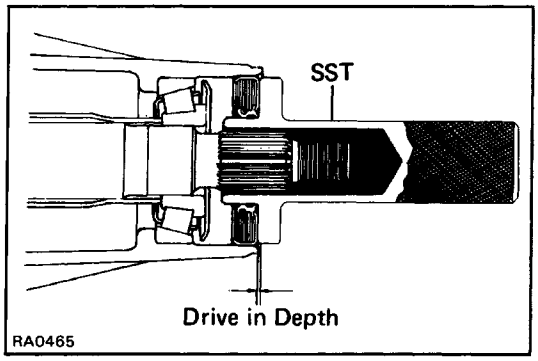
(b) Remove the oil slinger.

4. REMOVE FRONT BEARING AND BEARING SPACER

(See step 9 on page SA–138)

5. INSTALL NEW BEARING SPACER AND FRONT BEARING

(See step 12 on page SA–149)



6. INSTALL OIL SLINGER AND NEW OIL SEAL

(a) Install the oil slinger facing as shown.

(b) Using SST, drive in a new oil seal as shown.

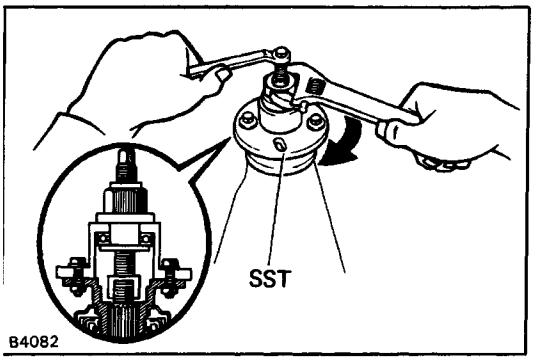
SST 09554–30011

Oil seal drive in depth:

7.5 in. 1.5 mm (0.059 in.)

8 in. 1.0 mm (0.039 in.)

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



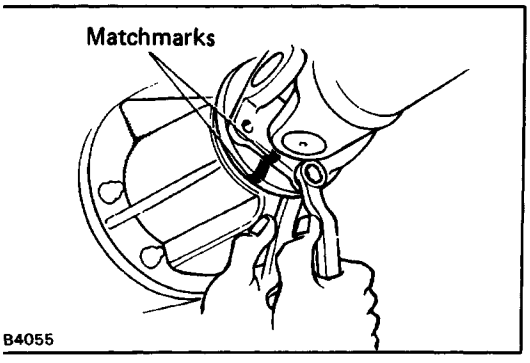
7. INSTALL COMPANION FLANGE

(See step 14 on page SA–149)

8. ADJUST DRIVE PINION BEARING PRELOAD

(See step 15 on page SA–150)

9. STAKE DRIVE PINION NUT



10. CONNECT PROPELLER SHAFT FLANGE TO COMPANION FLANGE

(a) Align the matchmarks on the flanges and connect the flanges with four bolts and nuts.

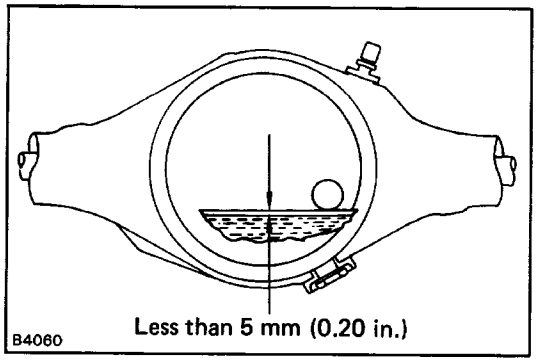
(b) Torque the four bolts and nuts.

Torque: 4WD 3VZ–E [MT]

76 N–m (780 kgf–cm, 56 ft–lbf)

Ex. 4WD 3VZ–E [MT]

74 N–m (750 kgf–cm, 54 ft–lbf)



11. CHECK DIFFERENTIAL OIL LEVEL

Fill with hypoid gear oil if necessary.

Oil type: API GL–5 hypoid gear oil

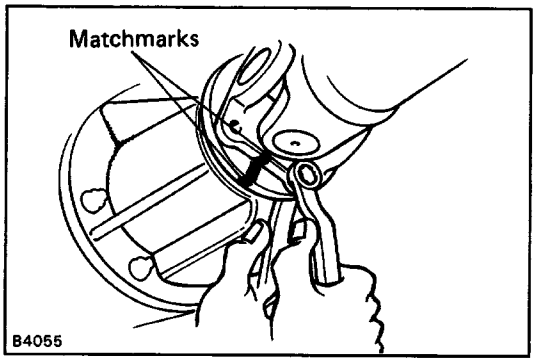
Viscosity: Above – 180C (0°F) SAE 90

Below – 180C (0°F) SAE 80V1r or 80w–90

Capacity:

liters (US qts, Imp. qts)

2W D	7.5 in.	2 pinion	1.35 (1.43, 1.19)
	8 in.	2 pinion	1.8 (1.9, 1.6)
		4 pinion	2.2 (2.3, 1.9)
4WD	8 in.	2 pinion	2.2 (2.3, 1.9)
		4 pinion	2.2 (2.3, 1.9)



REMOVAL OF DIFFERENTIAL

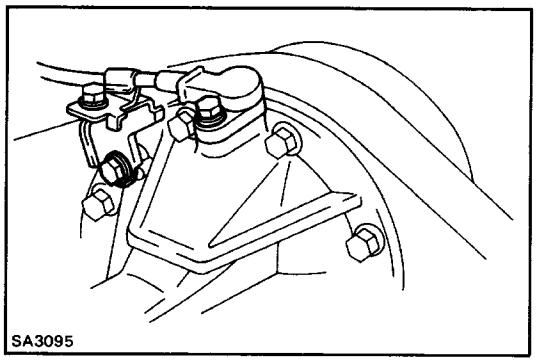
1. REMOVE DRAIN PLUG AND DRAIN DIFFERENTIAL OIL

2. REMOVE REAR AXLE SHAFTS

(See page SA–124 or SA–127)

3. DISCONNECT PROPELLER SHAFT FROM DIFFERENTIAL

(See page SA–135)



4. (wl REAR–WHEEL ANTI–LOCK BRAKE SYSTEM) DISCONNECT SPEED SENSOR

Remove the two bolts and the speed sensor.

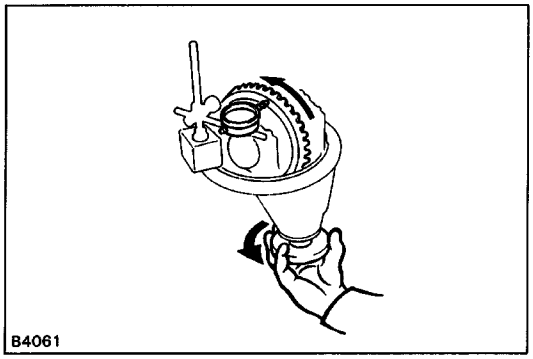
5. REMOVE DIFFERENTIAL CARRIER ASSEMBLY

DISASSEMBLY OF DIFFERENTIAL

(See page SA–134)

HINT: If the differential is noisy, perform the following preinspection before disassembly to determine the cause.

If the differential has severe problems, disassemble and repair it as necessary.



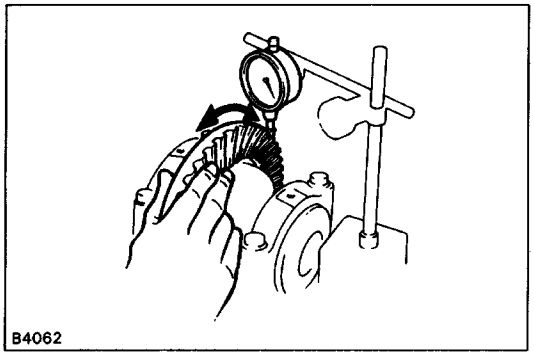
1. CHECK RING GEAR RUNOUT

If the runout is greater than maximum, install a new ring gear.

Maximum runout:

7.5 in. 0.07 mm (0.0028 in.)

8 in. 0.10 mm (0.0039 in.)



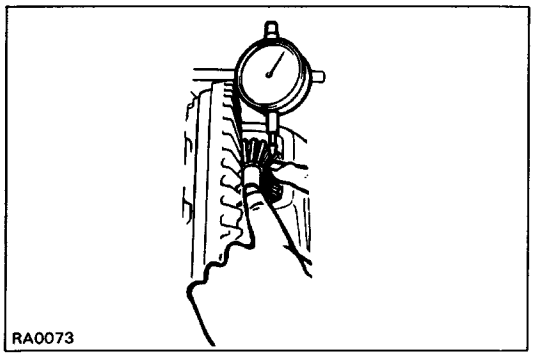
2. CHECK RING GEAR BACKLASH

If the backlash is not within specifications, adjust the side bearing preload or repair as necessary. (See step 8 on page SA–147)

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

3. INSPECT TOOTH CONTACT BETWEEN RING GEAR AND DRIVE PINION (See step 9 on page SA–149)

Note the tooth contact position.



4. (2 PINION TYPE)

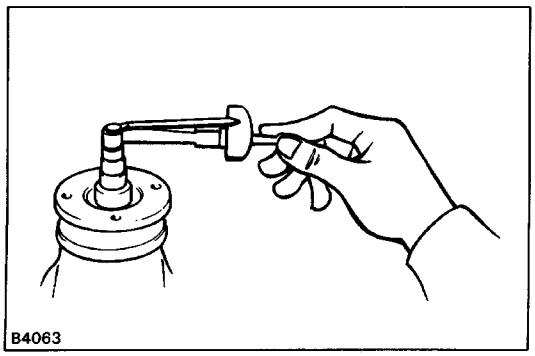
CHECK SIDE GEAR BACKLASH

Measure the side gear backlash while holding one pinion gear toward the case.

Standard backlash:

0.05 – 0.20 mm (0.0020 – 0.0079 in.)

If the backlash is not within specification, install the proper thrust washers.



5. MEASURE DRIVE PINION PRELOAD

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

Preload (starting):

7.5 in.

0.6 – 1.0 N–m (6 – 10 kgf–cm, 5.2 – 8.7 in.–lbf)

8 in.

(2 pinion type)

0.9 – 1.3 N–m (9 – 13 kgf–cm, 7.8 – 11.3 in.–lbf)

(4 pinion type)

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

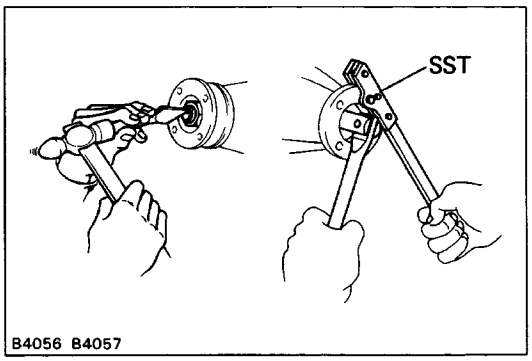
6. CHECK TOTAL PRELOAD

Using a torque meter, measure the total preload.

Total preload (starting):

Add drive pinion preload

0.4 – 0.6 N–m (4 – 6 kgf–cm, 3.5 – 5.2 in.–lbf)

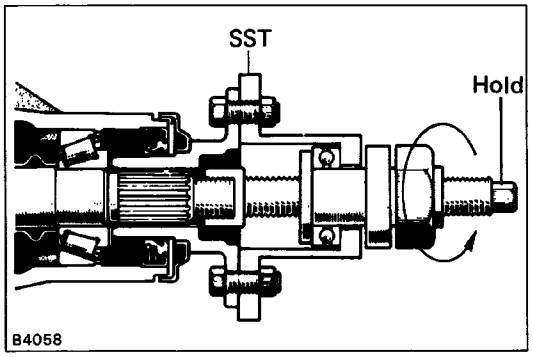


7. REMOVE COMPANION FLANGE

(a) Using a hammer and chisel, loosen the staked part of the nut.

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

SST 09330–0002 1

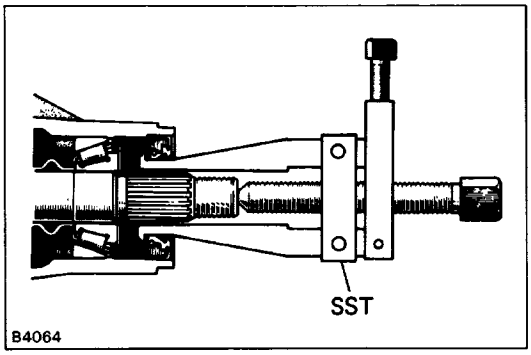


(c) Using SST, remove the companion flange.

SST 09557–22022

(7.5 in. 09557–22030)

(8 in. 09557–22050)

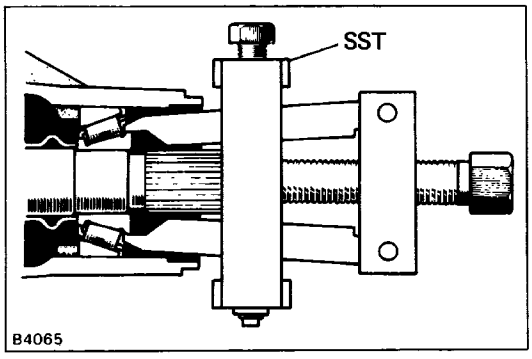


8. REMOVE OIL SEAL AND OIL SLINGER

(a) Using SST, remove the oil seal from the housing.

SST 09308–10010

(b) Remove the oil slinger.



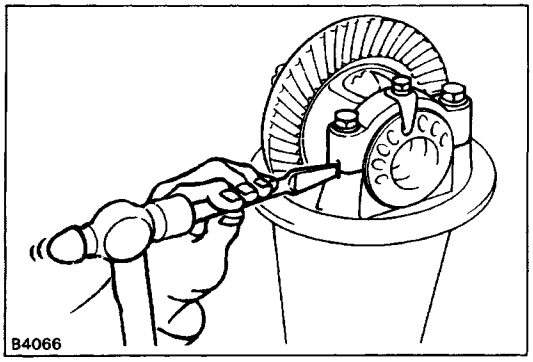
9. REMOVE FRONT BEARING AND BEARING SPACER

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

SST 09556–30010

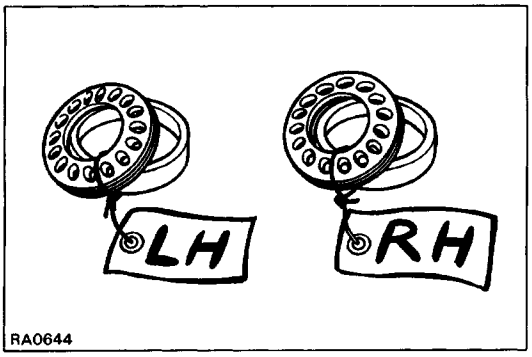
(b) Remove the bearing spacer.

If the front bearing is damaged or worn, replace the bear–ing.

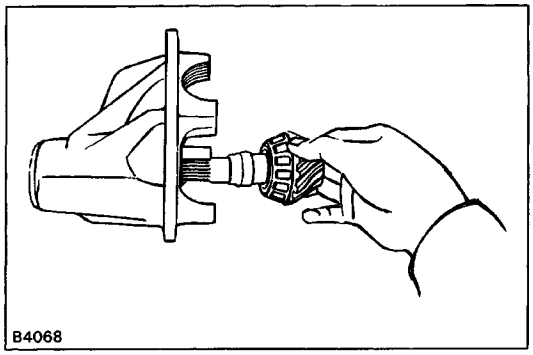


10. REMOVE DIFFERENTIAL CASE AND RING GEAR

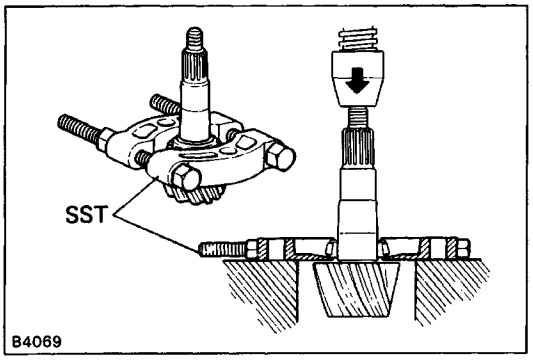
(a) Place matchmarks on the bearing cap and differen–tial carrier.
(b) Remove the two adjusting nut locks.
(c) Remove the two bearing caps and two adjusting nuts.
(d) Remove the bearing outer races.
(e) Remove the differential case from the carrier.



HINT: Tag the disassembled parts to show the location for reassembly.

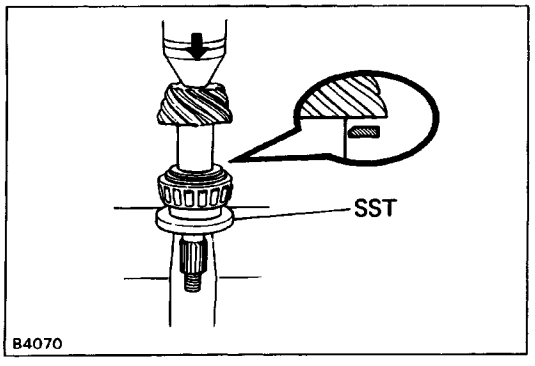


11. REMOVE DRIVE PINION FROM DIFFERENTIAL CARRIER

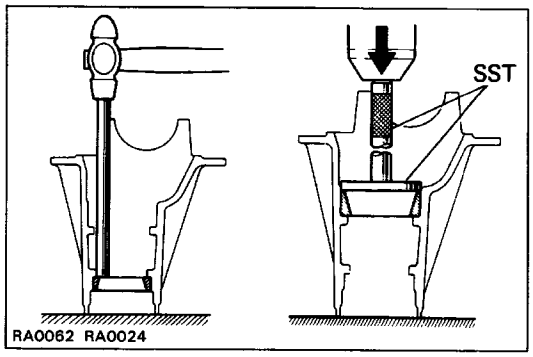


12. REPLACE DRIVE PINION REAR BEARING

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



(b) Install the washer on the drive pinion with the cham–fered end facing the pinion gear.
(c) Using a press and SST, press the reused washer and new rear bearing on the drive pinion.
SST 09506–30012



13. REPLACE DRIVE PINION FRONT AND REAR BEARING OUTER RACES

(a) Using a hammer and brass bar, drive out the outer race.

(b) Using a press and SST, drive in a new outer race.

SST

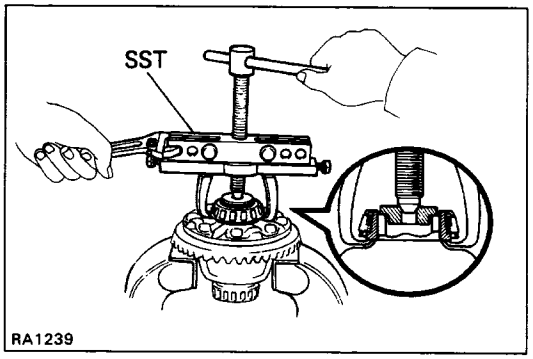
Front side 09608–35014 (09608–06020, 09608–06110)

Rear side

8 in. 4 pinion type

09608–35014 (09608–06020, 09608–06180)

Others 09608–35014 (09608–06020, 09608–06120)

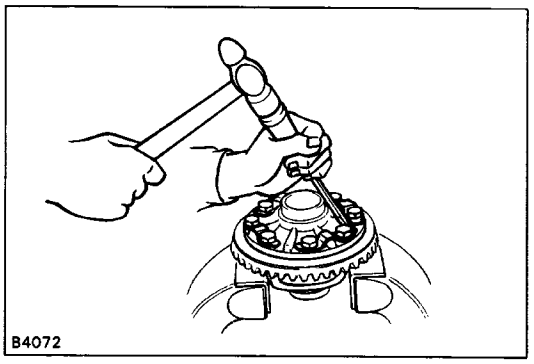


14. REMOVE SIDE BEARINGS FROM DIFFERENTIAL CASE

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

SST 09950–20017

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

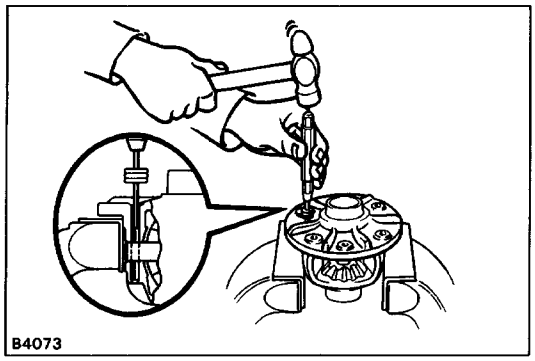


15. REMOVE RING GEAR

(a) Remove the ring gear set bolts and lock plates.

(b) Place alignment marks on the ring gear and differential case.

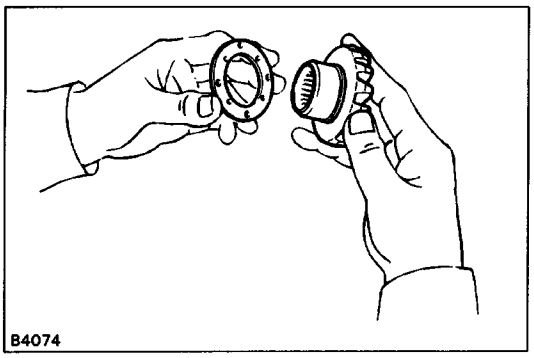
(c) Using plastic or copper hammer, tap on the ring gear to separate it from the differential case.


B4073

REPLACEMENT OF DIFFERENTIAL CASE COMPONENT PARTS (2 Pinion Type)

1. DISASSEMBLE DIFFERENTIAL CASE

Using a hammer and punch, drive out the straight pin. Remove the pinion shaft, two pinion gears, two side gears and two thrust washers.


B4074

2. ASSEMBLE DIFFERENTIAL CASE

(a) Install the proper thrust washers and side gears.

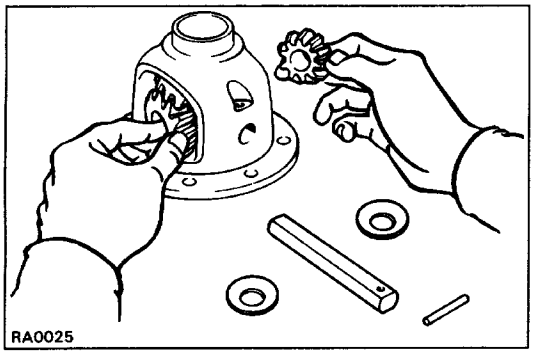
Using the table below, select thrust washers which will ensure that the backlash is within specification.

Try to select washers of the same size for both sides.

Standard backlash: 0.05 – 0.20 mm
(0.0020 – 0.0079 in.)

Thrust washer thickness

7.5 in.		8 in.	
Thickness	mm (in.)	Thickness	mm (in.)
1.0	(0.039)	1.6	(0.063)
1.1	(0.043)	1.7	(0.067)
1.2	(0.047)	1.8	(0.071)
1.3	(0.051)		

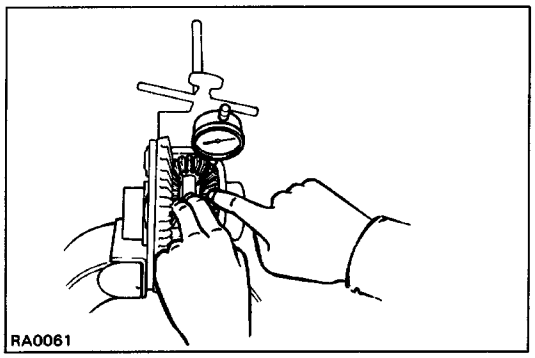

RA0025

Install thrust washers and side gears in the differential case.

(b) Check the side gear backlash.

Measure the side gear backlash while holding one pinion gear toward the case.

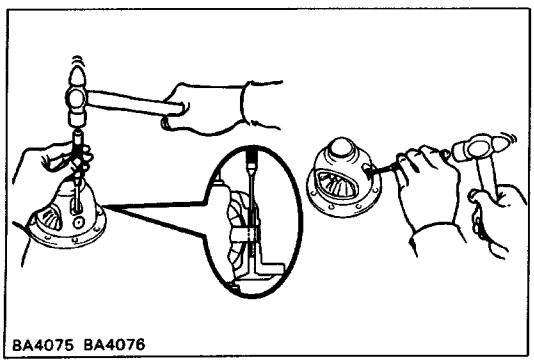
Standard backlash: 0.05 – 0.20 mm
(0.0020 – 0.0079 in.)

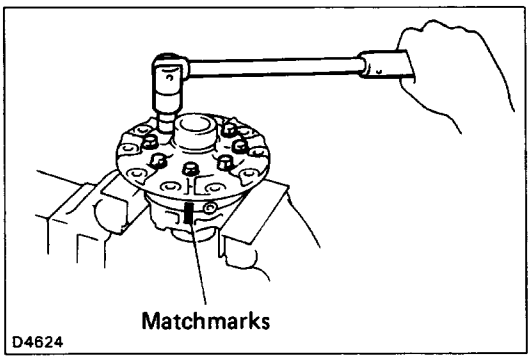

RA0061

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

(c) Install the straight pin.

- Using the hammer and punch, drive the straight pin through the case and hole in the pinion shaft.
- Stake the pin and differential case.

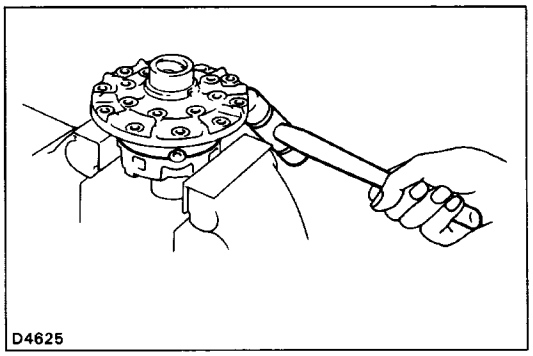

BA4075 BA4076



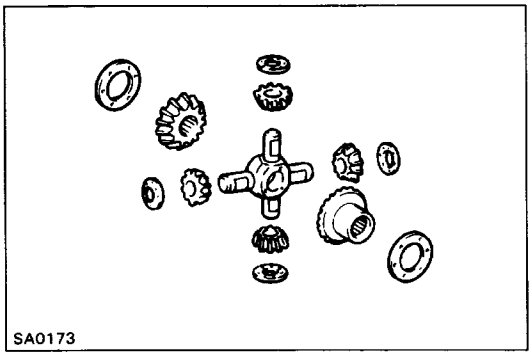
(4 Pinion Type)

1. DISASSEMBLE DIFFERENTIAL CASE

(a) Place the matchmarks on the LH and RH cases.
(b) Remove the eight bolts.

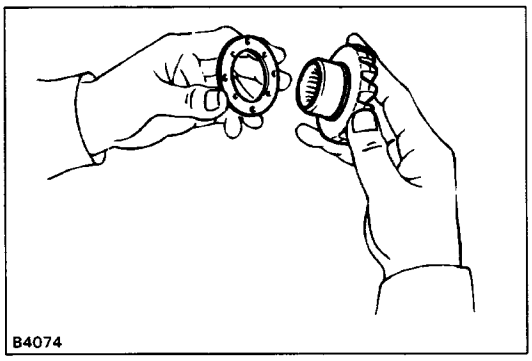


(c) Using a plastic hammer, separate the LH and RH cases.



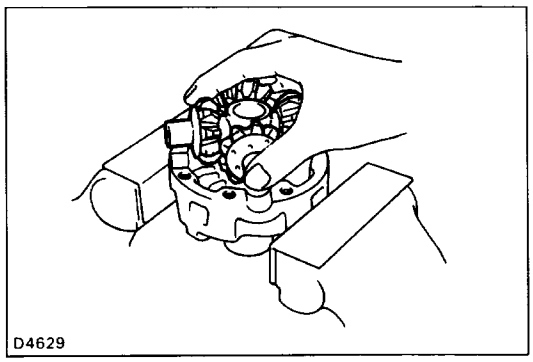
2. REMOVE FOLLOWING PARTS FROM CASE:

- Two side gears
- Two side gears thrust washers
- Spider
- Four pinion gears
- Four pinion gear thrust washers

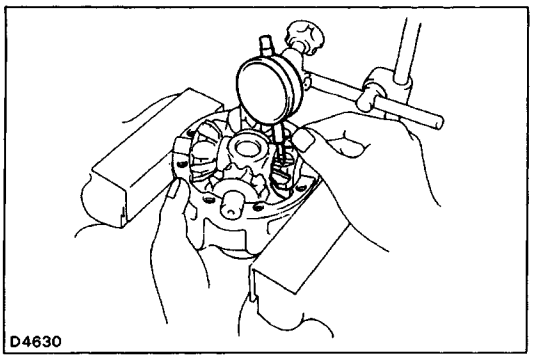


3. MEASURE SIDE GEAR BACKLASH

(a) Install the thrust washer to the side gear.
(b) Install the side gear to the RH case.



(c) Install the four pinion gears and thrust washers tc the spider.
(d) Install the pinion gear and spider to the RH case.



(e) Hold the side gear, measure the side gear backlash.
Backlash: 0.05 – 0.20 mm (0.0020 – 0.0079 in.)

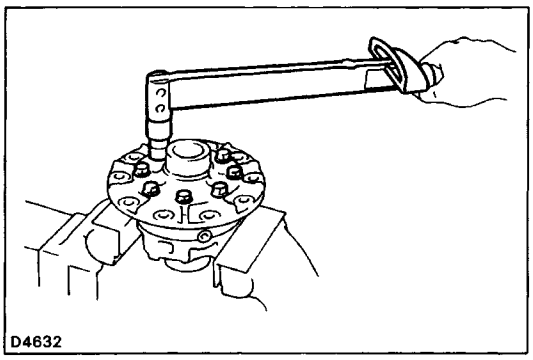
HINT: Measure the backlash at the RH case at the LH case.

(f) If the backlash is not within specification, install a thrust washer of a different thickness.
HINT: Use washer of the same thickness on both the right and left sides.

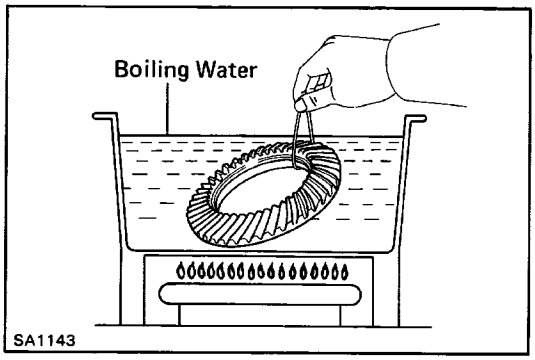
Thickness mm (in.)			
0.9	(0.035)	1.2	(0.047)
1.0	(0.039)	1.3	(0.051)
1.1	(0.043)		

4. ASSEMBLE DIFFERENTIAL CASE

(a) Install the side gear and thrust washer to the RH case.
(b) Install the pinion gears and spider to the RH case.
(c) Install the side gear and thrust washer to the LH case.
(d) Apply gear oil to the each parts.



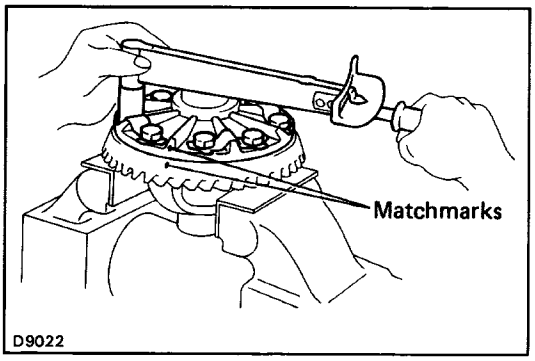
(e) Align the matchmarks on the LH and RH case.
(f) Torque the eight bolts.
Torque: 47 N–m (480 kgf–cm, 35 ft–lbf)



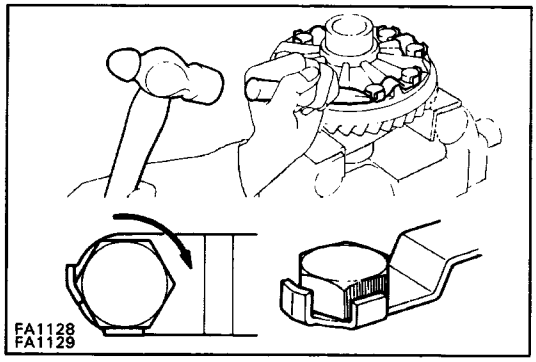
ASSEMBLY OF DIFFERENTIAL

1. INSTALL RING GEAR ON DIFFERENTIAL CASE

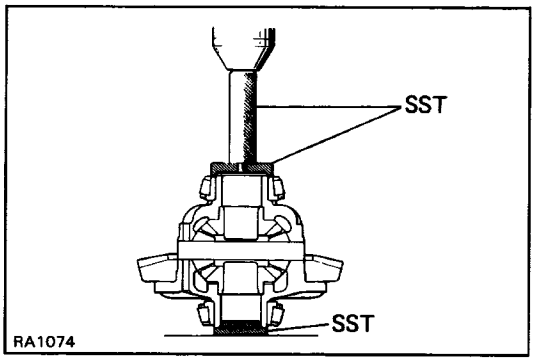
(a) Clean the contact surfaces of the differential case and ring gear.
(b) Heat the ring gear in boiling water.
(c) After the moisture on the ring gear has completely evaporated, quickly install the ring gear to the differ–ential case.



(d) Align the matchmarks on the ring gear and differen–tial case.
(e) Coat the ring gear set bolts with gear oil.
(f) Temporarily install the lock plates and 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)

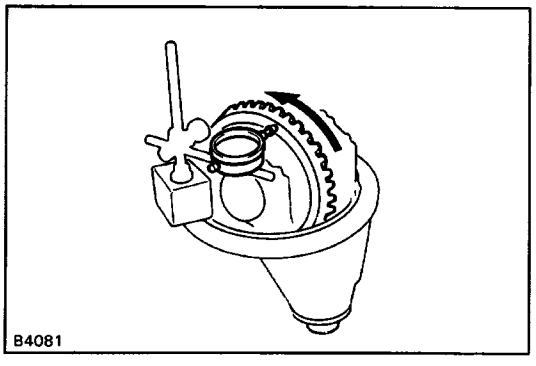


(h) Using a hammer and drift punch, stake the lock plates.
HINT: Stake one claw flush with the flat surface of the bolt. For the claw contacting the protruding por-tion of the bolt, stake only the half on the tightening side.



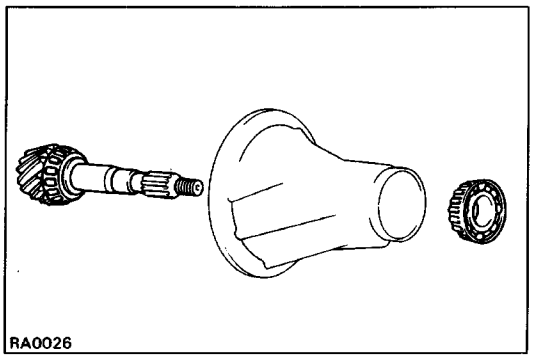
2. INSTALL SIDE BEARINGS

Using a press and SST, press the side bearings on the dif–ferential case.
SST 09550–10012
(09252–10010, 09557–10010, 09558–10010)



3. CHECK RING GEAR RUNOUT

(a) Install the differential case onto the carrier and tighten the adjusting nut just to where there is no play in the bearings.
(b) Check the ring gear runout.
Maximum runout:
7.5 in. 0.07 mm (0.0028 in.)
8 in. 0.10 mm (0.0039 in.)

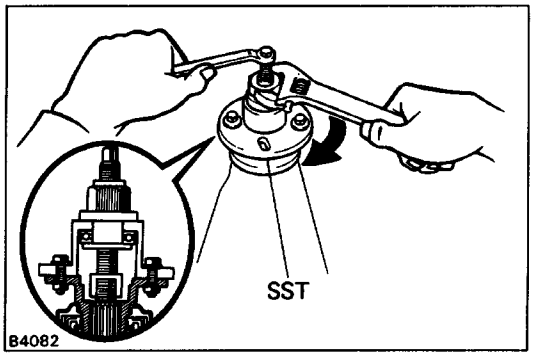


4. TEMPORARILY ADJUST DRIVE PINION PRELOAD

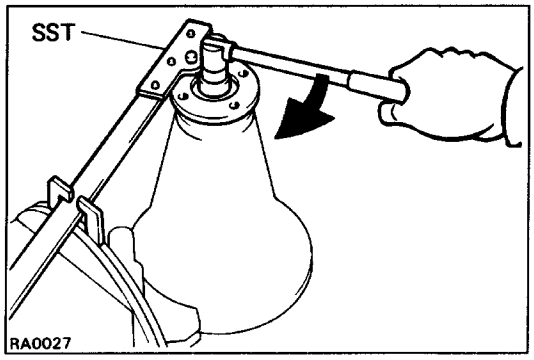
(a) Install the following parts.

- Drive pinion
- Front bearing

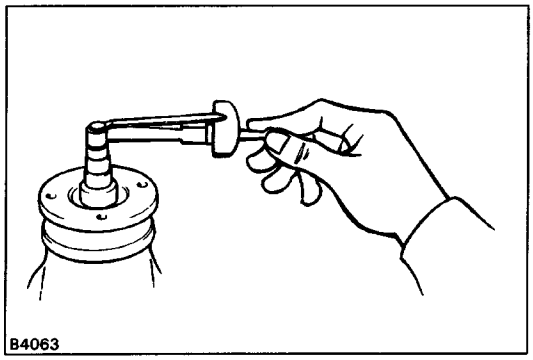
HINT: Assemble the spacer, oil slinger and oil seal after adjusting the gear contact pattern.



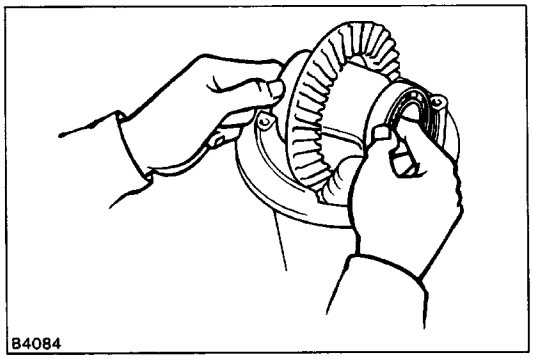
(b) Install the companion flange with SST.
SST 09557–22022
(7.5 in. 09557–22030)
(8 in. 09557–22050)



(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 meter, measure the preload.
Preload (starting):
New bearing
7.5 in.
1.2 – 1.9 N –m
(12 – 19 kgf–cm, 10.4 – 16.5 in. –lbf)
8 in.
(2 pinion type)
1.9 – 2.5 N–m
(19 – 25 kgf–cm, 16.5 – 22.6 in. –lbf)
(4 pinion type)
1.0 – 1.6 W
(10 – 16 kgf–cm, 8.7 – 13.9in. –lbf)
Reused bearing
7.5 in.
0.6 – 1.0 N–m
(6 – 10 kgf–cm, 5.2 – 8.7 in. –lbf)
8 in.
(2 pinion type)
0.9 – 1.3 N –m
(9 – 13 kgf– cm, 7.8 – 11.3 in.–lbf)
(4 pinion type)
0.5 – 0.8 N–
(5 – 8 kgf –cm, 4.3 – 6.9 in. –lbf)

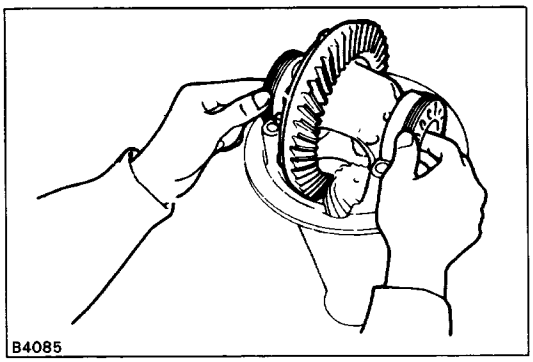


5. INSTALL DIFFERENTIAL CASE IN CARRIER

(a) Place the bearing outer races on their respective bearings. Make sure the left and right outer races are not interchanged.

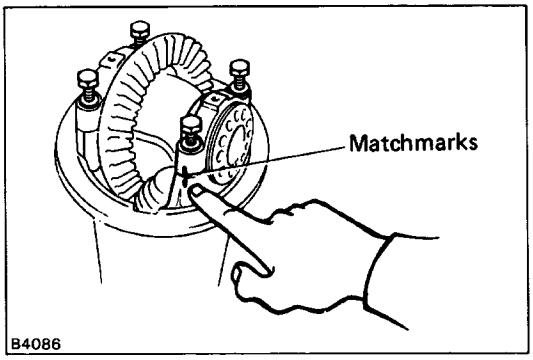
(b) Install the case in the carrier.

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



6. INSTALL ADJUSTING NUTS

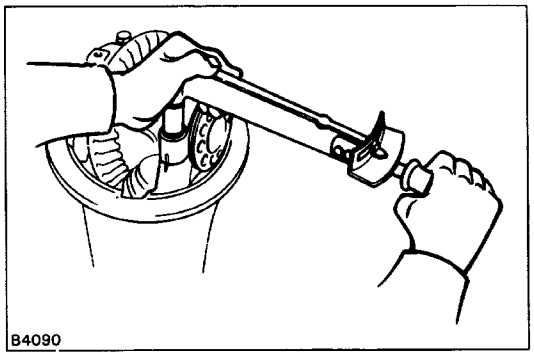
Install the adjusting nuts on the carrier, making sure the nuts are threaded properly.



7. INSTALL BEARING CAPS

Align the matchmarks on the cap and carrier. Screw in the two bearing cap bolts two or three 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.

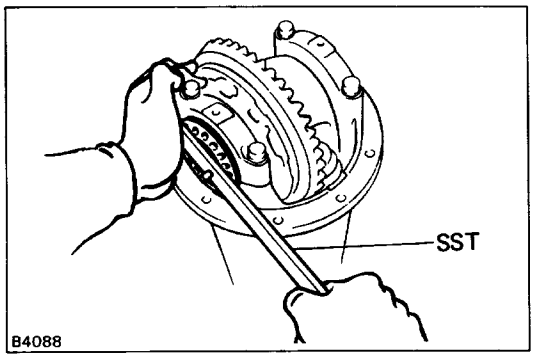


8. ADJUST SIDE BEARING PRELOAD

(a) Tighten the four bearing cap bolts to the specified torque, then loosen them to the point where they can be turned by hand.

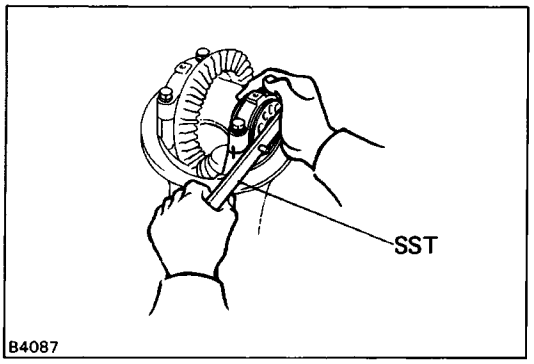
Torque: 78 N–m (800 kgf–cm, 58 ft–lbf)

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

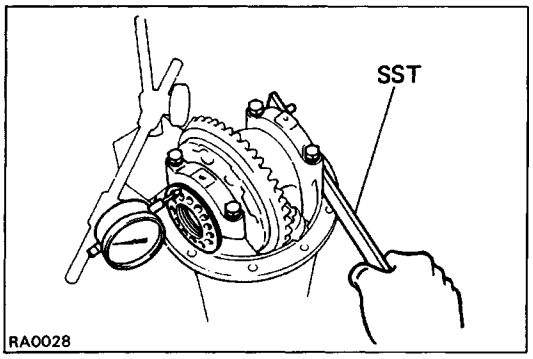


(c) Using SST, tighten the adjusting nut on the ring gear side until the ring gear has a backlash of about 0.2 mm (0.008 in.)

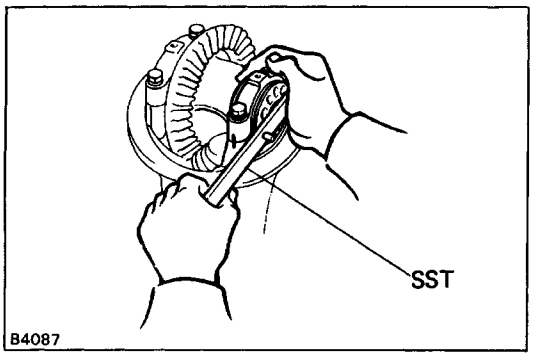
SST 09 504–00011



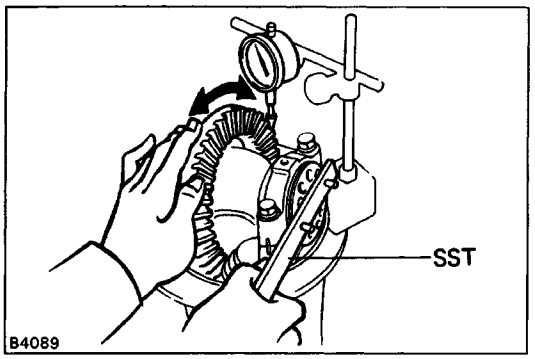
(d) While turning the ring gear, use SST to fully tighten the adjusting nut on the drive pinion side. After the bearings are settled, loosen the adjusting nut on the drive pinion side.
SST 09504–00011



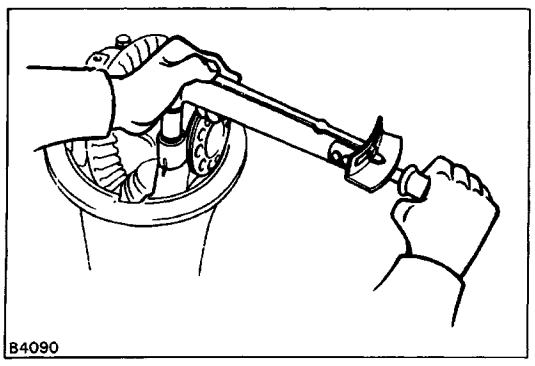
(e) Place a dial indicator on the top of the adjusting nut on the ring gear side.
(f) Adjust the side bearing for zero preload by tighten–ing the other adjusting nut until the pointer on the in–dicator begins to move.



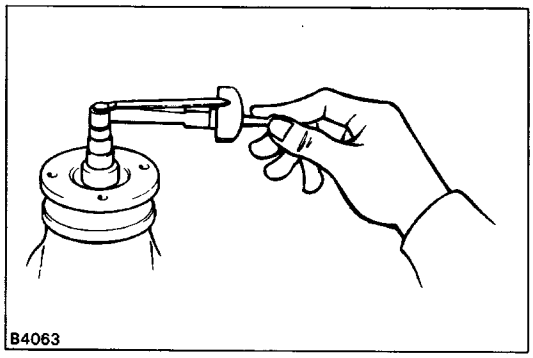
(g) Tighten the adjusting nut 1 – 1’I2 notches from the zero preload position.



(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 equal amounts. For example, loosen the nut on the left side one notch and tighten 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.)


B4063

(k) Using a torque meter, measure the total preload.

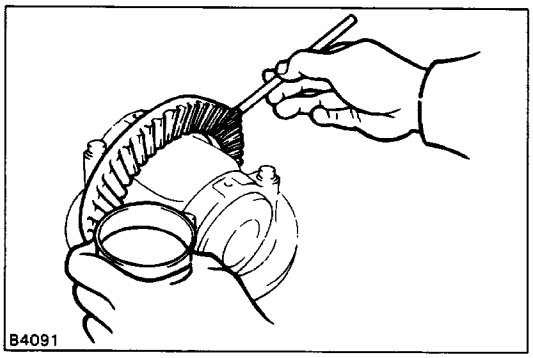
Total preload (starting):

Add drive pinion preload

0.4 – 0.6 N–m

(4 – 6 kgf –cm, 3.5 – 5.2 in.–lbf)

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

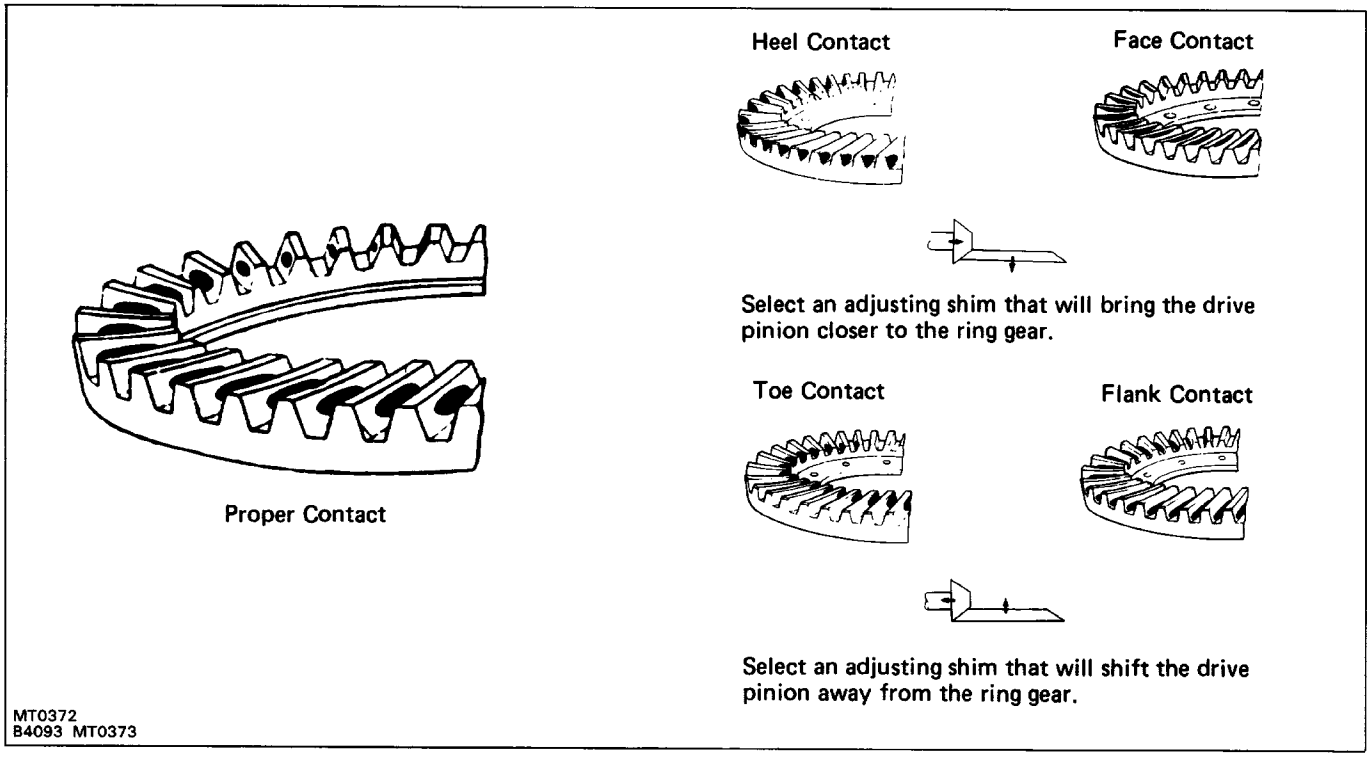

B4091

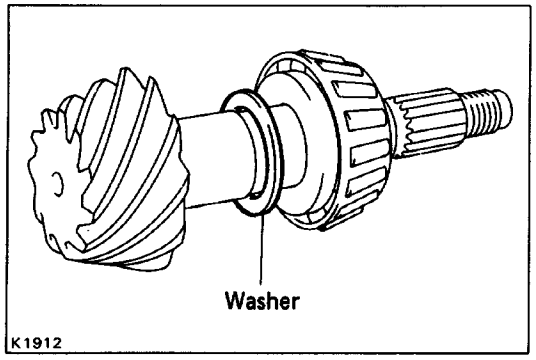
9. INSPECT TOOTH CONTACT BETWEEN RING GEAR AND DRIVE PINION

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

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

(c) Inspect the tooth pattern.

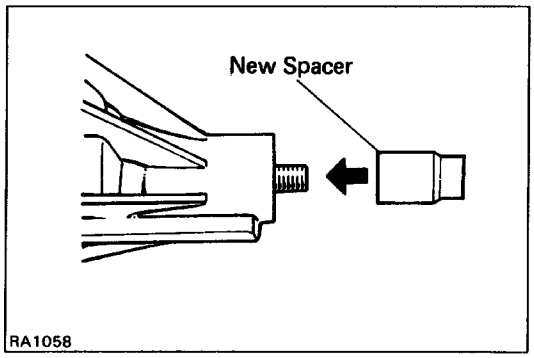




If the teeth are not contacting properly, use the following chart to select a proper washer for correction.

Washer thickness

7.5 in.		8 in.	
Thickness	mm (in.)	Thickness	mm (in.)
2.24	(0.0882)	1.70	(0.0669)
2.27	(0.0894)	1.73	(0.0681)
2.30	(0.0906)	1.76	(0.0693)
2.33	(0.0917)	1.79	(0.0705)
2.36	(0.0929)	1.82	(0.0717)
2.39	(0.0941)	1.85	(0.0728)
2.42	(0.0953)	1.88	(0.0740)
2.45	(0.0965)	1.91	(0.0752)
2.48	(0.0976)	1.94	(0.0764)
2.51	(0.0988)	1.97	(0.0776)
2.54	(0.1000)	2.00	(0.0787)
2.57	(0.1012)	2.03	(0.0799)
2.60	(0.1024)	2.06	(0.0811)
2.63	(0.1035)	2.09	(0.0823)
2.66	(0.1047)	2.12	(0.0835)
2.69	(0.1059)	2.15	(0.0846)
2.72	(0.1071)	2.18	(0.0858)
		2.21	(0.0870)
		2.24	(0.0882)
		2.27	(0.0894)
		2.30	(0.0906)
		2.33	(0.0917)



10. REMOVE COMPANION FLANGE

(See step 7 on page SA–138)

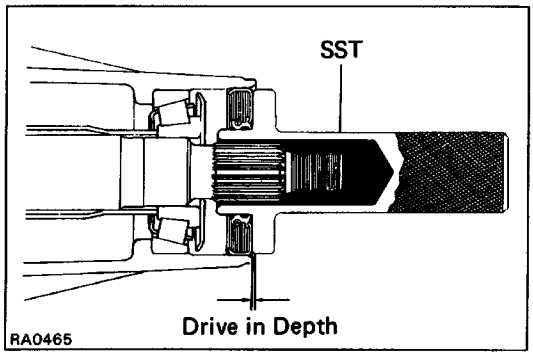
11 REMOVE FRONT BEARING

(See step 9 on page SA–138)

12. INSTALL NEW BEARING SPACER AND FRONT BEARING

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

(b) Install the front bearing on the shaft.



13. INSTALL OIL SLINGER AND NEW OIL SEAL

(a) Install the oil slinger facing as shown.

(b) Using SST, drive in a new oil seal as shown.

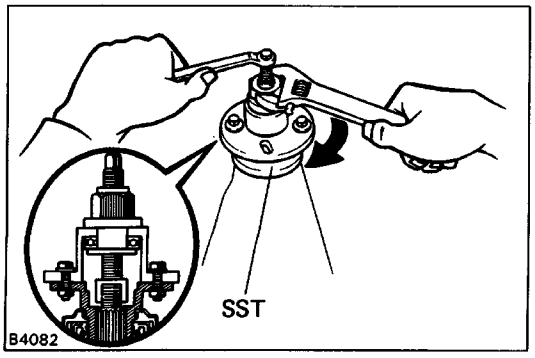
SST 09554–30011

Oil seal drive in depth:

7.5 in. 1.5 mm (0.059 in.)

8 in. 1.0 mm (0.039 in.)

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



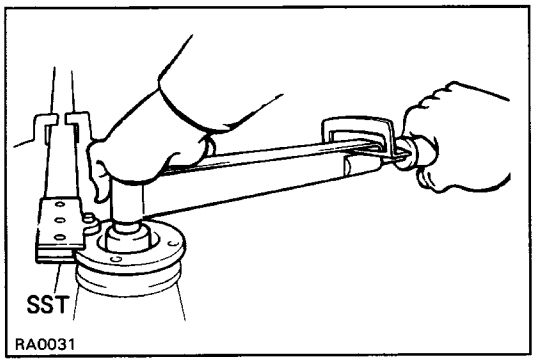
14. INSTALL COMPANION FLANGE

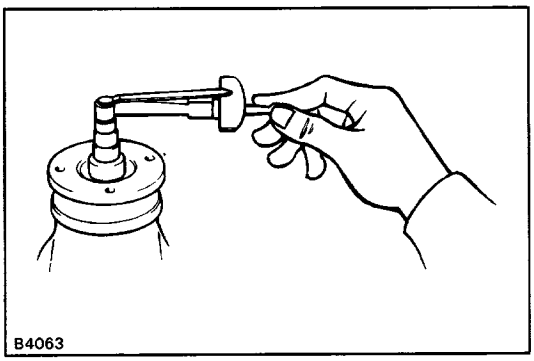
(a) Install the companion flange with SST.

SST 09557–22022

(7.5 in. 09557–22030)

(8 in. 09557–22050)





(b) Coat the threads of a new nut with MP grease.

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

SST 09330–00021

Torque:

7.5 in.

108 N–m (1,100 kgf–cm, 80 ft–lbf)

8 in.

196 N–m (2,000 kgf–cm, 145 ft–lbf)

15. ADJUST DRIVE PINION PRELOAD

Using a torque meter, measure the preload of the back–lash between the drive pinion and ring gear.

Preload (starting):

New bearing

7.5 in.

1.2 – 1.9 N–m

(12 – 19 kgf–cm, 10.4 – 16.5 in.–lbf)

8 in.

(2 pinion type)

1.9 – 2.5 N–m

(19 – 26 kgf–cm, 16.5 – 22.6–lbf)

(4 pinion type)

1.0 – 1.6 N–m

(10 – 16 kgf–cm, 8.7 – 13.9 in.–lbf)

Reused bearing

7.5 in.

0.6 – 1.0 N–m

(6 – 10 kgf–cm, 5.2 – 8.7 in.–lbf)

8 in.

(2 pinion type)

0.9 – 1.3 N–m

(9 – 13 kgf–cm, 7.8 – 11.3 in.–lbf)

(4 pinion type)

0.5 – 0.8 N–m

(5 – 8 kgf –cm, 4.3 – 6.9 in.–lbf)

(a) If preload is greater than specification, replace the bearing spacer.

(b) If preload is less than specification, retighten the nut 13 N–m (130 kgf–cm, 9 ft–lbf) a little at a time until the specified preload is reached.

Maximum torque:

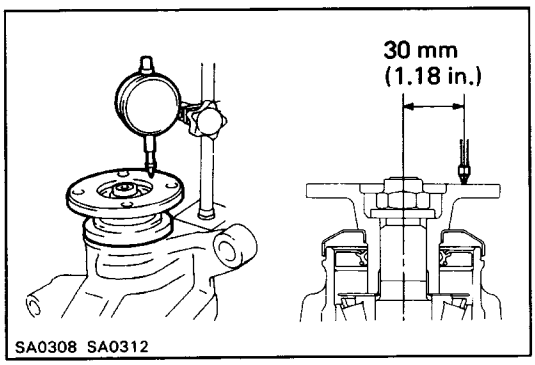
7.5 in.

235 N–m (2,400 kgf–cm, 174 ft–lbf)

8 in.

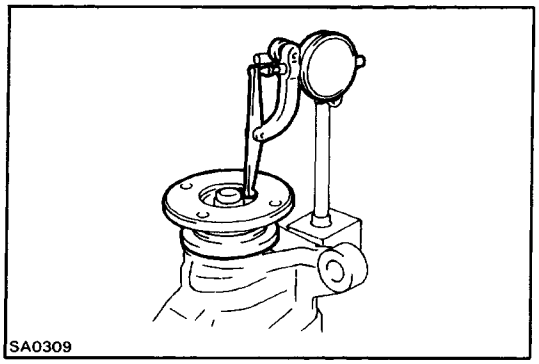
343 N–m (3,500 kgf–cm, 253 ft–lbf)

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

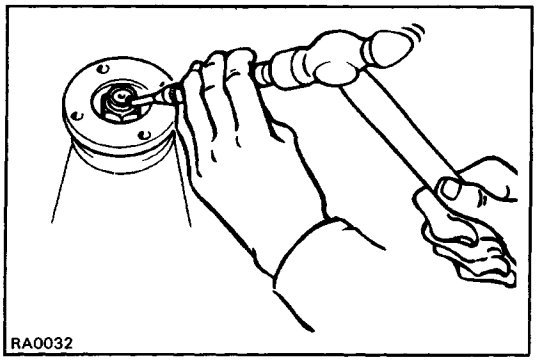


16. CHECK RUNOUT OF COMPANION FLANGE

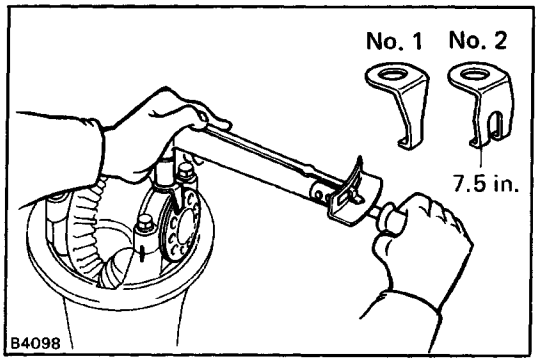
Maximum vertical runout: 0.10 mm (0.0039 in.)



Maximum lateral runout: 0.10 mm (0.0039 in.)



17. STAKE DRIVE PINION NUT



18. INSTALL ADJUSTING NUT LOCKS

(a) (7.5 in.)

Select either a lock No. 1 or No. 2, whichever will fit the adjusting nuts.

(b) Install the lock on the bearing caps.

Torque: 13 N–m (130 kgf–cm, 9 ft–lbf)

INSTALLATION OF DIFFERENTIAL

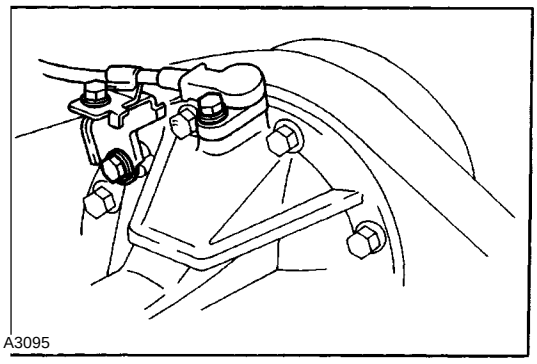
(See page SA–134)

1. INSTALL A NEW GASKET

2. INSTALL DIFFERENTIAL CARRIER ASSEMBLY

Install the differential carrier assembly in the axle and install the 10 nuts. Torque the nuts.

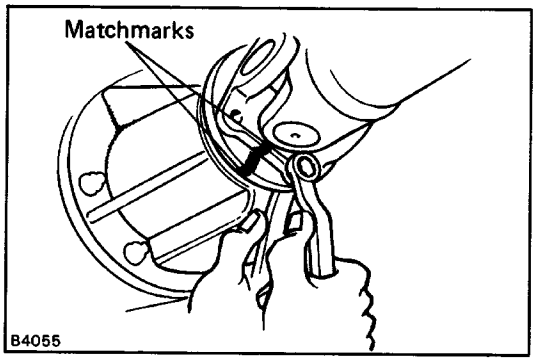
Torque: Single tire 25 N–m (250 kgf–cm, 18 ft–lbf)
Double tire 31 N–m (315 kgf–cm, 23 ft–lbf)

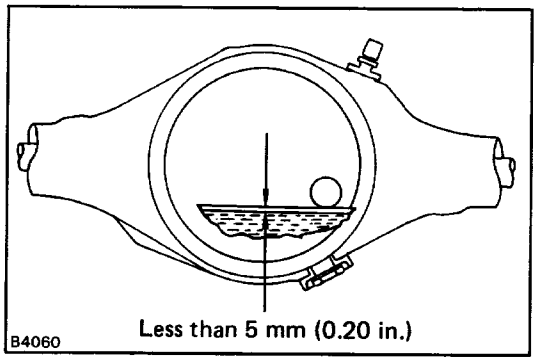


3. (w/ REAR–WHEEL ANTI–LOCK BRAKE SYSTEM) CONNECT SPEED SENSOR

Connect the speed sensor with the two bolts.

Torque: 19 N–m (195 kgf–cm, 14 ft–lbf)





4. CONNECT PROPELLER SHAFT FLANGE TO COMPANION FLANGE

(a) Align the matchmarks on the flanges and connect the flanges with four bolts and nuts.

(b) Torque the bolts and nuts.

Torque: 4WD 3VZ–E [MT]
76 N–m (780 kgf–cm, 56 ft–lbf)
Ex. 4WD 3VZ–E [MT]
74 N–m (750 kgf–cm, 54 ft–lbf)

5. INSTALL DRAIN PLUG AND FILL DIFFERENTIAL WITH GEAR OIL

Oil type: APL GL–5 hypoid gear oil
Viscosity: Above – 180C (0°F) SAE 90
Below – 180C (0° F)
SAE 80w or 80W–90

Capacity:

liters (US qts, Imp. qts)

2W D	7.5 in.	2 pinion	1.35 (1.43, 1.19)
	8 in.	2 pinion	1.8 (1.9, 1.6)
		4 pinion	2.2 (2.3, 1.9)
4WD	8 in.	2 pinion	2.2 (2.3, 1.9)
		4 pinion	2.2 (2.3, 1.9)

Torque the filler plug.

Torque: 49 N–m (500 kgf–cm, 36 ft–lbf)