

SECTION 2

CLUTCH

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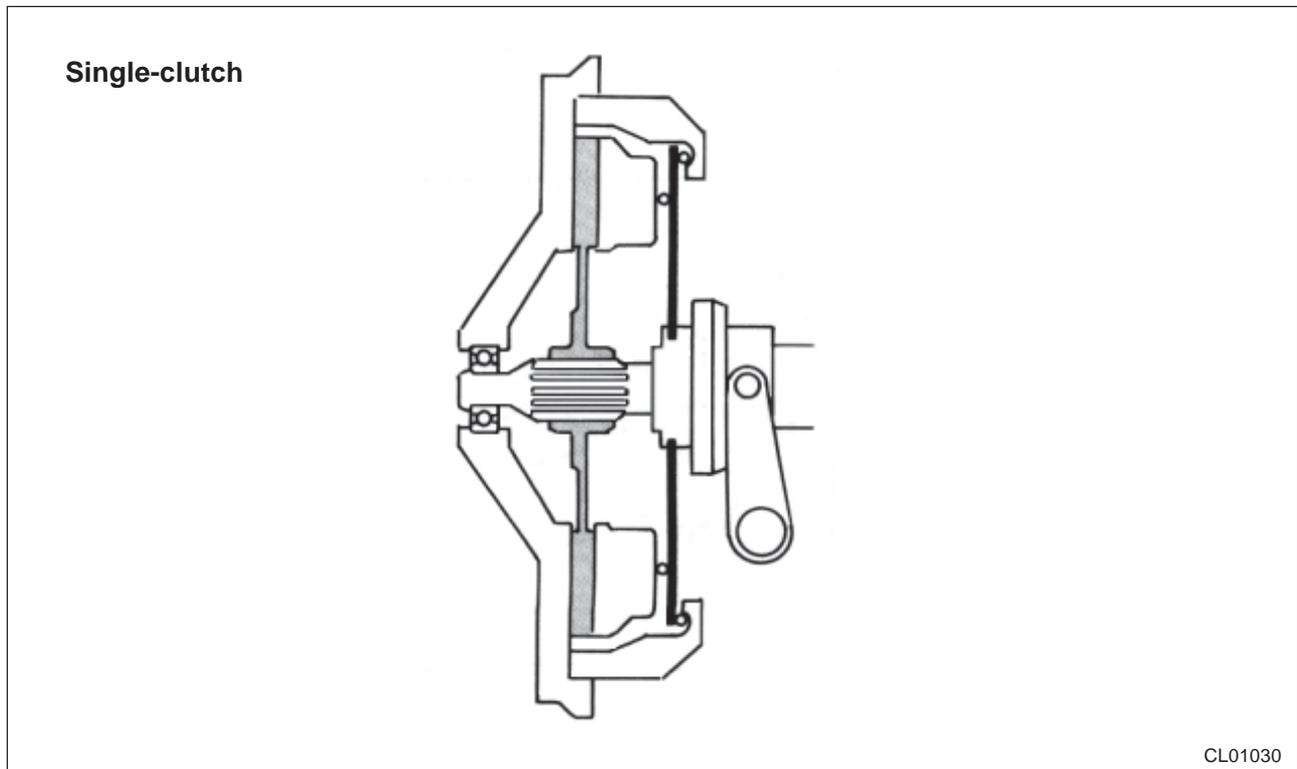
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2. CLUTCH

1. INTRODUCTION (CLUTCH DESIGN AND FUNCTION)

1-1. GENERAL



(1) Clutch system consists of a clutch assembly, pressure plate assembly, clutch disc, clutch control parts.

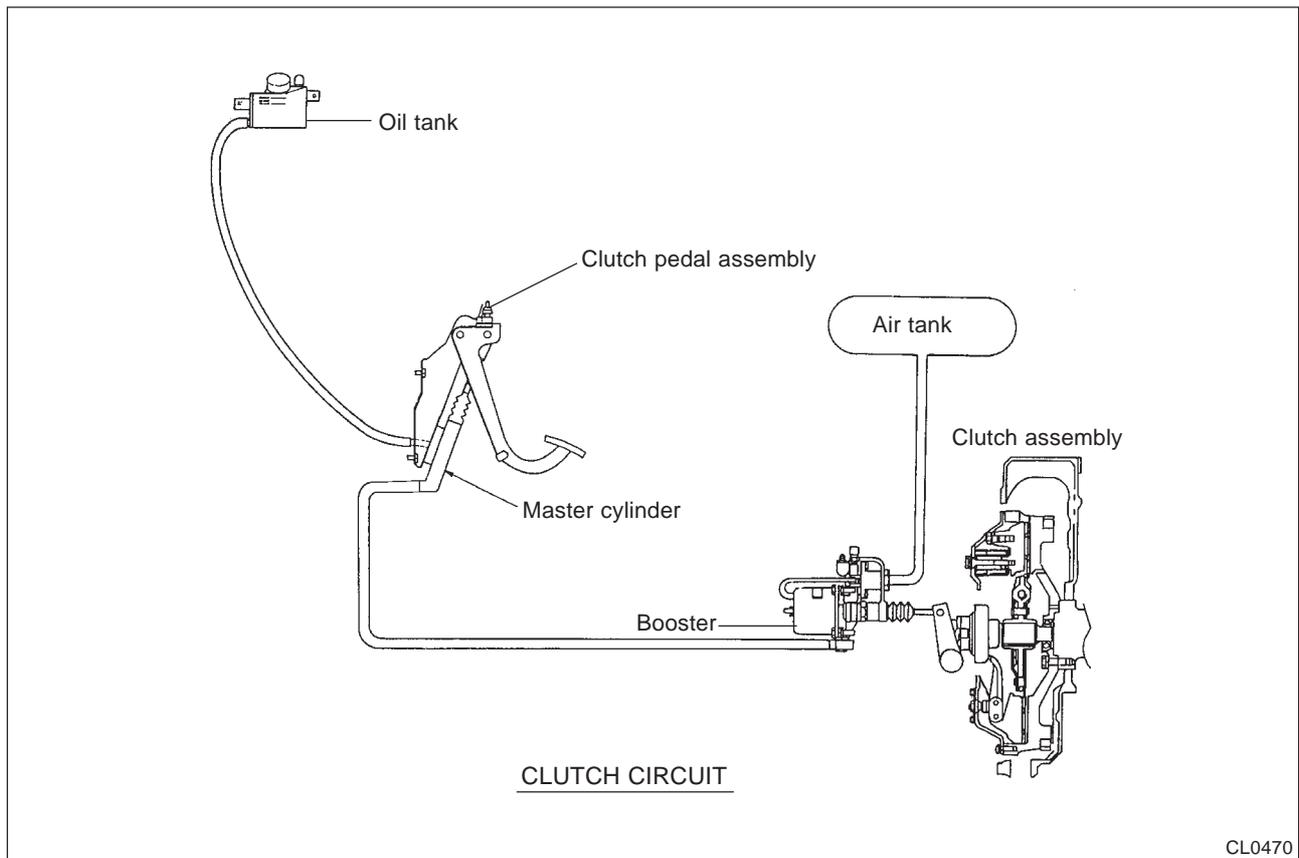
- Clutch is a device used to connect and disconnect engine power flow to the transmission.
- Pedal action allows engine power flow to be gradually applied when the vehicle is starting out from rest and interrupts power flow to avoid gear clashing when shifting gears.
- When the clutch pedal is depressed, the three major clutch assembly components - flywheel, clutch disc, and pressure plate - are disengaged, thus interrupting power flow.
- As the clutch pedal is released, the pressure plate moves closer to the clutch disc, clamping the disc between the pressure plate and the flywheel.

(2) Friction plate

Single - Plate clutch - Dry clutch

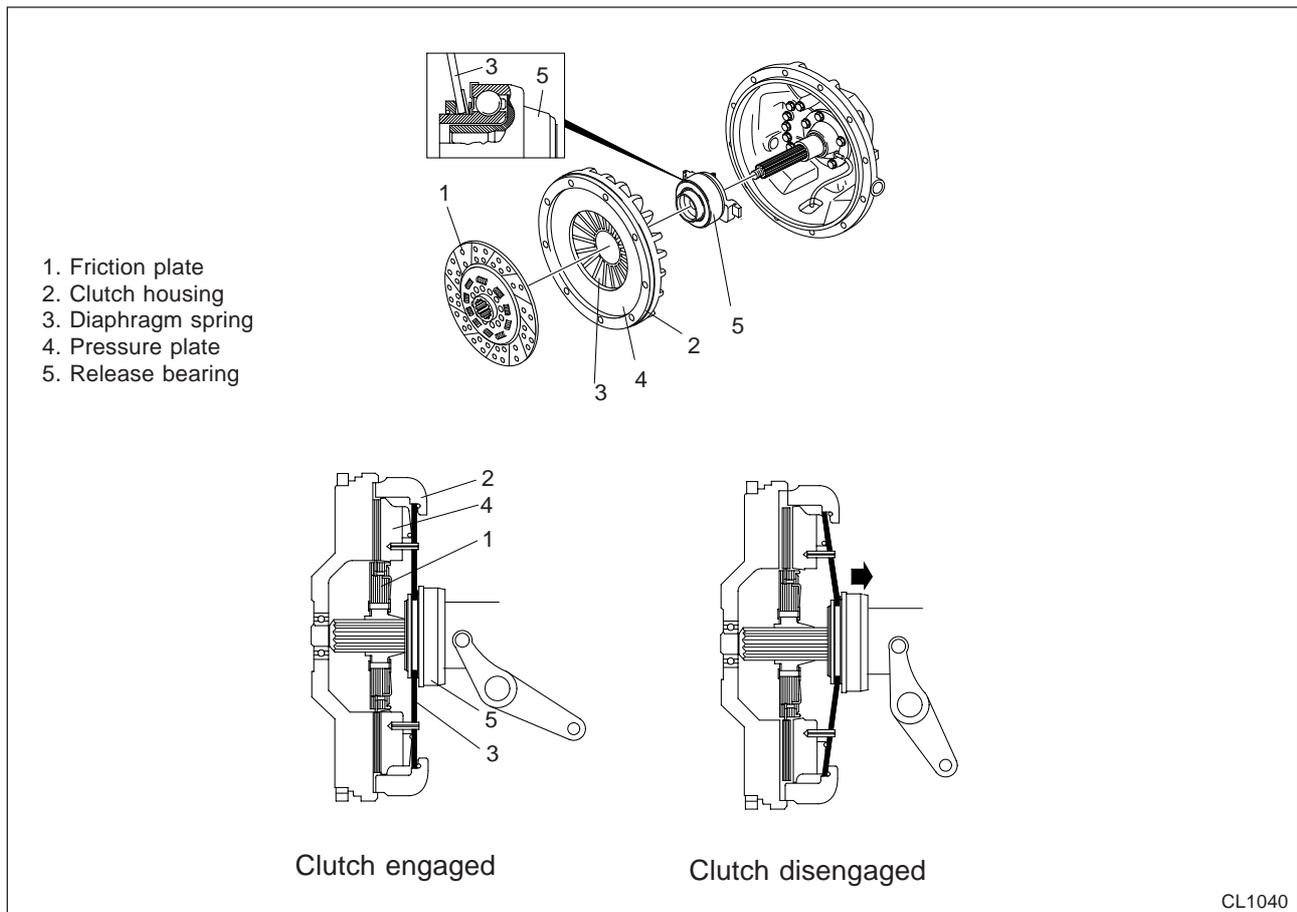
- Coil spring type
- Diaphragm spring type

1-2. CLUTCH CONTROL SYSTEM (PUSH TYPE)



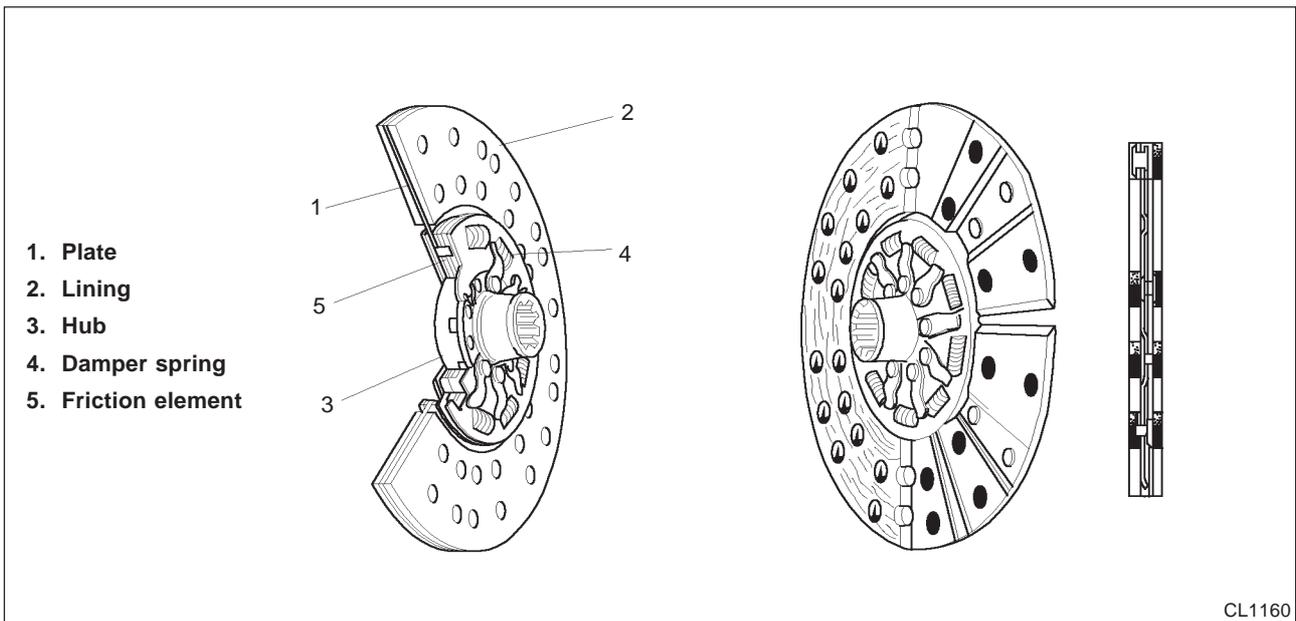
- The main parts of the clutch are the pressure plate, driven plate, clutch cover, spring, release lever.
- The driven plate is located in the flywheel and pressure plate.
- Declutching is performed with the clutch pedal, which is located on the footplate . When the clutch pedal is depressed, master cylinder, which is full of hydraulic fluid.
- The hydraulic fluid arrives from a reservoir tank located above the clutch pedal. Master cylinder and hydraulic pressure arises this pressure is then transmitted via a steel pipe and an armoured hose to the booster. The booster, which is located on the outside of the transmission has the job of converting the pressure from the master cylinder into mechanical movement. This takes place when the hydraulic pressure from the master cylinder reaches a piston rod and a relay valve in the booster.
- When the popper valve is depressed by the hydraulic pressure it opens a passage for compressed air to the booster.
- The compressed air forces a piston, which is attached to the piston rod, forwards taking the piston rod along with it, and transmits the movement to a clutch release lever.

1-3. CLUTCH CONTROL SYSTEM (PULL TYPE)



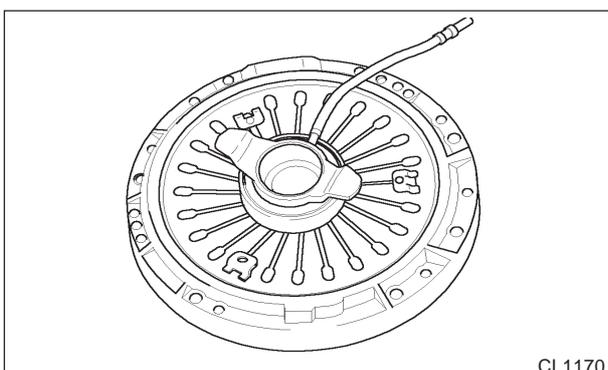
- The main parts of the clutch are the clutch housing diaphragm spring, release bearing, pressure plate and friction plate.
- The clutch housing which contains the pressure plate and diaphragm spring is bolted to the flywheel and rotates with the engine.
- The friction plate is attached in the direction of rotation by splines to the output shaft of the transmission.
- The release bearing is attached to the diaphragm spring and can be replaced separately.
- When the clutch is attached to the flywheel, the diaphragm spring is brought under pressure and forces the pressure plate and friction plate against the flywheel.
- When the clutch pedal is pushed down, the diaphragm spring is pulled backwards by the release bearing and thus release its force against the pressure plate.
- The clutch is now disengaged.

1-4. CLUTCH DISC



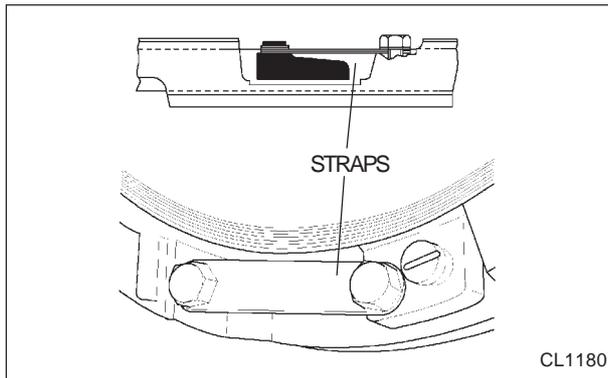
- The plates are of the dry type and have linings on both sides.
- Each plate consists of a disc, damper springs, hub and linings.
- The linings, which are of non-asbestos material, are riveted to the plates.
- The plate is connected to the hub by friction elements and damper spring.
- This is to smooth out the pulsing torque from the engine, the transmission would otherwise be subject to heavy wear.
- The hub is splined, this enabling it to move back forth on the shaft.
- To make the pressure on the plates as even as possible, the plates have wavy metal segments.
- This also provides for smooth engagement of the clutch and reduces the risk of overheating.

1-5. DIAPHRAGM SPRING



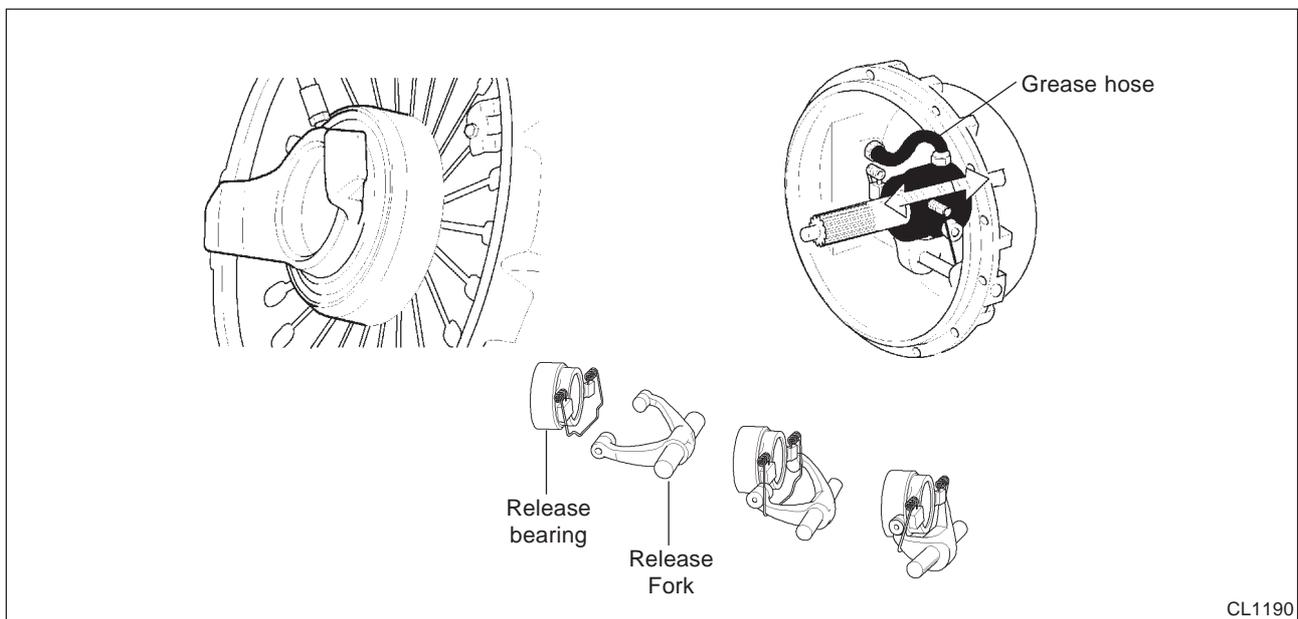
- When the clutch pedal is released, the clutch is brought under pressure by a diaphragm spring
- This consists of a slotted steel plate with the release bearing attached in the center.

1-6. STRAPS



- Since the pressure plate must be able to move axially, it is attached to the clutch housing by spring straps.

1-7. RELEASE BEARING



- The purpose of the release bearing is to transfer clutch movement from the release fork to the diaphragm spring.
- One part of the bearing is located in the direction of rotation by the release bearing, the other part is attached to the diaphragm spring and rotates with the clutch housing and engine.
- The gliding surface for the axial movement of the bearing is lubricated via an oil hose. The oil hose is connected to a lube point which is attached on the outside of the clutch housing.
- A U-shaped spring is mounted on the release bearing. The purpose of the spring is to guide the clutch fork to the correct side of the release bearing when transmission is being fitted.

2. GENERAL

2-1. SPECIFICATIONS

2-1-a. CLUTCH ASSEMBLY

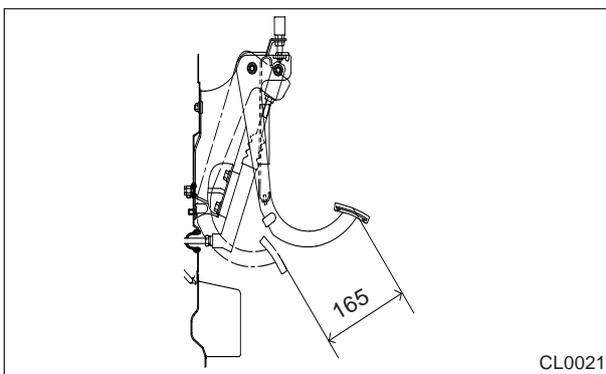
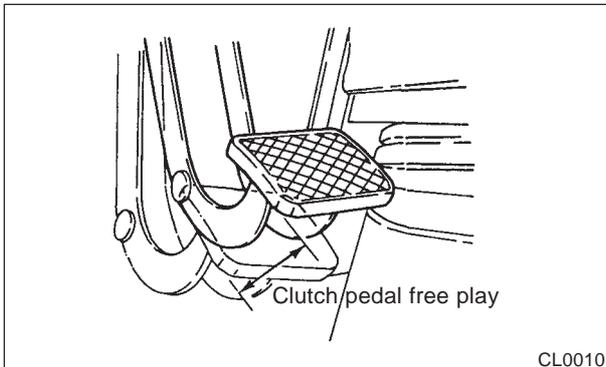
Item		Engine type	
		DE08TiS	DE12TiS, DV15TiS, DDC
Clutch cover	Spring type	Coil spring	Diaphragm spring
	Operate type	Push type	Pull type
	Fixing weight (kg·m)	1,600~2,320	2,300~3,150
Clutch disc	Type	Dry single plate type	←
	Disc size(Outside dia.x inside dia. x thickness, mm)	430 X 250 X 11.5(Pyunghwa) 430 X 260 X 11.5(Seojin)	430X242X10(Pyung hwa) 430X242X11.5(Seojin) 430X250X11.5(Mixer truck)
	Hub spline (Diameter x stroke)	Involute spline, $\phi 45 \times 16$	Angular type, $\phi 52.3 \times 10$

2-1-b. CLUTCH CONTROL

Item		Engine type		DE08TiS DE12TiS C8.3	DV15TiS	DV15TiS(ZF T/M) DDC
		Pedal	Travel(mm)	About 165		
Free play(mm)	40~50		25~30	25~35		
Master cylinder	Manufacturer	DAE CHUEL CO.				
	Diameter x stroke(mm)	$\phi 20 \times 35$			←	
Clutch booster	Manufacturer	Kongsberg(Jung-ang)			WABCO	
	Type	Manual Type			Auto Type	
	Power piston	diameter x stroke(mm)	$\phi 105 \times 35.8$	$\phi 90 \times 35$	$\phi 100 \times 85$	
	Hydraulic piston	diameter x stroke(mm)	$\phi 19.8 \times 35.8$	$\phi 22.2 \times 35$	$\phi 25 \times 85$	
	Relay piston	diameter x stroke(mm)	$\phi 16 \times 3.6$	$\phi 16 \times 3.5$	—	

2-2. INSPECTION AND MAINTENANCE

2-2-a. PEDAL FREE PLAY AND HEIGHT



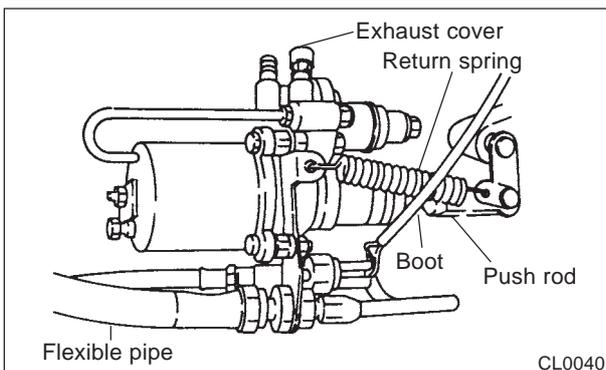
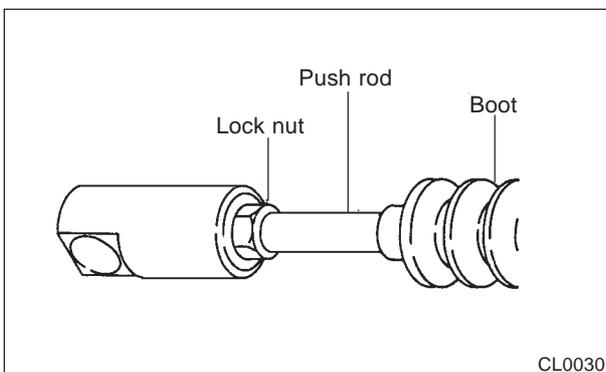
• Type and Specifications

Item	Type and Specifications	
Clutch Booster	Manual type	Auto type
Clutch pedal free play(mm)	40~50	25~35
Clutch Pedal height(mm)	about 165	←

Pedal free play adjustment is to be performed

- when disassembling pedal, master cylinder, and booster
- when clutch cover is to be disassembled or disc abrasion is found
- when pedal free play is less than 35mm (Manual type).

2-2-b. PEDAL FREE PLAY ADJUSTMENT



1. Master cylinder
 - Disconnect the return spring and loosen the push rod lock nut, then turn the push rod until its end is brought into contact with the piston lightly.
 - When push rod is brought into contact with piston, back off the rod half a turn(about 0.5mm) and tighten the lock nut.
2. Clutch booster(Manual type)
 - Remove boot and disconnect return spring.
 - Use a wrench to loosen push rod by turning it slowly until resistance increases, then back off the push rod 3 turns.
(But, in case of 8 ton truck, back off the push rod 2 turns.)
 - Tighten the lock nut and install the boot and return spring.
3. Booster adjustment(Auto adjust type)
Adjust only master cylinder free play, as the booster of Z/F transmission is adjusted automatically
4. After completing the above operations, adjust air pressure to 0kg/cm² and check the pedal free play when the pedal starts to meet the resistance.

2-2-c. INSPECTION OF BOOSTER

1. Inspection of air leak

Install booster on vehicle and check to ensure that there is no air leakage from the booster exhaust cover when air pressure is increased to 6.0kg/cm² or higher. Also check to ensure that air does not leak from booster exhaust cover while the clutch pedal is fully depressed.

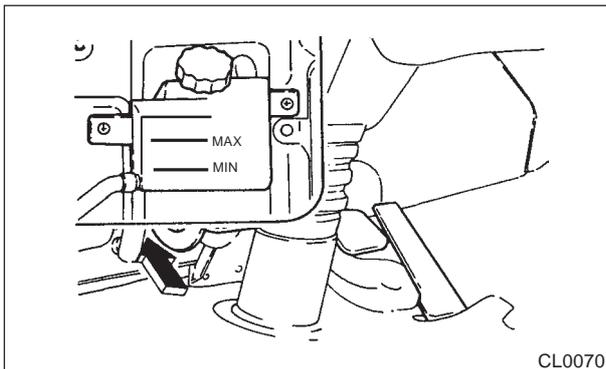
2. Inspection of oil leak

With the clutch pedal depressed, check to ensure that oil does not leak through the joints in hydraulic circuits. Keep the clutch pedal partly depressed and check if vibrations are felt from pedal as time passes. Also check booster push rod for movement. If abnormal condition is not found, it indicates that piston cups and oil seals are in good working conditions.

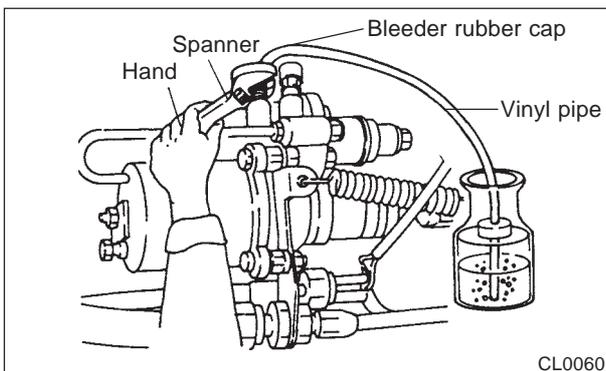
3. Inspection of operation

Operate the clutch pedal repeatedly and check movement of booster push rod, and listen for noise indicating discharge of air from the exhaust cover with no time delay on operation.

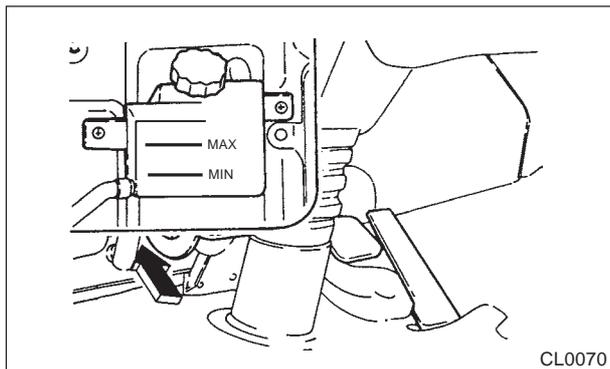
2-2-d. AIR BLEEDING



1. Fill the clutch fluid reservoir to the specified level with brake fluid and keep it filled during bleeding operation.



2. Remove bleeder rubber cap and connect a vinyl pipe to the bleeder and hold free end of the pipe in a transparent container filled with brake fluid.
3. Pump the clutch pedal several times and hold the pedal depressed.
4. With the pedal depressed, loosen the bleeder half a turn to discharge air-mixed brake fluid and tighten it immediately.



5. Repeat the above steps of operation until air bubbles disappear completely from the fluid being forced out.
6. After the completion of bleeding operation, check for pedal free play and clutch operation, then check that the level of brake fluid in the reservoir is normal.

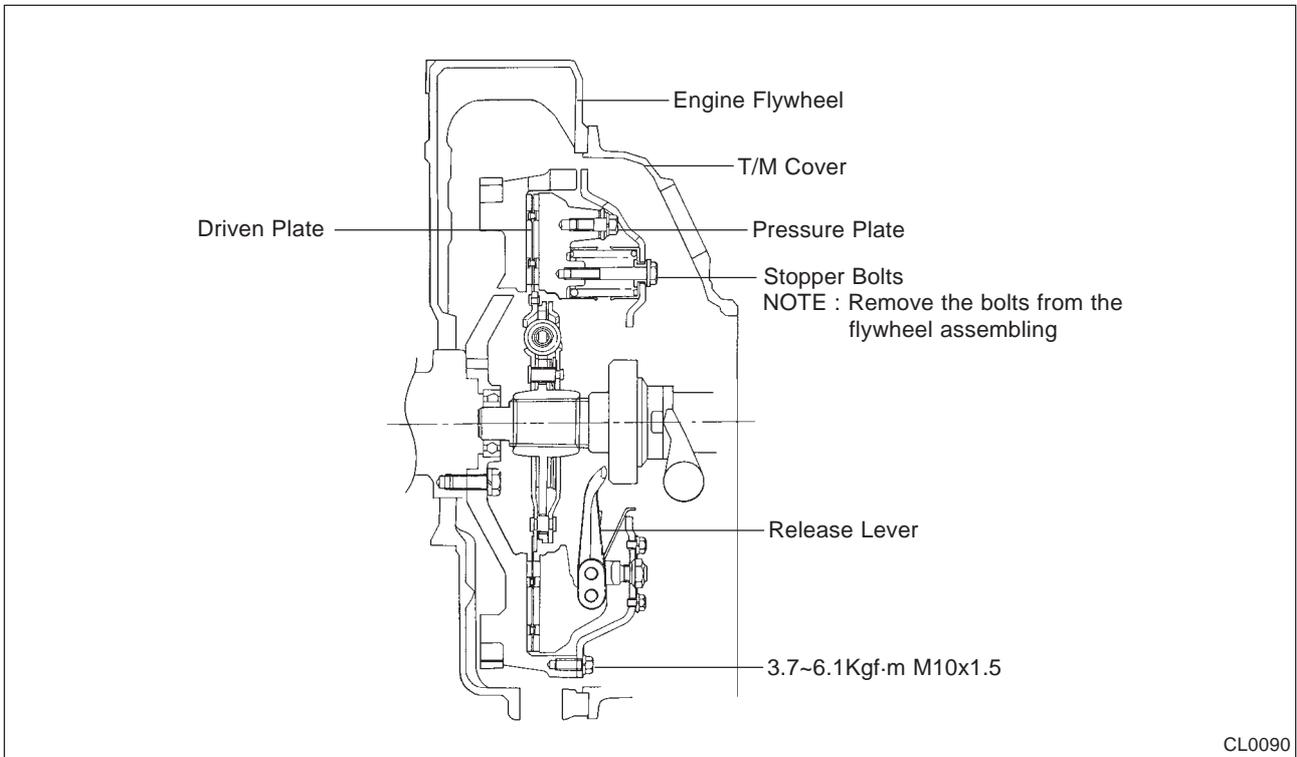
2-3. RECOMMENDED LUBRICANTS

Clutch fluid	Specifications	Hydraulic brake fluid SAE J1703 Recommendation-SSK201
	Total capacity	0.3L
	Reservoir capacity	0.2L
Grease		Multipurpose type or chassis type grease NLGI No. 1 or 2

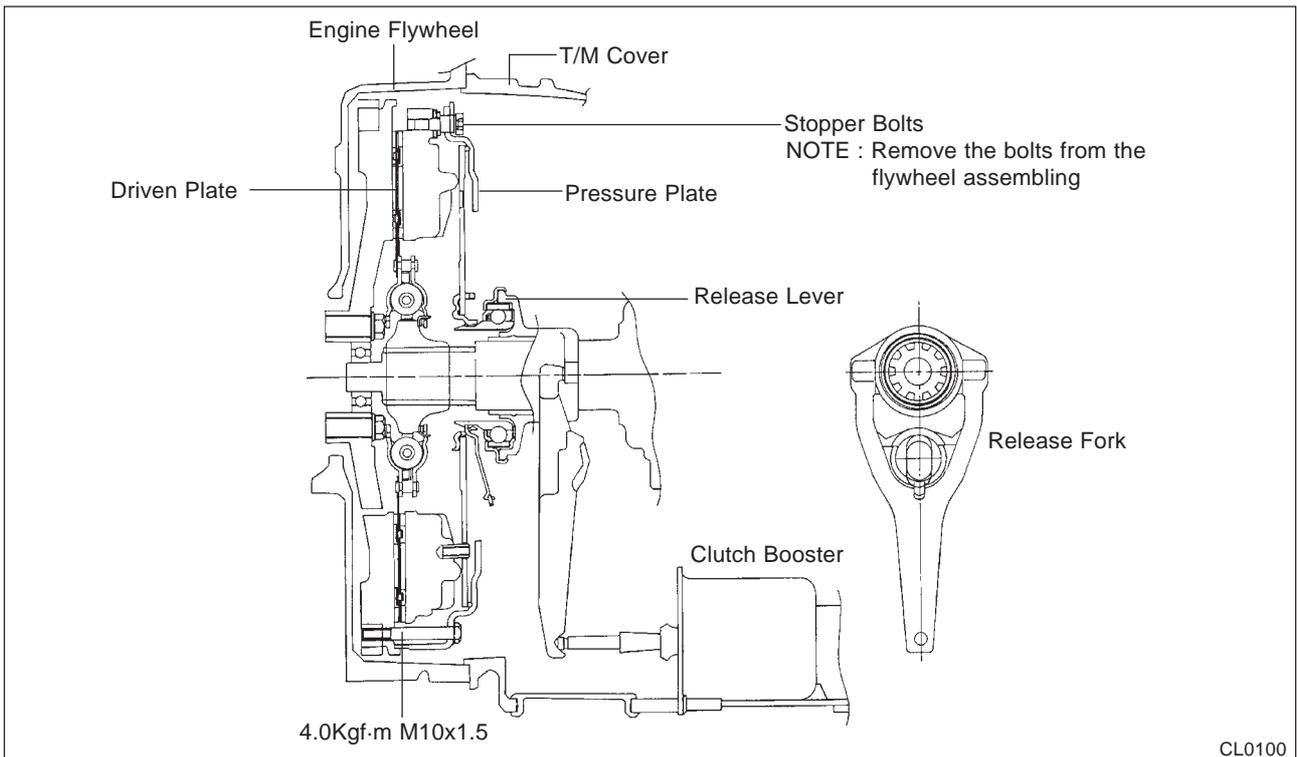
3. CLUTCH ASSEMBLY

3-1. GENERAL DESCRIPTIONS

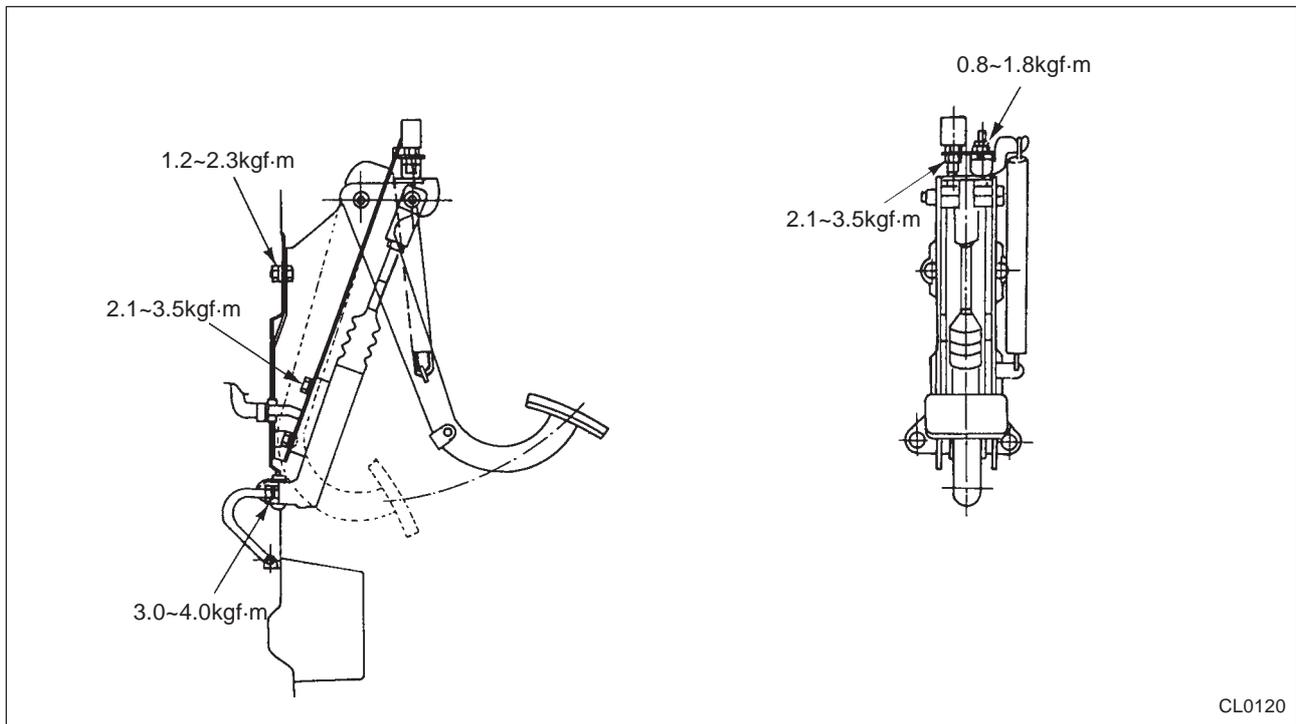
3-1-a. CLUTCH ASSEMBLY FOR PUSH TYPE



3-1-b. CLUTCH ASSEMBLY FOR PULL TYPE

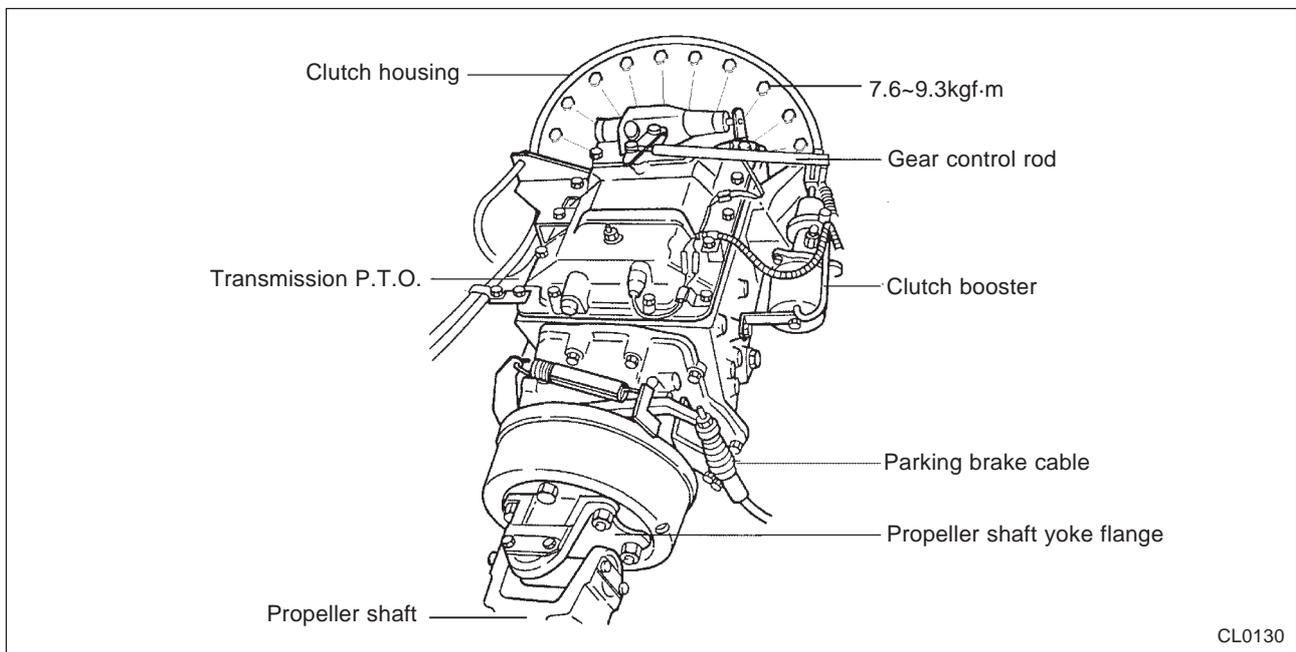


3-1-c. CLUTCH PEDAL ASSEMBLY DESCRIPTIONS



CL0120

3-2. DISASSEMBLY AND REASSEMBLY (PUSH TYPE/PULL TYPE)



CL0130

Disassembly

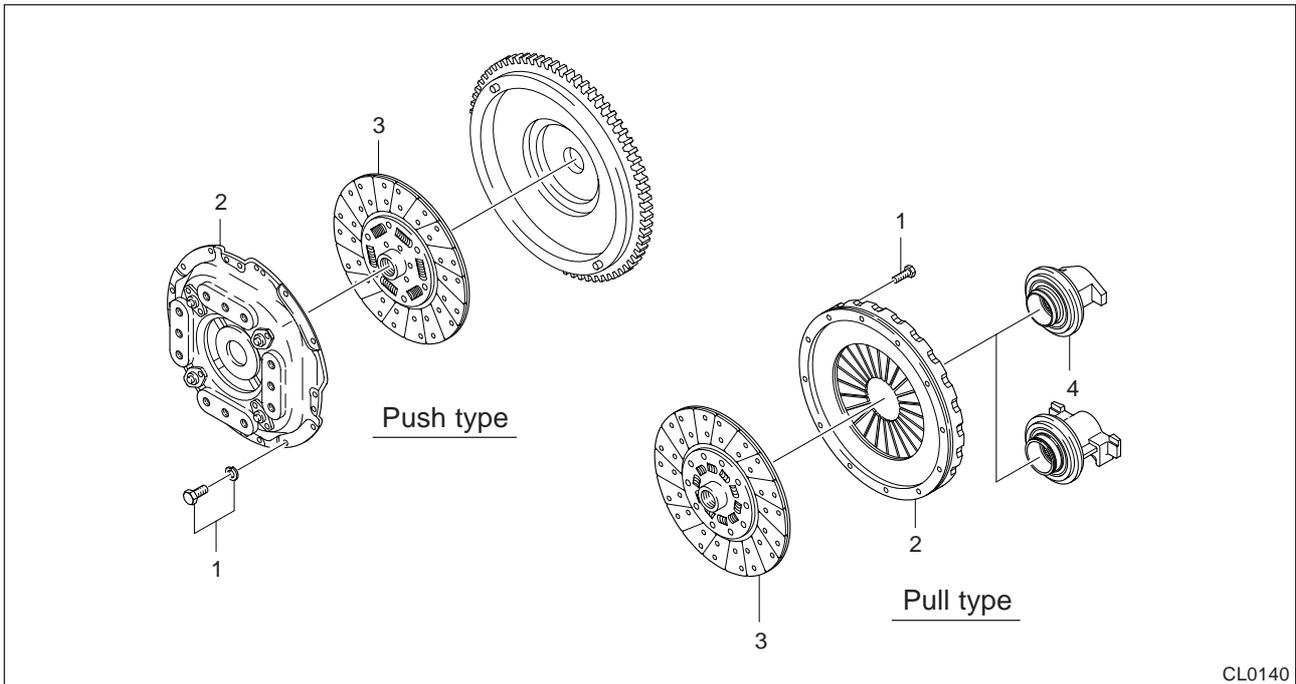
1. Transmission side unit
2. Propeller shaft
3. Transmission assembly

Reassembly

3. Transmission assembly
2. Propeller shaft
1. Transmission side unit

2. CLUTCH

After the removal of transmission assembly, follow the steps outlined below.



CL0140

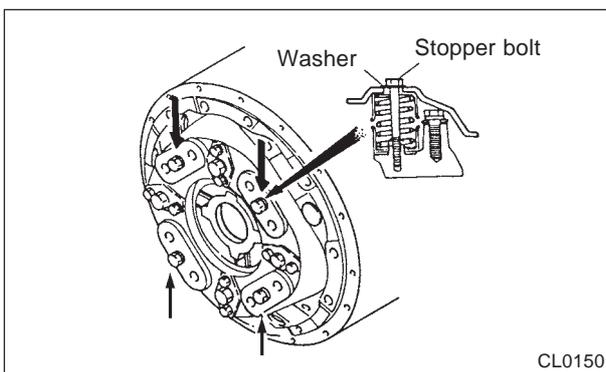
Disassembly

1. Bolt/washer
2. Clutch cover
3. Clutch disc
4. Release bearing

Reassembly

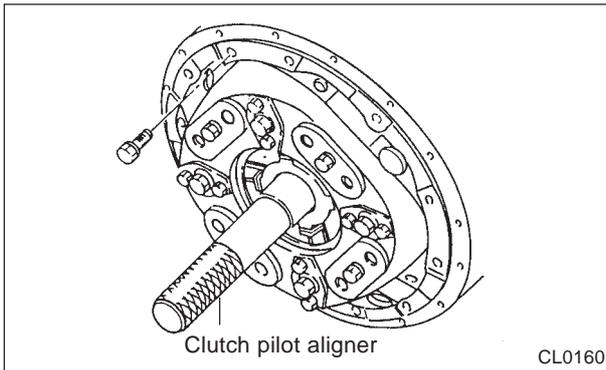
4. Release bearing
3. Clutch disc
2. Clutch cover
1. Bolt/washer

3-2-a. IMPORTANT OPERATIONS - DISASSEMBLY (PUSH TYPE)



CL0150

- When removing or reinstalling the clutch cover, be sure to use stopper bolt to fix clutch cover.
- Re-fit the clutch housing according to the previously made punch marks.



Clutch cover/ disc

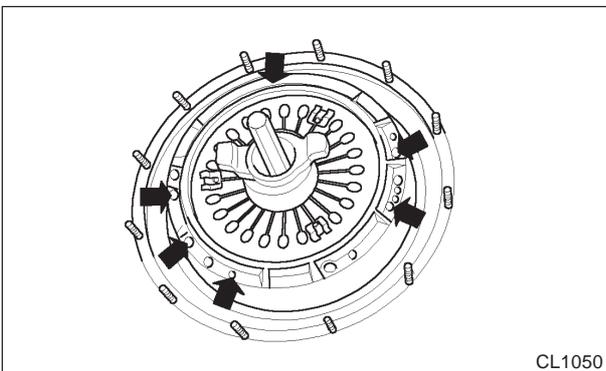
Remove or install clutch cover and disc assembly by using a special tool-clutch pilot aligner.

(Special tool : CA21081--> 15T Vehicle

CA21091--> 8T~16T cargo

TA25171--> ZF Transmission)

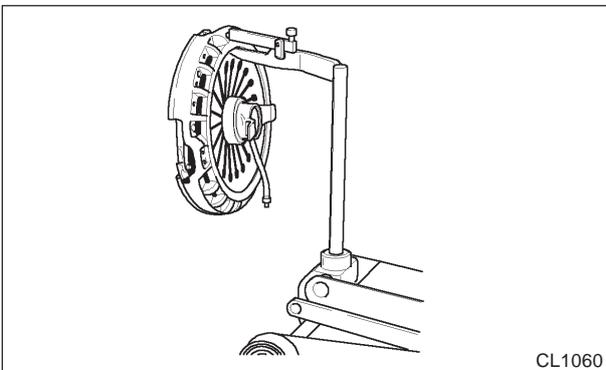
• IMPORTANT OPERATIONS - DISASSEMBLY (PULL TYPE)



(1) Remove the spring from the release bearing and attach the centering drift to the fly wheel.

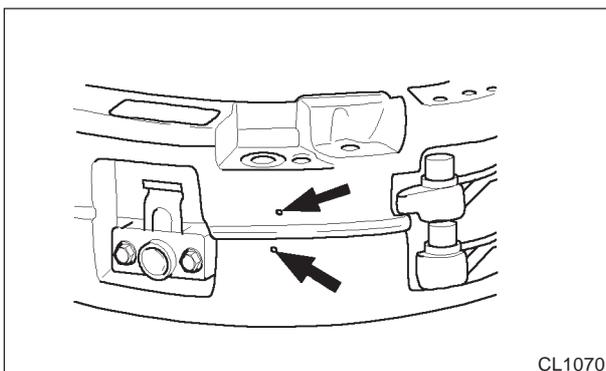
(2) Remove the bolts which hold the clutch to the flywheel. Slacken the bolts a couple of turns at a time so as not to produce flexing forces in the clutch.

NOTE : Do not remove the nuts from the studs.



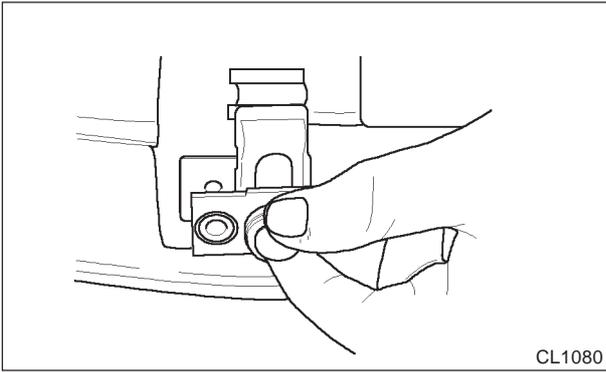
(3) Attach the lifting equipment to a jack. Place the lifting hook between the diaphragm spring and housing. Remove the nuts from the studs.

(4) Lift out the clutch and remove the plate centering drift.



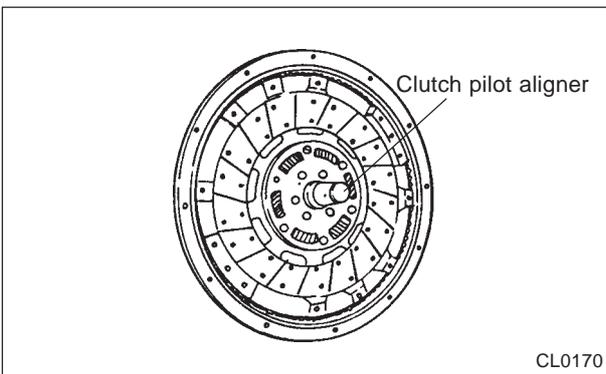
(5) Check the clutch and integral parts.

2. CLUTCH



- (6) Remove the L-shaped gliders.
- (7) Remove the hex socket screws which hold together the clutch housing and intermediate ring. Lift off the clutch housing and remove the plate.
- (8) Check the condition of the clutch its integral parts.

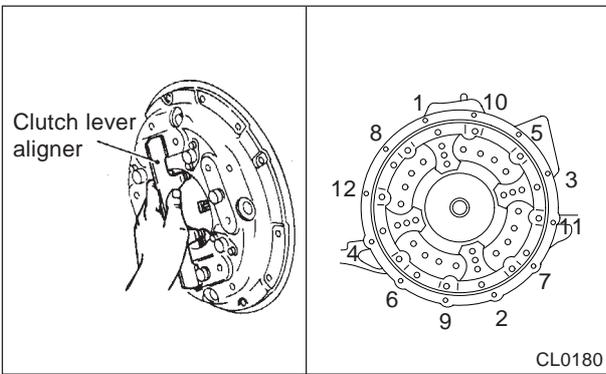
3-2-b. IMPORTANT OPERATIONS - REASSEMBLY (PUSH TYPE)



Clutch disc/cover

Install clutch cover and disc assembly by using a special tool-clutch pilot aligner.

(Special tool : CA21081--> 15T Vehicle
CA21091--> 8T~16T Cargo
TA25171--> ZF Transmission)



Clutch cover

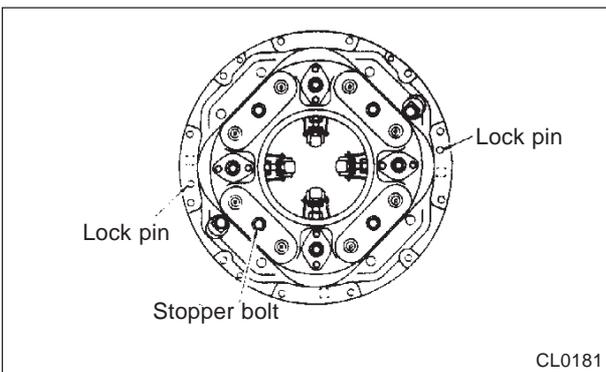
Tighten clutch cover fixing bolts in numerical order as shown.

(kgf.m)

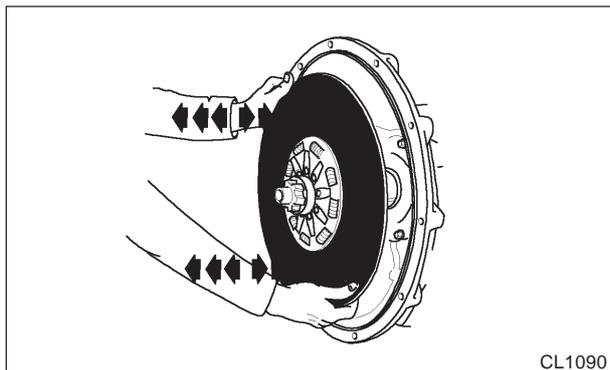
Tightening torque	4~6
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Check the Height of the Release Lever

Adjust the height of the release lever using a special tool

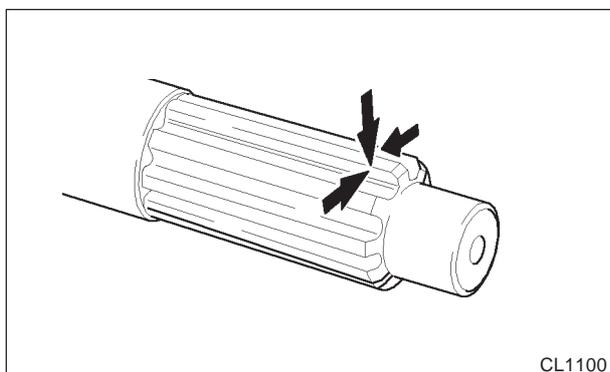


Install a lock pin to the flywheel prior to reassembly.



CL1090

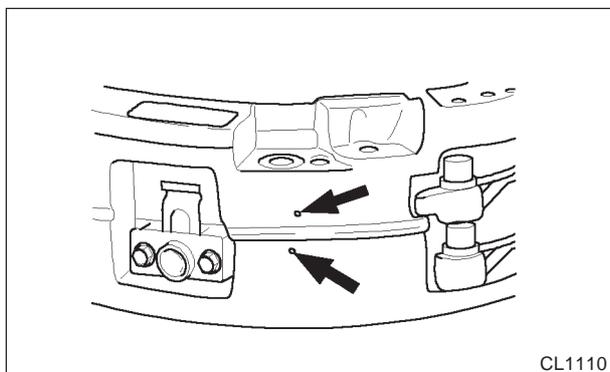
- (1) Fit the new plate to the shaft and move it back and forth so that any superfluous grease is scraped off by the friction plate hub.



CL1100

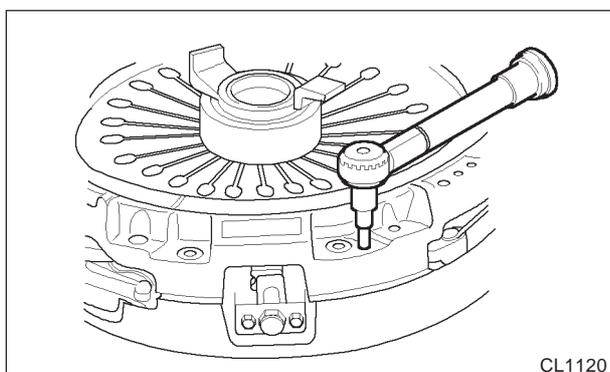
- (2) Remove the plate and check that all of the splines are evenly coated, see fig below. All superfluous grease in the bottom of the splines must be removed. If grease is unevenly applied, repeat item.

- (3) Remove superfluous grease from the friction plate hub when the shaft splines are correctly coated.



CL1110

- (4) Fit the clutch housing matching up the previously made punch marks.



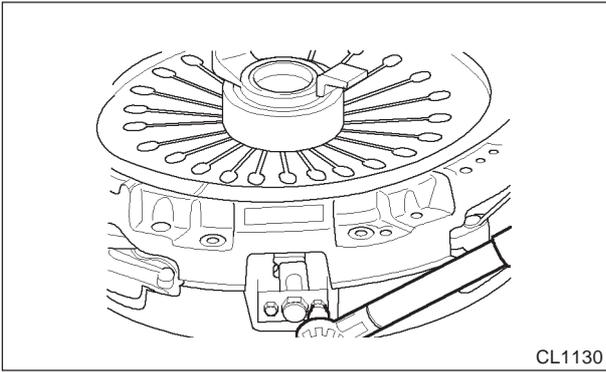
CL1120

- (5) Fit the hex socket screws and tighten to the adjacent torque.

(kgf·m)

Tightening torque	2.6±0.2
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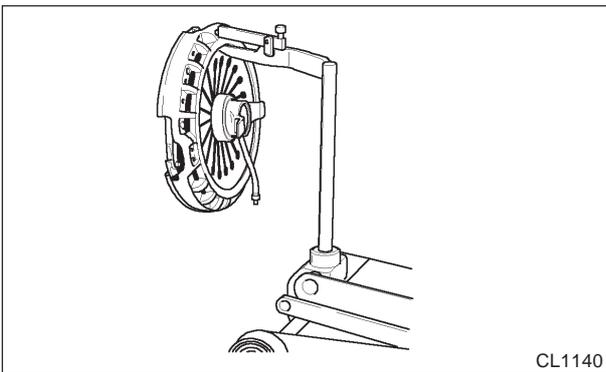
2. CLUTCH



- (6) Fit the L-shaped gliders. Tighten to the adjacent torque.

(kgf.m)

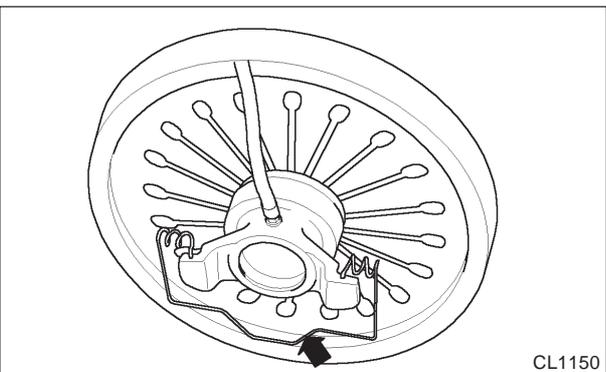
Tightening torque	1.4±0.1
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- (7) Fit the lifting equipment to a jack place the lifting hook of the equipment between the diaphragm spring and the housing.
 (8) Lift up and push in the clutch against the engine.
 (9) Rotate the flywheel until the studs mate with the holes in the clutch.
 (10) Fit the nuts to the studs and remove the lifting equipment
 (11) Fit the bolts. Tighten the bolts and nuts a couple of turns at a time so as to avoid causing flexing in the clutch.

(kgf.m)

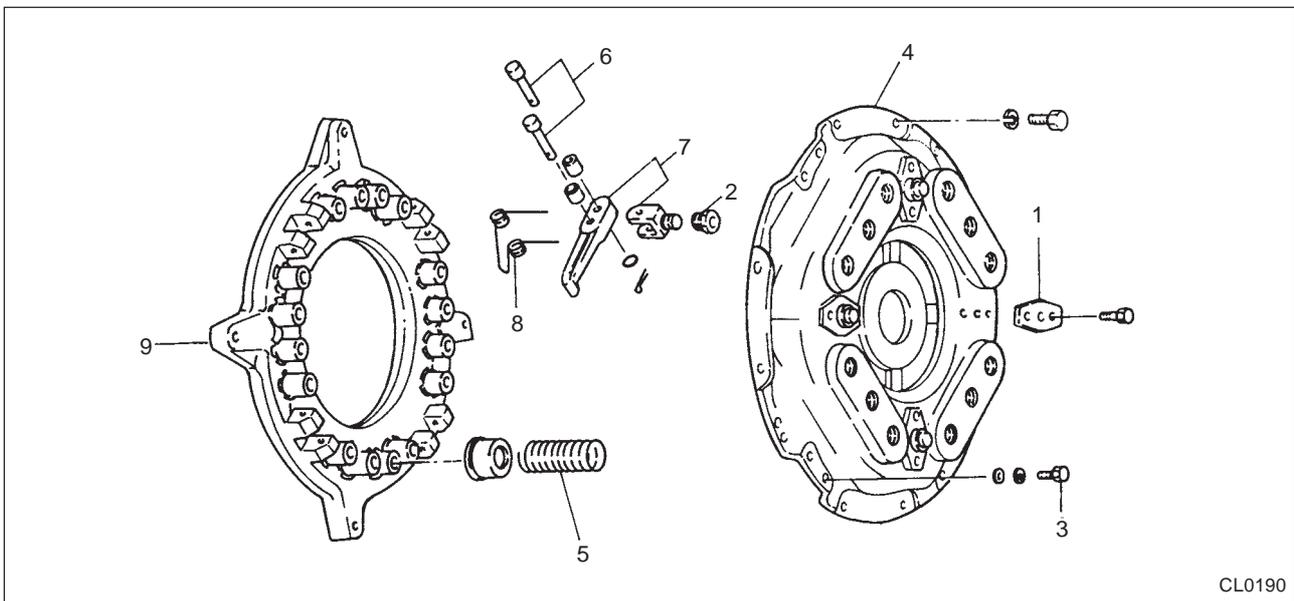
Tightening torque	6.5±0.6
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- (12) Remove the centering drift and fit the U-spring to the release bearing.

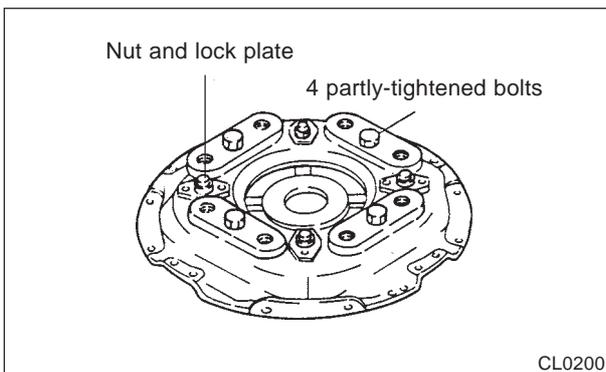
3-3. CLUTCH COVER

3-3-a. DISASSEMBLY STEPS FOR CLUTCH COVER (BASED ON PUSH TYPE)



- | | |
|-----------------|-----------------------------------|
| 1. Lock plate | 6. Lever pin |
| 2. Support nut | 7. Release lever and support bolt |
| 3. Bolt | 8. Return spring |
| 4. Clutch cover | 9. Pressure plate |
| 5. Spring | |
- * Reassembly is inverse of disassembly.

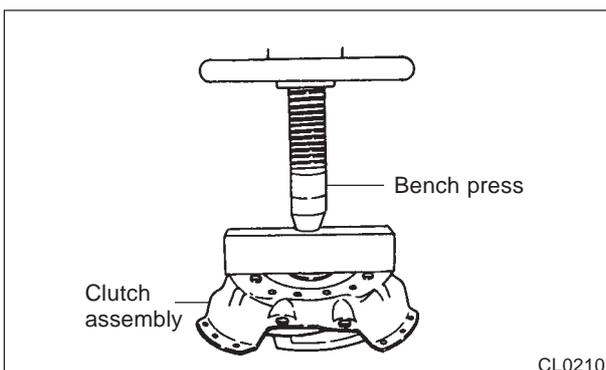
IMPORTANT OPERATIONS (DISASSEMBLY)



How to remove clutch cover

- Fix pressure spring with 4 partly-tightened bolts and then loosen bolts and nuts.
- Mark assembly locations on clutch cover "4" and pressure plate "9".
- To remove clutch cover, use bench press to remove the 4 remaining partly-tightened bolts.
- Slowly loosen bench press to remove pressure plate "9" and clutch cover "4".

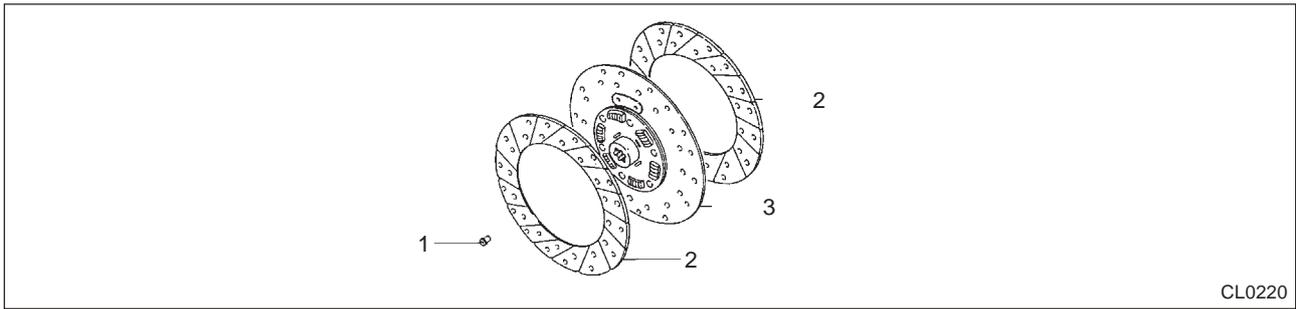
IMPORTANT OPERATIONS (REASSEMBLY)



Support nut

- Use a bench press.
Keep the nuts semi-tightened as the height of the release lever should be adjusted after the installation of clutch assembly on vehicle.

3-3-b. DISASSEMBLY STEPS FOR CLUTCH DISC (BASED ON PUSH TYPE)

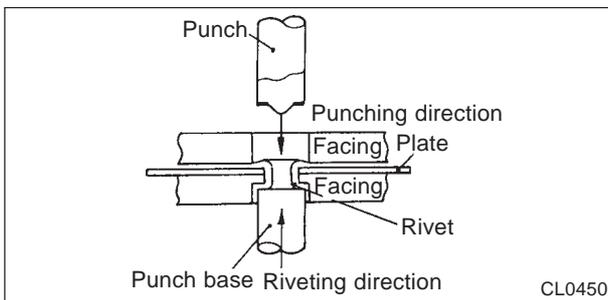


CL0220

- 1. Rivet
- 2. Facing
- 3. Plate

* Reassembly is inverse of disassembly.

IMPORTANT OPERATIONS (REASSEMBLY)



CL0450

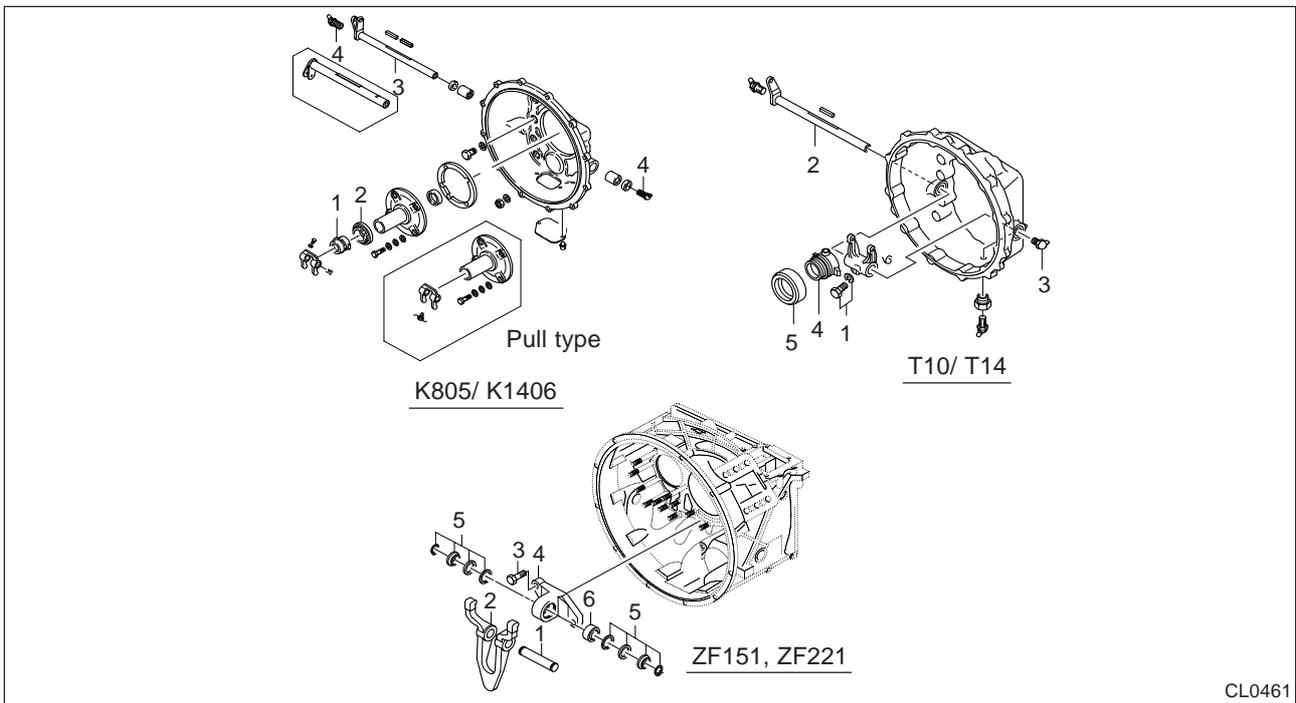
Plate, Facing

- Remove the oil, grease be found on the lining, the friction plate must be reassembled.

Rivet

- Direction of riveting and punching are as illustrated.
- Rivet caulking pressure : 1,000 kg
- Rivet diameter : 5 mm

3-3-c. DISASSEMBLY STEPS FOR CLUTCH HOUSING (BASED ON PULL TYPE)



CL0461

K805/K1406

- 1. Shift block
- 2. Release bearing
- 3. Release fork
- 4. Grease nipple

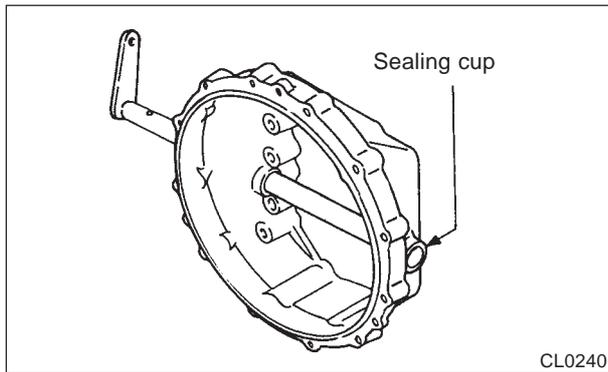
T10/T14

- 1. Set bolt
- 2. Release fork shaft
- 3. Grease nipple
- 4. Release shift
- 5. Release bearing

ZF16S-151/221

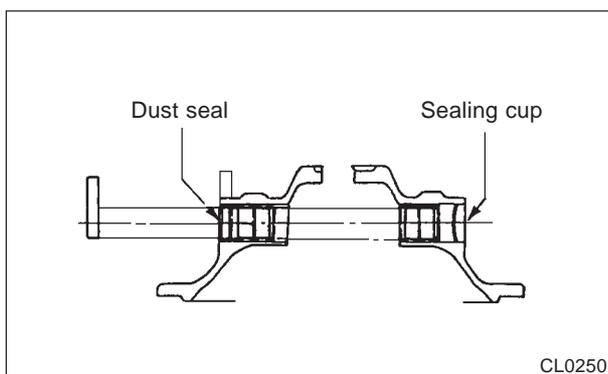
- 1. Pin
- 2. Release fork
- 3. Screw
- 4. Bracket
- 5. Reatining ring/Sealing/Sealing washer
- 6. Joint bearing

* Reassembly is inverse of disassembly.

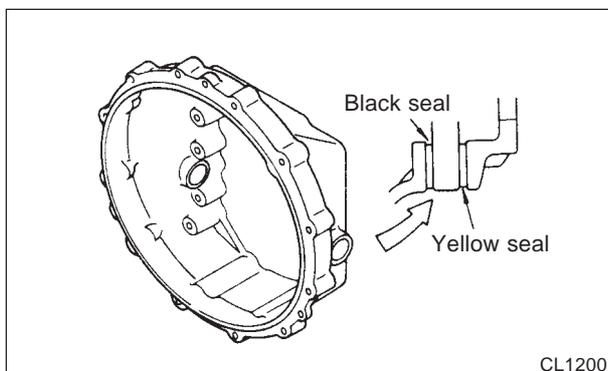
IMPORTANT OPERATIONS (DISASSEMBLY)**Shift lever shaft**

Remove the sealing cup on the opposite side by tapping on the end of the shift lever.

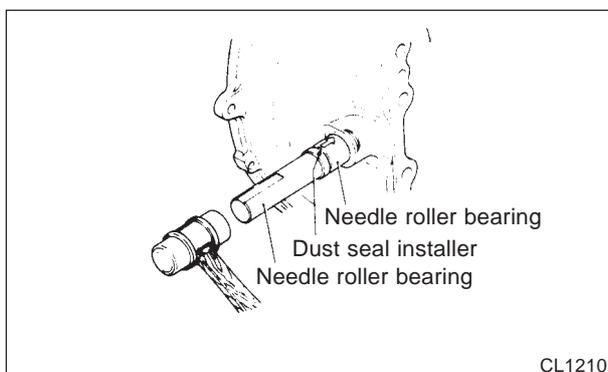
Insert a round bar into the place from which sealing cup has been removed and remove the shift lever shaft out from the clutch housing.

**Check of needle roller bearing and clutch shaft**

Before starting disassembly operation, visually check for any abnormal conditions. Disassemble and replace the bearing when unusual sound or binding is noticeable.

**Needle roller bearing reassembly**

(1) Insert a seal position, outside yellow and in side black.



(2) Reassemble a needle roller bearing by installer

IMPORTANT OPERATIONS(Reassembly)**1. Release bearing and shift block**

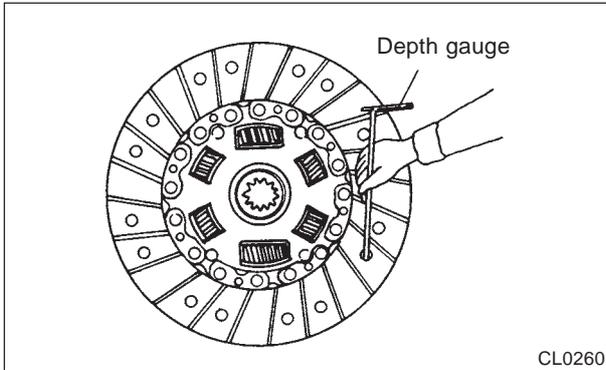
Apply specified grease to the shift block.

(Multipurpose type or chassis type grease NLGI No. 1 or 2)

3-4. INSPECTION AND REPAIR

- Make necessary corrections or parts replacement if wear, damage or any other abnormal conditions are found through inspection.

3-4-a. DISC FACING



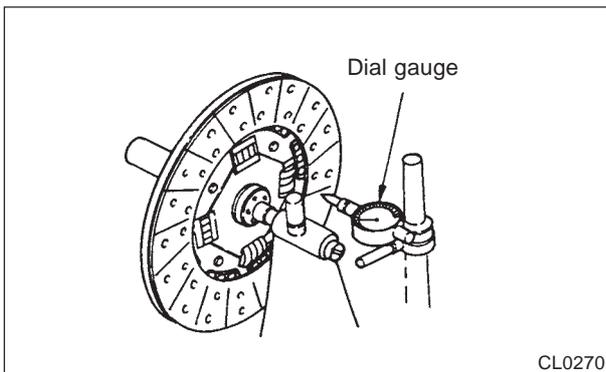
Check the surface of facing for cracks, hardening due to heat, or oil or grease contamination.

• **Depth of rivet head from surface** (mm)

Standard	Limit
2.1	0.2

- (1) Should oil or grease be found on the linings, the friction plate must be replaced.
- (2) If the friction plate is discolored due to overheating, it must be replaced.

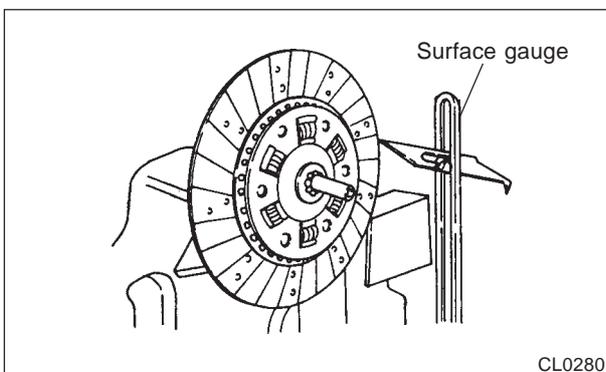
3-4-b. MEASUREMENT OF DISC FACING WARPAGE



• **Measurement of clutch disc warpage** (mm)

Standard	Limit
1.0	1.5

3-4-c. WEAR ON SPLINES

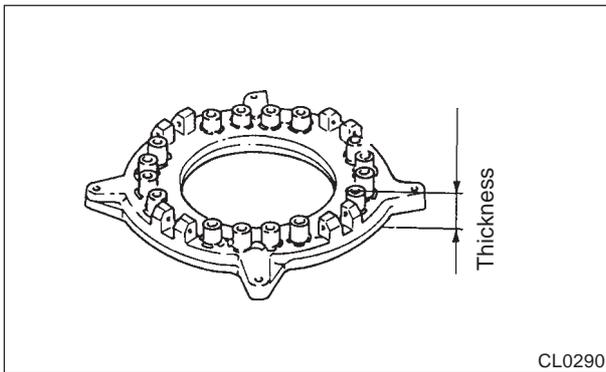


Install clutch discs on top gear shaft splines and check the amount of wear at circumference of clutch discs.

(mm)

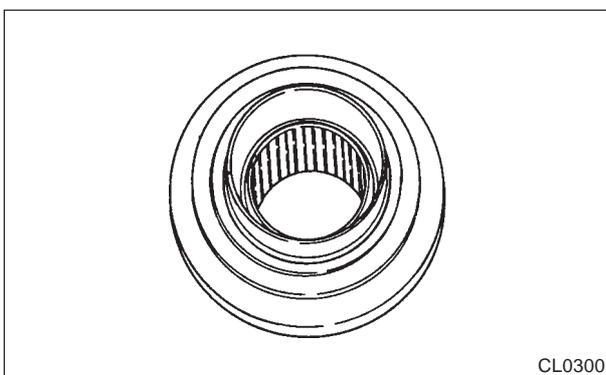
Standard	Limit
1.5	2.5

3-4-d. MEASUREMENT OF PRESSURE PLATE



- (1) Radial wear grooves of max 0.2mm are permissible on the surface of the pressure plate. If wear is more extensive the pressure plate must be replaced.
- (2) Patchy discolouration is acceptable and can be removed with emery cloth.
- (3) If there are cracks in the pressure. Plate due to over heating, it must be replaced.

3-4-e. RELEASE BEARING REPLACEMENT



Inspection of release bearing

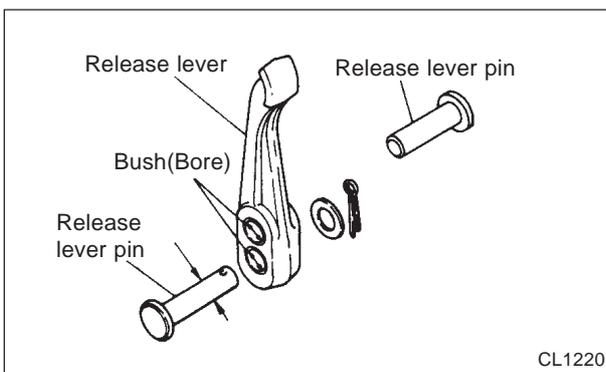
Check release bearing and shift block for abnormal conditions. Disassemble them when unusual sound or binding is noticeable.

Release bearing replacement

Use a bench press when assembling or disassembling.

Install the parts after applying specified grease. (Multipurpose type or chassis type grease NLGI No. 1 or 2)

3-4-f. MEASUREMENT OF RELEASE LEVER PIN, BUSHING



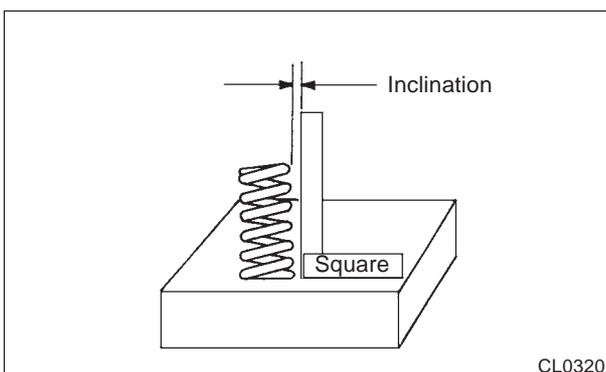
Check contact faces for evidence of abnormal wear.

Release lever pin

(mm)

Standard	Limit
12.0	11.9

3-4-g. SPRING INCLINATION

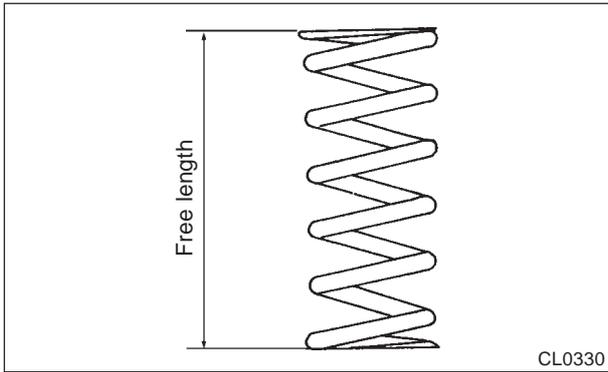


Measure inclination to determine whether the spring is in normal operation.

(mm)

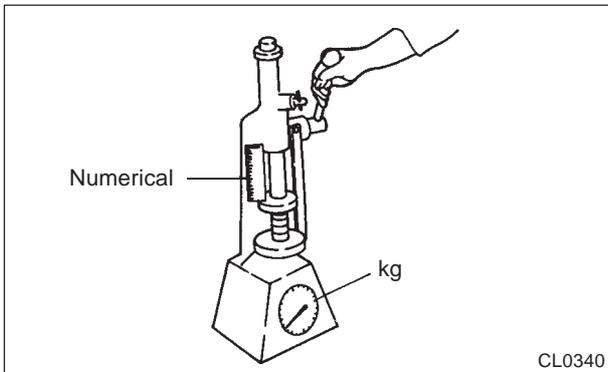
Standard	Limit
3.6	4.4

3-4-h. FREE LENGTH



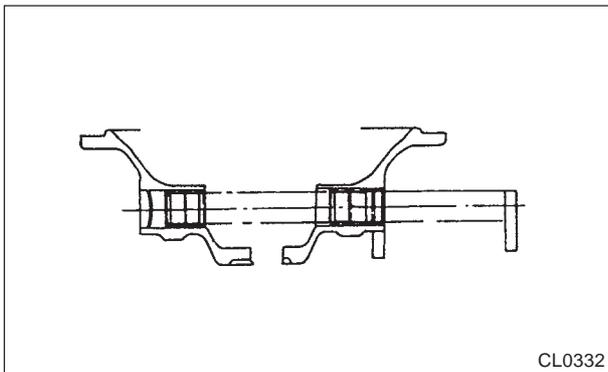
Measure the free length of pressure spring. Replace when wear or deviation from the limit is found.

3-4-i. SPRING TENSION



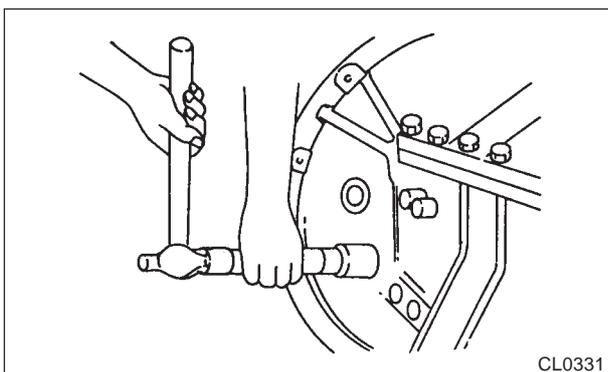
Use a suitable measuring instrument to check spring tension. Replace the spring when tension is below the limit.

3-4-j. NEEDLE ROLLER BEARING AND CLUTCH SHAFT



Before disassembling the clutch shaft, visually check the bearing for any abnormal conditions. Disassemble the unit when unusual sound or binding is noticeable.

3-4-k. NEEDLE ROLLER BEARING REPLACEMENT

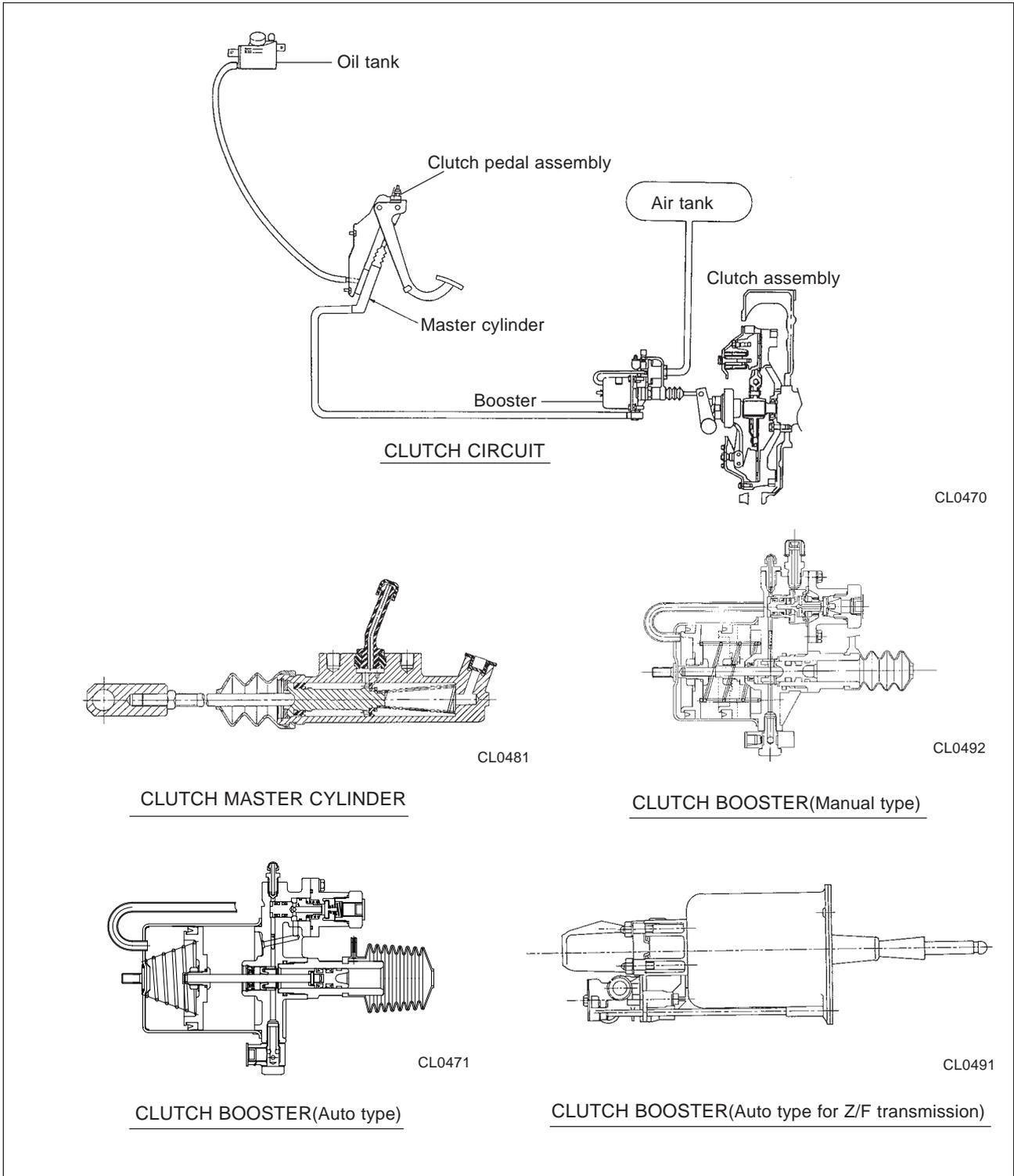


Use a 31.5mm diameter bar to remove needle roller bearing.
To reinstall the bearing, drive a 26.5mm diameter bar into the specified point against marked face of the bearing case.
Apply specified grease in between the needle roller bearing and dust seal.

4. CLUTCH CONTROL

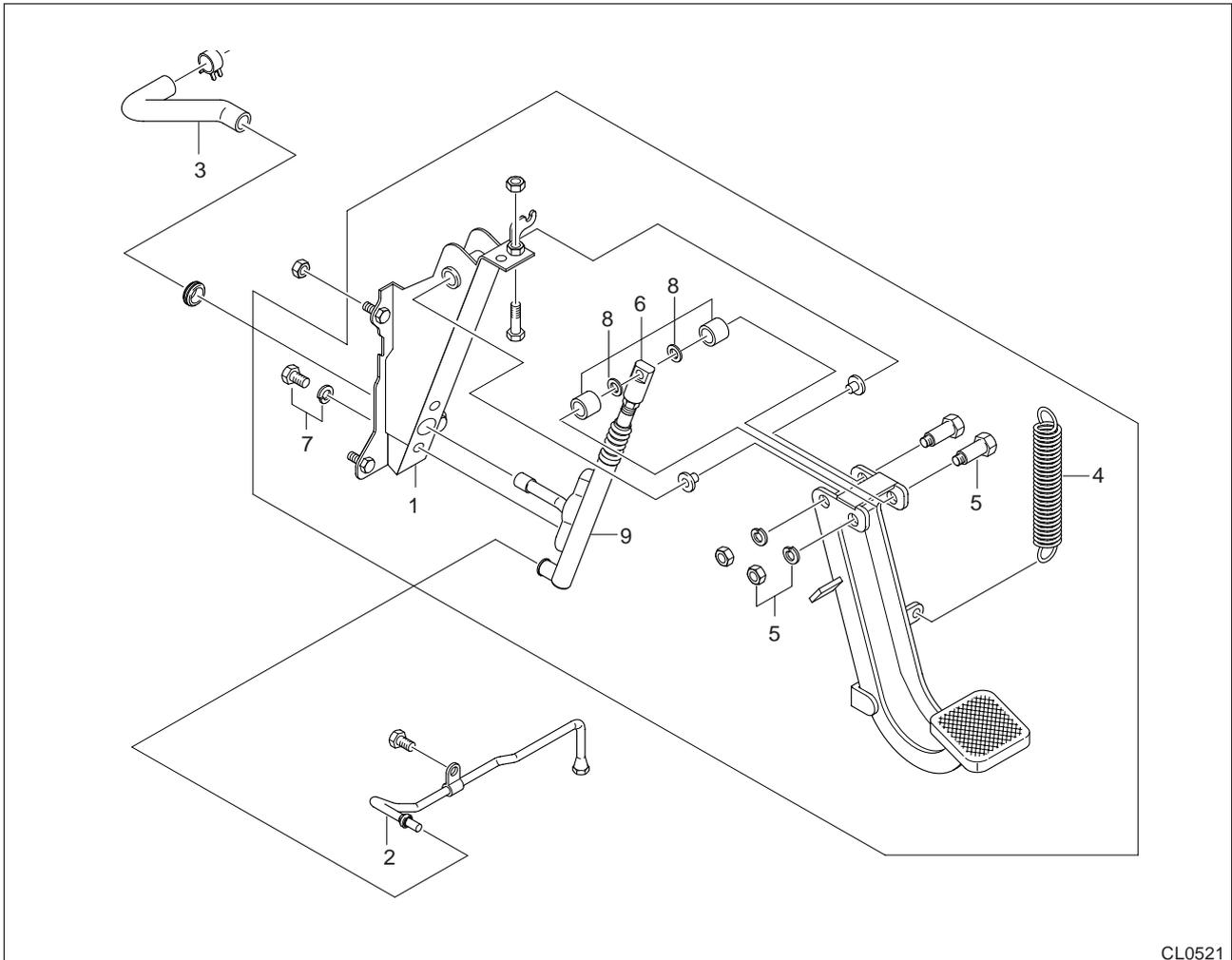
4-1. GENERAL DESCRIPTIONS

CLUTCH CIRCUIT



4-2. CLUTCH PEDAL ASSEMBLY

DISASSEMBLY AND REASSEMBLY



CL0521

Disassembly

1. Clutch pedal assembly bracket
2. Oil pipe
3. Reservoir hose
4. Return spring
5. Pivot bolt/washer/nut
6. Spacer
7. Master cylinder fixing bolt and washer
8. Washer wave
9. Master cylinder assembly

Reassembly

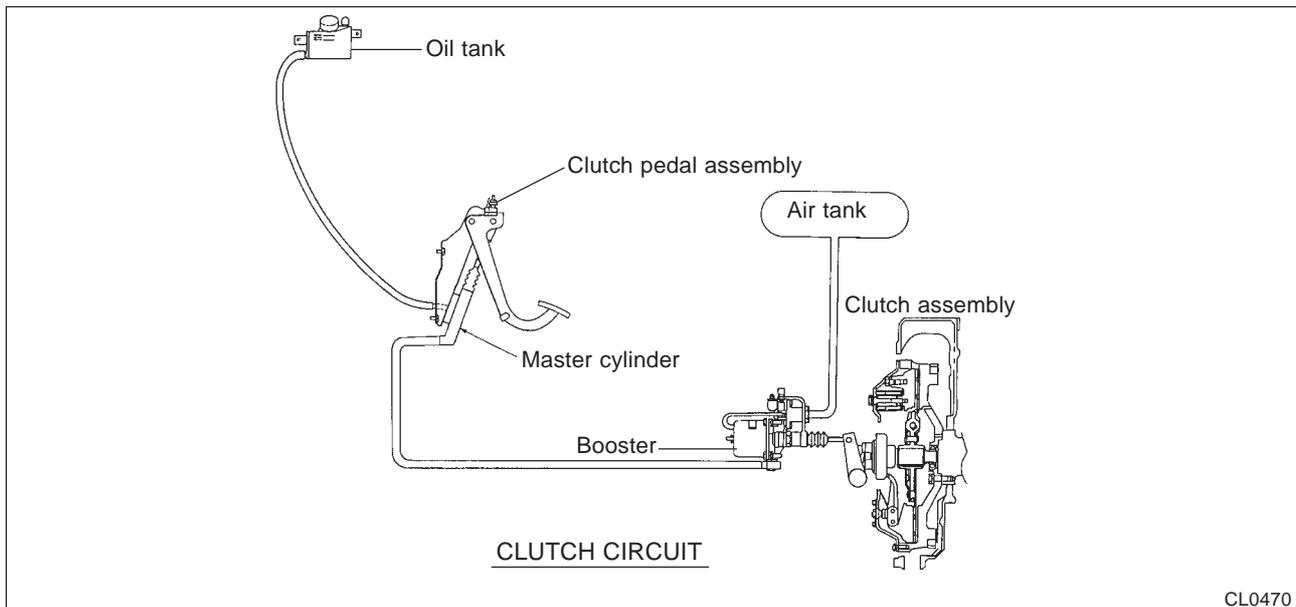
9. Master cylinder assembly
8. Washer wave
7. Master cylinder fixing bolt and washer
6. Spacer
5. Pivot bolt/washer/nut
4. Return spring
3. Reservoir hose
2. Oil pipe
1. Clutch pedal assembly bracket

3. Reservoir hose

Prepare a tray to receive brake fluid flowing out when flexible hose is disconnected.

Installation shall be performed in accordance with the general information on master cylinder adjustment and air bleeding procedures.

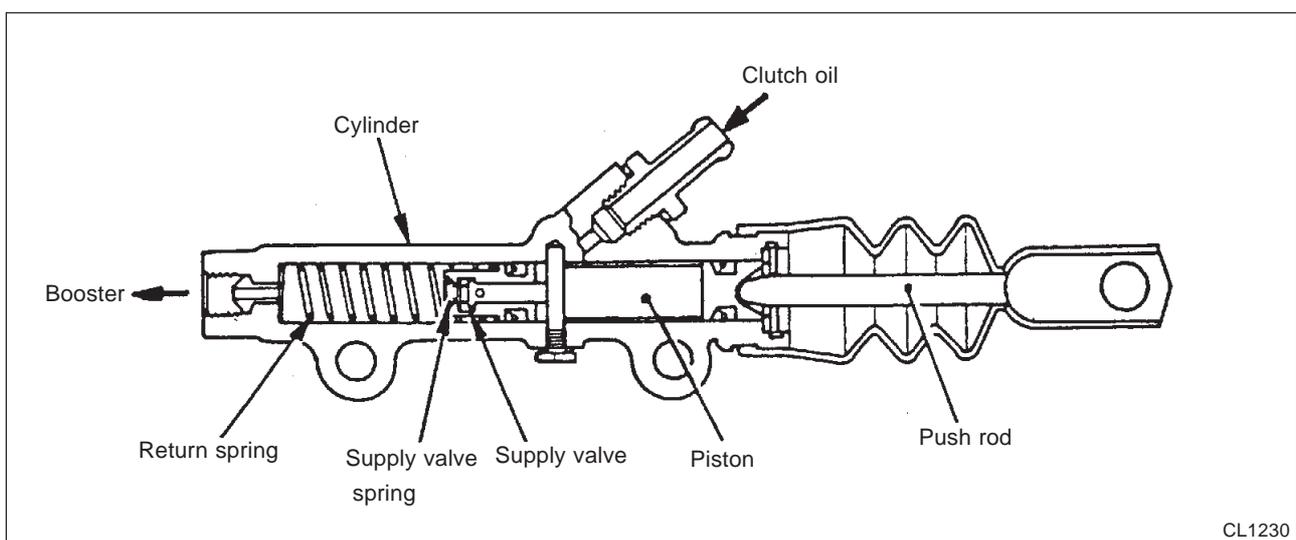
4-2-a. PEDAL LINKAGE



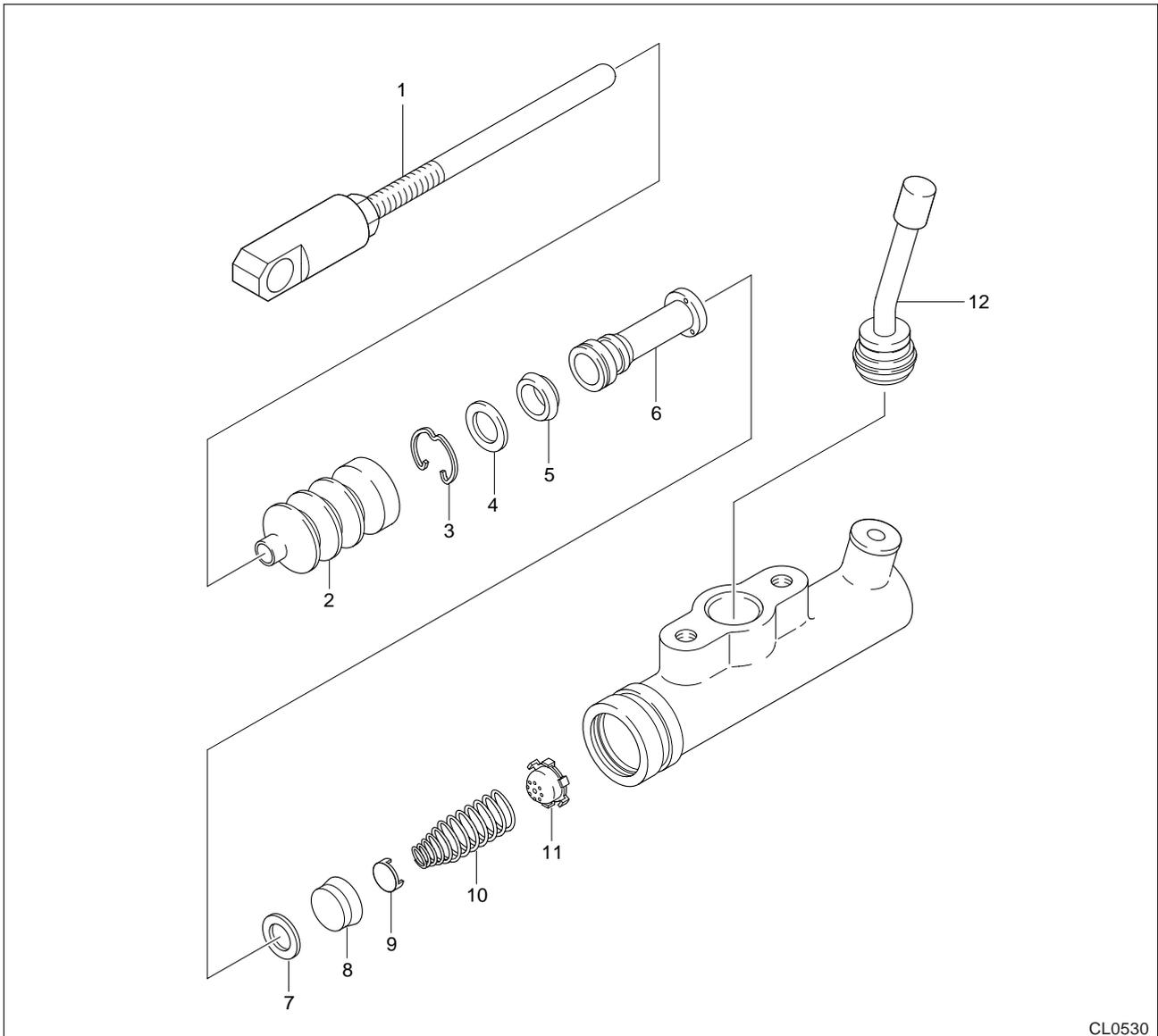
- The purpose of the pedal linkage is to carry the movement of the clutch to the release bearing.
- The linkage between the clutch pedal and the lever on the clutch housing consists of a hydraulic system made up of a master cylinder (operated by the clutch pedal) and an air-power clutch booster which acts on the lever.
- The pedal linkage lever transfers clutch movement mechanically via a shaft to the release fork which is connected to the release bearing.

4-2-b. CLUTCH MASTER CYLINDER

- The clutch pedal acts on the supply valve of the master cylinder via a push rod. At rest, the pressure side of the supply valve is in connection via a drilling with the fluid reservoir. When the clutch pedal is pushed down, the drilling is closed and pressure is applied to the clutch booster.



DISASSEMBLY STEPS



CL0530

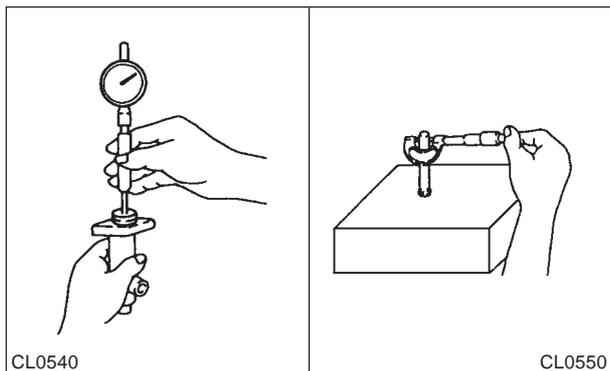
- | | |
|-------------------|-------------------|
| 1. Push rod | 7. Spacer |
| 2. Boot | 8. Primary cup |
| 3. Retaining ring | 9. Spring seat |
| 4. Plate | 10. Return spring |
| 5. Secondary cup | 11. Check valve |
| 6. Piston | 12. Nipple-hose |

Inspection and repair

Make necessary correction or parts replacement if wear, damage or any other abnormal conditions are found through inspection.

Master cylinder assembly

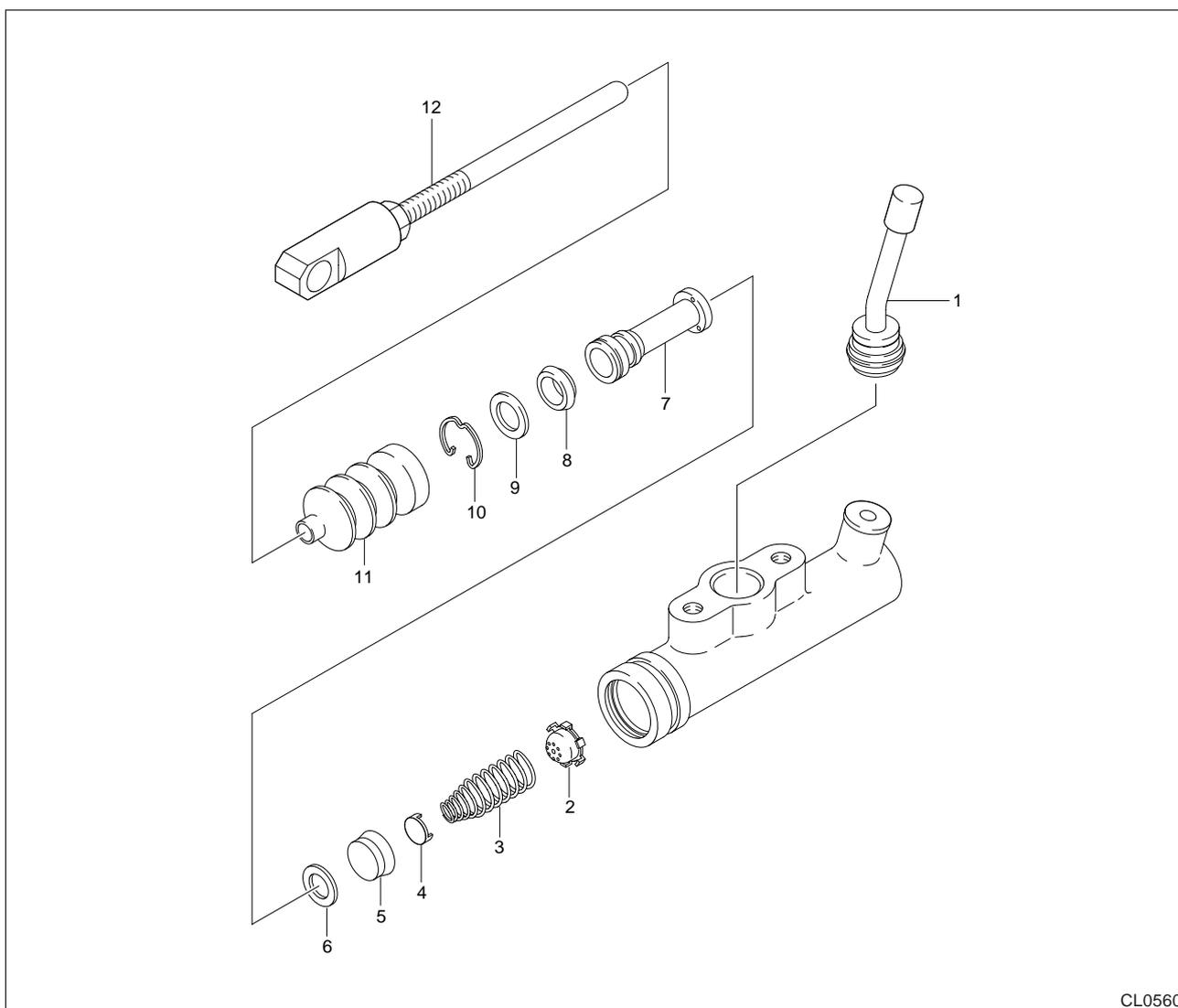
Replace master cylinder assembly if inner face of the cylinder is found to have wear, corrosion or damage.

**Clearance between the Body and Piston**

(mm)

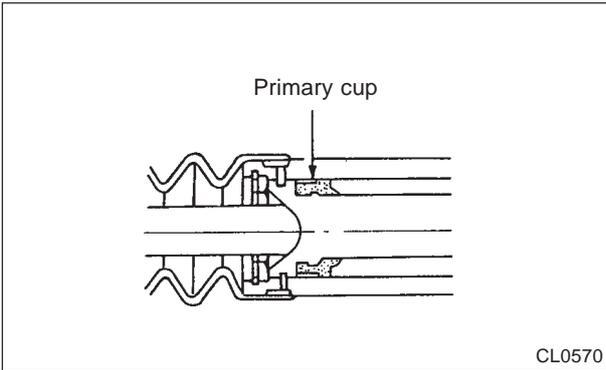
Standard	Limit
0.10	0.15

Check return port for restrictions and clean if necessary.

REASSEMBLY STEPS

- | | | |
|------------------|------------------|--------------------|
| 1. Nipple-hose | 5. Primary cup | 9. Plate |
| 2. Check valve | 6. Spacer | 10. Retaining ring |
| 3. Return spring | 7. Piston | 11. Boot |
| 4. Spring seat | 8. Secondary cup | 12. Push rod |

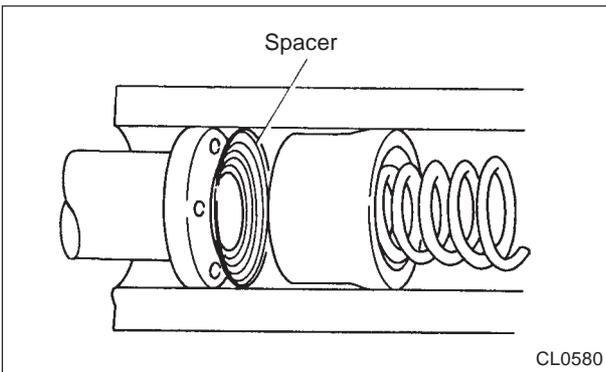
IMPORTANT OPERATIONS(REASSEMBLY)



3. Primary cup

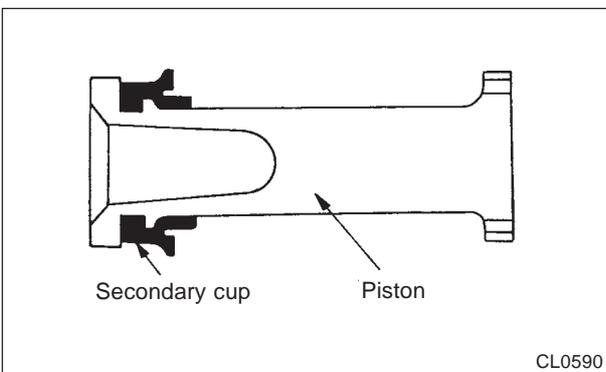
Install the parts after dipping them in clean brake fluid.

Note the direction of cup.



4. Spacer

Note the direction of spacer.



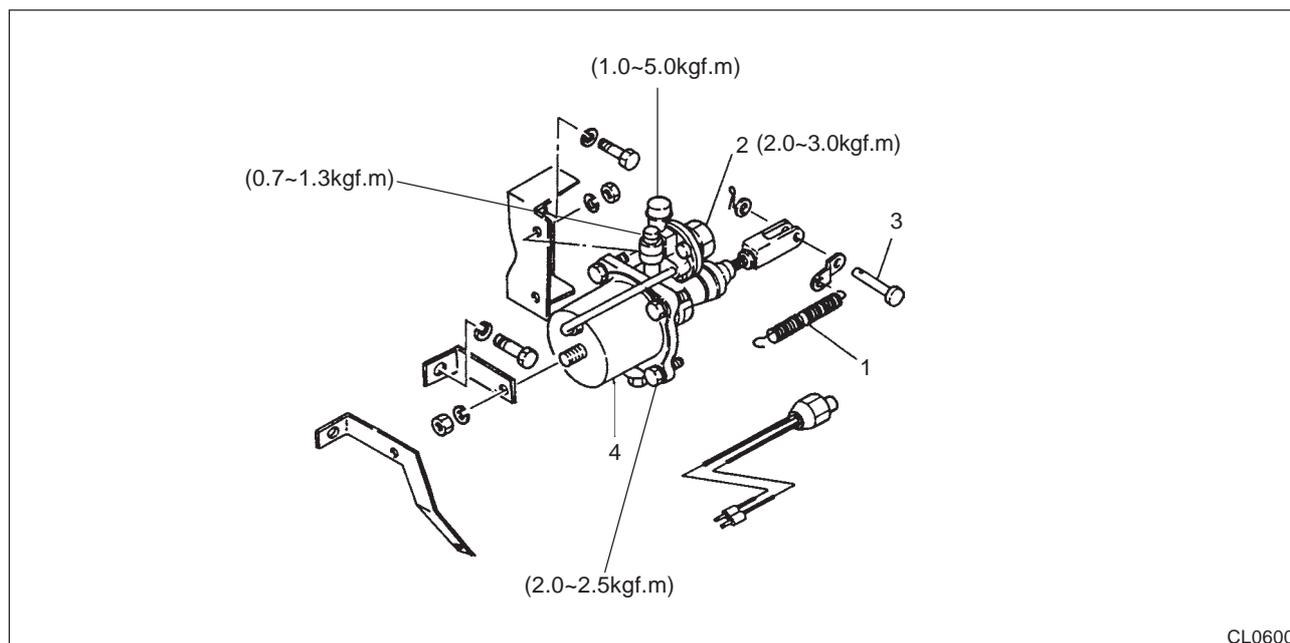
5. Secondary cup

Install the parts after dipping them in clean brake fluid.

Note the direction of cup.

4-3. BOOSTER (BASED ON MANUAL TYPE)

REMOVAL AND INSTALLATION



CL0600

Removal steps

1. Return spring
2. Air pipe and Oil pipe
3. Pin
4. Booster(including bracket)

Installation steps

4. Booster(including bracket)
3. Pin
2. Air pipe and Oil pipe
1. Return spring

IMPORTANT OPERATIONS

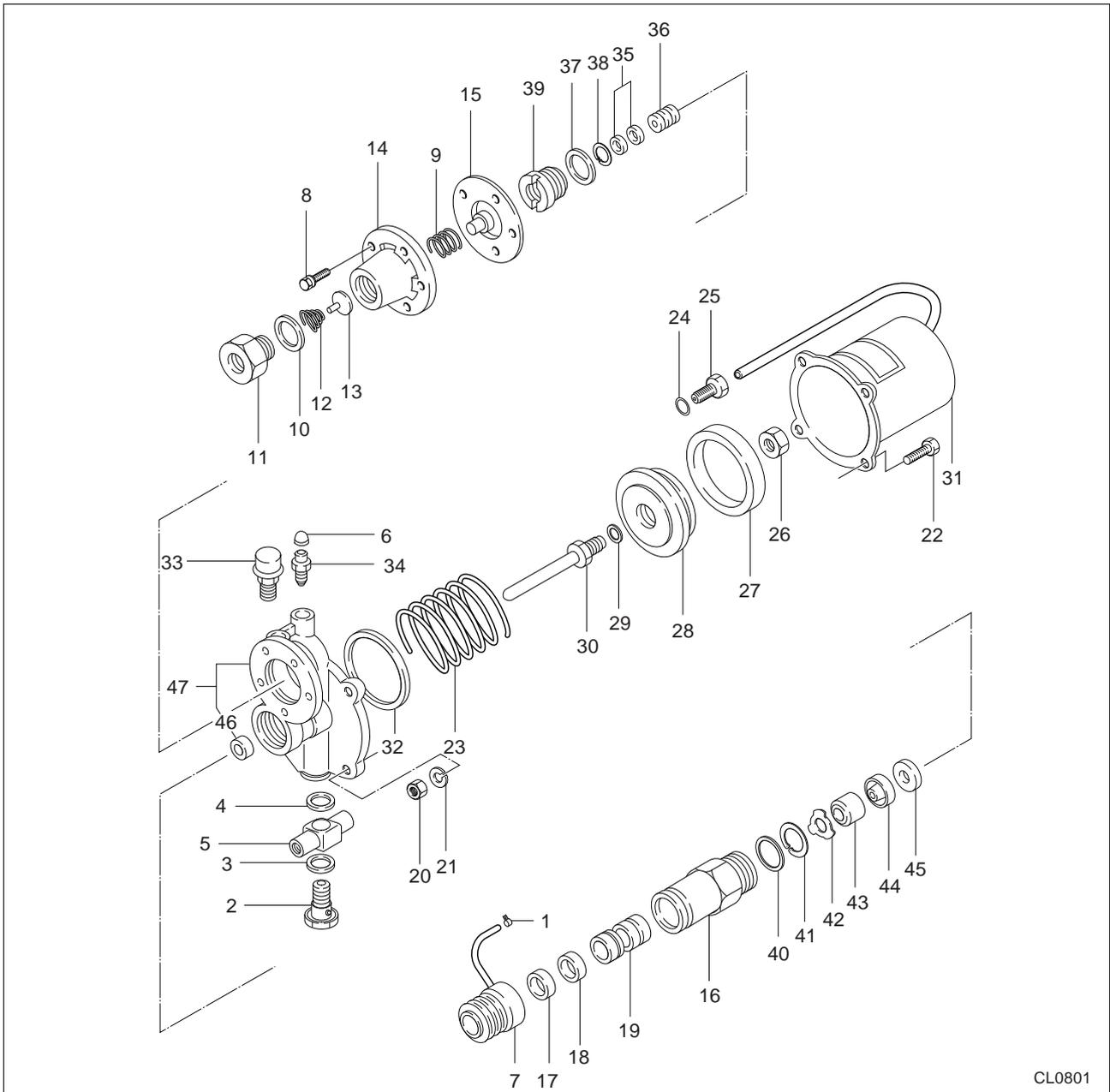
1. Return spring installation

Refer to the general information on booster adjustment, air bleeding and booster inspection procedure.

2. Air pipe and Oil pipe removal

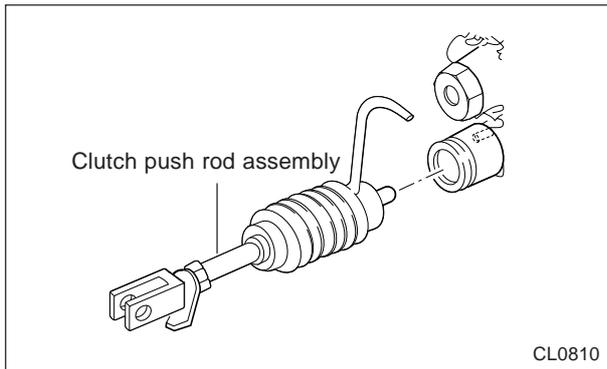
After removing the plug, take measures to prevent the entry of foreign matters.

DISASSEMBLY STEPS (KONGSBERG)

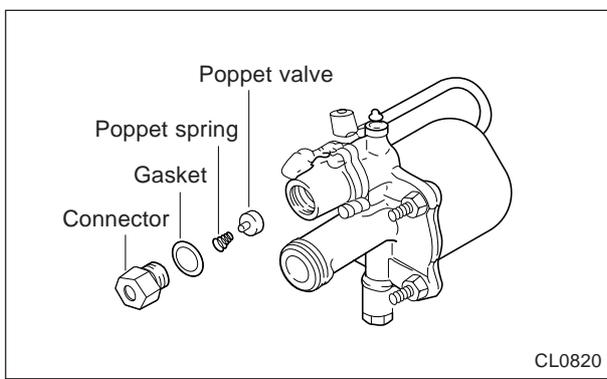


CL0801

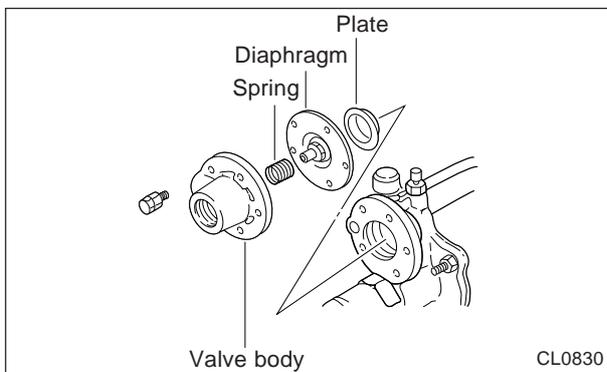
- | | | |
|------------------------|-----------------------|------------------------|
| 1. Clamp | 17. Packing cup | 33. Cover assembly |
| 2. Eye-bolt | 18. Packing cup | 34. Screw-air bleeding |
| 3. Gasket | 19. Piston hydraulic | 35. Packing cup |
| 4. Gasket | 20. Nut | 36. Piston |
| 5. Connector | 21. Washer | 37. Gasket |
| 6. Protector | 22. Bolt | 38. Retaining ring |
| 7. Guard-A | 23. Spring | 39. Fitting |
| 8. Screw | 24. Gasket | 40. O-ring |
| 9. Spring | 25. Bush | 41. Retaining ring |
| 10. Gasket | 26. Nut | 42. Washer |
| 11. Connector | 27. Packing cup | 43. Retainer |
| 12. Spring | 28. Piston | 44. Packing |
| 13. Poppet valve | 29. O-ring | 45. Washer |
| 14. Body upper valve | 30. Push rod assembly | 46. Oil seal |
| 15. Diaphragm | 31. Shell assembly | 47. End plate assembly |
| 16. Cylinder hydraulic | 32. O-ring | |

IMPORTANT OPERATIONS (DISASSEMBLY)

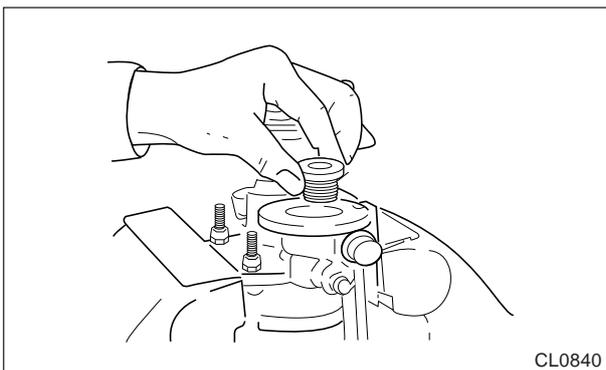
- (1) Remove the clutch push rod assembly.
(The push rod for manual clutch booster is of a simple bar type.)



- (2) Disengage the connector and remove gasket, poppet spring, and poppet valve.

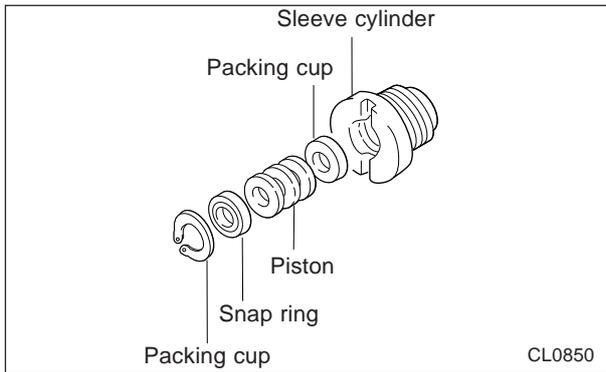


- (3) Disengage the valve body and remove the spring, diaphragm assembly, and plate.

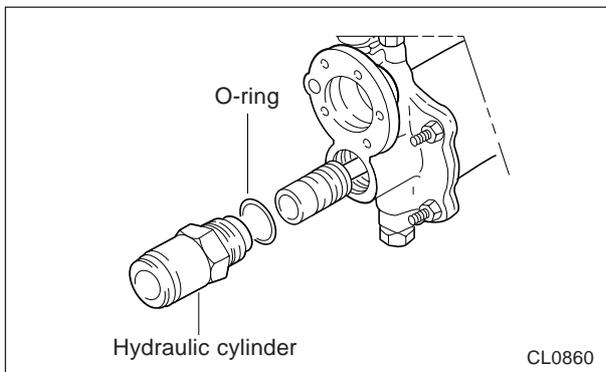


- (4) Remove the sleeve cylinder and gasket.

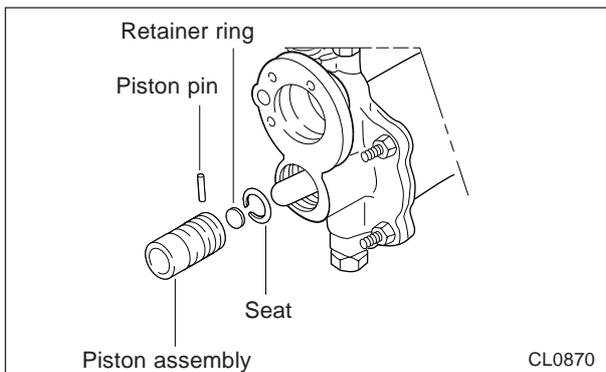
2. CLUTCH



- (5) Take out the snap ring from the sleeve cylinder, and remove the packing cup by pulling out the piston assembly.



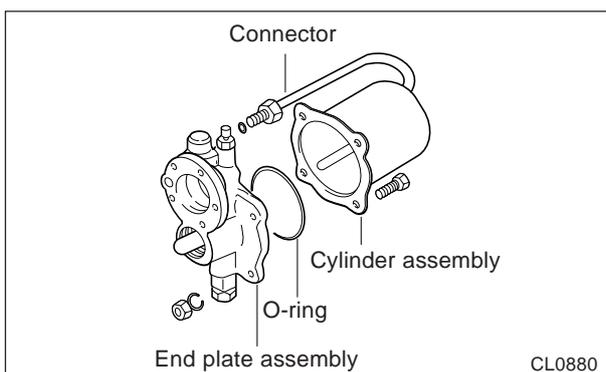
- (6) Disengage the hydraulic cylinder.



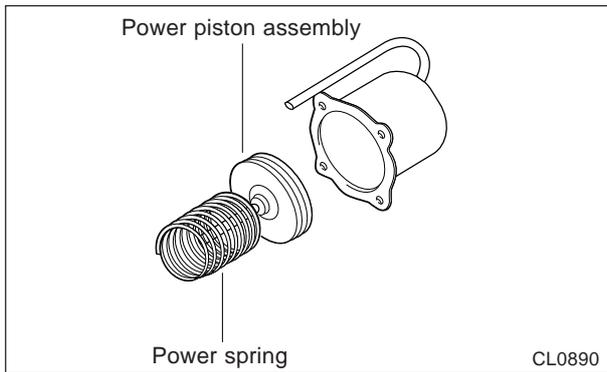
- (7) Take out the retainer ring and piston pin, and disengage the piston assembly from the push rod.

Caution

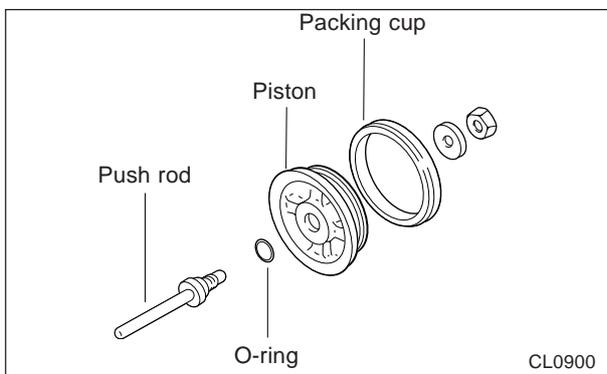
1. Ensure that the seat remains in the piston when the piston assembly is pulled out.
2. Seat, piston pin, and retainer ring are not applied to the manual type clutch booster.
3. The hydraulic piston for automatic clutch booster looks different than that for manual clutch booster.



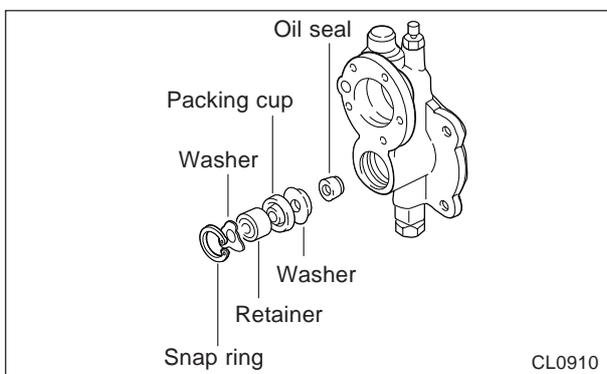
- (8) Disengage the connector, and remove the end plate assembly and O-ring.



- (9) Remove the power piston assembly.
(For manual clutch booster, power spring is installed.)

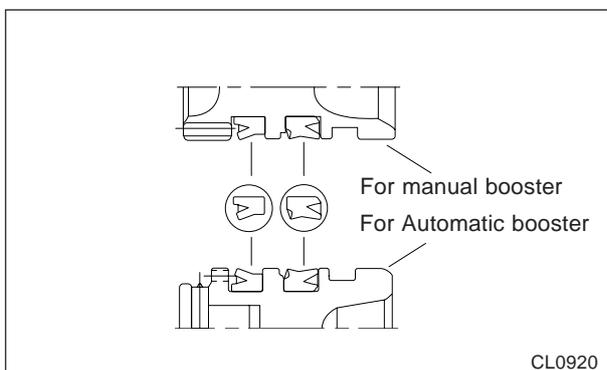


- (10) Disassemble the power piston assembly.



- (11) Pull out the snap ring from the end plate, and then take out the washer, retainer, packing cup, washer, and oil seal.
(12) Remove the packing cup from the hydraulic piston assembly.

IMPORTANT OPERATIONS (REASSEMBLY)

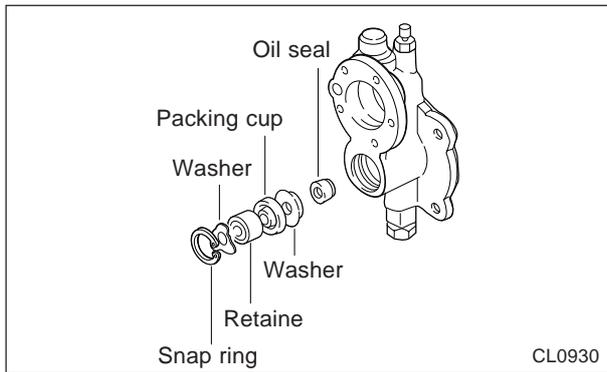


- (1) Using a packing cup guide to the hydraulic piston, assemble the packing cup. The 2 packing cups are different in shape from each other, so that it is necessary to pay attention to the position and direction of assembly.

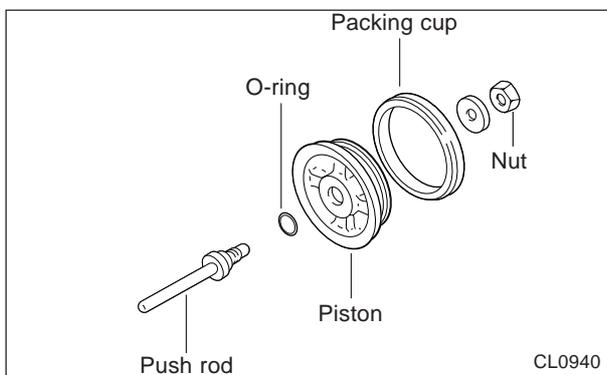
Caution

1. Apply rubber grease to the packing cup before assembly.
2. Automatic clutch booster: The power piston and hydraulic piston are assembled with a pin.

2. CLUTCH



- (2) Assemble the oil seal, washer, packing cup, retainer, washer, and ring to the end plate.



- (3) Assemble the power piston assembly.

- Power piston

(kgf·m)

Tightening torque	2.0 ~ 3.0
-------------------	-----------

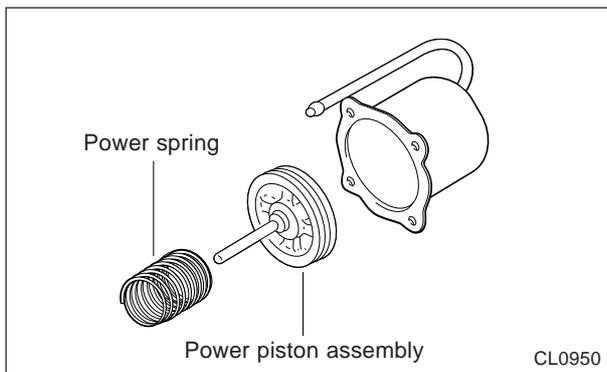
Caution

Coat the packing cup and O-ring with air master paste before assembling.

- Nut

(kgf·m)

Tightening torque	4 ~ 6
-------------------	-------



- (4) Assemble the power piston assembly to the cell cylinder.
(For manual clutch booster, power spring is installed.)

- (5) Place the O-ring over the end plate assembly before assembling it to the cell cylinder assembly.

(kgf·m)

Tightening torque	2.0 ~ 2.5
-------------------	-----------

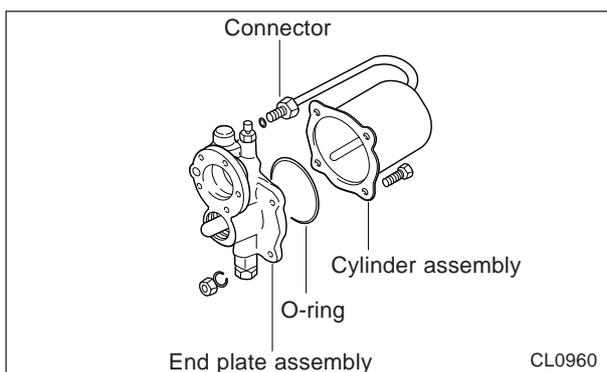
Caution

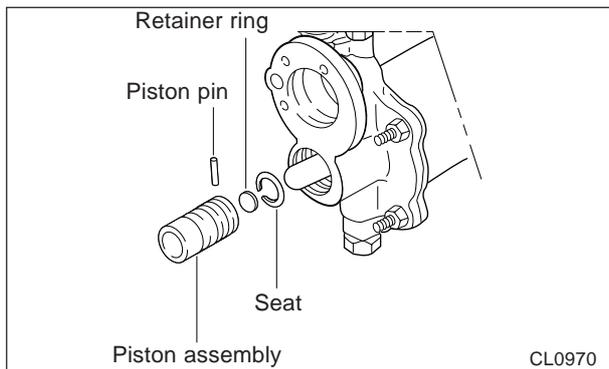
Coat the inside of the packing cup and the O-ring with air master paste before assembling.

- (6) Install the connector.

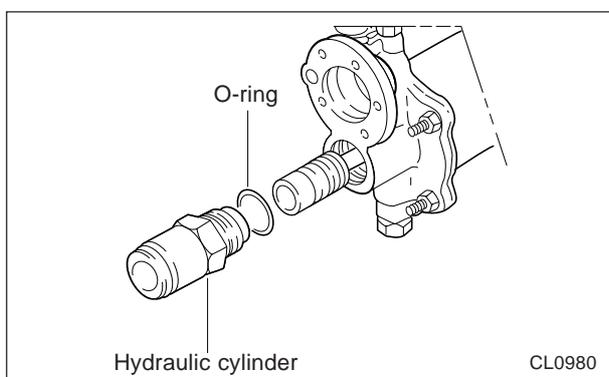
(kgf·m)

Tightening torque	0.8 ~ 1.0
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(7) Mount the seat onto the piston assembly and assemble the straight pin and retainer ring to the rod.

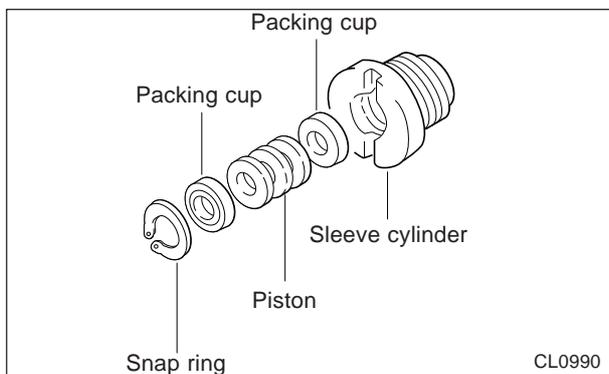


(8) Assemble the hydraulic cylinder. (kgf·m)

Tightening torque	2.0 ~ 3.0
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Caution

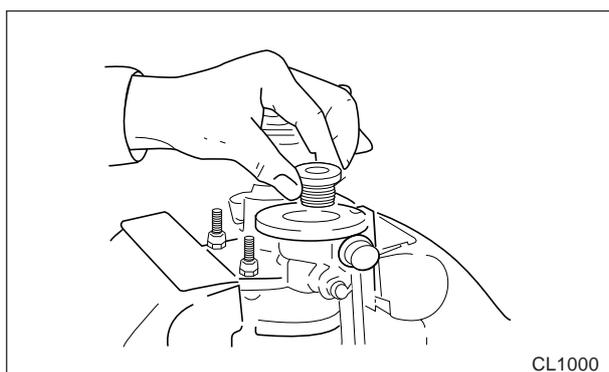
Coat the inside of the cylinder with grease.



(9) Slide the piston assembly into the sleeve cylinder and then assemble the snap ring.

Caution

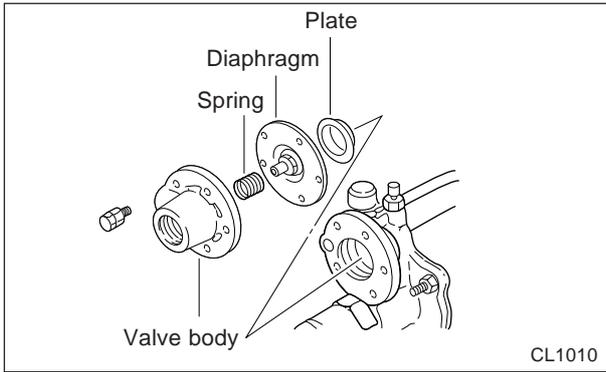
Coat the circumference of the piston groove and packing cup with rubber grease.



(10) Install a gasket onto the sleeve cylinder.

	(kgf·m)
Tightening torque	3.0 ~ 4.0

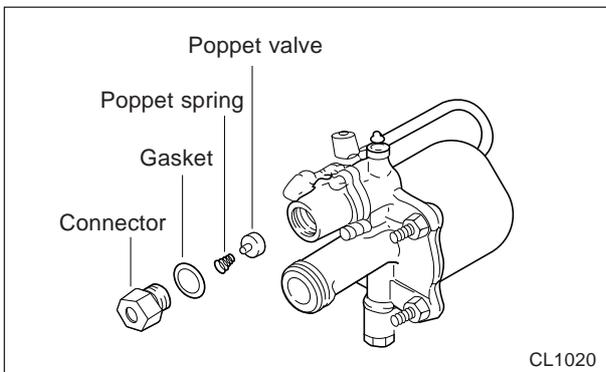
2. CLUTCH



- (11) Put together the plate, diaphragm, spring and valve body.

(kgf·m)

Tightening torque	0.4 ~ 0.6
-------------------	-----------



- (12) Install the poppet valve, poppet spring, gasket, and connector into the valve body.

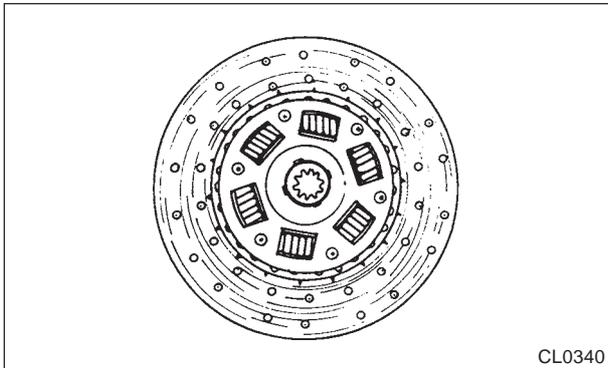
(kgf·m)

Tightening torque	2.0 ~ 3.0
-------------------	-----------

- (13) Install the auto push rod assembly. At this time, do not attach the boots to the cylinder side.

5. TROUBLES AND CORRECTIVE ACTIONS

5-1. DIAGNOSIS OF CLUTCH DISC/COVER

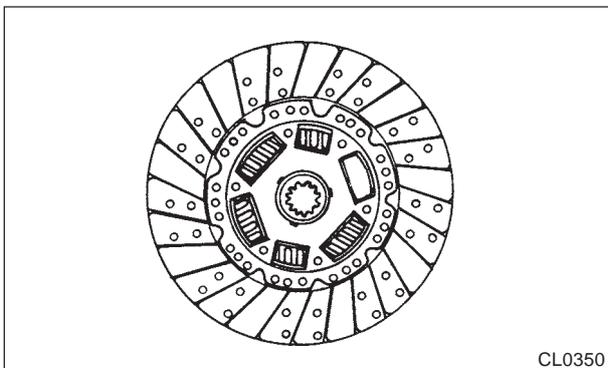


- **Abrasion up to disc facing rivet**

Cause: Only the disc has been replaced although the lives of clutch cover and flywheel have come to an end.

Results: Clutch slippage, damage to flywheel and clutch cover

Corrections: Replace clutch cover, flywheel and disc.

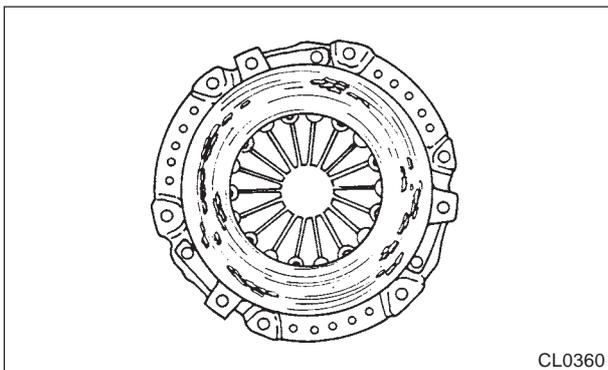


- **Excess abrasion of torsion spring**

Cause: Excessive loading, careless driving, or poor alignment when installing clutch

Results: Travel difficulty, unusual sound, or malfunction of clutch

Corrections: Replacement of clutch disc and no overloading

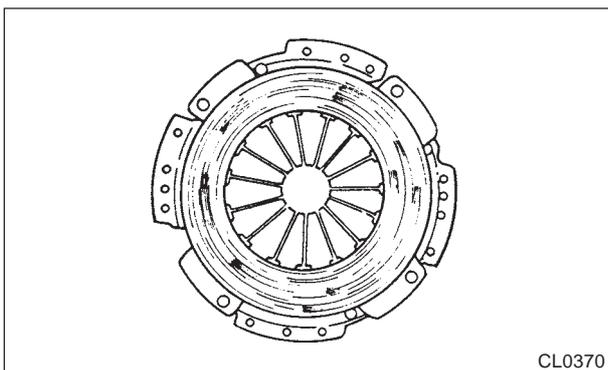


- **Generation of heat spots**

Cause: Disc facing has been stained with oil or grease.

Results: Clutch vibrations and slippage

Corrections: Keep disc facing clean of oil or grease when installing clutch disc and cover.



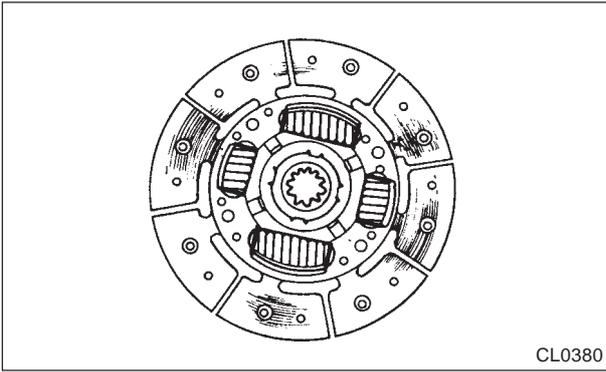
- **Vibration marks on pressure plate**

Cause: 1. Disc facing has been stained with oil or grease.

2. Excessive vibrations of clutch linkages or engine

Results: Chattering

Corrections: Replace clutch disc, and check for vibrations and clutch free play portion. Perform corrective measures accordingly.



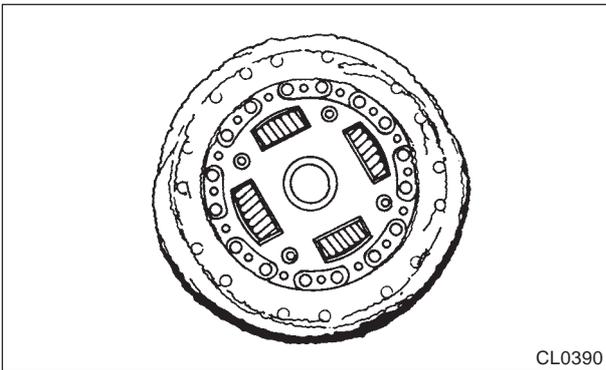
- **Burnt disc facing**

Cause: 1. Disc facing has been stained with oil or grease.

2. Excessive abrasion of flywheel
3. Excessive abrasion of clutch cover

Results: Clutch slippage and damage to facing

Corrections: Replace clutch disc and cover, and repair flywheel.



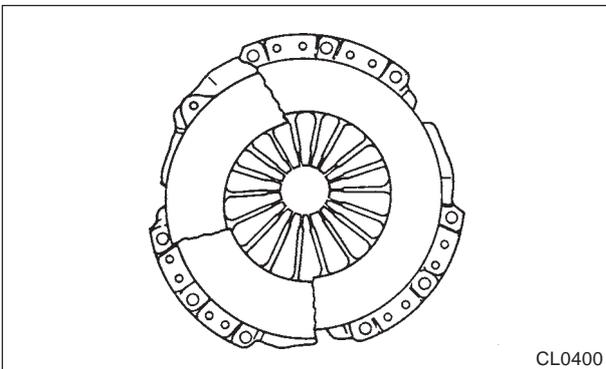
- **Excessive abrasion of disc facing and pressure plate**

Cause: 1. Only the disc has been replaced instead of clutch cover.

2. Excessive abrasion of flywheel

Results: Clutch slippage, abrasion of pressure plate, or damage to disc facing

Corrections: Replace clutch cover and disc, and repair flywheel.

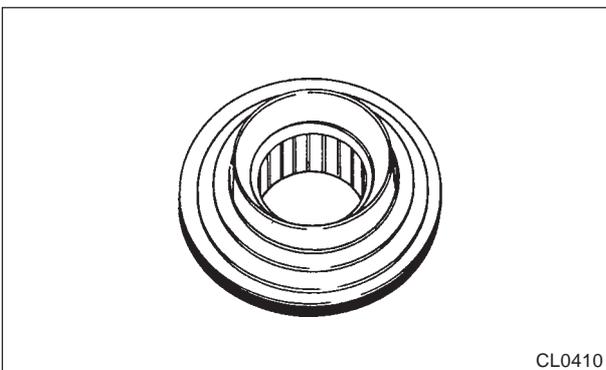


- **Breakage of clutch cover**

Cause: Frequent use of partially-engaged clutch and overheating of clutch

Results: Malfunction of clutch (travel difficulty) due to breakage of clutch cover

Corrections: Replace clutch cover.



- **Damage to release bearing**

Cause: Eccentric release bearing

Results: Unusual sound, damage to clutch, and malfunction of clutch

Corrections: Replace release bearing.

5-2. DIAGNOSIS ACCORDING TO VARIOUS COMPLAINTS

5-2-a. CAUTIONS

- 1) Avoid driving the vehicle with the clutch partially engaged.
- 2) Avoid jack-rabbit starts and frequent use of engine brake.
- 3) Do not use partially-engaged clutch to control the vehicle speed.
- 4) While traveling, change gears step by step according to engine rpm.
- 5) In the case of slippage or trouble with the clutch or vehicle whilst traveling along a road, immediately pull up the vehicle to the roadside, place the gearshift lever in the NEUTRAL position, depress the clutch for about 3 minutes, and then release your foot from the clutch to start travel.

5-2-b. VIBRATIONS

Complaints	Cause	Correction
Unbalance of flywheel	Out-of-balance flywheel	Replace the flywheel
Unbalance of clutch cover	Out-of-balance clutch cover	Replace the clutch cover
Disc chattering	Bad contact surface	Replace the clutch discs
Difference in height of cover finger	Uneven contact with release bearing	Replace the clutch cover

5-2-c. CLUTCH NOISES

1. Bad clutch discs	Anti-distortion capacity does not suit the vehicle.	Replace with genuine Daewoo discs.
2. Unbalance		Replace with genuine Daewoo clutch cover and discs.
3. Flywheel pilot bearing	Trouble in pilot bearing or misaligned bearing	Replace the bearing.
4. Release bearing	1) Trouble in release bearing or lack of lubricant 2) Misaligned bearing	Replace with new bearings and align them as specified.
5. Release linkage	Damage of linkage or pedal	Repair or replace
6. Abrasion or breakage of disc spring	Careless driving (resulting from using a high gear ratio at low vehicle speed)	Replace with new discs.

5-2-d. JACK-RABBIT STARTS

Complaints	Cause	Correction
1. Oil sticking to disc facing	Oil leaks from transmission and engine crank shaft	Clean the clutch cover and replace discs and oil seal.
2. Use of rejected facing	The specified facing has not been in use.	Use the specified discs.
3. Binding of clutch linkages	Damage of bush, clutch cable, master cylinder, and release cylinder front cover	Repair or replace.
4. Troubles in the engine, transmission, or suspension	Damage of engine, transmission or suspension	Repair or replace.
5. Clutch dragging is felt.	1) Misplaced release bearing 2) Bad clutch (Parts have become loose.) 3) Clutch lever or diaphragm spring distorted during reassembly operation 4) Clutch discs deformed during reassembly operation 5) Misalignment of transmission and crank shaft	1) Check and adjust. 2) Install a new clutch. 3) Install a new clutch. 4) Install a new clutch. 5) Check the engine and transmission housing for concentricity and repair as necessary.

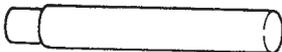
5-2-e. ENGAGEMENT PROBLEM

Complaints	Cause	Correction
1. Binding of transmission shaft to hub spline	1) Damage to the spline before reassembly operation 2) Damage of hub spline or transmission shaft 3) Particles sticking to transmission shaft or hub	1) Remove metal chips or replace with a new part. 2) Replace the discs or shaft. 3) Clean the hub or shaft, and re-grease.
2. Particles generated from disc facing have stuck to flywheel or pressure plate.	The vehicle has not been in use over extended time.	Wipe the contact surface with sandpaper.
3. Binding of disc facing to flywheel or pressure plate	After stopping the vehicle, the contact surface of disc facing forms a vacuum state.	Make a hole of about 2mm diameter to the disc facing rivet and use sand paper to polish the contact surface.
4. The clutch discs are too thick	Bad discs	Replace with genuine Daewoo discs.
5. Damage or binding of flywheel pilot bearing	Misaligned bearing	Replace the pilot bearing.
6. Clutch dragging is felt.	1) Excessive free play of release bearing 2) Excessive abrasion of release system 3) Clutch working fluid leakage or shortage 4) Oil leakage or shortage from hydraulic system 5) Inflow of air to hydraulic system 6) Loosely tightened clutch 7) Large cushion amount 8) Hub distorted or damaged during reassembly operation 9) Diaphragm spring distorted when assembling the engine to transmission 10) Overstroke applied to the clutch	1) Readjust as specified. 2) Replace damaged parts. 3) Replenish working fluid. 4) Replace damaged parts. 5) Bleed air. 6) Replace the deformed clutch with the new one and tighten the new clutch as required. 7) Install genuine Daewoo discs. 8) Install genuine Daewoo discs. 9) Replace the clutch. 10) Check the pedal for the amount of movement.

5-2-f. SLIP

Complaints	Cause	Correction
1. Excessive abrasion of disc facing	1) Normal abrasion 2) Careless driving(Frequent use of partially engaged clutch) 3) Improper clutch resistance	Replace with new clutch cover discs, if possible.
2. Oil sticking to disc facing	1) Oil leakage from transmission or engine crank shaft 2) Over inject grease to spline shaft when performing reassembly operation 3) Grease leakage from release bearing	Thoroughly clean the clutch cover and replace the discs, oil seal, and bearing.
3. The clutch works even in a partially engaged state.	1) Insufficient free play of release bearing 2) Excessive friction of release linkage 3) Release cylinder has difficulty in coming back to its original position.	1) Adjust bearing free play. 2) Repair the linkage if necessary. 3) Replace the release cylinder.
4. Incorrect depth of flywheel	Flywheel was repolished or modified incorrectly.	Repolish the flywheel correctly or replace it if necessary.
5. Bad clutch installed	A clutch for different type vehicle has been installed.	Install genuine Daewoo clutch.
6. Distortion of clutch lever or diaphragm	Careless handling when removing or installing the clutch	Reassemble the clutch in accordance with "Clutch Assembly/Disassembly Steps"
7. Clutch overheating	Careless use	Replace with new clutch cover and discs.
8. Bad contact of disc facing with flywheel	Dents made on the contact surface of flywheel	Repolish the contact surface of fly wheel.

6. SPECIAL TOOLS

NO	Tool name	Tool number	Configuration
1	Disc exchange shaft	CA21081	
2	"	CA21091	
3	"	TA25171	