

DIFFERENTIALS

DI

	Page
1. General Description	2
2. Differential Gear Oil	19
3. Front Differential Assembly	21
4. Rear Differential (T-type)	22
5. Rear Differential (VA-type)	42
6. Rear Differential Front Oil Seal	58
7. Rear Differential Side Oil Seal	60
8. Rear Differential Front Member	61
9. Rear Differential Mount Bushing	62
10. Rear Differential Inspection Mode	66
11. General Diagnostic Table	68

General Description

DIFFERENTIALS

1. General Description

A: SPECIFICATION

1. REAR DIFFERENTIAL

When replacing a rear differential assembly, select the correct one according to the following table.

NOTE:

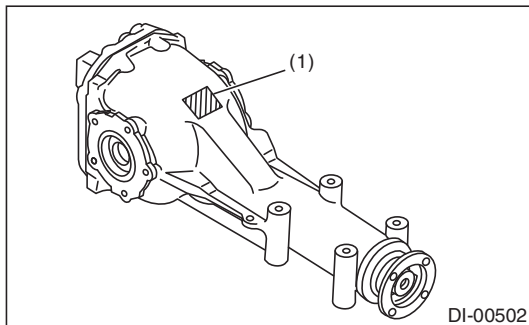
- Using a different rear differential assembly will cause the drive train and tires to drag or emit abnormal noise.
- For option code, refer to "ID" section. <Ref. to ID-2, IDENTIFICATION, Identification.>

Model	2.5 L non-turbo		2.0 L turbo
	CVT	6MT	CVT
Rear differential type	VA1-type	T-type	T-type
Identification	XD	B4	X1
LSD type	—		
Type of gear	Hypoid gear		
Gear ratio (number of gear teeth)	3.700 (37/10)	4.444 (40/9)	4.111 (37/9)
Oil capacity	0.8 L (0.8 US qt, 0.7 Imp qt)		
Rear differential gear oil	GL-5		

2. IDENTIFICATION

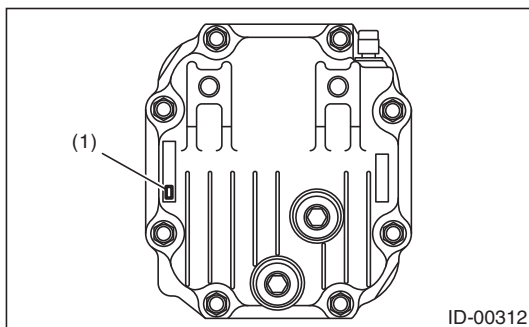
Identification positions are shown in the following figures. For details concerning identification, refer to the "ID" section.

- T-type



(1) Identification

- VA1-type



(1) Identification

General Description

DIFFERENTIALS

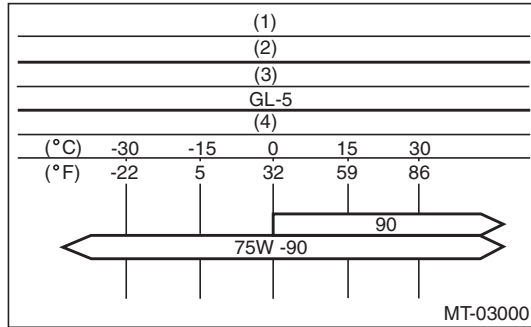
3. REAR DIFFERENTIAL GEAR OIL

Recommended gear oil:

GL-5 (75W-90) or equivalent

CAUTION:

Each oil manufacturer has its base oil and additives. Thus, do not mix two or more brands.



- (1) Item
- (2) Rear differential gear oil
- (3) API classification
- (4) SAE viscosity No. and applicable temperature

4. SERVICE DATA

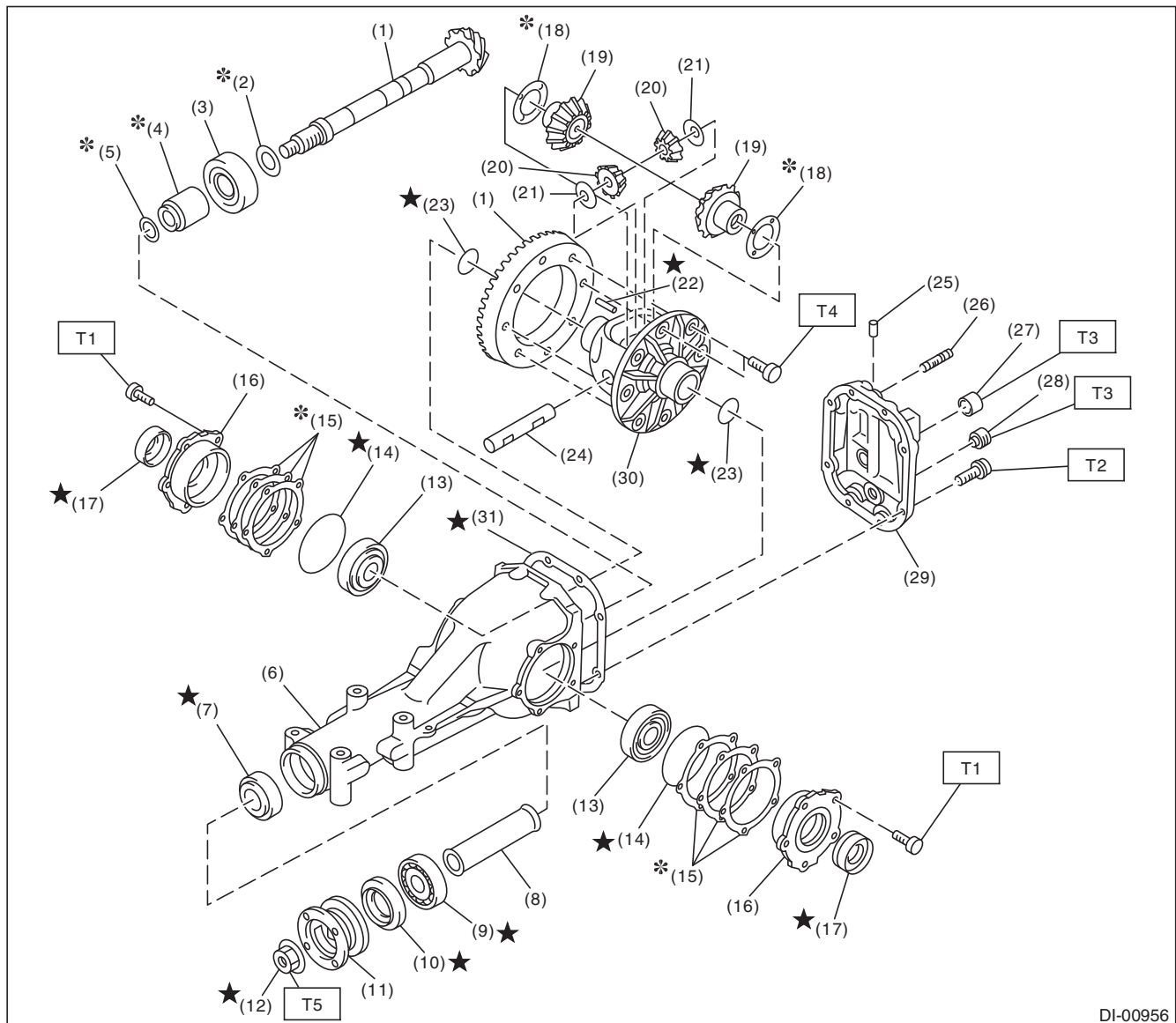
Drive pinion bearing preload (for new bearing)	Measured with spring measurement (measured from the companion flange bolt)	N (kgf, lbf)	T-type	18.1 — 38.8 (1.8 — 4.0, 4.1 — 8.7)
			VA1-type	12.7 — 32.2 (1.3 — 3.3, 2.9 — 7.2)
	Measured with torque wrench	N·m (kgf-m, ft-lb)	T-type	0.69 — 1.47 (0.07 — 0.15, 0.51 — 1.08)
			VA1-type	0.48 — 1.22 (0.05 — 0.12, 0.35 — 0.90)
Side gear backlash		mm (in)	T-type	0.10 — 0.20 (0.004 — 0.008)
			VA1-type	0.05 — 0.15 (0.002 — 0.006)
Hypoid driven gear backlash		mm (in)	T-type	0.10 — 0.20 (0.004 — 0.008)
			VA1-type	0.10 — 0.15 (0.004 — 0.006)
Hypoid driven gear runout on its back surface		mm (in)	T-type	0.05 (0.002)
Total preload (measured from the companion flange bolt hole)		N (kgf, lbf)	T-type	20.7 — 54.4 (2.1 — 5.5, 4.7 — 12.2)
Companion flange mating surface runout		mm (in)		0.08 (0.003)
Companion flange runout on its inner side		mm (in)		0.08 (0.003)

General Description

DIFFERENTIALS

B: COMPONENT

1. REAR DIFFERENTIAL (T-TYPE)



DI-00956

- | | | |
|---|------------------------------|------------------------|
| (1) Hypoid driven gear and drive pinion set | (14) O-ring | (27) Filler plug |
| (2) Pinion height adjusting washer | (15) Side retainer shim | (28) Drain plug |
| (3) Rear bearing | (16) Side retainer | (29) Rear cover |
| (4) Preload adjusting spacer | (17) Side oil seal | (30) Differential case |
| (5) Preload adjusting washer | (18) Side gear thrust washer | (31) Gasket |
| (6) Differential carrier | (19) Side gear | |
| (7) Front bearing | (20) Pinion mate gear | |
| (8) Spacer | (21) Pinion mate gear washer | |
| (9) Pilot bearing | (22) Pinion shaft lock pin | |
| (10) Front oil seal | (23) Snap ring | |
| (11) Companion flange | (24) Pinion mate shaft | |
| (12) Self-locking nut | (25) Air breather cap | |
| (13) Side bearing | (26) Stud bolt | |

Tightening torque: N·m (kgf-m, ft-lb)

T1: 10.5 (1.1, 7.7)

T2: 29.5 (3.0, 21.8)

T3: 49 (5.0, 36.1)

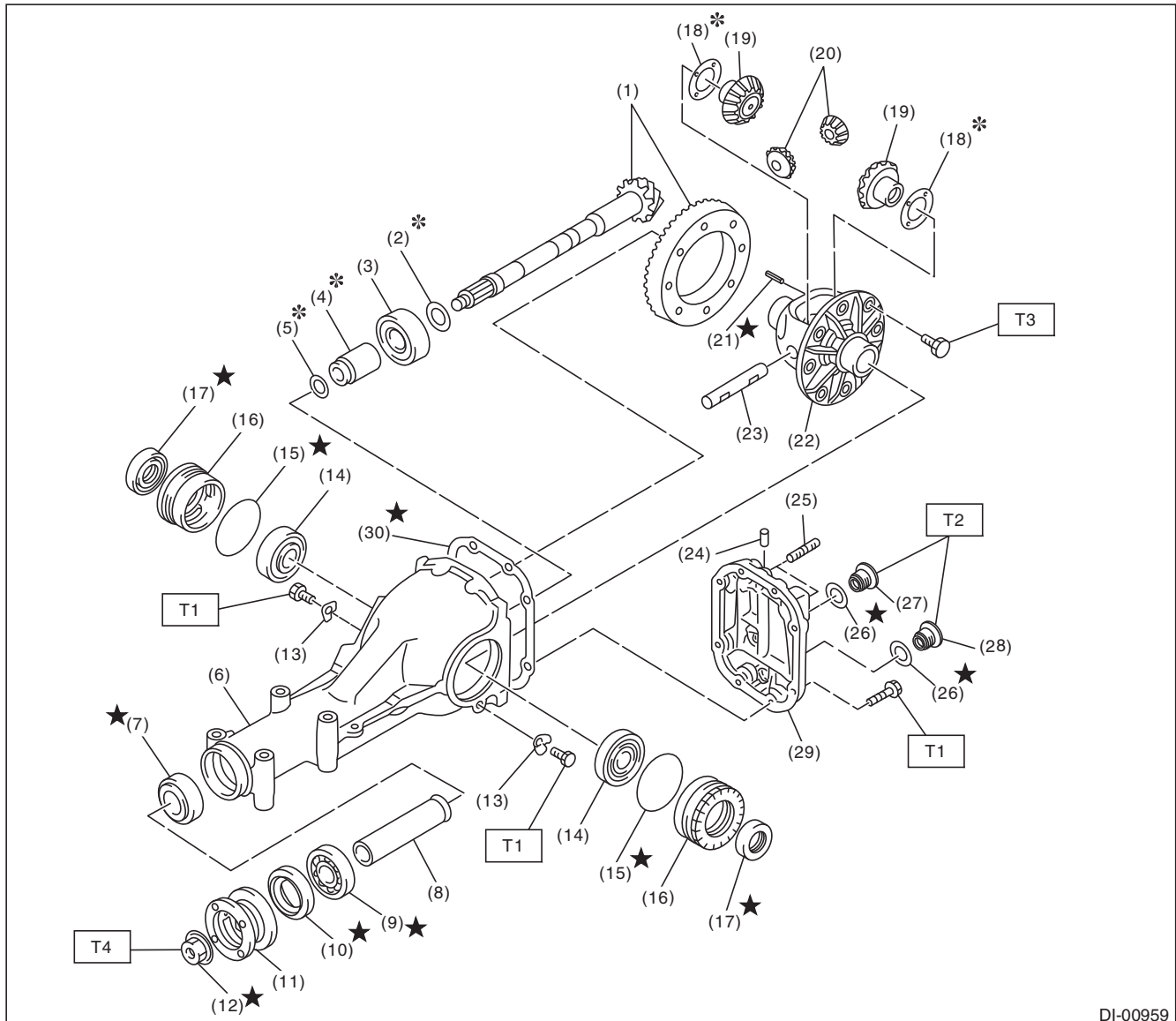
T4: 103 (10.5, 76.0)

T5: 181.5 (18.5, 133.9)

General Description

DIFFERENTIALS

2. REAR DIFFERENTIAL (VA1-TYPE)



DI-00959

- | | | |
|---|------------------------------|------------------|
| (1) Hypoid driven gear and drive pinion set | (13) Lock plate | (25) Stud bolt |
| (2) Pinion height adjusting washer | (14) Side bearing | (26) Gasket |
| (3) Rear bearing | (15) O-ring | (27) Filler plug |
| (4) Preload adjusting spacer | (16) Side retainer | (28) Drain plug |
| (5) Preload adjusting washer | (17) Side oil seal | (29) Rear cover |
| (6) Differential carrier | (18) Side gear thrust washer | (30) Gasket |
| (7) Front bearing | (19) Side gear | |
| (8) Spacer | (20) Pinion mate gear | |
| (9) Pilot bearing | (21) Spring pin | |
| (10) Front oil seal | (22) Differential case | |
| (11) Companion flange | (23) Pinion mate shaft | |
| (12) Self-locking nut | (24) Air breather cap | |

Tightening torque: N·m (kgf-m, ft-lb)

T1: 25 (2.5, 18.4)

T2: 50 (5.1, 36.9)

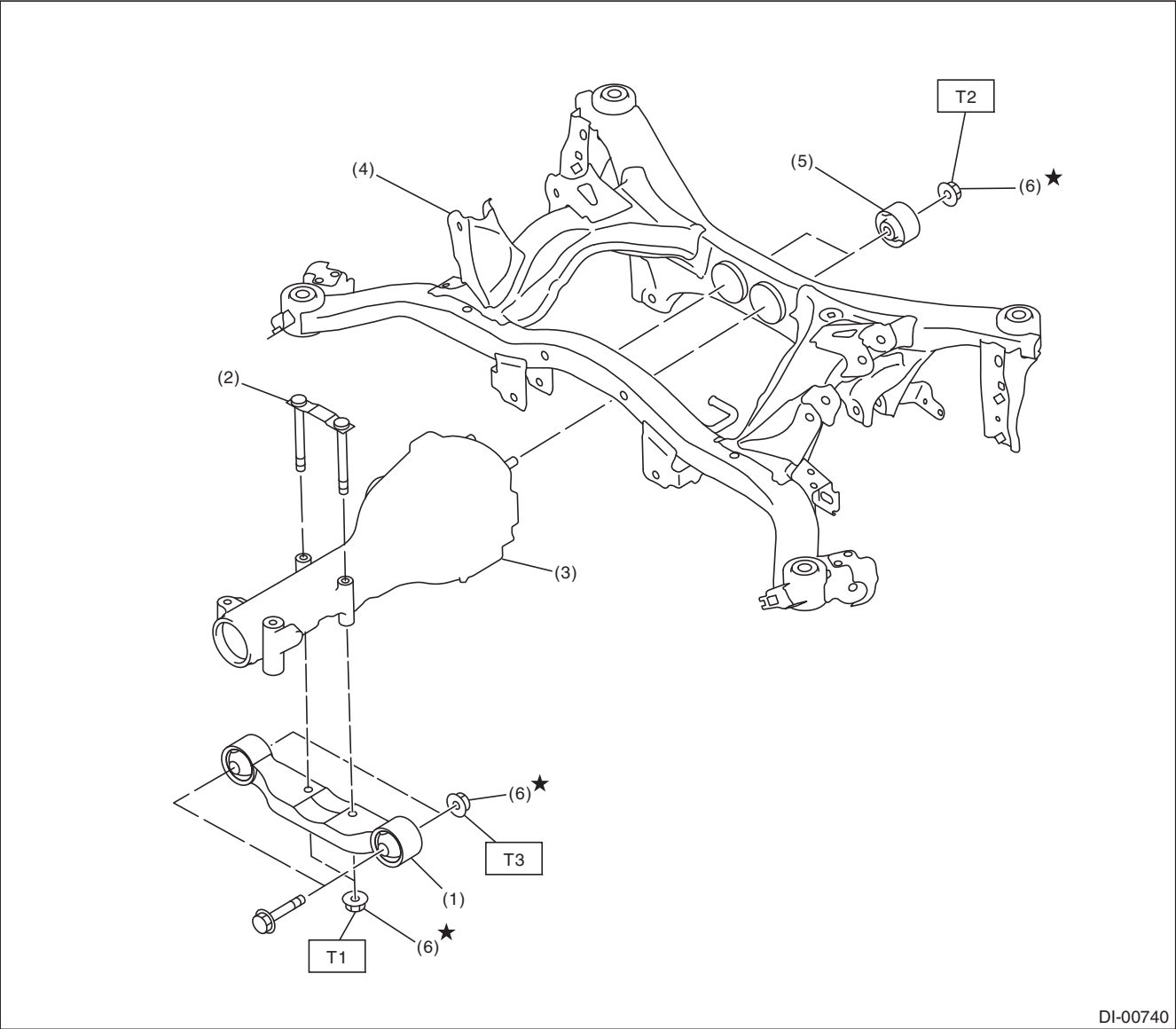
T3: <Ref. to DI-45, ASSEMBLY, Rear Differential (VA-type).>

T4: 191 (19.5, 140.9)

General Description

DIFFERENTIALS

3. REAR DIFFERENTIAL MOUNTING SYSTEM



DI-00740

- | | |
|------------------------------------|-------------------------------------|
| (1) Rear differential front member | (4) Rear sub frame |
| (2) Rear differential member plate | (5) Rear differential mount bushing |
| (3) Rear differential ASSY | (6) Self-locking nut |

Tightening torque: N-m (kgf-m, ft-lb)
T1: 50 (5.1, 36.9)
T2: 70 (7.1, 51.6)
T3: 110 (11.2, 81.1)

General Description

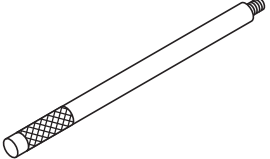
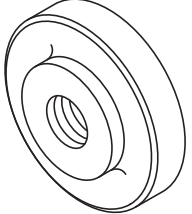
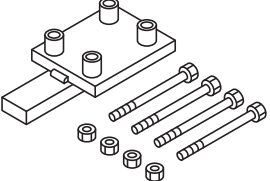
DIFFERENTIALS

C: CAUTION

- Wear appropriate work clothing, including a cap, protective goggles and protective shoes when performing any work.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust and dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly and replacement.
- Vehicle components are extremely hot after driving. Be wary of receiving burns from heated parts.
- Use SUBARU genuine gear oil, grease or equivalent. Do not mix gear oil, grease, etc. of different grades or manufacturers.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or rigid racks at the specified points.
- Apply gear oil onto sliding or revolving surfaces before installation.
- Before installing the O-ring or snap ring, apply a sufficient amount of gear oil to avoid damage and deformation.
- Before securing a part on a vise, place cushioning material such as wood blocks, aluminum plate, or cloth between the part and the vise.
- Avoid damaging the mating surface of the case.

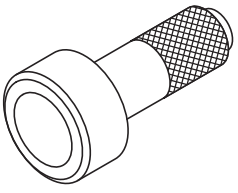
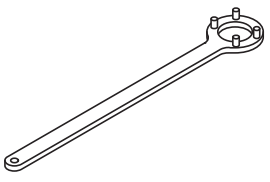
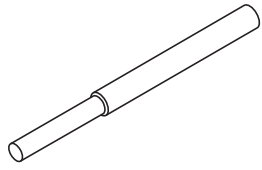
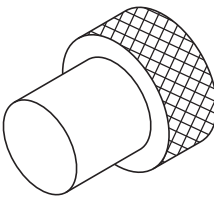
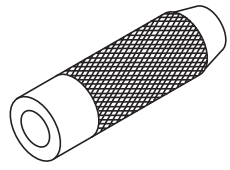
D: PREPARATION TOOL

1. SPECIAL TOOL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-398477701	398477701	HANDLE	• Used for installing the rear bearing race. • Used for installing the front bearing race.
 ST-398477702	398477702	DRIFT	• Used for installing the front bearing race. (T-type) • Used for installing the rear bearing race. (VA1-type) • Used for installing side bearing race. (VA1-type)
 ST-398217700	398217700	ATTACHMENT SET	Stand for rear differential carrier disassembly and assembly.

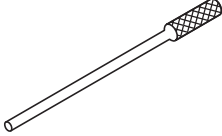
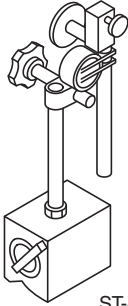
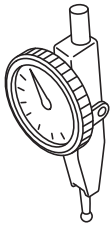
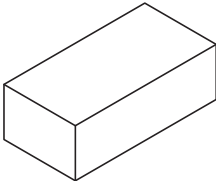
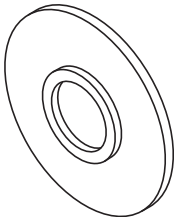
General Description

DIFFERENTIALS

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-498447120	498447120	INSTALLER	Used for installing the front oil seal.
 ST-498427200	498427200	FLANGE WRENCH	Used for stopping rotation of companion flange when removing and tightening self-lock nut.
 ST-398467700	398467700	DRIFT	Used for removing drive pinion shaft, pilot bearing and front bearing cone.
 ST-399780104	399780104	WEIGHT	• Used for installing the front bearing cone and the companion flange. • Used for installing the pilot bearing.
 ST-899580100	899580100	INSTALLER	Used for installing the front bearing cone and the pilot bearing.

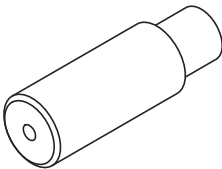
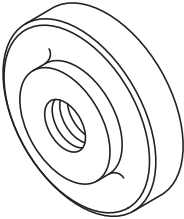
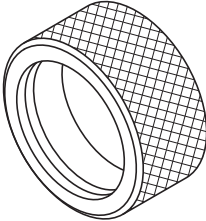
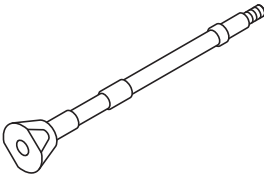
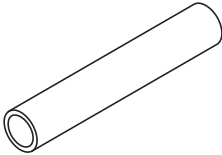
General Description

DIFFERENTIALS

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-899904100	899904100	STRAIGHT PIN REMOVER	- Used for removing and installing the pinion mate shaft lock pin. (T-type) - Used for removing and installing the pinion mate shaft spring pin. (VA1-type)
 ST-498247001	498247001	MAGNET BASE	- Used for measuring backlash between side gear and pinion, and hypoid gear. - Used together with DIAL GAUGE (498247100).
 ST-498247100	498247100	DIAL GAUGE	- Used for measuring backlash between side gear and pinion, and hypoid gear. - Used together with MAGNET BASE (498247001).
 ST-398507704	398507704	BLOCK	Used for adjusting pinion height and preload.
 ST-398177700	398177700	INSTALLER	Used for installing the rear bearing cone. (T-type)

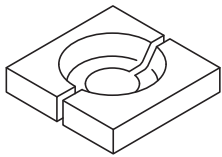
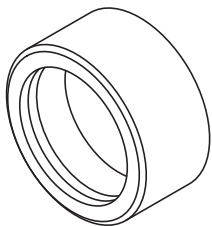
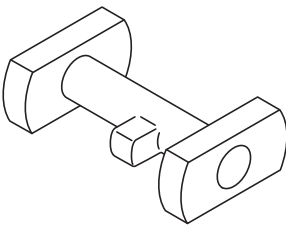
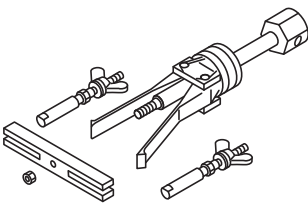
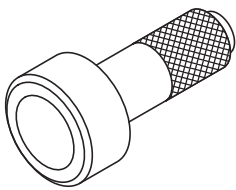
General Description

DIFFERENTIALS

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-398457700	398457700	ATTACHMENT	Used for removing the side retainer. (T-type)
 ST-398477703	398477703	DRIFT 2	Used for installing the rear bearing race. (T-type)
 ST-398437700	398437700	DRIFT	Used for installing the side oil seal. (T-type)
 ST-398507702	398507702	DUMMY SHAFT	Used for adjusting pinion height and preload. (T-type)
 ST-398507703	398507703	DUMMY COLLAR	Used for adjusting pinion height and preload. (T-type)

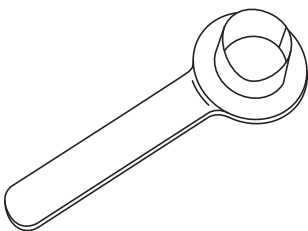
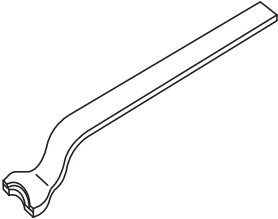
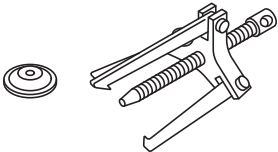
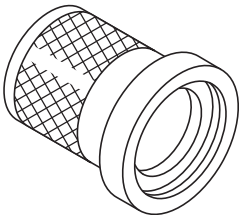
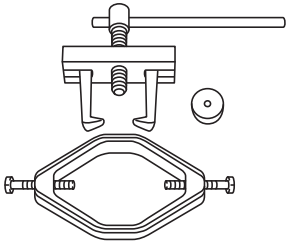
General Description

DIFFERENTIALS

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-398517700	398517700	REPLACER	Used for removing rear bearing cone. (T-type)
 ST-398487700	398487700	DRIFT	Used for installing side bearing cone. (T-type)
 ST-398507701	398507701	DIFFERENTIAL CARRIER GAUGE	Used for adjusting pinion height. (T-type)
 ST-398527700	398527700	PULLER ASSY	• Used for removing front oil seal. • Used for removing the side bearing race. (T-type) • Used for removing side oil seal.
 ST-398417700	398417700	DRIFT	Used for installing side bearing race. (T-type)

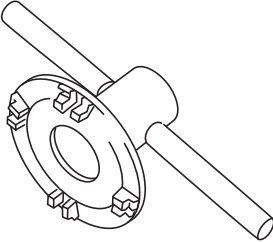
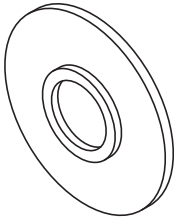
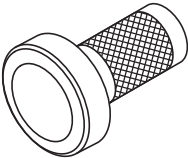
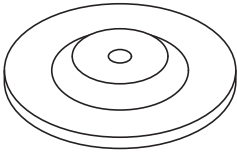
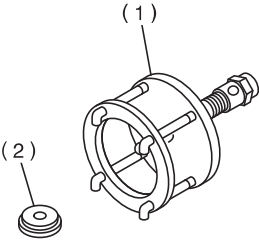
General Description

DIFFERENTIALS

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST28099PA090	28099PA090	OIL SEAL PROTECTOR	Used for installing the rear drive shaft to the rear differential. (For oil seal protection)
 ST28099PA100	28099PA100	DRIVE SHAFT REMOVER	Used for removing the rear drive shaft from rear differential. (T-type)
 ST-399703600	399703600	PULLER ASSY	Used for removing companion flange.
 ST-899874100	899874100	INSTALLER	Used for installing the companion flange.
 ST18759AA000	18759AA000	PULLER ASSY	Used for removing the side bearing cone. (T-type)

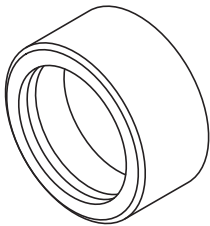
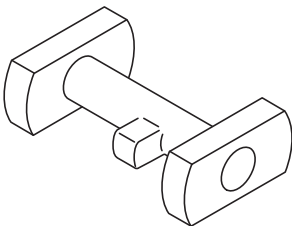
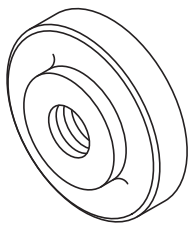
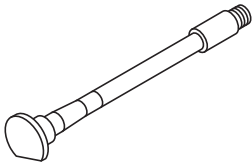
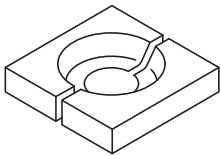
General Description

DIFFERENTIALS

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST18630AA010	18630AA010	WRENCH COMPL RETAINER	- Used for removing and installing the side retainer. (VA1-type) - WRENCH ASSY (499787000) can also be used.
 ST-498175500	498175500	INSTALLER	Used for installing the rear bearing cone. (VA1-type)
 ST498447100	498447100	INSTALLER	Used for installing the side oil seal. (VA1-type)
 ST-399520105	399520105	SEAT	- Used for removing the side bearing cone. (VA1-type) - Used together with PULLER SET (899524100). (VA1-type)
 ST-899524100	899524100	PULLER SET	- Used for removing the side bearing cone. (VA1-type) - Used together with SEAT (399520105). (1) Puller (2) Cap

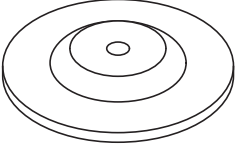
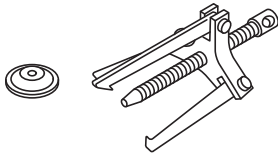
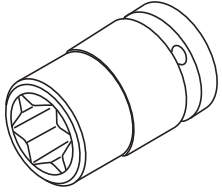
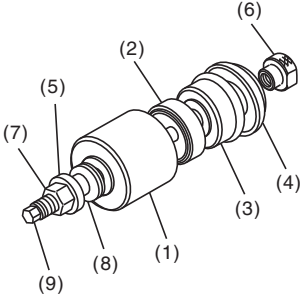
General Description

DIFFERENTIALS

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 ST-498485400	498485400	DRIFT	Used for installing side bearing cone. (VA1-type)
 ST-498505501	498505501	DIFFERENTIAL CARRIER GAUGE	Used for adjusting pinion height. (VA1-type)
 ST-498447110	498447110	DRIFT	Used for installing the front bearing race. (VA1-type)
 ST-498447150	498447150	DUMMY SHAFT	Used for adjusting pinion height and preload. (VA1-type)
 ST-498515500	498515500	REPLACER	Used for removing rear bearing cone. (VA1-type)

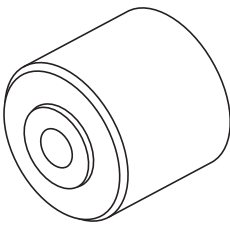
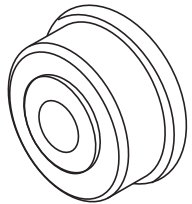
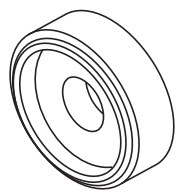
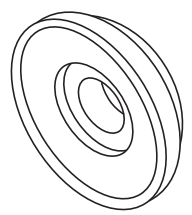
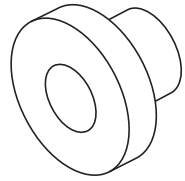
General Description

DIFFERENTIALS

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-499705404	499705404	SEAT	- Used for removing the side bearing race. (VA1-type) - Used together with PULLER ASSY (499705401).
 ST-499705401	499705401	PULLER ASSY	- Used for removing the side bearing race. (VA1-type) - Used together with SEAT (499705404).
 ST18270KA020	18270KA020	SOCKET (E20)	Used for removing and installing the hypoid driven gear. (VA1-type)
 ST41399FG001	41399FG001	SPECIAL TOOL ASSY	- Used for removing and installing the rear differential mount bushing. - Use (1), (3), (5), (6), (7), (8) and (9) for removal. - Use (2), (4), (5), (6), (7), (8) and (9) for installation. (1) SPECIAL TOOL A (41399FG010) (2) SPECIAL TOOL B (41399FG020) (3) SPECIAL TOOL C (41399FG031) (4) SPECIAL TOOL D (41399FG041) (5) SPECIAL TOOL SLEEVE (41399FG050) (6) SPECIAL TOOL RING (41399FG061) (7) SPECIAL TOOL NUT (41399FG070) (8) SPECIAL TOOL BEARING (41399FG080) (9) SPECIAL TOOL SHAFT (41399FG091)

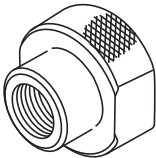
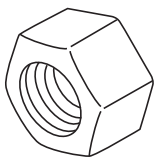
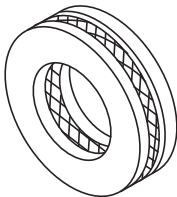
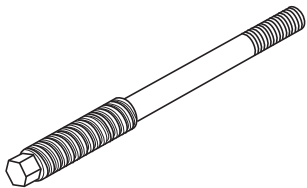
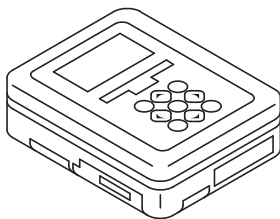
General Description

DIFFERENTIALS

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST41399FG010	41399FG010	SPECIAL TOOL A	- Used for removing the rear differential mount bushing. - For combination of tools for removal, refer to "SPECIAL TOOL ASSY (41399FG001)".
 ST41399FG020	41399FG020	SPECIAL TOOL B	- Used for installing the rear differential mount bushing. - For combination of tools for installation, refer to "SPECIAL TOOL ASSY (41399FG001)".
 ST41399FG031	41399FG031	SPECIAL TOOL C	- Used for removing the rear differential mount bushing. - For combination of tools for removal, refer to "SPECIAL TOOL ASSY (41399FG001)".
 ST41399FG041	41399FG041	SPECIAL TOOL D	- Used for installing the rear differential mount bushing. - For combination of tools for installation, refer to "SPECIAL TOOL ASSY (41399FG001)".
 ST41399FG050	41399FG050	SPECIAL TOOL SLEEVE	- Used for removing and installing the rear differential mount bushing. - For combination of tools for removal and installation, refer to "SPECIAL TOOL ASSY (41399FG001)".

General Description

DIFFERENTIALS

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST41399FG061	41399FG061	SPECIAL TOOL RING	- Used for removing and installing the rear differential mount bushing. - For combination of tools for removal and installation, refer to "SPECIAL TOOL ASSY (41399FG001)".
 ST41399FG070	41399FG070	SPECIAL TOOL NUT	- Used for removing and installing the rear differential mount bushing. - For combination of tools for removal and installation, refer to "SPECIAL TOOL ASSY (41399FG001)".
 ST41399FG080	41399FG080	SPECIAL TOOL BEARING	- Used for removing and installing the rear differential mount bushing. - For combination of tools for removal and installation, refer to "SPECIAL TOOL ASSY (41399FG001)".
 ST41399FG091	41399FG091	SPECIAL TOOL SHAFT	- Used for removing and installing the rear differential mount bushing. - For combination of tools for removal and installation, refer to "SPECIAL TOOL ASSY (41399FG001)".
 ST1B022XU0	1B022XU0	SUBARU SELECT MONITOR III KIT	Used for troubleshooting the electrical system.

General Description

DIFFERENTIALS

2. GENERAL TOOL

TOOL NAME	REMARKS
Transmission jack	Used for removing and installing the rear differential.
Puller	Used for removing the side bearing retainer.
Thickness gauge	Used for measuring clearance.
Hexagon wrench	Used for installing and removing the filler plug and drain plug.
Tire lever	Used for removing the rear drive shaft. (VA1-type)
Angle gauge	Used for installing the hypoid driven gear.

2. Differential Gear Oil

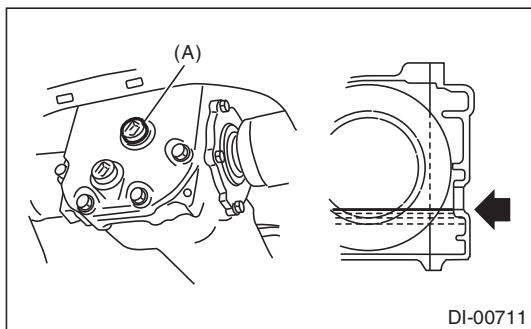
A: INSPECTION

- 1) Lift up the vehicle.
- 2) Remove the filler plug, and then check the gear oil. Replace the gear oil if it is contaminated, deteriorated or cloudy. <Ref. to DI-19, REPLACEMENT, Differential Gear Oil.>
- 3) Check that the gear oil level is within -5 mm (-0.2 in) from the bottom of the filler plug hole. If the level is low, make sure that there is no oil leakage and re-fill up to the bottom of filler plug hole.

NOTE:

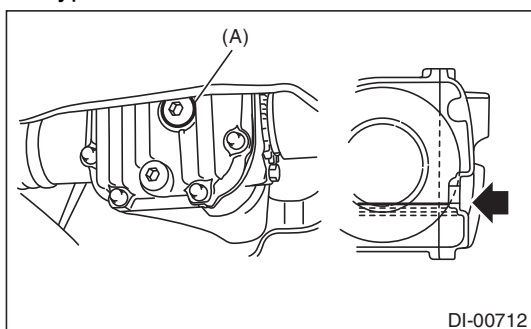
On VA1-types at factory settings, the oil level may be within -14 mm (-0.6 in) from the bottom of the filler plug. This is at normal level, requiring no oil re-fill.

- T-type



(A) Filler plug

- VA1-type



(A) Filler plug

- 4) Install the filler plug.

NOTE:

- For the T-type, apply liquid gasket to the filler plug.

Liquid gasket:

THREE BOND 1105 (Part No. 004403010) or equivalent

- For VA type, use a new gasket.

Tightening torque:

T-type:

49 N·m (5.0 kgf-m, 36.1 ft-lb)

VA-type:

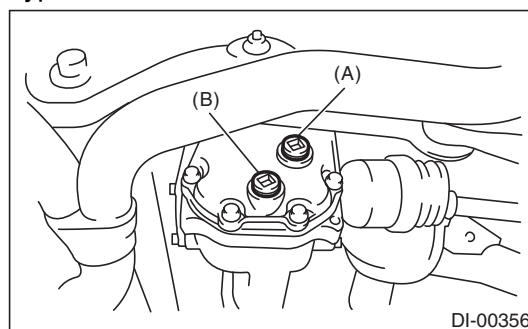
50 N·m (5.1 kgf-m, 36.9 ft-lb)

B: REPLACEMENT

CAUTION:

- Gear oil is extremely hot just after driving. Be wary of receiving burns.
- Be careful not to spill the differential gear oil on exhaust pipe. If gear oil is spilled, wipe it off completely.

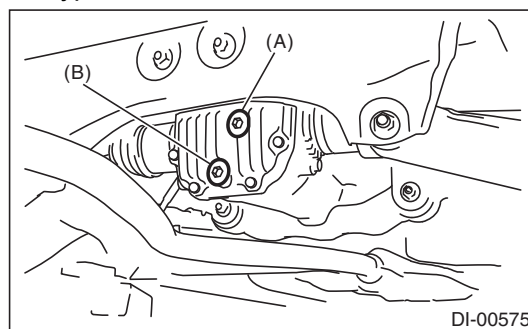
- 1) Lift up the vehicle.
 - 2) Remove the drain plug and filler plug, and drain the gear oil.
- T-type



(A) Filler plug

(B) Drain plug

- VA1-type



(A) Filler plug

(B) Drain plug

Differential Gear Oil

DIFFERENTIALS

3) Tighten the drain plug.

NOTE:

- For the T-type, apply liquid gasket to the drain plug.

Liquid gasket:

THREE BOND 1105 (Part No. 004403010) or equivalent

- For VA type, use a new gasket.

Tightening torque:

T-type

49 N·m (5.0 kgf-m, 36.1 ft-lb)

VA-type:

50 N·m (5.1 kgf-m, 36.9 ft-lb)

4) Fill the differential carrier with gear oil to the bottom of filler plug.

NOTE:

Carefully refill gear oil while watching the level. Excessive or insufficient oil must be avoided.

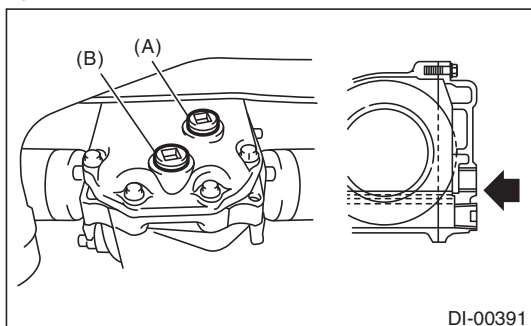
Recommended gear oil:

<Ref. to DI-2, SPECIFICATION, General Description.>

Oil capacity:

0.8 L (0.8 US qt, 0.7 Imp qt)

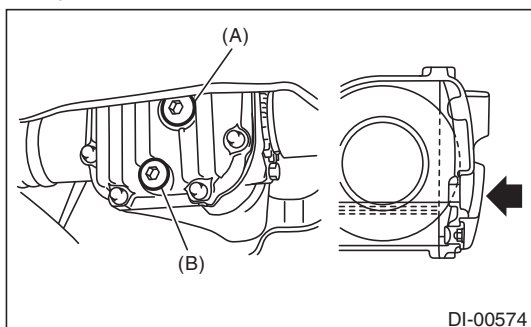
- T-type



(A) Filler plug

(B) Drain plug

- VA1-type



(A) Filler plug

(B) Drain plug

5) Install the filler plug.

NOTE:

- For the T-type, apply liquid gasket to the filler plug.

Liquid gasket:

THREE BOND 1105 (Part No. 004403010) or equivalent

- For VA type, use a new gasket.

Tightening torque:

T-type:

49 N·m (5.0 kgf-m, 36.1 ft-lb)

VA-type:

50 N·m (5.1 kgf-m, 36.9 ft-lb)

3. Front Differential Assembly

A: NOTE

1. CVT (TR580) MODEL

For front differential for the CVT (TR580) model, refer to the "CVT (TR580)" section. <Ref. to CVT(TR580)-308, Front Differential Assembly.>

2. CVT (TR690) MODEL

For front differential for the CVT (TR690) model, refer to the "CVT (TR690)" section. <Ref. to CVT(TR690)-265, Front Differential Assembly.>

3. MT MODEL

For the front differential of the manual transmission model, refer to "6MT" section. <Ref. to 6MT-87, Front Differential Assembly.>

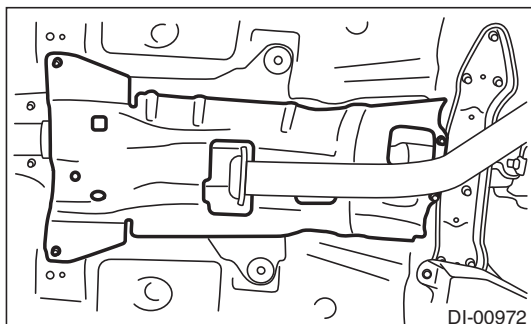
Rear Differential (T-type)

DIFFERENTIALS

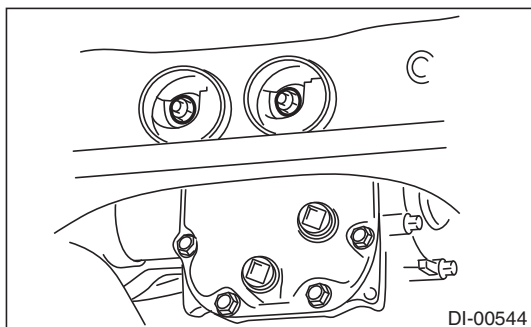
4. Rear Differential (T-type)

A: REMOVAL

- 1) Shift the select lever or gear shift lever to neutral.
- 2) Disconnect the ground cable from battery.
- 3) Release the parking brake.
- 4) Loosen the wheel nuts.
- 5) Lift up the vehicle.
- 6) Remove the rear wheels.
- 7) Drain differential gear oil. <Ref. to DI-19, REPLACEMENT, Differential Gear Oil.>
- 8) Remove the rear exhaust pipe.
 - 2.5 L non-turbo model
<Ref. to EX(H4DO)-18, REMOVAL, Rear Exhaust Pipe.>
 - 2.0 L turbo model
<Ref. to EX(H4DOTC)-45, REMOVAL, Rear Exhaust Pipe.>
- 9) Remove the heat shield cover.



- 10) Remove the propeller shaft. <Ref. to DS-11, REMOVAL, Propeller Shaft.>
- 11) Loosen the self-lock nuts which hold the rear differential to the rear sub frame assembly.



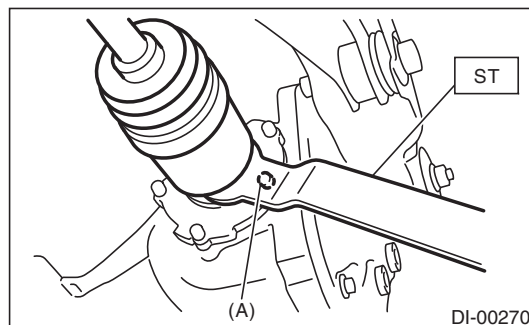
- 12) Remove the DOJ of rear drive shaft from rear differential using ST or tire lever.

NOTE:

- For the T-type, use the ST.
- For the VA-type, use the tire lever.
- When removing the DOJ from the rear differential, fit the tire lever or ST to the bolts as shown in the figure so as not to damage the side retainer.

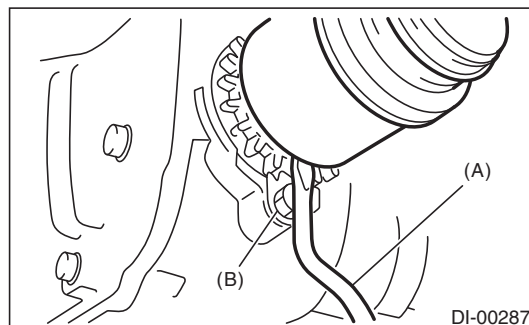
T-type

ST 28099PA100 DRIVE SHAFT REMOVER



(A) Bolt

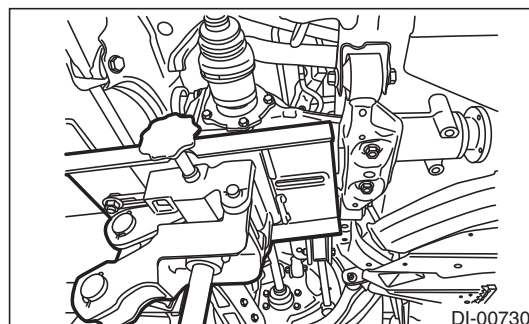
VA-type



(A) Tire lever

(B) Bolt

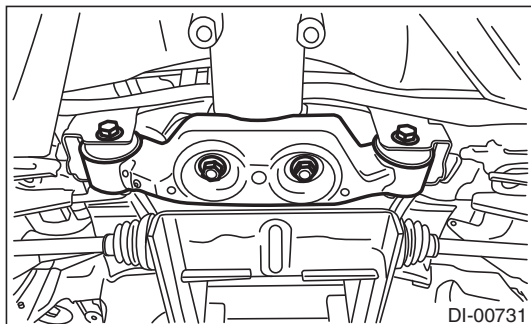
- 13) Set the rear differential to transmission jack.



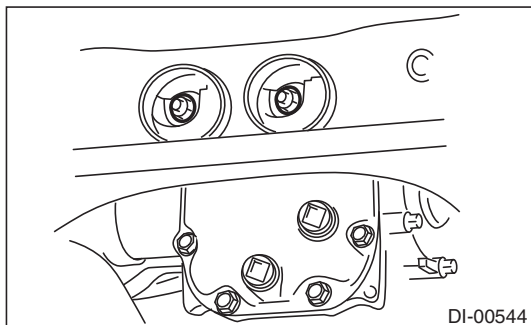
Rear Differential (T-type)

DIFFERENTIALS

- 14) Remove the rear differential front member.



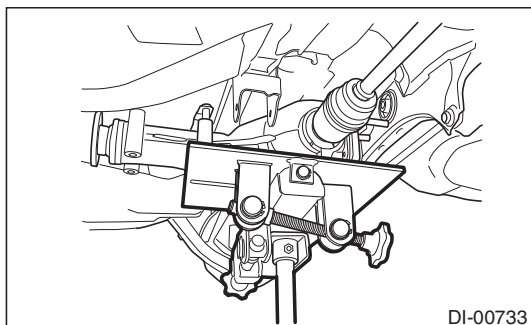
- 15) Remove the self-lock nuts which hold the rear differential to the rear sub frame assembly.



- 16) Pull out the rear differential stud bolt from rear differential mount bushing.

NOTE:

When removing the stud bolt from the rear differential mount bushing, carefully adjust the angle and location of transmission jack and jack stand, if necessary.



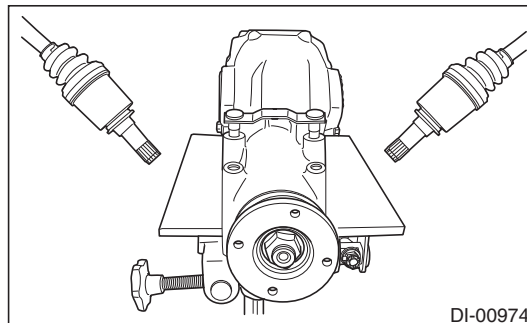
- 17) Lower the transmission jack.

- 18) Pull out the rear drive shaft from the rear differential.

NOTE:

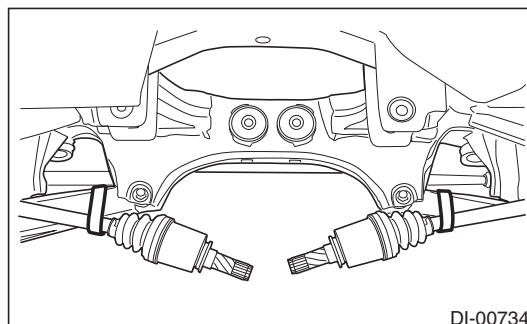
If it is difficult to pull out the rear drive shaft from rear differential, use the ST for T-type and the tire lever for VA-type.

ST 28099PA100 DRIVE SHAFT REMOVER

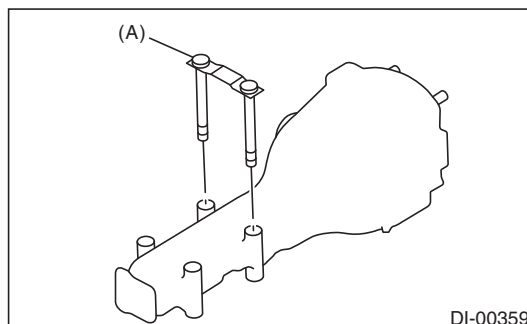


- 19) Lower the transmission jack.

- 20) Secure the rear drive shaft to rear lateral link using wire.



- 21) Remove the rear differential member plate from rear differential.



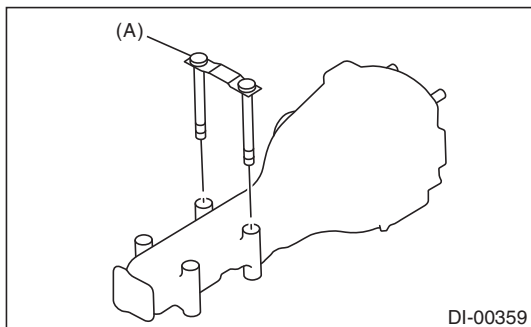
(A) Rear differential member plate

Rear Differential (T-type)

DIFFERENTIALS

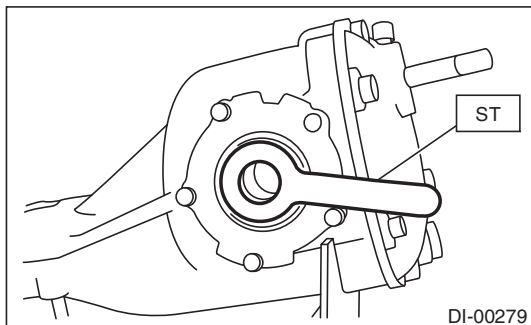
B: INSTALLATION

- 1) Attach the rear differential member plate to the rear differential.

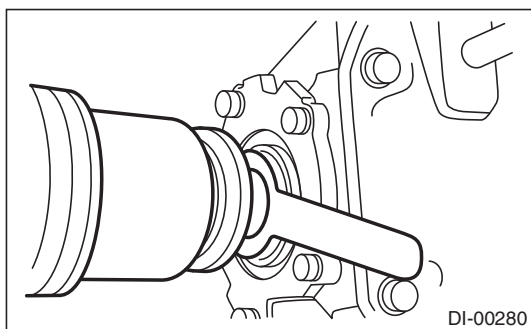


(A) Rear differential member plate

- 2) Set the rear differential to transmission jack.
3) Set the ST to the rear differential.
ST 28099PA090 OIL SEAL PROTECTOR

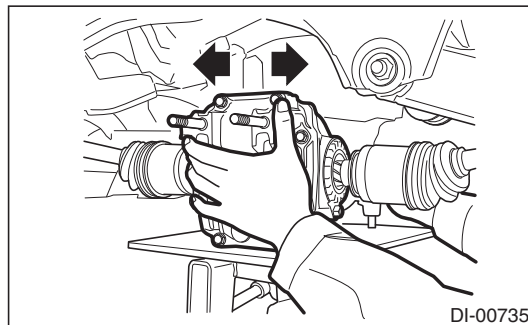


- 4) Insert the rear drive shaft until the spline portion of the rear drive shaft exceeds the side oil seal.

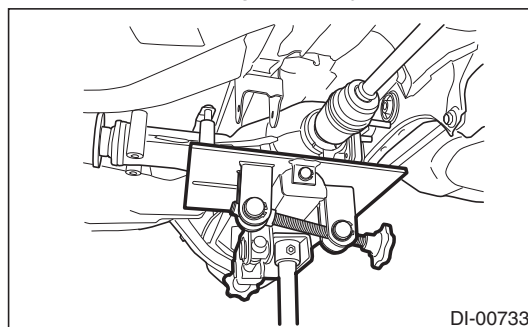


- 5) Remove ST from rear differential.

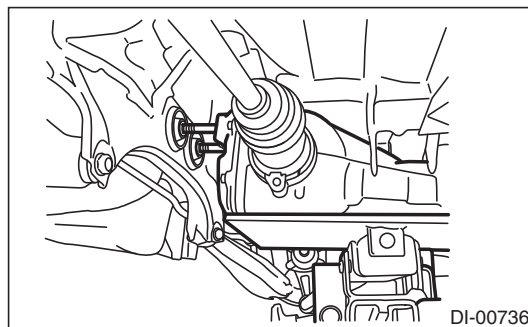
- 6) Push the rear differential from side to side to insert the DOJ into rear differential completely.



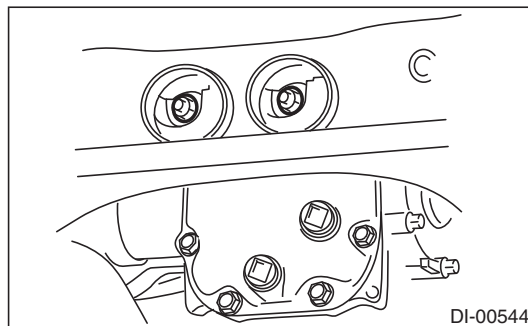
- 7) Adjust the transmission jack, if necessary, and insert the rear differential stud bolt into the rear differential mount bushing properly.



- 8) After inserting the rear differential stud bolt into the rear differential mount bushing, lift up the transmission jack and align the rear differential to its attachment position.



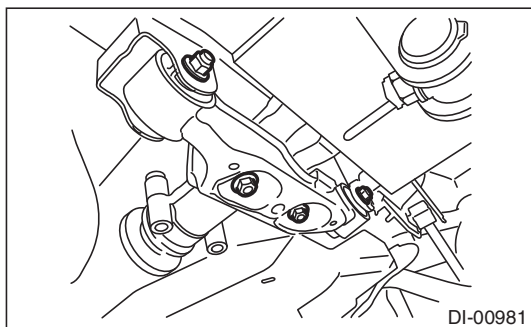
- 9) Tighten a new self-locking nut temporarily to the rear differential stud bolt.



Rear Differential (T-type)

DIFFERENTIALS

10) Install the rear differential front member, and temporarily attach and tighten a new self-locking nut.



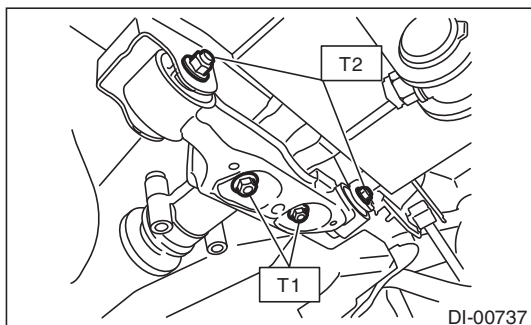
11) Remove the transmission jack.

12) Tighten the self-locking nut.

Tightening torque:

T1: 50 N·m (5.1 kgf-m, 36.9 ft-lb)

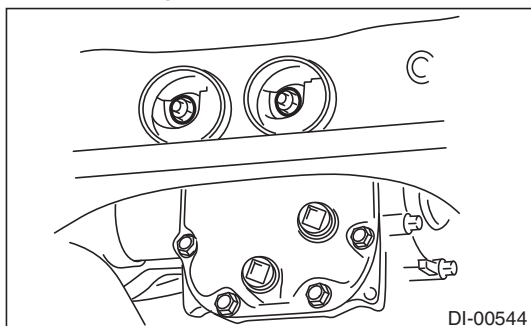
T2: 110 N·m (11.2 kgf-m, 81.1 ft-lb)



13) Tighten the self-locking nut.

Tightening torque:

70 N·m (7.1 kgf-m, 51.6 ft-lb)

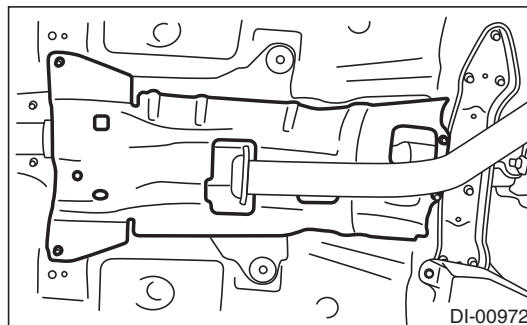


14) Install the propeller shaft. <Ref. to DS-13, INSTALLATION, Propeller Shaft.>

15) Install the heat shield cover.

Tightening torque:

18 N·m (1.8 kgf-m, 13.3 ft-lb)



16) Install the rear exhaust pipe.

- 2.5 L non-turbo model

<Ref. to EX(H4DO)-19, INSTALLATION, Rear Exhaust Pipe.>

- 2.0 L turbo model

<Ref. to EX(H4DOTC)-46, INSTALLATION, Rear Exhaust Pipe.>

17) Fill differential gear oil. <Ref. to DI-19, REPLACEMENT, Differential Gear Oil.>

18) Installing procedure hereafter is in the reverse order of removal.

19) Perform "Rear differential inspection mode" using the Subaru Select Monitor. (CVT model) <Ref. to DI-66, Rear Differential Inspection Mode.>

CAUTION:

Be sure to perform rear differential inspection mode when the following work has been performed.

- Replacement of rear differential
- Replacement of rear differential hypoid gear set
- Replacement of transmission assembly
- Replacement of front differential hypoid gear set

Rear Differential (T-type)

DIFFERENTIALS

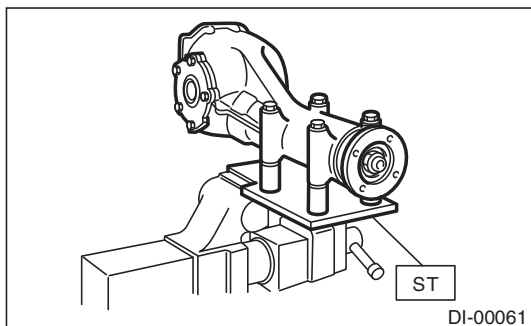
C: DISASSEMBLY

To detect the real cause of trouble, inspect the following items before disassembling.

- Tooth contact and backlash between hypoid driven gear and drive pinion
- Hypoid driven gear runout on its back surface
- Total preload of drive pinion

1) Set the ST on vise and install the differential assembly to ST.

ST 398217700 ATTACHMENT SET

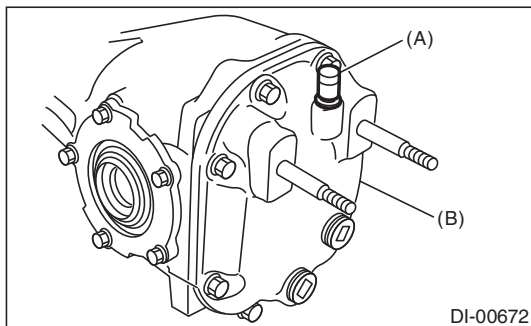


2) Remove the drain plug and filler plug.

3) Remove the air breather cap.

NOTE:

- Do not attempt to remove the air breather cap unless necessary.
- Whenever the air breather cap is removed, replace it with a new part.



(A) Air breather cap

(B) Rear cover

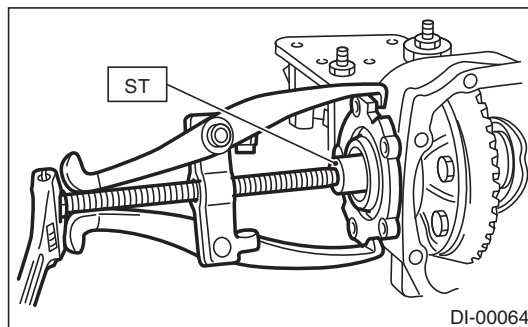
4) Remove the bolts, and then remove the rear cover.

5) Remove the side retainer attachment bolts, set the ST to differential case, and extract the side retainers RH and LH with a puller.

NOTE:

- Side retainer shim of each side should be kept together with its mating retainer.
- Keep the side retainers separate by attaching tags or in similar ways to make it possible to identify RH and LH sides during reassembly.

ST 398457700 ATTACHMENT

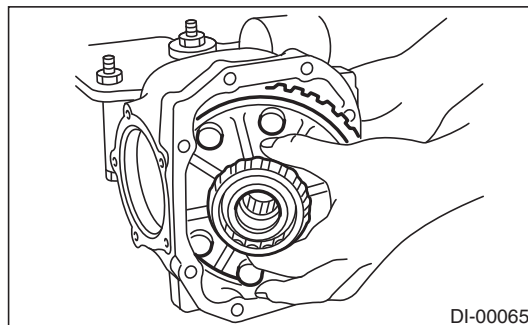


6) Remove the oil seal and O-ring from the side retainer.

7) Pull out the differential case assembly from the differential carrier.

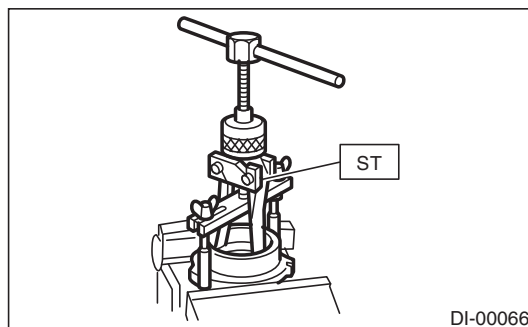
NOTE:

Be careful not to hit the teeth of hypoid driven gear against the differential carrier.



8) When replacing the side bearing, remove the bearing race from the side retainer using ST.

ST 398527700 PULLER ASSY



Rear Differential (T-type)

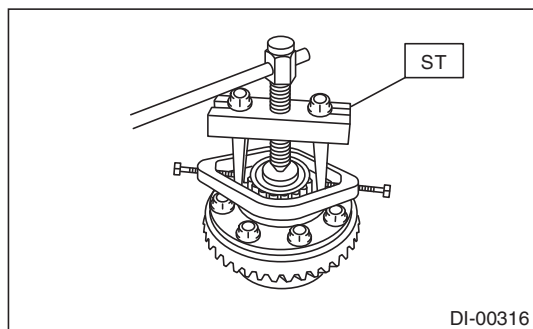
DIFFERENTIALS

9) Using the ST, remove the bearing cone.

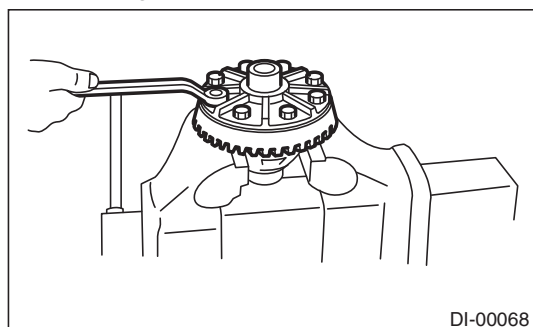
NOTE:

- Do not attempt to disassemble the parts unless necessary.
- Set the ST so that its claws catch the edge of the bearing cone.
- Never mix up the RH and LH bearing races and cones.

ST 18759AA000 PULLER ASSY

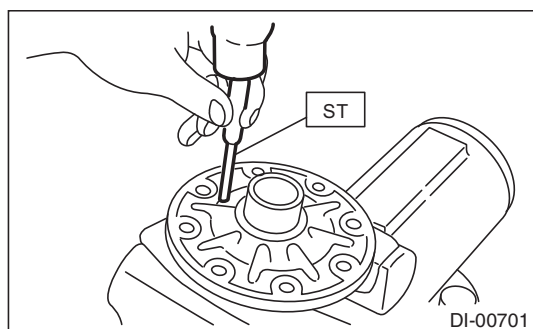


10) Remove the hypoid driven gear by loosening hypoid driven gear bolts.



11) Remove the pinion shaft lock pin from hypoid driven gear side using ST.

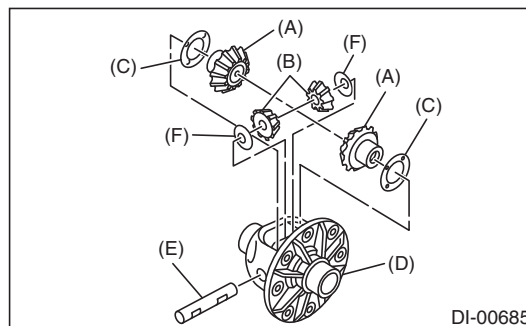
ST 899904100 STRAIGHT PIN REMOVER



12) Draw out the pinion mate shaft, and remove pinion mate gears, pinion mate gear washers, side gears, and side gear thrust washers.

NOTE:

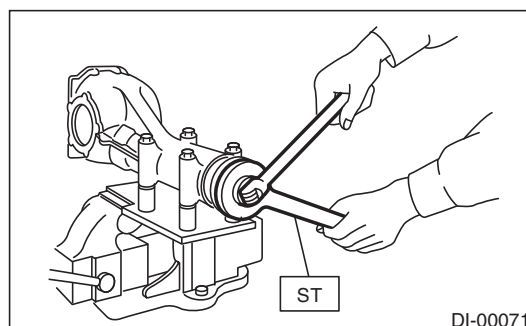
The gears and washers should be marked with RH or LH, front or rear, or kept separately.



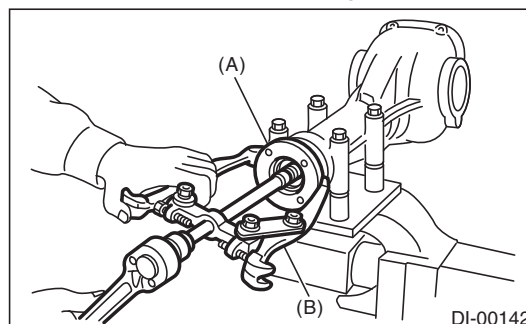
- (A) Side gear
- (B) Pinion mate gear
- (C) Side gear thrust washer
- (D) Differential case
- (E) Pinion mate shaft
- (F) Pinion mate gear washer

13) Remove the self-locking nut while securing the companion flange with ST.

ST 498427200 FLANGE WRENCH



14) Extract the companion flange with a puller.



- (A) Companion flange
- (B) Puller

Rear Differential (T-type)

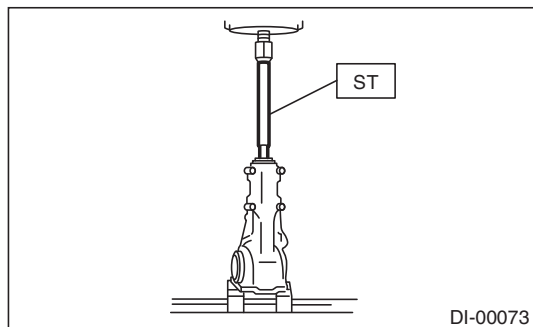
DIFFERENTIALS

15) Press the end of drive pinion shaft using ST and remove the rear bearing cone, preload adjusting spacer and washer.

NOTE:

Hold the drive pinion so as not to drop it.

ST 398467700 DRIFT

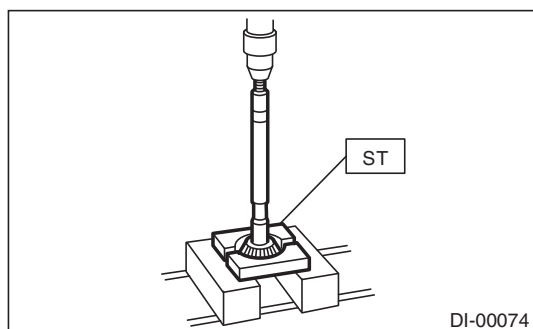


16) Remove the rear bearing cone from drive pinion by supporting the cone with ST.

NOTE:

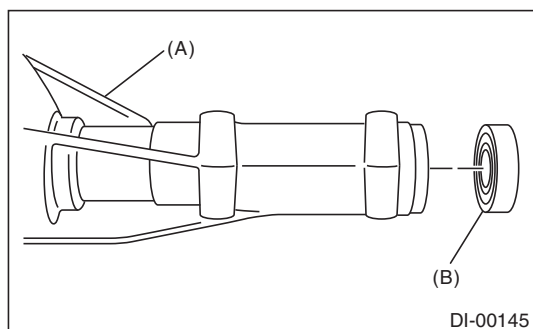
Place the replacer so that its center-recessed side faces the bearing cone.

ST 398517700 REPLACER



17) Remove the front oil seal from differential carrier using ST.

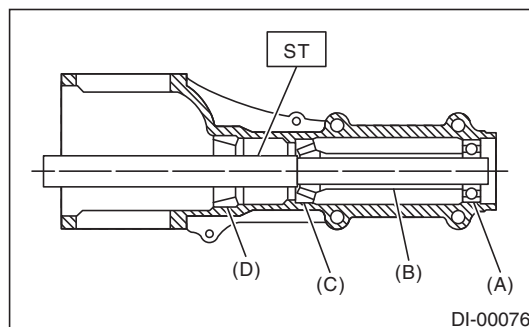
ST 398527700 PULLER ASSY



- (A) Differential carrier
- (B) Front oil seal

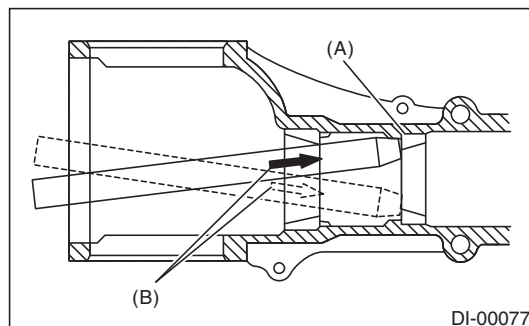
18) Remove the pilot bearing together with the front bearing cone and spacer using the ST.

ST 398467700 DRIFT



- (A) Pilot bearing
- (B) Spacer
- (C) Front bearing
- (D) Rear bearing race

19) When replacing the bearings, use a brass bar to tap out the front bearing race and rear bearing race in this order to remove them.



- (A) 2 cutout portions along diagonal lines
- (B) Tap alternately with brass bar.

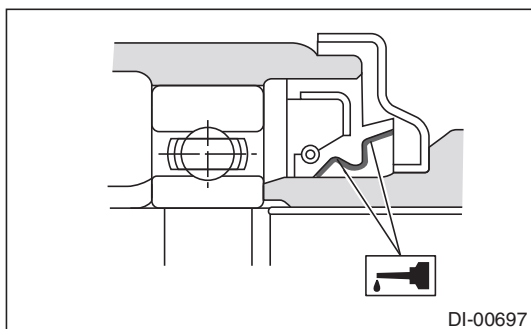
Rear Differential (T-type)

DIFFERENTIALS

D: ASSEMBLY

NOTE:

- Assemble in the reverse order of disassembly.
- Check and adjust each part during assembly.
- Keep the shims and washers in order, so that they are not improperly installed.
- Thoroughly clean the surfaces on which the shims, washers and bearings are to be installed.
- Apply gear oil when installing the bearings and thrust washers.
- Be careful not to mix up the RH and LH bearing races.
- Use a new O-ring and gasket.
- Replace the oil seal with a new part at every disassembly.
- Be careful not to mix up the oil seal RH and LH.
- Apply differential gear oil to the lips when installing the oil seal.



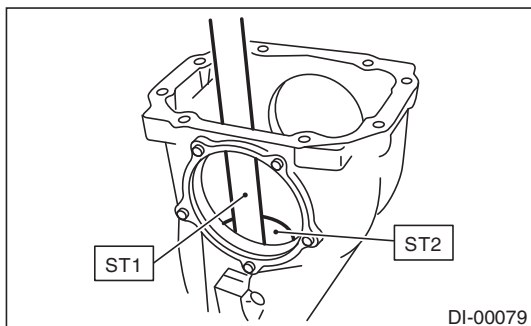
1) Adjusting preload for front and rear bearings

NOTE:

Adjust the bearing preload between front and rear bearings with preload adjusting spacer and washer. Pinion height adjusting washer is not affected by this adjustment. The adjustment must not be carried out with oil seal inserted.

(1) Install the rear bearing race into the differential carrier using ST1 and ST2.

ST1 398477701 HANDLE
ST2 398477703 DRIFT 2



(2) Install the front bearing race to the differential carrier using ST1 and ST2.

NOTE:

Use a new front bearing race.

ST1 398477701 HANDLE

ST2 398477702 DRIFT

(3) Insert ST1 into the differential carrier with the pinion height adjusting washer and rear bearing cone fitted onto it.

NOTE:

If tooth contact (drive pinion, hypoid driven gear) is normal in the inspection before disassembling, verify that the washer is not deformed, and then re-use the used washer.

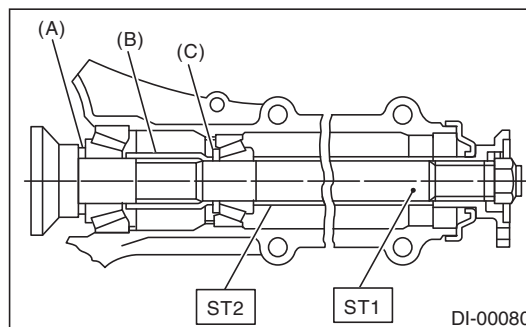
(4) Install the pinion height adjusting washer, preload adjusting spacer and washer, front bearing cone, ST2, companion flange and self-locking nut.

NOTE:

Use new front bearing cone.

ST1 398507702 DUMMY SHAFT

ST2 398507703 DUMMY COLLAR



- (A) Pinion height adjusting washer
- (B) Preload adjusting spacer
- (C) Preload adjusting washer

Rear Differential (T-type)

DIFFERENTIALS

(5) Turn the ST1 by hand to smooth the bearing, and tighten the self-locking nut while measuring the initial load or initial torque with a spring scale or torque wrench. Select the preload adjusting washer and spacer so that the specified preload is obtained when nut is tightened to the specified torque.

NOTE:

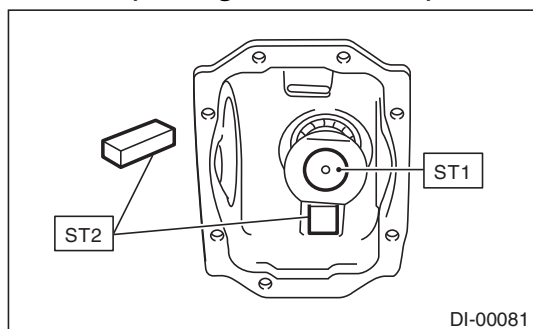
- Use a new self-locking nut.
- Measure the preload in direction of tangent to the flange.
- Be careful not to give excessive preload.
- When tightening the self-locking nut, lock ST1 with ST2 as shown in the figure.

ST1 398507702 DUMMY SHAFT

ST2 398507704 BLOCK

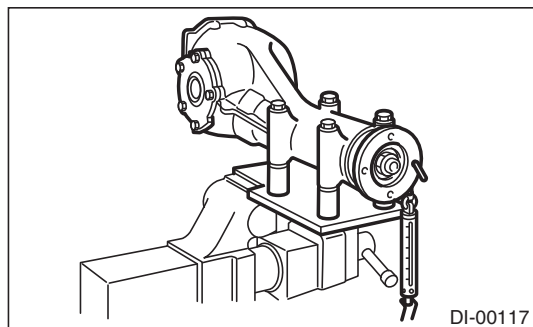
Tightening torque:

181.5 N·m (18.5 kgf-m, 133.9 ft-lb)



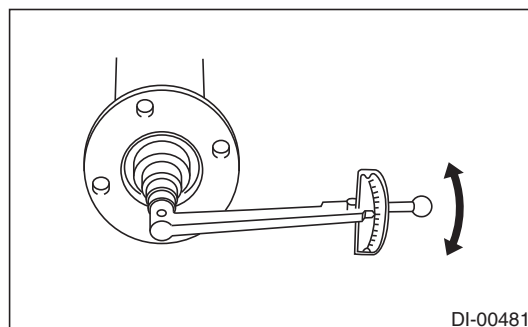
Initial load:

18.1 — 38.8 N (1.8 — 4.0 kgf, 4.1 — 8.7 lbf)



Initial torque:

0.69 — 1.47 N·m (0.07 — 0.15 kgf-m, 0.51 — 1.08 ft-lb)



Preload adjusting washer

Part No.	Thickness mm (in)
383705200	2.59 (0.1020)
383715200	2.57 (0.1012)
383725200	2.55 (0.1004)
383735200	2.53 (0.0996)
383745200	2.51 (0.0988)
383755200	2.49 (0.0980)
383765200	2.47 (0.0972)
383775200	2.45 (0.0965)
383785200	2.43 (0.0957)
383795200	2.41 (0.0949)
383805200	2.39 (0.0941)
383815200	2.37 (0.0933)
383825200	2.35 (0.0925)
383835200	2.33 (0.0917)
383845200	2.31 (0.0909)

Preload adjusting spacer

Part No.	Length mm (in)
383695201	56.2 (2.213)
383695202	56.4 (2.220)
383695203	56.6 (2.228)
383695204	56.8 (2.236)
383695205	57.0 (2.244)
383695206	57.2 (2.252)

Rear Differential (T-type)

DIFFERENTIALS

2) Adjusting drive pinion height:

Adjust the drive pinion height with pinion height adjusting washer installed between the rear bearing cone and the back of pinion gear.

(1) Attach the ST2.

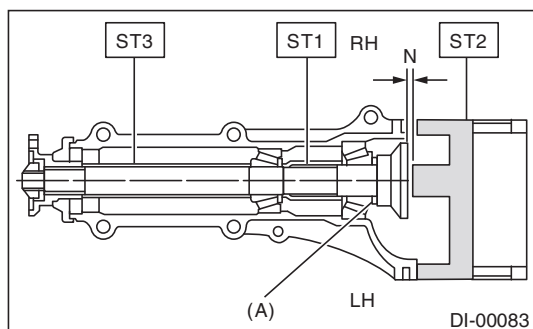
NOTE:

At this time, install a provisionally selected or previously used pinion height adjusting washer. Measure and record the thickness.

ST1 398507702 DUMMY SHAFT

ST2 398507701 DIFFERENTIAL CARRIER GAUGE

ST3 398507703 DUMMY COLLAR



(A) Pinion height adjusting washer

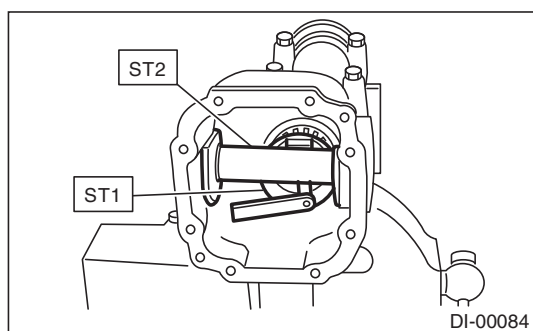
(2) Measure the clearance "N" between the end of ST2 and the end surface of ST1 by using a thickness gauge.

NOTE:

Make sure there is no clearance between the differential carrier and ST2.

ST1 398507702 DUMMY SHAFT

ST2 398507701 DIFFERENTIAL CARRIER GAUGE



(3) Obtain the thickness of pinion height adjusting washer to be inserted from the following formula, and replace the temporarily installed washer with this one.

$$T = T_o + N - (H \times 0.01) - 0.20 \text{ mm (0.0079 in)}$$

T	Thickness of pinion height adjusting washer mm (in)	
T _o	Thickness of washer temporarily inserted mm (in)	
N	Clearance of thickness gauge mm (in)	
H	Figure marked on drive pinion head	

Memo:

(Example of calculation)

$$T_o = 3.39 \text{ mm (0.1335 in)}$$

$$N = 0.24 \text{ mm (0.0094 in)}$$

$$H = + 1$$

$$T = 3.39 \text{ mm (0.1335 in)} + 0.24 \text{ mm (0.0094 in)} - 0.01 \text{ mm (0.0004 in)} - 0.20 \text{ mm (0.0079 in)} = 3.42 \text{ mm (0.1346 in)}$$

Result: Thickness = 3.42 mm (0.1346 in)

Therefore use washer 383605200.

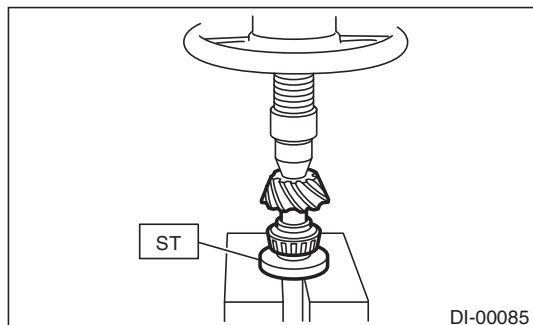
Pinion height adjusting washer	
Part No.	Thickness mm (in)
383495200	3.09 (0.1217)
383505200	3.12 (0.1228)
383515200	3.15 (0.1240)
383525200	3.18 (0.1252)
383535200	3.21 (0.1264)
383545200	3.24 (0.1276)
383555200	3.27 (0.1287)
383565200	3.30 (0.1299)
383575200	3.33 (0.1311)
383585200	3.36 (0.1323)
383595200	3.39 (0.1335)
383605200	3.42 (0.1346)
383615200	3.45 (0.1358)
383625200	3.48 (0.1370)
383635200	3.51 (0.1382)
383645200	3.54 (0.1394)
383655200	3.57 (0.1406)
383665200	3.60 (0.1417)
383675200	3.63 (0.1429)
383685200	3.66 (0.1441)

Rear Differential (T-type)

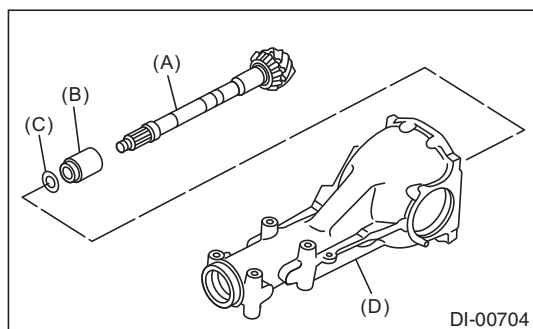
DIFFERENTIALS

3) Install the selected pinion height adjusting washer on drive pinion, and press the rear bearing cone into position with ST.

ST 398177700 INSTALLER



4) Insert the drive pinion into the differential carrier, and install the preselected preload adjusting spacer and washer.



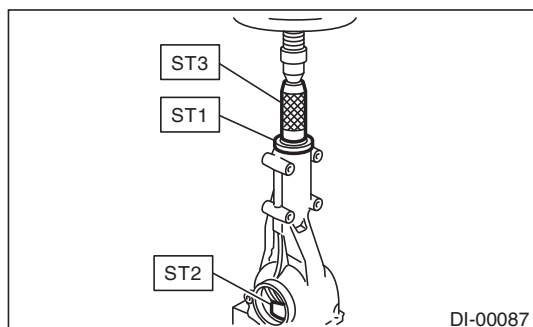
- (A) Drive pinion
- (B) Preload adjusting spacer
- (C) Preload adjusting washer
- (D) Differential carrier

5) Press-fit the front bearing cone with ST1, ST2 and ST3.

ST1 398507703 DUMMY COLLAR

ST2 399780104 WEIGHT

ST3 899580100 INSTALLER



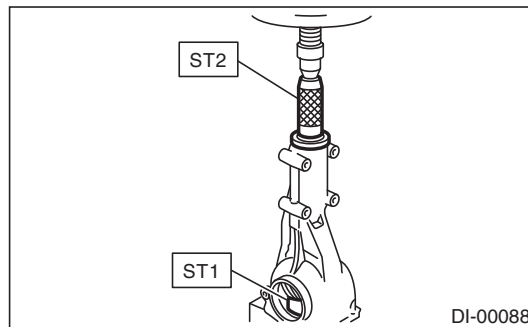
6) Insert the spacer, then press-fit the pilot bearing with ST1 and ST2.

NOTE:

Use a new pilot bearing.

ST1 399780104 WEIGHT

ST2 899580100 INSTALLER

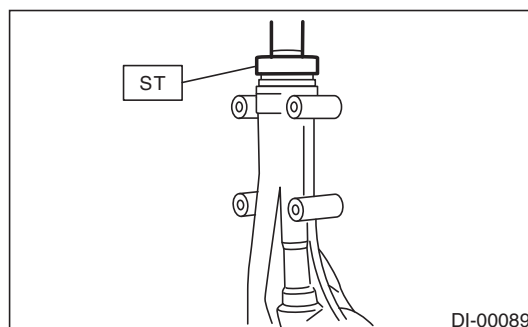


7) Using the ST, install the oil seal.

NOTE:

- Use a new oil seal.
- Press-fit until the oil seal end comes 1 mm (0.04 in) inward from end of carrier.
- Apply differential gear oil to the oil seal lips.

ST 498447120 INSTALLER



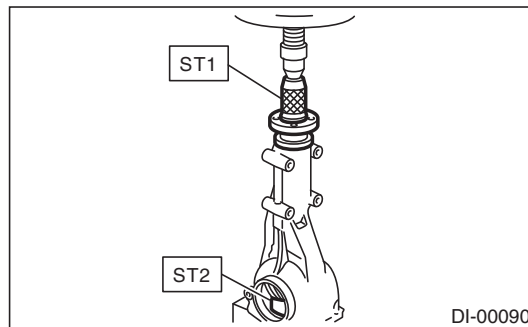
8) Press-fit the companion flange with ST1 and ST2.

NOTE:

Be careful not to damage the bearing.

ST1 899874100 INSTALLER

ST2 399780104 WEIGHT



Rear Differential (T-type)

DIFFERENTIALS

9) Apply seal material on the drive pinion shaft thread and new self-locking nut seat.

Seal material:

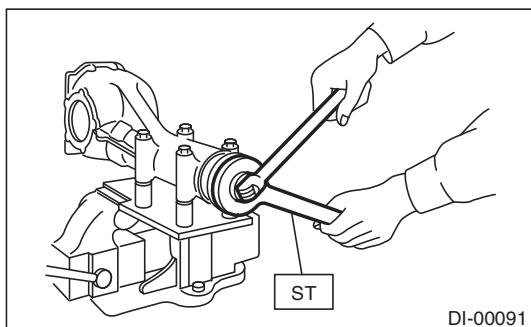
THREE BOND 1324 (Part No. 004403042) or equivalent

10) Attach the new self-locking nut and use the ST to fix the companion flange in place, then tighten the self-locking nut.

Tightening torque:

181.5 N·m (18.5 kgf-m, 133.9 ft-lb)

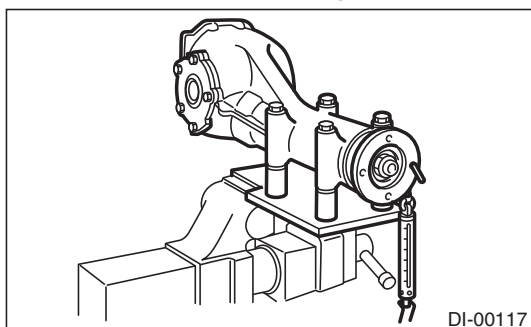
ST 498427200 FLANGE WRENCH



11) Check the initial torque or initial load.

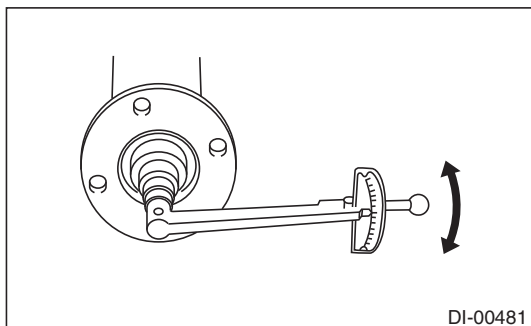
Initial load:

18.1 — 38.8 N (1.8 — 4.0 kgf, 4.1 — 8.7 lbf)



Initial torque:

0.69 — 1.47 N·m (0.07 — 0.15 kgf-m, 0.51 — 1.08 ft-lb)

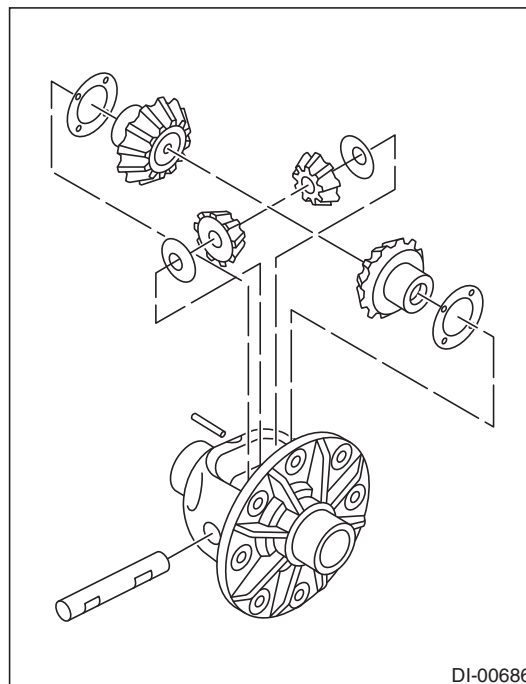


12) Assembling differential case

(1) Install the side gears and pinion mate gears, with their side gear thrust washers, pinion mate gear washer, and pinion mate shaft, into the differential case.

NOTE:

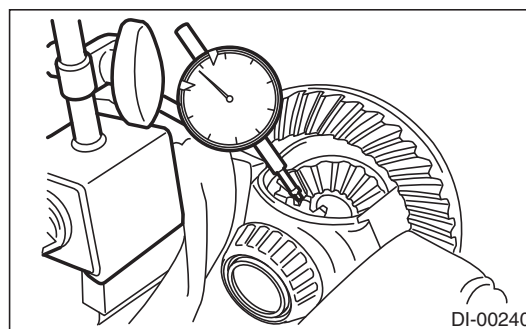
- Apply gear oil on both sides of the washer and on the pinion mate shaft before installing.
- Insert the pinion mate shaft into the differential case by aligning the pin holes.



(2) Measure the side gear backlash.

Side gear backlash:

0.10 — 0.20 mm (0.004 — 0.008 in)



(3) Adjust the backlash as specified by selecting side gear thrust washer.

Side gear thrust washer	
Part No.	Thickness mm (in)
383445201	0.75 — 0.80 (0.0295 — 0.0315)
383445202	0.80 — 0.85 (0.0315 — 0.0335)
383445203	0.85 — 0.90 (0.0335 — 0.0354)

Rear Differential (T-type)

DIFFERENTIALS

- (4) Check the condition of rotation after applying oil to the gear tooth surfaces and washer surfaces.
- (5) Drive the pinion shaft lock pin into the differential case.

NOTE:

Use a new pinion shaft lock pin.

ST 899904100 STRAIGHT PIN REMOVER

- 13) Install the driven gear to the differential case.

NOTE:

- Before installing bolts, apply seal material to bolt threads.

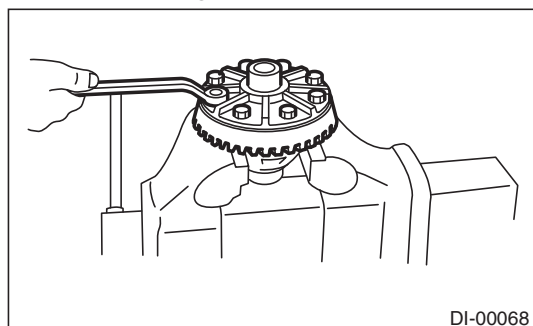
Seal material:

THREE BOND 1324 (Part No. 004403042) or equivalent

- Make sure there is no clearance between the differential case and driven gear.
- Tighten opposing bolts in order.

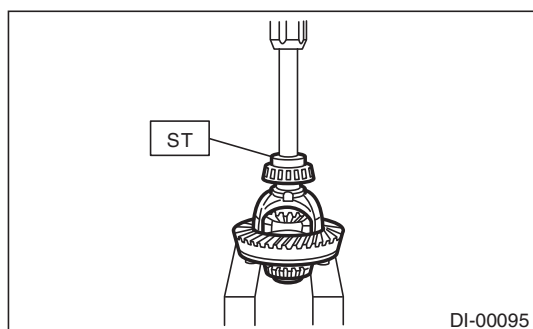
Tightening torque:

103 N·m (10.5 kgf-m, 76.0 ft-lb)



- 14) Using the ST, press-fit the side bearing to the differential case.

ST 398487700 DRIFT

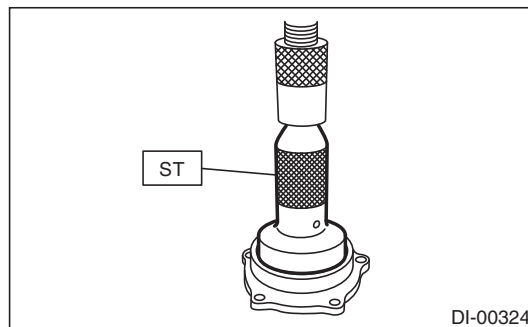


- 15) Using the ST, press-fit the side bearing outer race to the side retainer.

CAUTION:

Make sure that the bearing outer races and cones are properly assembled.

ST 398417700 DRIFT



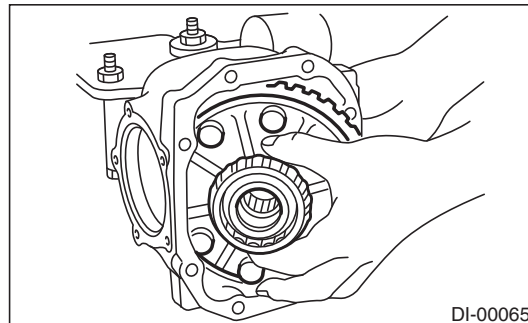
- 16) Side retainer shim adjustment

(1) The hypoid driven gear backlash and side bearing preload can be adjusted by the side retainer shim thickness.

(2) Install the differential case assembly into differential carrier in the reverse order of disassembly.

NOTE:

Be careful not to hit the teeth of hypoid driven gear against the differential carrier.



- (3) Install the side retainer shim.

NOTE:

- Be careful not to mix up the side retainer shim RH and LH.
- Replace broken or corroded side retainer shims with a new part of the same thickness.

Side retainer shim	
Part No.	Thickness mm (in)
383475201	0.20 (0.0079)
383475202	0.25 (0.0098)
383475203	0.30 (0.0118)
383475204	0.40 (0.0157)
383475205	0.50 (0.0197)

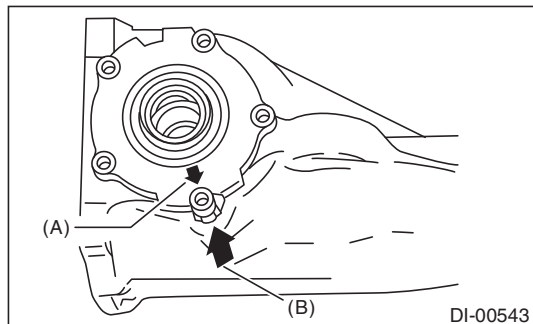
Rear Differential (T-type)

DIFFERENTIALS

- (4) Align the arrow mark on the differential carrier with the arrow mark on the side retainer when installing the side retainer.

NOTE:

Be careful that the side bearing outer race is not damaged by the bearing roller.

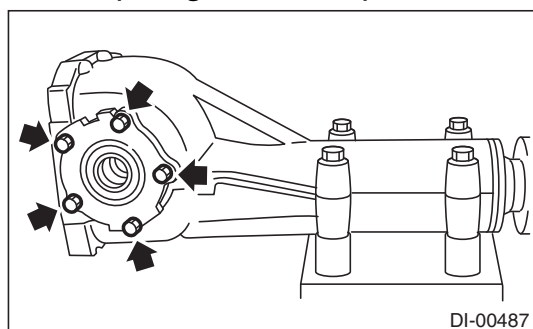


- (A) Arrow mark (on the side retainer)
(B) Arrow mark (on the differential carrier)

- (5) Tighten the side retainer bolts.

Tightening torque:

10.5 N·m (1.1 kgf-m, 7.7 ft-lb)



- (6) Measure the hypoid driven gear to drive pinion backlash. Set the magnet base on differential carrier. Align the contact point of dial gauge with tooth face of hypoid driven gear, and move hypoid driven gear while holding drive pinion still. Read the value indicated on dial gauge. If the backlash is outside the standard range, adjust the side retainer shim by the following method.

• When backlash is less than 0.1 mm (0.004 in):

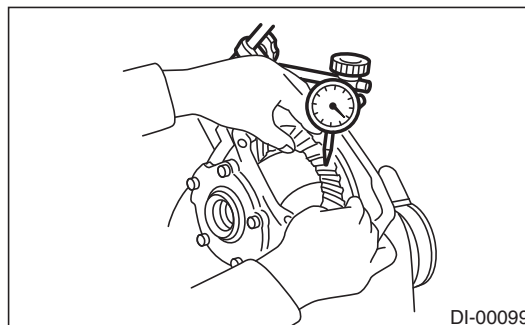
Reduce the thickness of shim on the back side of the hypoid driven gear and increase the thickness of shims on the teeth side of the hypoid driven gear.

• When backlash exceeds 0.2 mm (0.008 in):

Increase the thickness of shim on the back side of the hypoid driven gear and reduce the thickness of shims on the teeth side of the hypoid driven gear.

Backlash:

0.10 — 0.20 mm (0.004 — 0.008 in)



- (7) Measure the total preload of the drive pinion. If the total preload is outside the specification range, adjust the thickness of side retainer shims, increasing/reducing both shims by an even amount at a time.

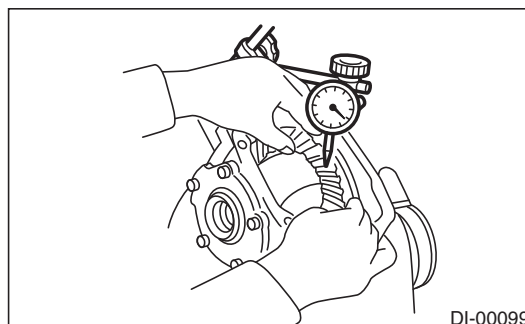
Total preload:

20.7 — 54.4 N (2.1 — 5.5 kgf, 4.7 — 12.2 lbf)

- 17) Recheck the hypoid driven gear to drive pinion backlash.

Backlash:

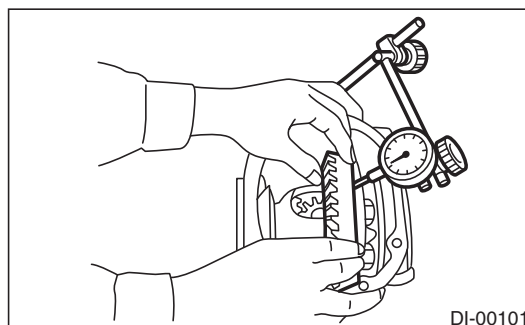
0.10 — 0.20 mm (0.004 — 0.008 in)



- 18) Check pinion and hypoid driven gears rotate smoothly and make sure of the hypoid driven gear runout on its back surface. If the hypoid driven gear runout on its back surface exceeds the specification, check for any foreign objects between the hypoid driven gear and differential case, and for any deformation of the differential case or hypoid driven gear.

Hypoid driven gear back surface runout:

0.05 mm (0.002 in)



Rear Differential (T-type)

DIFFERENTIALS

19) Check and adjustment of the tooth contact of hypoid driven gear and drive pinion

(1) Apply lead-free red dye evenly on the both sides of three to four teeth of the hypoid driven gear. Check the contact pattern after rotating the hypoid driven gear several revolutions back and forth until a definite contact pattern appears on the hypoid driven gear.

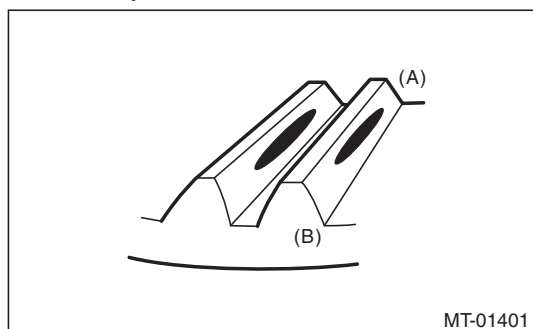
(2) When the contact pattern is not correct, re-adjust.

NOTE:

Be sure to wipe off the lead-free red dye completely after the adjustment is completed.

- Correct tooth contact

Check item: Tooth contact pattern is slightly shifted toward toe side under no-load rotation. (When driving, it moves towards the heel side.)

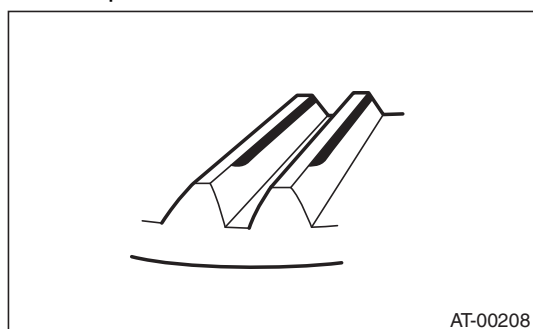


- (A) Toe side
(B) Heel side

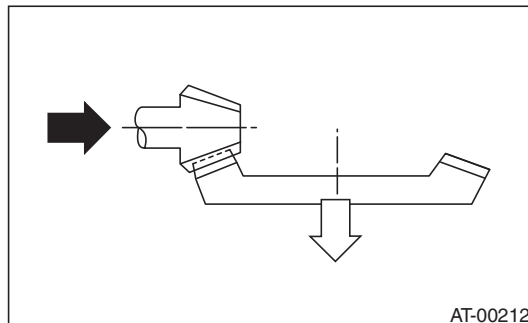
- Face contact

Check item: Backlash is too large.

Contact pattern



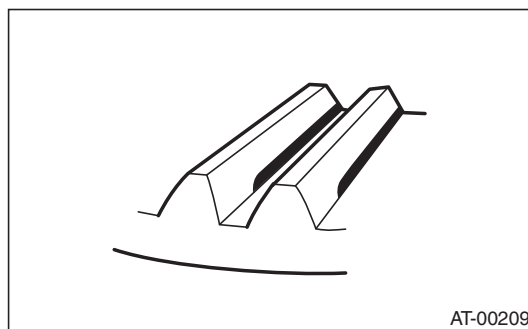
Corrective action: Increase thickness of pinion height adjusting washer according to the procedure for bringing drive pinion close to hypoid driven gear side.



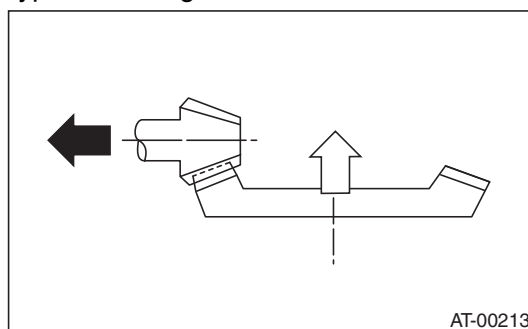
- Flank contact

Check item: Backlash is too small.

Contact pattern



Corrective action: Reduce the thickness of pinion height adjusting washer according to the procedure for bringing drive pinion away from hypoid driven gear.



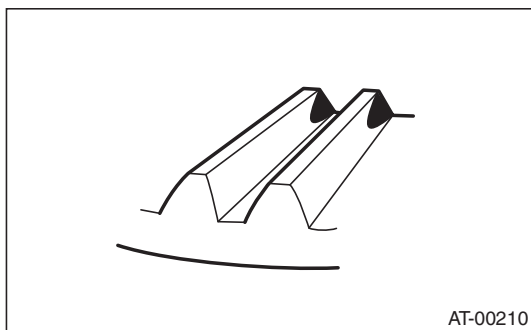
Rear Differential (T-type)

DIFFERENTIALS

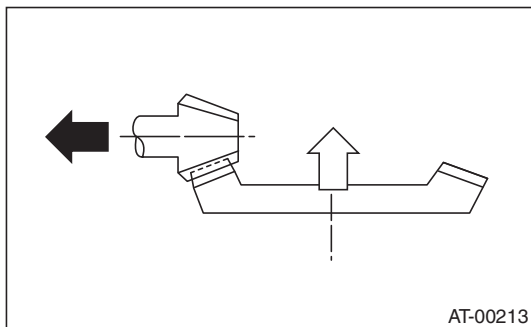
- Toe contact (inside contact)

Check item: Teeth contact area is too small.

Contact pattern



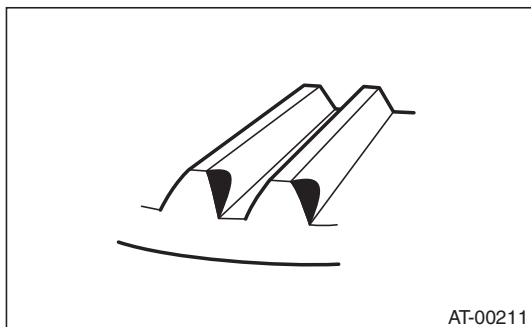
Corrective action: Reduce the thickness of pinion height adjusting washer according to the procedure for bringing drive pinion close to hypoid driven gear.



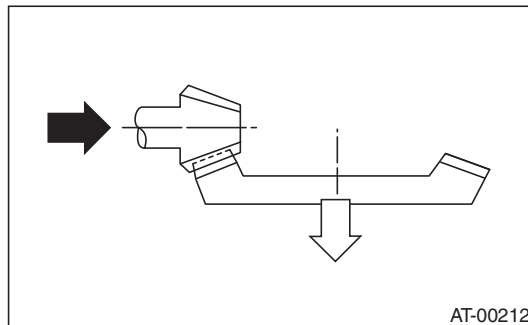
- Heel contact (outside end contact)

Check item: Teeth contact area is too small.

Contact pattern



Corrective action: Increase thickness of pinion height adjusting washer according to the procedure for bringing drive pinion close to hypoid driven gear side.

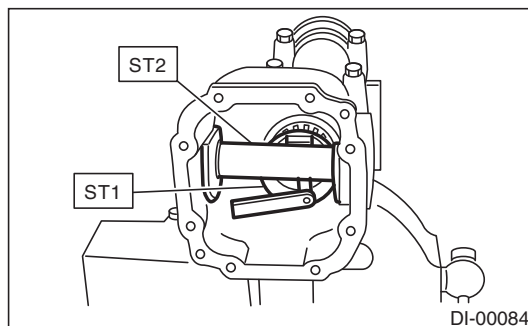


20) If proper tooth contact is not obtained, readjust the drive pinion height by changing the RH and LH side retainer shims and the hypoid gear backlash.

(1) Drive pinion height

ST1 398507702 DUMMY SHAFT

ST2 398507701 DIFFERENTIAL CARRIER GAUGE



$$T = T_o + N - (H \times 0.01) - 0.20 \text{ mm (0.0079 in)}$$

T	Thickness of pinion height adjusting washer mm (in)	
T _o	Thickness of washer temporarily inserted mm (in)	
N	Clearance of thickness gauge mm (in)	
H	Figure marked on drive pinion head	

Memo:

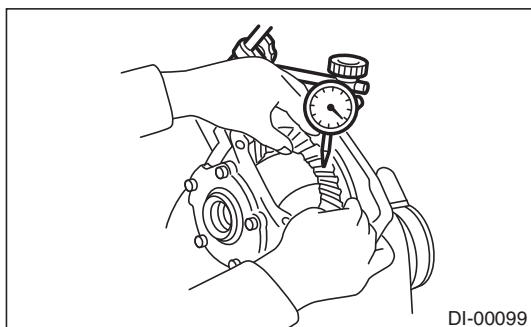
Rear Differential (T-type)

DIFFERENTIALS

(2) Hypoid gear backlash

Backlash:

0.10 — 0.20 mm (0.004 — 0.008 in)



21) Remove the RH and LH side retainers.

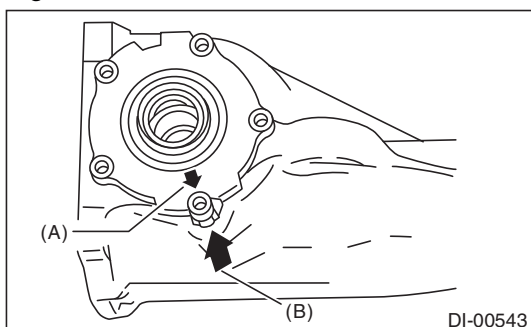
22) Install the O-ring to left and right side retainers.

NOTE:

Use new O-rings.

23) Install the oil seal to the side retainers on both sides. <Ref. to DI-60, REPLACEMENT, Rear Differential Side Oil Seal.>

24) Align the arrow mark on the differential carrier with the arrow mark on the side retainer when installing the side retainer.



(A) Arrow mark (on the side retainer)

(B) Arrow mark (on the differential carrier)

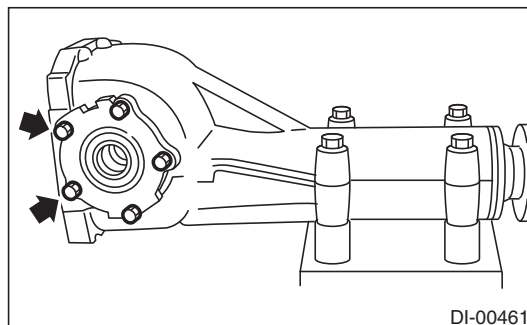
25) Apply liquid gasket to the bolts indicated by arrows, and tighten the bolts.

Liquid gasket:

THREE BOND 1110F, THREE BOND 1110B or equivalent

Tightening torque:

10.5 N·m (1.1 kgf-m, 7.7 ft-lb)



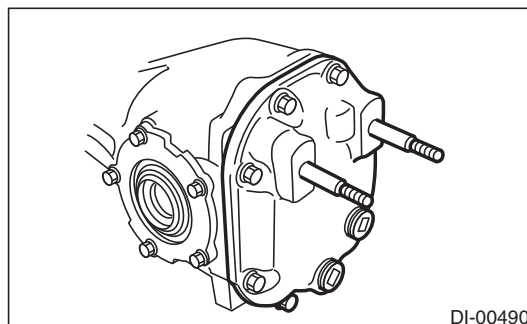
26) Install the gasket and rear cover, and tighten the bolts to specified torque.

NOTE:

Use a new gasket.

Tightening torque:

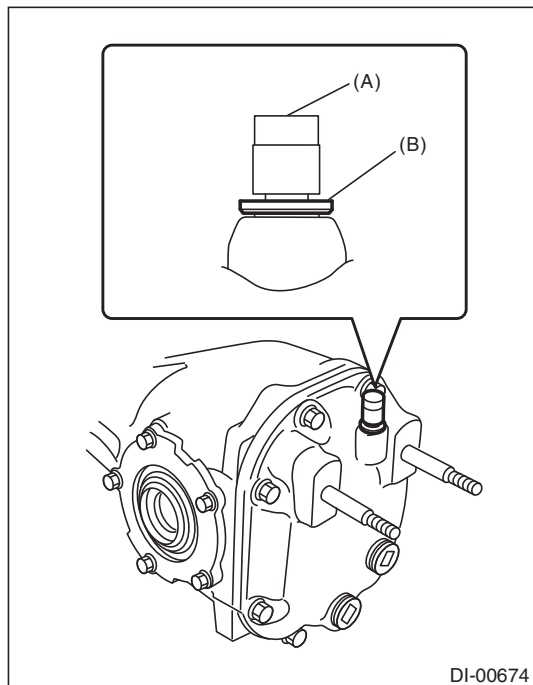
29.5 N·m (3.0 kgf-m, 21.8 ft-lb)



27) Install the air breather cap.

NOTE:

When installing the air breather cap, do not tap section (A). Be sure to tap section (B) to install.



DI-00674

28) Install the drain plug.

NOTE:

Apply liquid gasket to the drain plug.

Liquid gasket:

THREE BOND 1105 (Part No. 004403010) or equivalent

Tightening torque:

49 N·m (5.0 kgf-m, 36.1 ft-lb)

29) Install the filler plug.

NOTE:

After installing the rear differential assembly to the vehicle, fill the gear oil, then apply liquid gasket, and tighten to the specified torque. <Ref. to DI-19, REPLACEMENT, Differential Gear Oil.>

E: INSPECTION

Wash all the disassembled parts clean, and examine them for wear, damage and other defects. Repair or replace the defective parts as necessary.

1) Hypoid driven gear and drive pinion

- If there is evidently an abnormal tooth contact, find out the cause and adjust until the teeth contact correctly. Replace the gear if there is an excessive worn or an incapable adjustment.
- If crack, cutout or seizure is found, replace the parts as a set. Slight damage of some teeth can be corrected by oil stone or the like.

2) Side gear and pinion mate gear

- Replace if cracks, scoring or other defects are evident on the tooth surface.
- Replace if thrust washer contact surface is worn or scored. Slight damages of the surface can be corrected by oil stones or equivalent.

3) Bearing

Replace if seizure, peeling, wear, rust, dragging during rotation, noise or other defect is evident.

4) Thrust washer of the side gear and pinion mate gear

Replace if seized, flawed, abnormally worn or having other defects.

5) Oil seal

Replace if deformed or damaged, and at every disassembling.

6) Differential carrier

Replace if the bearing bores are worn or damaged.

7) Differential case

Replace if sliding surfaces are abnormally worn, burned, or cracked.

8) Companion flange

Replace if the oil seal lip contact surface shows cracking.

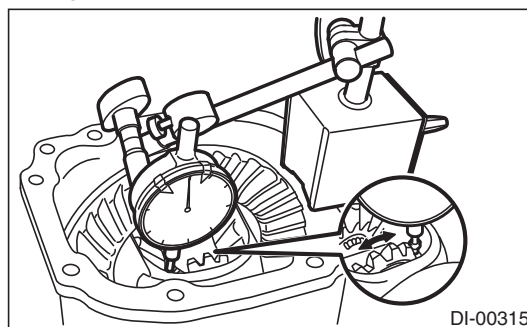
1. SIDE GEAR BACKLASH

Using a dial gauge, check the backlash of side gear.

Side gear backlash:

0.10 — 0.20 mm (0.004 — 0.008 in)

If the side gear backlash is not within the specification, select the side gear thrust washer and adjust the side gear backlash as specified.



DI-00315

Rear Differential (T-type)

DIFFERENTIALS

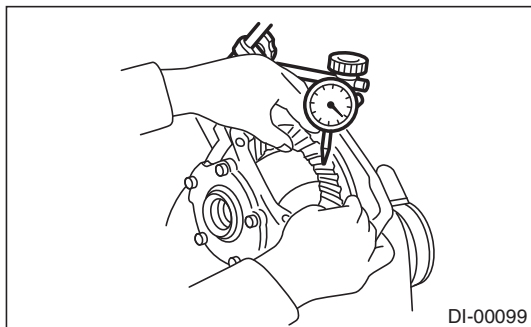
2. HYPOID DRIVEN GEAR BACKLASH

Using a dial gauge, check the backlash of hypoid driven gear.

Hypoid driven gear backlash:

0.10 — 0.20 mm (0.004 — 0.008 in)

If the hypoid driven gear backlash is outside the specification range, adjust the side bearing preload and repair if necessary.



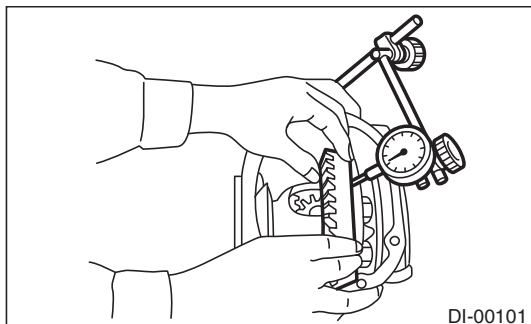
3. HYPOID DRIVEN GEAR RUNOUT ON ITS BACK SURFACE

Using a dial gauge, check the hypoid driven gear back surface runout.

Hypoid driven gear back surface runout:

0.05 mm (0.002 in)

If the hypoid driven gear runout on its back surface exceeds the limit, replace the hypoid driven gear.



4. TOOTH CONTACT BETWEEN HYPOID DRIVEN GEAR AND DRIVE PINION

Inspect the tooth contact between the hypoid driven gear and drive pinion. <Ref. to DI-29, ASSEMBLY, Rear Differential (T-type).>

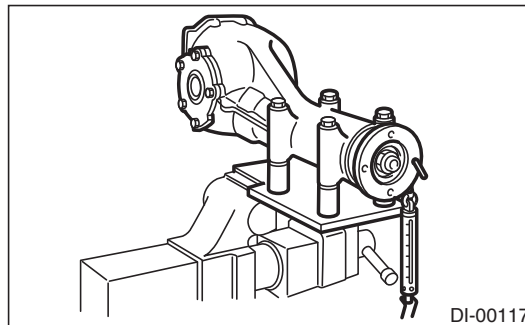
5. TOTAL PRELOAD

Using a spring scale, check the total preload.

Total preload:

20.7 — 54.4 N (2.1 — 5.5 kgf, 4.7 — 12.2 lb)

If the total preload is not within the specification, adjust the side retainer shim.



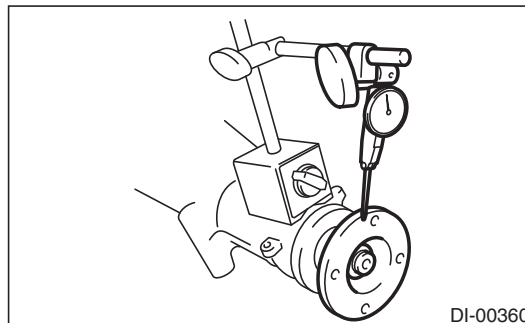
6. COMPANION FLANGE

1) If rust or dirt is attached to the companion flange, remove them.

2) Set a dial gauge at a companion flange surface (mating surface of propeller shaft and companion flange), and then measure the companion flange runout.

Limit of runout:

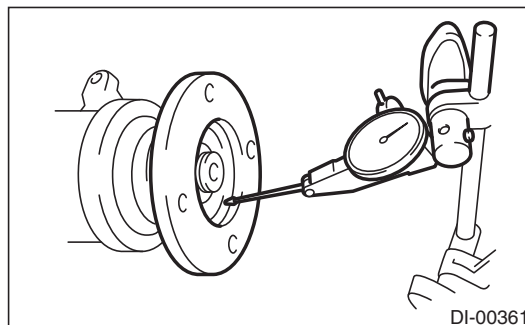
0.08 mm (0.003 in)



3) Set the gauge inside of the companion flange, and measure the runout.

Limit of runout:

0.08 mm (0.003 in)



4) If either runout exceeds the limit, move the phase of companion flange and drive pinion 90° each, and find the point where the runout is within the limit.

5) If the runout exceeds the limit after changing the phase, replace the companion flange and recheck the runout.

6) If the runout exceeds the limit after replacing the companion flange, the drive pinion may be assembled incorrectly or bearing is faulty.

F: ADJUSTMENT

1. SIDE GEAR BACKLASH

Adjust the side gear backlash. <Ref. to DI-29, ASSEMBLY, Rear Differential (T-type).>

2. HYPOID DRIVEN GEAR BACKLASH

Adjust hypoid driven gear backlash. <Ref. to DI-29, ASSEMBLY, Rear Differential (T-type).>

3. TOOTH CONTACT BETWEEN HYPOID DRIVEN GEAR AND DRIVE PINION

Adjust the tooth contact between hypoid driven gear and drive pinion gear. <Ref. to DI-29, ASSEMBLY, Rear Differential (T-type).>

4. TOTAL PRELOAD

Adjust the side retainer shim. <Ref. to DI-29, ASSEMBLY, Rear Differential (T-type).>



Rear Differential (VA-type)

DIFFERENTIALS

5. Rear Differential (VA-type)

A: REMOVAL

The removal procedure for VA-type is included in "REMOVAL" for T-type. <Ref. to DI-22, REMOVAL, Rear Differential (T-type).>

B: INSTALLATION

The installation procedure for VA-type is included in "INSTALLATION" for T-type. <Ref. to DI-24, INSTALLATION, Rear Differential (T-type).>

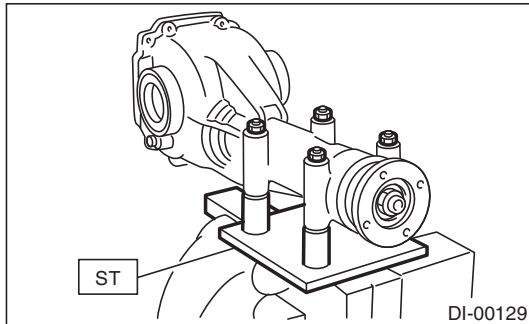
C: DISASSEMBLY

To detect the real cause of trouble, inspect the following items before disassembling.

- Tooth contact and backlash between hypoid driven gear and drive pinion

1) Set the ST on vise and install the differential assembly to ST.

ST 398217700 ATTACHMENT SET

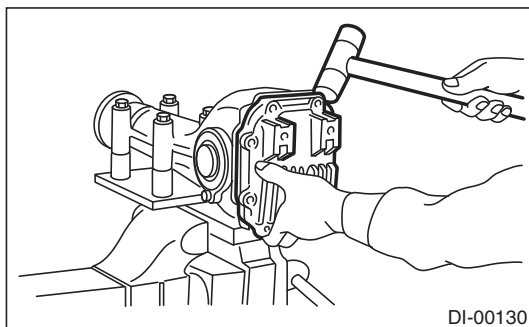


2) Remove the drain plug and filler plug.

3) Remove the rear cover by removing retaining bolts.

NOTE:

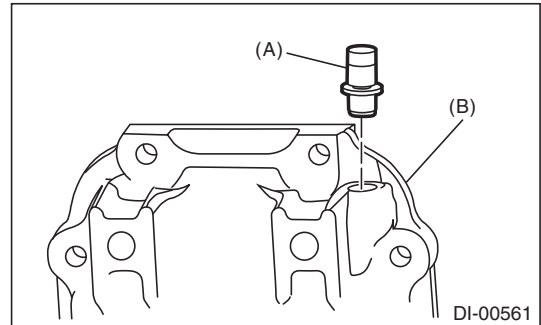
Remove it by tapping with a plastic hammer.



4) Remove the air breather cap.

NOTE:

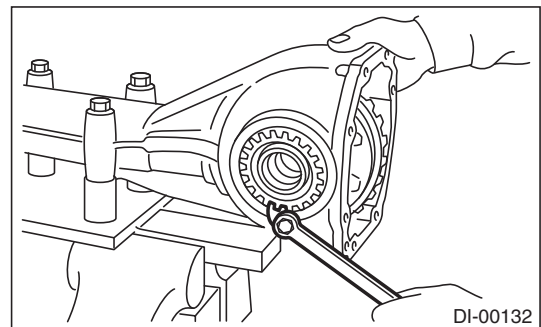
- Do not attempt to remove the air breather cap unless necessary.
- Whenever the air breather cap is removed, replace it with a new part.



(A) Air breather cap

(B) Rear cover

5) Remove the lock plate RH and LH.

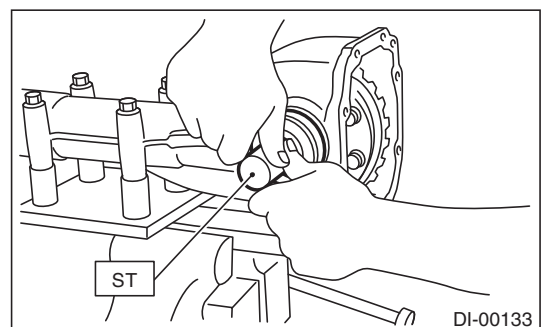


6) Remove the side retainer RH and LH with ST.

NOTE:

When keeping the retainers aside, use labels etc. to avoid confusing the left and right.

ST 18630AA010 WRENCH COMPL RETAINER



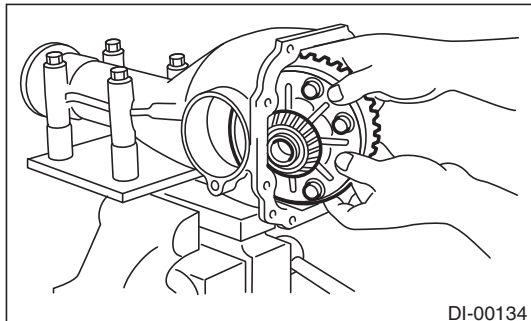
Rear Differential (VA-type)

DIFFERENTIALS

7) Pull out the differential case assembly from differential carrier.

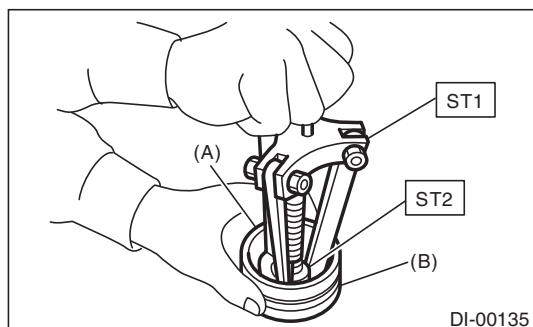
NOTE:

Be careful not to hit the teeth of hypoid driven gear against the differential carrier.



8) Remove the bearing race from side retainer RH and LH with ST1 and ST2.

ST1 499705401 PULLER ASSY
ST2 499705404 SEAT

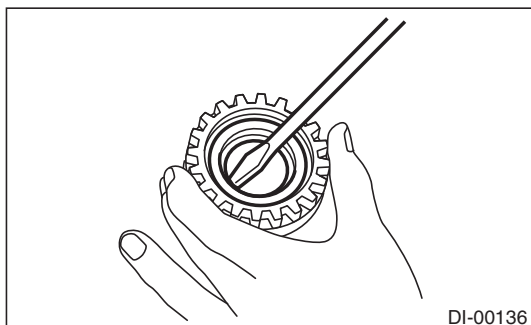


- (A) Bearing race
(B) Side retainer

9) Remove the oil seal from RH and LH side retainers.

NOTE:

Perform this operation only when changing oil seal.



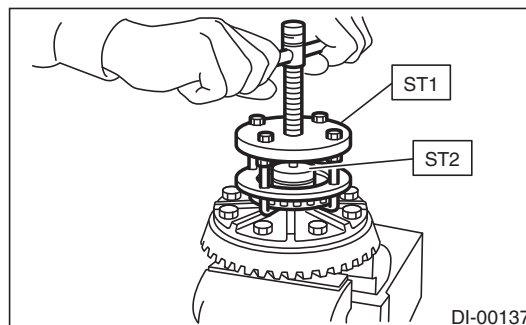
10) Remove the O-ring.

11) Extract the bearing cone with ST1 and ST2.

NOTE:

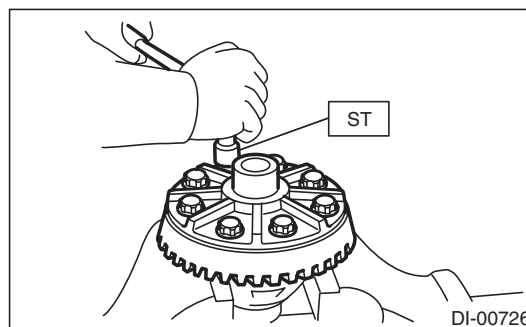
- Do not attempt to disassemble the parts unless necessary.
- Set the puller so that its claws catch the edge of the bearing cone.
- Store so that the right and left side bearing races and cones are not mixed together.

ST1 899524100 PULLER SET
ST2 399520105 SEAT



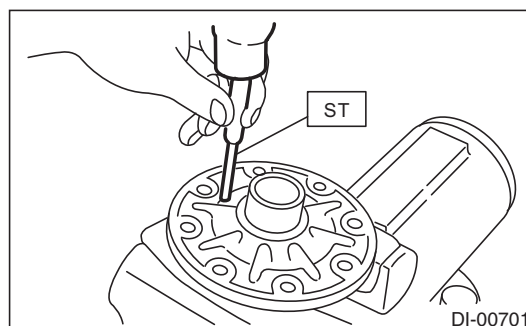
12) Using the ST, loosen the hypoid driven gear bolt and remove the hypoid driven gear.

ST 18270KA020 SOCKET (E20)



13) Remove the spring pin from hypoid driven gear side using ST.

ST 899904100 STRAIGHT PIN REMOVER



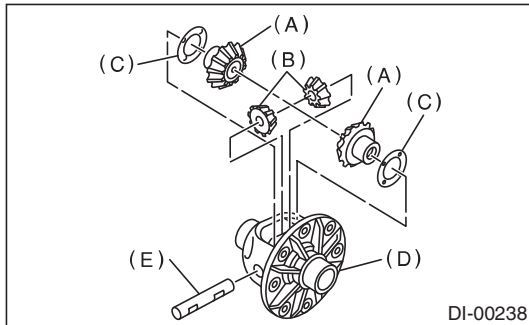
Rear Differential (VA-type)

DIFFERENTIALS

14) Draw out the pinion mate shaft and remove pinion mate gears, side gears and side gear thrust washers.

NOTE:

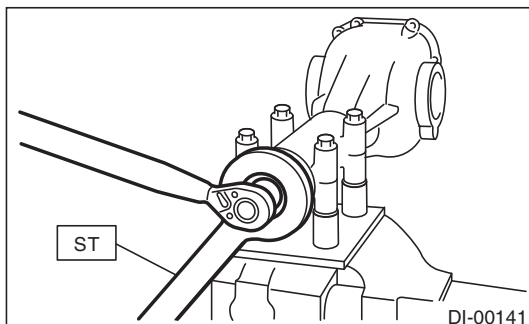
The gears and washers should be marked with RH or LH, front or rear, or kept separately.



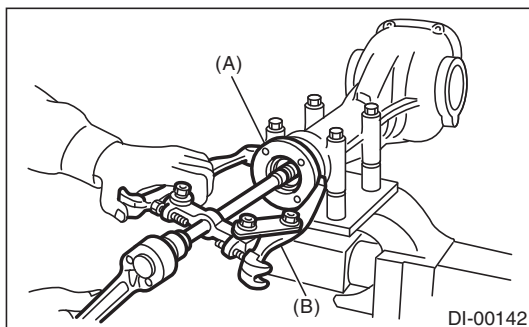
- (A) Side gear
- (B) Pinion mate gear
- (C) Side gear thrust washer
- (D) Differential case
- (E) Pinion mate shaft

15) Remove the self-locking nut while securing the companion flange with ST.

ST 498427200 FLANGE WRENCH



16) Extract the companion flange with a puller.



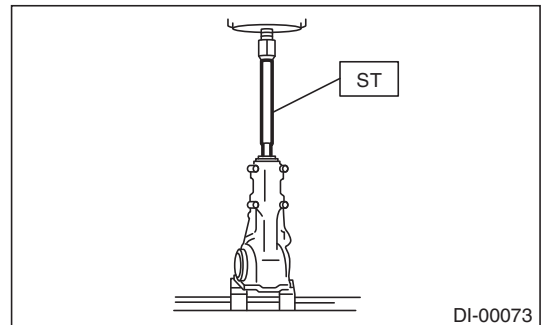
- (A) Companion flange
- (B) Puller

17) Press the end of drive pinion shaft and extract it together with rear bearing cone, pinion height adjusting washer and washer by using the ST.

NOTE:

Hold the drive pinion so as not to drop it.

ST 398467700 DRIFT

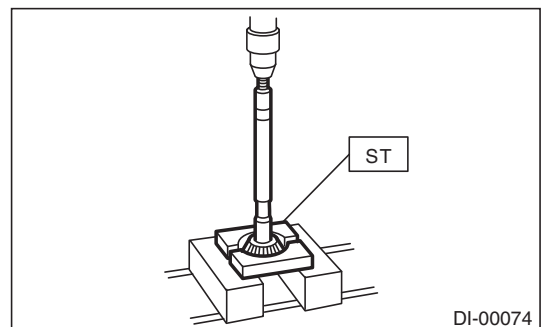


18) Remove the rear bearing cone from drive pinion by supporting the cone with ST.

NOTE:

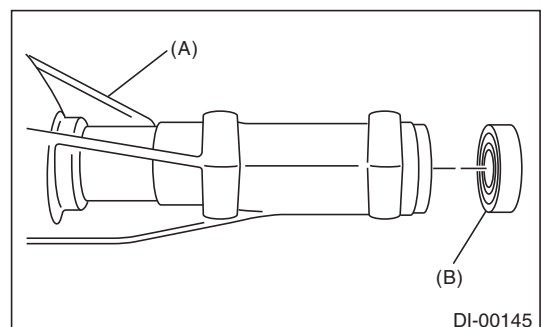
Place the replacer so that its center-recessed side faces the bearing cone.

ST 498515500 REPLACER



19) Remove the front oil seal from differential carrier using ST.

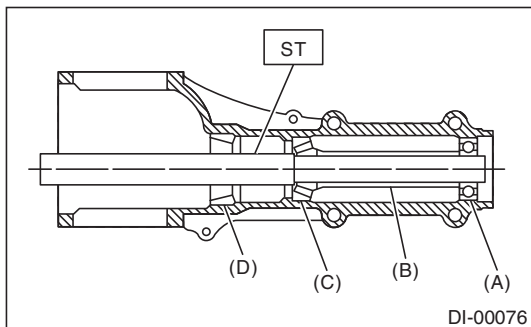
ST 398527700 PULLER ASSY



- (A) Differential carrier
- (B) Front oil seal

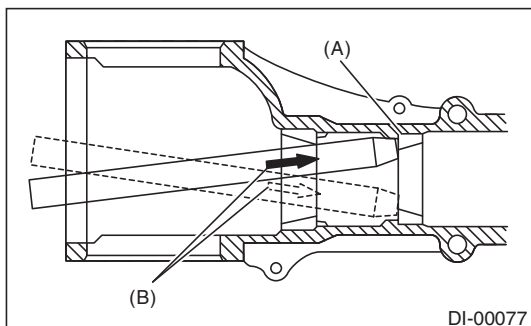
20) Remove the pilot bearing together with the front bearing cone and spacer using the ST.

ST 398467700 DRIFT



- (A) Pilot bearing
- (B) Spacer
- (C) Front bearing
- (D) Rear bearing race

21) When replacing the bearings, tap out the front bearing race and rear bearing race in this order using a brass bar to remove them.

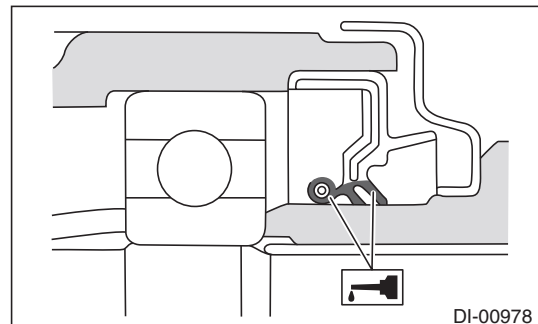


- (A) 2 cutout portions along diagonal lines
- (B) Tap alternately with brass bar.

D: ASSEMBLY

NOTE:

- Assemble in the reverse order of disassembly.
- Check and adjust each part during assembly.
- Use new gaskets and O-rings.
- Keep the shims and washers in order, so that they are not improperly installed.
- Thoroughly clean the surfaces on which the shims, washers and bearings are to be installed.
- Apply gear oil when installing the bearings and thrust washers.
- Be careful not to mix up the RH and LH bearing races.
- Replace the oil seal and O-ring with a new part at every disassembly.
- Be careful not to mix up the side oil seal RH and LH.
- Apply differential gear oil to the lips when installing the oil seal.



1) Adjusting preload for front and rear bearings

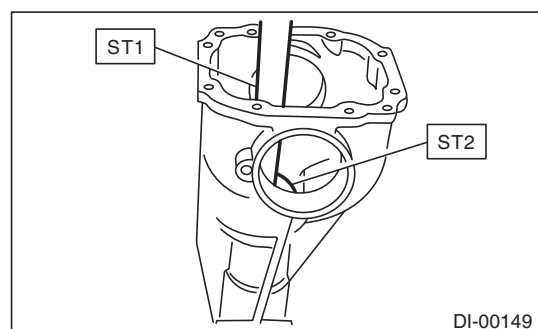
NOTE:

Adjust the bearing preload between front and rear bearings with preload adjusting spacer and washer. Pinion height adjusting washer is not affected by this adjustment. The adjustment must be carried out with oil seal removed.

(1) Install the rear bearing race into the differential carrier using ST1 and ST2.

ST1 398477701 HANDLE

ST2 398477702 DRIFT



Rear Differential (VA-type)

DIFFERENTIALS

(2) Install the front bearing race to the differential carrier using ST1 and ST2.

NOTE:

Use a new front bearing race.

ST1 398477701 HANDLE

ST2 498447110 DRIFT

(3) Insert the front bearing cone.

NOTE:

Use new front bearing cone.

(4) Measure and record the thickness of pinion height adjusting washer.

NOTE:

If tooth contact (drive pinion and hypoid driven gear) is normal in the inspection before disassembling, verify that the washer is not deformed, and then reuse the used washer.

(5) Insert the ST (DUMMY SHAFT) into case with the pinion height adjusting washer and rear bearing cone fitted onto it.

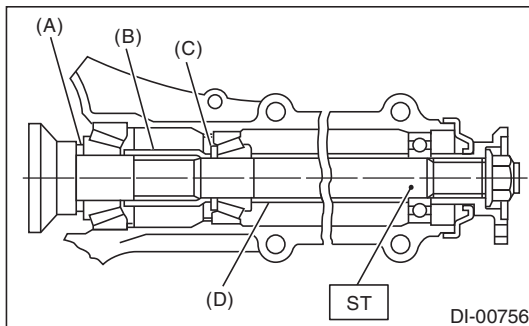
(6) Install the pinion height adjusting washer, preload adjusting spacer, washer, front bearing cone, spacer, pilot bearing, companion flange, and self-locking nut.

NOTE:

Use a new pilot bearing.

ST 498447150 DUMMY SHAFT

Part No. 32285AA000 Spacer



- (A) Pinion height adjusting washer
- (B) Preload adjusting spacer
- (C) Preload adjusting washer
- (D) Spacer (SUBARU genuine parts)

(7) Turn the ST by hand to slowly seat the bearing, and tighten the self-locking nut while measuring the initial load or initial torque with a spring scale or torque wrench. Select the preload adjusting washer and spacer so that the specified preload is obtained when nut is tightened to the specified torque.

NOTE:

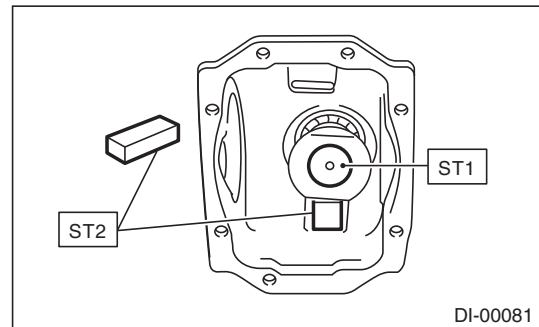
- Use a new self-locking nut.
- Measure the preload in direction of tangent to the flange.
- Be careful not to give excessive preload.
- When tightening the self-locking nut, lock ST1 with ST2 as shown in the figure.

ST1 498447150 DUMMY SHAFT

ST2 398507704 BLOCK

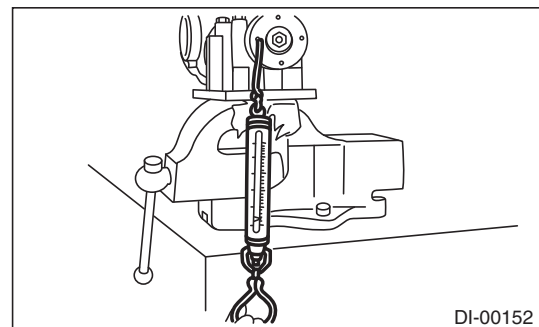
Tightening torque:

191 N·m (19.5 kgf-m, 140.9 ft-lb)



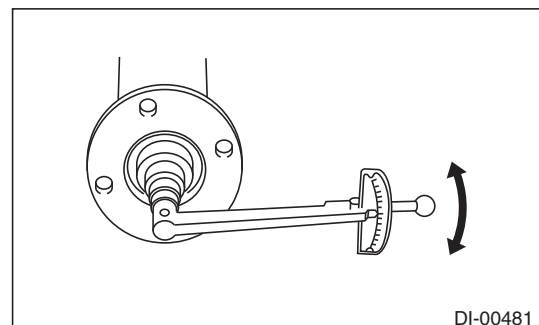
Initial load:

12.7 — 32.2 N (1.3 — 3.3 kgf, 2.9 — 7.2 lbf)



Initial torque:

0.48 — 1.22 N·m (0.05 — 0.12 kgf-m, 0.35 — 0.90 ft-lb)



Rear Differential (VA-type)

DIFFERENTIALS

Preload adjusting washer

Part No.	Thickness mm (in)
38336AA000	1.500 (0.0591)
38336AA120	1.513 (0.0596)
38336AA010	1.525 (0.0600)
38336AA130	1.538 (0.0606)
38336AA020	1.550 (0.0610)
38336AA140	1.563 (0.0615)
38336AA030	1.575 (0.0620)
38336AA150	1.588 (0.0625)
38336AA040	1.600 (0.0630)
38336AA160	1.613 (0.0635)
38336AA050	1.625 (0.0640)
38336AA170	1.638 (0.0645)
38336AA060	1.650 (0.0650)
38336AA180	1.663 (0.0655)
38336AA070	1.675 (0.0659)
38336AA190	1.688 (0.0665)
38336AA080	1.700 (0.0669)
38336AA200	1.713 (0.0674)
38336AA090	1.725 (0.0679)
38336AA210	1.738 (0.0684)
38336AA100	1.750 (0.0689)
38336AA220	1.763 (0.0694)
38336AA110	1.775 (0.0699)

Preload adjusting spacer

Part No.	Length mm (in)
32288AA040	52.3 (2.059)
32288AA050	52.5 (2.067)
31454AA100	52.6 (2.071)
32288AA060	52.7 (2.075)
31454AA110	52.8 (2.079)
32288AA070	52.9 (2.083)
31454AA120	53.0 (2.087)
32288AA080	53.1 (2.091)
32288AA090	53.3 (2.098)

2) Adjusting drive pinion height:

Adjust the drive pinion height with pinion height adjusting washer installed between the rear bearing cone and the back of pinion gear.

(1) Attach the ST2.

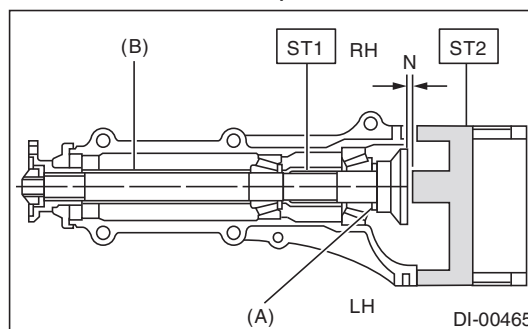
NOTE:

At this time, install a provisionally selected or previously used pinion height adjusting washer.

ST1 498447150 DUMMY SHAFT

ST2 498505501 DIFFERENTIAL CARRIER GAUGE

Part No. 32285AA000 Spacer



(A) Pinion height adjusting washer

(B) Spacer (SUBARU genuine parts)

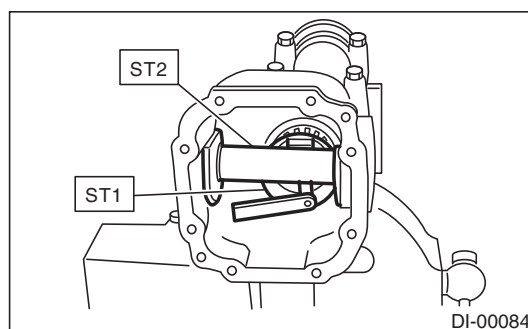
(2) Measure the clearance "N" between the end of ST2 and the end surface of ST1 by using a thickness gauge.

NOTE:

Make sure there is no clearance between the differential carrier and ST2.

ST1 498447150 DUMMY SHAFT

ST2 498505501 DIFFERENTIAL CARRIER GAUGE



Rear Differential (VA-type)

DIFFERENTIALS

(3) Obtain the thickness of pinion height adjusting washer to be inserted from the following formula, and replace the temporarily installed washer with this one.

NOTE:

Adjust it using the 1 — 3 washers.

$$T = T_o + N - 0.05 \text{ mm (0.0020 in)}$$

T	Thickness of pinion height adjusting washer mm (in)	
T _o	Thickness of washer temporarily inserted mm (in)	
N	Clearance of thickness gauge mm (in)	
Memo:		

(Example of calculation)

T_o = 0.15 mm (0.0059 in)

N = 0.1 mm (0.0039 in)

T = 0.15 + 0.1 - 0.05 = 0.2 mm (0.0079 in)

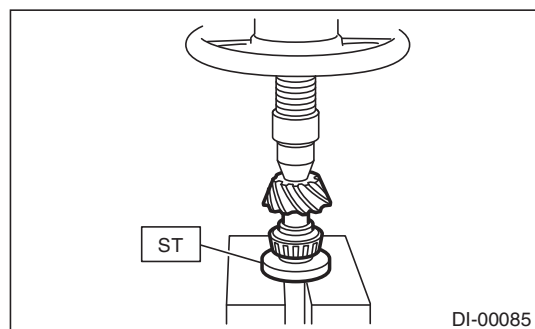
Result: Thickness = 0.2 mm (0.0079 in)

Therefore use part number 32295AA220.

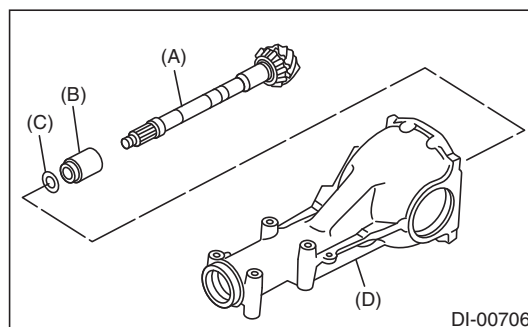
Pinion height adjusting washer	
Part No.	Thickness mm (in)
32295AA200	0.150 (0.0059)
32295AA210	0.175 (0.0069)
32295AA220	0.200 (0.0079)
32295AA230	0.225 (0.0089)
32295AA240	0.250 (0.0098)
32295AA250	0.275 (0.0108)

3) Install the selected pinion height adjusting washer on drive pinion, and press the rear bearing cone into position with ST.

ST 498175500 INSTALLER



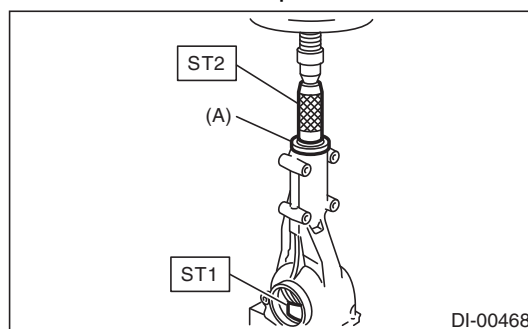
4) Insert the drive pinion into the differential carrier, and install the preselected preload adjusting spacer and washer.



- (A) Drive pinion
- (B) Preload adjusting spacer
- (C) Preload adjusting washer
- (D) Differential carrier

5) Press-fit the front bearing cone into the carrier with ST1, ST2 and the spacer.

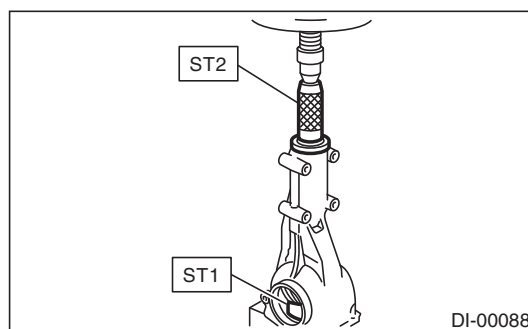
ST1 399780104 WEIGHT
ST2 899580100 INSTALLER
Part No. 32285AA000 Spacer



- (A) Spacer (SUBARU genuine parts)

6) Insert the spacer, then press-fit the pilot bearing with ST1 and ST2.

ST1 399780104 WEIGHT
ST2 899580100 INSTALLER



Rear Differential (VA-type)

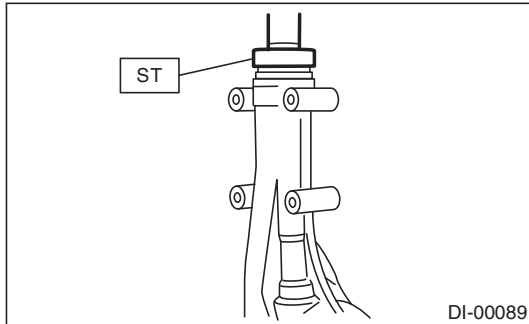
DIFFERENTIALS

7) Using the ST, install the oil seal.

NOTE:

- Use a new oil seal.
- Press-fit until the oil seal end comes 1 mm (0.04 in) inward from end of carrier.
- Apply differential gear oil to the oil seal lips.

ST 498447120 INSTALLER



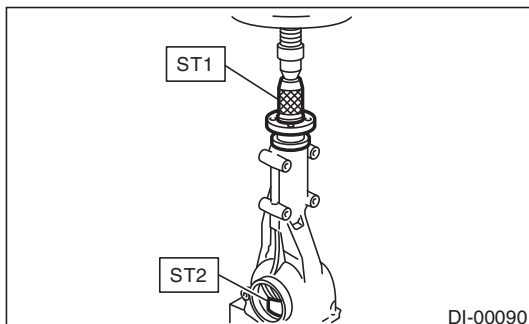
8) Press-fit the companion flange with ST1 and ST2.

NOTE:

Be careful not to damage the pilot bearing.

ST1 899874100 INSTALLER

ST2 399780104 WEIGHT



9) Attach the self-locking nut and use the ST to fix the companion flange in place, then tighten the self-locking nut.

NOTE:

- Use a new self-locking nut.
- Before installing the self-locking nut, apply the seal material to the threads of the drive pinion shaft and to the seating surface of the self-locking nut.

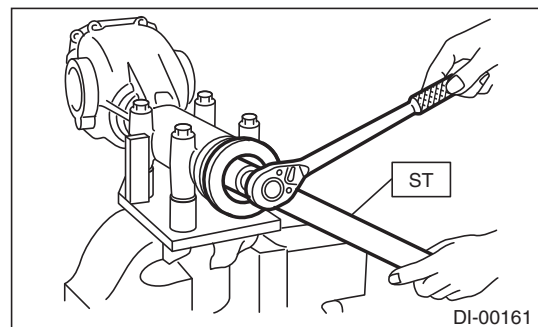
Seal material:

THREE BOND 1324 (Part No. 004403042) or equivalent

Tightening torque:

191 N·m (19.5 kgf·m, 140.9 ft·lb)

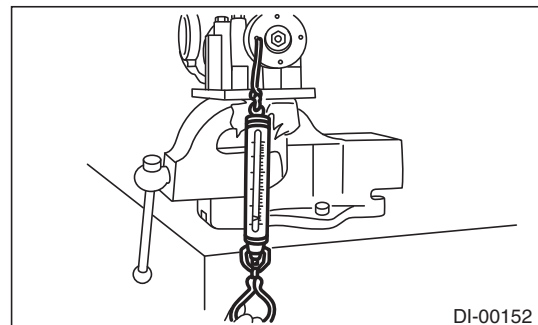
ST 498427200 FLANGE WRENCH



10) Check the initial torque or initial load.

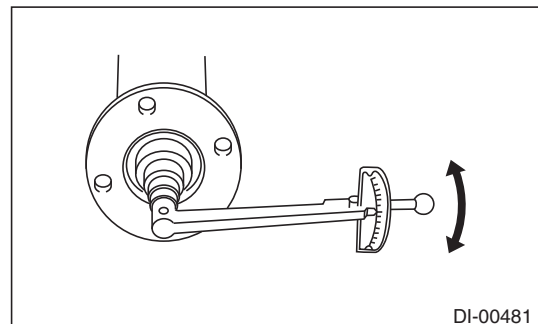
Initial load:

12.7 — 32.2 N (1.3 — 3.3 kgf, 2.9 — 7.2 lbf)



Initial torque:

0.48 — 1.22 N·m (0.05 — 0.12 kgf·m, 0.35 — 0.90 ft·lb)



Rear Differential (VA-type)

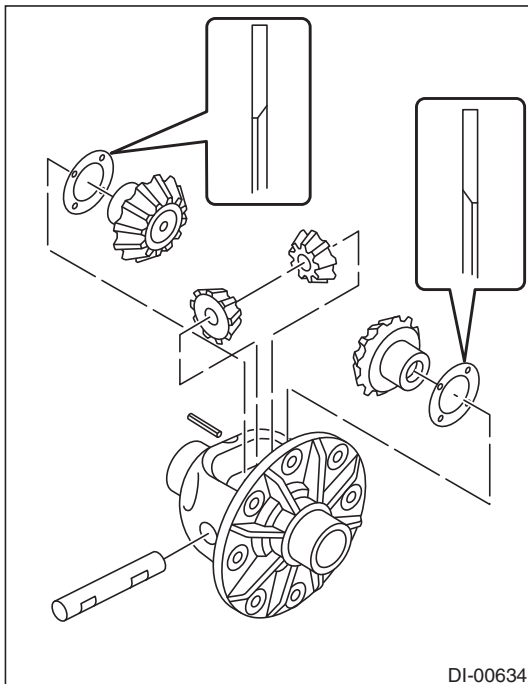
DIFFERENTIALS

11) Assembling differential case

- (1) Install the side gears and pinion mate gears, with their side gear thrust washers and pinion mate shaft, into the differential case.

NOTE:

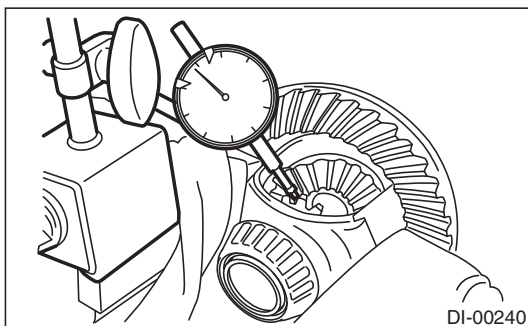
- Apply gear oil on both sides of the washer and on the side gear shaft before installing.
- Insert the pinion mate shaft into the differential case by aligning the pin holes.
- The thrust washer inner surface has a chamfered side. Install the washer with the chamfered side facing toward the side gear.



- (2) Measure the side gear backlash.

Side gear backlash:

0.05 — 0.15 mm (0.002 — 0.006 in)



- (3) Adjust the side gear backlash by selecting side gear thrust washer.

Side gear thrust washer	
Part No.	Thickness mm (in)
803135011	0.925 — 0.950 (0.0364 — 0.0374)
803135012	0.950 — 0.975 (0.0374 — 0.0384)
803135013	0.975 — 1.000 (0.0384 — 0.0394)
803135014	1.000 — 1.025 (0.0394 — 0.0404)
803135015	1.025 — 1.050 (0.0404 — 0.0413)

- (4) Check the condition of rotation after applying oil to the gear tooth surfaces and washer surfaces.

- (5) Drive the spring pin into the differential case.

NOTE:

Use new spring pin.

- 12) Install the hypoid driven gear to differential case.

NOTE:

- Before installing bolts, apply seal material to bolt threads.

Seal material:

THREE BOND 1324 (Part No. 004403042) or equivalent

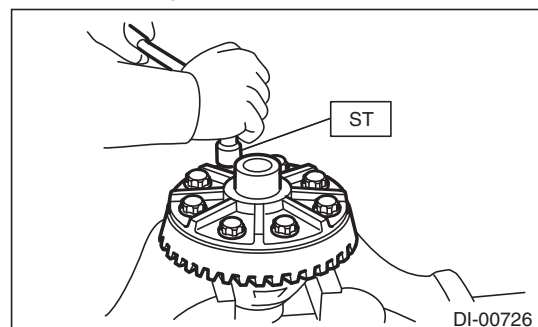
- Tighten opposing bolts in order.

- (1) Tighten the hypoid driven gear mounting bolts to the specified torque using the ST.

ST 18270KA020 SOCKET (E20)

Tightening torque:

20 N·m (2.0 kgf-m, 14.8 ft-lb)



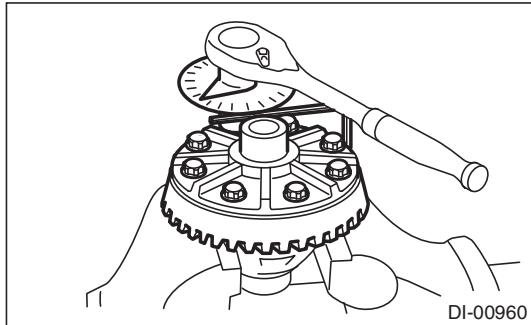
Rear Differential (VA-type)

DIFFERENTIALS

(2) While checking the tightening angle with the angle gauge, further tighten the hypoid driven gear mounting bolts.

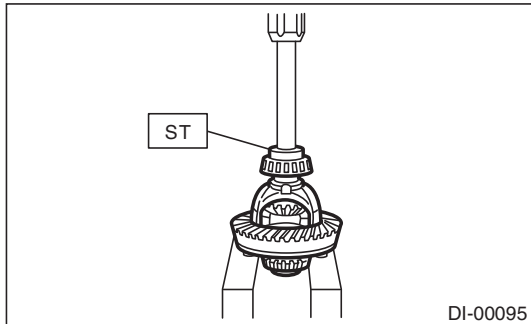
Tightening angle:

$35^{\circ} \pm 2^{\circ}$



13) Using the ST, press-fit the side bearing to the differential case.

ST 498485400 DRIFT



14) Assemble the side retainer.

(1) Install the oil seal into side retainer RH and LH.

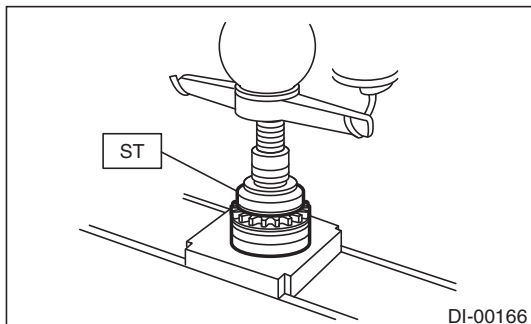
CAUTION:

Pay attention to the left and right of the oil seal.

NOTE:

- Use a new oil seal.
- Apply differential gear oil to the oil seal lip.

ST 498447100 INSTALLER

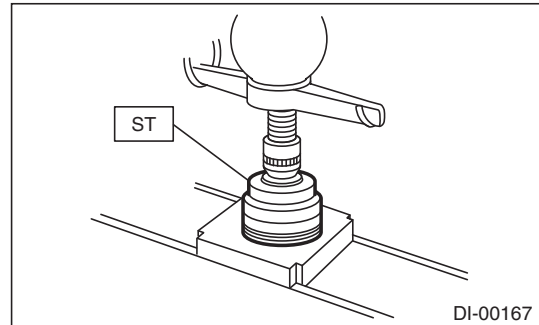


(2) Install the bearing race into side retainer RH and LH.

CAUTION:

Make sure that the bearing outer races and cones are properly assembled.

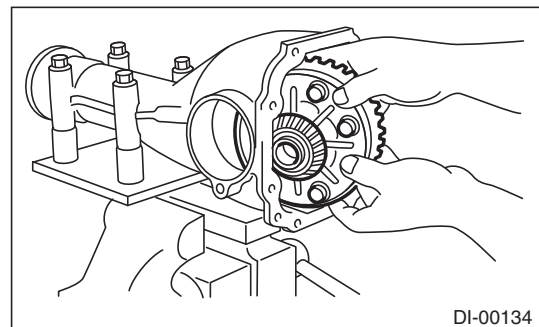
ST 398477702 DRIFT



(3) Install the differential case assembly into differential carrier in the reverse order of disassembly.

NOTE:

Be careful not to hit the teeth of hypoid driven gear against the differential carrier.

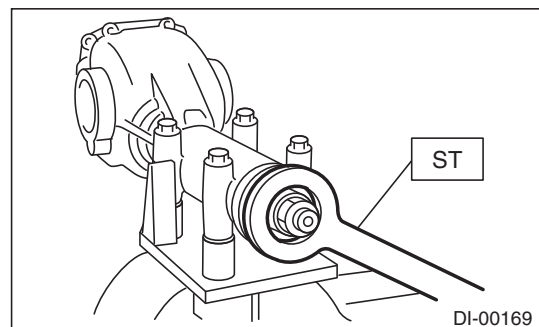


(4) Temporarily tighten the side retainers RH and LH in differential carrier to install.

15) Perform the backlash adjustment between the hypoid driven gear and drive pinion, and preload adjustment of differential side bearing.

(1) Turn the drive pinion with ST for better fitting of differential side bearing.

ST 498427200 FLANGE WRENCH

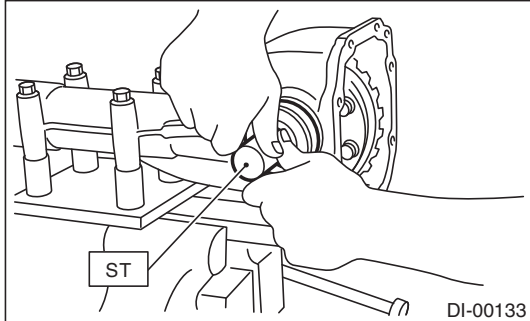


Rear Differential (VA-type)

DIFFERENTIALS

(2) Using the ST, tighten side retainer RH, and then tighten side retainer LH until there is no backlash.

ST 18630AA010 WRENCH COMPL RETAINER

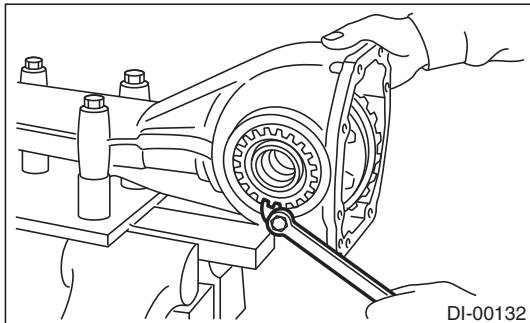


(3) Loosen the side retainer LH by approx. 1 and 1/2 teeth, and tighten the side retainer RH by approx. 2 teeth [amount that the side retainer LH is turned back (approx. 1 and 1/2 teeth) + approx. 1/2 teeth]. Difference between [amount that the side retainer LH is turned back (approx. 1 and 1/2 teeth)] and [amount that the side retainer RH is tightened (approx. 2 teeth)] gives preload.

(4) Temporarily tighten the lock plate.

NOTE:

Turn over the lock plate to shift the holder by 1/2 teeth.



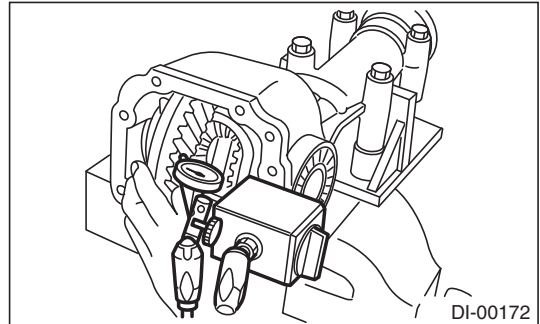
(5) Measure the hypoid driven gear-to-drive pinion backlash. Set the magnet base on differential carrier. Align the contact point of dial gauge with tooth face of hypoid driven gear, and move hypoid driven gear while holding drive pinion still. Read the value indicated on dial gauge.

NOTE:

If measured value of backlash is not within the specified range, repeat the procedures for pinion driven gear set backlash adjustment and the differential side bearing preload adjustment.

Backlash:

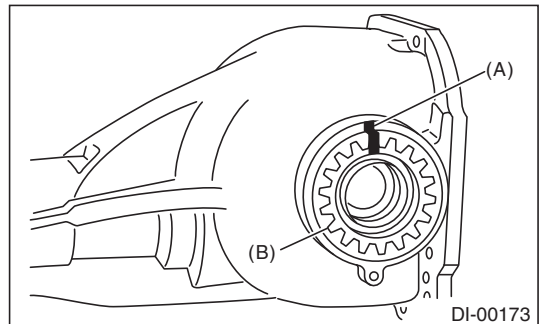
0.10 — 0.15 mm (0.004 — 0.006 in)



16) Put alignment marks on both the differential carrier and side retainer. Remove the side retainers one side at a time. After installing an O-ring and applying oil to the threaded portion, restore them to the original position.

NOTE:

Use new O-rings.



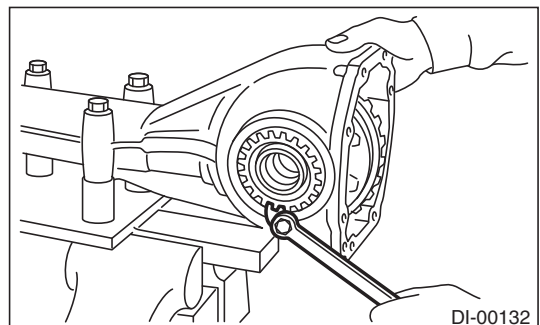
(A) Alignment mark

(B) Side retainer

17) Install the lock plate, and tighten the bolts to the specified torque.

Tightening torque:

25 N·m (2.5 kgf-m, 18.4 ft-lb)



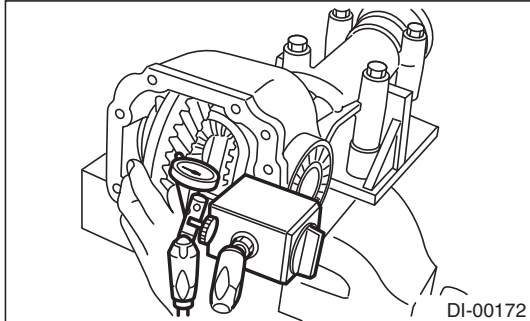
Rear Differential (VA-type)

DIFFERENTIALS

18) Recheck the backlash between hypoid driven gear and drive pinion.

Backlash:

0.10 — 0.15 mm (0.004 — 0.006 in)



19) Checking and adjusting the tooth contact of hypoid driven gear

(1) Apply lead-free red dye evenly on the both sides of three to four teeth of the hypoid driven gear. Check the contact pattern after rotating the hypoid driven gear several revolutions back and forth until a definite contact pattern appears on the hypoid driven gear.

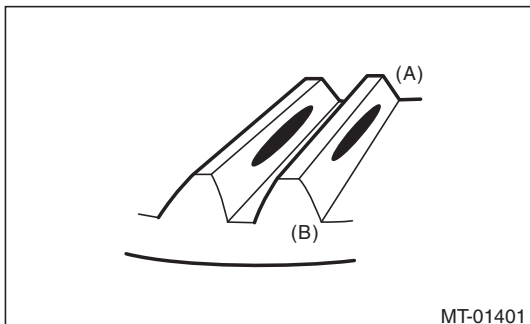
(2) When the contact pattern is not correct, re-adjust.

NOTE:

Be sure to wipe off the lead-free red dye completely after the adjustment is completed.

- Correct tooth contact

Check item: Tooth contact pattern is slightly shifted toward toe side under no-load rotation. (When driving, it moves towards the heel side.)

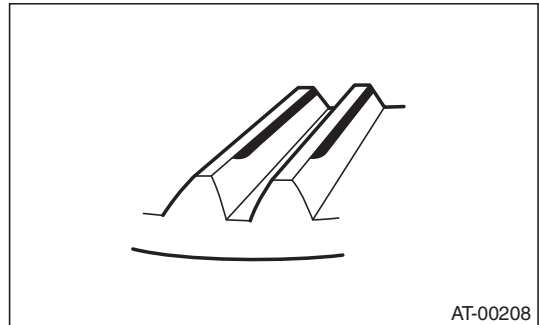


- (A) Toe side
(B) Heel side

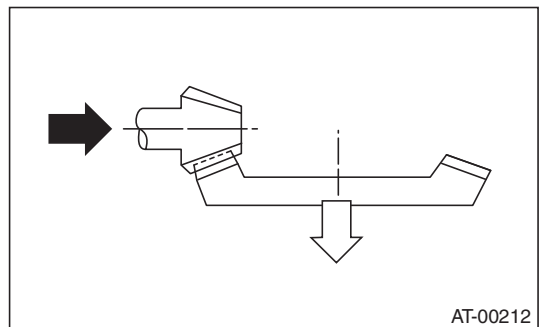
- Face contact

Check item: Backlash is too large.

Contact pattern



Corrective action: Increase thickness of pinion height adjusting washer according to the procedure for bringing drive pinion close to hypoid driven gear side.



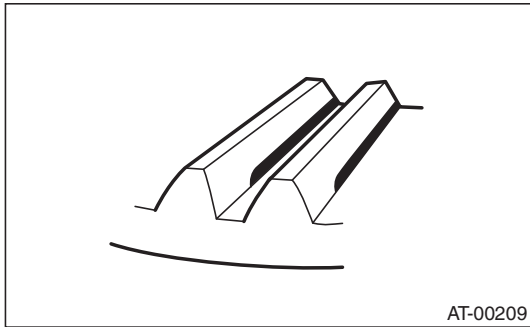
Rear Differential (VA-type)

DIFFERENTIALS

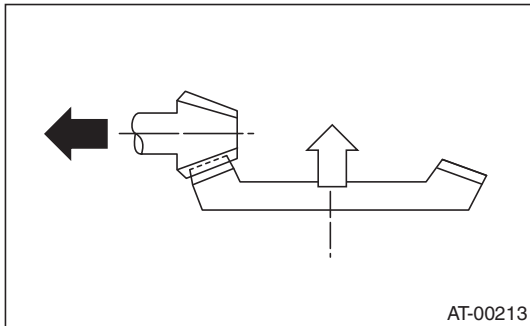
- Flank contact

Check item: Backlash is too small.

Contact pattern



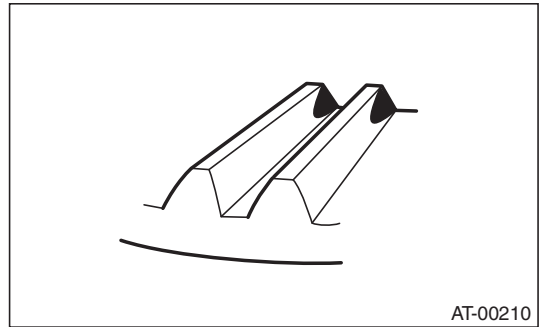
Corrective action: Reduce the thickness of pinion height adjusting washer according to the procedure for bringing drive pinion away from hypoid driven gear.



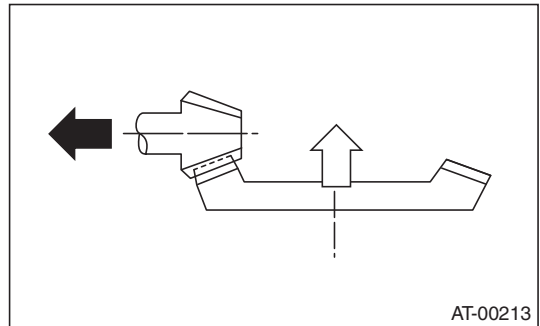
- Toe contact (inside contact)

Check item: Teeth contact area is too small.

Contact pattern



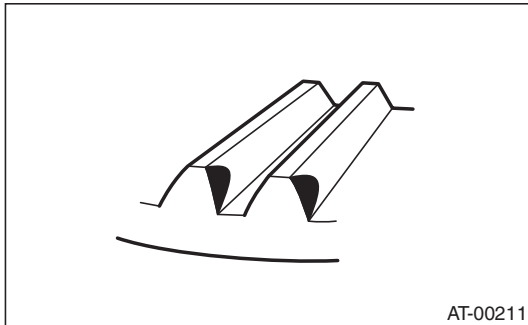
Corrective action: Reduce the thickness of pinion height adjusting washer according to the procedure for bringing drive pinion away from hypoid driven gear side.



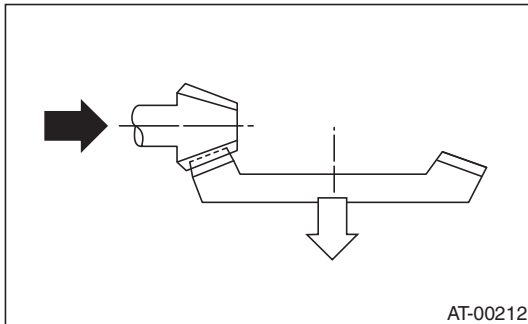
Rear Differential (VA-type)

DIFFERENTIALS

- Heel contact (outside end contact)
Check item: Teeth contact area is too small.
Contact pattern



Corrective action: Increase thickness of pinion height adjusting washer according to the procedure for bringing drive pinion close to hypoid driven gear side.



20) If correct tooth contact is not obtained, readjust the drive pinion height and the differential side bearing preload (already mentioned) and the hypoid gear backlash.

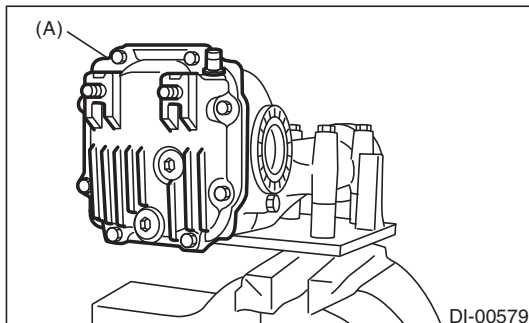
21) Install the gasket and rear cover to the differential carrier, and tighten the bolts to specified torque.

NOTE:

Use a new gasket.

Tightening torque:

25 N·m (2.5 kgf-m, 18.4 ft-lb)

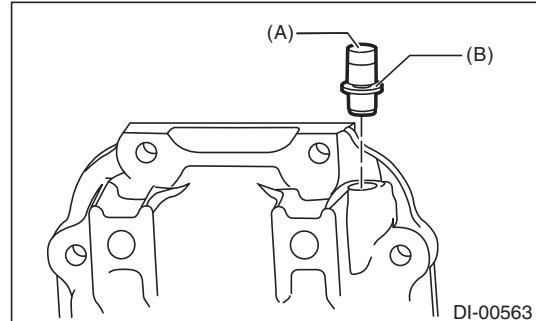


(A) Rear cover

22) Install the air breather cap.

NOTE:

When installing the air breather cap, do not tap section (A). Be sure to tap section (B) to install.



23) Install the drain plug.

NOTE:

Use a new gasket.

Tightening torque:

50 N·m (5.1 kg-m, 36.9 ft-lb)

24) Install the filler plug.

NOTE:

After installing the rear differential assembly to the vehicle, fill the gear oil, then use a new gasket, and tighten to the specified torque. <Ref. to DI-19, REPLACEMENT, Differential Gear Oil.>

E: INSPECTION

Wash all the disassembled parts clean, and examine them for wear, damage or other defects. Repair or replace the defective parts as necessary.

1) Hypoid driven gear and drive pinion

- If there is evidently an abnormal tooth contact, find out the cause and adjust until the teeth contact correctly. Replace the gear if there is an excessive worn or an incapable adjustment.

- If crack, cutout or seizure is found, replace the parts as a set. Slight damage of some teeth can be corrected by oil stone or the like.

2) Side gear and pinion mate gear

- Replace if cracks, scoring or other defects are evident on the tooth surface.

- Replace if thrust washer contact surface is worn or seized. Slight damages of the surface can be corrected by oil stones or equivalent.

3) Bearing

Replace if seizure, peeling, wear, rust, dragging during rotation, noise or other defect is evident.

4) Thrust washer of the side gear and pinion mate gear

Replace if seized, flawed, abnormally worn or having other defects.

5) Oil seal

Replace if deformed or damaged, and at every disassembling.

Rear Differential (VA-type)

DIFFERENTIALS

6) Differential carrier

Replace if the bearing bores are worn or damaged.

7) Differential case

Replace if its sliding surfaces are abnormally worn, burned, or cracked.

8) Companion flange

Replace if the oil seal lip contact surface shows cracking.

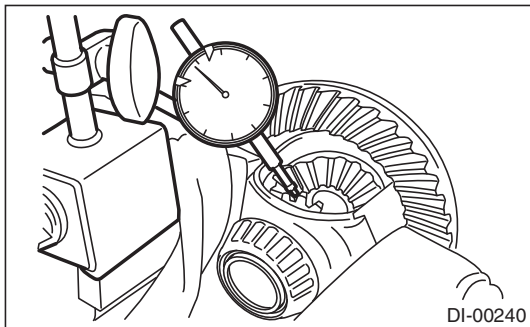
1. SIDE GEAR BACKLASH

Using a dial gauge, check the backlash of side gear.

Side gear backlash:

0.05 — 0.15 mm (0.002 — 0.006 in)

If the side gear backlash is outside the specification range, select the side gear thrust washer and adjust the side gear backlash as specified.



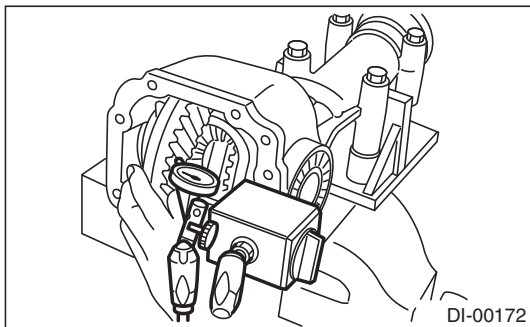
2. HYPOID DRIVEN GEAR BACKLASH

Using a dial gauge, check the backlash of hypoid driven gear.

Hypoid driven gear backlash:

0.10 — 0.15 mm (0.004 — 0.006 in)

If the hypoid driven gear backlash is outside the specification range, adjust the side bearing preload and repair if necessary.



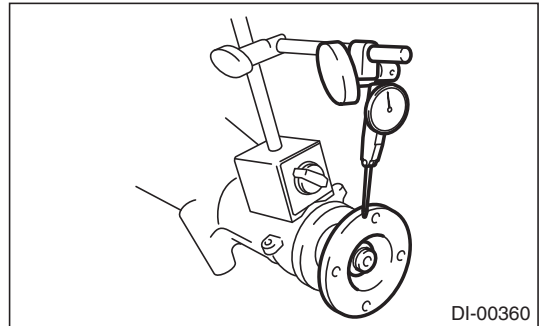
3. COMPANION FLANGE

1) If rust or dirt is attached to the companion flange, remove them.

2) Set a dial gauge at a companion flange surface (mating surface of propeller shaft and companion flange), and then measure the companion flange runout.

Limit of runout:

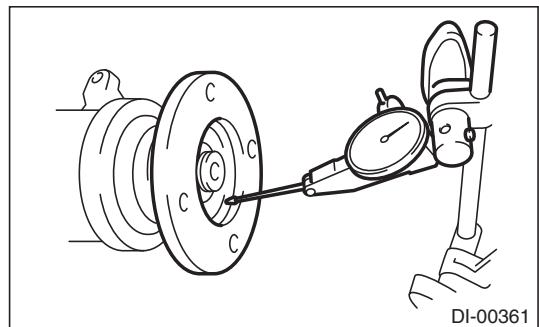
0.08 mm (0.003 in)



3) Set the gauge inside of the companion flange, and measure the runout.

Limit of runout:

0.08 mm (0.003 in)



4) If either runout exceeds the limit, move the phase of companion flange and drive pinion 90° each, and find the point where the runout is within the limit.

5) If the runout exceeds the limit after changing the phase, replace the companion flange and recheck the runout.

6) If the runout exceeds the limit after replacing the companion flange, the drive pinion may be assembled incorrectly or bearing is faulty.

4. TOOTH CONTACT BETWEEN HYPOID DRIVEN GEAR AND DRIVE PINION

Inspect the tooth contact between the hypoid driven gear and drive pinion. <Ref. to DI-45, ASSEMBLY, Rear Differential (VA-type).>

F: ADJUSTMENT

1. SIDE GEAR BACKLASH

Adjust the side gear backlash. <Ref. to DI-45, ASSEMBLY, Rear Differential (VA-type).>

2. HYPOID DRIVEN GEAR BACKLASH

Adjust hypoid driven gear backlash. <Ref. to DI-45, ASSEMBLY, Rear Differential (VA-type).>

3. TOOTH CONTACT BETWEEN HYPOID DRIVEN GEAR AND DRIVE PINION

Adjust the tooth contact between hypoid driven gear and drive pinion gear. <Ref. to DI-45, ASSEMBLY, Rear Differential (VA-type).>



Rear Differential Front Oil Seal

DIFFERENTIALS

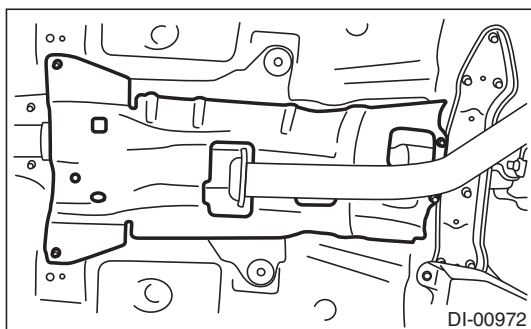
6. Rear Differential Front Oil Seal

A: INSPECTION

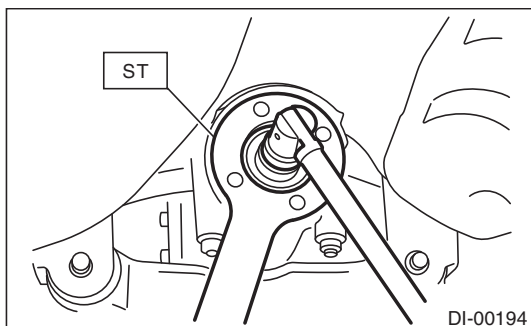
Make sure that there is no leakage from front oil seal portion. If there is any leakage replace the oil seal and inspect the propeller shaft.

B: REPLACEMENT

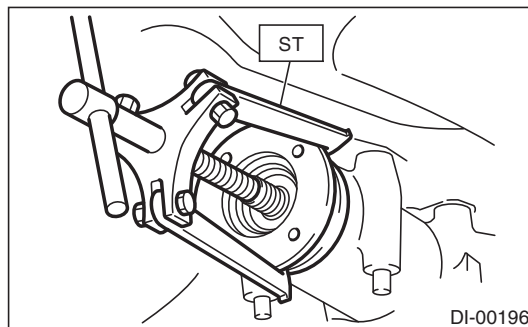
- 1) Shift the select lever or gear shift lever to neutral.
- 2) Disconnect the ground cable from battery.
- 3) Release the parking brake.
- 4) Lift up the vehicle.
- 5) Drain differential gear oil. <Ref. to DI-19, REPLACEMENT, Differential Gear Oil.>
- 6) Remove the rear exhaust pipe.
 - 2.5 L non-turbo model
<Ref. to EX(H4DO)-18, REMOVAL, Rear Exhaust Pipe.>
 - 2.0 L turbo model
<Ref. to EX(H4DOTC)-45, REMOVAL, Rear Exhaust Pipe.>
- 7) Remove the heat shield cover.



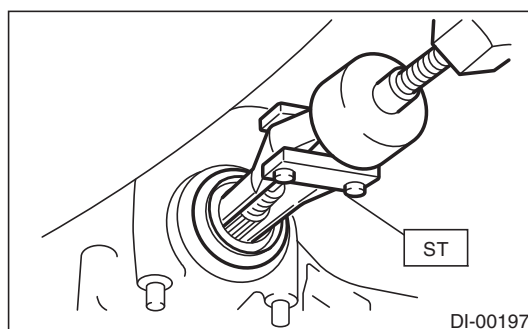
- 8) Remove the propeller shaft. <Ref. to DS-11, REMOVAL, Propeller Shaft.>
 - 9) Check the initial torque and write it down.
 - 10) Remove the self-locking nut while holding the companion flange with ST.
- ST 498427200 FLANGE WRENCH



- 11) Extract the companion flange using the ST.
- ST 399703600 PULLER ASSY



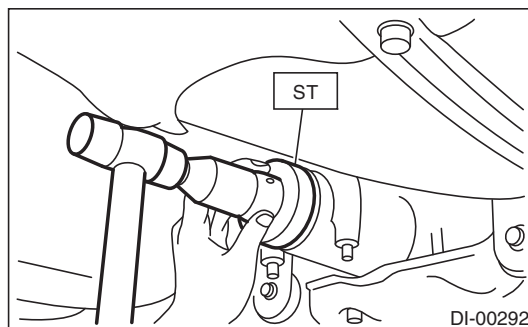
- 12) Remove the oil seal using ST or screwdriver.
- ST 398527700 PULLER ASSY



- 13) Using the ST, install the oil seal.

NOTE:

- Use a new oil seal.
 - Apply differential gear oil to the oil seal lips.
- ST 498447120 INSTALLER



- 14) Install the companion flange.

NOTE:

Use a plastic hammer to install companion flange.

15) Tighten the self-locking nut to the specified torque so that the initial torque of companion flange becomes the same as that of before oil seal replacement.

NOTE:

- Use a new self-locking nut.
- Before installing the self-locking nut, apply the seal material to the threads of the drive pinion shaft and to the seating surface of the self-locking nut.

Seal material:

THREE BOND 1324 (Part No. 004403042) or equivalent

Tightening torque:

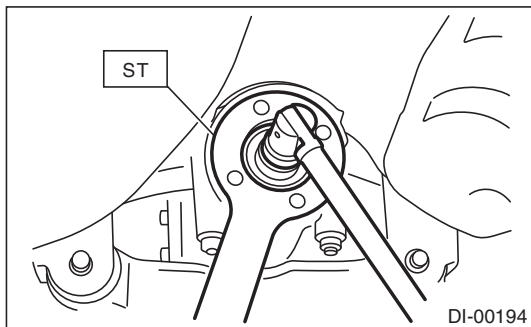
T-type

167 — 196 N·m (17.0 — 20.0 kgf-m, 123.2 — 144.6 ft-lb)

VA-type

162 — 220 N·m (16.5 — 22.5 kgf-m, 119.5 — 162.3 ft-lb)

ST 498427200 FLANGE WRENCH



16) Hereafter, perform assembly in the reverse order of disassembly.

17) Fill differential gear oil. <Ref. to DI-19, REPLACEMENT, Differential Gear Oil.>

Rear Differential Side Oil Seal

DIFFERENTIALS

7. Rear Differential Side Oil Seal

A: INSPECTION

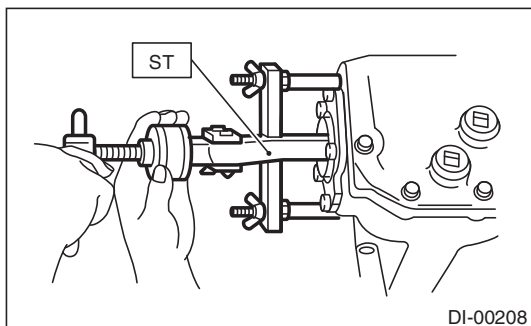
Check that there is no oil leakage from the side oil seal. If there is any leakage, replace the oil seal.

B: REPLACEMENT

1) Remove the rear differential. <Ref. to DI-22, REMOVAL, Rear Differential (T-type).> <Ref. to DI-42, REMOVAL, Rear Differential (VA-type).>

2) Remove the rear differential side oil seal using a ST or screwdriver wrapped with vinyl tape to prevent the side retainer from scratching.

ST 398527700 PULLER ASSY

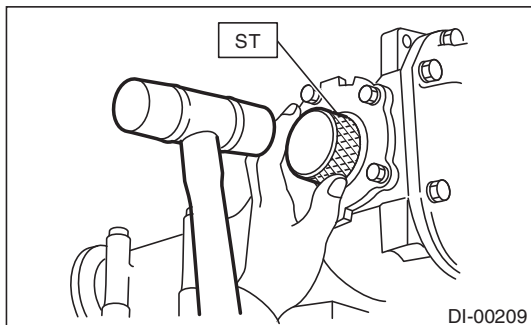


3) Using the ST, install the oil seal.

NOTE:

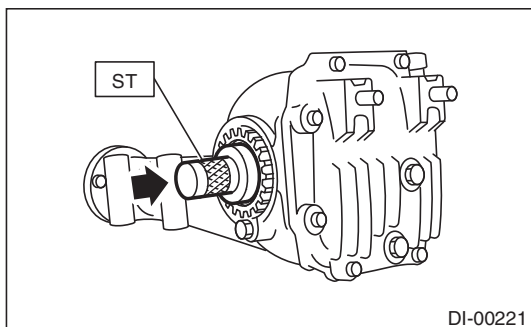
- Use a new oil seal.
- Apply differential gear oil to the oil seal lips.
- T-type

ST 398437700 DRIFT



- VA1-type

ST 498447100 INSTALLER

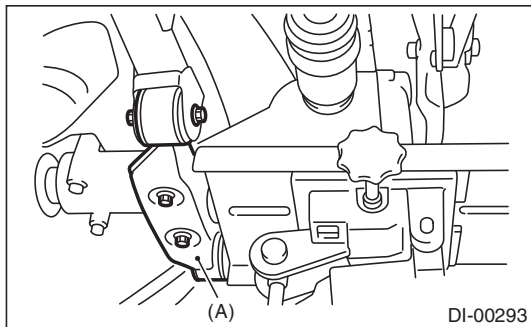


4) Install the rear differential. <Ref. to DI-24, INSTALLATION, Rear Differential (T-type).> <Ref. to DI-42, INSTALLATION, Rear Differential (VA-type).>

8. Rear Differential Front Member

A: REMOVAL

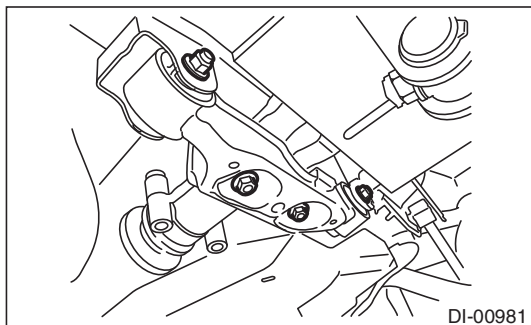
- 1) Disconnect the ground cable from battery.
- 2) Lift up the vehicle.
- 3) Support the rear differential using transmission jack, and then remove the rear differential front member.



(A) Rear differential front member

B: INSTALLATION

- 1) Install the rear differential front member, and temporarily attach and tighten a new self-locking nut.

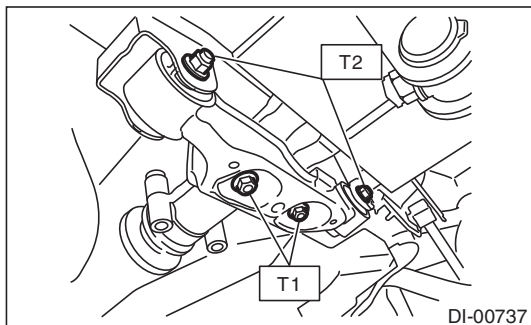


- 2) Remove the transmission jack.
- 3) Tighten the self-locking nut.

Tightening torque:

T1: 50 N·m (5.1 kgf-m, 36.9 ft-lb)

T2: 110 N·m (11.2 kgf-m, 81.1 ft-lb)



C: INSPECTION

- 1) Check the rear differential front member for damage, bend and corrosion. If damage, bend or corrosion is excessive, replace the rear differential front member.
- 2) Check the bushings of rear differential front member for cracking, hardening and damage. If cracking, hardening or damage is excessive, replace rear differential front member.

Rear Differential Mount Bushing

DIFFERENTIALS

9. Rear Differential Mount Bushing

A: INSPECTION

Check the rear differential mount bushing for cracks, hardening or damage. If cracking, hardening or damage is excessive, replace rear differential mount bushing.

B: REPLACEMENT

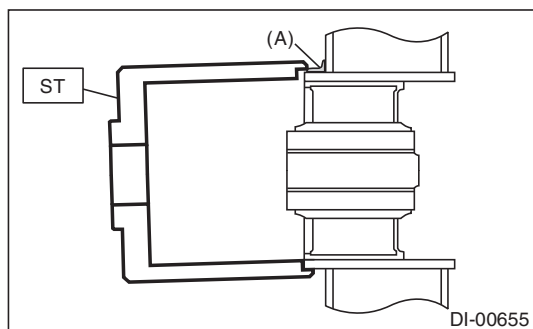
CAUTION:

- Apply the molybdenum grease on the square thread of the ST (shaft and nut) before use.
- If there was so much rust in the rear differential mount bushing, remove the rust before starting work.

1) Remove the rear differential. <Ref. to DI-22, REMOVAL, Rear Differential (T-type).> <Ref. to DI-42, REMOVAL, Rear Differential (VA-type).>

2) Fit the ST to the periphery of the sub frame cylinder, and make sure that the ST does not contact with welded spots or spatters.

ST 41399FG010 SPECIAL TOOL A



(A) Welded spot

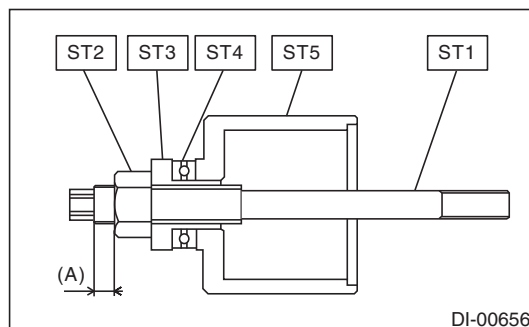
3) If the ST contacts with welded spots or spatters, remove the excessive welds or spatters with sander or the equivalent so that the ST contacts the cylinder peripheral part.

CAUTION:

Performing the operation with the ST contacting with welded spots or spatters may break the ST. Be sure to remove excessive welds or spatters before the operation.

4) Set ST1, ST2, ST3, ST4 and ST5 as shown in the figure.

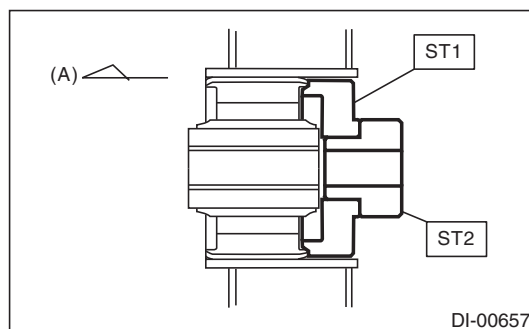
ST1	41399FG091	SPECIAL TOOL SHAFT
ST2	41399FG070	SPECIAL TOOL NUT
ST3	41399FG050	SPECIAL TOOL SLEEVE
ST4	41399FG080	SPECIAL TOOL BEARING
ST5	41399FG010	SPECIAL TOOL A



(A) 5 mm (0.2 in) or less

5) Fit and hold the ST1 and ST2 to the rear differential mount bushing from the rear side of vehicle.

ST1	41399FG031	SPECIAL TOOL C
ST2	41399FG061	SPECIAL TOOL RING



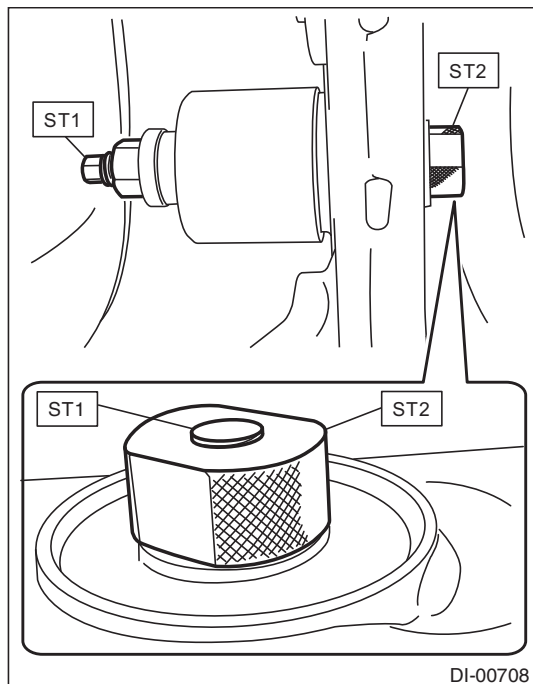
(A) Front side of vehicle

Rear Differential Mount Bushing

DIFFERENTIALS

6) Insert the ST set in the step 4) through the rear differential mount bushing hole from the front side of vehicle, and screw in the ST1 by hand till the front end of ST1 comes out slightly from the rear end of ST2.

ST1 41399FG091 SPECIAL TOOL SHAFT
ST2 41399FG061 SPECIAL TOOL RING

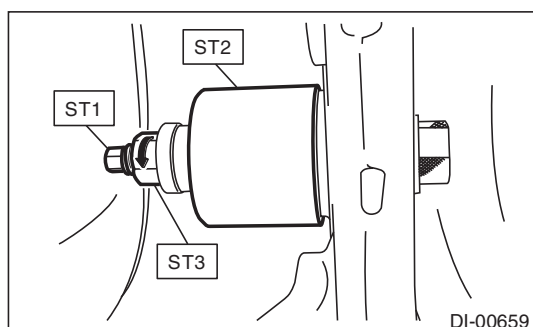


7) Hold the ST1 to prevent it from rotating, and screw in the ST3 by hand till there is no loose fit on the ST2.

CAUTION:

When setting the ST to the vehicle, always make sure that the ST2 fits the periphery of the sub frame cylinder and is not tilted.

ST1 41399FG091 SPECIAL TOOL SHAFT
ST2 41399FG010 SPECIAL TOOL A
ST3 41399FG070 SPECIAL TOOL NUT

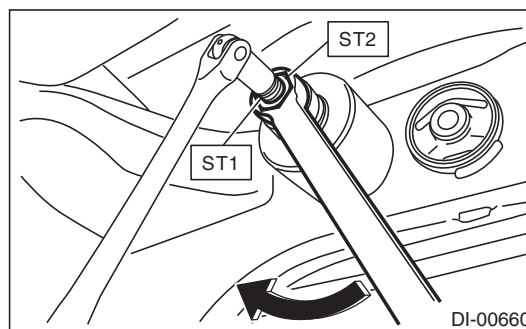


8) Hold the ST1 with a tool to prevent it from rotating, and screw in the ST2 to remove the rear differential mount bushing.

CAUTION:

- Rotation of ST1 will damage the screw at the rear end of rear differential mount bushing. Never rotate the ST1.
- If the ST starts to tilt while removing the rear differential mount bushing, stop the work and set the ST again.

ST1 41399FG091 SPECIAL TOOL SHAFT
ST2 41399FG070 SPECIAL TOOL NUT



Rear Differential Mount Bushing

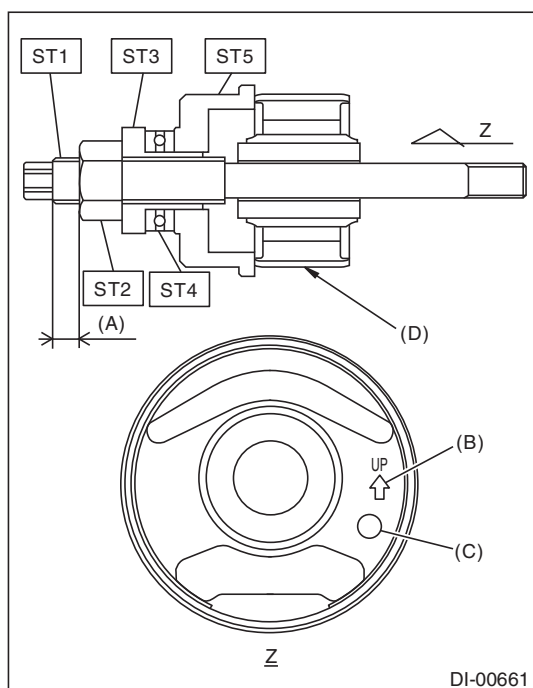
DIFFERENTIALS

9) Set ST1, ST2, ST3, ST4, ST5 and rear differential mount bushing as shown in the figure.

NOTE:

- Set the ST2 nut near to the end of ST1 screw.
- Hold the rear differential mount bushing with the marked side facing toward the rear of the vehicle, and set the rear differential mount bushing to the ST so that the arrow mark faces upward.
- Mark the bottom end of rear differential mount bushing to identify the installing direction.

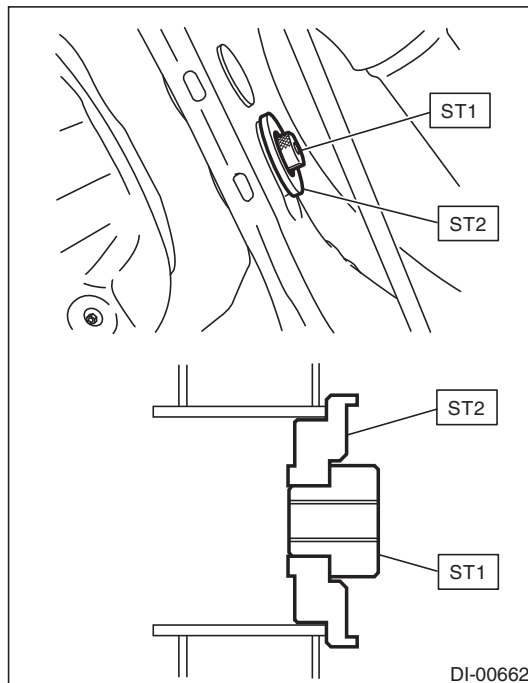
ST1 41399FG091 SPECIAL TOOL SHAFT
 ST2 41399FG070 SPECIAL TOOL NUT
 ST3 41399FG050 SPECIAL TOOL SLEEVE
 ST4 41399FG080 SPECIAL TOOL BEARING
 ST5 41399FG020 SPECIAL TOOL B



- (A) 8 mm (0.31 in) or more
 (B) Arrow mark
 (C) Mark
 (D) Marked position

10) Attach ST1 to the ST2, and fit and hold the STs as a unit to the sub frame from the rear side of vehicle.

ST1 41399FG061 SPECIAL TOOL RING
 ST2 41399FG041 SPECIAL TOOL D



Rear Differential Mount Bushing

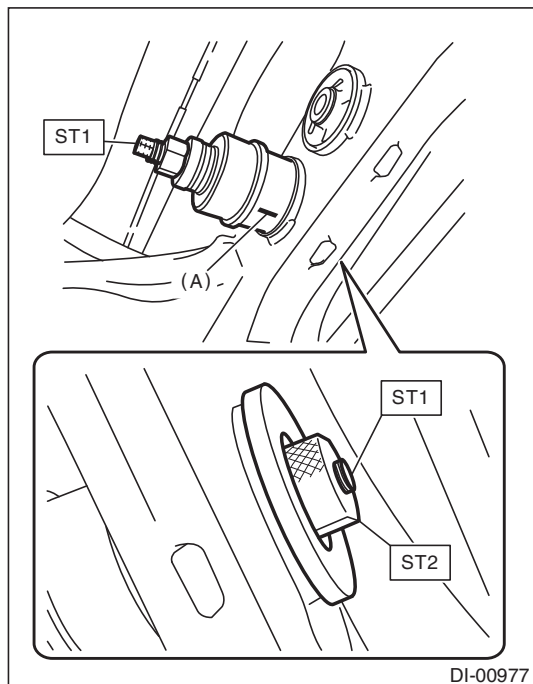
DIFFERENTIALS

11) Insert the ST and rear differential mount bushing set in the step 9) through the sub frame from the front side of vehicle, and screw in the ST1 by hand till the front end of ST1 comes out slightly from the rear end of ST2.

CAUTION:

Set the rear differential mount bushing with its mark facing the bottom end direction.

ST1 41399FG091 SPECIAL TOOL SHAFT
ST2 41399FG061 SPECIAL TOOL RING



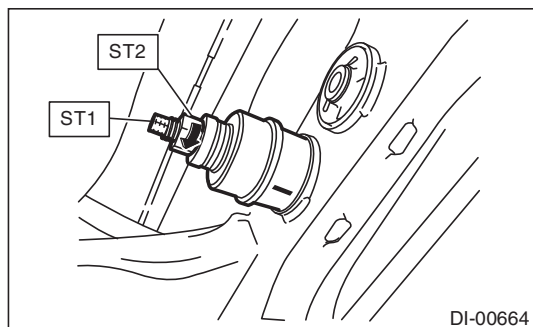
(A) Mark

12) Hold the ST1 to prevent it from rotating, and screw in the ST2 by hand till there is no loose fit on the ST and the rear differential mount bushing.

CAUTION:

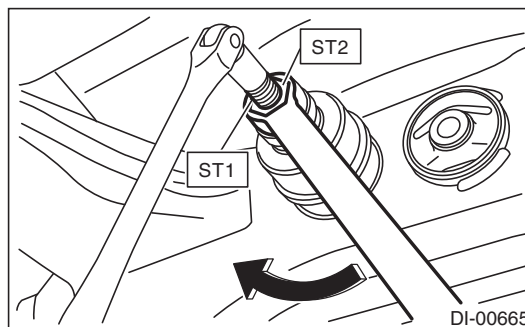
Make sure that the ST and rear differential mount bushing are not tilted.

ST1 41399FG091 SPECIAL TOOL SHAFT
ST2 41399FG070 SPECIAL TOOL NUT

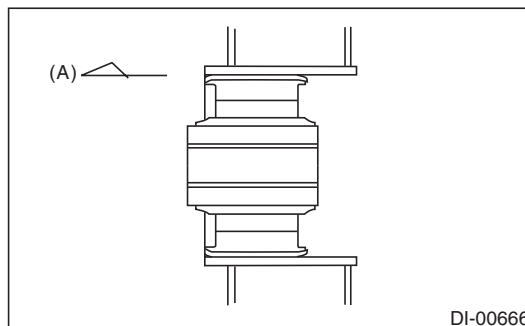


13) Screw in the ST2 while holding the ST1 with a tool to prevent it from rotating, and press-fit the rear differential mount bushing to the front end of sub frame cylinder.

ST1 41399FG091 SPECIAL TOOL SHAFT
ST2 41399FG070 SPECIAL TOOL NUT



14) Make sure that the rear differential mount bushing is inserted to the front end of sub frame cylinder.



(A) Front side of vehicle

15) Install the rear differential. <Ref. to DI-24, INSTALLATION, Rear Differential (T-type).> <Ref. to DI-42, INSTALLATION, Rear Differential (VA-type).>

Rear Differential Inspection Mode

DIFFERENTIALS

10. Rear Differential Inspection Mode

A: GENERAL DESCRIPTION

CAUTION:

Be sure to perform rear differential inspection mode.

- Follow the messages displayed on the Subaru Select Monitor when working.
- "Rear differential inspection mode" using the Subaru Select Monitor is available only for the CVT model.
- Perform rear differential inspection mode when the following work has been performed.

Transmission assembly replacement/Replacement of rear differential/Replacement of front differential hypoid gear set/Replacement of rear differential hypoid gear set

B: PROCEDURE

CAUTION:

Do not turn the power of the Subaru Select Monitor OFF during work, and do not disconnect the data link connector.

- 1) Shift the select lever to "P" range.
- 2) Apply the parking brake.
- 3) Lift up the vehicle.

WARNING:

Lift up the vehicle until the tire bottom is 30 cm or more above the ground.

- 4) Connect the Subaru Select Monitor to data link connector.
- 5) Turn the ignition switch to ON. (For model with push button start, press the push button ignition switch twice without depressing brake pedal.)
- 6) Select {Work Support} in the «Transmission Diagnosis» screen of Subaru Select Monitor.
- 7) Select {Maintenance mode} in the «Work Support» screen of Subaru Select Monitor.
- 8) Select {Rear differential inspection mode} in the «Maintenance mode» screen of the Subaru Select Monitor.
- 9) Follow the messages displayed on the Subaru Select Monitor screen when working.
- 10) The results of the rear differential inspection mode are displayed on the Subaru Select Monitor screen.
 - When ended normally: "The rear differential has been replaced normally."
 - When ended abnormally: "A rear differential abnormality has been detected. Reinspect the items at the time of rear differential installation."
 - When interrupted: "Inspection is stopped. Restart this inspection mode from the beginning."

Rear Differential Inspection Mode

DIFFERENTIALS

11) After the message "Inspection has been completed. Set the ignition switch to OFF." appears, the rear differential inspection mode completes.

NOTE:

- When the rear differential inspection mode is completed properly, the following warning lights may illuminate. But this is not a malfunction. If warning light illuminates, clear the memory.
VDC/ABS, engine, power steering, EyeSight
- For detailed operation procedures, refer to "PC application help for Subaru Select Monitor".
- If the rear differential inspection mode does not end normally, repeat the mode until it ends normally.
- When the inspection mode does not end normally, the AWD warning light will start blinking at 2 Hz.
- When the rear differential inspection mode ends abnormally, the front differential and rear differential may be different from the specifications for the vehicle.
- When the rear differential inspection mode is interrupted, the following reasons are possible.

Message	Main reasons for abnormal termination
• "Inspection is stopped." • "Inspection is stopped. Restart this inspection mode from the beginning."	• TCM has detected a failure. • VDC has a failure. • Brake is applied after start during automatic running. • Too delayed operation to the instructions displayed on the Subaru Select Monitor.
"TCM incompatible. Rear differential inspection mode is stopped."	The model does not support the rear differential inspection mode.
The TCM has detected a fault. Inspect following the manual.	TCM has detected a failure.

12) Perform "Function Check Sequence" for VDC. <Ref. to VDC(diag)-17, READ FREEZE FRAME DATA, OPERATION, Subaru Select Monitor.> <Ref. to VDC-23, ADJUSTMENT, VDC Control Module and Hydraulic Control Unit (VDCCM&H/U).>



General Diagnostic Table

DIFFERENTIALS

11. General Diagnostic Table

A: INSPECTION

Symptom or trouble	Possible cause	Remedy
1. Oil leakage	(1) Worn, scratched, or incorrectly seated front or side oil seal. Scored, battered or excessively worn sliding surface of companion flange.	Repair or replace.
	(2) Clogged or damaged air breather cap.	Clean, repair or replace.
	(3) Loose bolts on the side retainer, or incorrectly fitted O-ring.	Tighten the bolts to specified torque. Replace the O-ring.
	(4) Loose rear cover attachment bolts or damaged gasket.	Replace the gasket, and tighten the bolts to specified torque.
	(5) Loose filler plug or drain plug.	• Apply liquid gasket, and tighten to the specified torque. (T-type) • Replace the gasket, and tighten to the specified torque. (VA-type)
	(6) Wear, damage or incorrect fitting of drive shaft, side retainer or oil seal.	Repair or replace.
2. Seizure NOTE: Seized or damaged parts should be replaced, and also other parts should be thoroughly checked for any defect and should be repaired or replaced as required.	(1) Insufficient backlash for hypoid gear.	Readjust or replace.
	(2) Excessive preload for side, rear or front bearing.	Readjust or replace.
	(3) Insufficient or improper oil used.	Add recommended oil to the specified level.
3. Damage NOTE: Damaged parts should be replaced, and also other parts should be thoroughly checked for any defect and should be repaired or replaced as required.	(1) Improper backlash for hypoid gear.	Readjust or replace.
	(2) Insufficient or excessive preload for side, rear or front bearing.	Readjust or replace.
	(3) Excessive backlash for differential gear.	Replace gear or thrust washer.
	(4) Loose bolts and nuts such as hypoid driven gear bolt.	Retighten.
	(5) Damage due to overloading.	Replace.
4. Noises when starting or shifting gears NOTE: Noises may be caused by differential assembly, universal joint, wheel bearing, etc. Find out what is actually making noise before disassembling.	(1) Improper tooth contact of hypoid driven gear and drive pinion	Readjust. (drive pinion adjustment and backlash adjustment)
	(2) Excessive backlash for hypoid driven gear	Replace the gear or the pinion height adjusting washer.
	(3) Excessive backlash for side gear.	Replace gear or thrust washer.
	(4) Insufficient preload for front or rear bearing.	Readjust.
	(5) Loose drive pinion nut.	Tighten to the specified torque.
	(6) Loose bolts and nuts such as side retainer attachment bolt.	Tighten to the specified torque.
5. Noises when cornering	(1) Damaged differential gear.	Replace.
	(2) Excessive wear or damage of thrust washer.	Replace.
	(3) Broken pinion mate shaft.	Replace.
	(4) Stuck or damaged side bearing	Replace.

General Diagnostic Table

DIFFERENTIALS

Symptom or trouble	Possible cause	Remedy
6. Gear Noise NOTE: Since noises from engine, muffler, transmission, propeller shaft, wheel bearings, tires, and body are sometimes mistaken for noises from differential assembly, be careful in checking them. Inspection methods to locate noises include coasting, accelerating, cruising, and lifting-up all four wheels. Perform these inspections according to the condition of trouble. When listening to noises, shift the gear into four-wheel drive and fourth speed position, trying to pick up only differential noise.	(1) Improper tooth contact of hypoid driven gear and drive pinion	Readjust or replace the hypoid gear set.
	(2) Improper backlash of the hypoid driven gear	Readjust.
	(3) Scored or chipped teeth of hypoid gear.	Replace hypoid gear set.
	(4) Scuffed hypoid gear	Replace hypoid gear set.
	(5) Improper preload for front or rear bearings.	Readjust.
	(6) Stuck, scored or chipped teeth of front or rear bearing	Replace.
	(7) Stuck, scored or chipped teeth of side bearing	Replace.
	(8) Vibrating differential gear.	Replace the differential gear.

General Diagnostic Table

DIFFERENTIALS

