CLUTCH 2-10

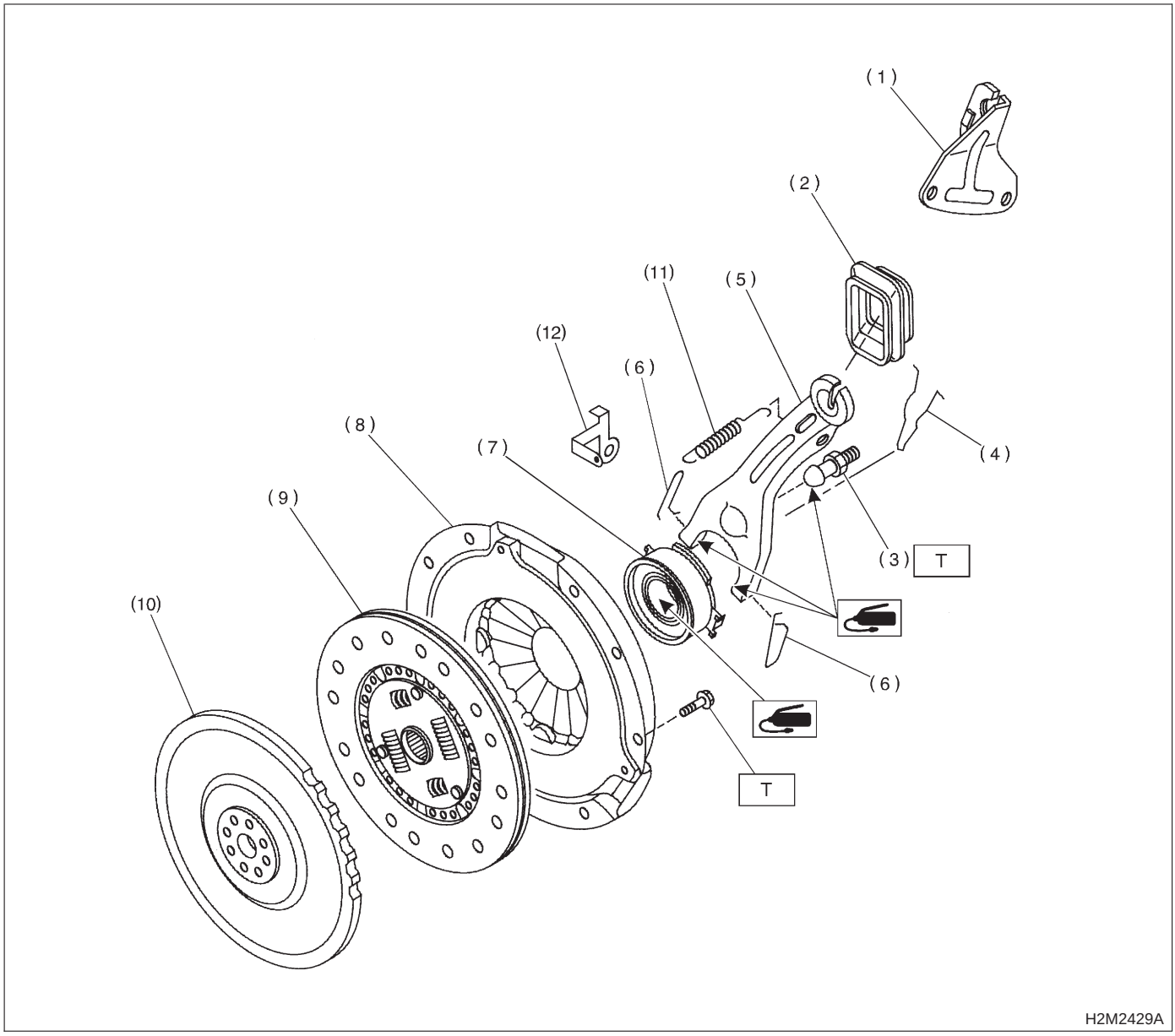
1. Specifications

				2200 cc	2500 cc
Clutch cover	Diaphragm set load		kg (lb)	450 (992)	550 (1,213)
Clutch disc	Facing material			Woven	
	O.D. × I.D. × thickness		mm (in)	225 × 150 × 3.5 (8.86 × 5.91 × 0.138)	
	Spline O.D. (No. of teeth)		mm (in)	25.2 (0.992) (24)	
	Depth of rivet head mm (in)	Standard		1.3 — 1.9 (0.051 — 0.075)	
		Limit of sinking		0.3 (0.012)	
	Limit for runout		mm (in)	1.0 (0.039) at R = 107 (4.21)	
Clutch release lever ratio				3.0	1.6
Release lever	Stroke		mm (in)	24 — 26 (0.94 — 1.02)	11 — 13 (0.43 — 0.51)
	Play at release lever center		mm (in)	3 — 4 (0.12 — 0.16)	
Release bearing				Grease-packed self-aligning	
Clutch pedal	Full stroke		mm (in)	140 — 145 (5.51 — 5.71)	130 — 135 (5.12 — 5.31)

O.D.; Outer Diameter I.D.; Inner Diameter

1. Clutch System

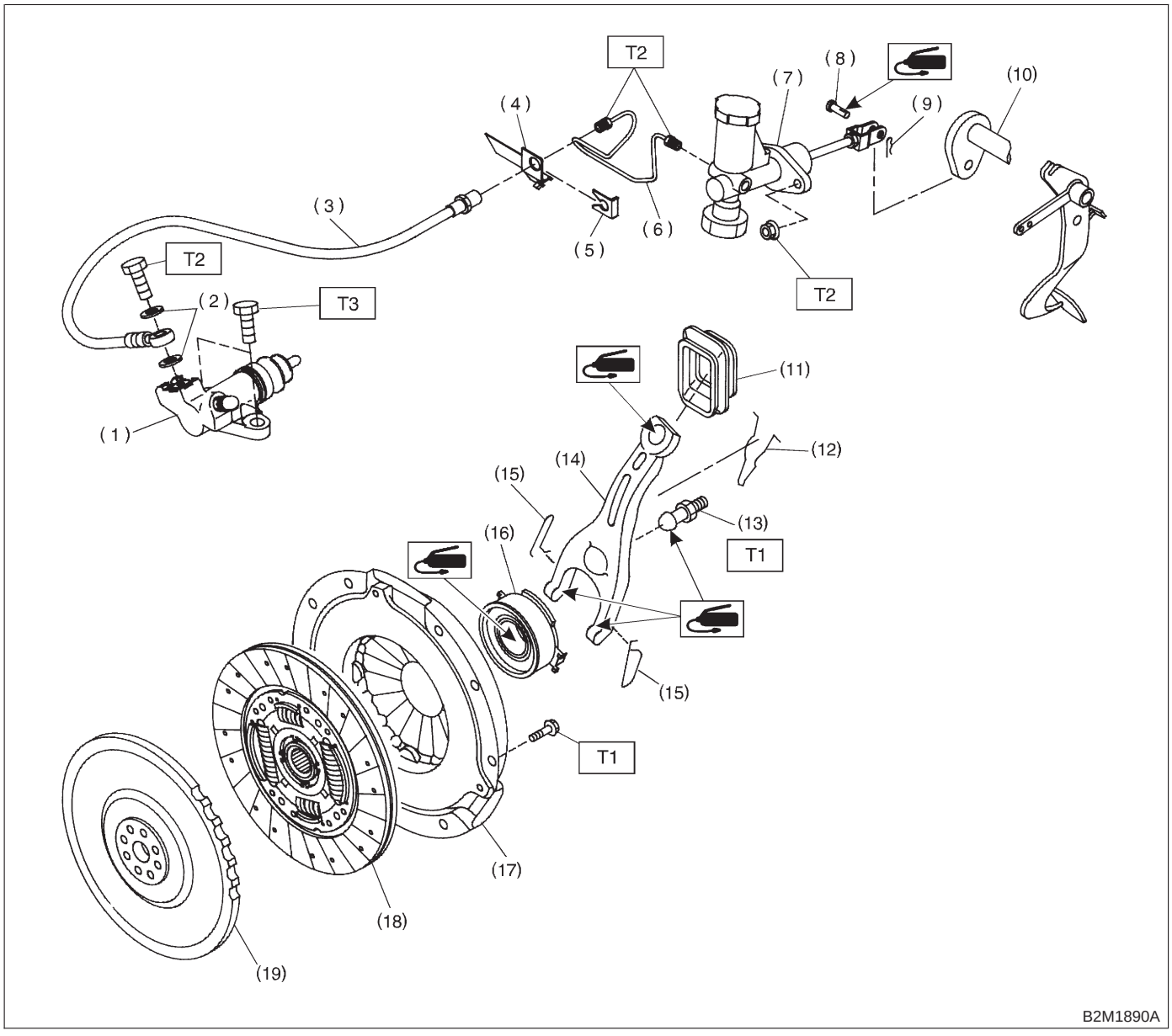
A: MECHANICAL APPLICATION TYPE



(1) Clutch cable bracket
(2) Clutch release lever sealing
(3) Pivot
(4) Retainer spring
(5) Clutch release lever
(6) Clip
(7) Clutch release bearing
(8) Clutch cover
(9) Clutch disc
(10) Flywheel
(11) Return spring
(12) Clutch return spring bracket

Tightening torque: N·m (kg-m, ft-lb)
T: 15.7±1.5 (1.6±0.15, 11.6±1.1)

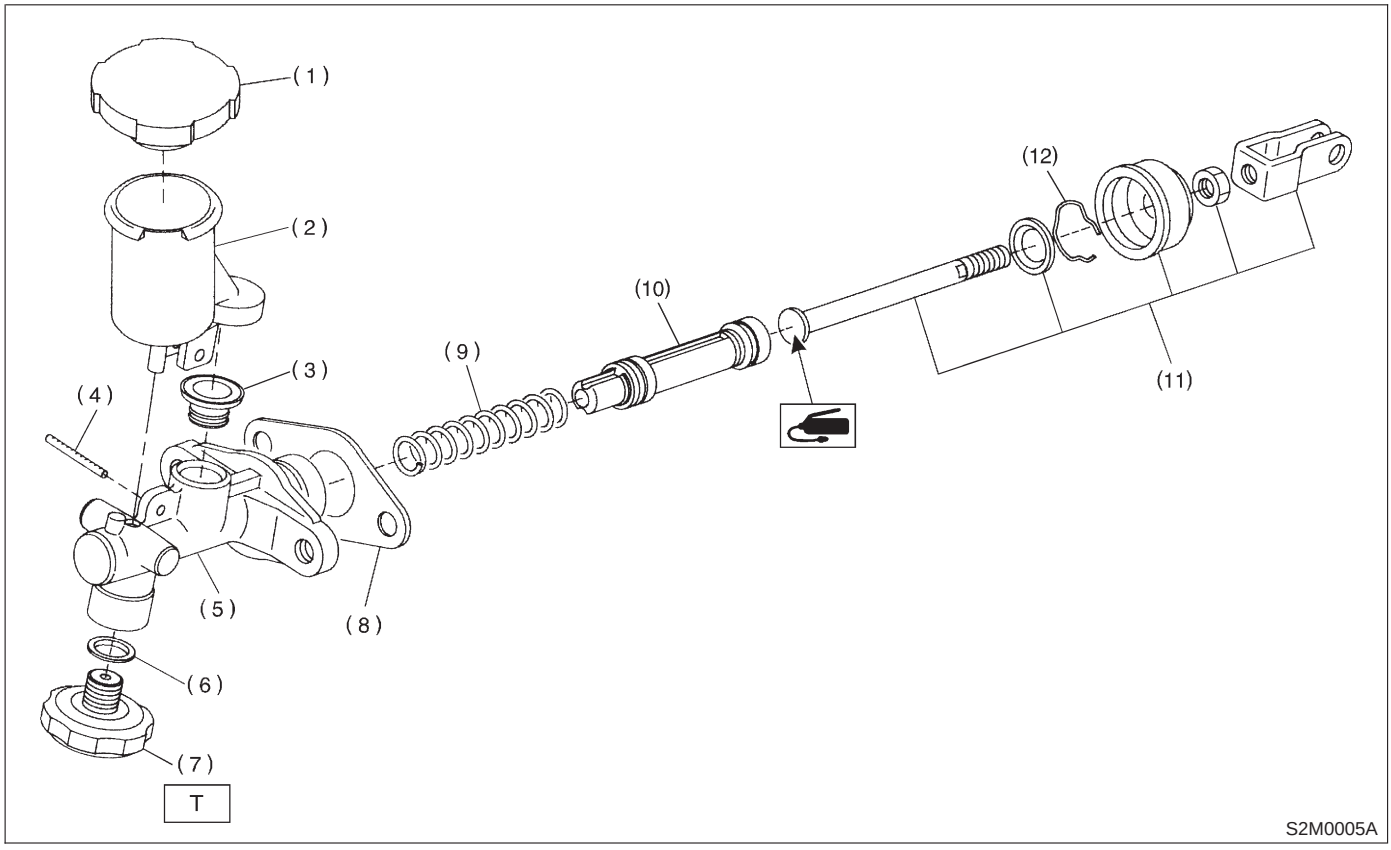
B: HYDRAULIC APPLICATION TYPE



(1) Operating cylinder
(2) Washer
(3) Clutch hose
(4) Bracket
(5) Clamp
(6) Pipe
(7) Master cylinder ASSY
(8) Clevis pin
(9) Snap pin
(10) Lever
(11) Clutch release lever sealing
(12) Retainer spring
(13) Pivot
(14) Release lever
(15) Clip
(16) Release bearing
(17) Clutch cover
(18) Clutch disc
(19) Flywheel

Tightening torque: N·m (kg-m, ft-lb)
T1: 15.7±1.5 (1.6±0.15, 11.6±1.1)
T2: 18±3 (1.8±0.3, 13.0±2.2)
T3: 37±3 (3.8±0.3, 27.5±2.2)

2. Master Cylinder and Reservoir Tank



(1) Reservoir cap
(2) Reservoir tank
(3) Oil seal
(4) Straight pin
(5) Master cylinder
(6) Washer
(7) Diaphragm spring
(8) Seat
(9) Return spring
(10) Piston
(11) Push rod
(12) Piston stop ring

Tightening torque: N·m (kg-m, ft-lb)
T: 46.6±7.4 (4.75±0.75, 34.4±5.4)

1. General

A: PRECAUTION

1. MECHANICAL APPLICATION TYPE

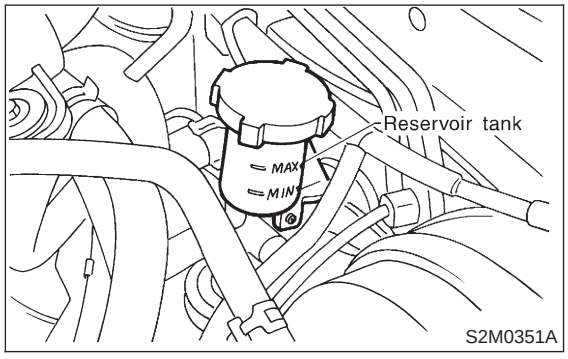
When servicing clutch system, pay attention to the following items.
1) Check the routing of clutch cable for smoothness.
2) Excessive tightness or looseness of clutch cable have a bad influence upon the cable durability.
3) Apply grease sufficiently to the connecting portion of clutch pedal.
4) Apply grease sufficiently to the release lever portion.
5) Position clutch cable through the center of toe board hole and route it smoothly. Adjustment is done by moving the outer cable.
6) Make sure not to let the clutch chatter when starting forward or rearward. If clutch chattering occurs, readjust so that the bend of clutch outer cable becomes flatter.

2. HYDRAULIC APPLICATION TYPE

When servicing clutch system, pay attention to the following items.
1) Check fluid level using a scale on outside of reservoir tank. If the level is below “MIN”, add brake fluid to bring it up to “MAX”.

Recommended brake fluid:
FMVSS No. 116, fresh DOT3 or DOT4 brake fluid

CAUTION:
● Avoid mixing different brakes of brake fluid to prevent degradation of the fluid.
● Be careful not to allow dirt or dust to get into the reservoir tank.
● Use fresh DOT3 or DOT4 brake fluid when refilling fluid.



2) Make sure that brake fluid does not leak from master cylinder, operating cylinder and piping.
3) Apply grease sufficiently to the release lever pinion.
4) Check for proper clutch disengagement and clutch pedal return ability.

2. On-car Service

A: ADJUSTMENT

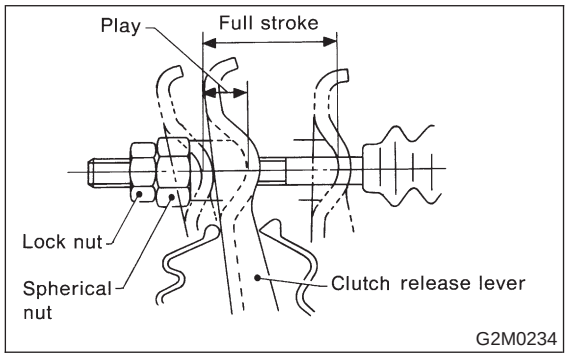
1. MECHANICAL APPLICATION TYPE

1) Remove release lever return spring from lever.
2) Adjust spherical nut so that the play is within the specified value at the lever end (center of spherical nut).

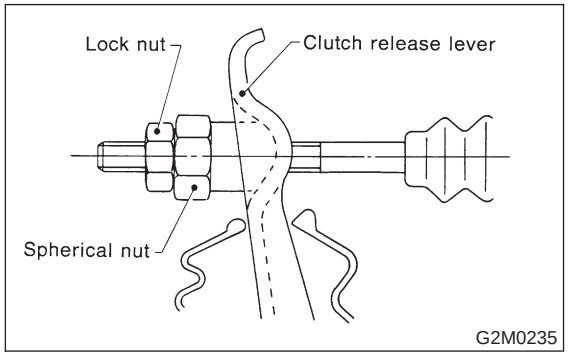
CAUTION:
Take care not to twist the cable during adjustment.

Play: 3 — 4 mm (0.12 — 0.16 in)

Full stroke: 24 — 26 mm (0.94 — 1.02 in)



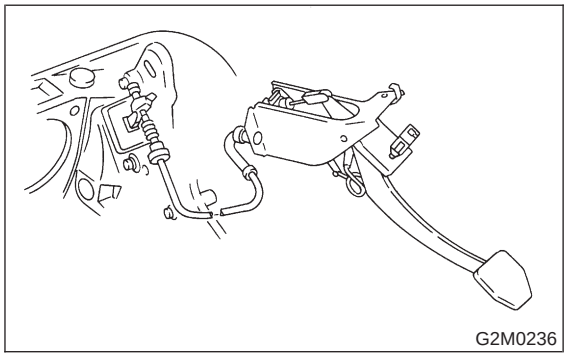
3) Upon completion of adjustment, securely lock spherical nut with lock nut.



4) Install return spring on lever.

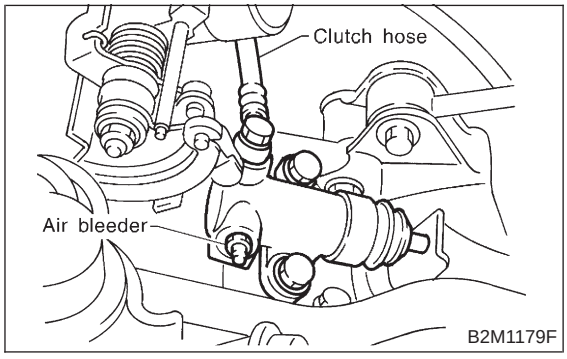
NOTE:
Hook the long hook side of the return spring with the lever.

5) Depress clutch pedal to assure there is no abnormality in the clutch system.

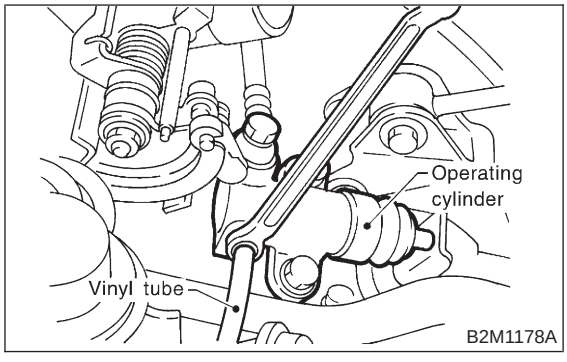


2. HYDRAULIC APPLICATION TYPE

Bleed air from oil line with the help of a co-worker.
1) Remove air chamber.
2) Fit one end of a vinyl tube into the air bleeder of operating cylinder and put the other end into a brake fluid container.



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

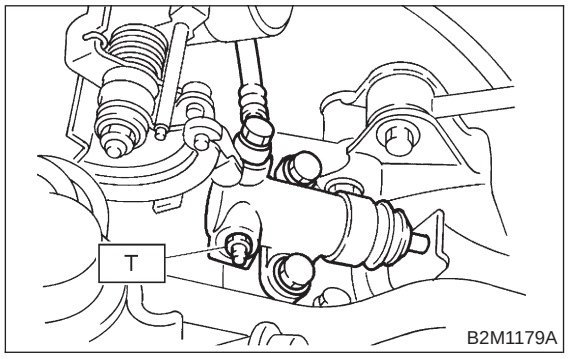


4) Repeat these steps until there are no more air bubbles in the vinyl tube.

CAUTION:
Cover bleeder with waste cloth when loosening it, to prevent brake fluid from being splashed over surrounding parts.

5) Tighten air bleeder.

Tightening torque:
T: 18±3 N·m (1.8±0.3 kg-m, 13.0±2.2 ft-lb)



6) After depressing the clutch pedal, make sure that there are no leaks evident in the entire system.
7) After bleeding air from system, ensure that clutch operates properly.

3. Release Bearing and Lever

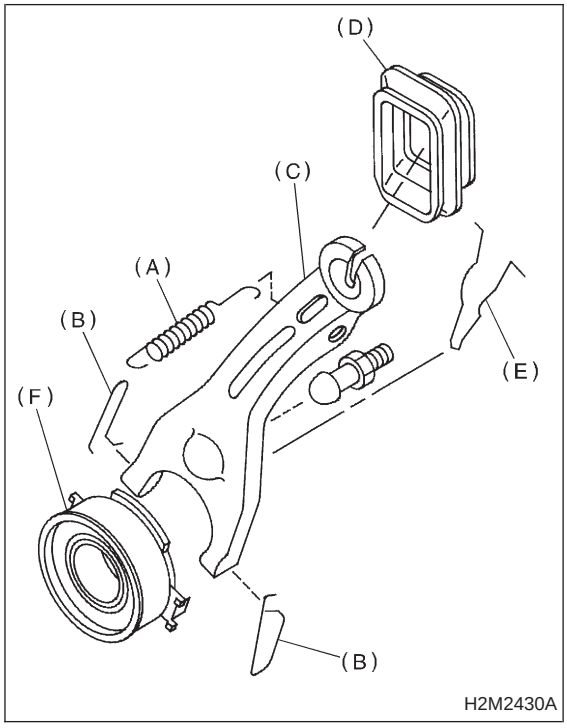
A: REMOVAL

1. MECHANICAL APPLICATION TYPE

1) Remove release lever return spring.
2) Remove the two clips from clutch release lever and remove release bearing.

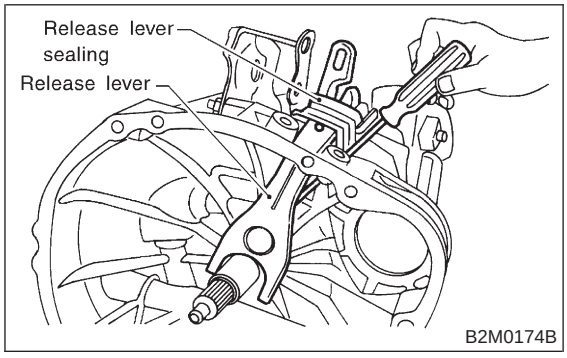
CAUTION:
Be careful not to deform clips.

3) Remove release lever seal.



(A) Release lever return spring
(B) Clip
(C) Release lever
(D) Release lever seal
(E) Retainer spring
(F) Clutch release lever bearing

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

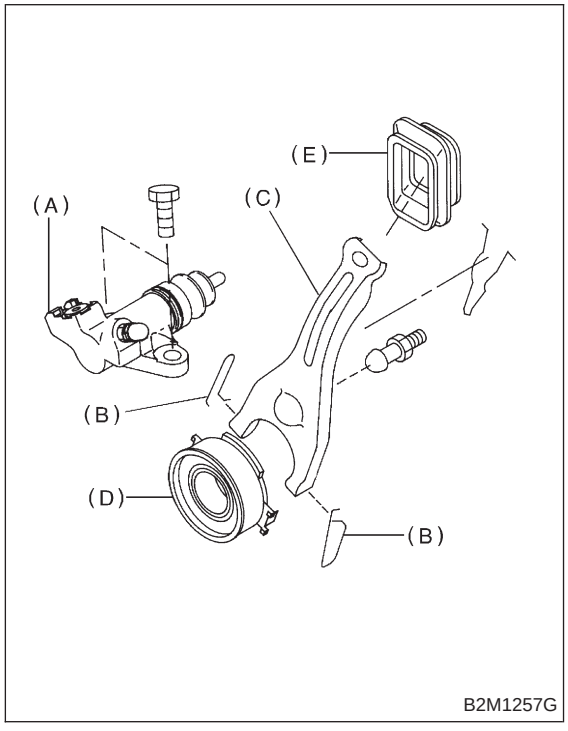


2. HYDRAULIC APPLICATION TYPE

1) Remove transmission assembly from vehicle body.
<Ref. to 2-11 [W2B0].>
2) Remove the two clips from clutch release lever and remove release bearing.

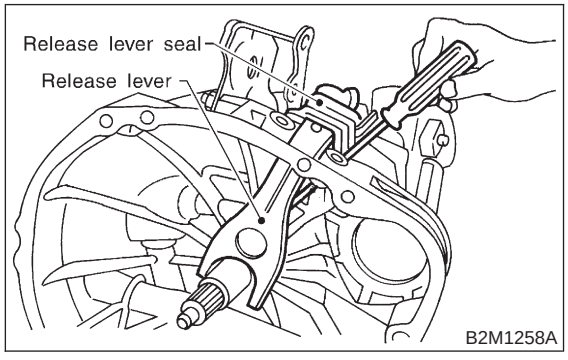
CAUTION:
Be careful not to deform clips.

3) Remove release lever seal.



(A) Operating cylinder
(B) Clip
(C) Clutch release lever
(D) Release bearing
(E) Release lever seal

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



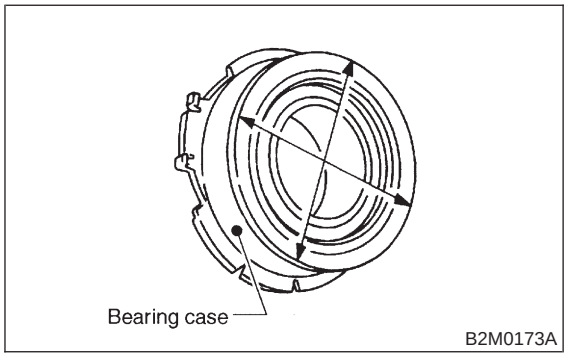
B: INSPECTION

1. RELEASE BEARING

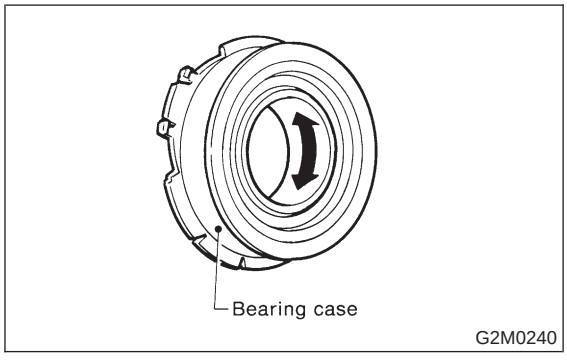
CAUTION:
Since this bearing is grease sealed and is of a nonlubrication type, do not wash with gasoline or any solvent when servicing the clutch.

1) Check the bearing for smooth movement by applying force in the radial direction.

Radial direction stroke:
Approx. 1.4 mm (0.055 in)



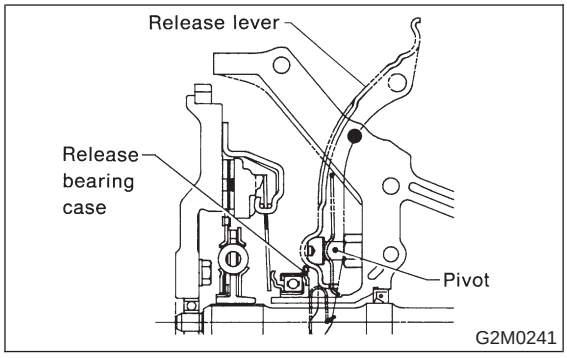
2) Check the bearing for smooth rotation by applying pressure in the thrust direction.



3) Check wear and damage of bearing case surface contacting with lever.

2. RELEASE LEVER

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



C: INSTALLATION

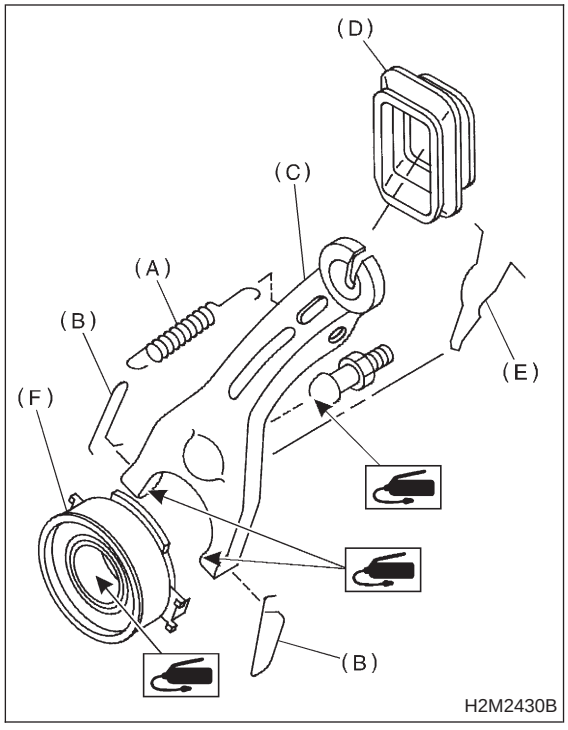
1. MECHANICAL APPLICATION TYPE

CAUTION:
Before or during assembling, lubricate the following points with a light coat of grease.
- **Inner groove of release bearing**
- **Contact surface of lever and pivot**
- **Contact surface of lever and bearing**
- **Transmission main shaft spline (Use grease containing molybdenum disulphide.)**

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

NOTE:
Confirm that retainer spring is securely fitted by observing it through the main case hole.

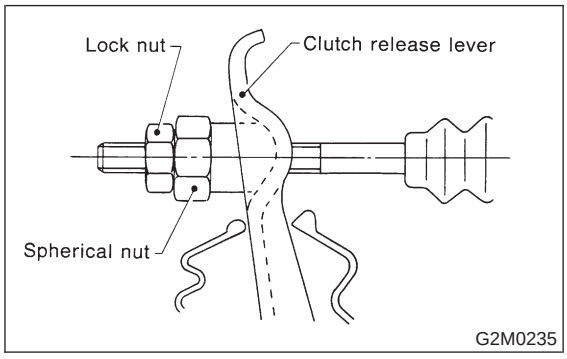
2) Install release bearing and fasten it with two clips.
3) Install release lever seal.



(A) Release lever return spring
(B) Clip
(C) Release lever
(D) Release lever seal
(E) Retainer spring
(F) Clutch release lever bearing

4) After remounting engine and transmission on body, make adjustment of the clutch release lever end play.

CAUTION:
Take care not to twist the cable during adjustment.



5) Install release lever return spring.

NOTE:
Hook up the return spring to right side hole of the release lever.

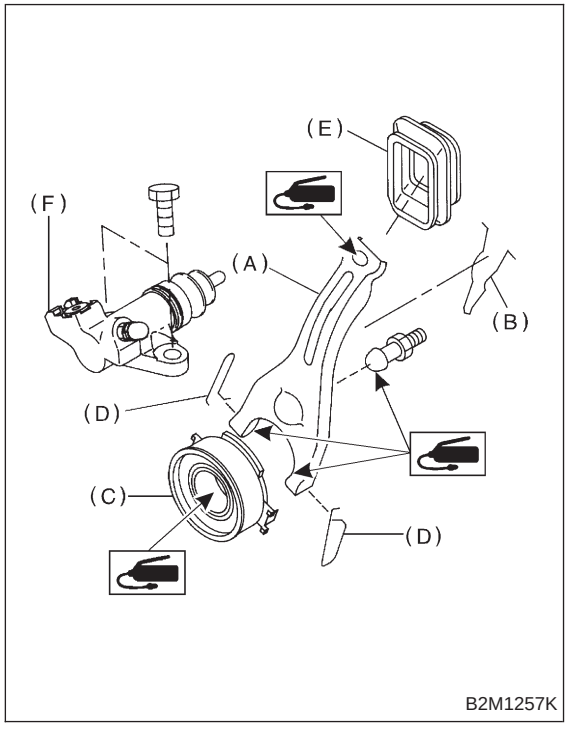
2. HYDRAULIC APPLICATION TYPE

CAUTION:
Before or during assembling, lubricate the following points with a light coat of grease.
- **Inner groove of release bearing**
- **Contact surface of lever and pivot**
- **Contact surface of lever and bearing**
- **Transmission main shaft spline (Use grease containing molybdenum disulphide.)**

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

NOTE:
● Apply grease (SUNLIGHT 2: P/N 003602010) to contact point of release lever and operating cylinder.
● Confirm that retainer spring is securely fitted by observing it through the main case hole.

2) Install release bearing and fasten it with two clips.
3) Install release lever seal.



(A) Release lever
(B) Retainer spring
(C) Release bearing
(D) Clip
(E) Release lever seal
(F) Operating cylinder

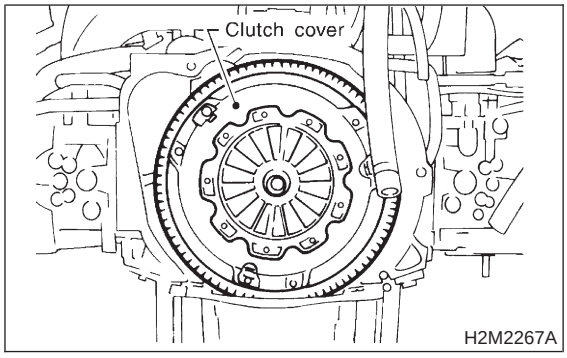
4) After remounting engine and transmission on body.
<Ref. to 2-11 [W2C0].>
5) Bleed air from oil line with the help of a coworker.
<Ref. to 2-10 [W2A2].>

4. Clutch Disc and Cover

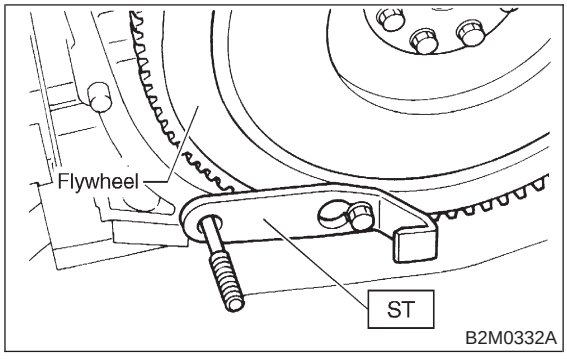
A: REMOVAL

1) Remove clutch cover and clutch disc.

CAUTION:
● Take care not to allow oil on the clutch disc facing.
● Do not disassemble either clutch cover or clutch disc.



2) Install ST on flywheel.
ST 498497100 CRANKSHAFT STOPPER



3) Remove flywheel.

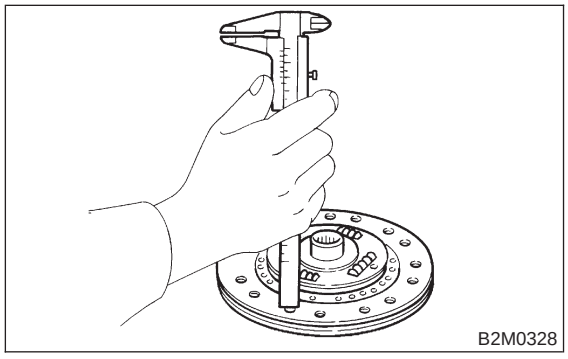
B: INSPECTION

1. CLUTCH DISC

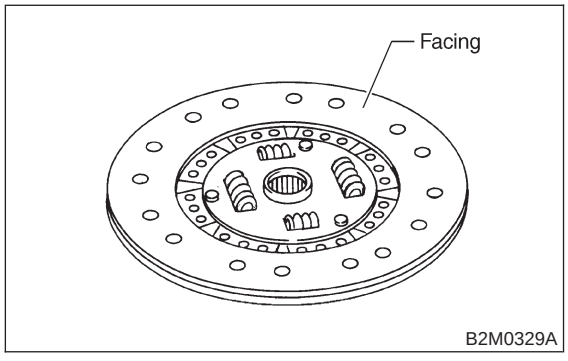
1) Facing wear
Measure the depth of rivet head from the surface of facing. Replace if facings are worn locally or worn down to less than the specified value.

CAUTION:
Do not wash clutch disc with any cleaning fluid.

Depth of rivet head:
Standard value
1.3 — 1.9 mm (0.051 — 0.075 in)
Limit of sinking
0.3 mm (0.012 in)

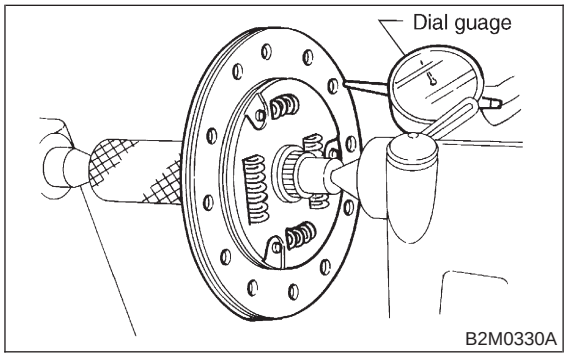


2) Hardened facing
Correct by using emery paper or replace.
3) Oil soakage on facing
Replace clutch disc and inspect transmission front oil seal, transmission case mating surface, engine rear oil seal and other points for oil leakage.

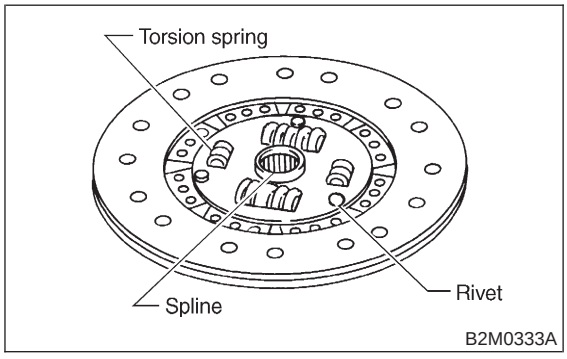


4) Deflection on facing
If deflection exceeds the specified value at the outer circumference of facing, repair or replace.

Limit for deflection:
1.0 mm (0.039 in) at R = 107 mm (4.21 in)

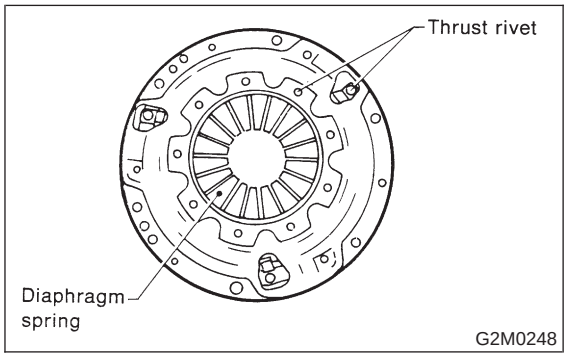


5) Worn spline, loose rivets and torsion spring failure Replace defective parts.

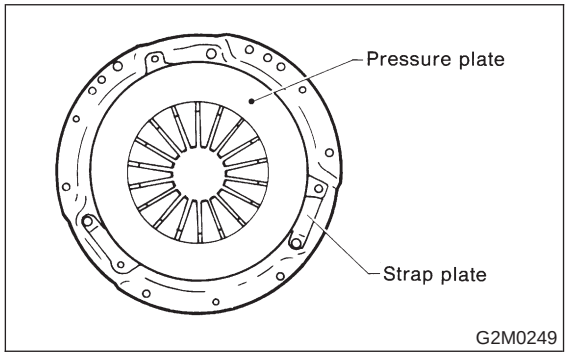


2. CLUTCH COVER

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



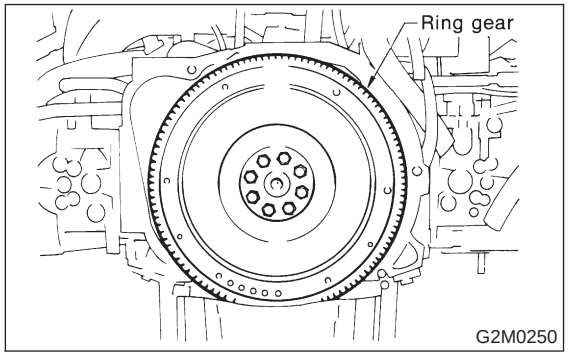
3) Damaged or worn disc contact surface of pressure plate.
4) Loose strap plate setting bolt.
5) Worn diaphragm sliding surface.



3. FLYWHEEL

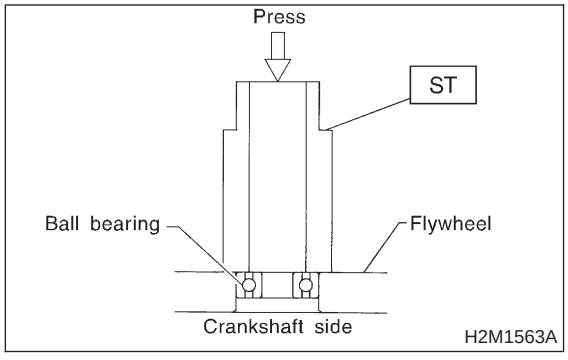
CAUTION:
Since this bearing is grease sealed and is of a nonlubrication type, do not wash with gasoline or any solvent.

1) Damage of facing and ring gear
If defective, replace flywheel.



2) Smoothness of rotation
Rotate ball bearing applying pressure in thrust direction. If noise or excessive play is noted, replace ball bearing as follows:
(1) Drive out ball bearing from flywheel.
(2) Press bearing into flywheel until bearing end surface is flush with clutch disc contact surface of flywheel. Do not press inner race.

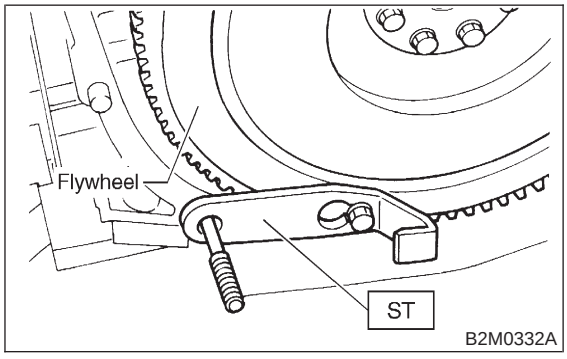
ST 899754112 SNAP RING PRESS



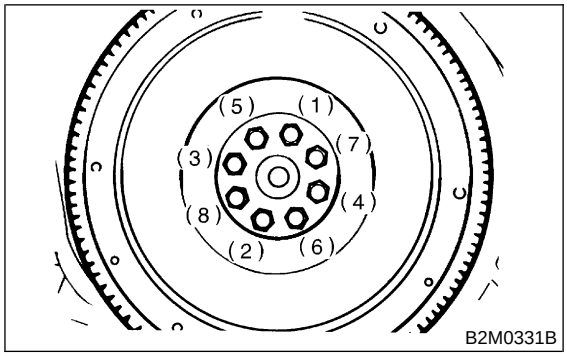
C: INSTALLATION

1) Install flywheel.
2) Install ST, and tighten the flywheel attaching bolts to the specified torque.
ST 498497100 CRANKSHAFT STOPPER

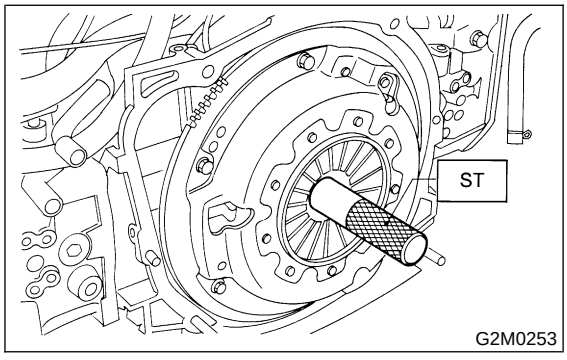
Tightening torque:
72±3 N·m (7.3±0.3 kg-m, 52.8±2.2 ft-lb)



NOTE:
Tighten flywheel installing bolts gradually. Each bolt should be tightened to the specified torque in a crisscross fashion.



3) Insert ST into the clutch disc and install them on the flywheel by inserting the ST end into the pilot bearing.
ST 499747100 CLUTCH DISC GUIDE

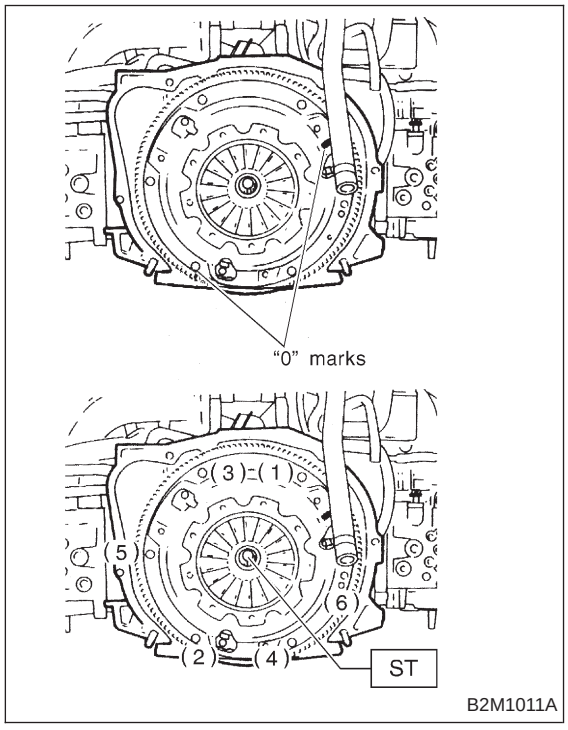


4) Install clutch cover on flywheel and tighten bolts to the specified torque.

NOTE:
● When installing the clutch cover on the flywheel, position the clutch cover so that there is a gap of 120° or more between “0” marks on the flywheel and clutch cover. (“0” marks indicate the directions of residual unbalance.)
● Note the front and rear of the clutch disc when installing.
● Tighten clutch cover installing bolts gradually. Each bolt should be tightened to the specified torque in a crisscross fashion.

Tightening torque:
15.7±1.5 N·m (1.6±0.15 kg-m, 11.6±1.1 ft-lb)

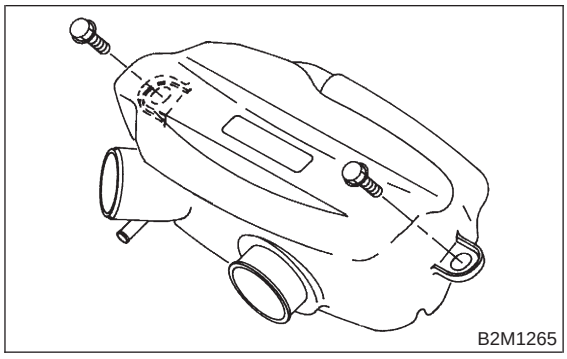
5) Remove ST.
ST 499747100 CLUTCH DISC GUIDE



5. Operating Cylinder

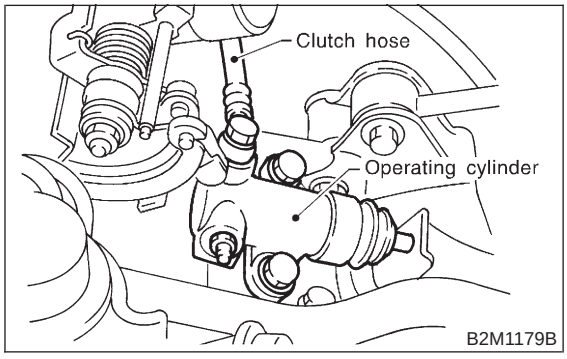
A: REMOVAL AND INSTALLATION

1) Remove air chamber.
<Ref. to 2-7 [W18A0].>

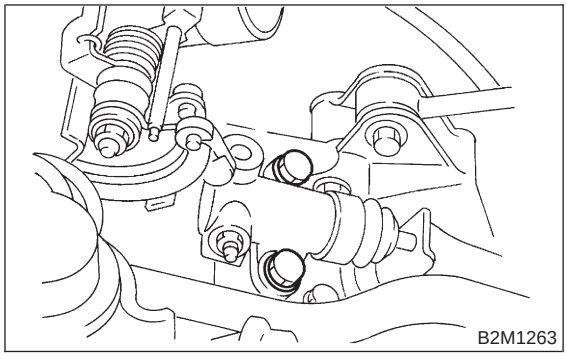


2) Remove clutch hose from operating cylinder.

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



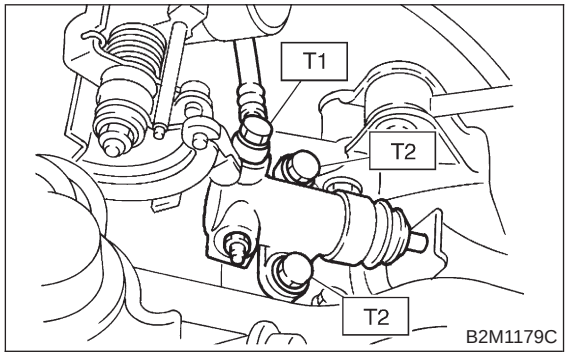
3) Remove operating cylinder from transmission.



4) Installation is in the reverse order of removal.

NOTE:
Before installing operating cylinder, apply grease (SUNLIGHT 2: P/N 003602010) to contact point of release lever and operating cylinder.

Tightening torque:
T1: 18±3 N·m (1.8±0.3 kg-m, 13.0±2.2 ft-lb)
T2: 37±3 N·m (3.8±0.3 kg-m, 27.5±2.2 ft-lb)

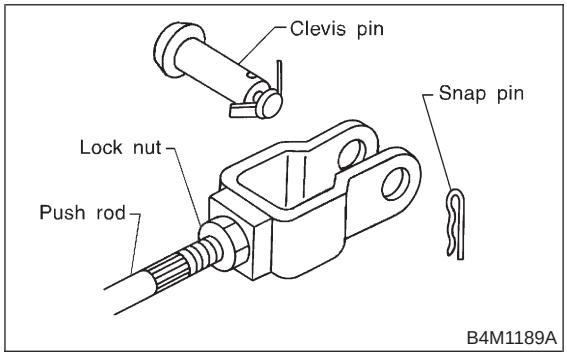


5) After bleeding air from operating cylinder, ensure that clutch operates properly.
<Ref. to 2-10 [W2A2].>

6. Master Cylinder and Reservoir Tank

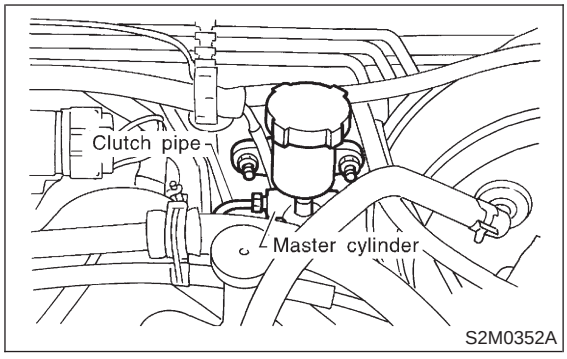
A: REMOVAL

1) Thoroughly drain brake fluid from reservoir tank.
2) Remove snap pin, clevis pin and separate push rod of master cylinder from clutch pedal.



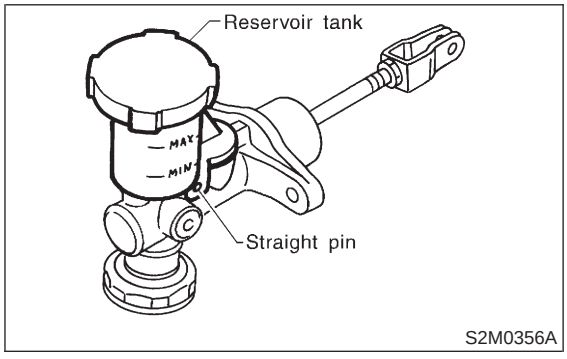
3) Remove clutch pipe from master cylinder.
4) Remove master cylinder with reservoir tank.

CAUTION:
Be extremely careful not to spill brake fluid. Brake fluid spilt on the vehicle body will harm the paint surface; wipe it off quickly if spilt.

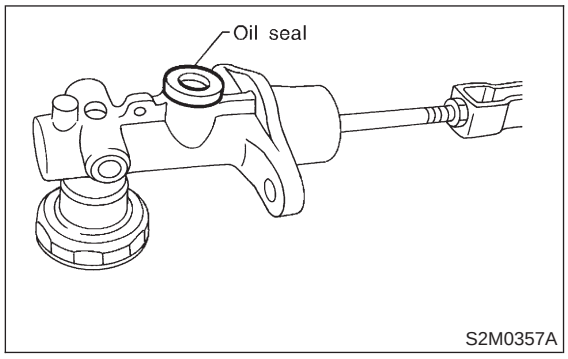


B: DISASSEMBLY

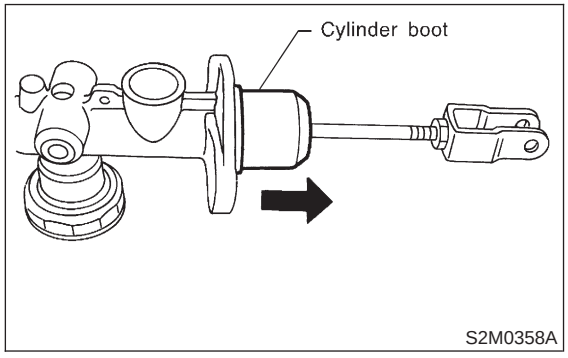
1) Remove straight pin and reservoir tank.



2) Remove oil seal.



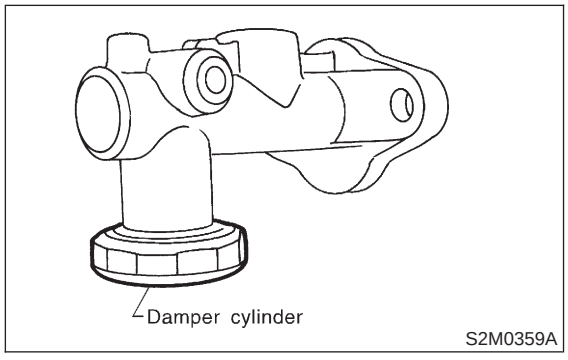
3) Move the cylinder boot backward.



4) Remove snap ring.

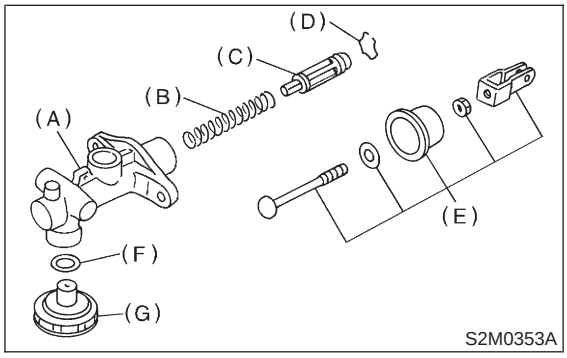
CAUTION:
Be careful when removing the snap ring to prevent the rod, washer, piston and return spring from flying out.

5) Remove damper cylinder from master cylinder body.



C: INSPECTION

If any damage, deformation, wear, swelling, rust or other faults are found on the cylinder, piston, push rod, fluid reservoir, return spring and gasket, replace the faulty part.



(A) Master cylinder body
(B) Return spring
(C) Piston
(D) Snap ring
(E) Rod assy
(F) Washer
(G) Damper cylinder

D: ASSEMBLY

CAUTION:
Apply a coat of grease to the contacting surfaces of the push rod and piston before installation.

1) To assemble the master cylinder reverse the sequence of disassembly procedure.
2) Install damper cylinder washer. Install damper cylinder and tighten to the specified torque.

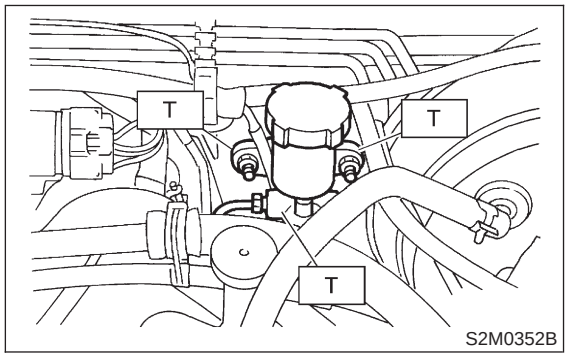
Tightening torque:
T: 46.6±7.4 N·m (4.75±0.75 kg-m, 34.4±5.4 ft-lb)

E: INSTALLATION

1) Install master cylinder to body, and install clutch pipe to master cylinder.

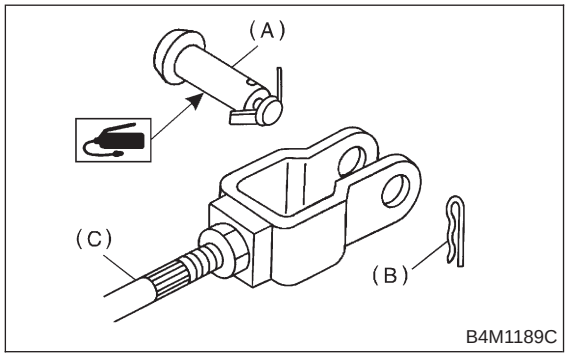
CAUTION:
Check that pipe is routed properly.

Tightening torque:
T: 18±3 N·m (1.8±0.3 kg-m, 13.0±2.2 ft-lb)



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

NOTE:
Apply grease to clevis pin.



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

3) After bleeding air from system, ensure that clutch operates properly.
<Ref. to 2-10 [W2A2].>

7. Brake Fluid

A: REPLACEMENT

CAUTION:
● The FMVSS No. 116, fresh DOT3 or 4 brake fluid must be used.
● Cover bleeder with waste cloth, when loosening it, to prevent brake fluid from being splashed over surrounding parts.
● Avoid mixing different brands of brake fluid to prevent degrading the quality of the fluid.
● Be careful not to allow dirt or dust to get into the reservoir tank.

NOTE:
● During bleeding operation, keep the clutch reserve tank filled with brake fluid to eliminate entry of air.
● Clutch pedal operating must be very slow.
● For convenience and safety, it is advisable to have two men working.
● The amount of brake fluid required is approximately 70 mℓ (2.4 US fl oz, 2.5 Imp fl oz) for total clutch system.

1) Either jack-up vehicle and place a safety stand under it, or lift-up vehicle.
2) Remove both front and rear wheels.
3) Draw out the brake fluid from reserve tank with syringe.
4) Refill reservoir tank with recommended brake fluid.

Recommended brake fluid:
FMVSS No. 116, fresh DOT3 or 4 brake fluid

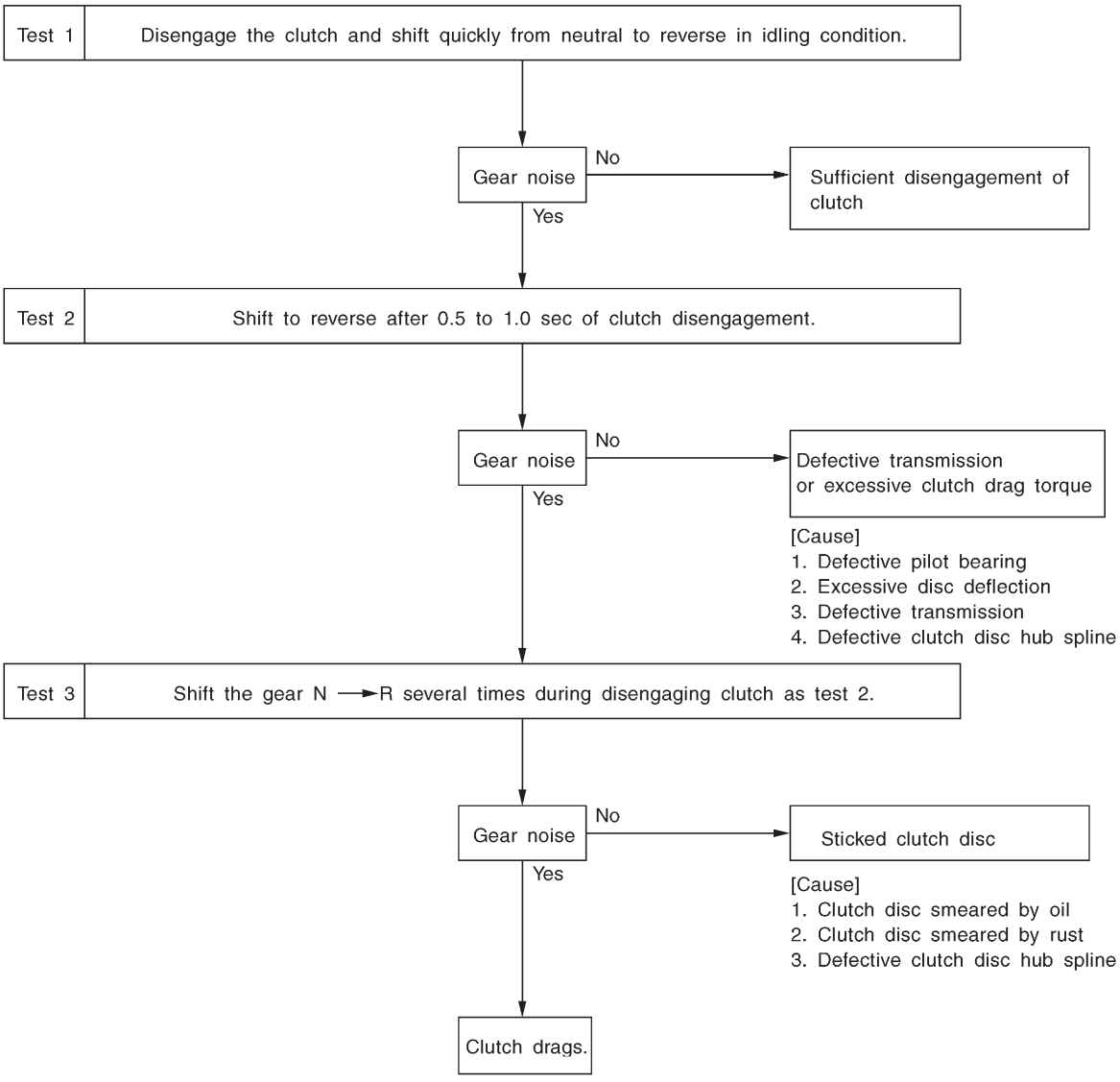
5) Bleed air from oil line with the help of a co-worker.
<Ref. to 2-10 [W2A2].>

1. Clutch Trouble in General

Symptom	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 revs up when shifting. ● High speed driving is impossible; especially rapid acceleration impossible and vehicle speed does not increase in proportion to an increase in engine speed. ● Power falls, particularly when ascending a slope, and there is a smell of burning of the clutch facing. ● Method of testing: Put the vehicle in stationary condition with parking brake fully applied. Disengage the clutch and shift the transmission gear into the first. Gradually allow the clutch to engage while gradually increasing the engine speed. The clutch function is satisfactory if the engine stalls. However, the clutch is slipping if the vehicle does not start off and the engine does not stall.	(a) No clutch pedal play	Readjust.
	(b) No release lever end play	Readjust.
	(c) Clutch facing smeared by oil	Replace.
	(d) Worn clutch facing	Replace.
	(e) Deteriorated diaphragm spring	Replace.
	(f) Distorted pressure plate or flywheel	Correct or replace.
	(g) Defective release bearing holder	Correct or replace.
	(h) Defective pedal and cable system	Correct or replace.
2. Clutch drags. As a symptom of this trouble, a harsh scratching noise develops and control becomes quite difficult when shifting gears. The symptom becomes more apparent when shifting into the first gear. However, because much trouble of this sort is due to defective synchronization mechanism, carry out the test as described after. ● Method of testing: <Ref. to 2-10 [K1A0].> It may be judged as insufficient disengagement of clutch if any noise occurs during this test.	(a) Excessive clutch pedal play	Readjust.
	(b) Excessive clutch release lever play	Readjust.
	(c) Worn or rusty clutch disc hub spline	Replace clutch disc.
	(d) Excessive deflection of clutch disc facing	Correct or replace.
	(e) Seized crankshaft pilot needle bearing	Replace.
	(f) Malfunction of pedal and cable system	Correct or replace.
	(g) Cracked clutch disc facing	Replace.
	(h) Sticked clutch disc (smeared by oil or water)	Replace.
3. Clutch chatters. Clutch chattering is an unpleasant vibration to the whole body when the vehicle is just started with clutch partially engaged.	(a) Improper clutch cable routing	Correct.
	(b) Adhesion of oil on the facing	Replace clutch disc.
	(c) Weak or broken torsion spring	Replace clutch disc.
	(d) Defective facing contact or excessive disc	Replace clutch disc defection.
	(e) Warped pressure plate or flywheel	Correct or replace.
	(f) Loose disc rivets	Replace clutch disc.
	(g) Loose engine mounting	Retighten or replace mounting.
	(h) Improper adjustment of pitching stopper	Adjustment.
4. Noisy clutch Examine whether the noise is generated when the clutch is disengaged, engaged, or partially engaged.	(a) Broken, worn or unlubricated release bearing	Replace release bearing.
	(b) Insufficient lubrication of pilot bearing	Apply grease.
	(c) Loose clutch disc hub	Replace clutch disc.
	(d) Loose torsion spring retainer	Replace clutch disc.
	(e) Deteriorated or broken torsion spring	Replace clutch disc.

Symptom	Possible cause	Corrective action
5. Clutch grabs. 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 clutch disc.
	(b) Deteriorated cushioning spring	Replace clutch disc.
	(c) Worn or rusted spline of clutch disc or main	Take off rust, apply grease or replace clutch shaft disc or mainshaft.
	(d) Deteriorated or broken torsion spring	Replace clutch disc.
	(e) Loose engine mounting	Retighten or replace mounting.
	(f) Deteriorated diaphragm spring	Replace.

A: DIAGNOSTIC DIAGRAM OF CLUTCH DRAG



[Cause]
1. Cracked clutch disc facing
2. Damaged or worn clutch cover
3. Malfunction of clutch release system
4. Insufficient clutch release amount
5. Excessive clutch pedal play

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