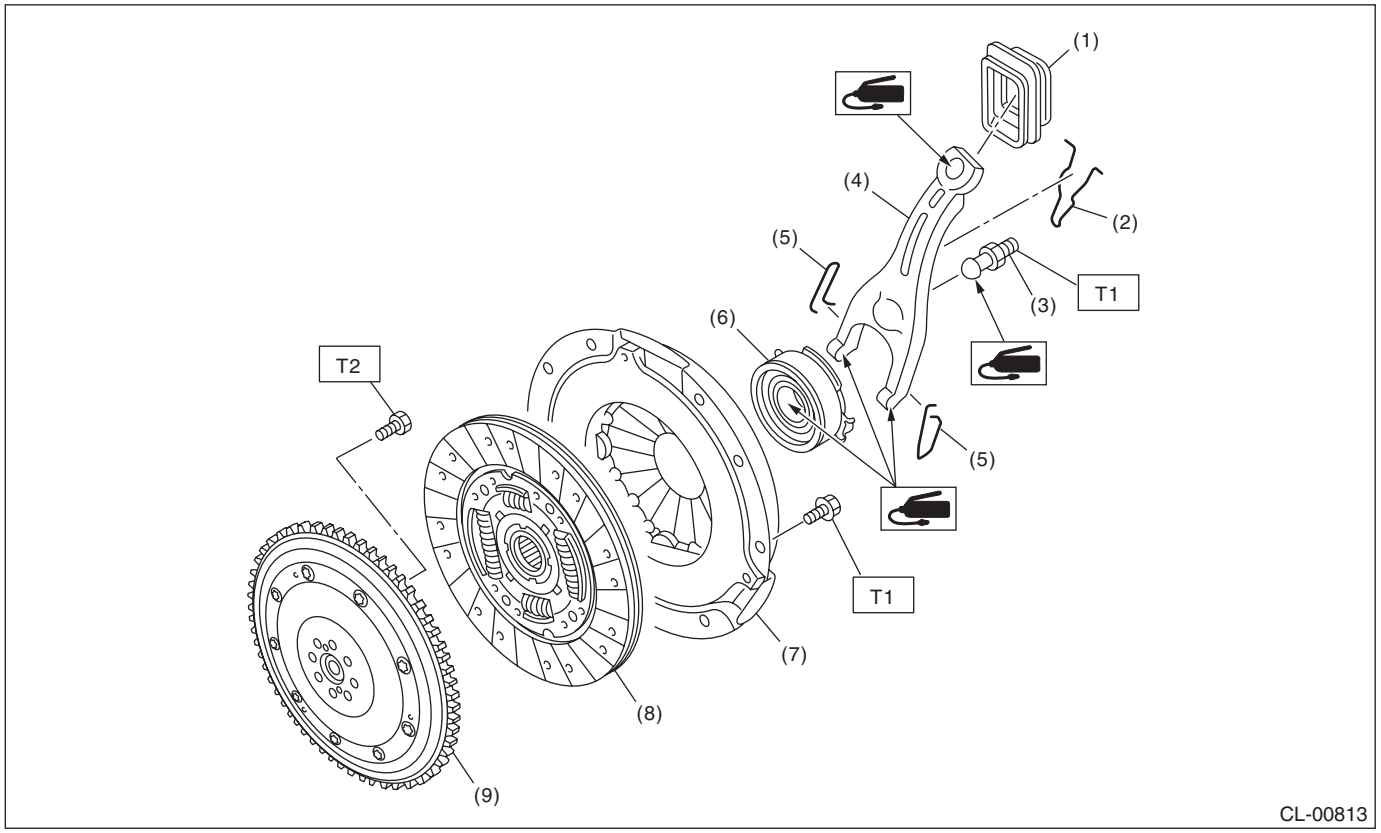
1. General Description

A: SPECIFICATION

Model			2.0 L
Transmission type			5MT
Clutch cover	Type		Push type
	Diaphragm set load N (kgf, lbf)		5,688 (580, 1,279)
Clutch disc	Facing material		Woven (Non-asbestos)
	O.D. × I.D. × thickness mm (in)	Clutch cover side	225 × 150 × 3.5 (8.86 × 5.9 × 0.138)
		Flywheel side	
	Spline outer diameter mm (in)		25.2 (0.992), (Number of teeth: 24)
	Depth of rivet head mm (in)	Clutch cover side	1.65 — 2.25 (0.065 — 0.089)
		Flywheel side	
		Limit of sinking	0.3 (0.012)
	Deflection limit mm (in)		0.7 (0.028) at R = 110 (4.33)
Clutch release lever ratio			1.6
Release bearing			Grease-packed self-aligning
Clutch pedal	Full stroke mm (in)		130 — 135 (5.12 — 5.31)
	Free play mm (in)		4 — 10 (0.16 — 0.39)
Flywheel	Type		Flexible

B: COMPONENT

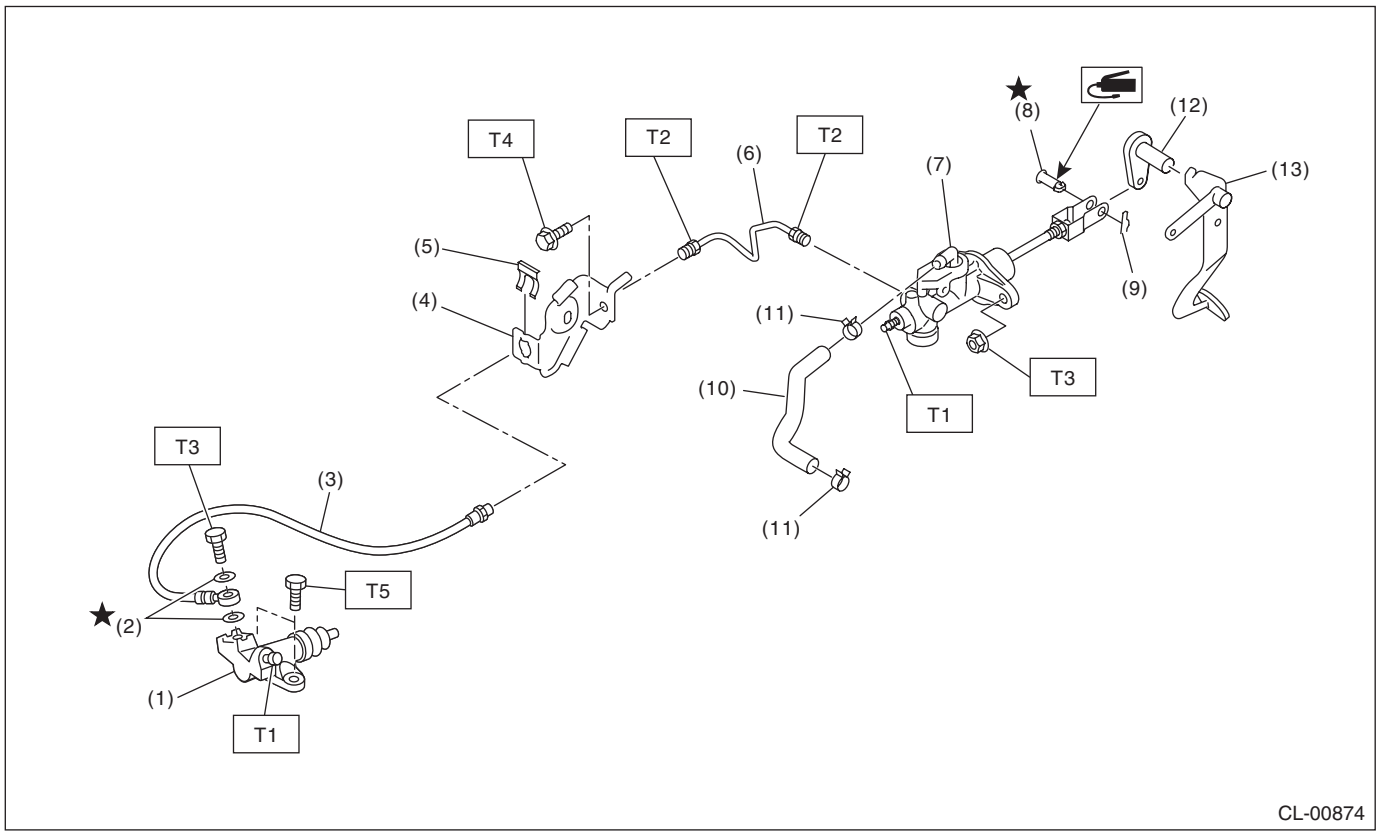
1. CLUTCH ASSEMBLY



(1) Dust cover
(2) Lever spring
(3) Pivot
(4) Release lever
(5) Clip
(6) Release bearing
(7) Clutch cover
(8) Clutch disc
(9) Flywheel

Tightening torque:N·m (kgf-m, ft-lb)
T1: 16 (1.6, 11.8)
T2: <Ref. to CL-13, INSTALLATION, Flywheel.>

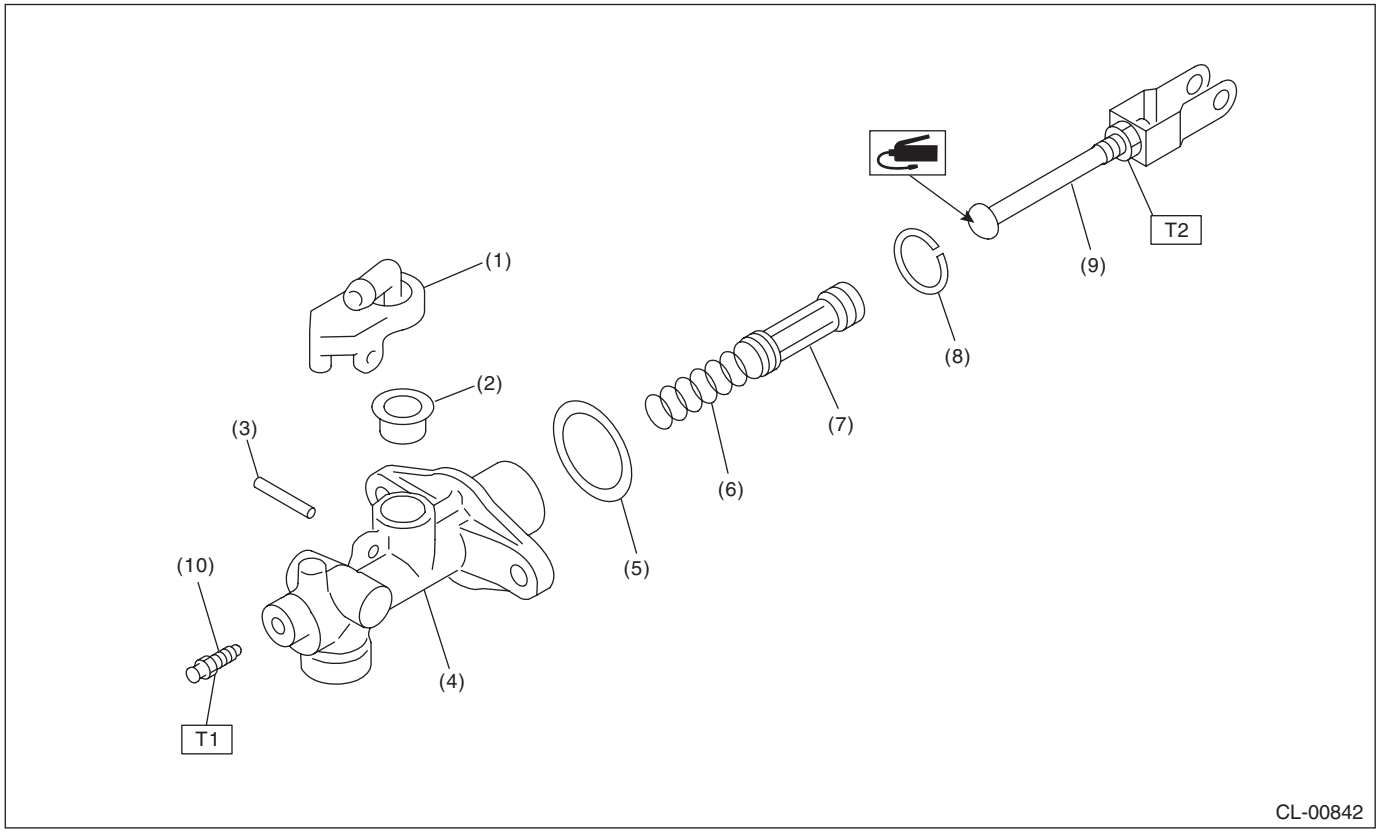
2. CLUTCH PIPE AND HOSE



(1)	Operating cylinder	(8)	Clevis pin
(2)	Gasket	(9)	Snap pin
(3)	Clutch hose	(10)	Tank hose
(4)	Bracket	(11)	Clamp
(5)	Clamp	(12)	Lever
(6)	Clutch pipe	(13)	Pedal
(7)	Master cylinder ASSY		

Tightening torque:N·m (kgf-m, ft-lb)
T1: 7.8 (0.8, 5.8)
T2: 15 (1.5, 11.1)
T3: 18 (1.8, 13.3)
T4: 25 (2.5, 18.4)
T5: 37 (3.8, 27.3)

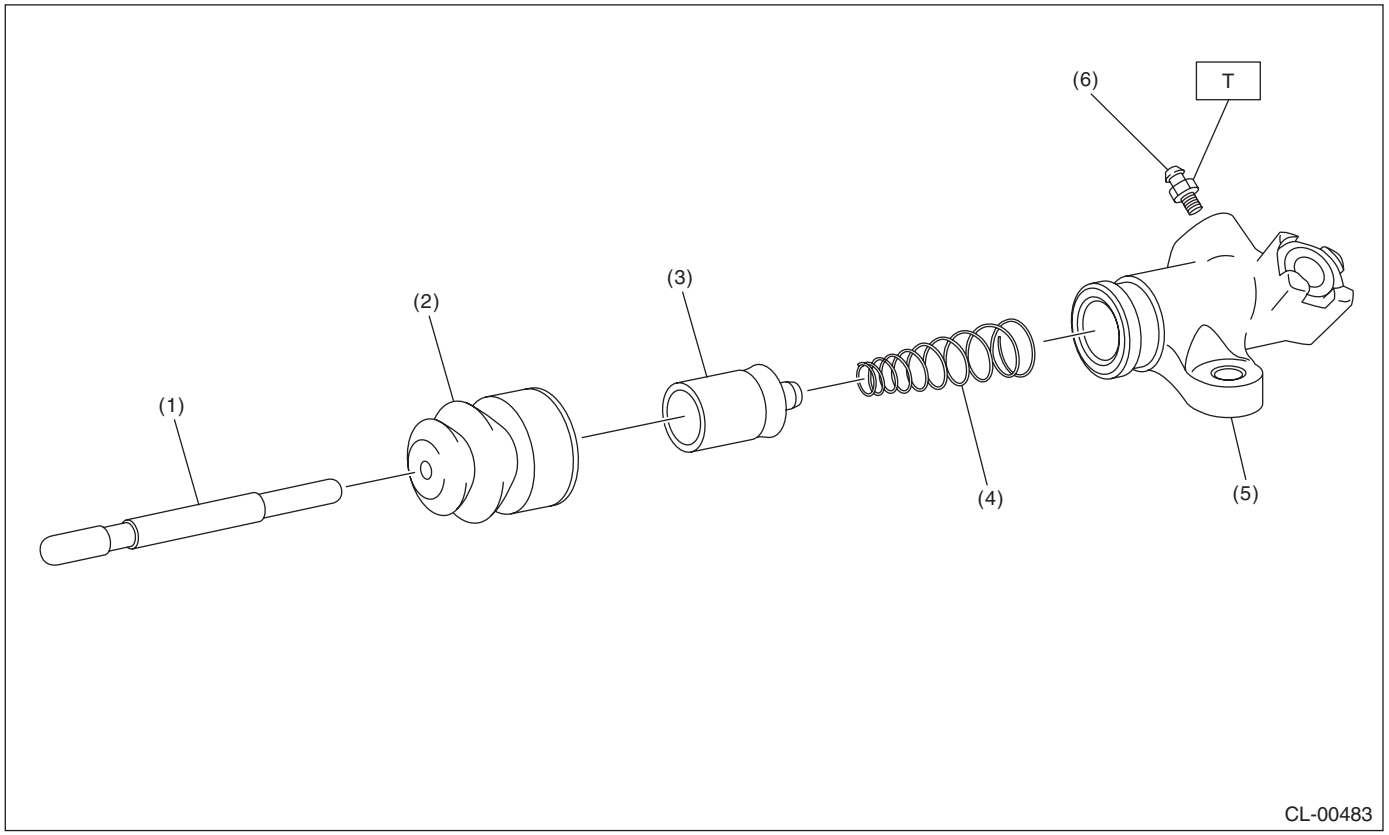
3. MASTER CYLINDER



(1)	Nipple	(6)	Return spring
(2)	Oil seal	(7)	Piston
(3)	Straight pin	(8)	Piston stop ring
(4)	Master cylinder	(9)	Push rod ASSY
(5)	Seat	(10)	Breather screw

Tightening torque:N·m (kgf-m, ft-lb)
T1: 7.8 (0.8, 5.8)
T2: 10 (1.0, 7.4)

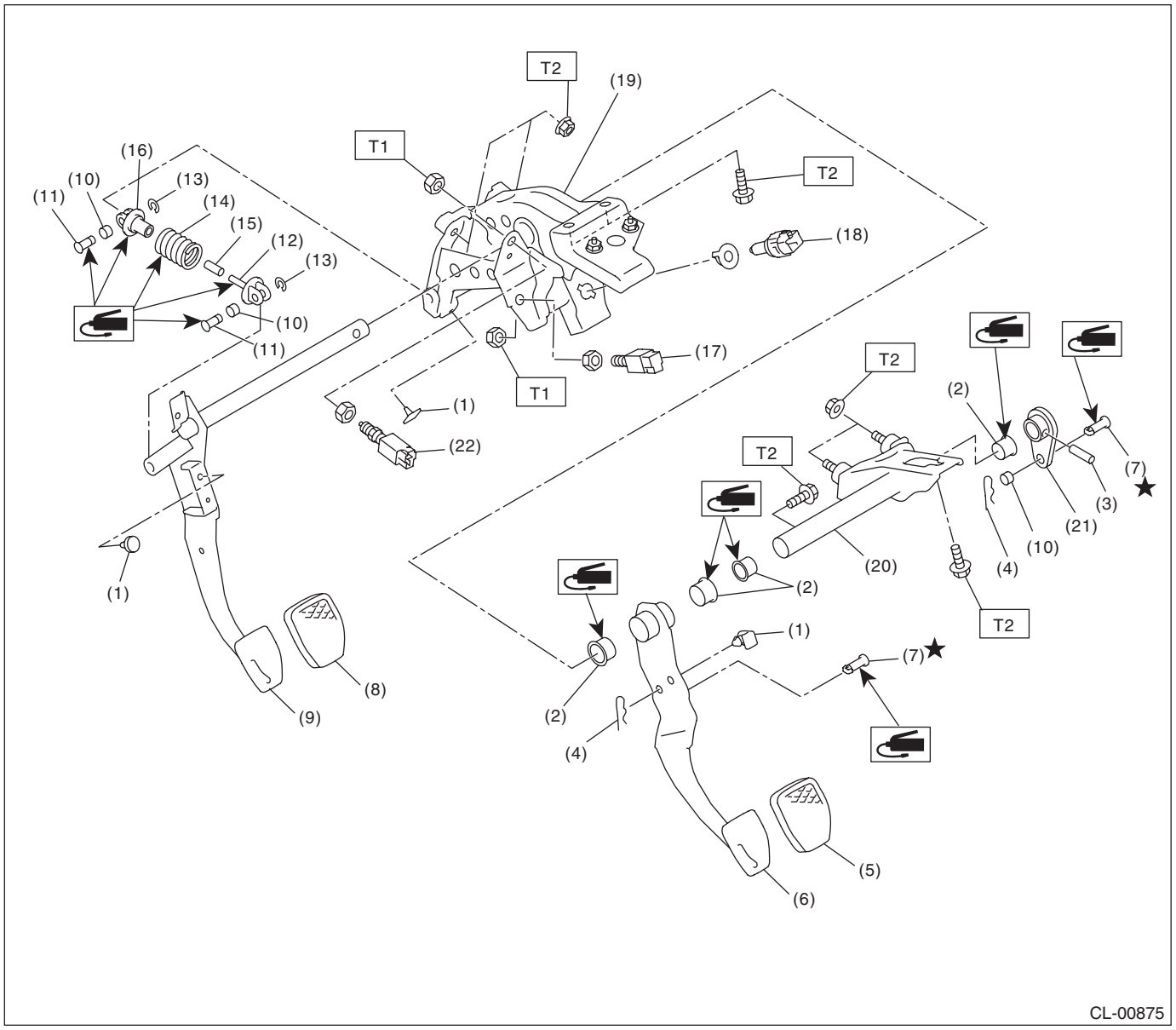
4. OPERATING CYLINDER



(1) Push rod
(2) Boot
(3) Piston
(4) Piston spring
(5) Operating cylinder
(6) Breather screw

Tightening torque:N·m (kgf-m, ft-lb)
T: 7.8 (0.8, 5.8)

5. CLUTCH PEDAL



(1) Stopper
(2) Bushing
(3) Spring pin
(4) Snap pin
(5) Brake pedal pad
(6) Brake pedal
(7) Clevis pin
(8) Clutch pedal pad
(9) Clutch pedal
(10) Bushing C
(11) Clutch clevis pin
(12) Assist rod A
(13) Clip
(14) Assist spring
(15) Assist bushing
(16) Assist rod B
(17) Clutch switch
(18) Stop light switch
(19) Pedal bracket
(20) Clutch master cylinder bracket
(21) Lever
(22) Clutch start switch

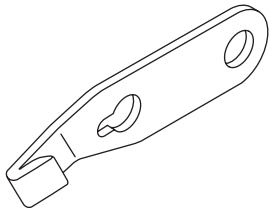
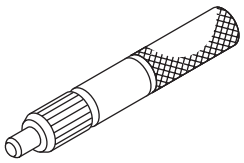
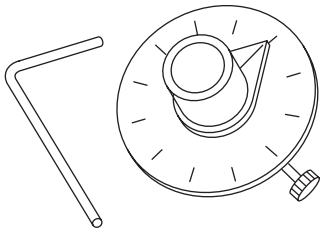
Tightening torque:N·m (kgf-m, ft-lb)
T1: 8 (0.8, 5.9)
T2: 18 (1.8, 13.3)

C: CAUTION

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

D: PREPARATION TOOL

1. SPECIAL TOOL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-498497100	498497100	CRANKSHAFT STOPPER	Used for stopping rotation of the flywheel when loosening/tightening bolts, etc.
 ST-499747100	499747100	CLUTCH DISC GUIDE	Used for installing the clutch disc to the flywheel.
 ST18854AA000	18854AA000	ANGLE GAUGE	Used for tightening the flywheel.

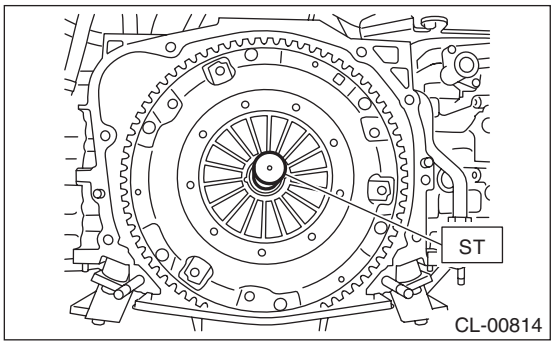
2. GENERAL TOOL

TOOL NAME	REMARKS
Circuit tester	Used for measuring resistance, voltage and ampere.
Dial gauge	Used for measuring clutch disc run-out.
Depth gauge	Used for measuring clutch disc wear.

2. Clutch Disc and Cover

A: REMOVAL

1) Remove the transmission assembly from the vehicle.
<Ref. to 5MT-23, REMOVAL, Manual Transmission Assembly.>
2) Attach the ST on the flywheel.
ST 499747100 CLUTCH DISC GUIDE



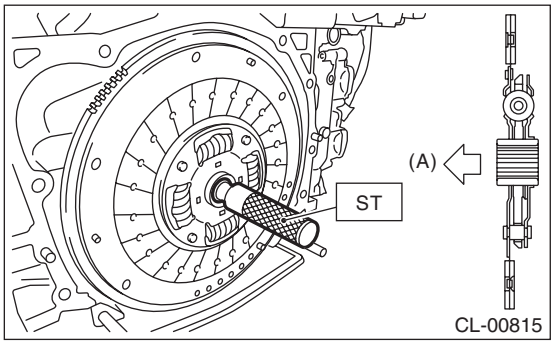
3) Remove the clutch cover and clutch disc.

NOTE:
• Take care not to allow oil to touch the clutch disc face.
• Do not disassemble the clutch cover or clutch disc.

B: INSTALLATION

1) Insert the ST into the clutch disc and attach to the flywheel by inserting the ST end into pilot bearing.

NOTE:
When installing the clutch disc, be careful to attach in the correct direction.
ST 499747100 CLUTCH DISC GUIDE

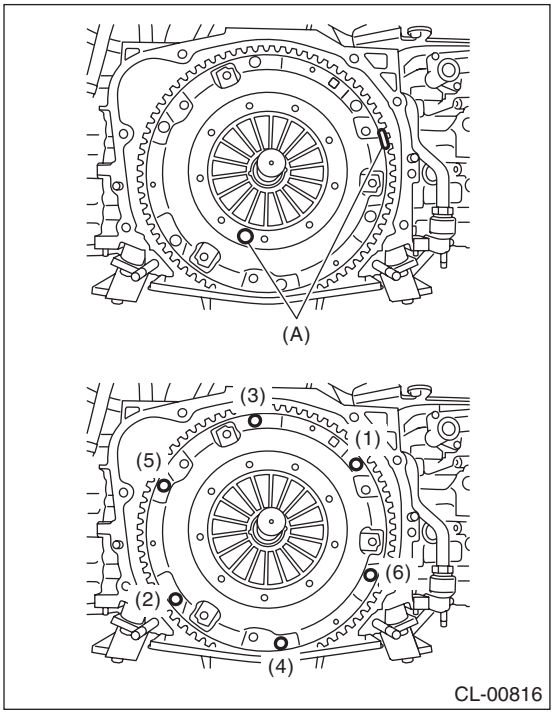


(A) Flywheel side

2) Install the clutch cover to the flywheel and tighten the bolts to the specified torque.

NOTE:
• When installing a clutch cover to the flywheel, position the clutch cover so that the spacing between the unbalance marks (paint mark) on the flywheel and clutch cover is 120° or more apart. (The unbalance mark indicates the direction of residual unbalance.)
• Temporarily tighten the bolts by hand. Each bolt should be tightened to the specified torque in a crisscross order.

Tightening torque:
16 N·m (1.6 kgf-m, 11.8 ft-lb)



(A) Unbalance mark (paint)

3) Remove the ST.
ST 499747100 CLUTCH DISC GUIDE
4) Install the transmission assembly. <Ref. to 5MT-26, INSTALLATION, Manual Transmission Assembly.>

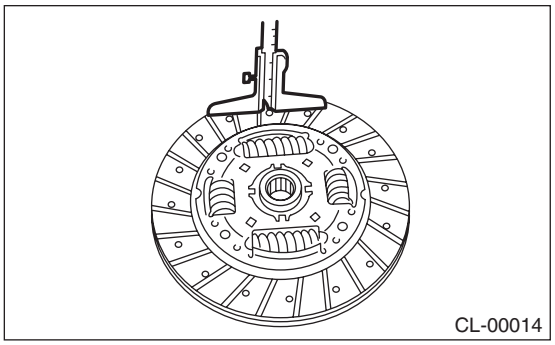
C: INSPECTION

1. CLUTCH DISC

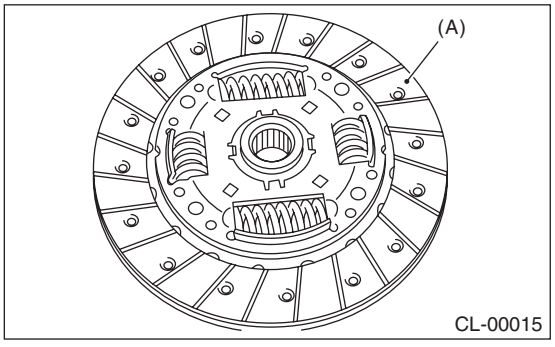
1) Facing wear
Measure the depth from the facing surface to the rivet head. Replace if the face is worn locally or worn down to less than the specified value.

Depth to rivet head:
Limit of sinking
0.3 mm (0.012 in)

NOTE:
Do not wash the clutch disc with any type of cleaning fluid.



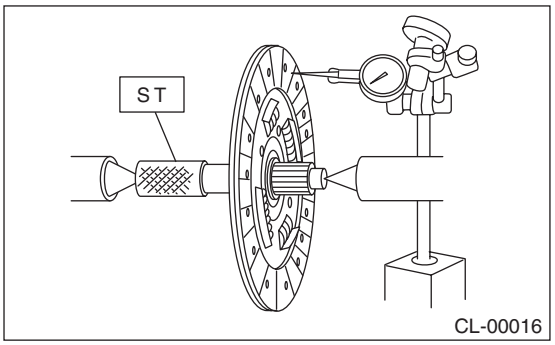
2) Hardened facing
Replace the clutch disc.
3) Oil soakage on facing
Replace the clutch disc and inspect the transmission front oil seal, transmission case mating surface, engine rear oil seal and other locations for oil leakage.



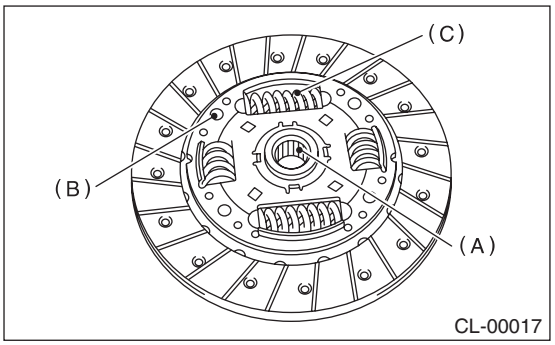
(A) Clutch facing

4) Deflection on facing
If deflection exceeds the specified value at the outer circumference of the facing, replace the clutch disc.
ST 499747100 CLUTCH DISC GUIDE

Limit for deflection:
0.7 mm (0.028 in) at R = 110 mm (4.33 in)



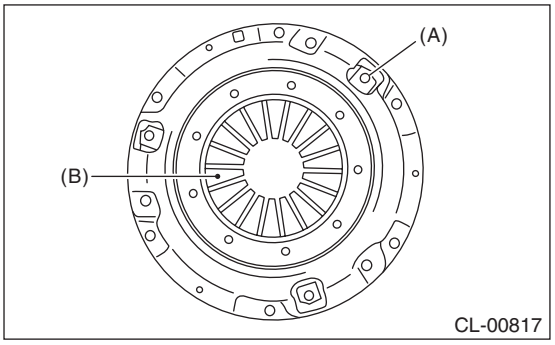
5) If there is spline wear, loose rivets, failed damper springs, etc., replace the clutch disc.



(A) Spline
(B) Rivet
(C) Damper spring

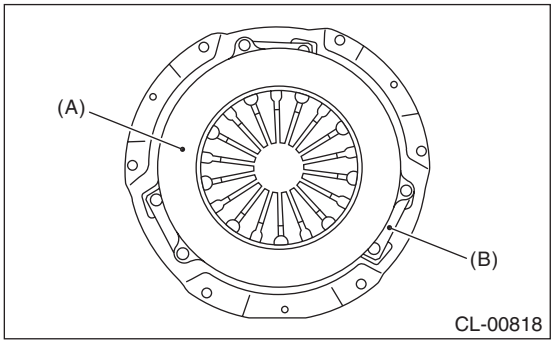
2. CLUTCH COVER

NOTE:
Visually check the following items without disassembling, and replace or repair if defective.
1) Loose thrust rivet
2) Damaged or worn bearing contact area at the center of diaphragm spring



(A) Thrust rivet
(B) Diaphragm spring

3) Damaged or worn disc contact surface of the pressure plate
4) Loose strap plate installation area
5) Worn diaphragm sliding area

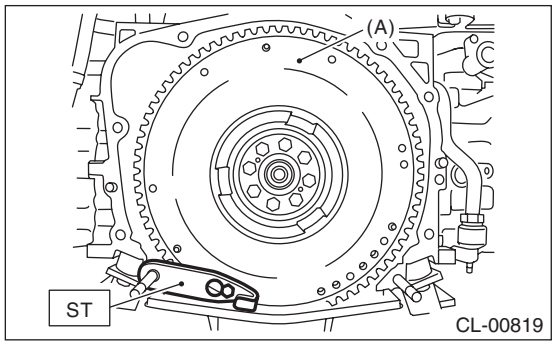


(A) Pressure plate
(B) Strap plate

3. Flywheel

A: REMOVAL

1) Remove the transmission assembly. <Ref. to 5MT-23, REMOVAL, Manual Transmission Assembly.>
2) Remove the clutch cover and clutch disc. <Ref. to CL-10, REMOVAL, Clutch Disc and Cover.>
3) Attach the ST.
ST 498497100 CRANKSHAFT STOPPER



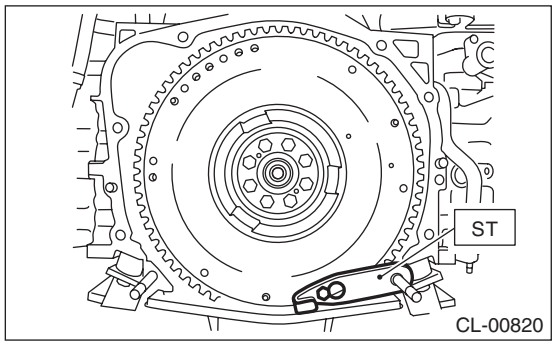
(A) Flywheel

4) Remove the flywheel and crankshaft position sensor plate.

B: INSTALLATION

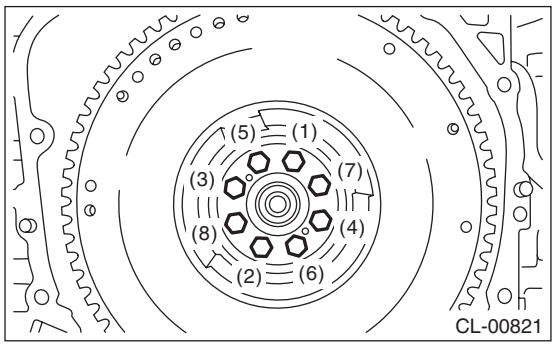
1) Temporarily tighten the crankshaft position sensor plate and flywheel.

NOTE:
Align the knock pin hole of the crankshaft position sensor plate to the knock pin of the crankshaft to secure the knock pin.
2) Attach the ST.
ST 498497100 CRANKSHAFT STOPPER



3) Tighten the flywheel mounting bolts in two stages.
(1) Tighten the flywheel attachment bolts.

Tightening torque:
30 N·m (3.1 kgf-m, 22.1 ft-lb)



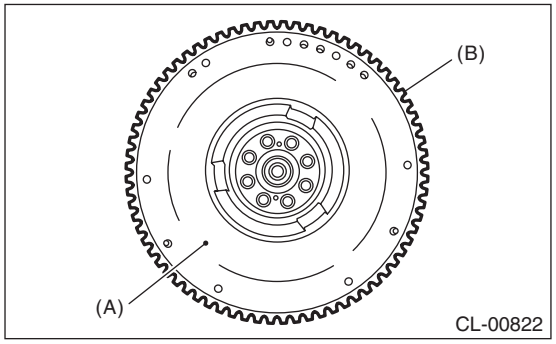
(2) While checking the tightening angle with the ST, further tighten the flywheel mounting bolts.

Tightening angle:
30° — 35°

ST 18854AA000 ANGLE GAUGE
4) Install the clutch disc and cover. <Ref. to CL-10, INSTALLATION, Clutch Disc and Cover.>
5) Install the transmission assembly. <Ref. to 5MT-26, INSTALLATION, Manual Transmission Assembly.>

C: INSPECTION

CAUTION:
Because the center bearing is grease-sealed and is a non-lubrication type, do not wash with gasoline or solvents.
1) If there is damage or defectiveness in the facing sliding surface or ring gear, replace the flywheel.



(A) Flywheel
(B) Ring gear

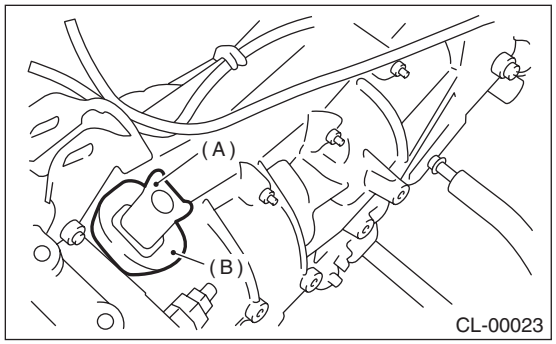
2) Smoothness of rotation
Rotate the ball bearing while applying pressure in the thrust direction.
3) If noise or excessive play is noted, replace the flywheel.

4. Release Bearing and Lever

A: REMOVAL

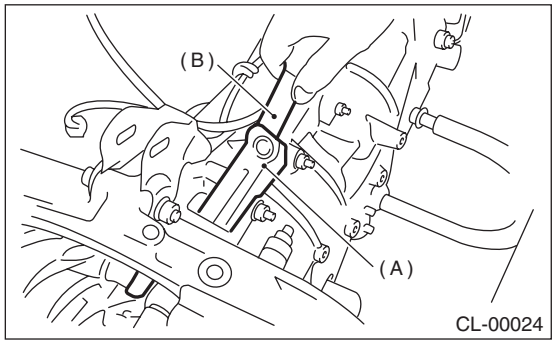
1) Remove the transmission assembly from the vehicle.
<Ref. to 5MT-23, REMOVAL, Manual Transmission Assembly.>
2) Remove the two clips from the release lever and remove the release bearing.

CAUTION:
Be careful not to deform the clips.
3) Remove the dust cover.



(A) Release lever
(B) Dust cover

4) Remove the lever spring from the pivot with a screwdriver by accessing it through the clutch housing release lever hole. Then remove the release lever.



(A) Release lever
(B) Screwdriver

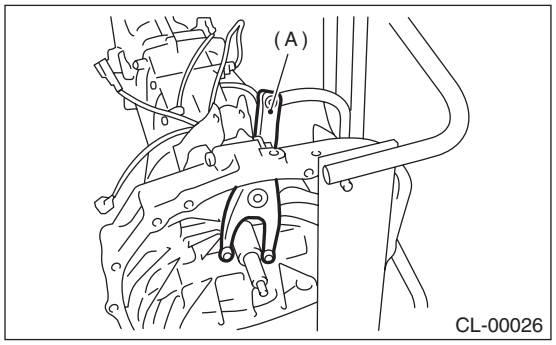
B: INSTALLATION

NOTE:
Apply the specified grease to lubricate to the following points before installation.
- Contact surface of lever and pivot
- Contact surface of lever and bearing
- Transmission main shaft spline
- Contact surface of release bearing and transmission case

Grease
NICHIMOLY N-130 or equivalent

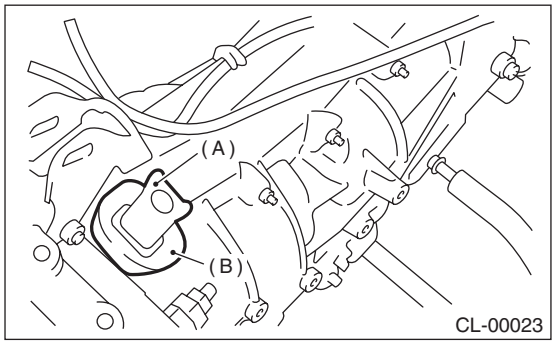
1) While pushing the release lever to the pivot and twisting it to both sides, fit the lever spring onto the raised portion of the pivot.

NOTE:
Observing from the main case hole, check that the lever spring is installed securely.



(A) Release lever

2) Install the release bearing and fasten it with two clips.
3) Install the dust cover.



(A) Release lever
(B) Dust cover

4) Check the bearing for smooth movement by operating the release lever.
5) Apply grease to the contact point of the release lever and operating cylinder.

Grease
NICHIMOLY N-130 or equivalent

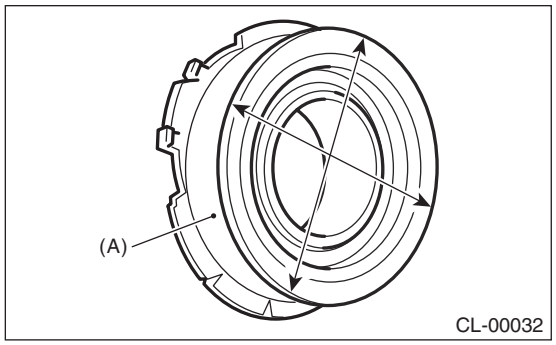
6) Install the transmission assembly. <Ref. to 5MT-26, INSTALLATION, Manual Transmission Assembly.>

C: INSPECTION

1. RELEASE BEARING

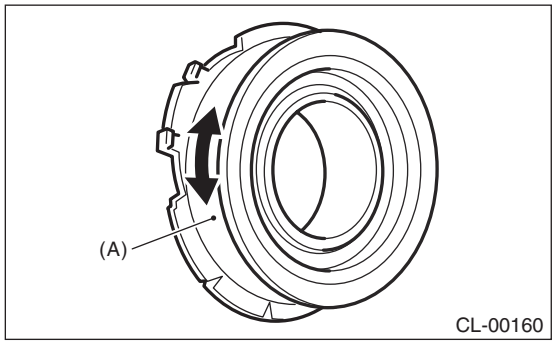
CAUTION:
Since this bearing is grease-sealed and is a non-lubrication type, do not wash with gasoline or any other solvent when servicing the clutch.
1) Check the bearing for smooth movement by applying force to the bearing in the radial direction.

Radial direction stroke:
1.6 mm (0.063 in)



(A) Bearing case

2) While applying force to the bearing in the rotational direction, check the bearing for smooth rotation.

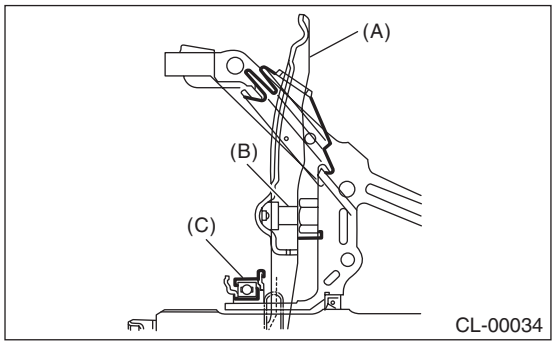


(A) Bearing case

3) Check for wear and damage at the bearing case surface in contact with the lever.

2. RELEASE LEVER

Check the pivot portion of the lever and the contact area with the release bearing case for wear.



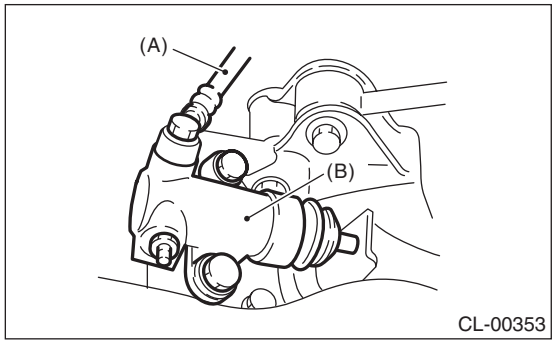
(A) Release lever
(B) Pivot
(C) Release bearing

5. Operating Cylinder

A: REMOVAL

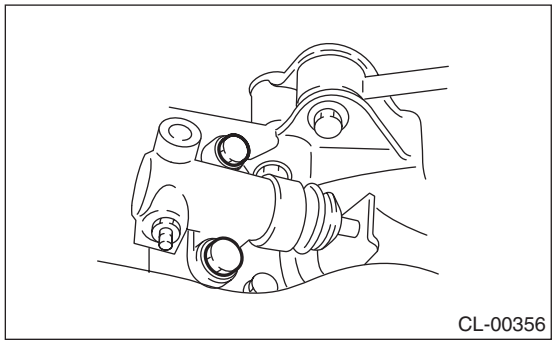
1) Remove the air intake boot assembly. <Ref. to IN(H4DO)-12, REMOVAL, Air Intake Boot.>
2) Disconnect the clutch hose from the operating cylinder.

CAUTION:
Cover the hose joint to prevent the clutch fluid from flowing out.



(A) Clutch hose
(B) Operating cylinder

3) Remove the operating cylinder from the transmission.



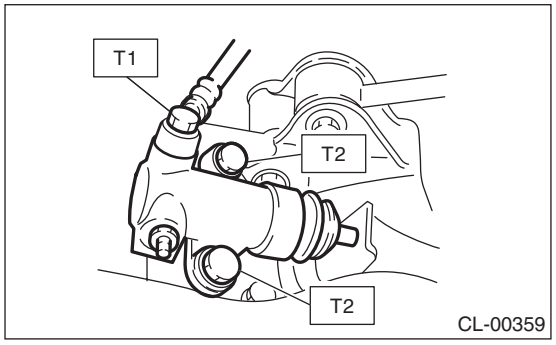
B: INSTALLATION

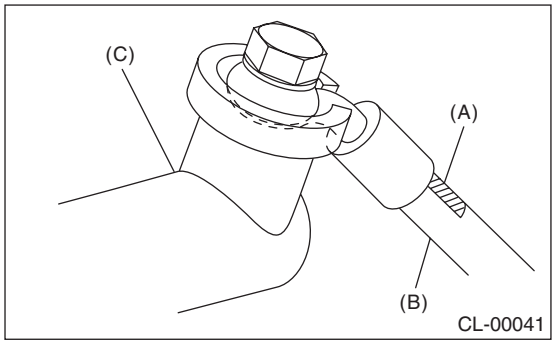
1) Install in the reverse order of removal.

NOTE:
• Before installing the operating cylinder, apply grease to the contact point of the release lever and operating cylinder.

Grease:
NICHIMOLY N-130 or equivalent
• Be sure to install the clutch hose with the mark side facing upward.
• Be careful not to twist the clutch hose during installation.
• Use a new gasket.

Tightening torque:
T1: 18 N·m (1.8 kgf-m, 13.3 ft-lb)
T2: 37 N·m (3.8 kgf-m, 27.3 ft-lb)



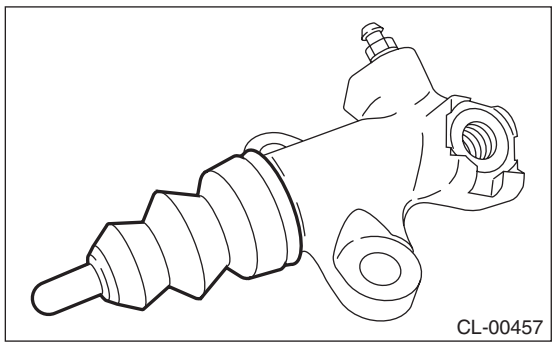


(A) Mark
(B) Clutch hose
(C) Operating cylinder

2) After bleeding air from the operating cylinder, ensure that the clutch operates properly. <Ref. to CL-22, Clutch Fluid Air Bleeding.>

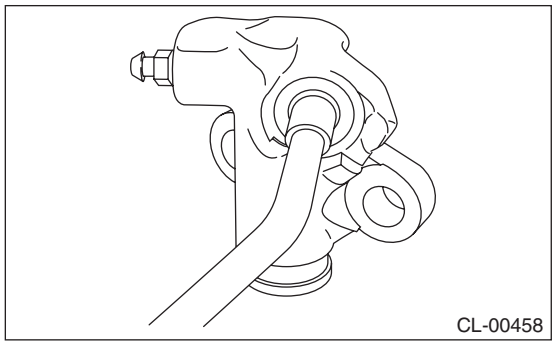
C: DISASSEMBLY

1) Remove the boot and push rod.

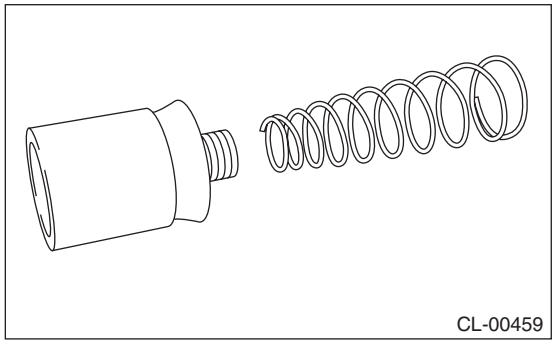


2) Apply compressed air through clutch hose attachment hole.

NOTE:
Face the piston hole down and place a piece of wood underneath to prevent the piston from popping out.



3) Separate the piston and piston spring.

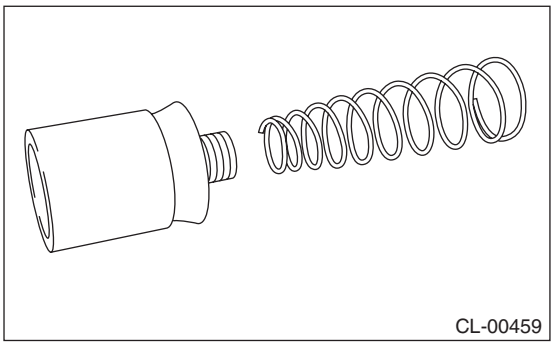


D: ASSEMBLY

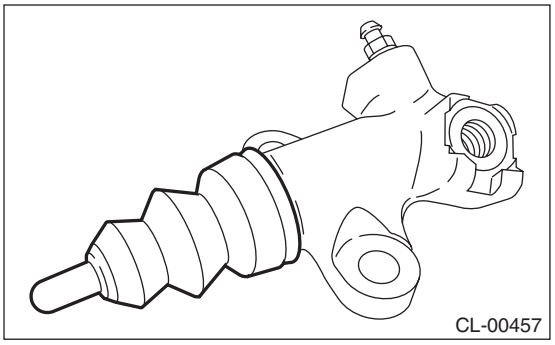
NOTE:
During assembly, apply hydraulic oil to all parts.

Recommended clutch fluid:
New FMVSS No. 116 DOT3 or DOT4

1) Install the piston spring onto the piston.



2) Insert piston into the operating cylinder.
3) Install push rod to the boot.
4) Install boot and push rod to the operating cylinder.



E: INSPECTION

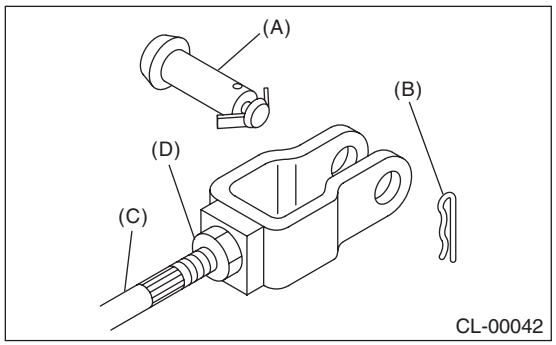
1) Check that the operating cylinder is not damaged. Replace the operating cylinder if it is damaged.
2) Check the clutch fluid leakage on the operating cylinder or the boot for damage. Replace the operating cylinder if clutch fluid leaks or boot damages are noted.

6. Master Cylinder

A: REMOVAL

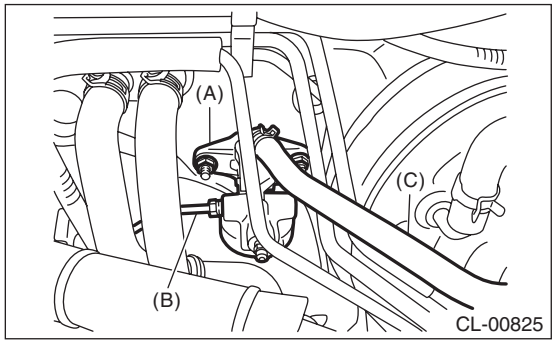
CAUTION:
Be careful not to spill the brake fluid. Brake fluid spilled on the vehicle body will harm the paint surface; wash it off with water and wipe clean quickly if spilled.

1) Drain the clutch fluid. <Ref. to CL-21, Clutch Fluid.>
2) Remove the cover assembly - instrument panel LWR driver. <Ref. to EI-62, REMOVAL, Instrument Panel Lower Cover.>
3) Remove the snap pin and clevis pin, and then separate the push rod of the master cylinder from clutch pedal.



(A) Clevis pin
(B) Snap pin
(C) Push rod
(D) Lock nut

4) Remove the air intake boot assembly. <Ref. to IN(H4DO)-12, REMOVAL, Air Intake Boot.>
5) Disconnect the clutch pipe and tank hose from the master cylinder.
6) Remove the master cylinder.

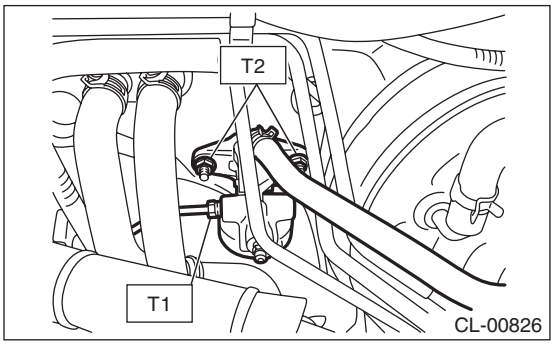


(A) Master cylinder
(B) Clutch pipe
(C) Tank hose

B: INSTALLATION

1) Install the master cylinder to the vehicle body, and connect the clutch pipe and tank hose to the master cylinder.

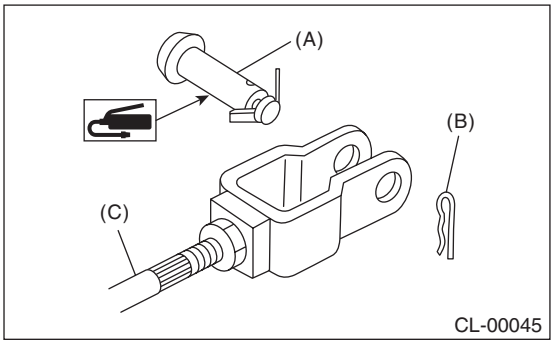
Tightening torque:
T1: 15 N·m (1.5 kgf-m, 11.1 ft-lb)
T2: 18 N·m (1.8 kgf-m, 13.3 ft-lb)



2) Connect the push rod of the master cylinder to the clutch pedal, and install the clevis pin and snap pin.

CAUTION:
Always use a new clevis pin.

NOTE:
Apply grease to the clevis pin.

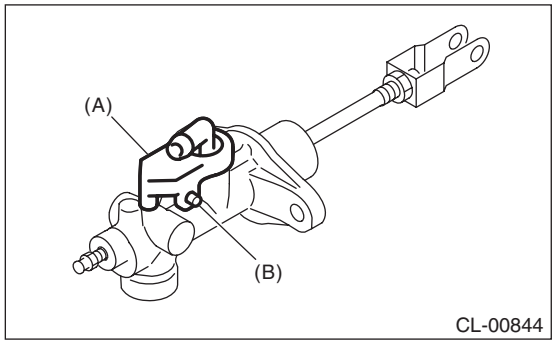


(A) Clevis pin
(B) Snap pin
(C) Push rod

3) Install the cover assembly - instrument panel LWR driver. <Ref. to EI-62, INSTALLATION, Instrument Panel Lower Cover.>
4) After bleeding air from the clutch system, ensure that the clutch operates properly. <Ref. to CL-22, Clutch Fluid Air Bleeding.>
5) Install the air intake boot assembly. <Ref. to IN(H4DO)-12, INSTALLATION, Air Intake Boot.>

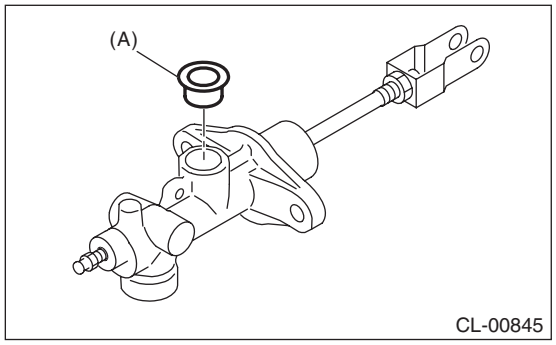
C: DISASSEMBLY

1) Remove the straight pin and nipple.



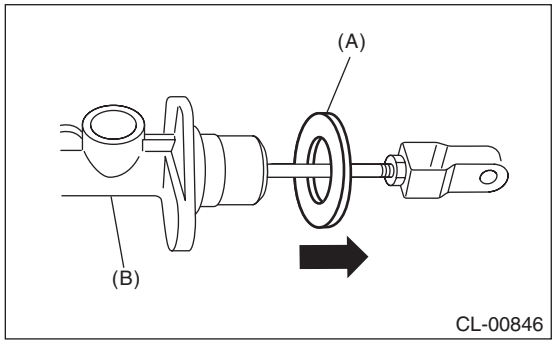
(A) Nipple
(B) Straight pin

2) Remove the oil seal.



(A) Oil seal

3) Move the seat towards the rear.



(A) Seat
(B) Master cylinder

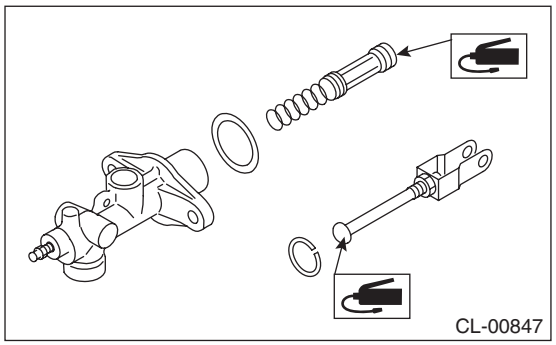
4) Remove the piston stop ring.

CAUTION:
When removing the piston stop ring, be careful to prevent the rod, washer, piston and return spring from popping out.

D: ASSEMBLY

1) Apply a coat of grease to the contact surfaces of the push rod and piston before installation.

Grease:
SILICONE GREASE G-40M or equivalent

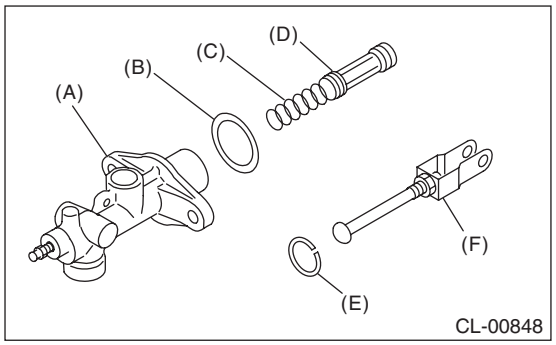


2) Assemble in the reverse order of disassembly.

Tightening torque:
10 N·m (1.0 kgf-m, 7.4 ft-lb)

E: INSPECTION

If any damage, deformation, wear, swelling, rust or other faults are found on the cylinder, piston, push rod, nipple, return spring, breather screw, seat or hose, replace the faulty part.

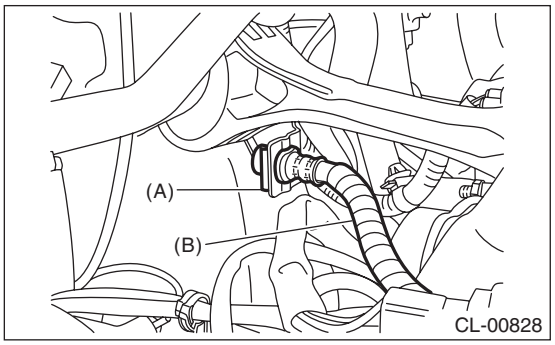


(A) Master cylinder body
(B) Seat
(C) Return spring
(D) Piston
(E) Piston stop ring
(F) Push rod ASSY

7. Clutch Pipe and Hose

A: REMOVAL

1) Remove the air intake boot assembly. <Ref. to IN(H4DO)-12, REMOVAL, Air Intake Boot.>
2) Drain the clutch fluid. <Ref. to CL-21, Clutch Fluid.>
3) Disconnect the clutch pipe from the clutch hose and master cylinder.
4) Pull out the clamp, then disconnect the clutch hose from the bracket.



(A) Clamp
(B) Clutch hose

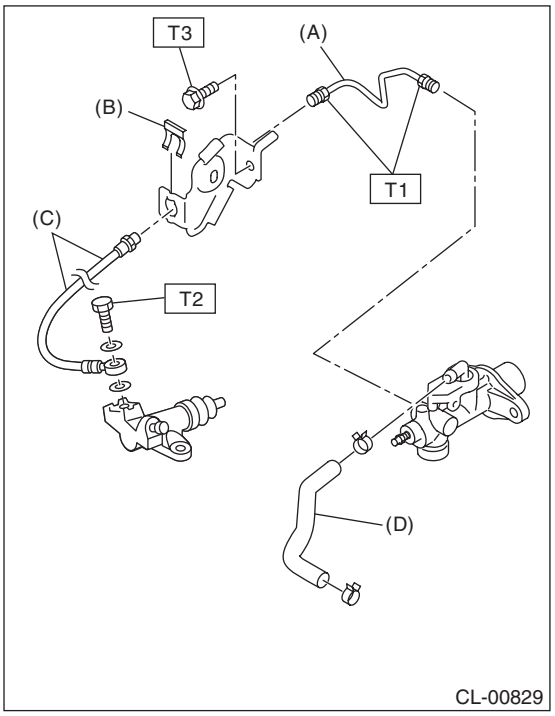
5) Remove the clutch hose from operating cylinder.
6) Remove the bracket.

B: INSTALLATION

Install in the reverse order of removal.

NOTE:
Bleed air from the clutch fluid. <Ref. to CL-22, Clutch Fluid Air Bleeding.>

Tightening torque:
T1: 15 N·m (1.5 kgf-m, 11.1 ft-lb)
T2: 18 N·m (1.8 kgf-m, 13.3 ft-lb)
T3: 25 N·m (2.5 kgf-m, 18.4 ft-lb)



(A) Clutch pipe
(B) Clamp
(C) Clutch hose
(D) Tank hose

C: INSPECTION

Check the pipes and hoses for breaks and damage. Check joints for fluid leakage. If crack, breakage or damage is found, repair or replace the faulty pipe or hose.

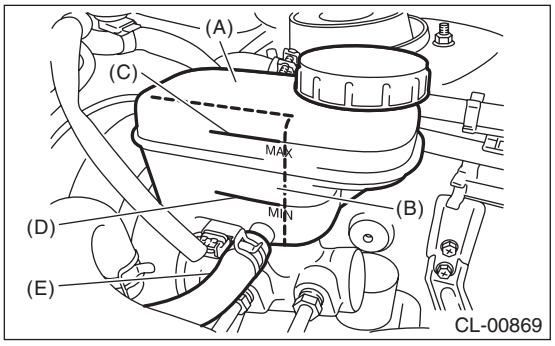
8. Clutch Fluid

A: INSPECTION

CAUTION:
Be careful not to spill the brake fluid. Brake fluid spilled on the vehicle body will harm the paint surface; wash it off with water and wipe clean quickly if spilled.

1) Park the vehicle on a level surface.
2) Inspect the fluid level using the scale on the outside of the reservoir tank. If the level is below “MIN”, add fluid to bring it up to “MAX”, and also inspect for leakage.

Recommended brake fluid:
New FMVSS No. 116 DOT3 or DOT4



(A) Reservoir tank
(B) Clutch fluid chamber
(C) MAX. level
(D) MIN. level
(E) Tank hose

CAUTION:
This reservoir tank has the brake fluid chamber and the clutch fluid chamber. When checking the fluid level, always check the fluid from the clutch fluid chamber side where the tank hose is connected.

B: REPLACEMENT

CAUTION:
• Be careful not to spill the brake fluid. Brake fluid spilled on the vehicle body will harm the paint surface; wash it off with water and wipe clean quickly if spilled.
• Use new FMVSS No. 116 DOT3 or DOT4.
• Cover the air breather with cloth to prevent brake fluid from being splashed on surrounding parts when loosening the breather.
• Avoid mixing brake fluid of different brands to prevent fluid performance from degrading.
• Be careful not to allow dirt or dust to enter the reservoir tank.

NOTE:
• During the bleeding operation, keep the reservoir tank filled with brake fluid to prevent entry of air.
• Clutch pedal must be operated very slowly.
• Bleed air from the oil line with help of a co-worker.
• The amount of brake fluid required is approximately 150 m ℓ (5.1 US fl oz, 5.3 Imp fl oz) for total clutch system.

1) Remove the air intake boot assembly. <Ref. to IN(H4DO)-12, REMOVAL, Air Intake Boot.>
2) Drain the brake fluid from the air breather of the operating cylinder.
3) Refill the reservoir tank with recommended brake fluid.

Recommended brake fluid:
New FMVSS No. 116 DOT3 or DOT4

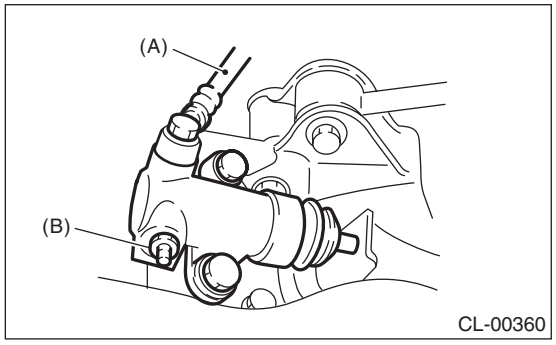
4) If necessary, bleed air from the clutch fluid. <Ref. to CL-22, Clutch Fluid Air Bleeding.>
5) Install the air intake boot assembly. <Ref. to IN(H4DO)-12, INSTALLATION, Air Intake Boot.>

9. Clutch Fluid Air Bleeding

A: PROCEDURE

CAUTION:
Be careful not to spill the brake fluid. Brake fluid spilled on the vehicle body will harm the paint surface; wash it off with water and wipe clean quickly if spilled.

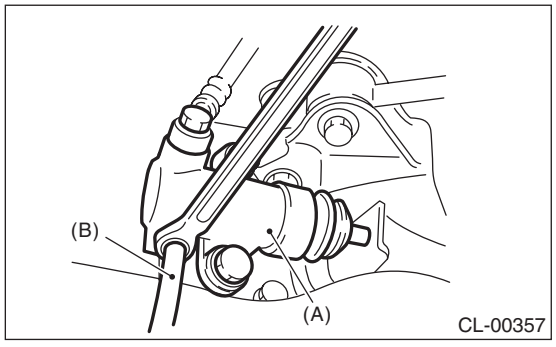
NOTE:
Bleed air from the oil line with help of a co-worker.
1) Remove the air intake boot assembly. <Ref. to IN(H4DO)-12, REMOVAL, Air Intake Boot.>
2) Fit one end of a vinyl tube into the air breather of the operating cylinder, and put the other end into a container.



(A) Clutch hose
(B) Air breather

3) Slowly depress the clutch pedal and keep it depressed. Then open the air breather to discharge air together with the fluid.
Release the air breather for 1 or 2 seconds. Next, with the breather closed, slowly release the clutch pedal.

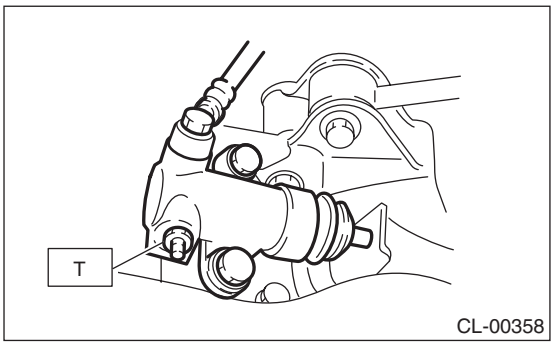
CAUTION:
Cover the breather with cloth to prevent brake fluid from being splashed on surrounding parts when loosening the breather.



(A) Operating cylinder
(B) Vinyl tube

4) Repeat procedure 3), until there are no more air bubbles appearing from the air breather.
5) Tighten the air breather.

Tightening torque:
T: 7.8 N·m (0.8 kgf-m, 5.8 ft-lb)

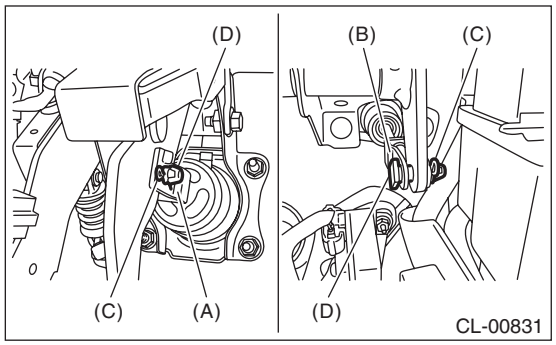


6) After stepping on the clutch pedal, make sure that there are no leaks evident in the entire clutch system.
7) After bleeding the air from clutch system, ensure that the clutch operates properly.
8) Install the air intake boot assembly. <Ref. to IN(H4DO)-12, INSTALLATION, Air Intake Boot.>

10.Clutch Pedal

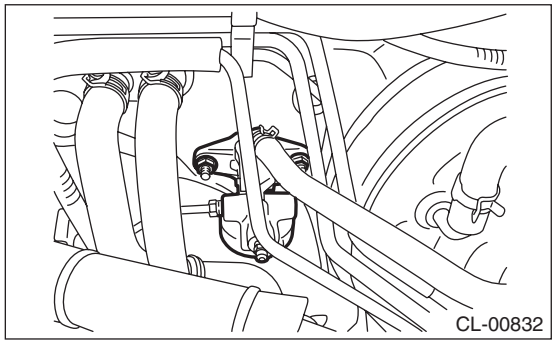
A: REMOVAL

1) Disconnect the ground cable from battery.
2) Remove the steering column. <Ref. to PS-18, REMOVAL, Steering Column.>
3) Disconnect the connector from the stop light switch and clutch switch.
4) Remove the snap pins from clevis pins which secure the lever to the push rod and operating rod.
5) Pull out the clevis pins which secures the lever to the push rod and operating rod.



(A) Operating rod
(B) Push rod
(C) Snap pin
(D) Clevis pin

6) Remove the air intake boot assembly. <Ref. to IN(H4DO)-12, REMOVAL, Air Intake Boot.>
7) Remove the nut which secures the clutch master cylinder.



8) Remove the bolts and nuts which secure the brake pedal and clutch pedal, and remove the pedal assembly.

NOTE:
Hold the clutch master cylinder with a wire or a string to avoid the clutch pipe from bending.

B: INSTALLATION

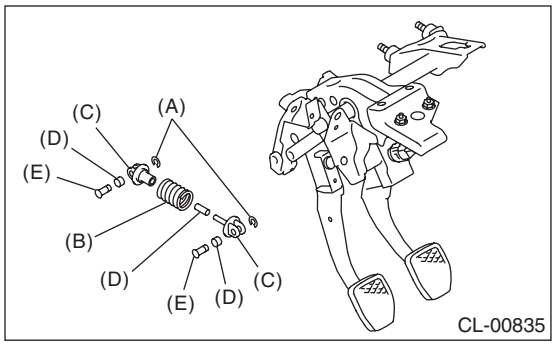
1) Install in the reverse order of removal.

Tightening torque:
18 N·m (1.8 kgf-m, 13.3 ft-lb)

CAUTION:
Always use a new clevis pin.
2) Adjust the clutch pedal after installation. <Ref. to CL-24, ADJUSTMENT, Clutch Pedal.>

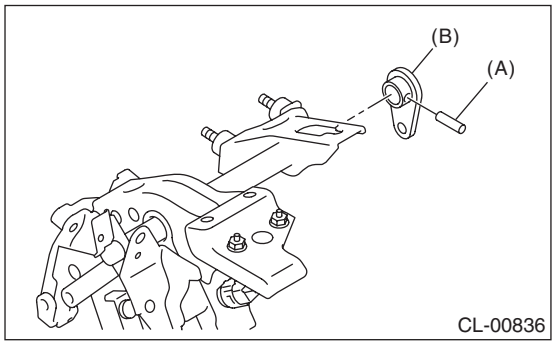
C: DISASSEMBLY

1) Remove the clutch switches.
2) Remove the clip, assist spring, rod and bushing.



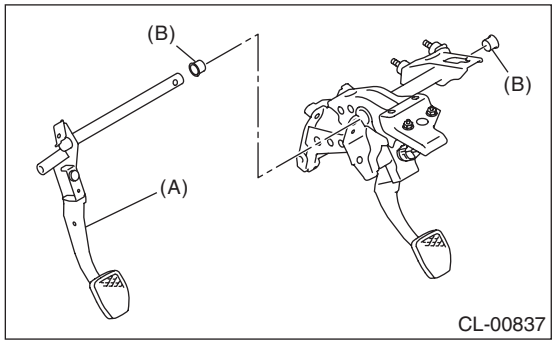
(A) Clip
(B) Assist spring
(C) Assist rod
(D) Bushing
(E) Clevis pin

3) Remove the spring pin and lever.



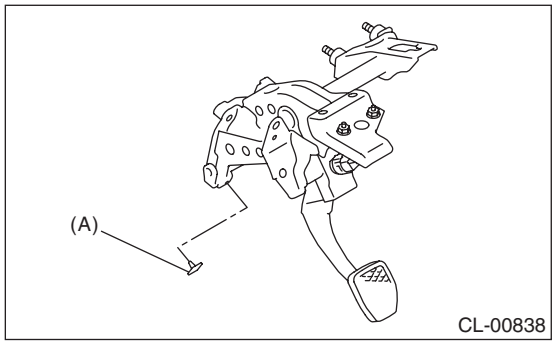
(A) Spring pin
(B) Lever

4) Remove the clutch pedal and bushings.



(A) Clutch pedal
(B) Bushing

5) Remove the stopper from the pedal bracket.



(A) Stopper

6) Remove the clutch pedal pad.

D: ASSEMBLY

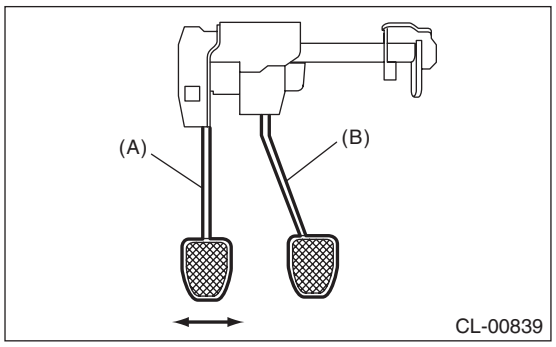
1) Temporarily assemble the clutch switch, etc. to pedal bracket.
2) Clean the clutch pedal and brake pedal bushing holes, apply grease, and install the bushings.
3) Align the holes of the pedal bracket, clutch pedal and brake pedal, and install the brake pedal return spring, assist rod, spring and bushing.
4) Install the clutch clevis pin and clips.

NOTE:
Clean the inside of the bushings and apply grease before installing the spacer.

E: INSPECTION

Move the clutch pedal pads in the lateral direction with a force of approximately 10 N (1 kgf, 2 lbf) to check that the clutch pedal deflection is within the service limit. If it exceeds the service limit, replace with new bushings.

Deflection of the clutch pedal:
Service limit
4.0 mm (0.157 in) or less



(A) Clutch pedal
(B) Brake pedal

F: ADJUSTMENT

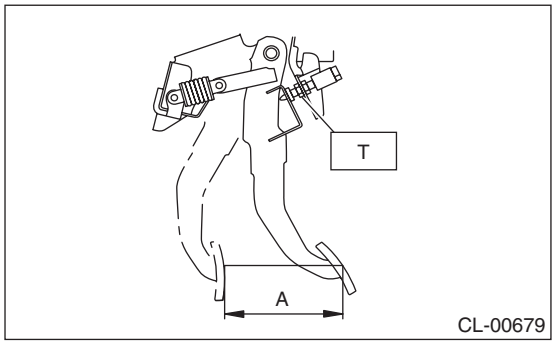
1) Turn the lock nut until the full stroke of clutch pedal becomes within the specification.

CAUTION:
When adjusting the full stroke of clutch pedal, do not turn the clutch switch.

NOTE:
If the lock nut cannot adjust the full stroke of clutch pedal to the specified value, adjust it by turning the master cylinder push rod.

Clutch pedal full stroke A:
130 — 135 mm (5.12 — 5.31 in)

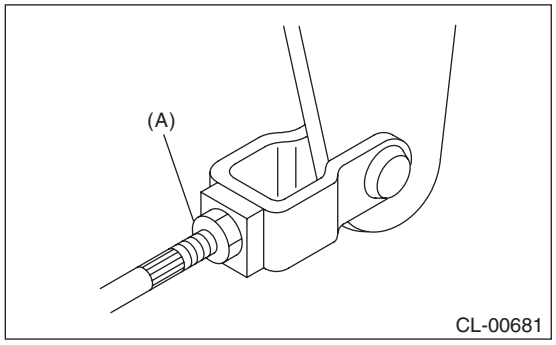
Tightening torque (Clutch switch lock nut):
T: 8 N·m (0.8 kgf-m, 5.9 ft-lb)



2) If the full stroke is not within the specified value, loosen the clutch switch lock nut to adjust.

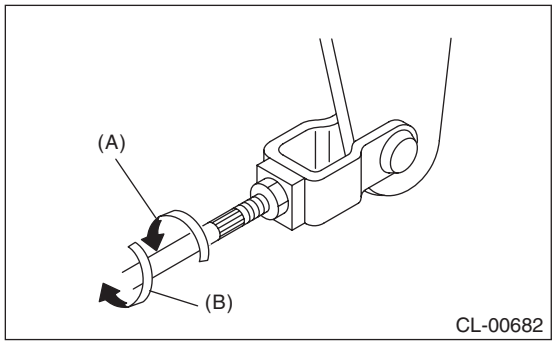
Tightening torque:
8 N·m (0.8 kgf-m, 5.9 ft-lb)

3) Loosen the push rod lock nuts.



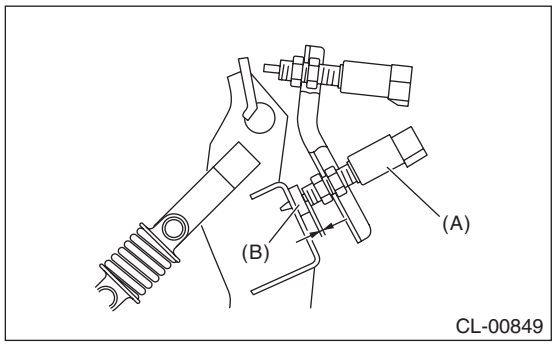
(A) Push rod lock nut

4) Make sure that the clutch pedal contacts the clutch pedal bracket stopper when the clutch pedal is at the maximum stroke position.



(A) In the longer direction
(B) In the shorter direction

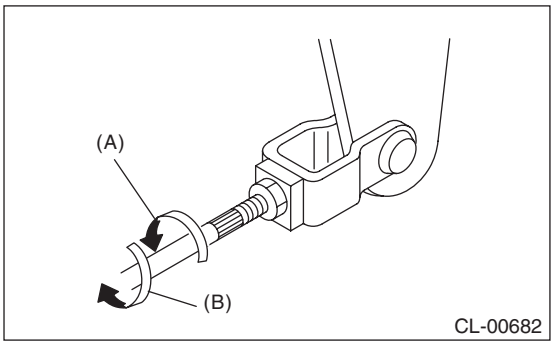
5) Make sure that the clutch pedal contacts the clutch switch side when the pedal is released.
6) Turn the push rod to shorten until a clearance is gained on the clutch switch side.



(A) Clutch switch
(B) Stopper

7) Turn the push rod to lengthen until clutch pedal contacts the clutch switch.

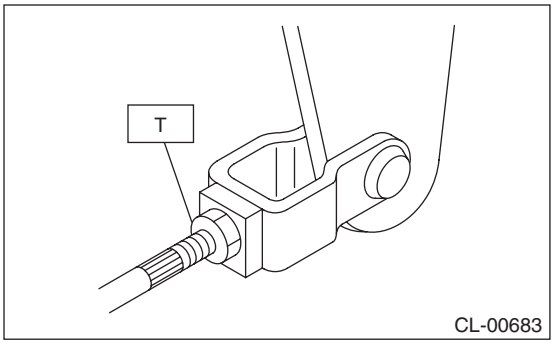
8) Turn further in the direction that will shorten the push rod by 270°.



(A) In the longer direction
(B) In the shorter direction

9) Check that the clevis pin moves smoothly by moving it in the left and right directions.
10) Tighten the push rod lock nut.

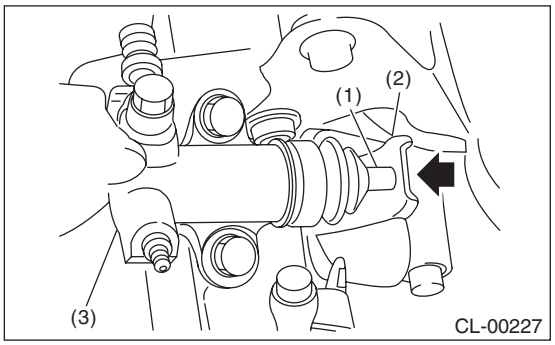
Tightening torque (Push rod lock nut):
T: 10 N·m (1.0 kgf-m, 7.4 ft-lb)



11) Depress and release the clutch pedal two or three times to ensure that the clutch pedal and release lever operate smoothly. If the clutch pedal and release lever do not operate smoothly, bleed air from the clutch hydraulic system. <Ref. to CL-22, Clutch Fluid Air Bleeding.>
12) Measure the clutch pedal full stroke length again to ensure that it is within specifications. If it is not within specifications, repeat adjustment procedures again from the beginning.

Clutch pedal full stroke:
130 — 135 mm (5.12 — 5.31 in)

13) Push the release lever until the operating cylinder push rod retracts. Check that the clutch fluid level in the reservoir tank increases.



(1) Push rod
(2) Release lever
(3) Operating cylinder

14) If the clutch fluid level increases, hydraulic clutch play is correct.
15) If the clutch fluid level does not increase or push rod does not retract, readjust the clutch pedal.
16) Check the fluid level using the scale on the reservoir tank. <Ref. to CL-21, INSPECTION, Clutch Fluid.>

11.Clutch Switch

A: REMOVAL

1) Disconnect the ground cable from battery.
2) Remove the cover assembly - instrument panel LWR driver. <Ref. to EI-62, REMOVAL, Instrument Panel Lower Cover.>
3) Disconnect the connector of clutch switch.
4) Remove the clutch switches.

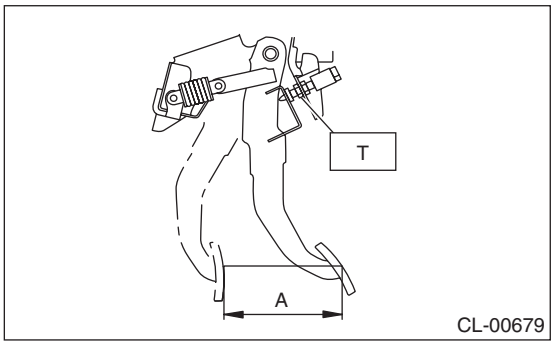
B: INSTALLATION

1. CLUTCH SWITCH

1) Move the clevis pin of push rod to left and right, retain it at the position where it moves smoothly, and measure the clutch pedal stroke.

Clutch pedal full stroke A:
130 — 135 mm (5.12 — 5.31 in)

Tightening torque:
T: 8 N·m (0.8 kgf-m, 5.9 ft-lb)

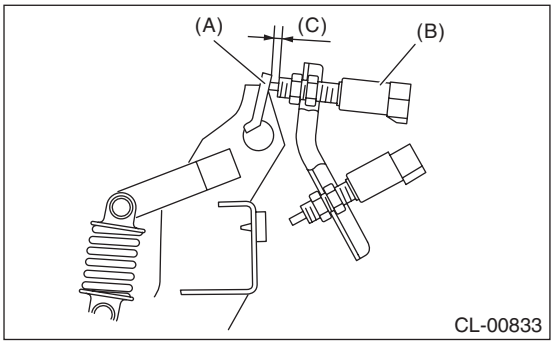


2) If the clutch pedal stroke is out of specification, adjust the stroke. <Ref. to CL-24, ADJUSTMENT, Clutch Pedal.>
3) Connect the clutch switch connector.

2. CLUTCH START SWITCH

1) Fully depress the clutch pedal and hold it.
2) Install the clutch pedal plate and clutch start switch so that the gap between them is 3 — 3.5 mm (0.12 — 0.14 in), and then tighten the lock nut.

Tightening torque:
8 N·m (0.8 kgf-m, 5.9 ft-lb)



(A) Plate
(B) Clutch start switch
(C) 3 — 3.5 mm (0.12 — 0.14 in)

3) Connect the clutch start switch connector.
4) Make sure that engine does not start with clutch pedal not depressed.
5) Make sure that engine starts with clutch pedal fully depressed.

C: INSPECTION

1. CLUTCH START SWITCH

1) Inspect the following items, and if the operation is not normal, adjust the clutch start switch and inspect again. <Ref. to CL-29, ADJUSTMENT, Clutch Switch.>

• Make sure that engine does not start with clutch pedal not depressed.

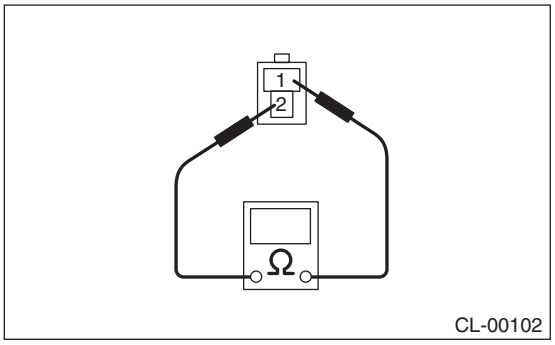
• Make sure that engine starts with clutch pedal fully depressed.

2) If the operation is not normal even after adjusting the clutch start switch, check the continuity of the clutch start switch.

(1) Remove the clutch start switch. <Ref. to CL-27, REMOVAL, Clutch Switch.>

(2) Measure the resistance between terminal 1 and 2 of the switch. If the resistance is not at the standard value, replace the switch.

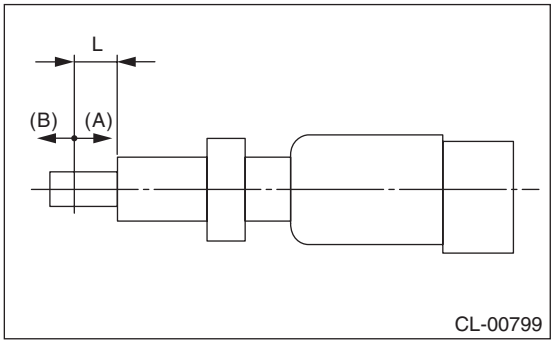
Condition	Terminal No.	Specified resistance
ON	No. 1 — No. 2	Less than 1 Ω
OFF	No. 1 — No. 2	1 MΩ or more



(3) Check that the switch changes between ON/OFF within L dimension.

L dimension:

4 — 5.5 mm (0.16 — 0.22 in)



(A) ON

(B) OFF

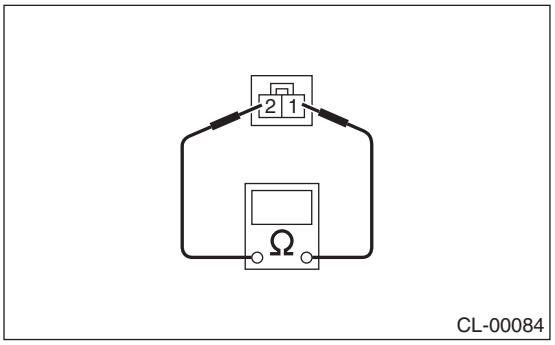
2. CLUTCH SWITCH

1) Check the clutch switch for continuity.

(1) Disconnect the connector of clutch switch.

(2) Measure the resistance between terminal 1 and 2 of the switch. If the resistance is not within the specification, inspect the clutch stroke and its installing condition, and check again.

Condition	Terminal No.	Specified resistance
When clutch pedal is depressed	No. 1 — No. 2	1 MΩ or more
When the clutch pedal is not depressed	No. 1 — No. 2	Less than 1 Ω

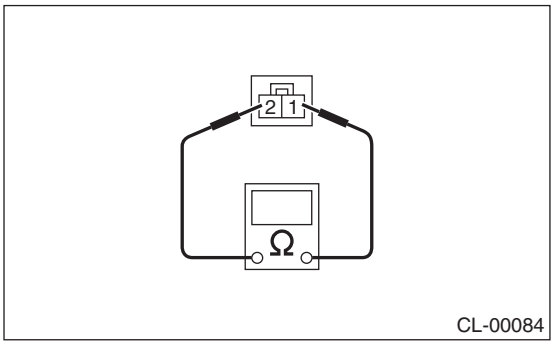


2) If the operation is not normal even when the clutch stroke and its installing condition is normal, check the continuity of the clutch switch.

(1) Remove the clutch switches. <Ref. to CL-27, REMOVAL, Clutch Switch.>

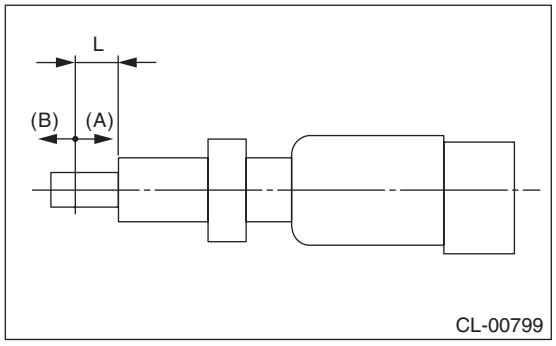
(2) Measure the resistance between terminal 1 and 2 of the switch. If the resistance is not at the standard value, replace the switch.

Condition	Terminal No.	Specified resistance
ON	No. 1 — No. 2	Less than 1 Ω
OFF	No. 1 — No. 2	1 MΩ or more



(3) Check that the switch changes between ON/OFF within L dimension.

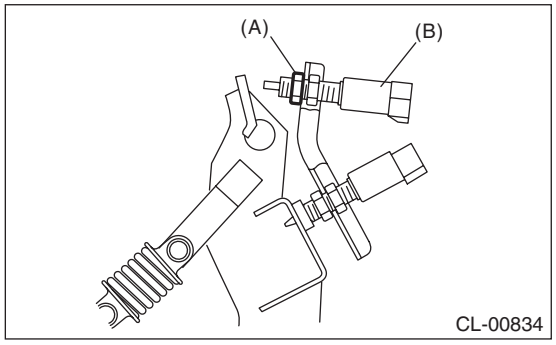
L dimension:
5 — 6.5 mm (0.2 — 0.26 in)



(A) ON
(B) OFF

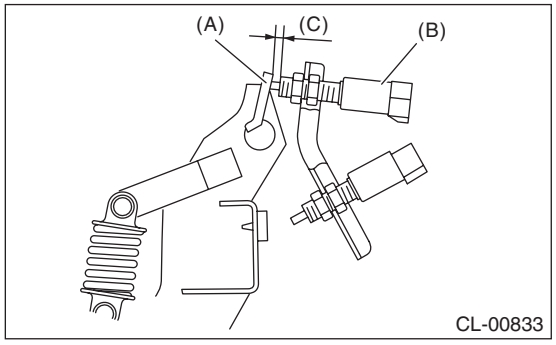
D: ADJUSTMENT

1) Loosen the lock nut of the clutch start switch.



(A) Lock nut
(B) Clutch start switch

2) Fully depress the clutch pedal and hold it.
3) Adjust the gap between the clutch pedal plate and the clutch start switch to be 3 — 3.5 mm (0.12 — 0.14 in).



(A) Plate
(B) Clutch start switch
(C) 3 — 3.5 mm (0.12 — 0.14 in)

4) Tighten the lock nut.

Tightening torque:
8 N·m (0.8 kgf-m, 5.9 ft-lb)

12.General Diagnostic Table

A: INSPECTION

1. CLUTCH

Symptoms	Possible cause	Corrective action
1. Clutch slippage. It is hard to perceive clutch slippage in the early stage, but pay attention to the following symptoms. • Engine speeds up when shifting. • High-speed driving is not possible; especially rapid acceleration is not possible and vehicle speed does not increase in proportion to the increase in engine speed. • Power drops particularly when ascending a slope, and there is a burning smell of the clutch plate. • Method of testing: Park the vehicle and fully apply the parking brake. Disengage the clutch and shift the transmission gear into the 1st. Gradually increase the engine speed while gradually allowing the clutch to engage. The clutch function is satisfactory if the engine stalls. However, the clutch is slipping if the vehicle does not move forward and the engine does not stall.	(a) Oil on the clutch face	Replace.
	(b) Worn clutch face	Replace.
	(c) Deteriorated diaphragm spring	Replace.
	(d) Warped pressure plate or flywheel	Repair or replace.
	(e) Defective release bearing holder	Repair or replace.
2. Clutch drags. As a symptom of this trouble, a harsh scratching noise occurs and control becomes difficult when shifting gears. The symptom becomes more apparent when shifting into the 1st gear. However, because most trouble of this sort is due to a defective synchronization mechanism, perform the following tests. • Method of testing: <Ref. to CL-31, DIAGNOSTIC DIAGRAM OF CLUTCH DRAG, INSPECTION, General Diagnostic Table.> The problem is caused by insufficient disengagement of the clutch if an abnormal noise occurs during this test.	(a) Worn or rusty clutch disc hub spline	Replace the clutch disc.
	(b) Excessive deflection of clutch disc face	Repair or replace.
	(c) Crankshaft pilot needle bearing sticking	Replace.
	(d) Cracked clutch disc face	Replace.
	(e) Stuck clutch disc (smeared by oil or water)	Replace.
3. Clutch chatters. Clutch chattering is an unpleasant vibration to the whole vehicle when the vehicle is just started with clutch partially engaged.	(a) Adhesion of oil on the clutch face	Replace the clutch disc.
	(b) Weak or broken damper spring	Replace the clutch disc.
	(c) Poor contact of the disc surface or excessively worn disc	Replace the faulty clutch disc.
	(d) Warped pressure plate or flywheel	Repair or replace.
	(e) Loose disc rivets	Replace the clutch disc.
	(f) Loose engine mounting	Retighten or replace mounting.
	(g) Loose pitching stopper	Retighten the pitching stopper. Or replace it.

Symptoms	Possible cause	Corrective action
4. Noisy clutch Noise occurs when the clutch is disengaged, engaged, or partially engaged.	(a) Broken, worn or insufficiently lubricated release bearing	Replace the release bearing.
	(b) Insufficient lubrication of the pilot bearing	Replace the pilot bearing.
	(c) Loose clutch disc hub	Replace the clutch disc.
	(d) Loose damper spring retainer	Replace the clutch disc.
	(e) Deteriorated or broken damper spring	Replace the clutch disc.
5. Clutch grabs suddenly. When starting the vehicle with the clutch partially engaged, the clutch engages suddenly and the vehicle jumps instead of making a smooth start.	(a) Grease or oil on facing	Replace the clutch disc.
	(b) Deteriorated cushioning spring	Replace the clutch disc.
	(c) Worn or rusted spline of clutch disc or main shaft	Take off rust, apply grease or replace clutch disc or main shaft.
	(d) Deteriorated or broken damper spring	Replace the clutch disc.
	(e) Loose engine mounting	Retighten or replace mounting.
	(f) Deteriorated diaphragm spring	Replace.

2. CLUTCH PEDAL

Symptoms	Corrective action
Insufficient clutch pedal free play	Adjust the free play of the pedal.
Excessively worn and damaged pedal shaft and/or bushing	Replace the bushing or shaft with a new part.

3. DIAGNOSTIC DIAGRAM OF CLUTCH DRAG

Step		Check	Yes	No
1	**CHECK GEAR NOISE.** 1) Start the engine. 2) Disengage the clutch and shift quickly from neutral to reverse in idling condition.	Is there any abnormal noise from the transmission gear?	Go to step **2**.	Clutch is normal.
2	**CHECK GEAR NOISE.** Disengage the clutch at idle and shift from neutral to reverse within 0.5 — 1.0 seconds.	Is there any abnormal noise from the transmission gear?	Go to step **3**.	Inspect defective transmission or excessive clutch drag torque, pilot bearing, clutch disc, transmission and clutch disc hub spline.
3	**CHECK GEAR NOISE.** 1) Disengage the clutch at idle and shift from neutral to reverse within 0.5 — 1.0 seconds. 2) With the clutch disengaged, shift from neutral to reverse, reverse to neutral several times.	Is there any abnormal noise from the transmission gear?	Inadequate clutch disengage. Inspect the clutch disc, clutch cover, clutch release, and clutch pedal free play.	Clutch and flywheel seizure. Inspect the clutch disc and the spline of the clutch disc hub.

CHASSIS SECTION

FRONT SUSPENSION	FS
REAR SUSPENSION	RS
WHEEL AND TIRE SYSTEM	WT
TIRE PRESSURE MONITORING SYSTEM (DIAGNOSTICS)	TPM(diag)
DIFFERENTIALS	DI
TRANSFER CASE	TC
DRIVE SHAFT SYSTEM	DS
VEHICLE DYNAMICS CONTROL (VDC)	VDC
VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)	VDC(diag)
BRAKE	BR
PARKING BRAKE	PB
POWER ASSISTED SYSTEM (POWER STEERING)	PS
POWER ASSISTED SYSTEM (POWER STEERING) (DIAGNOSTICS)	PS(diag)

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.

FUJI HEAVY INDUSTRIES LTD. G1120BE4

FRONT SUSPENSION

FS

Page

1. General Description 2
2. Wheel Alignment 7
3. Front Crossmember 18
4. Front Crossmember Support Plate 26
5. Front Stabilizer 27
6. Front Ball Joint 30
7. Front Arm 34
8. Front Strut 40
9. General Diagnostic Table 46

1. General Description

A: SPECIFICATION

1. TORQUE CONVERTER

Model	DOHC Non-turbo
Type	Symmetric, 3-element, single stage, 2-phase torque converter
Stall torque ratio	2.34
Nominal mm (in)	236 (9.29)
Stall speed (at sea level)	2,350 — 3,100
One-way clutch	Sprague type one-way clutch

2. OIL PUMP

Type		Internal gear pump
Driving method		Driven by chain
Number of teeth	Inner rotor	8
	Outer rotor	9

3. TRANSMISSION CONTROL ELEMENT

Type	Forward continuously variable speed change, 1 reverse, planetary gear
Multi-plate clutch	1 sets
Multi-plate brake	1 sets

4. TRANSMISSION GEAR RATIO

Forward	3.581 — 0.570
Rev	3.667

5. PLATE

Number of forward clutch drive plates	3
Number of reverse brake drive plates	4

6. SELECTOR POSITION

P (Park)	Transmission neutral, output shaft locked, engine start enabled
R (Reverse)	Rev
N (Neutral)	Transmission neutral, engine start enabled
D (Drive)	Forward continuously variable speed change
M (manual mode) (paddle shift + side)	Manual gear change 1st → 2nd → 3rd → 4th → 5th → 6th
M (manual mode) (paddle shift –side)	Manual gear change 1st ← 2nd ← 3rd ← 4th ← 5th ← 6th
L (low)	Forward continuously variable speed change (engine brake)

7. HYDRAULIC CONTROL AND LUBRICATION

Type	Electronic hydraulic control (Gear ratio is changed by signals of vehicle speed and accelerator opening angle.)
Fluid	Specified fluid: SUBARU CVT OIL FOR LINEARTRONIC **CAUTION:** **Always use specified CVTF. Using other fluid will cause malfunction.**
Fluid capacity L (US qt, Imp qt)	11.93 — 12.43 (12.6 — 13.1, 10.5 — 10.9)
Lubrication system	Forced feed lubrication with oil pump

8. COOLING AND HARNESS

Cooling system	CVTF cooler (with warmer feature)
Inhibitor switch harness	16 poles
Transmission harness	12 poles

9. TRANSFER

Transfer type	Multi-plate transfer (MP-T)
Number of transfer clutch drives & driven plates	4
Control method	Electronic hydraulic type
Reduction gear ratio	1.000 (43/43)

10.REDUCTION GEAR RATIO

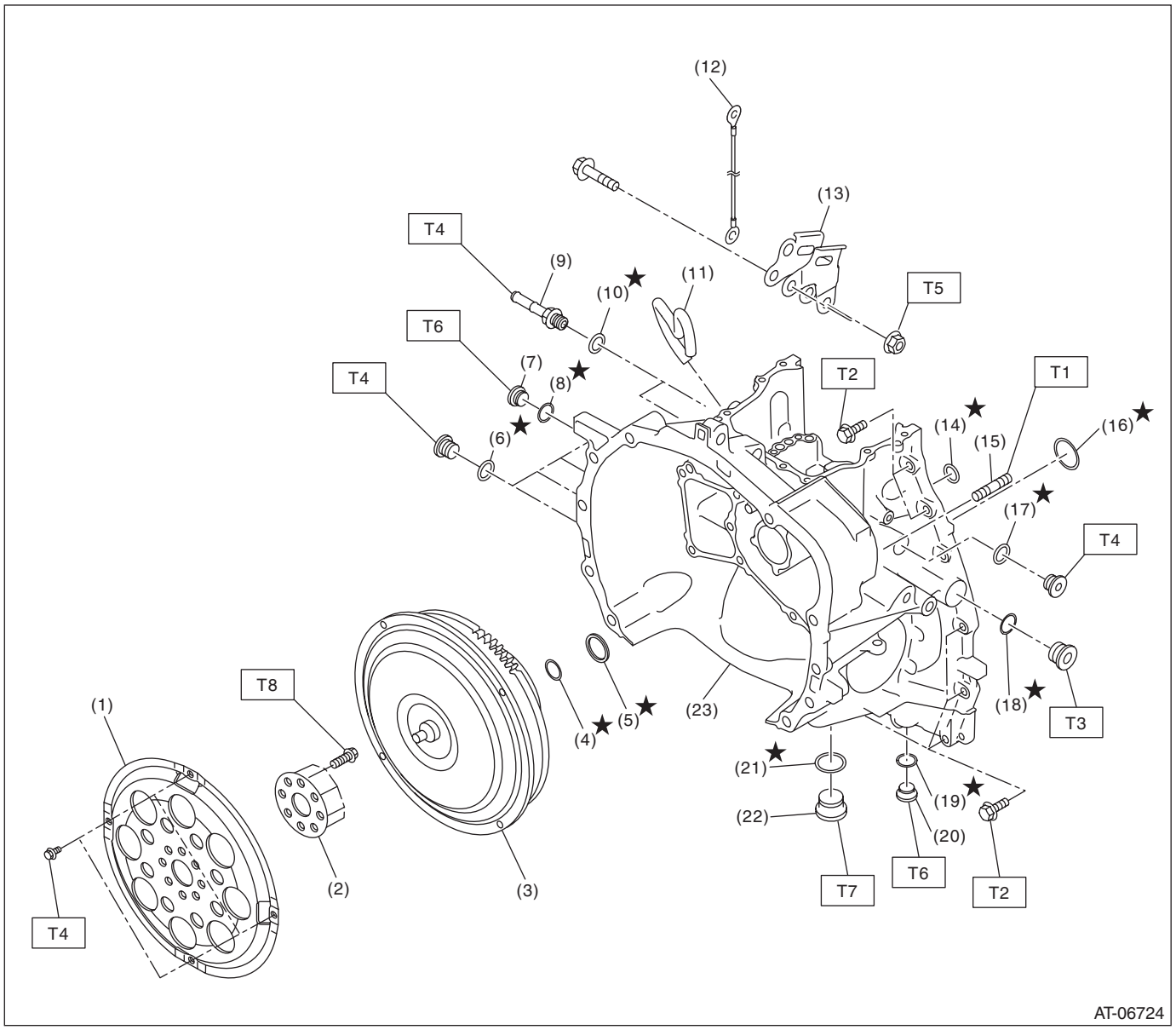
Front final reduction gear ratio	3.700

11.RECOMMENDED GEAR OIL

Lubrication oil	GL-5 (75W-90)
Front differential oil capacity ℓ (US qt, Imp qt)	1.3 — 1.4 (1.4 — 1.5, 1.1 — 1.2)

B: COMPONENT

1. TORQUE CONVERTER ASSEMBLY AND CONVERTER CASE

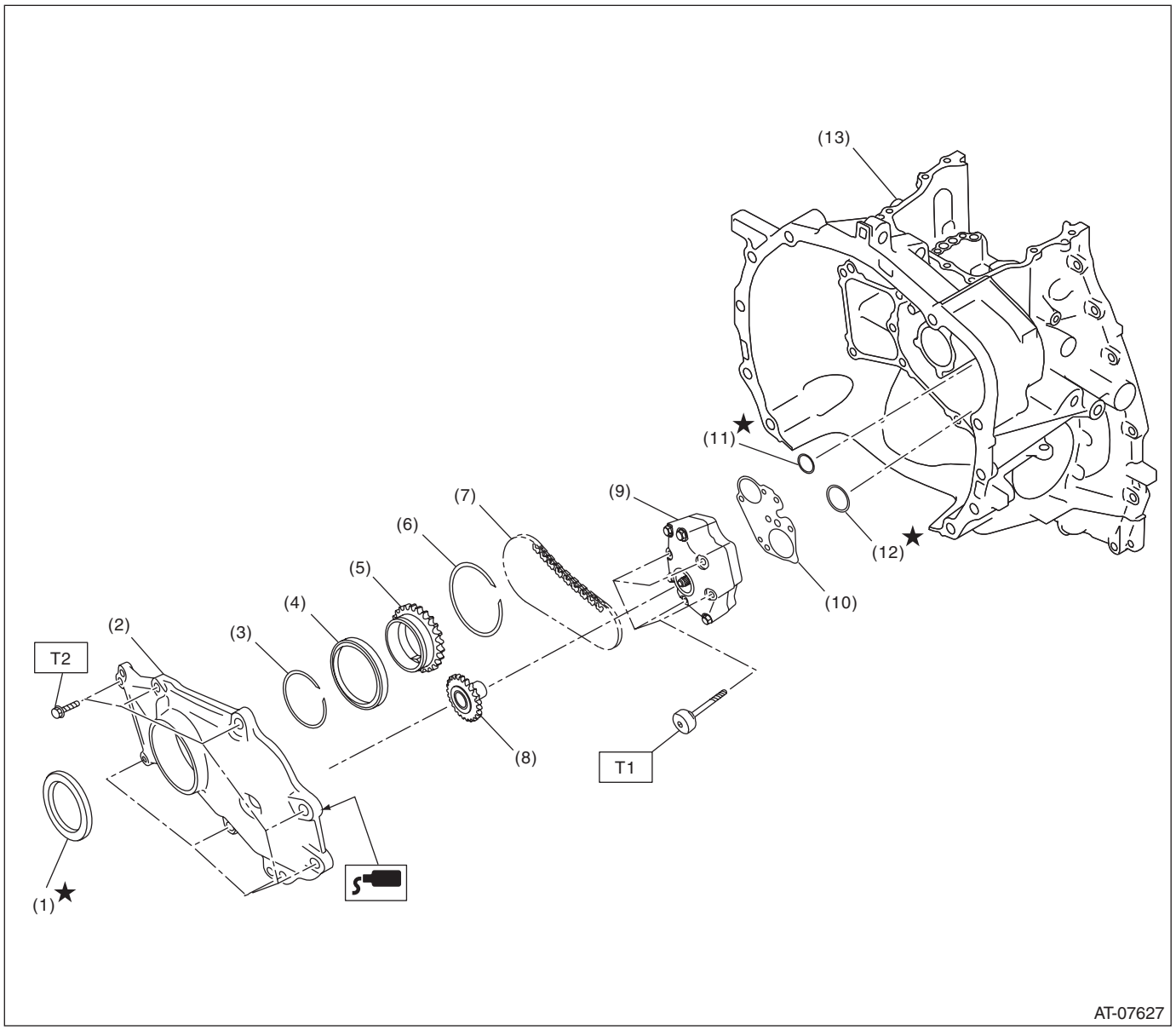


(1)	Drive plate	(13)	Pitching stopper bracket
(2)	Reinforcement drive plate	(14)	O-ring
(3)	Torque converter ASSY	(15)	Stud bolt
(4)	O-ring	(16)	O-ring
(5)	Seal ring	(17)	O-ring
(6)	O-ring	(18)	O-ring
(7)	Front differential gear oil filler plug	(19)	Gasket
(8)	O-ring	(20)	Overflow drain plug
(9)	Oil cooler pipe	(21)	Gasket
(10)	O-ring	(22)	Front differential gear oil drain plug
(11)	Air breather hose	(23)	Converter case
(12)	Transmission radio ground cord		

Tightening torque:N·m (kgf-m, ft-lb)

- ***T1: 18 (1.8, 13.3)***
- ***T2: 22 (2.2, 16.2)***
- ***T3: 22.5 (2.3, 16.6)***
- ***T4: 25 (2.5, 18.4)***
- ***T5: 41 (4.2, 30.2)***
- ***T6: 50 (5.1, 36.9)***
- ***T7: 70 (7.1, 51.6)***
- ***T8: <Ref. to CVT-150, INSTALLATION, Drive Plate.>***

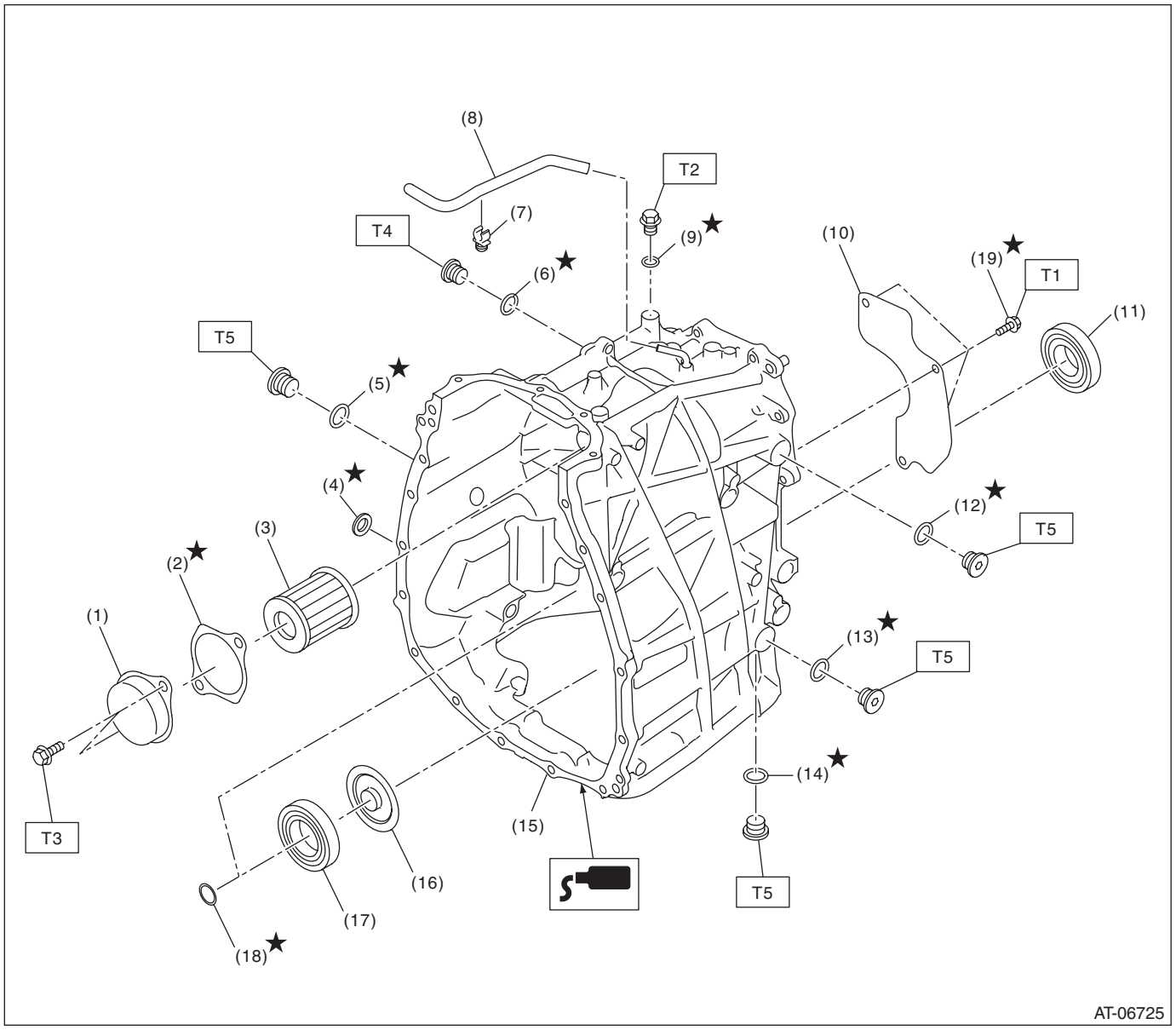
2. OIL PUMP ASSY



(1) Oil seal
(2) Oil pump chain cover
(3) Snap ring
(4) Ball bearing
(5) Drive sprocket
(6) Snap ring
(7) Oil pump chain
(8) Driven sprocket
(9) Oil pump ASSY
(10) Plate (Transmission serial No. 0047651 or later)
(11) O-ring (small)
(12) O-ring (large)
(13) Converter case

Tightening torque: N·m (kgf-m, ft-lb)
T1: 8.5 (0.9, 6.3)
T2: 21 (2.1, 15.5)

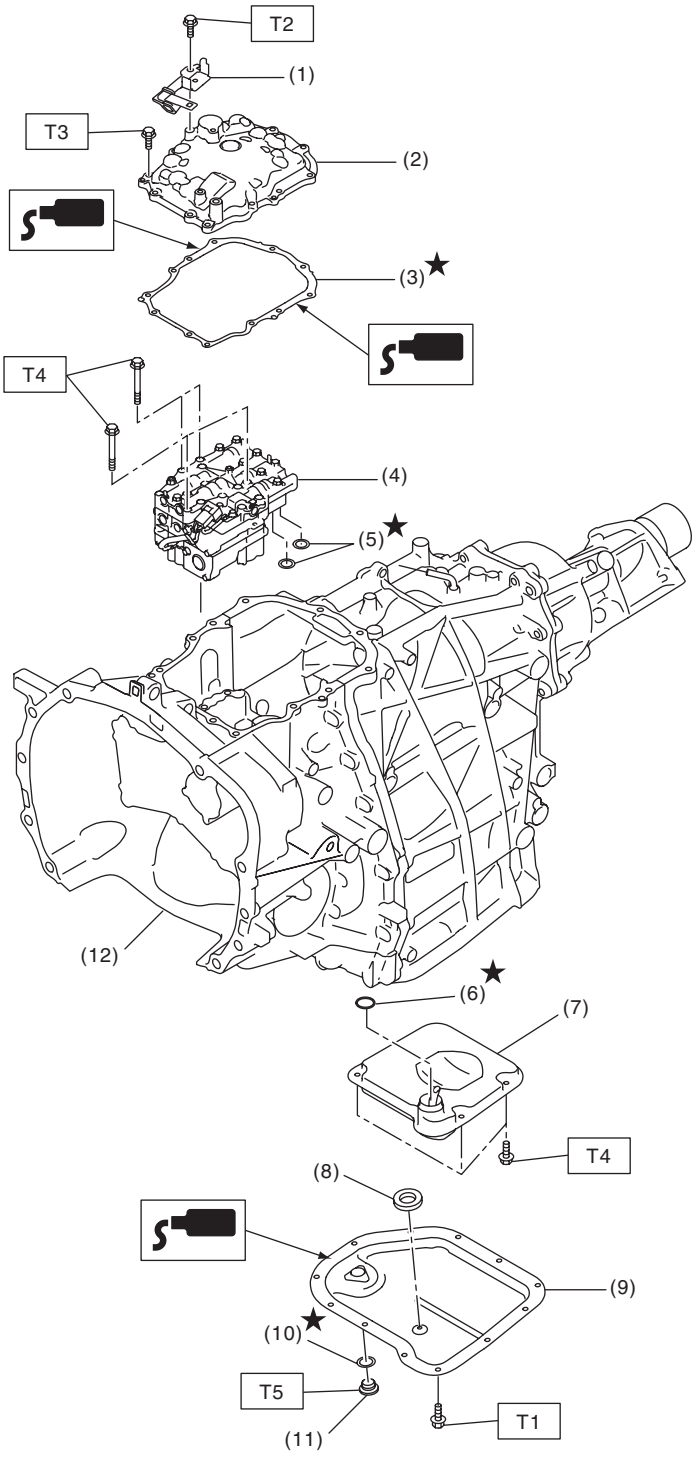
3. TRANSMISSION CASE



(1) CVTF filter cover
(2) Gasket
(3) CVTF filter
(4) Oil seal
(5) Gasket
(6) O-ring
(7) Clip
(8) Air breather hose
(9) O-ring
(10) Oil stopper plate
(11) Ball bearing
(12) O-ring
(13) Gasket
(14) O-ring
(15) Transmission case
(16) Oil guide
(17) Ball bearing
(18) Seal ring
(19) MEC bolt

Tightening torque:N·m (kgf-m, ft-lb)
T1: 9 (0.9, 6.6)
T2: 13 (1.3, 9.6)
T3: 17 (1.7, 12.5)
T4: 25 (2.5, 18.4)
T5: 50 (5.1, 25.8)

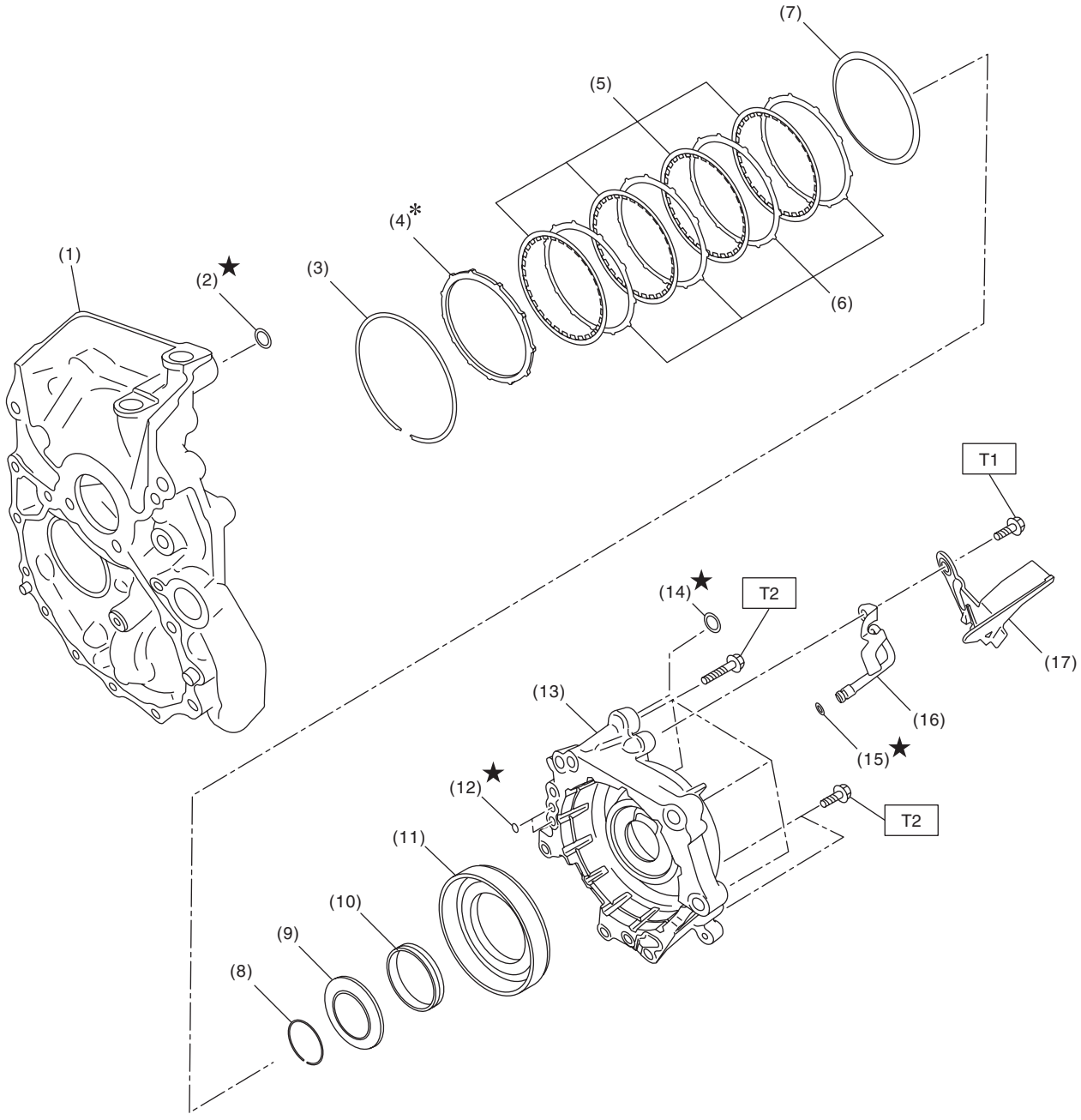
4. CONTROL VALVE BODY



AT-06726

(1)	Transmission harness stay	(7)	Oil strainer	***Tightening torque:N·m (kgf-m, ft-lb)***
(2)	Valve cover	(8)	Magnet	***T1: 5 (0.5, 3.7)***
(3)	Gasket	(9)	Oil pan	***T2: 7 (0.7, 5.2)***
(4)	Control valve body	(10)	Gasket	***T3: 8 (0.8, 5.9)***
(5)	O-ring	(11)	CVTF drain plug	***T4: 9 (0.9, 6.6)***
(6)	O-ring	(12)	Transmission ASSY	***T5: 31 (3.2, 22.9)***

5. REVERSE BRAKE ASSEMBLY

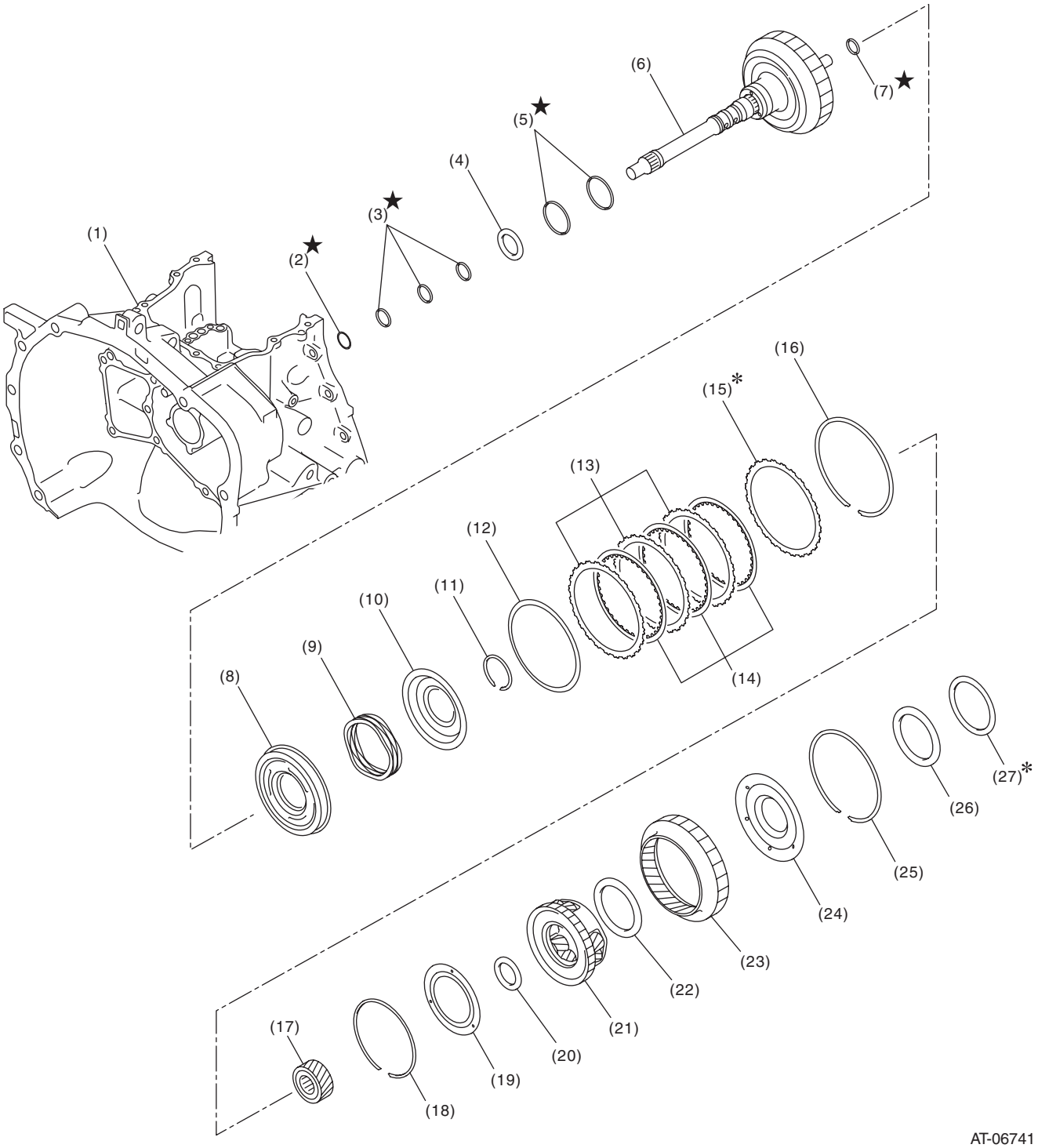


AT-06803

(1) Drive pinion retainer
(2) O-ring
(3) Snap ring
(4) Retaining plate
(5) Drive plate
(6) Driven plate
(7) Dish plate
(8) Snap ring
(9) Spring retainer
(10) Return spring
(11) Reverse brake piston
(12) O-ring
(13) Reverse brake housing
(14) O-ring
(15) O-ring
(16) Lubrication pipe
(17) Oil guide

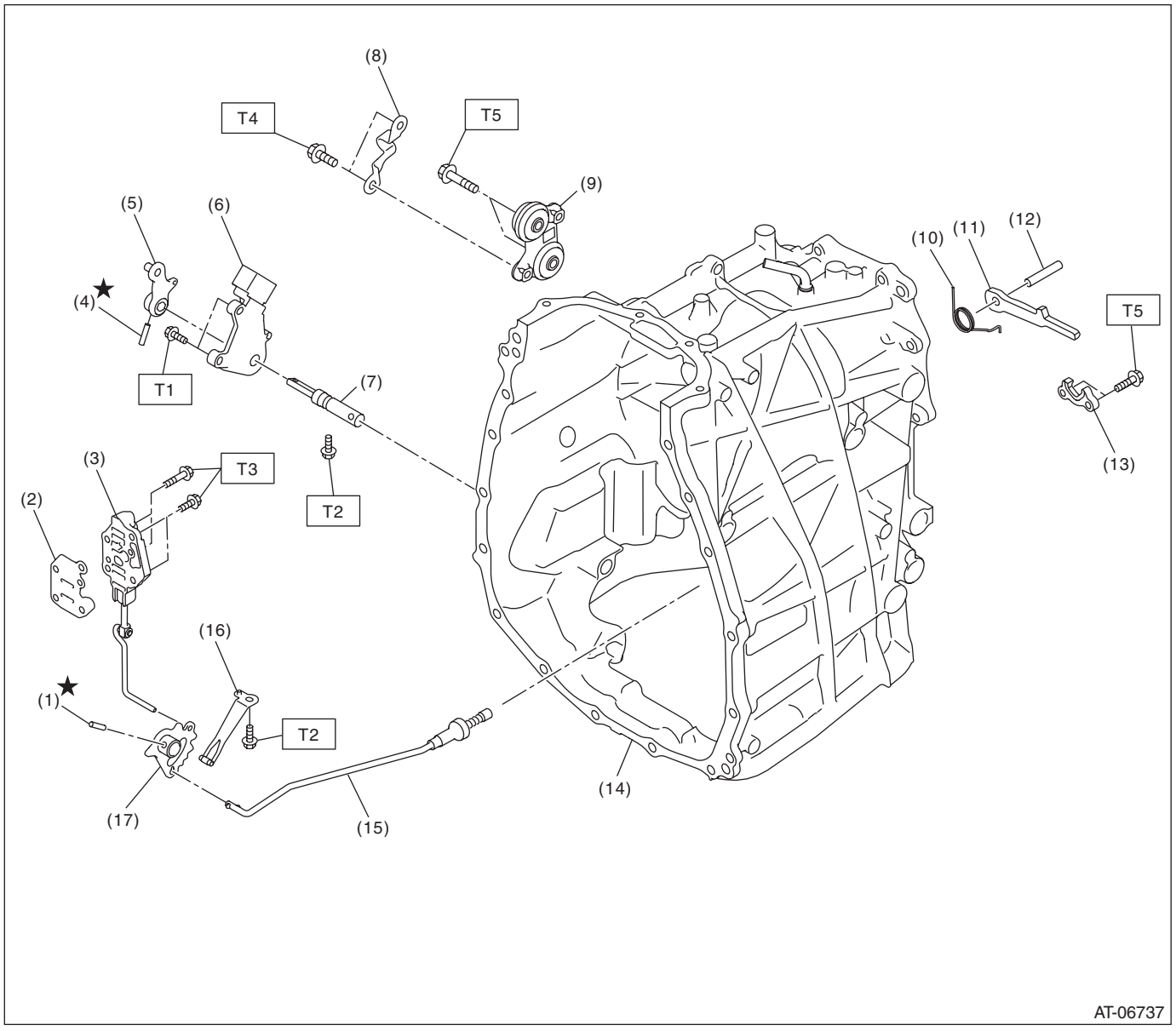
Tightening torque:N·m (kgf-m, ft-lb)
T1: 16 (1.6, 11.8)
T2: 37 (3.8, 27.3)

6. FORWARD CLUTCH ASSEMBLY



(1) Converter case
(2) O-ring
(3) Seal ring
(4) Thrust bearing
(5) Seal ring
(6) Forward clutch drum ASSY
(7) Seal ring
(8) Forward clutch piston
(9) Return spring
(10) Chamber COMPL
(11) Snap ring
(12) Dish plate
(13) Driven plate
(14) Drive plate
(15) Retaining plate
(16) Snap ring
(17) Sun gear
(18) Snap ring
(19) Balance oil guide
(20) Thrust bearing
(21) Planetary carrier ASSY
(22) Thrust bearing
(23) Internal gear
(24) Thrust gear plate
(25) Snap ring
(26) Thrust bearing
(27) Washer

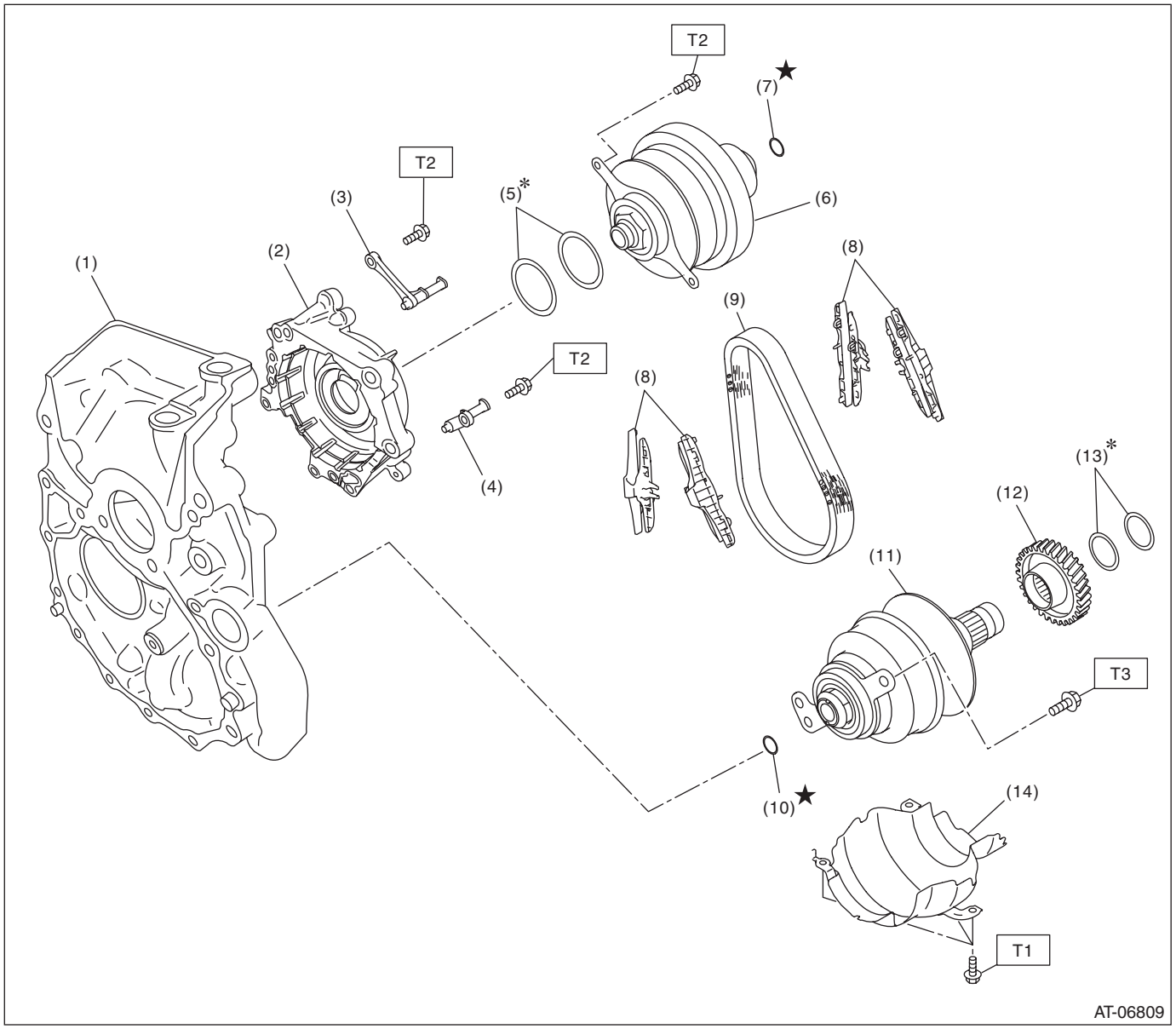
7. TRANSMISSION CONTROL DEVICE



(1) Spring pin
(2) Separator plate
(3) Manual valve ASSY
(4) Spring pin
(5) Shifter arm
(6) Inhibitor switch
(7) Shifter arm shaft
(8) Cable bracket
(9) Plate ASSY
(10) Return spring
(11) Parking pawl
(12) Shaft
(13) Parking support
(14) Transmission case
(15) Parking rod
(16) Detent spring
(17) Manual plate

Tightening torque:N·m (kgf-m, ft-lb)
T1: 5 (0.5, 3.7)
T2: 7 (0.7, 5.2)
T3: 9 (0.9, 6.6)
T4: 18 (1.8, 13.3)
T5: 25 (2.5, 18.4)

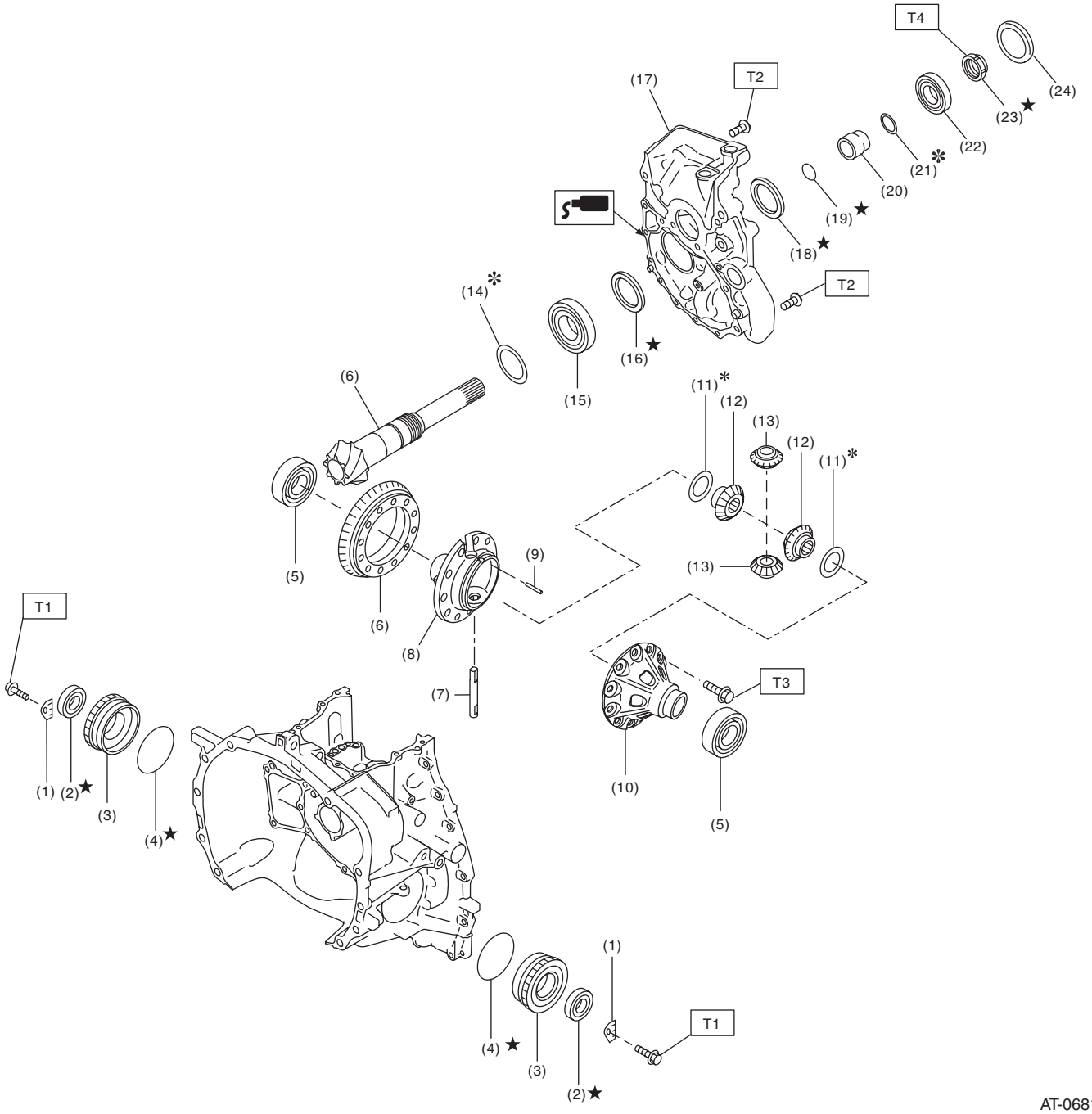
8. PRIMARY PULLEY, SECONDARY PULLEY & VARIATOR CHAIN AND REDUCTION DRIVE GEAR



(1)	Drive pinion retainer	(8)	Chain guide
(2)	Reverse brake housing	(9)	Variator chain
(3)	Support rod	(10)	Seal ring
(4)	Lubrication pipe	(11)	Secondary pulley ASSY
(5)	Primary pulley shim	(12)	Reduction drive gear
(6)	Primary pulley ASSY	(13)	Reduction gear shim
(7)	Seal ring	(14)	Oil baffle

Tightening torque:N·m (kgf-m, ft-lb)
T1: 16 (1.6, 11.8)
T2: 21 (2.1, 15.5)
T3: 67.5 (6.9, 49.8)

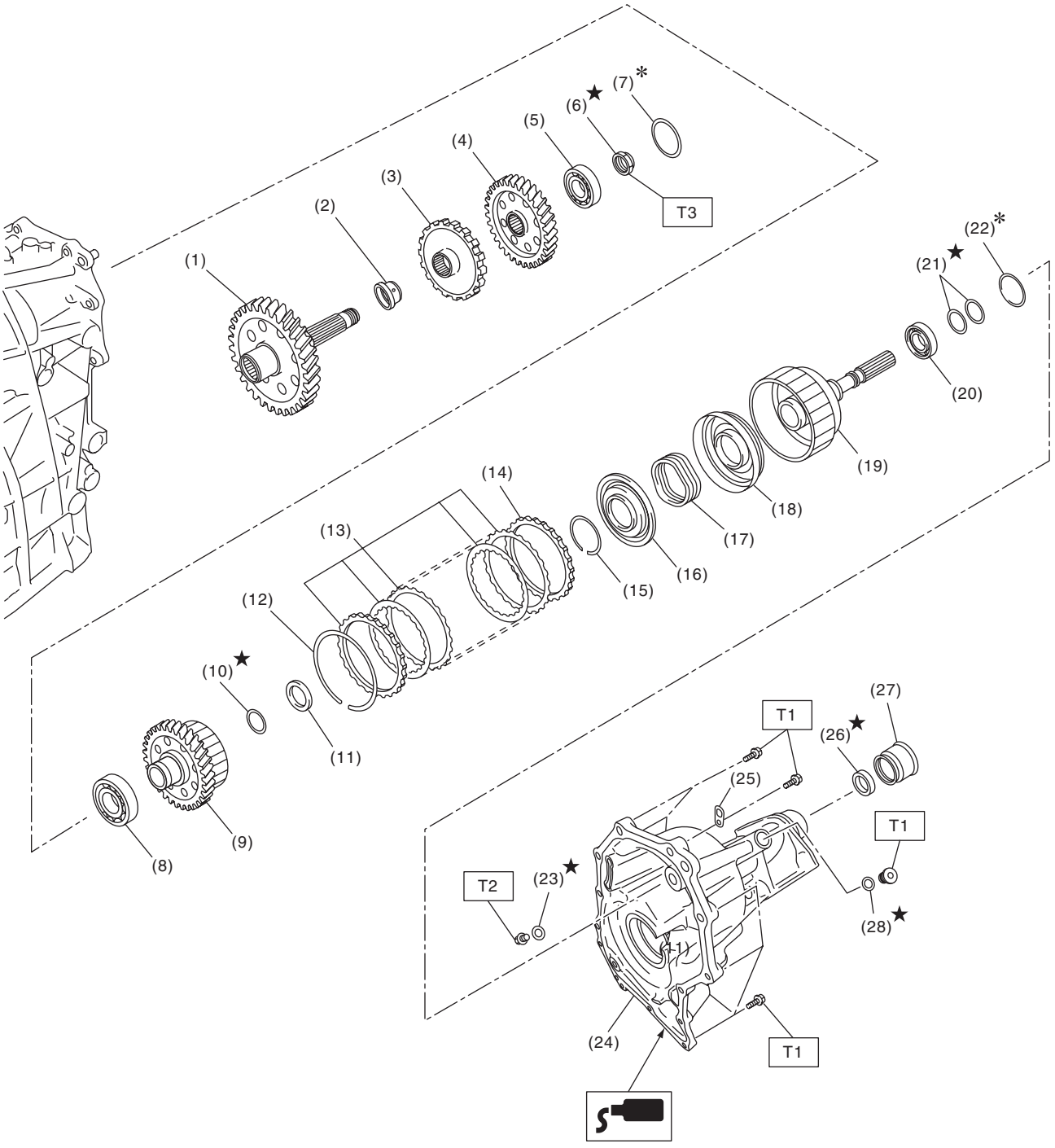
9. FRONT DIFFERENTIAL GEAR



(1) Lock plate
(2) Oil seal
(3) Differential side retainer
(4) O-ring
(5) Taper roller bearing
(6) Drive pinion gear set
(7) Pinion shaft
(8) Differential case RH
(9) Straight pin
(10) Differential case LH
(11) Washer
(12) Differential bevel gear
(13) Differential bevel pinion
(14) Drive pinion shim
(15) Taper roller bearing
(16) Oil seal
(17) Drive pinion retainer
(18) Oil seal
(19) O-ring
(20) Drive pinion spacer
(21) Drive pinion washer
(22) Taper roller bearing
(23) Lock nut
(24) Plug

Tightening torque:N·m (kgf-m, ft-lb)
T1: 25 (2.5, 18.4)
T2: 43 (4.4, 31.7)
T3: 64 (6.5, 47.2)
T4: <Ref. to CVT-276, ASSEMBLY, Drive Pinion Shaft Assembly.>

10.TRANSFER AND EXTENSION CASE

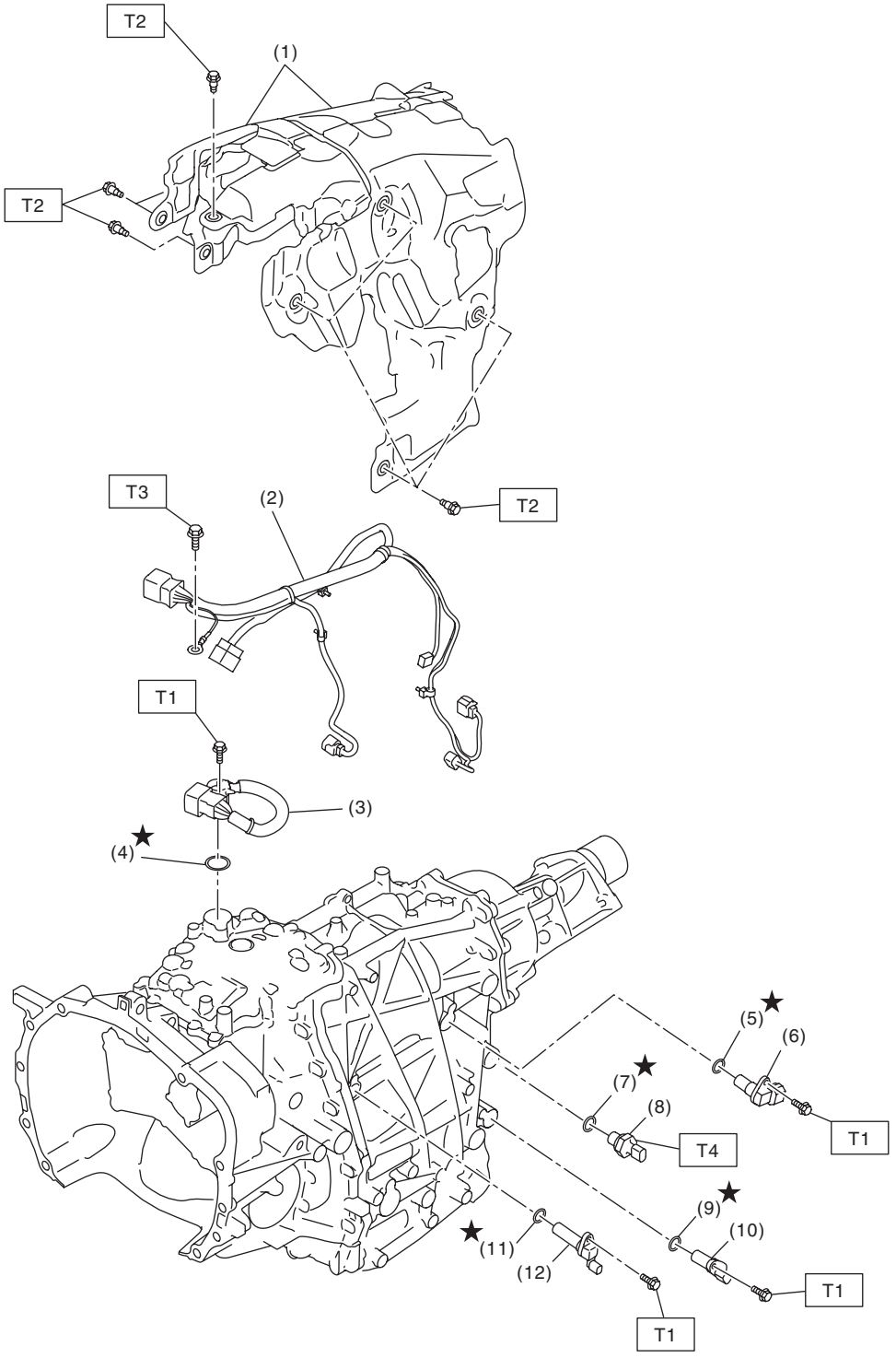


AT-06868

(1) Reduction driven gear COMPL
(2) Collar
(3) Parking gear
(4) Transfer drive gear
(5) Ball bearing
(6) Lock nut
(7) Transfer drive gear shim
(8) Ball bearing
(9) Transfer driven gear
(10) Seal ring
(11) Thrust bearing
(12) Snap ring
(13) Transfer clutch plate set
(14) Pressure plate
(15) Snap ring
(16) Transfer clutch piston seal
(17) Transfer clutch piston return spring
(18) Transfer clutch piston
(19) Rear drive shaft
(20) Ball bearing
(21) Seal ring
(22) Transfer driven gear shim
(23) Gasket
(24) Extension case
(25) Transmission hanger
(26) Oil seal
(27) Dust cover
(28) O-ring

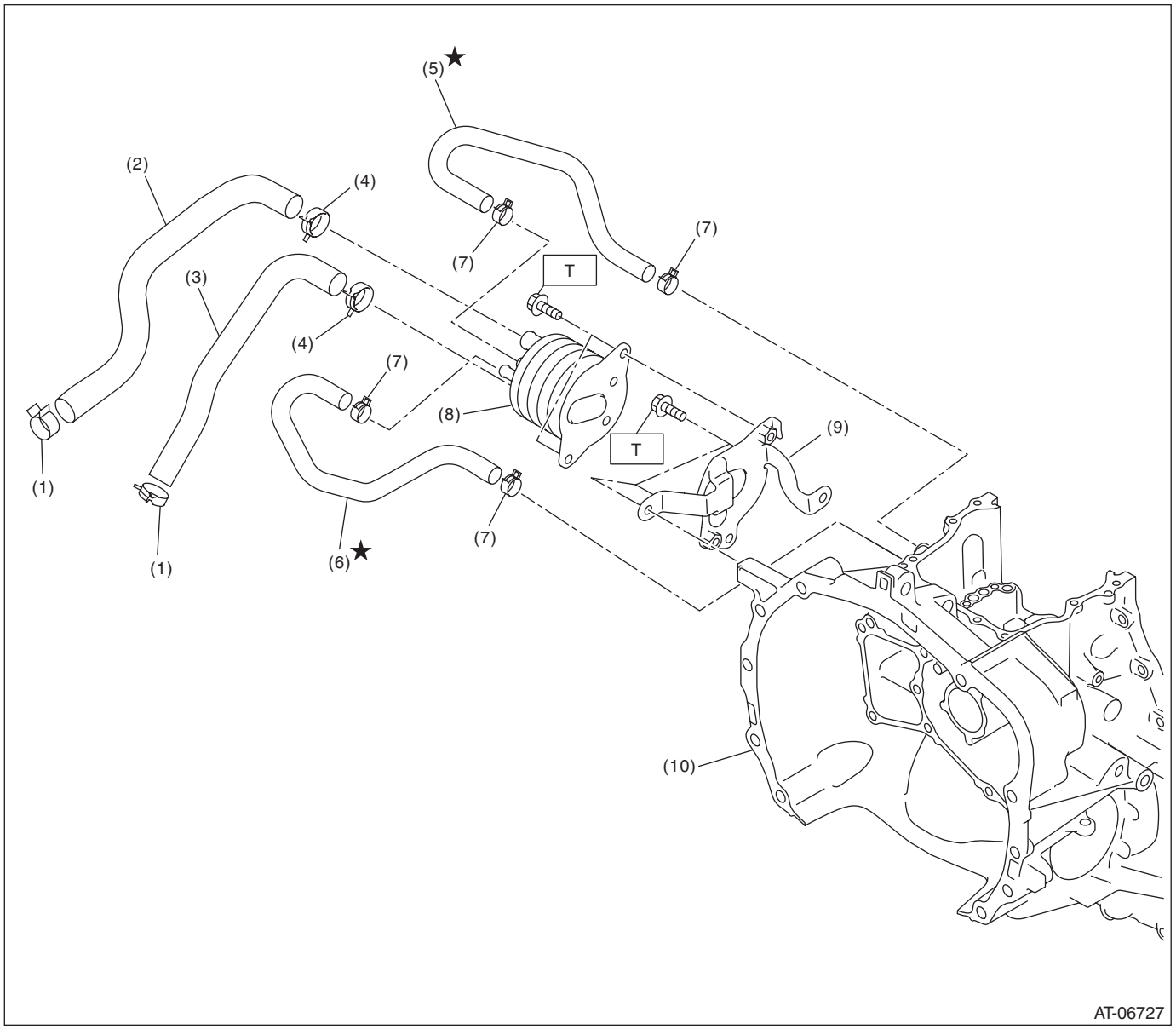
Tightening torque:N·m (kgf-m, ft-lb)
T1: 25 (2.5, 18.4)
T2: 35 (3.6, 25.8)
T3: 95 (9.7, 70.1)

11.TRANSMISSION HARNESS AND SENSOR



(1)	Transmission case cover	(7)	O-ring	***Tightening torque:N·m (kgf-m, ft-lb)***
(2)	Inhibitor harness	(8)	Secondary pressure sensor	***T1: 7 (0.7, 3.7)***
(3)	Transmission harness	(9)	O-ring	***T2: 8 (0.8, 5.9)***
(4)	O-ring	(10)	Secondary speed sensor	***T3: 14 (1.4, 10.3)***
(5)	O-ring	(11)	O-ring	***T4: 39 (4.0, 28.8)***
(6)	Primary speed sensor	(12)	Turbine speed sensor	

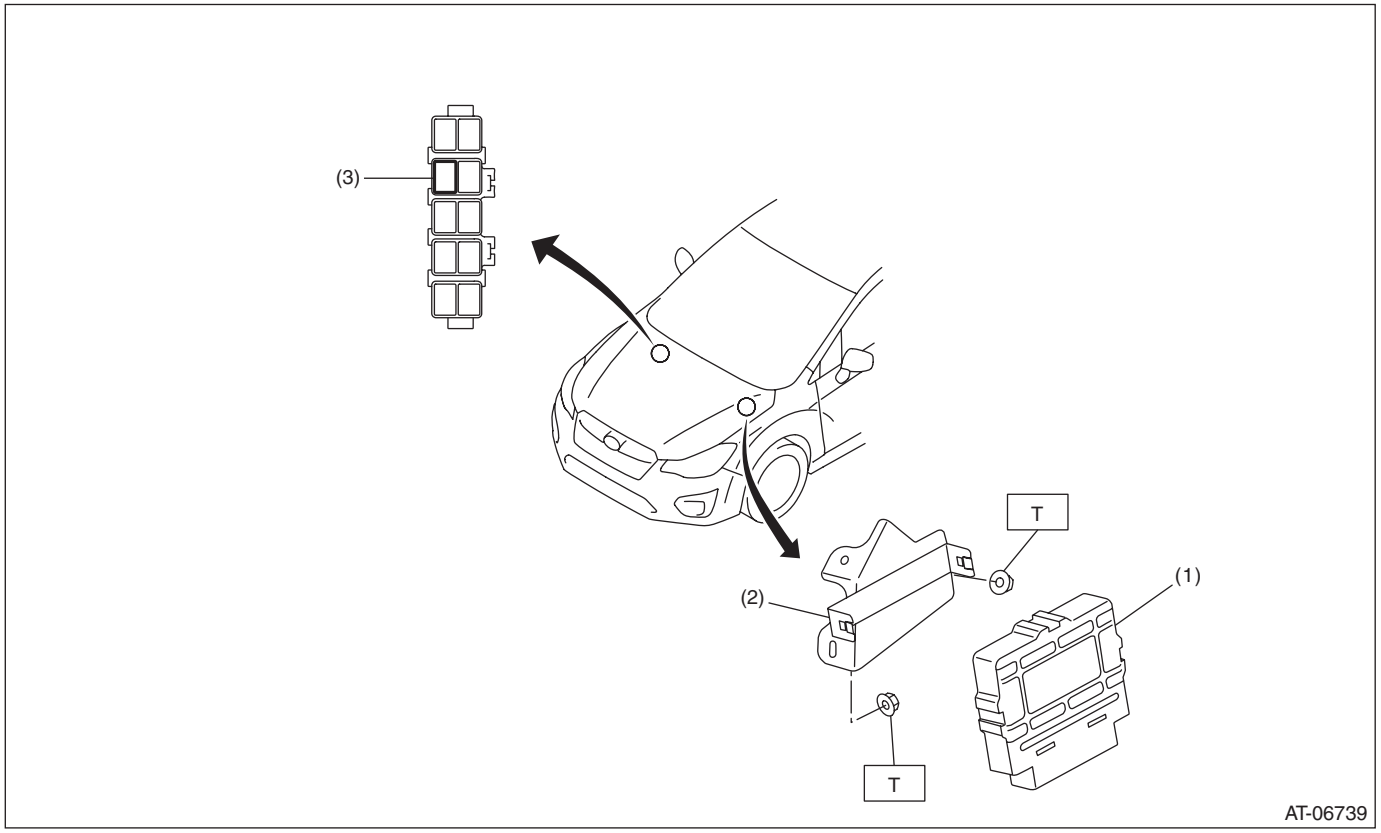
12.CVTF COOLER (WITH WARMER FEATURE)



(1)	Hose clamp	(6)	CVTF cooler outlet hose
(2)	Engine coolant outlet hose	(7)	Hose clamp
(3)	Engine coolant inlet hose	(8)	CVTF cooler (with warmer feature)
(4)	Hose clamp	(9)	CVTF cooler bracket
(5)	CVTF cooler inlet hose	(10)	Converter case

Tightening torque:N·m (kgf-m, ft-lb)
T: 23 (2.3, 17.0)

13.TRANSMISSION CONTROL MODULE

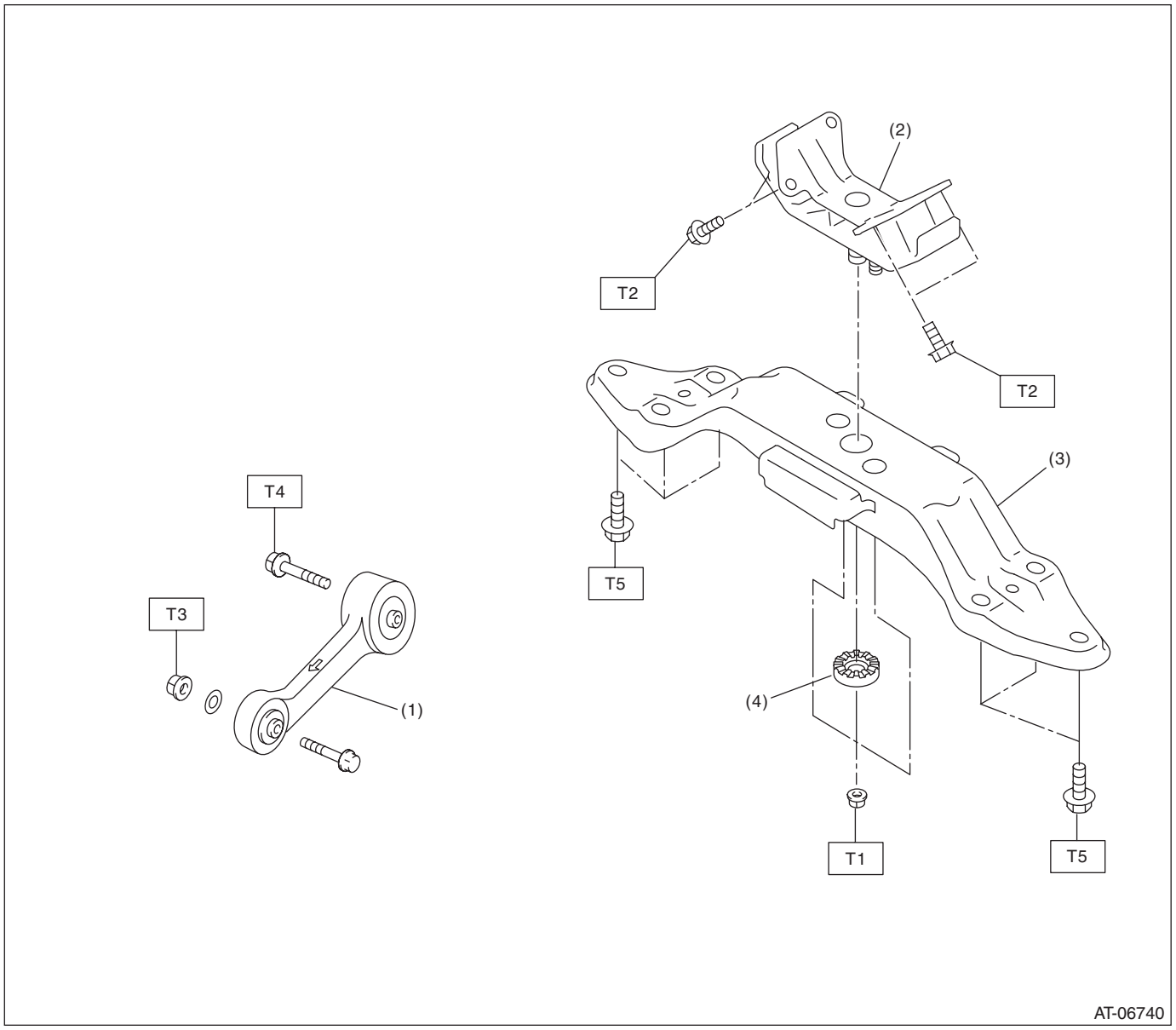


(1) Transmission control module (TCM)
(2) TCM bracket
(3) Relay

Tightening torque:N·m (kgf-m, ft-lb)

T: 7.5 (0.8, 5.5)

14.TRANSMISSION MOUNTING



(1)	Pitching stopper	(3)	Transmission rear crossmember
(2)	Rear cushion rubber	(4)	Stopper

Tightening torque:N·m (kgf-m, ft-lb)

T1: 35 (3.6, 25.8)
T2: 40 (4.1, 29.5)
T3: 50 (5.1, 36.9)
T4: 58 (5.9, 42.8)
T5: 70 (7.1, 51.6)

C: CAUTION

- Wear appropriate work clothing, including a cap, protective goggles and protective shoes when performing any work.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust and dirt.
- Do not place the valve cover with its inner side facing up until it is installed, to prevent intrusion of foreign matter into the control valve body.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly and replacement.
- When disassembling the case and other light alloy parts, use a plastic hammer to force it apart. Do not pry apart with screwdrivers or other tools.
- Vehicle components are extremely hot after driving. Be wary of receiving burns from heated parts.
- Use SUBARU genuine CVTF and recommended grease. Do not mix CVTF, grease etc. of different grades or manufacturers.
- Be sure to tighten bolts and nuts to the specified torque.
- Place lifts, shop jacks or rigid racks at specified locations.
- Apply CVTF onto sliding or revolving surfaces before installation.
- Replace deformed or damaged snap rings with new parts.
- Before installing O-rings or oil seals, apply sufficient amount of CVTF or gear oil to appropriate locations in order to avoid damage and deformation.
- Be careful not to incorrectly install or fail to install O-rings, snap rings and other such parts.
- Before securing a part on a vise, place cushioning material such as wood blocks, aluminum plate, or cloth between the part and the vise.
- Avoid damaging the mating surface of the case.
- Before applying liquid gasket, completely remove the old liquid gasket.
- After removing the sensors, breather hose and plugs, plug the holes to avoid foreign materials intruding as necessary.
- During disassembly or assembly, be sure to use nylon gloves or paper towels. Do not use cloth gloves or waste cloth.

D: PREPARATION TOOL

1. SPECIAL TOOL

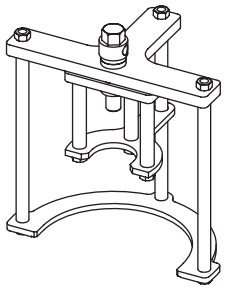
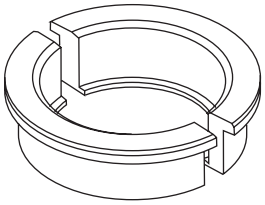
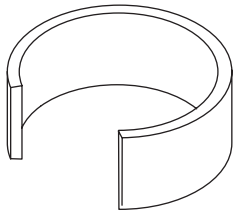
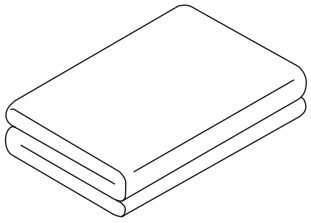
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST18769AA010	18769AA010 (Newly adopted tool)	EXPANDER PULLEY	Used for removing and installing the secondary pulley assembly.
 ST18767AA010	18767AA010 (Newly adopted tool)	BEARING REMOVER	Used for removing the ball bearing of transfer clutch assembly.
 ST18762AA010	18762AA010 (Newly adopted tool)	COMPRESSOR SPECIAL TOOL	Used for removing and installing snap ring of forward clutch assembly.
 ST18761AA010	18761AA010 (Newly adopted tool)	SHEET SPECIAL TOOL	• Used for removing and installing control valve body. • Used for removing and installing valve cover. • Used for removing and installing transmission harness.

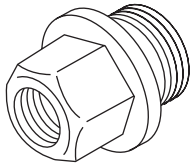
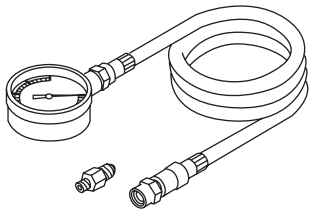
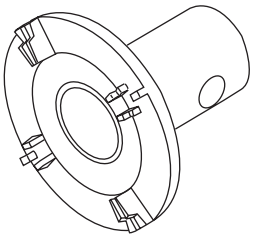
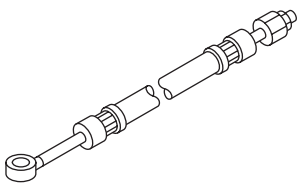
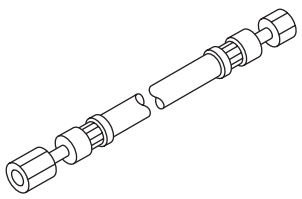
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST18681AA010	18681AA010 (Newly adopted tool)	PRESSURE GAUGE ADAPTER	Used for measuring the secondary pressure (line pressure). NOTE: Used together with the genuine O-ring (Part No. 806916050).
 ST18801AA000	18801AA000	OIL PRESSURE GAUGE ASSY	Used for measuring the secondary pressure (line pressure).
 ST18658AA020	18658AA020	WRENCH COMPL RETAINER	Used for removing and installing the differential side retainer.
 ST34099AC020	34099AC020	ADAPTER HOSE B	Used for measuring the transfer clutch hydraulic pressure. NOTE: Used with genuine union screw (Part No. 801914010) and gasket (Part No. 803914060).
 ST34099AC010	34099AC010	ADAPTER HOSE A	Used for measuring the transfer clutch hydraulic pressure.

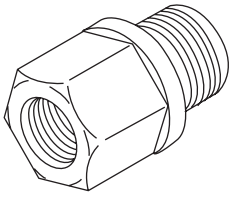
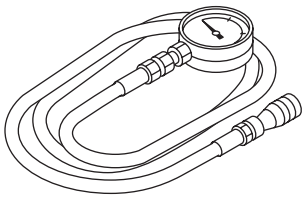
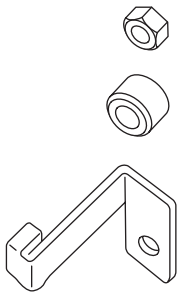
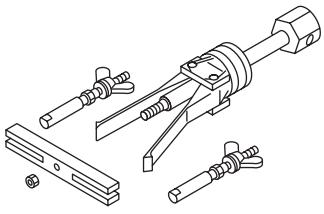
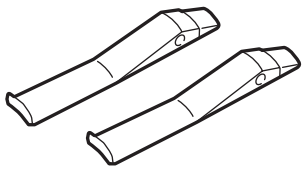
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST18681AA000	18681AA000	PRESSURE GAUGE ADAPTER	Used for measuring the transfer clutch hydraulic pressure. NOTE: Used together with the genuine O-ring (Part No. 806911080).
 ST-498575400	498575400	OIL PRESSURE GAUGE ASSY	Used for measuring the transfer clutch hydraulic pressure.
 ST-498277200	498277200	STOPPER SET	• Used for removing and installing transmission assembly to engine. • Used for preventing the torque converter from dropping off.
 ST-398527700	398527700	PULLER ASSY	• Used for removing the extension case oil seal. • Used for removing the bearing of transmission case. • Used for removing the bearing of reduction driven gear. • Used for removing the bearing outer race of the drive pinion shaft.
 ST18760AA000	18760AA000	CLAW	• Used for removing the bearing of transmission case. • Used together with PULLER ASSY (398527700).

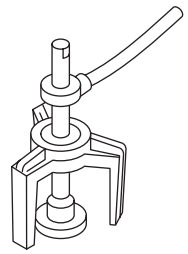
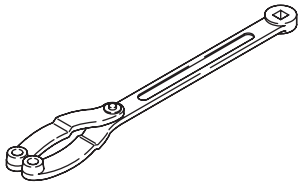
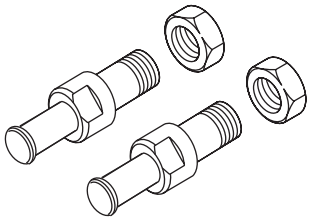
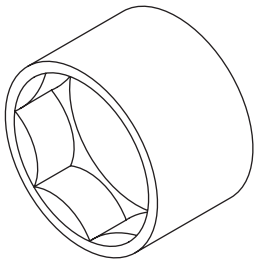
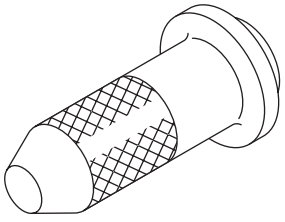
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-398673600	398673600	COMPRESSOR	Used for removing and installing snap ring of forward clutch assembly.
 ST18355AA000	18355AA000	PULLEY WRENCH	• Used for removing and installing the lock nut of reduction driven gear. • Used together with PIN SET (18334AA000).
 ST18334AA000	18334AA000	PIN SET	• Used for removing and installing the lock nut of reduction driven gear. • Used together with PULLEY WRENCH (18355AA000).
 ST-499987003	499987003	SOCKET WRENCH (35)	Used for removing and installing the lock nut of reduction driven gear.
 ST-498057300	498057300	OIL SEAL INSTALLER	Used for installing the extension case oil seal.

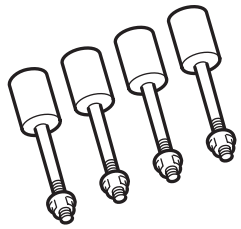
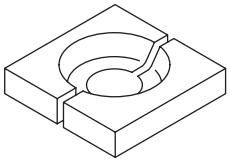
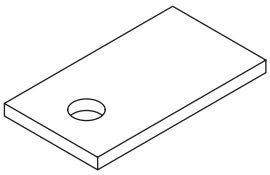
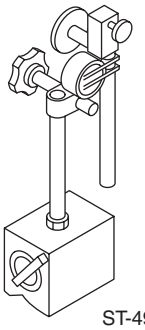
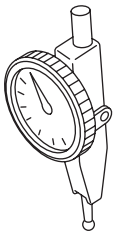
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST18632AA000	18632AA000	STAND ASSY	Used for disassembling and assembling the transmission.
 ST-498515500	498515500	REMOVER	Used for removing the bearing inner race of the drive pinion shaft.
 ST-498255400	498255400	PLATE	Used for measuring the backlash of hypoid gear.
 ST-498247001	498247001	MAGNET BASE	• Used for measuring the backlash of differential bevel pinion gear. • Used for measuring the backlash of hypoid gear. • Used together with DIAL GAUGE (498247100).
 ST-498247100	498247100	DIAL GAUGE	• Used for measuring the backlash of differential bevel pinion gear. • Used for measuring the backlash of hypoid gear. • Used together with DIAL GAUGE (498247101).

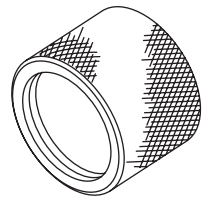
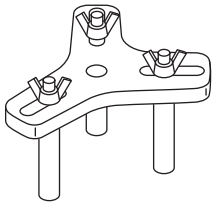
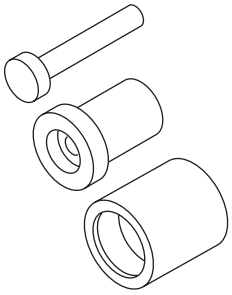
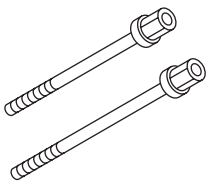
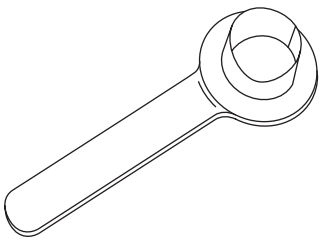
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST18675AA000	18675AA000	DIFFERENTIAL SIDE OIL SEAL INSTALLER	Used for installing the differential side retainer oil seal.
 ST18762AA000	18762AA000	COMPRESSOR SPECIAL TOOL	Used for disassembling and installing the multi-plate clutch piston.
 ST-927720000	927720000	HOUSING BUSHING INSTALLER AND REMOVER	• Used for installing the oil seal. • Use BUSHING SHAFT (927880000).
 ST18763AA000	18763AA000	COMPRESSOR SHAFT	Used for measuring the backlash of hypoid gear.
 ST28399SA010	28399SA010	OIL SEAL PROTECTOR	Used for protecting oil seal when installing front drive shaft.

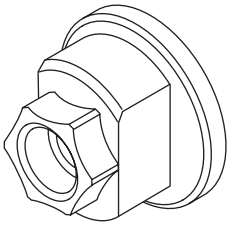
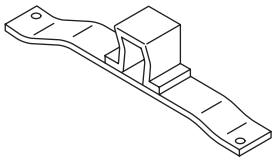
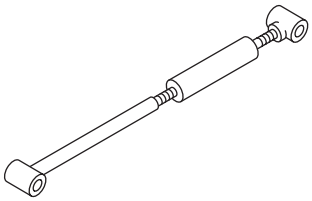
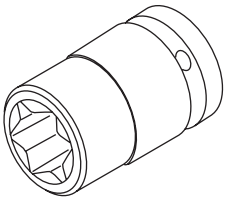
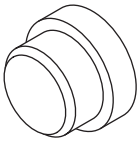
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-498937110	498937110	HOLDER	• Used for removing and installing the drive pinion lock nut. • Used as a holder to rotate gear when checking tooth contact.
 ST41099AA010	41099AA010	ENGINE SUPPORT BRACKET	Used for supporting the engine.
 ST41099AA020	41099AA020	ENGINE SUPPORT	Used for supporting the engine.
 ST18270KA020	18270KA020	SOCKET (E20)	• Used for removing and installing the hypoid driven gear. • Used for removing and installing the drive pinion shaft retainer.
 ST-398497701	398497701	SEAT	Used for removing and installing the bearing.

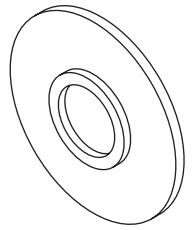
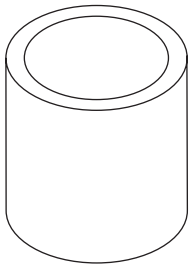
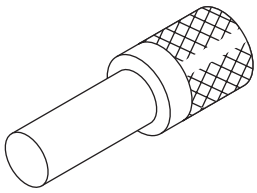
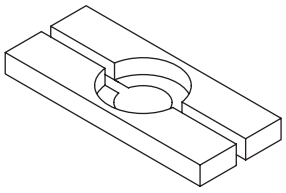
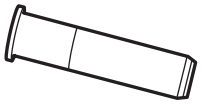
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-398177700	398177700	INSTALLER	• Used for installing the ball bearing. • Used for installing the parking gear. • Used for installing the bearing outer race. • Used for installing the plug.
 ST28499TC010	28499TC010 (Newly adopted tool)	PRESS SNAP RING	• Used for installing the ball bearing of the transmission case. • Used for installing the bearing outer race of drive pinion shaft.
 ST-899864100	899864100	REMOVER	• Used for removing and installing the ball bearing. • Used for removing the parking gear and transfer drive gear. • Used for removing the bearing inner race of the front differential.
 ST-498077000	498077000	REMOVER	Used for removing the bearing inner race of the front differential.
 ST18657AA010	18657AA010	INSTALLER	Used for installing the oil seal at shifter arm shaft portion.

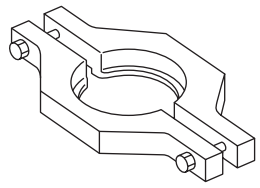
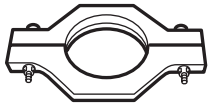
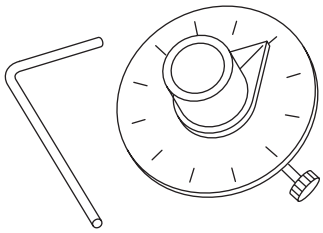
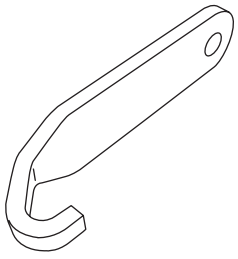
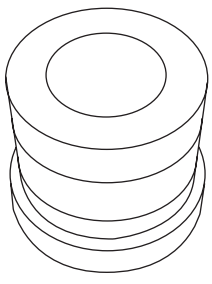
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-498077600	498077600	REMOVER	Used for removing the ball bearing of drive sprocket.
 ST18720AA000	18723AA000	REMOVER	Used for removing the ball bearing of transfer clutch assembly.
 ST18854AA000	18854AA000	ANGLE GAUGE	• Used for installing the hypoid driven gear. • Used for installing the drive plate.
 ST-498497300	498497300	CRANKSHAFT STOPPER	Used for stopping the drive plate rotation when removing and installing the drive plate.
 ST-399513600	399513600	INSTALLER	Used for removing the ball bearing of drive sprocket.

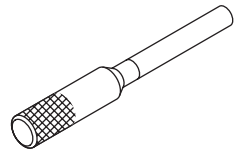
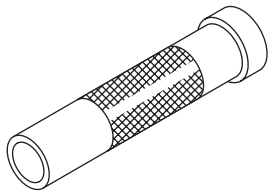
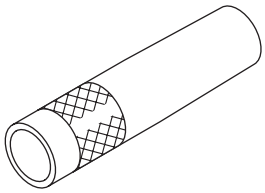
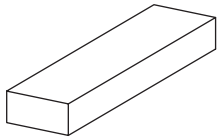
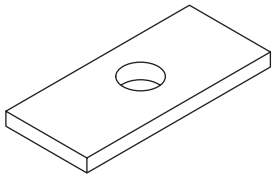
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-499267300	499267300	STOPPER PIN	Used for adjusting the inhibitor switch.
 ST-499277100	499277100	BUSHING 1-2 INSTALLER	• Used for installing the bearing of the transmission case. • Used for installing the ball bearing. • Used for installing the bearing inner race.
 ST-499277200	499277200	INSTALLER	Used for installing the ball bearing of the transfer clutch assembly.
 ST-499575400	499575400	GAUGE	Used for measuring height of end play.
 ST-499575500	499575500	GAUGE	Used for measuring height of end play.

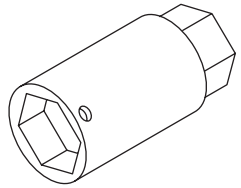
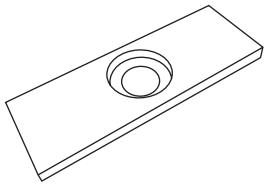
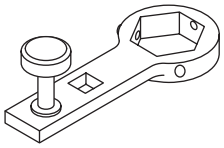
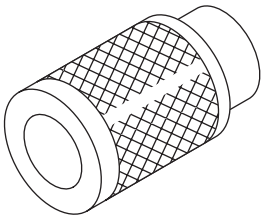
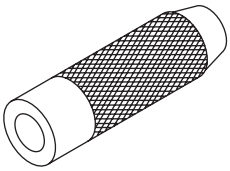
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-499787500	499787500	ADAPTER	• Used for removing and installing the drive pinion shaft lock nut. • Used for measuring the preload of the drive pinion shaft. • Used for measuring the backlash of hypoid gear.
 ST-499575600	499575600	GAUGE	Used for measuring height of end play.
 ST-499787700	499787700	WRENCH	• Used for removing and installing the drive pinion shaft lock nut. • Used for measuring the preload of the drive pinion shaft. • Used for measuring the backlash of hypoid gear.
 ST-499757002	499757002	INSTALLER	• Used for removing the bearing of reduction driven gear. • Used for installing the parking gear. • Used for installing the transfer drive gear.
 ST-899580100	899580100	INSTALLER	• Used for installing the collar of reduction driven gear. • Used for installing the ball bearing of the transfer drive gear. • Used for installing the bearing inner race of drive pinion shaft.

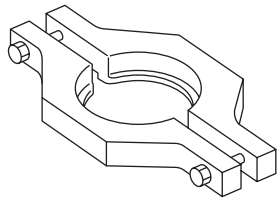
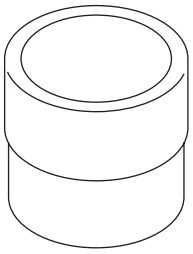
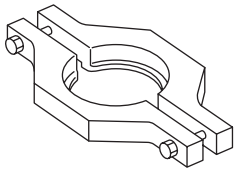
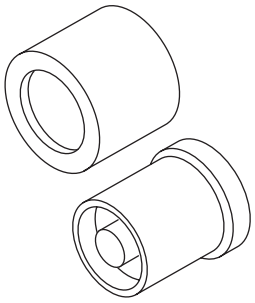
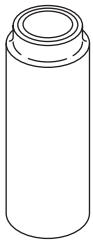
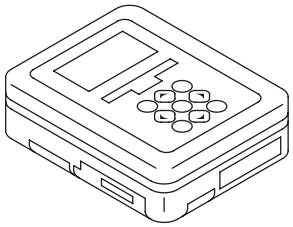
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-498077300	498077300	REMOVER	Used for installing the ball bearing of reduction driven gear.
 ST-499755602	499755602	PRESS SNAP RING	• Used for installing the oil seal. • Used for installing the ball bearing and roller bearing. • Used for installing the plug.
 ST-498077400	498077400	REMOVER	Used for removing the ball bearing of transfer driven gear.
 ST20099AE020	20099AE020	INSTALLER	Used for installing the bearing outer race of drive pinion shaft.
 ST-927130000	927130000	EXTENSION DRIVE SHAFT	Used for installing the bearing inner race of drive pinion shaft.

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST1B022XU0	1B022XU0	SUBARU SELECT MONITOR III KIT	Used for troubleshooting the electrical system.

2. GENERAL TOOL

TOOL NAME	REMARKS
Circuit tester	Used for measuring resistance and voltage.
Thickness gauge	Used for measuring the clearance in reverse brake, forward clutch and transfer clutch.
Caliper	Used for measuring the dimension.
Spring scale	Used for measuring the starting torque of the drive pinion.
TORX® bit T70	Used for removing and installing differential gear oil drain plug.
Straight pin remover	Used for removing and installing the straight pin.
Push/pull gauge	Used for measuring clutch clearance.

2. CVTF

A: INSPECTION

Check for leakage of CVTF from transmission.

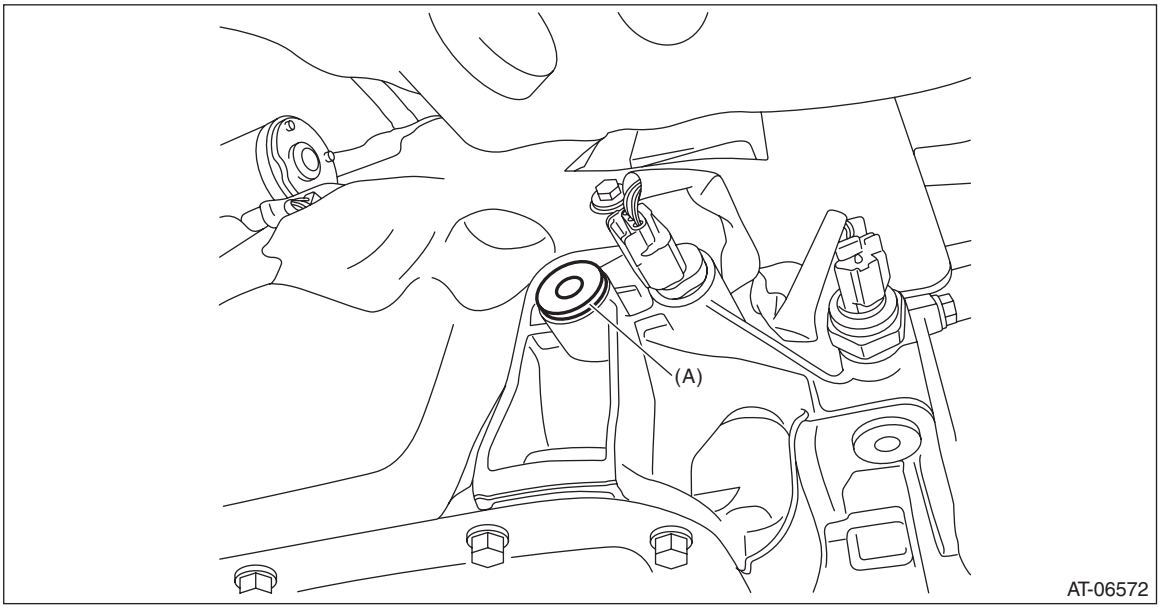
B: ADJUSTMENT

CAUTION:
• CVTF level changes along with CVTF temperature. When inspecting CVTF level, observe the specified CVTF temperature.
• Always use specified CVTF. Using other fluid will cause malfunction.

1) Idle the engine to raise CVTF temperature to 35 — 45°C (95 — 113°F) on Subaru Select Monitor.
2) Operate the select lever in P → R → N → D and D → N → R → P to circulate CVTF with the engine idling.
3) With the engine running, lift up the vehicle and remove the filler plug.

CAUTION:
Pay special attention to the following operations as the engine is at idle.

NOTE:
CVTF is at the specified level when it is up to the filler plug hole lower section.

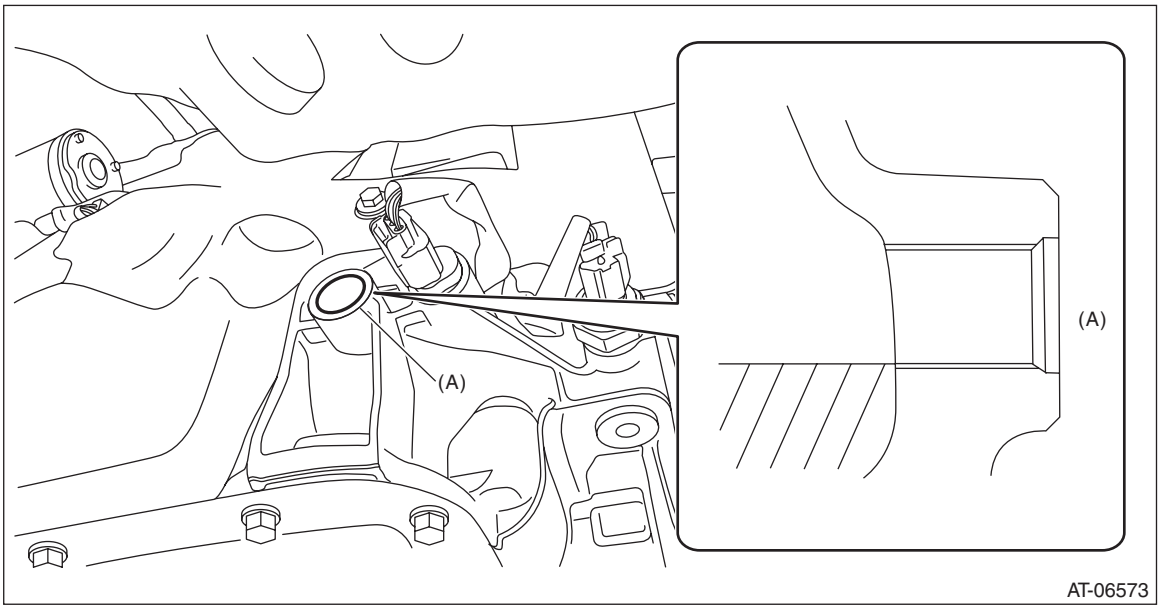


(A) Filler plug

4) When there is no CVTF leakage from the transmission, add the specified fluid up to the filler plug hole lower section.

Specified fluid:
<Ref. to CVT-4, HYDRAULIC CONTROL AND LUBRICATION, SPECIFICATION, General Description.>

CAUTION:
Note that when CVTF is added up to the lower section of filler plug while the transmission is in cold condition, overfilling of CVTF occurs, causing the oil to spill out.



(A) Filler plug hole

5) Install the filler plug.

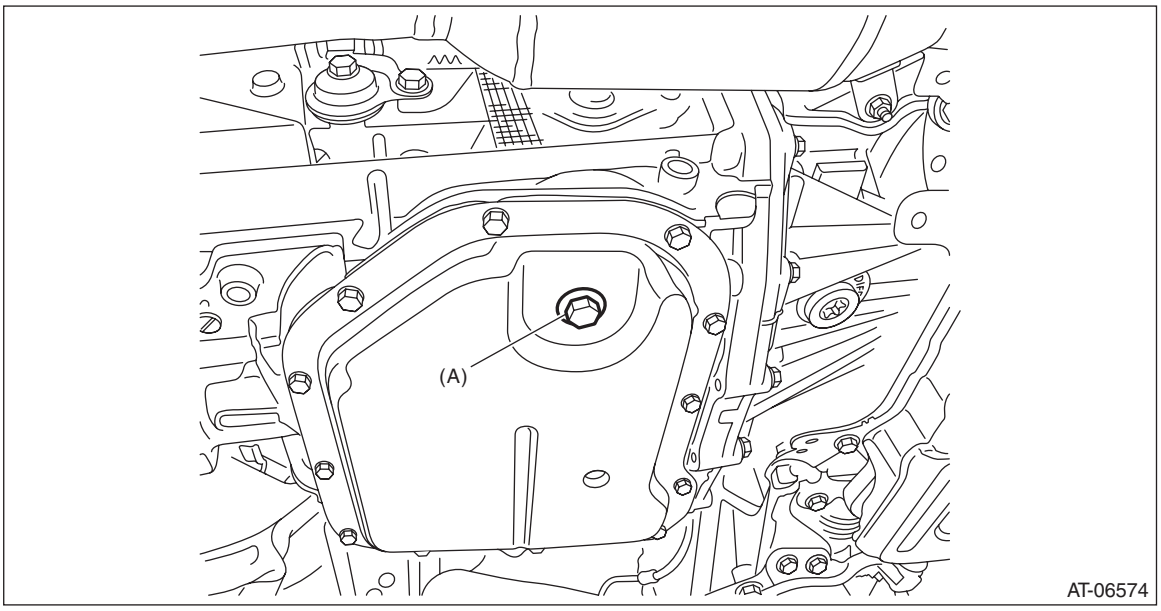
NOTE:
Use a new gasket.

Tightening torque:
50 N·m (5.1 kgf-m, 36.9 ft-lb)

C: REPLACEMENT

CAUTION:
• Directly after the vehicle has been running or the engine has been long idle running, the CVTF is hot. Be careful not to burn yourself.
• Be careful not to spill the CVTF on exhaust pipe to prevent it from emitting smoke or causing fires. If CVTF adheres, wipe it off completely.
• Always use specified CVTF. Using other fluid will cause malfunction.

1) Lift up the vehicle, and remove the CVTF drain plug.



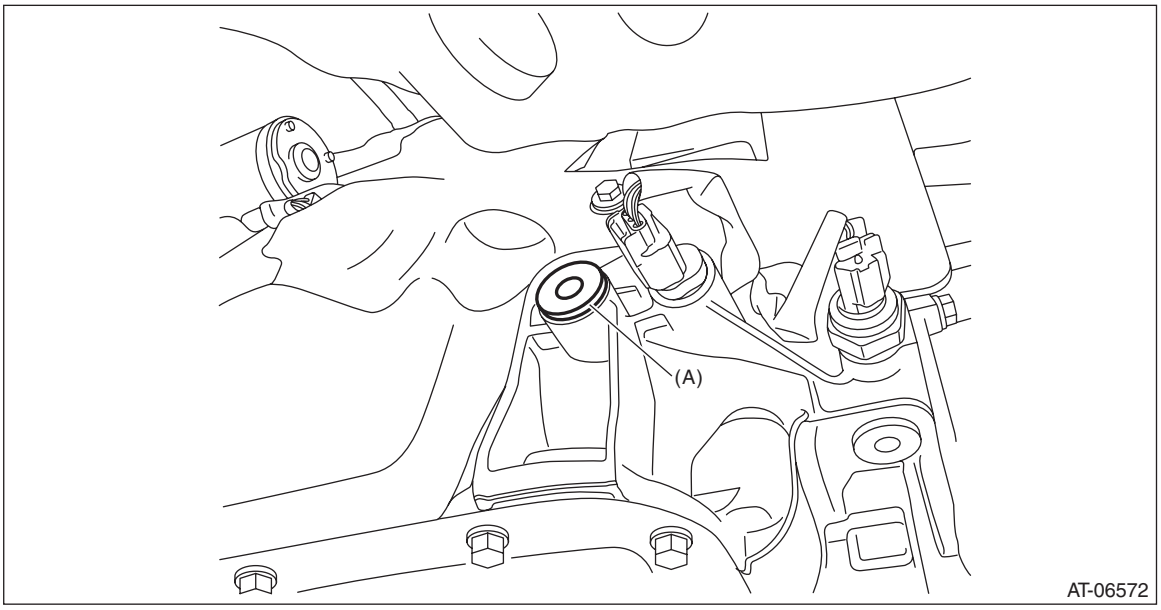
(A) CVTF drain plug

2) Check the CVTF condition. <Ref. to CVT-40, CONDITION CHECK, CVTF.>
3) Install the CVTF drain plug and gasket.

NOTE:
• Use a new gasket.

Tightening torque:
31 N·m (3.2 kgf-m, 22.9 ft-lb)

4) Remove the filler plug.



(A) Filler plug

5) Add the specified fluid up to the filler plug hole lower section.

Specified fluid:
<Ref. to CVT-4, HYDRAULIC CONTROL AND LUBRICATION, SPECIFICATION, General Description.>

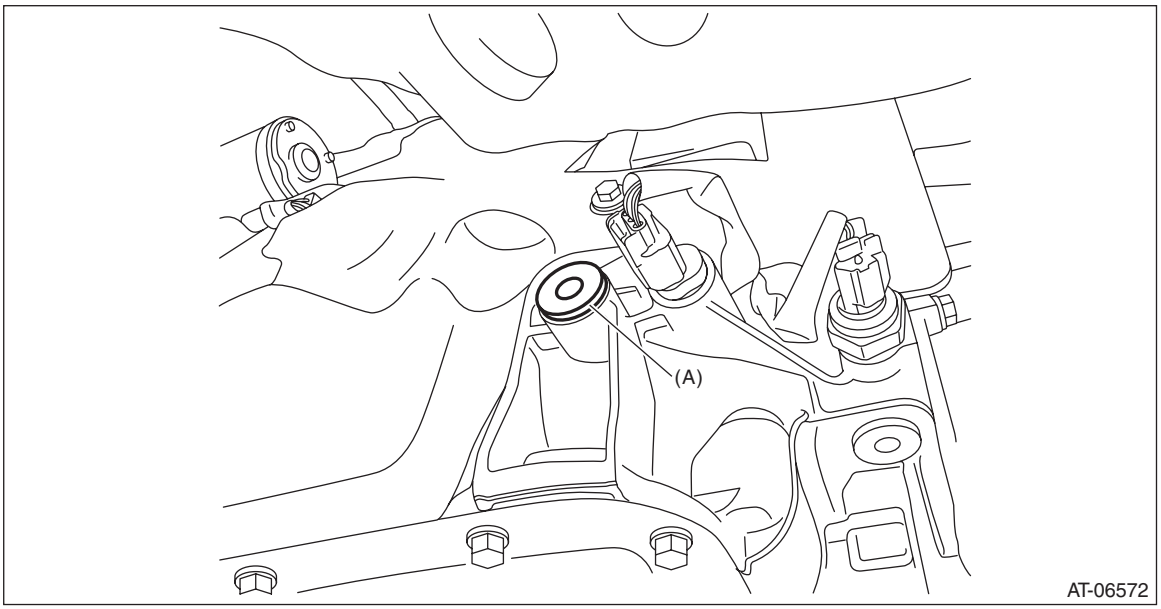
6) Temporarily tighten the filler plug.
7) Idle the engine to raise CVTF temperature to 35 — 45°C (95 — 113°F) on Subaru Select Monitor.
8) Operate the select lever in P → R → N → D and D → N → R → P to circulate CVTF with the engine idling.

CAUTION:
Pay special attention to the following operations as the engine is at idle.

9) With the select lever shifted to “P” range and the engine started, lift up the vehicle. Adjust the CVTF level and check for leakage. <Ref. to CVT-36, ADJUSTMENT, CVTF.>

10) Replace with a new gasket, and attach the filler plug.

Tightening torque:
50 N·m (5.1 kgf-m, 36.9 ft-lb)



(A) Filler plug

D: CONDITION CHECK

NOTE:
When replacing CVTF, determine the condition inside the transmission body by inspecting the drained CVTF.

Fluid condition	Trouble and possible cause	Corrective action
Metal particles.	Excessive wear of the internal of the transmission body.	Replace CVTF and check if CVT operates correctly.
Thick and varnish-form fluid.	Burnt clutches	Replace CVTF and check the CVT body or vehicle for faulty.
Clouded CVTF or bubbles.	Water mixed in fluid.	Replace CVTF and check the water entering point.

3. Differential Gear Oil

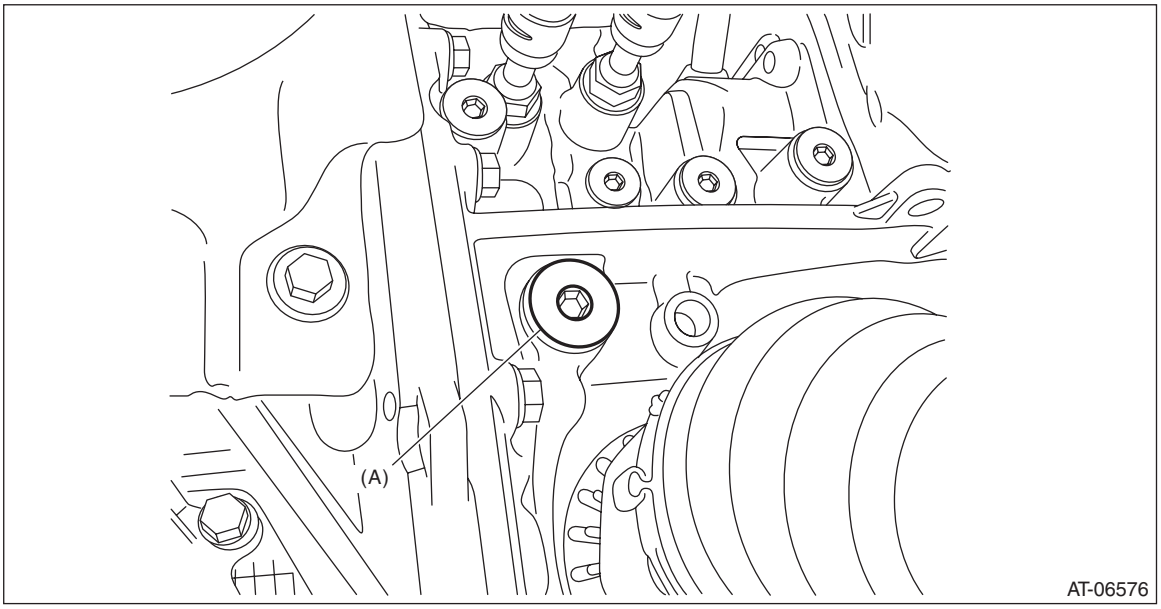
A: INSPECTION

Check that there is no leakage of differential gear oil from the converter case.

B: ADJUSTMENT

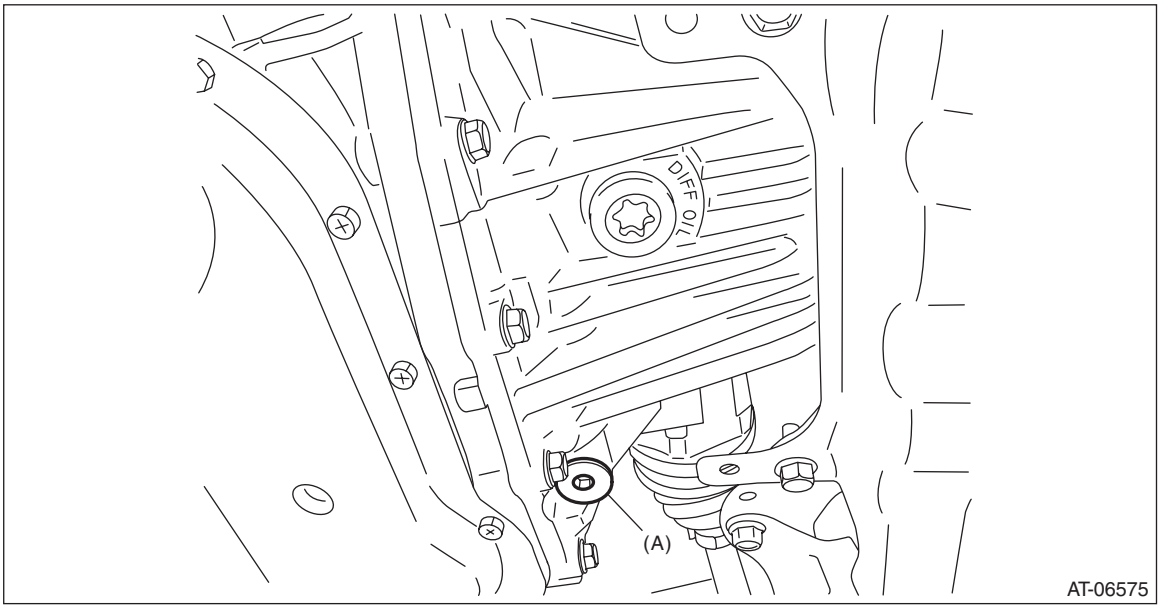
NOTE:
Immediately after removing the overflow drain plug, remaining gear oil (approx. 8 cc) may come out of the overflow pipe. This is not included in the specified amount. When removing the overflow drain plug, make sure the gear oil flows out of the overflow drain plug hole by filling with gear oil.

1) Lift up the vehicle.
2) Remove the filler plug.



(A) Filler plug

3) Remove the overflow drain plug.



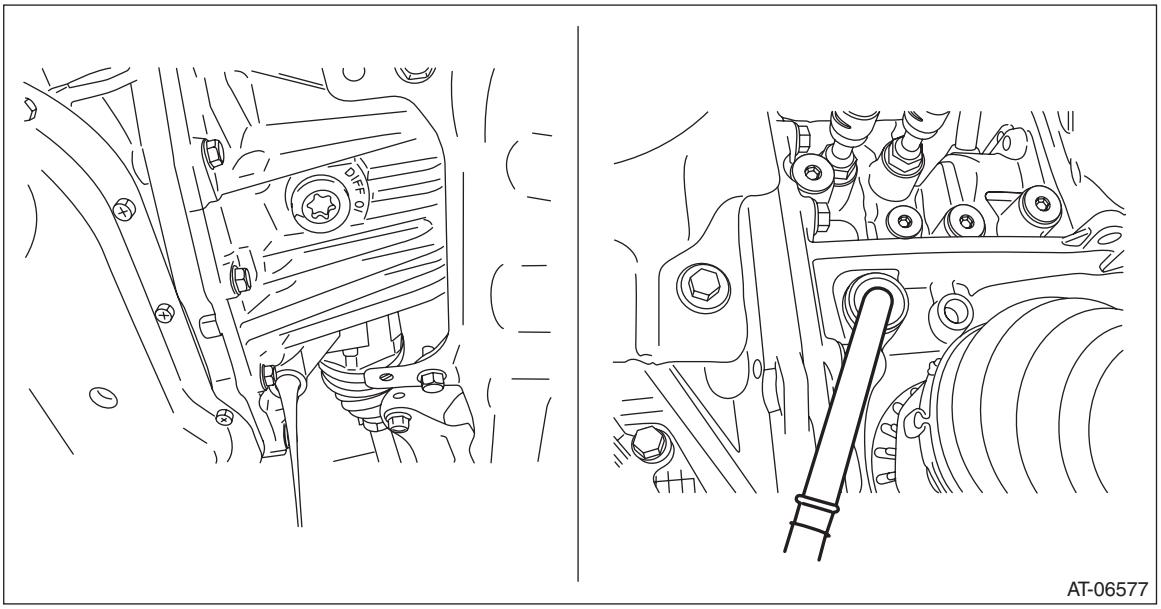
(A) Overflow drain plug

4) Fill in the differential gear oil through the filler plug hole up to where the oil flows out of the overflow drain plug.

Recommended gear oil:
<Ref. to CVT-4, RECOMMENDED GEAR OIL, SPECIFICATION, General Description.>
5) When the flow of the differential gear oil turns into a narrow stream, install the overflow drain plug.

NOTE:
Use a new gasket.

Tightening torque:
50 N·m (5.1 kgf-m, 36.9 ft-lb)



6) Install the filler plug.

NOTE:
Use a new gasket.

Tightening torque:
50 N·m (5.1 kgf-m, 36.9 ft-lb)

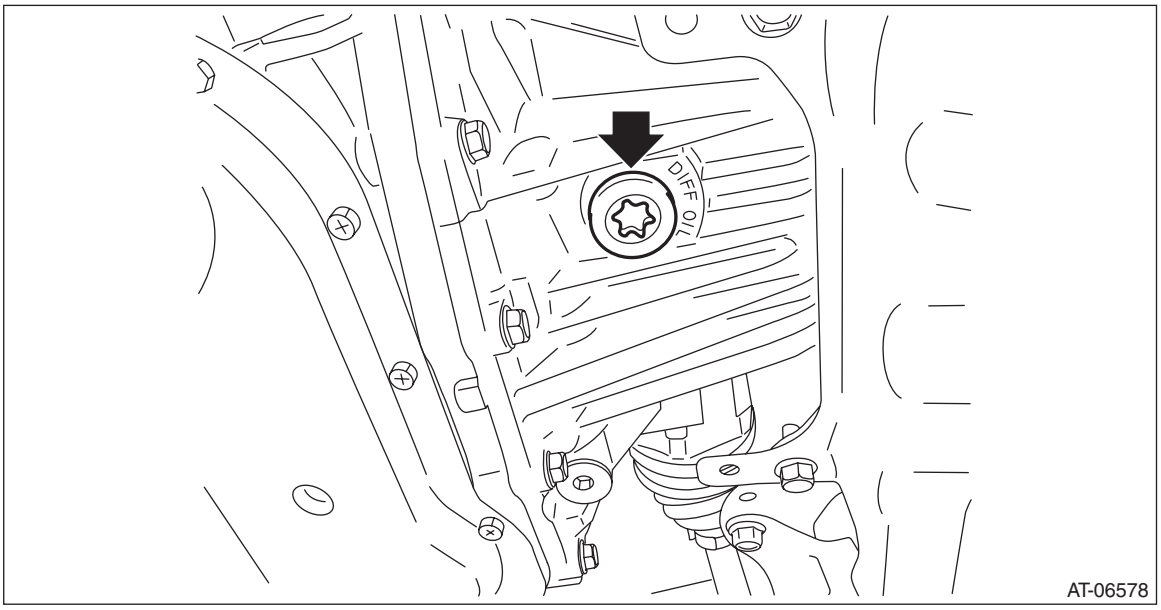
C: REPLACEMENT

CAUTION:
• Immediately after the vehicle has been running or after idling for a long time, the differential gear oil will be hot. Be careful not to burn yourself.
• Be careful not to spill differential gear oil on the exhaust pipe to prevent it from emitting smoke or causing a fire. If gear oil adheres, wipe it off completely.
1) Lift up the vehicle.
2) Remove the differential gear oil drain plug using TORX® bit T70. Drain differential gear oil.

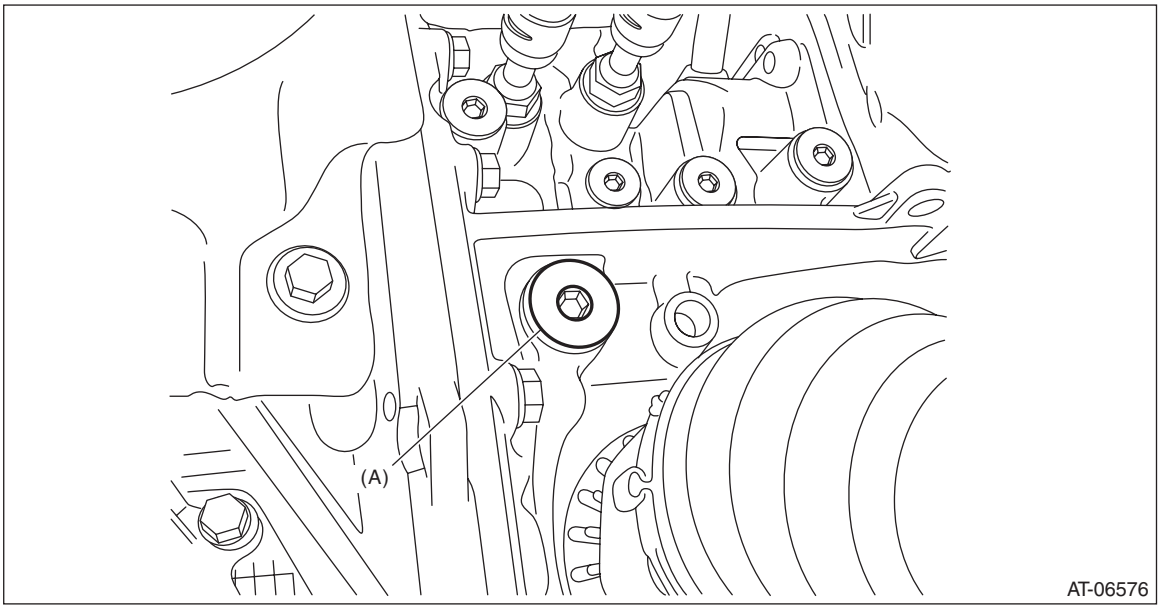
3) Install the differential gear oil drain plug using TORX® bit T70.

NOTE:
Use a new gasket.

Tightening torque:
70 N·m (7.1 kgf-m, 51.6 ft-lb)



4) Remove the filler plug.

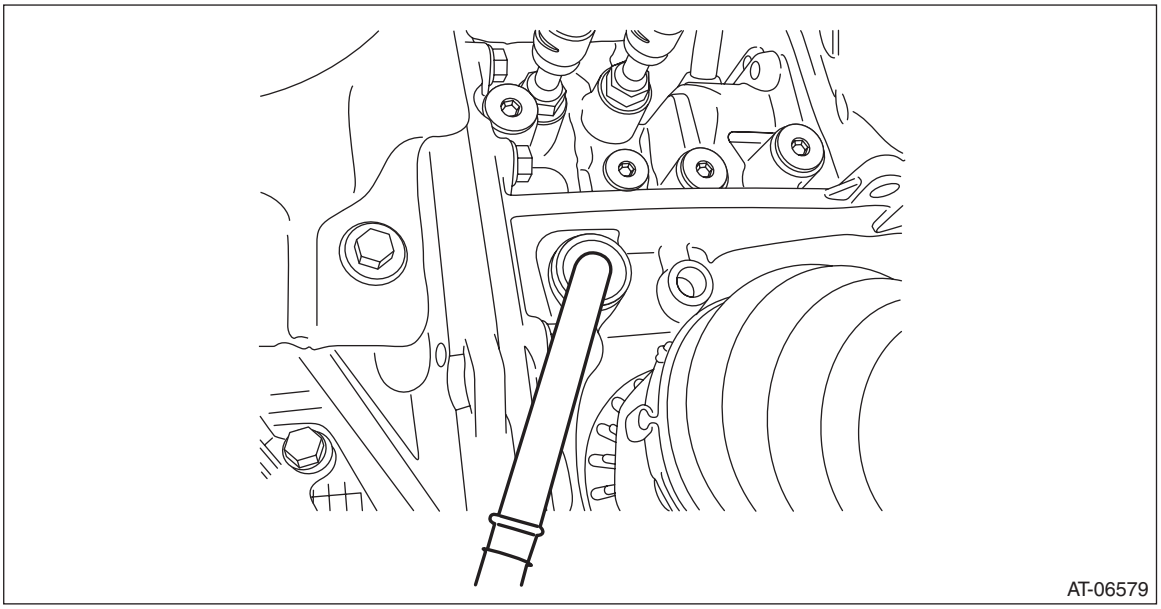


(A) Filler plug

5) Pour gear oil into the filler plug hole.

Recommended gear oil:
<Ref. to CVT-4, RECOMMENDED GEAR OIL, SPECIFICATION, General Description.>

Gear oil capacity:
<Ref. to CVT-4, RECOMMENDED GEAR OIL, SPECIFICATION, General Description.>



6) Adjust the level of differential gear oil. <Ref. to CVT-41, ADJUSTMENT, Differential Gear Oil.>

4. AWD ON/OFF Switching Mode

A: GENERAL DESCRIPTION

- Follow the messages displayed on the Subaru Select Monitor when working.
- Perform as necessary in FWD mode.
- When switched to FWD, AWD light illuminates.

B: PROCEDURE

CAUTION:
• Do not turn the power of the Subaru Select Monitor OFF during work, and do not disconnect the data link connector.
• On completing the work in FWD, switch back in AWD.
1) Shift the select lever to “P” range.
2) Connect the Subaru Select Monitor to data link connector.
3) Turn the ignition switch to ON.
4) Turn off all switches causing an electrical load, such as headlights, A/C, seat heater and rear defogger.
5) Select {AT related learning & inspecting mode} in the «Transmission Diagnosis» screen of the Subaru Select Monitor.
6) Select {AWD ON/OFF switching mode} in the «AT related learning & inspecting mode» display screen of the Subaru Select Monitor.
7) Follow the messages displayed on the Subaru Select Monitor screen when working.
Switching completes successfully if any of the following messages is displayed.
- When switching from AWD to FWD: {Switched to FF. To return to AWD, perform basic mode again.}
- When switching from FWD to AWD: {Switched to AWD. To return to FF, perform basic mode again.}

NOTE:
- If communication error occurs during switching mode, start in the “AWD ON/OFF switching mode” again.
- If operation is interrupted before the successful end message is displayed, perform the {AWD ON/OFF switching mode} from the beginning until confirming the operation is successfully ended. If this mode fails to complete successfully, the cause is as follows.
  - Select lever is not in “P” range.
  - Engine is running.
- For detailed operation procedures, refer to “PC application help for Subaru Select Monitor”.

5. Road Test

A: INSPECTION

1. GENERAL PRECAUTION

Road tests should be conducted to properly diagnose the condition of CVT.

CAUTION:
Always observe the local traffic laws when performing the test.

2. D RANGE SHIFT FUNCTION

Make sure the engine speed is 1,100 — 1,300 rpm while driving on the level road at 50 km/h (31 MPH) after accelerating from halting to 1/4 of accelerator opening angle. Then stop the vehicle. Check normal gear change has occurred while the vehicle speed changes from a constant speed to zero.

3. KICK-DOWN FUNCTION

Check if engine speed will rise by operating the accelerator opening angle to the full from a constant speed of 50 km/h (31 MPH) or more.

4. ENGINE BRAKE OPERATION

• Model with manual mode

• Drive in “6th speed of manual mode” [70 — 80 km/h (43 — 50 MPH)], and shift down from 6th to 5th. Check if the indicator of combination meter switches “6” → “5”. At the same time, check the engine brake in 5th gear.
• Drive in “5th speed of manual mode” [60 — 70 km/h (37 — 43 MPH)], and shift down from 5th to 4th. Check if the indicator of combination meter switches “5” → “4”. At the same time, check the engine brake in 4th gear.
• Drive in “4th speed of manual mode” [50 — 60 km/h (31 — 37 MPH)], and shift down from 4th to 3rd. Check if the indicator of combination meter switches “4” → “3”. At the same time, check the engine brake in 3rd gear.
• Drive in “3rd speed of manual mode” [40 — 50 km/h (25 — 31 MPH)], and shift down from 3rd to 2nd. Check if the indicator of combination meter switches “3” → “2”. At the same time, check the engine brake in 2nd gear.
• Drive in “2nd speed of manual mode” [20 — 30 km/h (12 — 19 MPH)], and shift down from 2nd to 1st. Check if the indicator of combination meter switches “2” → “1”. At the same time, check the engine brake in 1st gear.

• Model without manual mode

Drive in D range at [50 — 60 km/h (31 — 37 MPH)], and shift to “L” range. Check if the indicator of combination meter switches “D” → “L”. At the same time, check the engine brake in L range.

5. LOCK-UP FUNCTION

When the accelerator is lightly depressed while driving on a flat road in “D” range, check that rpm does not change abruptly.

6. P RANGE OPERATION

Stop the vehicle on an uphill grade of 5% or more and shift to the “P” range and apply the parking brake. Check that the vehicle does not move when the parking brake is released.

7. NOISE AND VIBRATION

Check for noise and vibration during a constant driving, accelerating, decelerating and manual shift operation.

8. OIL LEAKAGE

After the driving test, inspect for leakage of CVTF and differential gear oil from the transmission body.

6. Stall Test

A: INSPECTION

CAUTION:
Make sure no other person is around the vehicle during stall test measurement.

NOTE:
Stall test is extremely important in diagnosing the condition of CVT and engine. The test is necessary to measure the engine stall speeds in “R” and “D” range.
Purposes of the stall test:
- Operational check of forward clutch and reverse brake
- Operational check of the torque converter assembly
- Engine performance check

1) Place wheel chocks at the front and rear of all wheels and engage the parking brake.
2) Turn the A/C OFF.
3) Using the Subaru Select Monitor, check if the throttle valve operates when you depress the accelerator pedal. <Ref. to EN(H4DO)(diag)-37, READ CURRENT DATA FOR ENGINE (NORMAL MODE), OPERATION, Subaru Select Monitor.>
4) Check the engine oil level. <Ref. to LU(H4DO)-10, Engine Oil.>
5) Check the coolant level. <Ref. to CO(H4DO)-13, Engine Coolant.>
6) Adjust the CVTF level. <Ref. to CVT-36, ADJUSTMENT, CVTF.>
7) Increase the CVTF temperature to 60 — 80°C (140 — 176°F) with the engine running and the select lever shifted to “N” or “P” range.
8) Shift the select lever to “D” range.
9) Depress the accelerator pedal to the full while fully depressing the foot brake pedal with your left foot.
10) When the engine speed stabilizes, quickly record the engine speed and release accelerator pedal. Shift the select lever to “N” range. Let the engine idle for one minute or more to cool it down.
11) Shift to “R” range and perform the same stall test.

NOTE:
- Do not perform a stall test for over 5 seconds at a time. (From closed throttle, fully open throttle to stall speed reading) Failure to follow this instruction will cause the engine oil and CVTF to deteriorate and the clutch and brake to be adversely affected.
- Be sure to cool down the engine for at least one minute after each stall test with the select lever set in the “P” or “N” range and with the idle speed of 1,200 rpm or less.
- If the stall speed is higher than the specified range, attempt to finish the stall test in as short a time as possible, in order to prevent the CVT from sustaining damage.

Stall speed standard:
2,350 — 3,100 rpm

Stall test judgment

Classification	Range	Probable cause
Lower than standard value	D, R	• Throttle valve is not fully open. • Insufficient engine output • Torque converter malfunction
Higher than standard value	D	• Forward clutch slippage • Secondary pressure (line pressure) is low. • Variator chain malfunction
	R	• Reverse brake slippage • Secondary pressure (line pressure) is low. • Variator chain malfunction
	D, R	• Torque converter malfunction • Control valve body malfunction • TCM malfunction • Damaged harness and harness connector

7. Time Lag Test

A: INSPECTION

NOTE:
When the select lever is shifted while the engine is idling, there will be a certain time elapse or lag before shock is felt. This symptom helps to check the condition of forward clutch and reverse brake.

- Perform the test at normal operation CVTF temperature of 60 — 80°C (140 — 176°F).
- Be sure to allow one minute or more interval between tests.
- Make three measurements and take the average value.

1) Apply the parking brake.
2) Start the engine. Check the idle speed. (A/C OFF)
3) Shift the select lever from “N” to “D” range. Using a stop watch, measure the time elapsed from shifting the lever until the shock is felt.

Time lag standard:
1.2 seconds or less

If “N” → “D” time lag is longer than specified:

- Secondary pressure (line pressure) is too low.
- Forward clutch worn
- Forward clutch piston malfunction
- Control valve body malfunction
- Learning incomplete

4) In the same manner, measure the time lag when shifting from “N” to “R” range.

Time lag standard:
1.5 seconds or less

If “N” → “R” time lag is longer than specified:

- Secondary pressure (line pressure) is too low.
- Reverse brake worn
- Reverse brake piston malfunction
- Control valve body malfunction
- Learning incomplete

8. Secondary Pressure (Line Pressure) Test

A: INSPECTION

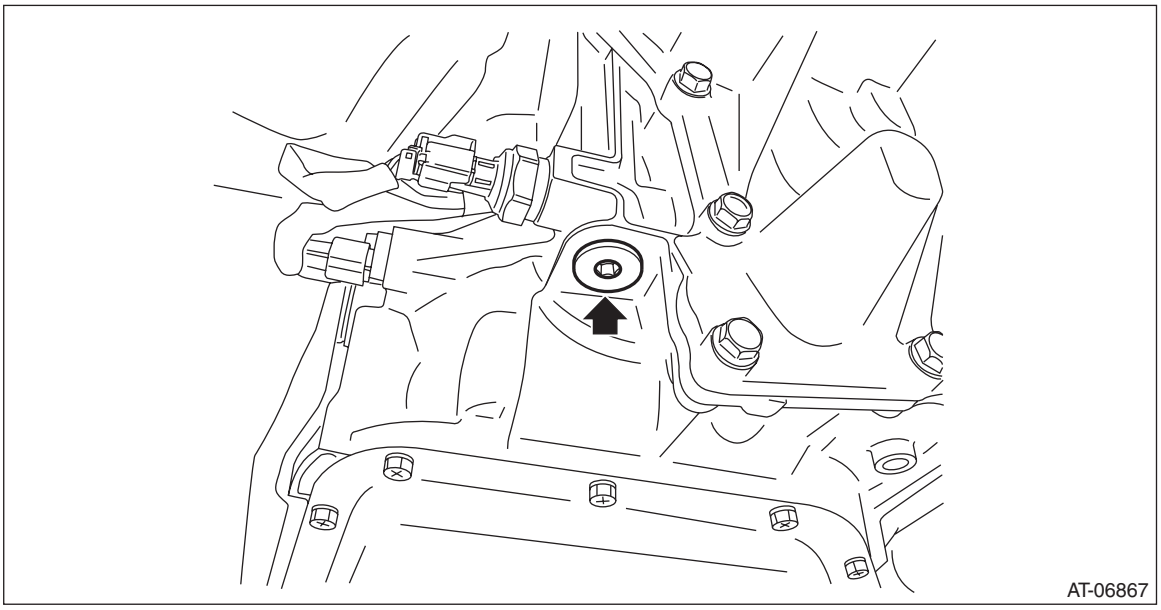
CAUTION:
• Directly after the vehicle has been running or the engine has been long idle running, the CVTF is hot. Be careful not to burn yourself.
• Make sure no other person is around the vehicle during secondary pressure (line pressure) test measurement.
• After performing the secondary pressure (line pressure) test measurement, adjust the CVTF level.

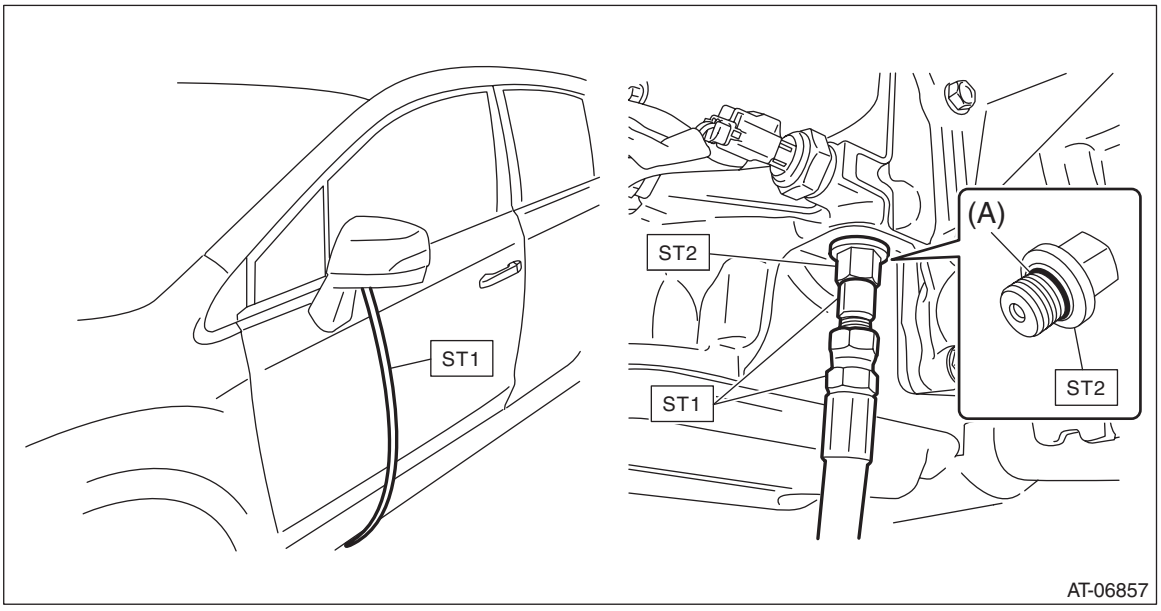
NOTE:
• If the pulley and variator chain, clutch or brake show signs of slipping or shift feel is not correct, check the secondary pressure (line pressure).
• Connect Subaru Select Monitor to vehicle so as to measure the engine speed and actual secondary pressure (secondary pressure (line pressure)).
• In many cases, slippage or inability to operate the vehicle may be due to insufficient oil pressure for the operation of clutch, brake or control valve.
1) Lift up the vehicle.

2) Remove the secondary pressure (line pressure) test plug, and install ST1 and ST2.

CAUTION:
Removal of the test plug and installation of the ST shall be both performed quickly.

NOTE:
Use ST2 PRESSURE GAUGE ADAPTER with genuine O-ring (part No. 806916050) attached.
ST1 18801AA000 OIL PRESSURE GAUGE ASSY
ST2 18681AA010 PRESSURE GAUGE ADAPTER





(A) O-ring (genuine part)

3) Lower the vehicle.
4) Set the gauge so that it can be seen from the driver's seat.
5) Using the Subaru Select Monitor, check if the throttle valve operates when you depress the accelerator pedal. <Ref. to EN(H4DO)(diag)-37, READ CURRENT DATA FOR ENGINE (NORMAL MODE), OPERATION, Subaru Select Monitor.>
6) Check the engine oil level. <Ref. to LU(H4DO)-10, Engine Oil.>
7) Check the coolant level. <Ref. to CO(H4DO)-13, Engine Coolant.>
8) Adjust the CVTF level. <Ref. to CVT-36, ADJUSTMENT, CVTF.>

9) Increase the CVTF temperature to 60 — 80°C (140 — 176°F) with the engine running and the select lever shifted to “N” or “P” range.
10) Shift the select lever to “D” range.
11) Depress the accelerator pedal to the full while fully depressing the foot brake pedal with your left foot.
12) Immediately after the engine speed becomes steady, record the reading of the secondary pressure (line pressure), engine speed and actual secondary pressure on Subaru Select Monitor. And then release the accelerator pedal. Shift the select lever to “N” range. Let the engine idle for one minute or more to cool it down.

NOTE:
• Do not continue the stall test for 5 seconds or more at a time (from fully closed throttle, fully open throttle to secondary pressure (line pressure) reading). Failure to follow this instruction will cause the engine oil and CVTF to deteriorate and the clutch and brake to be adversely affected.
• After performing the secondary pressure (line pressure) test, be sure to cool down the engine for at least one minute with the select lever set in “P” or “N” range and with the idle speed at 1,200 rpm or less.
• Under each condition, check that the measured pressure matches almost totally with actual secondary pressure.
• When both measured pressure and actual secondary pressure are out of specification, judge as control valve malfunction.
• The value at stall is for reference because the pressure changes under different conditions or circumstances.
• The value at idling is steady because it is not affected by any condition or circumstance.

Secondary pressure (line pressure) standard				
	Range	Throttle	Brake	Secondary pressure (line pressure) (MPa (kgf/cm^2, psi))
Stall	D, R	Full open	ON	4.5 — 6.0 (45.9 — 61.2, 652 — 870)
Idling	P, N	Full closed	OFF	0.5 — 1.5 (5.1 — 15.3, 72 — 218)

13) Remove the ST and install the plug after measurement.

CAUTION:
Removal of the ST and installation of the test plug shall be both performed quickly.

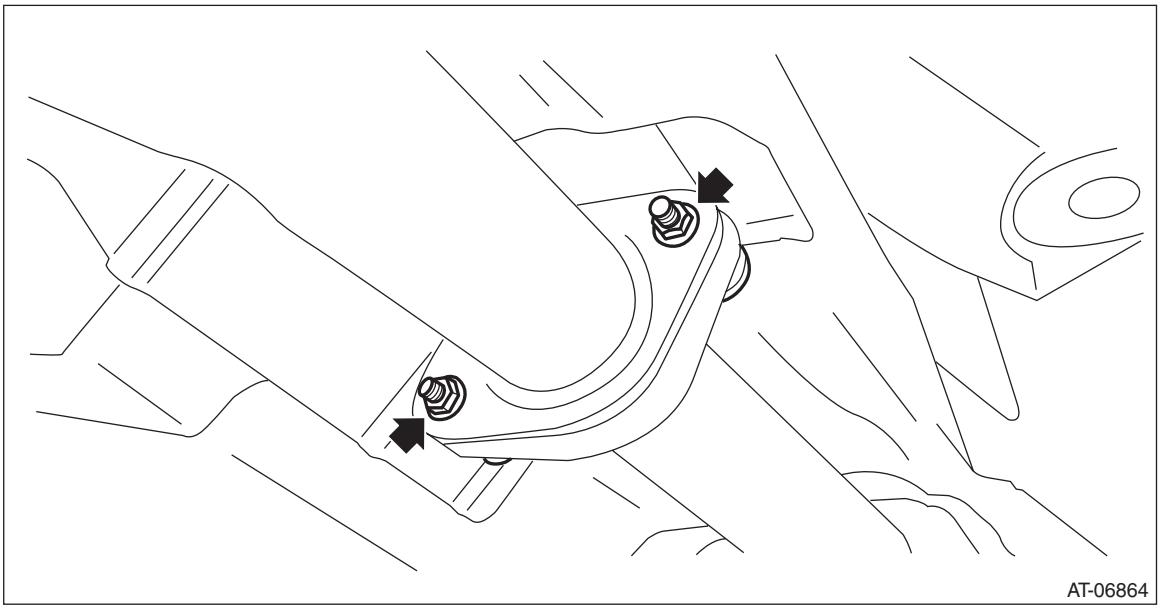
NOTE:
• Use new O-rings.
• Apply CVTF to the O-ring.

Tightening torque:
50 N·m (5.1 kgf-m, 36.9 ft-lb)
14) Adjust the CVTF level. <Ref. to CVT-36, ADJUSTMENT, CVTF.>

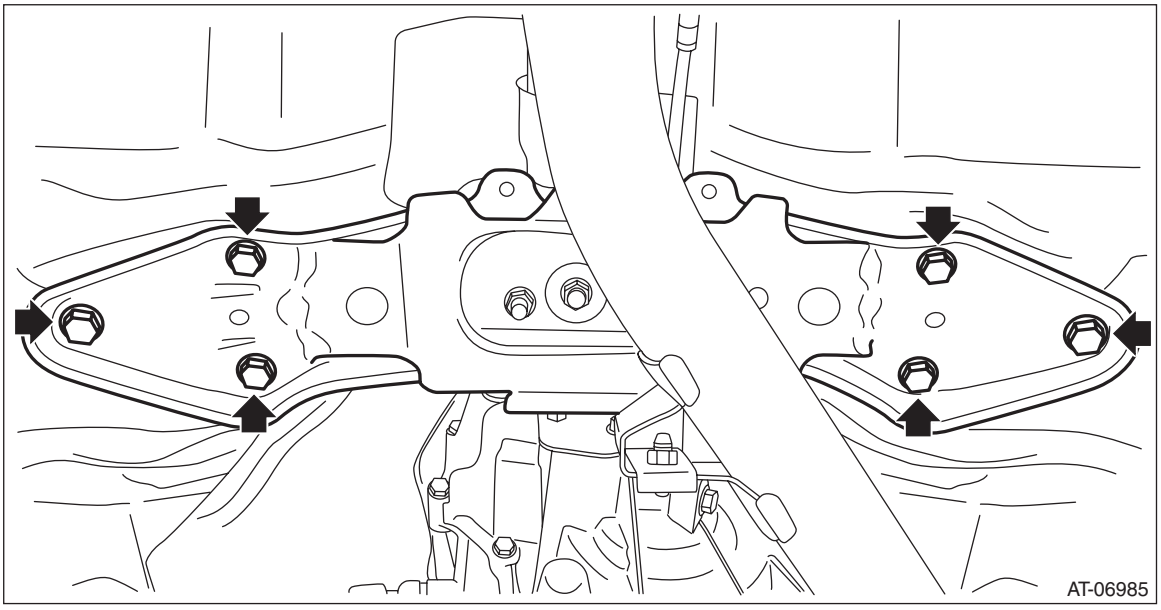
9. Transfer Clutch Pressure Test

A: INSPECTION

1) Lift up the vehicle.
2) Remove the rear exhaust pipe from center exhaust pipe.



3) Remove the heat shield cover.
4) Set the transmission jack under the transmission.
5) Remove the mounting bolt of rear crossmember.

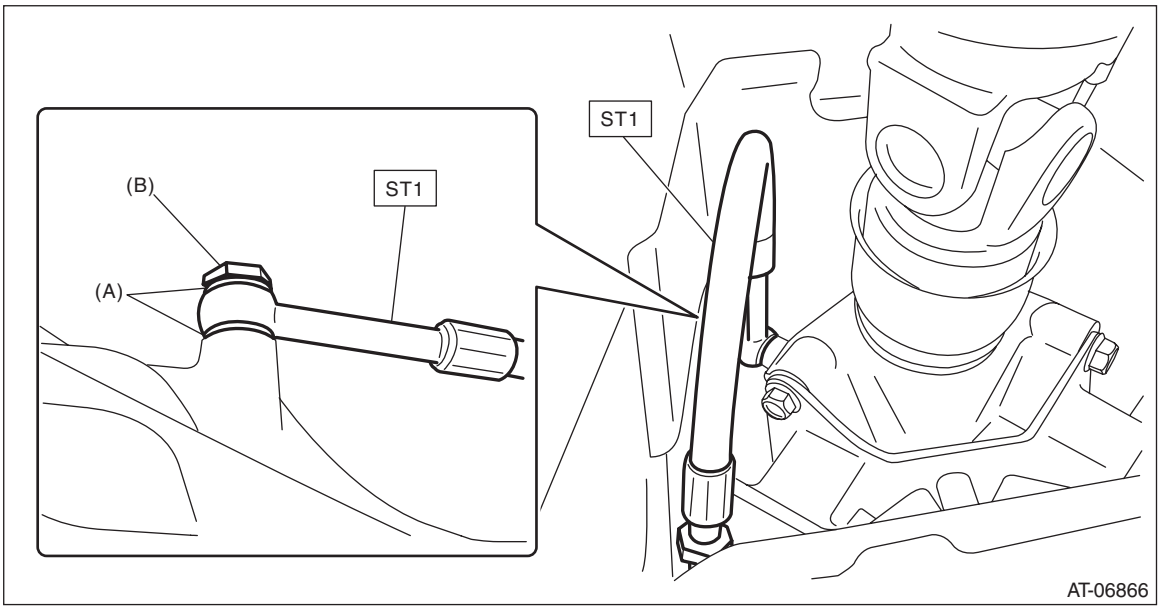


6) Lower the rear side of transmission until the transfer clutch pressure test plug can be removed.
7) Remove the transfer clutch pressure test plug.

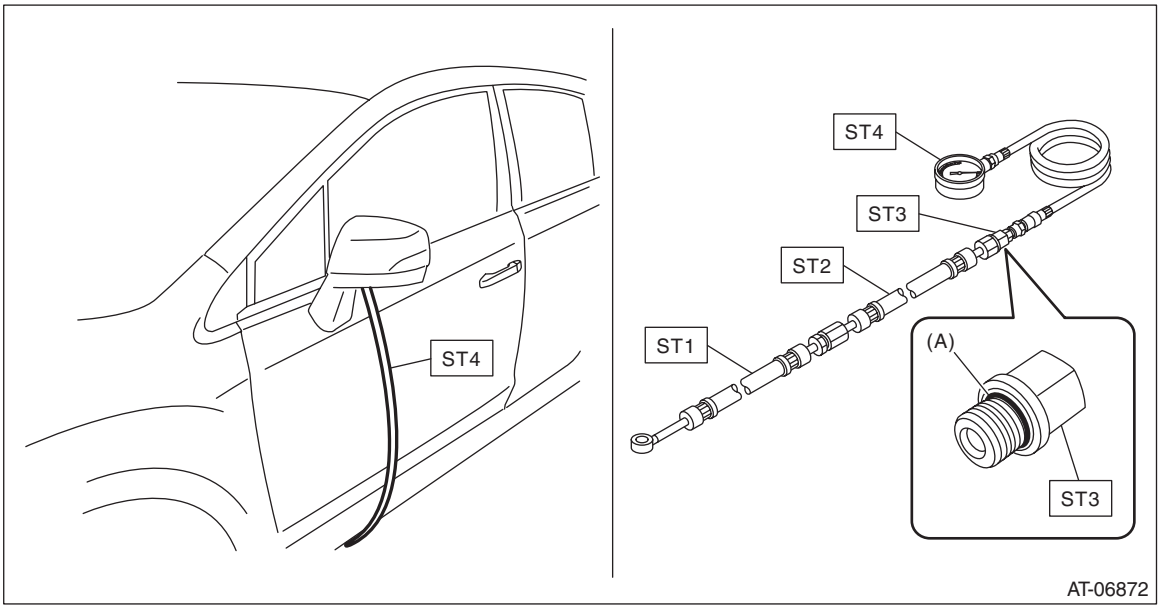
8) Set the ST1, ST2, ST3 and ST4 to the transmission.

NOTE:
• Use ST1 ADAPTER HOSE B with genuine union screw (part No. 801914010) and gasket (part No. 803914060) attached.
• Use ST3 PRESSURE GAUGE ADAPTER with genuine O-ring (part No. 806911080) attached.

ST1 34099AC020 ADAPTER HOSE B
ST2 34099AC010 ADAPTER HOSE A
ST3 18681AA000 PRESSURE GAUGE ADAPTER
ST4 498575400 OIL PRESSURE GAUGE ASSY



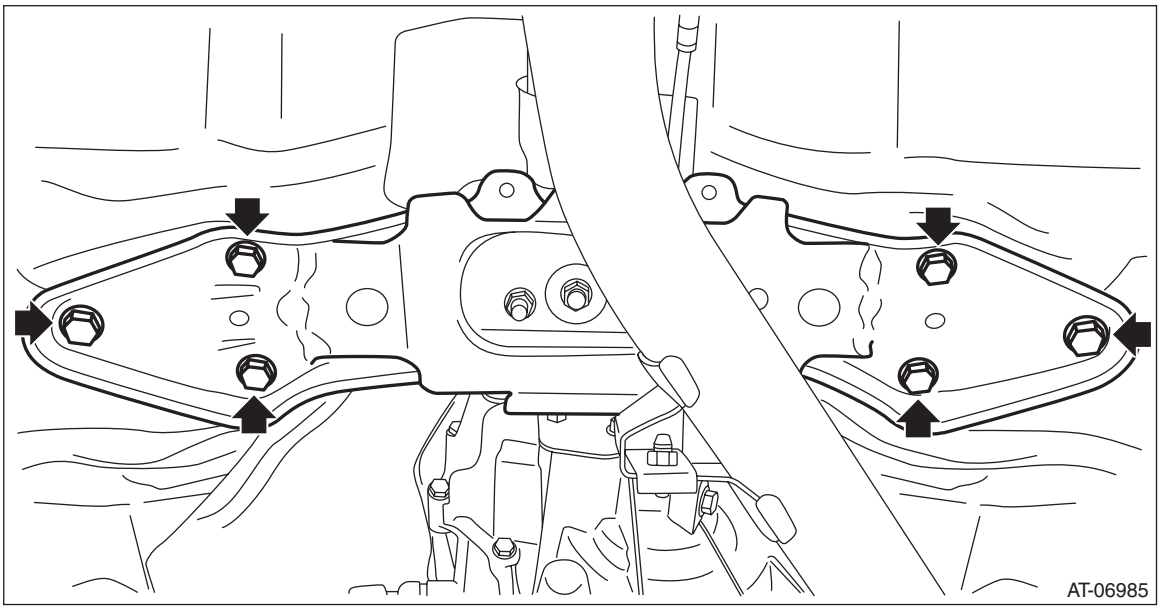
(A) Gasket (genuine part)
(B) Union screw (genuine part)



(A) O-ring (genuine part)

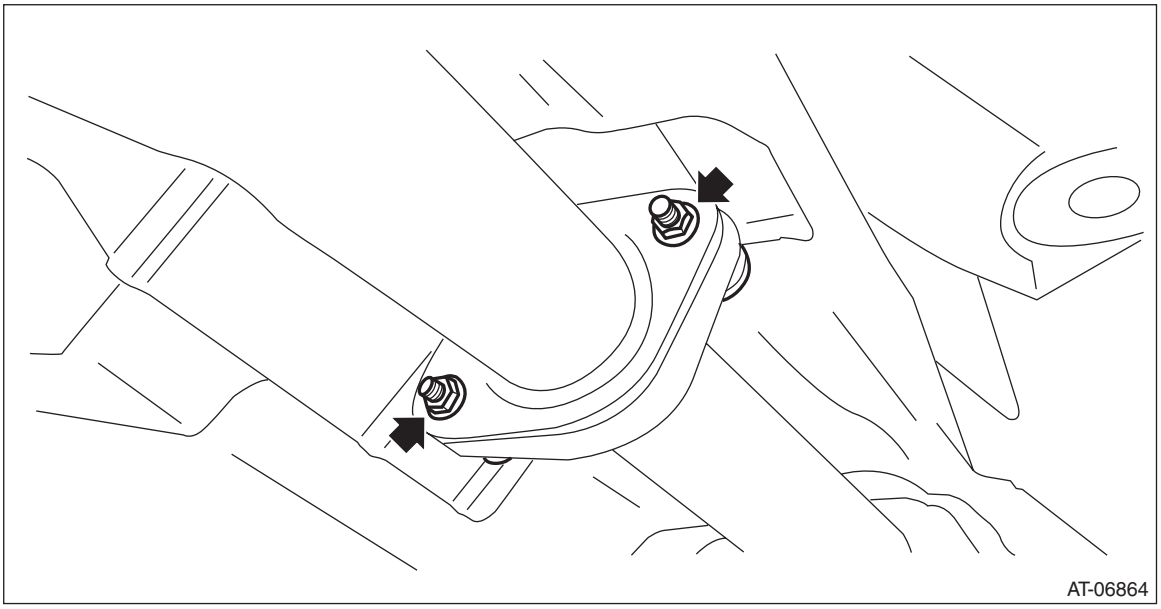
9) Raise the transmission, and install the rear crossmember.

Tightening torque:
70 N·m (7.1 kgf-m, 51.6 ft-lb)



10) Install the rear exhaust pipe to center exhaust pipe.

Tightening torque:
18 N·m (1.8 kgf-m, 13.3 ft-lb)



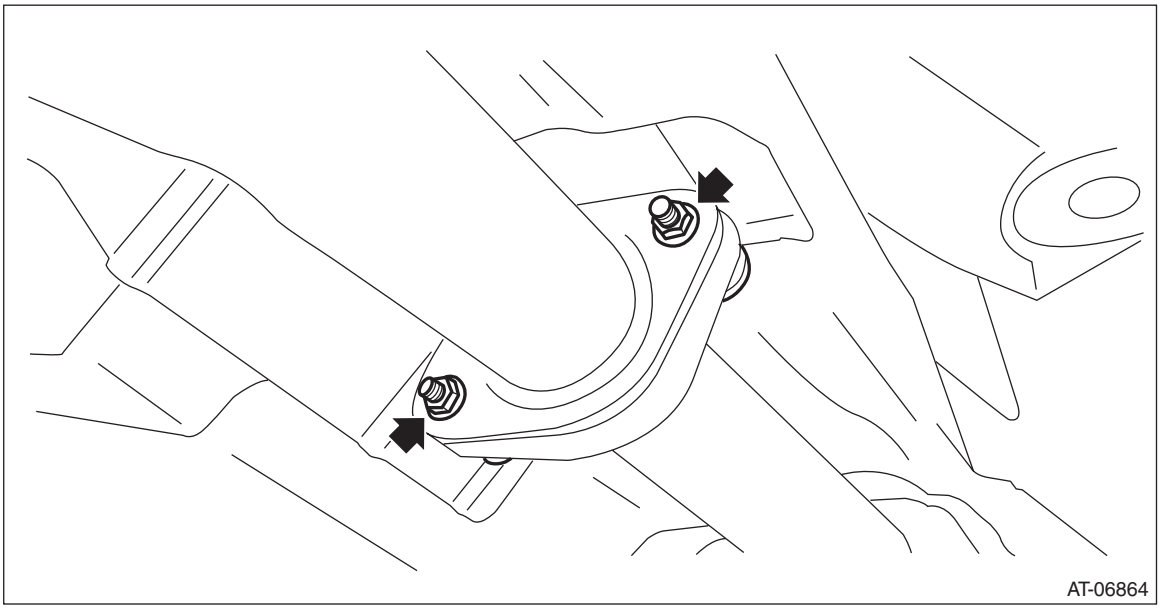
11) Lower the vehicle.
12) Connect the Subaru Select Monitor to the data link connector and read the current data.

13) Check the transfer clutch pressure as in secondary pressure (line pressure) test. <Ref. to CVT-49, Secondary Pressure (Line Pressure) Test.>

NOTE:
- Use Subaru Select Monitor for switching to FWD mode. <Ref. to CVT-45, AWD ON/OFF Switching Mode.>
- If no oil pressure is produced, if it does not change in AWD mode or if oil pressure is produced in FWD mode, there may be a problem in the control valve body.

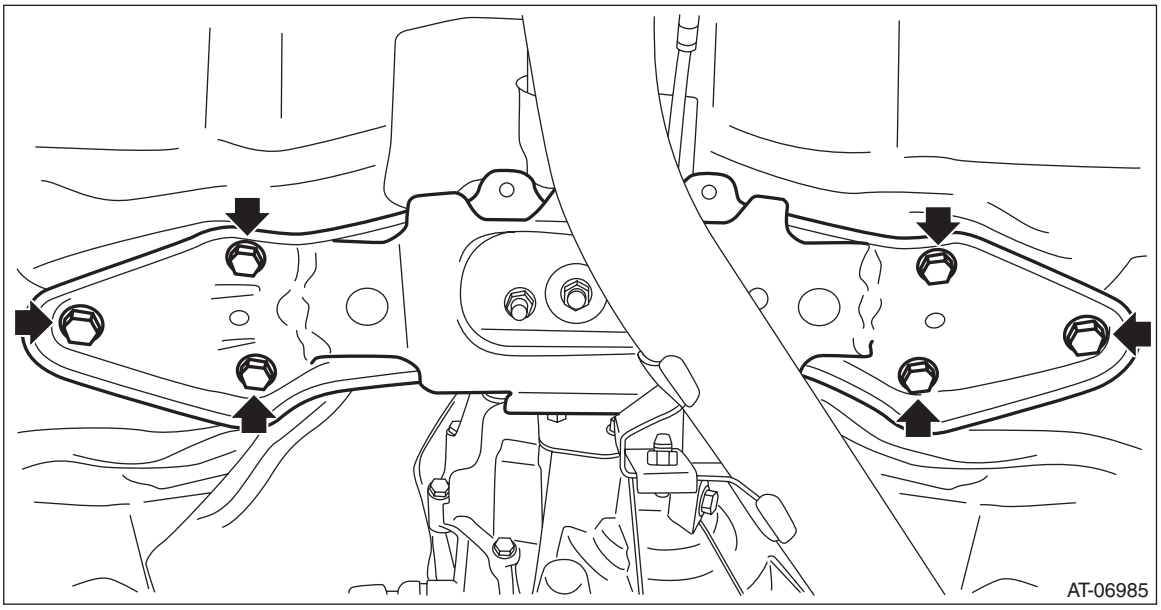
Range position	ON Duty ratio (%)	Accelerator pedal opening angle (%)	Standard transfer clutch pressure kPa (kgf/cm^2, psi)	
			AWD mode	FWD mode
D	95 — 100	Fully opened (100)	1,000 — 1,200 (10.2 — 12.2, 145 — 174)	—
	60	Adjust ON Duty ratio to 60%.	400 — 700 (4.1 — 7.1, 58 — 102)	—
	0	Fully closed (0)	—	0 (0, 0)
N or P	0	Fully closed (0)	0	—

14) Lift up the vehicle.
15) Remove the rear exhaust pipe from center exhaust pipe.



16) Set the transmission jack under the transmission.

17) Remove the mounting bolt of rear crossmember.



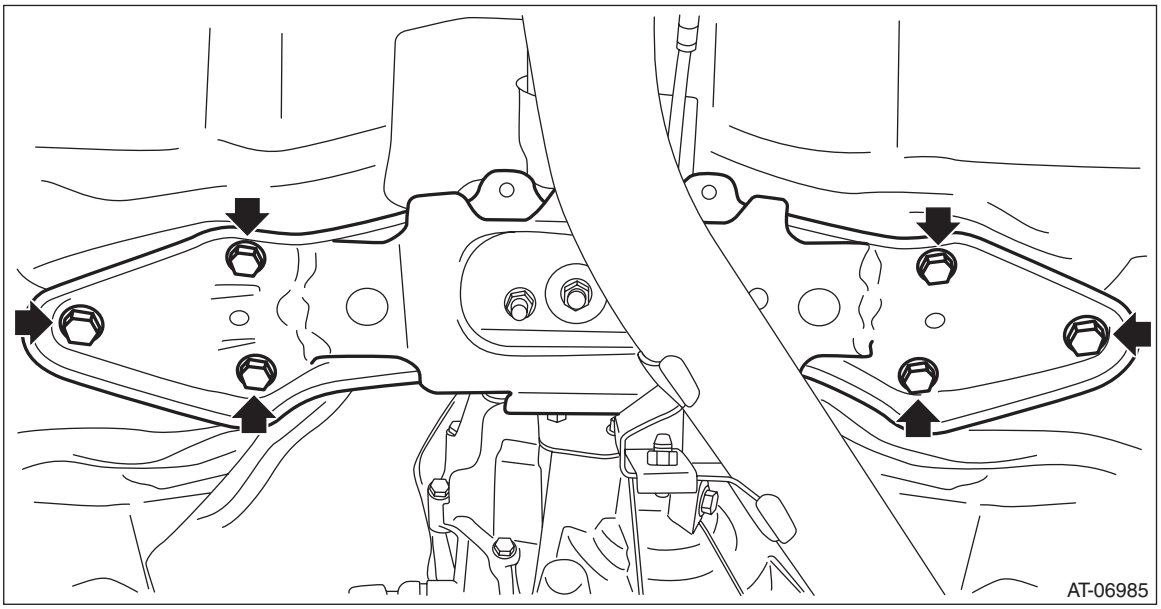
18) Lower the rear side of transmission until the ST can be removed.
19) Remove the ST and install the plug.

NOTE:
- Use new O-rings.
- Apply CVTF to the O-ring.

Tightening torque:
25 N·m (2.5 kgf-m, 18.4 ft-lb)

20) Raise the transmission, and install the rear crossmember.

Tightening torque:
70 N·m (7.1 kgf-m, 51.6 ft-lb)



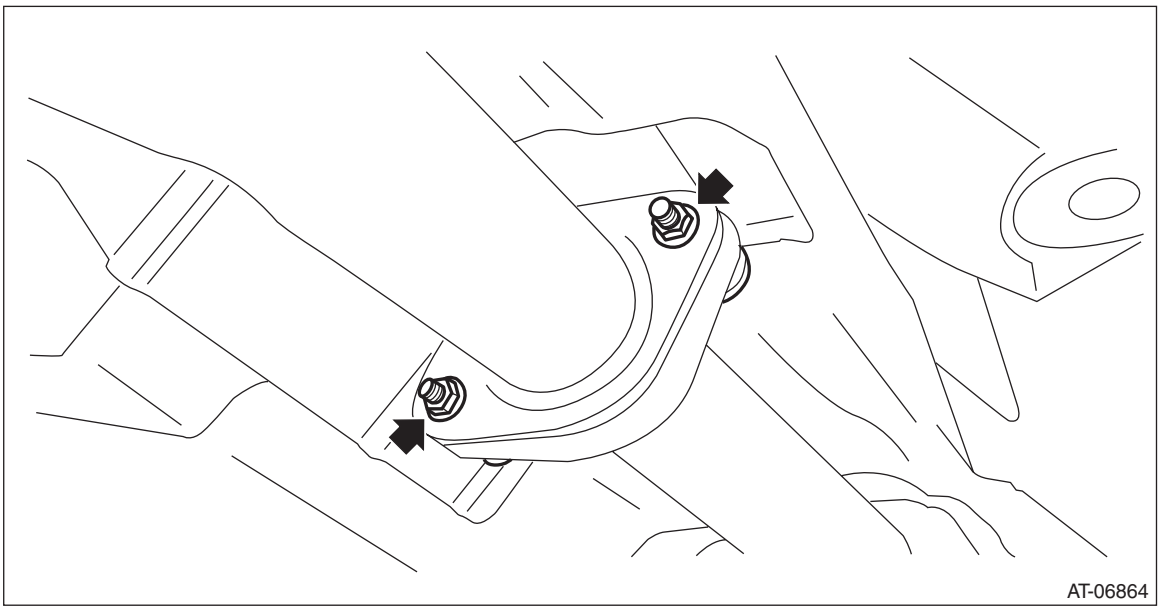
21) Install the heat shield cover.

Tightening torque:
18 N·m (1.8 kgf-m, 13.3 ft-lb)

22) Install the rear exhaust pipe to center exhaust pipe.

NOTE:
Use a new gasket.

Tightening torque:
18 N·m (1.8 kgf-m, 13.3 ft-lb)

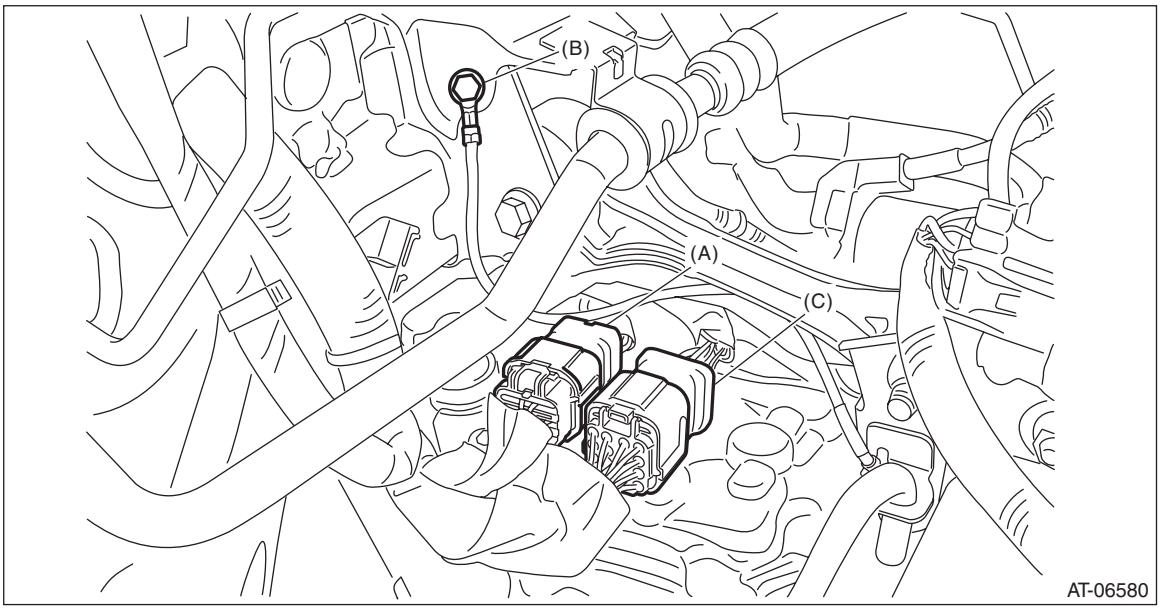


23) Lower the vehicle.

10.Automatic Transmission Assembly

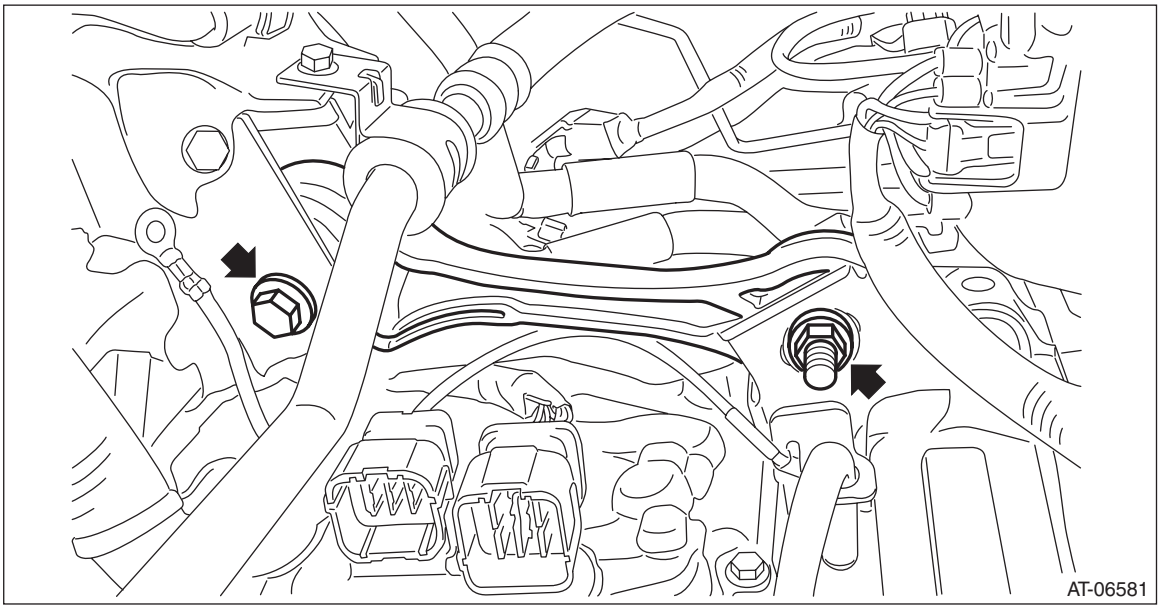
A: REMOVAL

1) Disconnect the ground cable from battery.
2) Remove the air intake boot assembly. <Ref. to IN(H4DO)-12, REMOVAL, Air Intake Boot.>
3) Disconnect the following connectors.
- Transmission harness connectors
- Inhibitor harness connector
- Transmission radio ground terminal

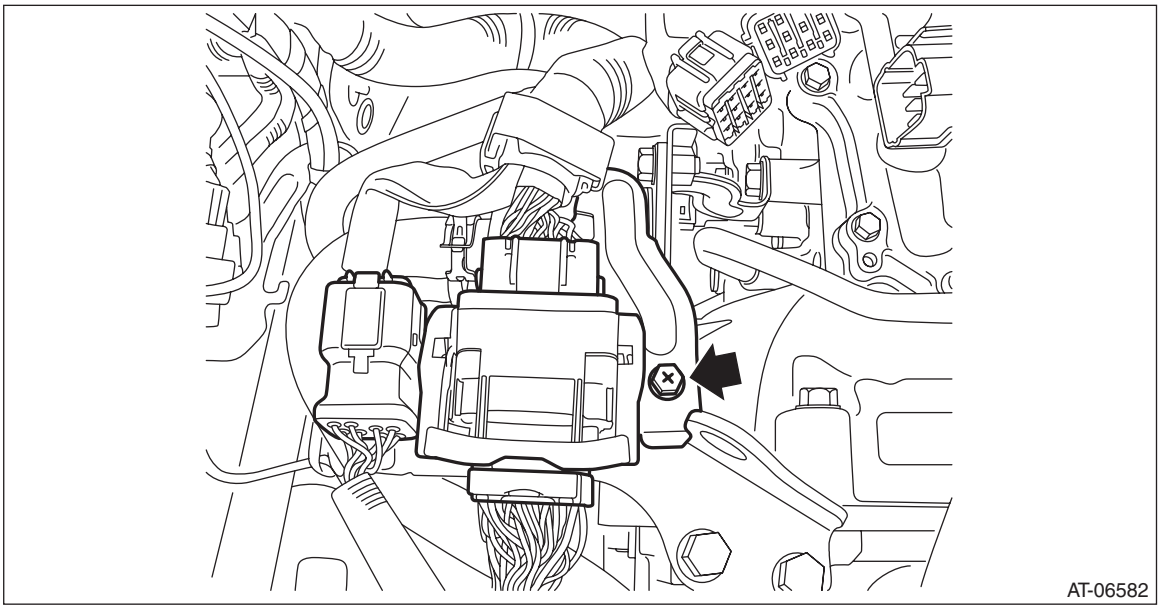


(A) Transmission harness connectors
(B) Transmission radio ground terminal
(C) Inhibitor harness connector

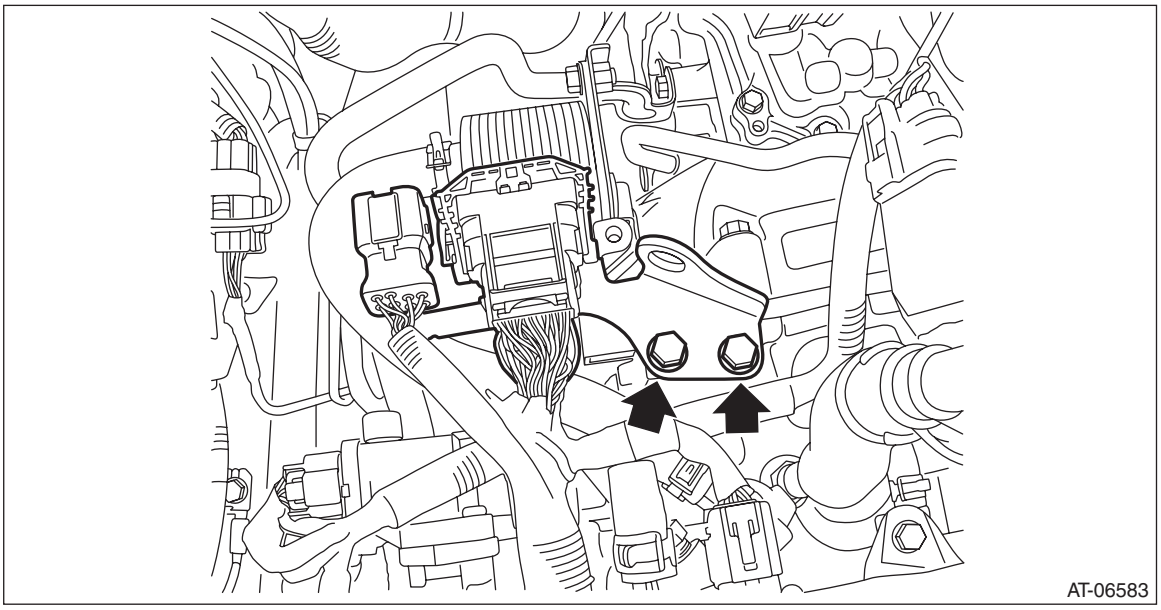
4) Remove the starter. <Ref. to SC(H4DO)-9, REMOVAL, Starter.>
5) Remove the pitching stopper.



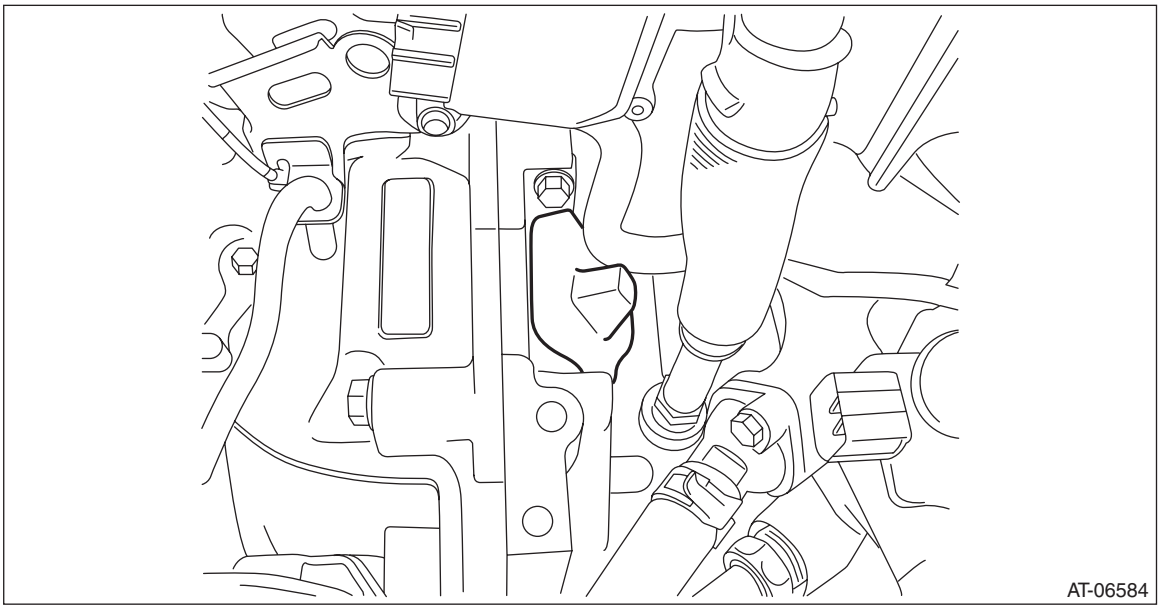
6) Remove the harness bracket, and then remove the engine harness.



7) Disconnect the EGR control valve harness connector, throttle position sensor harness connector and manifold pressure sensor harness connector.
8) Remove the engine hanger rear.

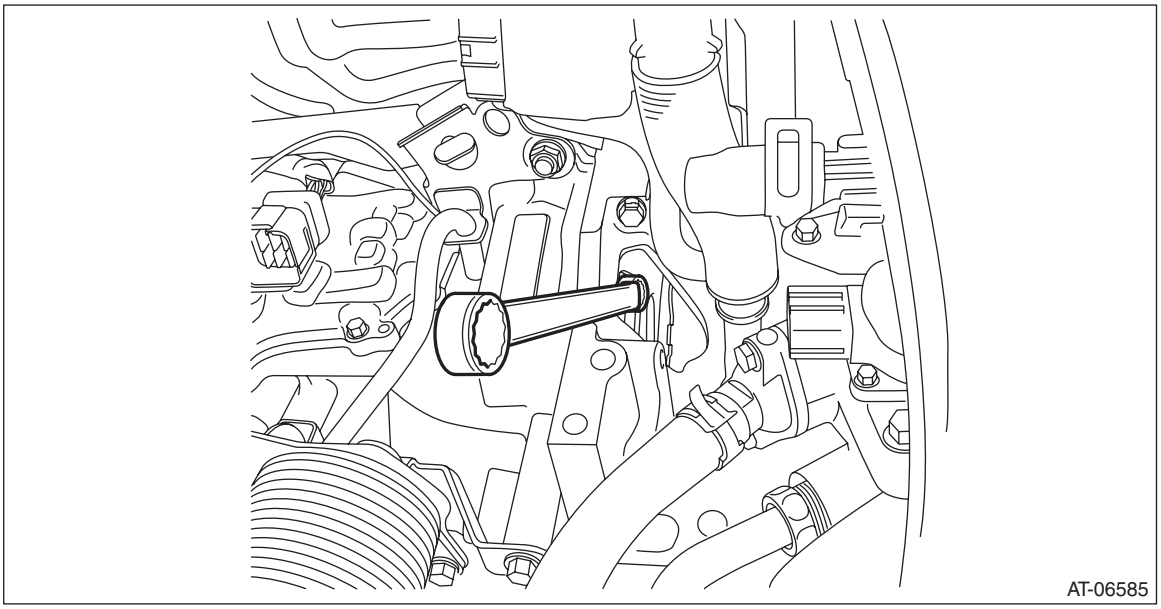


9) Remove the service hole plug.



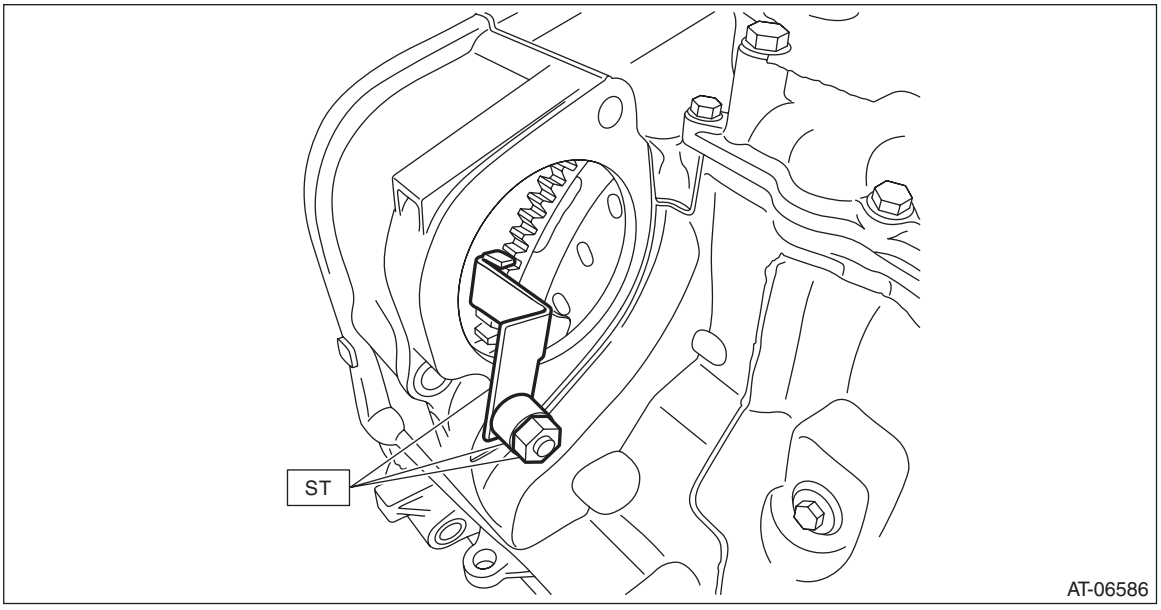
10) Remove the four bolts combining the torque converter and drive plate while rotating the crank pulley a little at a time in the same direction as engine revolution.

CAUTION:
- **Be careful not to drop bolts into the converter housing.**
- **Be careful not to damage the mounting bolts.**

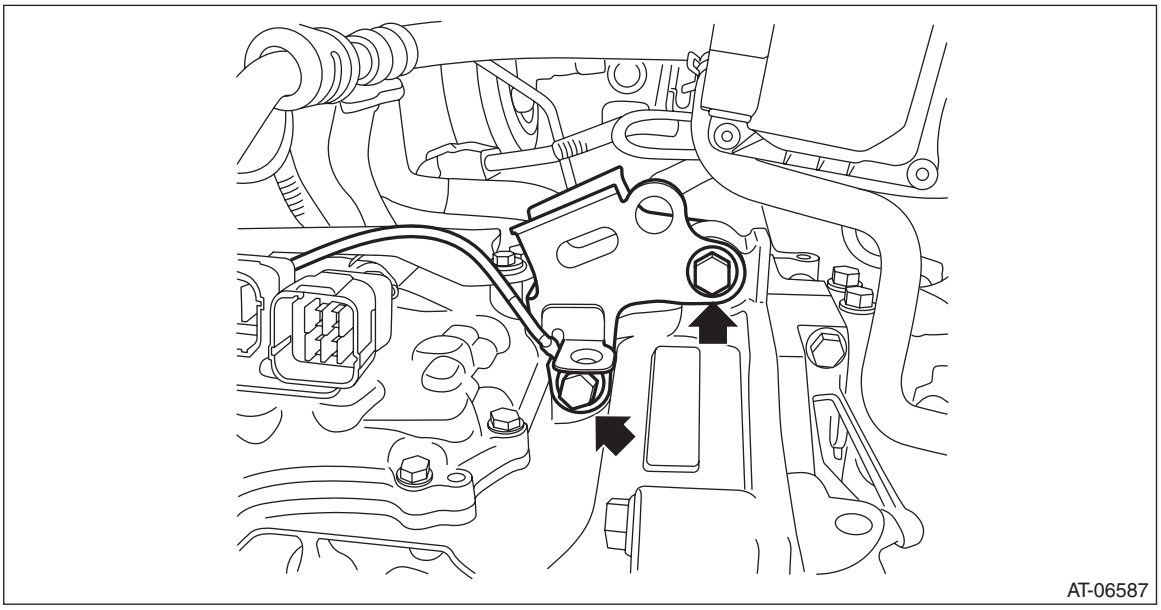


11) Make sure the torque converter moves freely by rotating with finger through the starter installation hole.

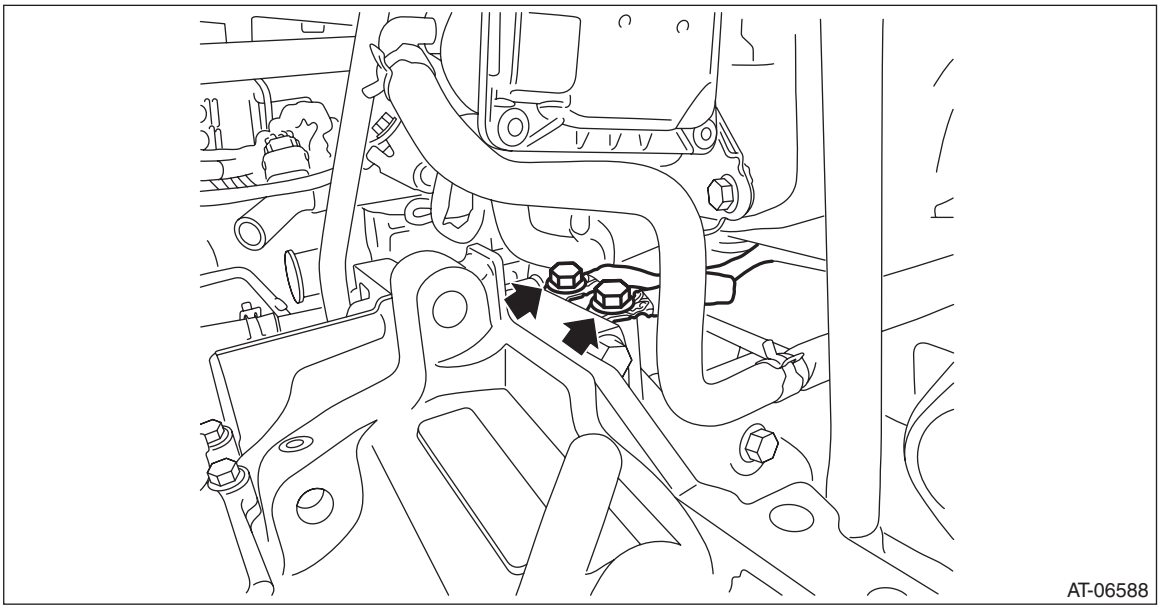
12) Attach the ST to the converter case.
ST 498277200 STOPPER SET



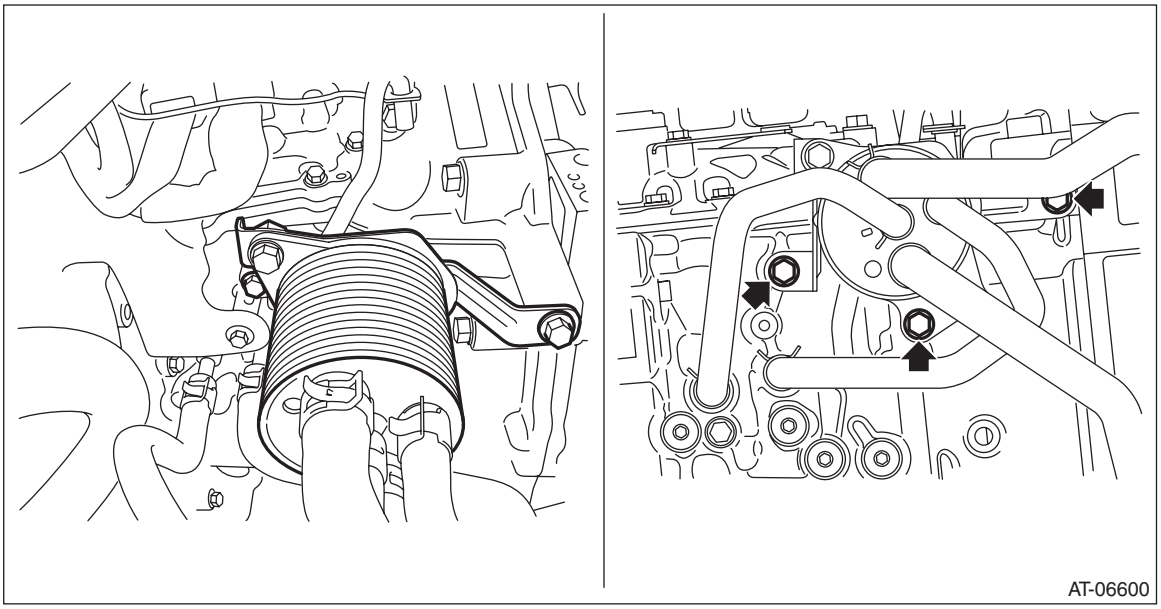
13) Remove the air breather hose from the pitching stopper bracket, and then remove the pitching stopper bracket and transmission radio ground cord.



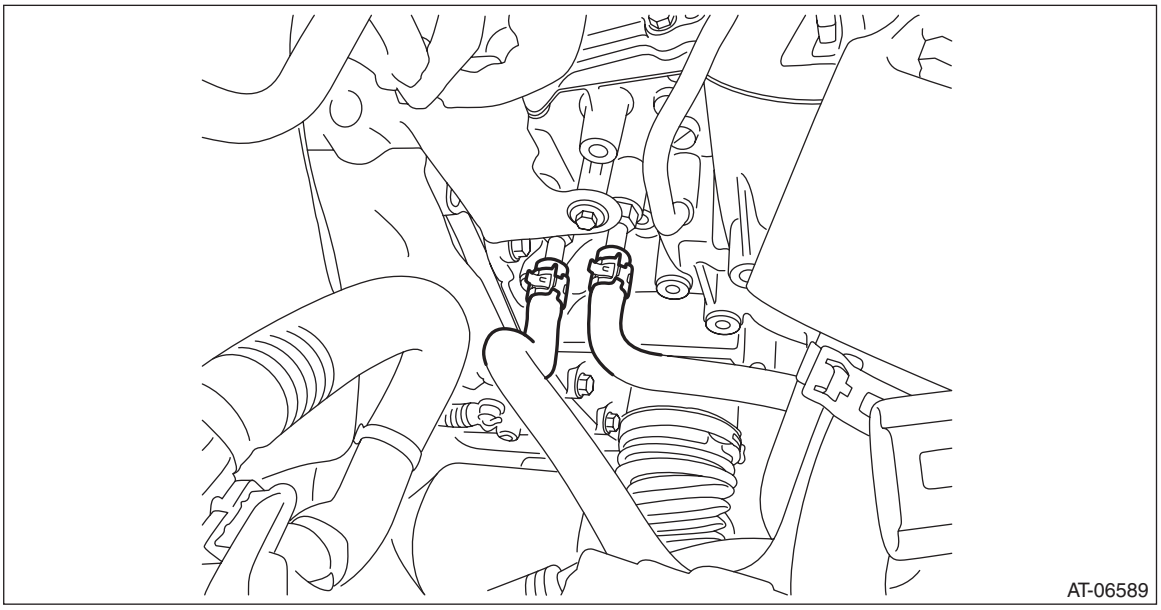
14) Remove the engine ground terminal.



15) Remove the CVTF cooler (with warmer feature) from the transmission, and using a piece of wire, affix to a location of the body where it will not interfere with the removal of the transmission.

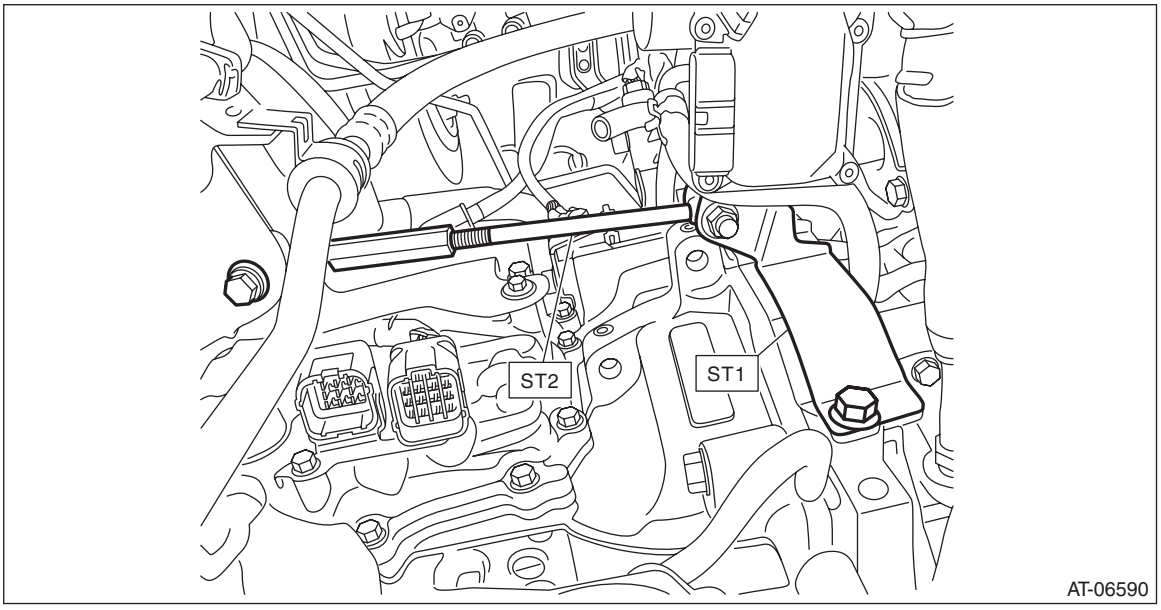


16) Remove the CVTF inlet hose and outlet hose from the pipe.

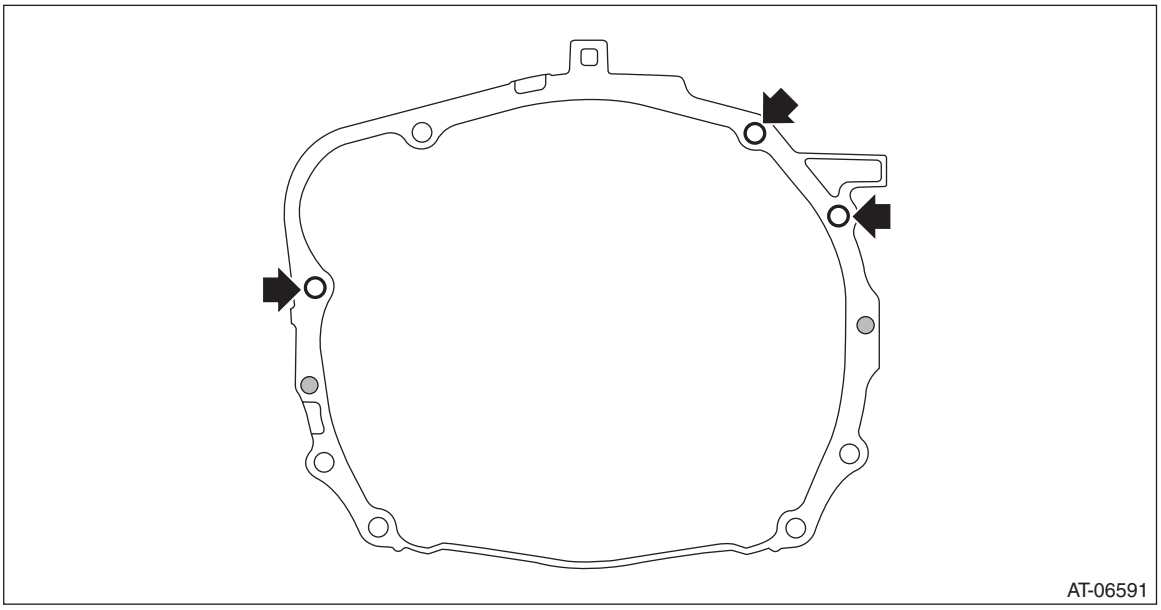


17) Set the ST.

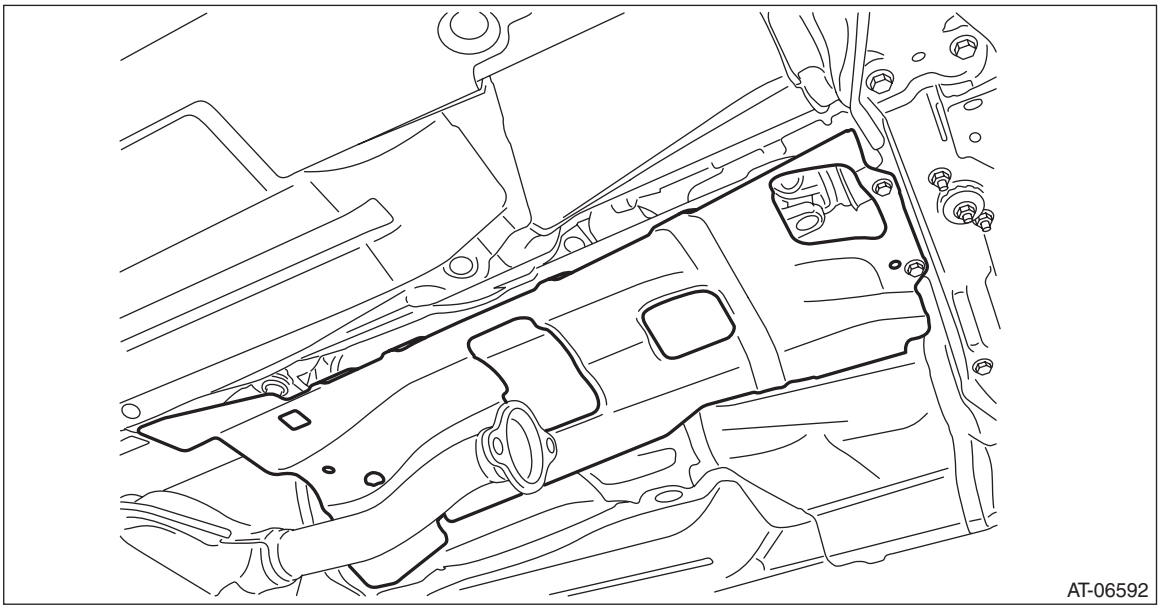
ST1 41099AA010 ENGINE SUPPORT BRACKET
ST2 41099AA020 ENGINE SUPPORT



18) Remove the three transmission connecting bolts.

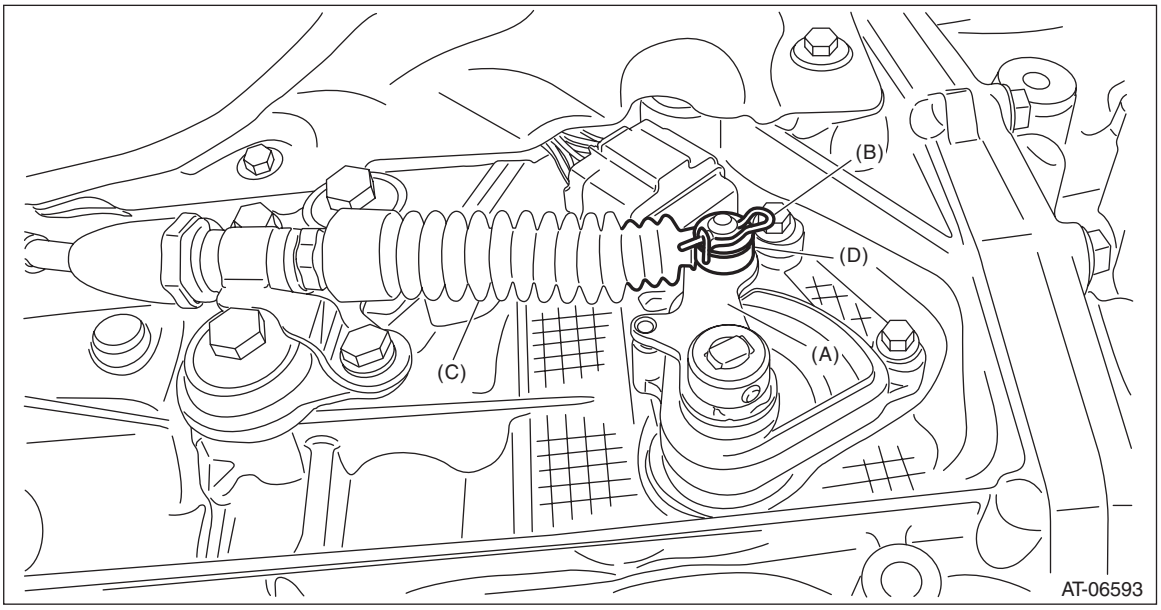


19) Lift up the vehicle.
20) Remove the front wheels. <Ref. to WT-4, REMOVAL, Tire and Wheel.>
21) Remove the under cover.
22) Remove the center exhaust pipe. <Ref. to EX(H4DO)-14, REMOVAL, Rear Exhaust Pipe.>
23) Remove the center exhaust cover.



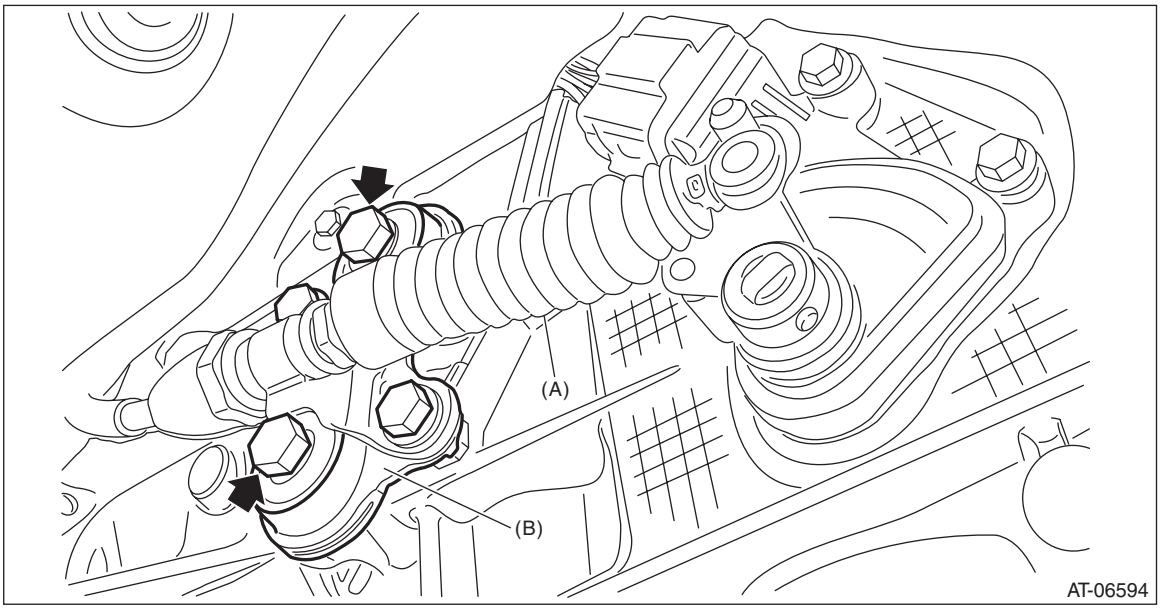
24) Remove the CVTF drain plug to drain CVTF. <Ref. to CVT-38, REPLACEMENT, CVTF.>
25) Drain differential gear oil. <Ref. to CVT-42, REPLACEMENT, Differential Gear Oil.>

26) Remove the snap pin and washer from shifter arm and remove the select cable from shifter arm.



(A) Shifter arm
(B) Snap pin
(C) Select cable
(D) Plate ASSY

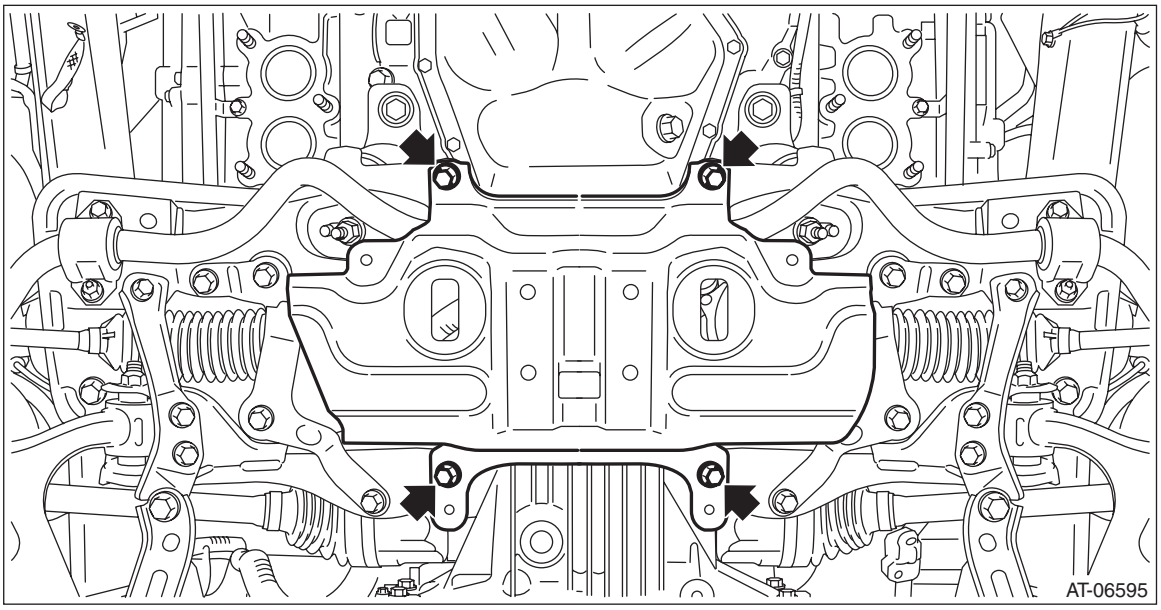
27) Remove the plate assembly from the transmission case.



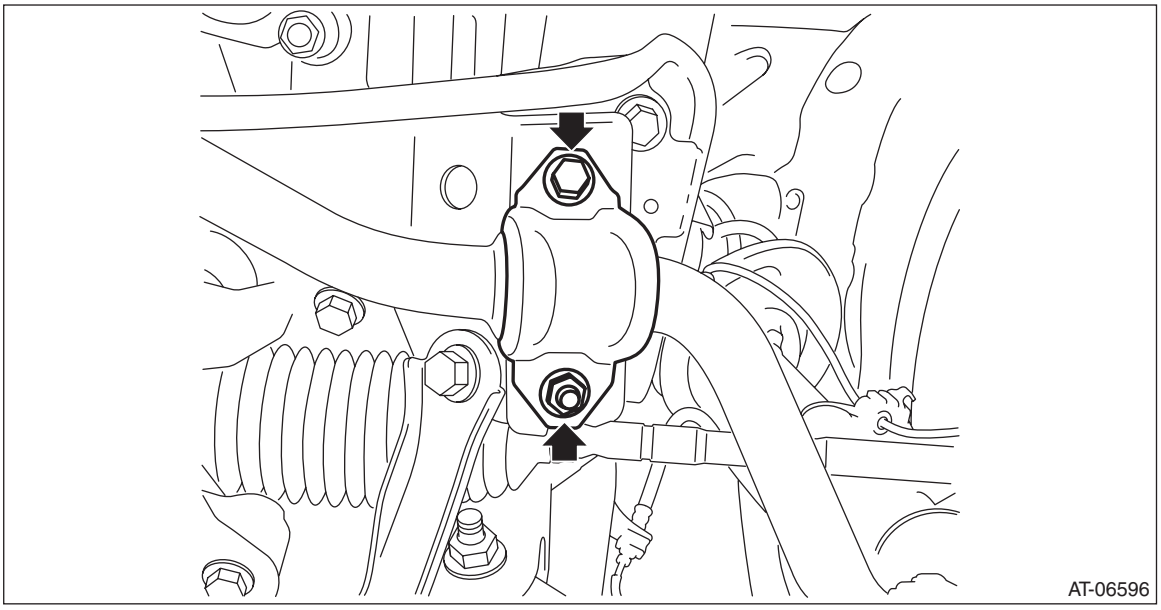
(A) Select cable
(B) Plate ASSY

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

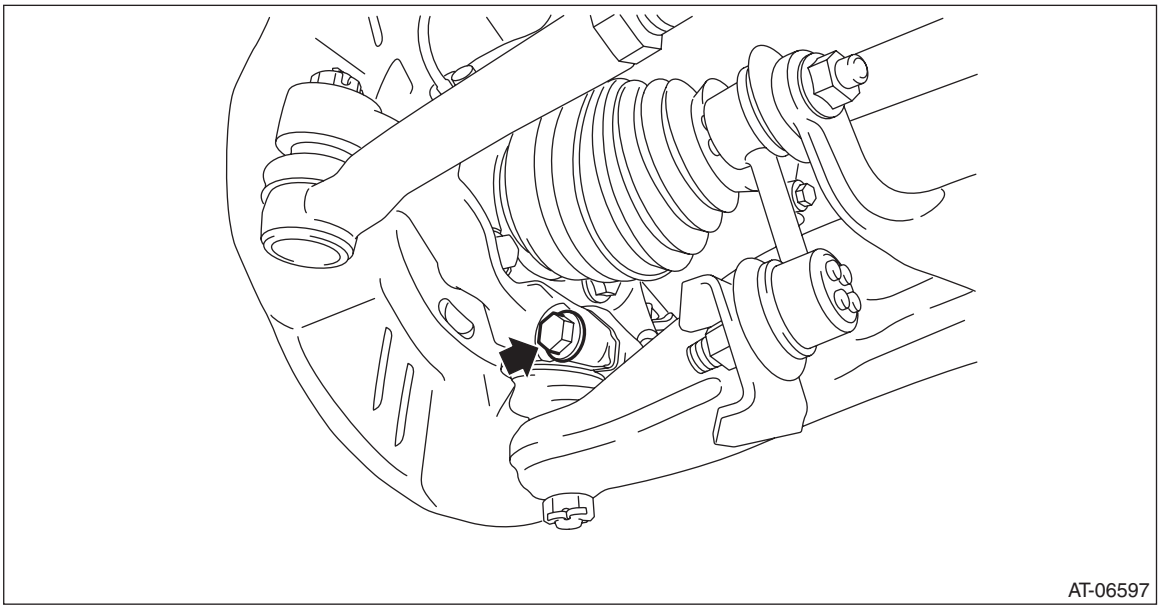
29) Remove the jack-up plate.



30) Remove the stabilizer bracket.



31) Remove the bolts which secure to the front housing, and separate the front arm and housing.



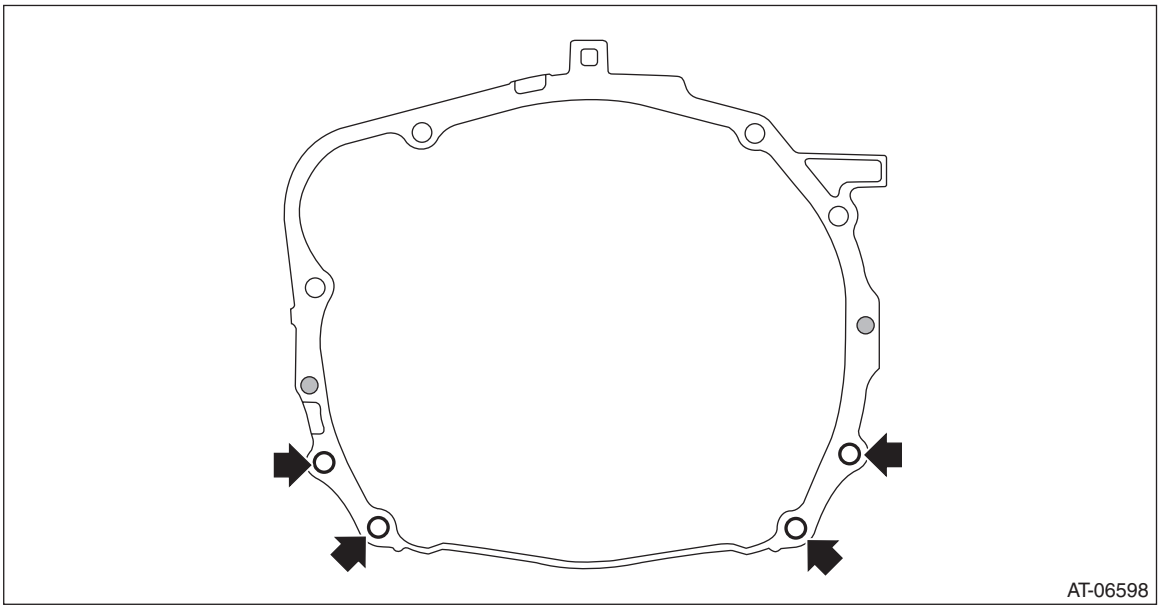
32) Using a tire lever or a crow bar, etc., pull out until the front drive shaft transmission side joint slides move smoothly.

NOTE:
Place cloth between the tire lever or bar and the transmission in order to avoid damaging the transmission side retainer.

33) Hold the transmission side joint of the front drive shaft by hand and extract the housing from the transmission while pressing the housing outward, so as not to stretch the boot.

NOTE:
- Before pulling RH front drive shaft from transmission, turn the steering wheel to left hand full lock.
- Before pulling LH front drive shaft from transmission, turn the steering wheel to right hand full lock.

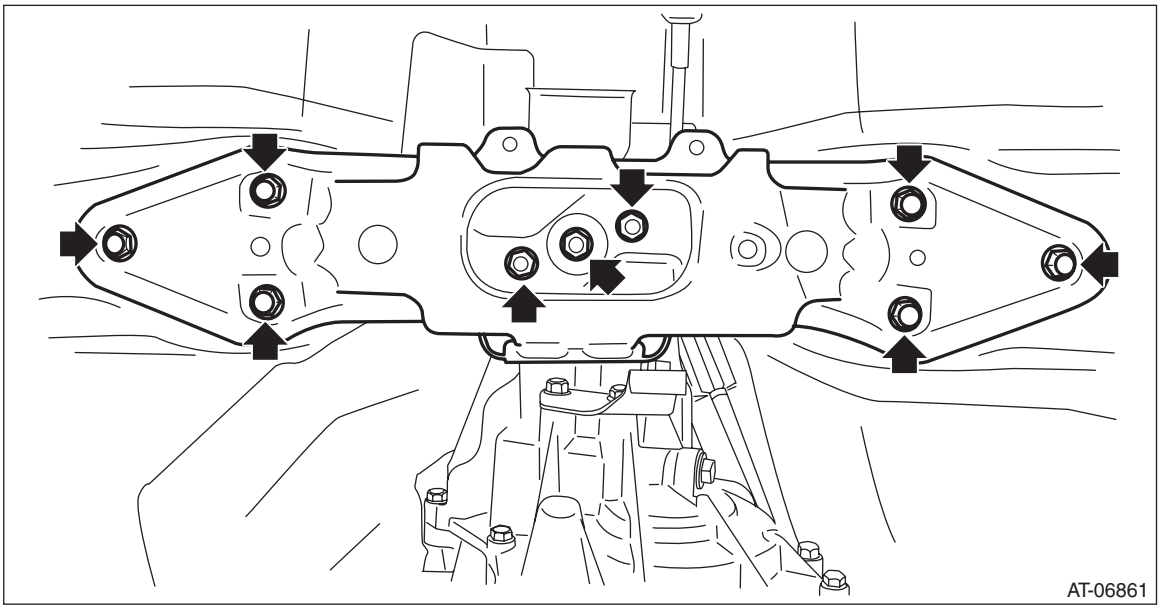
34) Remove the two transmission connecting bolts and two nuts (lower side).



35) Set the transmission jack under the transmission.

NOTE:
Make sure that the support plates of transmission jack do not touch the oil pan.

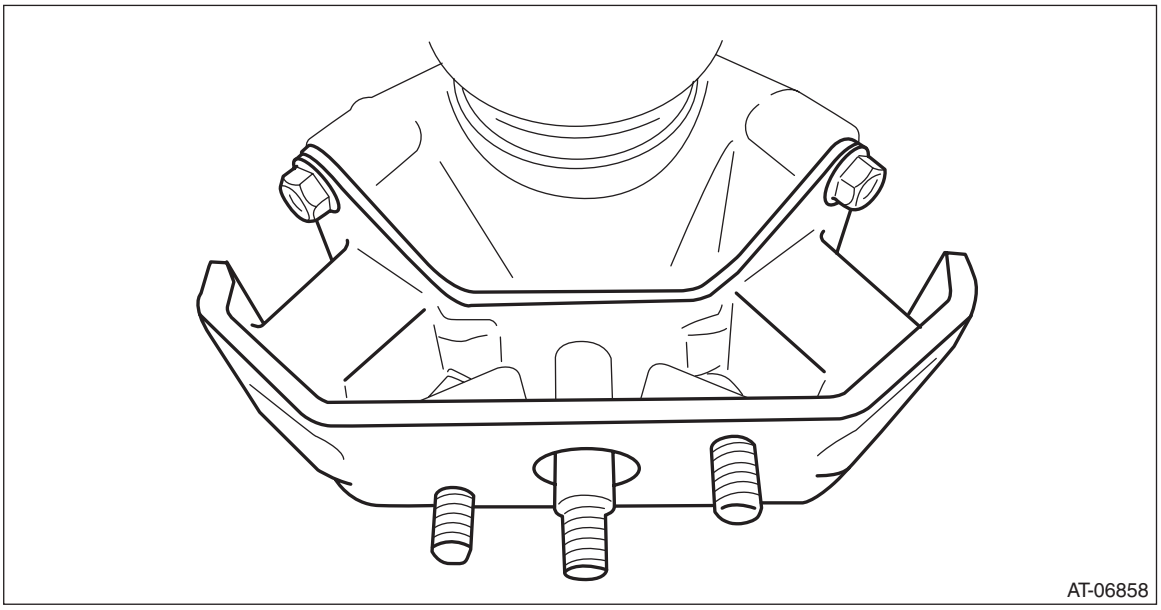
36) Remove the transmission rear crossmember from the vehicle.



37) While lowering the transmission jack gradually, fully retract the engine support, and then tilt the engine rearward.
38) Remove the transmission assembly.

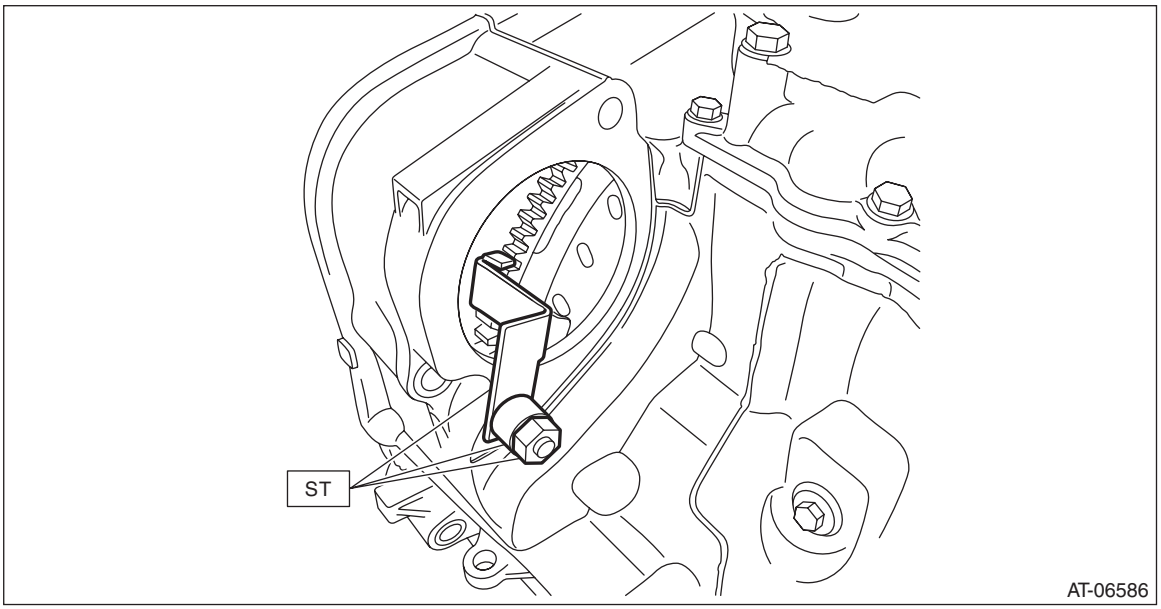
NOTE:
Remove it while moving the transmission jack up and down so that the engine and transmission remain directly aligned.

39) Remove the rear cushion rubber.



B: INSTALLATION

1) Attach the ST to converter case.
ST 498277200 STOPPER SET

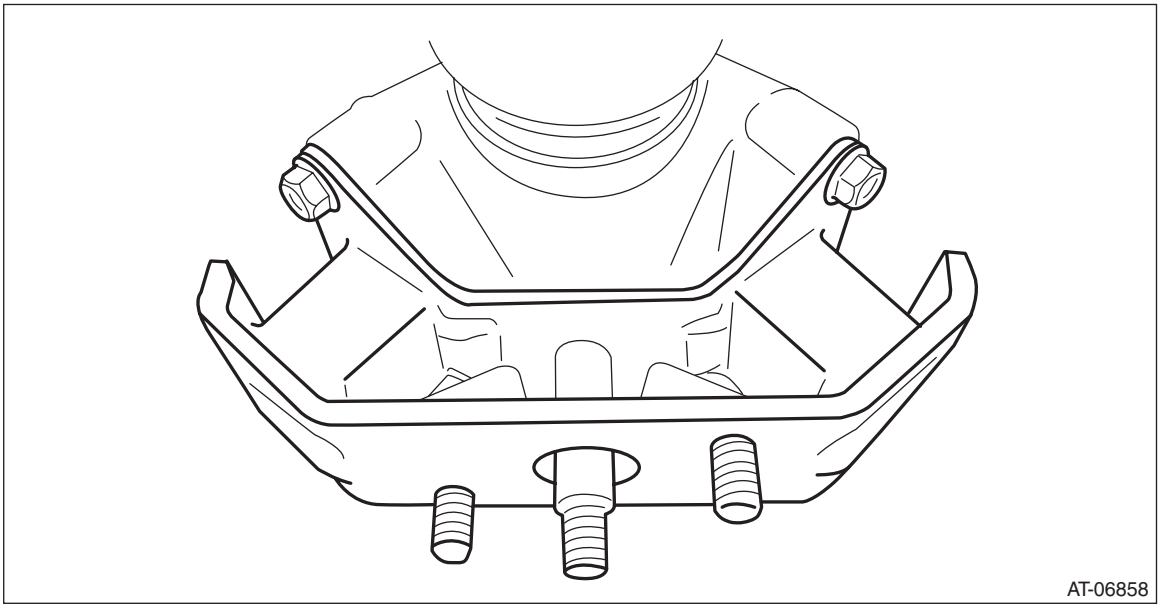


2) When completely overhauling the transmission, refill CVTF through the transmission right side plug. <Ref. to CVT-154, Preparation for Overhaul.>
3) Replace the front differential side retainer oil seal. <Ref. to CVT-87, REPLACEMENT, Differential Side Retainer Oil Seal.>

NOTE:
- Be sure to replace the differential side retainer oil seal with a new part whenever the front drive shaft is removed from the transmission.
- When a new differential side retainer oil seal has been installed, replacement is not required.

4) Install the rear cushion rubber on the transmission.

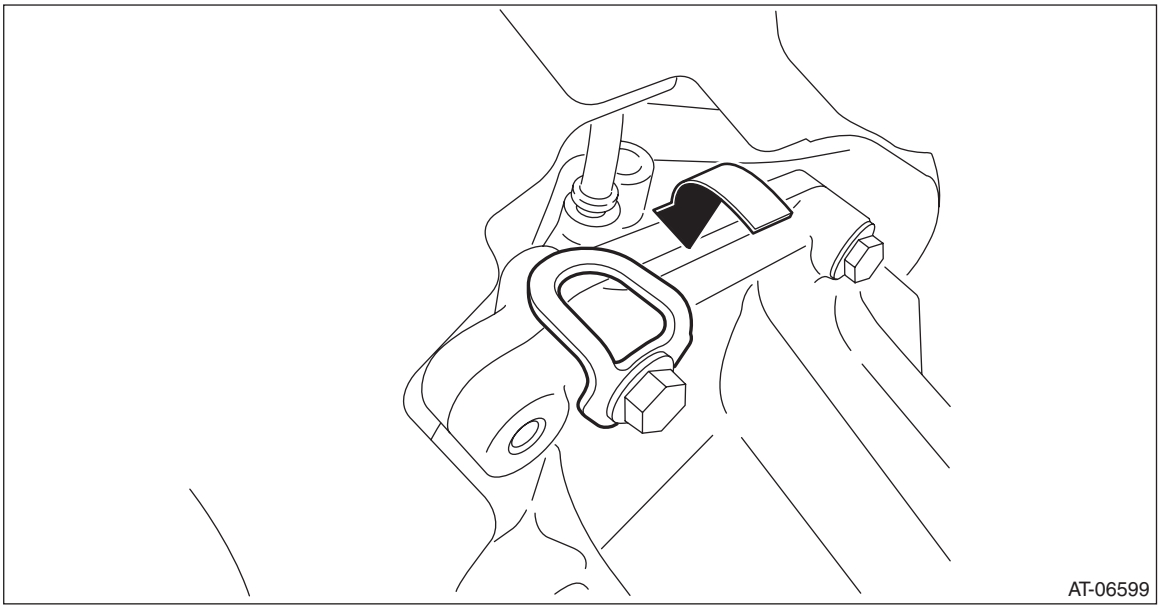
Tightening torque:
40 N·m (4.1 kgf-m, 29.5 ft-lb)



5) Mount the transmission onto the transmission jack.

6) Strike and bend the transmission hanger of transmission rear with a rubber hammer etc. so that it gets in contact with the transmission case.

CAUTION:
Do not apply extra overload or impact to the transmission case.

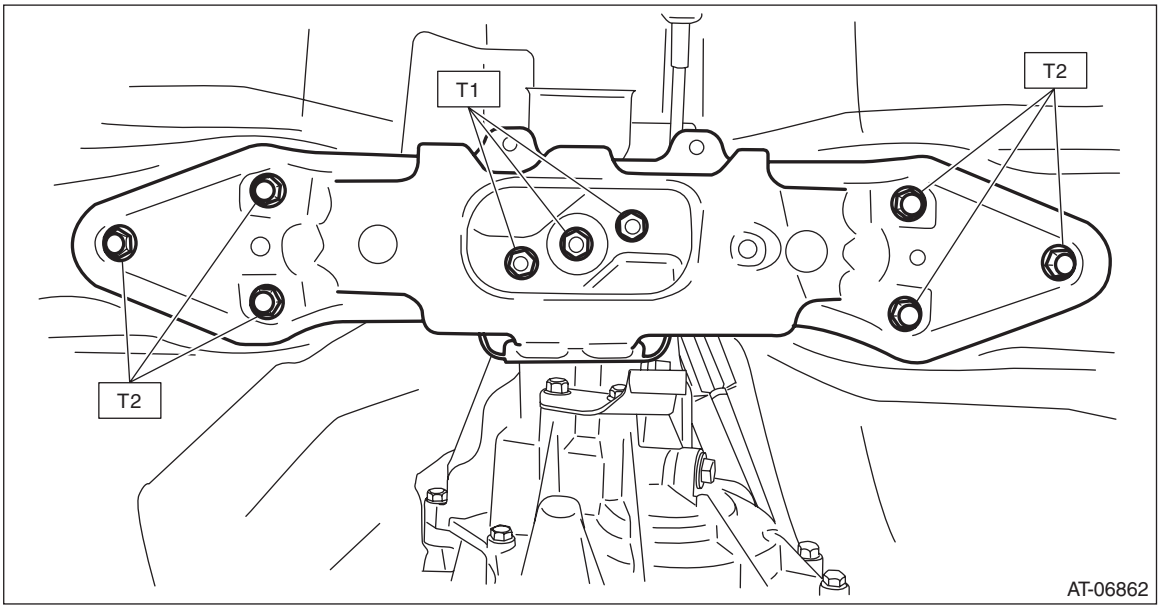


7) Remove the pitching stopper bracket, if mounted.
8) Install the transmission onto the engine.

NOTE:
- While raising the transmission jack gradually, turn the screw of engine support, then tilt the engine forward.
- Temporarily attach the two engine connecting bolts and two nuts (lower side).

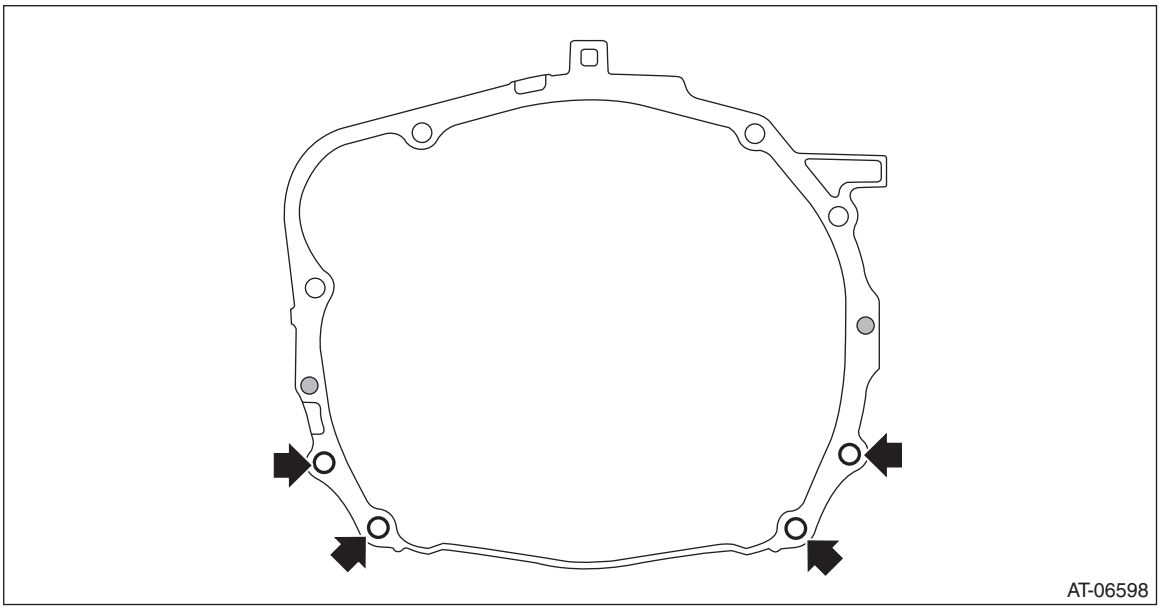
9) Install the transmission rear crossmember.

Tightening torque:
T1: 35 N·m (3.6 kgf-m, 25.8 ft-lb)
T2: 70 N·m (7.1 kgf-m, 51.6 ft-lb)



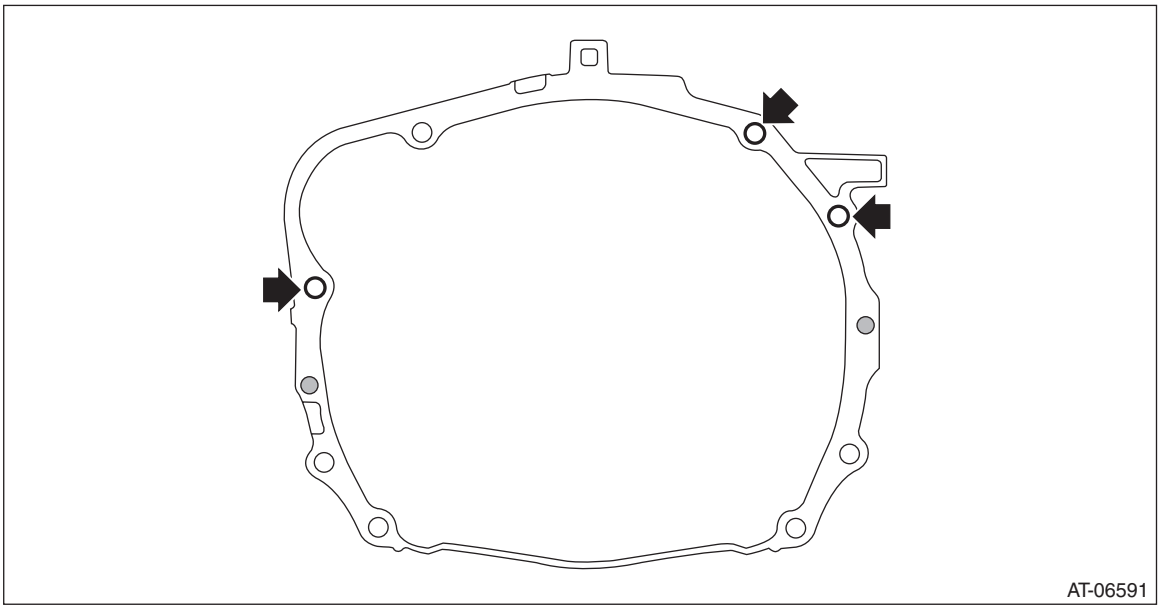
10) Tighten the two engine connecting bolts and two nuts (lower side).

Tightening torque:
50 N·m (5.1 kgf-m, 36.9 ft-lb)



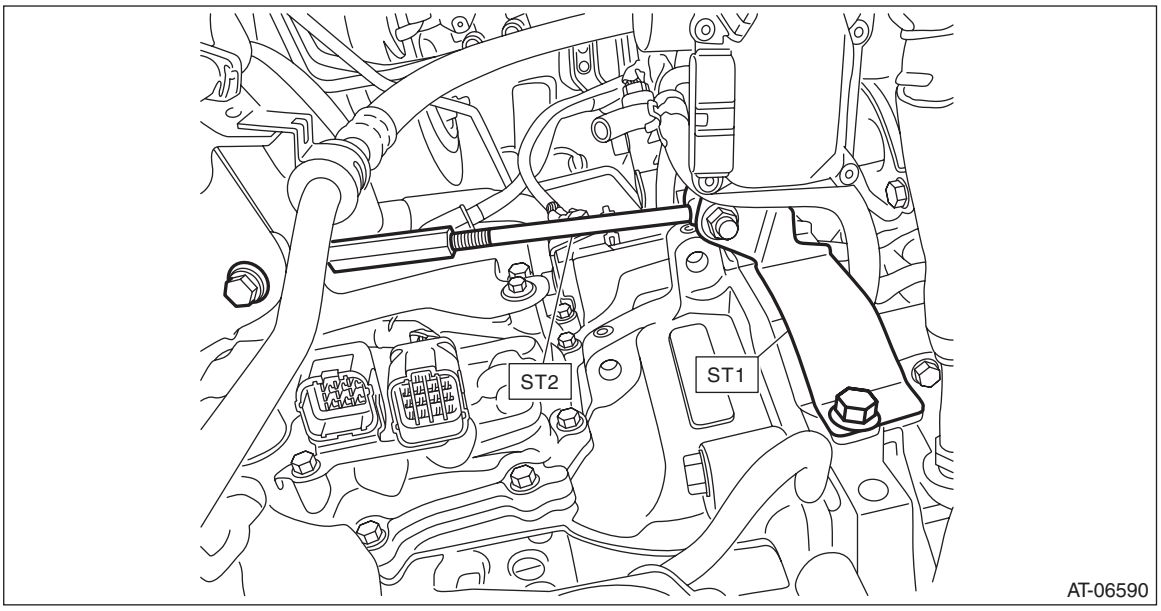
11) Remove the transmission jack.
12) Lower the vehicle.
13) Install the three engine mounting bolts (upper side).

Tightening torque:
50 N·m (5.1 kgf-m, 36.9 ft-lb)



14) Remove the ST (STOPPER SET) from converter case.

15) Remove the ST (ENGINE SUPPORT BRACKET and ENGINE SUPPORT).
ST1 41099AA010 ENGINE SUPPORT BRACKET
ST2 41099AA020 ENGINE SUPPORT



16) Match the torque converter screw hole with drive plate hole to install the bolt.

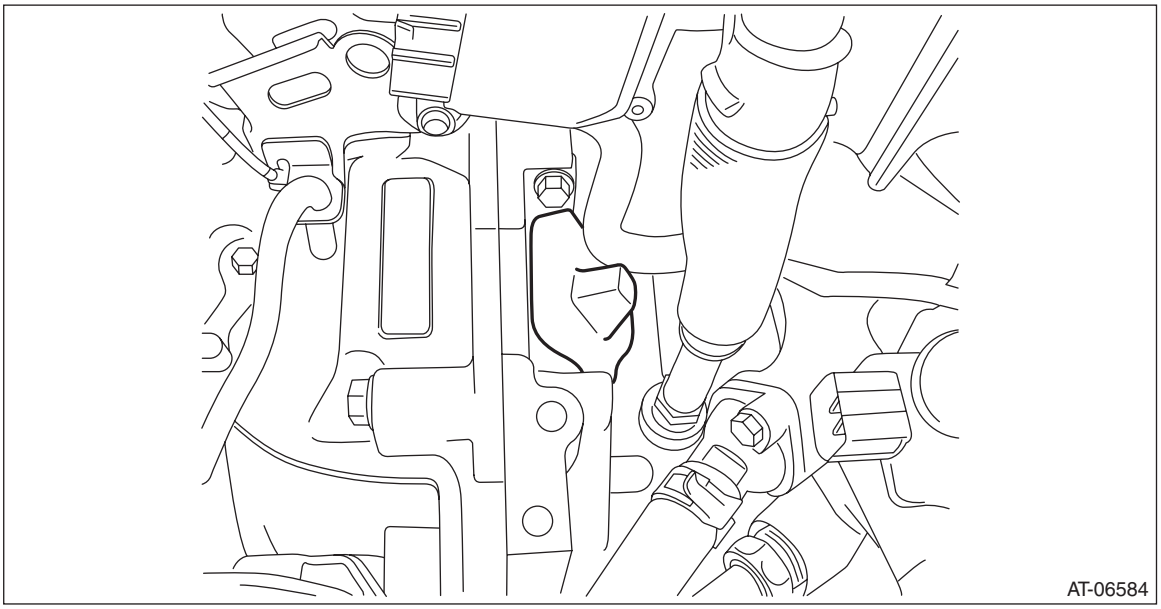
CAUTION:
- **Do not drop the mounting bolt in the converter housing.**
- **Do not damage the mounting bolt.**

Tightening torque:
25 N·m (2.5 kgf-m, 18.4 ft-lb)

17) Install the remaining three bolts by rotating the crank pulley a little at a time in the same direction as engine revolution.

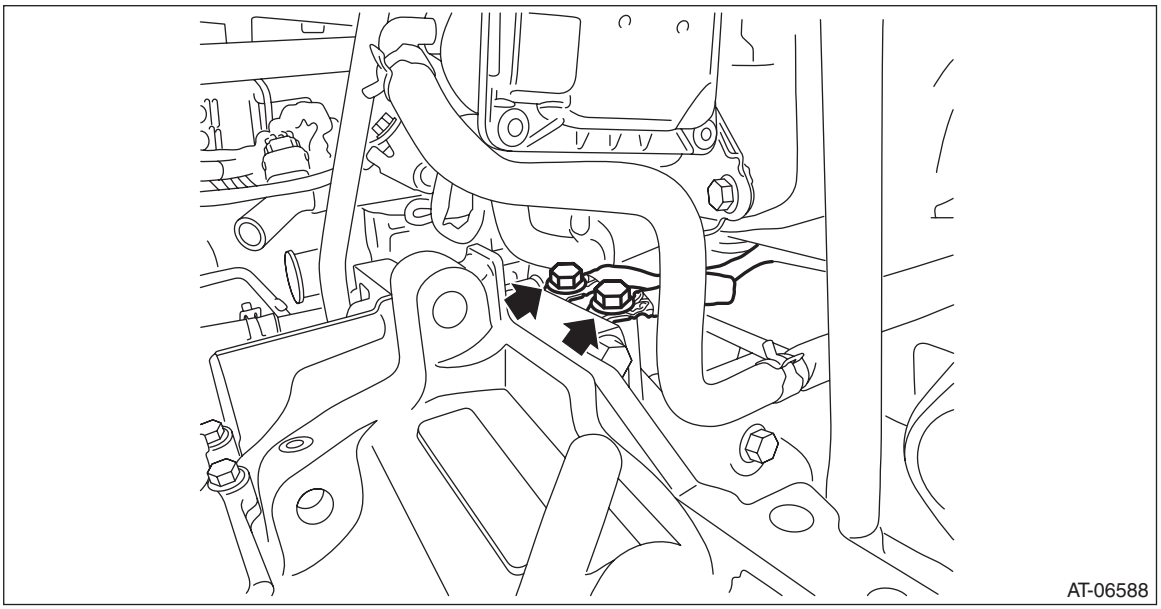
Tightening torque:
25 N·m (2.5 kgf-m, 18.4 ft-lb)

18) Install the service hole plug.

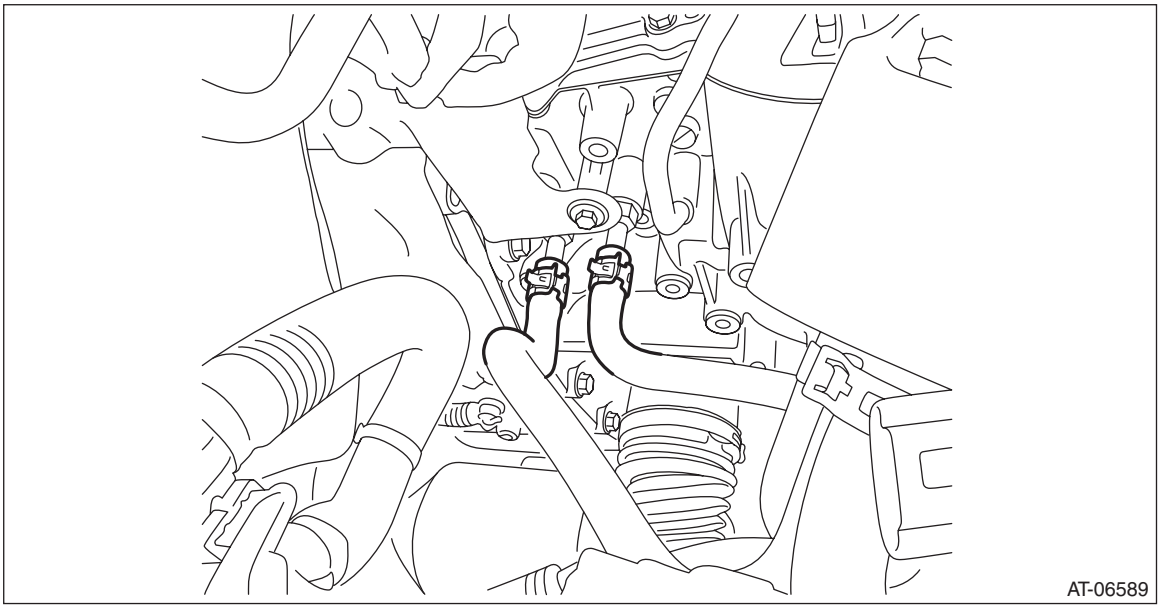


19) Install the engine ground terminals.

Tightening torque:
19 N·m (1.9 kgf-m, 14.0 ft-lb)

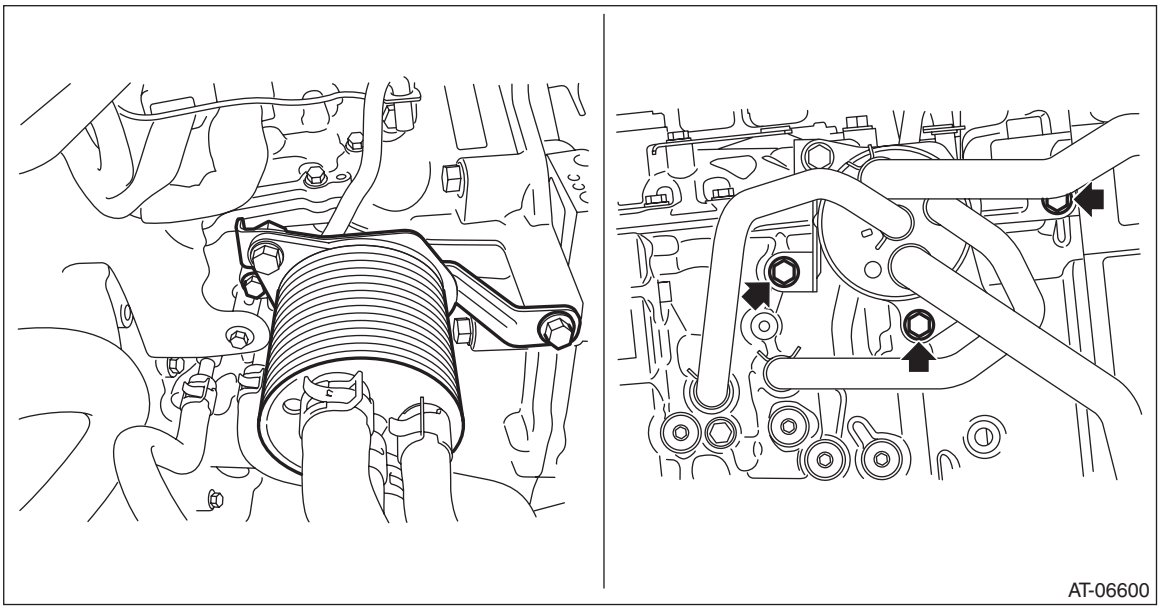


20) Replace the CVTF inlet hose and CVTF outlet hose.
21) Install the CVTF inlet hose and CVTF outlet hose to transmission.



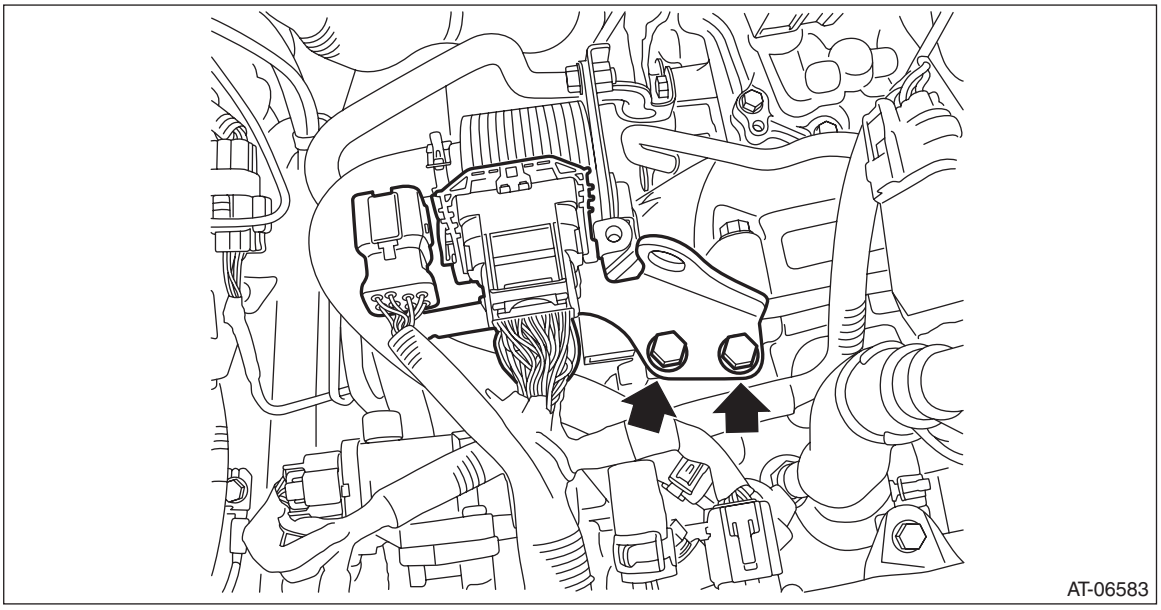
22) Install the CVTF cooler (with warmer feature) to the transmission.

Tightening torque:
23 N·m (2.3 kgf-m, 17.0 ft-lb)



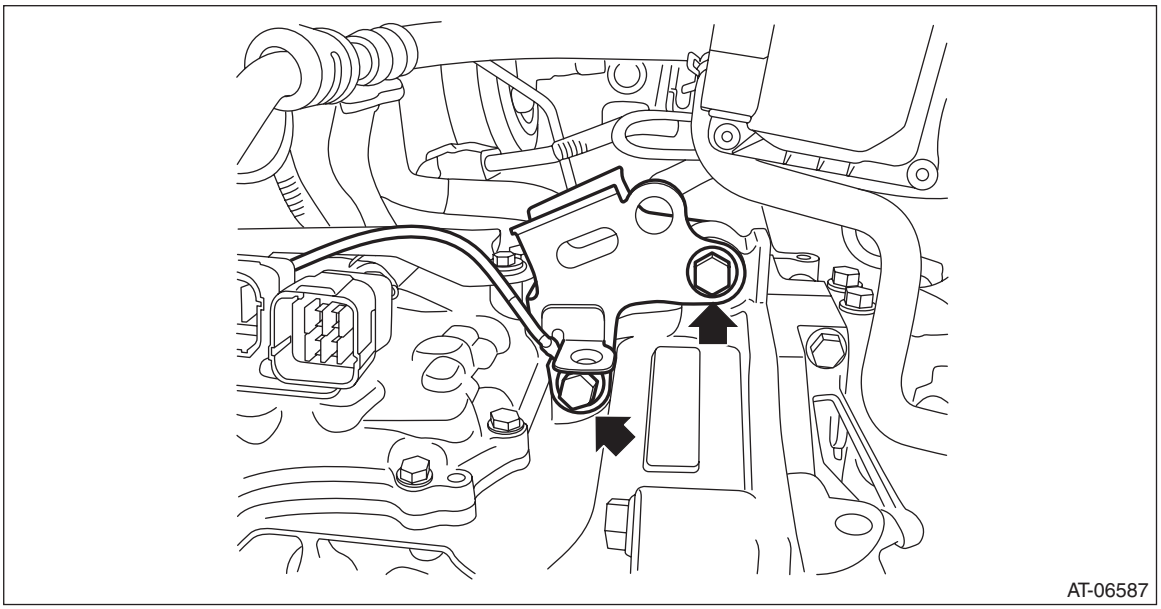
23) Install the starter. <Ref. to SC(H4DO)-11, INSTALLATION, Starter.>
24) Install the engine hanger rear.

Tightening torque:
21 N·m (2.1 kgf-m, 15.5 ft-lb)



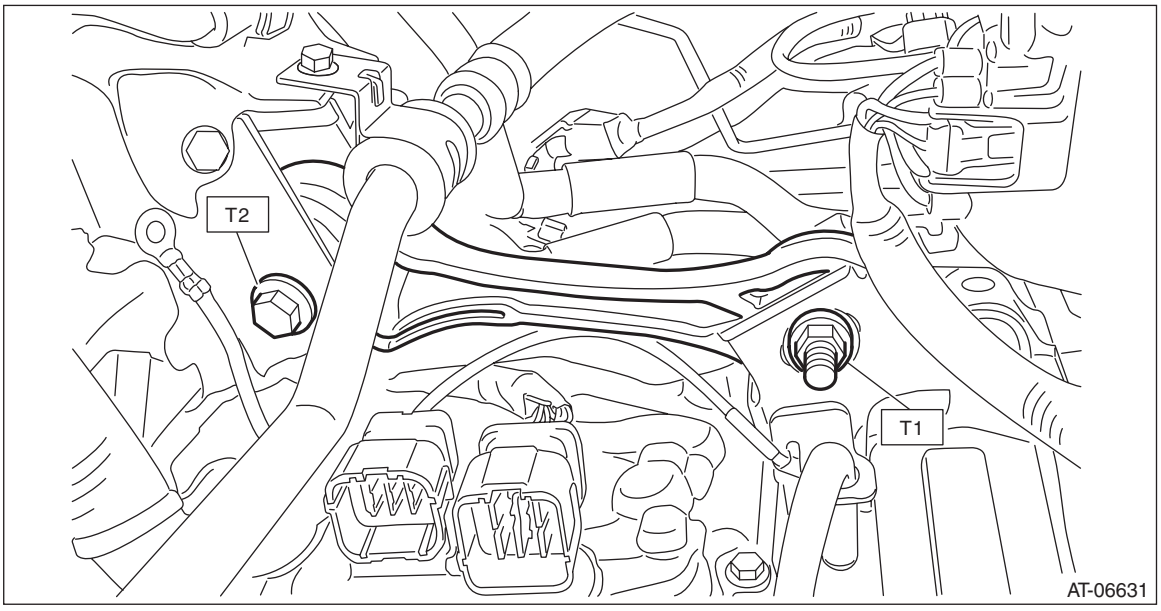
25) Install the pitching stopper bracket and transmission radio ground cord.

Tightening torque:
41 N·m (4.2 kgf-m, 30.2 ft-lb)



26) Install the air breather hose to the pitching stopper bracket.
27) Install the pitching stopper.

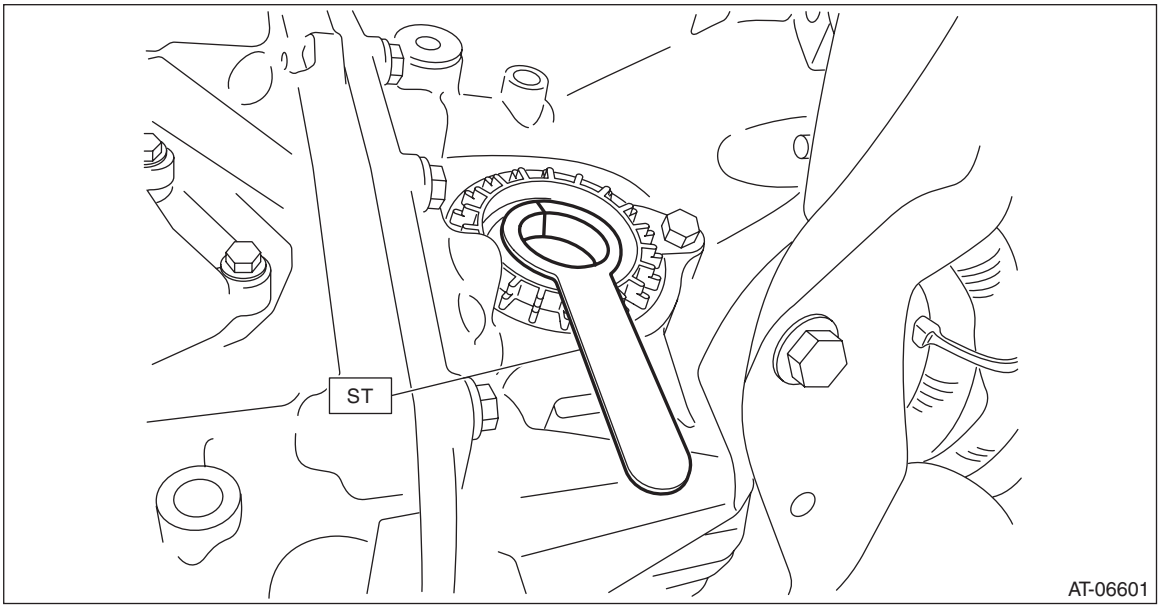
Tightening torque:
T1: 50 N·m (5.1 kgf-m, 36.9 ft-lb)
T2: 58 N·m (5.9 kgf-m, 42.8 ft-lb)



28) Connect the EGR control valve harness connector, throttle position sensor harness connector and manifold pressure sensor harness connector.

Tightening torque:
Bulkhead harness connector bracket
7.5 N·m (0.8 kgf-m, 5.5 ft-lb)
29) Lift up the vehicle.
30) Apply grease to the side retainer oil seal lip.

31) Set the ST to side retainer.
ST 28399SA010 OIL SEAL PROTECTOR



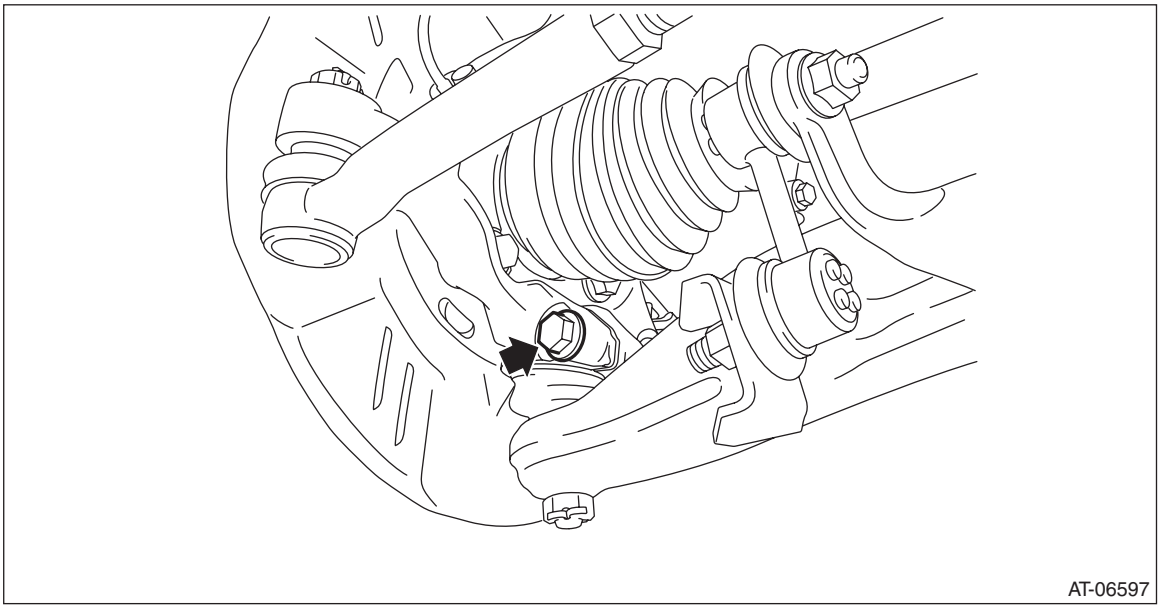
32) Replace the circlip of the drive shaft with a new part.
33) Insert the front drive shaft spline section into transmission and remove the ST (OIL SEAL PROTECTOR).

NOTE:
- Before inserting RH front drive shaft into transmission, turn the steering wheel to left hand full lock.
- Before inserting LH front drive shaft into transmission, turn the steering wheel to right hand full lock.

34) Insert the drive shaft into the transmission securely by pressing the housing from outside of the vehicle.
35) Insert the ball joint into housing and secure with bolt.

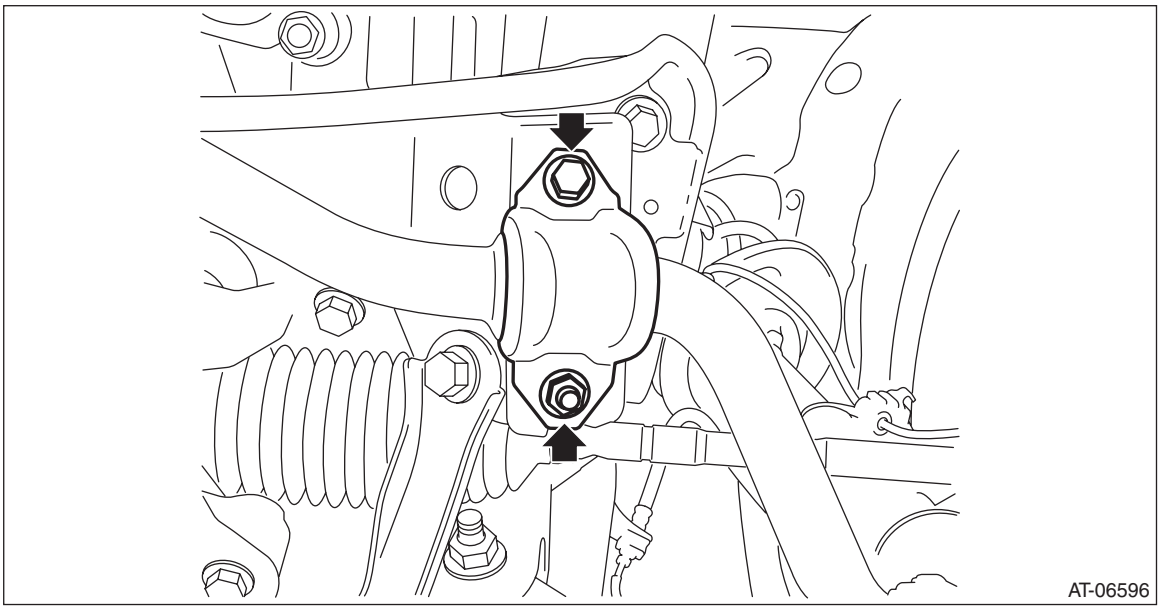
Tightening torque:
50 N·m (5.1 kgf-m, 36.9 ft-lb)

CAUTION:
- **Do not apply grease to the tapered portion of ball stud.**
- **Before tightening, make sure the lower side of housing and stepped section of ball joint are in contact.**



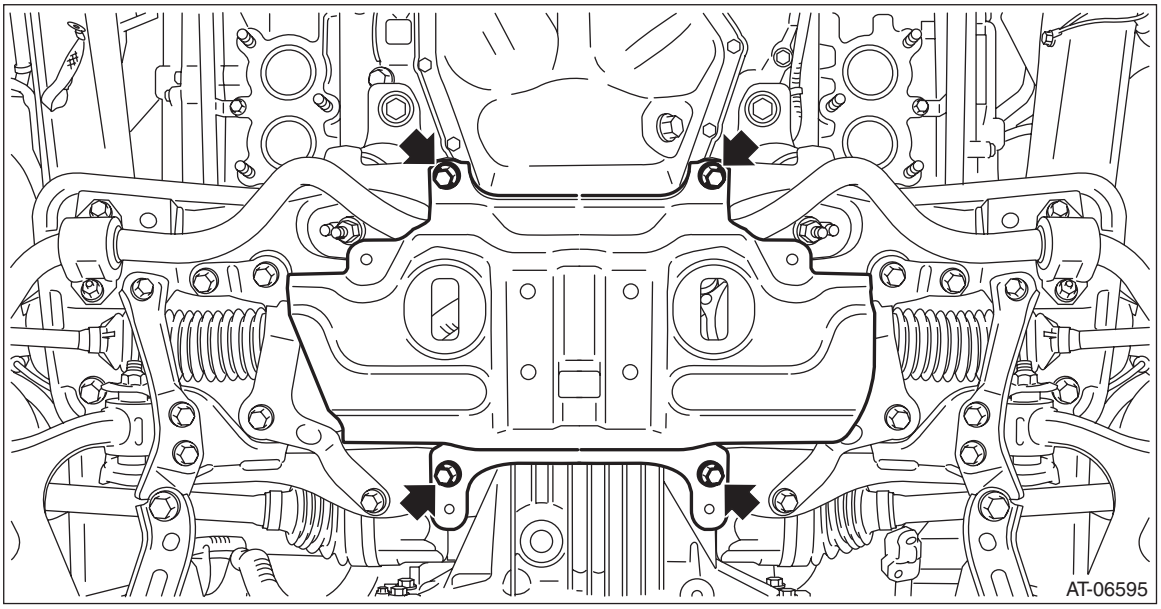
36) Install the stabilizer bracket.

Tightening torque:
25 N·m (2.5 kgf-m, 18.4 ft-lb)



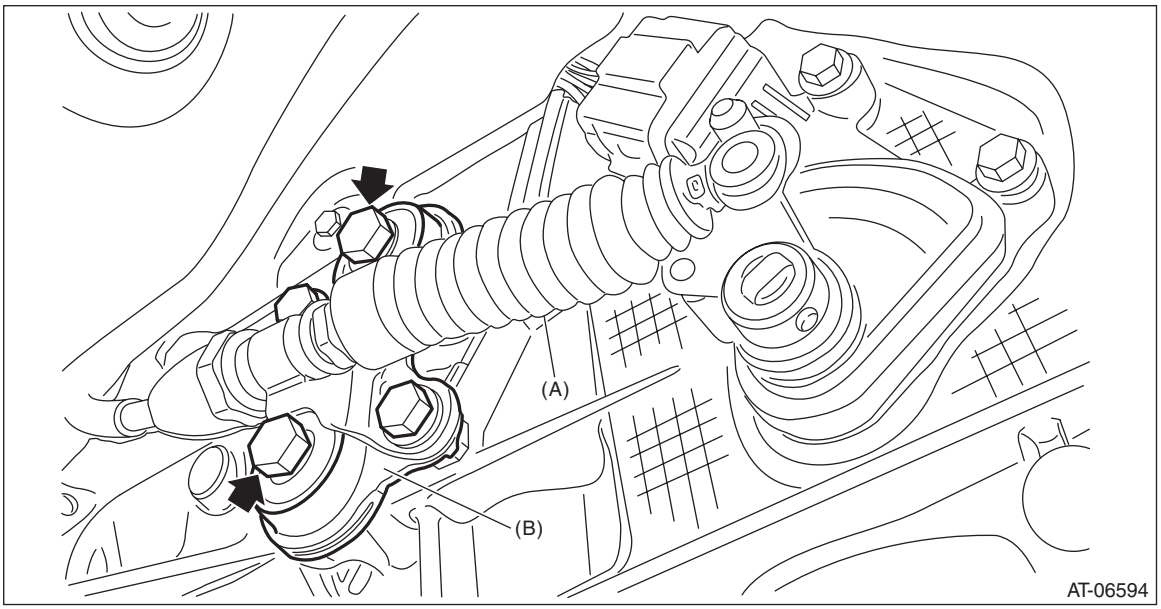
37) Install the jack-up plate.

Tightening torque:
60 N·m (6.1 kgf-m, 44.3 ft-lb)



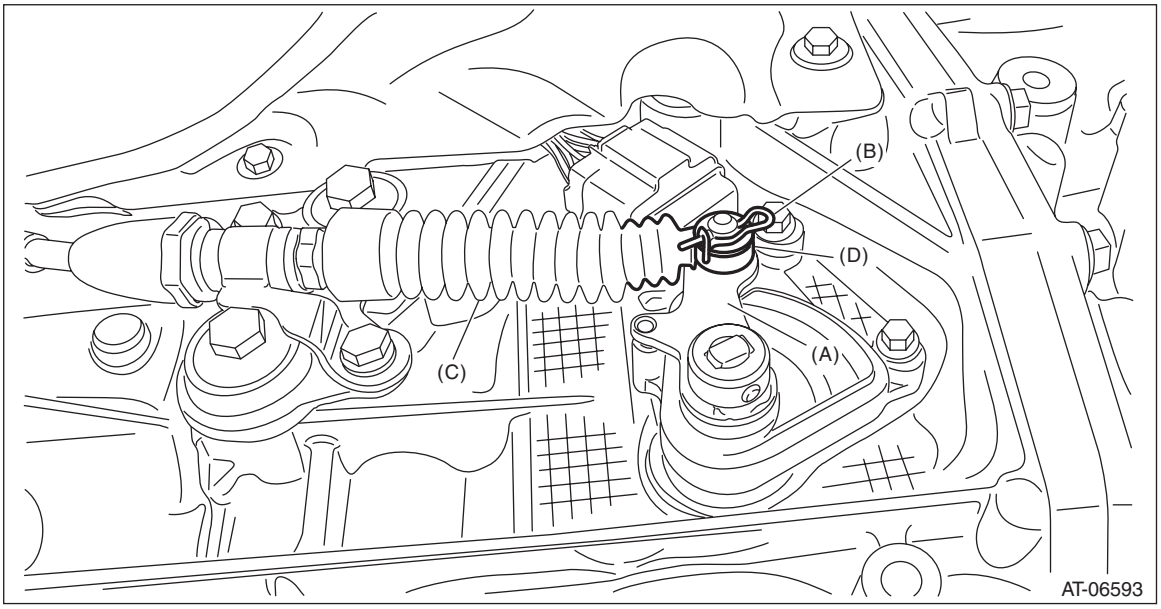
38) Install the plate assembly to transmission.

Tightening torque:
25 N·m (2.5 kgf-m, 18.4 ft-lb)



(A) Select cable
(B) Plate ASSY

39) Install the washer and snap pin to the shifter arm.

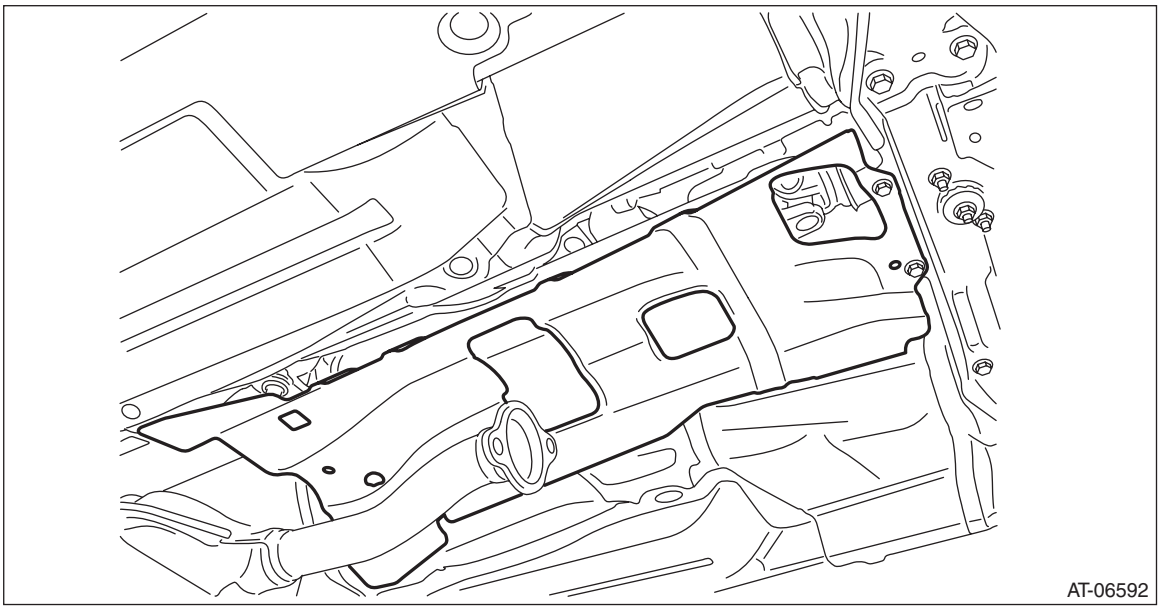


(A) Shifter arm
(B) Snap pin
(C) Select cable
(D) Washer

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

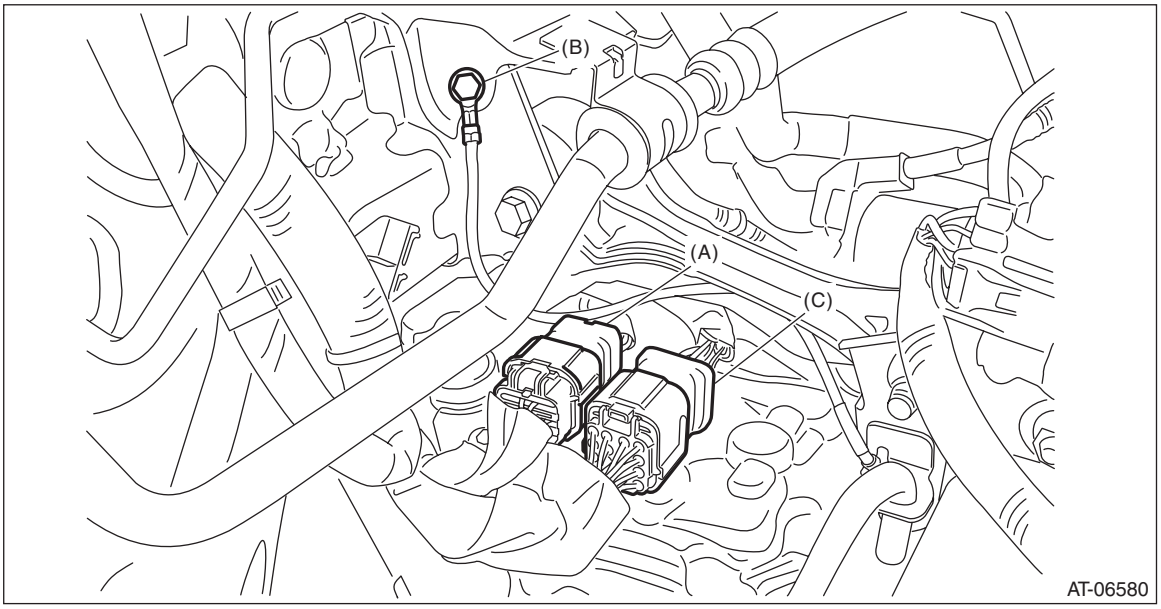
41) Install the center exhaust cover.

Tightening torque:
18 N·m (1.8 kgf-m, 13.3 ft-lb)



42) Install the center exhaust pipe. <Ref. to EX(H4DO)-9, INSTALLATION, Front Exhaust Pipe.>
43) Install the under cover.
44) Lower the vehicle.
45) Connect the following harness connectors.
- Transmission harness connectors
- Inhibitor harness connector
- Transmission radio ground terminal

Tightening torque:
13 N·m (1.3 kgf-m, 9.6 ft-lb)



(A) Transmission harness connectors
(B) Transmission radio ground terminal
(C) Inhibitor harness connector

46) Install the air intake boot assembly. <Ref. to IN(H4DO)-12, INSTALLATION, Air Intake Boot.>

47) Install the front wheels. <Ref. to WT-4, INSTALLATION, Tire and Wheel.>
48) Connect the battery ground terminal.
49) Refill differential gear oil to adjust the differential gear oil amount. <Ref. to CVT-41, Differential Gear Oil.>
50) Refill CVTF to adjust the CVTF level. <Ref. to CVT-36, CVTF.>
51) Perform Clear Memory 2 operation. <Ref. to CVT(diag)-18, Clear Memory Mode.>
52) Perform the diagnosis again. <Ref. to CVT(diag)-20, Learning Control.>
53) Execute the rear differential inspection mode. <Ref. to DI-67, Rear Differential Inspection Mode.>

CAUTION:
Always execute the rear differential inspection mode at the replacement of the following.

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

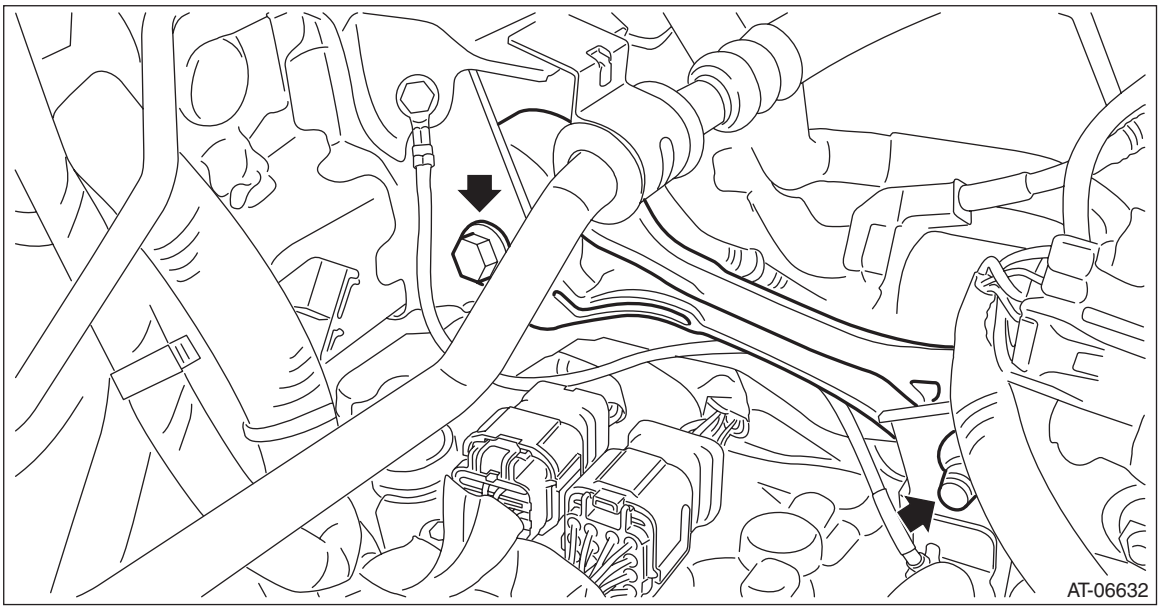
54) Perform the road test to make sure there is no fault. <Ref. to CVT-46, INSPECTION, Road Test.>

11.Transmission Mounting System

A: REMOVAL

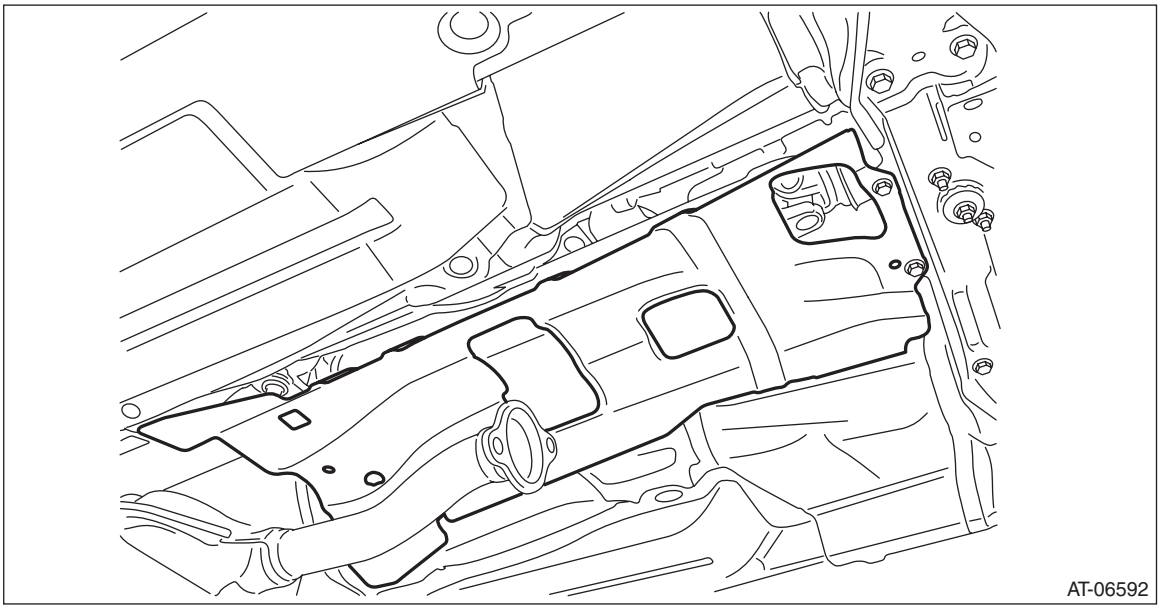
1. PITCHING STOPPER

1) Disconnect the ground cable from battery.
2) Remove the air intake boot assembly. <Ref. to IN(H4DO)-12, REMOVAL, Air Intake Boot.>
3) Remove the pitching stopper.



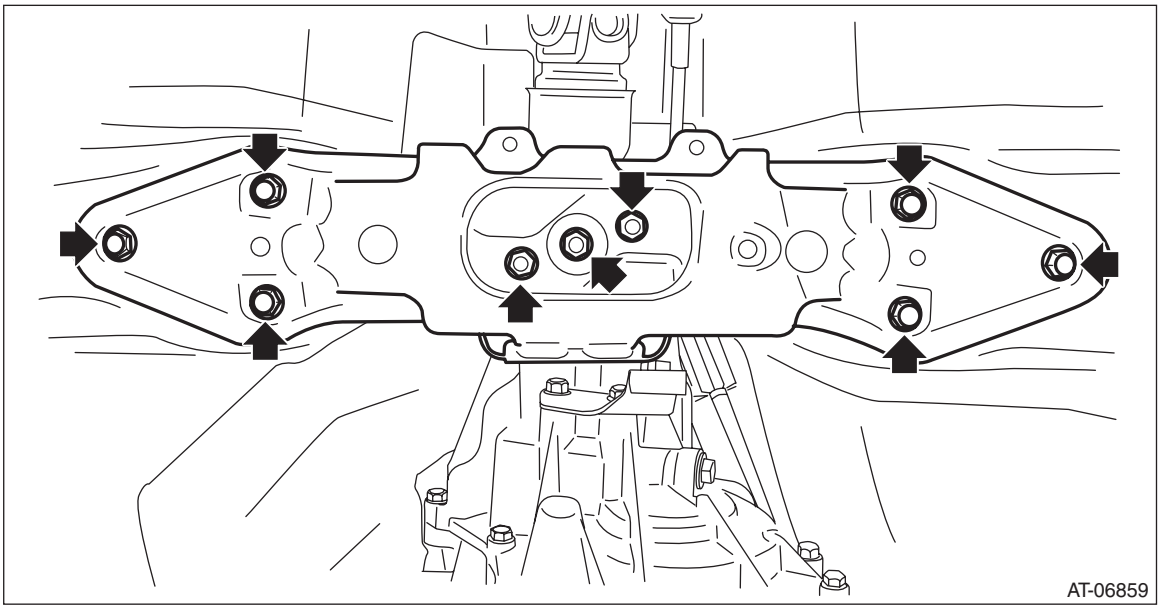
2. TRANSMISSION REAR CROSSMEMBER AND REAR CUSHION RUBBER

1) Disconnect the ground cable from battery.
2) Lift up the vehicle.
3) Remove the center exhaust pipe. <Ref. to EX(H4DO)-13, REMOVAL, Center Exhaust Pipe.>
4) Remove the center exhaust cover.

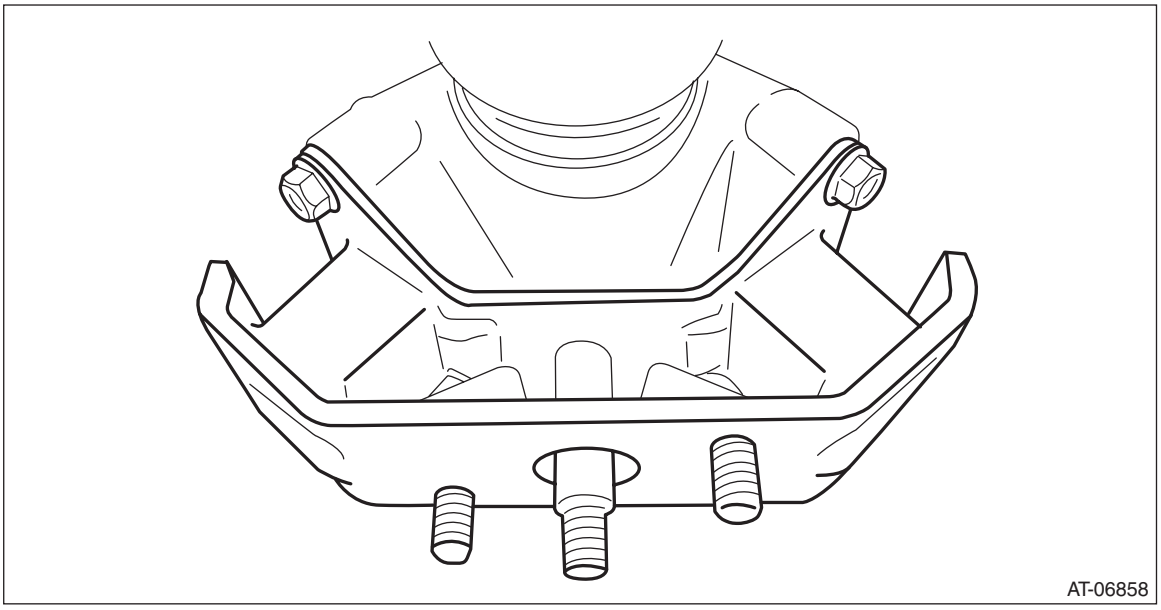


5) Set the transmission jack under the transmission. Make sure that the support plate of transmission jack does not touch the oil pan.

6) Remove the transmission rear crossmember.



7) Remove the rear cushion rubber.

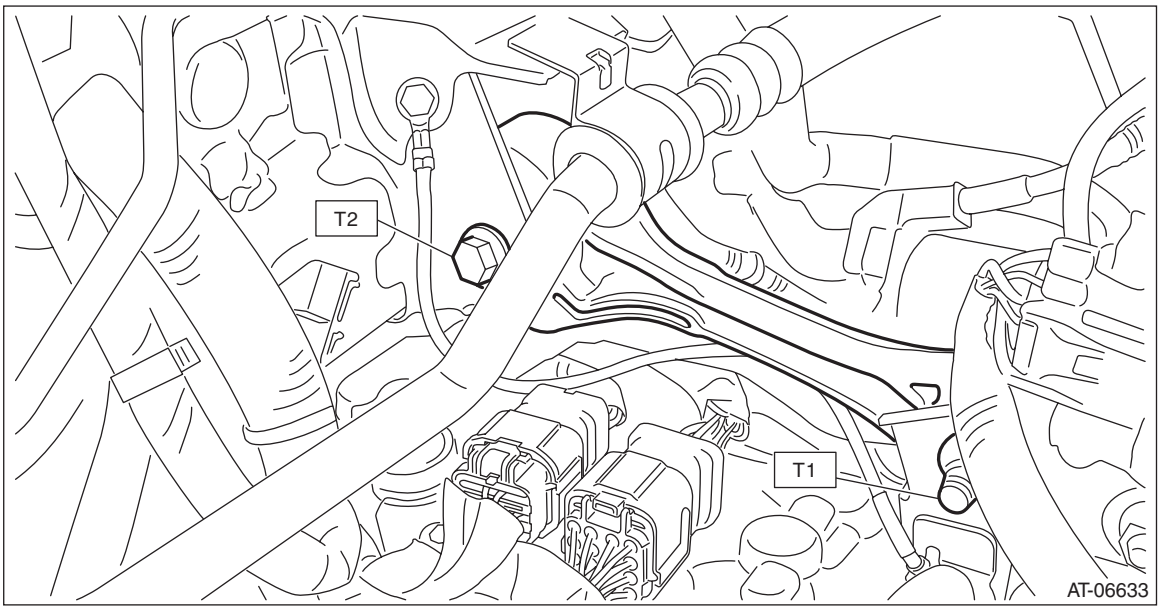


B: INSTALLATION

1. PITCHING STOPPER

1) Install the pitching stopper.

Tightening torque:
T1: 50 N·m (5.1 kgf-m, 36.9 ft-lb)
T2: 58 N·m (5.9 kgf-m, 42.8 ft-lb)

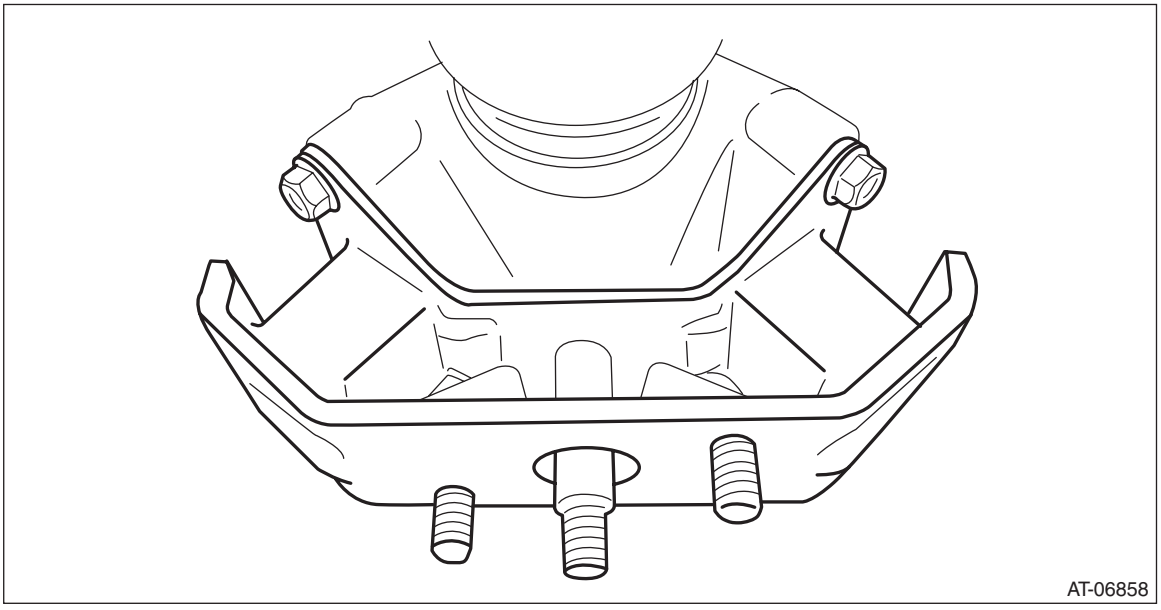


2) Install the air intake boot assembly. <Ref. to IN(H4DO)-12, INSTALLATION, Air Intake Boot.>
3) Connect the battery ground terminal.

2. TRANSMISSION REAR CROSSMEMBER AND REAR CUSHION RUBBER

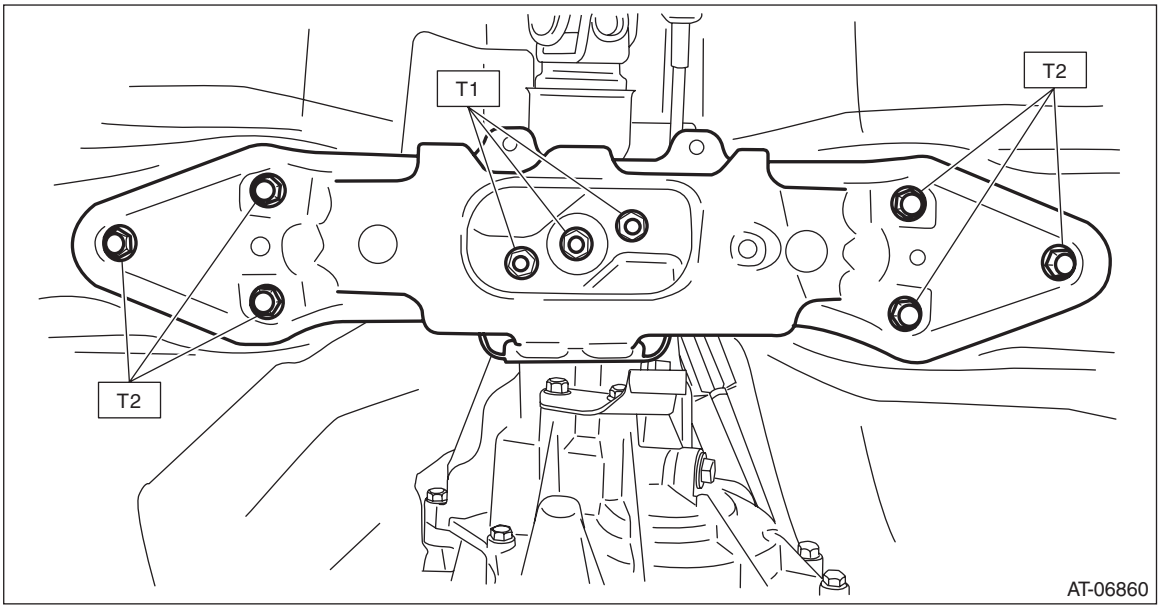
1) Attach the rear cushion rubber to the transmission.

Tightening torque:
40 N·m (4.1 kgf-m, 29.5 ft-lb)



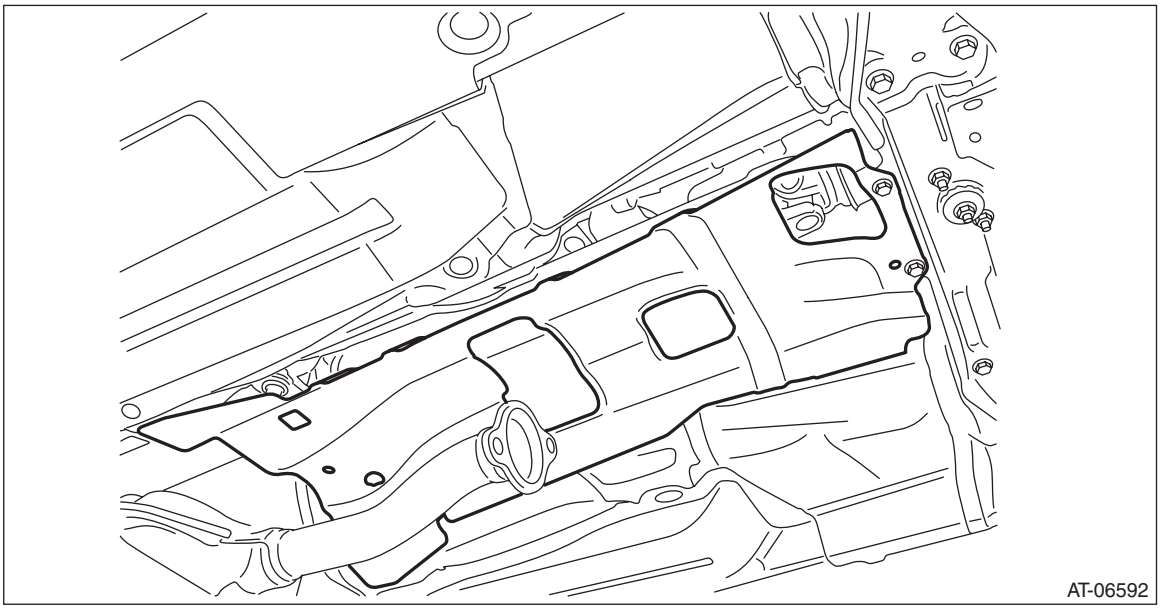
2) Install the crossmember.

Tightening torque:
T1: 35 N·m (3.6 kgf-m, 25.8 ft-lb)
T2: 70 N·m (7.1 kgf-m, 51.6 ft-lb)



3) Remove the transmission jack.
4) Install the center exhaust cover.

Tightening torque:
18 N·m (1.8 kgf-m, 13.3 ft-lb)



5) Install the center exhaust pipe. <Ref. to EX(H4DO)-13, INSTALLATION, Center Exhaust Pipe.>
6) Connect the battery ground terminal.

C: INSPECTION

- Check the crossmember for bends or damage.
- Check that the cushion rubber is not stiff, cracked or otherwise damaged.

12.Extension Case Oil Seal

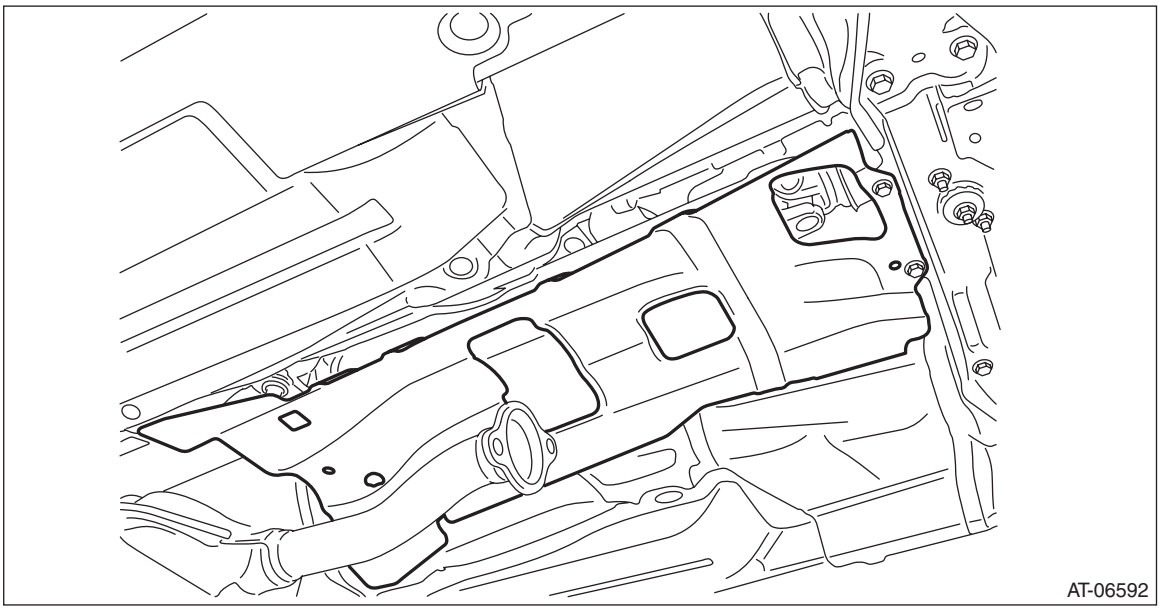
A: INSPECTION

Check for leakage of CVTF from the joint section of transmission and propeller shaft. If a leak is found, inspect the propeller shaft and replace the oil seal.

B: REPLACEMENT

CAUTION:
Immediately after the vehicle has been running or after idling for a long time, the CVTF will be hot. Be careful not to burn yourself.

1) Lift up the vehicle.
2) Remove the center exhaust pipe. <Ref. to EX(H4DO)-13, REMOVAL, Center Exhaust Pipe.>
3) Remove the center exhaust cover.



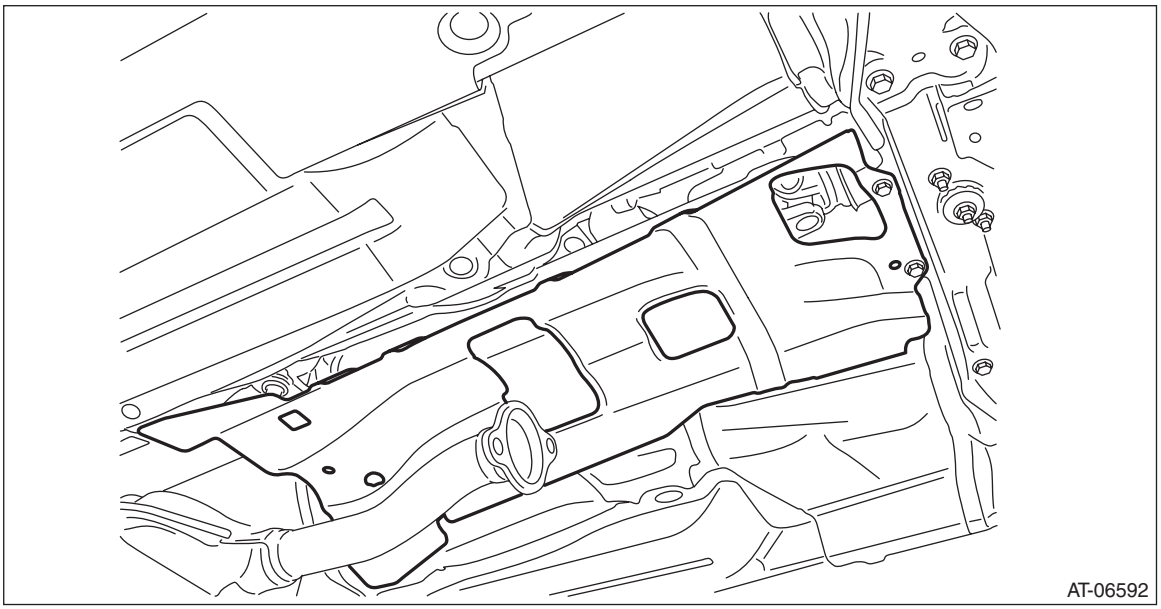
4) Clean the transmission exterior.
5) Remove the propeller shaft. <Ref. to DS-10, REMOVAL, Propeller Shaft.>
6) Using a screwdriver or ST, remove the oil seal trying not to damage the extension case.
ST 398527700 PULLER ASSY
7) Using the ST, install the oil seal.

NOTE:
- Use a new oil seal.
- Apply CVTF to the oil seal lip and press-fitting surface.

ST 498057300 OIL SEAL INSTALLER
8) Install the propeller shaft. <Ref. to DS-11, INSTALLATION, Propeller Shaft.>

9) Install the center exhaust cover.

Tightening torque:
18 N·m (1.8 kgf-m, 13.3 ft-lb)



10) Install the center exhaust pipe. <Ref. to EX(H4DO)-13, INSTALLATION, Center Exhaust Pipe.>
11) Adjust the CVTF level and check there is no leakage. <Ref. to CVT-36, ADJUSTMENT, CVTF.>

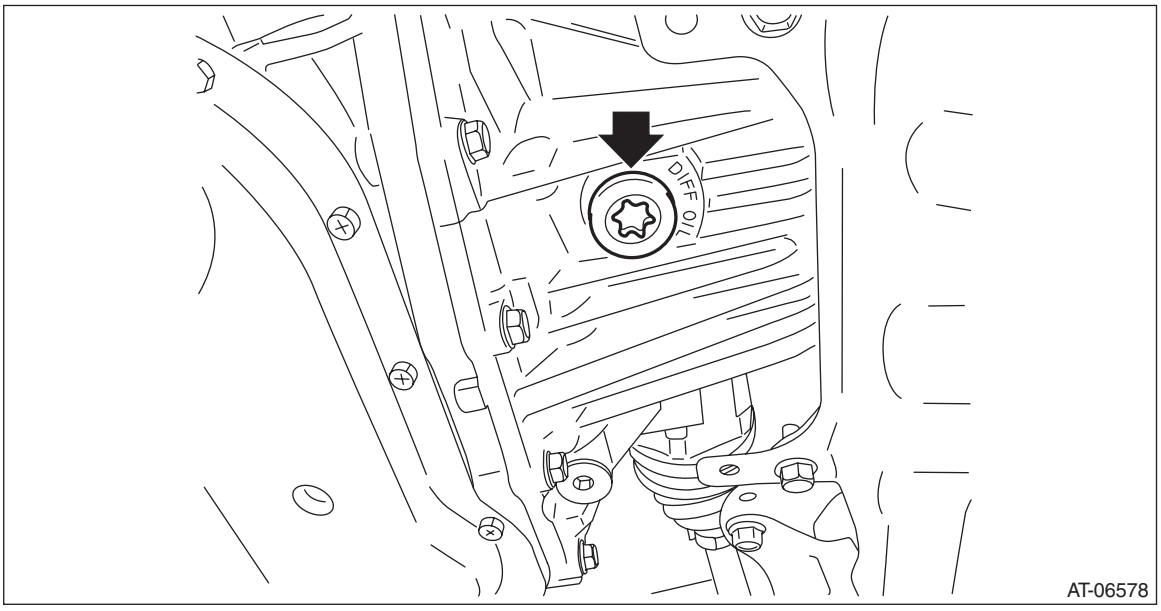
13.Differential Side Retainer Oil Seal

A: INSPECTION

Check for leakage of gear oil from differential side retainer oil seal part. If there is an oil leak, inspect the front drive shaft and replace the oil seal.

B: REPLACEMENT

CAUTION:
• Immediately after the vehicle has been running or after idling for a long time, the differential gear oil will be hot. Be careful not to burn yourself.
• Be careful not to spill the differential gear oil on exhaust pipe to prevent it from emitting smoke or fire. If differential gear oil is spilled on the exhaust pipe, wipe it off completely.
1) Remove the front wheels. <Ref. to WT-4, REMOVAL, Tire and Wheel.>
2) Remove the center exhaust pipe. <Ref. to EX(H4DO)-13, REMOVAL, Center Exhaust Pipe.>
3) Remove the differential gear oil drain plug using TORX® bit T70, and then drain differential gear oil.

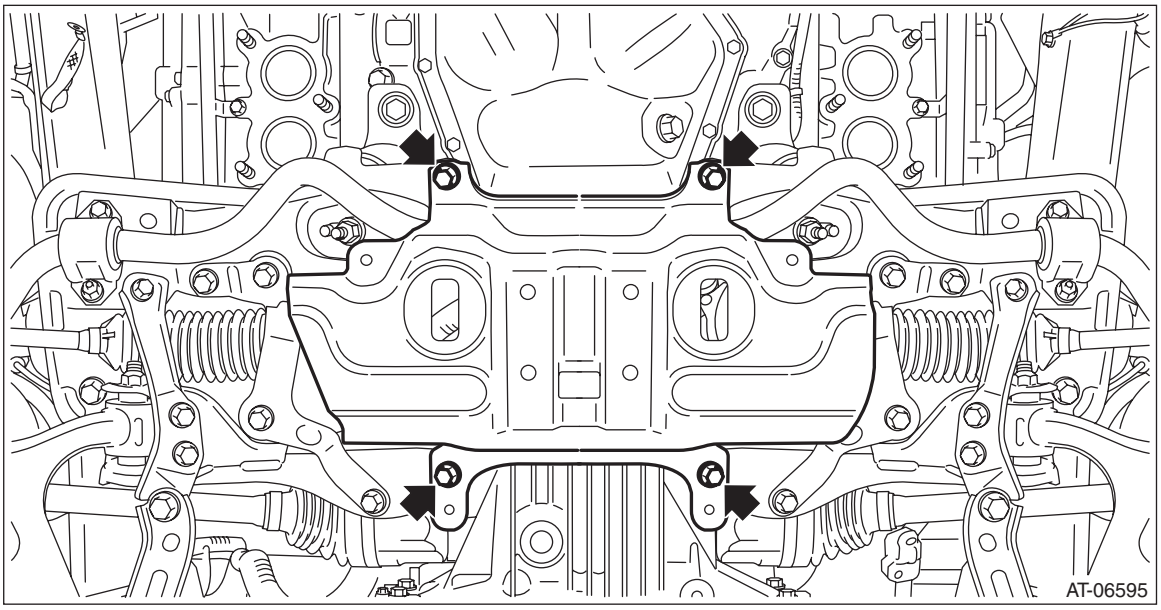


4) Tighten the differential gear oil drain plug.

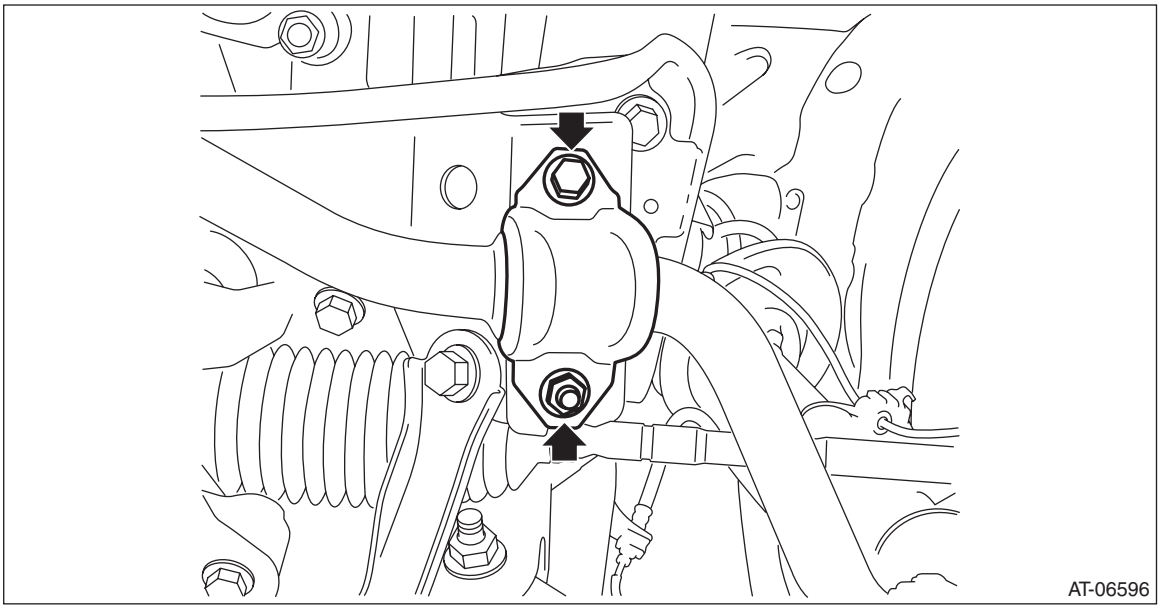
NOTE:
Use a new gasket.

Tightening torque:
70 N·m (7.1 kgf-m, 51.6 ft-lb)

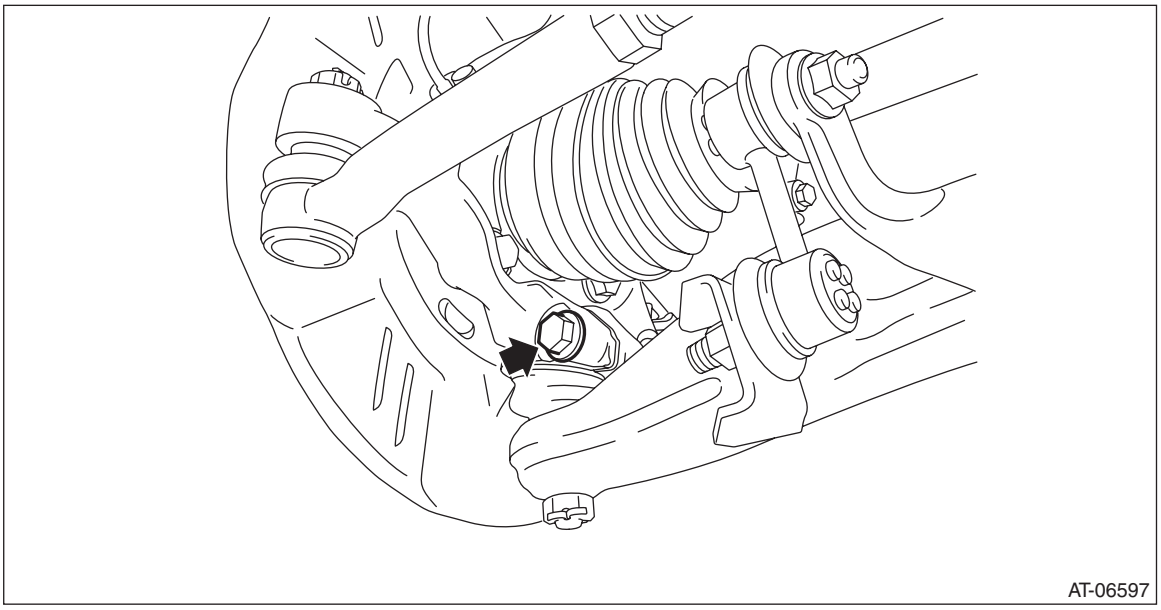
5) Remove the jack-up plate.



6) Remove the stabilizer bracket.



7) Remove the bolts which secure to the front housing, and separate the front arm and housing.



8) Using a crowbar, etc., pull out until the front drive shaft transmission side joint slides move smoothly.

NOTE:
Place cloth between the crowbar and the transmission in order to avoid damaging the transmission side retainer.

9) Hold the transmission side joint of the front drive shaft by hand and extract the housing from the transmission while pressing the housing outward, so as not to stretch the boot.

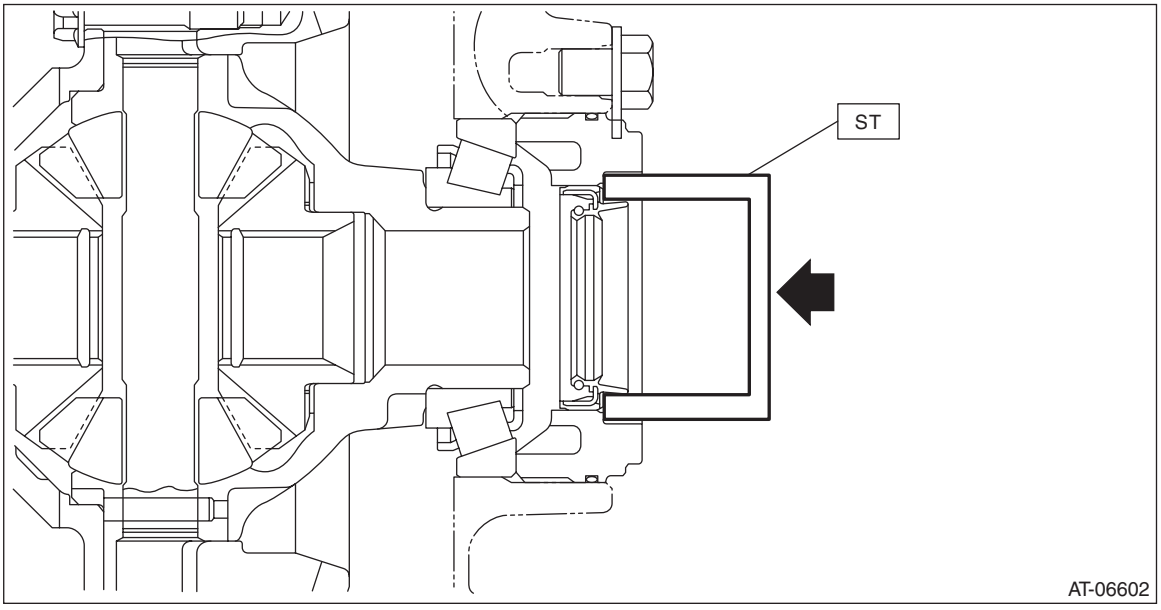
NOTE:
- Before pulling RH front drive shaft from transmission, turn the steering wheel to left hand full lock.
- Before pulling LH front drive shaft from transmission, turn the steering wheel to right hand full lock.

10) Remove the differential side retainer oil seal using driver wrapped with vinyl tape etc.

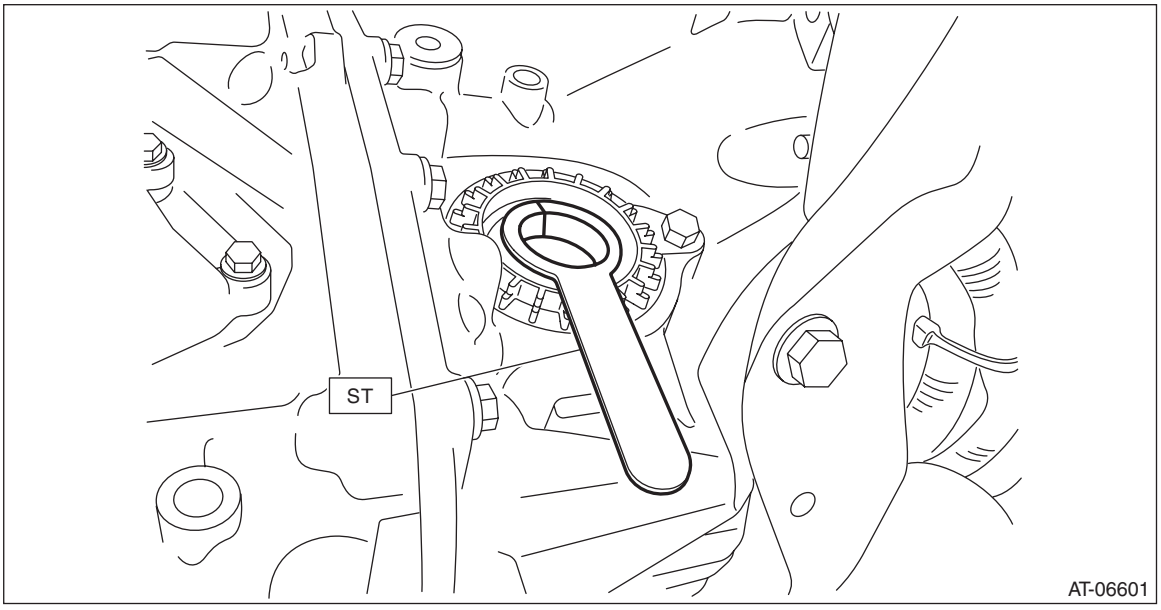
11) Using the ST, install the differential side retainer oil seal by lightly tapping with a hammer.

NOTE:
- Apply differential gear oil to the lip surface, so that the oil seal lip is not deformed.
- Apply differential gear oil to the press-fitting surface of oil seal and the differential side retainer.
- Oil seal has an identification mark (R, L). When installing oil seals, do not confuse the left and right.

ST 18675AA000 DIFFERENTIAL SIDE OIL SEAL INSTALLER



12) Set the ST to side retainer.
ST 28399SA010 OIL SEAL PROTECTOR



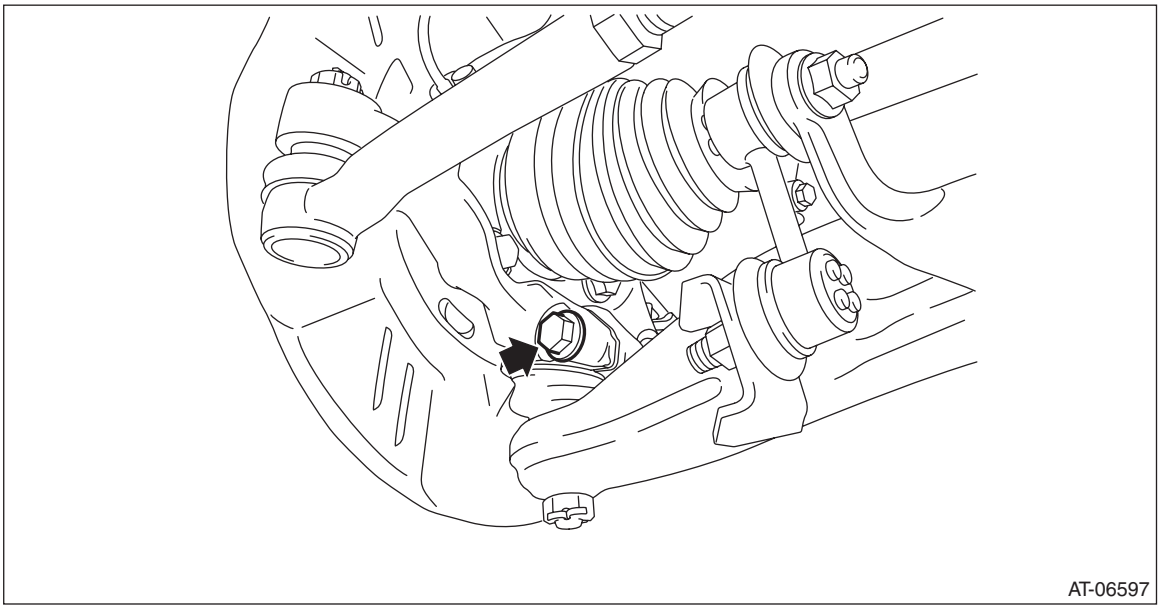
13) Replace the circlip of the drive shaft with a new part.
14) Insert the front drive shaft spline section into transmission and remove the ST (DIFFERENTIAL SIDE OIL SEAL INSTALLER).

NOTE:
- Apply grease to the side retainer oil seal lip.
- Before inserting RH front drive shaft into transmission, turn the steering wheel to left hand full lock.
- Before inserting LH front drive shaft into transmission, turn the steering wheel to right hand full lock.

15) Insert the drive shaft into the transmission securely by pressing the housing from outside of the vehicle.
16) Insert the ball joint into housing and secure with bolt.

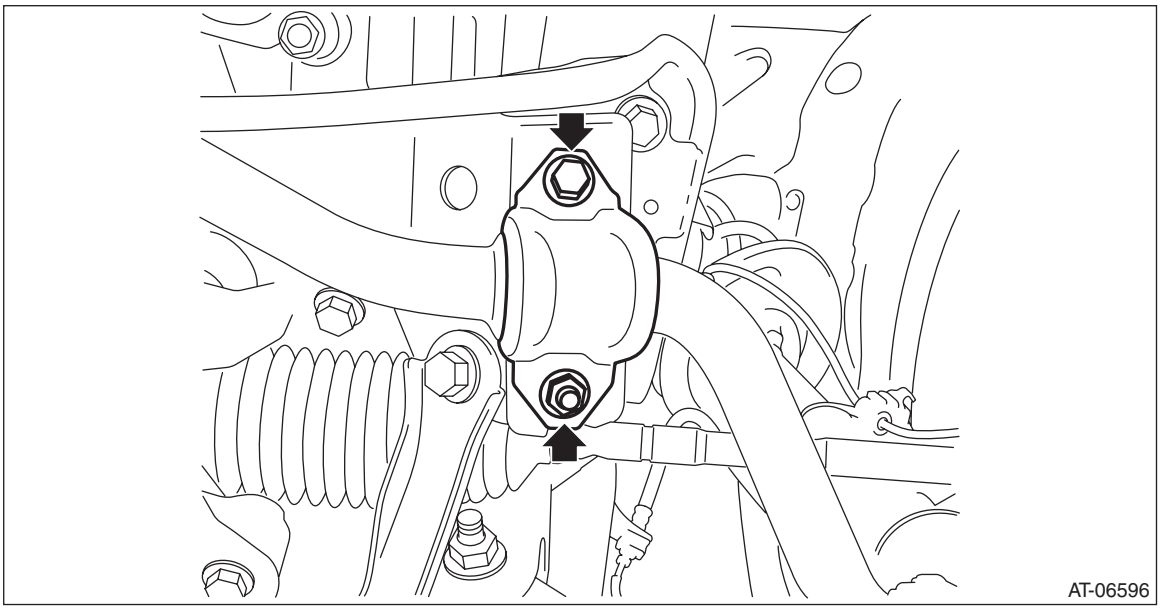
Tightening torque:
50 N·m (5.1 kgf-m, 36.9 ft-lb)

CAUTION:
- **Do not apply grease to the tapered portion of ball stud.**
- **Before tightening, make sure the lower side of housing and stepped section of ball joint are in contact.**



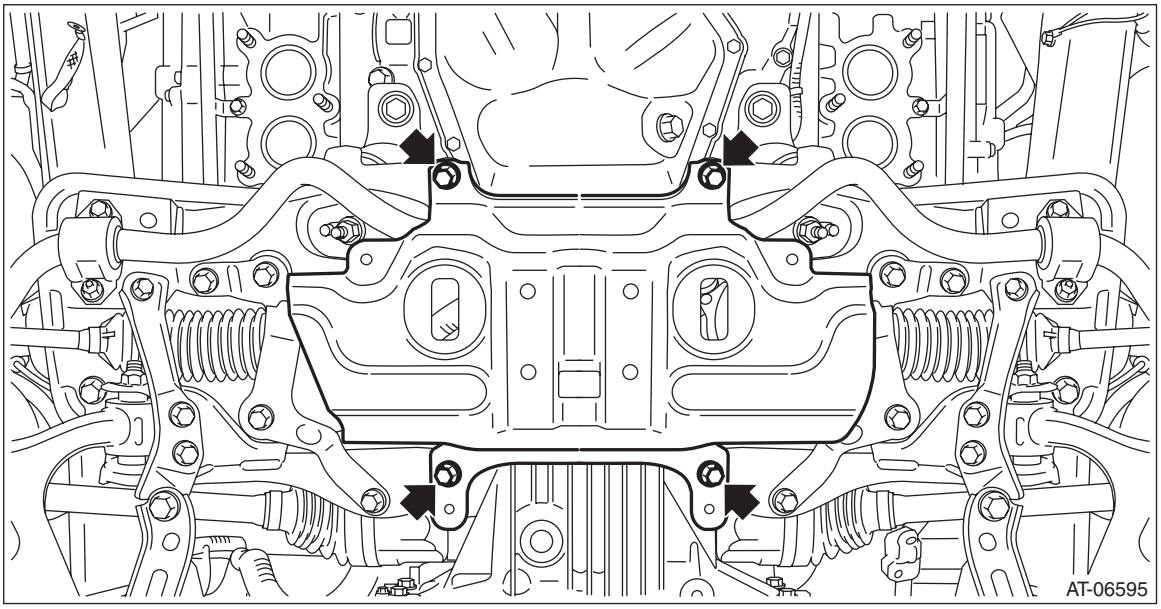
17) Install the stabilizer bracket.

Tightening torque:
25 N·m (2.5 kgf-m, 18.4 ft-lb)



18) Install the jack-up plate.

Tightening torque:
60 N·m (6.1 kgf-m, 44.3 ft-lb)



19) Install the center exhaust pipe. <Ref. to EX(H4DO)-13, INSTALLATION, Center Exhaust Pipe.>
20) Fill differential gear oil. <Ref. to CVT-41, Differential Gear Oil.>
21) Adjust the differential gear oil level, and check for leakage. <Ref. to CVT-41, ADJUSTMENT, Differential Gear Oil.>
22) Install the front wheels. <Ref. to WT-4, INSTALLATION, Tire and Wheel.>

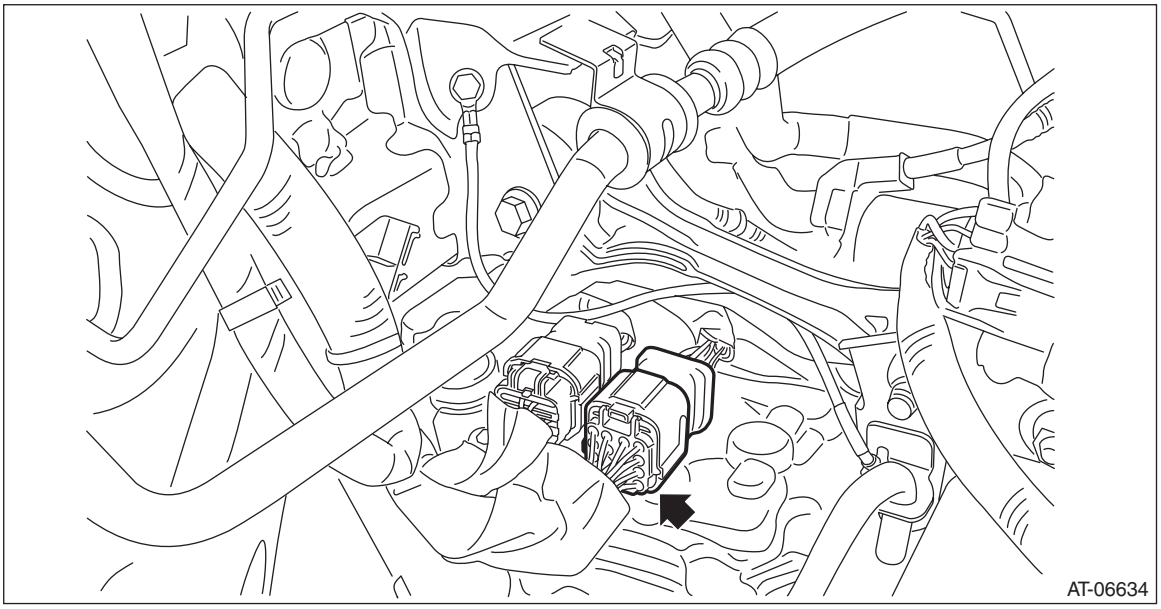
14.Inhibitor Switch

A: INSPECTION

When the driving condition or starter motor operation is improper, first check the shift linkage for improper operation. If the shift linkage is functioning properly, check the inhibitor switch.

1) Remove the air intake boot assembly. <Ref. to IN(H4DO)-12, REMOVAL, Air Intake Boot.>

2) Disconnect the inhibitor harness connector.

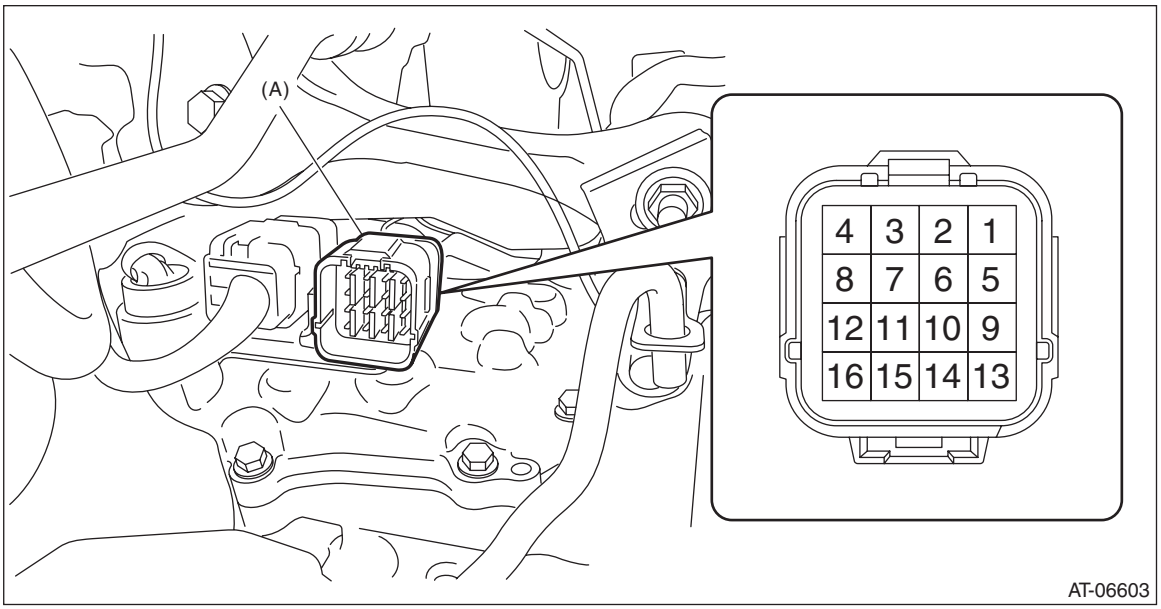


3) Check for continuity in inhibitor switch circuit by shifting the select lever in “P”, “R”, “N” and “D” respectively.

NOTE:

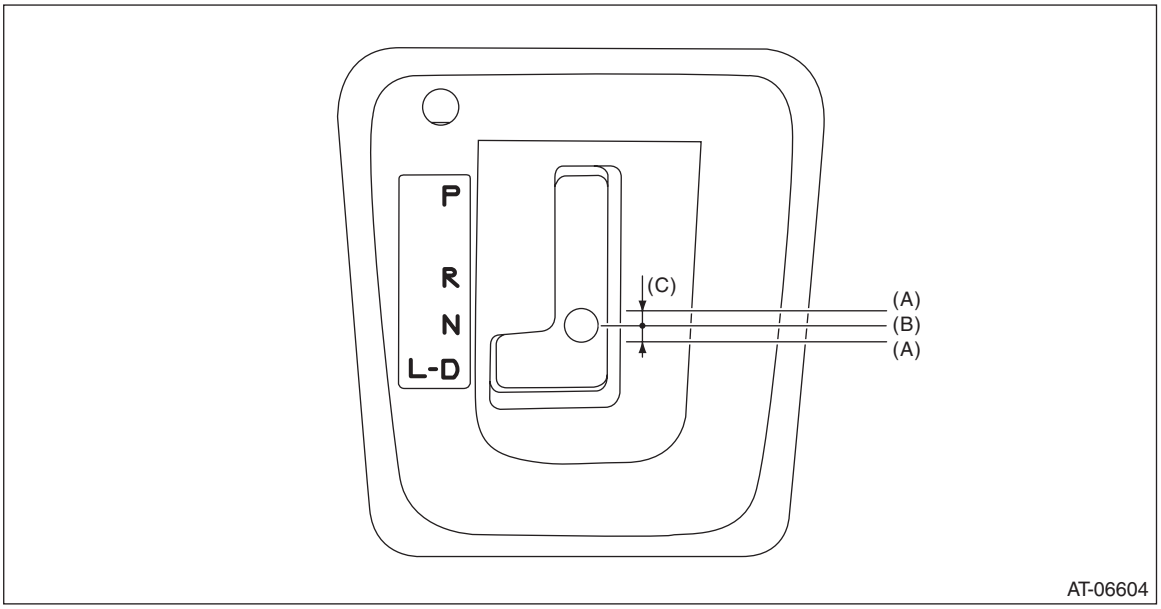
- Check that there is no continuity in the starter circuit when the select lever is in the “R” and “D” ranges.
- When inhibitor switch is normal, check there is no poor contact in vehicle side connector and no open circuit in harness.

	Range	Terminal No.
Signal sent to TCM	P	1 — 7
	R	2 — 7
	N	3 — 7
	D	4 — 7
Starter circuit	P/N	15 — 16
Back-up light circuit	R	13 — 14



(A) Inhibitor harness connector

4) Check that there is continuity at equal points when the select lever is moved 1.5° in both directions from the “N” range.
If there is continuity in only one direction or in other points, adjust the inhibitor switch. <Ref. to CVT-94, ADJUSTMENT, Inhibitor Switch.>

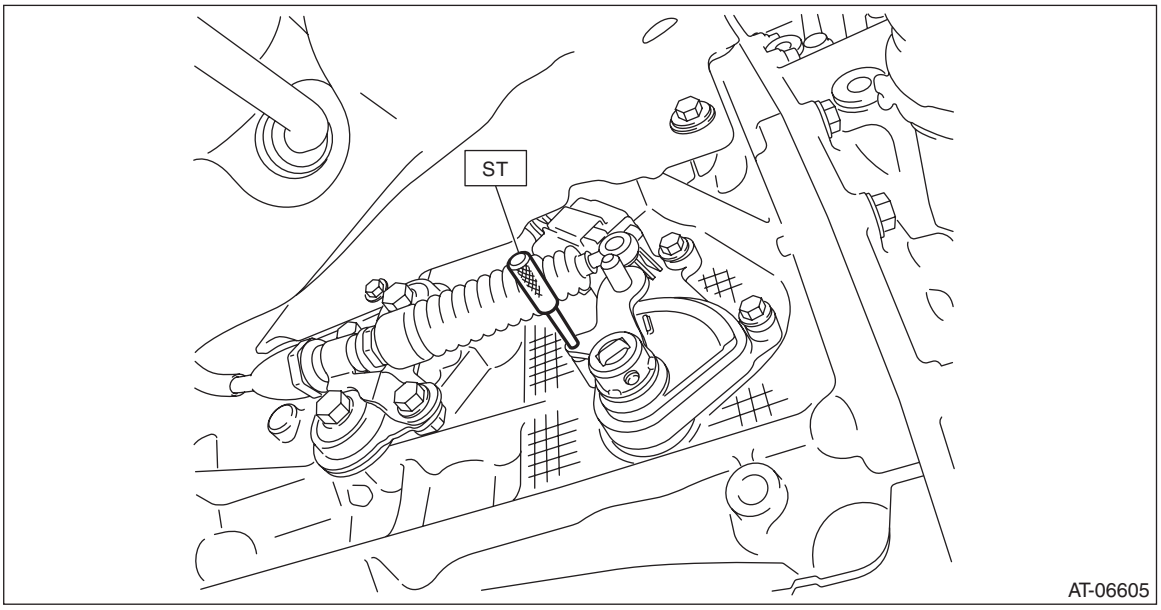


(A) Continuity does not exist.
(B) Continuity exists.
(C) 1.5°

5) Repeat the above inspection in other gear ranges. If there is fault, adjust the inhibitor switch and select cable. <Ref. to CVT-94, ADJUSTMENT, Inhibitor Switch.> <Ref. to CS-49, ADJUSTMENT, Select Cable.>

B: ADJUSTMENT

1) Shift the select lever to “N” range.
2) Loosen the two bolts holding the inhibitor switch.
3) Insert the ST vertically into the holes of the shifter arm and switch body.
ST 499267300 STOPPER PIN



4) Tighten the two bolts holding the inhibitor switch.

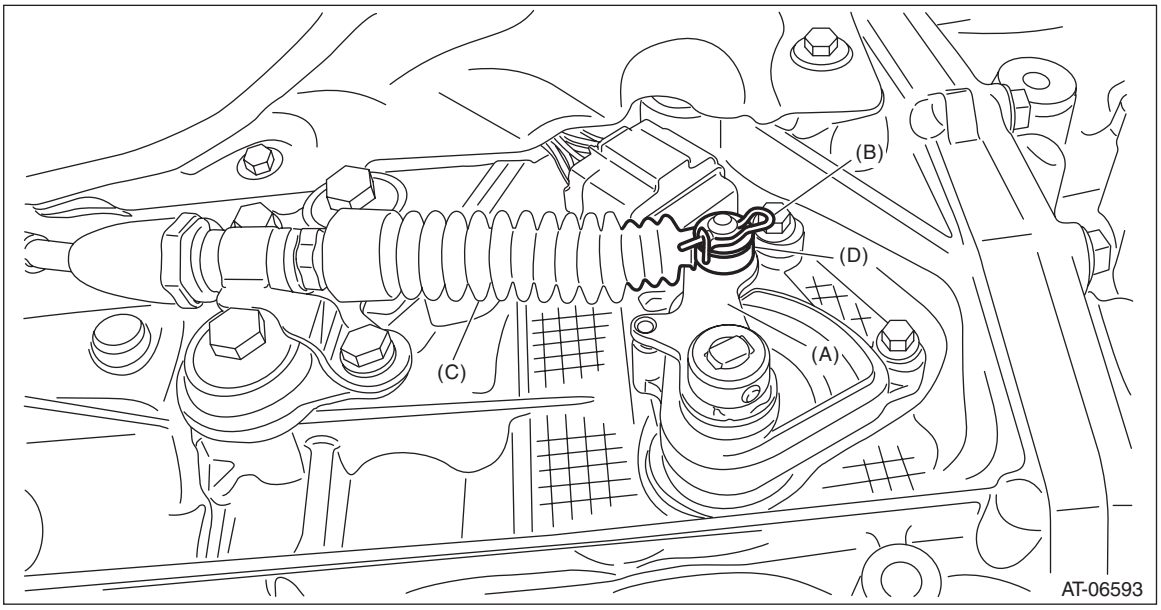
Tightening torque:
5 N·m (0.5 kgf-m, 3.7 ft-lb)

5) Repeat the inspection of the inhibitor switch. If the inhibitor switch is determined to be “faulty”, replace it.

C: REMOVAL

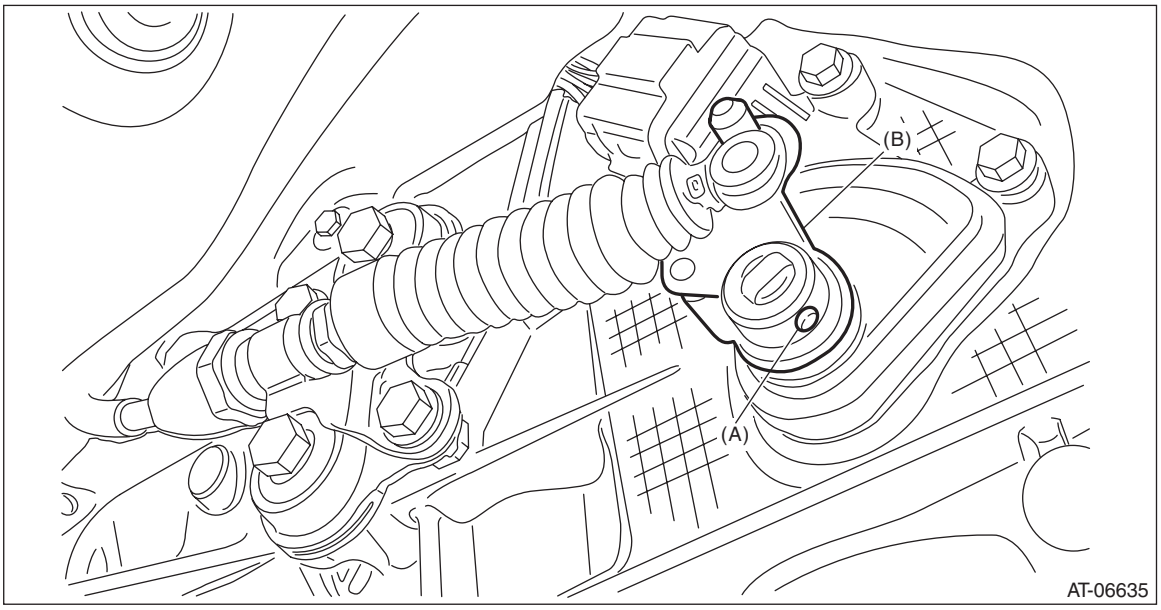
1) Shift the select lever to “N” range.
2) Disconnect the ground cable from battery.
3) Lift up the vehicle.
4) Remove the center exhaust pipe. <Ref. to EX(H4DO)-13, REMOVAL, Center Exhaust Pipe.>

5) Remove the snap pin and washer from the shifter arm.



(A) Shifter arm
(B) Snap pin
(C) Select cable
(D) Washer

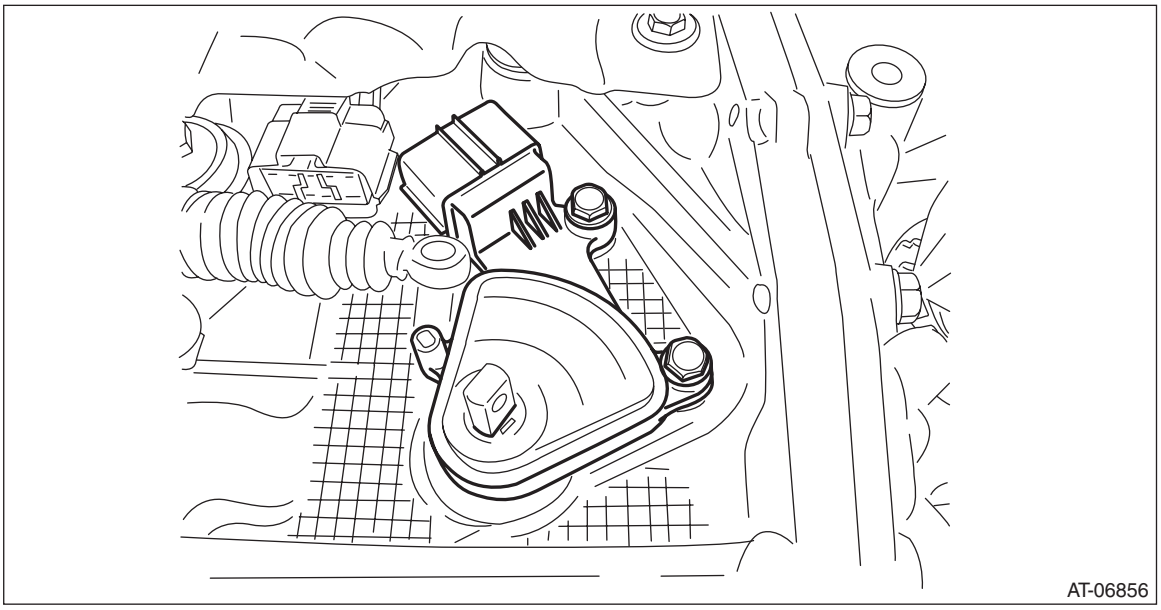
6) Remove the spring pin and shifter arm.



(A) Spring pin
(B) Shifter arm

7) Remove the inhibitor harness connector from inhibitor switch.

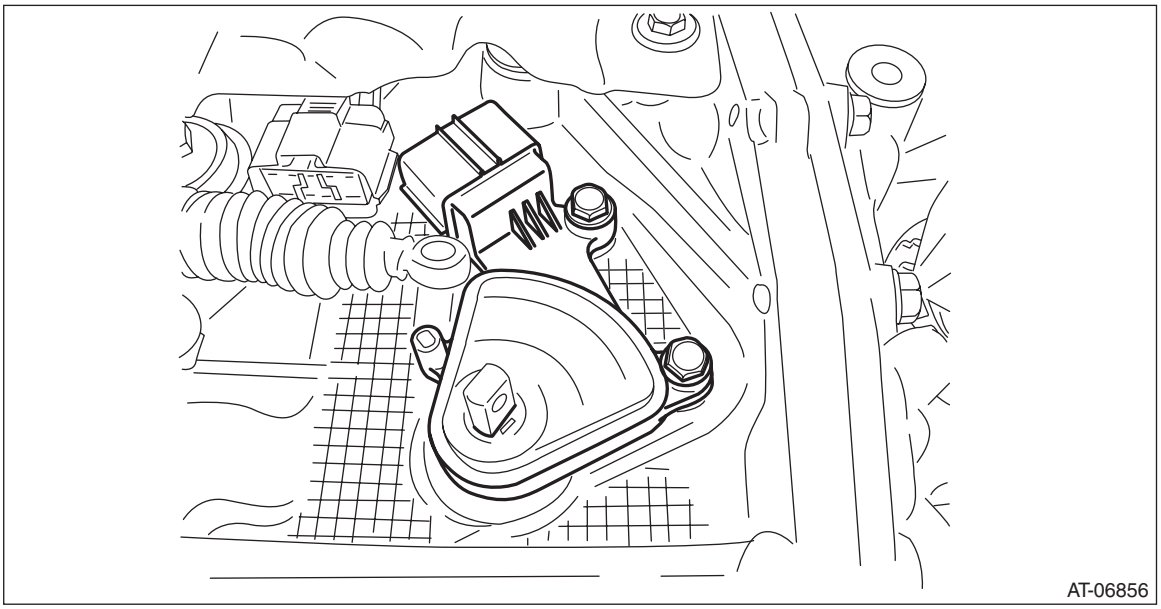
8) Remove the two inhibitor switch securing bolts.



9) Remove the inhibitor switch from the transmission case.

D: INSTALLATION

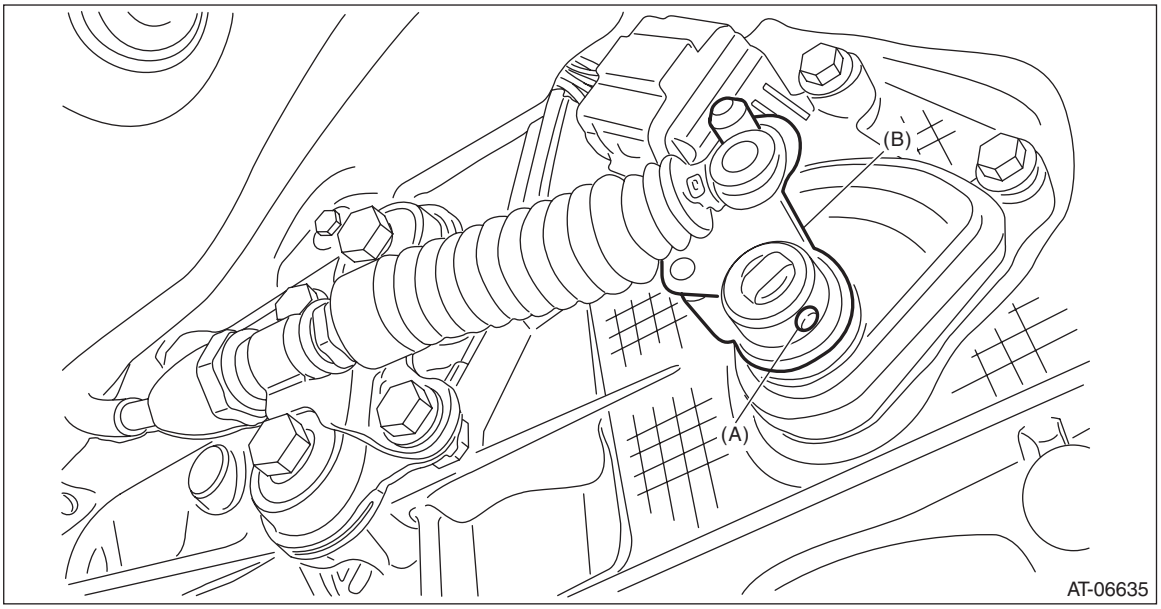
1) Install the inhibitor switch to the transmission case temporarily.



2) Connect the inhibitor harness connector to the inhibitor switch.

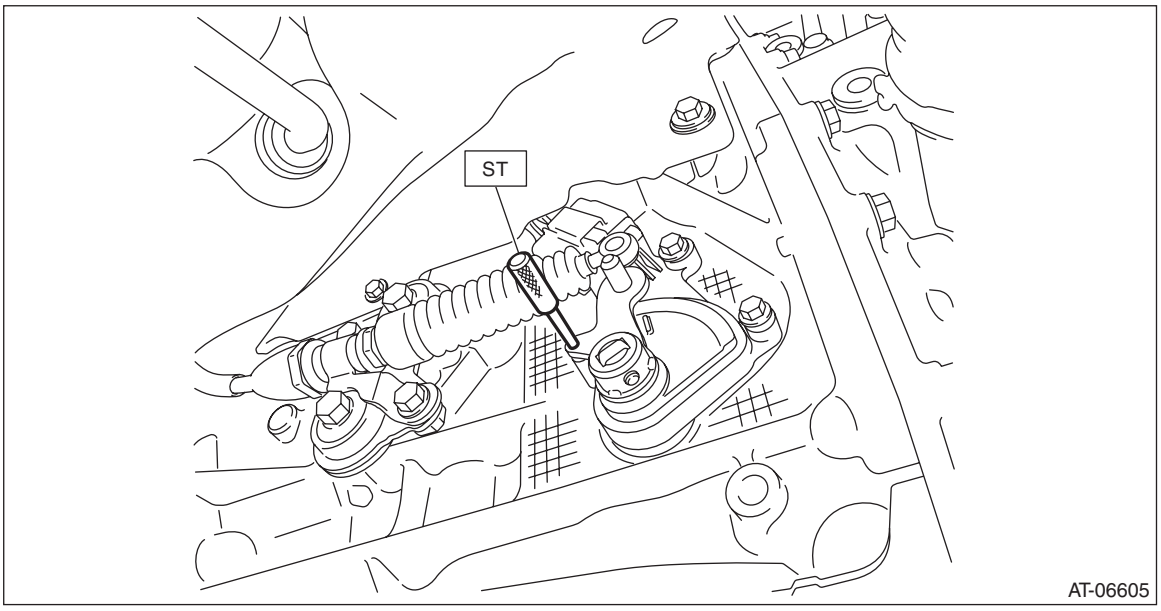
3) Install the shifter arm and fix with the spring pin.

NOTE:
Use new spring pin.



(A) Spring pin
(B) Shifter arm

4) Shift the shifter arm to “N” range.
5) Install the ST vertically in the cutout of shifter arm and the hole of switch body.
ST 499267300 STOPPER PIN

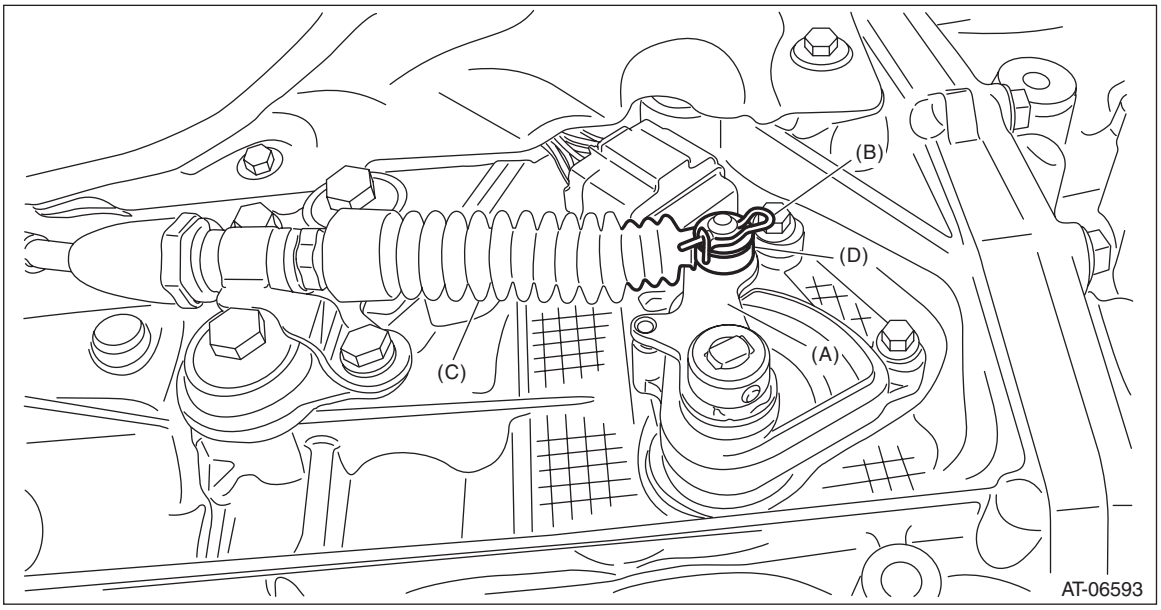


6) Tighten the two bolts holding the inhibitor switch.

Tightening torque:
5 N·m (0.5 kgf-m, 3.7 ft-lb)

7) Install the select cable to the shifter arm.

8) Install the washer and snap pin to the shifter arm.



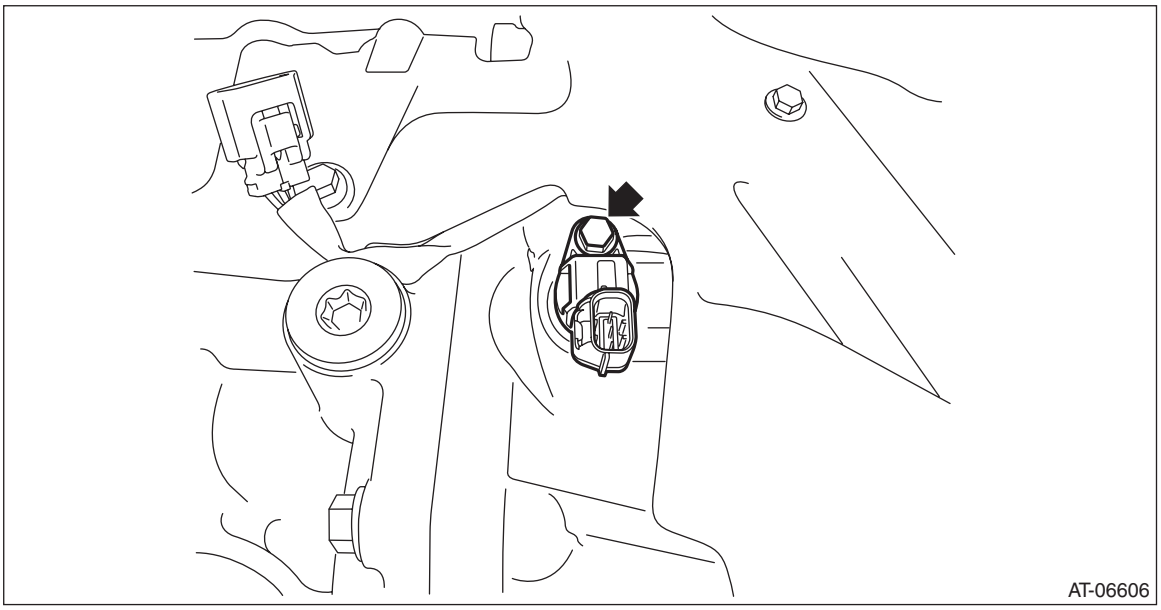
(A) Shifter arm
(B) Snap pin
(C) Select cable
(D) Washer

9) Install the center exhaust pipe. <Ref. to EX(H4DO)-13, INSTALLATION, Center Exhaust Pipe.>
10) Lower the vehicle.
11) Connect the battery ground terminal.
12) Check the inhibitor switch. <Ref. to CVT-92, INSPECTION, Inhibitor Switch.>

15.Turbine Speed Sensor

A: REMOVAL

CAUTION:
Be sure to prevent water or oil from contacting the connector terminal of turbine speed sensor. If adhesion occurs, replace with a new part.
1) Lift up the vehicle.
2) Remove the harness connector from turbine speed sensor.
3) Remove the turbine speed sensor.



B: INSTALLATION

CAUTION:
Be sure to prevent water or oil from contacting the connector terminal of turbine speed sensor. If adhesion occurs, replace with a new part.
Install in the reverse order of removal.

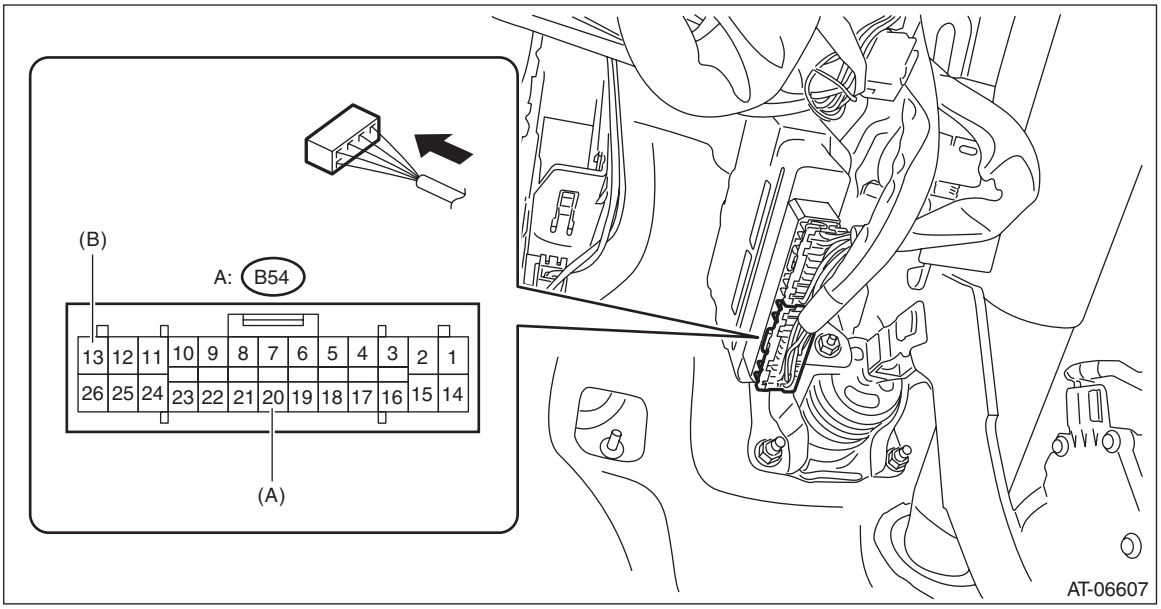
NOTE:
- Use new O-rings.
- Apply CVTF to the O-ring.

Tightening torque:
7 N·m (0.7 kgf-m, 5.2 ft-lb)

C: INSPECTION

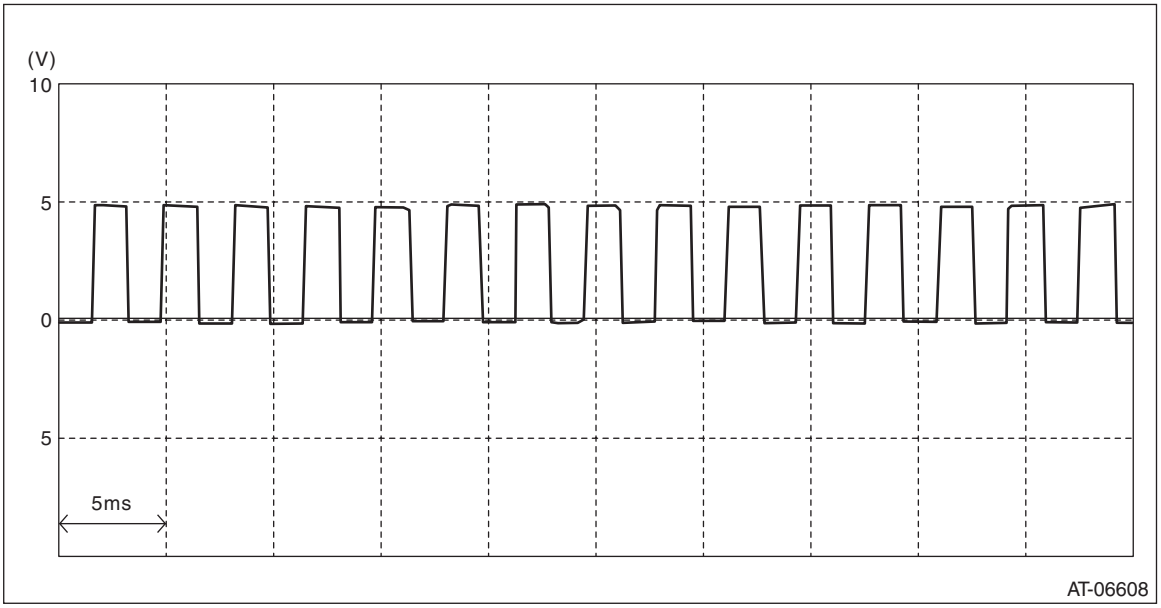
1) Remove the instrument panel lower cover. <Ref. to EI-62, REMOVAL, Instrument Panel Lower Cover.>
2) Set the probe of oscilloscope to TCM harness connector.

Connector & terminal
(B54) No. 20 (+) — No. 13 (–):



(A) + probe
(B) – probe

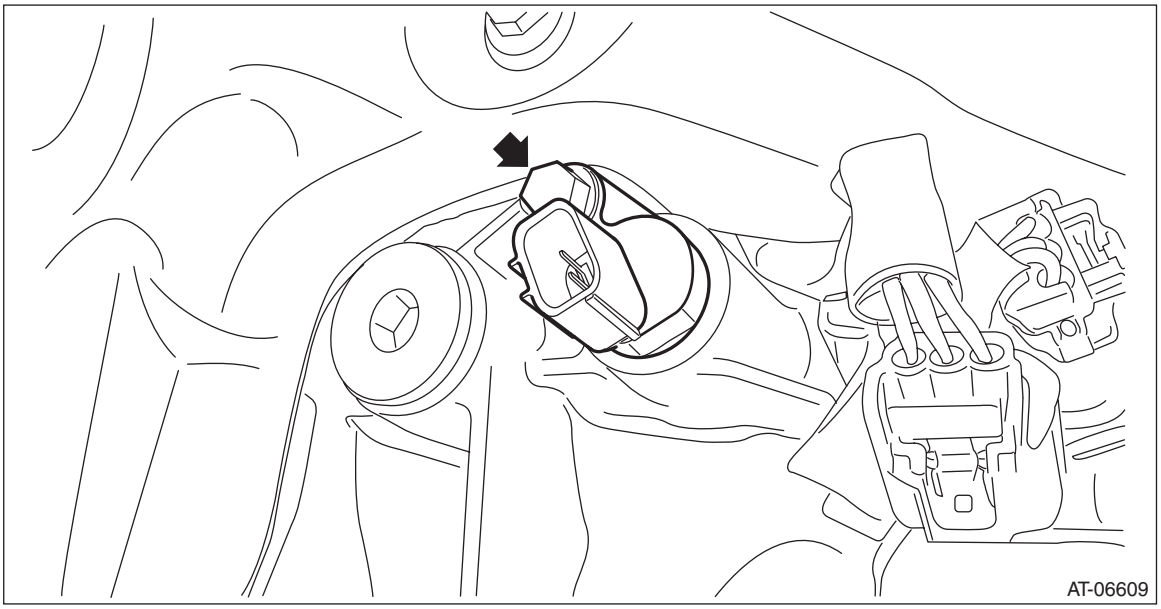
3) Start and warm up the engine.
4) Check the waveform and output voltage of the turbine speed sensor with engine idling.



16.Secondary Speed Sensor

A: REMOVAL

CAUTION:
• Be sure to prevent water or oil from contacting the connector terminal of secondary speed sensor. If adhesion occurs, replace with a new part.
• When secondary speed sensor is removed, CVTF leaks. After installing the secondary speed sensor, adjust the CVTF level.
1) Lift up the vehicle.
2) Remove the harness connector from secondary speed sensor.
3) Remove the secondary speed sensor.



B: INSTALLATION

CAUTION:
• Be sure to prevent water or oil from contacting the connector terminal of secondary speed sensor. If adhesion occurs, replace with a new part.
• After installing the secondary speed sensor, adjust the CVTF level.
Install in the reverse order of removal.

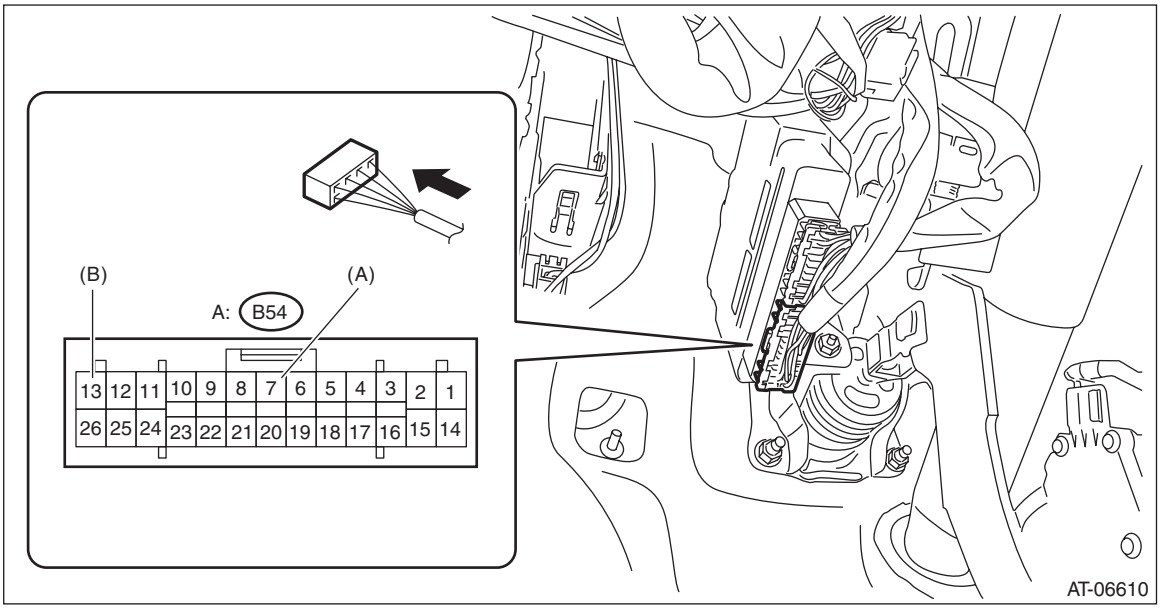
NOTE:
• Use new O-rings.
• Apply CVTF to the O-ring.

Tightening torque:
7 N·m (0.7 kgf-m, 5.2 ft-lb)

C: INSPECTION

1) Remove the instrument panel lower cover. <Ref. to EI-62, REMOVAL, Instrument Panel Lower Cover.>
2) Set the probe of oscilloscope to TCM harness connector.

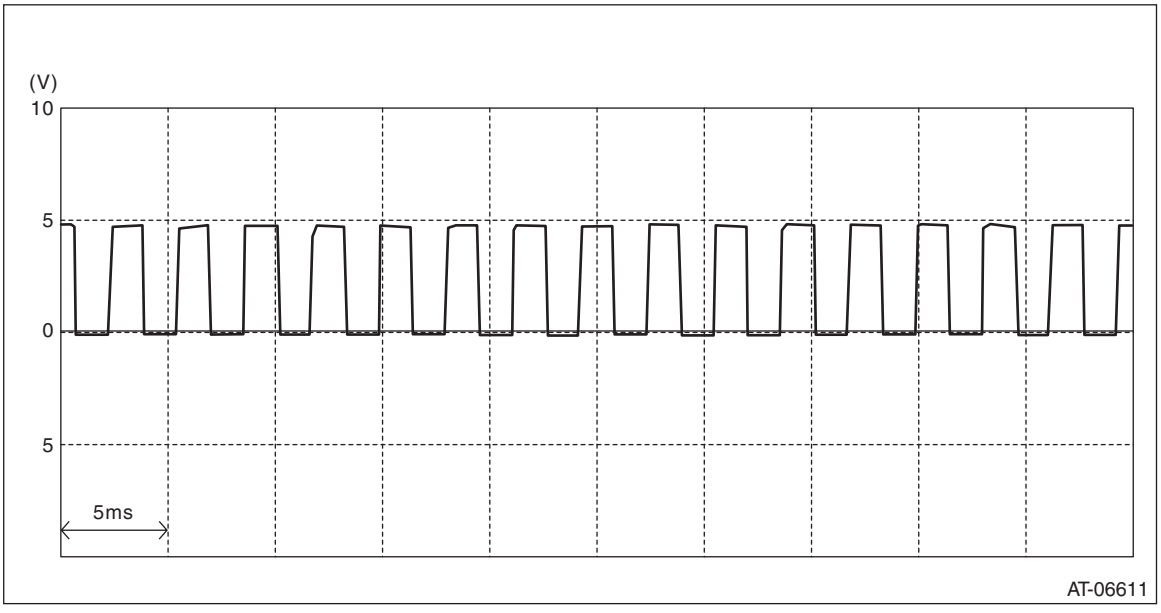
Connector & terminal
(B54) No. 7 (+) — No. 13 (–):



(A) + probe
(B) – probe

3) Start and warm up the engine.
4) Lift up the vehicle.

CAUTION:
Lift up the vehicle until the tire bottom is 0.3 m (0.98 ft) or more above the ground.
5) Shift the select lever to “D” range.
6) Check the waveform and output voltage of the secondary speed sensor with engine idling.

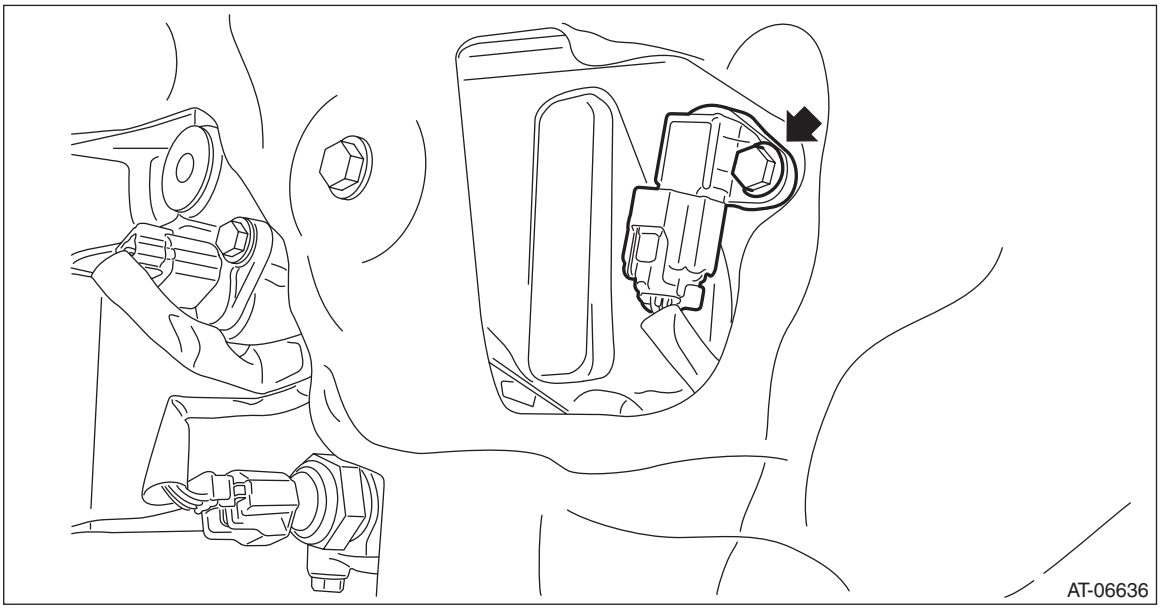


17.Primary Speed Sensor

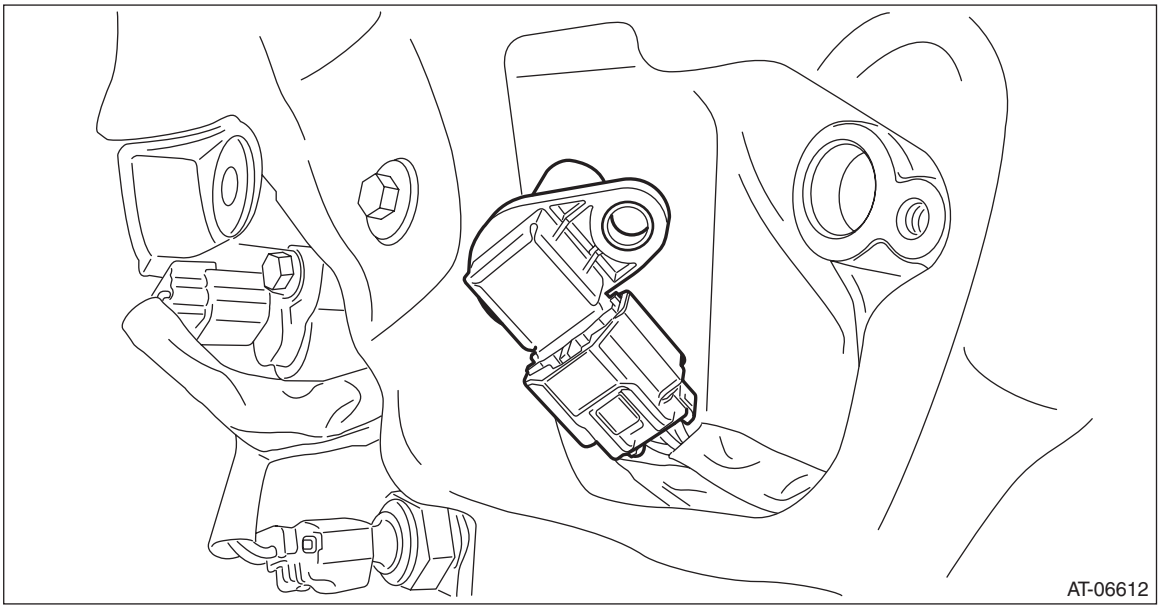
A: REMOVAL

CAUTION:
Be sure to prevent water or oil from contacting the connector terminal of primary speed sensor. If adhesion occurs, replace with a new part.

1) Remove the transmission assembly. <Ref. to CVT-58, REMOVAL, Automatic Transmission Assembly.>
2) Remove the primary speed sensor.



3) Remove the harness connector from primary speed sensor.



B: INSTALLATION

CAUTION:
Be sure to prevent water or oil from contacting the connector terminal of primary speed sensor. If adhesion occurs, replace with a new part.
Install in the reverse order of removal.

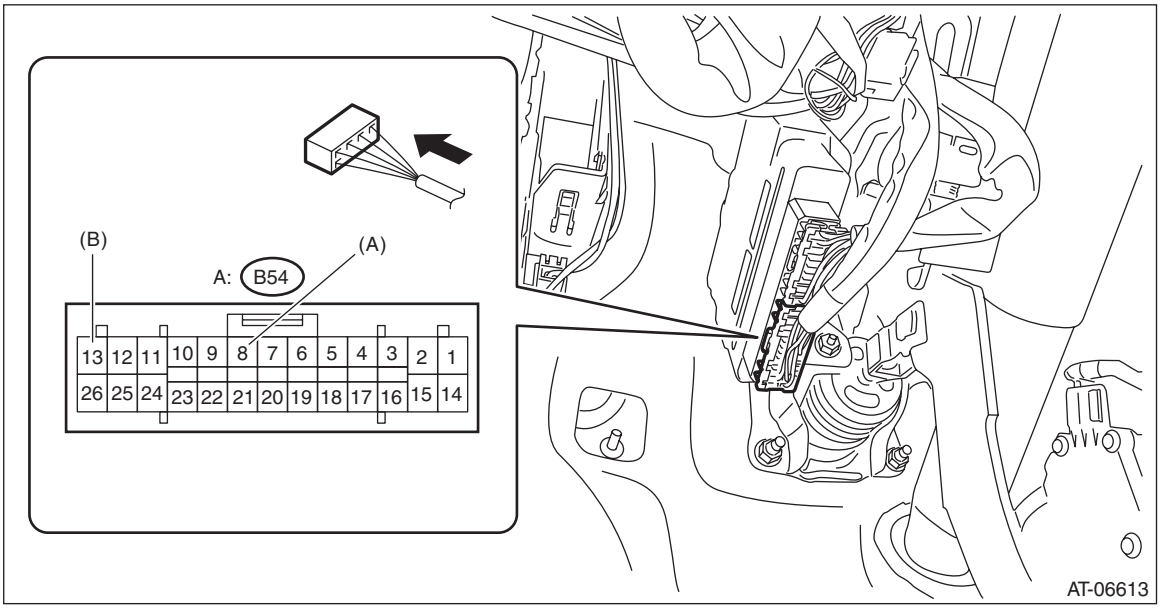
NOTE:
- Use new O-rings.
- Apply CVTF to the O-ring.

Tightening torque:
7 N·m (0.7 kgf-m, 5.2 ft-lb)

C: INSPECTION

1) Remove the instrument panel lower cover. <Ref. to EI-62, REMOVAL, Instrument Panel Lower Cover.>
2) Set the probe of oscilloscope to TCM harness connector.

Connector & terminal
(B54) No. 8 (+) — No. 13 (–):

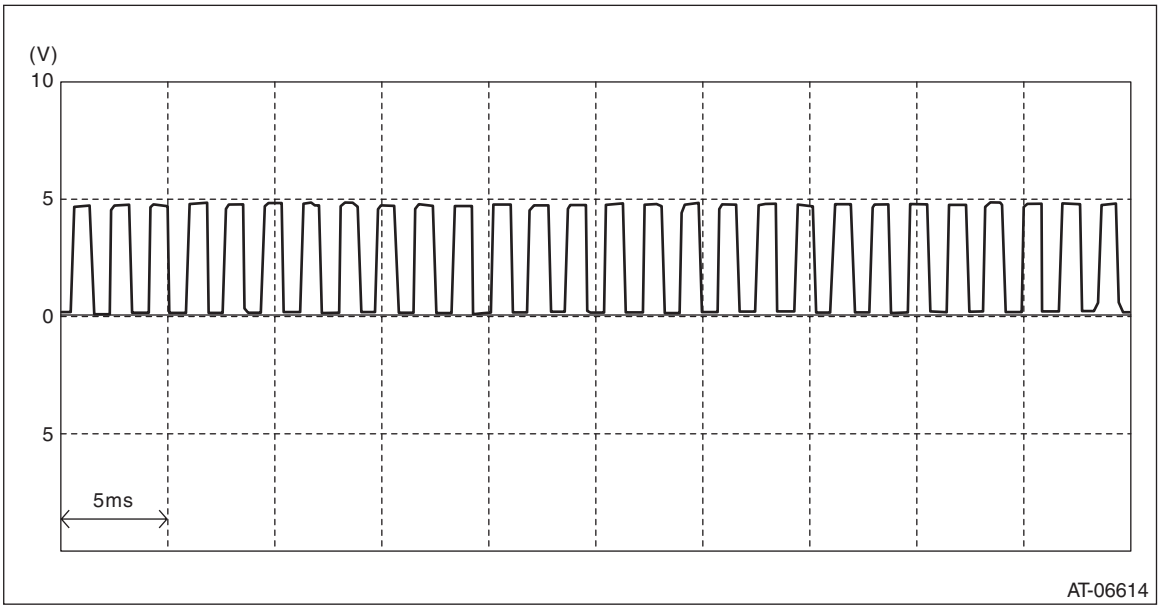


(A) + probe
(B) – probe

3) Start and warm up the engine.
4) Lift up the vehicle.

CAUTION:
Lift up the vehicle until the tire bottom is 0.3 m (0.98 ft) or more above the ground.
5) Shift the select lever to “D” range.

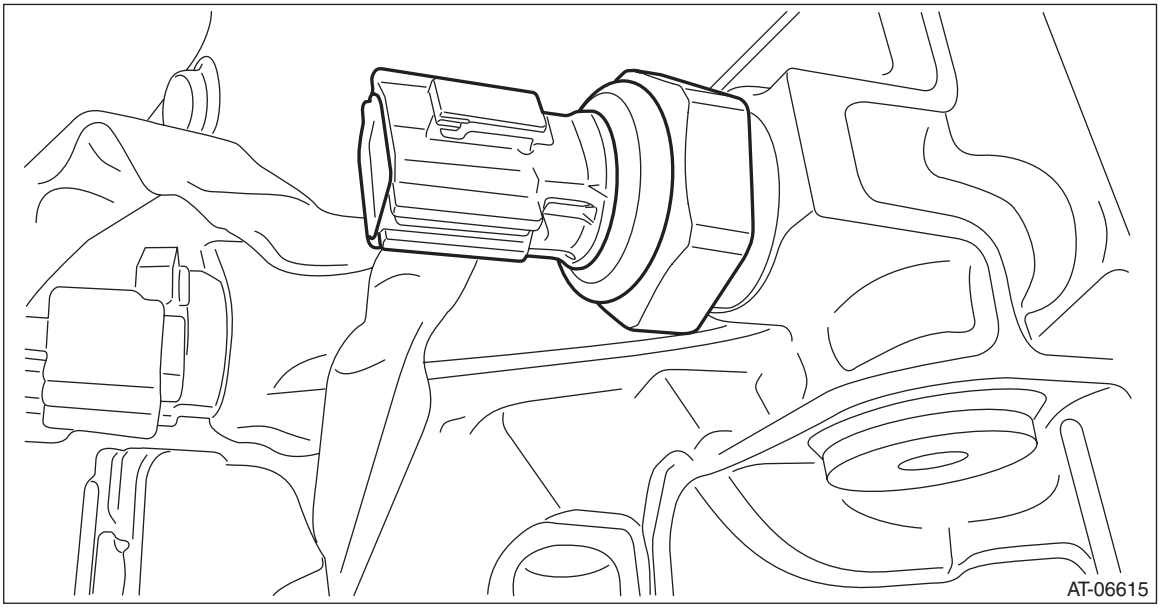
6) Check the waveform of primary speed sensor with engine idling running.



18.Secondary Pressure Sensor

A: REMOVAL

CAUTION:
• Be sure to prevent water or oil from contacting the connector terminal of secondary pressure sensor. If adhesion occurs, replace with a new part.
• When secondary pressure sensor is removed, CVTF leaks. After installing the secondary pressure sensor, adjust the CVTF level.
1) Disconnect the ground cable from battery.
2) Lift up the vehicle.
3) Remove the secondary pressure sensor connector.
4) Remove the secondary pressure sensor.



B: INSTALLATION

CAUTION:
• Be sure to prevent water or oil from contacting the connector terminal of secondary pressure sensor. If adhesion occurs, replace with a new part.
• After installing the secondary pressure sensor, adjust the CVTF level.
Install in the reverse order of removal.

NOTE:
Use new O-rings.

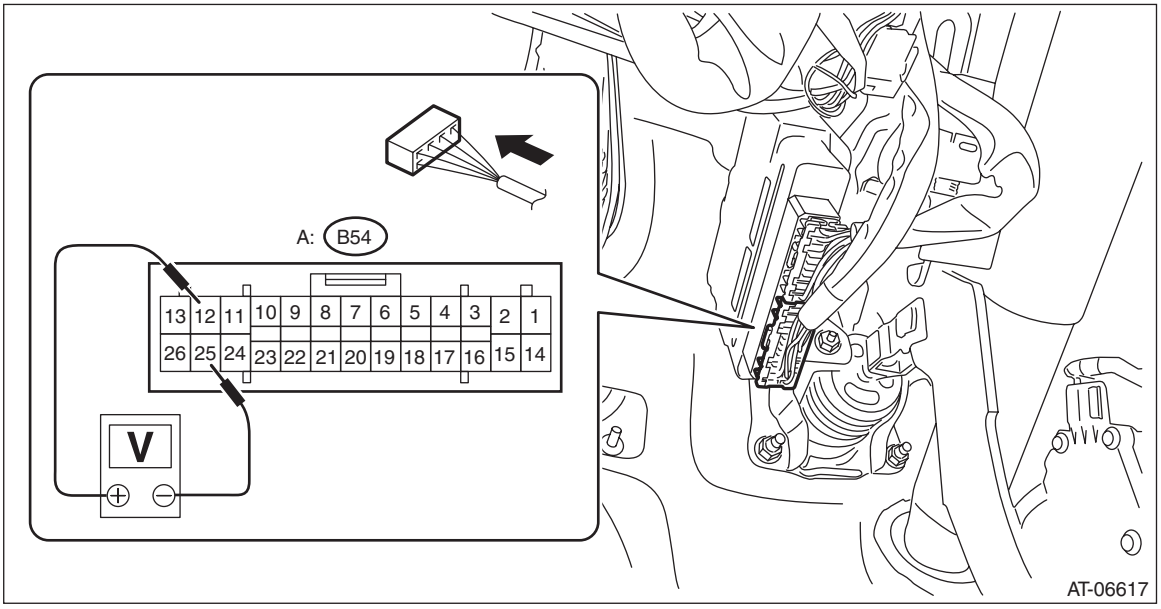
Tightening torque:
39 N·m (4.0 kgf-m, 28.8 ft-lb)

C: INSPECTION

1) Remove the instrument panel lower cover. <Ref. to EI-62, REMOVAL, Instrument Panel Lower Cover.>
2) Start and warm up the engine.
3) Shift the select lever to “P” or “N” range.
4) Depress the brake pedal and hold it.
5) Check the voltage of secondary pressure sensor with engine idling.

Connector & terminal
(B54) No. 12 (+) — No. 25 (–):

Standard
0.7 — 0.9 V



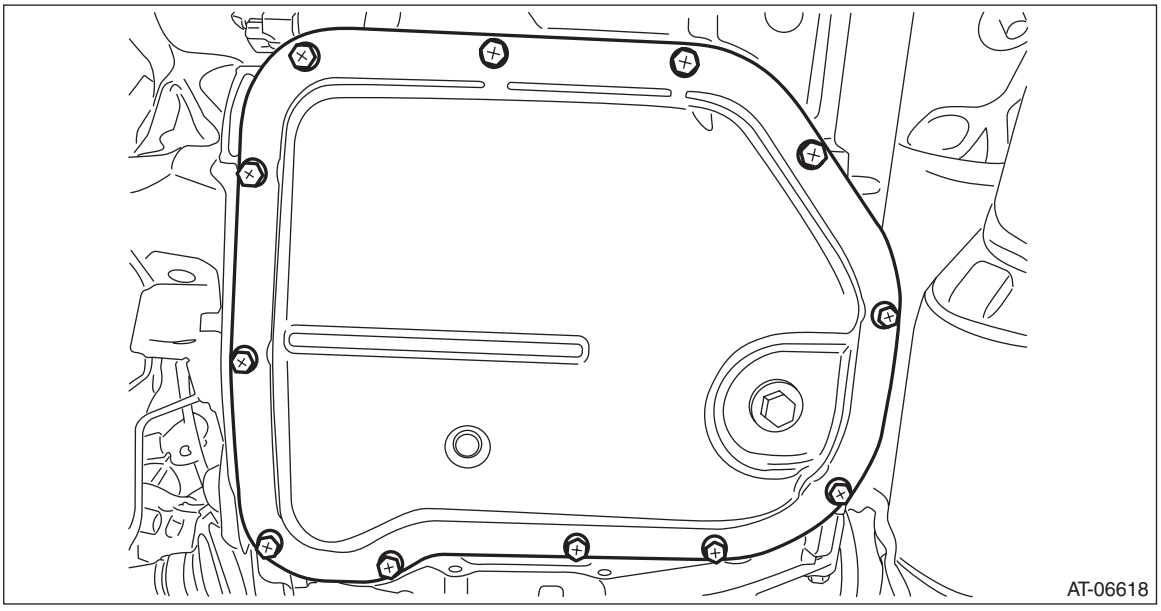
19.Oil Pan and Strainer

A: REMOVAL

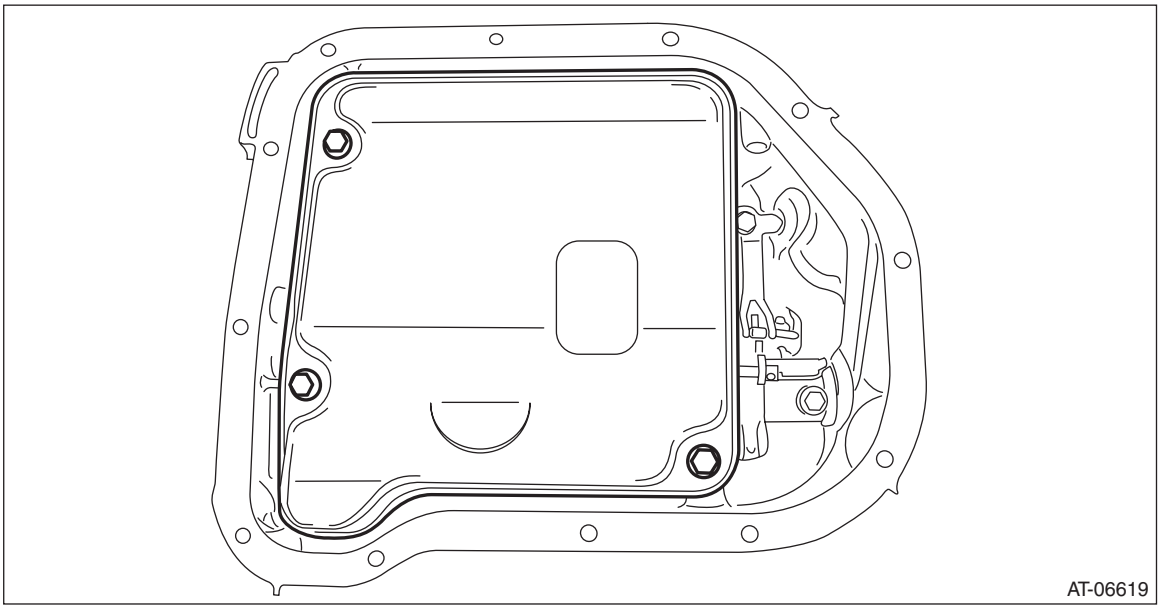
CAUTION:
• Directly after the vehicle has been running or the engine has been long idle running, the CVTF is hot. Be careful not to burn yourself.
• Be careful not to spill CVTF on the exhaust pipe to prevent it from emitting smoke or causing a fire. If the CVTF adheres, wipe it off completely.

1) Lift up the vehicle.
2) Clean the transmission exterior.
3) Remove the CVTF drain plug to drain CVTF.
4) Remove the oil pan.

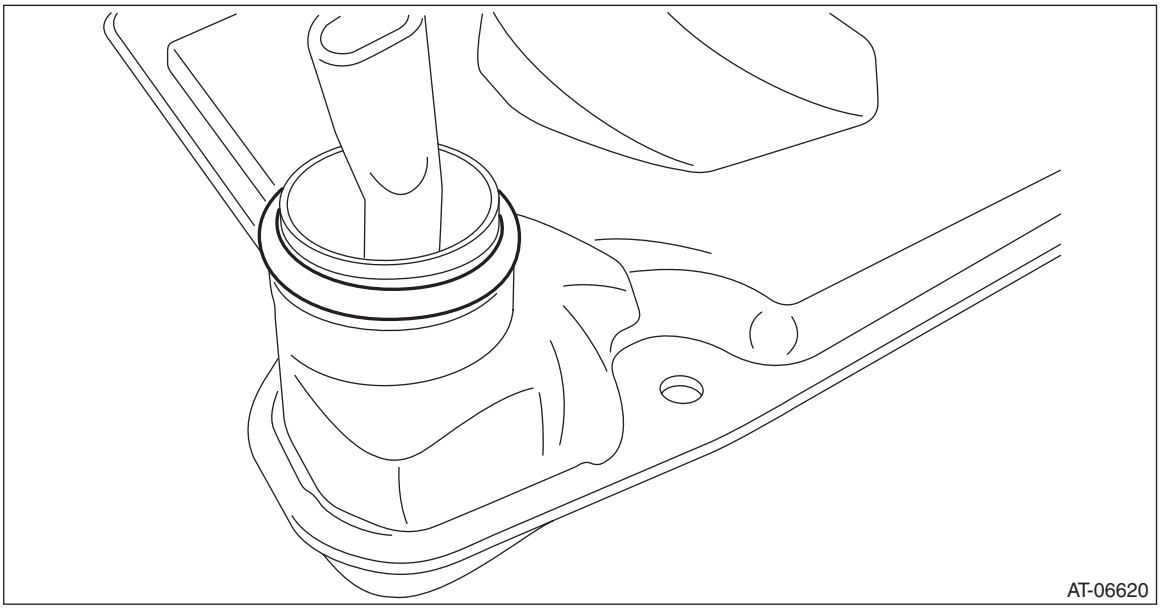
CAUTION:
Be careful not to allow foreign matter such as dust or dirt to enter the oil pan.



5) Remove the magnet.
6) Remove the oil strainer.



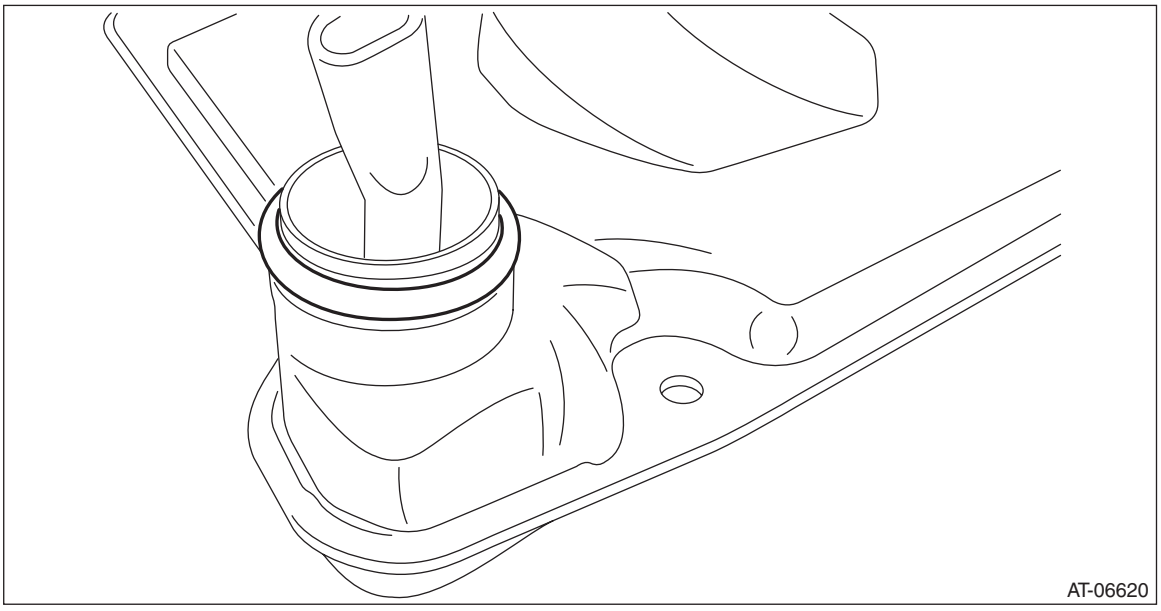
7) Remove the O-ring from oil strainer.



B: INSTALLATION

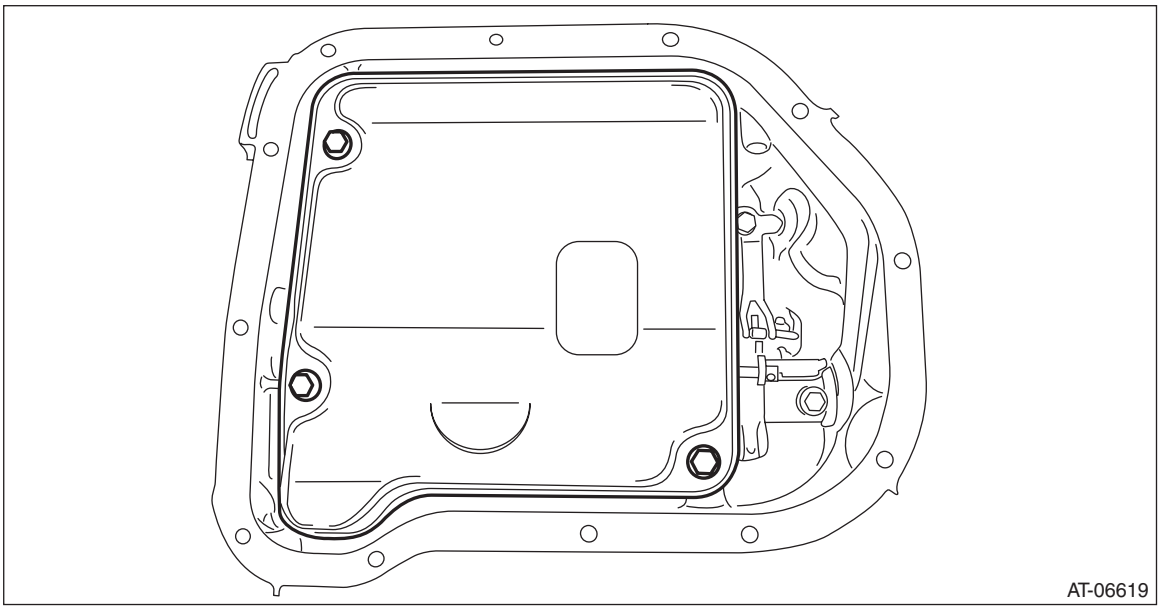
1) Clean the mating surface of oil pan and transmission case.
2) Install the O-ring to the oil strainer.

NOTE:
- Use new O-rings.
- Apply CVTF to the O-ring.



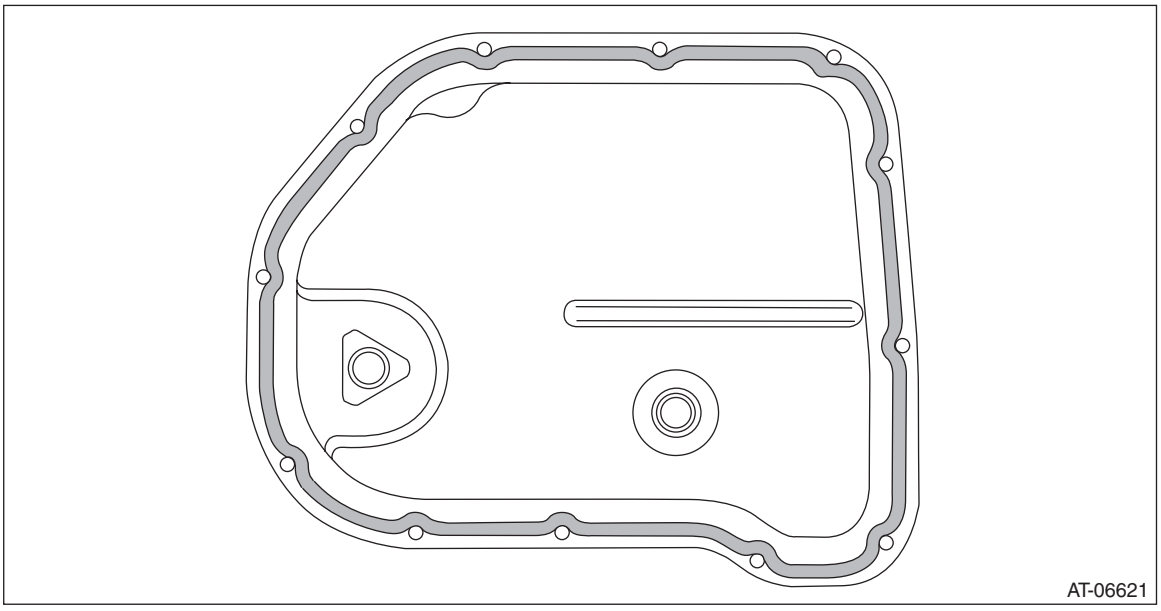
3) Install the oil strainer.

Tightening torque:
9 N·m (0.9 kgf-m, 6.6 ft-lb)



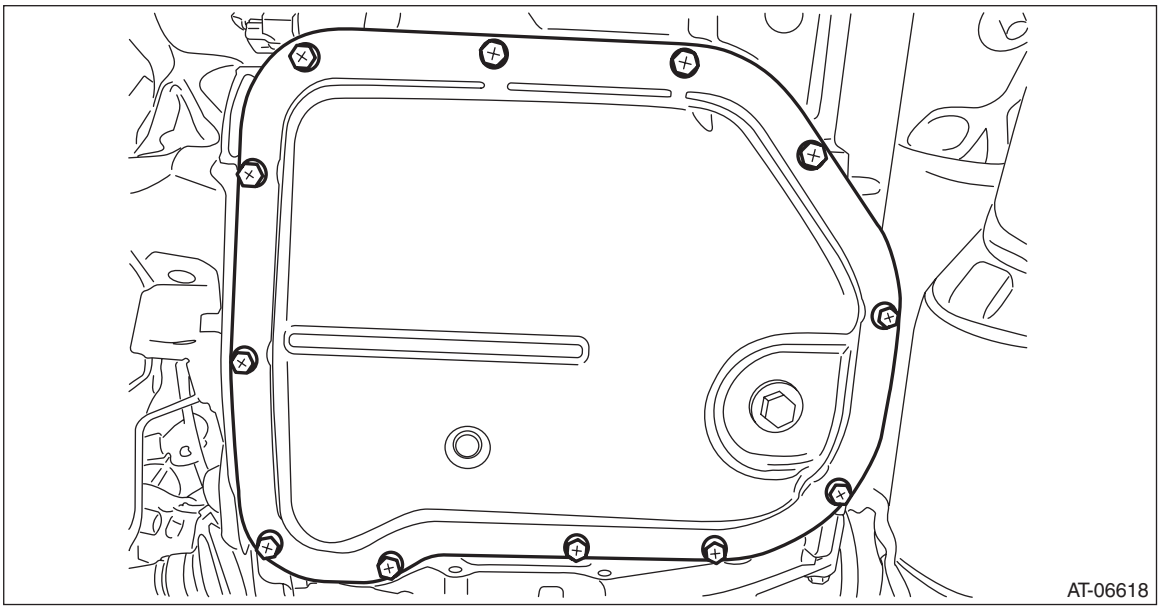
4) Clean the magnet.
5) Attach the magnet at the specified position of the oil pan.
6) Apply liquid gasket all around the oil pan mating surface seamlessly.

Liquid gasket:
THREE BOND 1217B (Part No. K0877YA020) or equivalent



7) Install the oil pan by equally tightening the bolts.

Tightening torque:
5 N·m (0.5 kgf-m, 3.7 ft-lb)



8) Refill CVTF and adjust the level. <Ref. to CVT-38, REPLACEMENT, CVTF.>

C: INSPECTION

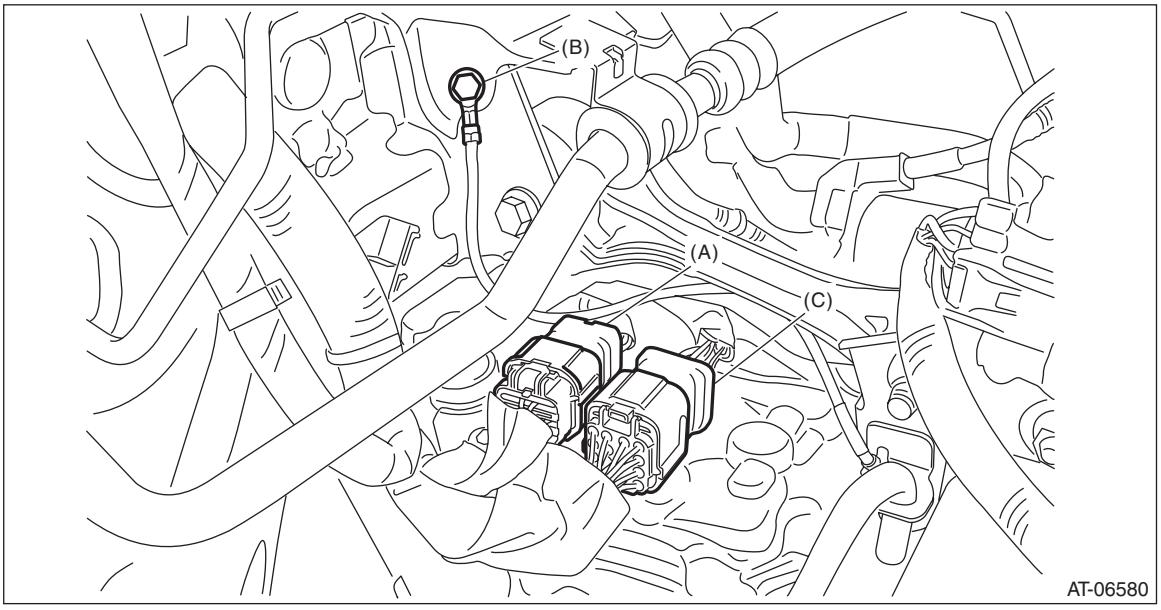
- Check each part for damage or dust.
- Check oil strainer for clogging.

20.Control Valve Body

A: REMOVAL

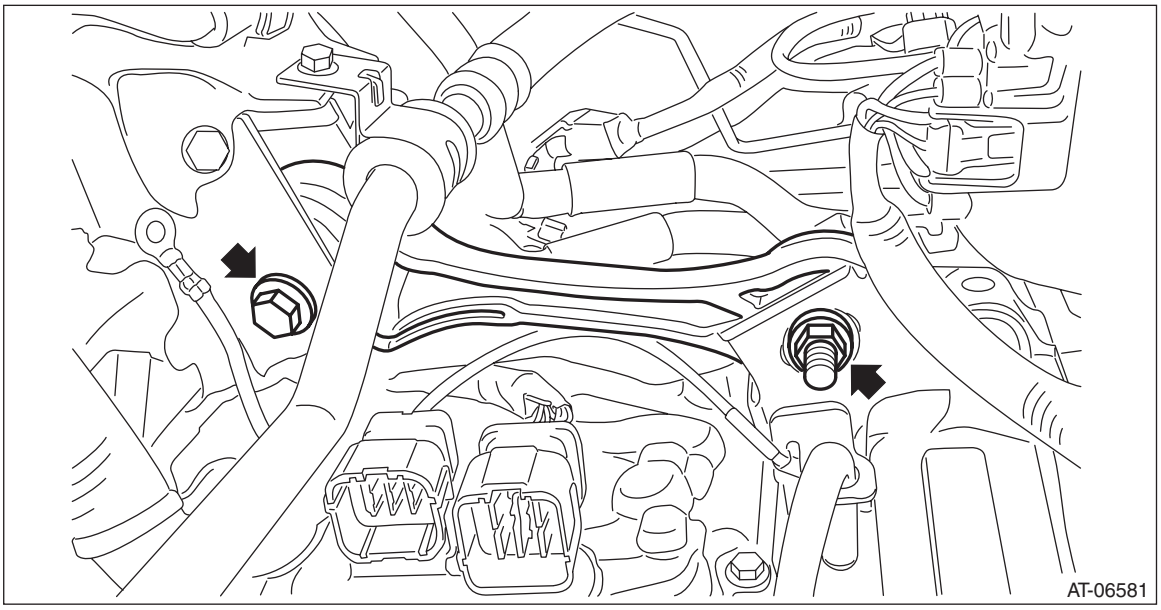
CAUTION:
• Directly after the vehicle has been running or the engine has been long idle running, the CVTF is hot. Be careful not to burn yourself.
• Be careful not to spill CVTF on the exhaust pipe to prevent it from emitting smoke or causing a fire. If the CVTF adheres, wipe it off completely.

NOTE:
The control valve body is replaced as an assembly only, because it is a non-disassembly part.
1) Disconnect the ground cable from battery.
2) Remove the air intake boot assembly. <Ref. to IN(H4DO)-12, REMOVAL, Air Intake Boot.>
3) Disconnect the following connectors.
- Transmission harness connectors
- Inhibitor harness connector
- Transmission radio ground terminal

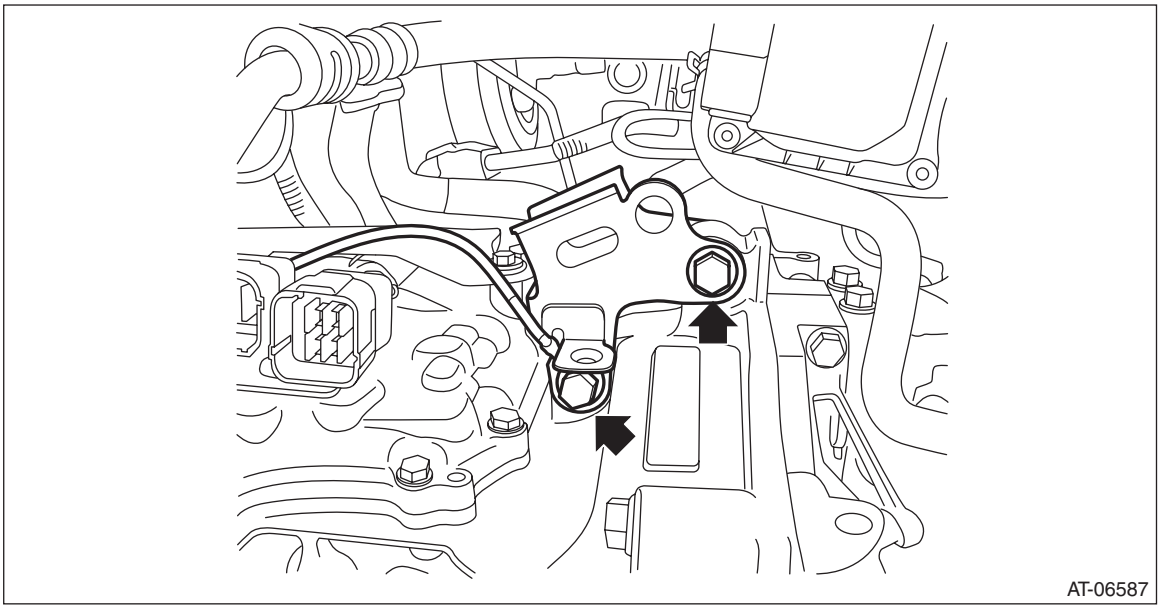


(A) Transmission harness connectors
(B) Transmission radio ground terminal
(C) Inhibitor harness connector

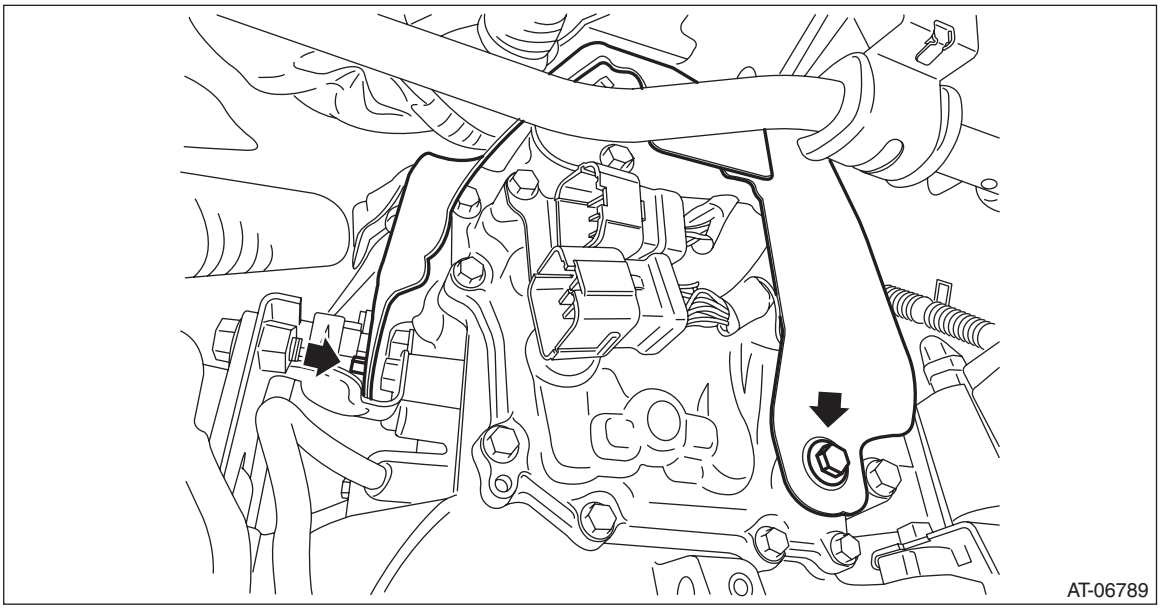
4) Remove the pitching stopper.



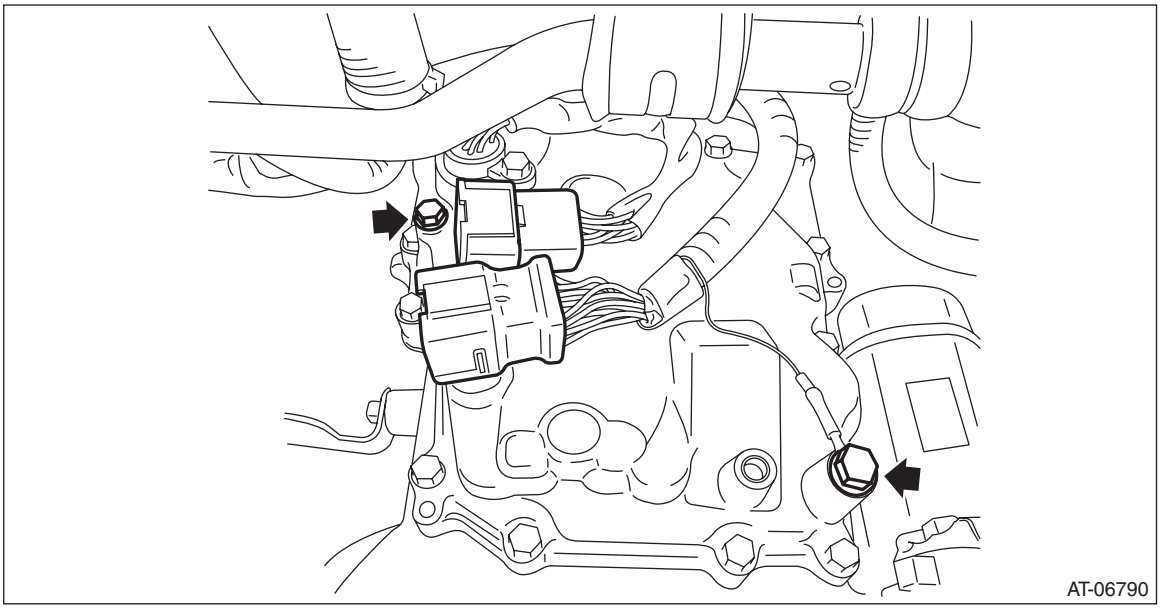
5) Remove the air breather hose from the pitching stopper bracket, and then remove the pitching stopper bracket and transmission radio ground cord.



6) Remove the transmission case cover.



7) Remove the transmission harness stay and ground terminal.

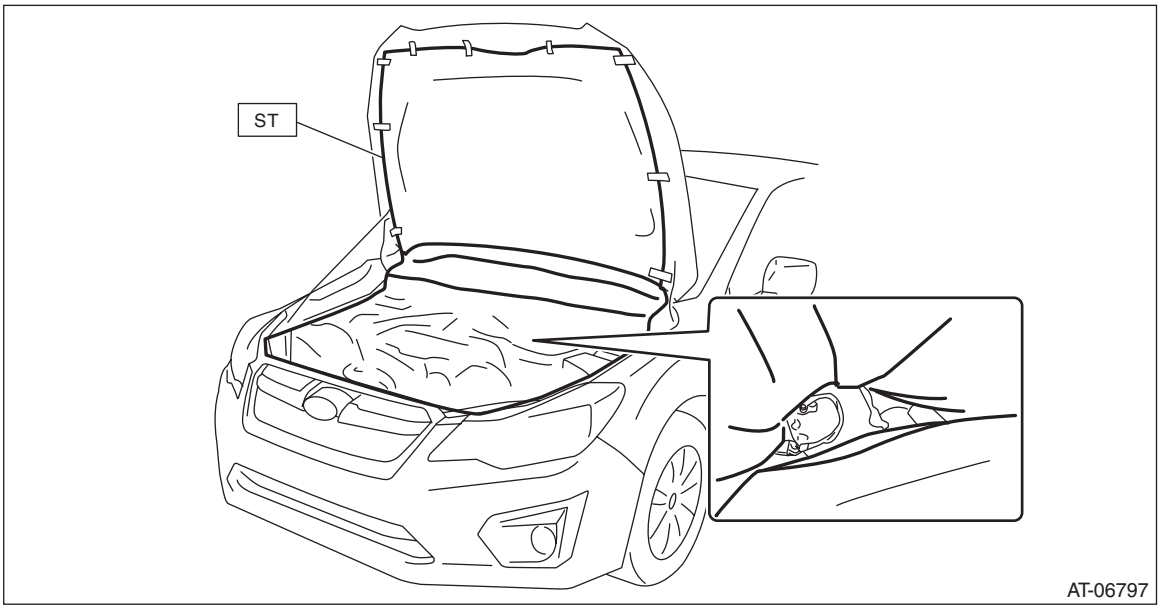


8) Remove the transmission harness connector from the harness stay.
9) Remove the throttle body, and move it aside so that it will not interfere with the removal of the control valve.
<Ref. to FU(H4DO)-18, REMOVAL, Throttle Body.>

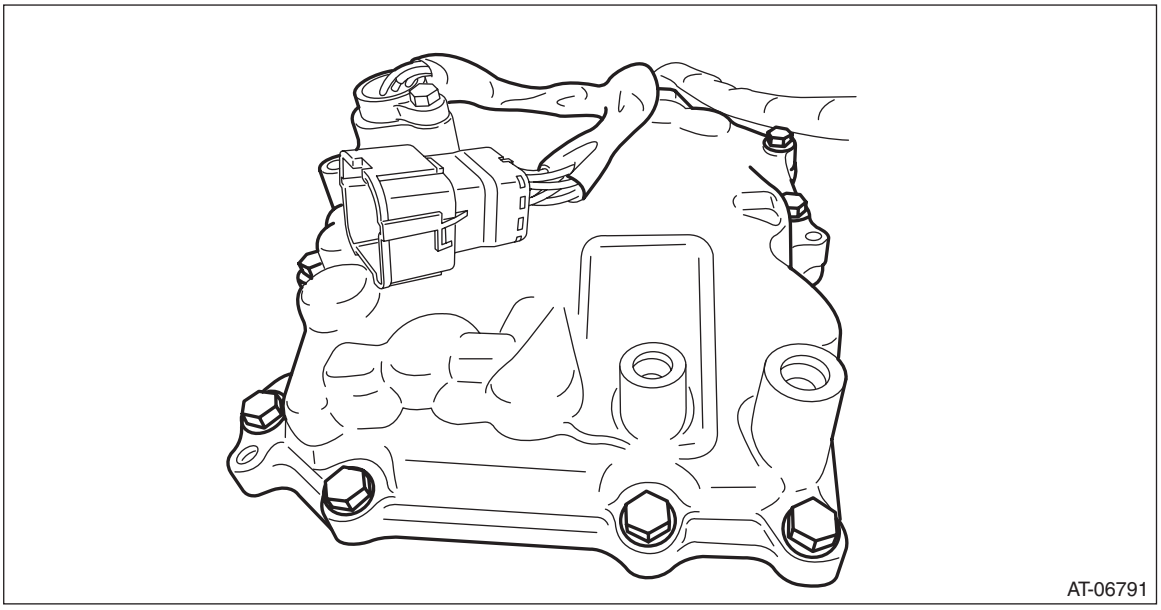
NOTE:
Do not remove the preheater hose.
10) Clean the transmission exterior.

11) Fix the ST with tape, and set the ST to the vehicle.

NOTE:
When replacing the control valve body, the sheet is included in the control valve body for repairs.
ST 18761AA010 SHEET SPECIAL TOOL

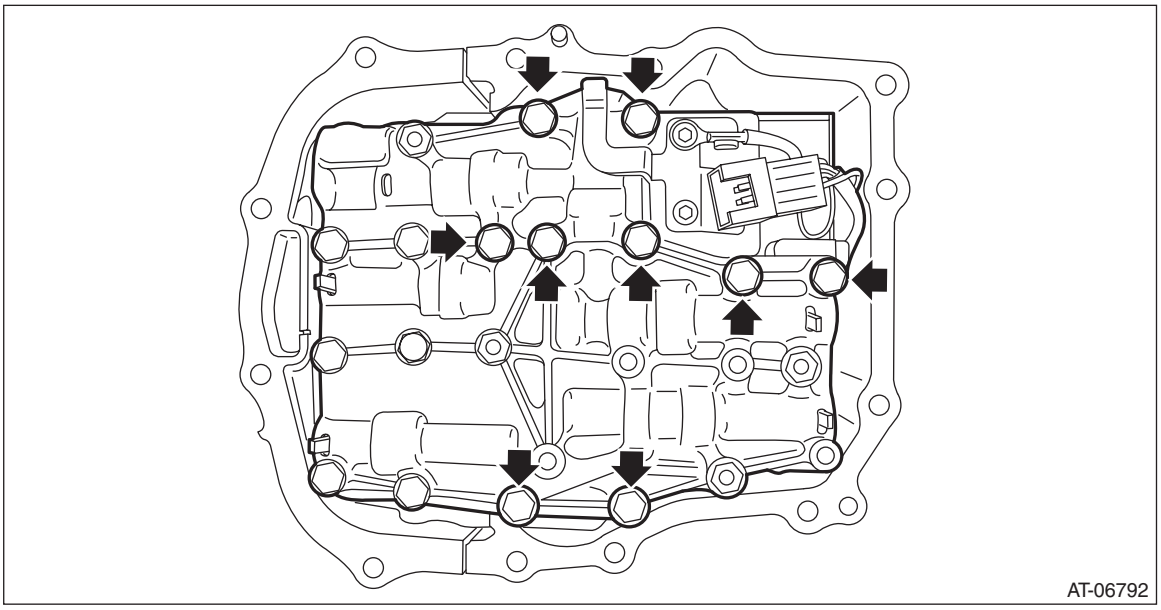


12) Remove the valve cover and gasket.

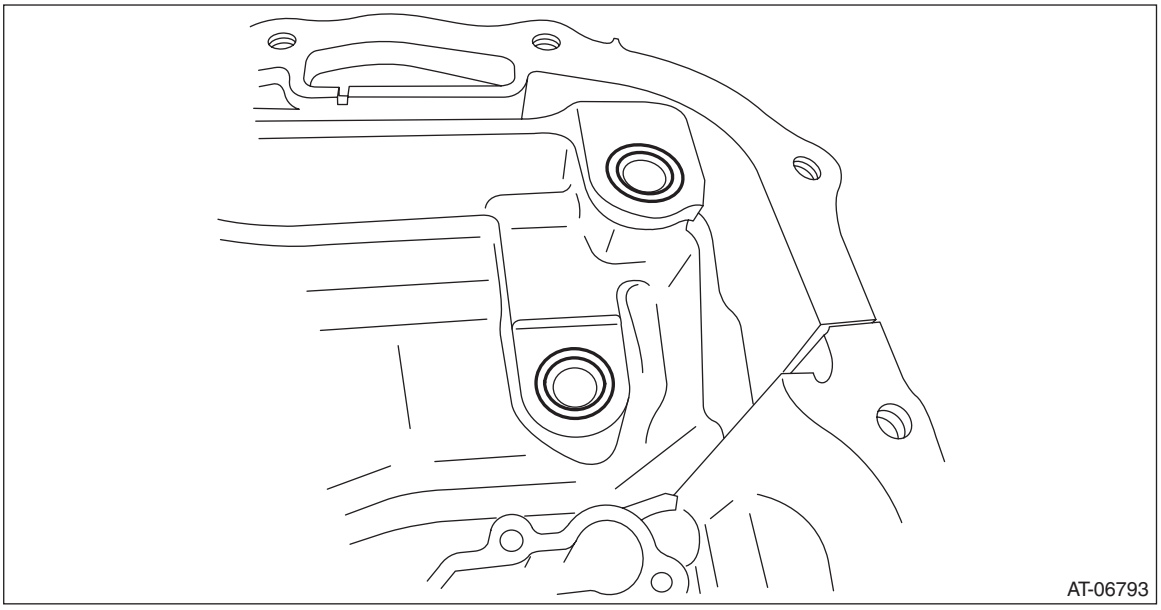


13) Disconnect the harness connector from the control valve body.

14) Remove the control valve body.



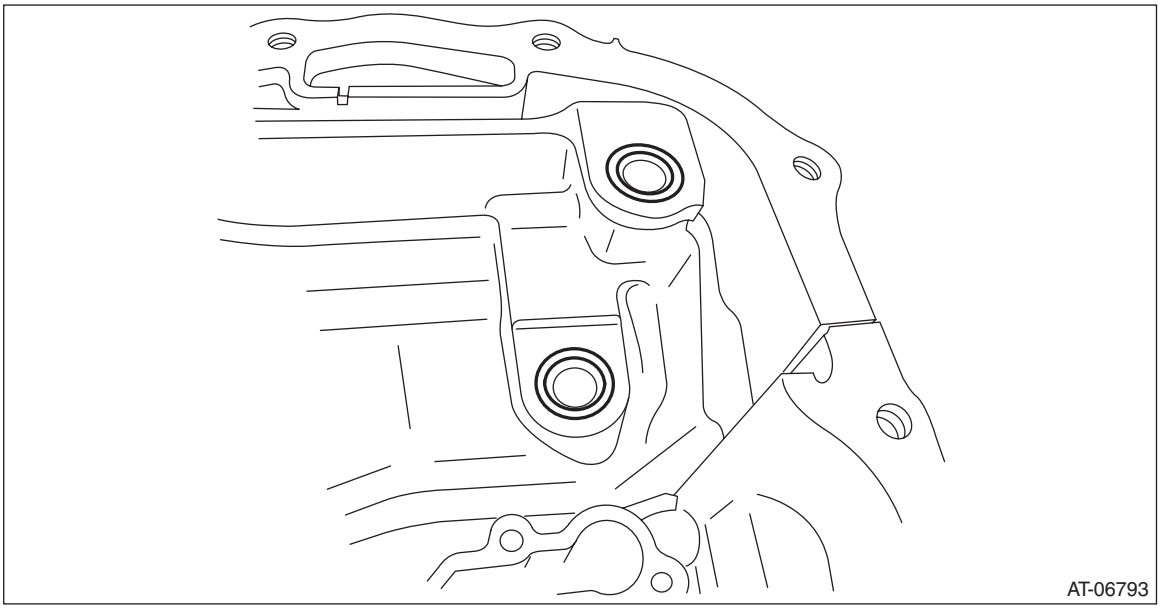
15) Remove the O-ring from the transmission.



B: INSTALLATION

1) Clean the mating surface of valve cover and transmission side.
2) Check the control valve body for dust and other foreign matter.
3) Install the O-ring.

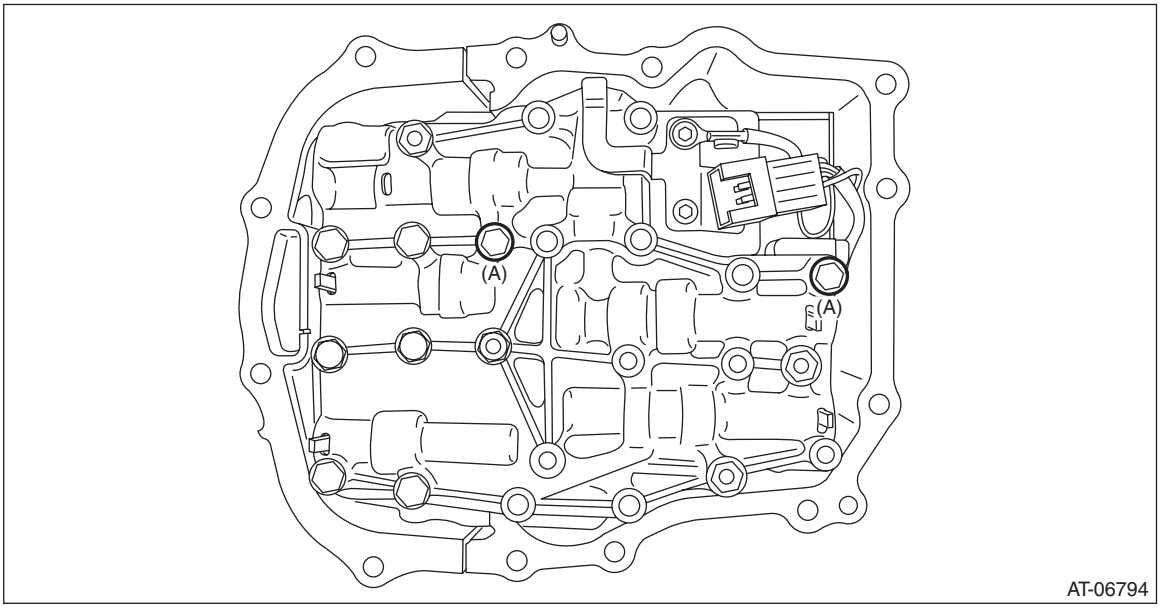
NOTE:
- Use new O-rings.
- Apply CVTF to the O-ring.



4) Install the control valve body.
   (1) Install the control valve body to the transmission.

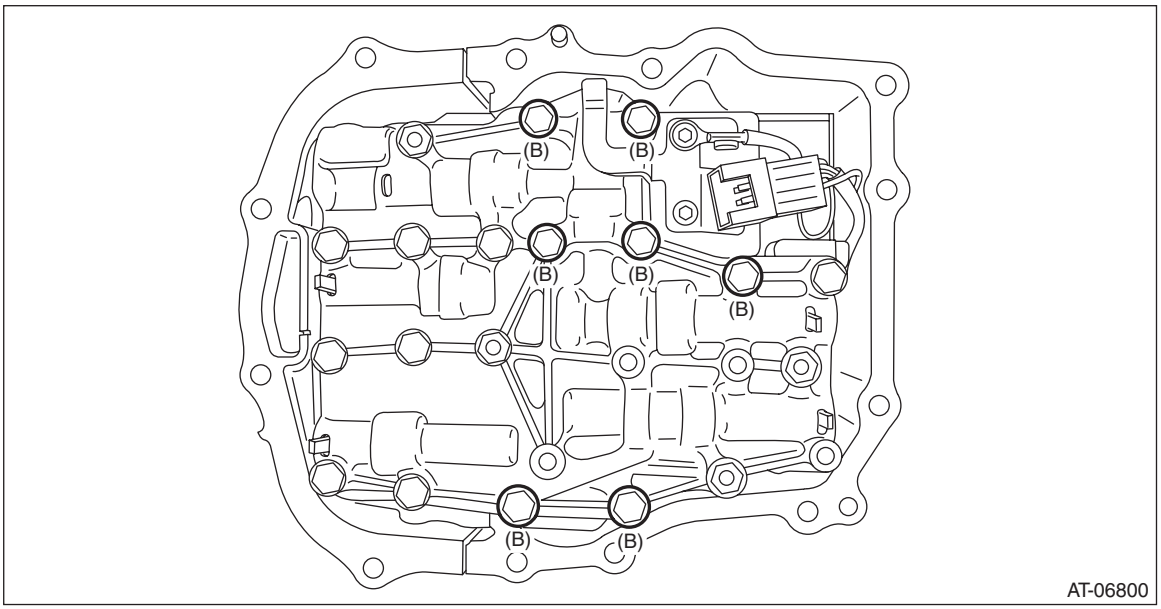
CAUTION:
- **Do not damage the O-ring.**
- **Perform installation so that the O-ring is not displaced.**

   (2) Temporarily tighten the bolt (A: silver).



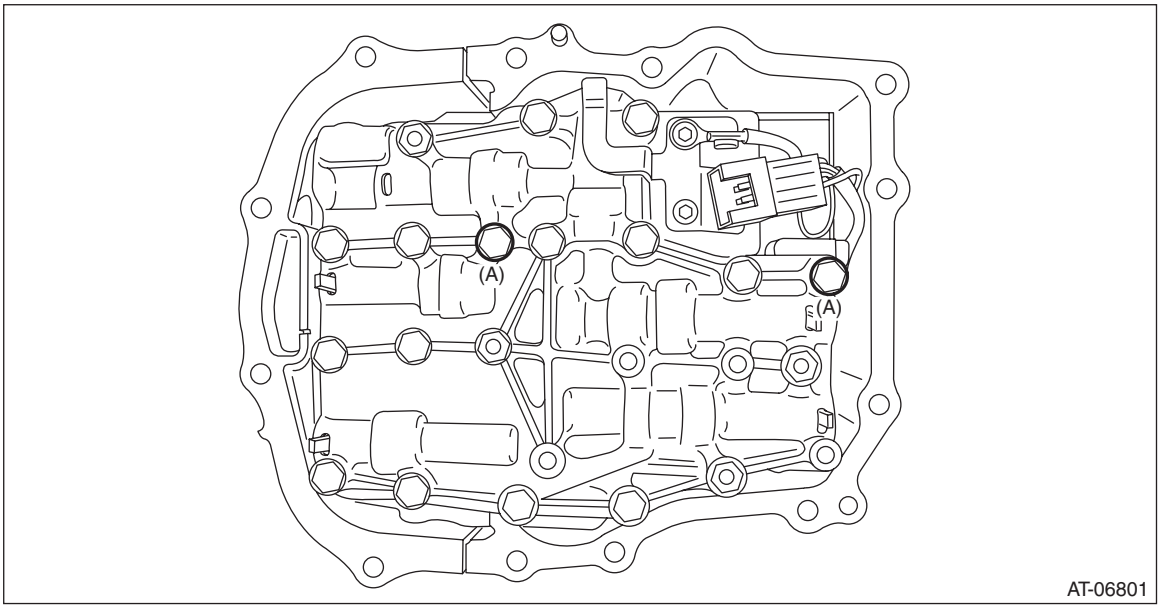
(3) Attach the bolt (B).

Tightening torque:
9 N·m (0.9 kgf-m, 6.6 ft-lb)



(4) Tighten the bolt (A: silver).

Tightening torque:
9 N·m (0.9 kgf-m, 6.6 ft-lb)

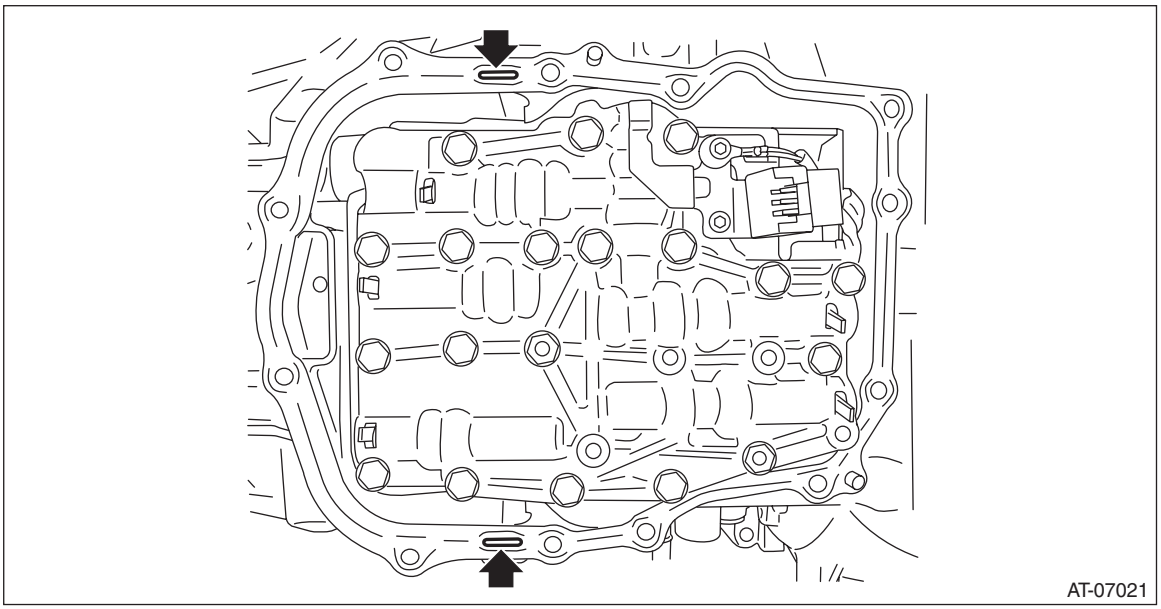


5) Install the gasket to the transmission.

NOTE:
Use a new gasket.

6) Apply liquid gasket to the oval hole of gasket.

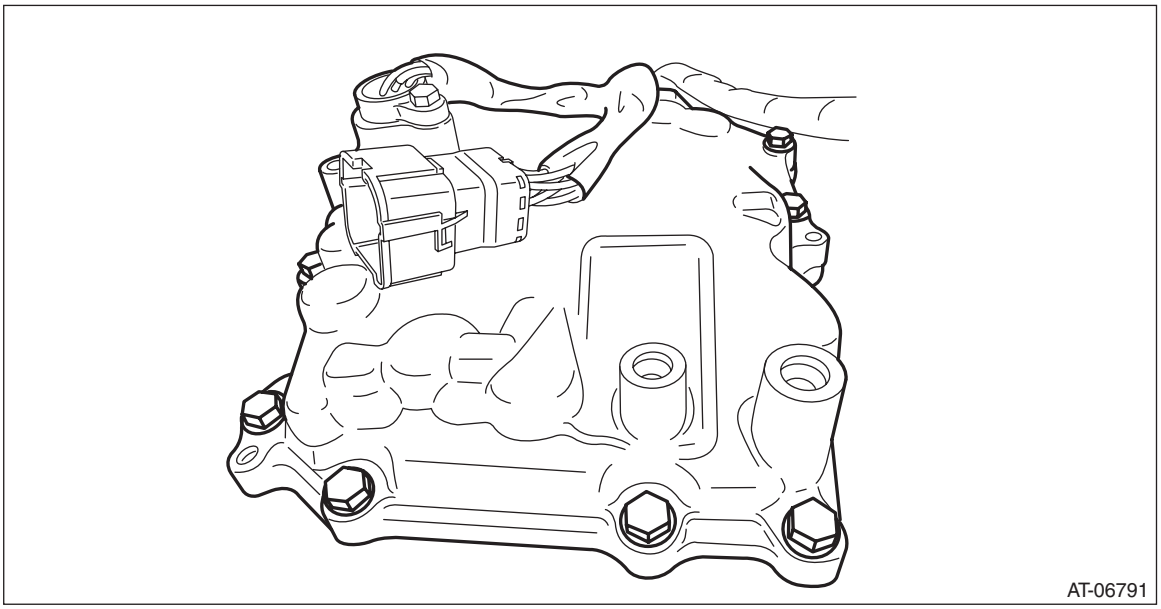
Liquid gasket:
THREE BOND 1215 (Part No. 004403007) or equivalent



7) Connect the transmission harness connector to the control valve body, and install the valve cover.

CAUTION:
Be careful not to catch the sheet of the ST.

Tightening torque:
8 N·m (0.8 kgf-m, 5.9 ft-lb)

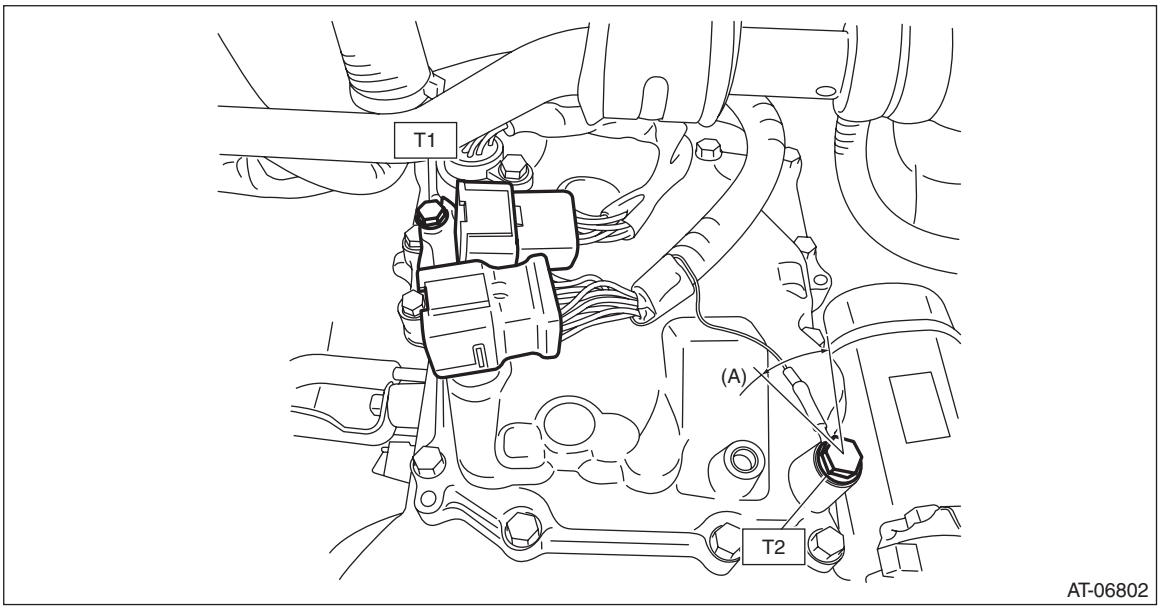


8) Remove the ST (SHEET SPECIAL TOOL).
9) Install the throttle body. <Ref. to FU(H4DO)-20, INSTALLATION, Throttle Body.>
10) Install the transmission harness connector to the harness stay.

11) Install the transmission harness stay and transmission ground terminal.

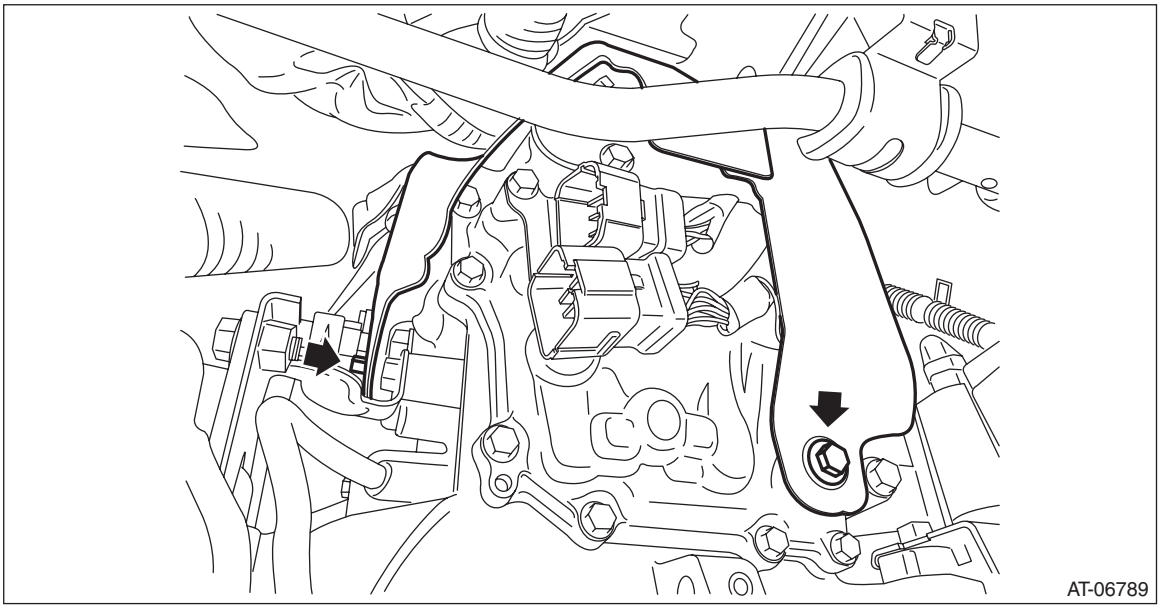
NOTE:
Install the transmission ground terminal in the direction within the range of approx. 30° (A).

Tightening torque:
T1: 7 N·m (0.7 kgf-m, 5.2 ft-lb)
T2: 14 N·m (1.4 kgf-m, 10.3 ft-lb)



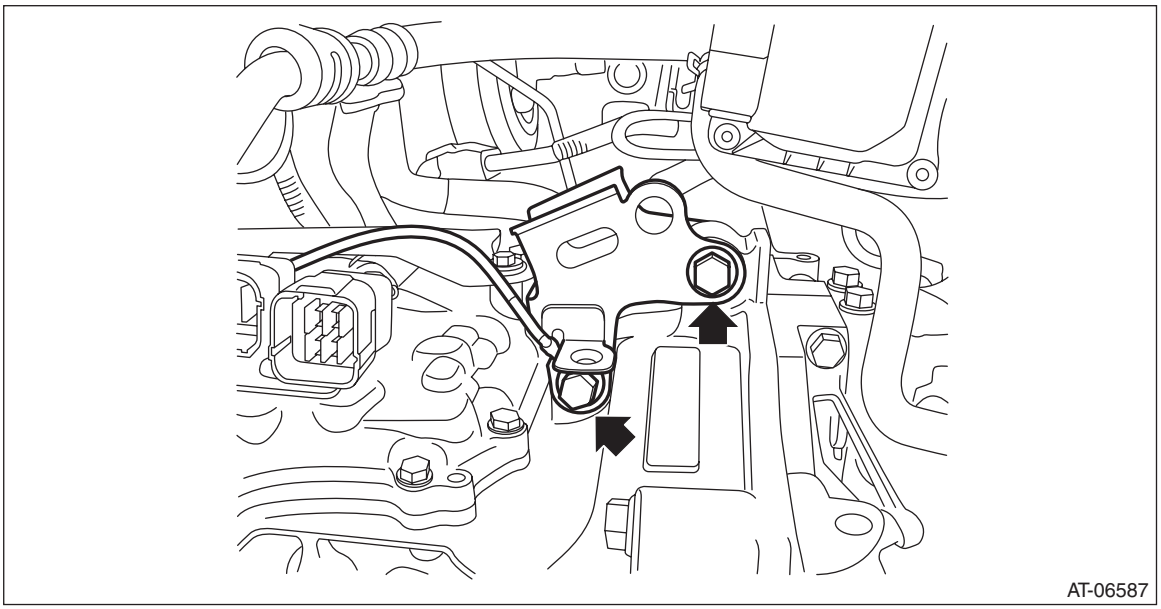
12) Install the transmission case cover.

Tightening torque:
8 N·m (0.8 kgf-m, 5.9 ft-lb)



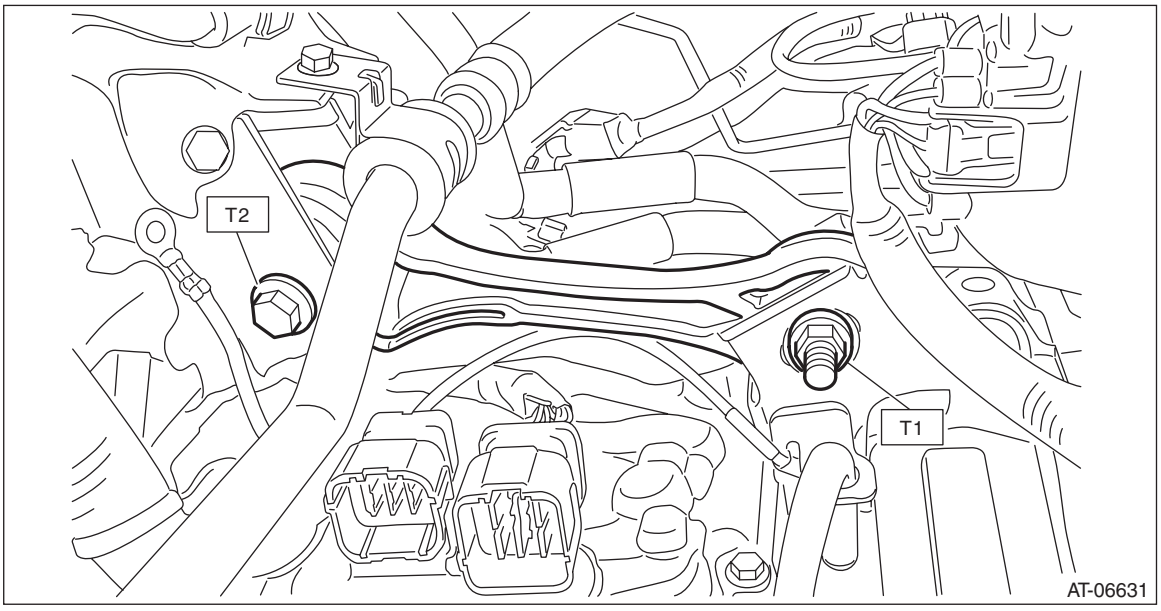
13) Install the pitching stopper bracket and transmission radio ground cord.

Tightening torque:
41 N·m (4.2 kgf-m, 30.2 ft-lb)



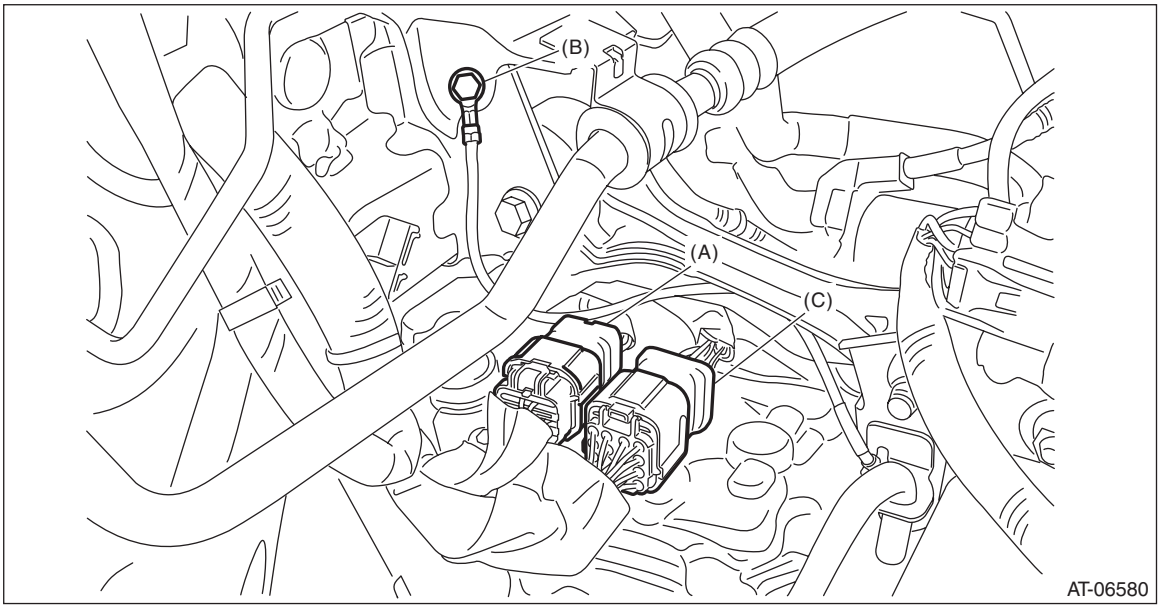
14) Install the air breather hose to the pitching stopper bracket.
15) Install the pitching stopper.

Tightening torque:
T1: 50 N·m (5.1 kgf-m, 36.9 ft-lb)
T2: 58 N·m (5.9 kgf-m, 42.8 ft-lb)



16) Connect the following harness connectors.
- Transmission harness connectors
- Inhibitor harness connector
- Transmission radio ground terminal

Tightening torque:
13 N·m (1.3 kgf-m, 9.6 ft-lb)



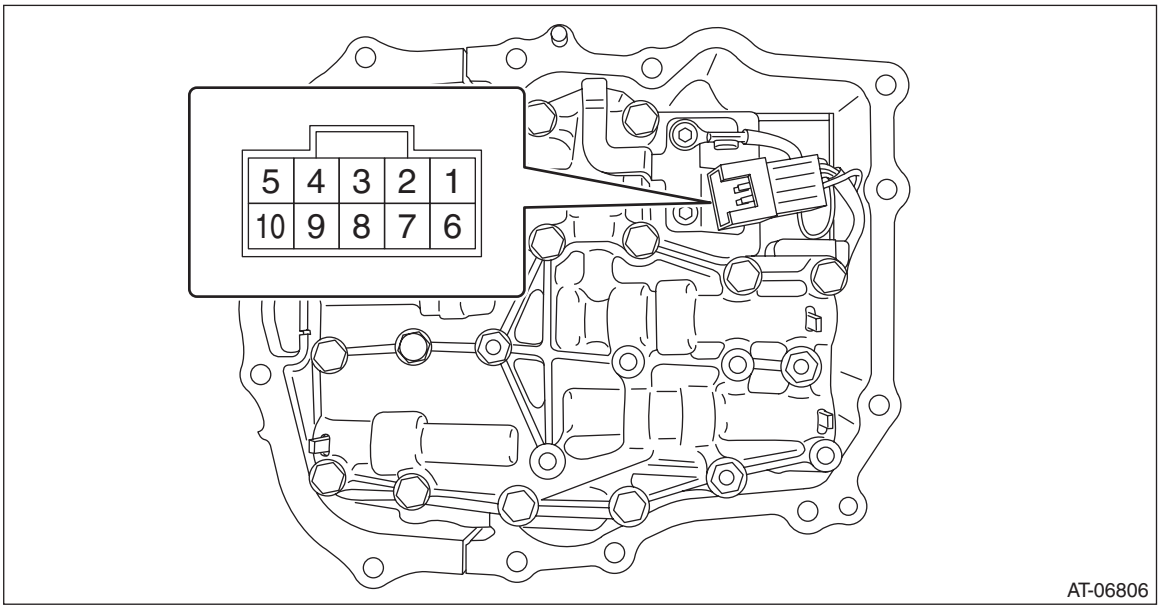
(A) Transmission harness connectors
(B) Transmission radio ground terminal
(C) Inhibitor harness connector

17) Install the air intake boot assembly. <Ref. to IN(H4DO)-12, INSTALLATION, Air Intake Boot.>
18) Adjust the CVTF level. <Ref. to CVT-36, ADJUSTMENT, CVTF.>

C: INSPECTION

- Check each part for damage or dust.
- Measure the resistance of each solenoid, sensor and ground wire.

NOTE:
Measurement should be performed at a temperature of 20°C (68°F).



- **Solenoid**

Solenoid	Terminal No.	Standard
Primary UP solenoid	No. 2 — Control valve body	Approx. 10 — 13.5 Ω
Secondary solenoid	No. 3 — Control valve body	Approx. 5 — 7 Ω
F&R clutch solenoid	No. 4 — Control valve body	Approx. 4 — 6 Ω
Primary DOWN solenoid	No. 7 — Control valve body	Approx. 10 — 13.5 Ω
Lock-up duty solenoid	No. 9 — Control valve body	Approx. 10 — 13.5 Ω
AWD solenoid	No. 10 — Control valve body	Approx. 2 — 4.5 Ω

- **Oil temperature sensor**

Sensor	Terminal No.	Standard (at 20°C (68°F))
Oil temperature sensor	No. 1 — No. 6	Approx. 2.5 kΩ

- **Transmission ground**

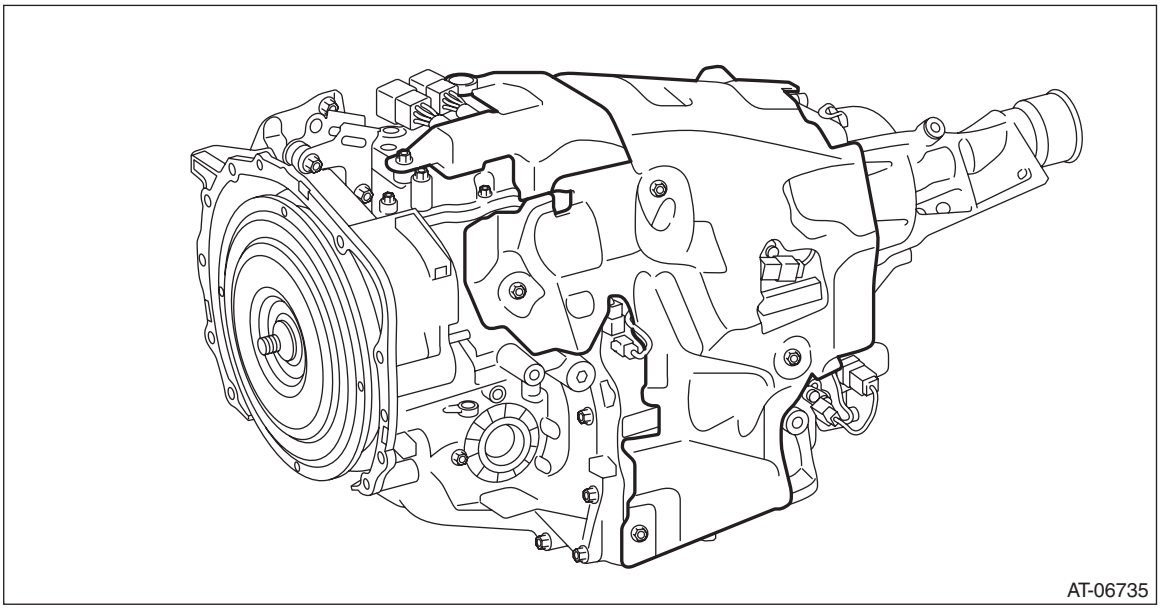
Terminal No.	Standard
No. 8 — Control valve body	Less than 1 Ω

21.Transmission Harness

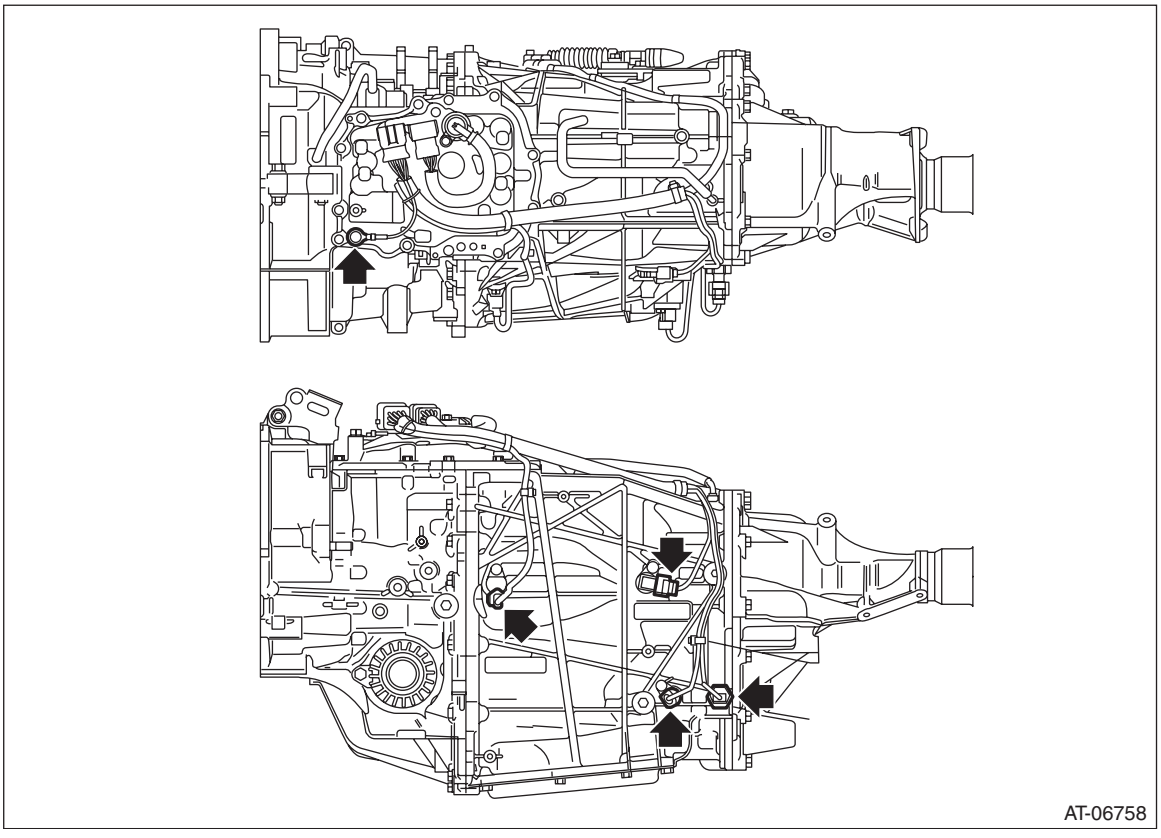
A: REMOVAL

1. INHIBITOR HARNESS

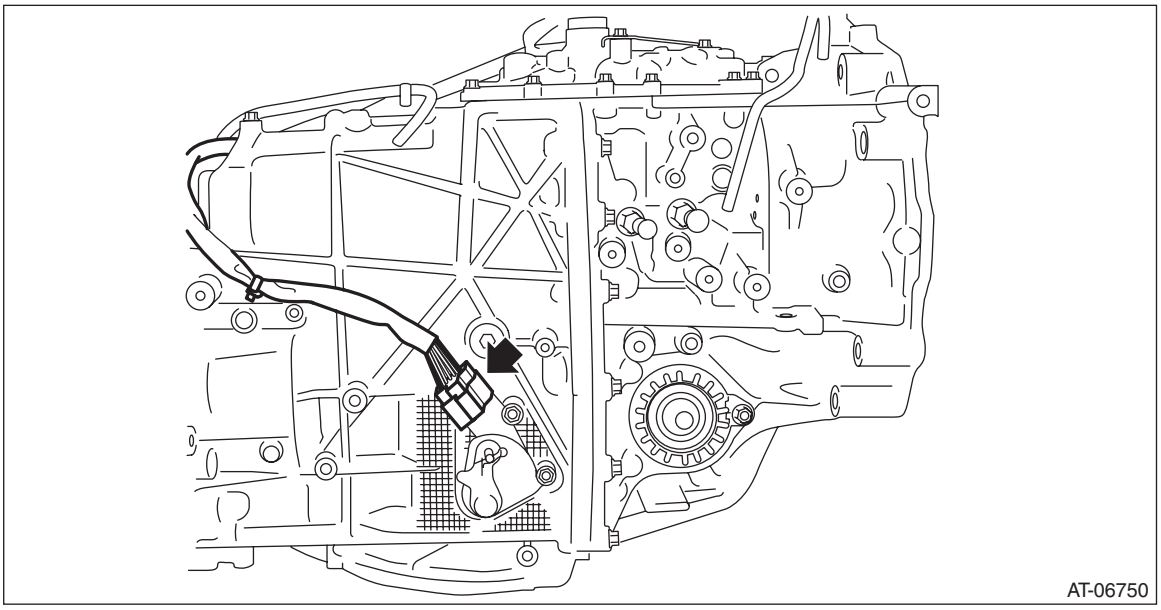
1) Remove the transmission from the vehicle. <Ref. to CVT-58, REMOVAL, Automatic Transmission Assembly.>
2) Remove the transmission case cover.



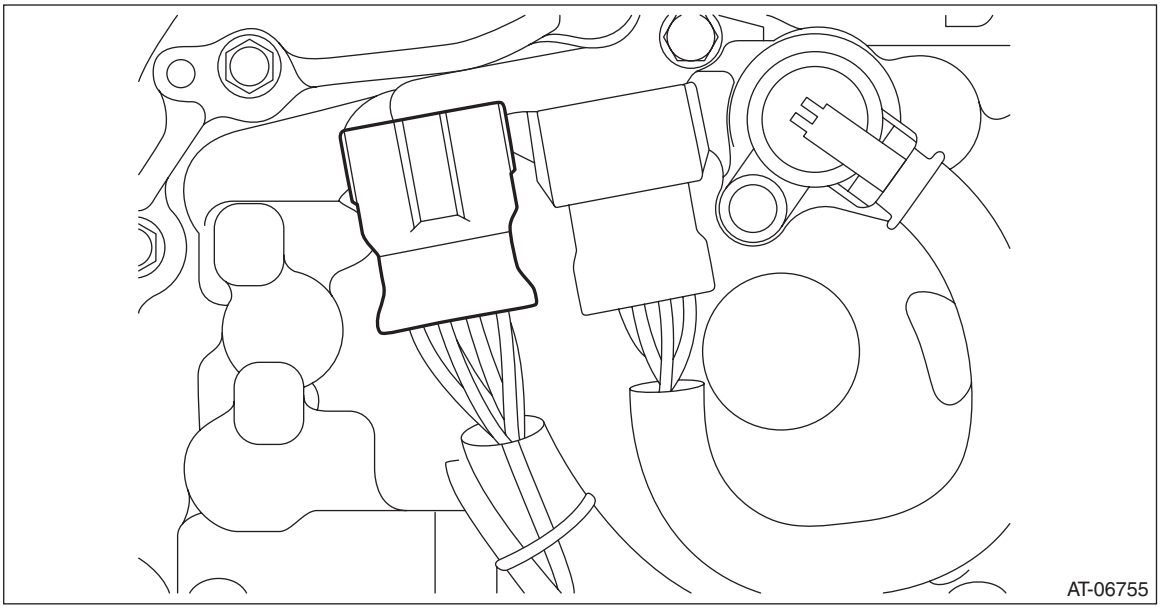
3) Remove the harness connector from the ground terminal, turbine speed sensor, primary speed sensor, secondary speed sensor and secondary pressure sensor.



4) Remove the harness connector from inhibitor switch.



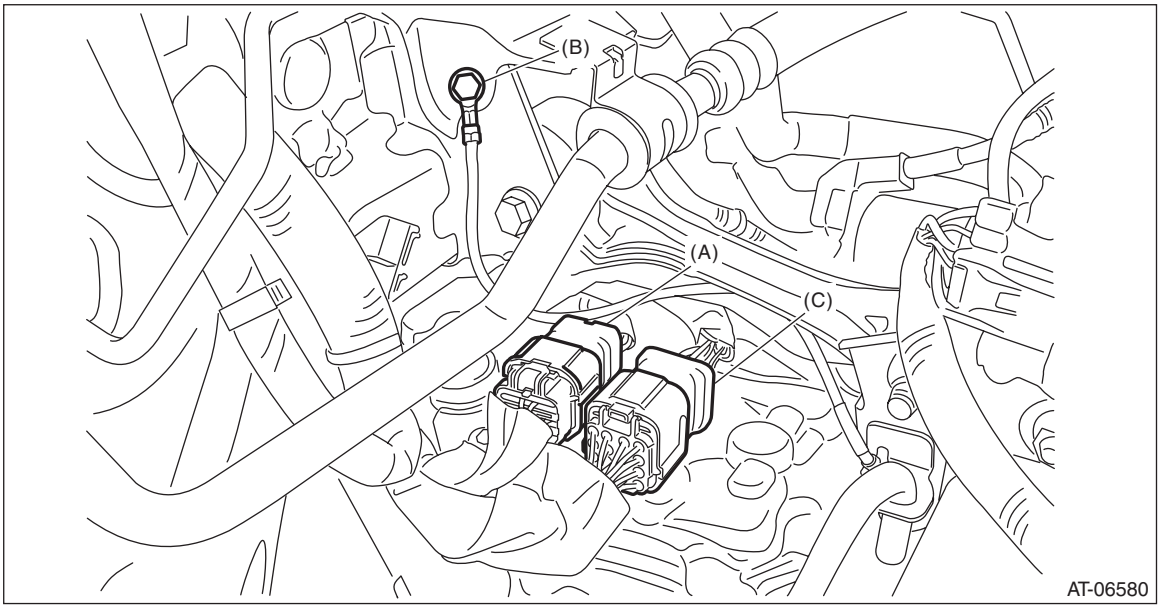
5) Remove the inhibitor harness connector from the transmission harness stay.



6) Remove the harness clip from the transmission, and remove the inhibitor harness.

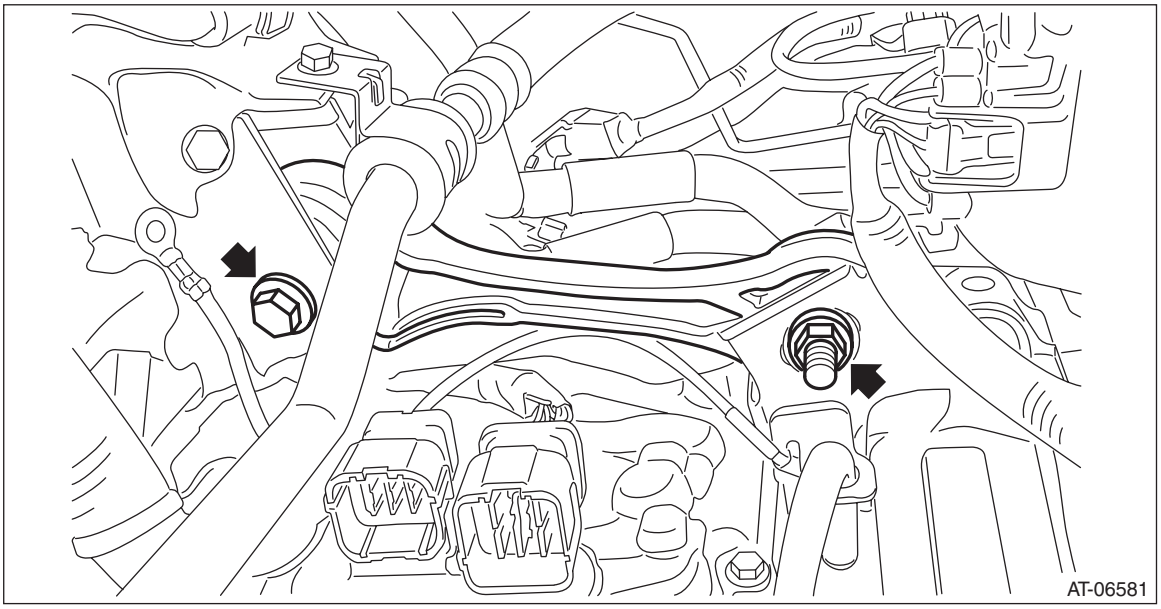
2. TRANSMISSION HARNESS

1) Disconnect the ground cable from battery.
2) Remove the air intake boot assembly. <Ref. to IN(H4DO)-12, REMOVAL, Air Intake Boot.>
3) Disconnect the following connectors.
- Transmission harness connectors
- Inhibitor harness connector
- Transmission radio ground terminal

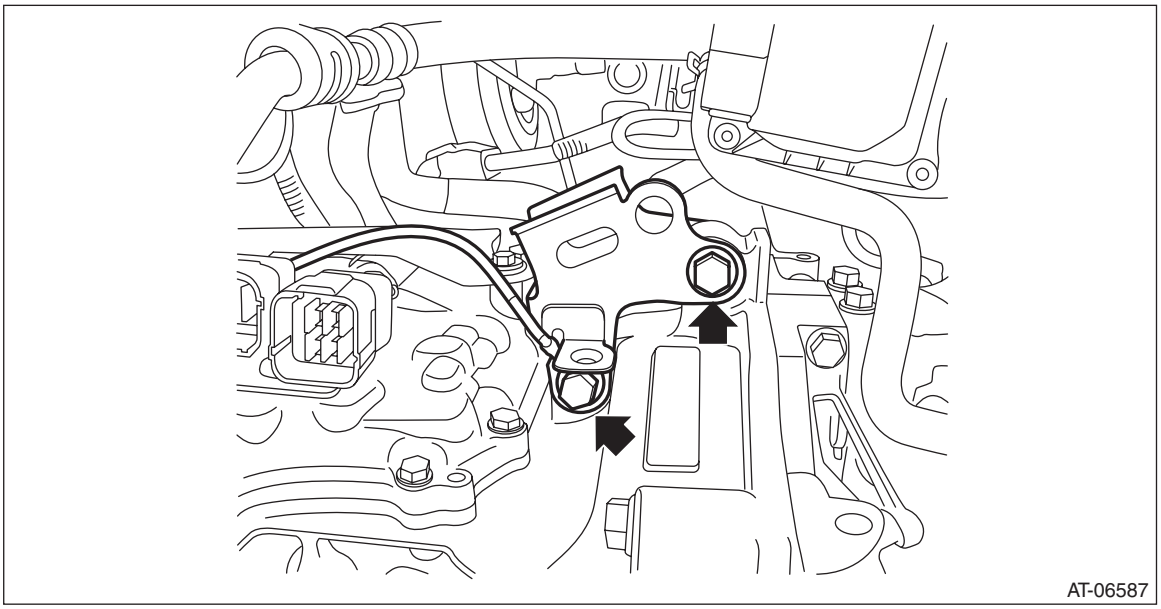


(A) Transmission harness connectors
(B) Transmission radio ground terminal
(C) Inhibitor harness connector

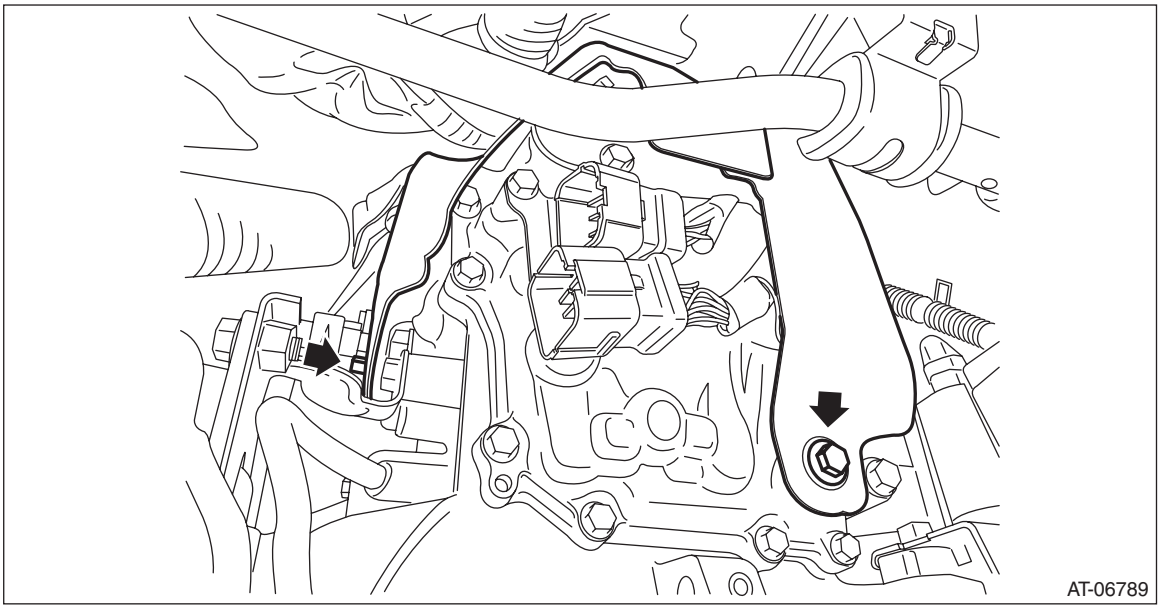
4) Remove the pitching stopper.



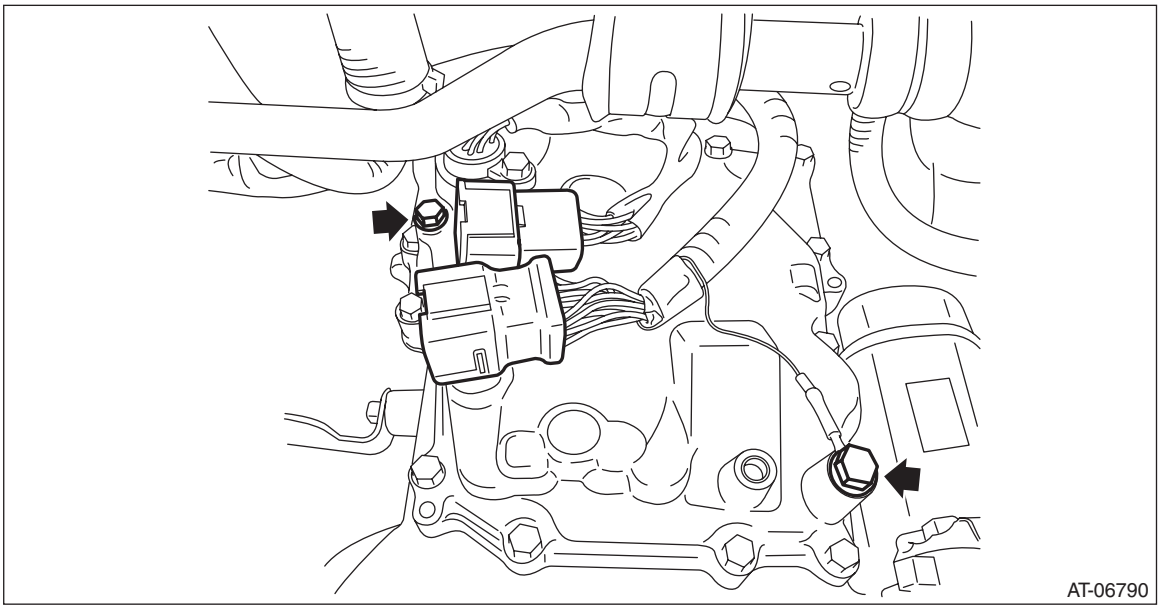
5) Remove the air breather hose from the pitching stopper bracket, and then remove the pitching stopper bracket and transmission radio ground cord.



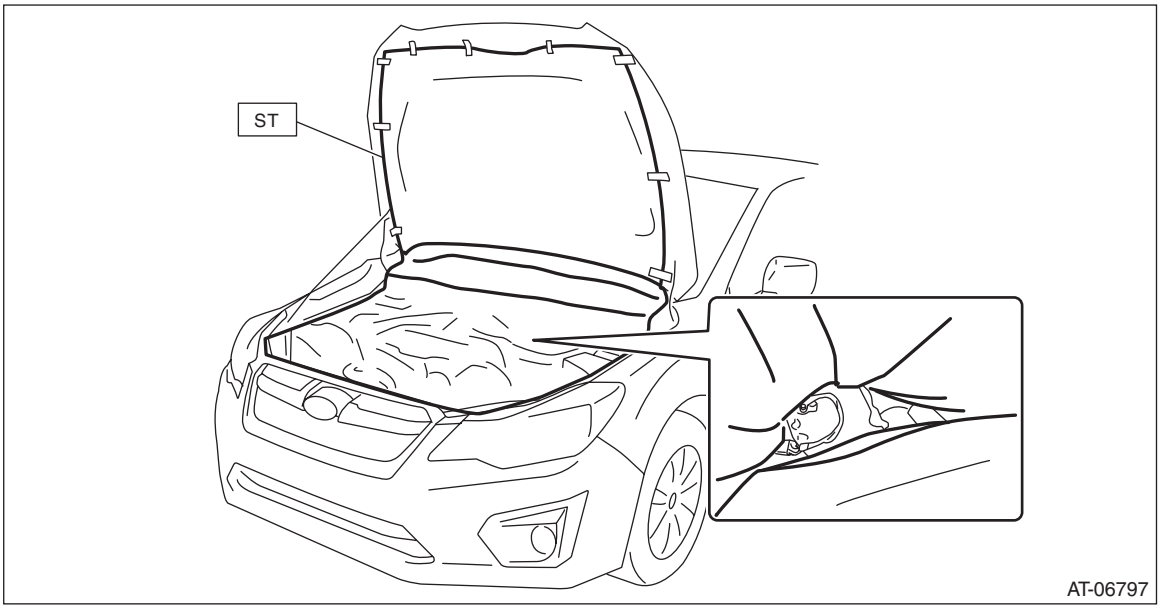
6) Remove the transmission case cover.



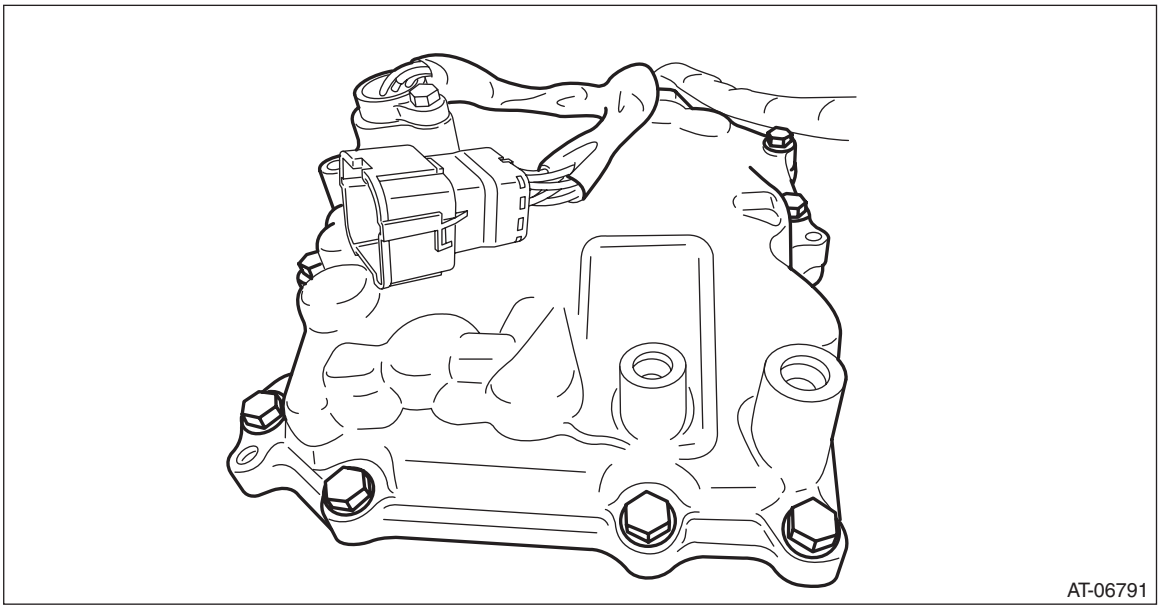
7) Remove the transmission harness stay and ground terminal.



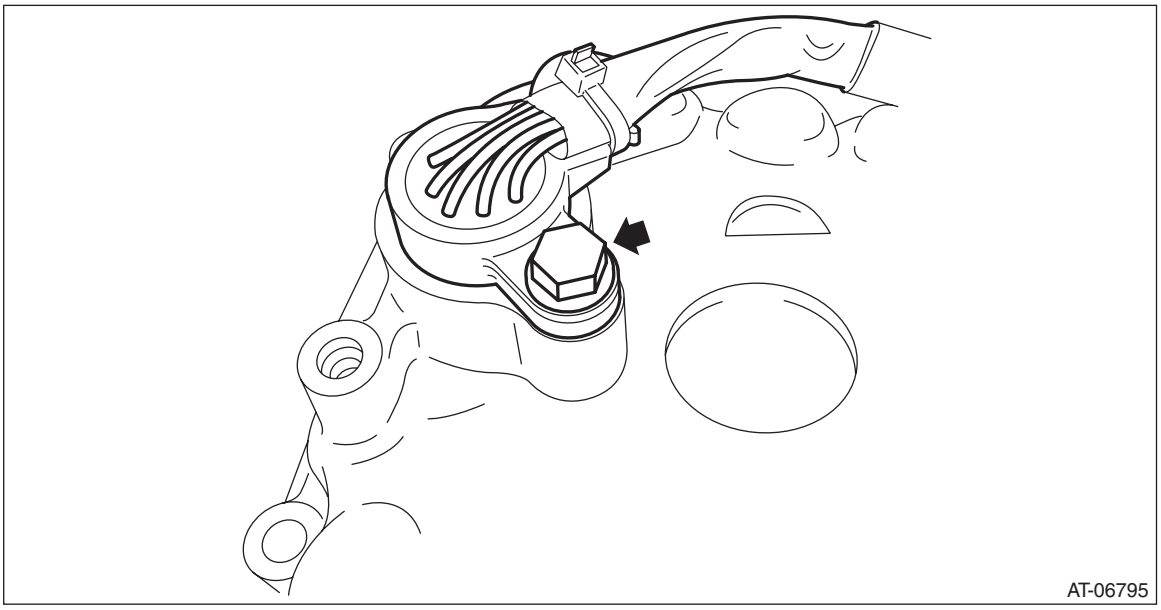
8) Remove the transmission harness connector from the harness stay.
9) Clean the transmission exterior.
10) Set the ST on the vehicle.
ST 18761AA010 SHEET SPECIAL TOOL



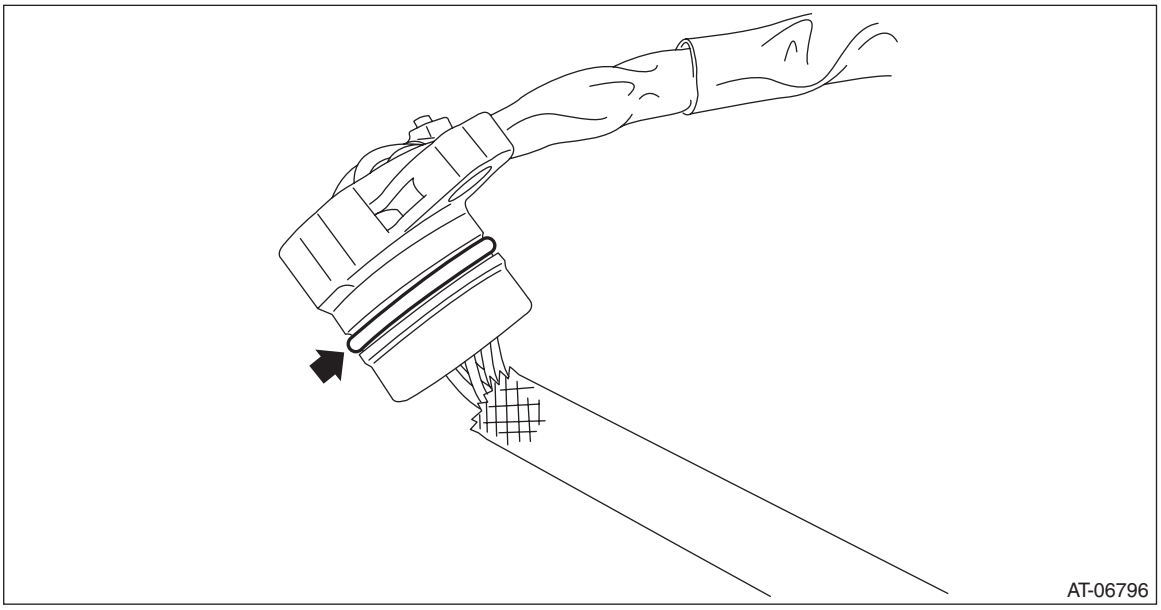
11) Remove the valve cover and gasket.



12) Remove the transmission harness connector from the control valve body.
13) Remove the transmission harness from the valve cover.



14) Remove the O-ring from the transmission harness.



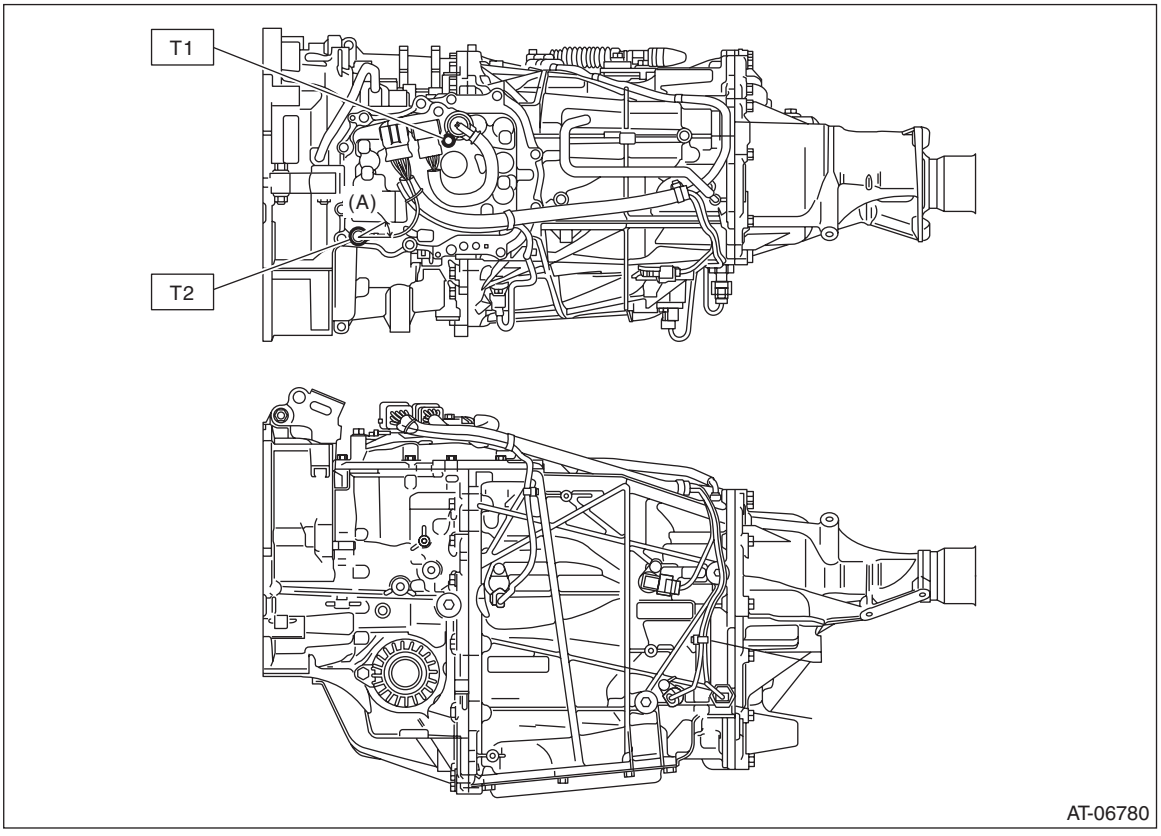
B: INSTALLATION

1. INHIBITOR HARNESS

Install in the reverse order of removal.

NOTE:
Install the transmission ground terminal in the direction within the range of approx. 30° (A).

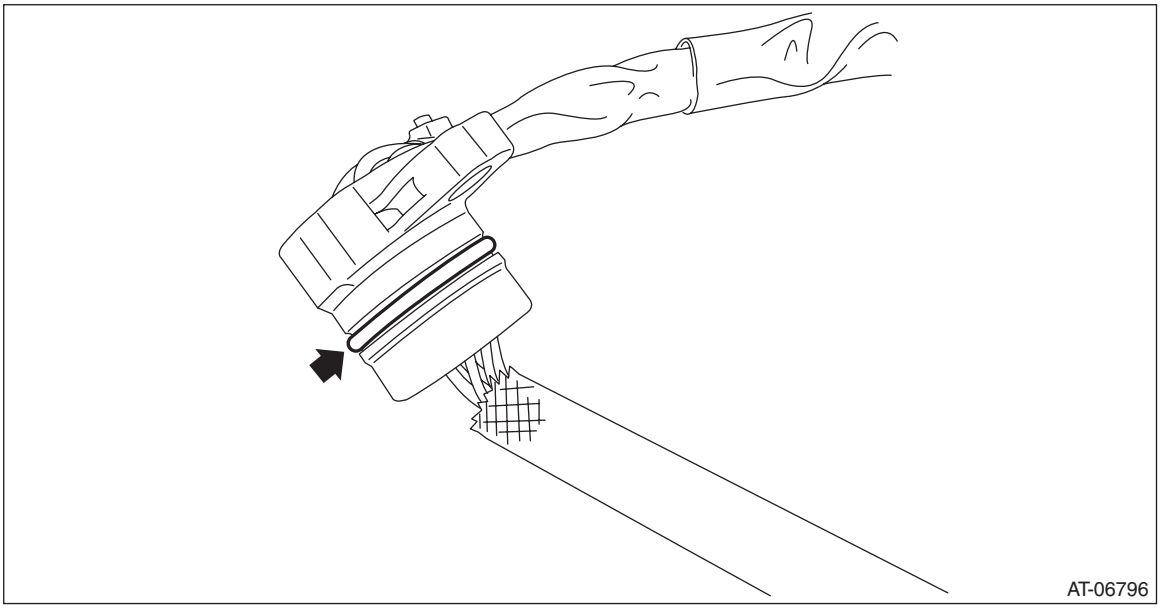
Tightening torque:
T1: 7 N·m (0.7 kgf-m, 3.7 ft-lb)
T2: 14 N·m (1.4 kgf-m, 10.3 ft-lb)



2. TRANSMISSION HARNESS

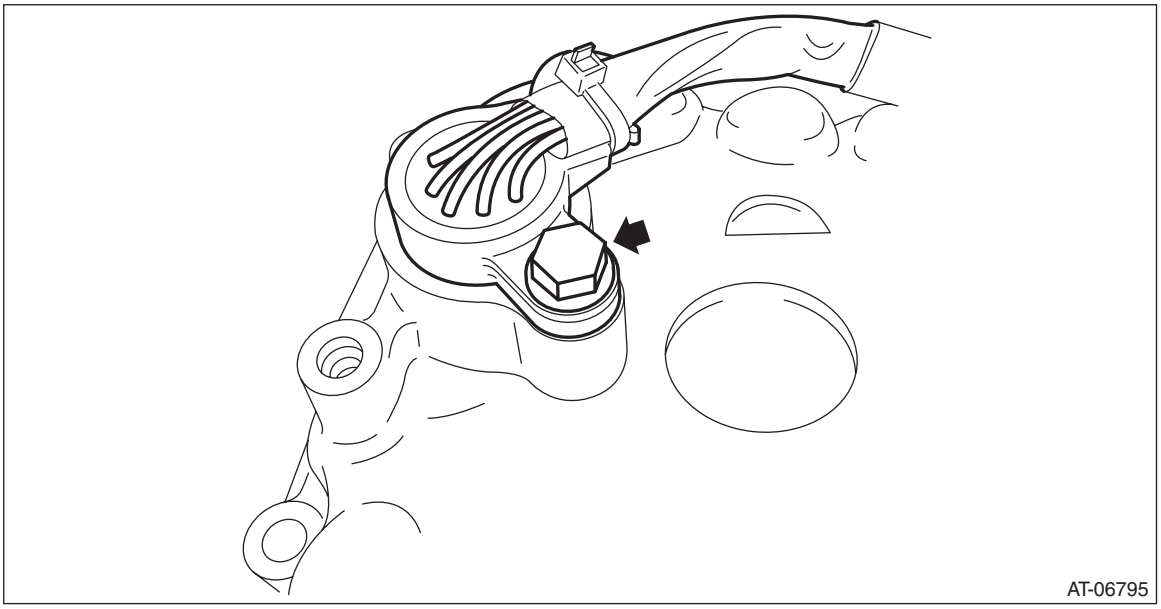
1) Clean the mating surface of valve cover and transmission side.
2) Check the control valve body for dust and other foreign matter.
3) Install the O-ring to the transmission harness.

NOTE:
- Use new O-rings.
- Apply CVTF to the O-ring.



4) Install the transmission harness to the valve cover.

Tightening torque:
7 N·m (0.7 kgf-m, 5.2 ft-lb)

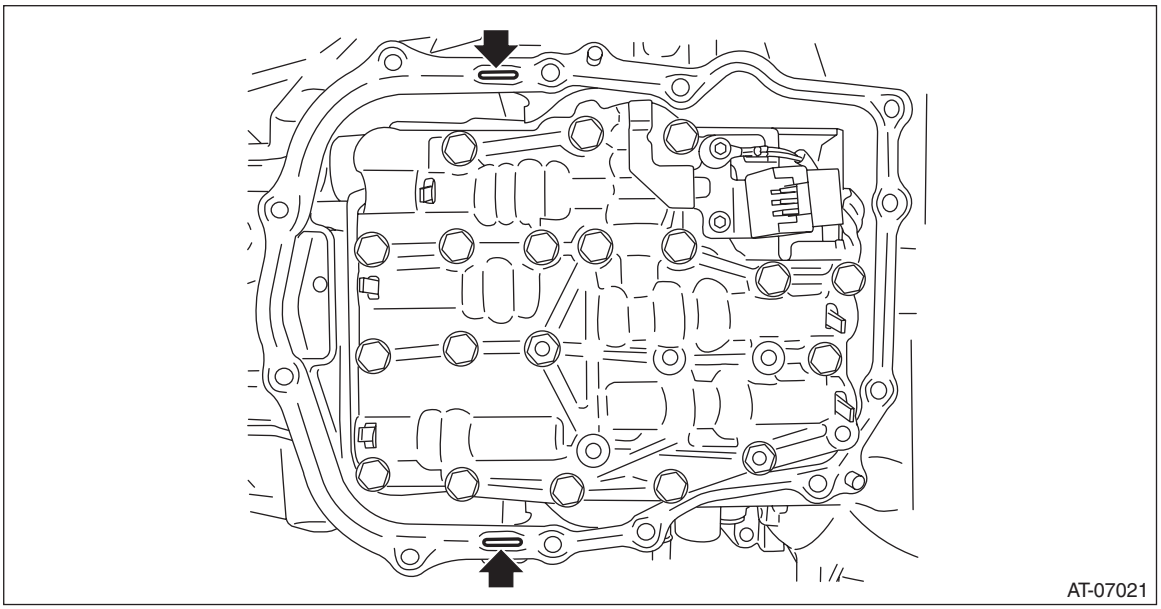


5) Install the gasket to the transmission.

NOTE:
Use a new gasket.

6) Apply liquid gasket to the oval hole of gasket.

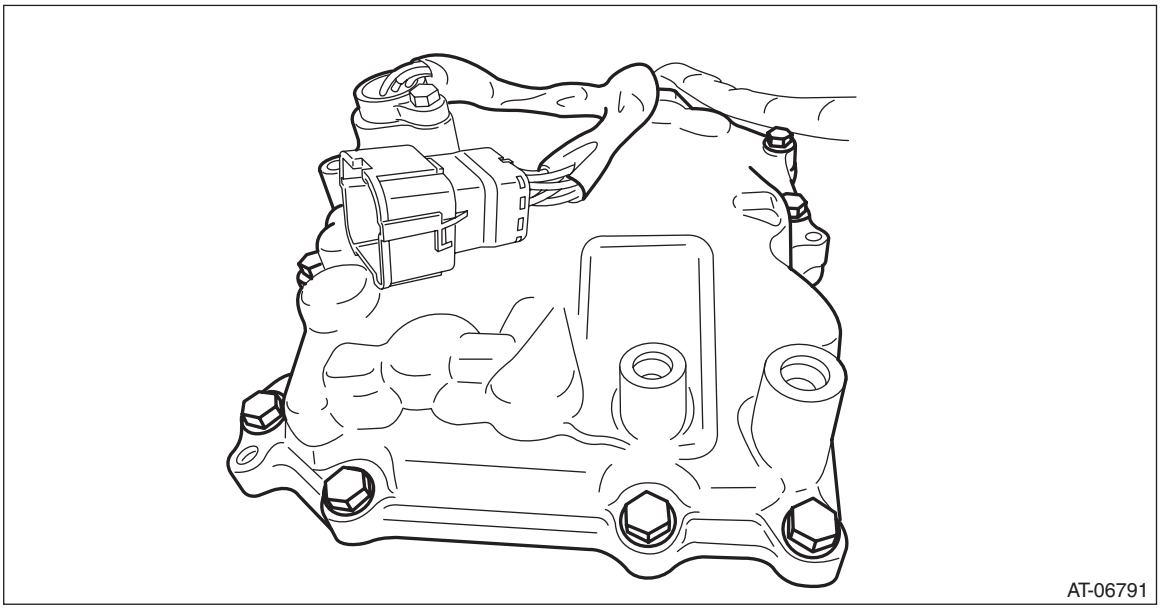
Liquid gasket:
THREE BOND 1215 (Part No. 004403007) or equivalent



7) Connect the transmission harness connector to the control valve body, and install the valve cover.

CAUTION:
Be careful not to catch the sheet of the ST.

Tightening torque:
8 N·m (0.8 kgf-m, 5.9 ft-lb)

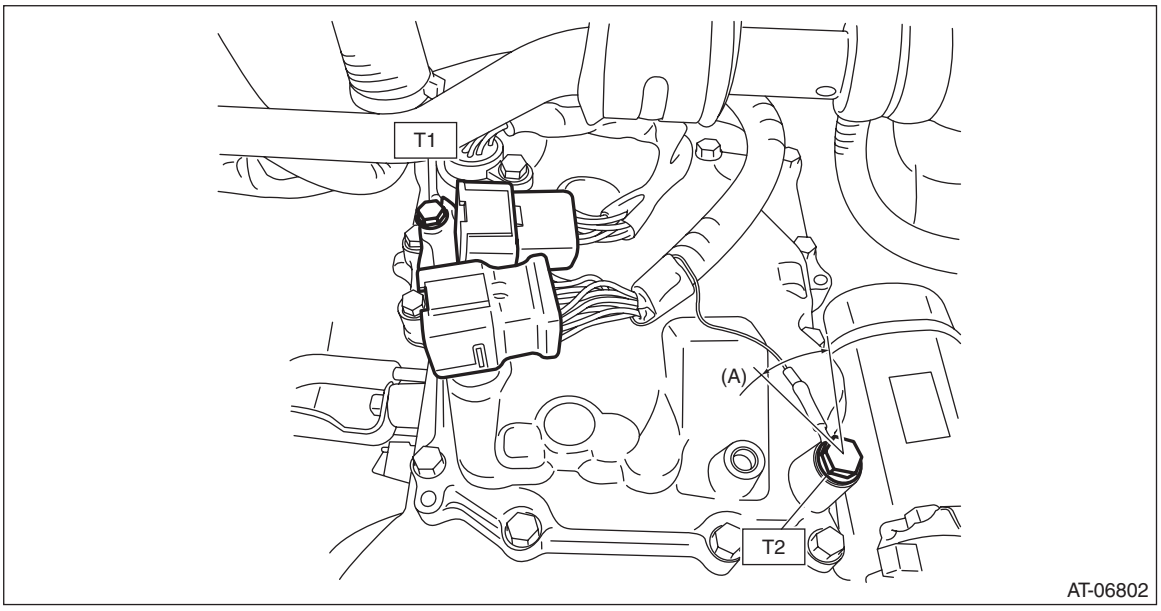


8) Remove the ST (SHEET SPECIAL TOOL).
9) Install the transmission harness connector to the harness stay.

10) Install the transmission harness stay and transmission ground terminal.

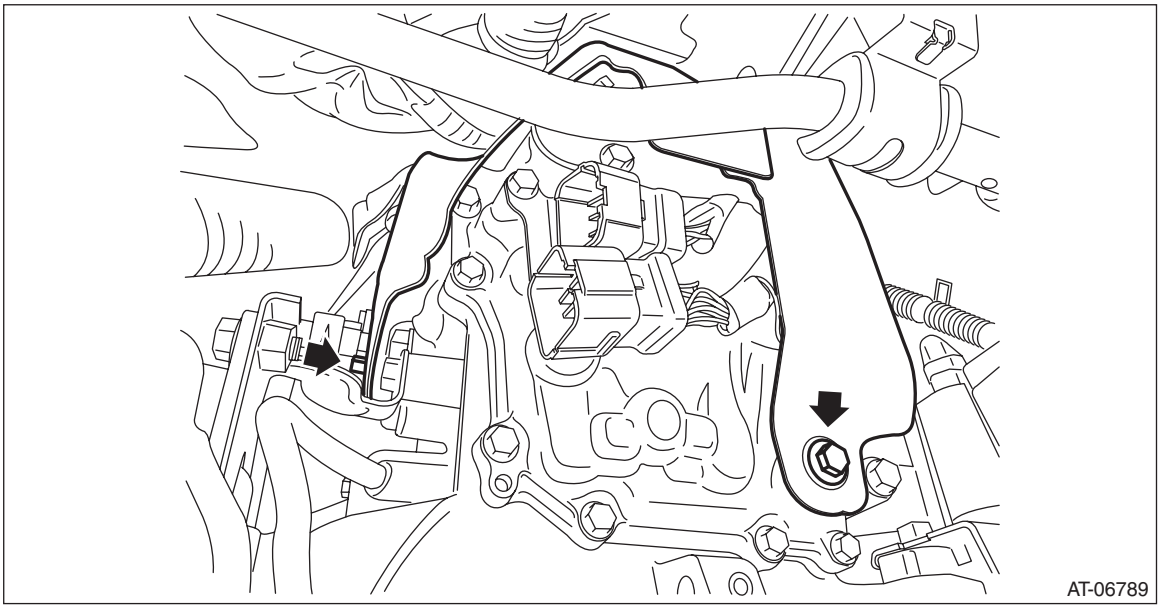
NOTE:
Install the transmission ground terminal in the direction within the range of approx. 30° (A).

Tightening torque:
T1: 7 N·m (0.7 kgf-m, 5.2 ft-lb)
T2: 14 N·m (1.4 kgf-m, 10.3 ft-lb)



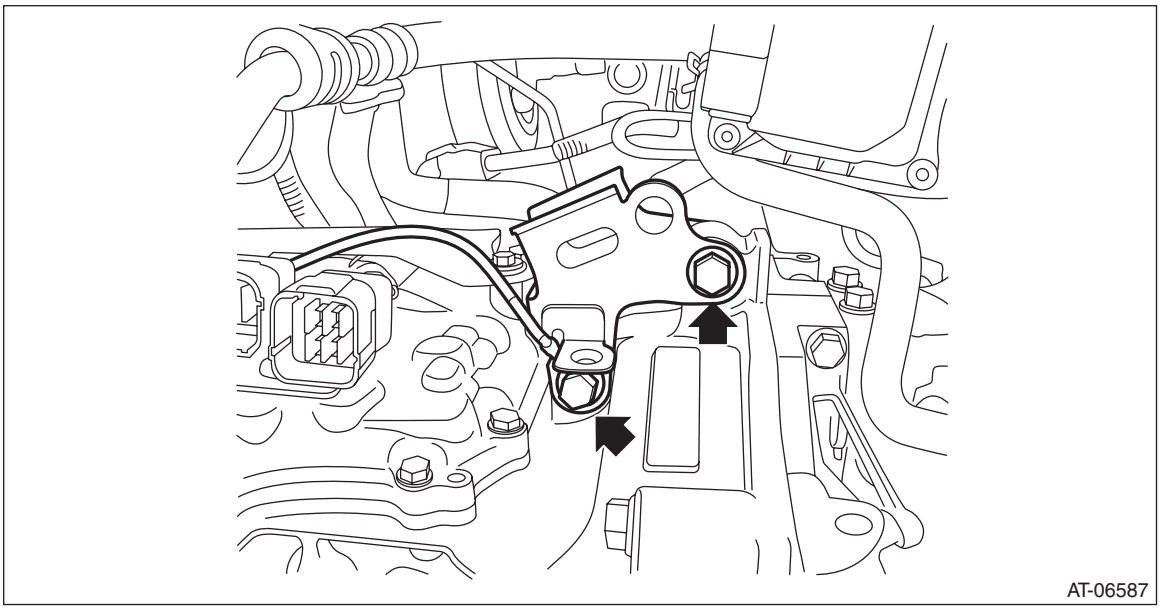
11) Install the transmission case cover.

Tightening torque:
8 N·m (0.8 kgf-m, 5.9 ft-lb)



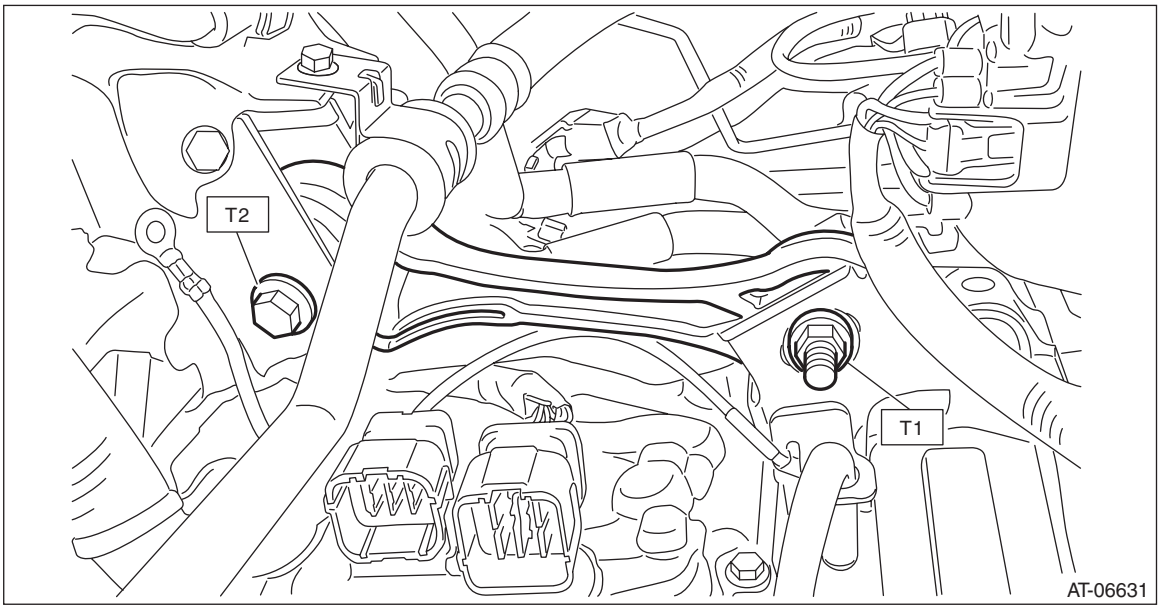
12) Install the pitching stopper bracket and transmission radio ground cord.

Tightening torque:
41 N·m (4.2 kgf-m, 30.2 ft-lb)



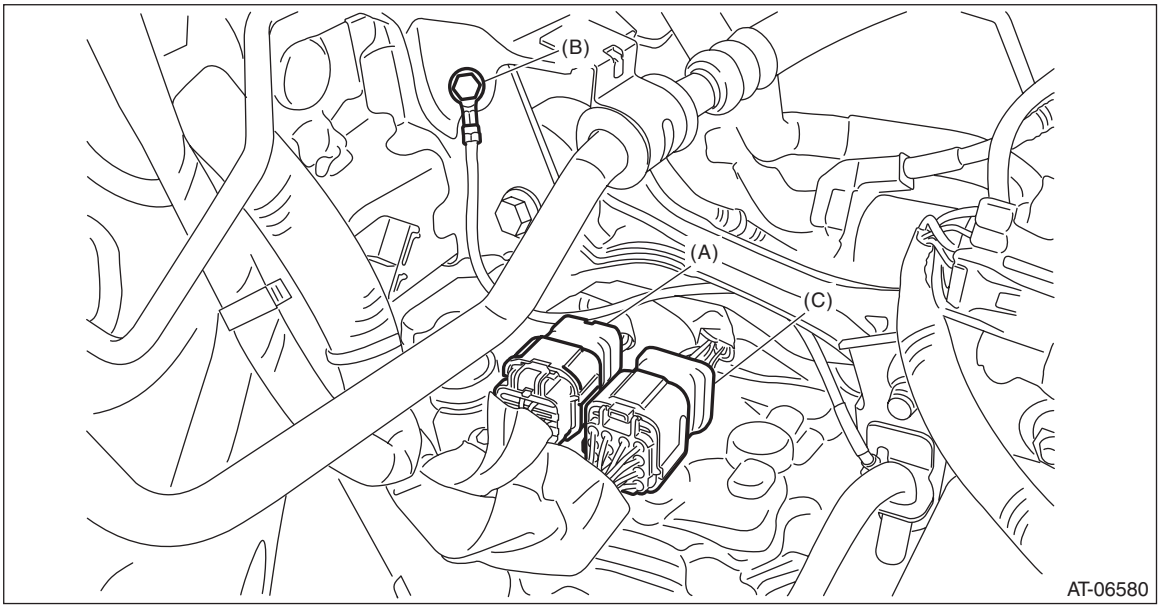
13) Install the air breather hose to the pitching stopper bracket.
14) Install the pitching stopper.

Tightening torque:
T1: 50 N·m (5.1 kgf-m, 36.9 ft-lb)
T2: 58 N·m (5.9 kgf-m, 42.8 ft-lb)



15) Connect the following harness connectors.
- Transmission harness connectors
- Inhibitor harness connector
- Transmission radio ground terminal

Tightening torque:
13 N·m (1.3 kgf-m, 9.6 ft-lb)



(A) Transmission harness connectors
(B) Transmission radio ground terminal
(C) Inhibitor harness connector

16) Install the air intake boot assembly. <Ref. to IN(H4DO)-12, INSTALLATION, Air Intake Boot.>
17) Adjust the CVTF level. <Ref. to CVT-36, ADJUSTMENT, CVTF.>

C: INSPECTION

1) Visually check the harness and connector for damage or crack.
2) Check the harness terminal for rust, disconnection or poor contact.
3) Check the continuity between harness terminals.

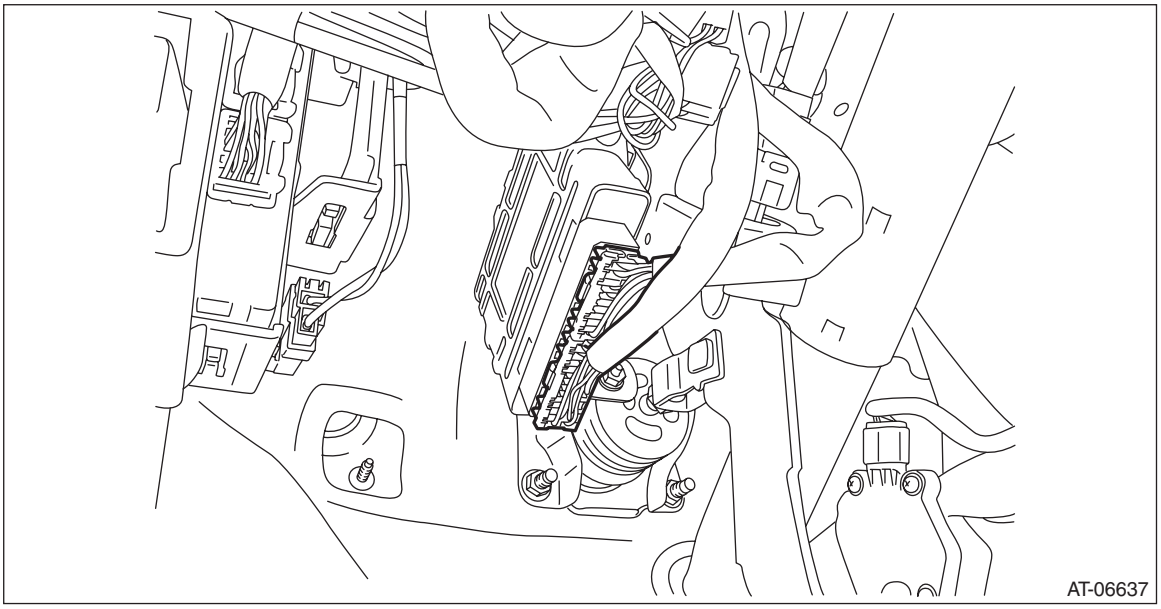
NOTE:
For details of transmission harness circuit, refer to wiring diagram. <Ref. to WI-68, WIRING DIAGRAM, CVT Control System.>

Harness continuity standard
Less than 1 Ω

22.Transmission Control Module (TCM)

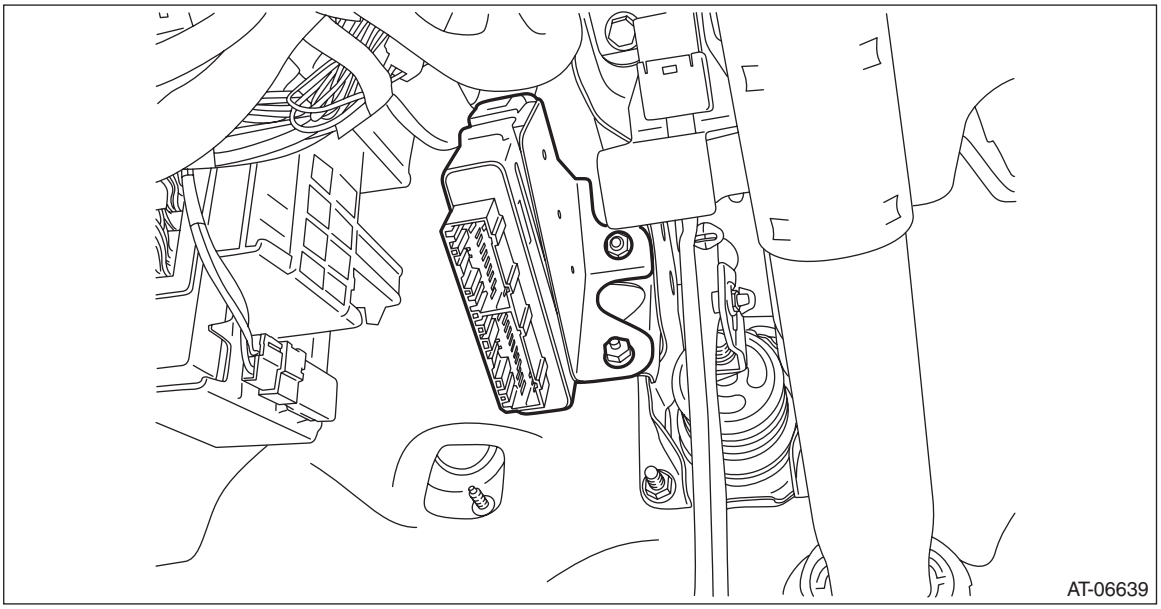
A: REMOVAL

1) Disconnect the ground cable from battery.
2) Remove the instrument panel lower cover. <Ref. to EI-62, REMOVAL, Instrument Panel Lower Cover.>
3) Remove the bulkhead harness connector from TCM.



4) Remove the TCM.

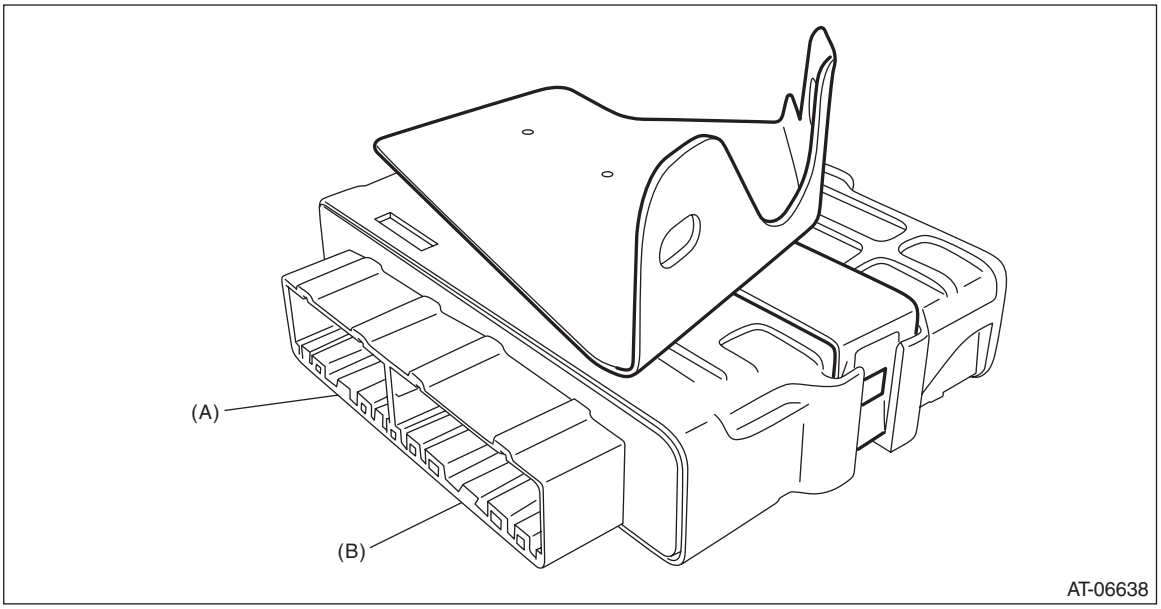
NOTE:
Replace the TCM and bracket as a set.



B: INSTALLATION

1) Install the TCM to the bracket.

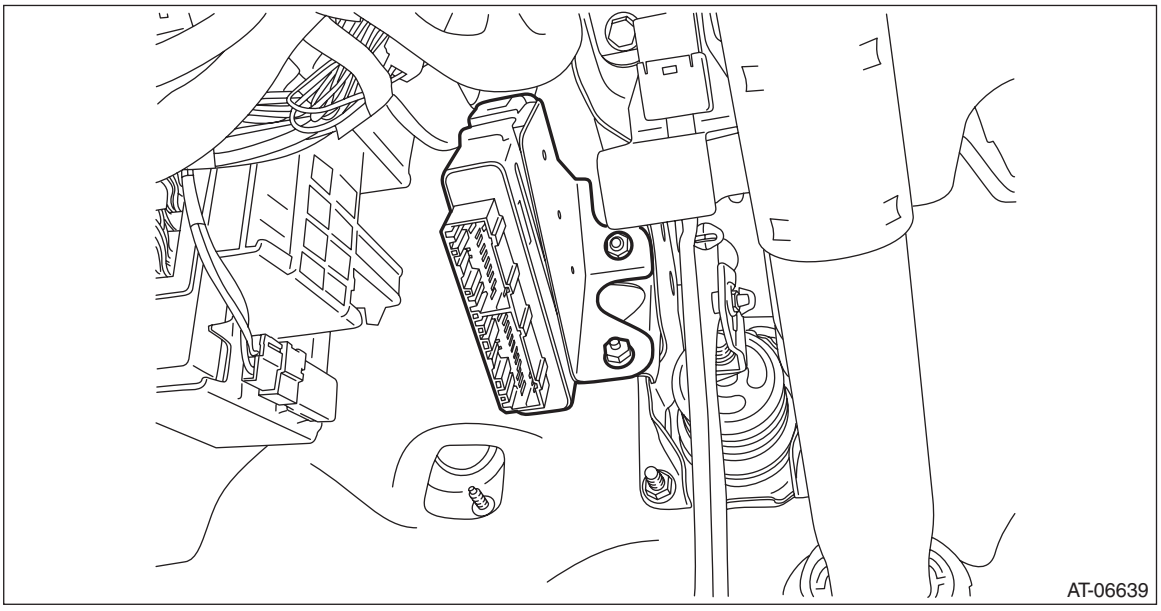
CAUTION:
To avoid the damage to bracket and TCM, do not remove after installing TCM to bracket. If installed by mistake, the part must be replaced with a new part.



(A) 22-pin connector side
(B) 26-pin connector side

2) Install the TCM.

Tightening torque:
7.5 N·m (0.8 kgf-m, 5.5 ft-lb)



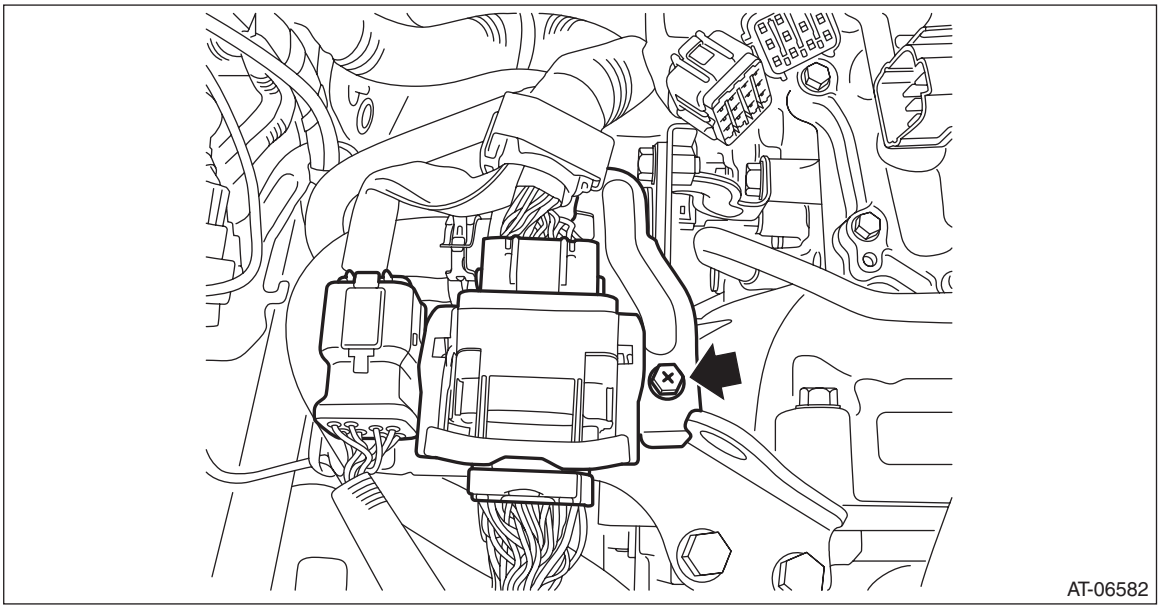
3) Install the harness connector to TCM.
4) Install the instrument panel lower cover. <Ref. to EI-62, INSTALLATION, Instrument Panel Lower Cover.>
5) Perform the diagnosis again. <Ref. to CVT(diag)-20, Learning Control.>

23.CVTF Cooler (With Warmer Function)

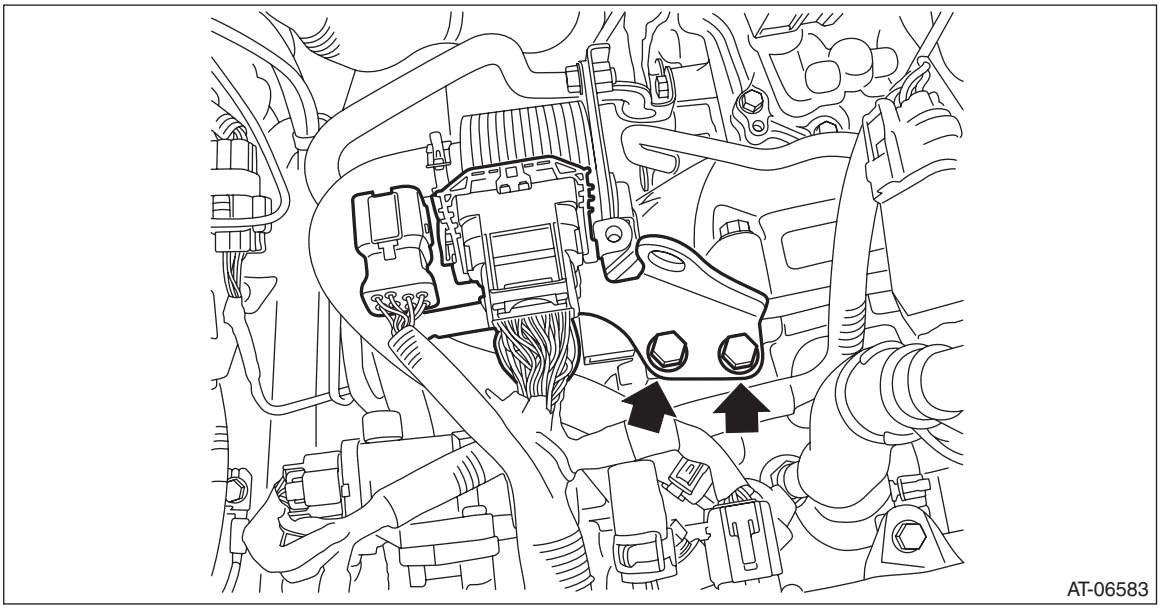
A: REMOVAL

CAUTION:
If the CVTF and engine coolant is spilt over exhaust pipe, wipe it off with cloth to avoid emitting smoke or causing a fire.

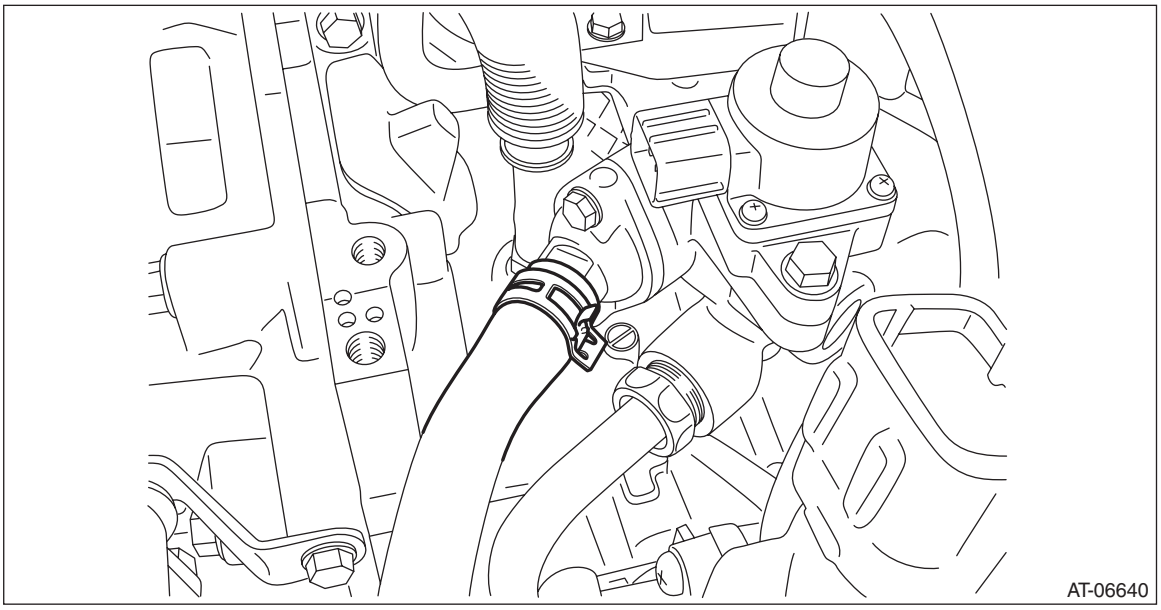
1) Disconnect the ground cable from battery.
2) Drain engine coolant. <Ref. to CO(H4DO)-13, REPLACEMENT, Engine Coolant.>
3) Remove the air intake boot assembly. <Ref. to IN(H4DO)-12, REMOVAL, Air Intake Boot.>
4) Remove the harness bracket, and then remove the engine harness.


AT-06582

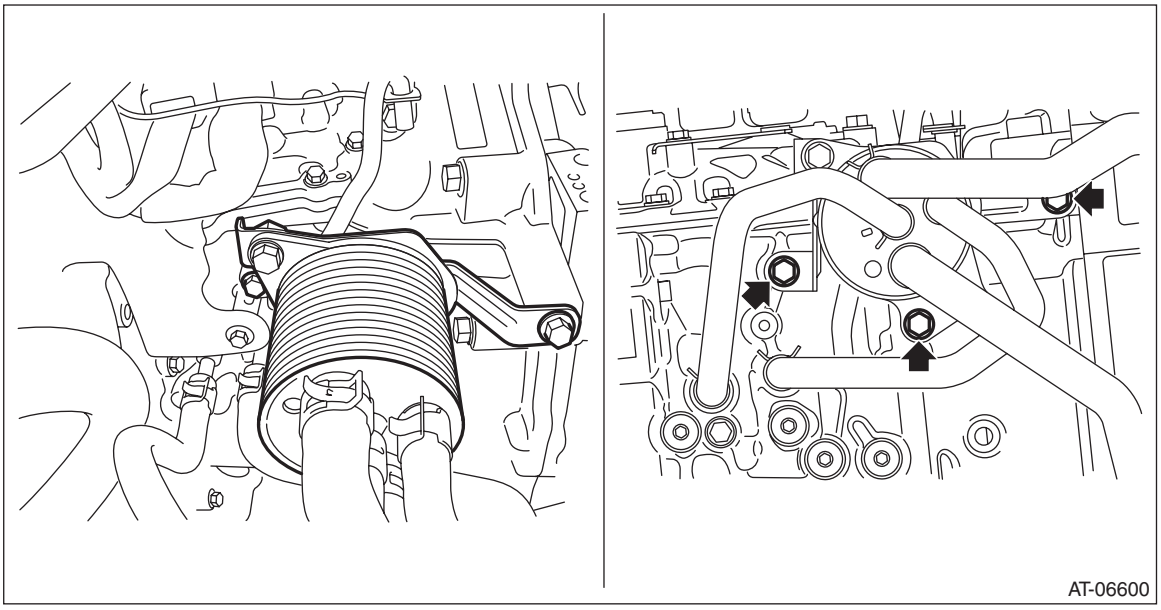
5) Disconnect the EGR control valve harness connector, throttle position sensor harness connector and manifold pressure sensor harness connector.
6) Remove the engine hanger rear.


AT-06583

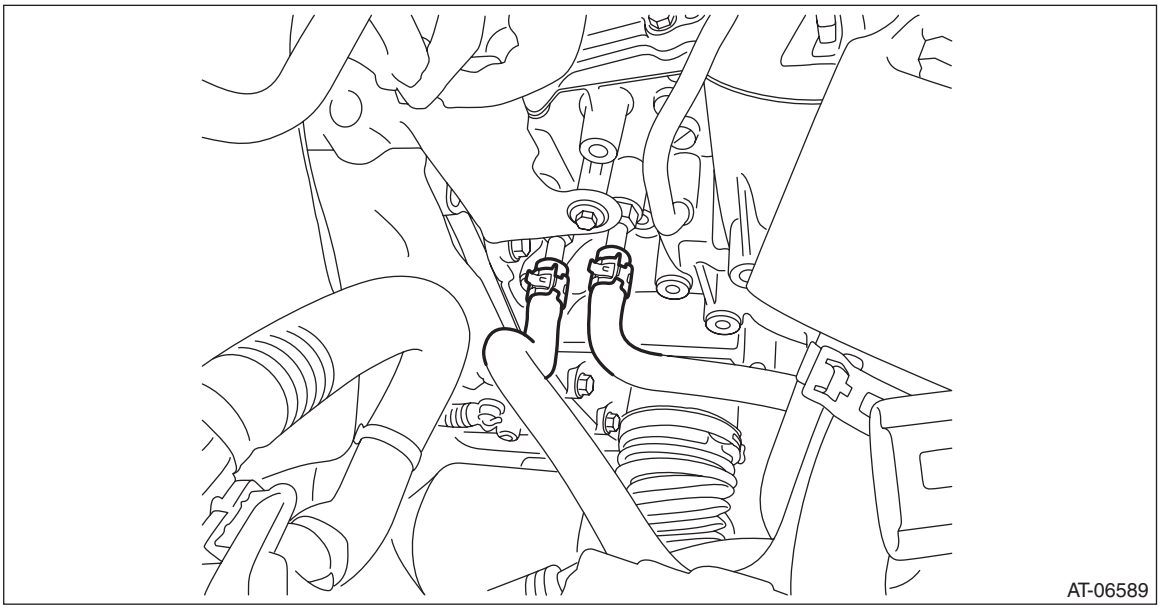
7) Disconnect the engine coolant outlet hose.



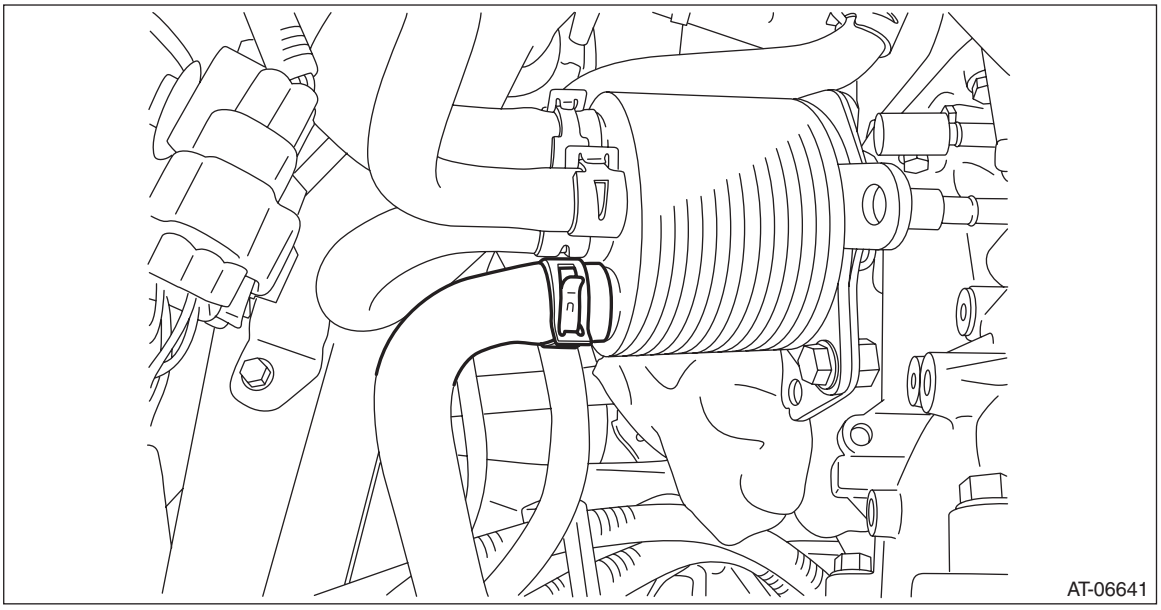
8) Remove the CVTF cooler (with warmer feature) from the transmission.



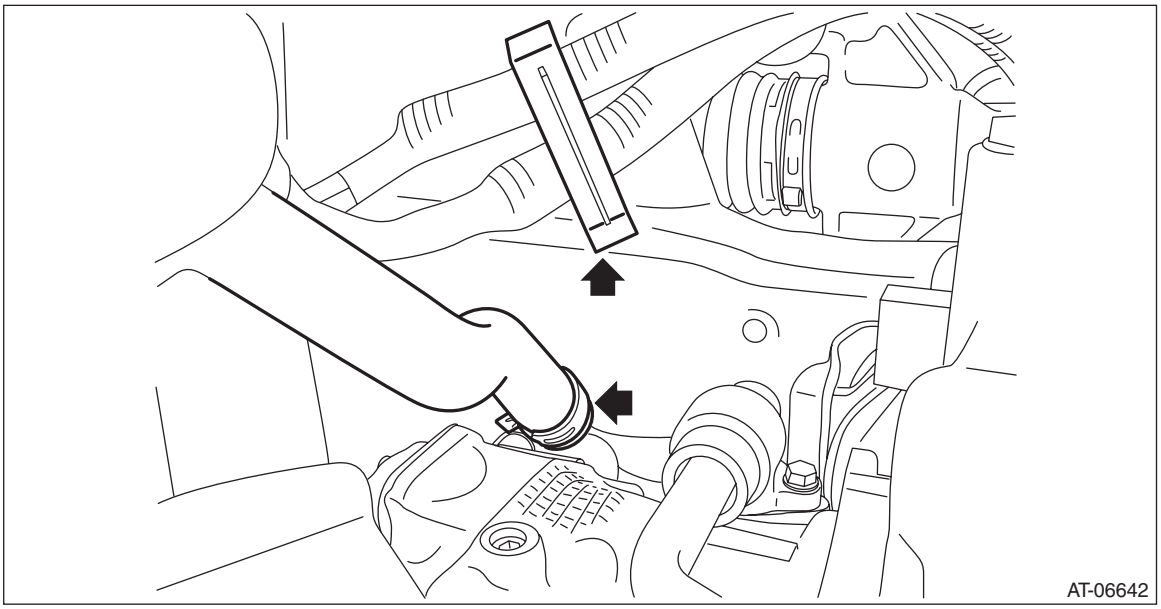
9) Remove the CVTF inlet hose and outlet hose from the pipe on the transmission side.



10) Disconnect the engine coolant inlet hose from the CVTF cooler (with warmer feature) assembly.



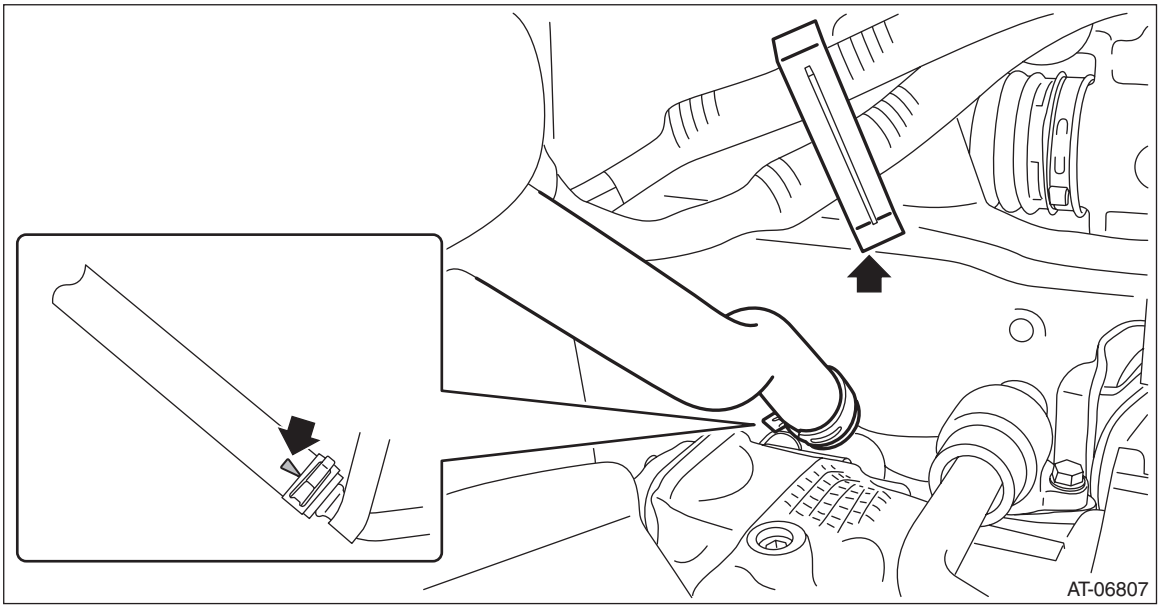
11) Remove the electric power steering harness from the clip, and remove the engine coolant inlet hose from the engine coolant pipe.



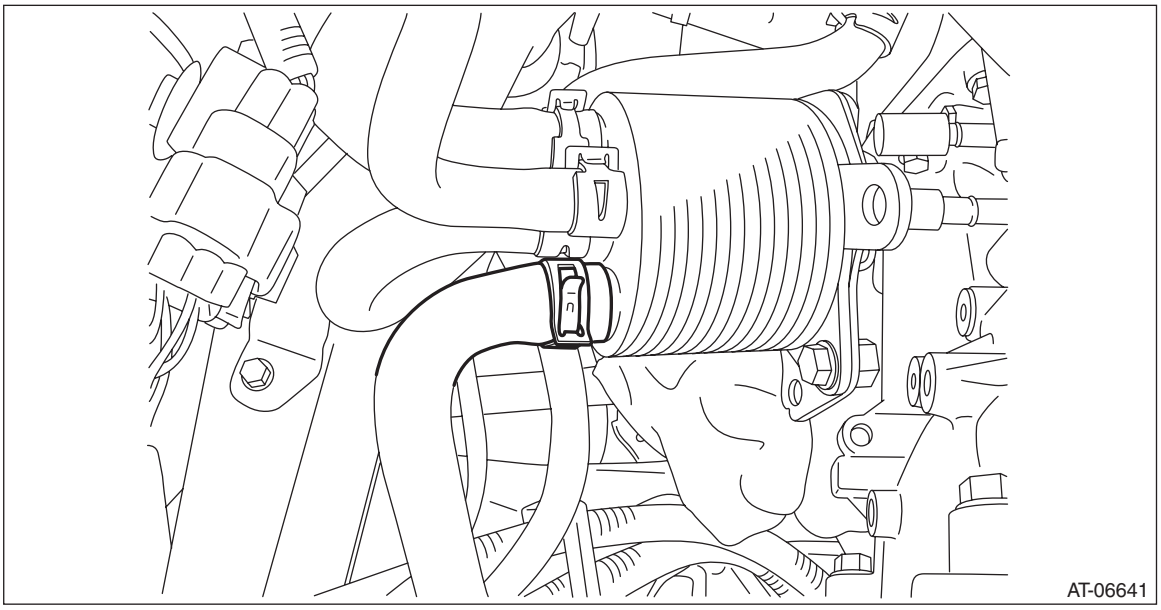
B: INSTALLATION

1) Install the engine coolant inlet hose to the engine coolant pipe, and secure the electric power steering harness to the clip.

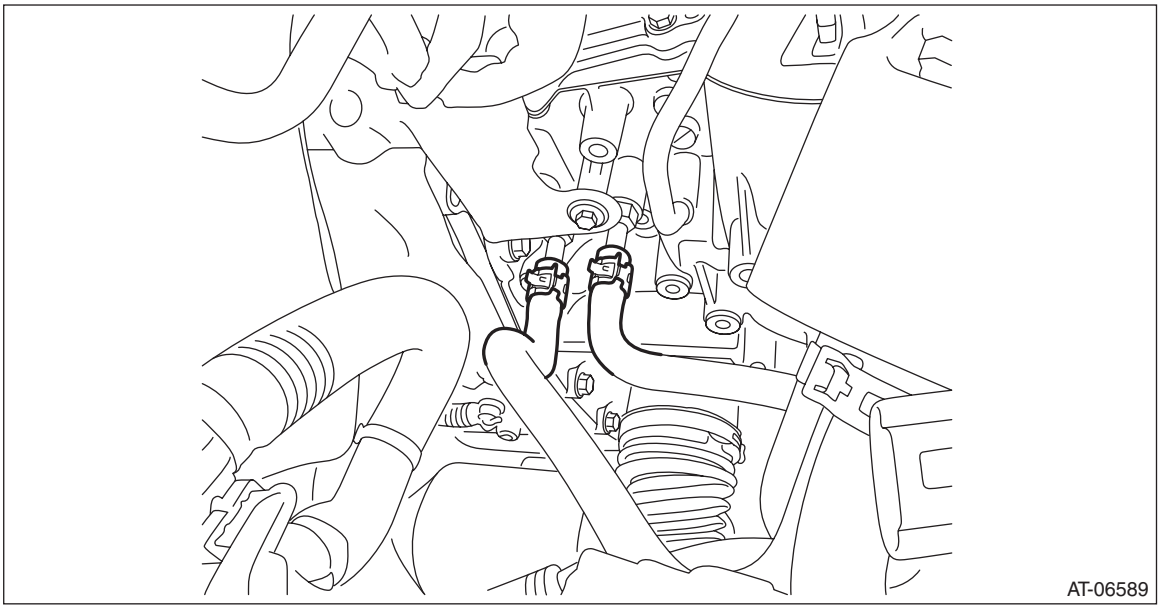
NOTE:
With the triangle mark on the engine coolant inlet hose facing the vehicle outside, install the hose to the engine side pipe.



2) Install the engine coolant inlet hose to the CVTF cooler (with warmer feature) assembly.

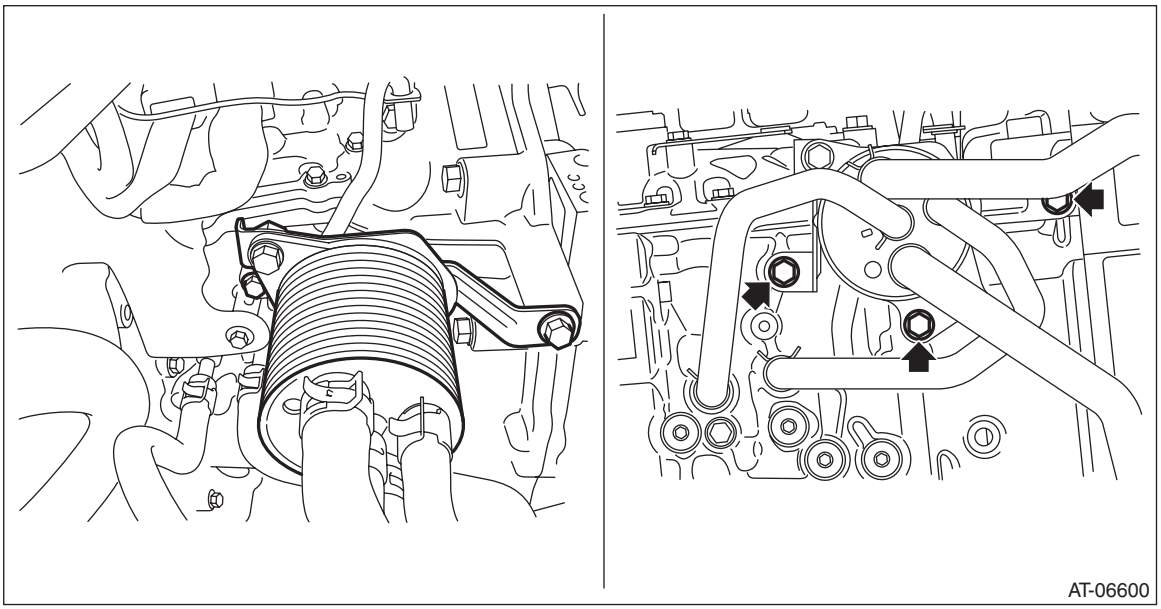


3) Install the CVTF inlet hose and CVTF outlet hose to transmission.

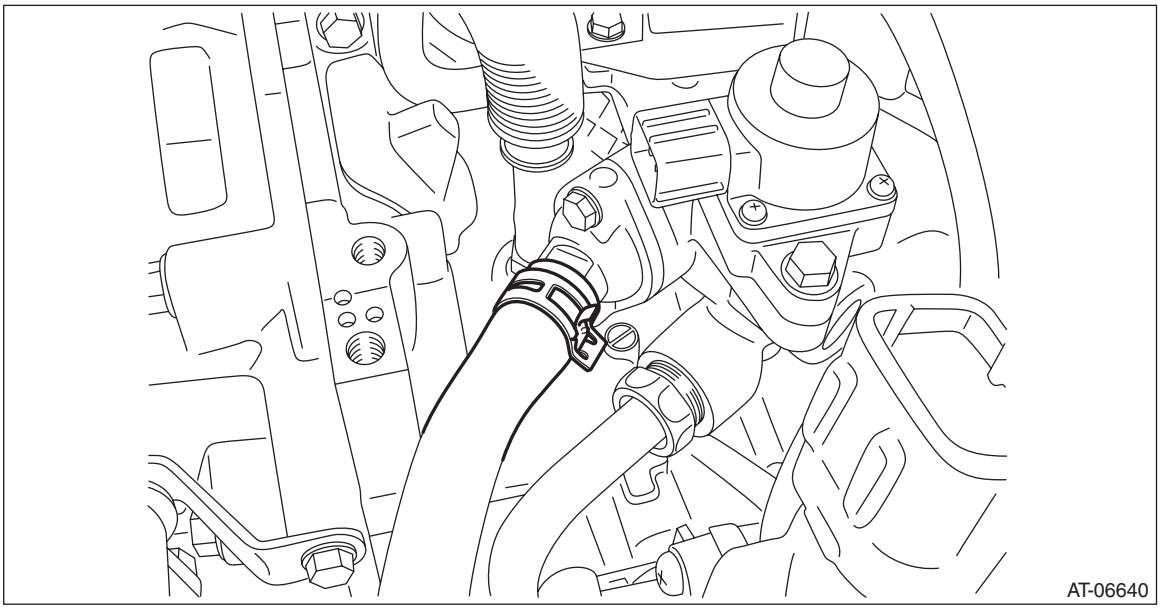


4) Install the CVTF cooler (with warmer feature) to the transmission.

Tightening torque:
23 N·m (2.3 kgf-m, 17.0 ft-lb)

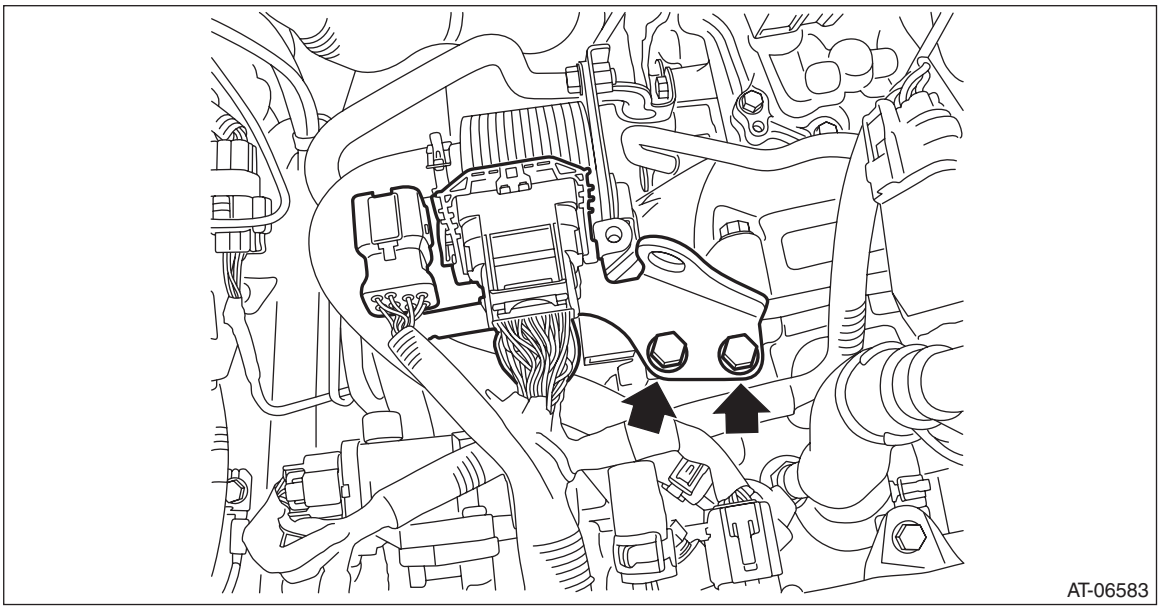


5) Connect the engine coolant outlet hose.



6) Install the engine hanger rear.

Tightening torque:
21 N·m (2.1 kgf-m, 15.5 ft-lb)



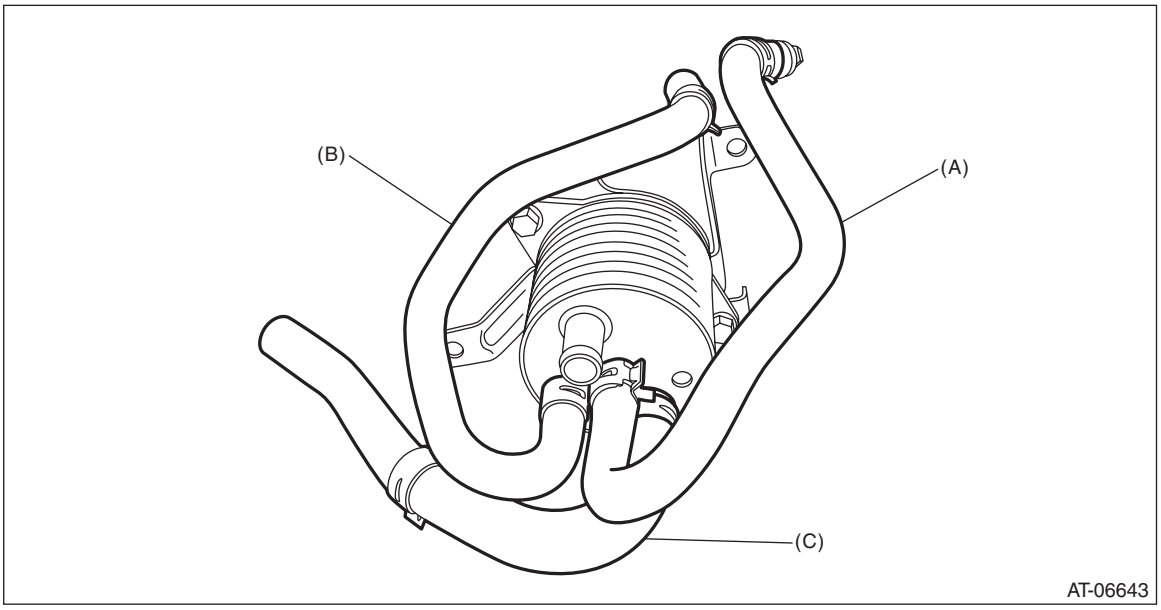
7) Connect the EGR control valve harness connector, throttle position sensor harness connector and manifold pressure sensor harness connector.

Tightening torque:
Bulkhead harness connector bracket
7.5 N·m (0.8 kgf-m, 5.5 ft-lb)

8) Install the air intake boot assembly. <Ref. to IN(H4DO)-12, INSTALLATION, Air Intake Boot.>
9) Connect the battery ground terminal.
10) Fill engine coolant. <Ref. to CO(H4DO)-13, REPLACEMENT, Engine Coolant.>
11) Adjust the CVTF level. <Ref. to CVT-36, ADJUSTMENT, CVTF.>

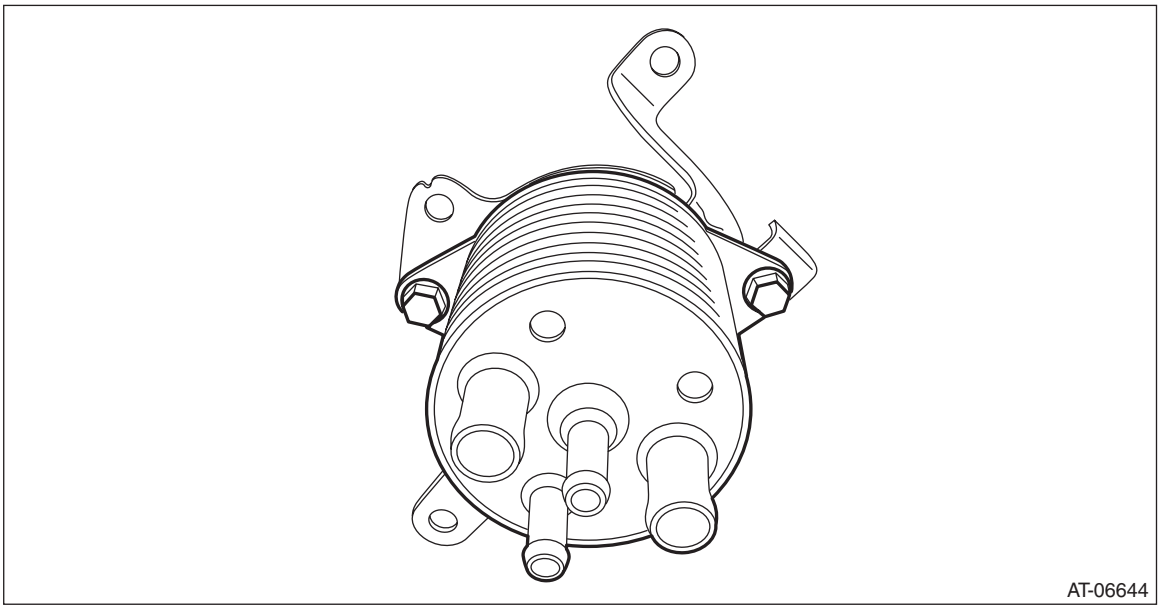
C: DISASSEMBLY

1) Remove the hoses from the CVTF cooler (with warmer feature).



(A) CVTF cooler inlet hose
(B) CVTF cooler outlet hose
(C) Engine coolant outlet hose

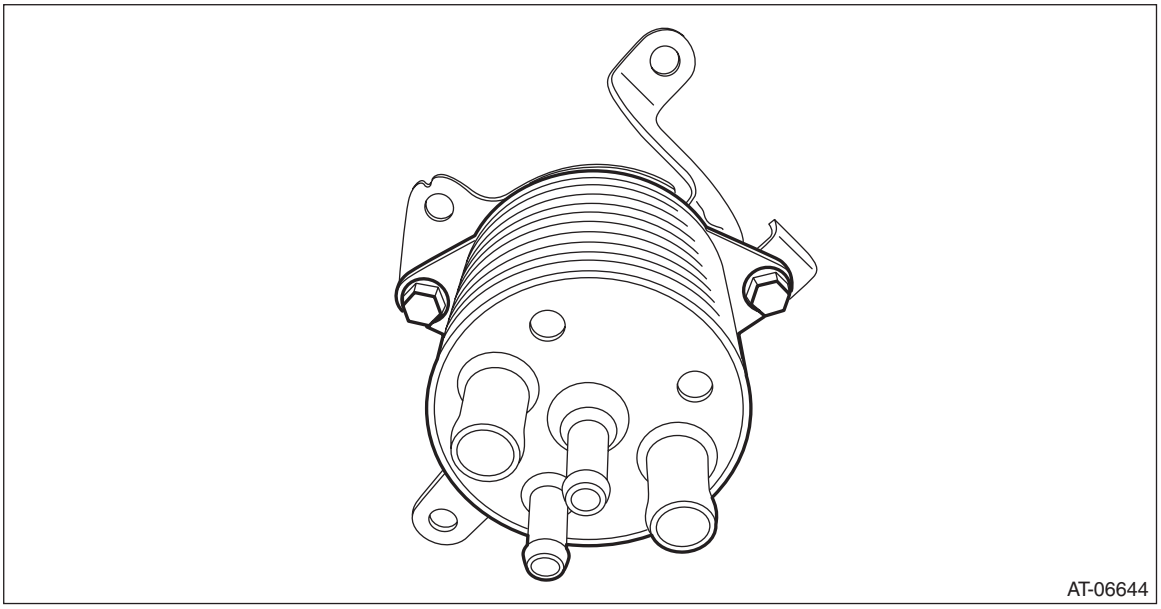
2) Remove the bracket from the CVTF cooler (with warmer feature).



D: ASSEMBLY

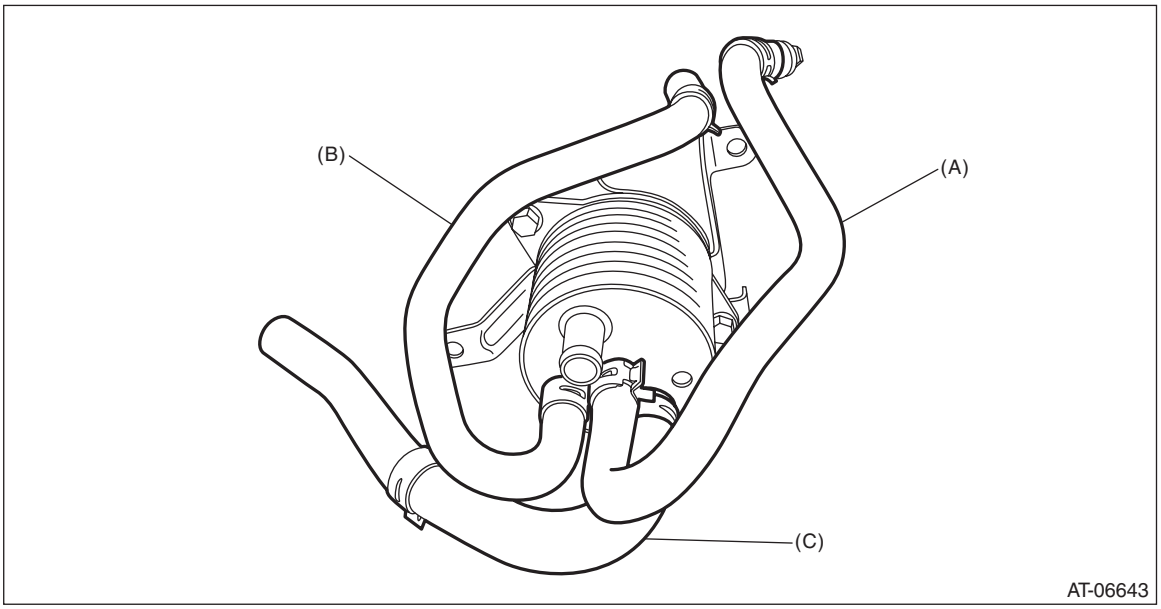
1) Attach the bracket.

Tightening torque:
23 N·m (2.3 kgf-m, 17.0 ft-lb)



2) Attach hoses to the CVTF cooler (with warmer feature).

NOTE:
- Use a new CVTF cooler hose.
- Align the painting marks on the hose and the CVTF cooler (with warmer feature).



(A) CVTF cooler inlet hose
(B) CVTF cooler outlet hose
(C) Engine coolant outlet hose

E: INSPECTION

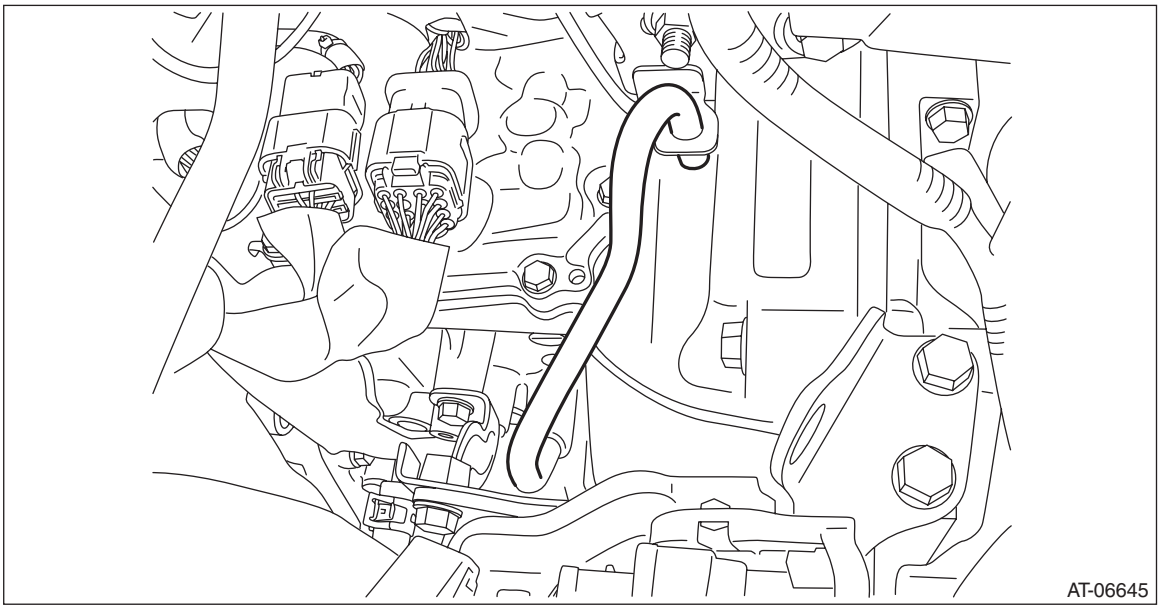
Replace any faulty CVTF cooler hoses, CVTF cooler pipes and clamps found in the inspection below.
1) Check that there are no CVTF or engine coolant leaks from the connections.
2) Check the clamp for deformation.
3) Lightly bend the CVTF cooler hose and check for cracks in the surface or other damages.
4) Pinch the CVTF cooler hose with your fingers and check for poor elasticity. Also check for poor elasticity in the parts where the clamp was installed by pressing with your fingernail.
5) Check for peeling, cracks, and deformation at the tip of the hose.
6) Check the CVTF cooler (with warmer feature) for any damage.

24.Air Breather Hose

A: REMOVAL

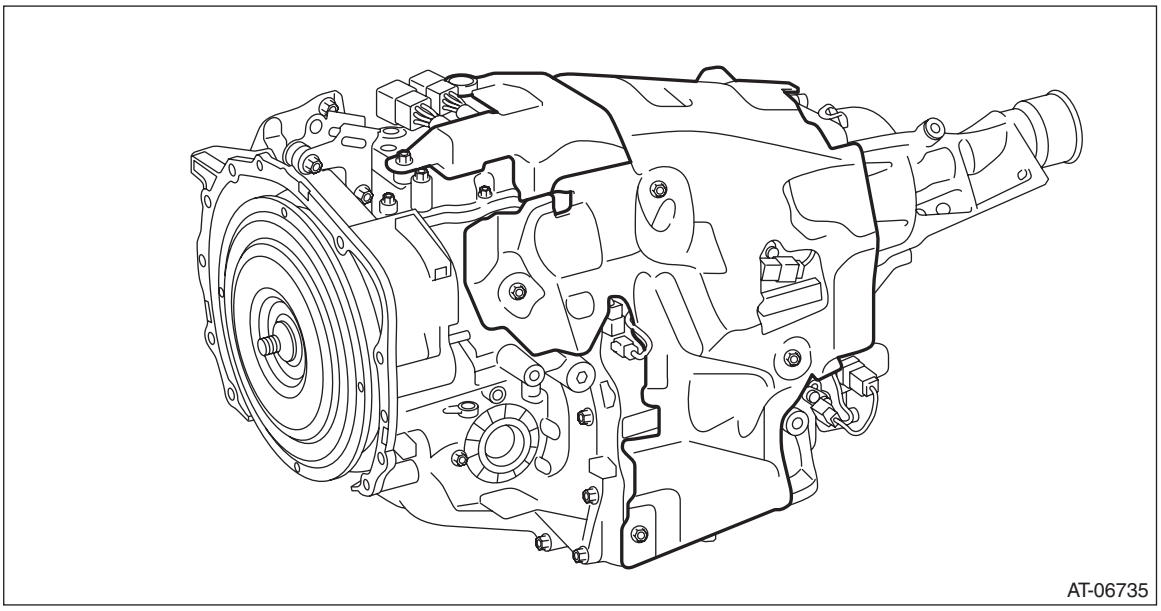
1. FRONT DIFFERENTIAL SIDE

1) Remove the air intake boot assembly. <Ref. to IN(H4DO)-12, REMOVAL, Air Intake Boot.>
2) Remove the air breather hose.

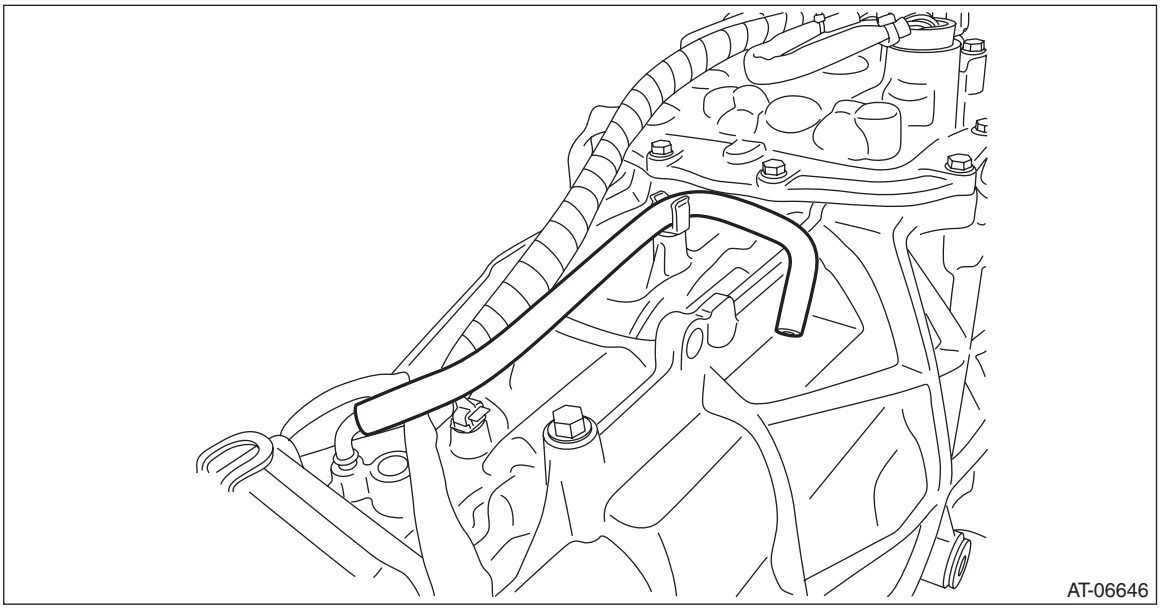


2. TRANSMISSION CASE SIDE

1) Remove the transmission assembly. <Ref. to CVT-58, REMOVAL, Automatic Transmission Assembly.>
2) Remove the transmission case cover.



3) Remove the air breather hose.



B: INSTALLATION

1. FRONT DIFFERENTIAL SIDE

Install in the reverse order of removal.

2. TRANSMISSION CASE SIDE

Install in the reverse order of removal.

Tightening torque:
Transmission case cover:
8 N·m (0.8 kgf-m, 5.9 ft-lb)

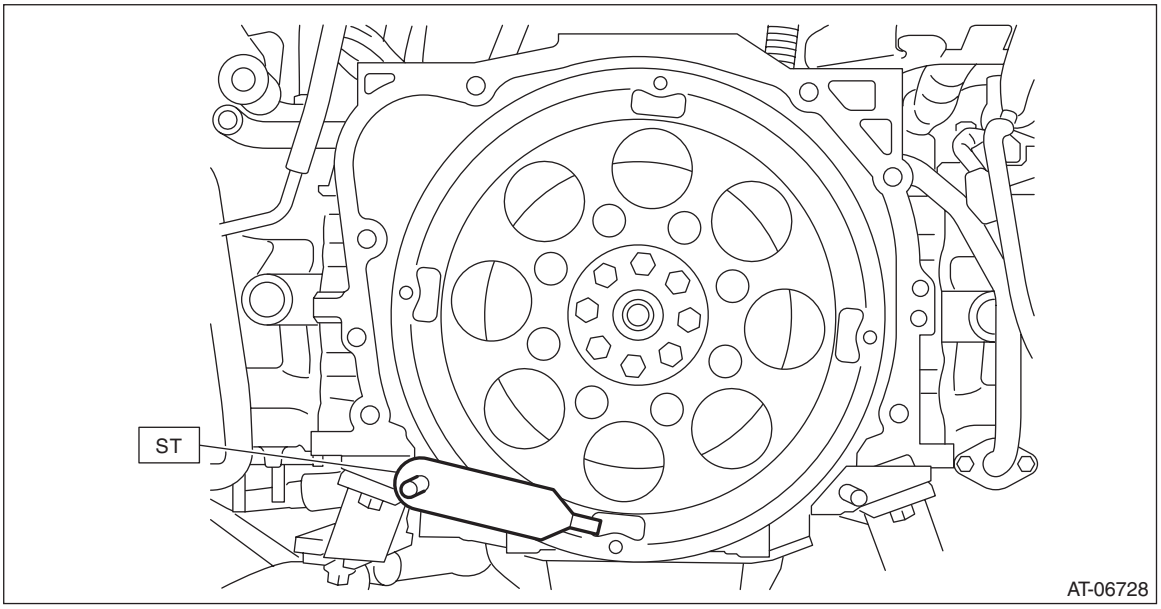
C: INSPECTION

Check the hose for peeling, crack or clogging.

25.Drive Plate

A: REMOVAL

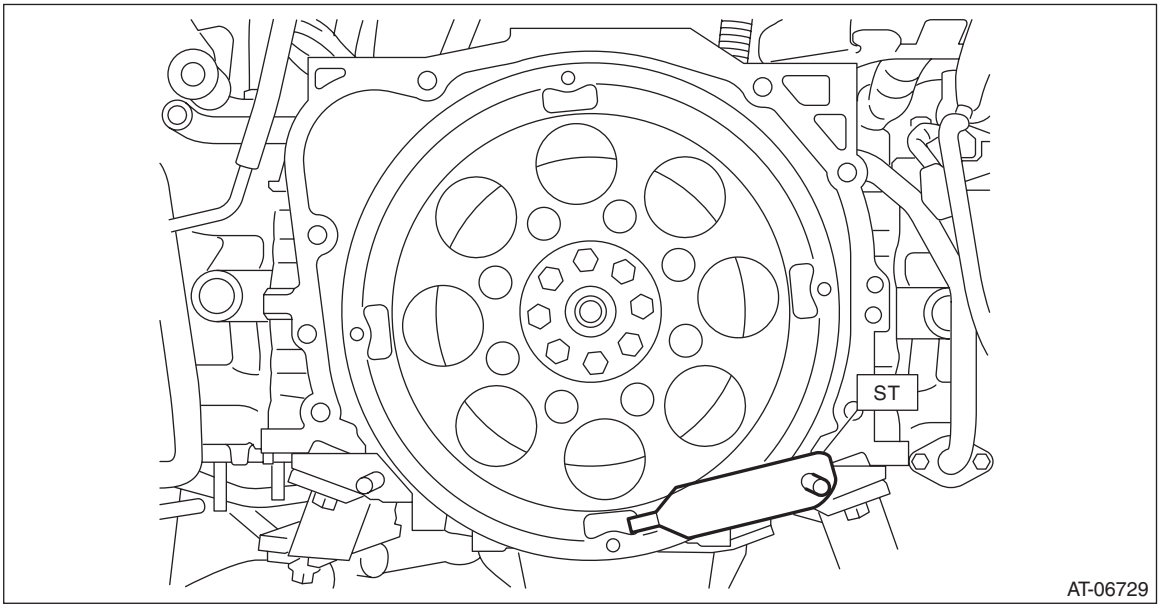
1) Remove the transmission assembly from the vehicle. <Ref. to CVT-58, REMOVAL, Automatic Transmission Assembly.>
2) Set the ST.
ST 498497300 CRANKSHAFT STOPPER



3) Remove the drive plate and reinforcement drive plate.

B: INSTALLATION

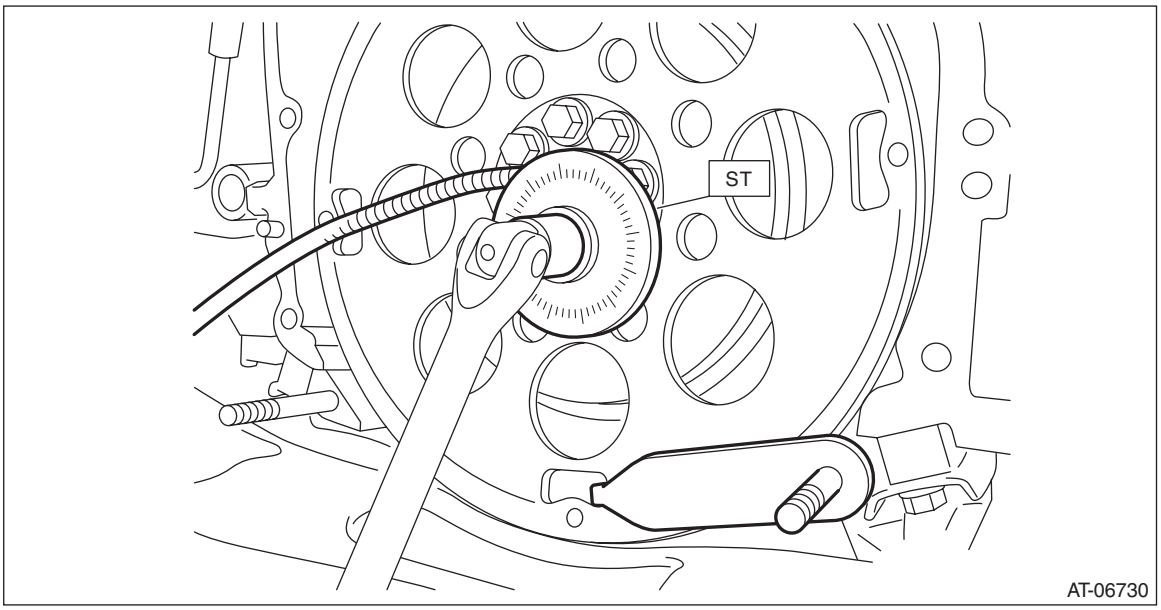
1) Temporarily install the drive plate and reinforcement drive plate.
2) Set the ST.
ST 498497300 CRANKSHAFT STOPPER



3) Tighten the drive plate mounting bolt in two stages.
(1) Tighten the drive plate mounting bolt.

Tightening torque:
30 N·m (3.1 kgf-m, 22.1 ft-lb)
(2) While checking the tightening angle with the ST, tighten the drive plate mounting bolts to the specified angle.

Tightening angle:
30° — 35°
ST 18854AA000 ANGLE GAUGE



4) Install the transmission assembly to the vehicle. <Ref. to CVT-69, INSTALLATION, Automatic Transmission Assembly.>

C: INSPECTION

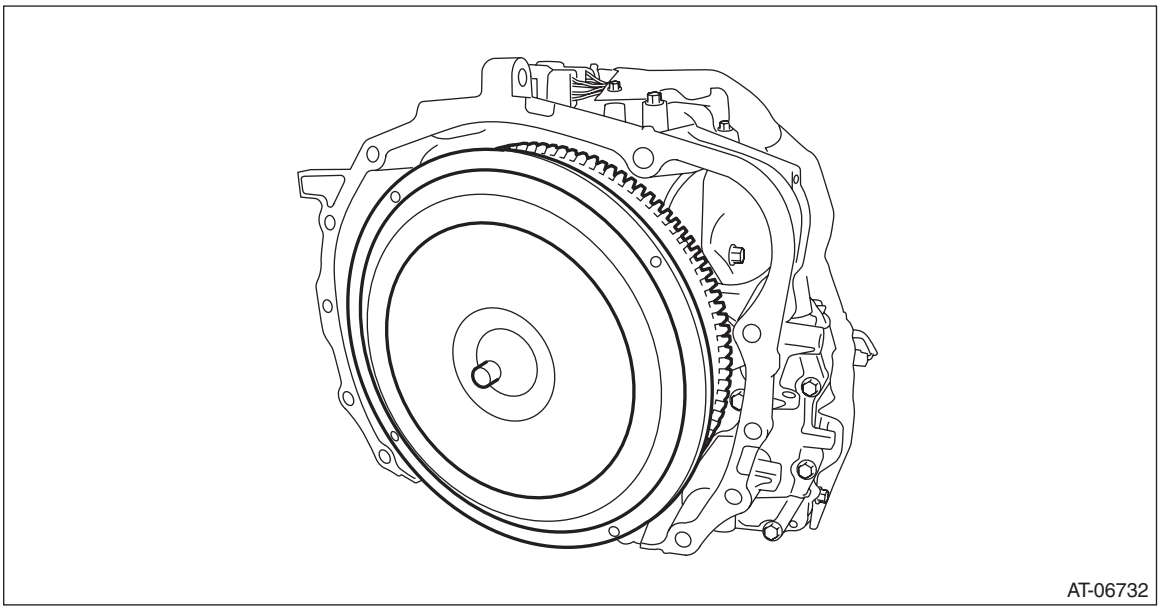
Check the drive cable for damage.

26.Torque Converter Assembly

A: REMOVAL

1) Remove the transmission assembly from the vehicle. <Ref. to CVT-58, REMOVAL, Automatic Transmission Assembly.>
2) Pull out the torque converter assembly horizontally.

CAUTION:
Do not scratch the inside of engaging parts.



3) Remove the O-ring from the input shaft.

B: INSTALLATION

1) Install the O-ring to the input shaft.

NOTE:
- Use new O-rings.
- Apply CVTF to the O-ring.

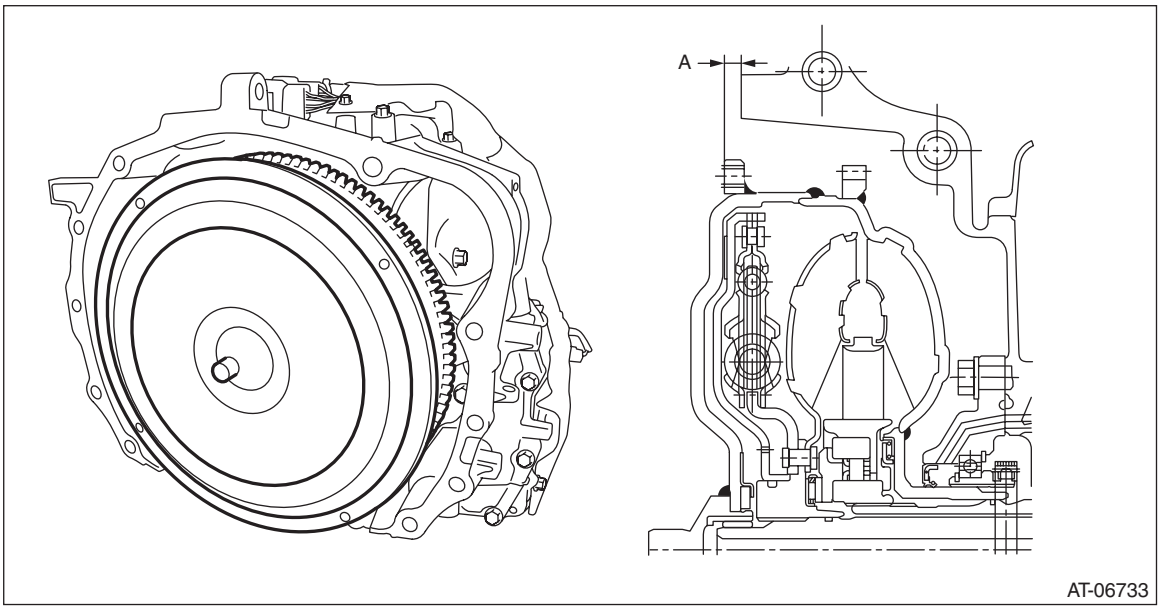
2) While holding the torque converter assembly by hand, carefully install it into the torque converter case.

NOTE:
- Apply CVTF to the oil seal lip.
- Do not damage the oil seal and O-ring.

3) Engage the splines while gently rotating the torque converter assembly by hand, and securely insert the assembly.

4) Measure depth “A”, from converter case end surface to drive plate contacting surface.

Standard (reference):
6.8 mm (0.268 in)



5) Install the transmission assembly to the vehicle. <Ref. to CVT-69, INSTALLATION, Automatic Transmission Assembly.>

C: INSPECTION

- Check the protrusion of torque converter center (front boss) is not deformed or damaged.
- Check the ring gear and exterior for break or damage.

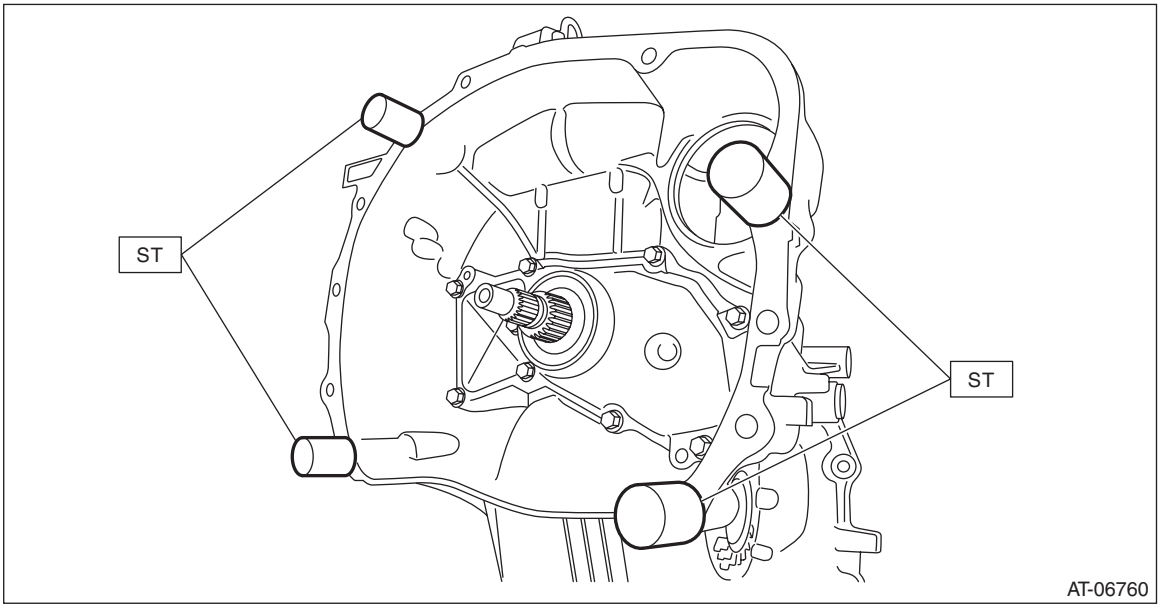
27.Preparation for Overhaul

A: GENERAL DESCRIPTION

Before disassembling and assembling the transmission, follow the following procedures to prepare.

B: PROCEDURE

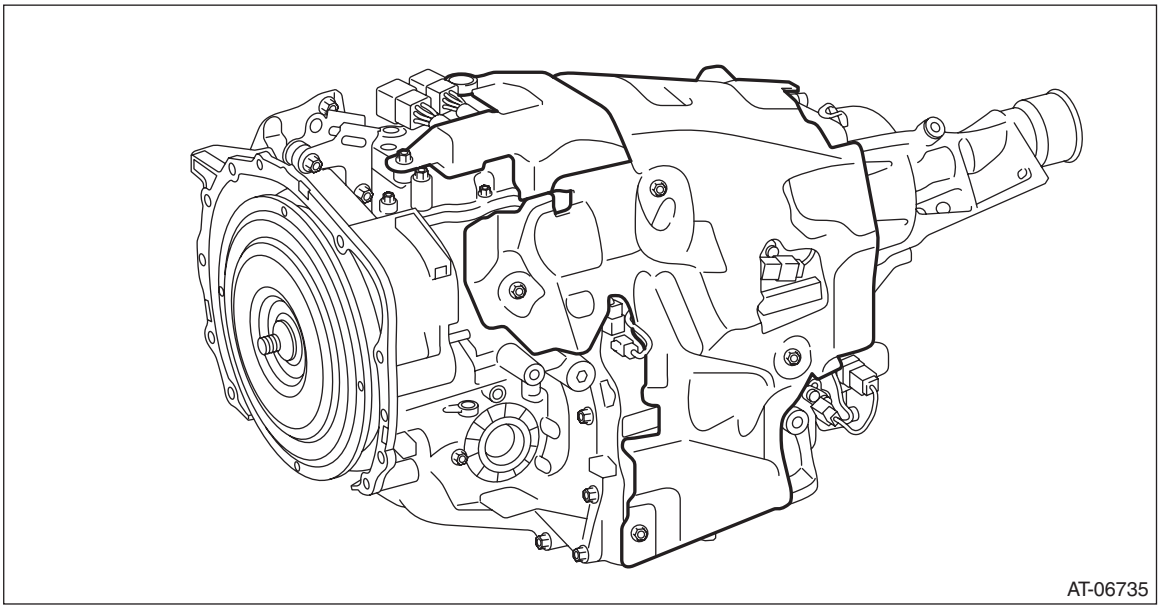
1) Clean the transmission exterior.
2) Remove the torque converter assembly. <Ref. to CVT-152, Torque Converter Assembly.>
3) Attach the ST on the transmission.
ST 18632AA000 STAND ASSY



4) Remove the transmission case cover on the transmission upper side.

NOTE:
Install using the following tightening torque.

Tightening torque:
8 N·m (0.8 kgf-m, 5.9 ft-lb)



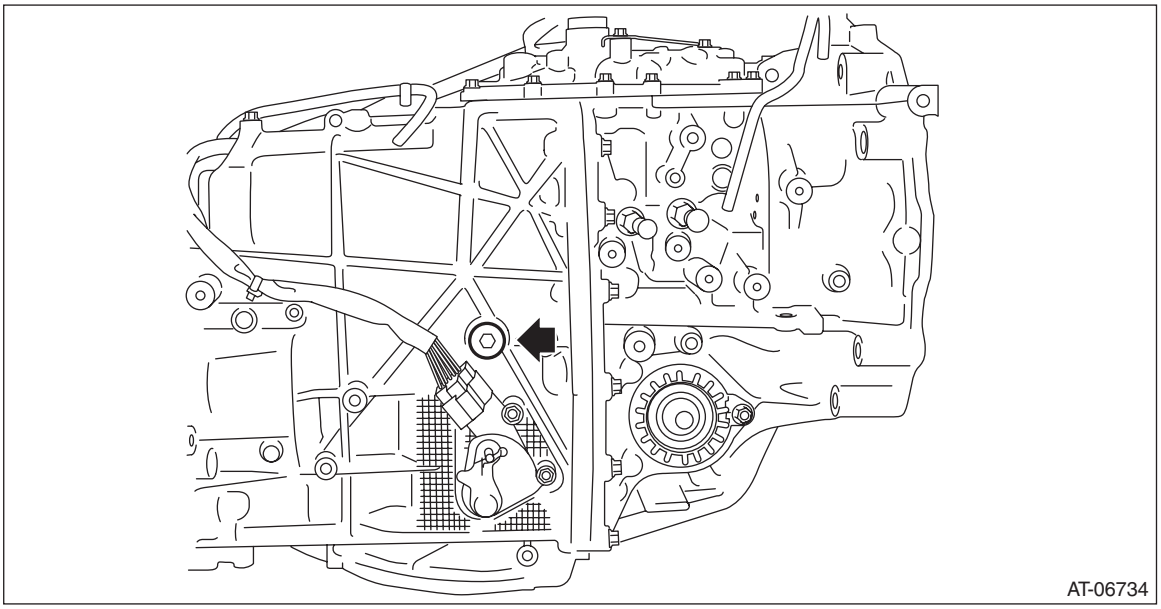
5) Place the transmission assembly on end.

6) When completely overhauling the transmission, refill approx. 10 ℓ (2.6 US qt, 8.8 Imp qt) of CVTF through the transmission right side plug, and install the plug. Finally, install the transmission case cover.

CAUTION:
Always use specified CVTF. Using other fluid will cause malfunction. <Ref. to CVT-4, HYDRAULIC CONTROL AND LUBRICATION, SPECIFICATION, General Description.>

NOTE:
Use a new gasket.

Tightening torque:
50 N·m (5.1 kgf-m, 36.9 ft-lb)

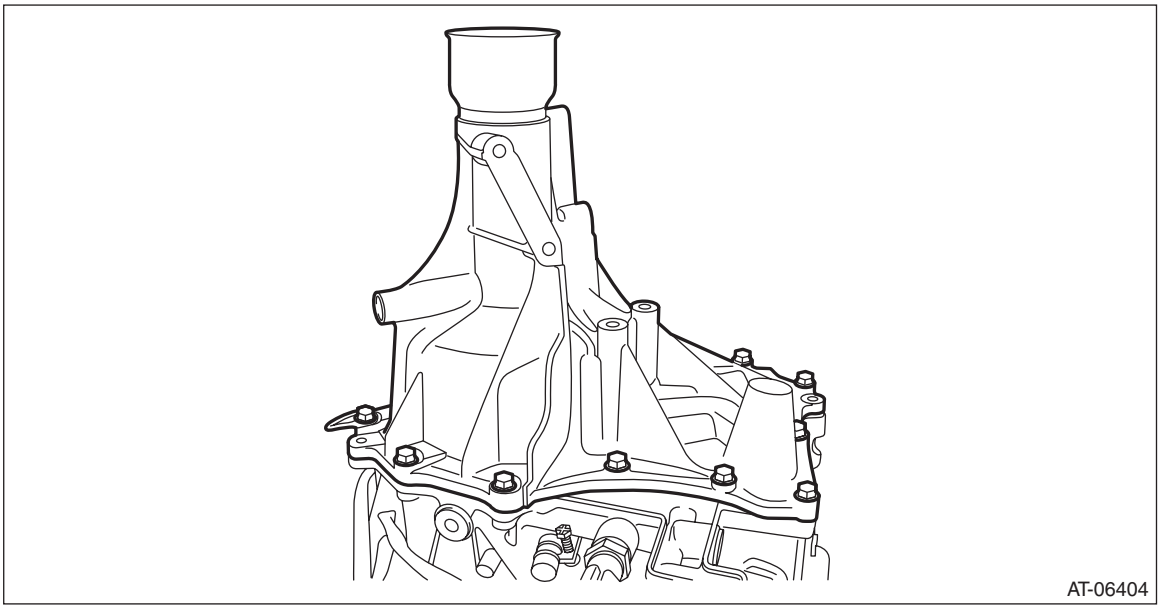


28.Extension Case

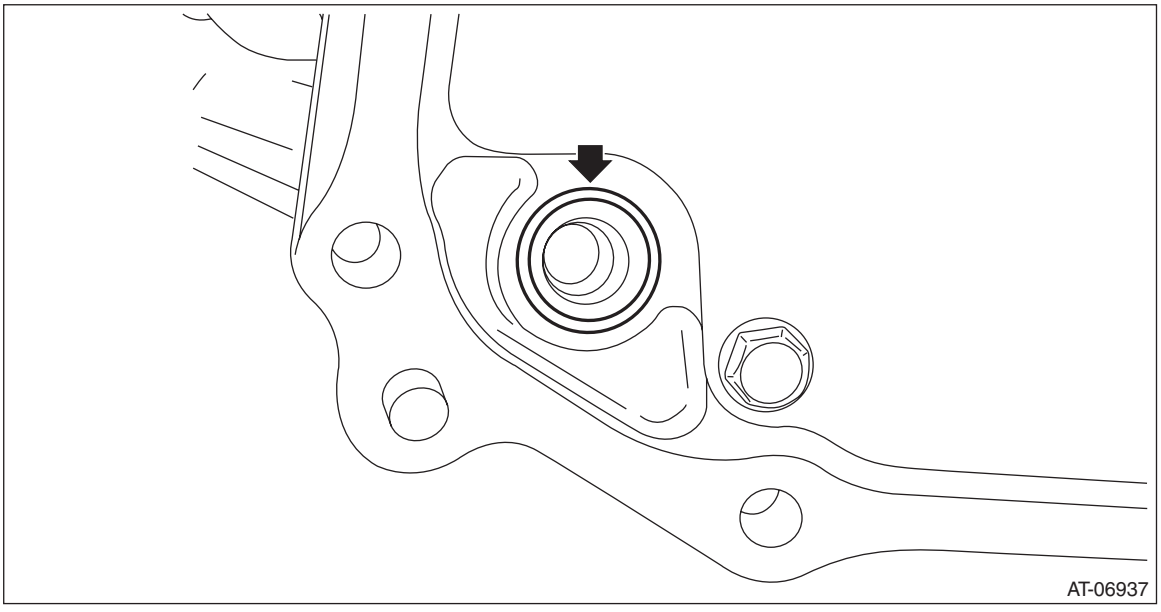
A: REMOVAL

1) Remove the transmission assembly from the vehicle. <Ref. to CVT-58, REMOVAL, Automatic Transmission Assembly.>
2) Remove the extension case and transmission hanger.

NOTE:
The total number of extension case mounting bolts is 13.



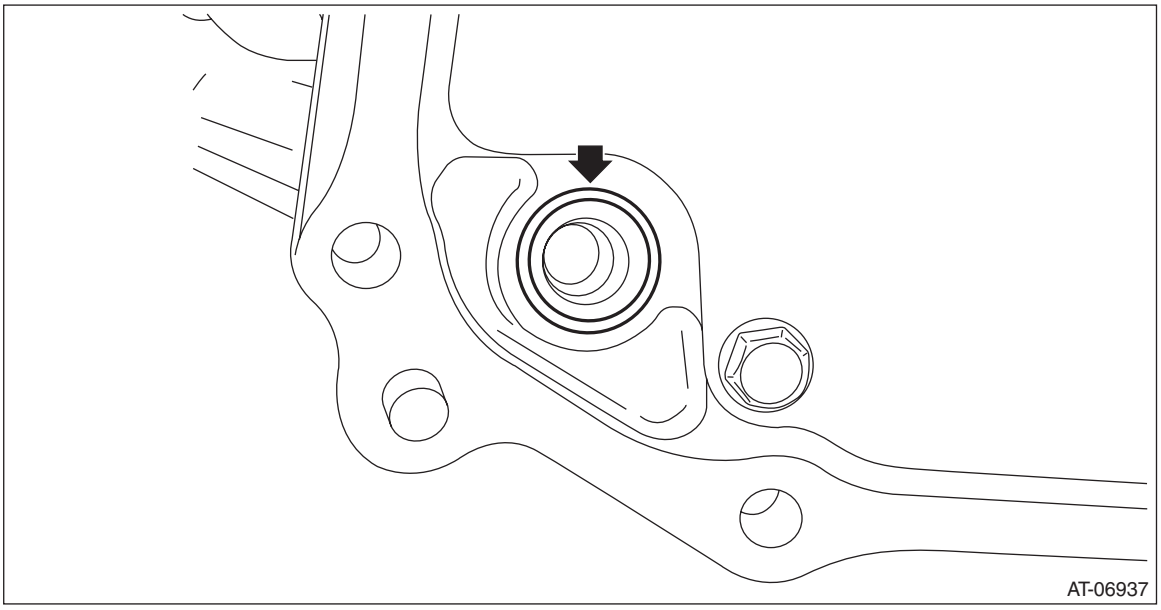
3) Remove the O-ring.



B: INSTALLATION

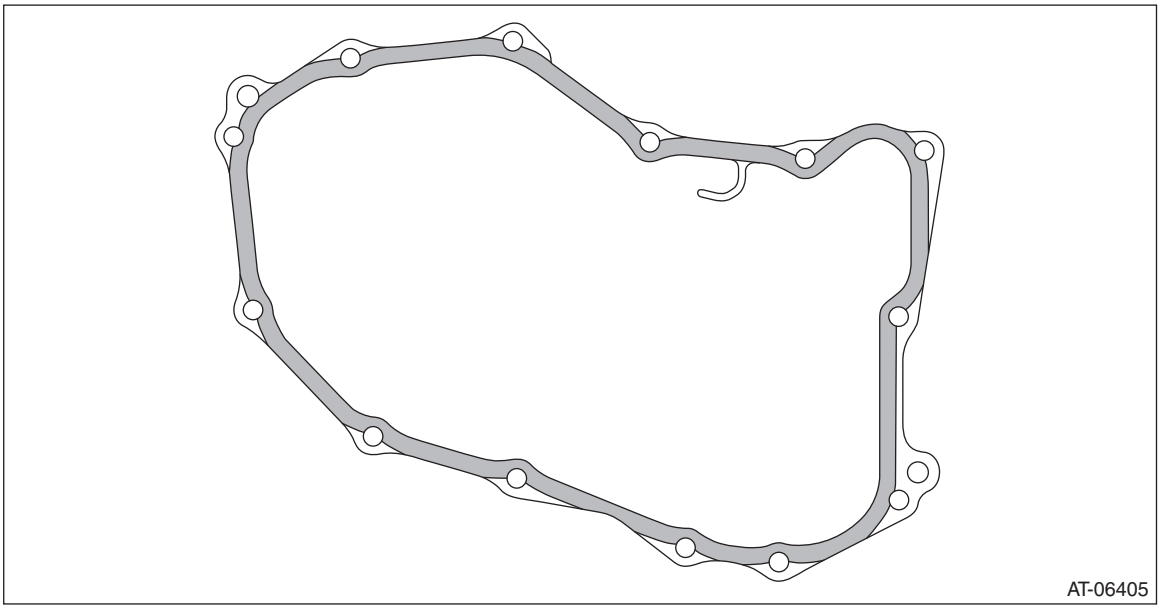
1) Clean the mating surface of extension case and transmission case.
2) Select the transfer drive gear shim. <Ref. to CVT-211, ADJUSTMENT, Reduction Drive Gear.>
3) Select the transfer driven gear shim. <Ref. to CVT-171, ADJUSTMENT, Transfer Clutch.>
4) Attach the selected transfer drive gear shim to extension case with vaseline.
5) Attach the selected transfer driven gear shim to extension case with vaseline.
6) Install the O-ring to the transmission case.

NOTE:
- Use new O-rings.
- Apply CVTF to the O-ring.



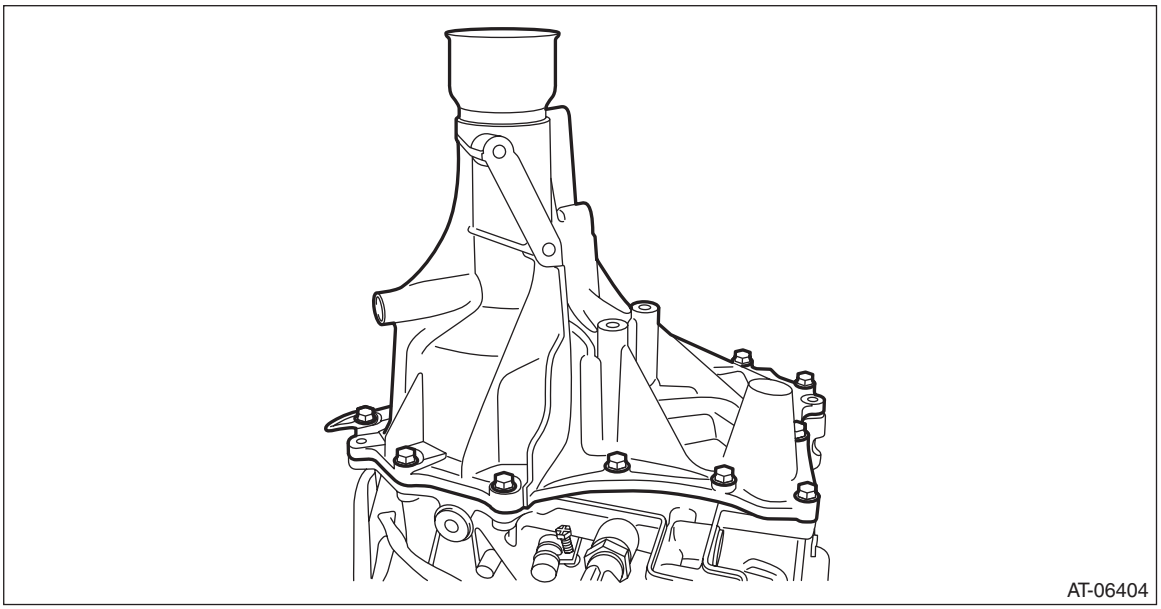
7) Apply liquid gasket to extension case seamlessly.

Liquid gasket:
THREE BOND 1215 (Part No. 004403007) or equivalent



8) Install the extension case to transmission hanger.

Tightening torque:
25 N·m (2.5 kgf-m, 18.4 ft-lb)



9) Install the transmission assembly. <Ref. to CVT-69, INSTALLATION, Automatic Transmission Assembly.>

C: DISASSEMBLY

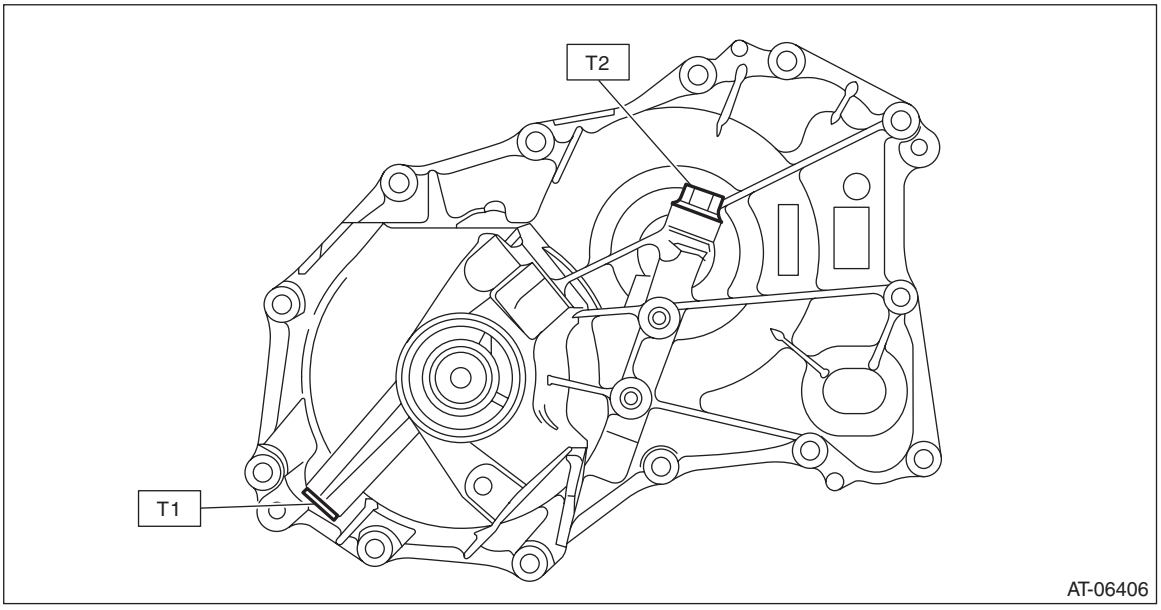
1) Remove the dust cover from extension case.
2) Remove the extension case oil seal from the extension case.
3) Remove all plugs.

D: ASSEMBLY

1) Press-fit the dust cover into extension case.
2) Install the extension case oil seal to extension case. <Ref. to CVT-87, REPLACEMENT, Differential Side Retainer Oil Seal.>
3) Install all plugs.

NOTE:
- Use a new O-ring or a gasket.
- Apply CVTF to the O-ring.

Tightening torque:
T1: 25 N·m (2.5 kgf-m, 18.4 ft-lb)
T2: 35 N·m (3.6 kgf-m, 25.8 ft-lb)



E: INSPECTION

- Check there is no leak of CVTF from the joint between extension case and transmission case.
- Check there is no damage or cracks on the extension case and other parts.

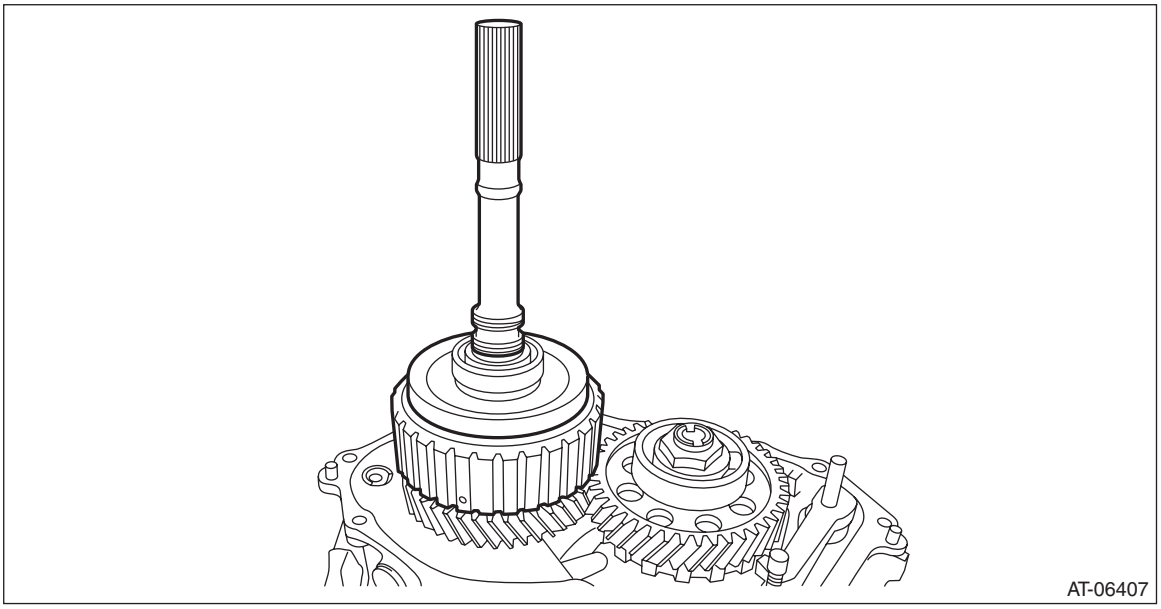
F: ADJUSTMENT

NOTE:
When replacing the extension case, select the transfer drive gear shim and transfer driven gear shim. <Ref. to CVT-211, ADJUSTMENT, Reduction Drive Gear.> <Ref. to CVT-171, ADJUSTMENT, Transfer Clutch.>

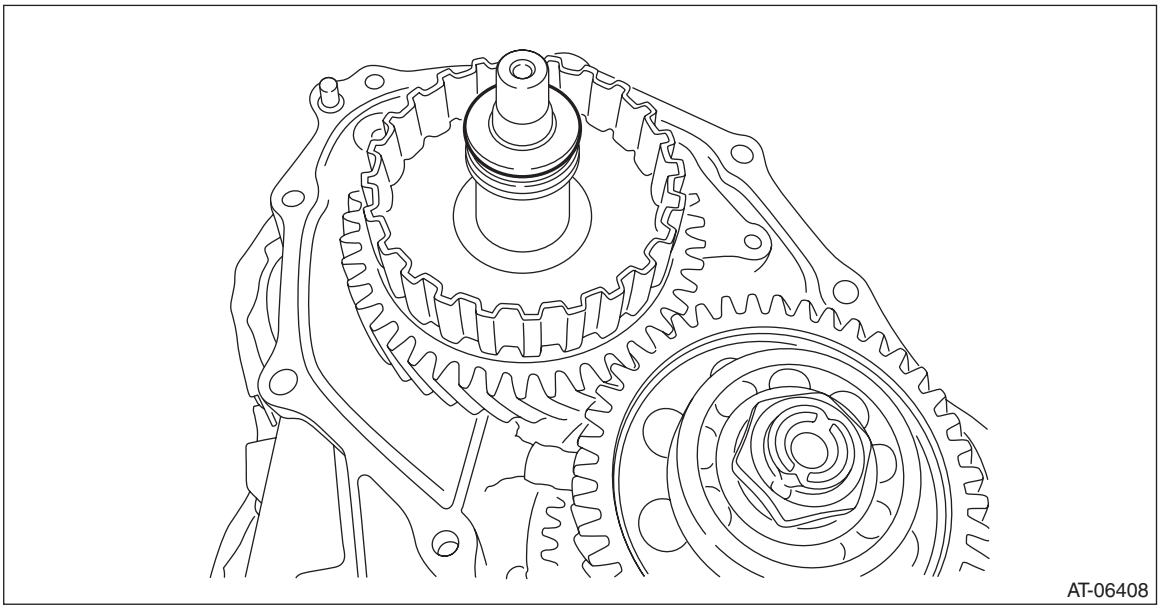
29.Transfer Clutch

A: REMOVAL

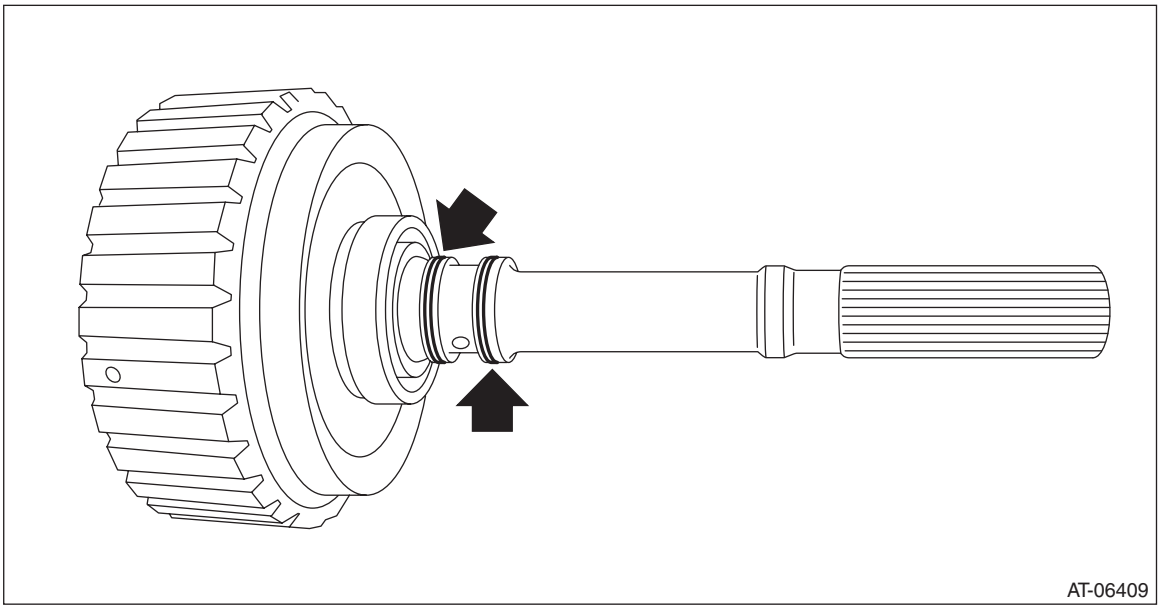
1) Remove the transmission assembly from the vehicle. <Ref. to CVT-58, REMOVAL, Automatic Transmission Assembly.>
2) Remove the extension case. <Ref. to CVT-156, REMOVAL, Extension Case.>
3) Remove the transfer clutch assembly.



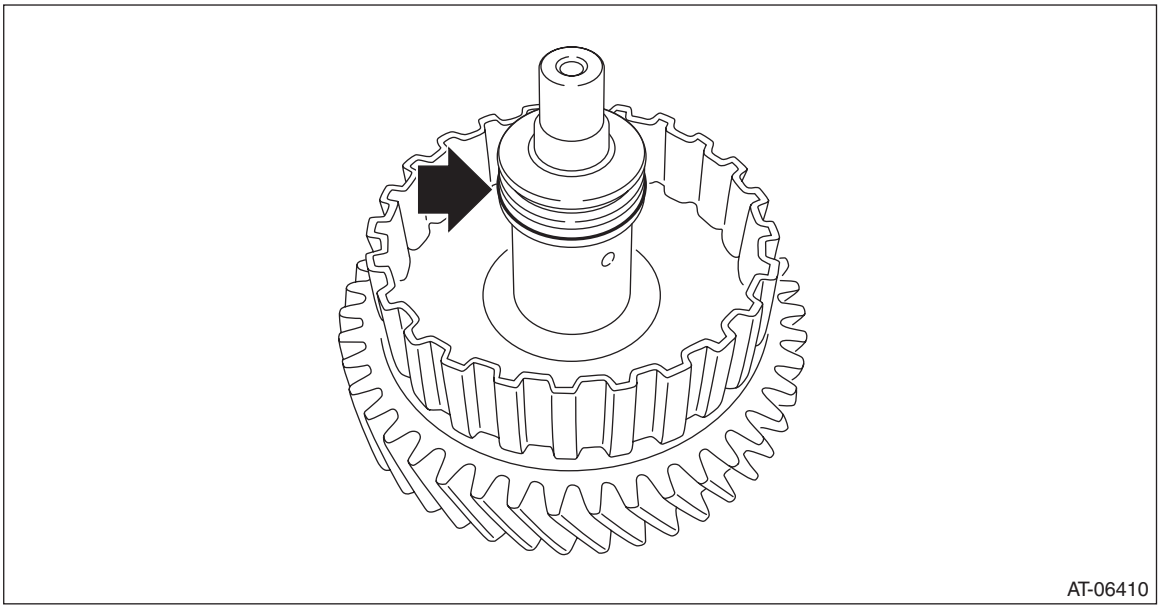
4) Remove the thrust bearing.



5) Remove the seal ring from transfer clutch assembly.



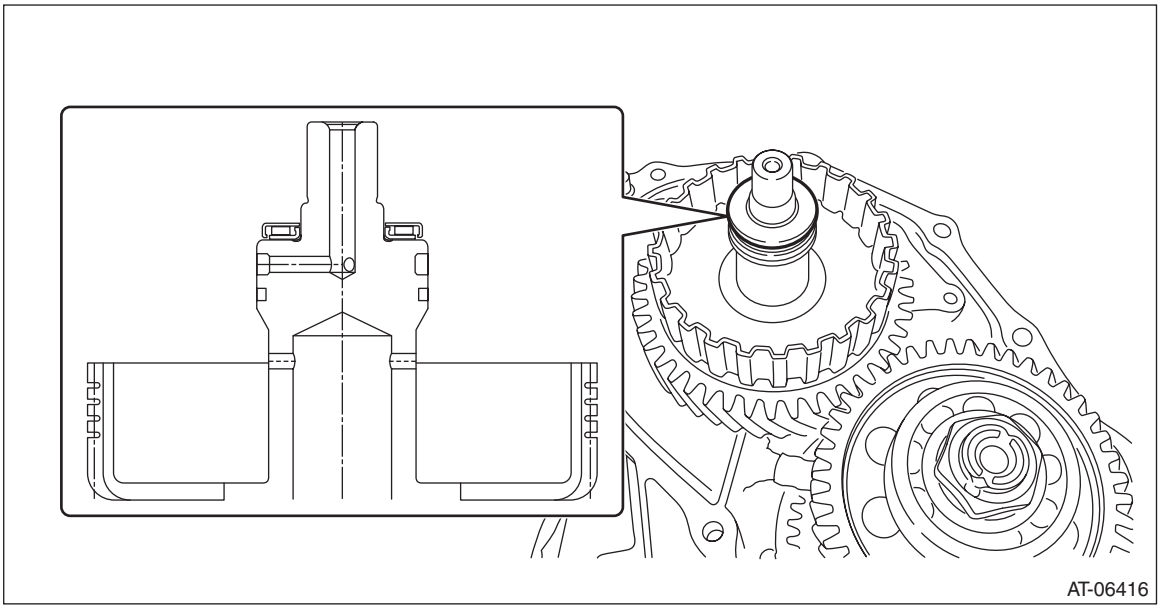
6) Remove the seal ring from the transfer driven gear assembly.



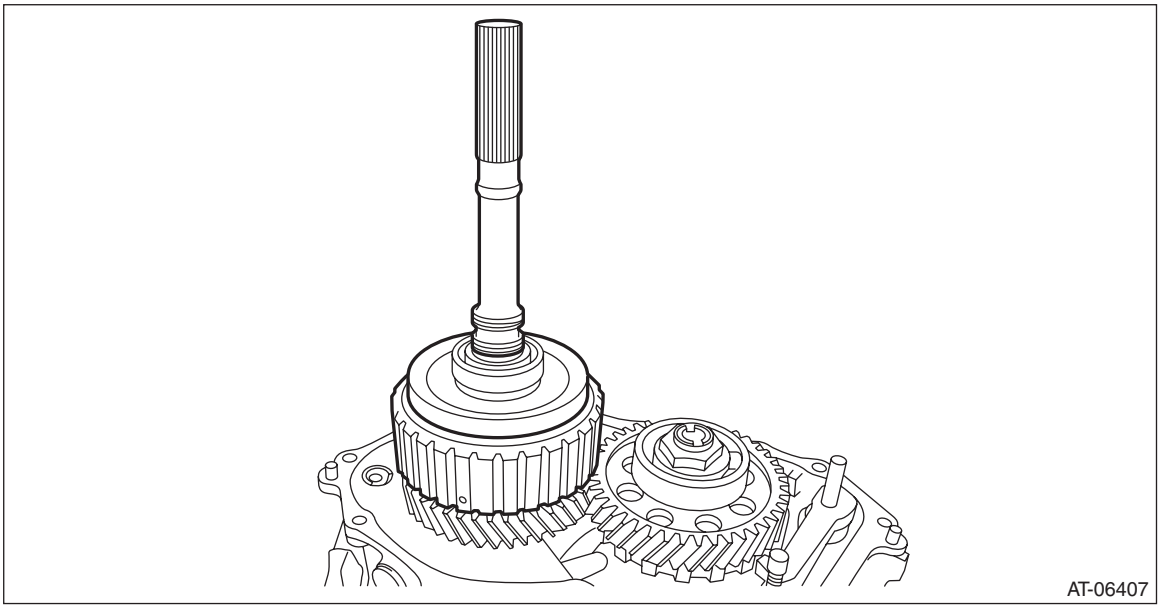
B: INSTALLATION

1) Install the thrust bearing.

NOTE:
Make sure to install in the right direction.



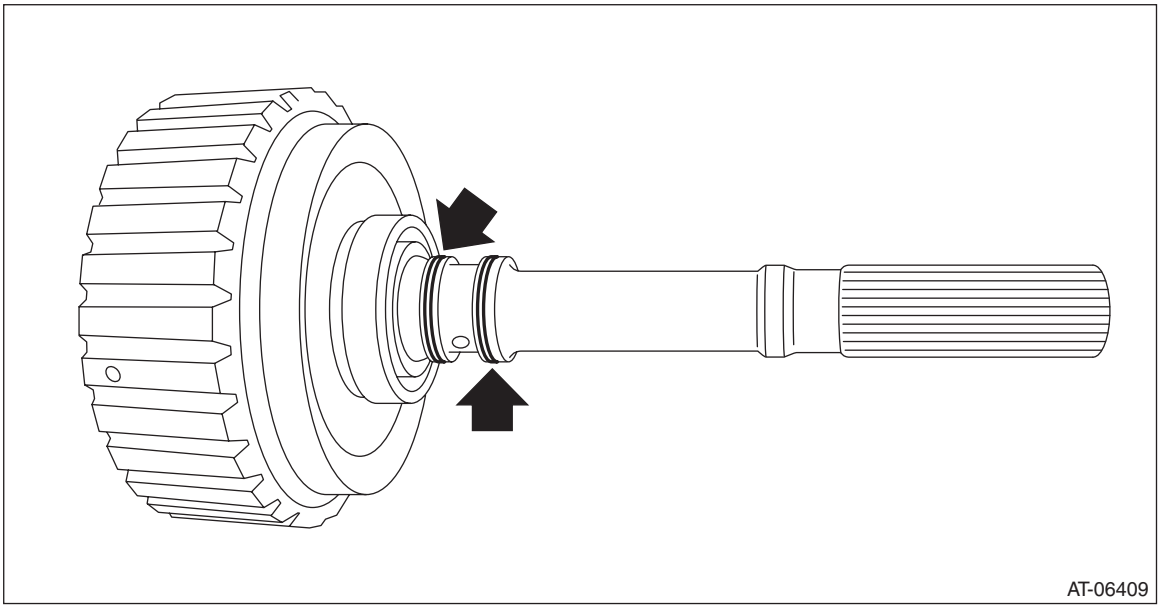
2) Install the transfer clutch assembly.



3) Select the transfer driven gear shim. <Ref. to CVT-171, ADJUSTMENT, Transfer Clutch.>
4) Attach the selected transfer driven gear shim to extension case with vaseline.
5) Remove the transfer clutch assembly.

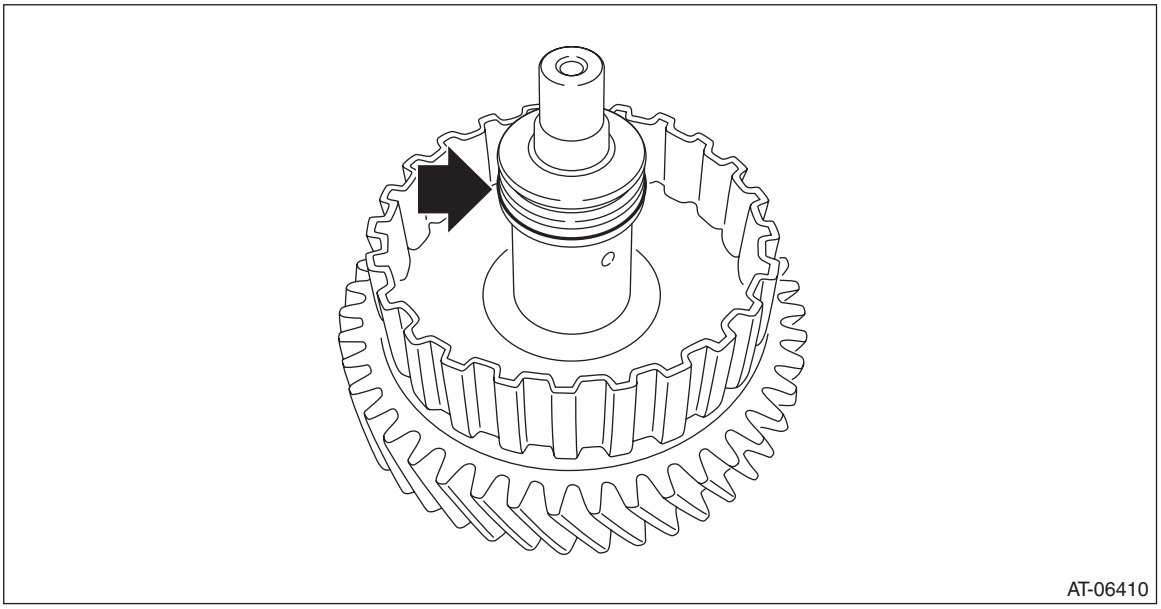
6) Install the seal ring to the transfer clutch assembly.

NOTE:
- Use a new seal ring.
- When installing the seal ring, do not expand the seal ring too much.
- Apply CVTF to the seal rings.



7) Install the seal ring to the transfer driven gear assembly.

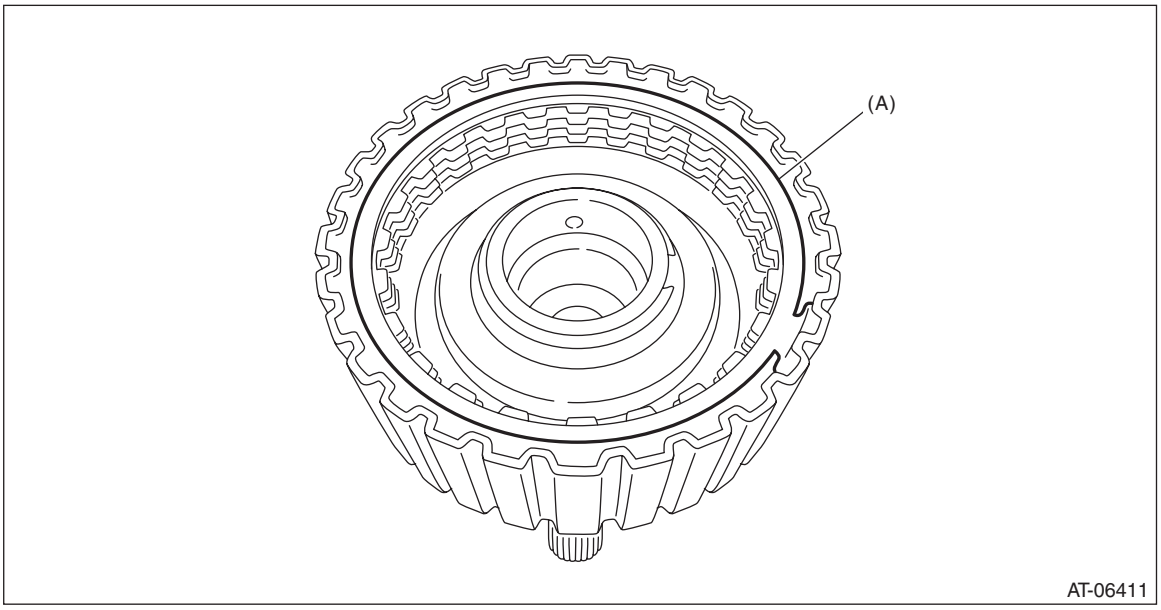
NOTE:
- Use a new seal ring.
- When installing the seal ring, do not expand the seal ring too much.
- Apply CVTF to the seal rings.



8) Install the extension case. <Ref. to CVT-157, INSTALLATION, Extension Case.>
9) Install the transmission assembly to the vehicle. <Ref. to CVT-69, INSTALLATION, Automatic Transmission Assembly.>

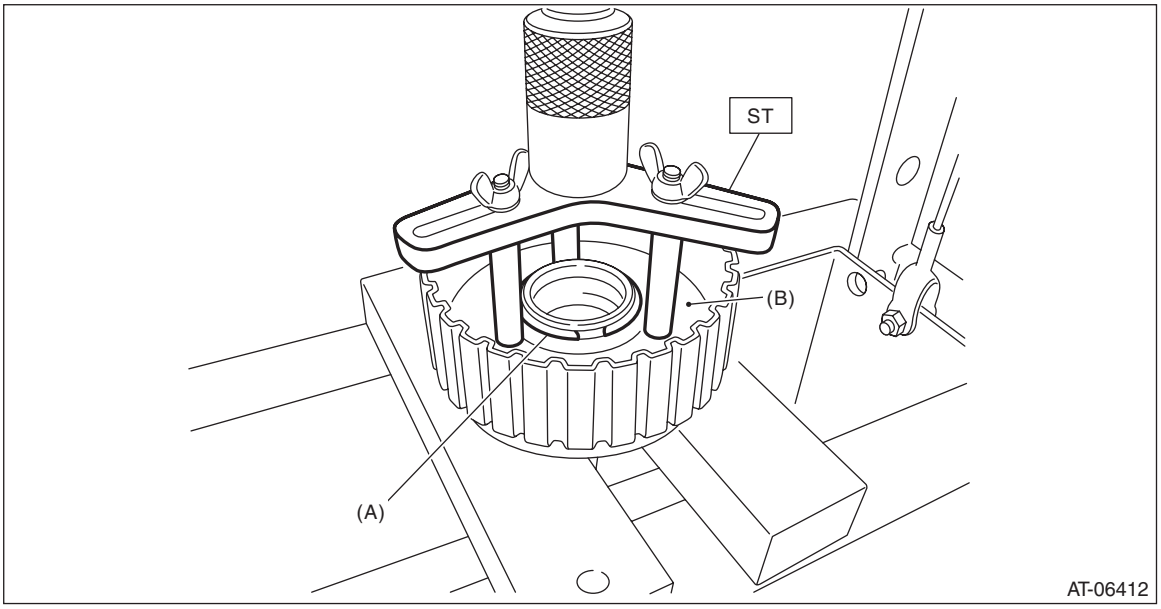
C: DISASSEMBLY

1) Remove the snap ring, and then remove the retaining plate, drive plate and driven plate.



(A) Snap ring

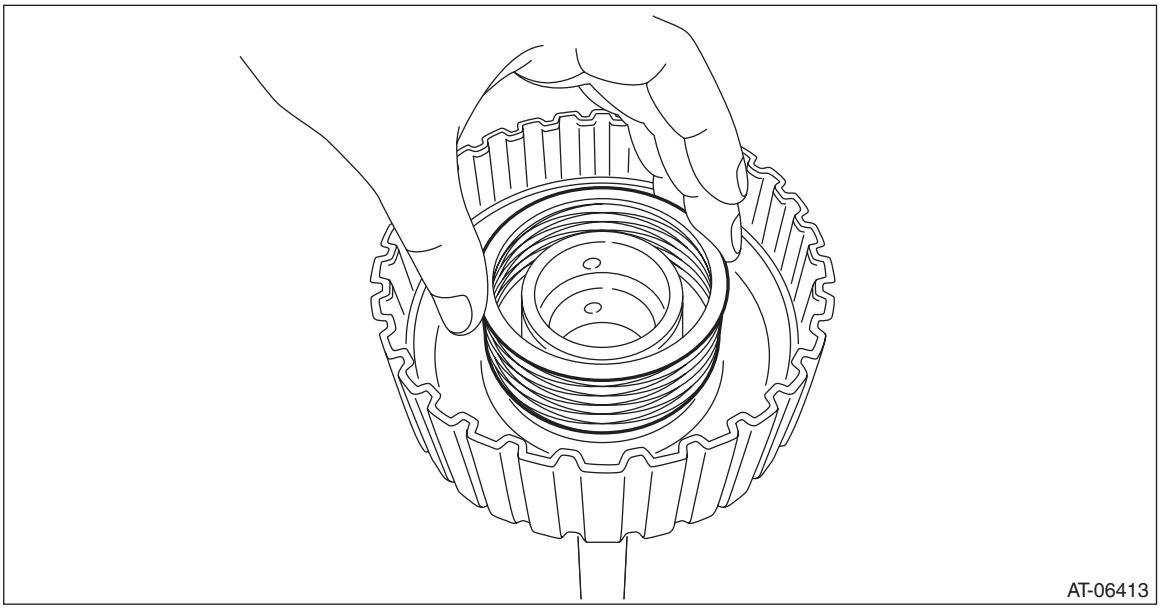
2) Compress the return spring using the ST to remove the snap ring.
ST 18762AA000 COMPRESSOR SPECIAL TOOL



(A) Snap ring
(B) Transfer clutch piston seal

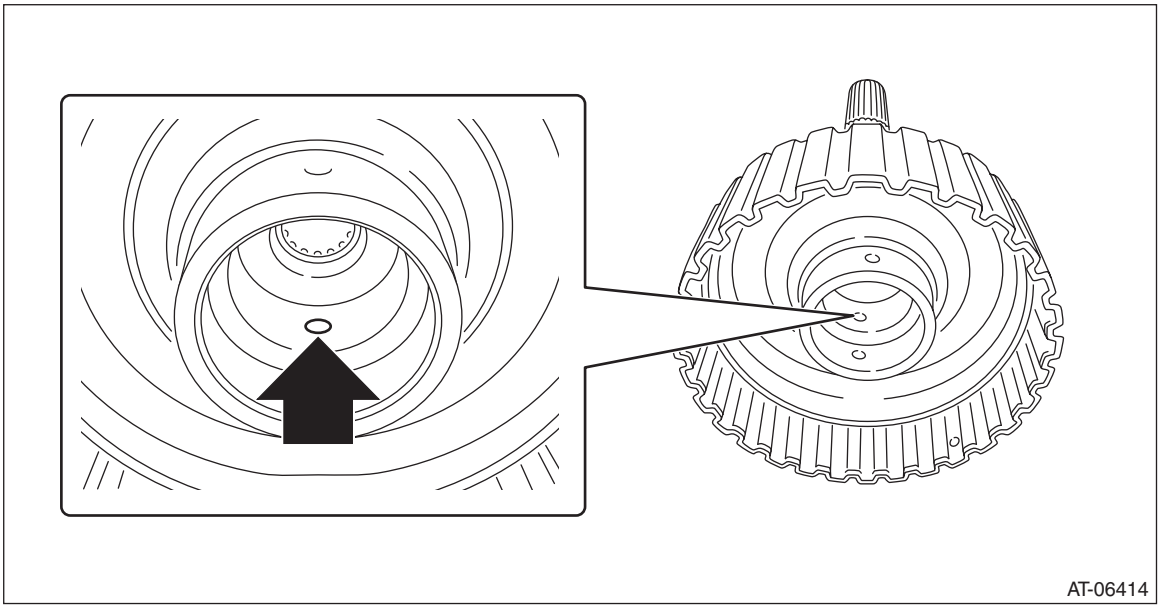
3) Remove the transfer clutch piston seal.

4) Remove the return spring.

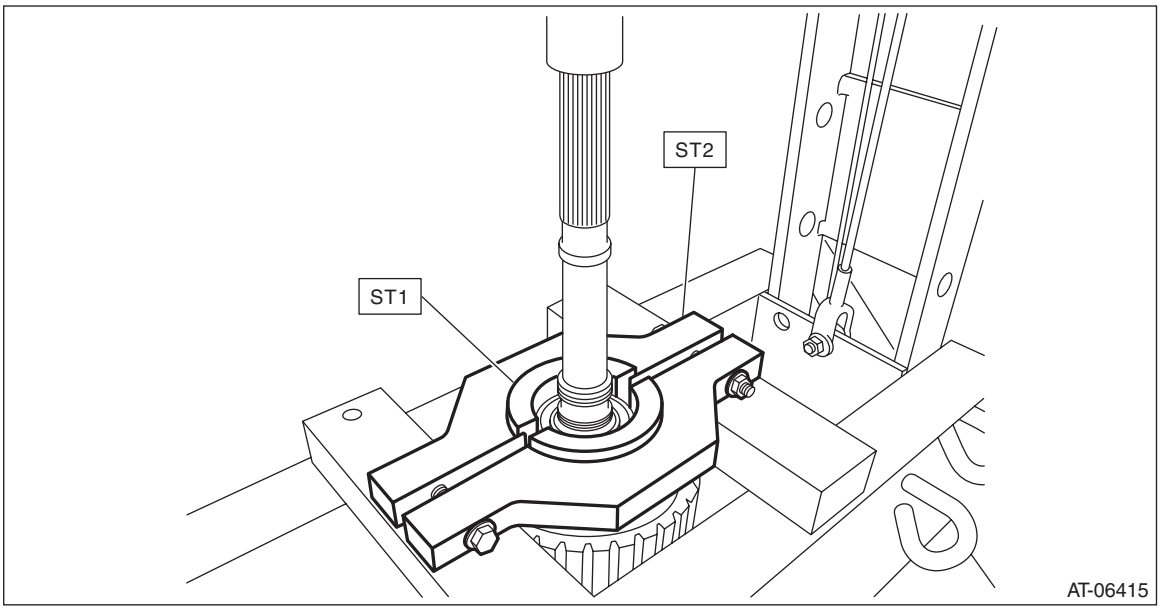


5) Remove the transfer clutch piston by blowing compressed air through transfer clutch assembly hole.

NOTE:
Plug the holes through which the compressed air is not blown.



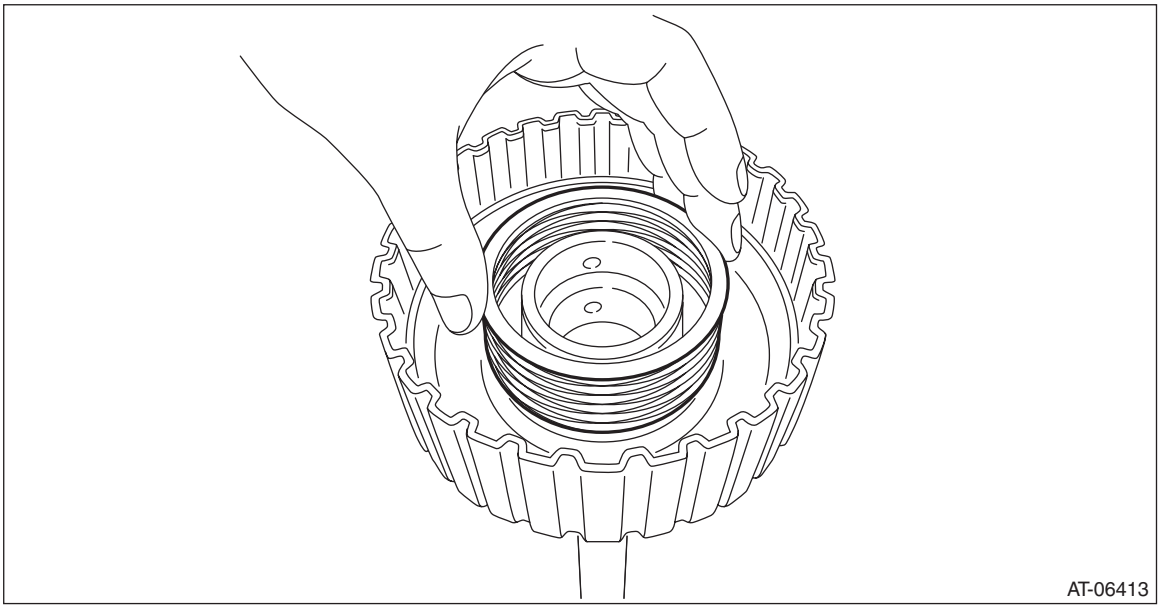
6) Remove the ball bearing using ST.
ST1 18767AA010 BEARING REMOVER
ST2 18723AA000 REMOVER



D: ASSEMBLY

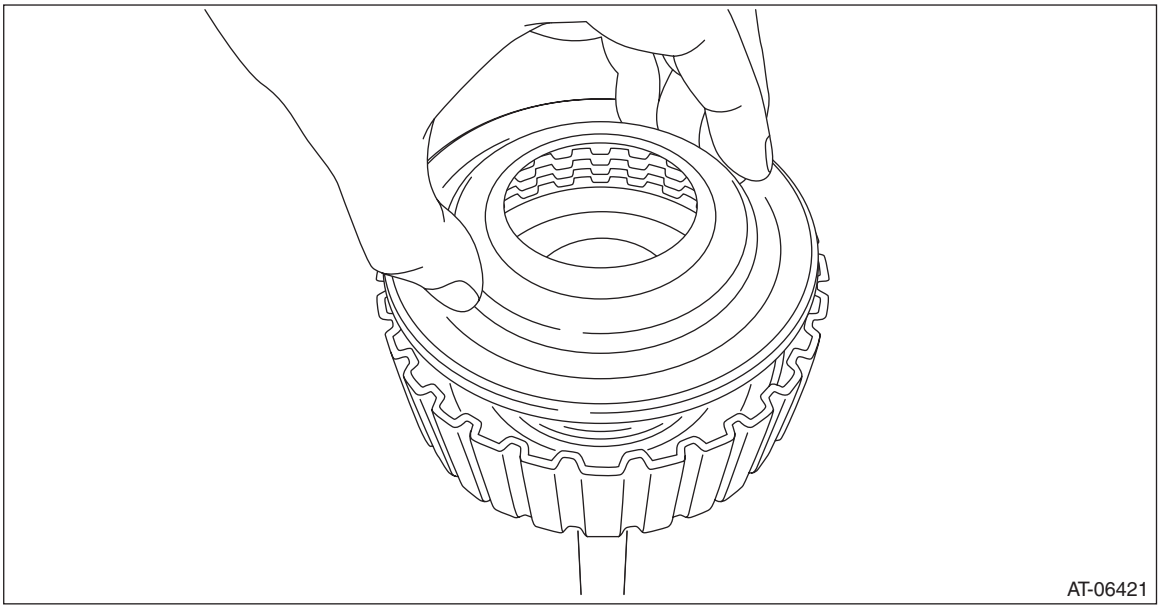
1) Install the transfer clutch piston.

NOTE:
Apply CVTF to the transfer clutch piston lip.
2) Install the return spring.

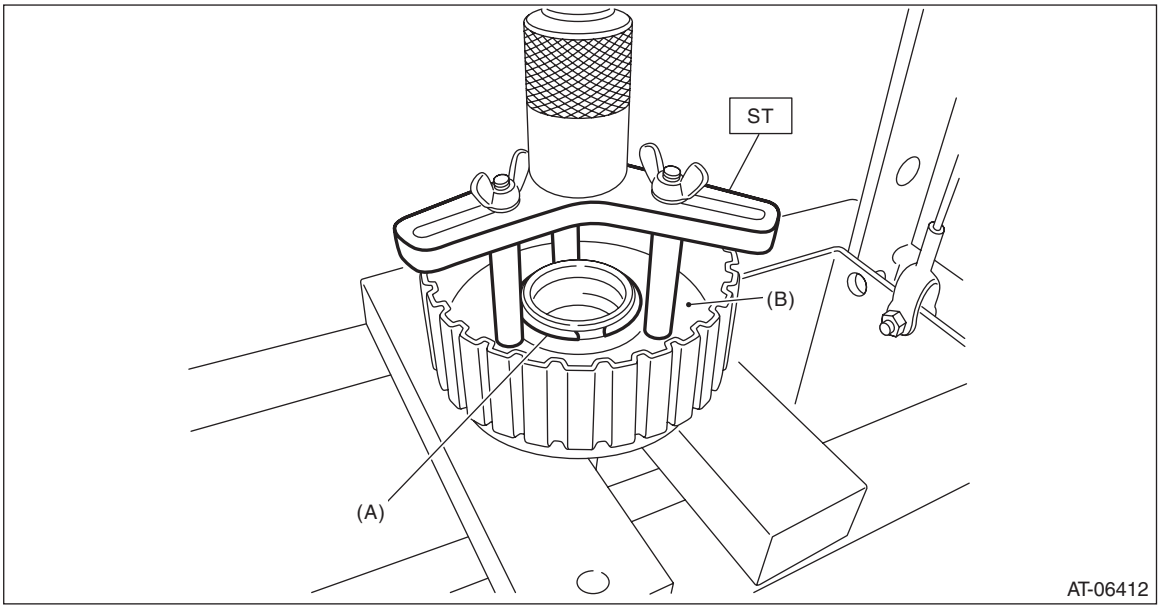


3) Install the transfer clutch piston seal.

NOTE:
Apply CVTF to the lip section of transfer clutch piston seal.

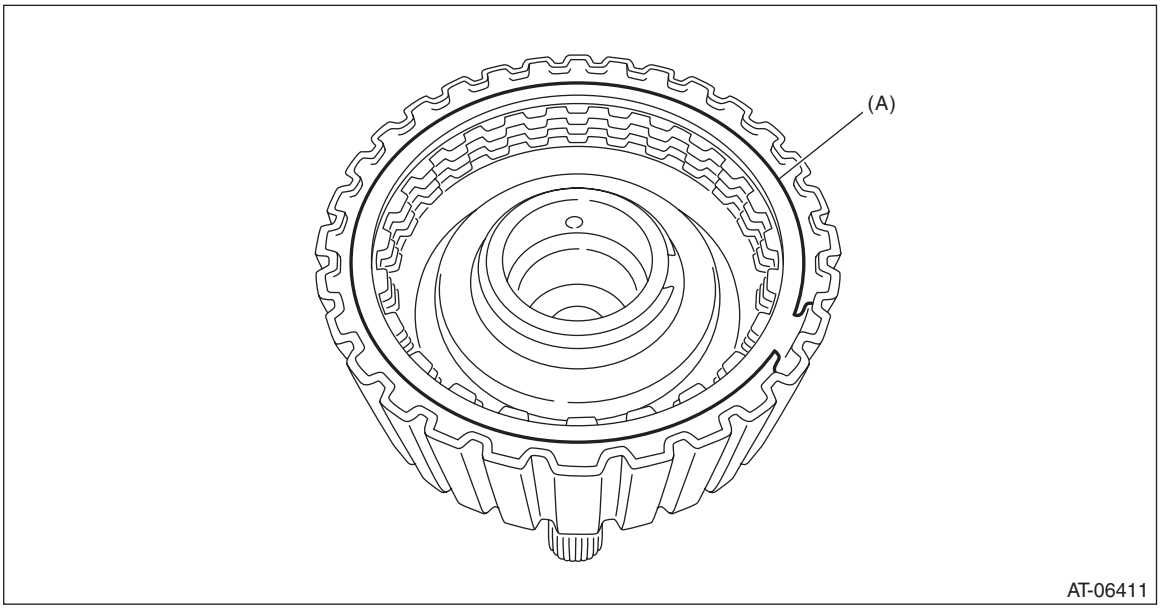


4) Compress the return spring using the ST to install the snap ring.
ST 18762AA000 COMPRESSOR SPECIAL TOOL



(A) Snap ring
(B) Transfer clutch piston seal

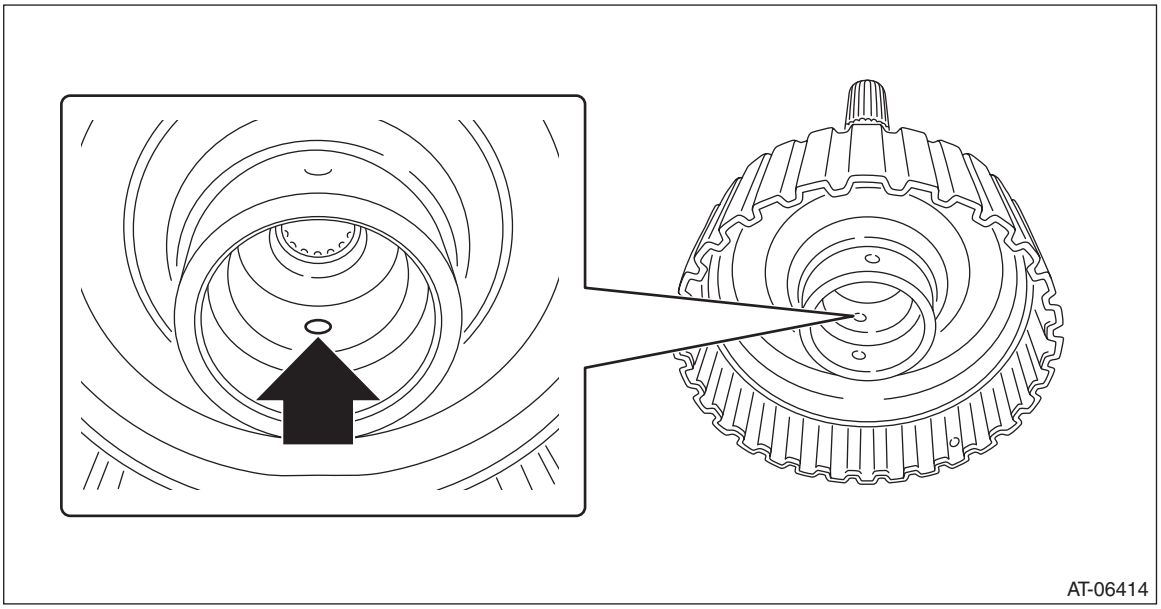
5) Install the pressure plate, driven plate, drive plate and snap ring.



(A) Snap ring

6) Blow compressed air through transfer clutch assembly hole, and check the transfer clutch piston operation.

NOTE:
Plug the holes through which the compressed air is not blown.

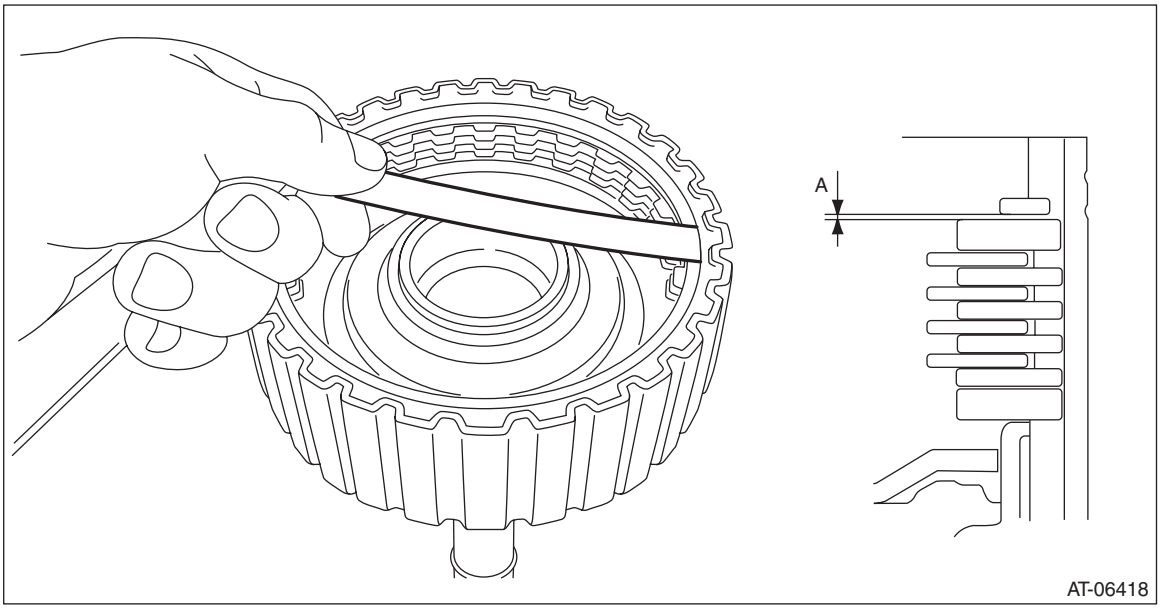


7) Before measuring clearance “A”, place same thickness shims on both sides to prevent the plate from tilting.

8) When clearance “A” exceeds the limit for use, replace the drive plate and driven plate as a set, and select and adjust the pressure plate within the initial specified value.

Initial standard:
0.7 — 1.1 mm (0.028 — 0.043 in)

Limit thickness:
1.3 mm (0.051 in)

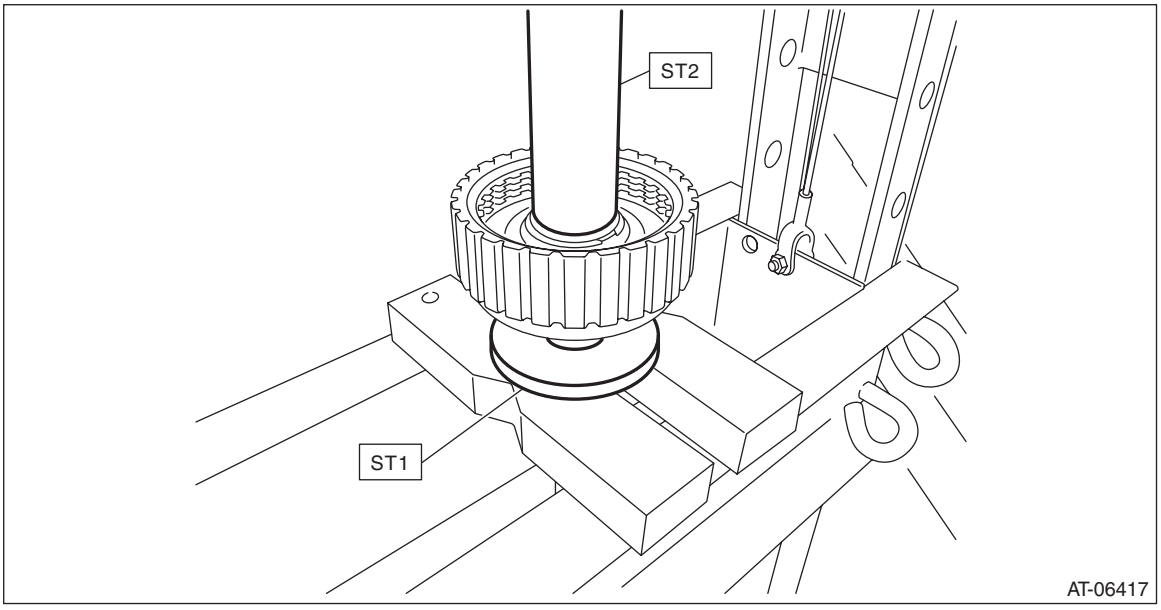


Pressure plate	
Part No.	Thickness mm (in)
31593AA151	3.3 (0.130)
31593AA161	3.7 (0.146)

9) Recheck the clearance. <Ref. to CVT-170, INSPECTION, Transfer Clutch.>

10) Using the ST, install the ball bearing.

NOTE:
Use a new ball bearing.
ST1 398177700 INSTALLER
ST2 499277000 INSTALLER



E: INSPECTION

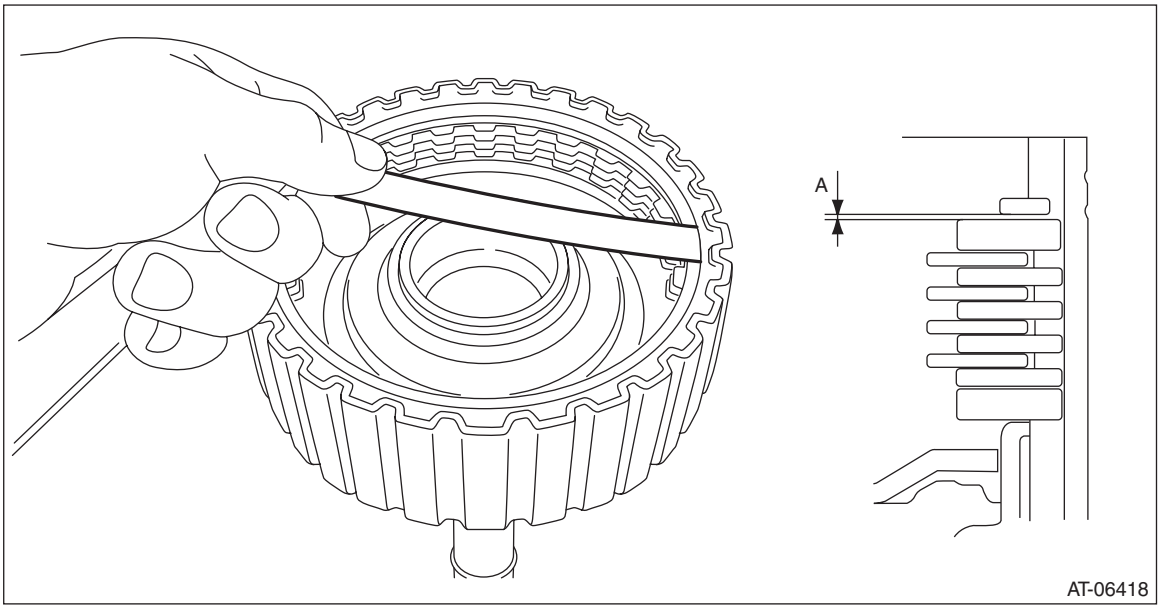
- Inspect the drive plate facing for wear and damage.
- Driven plate for discoloration (burned color)
- Make sure the snap ring is not worn and the return spring has no permanent distortion, damage, or deformation.
- Check the lip seal for damage.
- Inspect the extension end play, and adjust it to within the standard value. <Ref. to CVT-171, ADJUSTMENT, Transfer Clutch.>

1) Before measuring clearance “A” between snap ring and driven plate, place same thickness shims on both sides to prevent the plate from tilting.

2) When clearance “A” exceeds the limit for use, replace the drive plate and driven plate as a set, and select the pressure plate within the initial specified value.

Initial standard:
0.7 — 1.1 mm (0.028 — 0.043 in)

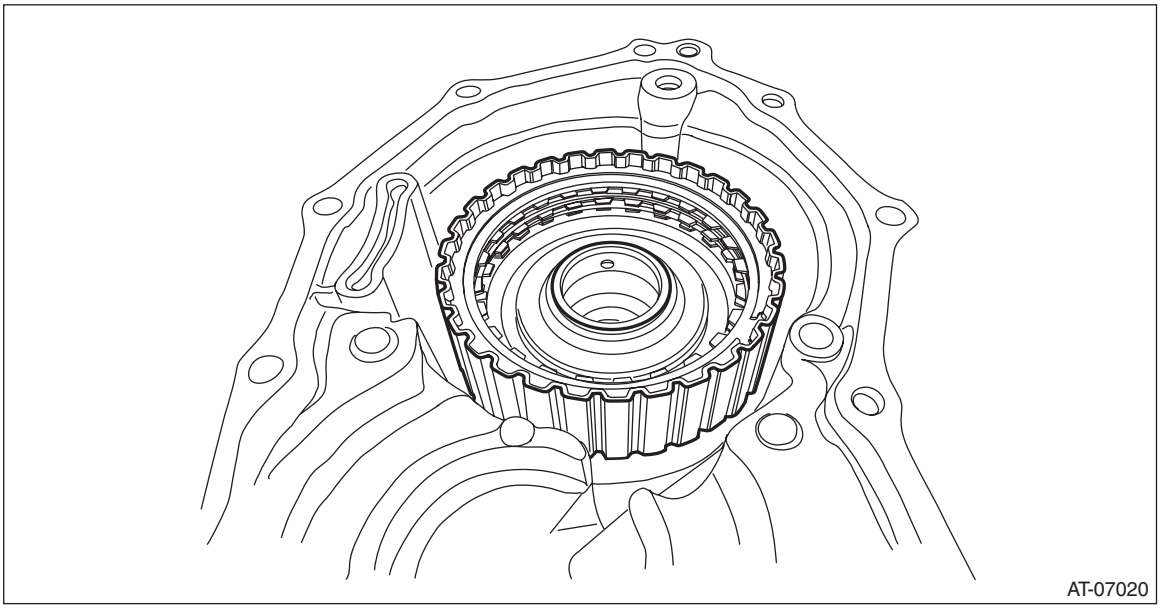
Limit thickness:
1.3 mm (0.051 in)



3) Check for tight corner braking phenomenon when the vehicle is moved forward with the steering fully turned. If tight corner braking occurs, perform the following procedures.
(1) With the steering wheel held at fully turned position, drive the vehicle in “D” range and with vehicle speed at approx. 5 km/h (3 MPH) in both clockwise and counterclockwise directions for approx. ten times each, while repeating acceleration and braking intermittently.
(2) If the tight corner braking phenomenon still persists, drive the vehicle again in a circle for several laps.

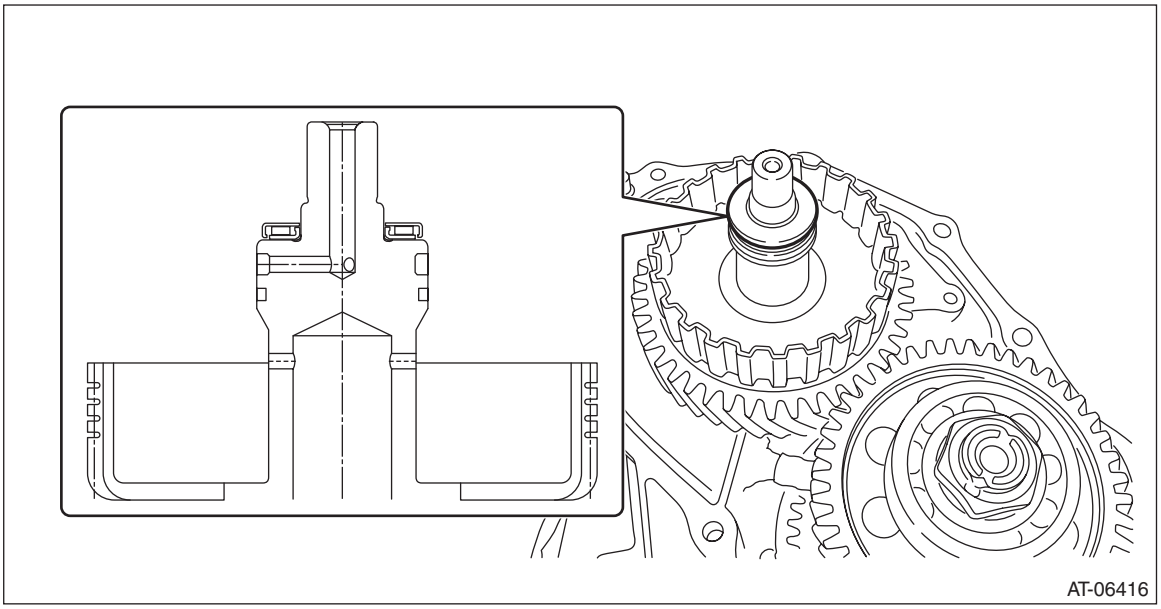
F: ADJUSTMENT

1) Install the transfer clutch assembly to the extension case with the transfer driven gear shims and thrust bearings removed.

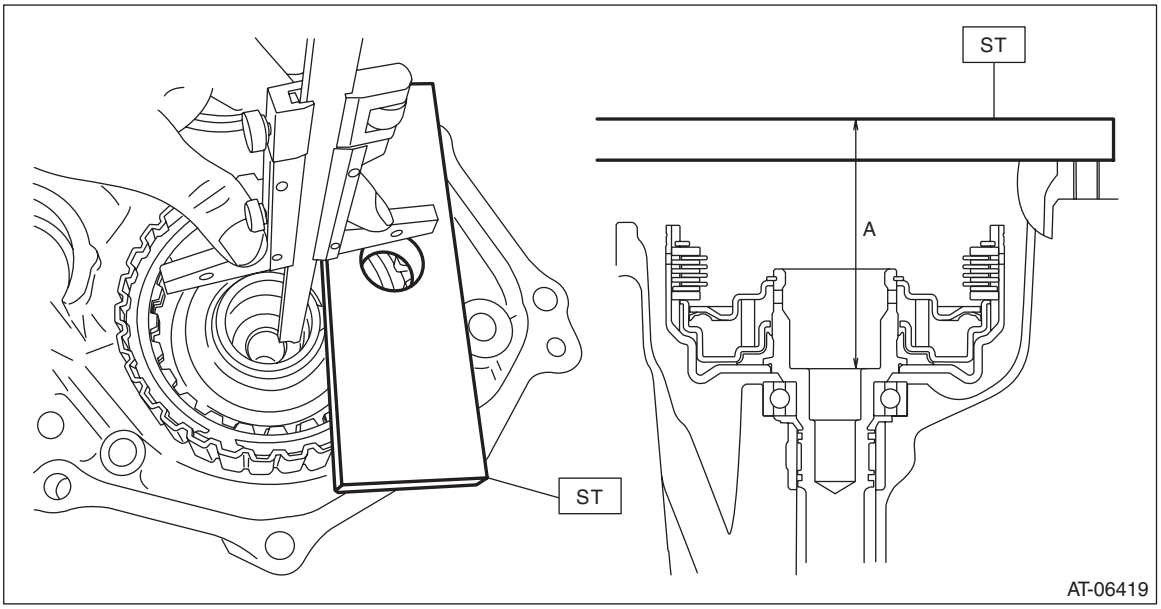


2) Install the thrust bearing to the transfer driven gear.

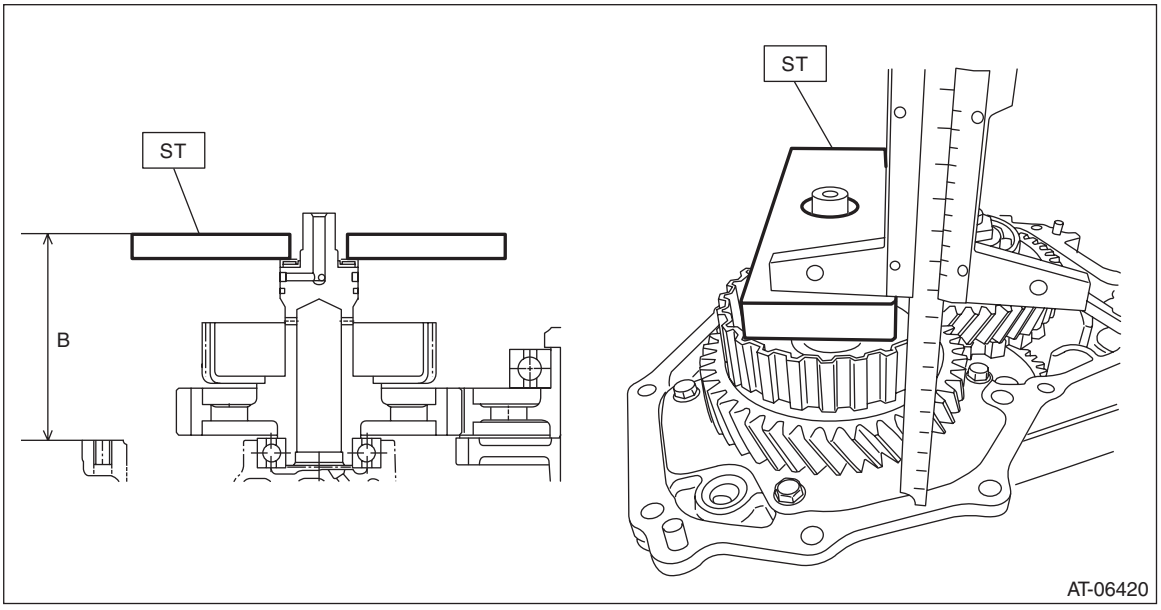
NOTE:
Make sure to install in the right direction.



3) Using the ST, measure the height “A” from the ST end face to the thrust bearing catch surface of the transfer clutch assembly.
ST 499575500 GAUGE



4) Using the ST, measure the height “B” from the transmission case mating surface to the end of ST.
ST 499575500 GAUGE



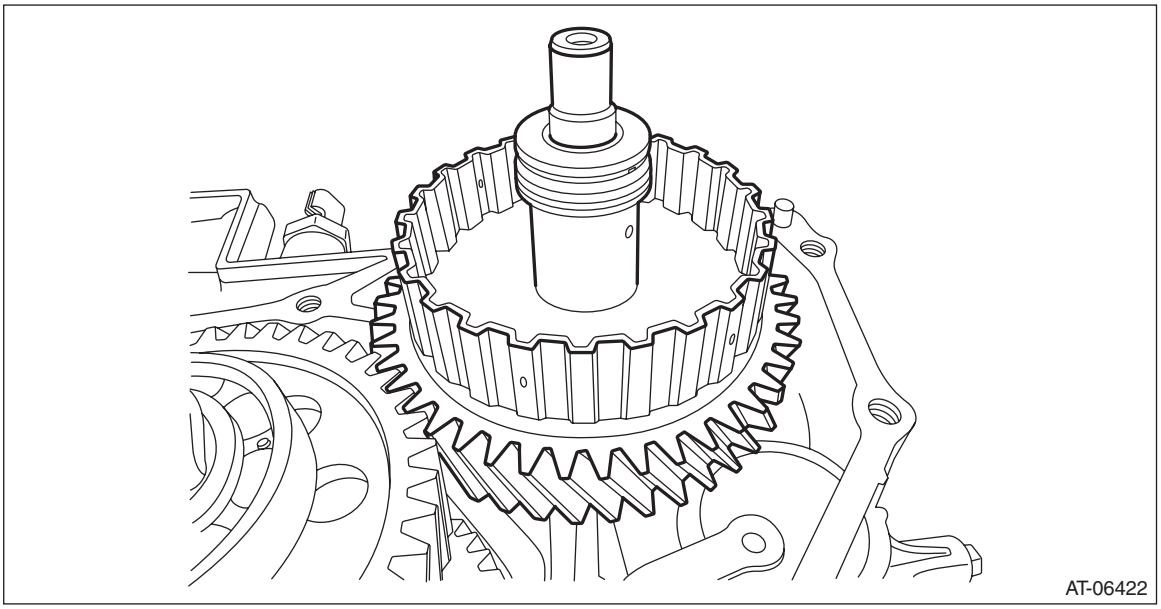
5) Obtain the thickness of transfer driven gear shim using the following formula to select one to three transfer driven gear shims.
T (mm) = A – B – (0.05 — 0.25)
[T (in) = A – B – (0.002 — 0.01)]
T: Transfer driven gear shim thickness
A: Height from the ST end face to the transfer clutch assembly thrust bearing catch surface
B: Height from the mating surface of the transmission case to the end of the ST
0.05 — 0.25 mm (0.002 — 0.01 in): Clearance

Transfer driven gear shim	
Part No.	Thickness mm (in)
33280AA030	0.3 (0.012)
33280AA040	0.4 (0.016)
33280AA050	0.5 (0.020)

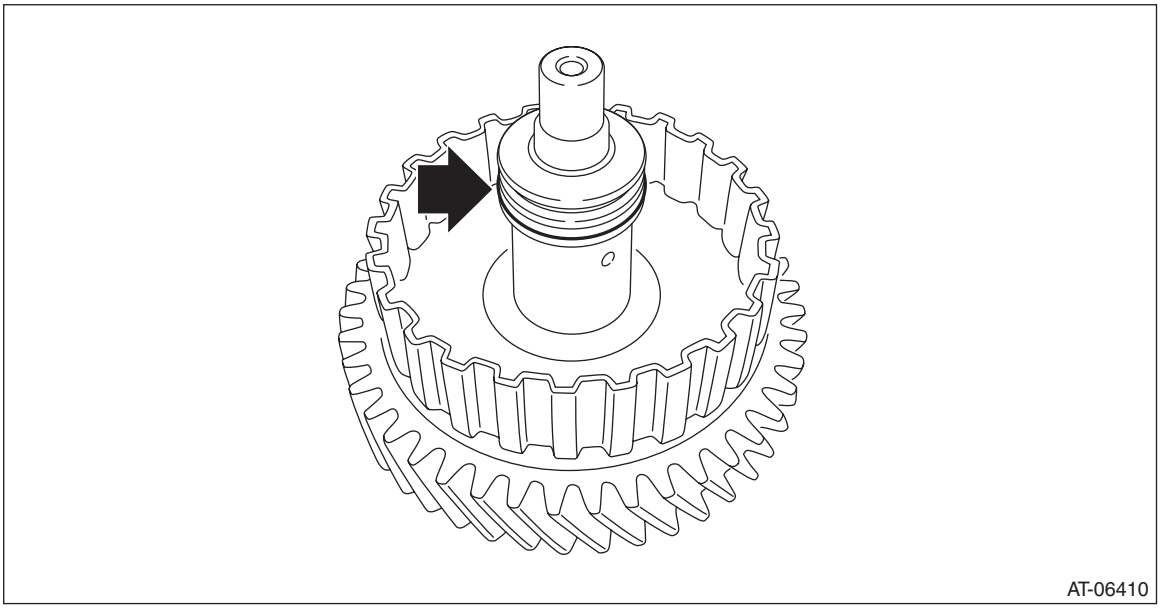
30.Transfer Driven Gear

A: REMOVAL

1) Remove the transmission assembly from the vehicle. <Ref. to CVT-58, REMOVAL, Automatic Transmission Assembly.>
2) Remove the extension case. <Ref. to CVT-156, REMOVAL, Extension Case.>
3) Remove the transfer clutch assembly. <Ref. to CVT-160, REMOVAL, Transfer Clutch.>
4) Remove the transfer driven gear assembly.

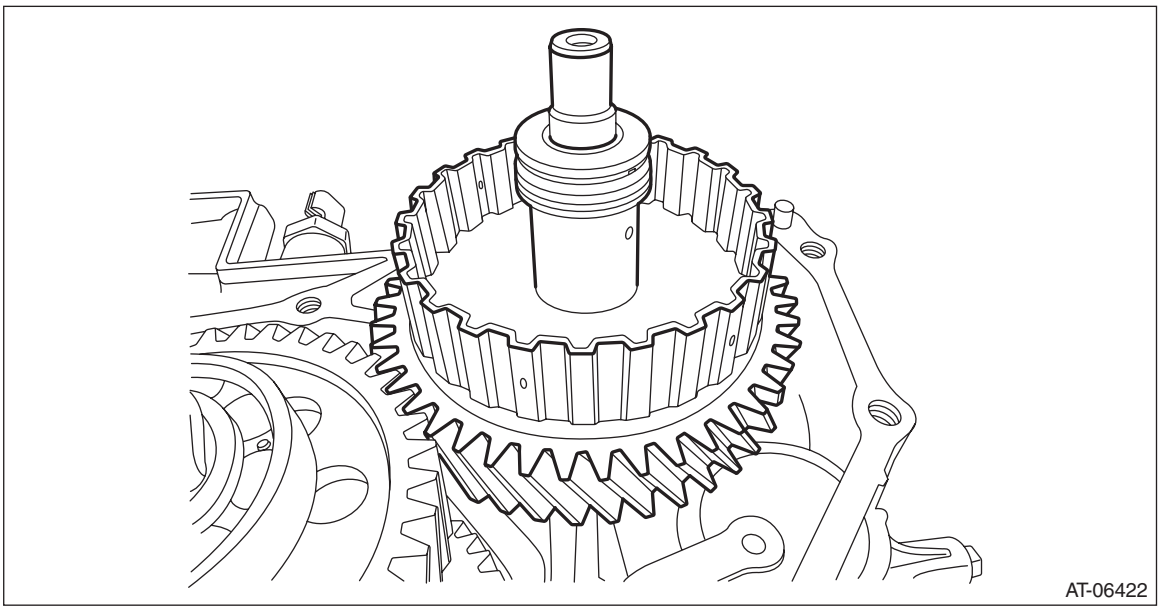


5) Remove the seal ring from the transfer driven gear assembly.



B: INSTALLATION

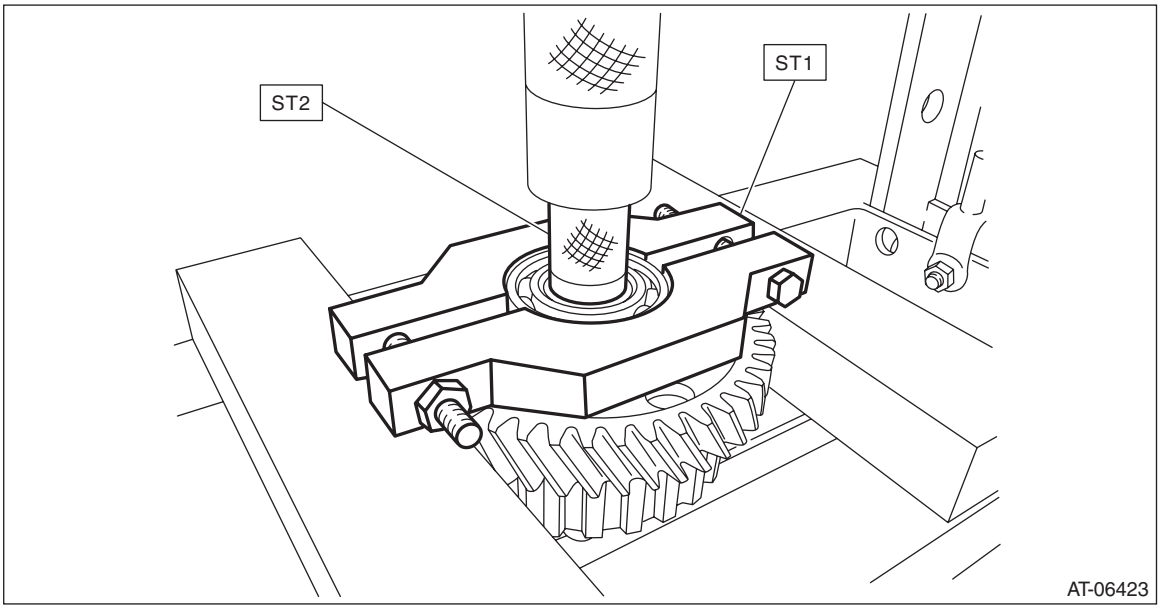
1) Install the transfer driven gear assembly.



2) Install the transfer clutch assembly. <Ref. to CVT-162, INSTALLATION, Transfer Clutch.>
3) Select the transfer driven gear shim. <Ref. to CVT-171, ADJUSTMENT, Transfer Clutch.>
4) Install the extension case. <Ref. to CVT-157, INSTALLATION, Extension Case.>
5) Install the transmission assembly to the vehicle. <Ref. to CVT-69, INSTALLATION, Automatic Transmission Assembly.>

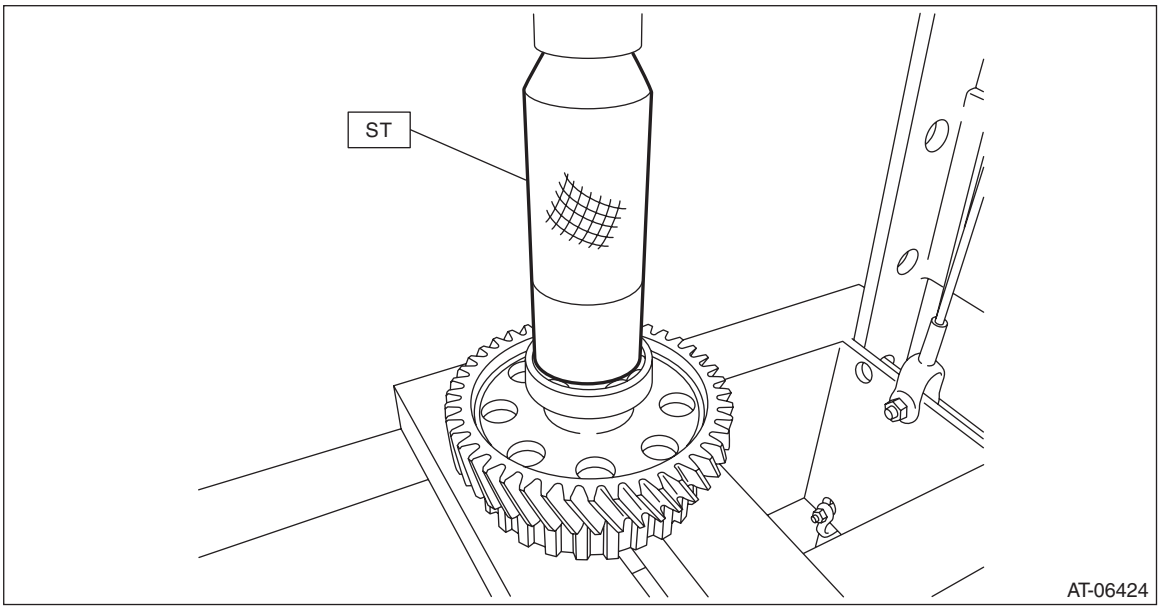
C: DISASSEMBLY

1) Remove the ball bearing using ST.
ST1 498077400 BEARING REMOVER
ST2 899864100 REMOVER



D: ASSEMBLY

1) Using the ST, install the ball bearing.
ST 899580100 INSTALLER



E: INSPECTION

- Check the ball bearing for smooth rotation.
- Check the ball bearing for excessive looseness.
- Check the transfer driven gear for breakage or damage.

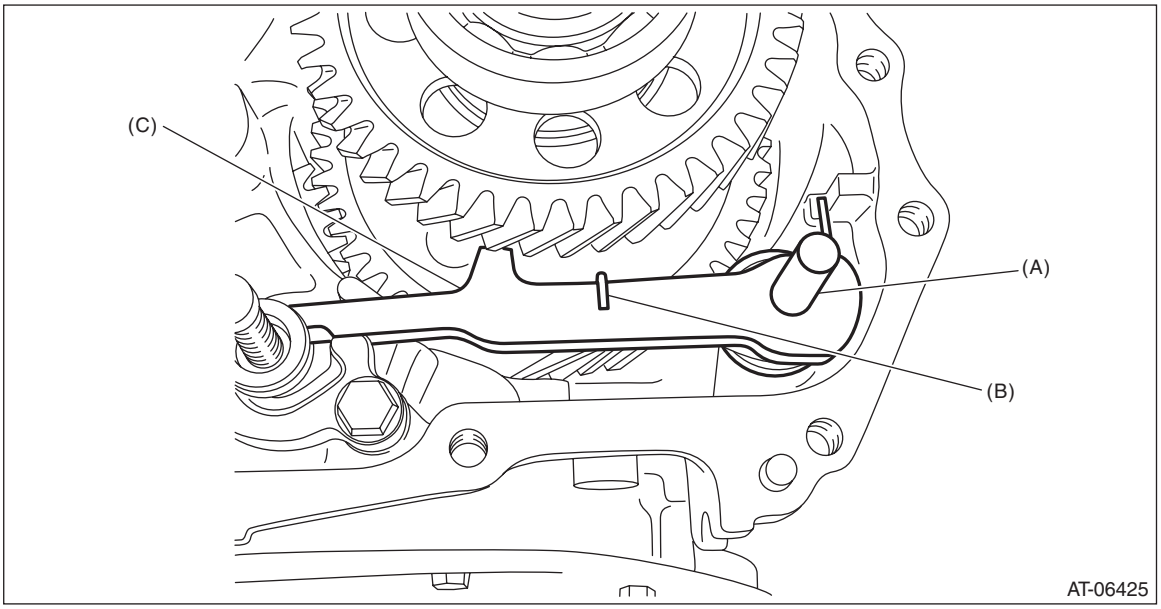
F: ADJUSTMENT

NOTE:
When the transfer driven gear or bearing is replaced, select the transfer driven gear shim. <Ref. to CVT-171, ADJUSTMENT, Transfer Clutch.>

31.Parking Pawl

A: REMOVAL

1) Remove the transmission assembly from the vehicle. <Ref. to CVT-58, REMOVAL, Automatic Transmission Assembly.>
2) Shift the range select lever to “N” range.
3) Remove the extension case. <Ref. to CVT-156, REMOVAL, Extension Case.>
4) Remove the parking pawl shaft, return spring and parking pawl.

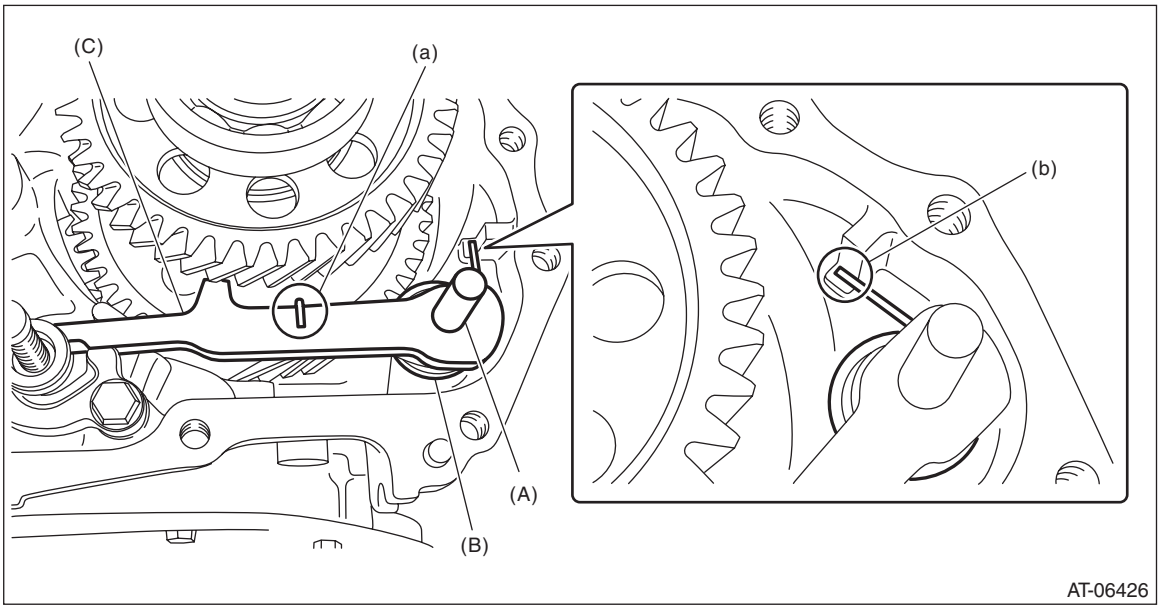


(A) Parking pawl shaft
(B) Return spring
(C) Parking pawl

B: INSTALLATION

1) Set the range select lever to the “N” range.
2) Install the parking pawl shaft, return spring and parking pawl.

NOTE:
Make sure that the end of return spring sticks out of parking pawl as shown in (a). Make sure that the other end contacts the rib of transmission case as shown in (b).



(A) Parking pawl shaft
(B) Return spring
(C) Parking pawl

3) Install the extension case. <Ref. to CVT-157, INSTALLATION, Extension Case.>
4) Install the transmission assembly to the vehicle. <Ref. to CVT-69, INSTALLATION, Automatic Transmission Assembly.>

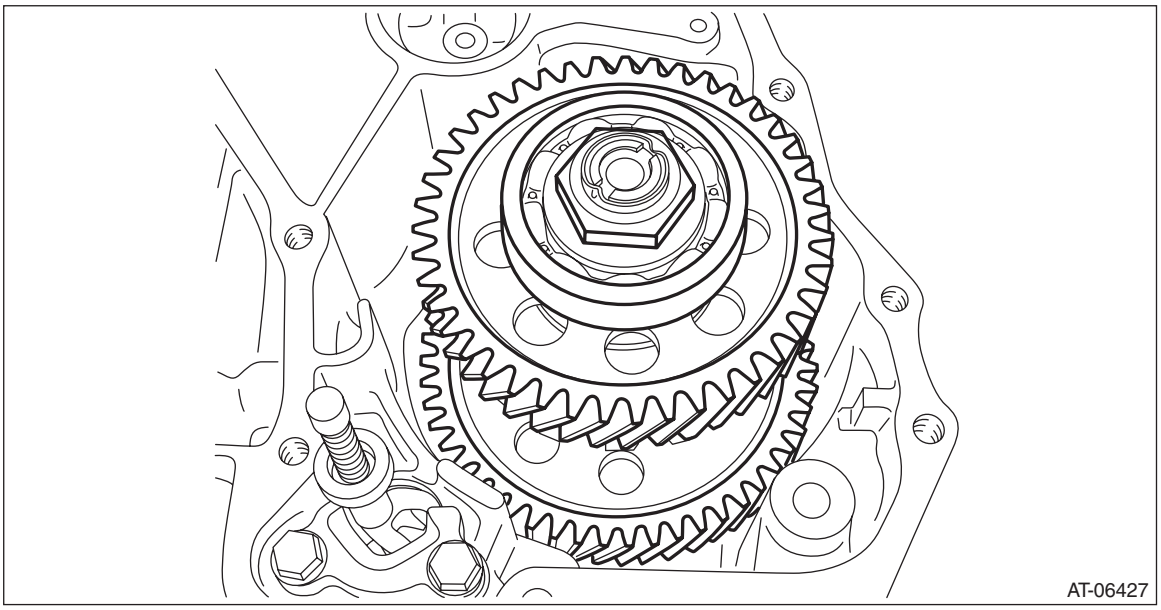
C: INSPECTION

- Check the parking pawl for breakage or damage.
- Check for worn, broken and/or damaged return spring.

32.Reduction Driven Gear

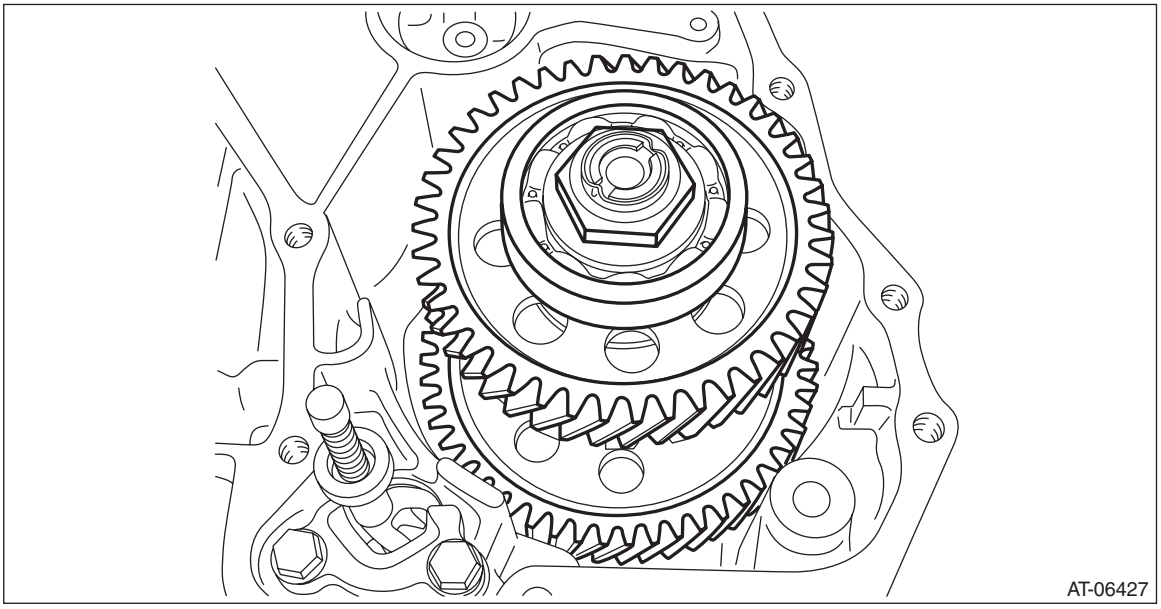
A: REMOVAL

1) Remove the transmission assembly from the vehicle. <Ref. to CVT-58, REMOVAL, Automatic Transmission Assembly.>
2) Remove the extension case. <Ref. to CVT-156, REMOVAL, Extension Case.>
3) Remove the transfer clutch assembly. <Ref. to CVT-160, REMOVAL, Transfer Clutch.>
4) Remove the transfer driven gear assembly. <Ref. to CVT-174, REMOVAL, Transfer Driven Gear.>
5) Remove the parking pawl. <Ref. to CVT-177, REMOVAL, Parking Pawl.>
6) Remove the reduction driven gear assembly.



B: INSTALLATION

1) Install the reduction driven gear assembly.

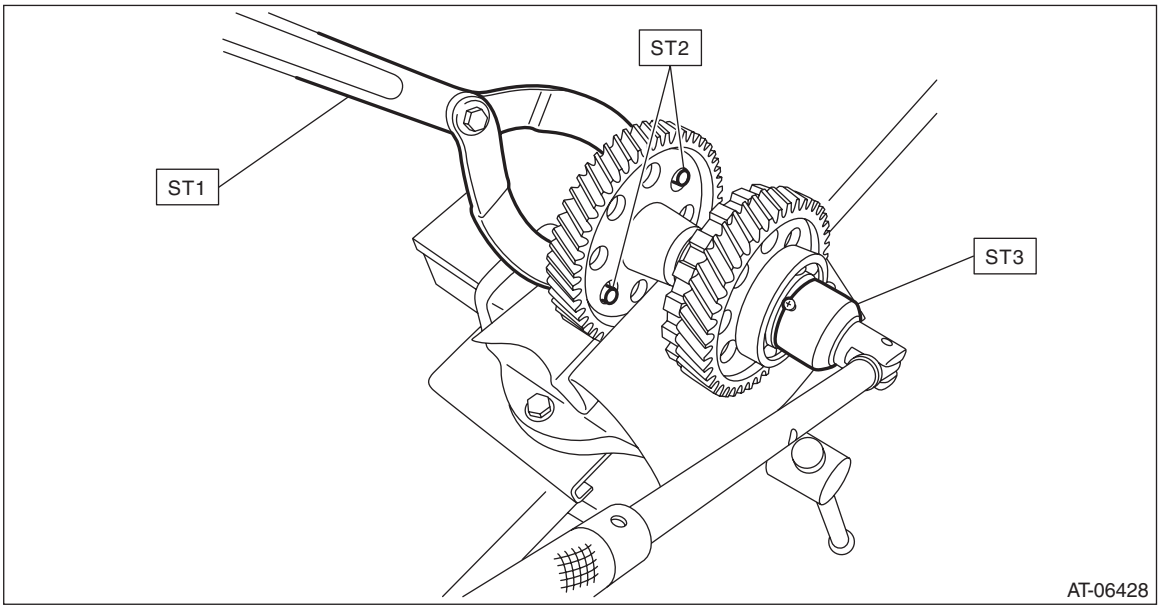


2) Select the transfer drive gear shim. <Ref. to CVT-211, ADJUSTMENT, Reduction Drive Gear.>
3) Install the parking pawl. <Ref. to CVT-178, INSTALLATION, Parking Pawl.>
4) Attach the selected transfer drive gear shim to extension case with vaseline.
5) Install the transfer driven gear assembly. <Ref. to CVT-175, INSTALLATION, Transfer Driven Gear.>
6) Install the transfer clutch assembly. <Ref. to CVT-162, INSTALLATION, Transfer Clutch.>

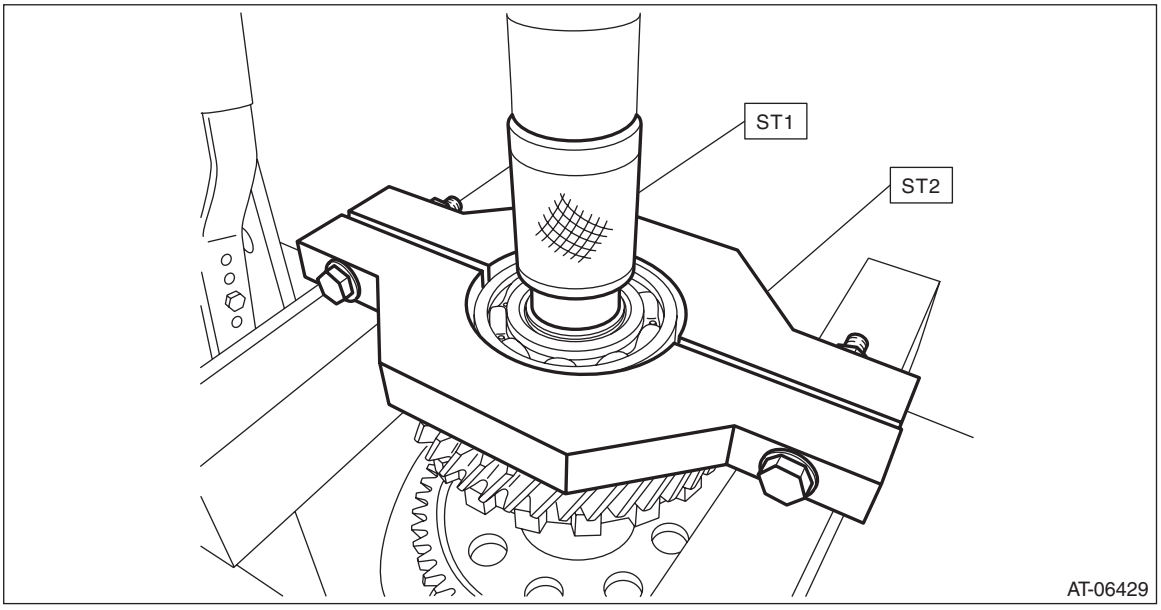
7) Install the extension case. <Ref. to CVT-157, INSTALLATION, Extension Case.>
8) Install the transmission assembly to the vehicle. <Ref. to CVT-69, INSTALLATION, Automatic Transmission Assembly.>

C: DISASSEMBLY

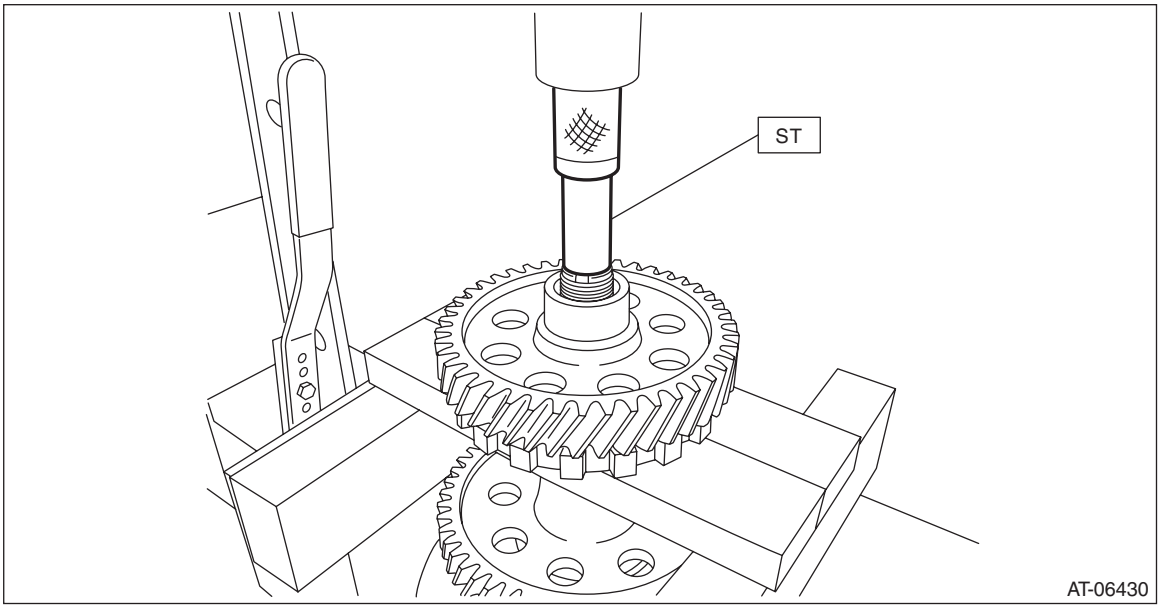
1) Flatten the tab of the lock nut.
2) Using the ST, counter the rotation of the reduction driven gear assembly, and remove the lock nut.
ST1 18355AA000 PULLEY WRENCH
ST2 18334AA000 PIN SET
ST3 499987003 SOCKET WRENCH (35)



3) Remove the ball bearing using ST.
ST1 499757002 INSTALLER
ST2 498077300 REMOVER

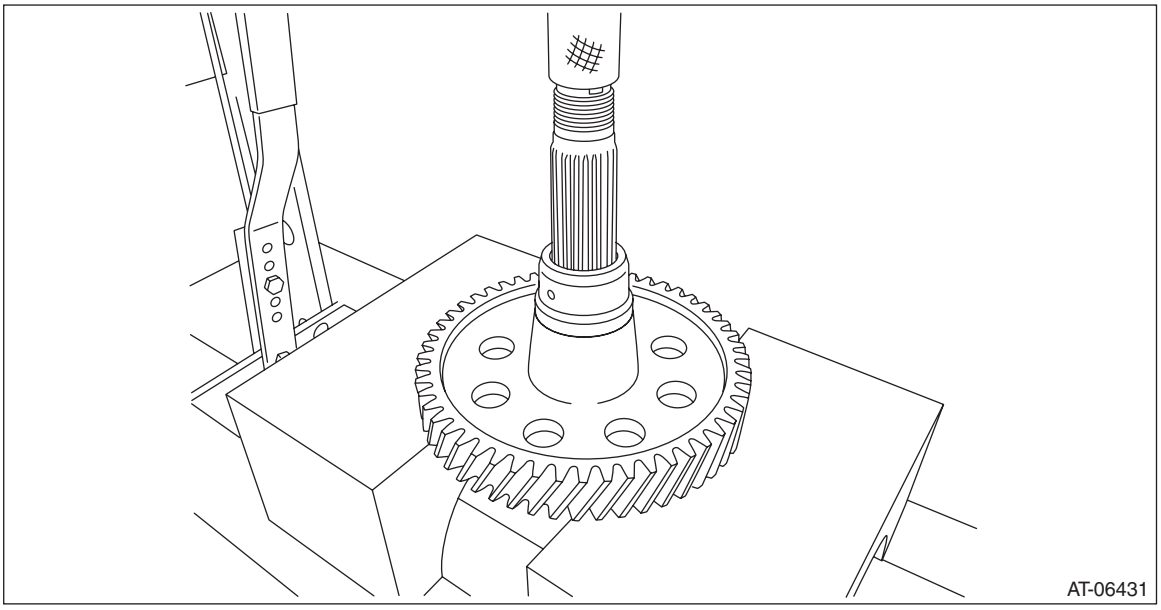


4) Using the ST, remove the parking gear and transfer drive gear.
ST 899864100 REMOVER



5) Remove the collar.

NOTE:
Reduction driven gear should be replaced by a reduction driven gear COMPL as a whole.

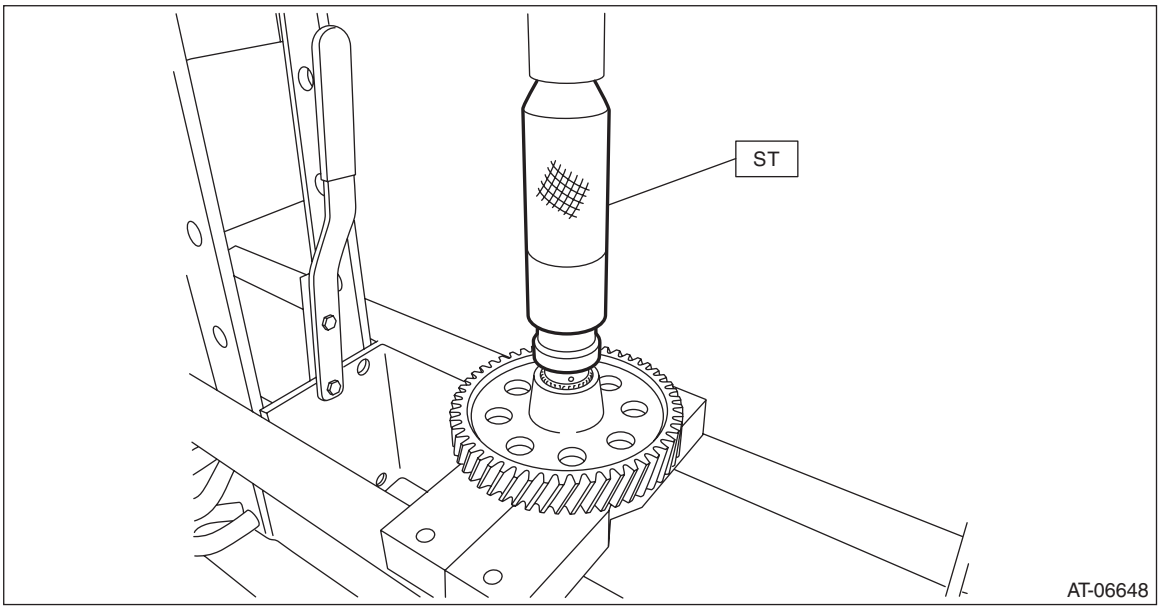


D: ASSEMBLY

1) Using the ST, attach the collar.

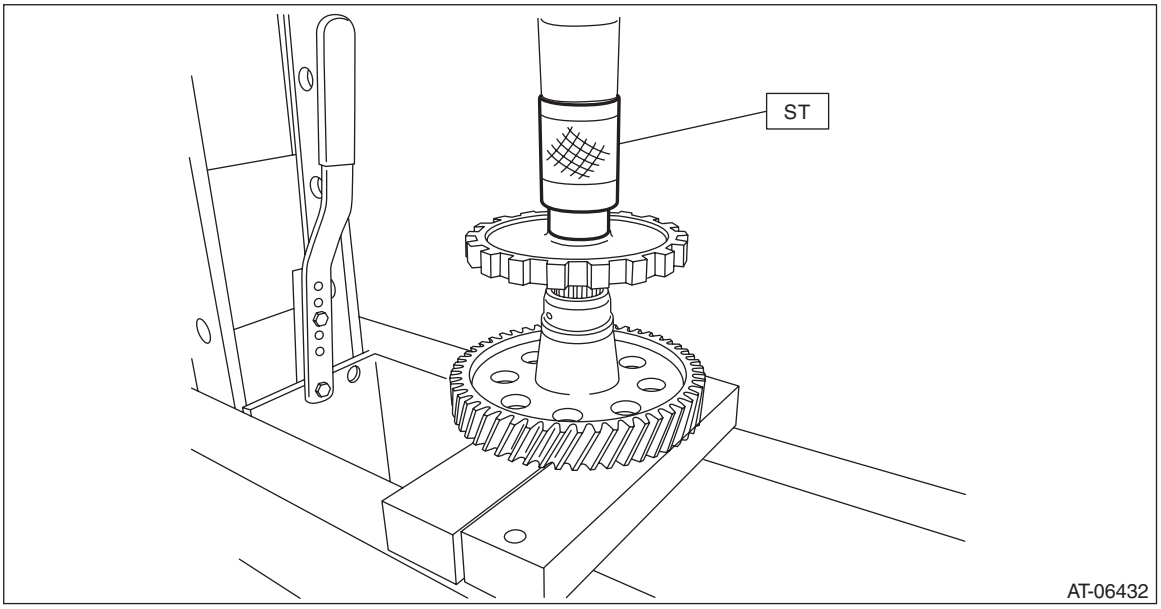
NOTE:
- Attach the collar in the correct direction.
- Use a new reduction driven gear COMPL.

ST 899580100 INSTALLER

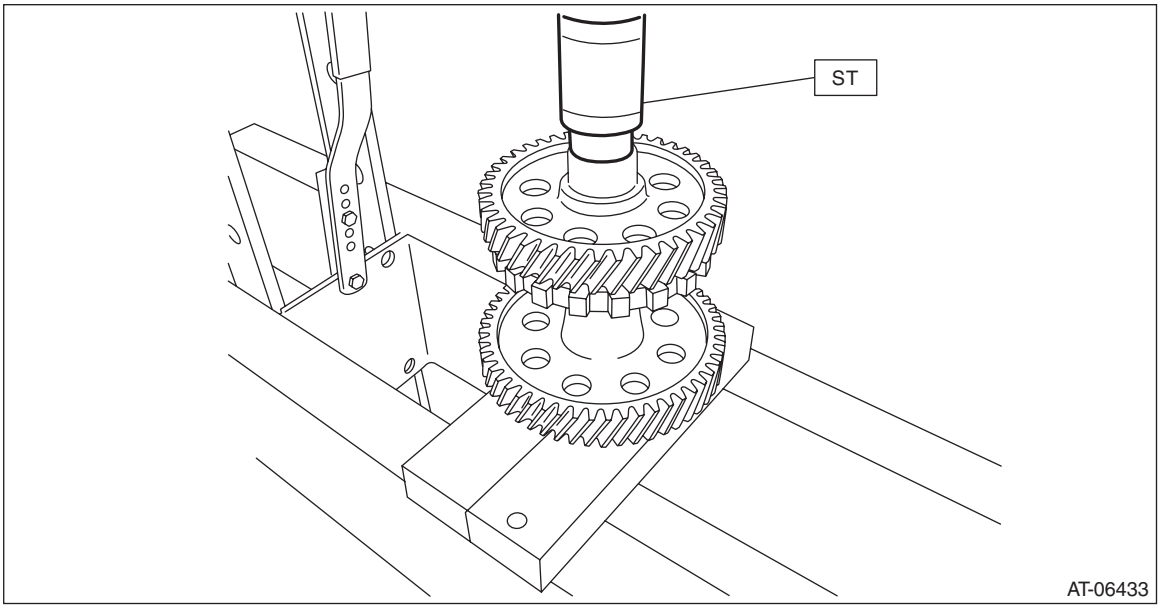


2) Using the ST, install the parking gear.

ST 499757002 INSTALLER

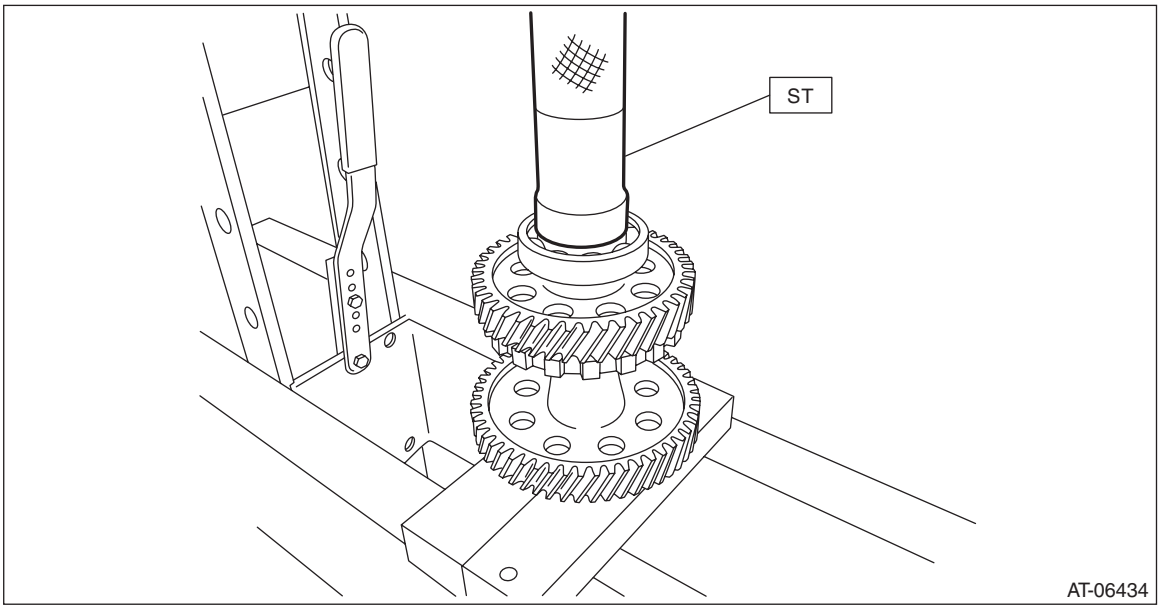


3) Using the ST, install the transfer drive gear.
ST 499757002 INSTALLER



4) Using the ST, install the ball bearing.

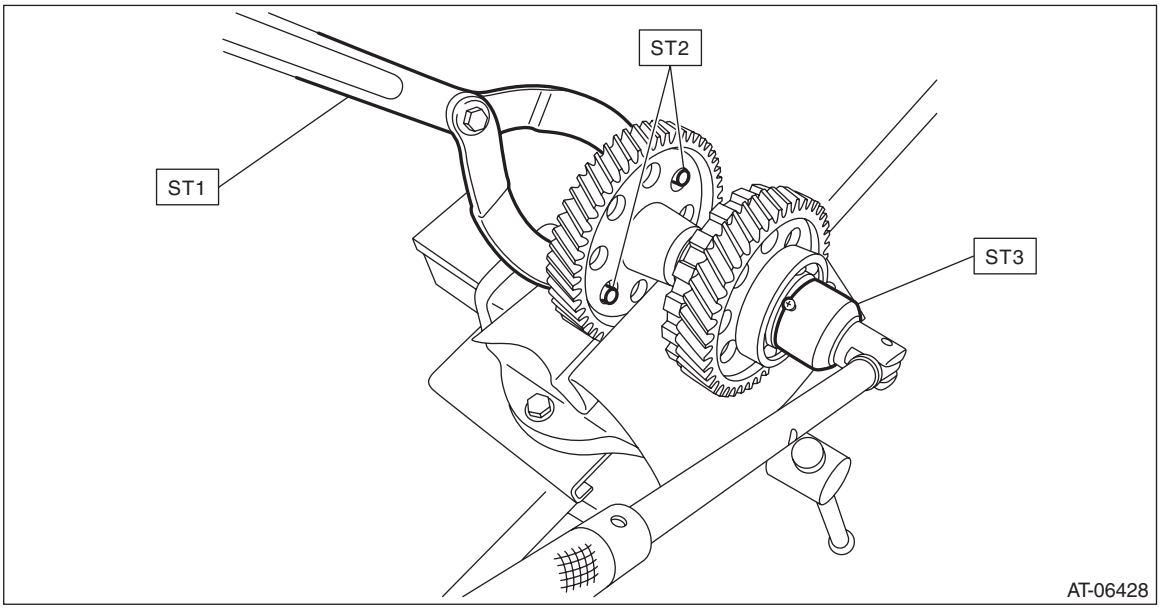
NOTE:
Use a new ball bearing.
ST 499277100 BUSHING 1-2 INSTALLER



5) Using the ST, counter the rotation of the reduction drive gear assembly, and install the lock nut.

NOTE:
Use a new lock nut.
ST1 18355AA000 PULLEY WRENCH
ST2 18334AA000 PIN SET
ST3 499987003 SOCKET WRENCH (35)

Tightening torque:
95 N·m (9.7 kgf-m, 70.1 ft-lb)



6) Crimp the lock nut in 4 locations.

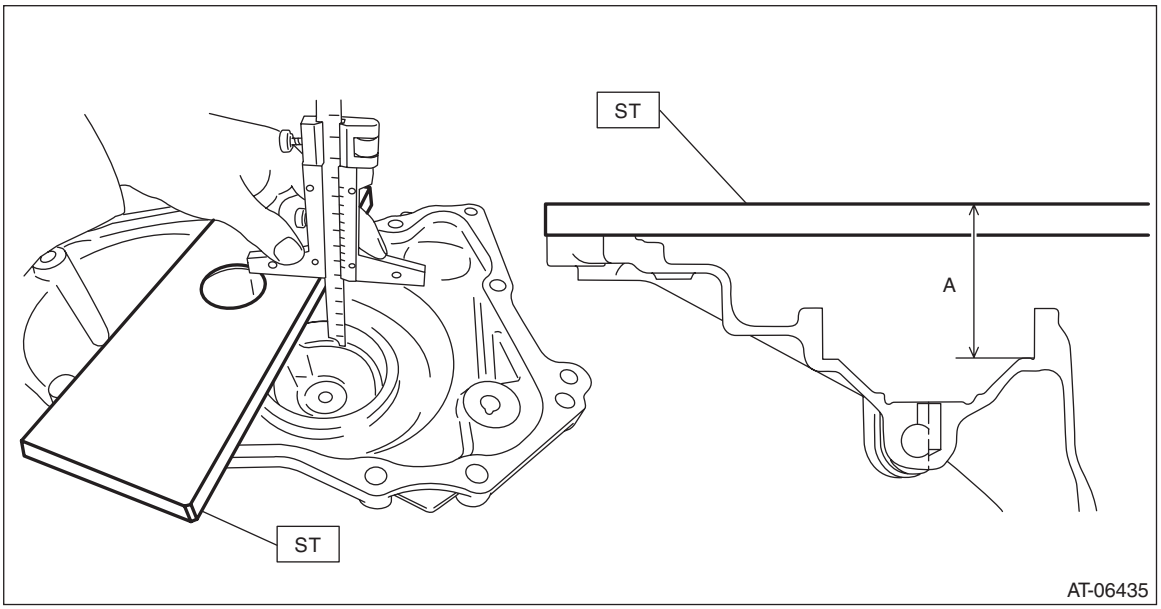
CAUTION:
Do not allow the lock nut to be cracked during crimping operation.

E: INSPECTION

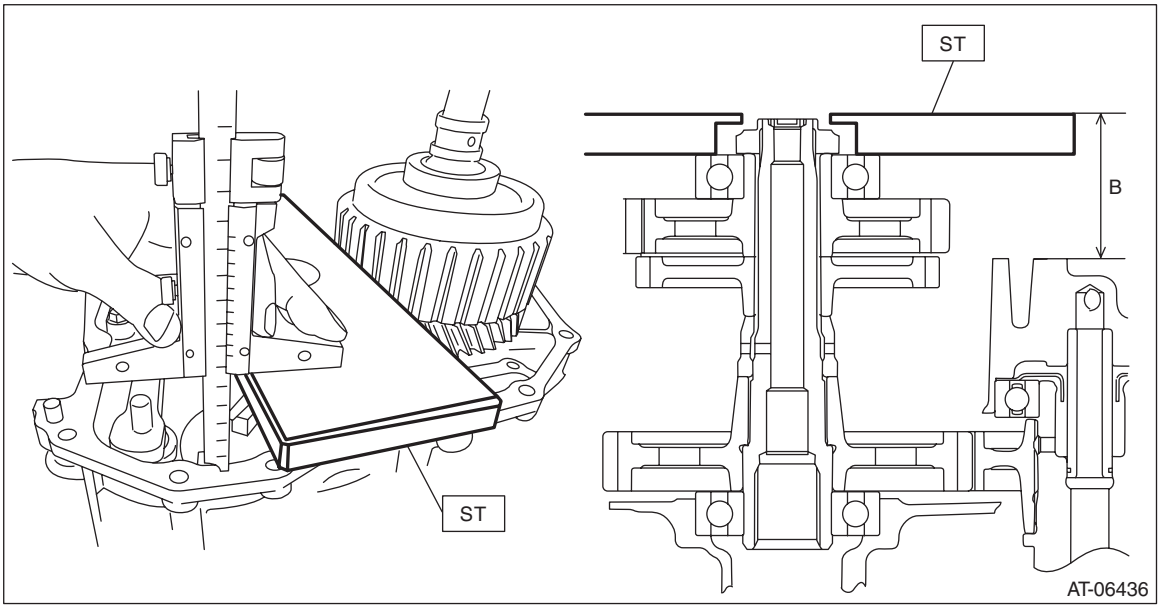
- Check the ball bearing for smooth rotation.
- Check the ball bearing for excessive looseness.
- Make sure each gear is not broken or damaged.

F: ADJUSTMENT

1) Measure the height “A” from the ST upper face to the ball bearing catch surface.
ST 499575600 GAUGE



2) Measure the height “B” from the ST to the mating surface of the transmission case.
ST 499575600 GAUGE



3) Obtain the thickness of transfer drive gear shim using the following formula to select one to three transfer drive gear shims.
T (mm) = A – B – (0.05 — 0.25)
[T (in) = A – B – (0.002 — 0.01)]
T: Shim thickness
A: Height from the ST upper face to the ball bearing catch surface
B: Height from ST to transmission case mating surface
0.05 — 0.25 mm (0.002 — 0.01 in): Clearance

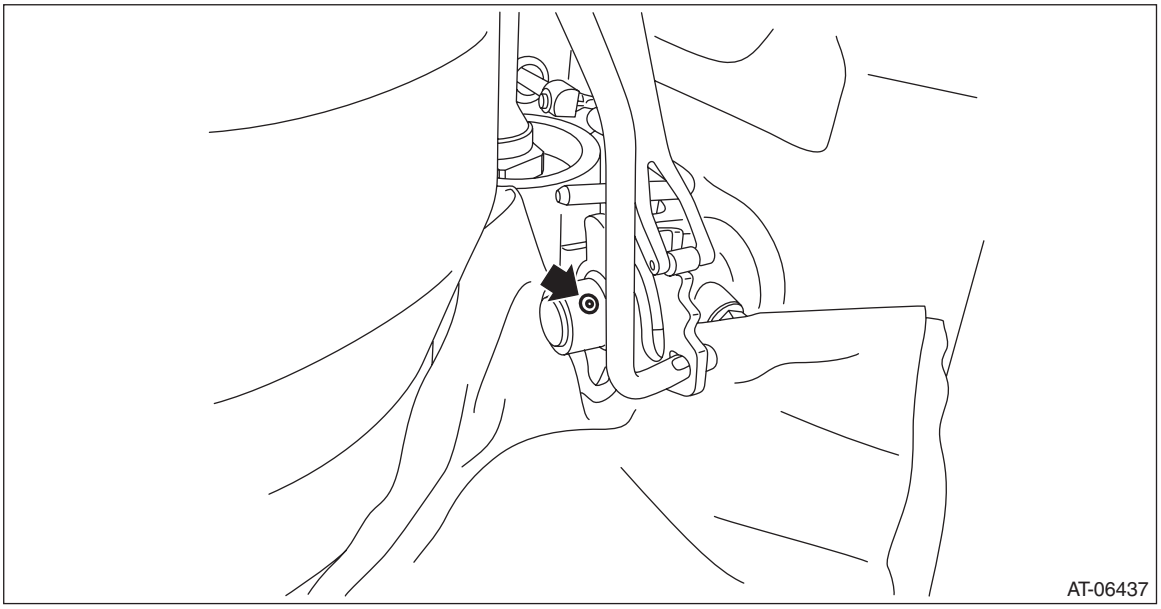
Transfer drive gear shim	
Part No.	Thickness mm (in)
33279AA090	0.3 (0.012)
33279AA100	0.4 (0.016)
33279AA110	0.5 (0.020)

33.Transmission Control Device

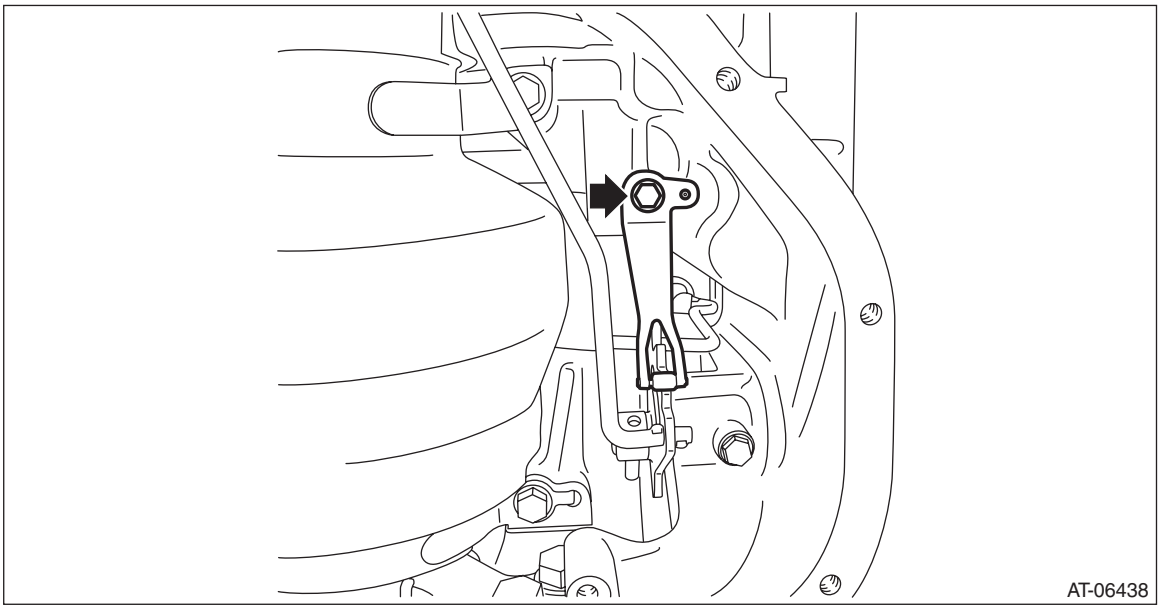
A: REMOVAL

1) Remove the transmission assembly from the vehicle. <Ref. to CVT-58, REMOVAL, Automatic Transmission Assembly.>
2) Remove the inhibitor switch. <Ref. to CVT-94, REMOVAL, Inhibitor Switch.>
3) Remove the oil pan and oil strainer. <Ref. to CVT-108, REMOVAL, Oil Pan and Strainer.>
4) Shift the manual plate to “N” range, and remove the spring pin.

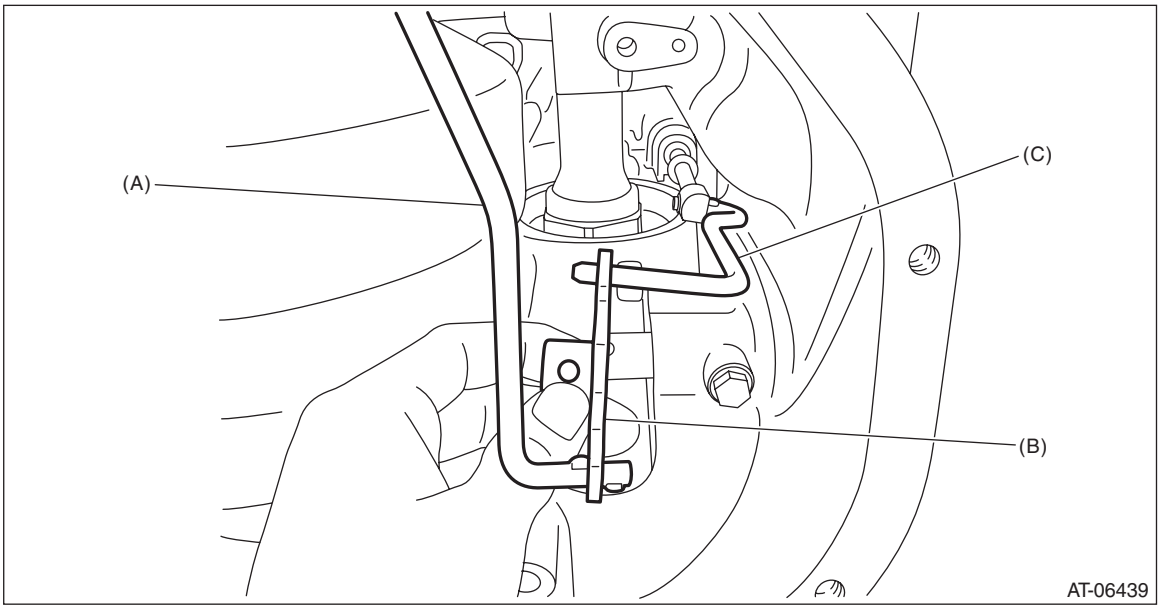
NOTE:
Prevent the spring pin from dropping in the transmission using paper towel etc.



5) Remove the detent spring.



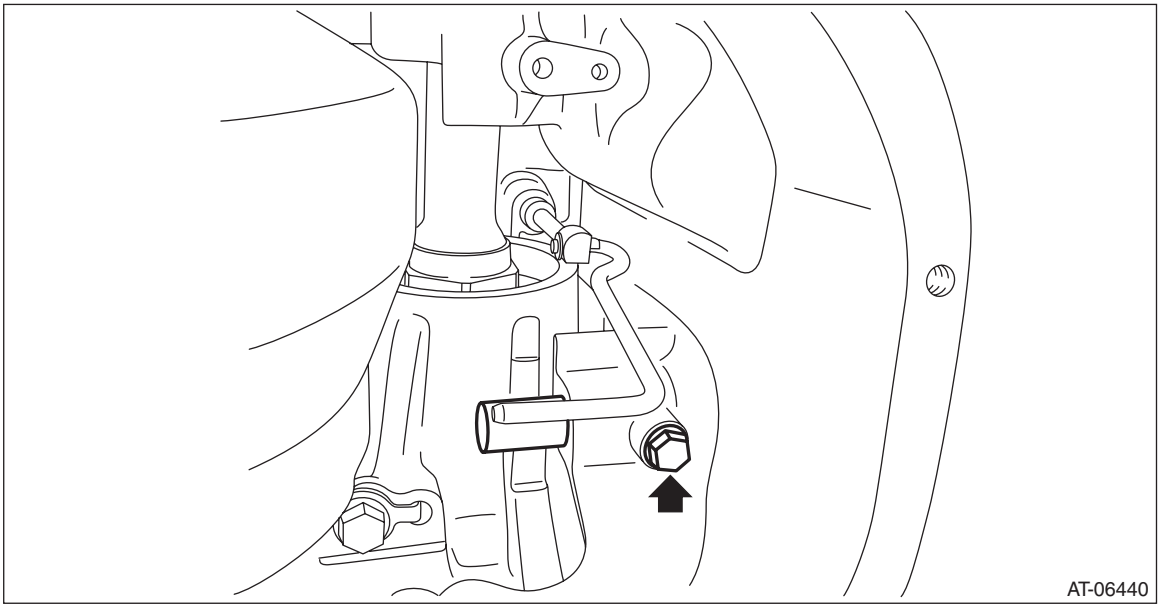
6) Remove the manual plate from the shifter arm shaft, and remove the shift connecting rod of the manual valve.



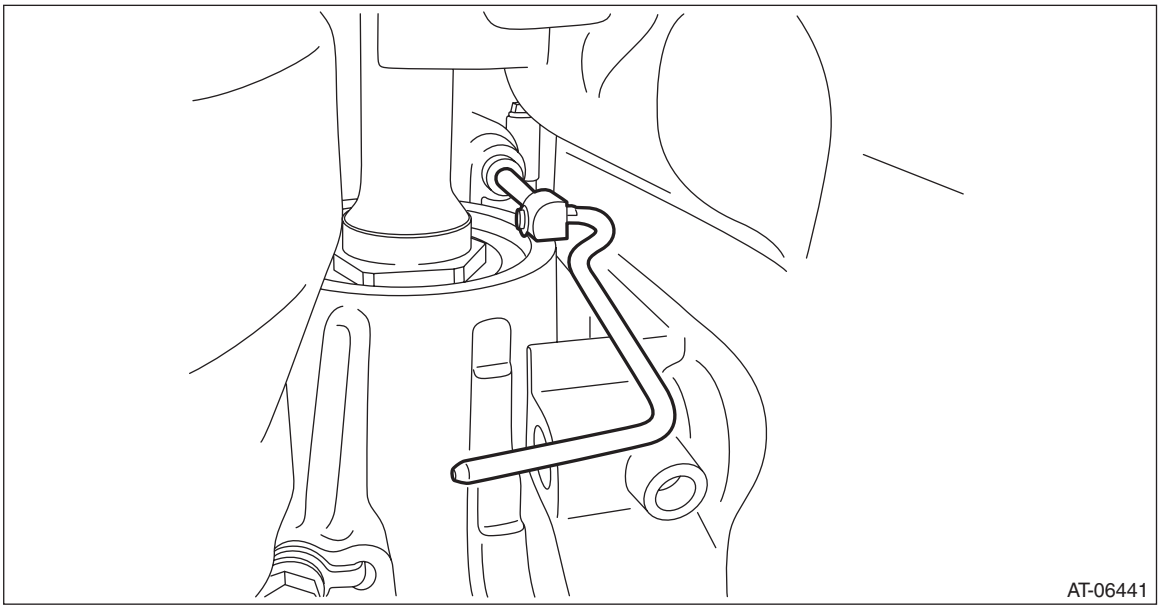
(A) Parking rod
(B) Manual plate
(C) Shift connecting rod

7) Remove the manual plate and parking rod.
8) Remove the bolt, and remove the shifter arm shaft.

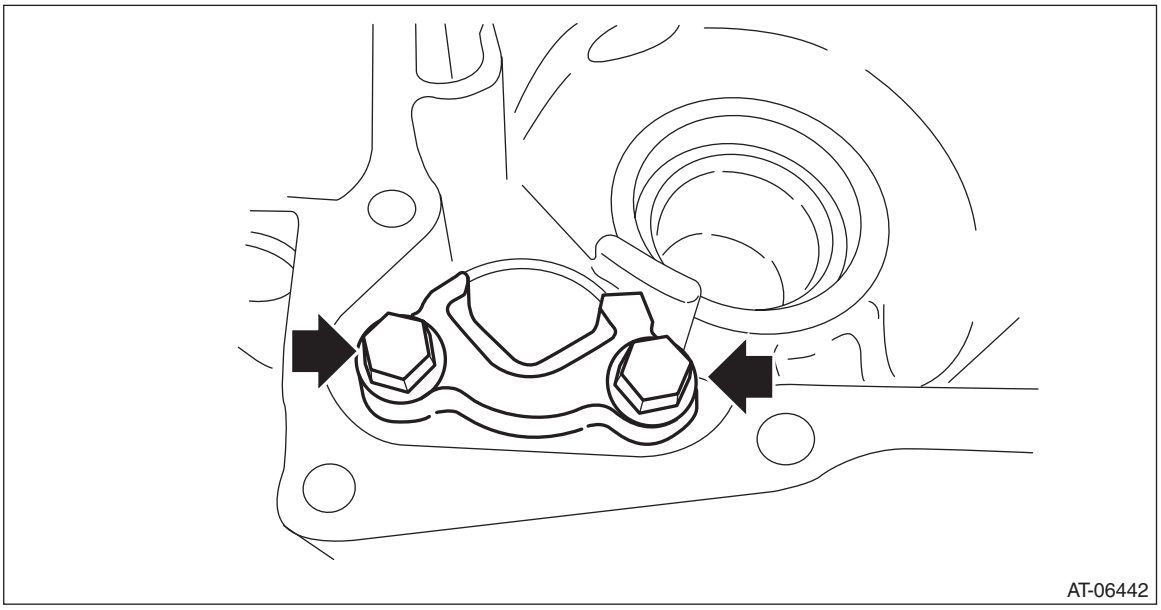
NOTE:
Do not damage the lip of oil seal press-fitted in the case.



9) Remove the manual valve.



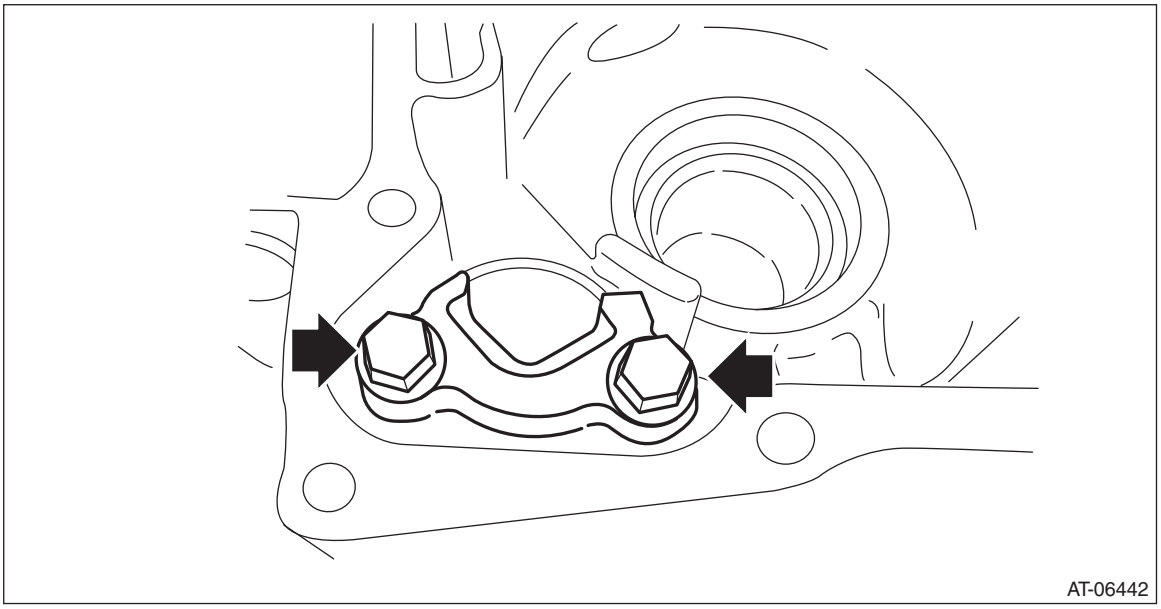
10) Remove the extension case. <Ref. to CVT-156, REMOVAL, Extension Case.>
11) Remove the parking support.



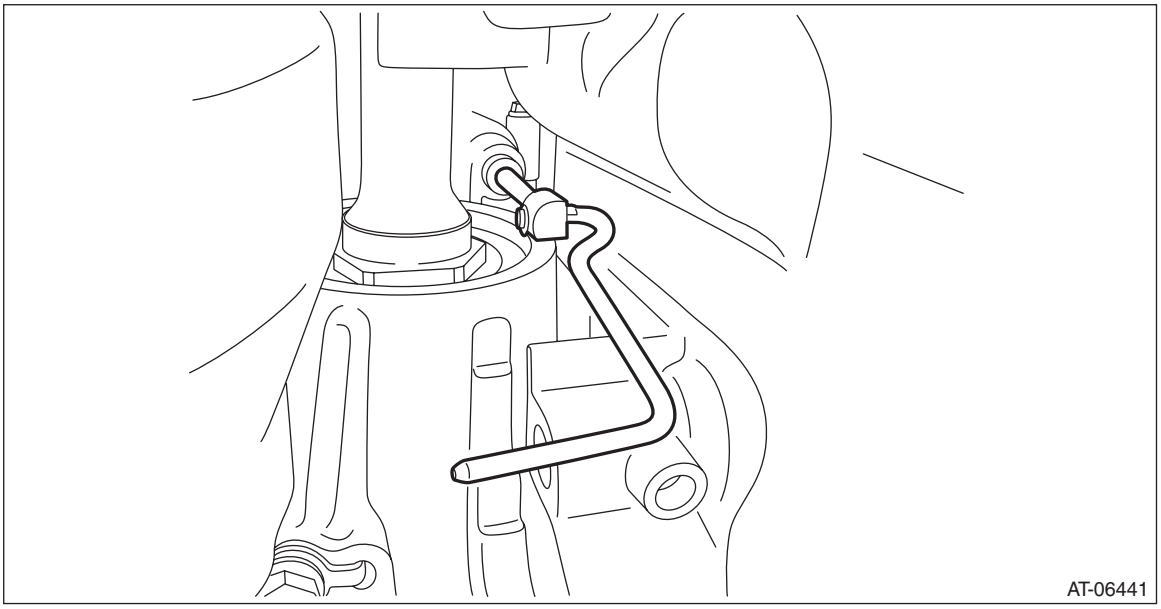
B: INSTALLATION

1) Install the parking support.

Tightening torque:
25 N·m (2.5 kgf-m, 18.4 ft-lb)



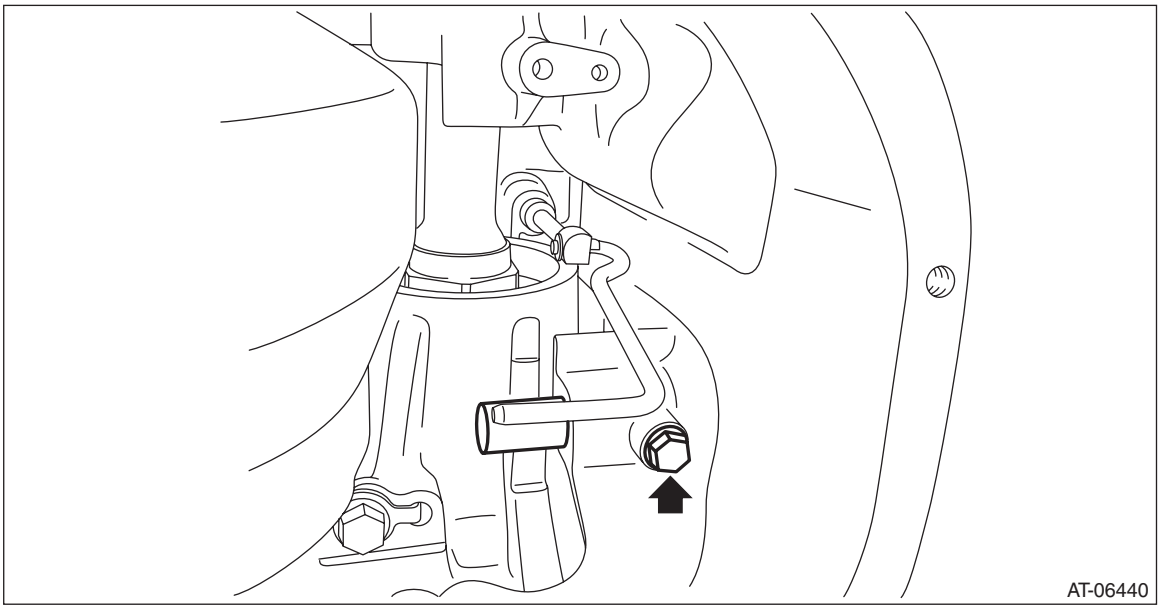
2) Install the extension case. <Ref. to CVT-157, INSTALLATION, Extension Case.>
3) Install the manual valve.



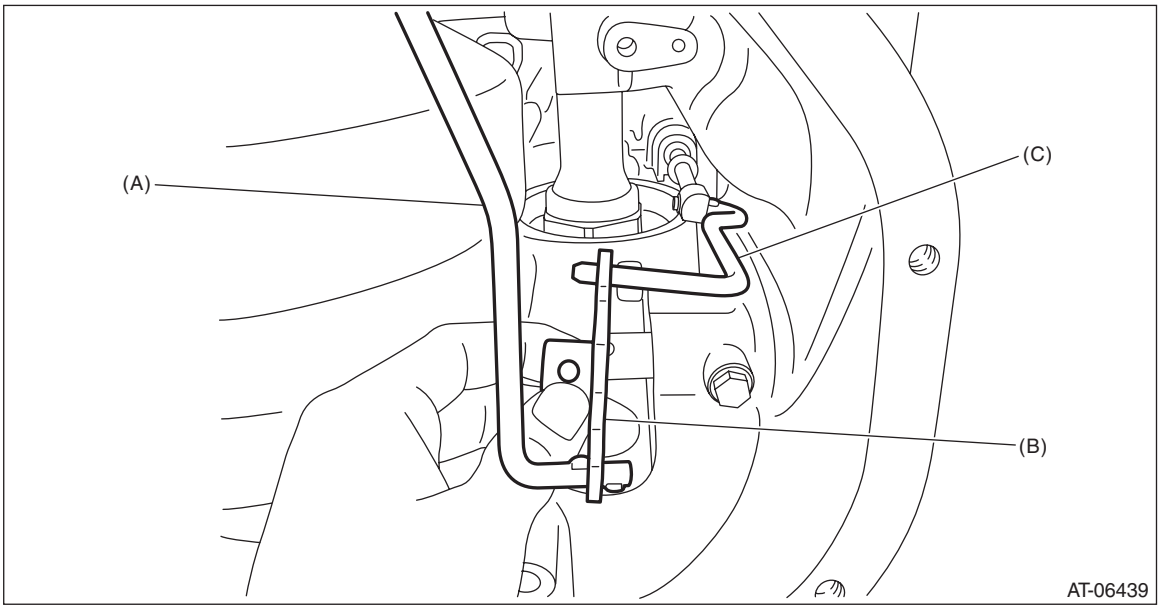
4) Install the shifter arm shaft and bolt.

NOTE:
Do not damage the lip of oil seal press-fitted in the case.

Tightening torque:
7 N·m (0.7 kgf-m, 5.2 ft-lb)



5) Install the parking rod to the manual plate.
6) Insert the parking rod into the transmission case, and install the shift connecting rod of the manual valve to the manual plate.

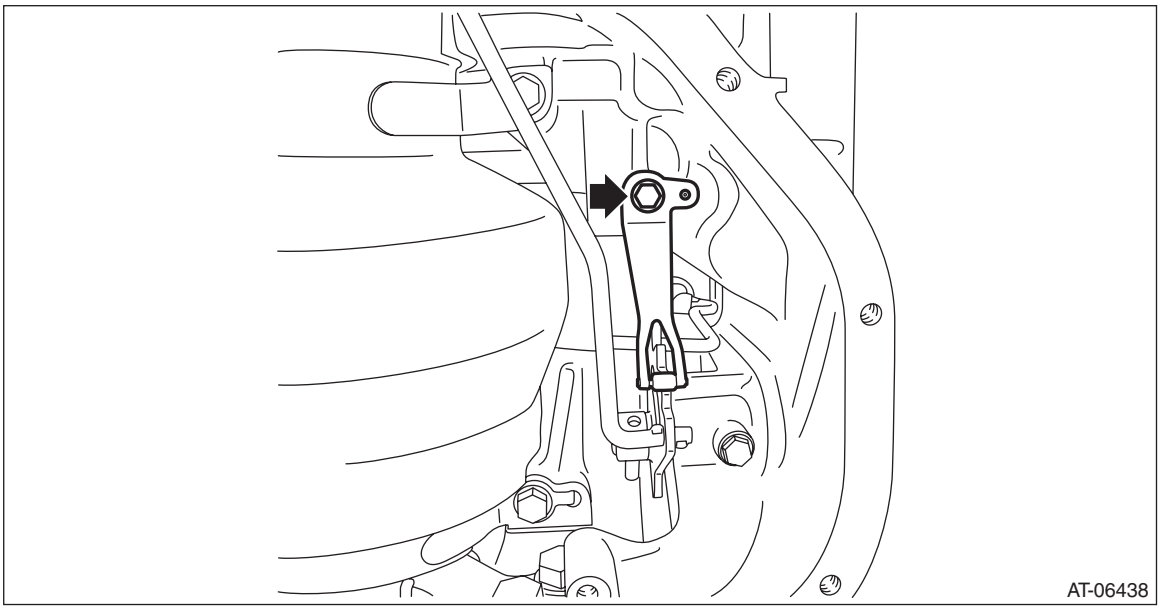


(A) Parking rod
(B) Manual plate
(C) Shift connecting rod

7) Install the manual plate to the shifter arm shaft.

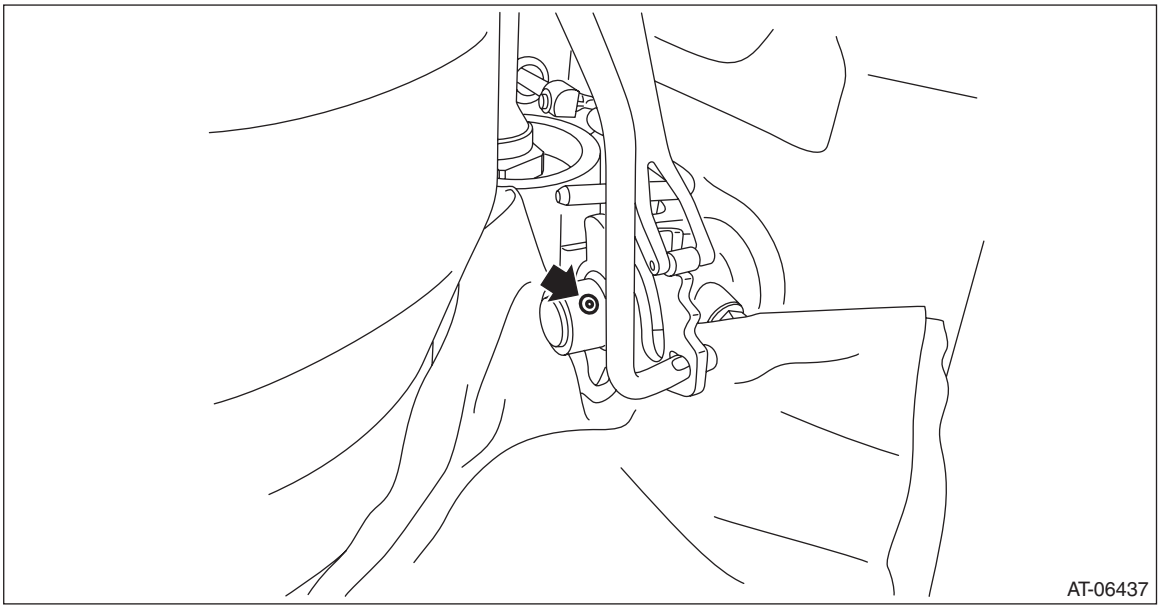
8) Install the detent spring to the transmission case.

Tightening torque:
7 N·m (0.7 kgf-m, 5.2 ft-lb)



9) Install the spring pin.

NOTE:
Use new spring pin.



10) Install the inhibitor switch. <Ref. to CVT-96, INSTALLATION, Inhibitor Switch.>
11) Adjust the inhibitor switch. <Ref. to CVT-94, ADJUSTMENT, Inhibitor Switch.>
12) Install the oil strainer and oil pan. <Ref. to CVT-109, INSTALLATION, Oil Pan and Strainer.>
13) Install the transmission assembly to the vehicle. <Ref. to CVT-69, INSTALLATION, Automatic Transmission Assembly.>

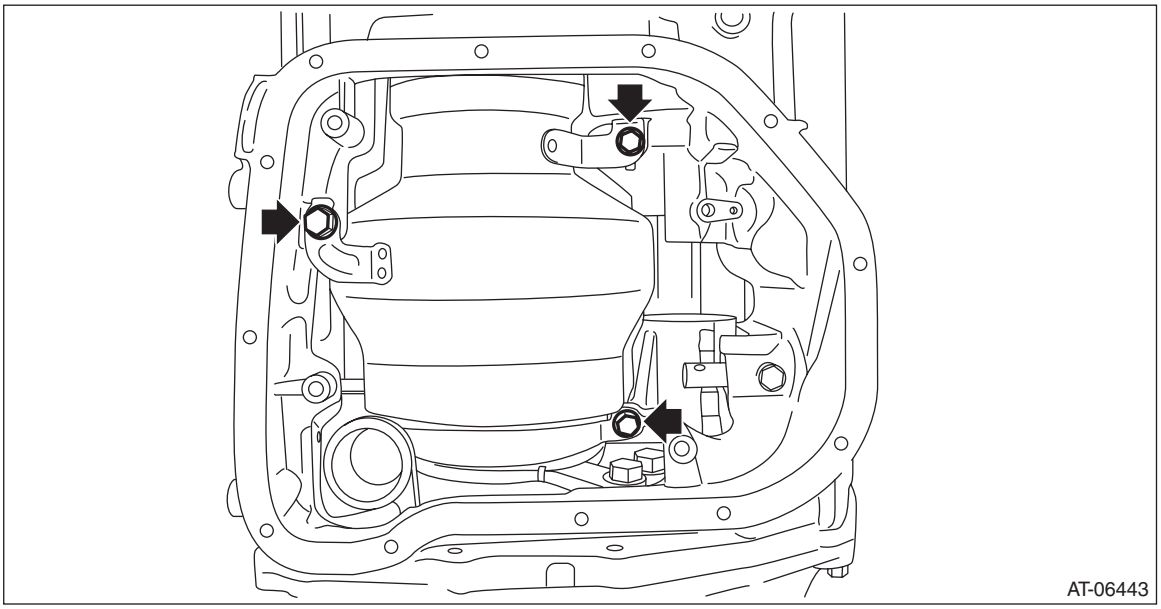
C: INSPECTION

Make sure that the manual plate and detent spring are not worn or otherwise damaged.

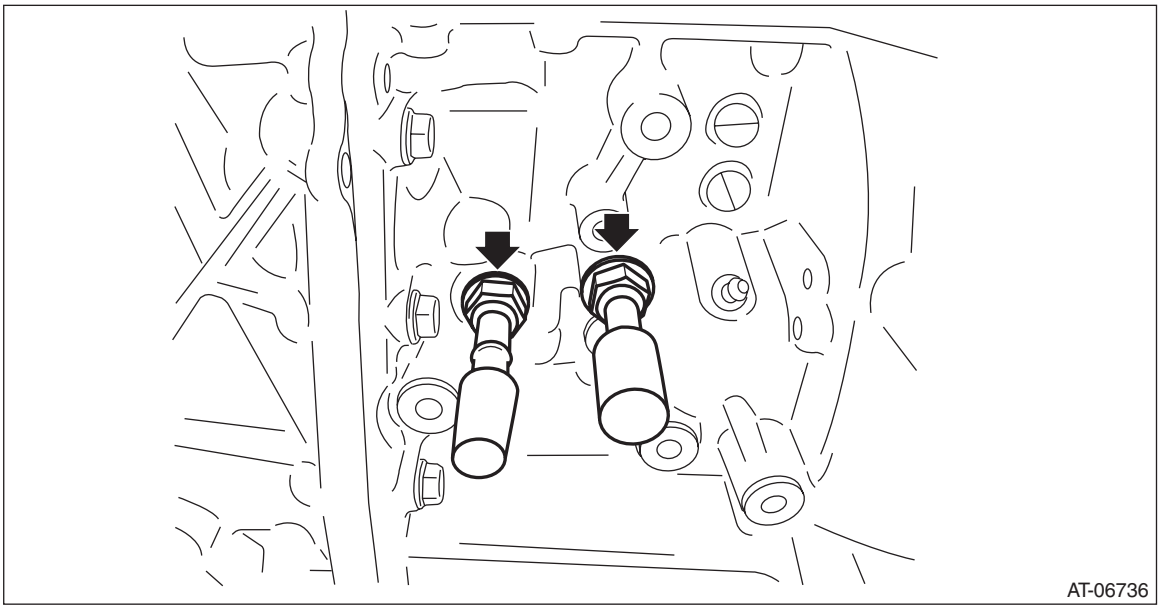
34.Transmission Case

A: REMOVAL

1) Remove the transmission assembly from the vehicle. <Ref. to CVT-58, REMOVAL, Automatic Transmission Assembly.>
2) Remove the air breather hose. <Ref. to CVT-148, REMOVAL, Air Breather Hose.>
3) Remove the control valve body. <Ref. to CVT-112, REMOVAL, Control Valve Body.>
4) Remove the transmission harness. <Ref. to CVT-124, REMOVAL, Transmission Harness.>
5) Remove the turbine speed sensor. <Ref. to CVT-99, REMOVAL, Turbine Speed Sensor.>
6) Remove the secondary speed sensor. <Ref. to CVT-101, REMOVAL, Secondary Speed Sensor.>
7) Remove the primary speed sensor. <Ref. to CVT-103, REMOVAL, Primary Speed Sensor.>
8) Remove the inhibitor switch. <Ref. to CVT-94, REMOVAL, Inhibitor Switch.>
9) Remove the extension case. <Ref. to CVT-156, REMOVAL, Extension Case.>
10) Remove the transfer clutch assembly. <Ref. to CVT-160, REMOVAL, Transfer Clutch.>
11) Remove the transfer driven gear assembly. <Ref. to CVT-174, REMOVAL, Transfer Driven Gear.>
12) Remove the parking pawl. <Ref. to CVT-177, REMOVAL, Parking Pawl.>
13) Remove the reduction driven gear assembly. <Ref. to CVT-179, REMOVAL, Reduction Driven Gear.>
14) Remove the oil pan and oil strainer. <Ref. to CVT-108, REMOVAL, Oil Pan and Strainer.>
15) Remove the transmission control device. <Ref. to CVT-187, REMOVAL, Transmission Control Device.>
16) Remove the oil baffle securing bolt.



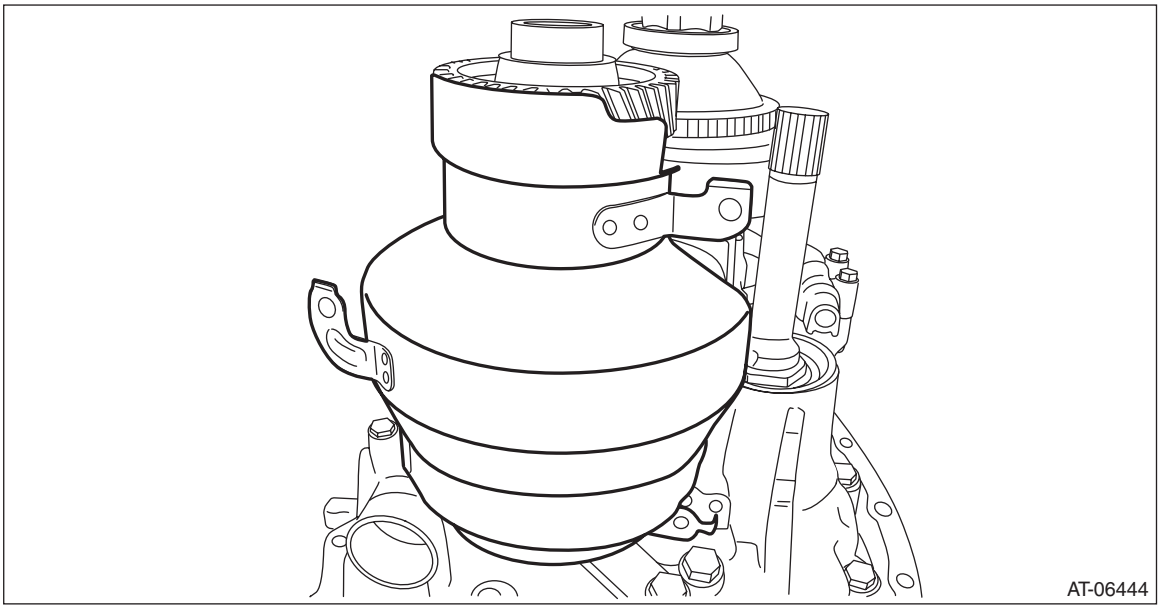
17) Remove the oil cooler pipe.



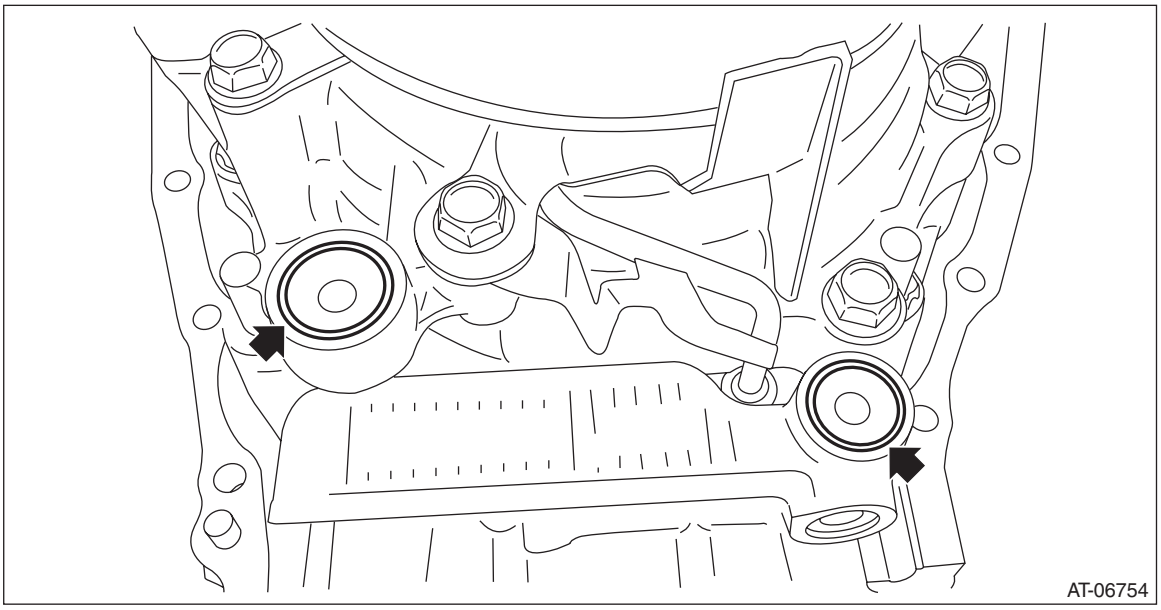
18) Remove the transmission case.

NOTE:
The total number of transmission case mounting bolts is 15.

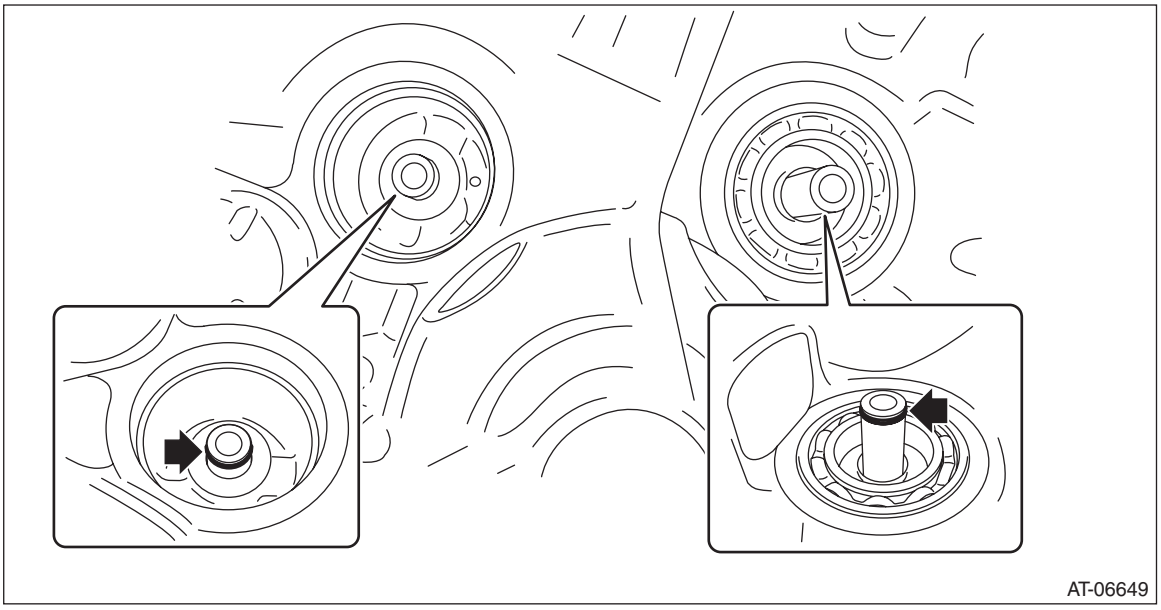
19) Remove the oil baffle.



20) Remove the O-ring.



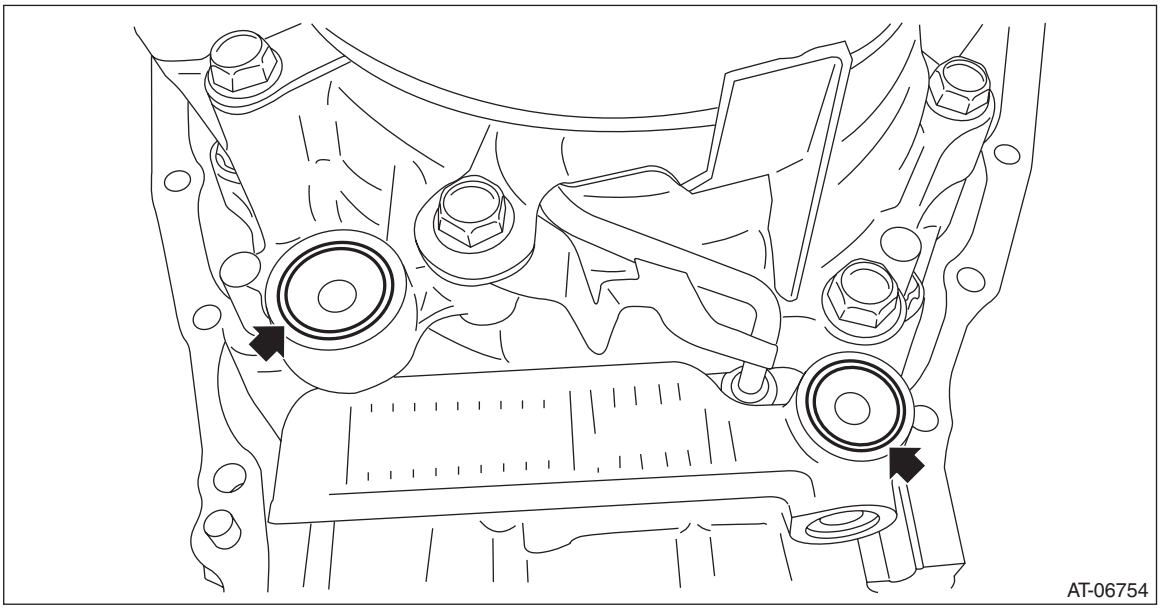
21) Remove the seal ring from the transmission case.



B: INSTALLATION

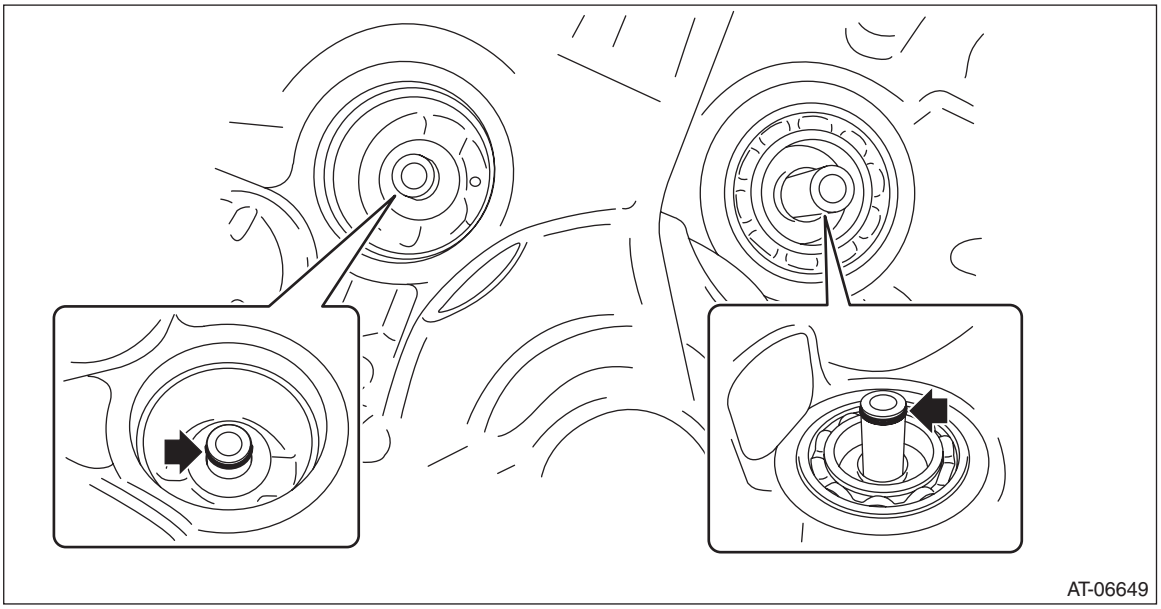
1) Clean the mating surface of transmission case and converter case.
2) Select the reduction gear shim. <Ref. to CVT-211, ADJUSTMENT, Reduction Drive Gear.>
3) Remove the transmission case, and install the selected reduction gear shim to the reduction drive gear.
4) Install the O-rings to the reverse clutch housing and drive pinion retainer.

NOTE:
- Use new O-rings.
- Apply CVTF to the O-ring.

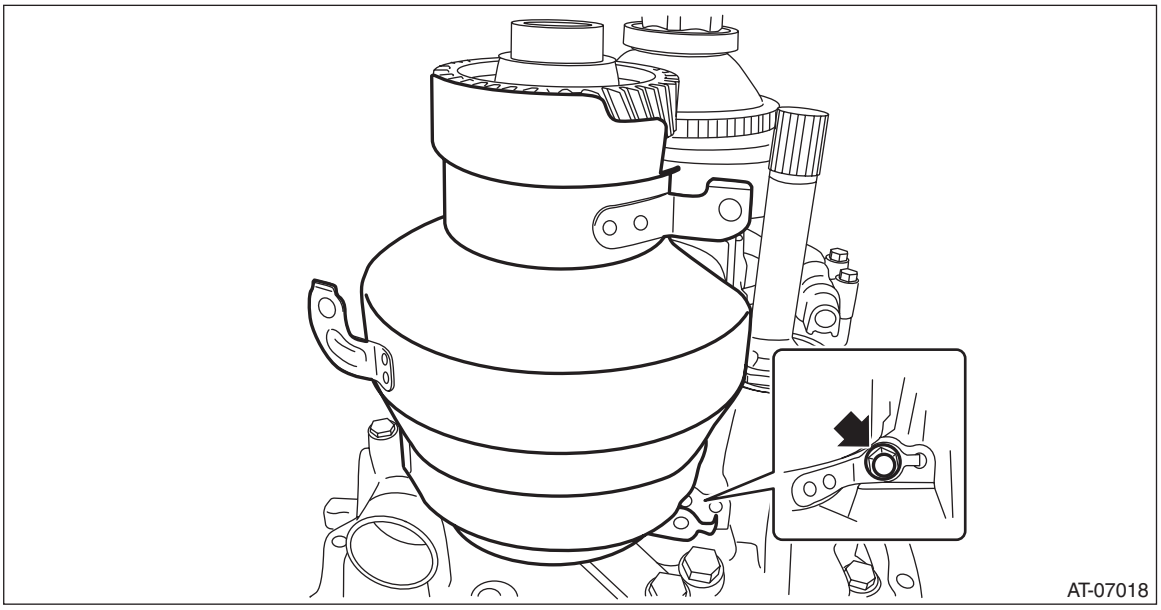


5) Install the seal ring to the transmission case.

NOTE:
- Use a new seal ring.
- Apply CVTF to the seal rings.

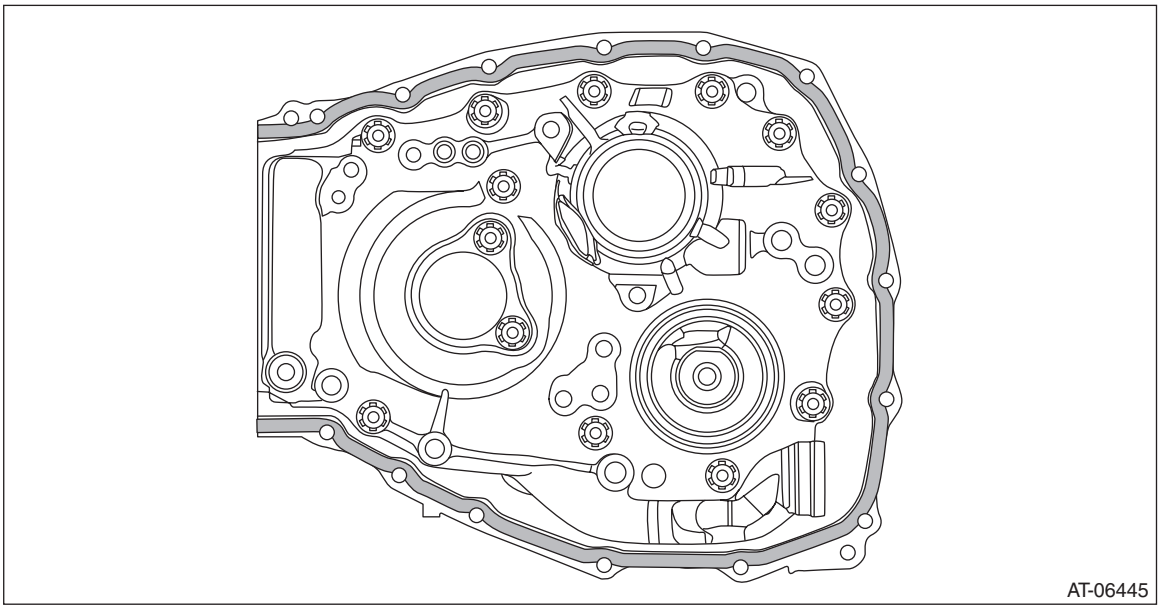


6) Cover the secondary pulley with the oil baffle, and temporarily install it with bolts.



7) Apply liquid gasket seamlessly to the mating surface of transmission case.

Liquid gasket:
THREE BOND 1215 (Part No. 004403007) or equivalent



8) Install the transmission case.

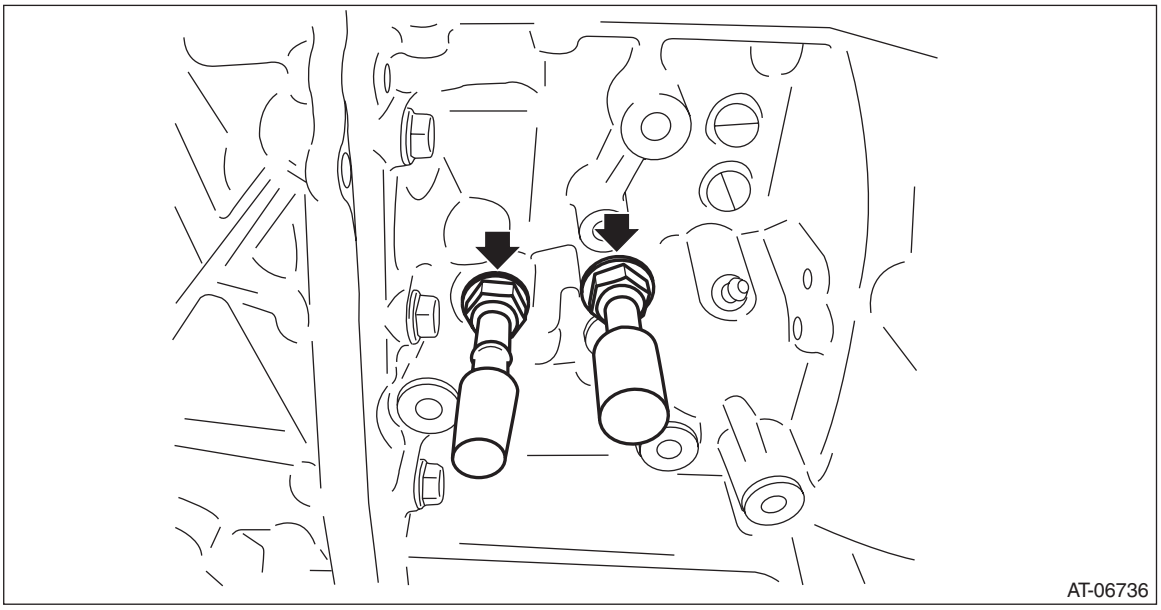
NOTE:
The total number of transmission case mounting bolts is 15.

Tightening torque:
22 N·m (2.2 kgf-m, 16.2 ft-lb)

9) Install the oil cooler pipe.

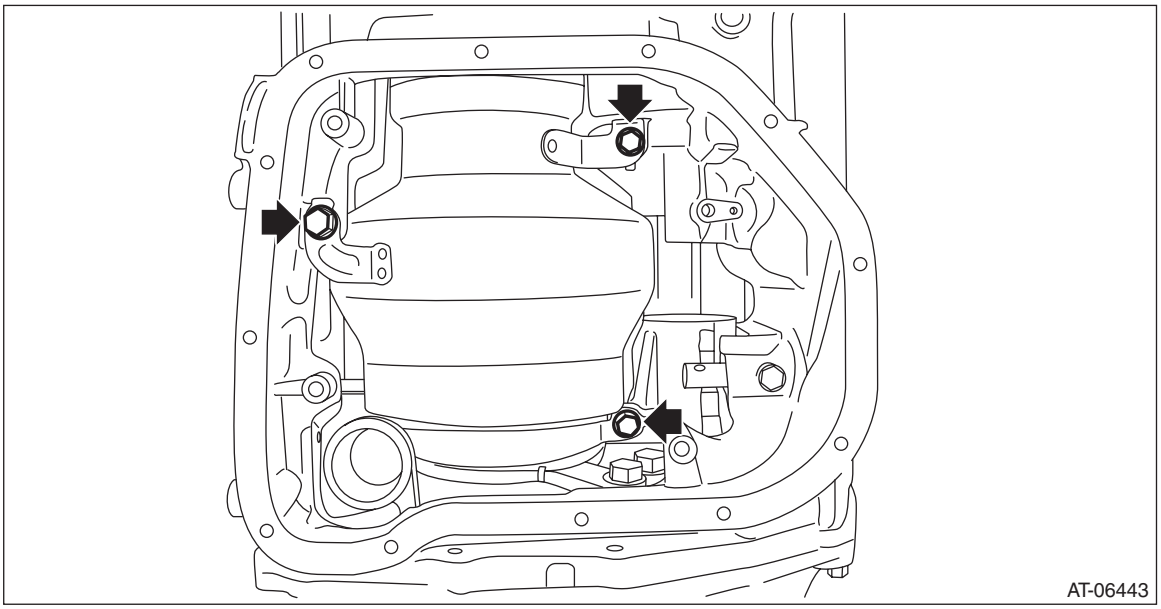
NOTE:
Use new O-rings.

Tightening torque:
25 N·m (2.5 kgf-m, 18.4 ft-lb)



10) Install the oil baffle securing bolt.

Tightening torque:
16 N·m (1.6 kgf-m, 11.8 ft-lb)

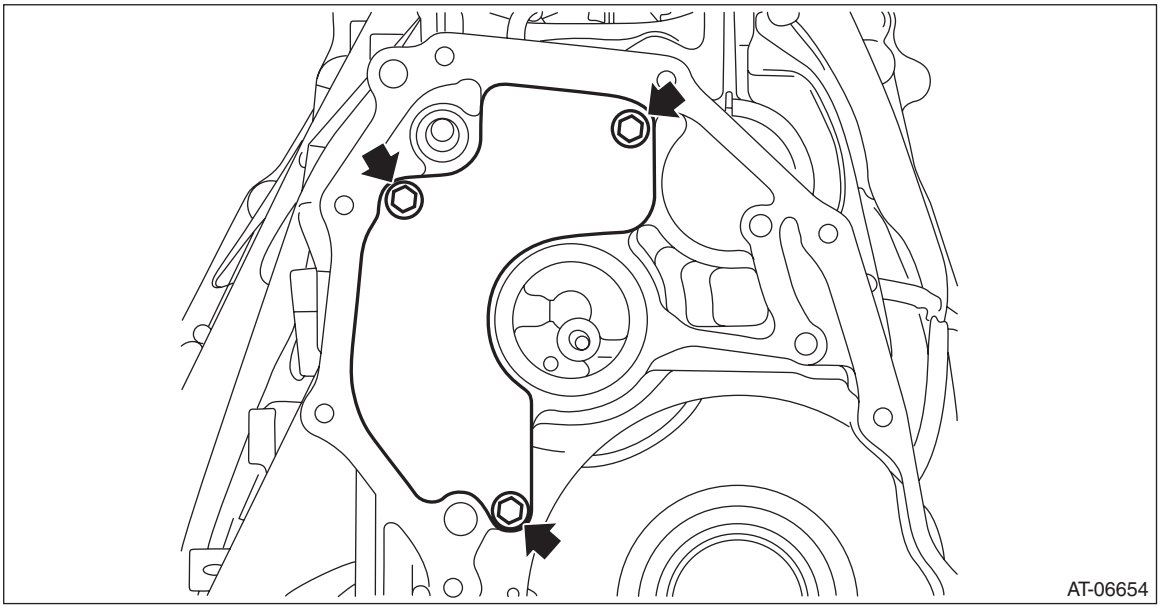


11) Install the transmission control device. <Ref. to CVT-190, INSTALLATION, Transmission Control Device.>
12) Install the oil pan and oil strainer. <Ref. to CVT-109, INSTALLATION, Oil Pan and Strainer.>
13) Install the reduction driven gear assembly. <Ref. to CVT-179, INSTALLATION, Reduction Driven Gear.>
14) Install the parking pawl. <Ref. to CVT-178, INSTALLATION, Parking Pawl.>
15) Install the transfer driven gear assembly. <Ref. to CVT-175, INSTALLATION, Transfer Driven Gear.>
16) Install the transfer clutch assembly. <Ref. to CVT-162, INSTALLATION, Transfer Clutch.>
17) Install the extension case. <Ref. to CVT-157, INSTALLATION, Extension Case.>
18) Install the inhibitor switch. <Ref. to CVT-96, INSTALLATION, Inhibitor Switch.>

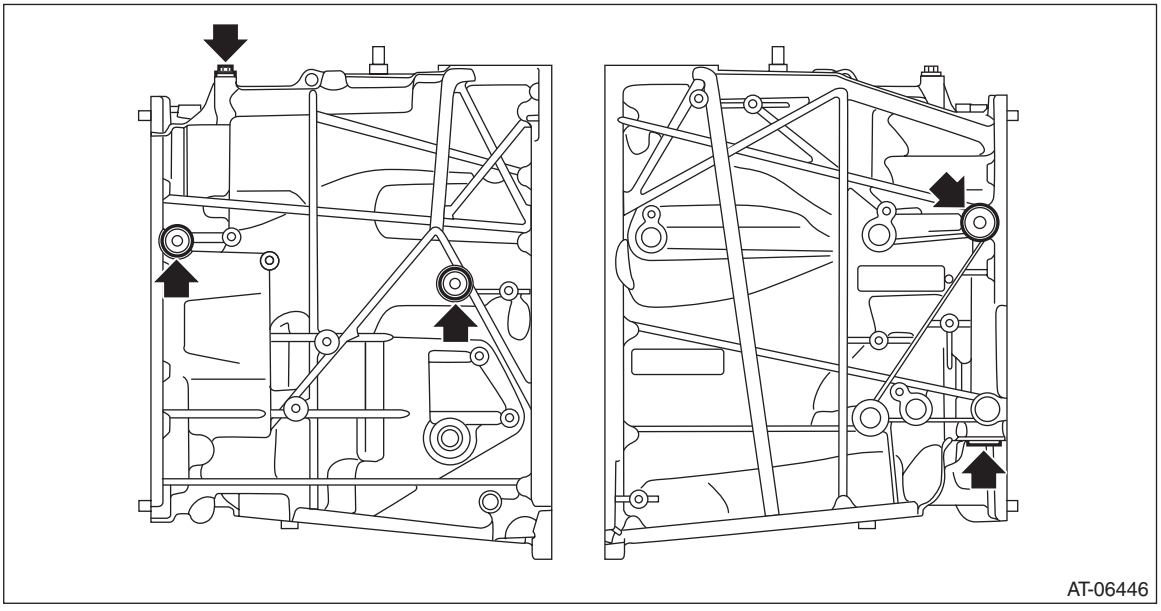
19) Install the secondary speed sensor. <Ref. to CVT-101, INSTALLATION, Secondary Speed Sensor.>
20) Install the primary speed sensor. <Ref. to CVT-104, INSTALLATION, Primary Speed Sensor.>
21) Install the turbine speed sensor. <Ref. to CVT-99, INSTALLATION, Turbine Speed Sensor.>
22) Install the transmission harness. <Ref. to CVT-130, INSTALLATION, Transmission Harness.>
23) Install the control valve body. <Ref. to CVT-117, INSTALLATION, Control Valve Body.>
24) Install the air breather hose. <Ref. to CVT-149, INSTALLATION, Air Breather Hose.>
25) Install the transmission assembly to the vehicle. <Ref. to CVT-69, INSTALLATION, Automatic Transmission Assembly.>

C: DISASSEMBLY

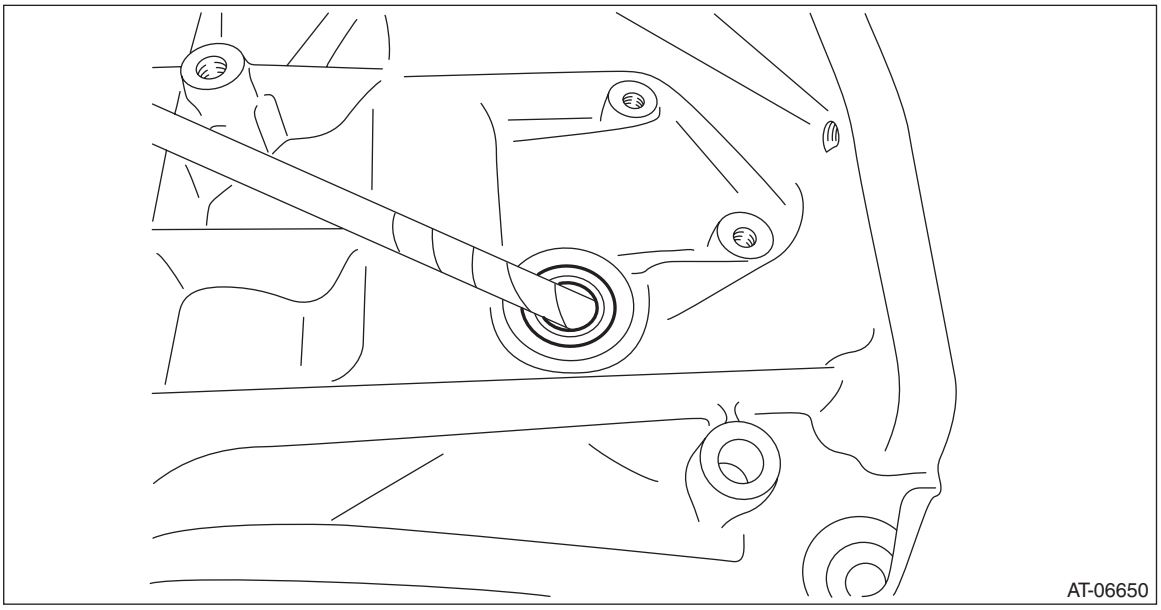
1) Remove the oil stopper plate.



2) Remove all plugs from the transmission case.

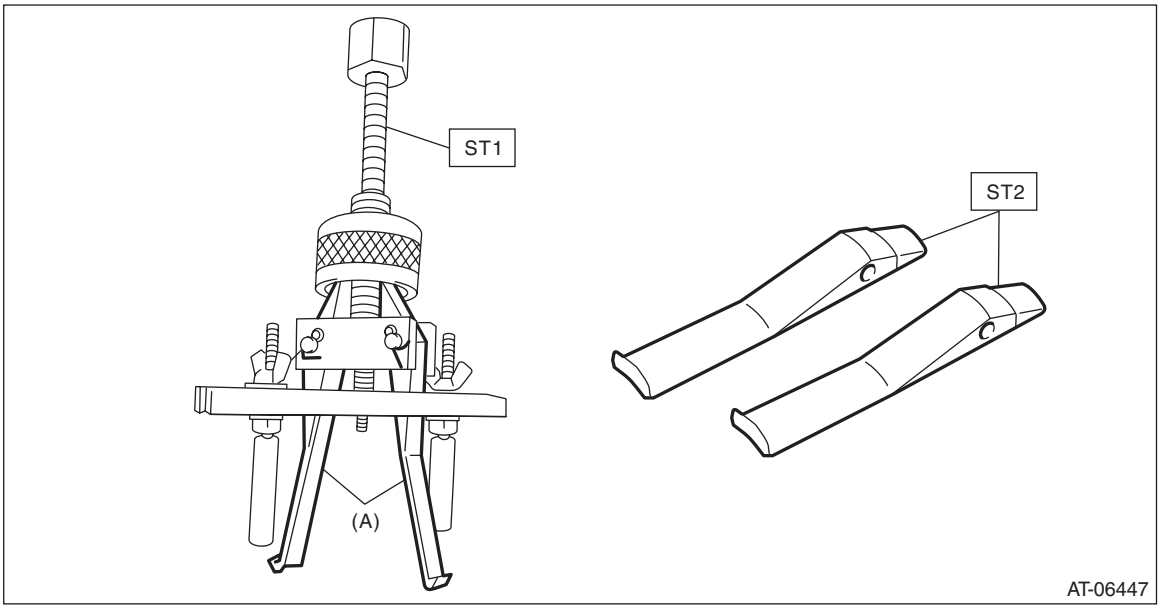


3) Remove the oil seal using a screwdriver wrapped with cloth etc.



4) Using the ST, remove the ball bearing of the secondary pulley.
   (1) Remove the claw of ST1, and attach the claw of ST2.

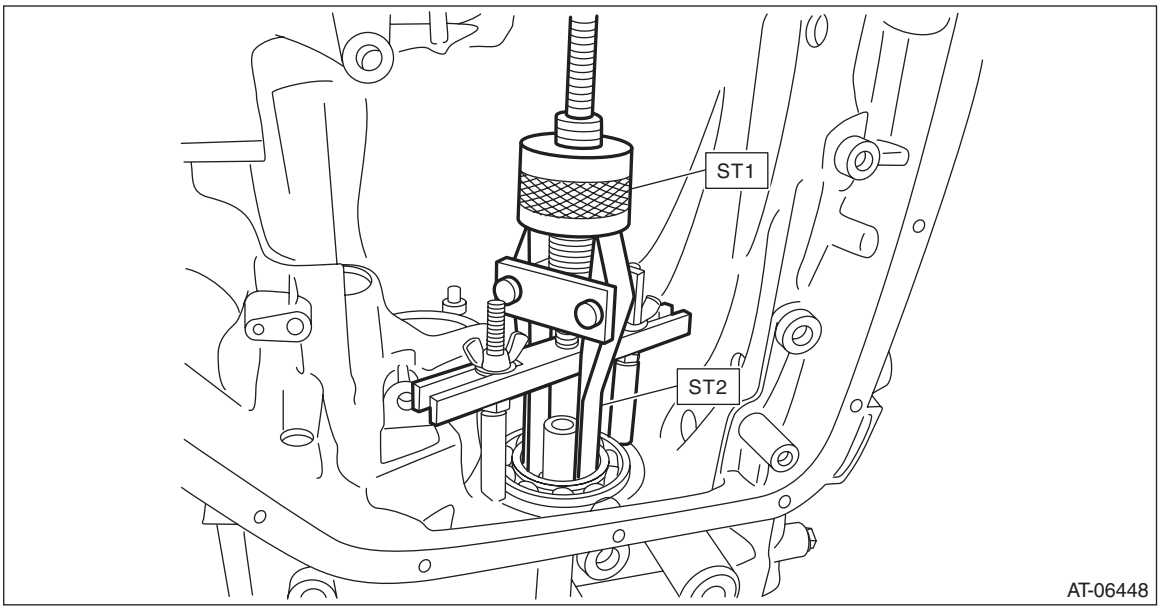
ST1 398527700 PULLER ASSY
ST2 18760AA000 CLAW



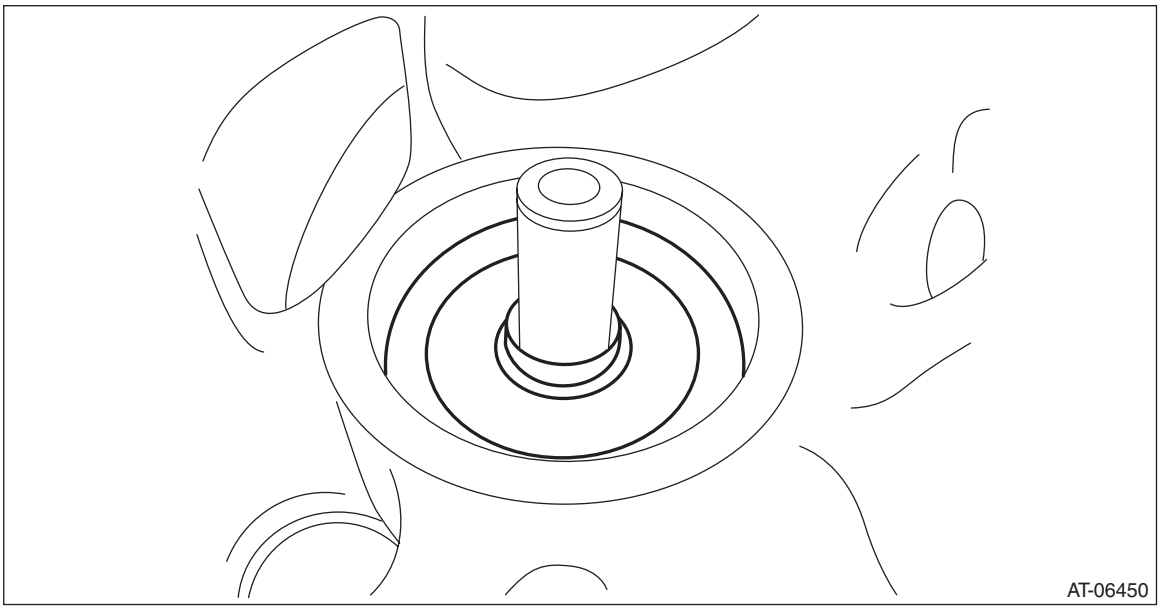
(A) Claw

(2) Using the ST, remove the ball bearing of the secondary pulley.

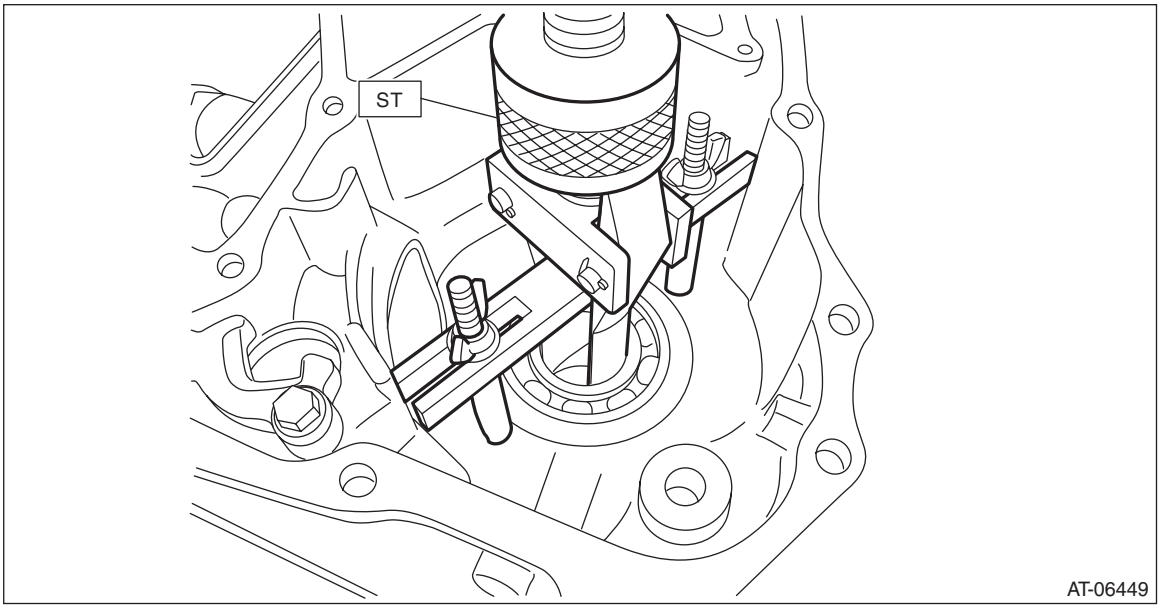
ST1 398527700 PULLER ASSY
ST2 18760AA000 CLAW



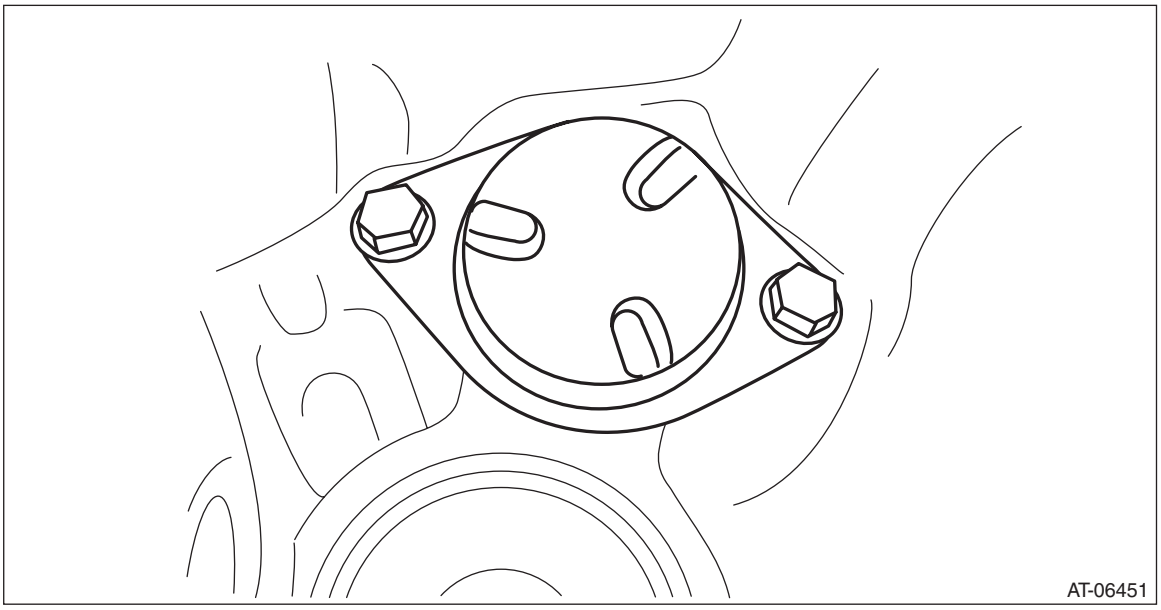
5) Remove the oil guide.



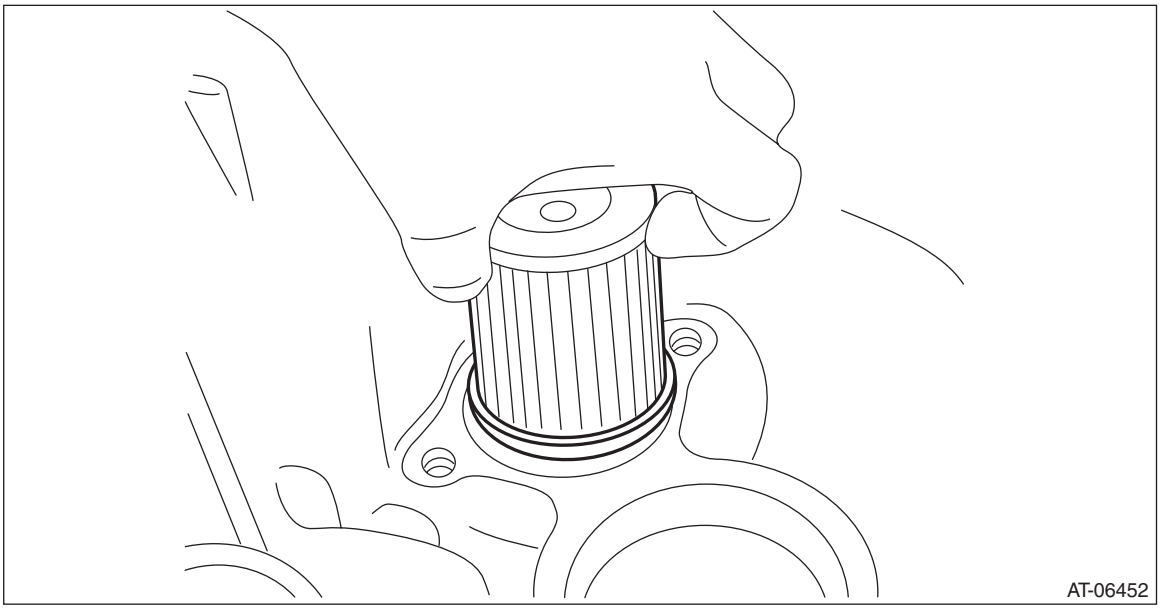
6) Remove the ball bearing from reduction driven gear using ST.
ST 398527700 PULLER ASSY



7) Remove the CVTF filter cover and gasket.



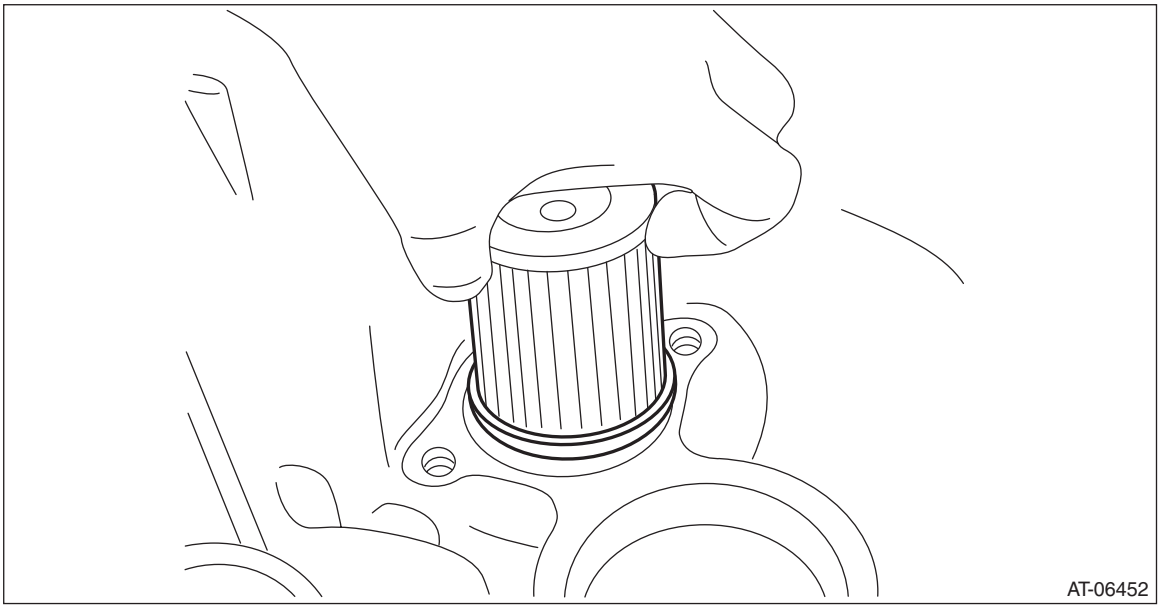
8) Remove the CVTF filter.



D: ASSEMBLY

1) Face the O-ring side of the CVTF filter to the transmission case side, and install the CVTF filter.

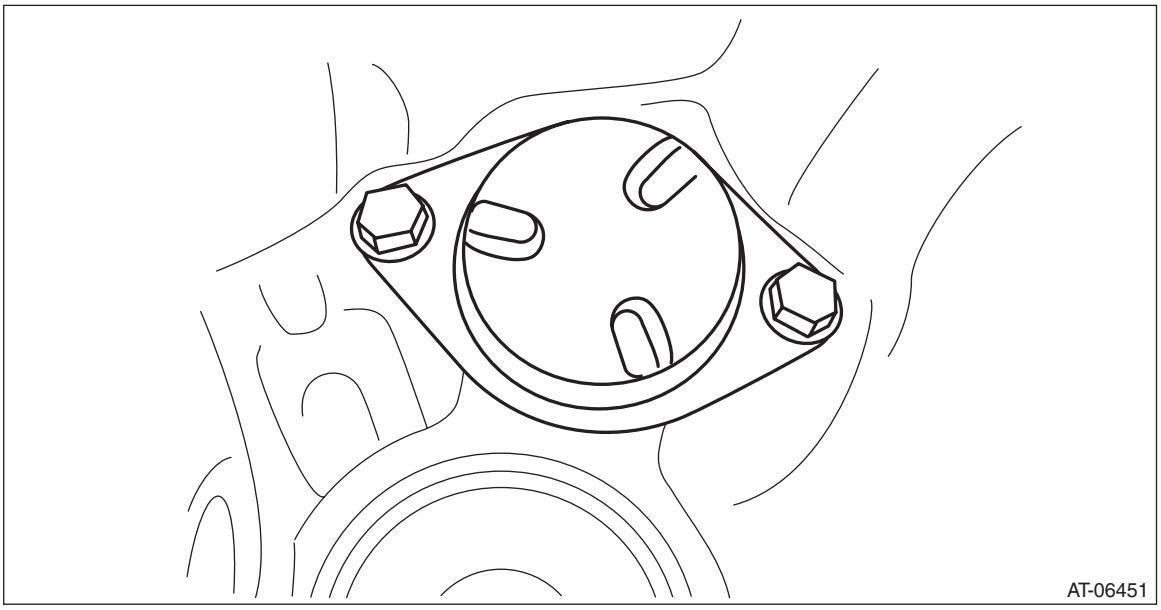
NOTE:
Apply CVTF to the O-ring of CVTF filter.



2) Install the CVTF filter cover and gasket.

NOTE:
Use a new gasket.

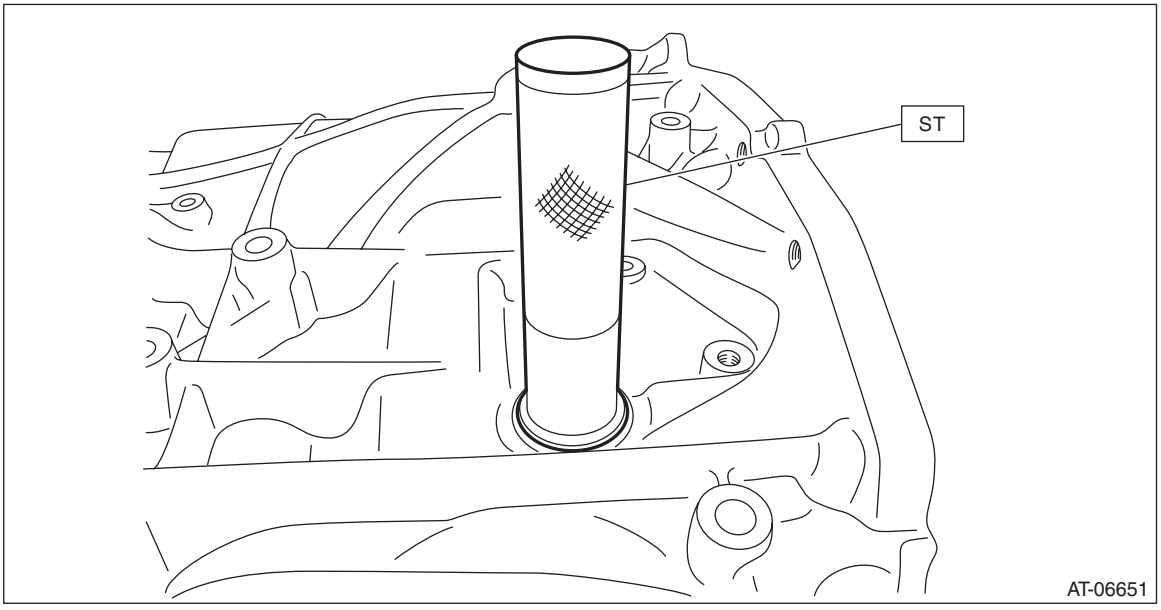
Tightening torque:
17 N·m (1.7 kgf-m, 12.5 ft-lb)



3) Using the ST, install the oil seal.

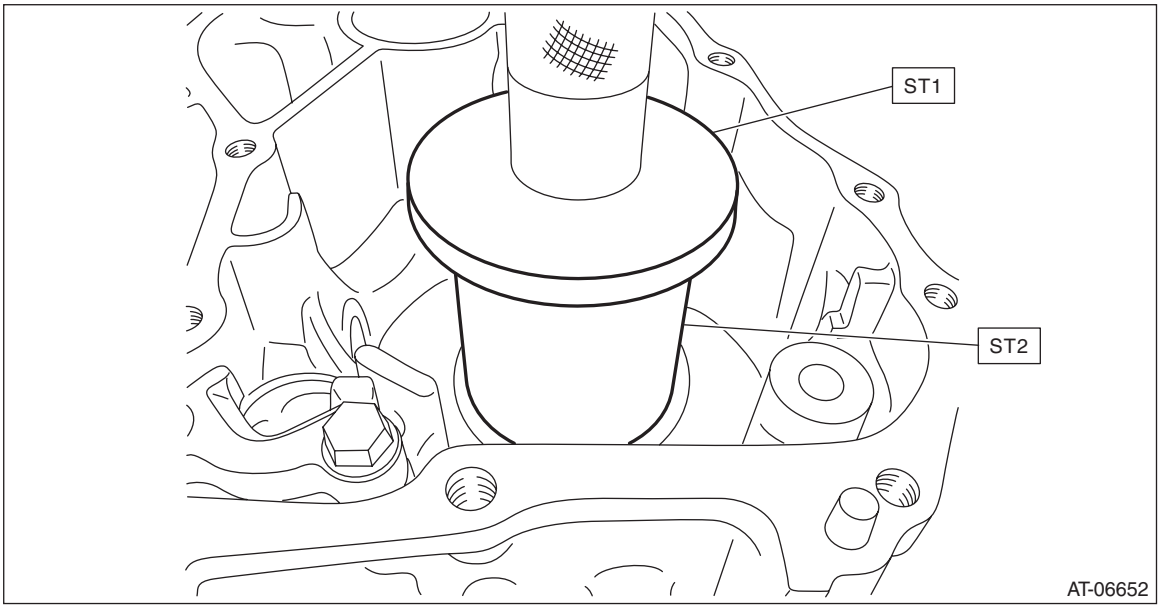
NOTE:
- Use a new oil seal.
- Apply CVTF to the oil seal lip and press-fitting surface.

ST 18657AA000 INSTALLER



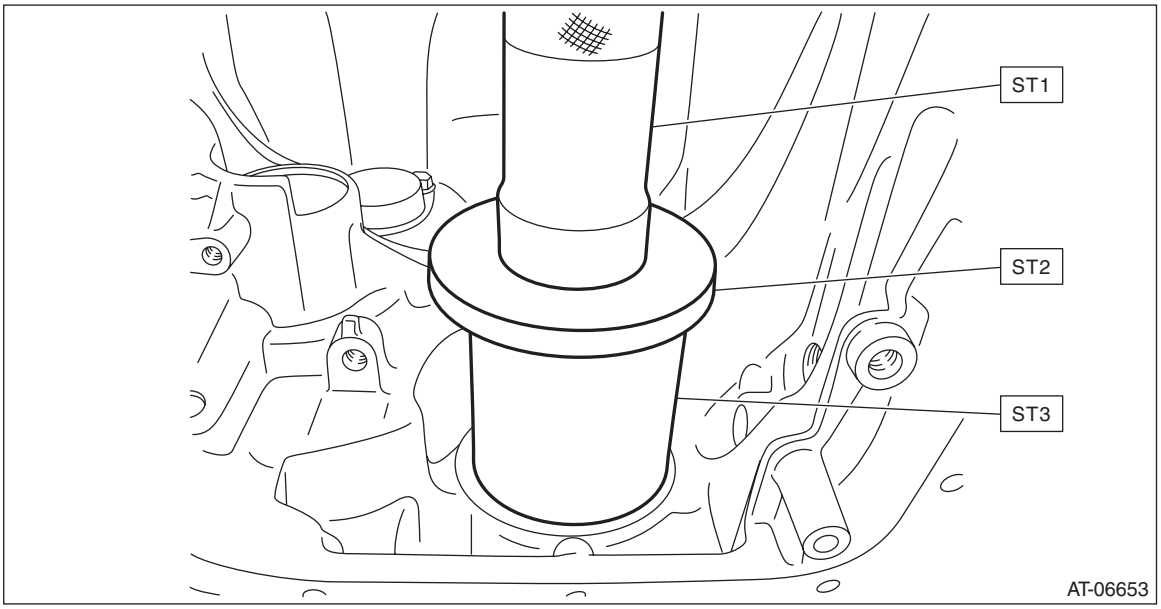
4) Using ST1 and ST2, install the ball bearing on the reduction driven gear side.

NOTE:
Use a new ball bearing.
ST1 398177700 INSTALLER
ST2 28499TC010 PRESS SNAP RING



5) Using ST1, ST2 and ST3, install the ball bearing on the secondary pulley side.

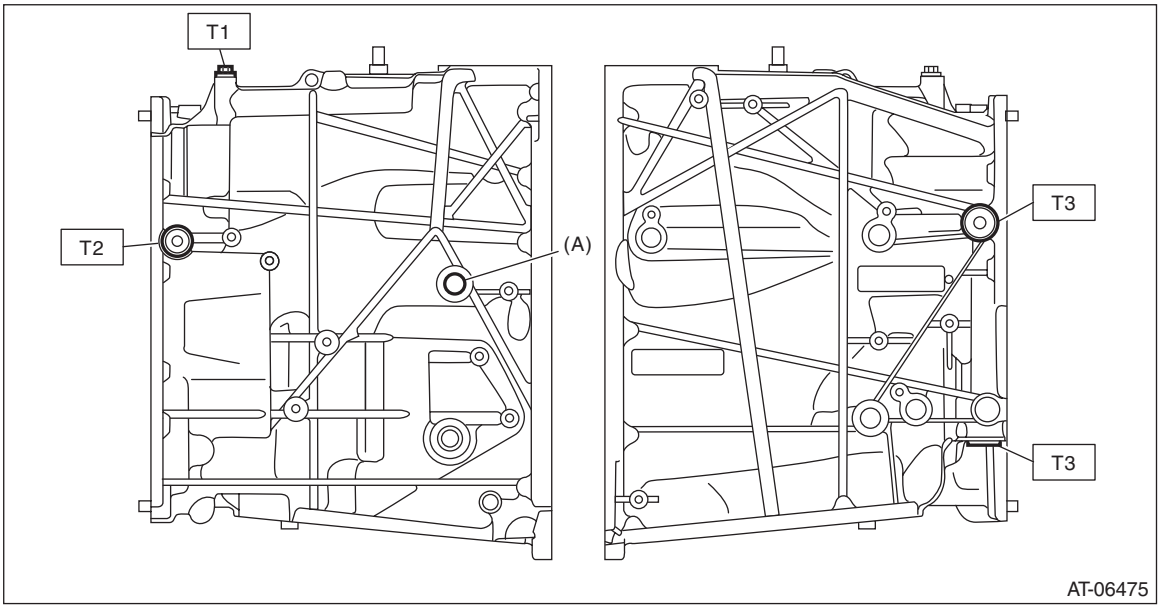
NOTE:
Use a new ball bearing.
ST1 499277100 BUSHING 1-2 INSTALLER
ST2 398177700 INSTALLER
ST3 28499TC010 PRESS SNAP RING



6) Install all plugs.

NOTE:
- Use new O-rings.
- Apply CVTF to the O-ring.
- For the plug (A), fill the CVTF, and then tighten the plug (A) using a new O-ring.

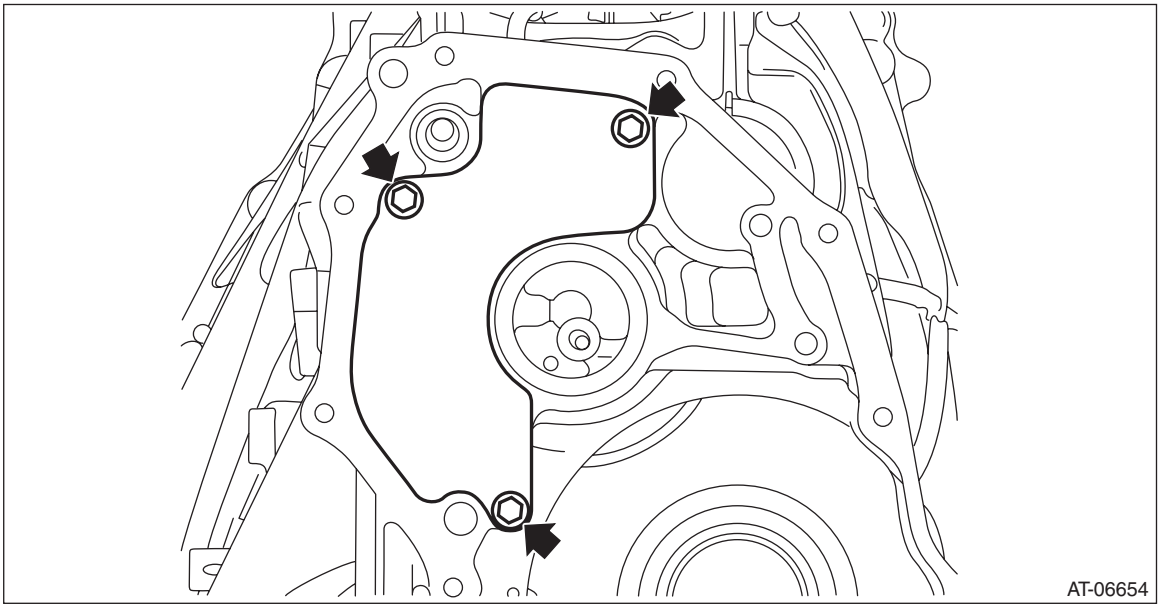
Tightening torque:
T1: 13 N·m (1.3 kgf-m, 9.6 ft-lb)
T2: 25 N·m (2.5 kgf-m, 18.4 ft-lb)
T3: 50 N·m (5.1 kgf-m, 36.9 ft-lb)



7) Install the oil stopper plate.

NOTE:
Use a new bolt.

Tightening torque:
9 N·m (0.9 kgf-m, 6.6 ft-lb)



E: INSPECTION

- Check the transmission case for damage.
- Check for leakage of CVTF from the connection between converter case and transmission case.
- Check the bearing for smooth operation.
- Check the bearing for seizure or wear.

F: ADJUSTMENT

NOTE:
When replacing the transmission case with a new part, perform the following check and adjustment for the selection.

- Select the transfer driven gear shim. <Ref. to CVT-171, ADJUSTMENT, Transfer Clutch.>
- Select the transfer drive gear shim. <Ref. to CVT-185, ADJUSTMENT, Reduction Driven Gear.>
- Select the reduction drive gear shim. <Ref. to CVT-211, ADJUSTMENT, Reduction Drive Gear.>

35.CVTF Filter

A: REMOVAL

NOTE:
• Although CVTF filter is a maintenance-free part, replace it if a large quantity of wear debris and metal particles are found in CVTF and CVTF filter.
• For removal of CVTF filter, refer to “Transmission Case”. <Ref. to CVT-193, REMOVAL, Transmission Case.> <Ref. to CVT-199, DISASSEMBLY, Transmission Case.>

B: INSTALLATION

NOTE:
For installation of CVTF filter, refer to “Transmission Case”. <Ref. to CVT-203, ASSEMBLY, Transmission Case.> <Ref. to CVT-196, INSTALLATION, Transmission Case.>

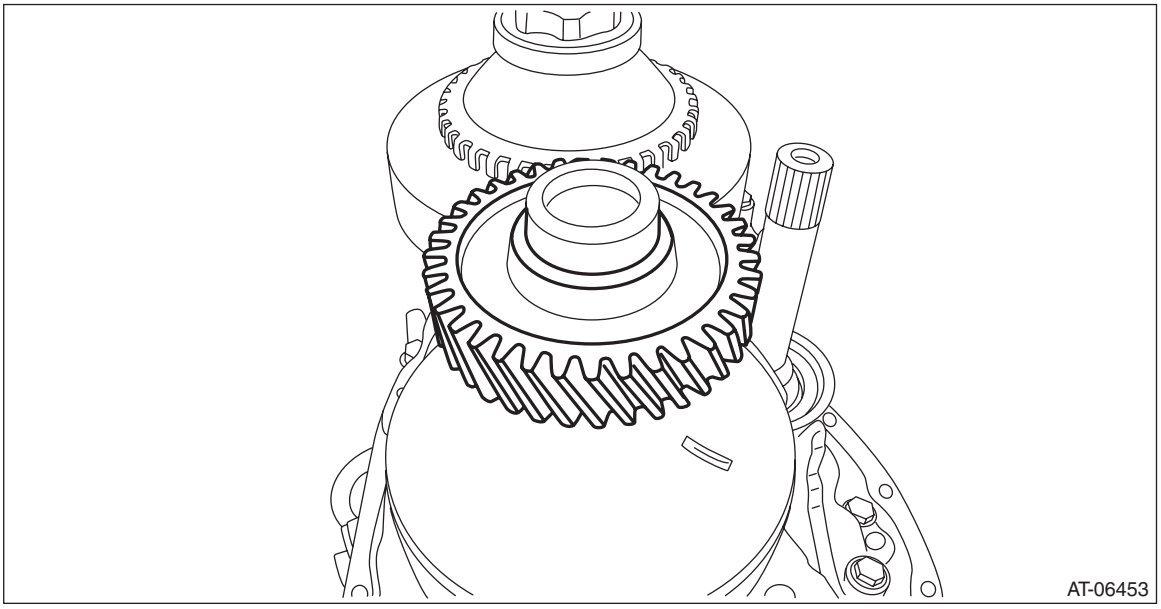
C: INSPECTION

- Check if a large quantity of wear debris or metal particles are in CVTF and CVTF filter.
- Check for broken part or damaged O-ring.

36.Reduction Drive Gear

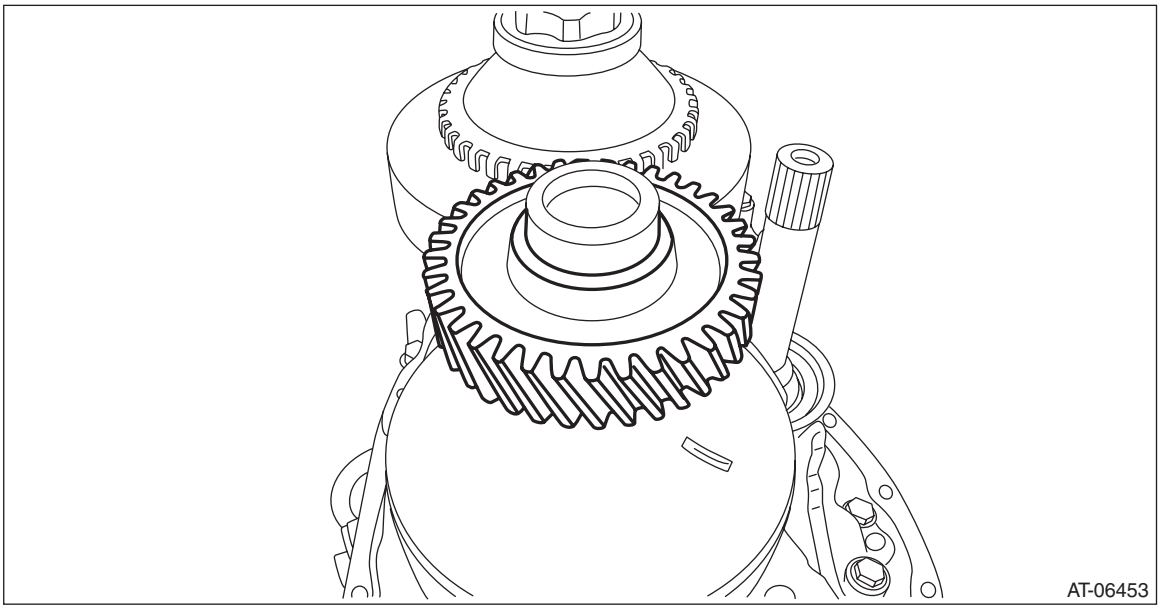
A: REMOVAL

1) Remove the transmission assembly from the vehicle. <Ref. to CVT-58, REMOVAL, Automatic Transmission Assembly.>
2) Remove the air breather hose. <Ref. to CVT-148, REMOVAL, Air Breather Hose.>
3) Remove the control valve body. <Ref. to CVT-112, REMOVAL, Control Valve Body.>
4) Remove the transmission harness. <Ref. to CVT-124, REMOVAL, Transmission Harness.>
5) Remove the turbine speed sensor. <Ref. to CVT-99, REMOVAL, Turbine Speed Sensor.>
6) Remove the secondary speed sensor. <Ref. to CVT-101, REMOVAL, Secondary Speed Sensor.>
7) Remove the primary speed sensor. <Ref. to CVT-103, REMOVAL, Primary Speed Sensor.>
8) Remove the inhibitor switch. <Ref. to CVT-94, REMOVAL, Inhibitor Switch.>
9) Remove the extension case. <Ref. to CVT-156, REMOVAL, Extension Case.>
10) Remove the transfer clutch assembly. <Ref. to CVT-160, REMOVAL, Transfer Clutch.>
11) Remove the transfer driven gear assembly. <Ref. to CVT-174, REMOVAL, Transfer Driven Gear.>
12) Remove the parking pawl. <Ref. to CVT-177, REMOVAL, Parking Pawl.>
13) Remove the reduction driven gear assembly. <Ref. to CVT-179, REMOVAL, Reduction Driven Gear.>
14) Remove the oil pan and oil strainer. <Ref. to CVT-108, REMOVAL, Oil Pan and Strainer.>
15) Remove the transmission control device. <Ref. to CVT-187, REMOVAL, Transmission Control Device.>
16) Remove the transmission case. <Ref. to CVT-193, REMOVAL, Transmission Case.>
17) Remove the reduction drive gear.



B: INSTALLATION

1) Install the reduction drive gear to secondary pulley.



2) Select the reduction drive gear shim. <Ref. to CVT-211, ADJUSTMENT, Reduction Drive Gear.>
3) Remove the transmission case, and install the selected shim.
4) Install the transmission case. <Ref. to CVT-196, INSTALLATION, Transmission Case.>
5) Install the transmission control device. <Ref. to CVT-190, INSTALLATION, Transmission Control Device.>
6) Install the oil strainer and oil pan. <Ref. to CVT-109, INSTALLATION, Oil Pan and Strainer.>
7) Install the reduction driven gear assembly. <Ref. to CVT-179, INSTALLATION, Reduction Driven Gear.>
8) Install the parking pawl. <Ref. to CVT-178, INSTALLATION, Parking Pawl.>
9) Install the transfer driven gear assembly. <Ref. to CVT-175, INSTALLATION, Transfer Driven Gear.>
10) Install the transfer clutch assembly. <Ref. to CVT-162, INSTALLATION, Transfer Clutch.>
11) Install the extension case. <Ref. to CVT-157, INSTALLATION, Extension Case.>
12) Install the inhibitor switch. <Ref. to CVT-96, INSTALLATION, Inhibitor Switch.>
13) Install the secondary speed sensor. <Ref. to CVT-101, INSTALLATION, Secondary Speed Sensor.>
14) Install the primary speed sensor. <Ref. to CVT-104, INSTALLATION, Primary Speed Sensor.>
15) Install the turbine speed sensor. <Ref. to CVT-99, INSTALLATION, Turbine Speed Sensor.>
16) Install the transmission harness. <Ref. to CVT-130, INSTALLATION, Transmission Harness.>
17) Install the control valve body. <Ref. to CVT-117, INSTALLATION, Control Valve Body.>
18) Install the air breather hose. <Ref. to CVT-149, INSTALLATION, Air Breather Hose.>
19) Install the transmission assembly to the vehicle. <Ref. to CVT-69, INSTALLATION, Automatic Transmission Assembly.>

C: INSPECTION

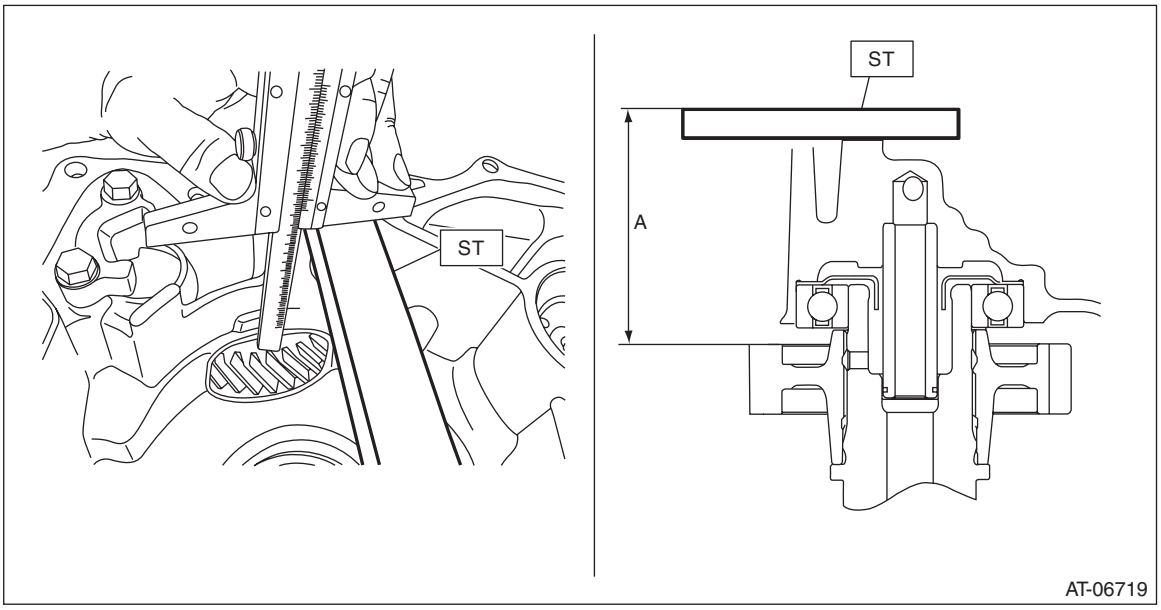
Check the reduction drive gear for breakage or damage.

D: ADJUSTMENT

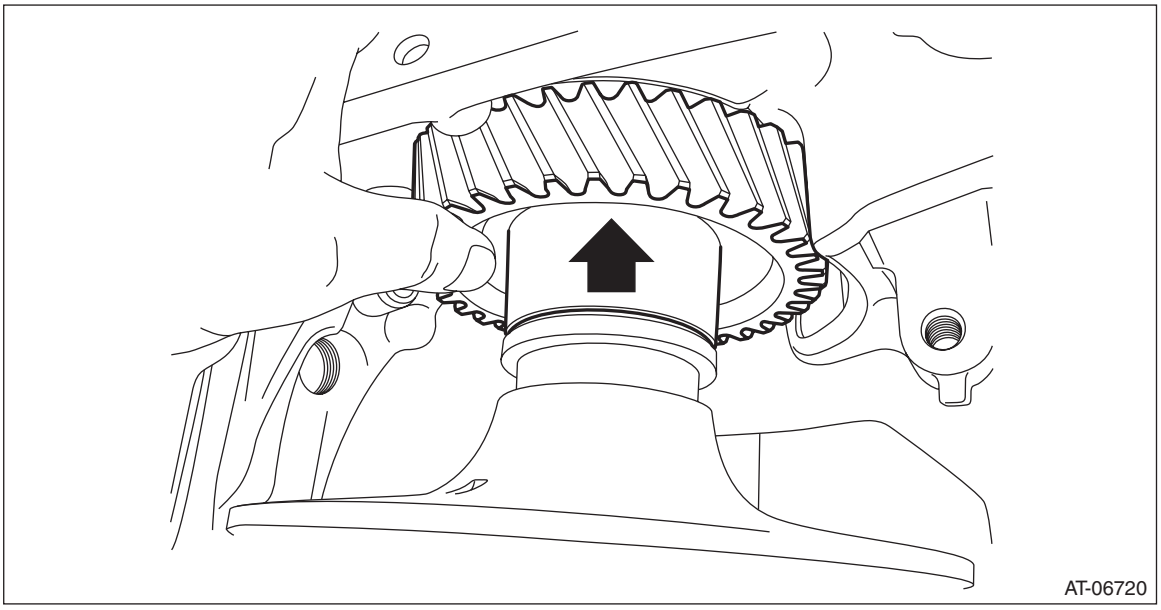
1) Install the transmission case, and secure it with four or five bolts.

Tightening torque:
22 N·m (2.2 kgf-m, 16.2 ft-lb)

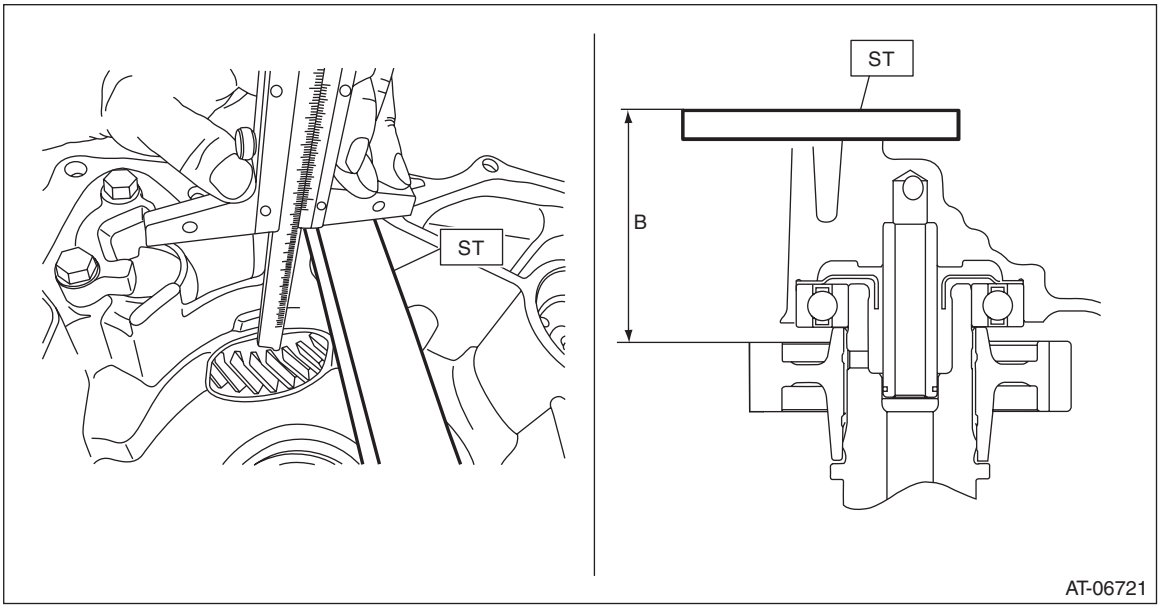
2) Measure depth “A” from the ST upper face to the reduction drive gear end face.
ST 499575400 GAUGE



3) Raise and hold the reduction drive gear.



4) Measure depth “B” from the ST upper face to the reduction drive gear end face.
ST 499575400 GAUGE



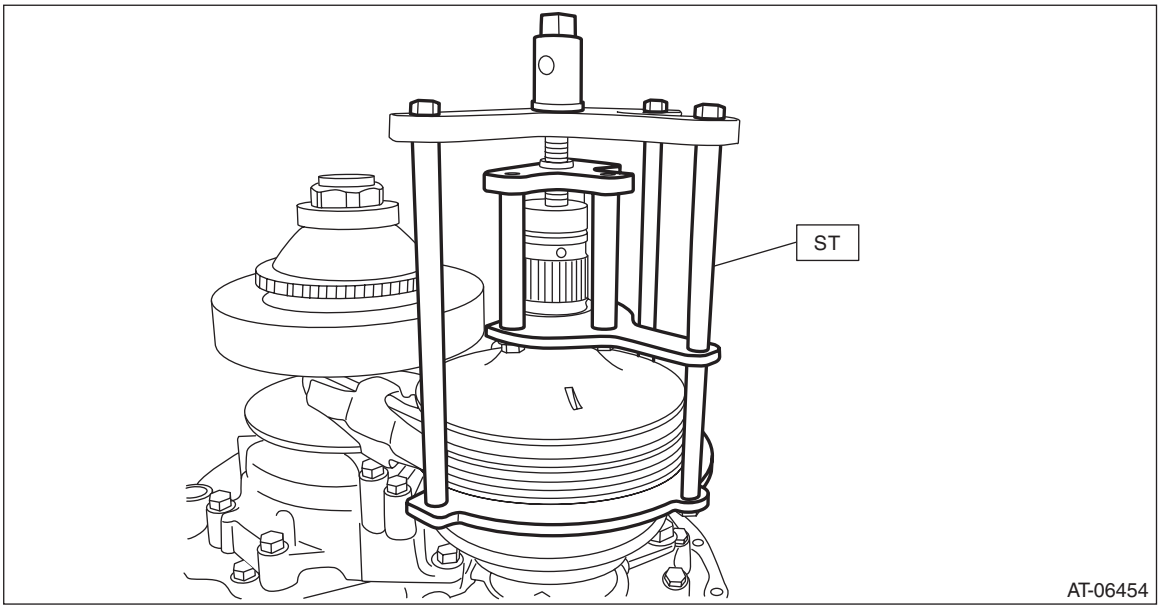
5) Obtain the thickness of reduction drive gear shim using the following formula to select one to three reduction drive gear shims.
T (mm) = A – B – (0.05 — 0.25)
[T (in) = A – B – (0.002 — 0.01)]
T: Reduction drive gear shim thickness
A: Depth from the ST upper face to the reduction drive gear end surface
B: Depth from the ST upper face to the reduction drive gear end surface
0.05 — 0.25 mm (0.002 — 0.01 in): Clearance

Part No.	Reduction drive gear shim thickness mm (in)
31288AA260	0.3 (0.012)
31288AA270	0.4 (0.016)
31288AA280	0.5 (0.020)
31288AA290	0.6 (0.024)

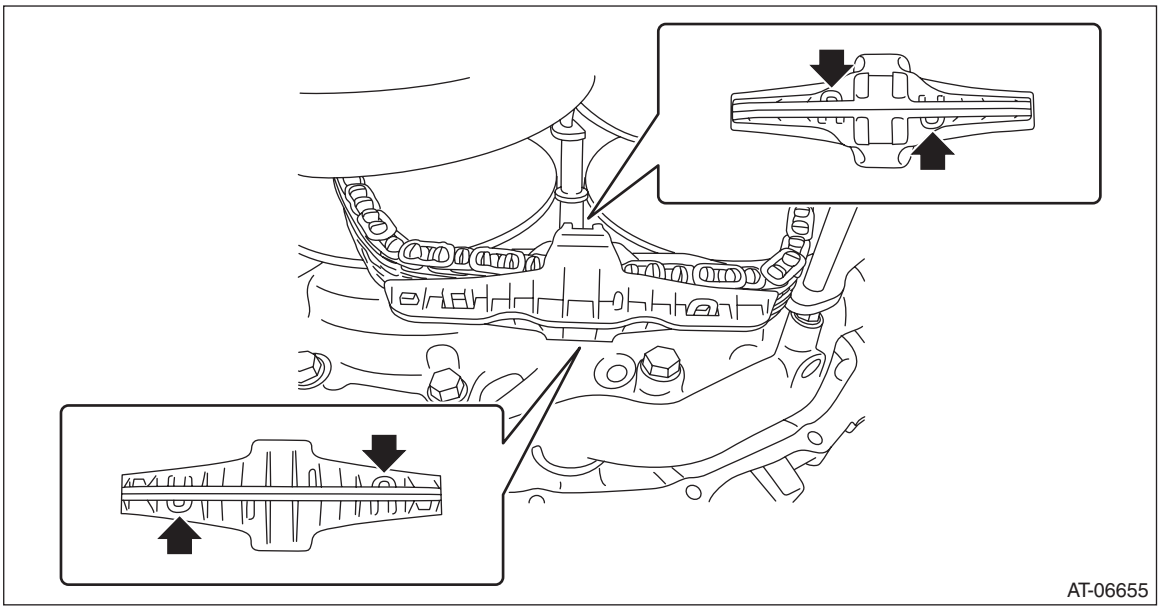
37.Primary Pulley and Secondary Pulley

A: REMOVAL

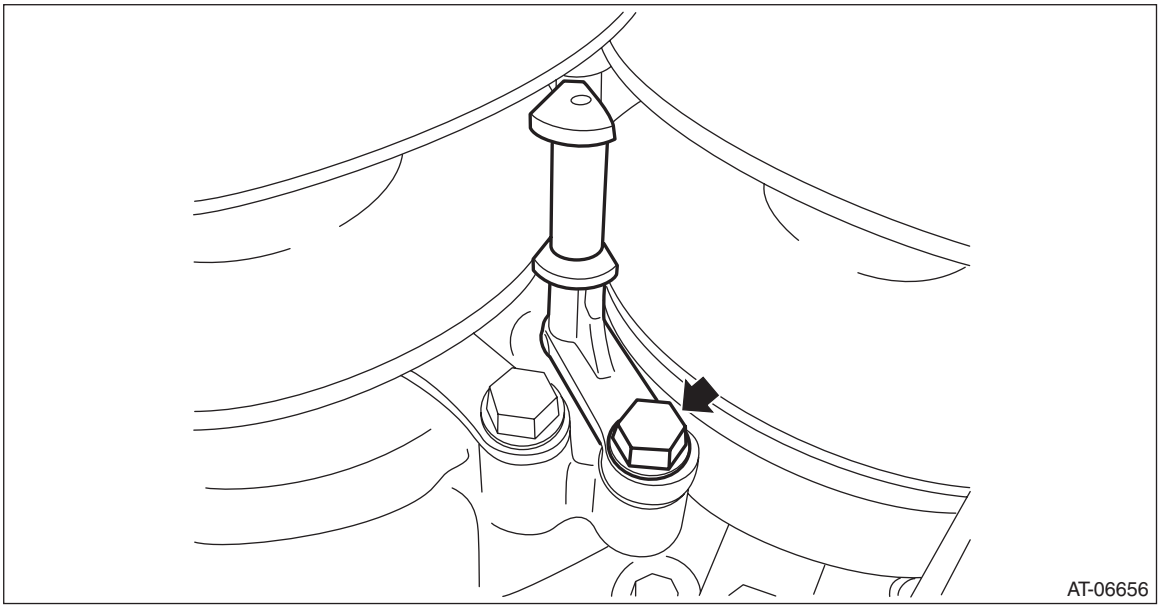
NOTE:
Always replace primary pulley and secondary pulley as an assembly because they are non-disassembled parts.
1) Remove the transmission assembly from the vehicle. <Ref. to CVT-58, REMOVAL, Automatic Transmission Assembly.>
2) Remove the air breather hose. <Ref. to CVT-148, REMOVAL, Air Breather Hose.>
3) Remove the control valve body. <Ref. to CVT-112, REMOVAL, Control Valve Body.>
4) Remove the transmission harness. <Ref. to CVT-124, REMOVAL, Transmission Harness.>
5) Remove the turbine speed sensor. <Ref. to CVT-99, REMOVAL, Turbine Speed Sensor.>
6) Remove the secondary speed sensor. <Ref. to CVT-101, REMOVAL, Secondary Speed Sensor.>
7) Remove the primary speed sensor. <Ref. to CVT-103, REMOVAL, Primary Speed Sensor.>
8) Remove the inhibitor switch. <Ref. to CVT-94, REMOVAL, Inhibitor Switch.>
9) Remove the extension case. <Ref. to CVT-156, REMOVAL, Extension Case.>
10) Remove the transfer clutch assembly. <Ref. to CVT-160, REMOVAL, Transfer Clutch.>
11) Remove the transfer driven gear assembly. <Ref. to CVT-174, REMOVAL, Transfer Driven Gear.>
12) Remove the parking pawl. <Ref. to CVT-177, REMOVAL, Parking Pawl.>
13) Remove the reduction driven gear assembly. <Ref. to CVT-179, REMOVAL, Reduction Driven Gear.>
14) Remove the oil pan and oil strainer. <Ref. to CVT-108, REMOVAL, Oil Pan and Strainer.>
15) Remove the transmission control device. <Ref. to CVT-187, REMOVAL, Transmission Control Device.>
16) Remove the transmission case. <Ref. to CVT-193, REMOVAL, Transmission Case.>
17) Remove the reduction drive gear. <Ref. to CVT-209, REMOVAL, Reduction Drive Gear.>
18) Set the ST to secondary pulley, expand the V groove of pulley, and then completely loosen the variator chain.
ST 18769AA010 EXPANDER PULLEY



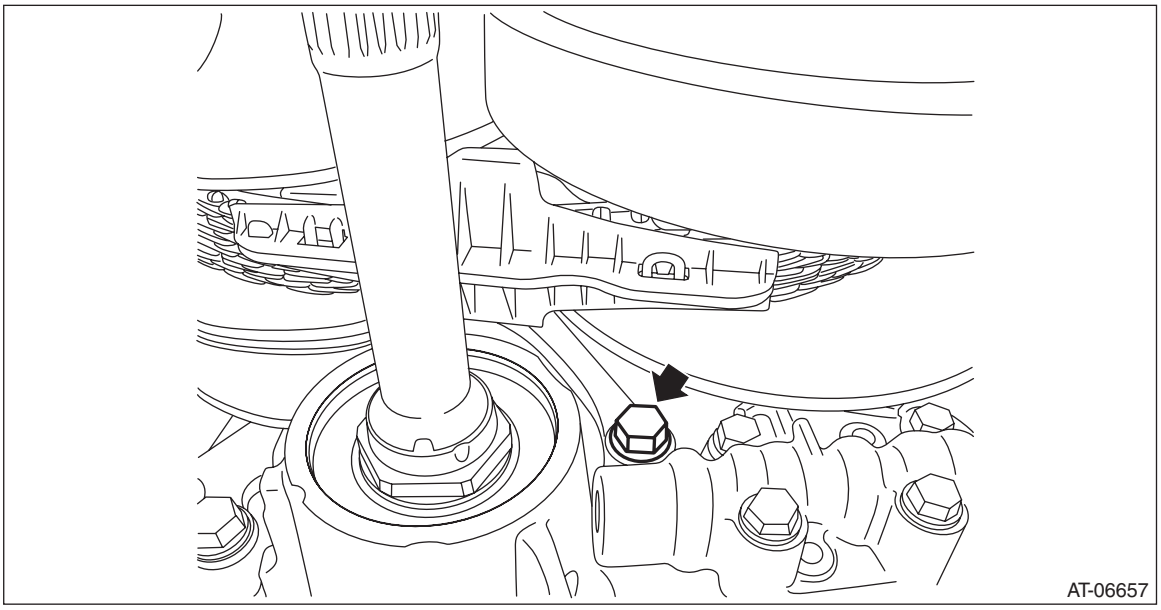
19) Remove the chain guide.
(1) Remove the chain guide from lubrication pipe.
(2) Detach the four claws to remove the chain guide.



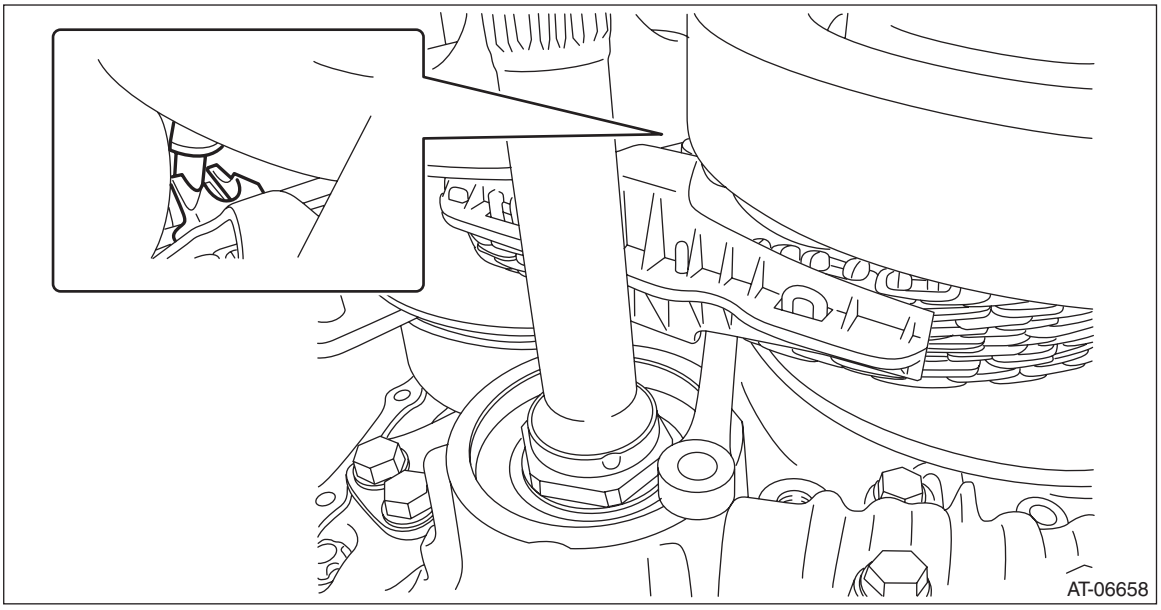
(3) Remove the lubrication pipe.



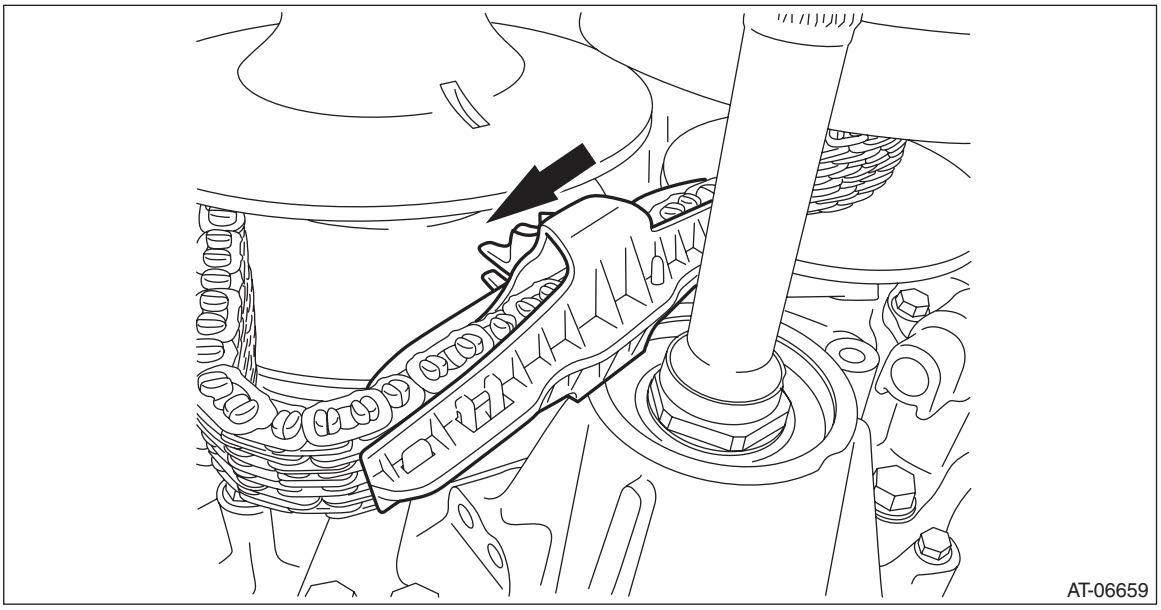
(4) Remove the support rod mounting bolts.



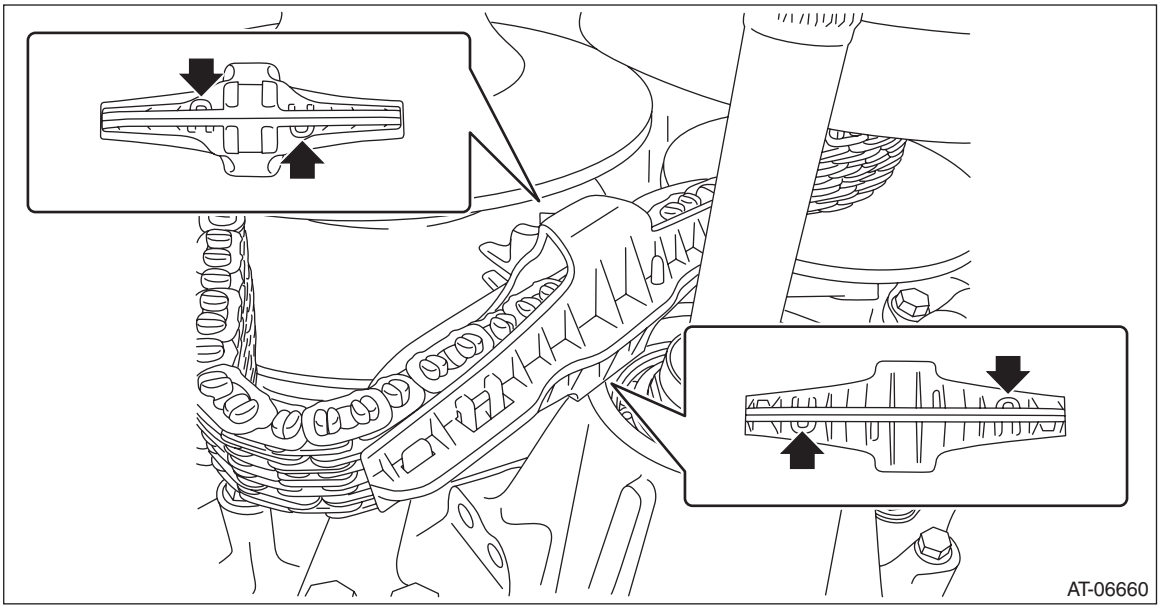
(5) Raise the support rod to remove the chain guide.



(6) Move the chain guide to the secondary pulley side.

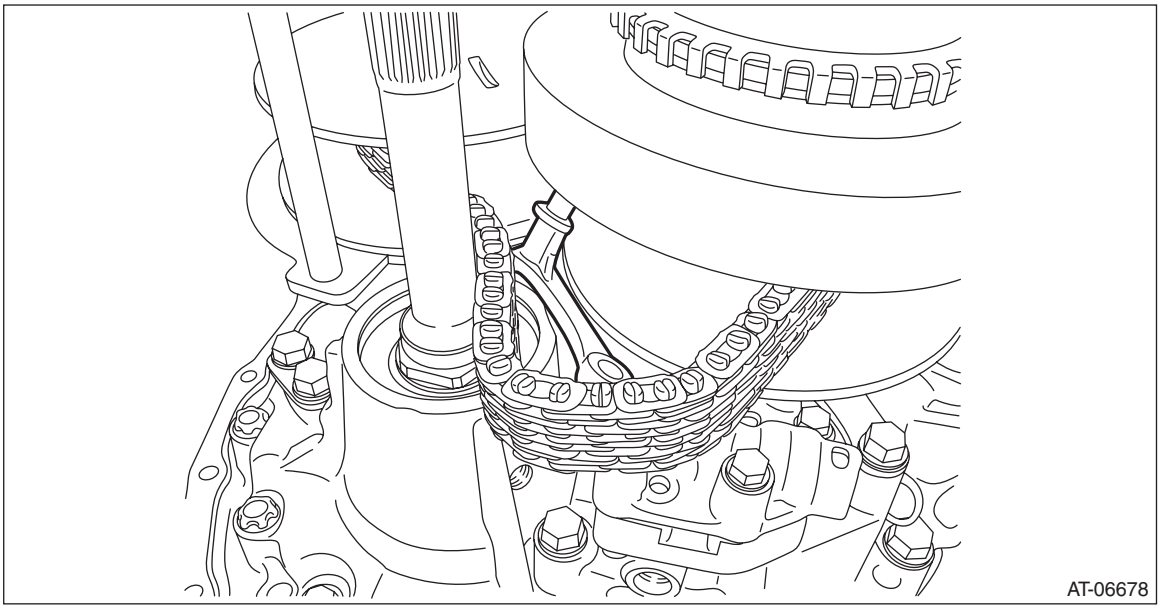


(7) Detach the four claws to remove the chain guide.

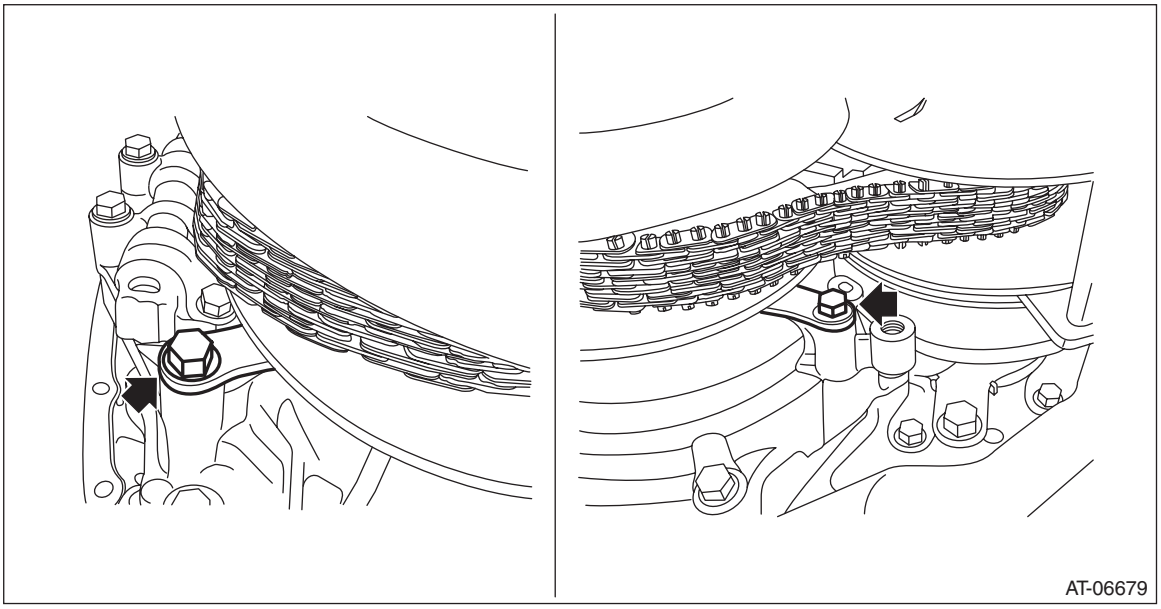


(8) Remove the support rod.

CAUTION:
Protect the both pulleys and variator chain from scratching.

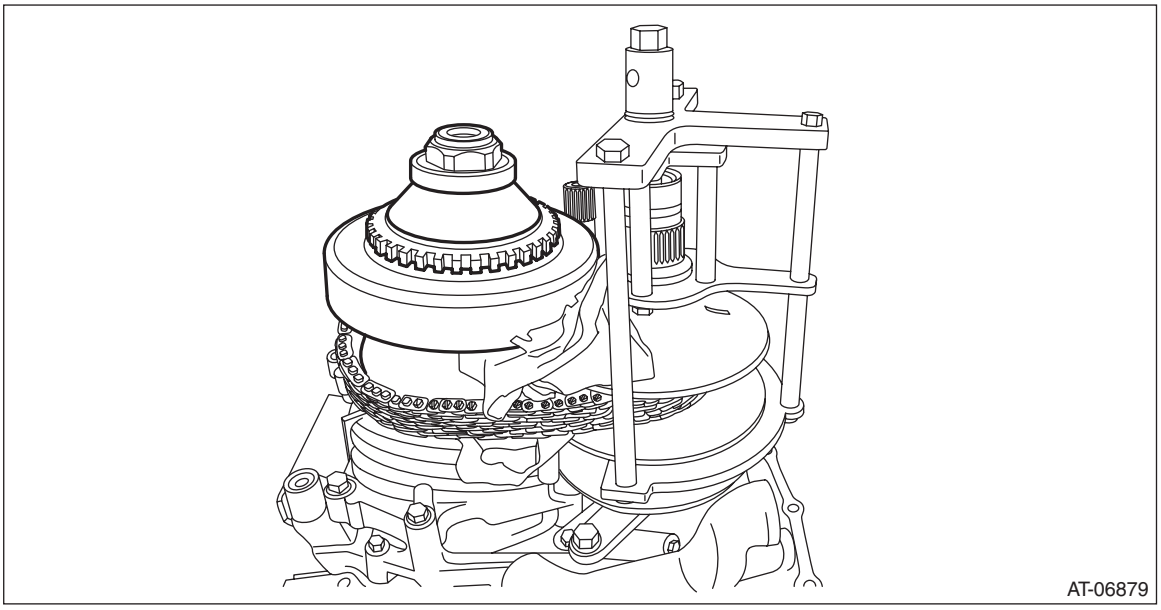


20) Remove the primary pulley mounting bolt.

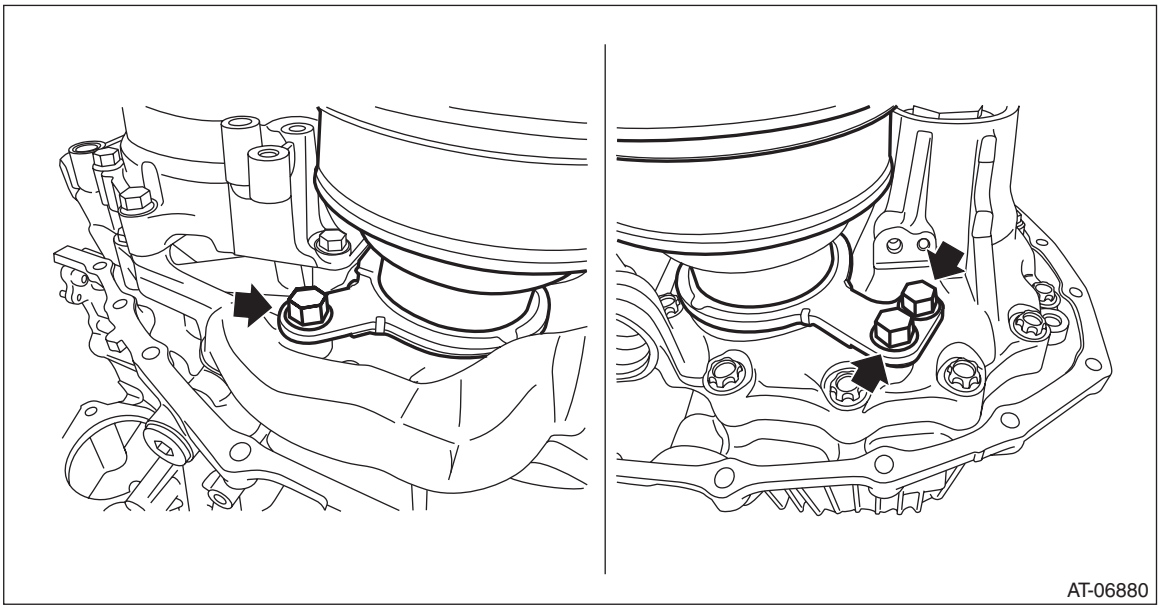


21) Remove the primary pulley from the reverse brake housing and intersect the V groove of secondary pulley and the V groove of primary pulley. Remove the variator chain from primary pulley, and remove the primary pulley.

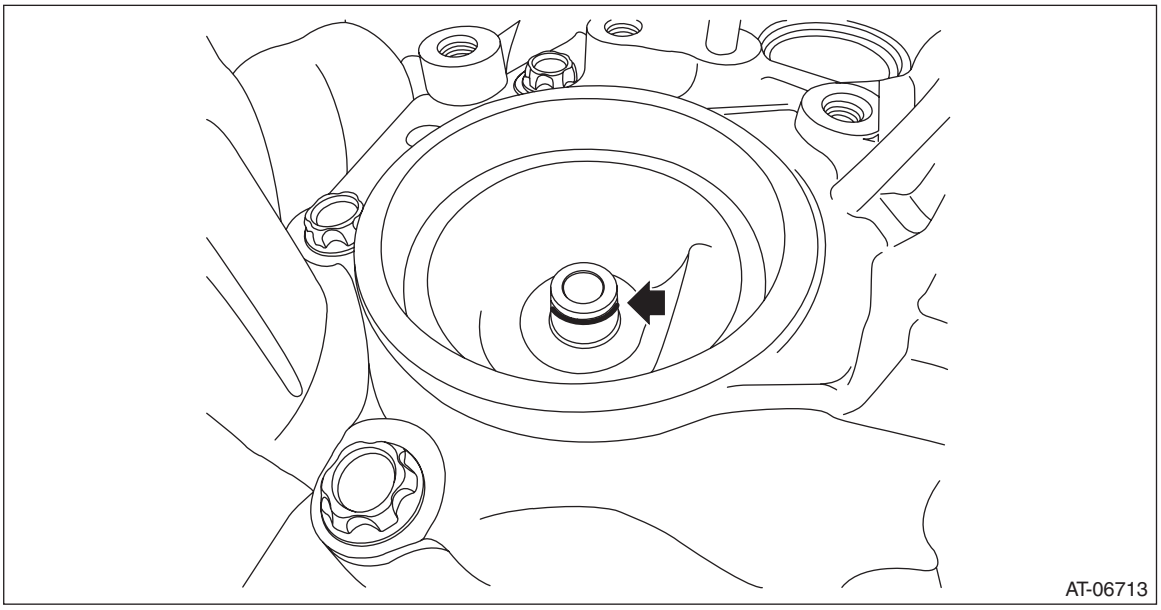
CAUTION:
Cover the V grooves of secondary pulley and primary pulley with cloth to protect the both pulleys and variator chain from scratching.



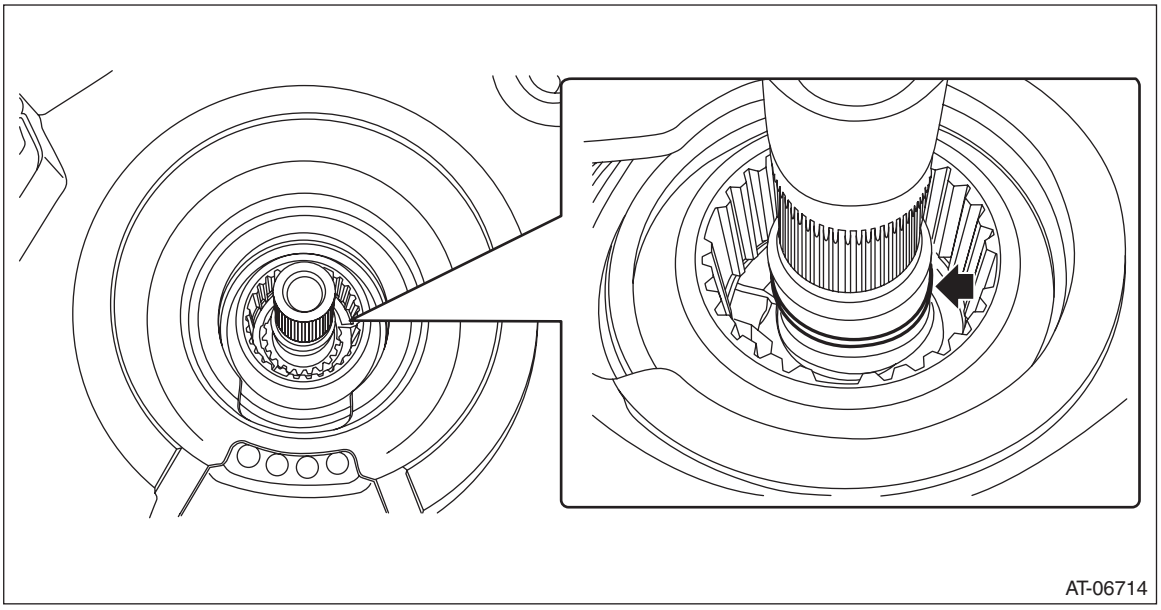
22) Remove the ST (EXPANDER PULLEY) from the secondary pulley.
23) Remove the variator chain from secondary pulley.
24) Remove the secondary pulley mounting bolts, and remove the secondary pulley.



25) Remove the seal ring from drive pinion retainer.



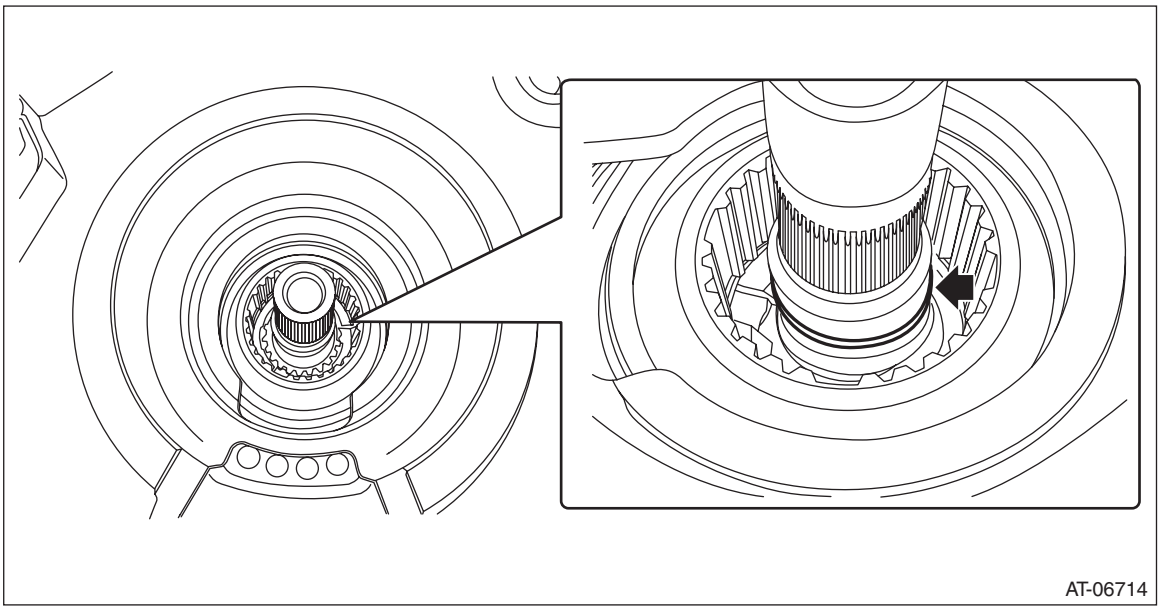
26) Remove the seal ring from the input shaft.



B: INSTALLATION

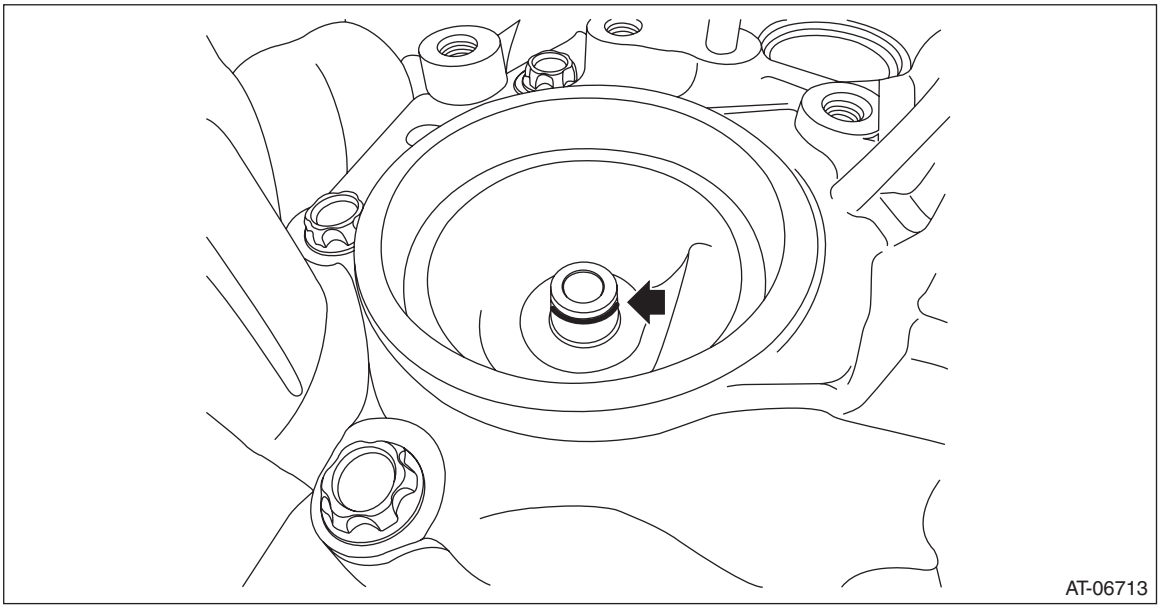
1) Select shims for pulley alignment. <Ref. to CVT-227, ADJUSTMENT, Primary Pulley and Secondary Pulley.>
2) Install the seal ring to the input shaft.

NOTE:
- Use a new seal ring.
- When installing the seal ring, do not expand the seal ring too much.
- Apply CVTF to the seal rings.



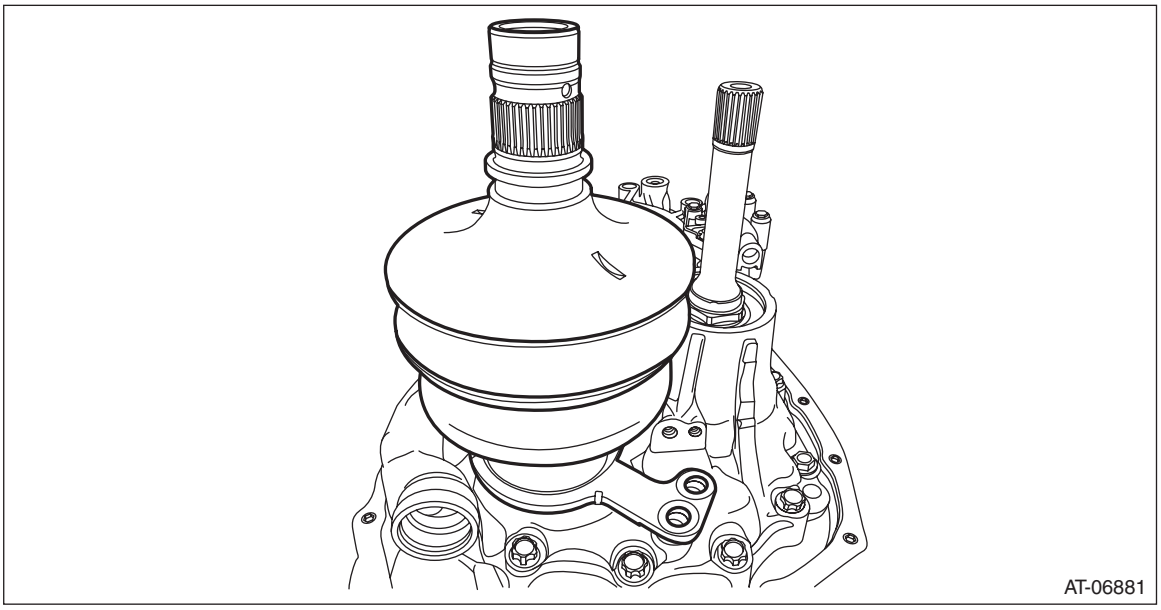
3) Install the seal ring to drive pinion retainer.

NOTE:
- Use a new seal ring.
- Apply CVTF to the seal rings.



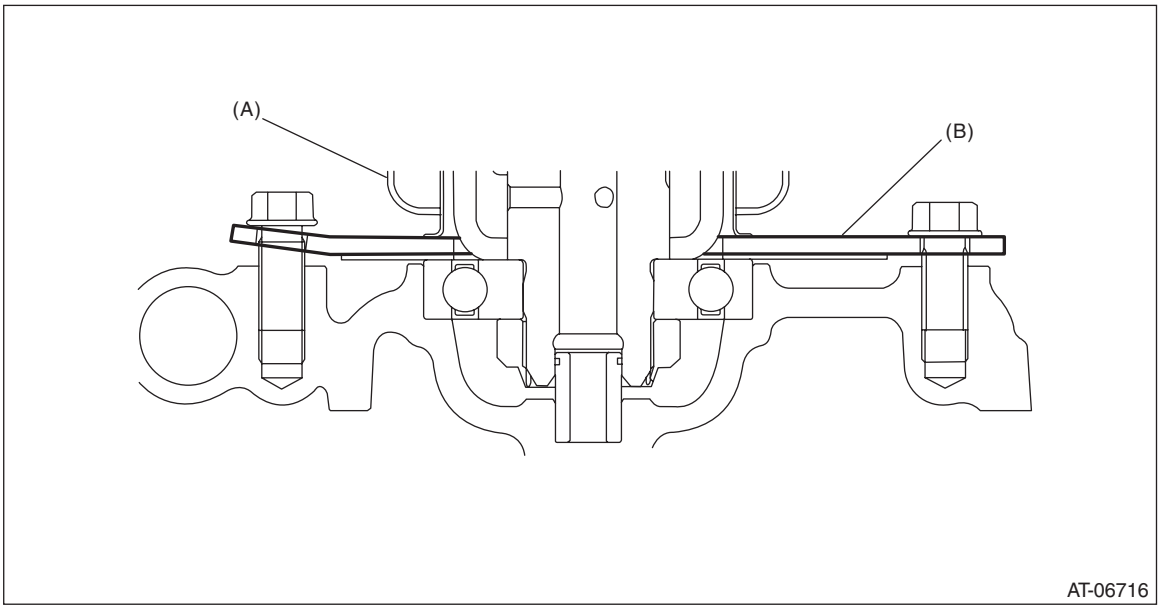
4) Install the selected shims to the primary pulley bearing catch surface.

5) Install the secondary pulley to the drive pinion retainer.



6) Install and tighten the secondary pulley securing bolts.
   (1) Tighten the three bolts until the seating surfaces contact the bearing retainer.

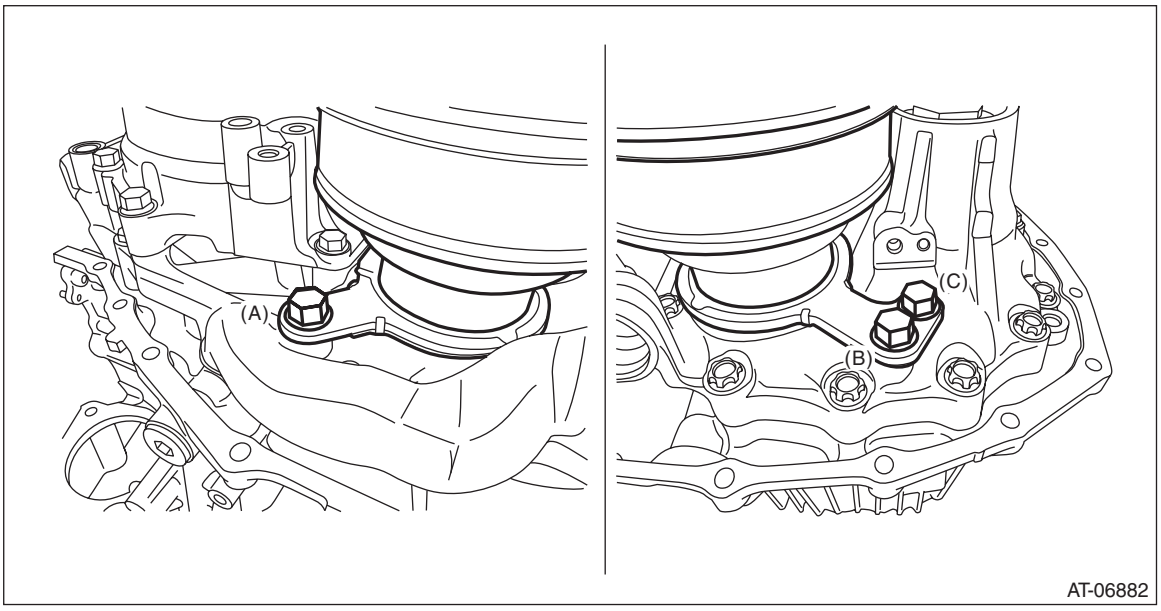
NOTE:
- Be careful not to tilt the bearing retainer of the secondary pulley.
- Apply CVTF to the bolt.



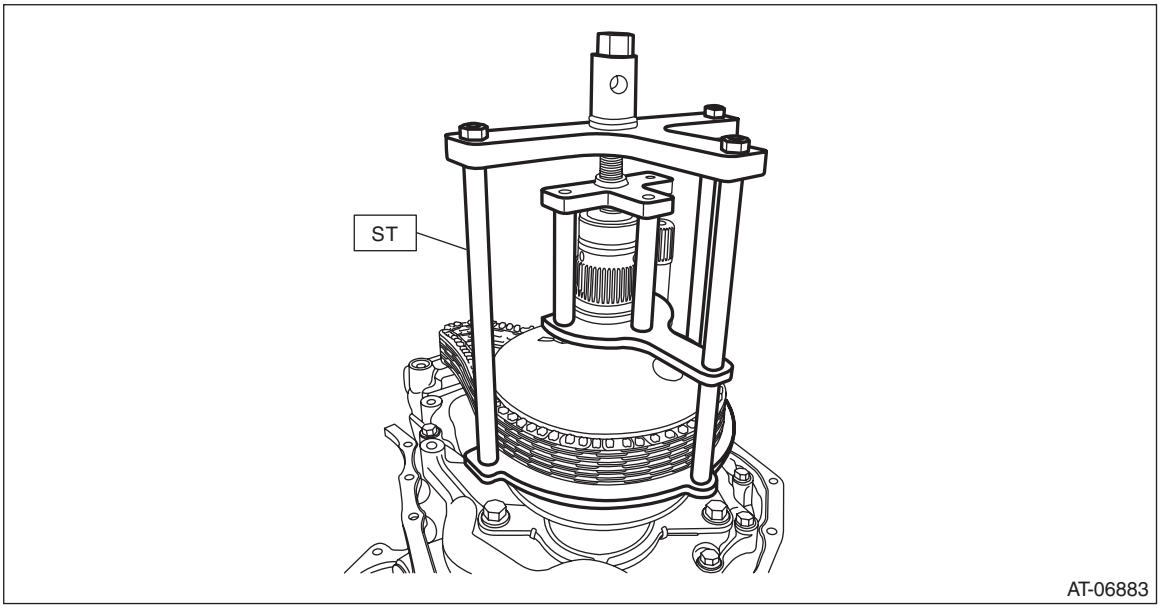
(A) Secondary pulley
(B) Bearing retainer

(2) Tighten the bolts in the order of (A) → (B) → (C) → (B).

Tightening torque:
67.5 N·m (6.9 kgf-m, 49.8 ft-lb)



7) Place the variator chain on the V groove of the secondary pulley, and set the ST.
ST 18769AA010 EXPANDER PULLEY

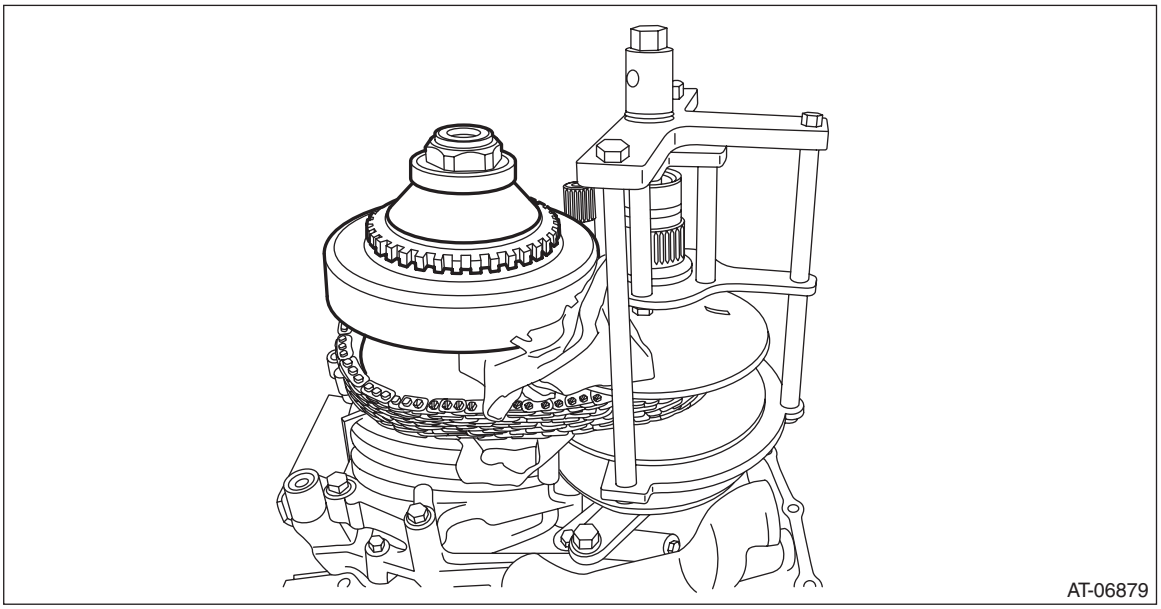


8) Expand the V groove of the secondary pulley.

9) Install the primary pulley to the reverse brake housing together with the variator chain.

CAUTION:
Cover the V grooves of primary pulley and secondary pulley with cloth to protect the both pulleys and variator chain from scratching.

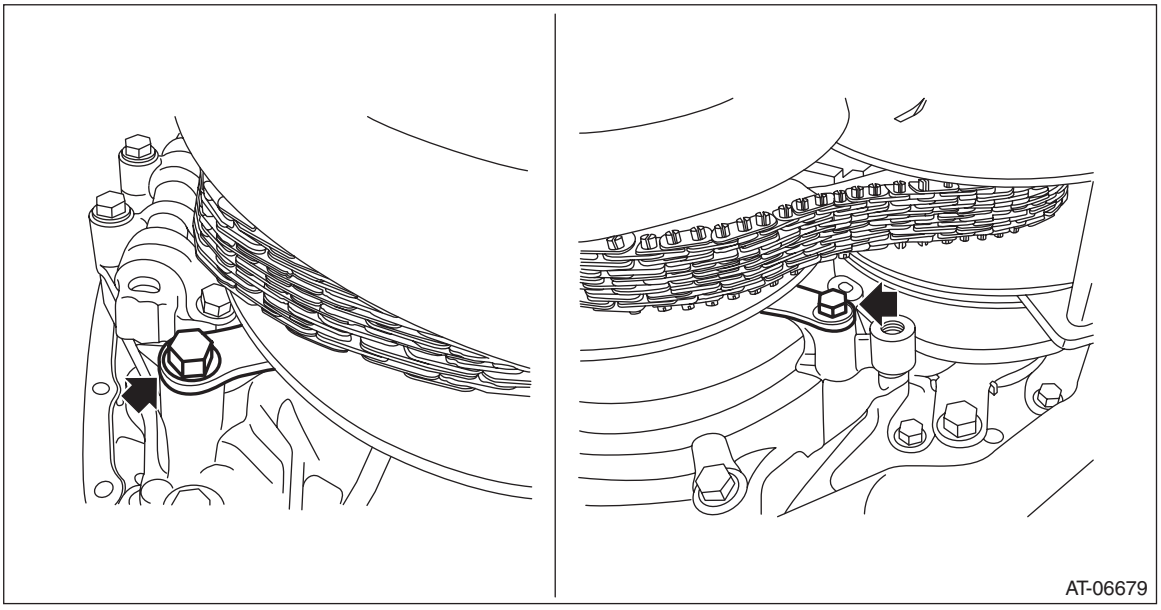
(1) Intersect the V groove of primary pulley and the V groove of secondary pulley and install the secondary pulley while placing the variator chain on secondary pulley.



(2) Install the primary pulley to the reverse brake housing so that the bolt hole of primary bearing retainer and the bolt hole of reverse brake housing are aligned.

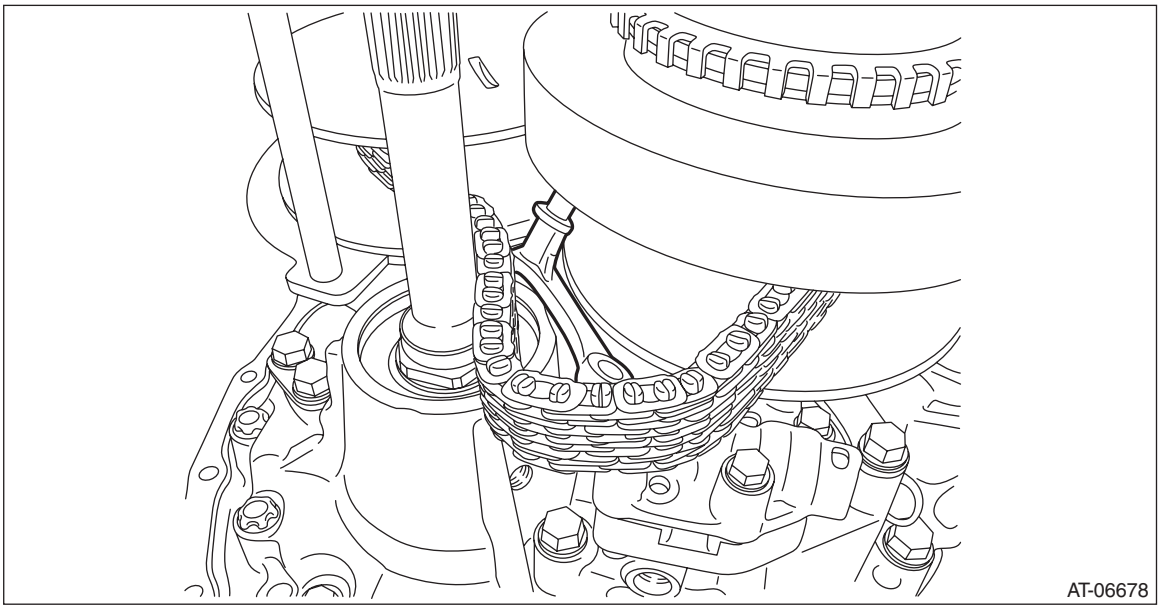
10) Install the primary pulley bolt.

Tightening torque:
21 N·m (2.1 kgf-m, 24.3 ft-lb)

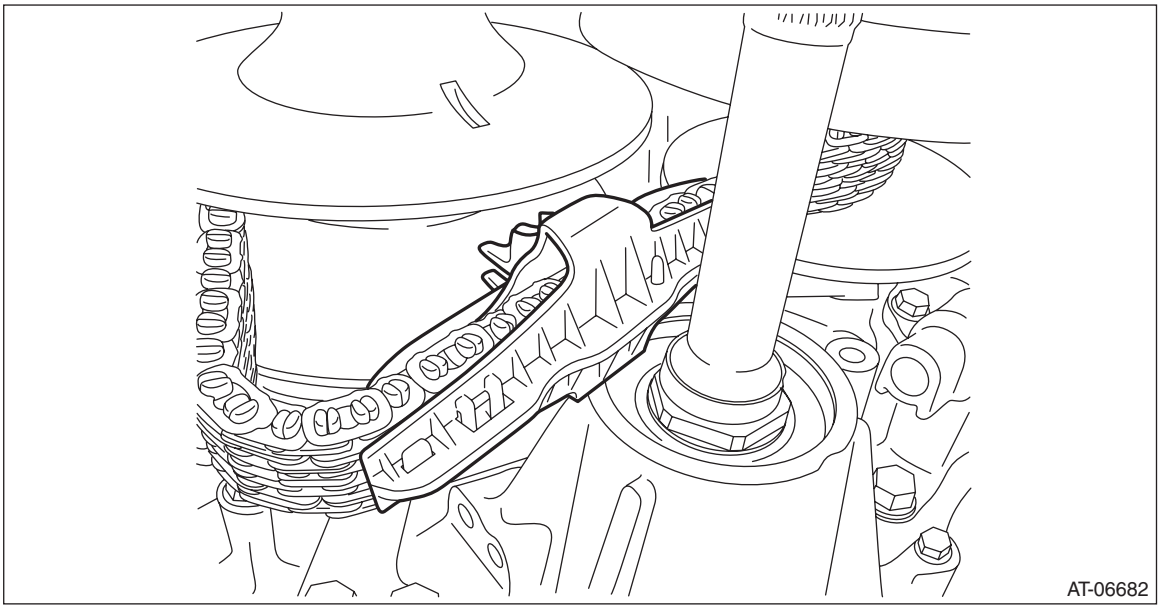


11) Install the chain guide.
(1) Place the support rod inside of the variator chain.

CAUTION:
Protect the both pulleys and variator chain from scratching.

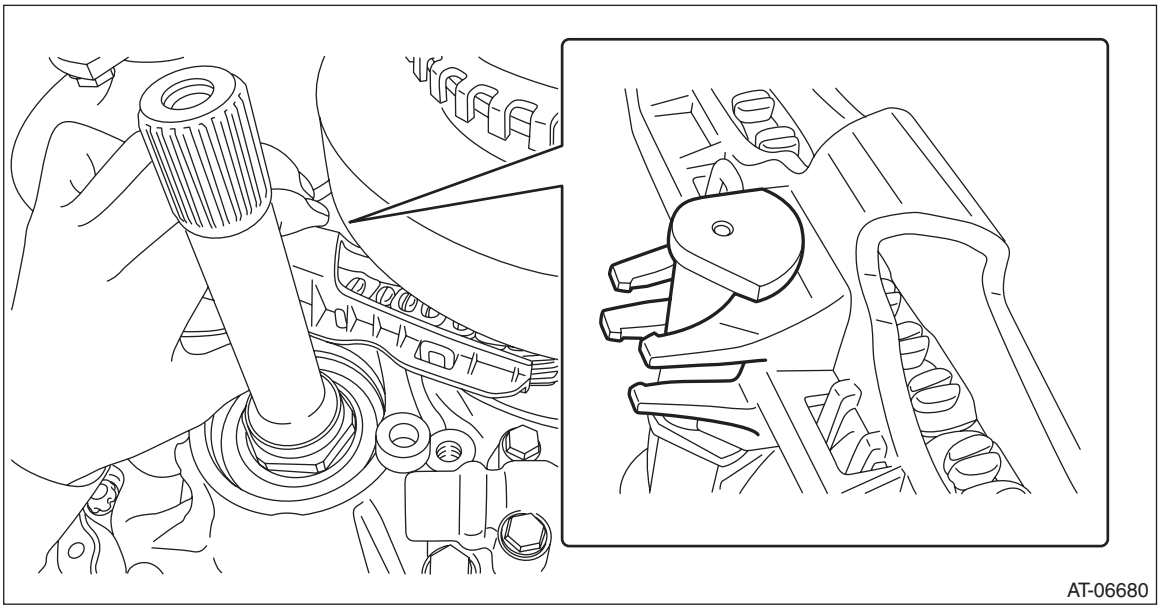

AT-06678

(2) Install the chain guide to the variator chain.


AT-06682

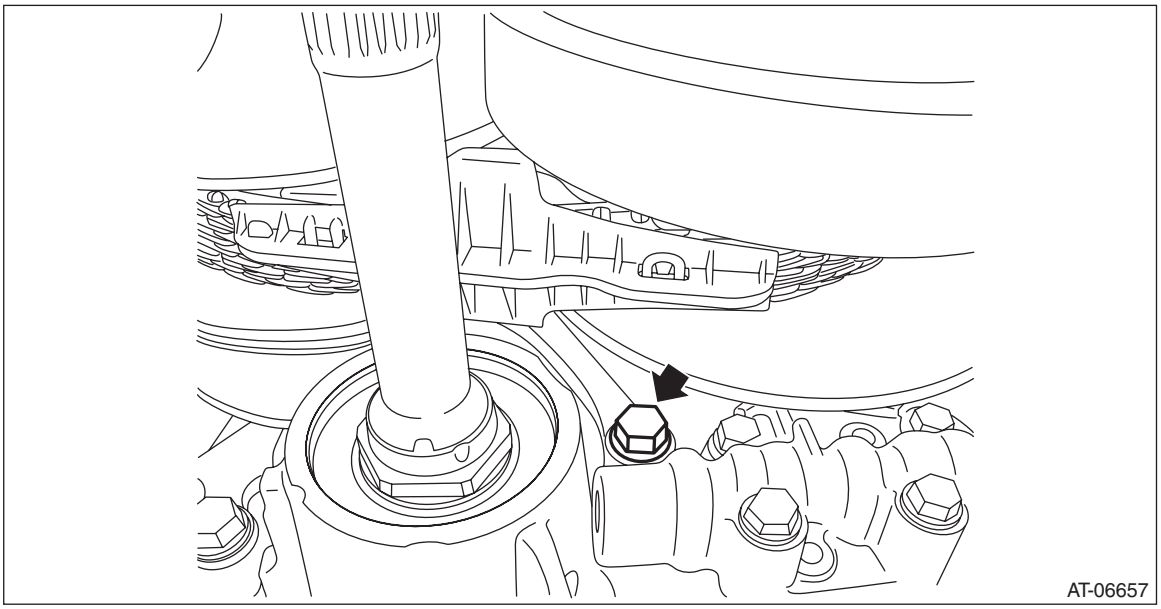
(3) Move the chain guide to the support rod side.

(4) While holding the support rod, press the chain guide so that the support rod runs through between the protrusions of chain guide and install the chain guide to the support rod.



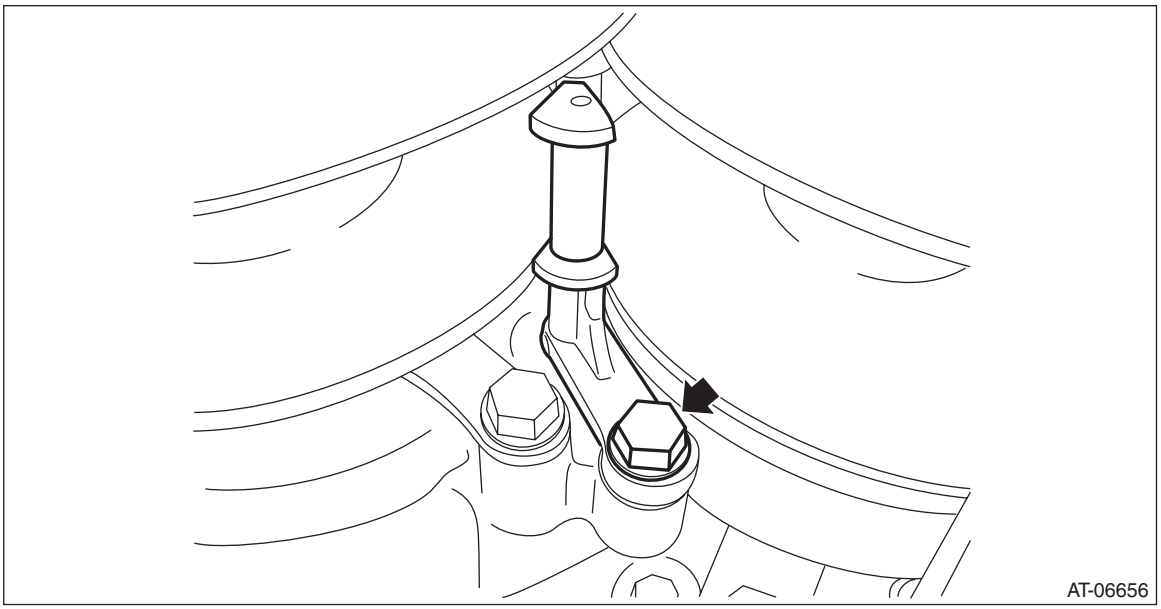
(5) Install the support rod.

Tightening torque:
21 N·m (2.1 kgf-m, 15.5 ft-lb)

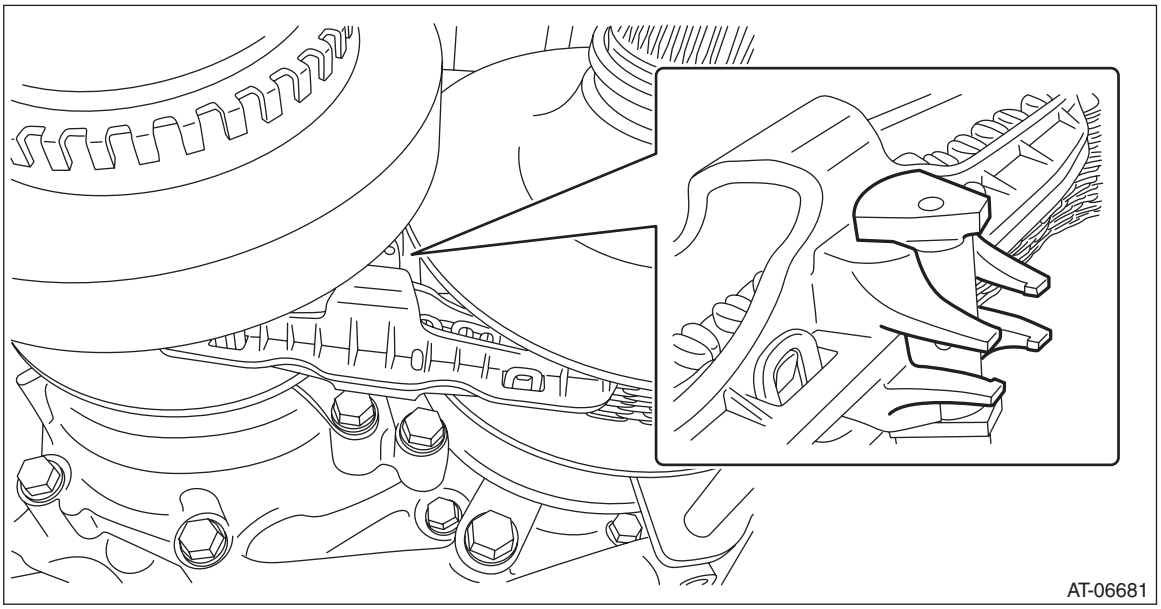


(6) Install the lubrication pipe.

Tightening torque:
21 N·m (2.1 kgf-m, 15.5 ft-lb)



(7) Install the chain guide so that the lubrication pipe runs through between the protrusions of each chain guide. Then remove the ST (PULLEY EXPANDER).



12) Install the reduction drive gear. <Ref. to CVT-210, INSTALLATION, Reduction Drive Gear.>
13) Select the reduction drive gear shim. <Ref. to CVT-211, ADJUSTMENT, Reduction Drive Gear.>
14) Install the transmission case. <Ref. to CVT-196, INSTALLATION, Transmission Case.>
15) Install the transmission control device. <Ref. to CVT-190, INSTALLATION, Transmission Control Device.>
16) Install the oil strainer and oil pan. <Ref. to CVT-109, INSTALLATION, Oil Pan and Strainer.>
17) Install the reduction driven gear assembly. <Ref. to CVT-179, INSTALLATION, Reduction Driven Gear.>
18) Install the transfer driven gear assembly. <Ref. to CVT-175, INSTALLATION, Transfer Driven Gear.>
19) Install the transfer clutch assembly. <Ref. to CVT-162, INSTALLATION, Transfer Clutch.>
20) Install the parking pawl. <Ref. to CVT-178, INSTALLATION, Parking Pawl.>
21) Install the extension case. <Ref. to CVT-157, INSTALLATION, Extension Case.>
22) Install the inhibitor switch. <Ref. to CVT-96, INSTALLATION, Inhibitor Switch.>
23) Install the secondary speed sensor. <Ref. to CVT-101, INSTALLATION, Secondary Speed Sensor.>

24) Install the primary speed sensor. <Ref. to CVT-104, INSTALLATION, Primary Speed Sensor.>
25) Install the turbine speed sensor. <Ref. to CVT-99, INSTALLATION, Turbine Speed Sensor.>
26) Install the transmission harness. <Ref. to CVT-130, INSTALLATION, Transmission Harness.>
27) Install the control valve body. <Ref. to CVT-117, INSTALLATION, Control Valve Body.>
28) Install the air breather hose. <Ref. to CVT-149, INSTALLATION, Air Breather Hose.>
29) Install the transmission assembly to the vehicle. <Ref. to CVT-69, INSTALLATION, Automatic Transmission Assembly.>

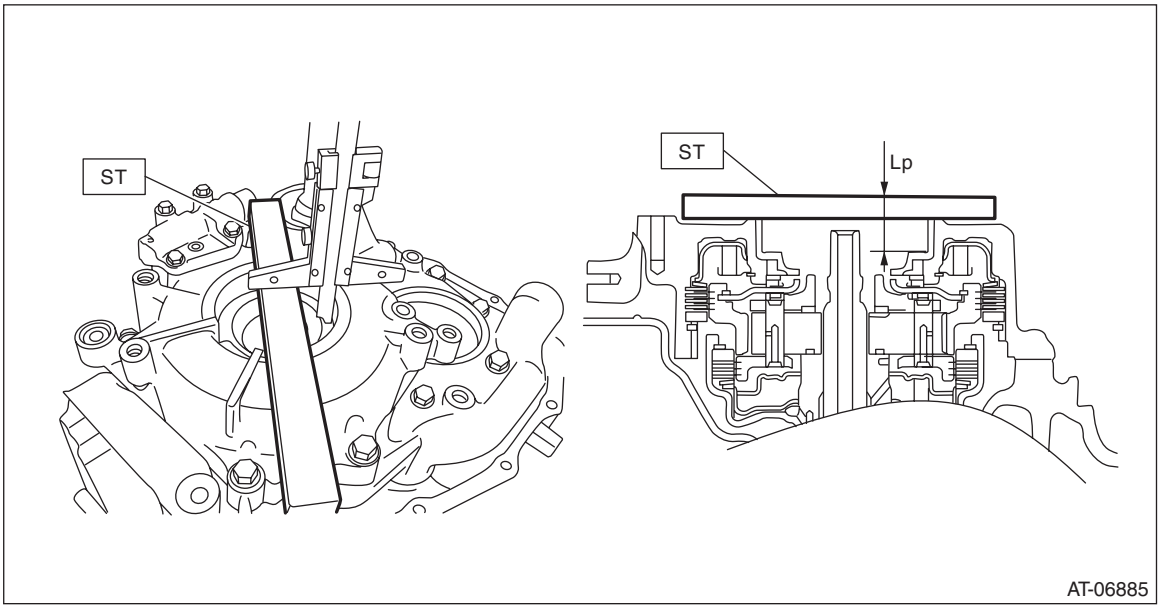
C: INSPECTION

- Check the surface of primary and secondary pulley cones for damage or wear.
- Check the primary and secondary pulley for damage.
- Check the bearing for seizure or wear.
- Apply CVTF to bearing and rotate the bearing to check for noise or dragging etc.

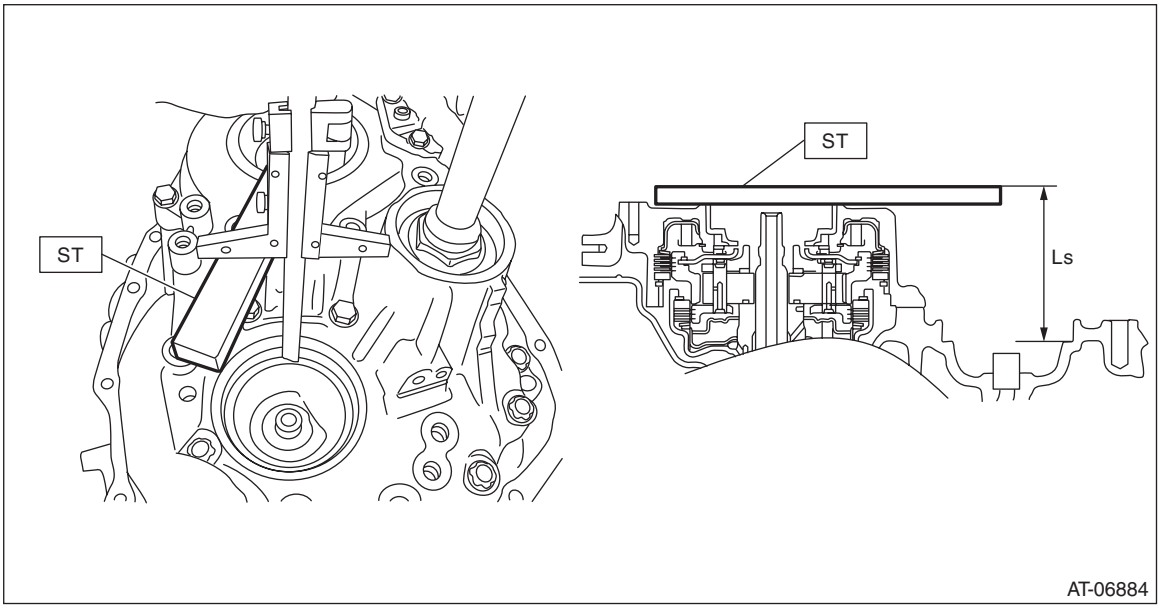
D: ADJUSTMENT

1. PROCEDURE IN REPLACEMENT OF PRIMARY AND SECONDARY PULLEY, OR IN REPLACEMENT OF PRIMARY PULLEY, SECONDARY PULLEY AND VARIATOR CHAIN

1) Measure the depth “Lp” from the ST upper face to the primary pulley bearing catch surface at several points and calculate the average.
ST 499575400 GAUGE



2) Measure the depth “Ls” from the ST upper face to the secondary pulley bearing catch surface at several points and calculate the average.
ST 499575400 GAUGE



3) Calculate the following formula.
Calculation formula:
T (mm) = B – A + Lp – Ls – 28.602
[T (in) = B – A + Lp – Ls – 1.126]
T: Pulley alignment
A: Specified primary pulley dimension
B: Specified secondary pulley dimension
Lp: Depth from the ST upper face to the primary pulley bearing catch surface
Ls: Depth from the ST upper face to the secondary pulley bearing catch surface
28.602 mm (1.126 in): Constant

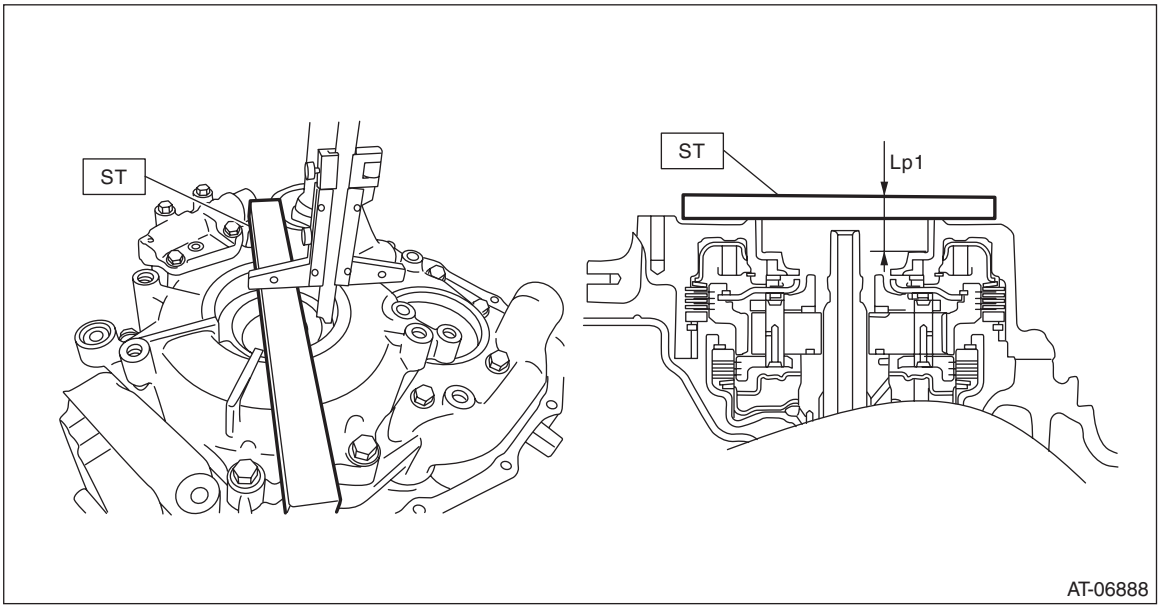
Pulley alignment T mm (in)	Thickness of shim mm (in)
-0.05 — 0.049(-0.002 — 0.002)	No shims
0.050 — 0.149(0.002 — 0.006)	0.1 (0.004)
0.150 — 0.249(0.006 — 0.010)	0.2 (0.008)
0.250 — 0.349(0.010 — 0.014)	0.3 (0.012)
0.350 — 0.449(0.014 — 0.018)	0.4 (0.016)
0.450 — 0.549(0.018 — 0.022)	0.5 (0.020)
0.550 — 0.649(0.022 — 0.026)	0.6 (0.024)
0.650 — 0.749(0.026 — 0.029)	0.7 (0.028)
0.750 — 0.849(0.029 — 0.033)	0.8 (0.031)
0.850 — 0.949(0.033 — 0.037)	0.9 (0.035)
0.950 — 1.049(0.037 — 0.041)	1.0 (0.039)
1.050 — 1.149(0.041 — 0.045)	1.1 (0.043)

4) Select one to two shims so that the total thickness meets the value obtained from step 3).

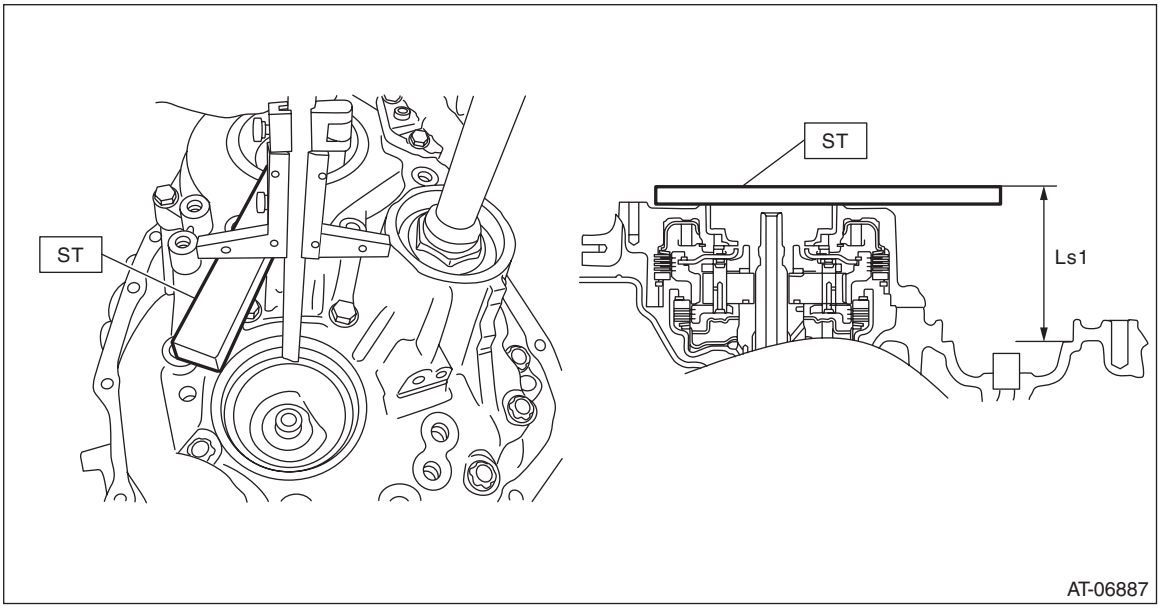
Part No.	Shim thickness mm (in)
32451AA050	0.1 (0.004)
32451AA060	0.2 (0.008)
32451AA070	0.3 (0.012)
32451AA080	0.4 (0.016)
32451AA090	0.5 (0.020)
32451AA100	0.6 (0.024)

2. PROCEDURE WHEN REPLACING ONLY DRIVE PINION RETAINER OR REVERSE BRAKE HOUSING

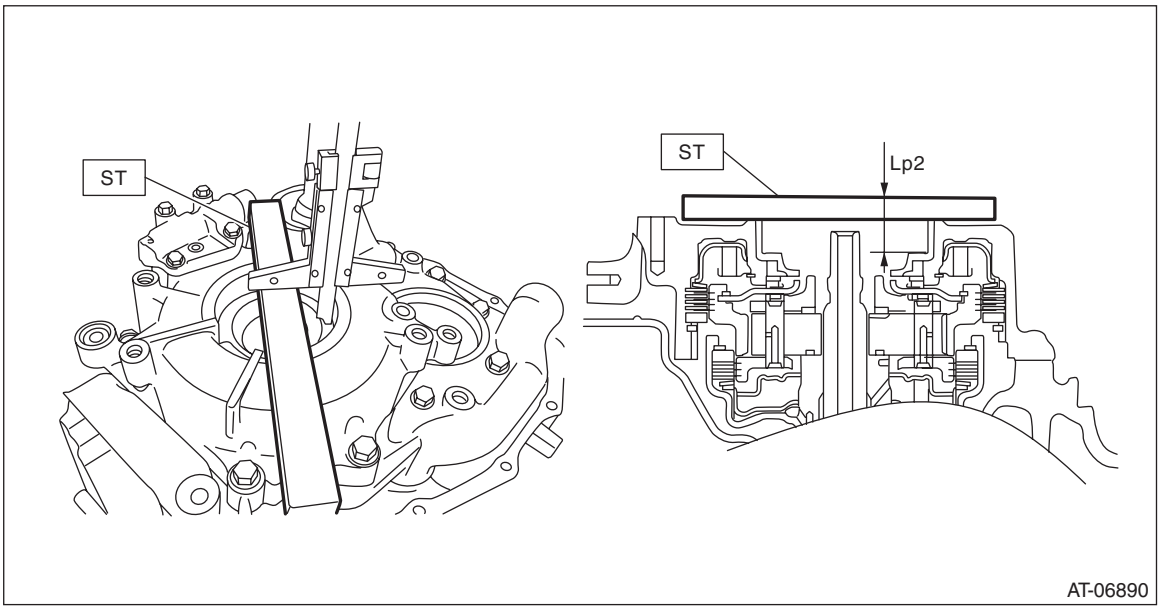
1) Clean the mating surface of current drive pinion retainer and converter case.
2) Measure and record the shim thickness that is attached on the current reverse brake housing.
3) Using the current drive pinion retainer, measure the depth “Lp1” from the ST upper face to the primary pulley bearing catch surface at several points and calculate the average.
ST 499575400 GAUGE



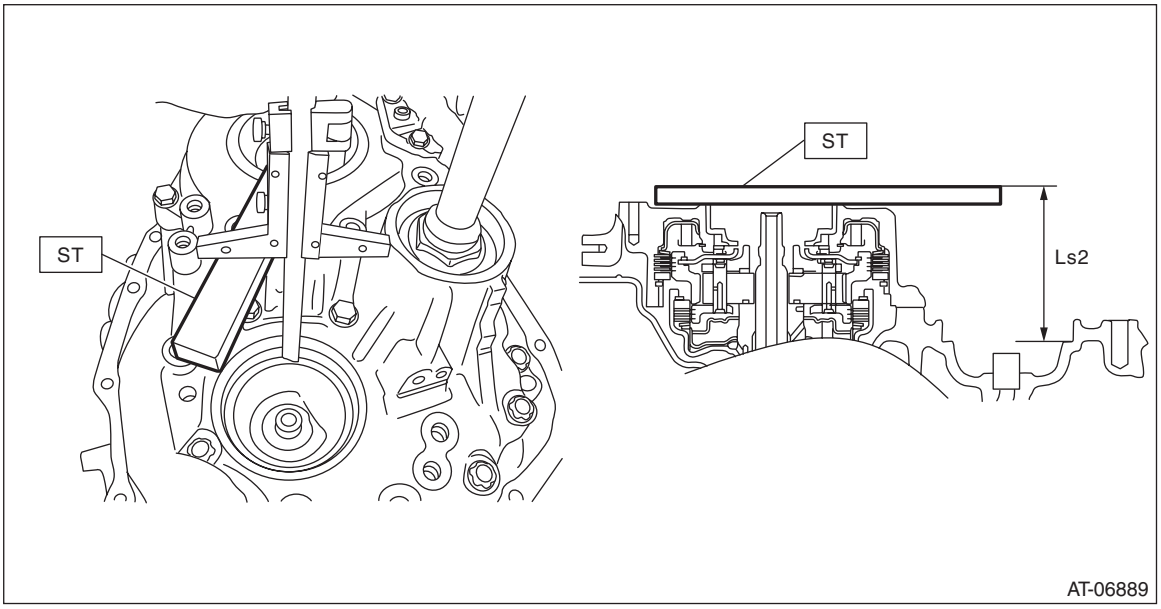
4) Using the current drive pinion retainer or current reverse brake housing, measure the depth “Ls1” from the ST upper face to the secondary pulley bearing catch surface at several points and calculate the average.
ST 499575400 GAUGE



5) Calculate the “LD1” using the following formula and record it.
Calculation formula:
LD1 mm (in) = Ls1 – Lp1
LD1: Height from the primary pulley bearing catch surface to the secondary pulley bearing catch surface
Lp1: Depth from the ST upper face to the primary pulley bearing catch surface
Ls1: Depth from the ST upper face to the secondary pulley bearing catch surface
6) Using the new drive pinion retainer or new reverse brake housing, measure the depth “Lp2” from the ST upper face to the primary pulley bearing catch surface at several points and calculate the average.
ST 499575400 GAUGE



7) Using the new drive pinion retainer or new reverse brake housing, measure the depth “Ls2” from the ST upper face to the secondary pulley bearing catch surface at several points and calculate the average.
ST 499575400 GAUGE



8) Calculate the “LD2” using the following formula and record it.
Calculation formula:
LD2 mm (in) = Ls2 – Lp2
LD2: Height from the primary pulley bearing catch surface to the secondary pulley bearing catch surface
Lp2: Depth from the ST upper face to the primary pulley bearing catch surface
Ls2: Depth from the ST upper face to the secondary pulley bearing catch surface

9) Calculate the recorded values of “LD1” and “LD2” to obtain the positive number to select the shims.
Calculation formula: T1 mm (in) = LD1 – LD2 or T2 mm (in) = LD2 – LD1
T1, T2: Difference between new drive pinion retainer or new reverse brake housing and current drive pinion retainer or current reverse brake housing
LD1: Calculated value of current drive pinion retainer or current reverse brake housing
LD2: Calculated value of new drive pinion retainer or new reverse brake housing

Difference of the case (T1) mm (in)	Shim selection procedure
0 — 0.050 (0 — 0.00197)	Select a new shim of the same thickness with the shim that is used on the primary pulley side of the current reverse brake housing.
0.051 — 0.150 (0.00201 — 0.00591)	Select a shim which is 0.1 mm (0.004 in) thicker than the shim that is used on the primary pulley side of the current reverse brake housing.
0.151 — 0.250 (0.00594 — 0.00984)	Select a shim which is 0.2 mm (0.008 in) thicker than the shim that is used on the primary pulley side of the current reverse brake housing.
0.251 — 0.350 (0.00988 — 0.01378)	Select a shim which is 0.3 mm (0.012 in) thicker than the shim that is used on the primary pulley side of the current reverse brake housing.
0.351 — 0.450 (0.01382 — 0.01772)	Select a shim which is 0.4 mm (0.016 in) thicker than the shim that is used on the primary pulley side of the current reverse brake housing.
0.451 — 0.550 (0.01776 — 0.02165)	Select a shim which is 0.5 mm (0.020 in) thicker than the shim that is used on the primary pulley side of the current reverse brake housing.
0.551 — 0.600 (0.02169 — 0.02362)	Select a shim which is 0.6 mm (0.024 in) thicker than the shim that is used on the primary pulley side of the current reverse brake housing.

Difference of the case (T2) mm (in)	Shim selection procedure
0 — 0.050 (0 — 0.00197)	Select a new shim of the same thickness with the shim that is used on the primary pulley side of the current reverse brake housing.
0.051 — 0.150 (0.00201 — 0.00591)	Select a shim which is 0.1 mm (0.004 in) thinner than the shim that is used on the primary pulley side of the current reverse brake housing.
0.151 — 0.250 (0.00594 — 0.00984)	Select a shim which is 0.2 mm (0.008 in) thinner than the shim that is used on the primary pulley side of the current reverse brake housing.
0.251 — 0.350 (0.00988 — 0.01378)	Select a shim which is 0.3 mm (0.012 in) thinner than the shim that is used on the primary pulley side of the current reverse brake housing.
0.351 — 0.450 (0.01382 — 0.01772)	Select a shim which is 0.4 mm (0.016 in) thinner than the shim that is used on the primary pulley side of the current reverse brake housing.
0.451 — 0.550 (0.01776 — 0.02165)	Select a shim which is 0.5 mm (0.020 in) thinner than the shim that is used on the primary pulley side of the current reverse brake housing.
0.551 — 0.600 (0.02169 — 0.02362)	Select a shim which is 0.6 mm (0.024 in) thinner than the shim that is used on the primary pulley side of the current reverse brake housing.

Part No.	Shim thickness mm (in)
32451AA050	0.1 (0.004)
32451AA060	0.2 (0.008)
32451AA070	0.3 (0.012)
32451AA080	0.4 (0.016)
32451AA090	0.5 (0.020)
32451AA100	0.6 (0.024)

38.Variator Chain

A: REMOVAL

For removal of variator chain, refer to “Primary Pulley and Secondary Pulley”. <Ref. to CVT-213, REMOVAL, Primary Pulley and Secondary Pulley.>

B: INSTALLATION

For installation of variator chain, refer to “Primary Pulley and Secondary Pulley”. <Ref. to CVT-220, INSTALLATION, Primary Pulley and Secondary Pulley.>

C: INSPECTION

Check the variator chain for damage and wear.

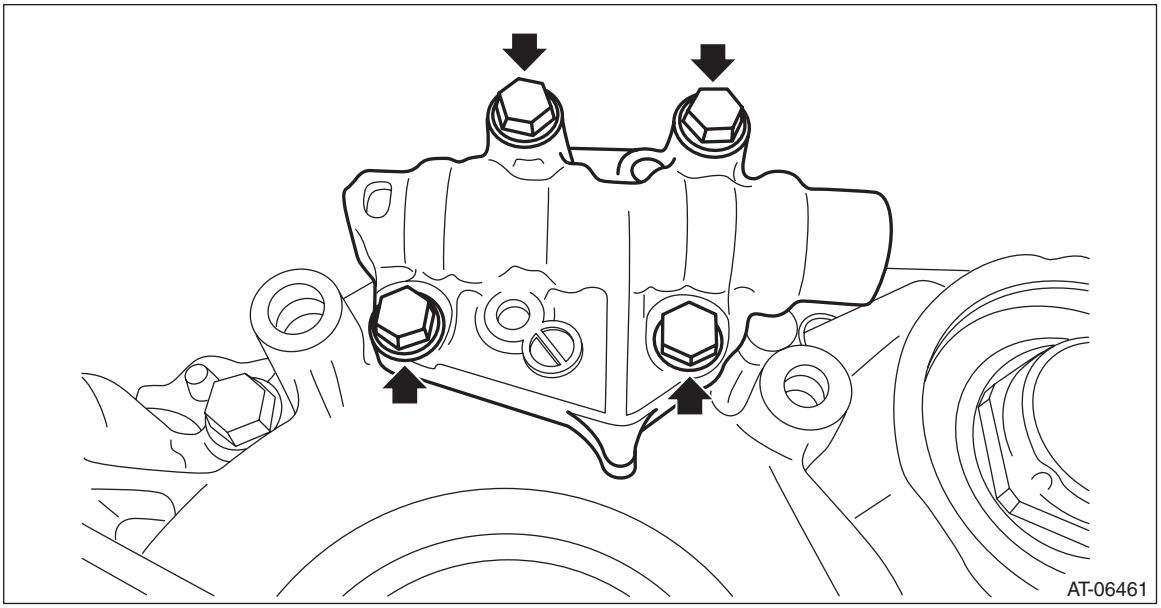
39.Reverse Brake Assembly

A: REMOVAL

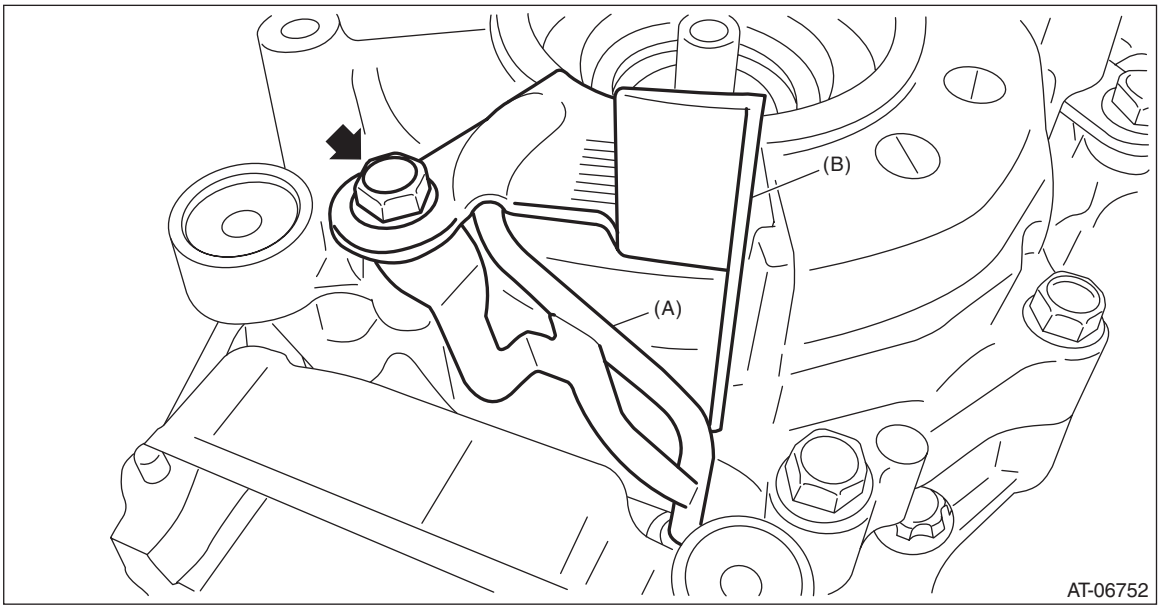
CAUTION:
The specifications of following parts vary depending on transmission serial No..
When replacing the following parts, be sure to check the serial number before replacing.
- **Reverse brake housing and bolt**

Transmission serial No.	101281 earlier 342794 earlier	101282 later 342795 later
Reverse brake housing	31654AA000	31654AA001
Bolt	800110240 × 4 800110360 × 2	010410400 × 6

1) Remove the transmission assembly from the vehicle. <Ref. to CVT-58, REMOVAL, Automatic Transmission Assembly.>
2) Remove the air breather hose. <Ref. to CVT-148, REMOVAL, Air Breather Hose.>
3) Remove the control valve body. <Ref. to CVT-112, REMOVAL, Control Valve Body.>
4) Remove the transmission harness. <Ref. to CVT-124, REMOVAL, Transmission Harness.>
5) Remove the turbine speed sensor. <Ref. to CVT-99, REMOVAL, Turbine Speed Sensor.>
6) Remove the secondary speed sensor. <Ref. to CVT-101, REMOVAL, Secondary Speed Sensor.>
7) Remove the primary speed sensor. <Ref. to CVT-103, REMOVAL, Primary Speed Sensor.>
8) Remove the inhibitor switch. <Ref. to CVT-94, REMOVAL, Inhibitor Switch.>
9) Remove the extension case. <Ref. to CVT-156, REMOVAL, Extension Case.>
10) Remove the transfer clutch assembly. <Ref. to CVT-160, REMOVAL, Transfer Clutch.>
11) Remove the transfer driven gear assembly. <Ref. to CVT-174, REMOVAL, Transfer Driven Gear.>
12) Remove the parking pawl. <Ref. to CVT-177, REMOVAL, Parking Pawl.>
13) Remove the reduction driven gear assembly. <Ref. to CVT-179, REMOVAL, Reduction Driven Gear.>
14) Remove the oil pan and oil strainer. <Ref. to CVT-108, REMOVAL, Oil Pan and Strainer.>
15) Remove the transmission control device. <Ref. to CVT-187, REMOVAL, Transmission Control Device.>
16) Remove the transmission case. <Ref. to CVT-193, REMOVAL, Transmission Case.>
17) Remove the reduction drive gear. <Ref. to CVT-209, REMOVAL, Reduction Drive Gear.>
18) Remove the primary pulley, secondary pulley and variator chain. <Ref. to CVT-213, REMOVAL, Primary Pulley and Secondary Pulley.>
19) Remove the manual valve assembly.

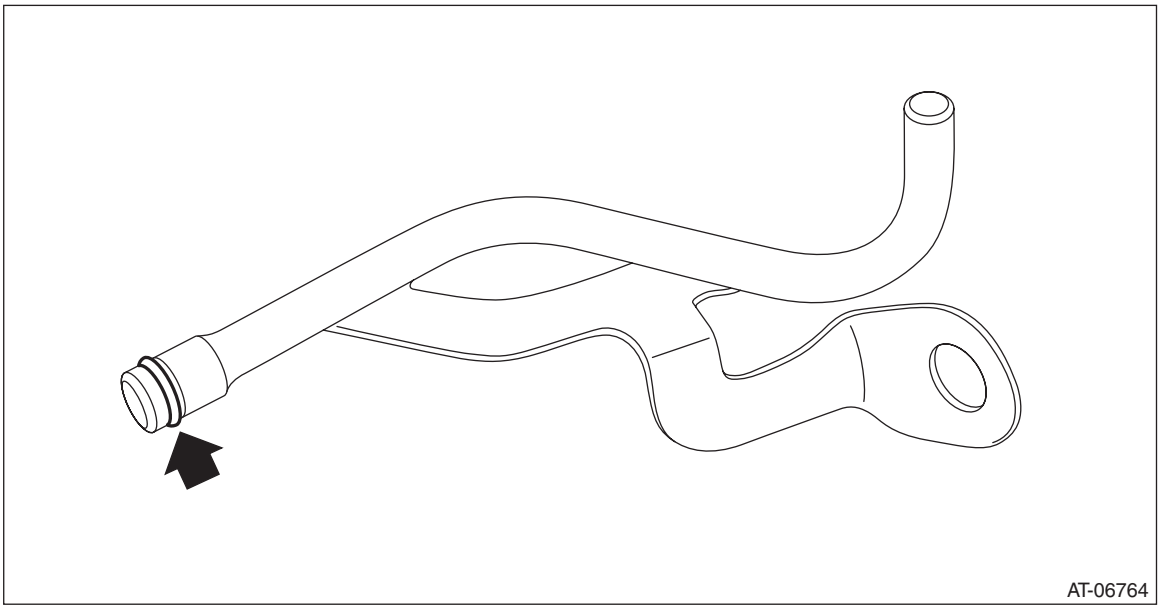


20) Remove the oil guide and lubrication pipe.

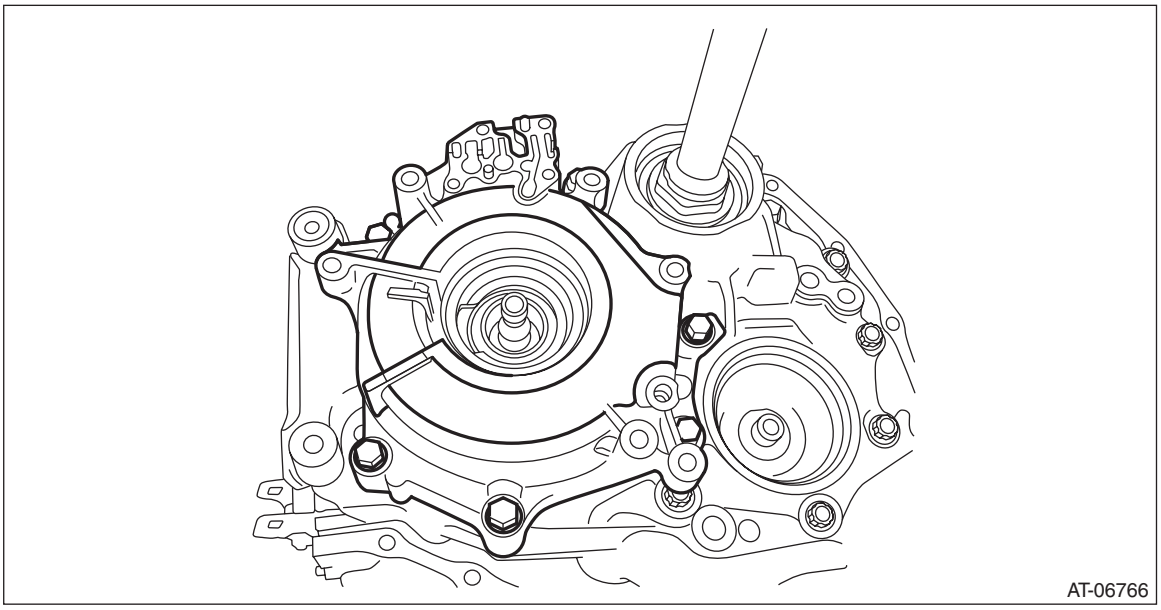


(A) Lubrication pipe
(B) Oil guide

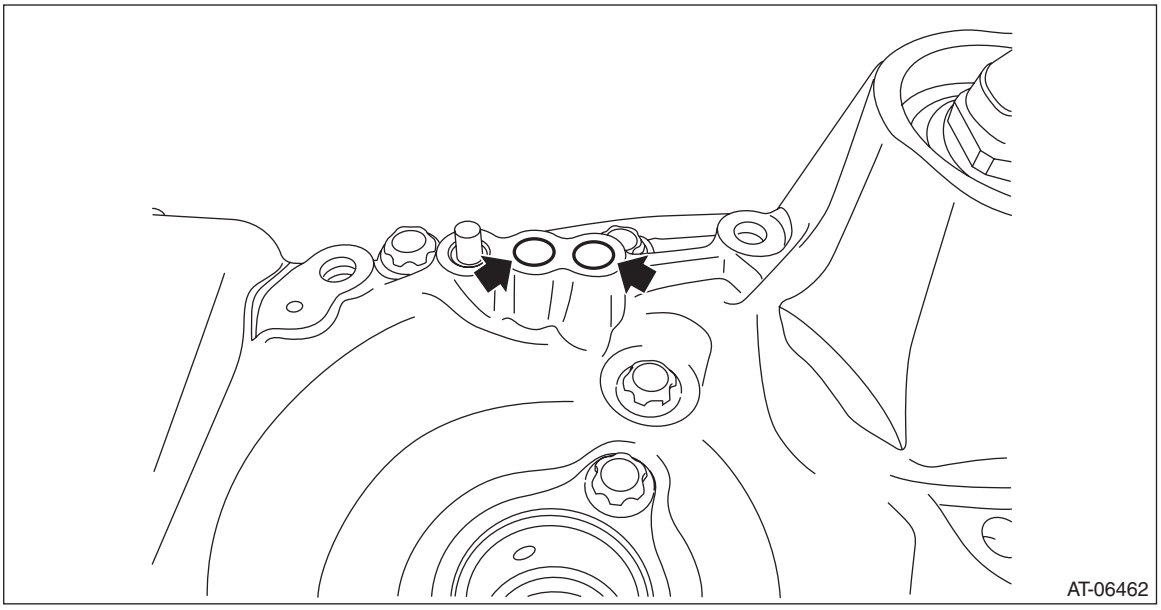
21) Remove the O-ring from lubrication pipe.



22) Remove the reverse brake assembly.

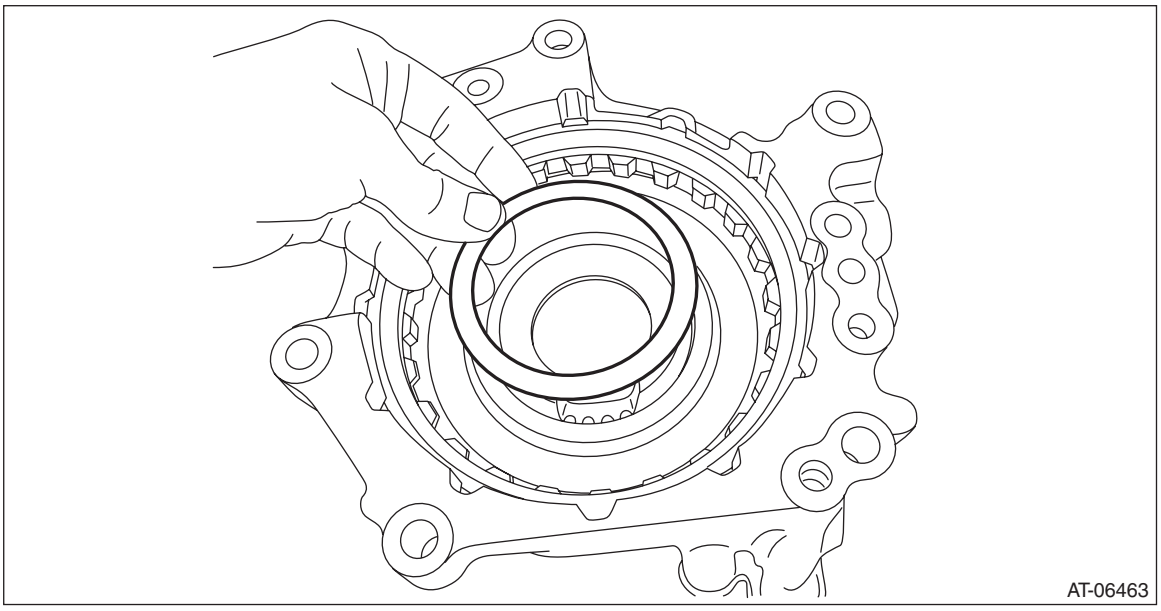


23) Remove the O-ring.



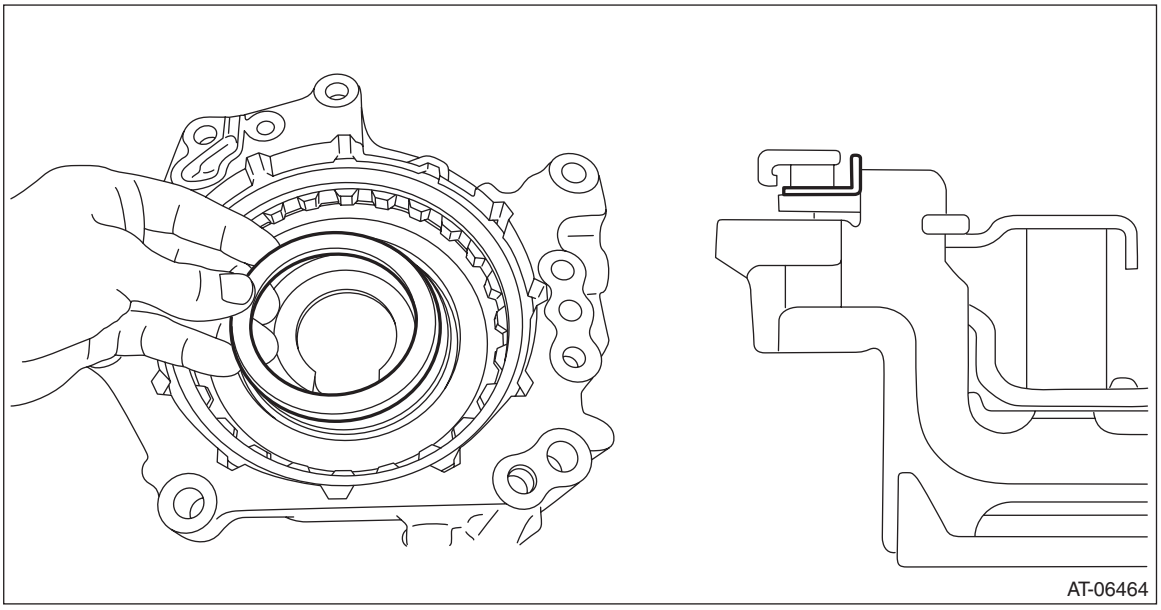
B: INSTALLATION

1) Select a washer. <Ref. to CVT-266, ADJUSTMENT, Forward Clutch Assembly.>
2) Install the selected washer to the reverse brake housing.

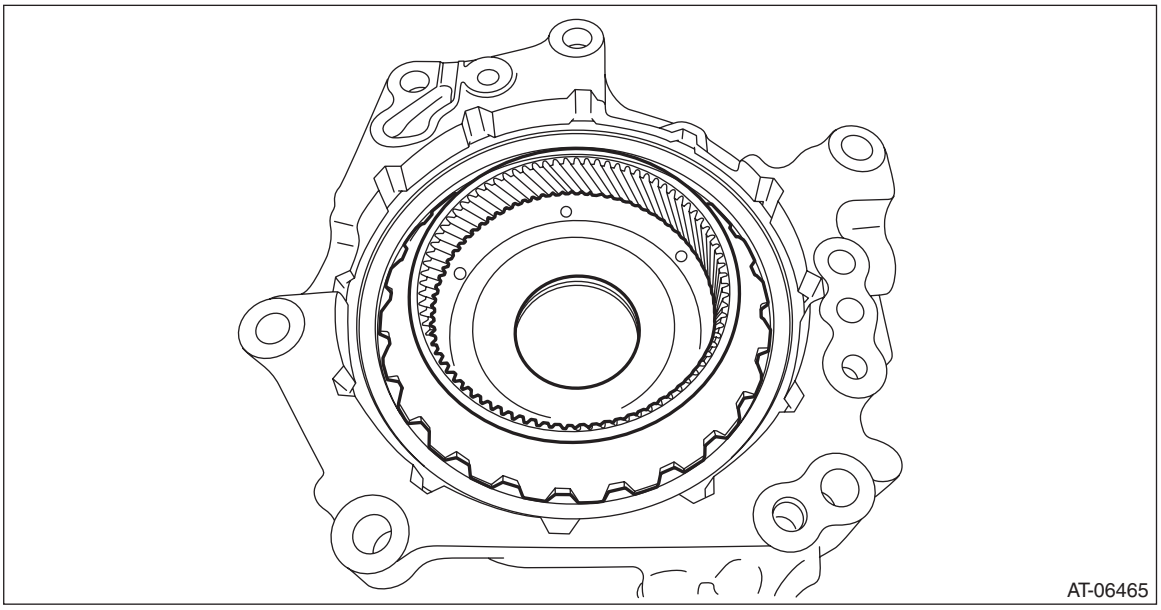


3) Install the thrust bearing to the reverse brake housing.

NOTE:
Face the temper color surface to the reverse brake side.

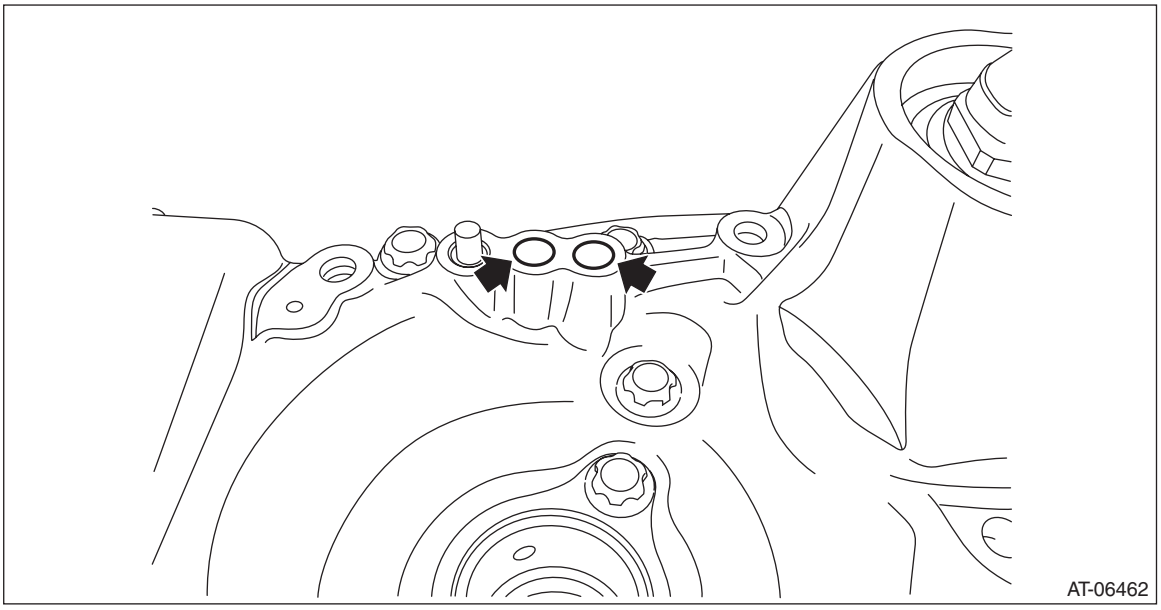


4) Remove the internal gear from the forward clutch assembly, and install it to the reverse brake housing.



5) Install the O-ring.

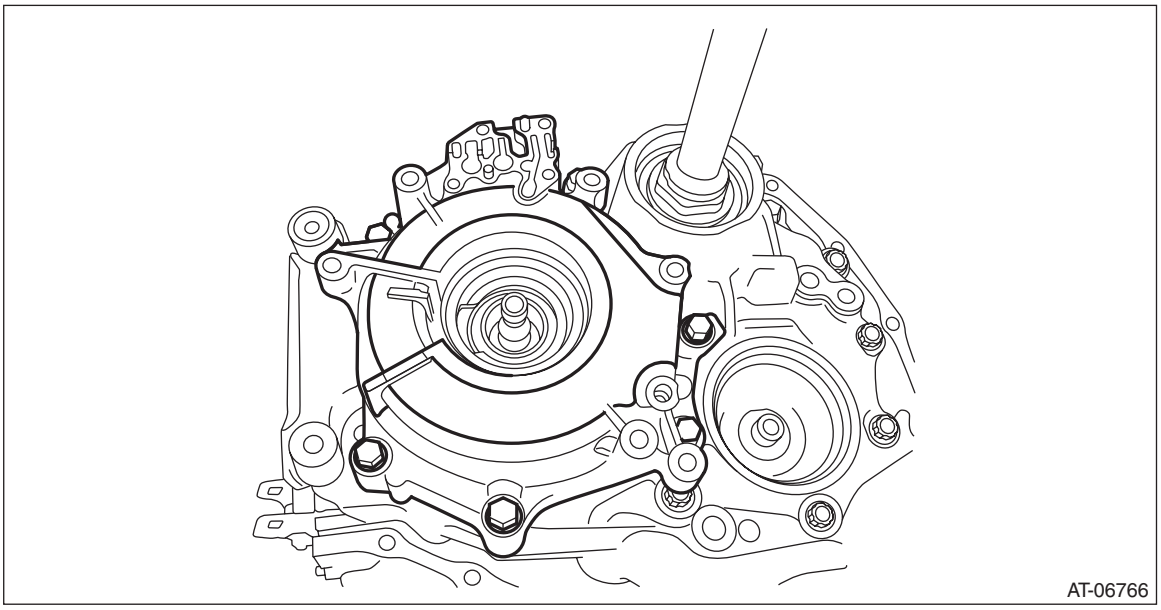
NOTE:
- Install a new O-ring.
- Apply CVTF to the O-ring.



6) Install the reverse brake assembly and internal gear as a unit to the drive pinion retainer.

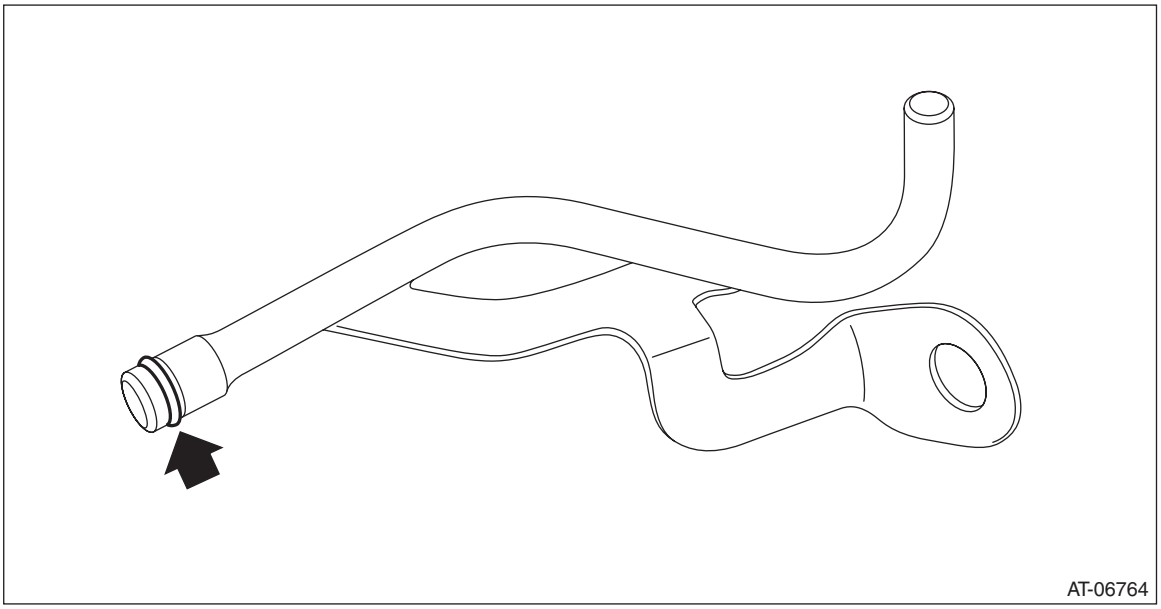
NOTE:
Slowly rotate the input shaft by hand to engage the internal gear and pinion gear of planetary carrier.

Tightening torque:
37 N·m (3.8 kgf-m, 27.3 ft-lb)



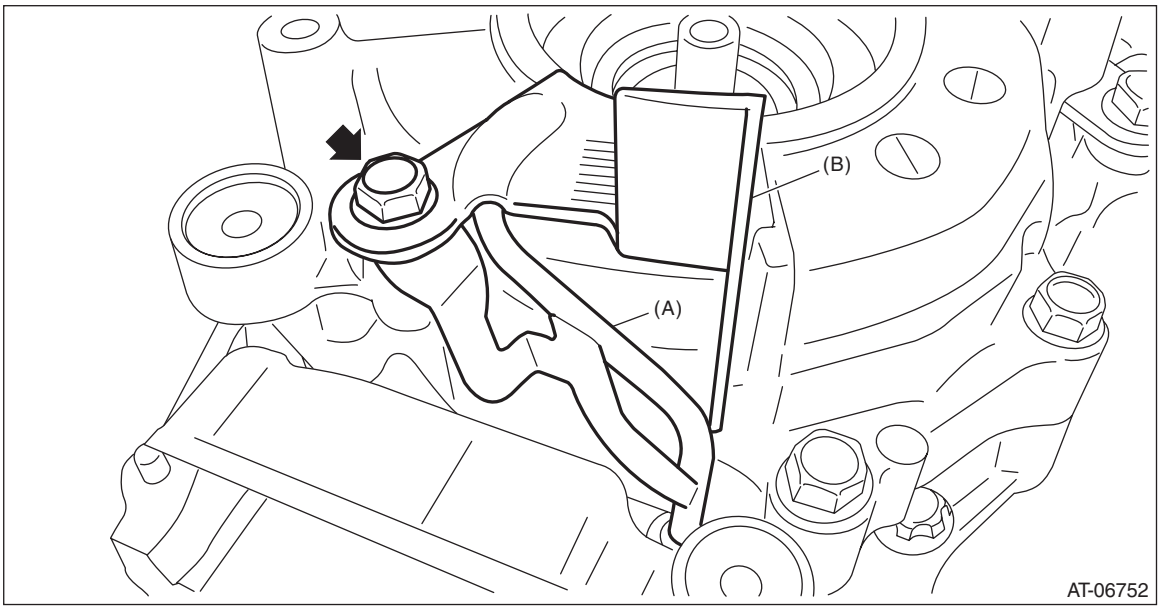
7) Install the O-ring to the lubrication pipe.

NOTE:
- Install a new O-ring.
- Apply CVTF to the O-ring.



8) Install the lubrication pipe and oil guide.

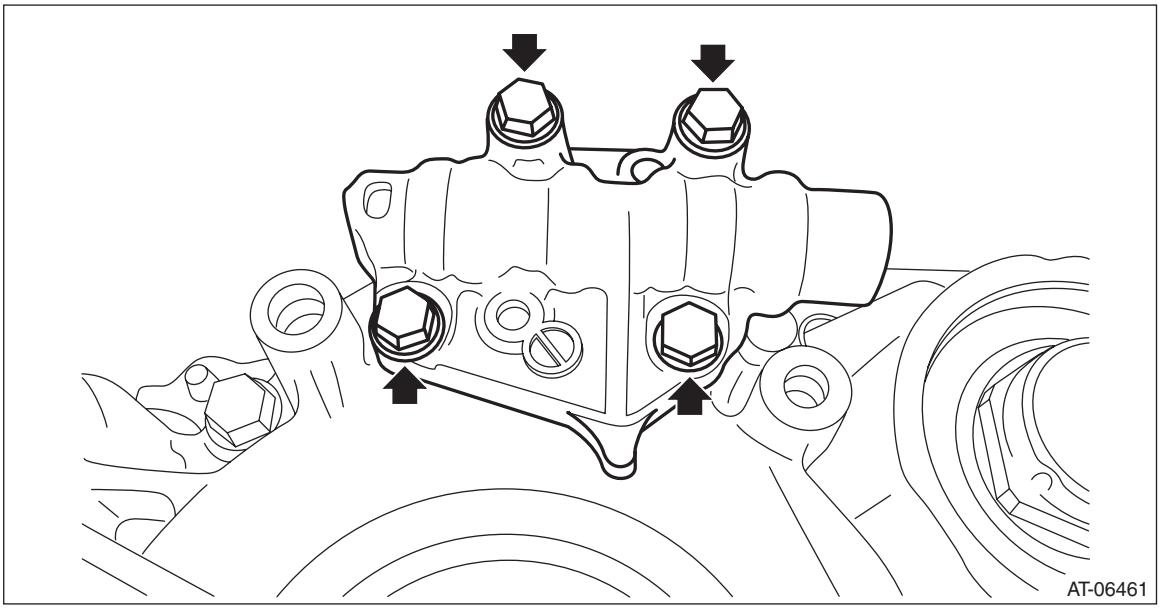
Tightening torque:
16 N·m (1.6 kgf-m, 11.8 ft-lb)



(A) Lubrication pipe
(B) Oil guide

9) Install the manual valve assembly and separator plate.

Tightening torque:
9 N·m (0.9 kgf-m, 6.6 ft-lb)

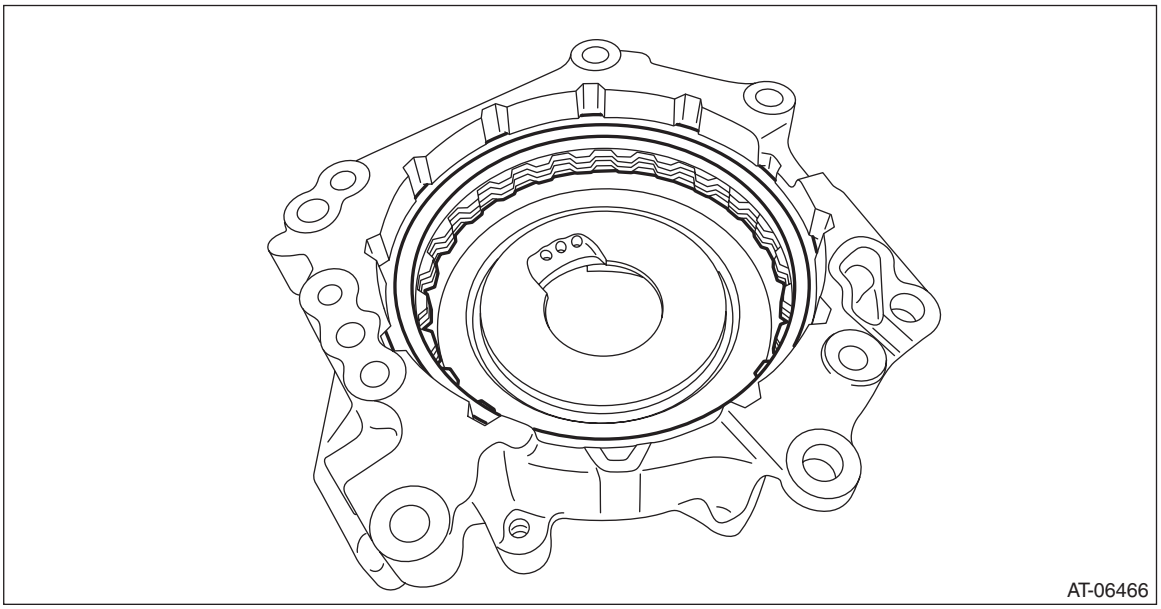


10) Install the primary pulley, secondary pulley and variator chain. <Ref. to CVT-220, INSTALLATION, Primary Pulley and Secondary Pulley.>
11) Select shims for pulley alignment. <Ref. to CVT-227, ADJUSTMENT, Primary Pulley and Secondary Pulley.>
12) Install the reduction drive gear. <Ref. to CVT-210, INSTALLATION, Reduction Drive Gear.>
13) Install the transmission case. <Ref. to CVT-196, INSTALLATION, Transmission Case.>
14) Install the transmission control device. <Ref. to CVT-190, INSTALLATION, Transmission Control Device.>

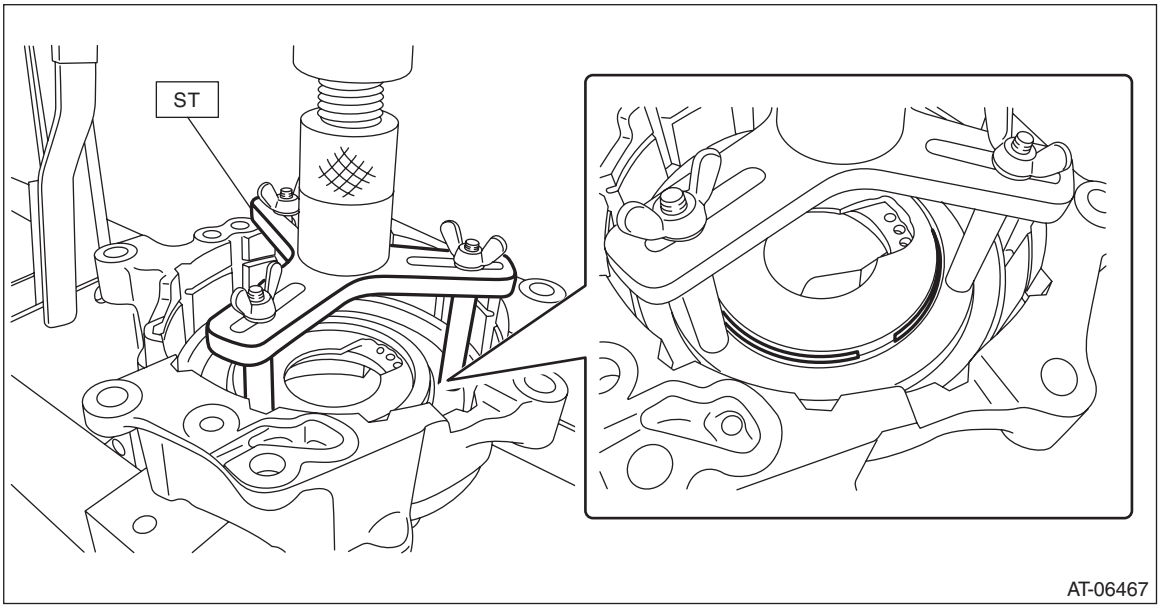
15) Install the oil strainer and oil pan. <Ref. to CVT-109, INSTALLATION, Oil Pan and Strainer.>
16) Install the reduction driven gear assembly. <Ref. to CVT-179, INSTALLATION, Reduction Driven Gear.>
17) Install the transfer driven gear assembly. <Ref. to CVT-175, INSTALLATION, Transfer Driven Gear.>
18) Install the transfer clutch assembly. <Ref. to CVT-162, INSTALLATION, Transfer Clutch.>
19) Install the parking pawl. <Ref. to CVT-178, INSTALLATION, Parking Pawl.>
20) Install the extension case. <Ref. to CVT-157, INSTALLATION, Extension Case.>
21) Install the inhibitor switch. <Ref. to CVT-96, INSTALLATION, Inhibitor Switch.>
22) Install the secondary speed sensor. <Ref. to CVT-101, INSTALLATION, Secondary Speed Sensor.>
23) Install the primary speed sensor. <Ref. to CVT-104, INSTALLATION, Primary Speed Sensor.>
24) Install the turbine speed sensor. <Ref. to CVT-99, INSTALLATION, Turbine Speed Sensor.>
25) Install the transmission harness. <Ref. to CVT-130, INSTALLATION, Transmission Harness.>
26) Install the control valve body. <Ref. to CVT-117, INSTALLATION, Control Valve Body.>
27) Install the air breather hose. <Ref. to CVT-149, INSTALLATION, Air Breather Hose.>
28) Install the transmission assembly to the vehicle. <Ref. to CVT-69, INSTALLATION, Automatic Transmission Assembly.>

C: DISASSEMBLY

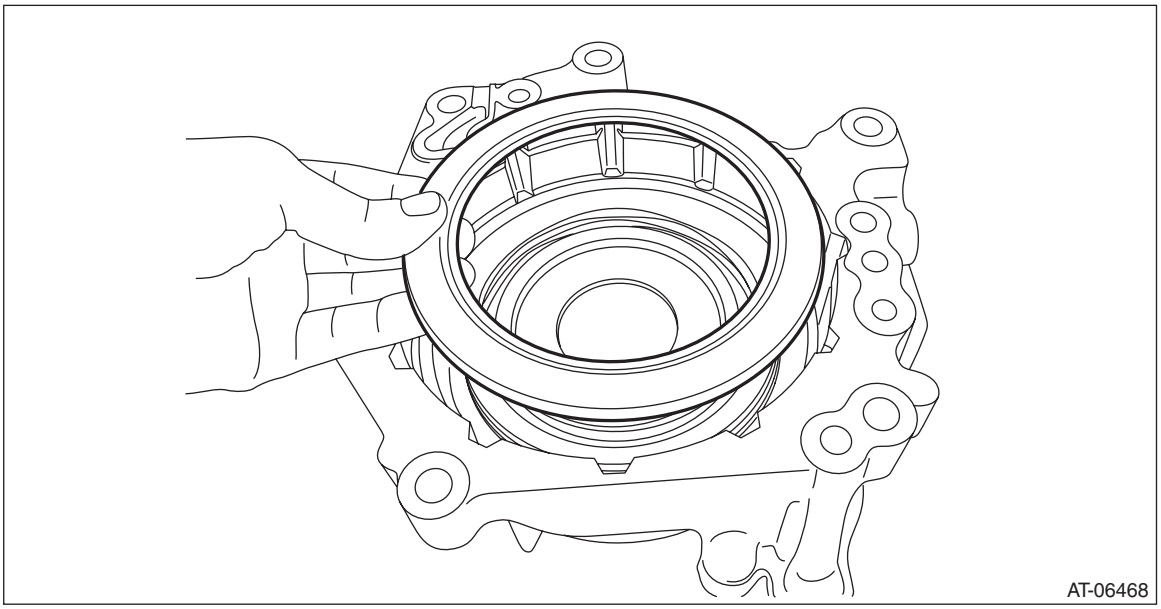
1) Remove the snap ring.
2) Remove the retaining plate, drive plate, driven plate and dish plate.



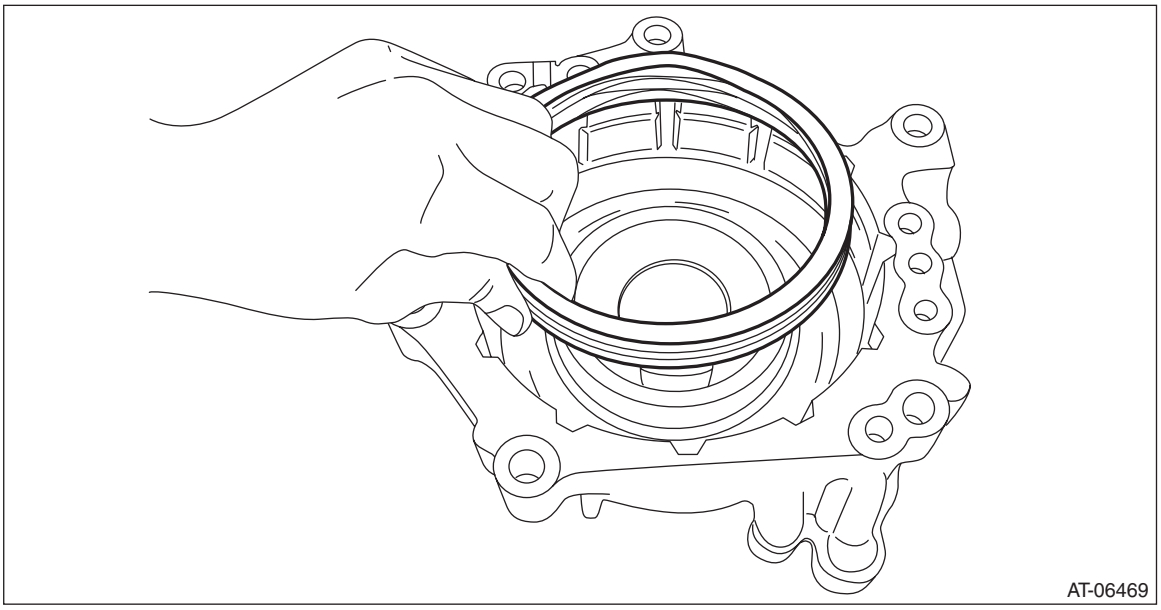
3) Compress the return spring using the ST to remove the snap ring.
ST 18762AA000 COMPRESSOR SPECIAL TOOL



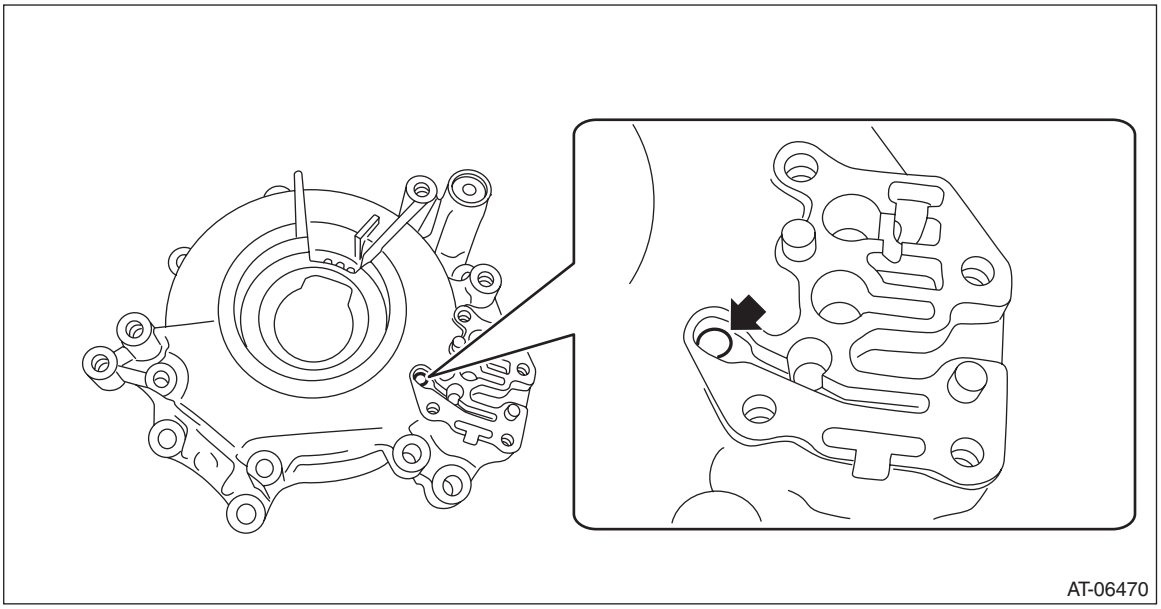
4) Using the ST, remove the snap ring and spring retainer.



5) Remove the return spring.



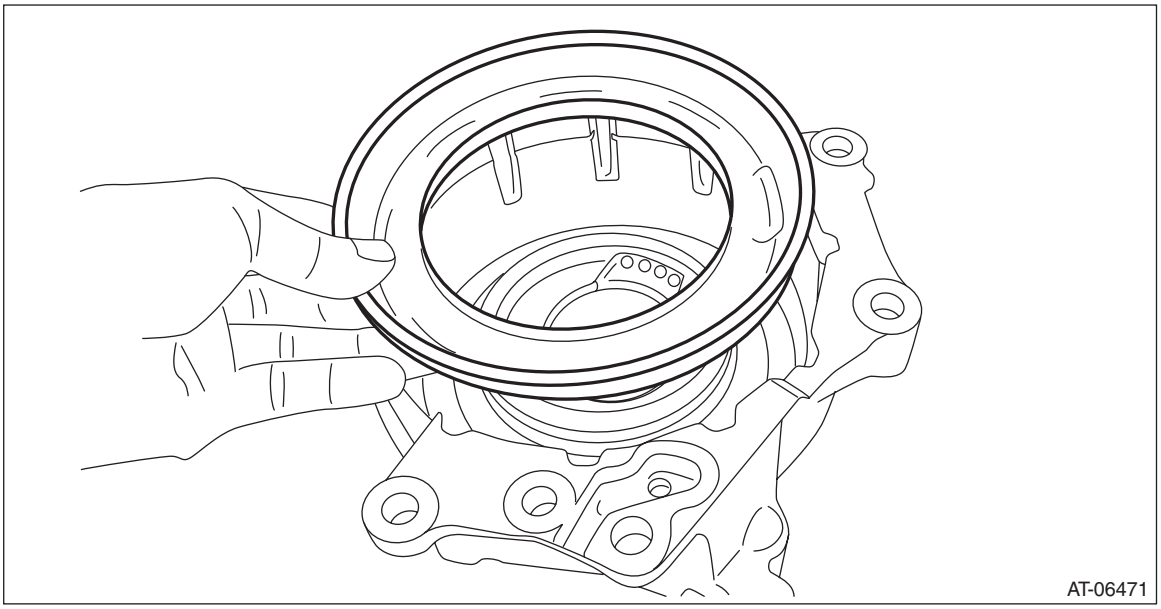
6) Remove the reverse brake piston by blowing compressed air intermittently from reverse brake housing hole.



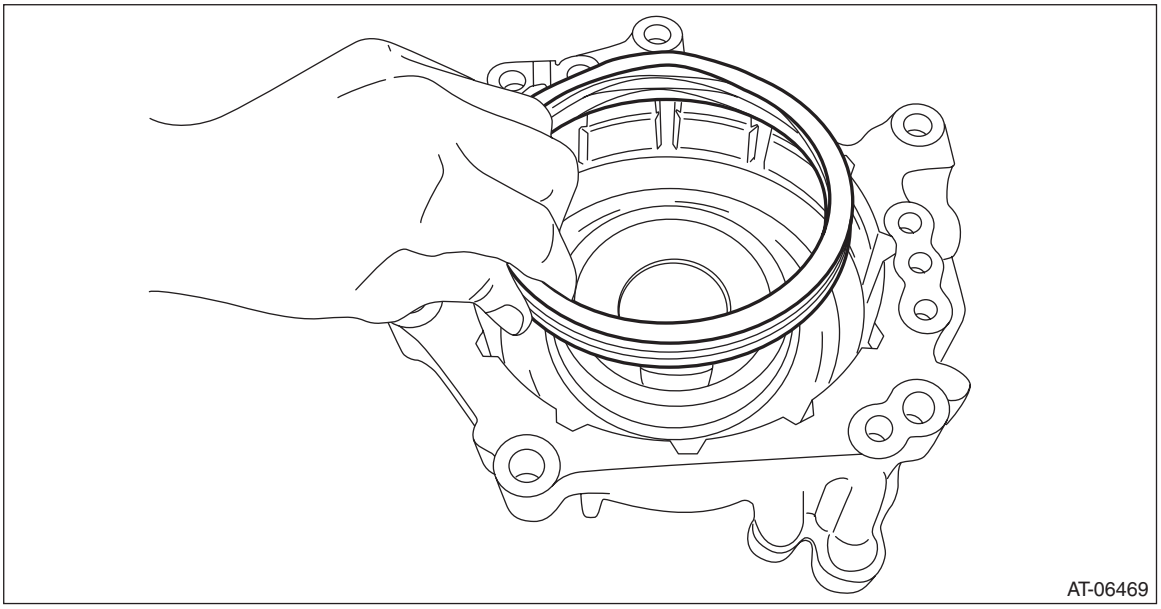
D: ASSEMBLY

1) Install the reverse brake piston.

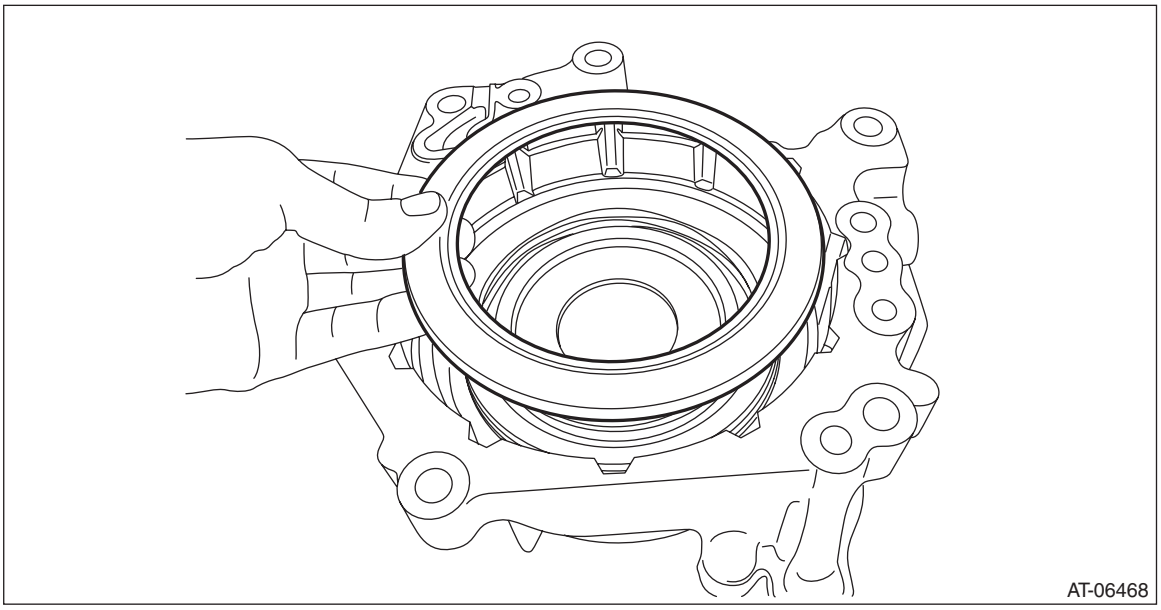
NOTE:
Apply CVTF to the sealing area of reverse brake piston.



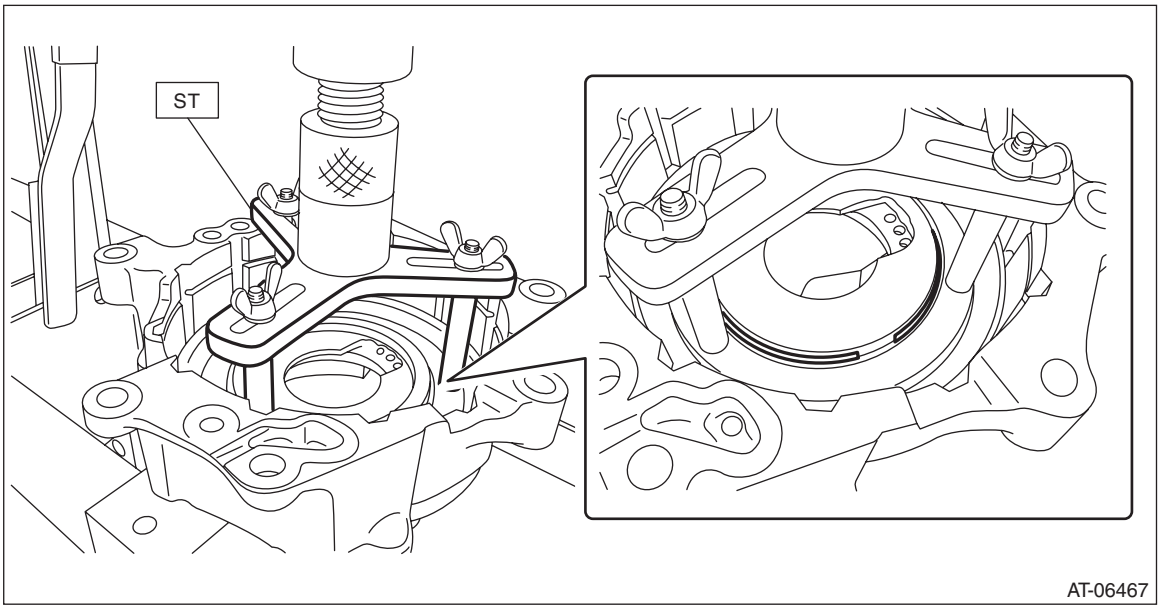
2) Install the return spring.



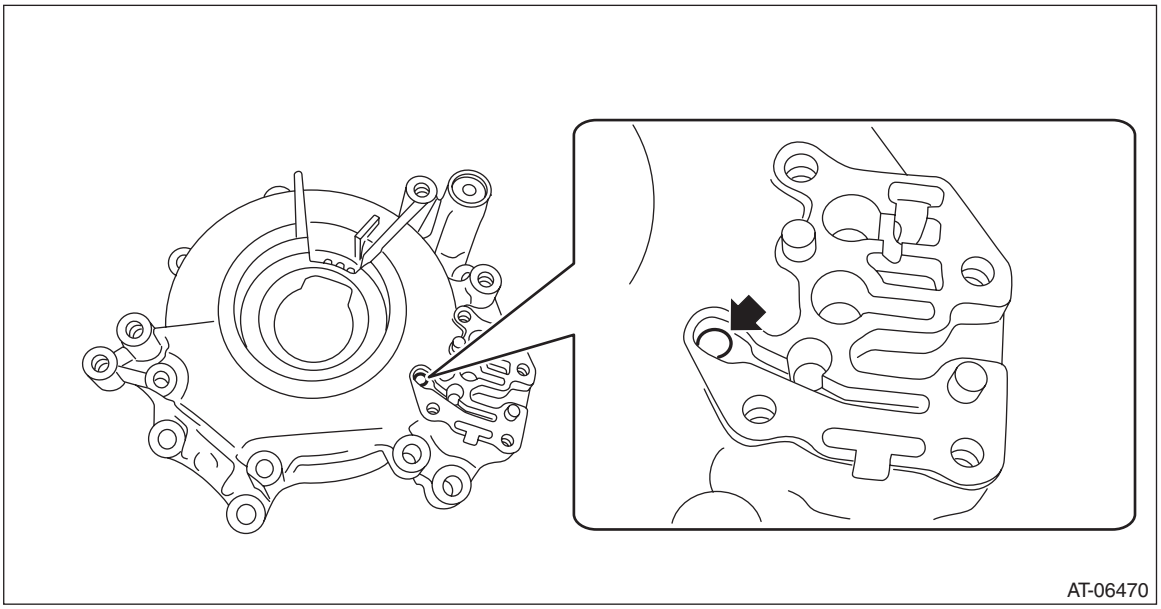
3) Install the spring retainer.



4) Compress the return spring using the ST to install the snap ring.
ST1 18762AA000 COMPRESSOR SPECIAL TOOL



5) Check the operation of reverse brake piston by blowing compressed air intermittently from reverse brake housing hole.



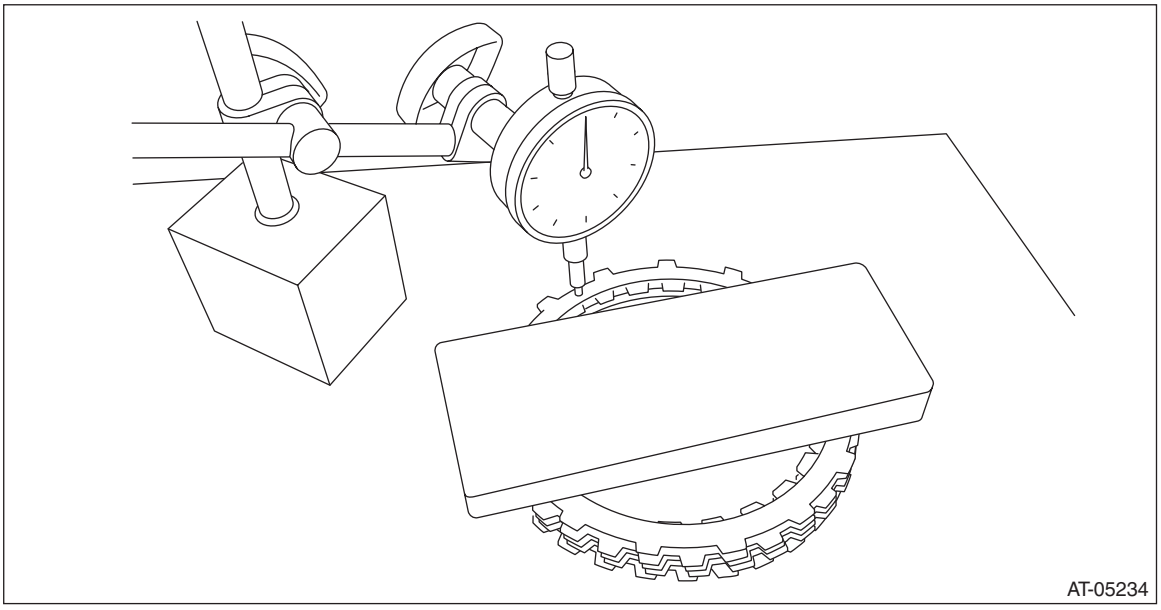
6) Place the driven plate, drive plate and retaining plate neatly in this order on surface table.
7) Set the dial gauge to retaining plate, and read its scale.

NOTE:
The value, which is read in the gauge at this time, is zero point.

8) Scale and record the weight "Z" of a flat board which will be put on retaining plate.

NOTE:
- Use a stiff board which does not bend against load as a flat board to be put on retaining plate.
- Use a flat board weighing less than 29 N (3.0 kgf, 6.5 lb).

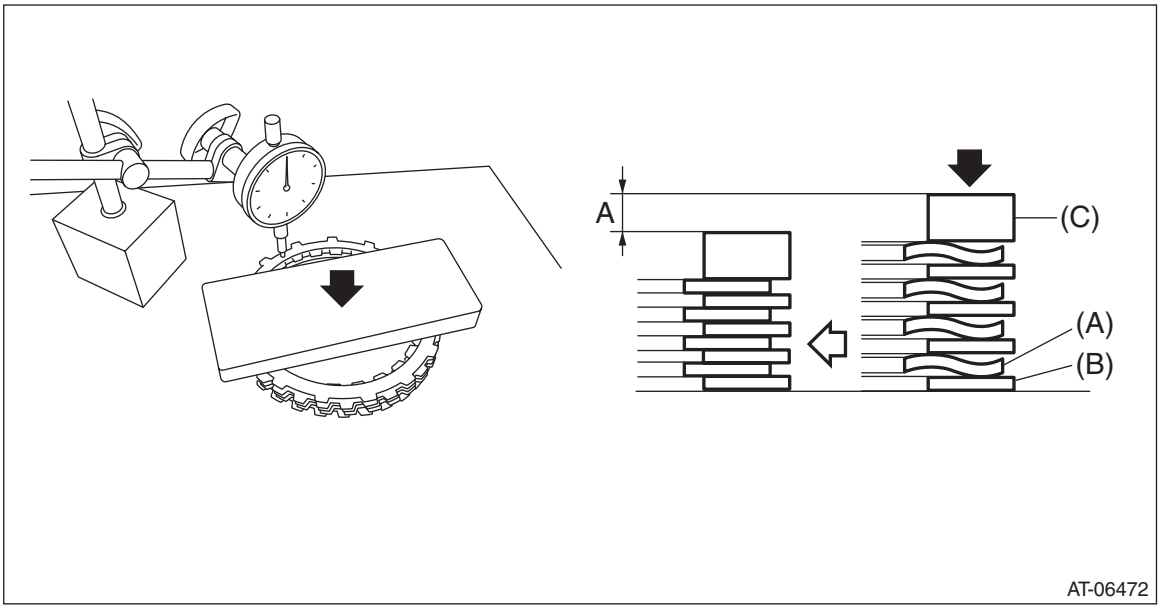
9) Put the flat board on retaining plate.



10) Using the following formula, read the push/pull gauge and calculate "N".
N = 29 N (3.0 kgf, 6.5 lb) – Z
29 N (3.0 kgf, 6.5 lb) : Load applied to clutch plate
Z: Flat board weight

11) Press the center of retaining plate by applying a force of “N” using push/pull gauge, and then measure and record the compression amount “A”.

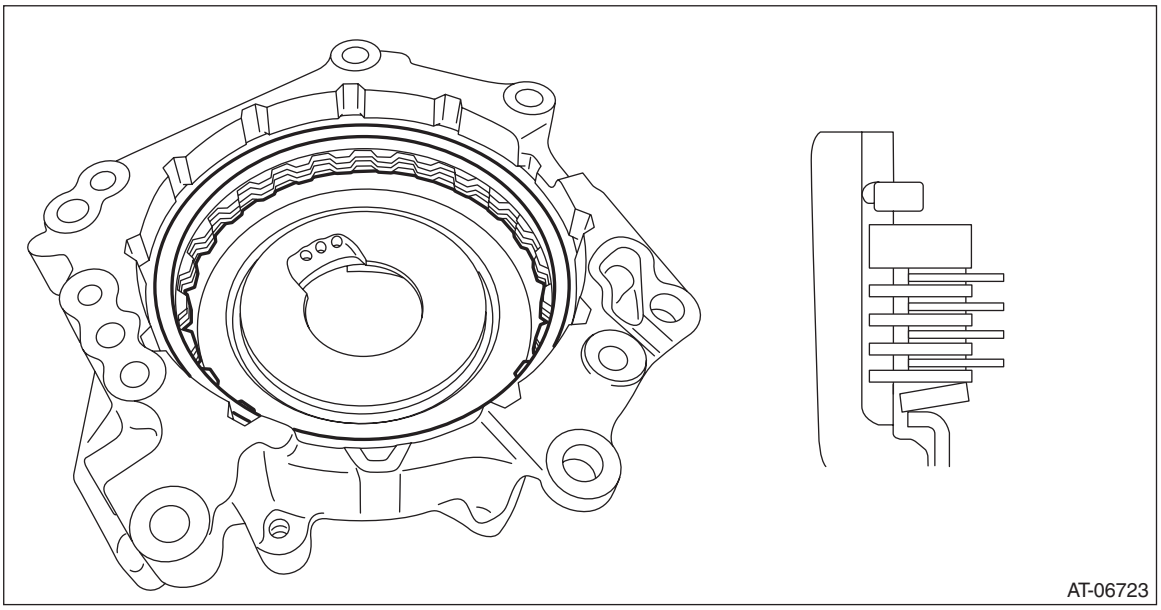
NOTE:
Measure at four points with a 90° interval and calculate the average.



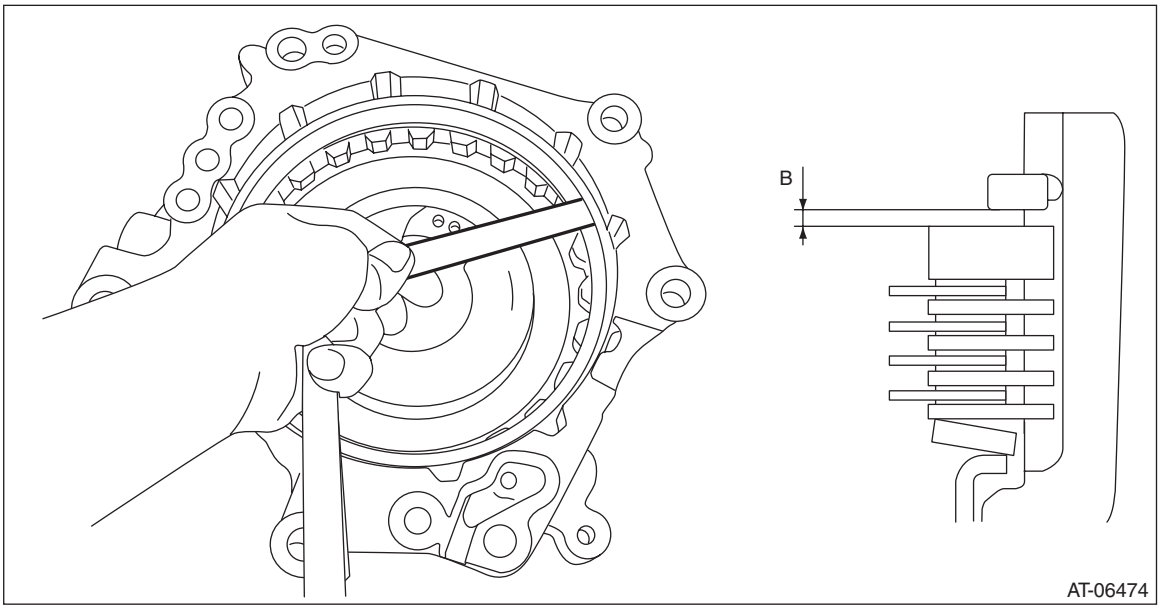
(A) Drive plate
(B) Driven plate
(C) Retaining plate

12) Install the dish plate, drive plate, driven plate, retaining plate and snap ring to the reverse brake housing.

NOTE:
Install the dish plate in the correct direction.



13) Measure and record the clearance “B” between the retaining plate and snap ring.



14) Piston stroke calculation
Calculate with A and B dimensions recorded before. If it exceeds the limit, replace with a new drive plate and adjust within the initial standard value.
S mm (in) = A + B
S: Piston stroke
A: Compression amount of drive plate and dish plate
B: Clearance between retaining plate and snap ring

Initial standard:
2.3 — 2.7 mm (0.091 — 0.106 in)

Limit thickness:
2.9 mm (0.114 in)

Retaining plate	
Part No.	Thickness mm (in)
31567AB750	4.2 (0.165)
31567AB800	4.4 (0.173)
31567AB810	4.6 (0.181)
31567AB820	4.8 (0.189)

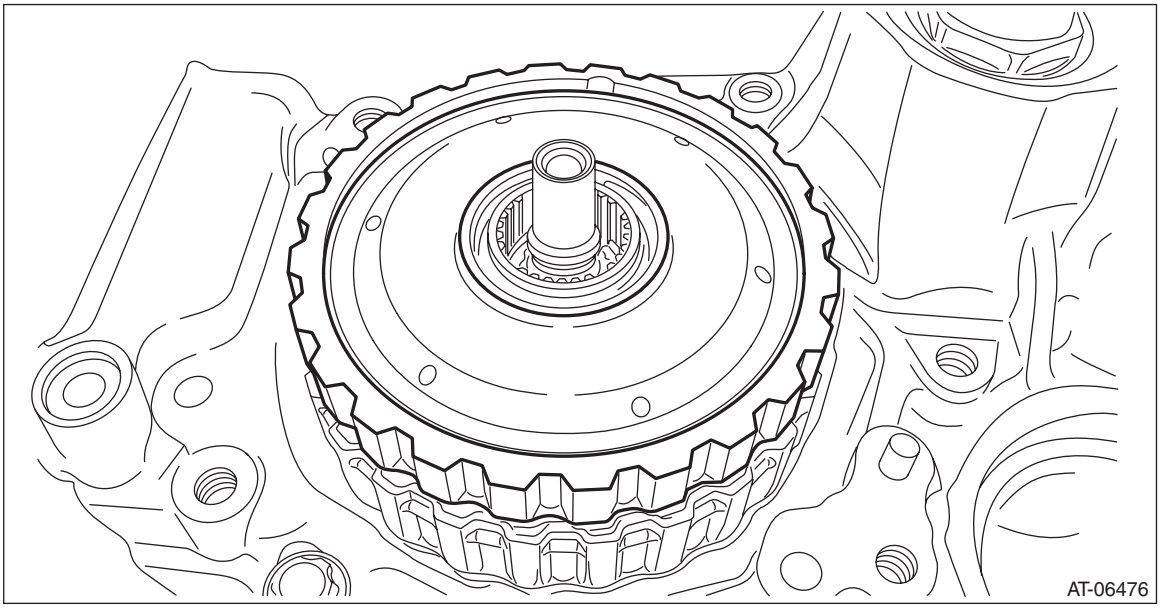
E: INSPECTION

- Inspect the drive plate facing for wear and damage.
- Check the driven plate for discoloration (burnt color).
- Check for worn snap ring, fatigue or damaged return spring or deformed spring retainer.
- Make sure the clearance between retaining plate and snap ring of reverse brake is within the limit. If it exceeds the limit, replace with a new drive plate and select and adjust the retaining plate within the initial standard value. <Ref. to CVT-244, ASSEMBLY, Reverse Brake Assembly.>

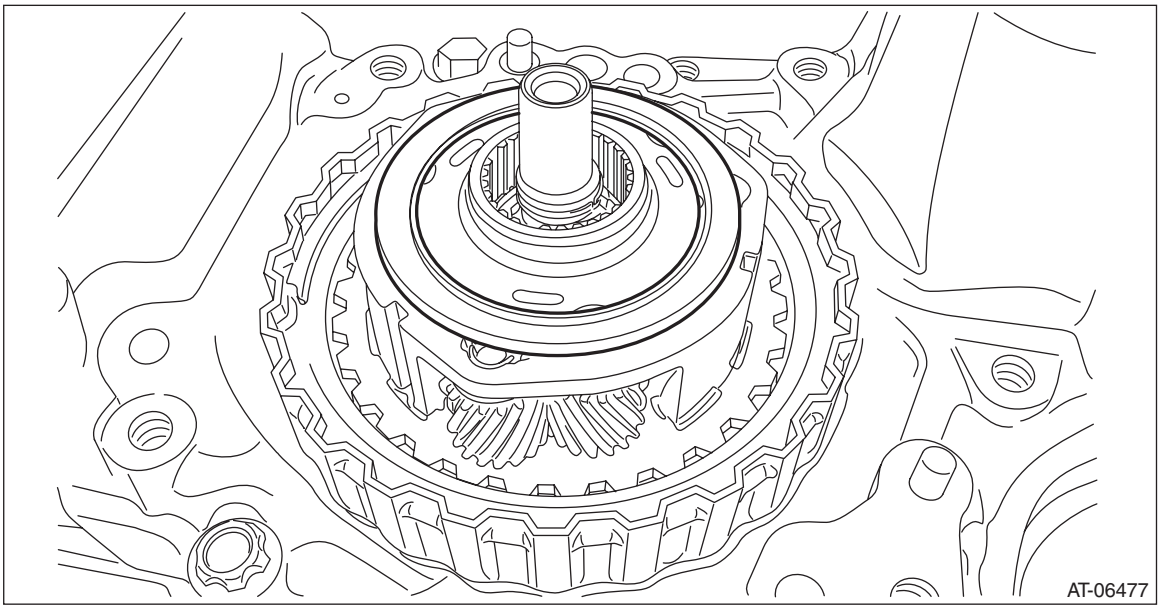
40.Forward Clutch Assembly

A: REMOVAL

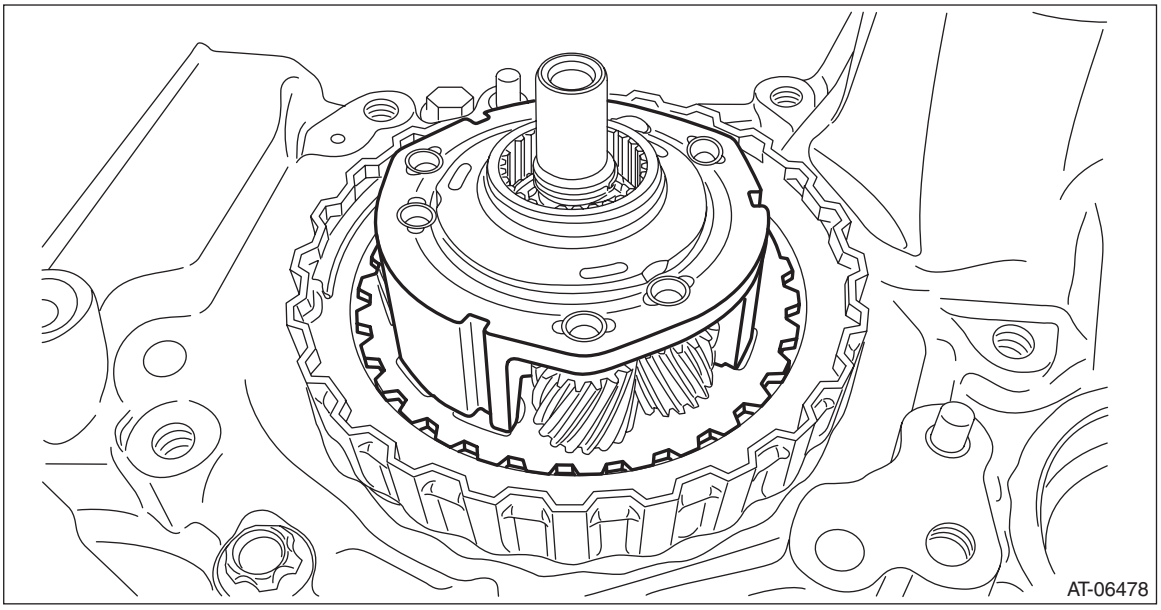
1) Remove the transmission assembly from the vehicle. <Ref. to CVT-58, REMOVAL, Automatic Transmission Assembly.>
2) Remove the air breather hose. <Ref. to CVT-148, REMOVAL, Air Breather Hose.>
3) Remove the control valve body. <Ref. to CVT-112, REMOVAL, Control Valve Body.>
4) Remove the transmission harness. <Ref. to CVT-124, REMOVAL, Transmission Harness.>
5) Remove the turbine speed sensor. <Ref. to CVT-99, REMOVAL, Turbine Speed Sensor.>
6) Remove the secondary speed sensor. <Ref. to CVT-101, REMOVAL, Secondary Speed Sensor.>
7) Remove the primary speed sensor. <Ref. to CVT-103, REMOVAL, Primary Speed Sensor.>
8) Remove the inhibitor switch. <Ref. to CVT-94, REMOVAL, Inhibitor Switch.>
9) Remove the extension case. <Ref. to CVT-156, REMOVAL, Extension Case.>
10) Remove the transfer clutch assembly. <Ref. to CVT-160, REMOVAL, Transfer Clutch.>
11) Remove the transfer driven gear assembly. <Ref. to CVT-174, REMOVAL, Transfer Driven Gear.>
12) Remove the parking pawl. <Ref. to CVT-177, REMOVAL, Parking Pawl.>
13) Remove the reduction driven gear assembly. <Ref. to CVT-179, REMOVAL, Reduction Driven Gear.>
14) Remove the oil pan and oil strainer. <Ref. to CVT-108, REMOVAL, Oil Pan and Strainer.>
15) Remove the transmission control device. <Ref. to CVT-187, REMOVAL, Transmission Control Device.>
16) Remove the transmission case. <Ref. to CVT-193, REMOVAL, Transmission Case.>
17) Remove the reduction drive gear. <Ref. to CVT-209, REMOVAL, Reduction Drive Gear.>
18) Remove the primary pulley, secondary pulley and variator chain. <Ref. to CVT-213, REMOVAL, Primary Pulley and Secondary Pulley.>
19) Remove the reverse brake assembly. <Ref. to CVT-234, REMOVAL, Reverse Brake Assembly.>
20) Remove the internal gear.



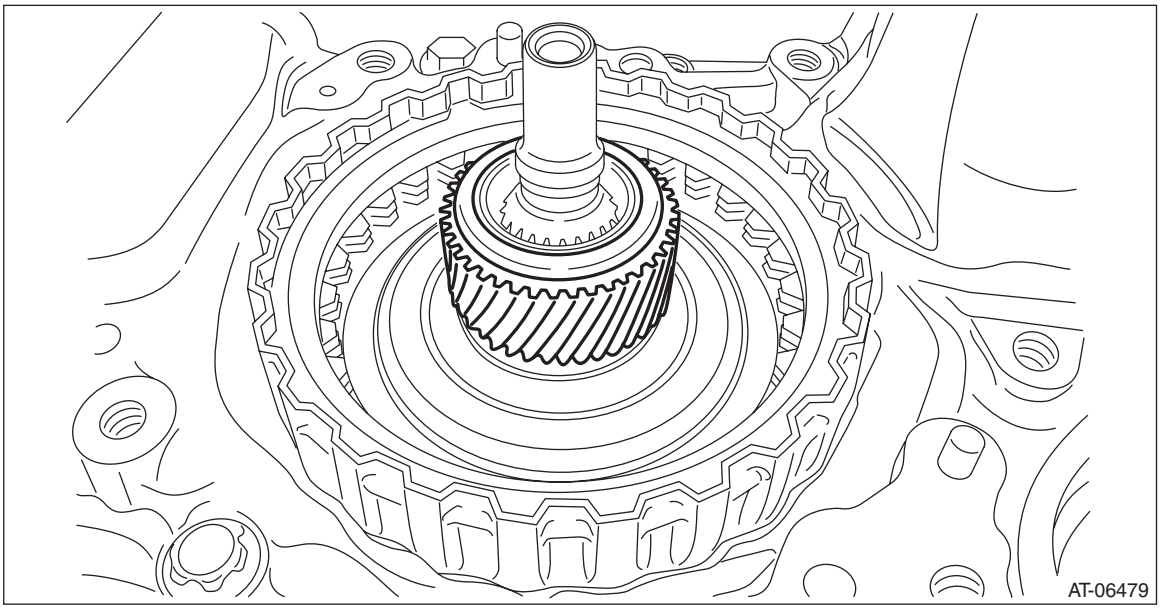
21) Remove the thrust bearing.



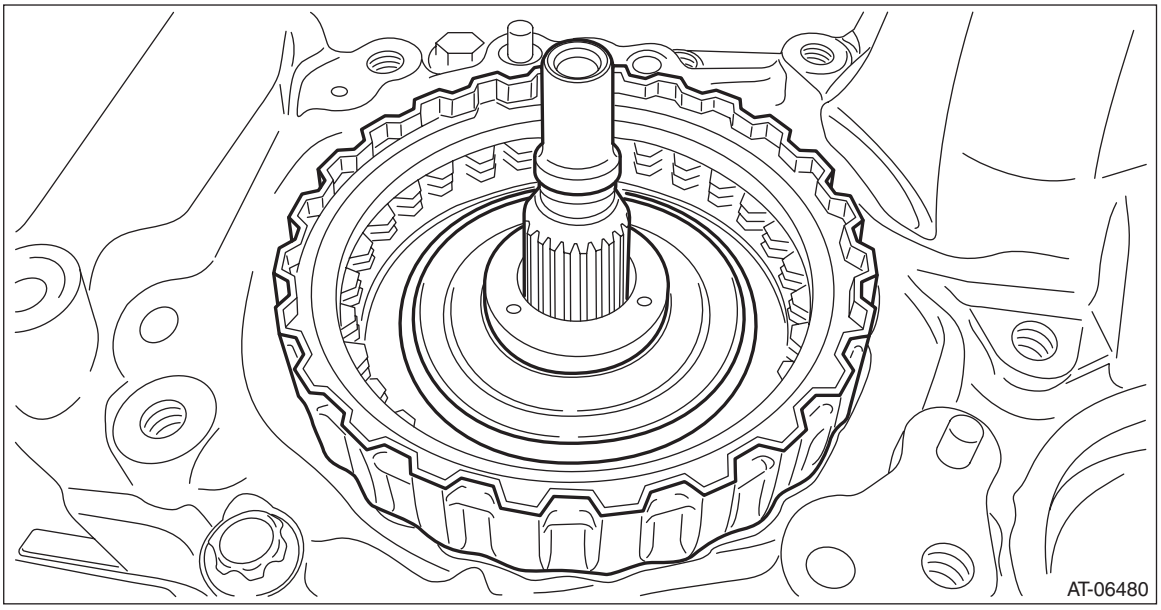
22) Remove the planetary carrier.



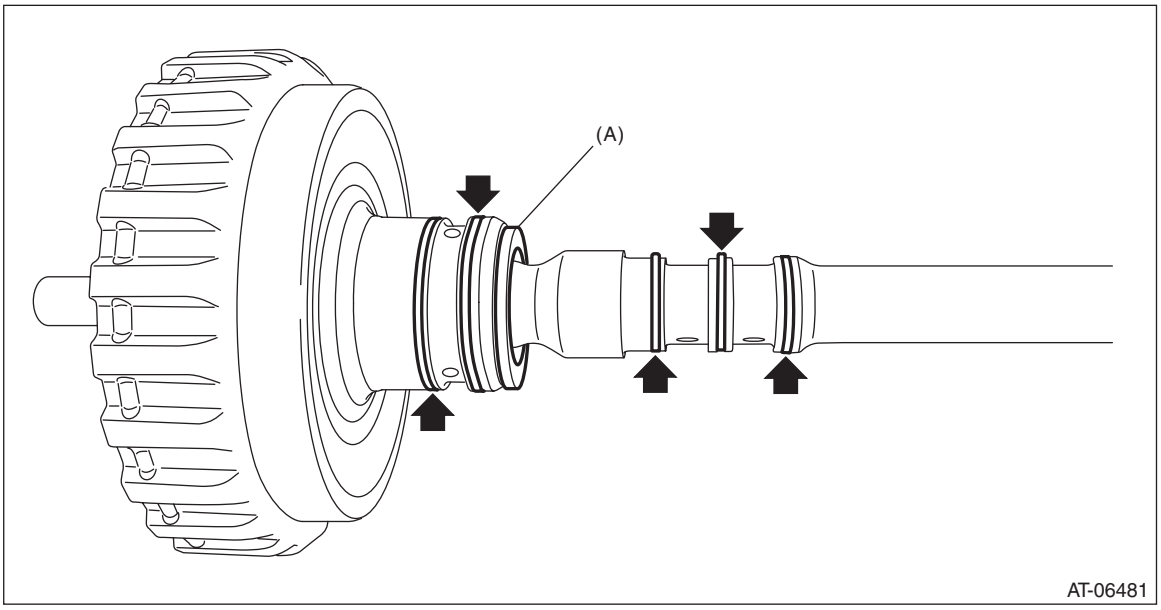
23) Remove the thrust bearing and sun gear.



24) Remove the forward clutch assembly.



25) Remove the thrust bearing and seal ring.

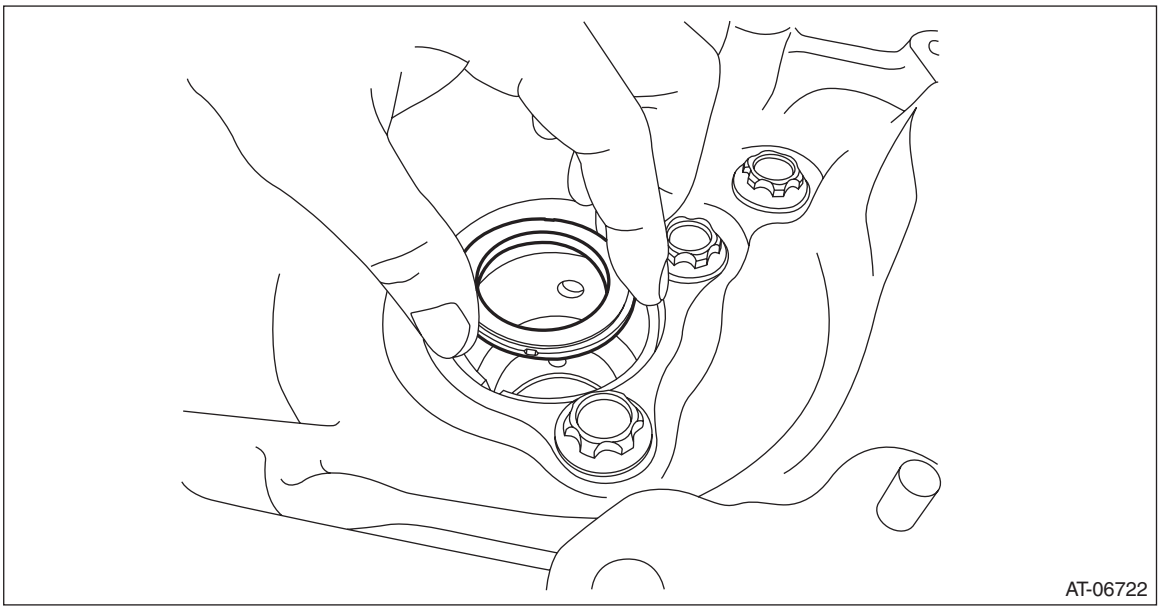


(A) Thrust bearing

B: INSTALLATION

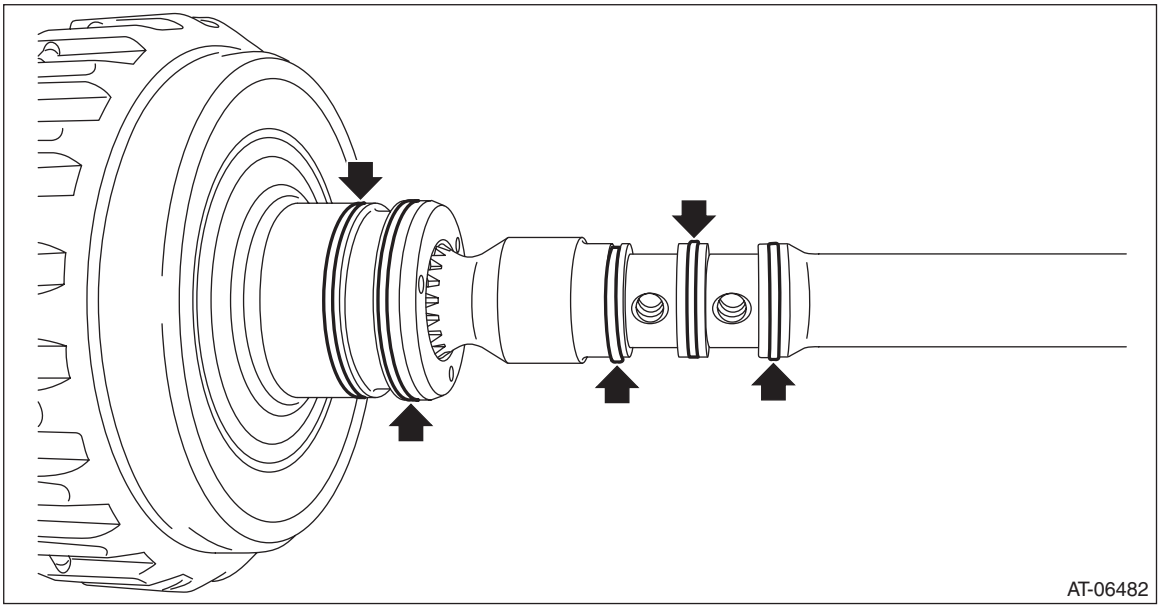
1) Install the thrust bearing to the converter case.

NOTE:
Face the temper color surface to the converter case side.

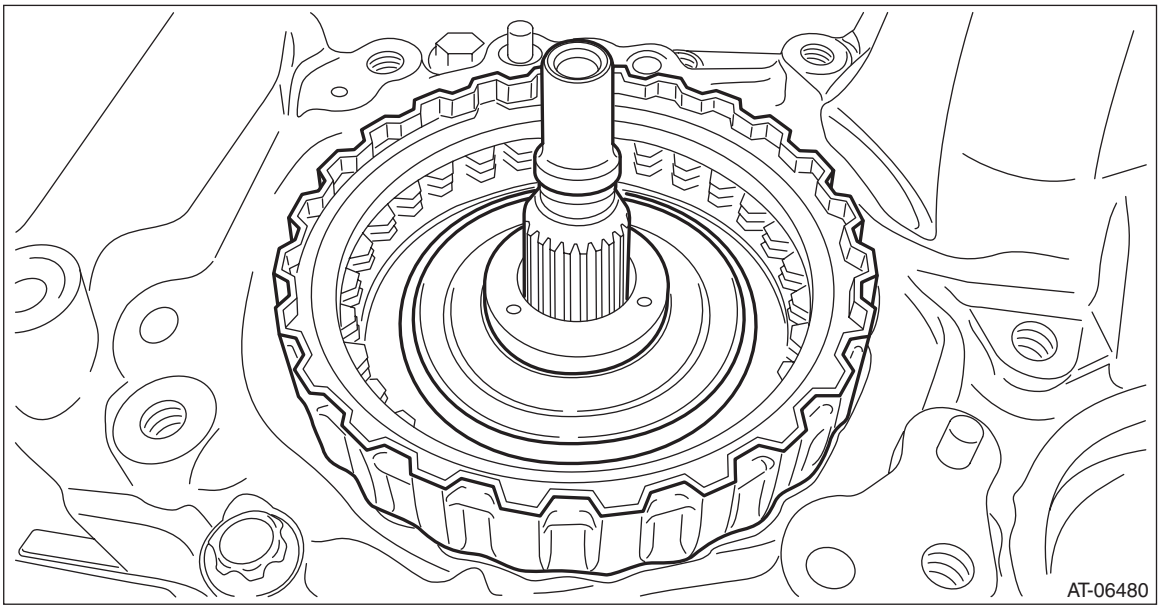


2) Install the seal ring to the input shaft.

NOTE:
- Use a new seal ring.
- When installing the seal ring, do not expand the seal ring too much.
- Apply CVTF to the seal rings.

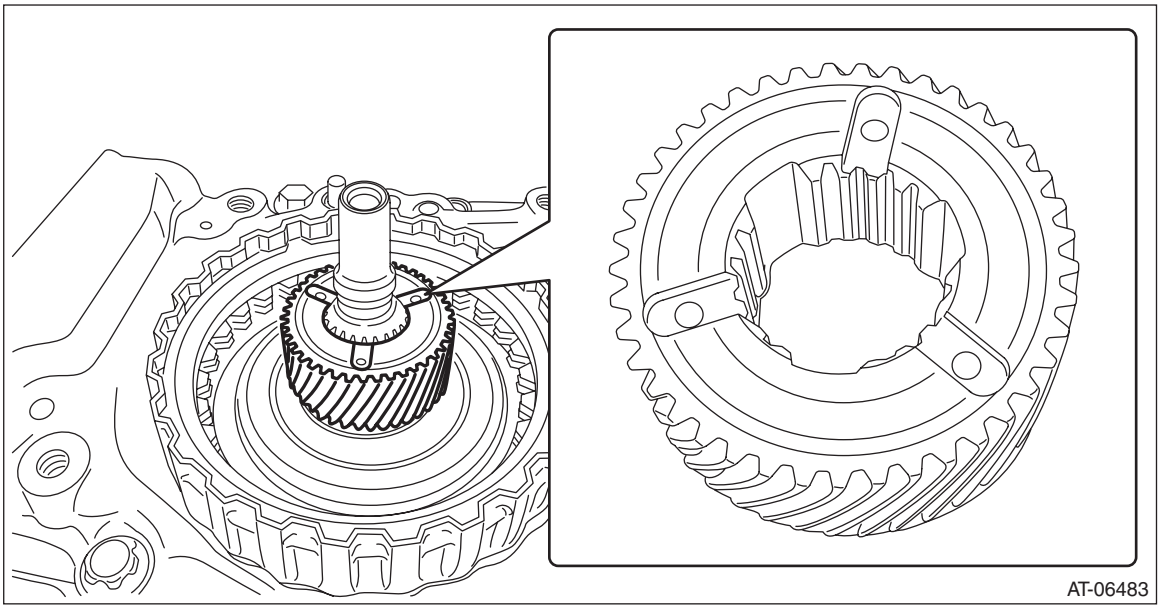


3) Install the forward clutch assembly to the converter case.



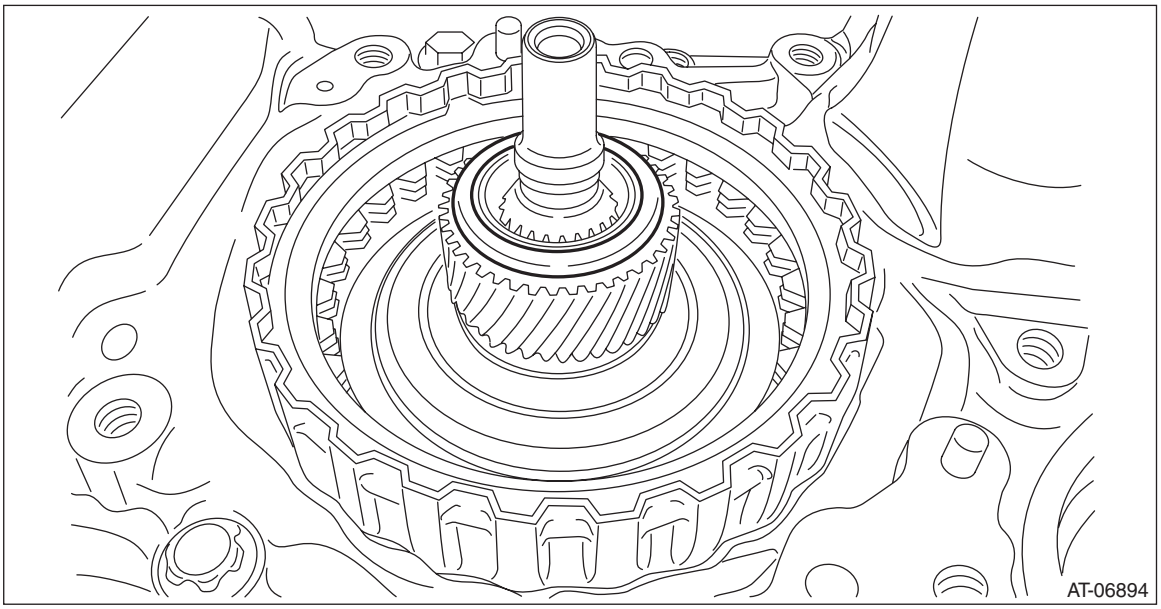
4) Install the sun gear.

NOTE:
Face the end face of the sun gear to the reverse brake side as shown in the figure.

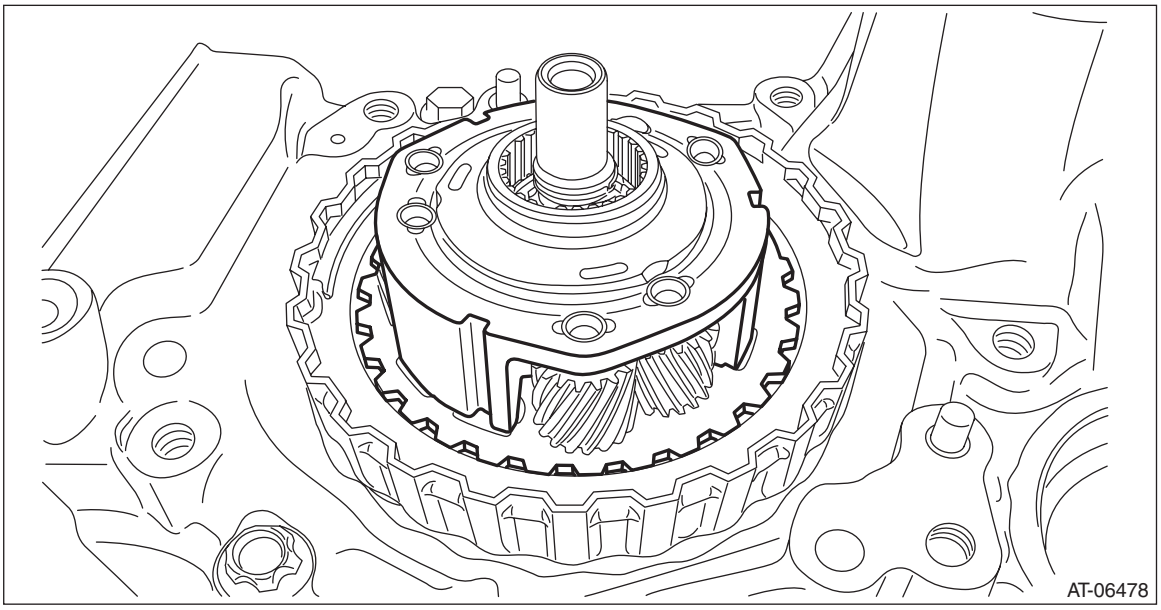


5) Install the thrust bearing to the sun gear.

NOTE:
Face the temper color surface to the reverse brake side.

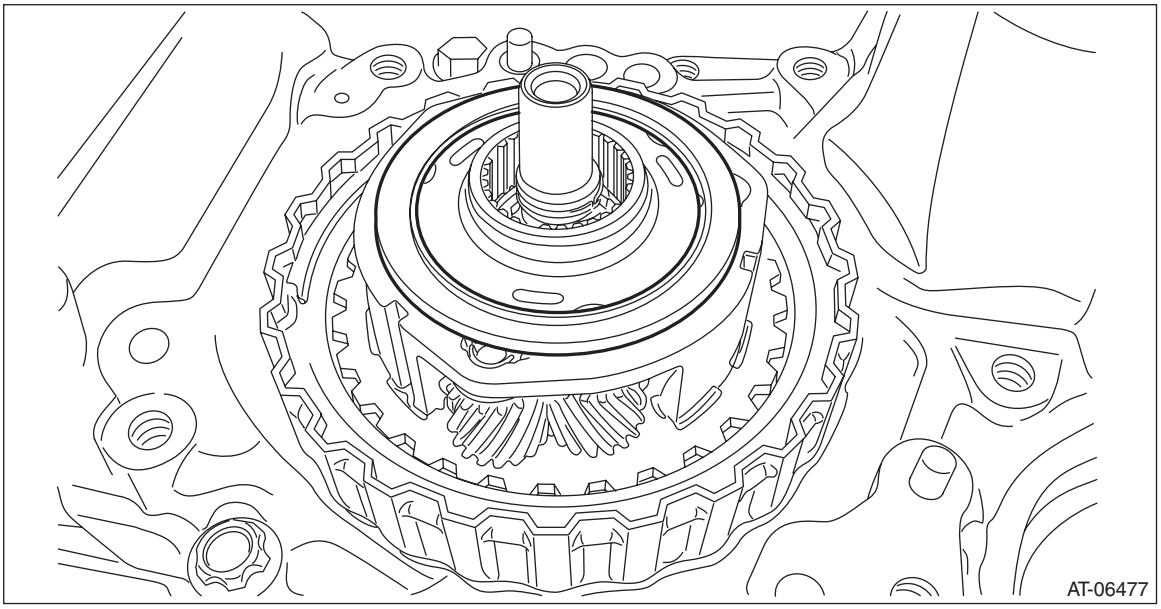


6) Install the planetary carrier.

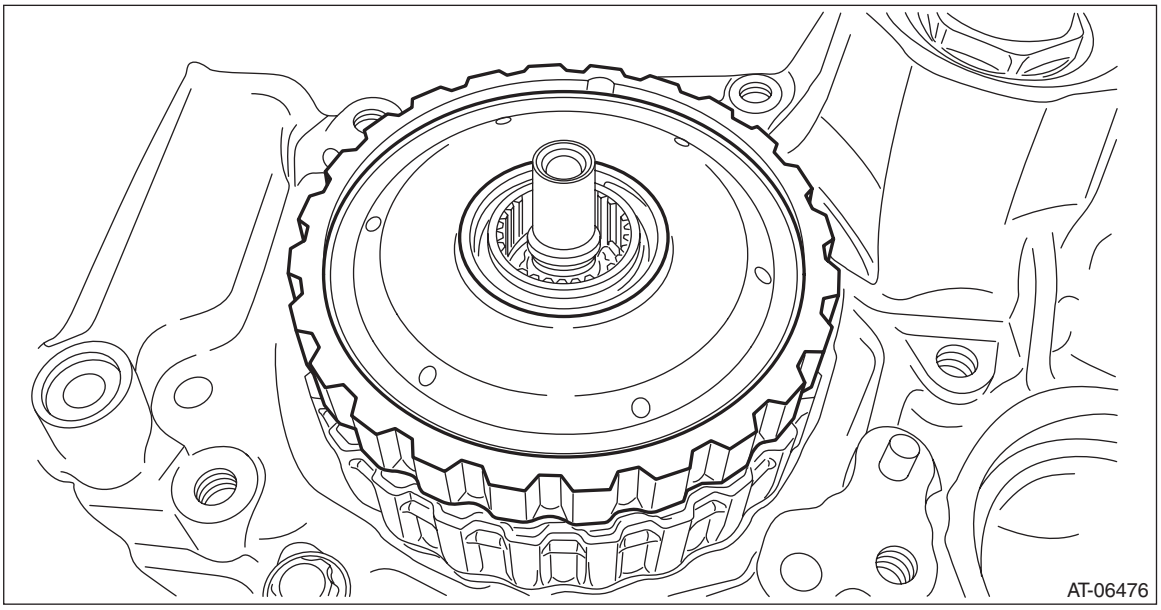


7) Install the thrust bearing.

NOTE:
Face the temper color surface to the reverse brake side.

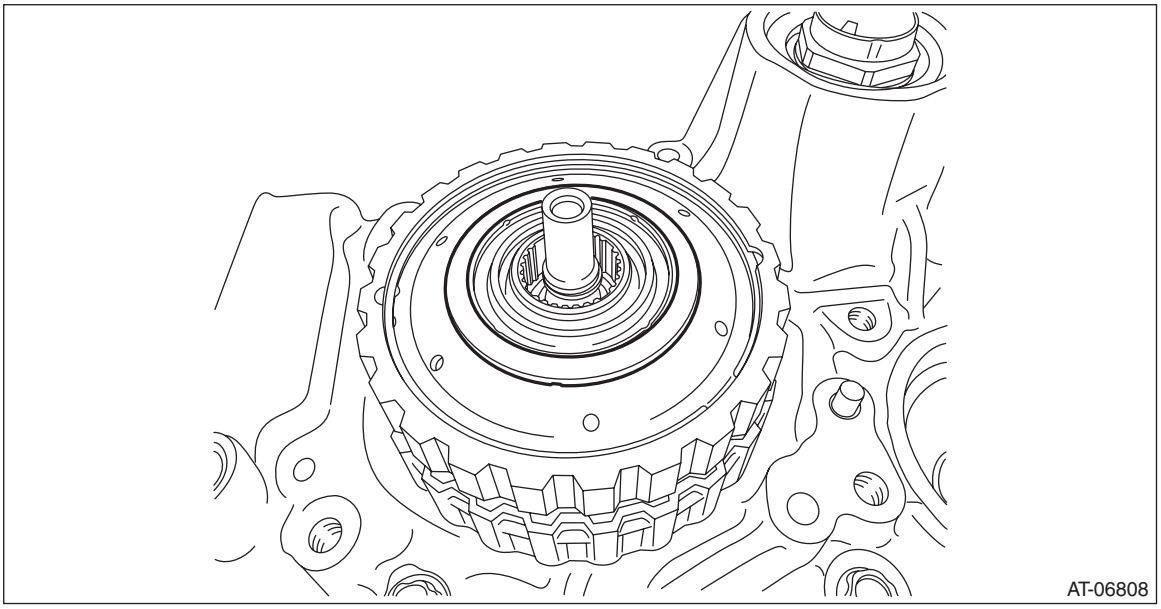


8) Install the internal gear.



9) Install the thrust bearing to the internal gear.

NOTE:
Face the temper color surface to the reverse brake side.



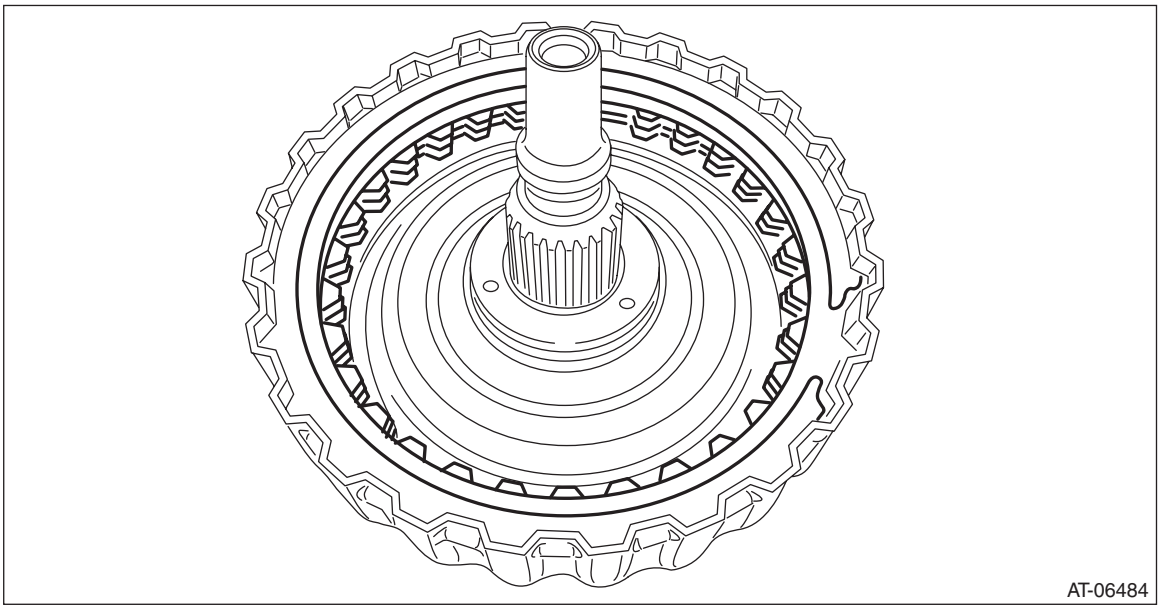
10) Select a washer. <Ref. to CVT-266, ADJUSTMENT, Forward Clutch Assembly.>
11) Install the reverse brake assembly. <Ref. to CVT-237, INSTALLATION, Reverse Brake Assembly.>
12) Install the primary pulley, secondary pulley and variator chain. <Ref. to CVT-220, INSTALLATION, Primary Pulley and Secondary Pulley.>
13) Install the reduction drive gear. <Ref. to CVT-210, INSTALLATION, Reduction Drive Gear.>
14) Install the transmission case. <Ref. to CVT-196, INSTALLATION, Transmission Case.>
15) Install the transmission control device. <Ref. to CVT-190, INSTALLATION, Transmission Control Device.>
16) Install the oil strainer and oil pan. <Ref. to CVT-109, INSTALLATION, Oil Pan and Strainer.>
17) Install the reduction driven gear assembly. <Ref. to CVT-179, INSTALLATION, Reduction Driven Gear.>
18) Install the transfer driven gear assembly. <Ref. to CVT-175, INSTALLATION, Transfer Driven Gear.>
19) Install the transfer clutch assembly. <Ref. to CVT-162, INSTALLATION, Transfer Clutch.>
20) Install the parking pawl. <Ref. to CVT-178, INSTALLATION, Parking Pawl.>
21) Install the extension case. <Ref. to CVT-157, INSTALLATION, Extension Case.>

22) Install the inhibitor switch. <Ref. to CVT-96, INSTALLATION, Inhibitor Switch.>
23) Install the secondary speed sensor. <Ref. to CVT-101, INSTALLATION, Secondary Speed Sensor.>
24) Install the primary speed sensor. <Ref. to CVT-104, INSTALLATION, Primary Speed Sensor.>
25) Install the turbine speed sensor. <Ref. to CVT-99, INSTALLATION, Turbine Speed Sensor.>
26) Install the transmission harness. <Ref. to CVT-130, INSTALLATION, Transmission Harness.>
27) Install the control valve body. <Ref. to CVT-117, INSTALLATION, Control Valve Body.>
28) Install the air breather hose. <Ref. to CVT-149, INSTALLATION, Air Breather Hose.>
29) Install the transmission assembly to the vehicle. <Ref. to CVT-69, INSTALLATION, Automatic Transmission Assembly.>

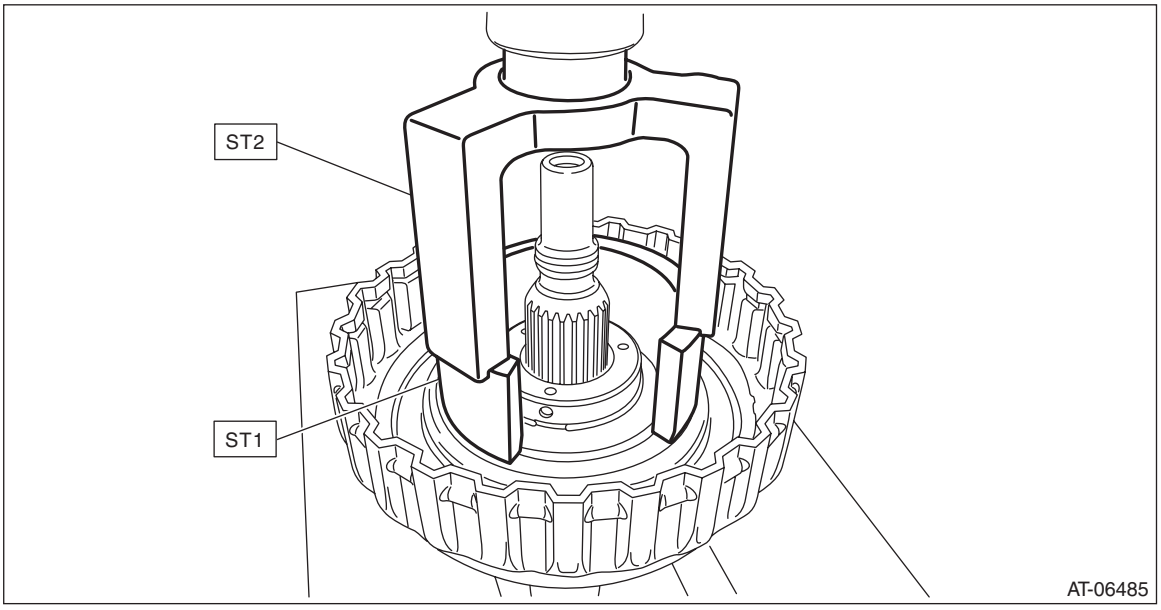
C: DISASSEMBLY

1. FORWARD CLUTCH ASSEMBLY

1) Remove the snap ring.
2) Remove the retaining plate, drive plate, driven plate and dish plate.

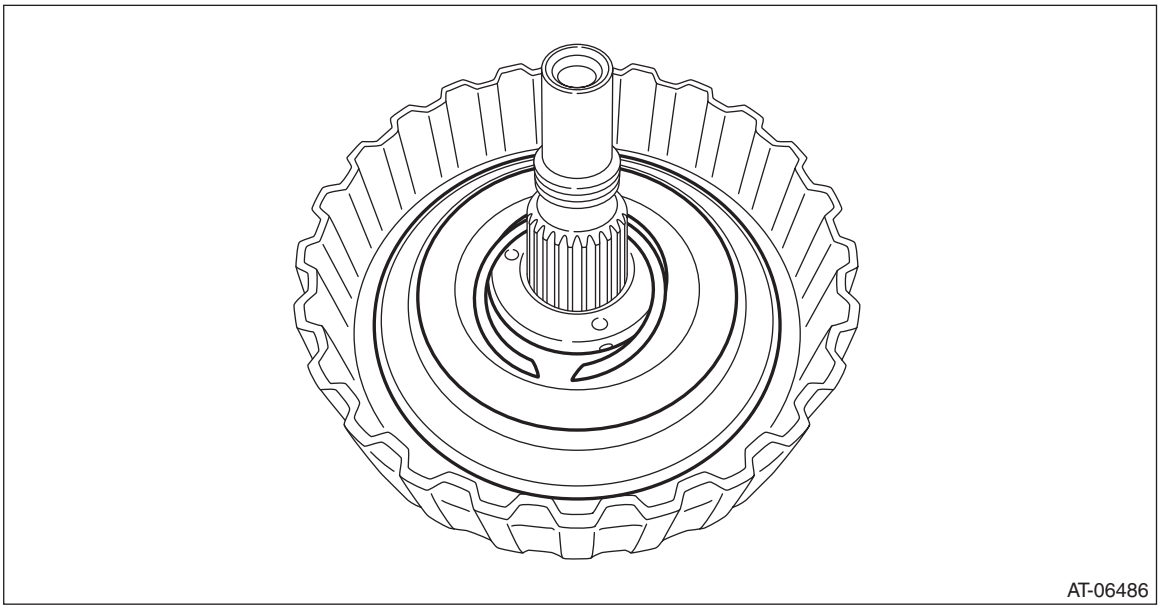

AT-06484

3) Compress the return spring using the ST to remove the snap ring.
ST1 18762AA010 COMPRESSOR SPECIAL TOOL
ST2 398673600 COMPRESSOR

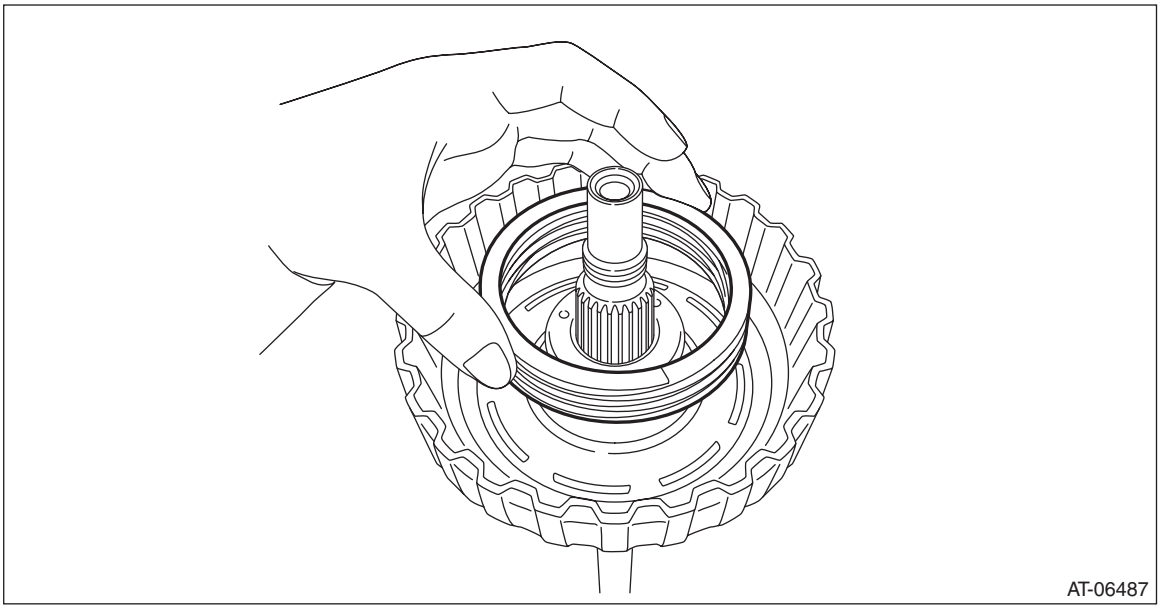


AT-06485

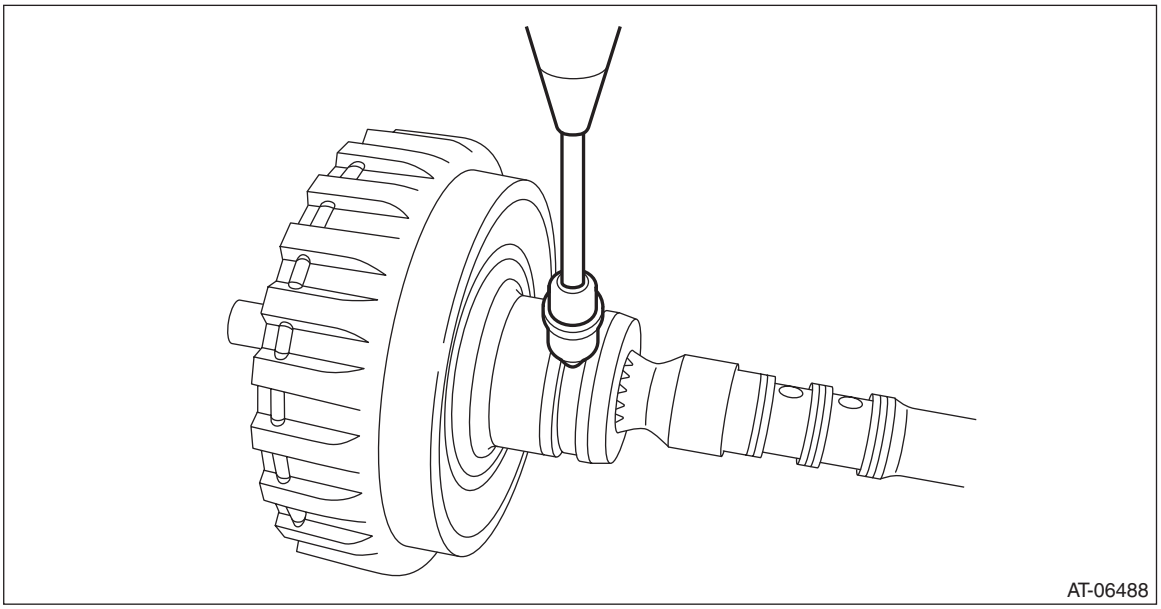
4) Remove the chamber COMPL and snap ring.



5) Remove the return spring.

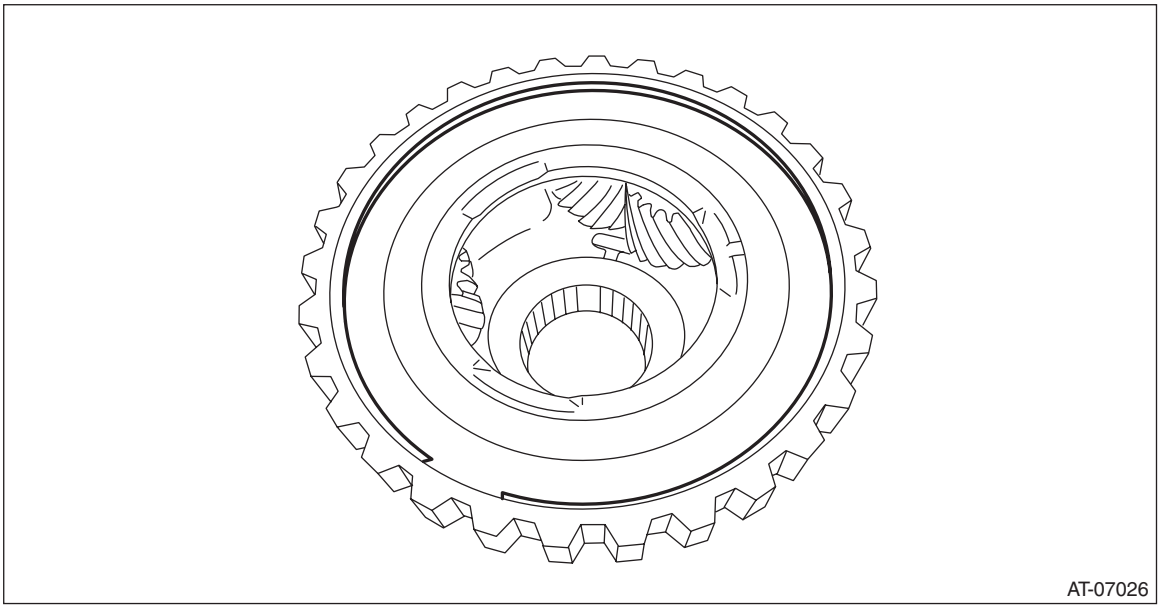


6) Remove the forward clutch piston by blowing compressed air intermittently from the forward clutch carrier hole.



2. PLANETARY CARRIER ASSY

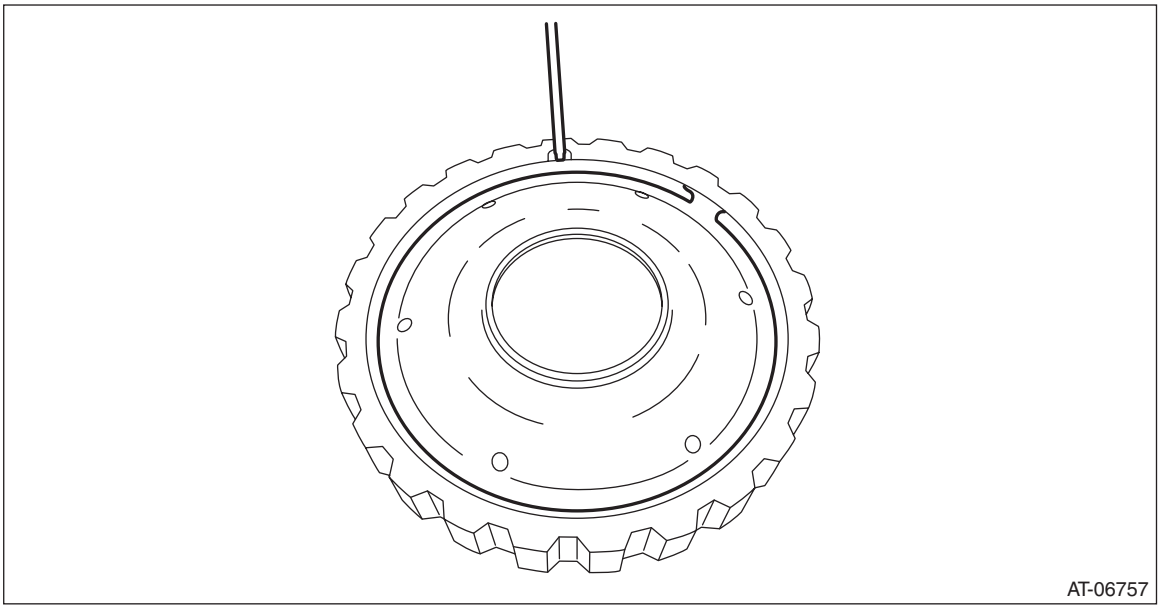
NOTE:
Disassemble the balance oil guide only.
1) Remove the snap ring.



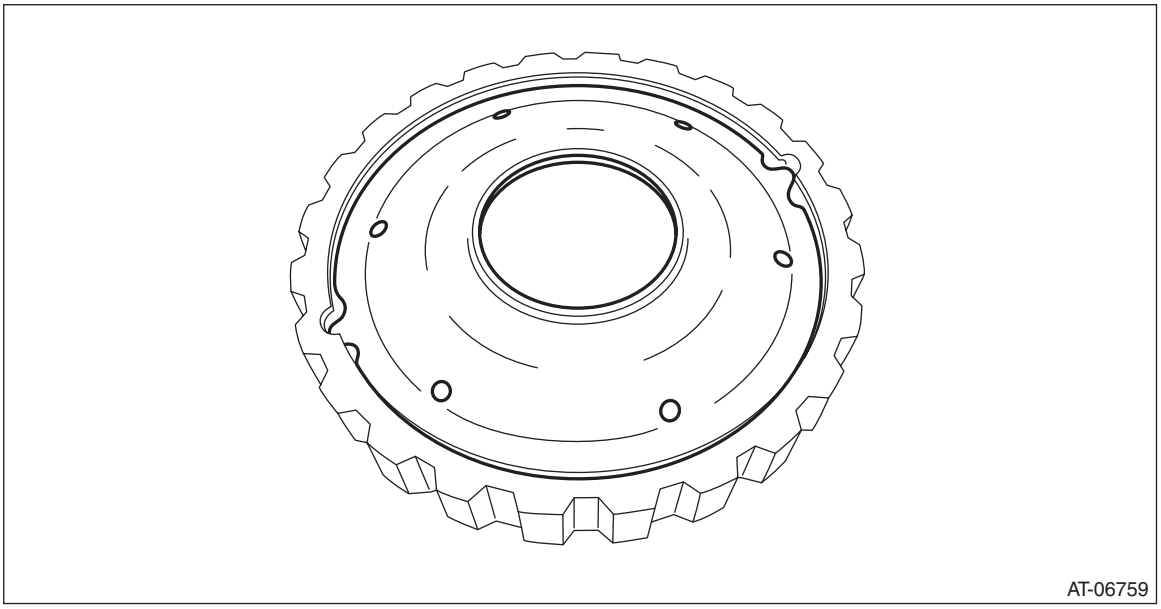
2) Remove the balance oil guide.

3. INTERNAL GEAR

1) Remove the snap ring.



2) Remove the thrust gear plate.

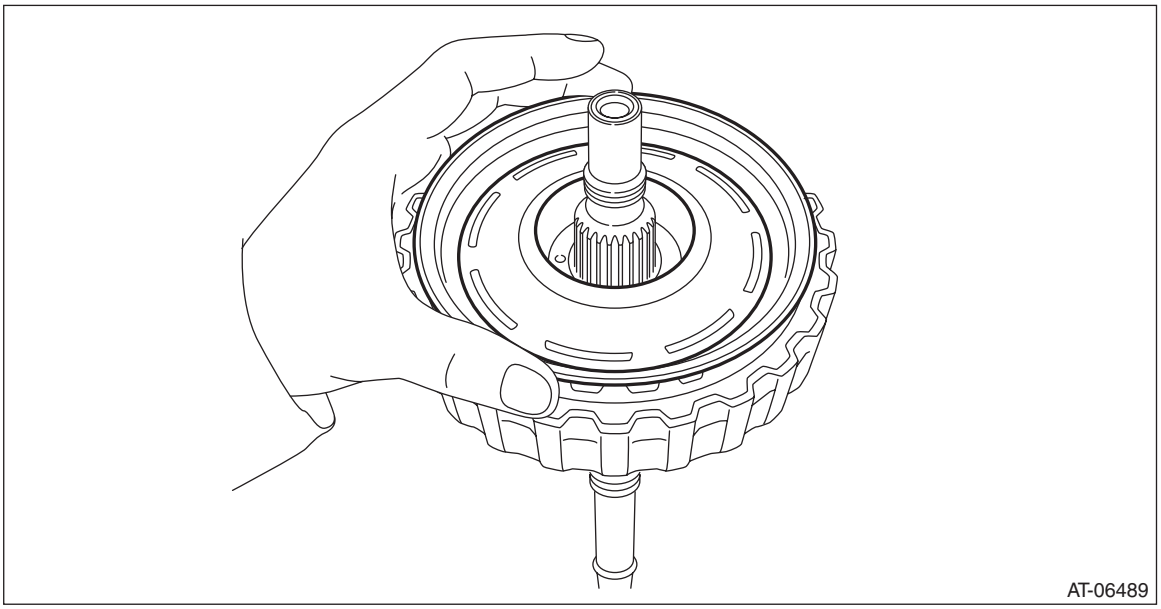


D: ASSEMBLY

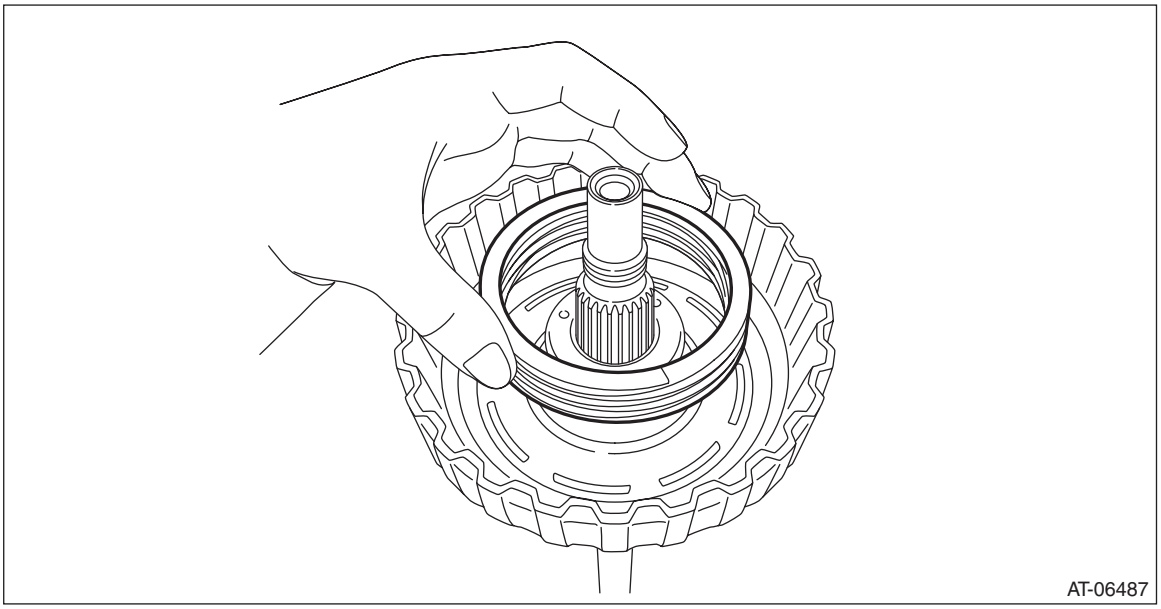
1. FORWARD CLUTCH ASSEMBLY

1) Install the forward clutch piston to forward clutch drum.

NOTE:
- Apply CVTF to the seal of forward clutch piston.
- Insert it all the way to the end.

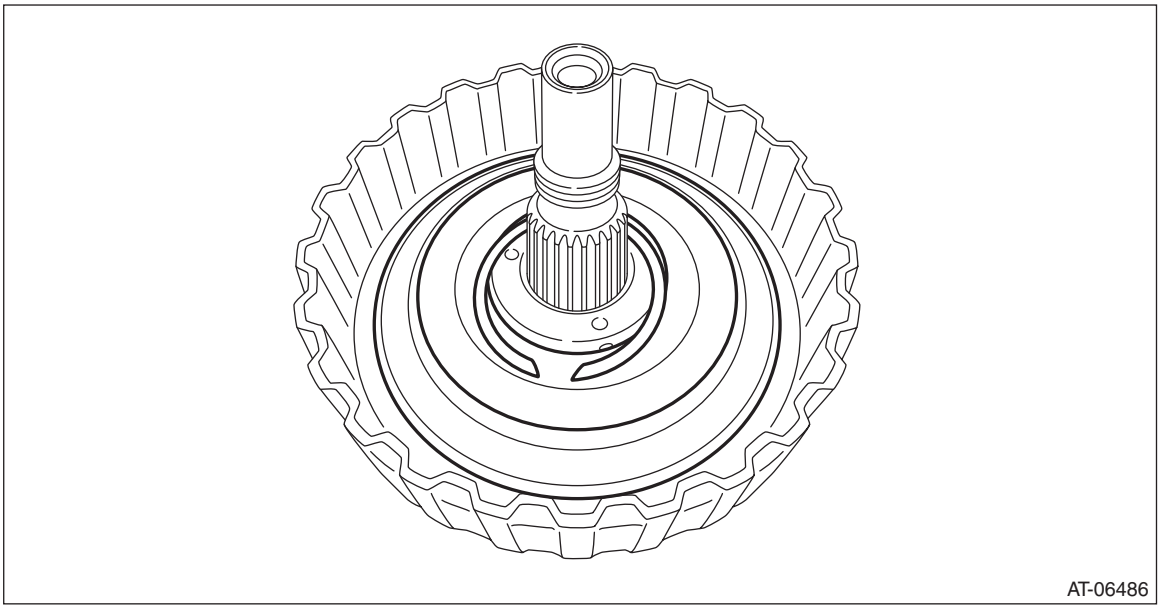


2) Install the return spring.

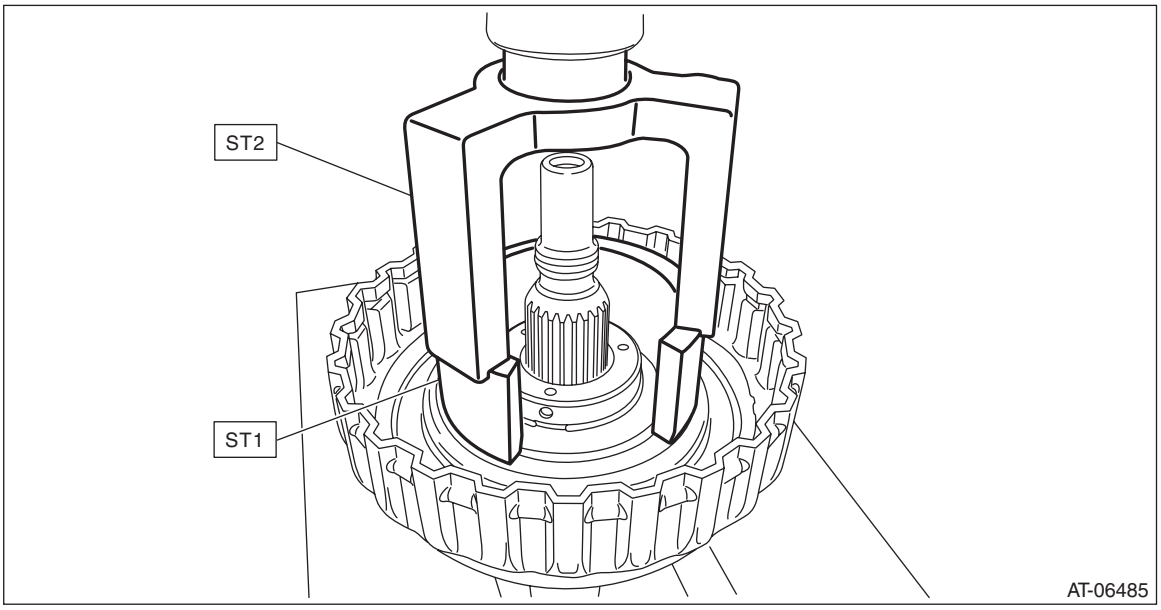


3) Install the chamber COMPL.

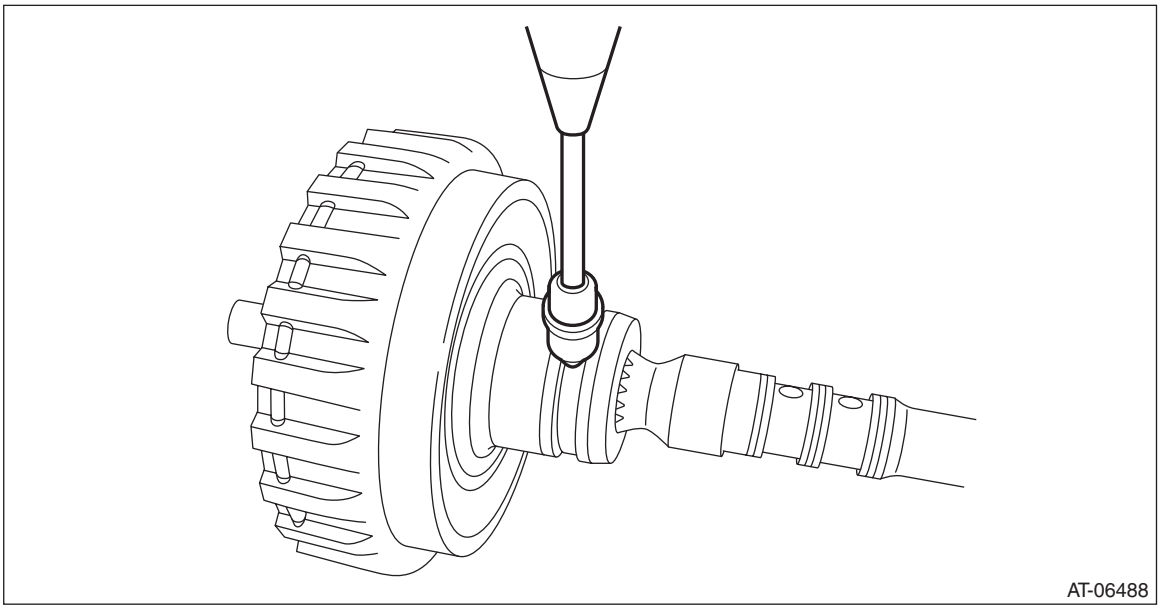
NOTE:
Apply CVTF to the sealing area of chamber COMPL.



4) Compress the return spring using the ST to install the snap ring.
ST1 18762AA010 COMPRESSOR SPECIAL TOOL
ST2 398673600 COMPRESSOR



5) Check the operation of forward clutch piston by blowing compressed air intermittently from forward clutch carrier hole.



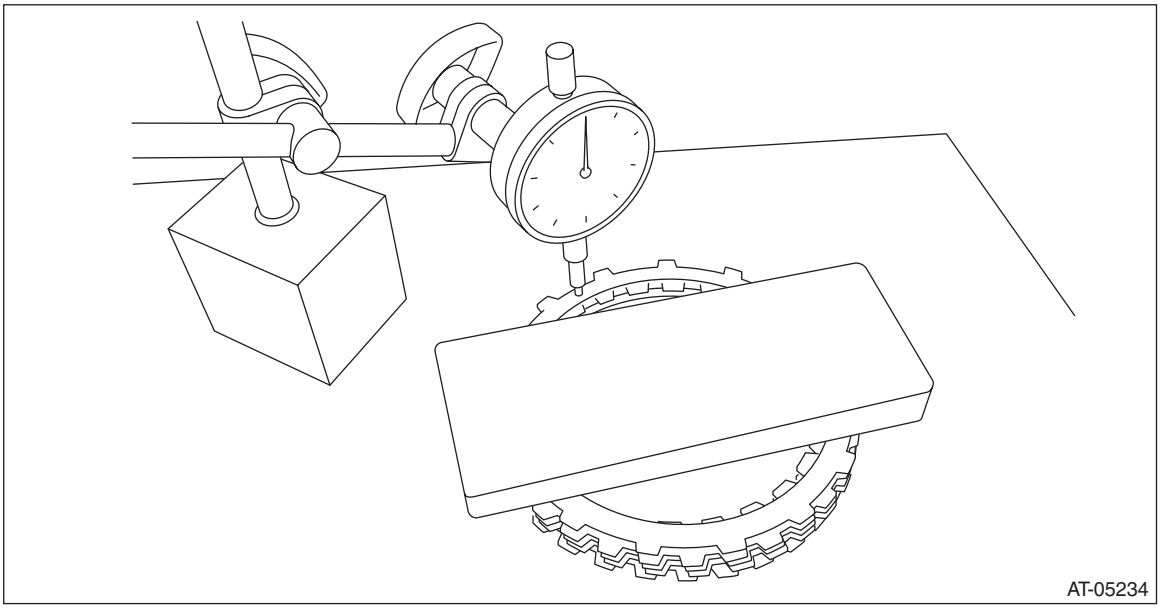
6) Place the driven plate, drive plate and retaining plate neatly in this order on surface table.
7) Set the dial gauge to retaining plate, and read its scale.

NOTE:
The value, which is read in the gauge at this time, is zero point.

8) Scale and record the weight "Z" of a flat board which will be put on retaining plate.

NOTE:
- The value, which is read in the gauge at this time, is zero point.
- Use a flat board weighing less than 52 N (5.3 kgf, 11.7 lb).

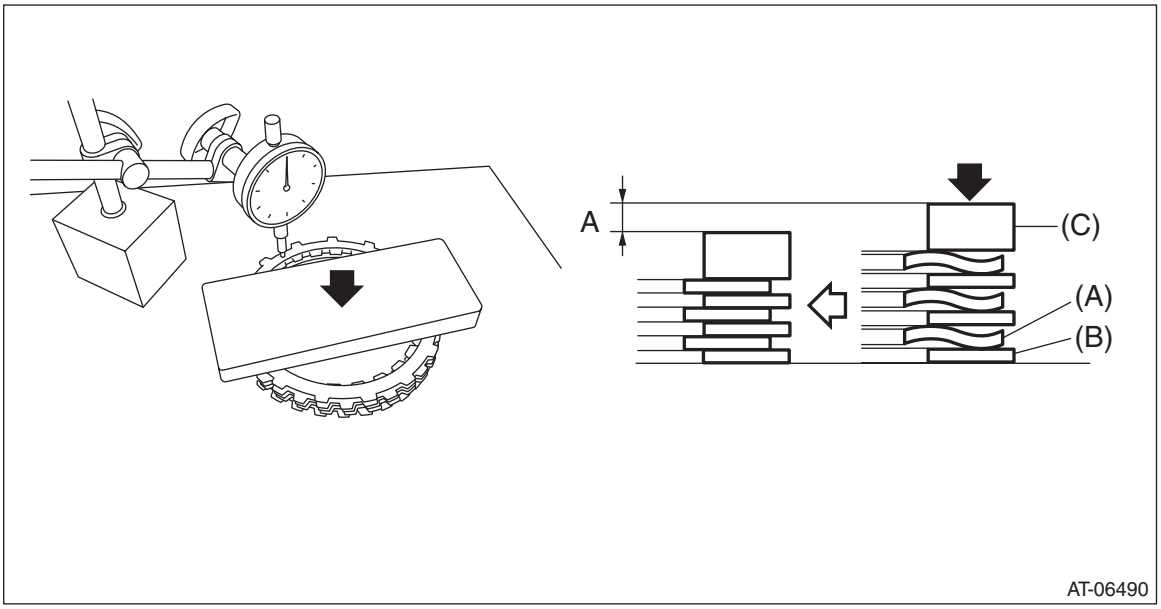
9) Put the flat board on retaining plate.



10) Using the following formula, read the push/pull gauge and calculate "N".
N = 52 N (5.3 kgf, 11.7 lb) – Z
52 N (5.3 kgf, 11.7 lb) : Load applied to clutch plate
Z: Flat board weight

11) Press the center of retaining plate by applying a force of “N” using push/pull gauge, and then measure and record the compression amount “A”.

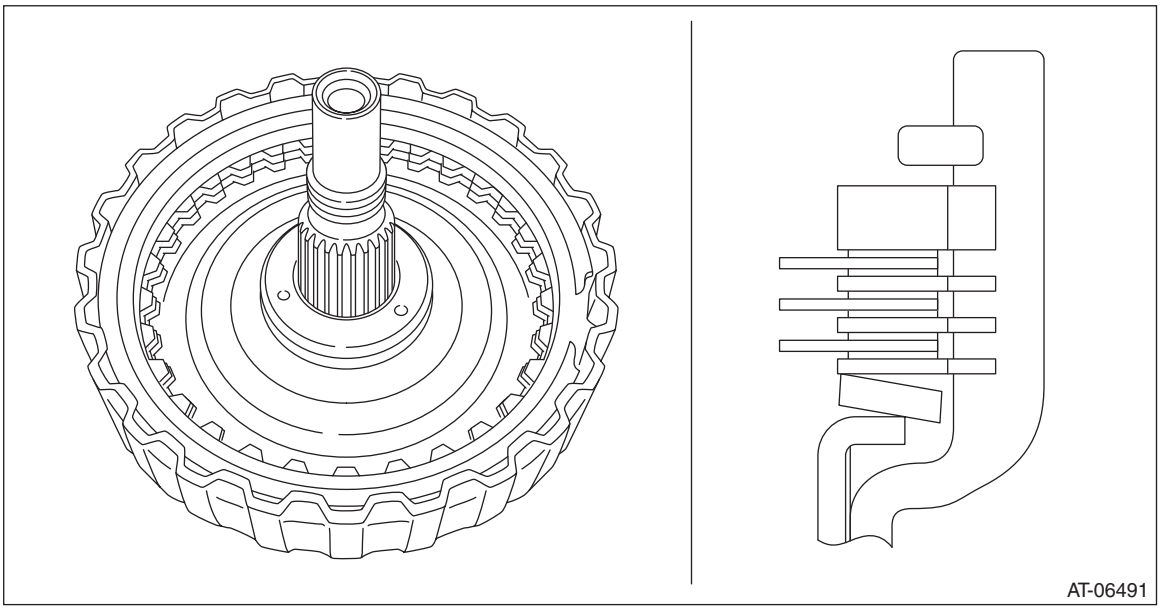
NOTE:
Measure at four points with a 90° interval and calculate the average.



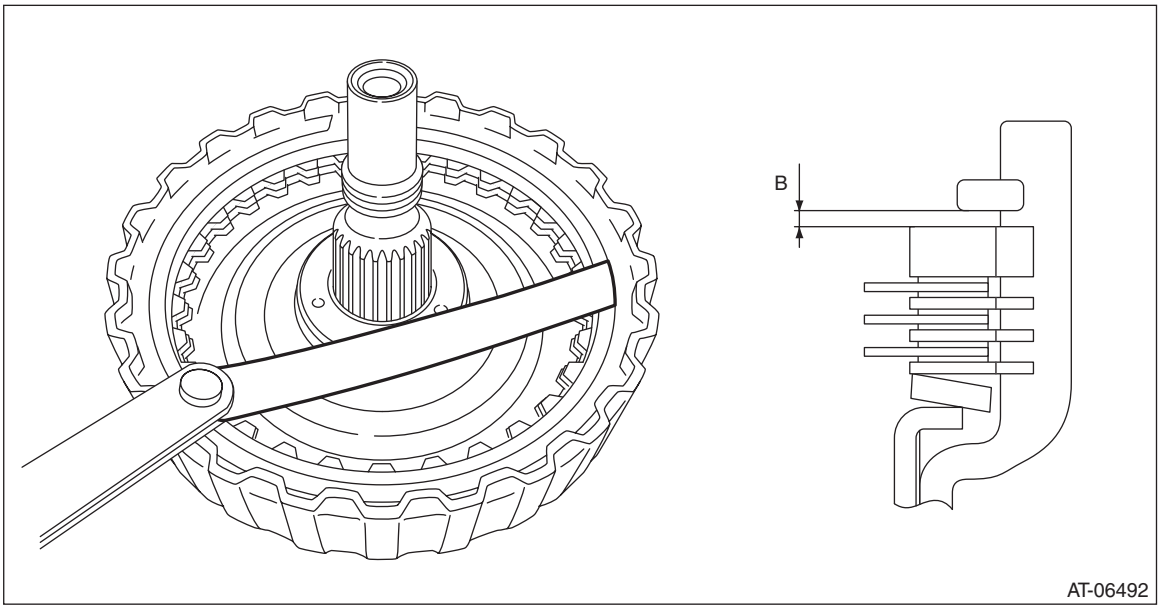
(A) Driven plate
(B) Drive plate
(C) Retaining plate

12) Install the dish plate, drive plate, driven plate, retaining plate and snap ring to the forward clutch carrier.

NOTE:
Install the dish plate in the correct direction.



13) Measure and record the clearance “B” between the retaining plate and snap ring.



14) Piston stroke calculation
Calculate with A and B dimensions recorded before.
If it exceeds the limit, replace with a new drive plate and adjust within the initial standard value.
S mm (in) = A + B
S: Piston stroke
A: Compression amount of drive plate and dish plate
B: Clearance between retaining plate and snap ring

Initial standard:
1.0 — 1.4 mm (0.040 — 0.055 in)

Limit thickness:
1.6 mm (0.063 in)

Retaining plate	
Item number	Thickness mm (in)
31567AB760	4.2 (0.165)
31567AB770	4.4 (0.173)
31567AB780	4.6 (0.181)
31567AB790	4.8 (0.189)
31567AB830	5.0 (0.197)

2. PLANETARY CARRIER ASSY

NOTE:
Assemble in the reverse order of disassembly.

3. INTERNAL GEAR

NOTE:
Assemble in the reverse order of disassembly.

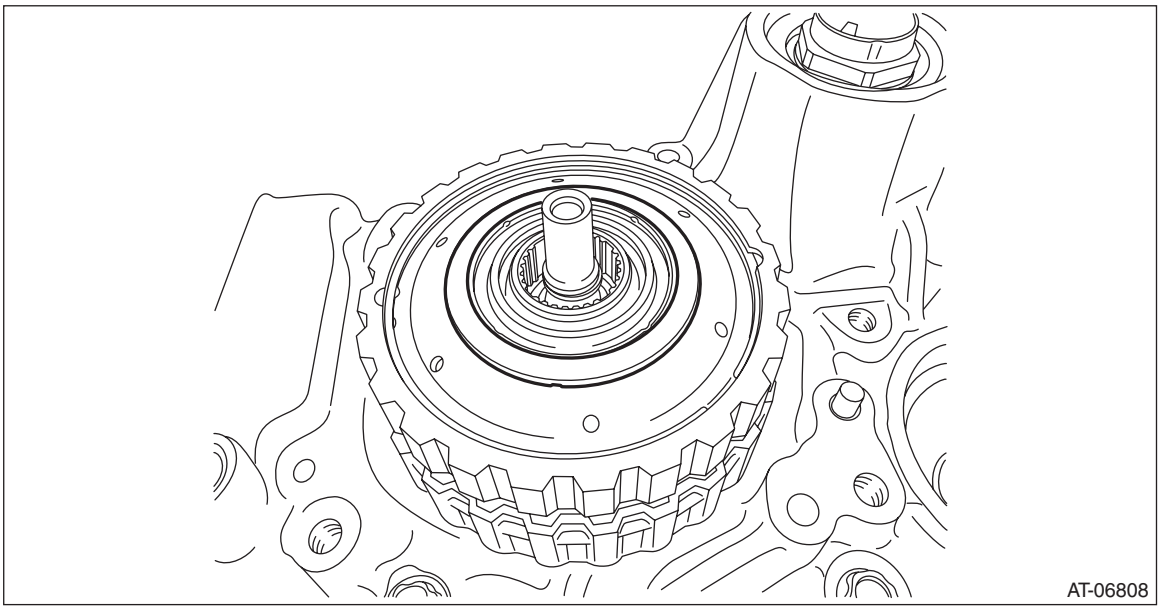
E: INSPECTION

- Check the forward clutch drum, internal gear, sun gear and forward clutch piston lip for wear or damage.
- Inspect the drive plate facing for wear and damage.
- Check the driven plate for discoloration (burnt color).
- Check for worn snap ring, fatigue or damaged return spring or deformed spring retainer.
- Make sure the clearance between retaining plate and internal gear of forward clutch is within the limit. If it exceeds the standard, replace the forward clutch. <Ref. to CVT-261, ASSEMBLY, Forward Clutch Assembly.>

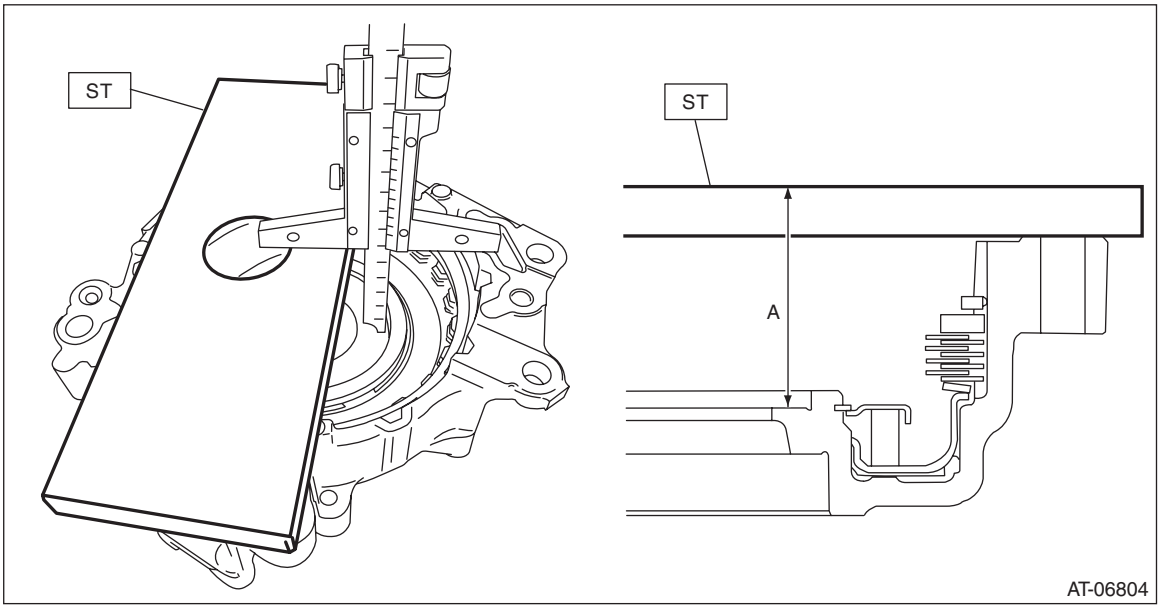
F: ADJUSTMENT

1) Install the thrust bearing to the internal gear.

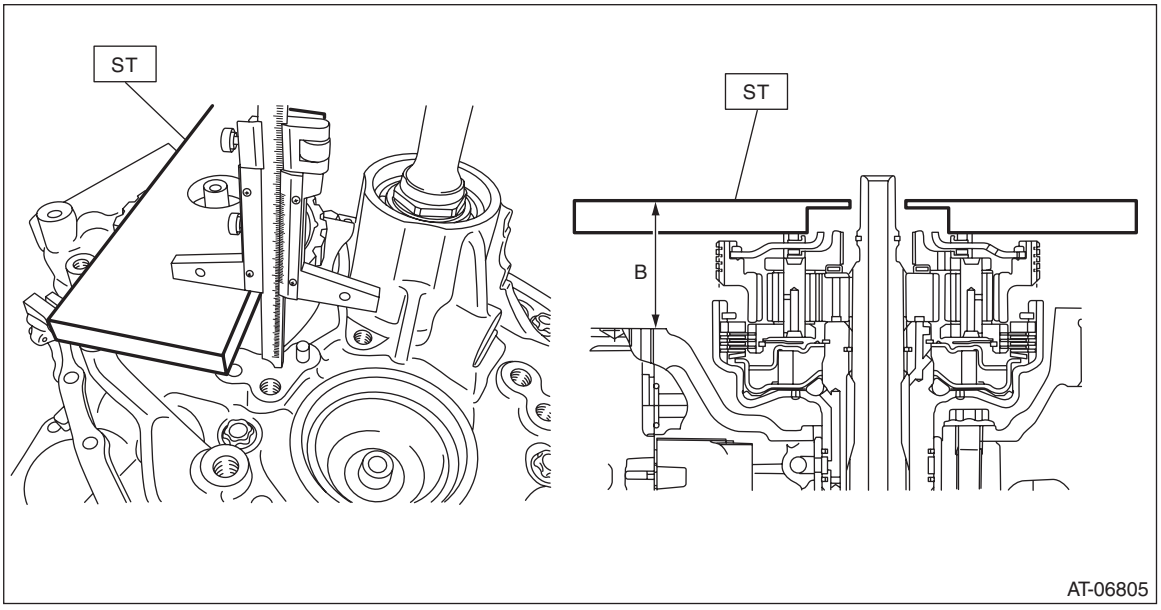
NOTE:
Face the temper color surface to the reverse brake side.



2) Measure depth “A” from the ST upper face to the washer mounting surface.
ST 499575600 GAUGE



3) Measure the height “B” from the ST upper face to the mating surface of the drive pinion retainer.
ST 499575600 GAUGE



4) Obtain the thickness of washer using the following formula to select the washer.
T (mm) = A – B – (0.35 — 0.70)
[T (in) = A – B – (0.014 — 0.028)]
T: Shim thickness
A: Depth from the ST upper face to the washer mounting surface
B: Height from ST upper face to the drive pinion retainer mating surface
0.35 — 0.70 mm (0.014 — 0.028 in): Clearance

Washer	
Part No.	Thickness mm (in)
803064020	1.3 (0.051)
803064021	1.55 (0.061)
803064022	1.8 (0.071)
803064023	2.05 (0.081)
803064024	2.3 (0.091)
803064025	2.55 (0.100)

41.Drive Pinion Shaft Assembly

A: REMOVAL

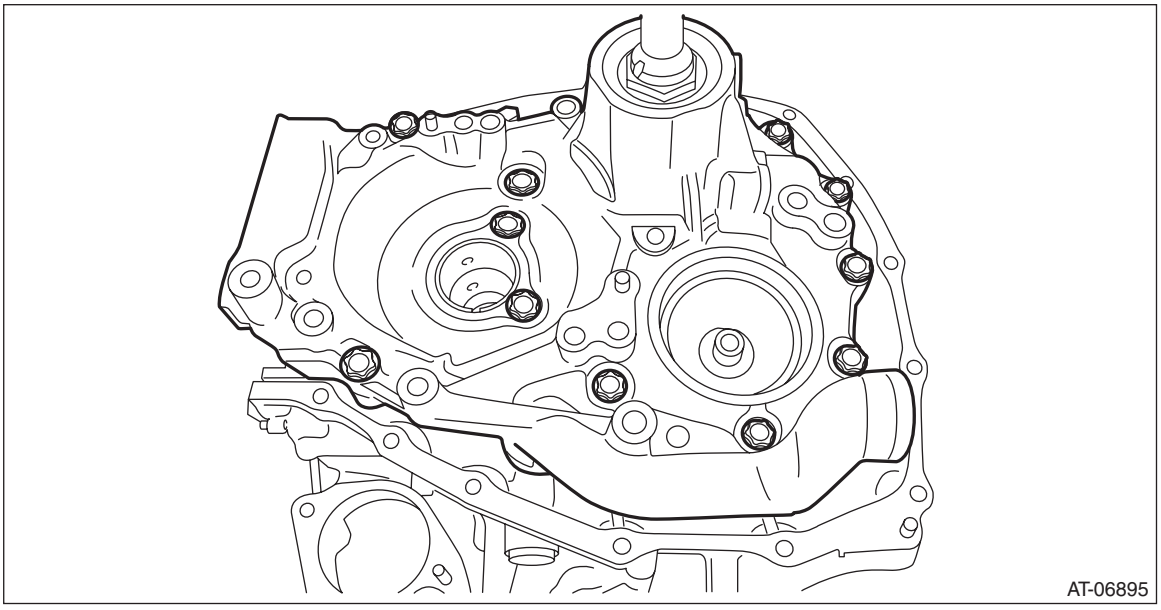
CAUTION:
The specifications of drive pinion retainer parts vary depending on transmission serial No..
When replacing the following parts, be sure to check the serial number before replacing.
- **Drive pinion retainer**

Transmission serial No.	96892 earlier 334608 earlier	96893 later 334609 later
Drive pinion retainer	32290AA020 32290AA021 can also be used.	32290AA021

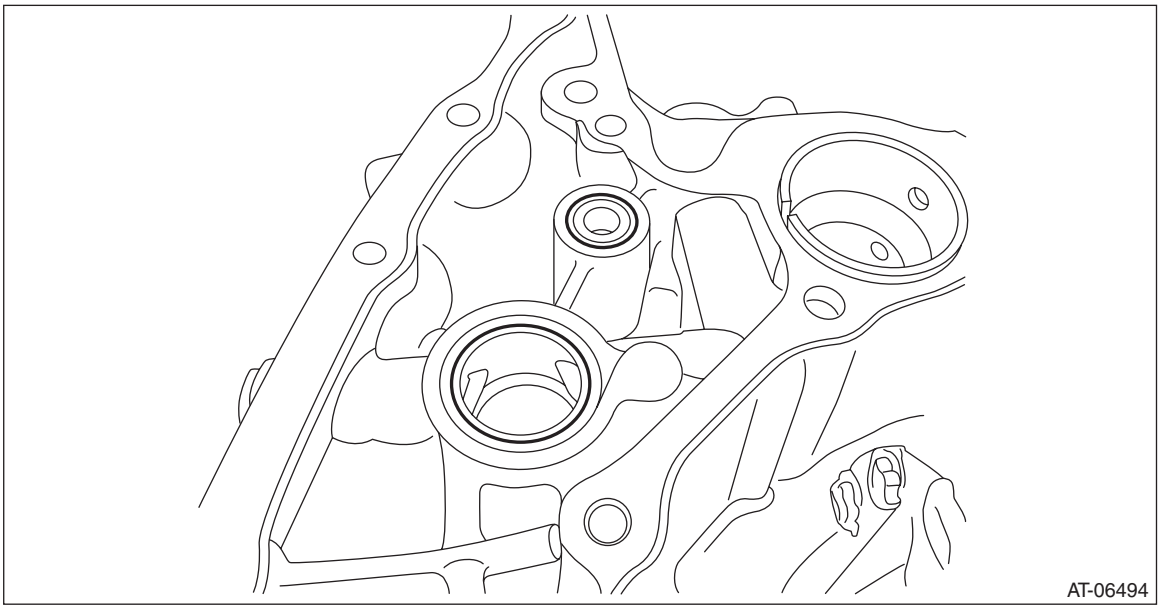
Transmission serial No.	96735 earlier	96736 later
Drive pinion retainer	32290AA030 32290AA031 can also be used.	32290AA031

1) Remove the transmission assembly from the vehicle. <Ref. to CVT-58, REMOVAL, Automatic Transmission Assembly.>
2) Remove the air breather hose. <Ref. to CVT-148, REMOVAL, Air Breather Hose.>
3) Remove the control valve body. <Ref. to CVT-112, REMOVAL, Control Valve Body.>
4) Remove the transmission harness. <Ref. to CVT-124, REMOVAL, Transmission Harness.>
5) Remove the turbine speed sensor. <Ref. to CVT-99, REMOVAL, Turbine Speed Sensor.>
6) Remove the secondary speed sensor. <Ref. to CVT-101, REMOVAL, Secondary Speed Sensor.>
7) Remove the primary speed sensor. <Ref. to CVT-103, REMOVAL, Primary Speed Sensor.>
8) Remove the inhibitor switch. <Ref. to CVT-94, REMOVAL, Inhibitor Switch.>
9) Remove the extension case. <Ref. to CVT-156, REMOVAL, Extension Case.>
10) Remove the transfer clutch assembly. <Ref. to CVT-160, REMOVAL, Transfer Clutch.>
11) Remove the transfer driven gear assembly. <Ref. to CVT-174, REMOVAL, Transfer Driven Gear.>
12) Remove the parking pawl. <Ref. to CVT-177, REMOVAL, Parking Pawl.>
13) Remove the reduction driven gear assembly. <Ref. to CVT-179, REMOVAL, Reduction Driven Gear.>
14) Remove the oil pan and oil strainer. <Ref. to CVT-108, REMOVAL, Oil Pan and Strainer.>
15) Remove the transmission control device. <Ref. to CVT-187, REMOVAL, Transmission Control Device.>
16) Remove the transmission case. <Ref. to CVT-193, REMOVAL, Transmission Case.>
17) Remove the reduction drive gear. <Ref. to CVT-209, REMOVAL, Reduction Drive Gear.>
18) Remove the primary pulley, secondary pulley and variator chain. <Ref. to CVT-213, REMOVAL, Primary Pulley and Secondary Pulley.>
19) Remove the reverse brake assembly. <Ref. to CVT-234, REMOVAL, Reverse Brake Assembly.>
20) Remove the forward clutch assembly. <Ref. to CVT-249, REMOVAL, Forward Clutch Assembly.>

21) Using the ST, remove the drive pinion retainer.
ST 18270KA020 SOCKET (E20)



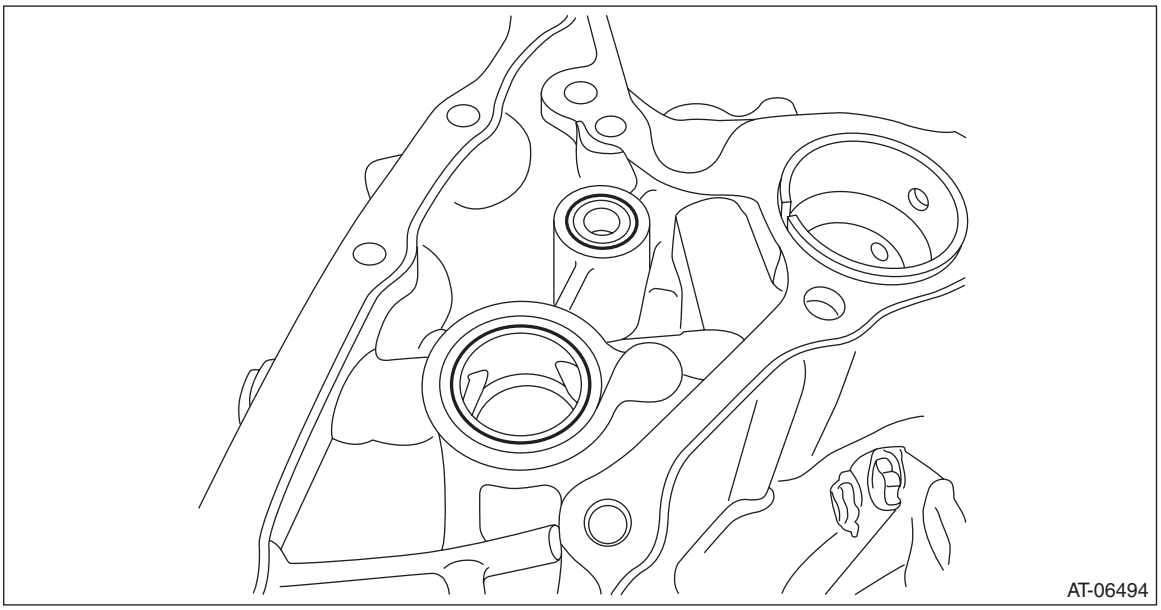
22) Remove the O-ring.



B: INSTALLATION

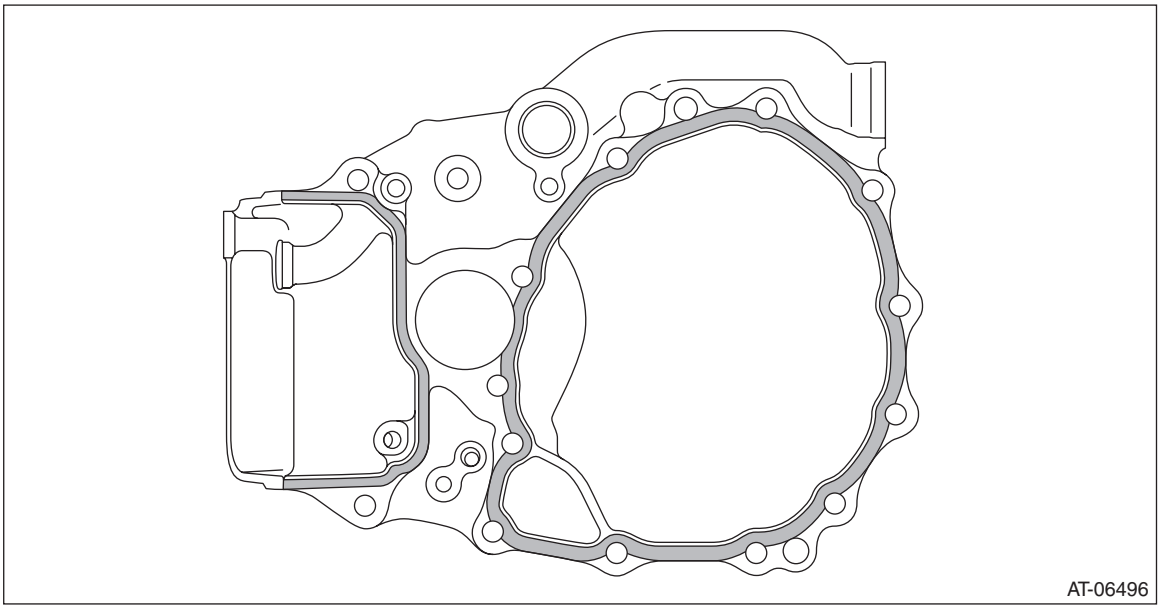
1) Clean the mating surface of drive pinion retainer and converter case.
2) Adjust the backlash and tooth contact between drive pinion shaft assembly and the front differential side gear. <Ref. to CVT-291, ADJUSTMENT, Drive Pinion Shaft Assembly.>
3) Install O-rings in two locations to the converter case.

NOTE:
- Use new O-rings.
- Apply CVTF to the O-ring.



4) Apply liquid gasket seamlessly to the mating surface of drive pinion retainer.

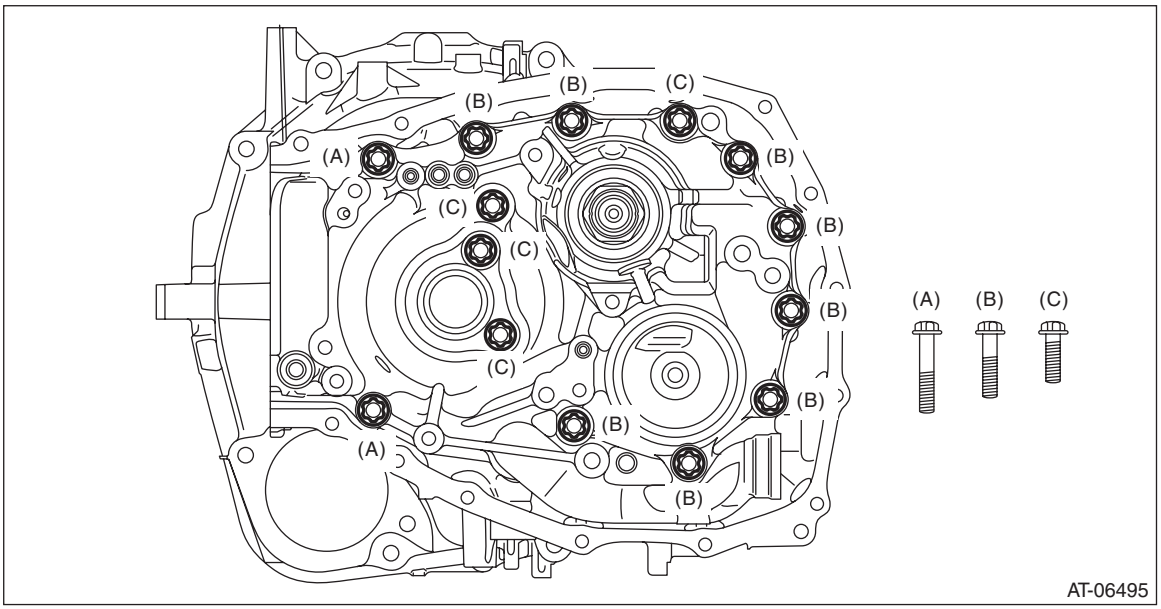
Liquid gasket:
THREE BOND 1215 (Part No. 004403007) or equivalent



5) Install the drive pinion retainer to converter case, and tighten the bolt using the ST.
ST 18270KA020 SOCKET (E20)

NOTE:
Do not confuse the three different-length bolts when installing.

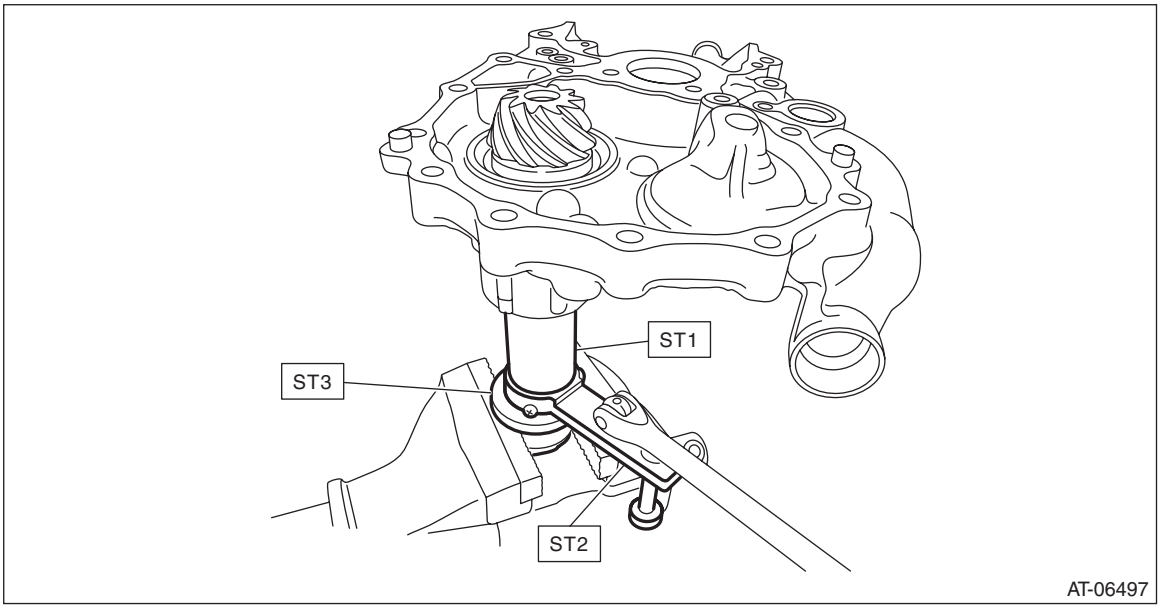
Tightening torque:
43 N·m (4.4 kgf-m, 31.7 ft-lb)



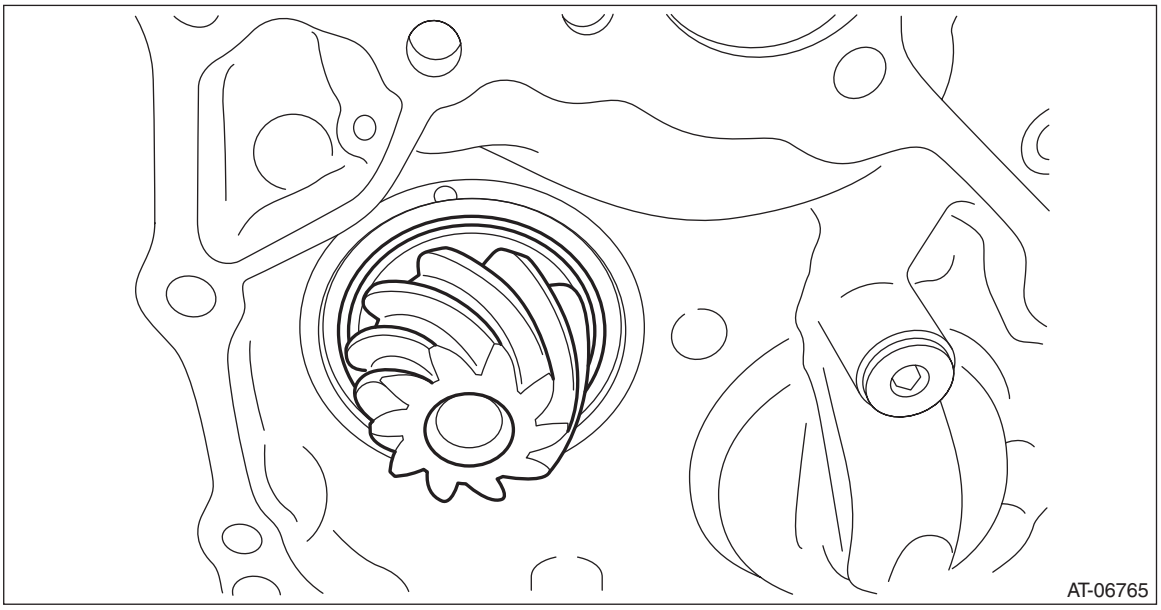
6) Install the forward clutch assembly. <Ref. to CVT-252, INSTALLATION, Forward Clutch Assembly.>
7) Install the reverse brake assembly. <Ref. to CVT-237, INSTALLATION, Reverse Brake Assembly.>
8) Install the primary pulley, secondary pulley and variator chain. <Ref. to CVT-220, INSTALLATION, Primary Pulley and Secondary Pulley.>
9) Install the reduction drive gear. <Ref. to CVT-210, INSTALLATION, Reduction Drive Gear.>
10) Install the transmission case. <Ref. to CVT-196, INSTALLATION, Transmission Case.>
11) Install the transmission control device. <Ref. to CVT-190, INSTALLATION, Transmission Control Device.>
12) Install the oil strainer and oil pan. <Ref. to CVT-109, INSTALLATION, Oil Pan and Strainer.>
13) Install the reduction driven gear assembly. <Ref. to CVT-179, INSTALLATION, Reduction Driven Gear.>
14) Install the transfer driven gear assembly. <Ref. to CVT-175, INSTALLATION, Transfer Driven Gear.>
15) Install the transfer clutch assembly. <Ref. to CVT-162, INSTALLATION, Transfer Clutch.>
16) Install the parking pawl. <Ref. to CVT-178, INSTALLATION, Parking Pawl.>
17) Install the extension case. <Ref. to CVT-157, INSTALLATION, Extension Case.>
18) Install the inhibitor switch. <Ref. to CVT-96, INSTALLATION, Inhibitor Switch.>
19) Install the secondary speed sensor. <Ref. to CVT-101, INSTALLATION, Secondary Speed Sensor.>
20) Install the primary speed sensor. <Ref. to CVT-104, INSTALLATION, Primary Speed Sensor.>
21) Install the turbine speed sensor. <Ref. to CVT-99, INSTALLATION, Turbine Speed Sensor.>
22) Install the transmission harness. <Ref. to CVT-130, INSTALLATION, Transmission Harness.>
23) Install the control valve body. <Ref. to CVT-117, INSTALLATION, Control Valve Body.>
24) Install the air breather hose. <Ref. to CVT-149, INSTALLATION, Air Breather Hose.>
25) Install the transmission assembly to the vehicle. <Ref. to CVT-69, INSTALLATION, Automatic Transmission Assembly.>

C: DISASSEMBLY

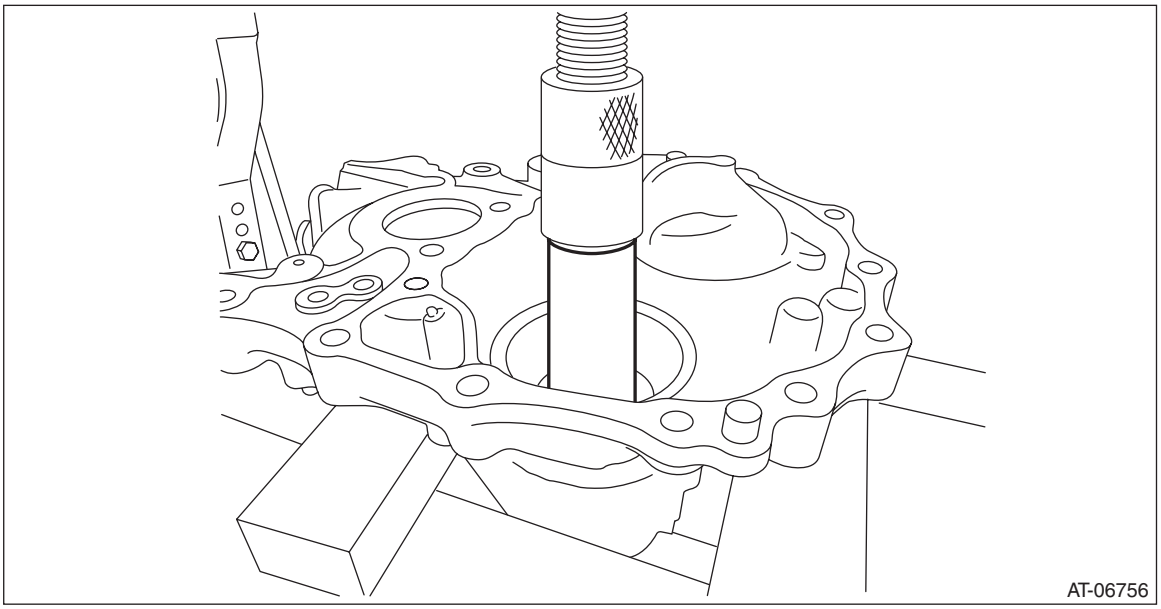
1) Flatten the tab of the lock nut.
2) Using ST1, ST2 and ST3, fix at the spline portion of drive pinion shaft to remove the lock nut.
ST1 499787500 ADAPTER
ST2 499787700 WRENCH
ST3 498937110 HOLDER



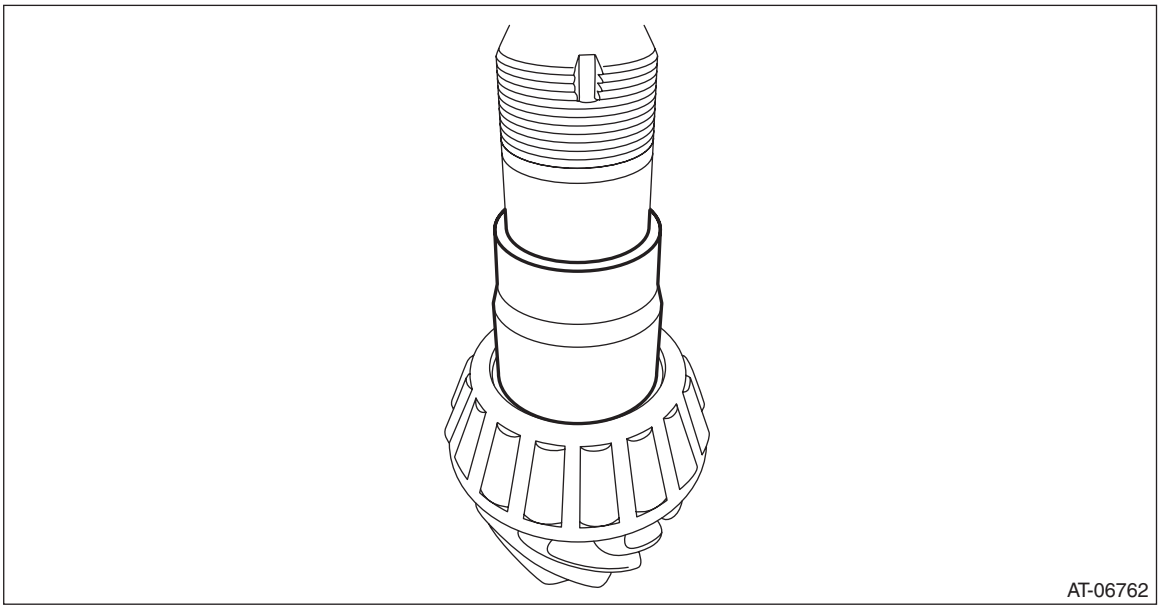
3) Remove the drive pinion shaft from the drive pinion retainer.



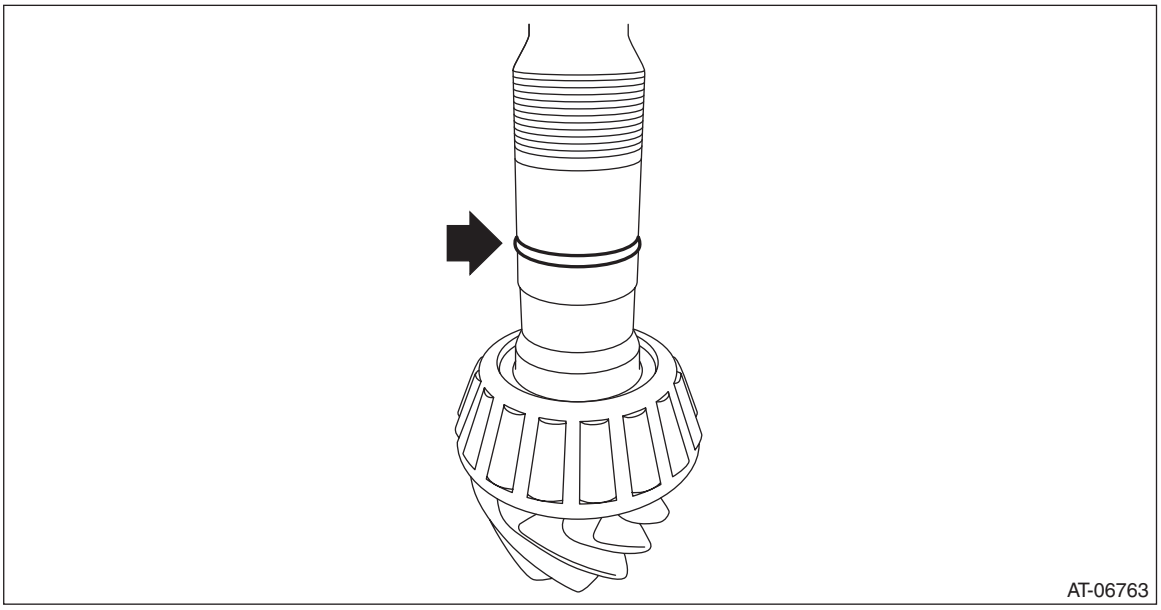
4) Using the round bar with diameter of 36 mm (1.42 in) or 37 mm (1.46 in), remove the bearing inner race and plug.



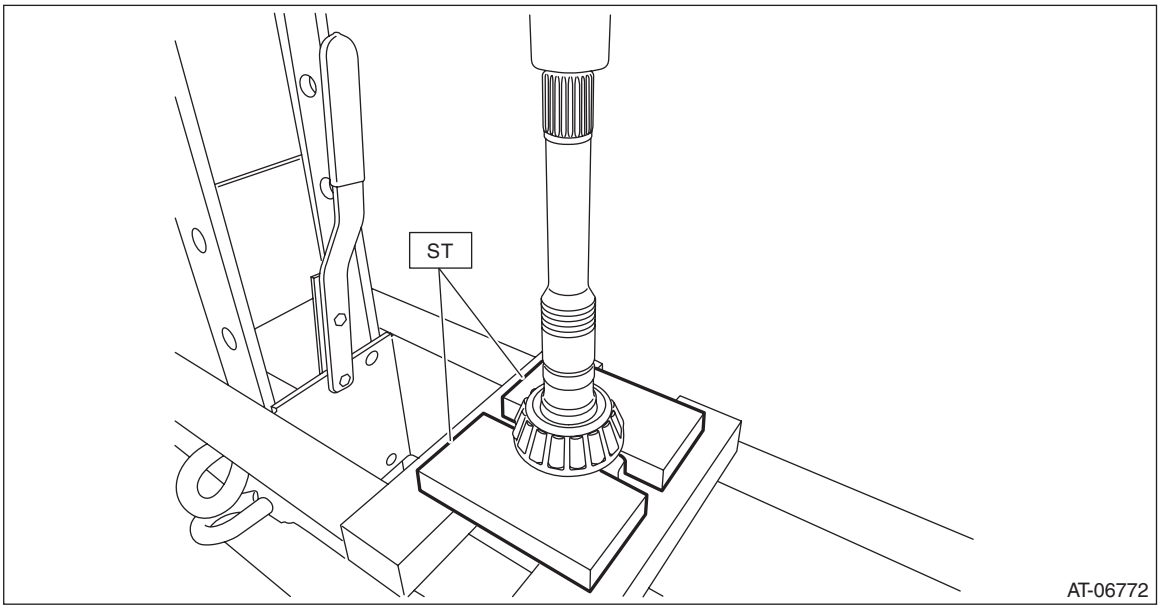
5) Remove the drive pinion washer.
6) Remove the drive pinion spacer.



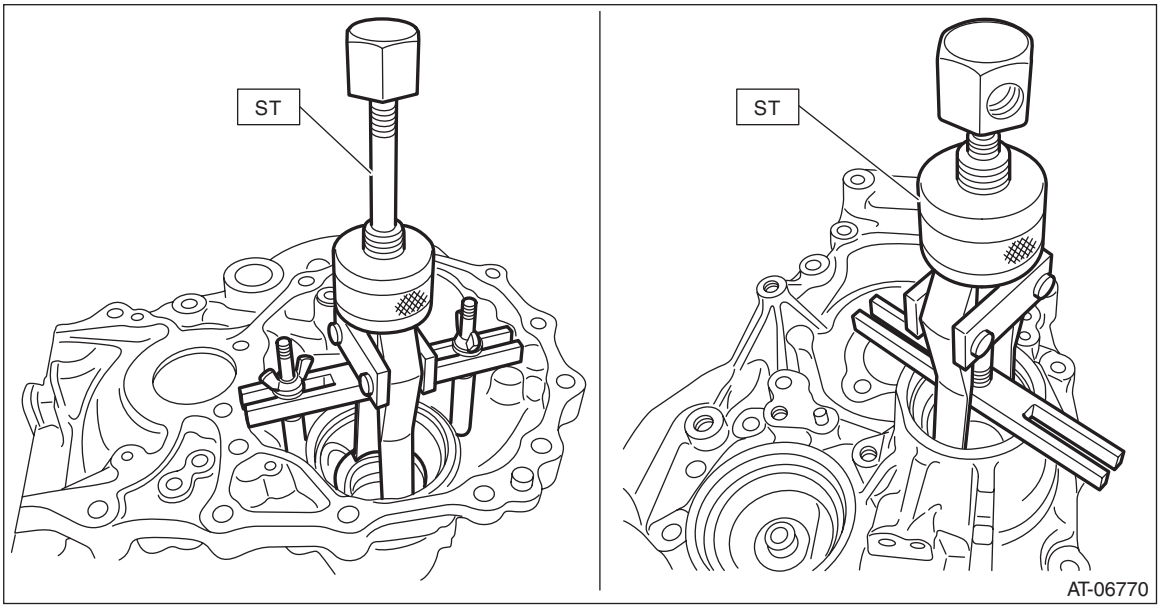
7) Remove the O-ring.



8) Remove the inner race and drive pinion shim from drive pinion shaft using ST.
ST 498515500 REMOVER

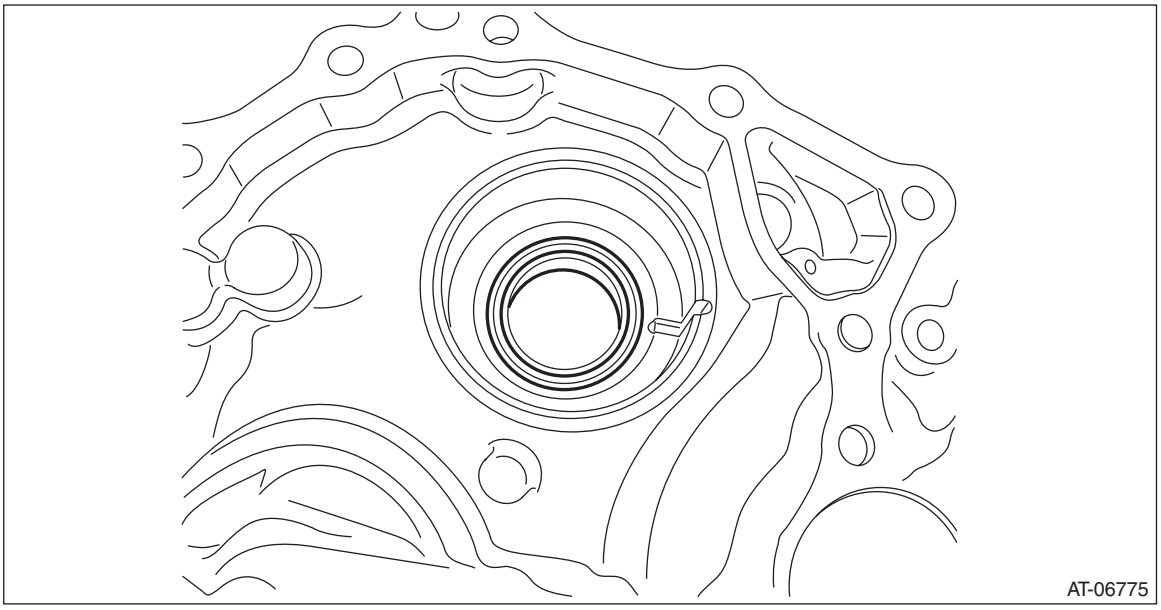


9) Using the ST, remove the outer race.
ST 398527700 PULLER ASSY

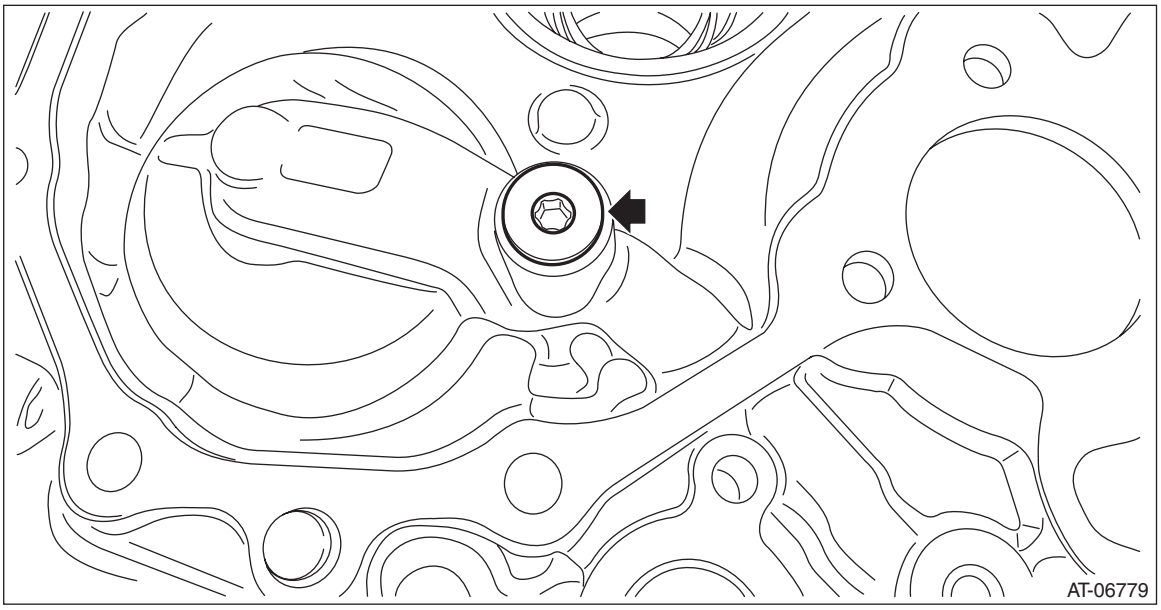


10) Remove the two oil seals using a screwdriver wrapped with cloth etc.

CAUTION:
Do not damage the fitting surface of oil seal.



11) Remove the plug from drive pinion retainer.

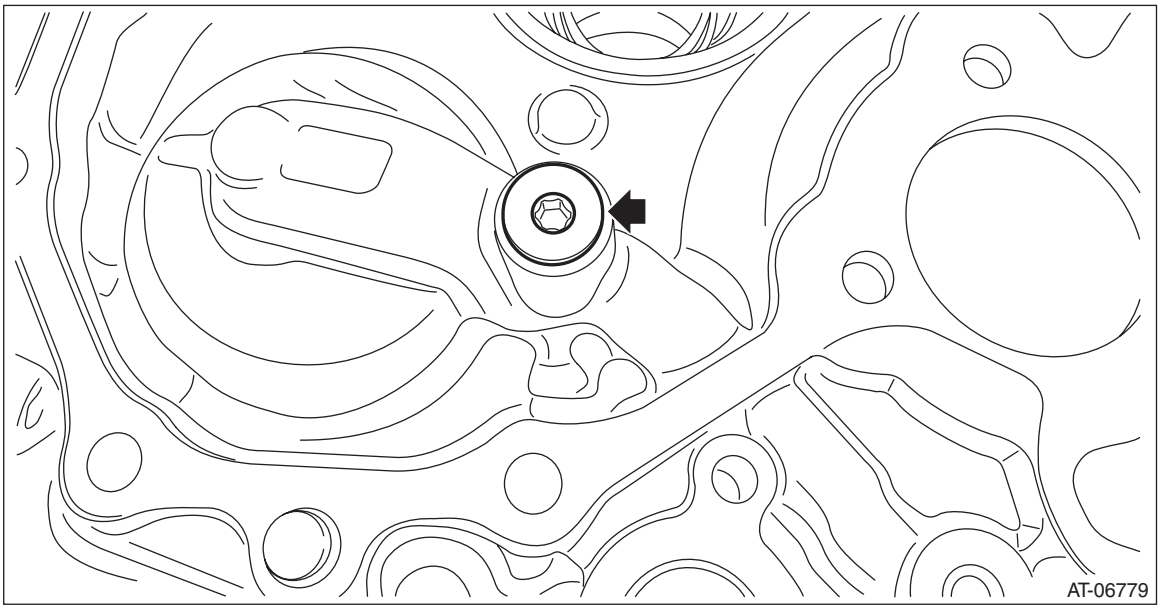


D: ASSEMBLY

1) Install the plug to drive pinion retainer.

NOTE:
- Use new O-rings.
- Apply CVTF to the O-ring.

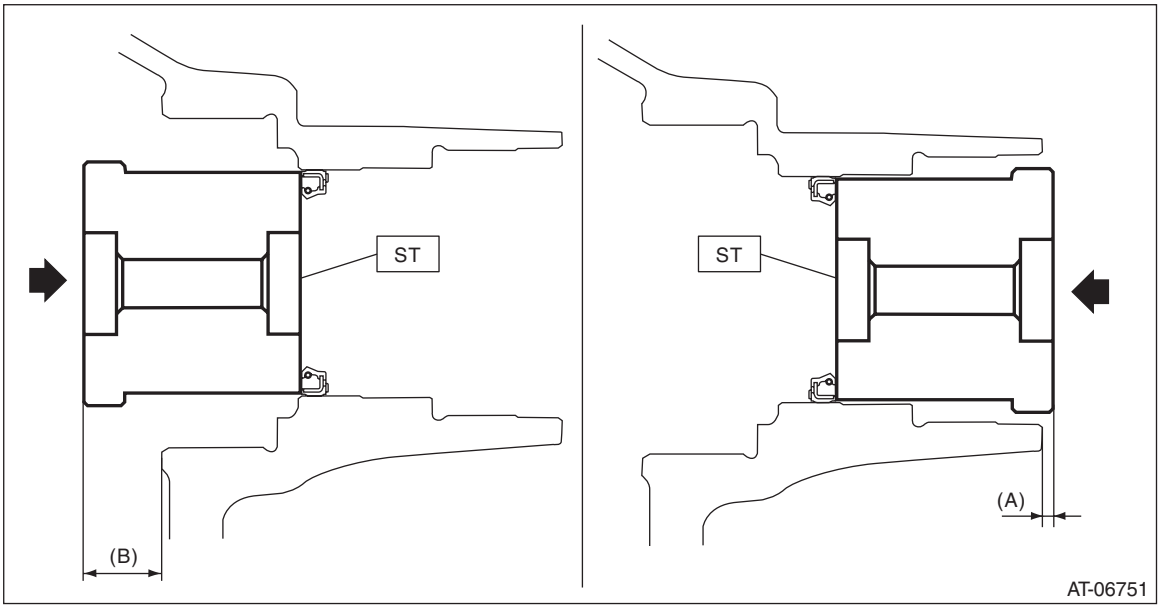
Tightening torque:
25 N·m (2.5 kgf-m, 18.4 ft-lb)



2) Using the ST, install the oil seal to drive pinion retainer.

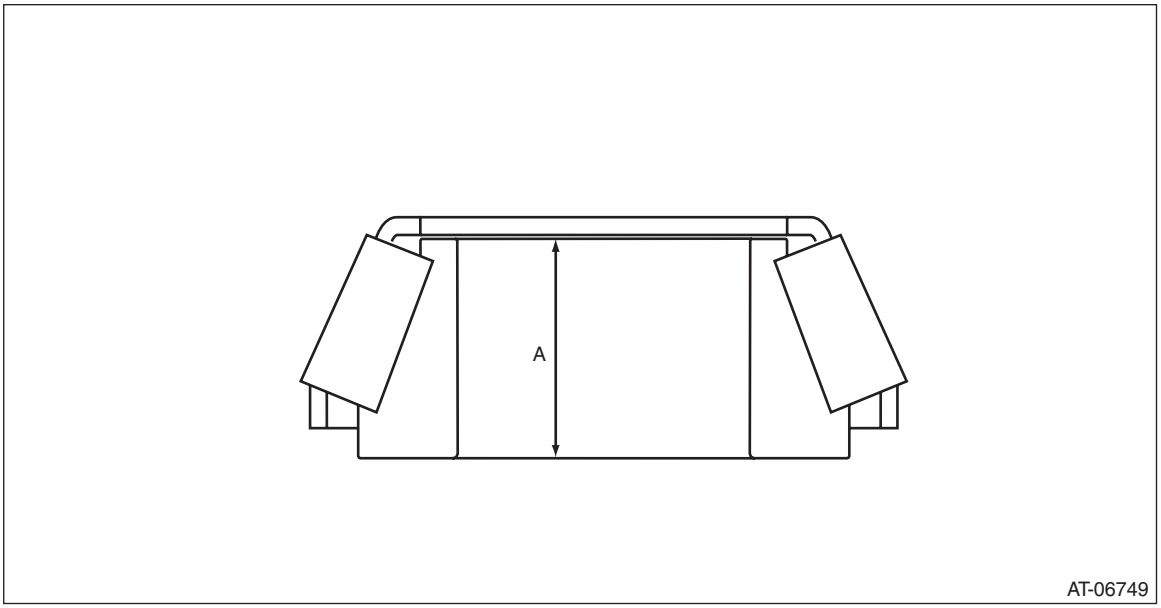
NOTE:
- Apply CVTF to the oil seal press-fitting surface and lip.
- Install the oil seal in the correct direction.

ST 927720000 HOUSING BUSHING INSTALLER AND REMOVER

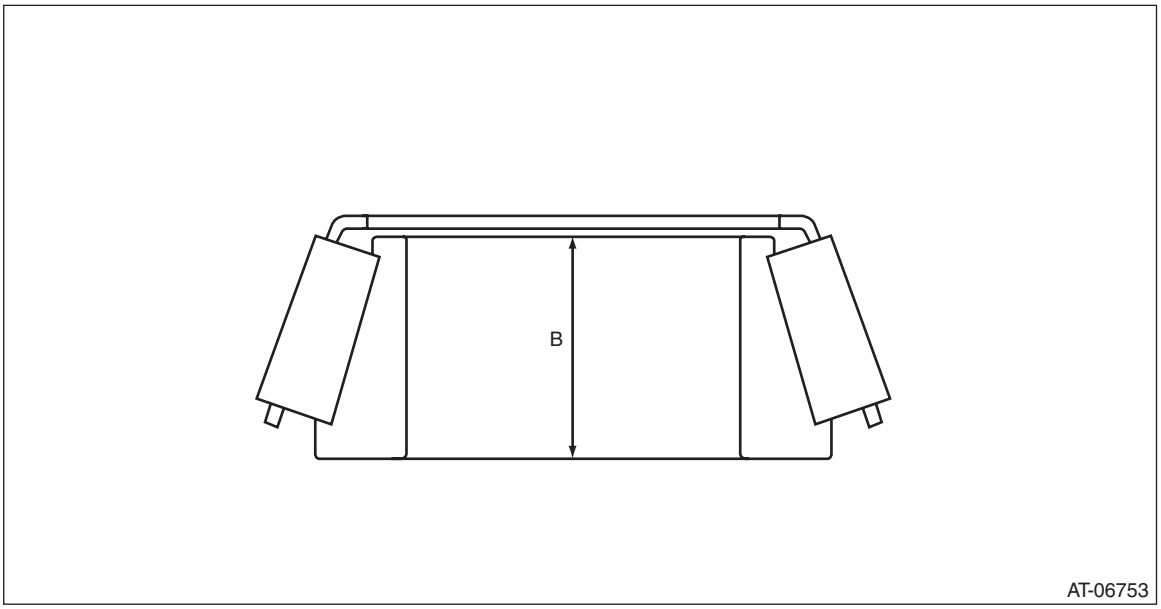


(A) 2.8 mm (0.11 in)
(B) 18.7 mm (0.74 in)

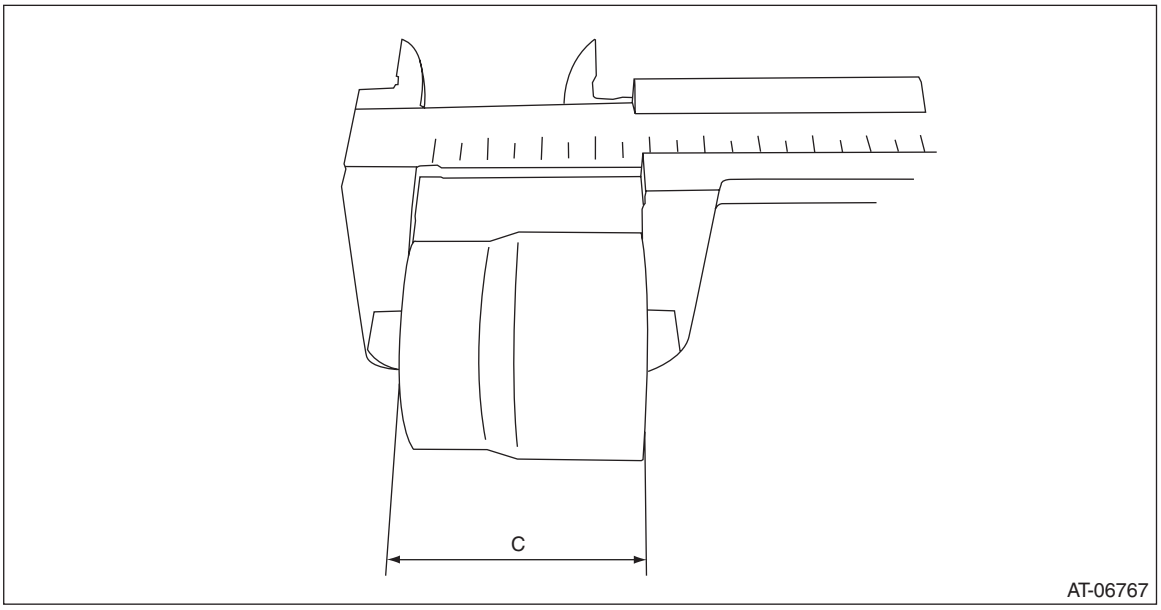
3) Select the drive pinion washer.
(1) Measure the roller bearing inner race width “A” on the front side.



(2) Measure the roller bearing inner race width “B” on the rear side.

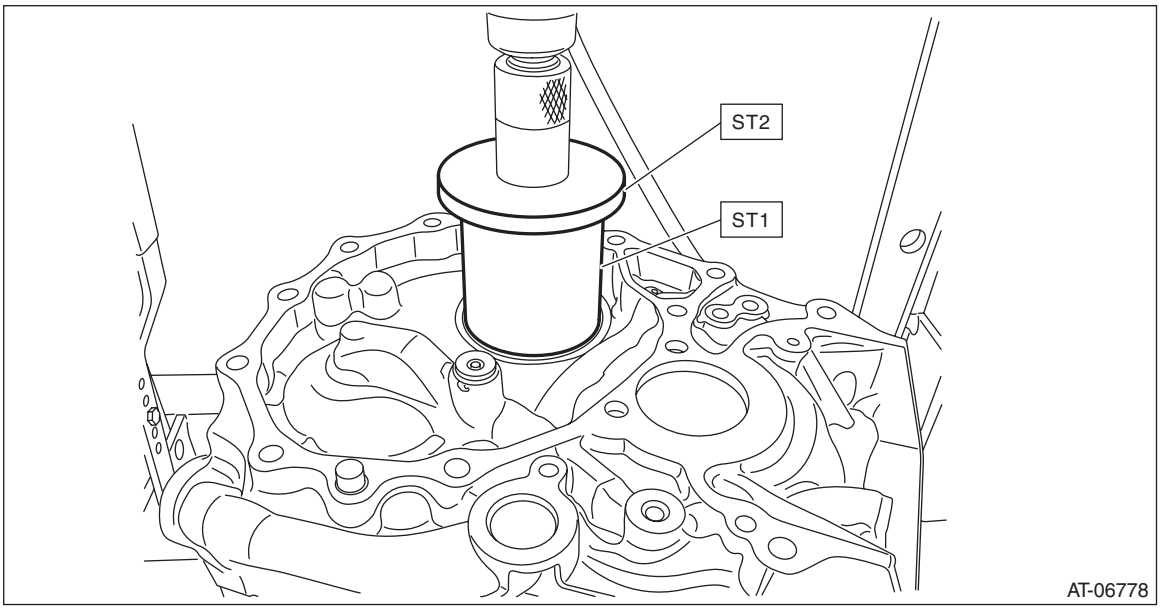


(3) Measure the spacer width “C”.

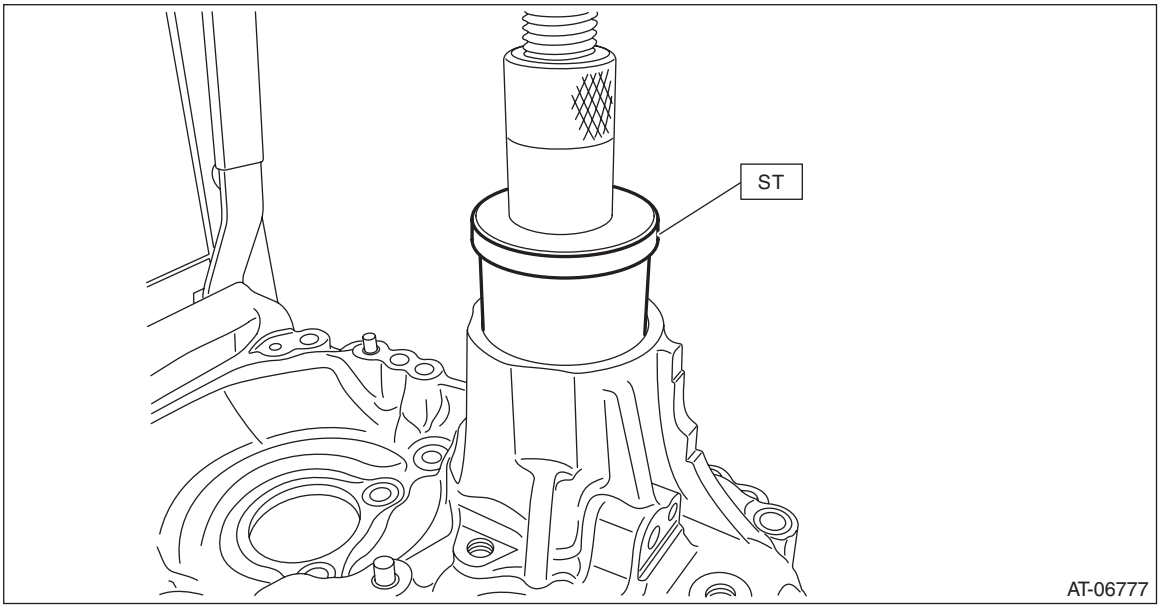


(4) Using the ST, install the front roller bearing outer race to the drive pinion retainer.

ST1 28499TC010 INSTALLER
ST2 398177700 INSTALLER



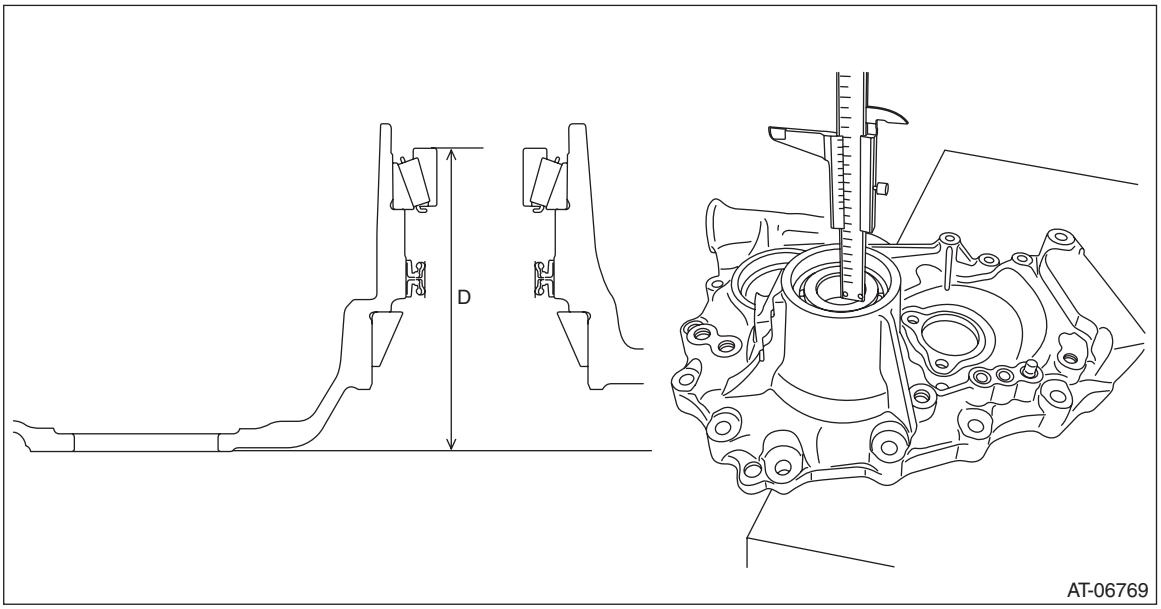
(5) Using the ST, install the rear roller bearing outer race to the drive pinion retainer.
ST 20099AE020 INSTALLER



(6) Place the drive pinion retainer on the surface plate, and install the inner race to the rear roller bearing outer race.

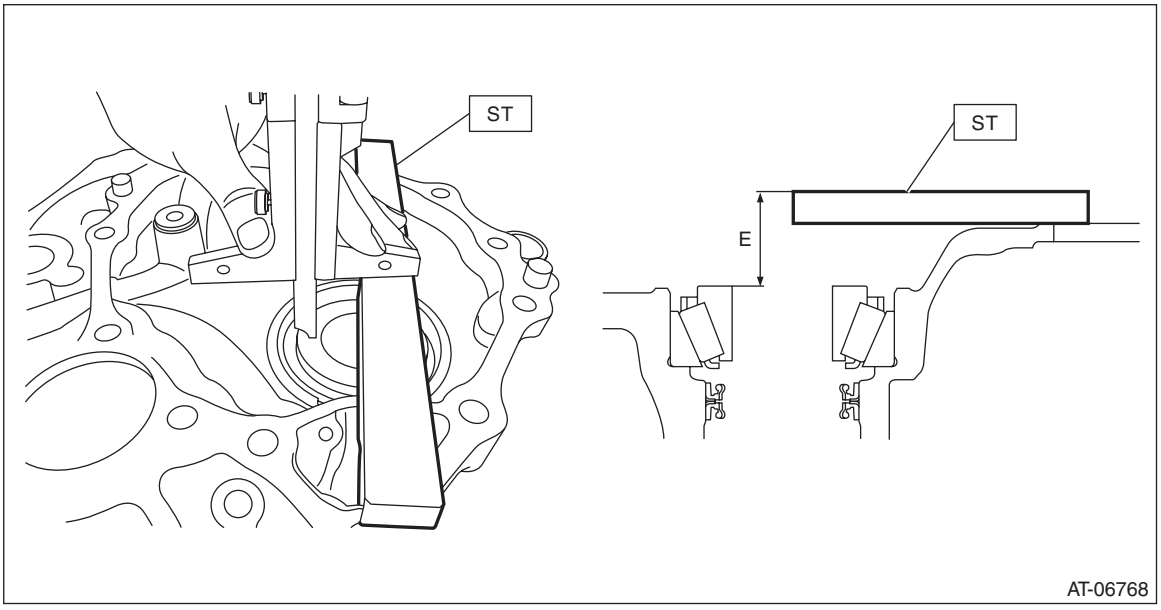
NOTE:
Place the drive pinion retainer so that the mating surface of the drive pinion retainer (mating surface with the converter case) contacts the surface plate.

(7) Measure the height “D” from the end face of the rear roller bearing inner race to the surface plate.



(8) Install the inner race to the front roller bearing outer race.

(9) Measure the depth “E” from the end face of the front roller bearing inner race to the end face of the ST.
ST 499575400 GAUGE

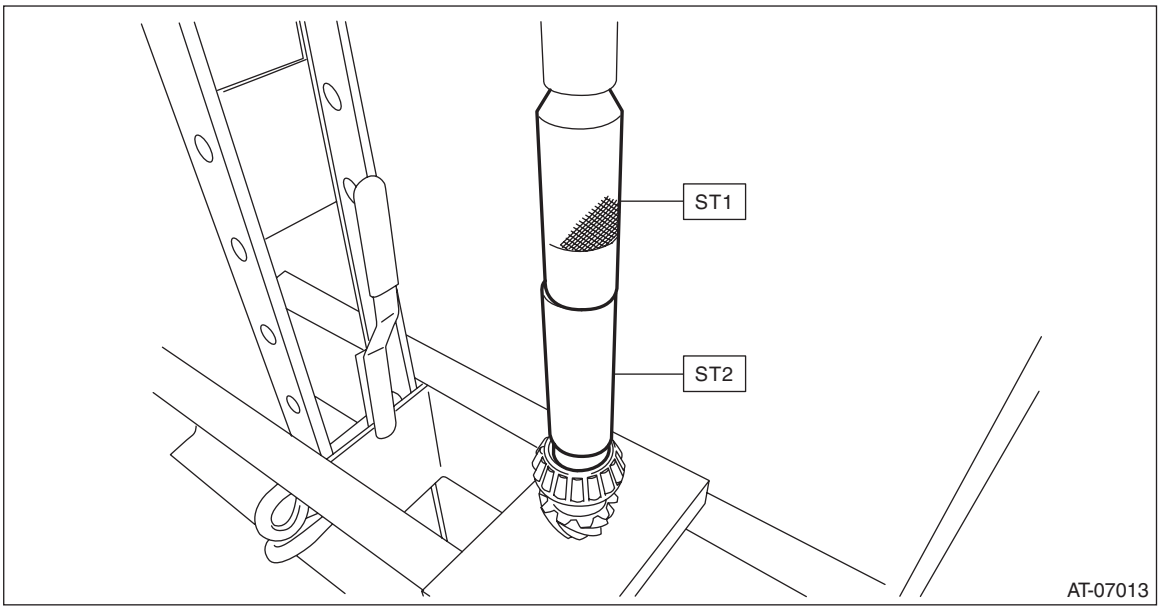


(10) Using following formula, select one to three drive pinion washers.
T (mm) = D – (A + B + C + E – 15) – (0±0.0125)
[T (in) = D – (A + B + C + E – 0.591) – (0±0.0005)]
A: Front roller bearing width
B: Rear roller bearing width
C: Spacer width
D: Height from end face of rear roller bearing inner race to surface plate
E: Depth from end face of front roller bearing inner race to end face of ST
15 mm (0.591 in): Thickness of ST
T: Drive pinion washer thickness
0±0.0125 mm (0±0.0005 in): Clearance

Drive pinion washer	
Part No.	Thickness mm (in)
38336AA750	0.150 (0.0059)
38336AA760	0.175 (0.0069)
38336AA770	0.200 (0.0079)
38336AA780	0.225 (0.0089)
38336AA790	0.250 (0.0098)
38336AA800	0.275 (0.0108)
38336AA810	0.300 (0.0118)
38336AA820	0.400 (0.0157)

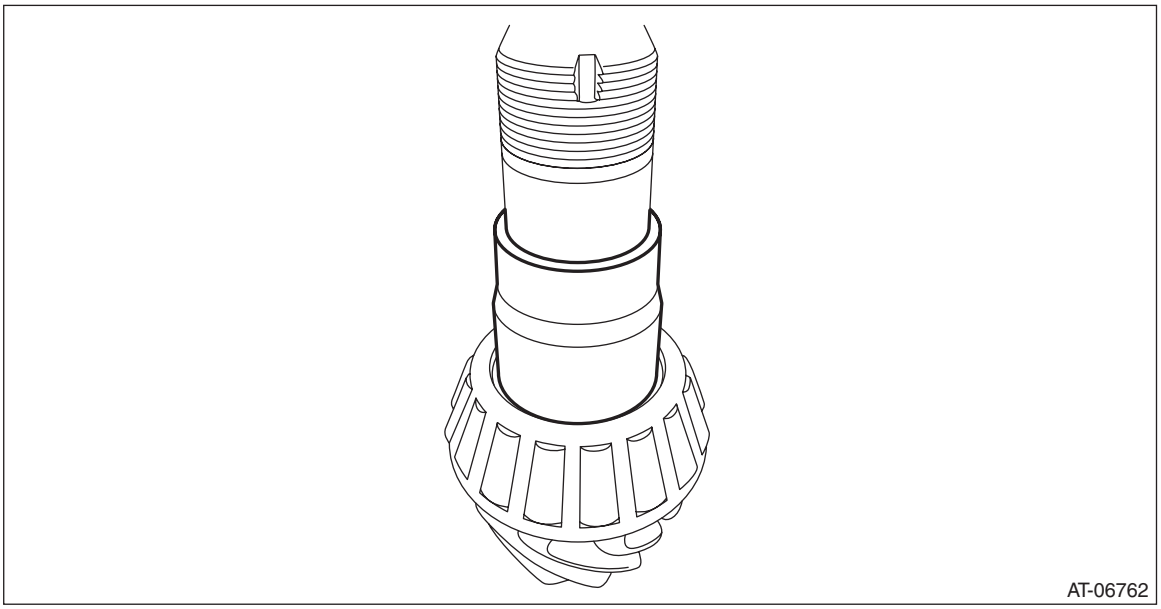
4) Measure and record the drive pinion shim thickness to be reused.
5) Install the drive pinion shim that is reused for the drive pinion shaft.

6) Using the ST1 and ST2, press-fit the inner race to the drive pinion shaft.
ST1 899580100 INSTALLER
ST2 927130000 EXTENSION DRIVE SHAFT

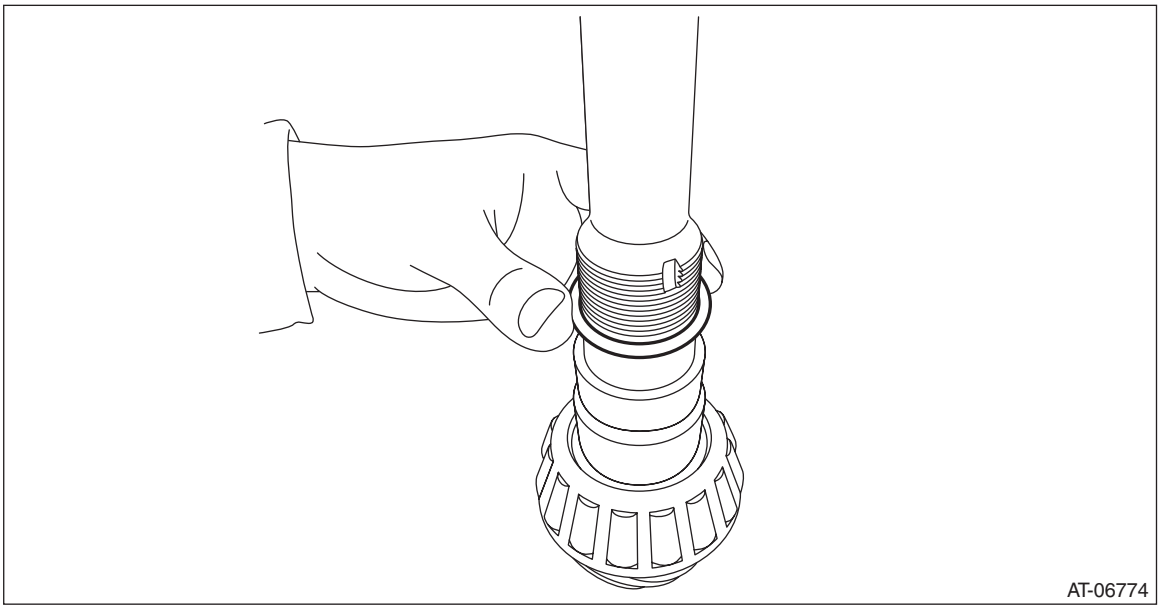


7) Install the drive pinion spacer.

NOTE:
Replace the O-ring with a new part after tooth contact inspection.



8) Install the selected drive pinion washer.

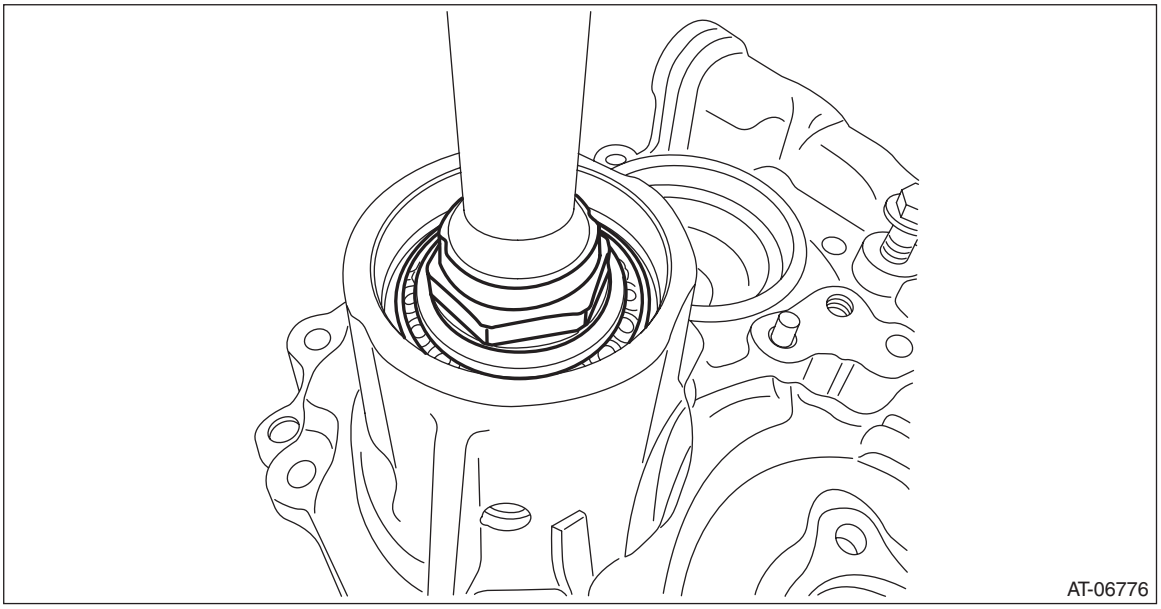


9) Insert the drive pinion shaft into the drive pinion retainer.

CAUTION:
Be careful not to damage the oil seal.

10) Install the inner bearing and lock nut.

NOTE:
Use a new lock nut.



11) Using the ST, tighten the lock nut to the specified torque so that the starting torque of the drive pinion shaft is within the specified range.

CAUTION:
Before inspecting the starting torque, apply differential gear oil to roller of bearing and rotate the bearing several times.

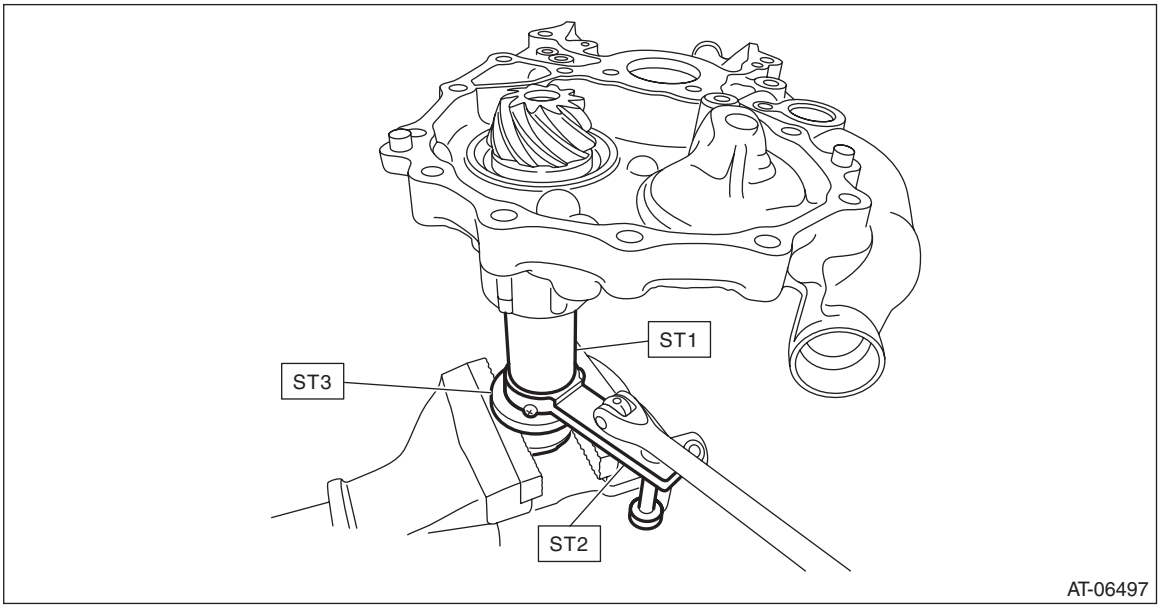
NOTE:
- Tighten the lock nut while directly aligning ST2 and torque wrench.
- If the starting torque is not within the specified range, select the drive pinion washer, and repeat the step until the starting torque is within the specified range.
- When a thicker drive pinion washer is selected, the starting torque decreases. When a thinner drive pinion washer is selected, the starting torque increases.

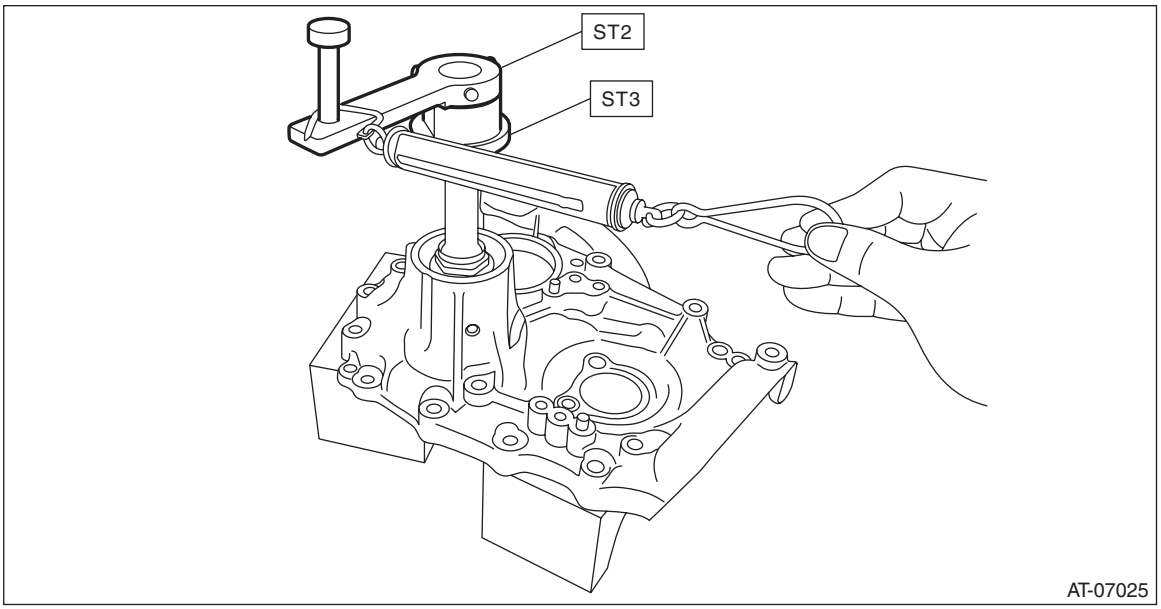
Starting torque:
5.1 — 17.1 N (0.5 — 1.7 kgf, 1.1 — 3.8 lbf)

ST1 499787500 ADAPTER
ST2 499787700 WRENCH
ST3 498937110 HOLDER

Using the following formula, calculate the tightening torque for a torque wrench.
T2 = L2/(L1 + L2) × T1
T1: 170 — 250 N·m (17.3 — 25.5 kgf-m, 125.4 — 184.4 ft-lb) [Specified tightening torque range]
T2: Tightening torque
L1: ST1 length 0.072 m (2.83 in)
L2: Torque wrench length
Example:

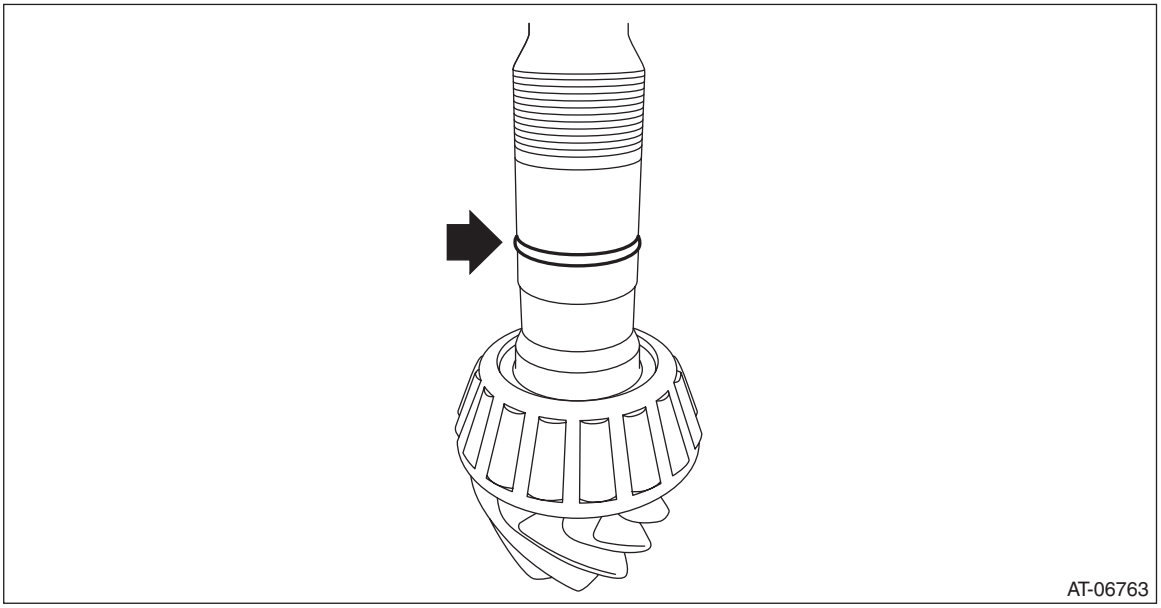
Torque wrench length m (in)	Tightening torque N·m (kgf-m, ft-lb)
0.4 (15.75)	144 — 211 (14.7 — 21.5, 106.2 — 155.6)
0.45 (17.72)	147 — 215 (15.0 — 21.9, 108.4 — 158.6)
0.5 (19.69)	149 — 218 (15.2 — 22.2, 109.9 — 160.8)
0.55 (21.65)	150 — 221 (15.3 — 22.5, 110.6 — 163.0)



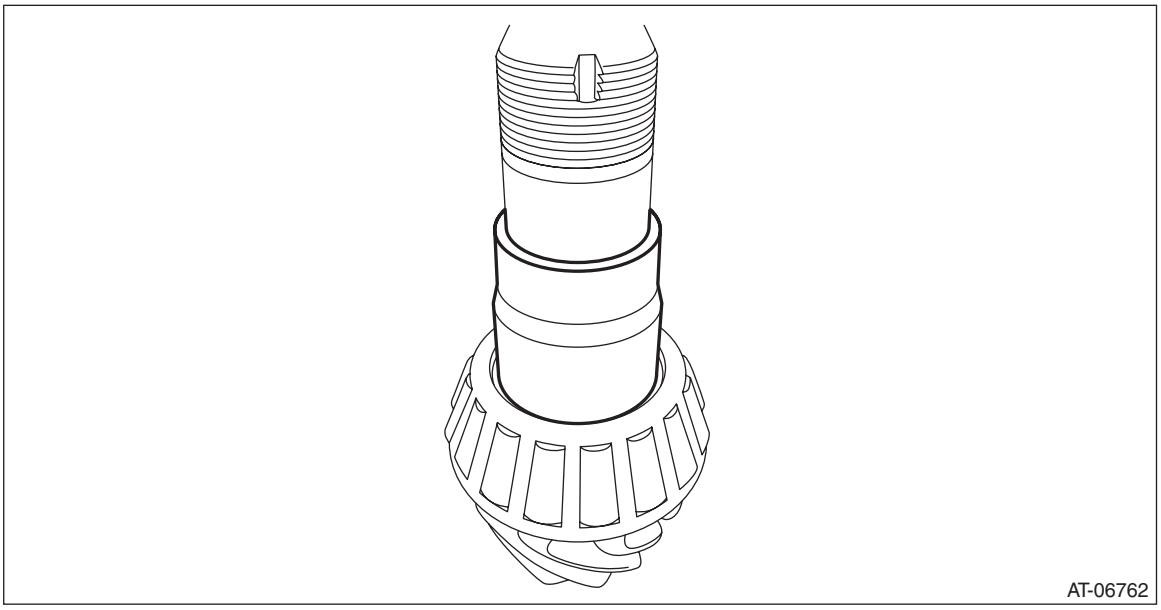


12) Install the drive pinion retainer to the converter case, and check the backlash and tooth contact. <Ref. to CVT-291, ADJUSTMENT, Drive Pinion Shaft Assembly.> <Ref. to CVT-312, ADJUSTMENT, Front Differential Assembly.>
13) Remove the drive pinion retainer from converter case. <Ref. to CVT-268, REMOVAL, Drive Pinion Shaft Assembly.>
14) Remove the drive pinion spacer from the drive pinion shaft. <Ref. to CVT-272, DISASSEMBLY, Drive Pinion Shaft Assembly.>
15) Install the O-ring to the drive pinion shaft.

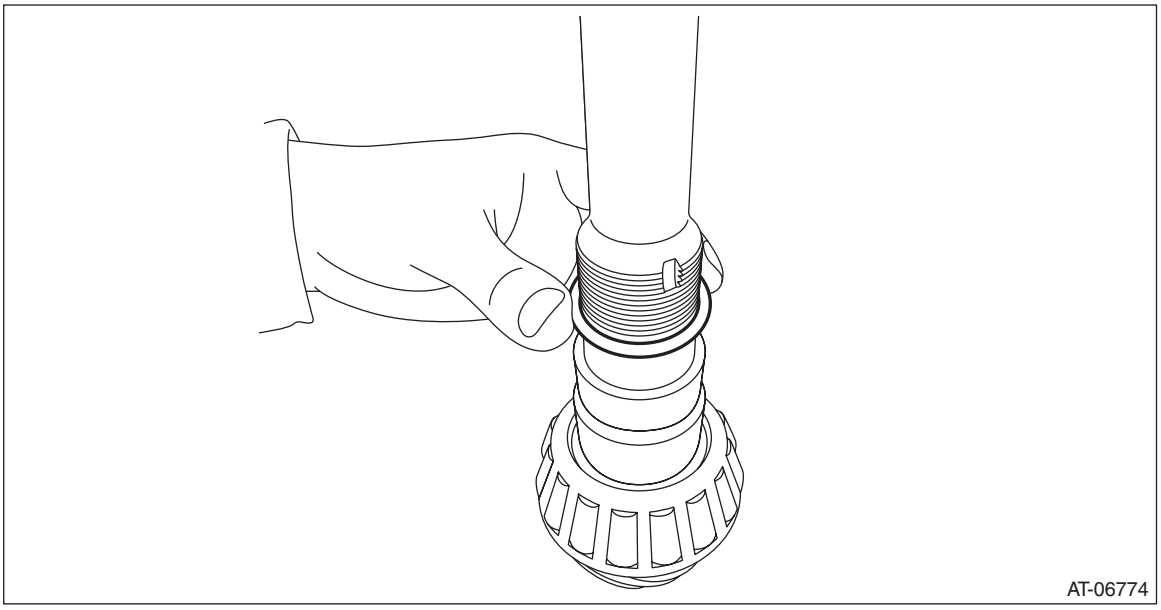
NOTE:
- Use new O-rings.
- Apply CVTF to the O-ring.



16) Install the drive pinion spacer to the drive pinion shaft.

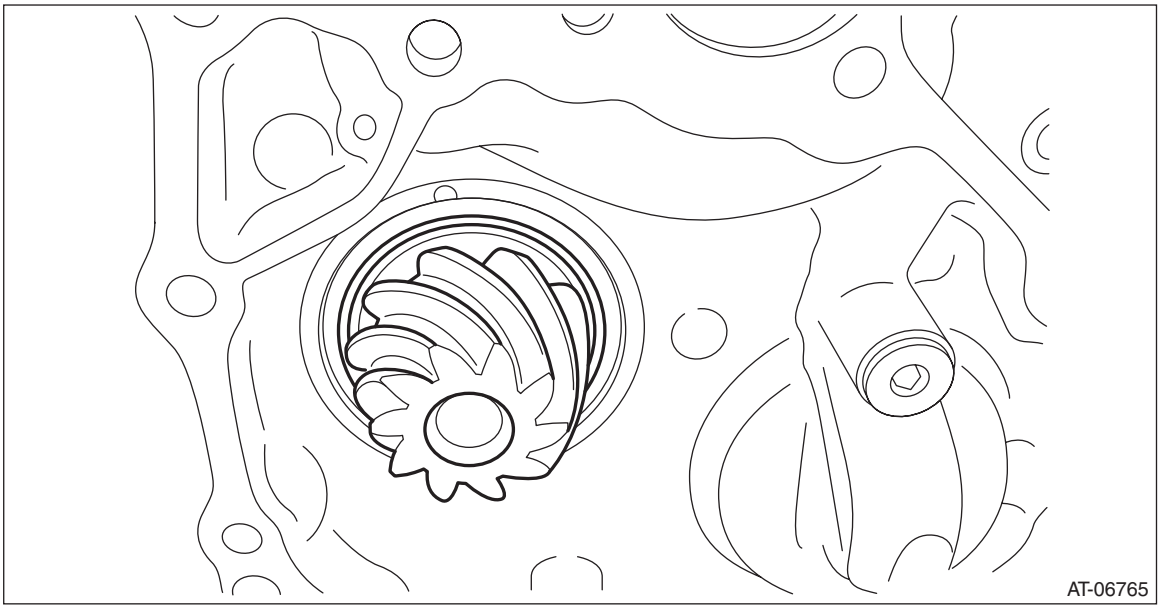


17) Install the drive pinion washer.

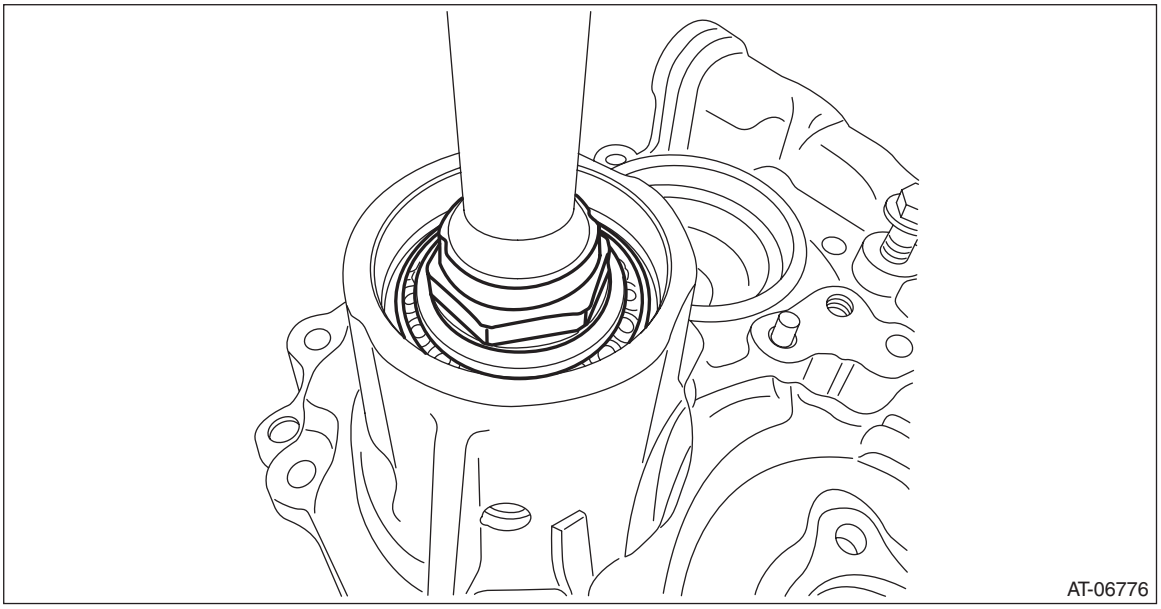


18) Insert the drive pinion shaft into the drive pinion retainer.

CAUTION:
Be careful not to damage the oil seal.



19) Install the inner bearing and lock nut.



20) Using the ST, tighten the lock nut to the specified torque so that the starting torque of the drive pinion shaft is within the specified range.

CAUTION:
Before inspecting the starting torque, apply differential gear oil to roller of bearing and rotate the bearing several times.

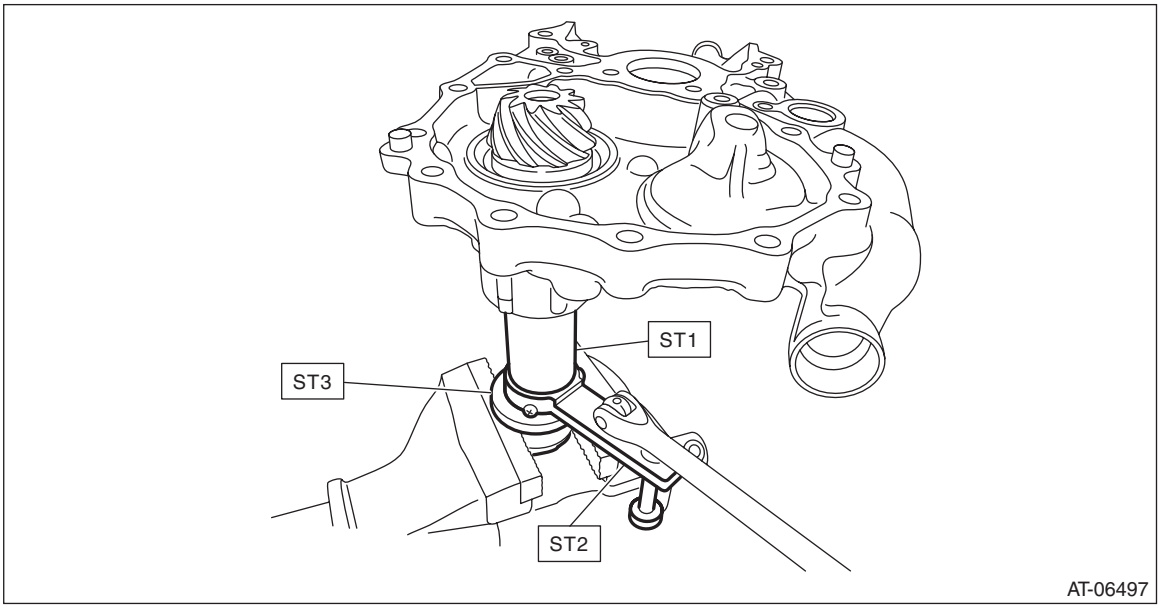
NOTE:
- Tighten the lock nut while directly aligning ST2 and torque wrench.
- If the starting torque is not within the specified range, select the drive pinion washer, and repeat the step until the starting torque is within the specified range.
- When a thicker drive pinion washer is selected, the starting torque decreases. When a thinner drive pinion washer is selected, the starting torque increases.

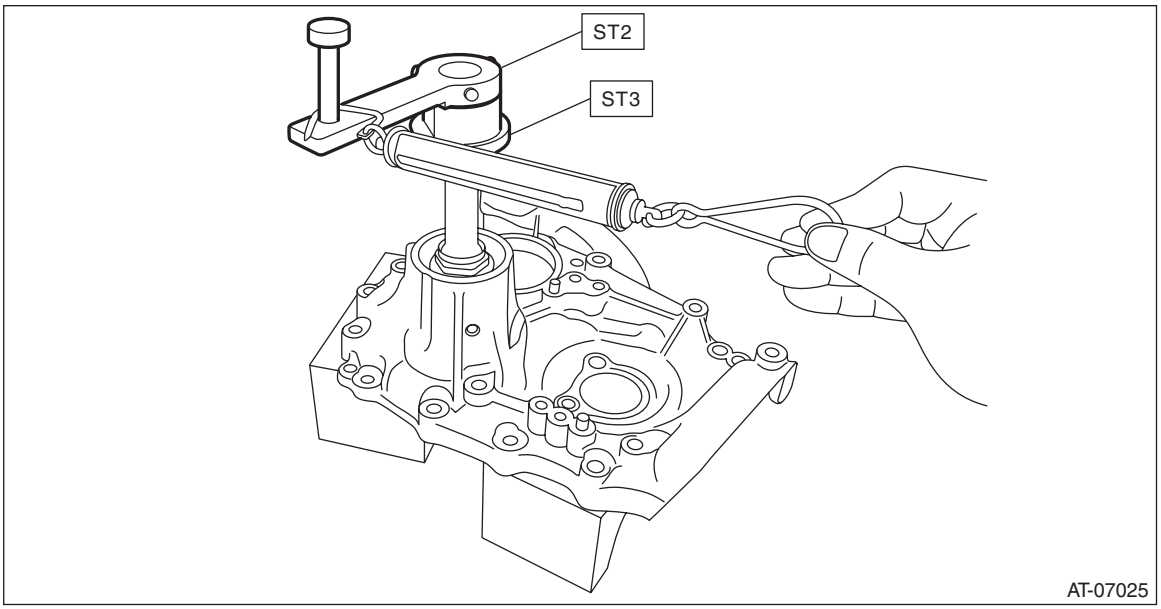
Starting torque:
5.1 — 17.1 N (0.5 — 1.7 kgf, 1.1 — 3.8 lbf)

ST1 499787500 ADAPTER
ST2 499787700 WRENCH
ST3 498937110 HOLDER

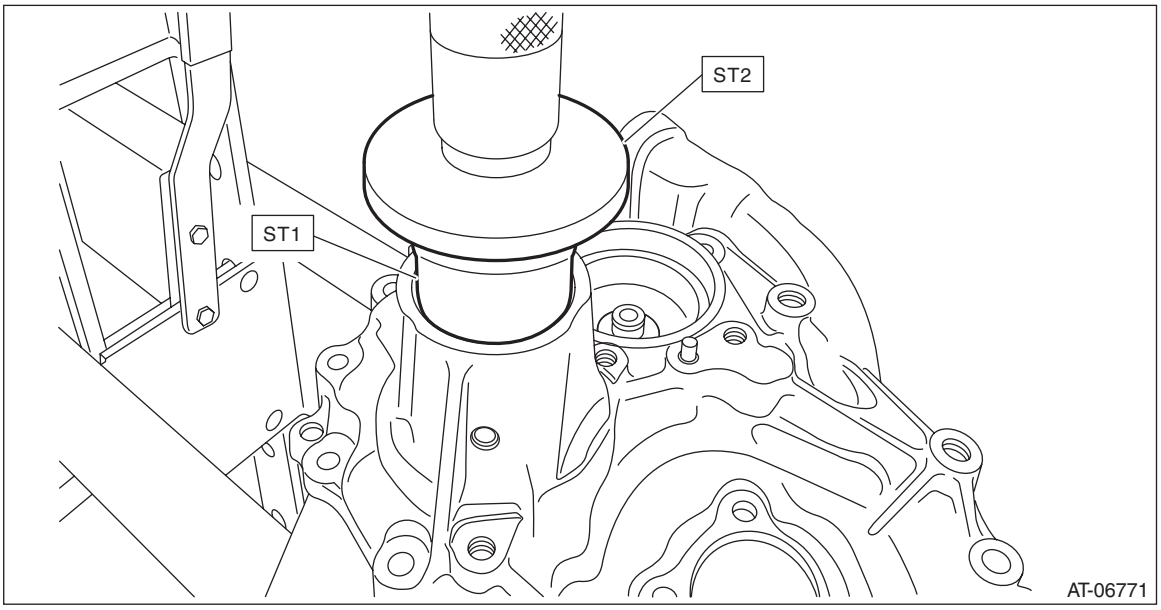
Using the following formula, calculate the tightening torque for a torque wrench.
$T2 = L2/(L1 + L2) \times T1$
T1: 170 — 250 N·m (17.3 — 25.5 kgf-m, 125.4 — 184.4 ft-lb) [Specified tightening torque range]
T2: Tightening torque
L1: ST1 length 0.072 m (2.83 in)
L2: Torque wrench length
Example:

Torque wrench length m (in)	Tightening torque N·m (kgf-m, ft-lb)
0.4 (15.75)	144 — 211 (14.7 — 21.5, 106.2 — 155.6)
0.45 (17.72)	147 — 215 (15.0 — 21.9, 108.4 — 158.6)
0.5 (19.69)	149 — 218 (15.2 — 22.2, 109.9 — 160.8)
0.55 (21.65)	150 — 221 (15.3 — 22.5, 110.6 — 163.0)





21) Crimp the lock nut in 2 locations.
22) Using the ST, install the plug.
ST1 499755602 PRESS SNAP RING
ST2 398177700 INSTALLER

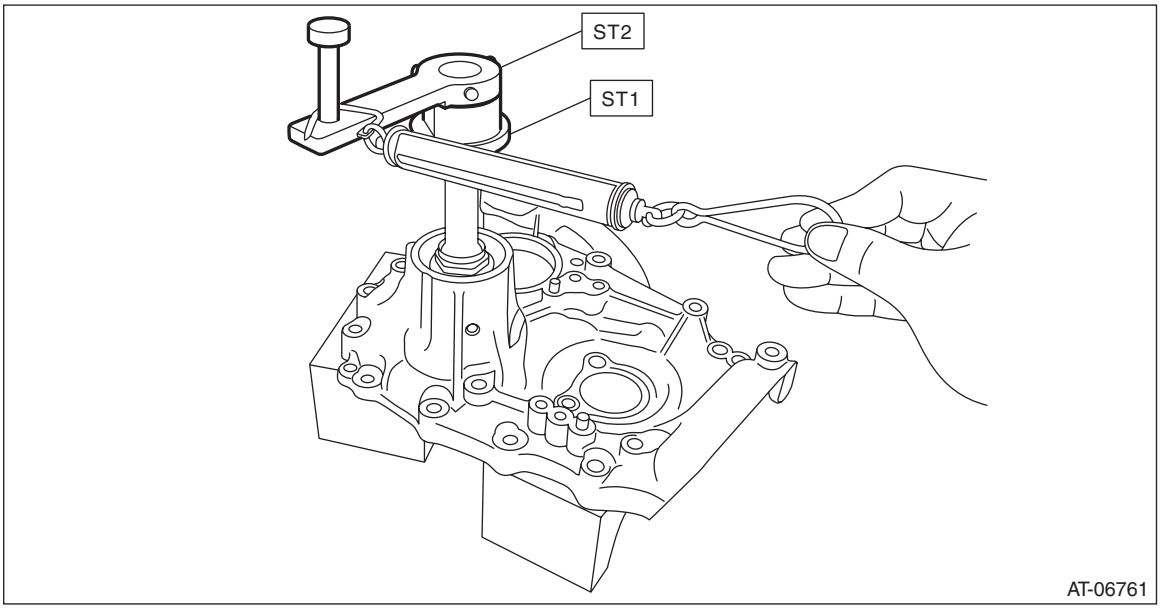


E: INSPECTION

- Make sure that all component parts are free of scratches, holes and other faults.
- Check the tooth contact. <Ref. to CVT-291, ADJUSTMENT, Drive Pinion Shaft Assembly.>
- Apply CVTF to bearing and rotate the bearing to check for noise or dragging etc.
- Check the starting torque of drive pinion shaft.

CAUTION:
Before measuring, apply differential gear oil to roller of bearing and rotate the bearing several times.
ST1 498937110 HOLDER
ST2 499787700 WRENCH

Starting torque:
5.1 — 17.1 N (0.5 — 1.7 kgf, 1.1 — 3.8 lbf)

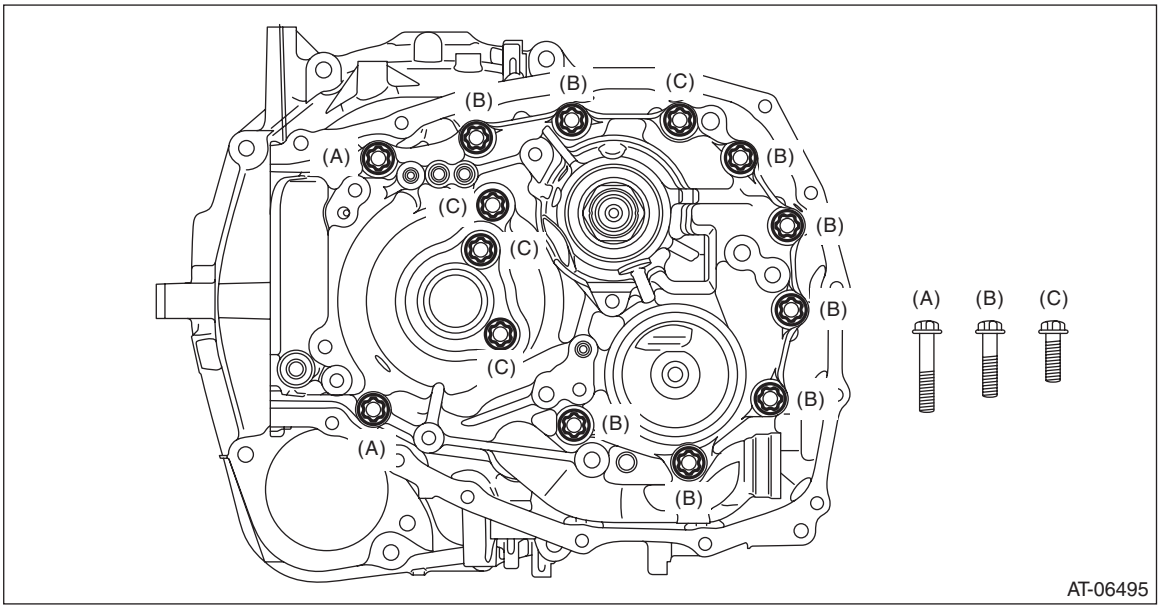


F: ADJUSTMENT

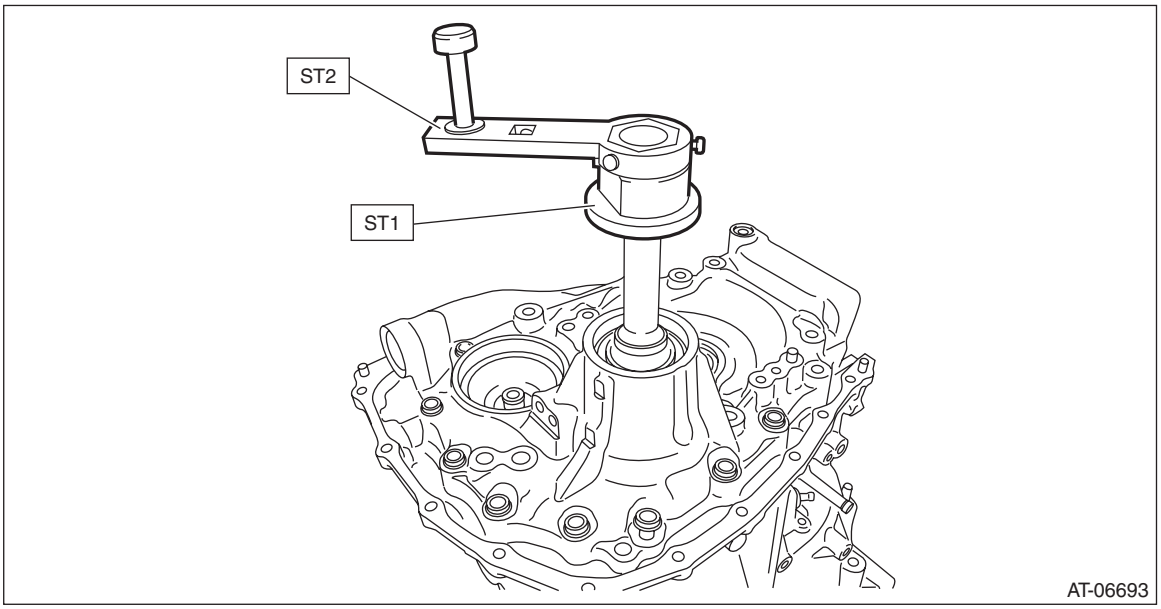
1) Remove the liquid gasket from the mating surface completely.
2) Using the ST, install the drive pinion retainer to converter case.
ST 18270KA020 SOCKET (E20)

NOTE:
Do not confuse the three different-length bolts when installing.

Tightening torque:
43 N·m (4.4 kgf-m, 31.7 ft-lb)



3) Rotate the drive pinion several times using ST1 and ST2.
ST1 498937110 HOLDER
ST2 499787700 WRENCH



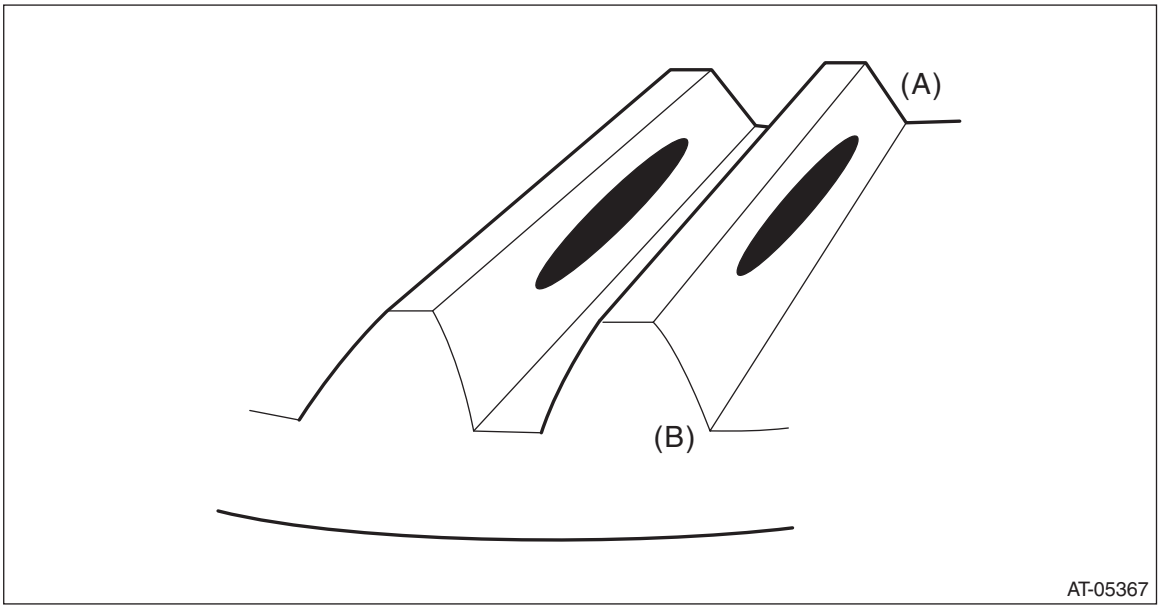
4) Adjust the drive pinion and hypoid driven gear backlash. <Ref. to CVT-312, ADJUSTMENT, Front Differential Assembly.>
5) Using the ST, remove the drive pinion retainer from converter case.
ST 18270KA020 SOCKET (E20)

6) Apply lead-free red dye evenly on the both sides of three to four teeth of the hypoid driven gear. Then install the drive pinion retainer and rotate the drive pinion in both directions several times. Remove the drive pinion retainer and check the tooth contact pattern.
If the teeth contact is inappropriate, adjust the backlash or thickness of the shim. <Ref. to CVT-312, ADJUSTMENT, Front Differential Assembly.>

NOTE:
After correction, wipe off the lead-free red dye.

- Correct tooth contact

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

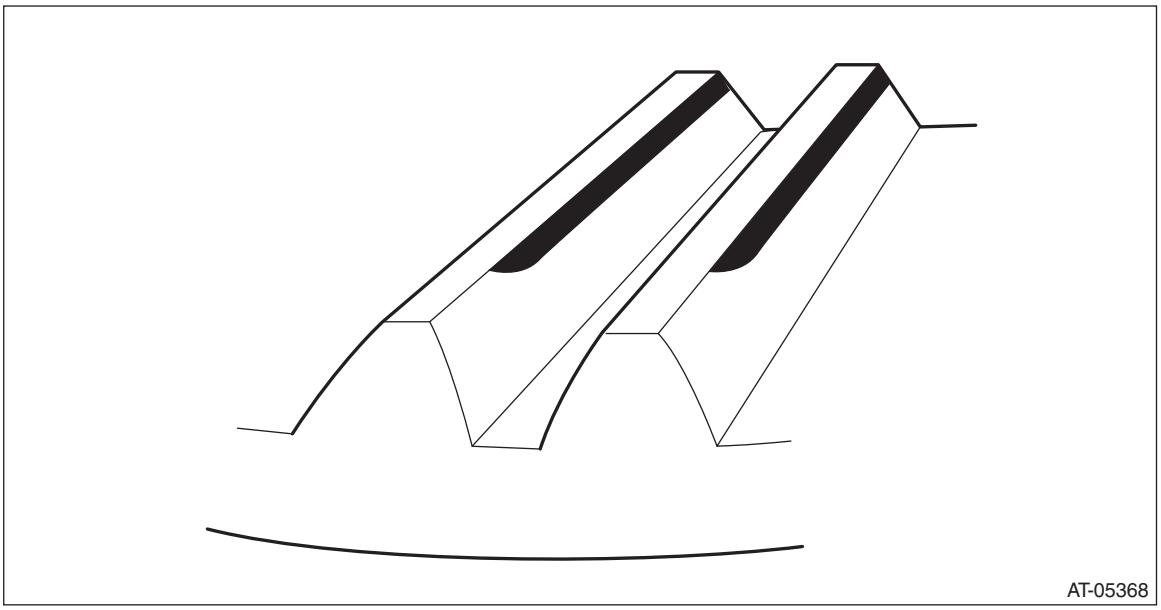


(A) Toe side
(B) Heel side

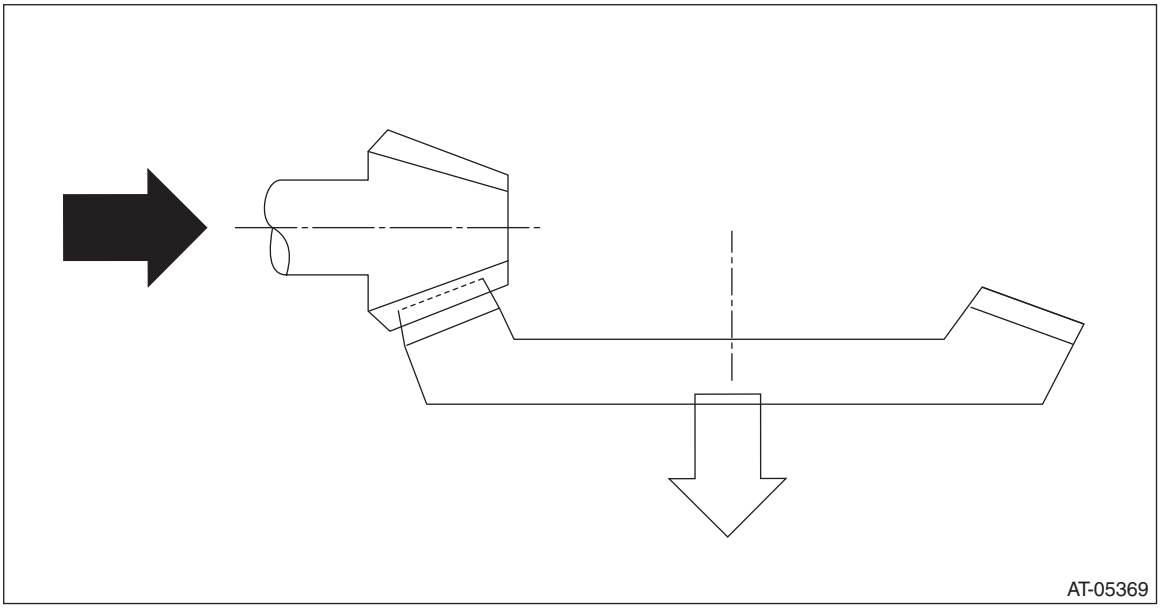
- Face contact

Check item: Backlash is too large.

Contact pattern



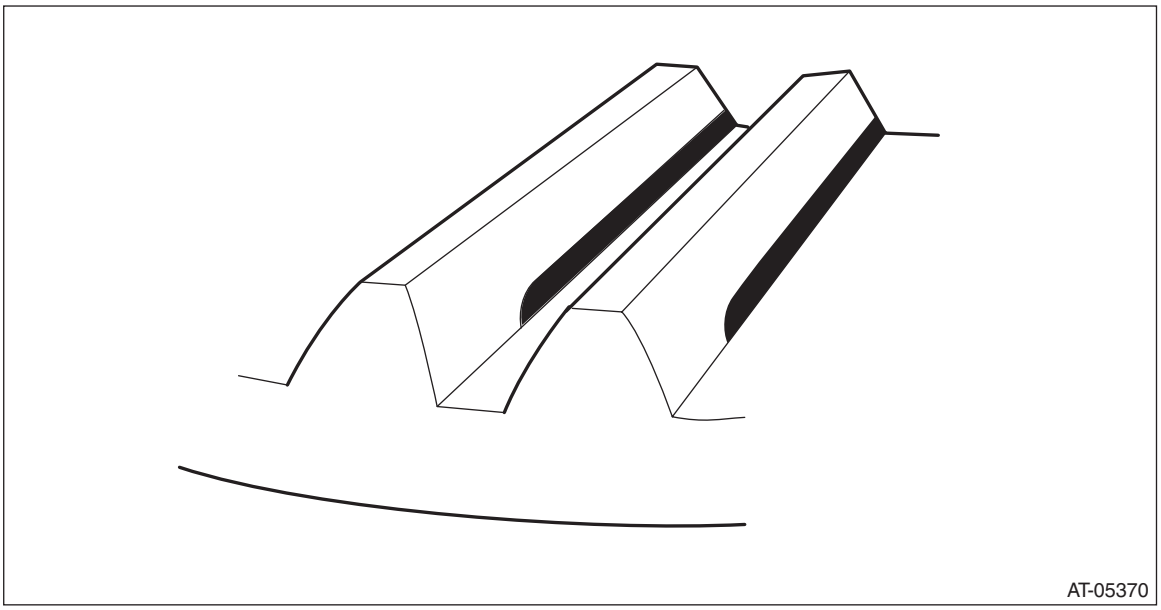
Corrective action: Increase thickness of drive pinion shim according to the procedures for moving the drive pinion close to hypoid driven gear.



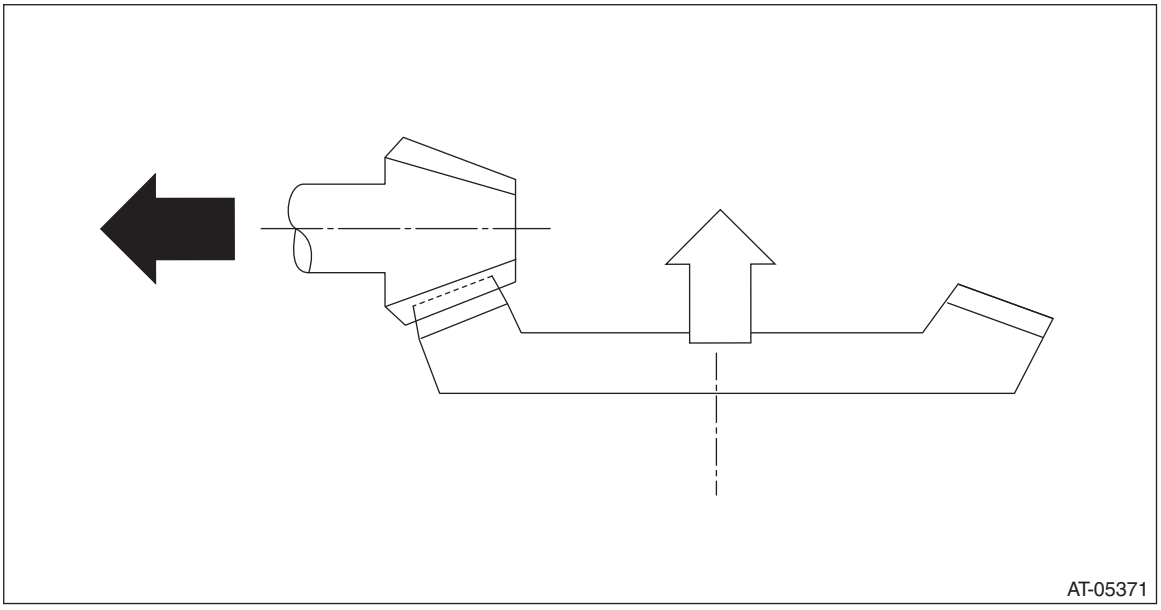
- Flank contact

Check item: Backlash is too small.

Contact pattern



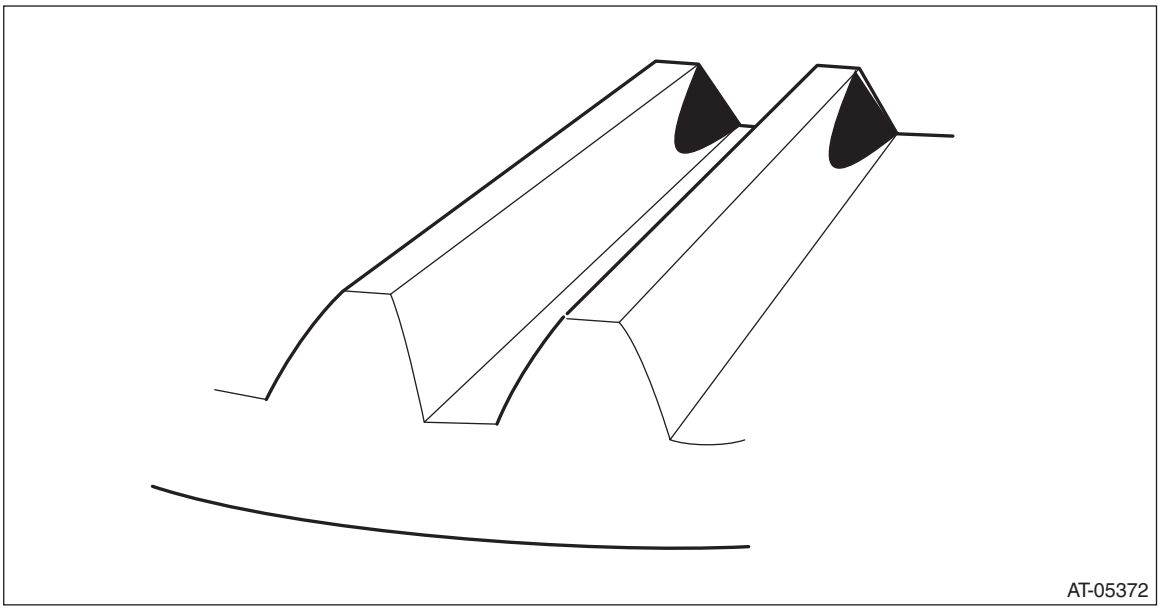
Corrective action: Reduce the thickness of the drive pinion shim according to the procedures for moving the drive pinion away from the hypoid driven gear.



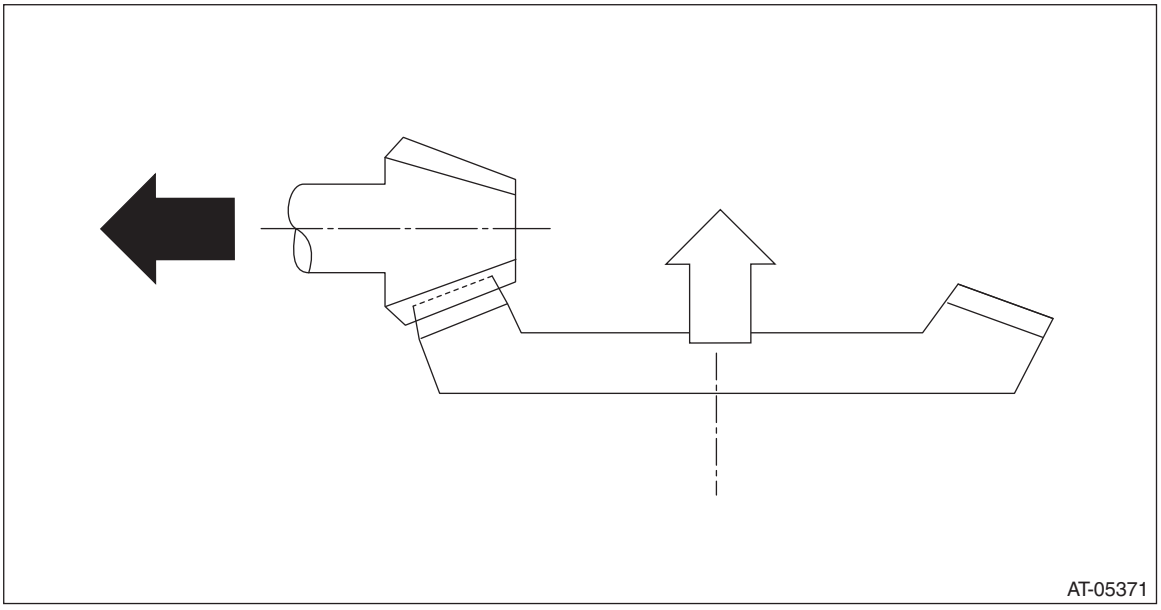
- Toe contact (inside contact)

Check item: Teeth contact area is too small.

Contact pattern



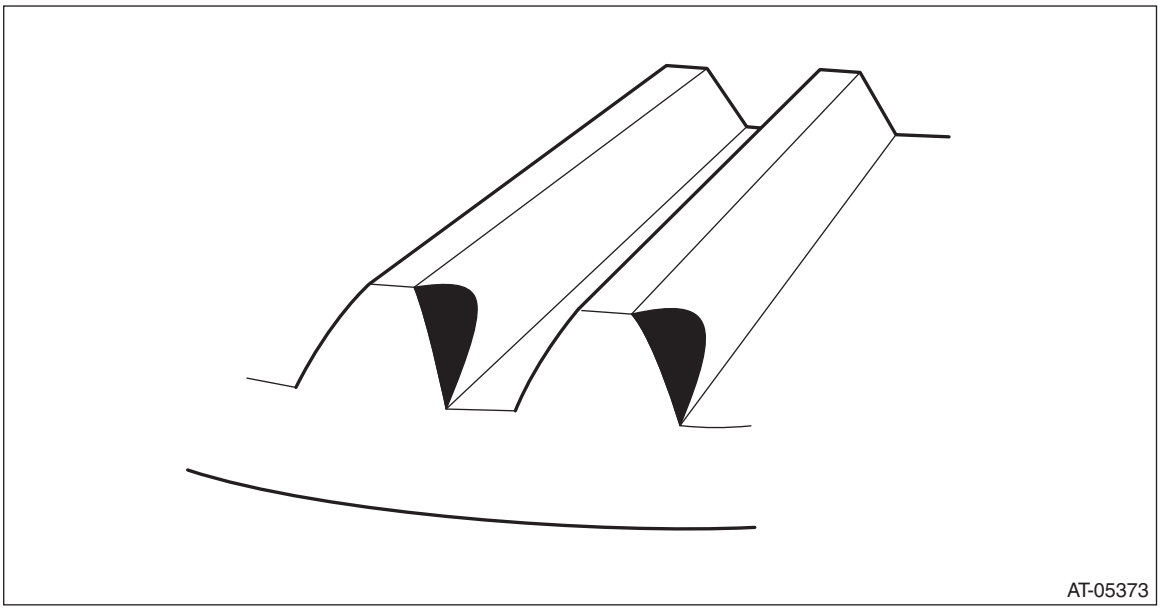
Corrective action: Reduce the thickness of the drive pinion shim according to the procedures for moving the drive pinion away from the hypoid driven gear side.



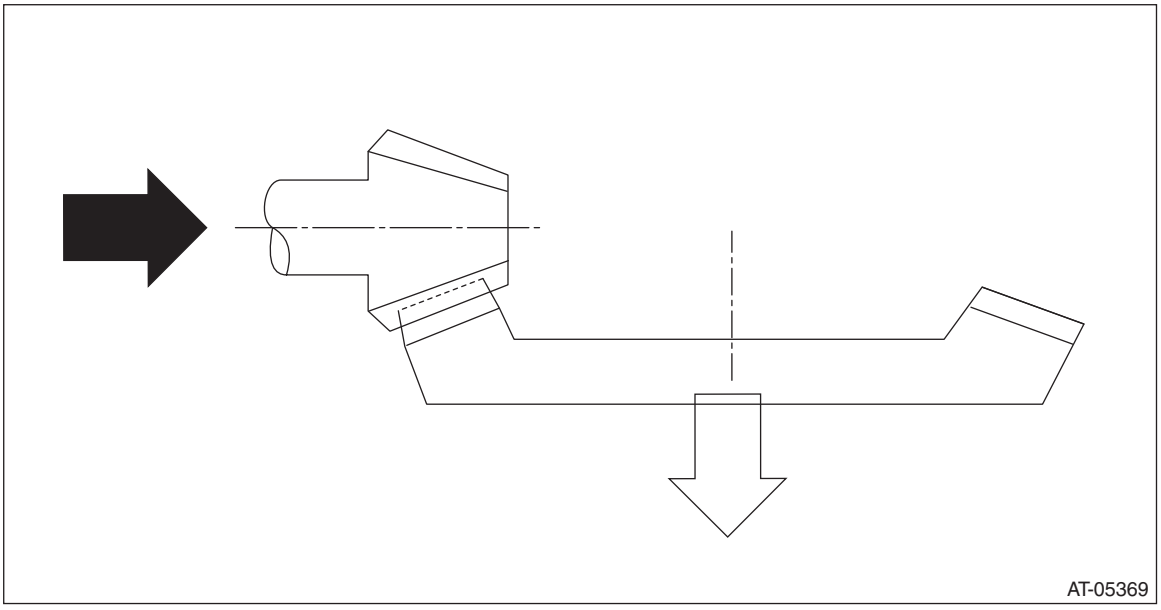
- Heel contact (outside end contact)

Check item: Teeth contact area is too small.

Contact pattern



Corrective action: Increase the thickness of the drive pinion shim according to the procedures for moving the drive pinion closer to the hypoid driven gear.



7) Using the ST, loosen the differential side retainer until the mounting groove of the O-ring appears, and then install the O-ring.

NOTE:
- When loosening the differential side retainer, record the number of the turns made.
- Perform this for both left and right differential side retainers.
- Use new O-rings.
- Apply the differential gear oil to O-ring.

ST 18658AA020 WRENCH COMPL RETAINER

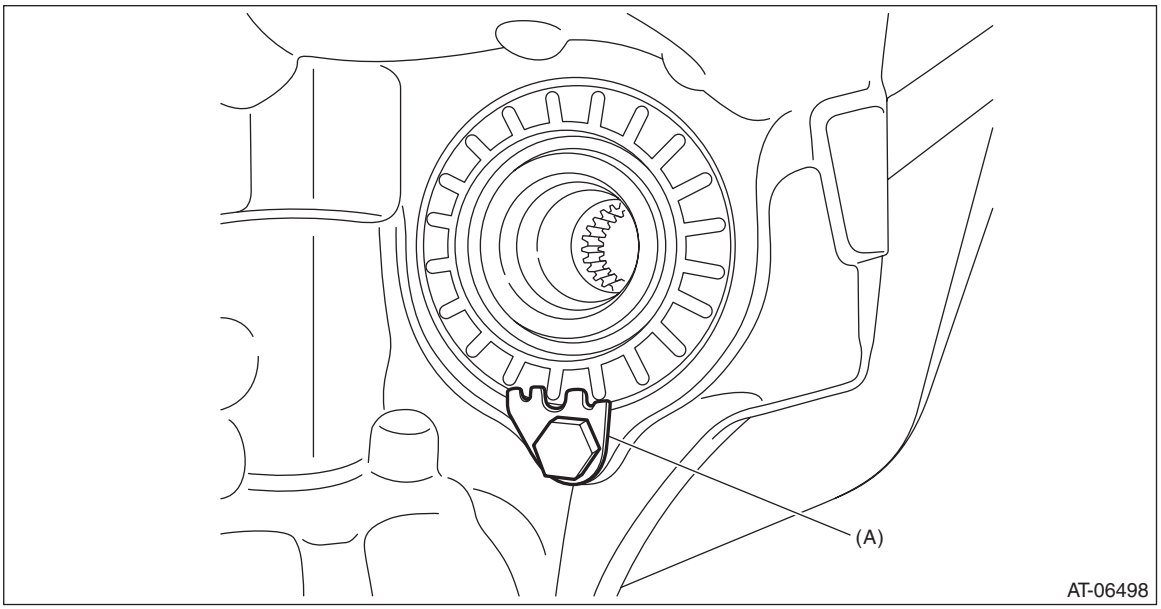
8) Using the ST, tighten the retainer to the position before it is loosened.

ST 18658AA020 WRENCH COMPL RETAINER

9) Replace the differential side retainer oil seal with a new part. <Ref. to CVT-87, Differential Side Retainer Oil Seal.>

10) Install the lock plate.

Tightening torque:
25 N·m (2.5 kgf-m, 18.4 ft-lb)

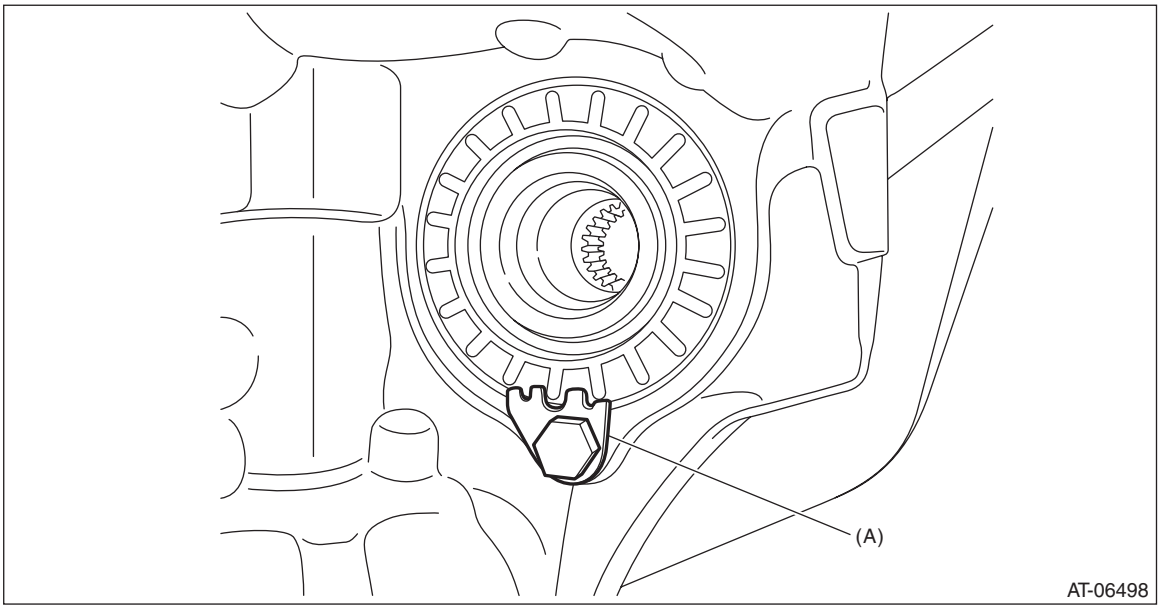


(A) Lock plate

42.Front Differential Assembly

A: REMOVAL

1) Remove the transmission assembly from the vehicle. <Ref. to CVT-58, REMOVAL, Automatic Transmission Assembly.>
2) Remove the air breather hose. <Ref. to CVT-148, REMOVAL, Air Breather Hose.>
3) Remove the control valve body. <Ref. to CVT-112, REMOVAL, Control Valve Body.>
4) Remove the transmission harness. <Ref. to CVT-124, REMOVAL, Transmission Harness.>
5) Remove the turbine speed sensor. <Ref. to CVT-99, REMOVAL, Turbine Speed Sensor.>
6) Remove the secondary speed sensor. <Ref. to CVT-101, REMOVAL, Secondary Speed Sensor.>
7) Remove the primary speed sensor. <Ref. to CVT-103, REMOVAL, Primary Speed Sensor.>
8) Remove the inhibitor switch. <Ref. to CVT-94, REMOVAL, Inhibitor Switch.>
9) Remove the extension case. <Ref. to CVT-156, REMOVAL, Extension Case.>
10) Remove the transfer clutch assembly. <Ref. to CVT-160, REMOVAL, Transfer Clutch.>
11) Remove the transfer driven gear assembly. <Ref. to CVT-174, REMOVAL, Transfer Driven Gear.>
12) Remove the parking pawl. <Ref. to CVT-177, REMOVAL, Parking Pawl.>
13) Remove the reduction driven gear assembly. <Ref. to CVT-179, REMOVAL, Reduction Driven Gear.>
14) Remove the oil pan and oil strainer. <Ref. to CVT-108, REMOVAL, Oil Pan and Strainer.>
15) Remove the transmission control device. <Ref. to CVT-187, REMOVAL, Transmission Control Device.>
16) Remove the transmission case. <Ref. to CVT-193, REMOVAL, Transmission Case.>
17) Remove the reduction drive gear. <Ref. to CVT-209, REMOVAL, Reduction Drive Gear.>
18) Remove the primary pulley, secondary pulley and variator chain. <Ref. to CVT-213, REMOVAL, Primary Pulley and Secondary Pulley.>
19) Remove the reverse brake assembly. <Ref. to CVT-234, REMOVAL, Reverse Brake Assembly.>
20) Remove the forward clutch assembly. <Ref. to CVT-249, REMOVAL, Forward Clutch Assembly.>
21) Remove the drive pinion shaft assembly. <Ref. to CVT-268, REMOVAL, Drive Pinion Shaft Assembly.>
22) Remove the lock plates on both sides.

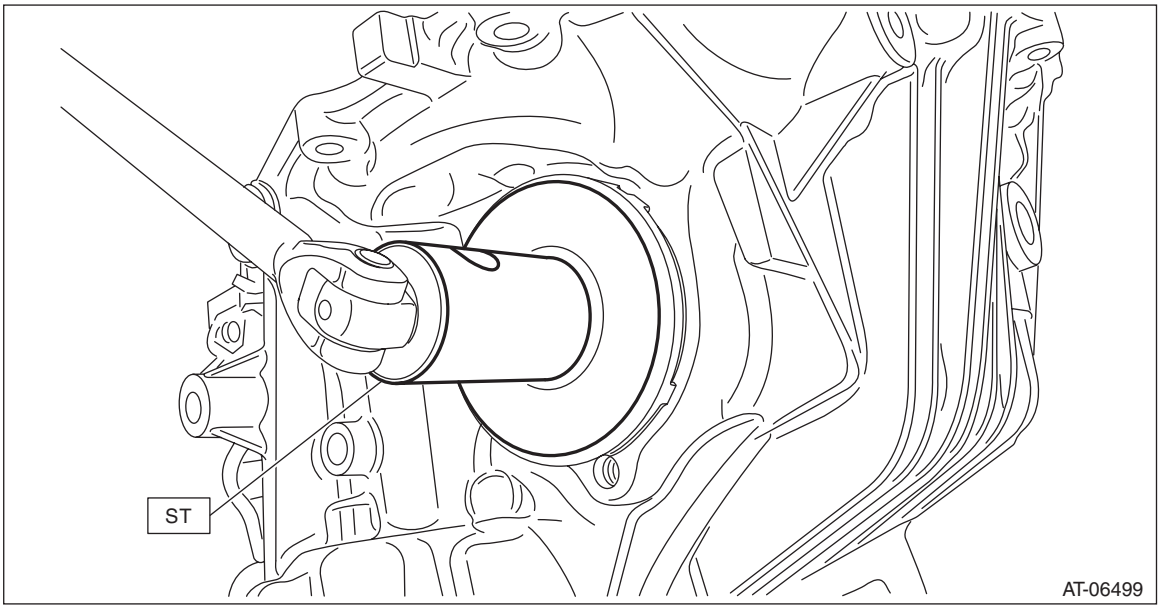


(A) Lock plate

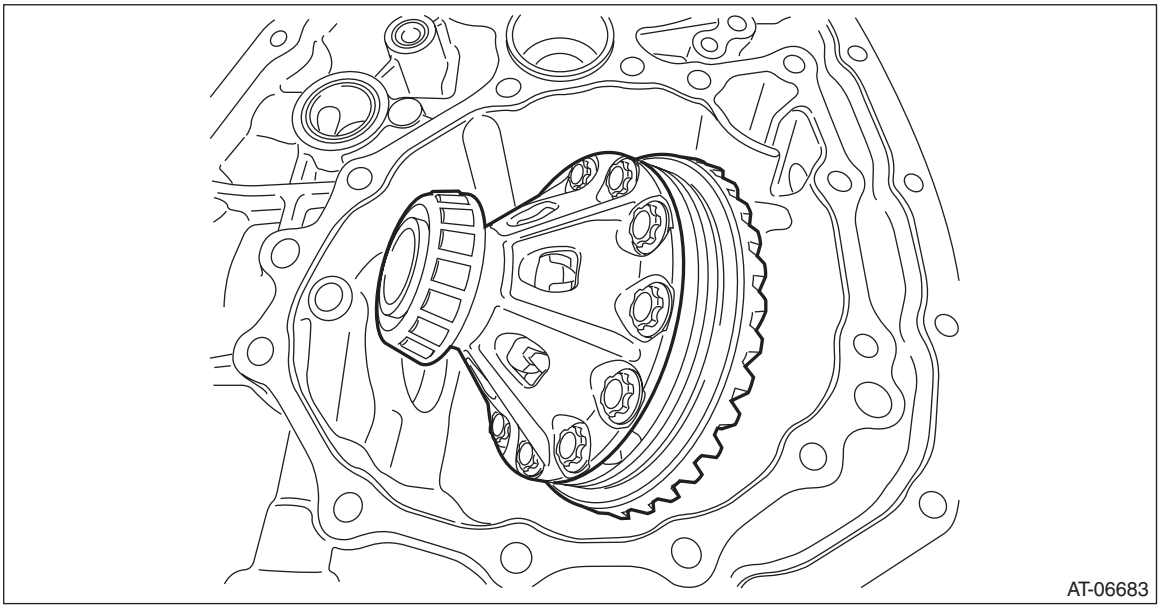
23) Remove the differential side retainers using ST.

NOTE:
• When the wrench COMPL retainer interferes with the converter case, align the cutout portion with the interference part.
• Support the differential case assembly by hand to avoid damaging the retainer mounting hole of the converter case.
• Keep the left and right differential side retainers and left and right bearing outer races by attaching tags or in similar ways to make it possible to identify RH and LH sides.

ST 18658AA020 WRENCH COMPL RETAINER



24) Remove the front differential assembly while being careful not to damage the attachment part of the retainer.

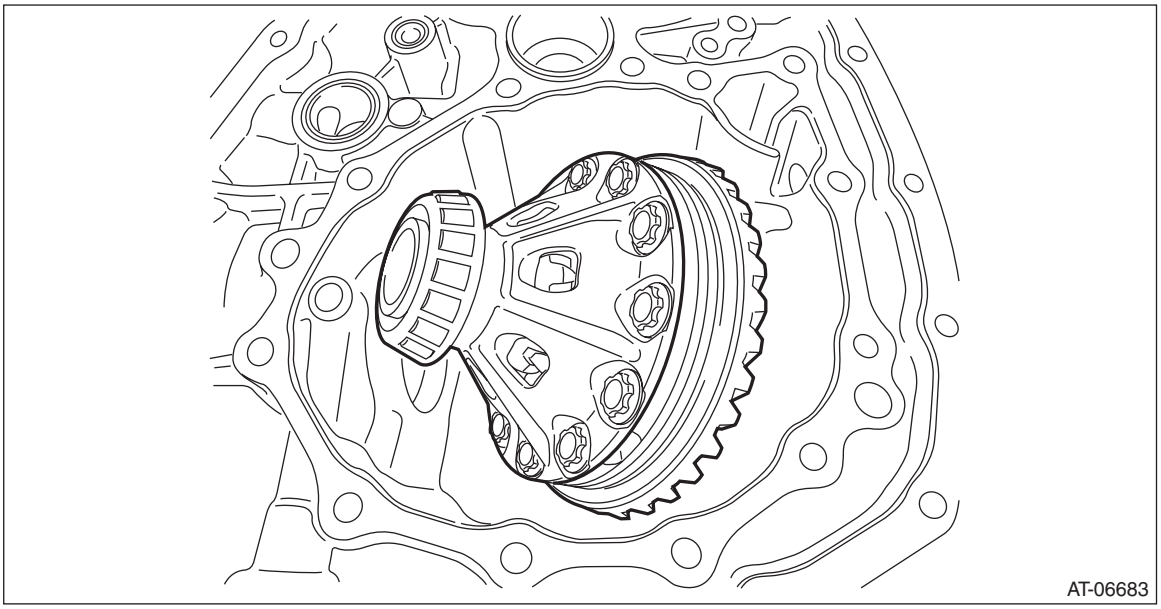


25) Remove the oil seals and O-rings from both differential side retainers. <Ref. to CVT-305, SIDE RETAINER, DISASSEMBLY, Front Differential Assembly.>

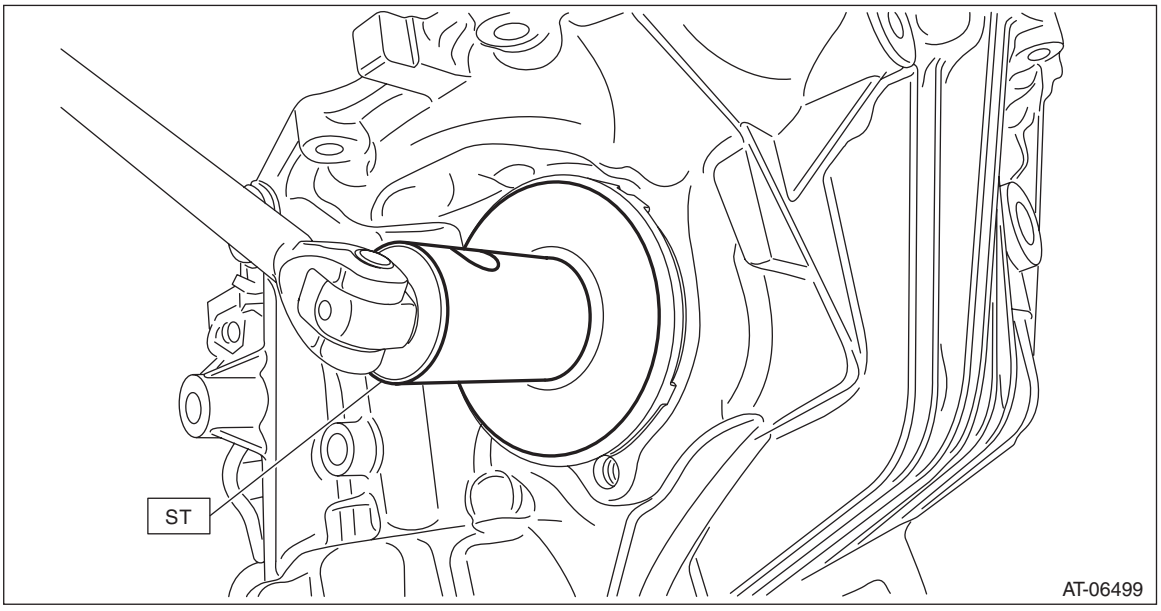
B: INSTALLATION

1) Install the front differential assembly to the converter case.

NOTE:
Be careful not to damage the inside of the case (especially the mounting surface of the differential side retainers).



2) Install the bearing outer race.
3) Temporarily install the differential side retainers using ST.
ST 18658AA020 WRENCH COMPL RETAINER



4) Adjust the backlash of the front differential. <Ref. to CVT-312, ADJUSTMENT, Front Differential Assembly.>
5) Inspect and adjust the tooth contact. <Ref. to CVT-291, ADJUSTMENT, Drive Pinion Shaft Assembly.>

6) Using the ST, loosen the differential side retainer until the mounting groove of the O-ring appears, and then install the O-ring.

NOTE:
- When loosening the differential side retainer, record the number of the turns made.
- Perform this for both left and right differential side retainers.
- Use new O-rings.
- Apply the differential gear oil to O-ring.

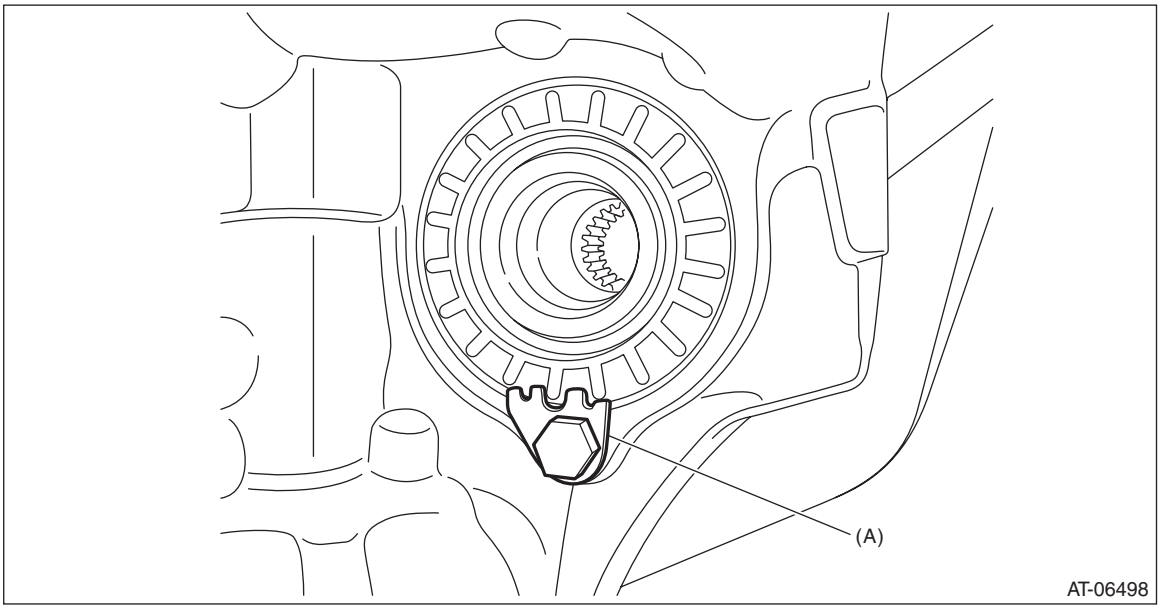
ST 18658AA020 WRENCH COMPL RETAINER

7) Using the ST, tighten the retainer to the position before it is loosened.

ST 18658AA020 WRENCH COMPL RETAINER

8) Install the oil seal to the differential side retainer. <Ref. to CVT-87, Differential Side Retainer Oil Seal.>
9) Install the lock plate.

Tightening torque:
25 N·m (2.5 kgf-m, 18.4 ft-lb)



(A) Lock plate

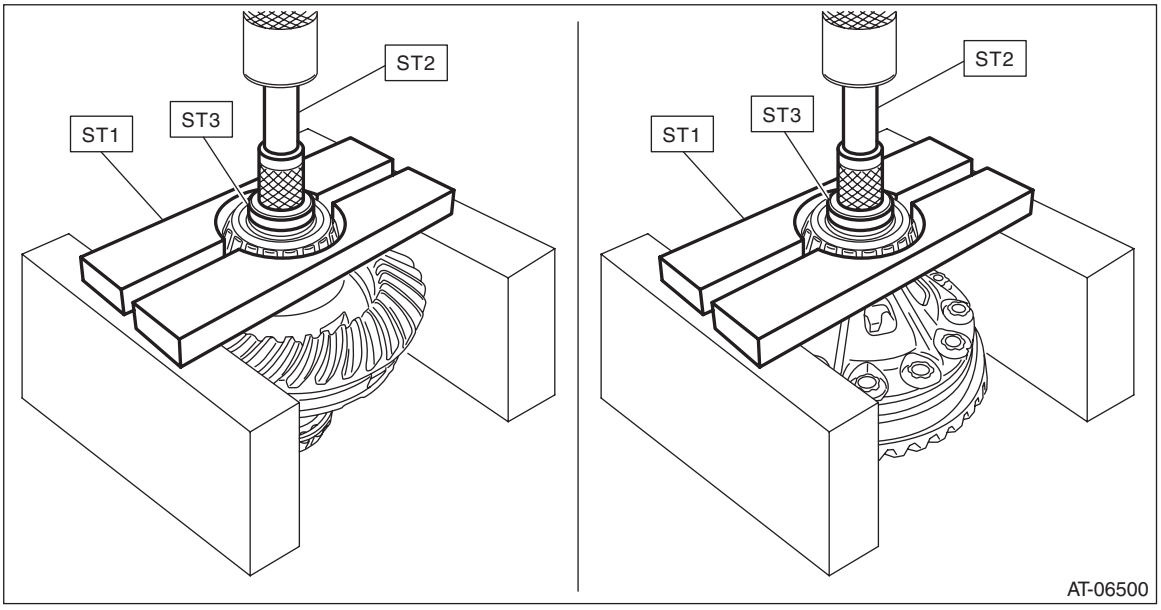
10) Install the drive pinion shaft assembly. <Ref. to CVT-270, INSTALLATION, Drive Pinion Shaft Assembly.>
11) Install the forward clutch assembly. <Ref. to CVT-252, INSTALLATION, Forward Clutch Assembly.>
12) Install the reverse brake assembly. <Ref. to CVT-237, INSTALLATION, Reverse Brake Assembly.>
13) Install the primary pulley, secondary pulley and variator chain. <Ref. to CVT-220, INSTALLATION, Primary Pulley and Secondary Pulley.>
14) Install the reduction drive gear. <Ref. to CVT-210, INSTALLATION, Reduction Drive Gear.>
15) Install the transmission case. <Ref. to CVT-196, INSTALLATION, Transmission Case.>
16) Install the oil strainer and oil pan. <Ref. to CVT-109, INSTALLATION, Oil Pan and Strainer.>
17) Install the transmission control device. <Ref. to CVT-190, INSTALLATION, Transmission Control Device.>
18) Install the reduction driven gear assembly. <Ref. to CVT-179, INSTALLATION, Reduction Driven Gear.>
19) Install the transfer driven gear assembly. <Ref. to CVT-175, INSTALLATION, Transfer Driven Gear.>
20) Install the transfer clutch assembly. <Ref. to CVT-162, INSTALLATION, Transfer Clutch.>
21) Install the parking pawl. <Ref. to CVT-178, INSTALLATION, Parking Pawl.>
22) Install the extension case. <Ref. to CVT-157, INSTALLATION, Extension Case.>
23) Install the inhibitor switch. <Ref. to CVT-96, INSTALLATION, Inhibitor Switch.>
24) Install the secondary speed sensor. <Ref. to CVT-101, INSTALLATION, Secondary Speed Sensor.>
25) Install the primary speed sensor. <Ref. to CVT-104, INSTALLATION, Primary Speed Sensor.>
26) Install the turbine speed sensor. <Ref. to CVT-99, INSTALLATION, Turbine Speed Sensor.>

27) Install the transmission harness. <Ref. to CVT-130, INSTALLATION, Transmission Harness.>
28) Install the control valve body. <Ref. to CVT-117, INSTALLATION, Control Valve Body.>
29) Install the air breather hose. <Ref. to CVT-149, INSTALLATION, Air Breather Hose.>
30) Install the transmission assembly to the vehicle. <Ref. to CVT-69, INSTALLATION, Automatic Transmission Assembly.>

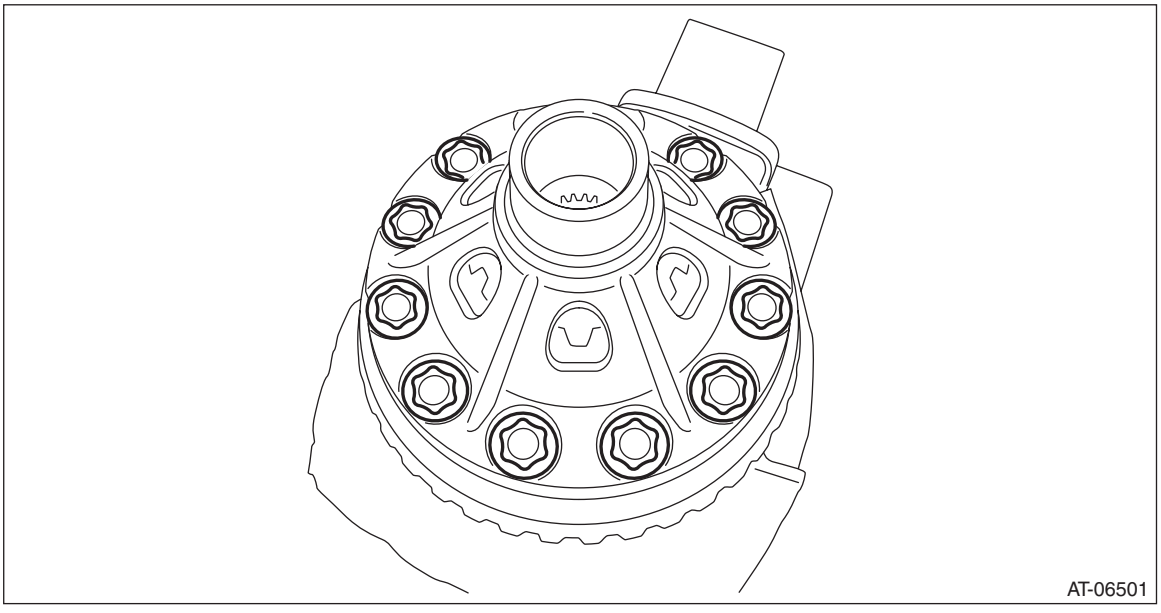
C: DISASSEMBLY

1. DIFFERENTIAL CASE ASSEMBLY

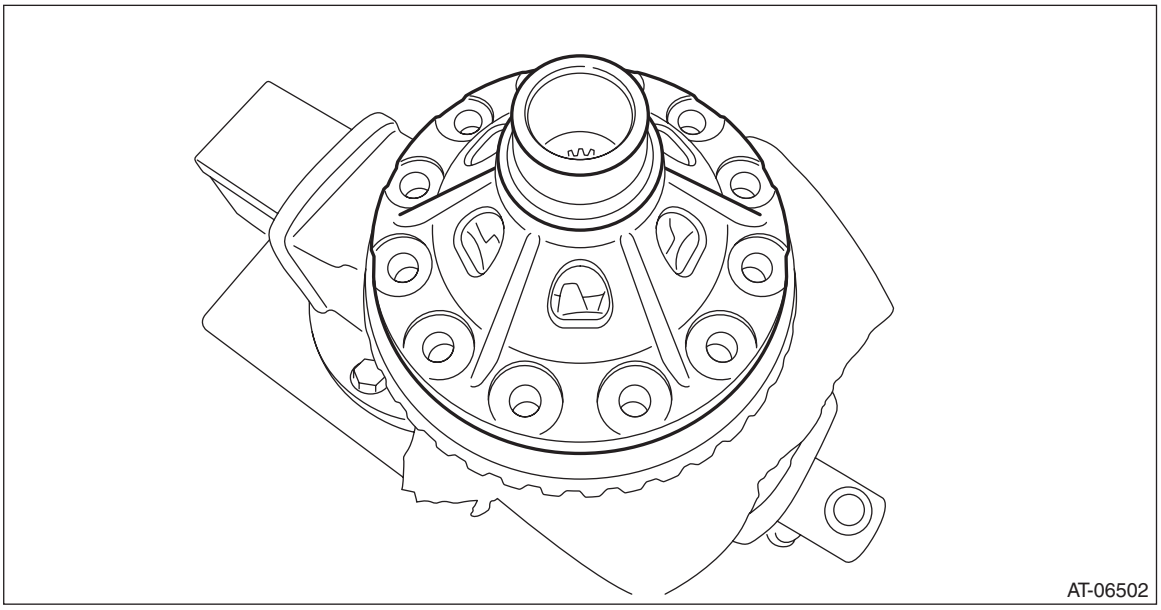
1) Remove the taper roller bearing using the ST.
ST1 498077000 REMOVER
ST2 899864100 REMOVER
ST3 398497701 SEAT



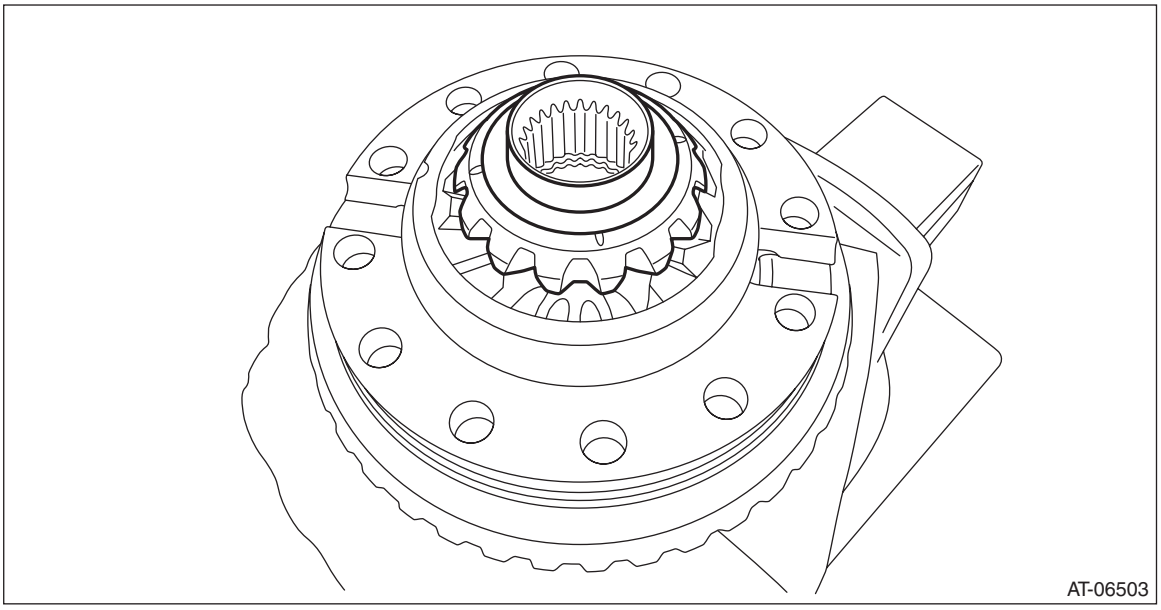
2) Remove the hypoid driven gear mounting bolt using the ST.
ST 18270KA020 SOCKET (E20)



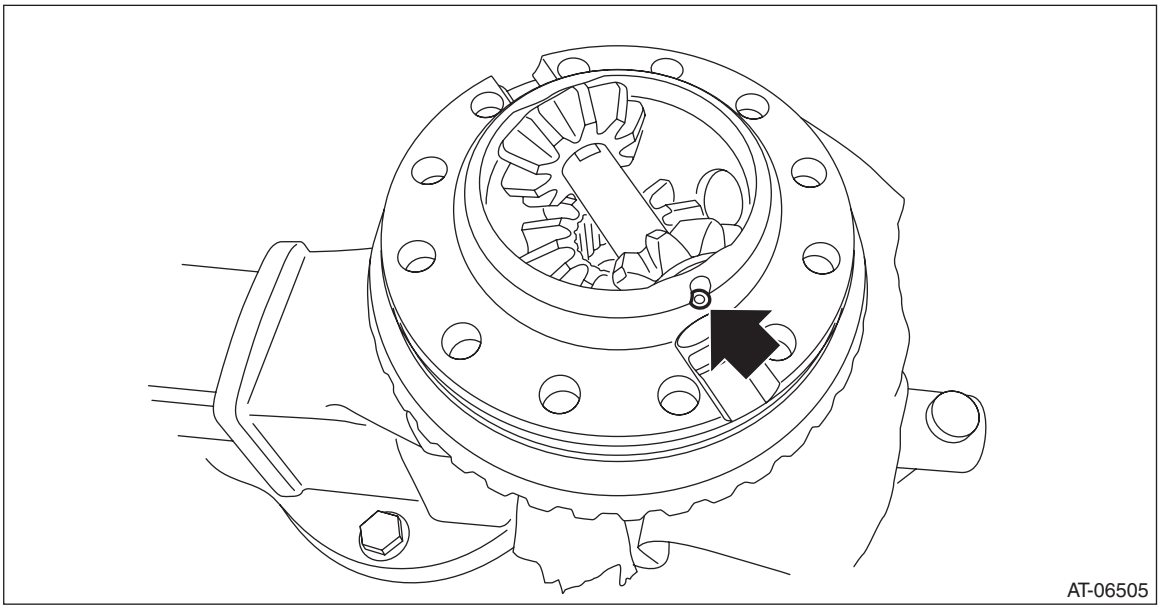
3) Remove the differential case (LH).



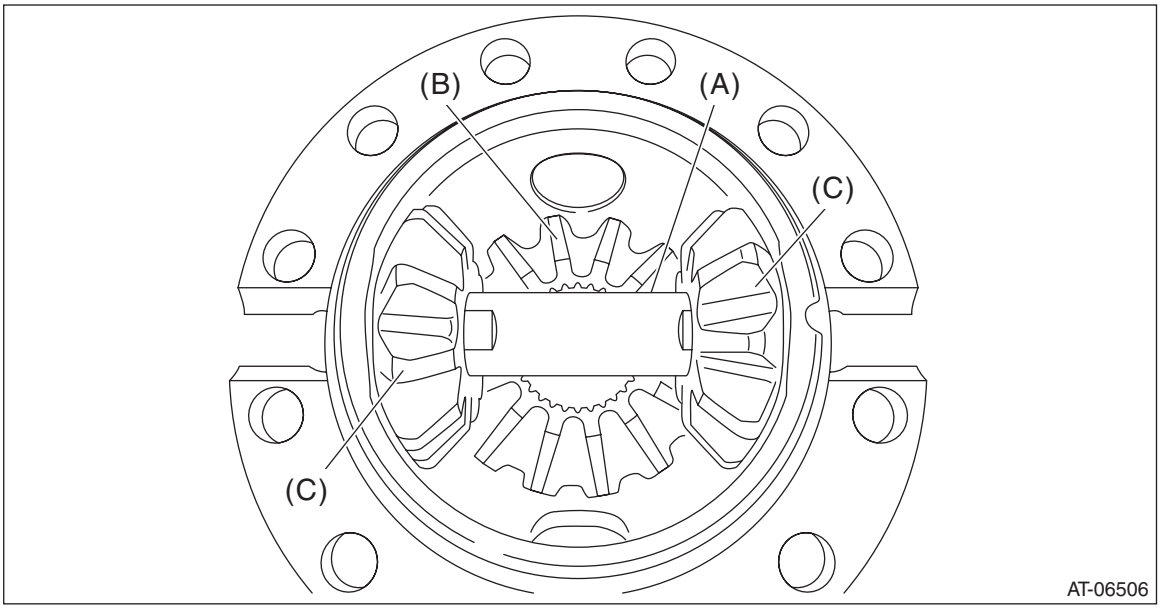
4) Remove the differential bevel gear and washer from differential case.



5) Remove the straight pin.



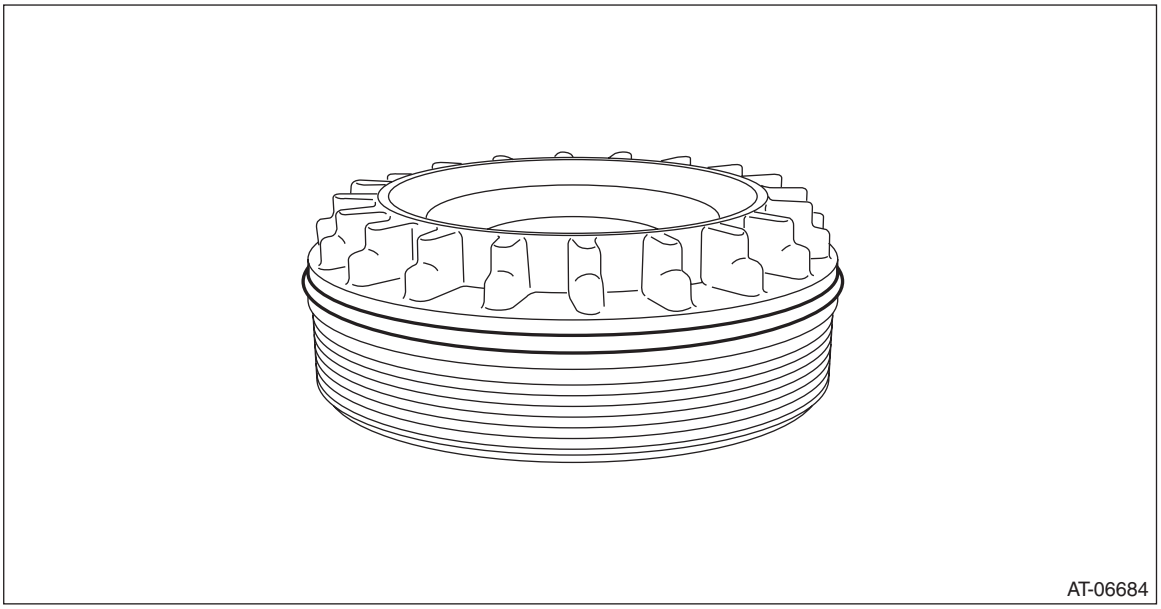
6) Remove the pinion shaft, then remove the differential bevel gear, washer and differential bevel pinion.



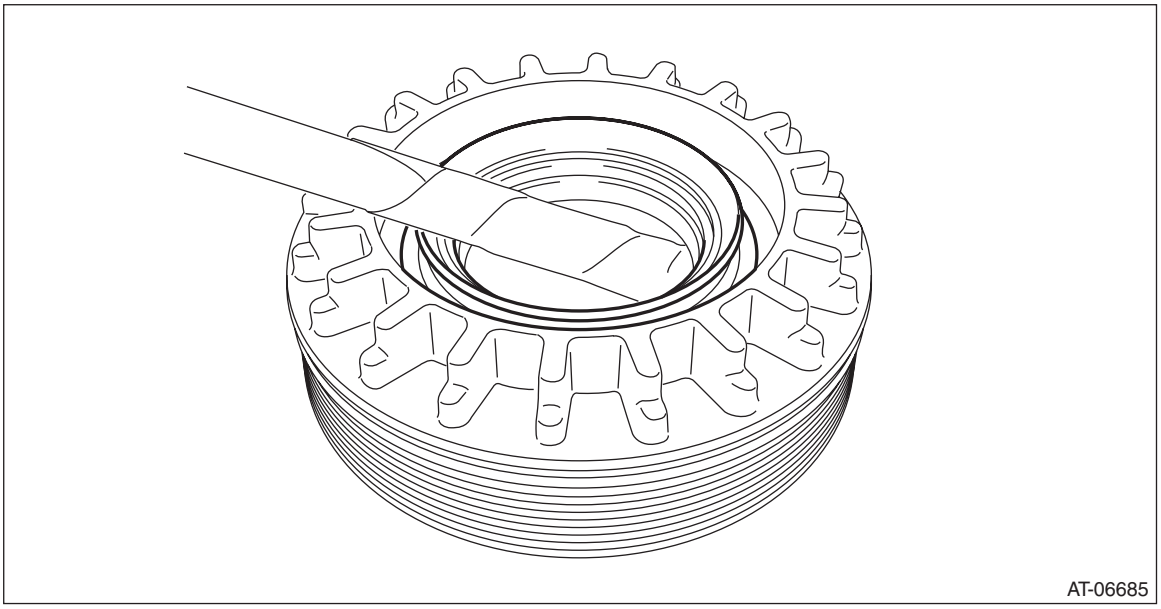
(A) Pinion shaft
(B) Differential bevel gear
(C) Differential bevel pinion

2. SIDE RETAINER

NOTE:
After adjusting the drive pinion backlash and tooth contact, replace the oil seal and O-ring with new parts.
1) Remove the O-ring.



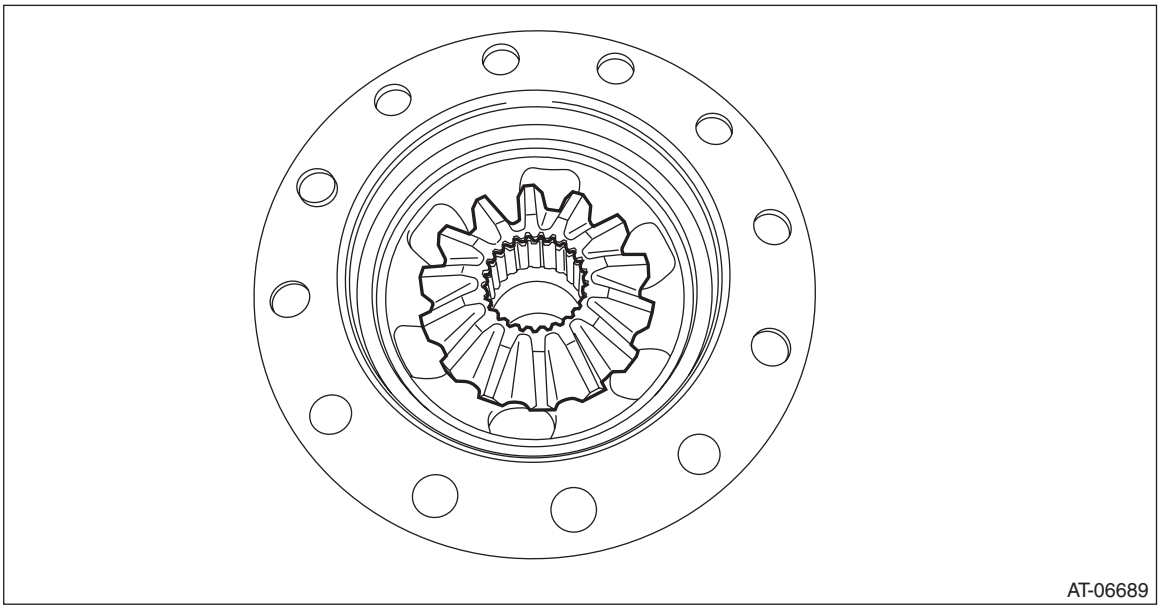
2) Remove the oil seal.



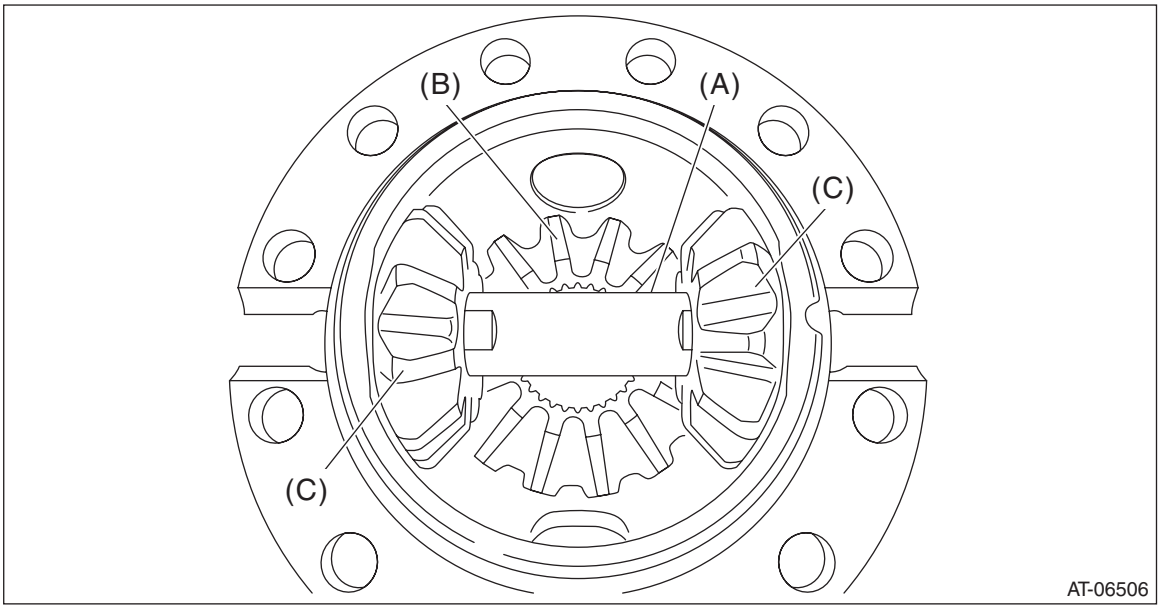
D: ASSEMBLY

1. DIFFERENTIAL CASE ASSY

1) Install the washer and differential bevel gear into the differential case (RH).

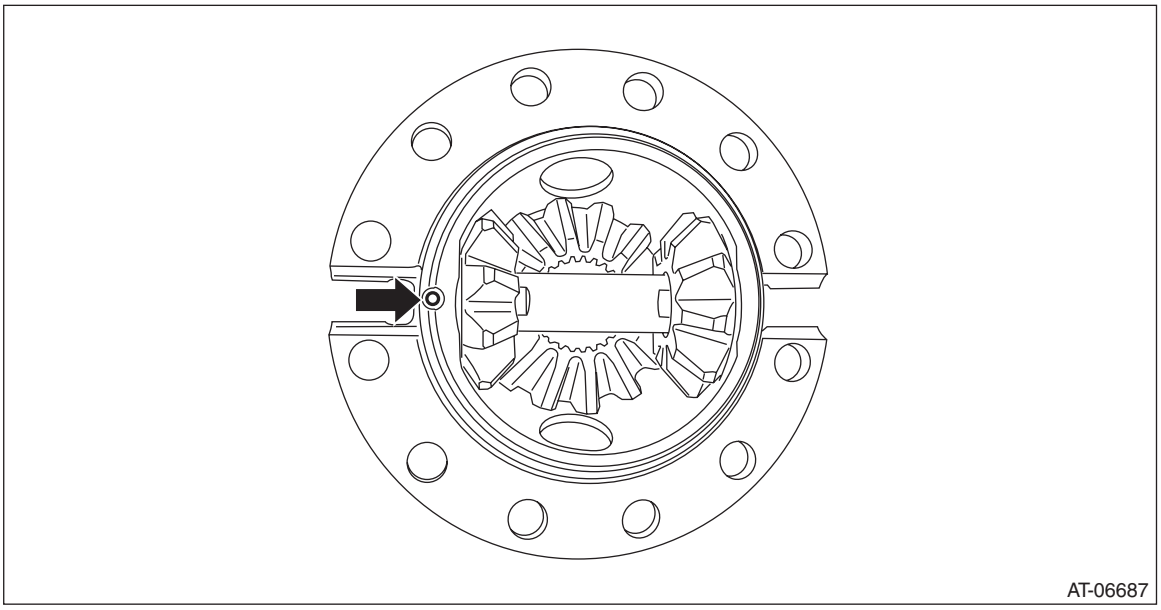


2) Install the differential bevel pinions into differential case (RH) and install the pinion shaft.

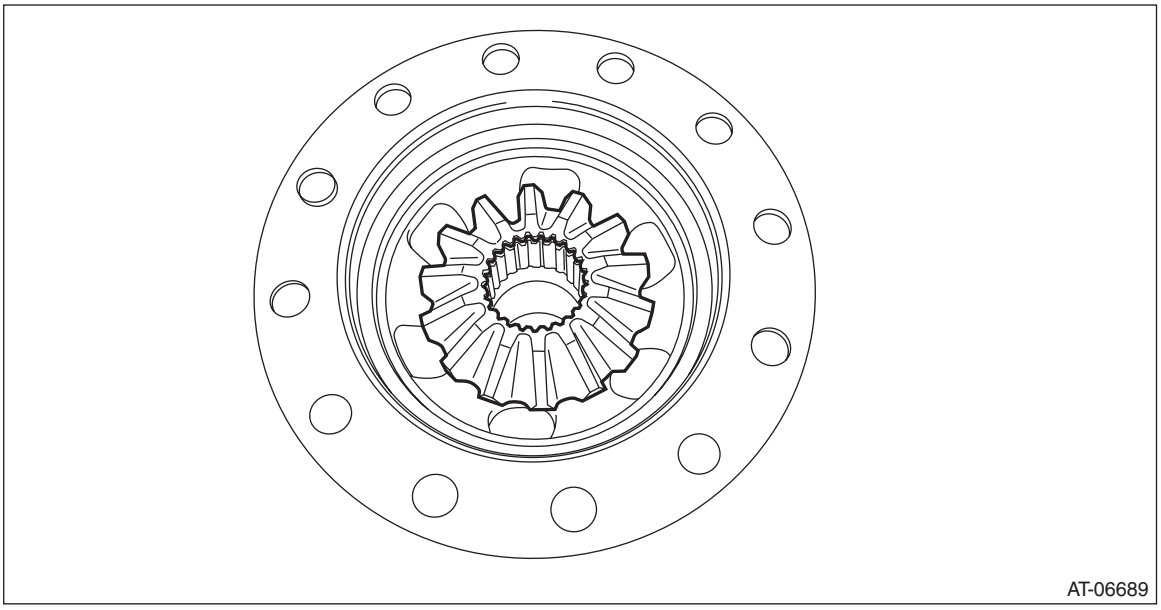


(A) Pinion shaft
(B) Differential bevel gear
(C) Differential bevel pinion

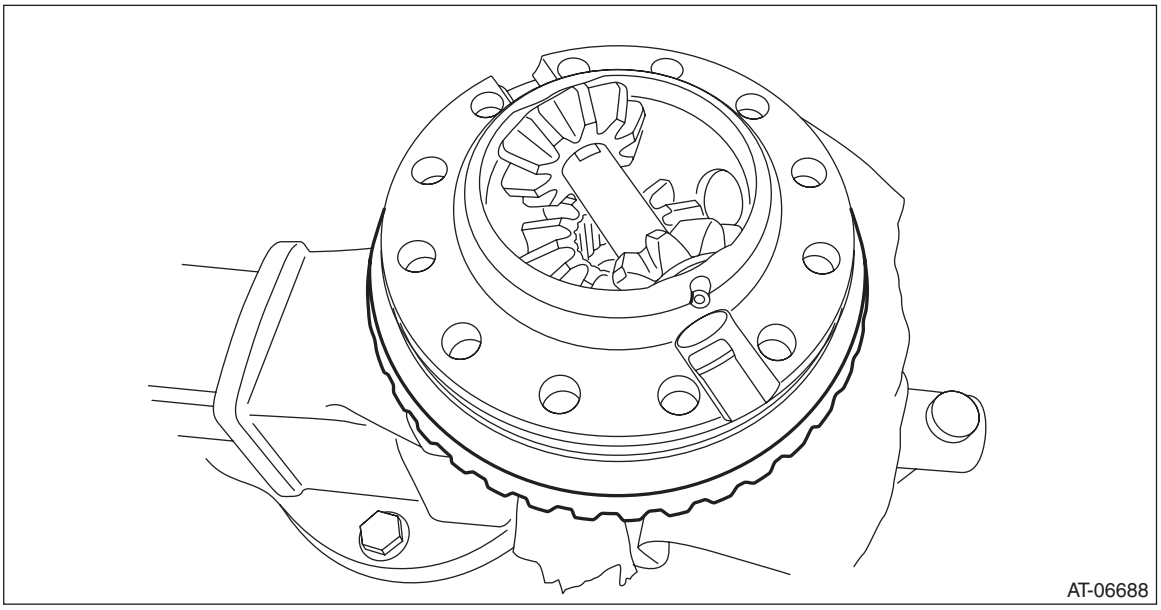
3) Install the straight pin.



4) Install the washer and differential bevel gear to the differential case (LH).

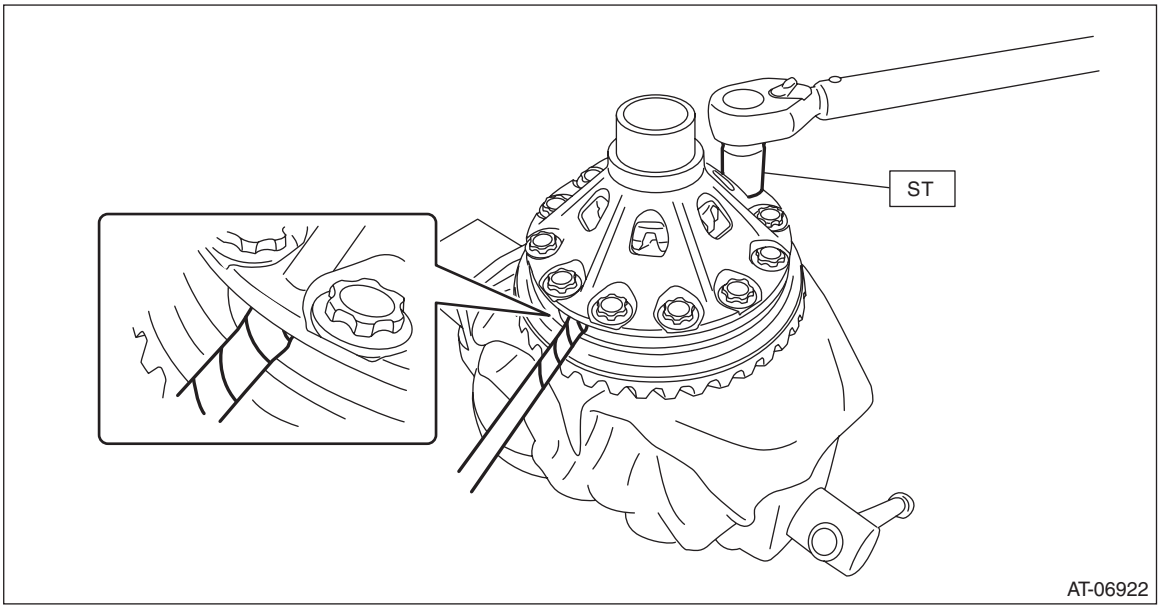


5) Install the differential case (RH) to the hypoid driven gear.



6) Install the differential case (LH) to the differential case (RH).
7) Using the ST, install the hypoid driven gear by tightening the installation bolt.
ST 18270KA020 SOCKET (E20)

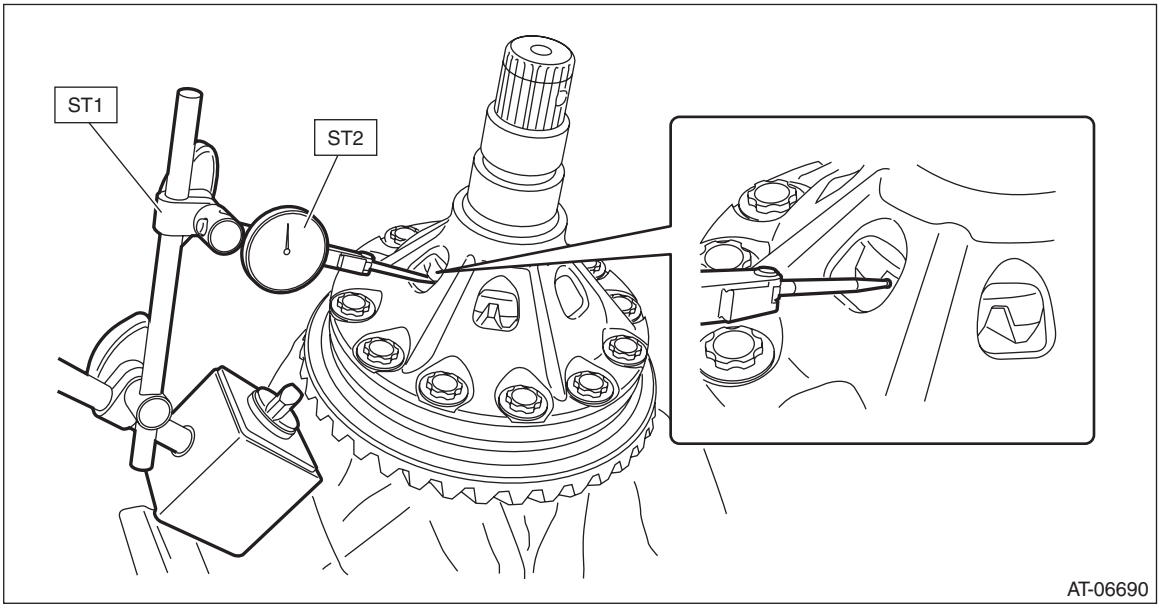
Tightening torque:
64 N·m (6.5 kgf-m, 47.2 ft-lb)



8) Measure the backlash, and select the washer.
(1) Install the SUBARU genuine axle shaft to differential case.
Part No. 38415AA070 Axle shaft
(2) Using ST1 and ST2, insert the ST2 through the window of differential case. Measure the backlash of the gear.

NOTE:
• Measure the backlash by applying a differential bevel pinion tooth between two differential bevel gear teeth.
• When measuring, fix the differential bevel pinion gear in place with a screwdriver covered with cloth, or a similar tool.
ST1 498247001 MAGNET BASE
ST2 498247100 DIAL GAUGE

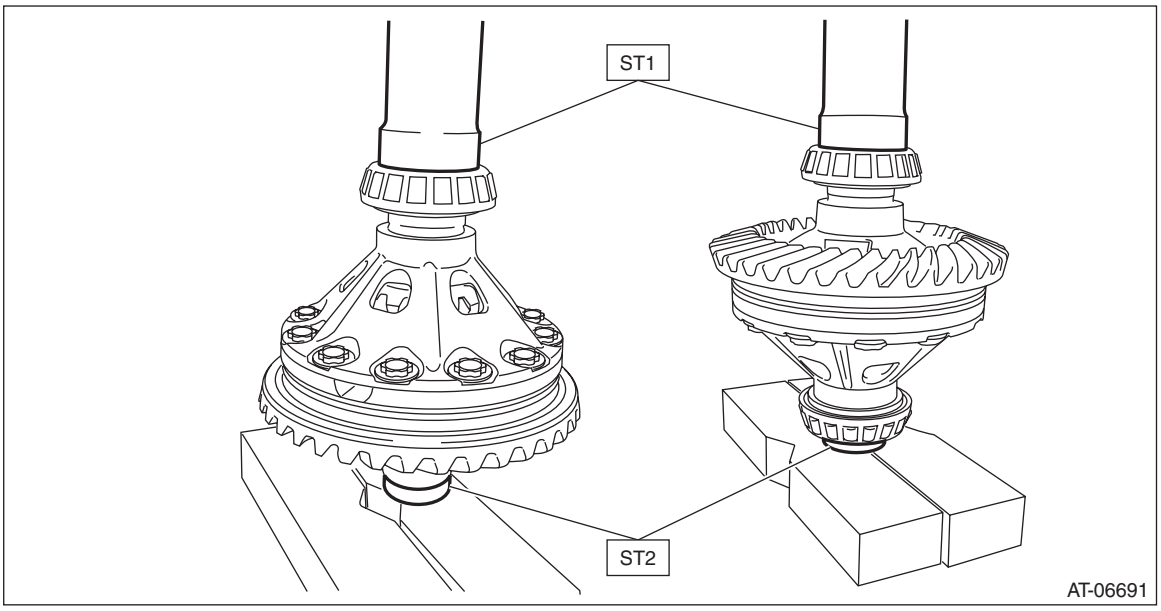
Specification:
0.13 — 0.18 mm (0.0051 — 0.0071 in)



(3) If the backlash is not within specification, select a washer from the table below and replace.

Washer	
Part No.	Thickness mm (in)
803038021	0.95 (0.037)
803038022	1.00 (0.039)
803038023	1.05 (0.041)

9) Using the ST, install the left and right taper roller bearings.
ST1 499277100 BUSHING 1-2 INSTALLER
ST2 398497701 SEAT

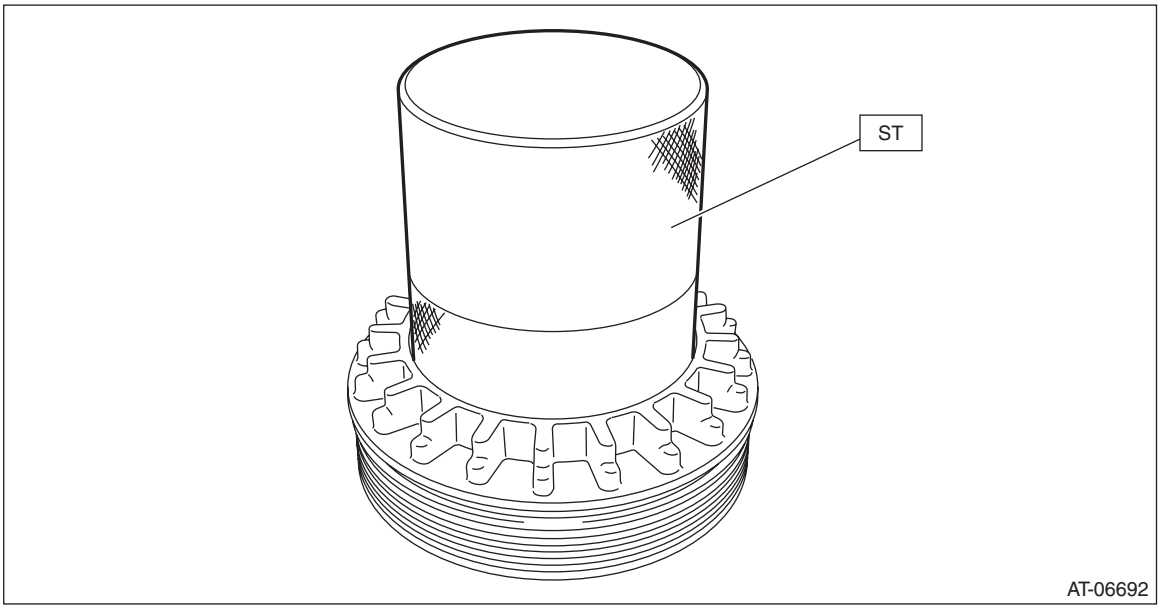


2. SIDE RETAINER

NOTE:
After adjusting the backlash and tooth contact, replace the oil seal and O-ring of side retainer with new parts.
1) Using the ST, install the oil seal.

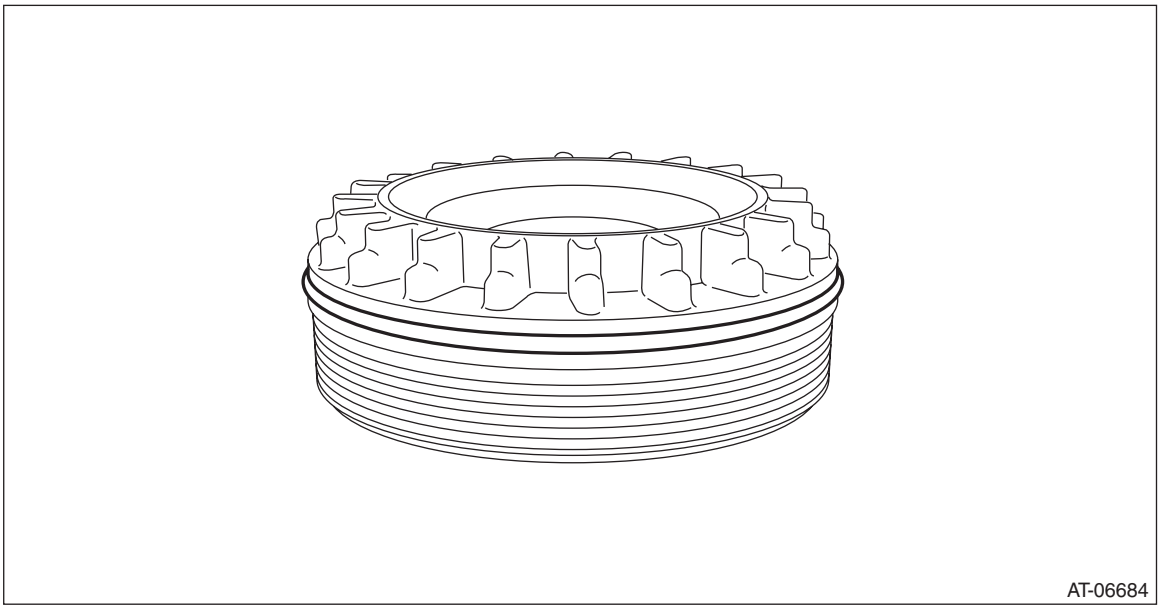
NOTE:
- Use a new oil seal.
- Apply differential gear oil to the oil seal lip and press-fitting surface.
- Oil seal has an identification mark (R, L). When installing oil seals, do not confuse the left and right.

ST 18675AA000 DIFFERENTIAL SIDE OIL SEAL INSTALLER



2) Install the O-ring.

NOTE:
- Use new O-rings.
- Apply the differential gear oil to O-ring.

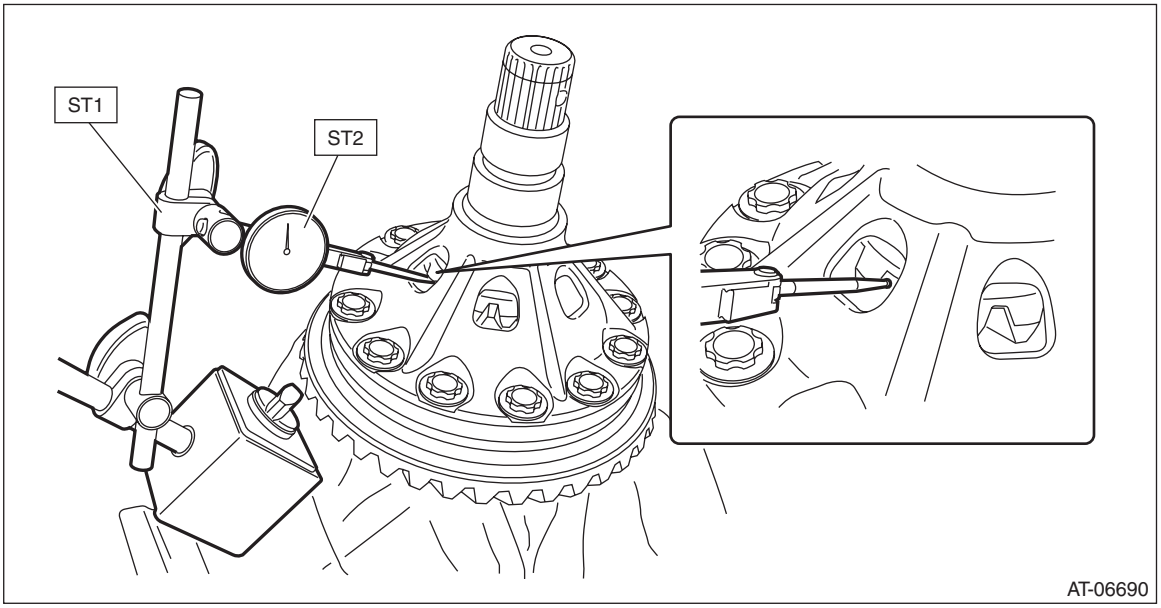

AT-06684

E: INSPECTION

- Check each component for scratches, damage or other faults.
- Using the ST, check the backlash of pinion gear.

ST1 498247001 MAGNET BASE
ST2 498247100 DIAL GAUGE

Specification:
0.13 — 0.18 mm (0.0051 — 0.0071 in)



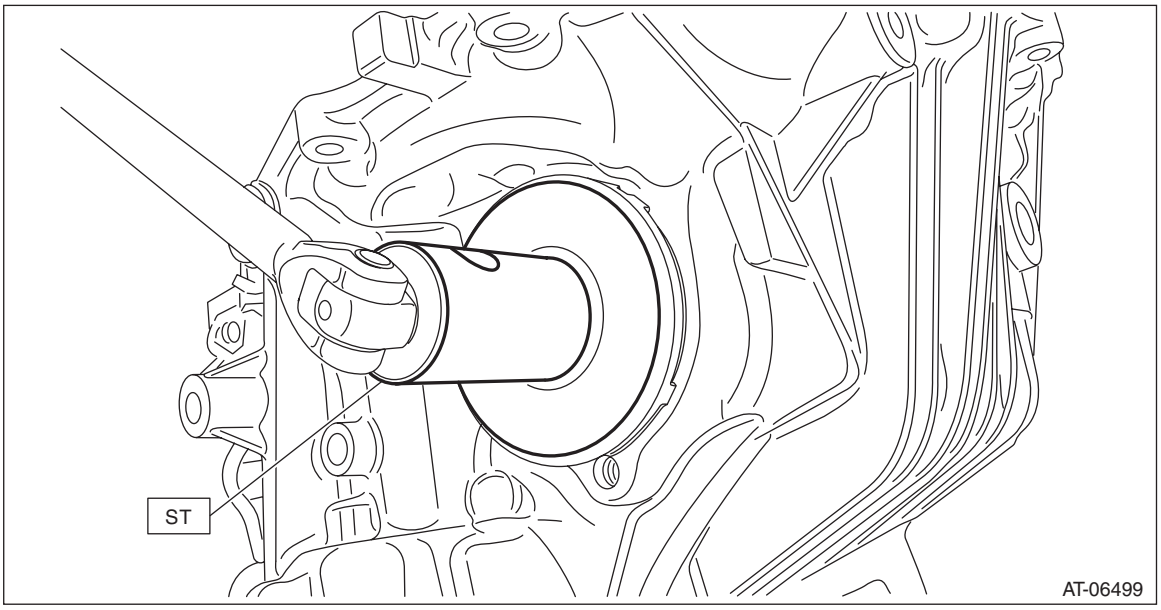
AT-06690

- Measure the hypoid gear backlash, and then adjust it to be within specification. <Ref. to CVT-312, ADJUSTMENT, Front Differential Assembly.>

F: ADJUSTMENT

1) Using the ST, screw-in the retainer until resistance is felt.

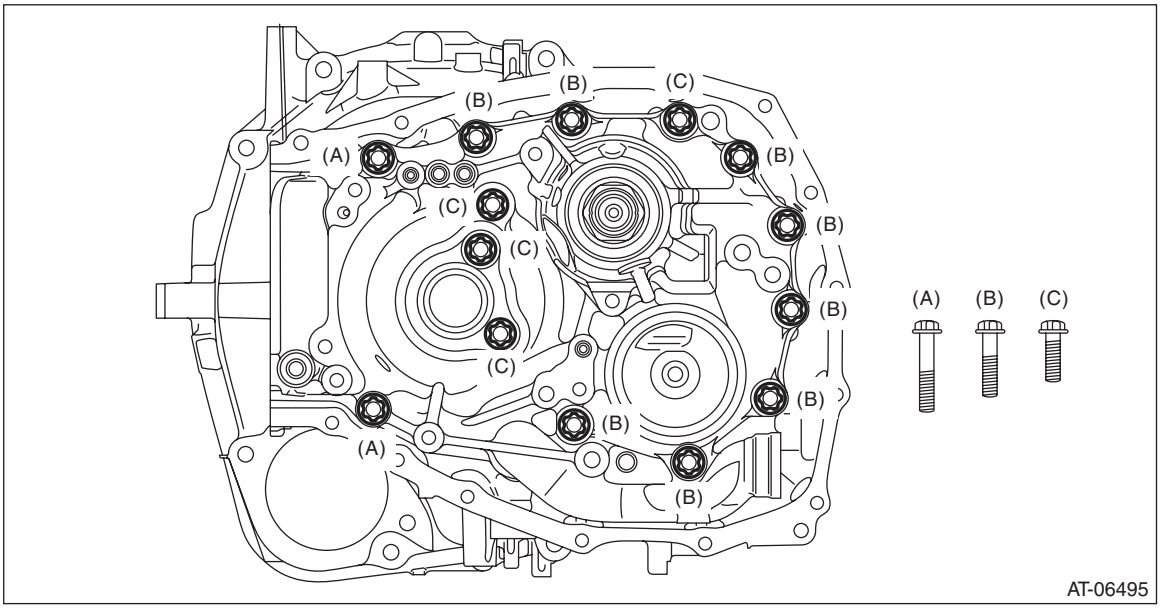
NOTE:
RH side should be screwed-in more than LH side.
ST 18658AA020 WRENCH COMPL RETAINER



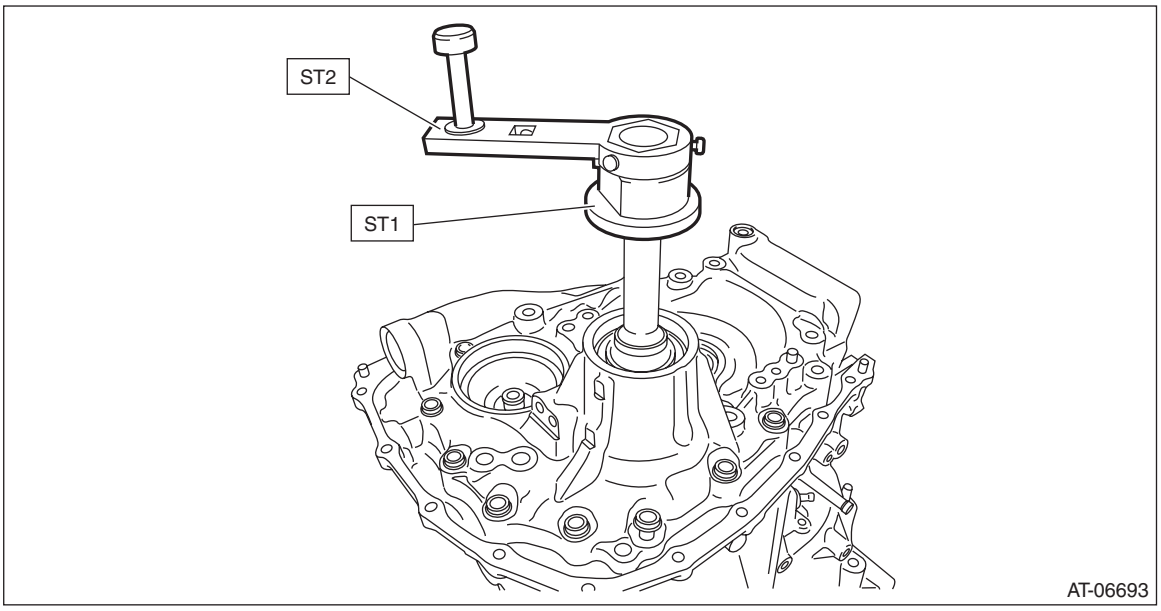
2) Remove the remaining liquid gasket from the mating surface completely.
3) Using the ST, install the drive pinion assembly to converter case.
ST 18270KA020 SOCKET (E20)

NOTE:
Do not confuse the three different-length bolts when installing.

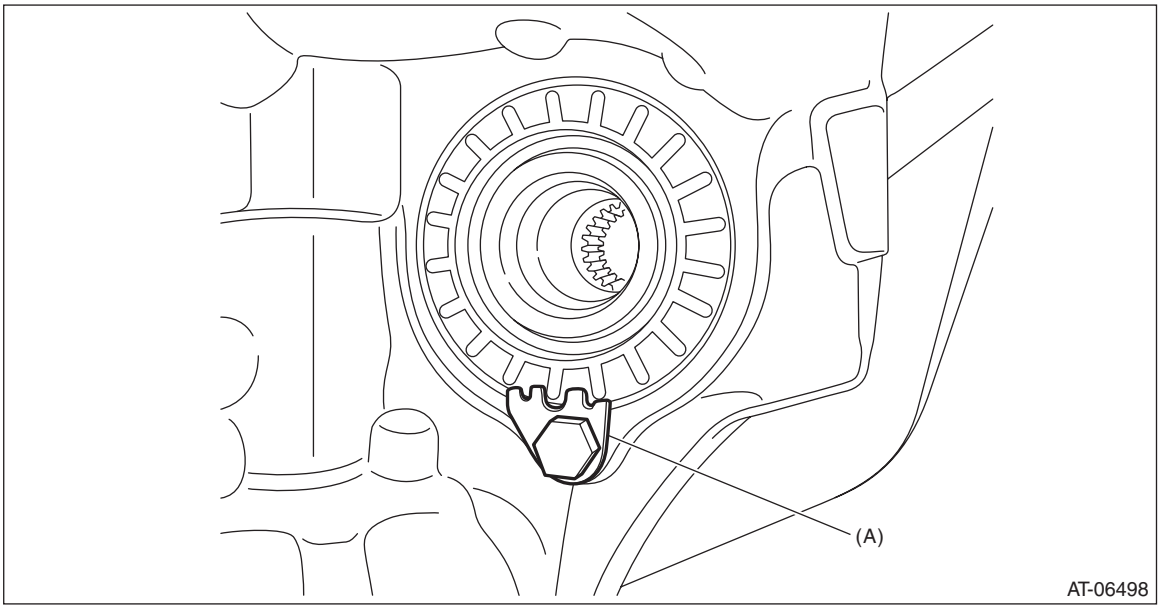
Tightening torque:
43 N·m (4.4 kgf-m, 31.7 ft-lb)



4) Rotate the drive pinion shaft more than ten times using ST1 and ST2.
ST1 18667AA010 HOLDER
ST2 499787700 WRENCH

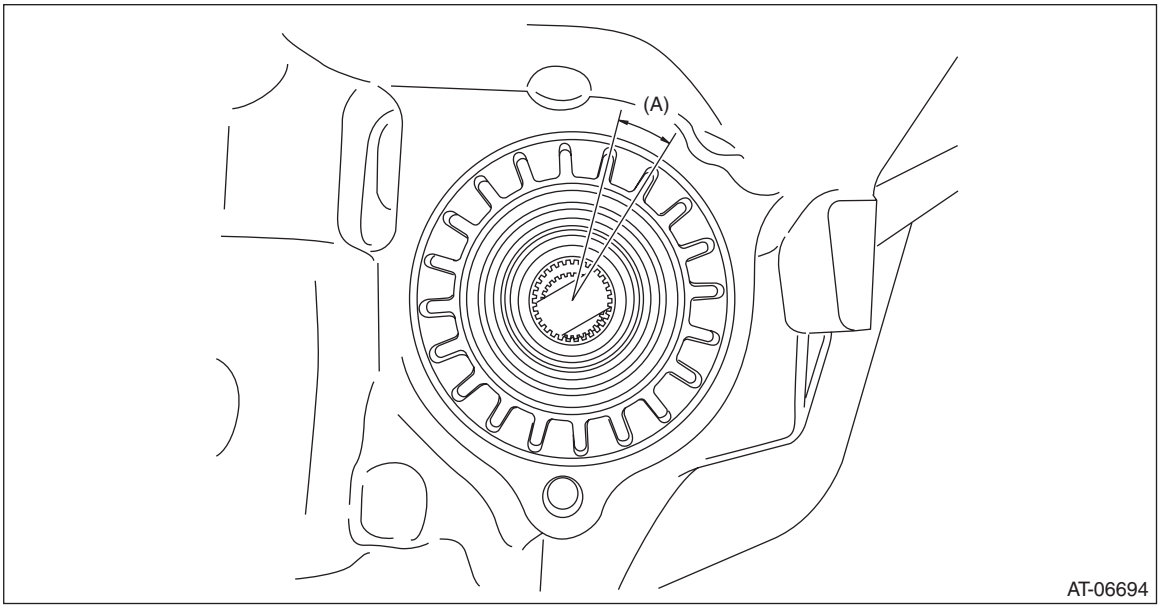


5) While rotating the pinion shaft, keep tightening the LH side retainer and loosening the RH side retainer until the pinion shaft no longer be turned, and loosen the LH retainer by 3 notches. When pinion shaft no longer turns, backlash is “zero”.
6) Secure with zero, lock plate. Loosen the retainer RH and retighten until it stops. Rotate the drive pinion 2 or 3 times. Tighten the retainer RH further 1-3/4 notches. This sets the preload. Finally, secure the retainer with its lock plate.



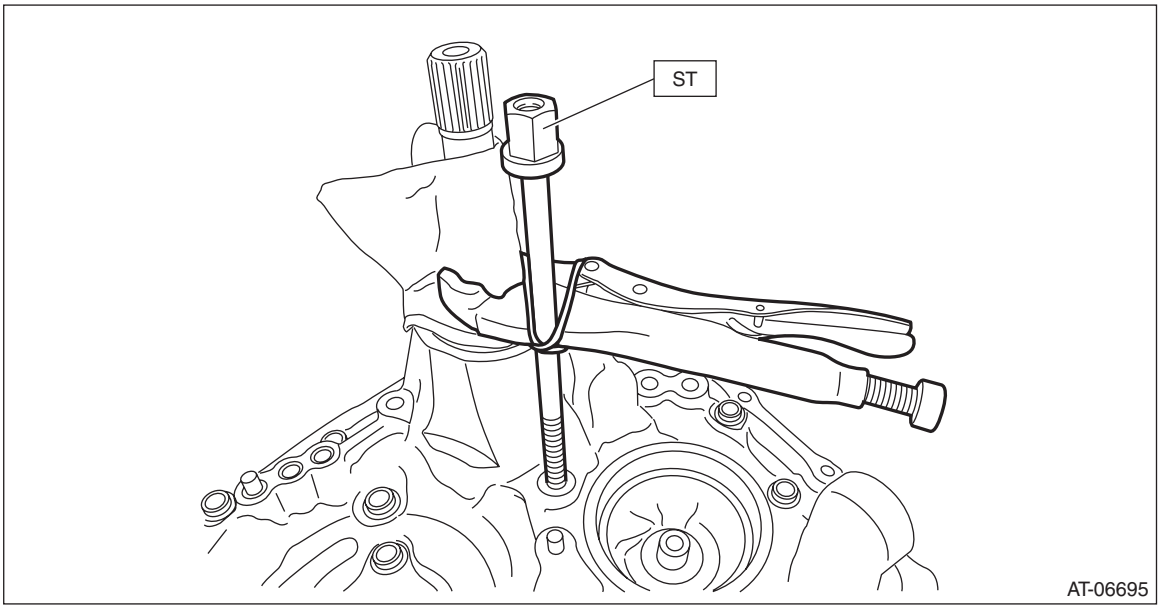
(A) Lock plate

NOTE:
Turning the retainer by every one tooth changes the backlash approx. 0.05 mm (0.0020 in).



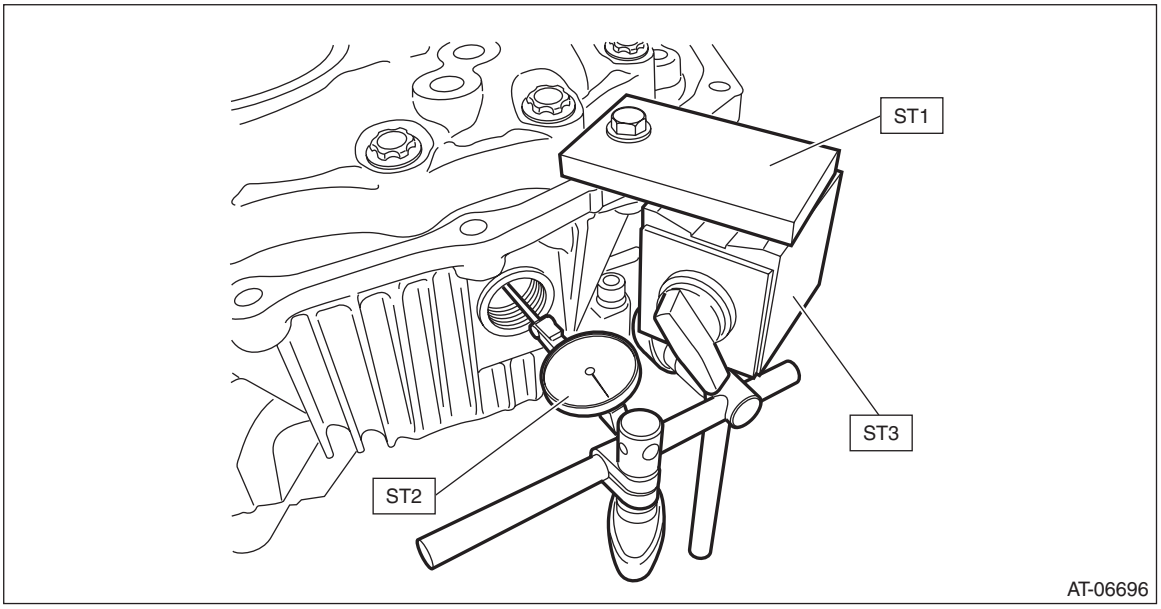
(A) 1 tooth

7) Insert the two Subaru genuine axle shafts into differential case.
Part No. 38415AA070 Axle shaft
8) Install the ST to the drive pinion retainer, and wrap the drive pinion shaft with cloth and pinch with vise pliers. Using a tie-wrap or a wire, fix the vise pliers to the ST.
Make sure the drive pinion shaft does not move.
ST 18763AA000 COMPRESSOR SHAFT



9) Check the backlash is within specification using ST1, ST2 and ST3.
ST1 498255400 PLATE
ST2 498247100 DIAL GAUGE
ST3 498247001 MAGNET BASE

Backlash:
0.13 — 0.18 mm (0.005 — 0.007 in)



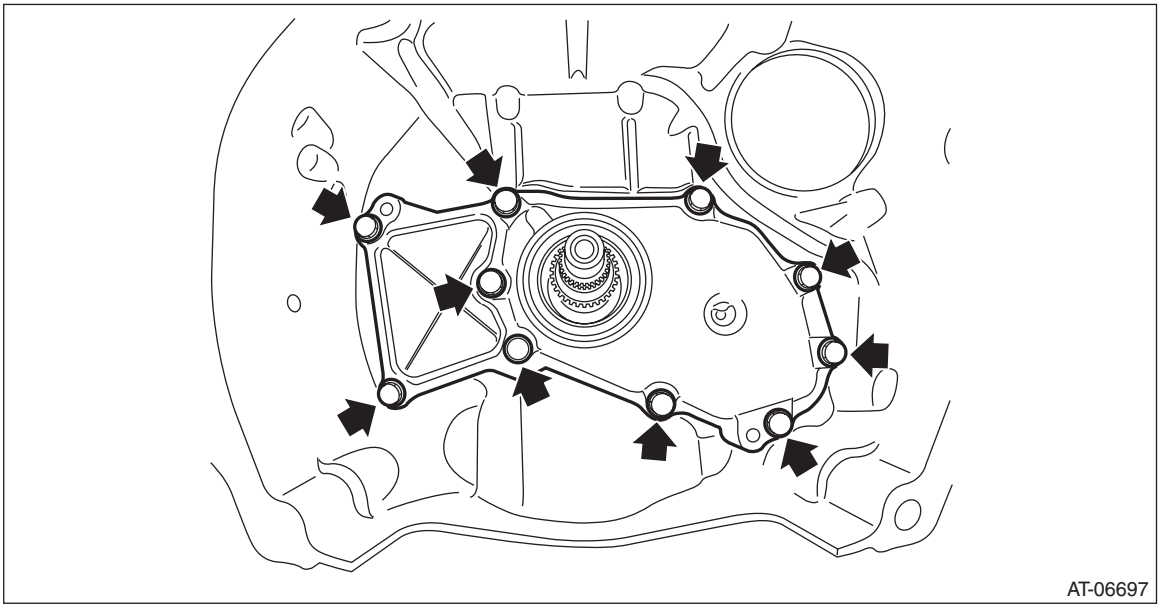
10) Adjust the teeth contact of the front differential and drive shaft. <Ref. to CVT-291, ADJUSTMENT, Drive Pinion Shaft Assembly.>

43.Oil Pump Chain

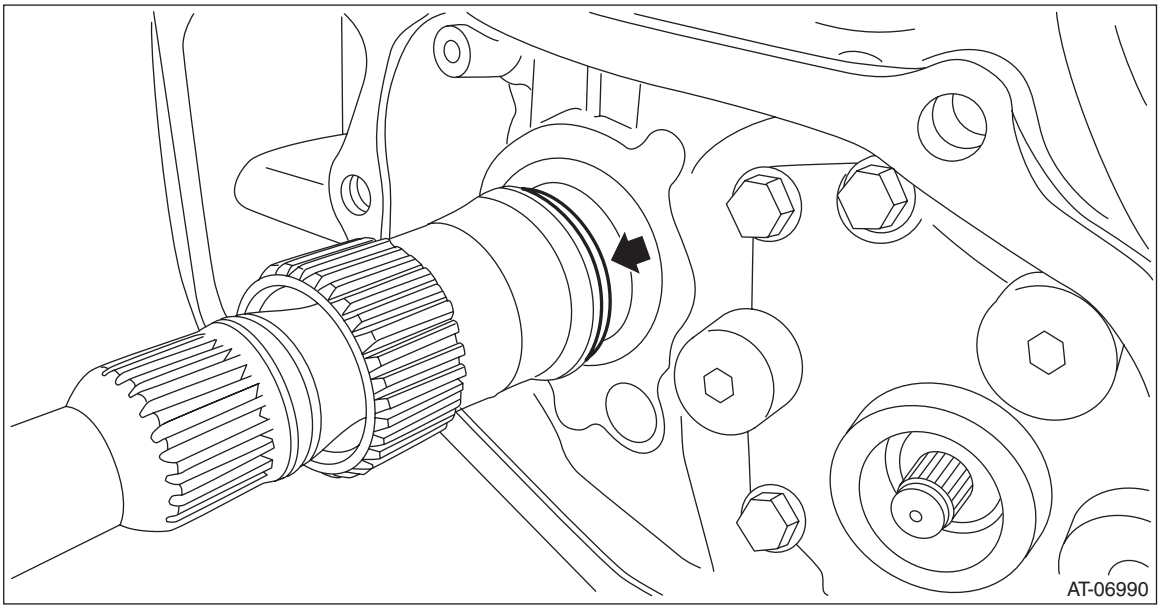
A: REMOVAL

1) Remove the transmission assembly from the vehicle. <Ref. to CVT-58, REMOVAL, Automatic Transmission Assembly.>
2) Remove the torque converter assembly. <Ref. to CVT-152, REMOVAL, Torque Converter Assembly.>
3) Remove the oil pump chain cover.

NOTE:
Oil pump chain cover may be hard to remove because the driven sprocket is installed to the shaft side of the oil pump. In this case, do not apply excessive force to remove it.

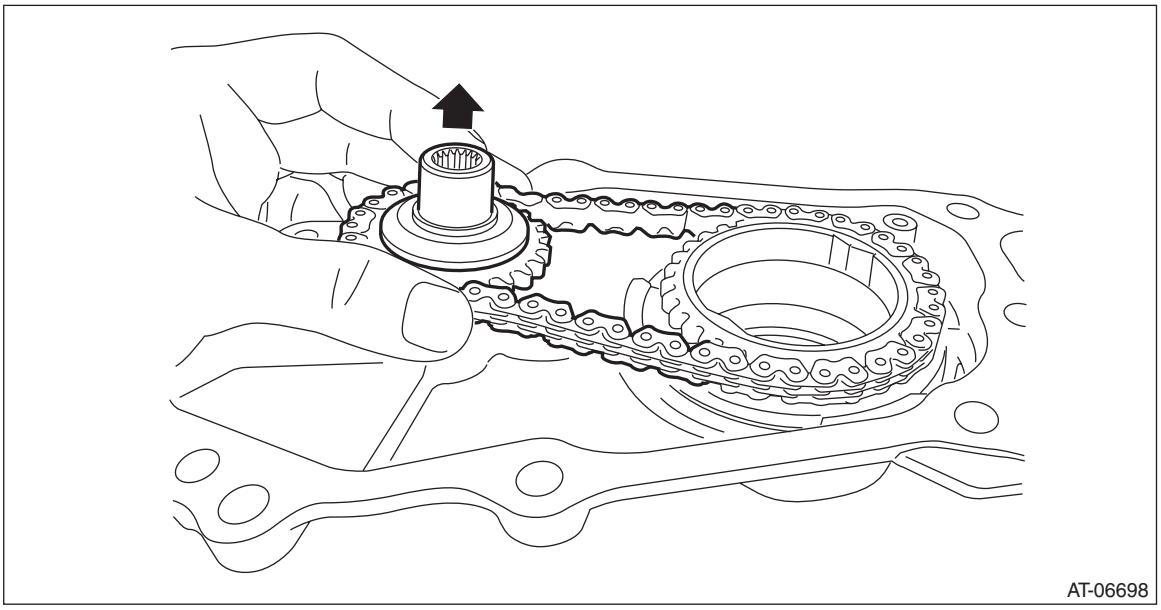


4) Remove the seal ring.

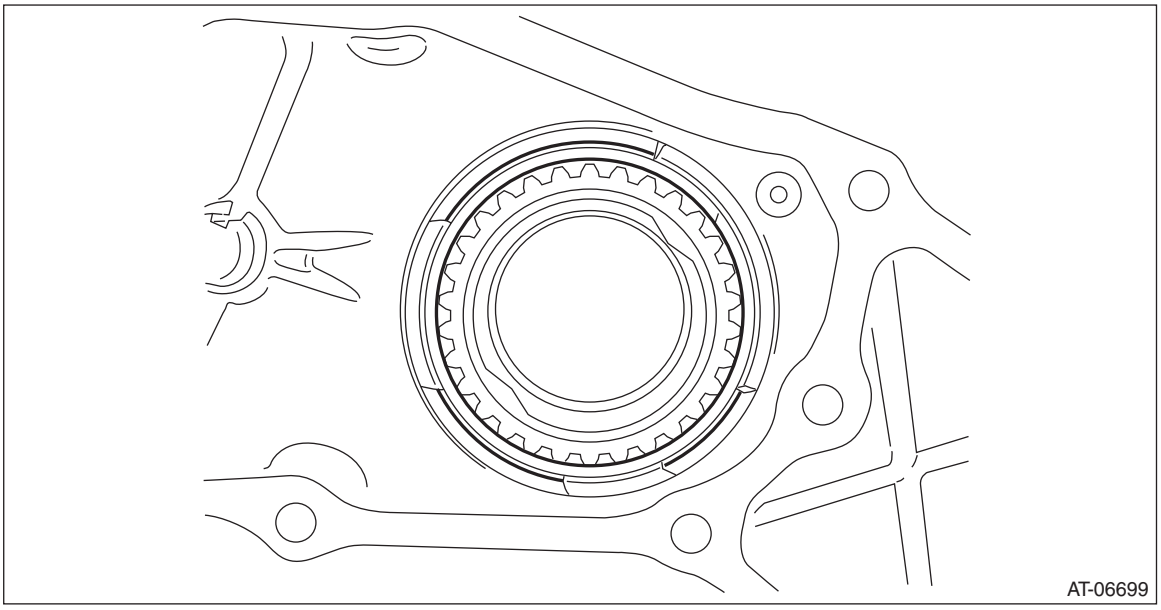


5) Remove the driven sprocket from oil pump chain cover to remove the oil pump chain.

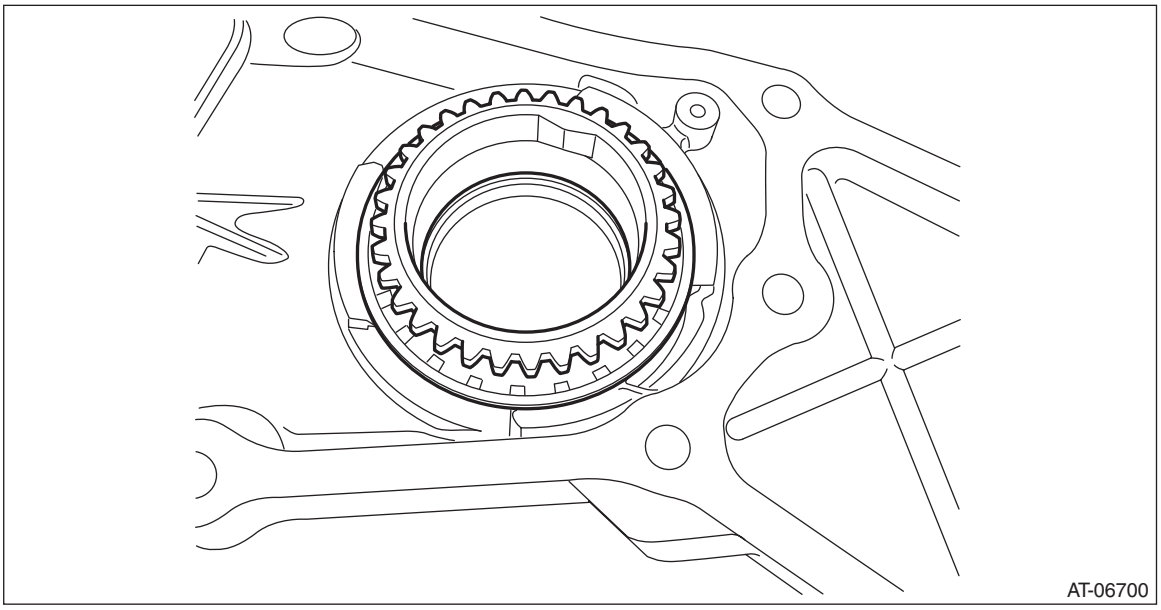
NOTE:
- The driven sprocket is replaced as an assembly only, because it is a non-disassembly part.
- If the ball bearing is removed from the driven sprocket, replace with a new part.



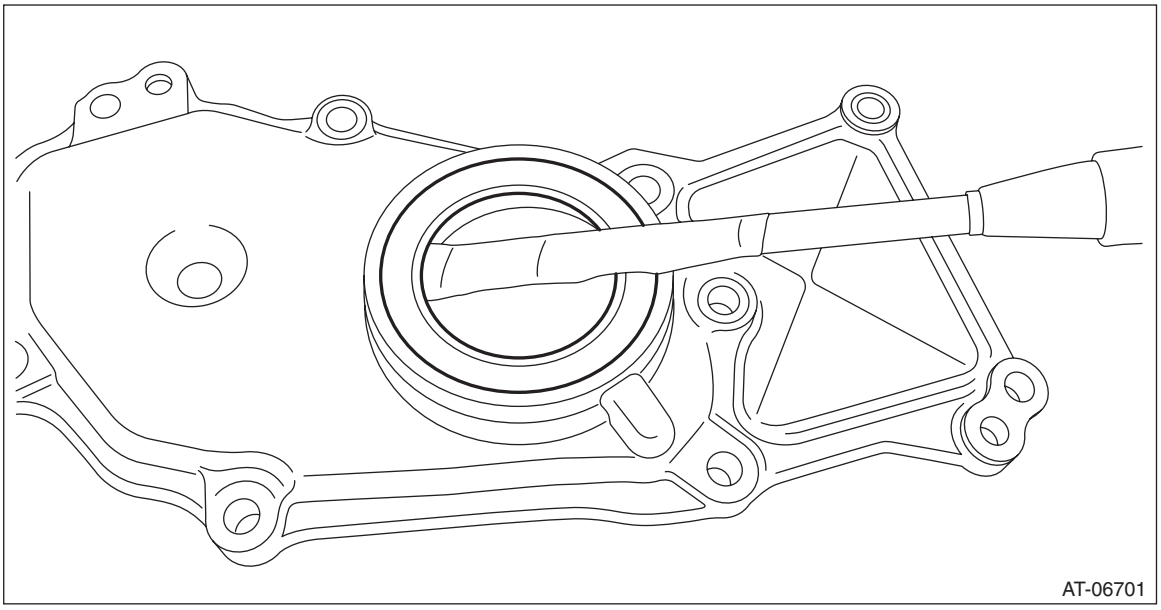
6) Remove the snap ring.



7) Remove the drive sprocket.



8) Remove the oil seal from the oil pump chain cover.

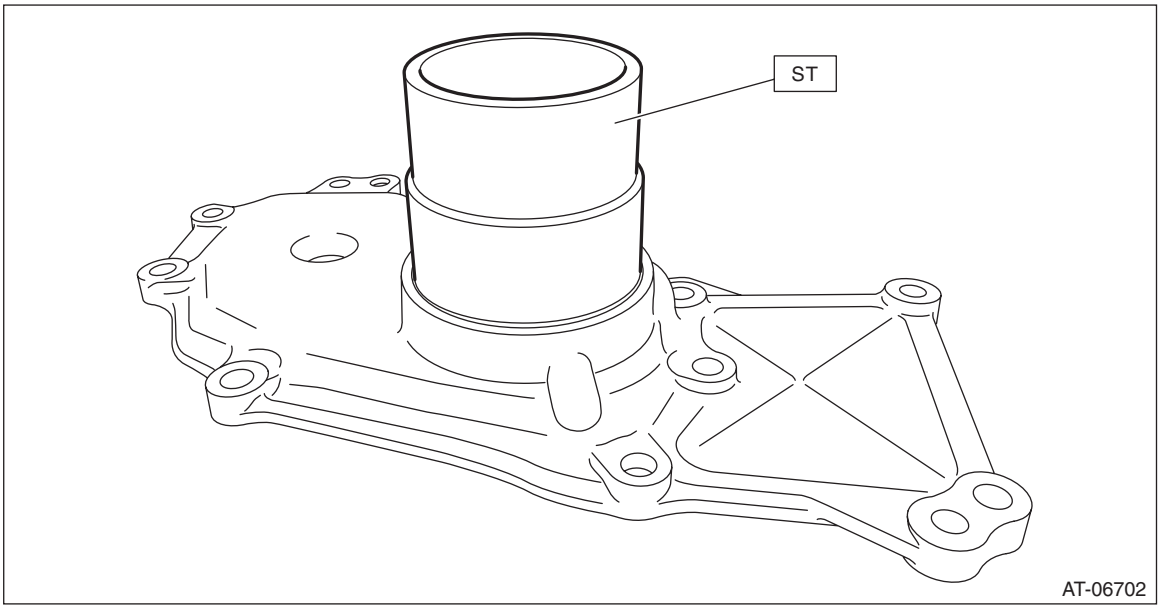


B: INSTALLATION

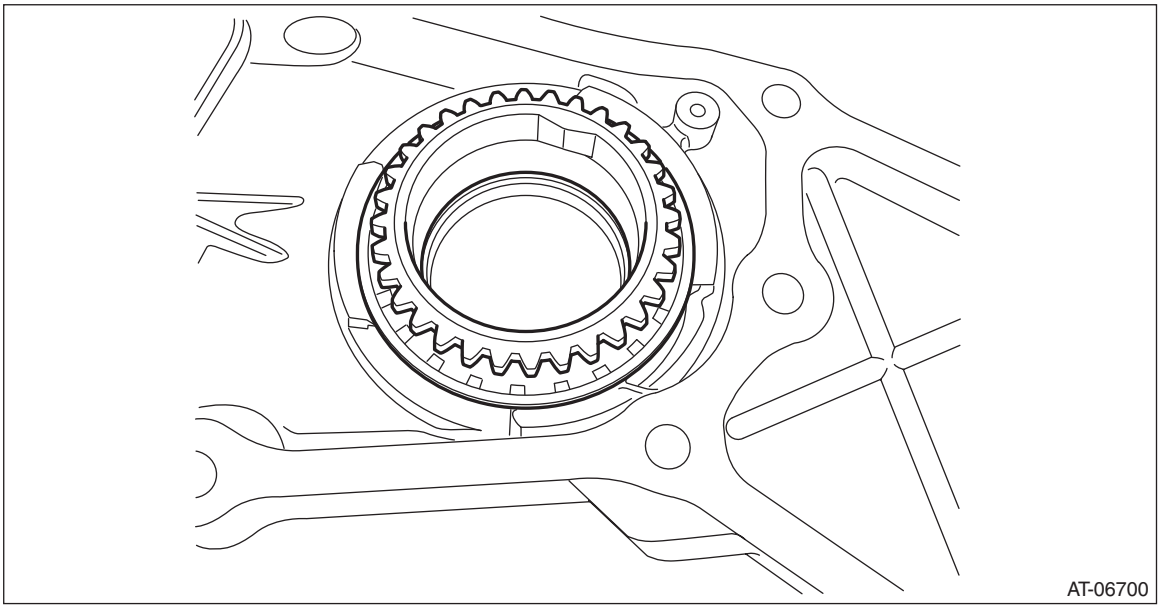
1) Clean the mating surface of oil pump chain cover and converter case.
2) Using the ST, install the oil seal.

NOTE:
- Use a new oil seal.
- Apply CVTF to the oil seal lip and press-fitting surface.

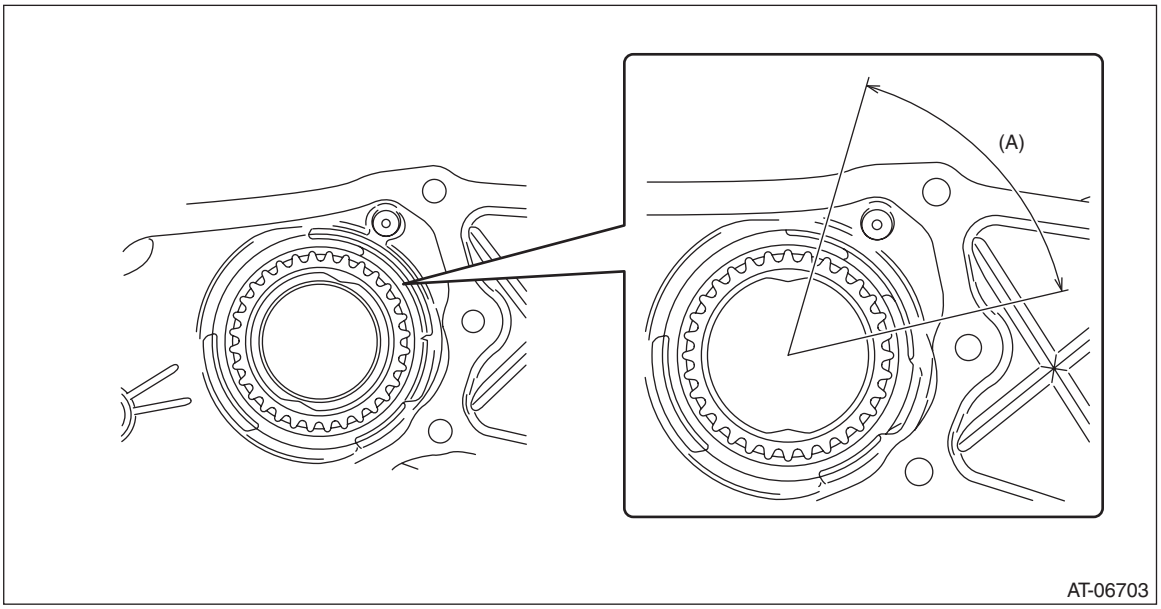
ST 499755602 PRESS SNAP RING



3) Install the drive sprocket.

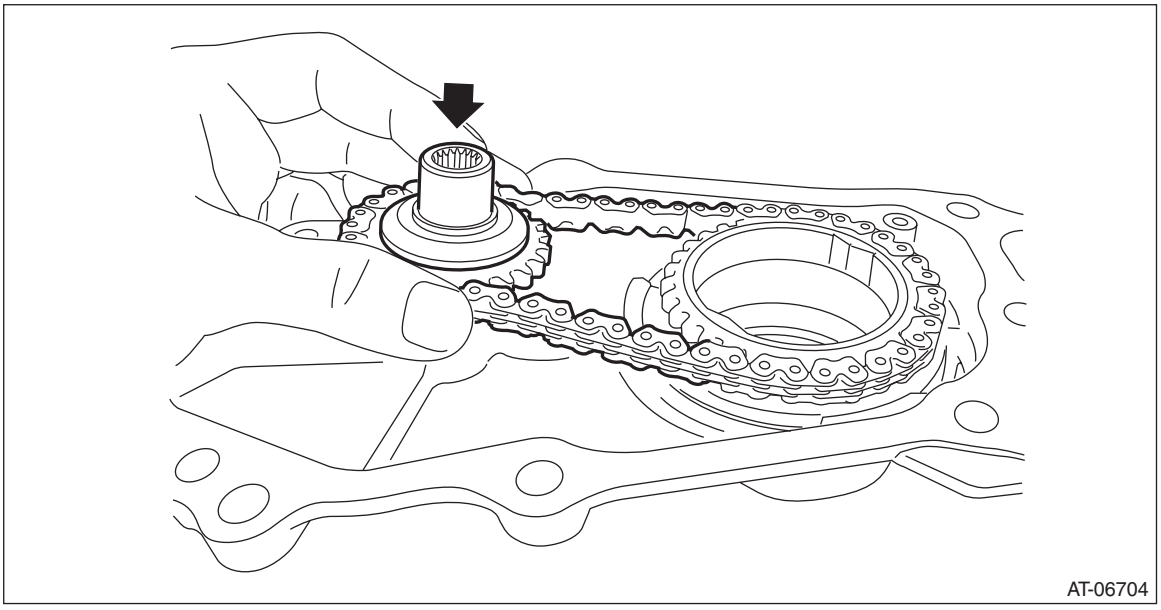


4) Install the snap ring so that its cutout portion is securely fitted into the snap ring groove of the oil pump chain cover.



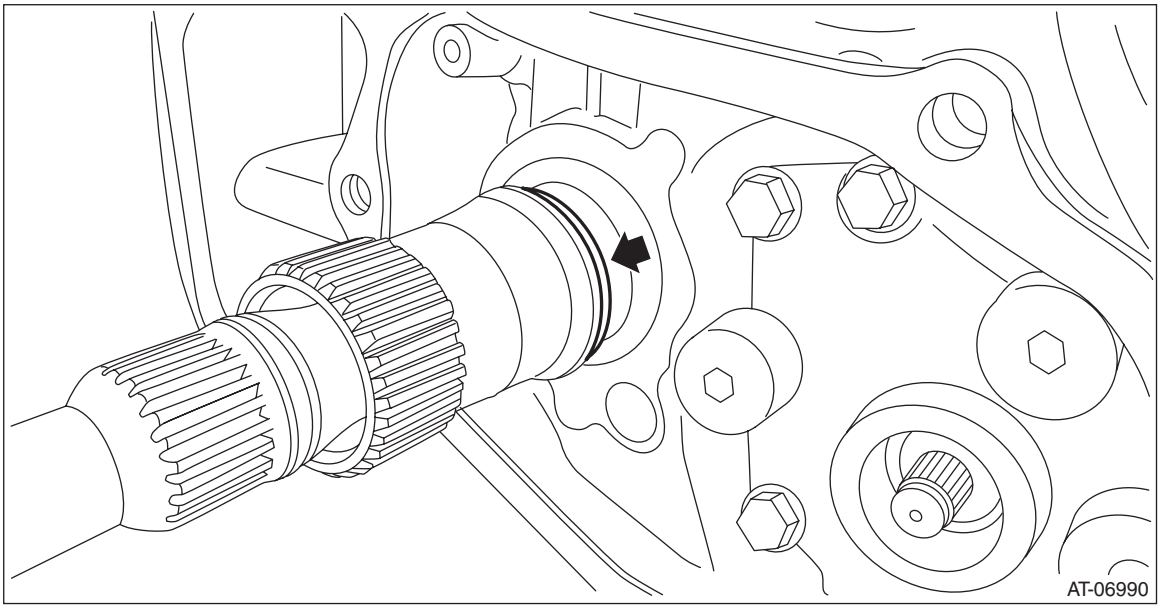
(A) Installation range of cutout portion for snap ring

5) Place the oil pump chain on drive sprocket.
6) Place the oil pump chain on driven sprocket and install the driven sprocket to oil pump chain cover.



7) Install the seal ring.

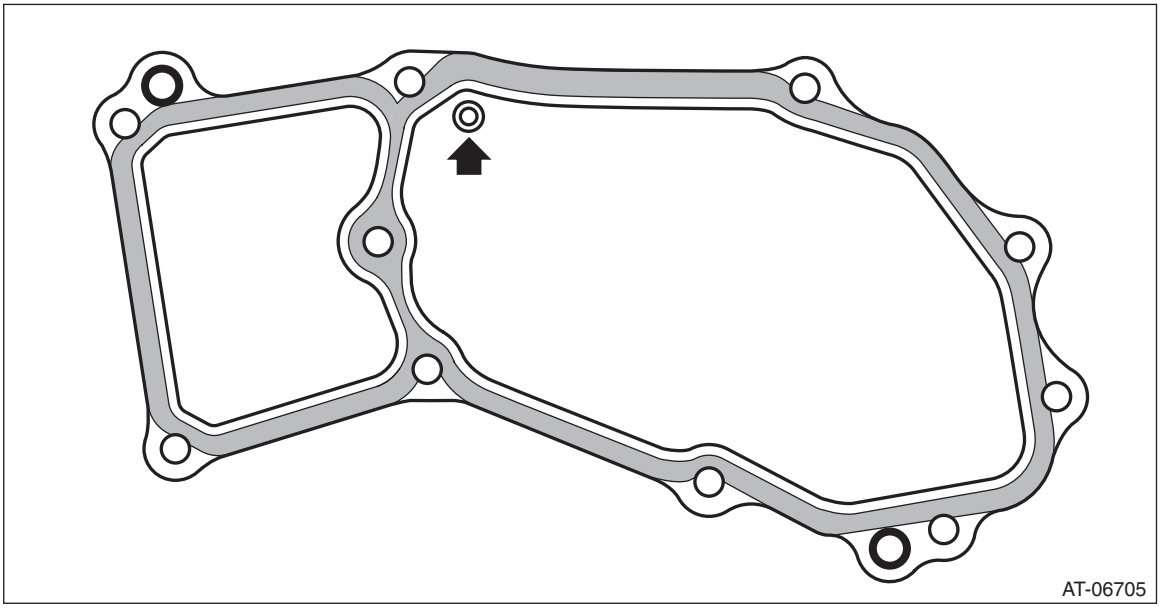
NOTE:
- Use a new seal ring.
- Apply CVTF to the seal rings.
- When installing the seal ring, do not expand the seal ring too much.



8) Apply liquid gasket seamlessly to the mating surface of oil pump chain cover.

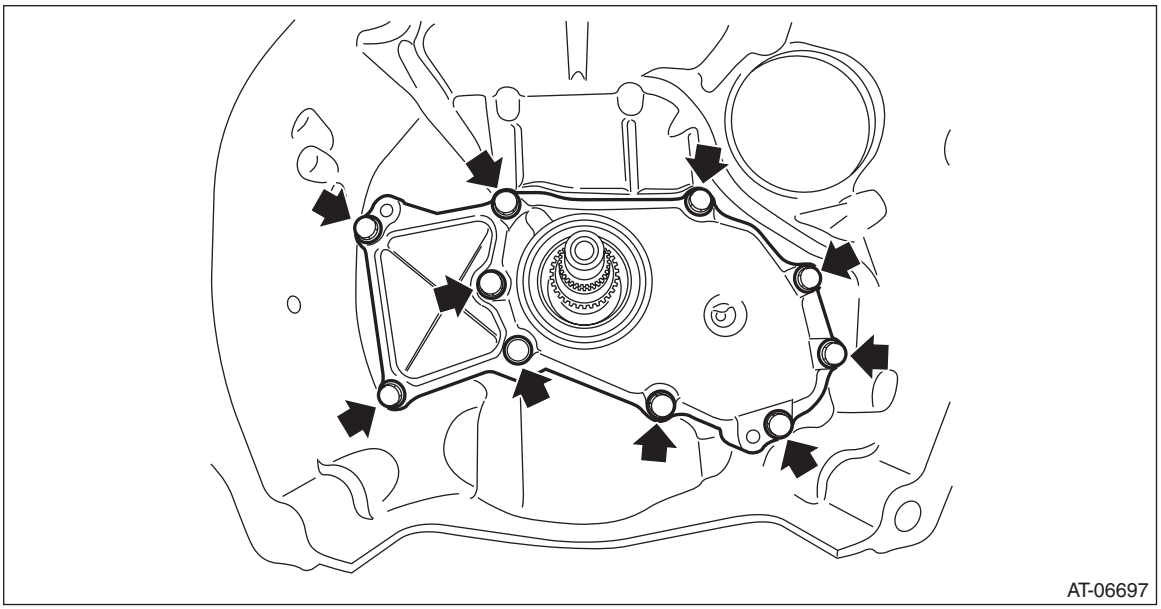
CAUTION:
Do not apply liquid gasket at the arrowed hole.

Liquid gasket:
THREE BOND 1215 (Part No. 004403007) or equivalent



9) Install the oil pump chain cover.

Tightening torque:
21 N·m (2.1 kgf-m, 15.5 ft-lb)

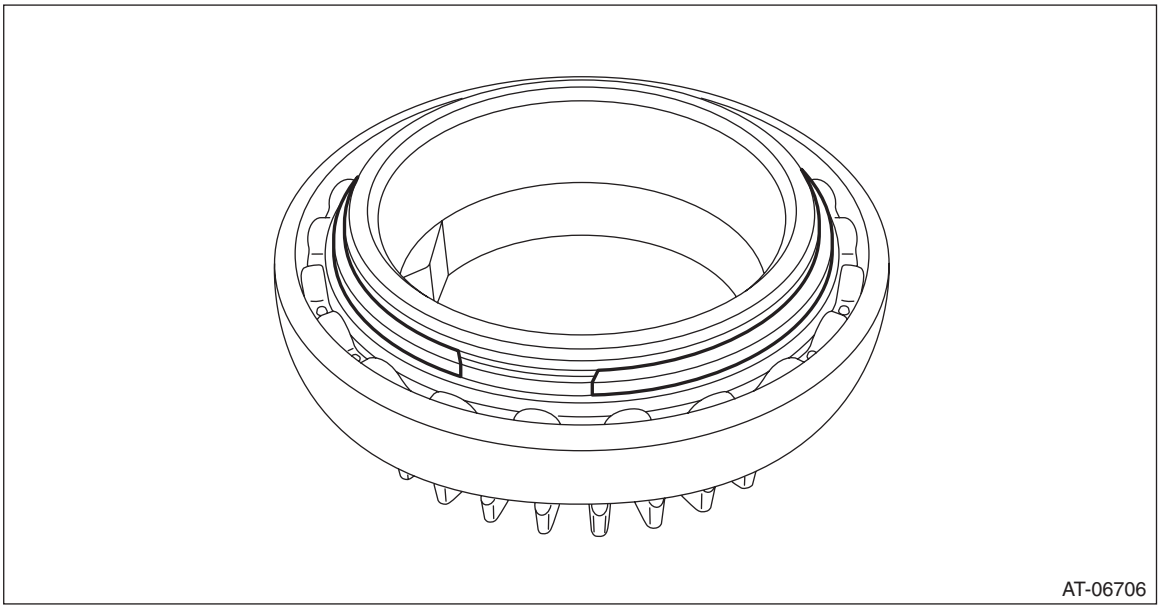


10) Install the torque converter assembly. <Ref. to CVT-152, INSTALLATION, Torque Converter Assembly.>
11) Install the transmission assembly to the vehicle. <Ref. to CVT-69, INSTALLATION, Automatic Transmission Assembly.>

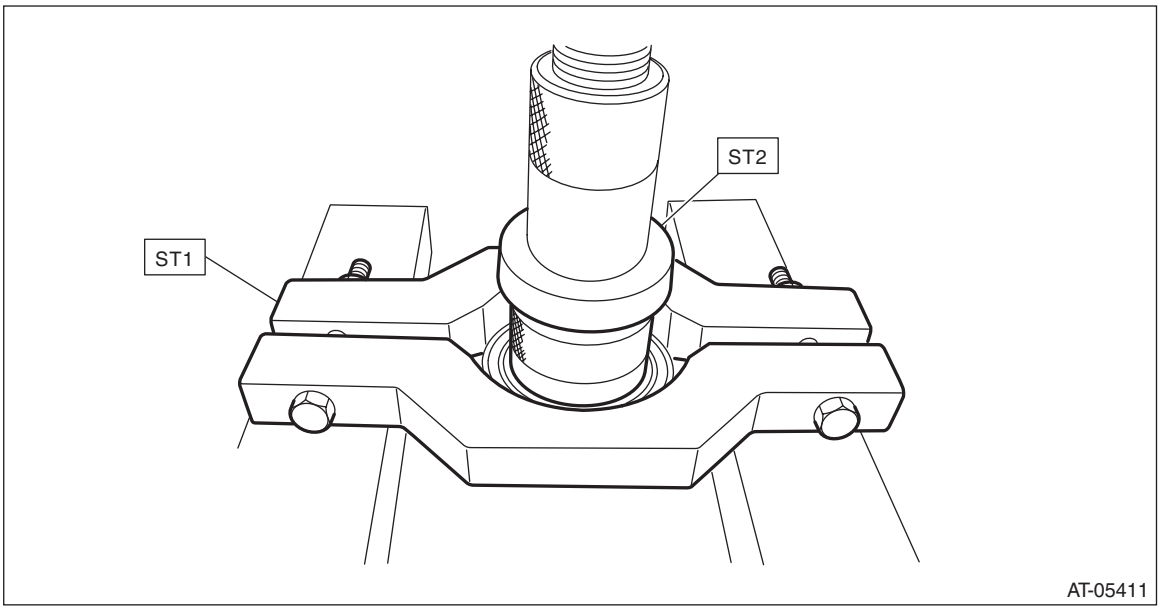
C: DISASSEMBLY

1. DRIVE SPROCKET

1) Remove the snap ring.



2) Remove the ball bearing using ST.
ST1 498077600 REMOVER
ST2 399513600 INSTALLER

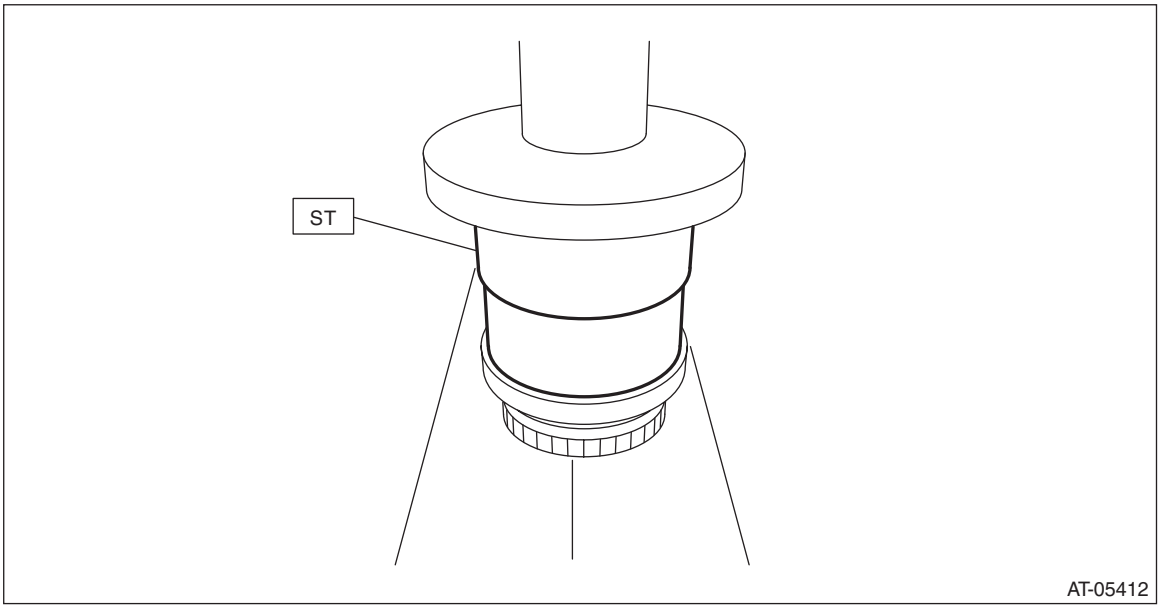


D: ASSEMBLY

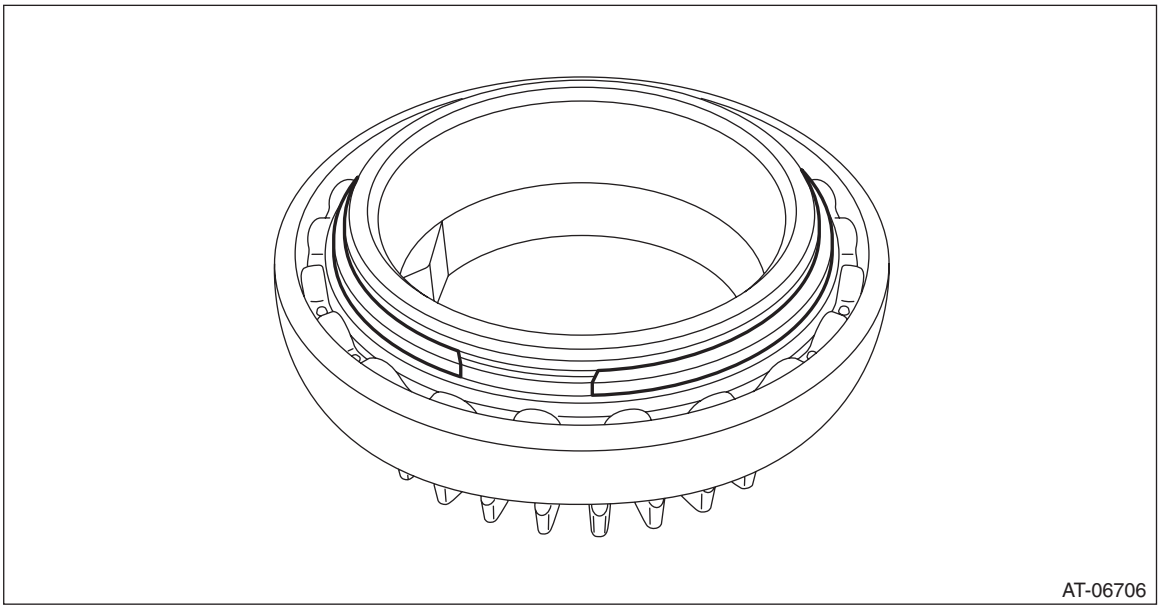
1. DRIVE SPROCKET

1) Using the ST, install the ball bearing.

NOTE:
Use a new ball bearing.
ST 499755502 PRESS SNAP RING



2) Install the snap ring.



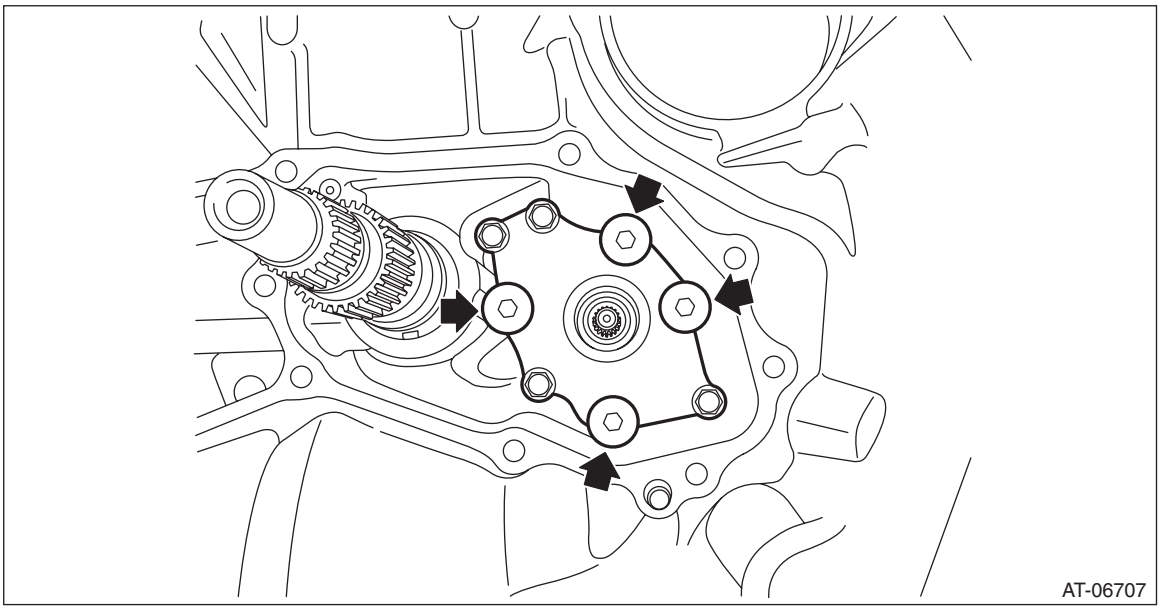
E: INSPECTION

- Check the oil pump chain for damage.
- Replace if gear teeth are broken, damaged, sharpen or excessively worn.
- Check the bearing for seizure or wear.
- Apply CVTF to bearing and rotate the bearing to check for noise or dragging etc.
- Check the oil pump chain cover for damage.
- Check for leakage of CVTF from the mating surface of oil pump chain cover.
- Check the oil seal for damage.

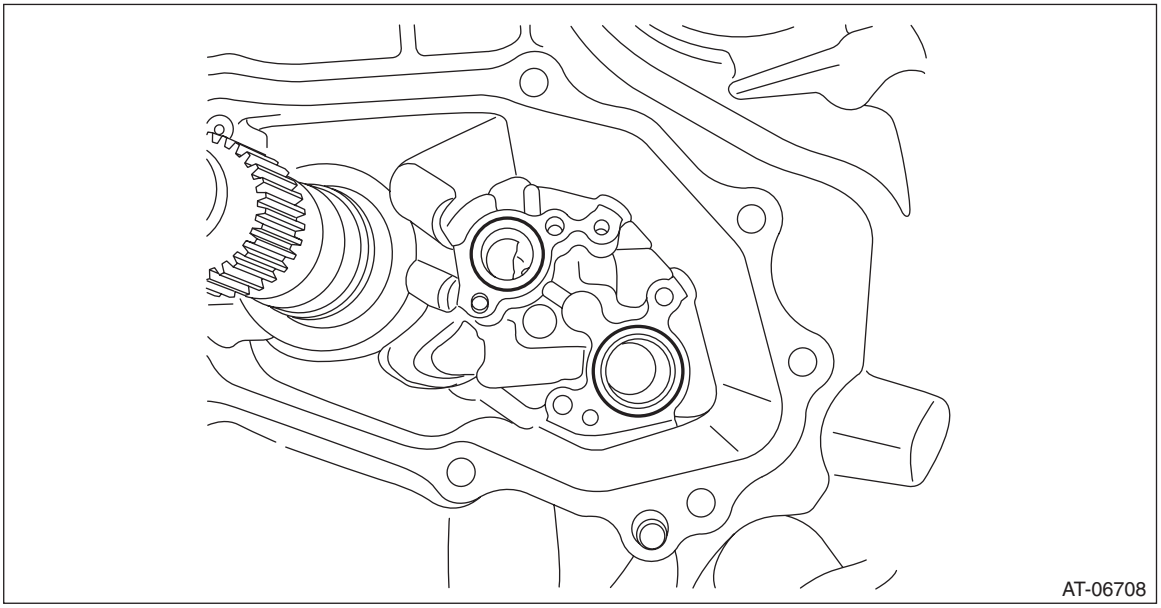
44.Oil Pump

A: REMOVAL

1) Remove the transmission assembly from the vehicle. <Ref. to CVT-58, REMOVAL, Automatic Transmission Assembly.>
2) Remove the torque converter assembly. <Ref. to CVT-152, REMOVAL, Torque Converter Assembly.>
3) Remove the oil pump chain cover. <Ref. to CVT-316, REMOVAL, Oil Pump Chain.>
4) Removal of the oil pump.
- Remove the oil pump. (Transmission serial No. 0047650 or earlier)
- Remove the oil pump and the plate. (Transmission serial No. 0047651 or later)



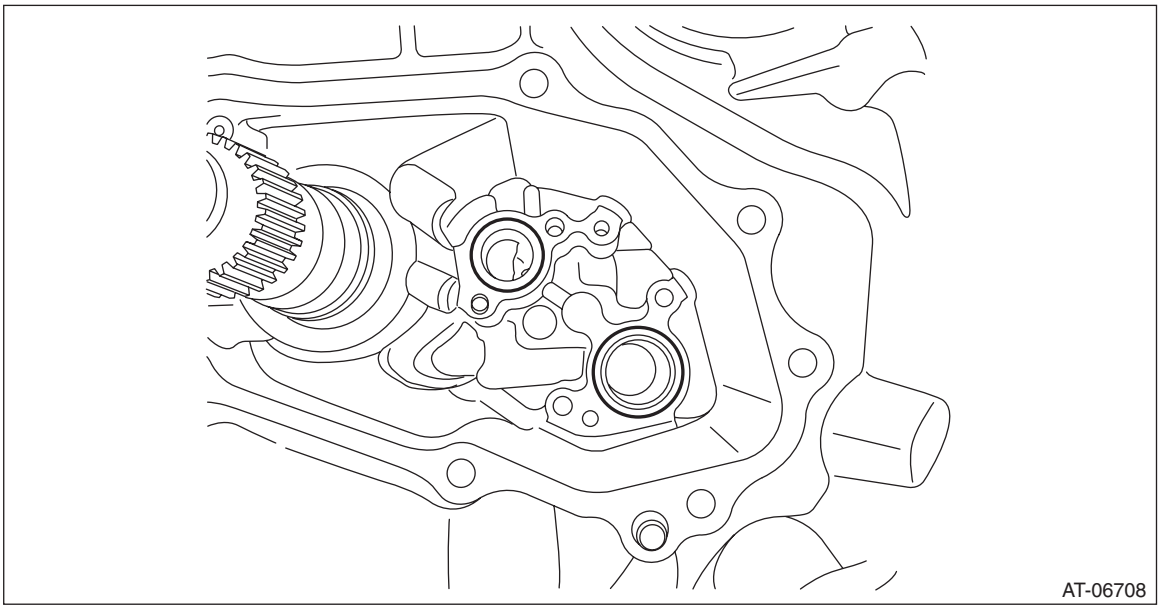
5) Remove the O-ring.



B: INSTALLATION

1) Install the O-ring.

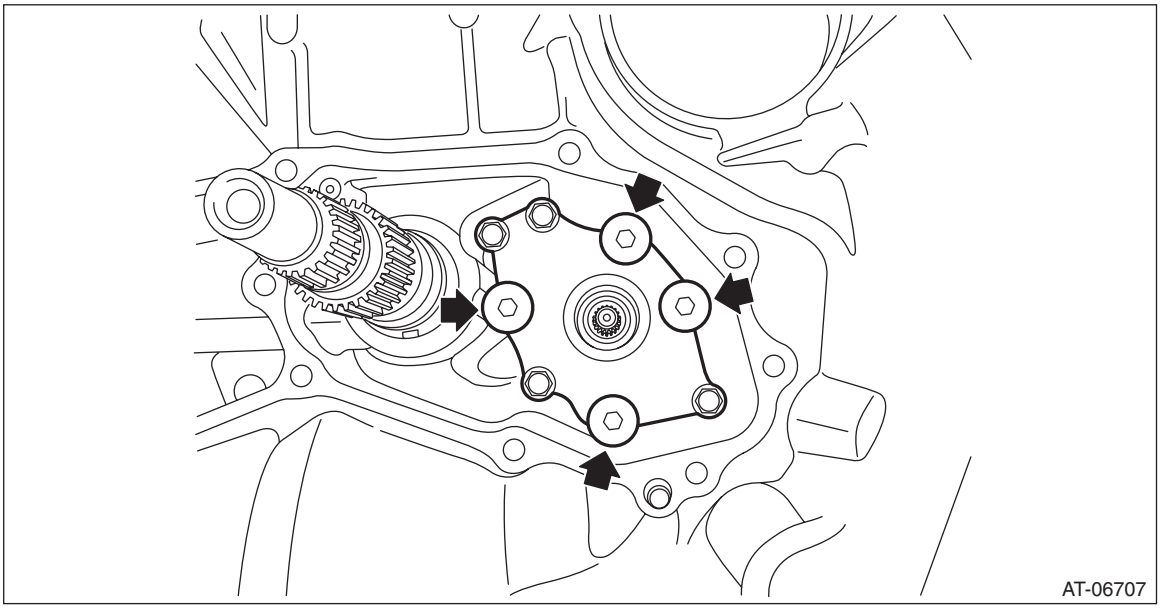
NOTE:
- Use new O-rings.
- Apply CVTF to the O-ring.



2) Installation of the oil pump.
- Install the oil pump. (Transmission serial No. 0047650 or earlier)
- Install the plate and the oil pump. (Transmission serial No. 0047651 or later)

NOTE:
Apply CVTF to the bolt.

Tightening torque:
8.5 N·m (0.9 kgf-m, 6.3 ft-lb)



3) Install the oil pump chain cover. <Ref. to CVT-319, INSTALLATION, Oil Pump Chain.>
4) Install the torque converter assembly. <Ref. to CVT-152, INSTALLATION, Torque Converter Assembly.>
5) Install the transmission assembly to the vehicle. <Ref. to CVT-69, INSTALLATION, Automatic Transmission Assembly.>

C: INSPECTION

Check the following items.
- Check the oil pump for damage and wear.
- Rotate the oil pump by hand, and check that it rotates smoothly.

1) Measure the secondary pressure. <Ref. to CVT-49, INSPECTION, Secondary Pressure (Line Pressure) Test.>
2) Remove the oil pan and oil strainer. <Ref. to CVT-112, REMOVAL, Control Valve Body.>
3) Check oil strainer for clogging.
When oil strainer has no clogging, replace the oil pump.

45.Converter Case

A: REMOVAL

1) Remove the transmission assembly from the vehicle. <Ref. to CVT-58, REMOVAL, Automatic Transmission Assembly.>
2) Remove the air breather hose. <Ref. to CVT-148, REMOVAL, Air Breather Hose.>
3) Remove the control valve body. <Ref. to CVT-112, REMOVAL, Control Valve Body.>
4) Remove the transmission harness. <Ref. to CVT-124, REMOVAL, Transmission Harness.>
5) Remove the turbine speed sensor. <Ref. to CVT-99, REMOVAL, Turbine Speed Sensor.>
6) Remove the secondary speed sensor. <Ref. to CVT-101, REMOVAL, Secondary Speed Sensor.>
7) Remove the primary speed sensor. <Ref. to CVT-103, REMOVAL, Primary Speed Sensor.>
8) Remove the inhibitor switch. <Ref. to CVT-94, REMOVAL, Inhibitor Switch.>
9) Remove the extension case. <Ref. to CVT-156, REMOVAL, Extension Case.>
10) Remove the transfer clutch assembly. <Ref. to CVT-160, REMOVAL, Transfer Clutch.>
11) Remove the transfer driven gear assembly. <Ref. to CVT-174, REMOVAL, Transfer Driven Gear.>
12) Remove the parking pawl. <Ref. to CVT-177, REMOVAL, Parking Pawl.>
13) Remove the reduction driven gear assembly. <Ref. to CVT-179, REMOVAL, Reduction Driven Gear.>
14) Remove the oil pan and oil strainer. <Ref. to CVT-108, REMOVAL, Oil Pan and Strainer.>
15) Remove the transmission control device. <Ref. to CVT-187, REMOVAL, Transmission Control Device.>
16) Remove the transmission case. <Ref. to CVT-193, REMOVAL, Transmission Case.>
17) Remove the reduction drive gear. <Ref. to CVT-209, REMOVAL, Reduction Drive Gear.>
18) Remove the primary pulley, secondary pulley and variator chain. <Ref. to CVT-213, REMOVAL, Primary Pulley and Secondary Pulley.>
19) Remove the reverse brake assembly. <Ref. to CVT-234, REMOVAL, Reverse Brake Assembly.>
20) Remove the forward clutch assembly. <Ref. to CVT-249, REMOVAL, Forward Clutch Assembly.>
21) Remove the drive pinion shaft assembly. <Ref. to CVT-268, REMOVAL, Drive Pinion Shaft Assembly.>
22) Remove the front differential assembly. <Ref. to CVT-298, REMOVAL, Front Differential Assembly.>
23) Remove the oil pump chain cover. <Ref. to CVT-316, REMOVAL, Oil Pump Chain.>
24) Remove the oil pump. <Ref. to CVT-325, REMOVAL, Oil Pump.>

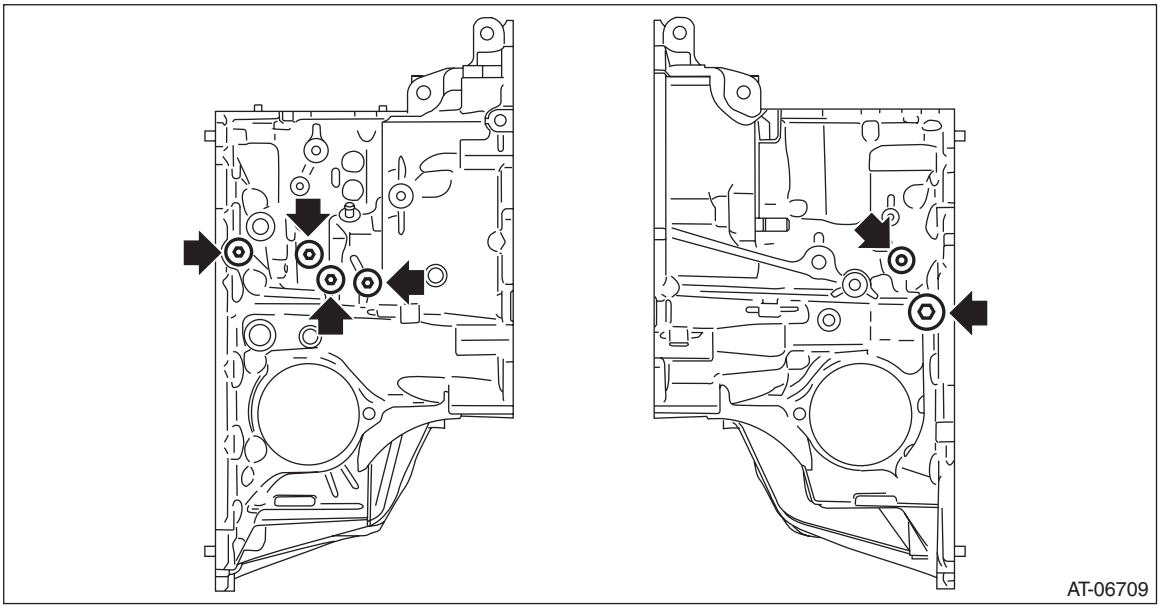
B: INSTALLATION

1) Install the oil pump. <Ref. to CVT-326, INSTALLATION, Oil Pump.>
2) Install the oil pump chain cover. <Ref. to CVT-319, INSTALLATION, Oil Pump Chain.>
3) Install the front differential assembly. <Ref. to CVT-300, INSTALLATION, Front Differential Assembly.>
4) Install the drive pinion shaft assembly. <Ref. to CVT-270, INSTALLATION, Drive Pinion Shaft Assembly.>
5) Install the forward clutch assembly. <Ref. to CVT-252, INSTALLATION, Forward Clutch Assembly.>
6) Install the reverse brake assembly. <Ref. to CVT-237, INSTALLATION, Reverse Brake Assembly.>
7) Install the primary pulley, secondary pulley and variator chain. <Ref. to CVT-220, INSTALLATION, Primary Pulley and Secondary Pulley.>
8) Install the reduction drive gear. <Ref. to CVT-210, INSTALLATION, Reduction Drive Gear.>
9) Install the transmission case. <Ref. to CVT-196, INSTALLATION, Transmission Case.>
10) Install the transmission control device. <Ref. to CVT-190, INSTALLATION, Transmission Control Device.>
11) Install the oil strainer and oil pan. <Ref. to CVT-109, INSTALLATION, Oil Pan and Strainer.>
12) Install the reduction driven gear assembly. <Ref. to CVT-179, INSTALLATION, Reduction Driven Gear.>
13) Install the transfer driven gear assembly. <Ref. to CVT-175, INSTALLATION, Transfer Driven Gear.>
14) Install the transfer clutch assembly. <Ref. to CVT-162, INSTALLATION, Transfer Clutch.>
15) Install the parking pawl. <Ref. to CVT-178, INSTALLATION, Parking Pawl.>
16) Install the extension case. <Ref. to CVT-157, INSTALLATION, Extension Case.>
17) Install the inhibitor switch. <Ref. to CVT-96, INSTALLATION, Inhibitor Switch.>
18) Install the secondary speed sensor. <Ref. to CVT-101, INSTALLATION, Secondary Speed Sensor.>
19) Install the primary speed sensor. <Ref. to CVT-104, INSTALLATION, Primary Speed Sensor.>
20) Install the turbine speed sensor. <Ref. to CVT-99, INSTALLATION, Turbine Speed Sensor.>
21) Install the transmission harness. <Ref. to CVT-130, INSTALLATION, Transmission Harness.>
22) Install the control valve body. <Ref. to CVT-117, INSTALLATION, Control Valve Body.>

23) Install the air breather hose. <Ref. to CVT-149, INSTALLATION, Air Breather Hose.>
24) Install the transmission assembly to the vehicle. <Ref. to CVT-69, INSTALLATION, Automatic Transmission Assembly.>

C: DISASSEMBLY

1) Remove the pitching stopper bracket and transmission radio ground cord, if mounted.
2) Remove the filler plug, oil drain plug and overflow drain plug. <Ref. to CVT-42, REPLACEMENT, Differential Gear Oil.>
3) Remove all plugs.



D: ASSEMBLY

1) Install the oil drain plug.

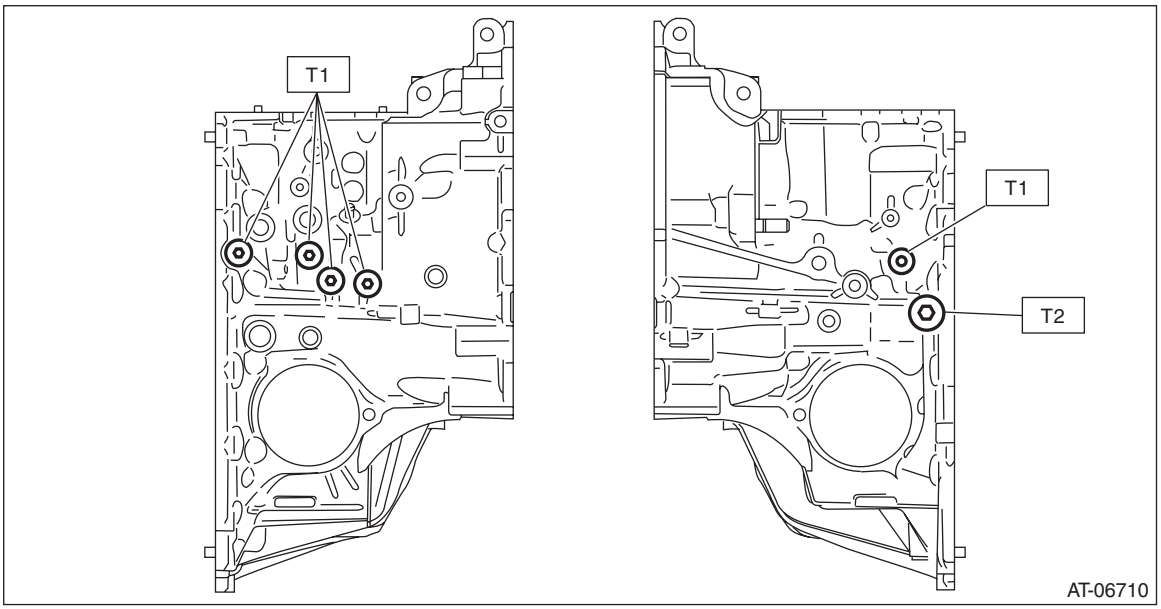
Tightening torque:
70 N·m (7.1 kgf-m, 51.6 ft-lb)
2) Install the overflow drain plug.

NOTE:
Overflow plug of differential gear oil is temporarily attached.

3) Install all plugs.

NOTE:
Use new O-rings.

Tightening torque:
T1: 25 N·m (2.5 kgf-m, 18.4 ft-lb)
T2: 50 N·m (5.1 kgf-m, 36.9 ft-lb)



4) Install the pitching stopper bracket and transmission radio ground cord.

Tightening torque:
41 N·m (4.2 kgf-m, 30.2 ft-lb)

E: INSPECTION

- Check for leakage of CVTF from the connection between converter case and transmission case.
- Check there is no damage or cracks on the converter case.

46.Diagnostics with Phenomenon

A: INSPECTION

Symptoms	Faulty parts
Stall speed is low after warming-up, with select lever in “D” or “R” range.	Engine control system
Vehicle does not move despite engine speed rising up, with select lever in “D” or “R” range.	• Engine control system • Select cable • CVTF • Secondary pressure circuit • Pulley, gear and variator chain • Forward/reverse changeover section • TCM • Control valve body • Inhibitor switch
Vehicle does not move by engine stall, with select lever in “D” or “R” range.	• Parking mechanism • Select cable • Bearing • Forward/reverse changeover section
Excessive shock occurs at starting, with select lever in “D” or “R” range.	• Secondary pressure circuit • Pulley, gear and variator chain
Acceleration speed from standstill is insufficient, with select lever in “D” or “R” range.	• Control valve body • Forward/reverse changeover section
Engine speed suddenly rises up during driving, with select lever in “D” or “R” range.	• Control valve body • Secondary pressure circuit • Primary pressure circuit
Vibration occurs during driving, with select lever in “D” or “R” range.	• Secondary pressure circuit • Primary pressure circuit • Forward/reverse changeover section • Pulley and variator chain • Torque converter ASSY • Hydraulic pressure circuit to torque converter • Control valve body
Sudden braking occurs during driving, with select lever in “D” or “R” range.	• Secondary pressure circuit • Primary pressure circuit • Control valve body
During deceleration, lockup clutch does not disengage until just before halting, with select lever in “D” or “R” range.	• Control valve body • Torque converter ASSY
Engine stalls with vehicle at a standstill, with select lever in “D” or “R” range.	• Engine control system • Control valve body
Excessive lockup shock occurs during driving, with select lever in “D” range.	Control valve body
Slipping occurs at lockup, or lockup does not occur during driving, with select lever in “D” range.	• Control valve body • Lockup hydraulic line • Torque converter ASSY
Excessive shift shock occurs when shifting the select lever from “N” range to “D” range, or from “N” range to “R” range.	• Inhibitor switch • Control valve body • Forward/reverse changeover section
Vehicle does not keep at standstill with select lever in “P” range, or parking cannot be released when shifting from “P” range to another range.	• Select cable • Parking mechanism
Select lever does not shift smoothly.	• Select cable • Inhibitor switch • Detent spring • Manual plate

CONTINUOUSLY VARIABLE TRANSMISSION (DIAGNOSTICS)

CVT(diag)

		Page
1.	Basic Diagnostic Procedure	2
2.	Check List for Interview	4
3.	General Description	5
4.	Electrical Component Location	7
5.	Transmission Control Module (TCM) I/O Signal	11
6.	Subaru Select Monitor	15
7.	Read Current Data	16
8.	Read Diagnostic Trouble Code (DTC)	17
9.	Clear Memory Mode	18
10.	Inspection Mode	19
11.	Learning Control	20
12.	AT OIL TEMP Warning Light Display	22
13.	AWD Warning Light Display	25
14.	Diagnostic Procedure for Subaru Select Monitor Communication	28
15.	List of Diagnostic Trouble Code (DTC)	32
16.	Diagnostic Procedure with Diagnostic Trouble Code (DTC)	35
17.	Diagnostic Procedure without Diagnostic Trouble Code (DTC)	87
18.	Diagnostics with Phenomenon	89

1. Basic Diagnostic Procedure

A: PROCEDURE

	Step	Check	Yes	No
1	**CHECK PRE-INSPECTION.** 1) Ask the customer when and how the trouble occurred using the interview check list. <Ref. to CVT(diag)-4, Check List for Interview.> 2) Before performing diagnostics, check the following items which might affect CVT problems. • General inspection <Ref. to CVT(diag)-5, INSPECTION, General Description.> • Disconnection of harness connector • Visual check for harness damage • Oil leakage • Stall speed test <Ref. to CVT-47, Stall Test.> • Secondary pressure test <Ref. to CVT-49, Secondary Pressure (Line Pressure) Test.> • Transfer clutch pressure test <Ref. to CVT-52, Transfer Clutch Pressure Test.> • Time lag test <Ref. to CVT-48, Time Lag Test.> • Road test <Ref. to CVT-46, Road Test.> • Inhibitor switch <Ref. to CVT-92, Inhibitor Switch.>	Is the item that is thought to influence the CVT problem working properly?	Go to step **2**.	Repair the items which may be affecting the CVT trouble.
2	**CHECK AT OIL TEMP LIGHT.** Turn the ignition switch to ON and wait for at least 2 seconds.	Does the AT OIL TEMP light illuminate?	Go to step **3**.	Check the AT OIL TEMP light.
3	**CHECK AT OIL TEMP LIGHT.** Start the engine and wait for 2 seconds or more.	Does the AT OIL TEMP light blink?	Go to step **4**.	Go to step **6**.
4	**CHECK FOR ANY OTHER DTC ON DISPLAY.** Read the DTC. NOTE: If the communication function of Subaru Select Monitor cannot be executed normally, check the communication circuit. <Ref. to CVT(diag)-28, COMMUNICATION FOR INITIALIZING IMPOSSIBLE, Diagnostic Procedure for Subaru Select Monitor Communication.>	Is DTC displayed on Subaru Select Monitor?	Record all DTC. Go to step **5**.	Go to step **6**.
5	**CHECK FREEZE FRAME DATA.** Using the Subaru Select Monitor, check the Freeze Frame Data.	Are freeze frame data recorded?	Record the freeze frame data. Go to step **7**.	Go to step **7**.
6	**PERFORM GENERAL DIAGNOSTICS.** 1) Inspect using “Diagnostic Procedure without Diagnostic Trouble Code (DTC)”. <Ref. to CVT(diag)-87, Diagnostic Procedure without Diagnostic Trouble Code (DTC).> 2) Inspect using “Diagnostics with Phenomenon”. <Ref. to CVT(diag)-89, Diagnostics with Phenomenon.> 3) Perform the Inspection Mode. <Ref. to CVT(diag)-19, Inspection Mode.> 4) Read the DTC.	Is DTC displayed on Subaru Select Monitor?	Go to step **7**.	Finish the diagnosis.

	Step	Check	Yes	No
7	**PERFORM DIAGNOSIS.** 1) Inspect by referring to “Diagnostic Procedure with Diagnostic Trouble Code (DTC)”. <Ref. to CVT(diag)-35, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> NOTE: For the DTC table, refer to “List of Diagnostic Trouble Code (DTC)”. <Ref. to CVT(diag)-32, List of Diagnostic Trouble Code (DTC).> 2) Repair the trouble cause. 3) Perform the Clear Memory Mode. 4) Perform the Inspection Mode. <Ref. to CVT(diag)-19, Inspection Mode.> 5) Read the DTC.	Is DTC displayed on Subaru Select Monitor?	Inspect by referring to “Diagnostic Procedure with Diagnostic Trouble Code (DTC)”. <Ref. to CVT(diag)-35, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Finish the diagnosis.

2. Check List for Interview

A: CHECK

Check the following items when a problem has occurred.

NOTE:
Use copies of this page for interviewing customers.

Customer's name			
Date of purchase			
Date of repair			
Transmission model	Transmission	V.I.N.	
Odometer reading	km (miles)		
Frequency	❑ Continuous ❑ Intermittent (times/day)		
Weather	❑ Fine ❑ Cloudy ❑ Rainy ❑ Snowy ❑ Other ( )		
Place	❑ Highland ❑ Suburbs ❑ Inner city ❑ Uphill ❑ Downhill ❑ Rough road ❑ Other ( )		
Ambient air temperature	❑ Hot ❑ Warm ❑ Cool ❑ Cold		
Vehicle speed	km/h (MPH)		
AT OIL TEMP light	❑ Blinks continuously	❑ Does not blink	
Select lever position	❑ P ❑ R ❑ N ❑ D ❑ Manual mode ❑ L		
Driving condition	❑ Not affected ❑ At racing ❑ While decelerating	❑ At starting ❑ While accelerating ❑ While turning (❑ RH/❑ LH)	❑ While idling ❑ When cruising (Vehicle speed km/h) ❑ Immediately after starting the engine
Manual mode	❑ ON ❑ OFF		
Symptoms	❑ Vehicle does not move (❑ Any position ❑ Particular position)		
	❑ Vehicle does not move (no load racing condition as in N range)		
	❑ Vehicle does not move (engine speed does not increase, felt as stall condition)		
	❑ Noise or vibration (Describe concretely:)		
	❑ Shock felt at N → D selection (seconds after shifting, when engine cold or after warm-up)		
	❑ Shock felt at N → R selection (seconds after shifting, when engine cold or after warm-up)		
	❑ Shifting is wrong (Describe concretely:)		
	❑ Shock or judder during driving		
	❑ Fails to accelerate.		
	❑ Engine speed increases abruptly during driving		
	❑ Shock or judder during standing start		
	❑ Select lever does not move		
	❑ Other ( )		

3. General Description

A: CAUTION

1. SUPPLEMENTAL RESTRAINT SYSTEM "AIRBAG"

The airbag system wiring harness is routed near the TCM.

CAUTION:
• All the airbag system wiring harnesses and connectors are colored yellow. Do not use an electric test equipment to check these circuits.
• Be careful not to damage the airbag system wiring harness when performing diagnostics or servicing the TCM.

2. MEASUREMENT

When measuring the voltage and resistance of the ECM, TCM or each sensor, use a tapered pin with a diameter of less than 0.64 mm (0.025 in) in order to avoid poor contact. Do not insert a pin of more than 0.65 mm (0.026 in) diameter.

B: INSPECTION

1. BATTERY

Measure the battery voltage and specific gravity of the electrolyte.

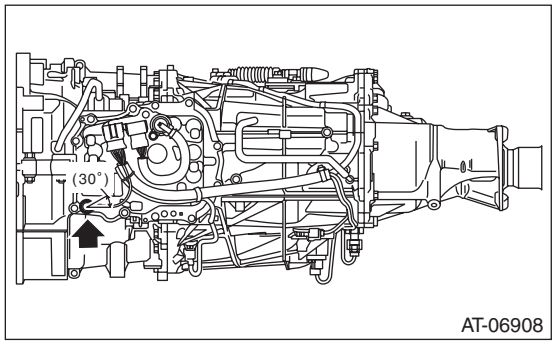
Standard voltage: 12 V or more

Specific gravity: 1.260 or more

2. TRANSMISSION GROUND

Make sure that the ground terminal bolt is tightened securely.

Tightening torque:
14 N·m (1.4 kgf-m, 10.3 ft-lb)



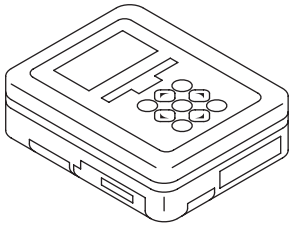
3. OPERATION OF SHIFT SELECT LEVER

Make sure there is no noise, dragging or contact pattern in each select lever range.

WARNING:
Stop the engine while checking operation of the select lever.

C: PREPARATION TOOL

1. SPECIAL TOOL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST1B022XU0	1B022XU0	SUBARU SELECT MONITOR III KIT	Used for troubleshooting the electrical system.

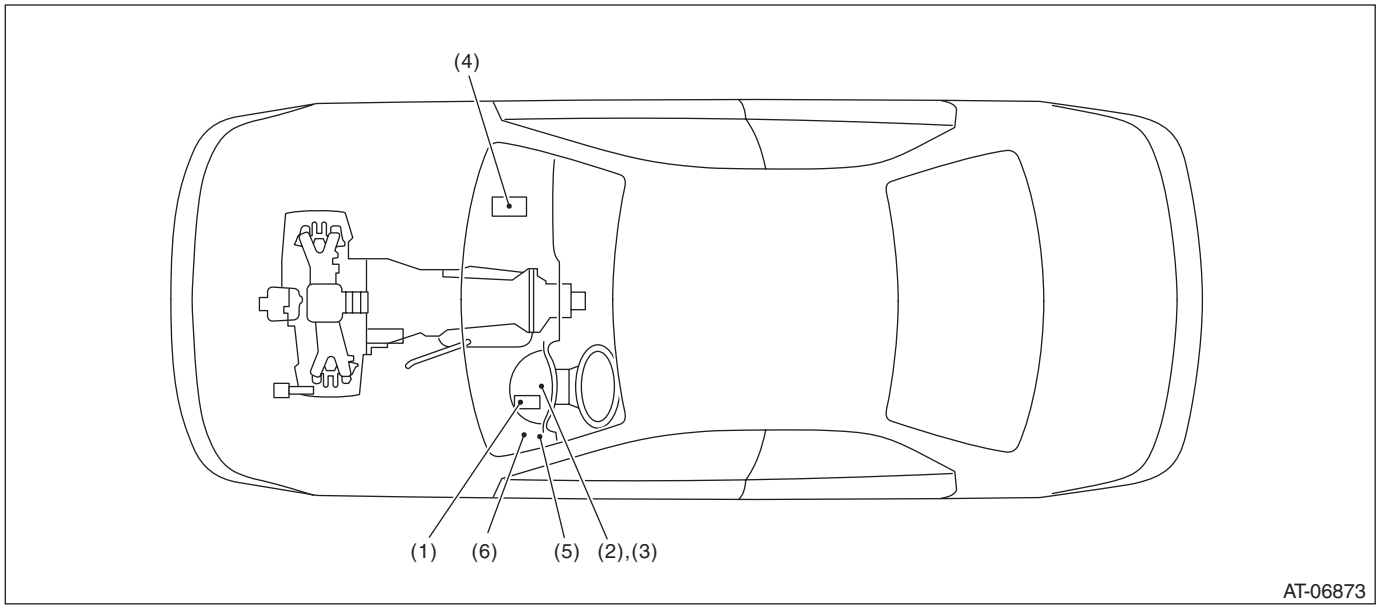
2. GENERAL TOOL

TOOL NAME	REMARKS
Circuit tester	Used for measuring resistance, voltage and current.
Oscilloscope	Used for measuring the sensor.

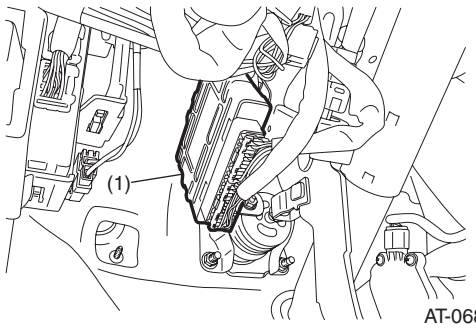
4. Electrical Component Location

A: LOCATION

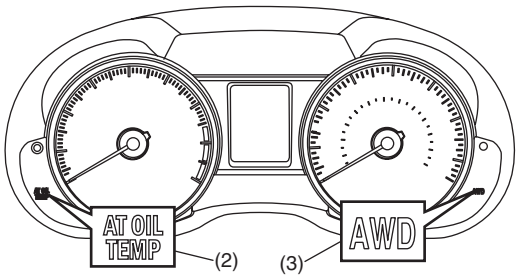
1. CONTROL MODULE



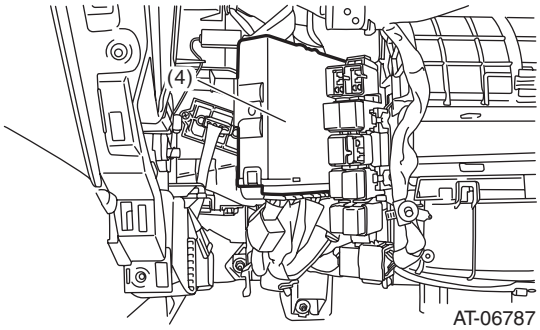
(1)	Transmission control module (TCM)	(3)	AWD light	(5)	Body integrated unit
(2)	AT OIL TEMP light	(4)	Engine control module (ECM)	(6)	Data link connector



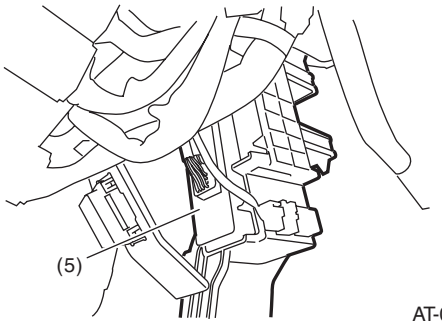
AT-06871



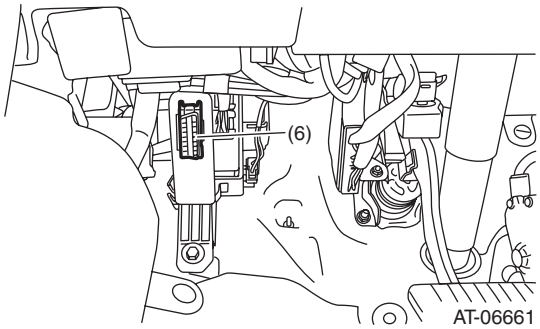
AT-06788



AT-06787

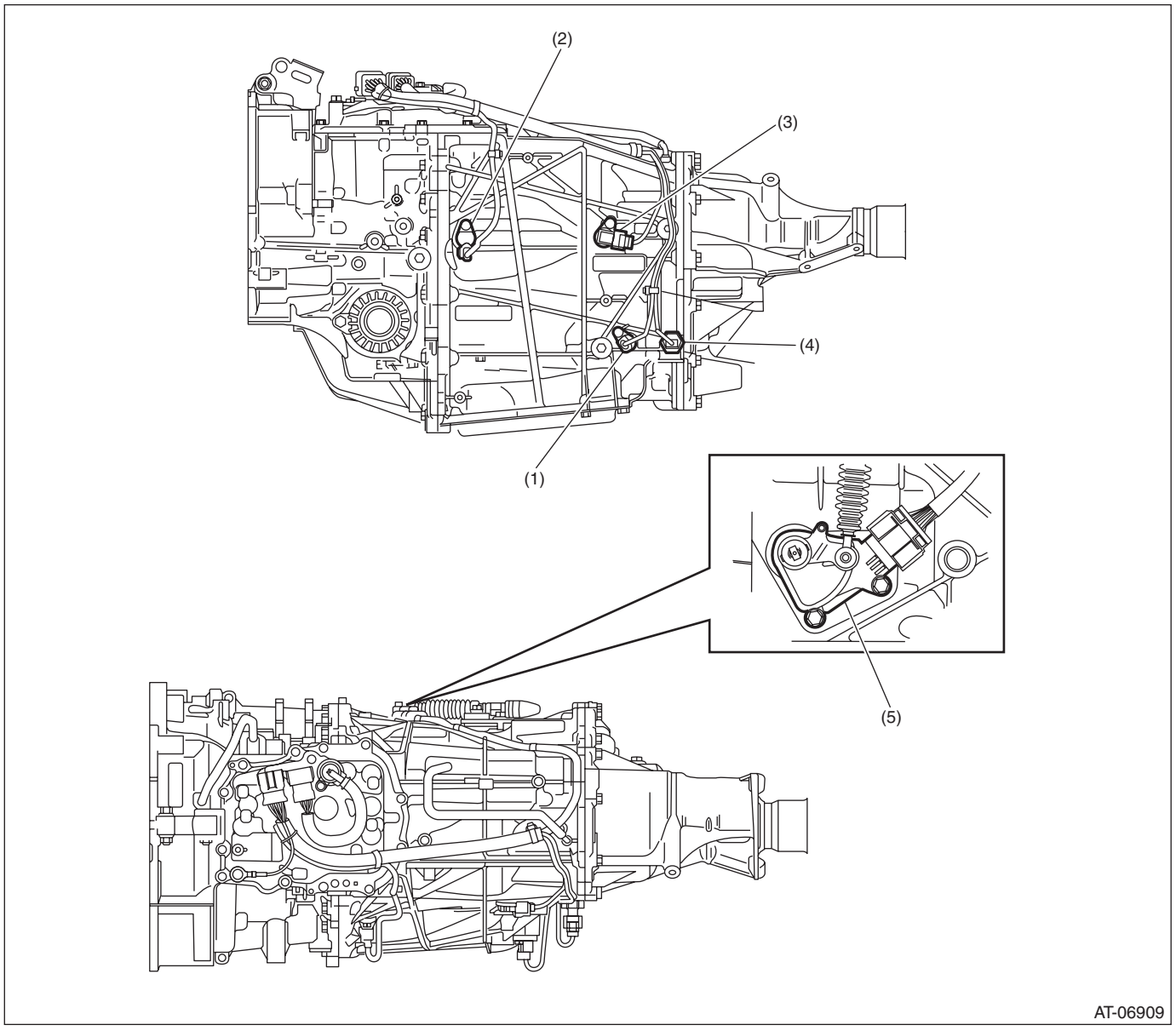


AT-06910



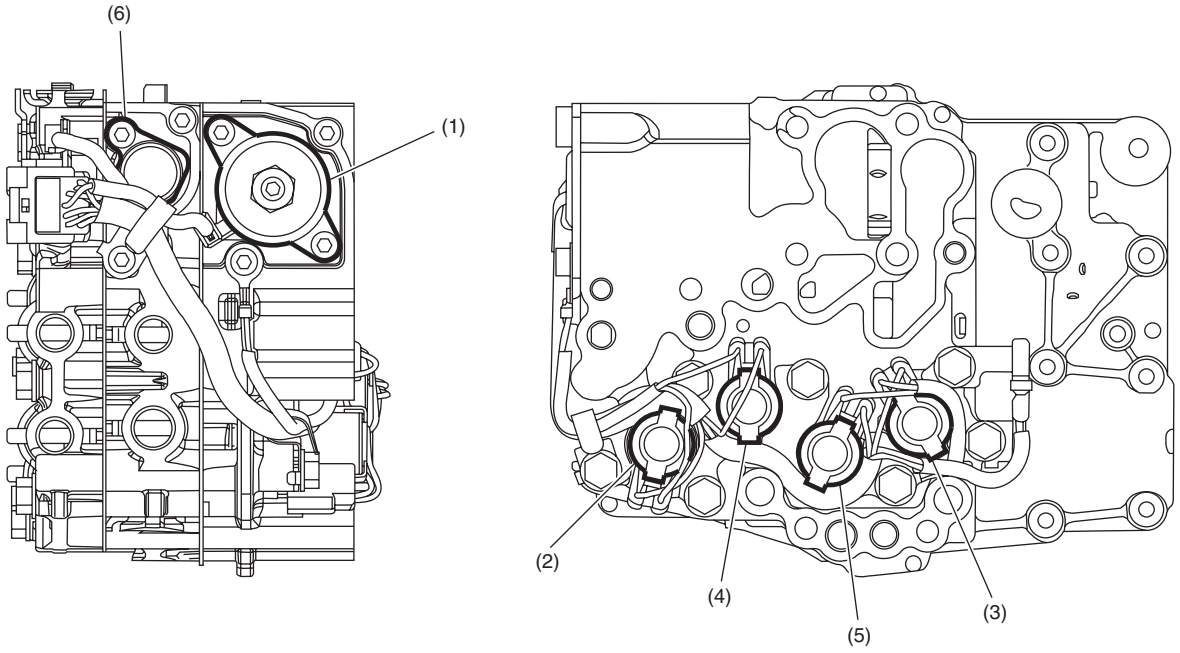
AT-06661

2. SENSOR



(1) Secondary speed sensor
(2) Turbine speed sensor
(3) Primary speed sensor
(4) Secondary pressure sensor
(5) Inhibitor switch

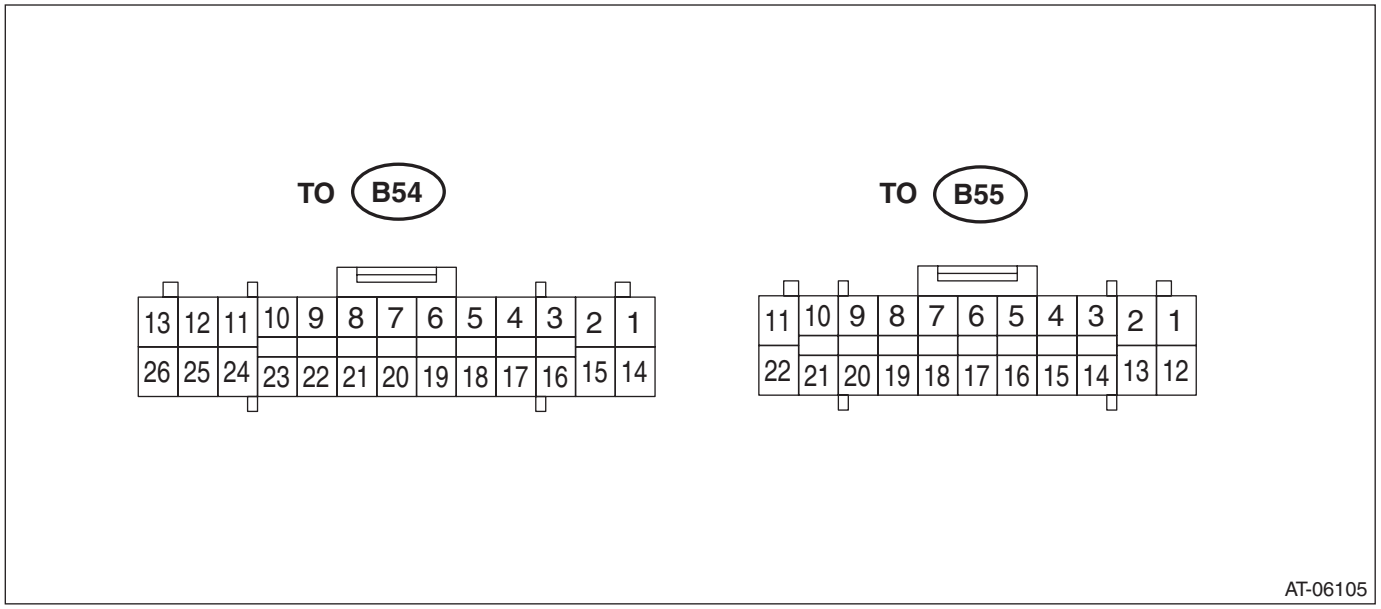
3. SOLENOID



(1) Secondary solenoid
(2) AWD solenoid
(3) Lock-up duty solenoid
(4) Primary DOWN solenoid
(5) Primary UP solenoid
(6) F&R solenoid

5. Transmission Control Module (TCM) I/O Signal

A: ELECTRICAL SPECIFICATION



NOTE:
Measure after warming up.

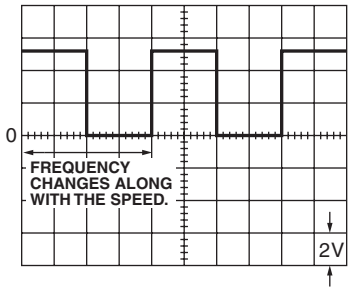
Item	Connector No.	Terminal No.	Measuring condition	Measured value	Resistance between terminal and chassis ground	Remarks
Backup power supply	B55	1	—	10 — 13 V	—	
Ignition power supply	B55	21	—	10 — 13 V	—	
Main power supply	B55	11	—	10 — 13 V	—	
Main power supply	B55	2	—	10 — 13 V	—	
Main power supply	B55	22	—	10 — 13 V	—	
Manual mode switch	B55	4	Manual mode switch ON	Less than 1 V	—	
			Manual mode switch OFF	8 V or more	—	
Manual mode UP switch	B55	5	Manual mode UP switch ON	Less than 1 V	—	
			Manual mode UP switch OFF	8 V or more	—	
Manual mode DOWN switch	B55	16	Manual mode DOWN switch ON	Less than 1 V	—	
			Manual mode DOWN switch OFF	8 V or more	—	
Stop light switch	B55	13	Stop light switch ON	8 V or more	—	
			Stop light switch OFF	Less than 1 V	—	
P range switch	B54	5	P range	Less than 1 V	—	
			Except for P range	8 V or more	—	
R range switch	B54	18	R range	Less than 1 V	—	
			Except for R range	8 V or more	—	
N range switch	B54	9	N range	Less than 1 V	—	
			Except for N range	8 V or more	—	

Item	Connector No.	Terminal No.	Measuring condition	Measured value	Resistance between terminal and chassis ground	Remarks
D range switch	B54	22	D range	Less than 1 V	—	
			Except for D range	8 V or more	—	
ATF temperature sensor	B54	3	ATF temperature at 20°C (68°F)	Approx. 2.5 V	Approx. 2.5 kΩ	
			ATF temperature at 80°C (176°F)	Approx. 0.7 V	Approx. 330 Ω	
ATF temperature sensor GND	B54	16	Always	Approx. 0 V	—	
Secondary pressure sensor power supply output	B54	2	Ignition switch ON	5 V	—	
Secondary pressure sensor	B54	17	Ignition switch ON, engine OFF	Approx. 0.5 V (0 MPa)	—	Value increases with increase of engine load. (0.5 — 4.5 V)
			Ignition switch ON, engine ON	Approx. 1.0 V (1.0 MPa)	—	
Secondary pressure sensor GND	B54	15	Always	Approx. 0 V	—	
Primary speed sensor	B54	6	While driving	0 or 5 V	—	Refer to the waveform (sensor)
Secondary speed sensor	B54	7	While driving	0 or 5 V	—	Refer to the waveform (sensor)
Turbine speed sensor	B54	20	Engine ON, “P” or “N” range	0 or 5 V	—	Refer to the waveform (sensor)
Self shut output	B55	20	For three seconds after ignition ON and OFF	Less than 1 V	—	
			Ignition switch OFF	8 V or more		
F&R solenoid	B54	11	Engine ON	Refer to the waveform (solenoid (1))	Approx. 4 — 6 Ω	Resistance value at 20°C (68°F) Value is higher as the temperature increase.
Secondary solenoid	B54	12	Engine ON	Refer to the waveform (solenoid (2))	Approx. 5 — 7 Ω	Resistance value at 20°C (68°F) Value is higher as the temperature increase.
Primary UP solenoid	B54	24	Engine ON, while UP shifting	Refer to the waveform (solenoid (3))	Approx. 10 — 13.5 Ω	Resistance value at 20°C (68°F) Value is higher as the temperature increase.
Primary DOWN solenoid	B54	25	Engine ON, while DOWN shifting	Refer to the waveform (solenoid (4))	Approx. 10 — 13.5 Ω	Resistance value at 20°C (68°F) Value is higher as the temperature increase.
Lock-up duty solenoid	B54	26	Lock-up ON	Refer to the waveform (solenoid (5))	Approx. 10 — 13.5 Ω	Resistance value at 20°C (68°F) Value is higher as the temperature increase.
AWD solenoid	B54	13	Engine ON, “P” or “N” range	Refer to the waveform (solenoid (6))	Approx. 2 — 4.5 Ω	Resistance value at 20°C (68°F) Value is higher as the temperature increase.
			Engine ON, “D” range, brake ON	Refer to the waveform (solenoid (7))		

Item	Connector No.	Terminal No.	Measuring condition	Measured value	Resistance between terminal and chassis ground	Remarks
CAN communication line (+)	B55	18	—	—	—	
CAN communication line (–)	B55	17	—	—	—	
GND	B54	1	Always	Approx. 0 V	—	
GND	B54	14	Always	Approx. 0 V	—	
Data link signal (Subaru Select Monitor)	B55	19	Ignition switch ON	8 V or more	—	
			Ignition switch OFF	Less than 1 V		

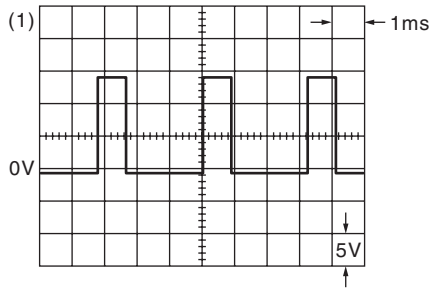
B: WAVEFORM

1. SENSOR

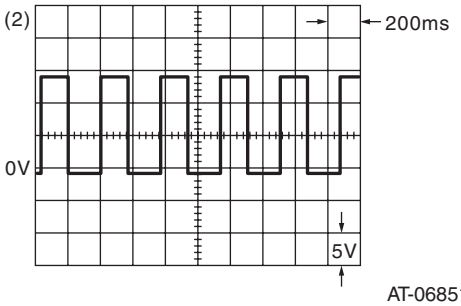


AT-04690

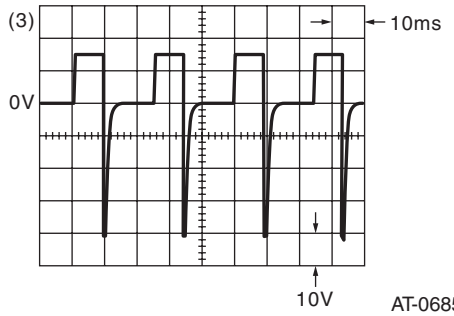
2. SOLENOID



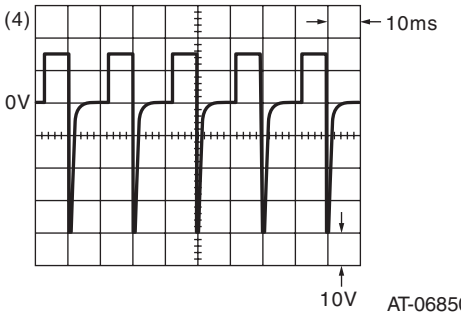
AT-06855



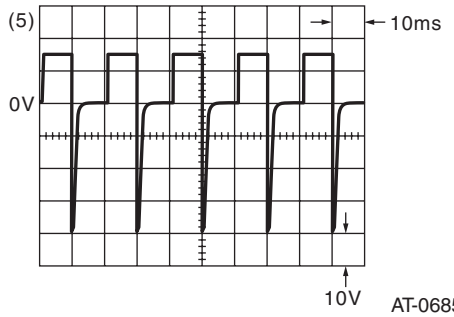
AT-06851



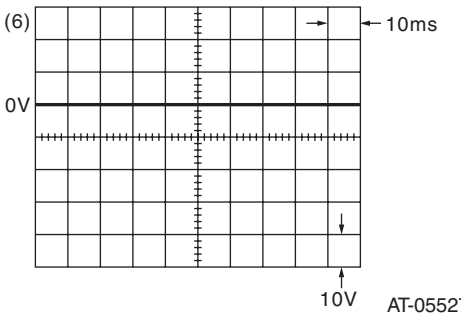
AT-06852



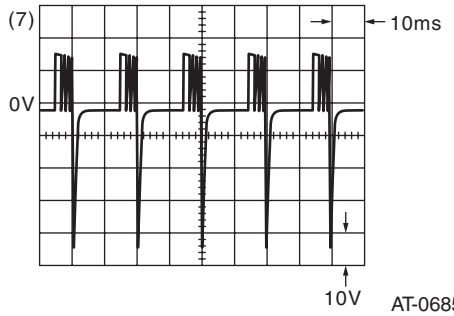
AT-06850



AT-06853



AT-05527



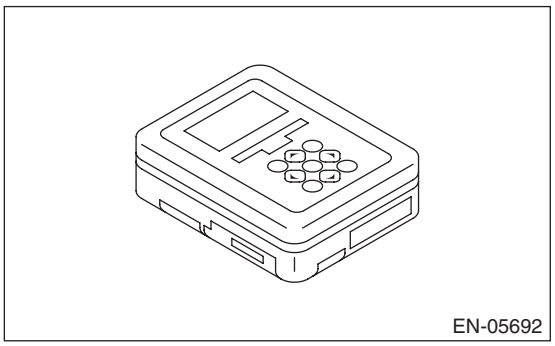
AT-06854

SUBARU.

6. Subaru Select Monitor

A: OPERATION

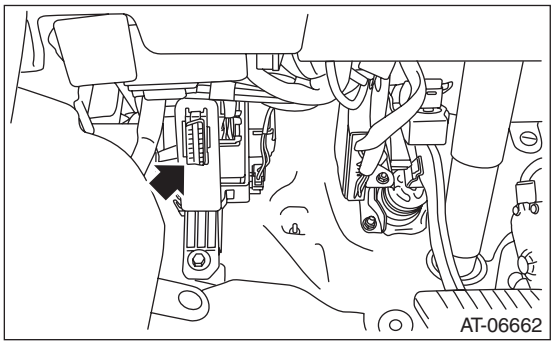
1) Prepare the Subaru Select Monitor kit.



2) Prepare PC with Subaru Select Monitor installed.
3) Connect the USB cable to SDI (Subaru Diagnosis Interface) and USB port on the personal computer (dedicated port for the Subaru Select Monitor).

NOTE:
The dedicated port for the Subaru Select Monitor means the USB port which was used to install the Subaru Select Monitor.

4) Connect the diagnosis cable to SDI.
5) Connect SDI to data link connector located in the lower portion of the instrument panel (on the driver's side).



CAUTION:
Do not connect scan tools other than the Subaru Select Monitor.

6) Start the PC.
7) Turn the ignition switch to ON.
8) Run the "PC application for Subaru Select Monitor".

7. Read Current Data

A: OPERATION

For detailed operation procedures, refer to “PC application help for Subaru Select Monitor”.

- The support data list is as follows.

Item	Display	Unit of measure
Engine speed signal	Engine Speed	rpm
Battery voltage	Battery Voltage	V
Accelerator position sensor	Accel. Opening Angle	%
Vehicle speed converted from secondary speed sensor signal	Front Wheel Speed	km/h or MPH
Lock-up duty solenoid set duty ratio	Lock Up Duty Ratio	%
AWD solenoid set duty ratio	Transfer Duty Ratio	%
Turbine speed sensor signal	Turbine Revolution Speed	rpm
ATF temperature sensor signal	ATF Temp.	°C or °F
Manual mode switch signal	Tiptronic Mode Switch	ON or OFF
Manual mode down switch signal	Down Switch	ON or OFF
Stop light switch signal	Stop Light Switch	ON or OFF
Manual mode up switch signal	Up Switch	ON or OFF
Drive range signal	D Range Signal	ON or OFF
Reverse range signal	R Range Signal	ON or OFF
AT OIL TEMP light 2 Hz blink condition	Diagnosis Lamp	ON or OFF
AT OIL TEMP light ON condition	ATF Temperature Lamp	ON or OFF
Parking range signal	P Range	ON or OFF
Neutral range signal	N Range	ON or OFF
AT learning mode condition	AT learning	Completed or Not Completed
Secondary speed sensor signal	Secondary Rev Speed	rpm
Secondary fluid pressure sensor signal	Actual Secondary Pressure	MPa
Secondary solenoid set current	Secondary Set Current	mA
Secondary solenoid actual current	Secondary Actual Current	mA
Gear ratio	Actual Gear Ratio	—
Shift step in manual mode	Shift Step in Manual Mode	—
Primary UP solenoid set duty ratio	Primary UP Duty	%
Primary DOWN solenoid set duty ratio	Primary DOWN Duty	%
F&R solenoid set current	F&R Linear Solenoid Set Current	mA
F&R solenoid actual current	F&R Linear Solenoid Actual Current	mA
Primary speed sensor signal	Primary Pulley Speed	rpm
L range signal	L-range	ON or OFF

8. Read Diagnostic Trouble Code (DTC)

A: OPERATION

1) Using the Subaru Select Monitor, on the «Main Menu» display, select {Each System Check}.
2) On «System Selection Menu» display, select {Transmission Control System}.
3) After transmission type information is displayed, select [OK].
4) On «Transmission Diagnosis» display, select {Diagnostic Code(s) Display}.
5) On «Diagnostic Code(s) Display» display, select {Temporary Diagnostic Code(s)} or {Memorized Diagnostic Code(s)}.

NOTE:
- For details concerning the work procedure, refer to the “PC application help for Subaru Select Monitor”.
- For details concerning DTC, refer to List of Diagnostic Trouble Code (DTC). <Ref. to CVT(diag)-32, List of Diagnostic Trouble Code (DTC).>

9. Clear Memory Mode

A: OPERATION

1) Shift the select lever to “P” range.
2) Using the Subaru Select Monitor, on the «Main Menu» display, select {Each System Check}.
3) On «System Selection Menu» display, select {Transmission Control System}.
4) After transmission type information is displayed, select [OK].
5) On «Transmission Diagnosis» display, select {Clear Memory}.
6) When «Done Turn Ignition Switch OFF» is displayed, select [OK].
7) Turn the ignition switch to OFF. To turn the ignition switch to ON again, wait for 10 seconds or more.
8) Turn the Subaru Select Monitor to OFF.

CAUTION:
• If {Clear Memories 2} is executed, learned control memory are cleared.
• If {Clear Memories 2} is executed, perform learning. <Ref. to CVT(diag)-20, Learning Control.>

10.Inspection Mode

A: PROCEDURE

<Ref. to CVT-46, Road Test.>

11.Learning Control

A: GENERAL DESCRIPTION

• Follow the messages displayed on the Subaru Select Monitor when working.
• When the following work is performed, perform learning for the transmission.
Replacement of TCM/Replacement or disassembly of transmission assembly/Replacement of control valve body/Performing “Clear Memories 2”.

B: PROCEDURE

1. PREPARATION FOR LEARNING

1) Warm up or cool down until the ATF temperature displayed on the Subaru Select Monitor is 40 — 65°C (104 — 149°F).
2) After stopping the vehicle, shift the select lever to “P” range.
3) Fully apply the parking brake.
4) Lift up the vehicle.

CAUTION:
While working, be sure to keep the lower edge of the tires 30 cm or more above the ground as vehicle will vibrate.
5) Connect the Subaru Select Monitor to data link connector.
6) Turn the ignition switch to ON.
7) Turn off all switches causing an electrical load, such as headlights, A/C, seat heater and rear defogger, etc.

2. SIMPLE LEARNING

NOTE:
Simple learning is performed with the vehicle lifted, without actually running the vehicle.

CAUTION:
Do not turn the power of the Subaru Select Monitor OFF during work, and do not disconnect the data link connector.
1) Select {AT related learning & inspecting mode} in the «Transmission Diagnosis» display screen of the Subaru Select Monitor.
2) Select {AT learning mode} in the «AT related learning & inspecting mode» screen of the Subaru Select Monitor.
3) Follow the messages displayed on the Subaru Select Monitor screen when working.

NOTE:
During AT learning in progress, AT OIL TEMP light in the combination meter starts flashing at 2 Hz and the learning operation starts. The following message is displayed on the screen when the AT OIL TEMP light which was flashing at 2 Hz turns off.

4) When «AT learning normally ended.» is displayed, simple AT learning is completed.

NOTE:
- If communication error occurs during learning, retry the “AT learning mode” from the beginning.
- If the message «Execute AT learning again after fixing troubles of the vehicle» appears, select [OK] and display the DTC list. After repairing the locations indicated by the DTC, start the “AT learning mode” over from the beginning.
- When communication error occurs during learning, select lever does not shift occasionally. If select lever does not shift, turn the ignition switch to OFF before operating the select lever.
- If the message «AT learning ended abnormally.» is displayed, start the “AT learning mode” over from the beginning.

Message	Main causes for abnormal termination
«AT learning ended abnormally.»	• Fault is detected during AT learning. • The accelerator pedal is depressed during AT learning. • An unspecified operation was performed during AT learning • ATF temperature becomes out of specification during AT learning. • Battery voltage is low. • Malfunction indicator light illuminates. • Parking brake not applied strongly enough. • Brake pedal is not fully depressed. • Abnormal idle speed increase, etc.

- For detailed operation procedures, refer to “PC application help for Subaru Select Monitor”.

12.AT OIL TEMP Warning Light Display

A: OPERATION

The AT OIL TEMP light illuminates or blinks, when the ATF temperature is high and malfunction occurs in CVT.

- When normal

AT OIL TEMP light always illuminates when the ignition switch is ON (engine OFF). Light goes off after two seconds from engine ON.

- When ATF temperature is high

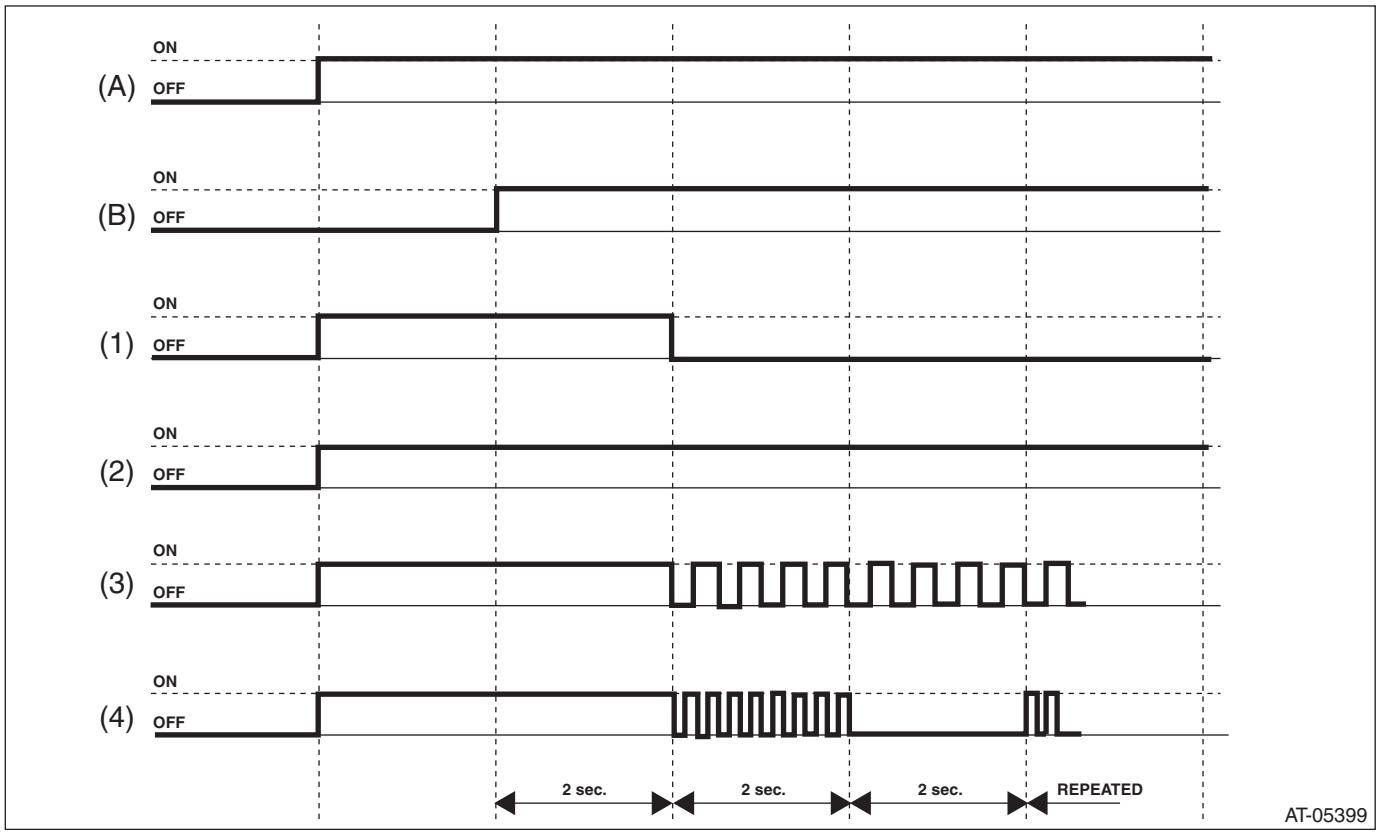
AT OIL TEMP light illuminates when the ATF temperature is abnormally high with engine ON.

- When malfunction is detected

AT OIL TEMP light blinks at 2 Hz when the TCM detects the malfunction of CVT with engine ON. In this case, inspect using “Diagnostic Procedure with Diagnostic Trouble Code (DTC)”. <Ref. to CVT(diag)-35, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

- When AT learning is not finished

AT OIL TEMP light repeats “Blinking at 4 Hz → Turning OFF” every two seconds, when the AT learning is not finished with engine ON. In this case, perform the “Learning”. (During AT learning, the light blinks at 2 Hz or illuminates.) <Ref. to CVT(diag)-20, Learning Control.>



(A) Ignition switch condition
(B) Engine condition
(1) When normal
(2) When ATF temperature is high
(3) When malfunction is detected
(4) When AT learning is not finished

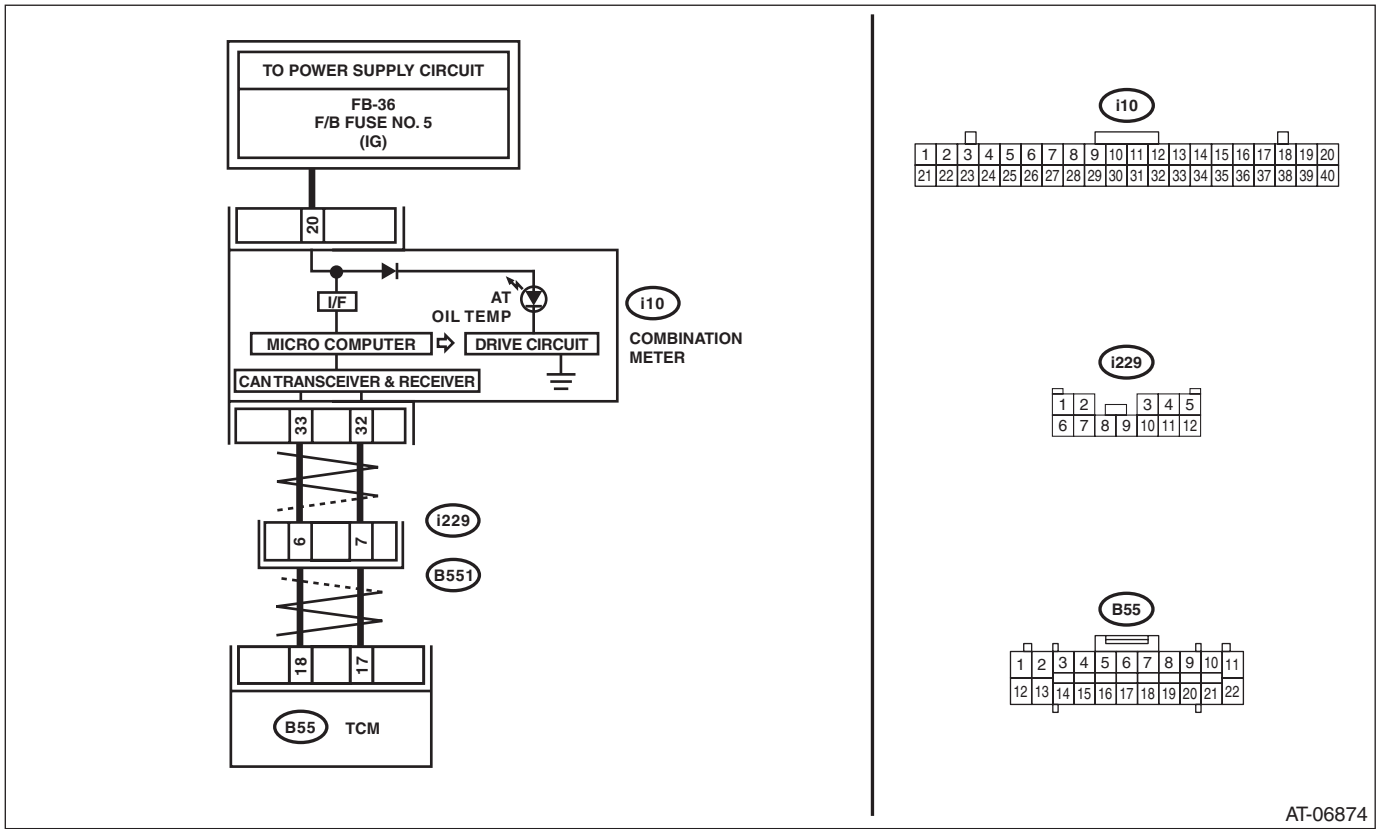
IF the AT OIL TEMP light does not illuminate, or illumination patterns are not as above, check the AT OIL TEMP light circuit. <Ref. to CVT(diag)-23, INSPECTION, AT OIL TEMP Warning Light Display.>

B: INSPECTION

DIAGNOSIS:
- AT OIL TEMP light circuit is open or shorted.
- Combination meter malfunction
- TCM is in special control mode.
- AT learning is not finished.

TROUBLE SYMPTOM:
- When the ignition switch is turned to ON, the AT OIL TEMP light does not illuminate.
- AT OIL TEMP light remains lit after engine start.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK AT OIL TEMP LIGHT.** Turn the ignition switch to ON.	Does the AT OIL TEMP light illuminate?	Go to step **2**.	Perform the self-diagnosis of combination meter. <Ref. to IDI-6, SELF-DIAGNOSIS DISPLAY MODE, OPERATION, Combination Meter System.>
2	**CHECK AT OIL TEMP LIGHT.** Start the engine.	Does AT OIL TEMP light go off after two seconds from engine start?	Current condition is normal. Go back to Basic Diagnostic Procedure. <Ref. to CVT(diag)-2, Basic Diagnostic Procedure.>	Go to step **3**.
3	**CHECK DTC.** Read the DTC relating the TCM using the Subaru Select Monitor.	Is DTC displayed?	Perform the diagnosis according to DTC.	Go to step **4**.

	Step	Check	Yes	No
4	**CHECK TCM.** Read the data of «ATF Temperature Lamp» using the Subaru Select Monitor.	Is “ON” displayed?	Go to step **5**.	Perform the self-diagnosis of combination meter. <Ref. to IDI-6, SELF-DIAGNOSIS DISPLAY MODE, OPERATION, Combination Meter System.>
5	**CHECK TCM.** Read the data of «ATF Temp.» using the Subaru Select Monitor.	Is the display 125°C or more?	Go to step **6**.	Check the TCM.
6	**CHECK ATF TEMPERATURE.** Check the real fluid temperature from the transmission case surface temperature.	Does it clearly differ from the «ATF Temp.» displayed on Subaru Select Monitor?	Perform the diagnosis according to DTC P0712 procedure. If there is no problems, perform the diagnosis according to DTC P0713 procedure.	When ATF temperature can be judged as actually high, perform the diagnosis again after the ATF temperature lowers.

13.AWD Warning Light Display

A: OPERATION

AWD light illuminates or blinks, when the AWD is in special control condition and AWD has malfunction.

- When normal

AWD light always illuminates when the ignition switch is ON (engine OFF). Light goes off after two seconds from engine ON.

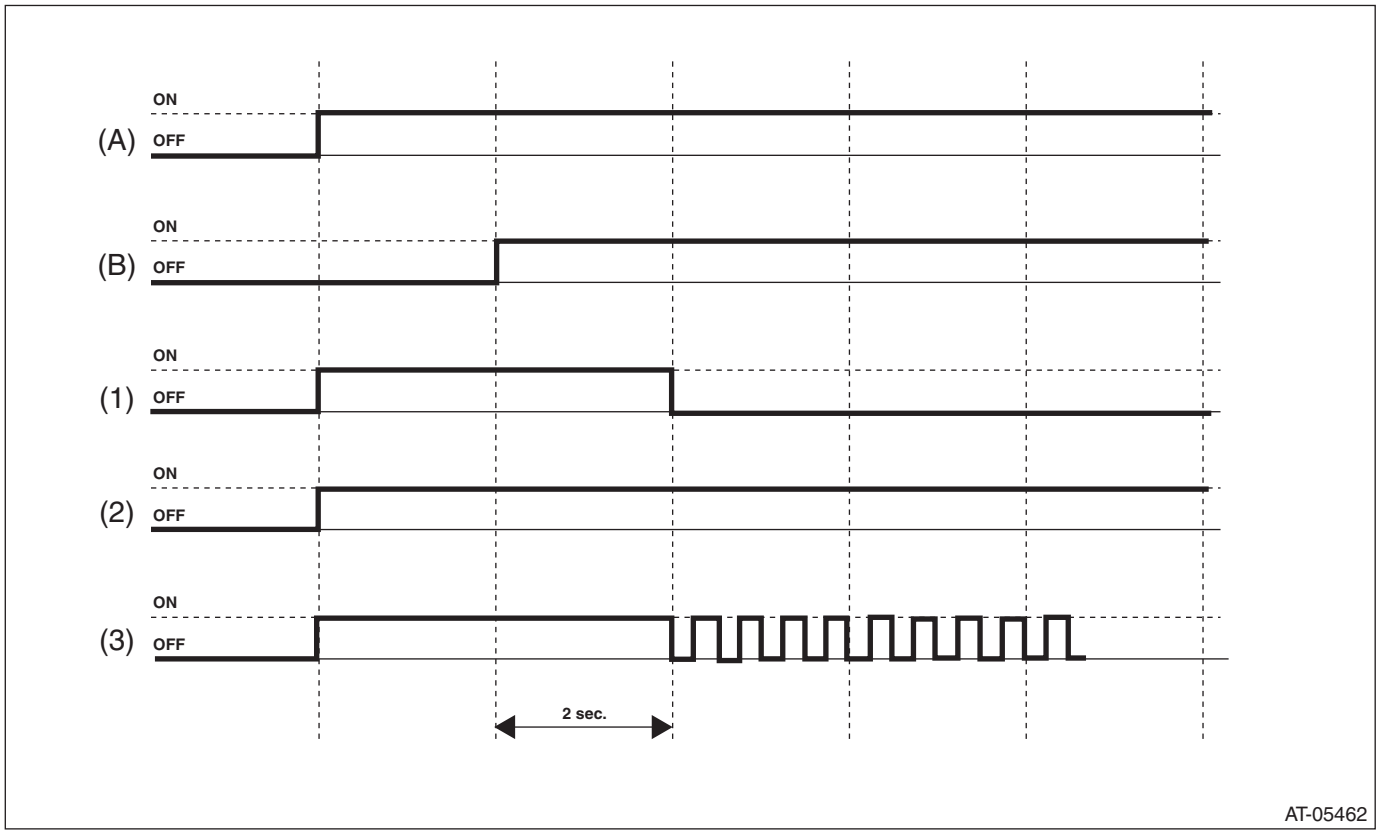
- When FF mode is selected

AWD light illuminates, when the AWD ON/OFF switching function is “FF mode” with engine ON.

- When malfunction is detected

AWD light blinks at 2 Hz when any of following malfunctions are detected with engine ON.

1. When tire with different diameter is installed, or air pressure of any of four wheels is excessively low
2. When “Rear differential inspection mode” is judged as NG <Ref. to DI-67, Rear Differential Inspection Mode.>



(A) Ignition switch condition (B) Engine condition

(1) When normal (2) When FF mode is selected (3) When malfunction is detected

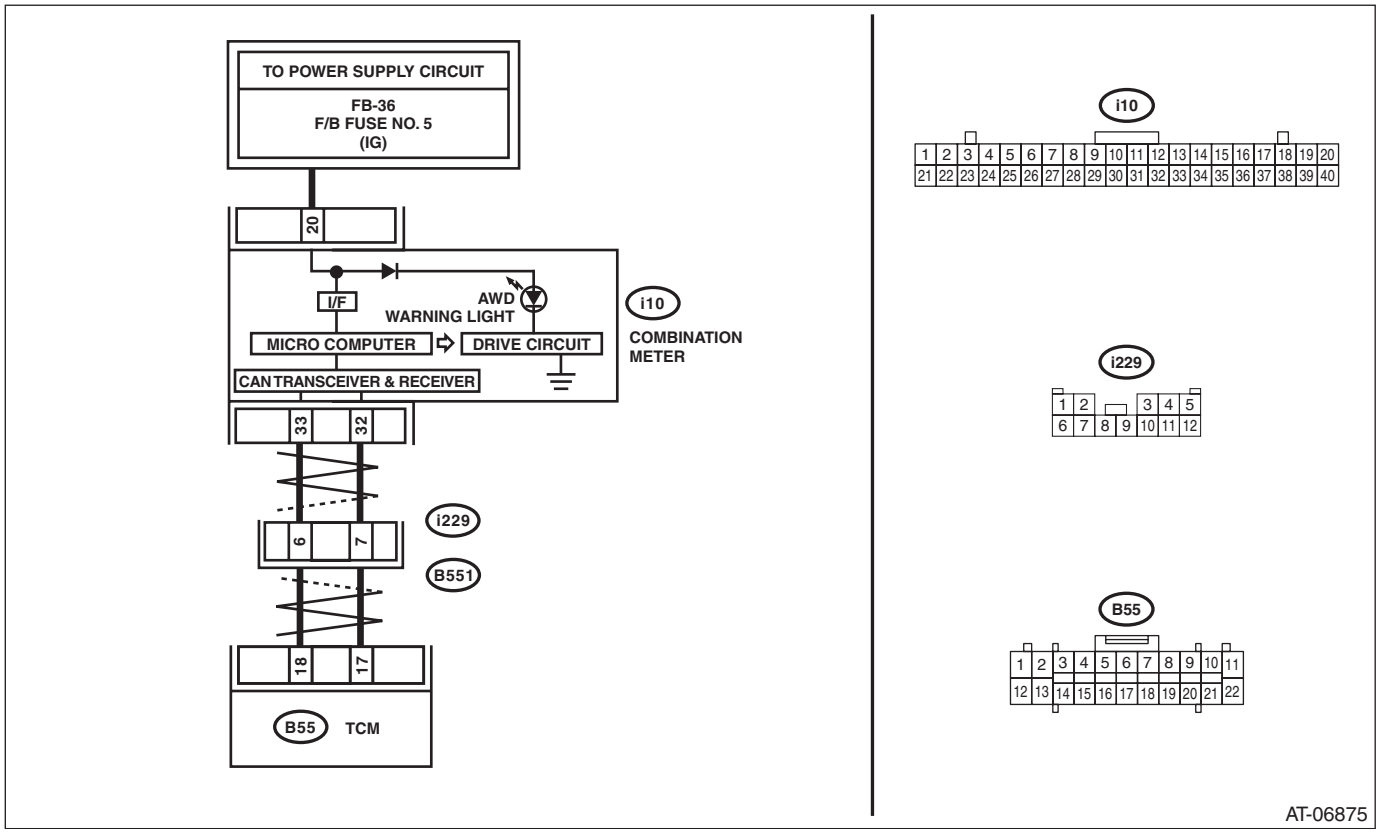
If the AWD light does not illuminate, or illumination patterns are not as above, check the AWD light circuit. <Ref. to CVT(diag)-26, INSPECTION, AWD Warning Light Display.>

B: INSPECTION

DIAGNOSIS:
- AWD light circuit is open or shorted.
- Combination meter malfunction
- TCM is in AWD special control mode.

TROUBLE SYMPTOM:
- When the ignition switch is turned to ON, the AWD light does not illuminate.
- AWD light remains lit after engine start.
- AWD light is blinking immediately after engine start.

WIRING DIAGRAM:



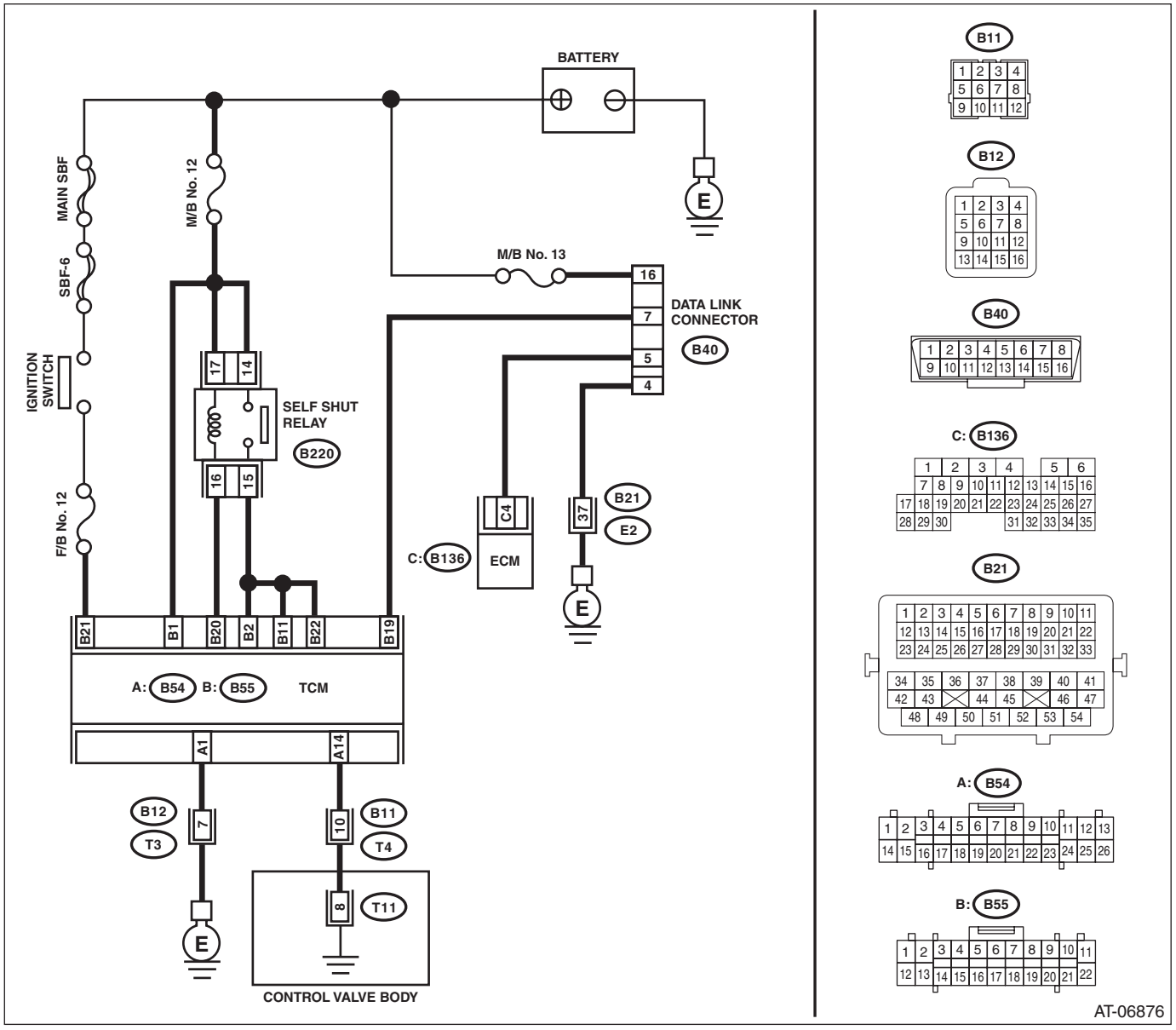
Step		Check	Yes	No
1	**CHECK AWD LIGHT.** Turn the ignition switch to ON.	Does the AWD light illuminate?	Go to step **2**.	Perform the self-diagnosis of combination meter. <Ref. to IDI-6, SELF-DIAGNOSIS DISPLAY MODE, OPERATION, Combination Meter System.>
2	**CHECK AWD LIGHT.** Start the engine.	Does AWD light go off after two seconds from engine start?	Current condition is normal. Go back to Basic Diagnostic Procedure. <Ref. to CVT(diag)-2, Basic Diagnostic Procedure.>	Go to step **3**.
3	**CHECK DTC.** Read the DTC relating the TCM using the Subaru Select Monitor.	Is DTC displayed?	Perform the diagnosis according to DTC.	Go to step **4**.

	Step	Check	Yes	No
4	**CHECK AWD LIGHT.** Check the display of AWD light after engine start.	Is AWD light illuminating?	Go to step **6**.	Go to step **5**.
5	**CHECK AWD LIGHT.** Check the display of AWD light after engine start.	Is AWD light blinking at 2 Hz?	Go to step **7**.	Go to step **8**.
6	**CHECK AWD ON/OFF SWITCHING FUNCTION.** Using the Subaru Select Monitor, select the {AWD ON/OFF switching mode} from «AT related learning & inspecting mode», and check the current mode. <Ref. to CVT-45, AWD ON/OFF Switching Mode.>	Is the message «At present, the vehicle is in AWD. Switch to FF?» displayed?	Go to step **8**.	If the message «At present, the vehicle is in FF. Switch to AWD?» is displayed, select “OK”, and switch to AWD mode.
7	**CHECK REAR DIFFERENTIAL.** Using the Subaru Select Monitor, select the {Rear differential inspection mode} from «AT related learning & inspecting mode», and check. <Ref. to DI-67, Rear Differential Inspection Mode.>	Does AWD light go off after inspection is finished normally?	Current condition is normal. Go back to Basic Diagnostic Procedure. <Ref. to CVT(diag)-2, Basic Diagnostic Procedure.>	Go to step **8**.
8	**CHECK COMBINATION METER.** Perform the self-diagnosis of combination meter. <Ref. to IDI-6, SELF-DIAGNOSIS DISPLAY MODE, OPERATION, Combination Meter System.>	Is there any trouble with the combination meter?	Repair the combination meter.	Check the TCM.

14.Diagnostic Procedure for Subaru Select Monitor Communication

A: COMMUNICATION FOR INITIALIZING IMPOSSIBLE

DIAGNOSIS:
Defective harness connector
TROUBLE SYMPTOM:
Subaru Select Monitor communication failure
WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK INSTALLATION OF TCM CONNECTOR.** Turn the ignition switch to OFF.	Is TCM connector connected to TCM?	Go to step **2**.	Connect the TCM connector to TCM.

	Step	Check	Yes	No
2	**CHECK SUBARU SELECT MONITOR POWER SUPPLY CIRCUIT.** Measure the voltage between data link connector and chassis ground. ***Connector & terminal*** ***(B40) No. 16 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Go to step **3**.	Repair harness connector between the battery and data link connector, and poor contact of the connector.
3	**CHECK SUBARU SELECT MONITOR GROUND CIRCUIT.** Measure the resistance of the harness between data link connector and engine ground. ***Connector & terminal*** ***(B40) No. 4 — Engine ground:*** ***(B40) No. 5 — Engine ground:***	Is the resistance less than 1 Ω?	Go to step **4**.	Repair the open circuit of harness between data link connector and engine ground.
4	**CHECK SUBARU SELECT MONITOR GROUND CIRCUIT.** Measure the resistance of harness between data link connector and chassis ground. ***Connector & terminal*** ***(B40) No. 16 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **5**.	Repair the short circuit of harness between data link connector and ground terminals.
5	**CHECK ENGINE GROUND CIRCUIT.** Check the engine ground circuit.	Is the engine ground circuit normal?	Go to step **6**.	Repair ground circuit of ECM.
6	**CHECK COMMUNICATION OF SUBARU SELECT MONITOR.** 1) Turn the ignition switch to ON. 2) Check communication with the transmission.	Is the name of system displayed on Subaru Select Monitor?	Go to step **11**.	Go to step **7**.
7	**CHECK COMMUNICATION OF SUBARU SELECT MONITOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the TCM connector. 3) Turn the ignition switch to ON. 4) Check communication with the engine system.	Is the name of system displayed on Subaru Select Monitor?	Go to step **9**.	Go to step **8**.
8	**CHECK OUTPUT SIGNAL OF TCM.** 1) Turn the ignition switch to OFF. 2) Connect the connector to TCM. 3) Disconnect the connectors from control modules connected to the data link connector (B40) No. 7, excluding TCM and ECM. **CAUTION:** **When disconnecting the connector from air-bag control module, always follow the precautions on AB section. <Ref. to AB-10, CAUTION, General Description.>** 4) Turn the ignition switch to ON. 5) Check communication with the transmission system.	Is the name of system displayed on Subaru Select Monitor?	Check each control module.	Go to step **9**.
9	**CHECK HARNESS CONNECTOR BETWEEN EACH CONTROL MODULE AND DATA LINK CONNECTOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the connectors of all control modules connected to the data link connector (B40) No. 7. 3) Measure the resistance between data link connector and chassis ground. ***Connector & terminal*** ***(B40) No. 7 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **10**.	Check harness and connector between each control module and data link connector.

	Step	Check	Yes	No
10	**CHECK OUTPUT SIGNAL OF TCM.** 1) Turn the ignition switch to ON. 2) Measure the voltage between data link connector and chassis ground. ***Connector & terminal*** ***(B40) No. 7 (+) — Chassis ground (–):***	Is the voltage 1 V or more?	Check harness and connector between each control module and data link connector.	Go to step **11**.
11	**CHECK HARNESS CONNECTOR BETWEEN TCM AND DATA LINK CONNECTOR.** 1) Disconnect the TCM connector. 2) Measure the resistance between TCM connector and data link connector. ***Connector & terminal*** ***(B40) No. 7 — (B55) No. 19:***	Is the resistance less than 1 Ω?	Go to step **12**.	Check the harness and connector between TCM and data link connector.
12	**CHECK INSTALLATION OF TRANSMISSION HARNESS CONNECTOR.**	Is the transmission harness connector connected to bulkhead harness connector?	Go to step **13**.	Connect the bulkhead harness connector to transmission harness connector.
13	**CHECK POOR CONTACT OF CONNECTORS.**	Is there poor contact of control module power supply and data link connector?	Repair the poor contact.	Go to step **14**.
14	**CHECK TCM POWER SUPPLY.** 1) Disconnect the TCM connector. 2) Turn the ignition switch to ON. 3) Measure the voltage between TCM connector and chassis ground. ***Connector & terminal*** ***(B55) No. 1 (+) — Chassis ground (–):*** ***(B55) No. 2 (+) — Chassis ground (–):*** ***(B55) No. 11 (+) — Chassis ground (–):*** ***(B55) No. 22 (+) — Chassis ground (–):***	Is the voltage 10 — 13 V?	Go to step **16**.	Go to step **15**.
15	**CHECK M/B FUSE (NO. 1).** 1) Turn the ignition switch to OFF. 2) Remove the fuse (No. 1).	Is the fuse (No. 1) blown out?	Replace the fuse. If the replaced fuse has blown out easily, repair short circuit of harness between fuse and TCM.	Repair the open circuit of harness between fuse and TCM, or fuse and battery, and poor contact of the connector.
16	**CHECK IGNITION POWER SUPPLY CIRCUIT.** 1) Turn the ignition switch to ON. 2) Measure the ignition power supply voltage between TCM connector and chassis ground. ***Connector & terminal*** ***(B55) No. 21 (+) — Chassis ground (–):***	Is the voltage 10 — 13 V?	Go to step **18**.	Go to step **17**.
17	**CHECK F/B FUSE (NO. 12).** Remove the fuse (No. 12).	Is the fuse (No. 12) blown out?	Replace the fuse. If the replaced fuse has blown out easily, repair short circuit of harness between fuse and TCM.	Repair the open circuit of harness between fuse and TCM, or fuse and battery, and poor contact of the connector.

	Step	Check	Yes	No
18	**CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.** 1) Turn the ignition switch to OFF. 2) Disconnect the TCM and transmission connectors. 3) Measure the resistance of harness between TCM and transmission connector. ***Connector & terminal*** ***(B54) No. 1 — (B12) No. 7:*** ***(B54) No. 14 — (B11) No. 10:***	Is the resistance less than 1 Ω?	Go to step **19**.	Repair the open circuit of harness between TCM and transmission harness connector, and poor contact of connector.
19	**CHECK HARNESS CONNECTOR BETWEEN TRANSMISSION AND TRANSMISSION GROUND.** Measure the resistance of the harness between transmission and transmission ground. ***Connector & terminal*** ***(T3) No. 7 — Transmission ground:*** ***(T4) No. 10 — Transmission ground:***	Is the resistance less than 1 Ω?	Go to step **20**.	Repair the open circuit of the harness between transmission and transmission ground.
20	**CHECK POOR CONTACT OF CONNECTORS.**	Is there poor contact of TCM power supply, ground and data link connector?	Repair the connector.	Check the TCM.

15.List of Diagnostic Trouble Code (DTC)

A: LIST

DTC	Item	Content of diagnosis	Reference
P0705	Transmission Range Sensor Circuit (PRNDL Input)	Inhibitor switch malfunction or short circuit	<Ref. to CVT(diag)-35, DTC P0705 TRANSMISSION RANGE SENSOR CIRCUIT (PRNDL INPUT), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0708	AT Range Switch Not Inputted	Inhibitor switch malfunction or open circuit	<Ref. to CVT(diag)-37, DTC P0708 AT RANGE SWITCH NOT INPUTTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0712	Transmission Fluid Temperature Sensor Circuit Low Input	ATF temperature sensor is faulty or input signal circuit is shorted.	<Ref. to CVT(diag)-39, DTC P0712 TRANSMISSION FLUID TEMPERATURE SENSOR CIRCUIT LOW INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0713	Transmission Fluid Temperature Sensor Circuit High Input	ATF temperature sensor is faulty or input signal circuit is open or shorted.	<Ref. to CVT(diag)-40, DTC P0713 TRANSMISSION FLUID TEMPERATURE SENSOR CIRCUIT HIGH INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0716	Torque Converter Turbine Speed	Turbine speed sensor is faulty or input signal circuit is open or shorted.	<Ref. to CVT(diag)-42, DTC P0716 TORQUE CONVERTER TURBINE SPEED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0719	Brake Switch Circuit Low	Brake switch is faulty or input signal circuit is open or shorted.	<Ref. to CVT(diag)-44, DTC P0719 BRAKE SWITCH CIRCUIT LOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0724	Brake Switch Circuit High	Brake switch is faulty or input signal circuit is shorted.	<Ref. to CVT(diag)-46, DTC P0724 BRAKE SWITCH CIRCUIT HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0730	Gearshift Control Performance Abnormal	Primary speed sensor, secondary speed sensor, control valve, or chain is faulty.	<Ref. to CVT(diag)-47, DTC P0730 GEARSHIFT CONTROL PERFORMANCE ABNORMAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0801	Reverse Inhibit Control Circuit	Shift lock solenoid is faulty or output signal circuit is open or shorted.	<Ref. to CVT(diag)-48, DTC P0801 REVERSE INHIBIT CONTROL CIRCUIT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0841	Secondary Oil Pressure Sensor Performance	Secondary pressure sensor or control valve is faulty	<Ref. to CVT(diag)-49, DTC P0841 SECONDARY OIL PRESSURE SENSOR PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0842	Secondary Oil Pressure Sensor Circuit (Low)	Secondary pressure sensor is faulty or input signal circuit is open or shorted.	<Ref. to CVT(diag)-51, DTC P0842 SECONDARY OIL PRESSURE SENSOR CIRCUIT (LOW), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0843	Secondary Oil Pressure Sensor Circuit (High)	Secondary pressure sensor is faulty or input signal circuit is shorted.	<Ref. to CVT(diag)-53, DTC P0843 SECONDARY OIL PRESSURE SENSOR CIRCUIT (HIGH), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0890	AT Self-Shut Relay Diagnosis (Low)	Self-shut relay is faulty or input signal circuit is open or shorted.	<Ref. to CVT(diag)-55, DTC P0890 AT SELF-SHUT RELAY DIAGNOSIS (LOW), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0951	Manual Switch	Manual mode switch is faulty or input signal circuit is open or shorted.	<Ref. to CVT(diag)-57, DTC P0951 MANUAL SWITCH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DTC	Item	Content of diagnosis	Reference
P0962	Secondary Solenoid Circuit (Low)	Secondary solenoid is faulty or output signal circuit is shorted.	<Ref. to CVT(diag)-59, DTC P0962 SECONDARY SOLENOID CIRCUIT (LOW), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0963	Secondary Solenoid Circuit (High)	Secondary solenoid is faulty or output signal circuit is open or shorted.	<Ref. to CVT(diag)-61, DTC P0963 SECONDARY SOLENOID CIRCUIT (HIGH), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0965	Forward & Reverse Solenoid Function	F&R solenoid, forward clutch or control valve is faulty.	<Ref. to CVT(diag)-63, DTC P0965 FORWARD & REVERSE SOLENOID FUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0966	Forward & Reverse Solenoid Circuit (Low)	F&R solenoid is faulty or output signal circuit is shorted.	<Ref. to CVT(diag)-64, DTC P0966 FORWARD & REVERSE SOLENOID CIRCUIT (LOW), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0967	Forward & Reverse Linear Solenoid Circuit (High)	F&R solenoid is faulty or output signal circuit is open or shorted.	<Ref. to CVT(diag)-66, DTC P0967 FORWARD & REVERSE LINEAR SOLENOID CIRCUIT (HIGH), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0970	Transfer Solenoid Circuit (Low)	AWD solenoid is faulty or output signal circuit is shorted.	<Ref. to CVT(diag)-68, DTC P0970 TRANSFER SOLENOID CIRCUIT (LOW), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0971	Transfer Solenoid Circuit (High)	AWD solenoid is faulty or output signal circuit is open or shorted.	<Ref. to CVT(diag)-69, DTC P0971 TRANSFER SOLENOID CIRCUIT (HIGH), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0973	Primary Solenoid System A Circuit (Low)	Primary UP solenoid is faulty or output signal circuit is shorted.	<Ref. to CVT(diag)-71, DTC P0973 PRIMARY SOLENOID SYSTEM A CIRCUIT (LOW), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0974	Primary Solenoid System A Circuit (High)	Primary UP solenoid is faulty or output signal circuit is open or shorted.	<Ref. to CVT(diag)-72, DTC P0974 PRIMARY SOLENOID SYSTEM A CIRCUIT (HIGH), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0976	Primary Solenoid System B Circuit (Low)	Primary DOWN solenoid is faulty or output signal circuit is shorted.	<Ref. to CVT(diag)-74, DTC P0976 PRIMARY SOLENOID SYSTEM B CIRCUIT (LOW), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0977	Primary Solenoid System B Circuit (High)	Primary DOWN solenoid is faulty or output signal circuit is open or shorted.	<Ref. to CVT(diag)-75, DTC P0977 PRIMARY SOLENOID SYSTEM B CIRCUIT (HIGH), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P170A	L-Range SW System	L range switch is faulty or input signal circuit is open or shorted.	<Ref. to CVT(diag)-76, DTC P170A L-RANGE SW SYSTEM, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1724	AT EEPROM Error	TCM EEPROM malfunction	<Ref. to CVT(diag)-77, DTC P1724 AT EEPROM ERROR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2746	Primary Pulley Revolution Speed Sensor Circuit	Primary speed sensor is faulty or input signal circuit is open or shorted.	<Ref. to CVT(diag)-78, DTC P2746 PRIMARY PULLEY REVOLUTION SPEED SENSOR CIRCUIT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2750	Sec. Pulley Revolution Speed Sensor Circuit	Secondary speed sensor is faulty or input signal circuit is open or shorted.	<Ref. to CVT(diag)-80, DTC P2750 SEC. PULLEY REVOLUTION SPEED SENSOR CIRCUIT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DTC	Item	Content of diagnosis	Reference
P2762	Lock-Up Duty Solenoid Malfunction	Lock-up duty solenoid, lock-up clutch or control valve is faulty	<Ref. to CVT(diag)-82, DTC P2762 LOCK-UP DUTY SOLENOID MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2763	Lock-Up Duty Solenoid Circuit (High)	Lock-up duty solenoid is faulty or output signal circuit is open or shorted.	<Ref. to CVT(diag)-83, DTC P2763 LOCK-UP DUTY SOLENOID CIRCUIT (HIGH), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2764	Lock-Up Duty Solenoid Circuit (Low)	Lock-up duty solenoid is faulty or output signal circuit is shorted.	<Ref. to CVT(diag)-85, DTC P2764 LOCK-UP DUTY SOLENOID CIRCUIT (LOW), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
U0073	Control Module Communication Bus “A” Off	CAN bus is shorted or communication error.	<Ref. to CVT(diag)-86, DTC U0073 CONTROL MODULE COMMUNICATION BUS “A” OFF, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
U0100	Lost Communication With ECM/PCM “A”	Detected that the engine data has not yet arrived.	<Ref. to CVT(diag)-86, DTC U0100 LOST COMMUNICATION WITH ECM/PCM “A”, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
U0122	Lost Communication With Vehicle Dynamics Control Module	Detected that the VDC data has not yet arrived.	<Ref. to CVT(diag)-86, DTC U0122 LOST COMMUNICATION WITH VEHICLE DYNAMICS CONTROL MODULE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
U0140	Lost Communication With Body Control Module	Detected that the body integrated unit data has not yet arrived.	<Ref. to CVT(diag)-86, DTC U0140 LOST COMMUNICATION WITH BODY CONTROL MODULE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
U0155	Lost Communication With Instrument Panel Cluster (IPC) Control Module	Detected that the meter data has not yet arrived.	<Ref. to CVT(diag)-86, DTC U0155 LOST COMMUNICATION WITH INSTRUMENT PANEL CLUSTER (IPC) CONTROL MODULE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
U0401	Invalid Data Received From ECM/PCM “A”	Detected abnormality of the engine data.	<Ref. to CVT(diag)-86, DTC U0401 INVALID DATA RECEIVED FROM ECM/PCM “A”, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
U0416	Invalid Data Received From Vehicle Dynamics Control Module	Detected abnormality of the VDC data.	<Ref. to CVT(diag)-86, DTC U0416 INVALID DATA RECEIVED FROM VEHICLE DYNAMICS CONTROL MODULE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
U0422	Invalid Data Received From Body Control Module	Detected abnormality of the body integrated unit data.	<Ref. to CVT(diag)-86, DTC U0422 INVALID DATA RECEIVED FROM BODY CONTROL MODULE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
U0423	Invalid Data Received From Instrument Panel Cluster Control Module	Detected abnormality of the meter data.	<Ref. to CVT(diag)-86, DTC U0423 INVALID DATA RECEIVED FROM INSTRUMENT PANEL CLUSTER CONTROL MODULE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

16.Diagnostic Procedure with Diagnostic Trouble Code (DTC)

A: DTC P0705 TRANSMISSION RANGE SENSOR CIRCUIT (PRNDL INPUT)

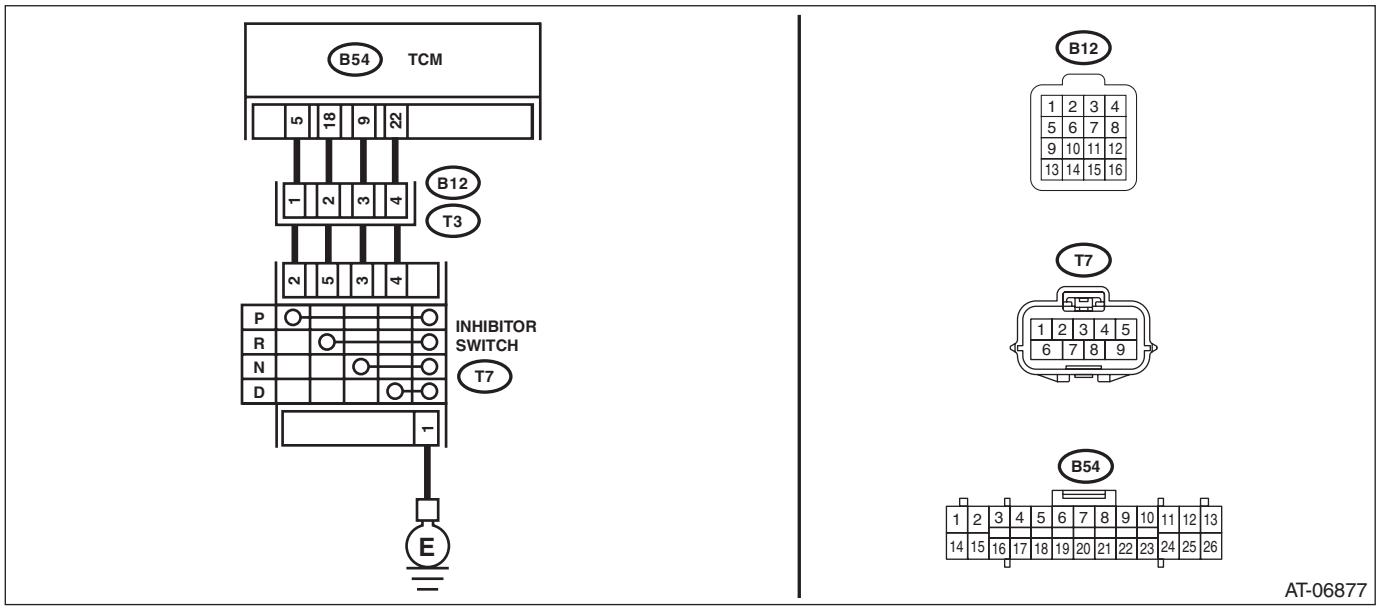
DTC DETECTING CONDITION:

- Inhibitor switch is faulty.
- At least 2 range signal is input.

TROUBLE SYMPTOM:

- Shift characteristics are erroneous.
- The range position of the select lever and the position of shift indicator display do not match.

WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK INPUT SIGNAL FOR TCM.** 1) Turn the ignition switch to ON. 2) Move the select lever to each range, and read the data of «P Range», «R Range Signal», «N Range» and «D Range Signal» using Subaru Select Monitor.	Is display “OFF” for the range other than corresponding range?	Go to step **5**.	Go to step **2**.
2	**CHECK HARNESS.** 1) Turn the ignition switch to OFF. 2) Disconnect the TCM and transmission connectors. 3) Measure the resistance between TCM connector and chassis ground. ***Connector & terminal*** ***(B54) No. 5 — Chassis ground:*** ***(B54) No. 18 — Chassis ground:*** ***(B54) No. 9 — Chassis ground:*** ***(B54) No. 22 — Chassis ground:***	Is each resistance 1 MΩ or more?	Go to step **3**.	Repair the short circuit of body harness.
3	**CHECK HARNESS.** 1) Disconnect the inhibitor switch connector. 2) Measure the resistance between transmission connector and chassis ground. ***Connector & terminal*** ***(T3) No. 1 — Chassis ground:*** ***(T3) No. 2 — Chassis ground:*** ***(T3) No. 3 — Chassis ground:*** ***(T3) No. 4 — Chassis ground:***	Is each resistance 1 MΩ or more?	Go to step **4**.	Repair the short circuit of transmission harness.

	Step	Check	Yes	No
4	**CHECK INHIBITOR SWITCH.** Move the select lever to each range, and measure the resistance between inhibitor switch connector terminals. ***Connector & terminal*** ***(T7) No. 2 — (T7) No. 1:*** ***(T7) No. 5 — (T7) No. 1:*** ***(T7) No. 3 — (T7) No. 1:*** ***(T7) No. 4 — (T7) No. 1:***	Is the resistance other than corresponding range 1 MΩ or more?	Go to step **5**.	Replace the inhibitor switch. <Ref. to CVT-92, Inhibitor Switch.>
5	**CHECK FOR POOR CONTACT.**	Is there poor contact between TCM, inhibitor switch, transmission ground?	Repair the poor contact.	Check the TCM.

B: DTC P0708 AT RANGE SWITCH NOT INPUTTED

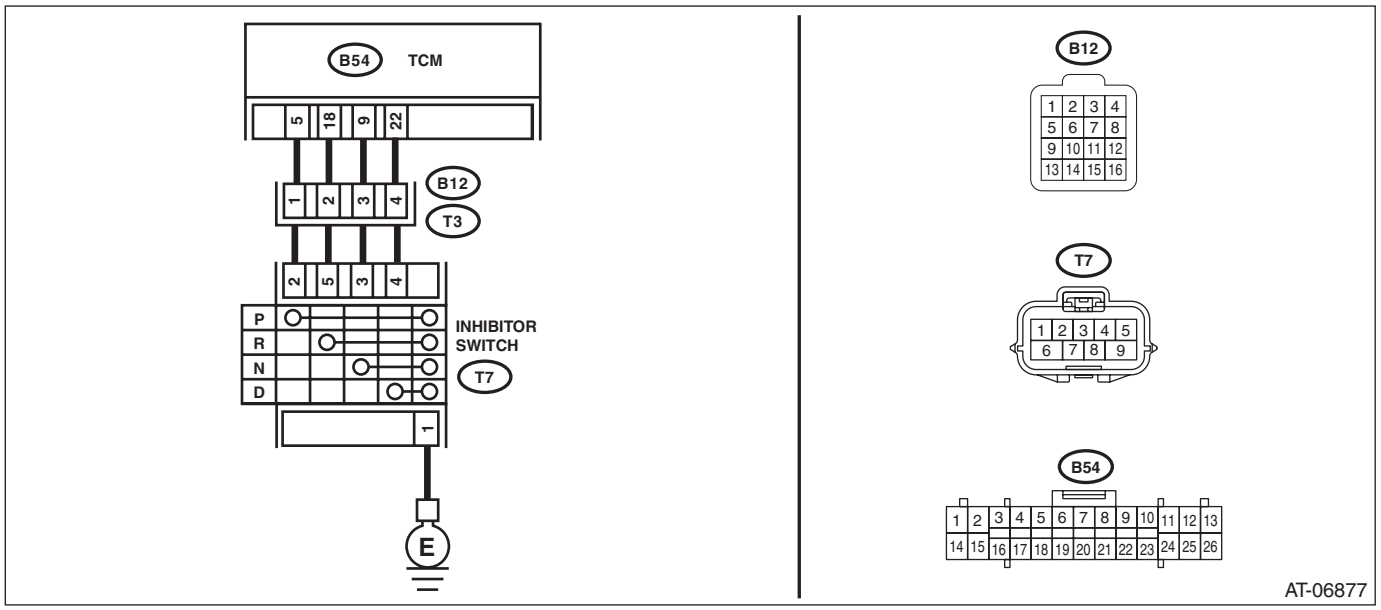
DTC DETECTING CONDITION:

- Inhibitor switch is faulty.
- No range signal is input.

TROUBLE SYMPTOM:

- Shift characteristics are erroneous.
- The range position of the select lever and the position of shift indicator display do not match.

WIRING DIAGRAM:



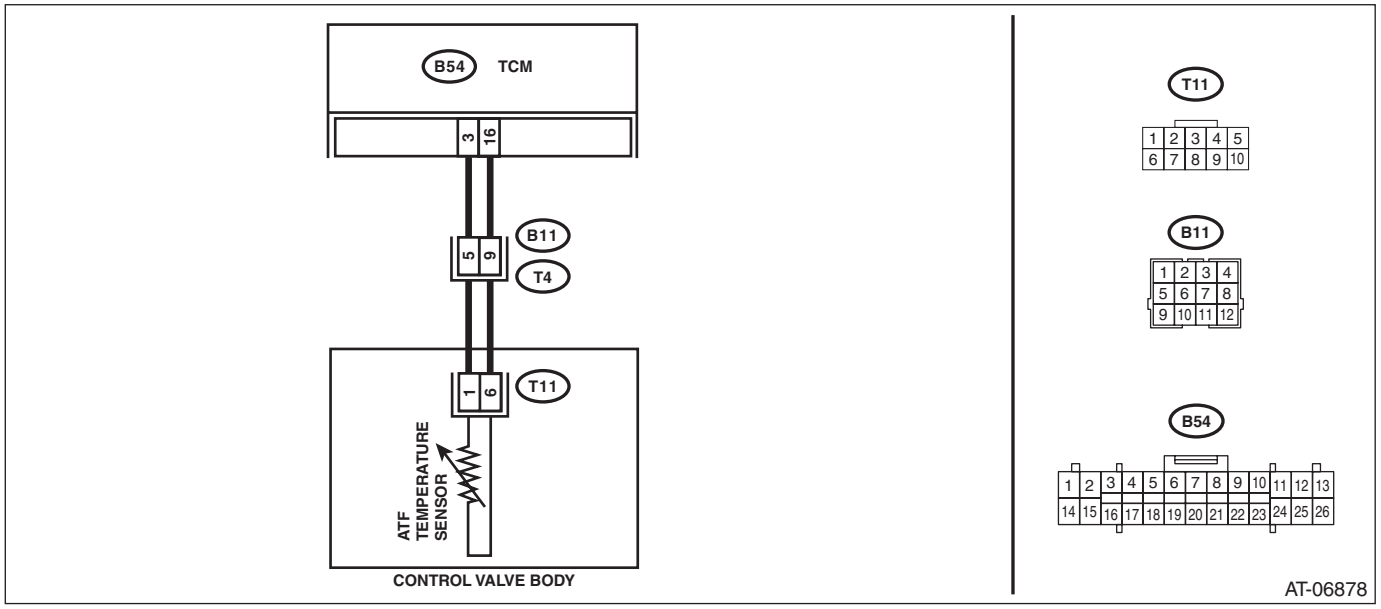
Step		Check	Yes	No
1	**CHECK INPUT SIGNAL FOR TCM.** 1) Turn the ignition switch to ON. 2) Move the select lever to each range, and read the data of «P Range», «R Range Signal», «N Range» and «D Range Signal» using Subaru Select Monitor.	Is the display of the corresponding range “ON”?	Go to step **7**.	Go to step **2**.
2	**CHECK HARNESS.** 1) Turn the ignition switch to OFF. 2) Disconnect the TCM and transmission connectors. 3) Measure the resistance of harness between TCM connector and transmission connector. ***Connector & terminal*** ***(B54) No. 5 — (B12) No. 1:*** ***(B54) No. 18 — (B12) No. 2:*** ***(B54) No. 9 — (B12) No. 3:*** ***(B54) No. 22 — (B12) No. 4:***	Is each resistance less than 1 Ω?	Go to step **3**.	Repair the open circuit of body harness.
3	**CHECK HARNESS.** Measure the resistance of harness between inhibitor switch connector and transmission ground. ***Connector & terminal*** ***(T7) No. 1 — Transmission ground:***	Is the resistance less than 1 Ω?	Go to step **4**.	Repair the open circuit of harness.

	Step	Check	Yes	No
4	**CHECK HARNESS.** 1) Disconnect the inhibitor switch connector. 2) Measure the resistance between transmission connector and inhibitor switch connector. ***Connector & terminal*** ***(T3) No. 1 — (T7) No. 2:*** ***(T3) No. 2 — (T7) No. 5:*** ***(T3) No. 3 — (T7) No. 3:*** ***(T3) No. 4 — (T7) No. 4:***	Is each resistance less than 1 Ω?	Go to step **5**.	Repair the open circuit of transmission harness.
5	**CHECK INHIBITOR SWITCH.** Move the select lever to each range, and measure the resistance between inhibitor switch connector terminals. ***Connector & terminal*** ***(T7) No. 2 — (T7) No. 1:*** ***(T7) No. 5 — (T7) No. 1:*** ***(T7) No. 3 — (T7) No. 1:*** ***(T7) No. 4 — (T7) No. 1:***	Is the resistance of the corresponding range less than 1 MΩ?	Go to step **6**.	Replace the inhibitor switch. <Ref. to CVT-92, Inhibitor Switch.>
6	**CHECK HARNESS.** 1) Turn the ignition switch to ON. 2) Measure the voltage between each connector and chassis ground. ***Connector & terminal*** ***Transmission connector (B12 side)*** ***(B12) No. 1 (+) — Chassis ground (–):*** ***(B12) No. 2 (+) — Chassis ground (–):*** ***(B12) No. 3 (+) — Chassis ground (–):*** ***(B12) No. 4 (+) — Chassis ground (–):*** ***Transmission connector (T7 side)*** ***(T7) No. 2 (+) — Chassis ground (–):*** ***(T7) No. 5 (+) — Chassis ground (–):*** ***(T7) No. 3 (+) — Chassis ground (–):*** ***(T7) No. 4 (+) — Chassis ground (–):***	Is each voltage less than 1 V?	Go to step **7**.	Repair the harness which outputs 1 V or more.
7	**CHECK FOR POOR CONTACT.**	Is there poor contact between TCM, inhibitor switch, transmission ground?	Repair the poor contact.	Check the TCM.

C: DTC P0712 TRANSMISSION FLUID TEMPERATURE SENSOR CIRCUIT LOW INPUT

DTC DETECTING CONDITION:
Input signal circuit of ATF temperature sensor is shorted.
TROUBLE SYMPTOM:
- Excessive shift shock
- Shift characteristics malfunction

WIRING DIAGRAM:

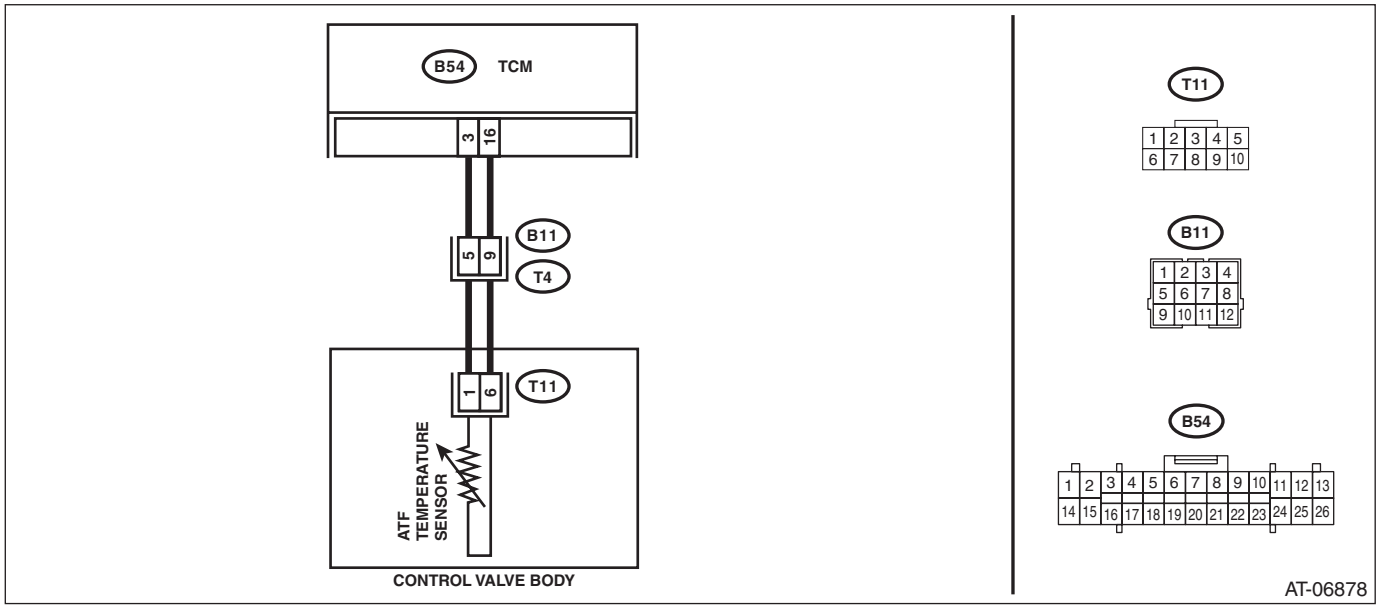


Step		Check	Yes	No
1	**CHECK HARNESS.** 1) Turn the ignition switch to OFF. 2) Disconnect the TCM and transmission connectors. 3) Measure the resistance of harness between TCM connector and chassis ground. ***Connector & terminal*** ***(B54) No. 3 — Chassis ground:*** ***(B54) No. 16 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **2**.	Repair the short circuit of harness.
2	**CHECK HARNESS.** Measure the resistance between transmission connector and transmission body. ***Connector & terminal*** ***(T4) No. 5 — Transmission body:*** ***(T4) No. 9 — Transmission body:***	Is the resistance 1 MΩ or more?	Go to step **3**.	Repair the short circuit of harness.
3	**CHECK HARNESS INSIDE TRANSMISSION.** **CAUTION:** **Start work after ATF cools down.** 1) Remove the transmission valve cover. 2) Check for the harness pinch, damage.	Is the harness normal?	Go to step **4**.	Replace the transmission harness.
4	**CHECK ATF TEMPERATURE SENSOR.** Measure the resistance between transmission connector terminals. ***Connector & terminal*** ***(T11) No. 1 — No. 6:***	Is resistance as follows? Fluid temperature 0°C → Approx. 6.0 kΩ Fluid temperature 20°C → Approx. 2.5 kΩ Fluid temperature 80°C → Approx. 330 Ω	Check the TCM.	Replace the transmission harness.

D: DTC P0713 TRANSMISSION FLUID TEMPERATURE SENSOR CIRCUIT HIGH INPUT

DTC DETECTING CONDITION:
Input signal circuit of ATF temperature sensor is open or shorted.
TROUBLE SYMPTOM:
- Excessive shift shock
- Shift characteristics malfunction

WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK HARNESS.** 1) Turn the ignition switch to ON. 2) Measure the voltage between TCM connectors. ***Connector & terminal*** ***(B54) No. 3 (+) — (B54) No. 16 (–):***	Is the voltage 5 V or more?	Repair the short circuit of harness.	Go to step **2**.
2	**CHECK HARNESS.** 1) Turn the ignition switch to OFF. 2) Disconnect the TCM and transmission connectors. 3) Measure the resistance between TCM connector and transmission connectors. ***Connector & terminal*** ***(B54) No. 3 — (B11) No. 5:*** ***(B54) No. 16 — (B11) No. 9:***	Is the resistance less than 1 Ω?	Go to step **3**.	Repair the open circuit of body harness.
3	**CHECK ATF TEMPERATURE SENSOR.** 1) Turn the ignition switch to OFF. 2) Disconnect the transmission connector. 3) Measure the resistance between transmission connector terminals. ***Connector & terminal*** ***(T4) No. 5 — No. 9:***	Is the resistance 1 MΩ or more?	Repair the open circuit of transmission harness.	Go to step **4**.

	Step	Check	Yes	No
4	**CHECK ATF TEMPERATURE SENSOR.** 1) Turn the ignition switch to OFF. 2) Connect the connectors to TCM and transmission. 3) Start the engine. 4) Warm up until the ATF temperature exceeds 50°C (122°F). 5) Turn the ignition switch to OFF. 6) Disconnect the transmission connector. 7) Measure the resistance between transmission connector terminals. ***Connector & terminal*** ***(T4) No. 5 — No. 9:***	Is the resistance 650 — 990 Ω?	Go to step **5**.	Go to step **7**.
5	**CHECK ATF TEMPERATURE SENSOR.** Measure the resistance between transmission connector terminals. ***Connector & terminal*** ***(T4) No. 5 — No. 9:***	Does the resistance value increase gradually while the ATF temperature decreases?	Go to step **6**.	Replace the transmission harness.
6	**CHECK INPUT SIGNAL FOR TCM.** 1) Connect the connector to transmission. 2) Turn the ignition switch to ON. (Do not start engine.) 3) Read the data of «ATF Temp.» using the Subaru Select Monitor.	Does the ATF temperature gradually decrease?	Check for poor contact of the ATF temperature sensor and transmission connector harness, and repair the defective part.	Go to step **7**.
7	**CHECK FOR POOR CONTACT.**	Is there poor contact of ATF temperature sensor circuit?	Repair the poor contact.	Check the TCM.

E: DTC P0716 TORQUE CONVERTER TURBINE SPEED

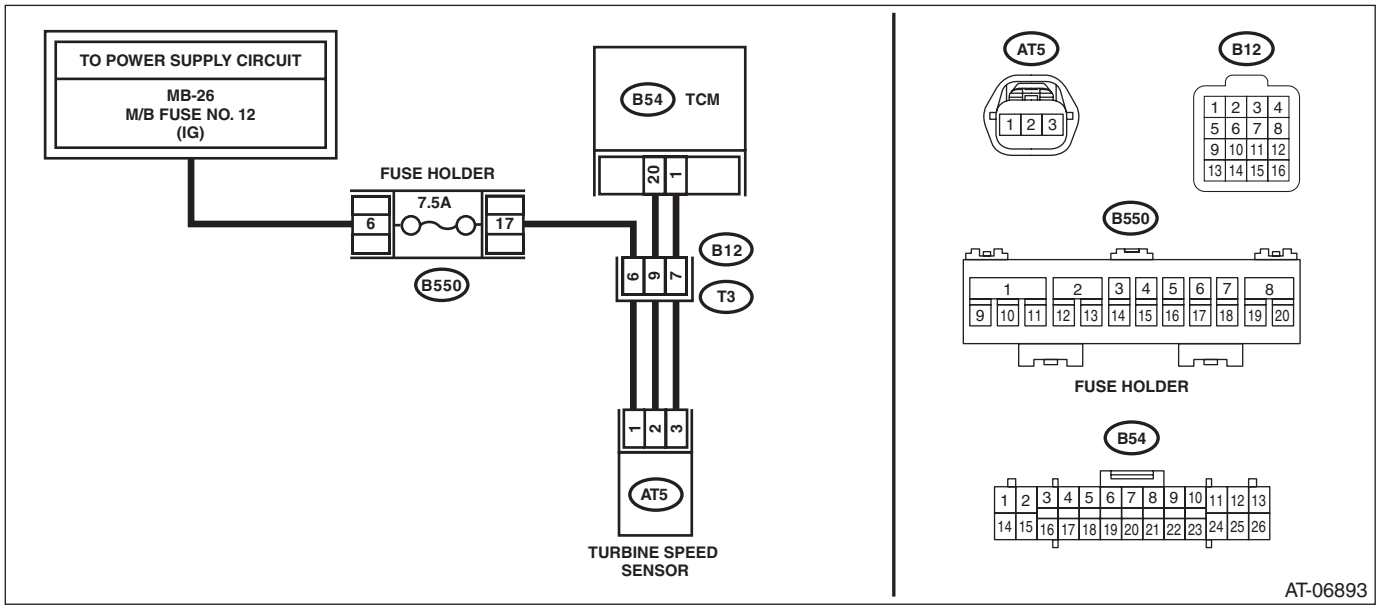
DTC DETECTING CONDITION:

- Input signal circuit of TCM is open or shorted.
- Turbine speed sensor is faulty.

TROUBLE SYMPTOM:

- Standing start problems
- Shock occurs when engaging the lockup clutch.
- Shock occurs when selecting shift position.

WIRING DIAGRAM:

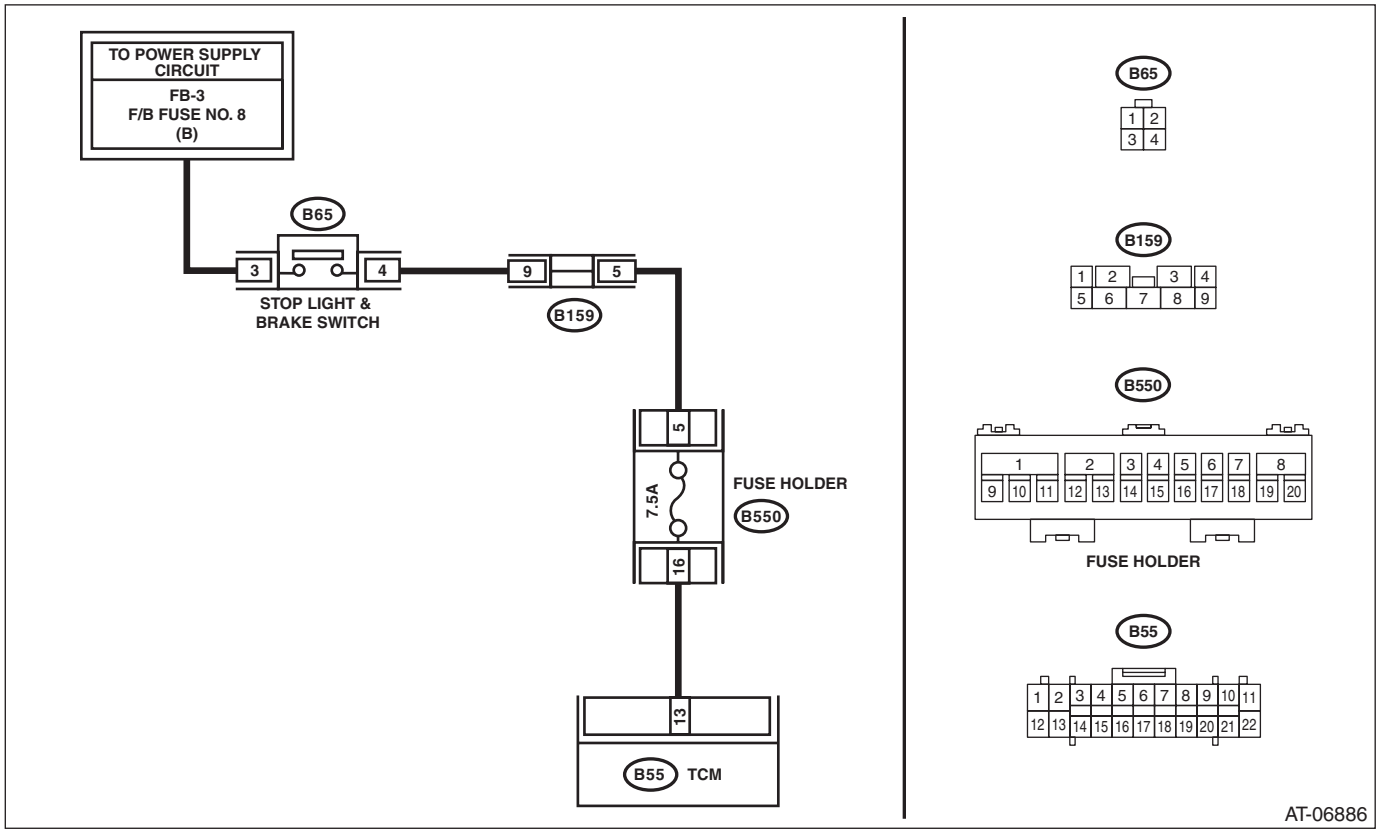


Step		Check	Yes	No
1	**CHECK FUSE.** 1) Turn the ignition switch to OFF. 2) Remove the fuse (7.5 A) from the fuse holder.	Is the fuse OK?	Go to step **2**.	Replace the fuse. If the fuse blows out easily, repair the short circuit of harness.
2	**CHECK HARNESS.** 1) Turn the ignition switch to OFF. 2) Disconnect the TCM and transmission connectors. 3) Measure the resistance between TCM connector and transmission connectors. ***Connector & terminal*** ***(B54) No. 20 — (B12) No. 9:*** ***(B550) No. 17 — (B12) No. 6:***	Is the resistance less than 1 Ω?	Go to step **3**.	Repair the open circuit of harness.
3	**CHECK HARNESS.** Measure the resistance between TCM connector and chassis ground. ***Connector & terminal*** ***(B54) No. 20 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **4**.	Repair the short circuit of harness.

	Step	Check	Yes	No
4	**CHECK TRANSMISSION HARNESS.** 1) Connect the TCM connector. 2) Turn the ignition switch to ON. 3) Measure the voltage between transmission connector terminals. ***Connector & terminal*** ***(B12) No. 6 (+) — (B12) No. 7 (–):*** NOTE: Delete the TCM memory after completing the CVT control system diagnosis. <Ref. to CVT(diag)-18, Clear Memory Mode.>	Is the voltage 10 — 13 V?	Go to step **5**.	Repair the open circuit of harness or poor contact of connector.
5	**CHECK INPUT SIGNAL FOR TCM.** 1) Turn the ignition switch to OFF. 2) Connect the transmission connector. 3) Start the engine. 4) Read the data of «Turbine Revolution Speed» using the Subaru Select Monitor.	Does the value of «Turbine Revolution Speed» change according to the engine speed?	Current condition is normal. Repair the poor contacts of harnesses of turbine speed sensor and transmission connector.	Go to step **6**.
6	**CHECK TRANSMISSION HARNESS.** 1) Turn the ignition switch to OFF. 2) Disconnect the transmission connector. 3) Lift up the vehicle. 4) Disconnect the turbine speed sensor connector. 5) Measure the resistance between transmission connector and turbine speed sensor connector. ***Connector & terminal*** ***(T3) No. 6 — (AT5) No. 1:*** ***(T3) No. 7 — (AT5) No. 3:*** ***(T3) No. 9 — (AT5) No. 2:***	Is the resistance less than 1 Ω?	Replace the turbine speed sensor. <Ref. to CVT-99, Turbine Speed Sensor.>	Replace the transmission harness.

F: DTC P0719 BRAKE SWITCH CIRCUIT LOW

DTC DETECTING CONDITION:
Brake switch malfunction or input signal circuit of brake switch is open or shorted.
TROUBLE SYMPTOM:
Gear is not shifted down when climbing a hill or driving down a hill.
WIRING DIAGRAM:

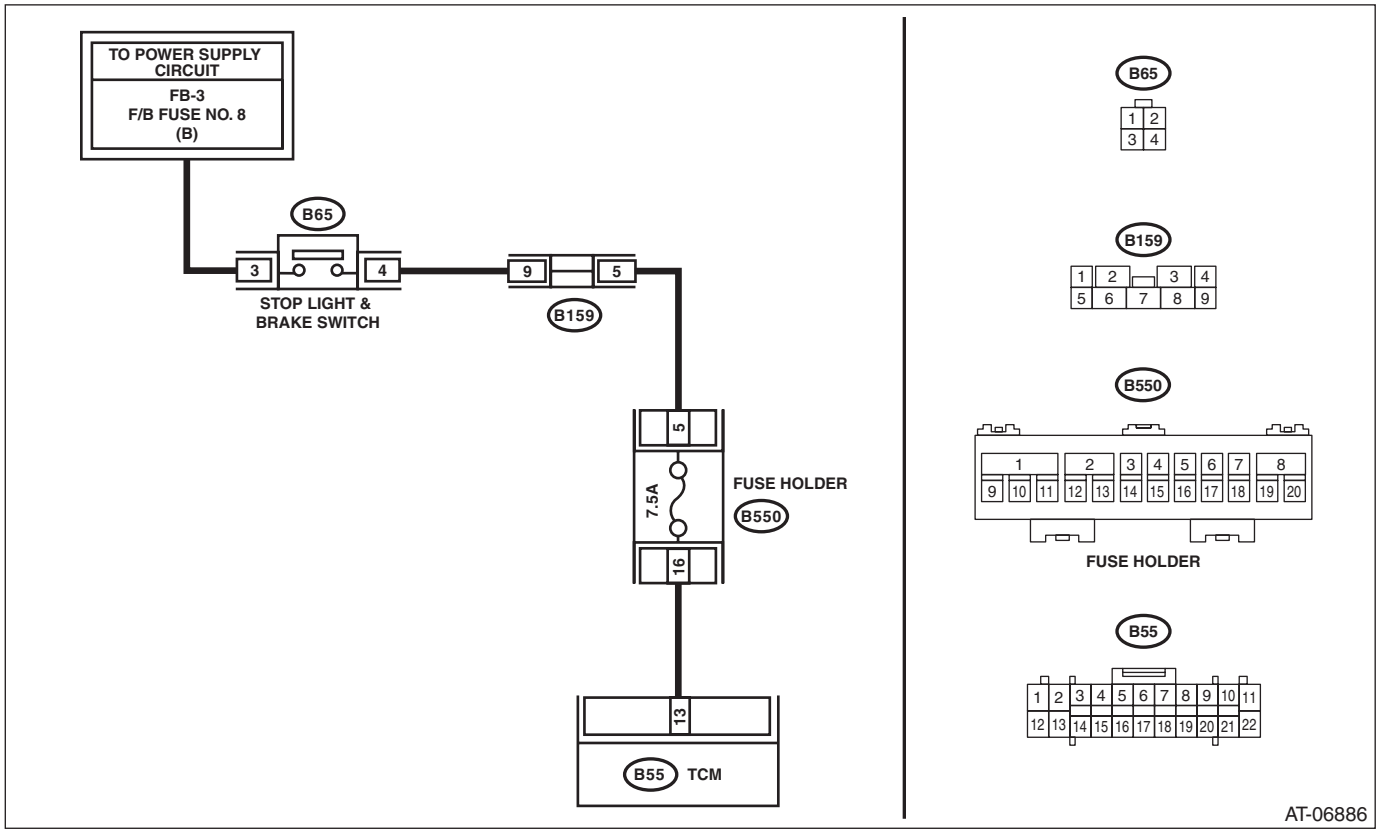


Step		Check	Yes	No
1	**CHECK FUSE (NO. 8).** 1) Turn the ignition switch to OFF. 2) Remove the fuse (No. 8).	Is the fuse (No. 8) blown out?	Replace the fuse (No. 8). If the new fuse (No. 8) has blown out easily, repair the short circuit of harness between fuse (No. 8) and stop light switch.	Go to step **2**.
2	**CHECK FUSE.** Remove the fuse (7.5 A) from the fuse holder.	Is the fuse (7.5 A) blown out?	Replace the fuse (7.5 A). If the replaced fuse (7.5 A) blows out easily, repair the short circuit of harness between fuse (7.5 A) and TCM.	Go to step **3**.

	Step	Check	Yes	No
3	**CHECK HARNESS.** 1) Turn the ignition switch to OFF. 2) Disconnect the TCM and stop light switch connector. 3) Measure the resistance between TCM connector and stop light switch connector. ***Connector & terminal*** ***(B55) No. 13 — (B65) No. 4:***	Is the resistance less than 1 Ω?	Go to step **4**.	Repair the open circuit of harness.
4	**CHECK HARNESS.** Measure the resistance between TCM connector and fuse (No. 8). ***Connector & terminal*** ***(B65) No. 3 — fuse (No. 8):***	Is the resistance less than 1 Ω?	Go to step **5**.	Repair the open circuit of harness.
5	**CHECK INPUT SIGNAL FOR TCM.** 1) Install the fuse (No. 8). 2) Connect the TCM and stop light switch connector. 3) Depress the brake pedal. 4) Measure the voltage between TCM connector and chassis ground. ***Connector & terminal*** ***(B55) No. 13 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Go to step **6**.	Replace the stop light switch.
6	**CHECK INPUT SIGNAL FOR TCM.** With brake pedal depressed, read the data of «Stop Light Switch» using Subaru Select Monitor.	Is “ON” displayed?	Current condition is normal. Check for poor contact in connectors or harnesses, and repair the defective part.	Go to step **7**.
7	**CHECK FOR POOR CONTACT.**	Is there poor contact of input signal of stop light switch?	Repair the poor contact.	Check the TCM.

G: DTC P0724 BRAKE SWITCH CIRCUIT HIGH

DTC DETECTING CONDITION:
Brake switch malfunction or input signal circuit of brake switch is shorted.
TROUBLE SYMPTOM:
Gear is not shifted down when climbing a hill or driving down a hill.
WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK STOP LIGHT SWITCH.** 1) Turn the ignition switch to OFF. 2) Disconnect the stop light switch connector. 3) Measure the resistance of harness between stop light switch connectors. ***Connector & terminal*** ***(B65) No. 3 — No. 4:***	Is the resistance 1 MΩ or more?	Go to step **2**.	Replace the stop light switch.
2	**CHECK HARNESS.** 1) Disconnect the TCM connector. 2) Turn the ignition switch to ON. 3) Measure the voltage between TCM connector and chassis ground. ***Connector & terminal*** ***(B55) No. 13 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Repair the short circuit of harness.	Go to step **3**.
3	**CHECK INPUT SIGNAL FOR TCM.** 1) Connect the TCM and stop light switch connector. 2) Turn the ignition switch to ON. 3) Read the data of «Stop Light Switch» using Subaru Select Monitor.	Is “OFF” displayed?	Current condition is normal. Check for poor contact in connectors or harnesses, and repair the defective part.	Go to step **4**.
4	**CHECK FOR POOR CONTACT.**	Is there poor contact of input signal of stop light switch?	Repair the poor contact.	Check the TCM.

H: DTC P0730 GEARSHIFT CONTROL PERFORMANCE ABNORMAL

DTC DETECTING CONDITION:

- Control valve hydraulic circuit malfunction
- Primary UP solenoid, primary Down solenoid characteristics malfunction
- CVT chain slippage

TROUBLE SYMPTOM:

- Acceleration is poor during standing start.
- Shift control malfunction
- Engine speed increases abruptly.

	Step	Check	Yes	No
1	**CHECK TRANSMISSION FLUID.** Check the condition of ATF. <Ref. to CVT-40, CONDITION CHECK, CVTF.>	Is the ATF OK?	Go to step **2**.	Check according to the "corrective action" of ATF (CVTF) "CONDITION CHECK". <Ref. to CVT-40, CONDITION CHECK, CVTF.>
2	**CHECK TRANSMISSION FLUID.** Check the amount of ATF. <Ref. to CVT-36, ADJUSTMENT, CVTF.>	Is the ATF amount correct?	Go to step **3**.	Adjust the amount of ATF. <Ref. to CVT-36, ADJUSTMENT, CVTF.>
3	**CHECK INPUT SIGNAL FOR TCM.** 1) Lift up the vehicle. 2) Start the engine. 3) Warm up until the ATF temperature reaches to 40 — 70°C (104 — 158°F). 4) Shift the select lever to "P" range. 5) Stabilize the engine speed at idle. 6) Read the data of «Actual secondary pressure» using Subaru Select Monitor.	Is the «Actual secondary pressure» 0.5 — 1.5 MPa?	Go to step **4**.	Perform the diagnosis according to DTC P0841 procedure.
4	**CHECK INPUT SIGNAL FOR TCM.** 1) Set the select lever to "D" range. 2) Release the brake pedal to stabilize the engine speed and front wheel speed. 3) Read the data of «Actual Gear Ratio» using Subaru Select Monitor.	Is the «Actual Gear Ratio» 1.5 — 2.6?	Go to step **5**.	Go to step **6**.
5	**CHECK INPUT SIGNAL FOR TCM.** 1) Set the select lever to "D" range. 2) Slowly increase the speed to 40 km/h (24 MPH) and keep the constant speed. 3) Read the data of «Actual Gear Ratio» using Subaru Select Monitor.	Is the «Actual Gear Ratio» 0.5 — 0.9?	Go to step **6**.	Replace the transmission assembly. <Ref. to CVT-58, Automatic Transmission Assembly.>
6	**DRIVING CHECK BY INSPECTION MODE.** 1) Turn the ignition switch to OFF. 2) Perform a drive check based on the "Inspection Mode". <Ref. to CVT(diag)-19, Inspection Mode.>	Does the AT OIL TEMP light blink and is DTC P0730 displayed?	Replace the transmission assembly. <Ref. to CVT-58, Automatic Transmission Assembly.>	If there is shift problems, abrupt increase of engine speed, standing start problems, replace the transmission assembly. <Ref. to CVT-58, Automatic Transmission Assembly.> If it is normal, temporary poor contact occurs.

I: DTC P0801 REVERSE INHIBIT CONTROL CIRCUIT

NOTE:
For diagnostic procedures, refer to “BODY CONTROL SYSTEM (DIAGNOSTICS)”. <Ref. to BC(diag)-34, DTC B1106 SHIFT LOCK CIRCUIT FAILURE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

J: DTC P0841 SECONDARY OIL PRESSURE SENSOR PERFORMANCE

DTC DETECTING CONDITION:

- Control valve hydraulic circuit malfunction
- Secondary pressure sensor fault or characteristics malfunction

TROUBLE SYMPTOM:

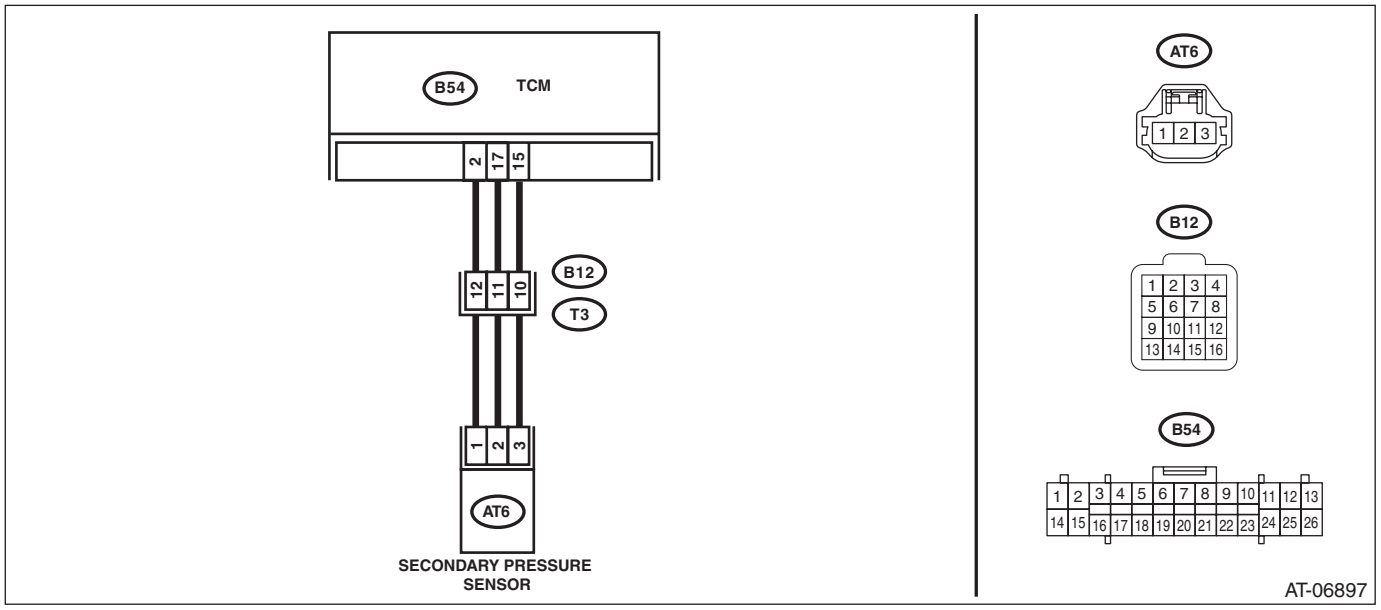
- Acceleration is poor during standing start.
- Shift control malfunction
- Engine speed increases abruptly.

	Step	Check	Yes	No
1	**CHECK TRANSMISSION FLUID.** Check the condition of ATF. <Ref. to CVT-40, CONDITION CHECK, CVTF.>	Is the ATF OK?	Go to step **2**.	Check according to the "corrective action" of ATF (CVTF) "CONDITION CHECK". <Ref. to CVT-40, CONDITION CHECK, CVTF.>
2	**CHECK TRANSMISSION FLUID.** Check the amount of ATF. <Ref. to CVT-36, ADJUSTMENT, CVTF.>	Is the ATF amount correct?	Go to step **3**.	Adjust the amount of ATF. <Ref. to CVT-36, ADJUSTMENT, CVTF.>
3	**CHECK INPUT SIGNAL FOR TCM.** 1) Lift up the vehicle. 2) Start the engine. 3) Warm up until the ATF temperature reaches to 40 — 70°C (104 — 158°F). 4) Shift the select lever to "P" range. 5) Stabilize the engine speed at idle. 6) Read the data of «Actual secondary pressure» using Subaru Select Monitor.	Is the «Actual secondary pressure» 0.5 — 1.5 MPa?	Go to step **4**.	Go to step **6**.
4	**CHECK INPUT SIGNAL FOR TCM.** 1) Keep the engine speed at 3000 rpm. 2) Read the data of «Actual secondary pressure» using Subaru Select Monitor.	Is the «Actual secondary pressure» higher than the value in Step 3? Does the value change according to the engine speed, within the range of 1.5 — 2.5 MPa?	Go to step **5**.	Go to step **6**.
5	**CHECK TCM INPUT SIGNAL (STALL TEST).** 1) Apply the parking brake. 2) Set the select lever to "D" range. 3) Depress the brake pedal firmly. 4) Slowly open the accelerator fully, and stabilize the engine speed. 5) Read the data of «Actual secondary pressure» using Subaru Select Monitor.	Is the «Actual secondary pressure» higher than the value in Step 4? Does the value change according to the engine speed, within the range of 4.5 — 6.0 MPa?	Go to step **7**.	Go to step **6**.
6	**CHECK SECONDARY PRESSURE SENSOR.**	Is the secondary pressure sensor damaged from the standpoint of appearance?	Replace the secondary pressure sensor. <Ref. to CVT-106, Secondary Pressure Sensor.>	Perform the diagnosis according to DTC P0842, P0843 procedure.

	Step	Check	Yes	No
7	**DRIVING CHECK BY INSPECTION MODE.** 1) Turn the ignition switch to OFF. 2) Perform a drive check based on the “Inspection Mode”. <Ref. to CVT(diag)-19, Inspection Mode.>	Does the AT OIL TEMP light blink and is DTC P0841 displayed?	Perform the secondary pressure test. <Ref. to CVT-49, Secondary Pressure (Line Pressure) Test.>	If there is shift problems, abrupt increase of engine speed, standing start problems, replace the transmission assembly. <Ref. to CVT-58, Automatic Transmission Assembly.> If it is normal, temporary poor contact occurs.

K: DTC P0842 SECONDARY OIL PRESSURE SENSOR CIRCUIT (LOW)

DTC DETECTING CONDITION:
Input signal circuit of secondary pressure sensor is open or shorted.
TROUBLE SYMPTOM:
Shift characteristics malfunction
WIRING DIAGRAM:

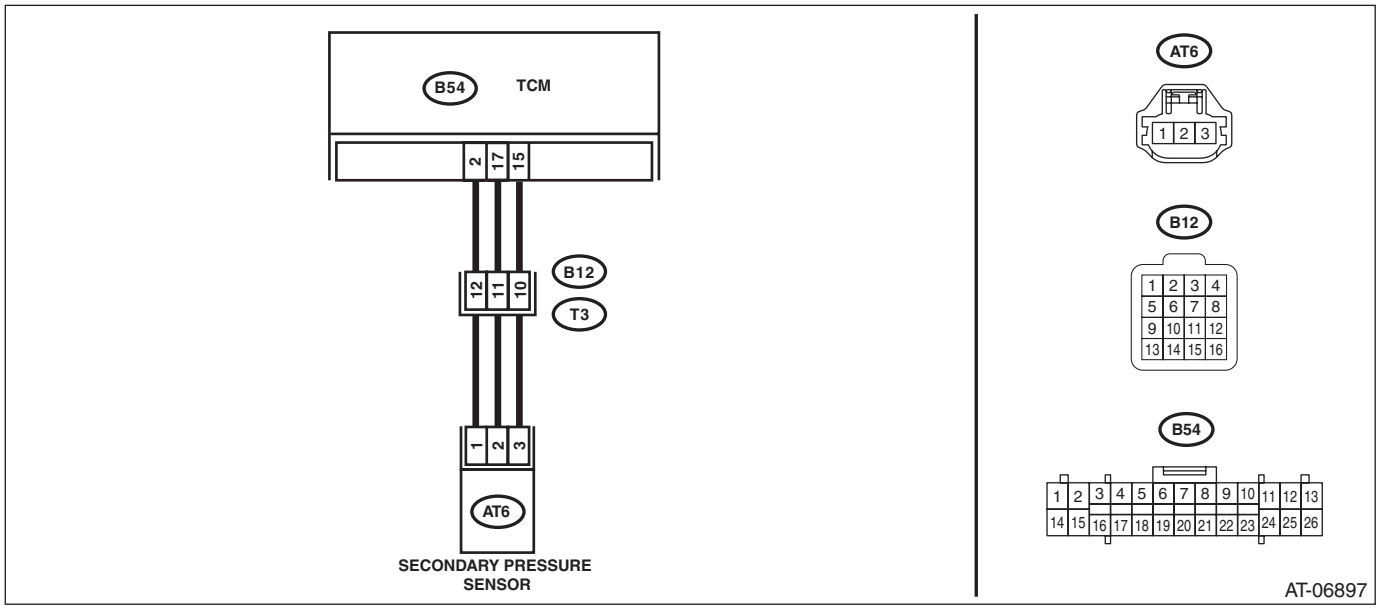


Step		Check	Yes	No
1	**CHECK INPUT SIGNAL FOR TCM.** 1) Start the engine. 2) Warm up until the ATF temperature reaches to 40 — 70°C (104 — 158°F). 3) Shift the select lever to “P” range. 4) Stabilize the engine speed at idle. 5) Read the data of «Actual secondary pressure» using Subaru Select Monitor.	Is the «Actual secondary pressure» 0.5 — 1.5 MPa?	Check for poor contact of connector.	Go to step **2**.
2	**CHECK HARNESS.** 1) Turn the ignition switch to OFF. 2) Disconnect the TCM and transmission connectors. 3) Measure the resistance between TCM connector and transmission connectors. ***Connector & terminal*** ***(B54) No. 2 — (B12) No. 12:*** ***(B54) No. 15 — (B12) No. 10:*** ***(B54) No. 17 — (B12) No. 11:***	Is the resistance less than 1 Ω?	Go to step **3**.	Repair the open circuit of harness.
3	**CHECK HARNESS.** Measure the resistance between TCM connector and chassis ground. ***Connector & terminal*** ***(B54) No. 2 — Chassis ground:*** ***(B54) No. 17 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **4**.	Repair the short circuit of harness.

	Step	Check	Yes	No
4	**CHECK TRANSMISSION HARNESS.** 1) Disconnect the secondary pressure sensor connector. 2) Measure the resistance between transmission connector and secondary pressure sensor connector. ***Connector & terminal*** ***(T3) No. 10 — (AT6) No. 3:*** ***(T3) No. 11 — (AT6) No. 2:*** ***(T3) No. 12 — (AT6) No. 1:***	Is the resistance less than 1 Ω?	Go to step **5**.	Repair the open circuit of harness.
5	**CHECK TRANSMISSION HARNESS.** Measure the resistance between transmission connector and chassis ground. ***Connector & terminal*** ***(T3) No. 11 — Chassis ground:*** ***(T3) No. 12 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **6**.	Repair the short circuit of harness.
6	**CHECK SENSOR POWER SUPPLY.** 1) Connect the connectors of TCM and transmission. 2) Turn the ignition switch to ON. 3) Measure the voltage between secondary pressure sensor connector terminals. ***Connector & terminal*** ***(AT6) No. 1 (+) — (AT6) No. 3 (–):***	Is the voltage 4.5 V or more?	Replace the secondary pressure sensor. <Ref. to CVT-106, Secondary Pressure Sensor.>	Check for poor contact of the connector, and repair the defective part.

L: DTC P0843 SECONDARY OIL PRESSURE SENSOR CIRCUIT (HIGH)

DTC DETECTING CONDITION:
Input signal circuit of secondary pressure sensor is shorted.
TROUBLE SYMPTOM:
Shift characteristics malfunction
WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK INPUT SIGNAL FOR TCM.** 1) Start the engine. 2) Warm up until the ATF temperature reaches to 40 — 70°C (104 — 158°F). 3) Shift the select lever to “P” range. 4) Stabilize the engine speed at idle. 5) Read the data of «Actual secondary pressure» using Subaru Select Monitor.	Is the «Actual secondary pressure» 0.5 — 1.5 MPa?	Check for poor contact of connector.	Go to step **2**.
2	**CHECK HARNESS.** 1) Turn the ignition switch to OFF. 2) Disconnect the TCM and transmission connectors. 3) Turn the ignition switch to ON. 4) Measure the voltage between TCM connector and chassis ground. ***Connector & terminal*** ***(B54) No. 2 (+) — Chassis ground (–):*** ***(B54) No. 17 (+) — Chassis ground (–):***	Is the voltage approx. 0 V?	Go to step **3**.	Repair the short circuit of harness.
3	**CHECK HARNESS.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between TCM connector terminals. ***Connector & terminal*** ***(B54) No. 2 — (B54) No. 17:***	Is the resistance less than 1 Ω?	Repair the short circuit of harness.	Go to step **4**.

	Step	Check	Yes	No
4	**CHECK TRANSMISSION HARNESS.** 1) Disconnect the secondary pressure sensor connector. 2) Turn the ignition switch to ON. 3) Measure the voltage between transmission connector and chassis ground. ***Connector & terminal*** ***(T3) No. 11 (+) — Chassis ground (–):*** ***(T3) No. 12 (+) — Chassis ground (–):***	Is the voltage approx. 0 V?	Go to step **5**.	Repair the short circuit of harness.
5	**CHECK TRANSMISSION HARNESS.** 1) Turn the ignition switch to OFF. 2) Measure the resistance between transmission connector terminals. ***Connector & terminal*** ***(T3) No. 11 — (T3) No. 12:***	Is the resistance less than 1 Ω?	Repair the short circuit of harness.	Go to step **6**.
6	**CHECK SENSOR POWER SUPPLY.** 1) Connect the connectors of TCM and transmission. 2) Turn the ignition switch to ON. 3) Measure the voltage between secondary pressure sensor connector terminals. ***Connector & terminal*** ***(AT6) No. 1 (+) — (AT6) No. 3 (–):***	Is the voltage 4.5 V or more?	Replace the secondary pressure sensor. <Ref. to CVT-106, Secondary Pressure Sensor.>	Check for poor contact of the connector, and repair the defective part.

M: DTC P0890 AT SELF-SHUT RELAY DIAGNOSIS (LOW)

DTC DETECTING CONDITION:

- Power supply circuit of TCM is open or shorted.
- Self shut relay malfunction

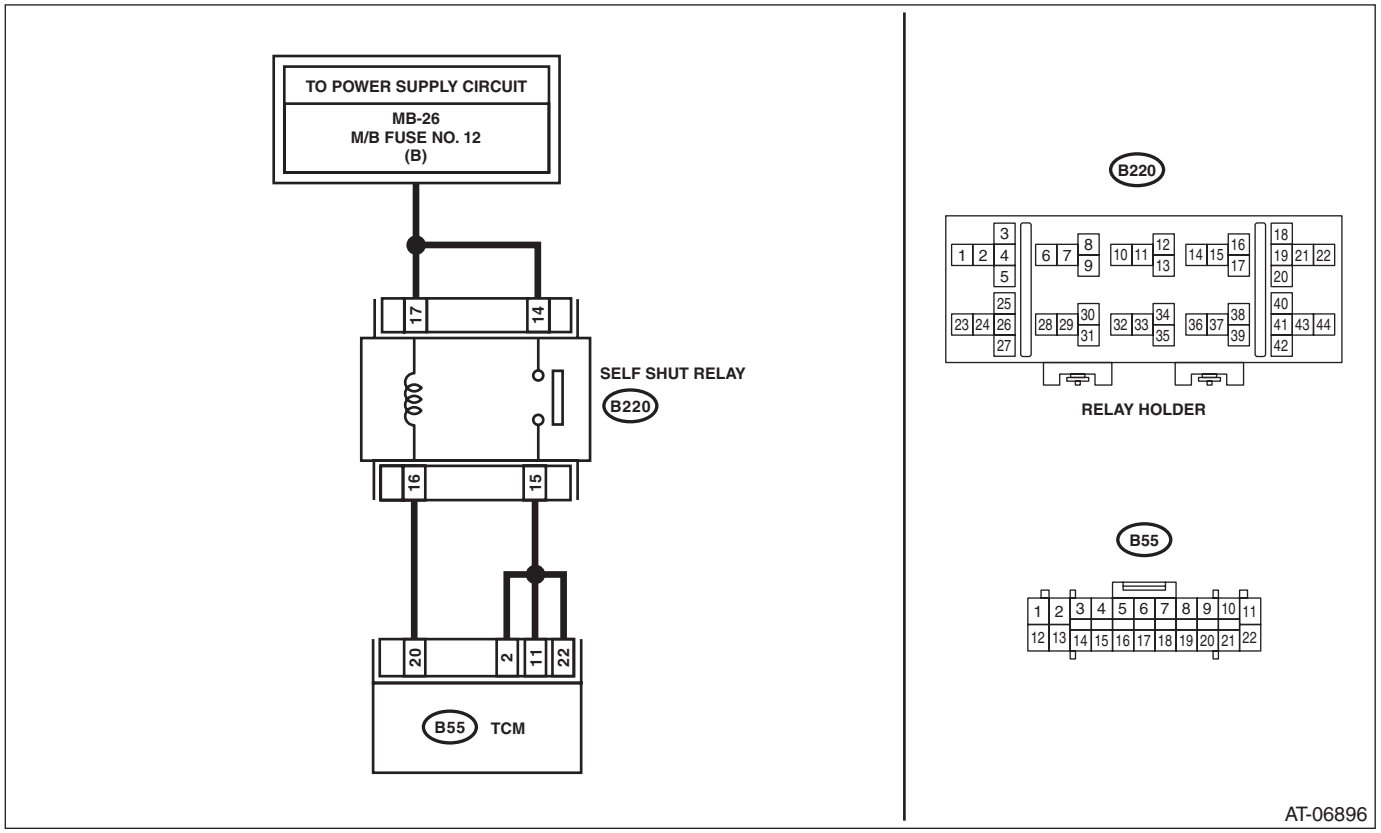
TROUBLE SYMPTOM:

Gear is not changed.

CAUTION:

After diagnosis, perform Clear Memory Mode for ECM. <Ref. to EN(H4DO)(diag)-56, Clear Memory Mode.>

WIRING DIAGRAM:

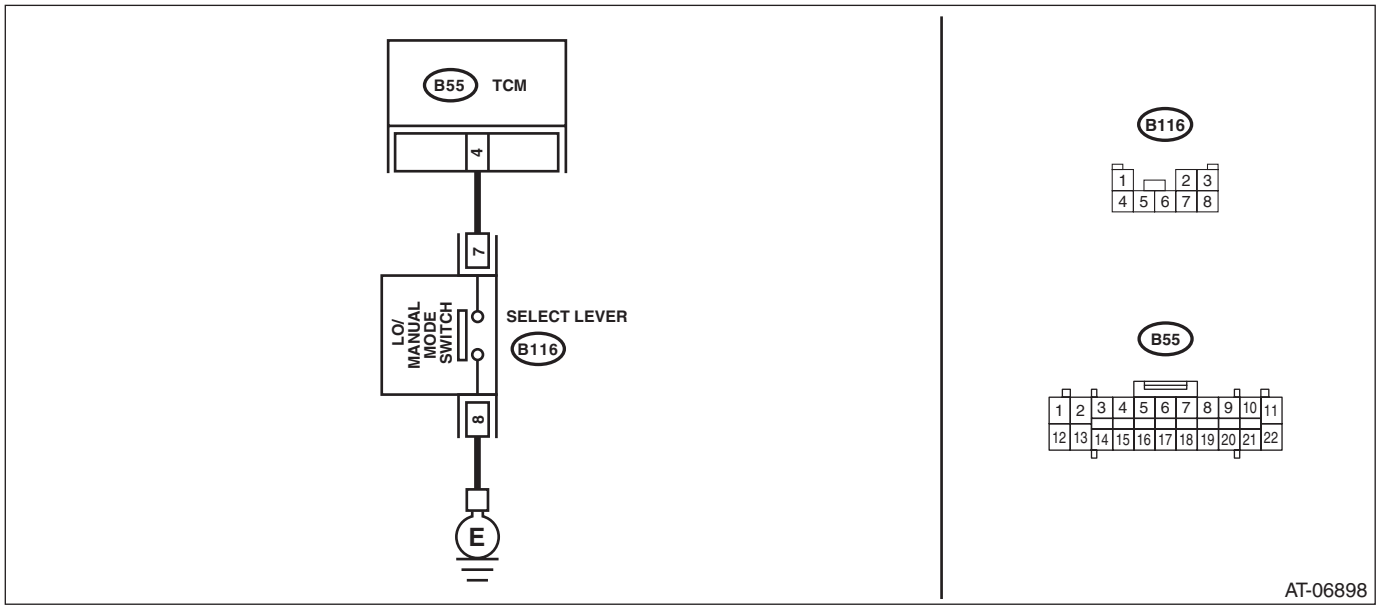


Step		Check	Yes	No
1	**CHECK HARNESS.** 1) Disconnect the TCM and self shut relay connectors. 2) Measure the resistance between TCM connector and self shut relay connector. ***Connector & terminal*** ***(B55) No. 20 — (B220) No. 16:*** ***(B55) No. 2 — (B220) No. 15:*** ***(B55) No. 11 — (B220) No. 15:*** ***(B55) No. 22 — (B220) No. 15:***	Is the resistance less than 1 Ω?	Go to step **2**.	Repair the open circuit of harness.
2	**CHECK HARNESS.** Measure the resistance between TCM connector and chassis ground. ***Connector & terminal*** ***(B55) No. 20 — Chassis ground:*** ***(B55) No. 2 — Chassis ground:*** ***(B55) No. 11 — Chassis ground:*** ***(B55) No. 22 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **3**.	Repair the short circuit of harness.

	Step	Check	Yes	No
3	**CHECK RELAY POWER SUPPLY.** Measure the voltage between self shut relay connector and chassis ground. ***Connector & terminal*** ***(B220) No. 14 (+) — Chassis ground (–):*** ***(B220) No. 17 (+) — Chassis ground (–):***	Is the voltage 10 V or more?	Go to step **4**.	Repair the open or short circuit of harness.
4	**CHECK SELF SHUT RELAY.** Measure the resistance between self shut relay terminals. ***Connector & terminal*** ***(B220) No. 16 — (B220) No. 17:***	Is the resistance 110 — 140 Ω?	Go to step **5**.	Replace the self shut relay.
5	**CHECK SELF SHUT RELAY.** Measure the resistance between self shut relay terminals. ***Connector & terminal*** ***(B220) No. 14 — (B220) No. 15:***	Is the resistance 1 MΩ or more?	Go to step **6**.	Replace the self shut relay.
6	**CHECK INPUT SIGNAL FOR TCM.** 1) Connect the connectors of TCM and self shut relay. 2) Read the data of «Battery voltage» using Subaru Select Monitor.	Is the «Battery voltage» 10 V or more?	Current condition is normal. Check for poor contact in connectors or harnesses, and repair the defective part.	Go to step **7**.
7	**CHECK FOR POOR CONTACT.**	Is there poor contact of the self shut relay circuit?	Repair the poor contact.	Check the TCM.

N: DTC P0951 MANUAL SWITCH

DTC DETECTING CONDITION:
Input signal circuit of manual mode switch is open or shorted.
TROUBLE SYMPTOM:
Manual mode can not be set.
WIRING DIAGRAM:



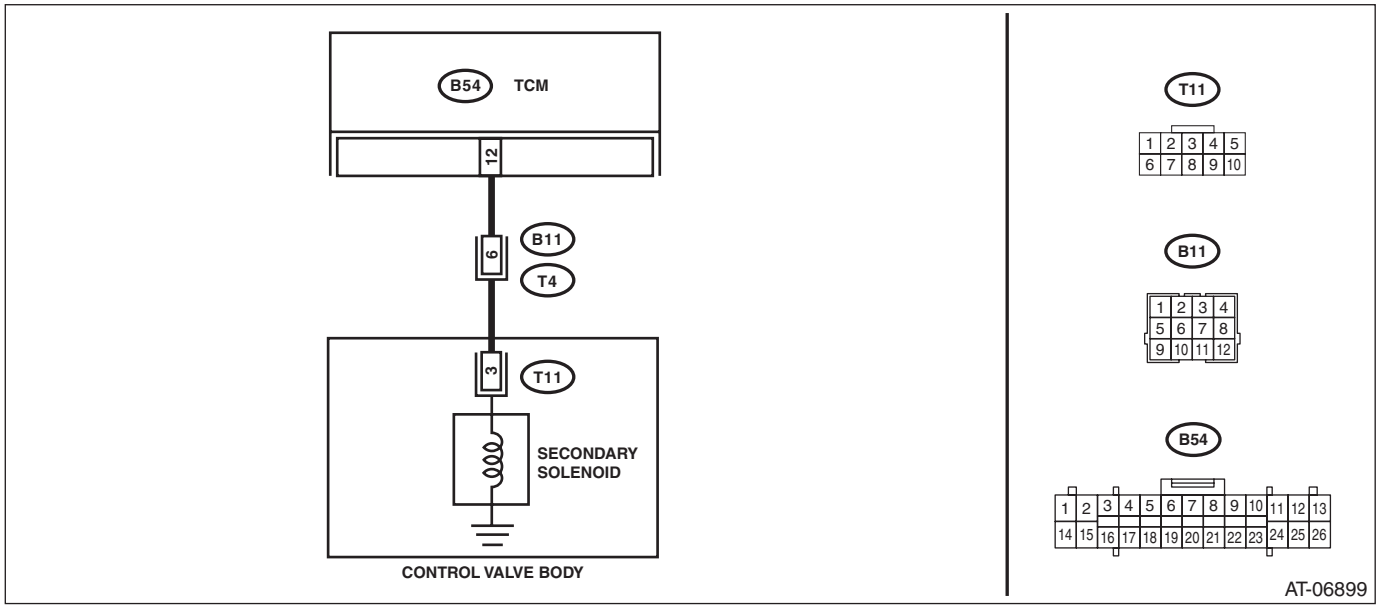
Step		Check	Yes	No
1	**CHECK HARNESS.** 1) Turn the ignition switch to OFF. 2) Disconnect the manual mode switch connector. 3) Measure the resistance between manual mode switch connector and chassis ground. ***Connector & terminal*** ***(B116) No. 8 — Chassis ground:***	Is the resistance less than 1 Ω?	Go to step **2**.	Repair the open circuit of harness.
2	**CHECK MANUAL MODE SWITCH.** Measure the resistance between manual mode switch terminals. ***Connector & terminal*** ***(B116) No. 7 — No. 8:***	Is the resistance 1 MΩ or more?	Go to step **3**.	Replace the select lever assembly. <Ref. to CS-20, Select Lever.>
3	**CHECK MANUAL MODE SWITCH.** 1) Shift the select lever to manual mode. 2) Measure the resistance between manual mode switch terminals. ***Connector & terminal*** ***(B116) No. 7 — No. 8:***	Is the resistance less than 1 Ω?	Go to step **4**.	Replace the select lever assembly. <Ref. to CS-20, Select Lever.>
4	**CHECK HARNESS.** 1) Disconnect the TCM connector. 2) Measure the resistance between TCM connector and manual mode switch connector. ***Connector & terminal*** ***(B55) No. 4 — (B116) No. 7:***	Is the resistance less than 1 Ω?	Go to step **5**.	Repair the open circuit of harness or poor contact of connector.
5	**CHECK HARNESS.** Measure the resistance between manual mode switch connector and chassis ground. ***Connector & terminal*** ***(B116) No. 7 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **6**.	Repair the short circuit of harness.

	Step	Check	Yes	No
6	**CHECK INPUT SIGNAL FOR TCM.** 1) Connect the TCM and manual mode switch connector. 2) Turn the ignition switch to ON. 3) Set the select lever to “D” range. 4) Read the data of «Tiptronic Mode Switch» using Subaru Select Monitor.	Does the value of «Tiptronic Mode Switch» change to “ON” with select lever in manual mode, and “OFF” with select lever in other than manual mode?	Current condition is normal.	Go to step **7**.
7	**CHECK FOR POOR CONTACT.**	Is there poor contact of the manual mode switch circuit?	Repair the poor contact.	Check the TCM.

O: DTC P0962 SECONDARY SOLENOID CIRCUIT (LOW)

DTC DETECTING CONDITION:
Output signal circuit of secondary solenoid is shorted.
TROUBLE SYMPTOM:
- Engine speed increases abruptly, and can not start.
- Engine speed increases abruptly during driving.

WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK INPUT SIGNAL FOR TCM.** 1) After driving with warm up condition, park the vehicle while depressing the brake pedal at "N" range. 2) Read the data of «Sec. Sol. Set Current» and «Sec. Sol. Actual Current» using Subaru Select Monitor.	Are the values of «Sec. Sol. Set Current» and «Sec. Sol. Actual Current» almost the same?	Check for poor contact of connector.	Go to step **2**.
2	**CHECK HARNESS.** 1) Turn the ignition switch to OFF. 2) Disconnect the TCM and transmission connectors. 3) Measure the resistance between TCM connector and chassis ground. ***Connector & terminal*** ***(B54) No. 12 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **3**.	Repair the short circuit of harness.
3	**CHECK SECONDARY SOLENOID.** Measure the resistance between transmission connector and transmission body. ***Connector & terminal*** ***(T4) No. 6 — Transmission body:***	Is the resistance approx. 7 Ω? (when engine cold)	Check for poor contact of the connector, and repair the defective part.	Go to step **4**.
4	**CHECK HARNESS INSIDE TRANSMISSION.** **CAUTION:** **Start work after ATF cools down.** 1) Remove the transmission valve cover. 2) Check for the harness pinch, damage.	Is the harness normal?	Go to step **5**.	Replace the transmission harness.

	Step	Check	Yes	No
5	**CHECK HARNESS INSIDE TRANSMISSION.** 1) Disconnect the control valve body connector. 2) Measure the resistance between transmission connector and transmission body. ***Connector & terminal*** ***(T4) No. 6 — Transmission body:***	Is the resistance 1 MΩ or more?	Replace the control valve body. <Ref. to CVT-112, Control Valve Body.>	Replace the transmission harness.

P: DTC P0963 SECONDARY SOLENOID CIRCUIT (HIGH)

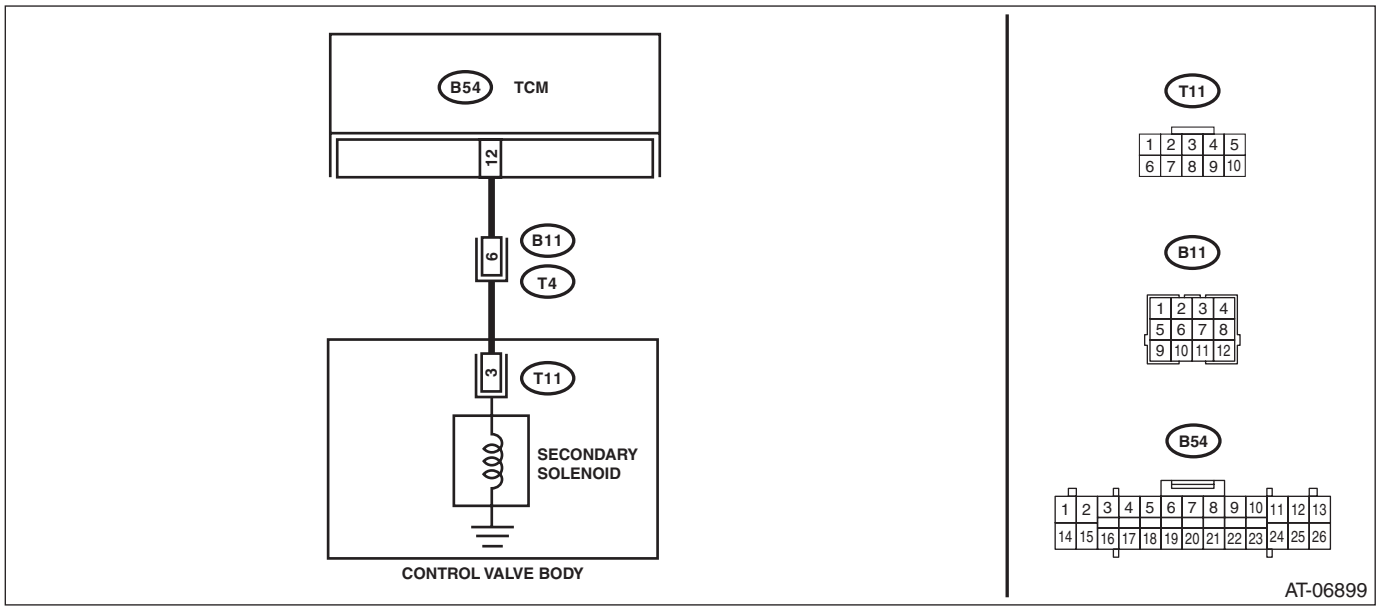
DTC DETECTING CONDITION:

- Output signal circuit of secondary solenoid is open or shorted.
- Secondary solenoid has open circuit inside.

TROUBLE SYMPTOM:

- Engine speed increases abruptly, and can not start.
- Engine speed increases abruptly during driving.

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK INPUT SIGNAL FOR TCM.** 1) After driving with warm up condition, park the vehicle while depressing the brake pedal at "N" range. 2) Read the data of «Sec. Sol. Set Current» and «Sec. Sol. Actual Current» using Subaru Select Monitor.	Are the values of «Sec. Sol. Set Current» and «Sec. Sol. Actual Current» almost the same?	Check for poor contact of connector.	Go to step **2**.
2	**CHECK HARNESS.** 1) Turn the ignition switch to OFF. 2) Disconnect the TCM and transmission connectors. 3) Measure the resistance between TCM connector and transmission connectors. ***Connector & terminal*** ***(B54) No. 12 — (B11) No. 6:***	Is the resistance less than 1 Ω?	Go to step **3**.	Repair the open circuit of harness.
3	**CHECK HARNESS.** 1) Turn the ignition switch to ON. 2) Measure the voltage between TCM connector and chassis ground. ***Connector & terminal*** ***(B54) No. 12 (+) — Chassis ground (–):***	Is the voltage approx. 0 V?	Go to step **4**.	Repair the short circuit of harness.
4	**CHECK SECONDARY SOLENOID.** Measure the resistance between transmission connector and transmission body. ***Connector & terminal*** ***(T4) No. 6 — Transmission body:***	Is the resistance approx. 7 Ω? (when engine cold)	Check for poor contact of the connector, and repair the defective part.	Go to step **5**.

	Step	Check	Yes	No
5	**CHECK HARNESS INSIDE TRANSMISSION.** **CAUTION:** **Start work after ATF cools down.** 1) Remove the transmission valve cover. 2) Check for the harness pinch, damage.	Is the harness normal?	Go to step **6**.	Replace the transmission harness.
6	**CHECK HARNESS INSIDE TRANSMISSION.** 1) Disconnect the control valve body connector. 2) Turn the ignition switch to ON. 3) Measure the voltage between transmission connector and transmission body. ***Connector & terminal*** ***(T4) No. 6 (+) — Transmission body (–):***	Is the voltage approx. 0 V?	Replace the control valve body. <Ref. to CVT-112, Control Valve Body.>	Replace the transmission harness.

Q: DTC P0965 FORWARD & REVERSE SOLENOID FUNCTION

DTC DETECTING CONDITION:

- Control valve hydraulic circuit malfunction
- F&R solenoid characteristics malfunction
- Clutch slippage caused by forward clutch facing deterioration
- Clutch slippage caused by hydraulic pressure leaks

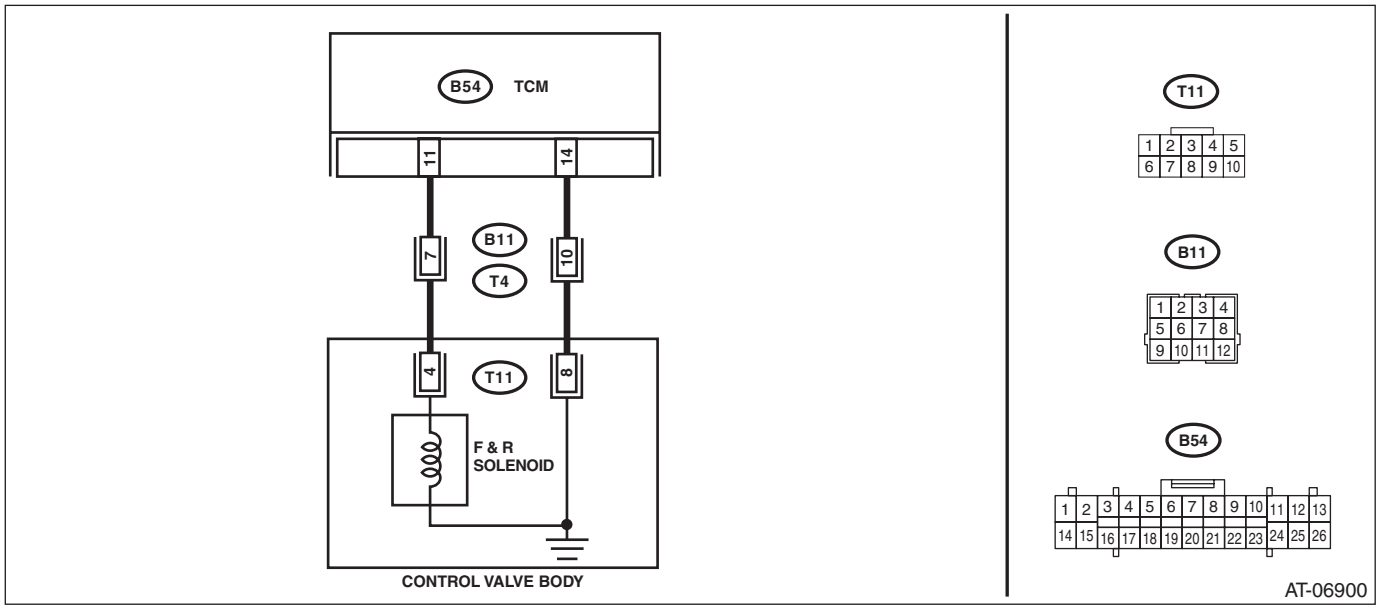
TROUBLE SYMPTOM:

- Engine speed increases abruptly, and can not accelerate.
- Excessive slippage is felt.

	Step	Check	Yes	No
1	**CHECK TRANSMISSION FLUID.** Check the condition of ATF. <Ref. to CVT-40, CONDITION CHECK, CVTF.>	Is the ATF OK?	Go to step **2**.	Check according to the "corrective action" of ATF (CVTF) "CONDITION CHECK". <Ref. to CVT-40, CONDITION CHECK, CVTF.>
2	**CHECK TRANSMISSION FLUID.** Check the amount of ATF. <Ref. to CVT-36, ADJUSTMENT, CVTF.>	Is the ATF amount correct?	Go to step **3**.	Adjust the amount of ATF. <Ref. to CVT-36, ADJUSTMENT, CVTF.>
3	**CHECK INPUT SIGNAL FOR TCM.** 1) Start the engine. 2) Warm up until the ATF temperature reaches to 40 — 70°C (104 — 158°F). 3) Shift the select lever to "P" range. 4) Stabilize the engine speed at idle. 5) Read the data of «Actual secondary pressure» using Subaru Select Monitor.	Is the «Actual secondary pressure» 0.5 — 1.5 MPa?	Go to step **4**.	Perform the diagnosis according to DTC P0841 procedure.
4	**STALL TEST.** Perform the stall test. <Ref. to CVT-47, Stall Test.>	Is the stall test normal?	Go to step **5**.	If the engine speed increases abruptly, replace the transmission assembly. <Ref. to CVT-58, Automatic Transmission Assembly.>
5	**DRIVING CHECK BY INSPECTION MODE.** 1) Turn the ignition switch to OFF. 2) Perform a drive check based on the "Inspection Mode". <Ref. to CVT(diag)-19, Inspection Mode.>	Does the AT OIL TEMP light blink and is DTC P0965 displayed?	Replace the transmission assembly. <Ref. to CVT-58, Automatic Transmission Assembly.>	If there is abrupt increase of engine speed, standing start problems, replace the transmission assembly. <Ref. to CVT-58, Automatic Transmission Assembly.> If it is normal, temporary poor contact occurs.

R: DTC P0966 FORWARD & REVERSE SOLENOID CIRCUIT (LOW)

DTC DETECTING CONDITION:
Output signal circuit of F&R solenoid is shorted.
TROUBLE SYMPTOM:
Excessive shift shock
WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK INPUT SIGNAL FOR TCM.** 1) After driving with warm up condition, park the vehicle while depressing the brake pedal at "D" range. 2) Read the data of «F&R Linear Solenoid Set Current» and «F&R Linear Solenoid Actual Current» using Subaru Select Monitor.	Are the values of «F&R Linear Solenoid Set Current» and «F&R Linear Solenoid Actual Current» almost the same?	Check for poor contact of connector.	Go to step **2**.
2	**CHECK HARNESS.** 1) Turn the ignition switch to OFF. 2) Disconnect the TCM and transmission connectors. 3) Measure the resistance between TCM connector and chassis ground. ***Connector & terminal*** ***(B54) No. 11 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **3**.	Repair the short circuit of harness.
3	**CHECK F&R SOLENOID.** Measure the resistance between transmission connector and transmission body. ***Connector & terminal*** ***(T4) No. 7 — Transmission body:***	Is the resistance approx. 6 Ω? (when engine cold)	Check for poor contact of the connector, and repair the defective part.	Go to step **4**.
4	**CHECK HARNESS INSIDE TRANSMISSION.** **CAUTION:** **Start work after ATF cools down.** 1) Remove the transmission valve cover. 2) Check for the harness pinch, damage.	Is the harness normal?	Go to step **5**.	Replace the transmission harness.

	Step	Check	Yes	No
5	**CHECK HARNESS INSIDE TRANSMISSION.** 1) Disconnect the control valve body connector. 2) Measure the resistance between transmission connector and transmission body. ***Connector & terminal*** ***(T4) No. 7 — Transmission body:***	Is the resistance 1 MΩ or more?	Replace the control valve body. <Ref. to CVT-112, Control Valve Body.>	Replace the transmission harness.

S: DTC P0967 FORWARD & REVERSE LINEAR SOLENOID CIRCUIT (HIGH)

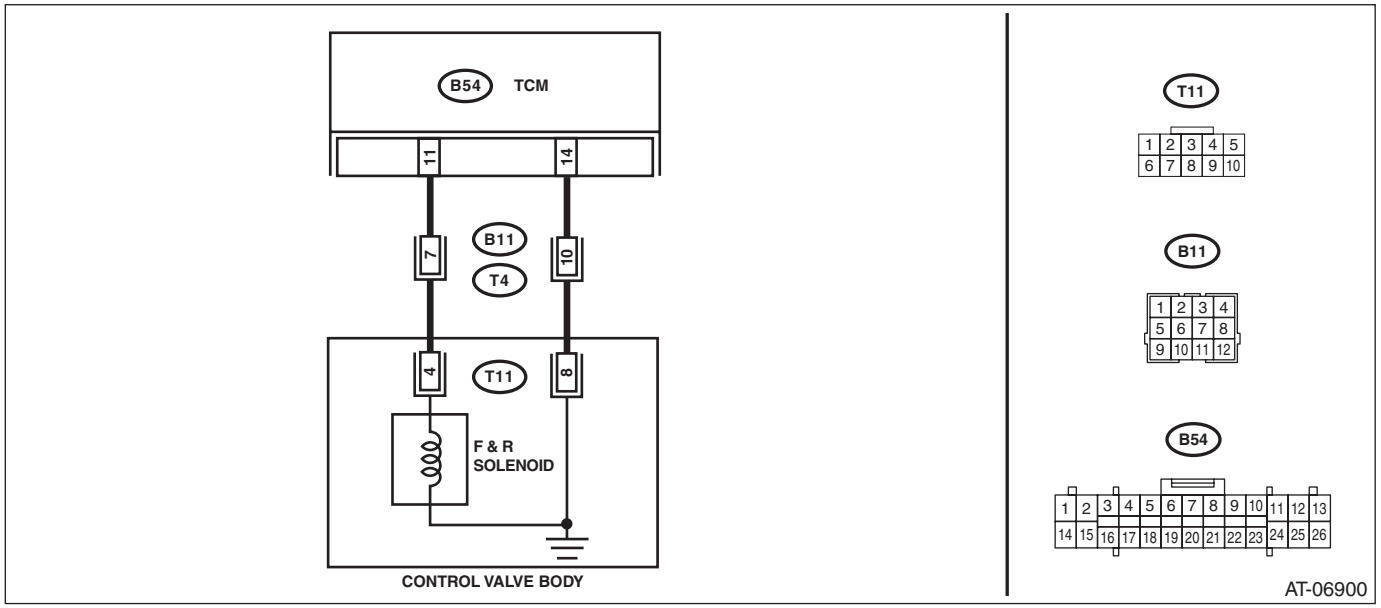
DTC DETECTING CONDITION:

- Output signal circuit of F&R solenoid is open or shorted.
- F&R solenoid has open circuit inside.

TROUBLE SYMPTOM:

Engine speed increases abruptly, and can not start.

WIRING DIAGRAM:

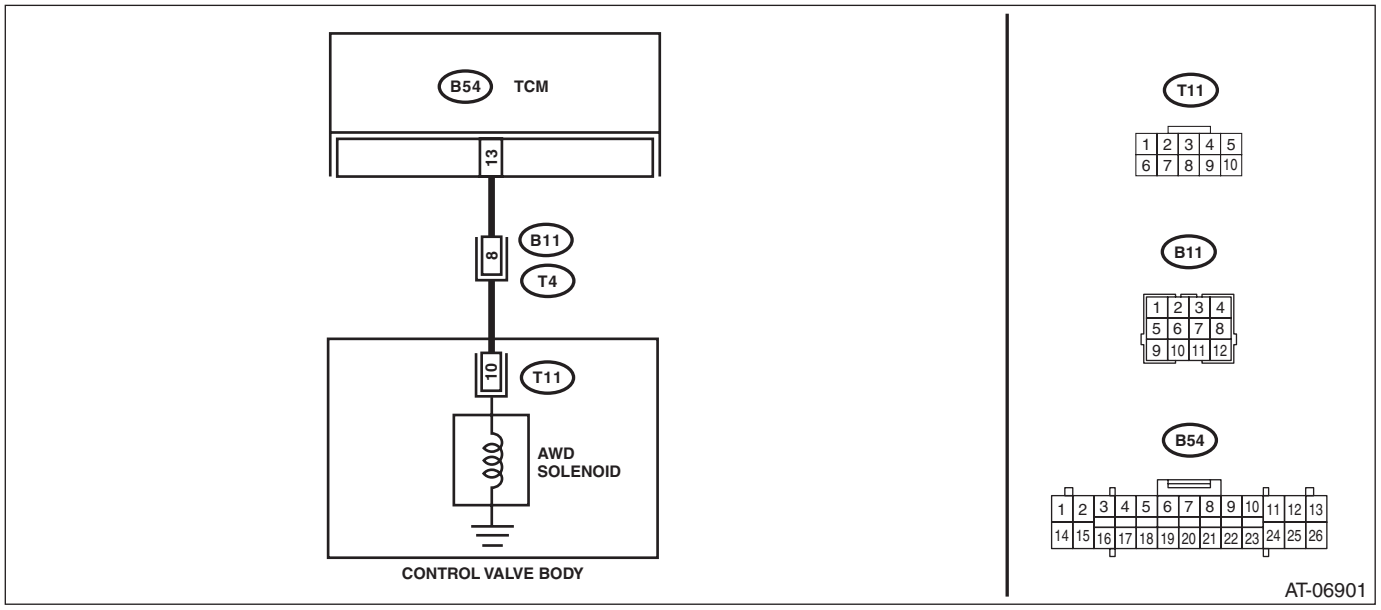


	Step	Check	Yes	No
1	**CHECK INPUT SIGNAL FOR TCM.** 1) After driving with warm up condition, park the vehicle while depressing the brake pedal at "D" range. 2) Read the data of «F&R Linear Solenoid Set Current» and «F&R Linear Solenoid Actual Current» using Subaru Select Monitor.	Are the values of «F&R Linear Solenoid Set Current» and «F&R Linear Solenoid Actual Current» almost the same?	Check for poor contact of connector.	Go to step **2**.
2	**CHECK HARNESS.** 1) Turn the ignition switch to OFF. 2) Disconnect the TCM and transmission connectors. 3) Measure the resistance between TCM connector and transmission connectors. ***Connector & terminal*** ***(B54) No. 11 — (B11) No. 7:***	Is the resistance less than 1 Ω?	Go to step **3**.	Repair the open circuit of harness.
3	**CHECK HARNESS.** 1) Turn the ignition switch to ON. 2) Measure the voltage between TCM connector and chassis ground. ***Connector & terminal*** ***(B54) No. 11 (+) — Chassis ground (–):***	Is the voltage approx. 0 V?	Go to step **4**.	Repair the short circuit of harness.
4	**CHECK F&R SOLENOID.** Measure the resistance between transmission connector and transmission body. ***Connector & terminal*** ***(T4) No. 7 — Transmission body:***	Is the resistance approx. 6 Ω? (when engine cold)	Check for poor contact of the connector, and repair the defective part.	Go to step **5**.

	Step	Check	Yes	No
5	**CHECK HARNESS INSIDE TRANSMISSION.** **CAUTION:** **Start work after ATF cools down.** 1) Remove the transmission valve cover. 2) Check for the harness pinch, damage.	Is the harness normal?	Go to step **6**.	Replace the transmission harness.
6	**CHECK HARNESS INSIDE TRANSMISSION.** 1) Disconnect the control valve body connector. 2) Turn the ignition switch to ON. 3) Measure the voltage between transmission connector and transmission body. ***Connector & terminal*** ***(T4) No. 7 (+) — Transmission body (–):***	Is the voltage approx. 0 V?	Replace the control valve body. <Ref. to CVT-112, Control Valve Body.>	Replace the transmission harness.

T: DTC P0970 TRANSFER SOLENOID CIRCUIT (LOW)

DTC DETECTING CONDITION:
Output signal circuit of AWD solenoid is shorted.
TROUBLE SYMPTOM:
Drivability getting worse.
WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK HARNESS.** 1) Turn the ignition switch to OFF. 2) Disconnect the TCM and transmission connectors. 3) Measure the resistance between TCM connector and chassis ground. ***Connector & terminal*** ***(B54) No. 13 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **2**.	Repair the short circuit of harness.
2	**CHECK AWD SOLENOID.** Measure the resistance between transmission connector and transmission body. ***Connector & terminal*** ***(T4) No. 8 — Transmission body:***	Is the resistance approx. 4 Ω? (when engine cold)	Check for poor contact of the connector, and repair the defective part.	Go to step **3**.
3	**CHECK HARNESS INSIDE TRANSMISSION.** **CAUTION:** **Start work after ATF cools down.** 1) Remove the transmission valve cover. 2) Check for the harness pinch, damage.	Is the harness normal?	Go to step **4**.	Replace the transmission harness.
4	**CHECK HARNESS INSIDE TRANSMISSION.** 1) Disconnect the control valve body connector. 2) Measure the resistance between transmission connector and transmission body. ***Connector & terminal*** ***(T4) No. 8 — Transmission body:***	Is the resistance 1 MΩ or more?	Replace the control valve body. <Ref. to CVT-112, Control Valve Body.>	Replace the transmission harness.

U: DTC P0971 TRANSFER SOLENOID CIRCUIT (HIGH)

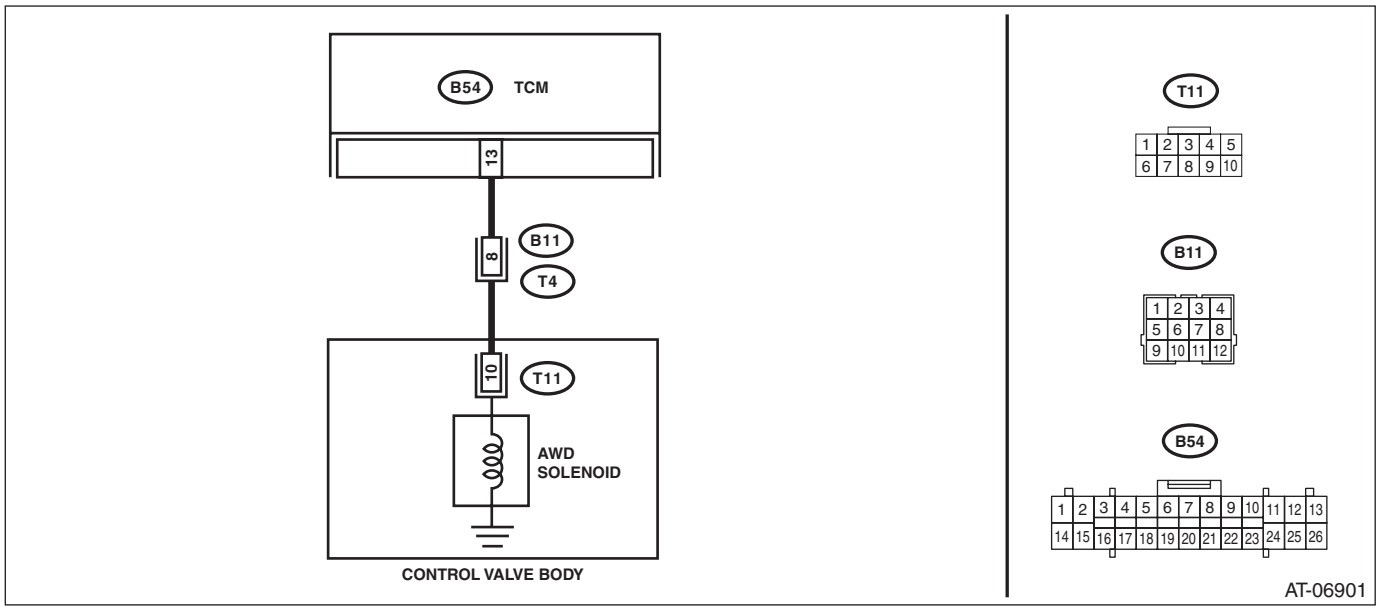
DTC DETECTING CONDITION:

- Output signal circuit of AWD solenoid is open or shorted.
- AWD solenoid has open circuit inside.

TROUBLE SYMPTOM:

- Tight corner braking phenomenon occurs.
- Drivability getting worse.

WIRING DIAGRAM:

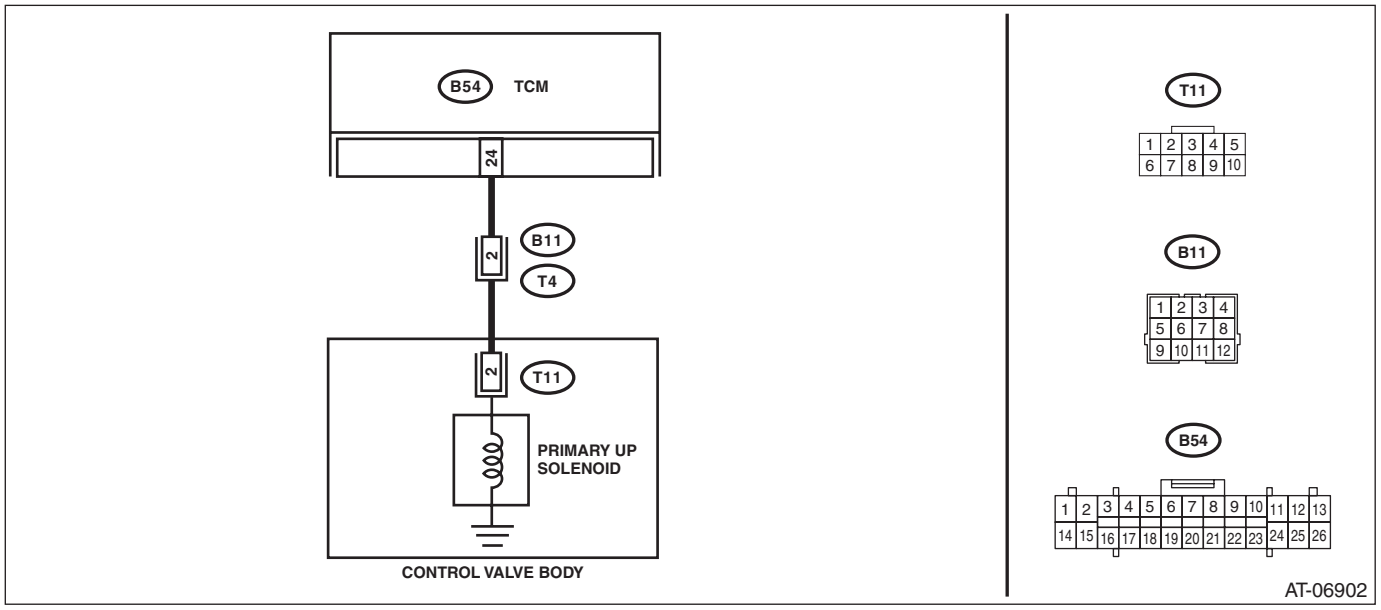


	Step	Check	Yes	No
1	**CHECK HARNESS.** 1) Turn the ignition switch to OFF. 2) Disconnect the TCM and transmission connectors. 3) Measure the resistance between TCM connector and transmission connectors. ***Connector & terminal*** ***(B54) No. 13 — (B11) No. 8:***	Is the resistance less than 1 Ω?	Go to step **2**.	Repair the open circuit of harness.
2	**CHECK HARNESS.** 1) Turn the ignition switch to ON. 2) Measure the voltage between TCM connector and chassis ground. ***Connector & terminal*** ***(B54) No. 13 (+) — Chassis ground (–):***	Is the voltage approx. 0 V?	Go to step **3**.	Repair the short circuit of harness.
3	**CHECK AWD SOLENOID.** Measure the resistance between transmission connector and transmission body. ***Connector & terminal*** ***(T4) No. 8 — Transmission body:***	Is the resistance approx. 4 Ω? (when engine cold)	Check for poor contact of the connector, and repair the defective part.	Go to step **4**.
4	**CHECK HARNESS INSIDE TRANSMISSION.** **CAUTION:** **Start work after ATF cools down.** 1) Remove the transmission valve cover. 2) Check for the harness pinch, damage.	Is the harness normal?	Go to step **5**.	Replace the transmission harness.

	Step	Check	Yes	No
5	**CHECK HARNESS INSIDE TRANSMISSION.** 1) Disconnect the control valve body connector. 2) Turn the ignition switch to ON. 3) Measure the voltage between transmission connector and transmission body. ***Connector & terminal*** ***(T4) No. 8 (+) — Transmission body (–):***	Is the voltage approx. 0 V?	Replace the control valve body. <Ref. to CVT-112, Control Valve Body.>	Replace the transmission harness.

V: DTC P0973 PRIMARY SOLENOID SYSTEM A CIRCUIT (LOW)

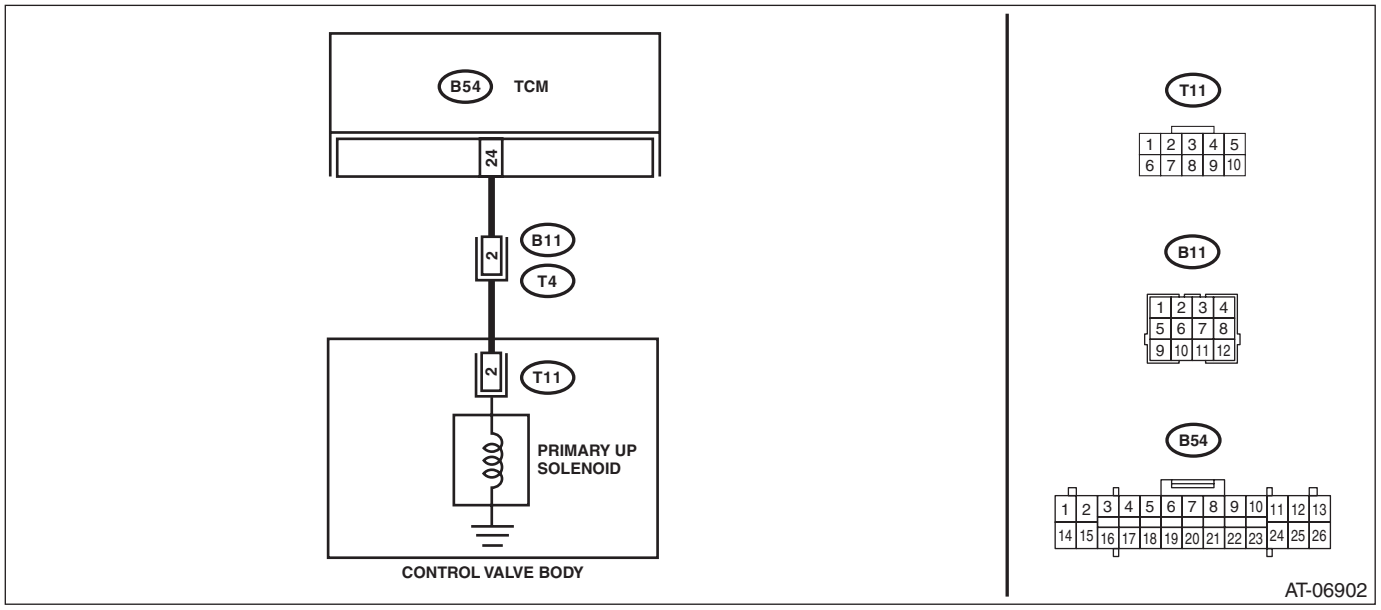
DTC DETECTING CONDITION:
Output signal circuit of primary UP solenoid is shorted.
TROUBLE SYMPTOM:
Gear is not changed. (No up-shift)
WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK HARNESS.** 1) Turn the ignition switch to OFF. 2) Disconnect the TCM and transmission connectors. 3) Measure the resistance between TCM connector and chassis ground. ***Connector & terminal*** ***(B54) No. 24 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **2**.	Repair the short circuit of harness.
2	**CHECK PRIMARY UP SOLENOID.** Measure the resistance between transmission connector and transmission body. ***Connector & terminal*** ***(T4) No. 2 — Transmission body:***	Is the resistance approx. 13 Ω? (when engine cold)	Check for poor contact of the connector, and repair the defective part.	Go to step **3**.
3	**CHECK HARNESS INSIDE TRANSMISSION.** **CAUTION:** **Start work after ATF cools down.** 1) Remove the transmission valve cover. 2) Check for the harness pinch, damage.	Is the harness normal?	Go to step **4**.	Replace the transmission harness.
4	**CHECK HARNESS INSIDE TRANSMISSION.** 1) Disconnect the control valve body connector. 2) Measure the resistance between transmission connector and transmission body. ***Connector & terminal*** ***(T4) No. 2 — Transmission body:***	Is the resistance 1 MΩ or more?	Replace the control valve body. <Ref. to CVT-112, Control Valve Body.>	Replace the transmission harness.

W: DTC P0974 PRIMARY SOLENOID SYSTEM A CIRCUIT (HIGH)

DTC DETECTING CONDITION:
Output signal circuit of primary UP solenoid is open or shorted.
TROUBLE SYMPTOM:
Gear is not changed. (No up-shift)
WIRING DIAGRAM:

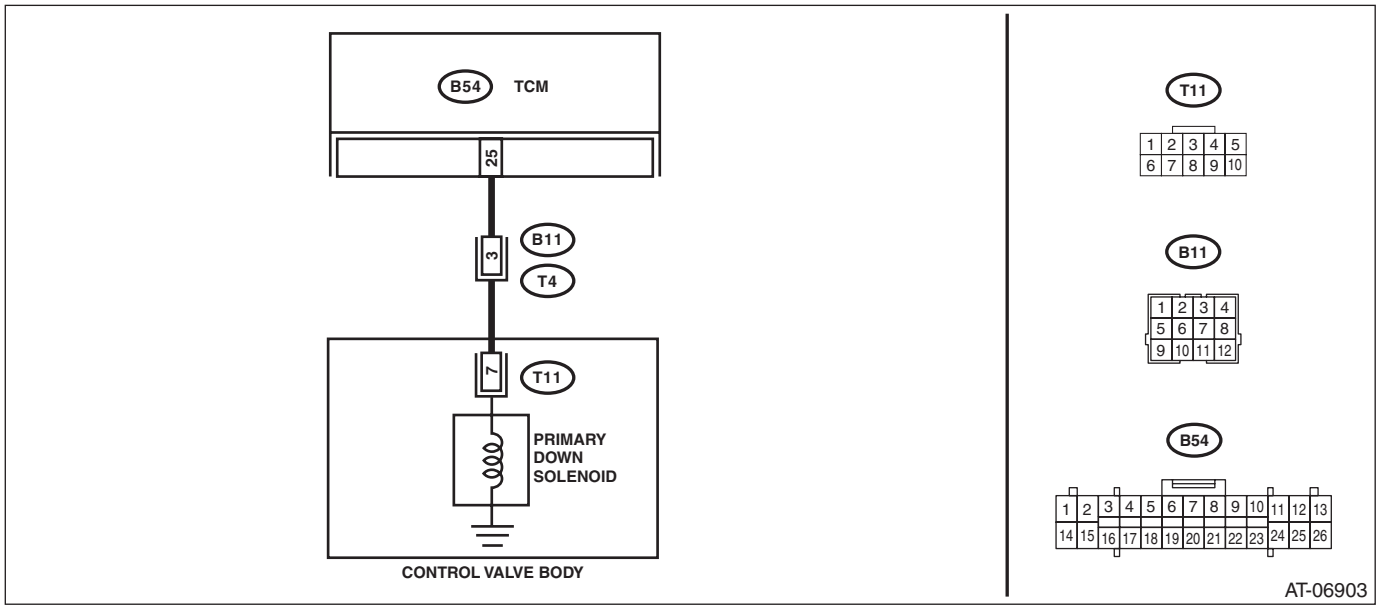


Step		Check	Yes	No
1	**CHECK HARNESS.** 1) Turn the ignition switch to OFF. 2) Disconnect the TCM and transmission connectors. 3) Measure the resistance between TCM connector and transmission connectors. ***Connector & terminal*** ***(B54) No. 24 — (B11) No. 2:***	Is the resistance less than 1 Ω?	Go to step **2**.	Repair the open circuit of harness.
2	**CHECK HARNESS.** 1) Turn the ignition switch to ON. 2) Measure the voltage between TCM connector and chassis ground. ***Connector & terminal*** ***(B54) No. 24 (+) — Chassis ground (–):***	Is the voltage approx. 0 V?	Go to step **3**.	Repair the short circuit of harness.
3	**CHECK PRIMARY UP SOLENOID.** Measure the resistance between transmission connector and transmission body. ***Connector & terminal*** ***(T4) No. 2 — Transmission body:***	Is the resistance approx. 13 Ω? (when engine cold)	Check for poor contact of the connector, and repair the defective part.	Go to step **4**.
4	**CHECK HARNESS INSIDE TRANSMISSION.** **CAUTION:** **Start work after ATF cools down.** 1) Remove the transmission valve cover. 2) Check for the harness pinch, damage.	Is the harness normal?	Go to step **5**.	Replace the transmission harness.

	Step	Check	Yes	No
5	**CHECK HARNESS INSIDE TRANSMISSION.** 1) Disconnect the control valve body connector. 2) Turn the ignition switch to ON. 3) Measure the voltage between transmission connector and transmission body. ***Connector & terminal*** ***(T4) No. 2 (+) — Transmission body (–):***	Is the voltage approx. 0 V?	Replace the control valve body. <Ref. to CVT-112, Control Valve Body.>	Replace the transmission harness.

X: DTC P0976 PRIMARY SOLENOID SYSTEM B CIRCUIT (LOW)

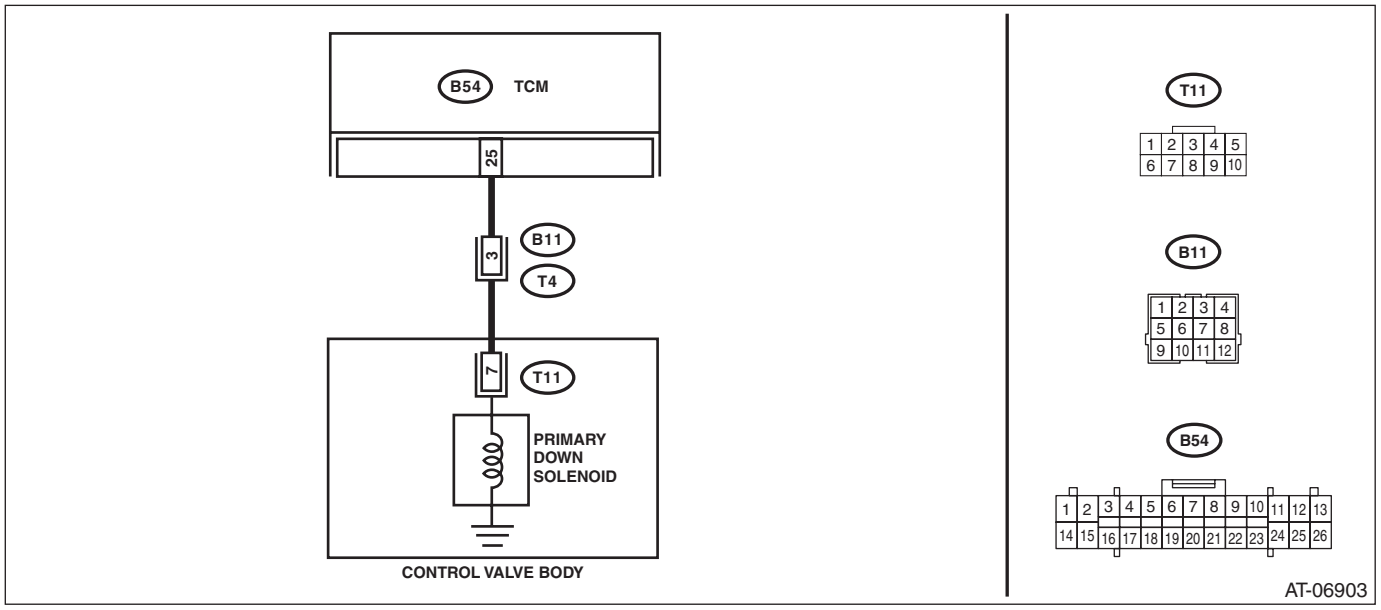
DTC DETECTING CONDITION:
Output signal circuit of primary DOWN solenoid is shorted.
TROUBLE SYMPTOM:
Gear is not changed. (No down-shift)
WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK HARNESS.** 1) Turn the ignition switch to OFF. 2) Disconnect the TCM and transmission connectors. 3) Measure the resistance between TCM connector and chassis ground. ***Connector & terminal*** ***(B54) No. 25 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **2**.	Repair the short circuit of harness.
2	**CHECK PRIMARY DOWN SOLENOID.** Measure the resistance between transmission connector and transmission body. ***Connector & terminal*** ***(T4) No. 3 — Transmission body:***	Is the resistance approx. 13 Ω? (when engine cold)	Check for poor contact of the connector, and repair the defective part.	Go to step **3**.
3	**CHECK HARNESS INSIDE TRANSMISSION.** **CAUTION:** **Start work after ATF cools down.** 1) Remove the transmission valve cover. 2) Check for the harness pinch, damage.	Is the harness normal?	Go to step **4**.	Replace the transmission harness.
4	**CHECK HARNESS INSIDE TRANSMISSION.** 1) Disconnect the control valve body connector. 2) Measure the resistance between transmission connector and transmission body. ***Connector & terminal*** ***(T4) No. 3 — Transmission body:***	Is the resistance 1 MΩ or more?	Replace the control valve body. <Ref. to CVT-112, Control Valve Body.>	Replace the transmission harness.

Y: DTC P0977 PRIMARY SOLENOID SYSTEM B CIRCUIT (HIGH)

DTC DETECTING CONDITION:
Output signal circuit of primary DOWN solenoid is open or shorted.
TROUBLE SYMPTOM:
Gear is not changed. (No down-shift)
WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK HARNESS.** 1) Turn the ignition switch to OFF. 2) Disconnect the TCM and transmission connectors. 3) Measure the resistance between TCM connector and transmission connectors. ***Connector & terminal*** ***(B54) No. 25 — (B11) No. 3:***	Is the resistance less than 1 Ω?	Go to step **2**.	Repair the open circuit of harness.
2	**CHECK HARNESS.** 1) Turn the ignition switch to ON. 2) Measure the voltage between TCM connector and chassis ground. ***Connector & terminal*** ***(B54) No. 25 (+) — Chassis ground (–):***	Is the voltage approx. 0 V?	Go to step **3**.	Repair the short circuit of harness.
3	**CHECK PRIMARY DOWN SOLENOID.** Measure the resistance between transmission connector and transmission body. ***Connector & terminal*** ***(T4) No. 3 — Transmission body:***	Is the resistance approx. 13 Ω? (when engine cold)	Check for poor contact of the connector, and repair the defective part.	Go to step **4**.
4	**CHECK HARNESS INSIDE TRANSMISSION.** **CAUTION:** **Start work after ATF cools down.** 1) Remove the transmission valve cover. 2) Check for the harness pinch, damage.	Is the harness normal?	Go to step **5**.	Replace the transmission harness.

	Step	Check	Yes	No
5	**CHECK HARNESS INSIDE TRANSMISSION.** 1) Disconnect the control valve body connector. 2) Turn the ignition switch to ON. 3) Measure the voltage between transmission connector and transmission body. ***Connector & terminal*** ***(T4) No. 3 (+) — Transmission body (–):***	Is the voltage approx. 0 V?	Replace the control valve body. <Ref. to CVT-112, Control Valve Body.>	Replace the transmission harness.

Z: DTC P170A L-RANGE SW SYSTEM

NOTE:
Refer to “DTC P0951 MANUAL SWITCH” for diagnostic procedure. <Ref. to CVT(diag)-57, DTC P0951 MANUAL SWITCH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

AA:DTC P1724 AT EEPROM ERROR

DTC DETECTING CONDITION:

- TCM EEPROM malfunction
- EEPROM writing error during self shut control

TROUBLE SYMPTOM:

- AT learning is not finished.
- Shock occurs when selecting N → D, N → R.

	Step	Check	Yes	No
1	**CHECK TCM CONNECTOR.**	Is the connection of TCM connector correct?	Go to step **2**.	Connect the TCM connector.
2	**CHECK SELF SHUT RELAY.** Turn the ignition switch to ON.	Does the relay operates simultaneously?	Go to step **3**.	Perform the diagnosis according to DTC P0890.
3	**CHECK SELF SHUT RELAY.** Turn the ignition switch to OFF.	Does the relay operate after two or three seconds delay?	Go to step **4**.	Perform the diagnosis according to DTC P0890.
4	**PERFORM AT LEARNING.** 1) Perform the {Clear Memories 2}. 2) Perform the AT learning. <Ref. to CVT(diag)-20, Learning Control.> 3) Start the engine.	Does the AT OIL TEMP light blink after AT learning is finished correctly?	Check the TCM.	Go to step **5**.
5	**CHECK FOR ANY OTHER DTC ON DISPLAY.** 1) Perform the {Clear Memory}. 2) Turn the ignition switch to OFF. 3) Start the engine after 10 seconds. 4) Repeat steps 2) and 3).	Does the AT OIL TEMP light blink and is DTC P1724 displayed?	Check the TCM.	Current condition is normal. Check for poor contact of TCM connector or harness.

AB:DTC P2746 PRIMARY PULLEY REVOLUTION SPEED SENSOR CIRCUIT

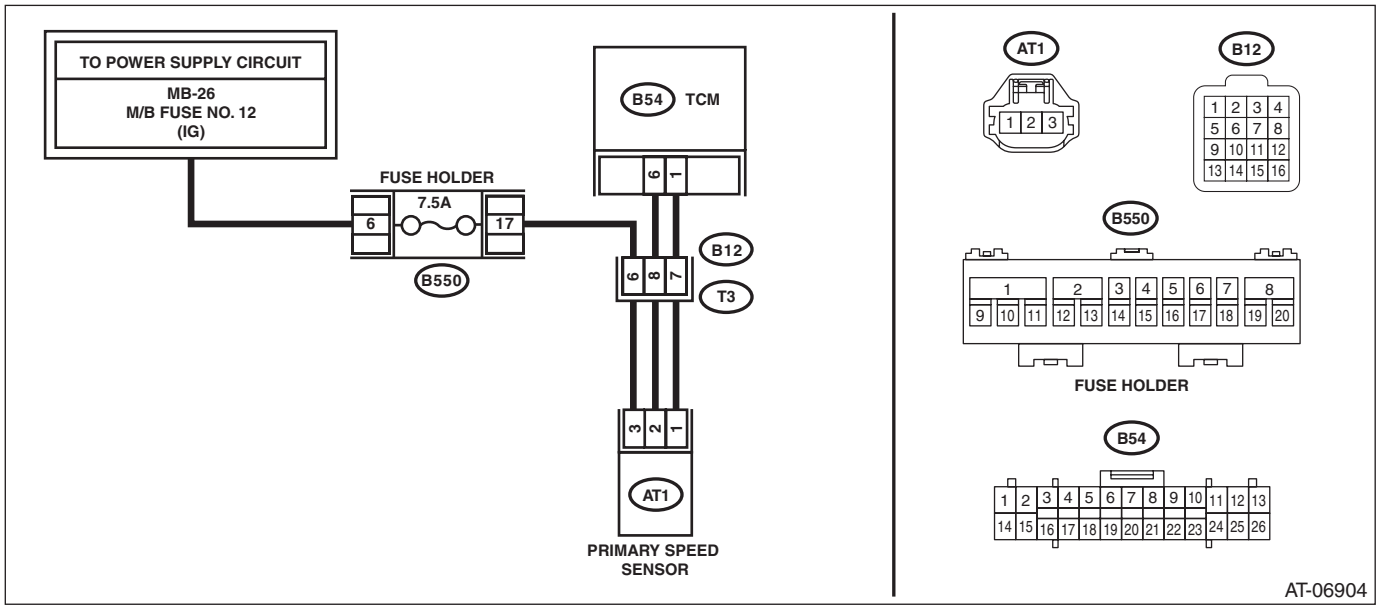
DTC DETECTING CONDITION:

- Output signal circuit of primary speed sensor is open or shorted.
- Primary speed sensor malfunction

TROUBLE SYMPTOM:

- Standing start problems
- Shock occurs when engaging the lockup clutch.
- Shock occurs when selecting shift position.

WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK FUSE.** 1) Turn the ignition switch to OFF. 2) Remove the fuse (7.5 A) from the fuse holder.	Is the fuse OK?	Go to step **2**.	Replace the fuse. If the fuse blows out easily, repair the short circuit of harness.
2	**CHECK HARNESS.** 1) Turn the ignition switch to OFF. 2) Disconnect the TCM and transmission connectors. 3) Measure the resistance between TCM connector and transmission connectors. ***Connector & terminal*** ***(B54) No. 6 — (B12) No. 8:*** ***(B550) No. 17 — (B12) No. 6:***	Is the resistance less than 1 Ω?	Go to step **3**.	Repair the open circuit of harness.
3	**CHECK HARNESS.** Measure the resistance between TCM connector and chassis ground. ***Connector & terminal*** ***(B54) No. 6 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **4**.	Repair the short circuit of harness.

	Step	Check	Yes	No
4	**CHECK TRANSMISSION HARNESS.** 1) Connect the TCM connector. 2) Turn the ignition switch to ON. 3) Measure the voltage between transmission connector terminals. ***Connector & terminal*** ***(B12) No. 6 (+) — (B12) No. 7 (–):*** NOTE: Delete the TCM memory after completing the CVT control system diagnosis. <Ref. to CVT(diag)-18, Clear Memory Mode.>	Is the voltage 10 — 13 V?	Go to step **5**.	Repair the open circuit of harness or poor contact of connector.
5	**CHECK INPUT SIGNAL FOR TCM.** 1) Turn the ignition switch to OFF. 2) Connect the transmission connector. 3) Lift up the vehicle. 4) Start the engine. 5) Set the select lever to “D” range. 6) Read the data of «Primary Pulley Speed» using Subaru Select Monitor.	Does the value of «Primary Pulley Speed» change according to those of «Turbine Revolution Speed»?	Current condition is normal. Repair the poor contacts of harnesses of primary speed sensor and transmission connector.	Go to step **6**.
6	**CHECK TRANSMISSION HARNESS.** 1) Turn the ignition switch to OFF. 2) Disconnect the transmission connector. 3) Disconnect the primary speed sensor connector. 4) Measure the resistance between transmission connector and primary speed sensor connector. ***Connector & terminal*** ***(T3) No. 6 — (AT1) No. 3:*** ***(T3) No. 7 — (AT1) No. 1:*** ***(T3) No. 8 — (AT1) No. 2:***	Is the resistance less than 1 Ω?	Replace the primary speed sensor. <Ref. to CVT-103, Primary Speed Sensor.>	Replace the transmission harness.

AC:DTC P2750 SEC. PULLEY REVOLUTION SPEED SENSOR CIRCUIT

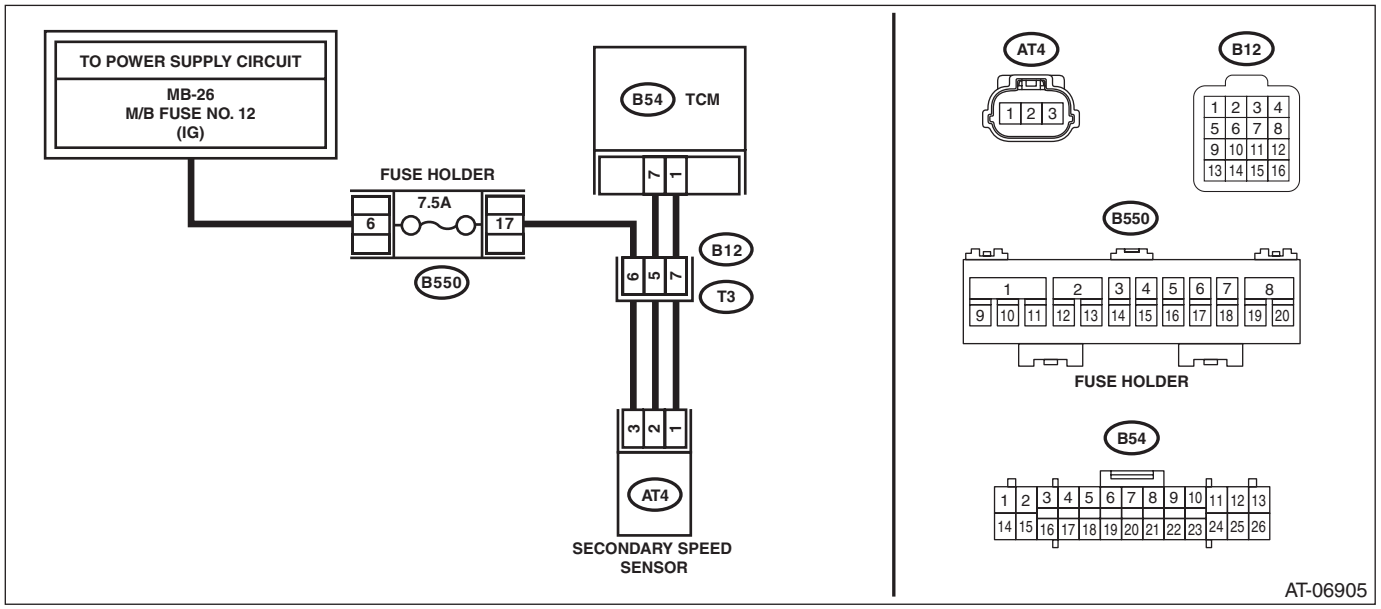
DTC DETECTING CONDITION:

- Output signal circuit of secondary speed sensor is open or shorted.
- Secondary speed sensor malfunction

TROUBLE SYMPTOM:

- Shifting shock is felt.
- Acceleration is poor during standing start.
- Shift control malfunction

WIRING DIAGRAM:



	Step	Check	Yes	No
1	**CHECK FUSE.** 1) Turn the ignition switch to OFF. 2) Remove the fuse (7.5 A) from the fuse holder.	Is the fuse OK?	Go to step **2**.	Replace the fuse. If the fuse blows out easily, repair the short circuit of harness.
2	**CHECK HARNESS.** 1) Turn the ignition switch to OFF. 2) Disconnect the TCM and transmission connectors. 3) Measure the resistance between TCM connector and transmission connectors. ***Connector & terminal*** ***(B54) No. 7 — (B12) No. 5:*** ***(B550) No. 17 — (B12) No. 6:***	Is the resistance less than 1 Ω?	Go to step **3**.	Repair the open circuit of harness.
3	**CHECK HARNESS.** Measure the resistance between TCM connector and chassis ground. ***Connector & terminal*** ***(B54) No. 7 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **4**.	Repair the short circuit of harness.

	Step	Check	Yes	No
4	**CHECK TRANSMISSION HARNESS.** 1) Connect the TCM connector. 2) Turn the ignition switch to ON. 3) Measure the voltage between transmission connector terminals. ***Connector & terminal*** ***(B12) No. 6 (+) — (B12) No. 7 (–):*** NOTE: Delete the TCM memory after completing the CVT control system diagnosis. <Ref. to CVT(diag)-18, Clear Memory Mode.>	Is the voltage 10 — 13 V?	Go to step **5**.	Repair the open circuit of harness or poor contact of connector.
5	**CHECK INPUT SIGNAL FOR TCM.** 1) Turn the ignition switch to OFF. 2) Connect the transmission connector. 3) Lift up the vehicle. 4) Start the engine. 5) Set the select lever to “D” range. 6) Read the data of «Secondary Pulley Speed» using Subaru Select Monitor.	Does the value of «Secondary Pulley Speed» change according to those of «Front Wheel Speed»?	Current condition is normal. Repair the poor contacts of harnesses of secondary speed sensor and transmission connector.	Go to step **6**.
6	**CHECK TRANSMISSION HARNESS.** 1) Turn the ignition switch to OFF. 2) Disconnect the transmission connector. 3) Disconnect the secondary speed sensor connector. 4) Measure the resistance between transmission connector and secondary speed sensor connector. ***Connector & terminal*** ***(T3) No. 5 — (AT4) No. 2:*** ***(T3) No. 6 — (AT4) No. 3:*** ***(T3) No. 7 — (AT4) No. 1:***	Is the resistance less than 1 Ω?	Replace the secondary speed sensor. <Ref. to CVT-101, Secondary Speed Sensor.>	Replace the transmission harness.

AD:DTC P2762 LOCK-UP DUTY SOLENOID MALFUNCTION

DTC DETECTING CONDITION:

- Lock up clutch malfunction
- Hydraulic leaks or hydraulic valve stick of lock up system

TROUBLE SYMPTOM:

- No lock-up occurs.
- Engine speed increases abruptly during driving.

	Step	Check	Yes	No
1	**CHECK DTC.** Read the DTC relating the ECM using the Subaru Select Monitor.	Is DTC displayed?	Perform the diagnosis according to DTC.	Go to step **2**.
2	**CHECK DTC.** Read the DTC relating the TCM using the Subaru Select Monitor.	Are DTC P0841, P0842, P0843 displayed?	Perform the diagnosis according to DTC.	Go to step **3**.
3	**CHECK TRANSMISSION FLUID.** Check the condition of ATF. <Ref. to CVT-40, CONDITION CHECK, CVTF.>	Is the ATF OK?	Go to step **4**.	Check according to the “corrective action” of ATF (CVTF) “CONDITION CHECK”. <Ref. to CVT-40, CONDITION CHECK, CVTF.>
4	**CHECK TRANSMISSION FLUID.** Check the amount of ATF. <Ref. to CVT-36, ADJUSTMENT, CVTF.>	Is the ATF amount correct?	Go to step **5**.	Adjust the amount of ATF. <Ref. to CVT-36, ADJUSTMENT, CVTF.>
5	**CHECK INPUT SIGNAL FOR TCM.** 1) Lift up the vehicle. 2) Start the engine. 3) Warm up until the ATF temperature reaches to 40 — 70°C (104 — 158°F). 4) Shift the select lever to “P” range. 5) Stabilize the engine speed at idle. 6) Read the data of «Actual secondary pressure» using Subaru Select Monitor.	Is the «Actual secondary pressure» 0.5 — 1.5 MPa?	Go to step **6**.	Perform the diagnosis according to DTC P0841 procedure.
6	**DRIVING CHECK FOR LOCK-UP CONDITION.** 1) Perform the “Clear Memory Mode”. <Ref. to CVT(diag)-18, Clear Memory Mode.> 2) Turn the ignition switch to OFF. 3) Start the engine. 4) Warm up until the ATF temperature exceeds 50°C. 5) Drive the vehicle for one minute or more while keeping the constant speed so that the display shown in the Subaru Select Monitor is as follows: «Lock Up Duty Ratio» is 70 % or more, and «Front Wheel Speed» is 40 km/h or more. 6) Turn the ignition switch to OFF. 7) Start the engine. 8) Perform the procedure in step 5) again. 9) Read the DTC using Subaru Select Monitor.	Does the AT OIL TEMP light blink and is DTC P2762 displayed?	Perform the secondary pressure test. <Ref. to CVT-49, Secondary Pressure (Line Pressure) Test.> When DTC other than P2762 is displayed, perform the diagnosis corresponding to the DTC.	Current condition is normal. Temporary oil pressure malfunction.

AE:DTC P2763 LOCK-UP DUTY SOLENOID CIRCUIT (HIGH)

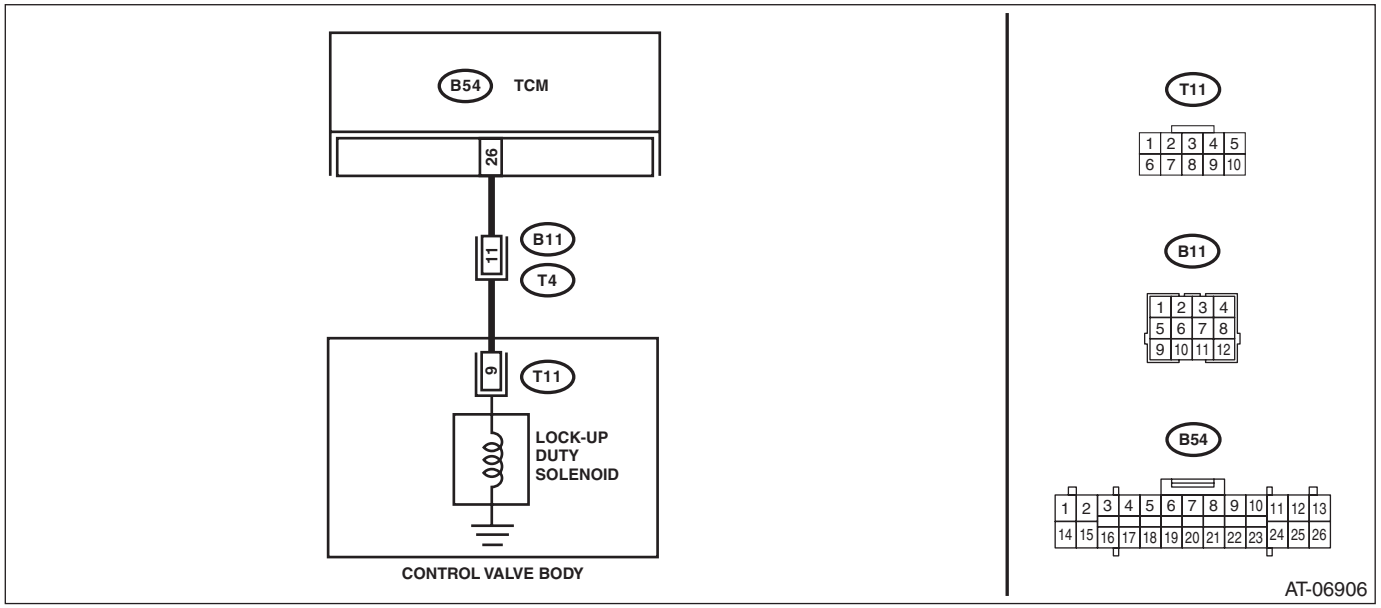
DTC DETECTING CONDITION:

Output signal circuit of lock-up duty solenoid is open or shorted.

TROUBLE SYMPTOM:

- No lock-up occurs.
- Engine stalls.

WIRING DIAGRAM:

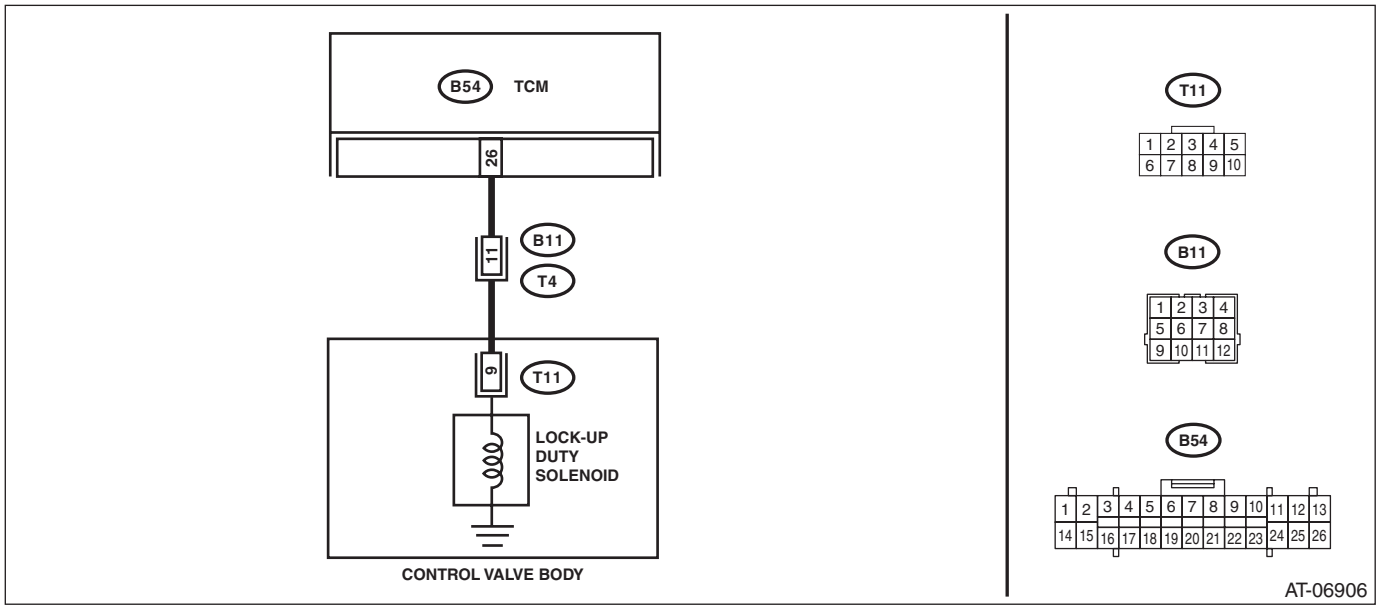


Step		Check	Yes	No
1	**CHECK HARNESS.** 1) Turn the ignition switch to OFF. 2) Disconnect the TCM and transmission connectors. 3) Measure the resistance between TCM connector and transmission connectors. ***Connector & terminal*** ***(B54) No. 26 — (B11) No. 11:***	Is the resistance less than 1 Ω?	Go to step **2**.	Repair the open circuit of harness.
2	**CHECK HARNESS.** 1) Turn the ignition switch to ON. 2) Measure the voltage between TCM connector and chassis ground. ***Connector & terminal*** ***(B54) No. 26 (+) — Chassis ground (–):***	Is the voltage approx. 0 V?	Go to step **3**.	Repair the short circuit of harness.
3	**CHECK LOCK-UP DUTY SOLENOID.** Measure the resistance between transmission connector and transmission body. ***Connector & terminal*** ***(T4) No. 11 — Transmission body:***	Is the resistance approx. 13 Ω? (when engine cold)	Check for poor contact of the connector, and repair the defective part.	Go to step **4**.
4	**CHECK HARNESS INSIDE TRANSMISSION.** **CAUTION:** **Start work after ATF cools down.** 1) Remove the transmission valve cover. 2) Check for the harness pinch, damage.	Is the harness normal?	Go to step **5**.	Replace the transmission harness.

	Step	Check	Yes	No
5	**CHECK HARNESS INSIDE TRANSMISSION.** 1) Disconnect the control valve body connector. 2) Turn the ignition switch to ON. 3) Measure the voltage between transmission connector and transmission body. ***Connector & terminal*** ***(T4) No. 11 (+) — Transmission body (–):***	Is the voltage approx. 0 V?	Replace the control valve body. <Ref. to CVT-112, Control Valve Body.>	Replace the transmission harness.

AF:DTC P2764 LOCK-UP DUTY SOLENOID CIRCUIT (LOW)

DTC DETECTING CONDITION:
Output signal circuit of lock up duty solenoid is shorted.
TROUBLE SYMPTOM:
No lock-up occurs.
WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK HARNESS.** 1) Turn the ignition switch to OFF. 2) Disconnect the TCM and transmission connectors. 3) Measure the resistance between TCM connector and chassis ground. ***Connector & terminal*** ***(B54) No. 26 — Chassis ground:***	Is the resistance 1 MΩ or more?	Go to step **2**.	Repair the short circuit of harness.
2	**CHECK LOCK-UP DUTY SOLENOID.** Measure the resistance between transmission connector and transmission body. ***Connector & terminal*** ***(T4) No. 11 — Transmission body:***	Is the resistance approx. 13 Ω? (when engine cold)	Check for poor contact of the connector, and repair the defective part.	Go to step **3**.
3	**CHECK HARNESS INSIDE TRANSMISSION.** **CAUTION:** **Start work after ATF cools down.** 1) Remove the transmission valve cover. 2) Check for the harness pinch, damage.	Is the harness normal?	Go to step **4**.	Replace the transmission harness.
4	**CHECK HARNESS INSIDE TRANSMISSION.** 1) Disconnect the control valve body connector. 2) Measure the resistance between transmission connector and transmission body. ***Connector & terminal*** ***(T4) No. 11 — Transmission body:***	Is the resistance 1 MΩ or more?	Replace the control valve body. <Ref. to CVT-112, Control Valve Body.>	Replace the transmission harness.

AG:DTC U0073 CONTROL MODULE COMMUNICATION BUS “A” OFF

NOTE:
Refer to “LAN SYSTEM (DIAGNOSTICS)” for diagnostic procedures. <Ref. to LAN(diag)-2, Basic Diagnostic Procedure.>

AH:DTC U0100 LOST COMMUNICATION WITH ECM/PCM “A”

NOTE:
Refer to “LAN SYSTEM (DIAGNOSTICS)” for diagnostic procedures. <Ref. to LAN(diag)-2, Basic Diagnostic Procedure.>

AI: DTC U0122 LOST COMMUNICATION WITH VEHICLE DYNAMICS CONTROL MODULE

NOTE:
Refer to “LAN SYSTEM (DIAGNOSTICS)” for diagnostic procedures. <Ref. to LAN(diag)-2, Basic Diagnostic Procedure.>

AJ:DTC U0140 LOST COMMUNICATION WITH BODY CONTROL MODULE

NOTE:
Refer to “LAN SYSTEM (DIAGNOSTICS)” for diagnostic procedures. <Ref. to LAN(diag)-2, Basic Diagnostic Procedure.>

AK:DTC U0155 LOST COMMUNICATION WITH INSTRUMENT PANEL CLUSTER (IPC) CONTROL MODULE

NOTE:
Refer to “LAN SYSTEM (DIAGNOSTICS)” for diagnostic procedures. <Ref. to LAN(diag)-2, Basic Diagnostic Procedure.>

AL:DTC U0401 INVALID DATA RECEIVED FROM ECM/PCM “A”

NOTE:
Refer to “LAN SYSTEM (DIAGNOSTICS)” for diagnostic procedures. <Ref. to LAN(diag)-2, Basic Diagnostic Procedure.>

AM:DTC U0416 INVALID DATA RECEIVED FROM VEHICLE DYNAMICS CONTROL MODULE

NOTE:
Refer to “LAN SYSTEM (DIAGNOSTICS)” for diagnostic procedures. <Ref. to LAN(diag)-2, Basic Diagnostic Procedure.>

AN:DTC U0422 INVALID DATA RECEIVED FROM BODY CONTROL MODULE

NOTE:
Refer to “LAN SYSTEM (DIAGNOSTICS)” for diagnostic procedures. <Ref. to LAN(diag)-2, Basic Diagnostic Procedure.>

AO:DTC U0423 INVALID DATA RECEIVED FROM INSTRUMENT PANEL CLUSTER CONTROL MODULE

NOTE:
Refer to “LAN SYSTEM (DIAGNOSTICS)” for diagnostic procedures. <Ref. to LAN(diag)-2, Basic Diagnostic Procedure.>

17.Diagnostic Procedure without Diagnostic Trouble Code (DTC)

A: CHECK SHIFT INDICATOR

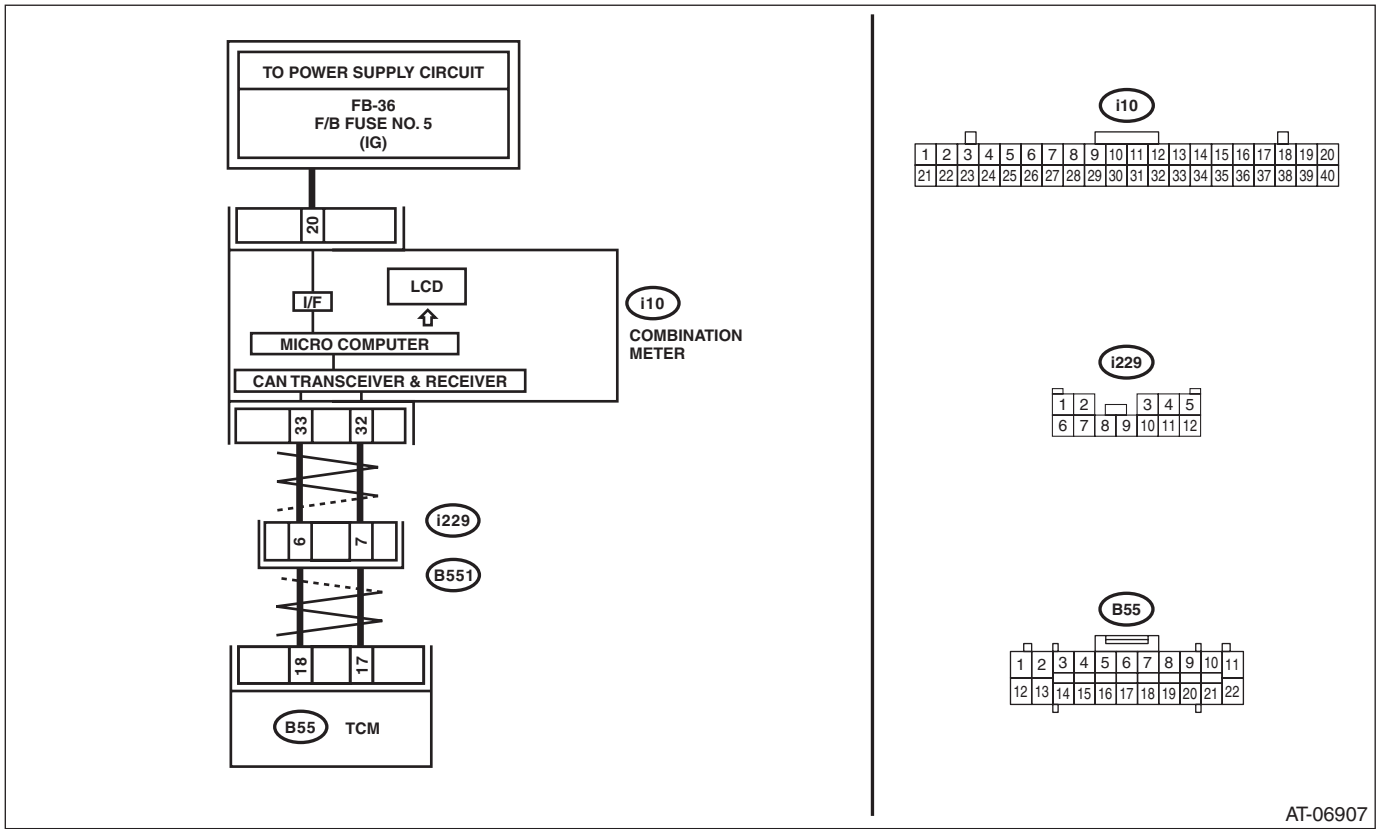
DIAGNOSIS:

- Output signal circuit of shift indicator is open or shorted.
- Combination meter malfunction

TROUBLE SYMPTOM:

- Shift indicator does not display or remains displayed.
- Shift indicator display does not change.

WIRING DIAGRAM:



Step		Check	Yes	No
1	**CHECK TCM.** Check the DTC relating the TCM using the Subaru Select Monitor.	Is DTC U0155 or U0423 displayed?	Perform the self-diagnosis of combination meter.	Go to step **2**.
2	**CHECK TCM.** Check the DTC relating the TCM using the Subaru Select Monitor.	Are DTCs other than U0155 and U0423 displayed?	Perform the diagnosis according to DTC.	Go to step **3**.
3	**CHECK COMBINATION METER.** Check the DTC of combination meter.	Is DTC displayed?	Perform the diagnosis according to DTC.	Go to step **4**.
4	**CHECK TCM.** 1) Operate the + side of the paddle shift switch. 2) Read the data of «Up Switch» using the Subaru Select Monitor.	Does it change between ON and OFF according to the operation?	Go to step **5**.	Check for poor contact between TCM and paddle shift UP switch, and repair the defective part.

	Step	Check	Yes	No
5	**CHECK TCM.** 1) Operate the – side of the paddle shift switch. 2) Read the data of «Down Switch» using the Subaru Select Monitor.	Does it change between ON and OFF according to the operation?	Go to step **6**.	Check for poor contact between TCM and paddle shift DOWN switch, and repair the defective part.
6	**CHECK TCM.** 1) Turn the ignition switch OFF, then turn it ON again. 2) Shift the select lever to manual mode. 3) Read the “Shift step in Manu. mode” data using the Subaru Select Monitor.	Is “1” displayed?	Go to step **7**.	Perform the diagnosis according to DTC P0951.
7	**CHECK TCM.** 1) Shift up the select lever. 2) Read the “Shift step in Manu. mode” data using the Subaru Select Monitor.	Is “2” displayed?	Currently, shift indicator is normal.	Check the TCM.

18.Diagnostics with Phenomenon

A: INSPECTION

Symptoms	Faulty parts
Engine stalls when driving in “D” or “R” range, or selecting “N” → “D”, “N” → “R”.	• Control valve • Engine control system
While driving in “D” range, vibration occurs immediately before the stop or engine stalls.	• Control valve • Torque converter
Vehicle cannot shift while driving in “D” range.	• Control valve • TCM • Shift mechanism • Power supply system
Excessive shock when selecting “N” → “D”, and “N” → “R”.	• Control valve • TCM • F&R clutch pack • ATF deterioration or lack
Excessive shock at standing start in “D” range.	• Control valve • TCM • F&R clutch pack • ATF deterioration or lack
Engine speed increases abruptly during driving in “D” or “R” range.	• Control valve • Secondary pressure sensor • F&R clutch pack • ATF deterioration or lack
Vehicle can not start when depressing the accelerator pedal in “D” or “R” range, or acceleration is very poor. (without abrupt engine increase)	• Control valve • F&R clutch pack • Shift mechanism • Parking mechanism • Engine control system • Power supply system
Shift indicator in combination meter displays the position which differs from select lever position.	• Inhibitor switch • Select cable related • Combination meter
Manual mode enters even though the select lever and paddle shift switch is not operated.	• Manual mode switch • Paddle shift switch • Select lever • TCM
Engine speed increases abruptly in “D” or “R” range, vehicle can not start.	• F&R clutch pack • Select cable related
Manual mode can not be set	• Select lever • TCM

MANUAL TRANSMISSION AND DIFFERENTIAL

5MT

		Page
1.	General Description	2
2.	Transmission Gear Oil	22
3.	Manual Transmission Assembly	23
4.	Transmission Mounting System	30
5.	Oil Seal	32
6.	Differential Side Retainer Oil Seal	34
7.	Switches and Harness	35
8.	Preparation for Overhaul	37
9.	Transfer Case and Extension Case Assembly	38
10.	Transfer Drive Gear	44
11.	Transfer Driven Gear	46
12.	Center Differential	48
13.	Reverse Check Sleeve	49
14.	Transmission Case	52
15.	Main Shaft Assembly for Single-Range	56
16.	Drive Pinion Shaft Assembly	61
17.	Front Differential Assembly	71
18.	Reverse Idler Gear	78
19.	Shifter Fork and Rod	80
20.	General Diagnostic Table	84

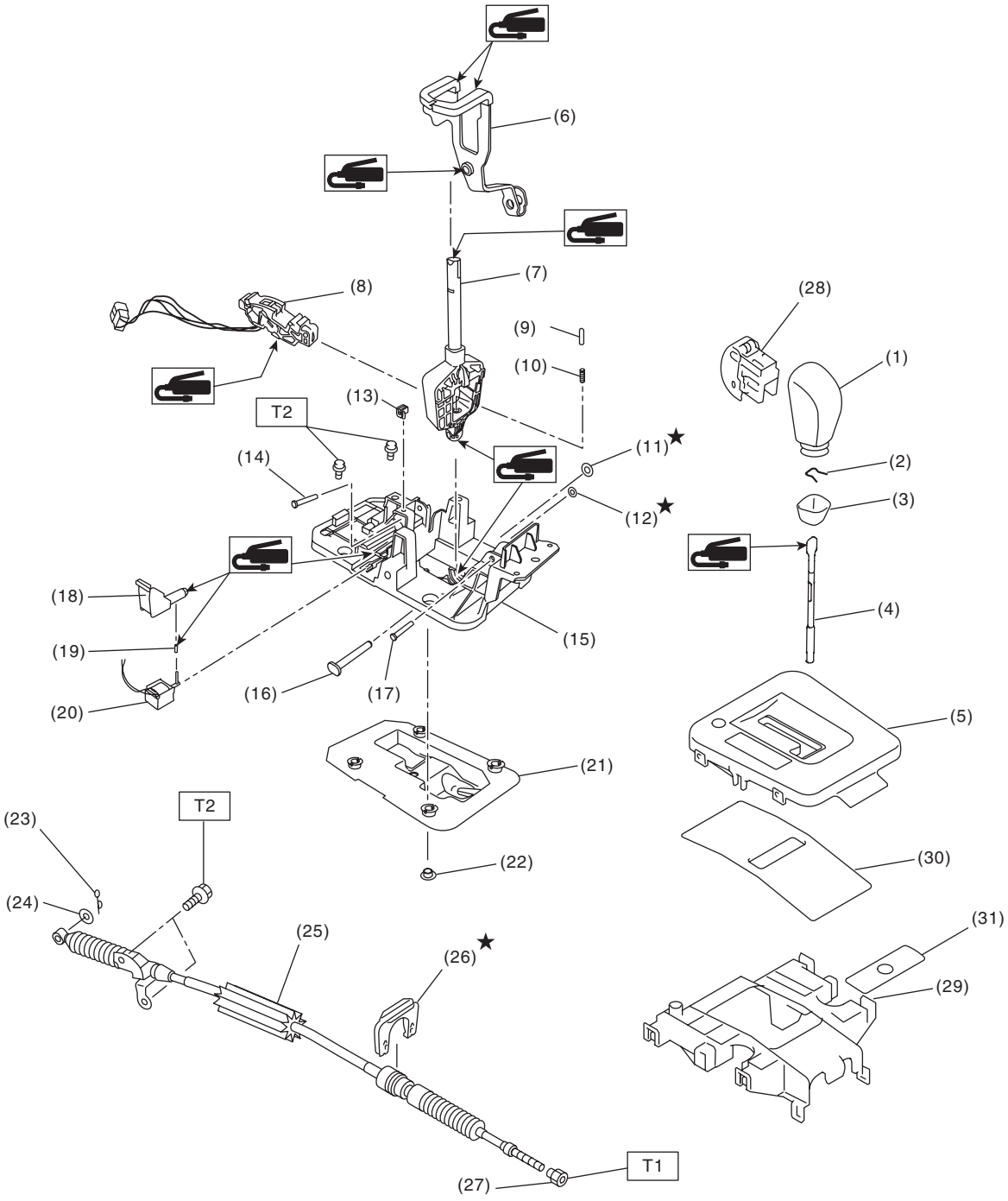
1. General Description

A: SPECIFICATION

Item	Specifications
Swing torque of rod against lever N (kgf, lb)	3.7 (0.38, 0.83) or less

B: COMPONENT

1. AT SELECT LEVER

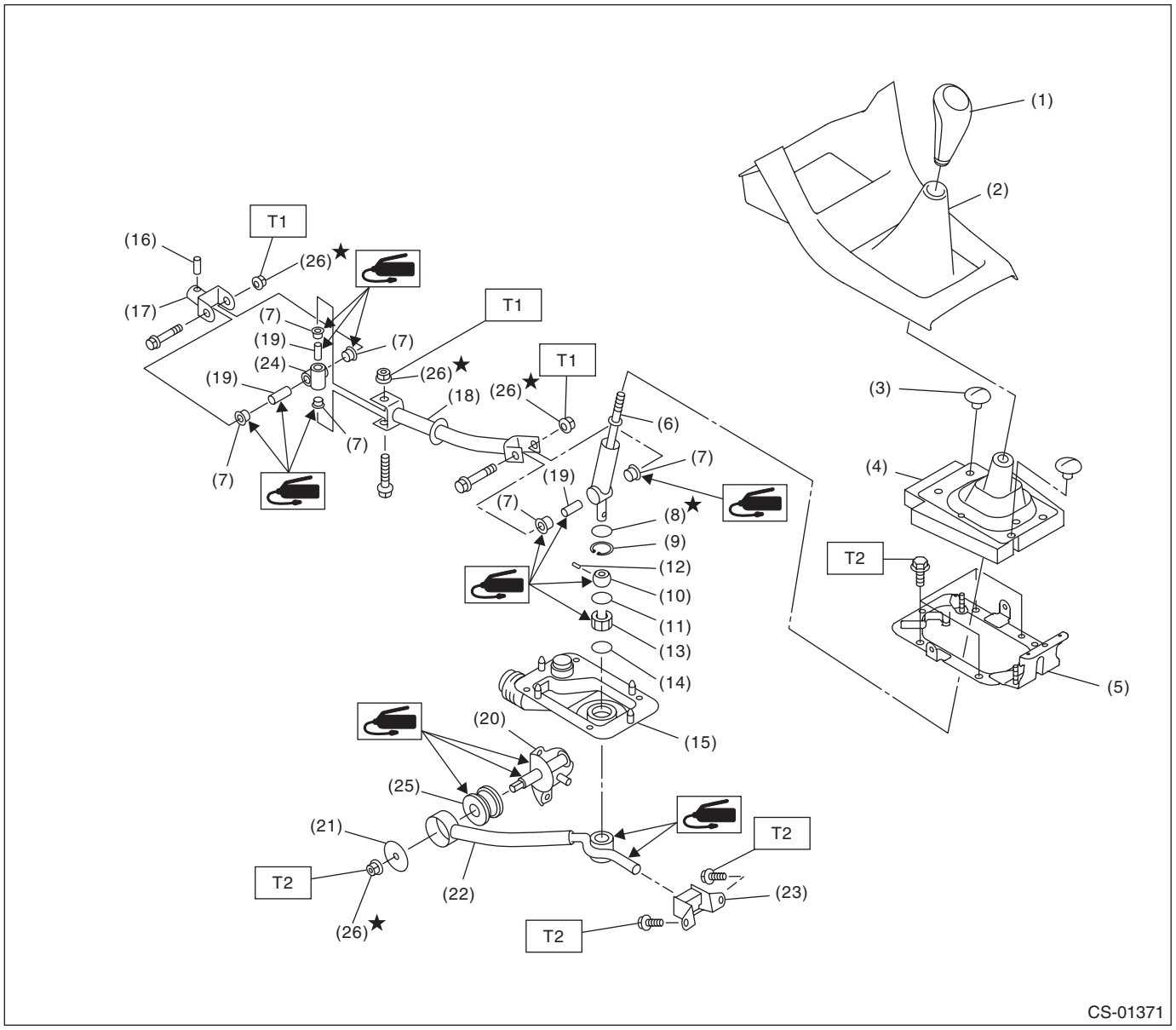


CS-01424

(1) Grip sub ASSY
(2) Clamp grip pin
(3) Cover grip AT
(4) Rod COMPL
(5) Indicator cover
(6) Arm COMPL
(7) Selector lever COMPL
(8) Plate guide
(9) Rod detent
(10) Detent spring
(11) Clamp push nut
(12) Clamp push nut
(13) Clamp pin
(14) Spacer pin guide
(15) Plate COMPL
(16) Shaft control
(17) Spacer pin guide
(18) Rod shift lock
(19) Cushion solenoid
(20) Solenoid unit
(21) Gasket
(22) Spacer plate
(23) Snap pin
(24) Washer
(25) Select cable
(26) Clamp
(27) Nut
(28) Button ASSY-AT
(29) Housing
(30) Blind A
(31) Blind B

Tightening torque:N·m (kgf-m, ft-lb)
T1: 7.5 (0.8, 5.5)
T2: 18 (1.8, 13.3)

2. 5MT GEAR SHIFT LEVER

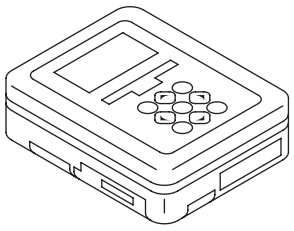


(1) Gear shift knob
(2) Console front cover ASSY
(3) Clamp
(4) Boot and insulator ASSY
(5) Plate COMPL
(6) Lever
(7) Bushing
(8) Lock wire
(9) Snap ring
(10) Bushing
(11) O-ring
(12) Spring pin
(13) Bushing B
(14) O-ring
(15) Boot
(16) Spring pin
(17) Joint
(18) Rod
(19) Spacer
(20) Shift bracket
(21) Plate
(22) Stay
(23) Cushion rubber
(24) Boss
(25) Bushing
(26) Self-locking nut

Tightening torque:N·m (kgf-m, ft-lb)
T1: 12 (1.2, 8.9)
T2: 18 (1.8, 13.3)

C: PREPARATION TOOL

1. SPECIAL TOOL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST1B022XU0	1B022XU0	SUBARU SELECT MONITOR III KIT	Used for troubleshooting the electrical system.

2. GENERAL TOOL

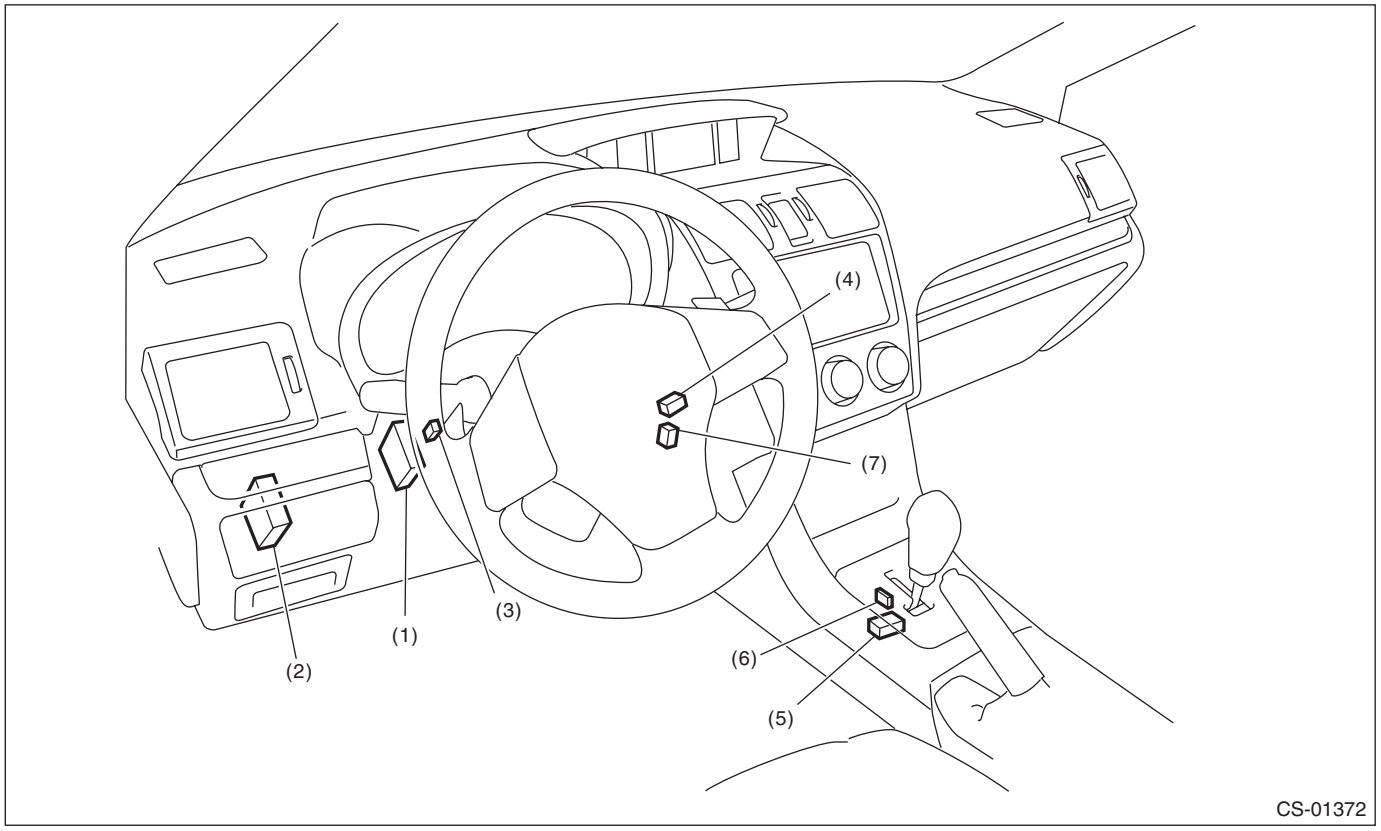
TOOL NAME	REMARKS
Circuit tester	Used for measuring resistance and voltage.

D: CAUTION

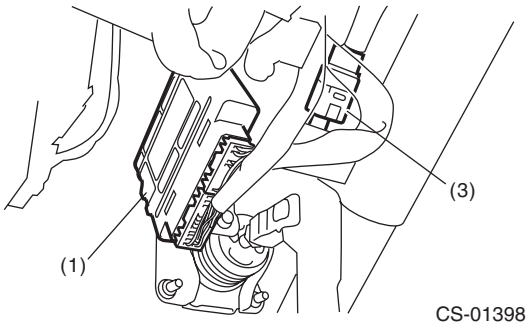
- Wear appropriate work clothing, including a cap, protective goggles and protective shoes when performing any work.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust and dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly and replacement.
- Use SUBARU genuine fluid, grease etc. or equivalent. Do not mix fluid, grease, etc. of different grades or manufacturers.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or rigid racks at the specified points.
- Apply grease onto sliding or revolving surfaces before installation.
- Before installing O-rings or snap rings, apply sufficient amount of fluid to avoid damage and deformation.
- Before securing a part in a vise, place cushioning material such as wood blocks, aluminum plate or cloth between the part and the vise.
- Before disconnecting electrical connectors, be sure to disconnect the negative terminal from battery.

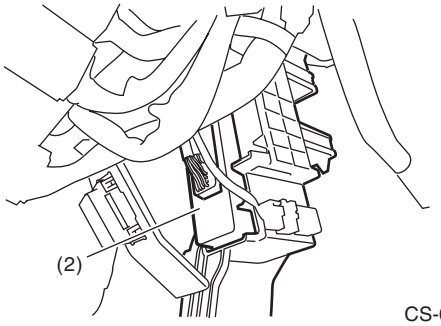
2. AT Shift Lock Control System

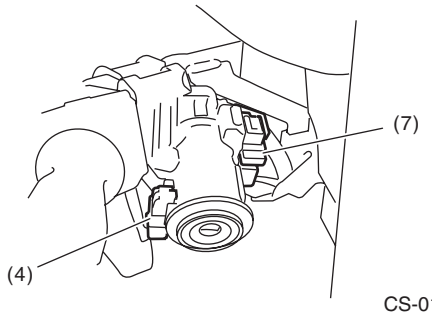
A: LOCATION

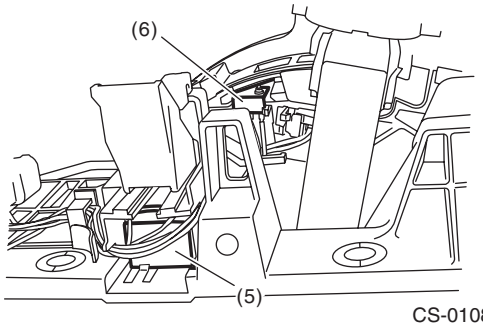


(1) TCM (“P” range)
(2) Body integrated unit
(3) Stop light and brake switch
(4) Key cylinder (with built-in key warning switch)
(5) Shift lock solenoid ASSY
(6) “P” range switch
(7) Key lock solenoid

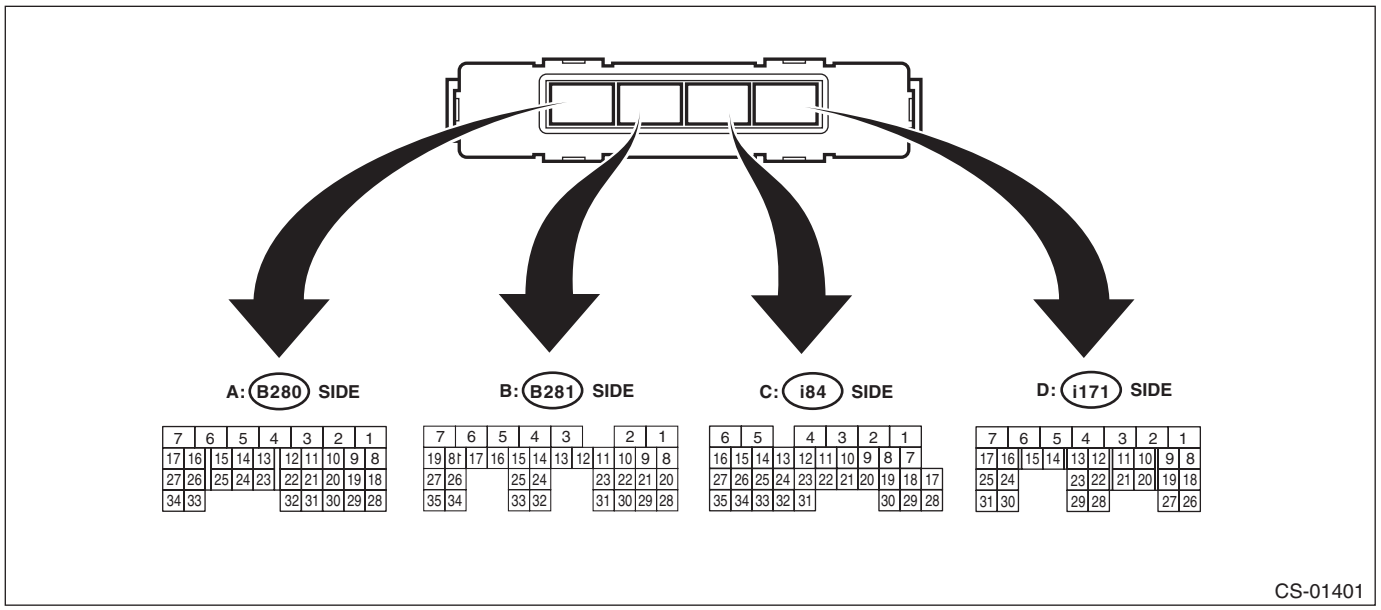






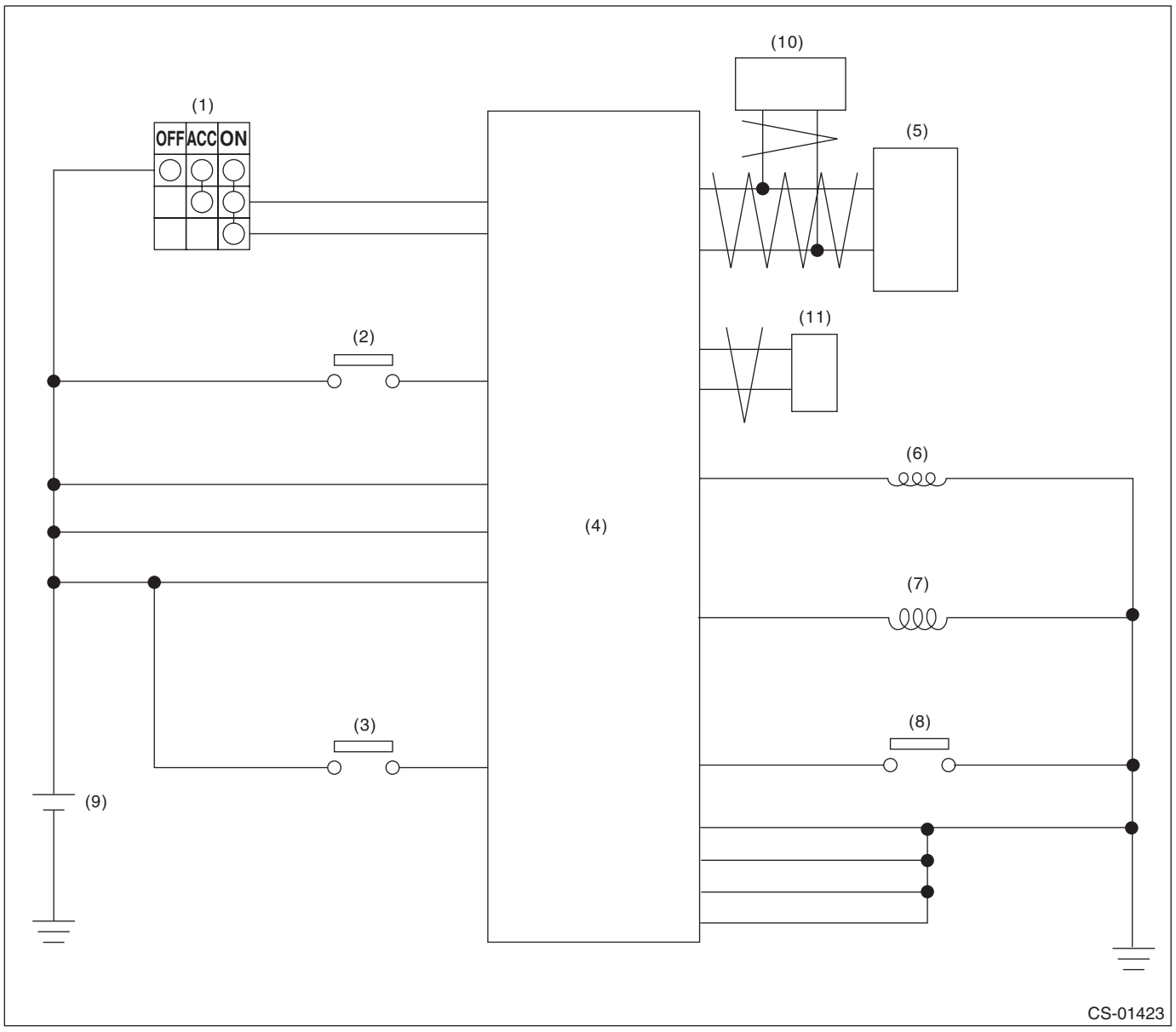


B: ELECTRICAL SPECIFICATION



Item	Connector No.	Terminal No.	Input/Output signal Measured value and measuring conditions
Battery power supply	B281	6	9 — 16 V
		7	
Ignition power supply	B280	32	10 — 15 V when ignition switch is at ACC.
	B281	3	10 — 15 V when ignition switch is at ON or START.
TCM (“P” range)	B281	20	Can not be measured because of digital communication
		28	
Stop light and brake switch	B280	10	9 — 16 V when the stop light & brake switch is ON. 0 V when the stop light & brake switch is OFF.
“P” range switch	B281	18	0 V when select lever is in “P” range. 9 — 16 V when select lever is in other positions than “P” range.
Shift lock solenoid signal	B281	5	8.5 — 16 V when shift lock is released. 0 V when shift lock is operating.
Key warning switch signal	B280	4	9 — 16 V when key is inserted. 0 V when key is removed.
Key lock solenoid signal	B281	4	7.5 — 16 V when ignition switch is turned ON, with select lever in “P” range and brake switch ON. 0 V at other conditions than above.
Ground	B280	1	—
	B281	31	
	i84	1	
	i171	29	
Delivery (test) mode signal	i84	27	Can not be measured because of digital communication
		35	

C: WIRING DIAGRAM



(1) Ignition switch
(2) Stop light and brake switch
(3) Key warning switch
(4) Body integrated unit
(5) TCM (shift range information)
(6) Key lock solenoid
(7) Shift lock solenoid
(8) “P” range switch
(9) Battery
(10) VDC CM (vehicle speed information)
(11) ECM (delivery (test) mode signal)

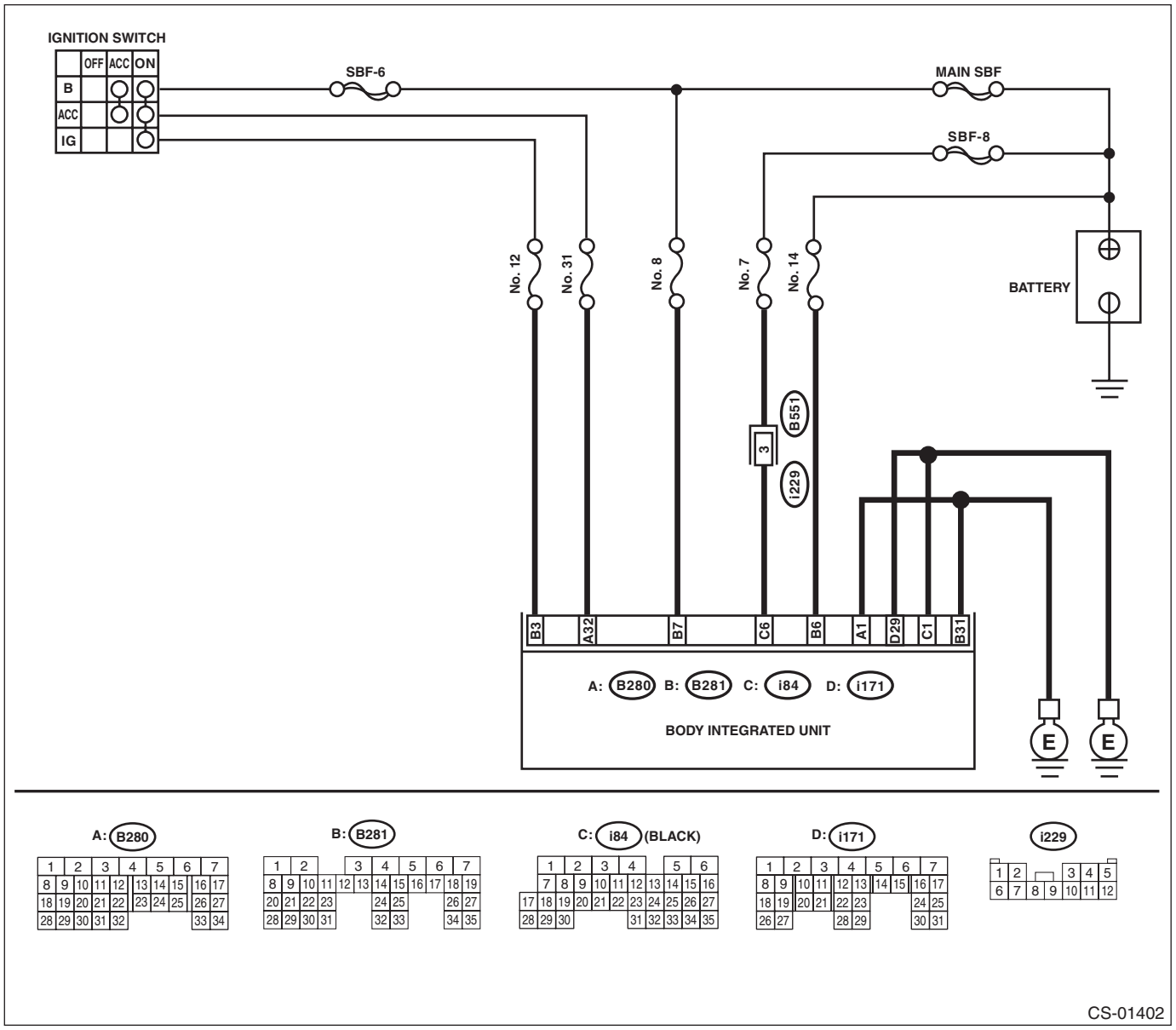
D: INSPECTION

1. SHIFT LOCK OPERATION

	Step	Check	Yes	No
1	**CHECK COMMUNICATION OF SUBARU SELECT MONITOR.** 1) Turn the ignition switch to ON. 2) Using the Subaru Select Monitor, check whether communication to all systems can be executed normally.	Is the system name displayed?	Go to step **2**.	Perform the inspection following the diagnostic procedure in the LAN section. <Ref. to LAN(diag)-2, Basic Diagnostic Procedure.>
2	**CHECK SHIFT LOCK.** 1) Turn the ignition switch to ON. 2) Shift the select lever to “P” range.	While brake pedal is not depressed, is it possible to move the select lever from the “P” range to other ranges?	Perform the inspection of “SELECT LEVER CANNOT BE LOCKED OR RELEASED”. <Ref. to CS-14, SELECT LEVER CANNOT BE LOCKED OR RELEASED, INSPECTION, AT Shift Lock Control System.>	Go to step **3**.
3	**CHECK SHIFT LOCK.**	While brake pedal is depressed, is it possible to move the select lever from the “P” range to other ranges?	Go to step **4**.	Perform the inspection of “SELECT LEVER CANNOT BE LOCKED OR RELEASED”. <Ref. to CS-14, SELECT LEVER CANNOT BE LOCKED OR RELEASED, INSPECTION, AT Shift Lock Control System.>
4	**CHECK SHIFT LOCK.** Shift the select lever to “N” range.	Is it possible to move the select lever from the “N” range to the “P” range?	Go to step **5**.	Perform the inspection of “SELECT LEVER CANNOT BE LOCKED OR RELEASED”. <Ref. to CS-14, SELECT LEVER CANNOT BE LOCKED OR RELEASED, INSPECTION, AT Shift Lock Control System.>

	Step	Check	Yes	No
5	**CHECK SHIFT LOCK.** 1) Shift the select lever to “N” range. 2) Turn the ignition switch to ACC.	While brake pedal is depressed, is it possible to move the select lever from the “N” range to the “P” range?	Go to step **6**.	Perform the inspection of “SELECT LEVER CANNOT BE LOCKED OR RELEASED”. <Ref. to CS-14, SELECT LEVER CANNOT BE LOCKED OR RELEASED, INSPECTION, AT Shift Lock Control System.>
6	**CHECK KEY INTERLOCK.** 1) Turn the ignition switch to OFF. 2) Shift the select lever to other than “P” range.	Can the ignition key be removed?	Perform the inspection of “KEY INTERLOCK CANNOT BE LOCKED OR RELEASED”. <Ref. to CS-17, KEY INTERLOCK CANNOT BE LOCKED OR RELEASED, INSPECTION, AT Shift Lock Control System.>	Go to step **7**.
7	**CHECK KEY INTERLOCK.** Shift the select lever to “P” range.	Can the ignition key be removed?	AT shift lock system is normal.	Perform the inspection of “KEY INTERLOCK CANNOT BE LOCKED OR RELEASED”. <Ref. to CS-17, KEY INTERLOCK CANNOT BE LOCKED OR RELEASED, INSPECTION, AT Shift Lock Control System.>

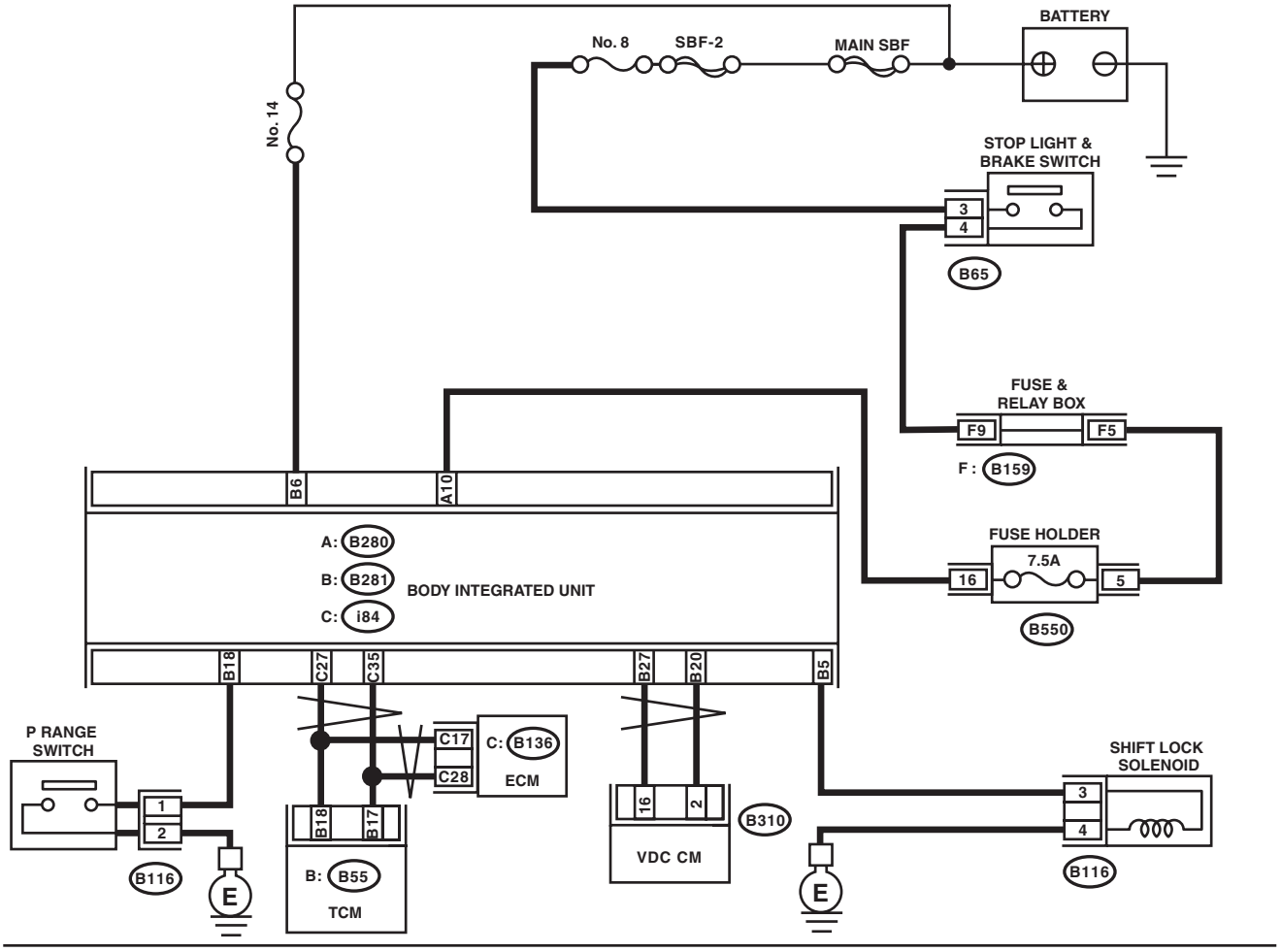
2. BODY INTEGRATED UNIT POWER SUPPLY AND GROUND CIRCUIT

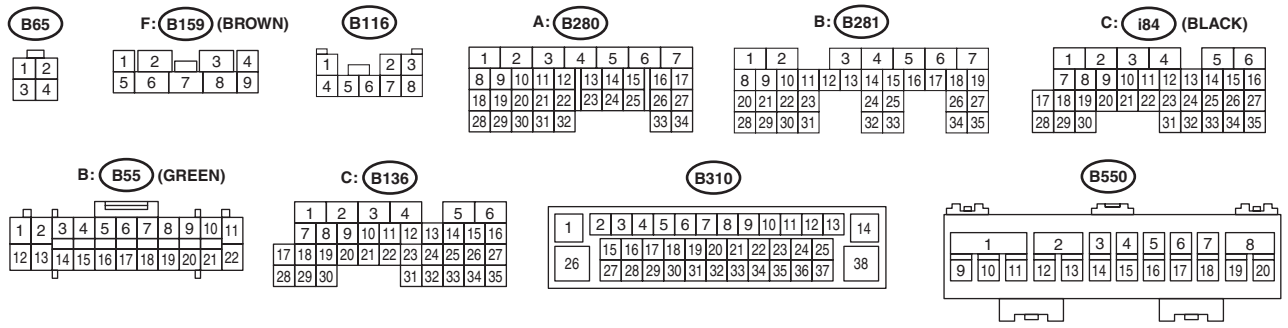


Step		Check	Yes	No
1	**CHECK DTC OF BODY INTEGRATED UNIT.** Check DTC of body integrated unit. <Ref. to LAN(diag)-9, OPERATION, Subaru Select Monitor.>	Is the DTC of power line displayed on body integrated unit?	Repair or replace it according to the DTC.	Go to step **2**.
2	**CHECK HARNESS BETWEEN BODY INTEGRATED UNIT AND BATTERY.** 1) Turn the ignition switch to ON. 2) Measure the voltage between body integrated unit and chassis ground. ***Connector & terminal*** ***(B281) No. 3 (+) — Chassis ground (–):*** ***(B280) No. 32 (+) — Chassis ground (–):*** ***(B281) No. 6 (+) — Chassis ground (–):*** ***(B281) No. 7 (+) — Chassis ground (–):*** ***(i84) No. 6 (+) — Chassis ground (–):***	Is the voltage 9 — 16 V?	Go to step **3**.	Check harness for open circuit between the body integrated unit and the battery or a blown fuse.

	Step	Check	Yes	No
3	**CHECK HARNESS BETWEEN BODY INTEGRATED UNIT AND CHASSIS GROUND.** 1) Turn the ignition switch to OFF. 2) Measure the harness resistance between the body integrated unit and chassis ground. ***Connector & terminal*** ***(B280) No. 1 — Chassis ground:*** ***(B281) No. 31 — Chassis ground:*** ***(i84) No. 1 — Chassis ground:*** ***(i171) No. 29 — Chassis ground:***	Is the resistance less than 1 Ω?	Go to step **4**.	Repair the open circuit of harness between the body integrated unit and chassis ground.
4	**CHECK FOR POOR CONTACT.**	Is there poor contact of connector?	Repair the poor contact.	Check body integrated unit.

3. SELECT LEVER CANNOT BE LOCKED OR RELEASED





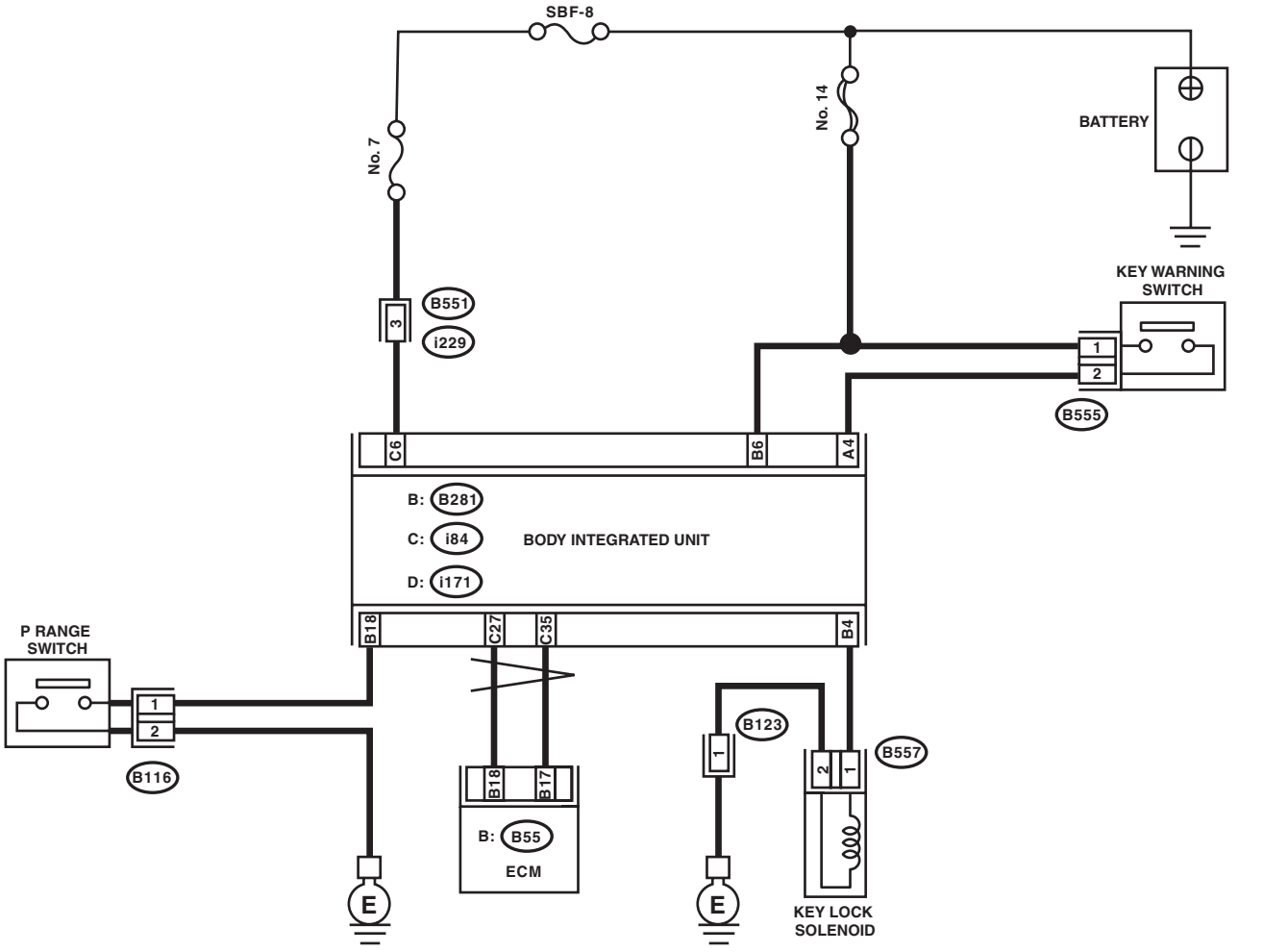
CS-01421

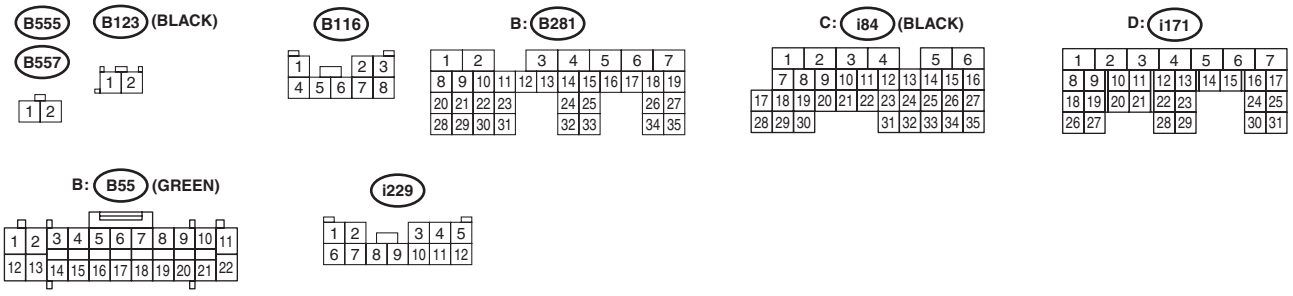
Step		Check	Yes	No
1	**CHECK BODY INTEGRATED UNIT POWER SUPPLY AND GROUND CIRCUIT.** <Ref. to CS-12, BODY INTEGRATED UNIT POWER SUPPLY AND GROUND CIRCUIT, INSPECTION, AT Shift Lock Control System.>	Is there any fault?	Follow the procedures to perform inspection and repair.	Go to step **2**.

	Step	Check	Yes	No
2	**CHECK CURRENT DATA.** 1) Connect the Subaru Select Monitor. 2) Shift the select lever to "P" range. 3) Turn the ignition switch to ON. 4) Select the current data display and display «P SW». <Ref. to LAN(diag)-9, OPERATION, Subaru Select Monitor.>	Is the display "ON" in the P range and "OFF" in ranges other than P?	Go to step **3**.	Go to step **8**.
3	**CHECK CURRENT DATA.** Select the current data display and display «Stop Light Switch». <Ref. to LAN(diag)-9, OPERATION, Subaru Select Monitor.>	Is "ON" displayed when the brake pedal is depressed and "OFF" displayed when the brake pedal is released?	Go to step **4**.	Go to step **11**.
4	**CHECK BODY INTEGRATED UNIT DTC.** Check the DTC of the body integrated unit when the brake pedal is pressed and when it is released. (Hold each condition for 5 seconds or more.)	Is there a DTC of a current malfunction?	Follow the DTC to perform inspection and repair.	Go to step **5**.
5	**CHECK CURRENT DATA.** Select the current data display and display «Shift Lock Solenoid». <Ref. to LAN(diag)-9, OPERATION, Subaru Select Monitor.>	Is "ON" displayed when the brake pedal is depressed and "OFF" displayed when the brake pedal is released?	Go to step **6**.	Replace the body integrated unit.
6	**CHECK CURRENT DATA.** Select the current data display and display «Shift Position». <Ref. to LAN(diag)-9, OPERATION, Subaru Select Monitor.>	Is the display "P" in the P range and other than "P" in ranges other than P?	Go to step **7**.	Check the following items. • Inhibitor switch • Harness between inhibitor switch and TCM • TCM input signal • TCM CAN communication • Body integrated unit CAN receive
7	**CHECK CURRENT DATA.** 1) Select the current data display and display «Front Wheel Speed». <Ref. to LAN(diag)-9, OPERATION, Subaru Select Monitor.> 2) Start the engine. 3) Raise vehicle speed gradually up to approximately 20 km/h.	Is a figure equivalent to the speedometer being indicated?	Go to step **12**.	Check the following items. • Wheel speed sensor • VDC/ABS CAN communication • Body integrated unit CAN receive Replace the wheel speed sensor, VDC/ABS, or body integrated unit.
8	**CHECK HARNESS BETWEEN BODY INTEGRATED UNIT AND "P" RANGE SWITCH.** 1) Disconnect the connector from body integrated unit. 2) Disconnect the connector of "P" range switch. 3) Check for open circuit of harness, short circuit to battery or short circuit to ground between the body integrated unit and "P" range switch. ***Connector & terminal*** ***(B281) No. 18 — (B116) No. 1:***	Is the harness normal?	Repair or replace the harness between the body integrated unit and the "P" range switch.	Go to step **9**.
9	**CHECK HARNESS BETWEEN "P" RANGE SWITCH AND CHASSIS GROUND.** Measure the resistance of harness between "P" range switch and chassis ground. ***Connector & terminal*** ***(B116) No. 2 — Chassis ground:***	Is it less than 10 Ω?	Go to step **10**.	Repair the harness between the "P" range switch and chassis ground.

	Step	Check	Yes	No
10	**CHECK "P" RANGE SWITCH.** Measure the resistance between "P" range switch connector terminals. ***Terminals*** ***No. 2 — No. 1:***	Is it less than 10 Ω in the "P" range, and 1 MΩ or more in ranges other than "P"?	Replace the body integrated unit.	Replace the "P" range switch.
11	**CHECK STOP LIGHT SWITCH INPUT SIGNAL.** 1) Disconnect the connector from body integrated unit. 2) Measure the voltage between the body integrated unit connector terminal and chassis ground. ***Connector & terminal*** ***(B280) No. 10 (+) — Chassis ground (–):***	Is the voltage 9 V to 16 V when the brake pedal is depressed, and approx. 0 V when not depressed?	Replace the body integrated unit.	Check the stop light system.
12	**CHECK SHIFT LOCK SOLENOID OPERATION.** Connect the battery to the shift lock solenoid unit connector terminal, and operate the solenoid. ***Terminals*** ***No. 3 (+) — No. 4 (–):***	Does the shift lock solenoid operate normally?	Check the lock mechanism of the select lever body.	Replace the shift lock solenoid.

4. KEY INTERLOCK CANNOT BE LOCKED OR RELEASED





CS-01422

Step		Check	Yes	No
1	**CHECK D CHECK FUSE.** Check that the D check fuse is disconnected.	Is the D check fuse disconnected?	Go to step **2**.	Remove the D check fuse and then turn the ignition switch to ON.

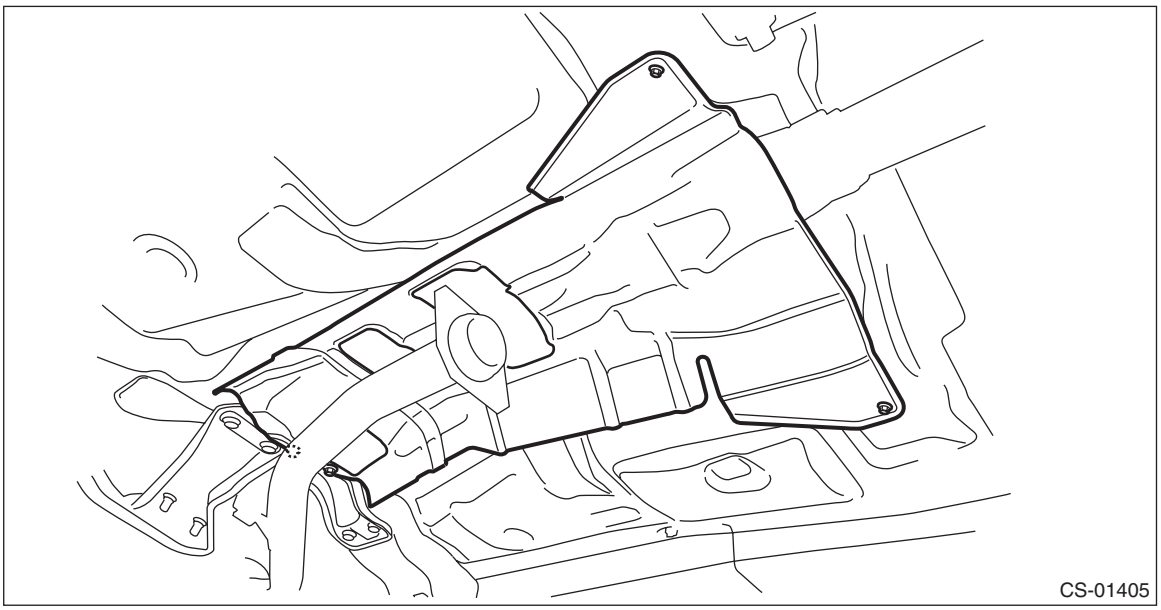
	Step	Check	Yes	No
2	**CHECK BODY INTEGRATED UNIT POWER SUPPLY AND GROUND CIRCUIT.** <Ref. to CS-12, BODY INTEGRATED UNIT POWER SUPPLY AND GROUND CIRCUIT, INSPECTION, AT Shift Lock Control System.>	Is there any fault?	Follow the procedures to inspect and repair.	Go to step **3**.
3	**CHECK CURRENT DATA.** 1) Connect the Subaru Select Monitor. 2) Shift the select lever to "P" range. 3) Turn the ignition switch to ON. 4) Select the current data display and display «P SW». <Ref. to LAN(diag)-9, OPERATION, Subaru Select Monitor.>	Is the display "ON" in the P range and "OFF" in ranges other than P?	Go to step **4**.	Go to step **7**.
4	**CHECK CURRENT DATA.** 1) Select the current data display and display the «key-lock warning SW». <Ref. to LAN(diag)-9, OPERATION, Subaru Select Monitor.> 2) Turn the ignition switch to OFF.	Does the display change from "ON" ←→ "OFF" when the key is inserted and removed?	Go to step **5**.	Go to step **10**.
5	**CHECK CURRENT DATA.** 1) Turn the ignition switch to ON. 2) Select the current data display and display «Key locking output». <Ref. to LAN(diag)-9, OPERATION, Subaru Select Monitor.>	Is the display "OFF" in the P range and "ON" in ranges other than P?	Go to step **11**.	Go to step **6**.
6	**CHECK DTC OF BODY INTEGRATED UNIT.** 1) Set the select lever to other than "P" range. 2) Check DTC of body integrated unit.	Is B1105 (key interlock circuit abnormal) a current malfunction?	Follow the DTC to perform inspection and repair.	Go to step **11**.
7	**CHECK HARNESS BETWEEN BODY INTEGRATED UNIT AND "P" RANGE SWITCH.** 1) Disconnect the connector from body integrated unit. 2) Disconnect the connector of "P" range switch. 3) Check for open circuit of harness, short circuit to battery or short circuit to ground between the body integrated unit and "P" range switch. ***Connector & terminal*** ***(B281) No. 18 — (B116) No. 1:***	Is the harness normal?	Repair or replace the harness between the body integrated unit and the "P" range switch.	Go to step **8**.
8	**CHECK HARNESS BETWEEN "P" RANGE SWITCH AND CHASSIS GROUND.** Measure the resistance of harness between "P" range switch and chassis ground. ***Connector & terminal*** ***(B116) No. 2 — Chassis ground:***	Is it less than 10 Ω?	Go to step **9**.	Repair the harness between the "P" range switch and chassis ground.
9	**CHECK "P" RANGE SWITCH.** Measure the resistance between "P" range switch connector terminals. ***Terminals*** ***No. 2 — No. 1:***	Is it less than 10 Ω in the "P" range, and 1 MΩ or more in ranges other than "P"?	Replace the body integrated unit.	Replace the "P" range switch.
10	**CHECK HARNESS BETWEEN BATTERY AND KEY WARNING SWITCH AND BODY INTEGRATED UNIT.** 1) Disconnect the connector from body integrated unit. 2) Measure the voltage between body integrated unit and chassis ground. ***Connector & terminal*** ***(B280) No. 4 (+) — Chassis ground (–):***	Is the display 9 V or more when the key is inserted, and less than 1.5 V with the key removed?	Replace the body integrated unit.	Check the following items. • Key warning switch • Harness/fuse • Ignition circuit

	Step	Check	Yes	No
11	**CHECK HARNESS BETWEEN BODY INTEGRATED UNIT AND KEY LOCK SOLENOID.** 1) Disconnect the connector from body integrated unit. 2) Disconnect the connector of key lock solenoid. 3) Check for open circuit of harness, short circuit to battery or short circuit to ground between the body integrated unit and key lock solenoid. ***Connector & terminal*** ***(B281) No. 4 — (B557) No. 1:***	Is the harness normal?	Repair or replace the harness between the body integrated unit and the key lock solenoid.	Go to step **12**.
12	**CHECK HARNESS BETWEEN KEY LOCK SOLENOID AND CHASSIS GROUND.** Measure the resistance of harness between key lock solenoid and chassis ground. ***Connector & terminal*** ***(B557) No. 2 — Chassis ground:***	Is it less than 10 Ω?	Go to step **13**.	Repair or replace the harness between the key lock solenoid and chassis ground.
13	**CHECK KEY LOCK SOLENOID OPERATION.** Connect the battery to the key lock solenoid connector terminal, and operate the solenoid. ***Terminals*** ***No. 2 (+) — No. 1 (–):***	Does the key lock solenoid operate normally?	Go to step **14**.	Replace the key lock solenoid.
14	**CHECK OUTPUT OF BODY INTEGRATED UNIT.** 1) Connect all connectors. 2) Insert the key. 3) Measure the voltage between body integrated unit and chassis ground. ***Connector & terminal*** ***(B281) No. 4 — Chassis ground:***	Is it 7.5 V to 16 V in ranges other than “P”, and 0 V in the “P” range?	Check the lock mechanism of the steering lock body.	Replace the body integrated unit.

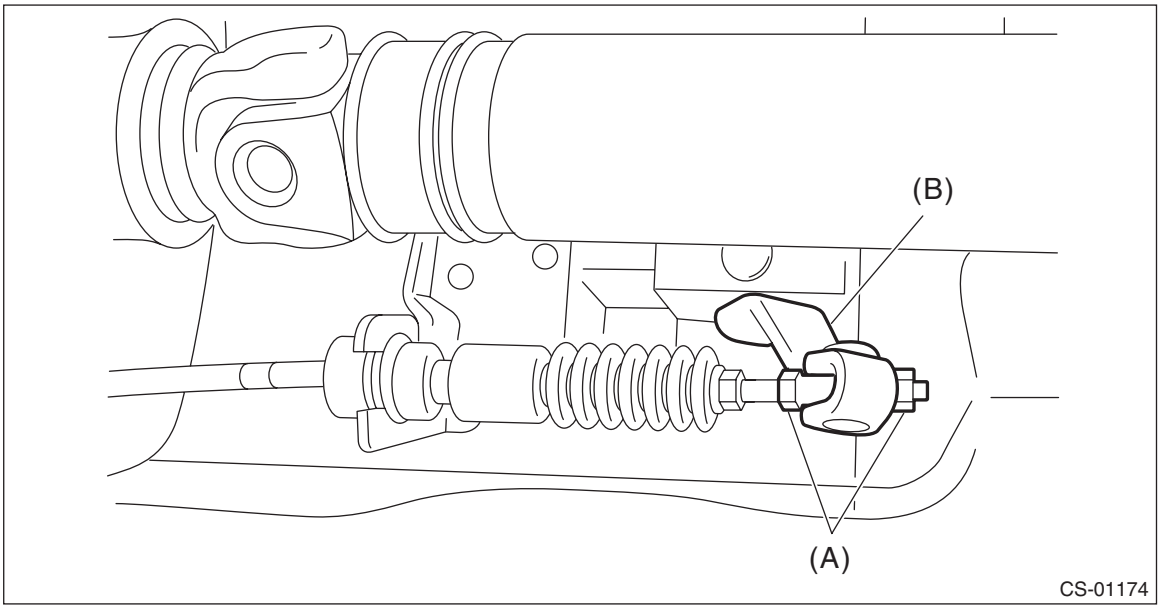
3. Select Lever

A: REMOVAL

1) Shift the select lever to “N” range.
2) Disconnect the ground cable from battery.
3) Lift up the vehicle.
4) Remove the rear exhaust pipe. <Ref. to EX(H4DO)-14, REMOVAL, Rear Exhaust Pipe.>
5) Remove the center exhaust cover.

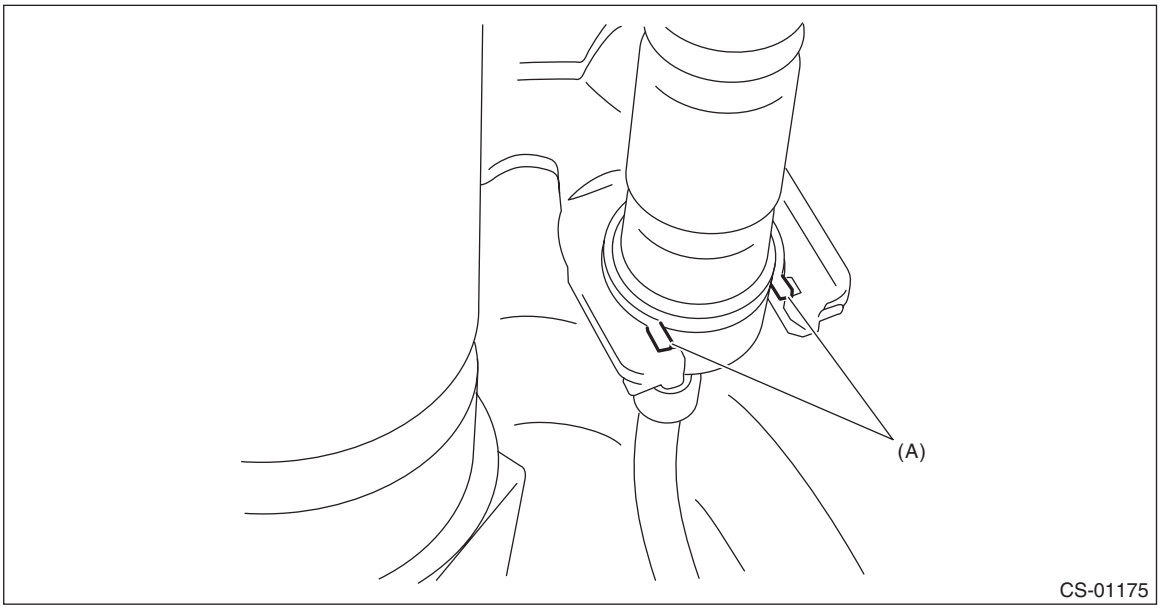


6) Disconnect the cable from the arm COMPL.



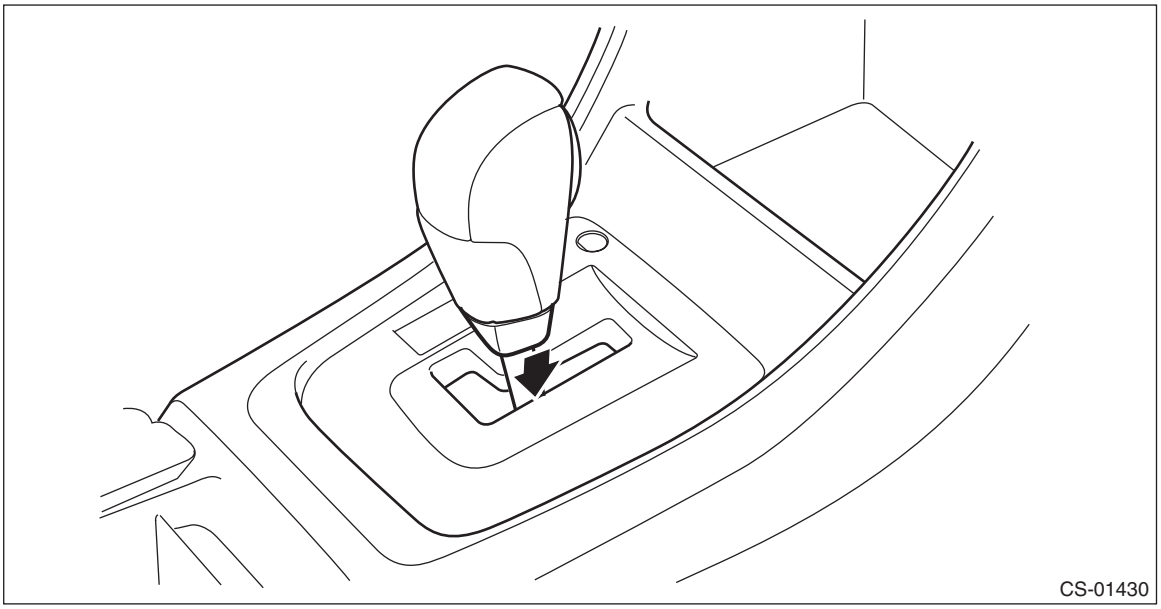
(A) Adjusting nut
(B) Arm COMPL

7) Raise the claw of clamp and remove the cable.

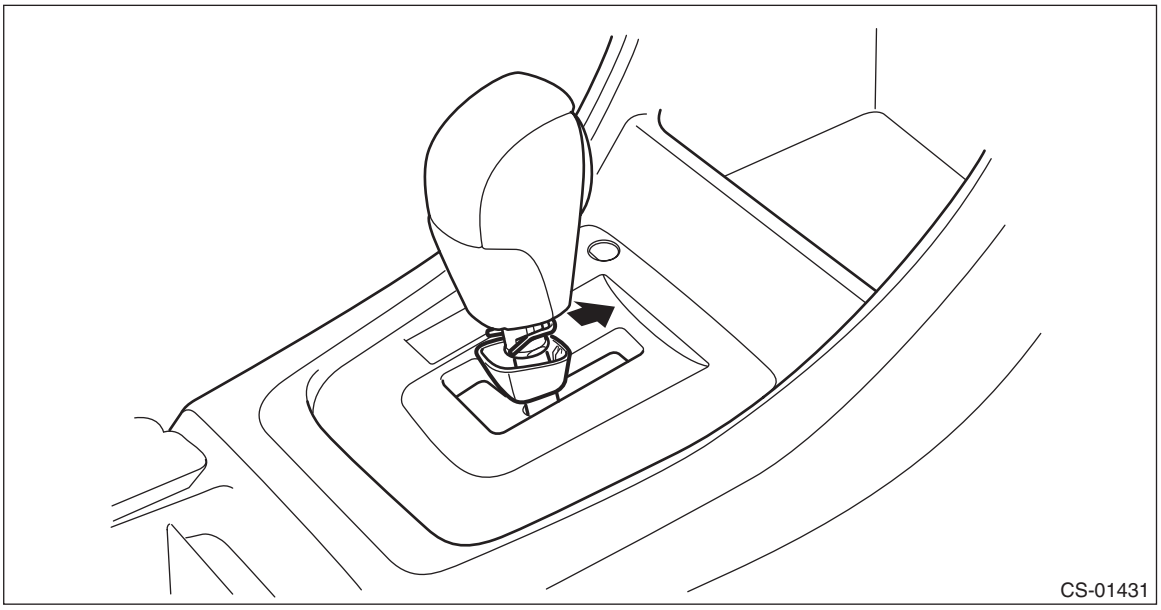


(A) Claw

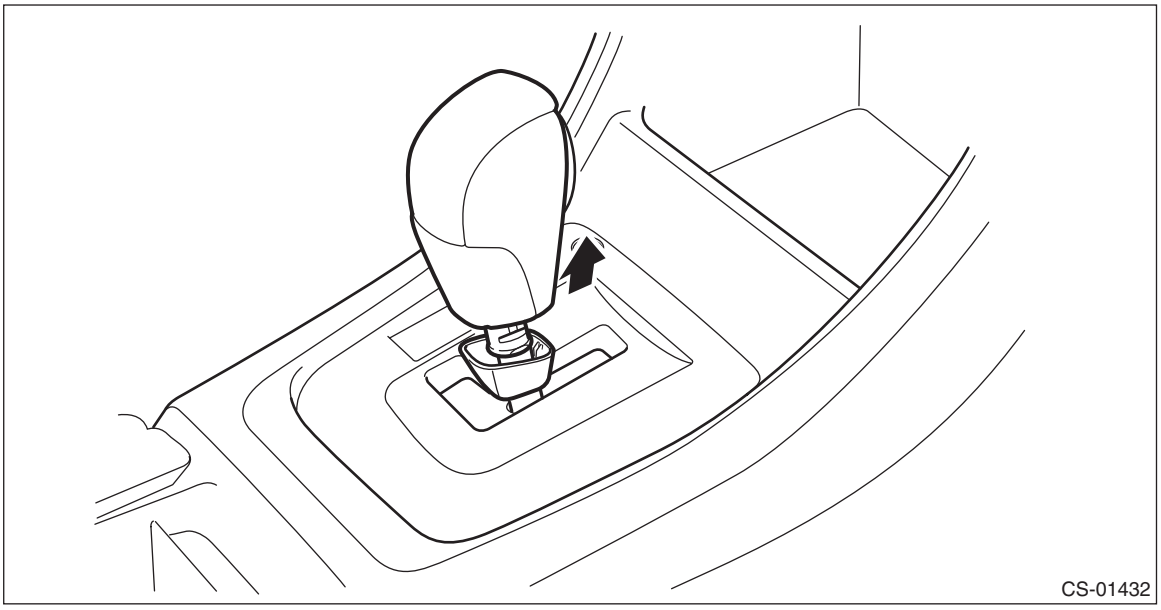
8) Lower the vehicle.
9) Shift the select lever to “N” range.
10) Lower the cover grip AT vertically toward the lever.



11) Remove the clamp grip pin.

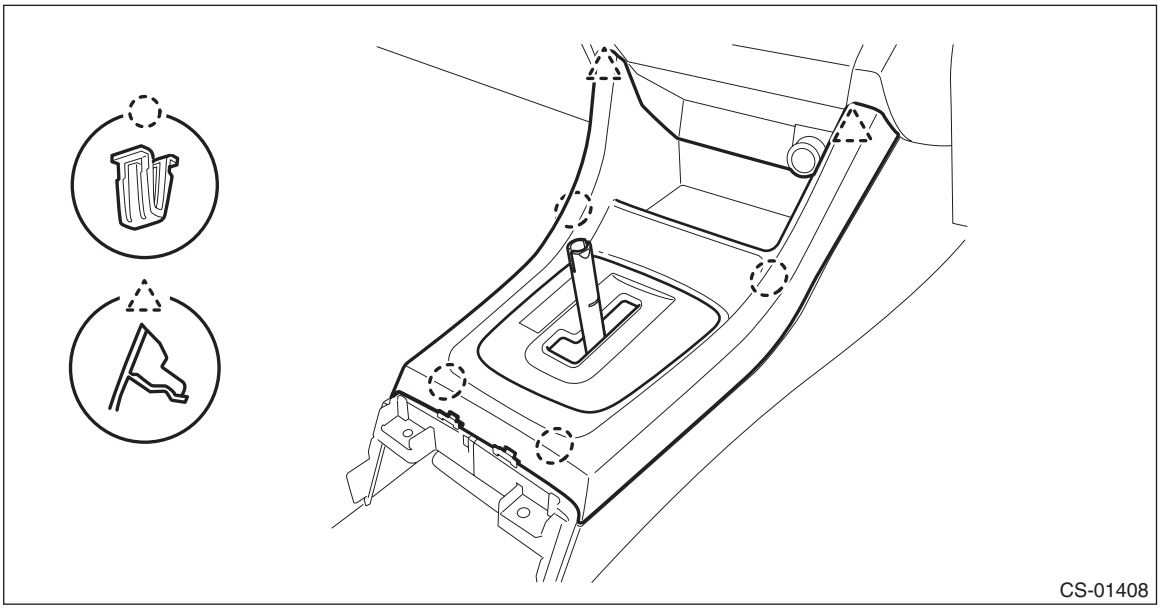


12) Remove the grip assembly.

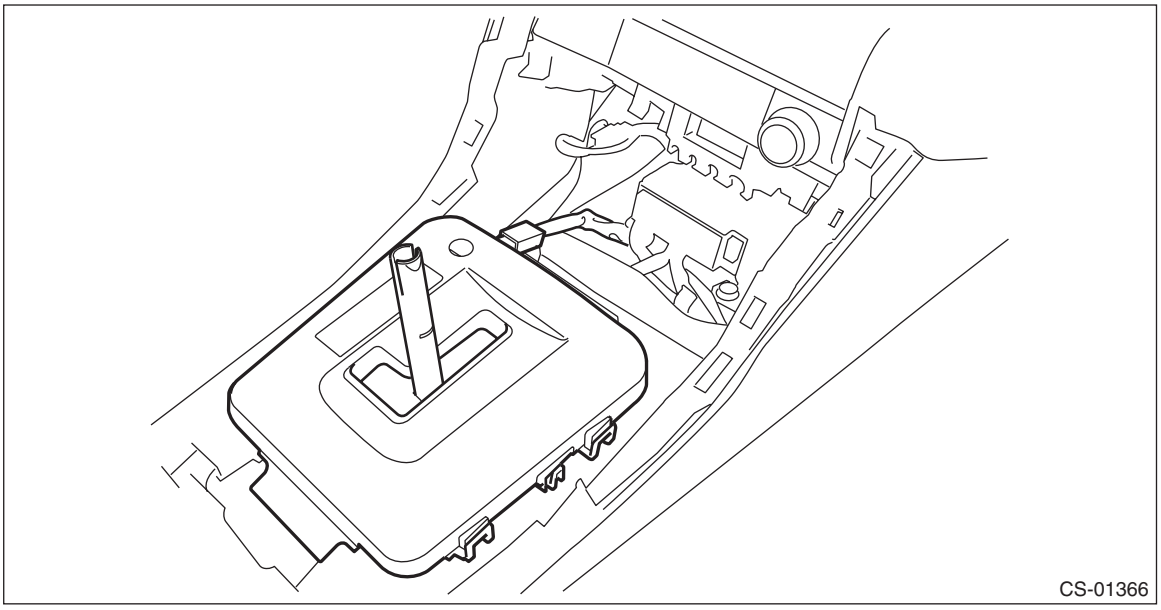


13) Remove the console box. <Ref. to EI-67, REMOVAL, Console Box.>

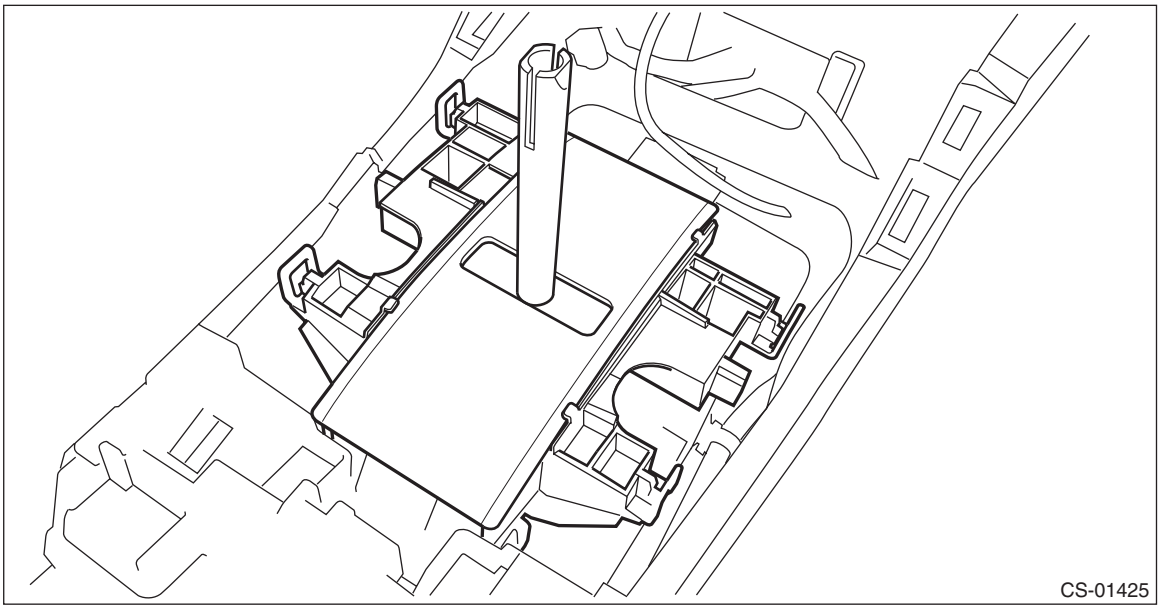
14) Remove the cover - shift lever.



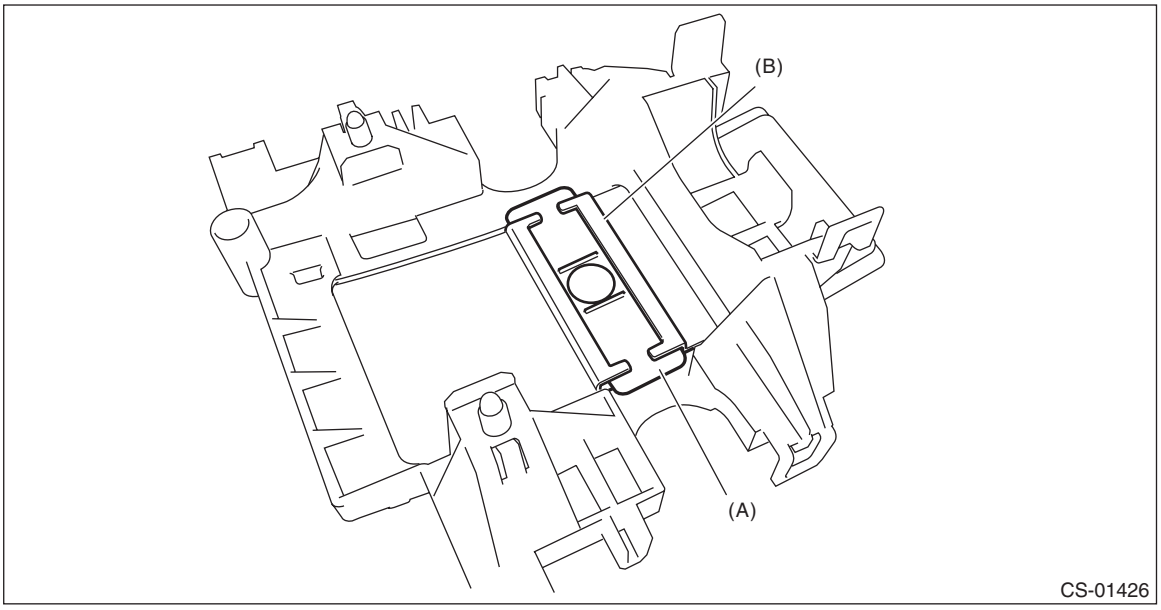
15) Disconnect the connector, and remove the indicator cover from the housing.



16) Remove the housing with the blind A and blind B.

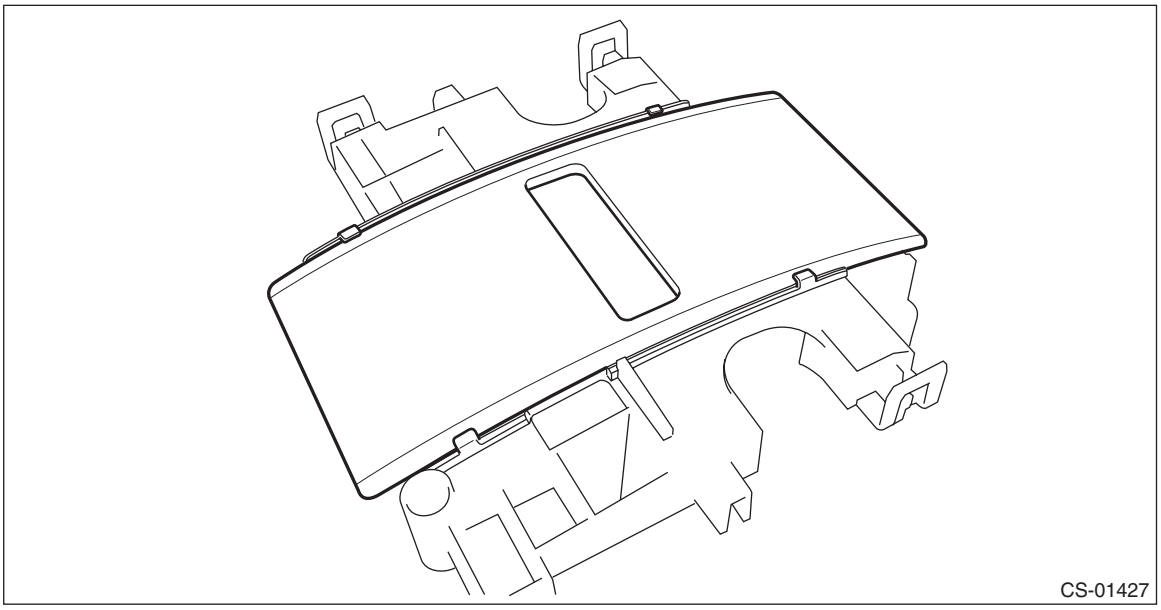


17) Remove the blind B.

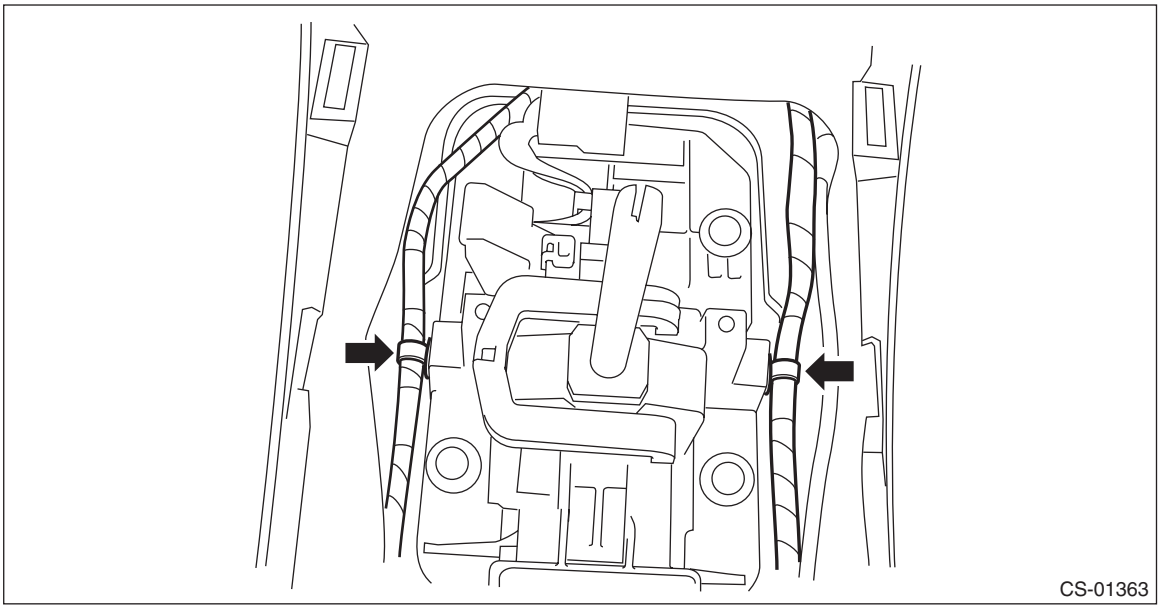


(A) Blind B
(B) Blind A

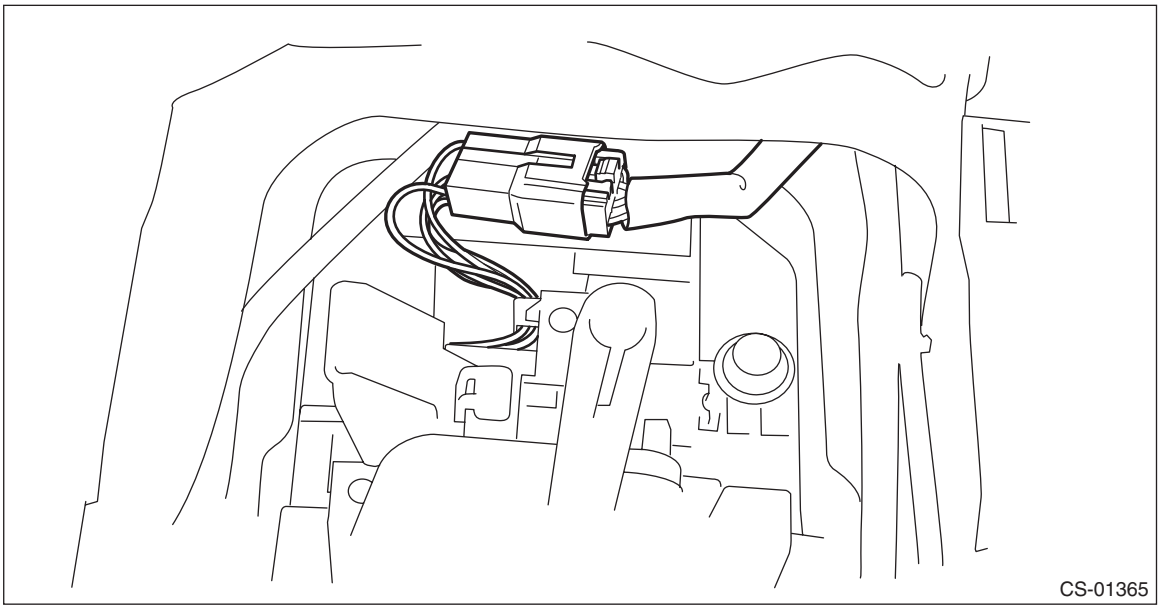
18) Remove the blind A from the housing.



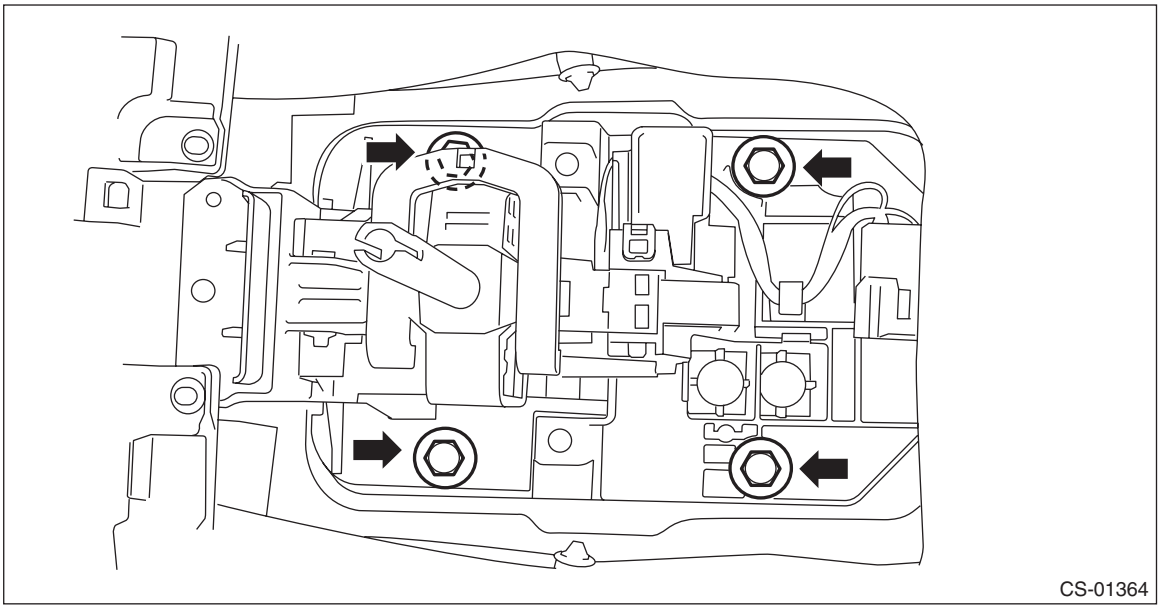
19) Remove the harness clip from the select lever.



20) Disconnect the harness connector.



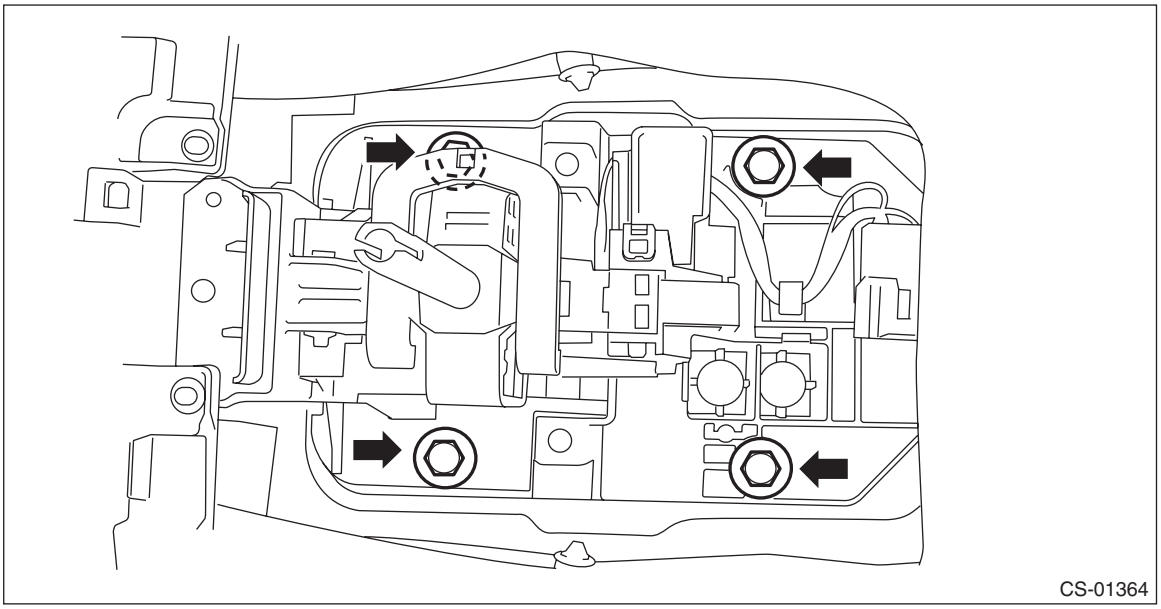
21) Remove the four bolts to remove the select lever assembly.



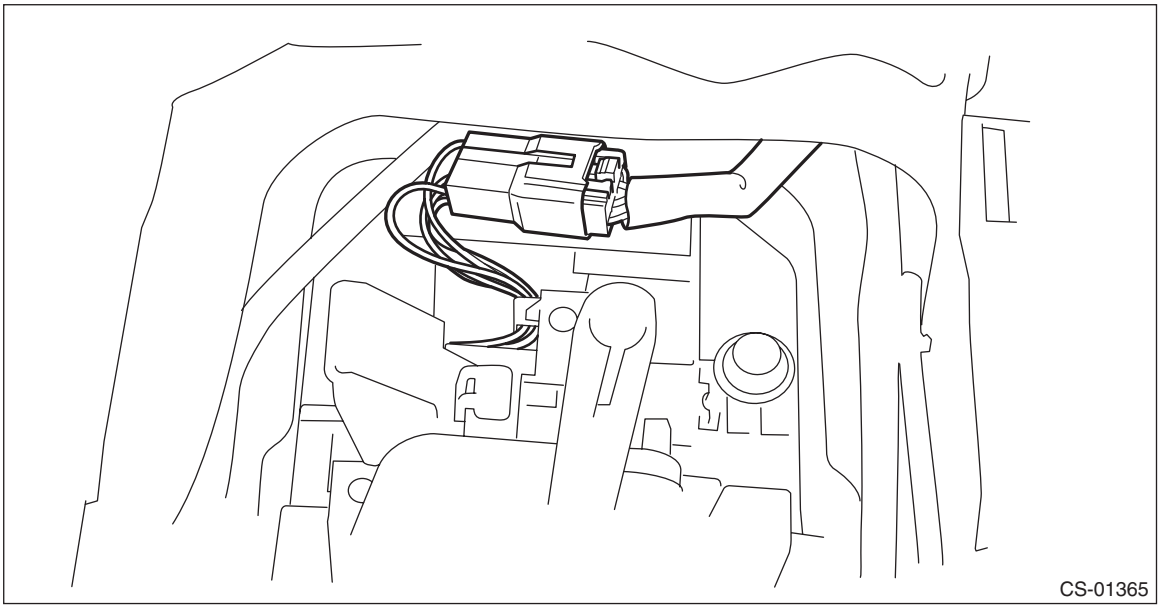
B: INSTALLATION

1) Set the select lever assembly to the vehicle body.
2) Tighten the four mounting bolts to attach the select lever assembly to the vehicle body.

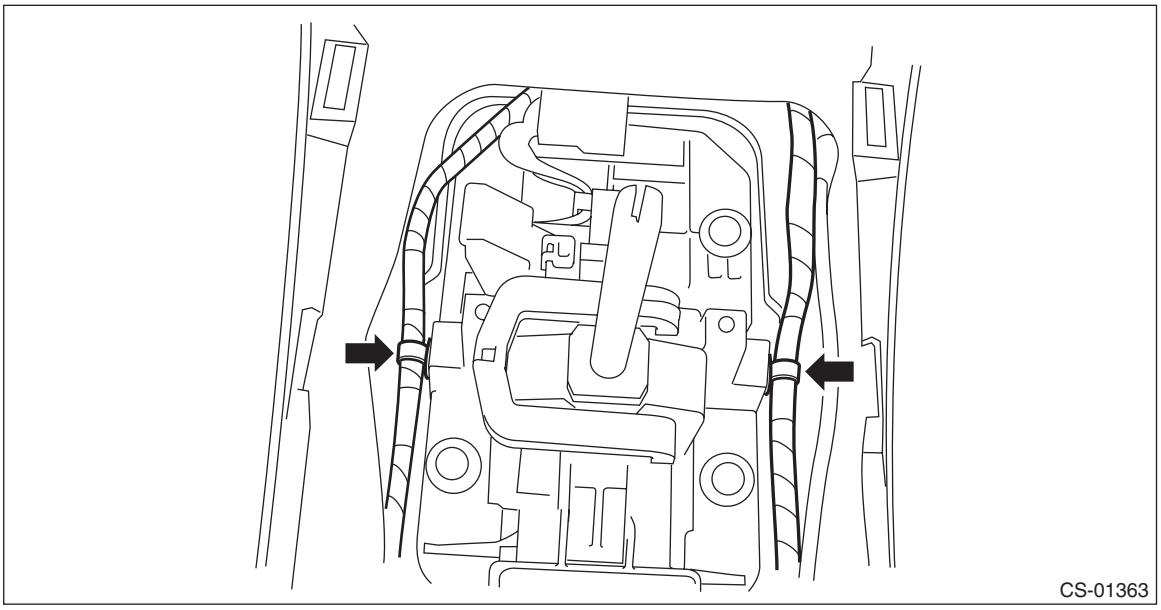
Tightening torque:
18 N·m (1.8 kgf-m, 13.3 ft-lb)



3) Connect the harness connector.

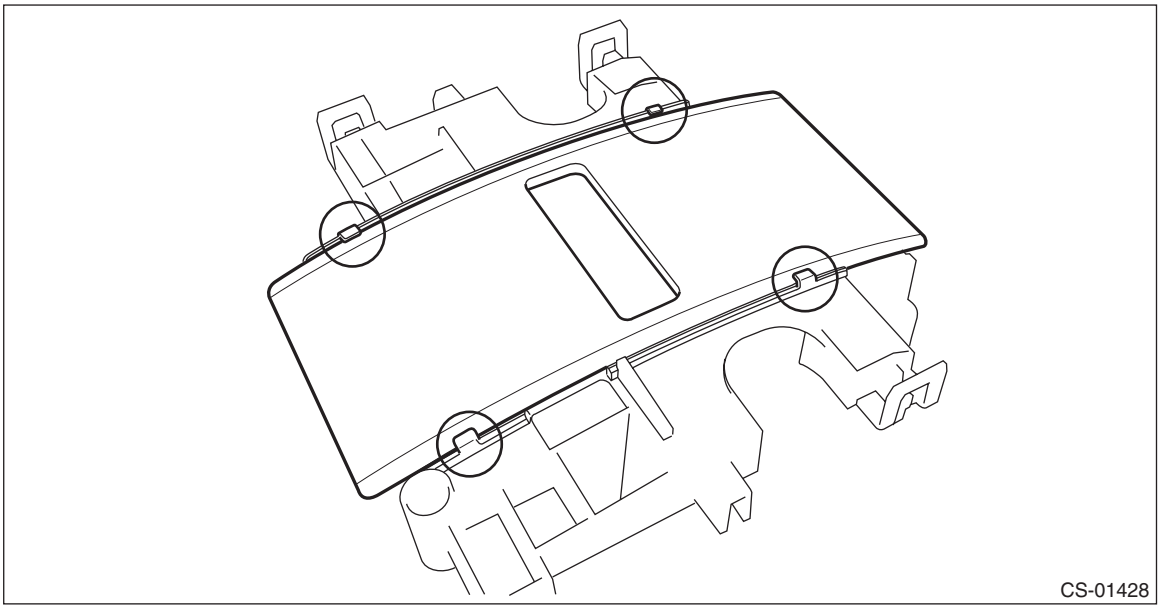


4) Install the harness clip to the select lever assembly.

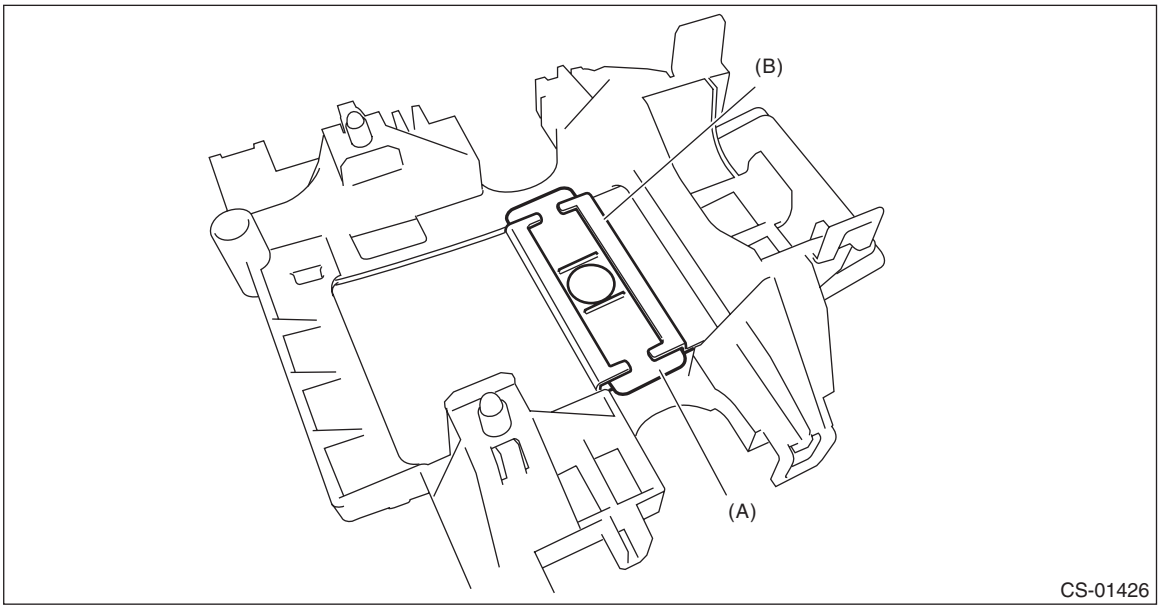


5) Shift the select lever to “N” range.
6) Install the blind A to the housing.

NOTE:
The blind A should be installed so that it is securely caught inside the tab of the housing.

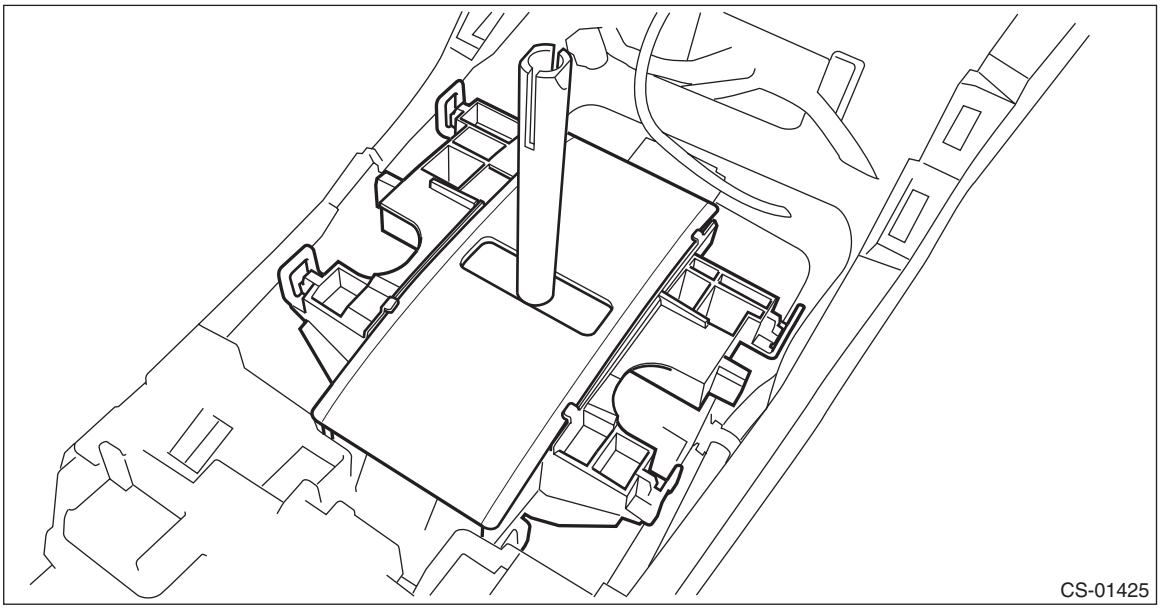


7) Install the blind B behind the blind A.

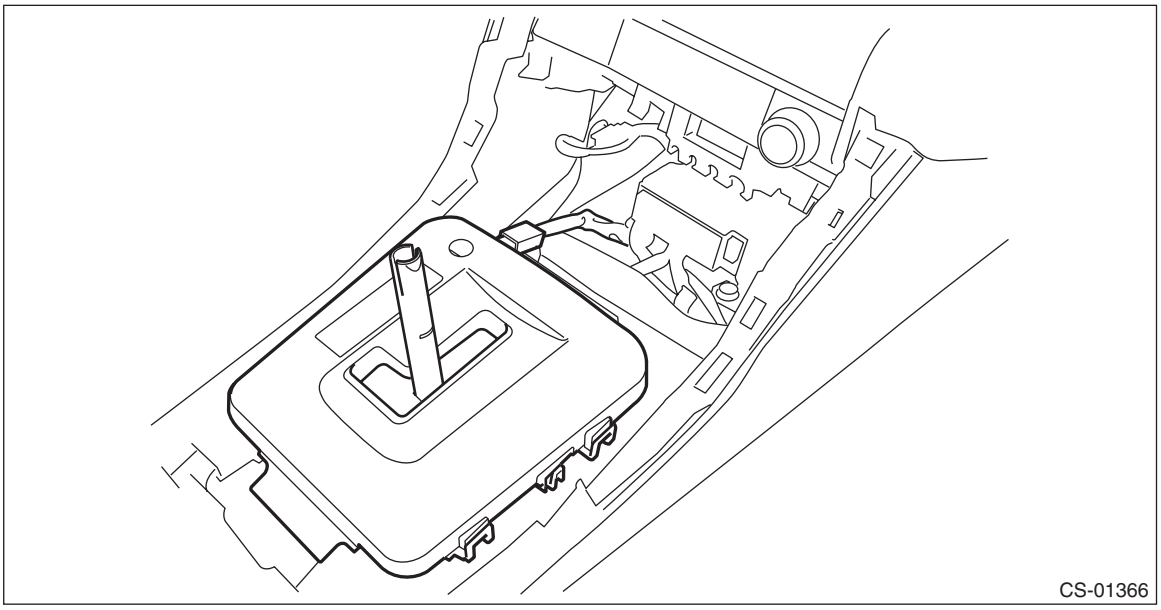


(A) Blind B
(B) Blind A

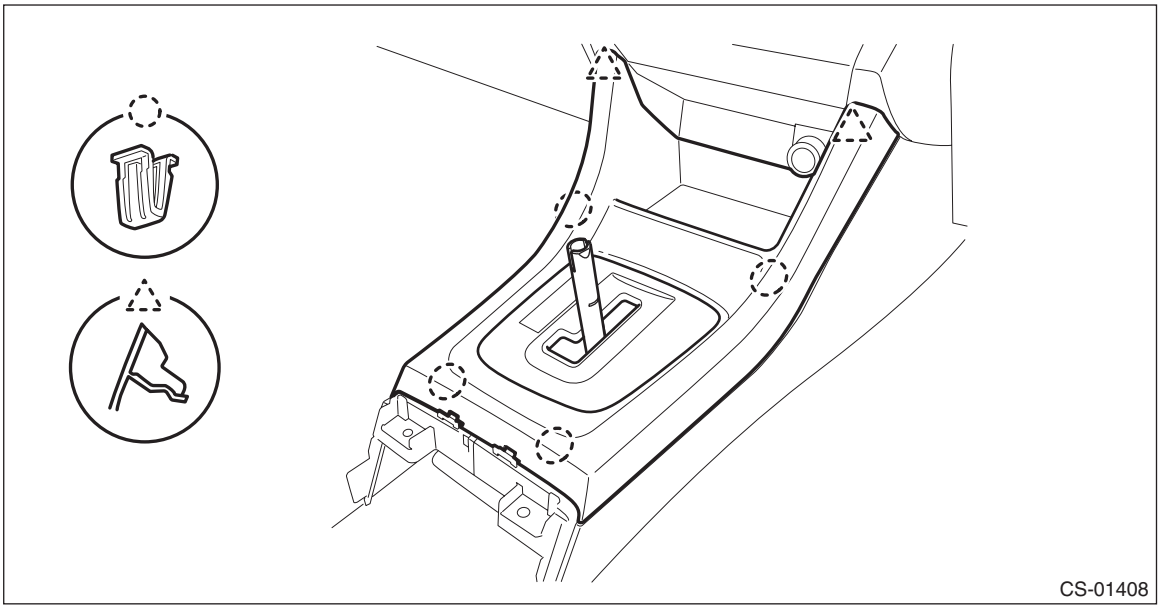
8) Install the housing.



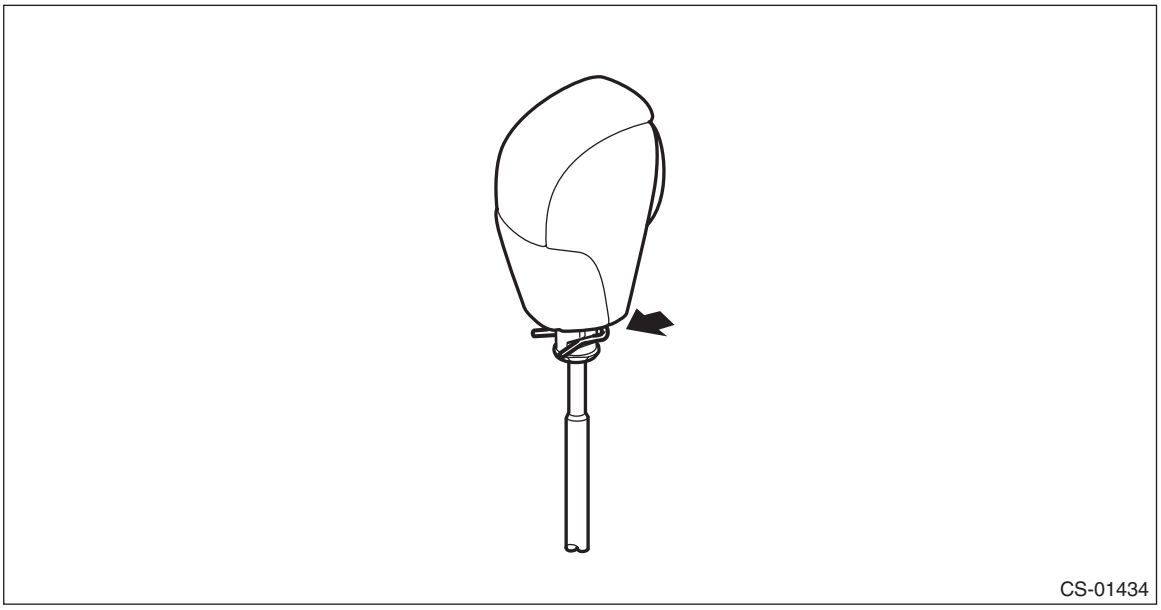
9) Install the indicator cover, then connect the connector.



10) Install the cover shift lever.

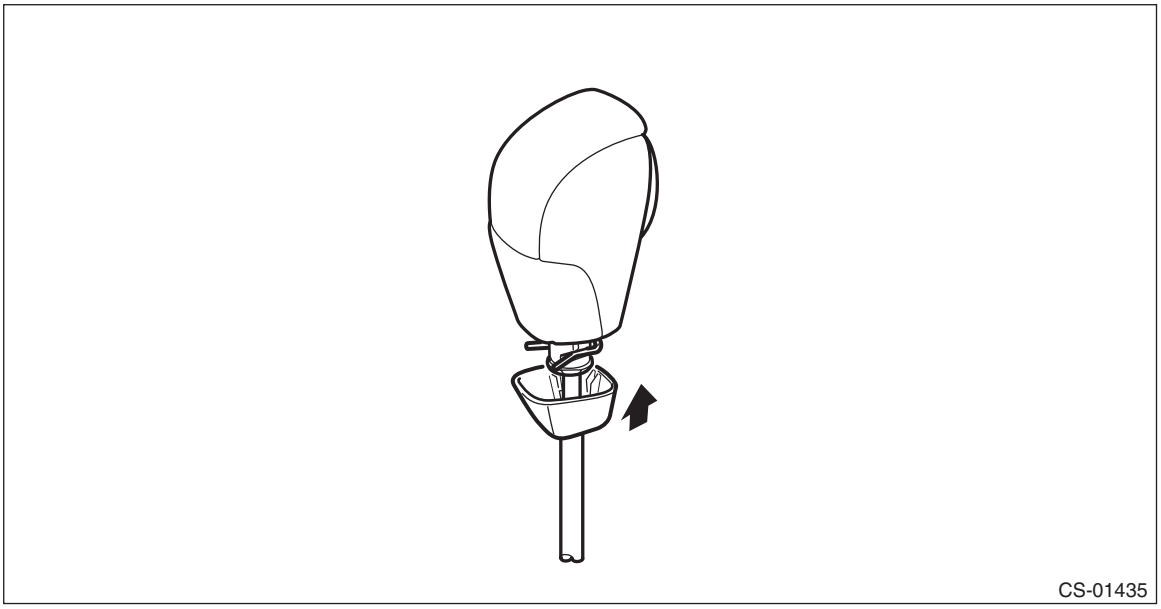


11) Accessing from the button side of the grip, attach the clamp grip pin.

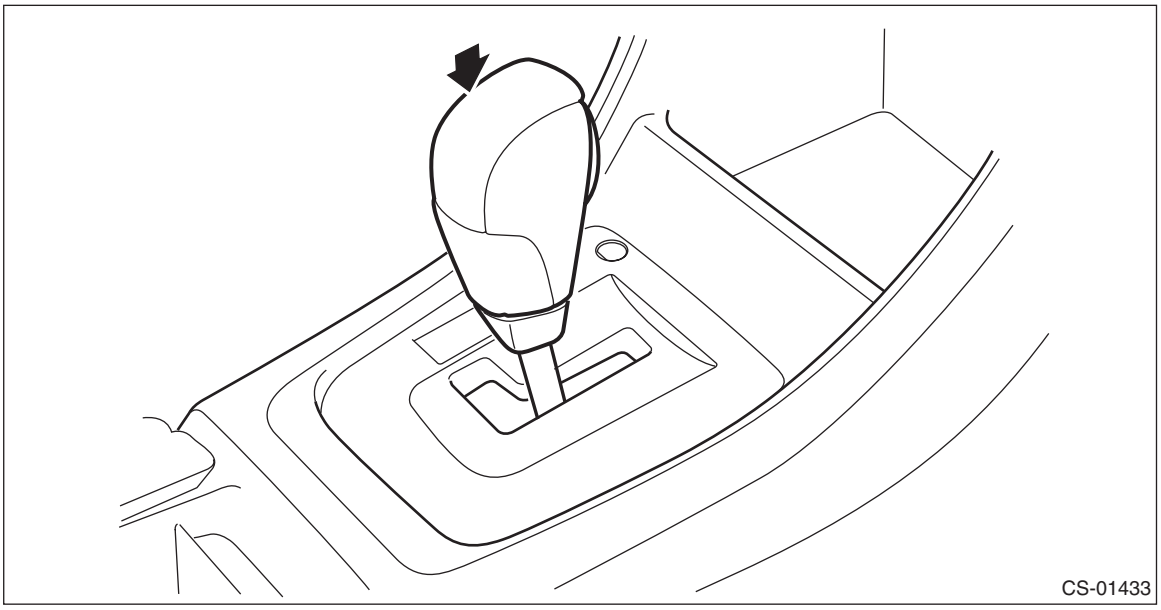


12) Install the cover grip AT securely.

NOTE:
After installation, check that the cover grip AT cannot be detached.



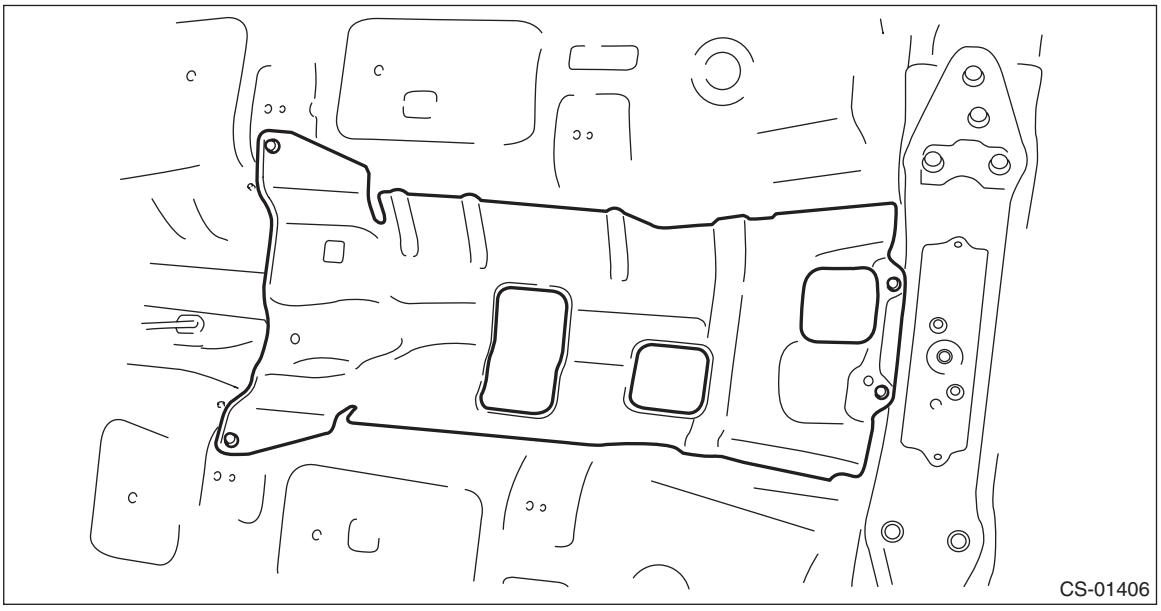
13) Insert the grip assembly to the select lever and press it down until a click is heard.



14) After installation of grip, check the following points.
- The grip will not come off.
- The button on the grip operates normally.

15) Install the console box. <Ref. to EI-69, INSTALLATION, Console Box.>
16) Lift up the vehicle.
17) Shift the range select lever to “N” range.
18) Secure the cable to the bracket. <Ref. to CS-45, INSTALLATION, Select Cable.>
19) Adjust the select cable position. <Ref. to CS-49, ADJUSTMENT, Select Cable.>
20) After adjustment, confirm that the select lever operates properly at all range positions using the shift lock release button.
21) Install the center exhaust cover.

Tightening torque:
18 N·m (1.8 kgf-m, 13.3 ft-lb)



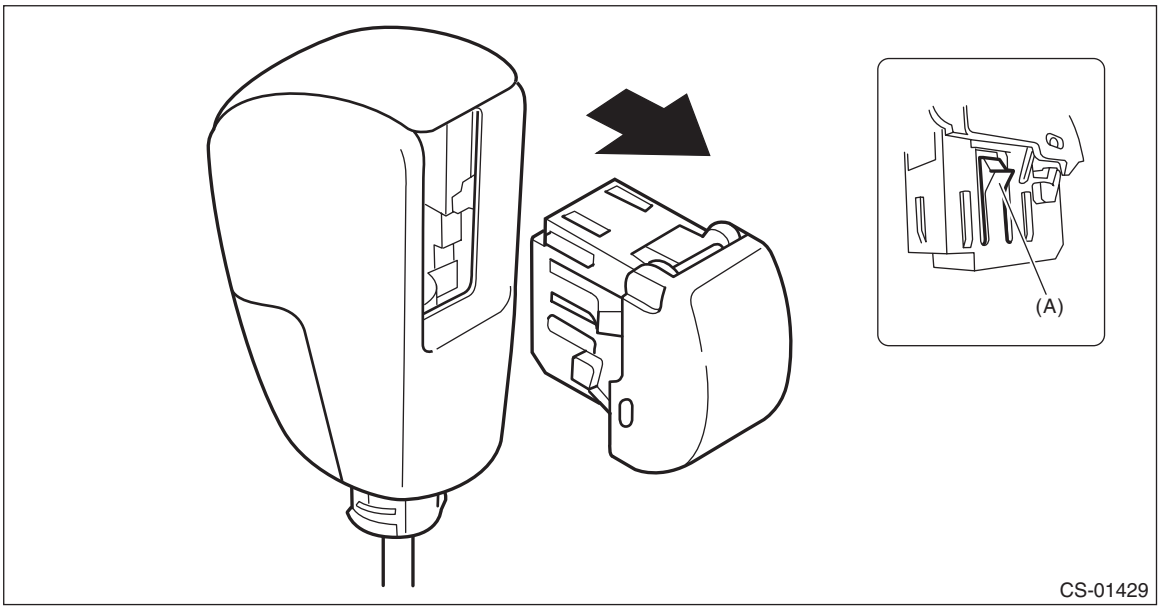
22) Install the rear exhaust pipe. <Ref. to EX(H4DO)-16, INSTALLATION, Rear Exhaust Pipe.>
23) Inspect the following items. If a malfunction is found in the inspection, adjust the select cable or inhibitor switch.

(1) The shift lock operates normally. <Ref. to CS-10, SHIFT LOCK OPERATION, INSPECTION, AT Shift Lock Control System.>
(2) Engine starts when the select lever is in “P” or “N” range, but not in other ranges.
(3) Back-up light illuminates when the select lever is in the “R” range, but not in other ranges.
(4) Select lever and indicator positions are matched.

C: DISASSEMBLY

1. GRIP ASSY

1) Remove the button assembly_AT.

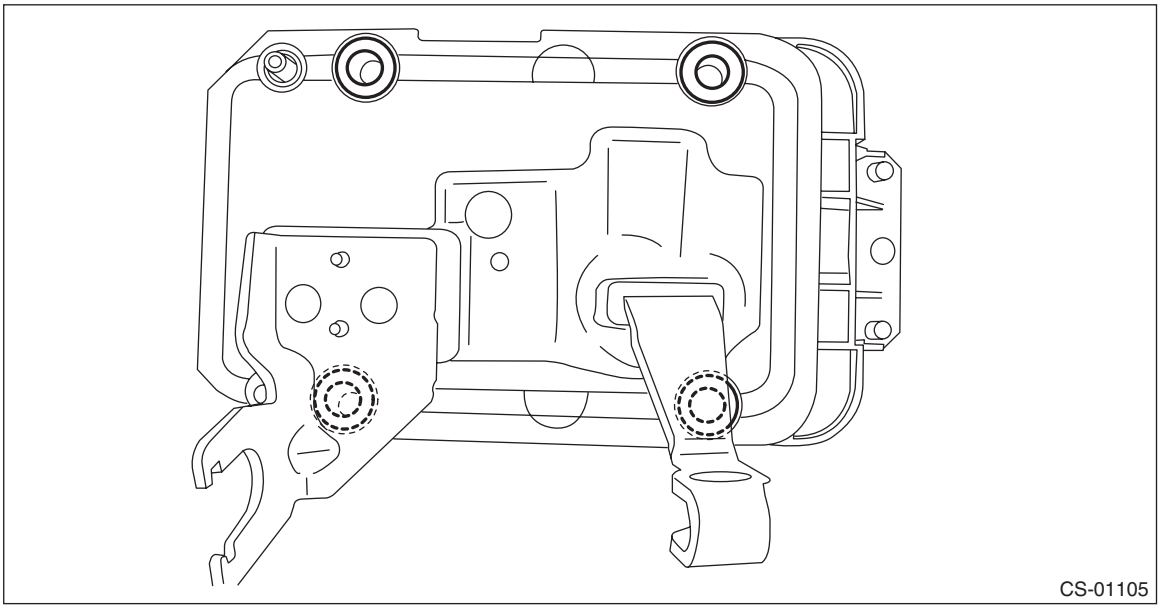


(A) Claw

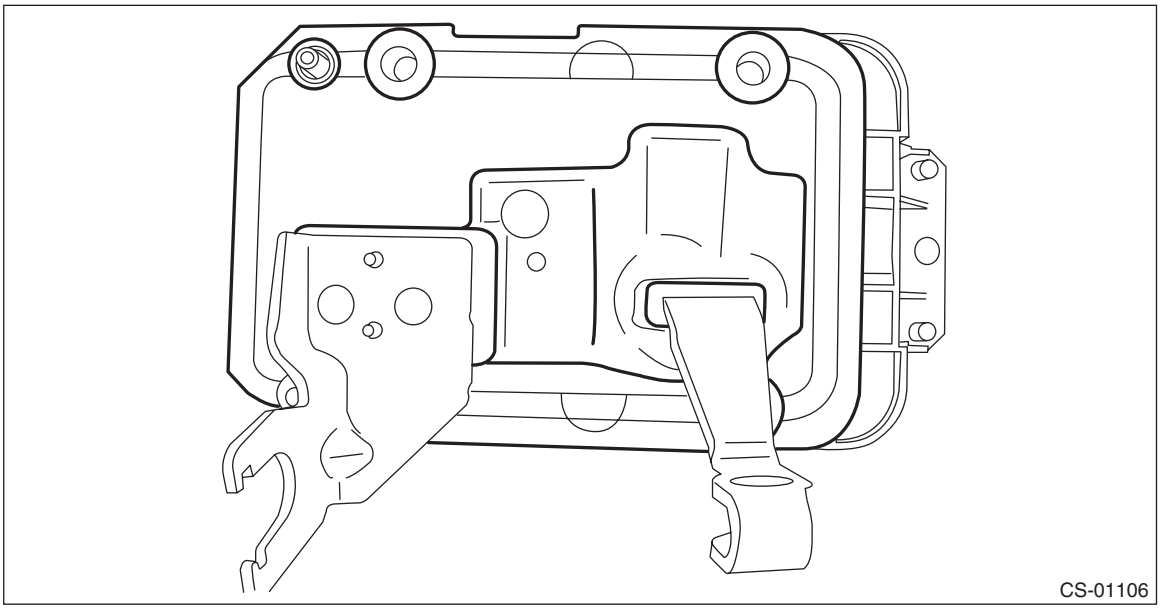
2) Remove the rod COMPL.

2. AT SELECT LEVER ASSEMBLY

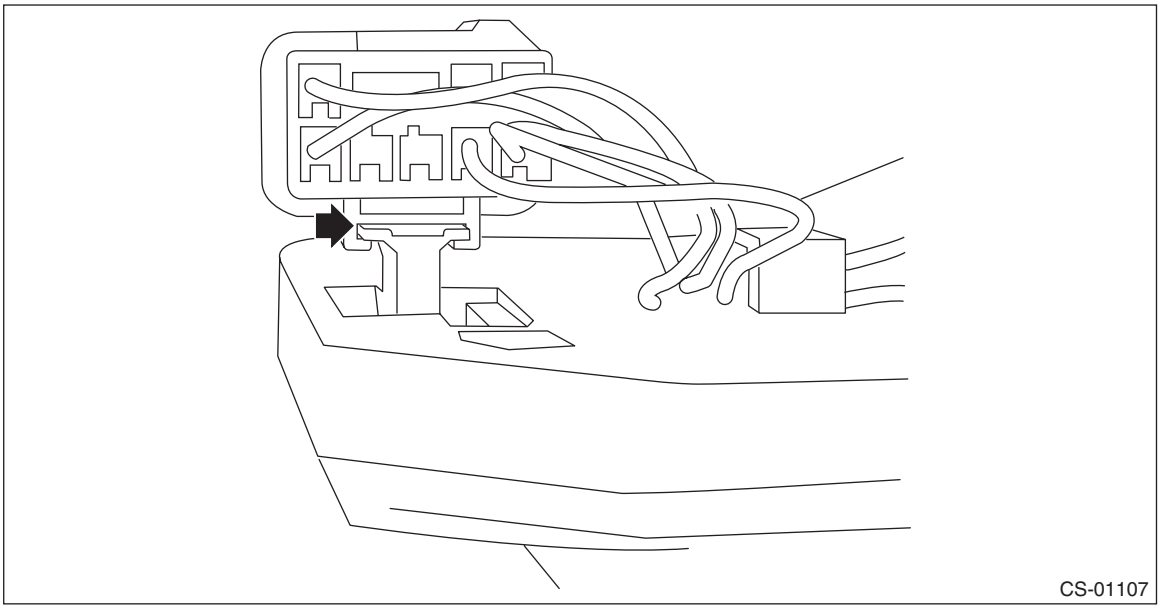
1) Remove the spacer plate.



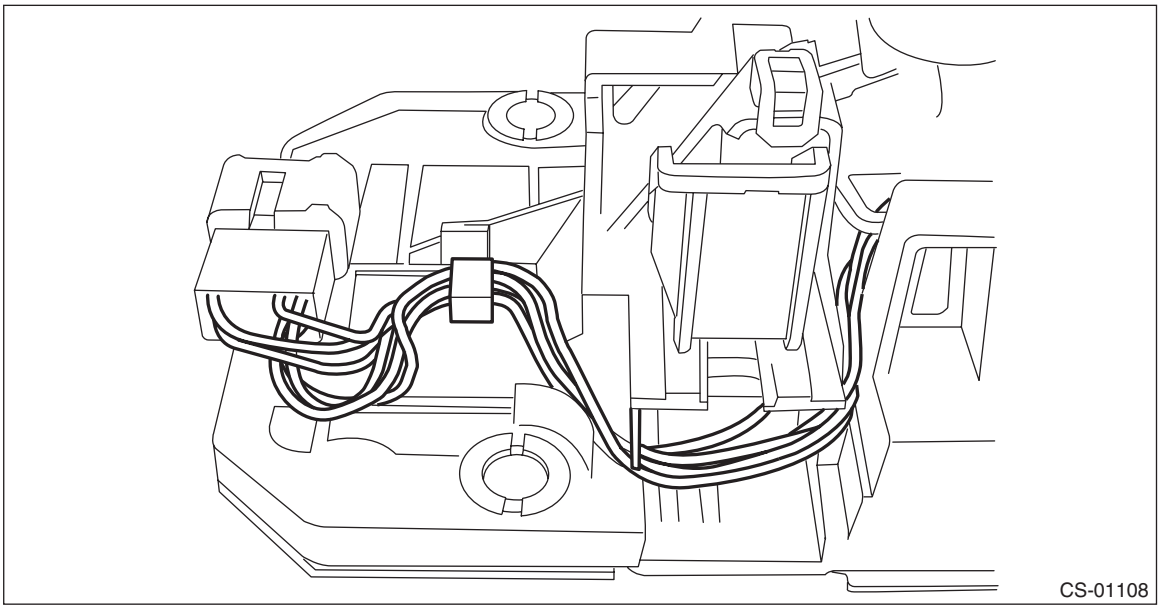
2) Remove the gasket.



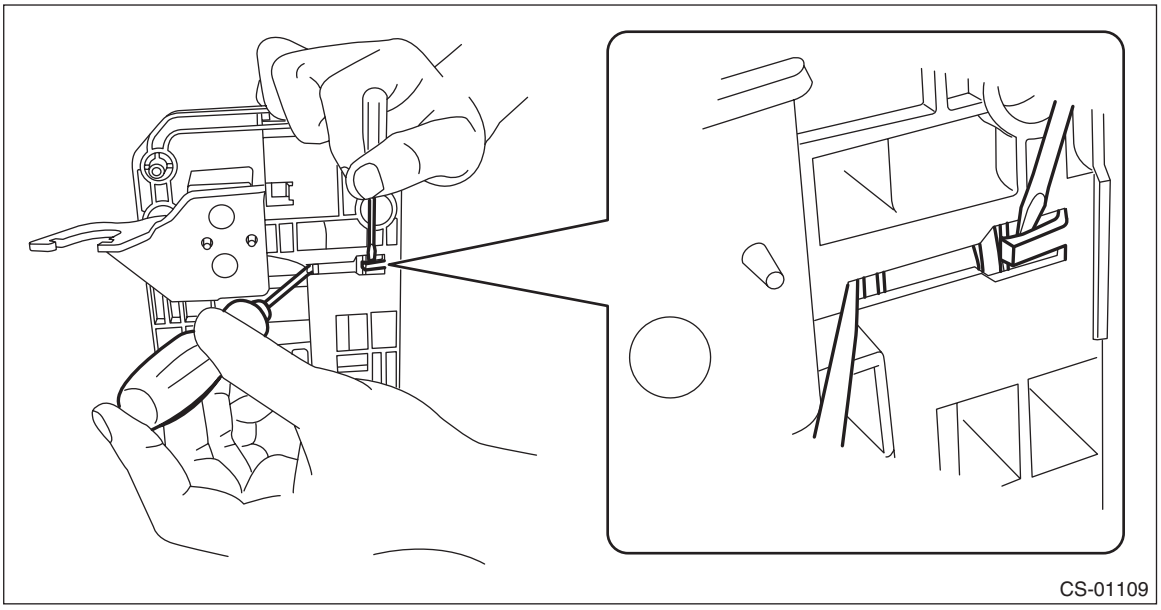
3) Insert a flat tip screwdriver with a thin tip under the connector and disconnect the harness connector from the plate COMPL.



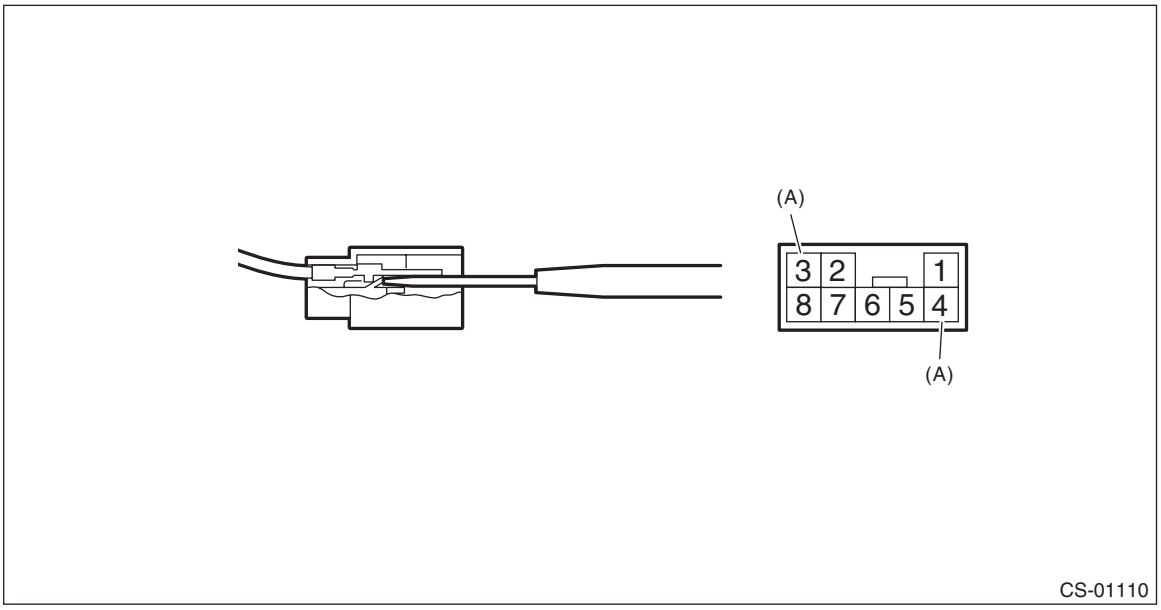
4) Remove the harness from the plate COMPL.



5) Raise the claw with a flat tip screwdriver with a thin tip and remove the solenoid unit.



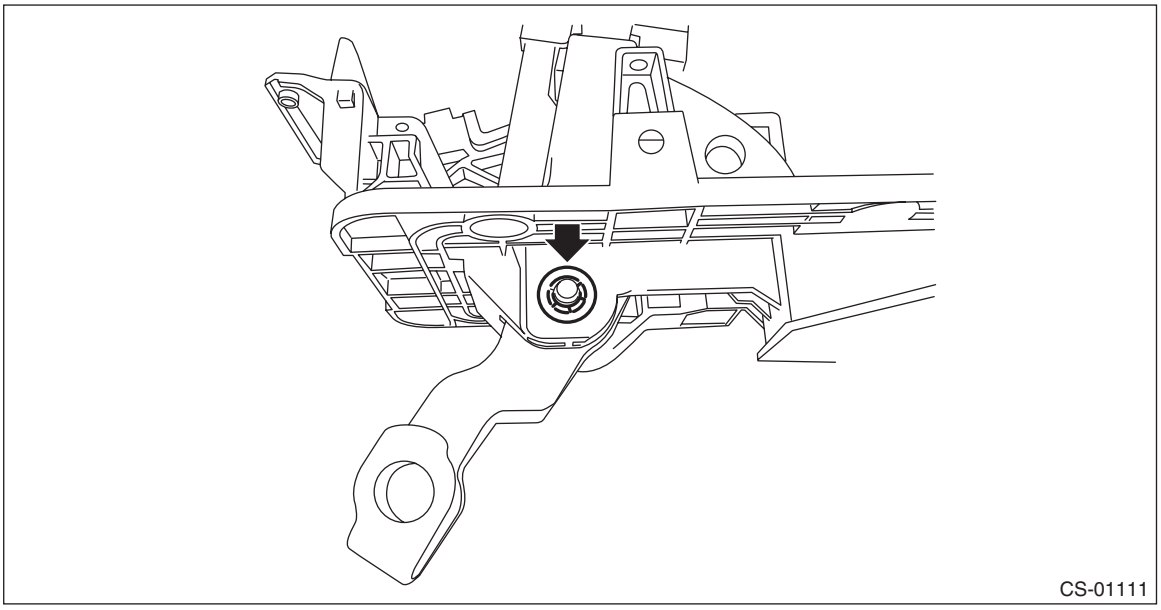
6) Using a flat tip screwdriver with a thin tip, remove the solenoid unit terminals from the connector.



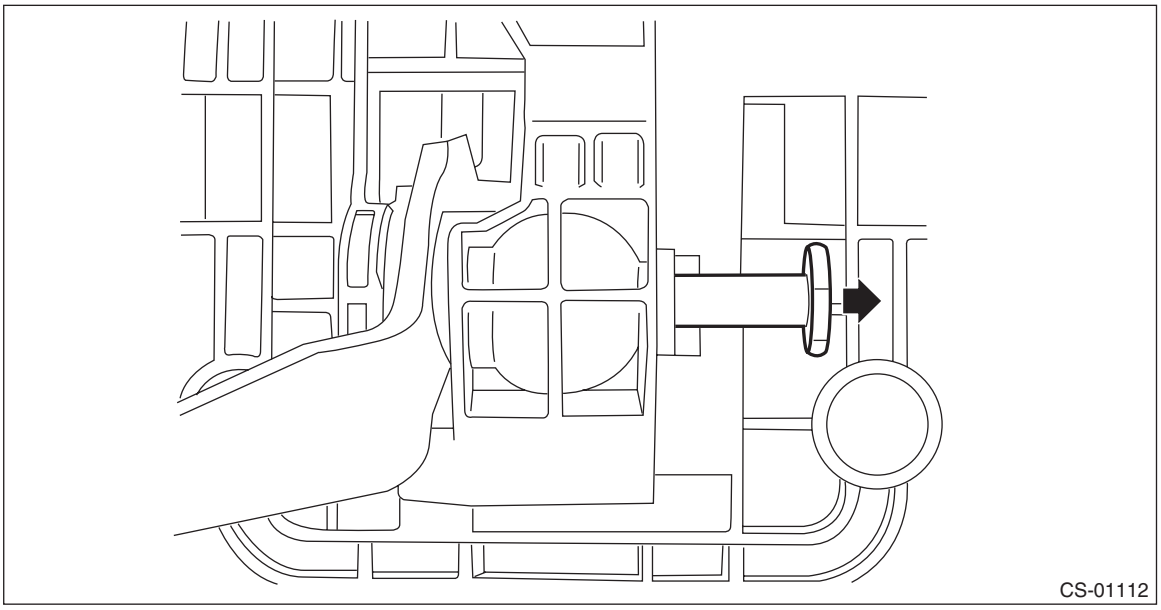
(A) Solenoid unit terminals

7) Remove the clamp push nut.

NOTE:
Replace the clamp push nut with a new part.

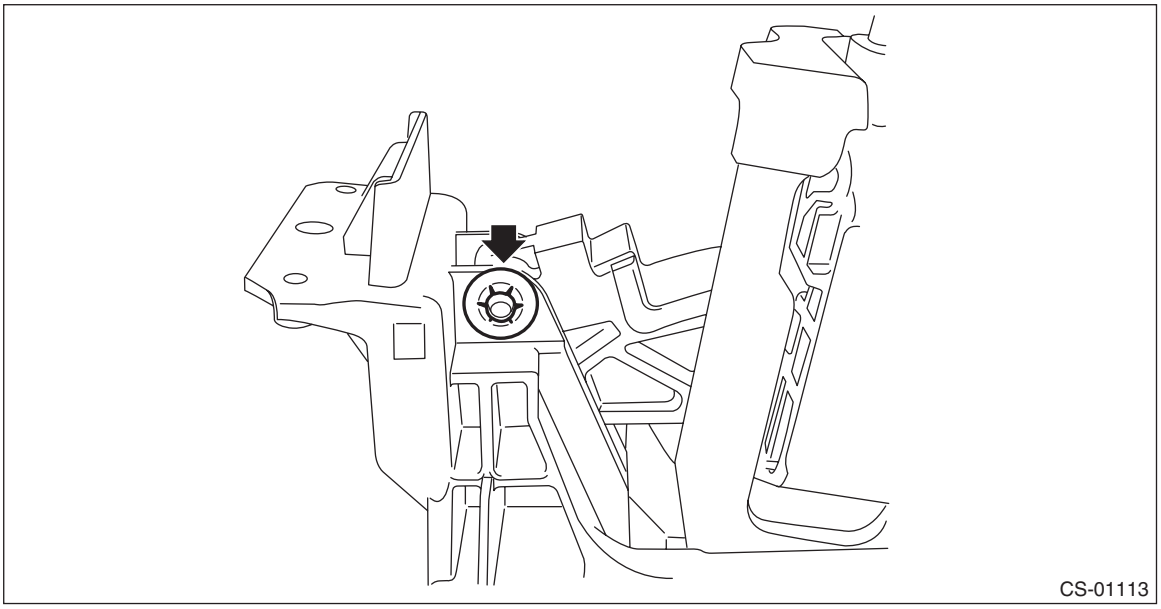


8) Pull out shaft control.

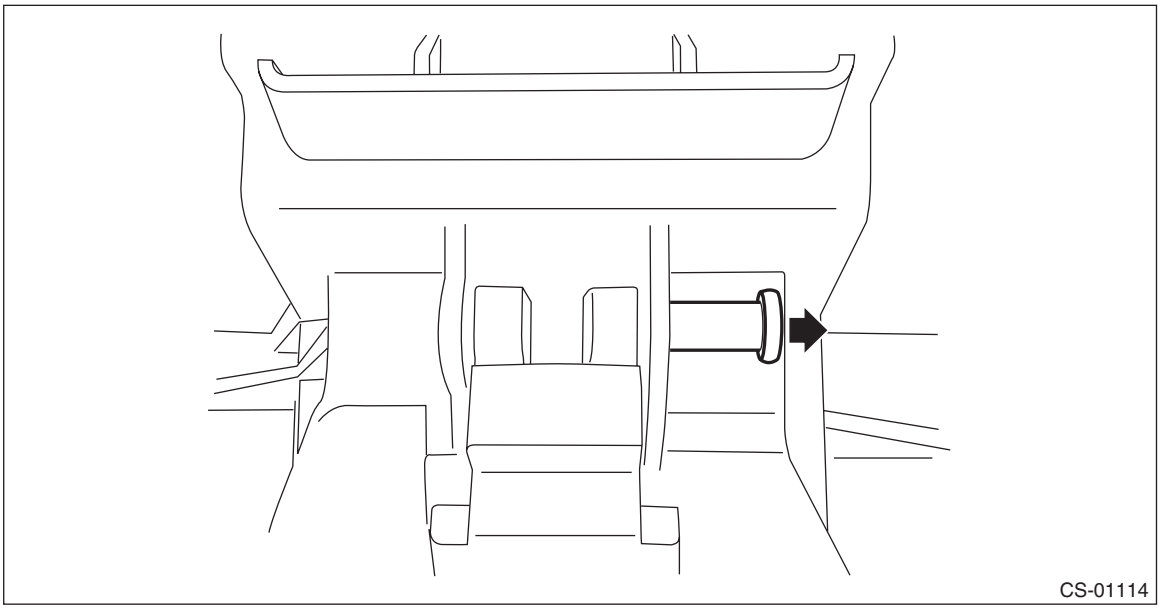


9) Remove the clamp push nut.

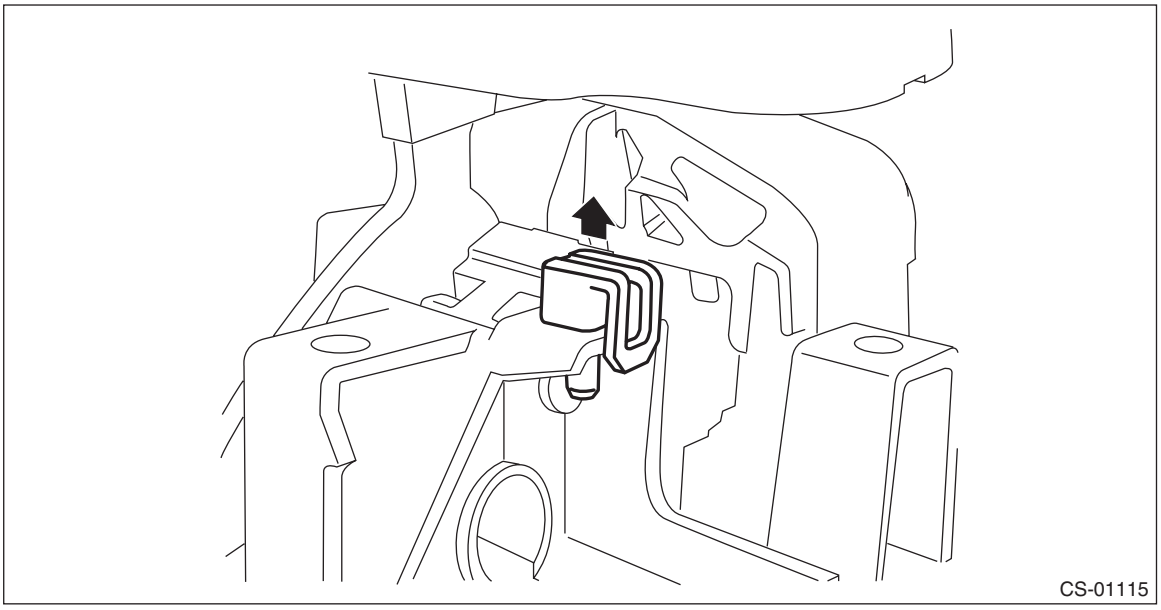
NOTE:
Replace the clamp push nut with a new part.



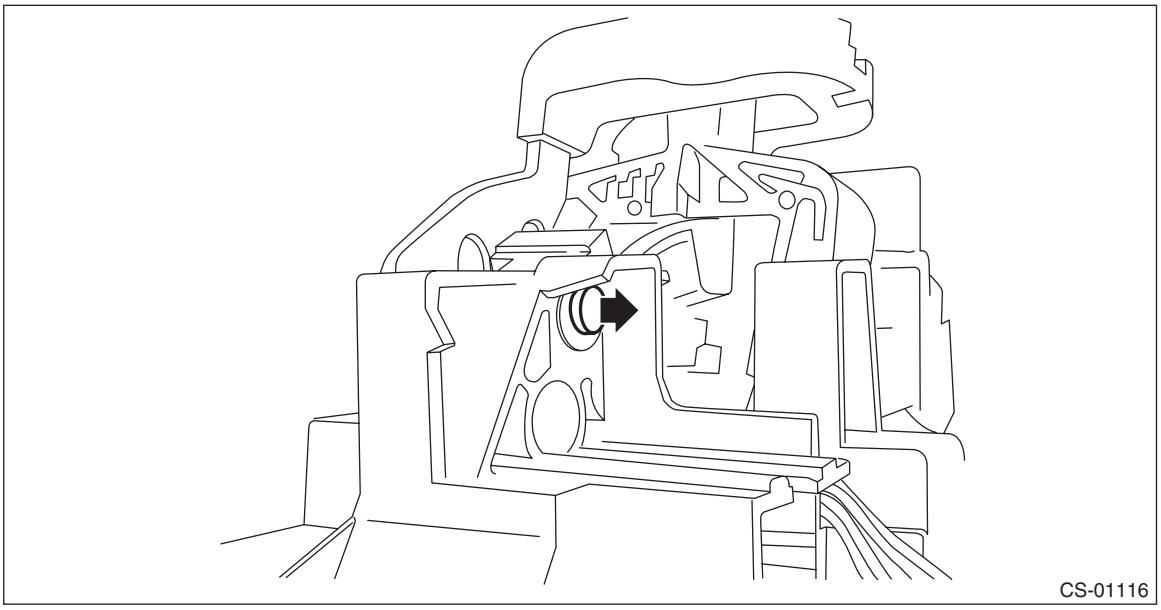
10) Pull out spacer pin guide.



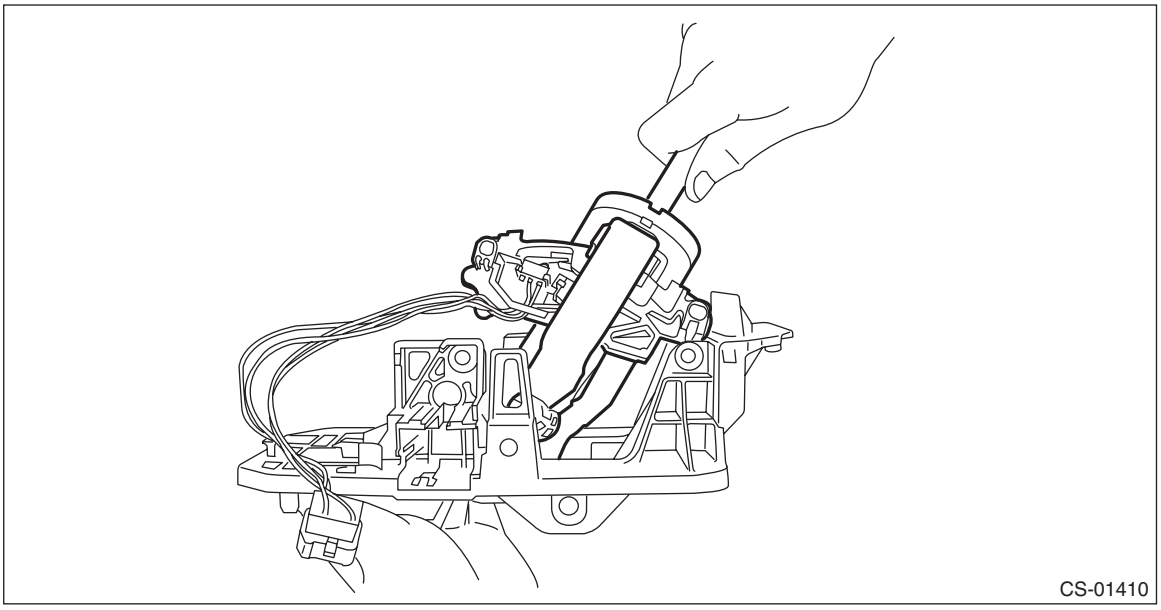
11) Remove the clamp pin.



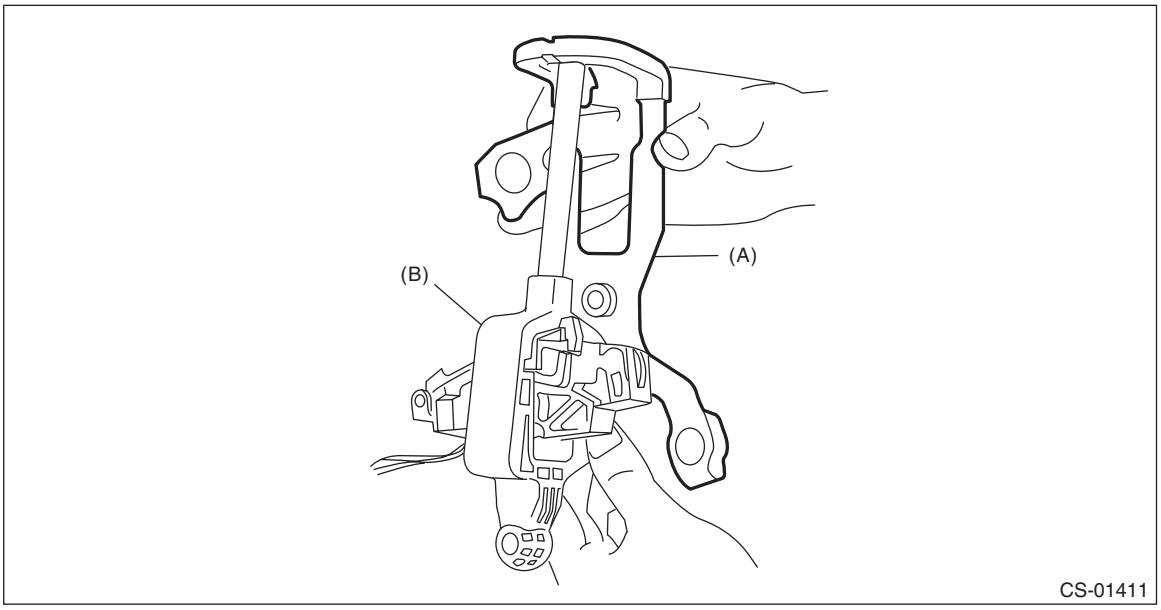
12) Remove the spacer pin guide.



13) Remove the select lever COMPL from the plate COMPL.

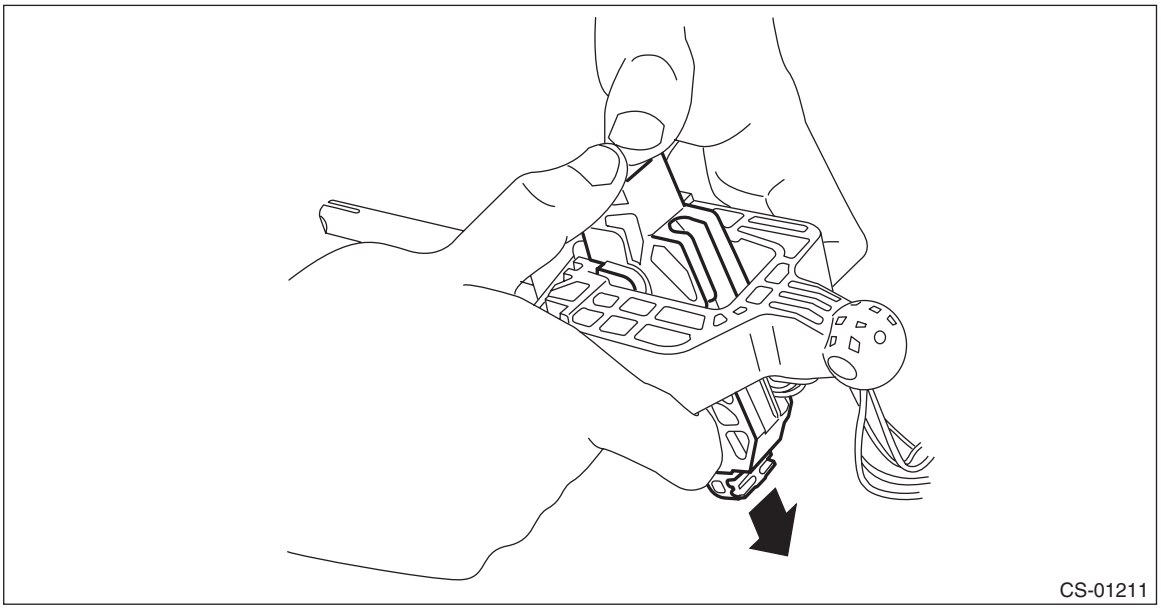


14) Remove the arm COMPL.

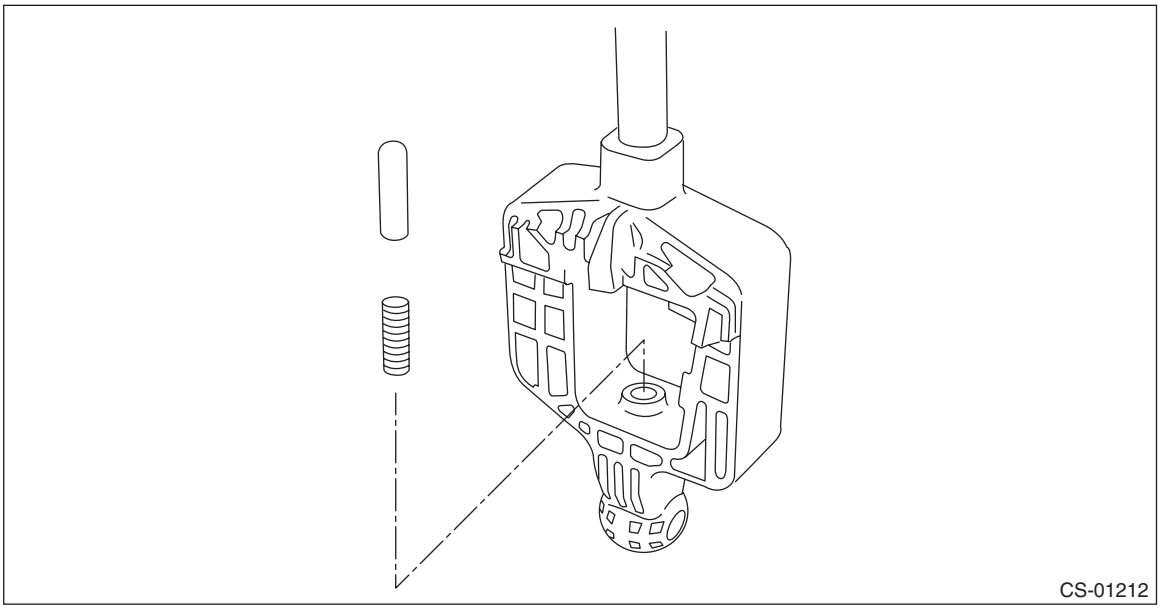


(A) Arm COMPL
(B) Selector lever COMPL

15) Remove the plate guide from the select lever COMPL.



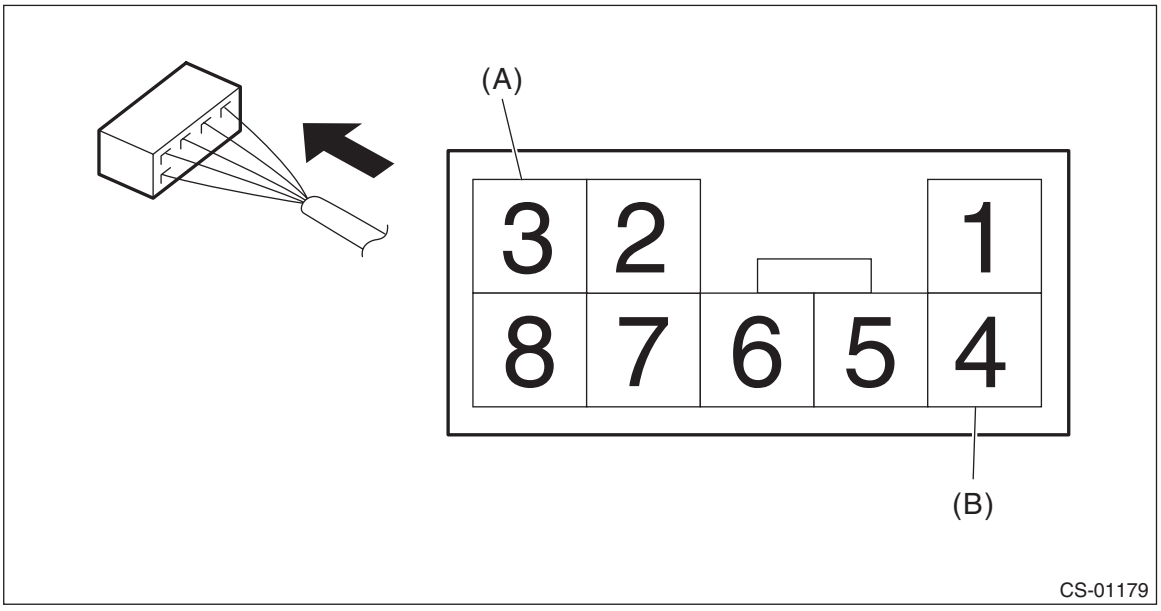
16) Remove the rod detent and detent spring from the select lever COMPL.



D: ASSEMBLY

1) Clean all the parts before assembly.
2) Apply Multemp D or equivalent to the sliding portion of each part.
3) Assemble in the reverse order of disassembly.

NOTE:
Insert the solenoid unit terminals to the harness connector.



(A) Solenoid unit (color code: blue)
(B) Solenoid unit (color code: black)

4) After installation, check the following points.
• The select indicator matches the select lever position when the select lever is changed from “P” range to “D” range.
• The select lever position and the position mark match each other.
• Operating force to move the select lever from “P” to “D” range.

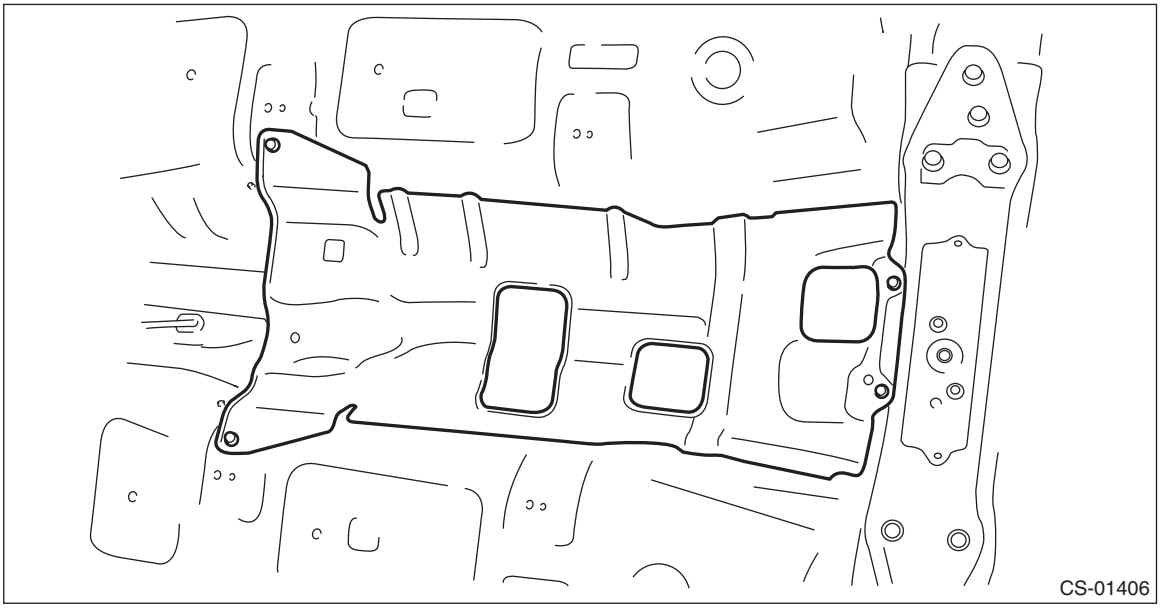
E: INSPECTION

1) Inspect the removed parts by comparing with new parts for deformation, damage and wear. Repair or replace if defective.
2) Inspect the select lever assembly operating condition before assembly. Normal if it operates smoothly.

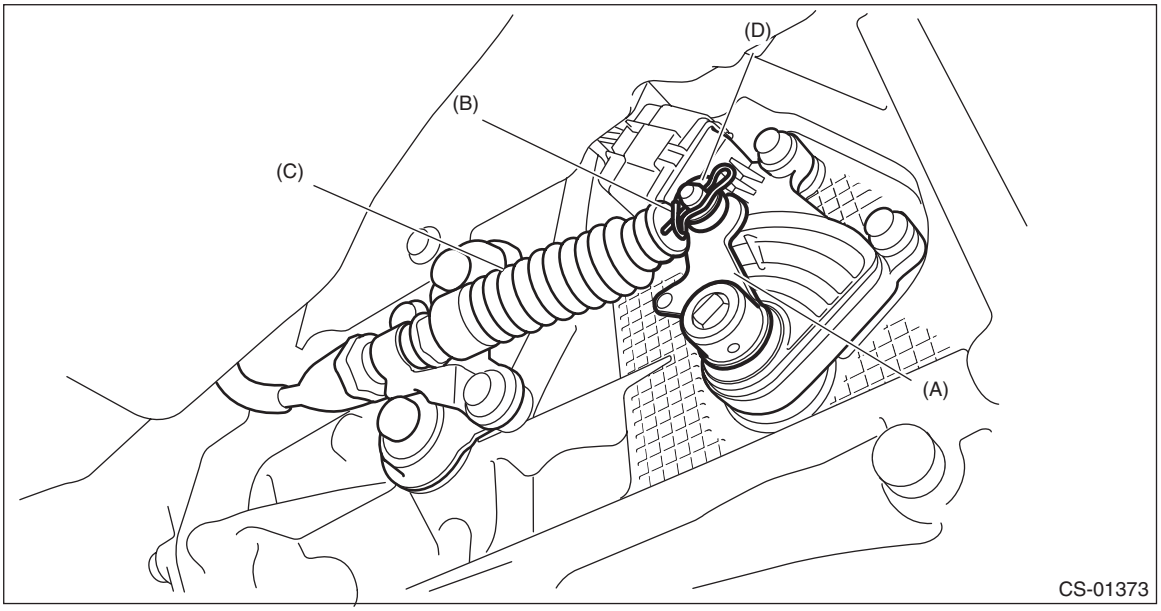
4. Select Cable

A: REMOVAL

1) Shift the select lever to “N” range.
2) Disconnect the ground cable from battery.
3) Lift up the vehicle.
4) Remove the front, center and rear exhaust pipes. <Ref. to EX(H4DO)-6, REMOVAL, Front Exhaust Pipe.> <Ref. to EX(H4DO)-13, REMOVAL, Center Exhaust Pipe.> <Ref. to EX(H4DO)-14, REMOVAL, Rear Exhaust Pipe.>
5) Remove the center exhaust cover.

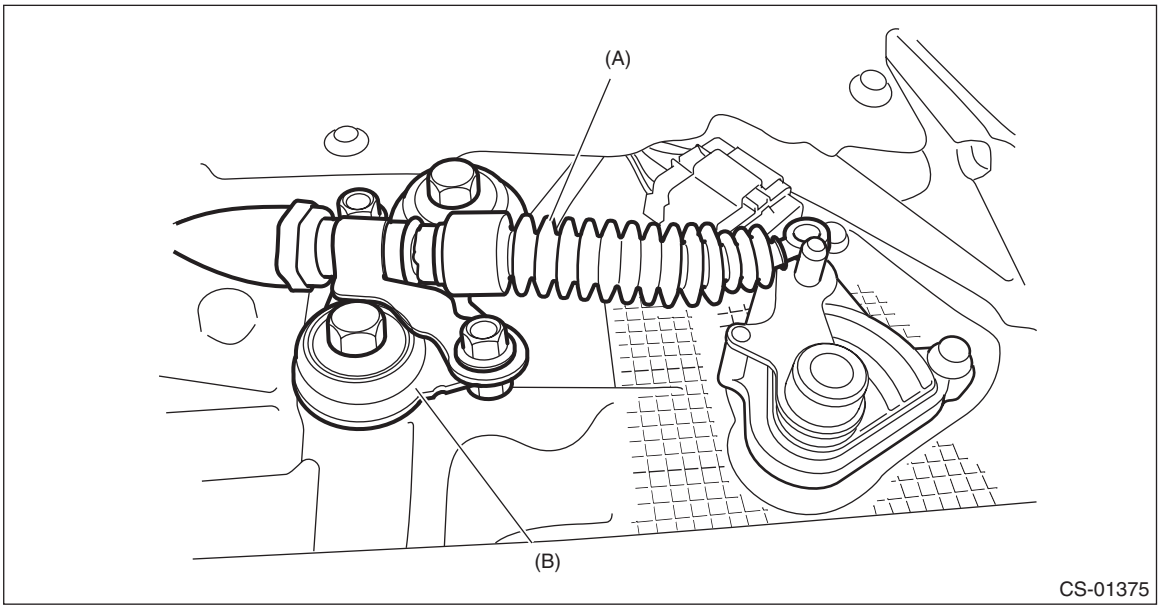


6) Remove the snap pin and washer from the shifter arm.



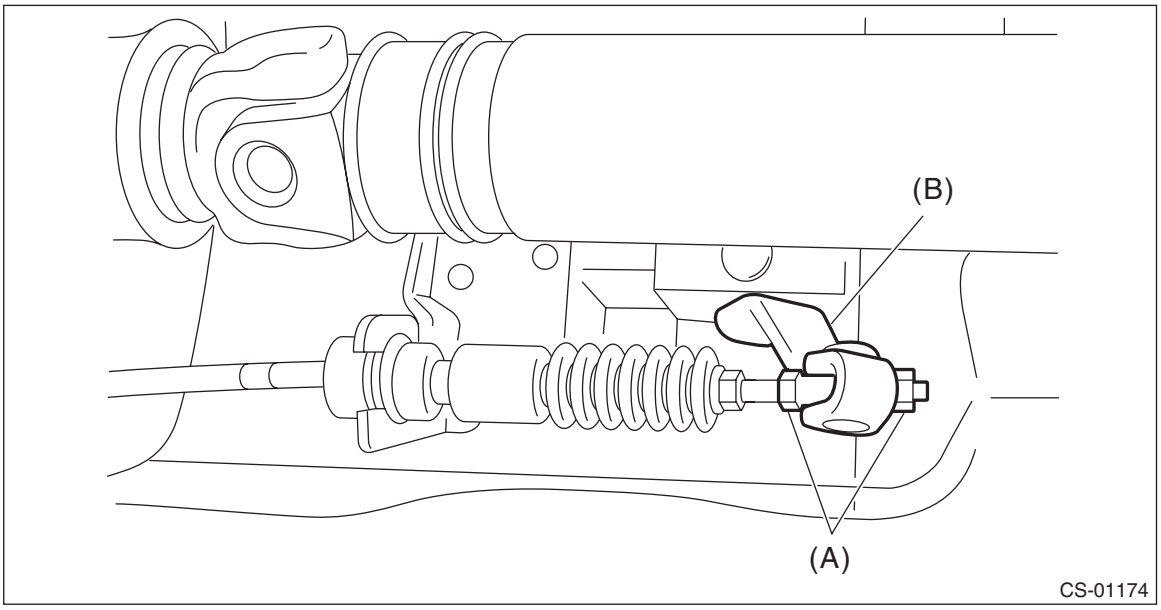
(A) Shifter arm
(B) Snap pin
(C) Select cable
(D) Washer

7) Remove the plate assembly from the transmission case.



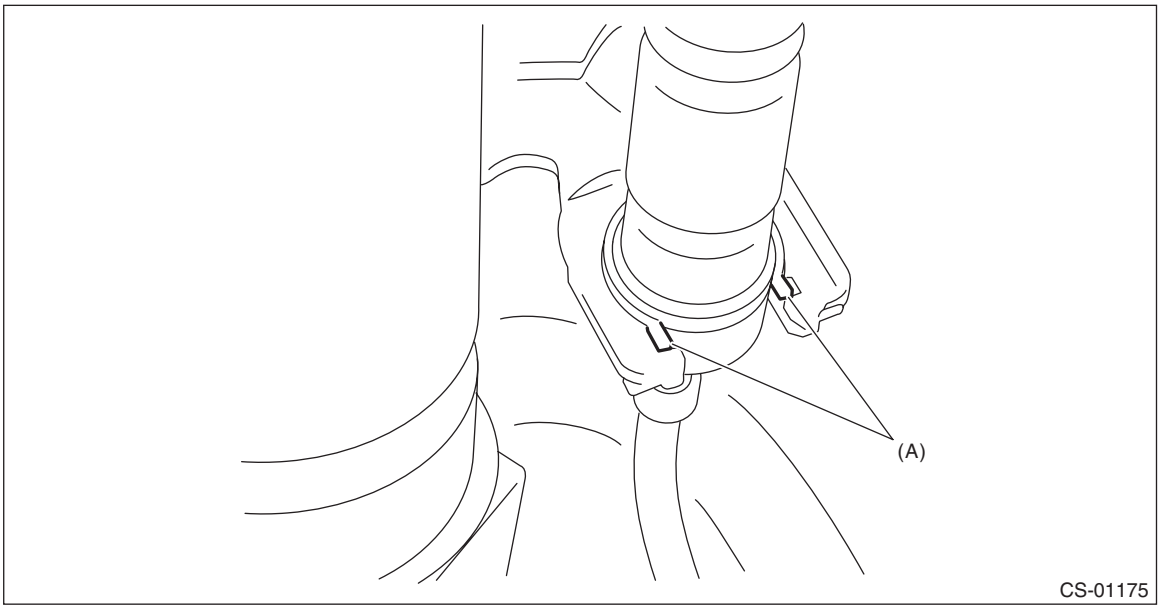
(A) Select cable
(B) Plate ASSY

8) Disconnect the cable from arm COMPL.



(A) Adjusting nut
(B) Arm COMPL

9) Raise the claw of clamp to remove the cable from bracket.



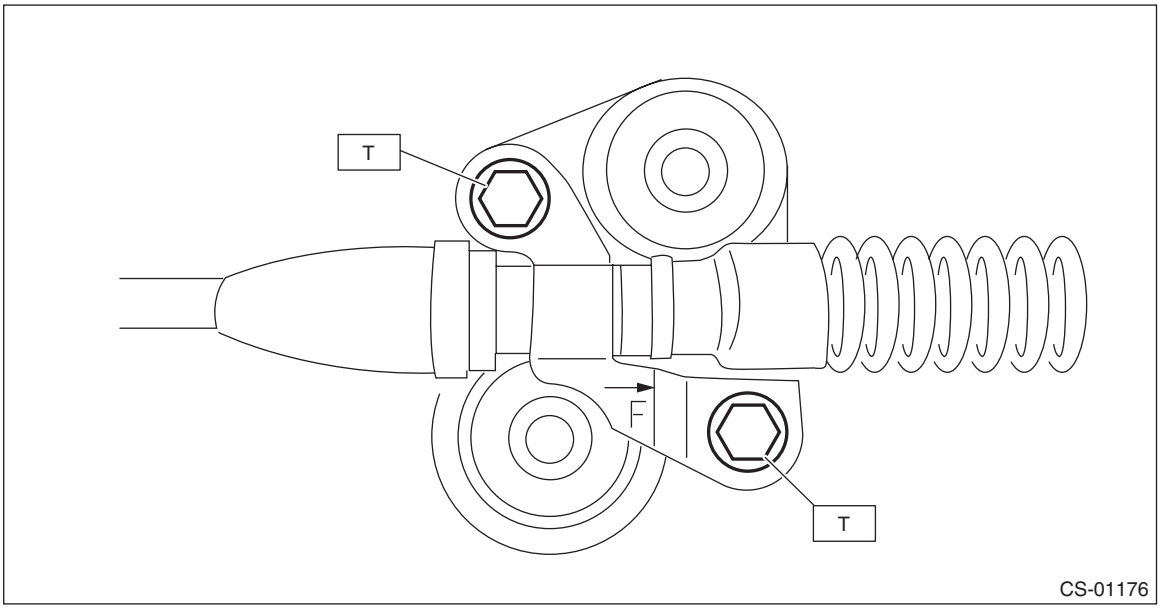
(A) Claw

10) Remove the select cable from plate assembly.

B: INSTALLATION

1) Install the select cable to plate assembly.

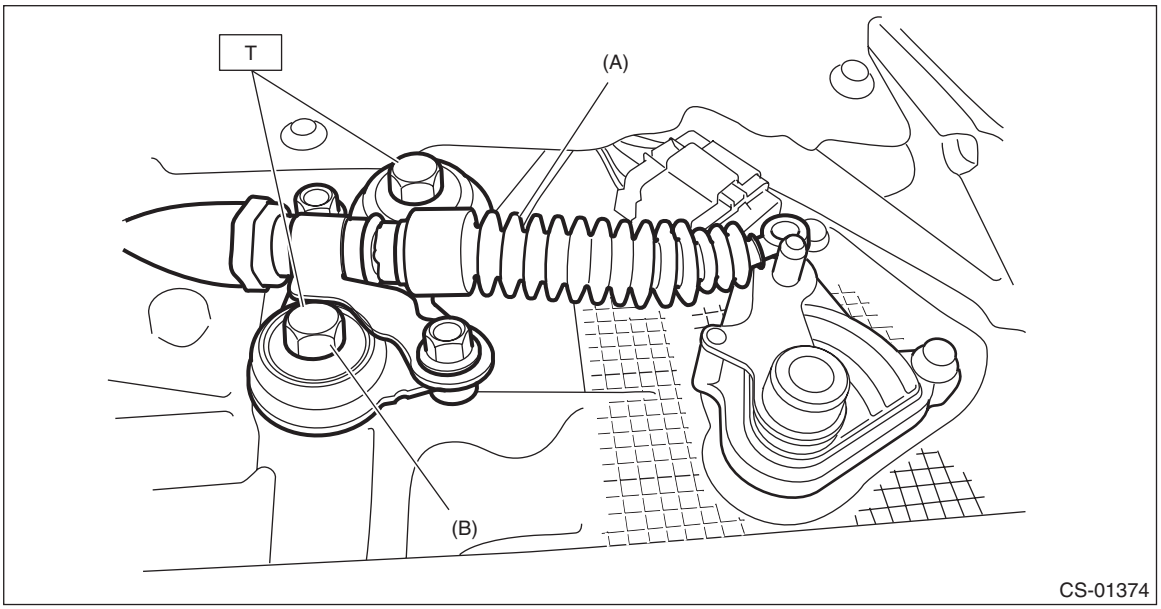
Tightening torque:
18 N·m (1.8 kgf-m, 13.3 ft-lb)



2) Install the select cable to the shifter arm.

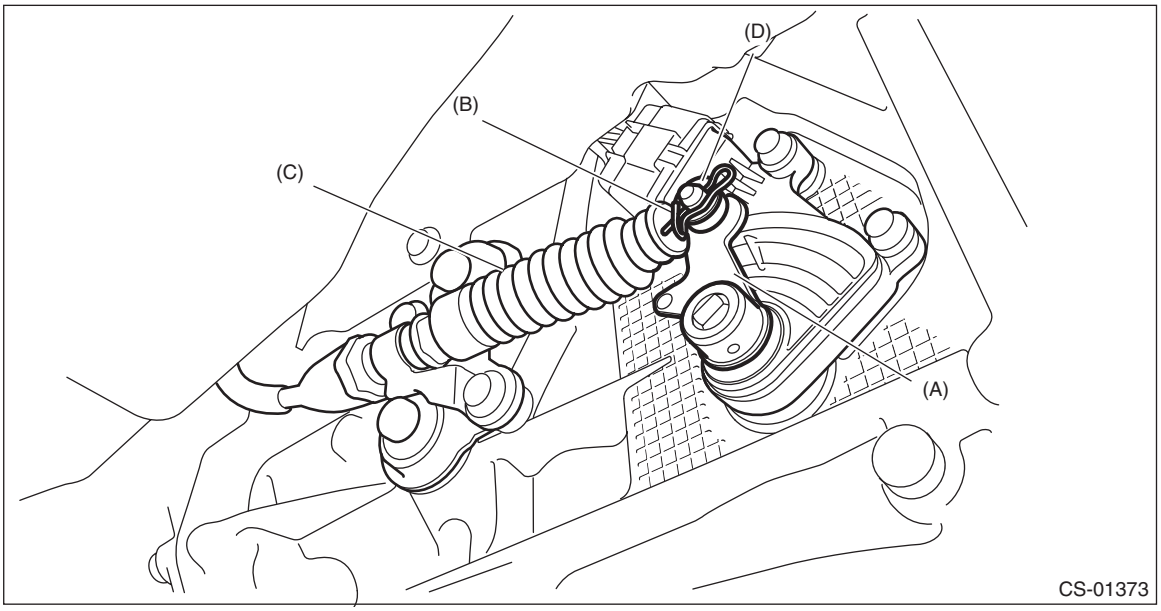
3) Install the plate assembly to transmission.

Tightening torque:
T: 25 N·m (2.5 kgf-m, 18.4 ft-lb)



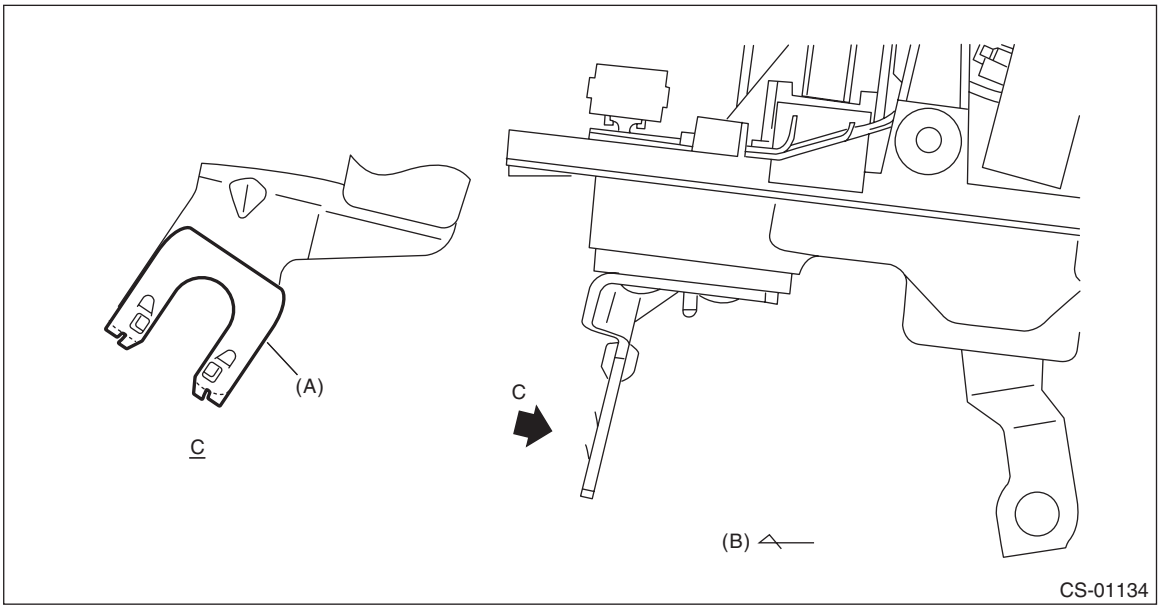
(A) Select cable
(B) Plate ASSY

4) Install the washer and snap pin to the shifter arm.



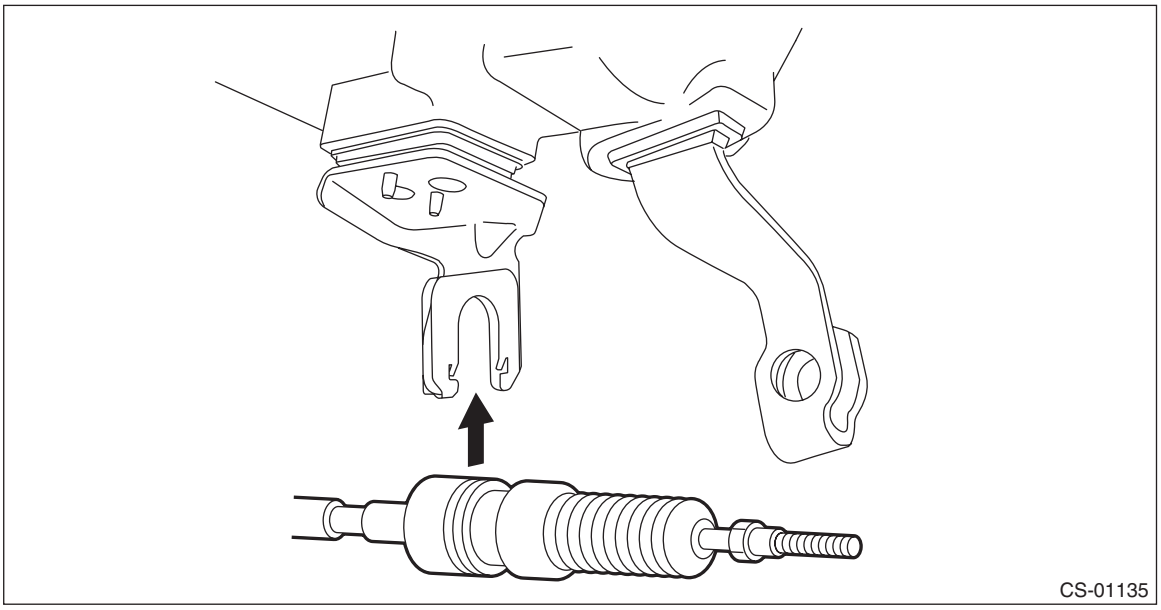
(A) Shifter arm
(B) Snap pin
(C) Select cable
(D) Washer

5) Install new clamp paying attention to the installing direction.



(A) Clamp
(B) Forward

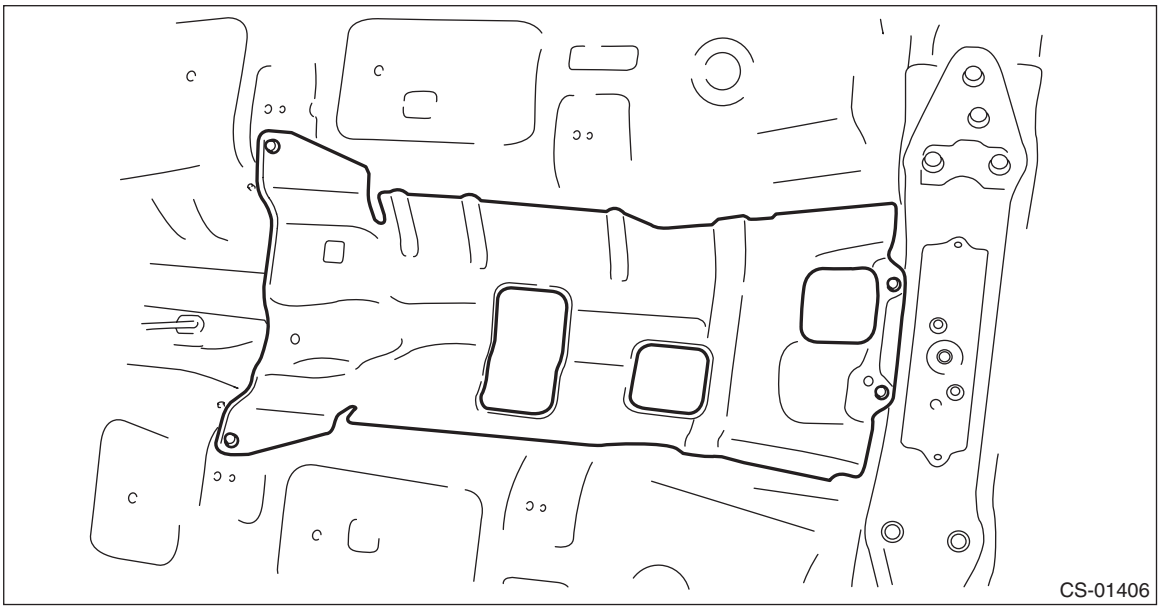
6) Insert the tip of inner cable into connector hole of select lever, and fix the cable to bracket.



7) Shift the select lever to the “N” range, and then adjust the select cable position. <Ref. to CS-49, ADJUSTMENT, Select Cable.>

8) Install the center exhaust cover.

Tightening torque:
18 N·m (1.8 kgf-m, 13.3 ft-lb)



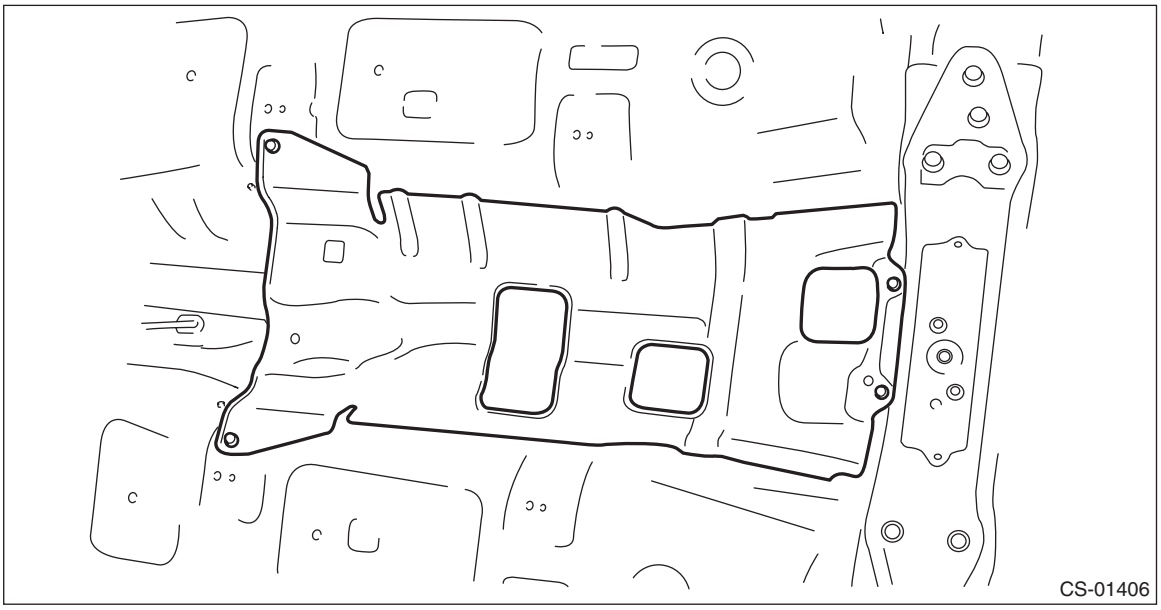
9) Install the front, center and rear exhaust pipe. <Ref. to EX(H4DO)-9, INSTALLATION, Front Exhaust Pipe.> <Ref. to EX(H4DO)-13, INSTALLATION, Center Exhaust Pipe.> <Ref. to EX(H4DO)-16, INSTALLATION, Rear Exhaust Pipe.>

C: INSPECTION

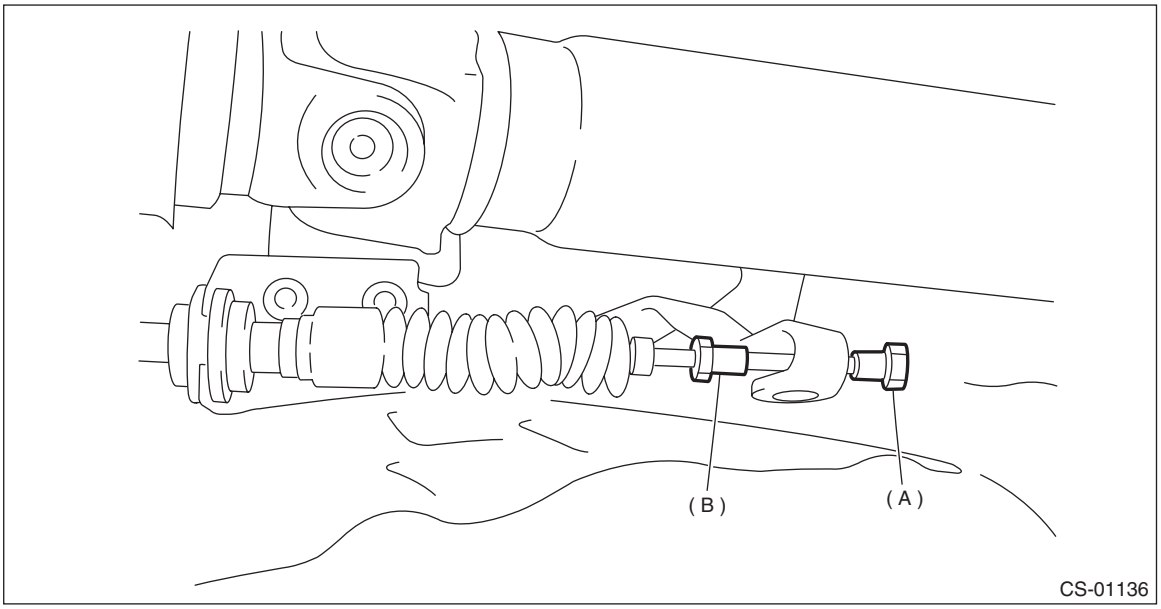
Check the removed cable and replace or adjust if damaged, rusty or malfunctioning.
1) Check the cable for smooth operation.
2) Check the inner cable for damage and rust.
3) Check the outer cable for damage, bends and cracks.
4) Check the boot for damage, cracks and deterioration.
5) Move the select lever from “P” to “D” range. Check the existence of feel to contact the detents in each range. If the detents cannot be felt or the position pointer is improperly aligned, adjust the cable.
6) Check if the starter motor rotates when the select lever is set to “P” range.
7) Check the back-up light illumination when the select lever is in “R” range.
8) Check the parking lock operation when the select lever is in “P” range.

D: ADJUSTMENT

1) Shift the select lever to “N” range.
2) Lift up the vehicle.
3) Remove the rear exhaust pipe. <Ref. to EX(H4DO)-14, REMOVAL, Rear Exhaust Pipe.>
4) Remove the center exhaust cover.

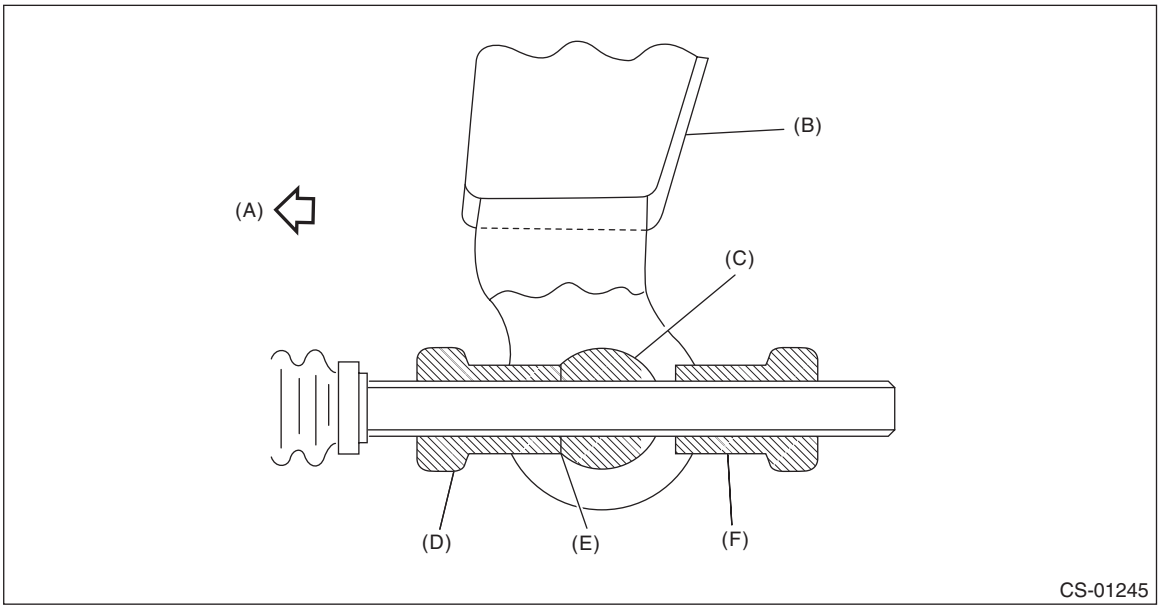


5) Loosen the adjusting nuts on both sides.



(A) Adjusting nut A
(B) Adjusting nut B

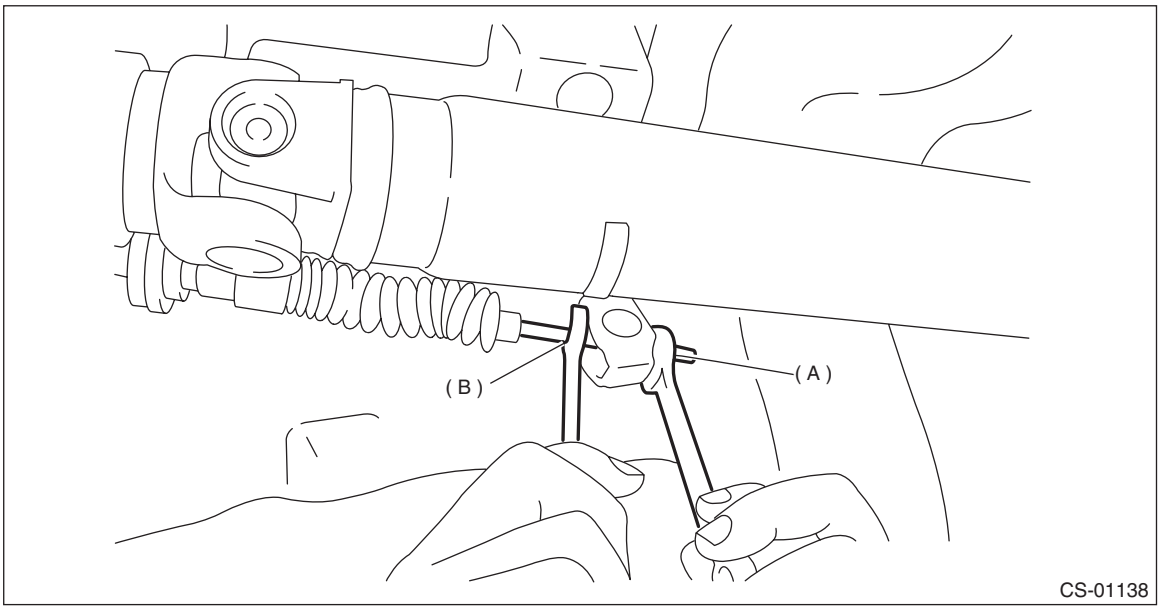
6) Turn adjusting nut B until it lightly touches the connector.



(A) Forward side
(B) Select lever
(C) Connector
(D) Adjusting nut B
(E) Contact point
(F) Adjusting nut A

7) Set a spanner wrench to adjusting nut B so that it does not rotate, and then tighten the adjusting nut A.

Tightening torque:
7.5 N·m (0.76 kgf-m, 5.5 ft-lb)



(A) Adjusting nut A
(B) Adjusting nut B

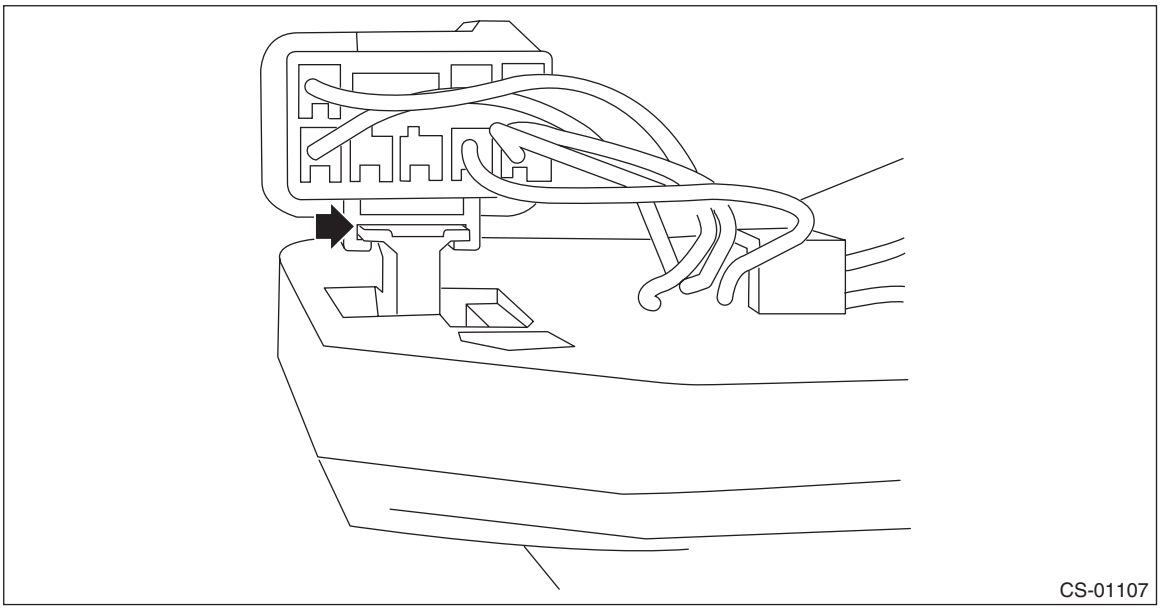
8) After the completion of adjustment, confirm that the select lever operates normally at all ranges.
9) Install in the reverse order of removal.

5. AT Shift Lock Solenoid and “P” Range Switch

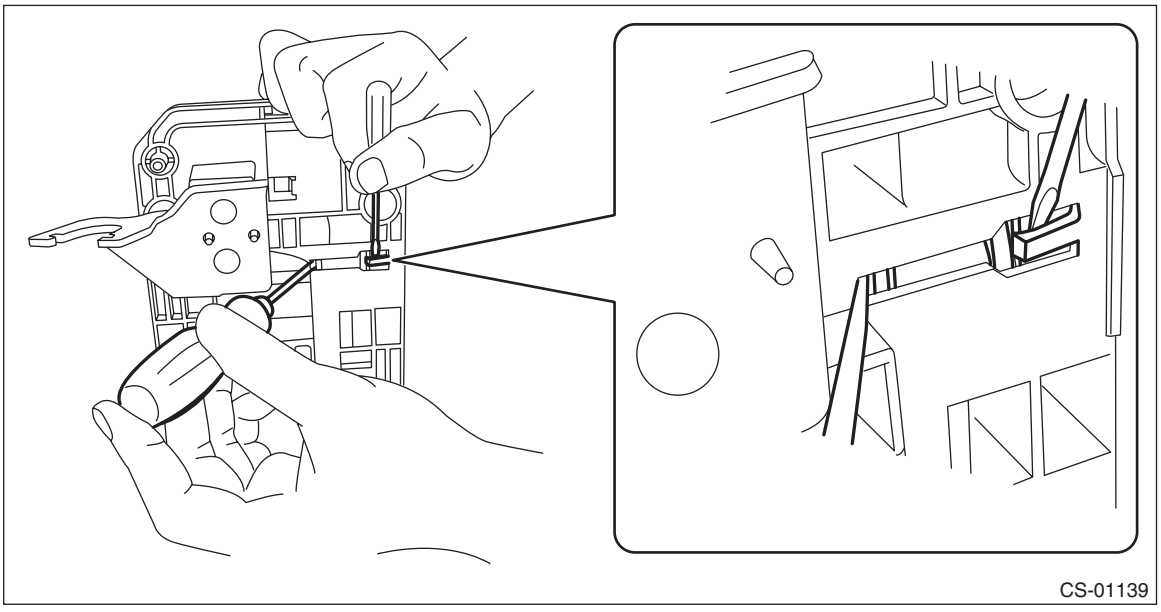
A: REMOVAL

1. SOLENOID UNIT

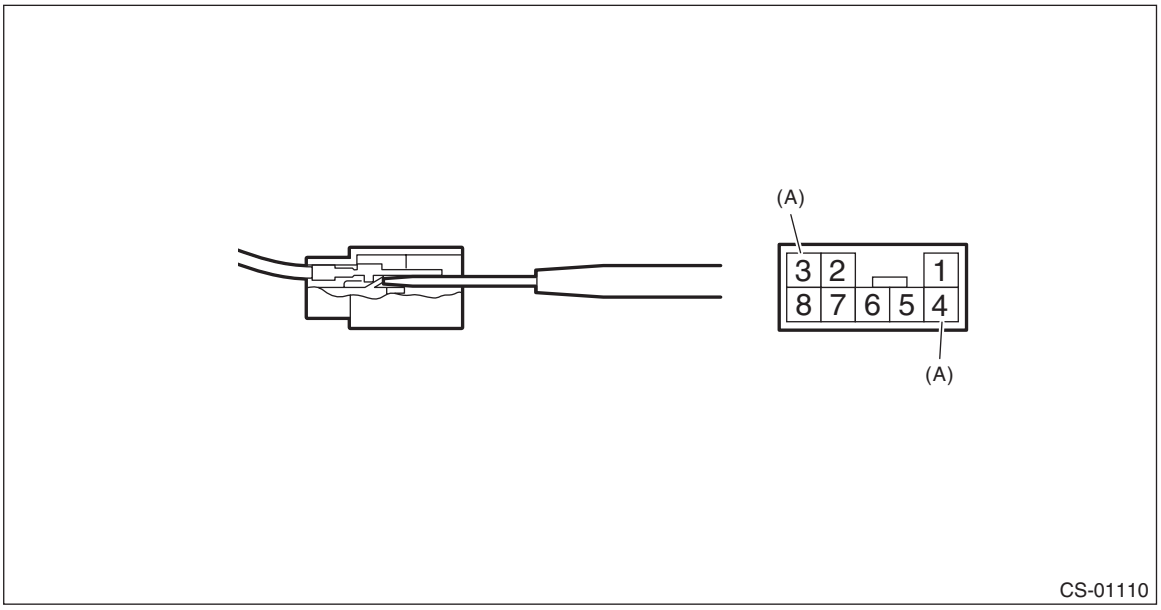
1) Remove the AT select lever. <Ref. to CS-20, REMOVAL, Select Lever.>
2) Remove the spacer and gasket. <Ref. to CS-33, DISASSEMBLY, Select Lever.>
3) Using a flat tip screwdriver with a thin tip, remove the harness connector from the plate COMPL.



4) Raise the claw using a flat tip screwdriver with a thin tip, and remove the solenoid unit from the plate COMPL.



5) Using a flat tip screwdriver with a thin tip, remove the solenoid unit terminals from the harness connector.



(A) Solenoid unit terminals

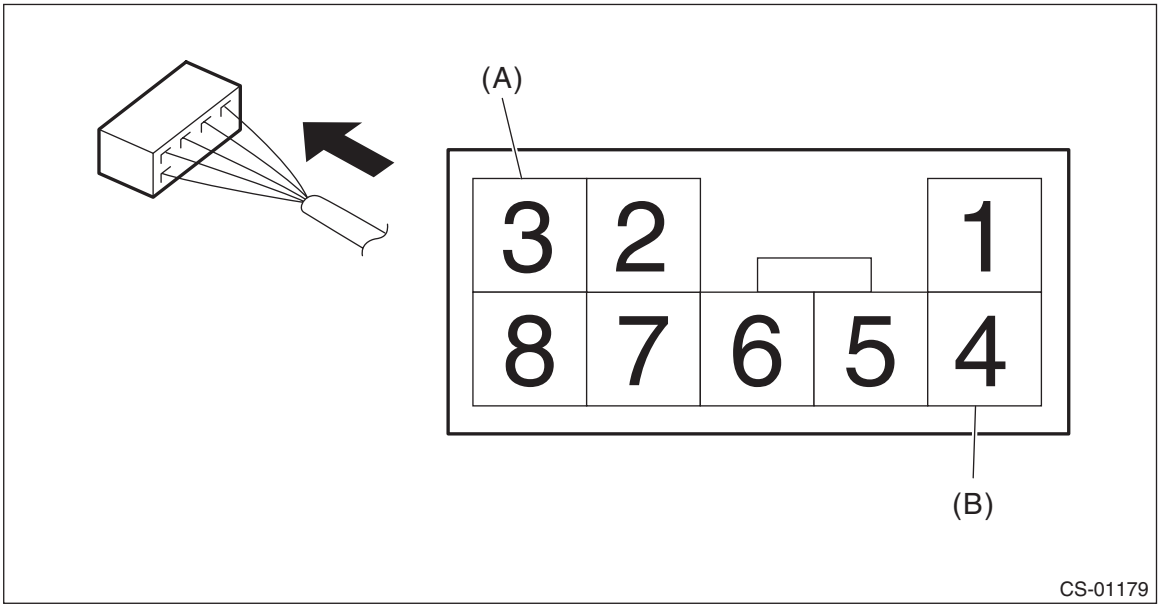
2. “P” RANGE SWITCH

For the removal of “P” range switch, refer to the procedure for AT select lever. <Ref. to CS-33, DISASSEMBLY, Select Lever.>

B: INSTALLATION

Install in the reverse order of removal.

NOTE:
Insert the solenoid unit terminals to the harness connector.



(A) Solenoid unit (color code: blue)
(B) Solenoid unit (color code: black)

C: INSPECTION

	Step	Check	Yes	No
1	**CHECK SOLENOID UNIT.** Measure the resistance of solenoid unit connector terminals. ***Terminals*** ***No. 4 — No. 3:***	Is the resistance 27.6 — 30.5 Ω?	Go to step **2**.	Replace the solenoid unit. <Ref. to CS-51, AT Shift Lock Solenoid and “P” Range Switch.>
2	**CHECK SOLENOID UNIT.** Connect the battery to the solenoid unit connector terminals, and then operate the solenoid. ***Terminals*** ***No. 3 (+) — No. 4 (–):***	Does the solenoid unit operate normally?	Go to step **3**.	Replace the solenoid unit. <Ref. to CS-51, AT Shift Lock Solenoid and “P” Range Switch.>
3	**CHECK “P” RANGE SWITCH.** 1) Shift the select lever to “P” range. 2) Measure the resistance between “P” range switch connector terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance less than 1 Ω?	Go to step **4**.	Replace the “P” range switch. <Ref. to CS-51, AT Shift Lock Solenoid and “P” Range Switch.>
4	**CHECK “P” RANGE SWITCH.** 1) Set the select lever to other than “P” range. 2) Measure the resistance between “P” range switch connector terminals. ***Terminals*** ***No. 1 — No. 2:***	Is the resistance 1 MΩ or more?	Normal	Replace the “P” range switch. <Ref. to CS-51, AT Shift Lock Solenoid and “P” Range Switch.>

6. Body Integrated Unit

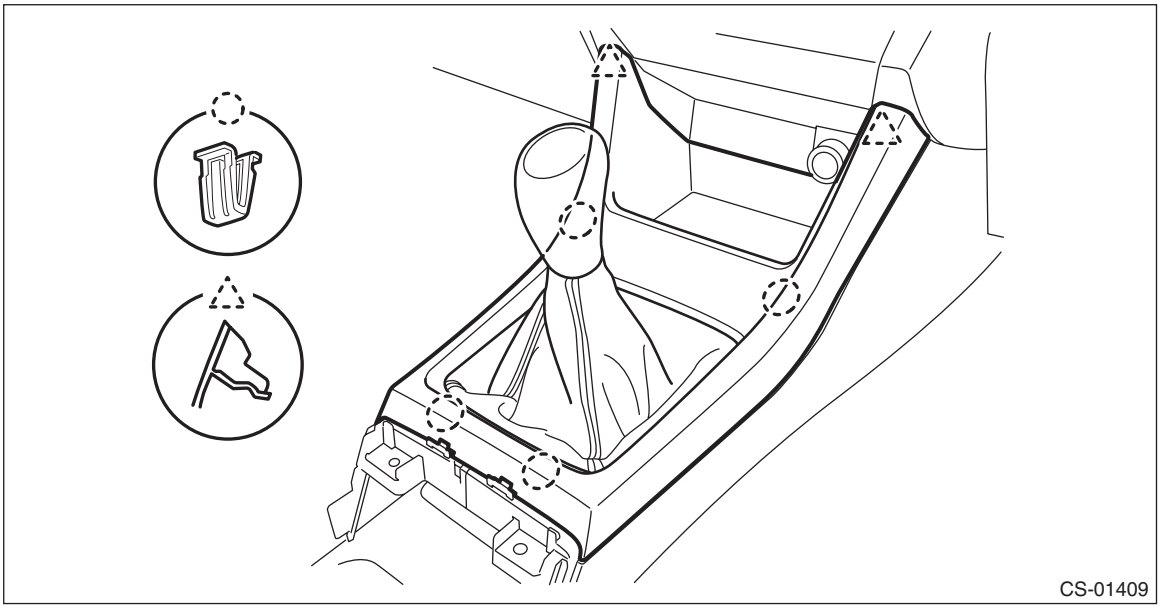
A: NOTE

Refer to “Body Integrated Unit” for removal and installation procedure. <Ref. to SL-76, Body Integrated Unit.>

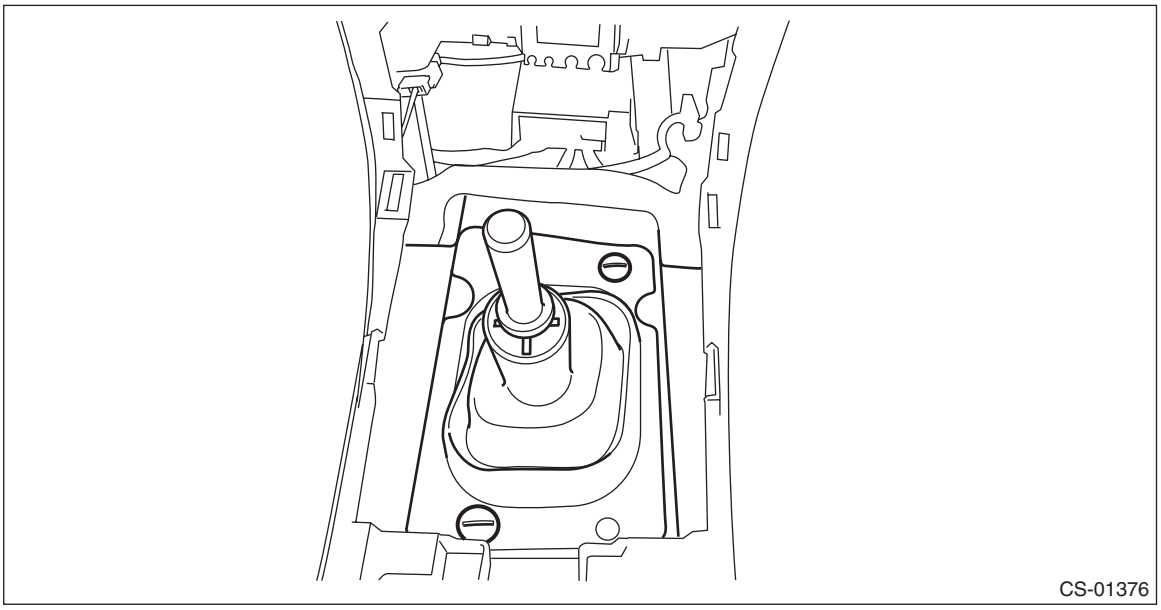
7. MT Gear Shift Lever

A: REMOVAL

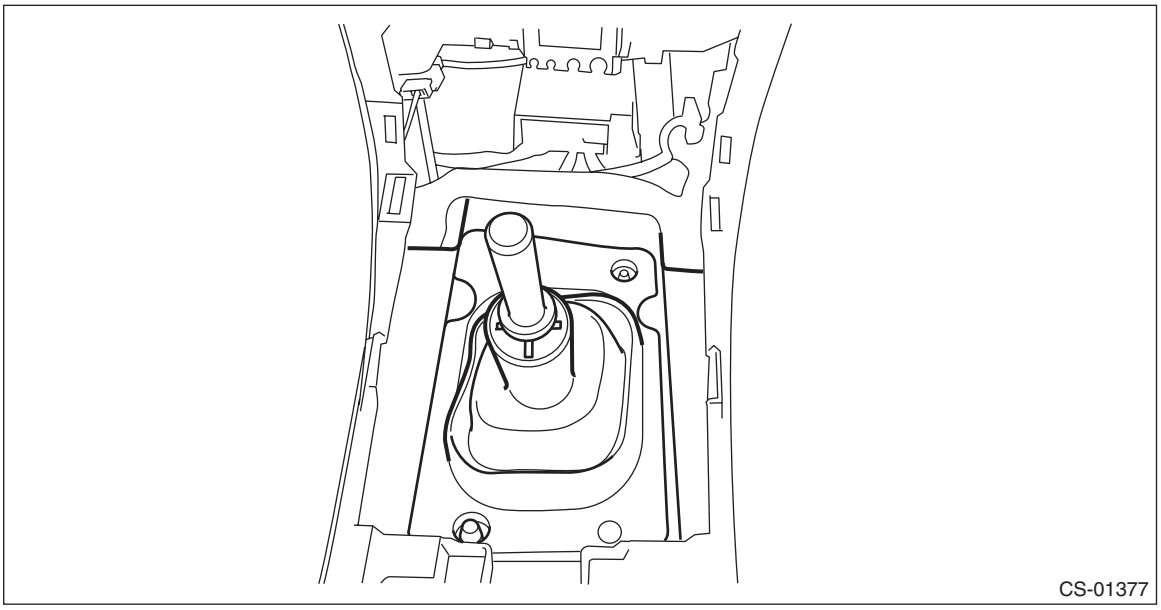
1) Disconnect the ground cable from battery.
2) Remove the console box. <Ref. to EI-67, REMOVAL, Console Box.>
3) Remove the gear shift knob and remove the cover - shift lever.



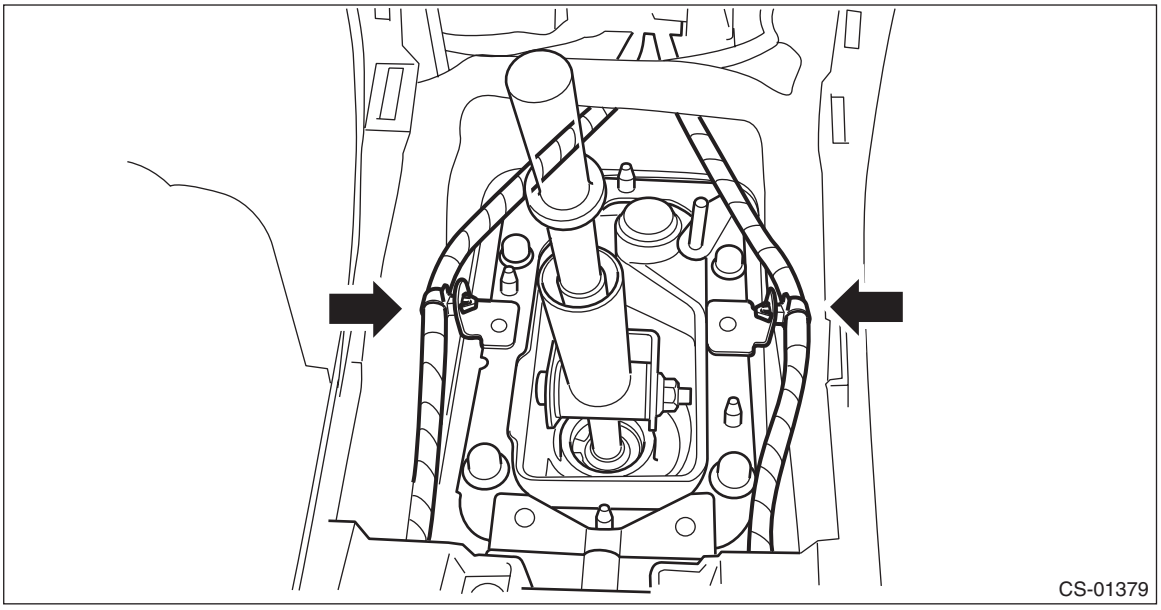
4) Remove the clamp.



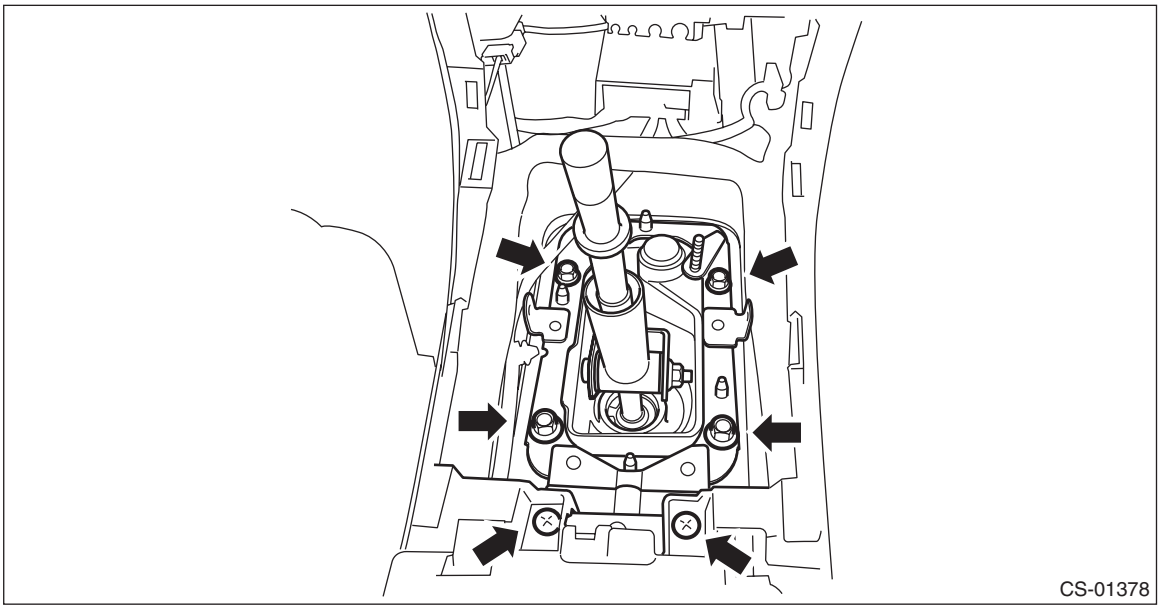
5) Remove the boot and insulator assembly.



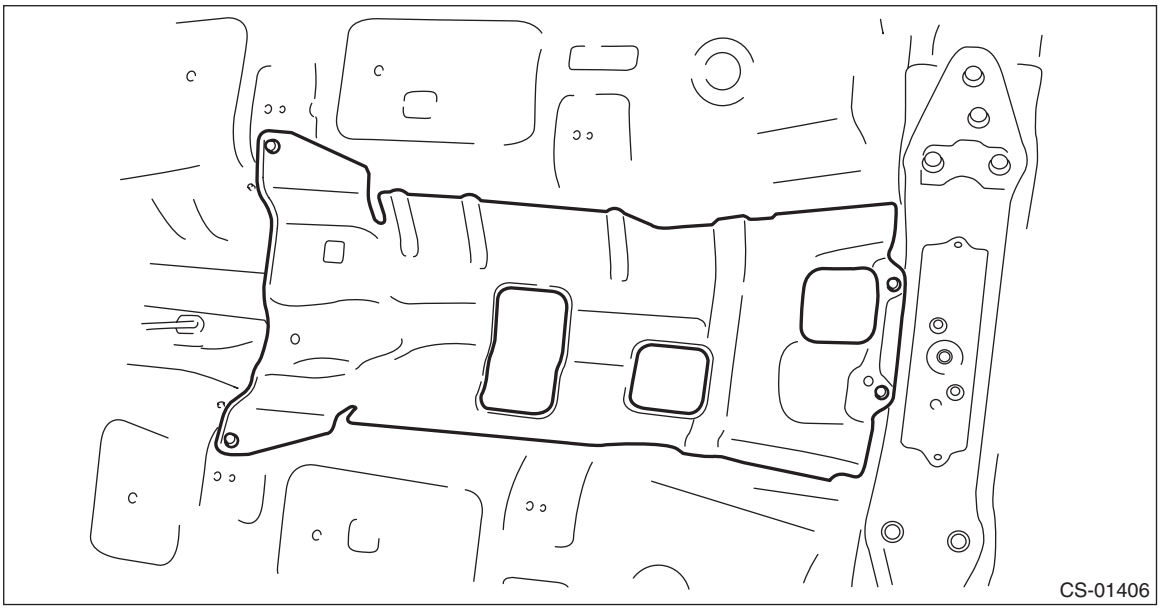
6) Remove the harness clamp from the plate COMPL.



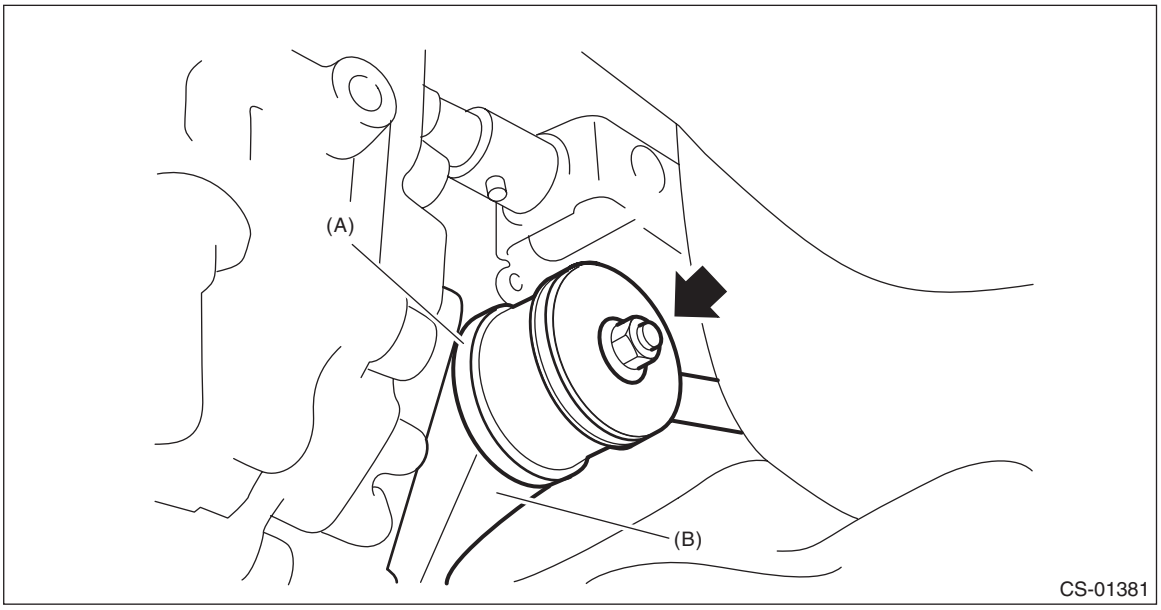
7) Remove the plate COMPL from the vehicle body.



8) Lift up the vehicle.
9) Remove the rear exhaust pipe. <Ref. to EX(H4DO)-14, REMOVAL, Rear Exhaust Pipe.>
10) Remove the center exhaust cover.

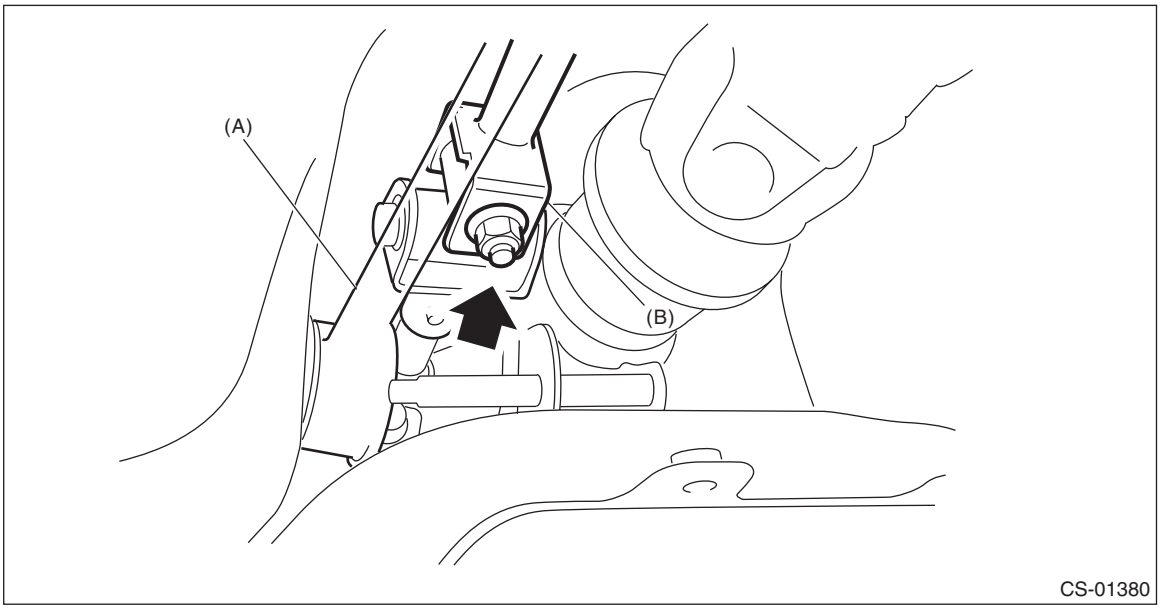


11) Remove the stay from the shift bracket.



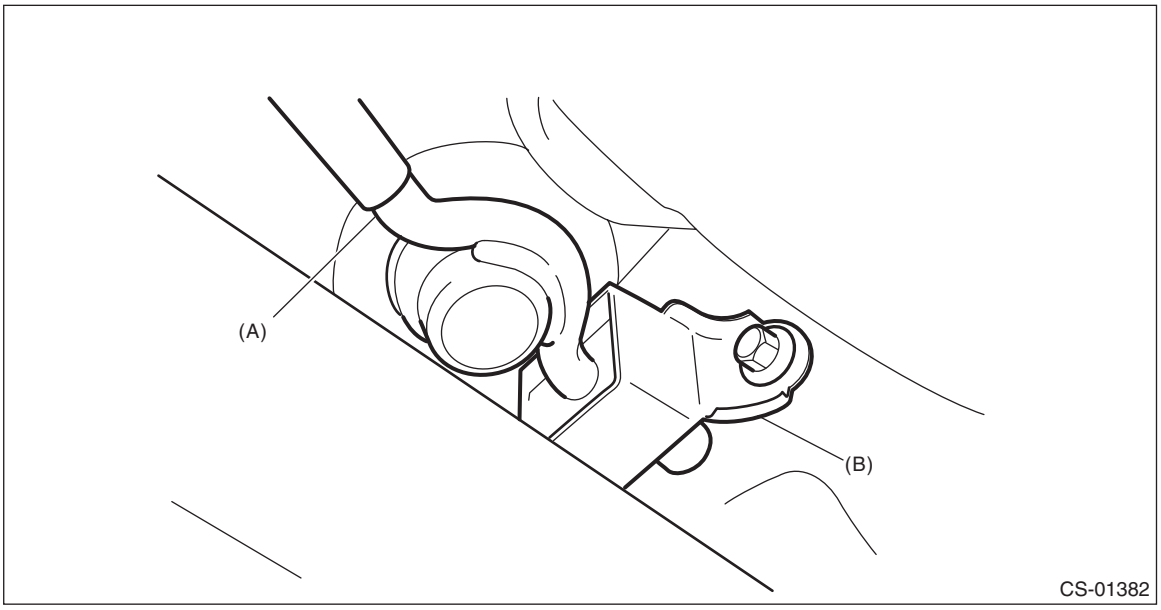
(A) Stay
(B) Shift bracket

12) Remove the rod from joint.



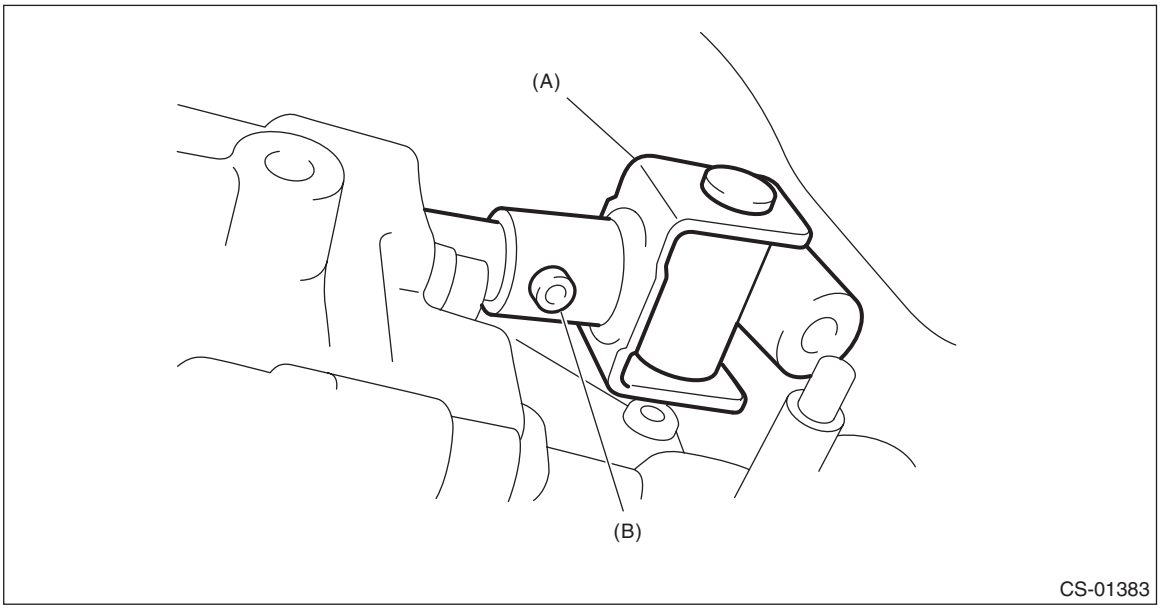
(A) Stay
(B) Rod

13) Remove the cushion rubber from the vehicle body.



(A) Stay
(B) Cushion rubber

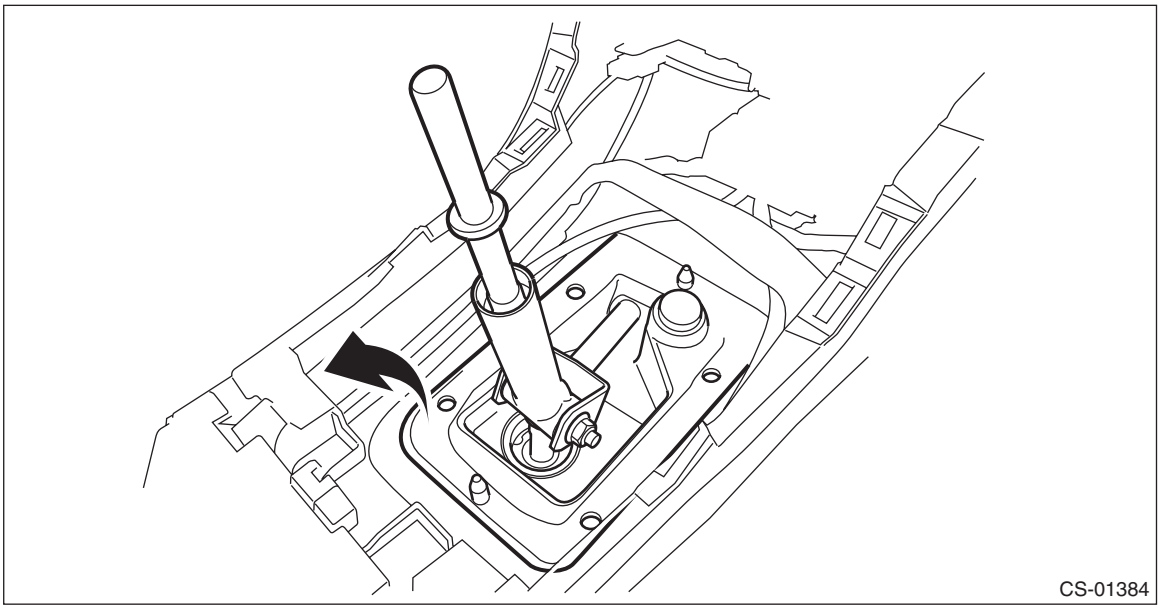
14) Extract the spring pin and remove the joint.



(A) Joint
(B) Spring pin

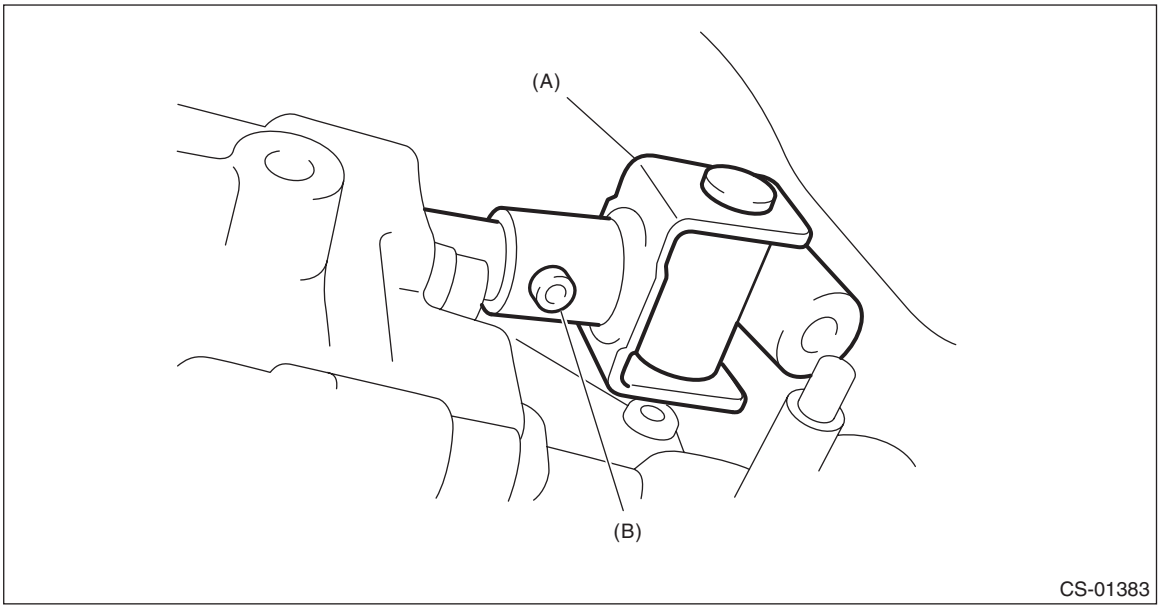
15) Lower the vehicle.

16) Remove the gear shift lever.



B: INSTALLATION

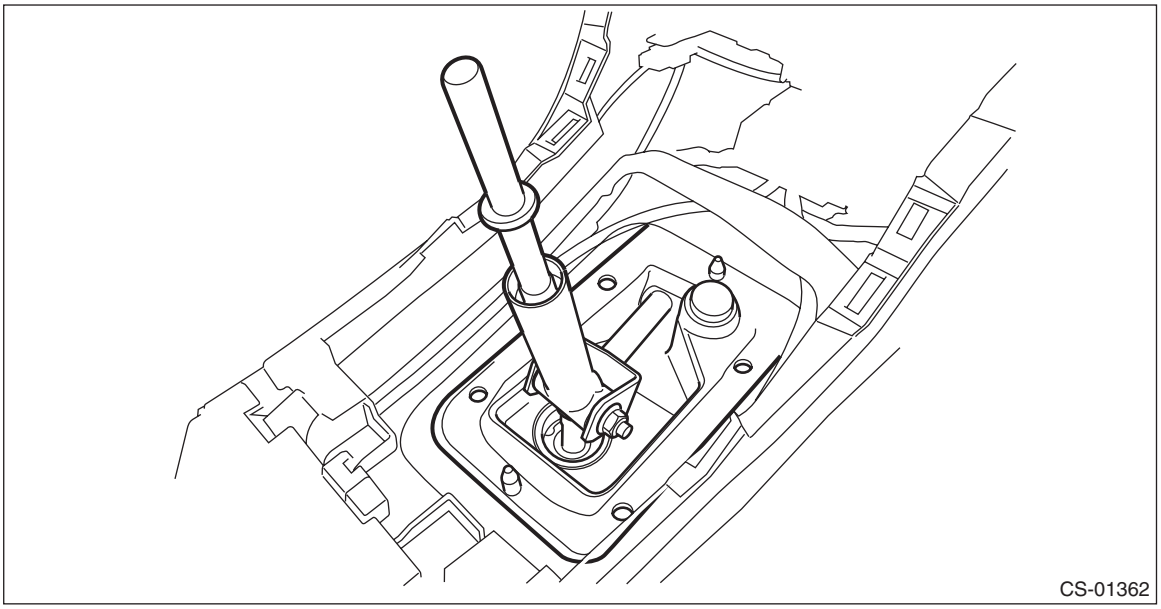
1) Install the joint to the transmission and secure with a spring pin.



(A) Joint
(B) Spring pin

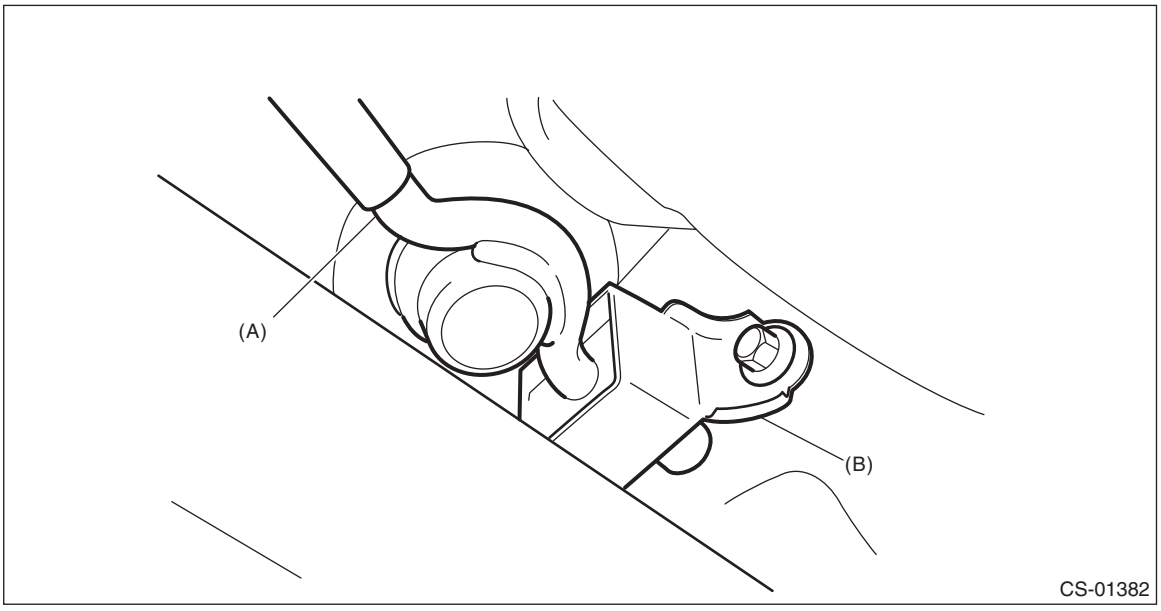
2) Insert the gear shift lever from the room side.

NOTE:
Insert the rod and the stay, and then temporarily set them onto the transmission mount.


CS-01362

3) Lift up the vehicle.
4) Mount the cushion rubber on the vehicle body.

Tightening torque:
18 N·m (1.8 kgf-m, 13.3 ft-lb)



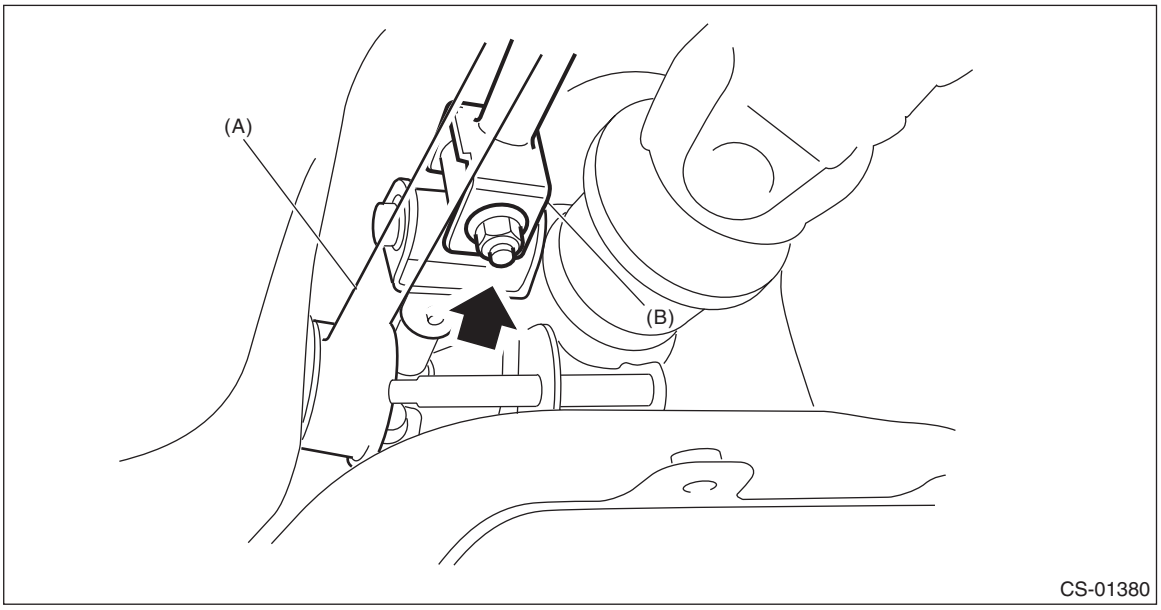
CS-01382

(A) Stay
(B) Cushion rubber

5) Connect the rod to the joint.

NOTE:
Use a new self-locking nut.

Tightening torque:
12 N·m (1.2 kgf-m, 8.9 ft-lb)

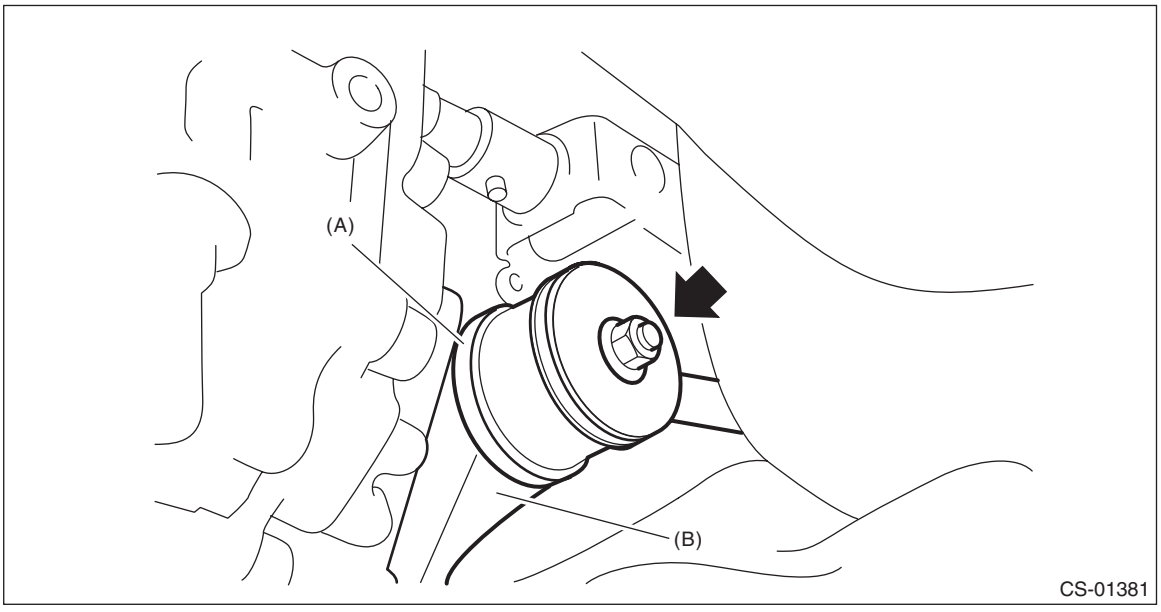


(A) Stay
(B) Rod

6) Connect the stay to the shift bracket.

NOTE:
Use a new self-locking nut.

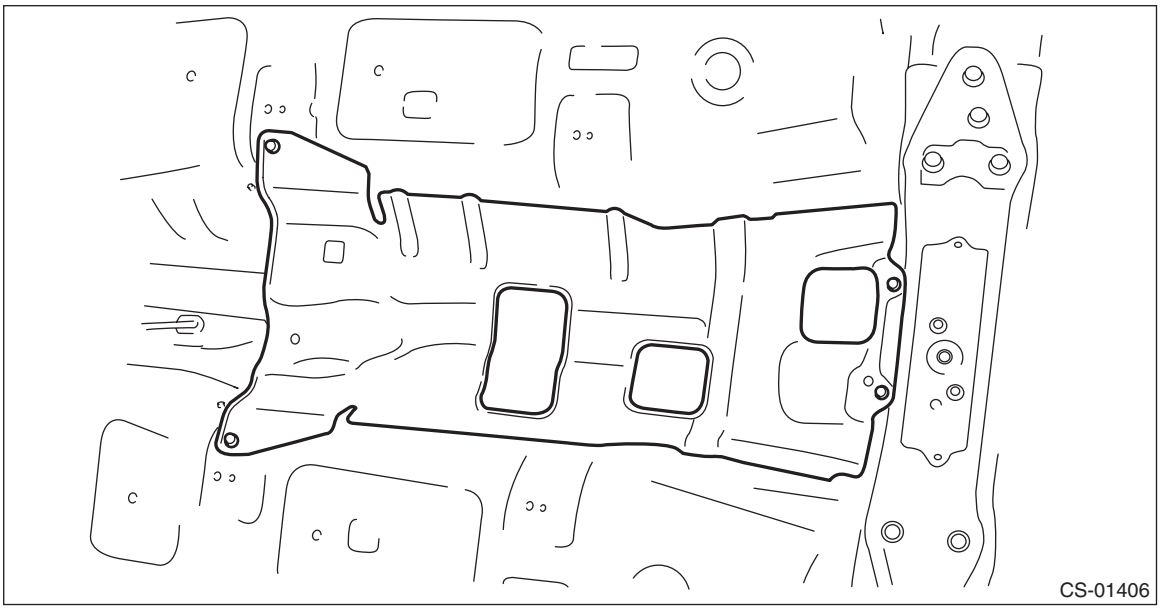
Tightening torque:
18 N·m (1.8 kgf-m, 13.3 ft-lb)



(A) Stay
(B) Shift bracket

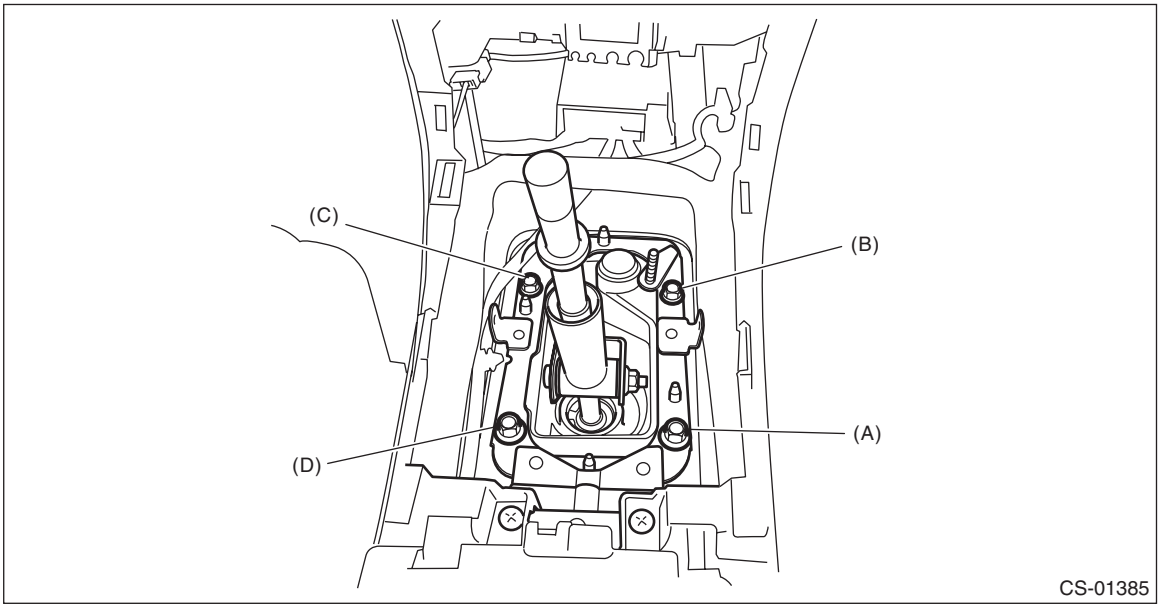
7) Install the center exhaust cover.

Tightening torque:
18 N·m (1.8 kgf-m, 13.3 ft-lb)



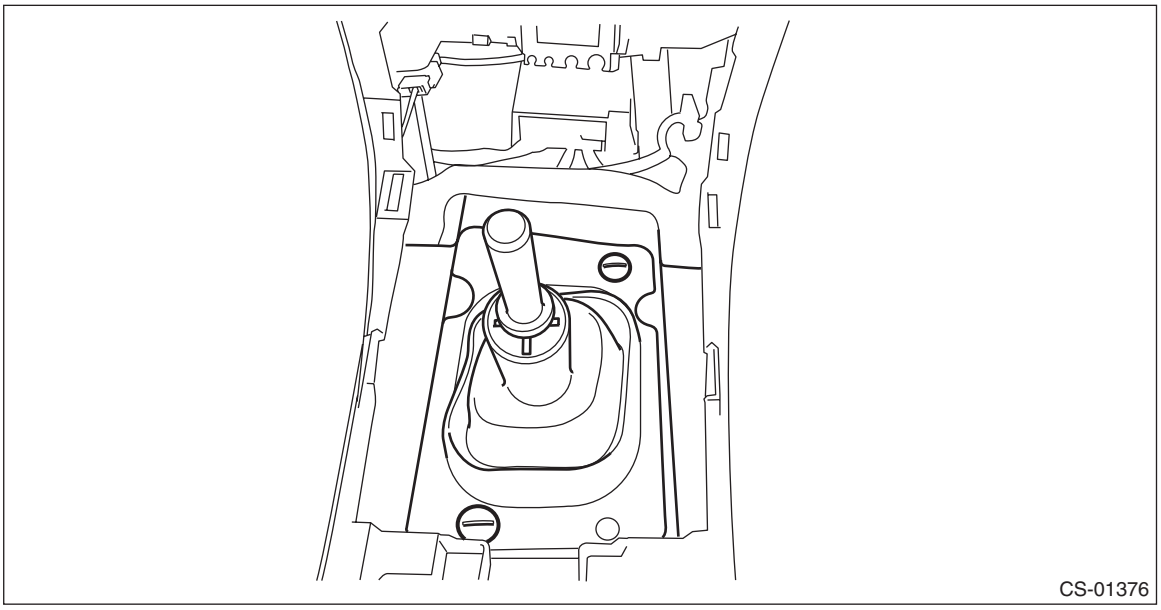
8) Install the rear exhaust pipe. <Ref. to EX(H4DO)-16, INSTALLATION, Rear Exhaust Pipe.>
9) Lower the vehicle.
10) Install the plate COMPL to the body.

Tightening torque:
18 N·m (1.8 kgf-m, 13.3 ft-lb)
(1) Set the plate COMPL to the vehicle.
(2) Temporarily tighten the bolt (A).
(3) Tighten the bolt (B).
(4) Tighten the bolt (A).
(5) Tighten the bolts (C) and (D).
(6) Tighten the console side cover attachment screws.



11) Install the harness clamp to the plate.

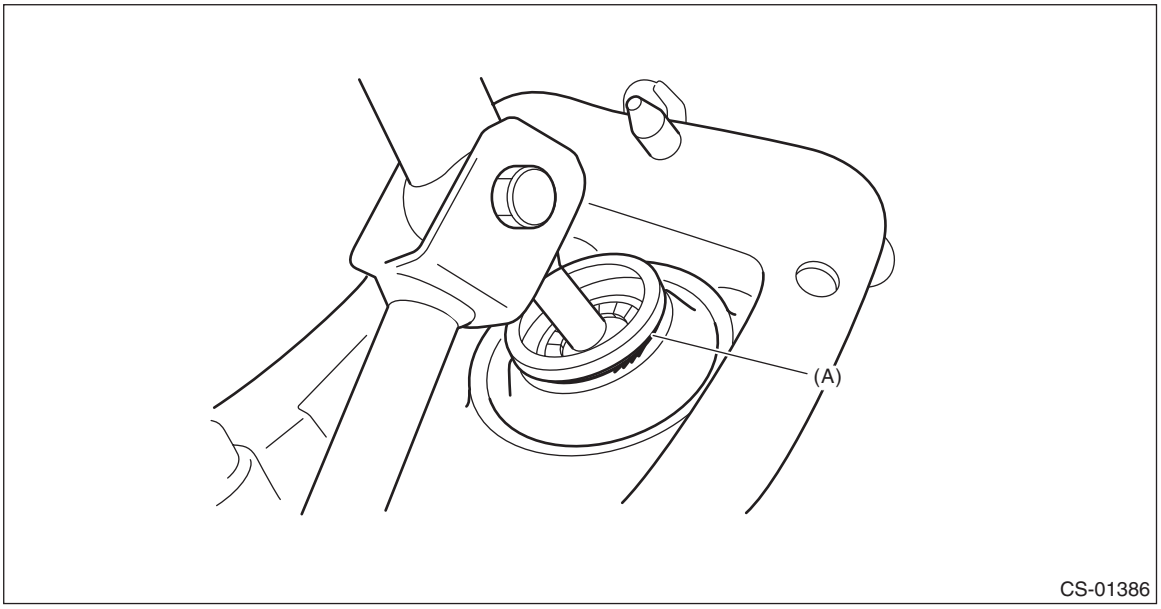
12) Install the boot and insulator assembly, and secure with a clamp.



13) Install the cover - shift lever, and install the gear shift knob.
14) Make sure the gears can be shifted accurately into each gear.

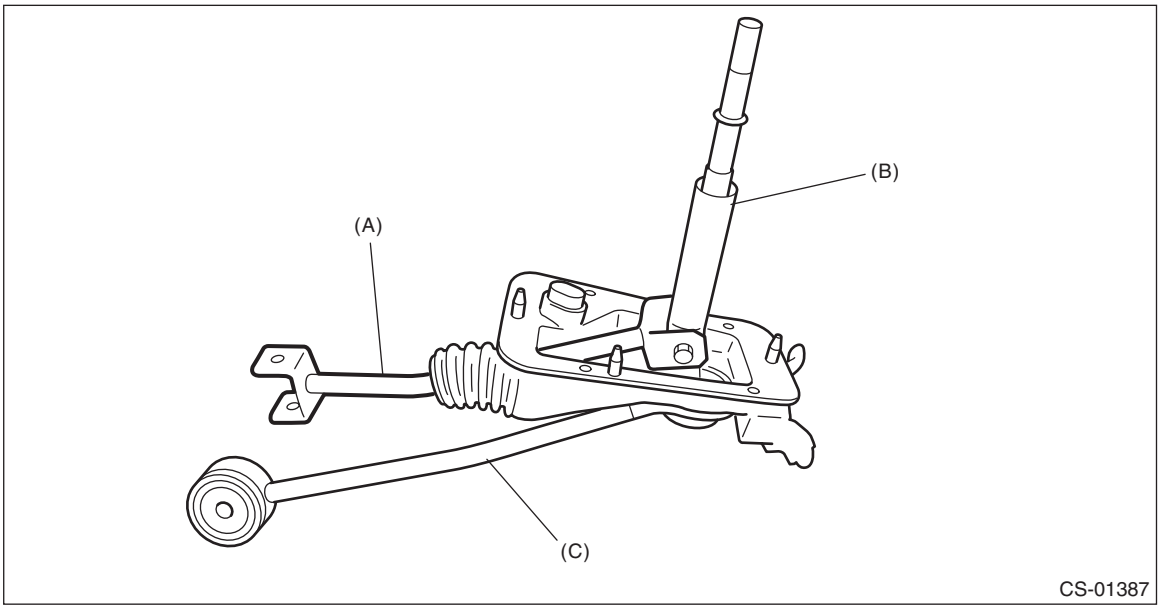
C: DISASSEMBLY

1) Remove the lock wires.



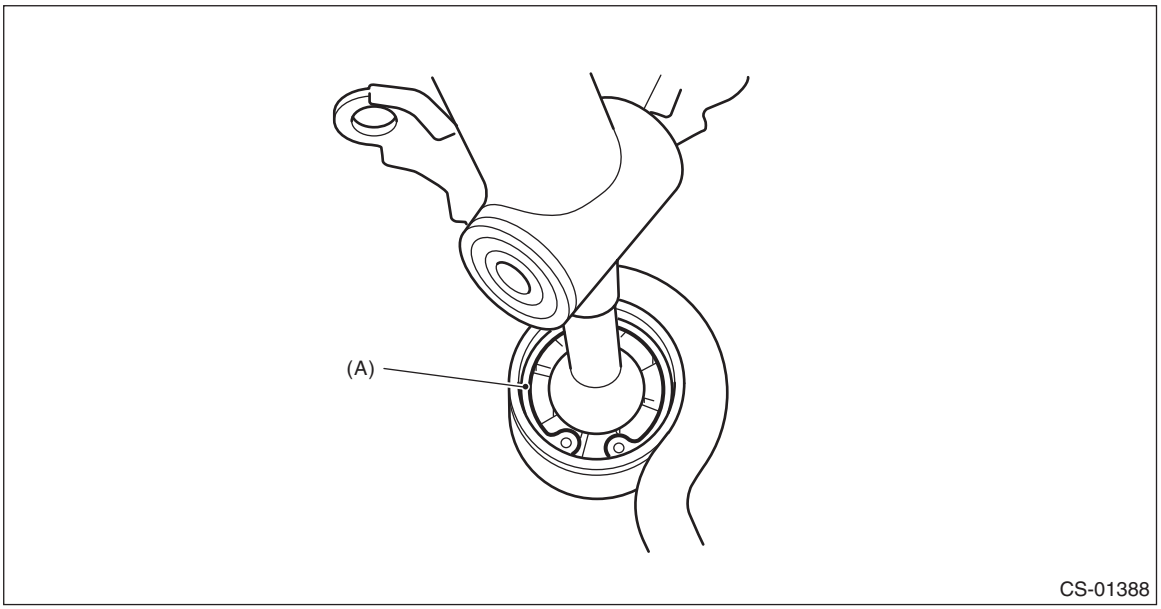
(A) Lock wire

2) Remove the rod from lever.



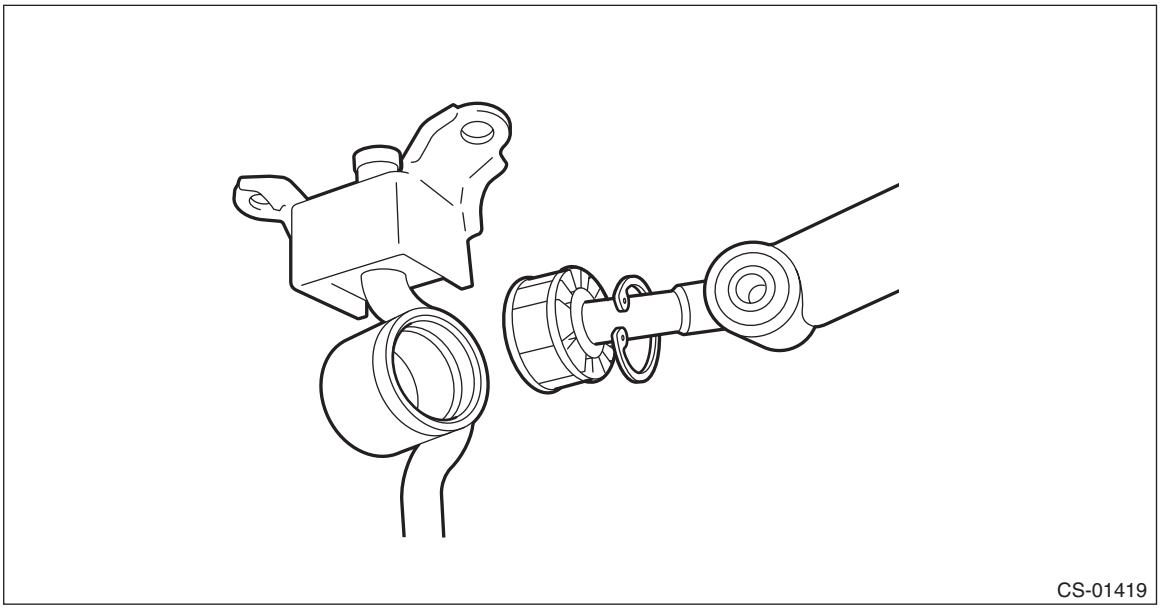
(A) Rod
(B) Lever
(C) Stay

3) Separate the rod and inner boot.
4) Remove the snap ring from the stay.

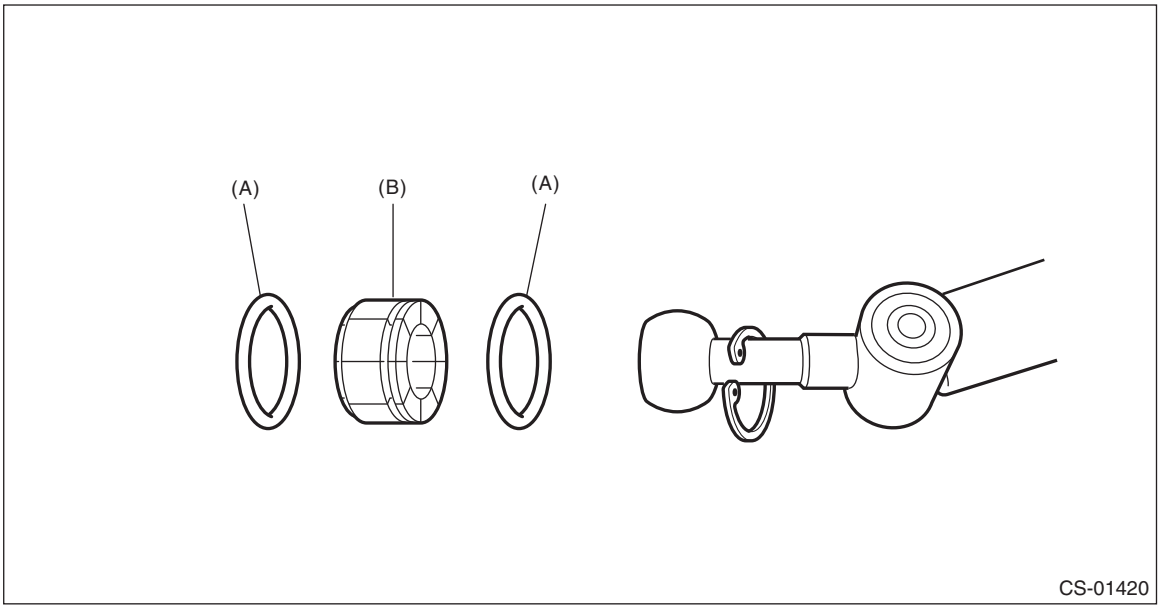


(A) Snap ring

5) Separate the gear shift lever and the stay.

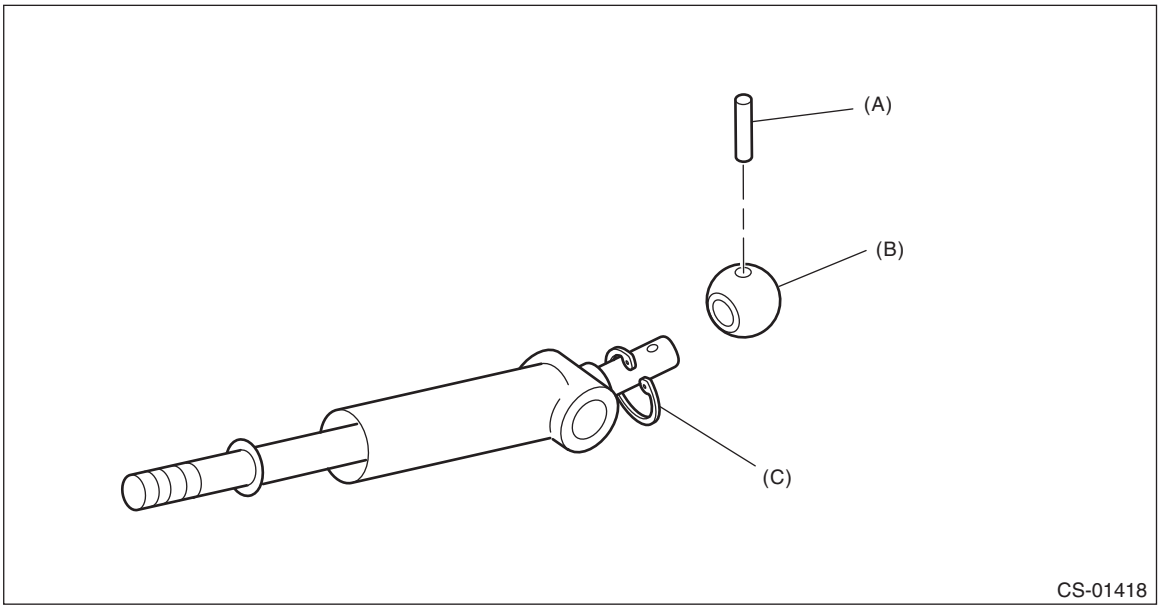


6) Remove the boot and bushing from the gear shift lever.



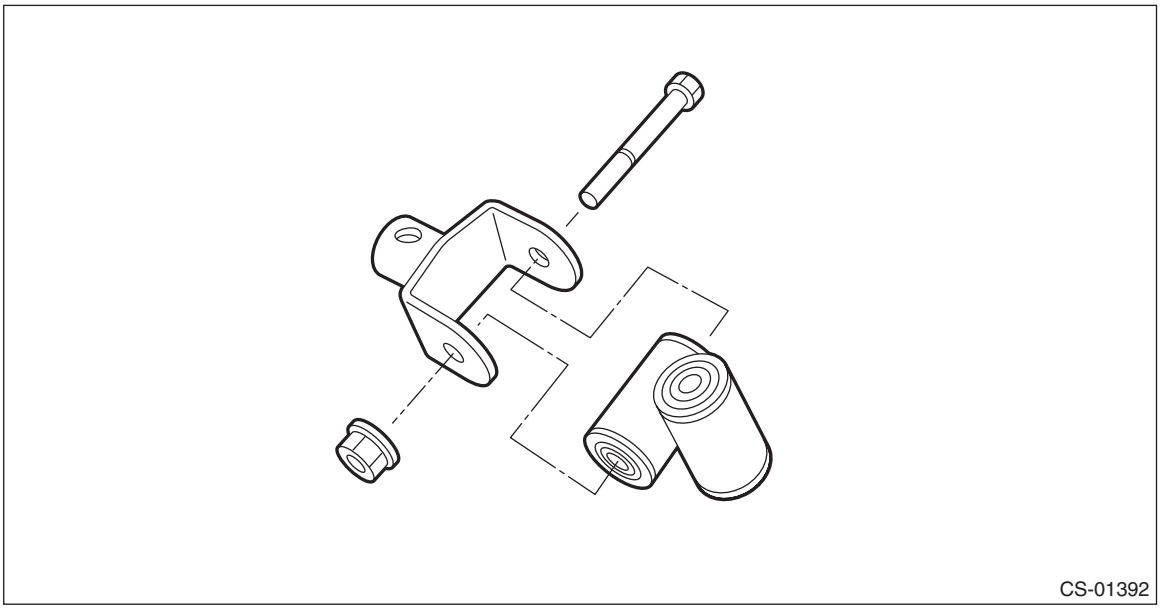
(A) O-ring
(B) Bushing

7) Remove the spring pin, and then remove the bushing and snap ring.

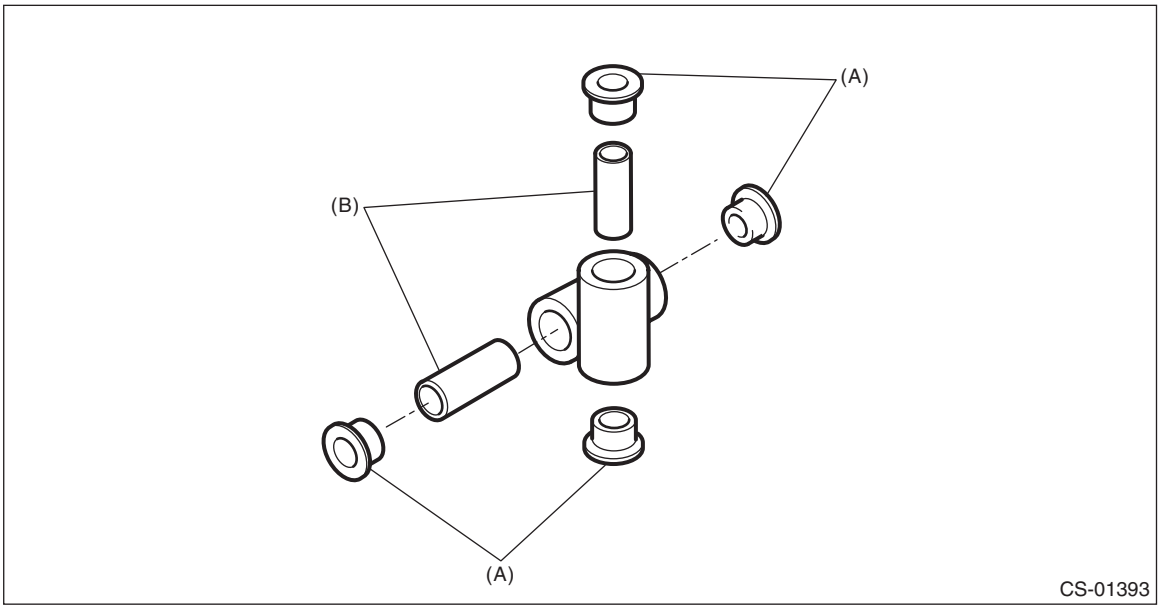


(A) Spring pin
(B) Bushing
(C) Snap ring

8) Remove the boss from the joint.

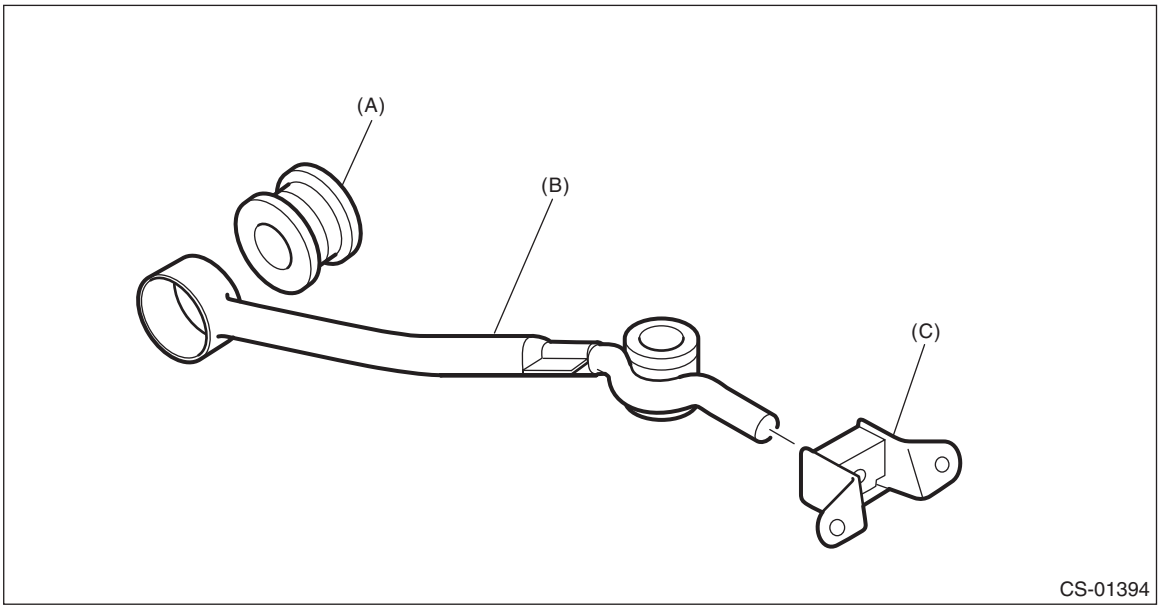


9) Remove the bushing and spacer from the boss.



(A) Bushing
(B) Spacer

10) Remove the bushing and cushion rubber from the stay.

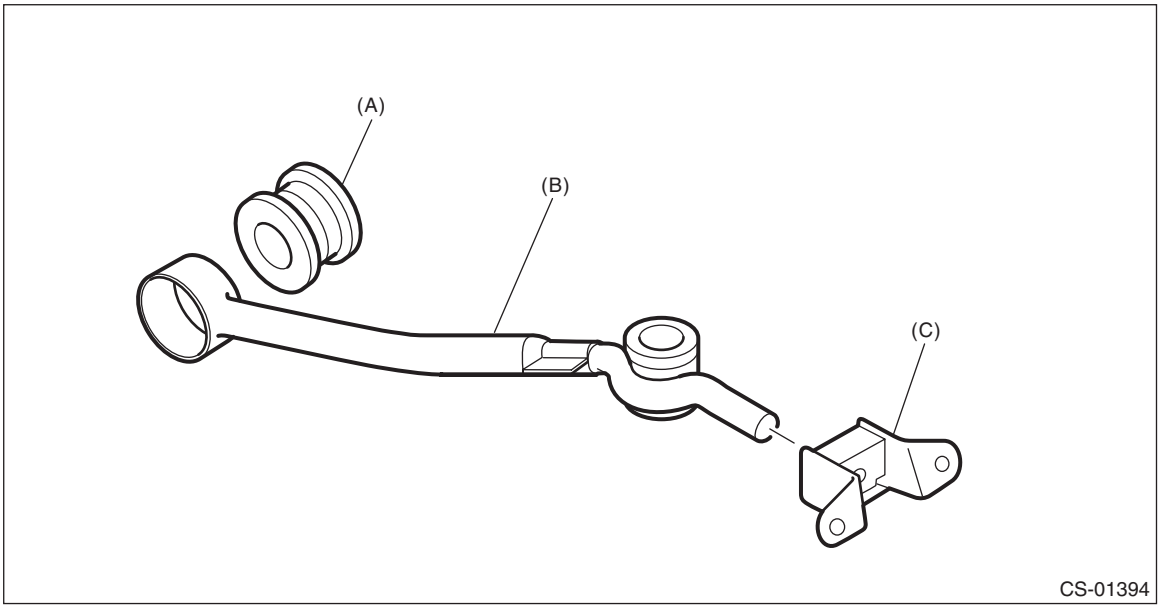


(A) Bushing B
(B) Stay
(C) Cushion rubber

D: ASSEMBLY

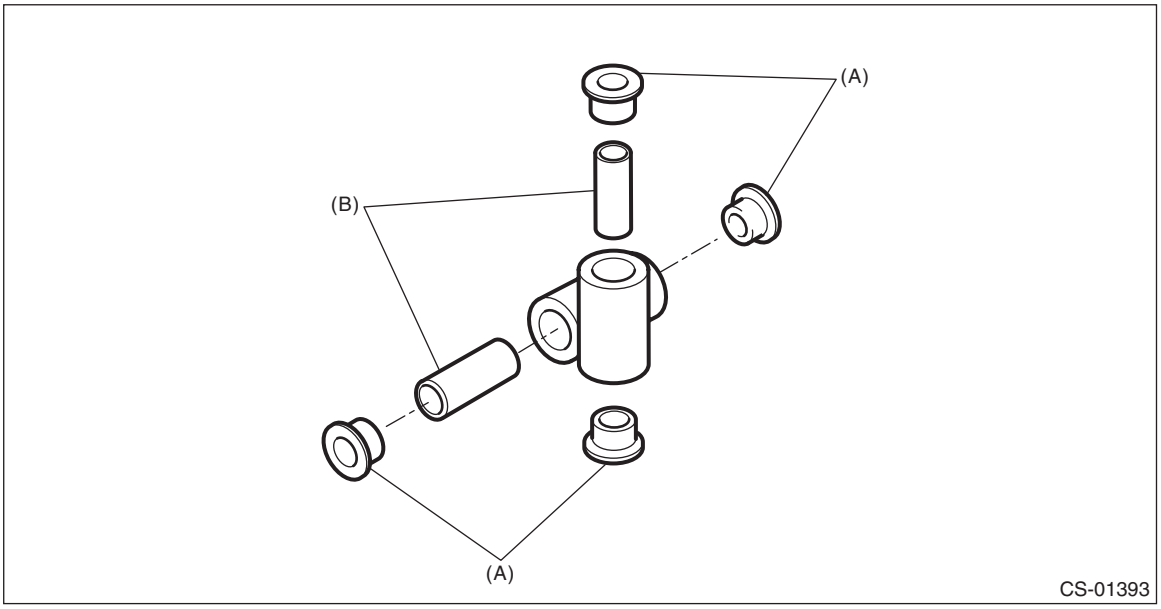
NOTE:
- Clean all the parts before assembly.
- Apply NIGTIGHT LYW No. 2 grease or equivalent to each part. <Ref. to CS-5, 5MT GEAR SHIFT LEVER, COMPONENT, General Description.>

1) Mount the bushing and cushion rubber to the stay.



(A) Bushing
(B) Stay
(C) Cushion rubber

2) Install the bushing and spacer to boss.

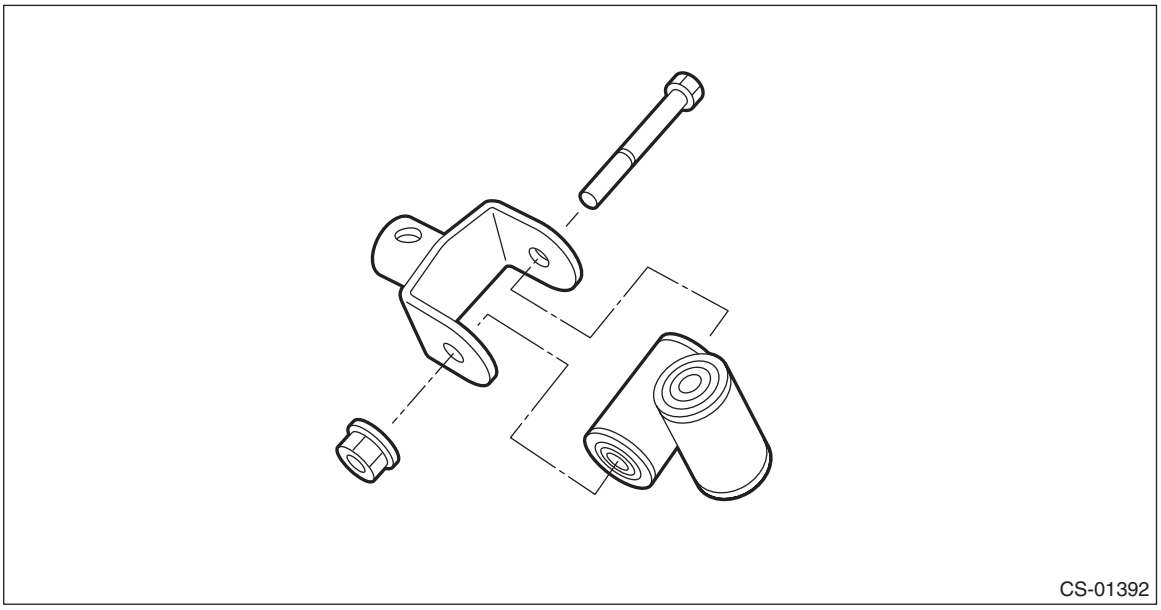


(A) Bushing
(B) Spacer

3) Install the boss to the joint.

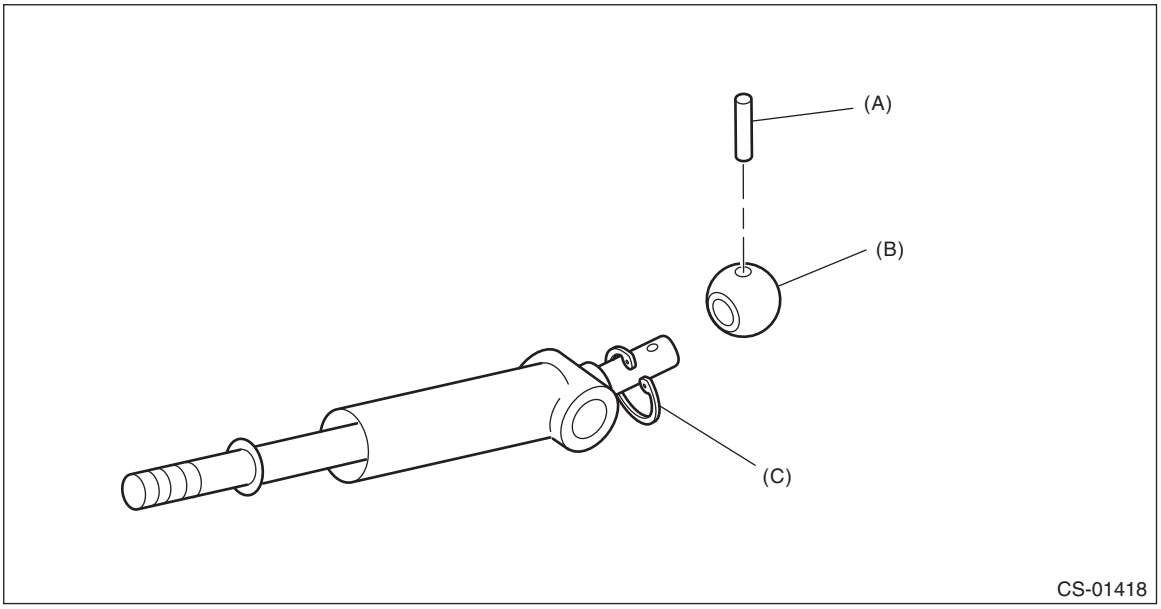
NOTE:
Use a new self-locking nut.

Tightening torque:
12 N·m (1.2 kgf-m, 8.9 ft-lb)



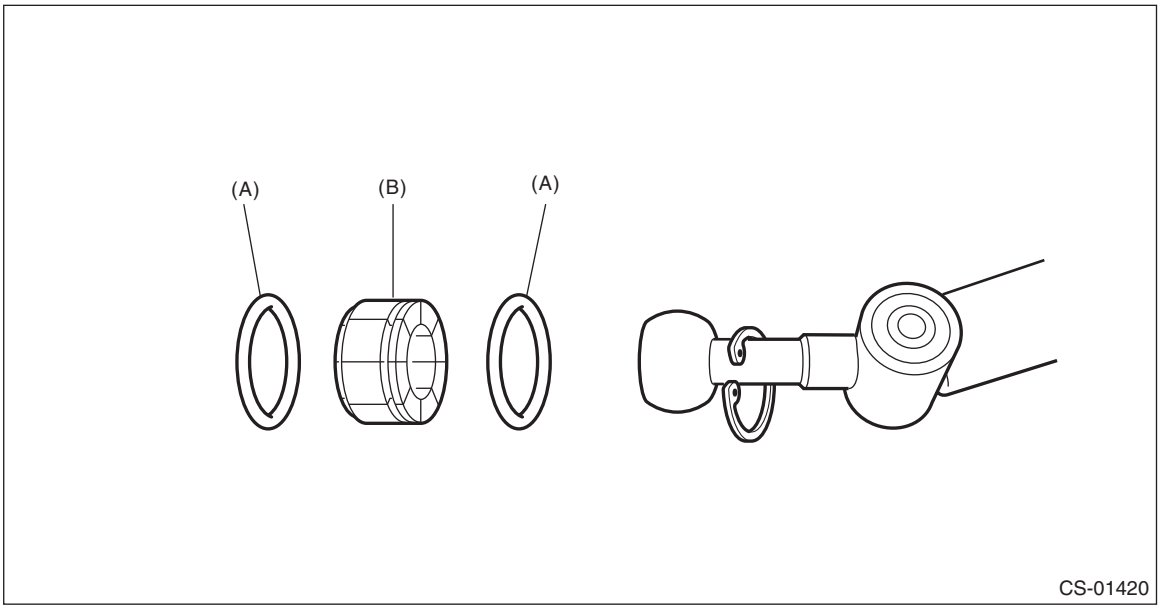
4) Install the snap ring to gear shift lever and install the bushing.

NOTE:
Apply grease to the bushing.



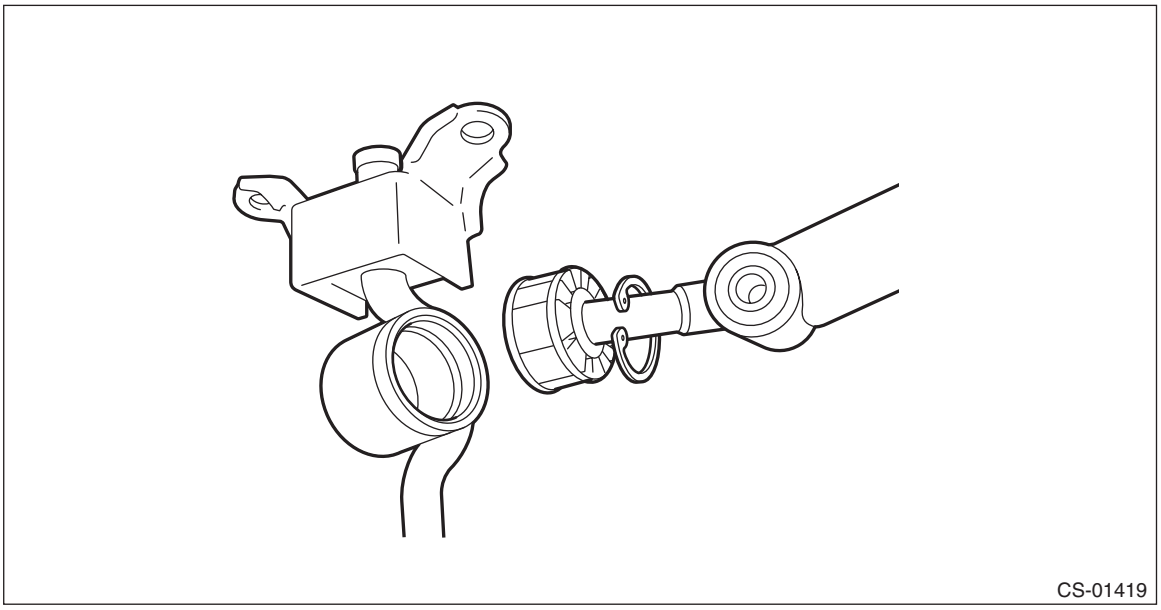
(A) Spring pin
(B) Bushing
(C) Snap ring

5) Apply grease to the bushing and O-ring, and then install to gear shift lever.

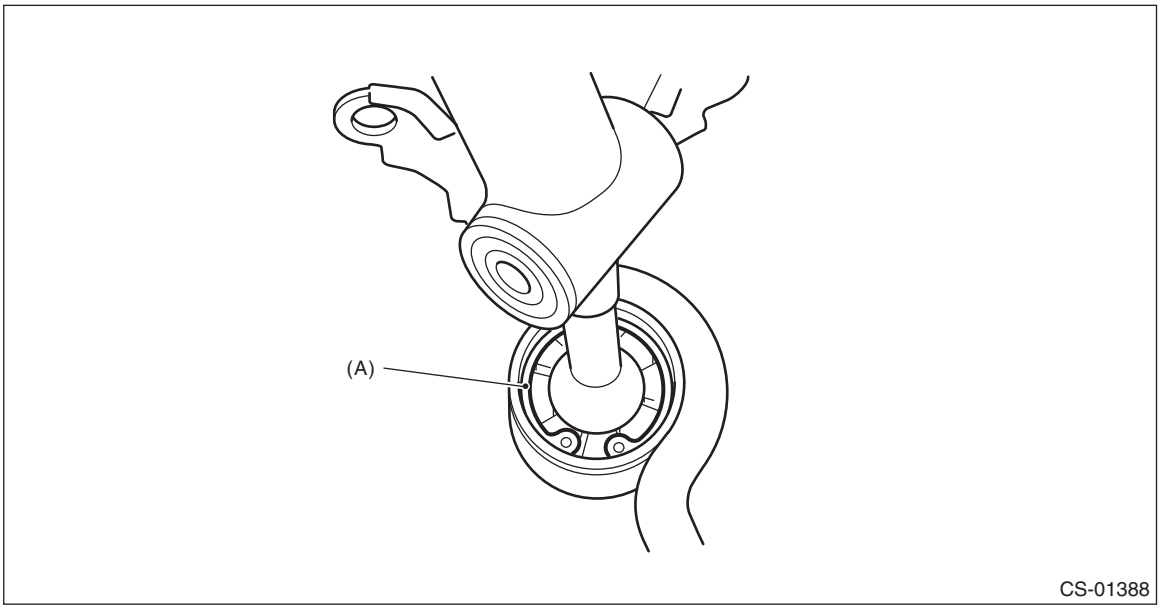


(A) O-ring
(B) Bushing

6) Apply sufficient grease into boss, and then install the gear shift lever to the stay.



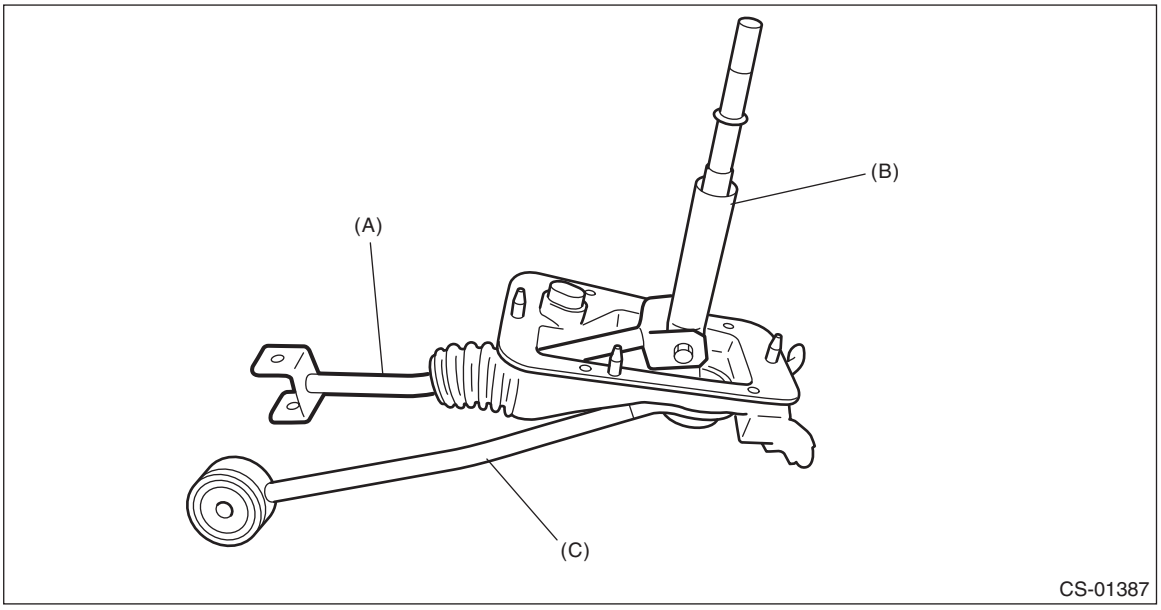
7) Install the snap ring.



(A) Snap ring

8) Insert the gear shift lever and rod into boot hole.
9) Install the rod.

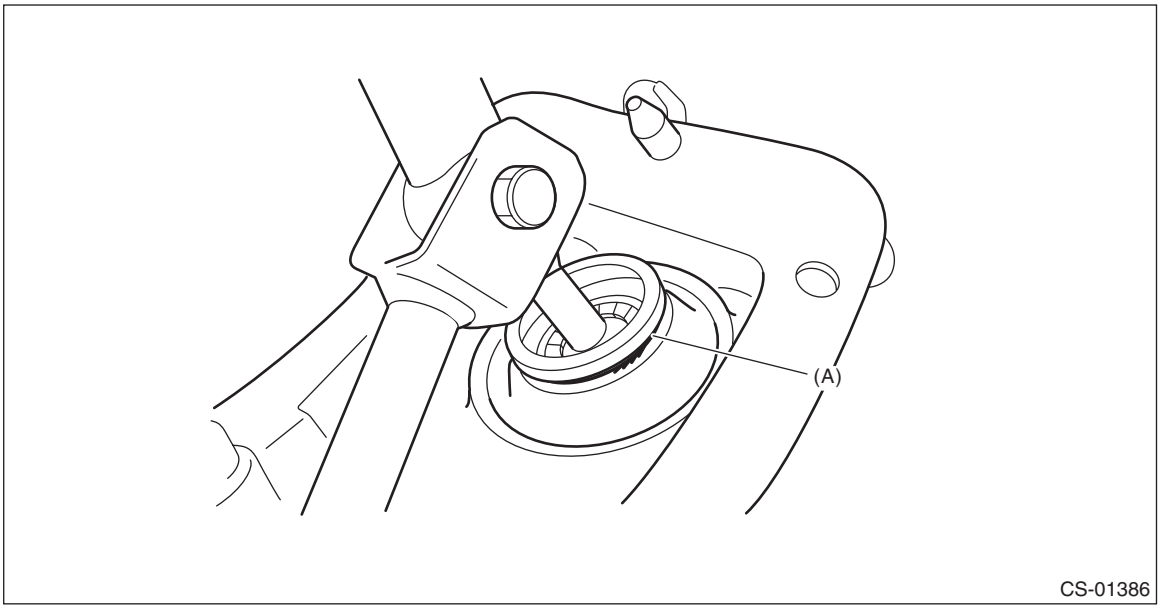
Tightening torque:
12 N·m (1.2 kgf-m, 8.9 ft-lb)



(A) Rod
(B) Lever
(C) Stay

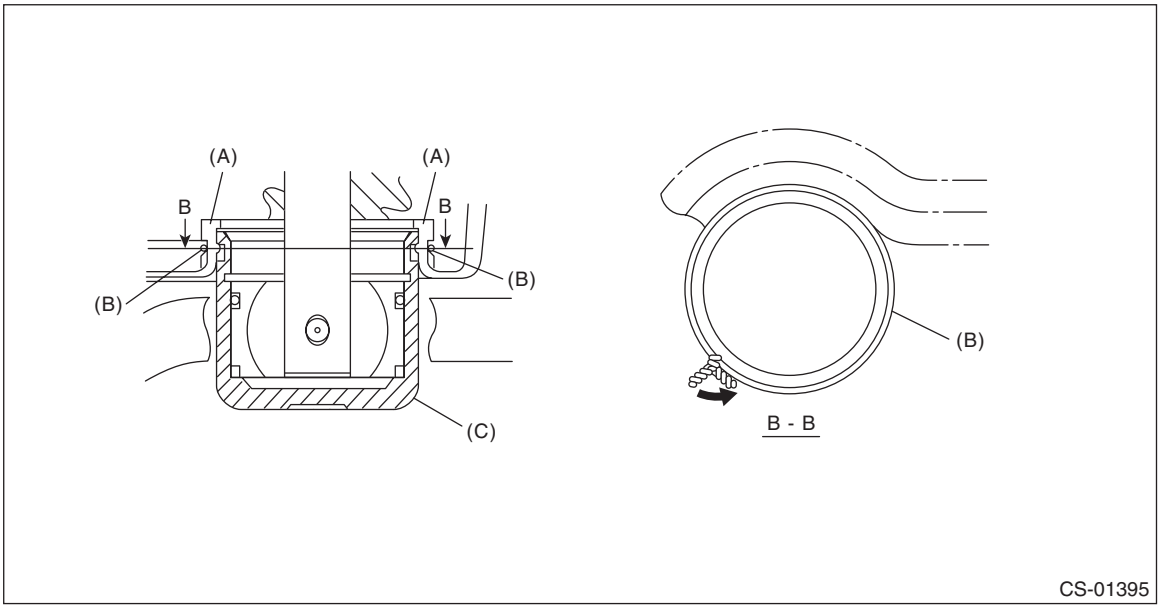
10) Install the lock wire.

NOTE:
Use a new lock wire.



(A) Lock wire

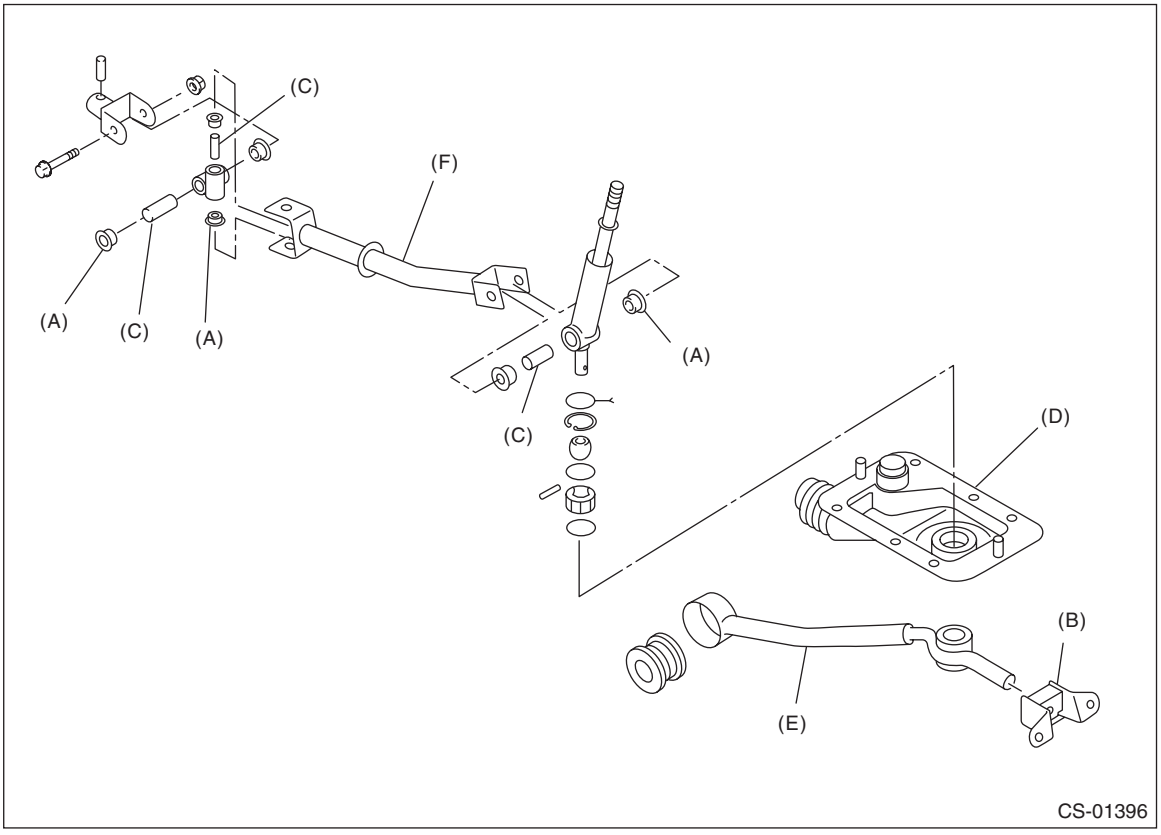
NOTE:
- Install the lock wire to the stay groove.
- Bend the extra wire to the same direction of lock wire winding.



(A) Inner boot
(B) Lock wire
(C) Stay

E: INSPECTION

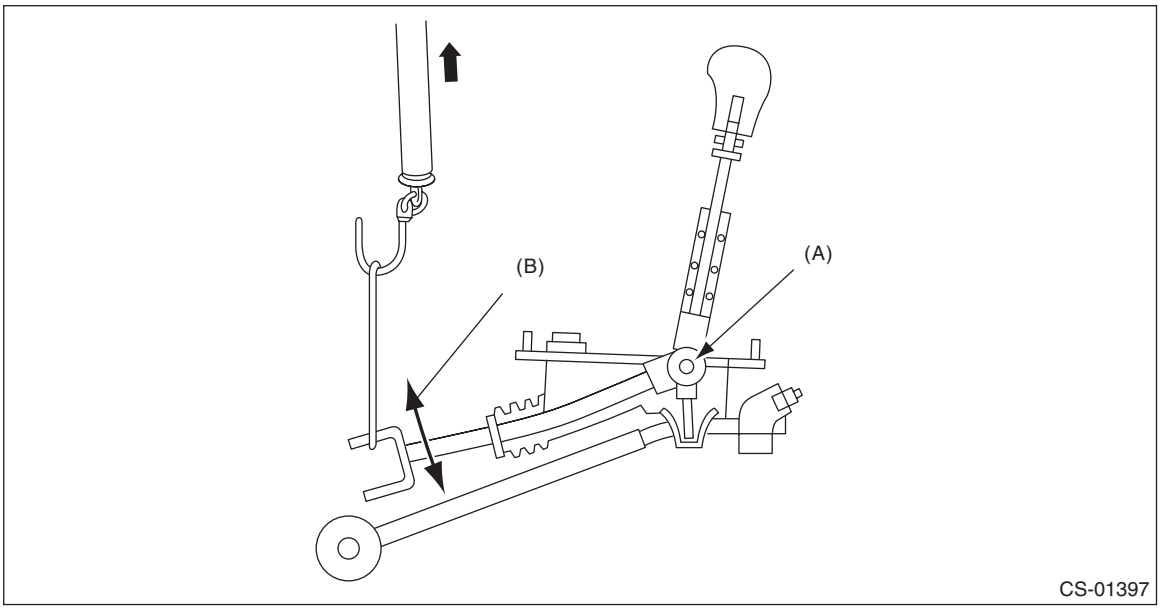
1) Check the parts (bushing, cushion rubber, spacer, boot, stay and rod, etc.) for deformation, damage and wear. If necessary, correct or replace faulty parts. Compare the removed parts with new parts to judge if there are damages or not.



(A) Bushing
(B) Cushion rubber
(C) Spacer
(D) Boot
(E) Stay
(F) Rod

2) Check the swing torque of rod linked with the gear shift lever. If the torque exceeds the specifications, replace the bushing or retighten nuts.

Swing torque:
3.7 N (0.38 kgf, 0.83 lbf) or less



(A) Pivot
(B) Swing torque

8. General Diagnostic Table

A: INSPECTION

Symptoms	Possible cause	Corrective action
Select lever	Starter does not run.	Adjust the select cable and inhibitor switch, or inspect the circuit.
	Back-up light does not illuminate.	Adjust the select cable and inhibitor switch, or inspect the circuit.
	AT shift lock system does not operate normally.	Adjust the select cable and inhibitor switch, or inspect the circuit.
	Manual mode can not be set.	Inspect the mode switch and select lever, or inspect the circuit.
	Up-shift is not engaged at manual mode.	Check the shift-up switch and circuit.
	Down-shift is not engaged at manual mode.	Check the shift-down switch and circuit.

CONTINUOUSLY VARIABLE TRANSMISSION

CVT

		Page
1.	General Description	3
2.	CVTF	36
3.	Differential Gear Oil	41
4.	AWD ON/OFF Switching Mode	45
5.	Road Test	46
6.	Stall Test	47
7.	Time Lag Test	48
8.	Secondary Pressure (Line Pressure) Test	49
9.	Transfer Clutch Pressure Test	52
10.	Automatic Transmission Assembly	58
11.	Transmission Mounting System	81
12.	Extension Case Oil Seal	85
13.	Differential Side Retainer Oil Seal	87
14.	Inhibitor Switch	92
15.	Turbine Speed Sensor	99
16.	Secondary Speed Sensor	101
17.	Primary Speed Sensor	103
18.	Secondary Pressure Sensor	106
19.	Oil Pan and Strainer	108
20.	Control Valve Body	112
21.	Transmission Harness	124
22.	Transmission Control Module (TCM)	136
23.	CVTF Cooler (With Warmer Function)	138
24.	Air Breather Hose	148
25.	Drive Plate	150
26.	Torque Converter Assembly	152
27.	Preparation for Overhaul	154
28.	Extension Case	156
29.	Transfer Clutch	160
30.	Transfer Driven Gear	174
31.	Parking Pawl	177
32.	Reduction Driven Gear	179
33.	Transmission Control Device	187
34.	Transmission Case	193
35.	CVTF Filter	208
36.	Reduction Drive Gear	209
37.	Primary Pulley and Secondary Pulley	213
38.	Variator Chain	233
39.	Reverse Brake Assembly	234
40.	Forward Clutch Assembly	249
41.	Drive Pinion Shaft Assembly	268
42.	Front Differential Assembly	298
43.	Oil Pump Chain	316

44. Oil Pump 325
45. Converter Case 328
46. Diagnostics with Phenomenon 331

1. General Description

A: SPECIFICATION

1. MANUAL TRANSMISSION AND DIFFERENTIAL

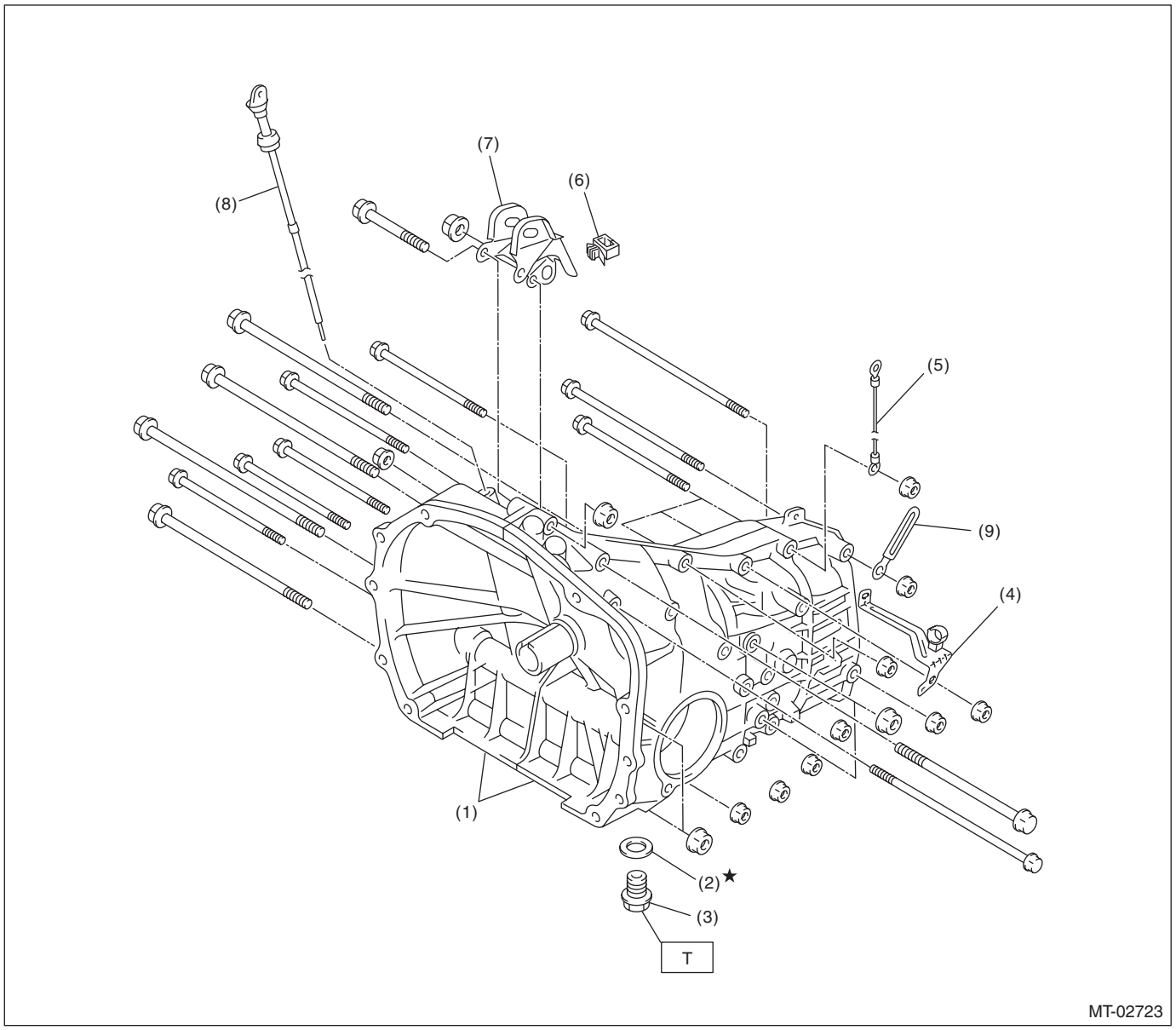
Type			5-forward speeds and 1-reverse (all stage with synchromesh)
Transmission gear ratio		1st	3.454
		2nd	1.888
		3rd	1.296
		4th	0.972
		5th	0.738
		Rev.	3.333
Front reduction gear	Final	Type of gear	Hypoid
		Gear ratio	4.111
Rear reduction gear	Transfer	Type of gear	Helical
		Gear ratio	1.000
	Final	Type of gear	Hypoid
		Gear ratio	4.111
Front differential	Type and number of gear		Straight bevel gear (bevel pinion: 2, bevel gear: 2)
Center differential	Type and number of gear		Straight bevel gear (bevel pinion: 2, bevel gear: 2 and viscous coupling)
Transmission gear oil			GL-5
Transmission gear oil capacity			3.5 ℓ (3.7 US qt, 3.1 Imp qt)

2. TRANSMISSION GEAR OIL

Recommended oil:
GL-5 (75W-90) or equivalent

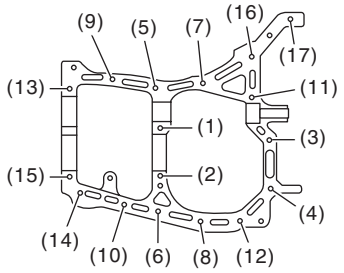
B: COMPONENT

1. TRANSMISSION CASE



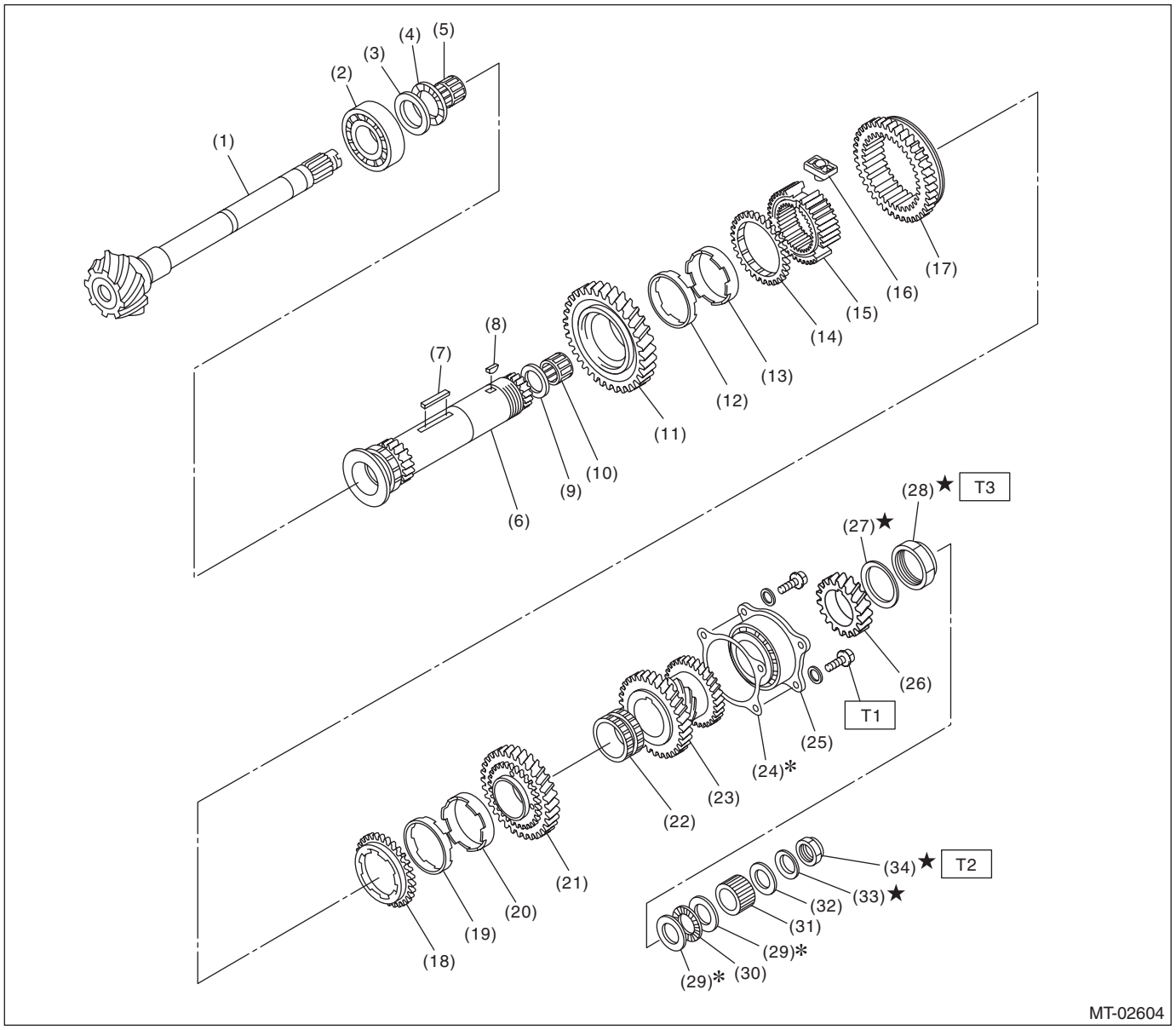
(1)	Transmission case ASSY	(6)	Clamp	***Tightening torque:N·m (kgf-m, ft-lb)***
(2)	Gasket	(7)	Pitching stopper bracket	***T: 44 (4.5, 32.5) (Aluminum gasket, silver)***
(3)	Drain plug	(8)	Oil level gauge	***70 (7.1, 51.6) (Copper gasket, brown)***
(4)	Harness bracket	(9)	Harness clip	***70 (7.1, 51.6) (Metal gasket, black)***
(5)	Transmission radio ground cord			

Transmission case tightening torque



Bolt No.	Bolt size mm	Tightening torque: N·m (kgf-m, ft-lb)
(5) — (15)	8	25 (2.5, 18.4)
(1) — (4) (16), (17)	10	39 (4.0, 28.8)

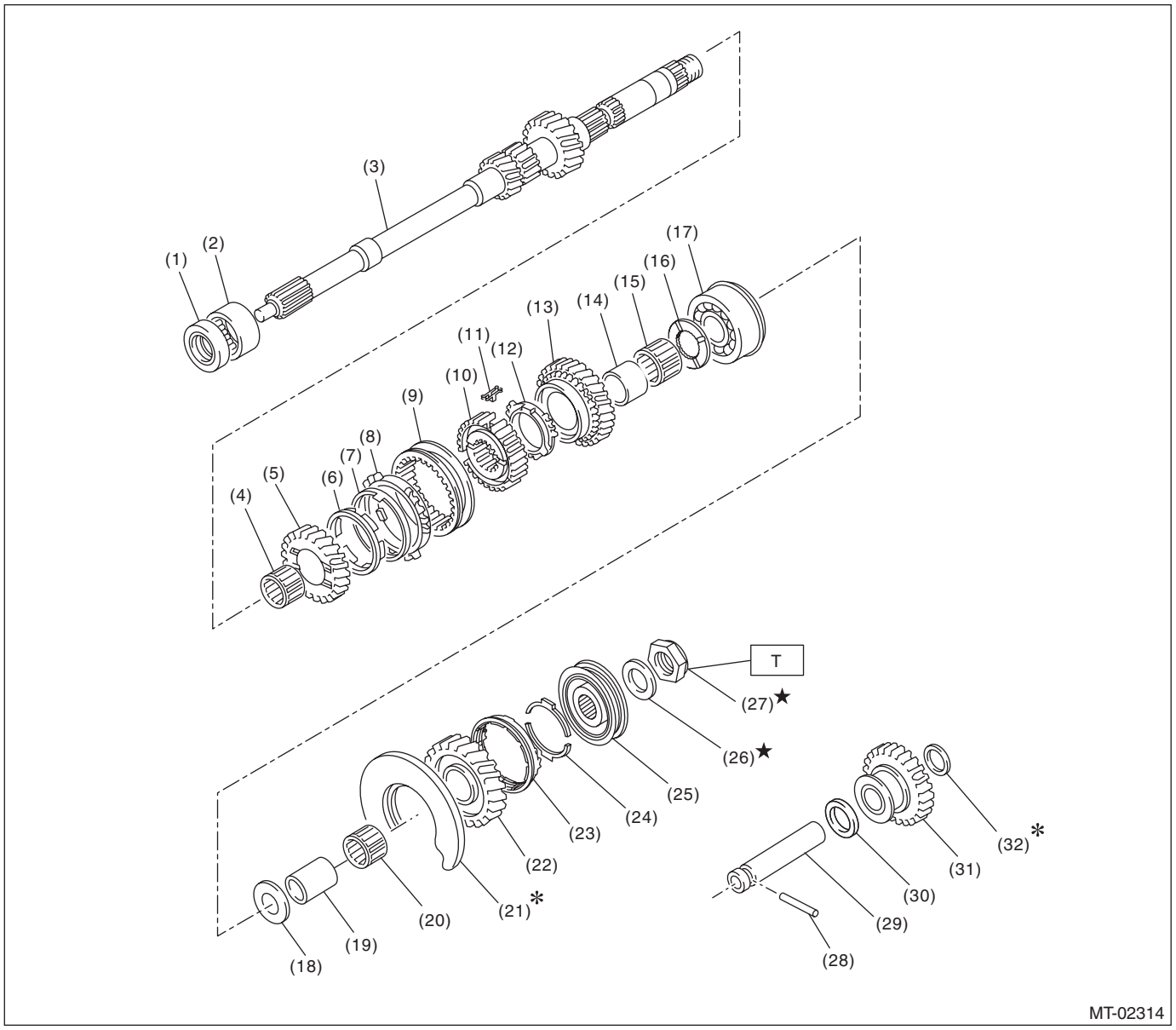
2. DRIVE PINION ASSEMBLY



(1) Drive pinion shaft
(2) Roller bearing
(3) Washer
(4) Thrust bearing
(5) Needle bearing
(6) Driven shaft
(7) Key
(8) Woodruff key
(9) Drive pinion collar
(10) Needle bearing
(11) 1st driven gear
(12) Inner baulk ring
(13) Synchro cone
(14) Outer baulk ring
(15) 1st-2nd synchronizer hub
(16) Ball detent
(17) Reverse driven gear
(18) Outer baulk ring
(19) Synchro cone
(20) Inner baulk ring
(21) 2nd driven gear
(22) 2nd driven gear bushing
(23) 3rd-4th driven gear
(24) Drive pinion shim
(25) Roller bearing
(26) 5th driven gear
(27) Lock washer
(28) Lock nut
(29) Adjusting washer
(30) Thrust bearing
(31) Differential bevel gear sleeve
(32) Washer
(33) Lock washer
(34) Lock nut

Tightening torque:N·m (kgf-m, ft-lb)
T1: 30 (3.1, 22.1)
T2: 120 (12.2, 88.5)
T3: 260 (26.5, 191.8)

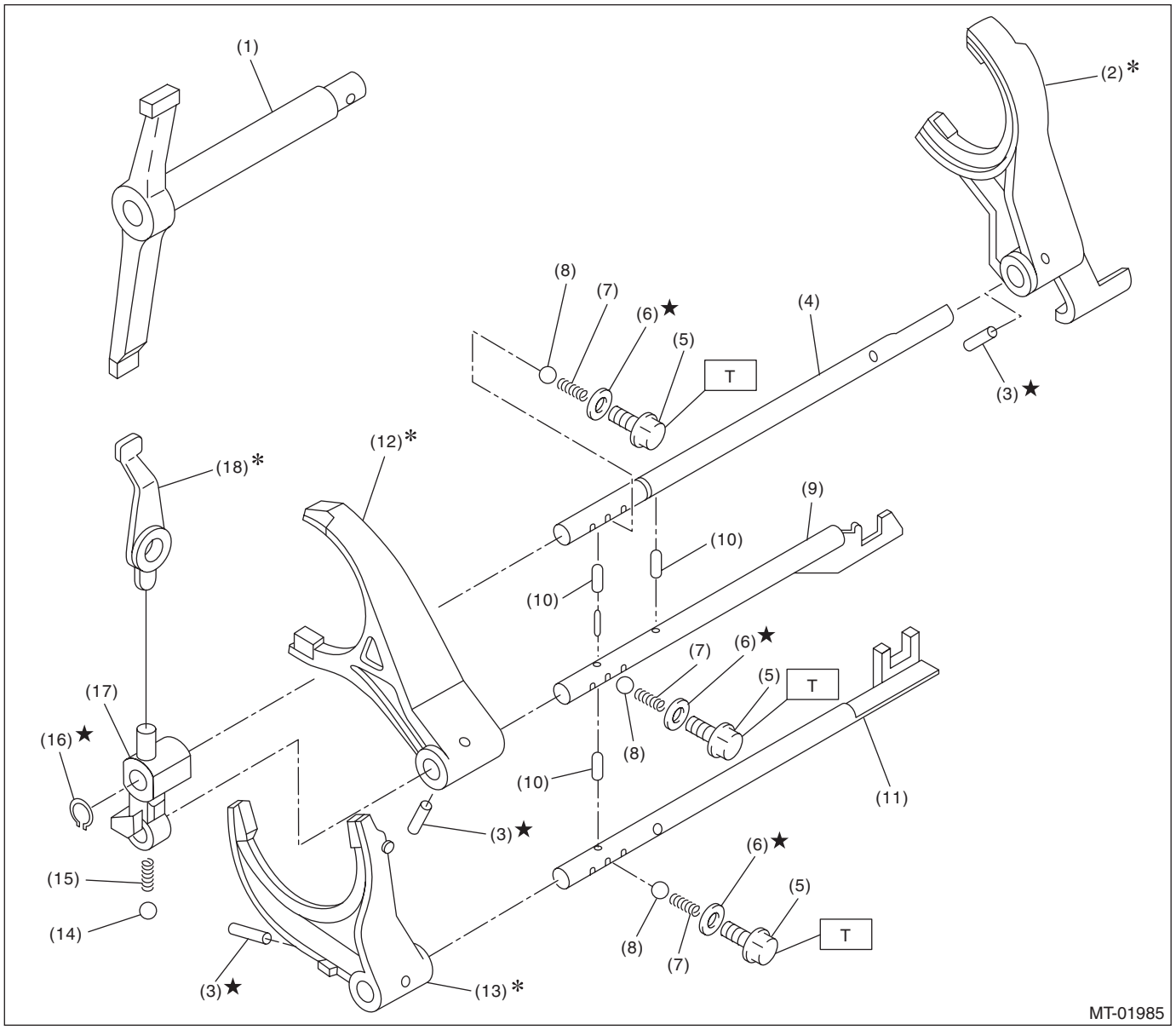
3. MAIN SHAFT FOR SINGLE-RANGE



(1) Oil seal
(2) Needle bearing
(3) Main shaft
(4) Needle bearing
(5) 3rd drive gear
(6) Inner baulk ring
(7) 3rd synchro cone
(8) Outer baulk ring
(9) 3rd-4th coupling sleeve
(10) 3rd-4th synchronizer hub
(11) 3rd-4th shifting insert key
(12) 4th baulk ring
(13) 4th drive gear
(14) 4th needle bearing race
(15) Needle bearing
(16) 4th gear thrust washer
(17) Ball bearing
(18) 5th gear thrust washer
(19) 5th needle bearing race
(20) Needle bearing
(21) Main shaft rear plate
(22) 5th drive gear
(23) 5th baulk ring
(24) Baulk lever
(25) 5th hub & sleeve No. 2
(26) Lock washer
(27) Lock nut
(28) Straight pin
(29) Reverse idler gear shaft
(30) Washer
(31) Reverse idler gear
(32) Washer

Tightening torque:N·m (kgf-m, ft-lb)
T: 120 (12.2, 88.5)

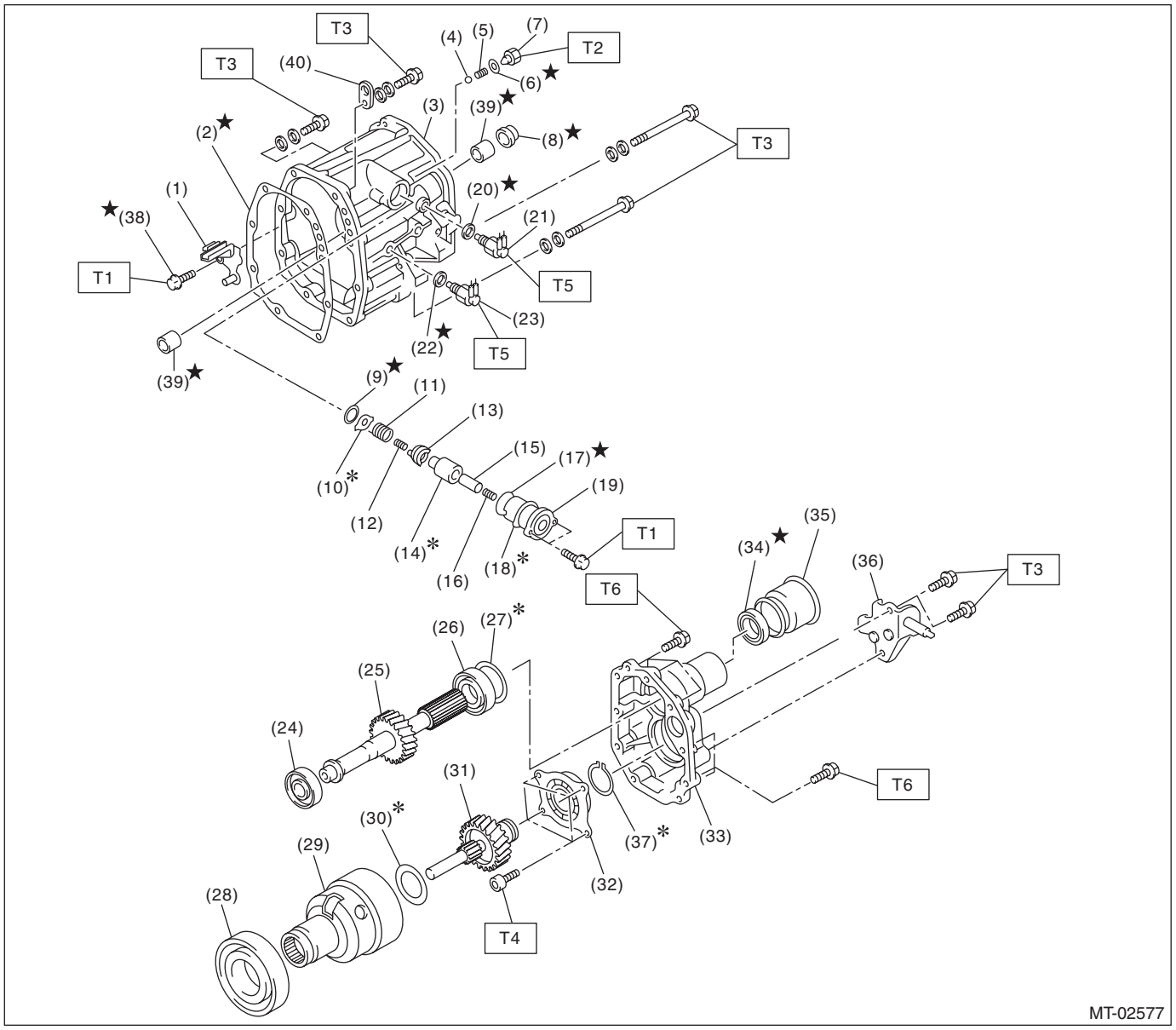
4. SHIFTER FORK AND SHIFTER ROD



(1) Shifter arm
(2) 5th shifter fork
(3) Straight pin
(4) Reverse fork rod
(5) Checking ball plug
(6) Gasket
(7) Checking ball spring
(8) Ball
(9) 3rd-4th fork rod
(10) Interlock plunger
(11) 1st-2nd fork rod
(12) 3rd-4th shifter fork
(13) 1st-2nd shifter fork
(14) Ball
(15) Spring
(16) Snap ring (outer)
(17) Reverse fork rod arm
(18) Reverse shifter lever

Tightening torque:N·m (kgf-m, ft-lb)
T: 20 (2.0, 14.8)

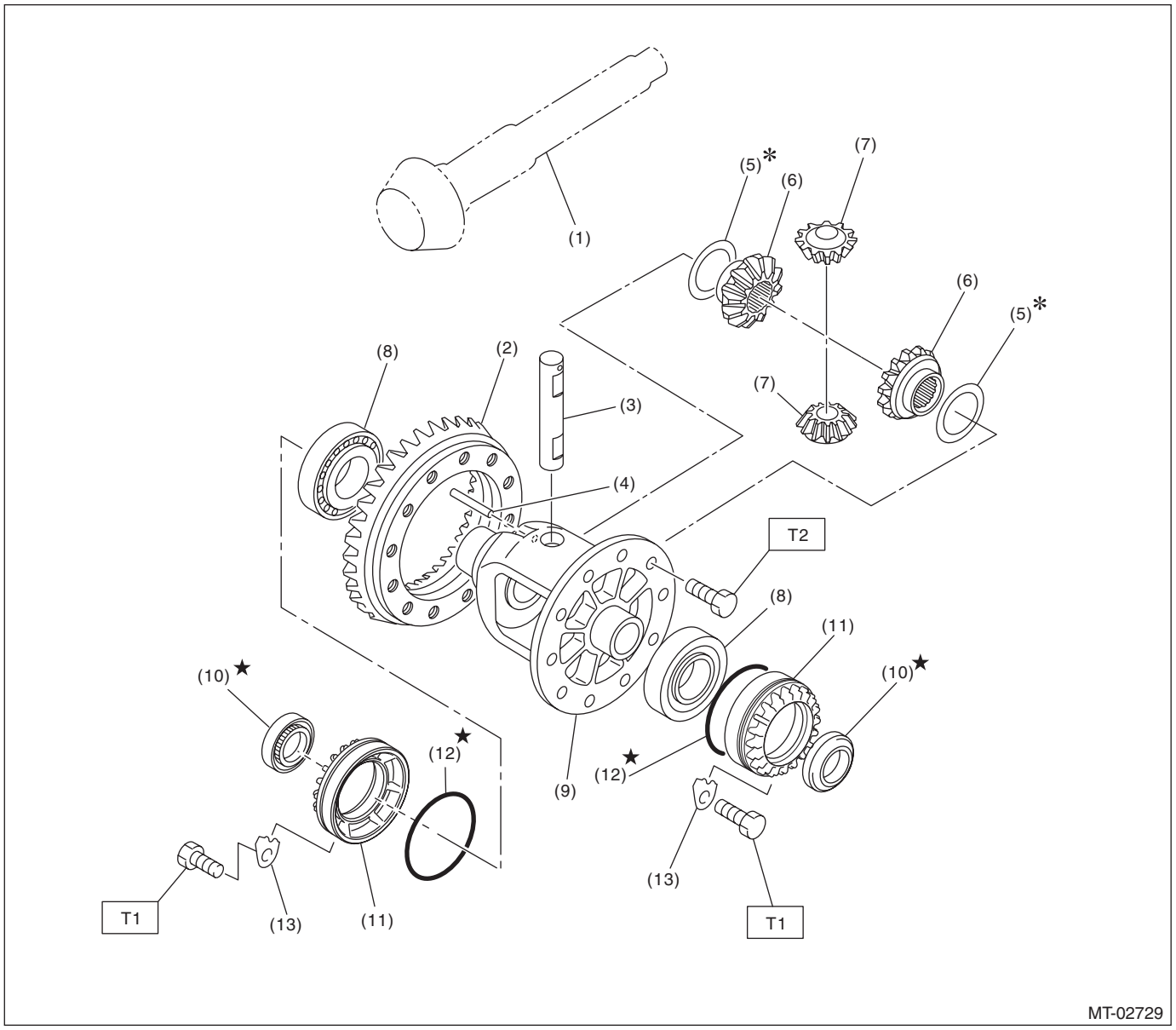
5. TRANSFER CASE AND EXTENSION



(1) Oil guide
(2) Gasket
(3) Transfer case
(4) Ball
(5) Reverse accent spring
(6) Gasket
(7) Plug
(8) Oil seal
(9) Snap ring (inner)
(10) Reverse check plate
(11) Reverse check spring
(12) Reverse return spring
(13) Reverse check cam
(14) Reverse accent shaft
(15) Return spring cap
(16) Return spring
(17) O-ring
(18) Adjusting select shim
(19) Reverse check sleeve
(20) Gasket
(21) Neutral position switch
(22) Gasket
(23) Back-up light switch
(24) Roller bearing
(25) Transfer driven gear
(26) Roller bearing
(27) Thrust washer
(28) Ball bearing
(29) Center differential
(30) Thrust washer
(31) Transfer drive gear
(32) Ball bearing
(33) Extension case
(34) Oil seal
(35) Dust cover
(36) Shift bracket
(37) Snap ring
(38) Precoat bolt
(39) Roller bearing
(40) Transmission hanger

Tightening torque:N·m (kgf-m, ft-lb)
T1: 6.4 (0.7, 4.7)
T2: 9.75 (1.0, 7.2)
T3: 24.5 (2.5, 18.1)
T4: 26 (2.7, 19.2)
T5: 32.3 (3.3, 23.8)
T6: 40 (4.1, 29.5)

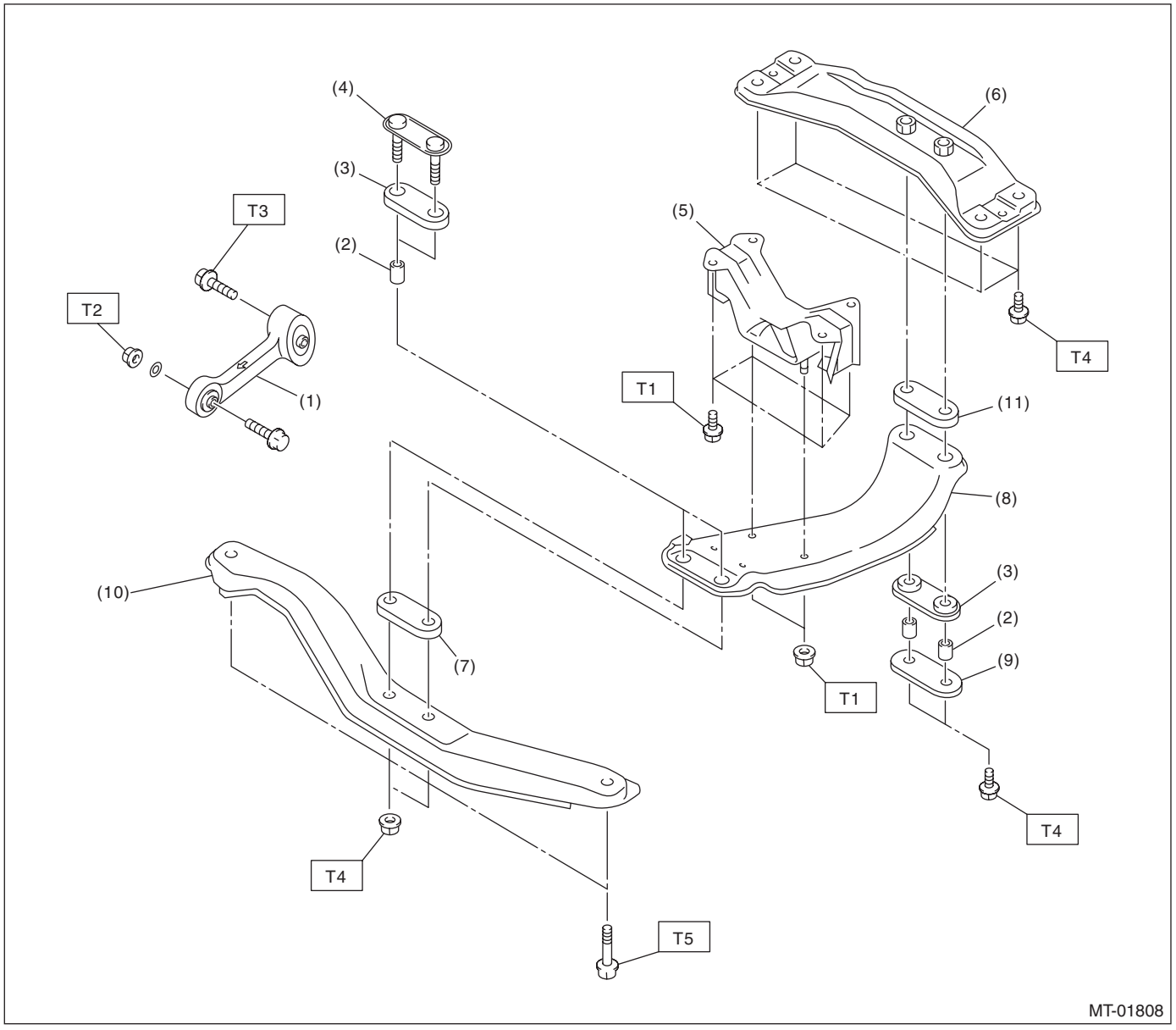
6. FRONT DIFFERENTIAL



(1) Drive pinion shaft
(2) Hypoid driven gear
(3) Pinion shaft
(4) Straight pin
(5) Washer
(6) Differential bevel gear
(7) Differential bevel pinion
(8) Roller bearing
(9) Differential case
(10) Oil seal
(11) Differential side retainer
(12) O-ring
(13) Retainer lock plate

Tightening torque:N·m (kgf-m, ft-lb)
T1: 25 (2.5, 18.4)
T2: 62 (6.3, 45.7)

7. TRANSMISSION MOUNTING



(1) Pitching stopper
(2) Spacer
(3) Lower cushion rubber
(4) Front plate
(5) Transmission cushion rubber
(6) Rear crossmember
(7) Upper cushion rubber
(8) Center crossmember
(9) Rear plate
(10) Front crossmember
(11) Rear cushion rubber

Tightening torque: N·m (kgf-m, ft-lb)
T1: 35 (3.6, 25.8)
T2: 50 (5.1, 36.9)
T3: 58 (5.9, 42.8)
T4: 70 (7.1, 51.6)
T5: 140 (14.3, 103.3)

C: CAUTION

• Wear appropriate work clothing, including a cap, protective goggles and protective shoes when performing any work.
• Remove contamination including dirt and corrosion before removal, installation or disassembly.
• Keep the disassembled parts in order and protect them from dust and dirt.
• Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly and replacement.
• When disassembling the case and other light alloy parts, use a plastic hammer to force it apart. Do not pry apart with screwdrivers or other tools.
• Vehicle components are extremely hot after driving. Be wary of receiving burns from heated parts.
• Use SUBARU genuine gear oil, grease or equivalent. Do not mix gear oil, grease, etc. of different grades or manufacturers.
• Be sure to tighten fasteners including bolts and nuts to the specified torque.
• Place shop jacks or rigid racks at the specified points.
• Apply gear oil onto sliding or revolving surfaces before installation.
• Replace deformed or damaged snap rings with new parts.
• Before installing O-rings or oil seals, apply sufficient amount of gear oil to avoid damage and deformation.
• Be careful not to incorrectly install or fail to install O-rings, snap rings and other such parts.
• Before securing a part on a vise, place cushioning material such as wood blocks, aluminum plate, or cloth between the part and the vise.
• Avoid damaging the mating surface of the case.
• Before applying liquid gasket, completely remove the old liquid gasket.

D: PREPARATION TOOL

1. SPECIAL TOOL

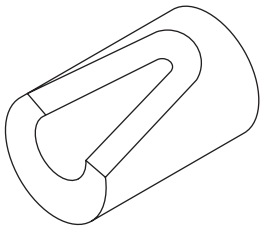
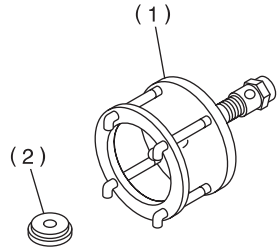
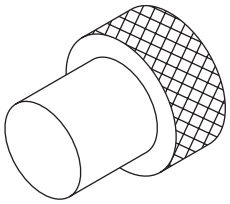
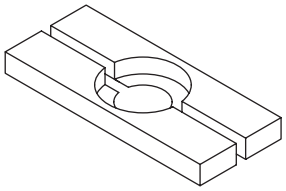
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-399411700	399411700	ACCENT BALL INSTALLER	Used for installing reverse fork rod arm.
 ST-899524100	899524100	PULLER SET	Used for removing the front differential roller bearing. (1) Puller (2) Cap
 ST-399780104	399780104	WEIGHT	Used for adjusting preload on the front differential roller bearing.
 ST-498077000	498077000	REMOVER	• Used for removing the roller bearing of the drive pinion shaft. • Used for removing the roller bearing of the transfer driven gear.

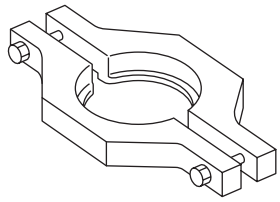
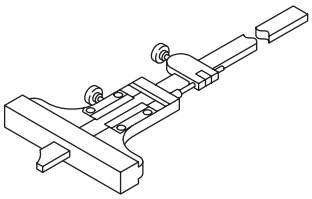
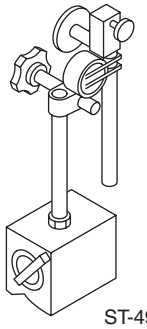
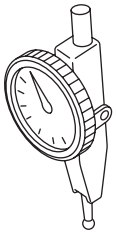
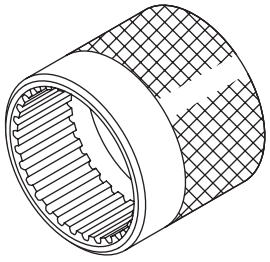
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-498077300	498077300	CENTER DIFFERENTIAL BEARING REMOVER	Used for removing the center differential ball bearing.
 ST-498147001	498147001	DEPTH GAUGE	Used for adjusting the extension end play and main shaft end play.
 ST-498247001	498247001	MAGNET BASE	• Used for measuring the backlash of bevel pinion gear and hypoid gear. • Used together with DIAL GAUGE (498247100).
 ST-498247100	498247100	DIAL GAUGE	• Used for measuring the backlash of bevel pinion gear and hypoid gear. • Used together with MAGNET BASE (498247001).
 ST-498427100	498427100	STOPPER	• Used for removing and installing the drive pinion shaft assembly lock nut. • Used for measuring the backlash of hypoid gear. • Used for adjusting preload on the front differential roller bearing.

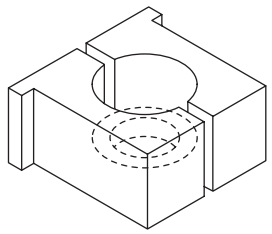
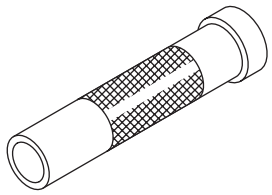
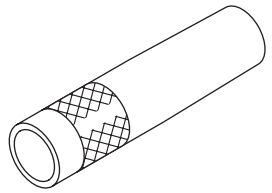
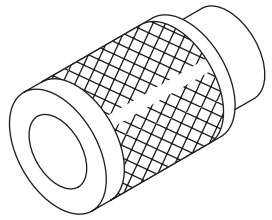
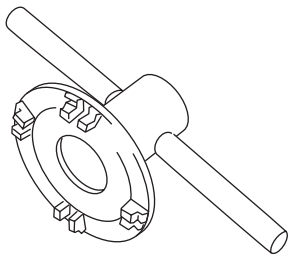
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-498937000	498937000	TRANSMISSION HOLDER	Used for removing and installing the main shaft lock nut.
 ST-499277100	499277100	BUSHING 1-2 INSTALLER	• Used for installing drive pinion shaft washer. • Used for installing the front differential roller bearing inner race.
 ST-499277200	499277200	INSTALLER	• Used for installing drive pinion shaft washer. • Used for installing the 2nd driven gear bushing, 3rd-4th driven gear, roller bearing and 5th driven gear.
 ST-499757002	499757002	INSTALLER	• Used for installing the roller bearing of transfer driven gear (transfer case side). • Used for removing the roller bearing and driven gear of the drive pinion shaft.
 ST18630AA010	18630AA010	WRENCH COMPL RETAINER	• Used for removing and installing the differential side retainer. • Used for backlash adjustment of the front differential hypoid gear and preload adjustment of the roller bearing. • WRENCH ASSY (499787000) can also be used.

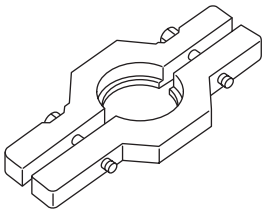
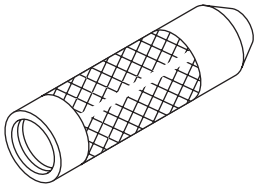
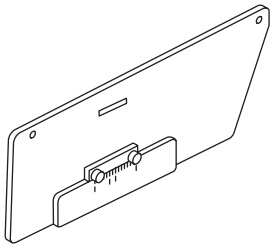
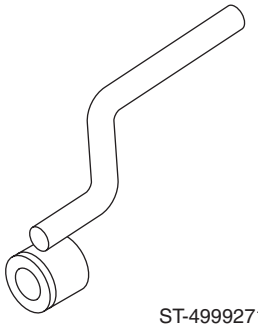
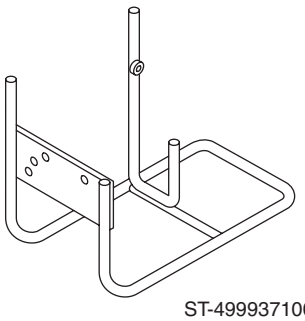
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-499857000	499857000	5TH DRIVEN GEAR REMOVER	Used for removing the 5th driven gear.
 ST-499877000	499877000	RACE 4-5 INSTALLER	• Used for installing the 4th drive gear needle bearing race. • Used together with REMOVER (899714110). • Used for installing the main shaft ball bearing. • Used for installing the 5th drive gear thrust washer.
 ST-499917500	499917500	DRIVE PINION GAUGE ASSY	Used for adjusting the drive pinion shim.
 ST-499927100	499927100	HANDLE	Used for backlash adjustment of the front differential hypoid and preload adjustment of the roller bearing.
 ST-499937100	499937100	TRANSMISSION STAND SET	Used for disassembling and assembling the transmission.

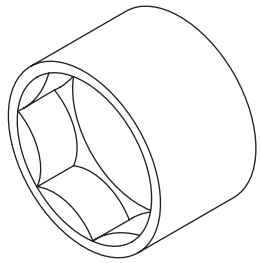
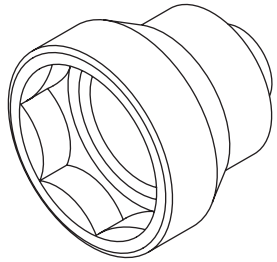
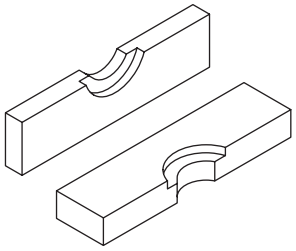
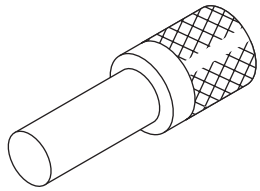
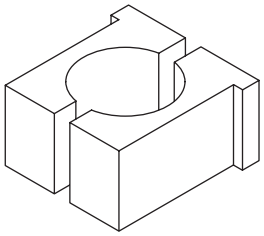
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-499987003	499987003	SOCKET WRENCH (35)	Used for removing and installing the main shaft lock nut.
 ST-499987300	499987300	SOCKET WRENCH (50)	Used for removing and installing the driven shaft lock nut.
 ST-899714110	899714110	REMOVER	Used for removing and installing the parts of main shaft and driven shaft.
 ST-899864100	899864100	REMOVER	• Used for removing the parts of the main shaft. • Used for installing the transfer case roller bearing. • Used for removing the roller bearing of transfer driven gear (transfer case side). • Used for installing the roller bearing of transfer driven gear (extension case side).
 ST-899884100	899884100	HOLDER	• Used for removing and installing the drive pinion shaft lock nut. • Used for removing and installing the driven shaft lock nut. • Used for measuring the starting torque of the drive pinion shaft.

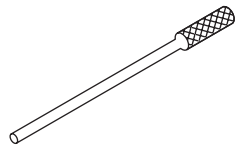
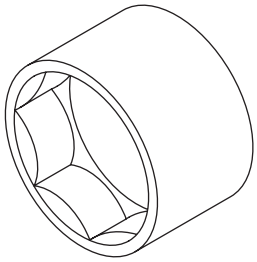
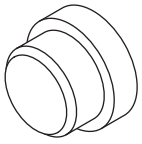
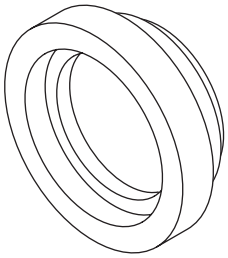
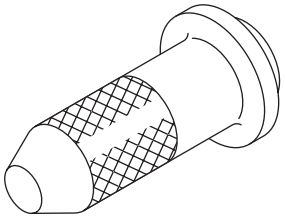
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-899904100	899904100	STRAIGHT PIN REMOVER	Used for removing and installing the straight pin.
 ST-899988608	899988608	SOCKET WRENCH (27)	• Used for removing and installing the drive pinion shaft lock nut. • Used for measuring the starting torque of the drive pinion shaft.
 ST-398497701	398497701	ADAPTER	Used for installing the front differential roller bearing.
 ST-499587000	499587000	INSTALLER	Used for installing the driven shaft parts.
 ST-498057300	498057300	INSTALLER	Used for installing the extension oil seal.

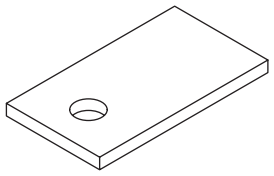
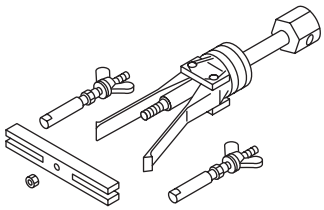
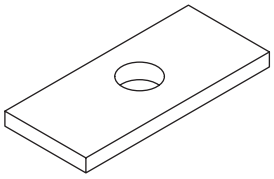
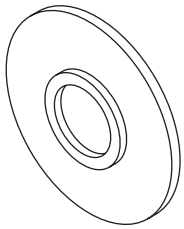
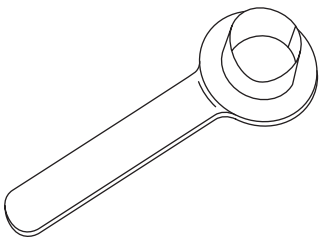
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-498255400	498255400	PLATE	Used for measuring the hypoid gear backlash.
 ST-398527700	398527700	PULLER ASSY	• Used for removing the extension oil seal. • Used for removing the bearing outer race and oil seal of front differential side retainer.
 ST-398643600	398643600	GAUGE	Used for adjusting the extension end play.
 ST-398177700	398177700	INSTALLER	• Used for installing the roller bearing of transfer driven gear (extension case side). • Used for installing the ball bearing of the transfer drive gear.
 ST28399SA010	28399SA010	OIL SEAL PROTECTOR	Used for protecting oil seal when inserting the front drive shaft.

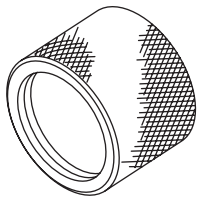
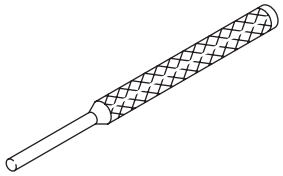
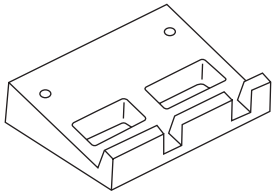
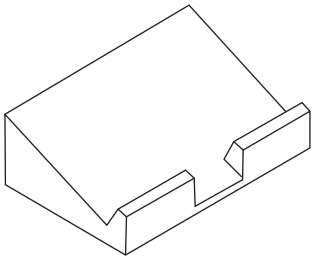
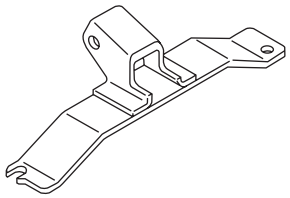
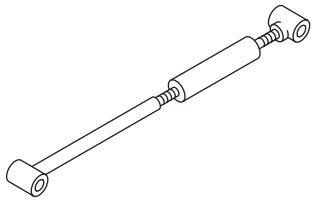
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST18675AA000	18675AA000	DIFFERENTIAL SIDE OIL SEAL INSTALLER	Used for installing the differential side retainer oil seal.
 ST-398791700	398791700	STRAIGHT PIN REMOVER 2	Used for installing and removing the straight pin.
 ST-498267200	498267200	CYLINDER HEAD TABLE	Used for installing and removing the roller bearing of the transfer case.
 ST-498267300	498267300	CYLINDER HEAD TABLE	Used for installing and removing the roller bearing of the transfer case.
 ST-41099AA010	41099AA010	ENGINE SUPPORT BRACKET	Used for supporting engine.

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST41099AA020	41099AA020	ENGINE SUPPORT	Used for supporting engine.

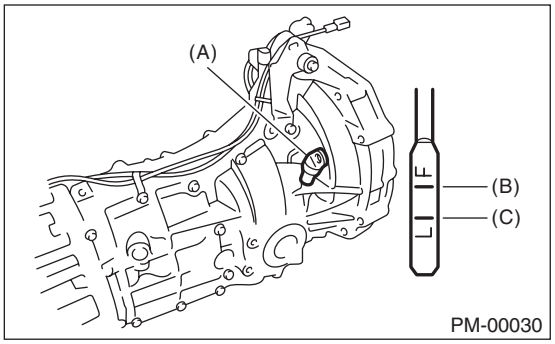
2. GENERAL TOOL

TOOL NAME	REMARKS
Circuit tester	Used for measuring resistance, voltage and current.
TORX® bit T70	Used for installing and removing the drain plug.

2. Transmission Gear Oil

A: INSPECTION

1) Park the vehicle on a level surface.
2) Turn the ignition switch to OFF, and wait until the engine cools.
3) Remove the oil level gauge and wipe it clean.
4) Reinsert the oil level gauge all the way. Be sure that the oil level gauge is correctly inserted in the proper direction.
5) Pull out the oil level gauge again, and check the oil level. If it is below the lower level, add oil through the oil level gauge hole to bring the level up to the upper level.



(A) Oil level gauge
(B) Upper level
(C) Lower level

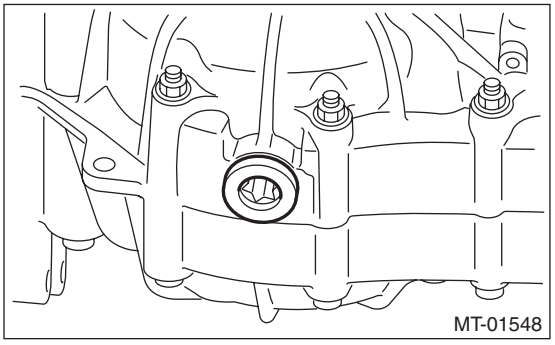
B: REPLACEMENT

1) Pull out the oil level gauge.
2) Lift up the vehicle.
3) Using the TORX® bit T70, remove the drain plug, and drain the transmission gear oil completely.

CAUTION:
• Immediately after driving the vehicle or after idling for a long time, the transmission gear oil will be hot. Be careful not to receive burns.
• Be careful not to spill the transmission gear oil on the exhaust pipe, to prevent emission of smoke or causing a fire. If gear oil is spilled, wipe it off completely.
4) Tighten the drain plug using TORX® bit T70.

NOTE:
• Tighten the drain plug after draining the transmission gear oil.
• Use a new gasket.

Tightening torque:
44 N·m (4.5 kgf-m, 32.5 ft-lb) (Aluminum gasket silver)
70 N·m (7.1 kgf-m, 51.6 ft-lb) (Copper gasket brown)
70 N·m (7.1 kgf-m, 51.6 ft-lb) (Metal gasket black)



5) Lower the vehicle.
6) Pour gear oil through the oil level gauge hole.

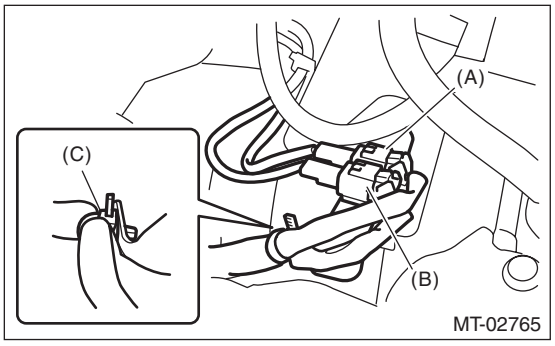
Recommended gear oil:
GL-5 (75W-90) or equivalent

Gear oil capacity:
3.5 ℓ (3.7 US qt, 3.1 Imp qt)
7) Measure the transmission gear oil amount, and check that it is within the specification.

3. Manual Transmission Assembly

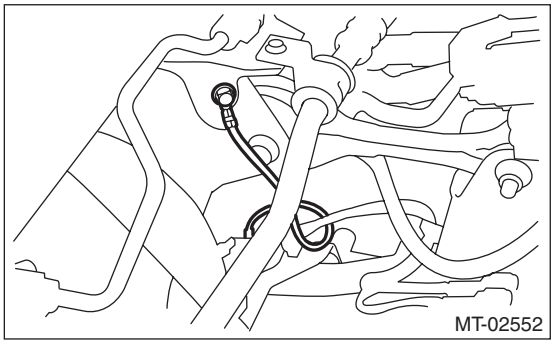
A: REMOVAL

1) Open the front hood.
2) Disconnect the ground cable from battery.
3) Drain transmission gear oil completely. <Ref. to 5MT-22, REPLACEMENT, Transmission Gear Oil.>
4) Remove the air intake boot. <Ref. to IN(H4DO)-12, REMOVAL, Air Intake Boot.>
5) Disconnect the following connectors and remove the clip from the bracket.

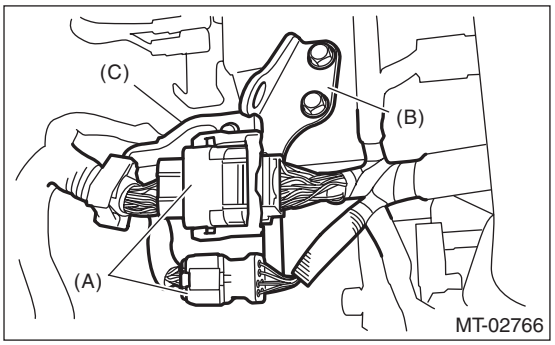


(A) Neutral position switch connector (Brown)
(B) Back-up light switch connector (Gray)
(C) Clip

6) Disconnect the transmission radio ground cord terminal.

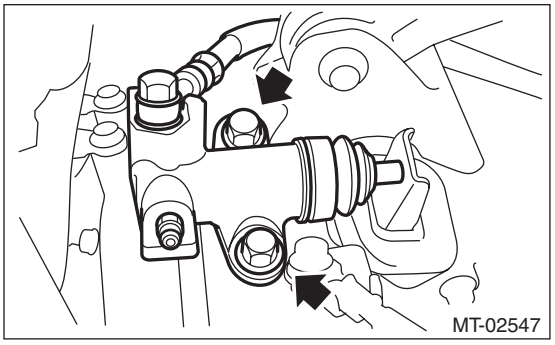


7) Remove the harness bracket and disconnect the engine harness connectors, and then remove the engine hanger rear.

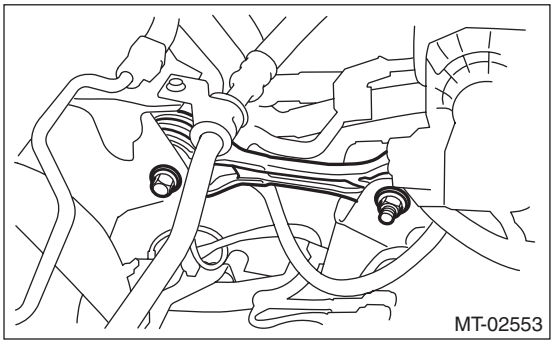


(A) Engine harness connectors
(B) Engine hanger rear
(C) Harness bracket

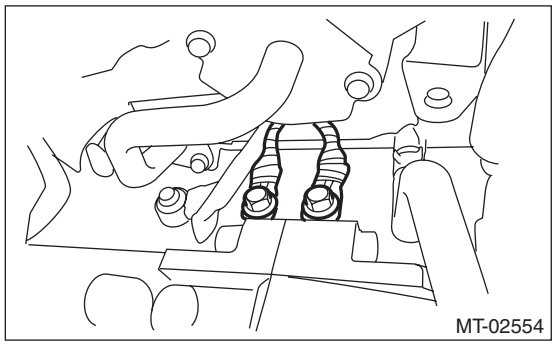
8) Remove the starter. <Ref. to SC(H4DO)-9, REMOVAL, Starter.>
9) Remove the operating cylinder from the transmission, and suspend on a wire.



10) Remove the pitching stopper.

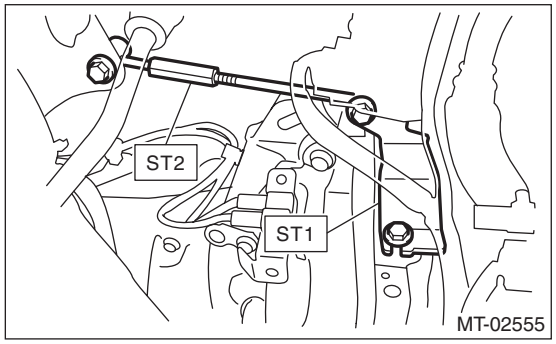


11) Disconnect two ground cables from rear end of the engine.

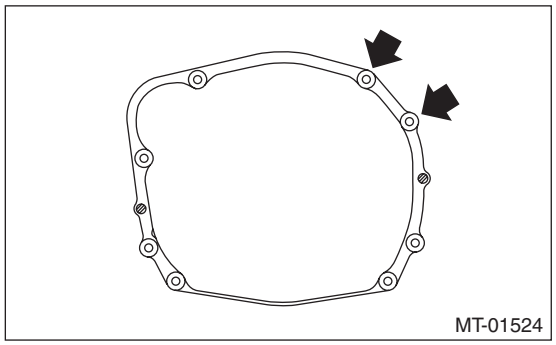


12) Set the ST.

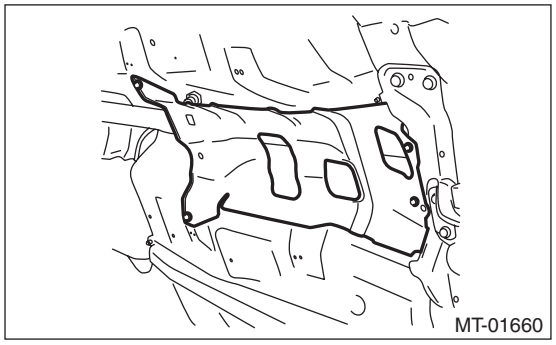
ST1 41099AA010 ENGINE SUPPORT BRACKET
ST2 41099AA020 ENGINE SUPPORT



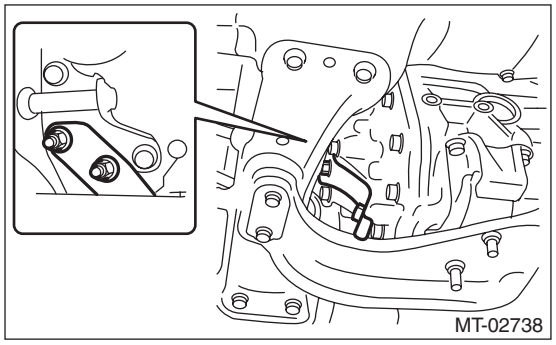
13) Lift up the vehicle.
14) Remove the under cover. <Ref. to EI-25, REMOVAL, Front Under Cover.>
15) Remove the center exhaust pipe. <Ref. to EX(H4DO)-13, REMOVAL, Center Exhaust Pipe.>
16) Remove the bolts which hold upper side of transmission to engine.



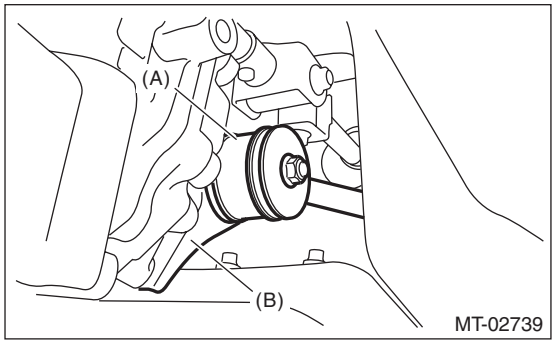
17) Remove the center exhaust cover.



18) Remove the hangar bracket from the transmission.

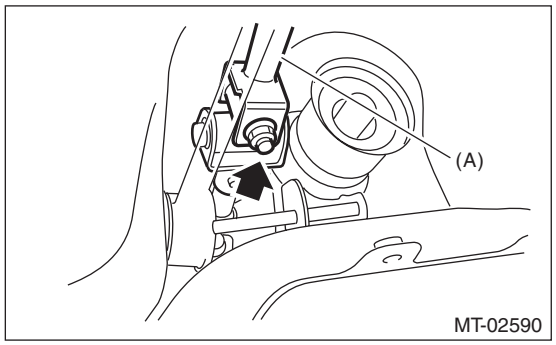


19) Remove the propeller shaft. <Ref. to DS-10, REMOVAL, Propeller Shaft.>
20) Remove the gear shift rod and the stay from the transmission.
(1) Remove the stay from the shift bracket.



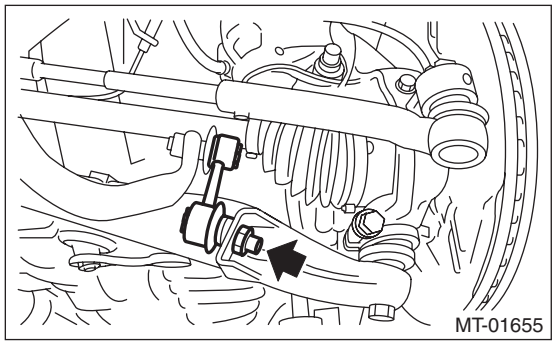
(A) Stay
(B) Shift bracket

(2) Remove the gear shift rod from the transmission.

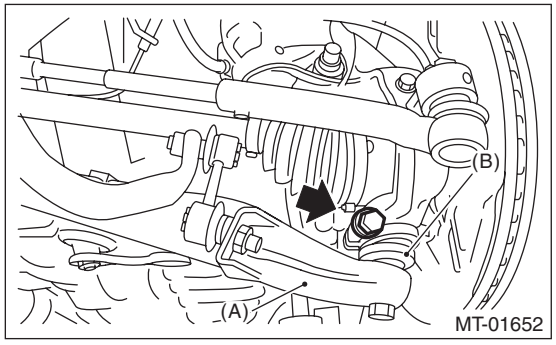


(A) Gear shift rod

21) Disconnect the stabilizer link from the front arm.

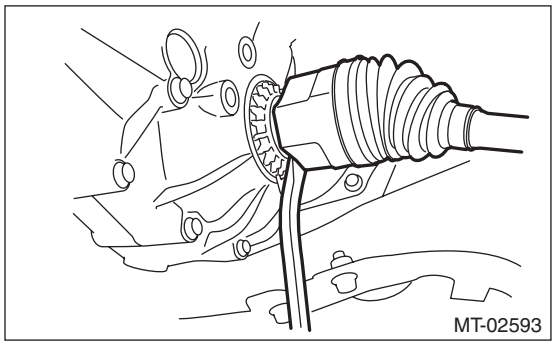


22) Remove the bolt securing the ball joint of the front arm to the housing, then separate the front arms and the housing.

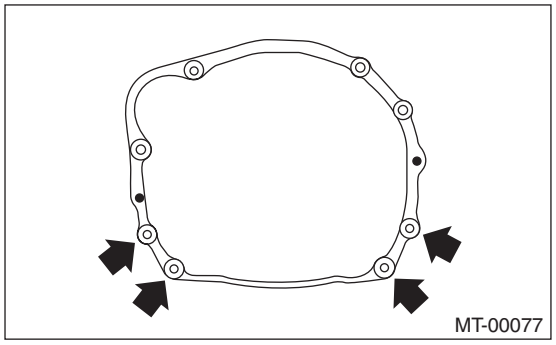


(A) Front arm
(B) Ball joint

23) Using a crowbar, remove the left and right front drive shaft from the transmission.

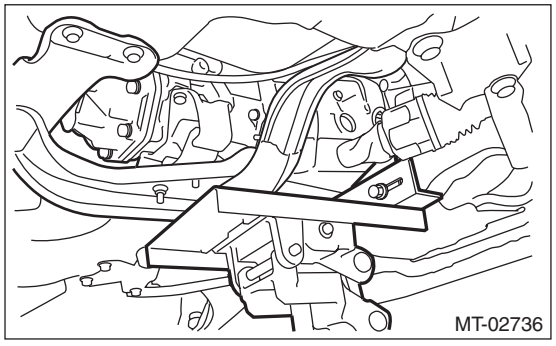


24) Remove the bolts and nuts which hold lower side of transmission to engine.

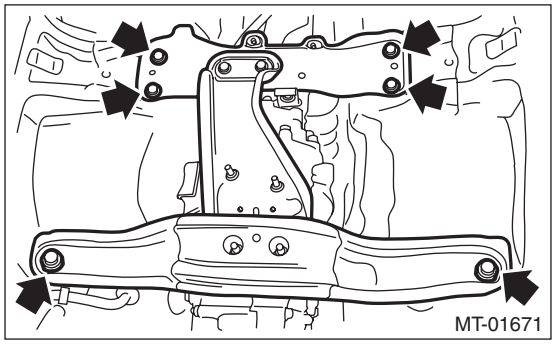


25) Place the transmission jack under the transmission.

CAUTION:
Always support the transmission case with a transmission jack.



26) Remove the front crossmember and rear crossmember from the vehicle.



27) While lowering the transmission jack, tighten the turnbuckle of the ST, and incline the engine unit rearward.
28) Remove the transmission.

NOTE:
Move the transmission jack towards the rear until the main shaft is withdrawn from the clutch disc.
29) Separate the transmission assembly from the transmission cushion rubber.

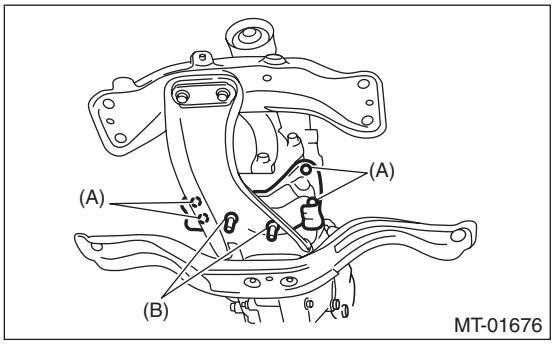
B: INSTALLATION

1) Replace the differential side retainer oil seal. <Ref. to 5MT-34, REPLACEMENT, Differential Side Retainer Oil Seal.>

NOTE:
• Be sure to replace the differential side retainer oil seal after removing the front drive shaft.
• When a new differential side retainer oil seal has been installed, replacement is not required.
2) Strike and bend the transmission hanger of transmission rear with a rubber hammer etc. so that it gets in contact with the transmission case.

CAUTION:
Do not apply excessive load or impact to the transmission case.
3) Install the transmission cushion rubber to the transmission, and tighten the bolt (A).
4) Install the transmission cushion rubber to the center crossmember, and temporarily tighten the nut (B).

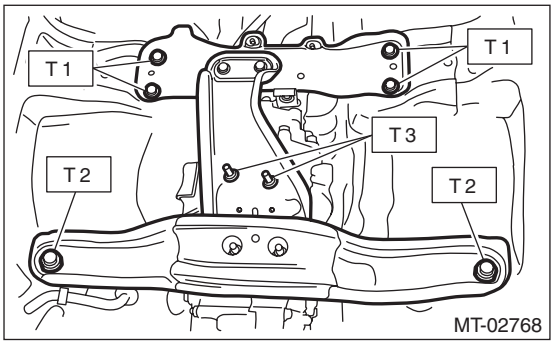
Tightening torque:
Bolt (A)
35 N·m (3.6 kgf-m, 25.8 ft-lb)



5) Install the transmission onto the engine.
(1) Lift up the transmission gradually using a transmission jack.
(2) Engage at the spline section.

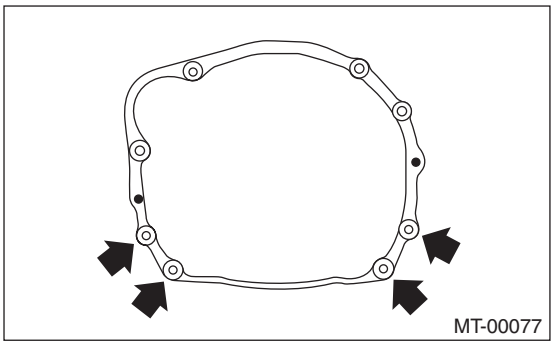
NOTE:
Be careful not to hit the main shaft against the clutch cover.
6) While raising the transmission jack, loosen the turnbuckle of the ST, and set the engine unit to the original position.
7) Install the front crossmember and rear crossmember.
8) Tighten the transmission cushion rubber mounting nut.

Tightening torque:
T1: 70 N·m (7.1 kgf-m, 51.6 ft-lb)
T2: 140 N·m (14.3 kgf-m, 103.3 ft-lb)
T3: 35 N·m (3.6 kgf-m, 25.8 ft-lb)



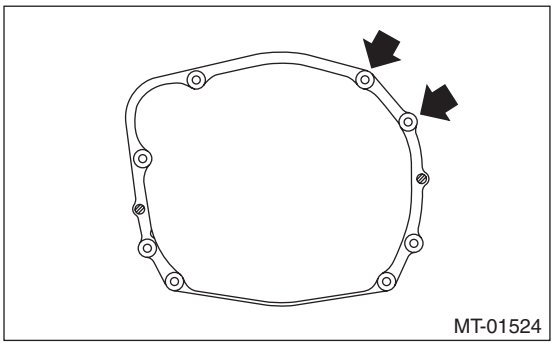
9) Take out the transmission jack.
10) Tighten the bolts and nuts which hold the lower side of transmission to the engine.

Tightening torque:
50 N·m (5.1 kgf-m, 36.9 ft-lb)

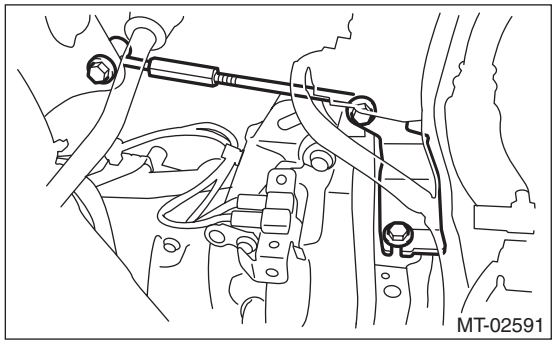


11) Lower the vehicle.
12) Install the starter. <Ref. to SC(H4DO)-11, INSTALLATION, Starter.>
13) Tighten the bolts which hold the upper side of the transmission to the engine.

Tightening torque:
50 N·m (5.1 kgf-m, 36.9 ft-lb)

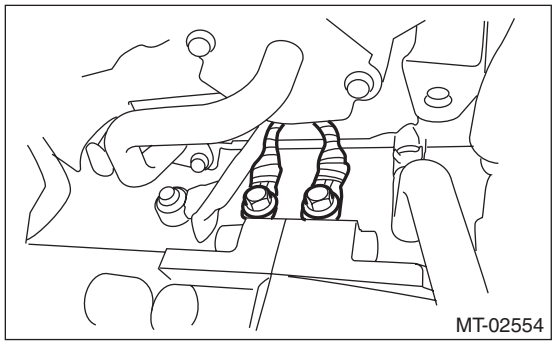


14) Remove the ST.



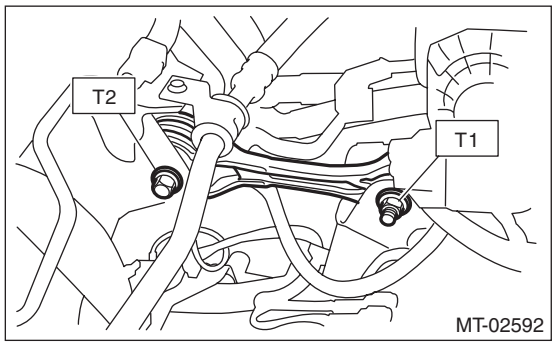
15) Install the ground cable.

Tightening torque:
19 N·m (1.9 kgf-m, 14.0 ft-lb)

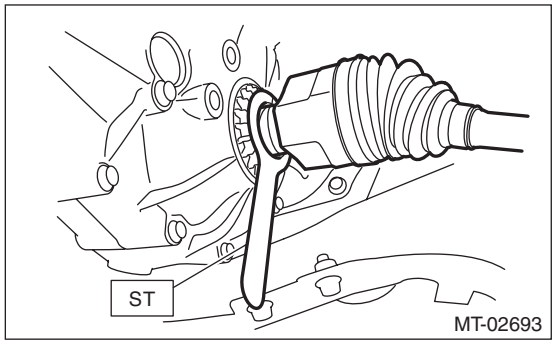


16) Install the pitching stopper.

Tightening torque:
T1: 50 N·m (5.1 kgf-m, 36.9 ft-lb)
T2: 58 N·m (5.9 kgf-m, 42.8 ft-lb)

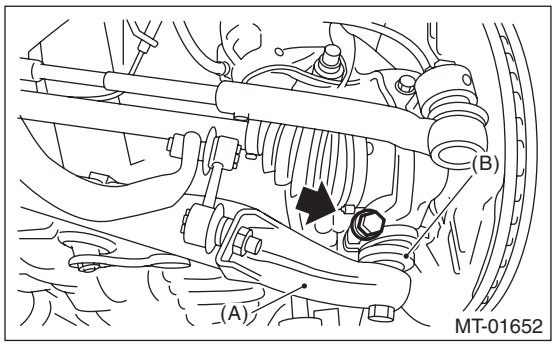


17) Lift up the vehicle.
18) Install the front drive shaft into the transmission.
ST 28399SA010 OIL SEAL PROTECTOR



19) Insert the front arm ball joint into the housing lower part, and tighten the mounting bolt.

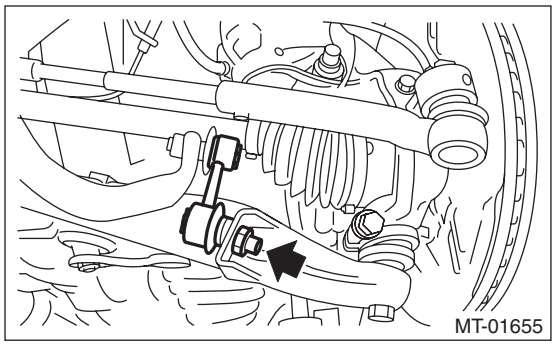
Tightening torque:
50 N·m (5.1 kgf-m, 36.9 ft-lb)



(A) Front arm
(B) Ball joint

20) Attach the stabilizer link to the front arm.

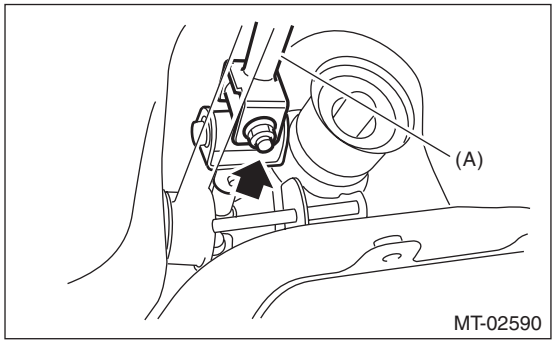
Tightening torque:
30 N·m (3.1 kgf-m, 22.1 ft-lb)



21) Attach the gear shift rod and stay.
(1) Attach the gear shift rod to the transmission.

NOTE:
Use a new self-locking nut.

Tightening torque:
12 N·m (1.2 kgf-m, 8.9 ft-lb)

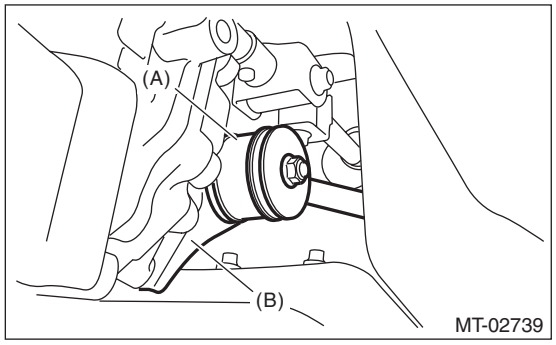


(A) Gear shift rod

(2) Install the stay to the shift bracket.

NOTE:
Use a new self-locking nut.

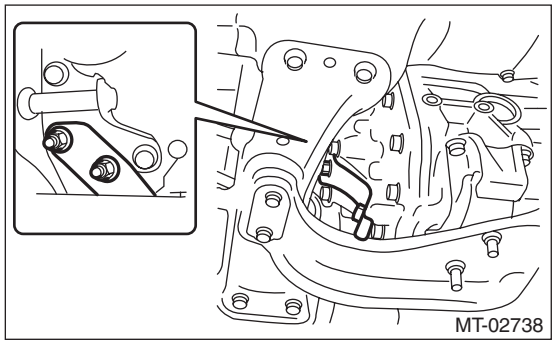
Tightening torque:
18 N·m (1.8 kgf-m, 13.3 ft-lb)



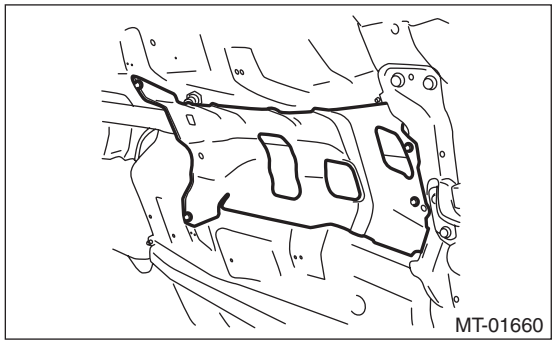
(A) Stay
(B) Shift bracket

22) Install the propeller shaft. <Ref. to DS-11, INSTALLATION, Propeller Shaft.>
23) Install the hanger bracket to the transmission.

Tightening torque:
23 N·m (2.3 kgf-m, 17.0 ft-lb)



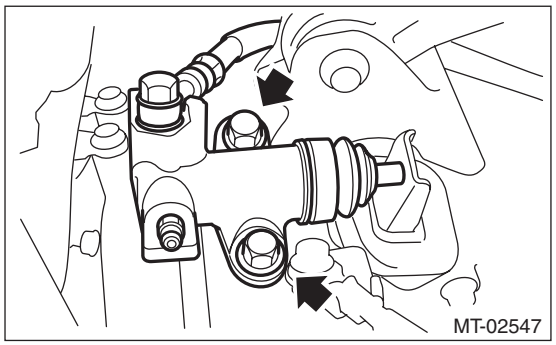
24) Install the center exhaust cover.
Tightening torque:
18 N·m (1.8 kgf-m, 13.3 ft-lb)



25) Install the center exhaust pipe. <Ref. to EX(H4DO)-13, INSTALLATION, Center Exhaust Pipe.>
26) Install the under cover. <Ref. to EI-25, INSTALLATION, Front Under Cover.>

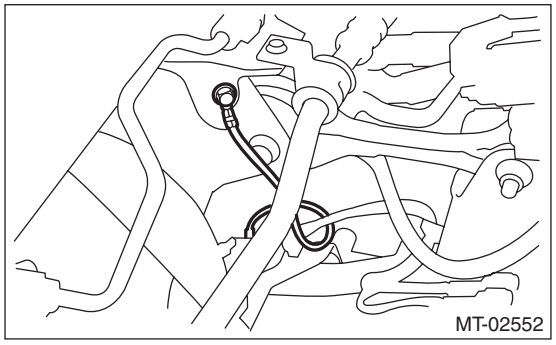
27) Install the operating cylinder.

Tightening torque:
37 N·m (3.8 kgf-m, 27.3 ft-lb)



28) Install the transmission radio ground cord terminal.

Tightening torque:
13 N·m (1.3 kgf-m, 9.6 ft-lb)

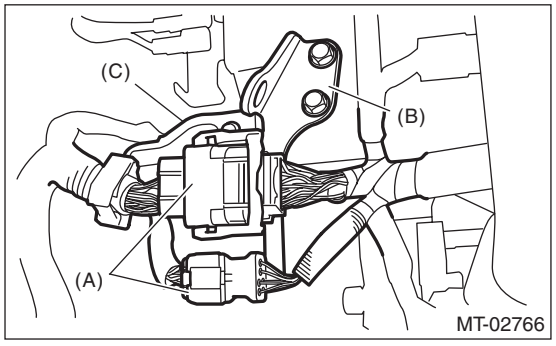


29) Install the engine hanger rear.

Tightening torque:
21 N·m (2.1 kgf-m, 15.5 ft-lb)

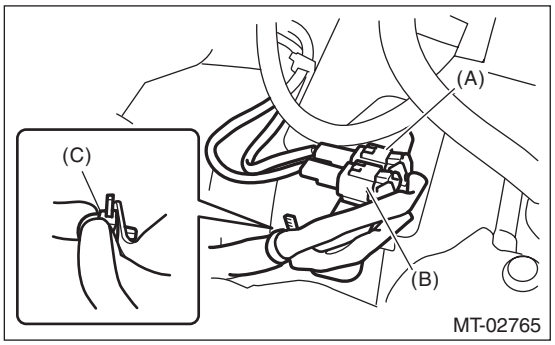
30) Connect the engine harness connector, then attach the harness bracket.

Tightening torque:
7.5 N·m (0.8 kgf-m, 5.5 ft-lb)



(A) Engine harness connectors
(B) Engine hanger rear
(C) Harness bracket

31) Connect the following connectors and secure the clip on the bracket.



(A) Neutral position switch connector (Brown)
(B) Back-up light switch connector (Gray)
(C) Clip

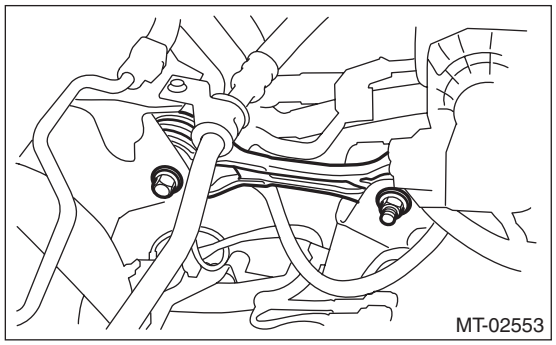
32) Install the air intake boot. <Ref. to IN(H4DO)-12, INSTALLATION, Air Intake Boot.>
33) Connect the battery ground terminal.
34) Remove the lift arm from vehicle.

4. Transmission Mounting System

A: REMOVAL

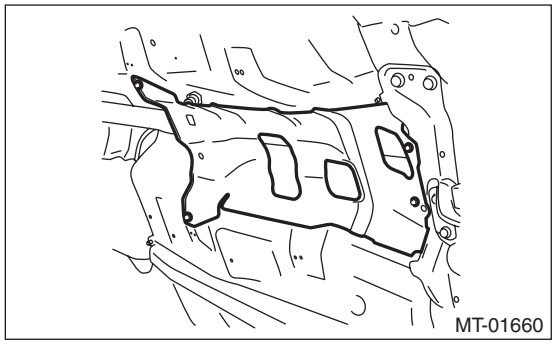
1. PITCHING STOPPER

1) Disconnect the ground cable from battery.
2) Remove the air intake boot. <Ref. to IN(H4DO)-12, REMOVAL, Air Intake Boot.>
3) Remove the pitching stopper.



2. CROSSMEMBER AND CUSHION RUBBER

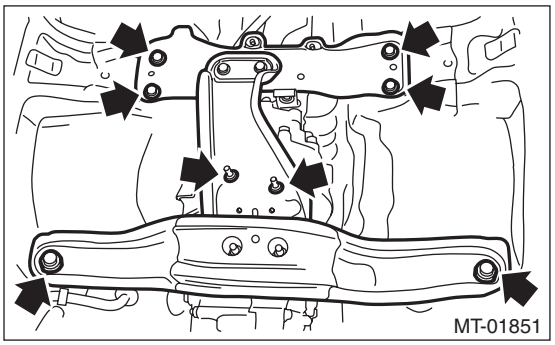
1) Disconnect the ground cable from battery.
2) Lift up the vehicle.
3) Remove the center exhaust pipe. <Ref. to EX(H4DO)-13, REMOVAL, Center Exhaust Pipe.>
4) Remove the center exhaust cover.



5) Set the transmission jack under the transmission body.

CAUTION:
Always support the transmission case with a transmission jack.

6) Remove the front crossmember and the rear crossmember.



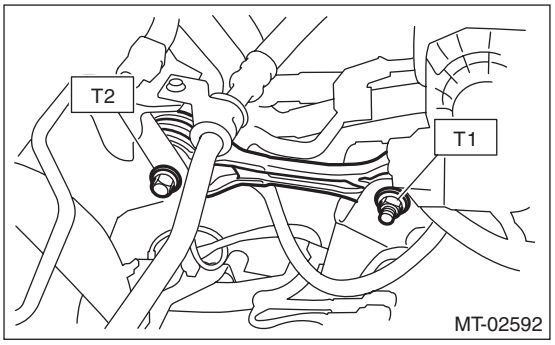
7) Remove the transmission cushion rubber.

B: INSTALLATION

1. PITCHING STOPPER

1) Install the pitching stopper.

Tightening torque:
T1: 50 N·m (5.1 kgf-m, 36.9 ft-lb)
T2: 58 N·m (5.9 kgf-m, 42.8 ft-lb)

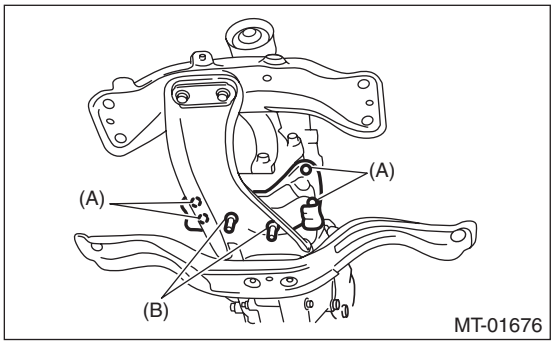


2) Install the air intake boot. <Ref. to IN(H4DO)-12, INSTALLATION, Air Intake Boot.>
3) Connect the battery ground terminal.

2. CROSSMEMBER AND CUSHION RUBBER

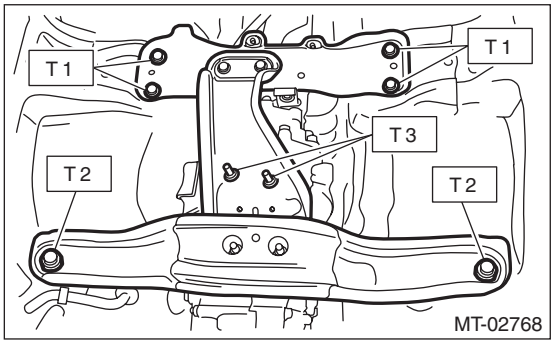
1) Install the transmission cushion rubber to the transmission, and tighten the bolt (A).
2) Install the transmission cushion rubber to the center crossmember, and temporarily tighten the nut (B).

Tightening torque:
Bolt (A)
35 N·m (3.6 kgf-m, 25.8 ft-lb)



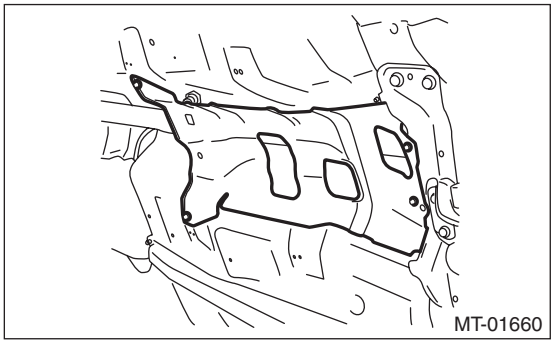
3) Install the front crossmember and rear crossmember.
4) Tighten the transmission cushion rubber mounting nut.

Tightening torque:
T1: 70 N·m (7.1 kgf-m, 51.6 ft-lb)
T2: 140 N·m (14.3 kgf-m, 103.3 ft-lb)
T3: 35 N·m (3.6 kgf-m, 25.8 ft-lb)



5) Remove the transmission jack.
6) Install the center exhaust cover.

Tightening torque:
18 N·m (1.8 kgf-m, 13.3 ft-lb)



7) Install the center exhaust pipe. <Ref. to EX(H4DO)-13, INSTALLATION, Center Exhaust Pipe.>
8) Lower the vehicle.
9) Connect the battery ground terminal.

C: INSPECTION

Check the following; repair or replace the faulty parts.

1. PITCHING STOPPER

Check the pitching stopper for bends or damage. Check that the rubber is not stiff, cracked or otherwise damaged.

2. CROSSMEMBER AND CUSHION RUBBER

Check the crossmember for bending or damage. Check that the cushion rubber does not have hardening, cracks or other damages.

5. Oil Seal

A: INSPECTION

Check for leakage of transmission gear oil from the oil seal. If there is oil leakage, replace the oil seal with the new part and check the propeller shaft.

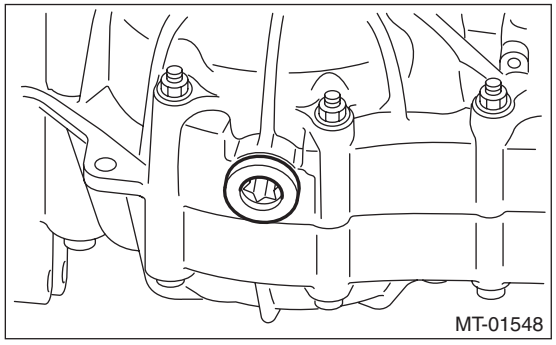
B: REPLACEMENT

1) Disconnect the ground cable from battery.
2) Lift up the vehicle.
3) Clean the transmission exterior.
4) Using the TORX® bit T70, remove the drain plug, and drain the transmission gear oil completely.

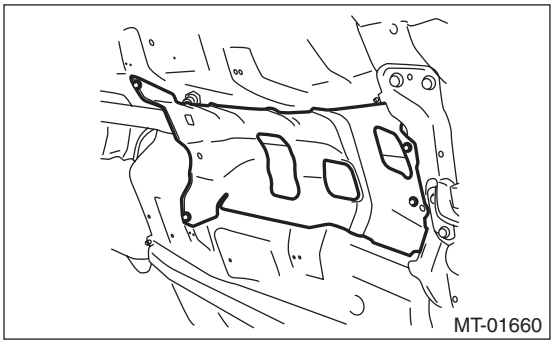
CAUTION:
• Immediately after the vehicle has been running or after idling for a long time, the transmission gear oil will be hot. Be careful not to receive burns.
• Be careful not to spill the transmission gear oil on the exhaust pipe, to prevent emission of smoke or causing a fire. If gear oil is spilled, wipe it off completely.
5) Tighten the drain plug using TORX® bit T70.

NOTE:
Use a new gasket.

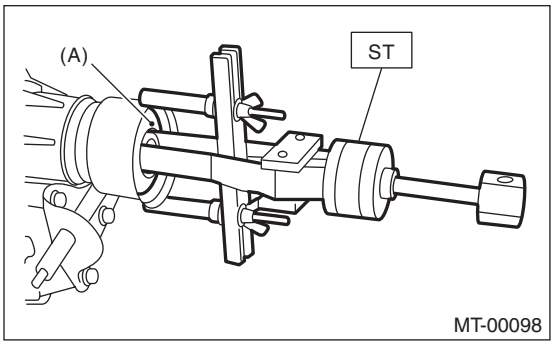
Tightening torque:
44 N·m (4.5 kgf-m, 32.5 ft-lb) (Aluminum gasket silver)
70 N·m (7.1 kgf-m, 51.6 ft-lb) (Copper gasket brown)
70 N·m (7.1 kgf-m, 51.6 ft-lb) (Metal gasket black)


MT-01548

6) Remove the rear exhaust pipe. <Ref. to EX(H4DO)-14, REMOVAL, Rear Exhaust Pipe.>
7) Remove the center exhaust cover.


MT-01660

8) Remove the propeller shaft. <Ref. to DS-10, REMOVAL, Propeller Shaft.>
9) Using the ST, remove the oil seal.
ST 398527700 PULLER ASSY

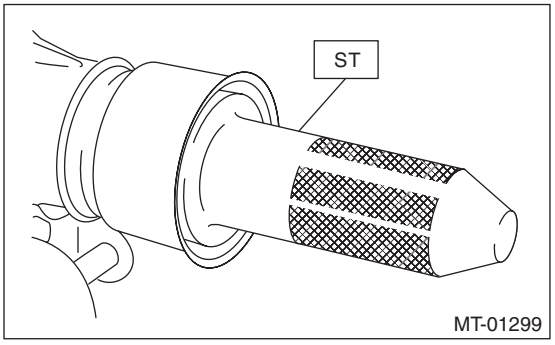


MT-00098

(A) Oil seal

10) Using the ST, install the oil seal.

NOTE:
• When grease is not applied to the oil seal lips, apply the transmission gear oil to the oil seal lips.
• Use a new oil seal.
ST 498057300 INSTALLER

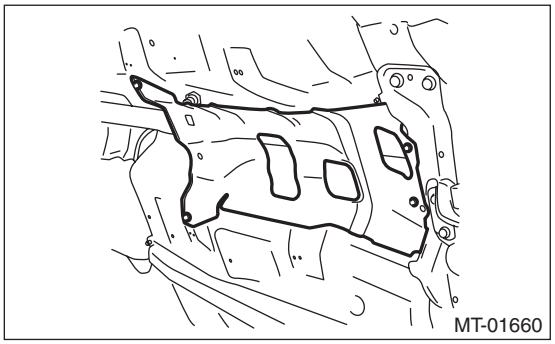


MT-01299

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

12) Install the center exhaust cover.

Tightening torque:
18 N·m (1.8 kgf-m, 13.3 ft-lb)



13) Install the rear exhaust pipe. <Ref. to EX(H4DO)-16, INSTALLATION, Rear Exhaust Pipe.>
14) Pour in transmission gear oil and check the oil level. <Ref. to 5MT-22, Transmission Gear Oil.>
15) Connect the battery ground terminal.

6. Differential Side Retainer Oil Seal

A: INSPECTION

Check for leakage of gear oil from differential side retainer oil seal part. If there is oil leakage, replace the oil seal with the new part and check the drive shaft.

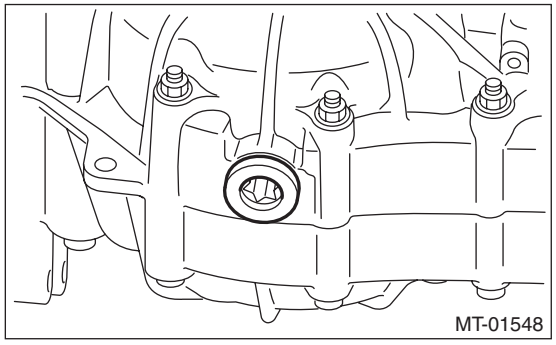
B: REPLACEMENT

1) Disconnect the ground cable from battery.
2) Lift up the vehicle.
3) Using the TORX® bit T70, remove the drain plug, and drain the transmission gear oil completely.

CAUTION:
• Immediately after the vehicle has been running or after idling for a long time, the transmission gear oil will be hot. Be careful not to receive burns.
• Be careful not to spill the transmission gear oil on the exhaust pipe, to prevent emission of smoke or causing a fire. If gear oil is spilled, wipe it off completely.
4) Tighten the drain plug using TORX® bit T70.

NOTE:
Use a new gasket.

Tightening torque:
44 N·m (4.5 kgf-m, 32.5 ft-lb) (Aluminum gasket silver)
70 N·m (7.1 kgf-m, 51.6 ft-lb) (Copper gasket brown)
70 N·m (7.1 kgf-m, 51.6 ft-lb) (Metal gasket black)

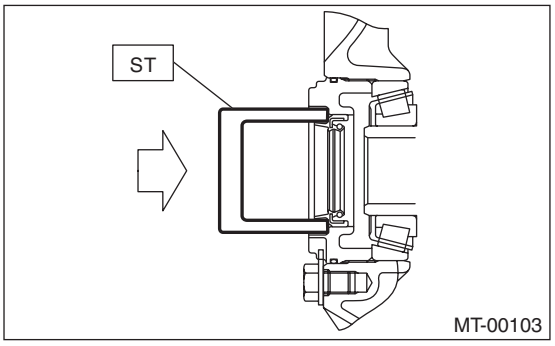


5) Remove the center exhaust pipe. <Ref. to EX(H4DO)-13, REMOVAL, Center Exhaust Pipe.>
6) Separate the front drive shaft from the transmission. <Ref. to DS-52, REMOVAL, Front Drive Shaft.>
7) Remove the differential side retainer oil seal.

NOTE:
• Be sure to replace the differential side retainer oil seal whenever the front drive shaft is removed from the transmission.
• Use the ST 398527700 PULLER ASSY to remove the oil seal. If removing the oil seal with a flat tip screwdriver, be careful not to scratch the differential side retainer.
8) Using the ST, install the differential side retainer oil seal by lightly tapping with a plastic hammer.

CAUTION:
• Apply transmission gear oil to the oil seal lips, and install the oil seal while being careful not to deform the lip.
• Check the identification marks (R, L) during the installation so as not to mix up the oil seal RH and LH.

NOTE:
Use a new oil seal.
ST 18675AA000 DIFFERENTIAL SIDE OIL SEAL INSTALLER



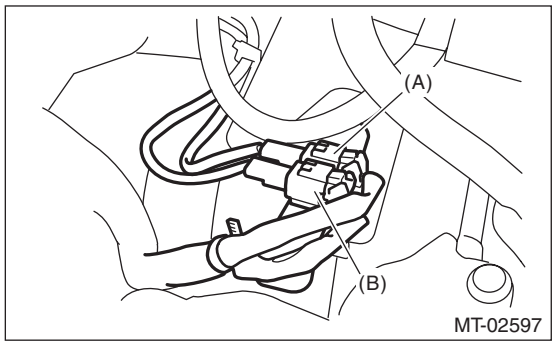
9) Install the front drive shaft. <Ref. to DS-53, INSTALLATION, Front Drive Shaft.>
ST 28399SA010 OIL SEAL PROTECTOR
10) Install the center exhaust pipe. <Ref. to EX(H4DO)-13, INSTALLATION, Center Exhaust Pipe.>
11) Lower the vehicle.
12) Pour in transmission gear oil and check the oil level. <Ref. to 5MT-22, REPLACEMENT, Transmission Gear Oil.>
13) Connect the battery ground terminal.

7. Switches and Harness

A: REMOVAL

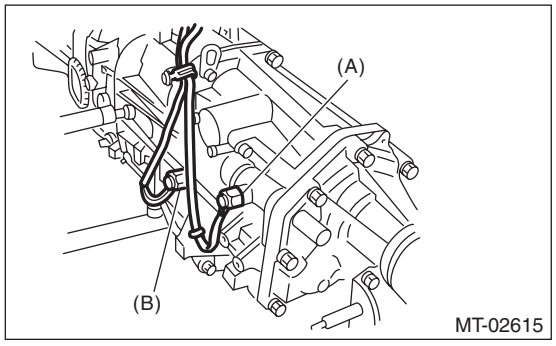
1. BACK-UP LIGHT AND NEUTRAL POSITION SWITCH

1) Disconnect the ground cable from battery.
2) Remove the air intake boot. <Ref. to IN(H4DO)-12, REMOVAL, Air Intake Boot.>
3) Disconnect the connector back-up light switch & neutral position switch.



(A) Neutral position switch connector (Brown)
(B) Back-up light switch connector (Gray)

4) Lift up the vehicle.
5) Remove the harness from each clip.
6) Remove the back-up light switch & neutral position switch with the harness.



(A) Neutral position switch
(B) Back-up light switch

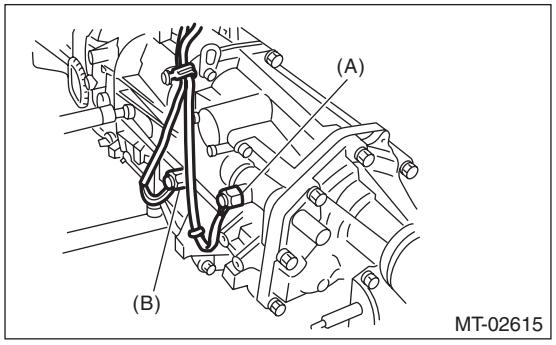
B: INSTALLATION

1. BACK-UP LIGHT AND NEUTRAL POSITION SWITCH

1) Install the back-up light switch & neutral position switch with the harness.

NOTE:
Use a new gasket.

Tightening torque:
32.3 N·m (3.3 kgf-m, 23.8 ft-lb)



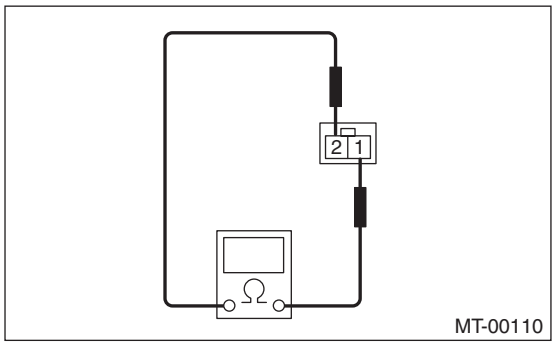
(A) Neutral position switch
(B) Back-up light switch

2) Secure the harness on each clip.
3) Connect the connectors of back-up light switch & neutral position switch.
4) Install the air intake boot. <Ref. to IN(H4DO)-12, INSTALLATION, Air Intake Boot.>
5) Connect the battery ground terminal.

C: INSPECTION

1. BACK-UP LIGHT SWITCH

1) Turn the ignition switch to OFF.
2) Disconnect the back light switch connector.
3) Measure the resistance between the back-up light switch terminals.

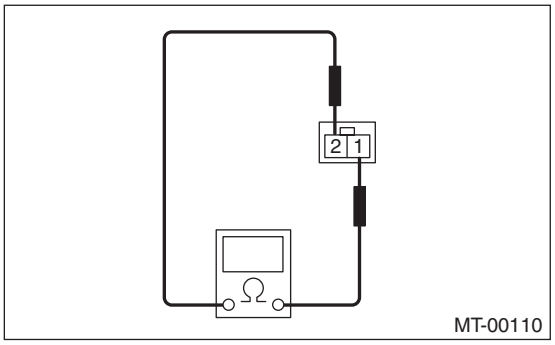


Gear shift position	Terminal No.	Specified resistance
Reverse position	1 and 2	Less than 1 Ω
Other positions		1 MΩ or more

4) Replace faulty parts.

2. NEUTRAL POSITION SWITCH

1) Turn the ignition switch to OFF.
2) Disconnect the connector of neutral position switch.
3) Measure the resistance between neutral position switch terminals.



Gear shift position	Terminal No.	Specified resistance
Neutral position	1 and 2	Less than 1 Ω
Other positions		1 MΩ or more

4) Replace faulty parts.

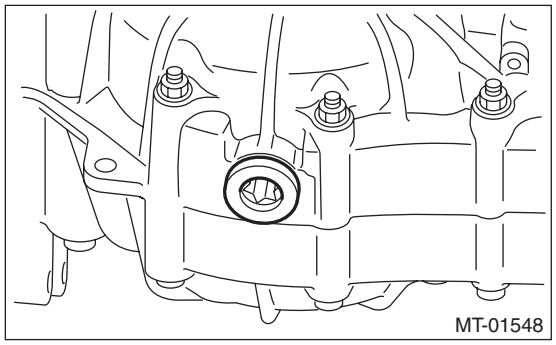
8. Preparation for Overhaul

A: PROCEDURE

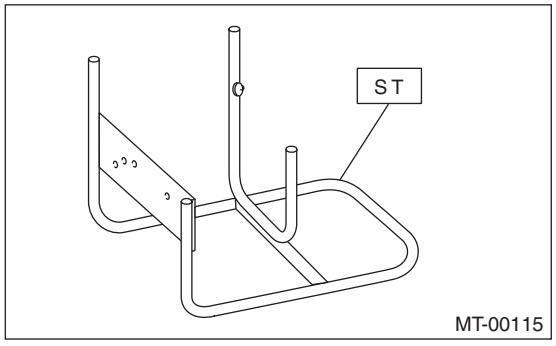
1) Clean oil, grease, dirt and dust from the transmission.
2) When gear oil remains in the transmission, use the TORX® bit T70 to remove the drain plug, and drain the transmission gear oil completely.
3) Tighten the drain plug using TORX® bit T70.

NOTE:
Use a new gasket.

Tightening torque:
44 N·m (4.5 kgf-m, 32.5 ft-lb) (Aluminum gasket silver)
70 N·m (7.1 kgf-m, 51.6 ft-lb) (Copper gasket brown)
70 N·m (7.1 kgf-m, 51.6 ft-lb) (Metal gasket black)



4) Attach the transmission to the ST.
ST 499937100 TRANSMISSION STAND

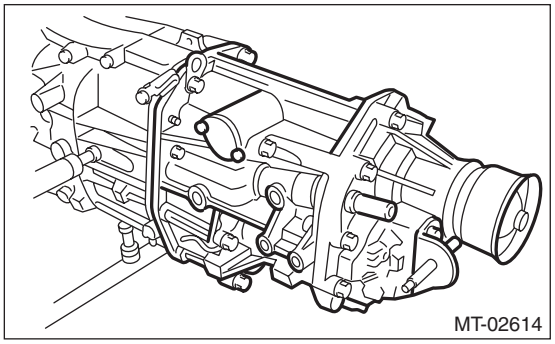


5) Apply oil to rotating parts before assembly.
6) All disassembled parts, if to be reused, should be reinstalled in the original positions and directions.
7) Gaskets, lock washers and lock nuts must be replaced with new ones.
8) Apply liquid gasket to the specified areas to prevent leakage.

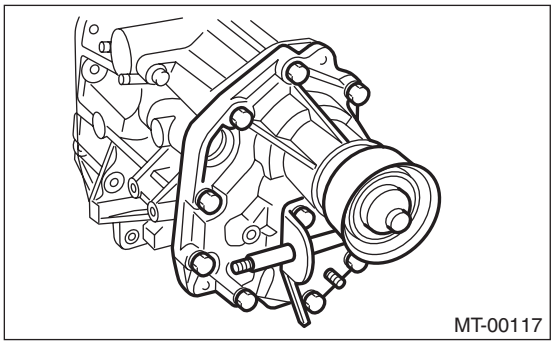
9. Transfer Case and Extension Case Assembly

A: REMOVAL

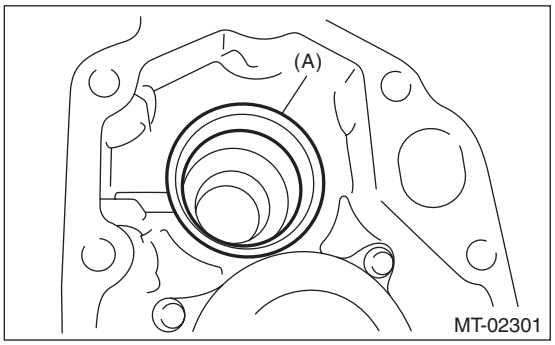
1) Remove the manual transmission assembly from the vehicle. <Ref. to 5MT-23, REMOVAL, Manual Transmission Assembly.>
2) Remove the back-up light switch and the neutral position switch. <Ref. to 5MT-35, REMOVAL, Switches and Harness.>
3) Remove the transfer case together with the extension case assembly.


MT-02614

4) Remove the gasket.
5) Remove the shifter arm.
6) Remove the extension case assembly.


MT-00117

7) Remove the transfer driven gear.
8) Remove the bearing outer race and thrust washer from the extension case.

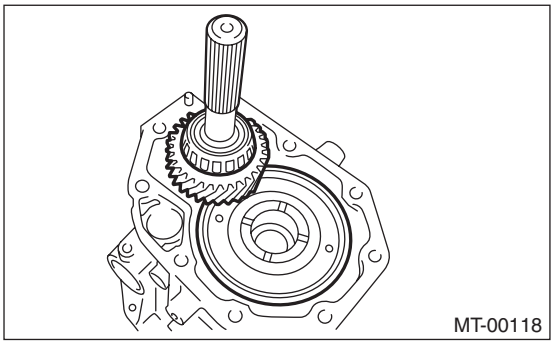


MT-02301

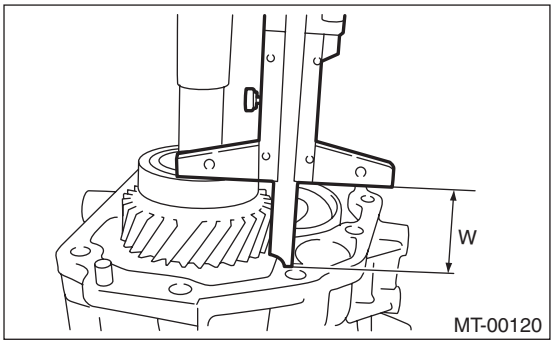
(A) Bearing outer race

B: INSTALLATION

1) Clean the mating surfaces of the transmission case, transfer case and extension case.
2) Install the center differential and transfer driven gear into the transfer case.


MT-00118

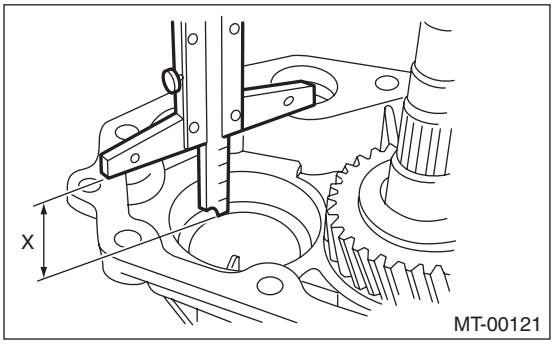
3) Install the bearing outer race to transfer driven gear.
4) While pressing the bearing outer race horizontally, rotate the driven shaft for ten turns.
5) Measure the height “W” between transfer case and taper roller bearing on the transfer driven gear.



MT-00120

6) Measure depth “X” of bearing insertion part of the extension case.

NOTE:
Measure with bearing outer race and thrust washer removed.



MT-00121

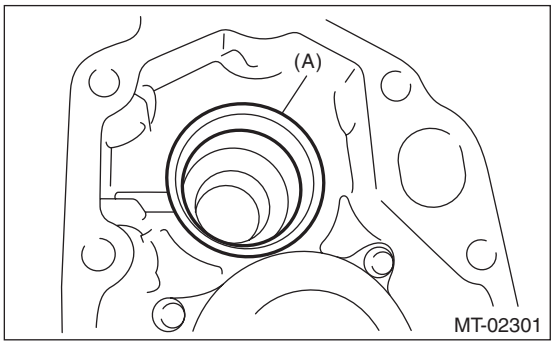
7) Calculate the thrust washer thickness "t" using the following calculation.
t = X – W + (0.15 — 0.20 mm (0.006 — 0.008 in))
X: Depth of bearing insertion part of the extension case
W: Height between transfer case and taper roller bearing on the transfer driven gear.
0.15 — 0.20 mm (0.006 — 0.008 in): Amount of standard protrusion
8) Select the washer with the nearest value in the following table.

NOTE:
Be sure that it is always within the preload.

Preload of the taper roller bearing (amount of standard protrusion):
0.15 — 0.20 mm (0.006 — 0.008 in)

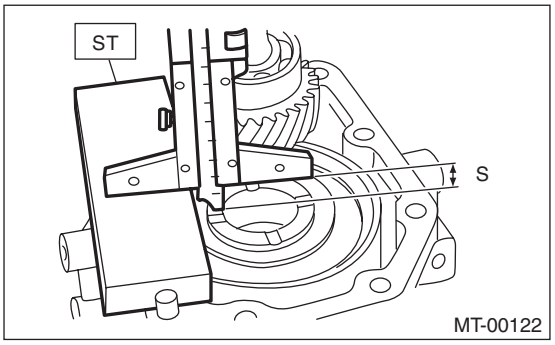
Thrust washer (61 × 50 × t)	
Part No.	Thickness mm (in)
803050060	0.50 (0.0197)
803050061	0.55 (0.0217)
803050062	0.60 (0.0236)
803050063	0.65 (0.0256)
803050064	0.70 (0.0276)
803050065	0.75 (0.0295)
803050066	0.80 (0.0315)
803050067	0.85 (0.0335)
803050068	0.90 (0.0354)
803050069	0.95 (0.0374)
803050070	1.00 (0.0394)
803050071	1.05 (0.0413)
803050072	1.10 (0.0433)
803050073	1.15 (0.0453)
803050074	1.20 (0.0472)
803050075	1.25 (0.0492)
803050076	1.30 (0.0512)
803050077	1.35 (0.0531)
803050078	1.40 (0.0551)
803050079	1.45 (0.0571)

9) Install the selected thrust washer and bearing outer race into the extension case.

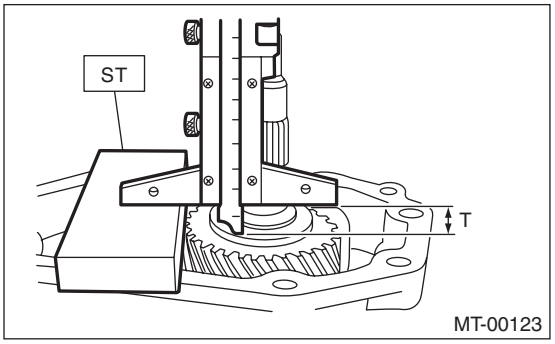


(A) Bearing outer race

10) Measure the depth "S" between transfer case and center differential.
ST 398643600 GAUGE



11) Measure the height "T" between the extension case and transfer drive gear.
ST 398643600 GAUGE



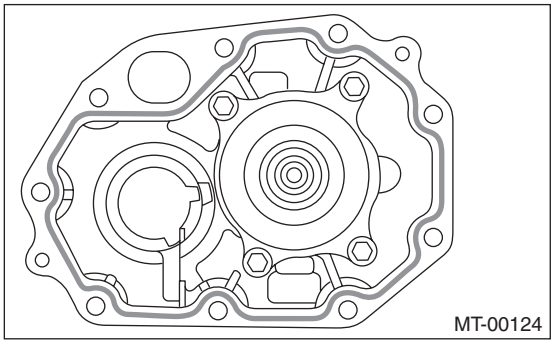
12) Calculate the thrust washer thickness "U" using the following calculation.
U = S + T – 30 mm (1.18 in) – (0.15 — 0.35 mm (0.0059 — 0.0138 in))
S: Depth between transfer case and center differential
T: Height between the extension case and transfer gear
30 mm (1.18 in): Thickness of ST
0.15 — 0.35 mm (0.0059 — 0.0138 in): Clearance
13) Select a suitable washer in the following table.

Clearance:
0.15 — 0.35 mm (0.0059 — 0.0138 in)

Thrust washer	
Part No.	Thickness mm (in)
803036050	0.9 (0.035)
803036054	1.0 (0.039)
803036051	1.1 (0.043)
803036055	1.2 (0.047)
803036052	1.3 (0.051)
803036056	1.4 (0.055)
803036053	1.5 (0.059)
803036057	1.6 (0.063)
803036058	1.7 (0.067)
803036080	1.8 (0.071)
803036081	1.9 (0.075)

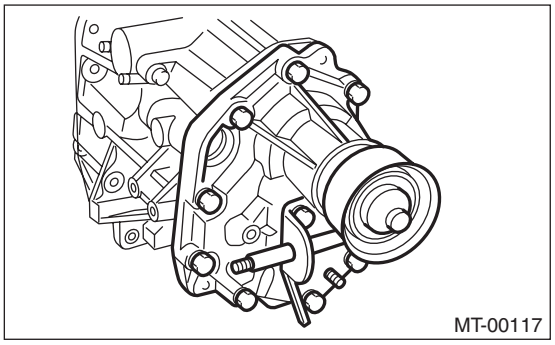
14) Install the selected thrust washer to center differential.
15) Apply a proper amount of liquid gasket to the transfer case mating surface.

Liquid gasket:
THREE BOND 1215 (Part No. 004403007) or equivalent


MT-00124

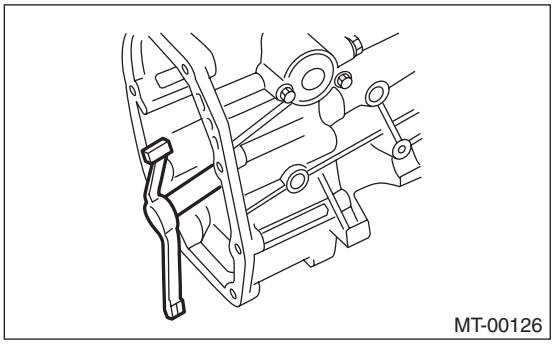
16) Install the extension case assembly to the transfer case.

Tightening torque:
40 N·m (4.1 kgf-m, 29.5 ft-lb)


MT-00117

17) Attach the shifter arm to transfer case.

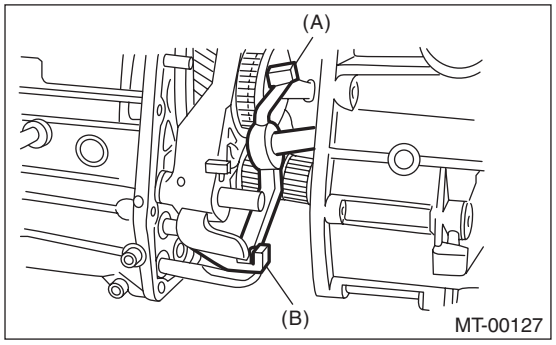
NOTE:
Apply gear oil to the oil seal lips.


MT-00126

18) Attach the gasket.

NOTE:
Use a new gasket.

19) Hang the shifter arm on 3rd-4th fork rod.

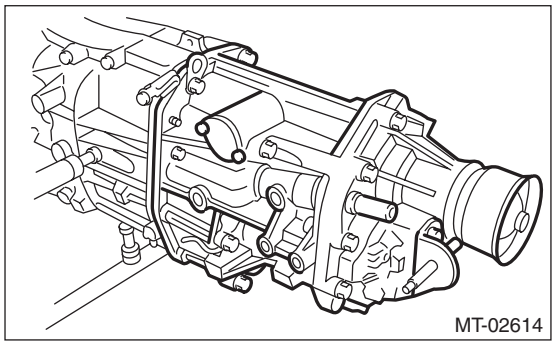


MT-00127

(A) Shifter arm
(B) 3rd-4th fork rod

20) Install the extension case assembly along with the transfer case to the transmission case.

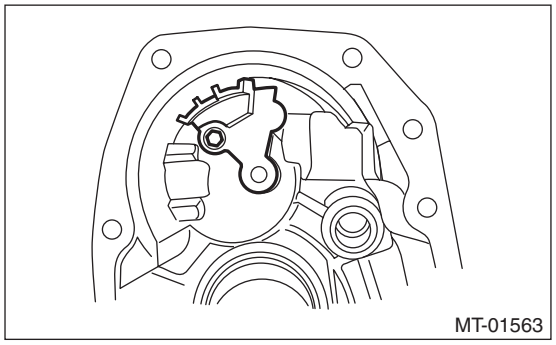
Tightening torque:
24.5 N·m (2.5 kgf-m, 18.1 ft-lb)


MT-02614

C: DISASSEMBLY

1. TRANSFER CASE

1) Remove the reverse check sleeve assembly. <Ref. to 5MT-49, REMOVAL, Reverse Check Sleeve.>
2) Remove the oil guide.

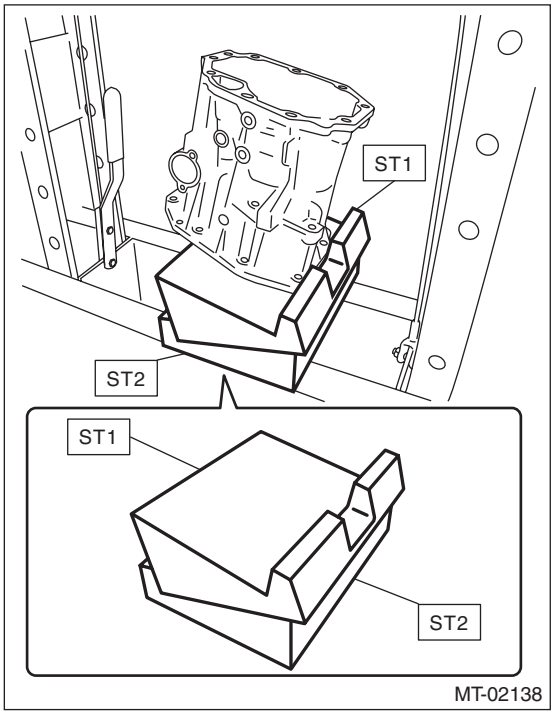

MT-01563

3) Remove the oil seal.

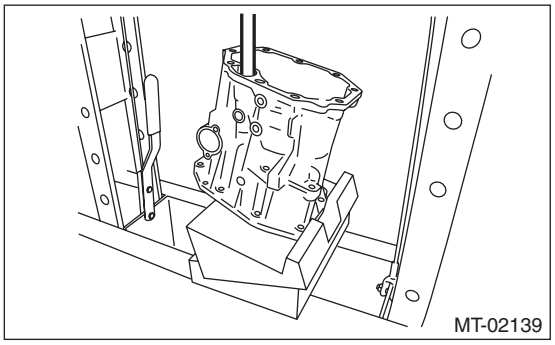
4) Set ST1, ST2 and transfer case to a press.

NOTE:
• Set the ST2 under ST1.
• Set the transfer case so that the hole for shifter arm is positioned vertically.

ST1 498267300 CYLINDER HEAD TABLE
ST2 498267200 CYLINDER HEAD TABLE



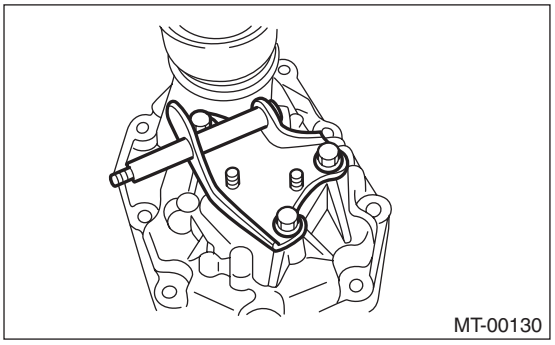
5) Using the round bar with diameter of 22 mm (0.87 in) or 23 mm (0.91 in), remove the roller bearing.



2. EXTENSION CASE

1) Remove the transfer drive gear assembly. <Ref. to 5MT-44, REMOVAL, Transfer Drive Gear.>

2) Remove the shift bracket.



3) Remove the oil seal from the extension case. <Ref. to 5MT-32, Oil Seal.>

D: ASSEMBLY

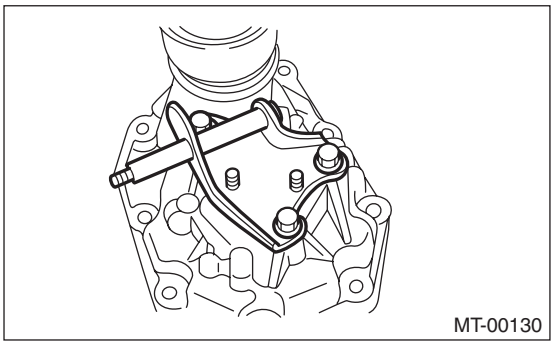
1. EXTENSION CASE

1) Using the ST, install the oil seal to the extension case. <Ref. to 5MT-32, Oil Seal.>

NOTE:
Use a new oil seal.

2) Install the shift bracket to extension case.

Tightening torque:
24.5 N·m (2.5 kgf-m, 18.1 ft-lb)



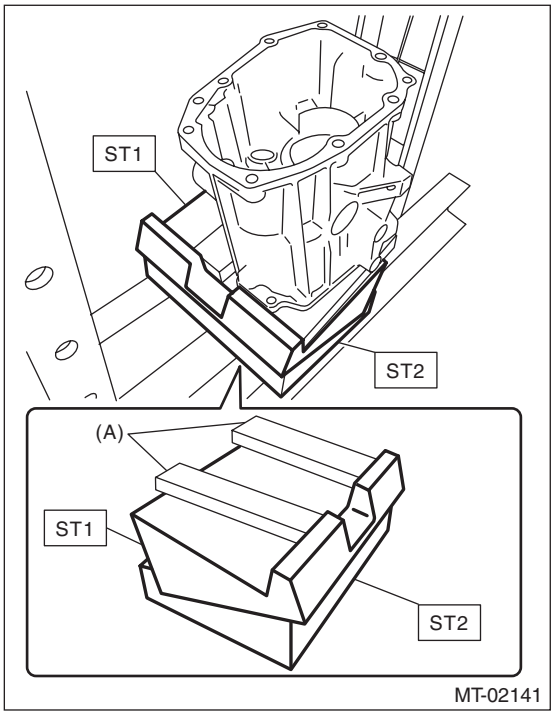
3) Install the transfer drive gear to the extension case. <Ref. to 5MT-44, INSTALLATION, Transfer Drive Gear.>

2. TRANSFER CASE

1) Set the ST1, ST2, iron plate and the transfer case to the press.

NOTE:
- Set the ST2 under ST1.
- Set the transfer case so that the hole for shifter arm is positioned vertically.
- Insert the iron plate which is thicker than the exposed length of the transfer case knock pin between the ST and transfer case.
- Set the iron plate so that the transfer case knock pin does not ride on the iron plate.

ST1 498267300 CYLINDER HEAD TABLE
ST2 498267200 CYLINDER HEAD TABLE

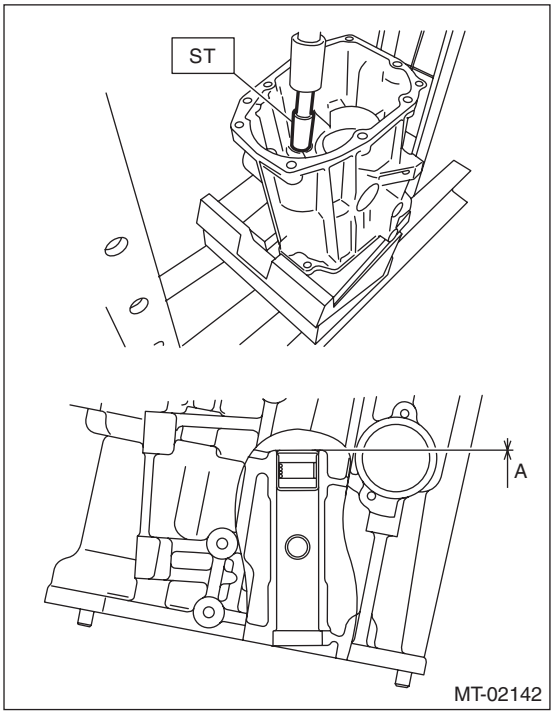


(A) Iron plate

2) Press-fit the roller bearing using the ST.

Press-fit depth of roller bearing:
A: 0±0.2 mm (0±0.01 in) from the end of transfer case

ST 899864100 REMOVER



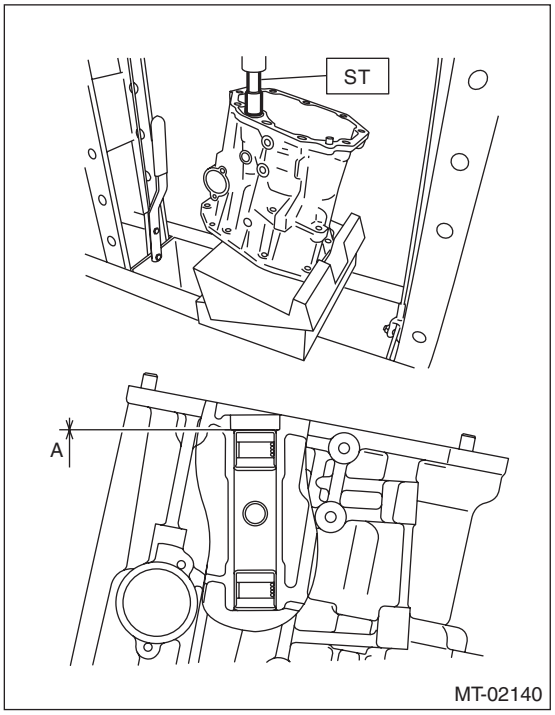
3) Remove the iron plate, and turn over the transfer case.

NOTE:
Set the transfer case so that the hole for shifter arm is positioned vertically.

4) Press-fit the roller bearing using the ST.

Press-fit depth of roller bearing:
A: 0±0.2 mm (0±0.01 in) from the end of transfer case

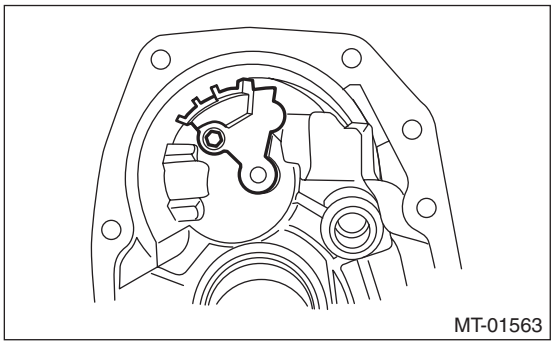
ST 899864100 REMOVER



5) Install the shifter arm to the transfer case, and make sure that the shift arm moves smoothly.
6) Install the oil guide to the transfer case.

NOTE:
Use a new installing bolt.

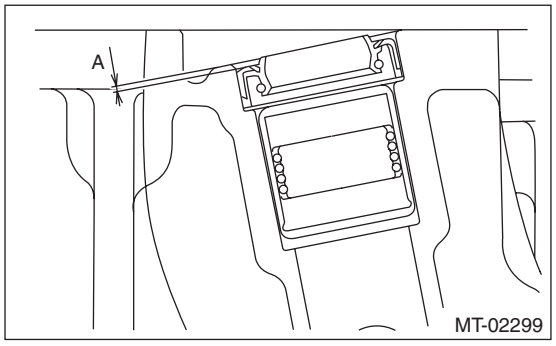
Tightening torque:
6.4 N·m (0.7 kgf-m, 4.7 ft-lb)



7) Install the reverse check sleeve assembly to the transfer case. <Ref. to 5MT-49, INSTALLATION, Reverse Check Sleeve.>

8) Install the oil seal.

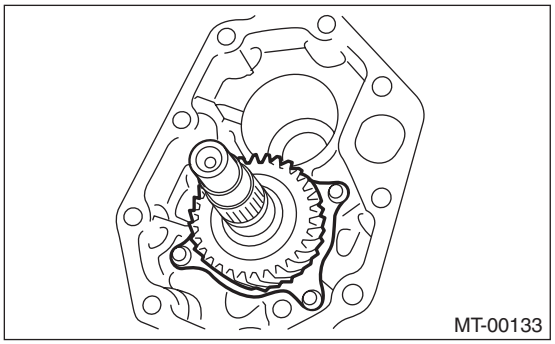
Press-fit depth of oil seal:
A: 1±0.2 mm (0.04±0.01 in) from the end of transfer case



10.Transfer Drive Gear

A: REMOVAL

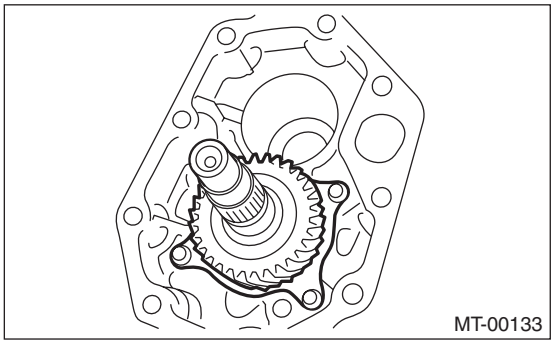
1) Remove the manual transmission assembly from the vehicle. <Ref. to 5MT-23, REMOVAL, Manual Transmission Assembly.>
2) Remove the back-up light switch and the neutral position switch. <Ref. to 5MT-35, REMOVAL, Switches and Harness.>
3) Remove the transfer case together with the extension case assembly. <Ref. to 5MT-38, REMOVAL, Transfer Case and Extension Case Assembly.>
4) Remove the extension case assembly.
5) Remove the transfer driven gear.
6) Remove the transfer drive gear.


MT-00133

B: INSTALLATION

1) Install the transfer drive gear.

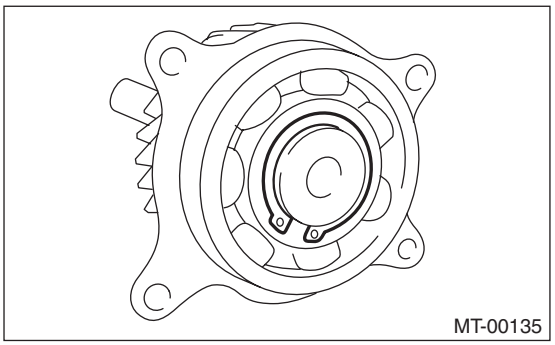
Tightening torque:
26 N·m (2.7 kgf-m, 19.2 ft-lb)


MT-00133

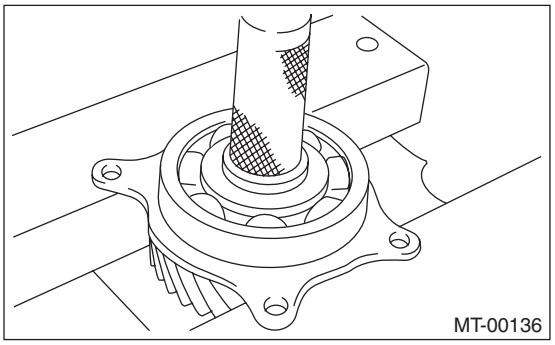
2) Select a thrust washer. <Ref. to 5MT-38, INSTALLATION, Transfer Case and Extension Case Assembly.>
3) Install the transfer driven gear.
4) Install the extension case assembly. <Ref. to 5MT-38, INSTALLATION, Transfer Case and Extension Case Assembly.>
5) Install the transfer case and the extension case assembly. <Ref. to 5MT-38, INSTALLATION, Transfer Case and Extension Case Assembly.>
6) Install the back-up light switch and the neutral position switch. <Ref. to 5MT-35, INSTALLATION, Switches and Harness.>
7) Install the manual transmission assembly to the vehicle. <Ref. to 5MT-26, INSTALLATION, Manual Transmission Assembly.>

C: DISASSEMBLY

1) Remove the snap ring.


MT-00135

2) Remove the ball bearing.

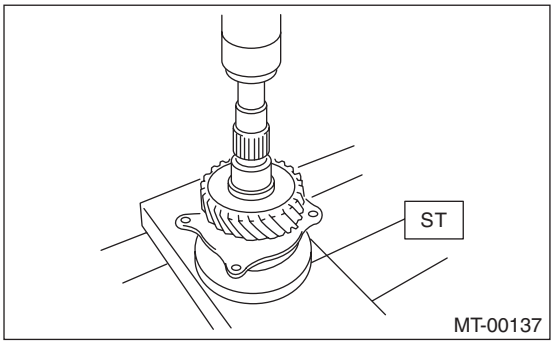

MT-00136

D: ASSEMBLY

1) Set the ST against the inner race of the bearing, and install the drive shaft.

CAUTION:
Do not apply a load in excess of 10 kN (1 ton, 1.1 US ton, 1.0 Imp ton).

NOTE:
Use a new ball bearing.
ST 398177700 INSTALLER



MT-00137

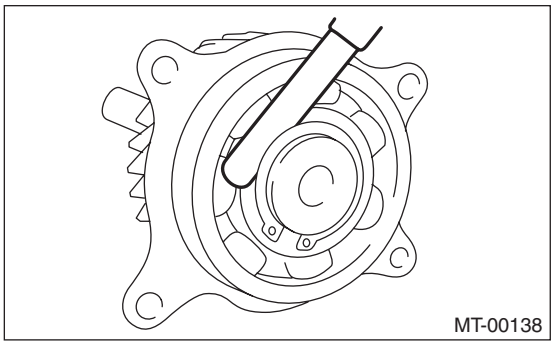
2) Install the snap ring on the transfer drive shaft.
3) Inspect the clearance between the snap ring and the ball bearing. <Ref. to 5MT-45, INSPECTION, Transfer Drive Gear.>

E: INSPECTION

1) Bearing
Replace the bearings in the following cases.
- In case of broken or rusty bearings
- In case of worn or damaged bearings
- When the bearings fail to turn smoothly or emit noise in rotation after gear oil lubrication.

2) Drive gear
If the drive gear tooth surface and shaft are excessively broken or damaged, replace the drive gear.
3) Measure the clearance between snap ring and inner race of ball bearing with a thickness gauge.

Clearance:
0.01 — 0.15 mm (0.0004 — 0.0059 in)



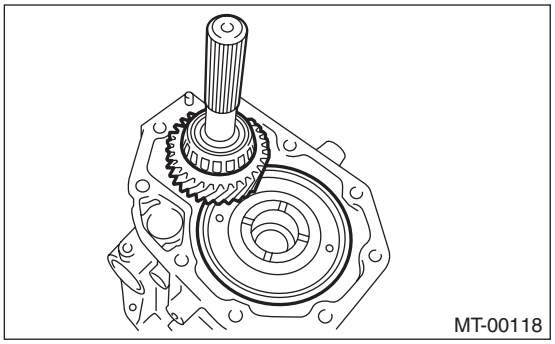
If the measurement is not within specification, select a suitable snap ring and replace it.

Snap ring (outer-30)	
Part No.	Thickness mm (in)
805030041	1.53 (0.0602)
805030042	1.65 (0.0650)
805030043	1.77 (0.0697)

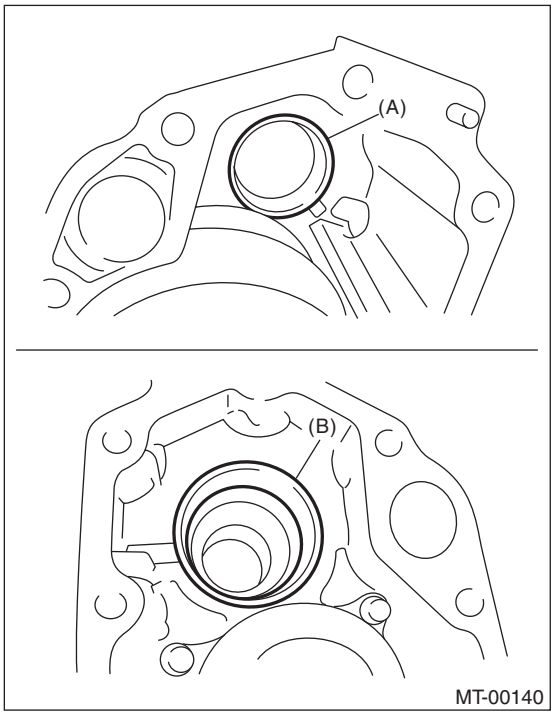
11.Transfer Driven Gear

A: REMOVAL

1) Remove the manual transmission assembly from the vehicle. <Ref. to 5MT-23, REMOVAL, Manual Transmission Assembly.>
2) Remove the back-up light switch and the neutral position switch. <Ref. to 5MT-35, REMOVAL, Switches and Harness.>
3) Remove the transfer case together with the extension case assembly. <Ref. to 5MT-38, REMOVAL, Transfer Case and Extension Case Assembly.>
4) Remove the extension case assembly.
5) Remove the transfer driven gear.



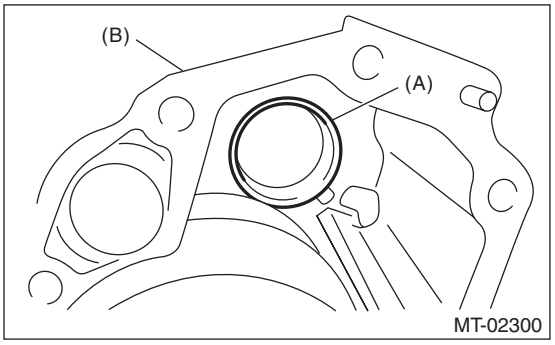
6) Remove bearing outer races from the extension case and transfer case.



(A) Bearing outer race (Transfer case side)
(B) Bearing outer race (Extension case side)

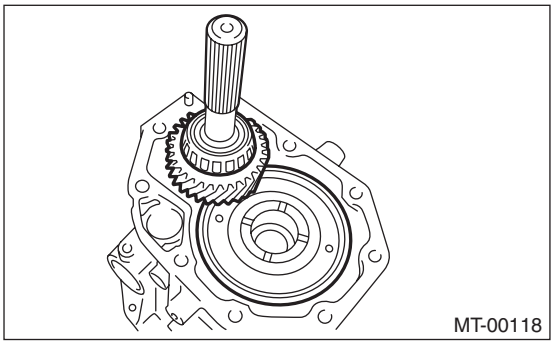
B: INSTALLATION

1) Install the bearing outer race to transfer case.



(A) Bearing outer race
(B) Transfer case

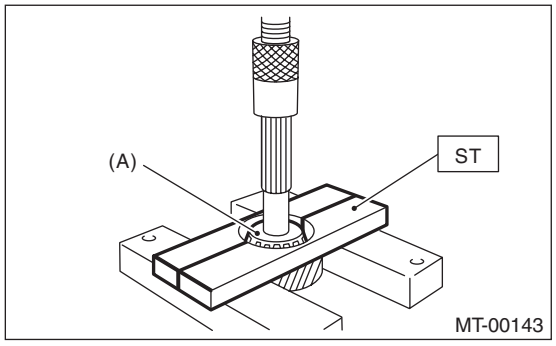
2) Install the transfer driven gear.



3) Select a thrust washer. <Ref. to 5MT-38, INSTALLATION, Transfer Case and Extension Case Assembly.>
4) Install the transfer case and the extension case assembly. <Ref. to 5MT-38, INSTALLATION, Transfer Case and Extension Case Assembly.>
5) Install the back-up light switch and the neutral position switch. <Ref. to 5MT-35, INSTALLATION, Switches and Harness.>
6) Install the manual transmission assembly to the vehicle. <Ref. to 5MT-26, INSTALLATION, Manual Transmission Assembly.>

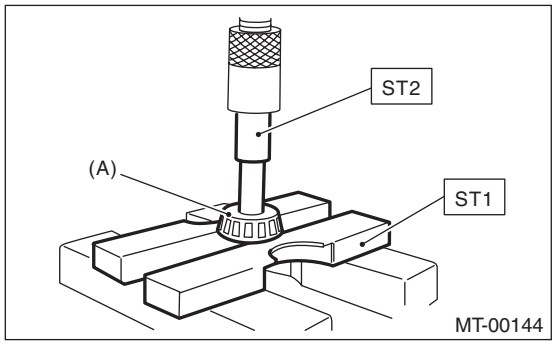
C: DISASSEMBLY

1) Using the ST, remove the roller bearing (extension case side).
ST 498077000 REMOVER



(A) Roller bearing

2) Using ST1 and ST2, remove the roller bearing (transfer case side).
ST1 498077000 REMOVER
ST2 899864100 REMOVER

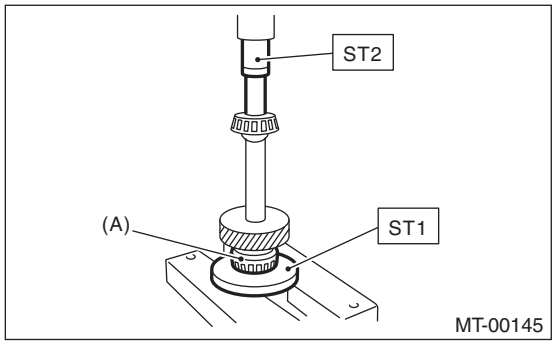


(A) Roller bearing

D: ASSEMBLY

1) Using the ST, install the roller bearing (extension case side).

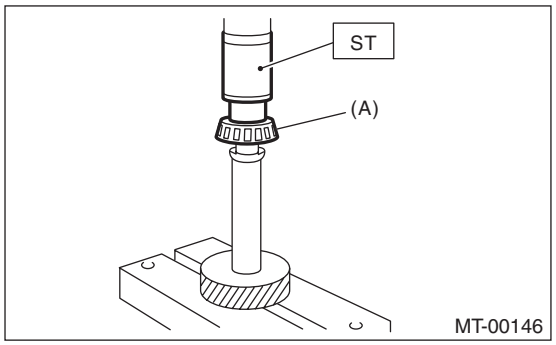
CAUTION:
Do not apply a load in excess of 10 kN (1 ton, 1.1 US ton, 1.0 Imp ton).
ST1 398177700 INSTALLER
ST2 899864100 REMOVER



(A) Roller bearing

2) Using ST, install the roller bearing (transfer case side).
ST 499757002 INSTALLER

CAUTION:
Do not apply a load in excess of 10 kN (1 ton, 1.1 US ton, 1.0 Imp ton).



(A) Roller bearing

E: INSPECTION

1) Bearing
Replace the bearings in the following cases.
- In case of broken or rusty bearings
- In case of worn or damaged bearings
- When the bearings fail to turn smoothly or emit noise in rotation after gear oil lubrication.

2) Driven gear
If the tooth face of driven gear and the shaft are excessively broken or damaged, replace the driven gear.

12.Center Differential

A: REMOVAL

1) Remove the manual transmission assembly from the vehicle. <Ref. to 5MT-23, REMOVAL, Manual Transmission Assembly.>
2) Remove the back-up light switch and the neutral position switch. <Ref. to 5MT-35, REMOVAL, Switches and Harness.>
3) Remove the transfer case together with the extension case assembly. <Ref. to 5MT-38, REMOVAL, Transfer Case and Extension Case Assembly.>
4) Remove the extension case assembly. <Ref. to 5MT-38, REMOVAL, Transfer Case and Extension Case Assembly.>
5) Remove the transfer driven gear. <Ref. to 5MT-46, REMOVAL, Transfer Driven Gear.>
6) Remove the center differential.

B: INSTALLATION

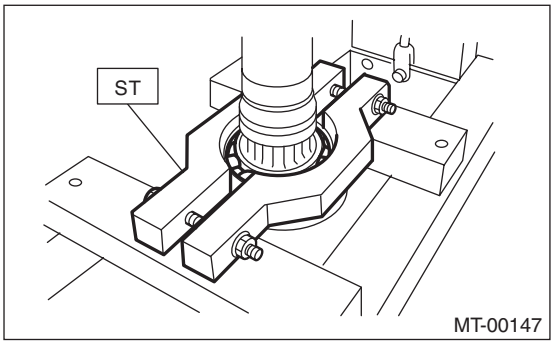
1) Attach the center differential to transfer case.
2) Install the transfer driven gear. <Ref. to 5MT-46, INSTALLATION, Transfer Driven Gear.>
3) Install the extension case assembly. <Ref. to 5MT-38, INSTALLATION, Transfer Case and Extension Case Assembly.>
4) Install the transfer case together with the extension case assembly. <Ref. to 5MT-38, INSTALLATION, Transfer Case and Extension Case Assembly.>
5) Install the back-up light switch and the neutral position switch. <Ref. to 5MT-35, INSTALLATION, Switches and Harness.>
6) Install the manual transmission assembly to the vehicle. <Ref. to 5MT-26, INSTALLATION, Manual Transmission Assembly.>

C: DISASSEMBLY

Remove the ball bearing using ST.

NOTE:
• Center differential is a non-disassembled part which should not be disassembled.
• Do not reuse the ball bearing.

ST 498077300 CENTER DIFFERENTIAL BEARING REMOVER

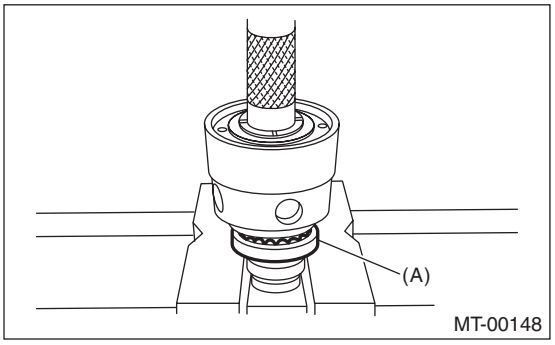


D: ASSEMBLY

Install the ball bearing to the center differential assembly.

CAUTION:
Do not apply a load in excess of 10 kN (1 ton, 1.1 US ton, 1.0 Imp ton).

NOTE:
Use a new ball bearing.



(A) Ball bearing

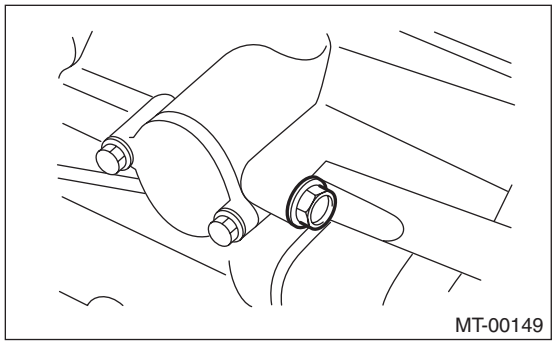
E: INSPECTION

1) Bearing
Replace the bearings in the following cases.
• In case of broken or rusty bearings
• In case of worn or damaged bearings
• When the bearings fail to turn smoothly or emit noise in rotation after gear oil lubrication.
• When bearing has other defects.
2) Center differential
If there is wear or damage, replace the center differential case assembly.

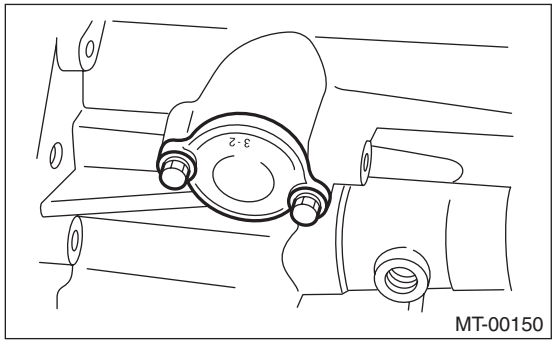
13.Reverse Check Sleeve

A: REMOVAL

1) Remove the manual transmission assembly from the vehicle. <Ref. to 5MT-23, REMOVAL, Manual Transmission Assembly.>
2) Remove the transfer case together with the extension case assembly. <Ref. to 5MT-38, REMOVAL, Transfer Case and Extension Case Assembly.>
3) Remove the plug, gasket, reverse accent spring, and reverse check ball.


MT-00149

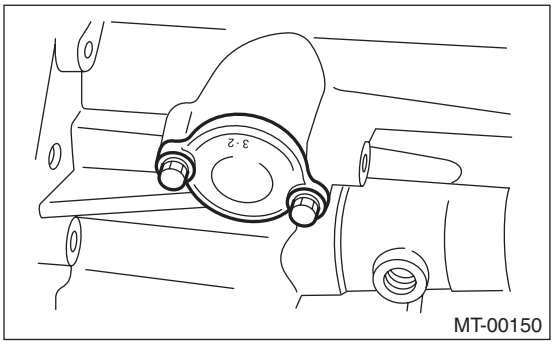
4) Remove the reverse check sleeve.


MT-00150

B: INSTALLATION

1) Install the reverse check sleeve.

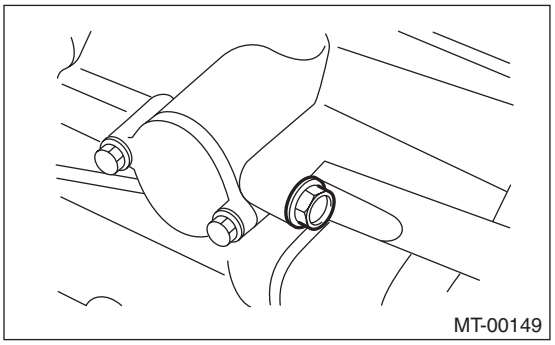
Tightening torque:
6.4 N·m (0.7 kgf-m, 4.7 ft-lb)


MT-00150

2) Install the reverse check ball, reverse accent spring, gasket, and plug to the transfer case.

NOTE:
Use a new gasket.

Tightening torque:
9.75 N·m (1.0 kgf-m, 7.2 ft-lb)

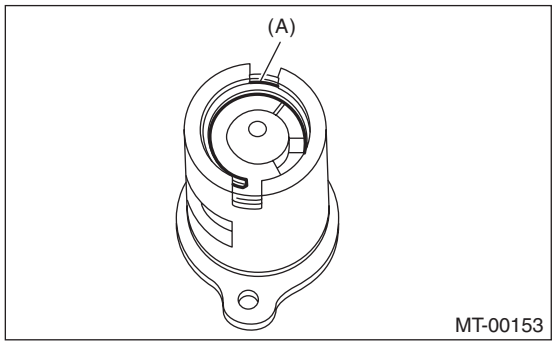

MT-00149

3) Install the transfer case together with the extension case assembly. <Ref. to 5MT-38, INSTALLATION, Transfer Case and Extension Case Assembly.>
4) Install the manual transmission assembly to the vehicle. <Ref. to 5MT-26, INSTALLATION, Manual Transmission Assembly.>

C: DISASSEMBLY

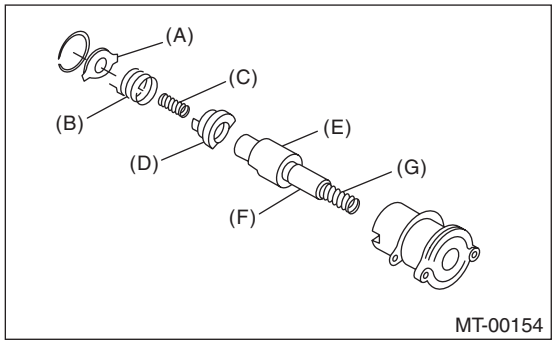
1) Cover the reverse check sleeve with cloth, and remove the snap ring by using screwdriver.

NOTE:
If the snap ring is deformed or the spring repulsive force is not enough, replace with a new snap ring.



(A) Snap ring

2) Remove the reverse check plate, reverse check spring, reverse check cam, return spring (5th-Reverse), reverse accent shaft, return spring cap, and return spring (1st-2nd).



(A) Reverse check plate
(B) Reverse check spring
(C) Return spring (5th-Reverse)
(D) Reverse check cam
(E) Reverse accent shaft
(F) Return spring cap
(G) Return spring (1st-2nd)

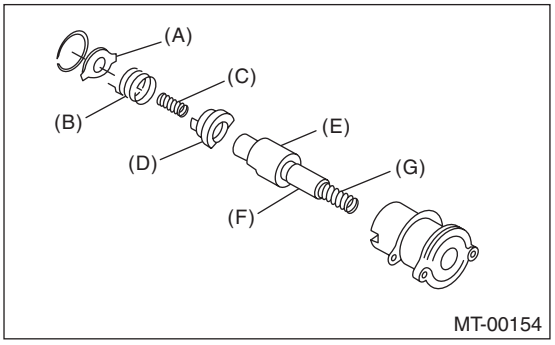
3) Remove the O-ring.

NOTE:
- Do not reuse the O-ring.
- Be careful not to damage the adjusting shim between reverse check sleeve assembly and case.

D: ASSEMBLY

1) Install the return spring (1st-2nd), return spring cap, reverse accent shaft, reverse check cam, return spring (5th-Reverse) and reverse check spring to the reverse check sleeve.

NOTE:
Be sure to insert the curved part of reverse check spring into the check cam groove.



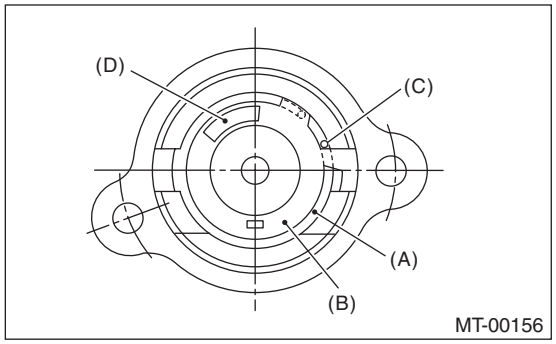
(A) Reverse check plate
(B) Reverse check spring
(C) Return spring (5th-Reverse)
(D) Reverse check cam
(E) Reverse accent shaft
(F) Return spring cap
(G) Return spring (1st-2nd)

2) Hook the curved part of reverse check spring onto the reverse check plate.
3) Rotate the cam so that the protrusion on the reverse check cam is located at the plate opening.
4) While fixing the cam to that position, attach the reverse check plate to the reverse check sleeve, and secure with snap ring.
5) Insert the O-ring into the sleeve groove.

NOTE:
Use new O-rings.

E: INSPECTION

• Make sure the cutout of the reverse accent shaft is aligned with the opening in the reverse check sleeve.
• Turn the cam by hand to check for smooth rotation.
• Move the cam and shaft all the way toward the plate, and make sure it releases.
If the cam does not return properly, replace the reverse check spring. If the shaft does not return, check for scratches on the inner surface of sleeve. If the sleeve is in good order, replace the spring.



(A) Snap ring
(B) Reverse check plate
(C) Reverse check spring
(D) Reverse check cam

• Select a suitable reverse accent shaft and reverse check plate. <Ref. to 5MT-51, ADJUSTMENT, Reverse Check Sleeve.>

F: ADJUSTMENT

1. NEUTRAL POSITION ADJUSTMENT

1) Shift the gear into 3rd gear position.
2) Because of the return spring, until the arm contacts the stopper the shifter arm will feel lighter moving towards 1st/2nd gear and heavier towards the reverse gear.
3) Make adjustment so that the heavy stroke (reverse side) is a little heavier than the lighter stroke (1st/2nd side).
4) To adjust, remove the bolts holding the reverse check sleeve assembly to the case, and move the sleeve assembly outward, then place an adjustment shim between the sleeve assembly and the case to adjust the clearance.

CAUTION:
Be careful not to damage the O-ring when placing shims.

NOTE:
• When the shim is removed, the neutral position will move closer to reverse; when the shim is added, the neutral position will move closer to 1st gear.
• If it is not possible to adjust the clearance with only shims, replace the reverse accent shaft and re-adjust.

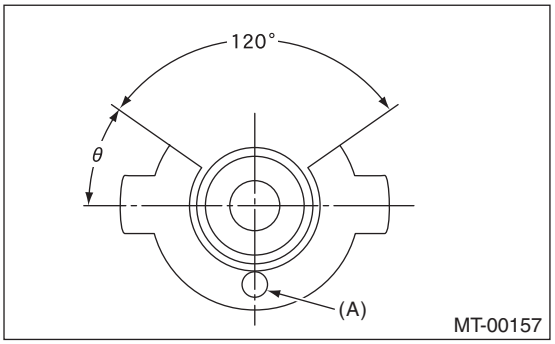
Adjusting shim	
Part No.	Thickness mm (in)
32190AA000	0.15 (0.0059)
32190AA010	0.30 (0.0118)

Reverse accent shaft		
Part No.	Mark	Remarks
32188AA130	S	Neutral position is closer to 1st gear.
32188AA140	T	Standard
32188AA150	U	Neutral position is closer to reverse gear.

2. REVERSE CHECK PLATE ADJUSTMENT

1) Shift the shifter arm to “5th” and then to reverse to see if the reverse check mechanism operates properly.
2) Also check to see if the arm returns to neutral when released from the reverse position. If the arm does not return properly, replace the reverse check plate.

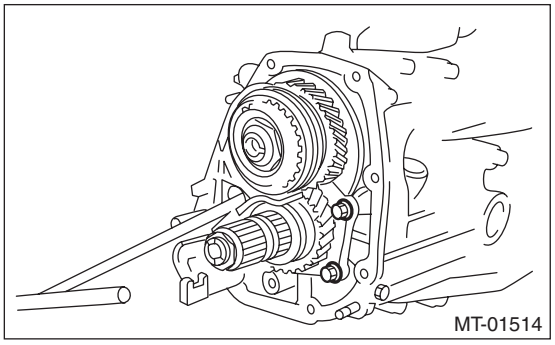
Reverse check plate			
Part No.	(A): No.	Angle θ	Content
32189AA001	0	28°	Arm stops closer to 5th gear.
32189AA011	1	31°	Arm stops closer to 5th gear.
32189AA021	2	34°	Arm stops in the center.
32189AA031	3	37°	Arm stops closer to reverse gear.
32189AA041	4	40°	Arm stops closer to reverse gear.



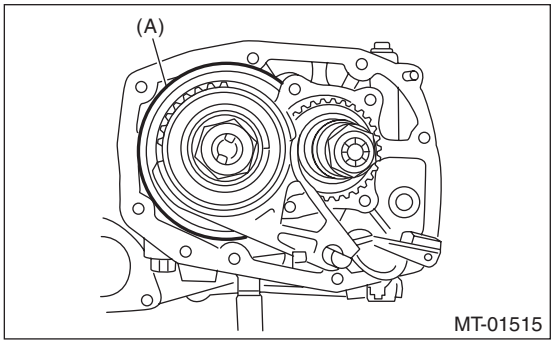
14.Transmission Case

A: REMOVAL

1) Remove the manual transmission assembly from the vehicle. <Ref. to 5MT-23, REMOVAL, Manual Transmission Assembly.>
2) Remove the clutch release lever. <Ref. to CL-14, REMOVAL, Release Bearing and Lever.>
3) Remove the transfer case together with the extension case assembly. <Ref. to 5MT-38, REMOVAL, Transfer Case and Extension Case Assembly.>
4) Remove the bearing mounting bolt.


MT-01514

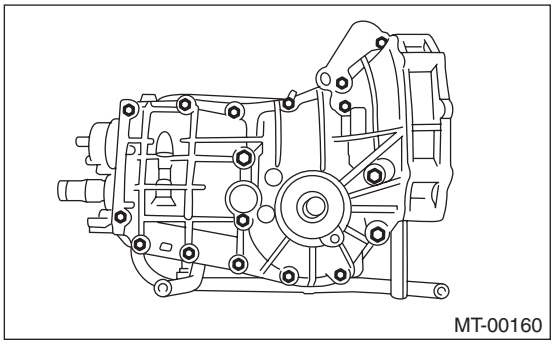
5) Remove the main shaft rear plate.



MT-01515

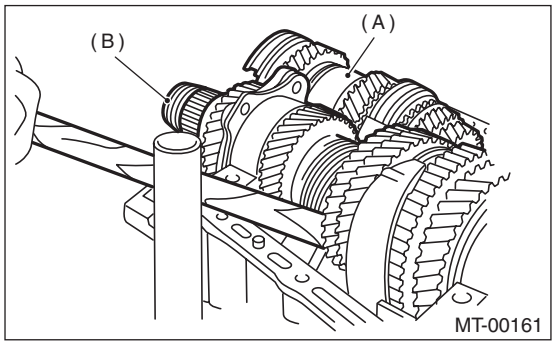
(A) Main shaft rear plate

6) Remove the bolts and nuts, and separate the transmission case into the right and left case.


MT-00160

7) Remove the drive pinion shaft assembly.

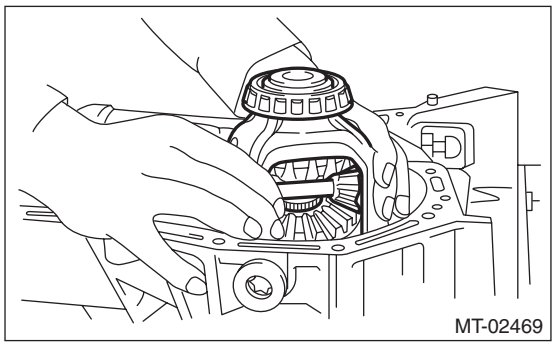
NOTE:
Use a hammer handle, etc. to remove if too tight.



MT-00161

(A) Main shaft ASSY
(B) Drive pinion shaft ASSY

8) Remove the main shaft assembly.
9) Remove the front differential assembly.


MT-02469

10) Remove the differential side retainers and bearing outer races on the left and right side. <Ref. to 5MT-71, REMOVAL, Front Differential Assembly.>

NOTE:
Do not confuse the right and left roller bearing outer races.
11) Remove the reverse idler gear. <Ref. to 5MT-80, REMOVAL, Shifter Fork and Rod.>
12) Remove the shifter fork and rod. <Ref. to 5MT-80, REMOVAL, Shifter Fork and Rod.>

B: INSTALLATION

1) Wipe off grease, oil and dust on the mating surfaces of transmission cases with cleaning solvent.
2) Install the reverse idler gear. <Ref. to 5MT-78, INSTALLATION, Reverse Idler Gear.>
3) Install the shifter fork and rod. <Ref. to 5MT-80, INSTALLATION, Shifter Fork and Rod.>
4) Select the drive pinion shim. <Ref. to 5MT-61, INSTALLATION, Drive Pinion Shaft Assembly.>
5) Install the bearing outer race to the transmission case LH side, and install the differential side retainer from which the O-ring have already been removed.
6) Install the front differential assembly.

7) Install the main shaft assembly.

NOTE:
Align the needle bearing knock pin hole to the transmission case knock pin.

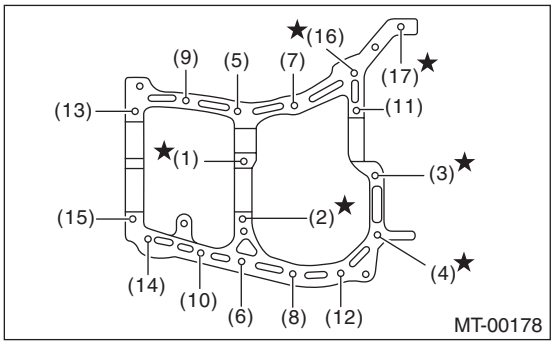
8) Install the selected drive pinion shims and drive pinion shaft assembly.

NOTE:
Align the roller bearing knock pin hole to the transmission case knock pin.

9) Align the left and right side of the transmission case, and tighten it with 17 mounting bolts.

NOTE:
• Insert bolts (11) and (16) from the LH side of the transmission case.
• Match the cases together so that the drive pinion shims are not caught between the cases.

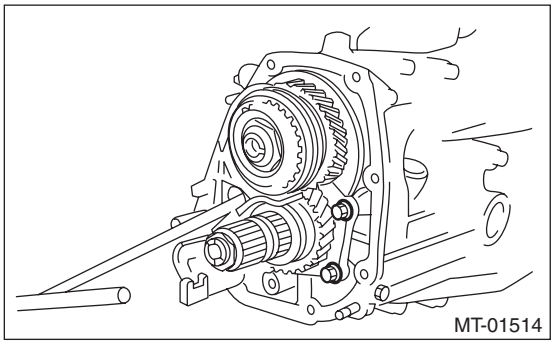
Tightening torque:
8 mm bolt
25 N·m (2.5 kgf-m, 18.4 ft-lb)
★ ***10 mm bolt***
39 N·m (4.0 kgf-m, 28.8 ft-lb)



10) Install the bearing outer race to the RH side of the transmission case.

11) Tighten the bearing mounting bolts.

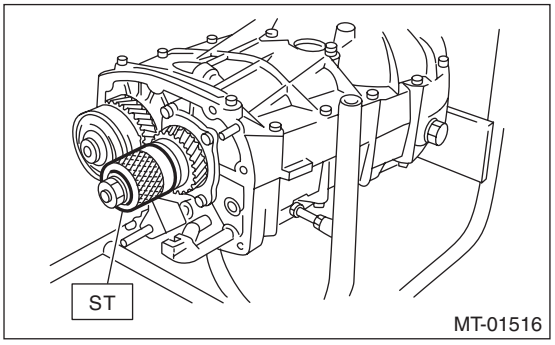
Tightening torque:
30 N·m (3.1 kgf-m, 22.1 ft-lb)



12) Adjust the backlash of the hypoid gear and the preload of the roller bearing.

(1) Attach the ST on drive pinion assembly.

ST 498427100 STOPPER

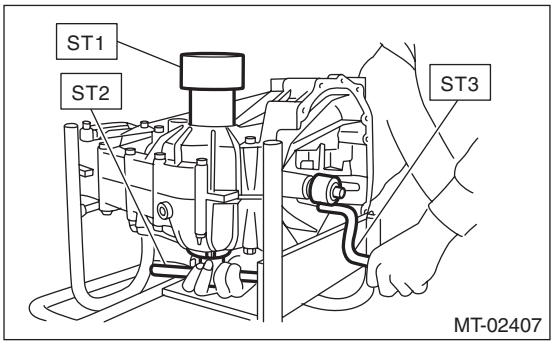


(2) Place the transmission with the LH side of case facing downward, and put ST1 on the bearing outer race.

(3) Screw the retainer assembly from the bottom into left case using ST2. Fit the ST3 on the main shaft. Shift the gear into 4th or 5th, and turn the shaft several times. Screw in the retainer while rotating the ST3 until a slight resistance is felt on ST2.

This is the contact point of the hypoid gear and the drive pinion shaft. Repeat the above sequence several times to ensure the contact point.

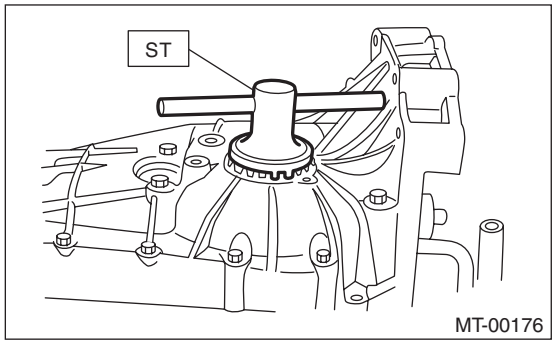
ST1 399780104 WEIGHT
ST2 18630AA010 WRENCH COMPL RETAINER
ST3 499927100 HANDLE



(4) Remove the WEIGHT, and screw in the side retainer without the O-ring into the RH side of the transmission case, and stop at the point where a slight resistance is felt.

NOTE:
In this condition, the backlash between hypoid gear and drive pinion shaft is zero.

ST 18630AA010 WRENCH COMPL RETAINER



(5) Loosen the side retainer on the LH side of the transmission case by 3 notches, and turn the side retainer on the RH side of the transmission case by the same notches in order to apply backlash.

(6) Screw in the side retainer of the RH side of the transmission case additionally by 1 notch in order to apply preload on taper roller bearing.

(7) Tighten temporarily both the lock plates LH and RH, and put marks on both the side retainer and lock plate for later readjustment.

NOTE:
If it is hard to install the lock plates, reverse the sides and install them.

(8) Turn the main shaft several times while tapping around the retainer lightly with plastic hammer.

13) Inspect and adjust backlash and tooth contact of the hypoid gear. <Ref. to 5MT-74, INSPECTION, Front Differential Assembly.>

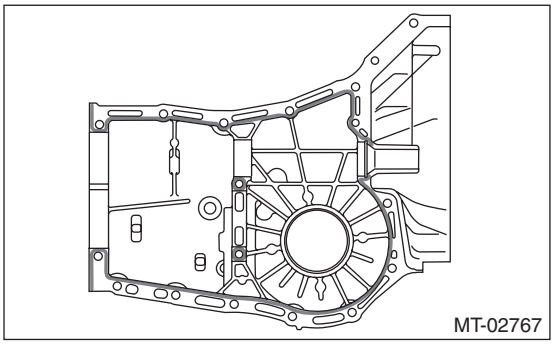
14) Separate the transmission case into left and right parts. <Ref. to 5MT-52, REMOVAL, Transmission Case.>

15) Check each shifter fork. <Ref. to 5MT-82, INSPECTION, Shifter Fork and Rod.>

16) Select a main shaft rear plate. <Ref. to 5MT-60, ADJUSTMENT, Main Shaft Assembly for Single-Range.>

17) Apply liquid gasket, then join the right side and left side of the case together.

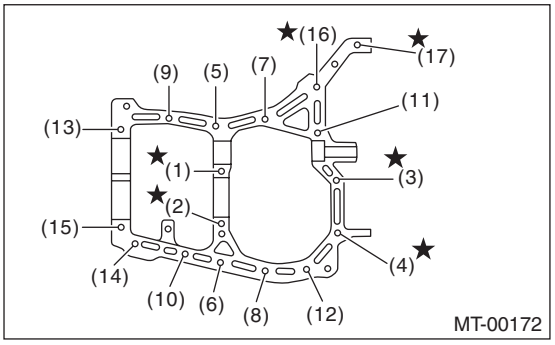
Liquid gasket:
THREE BOND 1215 (Part No. 004403007) or equivalent



18) With brackets and clips as shown in the figure, tighten the seventeen bolts.

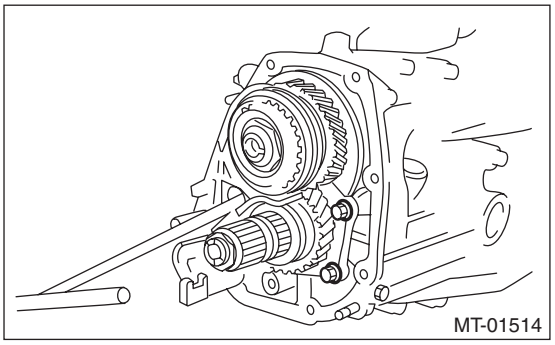
NOTE:
- Insert bolts (11) and (16) from the LH side of the transmission case.
- Match the cases together so that the drive pinion shims are not caught between the cases.

Tightening torque:
8 mm bolt
39 N·m (4.0 kgf-m, 28.8 ft-lb)
★ ***10 mm bolt***
39 N·m (4.0 kgf-m, 28.8 ft-lb)



19) Tighten the bearing mounting bolts.

Tightening torque:
30 N·m (3.1 kgf-m, 22.1 ft-lb)

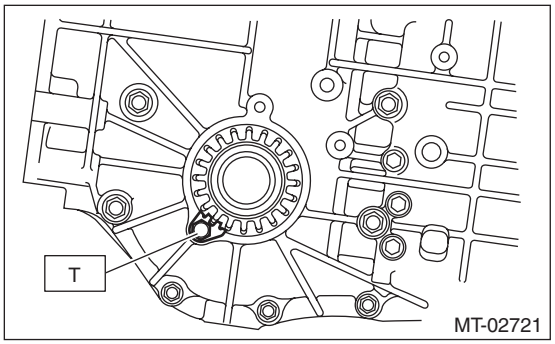


20) Remove the lock plate. Then loosen the retainer until the O-ring groove appears. Fit the O-ring into the groove and tighten the retainer into the position where it was not loosened.

NOTE:
- When loosening the retainer, record the number of the turns made.
- Perform this for both left and right side retainers.
- Use new O-rings.
- Apply gear oil to O-ring.

21) Install the lock plate.

Tightening torque:
T: 25 N·m (2.5 kgf-m, 18.4 ft-lb)



22) Install the transfer case together with the extension case assembly. <Ref. to 5MT-38, INSTALLATION, Transfer Case and Extension Case Assembly.>
23) Install the clutch release lever and bearing. <Ref. to CL-14, INSTALLATION, Release Bearing and Lever.>
24) Install the manual transmission assembly to the vehicle. <Ref. to 5MT-26, INSTALLATION, Manual Transmission Assembly.>

C: INSPECTION

Check the transmission case for cracks, damage, or oil leaks.

15.Main Shaft Assembly for Single-Range

A: REMOVAL

1) Remove the manual transmission assembly from the vehicle. <Ref. to 5MT-23, REMOVAL, Manual Transmission Assembly.>
2) Remove the transfer case together with the extension case assembly. <Ref. to 5MT-38, REMOVAL, Transfer Case and Extension Case Assembly.>
3) Remove the transmission case. <Ref. to 5MT-52, REMOVAL, Transmission Case.>
4) Remove the drive pinion shaft assembly. <Ref. to 5MT-61, REMOVAL, Drive Pinion Shaft Assembly.>
5) Remove the main shaft assembly.

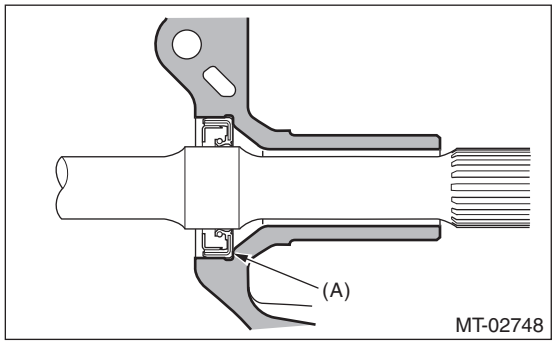
B: INSTALLATION

1) Attach the needle bearing and oil seal to the main shaft assembly.

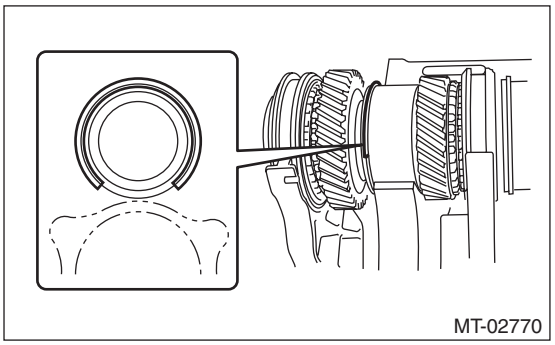
NOTE:
• Wrap the clutch splined section with vinyl tape to prevent damage to the oil seal.
• Apply NICHIMOLY N-130 (or equivalent) to the sealing lip of the oil seal.
• Use a new oil seal.

2) Fit the knock pin hole of the needle bearing outer race to the transmission case knock pin, and install the main shaft assembly.

NOTE:
• Align the end face of the seal with surface (A) when installing the oil seal.



• Face the cutout portion of the snap ring for the ball bearing to the drive pinion shaft assembly.



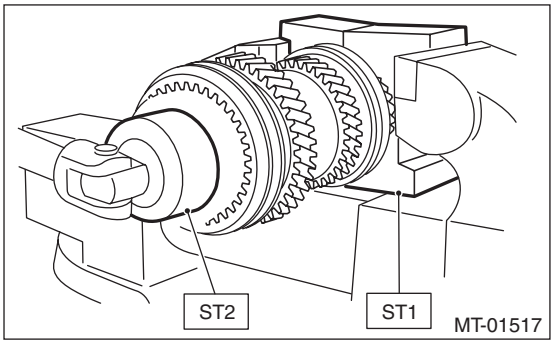
3) Install the drive pinion shaft assembly. <Ref. to 5MT-61, INSTALLATION, Drive Pinion Shaft Assembly.>
4) Check each shifter fork. <Ref. to 5MT-82, INSPECTION, Shifter Fork and Rod.>
5) Select a main shaft rear plate. <Ref. to 5MT-60, ADJUSTMENT, Main Shaft Assembly for Single-Range.>
6) Install the transmission case. <Ref. to 5MT-52, INSTALLATION, Transmission Case.>
7) Install the transfer case together with the extension case assembly. <Ref. to 5MT-38, INSTALLATION, Transfer Case and Extension Case Assembly.>
8) Install the manual transmission assembly to the vehicle. <Ref. to 5MT-26, INSTALLATION, Manual Transmission Assembly.>

C: DISASSEMBLY

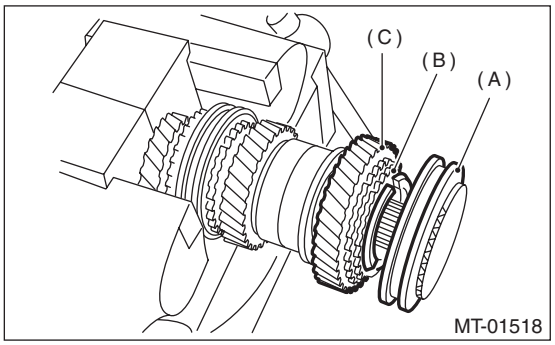
1) Put vinyl tape around main shaft spline to protect the oil seal from damage. Then pull out the oil seal and needle bearing by hand.
2) Remove the lock nut from the main shaft assembly.

NOTE:
Flatten the lock nut tab before removing the lock nut.

ST1 498937000 TRANSMISSION HOLDER
ST2 499987003 SOCKET WRENCH (35)



3) Remove the 5th hub & sleeve No. 2, baulk lever, baulk ring, and 5th drive gear & needle bearing.

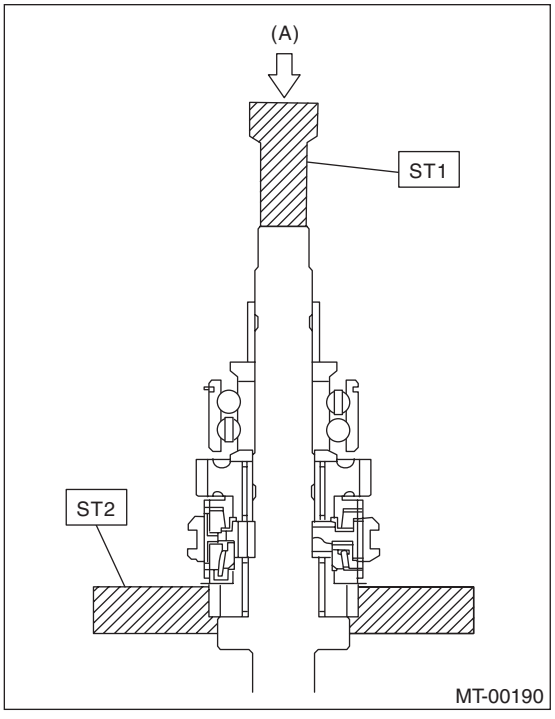


(A) 5th hub & sleeve No. 2
(B) Baulk ring
(C) 5th drive gear

4) Using ST1 and ST2, remove the rest of the parts.

NOTE:
• When replacing the sleeve & hub, replace them as a set.
• Do not disassemble the sleeve & hub; the aligning position is pre-matched.
• If it is necessary to disassemble, mark the engaging points on the splines beforehand.

ST1 899864100 REMOVER
ST2 899714110 REMOVER

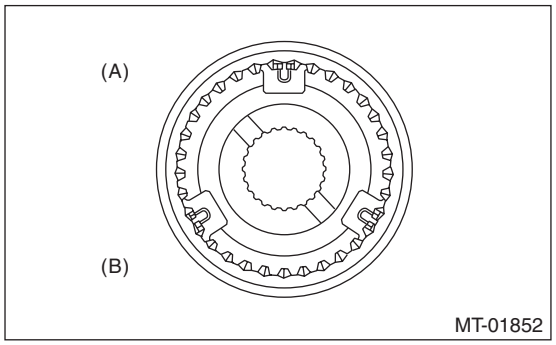


(A) Press

D: ASSEMBLY

1) When the sleeve & hub assemblies have been disassembled, reassemble by aligning the alignment marks.

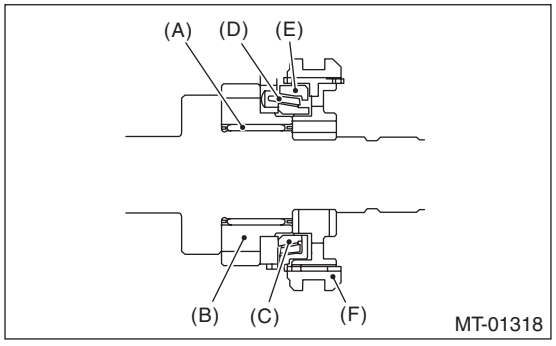
NOTE:
Position the open ends of the spring 120° apart.



(A) 3rd-4th sleeve & hub ASSY
(B) 3rd gear side

2) Install the 3rd drive gear, outer baulk ring, synchro cone, inner baulk ring, 3rd needle bearing and sleeve & hub assembly on the main shaft.

NOTE:
Align the groove in baulk ring with the shifting insert.

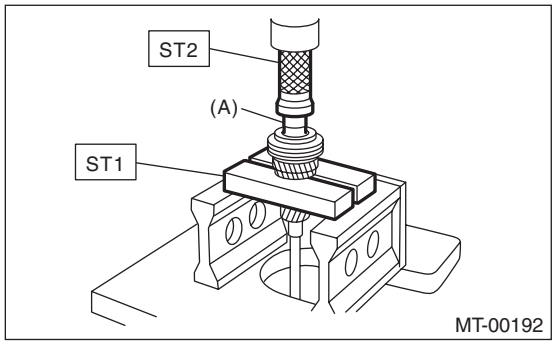


(A) 3rd needle bearing
(B) 3rd drive gear
(C) Inner baulk ring
(D) Synchro cone
(E) Outer baulk ring
(F) Sleeve & hub ASSY

3) Install the 4th needle bearing race onto the main shaft using ST1, ST2 and press.

CAUTION:
Do not apply a load in excess of 10 kN (1 ton, 1.1 US ton, 1.0 Imp ton).

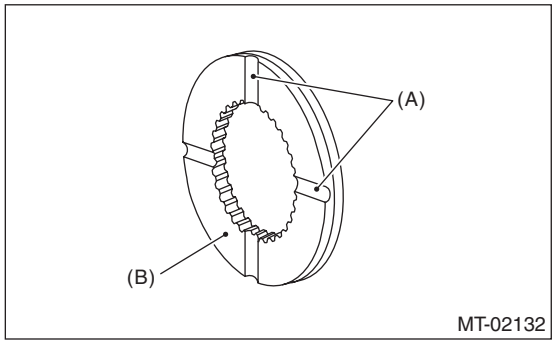
ST1 899714110 REMOVER
ST2 499877000 RACE 4-5 INSTALLER



(A) 4th needle bearing race

4) Install the baulk ring, needle bearing, 4th drive gear and 4th gear thrust washer to the main shaft.

NOTE:
• Align the baulk ring and hub & sleeve assembly with the key groove.
• Make sure the thrust washer is facing the correct direction.



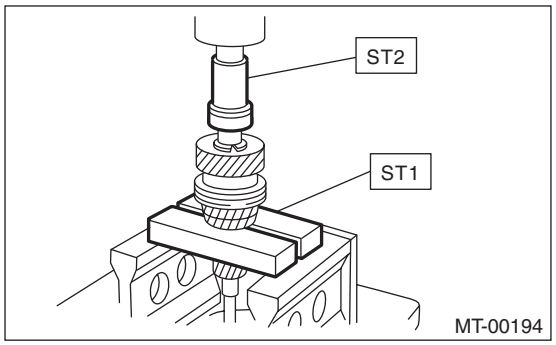
(A) Groove
(B) Face this surface to the 4th gear side.

5) Press-fit the ball bearing into the rear section of the main shaft using ST1, ST2 and a press.

CAUTION:
Do not apply a load in excess of 10 kN (1 ton, 1.1 US ton, 1.0 Imp ton).

NOTE:
Install the snap ring side of the ball bearing facing the 5th drive gear side.

ST1 899714110 REMOVER
ST2 499877000 RACE 4-5 INSTALLER

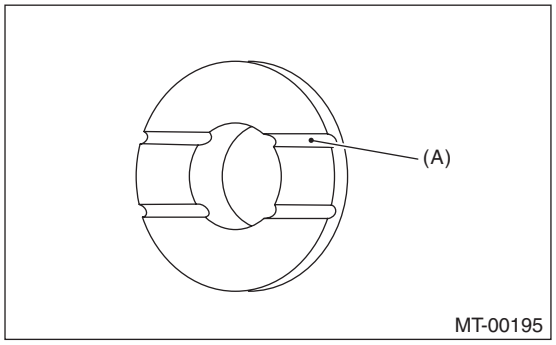


6) Using the ST1 and ST2, install the 5th gear thrust washer and 5th needle bearing race onto the rear section of the main shaft.

CAUTION:
Do not apply a load in excess of 10 kN (1 ton, 1.1 US ton, 1.0 Imp ton).

NOTE:
Make sure the thrust washer is facing the correct direction.

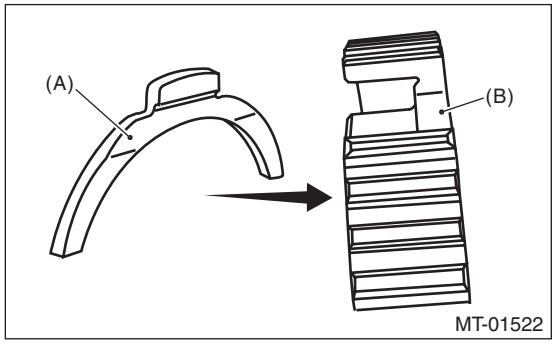
ST1 899714110 REMOVER
ST2 499877000 RACE 4-5 INSTALLER



(A) Face this surface to the 5th gear side.

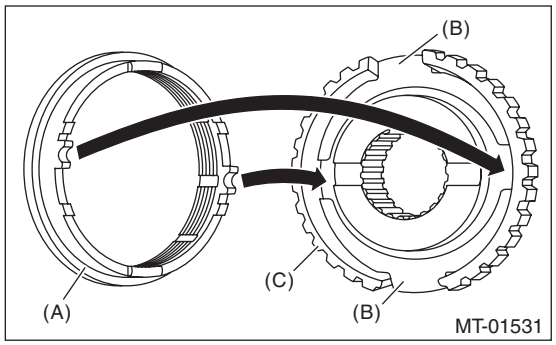
7) Install the rest of the parts to the rear section of the main shaft.

CAUTION:
• Install the baulk lever so that the concave side faces toward the 5th hub.



(A) Baulk lever
(B) 5th hub

• Align the protruded section of baulk ring between the baulk levers.



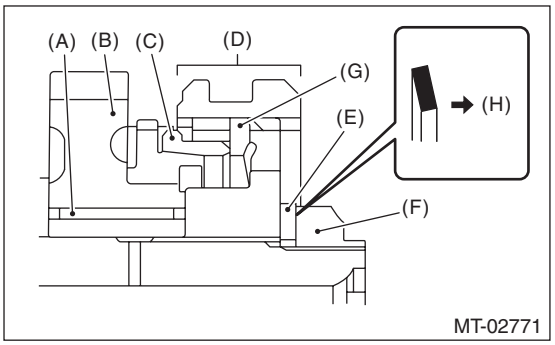
(A) Baulk ring
(B) Baulk lever
(C) 5th hub

8) Tighten the lock nuts to the specified torque using ST1 and ST2.

NOTE:
• Use new lock nuts and lock washers.
• Make sure the lock washer is installed in the proper direction.

ST1 499987003 SOCKET WRENCH (35)
ST2 498937000 TRANSMISSION HOLDER

Tightening torque:
120 N·m (12.2 kgf-m, 88.5 ft-lb)



(A) Needle bearing
(B) 5th drive gear
(C) Baulk ring
(D) 5th hub & sleeve No. 2
(E) Lock washer
(F) Lock nut
(G) Baulk lever
(H) Nut side

9) Crimp lock nuts in two locations after tightening.

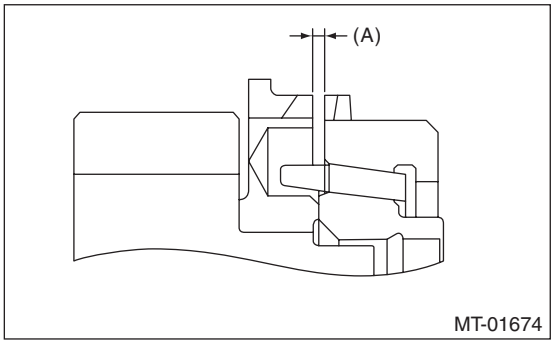
CAUTION:
Do not allow the lock nut to be cracked during crimping operation.

E: INSPECTION

Disassembled parts should be washed with cleaning solvent first, then inspected carefully.
1) Bearing
Replace the bearings in the following cases.
• When the bearing balls, outer races and inner races are broken or rusty.
• When the bearing is worn.
• When the bearings fail to turn smoothly or emit noise in rotation after gear oil lubrication.
• When bearing has other defects.
2) Bushing (each gear)
Replace the bushing in following cases.
• When the sliding surface is damaged or abnormally worn.
• When the inner wall is abnormally worn.

3) Gear
Replace gears in the following cases.
• Replace the gear with new part if its tooth surfaces are broken, damaged or excessively worn.
• Correct or replace if the contact surface between the cone and baulk ring is rough or damaged.
• Correct or replace if the inner surface or end face is damaged.
4) Baulk ring, synchro cone
Replace the baulk ring and synchro cone in the following cases.
• When the inner surface and end face are damaged.
• When the baulk ring inner surface is abnormally or partially worn down.
• When the contact surface of the baulk ring insert section is cracked or abnormally worn.
• If the gap between the end faces of the baulk ring and the gear splined part is excessively small, check the clearance (A) while pressing the ring against the cone.

Clearance (A):
0.5 mm (0.020 in) or more



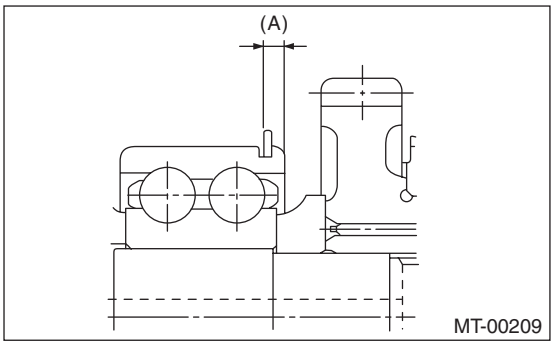
• Apply gear oil to the cone of the gear and while press-fitting the baulk ring, check there is no rotation in the circumferential direction.
5) Shifting insert key
Replace the insert key if deformed, excessively worn or defective in any way.
6) Coupling sleeve and synchronizer hub
• Check the slipping condition of the coupling sleeve.
• Check the splines on the coupling sleeve and synchronizer hub for wear.
7) Oil seal
Replace the oil seal if the lip is deformed, hardened, worn or defective in any way.
8) Gearshift mechanism
Repair or replace the gearshift mechanism if excessively worn, bent or defective in any way.

F: ADJUSTMENT

Selection of main shaft rear plate:
Measure the protrusion amount (A) of ball bearing from transmission main case surface, and select a suitable plate in the following table.

NOTE:
Before measuring, tap the end of main shaft with a plastic hammer lightly in order to make the clearance zero between the main case surface and moving flange of bearing.

Dimension (A) mm (in)	Part No.	Mark
4.00 — 4.13 (0.1575 — 0.1626)	32294AA041	1
3.87 — 4.00 (0.1524 — 0.1575)	32294AA051	2

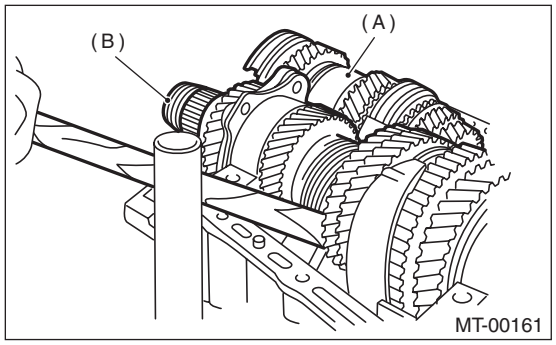


16.Drive Pinion Shaft Assembly

A: REMOVAL

1) Remove the manual transmission assembly from the vehicle. <Ref. to 5MT-23, REMOVAL, Manual Transmission Assembly.>
2) Remove the transfer case together with the extension case assembly. <Ref. to 5MT-38, REMOVAL, Transfer Case and Extension Case Assembly.>
3) Remove the transmission case. <Ref. to 5MT-52, REMOVAL, Transmission Case.>
4) Remove the drive pinion shaft assembly.

NOTE:
Use a hammer handle, etc. to remove if too tight.

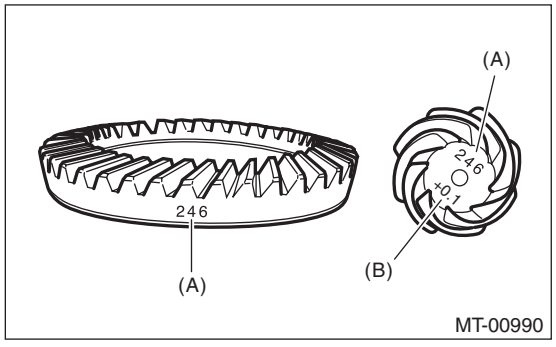


(A) Main shaft ASSY
(B) Drive pinion shaft ASSY

5) Remove the main shaft assembly. <Ref. to 5MT-56, REMOVAL, Main Shaft Assembly for Single-Range.>

B: INSTALLATION

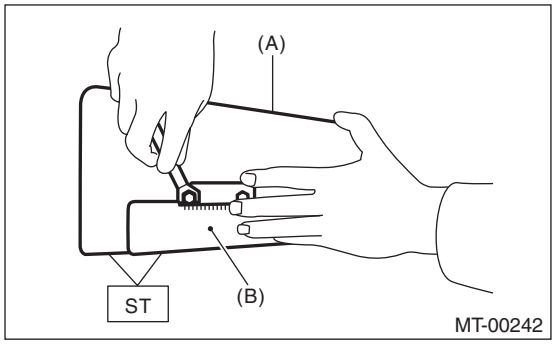
1) Remove the front differential assembly.
2) Hypoid gear set match mark/No.: The number (A) on top of the drive pinion, and the number on the hypoid driven gear are set numbers for the two gears. Use a pair having the same numbers.
The figure (B) below shows a number for shim adjustment. If no number is shown, the value is zero.



(A) Set number
(B) Number for shim adjustment

3) Place the drive pinion shaft assembly on transmission main case RH without shim and tighten the bearing mounting bolts.
4) Perform the adjustment of ST.
(1) Loosen the two bolts and adjust so that the scale indicates 0.5 correctly when the plate end and the scale end are on the same level.

ST 499917500 DRIVE PINION GAUGE ASSY



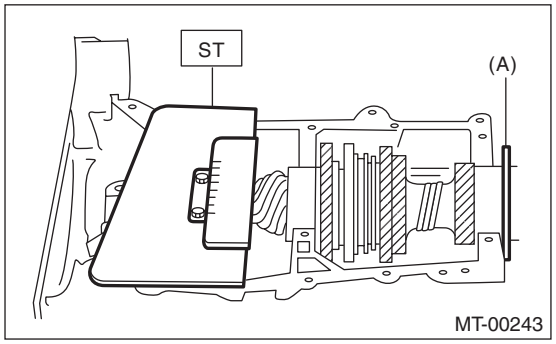
(A) Plate
(B) Scale

(2) Tighten the two bolts.
5) Position the ST by inserting the knock pin of ST into the knock hole of transmission case.

ST 499917500 DRIVE PINION GAUGE ASSY

6) Slide the drive pinion gauge scale with finger tip and read the value at the point where it matches with the end face of drive pinion.

ST 499917500 DRIVE PINION GAUGE ASSY



(A) Adjust the clearance to zero without shim.

7) The thickness of shim shall be determined by adding the value indicated on drive pinion to the value indicated on the ST. (Add if the number on drive pinion is prefixed by +, and subtract if the number is prefixed by –.)

ST 499917500 DRIVE PINION GAUGE ASSY

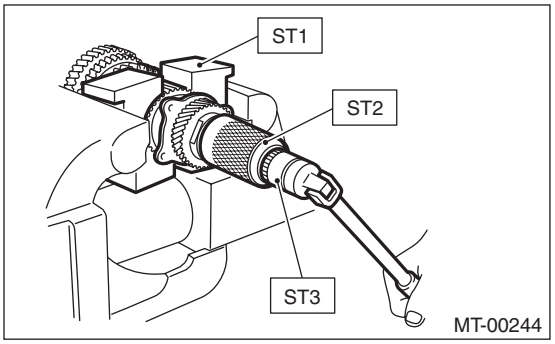
8) Select one to three shims in the following table for the value determined as described above, and take the shim(s) which thickness is closest to the said value.

Drive pinion shim	
Part No.	Thickness mm (in)
32295AA031	0.150 (0.0059)
32295AA041	0.175 (0.0069)
32295AA051	0.200 (0.0079)
32295AA061	0.225 (0.0089)
32295AA071	0.250 (0.0098)
32295AA081	0.275 (0.0108)
32295AA091	0.300 (0.0118)
32295AA101	0.500 (0.0197)

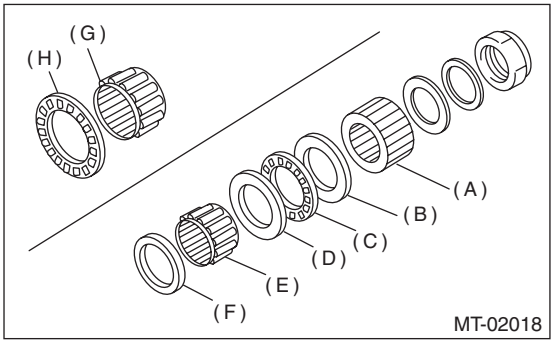
9) Install the front differential assembly. <Ref. to 5MT-71, INSTALLATION, Front Differential Assembly.>
10) Fit the transmission case knock pin to the knock pin hole of the roller bearing and install the drive pinion shaft assembly.
11) Install the main shaft assembly. <Ref. to 5MT-56, INSTALLATION, Main Shaft Assembly for Single-Range.>
12) Check each shifter fork. <Ref. to 5MT-82, INSPECTION, Shifter Fork and Rod.>
13) Install the transmission case. <Ref. to 5MT-52, INSTALLATION, Transmission Case.>
14) Install the transfer case together with the extension case assembly. <Ref. to 5MT-38, INSTALLATION, Transfer Case and Extension Case Assembly.>
15) Install the manual transmission assembly to the vehicle. <Ref. to 5MT-26, INSTALLATION, Manual Transmission Assembly.>

C: DISASSEMBLY

NOTE:
Attach a cloth to the end of driven shaft (on the frictional side of the thrust needle bearing) to prevent damage during disassembly or reassembly.
1) Flatten the tab of the lock nut. Remove the lock nut with ST1, ST2 and ST3.
ST1 899884100 HOLDER
ST2 498427100 STOPPER
ST3 899988608 SOCKET WRENCH (27)



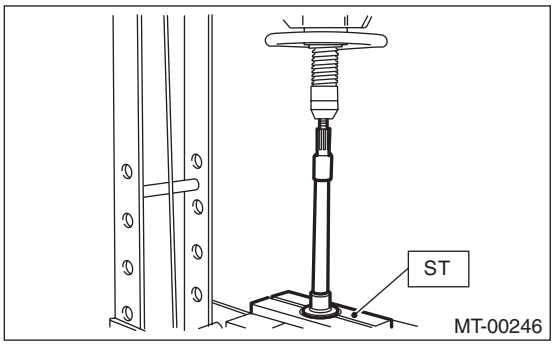
2) Draw out the drive pinion shaft from driven shaft. Remove the differential bevel gear sleeve, adjusting washer No. 1, adjusting washer No. 2, thrust bearing, needle bearing and drive pinion collar.



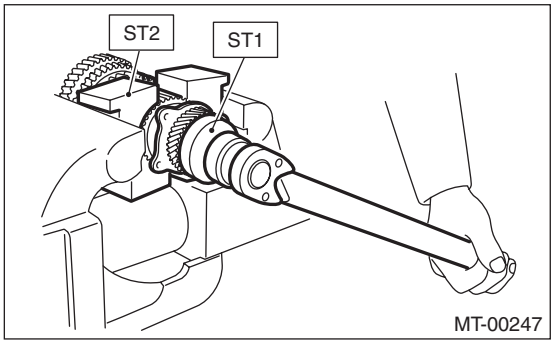
(A) Differential bevel gear sleeve
(B) Adjusting washer No. 1 (25 × 37.5 × t)
(C) Thrust bearing (25 × 37.5 × 3)
(D) Adjusting washer No. 2 (25 × 37.5 × t)
(E) Needle bearing (25 × 30 × 20)
(F) Drive pinion collar
(G) Needle bearing (30 × 37 × 23)
(H) Thrust bearing (33 × 50 × 3)

3) Remove the roller bearing and washer using ST and a press.

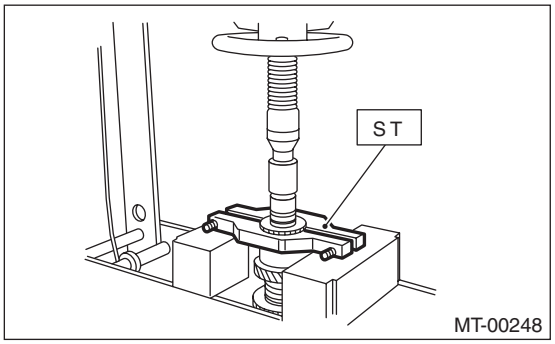
NOTE:
Do not reuse the roller bearing.
ST 498077000 REMOVER



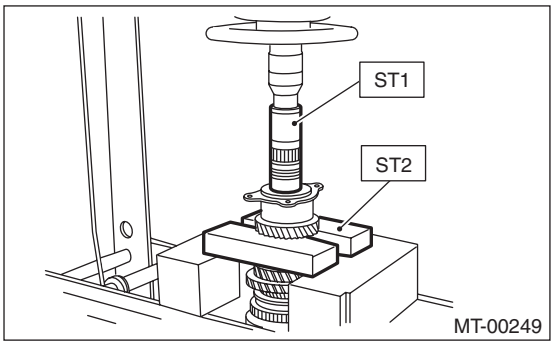
4) Flatten the tab of the lock nut. Remove the lock nut and lock washer using ST1 and ST2.
ST1 499987300 SOCKET WRENCH (50)
ST2 899884100 HOLDER



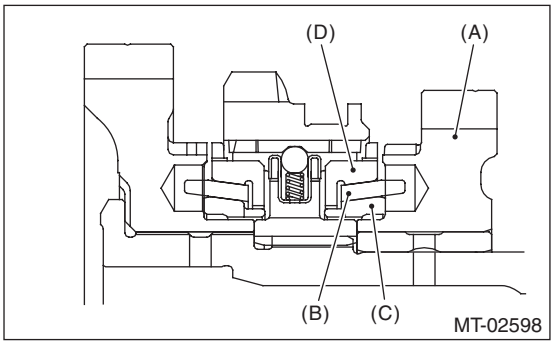
5) Remove the 5th driven gear using ST.
ST 499857000 5TH DRIVEN GEAR REMOVER



6) Remove the woodruff key.
7) Remove the roller bearing and 3rd-4th driven gear using ST1 and ST2.
ST1 499757002 INSTALLER
ST2 899714110 REMOVER

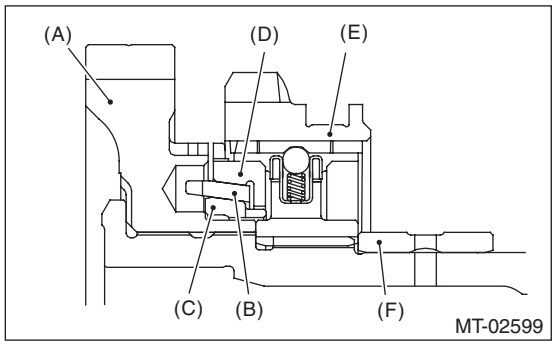


8) Remove the key.
9) Remove the 2nd driven gear, inner baulk ring, synchro cone and outer baulk ring.



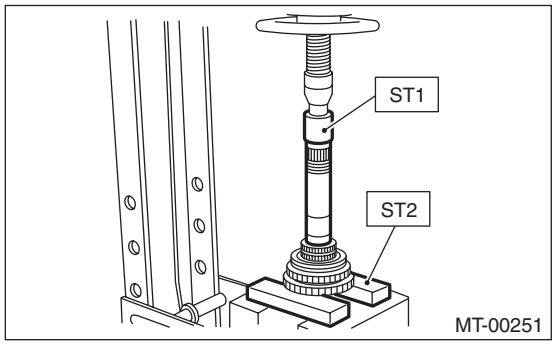
(A) 2nd driven gear
(B) Synchro cone
(C) Inner baulk ring
(D) Outer baulk ring

10) Remove the 1st driven gear, inner baulk ring, synchro cone, outer baulk ring, 2nd gear bushing and gear & hub assembly using ST1 and ST2.



(A) 1st driven gear
(B) Synchro cone
(C) Inner baulk ring
(D) Outer baulk ring
(E) Gear & hub
(F) 2nd gear bushing

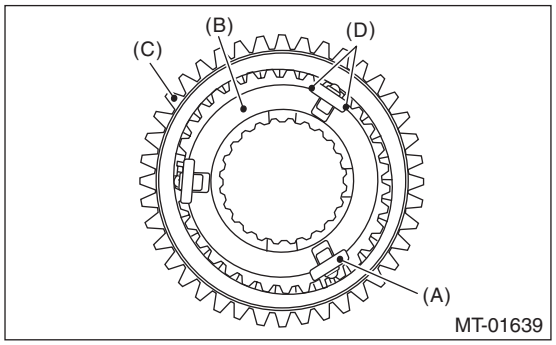
NOTE:
If necessary, use a new gear and hub assembly as a set, when replacing the gear or hub. Because these must engage at the specified point, avoid disassembly as much as possible. If it must be disassembled, mark the engaging point on the spline beforehand.
ST1 499757002 INSTALLER
ST2 899714110 REMOVER



D: ASSEMBLY

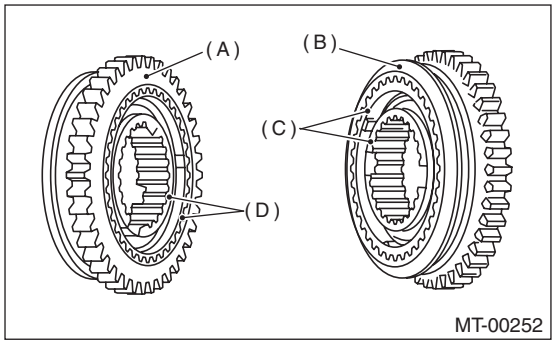
1) Install the sleeve and the gear and hub assembly by matching the alignment marks.

NOTE:
• Make sure that there is no large clearance at both sides of ball detent after assembly.



(A) Ball detent
(B) 1st-2nd synchronizer hub
(C) Reverse driven gear
(D) There is no large clearance at this part.

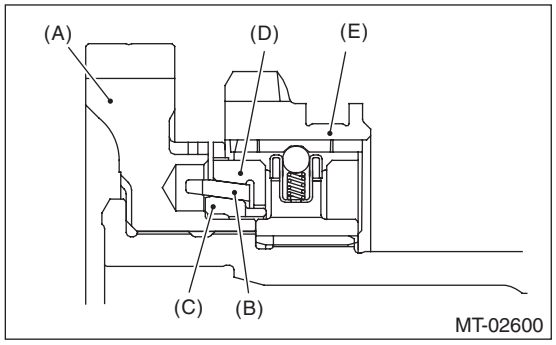
• Use the new gear & hub assembly, if replacing the gear or hub.



(A) 1st gear side
(B) 2nd gear side
(C) Flush surface
(D) Stepped surface

2) Install the 1st driven gear, inner baulk ring, synchro cone, outer baulk ring, and gear & hub assembly onto driven shaft.

NOTE:
• Install the gear & hub assembly in the proper position while paying attention to the installing direction.
• Align the baulk ring and gear & hub assembly with the key groove.

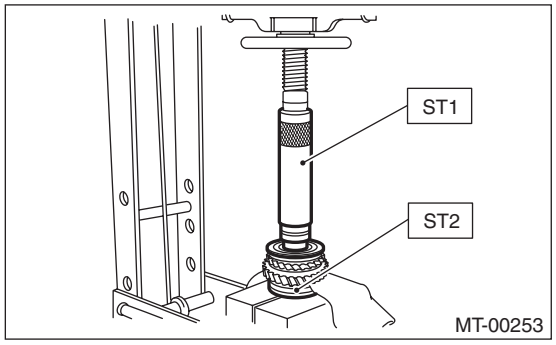


(A) 1st driven gear
(B) Synchro cone
(C) Inner baulk ring
(D) Outer baulk ring
(E) Gear & hub

3) Install the 2nd driven gear bushing onto driven shaft using ST1, ST2 and a press.

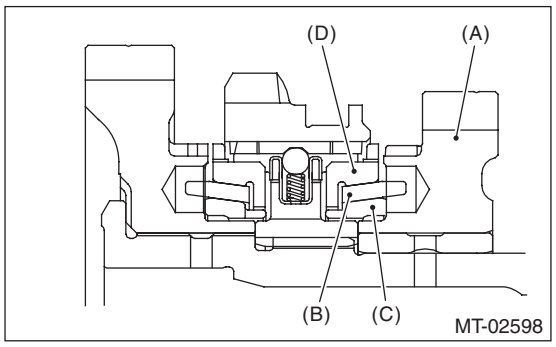
CAUTION:
Do not apply a load in excess of 10 kN (1 ton, 1.1 US ton, 1.0 Imp ton).

NOTE:
• Attach a cloth to the end of the driven shaft to prevent damage.
• When press fitting, align the oil holes of the shaft and bushing
ST1 499277200 INSTALLER
ST2 499587000 INSTALLER



4) Install the 2nd driven gear, inner baulk ring, synchro cone and outer baulk ring, and insert them onto driven shaft.

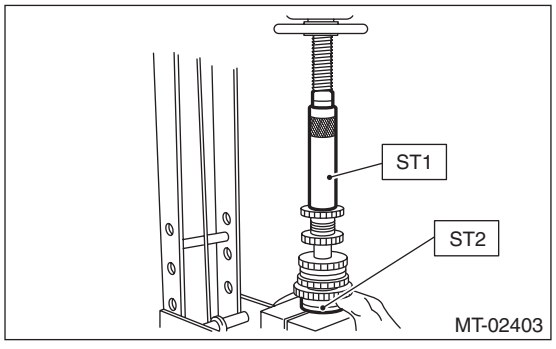
NOTE:
Align the groove in baulk ring with the insert.



(A) 2nd driven gear
(B) Synchro cone
(C) Inner baulk ring
(D) Outer baulk ring

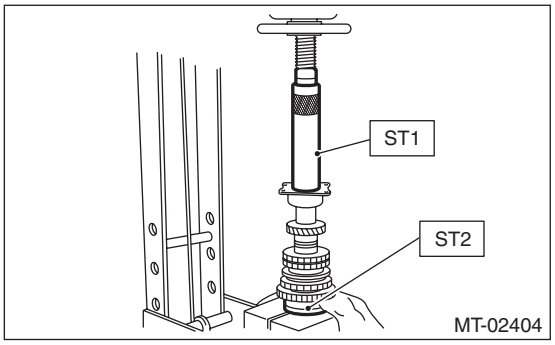
5) After installing key onto the driven shaft, install the 3rd-4th driven gear using ST1, ST2 and a press.

CAUTION:
Do not apply a load in excess of 10 kN (1 ton, 1.1 US ton, 1.0 Imp ton).
ST1 499277200 INSTALLER
ST2 499587000 INSTALLER



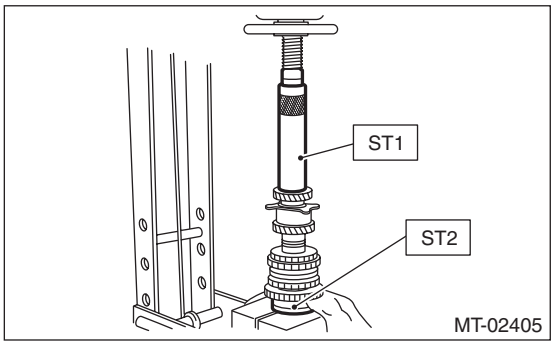
6) Install a set of roller bearings onto the driven shaft using ST1, ST2 and a press.

CAUTION:
Do not apply a load in excess of 10 kN (1 ton, 1.1 US ton, 1.0 Imp ton).
ST1 499277200 INSTALLER
ST2 499587000 INSTALLER



7) Position the woodruff key in groove of the rear of driven shaft. Install the 5th driven gear to the driven shaft using ST1, ST2 and a press.

CAUTION:
Do not apply a load in excess of 10 kN (1 ton, 1.1 US ton, 1.0 Imp ton).
ST1 499277200 INSTALLER
ST2 499587000 INSTALLER

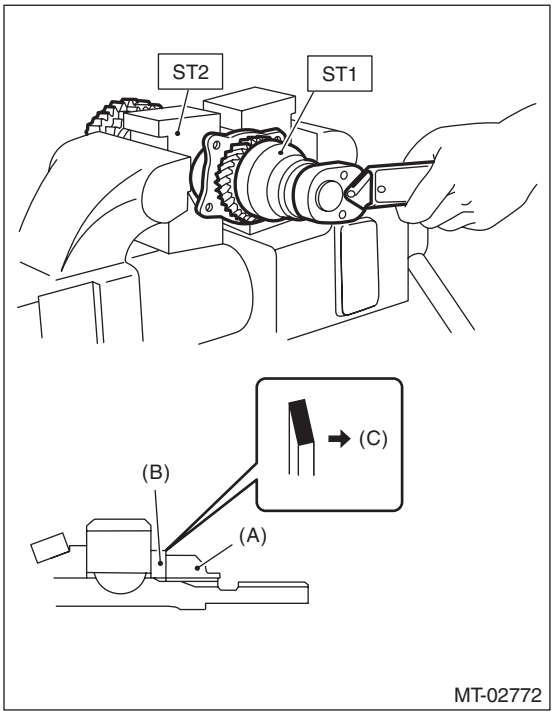


8) Install the lock washer. Tighten the lock nuts to the specified torque using ST1 and ST2.

NOTE:
- Use new lock nuts and lock washers.
- Make sure the lock washer is installed in the proper direction.

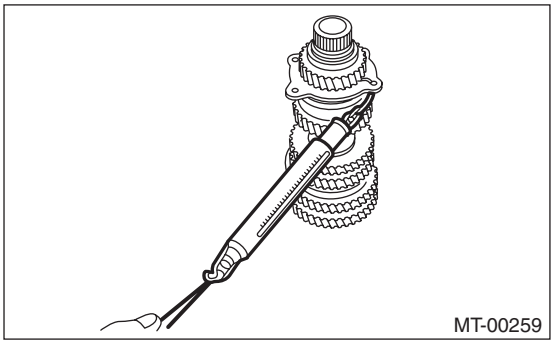
ST1 499987300 SOCKET WRENCH (50)
ST2 899884100 HOLDER

Tightening torque:
260 N·m (26.5 kgf-m, 191.8 ft-lb)



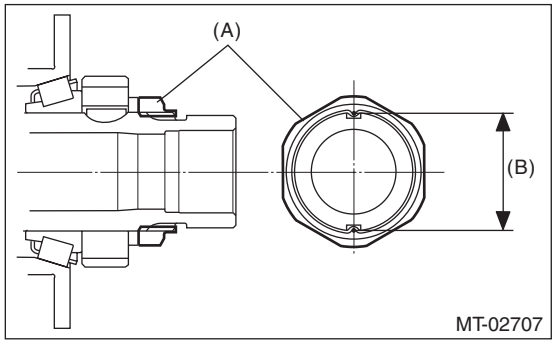
(A) Lock nut
(B) Lock washer
(C) Nut side

9) Using a spring scale, check that starting torque of the roller bearing is 0.1 to 1.5 N (0.01 to 0.15 kgf, 0.02 to 0.34 lbf).



10) Crimp the lock nut in two locations so that the dimension (B) becomes 41.1 mm (1.62 in) or less.

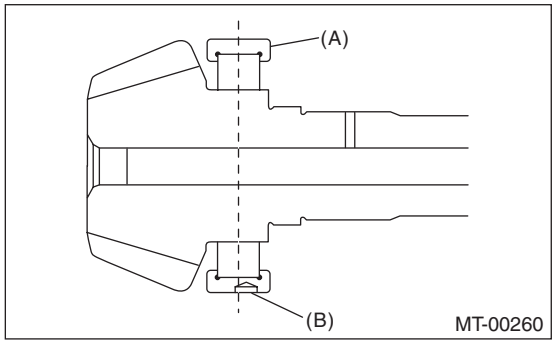
CAUTION:
Do not allow the lock nut to be cracked during crimping operation.



(A) Lock nut
(B) Outer dimension after crimping

11) Install the roller bearing onto the drive pinion shaft.

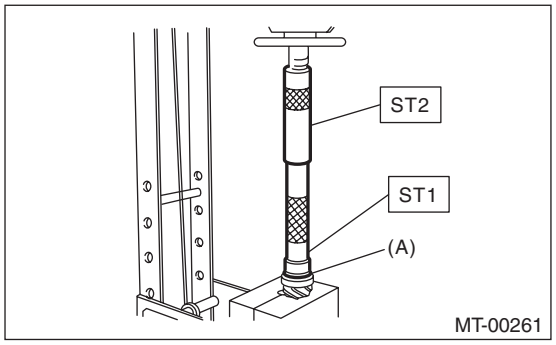
NOTE:
When installing the roller bearing, direct the knock pin hole of outer race toward rear.



(A) Roller bearing
(B) Knock pin hole

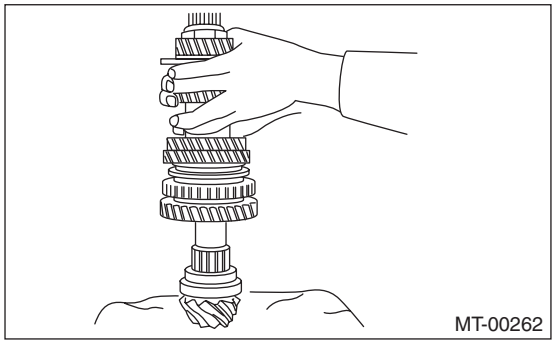
12) Install the washer using ST1, ST2 and a press.

CAUTION:
Do not apply a load in excess of 10 kN (1 ton, 1.1 US ton, 1.0 Imp ton).
ST1 499277100 BUSHING 1-2 INSTALLER
ST2 499277200 INSTALLER

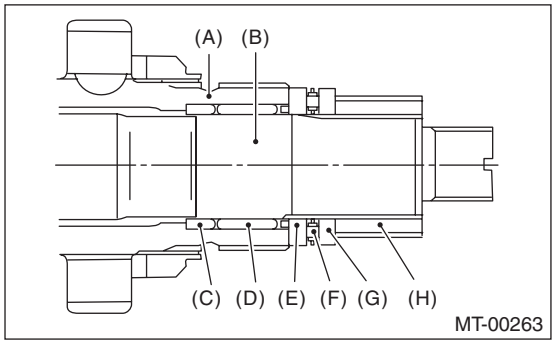


(A) Washer

13) Install the thrust bearing and needle bearing and install the driven shaft assembly.



14) Install the drive pinion collar, needle bearing, adjusting washer No. 2, thrust bearing, adjusting washer No. 1 and differential bevel gear sleeve in this order.



(A) Driven shaft
(B) Drive shaft
(C) Drive pinion collar
(D) Needle bearing (25 × 30 × 20)
(E) Adjusting washer No. 2 (25 × 36 × t)
(F) Thrust bearing (25 × 37.5 × 3)
(G) Adjusting washer No. 1 (25 × 36 × t)
(H) Differential bevel gear sleeve

15) Adjust the thrust bearing preload. <Ref. to 5MT-69, THRUST BEARING PRELOAD, ADJUSTMENT, Drive Pinion Shaft Assembly.>

E: INSPECTION

Disassembled parts should be washed with cleaning solvent first, then inspected carefully.

1) Bearing

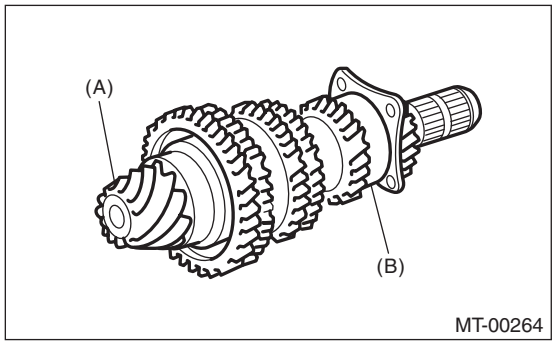
Replace the bearings in the following cases.

• When the bearing balls, outer races and inner races are broken or rusty.

• When the bearing is worn.

• When the bearings fail to turn smoothly or emit noise in rotation after gear oil lubrication.

• The ball bearing on the rear side of the drive pinion shaft should be checked for smooth rotation before the drive pinion shaft assembly is disassembled. In this case, because a preload is working on the bearing, its rotation feels like it is slightly dragging unlike other bearings.



(A) Drive pinion shaft
(B) Ball bearing

• When bearing has other defects.

2) Bushing (each gear)

Replace the bushing in following cases.

• When the sliding surface is damaged or abnormally worn.

• When the inner wall is abnormally worn.

3) Gear

Replace gears in the following cases.

• Replace the gear with new part if its tooth surfaces are broken, damaged or excessively worn.

• Correct or replace if the contact surface between the cone and baulk ring is rough or damaged.

• Correct or replace if the inner surface or end face is damaged.

4) Baulk ring, synchro cone

Replace the baulk ring and synchro cone in the following cases.

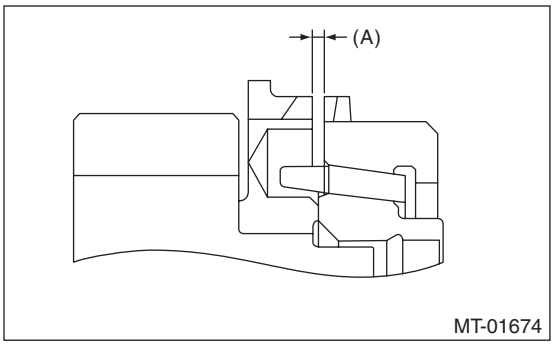
• When the inner surface and end face are damaged.

• When the baulk ring inner surface is abnormally or partially worn down.

• When the contact surface of the baulk ring insert section is cracked or abnormally worn.

• If the gap between the end faces of the baulk ring and the gear splined part is excessively small, check the clearance (A) while pressing the ring against the cone.

Clearance (A):
0.5 mm (0.020 in) or more



• Apply gear oil to the cone of the gear and while press-fitting the baulk ring, check there is no rotation in the circumferential direction.

5) Coupling sleeve and synchronizer hub

• Check the slipping condition of the coupling sleeve.

• Check the splines on the coupling sleeve and synchronizer hub for wear.

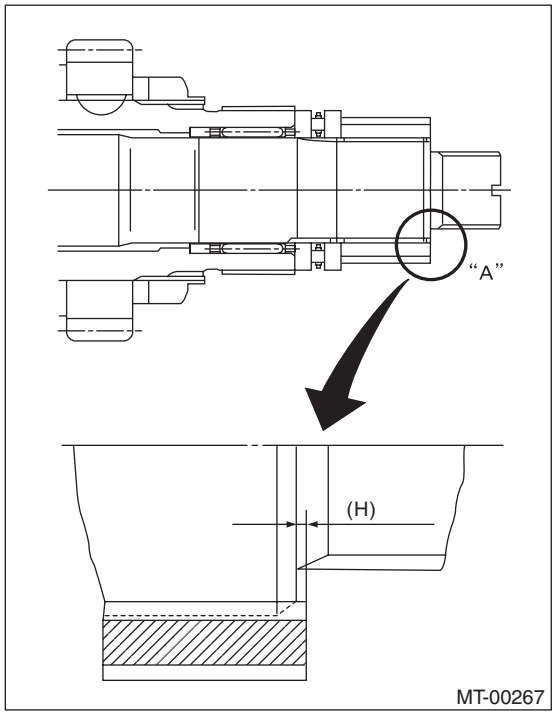
6) Ball detent

Replace the ball detent if deformed, excessively worn or defective in any way.

F: ADJUSTMENT

1. THRUST BEARING PRELOAD

1) Select a suitable adjusting washer No. 1 so that dimension (H) will be zero in a visual check. Position the washer (18.3 × 30 × t) and lock washer (18 × 30 × 2) and attach the lock nut.

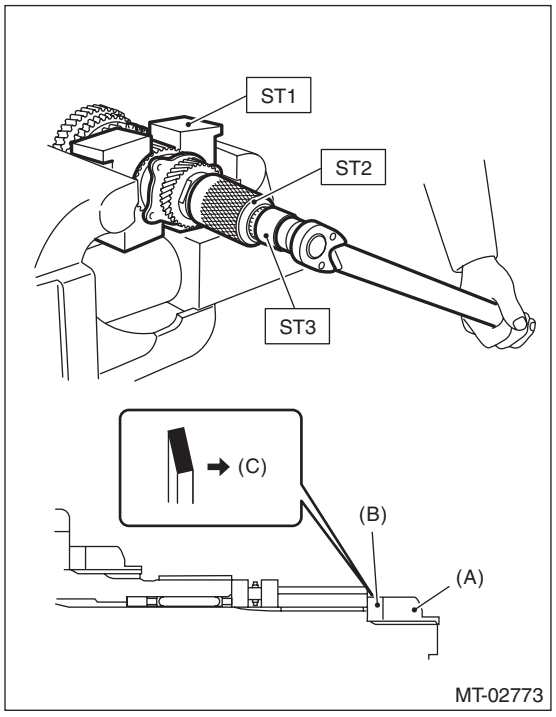


2) Using the ST1, ST2 and ST3, tighten the new lock nut to the specified torque.

NOTE:
- Use new lock nuts and lock washers.
- Make sure the lock washer is installed in the proper direction.

ST1	899884100	HOLDER
ST2	498427100	STOPPER
ST3	899988608	SOCKET WRENCH (27)

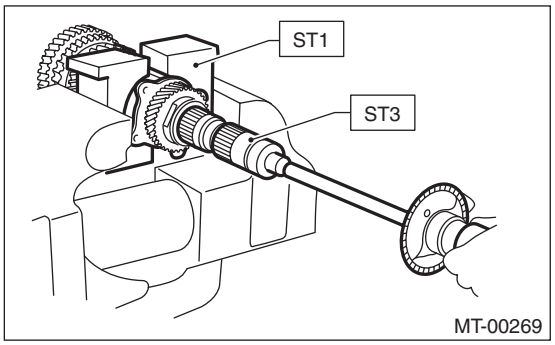
Tightening torque:
120 N·m (12.2 kgf-m, 88.5 ft-lb)



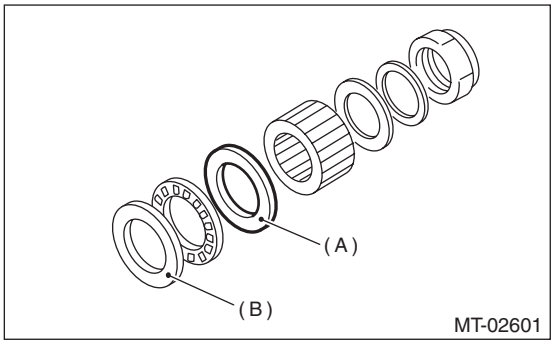
(A) Lock nut
(B) Lock washer
(C) Nut side

3) After removing the ST2, measure the starting torque using torque driver.
ST1 899884100 HOLDER
ST3 899988608 SOCKET WRENCH (27)

Starting torque:
0.3 — 0.8 N·m (0.03 — 0.08 kgf-m, 0.22 — 0.59 ft-lb)



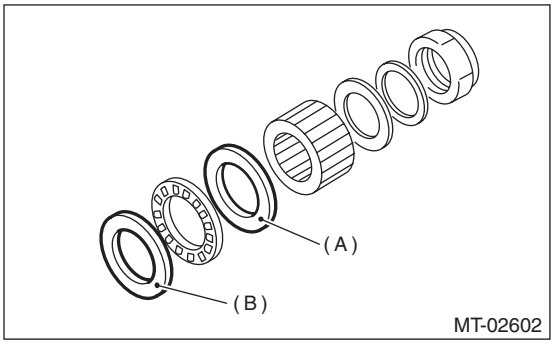
4) If the starting torque is not within the specified limit, select new adjusting washer No. 1 and re-check starting torque.



(A) Adjusting washer No. 1
(B) Adjusting washer No. 2

Adjusting washer No. 1	
Part No.	Thickness mm (in)
803025051	3.925 (0.1545)
803025052	3.950 (0.1555)
803025053	3.975 (0.1565)
803025054	4.000 (0.1575)
803025055	4.025 (0.1585)
803025056	4.050 (0.1594)
803025057	4.075 (0.1604)

5) If the specified starting torque cannot be obtained by the selection of adjusting washer No. 1, select adjusting washer No. 2 from the list below. Repeat steps 1) through 4) to adjust starting torque.



(A) Adjusting washer No. 1
(B) Adjusting washer No. 2

Starting torque	Dimension H	Adjusting washer No. 2
Low	Small	Select thicker one.
High	Large	Select thinner one.

Adjusting washer No. 2	
Part No.	Thickness mm (in)
803025059	3.850 (0.1516)
803025054	4.000 (0.1575)
803025058	4.150 (0.1634)

6) Recheck that the starting torque is within the specified range, then crimp the lock nut at four positions.

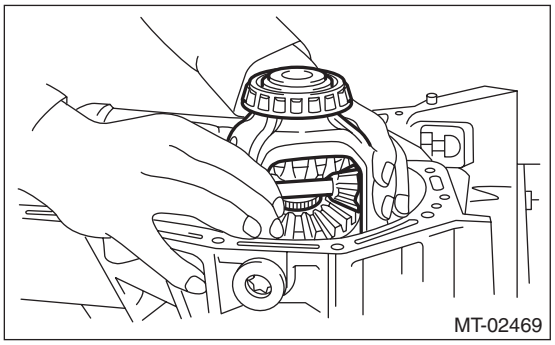
CAUTION:
Do not allow the lock nut to be cracked during crimping operation.

17.Front Differential Assembly

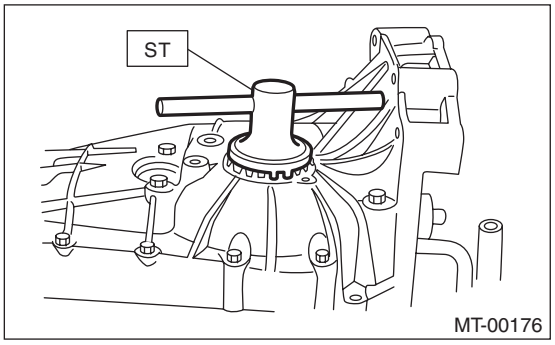
A: REMOVAL

1) Remove the manual transmission assembly from the vehicle. <Ref. to 5MT-23, REMOVAL, Manual Transmission Assembly.>
2) Remove the transfer case together with the extension case assembly. <Ref. to 5MT-38, REMOVAL, Transfer Case and Extension Case Assembly.>
3) Remove the transmission case. <Ref. to 5MT-52, REMOVAL, Transmission Case.>
4) Remove the drive pinion shaft assembly. <Ref. to 5MT-61, REMOVAL, Drive Pinion Shaft Assembly.>
5) Remove the main shaft assembly. <Ref. to 5MT-56, REMOVAL, Main Shaft Assembly for Single-Range.>
6) Remove the front differential assembly.

NOTE:
• Do not confuse the right and left roller bearing outer races.
• Be careful not to damage the oil seal of retainer.



7) Remove the differential side retainers using ST.
ST 18630AA010 WRENCH COMPL RETAINER

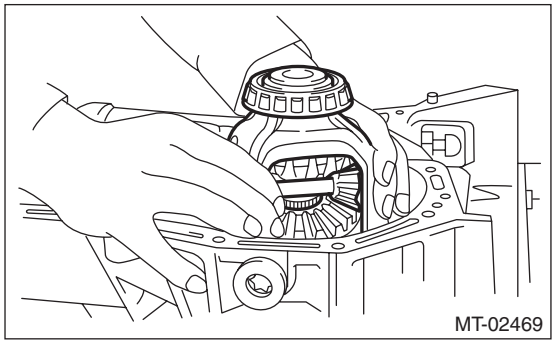


8) Remove the bearing outer race from the transmission case.
ST 398527700 PULLER ASSY

B: INSTALLATION

1) Install the differential side retainers using ST.
ST 18630AA010 WRENCH COMPL RETAINER
2) Install the bearing outer race to the transmission case.
3) Install the front differential assembly.

NOTE:
Be careful not to bend the seal lips of oil seal.

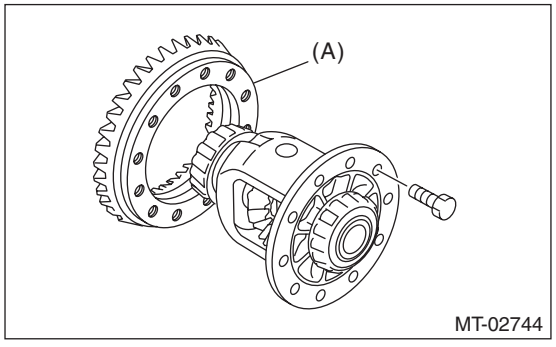


4) Install the main shaft assembly. <Ref. to 5MT-56, INSTALLATION, Main Shaft Assembly for Single-Range.>
5) Install the drive pinion shaft assembly. <Ref. to 5MT-61, INSTALLATION, Drive Pinion Shaft Assembly.>
6) Install the transmission case. <Ref. to 5MT-52, INSTALLATION, Transmission Case.>
7) Install the transfer case together with the extension case assembly. <Ref. to 5MT-38, INSTALLATION, Transfer Case and Extension Case Assembly.>
8) Install the manual transmission assembly to the vehicle. <Ref. to 5MT-26, INSTALLATION, Manual Transmission Assembly.>

C: DISASSEMBLY

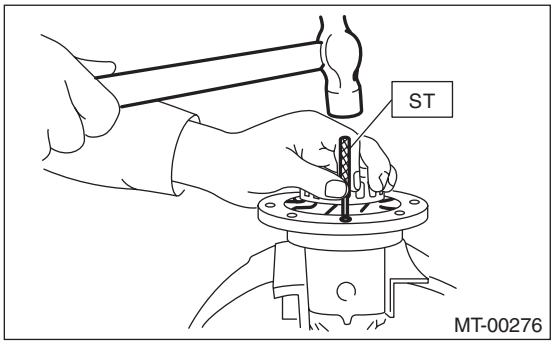
1. DIFFERENTIAL CASE ASSEMBLY

1) Remove the twelve bolts and remove hypoid driven gear.

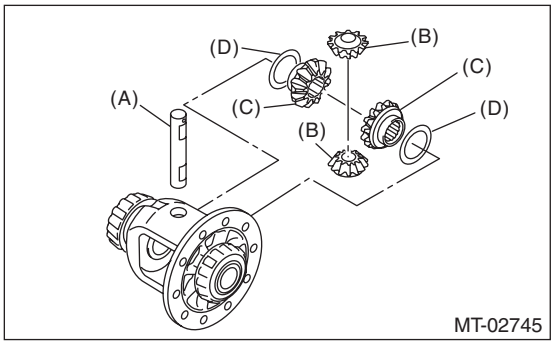


(A) Hypoid driven gear

2) Drive out the straight pin from differential assembly toward hypoid driven gear side.
ST 899904100 STRAIGHT PIN REMOVER

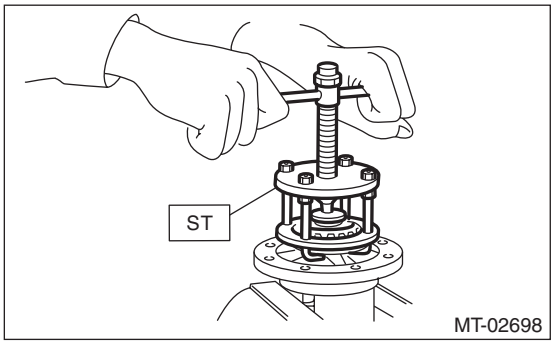


3) Pull out the pinion shaft, and remove the differential bevel pinion, differential bevel gear and washer.



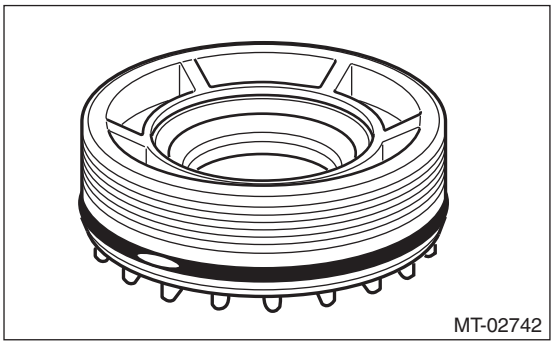
(A) Pinion shaft
(B) Differential bevel pinion
(C) Differential bevel gear
(D) Washer

4) Using the ST, remove the roller bearing.
ST 899524100 PULLER SET



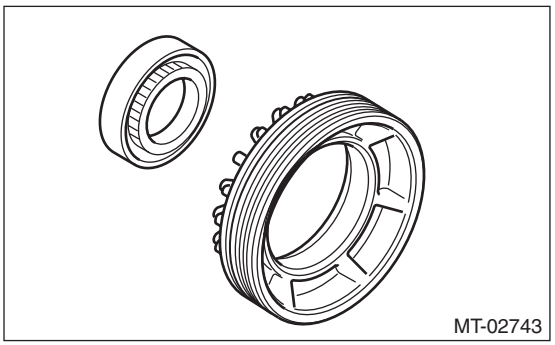
2. SIDE RETAINER

1) Remove the O-ring.



2) Remove the oil seal.

NOTE:
Remove it using a flat tip screwdriver wrapped with cloth or tape, etc.

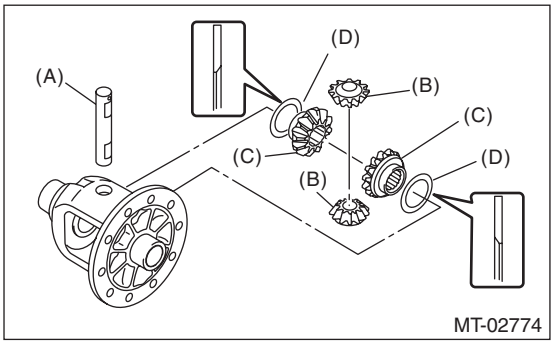


D: ASSEMBLY

1. DIFFERENTIAL CASE ASSEMBLY

1) Install the differential bevel gear and differential bevel pinion together with washer, and insert the pinion shaft.

NOTE:
Face the chamfered side of washer toward gear.

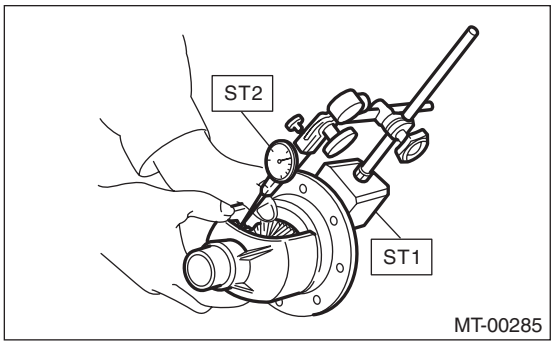


(A) Pinion shaft
(B) Differential bevel pinion
(C) Differential bevel gear
(D) Washer

2) Measure the backlash between differential bevel gear and differential pinion. If the backlash is out of the specified range, install a suitable washer to adjust. <Ref. to 5MT-75, BEVEL PINION GEAR BACKLASH, ADJUSTMENT, Front Differential Assembly.>

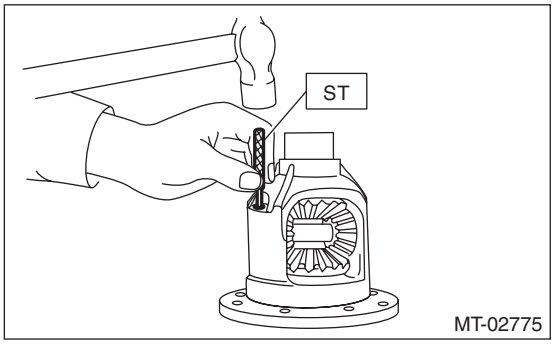
NOTE:
Be sure the pinion gear teeth contacts adjacent gear teeth during measurement.
ST1 498247001 MAGNET BASE
ST2 498247100 DIAL GAUGE

Standard backlash
0.13 — 0.18 mm (0.0051 — 0.0071 in)



3) Align the pinion shaft and differential case with each hole, and drive the straight pin into the holes from the hypoid driven gear side using the ST.

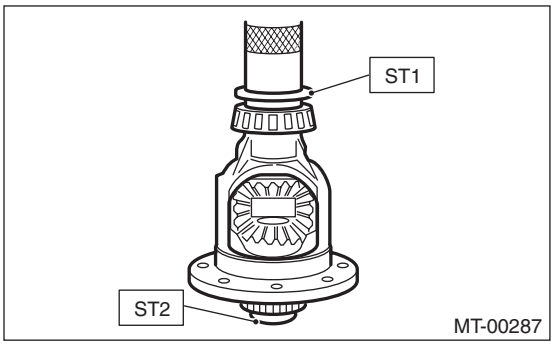
NOTE:
Lock the straight pin after installing.
ST 899904100 STRAIGHT PIN REMOVER



4) Install the roller bearing to differential case.

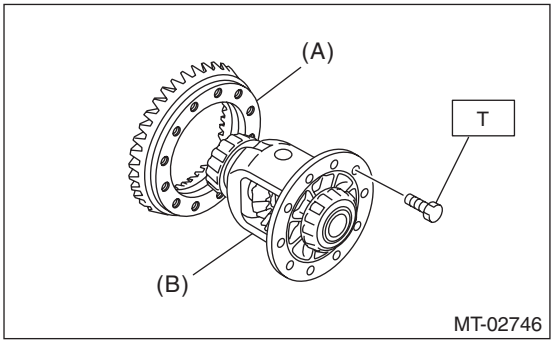
CAUTION:
Do not apply a load in excess of 10 kN (1 ton, 1.1 US ton, 1.0 Imp ton).

NOTE:
Be careful because the roller bearing outer races are used as a set.
ST1 499277100 BUSHING 1-2 INSTALLER
ST2 398497701 ADAPTER



5) Install the hypoid driven gear to the differential case using twelve bolts.

Tightening torque:
T: 62 N·m (6.3 kgf-m, 45.7 ft-lb)



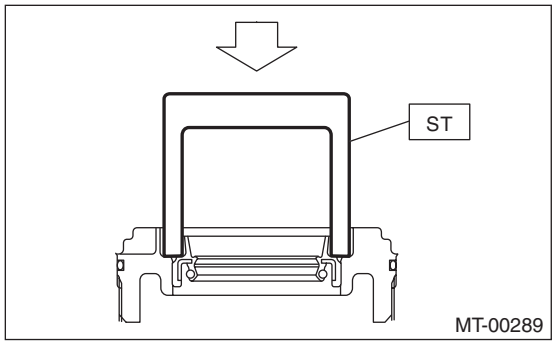
(A) Hypoid driven gear
(B) Differential case

2. SIDE RETAINER

1) Using the ST, install the oil seal by lightly tapping with a plastic hammer.

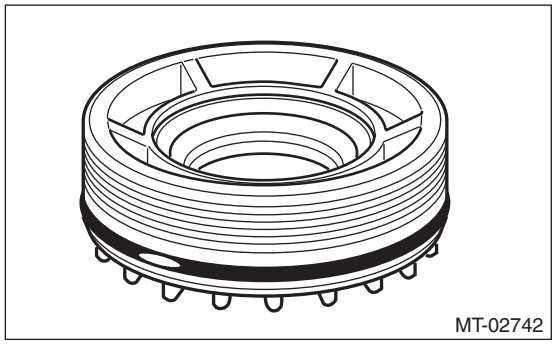
NOTE:
- Use a new oil seal.
- Apply transmission gear oil to the oil seal lips, and install the oil seal while being careful not to deform the lip.
- Check the identification marks (R, L), and attach the oil seal RH and LH.

ST 18675AA000 DIFFERENTIAL SIDE OIL SEAL INSTALLER



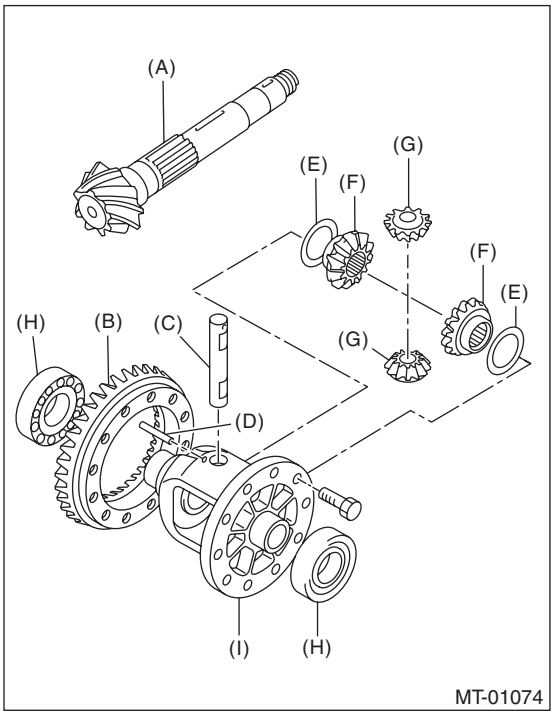
2) Install the O-ring.

NOTE:
- Use new O-rings.
- Apply gear oil to O-ring.
- Do not stretch or damage the O-ring.
- Install the O-ring after adjusting the backlash of the hypoid gear and the preload of the roller bearing.



E: INSPECTION

Repair or replace the differential gear in the following cases:
- When the hypoid drive gear and drive pinion shaft tooth surfaces are damaged, excessively worn, or seized.
- When the roller bearing on the drive pinion shaft has a worn or damaged roller path.
- When there is damage, wear or seizure of the differential bevel pinion, differential bevel gear, washer, pinion shaft or straight pin.
- When the differential case sliding surfaces are worn or damaged.



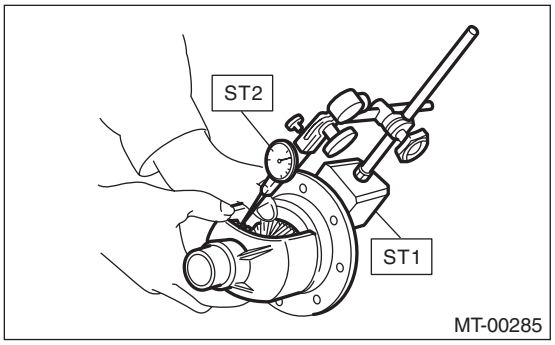
(A) Drive pinion shaft
(B) Hypoid driven gear
(C) Pinion shaft
(D) Straight pin
(E) Washer
(F) Differential bevel gear
(G) Differential bevel pinion
(H) Roller bearing
(I) Differential case

1. BEVEL PINION GEAR BACKLASH

Measure the backlash between the differential bevel gear and differential bevel pinion. If the backlash is out of the specified range, install a suitable washer to adjust. <Ref. to 5MT-75, ADJUSTMENT, Front Differential Assembly.>

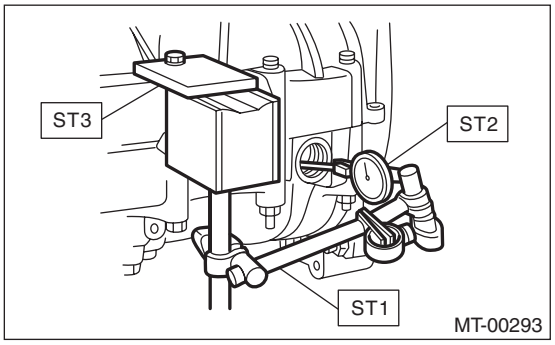
NOTE:
Be sure the pinion gear teeth contacts adjacent gear teeth during measurement.
ST1 498247001 MAGNET BASE
ST2 498247100 DIAL GAUGE

Standard backlash
0.13 — 0.18 mm (0.0051 — 0.0071 in)



2. HYPOID GEAR BACKLASH

1) Set the ST1, ST2 and ST3. Insert the needle through drain plug hole so that the needle comes in contact with the tooth surface on the right corner, and check the backlash.
ST1 498247001 MAGNET BASE
ST2 498247100 DIAL GAUGE
ST3 498255400 PLATE



2) Install SUBARU genuine axle shafts to both sides, rotate in the inversion direction so that the gauge contacts the tooth surface, and read the DIAL GAUGE.

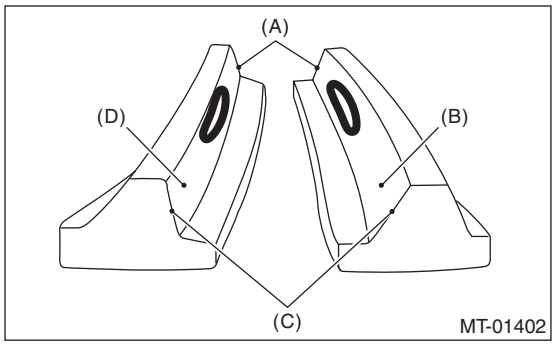
NOTE:
If the backlash is outside the specified range, adjust it by turning the side retainer in the right side case.
Part No. 38415AA100 Axle shaft

Backlash
0.13 — 0.18 mm (0.0051 — 0.0071 in)

3. TOOTH CONTACT OF HYPOID GEAR

Check tooth contact of hypoid gear as follows: Apply a thin uniform coat of red lead on both teeth surfaces on 3 or 4 teeth of the hypoid gear. Move the hypoid gear back and forth by turning the main shaft until a definite contact pattern is developed on the hypoid gear, and judge whether face contact is correct. When the contact pattern is not correct, adjust. <Ref. to 5MT-75, ADJUSTMENT, Front Differential Assembly.>

- Tooth contact is correct.



(A) Toe
(B) Coast side
(C) Heel
(D) Drive side

F: ADJUSTMENT

1. BEVEL PINION GEAR BACKLASH

1) Disassemble the front differential assembly. <Ref. to 5MT-71, DISASSEMBLY, Front Differential Assembly.>
2) Select a differential bevel gear washer from the table and install.

Washer	
Part No.	Thickness mm (in)
803038021	0.925 — 0.950 (0.0364 — 0.0374)
803038022	0.975 — 1.000 (0.0384 — 0.0394)
803038023	1.025 — 1.050 (0.0404 — 0.0413)

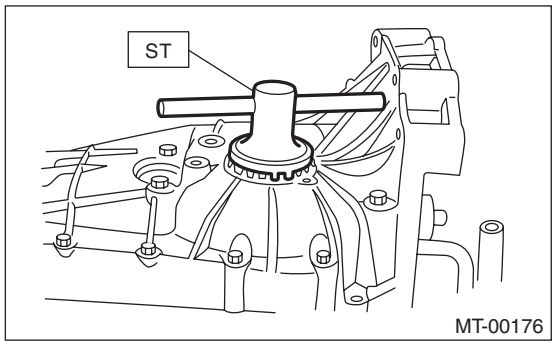
3) Adjust until the standard value is obtained.

Backlash:
Standard
0.13 — 0.18 mm (0.0051 — 0.0071 in)

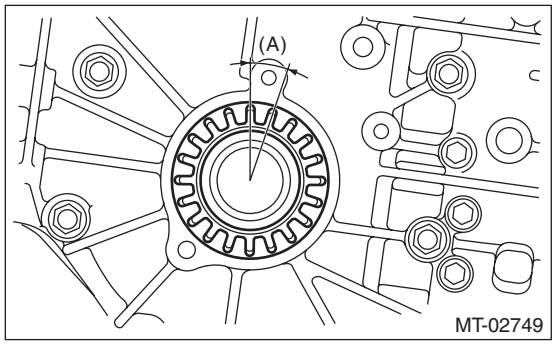
2. HYPOID GEAR BACKLASH

Adjust the backlash by rotating the side retainer in the RH side case.

ST 18630AA010 WRENCH COMPL RETAINER



NOTE:
Each time the side retainer rotates by one notch (A), the backlash changes by 0.05 mm (0.020 in).

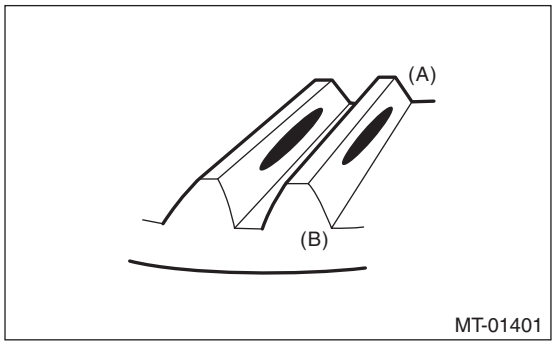


3. TOOTH CONTACT OF HYPOID GEAR

1) Adjust until correct teeth contact is obtained.
2) Check tooth contact, and perform the adjustment as follows.

- Correct tooth contact

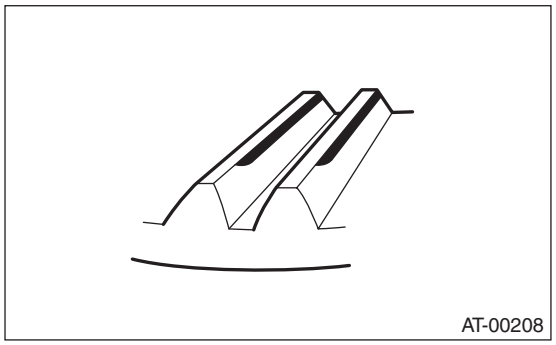
Check item: Tooth contact surface is slightly shifted toward the toe side under a no-load condition. (When driving, it moves towards the heel side.)



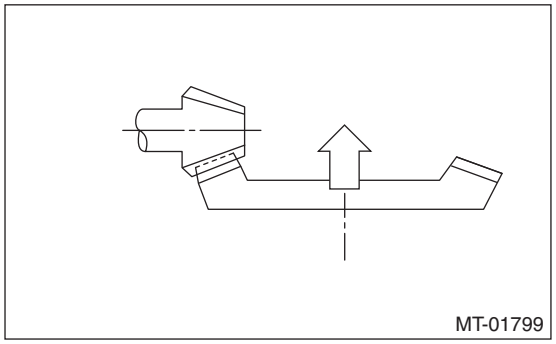
(A) Toe side
(B) Heel side

- Face contact

Check item: Backlash is too large.
Contact pattern

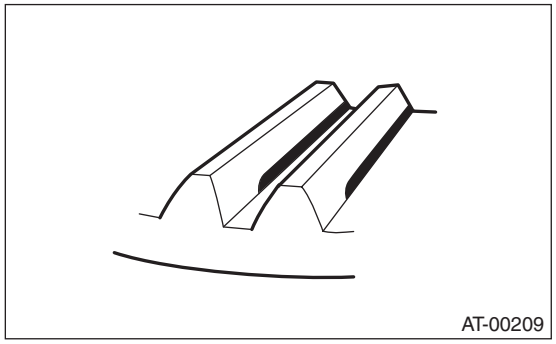


Corrective action: Tighten the side retainer to move the driven gear closer to the drive pinion shaft.

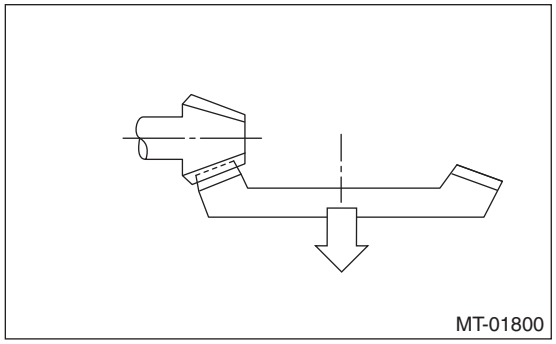


- Flank contact

Check item: Backlash is too small.
Contact pattern

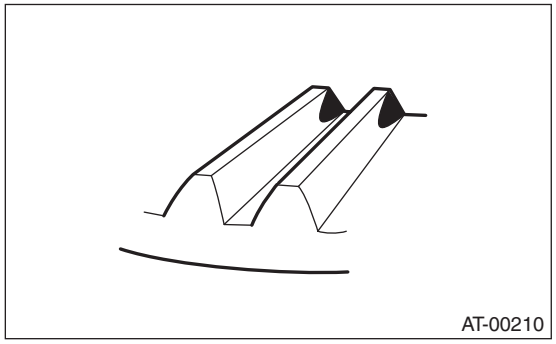


Corrective action: Loosen the side retainer to move the driven gear away from the drive pinion shaft.

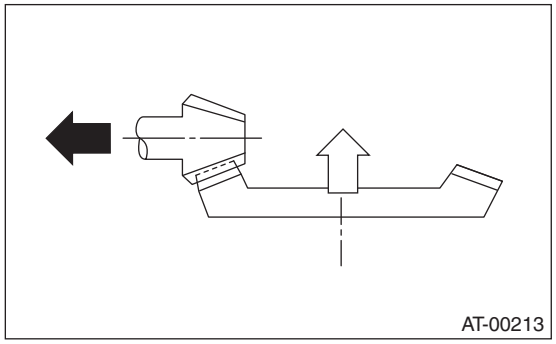


- Toe contact (inside contact)

Check item: Teeth contact area is too small.
Contact pattern

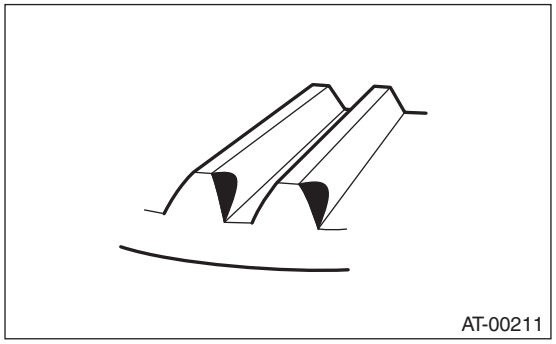


Corrective action: Increase the thickness of drive pinion shim and tighten the side retainer to move the driven gear closer to the drive pinion shaft according to the procedure for bringing drive pinion shaft away from driven gear.

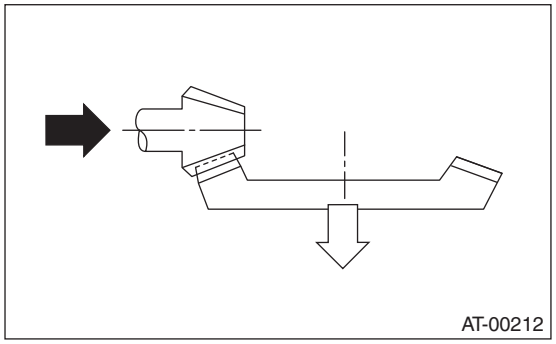


- Heel contact (outside end contact)

Check item: Teeth contact area is too small.
Contact pattern



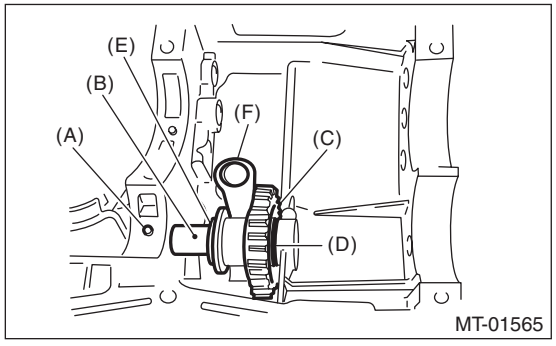
Corrective action: Reduce the thickness of drive pinion shim and loosen the side retainer to move the driven gear away from the drive pinion according to the procedure for moving drive pinion shaft closer to the driven gear.



18.Reverse Idler Gear

A: REMOVAL

1) Remove the manual transmission assembly from the vehicle. <Ref. to 5MT-23, REMOVAL, Manual Transmission Assembly.>
2) Remove the back-up light switch and the neutral position switch. <Ref. to 5MT-35, REMOVAL, Switches and Harness.>
3) Remove the transfer case together with the extension case assembly. <Ref. to 5MT-38, REMOVAL, Transfer Case and Extension Case Assembly.>
4) Remove the transmission case. <Ref. to 5MT-52, REMOVAL, Transmission Case.>
5) Remove the drive pinion shaft assembly. <Ref. to 5MT-61, REMOVAL, Drive Pinion Shaft Assembly.>
6) Remove the main shaft assembly. <Ref. to 5MT-56, REMOVAL, Main Shaft Assembly for Single-Range.>
7) Remove the front differential assembly. <Ref. to 5MT-71, REMOVAL, Front Differential Assembly.>
8) Remove the shifter forks and rods. <Ref. to 5MT-80, REMOVAL, Shifter Fork and Rod.>
9) Pull out the straight pin, and remove the reverse idler gear shaft, washer, reverse idler gear and washer.



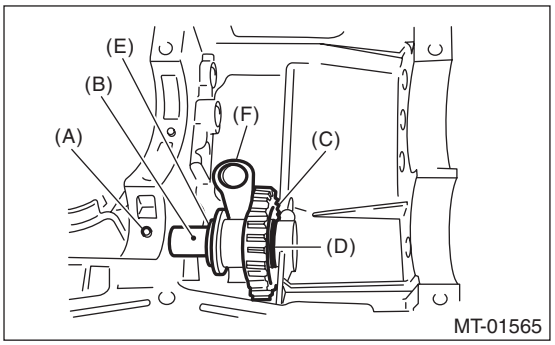
(A) Straight pin
(B) Reverse idler gear shaft
(C) Reverse idler gear
(D) Washer
(E) Washer
(F) Reverse shifter lever

10) Remove the reverse shifter lever.

B: INSTALLATION

1) Install the reverse shifter lever, washer, reverse idler gear, washer and reverse idler gear shaft, and secure them with the straight pin.

NOTE:
- Be sure to install the reverse idler gear shaft from rear side.
- Use a new straight pin.



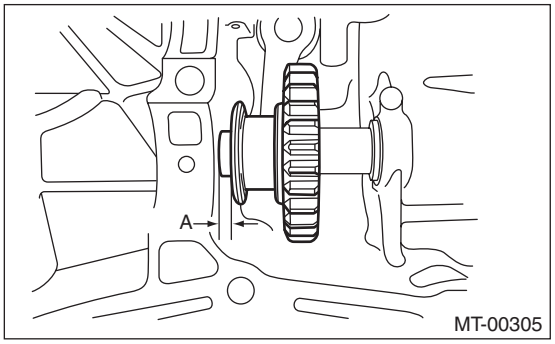
(A) Straight pin
(B) Reverse idler gear shaft
(C) Reverse idler gear
(D) Washer
(E) Washer
(F) Reverse shifter lever

2) Check and adjust clearance between the reverse idler gear and the timing case wall surface. <Ref. to 5MT-78, INSTALLATION, Reverse Idler Gear.> <Ref. to 5MT-79, ADJUSTMENT, Reverse Idler Gear.>
3) Install the shifter forks and rods. <Ref. to 5MT-80, INSTALLATION, Shifter Fork and Rod.>
4) Install the front differential assembly. <Ref. to 5MT-71, INSTALLATION, Front Differential Assembly.>
5) Install the main shaft assembly. <Ref. to 5MT-56, INSTALLATION, Main Shaft Assembly for Single-Range.>
6) Install the drive pinion shaft assembly. <Ref. to 5MT-61, INSTALLATION, Drive Pinion Shaft Assembly.>
7) Install the transmission case. <Ref. to 5MT-52, INSTALLATION, Transmission Case.>
8) Install the transfer case together with the extension case assembly. <Ref. to 5MT-38, INSTALLATION, Transfer Case and Extension Case Assembly.>
9) Install the back-up light switch and the neutral position switch. <Ref. to 5MT-35, INSTALLATION, Switches and Harness.>
10) Install the manual transmission assembly to the vehicle. <Ref. to 5MT-26, INSTALLATION, Manual Transmission Assembly.>

C: INSPECTION

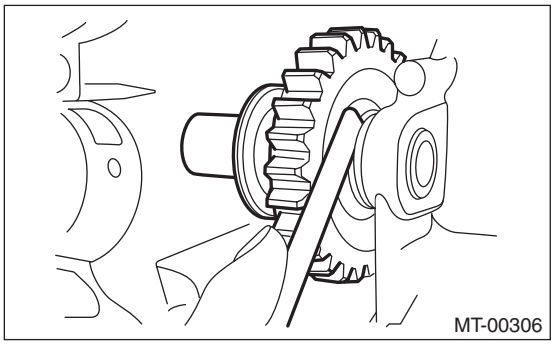
1) Move the reverse shifter rod toward the reverse side. Check the clearance between the reverse idler gear and the transmission case wall surface.
If out of specification, select the appropriate reverse shifter lever and adjust.

Clearance A:
6.0 — 7.5 mm (0.236 — 0.295 in)



2) After installing a suitable reverse shifter lever, shift into neutral. Check the clearance between the reverse idler gear and the transmission case wall surfaces.
If out of specification, select the appropriate washer and adjust.

Clearance:
0 — 0.5 mm (0 — 0.020 in)

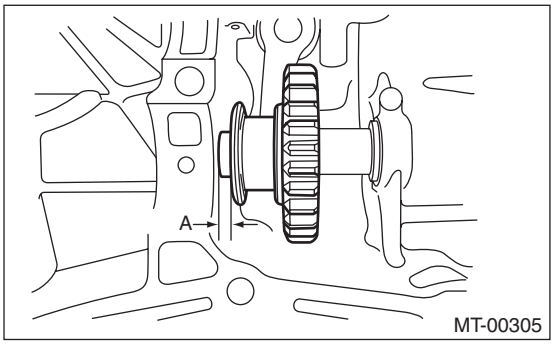


3) Check the reverse idler gear and shaft for damage. Replace if it is damaged.

D: ADJUSTMENT

1) Select the appropriate reverse shifter lever from the table below, and adjust until the clearance between the reverse idler gear and transmission case wall is within specification.

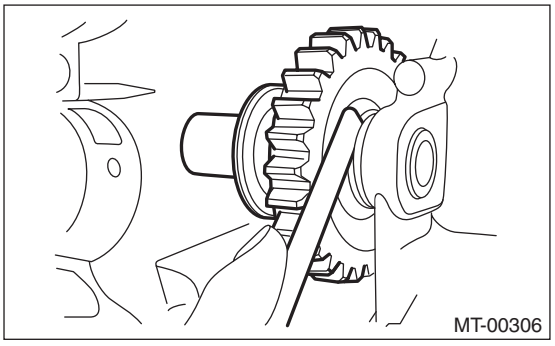
Clearance A:
6.0 — 7.5 mm (0.236 — 0.295 in)



Reverse shifter lever		
Part No.	Mark	Remarks
32820AA070	7	Far from case wall
32820AA080	8	Standard
32820AA090	9	Closer to case wall

2) Select the appropriate washer from the table below, and adjust until the clearance between the reverse idler gear and transmission case wall is within specification.

Clearance:
0 — 0.5 mm (0 — 0.020 in)

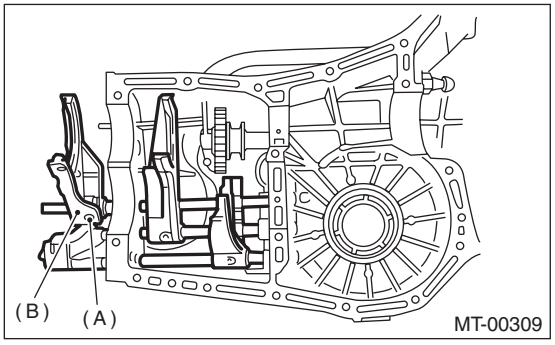


Washer	
Part No.	Thickness mm (in)
803020151	0.4 (0.016)
803020152	1.1 (0.043)
803020153	1.5 (0.059)
803020154	1.9 (0.075)
803020155	2.3 (0.091)

19.Shifter Fork and Rod

A: REMOVAL

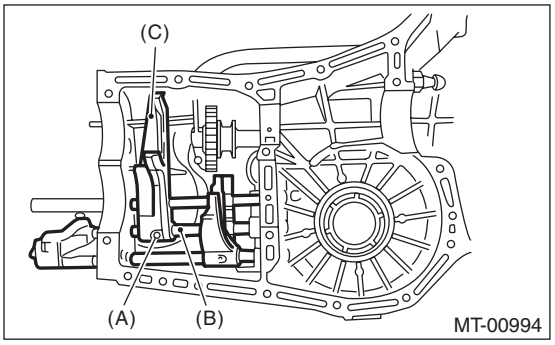
1) Remove the manual transmission assembly from the vehicle. <Ref. to 5MT-23, REMOVAL, Manual Transmission Assembly.>
2) Remove the back-up light switch and the neutral position switch. <Ref. to 5MT-35, REMOVAL, Switches and Harness.>
3) Remove the transfer case together with the extension case assembly. <Ref. to 5MT-38, REMOVAL, Transfer Case and Extension Case Assembly.>
4) Remove the transmission case. <Ref. to 5MT-52, REMOVAL, Transmission Case.>
5) Remove the drive pinion shaft assembly. <Ref. to 5MT-61, REMOVAL, Drive Pinion Shaft Assembly.>
6) Remove the main shaft assembly. <Ref. to 5MT-56, REMOVAL, Main Shaft Assembly for Single-Range.>
7) Remove the front differential assembly. <Ref. to 5MT-71, REMOVAL, Front Differential Assembly.>
8) Drive out the straight pin by tapping it with the ST, and remove the 5th shifter fork.
ST 398791700 STRAIGHT PIN REMOVER 2



(A) Straight pin
(B) 5th shifter fork

9) Remove the plugs, springs and check balls.
10) Drive out the straight pin by tapping it with the ST, and remove the 3rd – 4th fork rod and shifter fork.

NOTE:
When removing the rod, keep other rods in neutral. When driving out the straight pin, remove it toward the inside of case so that it does not hit against the case.
ST 398791700 STRAIGHT PIN REMOVER 2



(A) Straight pin
(B) 3rd-4th fork rod
(C) Shifter fork

11) Drive out the straight pin by tapping with the ST, and pull out the 1st – 2nd fork rod and shifter fork.
ST 398791700 STRAIGHT PIN REMOVER 2
12) Remove the snap ring (outer), and pull out the reverse fork rod from the reverse fork rod arm. Then take out the ball, spring and interlock plunger from the reverse fork rod arm. And then remove the rod.

NOTE:
When pulling out the reverse fork rod arm, be careful not to let the ball pop out of arm.
13) Remove the reverse shifter lever.

B: INSTALLATION

1) Install the spring and ball to the reverse fork rod arm, and press in the ST.
ST 399411700 ACCENT BALL INSTALLER
2) Install the reverse fork rod through the hole on the rear of the transmission case. Press out the ST using the reverse fork rod, and fix with outer snap ring.
3) Install the interlock plunger to reverse fork rod arm.

NOTE:
Apply grease to plunger to prevent it from falling.

4) Position the ball, spring and gasket in the reverse fork rod hole on the left side of transmission case, and tighten the checking ball plug.

NOTE:
Use a new gasket.

Tightening torque:
20 N·m (2.0 kgf-m, 14.8 ft-lb)

5) Install the 1st-2nd fork rod into 1st-2nd shifter fork through the hole on the rear of transmission case.

NOTE:
- Set the reverse fork rod to neutral.
- Check that the positions of interlock plunger is correct.

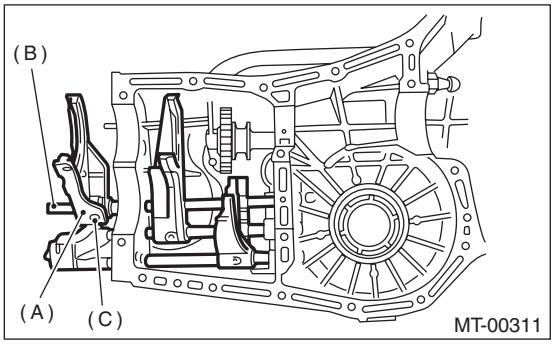
6) Align the holes in the rod and the fork, and drive the new straight pin into these holes using the ST.
ST 398791700 STRAIGHT PIN REMOVER 2
7) Install the interlock plunger (thin) onto the 3rd–4th fork rod.

NOTE:
Apply grease to plunger to prevent it from falling.

8) Attach the 3rd – 4th fork rod into 3rd – 4th shifter fork and reverse fork rod arm through the hole on the rear of the transmission case.
9) Align the holes in the rod and the fork, and drive the new straight pin into these holes.

NOTE:
- Set the reverse fork rod and the 1st – 2nd fork rod to neutral.
- Check that the positions of interlock plunger is correct.

ST 398791700 STRAIGHT PIN REMOVER 2
10) Install the 5th shifter fork onto the rear of reverse fork rod. Align the holes in the two parts and drive new straight pin into the specified place.
ST 398791700 STRAIGHT PIN REMOVER 2

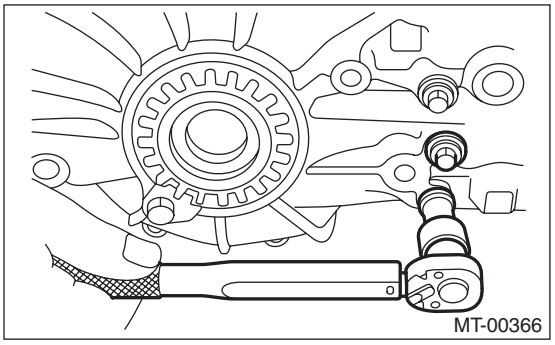


(A) 5th shifter fork
(B) Reverse fork rod
(C) Straight pin

11) Position the balls, checking ball springs and gaskets to the 3rd – 4th fork rod and 1st – 2nd fork rod holes, and install plugs.

NOTE:
Use a new gasket.

Tightening torque:
20 N·m (2.0 kgf-m, 14.8 ft-lb)

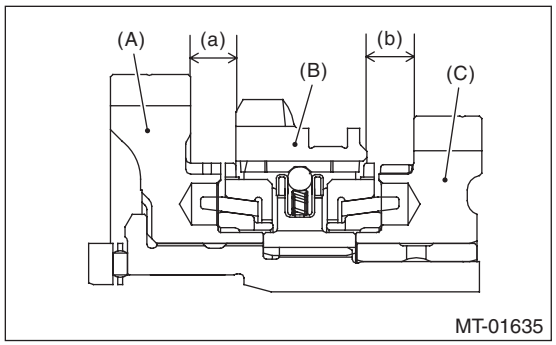


12) Install the front differential assembly. <Ref. to 5MT-71, INSTALLATION, Front Differential Assembly.>
13) Install the main shaft assembly. <Ref. to 5MT-56, INSTALLATION, Main Shaft Assembly for Single-Range.>
14) Install the drive pinion shaft assembly. <Ref. to 5MT-61, INSTALLATION, Drive Pinion Shaft Assembly.>
15) Install the transmission case. <Ref. to 5MT-52, INSTALLATION, Transmission Case.>
16) Install the transfer case together with the extension case assembly. <Ref. to 5MT-38, INSTALLATION, Transfer Case and Extension Case Assembly.>
17) Install the back-up light switch and the neutral position switch. <Ref. to 5MT-35, INSTALLATION, Switches and Harness.>
18) Install the manual transmission assembly to the vehicle. <Ref. to 5MT-26, INSTALLATION, Manual Transmission Assembly.>

C: INSPECTION

1) Check the fork and rod for damage. Replace if it is damaged.
2) Gearshift mechanism
Repair or replace the gearshift mechanism if excessively worn, bent or defective in any way.
3) Inspect the clearance between 1st, 2nd driven gear and reverse driven gear. If any clearance is not within specifications, replace the shifter fork as required.

Clearance (a) and (b):
9.5 mm (0.374 in)

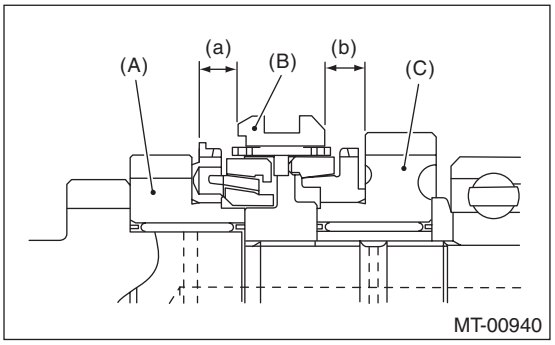


(A) 1st driven gear
(B) Reverse driven gear
(C) 2nd driven gear

1st-2nd shifter fork		
Part No.	Mark	Remarks
32804AA060	1	Approaches 1st gear by 0.2 mm (0.008 in).
32804AA070	No mark	Standard
32804AA080	3	Approaches 2nd gear by 0.2 mm (0.008 in)

4) Inspect the clearance between the 3rd, 4th drive gear and the coupling sleeve. If any clearance is not within specifications, replace the shifter fork as required.

Clearance (a) and (b):
9.3 mm (0.366 in)

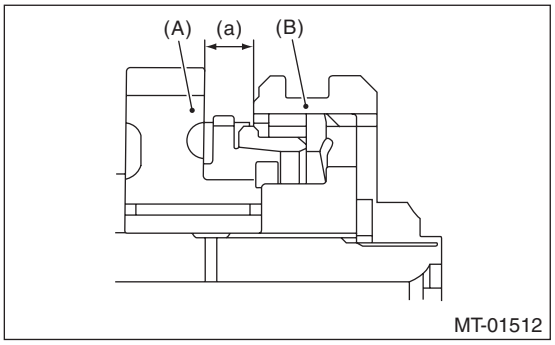


(A) 3rd drive gear
(B) Coupling sleeve
(C) 4th drive gear

3rd-4th shifter fork		
Part No.	Mark	Remarks
32810AA061	1	Approaches 4th gear by 0.2 mm (0.008 in).
32810AA071	No mark	Standard
32810AA101	3	Approaches 3rd gear by 0.2 mm (0.008 in)

5) Inspect the clearance between 5th drive gear and coupling sleeve. If any clearance is not within specifications, replace the shifter fork as required.

Clearance (a):
9.3 mm (0.366 in)



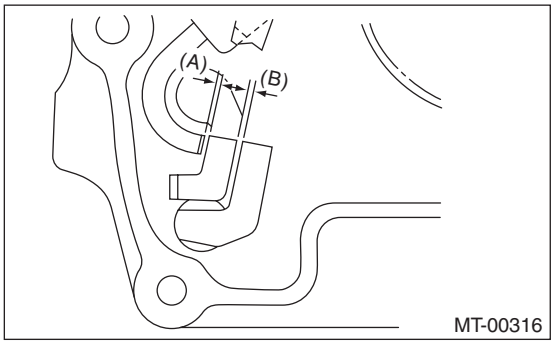
(A) 5th drive gear
(B) Coupling sleeve

5th shifter fork		
Part No.	Mark	Remarks
32812AA201	7	Approaches 5th gear by 0.2 mm (0.008 in).
32812AA211	No mark	Standard
32812AA221	9	Moves away from 5th gear by 0.2 mm (0.008 in).

6) Inspect the rod end clearances (A) and (B). If any clearance is not within specifications, replace the rod or fork as required.

Clearance (A):
3rd-4th — 5th
0.5 — 1.3 mm (0.020 — 0.051 in)

Clearance (B):
1st-2nd — 3rd-4th
0.4 — 1.4 mm (0.016 — 0.055 in)



20.General Diagnostic Table

A: INSPECTION

1. MANUAL TRANSMISSION

Symptoms	Possible cause	Corrective action
1. Gears are difficult to intermesh. NOTE: The cause for difficulty in shifting gears can be classified into two types: One is a defective gear shift system and the other is defective transmission. However, if the operation is heavy and engagement of the gears is difficult, a defective clutch disengagement may also be responsible. Check whether the clutch is correctly functioning, before checking the gear shift system and transmission.	(a) Worn, damaged or burred chamfer at internal spline of the sleeve and reverse driven gear	Replace.
	(b) Worn, damaged or burred chamfer of gear spline	Replace.
	(c) Worn or scratched bushings	Replace.
	(d) Incorrect contact or wear between baulk ring and gear cone	Repair or replace.
2. Gear slip-out • Gear slips out when coasting on rough road. • Gear slips out during acceleration.	(a) Defective pitching stopper adjustment	Replace.
	(b) Loose engine mounting bolts	Tighten.
	(c) Worn shifter fork or broken shifter check ball spring	Replace.
	(d) Worn or damaged ball bearing	Replace.
	(e) Excessive clearance between splines of synchronizer hub and synchronizer sleeve	Replace.
	(f) Synchronizer hub tooth step wear	Replace.
	(g) Worn 1st driven gear and driven shaft	Replace.
	(h) Worn 2nd driven gear and bushing	Replace.
	(i) Worn 3rd drive gear and needle bearing	Replace.
	(j) Worn 4th drive gear and needle bearing	Replace.
	(k) Worn reverse idler gear and bushing	Replace.
3. Noise emitted from transmission NOTE: If a noise is heard when the vehicle is parked with its engine idling and if a noise ceases when the clutch is disengaged, it may be considered that the noise is coming from the transmission.	(a) Insufficient or improper lubrication	Lubricate with specified oil or replace.
	(b) Worn or damaged gears and bearings NOTE: If the trouble is only wear of the gear teeth surfaces, only a high whirring noise will occur at high speeds, but if any part is broken, rhythmical clicking sounds will be heard even at low speeds.	Replace.

2. DIFFERENTIAL

Symptoms	Possible cause	Corrective action
1. Broken differential (case, gear, bearing, etc.) NOTE: Noise will occur, and eventually the differential will not be able to operate due to broken pieces obstructing the gear revolution.	(a) Insufficient or improper oil	Disassemble the differential and replace broken components. At the same time check other components for any trouble, and replace if necessary.
	(b) Use of vehicle under severe conditions such as excessive load and improper use of the clutch	Readjust the preload and backlash of the bearing, and the contact surface of gear.
	(c) Improper adjustment of taper roller bearing	Adjust.
	(d) Improper adjustment of the drive pinion and the hypoid driven gear	Adjust.
	(e) Excessive backlash of a vehicle under severe operating conditions due to worn differential side gear, washer or differential pinion.	Add recommended oil to the specified level. Do not use vehicle under severe operating conditions.
	(f) Loose hypoid driven gear clamping bolts	Tighten.
2. Differential and hypoid gear noises Troubles of the differential and hypoid gear always appear as noise problems. Therefore noise is the first indication of trouble. However, noises from the engine, muffler, tire, exhaust gas, bearing, body, etc. are easily mistaken for the differential noise. Pay special attention to the hypoid gear noise because it is easily confused with other gear noises. There are the following four kinds of noises. • Gear noise when driving: If noise increases as the vehicle speed increases, it may be due to insufficient gear oil, incorrect gear engagement, damaged gears, etc. • Gear noise when coasting: Damaged gears due to misadjusted bearings and incorrect shim adjustment. • Bearing noise when driving or coasting: Cracked, broken or damaged bearings • Noise mainly when turning: Noise from differential side gear, differential pinion or differential pinion shaft, etc.	(a) Insufficient oil	Lubricate.
	(b) Improper adjustment of hypoid driven gear and drive pinion	Check the tooth contact.
	(c) Worn teeth of hypoid driven gear and drive pinion	Replace as a set. Readjust the bearing preload.
	(d) Loose roller bearing	Readjust the backlash of the hypoid driven gear to drive pinion, and check the tooth contact.
	(e) Distorted hypoid driven gear or differential case	Replace.
	(f) Worn washer and differential pinion shaft	Replace.

CLUTCH SYSTEM

CL

		Page
1.	General Description	2
2.	Clutch Disc and Cover	10
3.	Flywheel	13
4.	Release Bearing and Lever	14
5.	Operating Cylinder	16
6.	Master Cylinder	18
7.	Clutch Pipe and Hose	20
8.	Clutch Fluid	21
9.	Clutch Fluid Air Bleeding	22
10.	Clutch Pedal	23
11.	Clutch Switch	27
12.	General Diagnostic Table	30