

**CHASSIS SECTION**

This service manual has been prepared to provide SUBARU service personnel with the necessary information and data for the correct maintenance and repair of SUBARU vehicles.

This manual includes the procedures for maintenance, disassembling, reassembling, inspection and adjustment of components and diagnostics for guidance of experienced mechanics.

Please peruse and utilize this manual fully to ensure complete repair work for satisfying our customers by keeping their vehicle in optimum condition. When replacement of parts during repair work is needed, be sure to use SUBARU genuine parts.

All information, illustration and specifications contained in this manual are based on the latest product information available at the time of publication approval.

|   |                  |
|---|------------------|
| <b>FRONT SUSPENSION</b>                             | <b>FS</b>        |
| <b>REAR SUSPENSION</b>                              | <b>RS</b>        |
| <b>WHEEL AND TIRE SYSTEM</b>                        | <b>WT</b>        |
| <b>DIFFERENTIALS</b>                                | <b>DI</b>        |
| <b>TRANSFER CASE</b>                                | <b>TC</b>        |
| <b>DRIVE SHAFT SYSTEM</b>                           | <b>DS</b>        |
| <b>ABS</b>  | <b>ABS</b>       |
| <b>ABS (DIAGNOSTICS)</b>                            | <b>ABS(diag)</b> |
| <b>VEHICLE DYNAMICS CONTROL (VDC)</b>               | <b>VDC</b>       |
| <b>VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)</b> | <b>VDC(diag)</b> |
| <b>BRAKE</b>  | <b>BR</b>        |
| <b>PARKING BRAKE</b>                                | <b>PB</b>        |
| <b>POWER ASSISTED SYSTEM (POWER STEERING)</b>       | <b>PS</b>        |

# DIFFERENTIALS

# *DI*

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# 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 the different rear differential assembly causes the drive line and tires to “drag” or emit noise.
- For option code, refer to “ID” section. <Ref. to ID-2, IDENTIFICATION, Identification.>

| Model                             | Sedan, Wagon                  |        |       |               |                  |               |
|-----------------------------------|-------------------------------|--------|-------|---------------|------------------|---------------|
|                                   | 2.0 L Non-turbo               |        | 2.5 L |               | 3.0 L            | 2.0 L Turbo   |
|                                   | AT                            | MT     | AT    | MT            |                  | AT            |
| KA, KS★1                          |                               |        |       | EC, EK, K4★1  |                  |               |
| Rear differential type            | VA1-type                      | T-type |       |               | VA2-type         |               |
| Classification                    | XJ                            | T2     |       | VB            | XT               | XU            |
| LSD type                          | —                             |        |       |               | Viscous coupling |               |
| Type of gear                      | Hypoid gear                   |        |       |               |                  |               |
| Gear ratio (Number of gear teeth) | 4.111 (37/9)                  |        |       | 3.700 (37/10) | 3.083 (37/12)    | 3.272 (36/11) |
| Oil capacity                      | 0.8 ℓ (0.8 US qt, 0.7 Imp qt) |        |       |               |                  |               |
| Rear differential gear oil        | GL-5                          |        |       |               |                  |               |

| Model                             | OUTBACK                       |               |              |               |
|-----------------------------------|-------------------------------|---------------|--------------|---------------|
|                                   | 2.5 L                         |               |              | 3.0 L         |
|                                   | AT                            | MT            |              | AT            |
| EC, EK, K4★1                      |                               | KS, KA★1      |              |               |
| Rear differential type            | T-type                        |               |              | VA2-type      |
| Classification                    | CF                            | EZ            | JE           | XU            |
| LSD type                          | Viscous coupling              |               |              |               |
| Type of gear                      | Hypoid gear                   |               |              |               |
| Gear ratio (Number of gear teeth) | 4.444 (40/9)                  | 3.900 (39/10) | 4.111 (37/9) | 3.272 (36/11) |
| Oil capacity                      | 0.8 ℓ (0.8 US qt, 0.7 Imp qt) |               |              |               |
| Rear differential gear oil        | GL-5                          |               |              |               |

★1: Option code



# General Description

## DIFFERENTIALS

### 5. ADJUSTING PART

• T-type

|   |                                    |                   |
|---|------------------------------------|-------------------|
| Drive pinion bearing preload (at companion flange bolt hole)<br>N (kgf, lb) | 18.1 — 38.8 (1.8 — 4.0, 4.1 — 8.7) |                   |
| Preload adjusting collar  | 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)      |
| Preload adjusting washer  | Part No.                           | Length 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)     |
| 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)                      |                   |
| Side gear backlash<br>mm (in)   | 0.1 — 0.2 (0.0039 — 0.0079)        |                   |

# General Description

DIFFERENTIALS

|  |               |                               |
|--|---------------|-------------------------------|
| Side gear thrust washer<br>(Model without LSD) | 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) |
| Side bearing standard width                    | mm (in)       | —<br>20.00 (0.7874)           |
| Side bearing 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)                 |
| Hypoid driven gear to drive pinion backlash    | Limit mm (in) | 0.10 — 0.20 (0.0039 — 0.0079) |
| Hypoid driven gear runout on its back surface  |               | 0.05 (0.0020)                 |

# General Description

## DIFFERENTIALS

### • VA1-type

|   |                                    |                                 |
|---|------------------------------------|---------------------------------|
| Drive pinion bearing preload (at companion flange bolt hole)<br>N (kgf, lb) | 12.7 — 32.4 (1.3 — 3.3, 2.9 — 7.3) |                                 |
| Preload adjusting collar  | 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)                    |
| 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)                     |                                 |
| 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)                  |
| Side gear backlash<br>mm (in)   | 0.05 — 0.15 (0.0020 — 0.0059)      |                                 |
| Side gear thrust washer   | 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) |
| Hypoid driven gear to drive pinion backlash                                 | Limit mm (in)                      | 0.10 — 0.15 (0.0039 — 0.0059)   |

# General Description

DIFFERENTIALS

• **VA2-type**

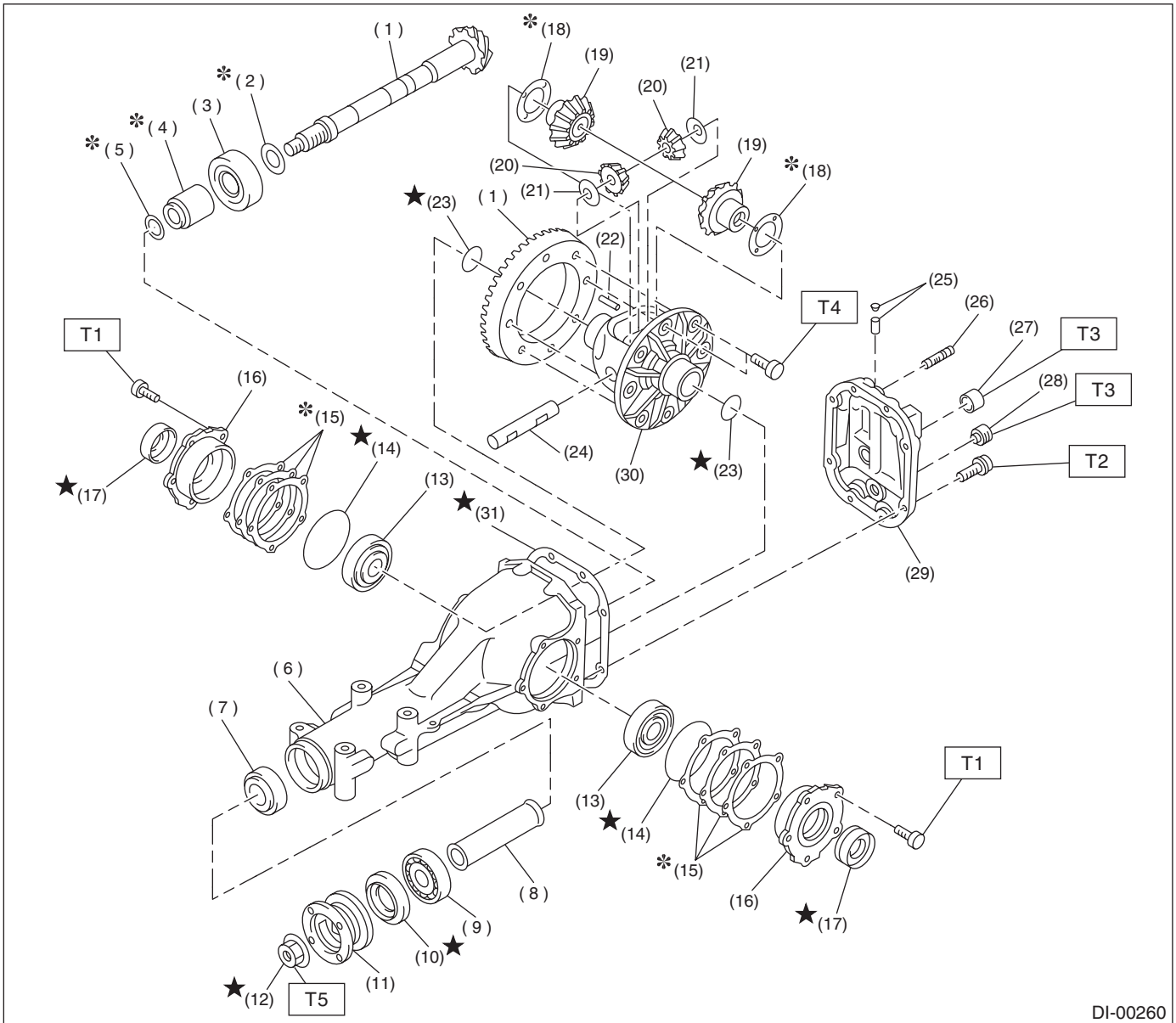
|   |                                    |                               |
|---|------------------------------------|-------------------------------|
| Drive pinion bearing preload (at companion flange bolt hole)<br>N (kgf, lb) | 12.7 — 32.4 (1.3 — 3.9, 2.9 — 7.3) |                               |
| Preload adjusting collar  | Part No.                           | Length mm (in)                |
|   | 31454AA250                         | 51.05 (2.010)                 |
|   | 31454AA260                         | 51.25 (2.018)                 |
|   | 31454AA270                         | 51.35 (2.022)                 |
|   | 31454AA280                         | 51.45 (2.026)                 |
|   | 31454AA290                         | 51.55 (2.030)                 |
|   | 31454AA300                         | 51.65 (2.033)                 |
|   | 31454AA310                         | 51.75 (2.037)                 |
|   | 31454AA320                         | 51.85 (2.041)                 |
|   | 31454AA330                         | 52.05 (2.049)                 |
| Preload adjusting washer  | Part No.                           | Thickness mm (in)             |
|   | 38336AA430                         | 1.500 (0.0591)                |
|   | 38336AA440                         | 1.513 (0.0596)                |
|   | 38336AA450                         | 1.525 (0.0600)                |
|   | 38336AA460                         | 1.538 (0.0606)                |
|   | 38336AA470                         | 1.550 (0.0610)                |
|   | 38336AA480                         | 1.563 (0.0615)                |
|   | 38336AA490                         | 1.575 (0.0620)                |
|   | 38336AA500                         | 1.588 (0.0625)                |
|   | 38336AA510                         | 1.600 (0.0630)                |
|   | 38336AA520                         | 1.613 (0.0635)                |
|   | 38336AA530                         | 1.625 (0.0640)                |
|   | 38336AA540                         | 1.638 (0.0645)                |
|   | 38336AA550                         | 1.650 (0.0650)                |
|   | 38336AA560                         | 1.663 (0.0655)                |
|   | 38336AA570                         | 1.675 (0.0659)                |
|   | 38336AA580                         | 1.688 (0.0665)                |
|   | 38336AA590                         | 1.700 (0.0669)                |
|   | 38336AA600                         | 1.713 (0.0674)                |
|   | 38336AA610                         | 1.725 (0.0679)                |
| 38336AA620  | 1.738 (0.0684)                     |                               |
| 38336AA630  | 1.750 (0.0689)                     |                               |
| 38336AA640  | 1.763 (0.0694)                     |                               |
| 38336AA650  | 1.775 (0.0699)                     |                               |
| Pinion height adjusting washer  | Part No.                           | Thickness mm (in)             |
|   | 32295AA350                         | 0.150 (0.0059)                |
|   | 32295AA360                         | 0.175 (0.0069)                |
|   | 32295AA370                         | 0.200 (0.0079)                |
|   | 32295AA380                         | 0.225 (0.0089)                |
|   | 32295AA390                         | 0.250 (0.0098)                |
|   | 32295AA400                         | 0.275 (0.0108)                |
| Hypoid driven gear to drive pinion backlash                                 | Limit mm (in)                      | 0.10 — 0.15 (0.0039 — 0.0059) |

# General Description

## DIFFERENTIALS

### B: COMPONENT

#### 1. REAR DIFFERENTIAL WITHOUT LSD (T-TYPE)



DI-00260

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

#### **Tightening torque: N·m (kgf·m, ft·lb)**

**T1: 10.3 (1.05, 7.6)**

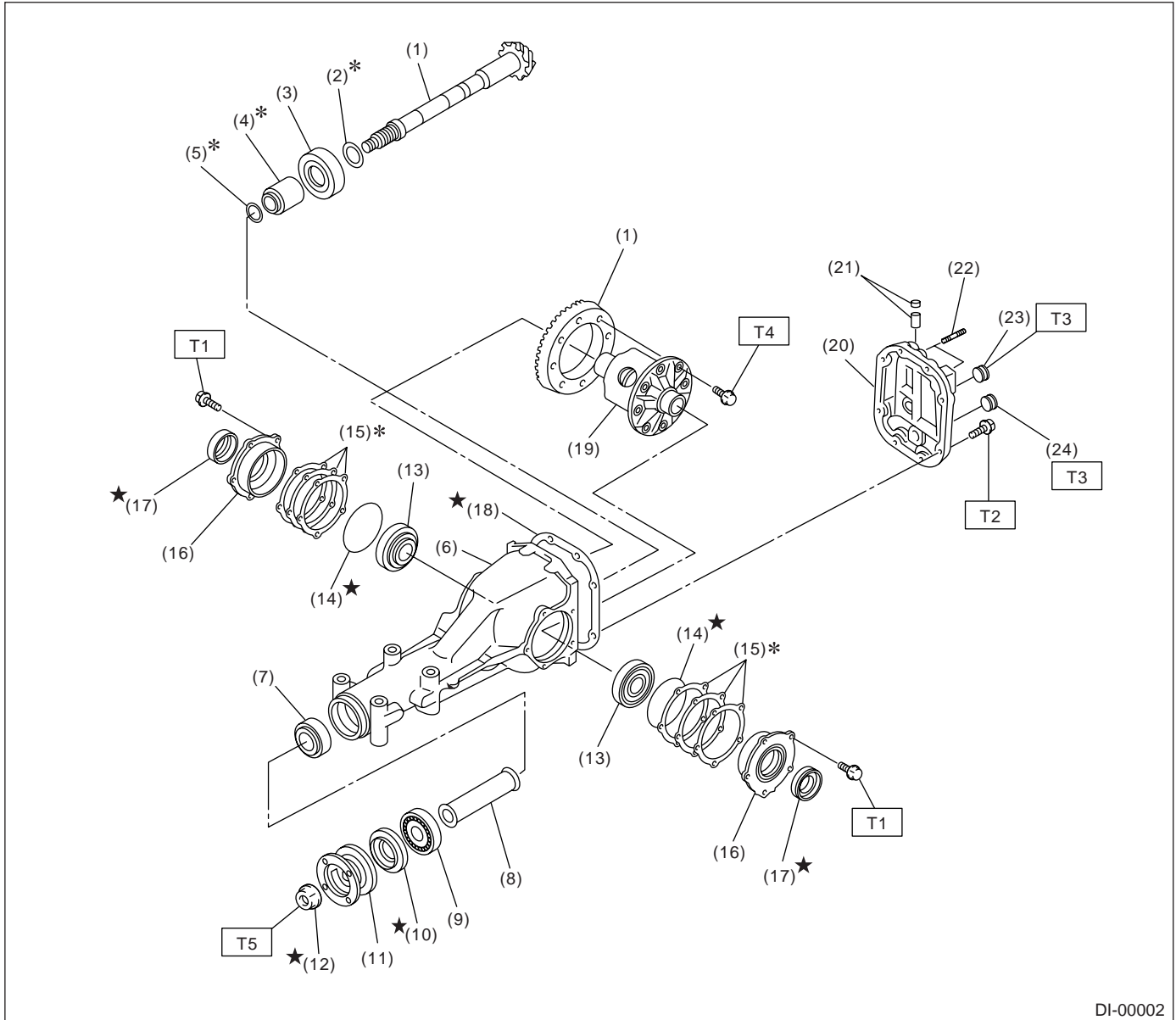
**T2: 29 (3.0, 21.7)**

**T3: 49 (5.0, 36.2)**

**T4: 105 (10.7, 77.4)**

**T5: 181 (18.5, 134)**

## 2. REAR DIFFERENTIAL WITH LSD (T-TYPE)



DI-00002

- |   |                                 |
|---|---------------------------------|
| (1) Hypoid driven gear and drive pinion set | (11) Companion flange           |
| (2) Pinion height adjusting washer          | (12) Self-locking nut           |
| (3) Rear bearing                            | (13) Side bearing               |
| (4) Bearing preload adjusting collar        | (14) O-ring                     |
| (5) Bearing preload adjusting washer        | (15) Side bearing retainer shim |
| (6) Differential carrier                    | (16) Side bearing retainer      |
| (7) Front bearing                           | (17) Side oil seal              |
| (8) Collar                                  | (18) Gasket                     |
| (9) Pilot bearing                           | (19) Differential case ASSY     |
| (10) Front oil seal                         | (20) Rear cover                 |
|   | (21) Air breather cap           |

- |                      |
|----------------------|
| (22) Stud bolt       |
| (23) Oil filler plug |
| (24) Oil drain plug  |

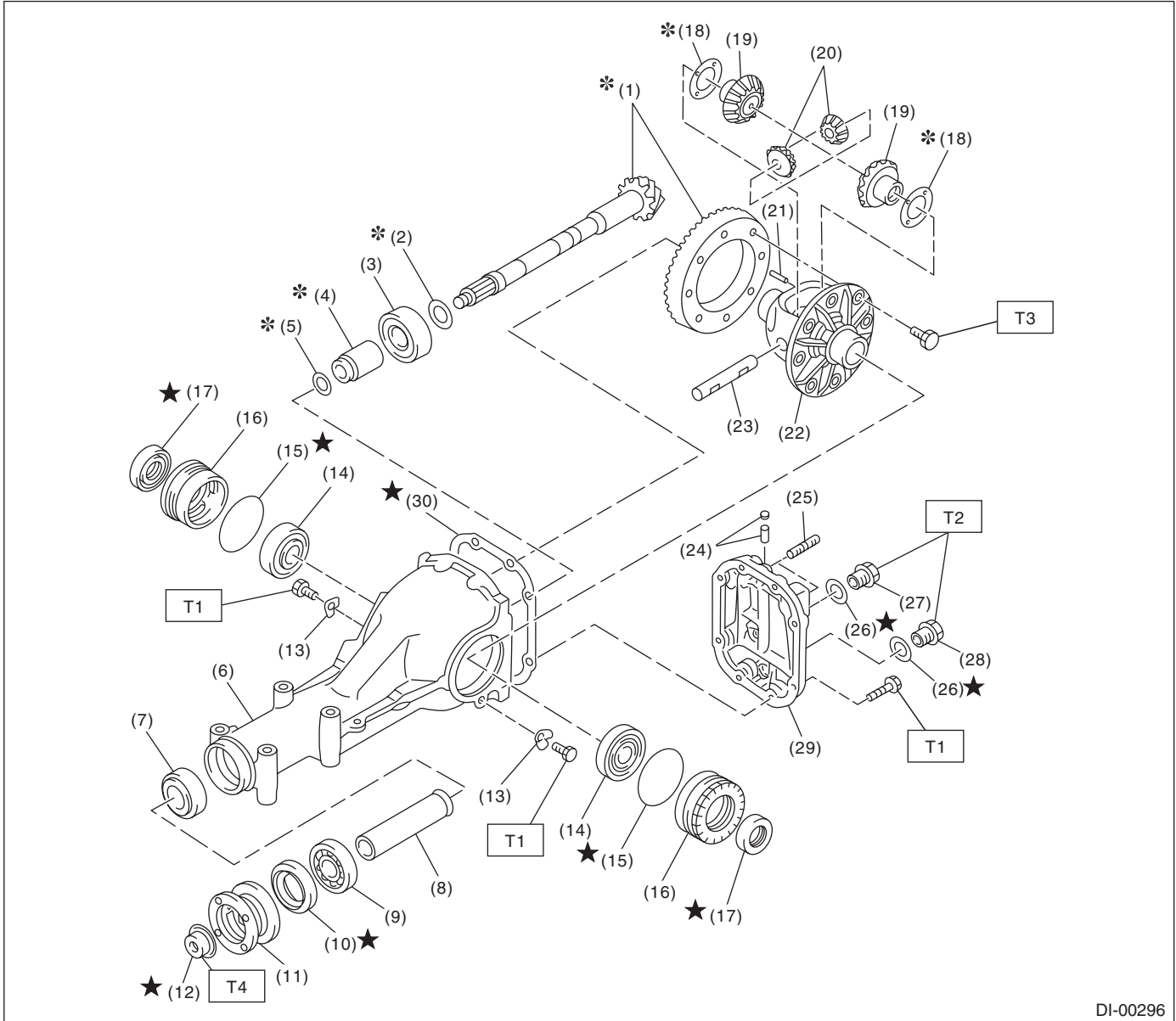
**Tightening torque: N·m (kgf·m, ft·lb)**

- |            |                         |
|------------|-------------------------|
| <b>T1:</b> | <b>10.3 (1.05, 7.6)</b> |
| <b>T2:</b> | <b>29 (3.0, 21.7)</b>   |
| <b>T3:</b> | <b>49 (5.0, 36.2)</b>   |
| <b>T4:</b> | <b>105 (10.7, 77.4)</b> |
| <b>T5:</b> | <b>181 (18.5, 134)</b>  |

# General Description

## DIFFERENTIALS

### 3. REAR DIFFERENTIAL (VA1-TYPE)



DI-00296

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

#### **Tightening torque: N·m (kgf·m, ft·lb)**

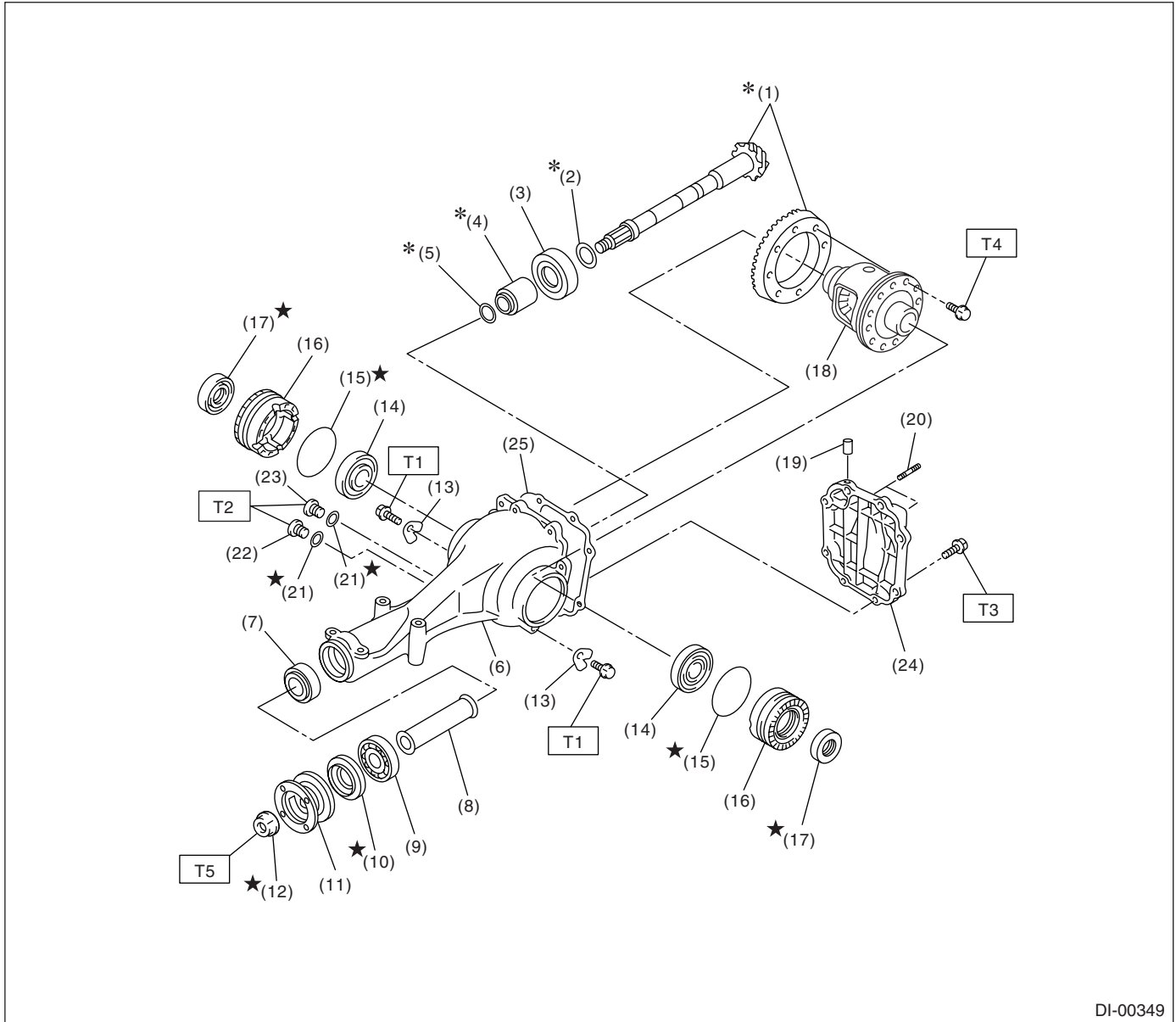
**T1: 25 (2.5, 18.1)**

**T2: 34 (3.5, 25.3)**

**T3: 62 (6.3, 45.6)**

**T4: 191 (19.5, 141)**

## 4. REAR DIFFERENTIAL (VA2-TYPE)



DI-00349

- |   |                             |
|---|-----------------------------|
| (1) Hypoid driven gear and drive pinion set | (11) Companion flange       |
| (2) Pinion height adjusting washer          | (12) Self-locking nut       |
| (3) Rear bearing                            | (13) Lock plate             |
| (4) Bearing preload adjusting collar        | (14) Side bearing           |
| (5) Bearing preload adjusting washer        | (15) O-ring                 |
| (6) Differential carrier                    | (16) Axle shaft holder      |
| (7) Front bearing                           | (17) Side oil seal          |
| (8) Collar                                  | (18) Differential case ASSY |
| (9) Pilot bearing                           | (19) Air breather cap       |
| (10) Front oil seal                         | (20) Stud bolt              |
|   | (21) Gasket                 |

- |                      |
|----------------------|
| (22) Oil filler plug |
| (23) Oil drain plug  |
| (24) Rear cover      |
| (25) Gasket          |

**Tightening torque: N·m (kgf·m, ft·lb)**

**T1: 25 (2.5, 18.1)**

**T2: 29 (3.0, 21.4)**

**T3: 34 (3.5, 25.3)**

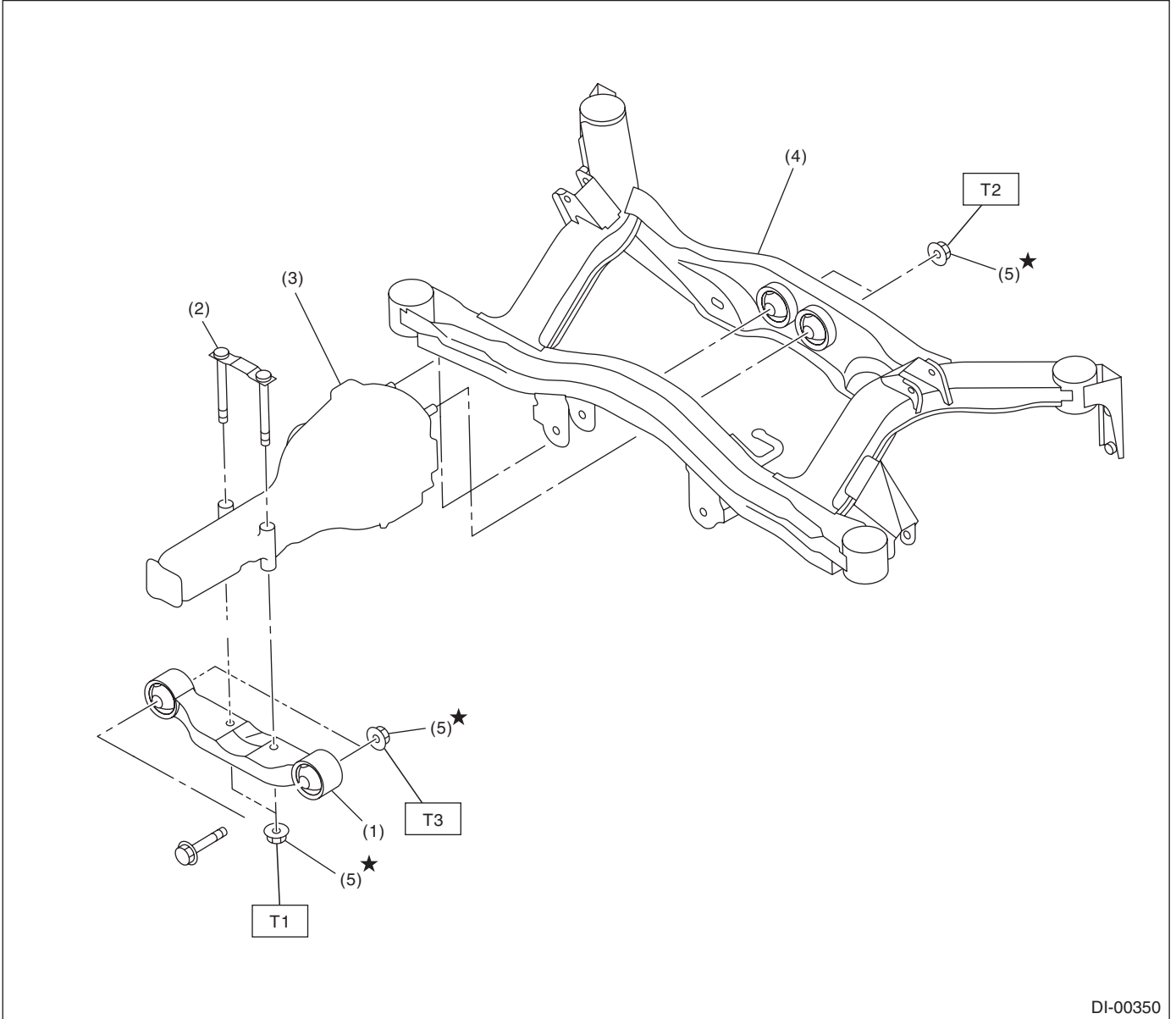
**T4: 62 (6.3, 45.6)**

**T5: 191 (19.5, 141)**

# General Description

## DIFFERENTIALS

### 5. REAR DIFFERENTIAL MOUNTING SYSTEM



- |                                    |                      |
|------------------------------------|----------------------|
| (1) Rear differential front member | (4) Sub frame        |
| (2) Rear differential member plate | (5) Self-locking nut |
| (3) Rear differential ASSY         |                      |

**Tightening torque: N·m (kgf·m, ft·lb)**

**T1: 52 (5.3, 38)**

**T2: 70 (7.1, 51)**

**T3: 110 (11.2, 81)**

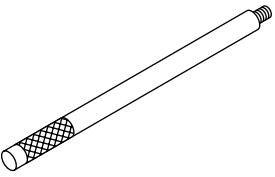
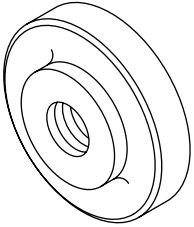
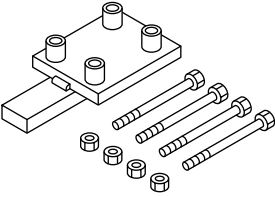
## C: CAUTION

- Wear work clothing, including a cap, protective goggles and protective shoes during operation.
- 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.
- Be careful not to burn yourself, because each part on the vehicle is hot after running.
- Use SUBARU genuine gear oil, grease etc. or the equivalent. Do not mix gear oil, grease etc. with that of another grade or from other 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 revolution surfaces before installation.
- Before installing O-rings or snap rings, apply sufficient amount of gear oil to avoid damage and deformation.
- Before securing a part on a vice, place cushioning material such as wood blocks, aluminum plate, or shop cloth between the part and the vice.
- Avoid damaging the mating surface of the case.

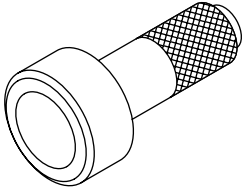
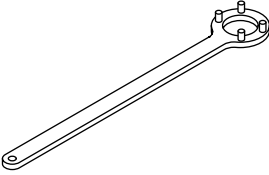
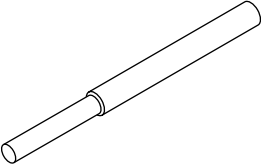
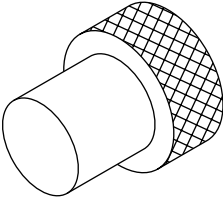
## D: PREPARATION TOOL

### 1. SPECIAL TOOL

| ILLUSTRATION  | TOOL NUMBER | DESCRIPTION    | REMARKS  |
|---|-------------|----------------|--|
|  <p style="text-align: center;">ST-398477701</p>  | 398477701   | HANDLE         | Used for installing front and rear bearing cone.   |
|  <p style="text-align: center;">ST-398477702</p> | 398477702   | DRIFT          | <ul style="list-style-type: none"> <li>• Used for press-fitting the bearing cone of differential carrier (front).</li> <li>• For T-type</li> </ul> |
|  <p style="text-align: center;">ST-398217700</p> | 398217700   | ATTACHMENT SET | Stand for rear differential carrier disassembly and assembly.  |

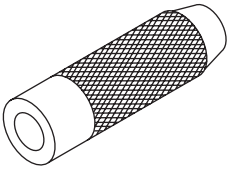
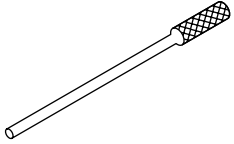
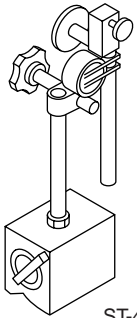
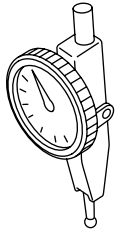
## General Description

### DIFFERENTIALS

| ILLUSTRATION  | TOOL NUMBER | DESCRIPTION   | REMARKS  |
|---|-------------|---------------|--|
|  <p style="text-align: center;">ST-498447120</p>   | 498447120   | INSTALLER     | Used for installing front oil seal.  |
|  <p style="text-align: center;">ST-498427200</p>   | 498427200   | FLANGE WRENCH | Used for stopping rotation of companion flange when removing and tightening self-locking nut.  |
|  <p style="text-align: center;">ST-398467700</p> | 398467700   | DRIFT         | <ul style="list-style-type: none"> <li>• Used for removing pinion, pilot bearing and front bearing cone.</li> <li>• For T-type and VA1-type</li> </ul> |
|  <p style="text-align: center;">ST-399780104</p> | 399780104   | WEIGHT        | Used for installing front bearing cone and pilot bearing companion flange.   |

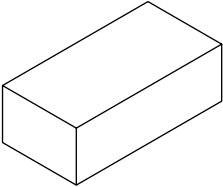
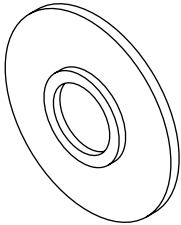
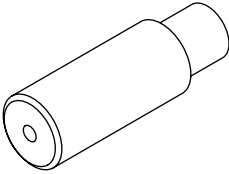
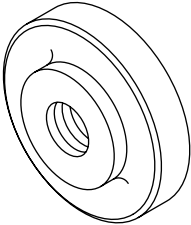
# General Description

DIFFERENTIALS

| ILLUSTRATION  | TOOL NUMBER | DESCRIPTION             | REMARKS  |
|---|-------------|-------------------------|--|
|  <p style="text-align: center;">ST-899580100</p>   | 899580100   | INSTALLER               | Used for press-fitting front bearing cone and pilot bearing.   |
|  <p style="text-align: center;">ST-899904100</p>   | 899904100   | STRAIGHT PIN<br>REMOVER | Used for driving out differential pinion shaft lock pin.   |
|  <p style="text-align: center;">ST-498247001</p>  | 498247001   | MAGNET BASE             | <ul style="list-style-type: none"> <li>• Used for measuring backlash between side gear and pinion, and hypoid gear.</li> <li>• Used with DIAL GAUGE (498247100).</li> </ul>  |
|  <p style="text-align: center;">ST-498247100</p> | 498247100   | DIAL GAUGE              | <ul style="list-style-type: none"> <li>• Used for measuring backlash between side gear and pinion, and hypoid gear.</li> <li>• Used with MAGNET BASE (498247001).</li> </ul> |

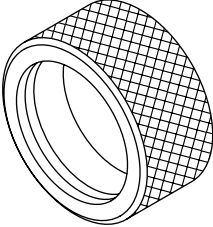
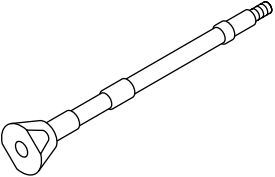
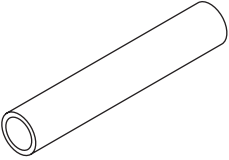
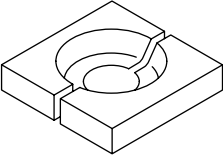
# General Description

## DIFFERENTIALS

| ILLUSTRATION  | TOOL NUMBER | DESCRIPTION | REMARKS  |
|---|-------------|-------------|--|
|  <p style="text-align: center;">ST-398507704</p>   | 398507704   | BLOCK       | <ul style="list-style-type: none"> <li>• Used for adjusting pinion height and preload.</li> <li>• For T-type and VA1-type</li> </ul>                       |
|  <p style="text-align: center;">ST-398177700</p>   | 398177700   | INSTALLER   | <ul style="list-style-type: none"> <li>• Used for installing rear bearing cone.</li> <li>• For T-type and VA2-type</li> </ul>                              |
|  <p style="text-align: center;">ST-398457700</p> | 398457700   | ATTACHMENT  | <ul style="list-style-type: none"> <li>• Used for removal of side bearing retainer.</li> <li>• For T-type</li> </ul>                                       |
|  <p style="text-align: center;">ST-398477703</p> | 398477703   | DRIFT 2     | <ul style="list-style-type: none"> <li>• Used for press-fitting bearing race (rear) of differential carrier.</li> <li>• For T-type and VA2-type</li> </ul> |

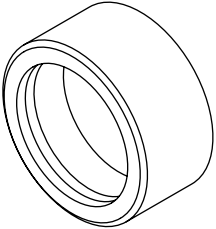
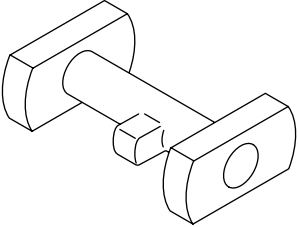
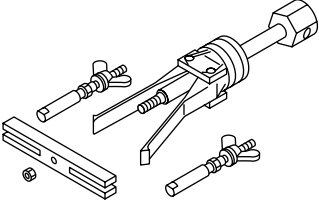
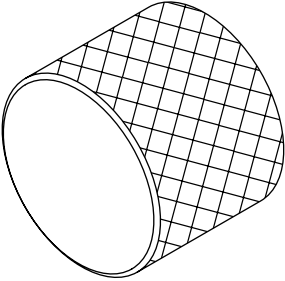
# General Description

DIFFERENTIALS

| ILLUSTRATION  | TOOL NUMBER                                  | DESCRIPTION         | REMARKS   |
|---|--|---------------------|---|
|  <p style="text-align: center;">ST-398437700</p>   | <p style="text-align: center;">398437700</p> | <p>DRIFT</p>        | <ul style="list-style-type: none"> <li>• Used for installing side oil seal.</li> <li>• For T-type and VA2-type</li> </ul>   |
|  <p style="text-align: center;">ST-398507702</p>   | <p style="text-align: center;">398507702</p> | <p>DUMMY SHAFT</p>  | <ul style="list-style-type: none"> <li>• Used for adjusting pinion height and preload.</li> <li>• For T-type</li> </ul>     |
|  <p style="text-align: center;">ST-398507703</p> | <p style="text-align: center;">398507703</p> | <p>DUMMY COLLAR</p> | <ul style="list-style-type: none"> <li>• Used for adjusting pinion height and preload.</li> <li>• For T-type</li> </ul>     |
|  <p style="text-align: center;">ST-398517700</p> | <p style="text-align: center;">398517700</p> | <p>REPLACER</p>     | <ul style="list-style-type: none"> <li>• Used for removing rear bearing cone.</li> <li>• For T-type and VA2-type</li> </ul> |

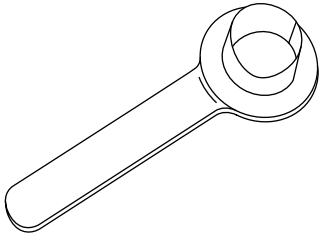
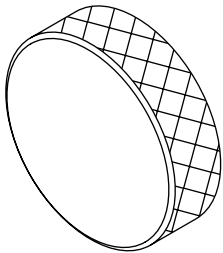
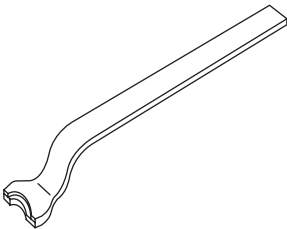
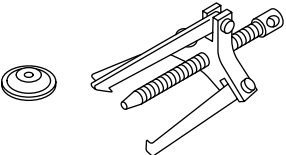
# General Description

## DIFFERENTIALS

| ILLUSTRATION  | TOOL NUMBER | DESCRIPTION                   | REMARKS   |
|---|-------------|-------------------------------|---|
|  <p style="text-align: center;">ST-398487700</p>   | 398487700   | DRIFT                         | <ul style="list-style-type: none"> <li>• Used for press-fitting side bearing cone.</li> <li>• For T-type and VA2-type</li> </ul>              |
|  <p style="text-align: center;">ST-398507701</p>   | 398507701   | DIFFERENTIAL<br>CARRIER GAUGE | <ul style="list-style-type: none"> <li>• Used for adjusting pinion height.</li> <li>• For T-type</li> </ul>                                   |
|  <p style="text-align: center;">ST-398527700</p> | 398527700   | PULLER ASSY                   | <ul style="list-style-type: none"> <li>• Used for removing front oil seal.</li> <li>• Used for removing side bearing cup. (T-type)</li> </ul> |
|  <p style="text-align: center;">ST-398227700</p> | 398227700   | DRIFT                         | <ul style="list-style-type: none"> <li>• Used for installing side bearing.</li> <li>• For T-type and VA2-type</li> </ul>                      |

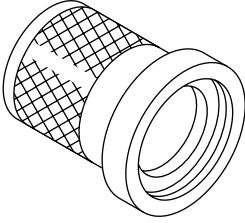
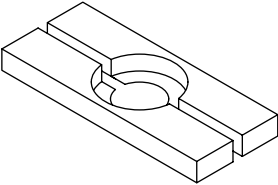
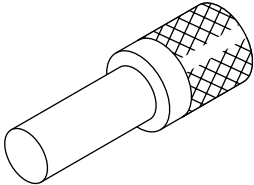
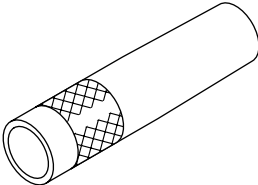
# General Description

DIFFERENTIALS

| ILLUSTRATION  | TOOL NUMBER | DESCRIPTION         | REMARKS   |
|---|-------------|---------------------|---|
|  <p style="text-align: center;">ST28099PA090</p>   | 28099PA090  | OIL SEAL PROTECTOR  | <ul style="list-style-type: none"> <li>• Used for installing the rear drive shaft to rear differential.</li> <li>• For oil seal protection</li> </ul> |
|  <p style="text-align: center;">ST-398237700</p>   | 398237700   | DRIFT               | <ul style="list-style-type: none"> <li>• Used for installing side bearing.</li> <li>• For T-type</li> </ul>   |
|  <p style="text-align: center;">ST28099PA100</p> | 28099PA100  | DRIVE SHAFT REMOVER | <ul style="list-style-type: none"> <li>• Used for removing rear drive shaft from rear differential.</li> <li>• For T-type</li> </ul>                  |
|  <p style="text-align: center;">ST-399703600</p> | 399703600   | PULLER ASSY         | Used for removing companion flange.   |

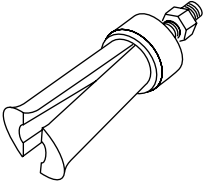
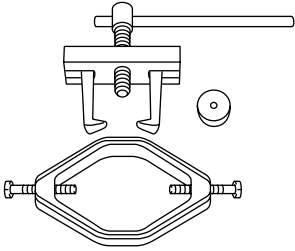
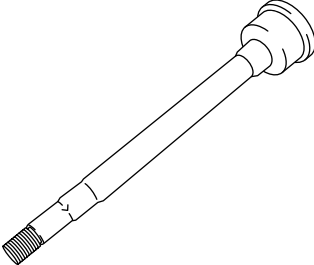
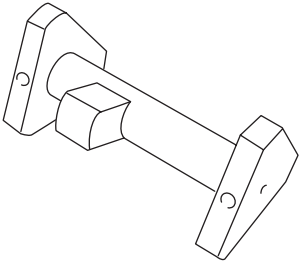
# General Description

## DIFFERENTIALS

| ILLUSTRATION  | TOOL NUMBER | DESCRIPTION | REMARKS  |
|---|-------------|-------------|--|
|  <p style="text-align: center;">ST-899874100</p>   | 899874100   | INSTALLER   | Used for installing companion flange.  |
|  <p style="text-align: center;">ST-498077000</p>   | 498077000   | REMOVER     | <ul style="list-style-type: none"> <li>• Used for removing side bearing cone from differential.</li> <li>• For VA2-type</li> </ul> |
|  <p style="text-align: center;">ST-899864100</p> | 899864100   | REMOVER     | Used for removing differential side bearing.   |
|  <p style="text-align: center;">ST-499277200</p> | 499277200   | INSTALLER   | <ul style="list-style-type: none"> <li>• Used for installing front bearing cone.</li> <li>• For VA2-type</li> </ul>                |

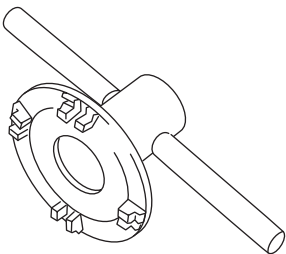
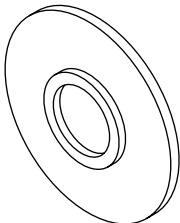
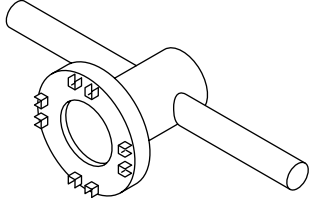
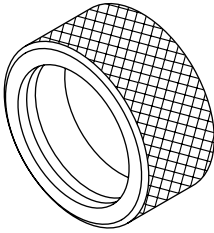
# General Description

DIFFERENTIALS

| ILLUSTRATION  | TOOL NUMBER  | DESCRIPTION   | REMARKS   |
|---|--|---|---|
|  <p>ST18758AA000</p>     | <p>18758AA000</p>                            | <p>PULLER</p>                           | <ul style="list-style-type: none"> <li>• Used for removing side bearing cup.</li> <li>• For VA2-type</li> </ul>                  |
|  <p>ST18759AA000</p>     | <p>18759AA000<br/>(Newly adopted tool)</p>   | <p>PULLER ASSY</p>                      | <ul style="list-style-type: none"> <li>• Used for removing differential from side bearing cone.</li> <li>• For T-type</li> </ul> |
|  <p>ST18678AA000</p> | <p>18678AA000<br/>(Newly adopted tool)</p>   | <p>DUMMY SHAFT</p>                      | <ul style="list-style-type: none"> <li>• Used for adjusting pinion height and preload.</li> <li>• For VA2-type</li> </ul>        |
|  <p>ST18831AA010</p> | <p>18831AA010<br/>(Newly adopted tool)</p> | <p>DIFFERENTIAL<br/>CARRIER GAUGE</p> | <ul style="list-style-type: none"> <li>• Used for adjusting pinion height.</li> <li>• For VA2-type</li> </ul>                  |

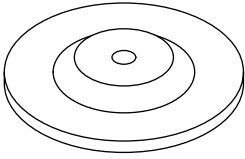
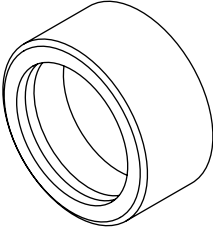
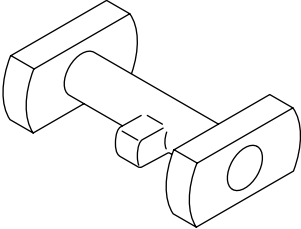
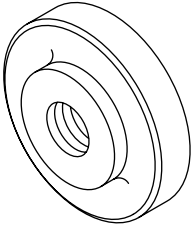
## General Description

### DIFFERENTIALS

| ILLUSTRATION  | TOOL NUMBER  | DESCRIPTION                                    | REMARKS  |
|---|--|--|--|
|  <p style="text-align: center;">ST18630AA010</p>   | <p style="text-align: center;">18630AA010<br/>(Newly adopted tool)</p> | <p style="text-align: center;">WRENCH ASSY</p> | <ul style="list-style-type: none"> <li>• Used for removing and installing side oil seal holder.</li> <li>• For VA2-type</li> </ul> <p>NOTE:<br/>Also available for VA1-type.</p> |
|  <p style="text-align: center;">ST-498175500</p>   | <p style="text-align: center;">498175500</p>                           | <p style="text-align: center;">INSTALLER</p>   | <ul style="list-style-type: none"> <li>• Used for installing rear bearing cone.</li> <li>• For VA1-type</li> </ul>   |
|  <p style="text-align: center;">ST-499785500</p> | <p style="text-align: center;">499785500</p>                           | <p style="text-align: center;">WRENCH ASSY</p> | <ul style="list-style-type: none"> <li>• Used for removing and installing side oil seal holder.</li> <li>• For VA1-type</li> </ul>   |
|  <p style="text-align: center;">ST-498447100</p> | <p style="text-align: center;">498447100</p>                           | <p style="text-align: center;">INSTALLER</p>   | <ul style="list-style-type: none"> <li>• Used for installing oil seal.</li> <li>• For VA1-type</li> </ul>  |

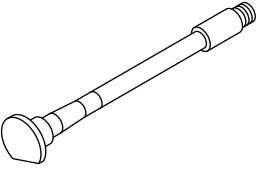
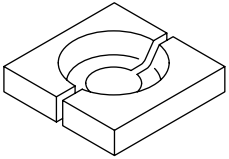
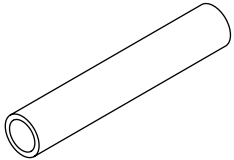
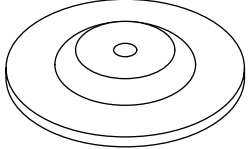
# General Description

DIFFERENTIALS

| ILLUSTRATION  | TOOL NUMBER | DESCRIPTION                   | REMARKS  |
|---|-------------|-------------------------------|--|
|  <p style="text-align: center;">ST-399520105</p>   | 399520105   | SEAT                          | <ul style="list-style-type: none"> <li>• Used for removing side bearing cone.</li> <li>• Used with PULLER SET (899524100).</li> <li>• For VA-type</li> </ul> |
|  <p style="text-align: center;">ST-498485400</p>   | 498485400   | DRIFT                         | <ul style="list-style-type: none"> <li>• Used for installing side bearing cone.</li> <li>• For VA1-type</li> </ul>   |
|  <p style="text-align: center;">ST-498505501</p> | 498505501   | DIFFERENTIAL<br>CARRIER GAUGE | <ul style="list-style-type: none"> <li>• Used for adjusting pinion height.</li> <li>• For VA1-type</li> </ul>  |
|  <p style="text-align: center;">ST-498447110</p> | 498447110   | DRIFT                         | <ul style="list-style-type: none"> <li>• Used for press-fitting the bearing race (front) of differential carrier.</li> <li>• For VA1-type</li> </ul>         |

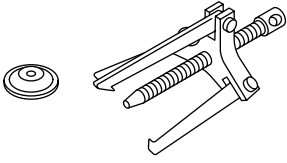
## General Description

### DIFFERENTIALS

| ILLUSTRATION  | TOOL NUMBER | DESCRIPTION  | REMARKS  |
|---|-------------|--------------|--|
|  <p style="text-align: center;">ST-498447150</p>   | 498447150   | DUMMY SHAFT  | <ul style="list-style-type: none"> <li>• Used for adjusting pinion height and preload.</li> <li>• For VA1-type</li> </ul>                                      |
|  <p style="text-align: center;">ST-498515500</p>   | 498515500   | REPLACER     | <ul style="list-style-type: none"> <li>• Used for removing rear bearing cone.</li> <li>• For VA1-type</li> </ul>   |
|  <p style="text-align: center;">ST32285AA000</p> | 32285AA000  | DUMMY COLLAR | <ul style="list-style-type: none"> <li>• Used for adjusting pinion height and preload.</li> <li>• For VA1-type</li> </ul>                                      |
|  <p style="text-align: center;">ST-499705404</p> | 499705404   | SEAT         | <ul style="list-style-type: none"> <li>• Used for removing side bearing race.</li> <li>• Used with PULLER ASSY (499705401).</li> <li>• For VA1-type</li> </ul> |

# General Description

DIFFERENTIALS

| ILLUSTRATION  | TOOL NUMBER | DESCRIPTION | REMARKS  |
|---|-------------|-------------|--|
|  <p style="text-align: center; margin-top: 10px;">ST-499705401</p> | 499705401   | PULLER ASSY | <ul style="list-style-type: none"> <li>• Used for removing side bearing race.</li> <li>• Used with SEAT (499705404).</li> <li>• For VA-type</li> </ul> |

## 2. GENERAL PURPOSE TOOL

| TOOL NAME         | REMARKS   |
|-------------------|---|
| Transmission jack | Used for assembly/disassembly of rear differential.     |
| Puller            | Used for removal of side bearing retainer.              |
| Thickness gauge   | Used for measuring clearance.                           |
| Hexagon wrench    | Used for installing and removing filler and drain plug. |
| Tire lever        | Used for removal of rear drive shaft. (VA-type)         |

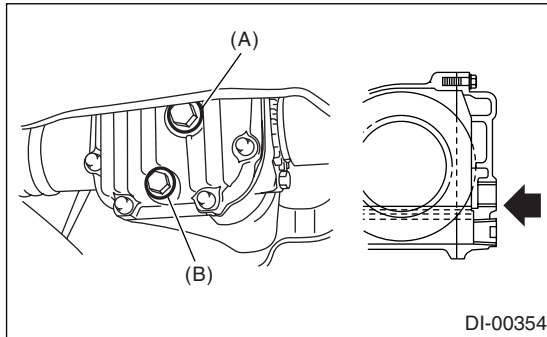
## 2. Differential Gear Oil

### A: INSPECTION

1) Remove the filler plug, and then check the gear oil. If it is contaminated or deteriorated, replace the gear oil. <Ref. to DI-26, REPLACEMENT, Differential Gear Oil.>

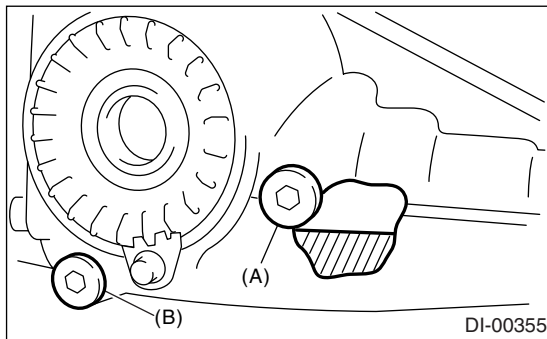
2) Check that the gear oil level is up to the bottom of filler plug hole. If the level is low, refill up to the bottom of filler plug hole.

- Except for VA2-type



- (A) Filler plug
- (B) Drain plug

- VA2-type



- (A) Filler plug
- (B) Drain plug

### B: REPLACEMENT

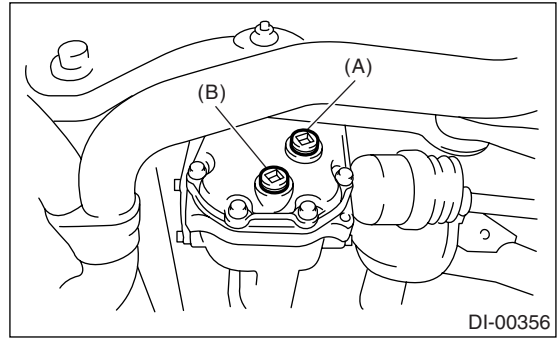
1) Jack-up the vehicle and support it with rigid racks.

2) Remove the oil drain plug and filler plug, and drain the gear oil.

#### CAUTION:

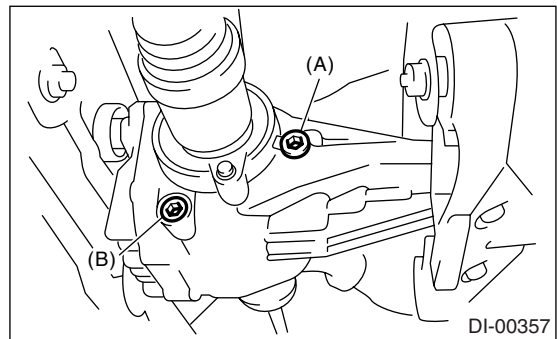
**Be careful not to burn your hands, because gear oil becomes extremely hot after running.**

- Except for VA2-type



- (A) Filler plug
- (B) Drain plug

- VA2-type



- (A) Filler plug
- (B) Drain plug

3) Tighten the oil drain plug.

#### NOTE:

- Apply liquid gasket to the drain plug threads for T-type.

#### Liquid gasket:

**THREE BOND 1105 (Part No. 004403010) or equivalent**

- Use a new aluminum gasket for VA1-type.
- Use a new metal gasket for VA2-type.

#### Tightening torque:

##### T-type:

**49 N·m (5.0 kgf-m, 36.2 ft-lb)**

##### VA1-type:

**34 N·m (3.5 kgf-m, 25.3 ft-lb)**

##### VA2-type:

**29 N·m (3.0 kgf-m, 21.4 ft-lb)**

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

#### NOTE:

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

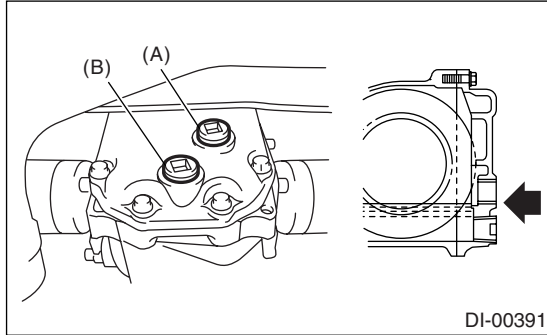
**Recommended gear oil:**

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

**Oil capacity:**

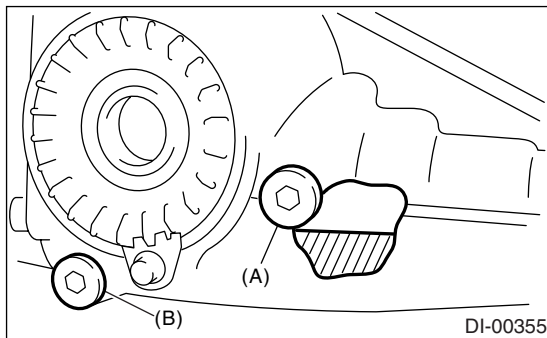
0.8 ℓ (0.8 US qt, 0.7 Imp qt)

- Except for VA2-type



- (A) Filler plug
- (B) Drain plug

- VA2-type



- (A) Filler plug
- (B) Drain plug

5) Install the filler plug.

**NOTE:**

- Apply liquid gasket to the filler plug threads for T-type.

**Liquid gasket:**

**THREE BOND 1105 (Part No. 004403010) or equivalent**

- Use a new aluminum gasket for VA1-type.
- Use a new metal gasket for VA2-type.

**Tightening torque:**

**T-type:**

**49 N·m (5.0 kgf·m, 36.2 ft·lb)**

**VA1-type:**

**34 N·m (3.5 kgf·m, 25.3 ft·lb)**

**VA2-type:**

**29 N·m (3.0 kgf·m, 21.4 ft·lb)**

## 3. Front Differential Assembly

### A: NOTE

#### 1. AT MODEL

- 4AT

For front differential of 4AT model, refer to “4AT” section. <Ref. to 4AT-113, Front Differential Assembly.>

- 5AT

For front differential of 5AT model, refer to “5AT” section. <Ref. to 5AT-94, Front Differential.>

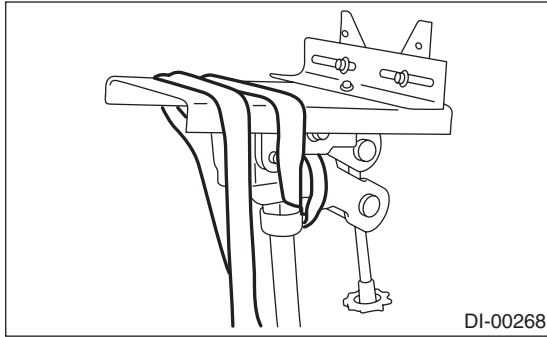
#### 2. MT MODEL

For front differential of manual transmission, refer to “5MT” section. <Ref. to 5MT-85, Front Differential Assembly.>

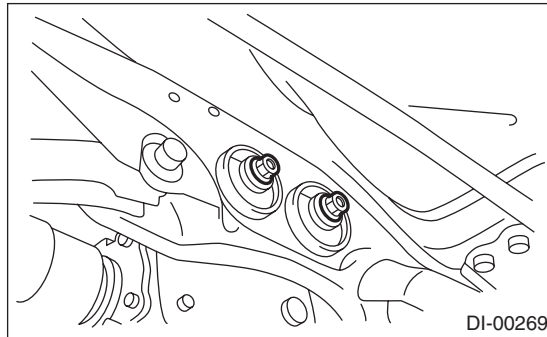
## 4. Rear Differential (T-type)

### A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Move the select lever or gear shift lever to neutral.
- 3) Loosen the wheel nuts.
- 4) Release the parking brake.
- 5) Jack-up the vehicle and support it with rigid racks.
- 6) Remove the rear wheels.
- 7) Remove the rear exhaust pipe and muffler.
  - 2.0 L SOHC and DOHC non-turbo model  
<Ref. to EX(H4SO 2.0)-11, Rear Exhaust Pipe.>  
<Ref. to EX(H4SO 2.0)-13, Muffler.>
  - 2.0 L DOHC turbo model  
<Ref. to EX(H4DOTC)-11, Rear Exhaust Pipe.>
- 8) Remove the propeller shaft.  
<Ref. to DS-10, REMOVAL, Propeller Shaft.>
- 9) Prepare the transmission jack and band.

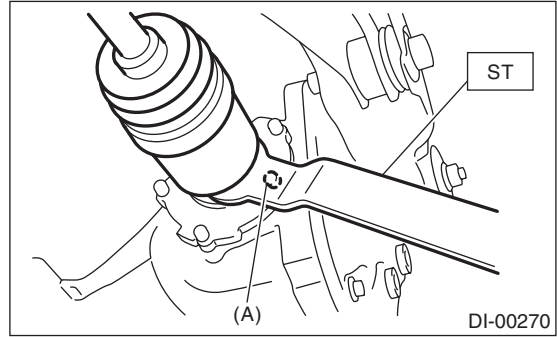


- 10) Loosen the self-locking nuts which hold the rear differential to rear crossmember.



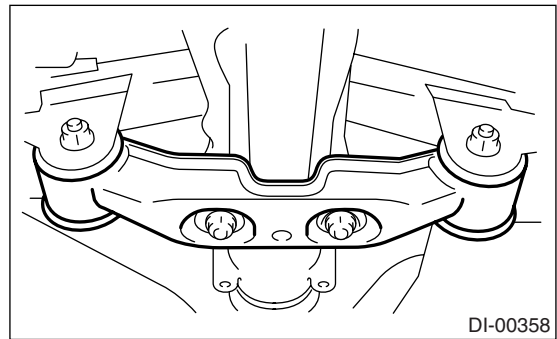
- 11) Remove the DOJ of rear drive shaft from rear differential using ST.

ST 28099PA100 DRIVE SHAFT REMOVER

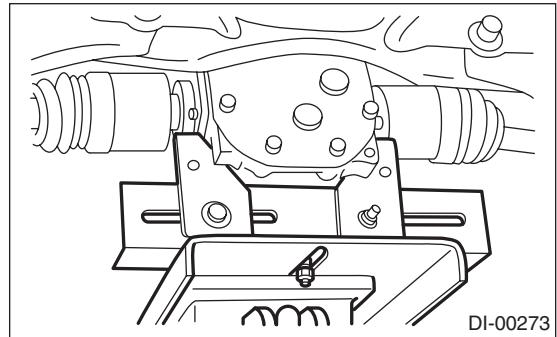


(A) Bolt

- 12) Remove the rear differential front member.



- 13) Support the rear differential with transmission jack.



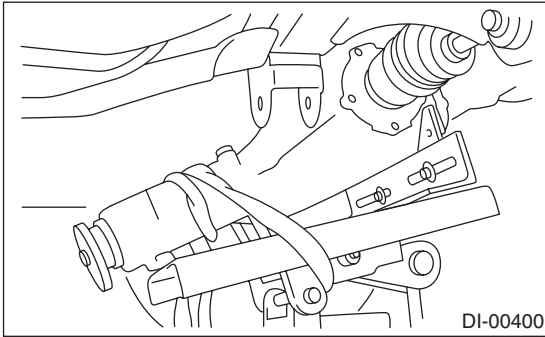
- 14) Secure the rear differential using band.
- 15) Remove the self-locking nuts which hold the rear differential to crossmember.
- 16) Remove the rear differential stud bolt from rear crossmember bushing.

# Rear Differential (T-type)

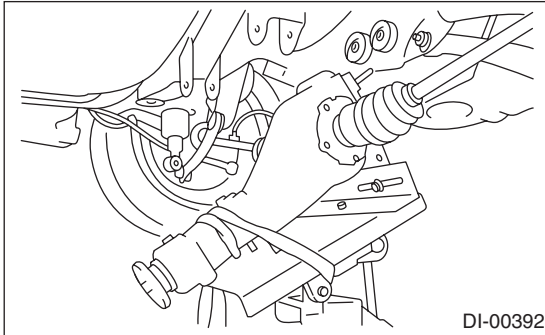
## DIFFERENTIALS

### NOTE:

When removing the stud bolt, carefully adjust the angle and location of transmission jack and jack stand, if necessary.



17) Lower the transmission jack stand after removing the rear differential stud bolt from rear cross-member. Rear drive shaft should not come into contact with lateral link bolt.

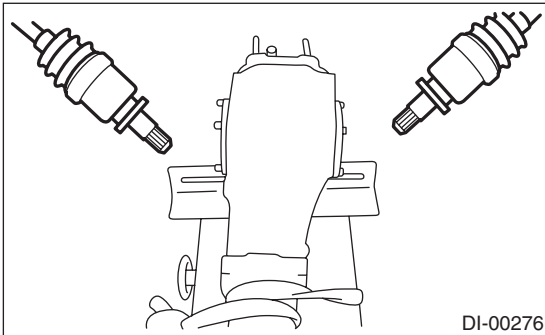


18) Pull out the axle shaft from rear differential.

### NOTE:

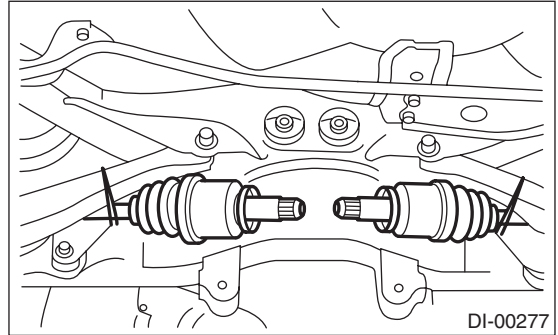
If it is difficult to remove the axle shaft from rear differential, remove it using ST.

ST 28099PA100 DRIVE SHAFT REMOVER

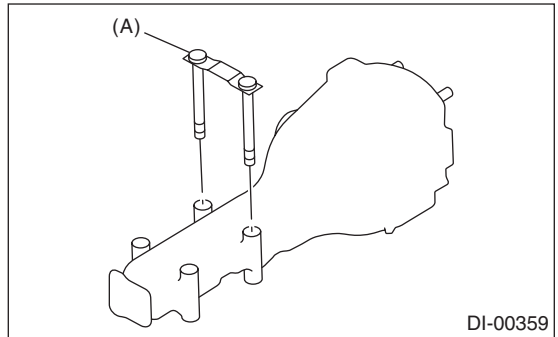


19) Lower the transmission jack.

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



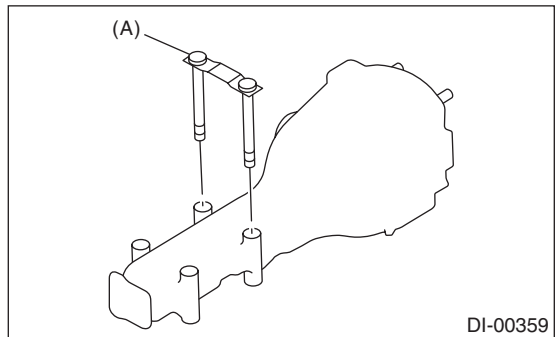
21) Remove the rear differential member plate from rear differential.



(A) Rear differential member plate

## B: INSTALLATION

1) Install the rear differential member plate to rear differential.



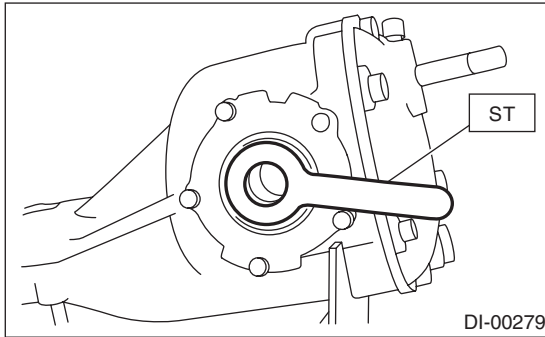
(A) Rear differential member plate

2) Set the rear differential to transmission jack.

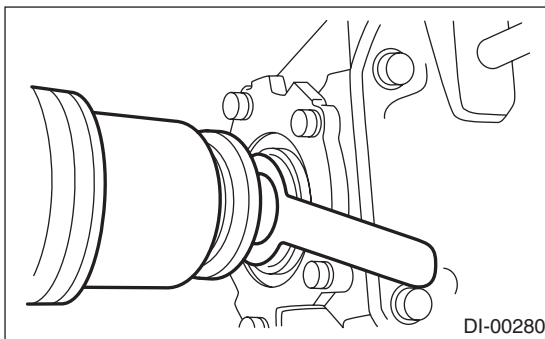
### NOTE:

Secure the rear differential to transmission jack using band.

- 3) Install the ST to rear differential.  
 ST 28099PA090 OIL SEAL PROTECTOR

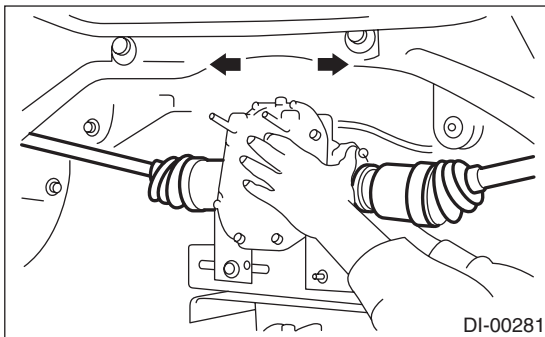


- 4) Insert the spline shaft until the spline portion comes inside the side oil seal.

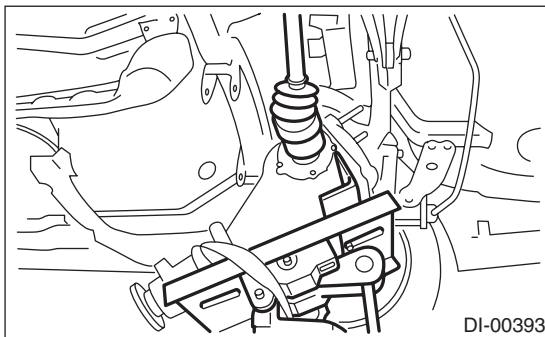


- 5) Remove ST from rear differential.  
 ST 28099PA090 OIL SEAL PROTECTOR

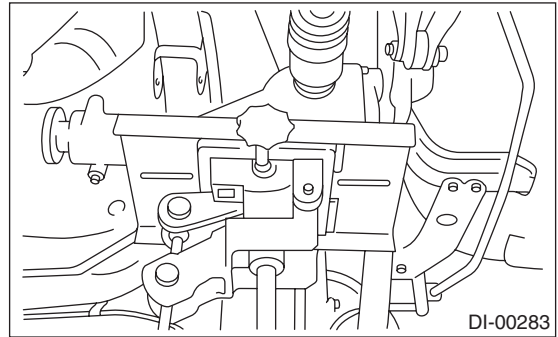
- 6) Push the rear differential to insert the axle shaft into rear differential.



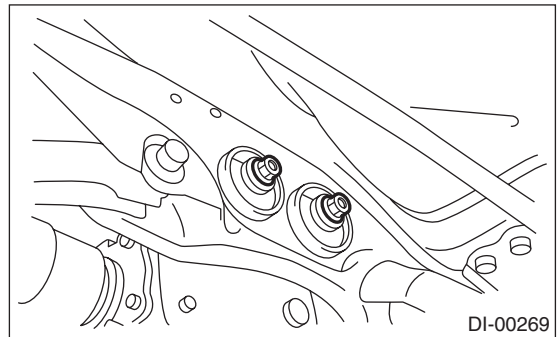
- 7) Adjust the transmission jack, if necessary, and insert the rear differential stud bolt into rear cross-member bushing properly.



- 8) After inserting the rear differential stud bolt into rear crossmember bushing, lift up the transmission jack and align the rear differential with its own position.



- 9) Tighten the rear crossmember self-locking nut temporarily.



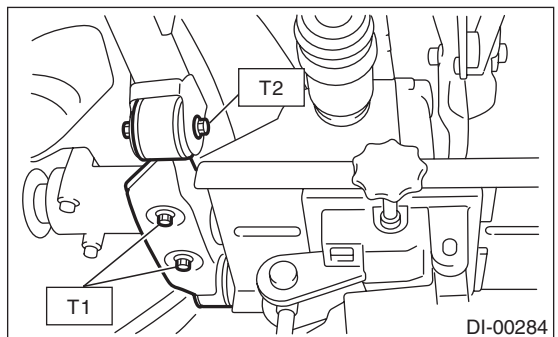
- 10) Remove the band from rear differential. Lift up the rear differential until the rear differential is separated from the transmission jack.

- 11) Install the rear differential front member.

**Tightening torque:**

**T1: 52 N·m (5.3 kgf-m, 38 ft-lb)**

**T2: 110 N·m (11.2 kgf-m, 81 ft-lb)**



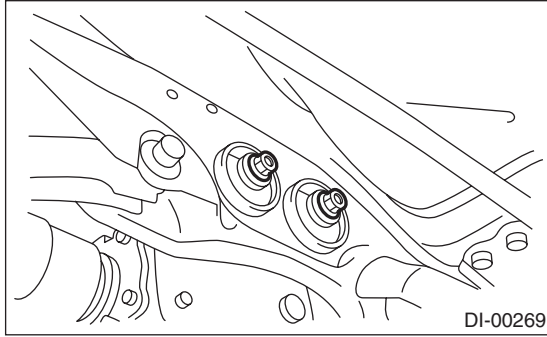
# Rear Differential (T-type)

## DIFFERENTIALS

12) Tighten the self-locking nut.

**Tightening torque:**

**70 N·m (7.1 kgf-m, 51 ft-lb)**



13) Lower the transmission jack.

14) Install the propeller shaft. <Ref. to DS-11, INSTALLATION, Propeller Shaft.>

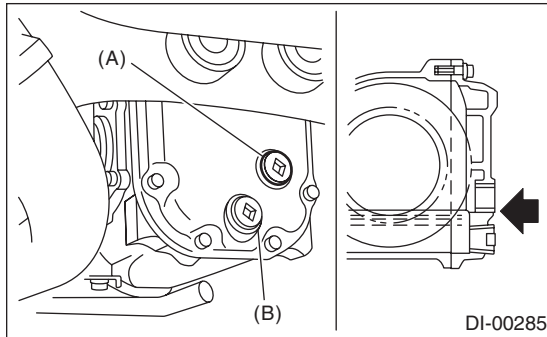
15) Install the heat shield cover.

16) Install the rear exhaust pipe and muffler.

17) After installing the rear differential carrier to the vehicle, remove the filler plug, and refill the gear oil to the bottom of plug hole.

**Oil capacity:**

**0.8 ℓ (0.8 US qt, 0.7 Imp qt)**



(A) Filler plug

(B) Drain plug

18) Tighten the filler plug.

**NOTE:**

Apply liquid gasket to the drain plug.

**Liquid gasket:**

**THREE BOND 1105 (Part No. 004403010) or equivalent**

**Tightening torque:**

**49.0 N·m (5.0 kgf-m, 36.2 ft-lb)**

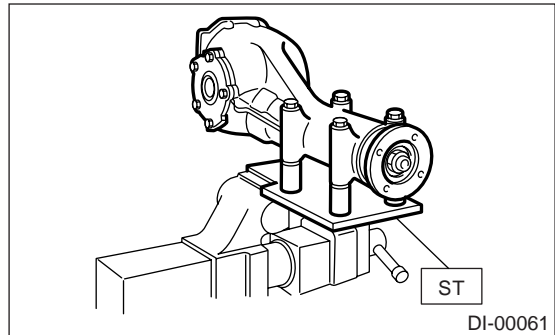
## C: DISASSEMBLY

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

- Tooth contact of hypoid driven gear and drive pinion, and backlash
- 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

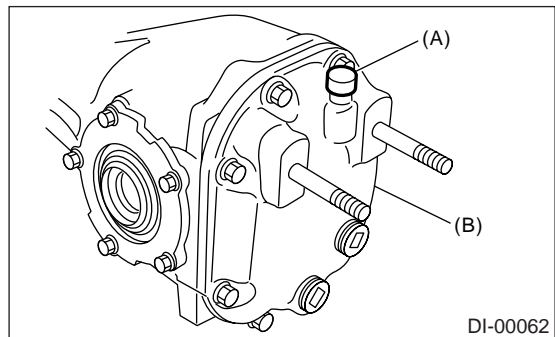


2) Drain the gear oil by removing plug.

3) Remove the air breather cap.

**NOTE:**

- Do not attempt to replace the air breather cap unless necessary.
- Replace the air breather cap with a new one when removing it.



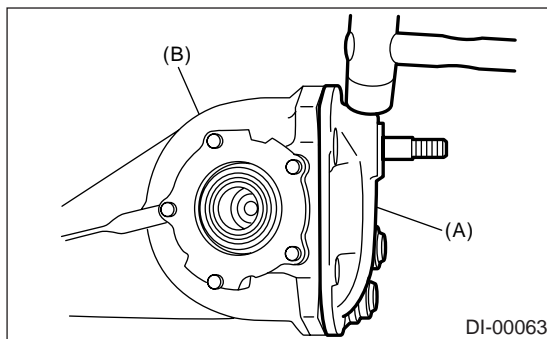
(A) Air breather cap

(B) Rear cover

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

**NOTE:**

Remove it by tapping with plastic hammer.



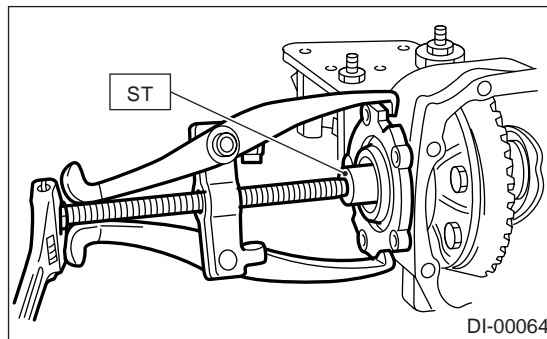
- (A) Rear cover
- (B) Differential carrier

5) Keep the side bearing retainers RH and LH separately for easier reassembly. Remove the side bearing retainer attaching bolts, set the ST to differential case, and extract the side bearing retainers RH and LH with a puller.

**NOTE:**

Each shim, which is installed to adjusted the side bearing preload, should be kept together with its mating retainer.

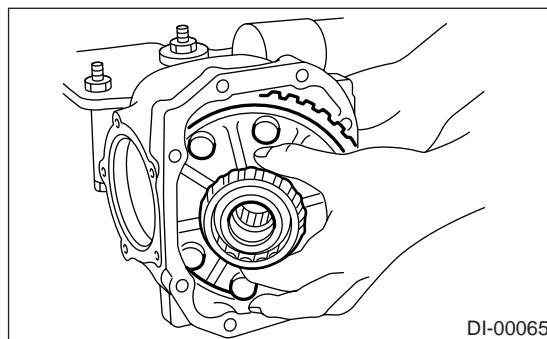
ST 398457700 ATTACHMENT



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

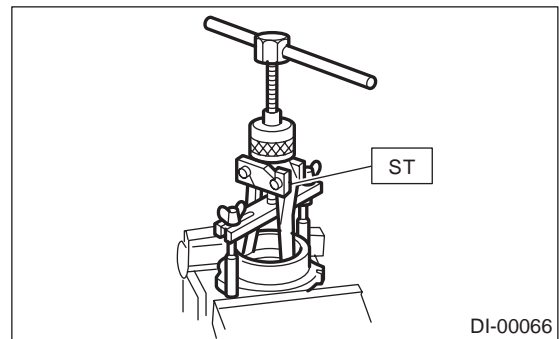
**NOTE:**

Be careful not to hit the teeth against the case.



7) When replacing the side bearing, remove the bearing cup from side bearing retainer using ST.

ST 398527700 PULLER ASSY

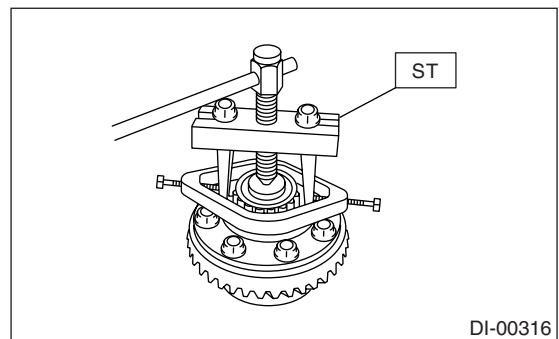


8) Extract the bearing cone with ST.

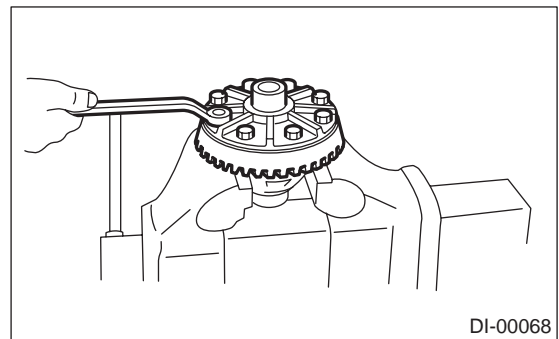
**NOTE:**

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

ST 18759AA000 PULLER ASSY



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



10) Drive out the pinion shaft lock pin from hypoid driven gear side (Model without LSD).

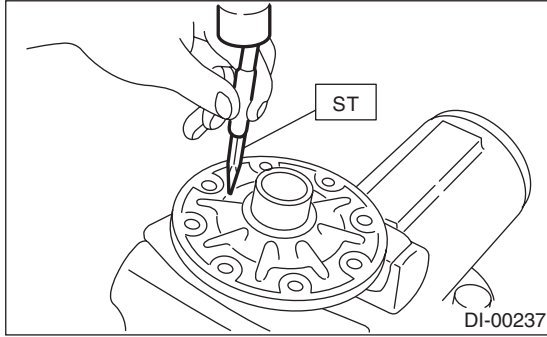
**NOTE:**

The lock pin is staked at the pin hole end on the differential carrier. Do not drive it out forcibly before removing the stake.

# Rear Differential (T-type)

## DIFFERENTIALS

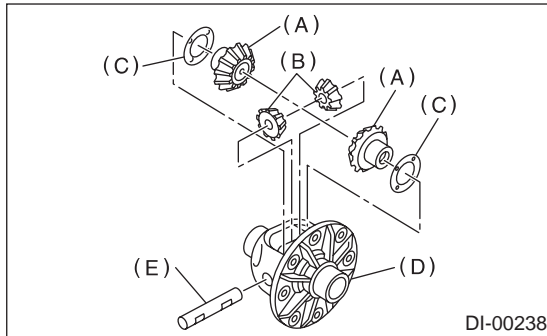
ST 899904100 STRAIGHT PIN REMOVER



11) Draw out the pinion mate shaft and remove pinion mate gears, side gears and thrust washers. (Model without LSD)

**NOTE:**

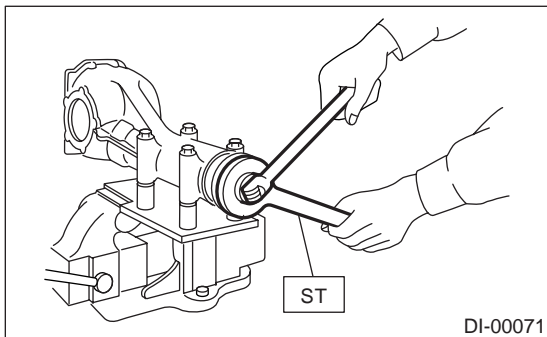
The gears should be marked or kept separated right and left, and front and rear as well as thrust washers.



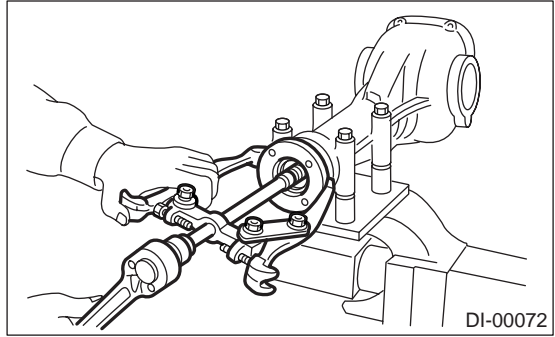
- (A) Side gear
- (B) Pinion mate gear
- (C) Thrust washer
- (D) Differential case
- (E) Pinion mate shaft

12) Hold the companion flange with ST and remove the self-locking nut.

ST 498427200 FLANGE WRENCH



13) Extract the companion flange with a puller.

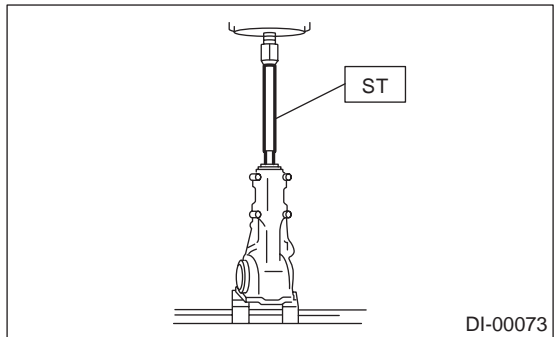


14) Press the end of drive pinion shaft and extract it together with rear bearing cone, pinion height adjust washer and washer.

**NOTE:**

Hold the drive pinion so as not to drop it.

ST 398467700 DRIFT

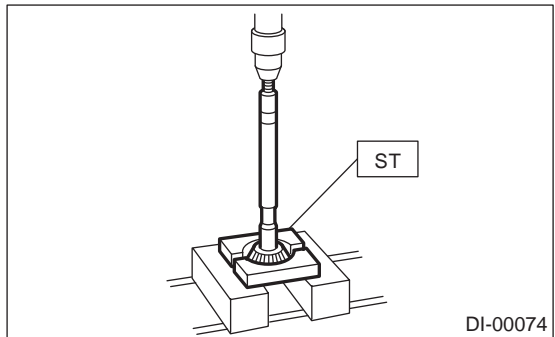


15) Remove the rear bearing cone from drive pinion by supporting the cone with ST.

**NOTE:**

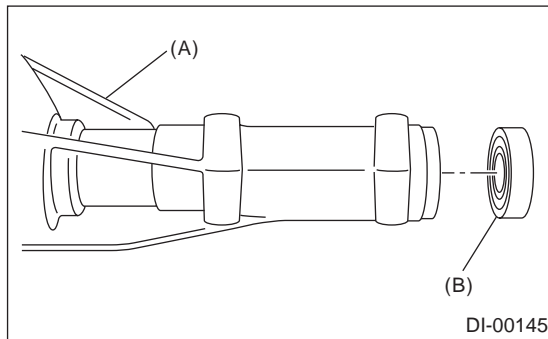
Place the replacer so that its center-recessed side faces the pinion gear.

ST 398517700 REPLACER



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

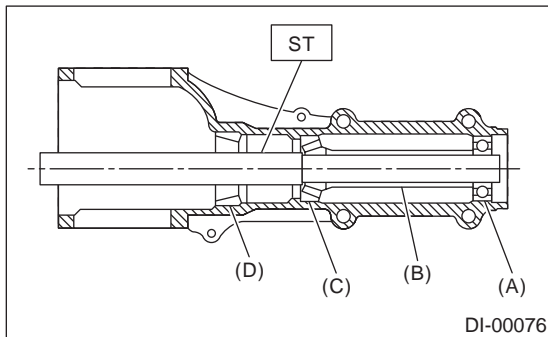
ST 398527700 PULLER ASSY



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

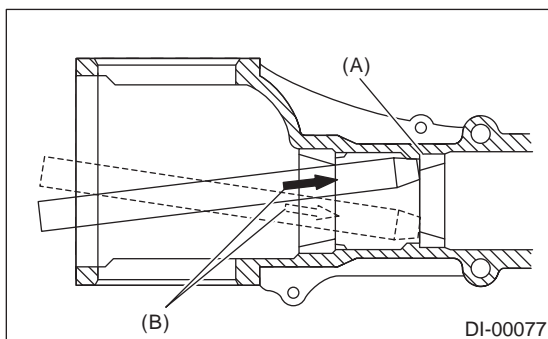
17) Remove the pilot bearing together with front bearing cone and collar using ST.

ST 398467700 DRIFT



- (A) Pilot bearing
- (B) Collar
- (C) Front bearing
- (D) Rear bearing cup

18) When replacing the bearings, hit out the front bearing cup and rear bearing cup in this order out of case using a brass bar.

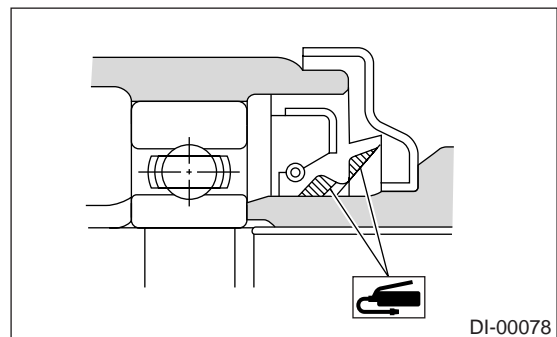


- (A) 2 cutouts along diagonal lines
- (B) Hit out alternately with brass bar

## 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 to the bearings and thrust washers when installing them.
- Be careful not to mix up the bearing races RH and LH.
- Use new O-rings and gasket.
- Replace the oil seals with new ones at every disassembly. Apply grease to the lips when installing the oil seals.
- Be careful not to mix up the differential oil seal RH and LH.

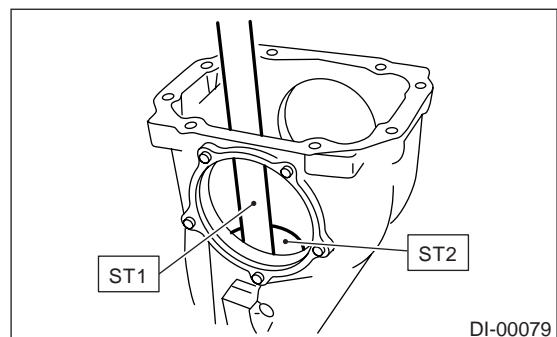


1) Adjusting preload for front and rear bearings: Adjust the bearing preload with collar and washer between front and rear bearings. Pinion height adjusting washer are not affected by this adjustment. The adjustment must be carried out without oil seal inserted.

(1) Press the rear bearing race into differential carrier with ST1 and ST2.

ST1 398477701 HANDLE

ST2 398477703 DRIFT 2



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

ST1 398477701 HANDLE

ST2 398477702 DRIFT

## Rear Differential (T-type)

### DIFFERENTIALS

- (3) Measure and record the thickness of pinion height adjust washer.

**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.

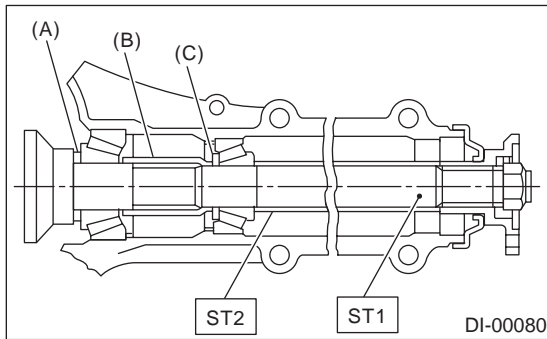
- (4) Insert the ST1 into carrier with pinion height adjusting washer and rear bearing cone fitted onto it.

**NOTE:**

Use new rear bearing cone.

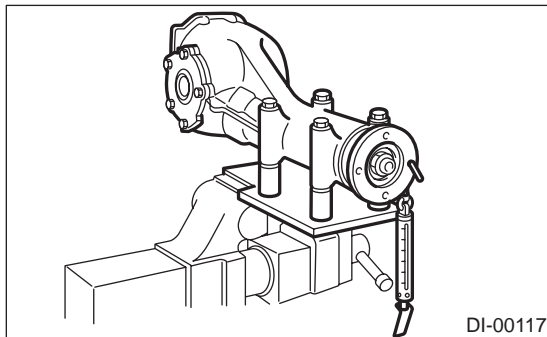
- (5) Install the preload adjusting collar and washer, front bearing cone, ST2, companion flange, and washer and drive pinion nut.

ST1 398507702 DUMMY SHAFT  
ST2 398507703 DUMMY COLLAR



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

- (6) Turn the ST1 with hand to make it seated, and tighten the self-locking nut while measuring the preload with spring balance. Select the preload adjusting washer and collar so that the specified preload is obtained when nut is tightened to the specified torque.



**NOTE:**

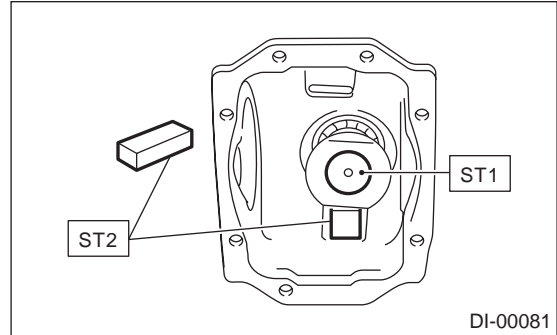
- Use a new self-locking nut.
- Be careful not to give excessive preload.
- When tightening the self-locking nut, lock ST1 with ST2 as shown in the figure.

- Measure the preload in direction of tangent to flange.

ST1 398507702 DUMMY SHAFT  
ST2 398507704 BLOCK

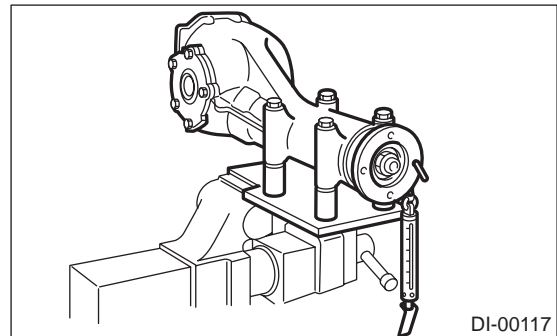
**Tightening torque:**

**181 N·m (18.5 kgf-m, 134 ft-lb)**



**Drive pinion bearing preload**

18.1 — 38.8 N (1.8 — 4.0 kgf, 4.1 — 8.7 lb)  
at companion flange bolt hole



|                          | Part No.  | Thickness mm (in) |
|--------------------------|-----------|-------------------|
| Preload adjusting washer | 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)     |

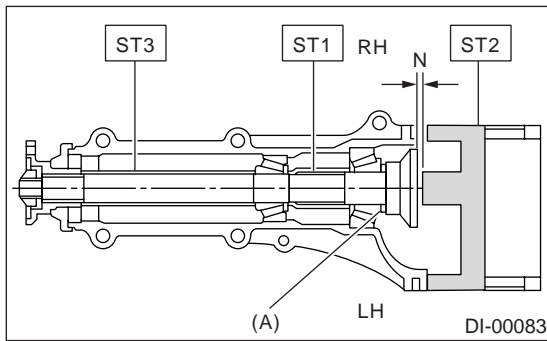
# Rear Differential (T-type)

| Preload adjusting collar | 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)   |

2) Adjusting drive pinion height:  
Adjust the drive pinion height with washer installed between the rear bearing cone and the back of pinion gear.

(1) Install the ST2.

- ST1 398507702 DUMMY SHAFT
- ST2 398507701 DIFFERENTIAL CARRIER GAUGE
- ST3 398507703 DUMMY COLLAR



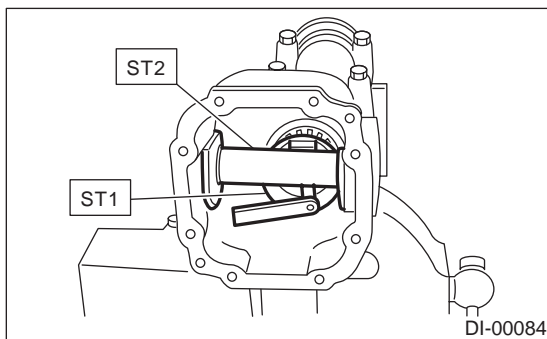
(A) Pinion height adjusting washer

(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 case 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.

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

**NOTE:**

Use copies of this page.

|       |   |  |
|-------|---|--|
| T     | Thickness of pinion height adjusting washer mm (in) |  |
| To    | 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)

$$To = 2.20 + 1.20 = 3.40 \text{ mm}$$

$$N = 0.23 \text{ mm } H = + 1$$

$$T = 3.40 + 0.23 - 0.01 - 0.20 = 3.42$$

Result: Thickness = 3.42 mm

Therefore use the pinion height adjusting washer of part number 383605200.

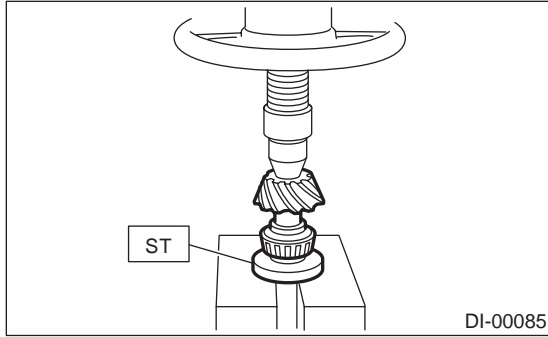
| Pinion height adjusting washer |                   |
|--------------------------------|-------------------|
| Part No.                       | Thickness mm (in) |
| 383495200                      | 3.09 (0.1217)     |
| 383505200                      | 3.12 (0.1228)     |
| 383515200                      | 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)

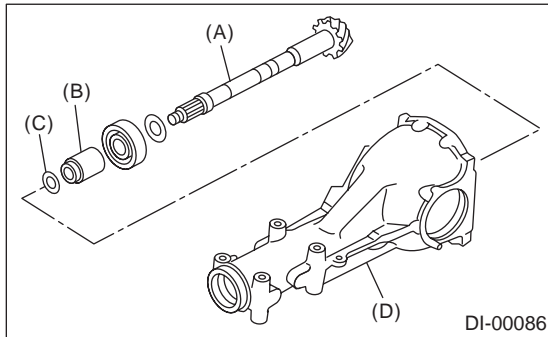
### DIFFERENTIALS

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

ST 398177700 INSTALLER



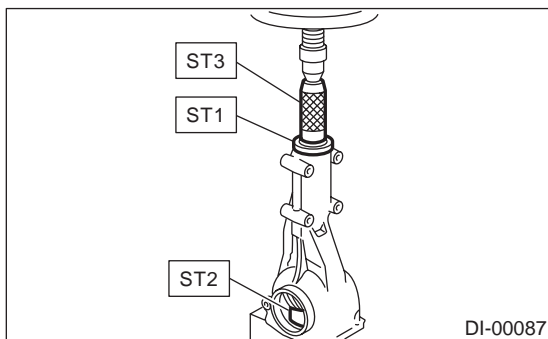
4) Insert the drive pinion into differential carrier, install the selected bearing preload adjusting collar and washer.



- (A) Drive pinion
- (B) Bearing preload adjusting collar
- (C) Bearing preload adjusting washer
- (D) Differential carrier

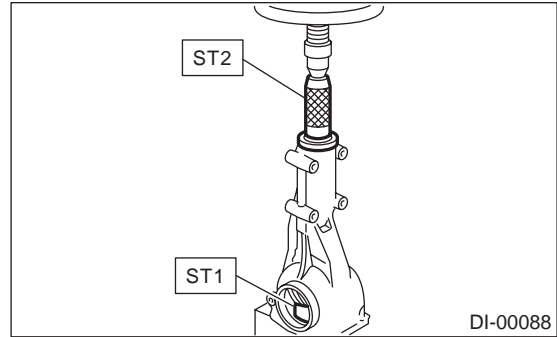
5) Press-fit the front bearing cone into case with ST1, ST2 and ST3.

ST1 398507703 DUMMY COLLAR  
 ST2 399780104 WEIGHT  
 ST3 899580100 INSTALLER



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

ST1 399780104 WEIGHT  
 ST2 899580100 INSTALLER

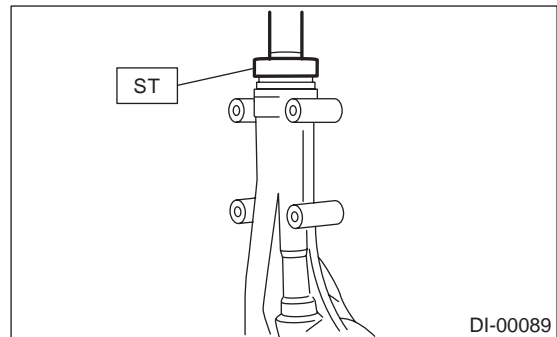


7) Fit a new oil seal with ST.

NOTE:

- Press-fit until end of oil seal is 1 mm (0.04 in) inward from end of carrier.
- Apply grease to the oil seal lips.

ST 498447120 INSTALLER

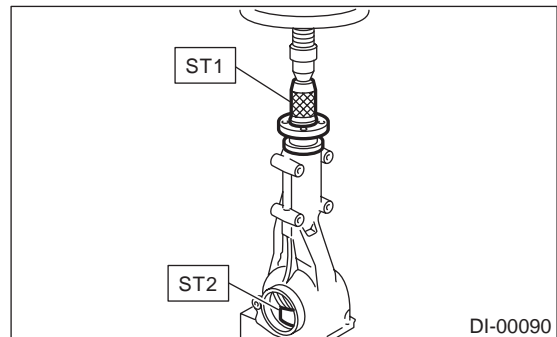


8) Press-fit the companion flange with ST1 and ST2.

NOTE:

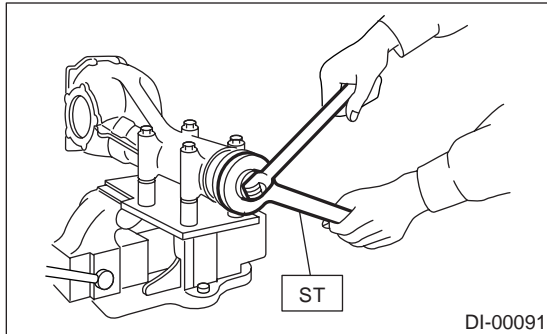
Be careful not to damage the bearing.

ST1 899874100 INSTALLER  
 ST2 399780104 WEIGHT



9) Install a new self-locking nut and secure the companion flange using ST and tighten the nut.  
 ST 498427200 FLANGE WRENCH

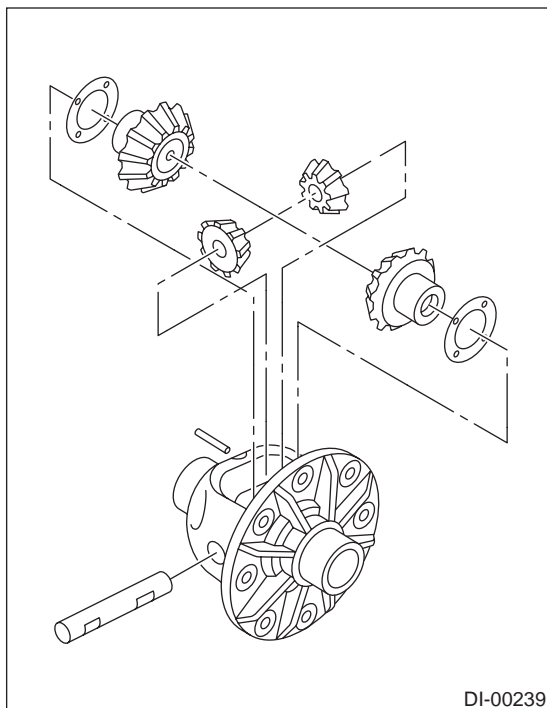
**Tightening torque:**  
**181 N·m (18.5 kgf·m, 134 ft·lb)**



10) Assembling differential case  
 Install the side gears and pinion mate gears, with their thrust washers and pinion mate shaft, into differential case. (Model without LSD)

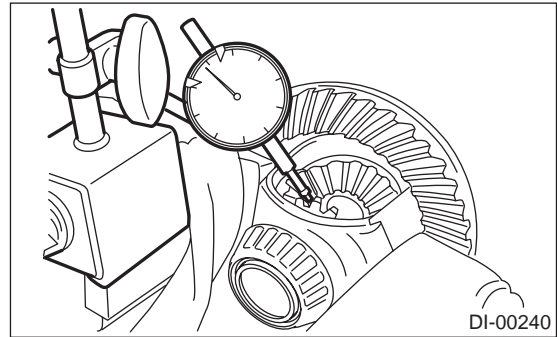
**NOTE:**

- 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 lock pin holes.



(1) Measure the side gear backlash.

**Side gear backlash:**  
**0.10 — 0.20 mm (0.0039 — 0.0079 in)**



(2) Adjust the side gear 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) |

(3) Check the condition of rotation after applying oil to the gear tooth surfaces and thrust surfaces.

(4) After inserting the pinion shaft lock pin into differential case, stake the both sides of the hole to prevent pin from falling off.

11) Install the hypoid driven gear to differential case.

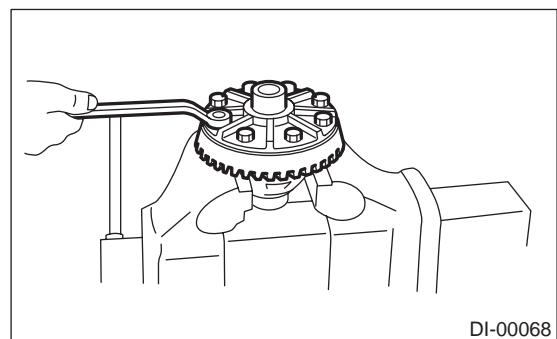
**NOTE:**

- Before installing bolts, apply Lock Tite to bolt threads.

**Lock Tite:**  
**THREE BOND 1324 (Part No. 004403042)**

- Tighten diagonally while tapping the bolt heads.

**Tightening torque:**  
**105 N·m (10.7 kgf·m, 77.4 ft·lb)**

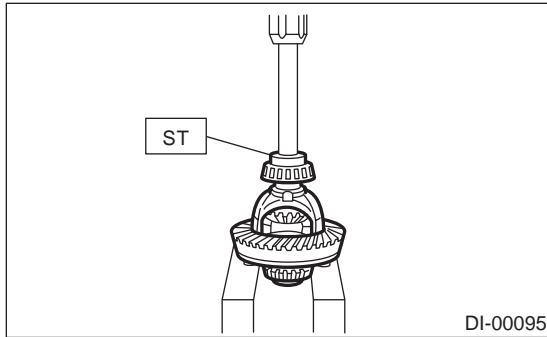


## Rear Differential (T-type)

### DIFFERENTIALS

12) Press the side bearing into differential case using ST.

ST 398227700 DRIFT

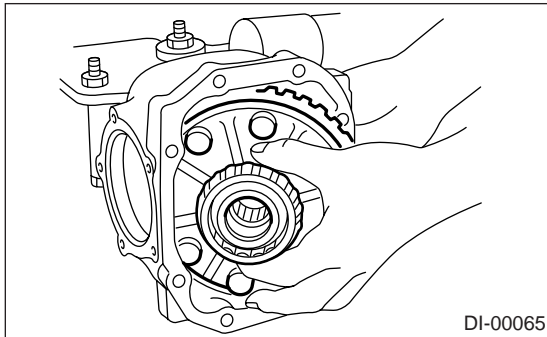


13) Press-fit the side bearing cone to the side bearing retainer using ST.

ST 398437700 DRIFT

14) Adjusting the side bearing retainer shims

- (1) The hypoid driven gear backlash and side bearing preload can be adjusted by the side bearing retainer shim thickness.
- (2) Install the differential assembly into differential carrier in the reverse order of disassembly.



(3) Install the side bearing retainer shims to retainers RH and LH from which they were removed.

#### NOTE:

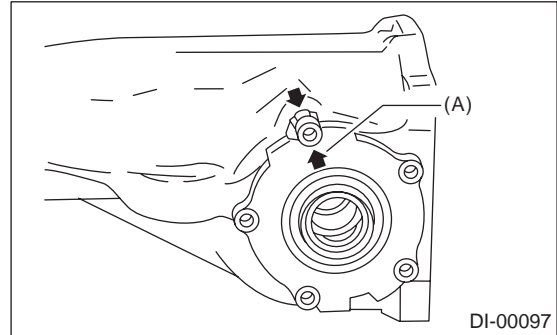
Replace the broken or corroded side retainer shim with a new one of same thickness.

| Side bearing 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)     |

(4) Align the arrow mark on differential carrier with the mark on side retainer during installation.

#### NOTE:

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

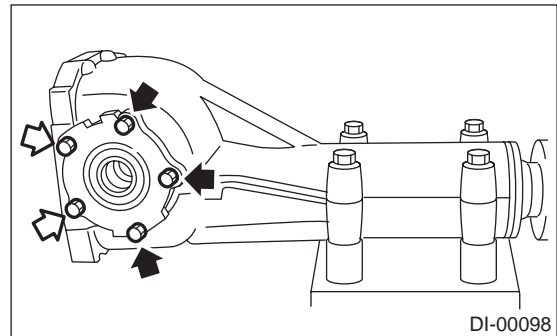


(A) Arrow mark

(5) Tighten the side bearing retainer bolts.

#### Tightening torque:

**10.3 N·m (1.05 kgf·m, 7.6 ft·lb)**

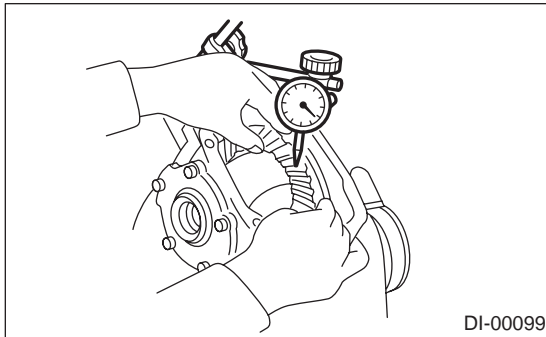


(6) Measure the hypoid driven gear to drive pinion backlash. Set the magnet base on differential carrier. Align the contact point of dial gauge with tooth face of hypoid driven gear, and move hypoid driven gear while holding drive pinion still. Read the value indicated on dial gauge.

If the backlash exceeds 0.2 mm (0.08 in), reduce the thickness of shim on the back face of hypoid driven gear and increase the thickness of shim on the tooth face of hypoid driven gear. If the backlash is less than 0.1 mm (0.004 in), increase the thickness of shim on the back face of hypoid driven gear and reduce the thickness of shim on the tooth face of hypoid driven gear.

**Backlash:**

**0.10 — 0.20 mm (0.0039 — 0.0079 in)**



(7) At the same time, measure the total preload of drive pinion. Compared with the resistance when differential case is not installed, if the total preload is not within specification, adjust the thickness of side bearing retainer shims, increasing/reducing by an even amount at a time.

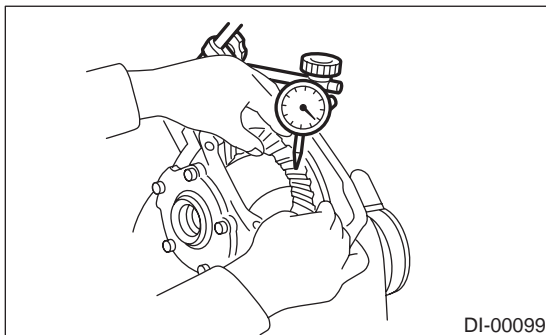
**Total preload:**

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

15) Recheck the hypoid driven gear to drive pinion backlash.

**Backlash:**

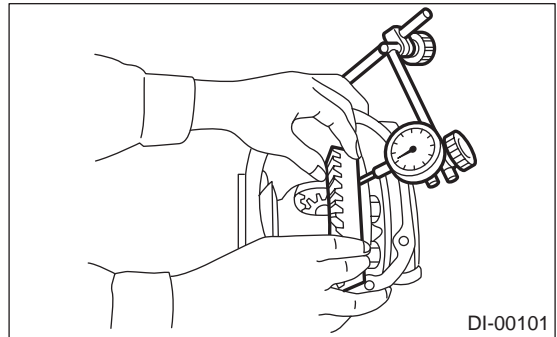
**0.10 — 0.20 mm (0.0039 — 0.0079 in)**



16) Check the hypoid driven gear runout on its back surface, and make sure that pinion and hypoid driven gear rotates smoothly. If the hypoid driven gear runout on its back surface exceed the specification, verify that there is any foreign material between hypoid driven gear and differential case, and they are not deformed.

**Hypoid driven gear runout on its back surface:**

**0.05 mm (0.0020 in)**



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

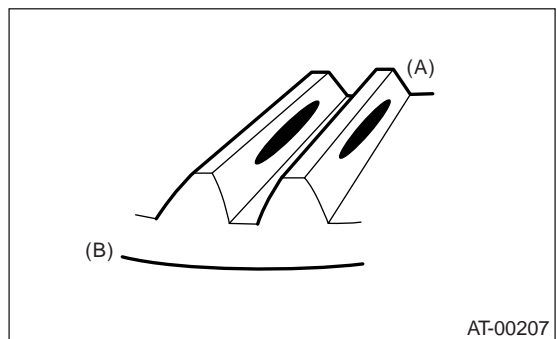
- (1) Apply an even coat of red lead on both sides of three or four teeth on the hypoid driven gear. Check the contact pattern after rotating the hypoid driven gear several revolutions back and forth until a definite contact pattern appears on the hypoid driven gear.
- (2) When the contact pattern is incorrect, readjust.

**NOTE:**

Be sure to wipe off red lead completely after adjustment is completed.

- Correct tooth contact

**Checking item: Tooth contact pattern is slightly shifted toward toe side under no-load rotation. [When loaded, contact pattern moves toward heel.]**



- (A) Toe side
- (B) Heel side

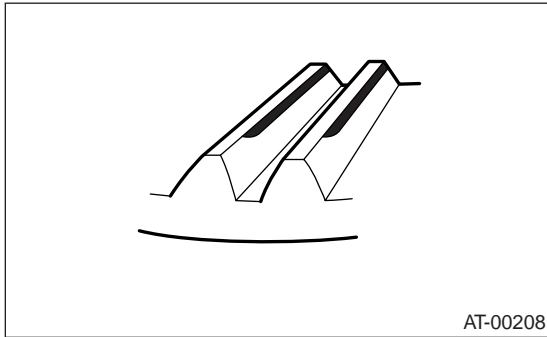
# Rear Differential (T-type)

## DIFFERENTIALS

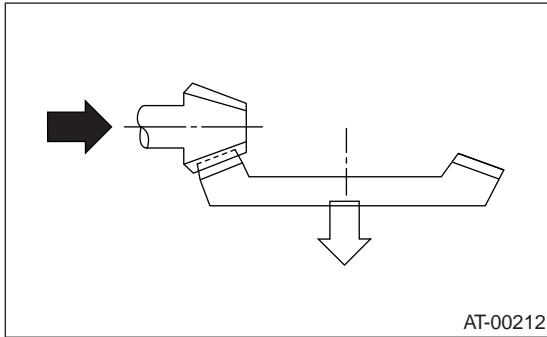
- Face contact

**Checking item: Backlash is too large.**

Contact pattern



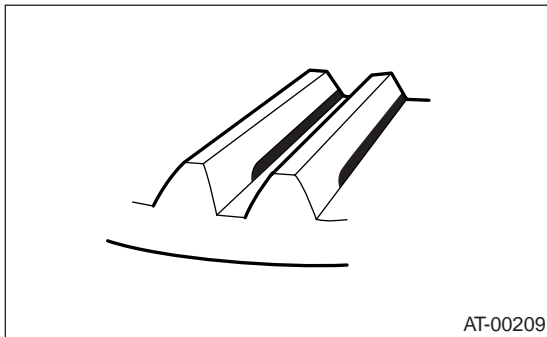
Corrective action: Increase thickness of drive pinion height adjusting washer in order to bring drive pinion close to hypoid driven gear.



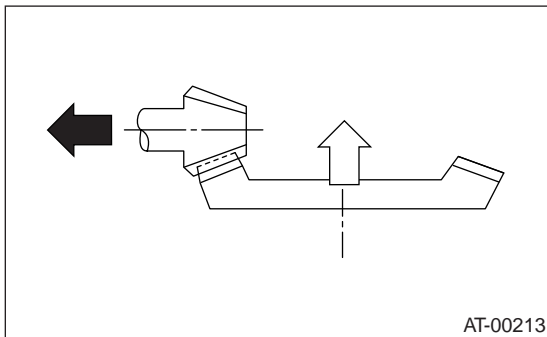
- Flank contact

**Checking item: Backlash is too small.**

Contact pattern



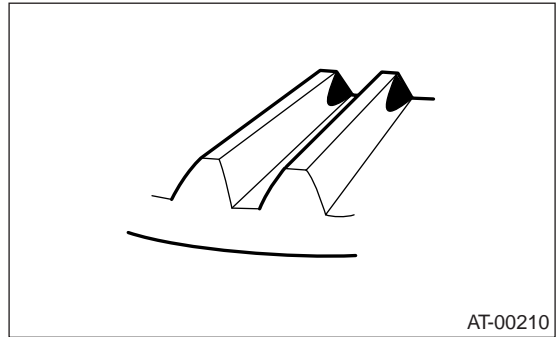
Corrective action: Reduce thickness of drive pinion height adjusting washer in order to bring drive pinion away from hypoid driven gear.



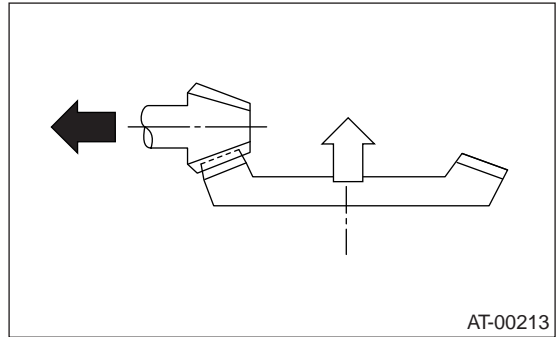
- Toe contact (inside end contact)

**Checking item: Contact areas is small**

Contact pattern



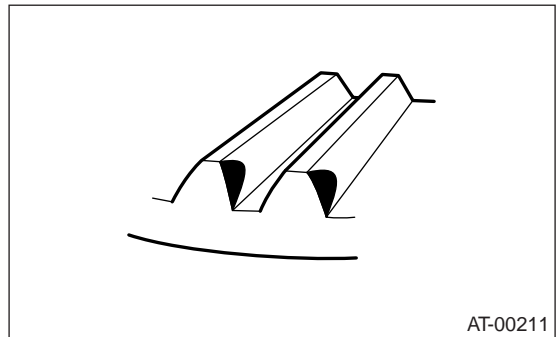
Corrective action: Reduce thickness of drive pinion height adjusting washer in order to bring drive pinion away from hypoid driven gear.



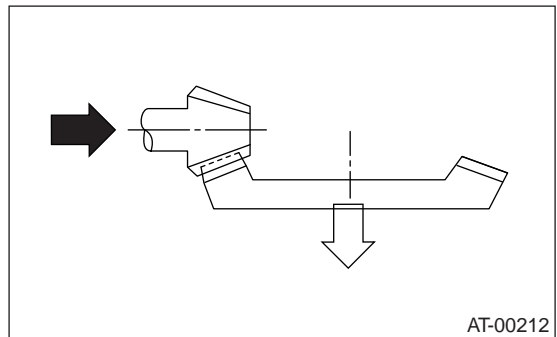
- Heel contact (outside end contact)

**Checking item: Contact areas is small**

Contact pattern



Corrective action: Increase thickness of drive pinion height adjusting washer in order to bring drive pinion close to hypoid driven gear.



18) If proper tooth contact is not obtained, once again adjust the drive pinion height by changing RH and LH side bearing retainer shims and the hypoid gear backlash.

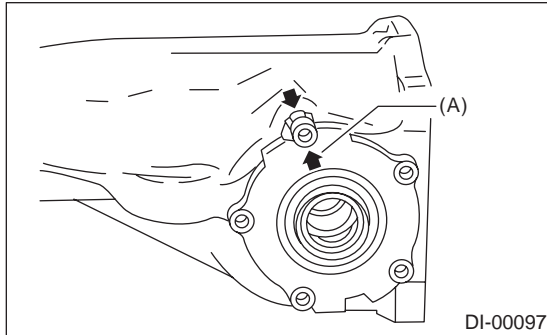
19) Remove the RH and LH side bearing retainer.

20) Install a new O-ring to side bearing retainer of both side.

21) Using the ST, install the oil seal to the side bearing retainer of both side.

ST 398437700 DRIFT

22) Align the arrow mark on differential carrier with the mark on side retainer during installation.

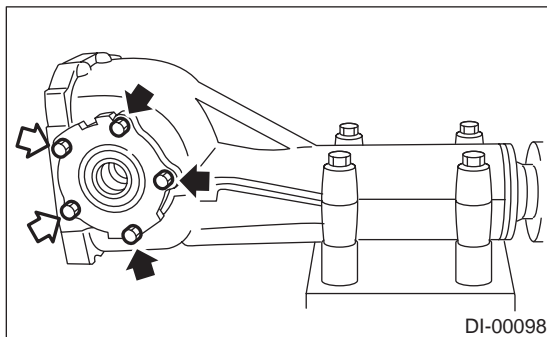


(A) Arrow mark

23) Tighten the side bearing retainer bolts.

**Tightening torque:**

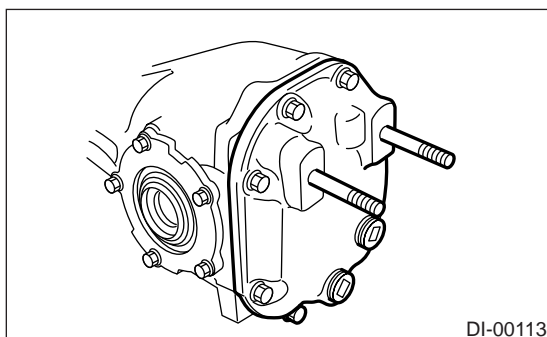
**10.3 N·m (1.05 kgf·m, 7.6 ft·lb)**



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

**Tightening torque:**

**29 N·m (3.0 kgf·m, 21.7 ft·lb)**



25) Install the breather cap.

26) Install the drain plug and filler plug.

**Tightening torque:**

**49 N·m (5.0 kgf·m, 36.2 ft·lb)**

## 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 abnormal tooth contact is evident, find out the cause and adjust to give correct tooth contact. Replace the gear if excessively worn or incapable of adjustment.

- If crack, score or seizure is evident, replace as a set. Slight damage of tooth can be corrected by oil stone or the like.

2) Side gear and pinion mate gear

- Replace if crack, score or other defects are evident on tooth surface.

- Replace if thrust washer contacting surface is worn or seized. Slight damage of the surface can be corrected by oil stone or the like.

3) Bearings

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

4) Thrust washers of side gear and pinion mate gear:

Replace if seizure, flaw, abnormal wear or other defect is evident.

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 its sliding surfaces are worn or cracked.

8) Companion flange

Replace if the oil seal lip contacting surfaces have flaws.

### 1. SIDE GEAR BACKLASH

Using a dial gauge, check the backlash of the side gear. (Model without LSD)

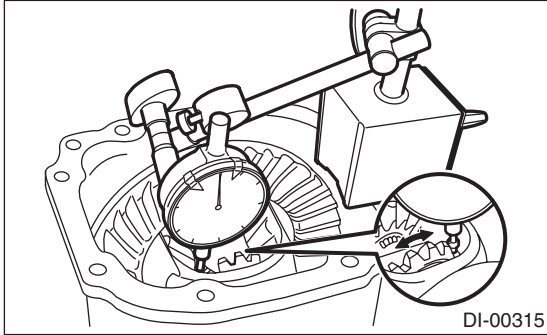
**Side gear backlash:**

**0.1 — 0.2 mm (0.004 — 0.008 in)**

# Rear Differential (T-type)

## DIFFERENTIALS

If the side gear backlash is not within the specification, adjust it as specified by selecting side gear thrust washer.



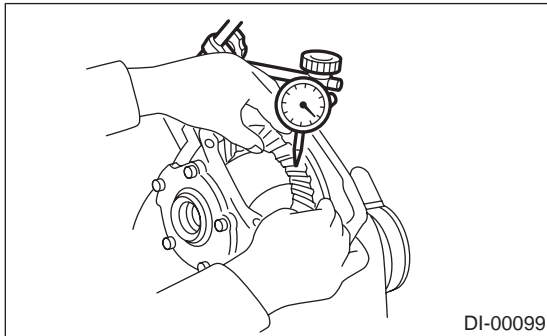
### 2. HYPOID DRIVEN GEAR BACKLASH

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

**Hypoid driven gear backlash:**

**0.1 — 0.2 mm (0.004 — 0.008 in)**

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



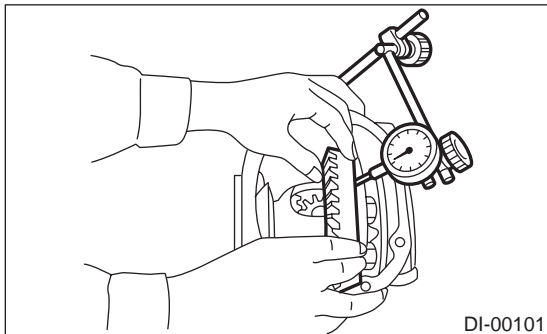
### 3. HYPOID DRIVEN GEAR RUNOUT ON ITS BACK SURFACE

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

**Hypoid driven gear runout on its back surface:**

**0.05 mm (0.0020 in)**

If the hypoid driven gear runout exceeds 0.05 mm (0.0020 in), replace the hypoid driven gear.



### 4. TOOTH CONTACT BETWEEN HYPOID DRIVEN GEAR AND DRIVE PINION

Inspect the tooth contact between hypoid driven gear and drive pinion. <Ref. to DI-35, ASSEMBLY, Rear Differential (T-type).>

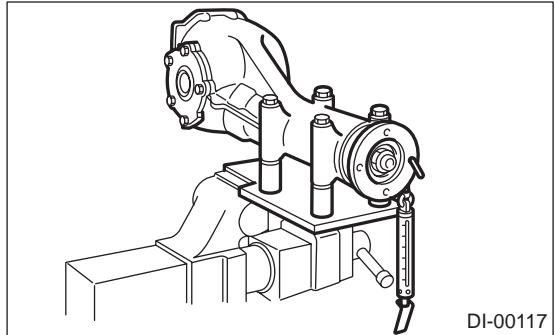
### 5. TOTAL PRELOAD

Using a spring balance, 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 bearing retainer shims.



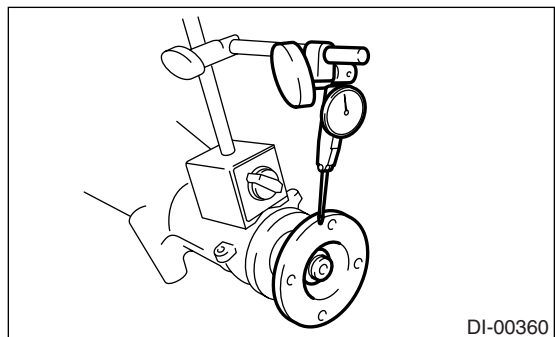
### 6. COMPANION FLANGE

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:**

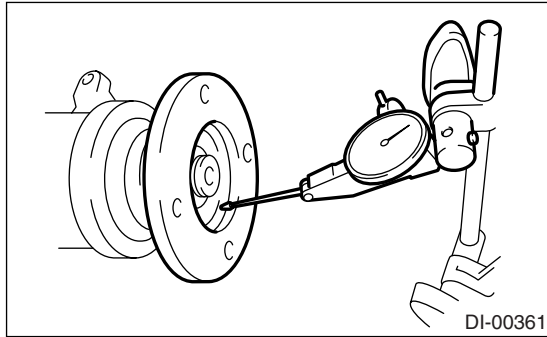
**0.08 mm (0.0031 in)**



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

**Limit of runout:**

**0.08 mm (0.0031 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-35, ASSEMBLY, Rear Differential (T-type).>

### 2. HYPOID DRIVEN GEAR BACKLASH

Adjust hypoid driven gear backlash.

<Ref. to DI-35, 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-35, ASSEMBLY, Rear Differential (T-type).>

### 4. TOTAL PRELOAD

Adjust the side bearing shim.

<Ref. to DI-35, ASSEMBLY, Rear Differential (T-type).>

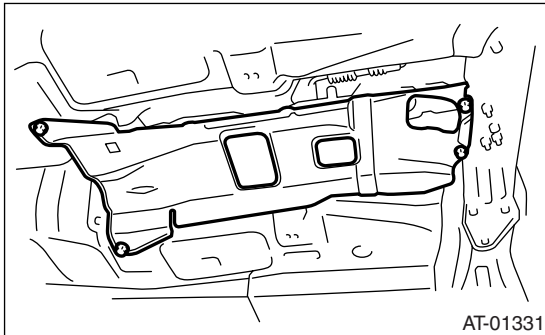
# Rear Differential (VA-type)

## DIFFERENTIALS

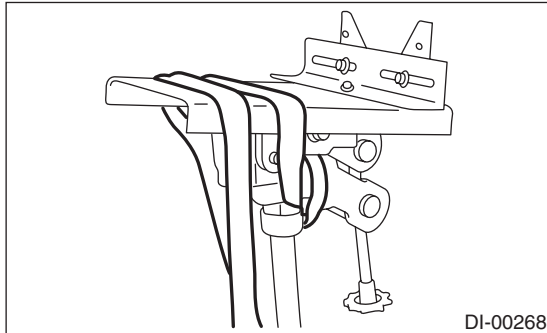
### 5. Rear Differential (VA-type)

#### A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Move the select lever or gear shift lever to neutral.
- 3) Loosen the wheel nuts.
- 4) Release the parking brake.
- 5) Jack-up the vehicle and support it with rigid racks.
- 6) Remove the rear wheels.
- 7) Remove the rear exhaust pipe and muffler.
- 8) Remove the heat shield cover.



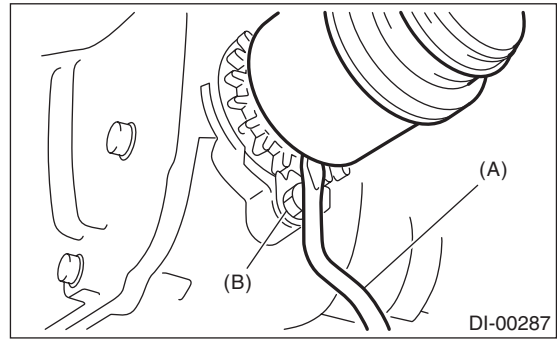
- 9) Remove the propeller shaft.  
<Ref. to DS-10, REMOVAL, Propeller Shaft.>
- 10) Prepare the transmission jack and band.



- 11) Loosen the self-locking nuts which hold the rear differential to rear crossmember.

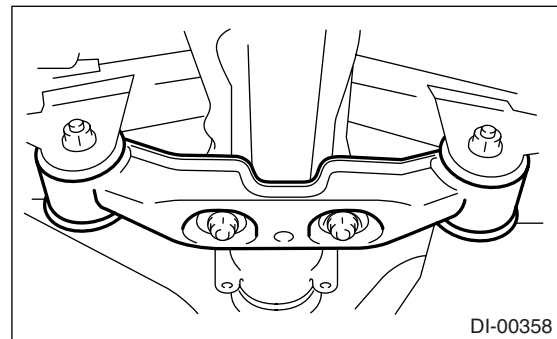


- 12) Remove the DOJ of rear drive shaft from rear differential.

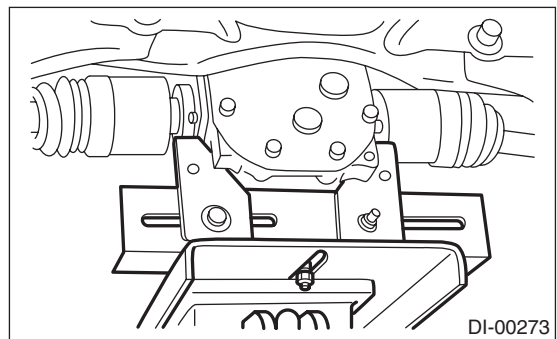


- (A) Tire lever  
(B) Bolt

- 13) Remove the nuts which hold the rear differential front member.



- 14) Support the rear differential with transmission jack.

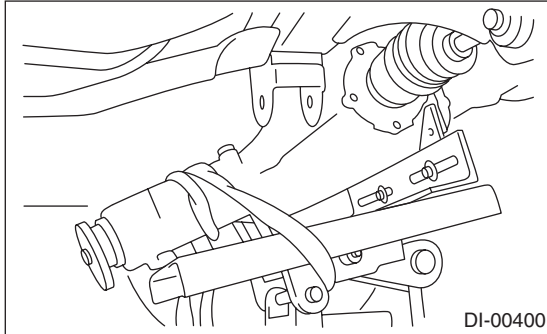


- 15) Remove the rear differential front member.
- 16) Secure the rear differential using band.
- 17) Remove the self-locking nuts which hold the rear differential to rear crossmember.

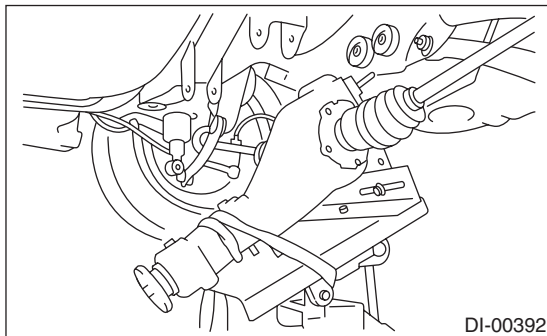
18) Remove the rear differential stud bolt from rear crossmember bushing.

**NOTE:**

When removing the stud bolt, carefully adjust the angle and location of transmission jack and jack stand, if necessary.



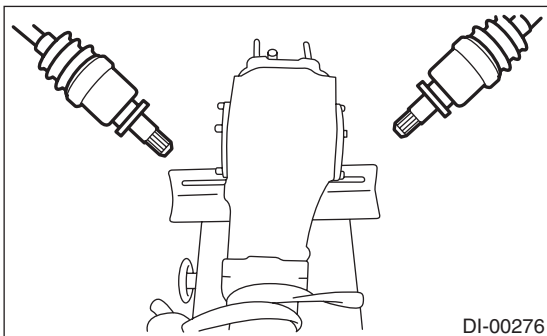
19) Lower the transmission jack stand after removing the rear differential stud bolt from rear crossmember. Rear drive shaft should not come into contact with lateral link bolt.



20) Pull out the axle shaft from rear differential.

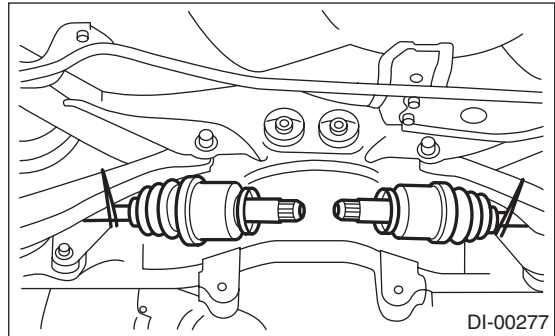
**NOTE:**

If it is difficult to remove the axle shaft from rear differential, remove it using tire lever.

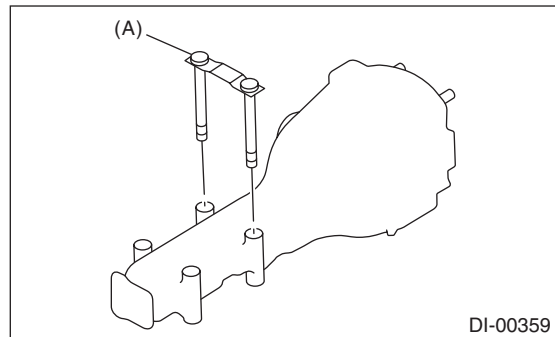


21) Lower the transmission jack.

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



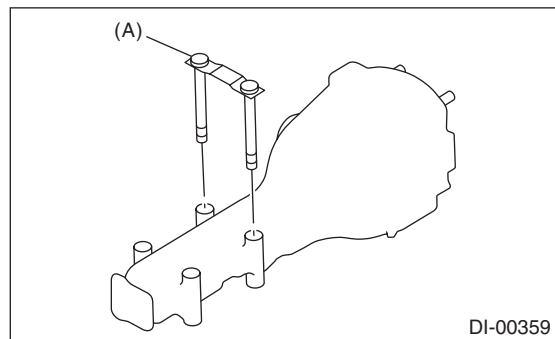
23) Remove the rear differential member plate from rear differential.



(A) Rear differential member plate

## B: INSTALLATION

1) Insert the rear differential member plate into rear differential.



(A) Rear differential member plate

2) Set the rear differential to transmission jack.

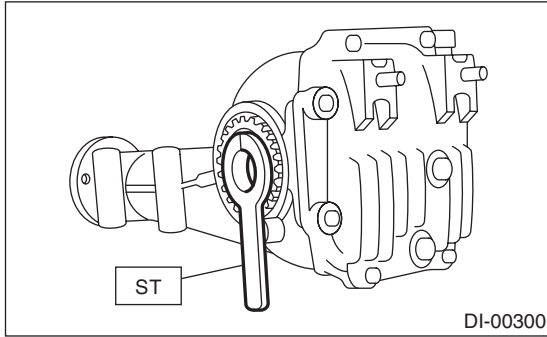
**NOTE:**

Secure the rear differential to transmission jack using band.

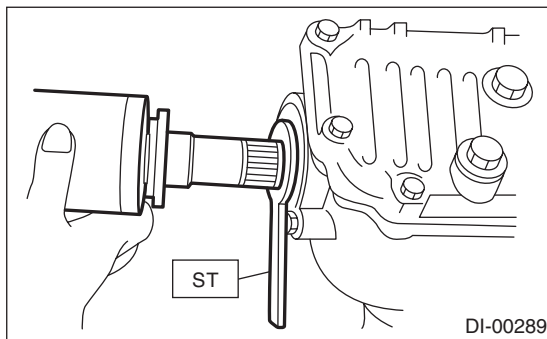
## Rear Differential (VA-type)

### DIFFERENTIALS

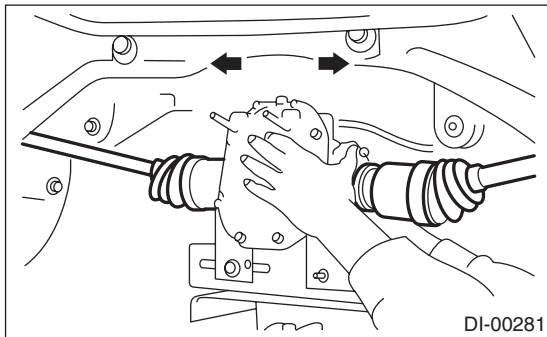
- 3) Install the ST to rear differential.  
ST 28099PA090 OIL SEAL PROTECTOR



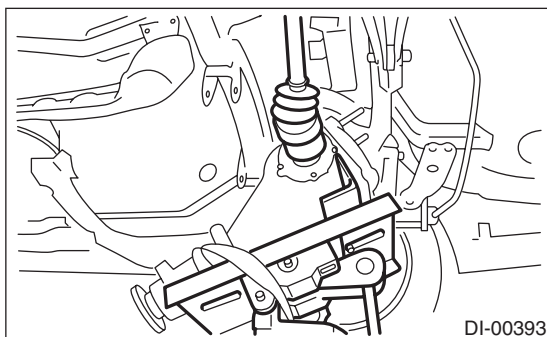
- 4) Insert the spline shaft until the spline portion comes inside the side oil seal.  
ST 28099PA090 OIL SEAL PROTECTOR



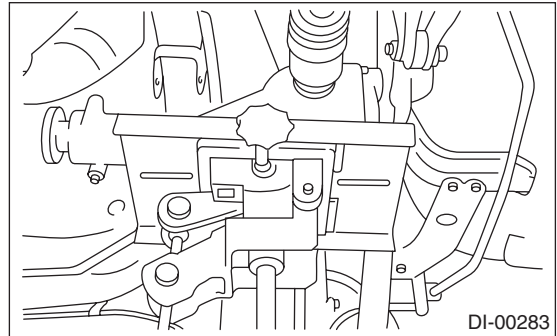
- 5) Remove ST from rear differential.  
ST 28099PA090 OIL SEAL PROTECTOR  
6) Push the rear differential to insert the axle shaft into rear differential.



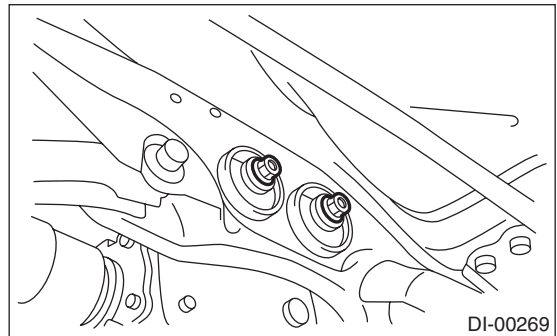
- 7) Adjust the transmission jack, if necessary, and insert the rear differential stud bolt into rear cross-member bushing properly.



- 8) After inserting the rear differential stud bolt into rear crossmember bushing, lift up the transmission jack and align the rear differential to the height of rear differential.



- 9) Tighten a new self-locking nut temporarily to rear crossmember.



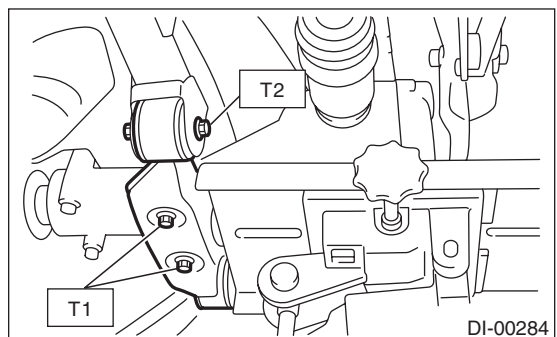
- 10) Remove the band from rear differential. Lift up the rear differential until the rear differential is left from the transmission jack.

- 11) Install the rear differential front member with a new self-locking nut.

#### **Tightening torque:**

**T1: 52 N·m (5.3 kgf-m, 38 ft-lb)**

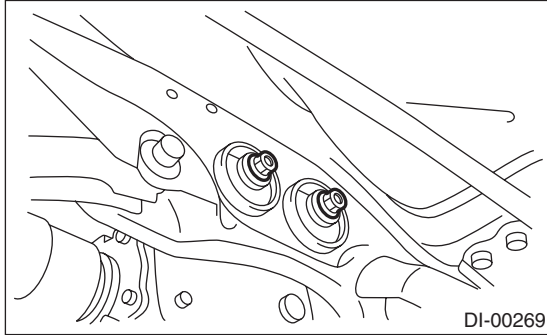
**T2: 110 N·m (11.2 kgf-m, 81 ft-lb)**



12) Tighten the self-locking nut.

**Tightening torque:**

**70 N·m (7.1 kgf-m, 51 ft-lb)**



13) Lower the transmission jack.

14) Install the propeller shaft.

<Ref. to DS-11, INSTALLATION, Propeller Shaft.>

15) Install the heat shield cover.

16) Install the rear exhaust pipe and muffler.

## C: DISASSEMBLY

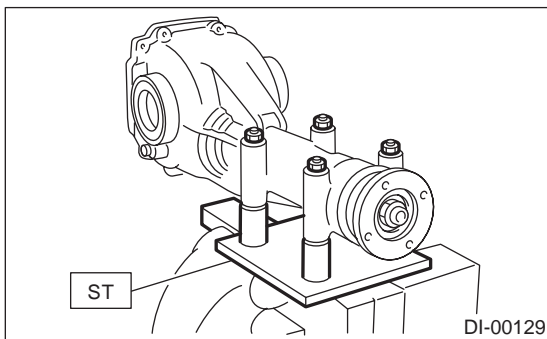
### 1. VA1-TYPE

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

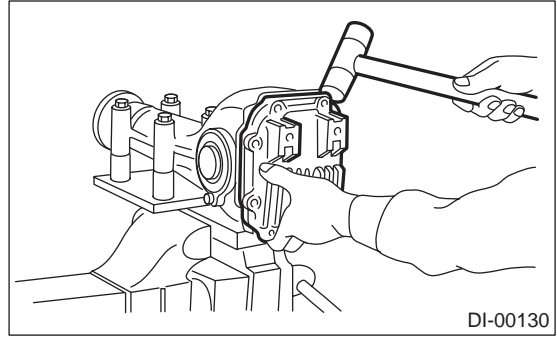
1) Set the ST on vise and install the differential assembly to ST.

ST 398217700 ATTACHMENT



2) Drain the gear oil by removing plug.

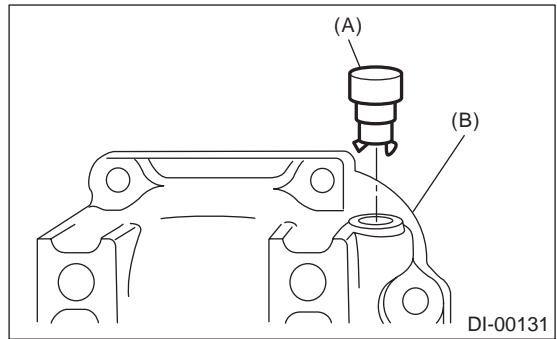
3) Remove the rear cover by loosening retaining bolts.



4) Remove the air breather cap.

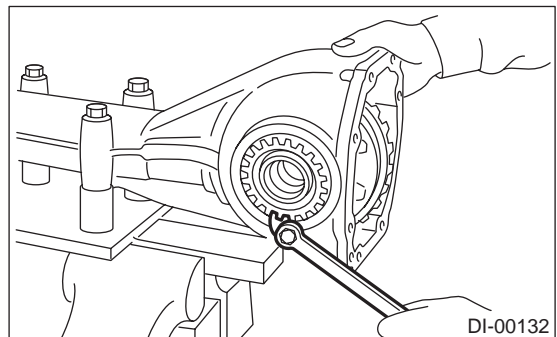
**NOTE:**

- Do not attempt to remove the air breather cap unless necessary.
- When removing the air breather cap, replace it with a new one.



- (A) Air breather cap
- (B) Rear cover

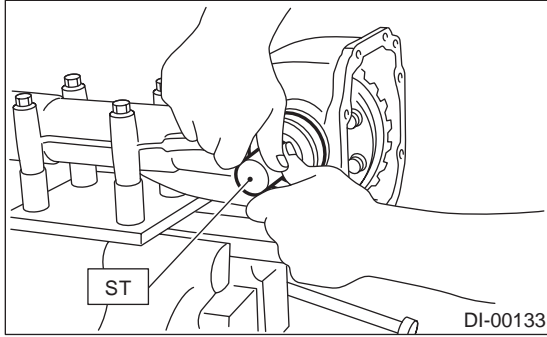
5) Remove the lock plate RH and LH.



# Rear Differential (VA-type)

## DIFFERENTIALS

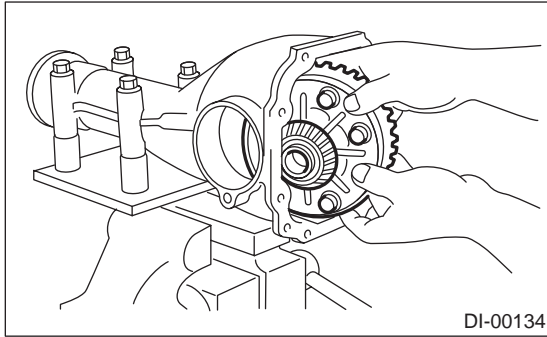
6) Remove the holder RH and LH with ST.  
ST 499785500 WRENCH ASSY



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

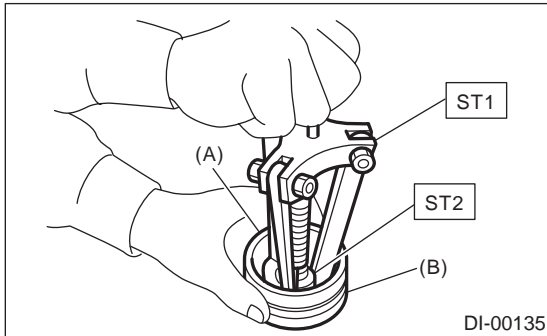
**NOTE:**

Be careful not to hit the teeth against the case.



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

ST1 499705401 PULLER ASSY  
ST2 499705404 SEAT

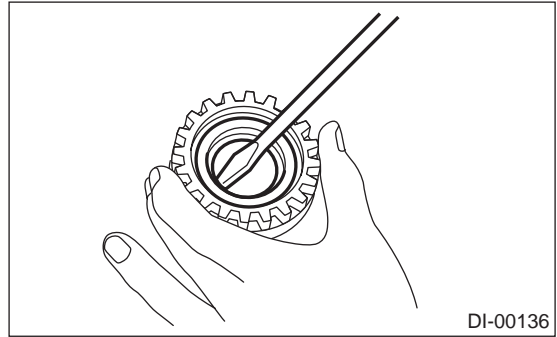


- (A) Bearing race
- (B) Holder

9) Remove the oil seal from holder RH and LH using screwdriver.

**NOTE:**

Perform this operation only when changing oil seal.

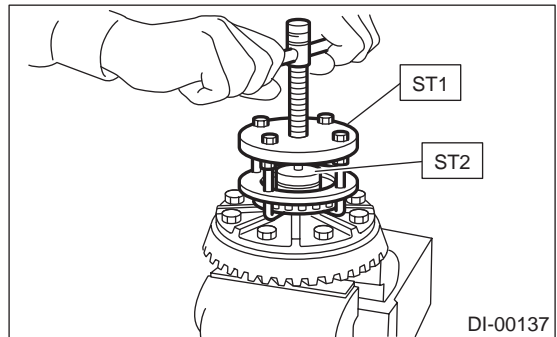


10) Extract the bearing cone with ST1 and ST2.

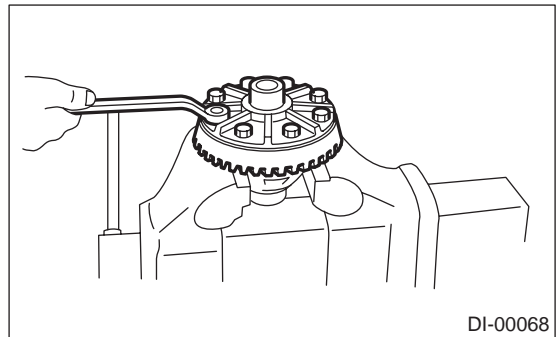
**NOTE:**

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

ST1 899524100 PULLER SET  
ST2 399520105 SEAT



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

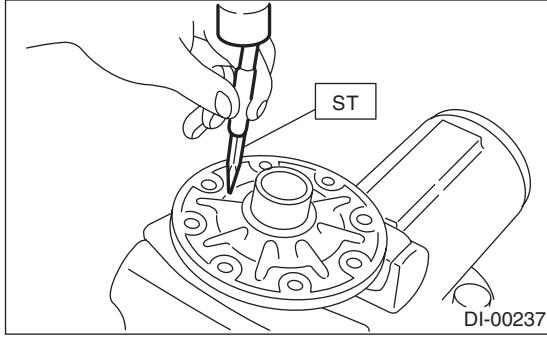


12) Drive out the pinion shaft lock pin from hypoid driven gear side.

**NOTE:**

The lock pin is staked at the pin hole end on the differential case. do not drive it out forcibly before unstaking it.

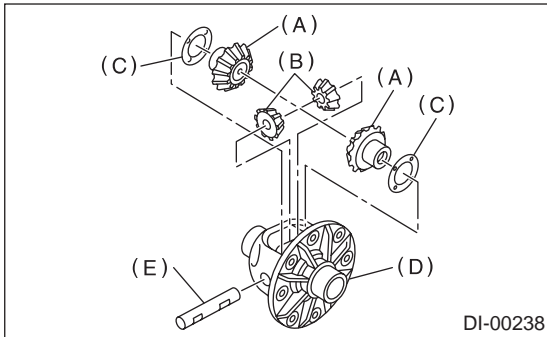
ST 899904100 STRAIGHT PIN REMOVER



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

**NOTE:**

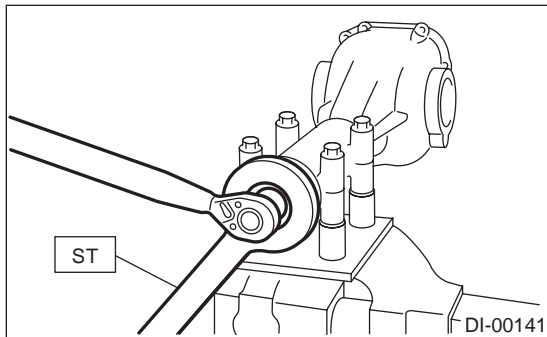
The gears should be marked or kept separated right and left, and front and rear as well as thrust washers.



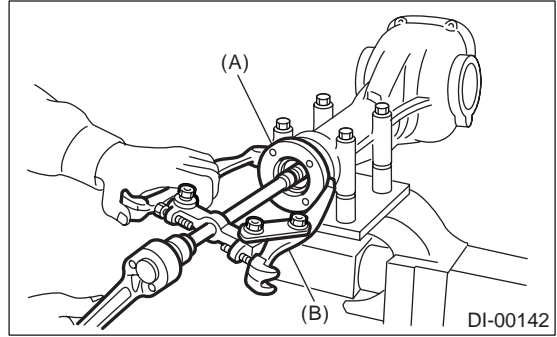
- (A) Side gear
- (B) Pinion mate gear
- (C) Thrust washer
- (D) Differential case
- (E) Pinion mate shaft

14) Support the companion flange with ST and remove self-locking nut.

ST 498427200 FLANGE WRENCH



15) Extract the companion flange with a puller.



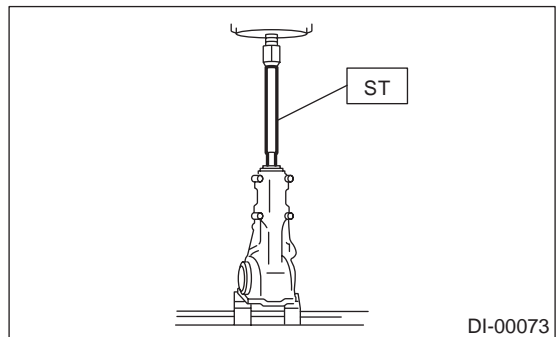
- (A) Companion flange
- (B) Puller

16) Press the end of drive pinion shaft and extract it together with rear bearing cone, pinion height adjust washer and washer.

**NOTE:**

Hold the drive pinion so as not to drop it.

ST 398467700 DRIFT

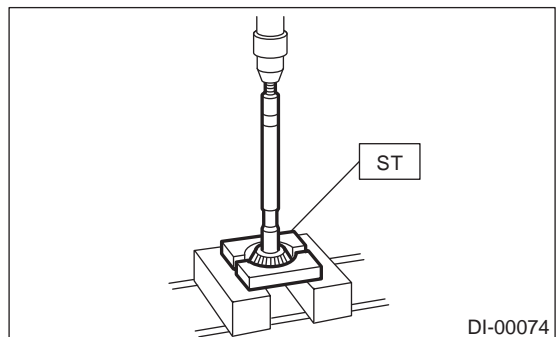


17) Remove the rear bearing cone from drive pinion by supporting the cone with ST.

**NOTE:**

Place the replacer so that its center-recessed side faces the pinion gear.

ST 498515500 REPLACER

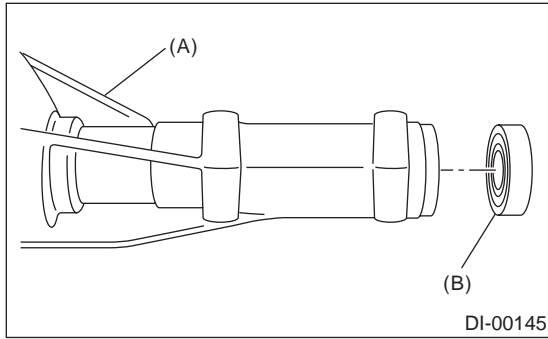


# Rear Differential (VA-type)

## DIFFERENTIALS

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

ST 398527700 PULLER SET

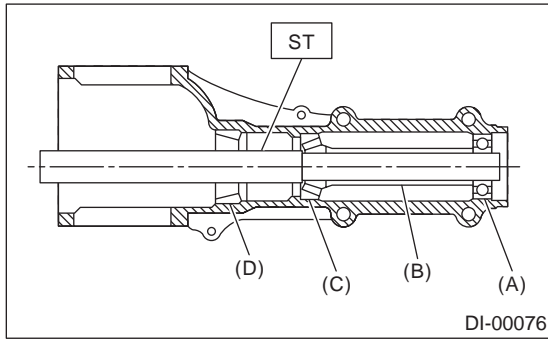


(A) Differential carrier

(B) Front oil seal

19) Remove the pilot bearing together with front bearing cone and collar using ST.

ST 398467700 DRIFT



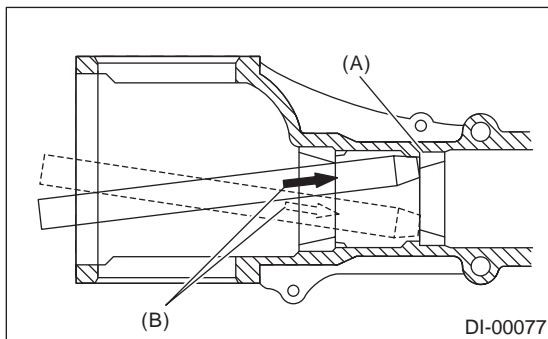
(A) Pilot bearing

(B) Collar

(C) Front bearing

(D) Rear bearing cup

20) When replacing the bearings, hit out the front bearing cup and rear bearing cup in this order out of case by using a brass bar.



(A) 2 cutouts along diagonal lines

(B) Hit out alternately with brass bar

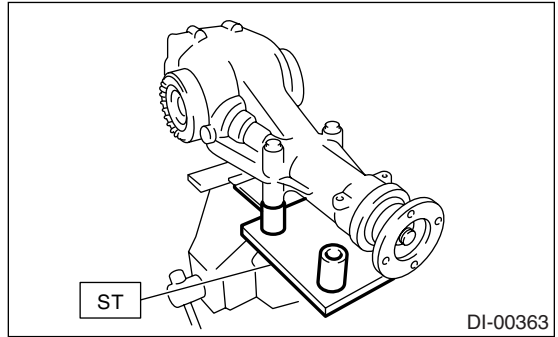
## 2. VA2-TYPE

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

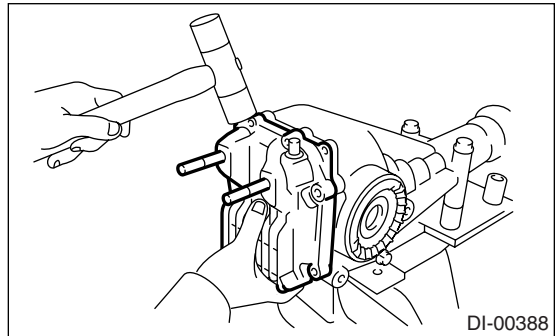
1) Set the ST on vise and install the differential assembly to ST.

ST 398217700 ATTACHMENT

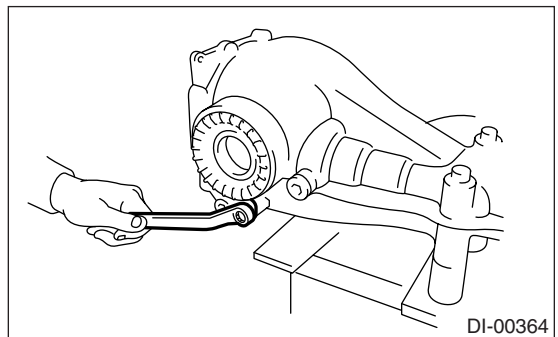


2) Drain the gear oil by removing plug.

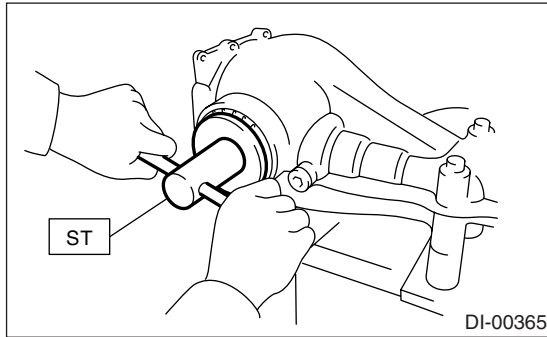
3) Remove the rear cover by loosening retaining bolts.



4) Remove the lock plate RH and LH.



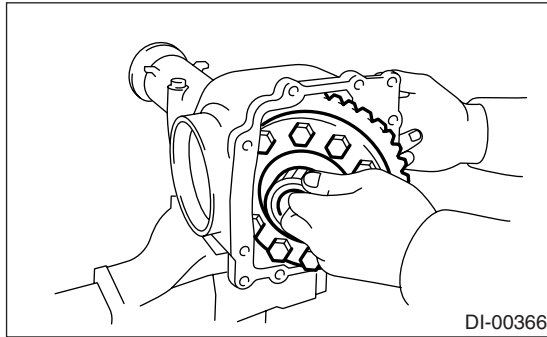
5) Remove the holder RH and LH with ST.  
ST 18630AA010 WRENCH



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

NOTE:

Be careful not to hit the teeth against the case.

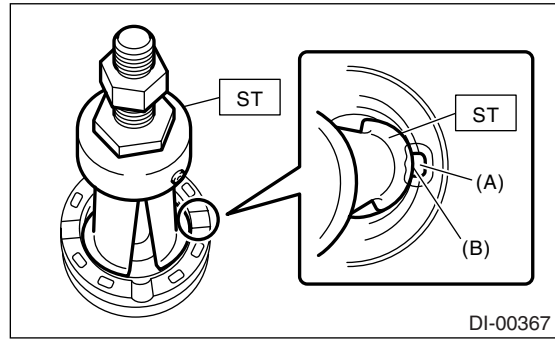


7) Remove the bearing race from holder RH and LH with ST1 and press.  
ST 18758AA000 PULLER

NOTE:

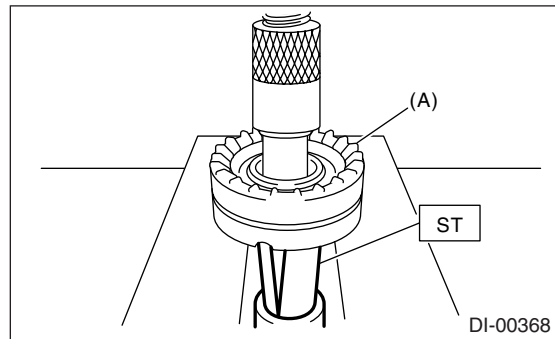
- Make sure the bolt of puller turn manually.

- Set the puller so that its claws catch the groove of holder.



(A) Groove

(B) Claw

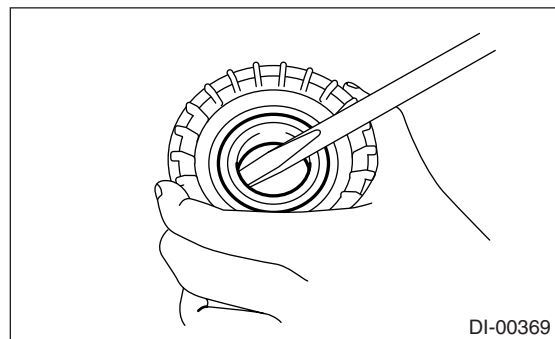


(A) Holder

8) Remove the oil seal from holder RH and LH using screwdriver.

NOTE:

Perform this operation only when changing oil seal.



DI-00369

9) Extract the bearing cone with ST1, ST2 and ST3.

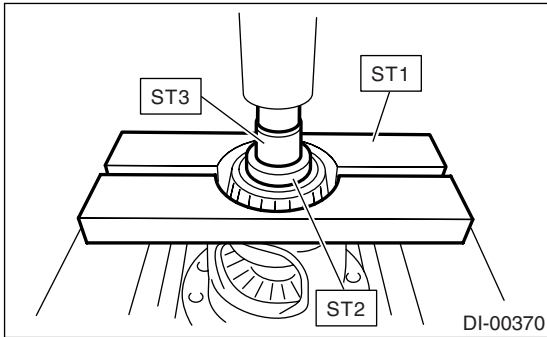
NOTE:

- Do not attempt to disassemble the parts unless necessary.
- Never mix up the bearing races RH and LH and cones.

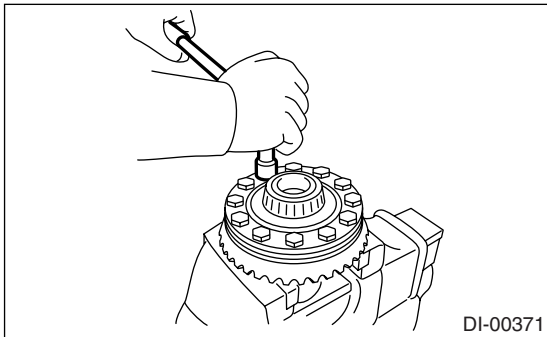
# Rear Differential (VA-type)

## DIFFERENTIALS

- ST1 49807700 REMOVER
- ST2 399520105 SEAT
- ST3 899864100 REMOVER

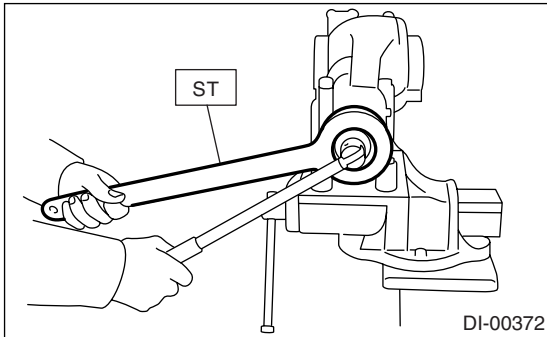


10) Remove the hypoid driven gear by loosening hypoid driven gear bolts.

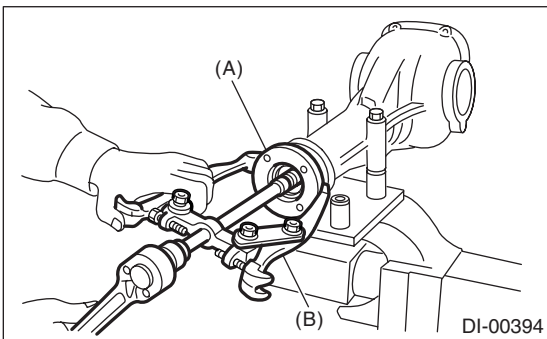


11) Support the companion flange with ST and remove self-locking nut.

ST 498427200 FLANGE WRENCH



12) Extract the companion flange with a puller.



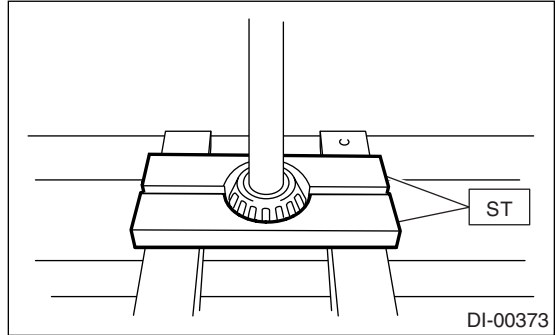
- (A) Companion flange
- (B) Puller

- 13) Removes the drive pinion shaft.
- 14) Remove the rear bearing cone from drive pinion by supporting cone with ST.

### NOTE:

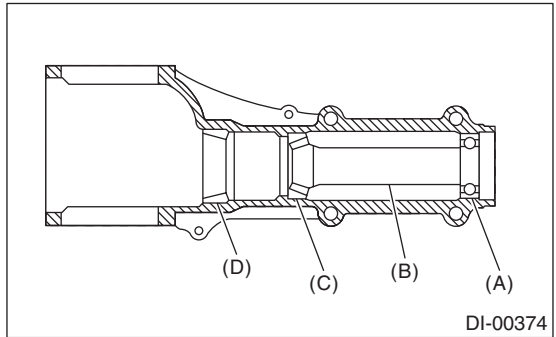
Place the replacer so that its center-recessed side faces the pinion gear.

ST 398517700 REPLACER



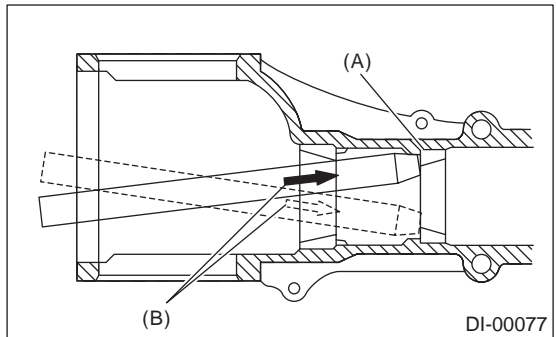
15) Remove the front oil seal from differential carrier using screwdriver.

16) Remove the pilot bearing, front bearing cone and collar.



- (A) Pilot bearing
- (B) Collar
- (C) Front bearing
- (D) Rear bearing cup

17) When replacing the bearings, hit out the front bearing cup and rear bearing cup in this order out of case by using a brass bar.



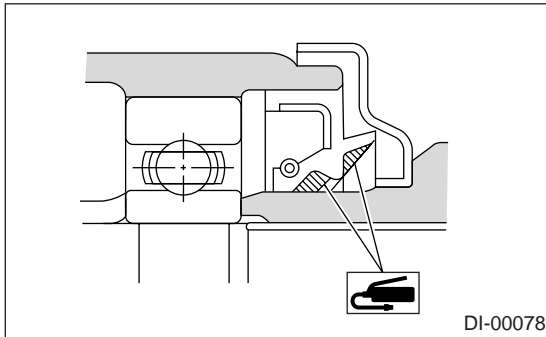
- (A) 2 cutouts along diagonal lines
- (B) Hit out alternately with brass bar

## D: ASSEMBLY

### 1. VA1-TYPE

**NOTE:**

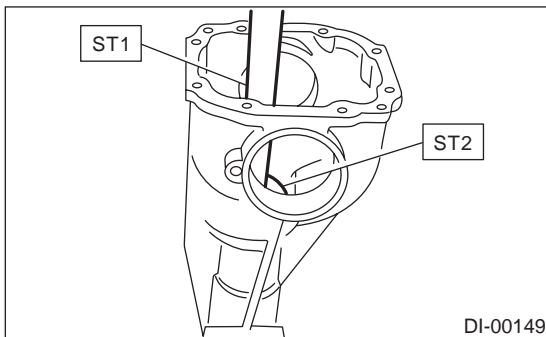
- Assemble in the reverse order of disassembly.
- Check and adjust each part during assembly.
- Use a new gasket.
- Keep the shims and washers in order, so that they are not improperly installed.
- Thoroughly clean the surfaces on which the shims, washers and bearings are to be installed.
- Apply gear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



1) Adjusting preload for front and rear bearings:  
Adjust the bearing preload with collar and washer between front and rear bearings. Pinion height adjusting washer are not affected by this adjustment. The adjustment must be carried out without oil seal inserted.

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

ST1 398477701 HANDLE  
ST2 398477702 DRIFT



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

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 adjust washer.

**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.

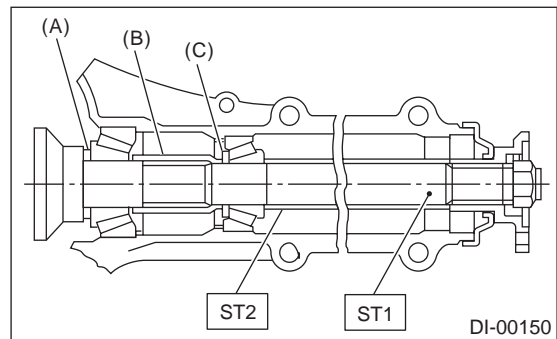
(5) Insert the ST1 into the case with pinion height adjusting washer and rear bearing cone fitted onto it.

**NOTE:**

Use new rear bearing cone.

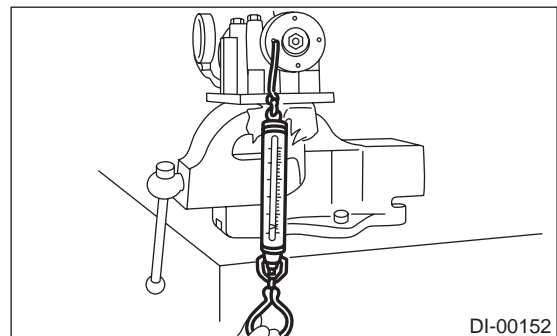
(6) Install the preload adjusting collar and washer, front bearing cone, ST2, companion flange, and washer and self-locking nut.

ST1 498447150 DUMMY SHAFT  
ST2 32285AA000 DUMMY COLLAR



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

(7) Turn the ST1 with hand to make it seated, and tighten the self-locking nut while measuring the preload with spring balance. Select the preload adjusting washer and collar so that the specified preload is obtained when nut is tightened to the specified torque.



# Rear Differential (VA-type)

## DIFFERENTIALS

### NOTE:

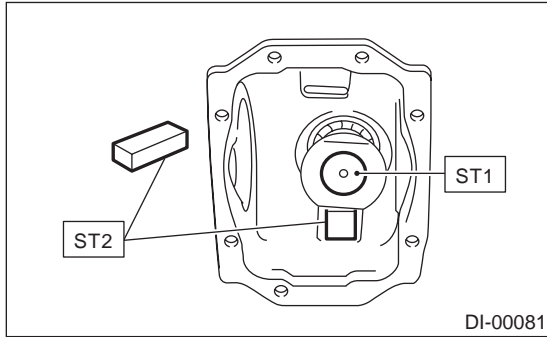
- Use a new self-locking nut.
- Be careful not to give excessive preload.
- When tightening the self-locking nut, lock ST1 with ST2 as shown in the figure.
- Measure the preload in direction of tangent to flange.

ST1 498447150 DUMMY SHAFT

ST2 398507704 BLOCK

### Tightening torque:

**191 N·m (19.5 kgf·m, 141 ft·lb)**



| Drive pinion bearing preload                |  |
|---|--|
| For new bearing:                            |  |
| 12.7 — 32.2 N (1.3 — 3.3 kgf, 2.9 — 7.3 lb) |  |
| Measure at companion flange bolt hole       |  |

|                          | Part No.       | Thickness mm (in) |
|--------------------------|----------------|-------------------|
| Preload adjusting washer | 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) |                   |

|                          | Part No.   | Length mm (in) |
|--------------------------|------------|----------------|
| Preload adjusting collar | 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:

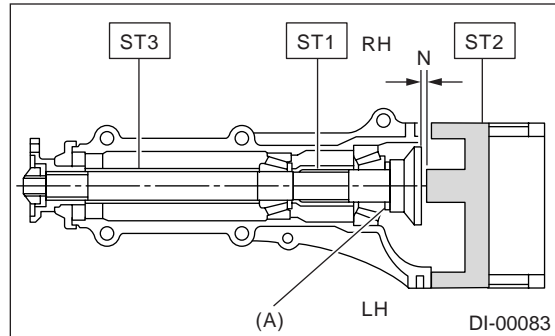
Adjust the drive pinion height with washer installed between the rear bearing cone and the back of pinion gear.

#### (1) Install the ST2.

ST1 498447150 DUMMY SHAFT

ST2 498505501 DIFFERENTIAL CARRIER GAUGE

ST3 32285AA000 DUMMY COLLAR



(A) Pinion height adjusting washer

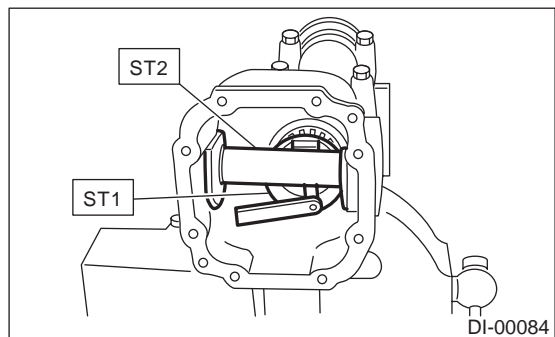
(2) Measure the clearance N between the end of ST2 and the end surface of ST1 by using a thickness gauge.

### NOTE:

Make sure there is no clearance between the case and ST2.

ST1 498447150 DUMMY SHAFT

ST2 498505501 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.

**NOTE:**

Adjust it using the 1 — 3 washers.

$$T = To + N - 0.05 \text{ (mm)}$$

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

(Example of calculation)

To = 0.15 mm

N = 0.1 mm

$$T = 0.15 + 0.1 - 0.05 = 0.2 \text{ mm}$$

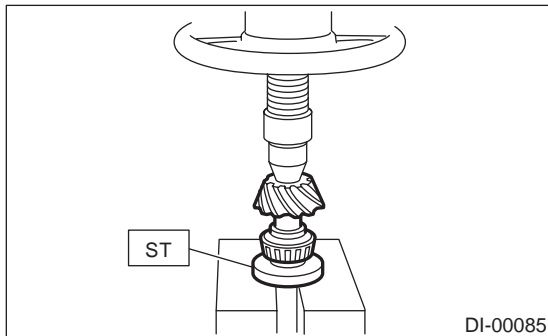
Result: Thickness = 0.2 mm

Therefore use the pinion height adjusting washer of part number 32295AA220.

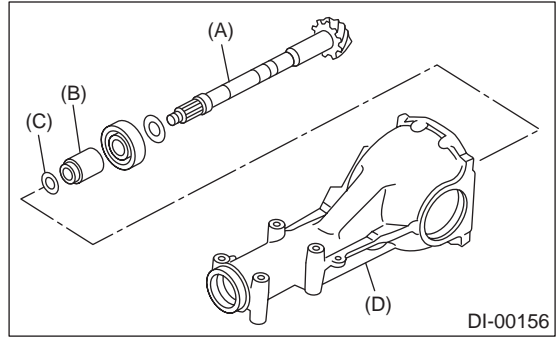
| Pinion height adjusting washer |                   |
|--------------------------------|-------------------|
| Part No.                       | Thickness mm (in) |
| 32295AA200                     | 0.150 (0.0059)    |
| 32295AA210                     | 0.175 (0.0069)    |
| 32295AA220                     | 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



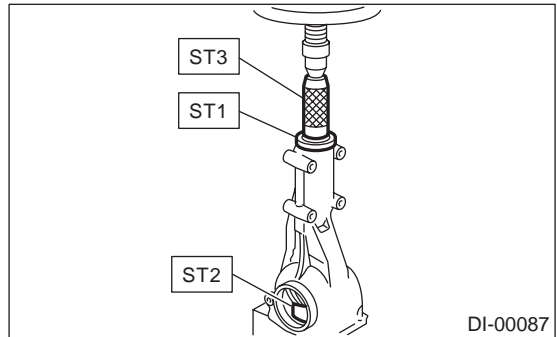
4) Insert the drive pinion into differential carrier, install the selected bearing preload adjusting collar and washer.



- (A) Drive pinion
- (B) Bearing preload adjusting collar
- (C) Bearing preload adjusting washer
- (D) Differential carrier

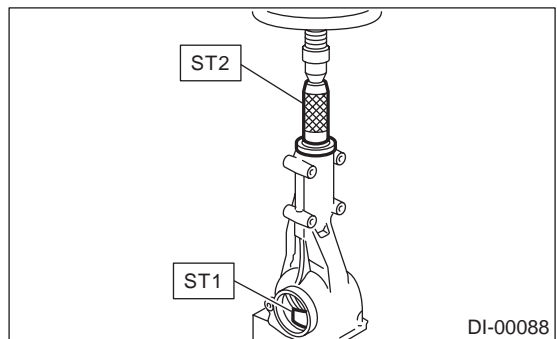
5) Press-fit the front bearing cone into carrier with ST1, ST2 and ST3.

- ST1 32285AA000 DUMMY COLLAR
- ST2 399780104 WEIGHT
- ST3 899580100 INSTALLER



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

- ST1 399780104 WEIGHT
- ST2 899580100 INSTALLER



7) Fit a new oil seal with ST.

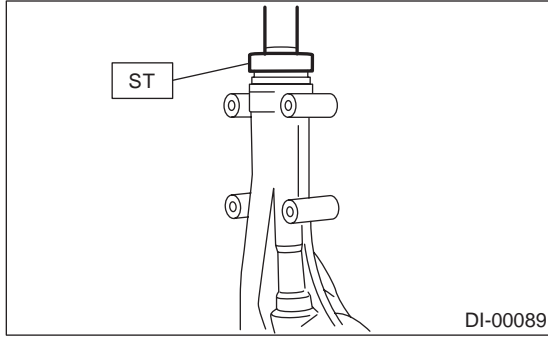
**NOTE:**

- Press-fit until end of oil seal is 1 mm (0.04 in) inward from end of carrier.
- Apply grease to the oil seal lips.

# Rear Differential (VA-type)

## DIFFERENTIALS

ST 498447120 INSTALLER



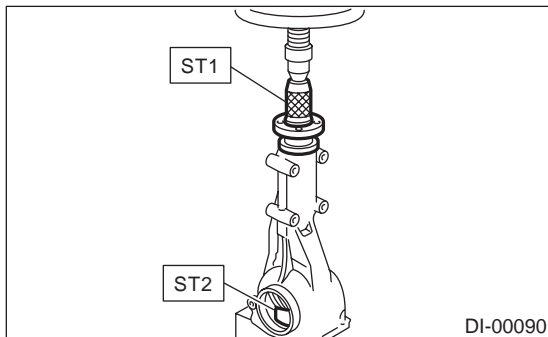
8) Press-fit the companion flange with ST1 and ST2.

**NOTE:**

Be careful not to damage the bearing.

ST1 899874100 INSTALLER

ST2 399780104 WEIGHT

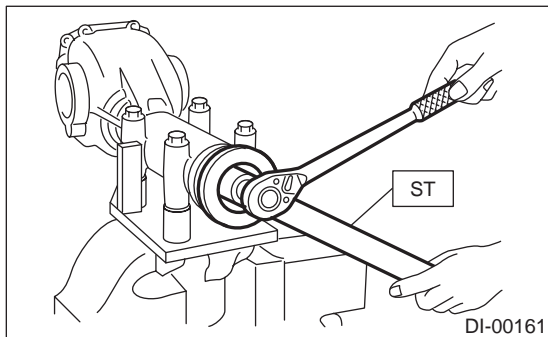


9) Install a new self-locking nut, and secure the companion flange using ST, and tighten the nut.

ST 498427200 FLANGE WRENCH

**Tightening torque:**

**191 N·m (19.1 kgf·m, 141 ft·lb)**



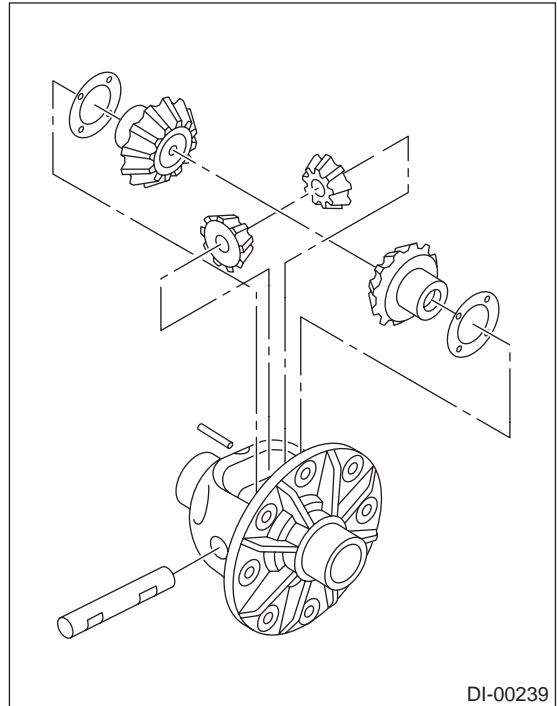
10) Assembling differential case

Install the side gears and pinion mate gears, with their thrust washers and pinion mate shaft, into differential case.

**NOTE:**

- Apply gear oil to both sides of the washer and the side gear shaft before installing.

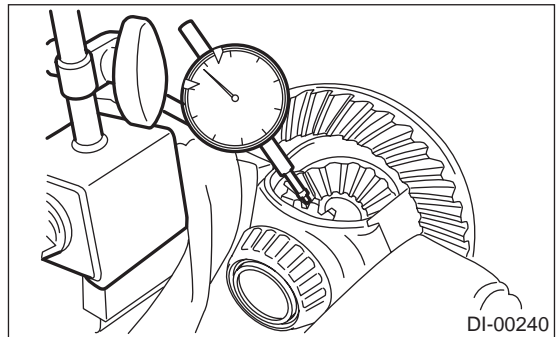
- Insert the pinion mate shaft into the differential case by aligning the lock pin holes.



(1) Measure the side gear backlash.

**Side gear backlash:**

**0.05 — 0.15 mm (0.0020 — 0.0059 in)**



(2) Adjust the side gear backlash as specified 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) |

(3) Check the condition of rotation after applying oil to the gear tooth surfaces and thrust surfaces.

(4) After inserting the pinion shaft lock pin into differential case, stake the both sides of the hole to prevent pin from falling off.

11) Install the hypoid driven gear on differential case.

NOTE:

- Before installing bolts, apply Lock Tite to bolt threads.

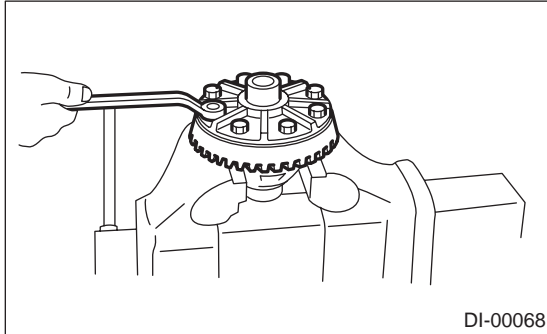
**Lock Tite:**

**THREE BOND 1324 (Part No. 004403042)**

- Tighten diagonally while tapping the bolt heads.

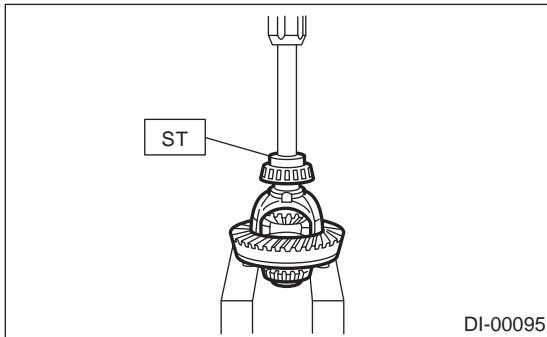
**Tightening torque:**

**62 N·m (6.3 kgf·m, 45.6 ft·lb)**



12) Press the side bearing into differential case using ST.

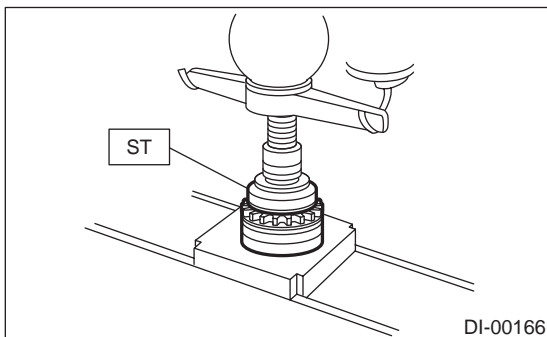
ST 498485400 DRIFT



13) Assemble holders.

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

ST 498447100 INSTALLER

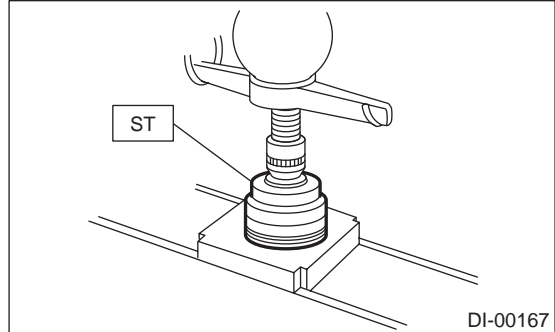


(2) Install the bearing race into holder RH and LH.

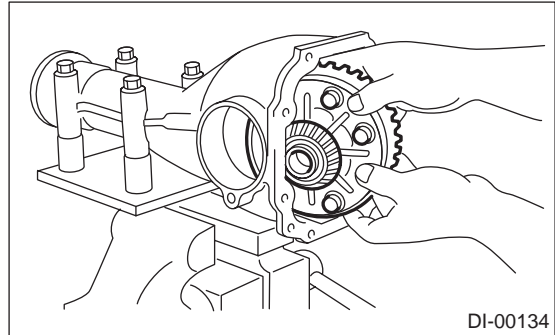
ST 398477702 DRIFT

**CAUTION:**

**Make sure that the oil seal, bearing outer race and cone are properly assembled.**



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

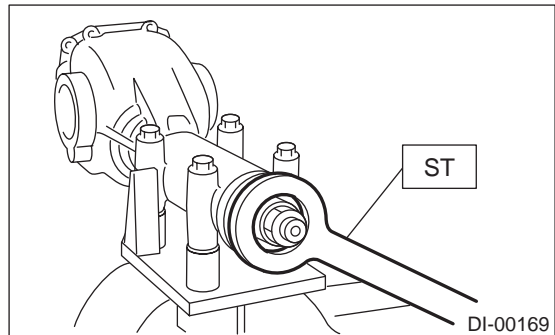


(4) Temporarily tighten the side holder RH and LH in differential carrier to install.

14) 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

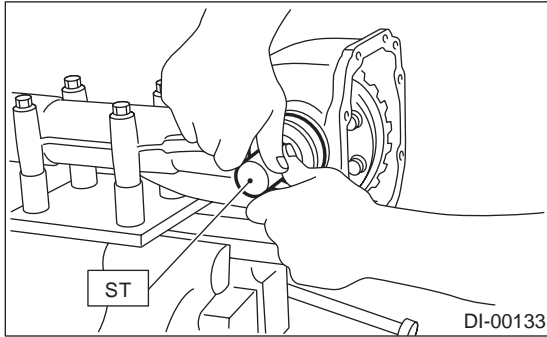


# Rear Differential (VA-type)

## DIFFERENTIALS

(2) Screw in the side holder LH until light contact is made with ST.

ST 499785500 WRENCH

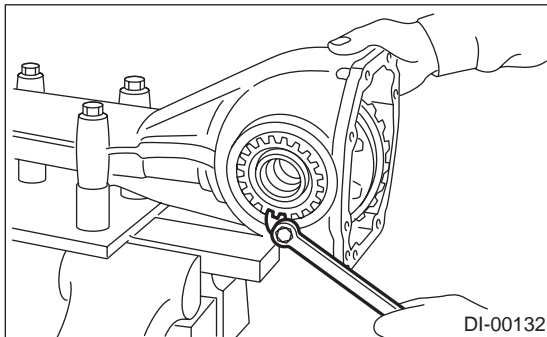


(3) Back off the side (hypoid driven gear side) holder approx. 1 1/2 teeth of holder, and tighten the other side holder by approx. 2 teeth (approx. 1 1/2 + 1/2 teeth). [Back off amount of side (hypoid driven gear side) holder + 1/2 tooth.] This + 1/2 tooth gives preload.

(4) Temporarily tighten the lock plate.

### NOTE:

Turn over the lock plate to displace the holder 1/2 tooth.



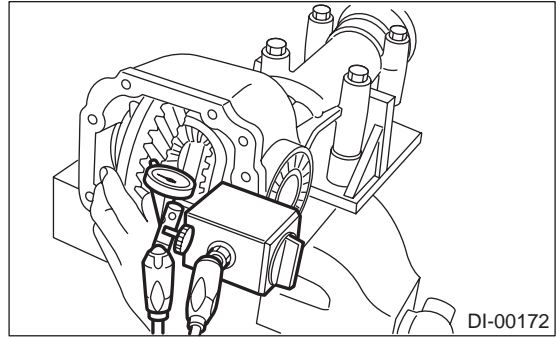
(5) Measure the hypoid driven gear-to-drive pinion backlash. Set the magnet base on differential carrier. Align the contact point of dial gauge with tooth face of hypoid driven gear, and move hypoid driven gear while holding drive pinion still. Read the value indicated on dial gauge.

### NOTE:

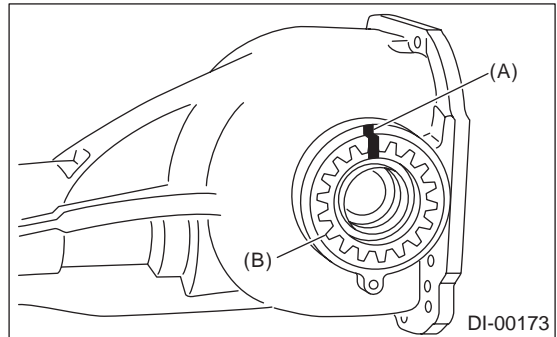
If measured backlash is not within specified range, repeat the procedures for pinion driven gear set backlash adjustment and differential side bearing preload adjustment.

### Backlash:

**0.10 — 0.15 mm (0.0039 — 0.0059 in)**



15) Draw a matching mark on both differential carrier and holder. Remove the holder side at a time. Replace in the original position after inserting an O-ring and applying grease to threaded portion.



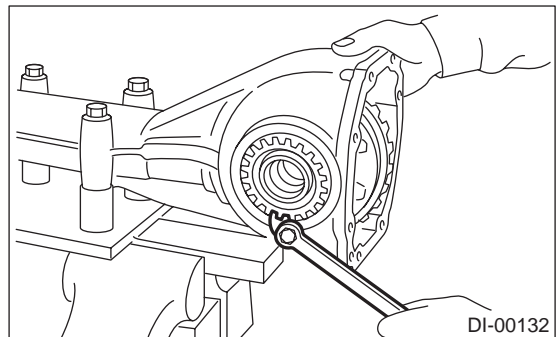
(A) Alignment mark

(B) Holder

16) Tighten the bolt of lock plate to specified torque.

### Tightening torque:

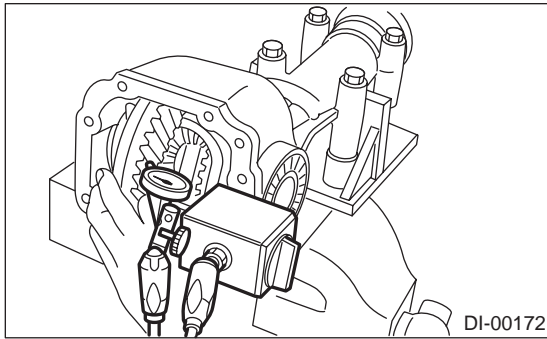
**25 N·m (2.5 kgf-m, 18.1 ft-lb)**



17) Recheck the hypoid driven gear to pinion backlash.

**Backlash:**

**0.10 — 0.15 mm (0.0039 — 0.0059 in)**



DI-00172

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

(1) Apply an even coat of red lead on both sides of three or four teeth on 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.

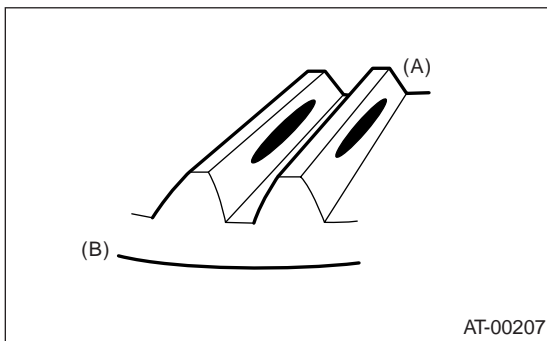
(2) When the contact pattern is incorrect, readjust.

**NOTE:**

Be sure to wipe off red lead completely after adjustment is completed.

- Correct tooth contact

**Checking item: Tooth contact pattern is slightly shifted toward to toe side under no-load rotation. [When loaded, contact pattern moves toward heel.]**



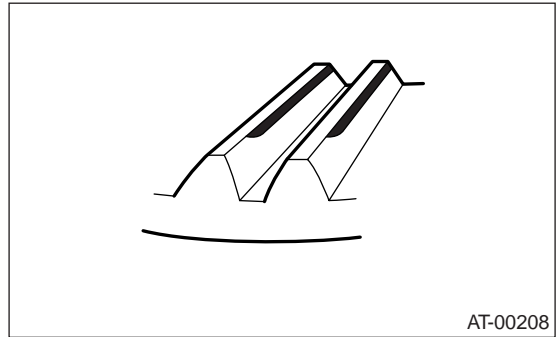
AT-00207

- (A) Toe side
- (B) Heel side

- Face contact

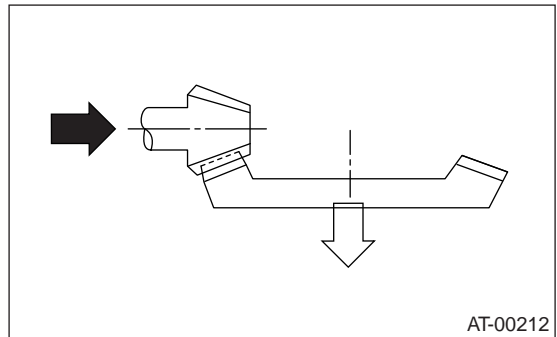
**Checking item: Backlash is too large.**

Contact pattern



AT-00208

Corrective action: Increase thickness of drive pinion height adjusting washer in order to bring drive pinion close to hypoid driven gear.

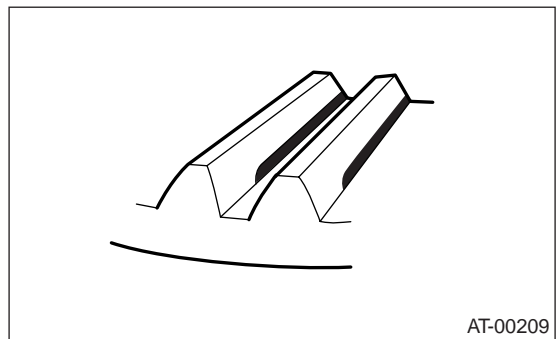


AT-00212

- Flank contact

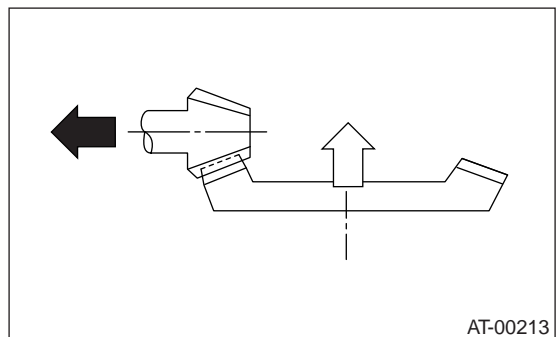
**Checking item: Backlash is too small.**

Contact pattern



AT-00209

Corrective action: Reduce thickness of drive pinion height adjusting washer in order to bring drive pinion away from hypoid driven gear.



AT-00213

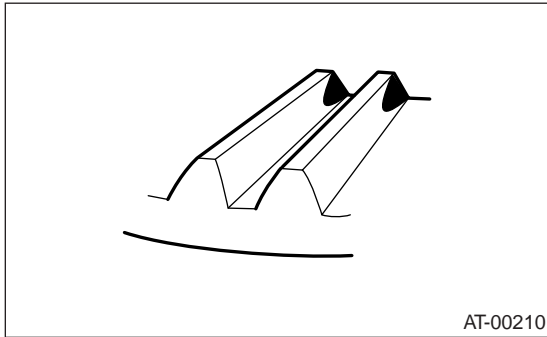
# Rear Differential (VA-type)

## DIFFERENTIALS

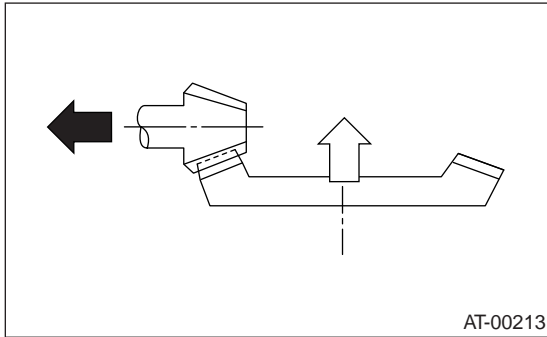
- Toe contact (inside end contact)

**Checking item: Contact areas is small**

Contact pattern



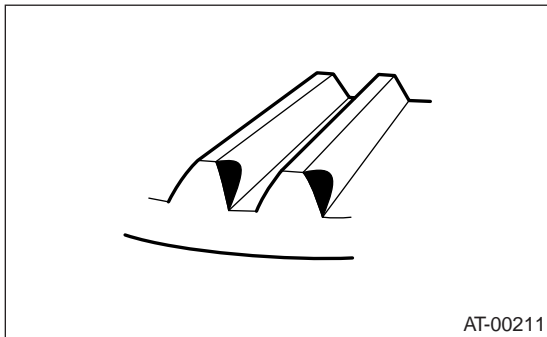
Corrective action: Reduce thickness of drive pinion height adjusting washer in order to bring drive pinion away from hypoid driven gear.



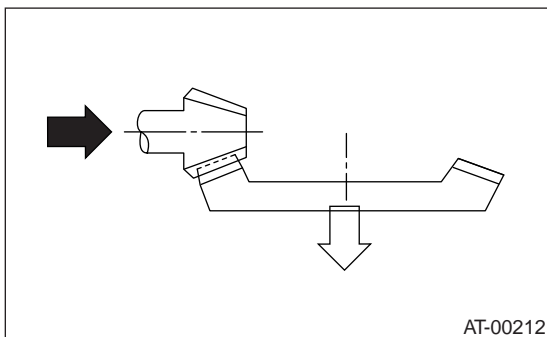
- Heel contact (outside end contact)

**Checking item: Contact areas is small**

Contact pattern



Corrective action: Increase thickness of drive pinion height adjusting washer in order to bring drive pinion close to hypoid driven gear.

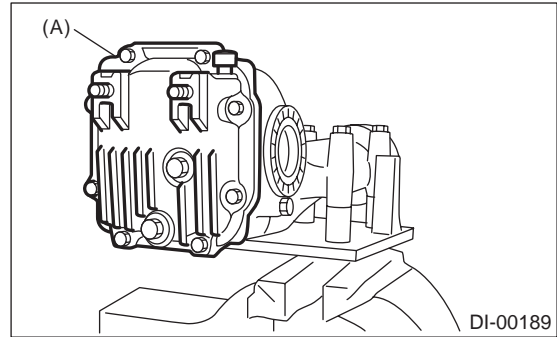


19) If proper tooth contact is not obtained, once again adjust the drive pinion height and the differential side bearing preload (already mentioned) and the hypoid gear backlash.

20) Install the new gasket and rear cover to differential carrier and tighten the bolts to specified torque.

**Tightening torque:**

**25 N·m (2.5 kgf-m, 18.1 ft-lb)**

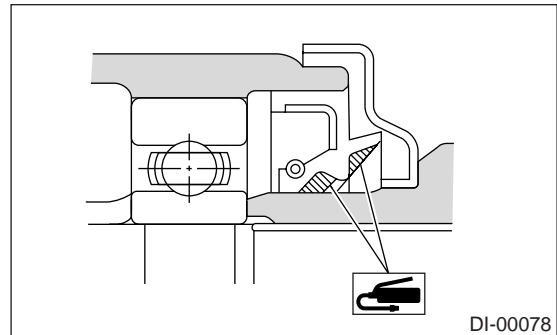


(A) Rear cover

## 2. VA2-TYPE

NOTE:

- Assemble in the reverse order of disassembly.
- Check and adjust each part during assembly.
- Use a new gasket.
- 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 bearing races RH and LH.
- Replace the oil seal with a new one at every disassembly. Apply grease to the lips when installing the oil seal.
- Be careful not to mix up the differential oil seal RH and LH.

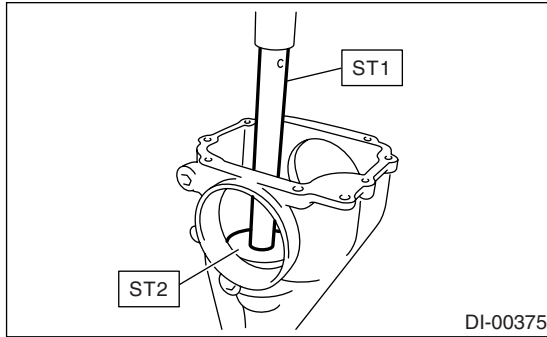


DI-00078

1) Adjusting preload for front and rear bearings:  
Adjust the bearing preload with collar and washer between front and rear bearings. Pinion height adjusting washer are not affected by this adjustment. The adjustment must be carried out without oil seal inserted.

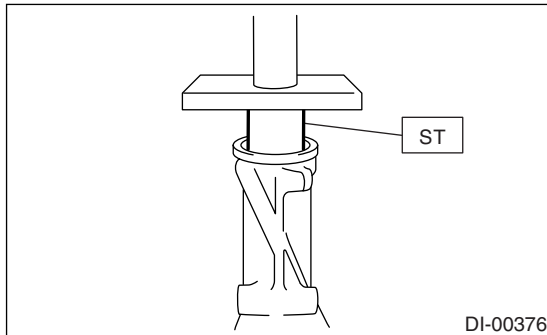
(1) Install the rear bearing race into differential carrier with ST1 and ST2.

ST1 398477701 HANDLE  
ST2 398477703 DRIFT 2



(2) Using the ST, install the front bearing race to the differential carrier.

ST 499277200 INSTALLER



(3) Insert the front bearing cone.

**NOTE:**

Use new front bearing cone.

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

**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.

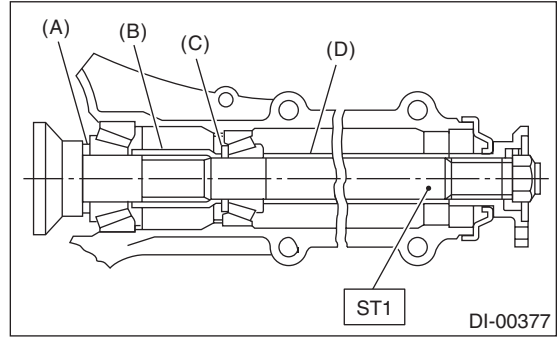
(5) Insert the ST1 into carrier with pinion height adjusting washer and rear bearing cone fitted onto it.

**NOTE:**

Use new rear bearing cone.

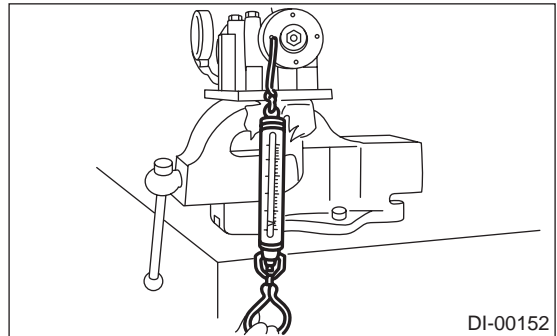
(6) Install the preload adjusting collar and washer, front bearing cone, collar, companion flange, and washer and self-locking nut.

ST1 18678AA000 DUMMY SHAFT



- (A) Pinion height adjusting washer
- (B) Preload adjusting collar
- (C) Preload adjusting washer
- (D) Collar

(7) Turn the ST1 with hand to make it seated, and tighten the self-locking nut while measuring the preload with spring balance. Select the preload adjusting washer and collar so that the specified preload is obtained when nut is tightened to the specified torque.



**NOTE:**

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

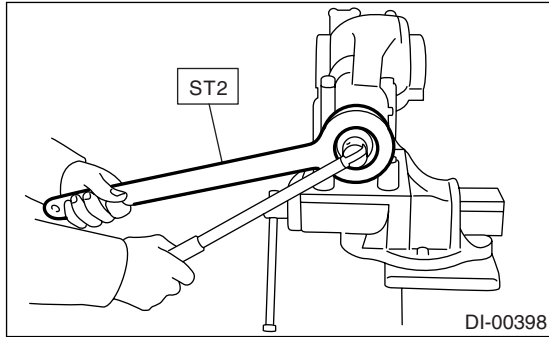
ST1 18678AA000 DUMMY SHAFT  
ST2 498427200 FLANGE WRENCH

# Rear Differential (VA-type)

## DIFFERENTIALS

### Tightening torque:

**191 N·m (19.5 kgf·m, 141 ft·lb)**



|   |
|---|
| Drive pinion bearing preload                |
| 12.7 — 32.4 N (1.3 — 3.3 kgf, 2.9 — 7.3 lb) |
| (at companion flange bolt hole)             |

|                          | Part No.                 | Thickness mm (in) |
|--------------------------|--------------------------|-------------------|
|                          | Preload adjusting washer | 38336AA430        |
| 38336AA440               |                          | 1.513 (0.0596)    |
| 38336AA450               |                          | 1.525 (0.0600)    |
| 38336AA460               |                          | 1.538 (0.0606)    |
| 38336AA470               |                          | 1.550 (0.0610)    |
| 38336AA480               |                          | 1.563 (0.0615)    |
| 38336AA490               |                          | 1.575 (0.0620)    |
| 38336AA500               |                          | 1.588 (0.0625)    |
| 38336AA510               |                          | 1.600 (0.0630)    |
| 38336AA520               |                          | 1.613 (0.0635)    |
| 38336AA530               |                          | 1.625 (0.0640)    |
| 38336AA540               |                          | 1.638 (0.0645)    |
| 38336AA550               |                          | 1.650 (0.0650)    |
| 38336AA560               |                          | 1.663 (0.0655)    |
| 38336AA570               |                          | 1.675 (0.0659)    |
| 38336AA580               |                          | 1.688 (0.0665)    |
| 38336AA590               |                          | 1.700 (0.0669)    |
| 38336AA600               |                          | 1.713 (0.0674)    |
| 38336AA610               |                          | 1.725 (0.0679)    |
| 38336AA620               |                          | 1.738 (0.0684)    |
| 38336AA630               | 1.750 (0.0689)           |                   |
| 38336AA640               | 1.763 (0.0694)           |                   |
| 38336AA650               | 1.775 (0.0699)           |                   |
|                          | Part No.                 | Length mm (in)    |
|                          | 31454AA250               | 51.05 (2.010)     |
| Preload adjusting collar | 31454AA260               | 51.25 (2.018)     |
|                          | 31454AA270               | 51.35 (2.022)     |
|                          | 31454AA280               | 51.45 (2.026)     |
|                          | 31454AA290               | 51.55 (2.030)     |
|                          | 31454AA300               | 51.65 (2.033)     |
|                          | 31454AA310               | 51.75 (2.037)     |
|                          | 31454AA320               | 51.85 (2.041)     |
|                          | 31454AA330               | 52.05 (2.049)     |

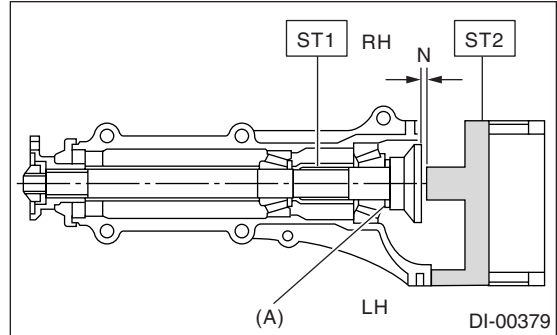
### 2) Adjusting drive pinion height:

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

(1) Install the ST2.

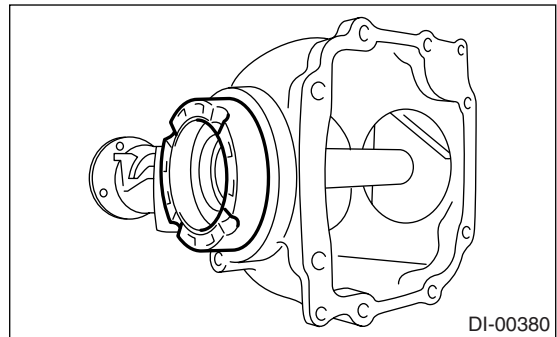
ST1 18678AA000 DUMMY SHAFT

ST2 18831AA010 DIFFERENTIAL CARRIER GAUGE



(A) Pinion height adjusting washer

(2) Install the side holder LH to the left side of differential carrier in reverse direction.



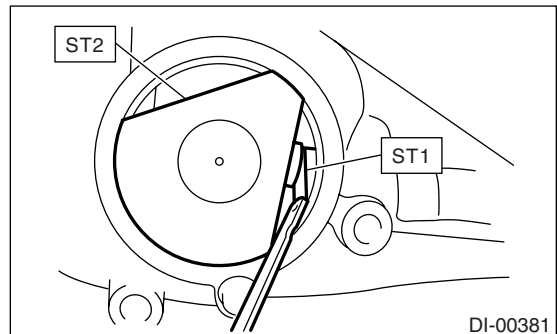
(3) Measure the clearance N between the end of ST2 and the end surface of ST1 by using a thickness gauge.

### NOTE:

Make sure there is no clearance between the case and ST2.

ST1 18678AA000 DUMMY SHAFT

ST2 18831AA010 DIFFERENTIAL CARRIER GAUGE



(4) 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.

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

|                |   |  |
|----------------|---|--|
| T              | Thickness of pinion height adjusting washer mm (in) |  |
| T <sub>o</sub> | Thickness of washer temporarily inserted mm (in)    |  |
| N              | Clearance of thickness gauge mm (in)                |  |
| Memo:          |   |  |

(Example of calculation)

T<sub>o</sub> = 0.15 mm

N = 0.1 mm

$$T = 0.15 + 0.1 - 0.05 = 0.2 \text{ mm}$$

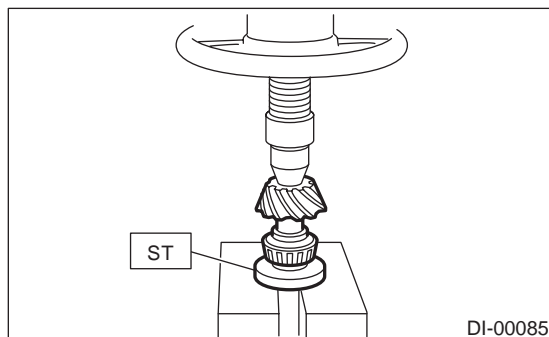
Result: Thickness = 0.2 mm

Therefore use the pinion height adjusting washer of part number 32295AA370.

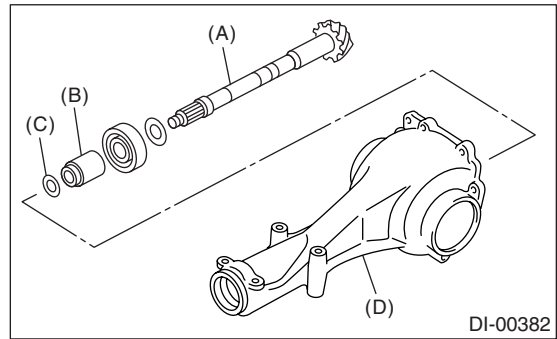
| Pinion height adjusting washer |                   |
|--------------------------------|-------------------|
| Part No.                       | Thickness mm (in) |
| 32295AA350                     | 0.150 (0.0059)    |
| 32295AA360                     | 0.175 (0.0069)    |
| 32295AA370                     | 0.200 (0.0079)    |
| 32295AA380                     | 0.225 (0.0089)    |
| 32295AA390                     | 0.250 (0.0098)    |
| 32295AA400                     | 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 398177700 INSTALLER



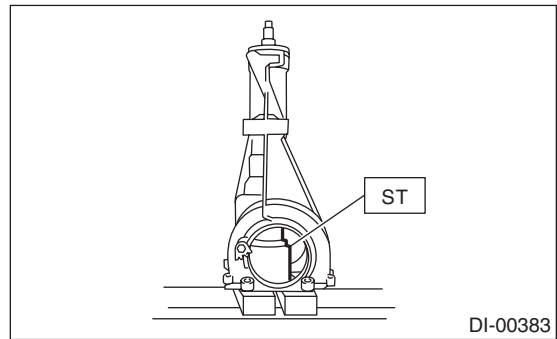
4) Insert the drive pinion into differential carrier, install the previously selected bearing preload adjusting collar and washer.



- (A) Drive pinion
- (B) Bearing preload adjusting collar
- (C) Bearing preload adjusting washer
- (D) Differential carrier

5) Set ST and differential carrier to the press and install the front bearing cone.

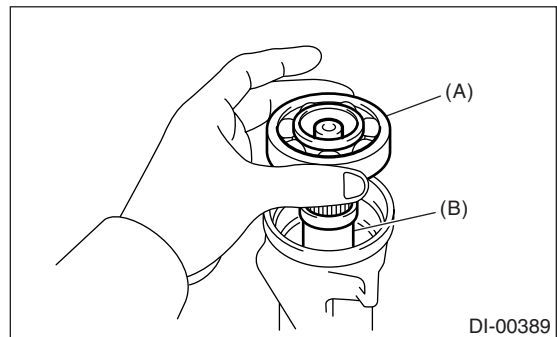
ST 399780104 WEIGHT



**NOTE:**

Set the carrier to the press until the companion flange is installed.

6) Insert the collar, then install the pilot bearing.



- (A) Pilot bearing
- (B) Collar

## Rear Differential (VA-type)

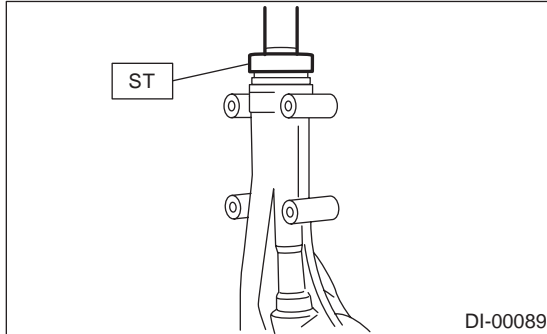
### DIFFERENTIALS

7) Fit a new oil seal with ST.

**NOTE:**

- Press-fit until end of oil seal is 1 mm (0.04 in) inward from end of carrier.
- Apply grease to the oil seal lips.

ST 499277200 INSTALLER

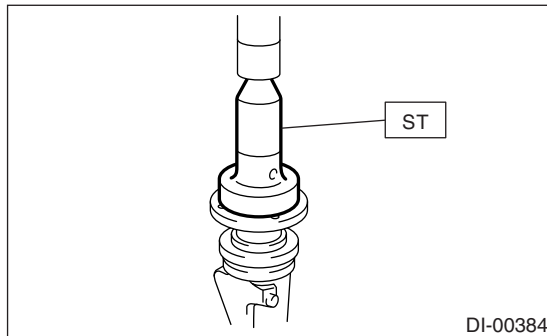


8) Press-fit the companion flange with ST.

**NOTE:**

Be careful not to damage the bearing.

ST 899874100 INSTALLER

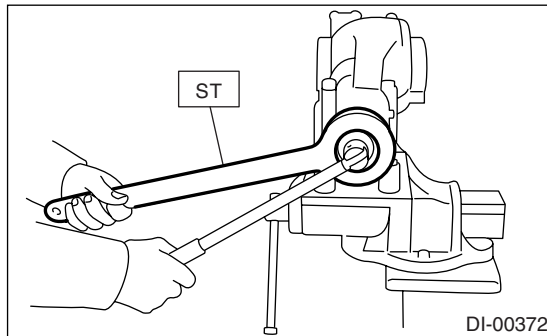


9) Install a new self-locking nut, and secure the companion flange using ST, and tighten the nut.

ST 498427200 FLANGE WRENCH

**Tightening torque:**

**191 N·m (19.1 kgf·m, 141 ft·lb)**



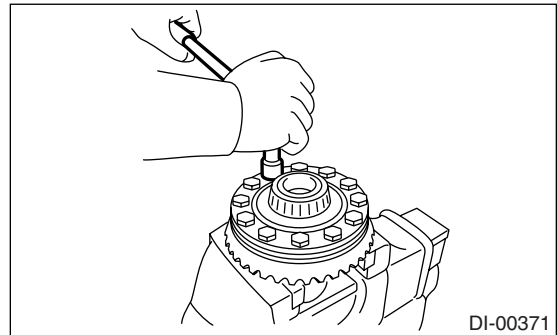
10) Install the hypoid driven gear on differential case.

**NOTE:**

- Tighten diagonally while tapping the bolt heads.
- Set a cushioning such as wooden block, aluminum plate or shop cloth between vise and differential case if the side gear comes into contact with vise.

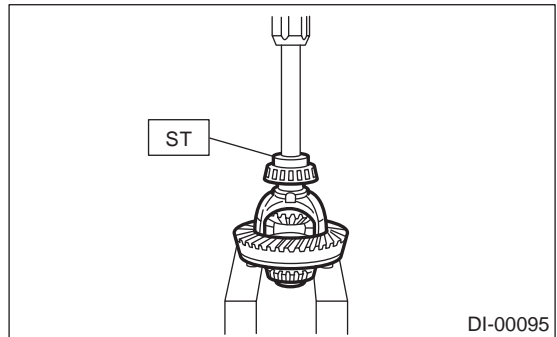
**Tightening torque:**

**62 N·m (6.3 kgf·m, 45.6 ft·lb)**



11) Press the side bearing into differential case using ST.

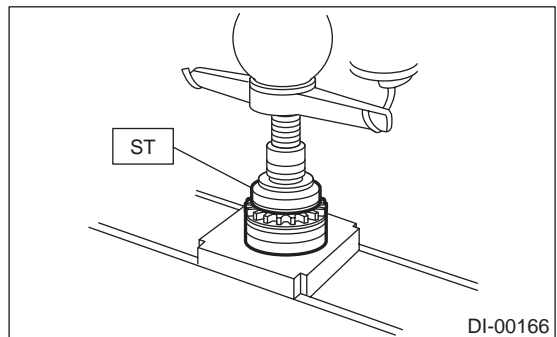
ST 398227700 DRIFT



12) Assemble holders.

(1) Install the new oil seal into holder RH and LH.

ST 498447100 INSTALLER

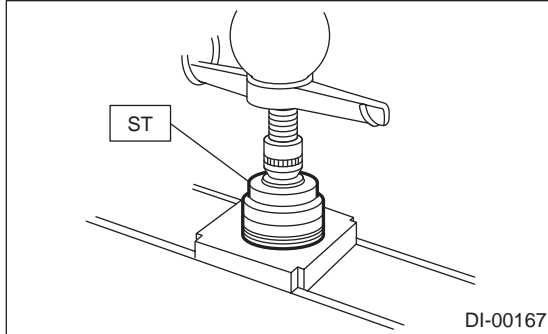


(2) Install the bearing race into holder RH and LH.

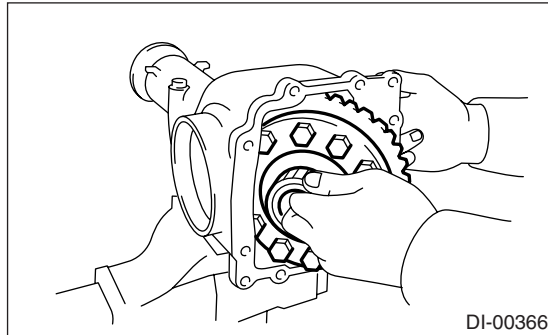
ST 398487700 DRIFT

**CAUTION:**

**Make sure that the oil seal, bearing outer race and cone are properly assembled.**



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

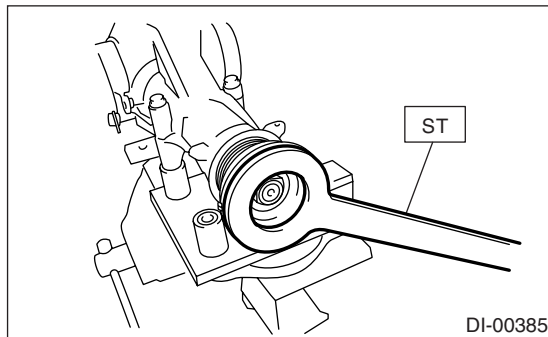


(4) Temporarily tighten the side holder RH and LH in differential carrier to install.

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

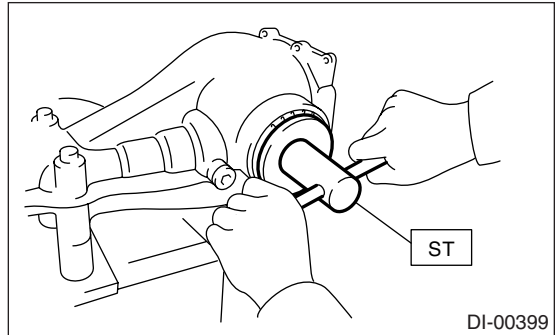
(1) Turn the drive pinion with ST for better fitting of differential side bearing.

ST 498427200 FLANGE WRENCH



(2) Screw in the side holder LH until light contact is made with ST.

ST 18630AA010 WRENCH

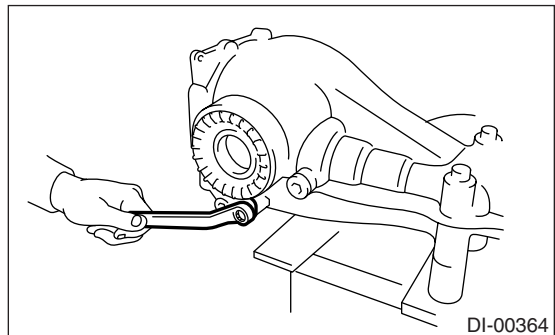


(3) Back off the side (hypoid driven gear side) holder approx. 1 1/2 teeth of holder, and tighten the other side holder by approx. 2 teeth (approx. 1 1/2 + 1/2 teeth). [Back off amount of side (hypoid driven gear side) holder + 1/2 tooth.] This + 1/2 tooth gives preload.

(4) Temporarily tighten the lock plate.

**NOTE:**

Turn over the lock plate to displace the holder 1/2 tooth.



(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:**

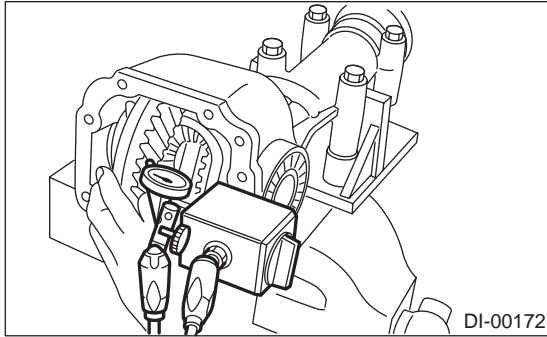
If measured backlash is not within specified range, repeat the procedures for pinion driven gear set backlash adjustment and differential side bearing preload adjustment.

# Rear Differential (VA-type)

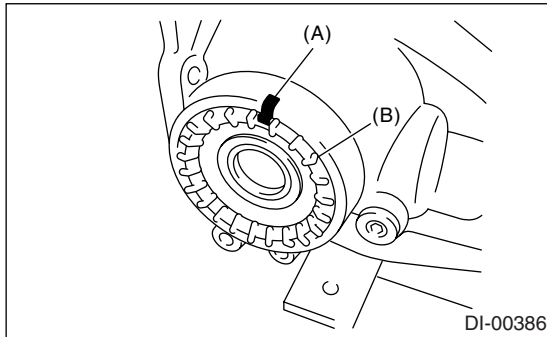
## DIFFERENTIALS

### Backlash:

0.10 — 0.15 mm (0.0039 — 0.0059 in)



14) Draw a matching mark on both differential carrier and holder. Remove the holder side at a time. Replace in the original position after inserting an O-ring and applying grease to threaded portion.



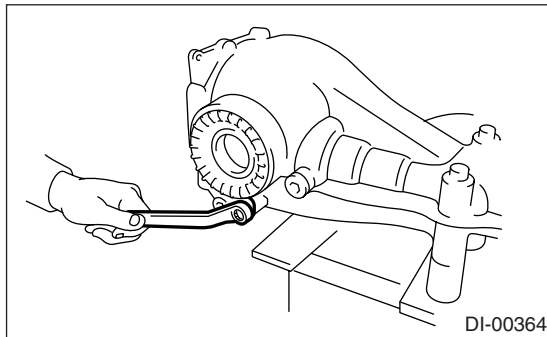
(A) Alignment mark

(B) Holder

15) Tighten the bolt of lock plate to specified torque.

### Tightening torque:

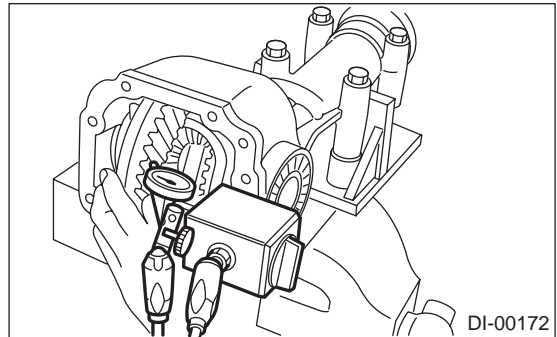
25 N·m (2.5 kgf·m, 18.1 ft·lb)



16) Recheck the hypoid driven gear to pinion backlash.

### Backlash:

0.10 — 0.15 mm (0.0039 — 0.0059 in)



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

(1) Apply an even coat of red lead on both sides of three or four teeth on 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.

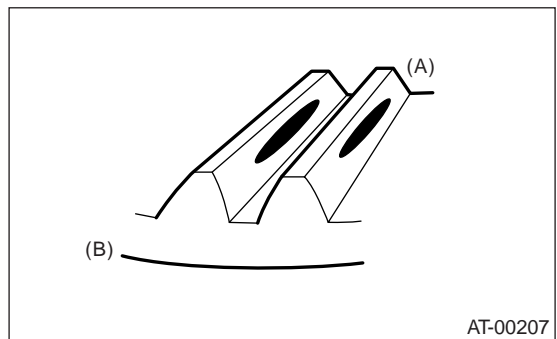
(2) When the contact pattern is incorrect, readjust.

### NOTE:

Be sure to wipe off red lead completely after adjustment is completed.

- Correct tooth contact

**Checking item: Tooth contact pattern is slightly shifted toward toe side under no-load rotation. [When loaded, contact pattern moves toward heel.]**



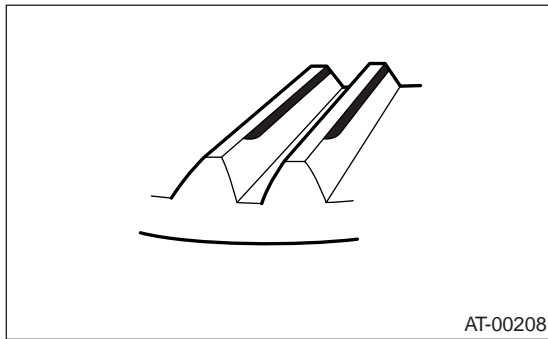
(A) Toe side

(B) Heel side

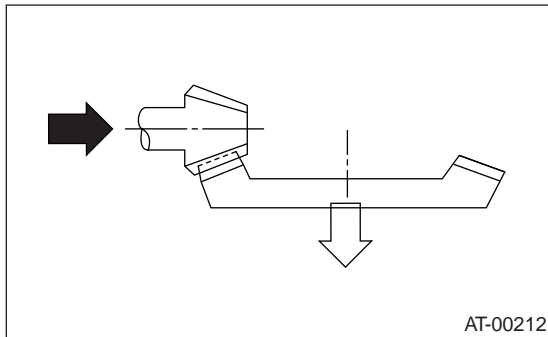
- Face contact

**Checking item: Backlash is too large.**

Contact pattern



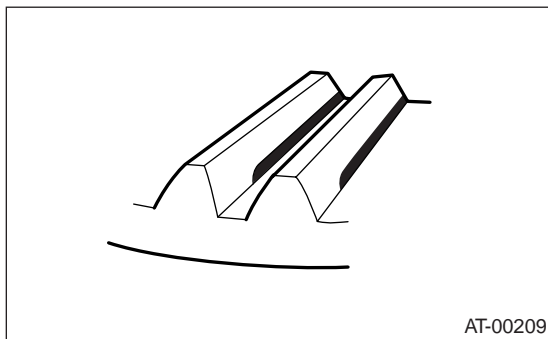
Corrective action: Increase thickness of drive pinion height adjusting washer in order to bring drive pinion close to hypoid driven gear.



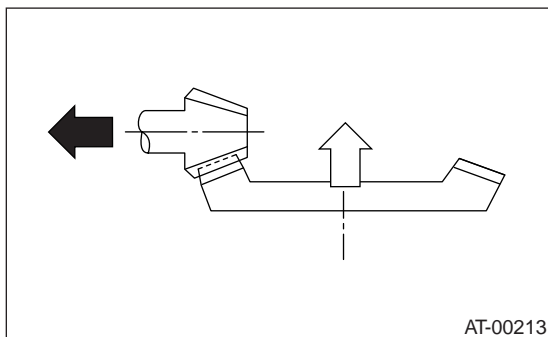
- Flank contact

**Checking item: Backlash is too small.**

Contact pattern



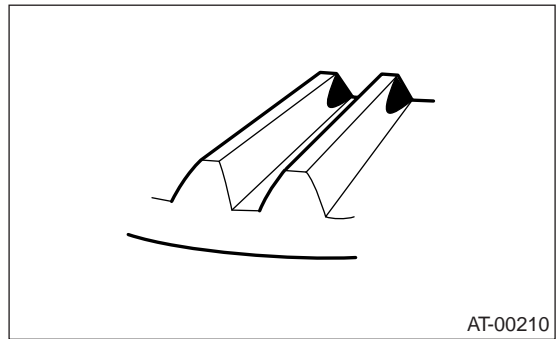
Corrective action: Reduce thickness of drive pinion height adjusting washer in order to bring drive pinion away from hypoid driven gear.



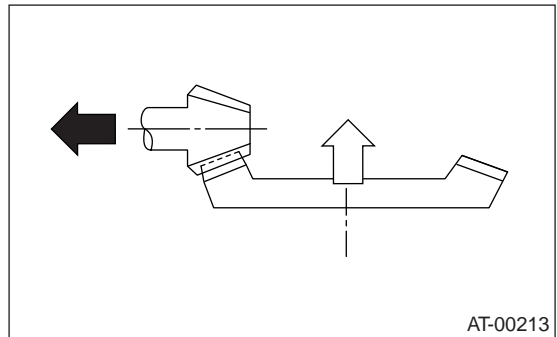
- Toe contact (inside end contact)

**Checking item: Contact areas is small**

Contact pattern



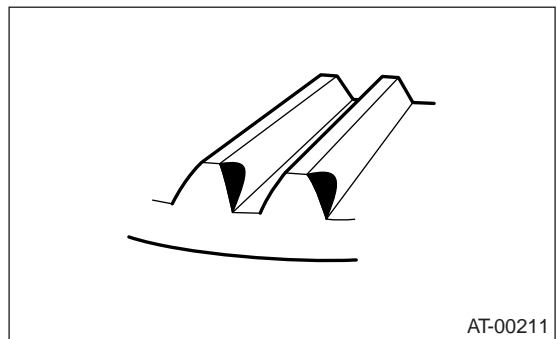
Corrective action: Reduce thickness of drive pinion height adjusting washer in order to bring drive pinion away from hypoid driven gear.



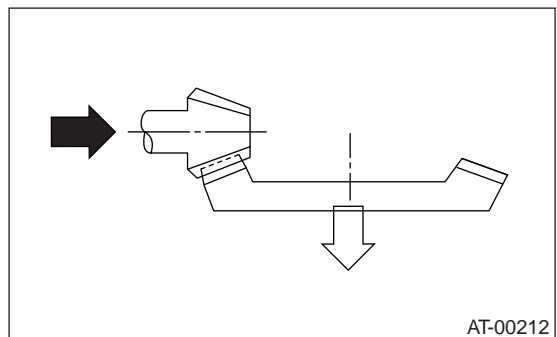
- Heel contact (outside end contact)

**Checking item: Contact areas is small**

Contact pattern



Corrective action: Increase thickness of drive pinion height adjusting washer in order to bring drive pinion close to hypoid driven gear.



# Rear Differential (VA-type)

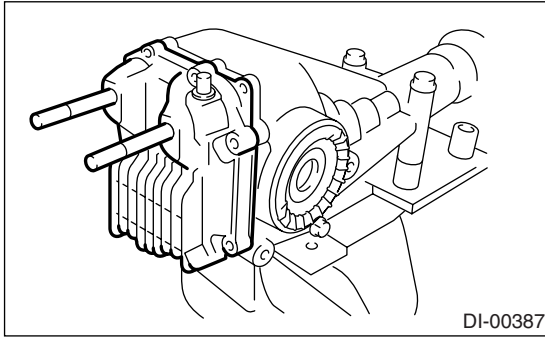
## DIFFERENTIALS

18) If proper tooth contact is not obtained, once again adjust the drive pinion height and the differential side bearing preload (already mentioned) and the hypoid gear backlash.

19) Install the new gasket and rear cover to differential carrier and tighten the bolts to specified torque.

### Tightening torque:

**25 N·m (2.5 kgf·m, 18.1 ft·lb)**



## 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 abnormal tooth contact is evident, find out the cause and adjust to give correct tooth contact. Replace the gear if excessively worn or incapable of adjustment.

- If crack, score or seizure is evident, replace as a set. Slight damage of tooth can be corrected by oil stone or the like.

2) Side gear and pinion mate gear

- Replace if crack, score or other defects are evident on tooth surface.

- Replace if thrust washer contacting surface is worn or seized. Slight damage of the surface can be corrected by oil stone or the like.

3) Bearings

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

4) Thrust washers of side gear and pinion mate gear:

Replace if seizure, flaw, abnormal wear or other defect is evident.

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 its sliding surfaces are worn or cracked.

8) Companion flange

Replace if the oil seal lip contacting surfaces have flaws.

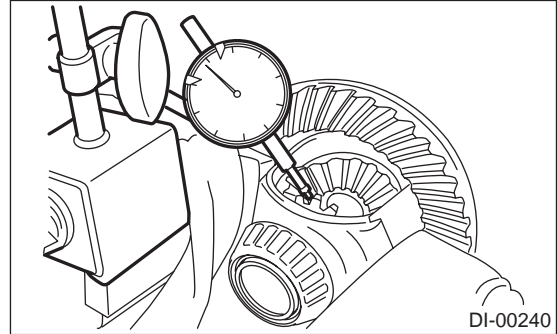
## 1. SIDE GEAR BACKLASH

Using a dial gauge, check the backlash of the side gear. (VA1-type only)

### Side gear backlash:

**0.05 — 0.15 mm (0.0020 — 0.0059 in)**

If the side gear backlash is not within the specification, adjust it as specified by selecting side gear thrust washer.



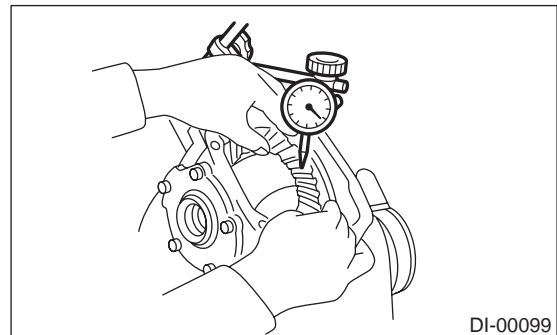
## 2. HYPOID DRIVEN GEAR BACKLASH

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

### Hypoid driven gear backlash:

**0.10 — 0.15 mm (0.0039 — 0.0059 in)**

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



## 3. TOOTH CONTACT BETWEEN HYPOID DRIVEN GEAR AND DRIVE PINION

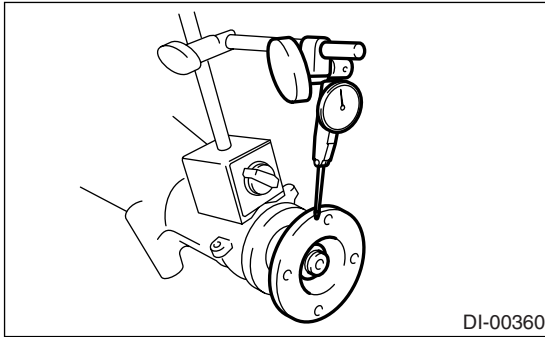
Inspect the tooth contact between hypoid driven gear and drive pinion. <Ref. to DI-55, ASSEMBLY, Rear Differential (VA-type).>

## 4. COMPANION FLANGE

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

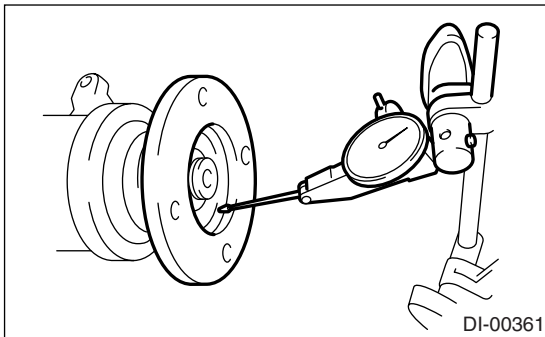
2) Set a dial gauge at a companion flange surface (mating surface of propeller shaft and companion flange), and then measure the companion flange runout.

**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 that 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. (VA1-type)  
 <Ref. to DI-55, ASSEMBLY, Rear Differential (VA-type).>

### 2. HYPOID DRIVEN GEAR BACKLASH

Adjust hypoid driven gear backlash.  
 <Ref. to DI-55, 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-55, ASSEMBLY, Rear Differential (VA-type).>

# Rear Differential Front Oil Seal

## DIFFERENTIALS

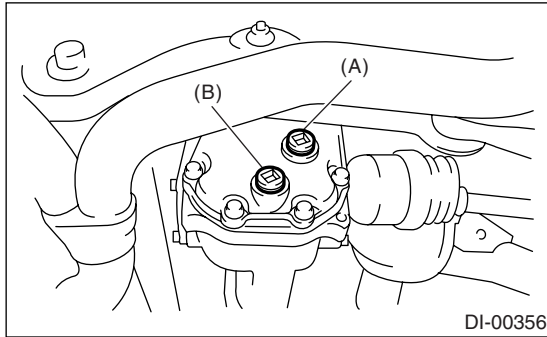
### 6. Rear Differential Front Oil Seal

#### 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.

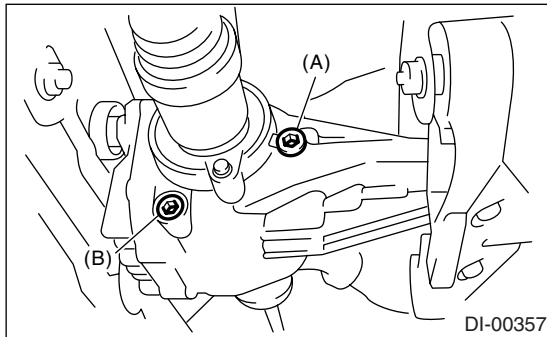
#### B: REPLACEMENT

- 1) Disconnect the ground cable from battery.
- 2) Move the select lever or gear shift lever to neutral.
- 3) Release the parking brake.
- 4) Remove the oil drain plug, and drain gear oil.
  - Except for VA2-type



- (A) Filler plug
- (B) Drain plug

- VA2-type



- (A) Filler plug
- (B) Drain plug

- 5) Install the oil drain plug.

#### NOTE:

- Apply liquid gasket to the oil drain plug for T-type.
- Use a new aluminum gasket for VA1-type.
- Use a new metal gasket for VA2-type.

#### Liquid gasket:

**THREE BOND 1105 (Part No. 004403010) or equivalent**

#### Tightening torque:

##### T-type:

**49 N·m (5.0 kgf-m, 36.2 ft-lb)**

##### VA1-type:

**34 N·m (3.5 kgf-m, 25.3 ft-lb)**

##### For VA2-type:

**29 N·m (3.0 kgf-m, 21.4 ft-lb)**

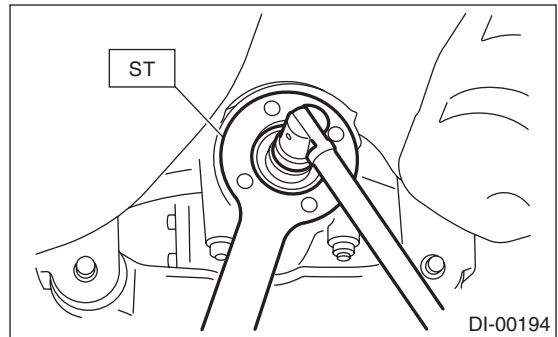
- 6) Jack-up the rear wheel and support the body with rigid racks.

- 7) Remove the rear exhaust pipe and muffler.

- 8) Remove the propeller shaft. <Ref. to DS-10, REMOVAL, Propeller Shaft.>

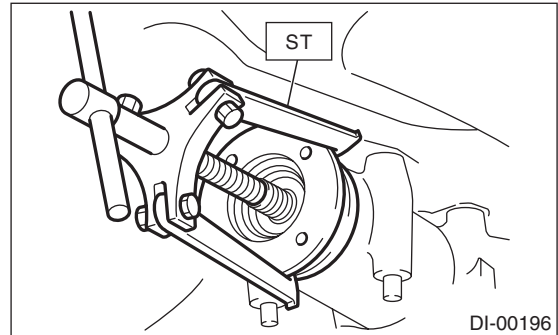
- 9) Remove the self-locking nut while holding the companion flange with ST.

ST 498427200 FLANGE WRENCH



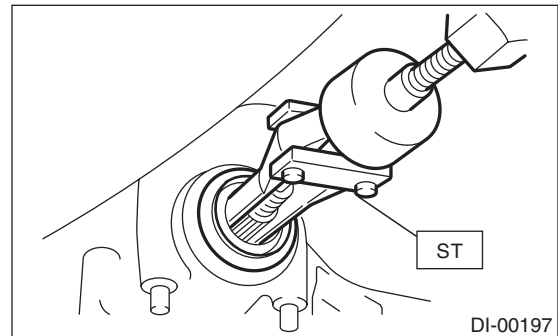
- 10) Extract the companion flange using ST.

ST 399703600 PULLER ASSY



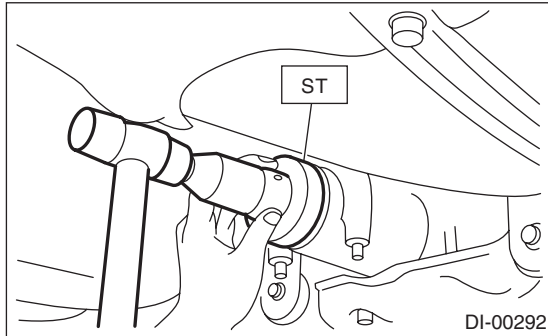
- 11) Remove the oil seal using ST or screwdriver.

ST 398527700 PULLER ASSY



12) Install a new oil seal with ST.

ST 498447120 OIL SEAL INSTALLER



13) Install the companion flange.

NOTE:

Use a plastic hammer to install companion flange.

14) Tighten the self-locking nut within the specified torque range so that the turning resistance of companion flange becomes the same as that of before oil seal replacement.

ST 498427200 FLANGE WRENCH

NOTE:

Use a new self-locking nut.

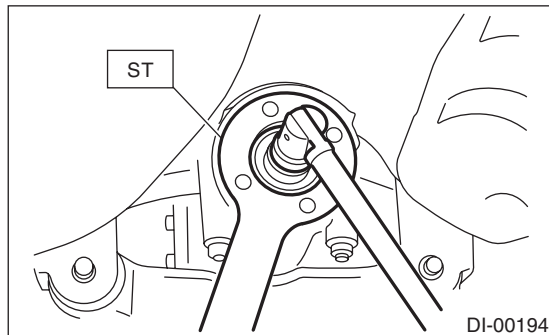
**Tightening torque:**

**T-type:**

**181 N·m (18.5 kgf·m, 134 ft·lb)**

**VA-type:**

**191 N·m (19.5 kgf·m, 141 ft·lb)**



15) Hereafter, reassemble in the reverse order of disassembly.

## 7. Rear Differential Side Oil Seal

### A: INSPECTION

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

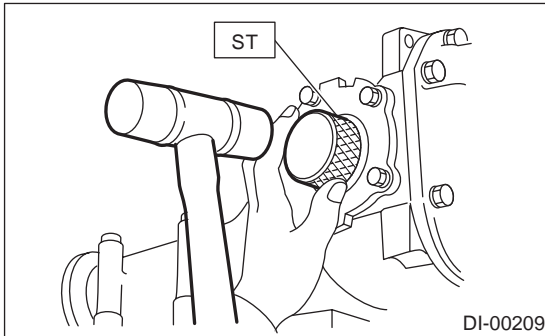
### B: REPLACEMENT

1) Remove the rear differential. <Ref. to DI-29, REMOVAL, Rear Differential (T-type).> <Ref. to DI-46, REMOVAL, Rear Differential (VA-type).>

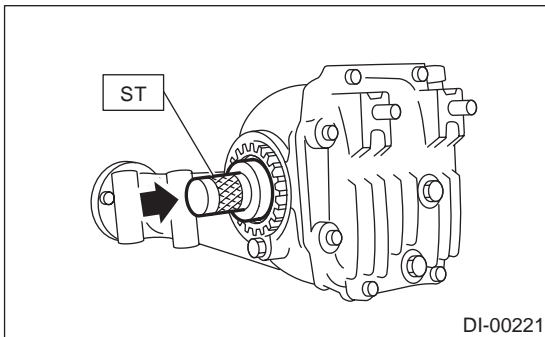
2) Remove the rear differential side oil seal using a screwdriver wrapped with vinyl tape to prevent the side retainer from scratches.

3) Using the ST, install the oil seal to the side retainer.

- T-type and VA2-type  
ST 398437700 DRIFT



- VA1-type  
ST 498447100 INSTALLER

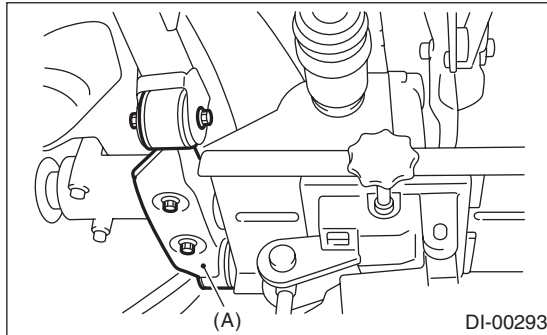


4) Install the rear differential. <Ref. to DI-30, INSTALLATION, Rear Differential (T-type).> <Ref. to DI-47, INSTALLATION, Rear Differential (VA-type).>

## 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

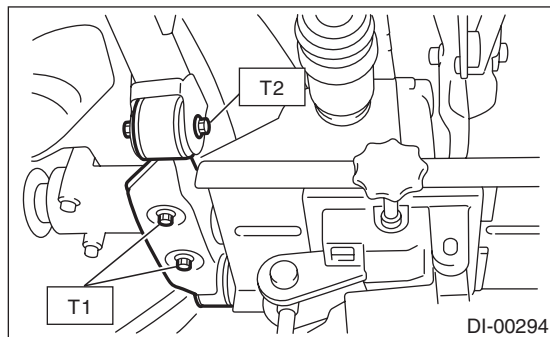
### B: INSTALLATION

Install the rear differential front member with a new self-locking nut.

#### *Tightening torque:*

**T1: 52 N·m (5.3 kgf-m, 38 ft-lb)**

**T2: 110 N·m (11.2 kgf-m, 81 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 member for cracking, hardening and damage. If cracking, hardening or damage is excessive, replace rear differential front member.

# General Diagnostic Table

DIFFERENTIALS

## 9. General Diagnostic Table

### A: INSPECTION

| Symptom or trouble  | Possible cause  | Remedy  |
|---|---|---|
| <b>1. Oil leakage</b>   | (1) Worn, scratched or incorrectly seated front or side oil seal. Scored, battered or excessively worn sliding surface of companion flange. | Correct or replace.   |
|   | (2) Clogged or damaged air breather.  | Clean, repair or replace.   |
|   | (3) Loose bolts on differential spindle or side retainer, or incorrectly fitted O-ring.   | Tighten the bolts to specified torque.<br>Replace the O-ring.                     |
|   | (4) Loose rear cover attaching bolts or damaged gasket.   | Tighten the bolts to specified torque.<br>Replace gasket and apply liquid gasket. |
|   | (5) Loose oil filler or drain plug.   | Retighten and apply liquid gasket.  |
|   | (6) Wear, damage or incorrectly fitting for spindle, side retainer and oil seal.  | Correct or replace.   |
| <b>2. Seizure</b><br>NOTE:<br>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.  | Replace seized part and fill with specified oil to specified level.               |
| <b>3. Damage</b><br>NOTE:<br>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.  | 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.   | Retightening.   |
|   | (5) Damage due to overloading.  | Replace.  |
| <b>4. Noises when starting or shifting gears</b><br>NOTE:<br>Noises may be caused by differential assembly, universal joint, wheel bearing, etc. Find out what is actually making noise before disassembling. | (1) Excessive backlash for hypoid gear.   | Readjust.   |
|   | (2) Excessive backlash for differential gear.   | Replace gear or thrust washer.  |
|   | (3) Insufficient preload for front or rear bearing.   | Readjust.   |
|   | (4) Loose drive pinion nut.   | Tighten to specified torque.  |
|   | (5) Loose bolts and nuts such as side bearing retainer attaching bolt.  | Tighten to specified torque.  |
| <b>5. Noises when cornering</b>   | (1) Damaged differential gear.  | Replace.  |
|   | (2) Excessive wear or damage of thrust washer.  | Replace.  |
|   | (3) Broken pinion mate shaft.   | Replace.  |
|   | (4) Seized or damaged side bearing.   | Replace.  |

# General Diagnostic Table

DIFFERENTIALS

| Symptom or trouble   | Possible cause                                       | Remedy                               |
|--|--|--------------------------------------|
| <b>6. Gear noise</b><br>NOTE:<br>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 jacking-up all four wheels. Perform these inspections according to condition of trouble. When listening to noises, shift gears into four wheel drive and fourth speed position, trying to pick up only differential noise. | (1) Improper tooth contact of hypoid gear.           | Readjust or replace hypoid gear set. |
|  | (2) Improper backlash for hypoid gear.               | Readjust.                            |
|  | (3) Scored or chipped teeth of hypoid gear.          | Replace hypoid gear set.             |
|  | (4) Seized hypoid gear.                              | Replace hypoid gear set.             |
|  | (5) Improper preload for front or rear bearings.     | Readjust.                            |
|  | (6) Seized, scored or chipped front or rear bearing. | Replace.                             |
|  | (7) Seized, scored or chipped side bearing.          | Replace.                             |
|  | (8) Vibrating differential carrier.                  | Replace.                             |

# General Diagnostic Table

DIFFERENTIALS

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