3 Transmission

3.1 Warnings and Notice

3.1.1 Warnings and Notice

3.1 Warnings and Notice

3.1.1 Warnings and Notice

Battery Disconnection Warning

Warning!

Unless directed otherwise, the ignition and start switch must be in the OFF or LOCK position, and all electrical loads must be OFF before servicing any electrical component. Disconnect the negative battery cable to prevent an electrical spark should a tool or equipment come in contact with an exposed electrical terminal. Failure to follow these precautions may result in personal injury and/or damage to the vehicle or its components.

Clutch Dust Warning

Warning!

When servicing clutch parts, do not create dust by grinding or sanding the clutch disc or by cleaning parts with a dry brush or with compressed air. A water- dampened cloth--NOT SOAKED--should be used. The clutch disc may contain fibers which can become airborne if dust is created during servicing. Breathing dust with fibers may cause serious bodily harm.

Moving Parts and Hot Surfaces Warning

Warning!

Avoid contact with moving parts and hot surfaces while working around a running engine in order to prevent physical injury.

Protective Goggles and Glove Warning

Warning!

Protective goggles and glove shall be properly worn when disassembling the exhaust system part, otherwise the iron rust dropped from the exhaust system parts and sharp edge may lead to severe personal injury.

Road Test Warning

Warning!

Carry out the road test of a vehicle under safe conditions and while obeying all traffic laws. Do not attempt any maneuvers that could jeopardize vehicle control. Failure to adhere to these precautions could lead to serious personal injury and vehicle damage. Engine

Lifting Notice

Note

When raising or supporting the engine for any reason, do not use a jack under the oil pan, any sheet metal, or the crankshaft pulley. Lifting the engine in an unapproved manner may cause component damage.

Fastener Notices

Note

Use the correct fastener in correct location. Replacement fasteners must be the correct part number for that application. Fasteners requiring replacement or fasteners requiring the use of thread locking compound or sealant are identified in the service procedure. Do not use paints, lubricants, or corrosion inhibitors on fasteners or fastener joint surfaces unless otherwise specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and torques when installing fasteners in order to avoid damage to parts and systems.

Sealant Notices

Note

Do not allow the RTV sealant to enter any blind threaded hole. RTV sealant that is allowed to enter a blind threaded hole can cause hydraulic lock of the fastener when the fastener is tightened. Hydraulic lock of a fastener can lead to damage to the fastener and/or the components. Hydraulic lock of a fastener can also prevent the proper clamping loads to be obtained when the fastener is tightened. Improper clamping loads can prevent proper sealing of the components allowing leakage to occur. Preventing proper fastener tightening can allow the components to loosen or separate leading to extensive engine damage.

3.2 Clutch System

3.2.1 Fastener Specifications

3.2.1.1 Fastener Specifications

Fastener Name	Model	Specifications	
		Metric (N.m)	US English(lb-ft)
Clutch Slave Cylinder Retaining Bolt	M8×1.25×25	18～22	13.3～16.2
Clutch Slave Cylinder Oil Pipe Bracket Bolt	M8×1.25×16	18～22	13.3～16.2
Clutch Pressure Plate and Driven Plate Retaining bolt	M8×1.25×14	22～33	16.2～24.3
Retaining nut for clutch pedal assembly	M8	16～26	11.8～19.2

3.2.1.2 General Specifications

Application	Specifications	
	Metric (mm)	US English (in)
Oil (hydraulic clutch)	DOT4	
Working Stroke for Clutch Pedal	125	4.92
Free Stroke for Clutch Pedal	5～10	0.2～0.4
Clutch Master Cylinder Diameter	15.87	0.63
Full stroke for clutch master cylinder	30	1.2
Clutch Pressure Plate Outer Diameter	256	10.1
Clutch Driven Plate Outer Diameter	212	8.3
Clutch Driven Plate Wear Limit (Rivet Head Depth)	0.5	0.002
Flywheel Plane Run Out (Clutch Driven Plate Mating Surface)	0.06	0.024

3.2.2 Description and Operation

3.2.2.1 Description and Operation

The clutch assembly is located between the engine and the transmission. The clutch is retained to the flywheel rear surface by retaining bolts. The clutch spline hub and transmission input shaft form rigid connections. During driving, the driver can press or release the clutch pedal, to temporarily separate the engine and the transmission or connect the engine and the transmission gradually, to cut off or pass the engine to the transmission input power. Clutch system mainly includes the following components:

- Drive parts: Clutch pressure plate. Clutch pressure plate is fixed to the flywheel by retaining bolts.
- Driven parts: Clutch driven plate with a splined hub. Spline hub slides along the input shaft. Drive parts and driven parts maintain contact through spring pressure. The pressure is applied by the diaphragm spring in the pressure plate assembly.
- Working parts: Clutch separation system consists of the clutch pedal, release shaft, fork and release bearing. When the clutch pedal is pressed, the release bearing is pushed, which then pushes the release lever in pressure plate assembly so as to separate the clutch.

3.2.3 System Working Principle

3.2.3.1 System Working Principle

1. Make Sure Vehicle Smooth Start:

Before start, the vehicle is stationary. If the engine and transmission has a rigid connection, and once a gear is engaged, vehicle will suddenly move forward because of the suddenly transmitted power. It not only will cause mechanical parts damage, but also the driving force is not enough to overcome the enormous inertia caused by the forward force, so that the rapidly decrease in engine speed will shut down the engine. If a clutch is used when starting, the engine and transmission will be temporarily separated, and then the clutch will gradually engage. Due to the sliding between the clutch driving parts and the driven part, the torque transmitted from the clutch gradually increases from zero, while the vehicle driving force gradually increases, so that the vehicle starts smoothly.

2. Easy to Shift:

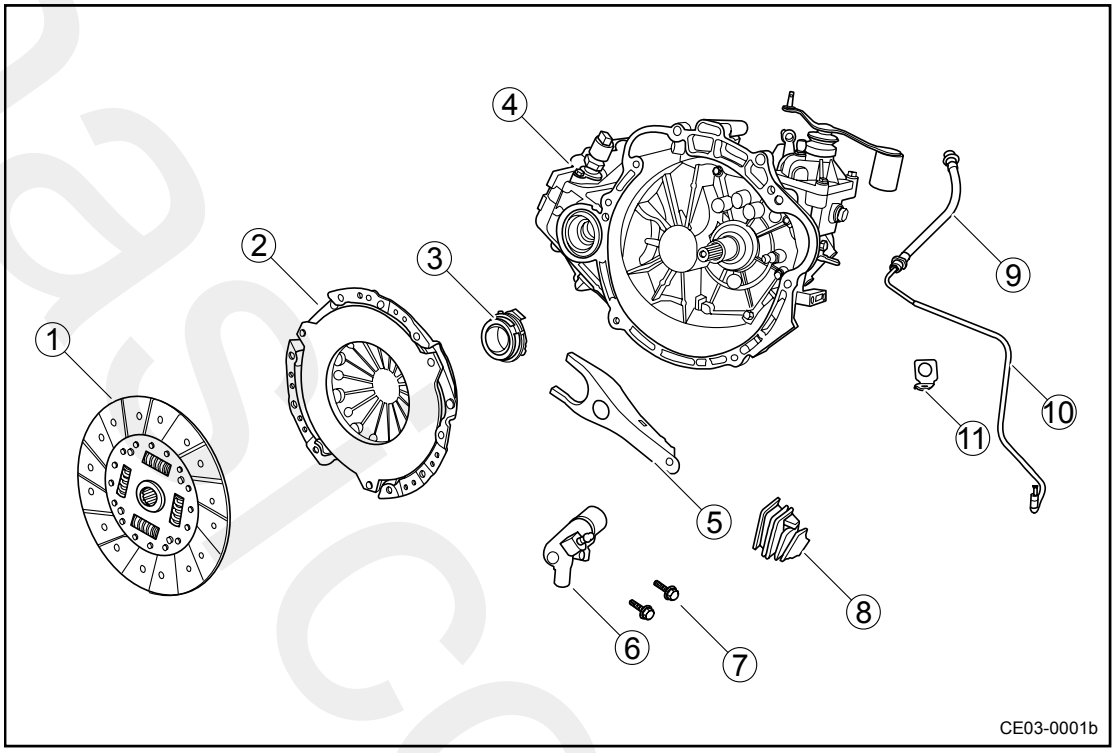
During driving, there is a need to frequently switch to different gears in order to adapt to changing driving conditions. If there is no clutch to temporarily separate the engine and transmission, then the transmission meshing gears will be hard to separate due to the unreleased load. In addition, gears with different speeds are difficult to mesh. Even if forced into the mesh, there will be a huge impact on tooth side and cause damage to parts. The use of the clutch to temporarily separate the engine and transmission, then the original pair of meshing gears surfaces pressure will be greatly reduced due to load released, and are easy to separate. For the other pairs of meshing gears, because the gear is separated from the engine, the inertia is small. Use appropriate shifting action to make the gears meshing circumferential speed to be equal to or close to equal, so as to avoid or mitigate the impact between gears.

3. Prevent the Transmission System Overload:

During emergency braking, the wheel speed suddenly decreases. Transmission system is connected to the engine and has the rotation inertia, so it remains the original speed, which generates a far greater inertia torque than the engine, causing damage to the power train parts. As the clutch relies on friction to transmit torque, so when the transmission system load exceeds the friction torque, the clutch drive parts and driven parts will skid, thus to prevent the overload.

3.2.4 Disassemble View

3.2.4.1 Disassemble View



1. Clutch Driven Plate
2. Clutch Pressure Plate
3. Release Bearing
4. Transmission Assembly
5. Release Fork
6. Clutch Slave Cylinder
7. Clutch Slave Cylinder Retaining Bolt
8. Release Fork Sheath
9. Clutch Hydraulic Hose
10. Clutch Slave Cylinder Oil Inlet Pipe
11. Clutch Hydraulic Hose Retaining Bracket

3.2.5 Diagnostic Information and Procedures

3.2.5.1 Diagnosis Description

Refer to "3.2.2 Description and Operation" and start system diagnosis. When fault occurs, refer to "Description and Operation" as it will help determine the correct symptom diagnosis procedures, so that it will also help to determine whether the customer described condition is normal. Refer to 3.2.2 Description and Operation to confirm the correct system diagnosis procedures.

3.2.5.2 Clutch Inseparable Malfunction (Gearshift Lever Can Not Select Gear)

Fault Definition: Under normal engine running conditions, press the clutch pedal to the full travel, the gearshift lever can not engage to or disengage from a gear.

1	Check whether there are obstacles under the clutch pedal?

A. Check whether the floor blocks the clutch pedal travel.

B. Check whether the vehicle is installed after market equipment, such as rubber flooring, and therefore affecting the clutch pedal travel.

Yes → Repair the faulty part.

No

2	Press the clutch pedal, check whether the clutch release fork moves?

Yes → Go to step 8.

No

3	Check whether the travel between the clutch pedal and clutch master cylinder is too great?

Check the pedal bushing for wear and tear?

Yes → Replace pedal bush.

No

4	Check whether the clutch master cylinder is seized or binding?

Yes → Replace the clutch master cylinder. Refer to 3.2.6.3 Disassemble and Assemble of Clutch Master Cylinder and Its Pipeline

No

5	Bleed the clutch hydraulic pipeline system. Refer to 3.2.6.4 Hydraulic Clutch Bleeding. Does clutch fork resume normal actions?

Yes → System normal

No

6	Check whether the clutch slave cylinder is seized or binding? (Under normal circumstances, cylinder should be able to move freely)

Yes → Replace the clutch master cylinder. Refer to 3.2.6.3 Disassemble and Assemble of Clutch Master Cylinder and Its Pipeline

7	Check whether the clutch master cylinder is leaking internally?

Inspect for correct clutch pedal reserve:

A. Release the clutch pedal to the halfway position.

B. Apply the clutch pedal several times.

C. Inspect to ensure the clutch pedal reserve is correct.

Clutch pedal reserve?

Yes → Replace the clutch master cylinder. Refer to 3.2.6.3 Disassemble and Assemble of Clutch Master Cylinder and Its Pipeline

No

8	Remove the transmission assembly. Check whether the clutch driven plate is damaged? (Whether warp or bend)

Yes → Replace the clutch driven plate.

No

9	Remove the transmission assembly. Check whether the clutch pressure plate is damaged? (Whether warp or bend)

Yes

Replace the clutch pressure plate.

No

10	Remove the transmission assembly, check whether the clutch driven plate is biding on the transmission input shaft axle?

Yes

Replace the clutch driven plate.

Next

System normal.

3.2.5.3 Clutch Slipping

Fault Definition: When the first gear is selected and the clutch is fully engaged, the vehicle is difficult to start or can not start.

1	Check whether the clutch pedal height is correct, otherwise the clutch master cylinder can not be completely reset. Measure the clutch pedal free travel. Refer to 3.2.8.4 Adjustment of Clutch Pedal Free Travel".

Next

2	Check whether the pipes are broken or damaged, causing the clutch slave cylinder oil pressure can not be released in time.

Yes

Replace the damaged

No

3	Check whether the clutch slave cylinder is binding?

Yes

Replace the clutch slave cylinder. Refer to 3.2.6.7 Clutch Slave Cylinder Replacement.

No

4	Check whether the clutch master cylinder is binding?

Yes

No

Replace clutch master cylinder. Refer to 3.2.6.3 Disassemble and Assemble Clutch Mater Cylinder and Its Pipeline

5	Check whether the clutch driven plate is overheating?

Yes

No

Cool the clutch driven plate.

6	Remove the transmission. Check whether the clutch disc is contaminated by oil.

Next

7	Remove the transmission. Check whether the clutch driven plate is excessively worn and torn, or broken?

Yes

No

Replace the clutch driven plate. Refer to 3.2.6.5 Clutch Assembly Replacement

8	Check whether the clutch pressure plate or flywheel is warped?

Yes

No

Replace the clutch pressure plate and flywheel. Refer to 3.2.6.5 Clutch Assembly Replacement and 2.7.8.20 Flywheel Replacement

9	Check whether the clutch pressure plate diaphragm spring is too soft. Replace the clutch assembly.

Next

Diagnosis completed

3.2.5.4 Clutch Bearings Noisy When Clutch Engaging

1	Check whether the release bearing is binding?

Yes

Clean and re-lubricate the release bearing. Check whether the bearing has burr and nick.

No

2	Check whether the release fork is installed incorrectly. Remove and re-install the release fork correctly.

Next

Diagnosis completed

3.2.5.5 Rattle of Clutch

1	Check whether the pressure plate diaphragm spring is too soft?

Yes → Replace the clutch pressure plate

No

2	Check whether the fork is not installed correctly, remove and re-install the release fork correctly.

Next

3	Check whether there is lubrication oil in clutch driven plate buffer block?

Yes → Rule out engine oil leakage and replace the clutch driven plate.

No

4	Check whether the driven plate damping spring is damaged. Replace the clutch driven plate.

Next

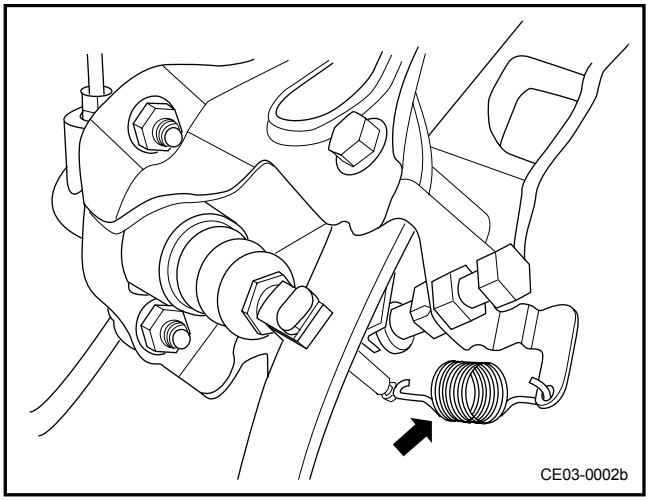
Diagnosis completed

3.2.6 Removal and Installation

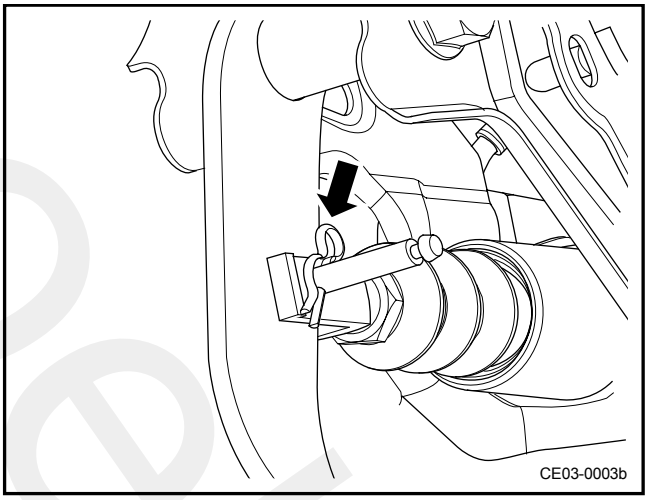
3.2.6.1 Clutch Pedal Replacement

Removal Procedure

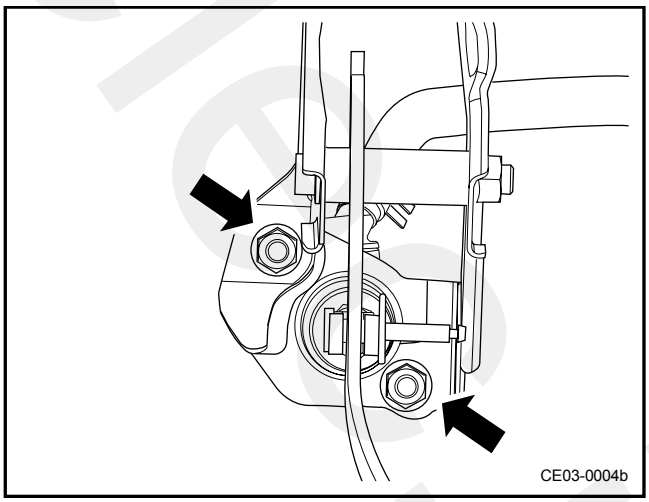
1. Remove return spring.



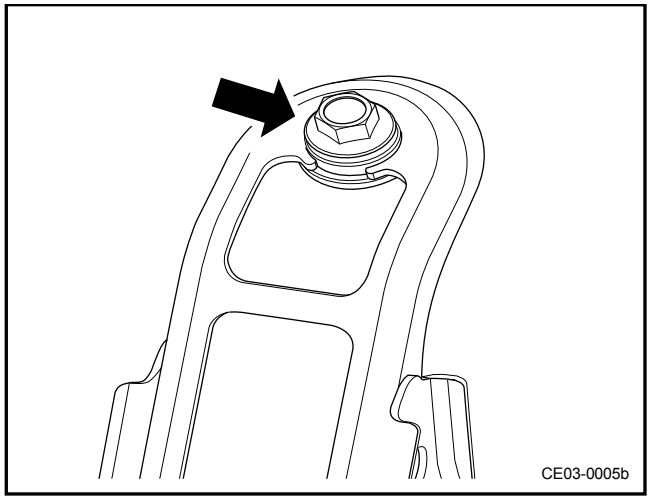
2. Disconnect the clutch master cylinder and clutch pedal and remove the pin shaft and lock pin.



3. Remove the nut connecting the clutch pedal with front skirt and clutch master pump.

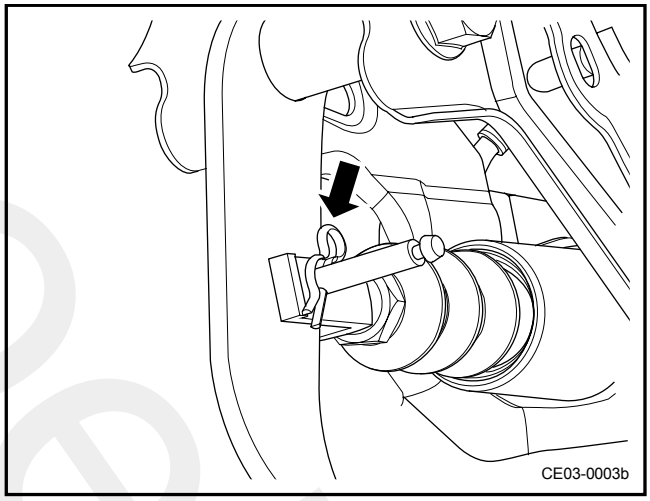


4. Remove retaining bolt between clutch pedal assembly and instrument panel beam.



Installation Procedure

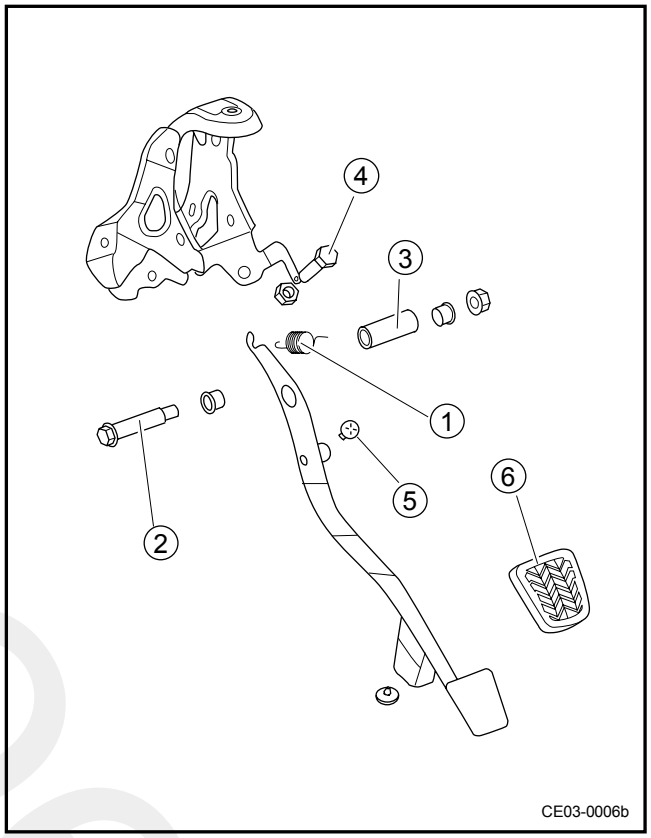
1. Install retaining bolt between clutch pedal assembly and instrument panel beam.
2. Install the nut connecting the clutch pedal with front skirt and clutch master cylinder.
3. Install the connection of clutch master cylinder and clutch pedal. Install the pin shaft and lock pin.
4. Install return spring.



3.2.6.2 Disassemble and assemble of clutch pedal

Removal Procedure

1. Remove return spring 1 for clutch pedal.
2. Remove clutch pedal shaft bolt 2 and nut.
3. Take down the spring cutting sleeve 3 from the pedal arm.
4. Remove limit bolt and nut.
5. Remove buffer block 5.
6. Remove pedal pad 6.



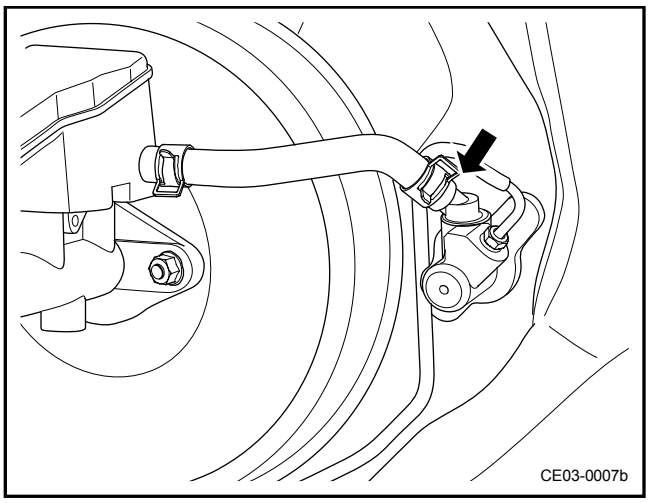
Installation Procedure:

1. Install pedal pad.
2. Install buffer block.
3. Install limit bolt and nut.
4. Install lubrication sleeve and bushing.
5. Install clutch pedal shaft bolt and nut.
6. Install return spring for clutch pedal.

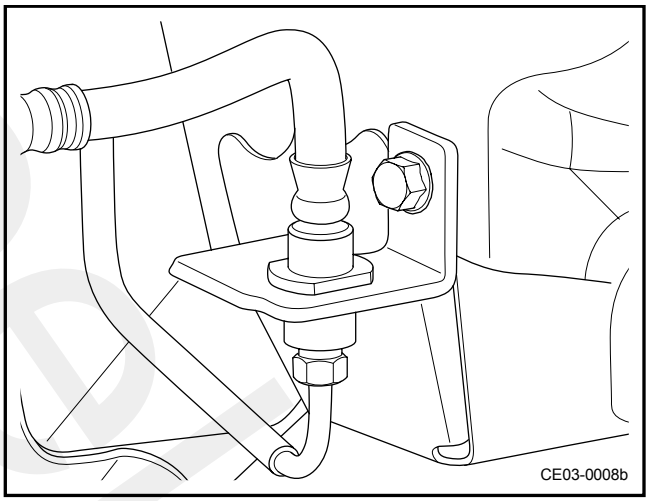
3.2.6.3 Disassemble and Assemble of Clutch Master Cylinder and Its Pipeline

Removal Procedure:

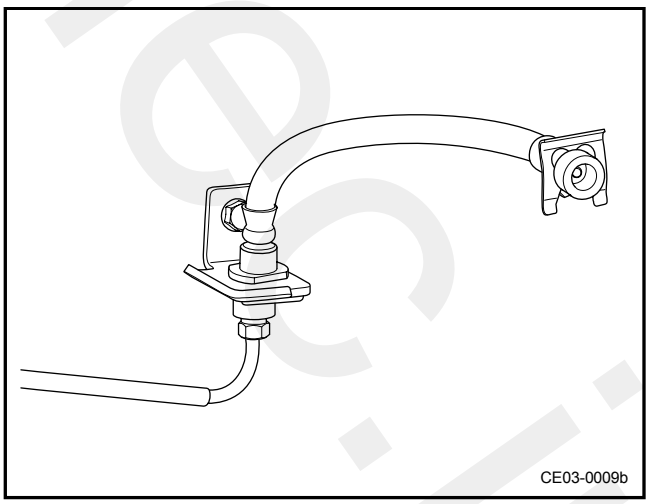
1. Remove clips on both sides of oil inlet hose for clutch and remove oil inlet hose for clutch.



2. Remove master cylinder oil outlet pipeline assembly and disconnect the tube and master cylinder screwed joint; remove the sing pipe clamp from the vehicle body. Disconnect the other end of hard tube with clutch hydraulic hose screwed connection.

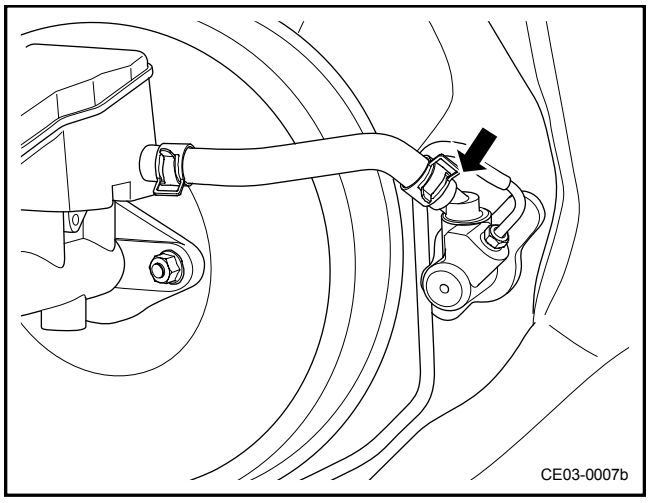


3. Remove the bolt connecting pipeline support and left longitudinal beam and L spring clip, and then pipeline support.
4. Remove the nut connecting the pedal and cutch master cylinder and the pipe connecting the master cylinder, and then remove the clutch master cylinder.
5. Loosen pipe threaded connection on both sides, remove spring clips on both sides of hydraulic hose for clutch and then hydraulic hose of clutch.



Installation Procedure:

1. Install hose pipe of the clutch.
2. Install the nut connecting the pedal and cutch master cylinder and the pipe connecting the master cylinder, and then install the clutch master cylinder.
3. Install pipeline support.
4. Install the connection of fixing hard tube of master pump oil outlet pipe assembly and master cylinder screwed joint; install the sing pipe clamp on vehicle body. Install the threaded joint of other end of hard tube and clutch hydraulic hose.
5. Install oil inlet hose for the clutch.



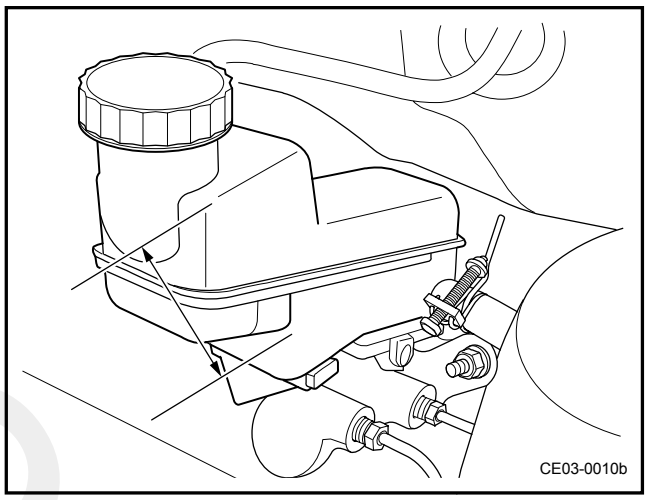
3.2.6.4 Hydraulic Clutch Bleeding

Note: The brake fluid is corrosive which may damage the electric joint and paint face.

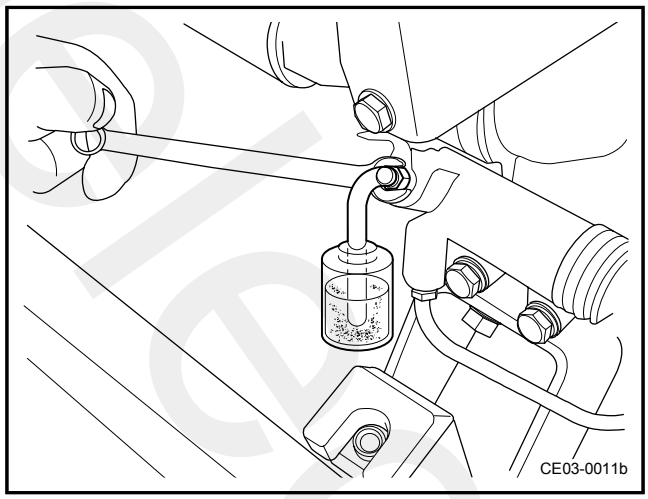
Use proper container and fender cover to prevent exposure to brake fluid. Use cotton cloth to timely wipe spilled brake fluid.

Note: Prohibit refilling brake fluid to the clutch master cylinder brake fluid reservoir; because the used brake fluid may be mixed with the air, impurities and moisture.

1. During the hydraulic system bleeding after disconnecting the pipeline and repairing, make sure the clutch/brake fluid level is between reservoir minimum (MIN) and maximum (MAX) marker.



2. Connect one end of the vinyl plastic hose to the bleeder nipple, the other end to a half full brake fluid container.
3. Slowly press the clutch pedal several times.
4. Release the bleeder nipple screws when pressing the clutch pedal, until the fluid begins to flow, and then tighten the bleeder nipple screws.
5. Repeat step 3 until bubbles no longer appear in fluid in container.

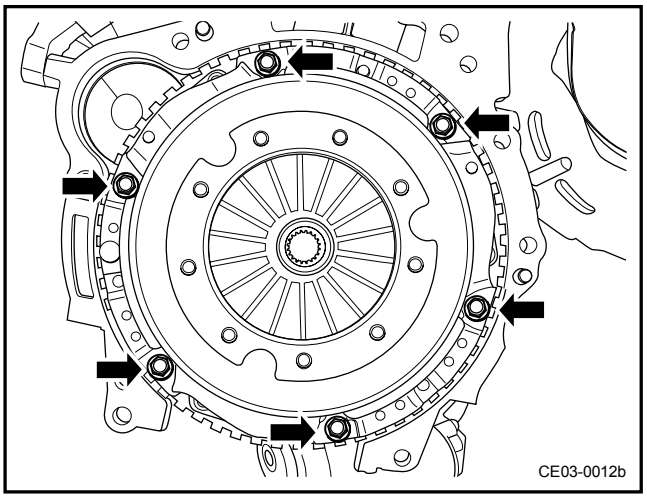


6. Fill brake fluid to the maximum (MAX) marker level.

3.2.6.5 Clutch Assembly Replacement

Removal Procedure:

Warning: Refer to “Battery Disconnection Warning” in “Warnings and Notices”.



1. Disconnect the battery negative cable. Refer to 2.12.6.1 Battery Disconnection Procedure.
2. Lift the vehicle. Refer to 1.3.1.1 Lifting and Jacking the Vehicle.
3. Remove the engine bottom shield. Refer to 12.10.1.6 Engine Bottom Shield Replacement.
4. Remove transmission assembly. Refer to 3.3.6.3 Transmission Assembly Replacement.
5. Remove Clutch pressure plate bolt.
6. Remove the clutch pressure plate and clutch plate.

Installation Procedure:

1. Apply multipurpose grease on clutch plate spline.
2. Align the clutch pressure plate and clutch plate with the flywheel with special tool (clutch mandrel).
3. Install pressure plate bolts and tighten.

Torque: 25N.m（Metric）,18.5 lb-ft（US English）

Note: Install bolts in diagonal order.

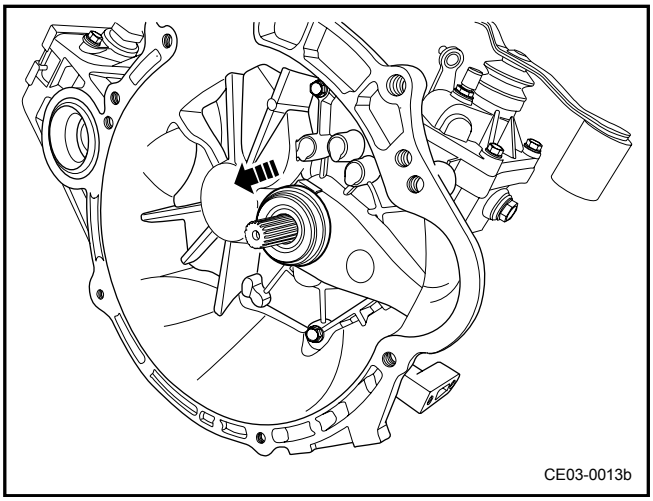
4. Install Transmission assembly.
5. Install the engine bottom shield.
6. Lower the vehicle.

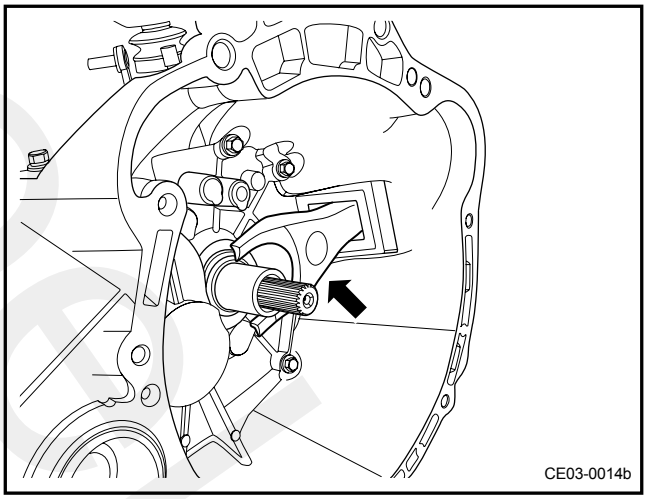
3.2.6.6 Release Bearing Replacement

Removal Procedure:

Warning: Refer to "Battery Disconnection Warning" in "Warnings and Notices".

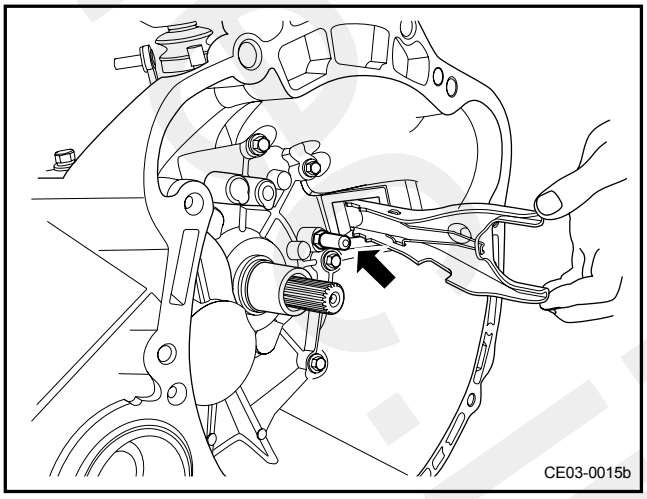
1. Disconnect the battery negative cable. Refer to 2.12.6.1 Battery Disconnection Procedure.
2. Lift the vehicle. Refer to 1.3.1.1 Lifting and Jacking the Vehicle.
3. Remove the engine bottom shield. Refer to 12.10.1.6 Engine Bottom Shield Replacement.
4. Remove transmission assembly. Refer to 3.3.6.3 Transmission Assembly Replacement.
5. Remove the release bearing from transmission input shaft.
6. Release the release fork from release fork fixing ball joint and then pull out the release fork.





Installation Procedure:

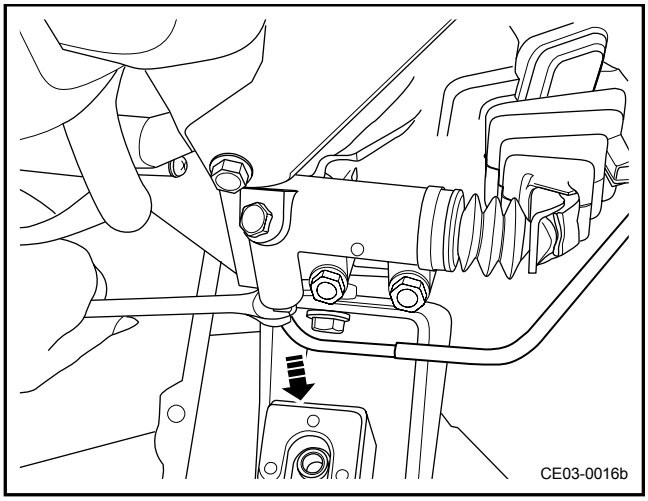
1. Install the release fork into the release fork dust cap and couple with the release fork fixing ball joint.
2. Install the release bearing onto transmission input shaft.
3. Install transmission assembly.
4. Install the engine bottom shield.



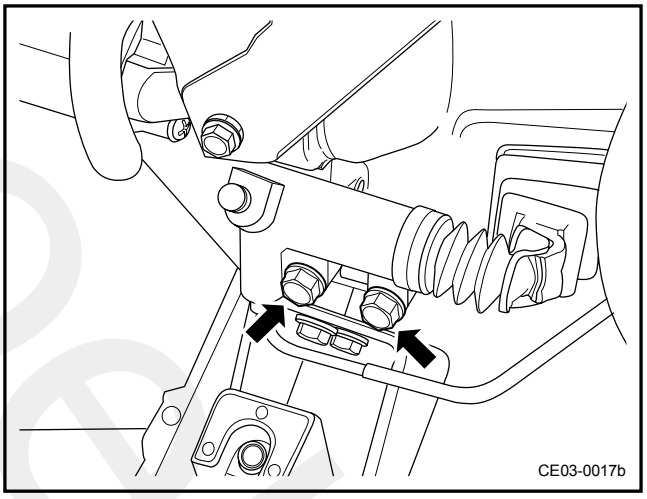
3.2.6.7 Clutch Slave Cylinder Replacement

Removal Procedure:

1. Remove the bolts and disconnect the tube from the clutch slave cylinder.

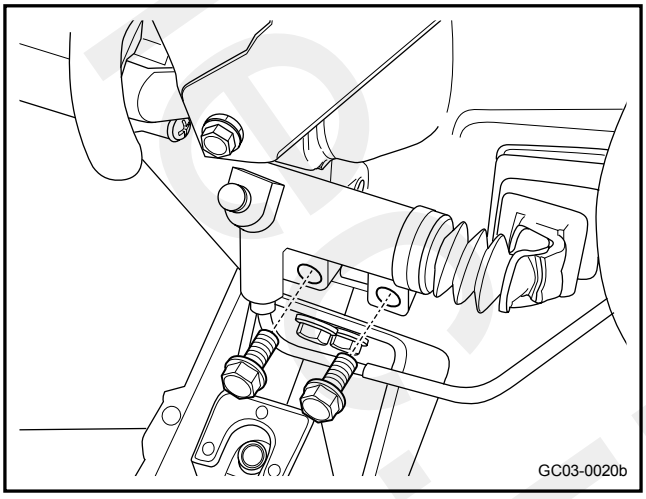


2. Remove clutch slave cylinder bolts and the clutch slave cylinder.



Installation Procedure:

1. Connect the clutch slave cylinder to the transmission housing and tighten the bolts.
   Torque: 20N.m（Metric）,14.8 lb-ft（US English）
2. Connect the clutch fluid tube to the clutch slave cylinder and tighten the bolts.
   Torque: 10N.m（Metric）,7.4 lb-ft（US English）
3. Apply grease to the connection position of pushrod and release lever and be careful not to make the dust cap dirty.



4. Bleed the hydraulic clutch,
5. Adjust the clutch pedal.
6. Fill brake fluid to the fluid reservoir Maximum mark.

3.3 Manual Transmission

3.3.1 Specifications

3.3.1.1 Fastener Specifications（S118）

Fastener Name	Model	Torque	
		Metric（N.m）	US English（lb-ft）
Tightening bolt for gear shift cable bracket	M8	15-22	11-16.2
Mounting bolt for gearbox case	M8	15-22	11-16.2
Connecting bolt for gear shift cover	M8	15-22	11-16.2
Connecting bolt for end cover	M6	7-10	5.2-7.4
Gear shift positioning assembly	M18	25-30	18.4-22.1
Locking bolt for reverse gear shaft	M8	15-22	11-16.2
Oil filling plug	M18	40-50	29.5-36.9
Oil drain plug	M18	40-50	29.5-36.9

3.3.1.2 Fastener Specifications（S160G）

Fastener Name	Model	Torque	
		Metric（N.m）	US English（lb-ft）
Tightening bolt for gear shift cable bracket	M8	15-22	11-16.2
Mounting bolt for gearbox case	M8	15-22	11-16.2
Connecting bolt for gear shift cover	M8	115-22	11-16.2
Connecting bolt for end cover	M6	7-10	5.2-7.4
Gear shift positioning assembly	M18	25-30	18.4-22.1
Locking bolt for reverse gear shaft	M8	15-22	11-16.2
Oil filling plug	M18	40-50	29.5-36.9
Oil drain plug	M18	40-50	29.5-36.9

3.3.1.3 Manual Transmission Specifications **(S118)**

Application	**Specification**
1st	3.636
2nd	2.111
3rd	1.37
4th	1.032
5th	0.771
Reverse	3.133
Main Reduction Ratio	3.867
Gear Oil Capacity	2.1～2.4L
Lubrication Oil	SAE75W-90
Type Or Model	/
Gear ratio for 1st gear	40/11
Gear ratio for 2nd gear	38/18
Gear ratio for 3rd gear	37/27
Gear ratio for 4th gear	32/31
Gear ratio for 5th gear	27/35
Gear ratio for reverse gear	47/15
Gear ratio for main reduction gear	58/15

3.3.1.4 Manual Transmission Specifications **(S160G)**

Application	**Specifications**
Gear Ratio	/
1st Gear	3.182
2nd Gear	1.895
3rd Gear	1.25
4th Gear	0.909
5th Gear	0.703
Reverse	3.133
Main Reduction Ratio	4.267
Gear Oil Capacity	2.1～2.4L
Lubrication Oil	SAE 75W/90 GL-4

Type Or Model	JL-S160G
Gear ratio for 1st gear	35/11
Gear ratio for 2nd gear	36/19
Gear ratio for 3rd gear	35/28
Gear ratio for 4th gear	30/33
Gear ratio for 5th gear	26/37
Gear ratio for reverse gear	47/15
Gear ratio for main reduction gear	64/15

3.3.1.5 Size Parameter Specification

Size Parameter	Specification	
	Metric (mm)	US English (in×10^{-3})
Axial clearance for input shaft 3rd gear	0.1-0.37	4.0-14.6
Axial clearance for input shaft 5th gear	0.1-0.23	4.0-9.1
Axial clearance for input shaft 4th and 5th gear	Less than 0.1	Less than 4.0
Axial clearance for input shaft 4th gear	0.1-0.23	4.0-14.6
Radial runout for input shaft	Less than 0.1	Less than 4.0
The distance between synchronous ring back and gear face	More than 0.5	More than 20.0
The distance between gear sleeve and gear shift fork	0.6	23.6
Wear and tear for input shaft: minimum diameter	3rd and 4th gear: 33.925 5th gear: 30.925	3rd and 4th: 1335 5th gear: 1217
Axial clearance between 1st and 2nd gear for main shaft	0.10-0.27	4.0-10.6
Radial runout for 1st and 2nd gear of main shaft	Less than 0.1	Less than 4.0
Radial runout for main shaft	Less than 0.1	Less than 4.0
Wear and tear for main shaft: minimum diameter	33.925	1335
The distance between oil seal (lateral) end face of gear shift cover and oil seal hole end face	11	433
The distance between oil seal (upper) end face of gear shift cover and oil seal hole end face	9.1	359

Note: The above size parameter specifications for S118 and S160G transmissions are the same.

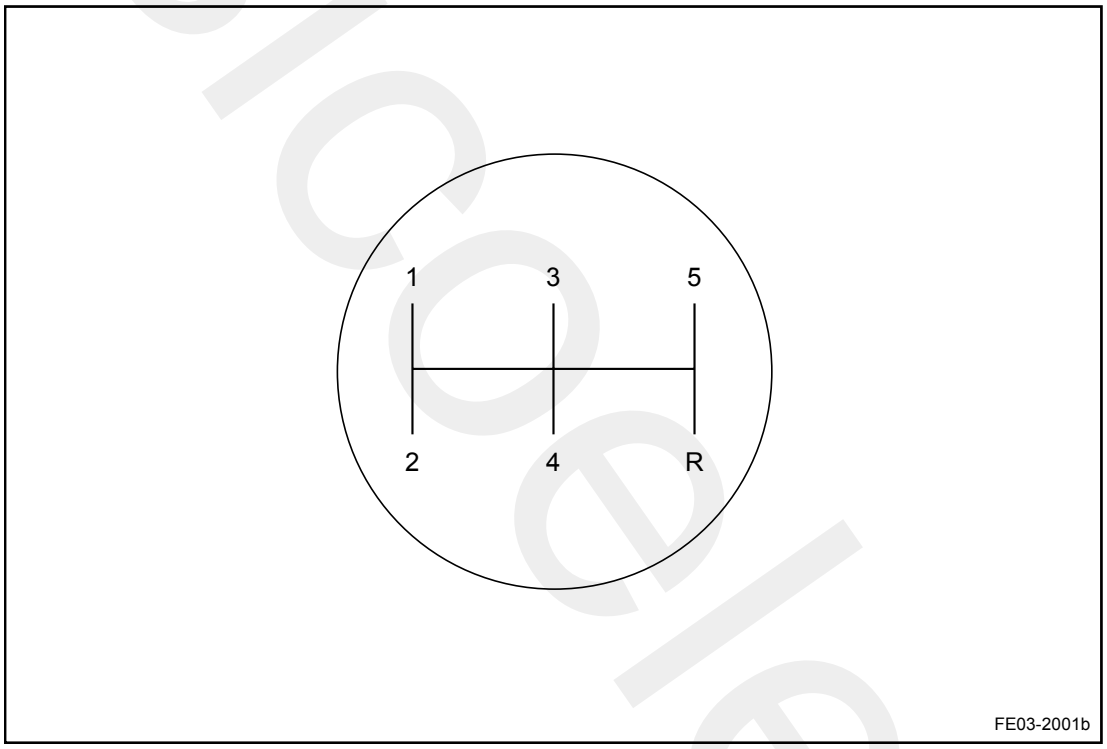
3.3.2 Description and Operation

3.3.2.1 Transmission System and Operation

Warning: during the course of diagnosis and maintenance, operation standard in safety specifications shall be observed to avoid hurting a person and damaging the vehicle. See "Warning about Lifting Vehicle" and "Warning about Road Test" in "Warning and Notices". When disassembling the transmission, it is necessary to avoid dust and use special tool for transmission maintenance. This not only improves maintenance efficiency and quality, but also avoids damaging the vehicle.

The transmission is normally engaged manually, five-gear synchronizer.

Control gears as follows:



Basic Components includes:

- Transmission case
- Gear ring and differential assembly
- Gear shift control mechanism
- Input shaft
- Input shaft gear
- Output shaft
- Output shaft gear

Gearshift Control Mechanism

Gearshift control mechanism makes gearshift fork move up and down to select shift fork

shaft, move left and right to select the gear. Self-locking bolt of gearshift shaft is used to prevent from being out of gear. Interlocked pins are provided between 5^{th} gear shift fork shaft and $1^{st}/2^{nd}$ gear shift fork shaft, and 5^{th} reverse gear shift fork shaft and 3^{rd} / 4^{th} gear shift fork shaft to avoid put into two gears simultaneously so that the transmission can work normally.

D (Drive)

D (Drive) means that a set of gearshift sliding shift fork controls the synchronizer with interlocking ring.

Reverse Gear

Reverse gear is asynchronous and adopts sliding idler. When putting into reverse gear, sliding idler engages with reverse gear of input shaft and reverse output gear of output shaft synchronously to transfer input torque to output shaft and make rotating direction of output shaft opposite to that of output shaft when putting into D (Drive) so as to reverse the vehicle.

3.3.3 System Working Principle

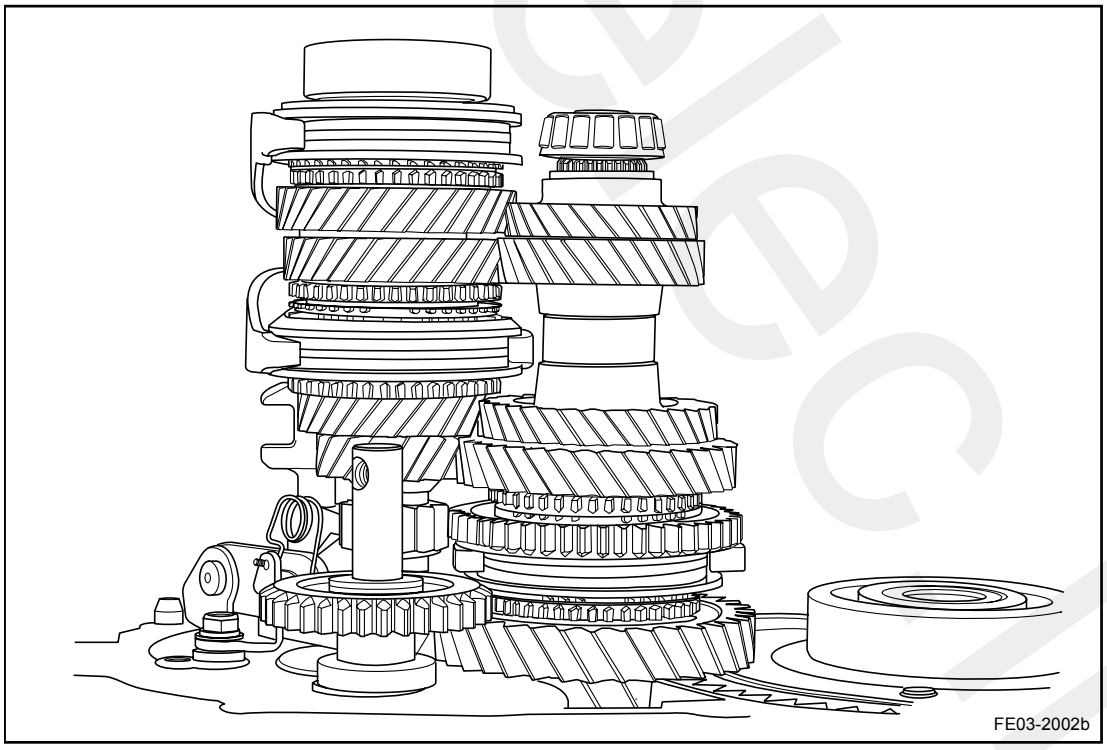
3.3.3.1 System Working Principle

- **Working Principle for Gear Shift**

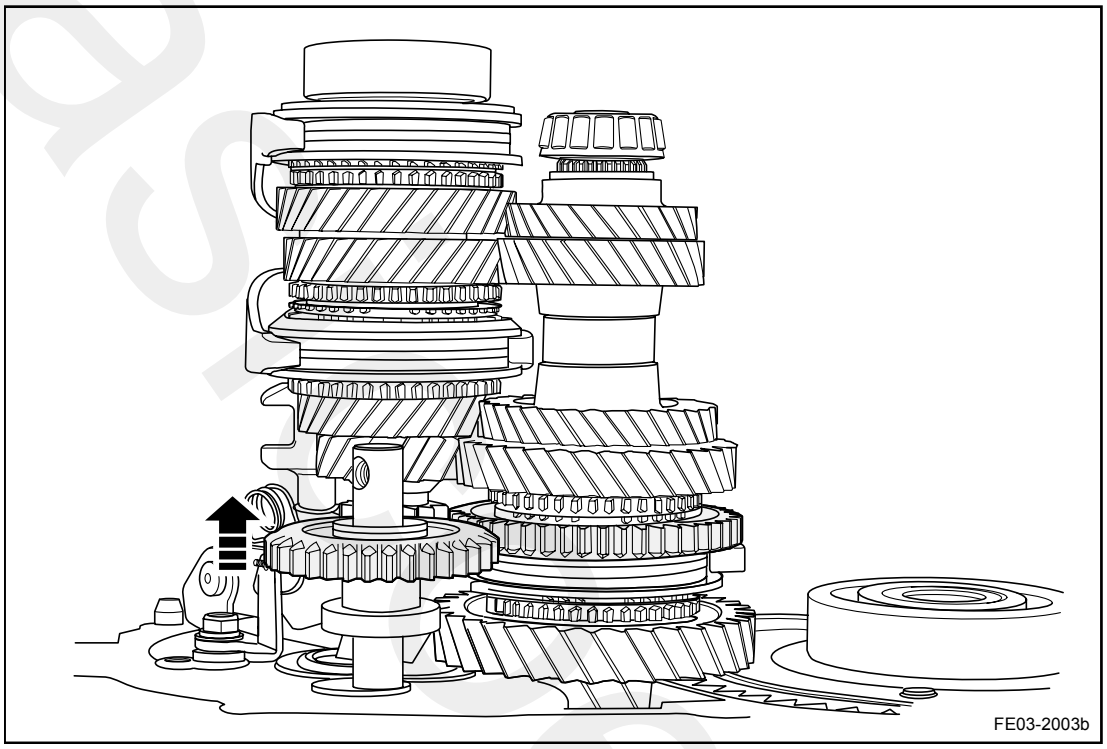
Because torque and rotating speed from engine output change within a small range, it cannot meet the requirement that the vehicle needs to have a large traction force and vehicle speed change range in complicated conditions. The role of transmission is to change drive ratio of output torque and rotating speed for the engine to enlarge change range of drive wheel torque and speed so as to adapt to changeable service conditions.

The manual transmission is 5-speed and 2-shaft transmission, which has five forward gears, one reverse gear and one neutral gear. Gearshift lever controls gearshift control mechanism and gearshift control mechanism pushes shift fork shaft and shift fork to make selected gear synchronizer and the gear engage synchronously to transfer torque and rotating speed of input shaft to output shaft, then to the differential, to drive half axle and drive wheel.

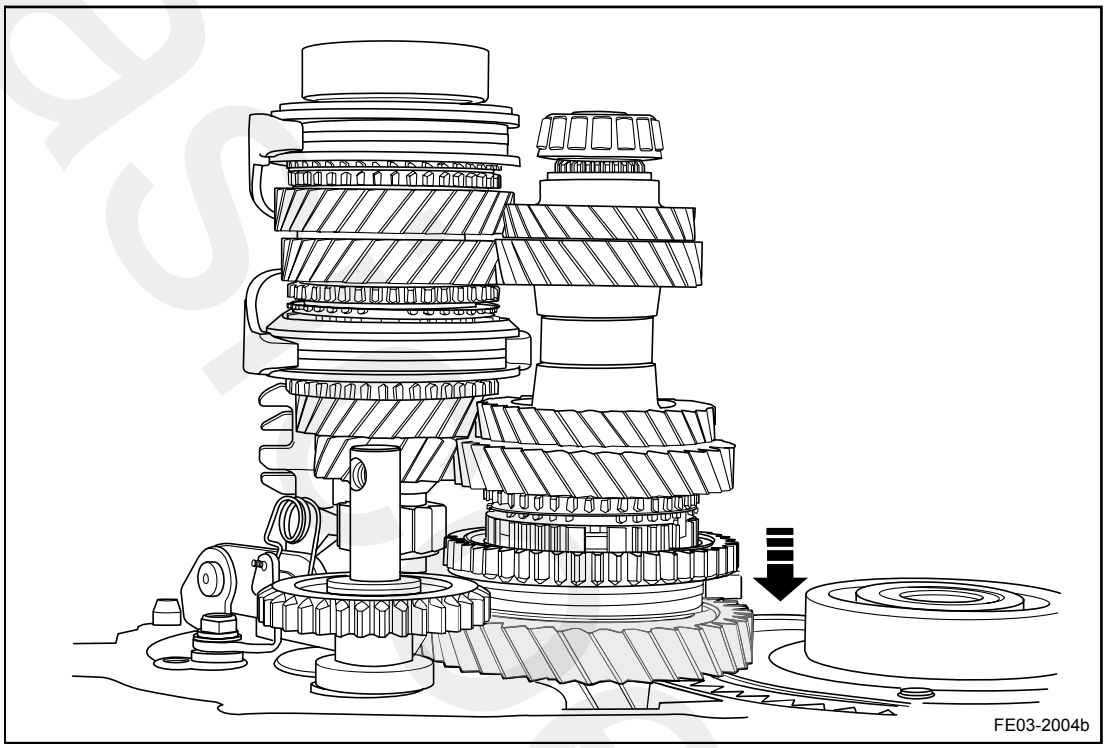
1. Working condition for neutral gear: it refers to the condition that gearshift control mechanism does not move shift fork shaft and shift fork, synchronizer and gear do not engage synchronously, reverse gear idler does not engage with reverse gear of input shaft and output gear of output shaft, and output shaft has no torque and rotating speed being output.



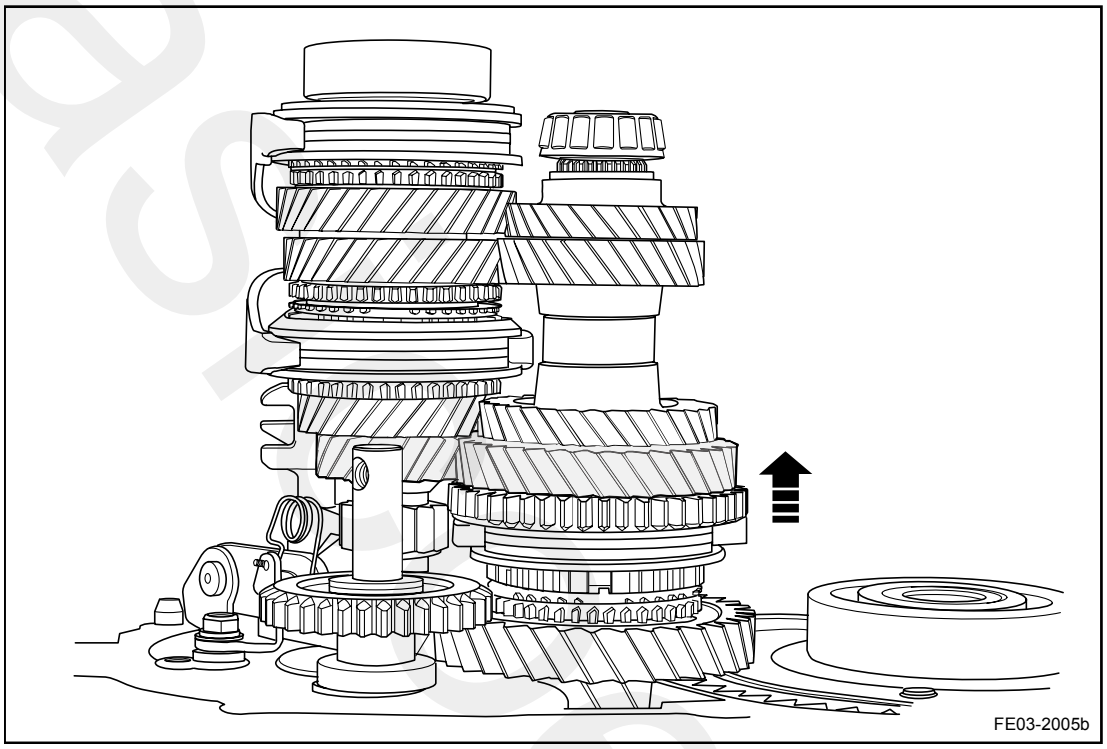
2. Working condition for reverse gear: it refers to the condition that gearshift control mechanism moves 5th reverse gear shift fork shaft and shift fork to the right to engage reverse gear idler with reverse gear of input shaft and reverse output gear of output shaft so as to output torque and rotating speed with the same direction as that of input shaft.



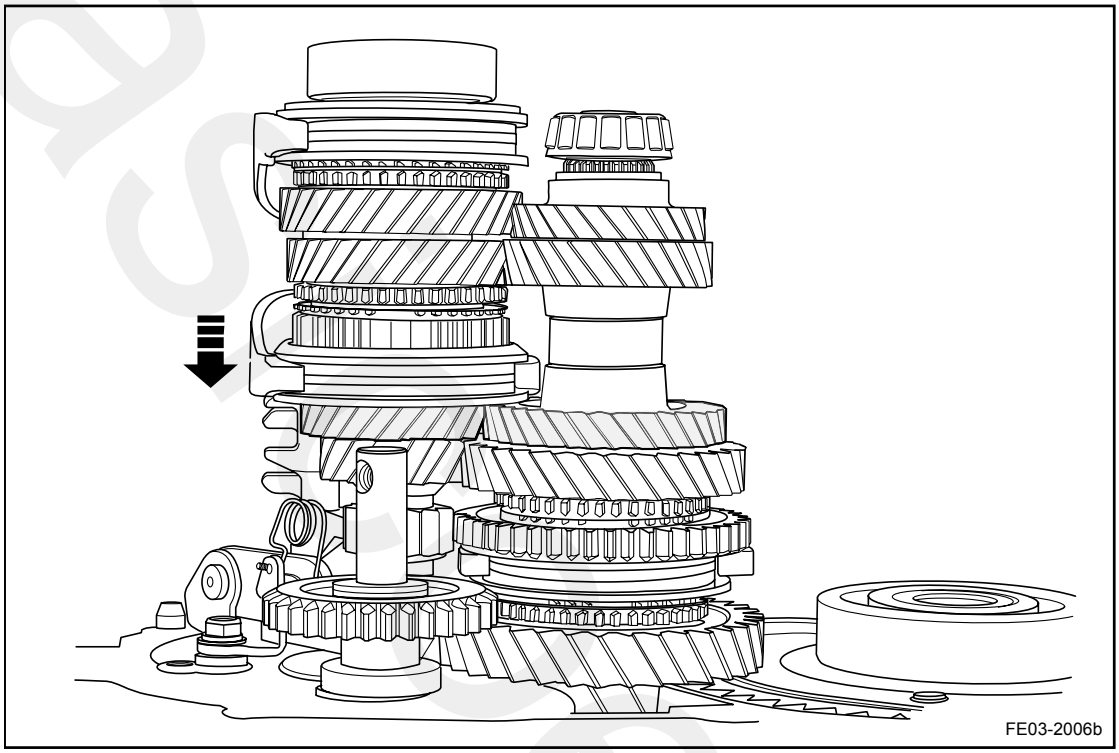
3. Working condition for 1st gear: it refers to the condition that gearshift control mechanism moves 1st and 2nd gear shift fork shaft and shift fork to the left (front end of the transmission) to engage 1st and 2nd gear synchronizer and output shaft 1st gear. Output shaft accepts torque from input shaft through output shaft 1st gear and outputs torque and rotating speed in the direction opposite to input shaft.



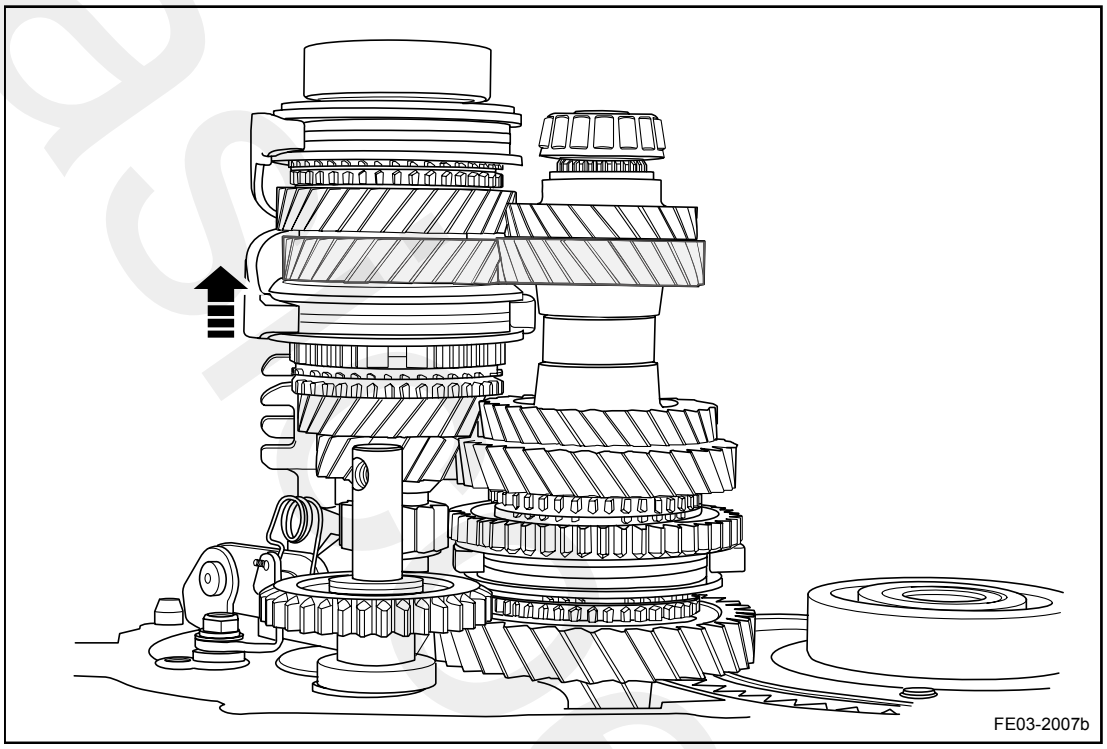
4. Working condition for 2nd gear: it refers to the condition that gearshift control mechanism moves 1st and 2nd gear shift fork shaft and shift fork to the right (rear end of the transmission) to engage 1st and 2nd gear synchronizer and output shaft 2nd gear. Output shaft accepts torque from input shaft through output shaft 2nd gear and outputs torque and rotating speed in the direction opposite to input shaft.



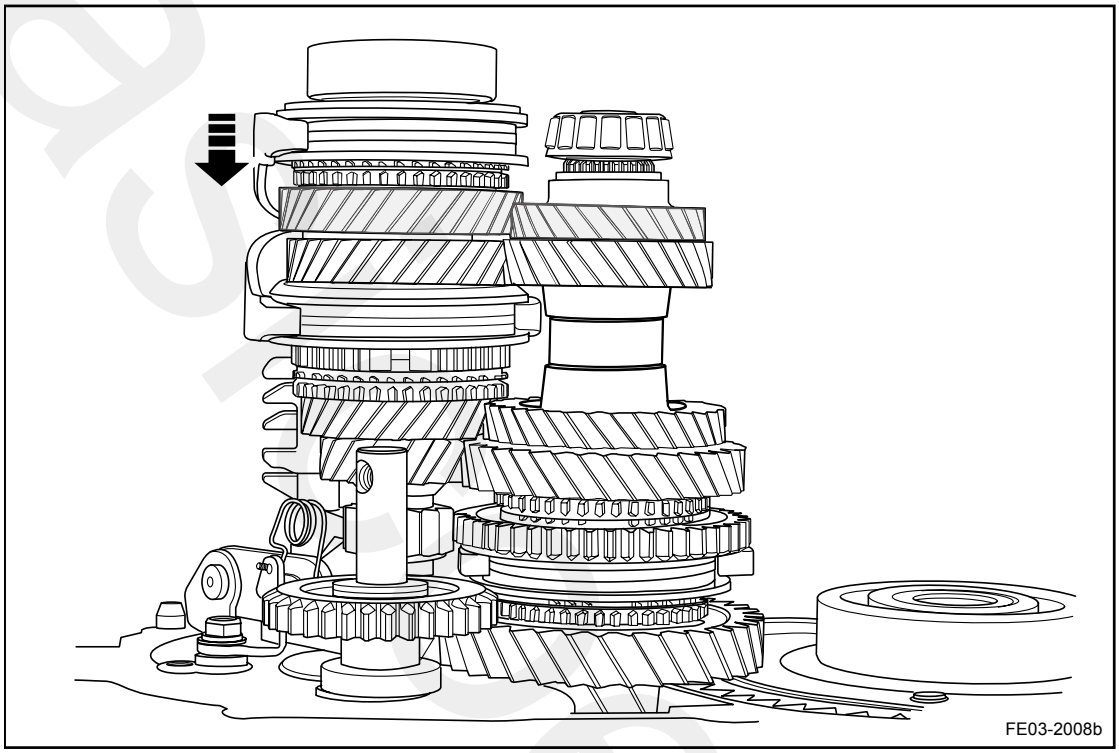
5. Working condition for 3rd gear: it refers to the condition that gearshift control mechanism moves 3rd and 4th gear shift fork shaft and shift fork to the left (front end of the transmission) to engage 3rd and 4th gear synchronizer and 3rd gear. Output shaft accepts torque from input shaft through output shaft 3rd gear and outputs torque and rotating speed in the direction opposite to input shaft.



6. Working condition for 4th gear: it refers to the condition that gearshift control mechanism moves 3rd and 4th gear shift fork shaft and shift fork to the right (rear end of the transmission) to engage 3rd and 4th gear synchronizer and 4th gear. Output shaft accepts torque from input shaft through output shaft 4th gear and outputs torque and rotating speed in the direction opposite to input shaft.



7. Working condition for 5th gear: it refers to the condition that gearshift control mechanism moves 5th reverse gear shift fork shaft and shift fork to the left (front end of the transmission) to engage 5th gear synchronizer and 5th gear. Output shaft accepts torque from input shaft through output shaft 5th gear and outputs torque and rotating speed in the direction opposite to input shaft.



- **Vehicle Speed Sensor Working Principle**

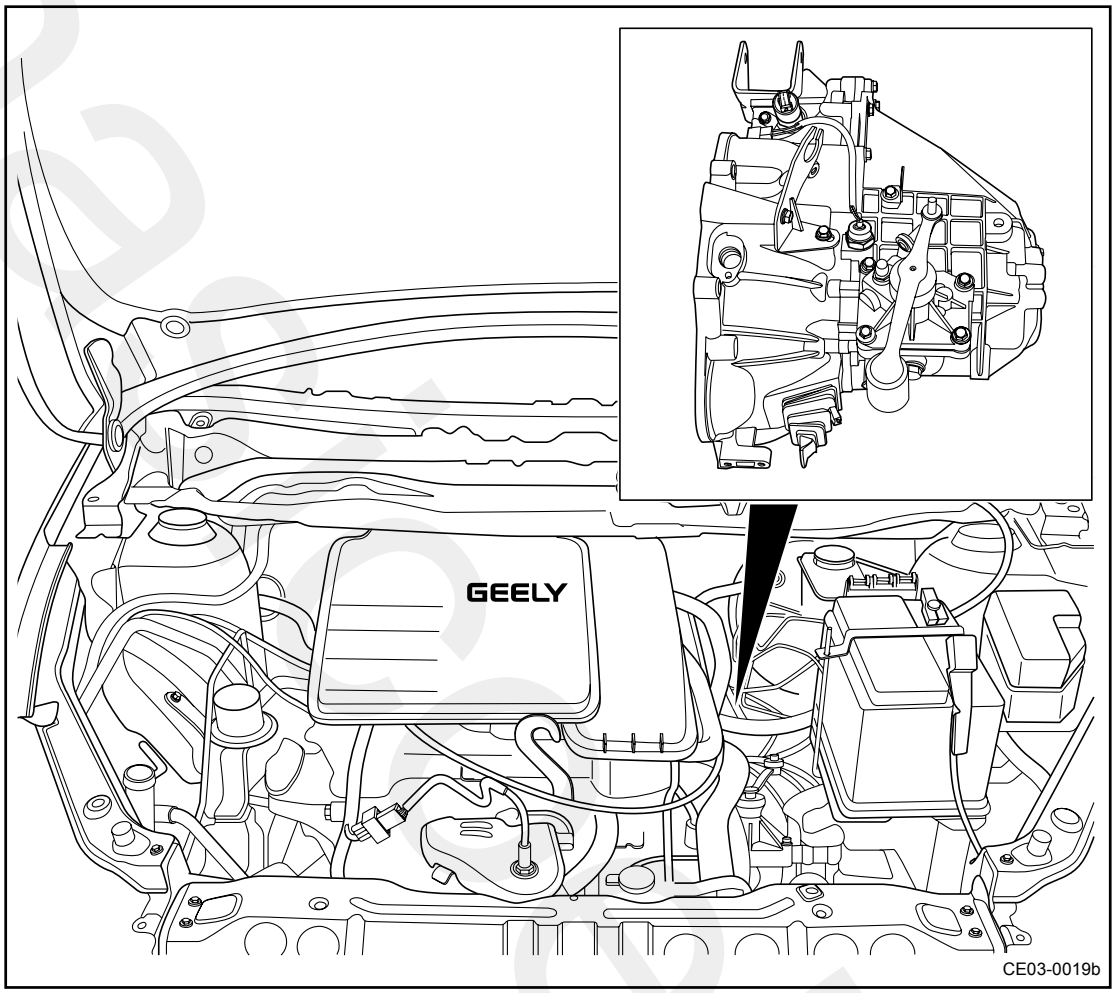
Vehicle speed sensor is a Hall sensor and installed on vehicle speed sensor driving gear. The transmission main shaft drives the vehicle speed sensor driving gear so that the vehicle speed sensor generate electric signal and transmit to the instrument.

- **Reverse Gear Switch Working Principle**

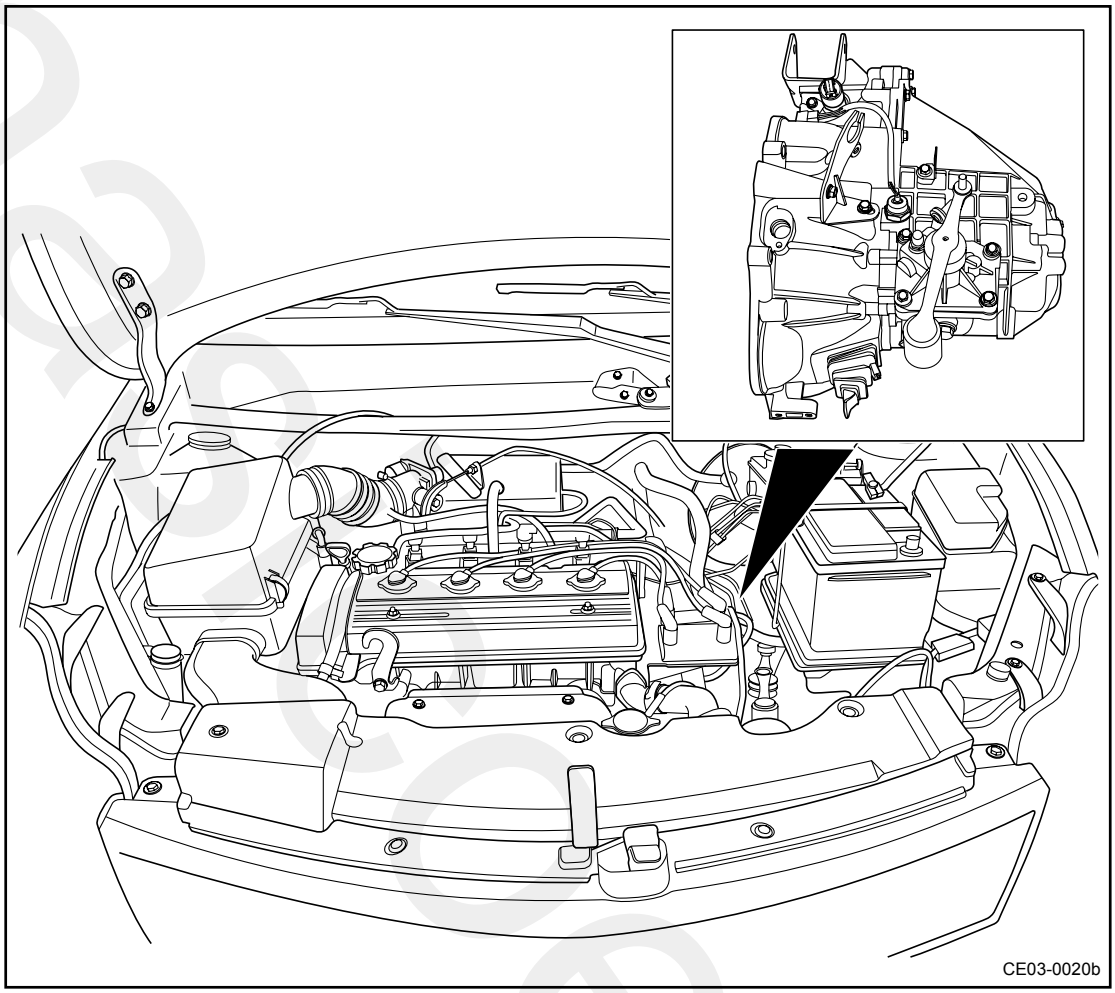
The reverse gear switch is a normal open switch. When engaged the reverse gear, the pin on transmission reverse gear fork will squeeze the contact of reverse gear switch to close the reverse gear switch, and therefore turn on the reverse light circuit to light the reverse lamp.

3.3.4 Component Location

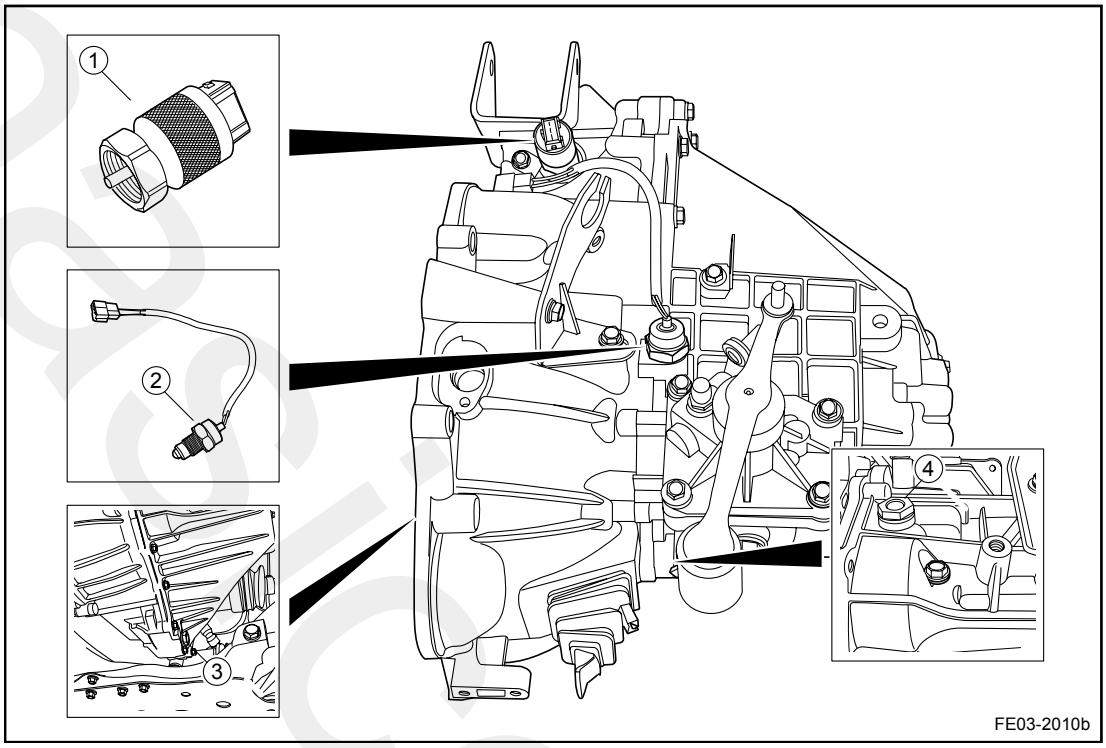
3.3.4.1 Transmission Assembly Location (S118)



3.3.4.2 Transmission Assembly Location (S160G)



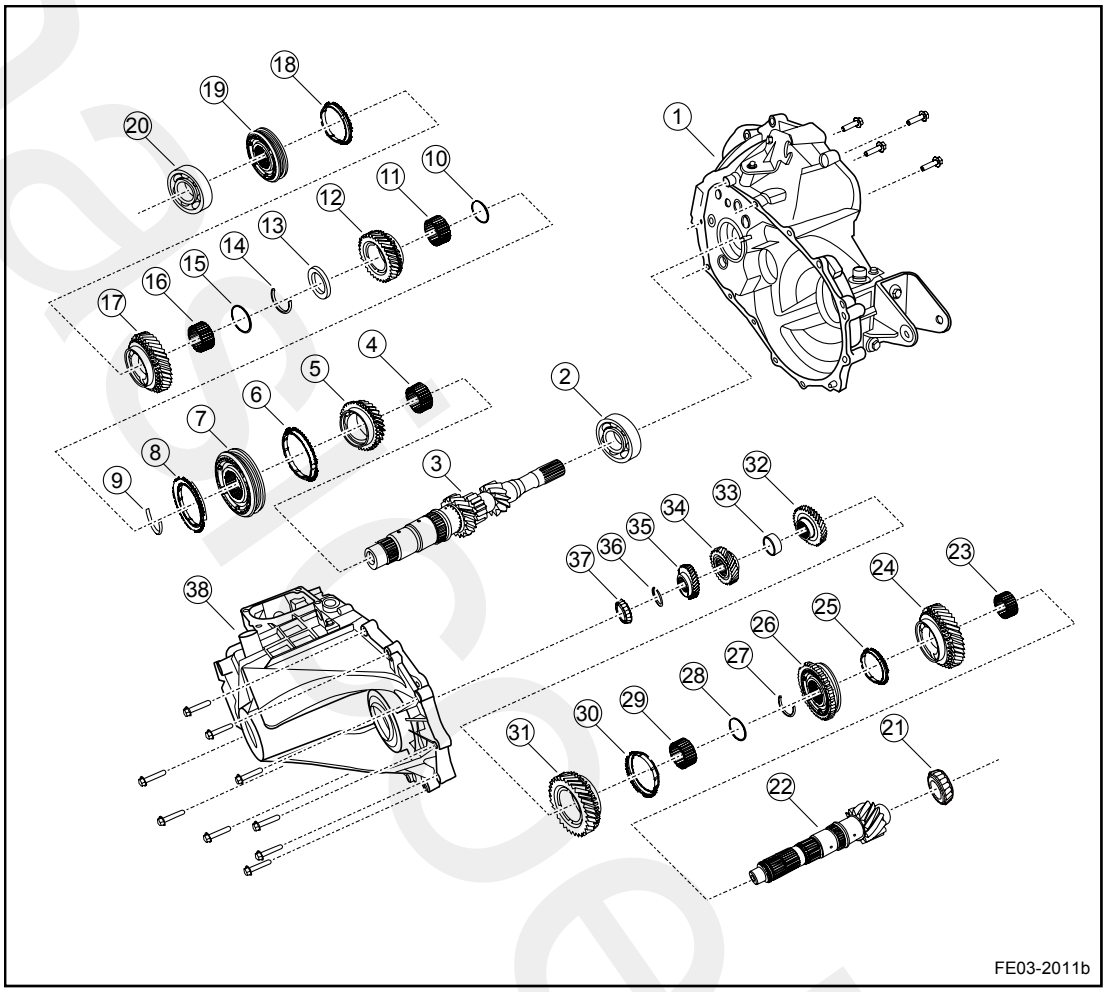
3.3.4.3 Vehicle Speed Sensor, Reverse Switch Location



1. Vehicle Speed Sensor
2. Reversing Switch
3. Oil Drain Hole
4. Transmission Fluid Filling Hole

3.3.5 Disassemble View

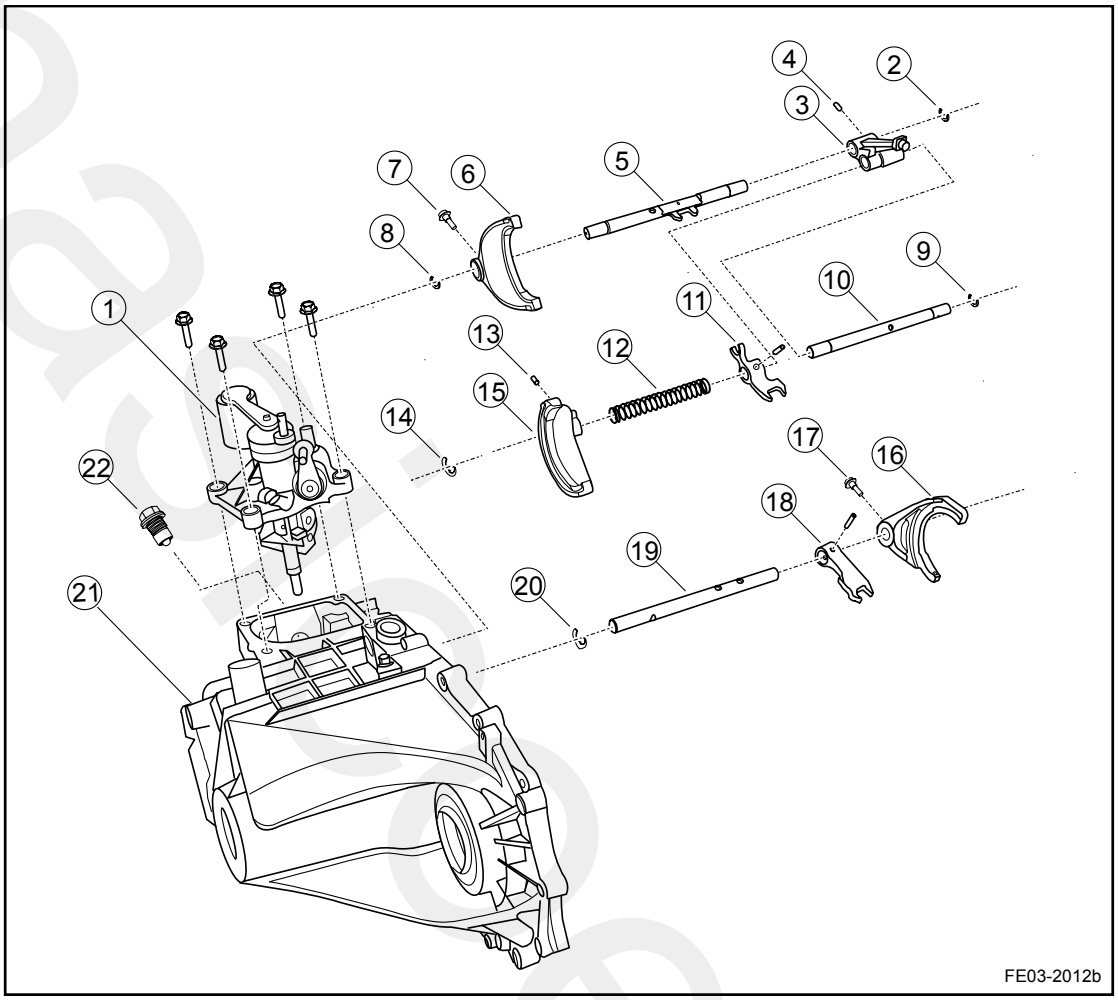
3.3.5.1 Disassemble View for Gear Assembly and Gearbox



1. Clutch Housing
2. Front end bearing for input shaft
3. Input Shaft
4. 3rd gear bearing
5. 3rd Gear
6. 3rd Synchronization Ring
7. 3rd and 4th Synchronizer
8. 4th synchronization ring
9. 3rd and 4th Synchronizer Snap Spring
10. 4th Gear Bearing Washer
11. 4th gear bearing
12. 4th gear
13. 4th gear ring
14. 4th gear snap spring
15. 5th gear bearing washer
16. 5th gear bearing
17. 5th gear
18. 5th synchronization ring
19. 5th Synchronizer
20. Input shaft end bearing
21. Input shaft front end bearing
22. Input shaft
23. 1st gear bearing
24. 1st gear for Input
25. 1st gear synchronization ring
26. 1st and 2nd gear synchronizer

27. 1st and 2nd synchronizer snap spring
28. 2nd gear bearing washer
29. 2nd gear bearing
30. 2nd gear synchronization ring
31. Output shaft 2nd gear
32. Output gear for output shaft 3rd gear
33. Output gear bushing for 3rd and 4th gear
34. Output gear for output shaft 4th gear
35. Output gear for output shaft 5th gear
36. Output gear snap spring for output shaft 5th gear
37. Rear end bearing for output shaft
38. Transmission case

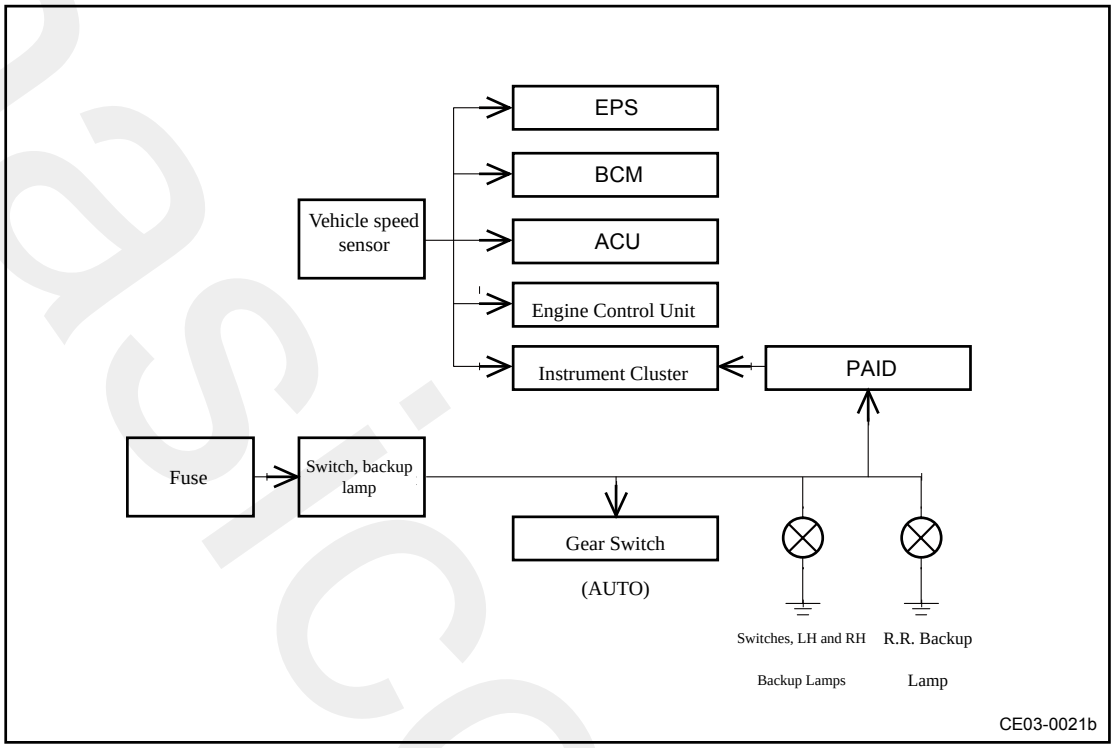
3.3.5.2 Disassemble View for Fork Assembly of Control Mechanism



1. Gear shift
2. Shift fork shaft circlip
3. Reverse gear shifting block
4. Interlocked pin
5. Shift fork shaft for 3rd and 4th gear
6. Shift fork for 3rd and 4th gear
7. Retaining bolt for Shift fork
8. Shift fork shaft circlip
9. Front end snap spring for 5th reverse gear shift fork shaft
10. 5th reverse gear shift fork shaft
11. 5th reverse gear shift fork
12. Return spring B
13. Interlocked pin
14. Shift fork shaft circlip
15. 5th gear Shift fork
16. Shift fork for 1st and 2nd gear
17. Retaining bolt for gear shift fork
18. 1st and 2nd gear guide block
19. 1st and 2nd gear shift fork shaft
20. Fork shaft circlip
21. Transmission Case
22. Gear shift locating assembly

3.3.6 Electric Schematic

3.3.6.1 Electric Schematic of Reverse Switch and Vehicle Speed Sensor



3.3.7 Diagnostic Information and Procedures

3.3.7.1 Diagnosis Description

Refer to 3.3.2 Description and Operation. Get familiar with the contents of system functions and operation before starting system diagnostic, so that it will help to determine the correct diagnostic steps, more importantly, it will also help to determine whether the customer described situation is normal.

3.3.7.2 Visual Inspection

Transmission common malfunctions are: hard to shift, gear stuck, gear collision and grinding noise. The clutch drive system malfunction can also cause the above symptoms, so it shall be carefully analyzed and distinguished during service.

Prior to transmission repair, carry out the general inspection of transmission and clutch:

- Check transmission and clutch pipelines for oil leaking.
- Check the transmission fluid level, viscosity and color; check for dirt and metal debris so as to determine whether there is internal component stuck, burnt or broken.
- Check transmission and the surrounding components. Check the bolts and nuts for loose or falling off;
- Conduct gear engaging and road test to confirm the vehicle conditions for further diagnosis.

Before repairing the transmission abnormal sound, distinguish the abnormal noises of clutch, drive shaft and engine and exclude the external factors that may generate abnormal sound and noise.

Before repairing the transmission abnormal sound, identify the following items:

- Road traveling noise

Such as the noises generated by tires, road surface, wheel bearings, engine and exhaust system, which vary for different vehicle dimensions and types and damping materials in vehicle body.

- Drive Shaft System Noise

As a mechanical device, drive shaft system can not be without sound during operation. There will be some noises during operation. To confirm the abnormal noise:

1. Choose a good road surface in order to reduce tires friction and body vibration generated noise;
2. Drive a distance long enough to completely warm up the lubricant;
3. Record speed and transmission gear when the noise occurs;

4. Determine whether there is noise when driving the vehicle in following conditions:
   - Slow acceleration or sudden acceleration;
   - Drive at constant speed on a even road with the throttle slightly open;
   - Cruise with the transmission engaged and throttle closed;
5. Stop vehicle and shut down the engine, check whether there is abnormal noise.

- Bearing Noise
  1. Differential Gear or Bearing Noise

     Differential bearings noise and the wheel bearing noise are likely to be confused. As the differential side bearing has a pre-load force, the differential bearings noise will not be significantly reduced as long as the differential and drive shaft are in operation even if the wheels leave the road.
  2. Wheel Bearing Noise

     When the transmission is in neutral gear and the vehicle is cruising, the wheel bearing echoes a continuous roar or friction sound. Since there is no pre-load force on wheel bearing, the wheel bearing noise will be significantly when the wheels leave the ground reduced.
- Bearing internal wear, deformation, indentation on bearing ring; micro-abrasive entering into the bearing and its seat ring; foreign matter entering into the bearing and the seat ring locked; bearing and its seat ring become loose due to wear and tear; these will generate noise or make the system not work properly.

3.3.7.3 Hard to Shift

The following table shows the location the fault may occur, check each component and replace if necessary.

Symptom	Suspected Parts	Refer to
Hard to Shift	1. Clutch	3.2Clutch System
	2. Transmission Gearshift Lever	3.1 Control System
	3. Transmission Shift Control Cable	3.1 Control System
	4. Transmission Shift Control Assembly	3.3.8Removal and Installation
	5. Faulty Gear or Synchronizer	3.3.8Removal and Installation

Diagnostic steps

1	Check the shifting operability of transmission.

A. Shut down the engine.

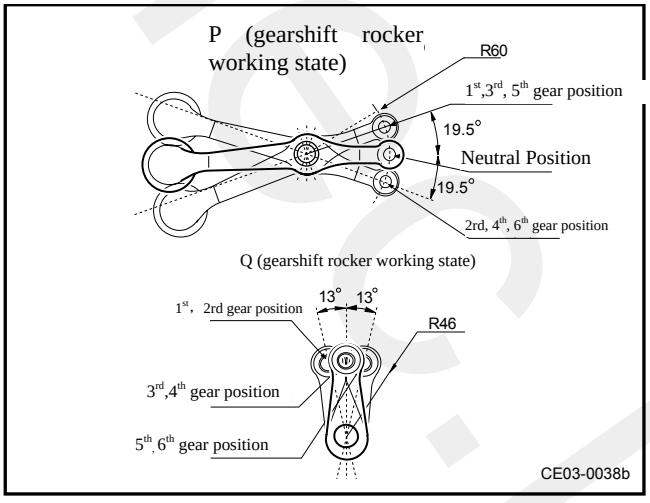
B. Shift rod is hard to engage or disengage the forward gears and reverse gear

No → To step 6

Yes

2	Check shifting force and shift control travel of transmission.

A. Operate the transmission gearshift lever. The shifting force is 20-30 N (4.5-6.7 LB). Transmission shift control travel should meet the range shown in the figure.



Yes

No

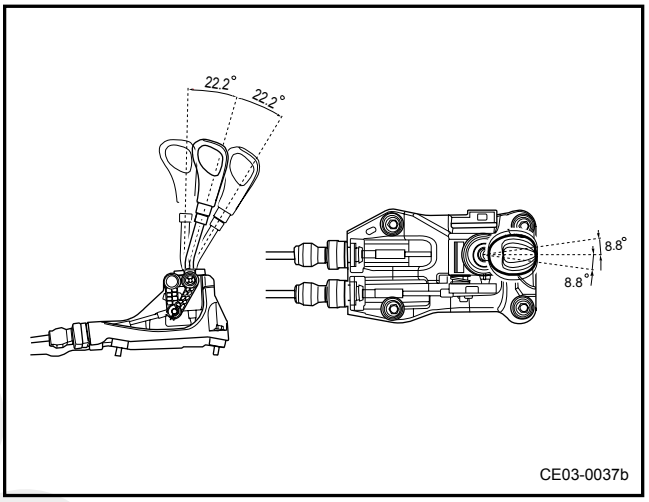
Repair or replace worn transmission shift control assembly or the fork.

3	Check transmission shifting selection force and shift control travel.

A. Disconnect transmission shift control guy wire and transmission control assembly.

B. Operate the gearshift lever. Check whether the shift control guy wire can stretch freely and easily.

C. Transmission shift lever selection force is less than 8 N (1.8 LB) and shifting force is less than 4 N (0.9 LB). The travel should meet the range shown in the figure.



Yes

No

Adjust or replace the gear control guy wire. Repair or replace the transmission gearshift control assembly or fork.

4	Check the movement of transmission shift control guy wire.

A. Disconnect the transmission gearshift lever and the transmission control guy wire.

B. Check whether the transmission control guy wire core is difficult to stretch or broken.

Yes

Replace the transmission shift control guy wire

5	Replace the transmission gearshift lever.

A. Is shifting problem resolved?

Yes

System normal

No

6	Check the clutch

A. With the engine running, locate the transmission at neutral gear.

B. Press the clutch pedal to the end and check whether the lever can easily engage or disengage the reverse gear.

No → Repair the clutch. Repair or replace the reverse gear.

Yes

7	Check the faulty gear.

A. Press the clutch pedal to the end. Try each forward gear to identify the faulty gear.

B. Disassemble the transmission. Check whether the faulty gear synchronizer or gear is damaged.

C. Replace the synchronizer or the gear.

D. Confirm repair completed.

Next

8	System normal.

3.3.7.4 Jumping Out Of Gear

The following table shows the locations fault may occur, check each component and, if necessary, replace these parts.

Symptom	Suspected Parts	**Refer to**
Jumping Out Of Gear	1. Engine mount	Engine Mount Replacement
	2. Transmission gearshift lever	3.1 Control System
	3. Transmission gearshift control guy wire	3.1 Control System
	4. Transmission gearshift control mechanism	3.3.8 Removal and Installation
	5. Gearshift fork and lock mechanism	3.3.8Removal and Installation

Diagnostic steps

1	Check the transmission and the engine mount.

A. Whether jittering during running of engine.

B. Serious jitter may cause the engine stall.

Yes → Tighten or replace the transmission and engine mount.

No

2	Check the transmission gearshift control system.

A. Whether the connection of transmission gearshift control guy wire and transmission gearshift control mechanism is firm.

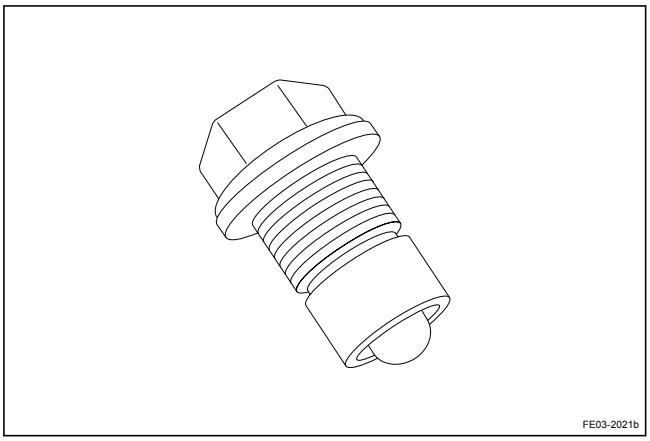
B. Whether the connection of transmission gearshift lever and transmission gearshift control guy wire is firm.

No → Tighten or replace the transmission gearshift guy wire or gearshift lever.

Yes

3	Check transmission gear self-locking nut.

A. Whether the gear self-locking nut is installed correctly.



No → Tighten or replace the gear self-locking nut.

Yes

4	Check the transmission gearshift control mechanism

A. Remove the transmission gearshift control mechanism and check the damage or deformation.

Yes → Replace the gearshift control mechanism.

No

5	Inspect the faulty gear fork locking pin.

A. Remove the transmission.

B. Disassemble the transmission. Check the shift fork for deformation.

C. Replace the damaged shift fork.

D. Confirm repair completed.

Next

6	System normal.

3.3.7.5 Hard to Disengage

The following table shows the locations the fault may occur. Check each component, if necessary, replace these components.

Symptom	Suspected Parts	**Refer to**
Jumping Out Of Gear	1. transmission gearshift lever	3.1 Control System
	2. transmission gearshift control guy wire	3.1 Control System
	3. transmission gearshift control mechanism	3.3.8Removal and Installation
	4. Gearshift fork and lock mechanism	3.3.8Removal and Installation
	5. Synchronizer	3.3.8Removal and Installation

Diagnostic steps

1	Check the transmission gearshift control system.

A. Disconnect the transmission gearshift control guy wire and transmission control mechanism.

B. Check the transmission gearshift lever for damage and jamming. The normal gear selection force is less than 8N (1.8LB) and shifting force is less than 4N (0.9LB).

C. Check the transmission gearshift control guy wire for damage and jamming.

Yes → Repair or replace the gearshift lever or shift control guy wire.

No

2	Check the transmission gearshift control mechanism

A. Operate the transmission gearshift control mechanism to shift up and down.

B. Check the transmission gearshift control mechanism for jamming.

C. Repair or replace damaged shift fork, or synchronizer.

D. Confirm repair completed.

Next

3	System normal.

3.3.7.6 Abnormal Noise When Running

Diagnostic steps

1	Check abnormal sound.

A. Stop the vehicle and locate the transmission at neutral gear with engine running.

B. Check whether the abnormal noise stops.

Yes → To step 4

No

2	Check the clutch abnormal noise.

A. Press the clutch to the end.

B. Check whether the abnormal noise stops.

No → Diagnose the clutch system abnormal noise; Diagnose engine abnormal noise

Yes

3	Check the transmission internal components.

A. Remove and disassemble the transmission.

B. Check the gear set bearing, input shaft gear set, each gear/bearing and main shaft bearings for damage.

C. Replace the faulty transmission components.

D. Confirm whether the system is normal.

Yes → System normal

No

4	Check drive shaft system and front suspension.

A. Locate the transmission at neutral gear and release the hand brake.

B. Lift the vehicle. Refer to 1.3.1.1 Lifting and Jacking the Vehicle.

C. Rotate the wheels. Check the drive axle, drive axle bearings for abnormal noise.

Note: The vehicle is lifted at this time. The noise may disappear because the loads on half axle and its bearing and front suspension decrease. Check whether the abnormal noise appears only when the axle and the front suspension are under

load.

D. Replace the damaged drive half axle or drive half axle bearings.

E. Confirm repair completed.

Next

5	System normal.

3.3.7.7 Gear Collision or Grinding Noise When Shifting During Running

Remove the transmission assembly; check and replace the synchronizer or gear and bearing of noisy gear.

3.3.7.8 Clunk When Shifting During Running

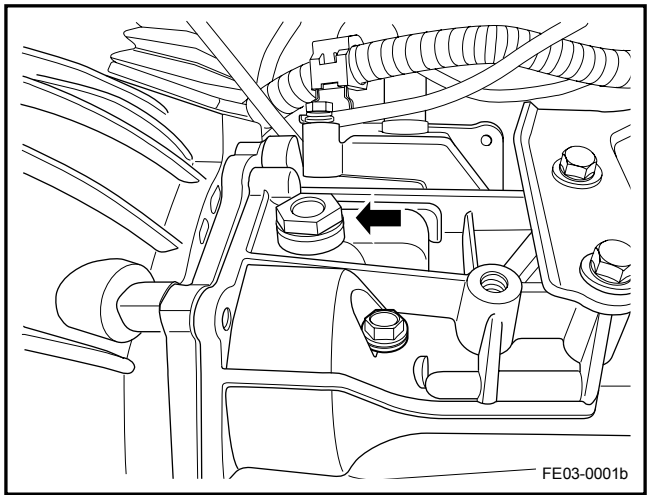
(Check the clutch and confirm it is fault free. Refer to 3.2 Clutch System) Remove Transmission assembly; check and replace the synchronizer of noisy gear.

3.3.8 Removal and Installation

3.3.8.1 Transmission fluid Level Inspection

Inspection Procedure:

Note: If the transmission fluid temperature is too high during the inspection, it may cause burns!

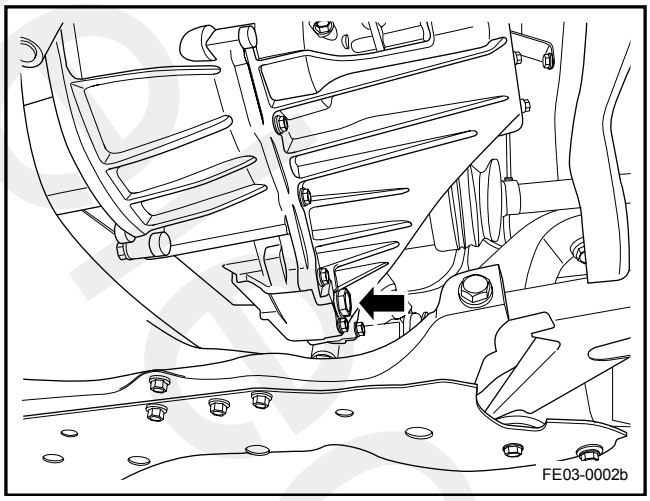


1. Park the vehicle on a level ground, wait for the transmission fluid cooling down, remove the transmission fill plug and check the transmission fluid level.

Note: Transmission fluid level should be even with the lower edge of plug.

2. If the Transmission fluid level is too low, add the dedicated manual transmission fluid through the plug until the oil begins to flow out.

3. Reinstall and tighten transmission fluid fill plug.



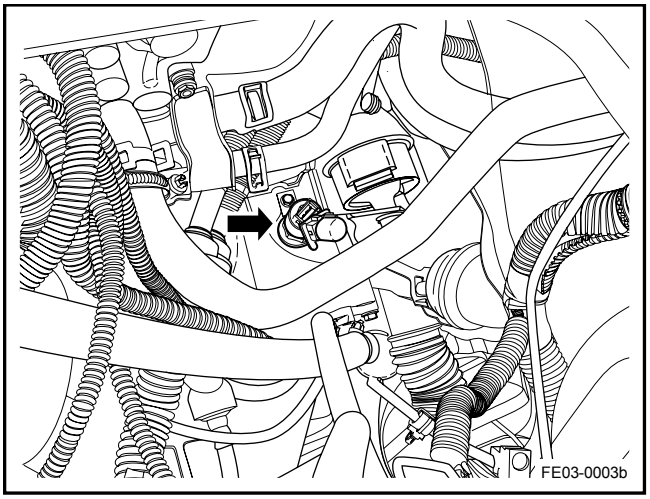
4. If needed to replace the transmission fluid, remove the transmission fluid plug and drain out the transmission fluid.

3.3.8.2 Vehicle Speed Sensor Replacement

Warning: Refer to "Battery Disconnection Warning" in "Warnings and Notices".

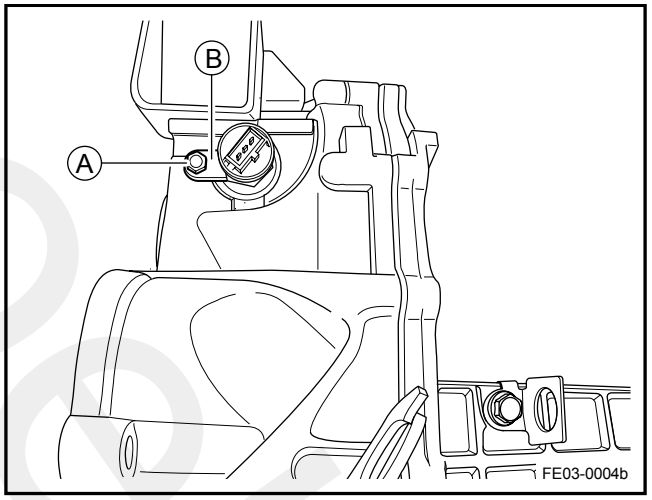
Removal Procedure:

1. Disconnect the vehicle speed sensor harness connector.

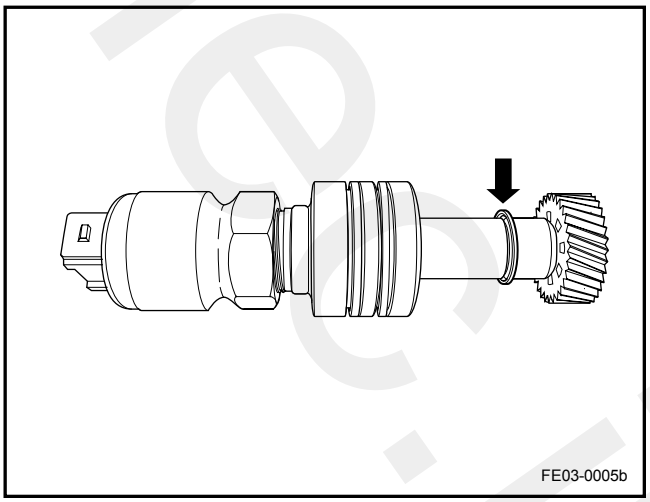


2. Remove vehicle speed sensor retaining bolt A.

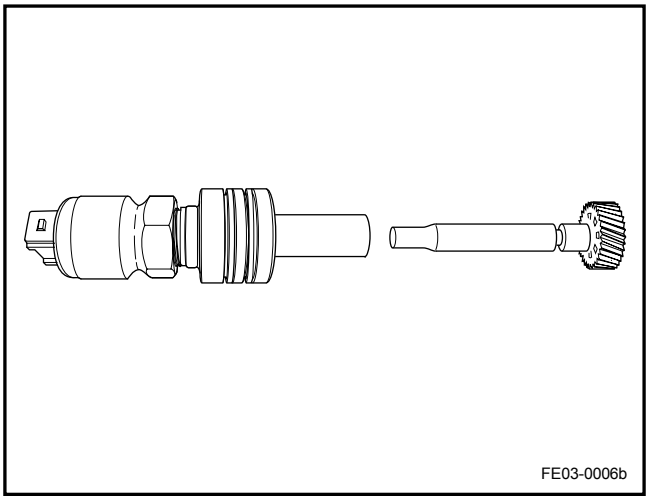
Note: the clip B shown in figure is movable!



3. Take out the circlip shown in figure and disassemble the vehicle speed sensor driven gear.

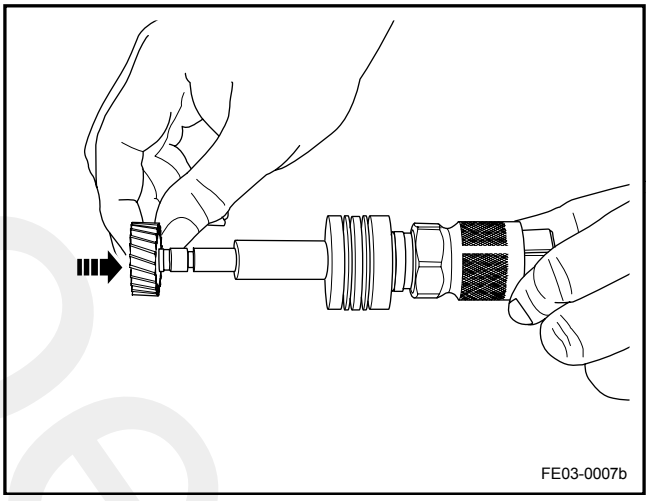


4. Disassemble vehicle speed sensor.

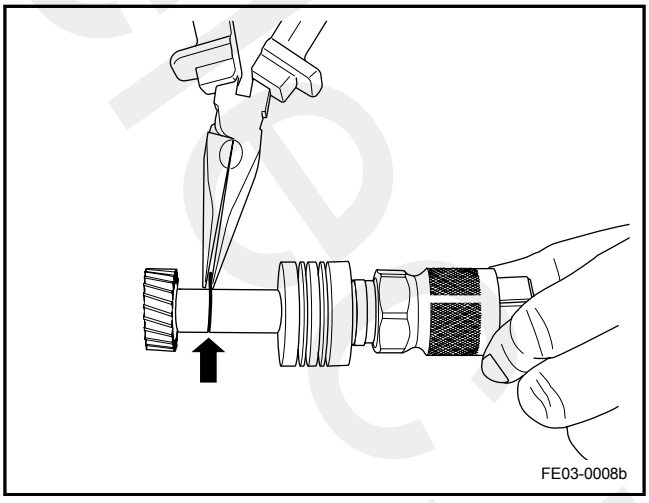


Installation Procedure:

1. Install vehicle speed sensor driven gear.

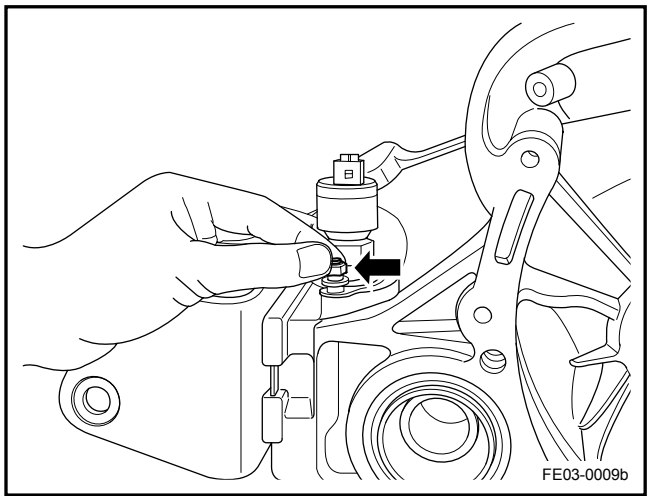


2. Install driven gear circlip.

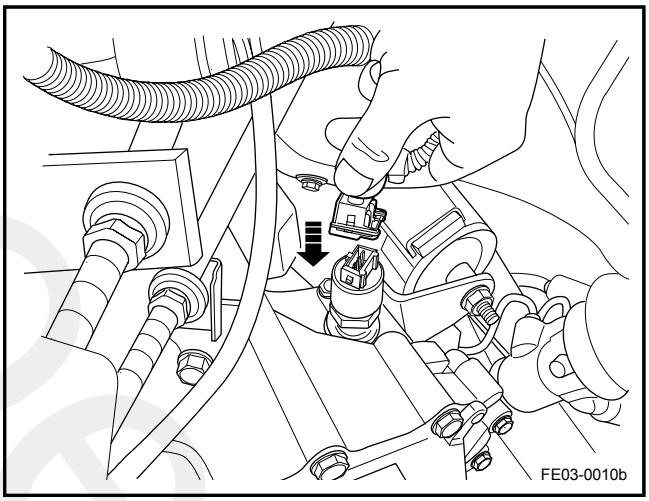


3. Install vehicle speed sensor and tighten the retaining bolt.

   Pay attention to the position of clip.



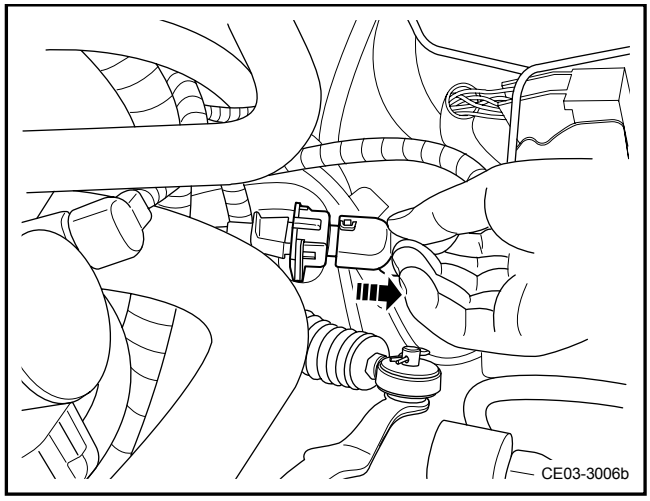
4. As shown in figure, connect the vehicle speed sensor harness connector.



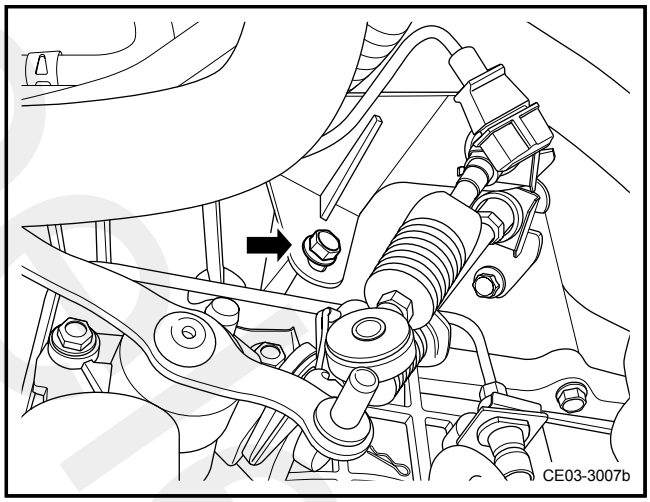
3.3.8.3 Transmission Assembly Replacement（S118）

Removal Procedure:

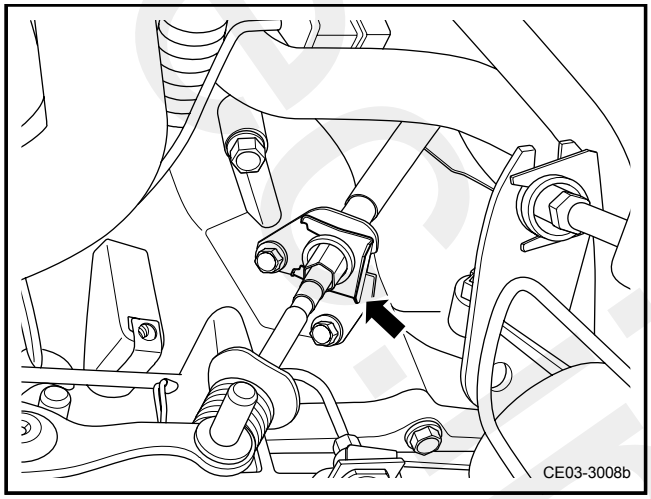
1. Remove battery negative cable. Refer to 2.12.6.1 Battery Disconnection Procedure.
2. Remove battery bottom plate, Refer to 2.12.6.2 Battery Replacement;
3. Remove air filter base;
4. Disconnect reverse light switch connector;
5. Disconnect vehicle speed sensor connector;



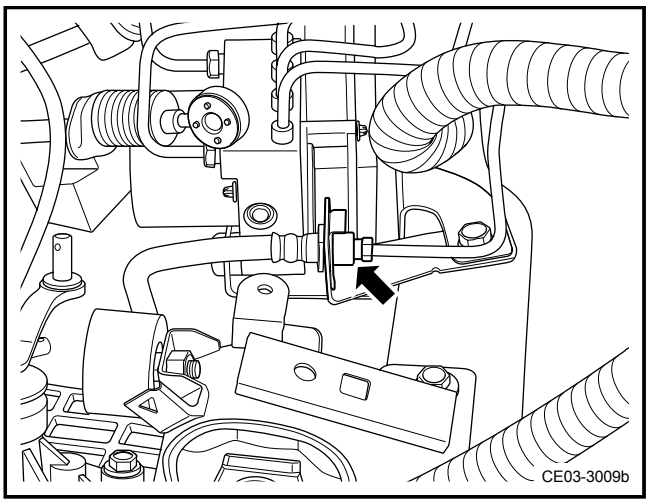
6. Disconnect rotating speed sensor connector;
7. Remove gearshift lever guy wire latch. Refer to 3.3.8.5 Gearshift Control Mechanism Replacement;
8. Remove gearshift lever fixing support;



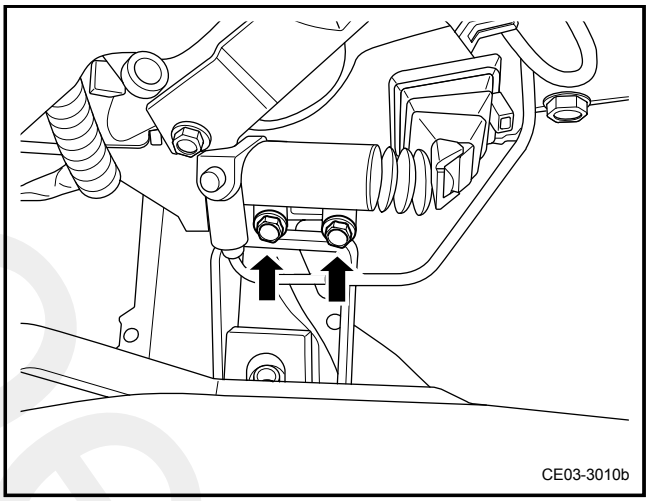
9. Remove gear selector control lever guy wire fixing clip;



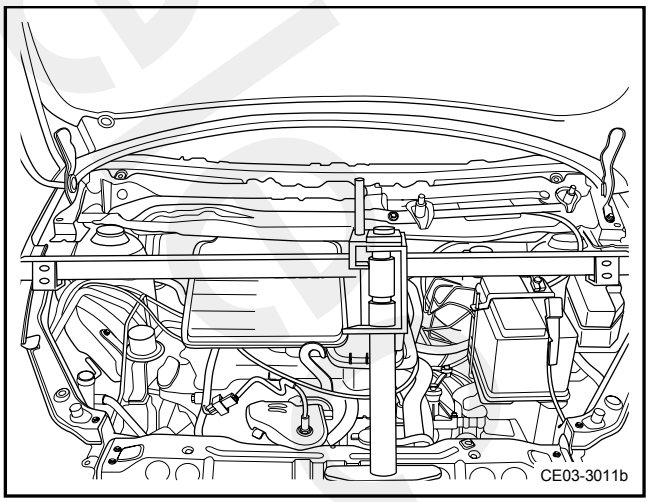
10. Remove clutch slave cylinder oil pipe;



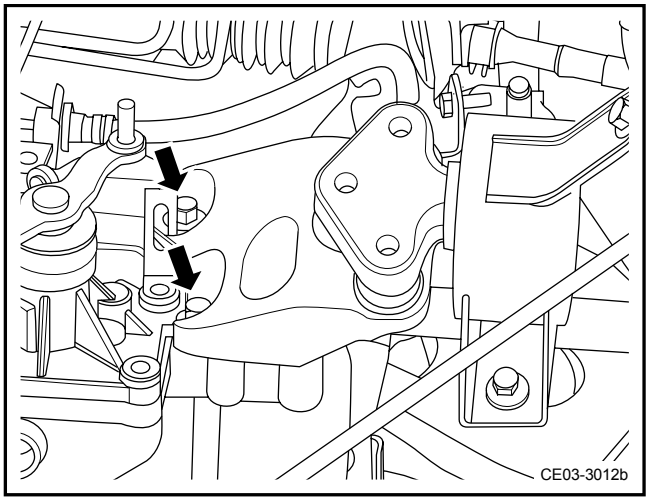
11. Remove clutch slave cylinder retaining bolt;
12. Remove starter motor cable and upper retaining bolt;
13. Remove transmission upper connecting bolt;



14. Fix the engine with special tools.



15. Remove left suspension support and bolt for power train;

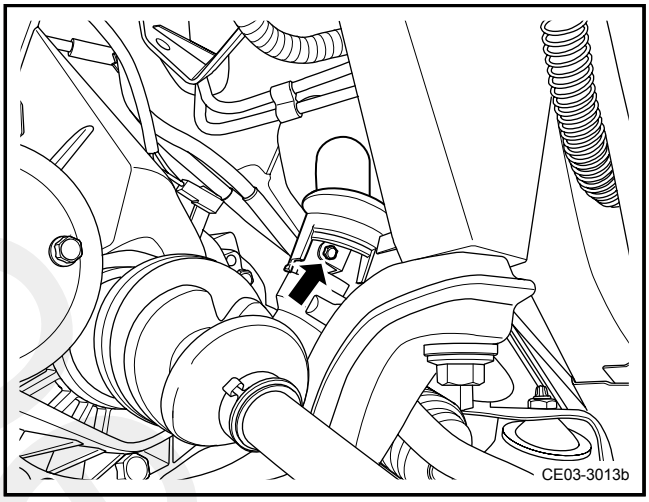


16. Remove two front wheel tires.

17. Lift the vehicle.

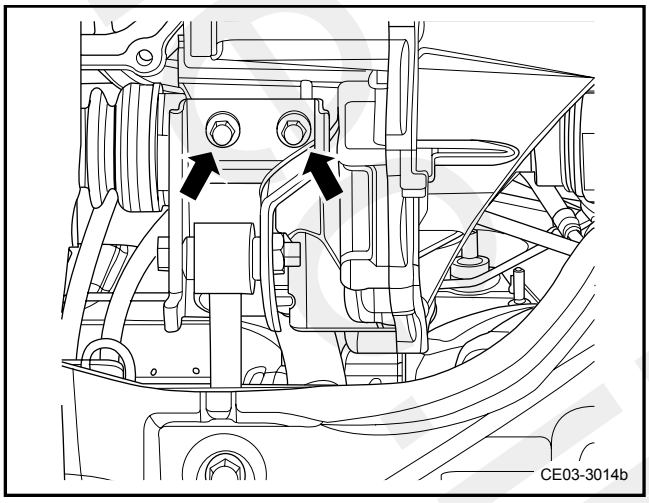
    Warning: Refer to "Vehicle Lifting Warning" in "Warnings and Notices".

18. Remove the transmission fluid drain bolt and then install after draining out the transmission fluid. Refer to 3.3.8.1 Transmission fluid Level Inspection

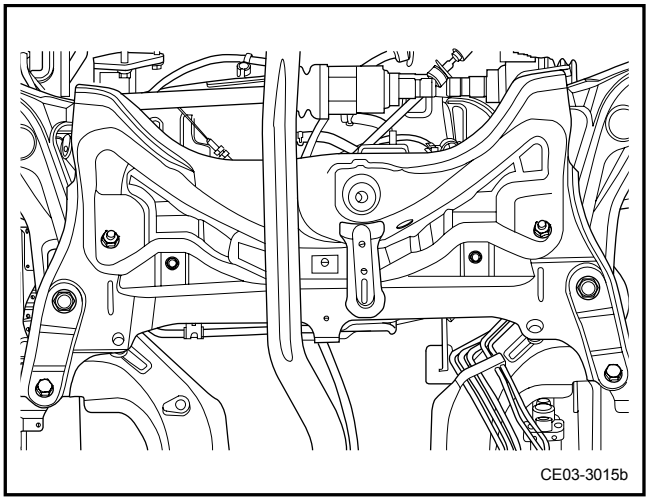


19. Remove the steering gear lateral pin bolt;

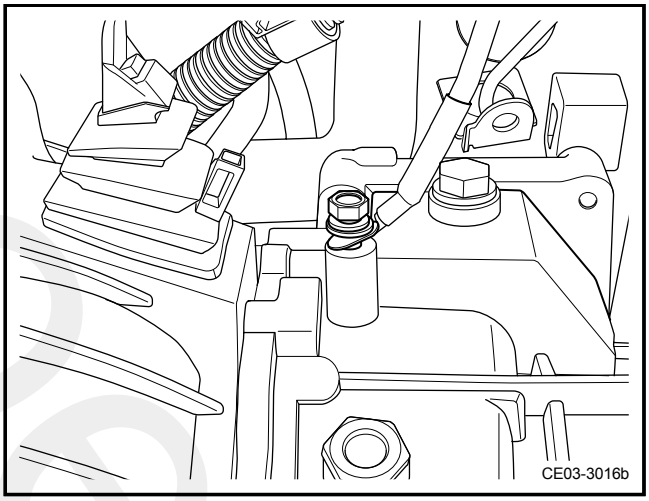
20. Remove rear suspension support and bolt for power train;



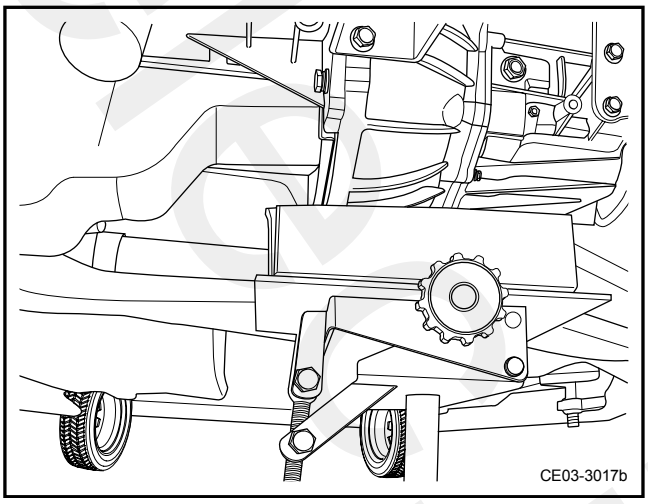
21. Remove subframe for front longitudinal beam and its connectors, refer to 12.6.4.2 Subframe Replacement;



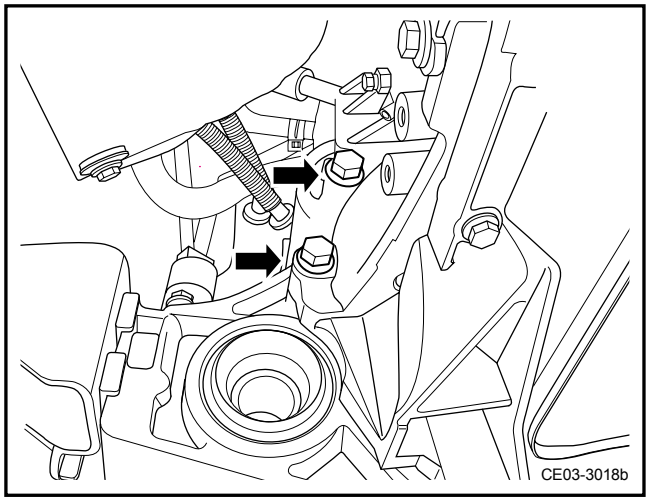
22. Remove left and right drive shaft, refer to 5.3.4.1 Drive Shaft Replacement;
23. Remove minus earth cable for the transmission;



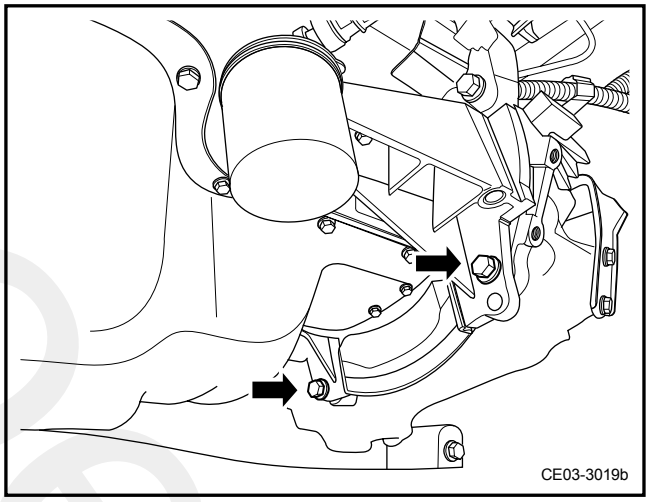
24. Support the transmission with a jack;



25. Remove transmission rear connecting bolts;

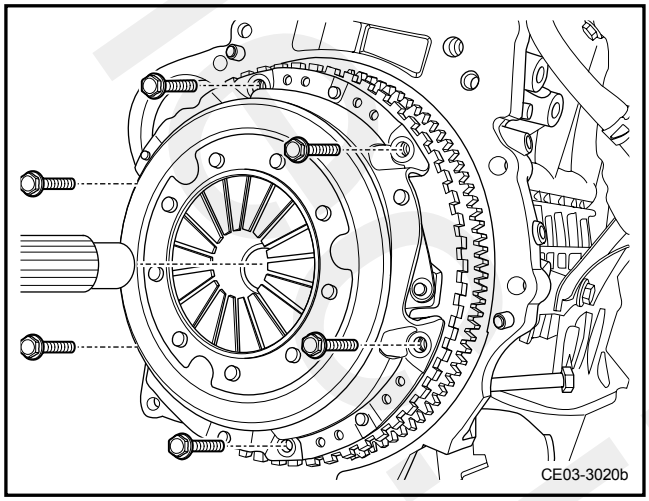


26. Remove the transmission bottom connecting bolts;
27. Remove the transmission assembly.

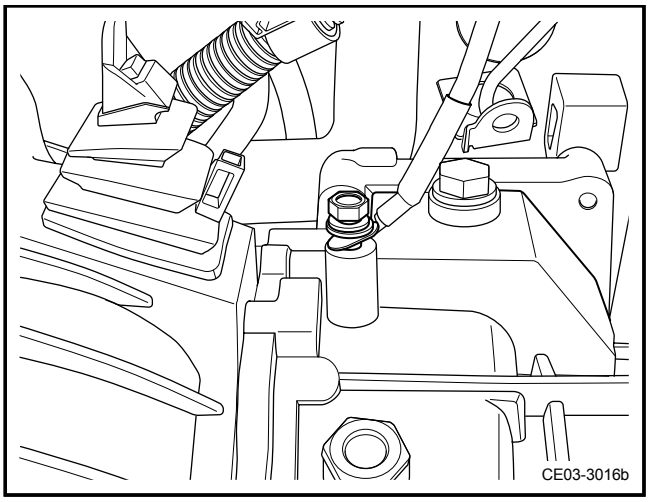


Installation Procedure:

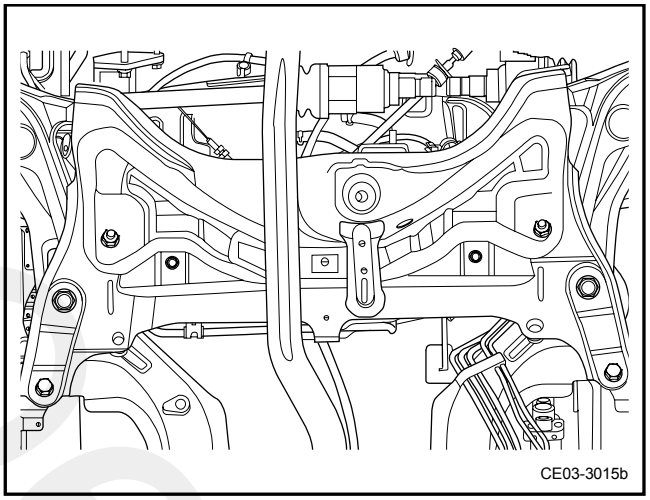
1. Lift the transmission assembly with a flat-panel jack;
2. Insert the transmission input shaft into the clutch plates. Push the transmission to the engine side. Pay attention to locating pin position.
3. Install transmission rear connecting bolt;
4. Install the transmission bottom connecting bolts and loose bottom connecting bolts.
6. Install starter motor retaining bolt and cable;



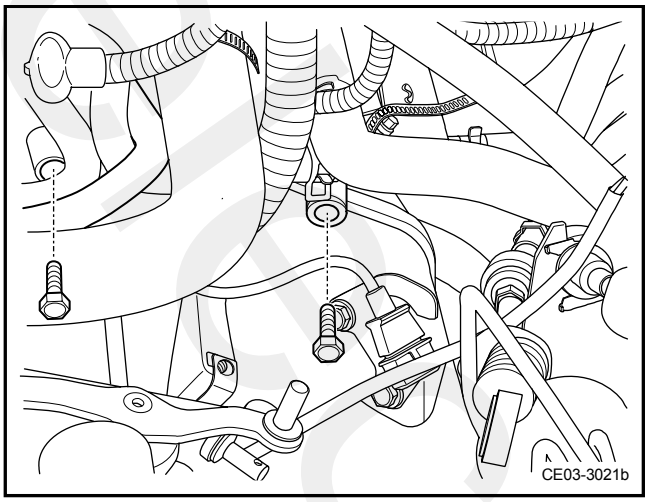
7. Install transmission case negative grounding cable.



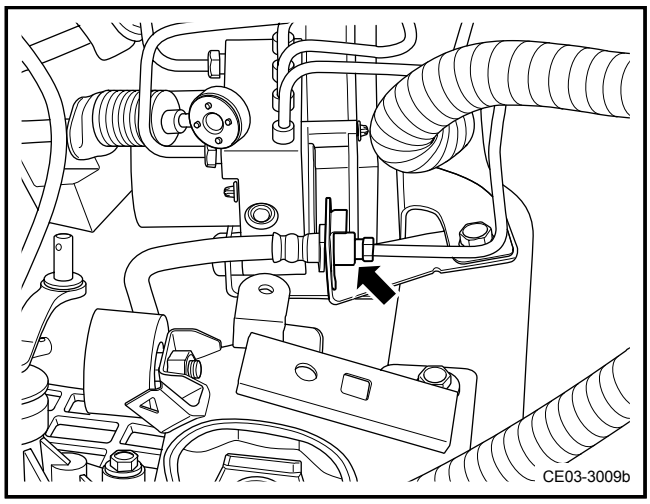
8. Install the left and right drive shafts;
9. Install front girder sub-frame and related connecting parts;



10. Install front wheel tires;
11. Remove the engine bracket special tool;
12. Install transmission upper connecting bolts;
13. Install rear suspension support and bolts for power train;
14. Install left suspension support and bolt for power train;



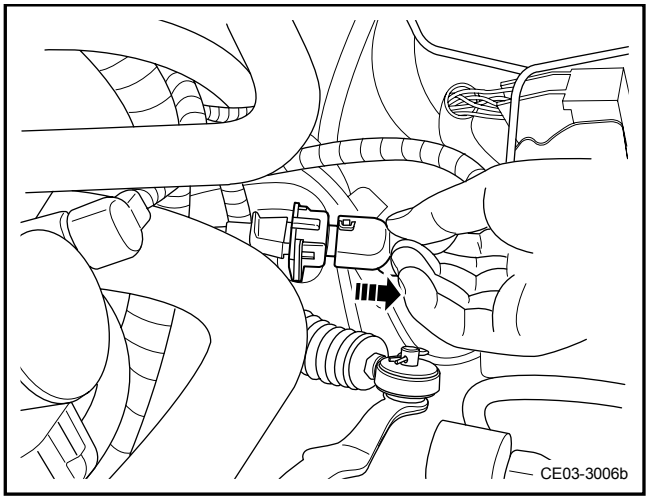
15. Install Clutch slave cylinder oil pipe;
16. Install Clutch slave cylinder and bleed the air; Refer to 3.2.6.4 Hydraulic Clutch Bleeding
17. Install gearshift control mechanism guy wire;
18. Install rotating speed connector;
19. Install the vehicle speed sensor connector;
20. Remove the reverse light switch connector;
21. Install the battery bottom plate;
22. Connect the battery negative cable;

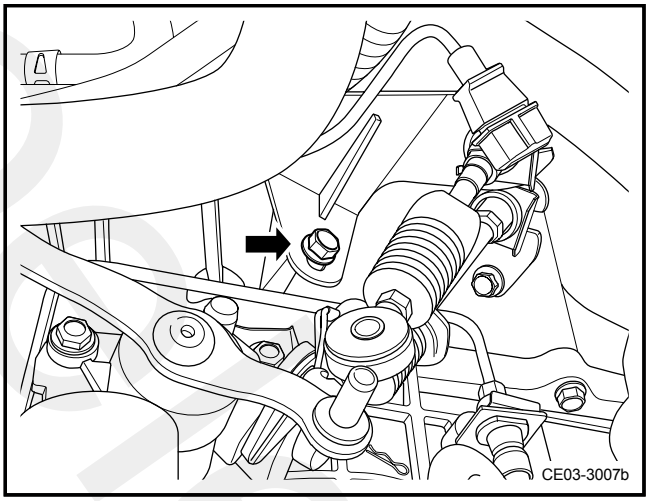


3.3.8.4 Transmission Assembly Replacement（S160）

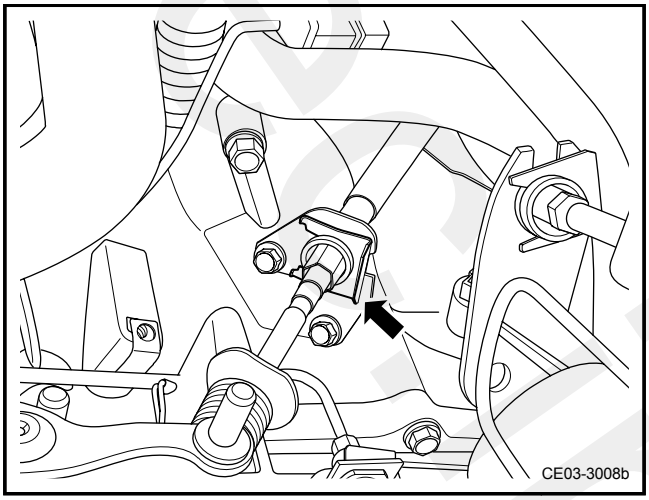
Removal Procedure:

1. Remove battery negative cable. Refer to 2.6.12.1 Battery Disconnection Procedure.
2. Remove battery bottom plate, Refer to 2.6.12.1 Battery Replacement.
3. Remove air filter base;
4. Disconnect reverse light switch connector;
5. Disconnect vehicle speed sensor connector;
6. Disconnect rotating sensor connector；
7. Remove gearshift lever guy wire latch; Refer to 3.3.8.5 Gearshift Control Mechanism Replacement
8. Remove gearshift lever fixing support;

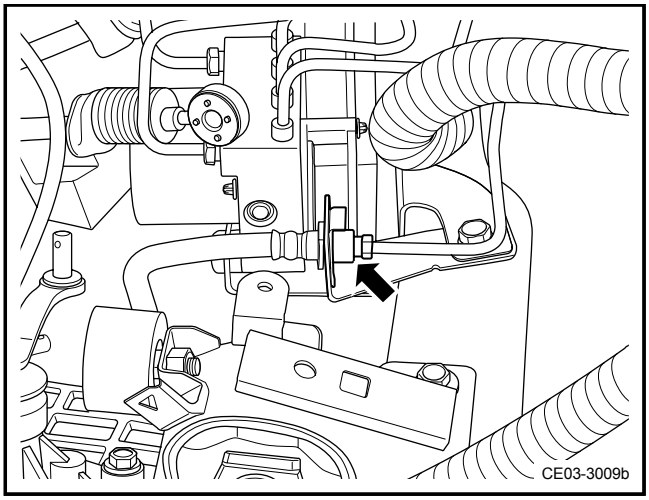




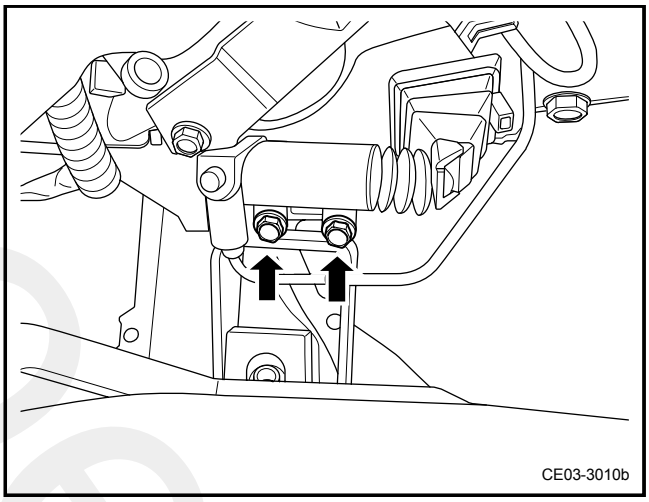
9. Remove gear selector control lever guy wire fixing clip;



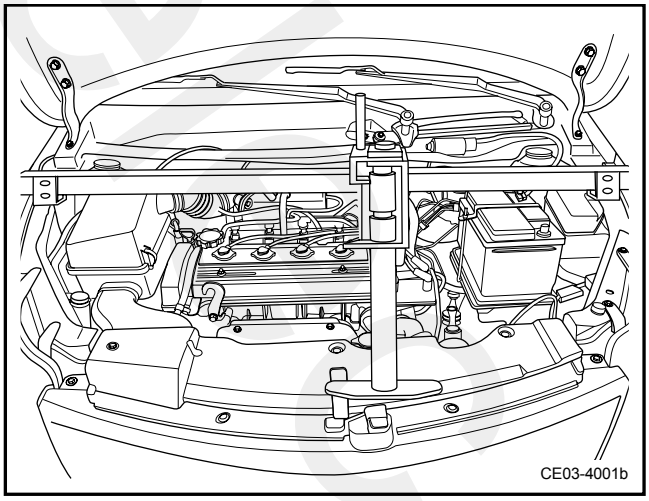
10. Remove clutch slave cylinder oil pipe;



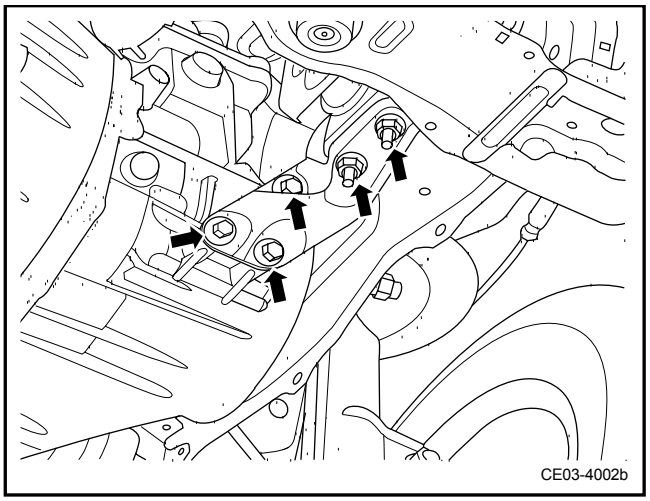
11. Remove clutch slave cylinder retaining bolt;
12. Remove starter motor cable and upper retaining bolt;
13. Remove transmission upper connecting bolt;



14. Fix the engine with special tools.



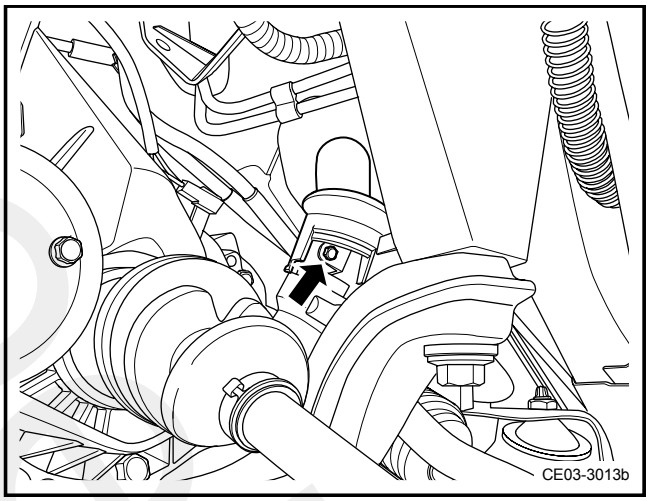
15. Remove front suspension support and bolt for power train;



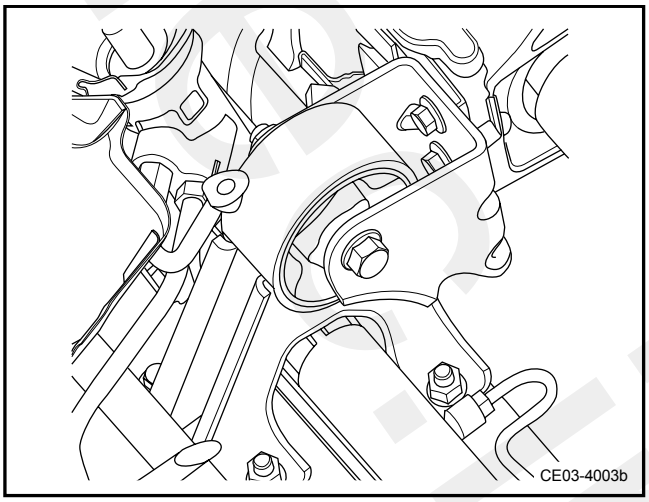
16. Remove two front wheel tires.
17. Lift the vehicle.

Warning: Refer to "Vehicle Lifting Warning" in "Warnings and Notices".

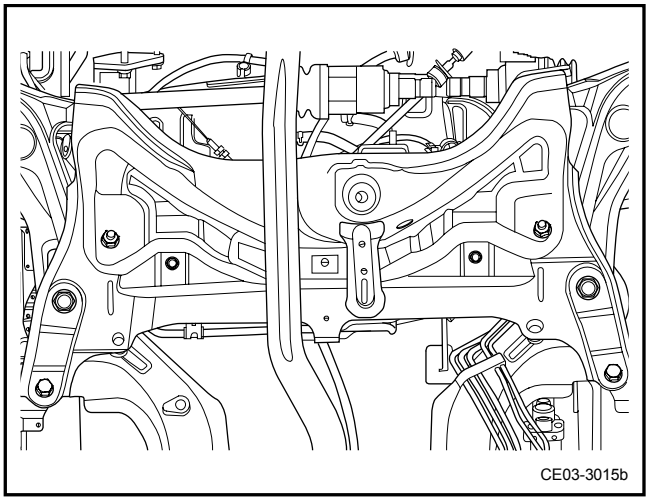
18. Remove the transmission fluid drain bolt and then install after draining out the transmission fluid. Refer to 3.3.8.1 Transmission fluid Level Inspection.
19. Remove the steering gear lateral pin bolt;



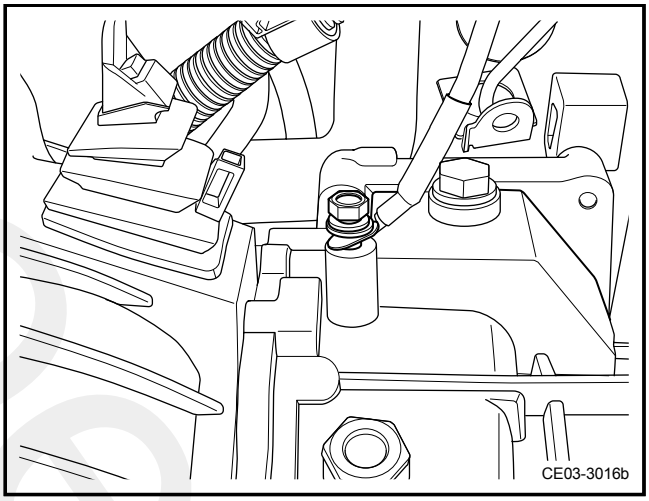
20. Remove rear suspension support and bolt for power train;



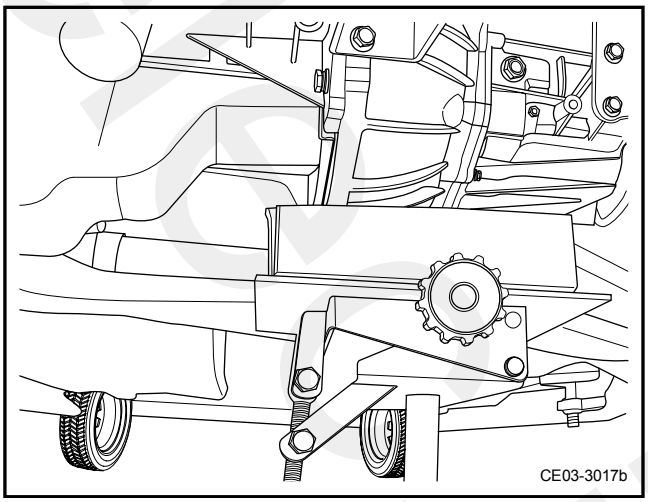
21. Remove the front girder sub-frame and related connecting parts; Refer to 12.6.4.2 Subframe Replacement;


CE03-3015b

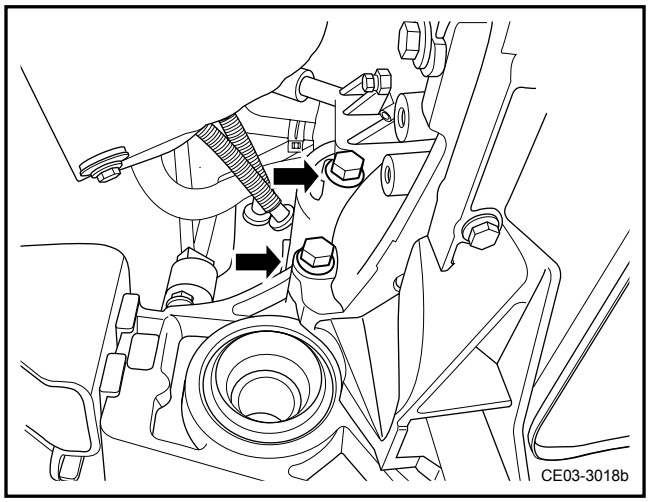
22. Remove the left and right side drive shafts; Refer to 5.3.4.1 Drive Shaft Replacement
23. Remove transmission negative cable;


CE03-3016b

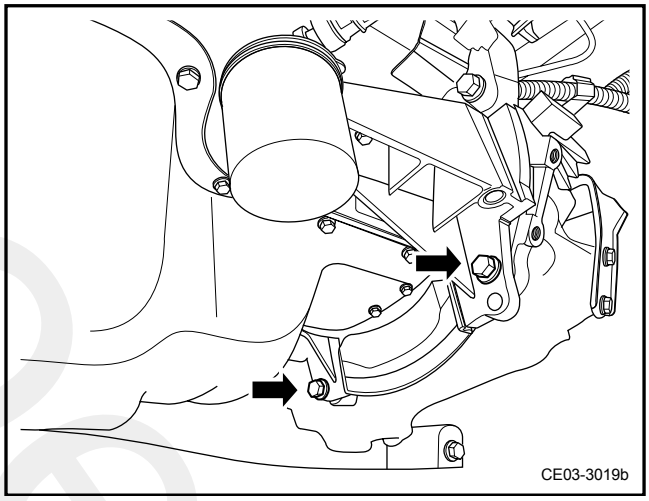
24. Support the transmission with a jack;


CE03-3017b

25. Remove transmission rear connecting bolts;

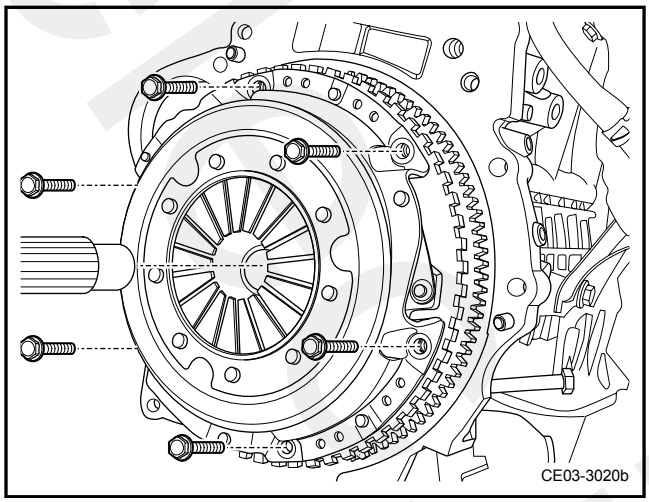


26. Remove the transmission bottom connecting bolts;
27. Remove the transmission assembly.

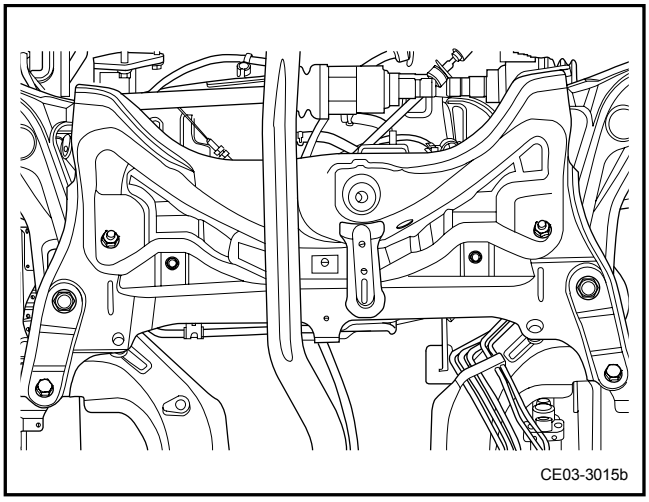


Installation Procedure:

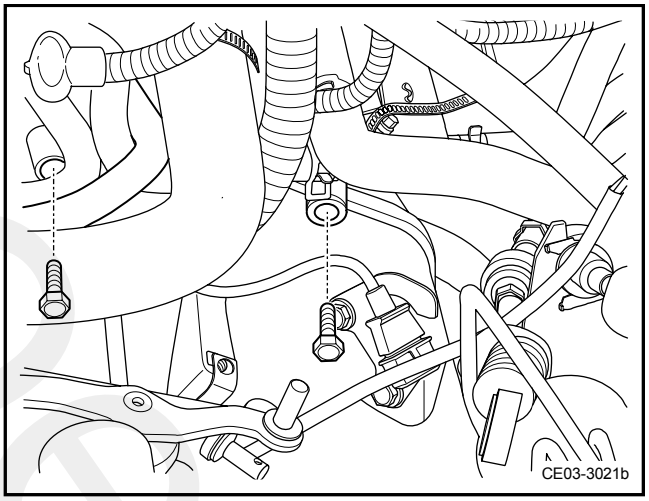
1. Lift the transmission assembly with a flat-panel jack;
2. Insert the transmission input shaft into the clutch plates. Push the transmission to the engine side. Pay attention to locating pin position.
4. Install the transmission bottom connecting bolts and start the bottom retaining bolt of motor.
6. Remove the flat-panel jack;
7. Install transmission case negative cable;



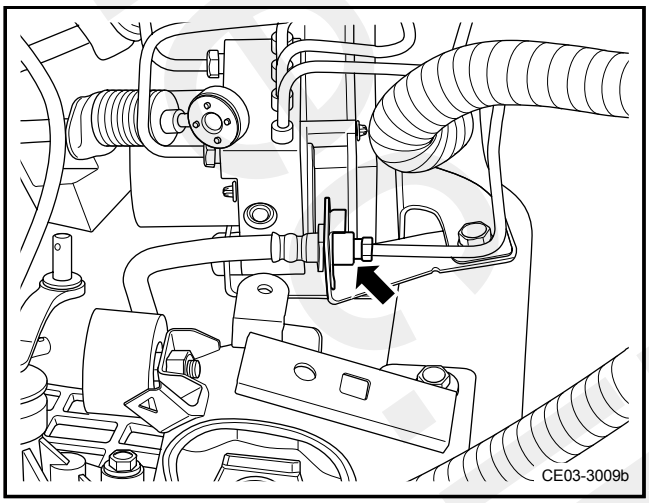
7. Install the left and right drive shafts;
8. Install front girder sub-frame and related connecting parts;



9. Install front wheel tires;
10. Remove the engine bracket special tool;
11. Install transmission upper connecting bolts;
13. Install rear suspension support and bolt for power train;
14. Install front suspension support and bolt for power train;



14. Install Clutch slave cylinder oil pipe;
15. Install Clutch slave cylinder and bleed the air; Refer to“3.2.6.4 Hydraulic Clutch Bleeding”
16. Install gearshift control mechanism guy wire;
17. Install rotating speed sensor connector;
18. Install the vehicle speed sensor connector;
19. Remove the reverse light switch connector;
20. Install the battery bottom plate;
21. Connect the battery negative cable;

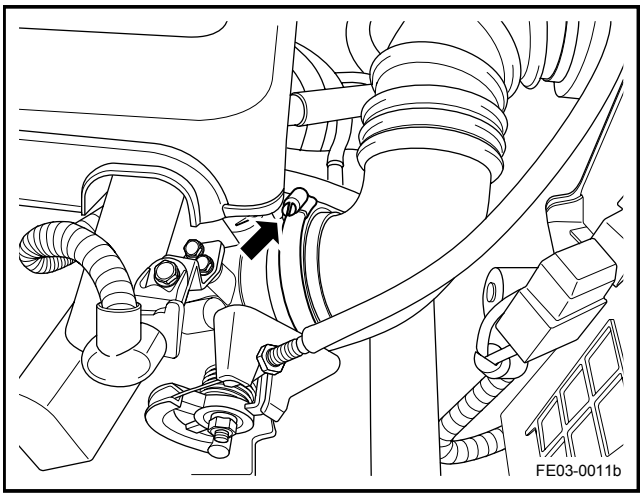


3.3.8.5 Gearshift Control Mechanism Replacement

Removal Procedure:

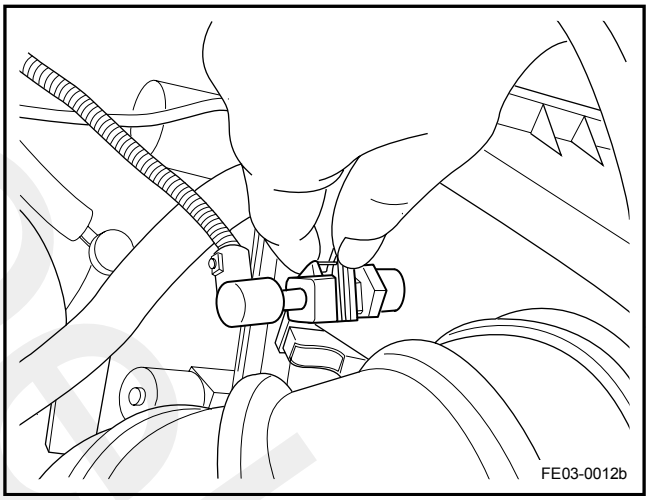
1. Disconnect minus earth cable, refer to 2.12.6.1 Battery Disconnection Procedure.

   Warning: refer to "Battery Disconnection Warning" in "Warnings and Notices".

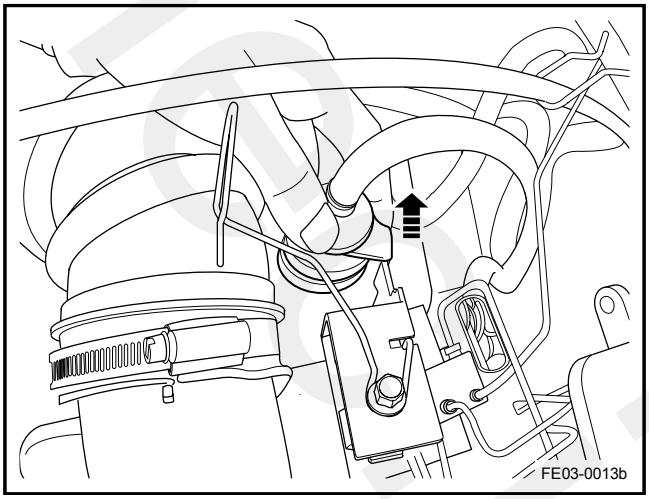


2. Remove air inlet pipe clip

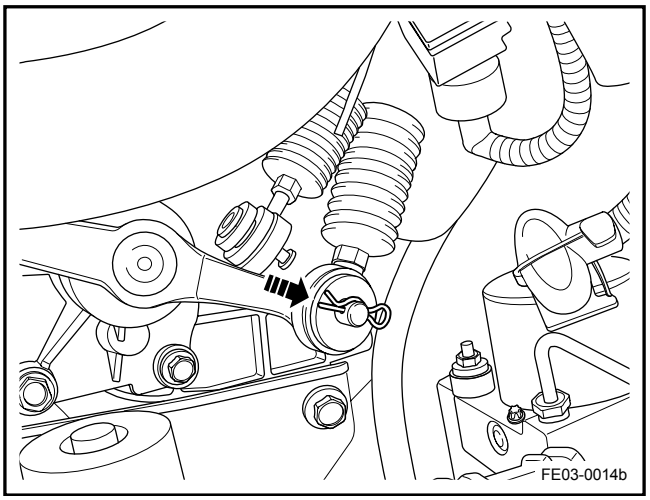
3. Disconnect harness connector for air inlet temperature sensor.



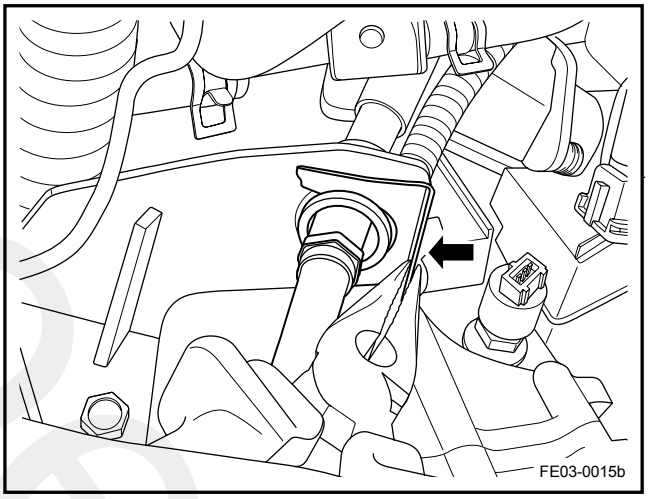
4. Remove carbon canister solenoid valve assembly from fixed bracket of carbon canister solenoid valve.



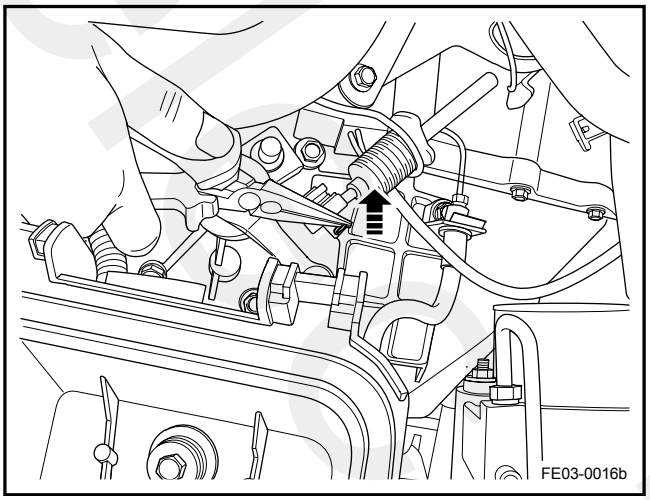
5. Remove gearshift lever cable pin.



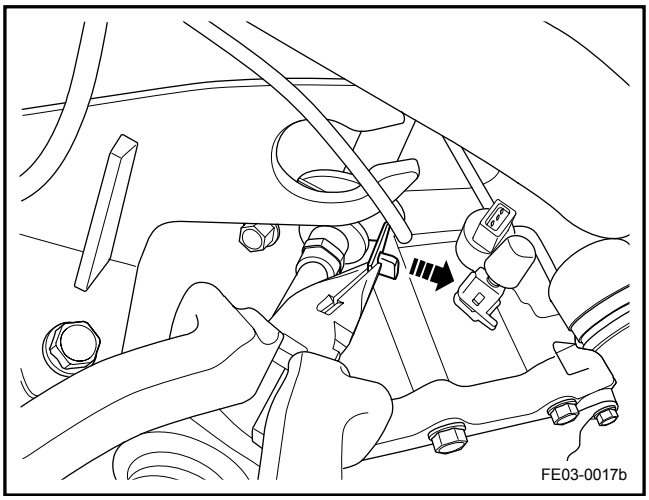
6. Remove retaining clips of gearshift lever cable and then take out gearshift lever cable.



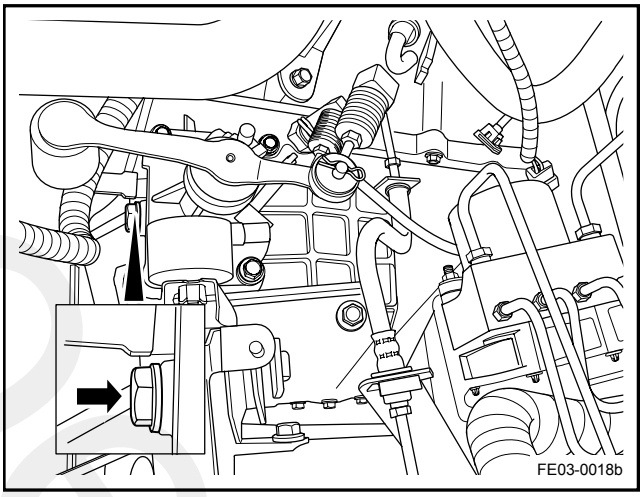
7. Remove selector lever cable pin.



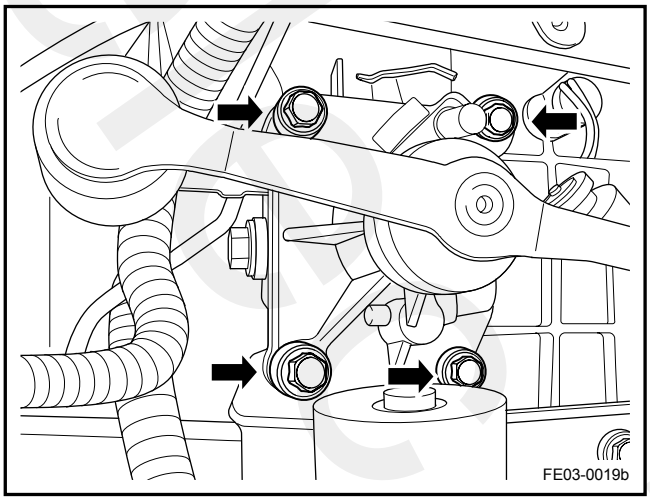
8. Remove retaining clip for selector lever cable and then selector lever cable.



9. Remove self-locking bolt of gearshift shaft shown in diagram.

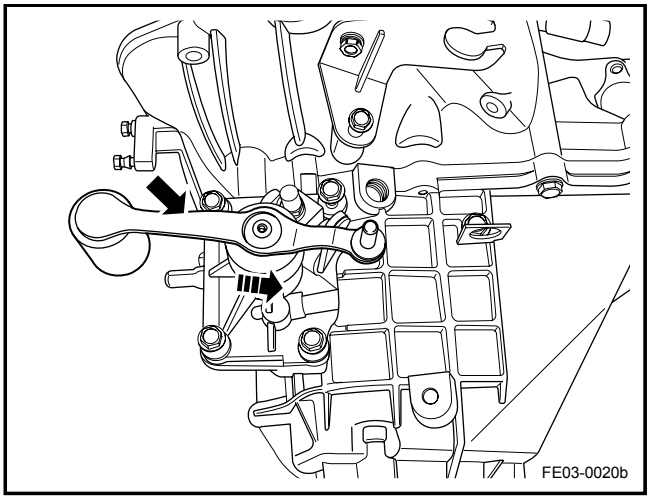


10. Remove four bolts shown in the diagram.



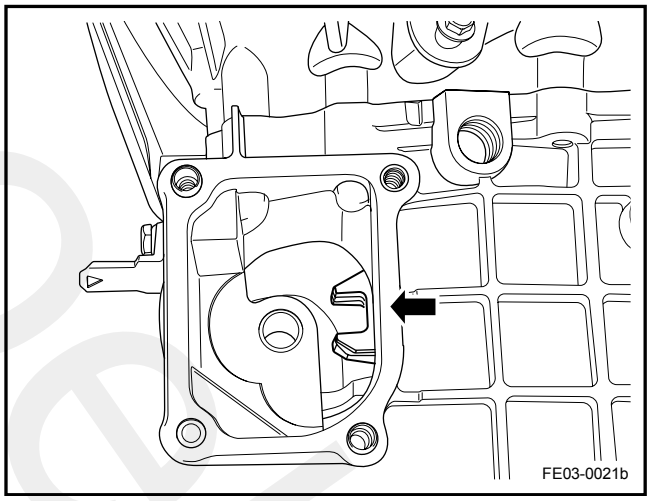
11. Take out gearshift control mechanism.

Note: the gear shall be in neutral position. Otherwise, gearshift lever cannot be taken out. When taking out, it is necessary to confirm return spring inside the transmission is in the free state. Otherwise it may fall inside the transmission.

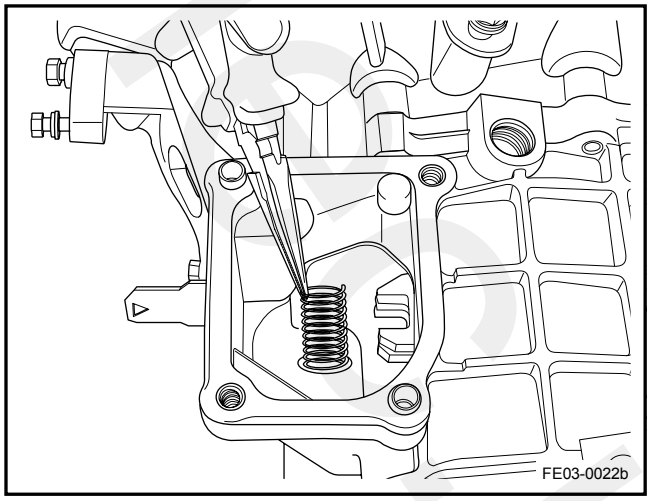


Installation Procedure:

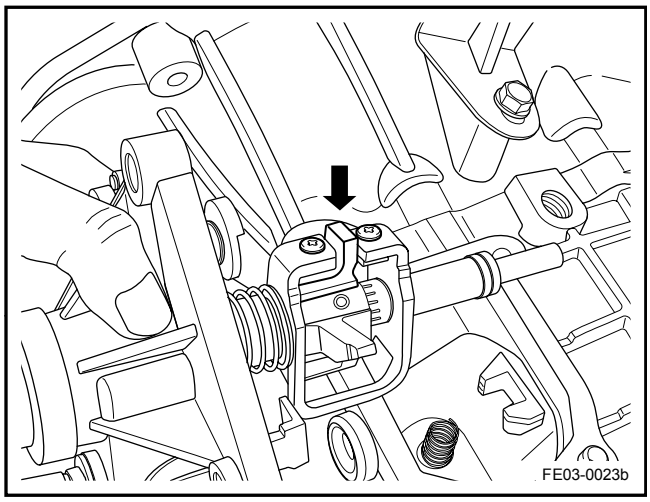
1. Confirm gearshift fork inside the transmission is in neutral position shown in the diagram.



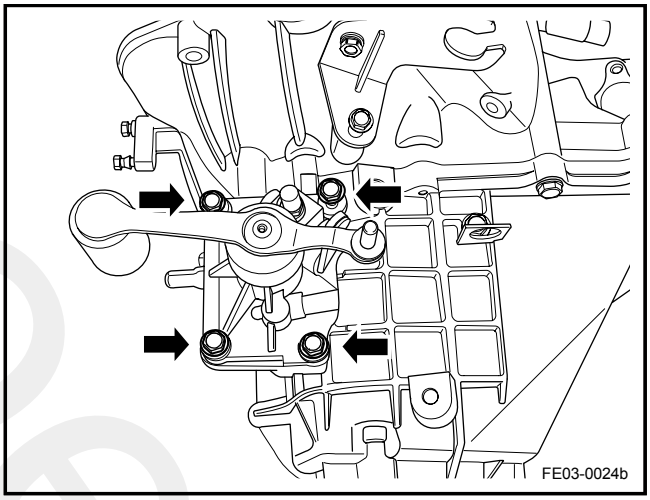
2. Install return spring into retaining hole and confirm it is in the right position.



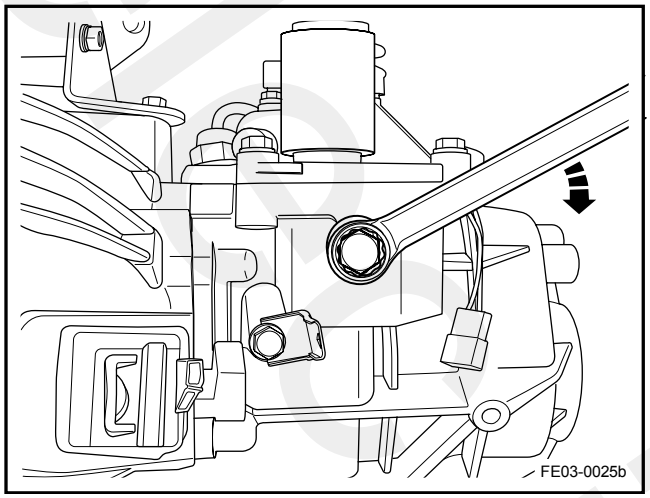
3. Confirm control slide position of gearshift control mechanism is at the same level before assembly.



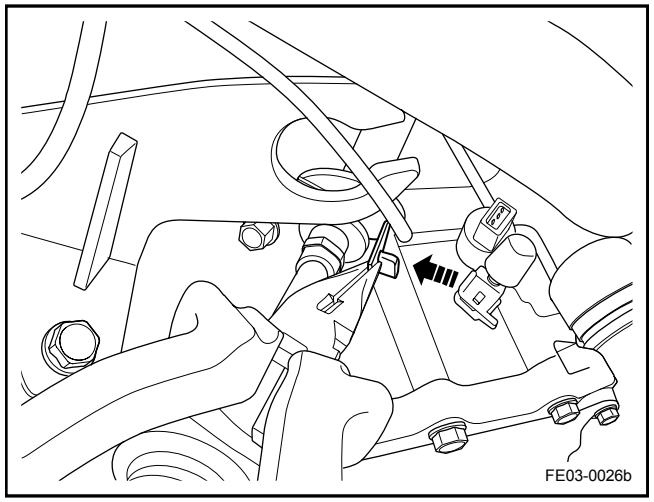
4. Before assembly, apply sealant on contact surface of gearshift lever assembly, and then install gearshift control mechanism and tighten four tightening bolts.



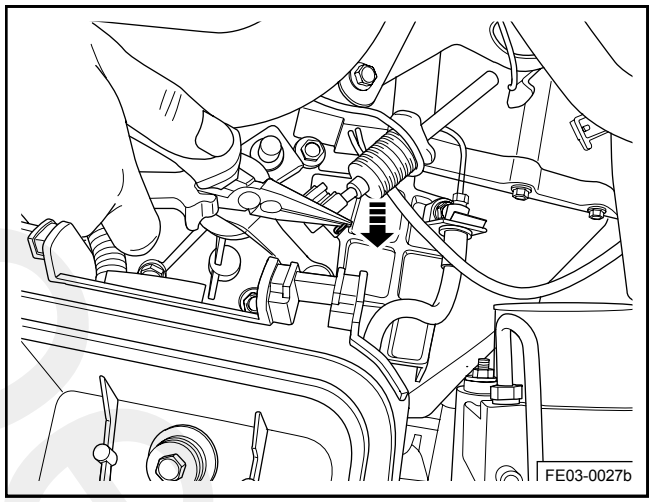
5. Install and tighten gearshift shaft self-locking bolt.



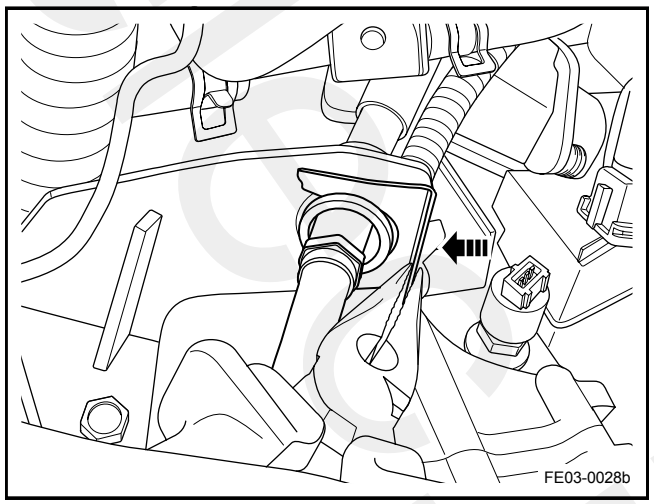
6. Install retaining clip of selector lever cable.



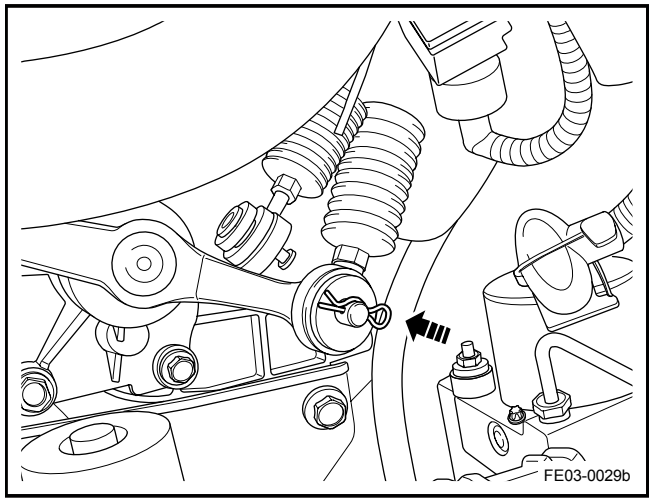
7. Install selector lever cable pin.



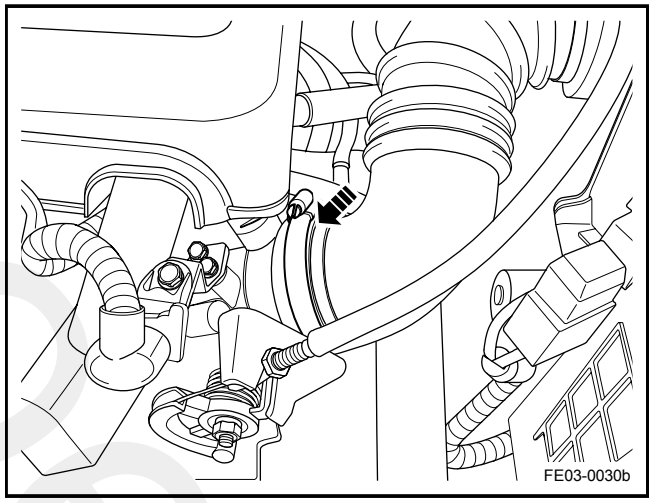
8. Install retaining clip of gearshift lever cable.



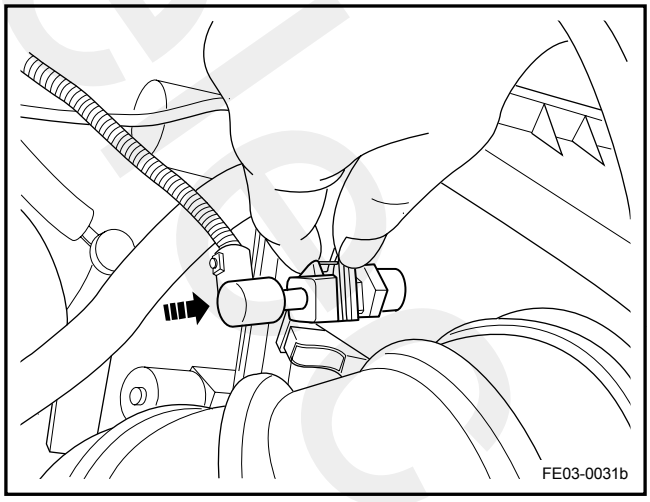
9. Install gearshift lever cable pin.



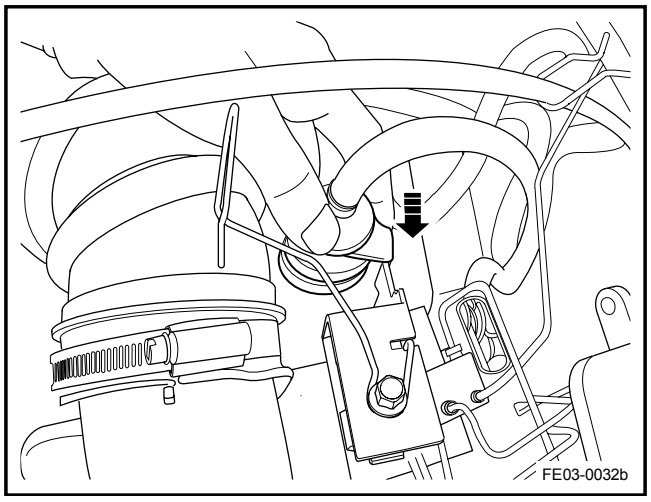
10. Install air inlet pipe and tighten the clamp.



11. Connect air inlet temperature sensor connector.



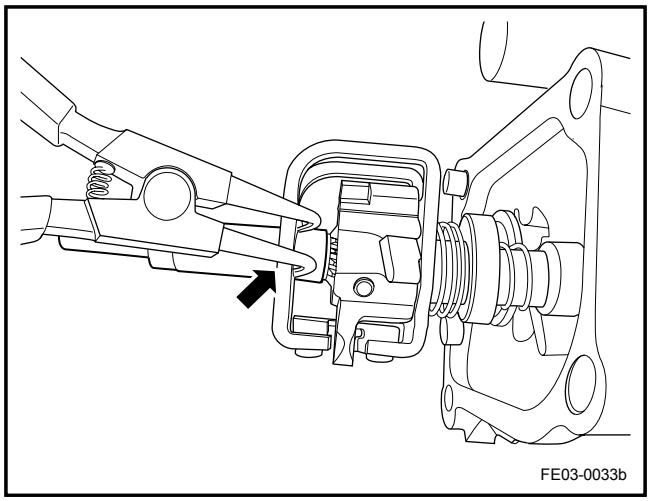
12. Install carbon canister and remove fixed bushing of solenoid valve.



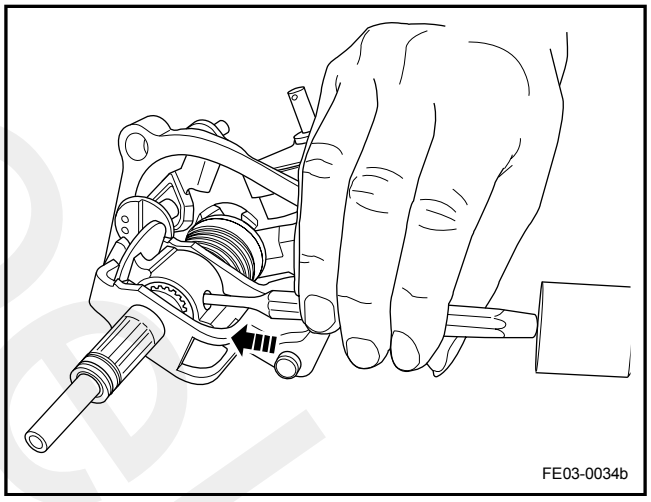
3.3.8.6 Disassembling and Assembling for Gearshift Control mechanism

Removal Procedure:

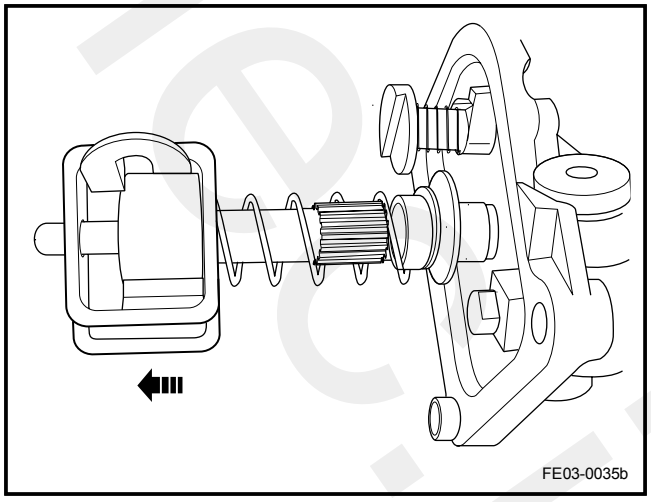
1. Remove gearshift control mechanism, refer to 3.3.8.5 Gearshift Control Mechanism Replacement
2. Use circlip plier to remove outside spring on gearshift control mechanism.



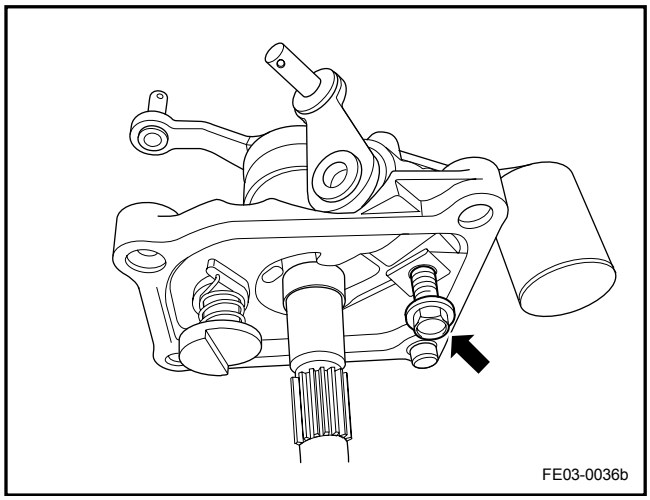
3. Remove locking pin on gearshift control mechanism.



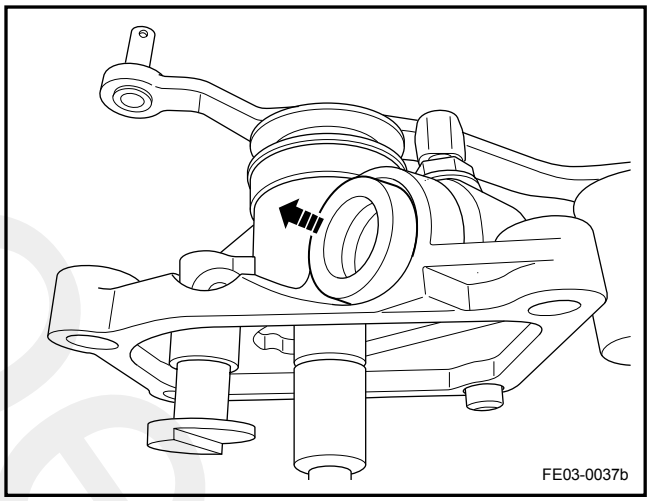
4. Remove sliding sleeve of gearshift lever



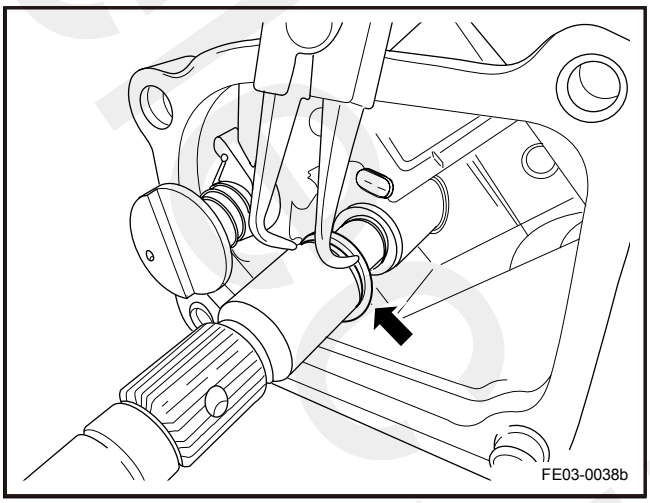
5. Remove retaining bolt of selector lever control arm.



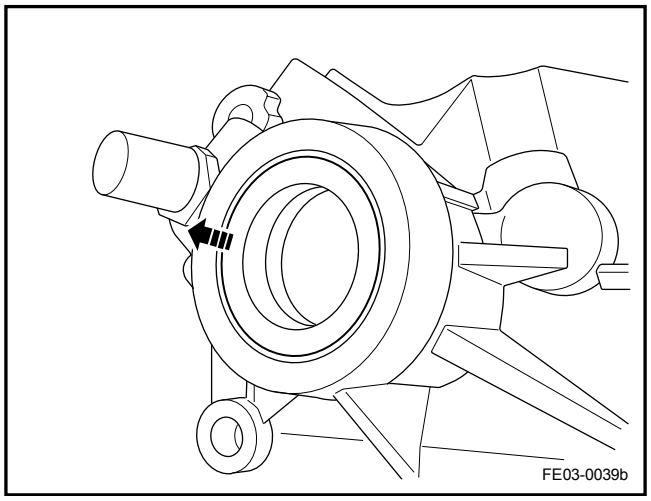
6. Remove oil seal of selector lever control arm as shown in the diagram.



7. Use circlip plier to take out inside spring on gearshift lever control arm.



8. Remove oil seal on gearshift lever control arm to disassemble gearshift control mechanism.

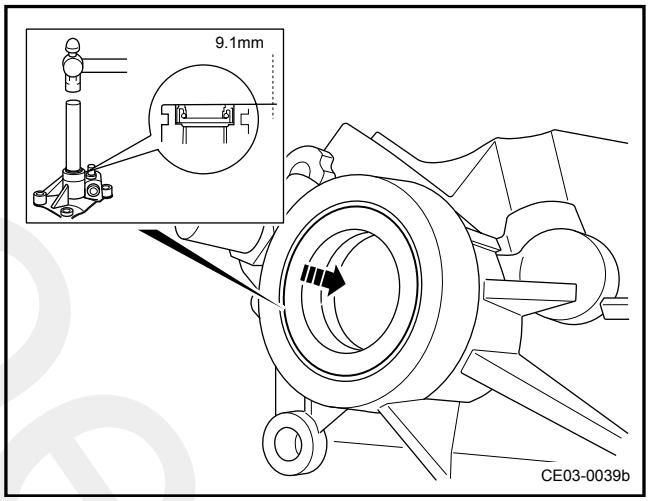


Installation Procedure:

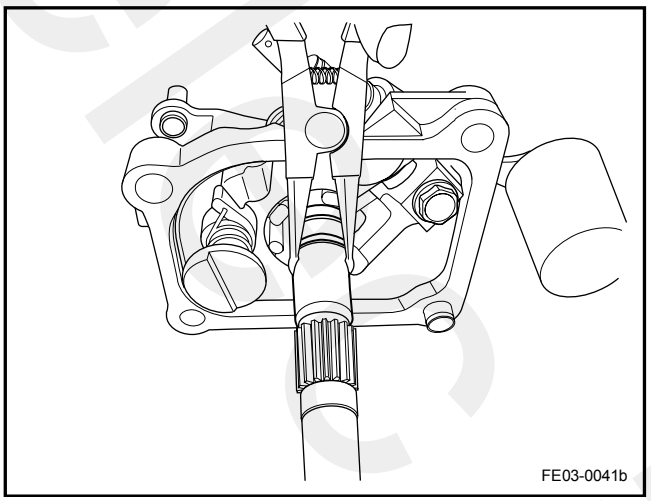
1. Install oil seal on gearshift lever control arm.

   Note: the distance between oil seal end and oil seal hole end is 0～9.1(0～359 in×10^{-3}).

2. Install gearshift lever joystick.

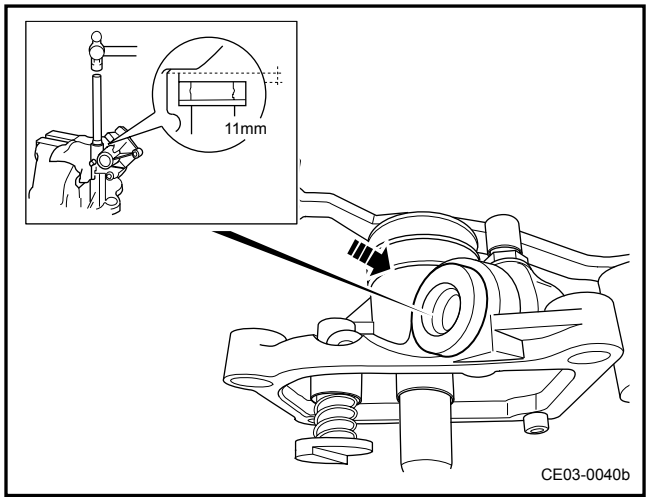


3. Install inside spring.



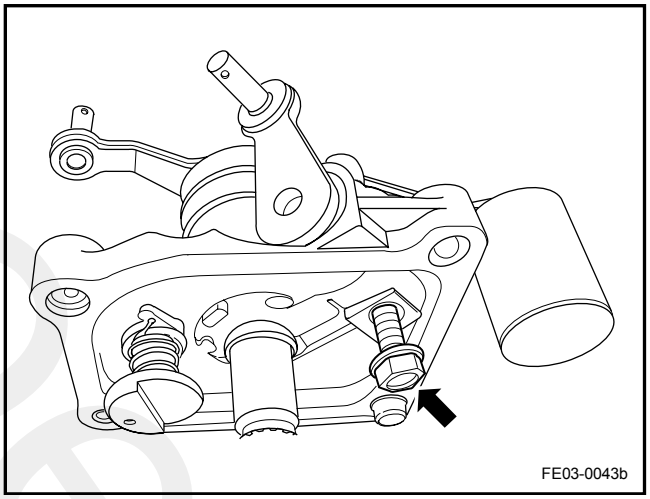
4. Install oil seal on selector lever control arm.

Note: the distance between oil seal end and oil seal hole end is 11mm (433 in×10^{-3}).

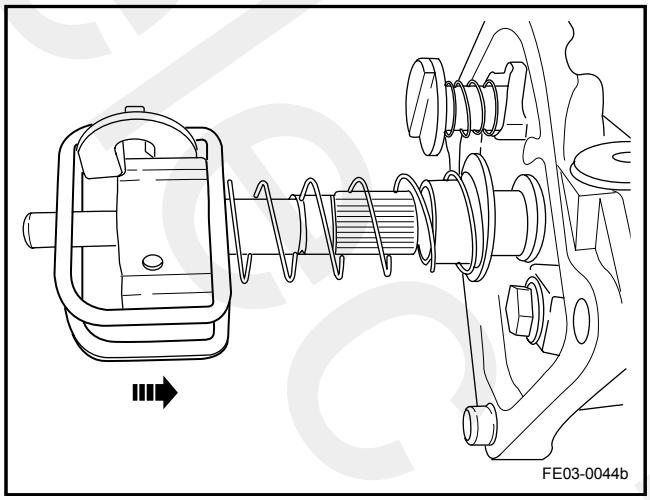


5. Install selector lever control arm and tighten bolts.

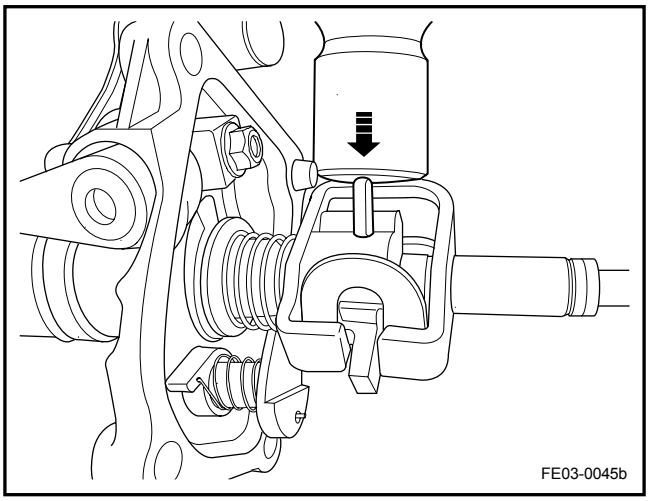
Note: Do not damage oil seal.



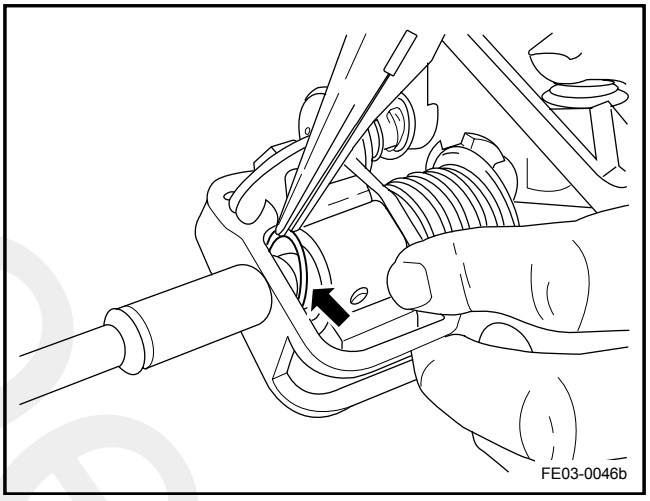
6. Install slide sleeve of gearshift lever.



7. Install locking pin of slide sleeve.



8. Install outside spring.

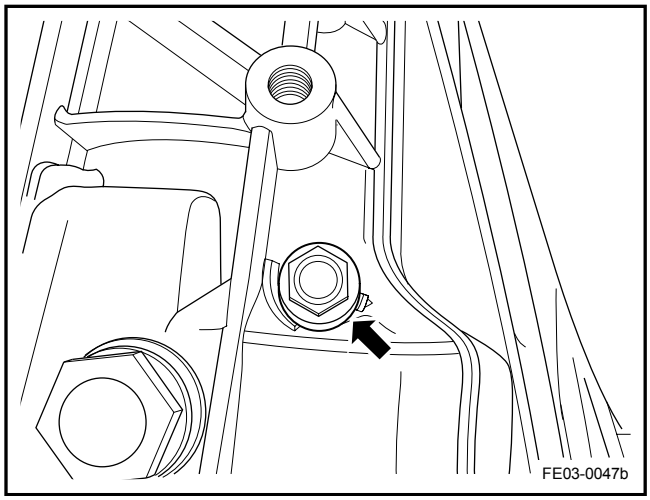


9. Install gearshift control mechanism, refer to 3.3.8.5 Gearshift Control Mechanism Replacement.

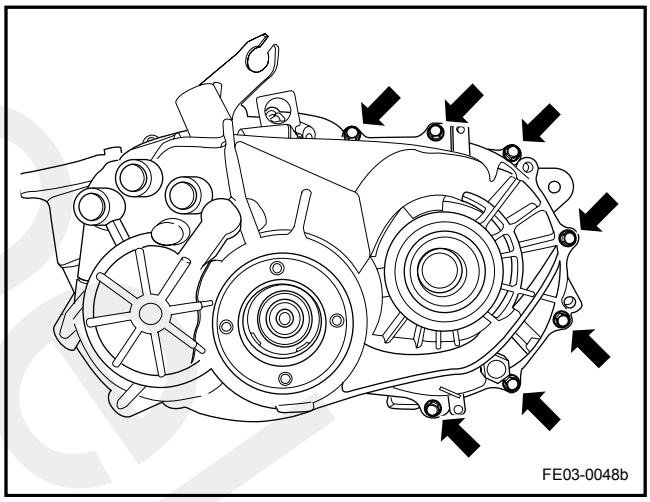
3.3.8.7 Shift Fork Shaft Replacement

Removal Procedure:

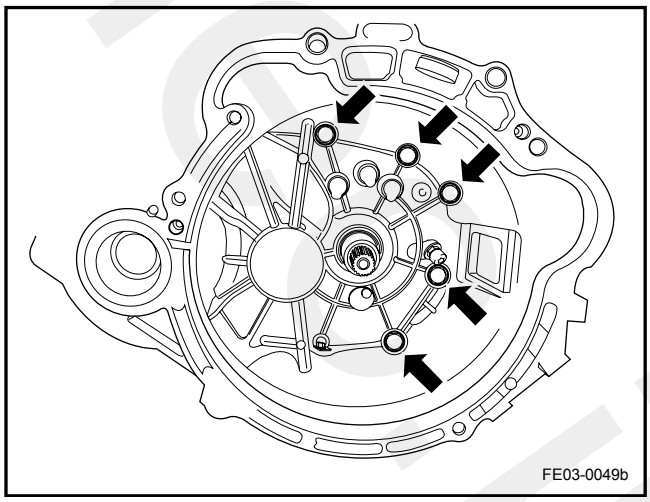
1. Remove transmission assembly, refer to 3.3.8.3 Transmission Assembly Replacement.
2. Remove gearshift control mechanism, refer to 3.3.8.5 Gearshift Control Mechanism Replacement.
3. Remove retaining bolt of reverse gear.



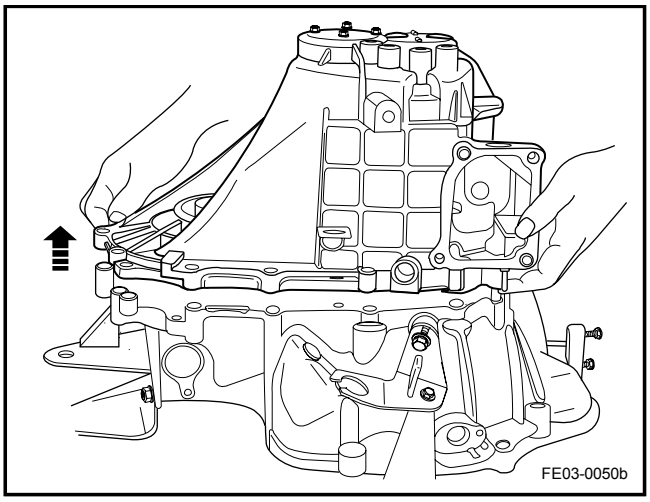
4. Remove external connecting bolt of transmission end cover.



5. Remove internal connecting bolt of transmission end cover.

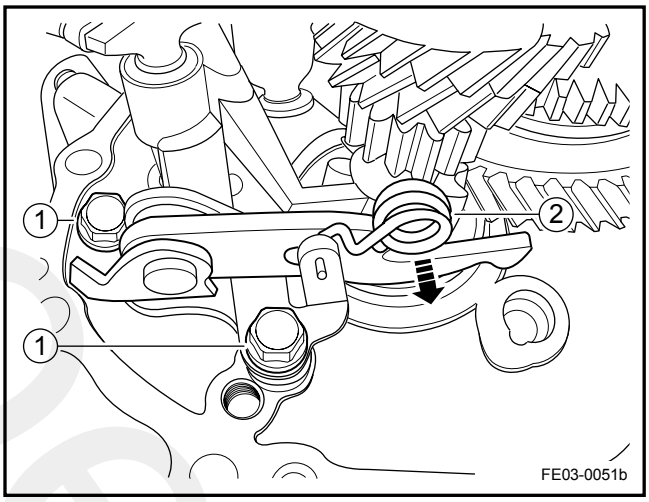


6. Take out end cover.

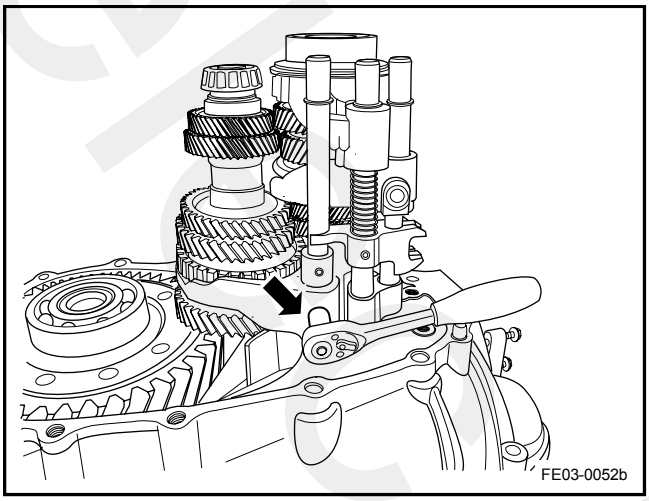


7. Remove linkage for reverse gear shift fork.

Note: Before removing retaining bolt (1), take out one end of return spring (2).

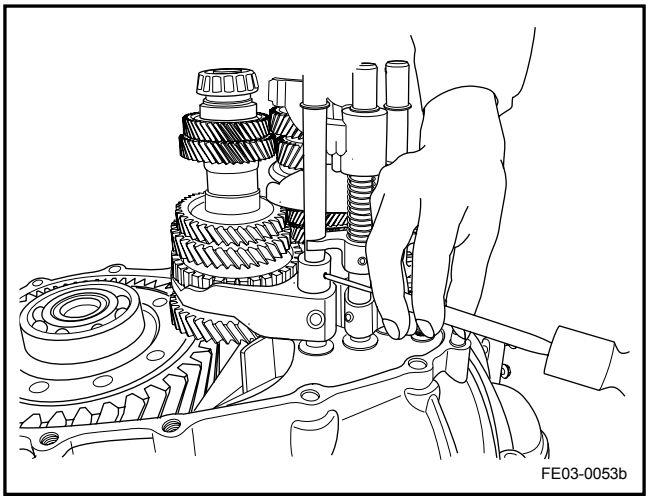


8. Remove retaining bolt of 1st and 2nd gear shift fork.



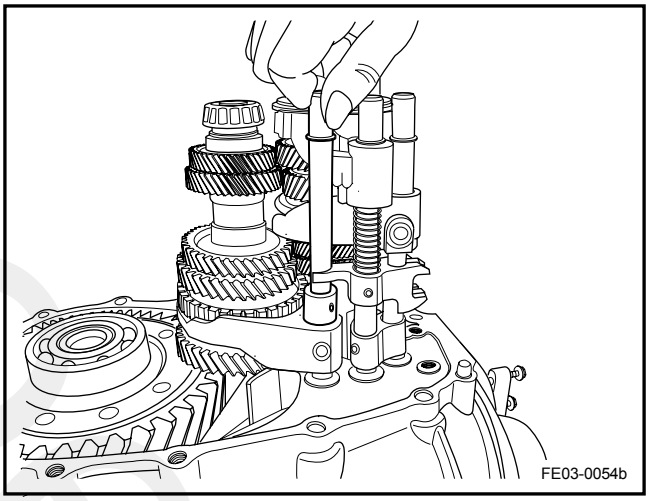
9. Remove lock pin for 1st and 2nd gear shift fork.

Note: It is necessary to use special tool. Otherwise, locking pin may expand, which cannot be taken out.

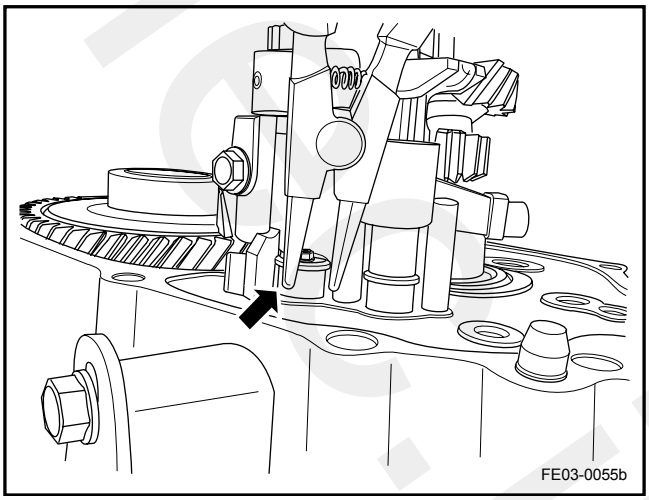


10. Rotate 180º clockwise and then take out 1st and 2nd gear shift fork shaft. Pay attention to self-locking pin on 5th and reverse gear shift fork.

Note: shift fork shaft and shift fork are closely matched. During the course of disassembling, it is forbidden to take out from both sides forcedly, which avoids deformation.

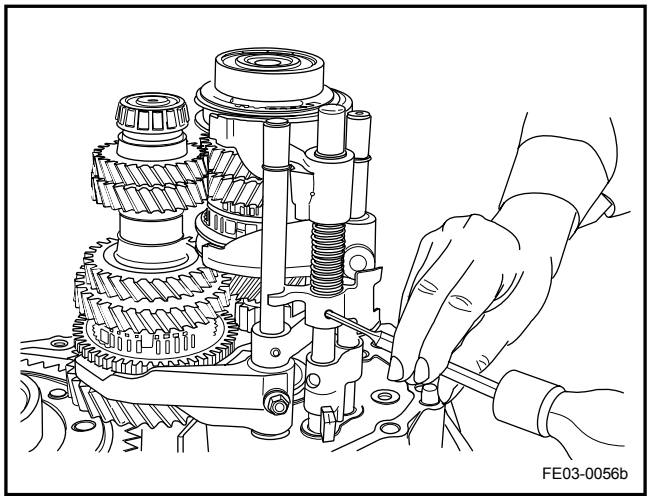


11. Use circlip plier to take out snap spring below 5th and reverse gear shift fork shaft.



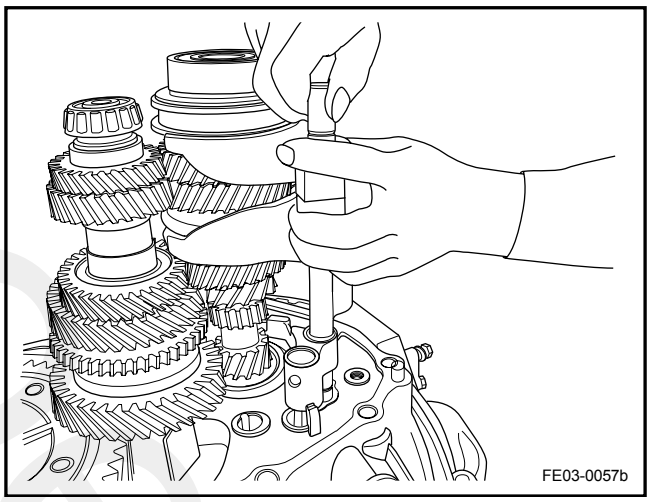
12. Remove locking pin for 5th and reverse gear shift fork shaft.

Note: It is necessary to use special tool. Otherwise, locking pin may expand, which cannot be taken out.*

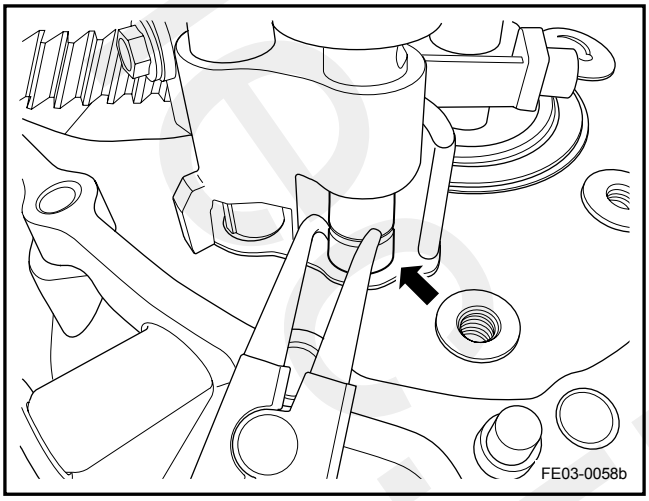


13. Rotate 180º clockwise and then take out 5th and reverse gear shift fork shaft. Avoid self-locking from falling down.

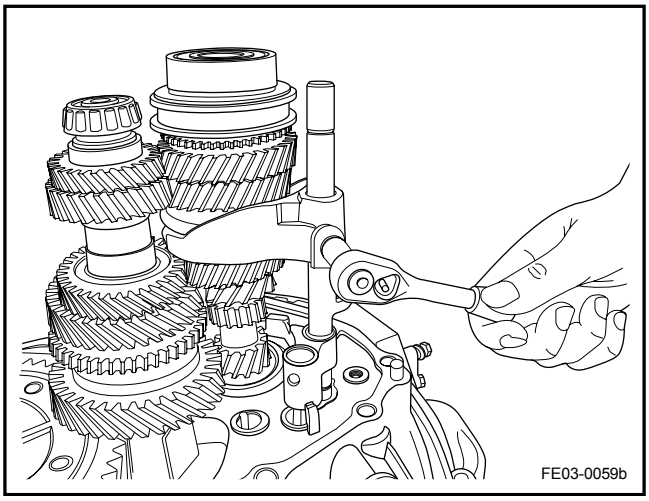
Note: shift fork shaft and shift fork are closely matched. During the course of disassembling, it is forbidden to take out from both sides forcedly, which avoids deformation. Middle spring shall be protected by hand to avoid spring and shift fork below from ejecting.



14. Use circlip plier to take out snap spring below 3rd and 4th gear shift fork shaft.

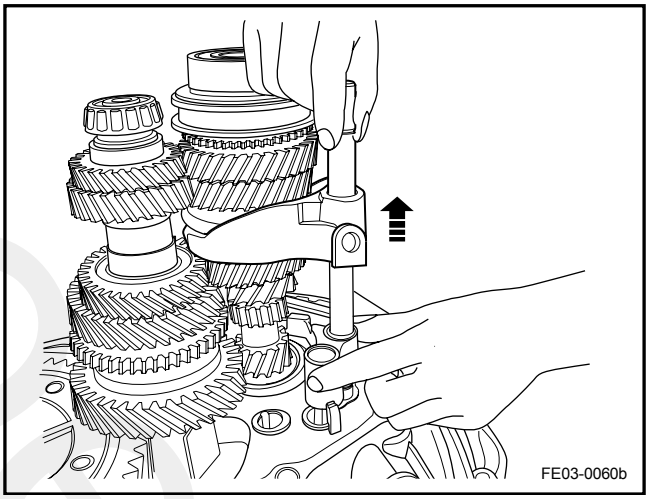


15. Remove retaining bolt of 3rd and 4th gear shift fork.



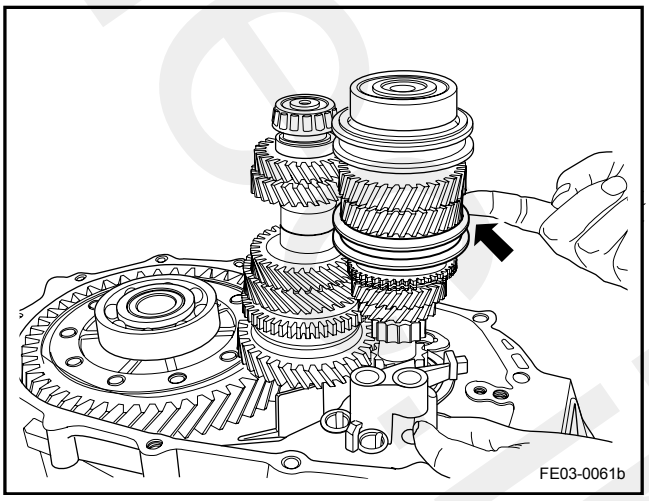
16. Push 3rd and 4th synchronizer into 4th gear and take out 3rd and 4th gear synchronizer shift fork shaft and accessories.

Note: shift fork shaft and shift fork are closely matched. During the course of disassembling, it is forbidden to take out from both sides forcedly, which avoids deformation.

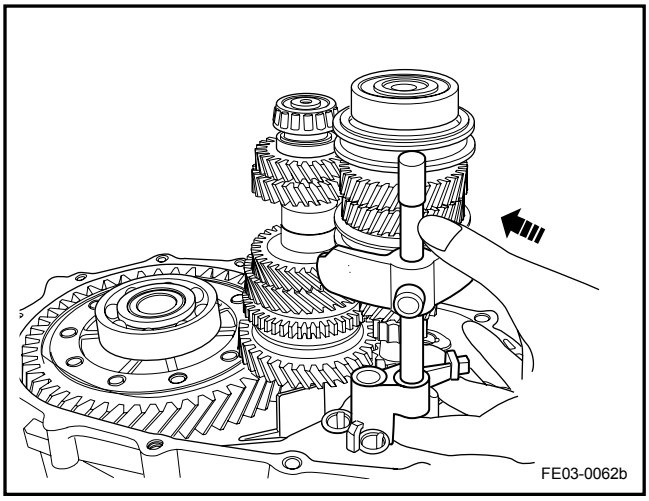


Installation Procedure:

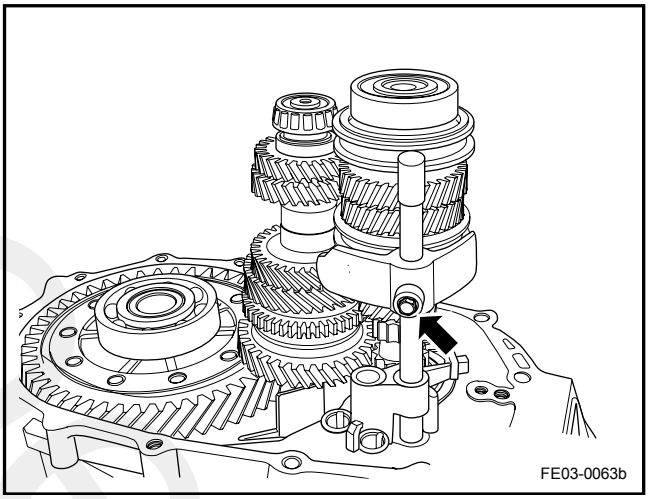
1. Push 3rd and 4th synchronizer into 4th gear.



2. Install 3rd and 4th gear shift fork and shift fork shaft.

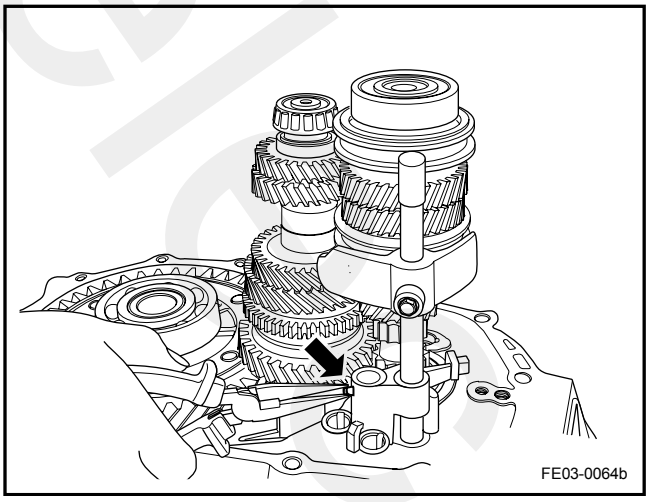


3. Install retaining bolts for 3rd and 4th gear shift fork shaft.

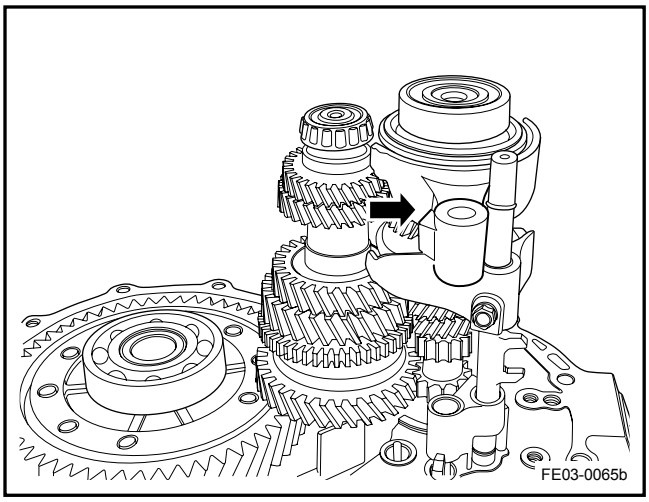


4. Install interlocked pin of 3rd and 4th synchronizer shift fork shaft and 5th reverse gear shift fork shaft.

Note: the groove on 3rd and 4th gear shift fork shaft shall align with pin hole.

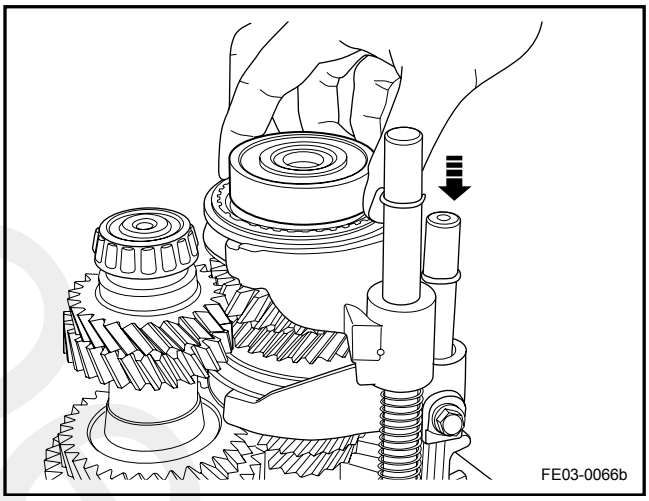


5. Install 5th gear synchronizer shift fork.



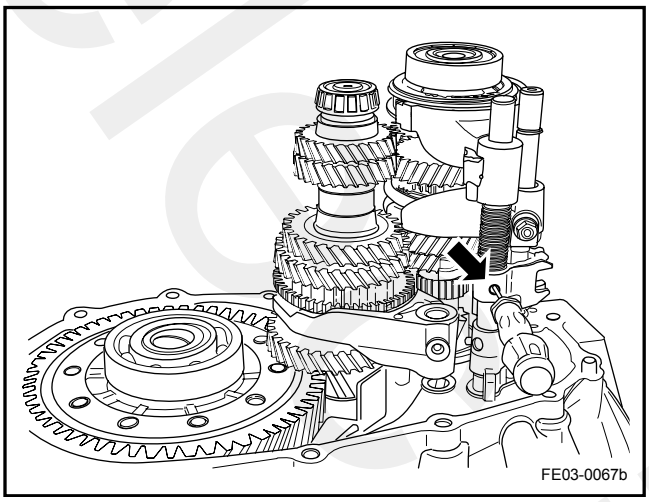
6. Install 5th reverse gear shift fork shaft.

Note: Keep 5th synchronizer by hand to avoid the synchronizer from ejecting during the course of installing shift fork.

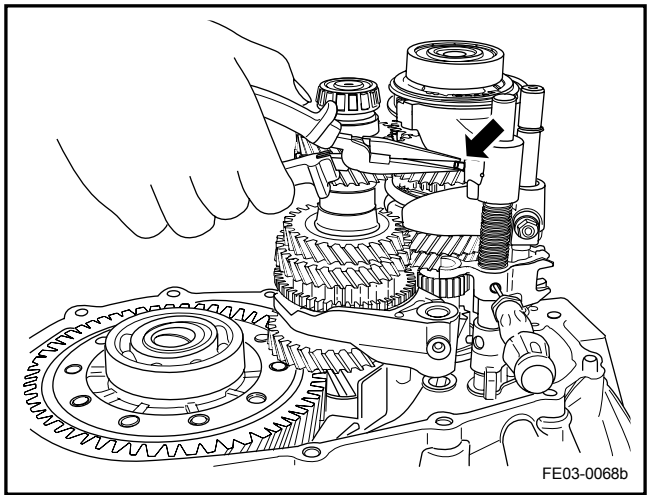


7. Insert a screwdriver into locking hole to fix 5th shift fork linkage temporarily.

Note: The groove above shift fork shaft and locking pin hole are the same.

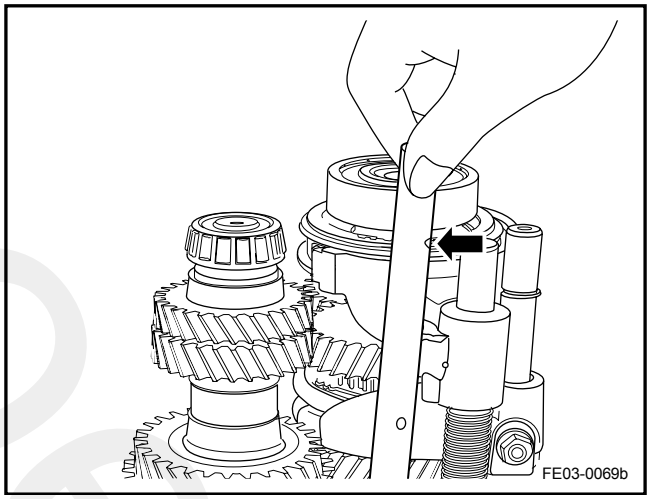


8. Install interlocked pin of 5th reverse gear and 1st and 2nd shift fork shaft.

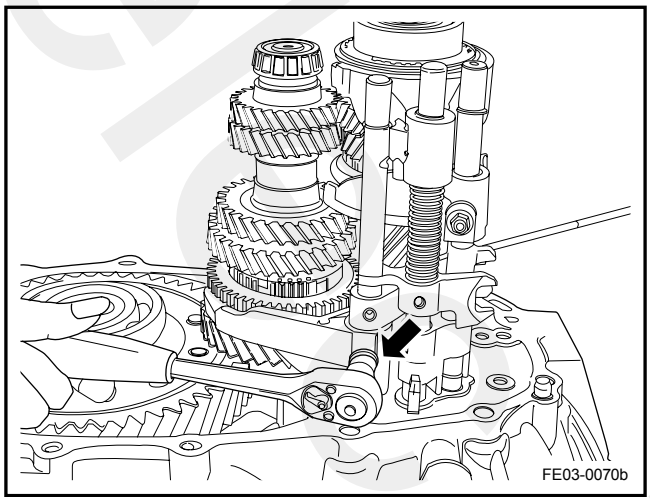


9. Install 1st and 2nd shift fork shaft.

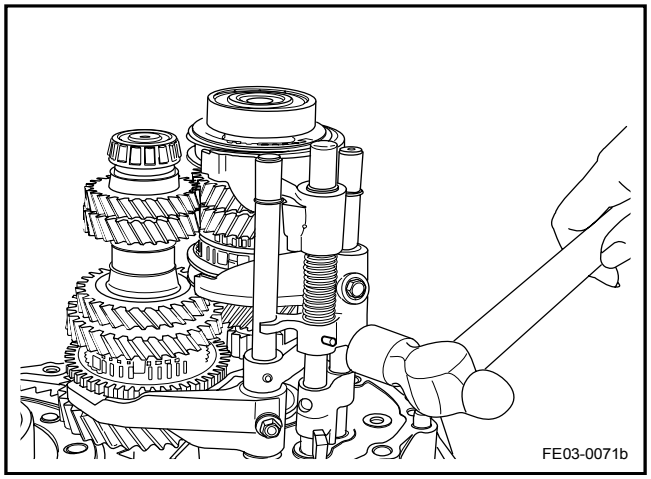
Note: The groove above shift fork shaft and locking pin hole are the same.



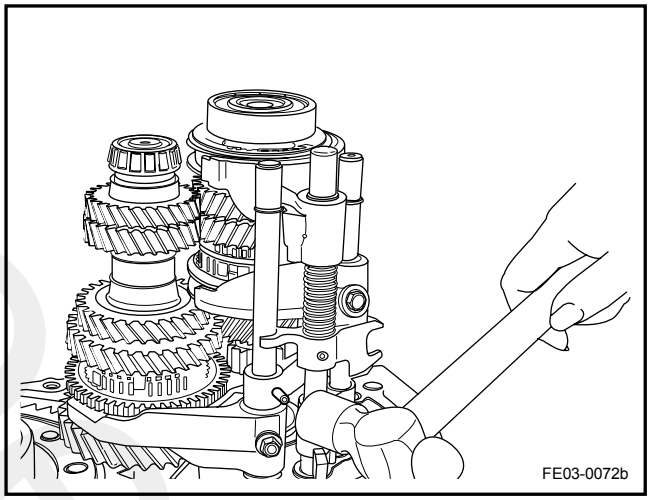
10. Install retaining bolt of 1st and 2nd shift fork shaft.



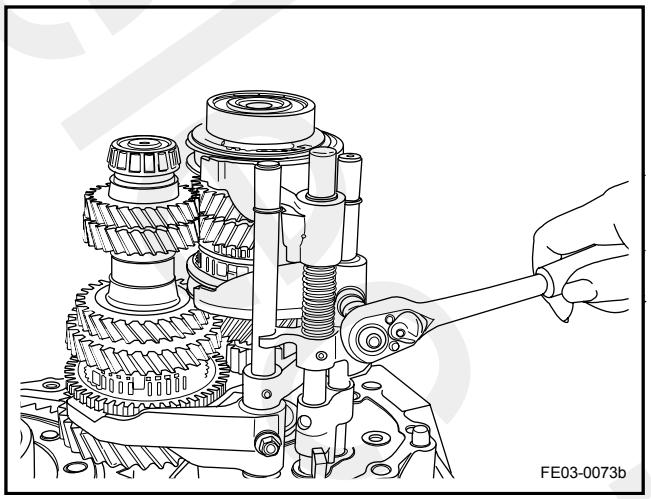
11. Install locking pin above 5th reverse gear shift fork shaft.



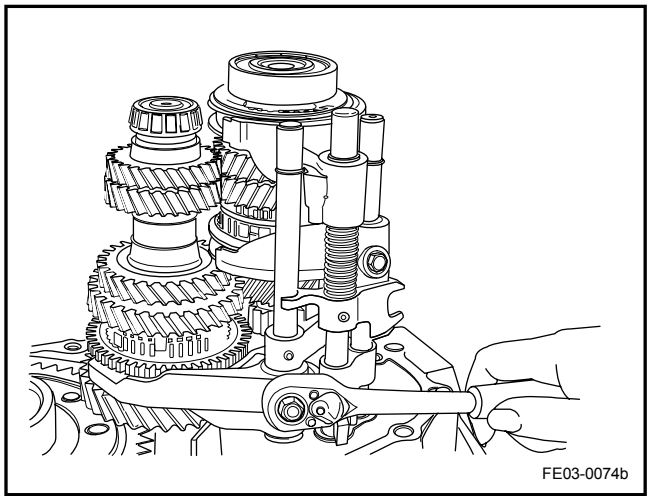
12. Install locking pin of 1st and 2nd gear shift fork shaft.



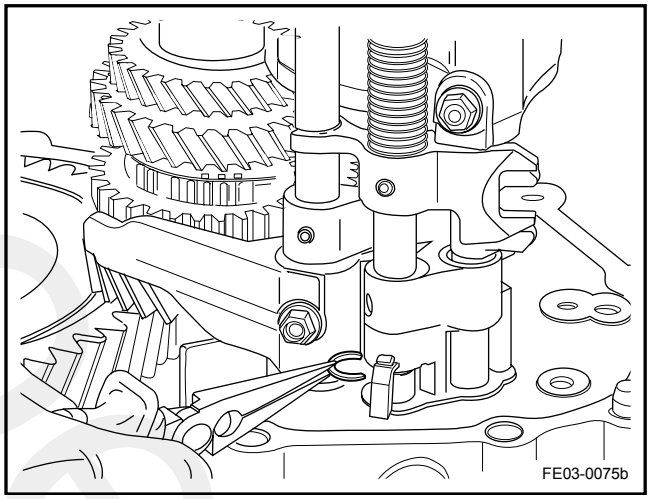
13. Tighten retaining bolt of 3rd and 4th shift fork shaft.



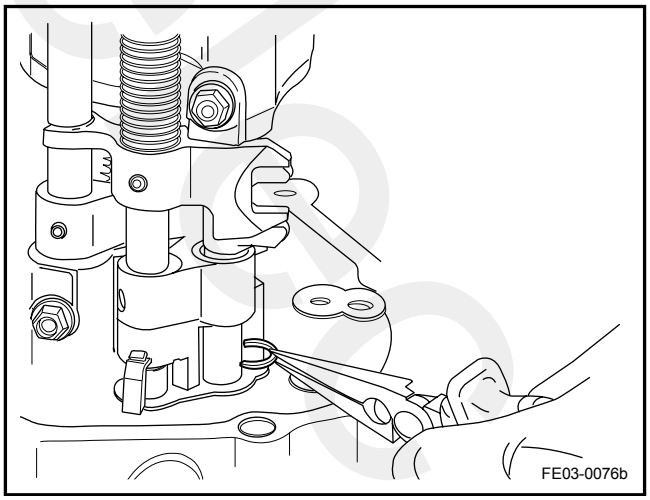
14. Tighten retaining bolt of 1st and 2nd shift fork shaft.



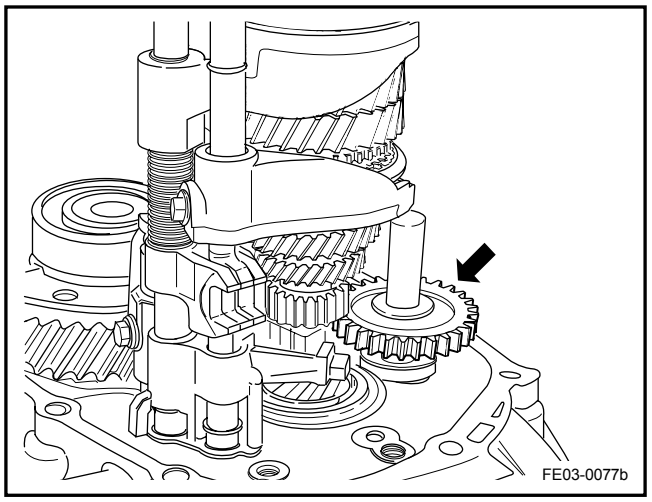
15. Install lower limit snap spring of 5th reverse gear shift fork shaft.



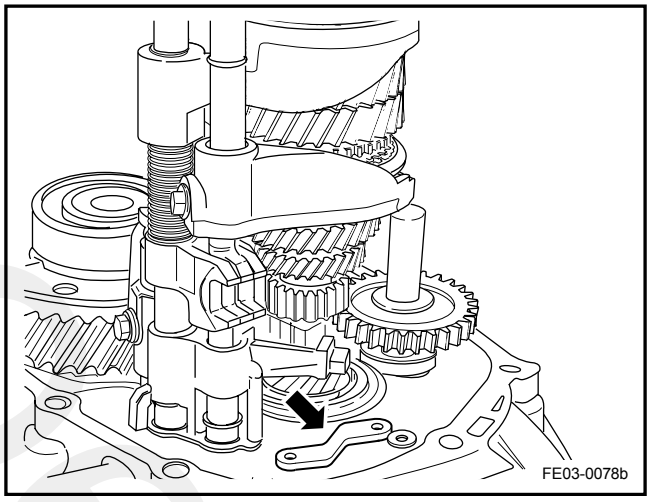
16. Install lower limit snap spring of 3rd and 4th shift fork shaft.



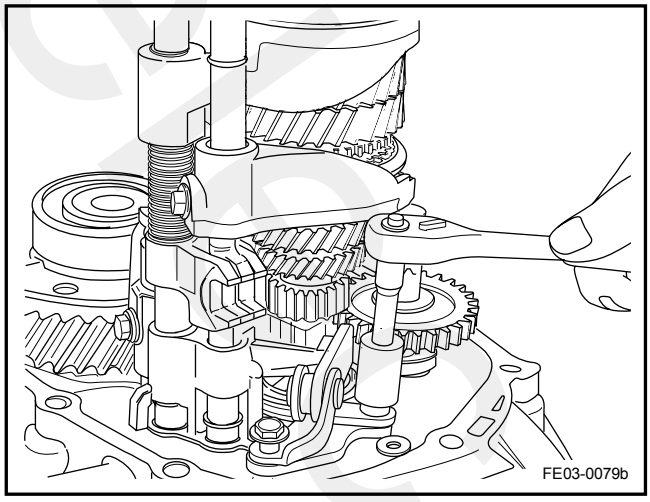
17. Install reverse gear and shaft.



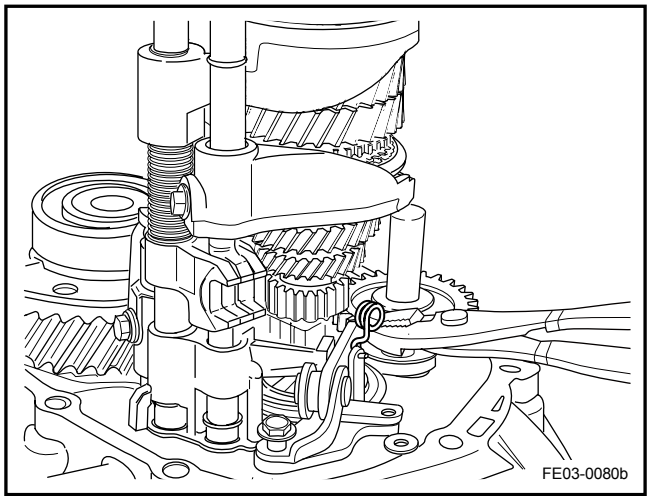
18. Install fixed bracket shims for reverse gear shift fork and linkage



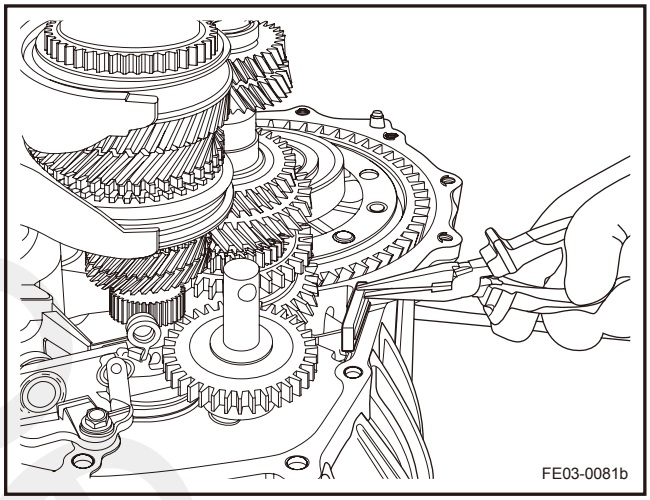
19. Install and tighten remaining bolts for reverse gear linkage



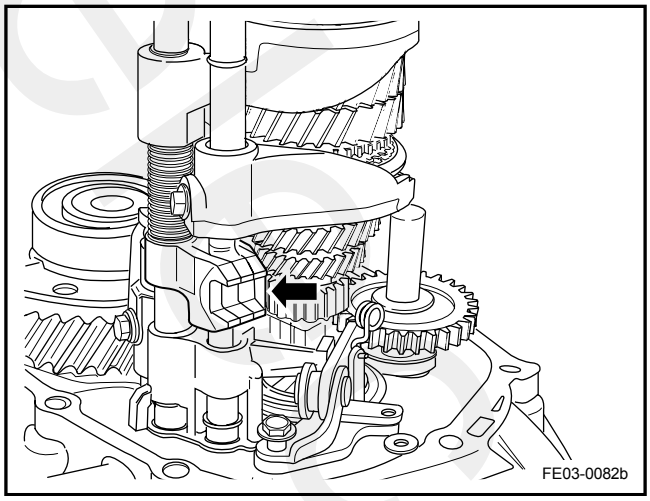
20. Install return spring of reverse gear linkage.



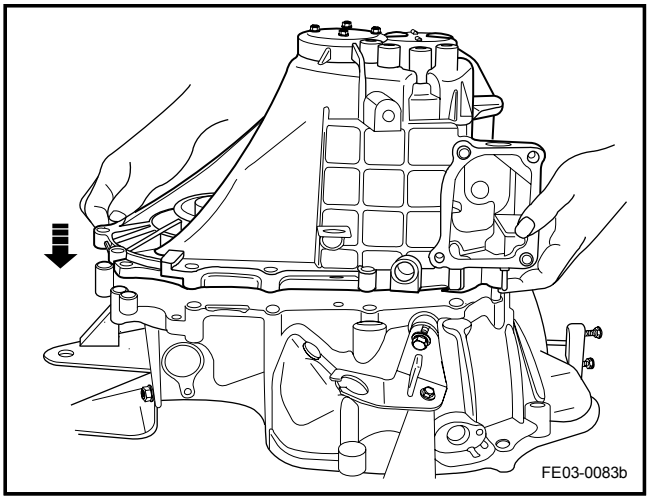
21. Install the magnet inside the transmission.



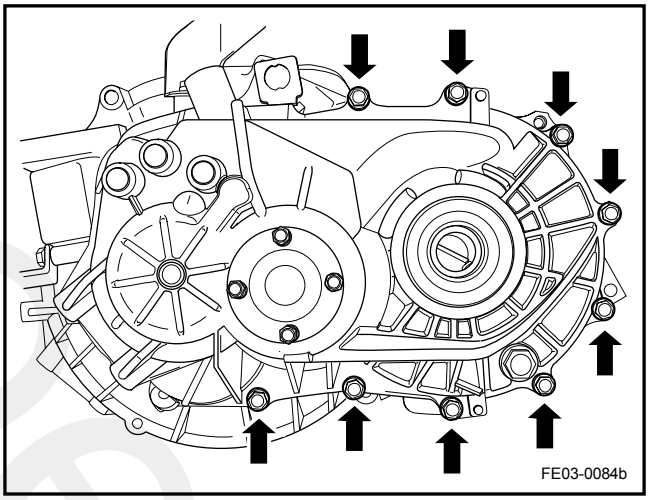
22. Confirm all gear shift forks are in neutral positions (all shift forks are at the same level) as shown in diagram.



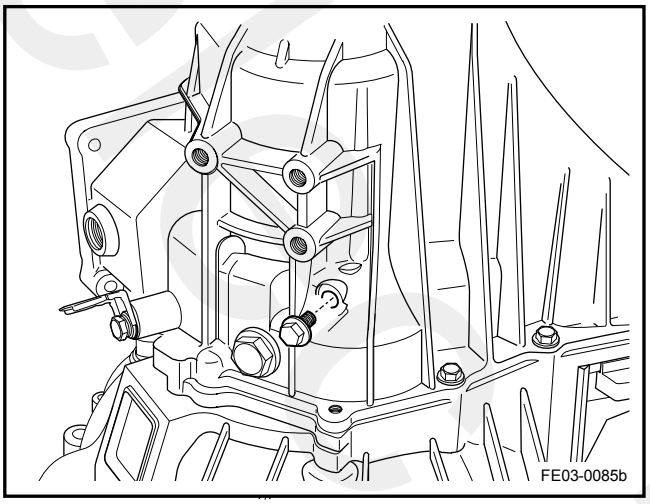
23. Install rear end cover of the transmission.



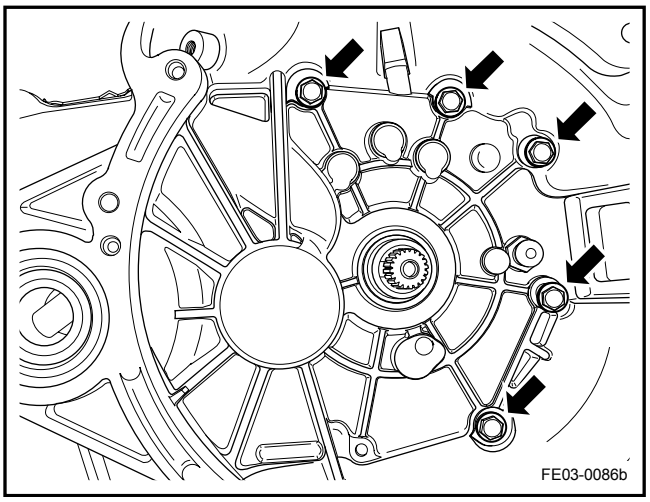
24. Install and tighten external fixed bolt of rear end cover of the transmission.



25. Install and tighten retaining bolts for reverse gear shaft



26. Install and tighten internal retaining bolt of end cover of the transmission.

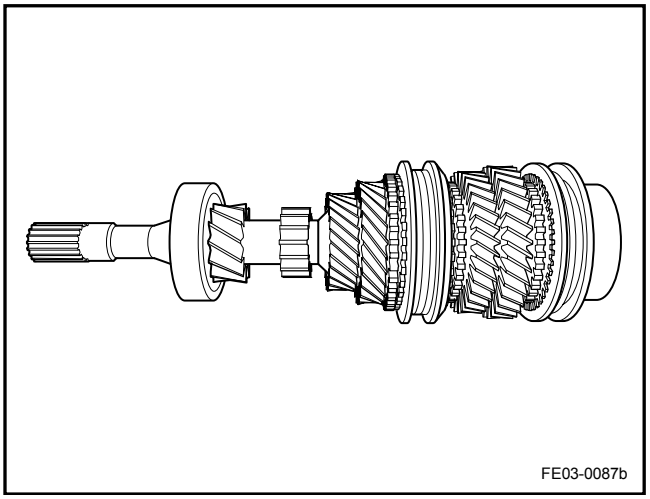


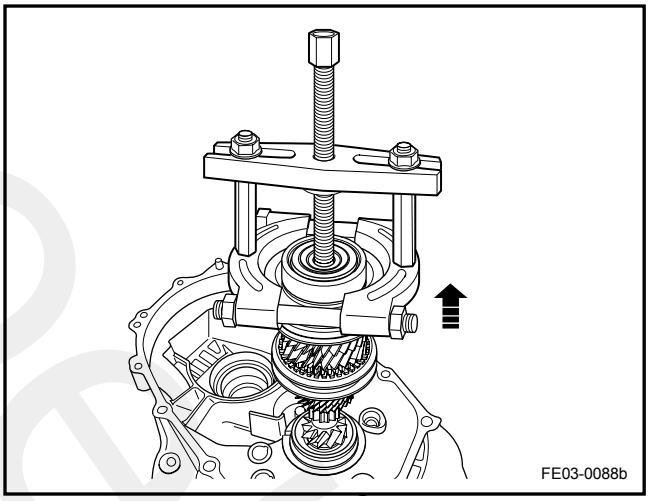
27. Install gearshift control mechanism.
28. Install transmission assembly.

3.3.8.8 Input Shaft Disassemble and Assemble

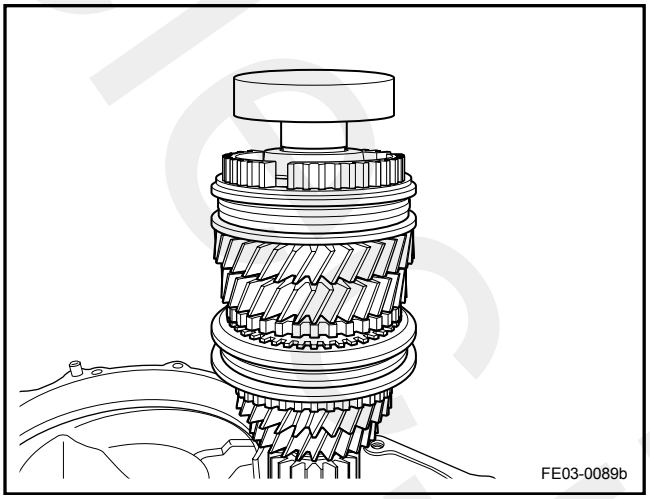
Removal Procedure:

1. Remove the transmission assembly, refer to 3.3.8.3/3.3.8.4 transmission assembly replacement.
2. Remove gearshift control mechanism, refer to 3.3.8.5 Gearshift Control Mechanism Replacement.
3. Remove shift fork shaft, refer to 3.3.8.7 Shift Fork Shaft Replacement.
4. Remove input shaft assembly inside the transmission.
5. Use special tool to pull out rear support bearing of input shaft.





6. It is the state after the bearing is pulled out.



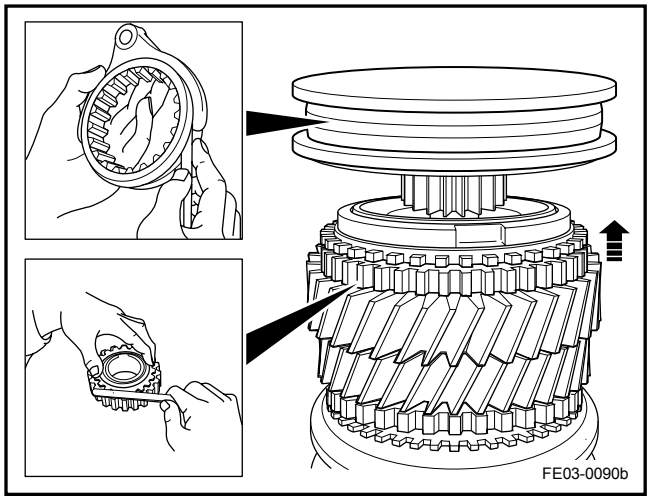
7. Take out 5th synchronizer assembly.

The distance between gear sleeve and gear shift fork:

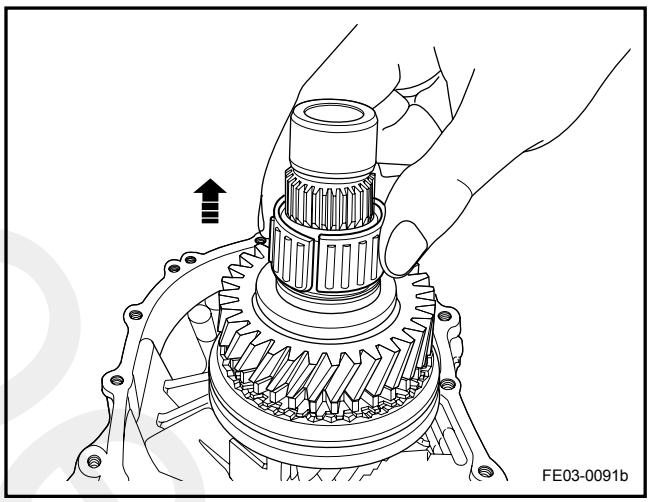
0.6mm(23.6×10^{-3}in)

The distance between synchronizer ring back and gear end surface:

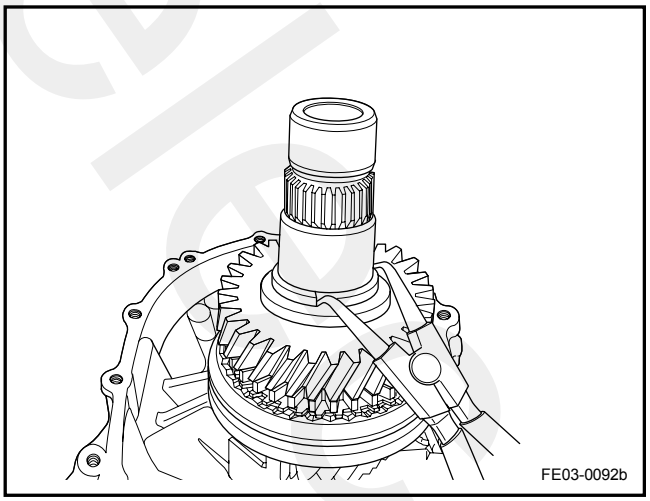
≥0.5mm(20.0×10^{-3}in)



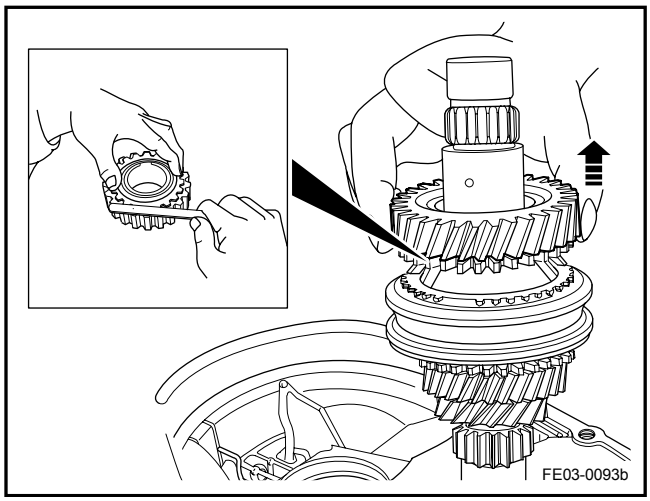
8. Take out 5th gear, needle bearing and washer.



9. Use circlip plier to take out 4th gear snap spring and washer.

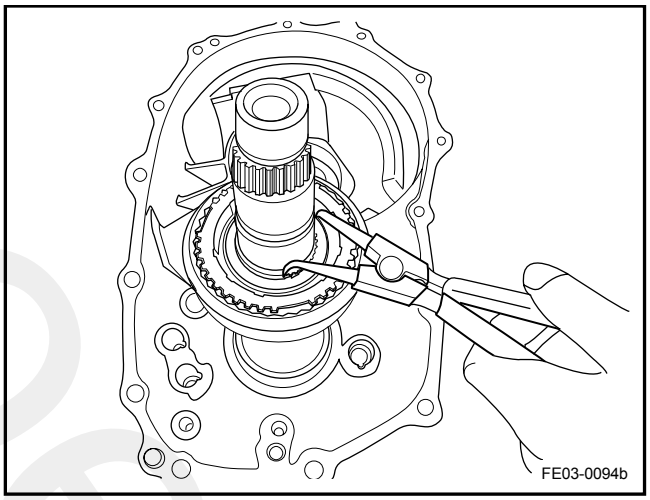


10. Take out 4th gear, needle bearing and washer.

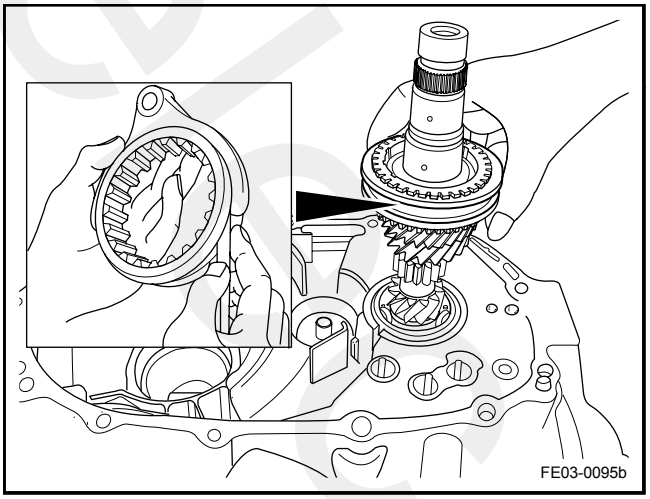


11. Use circlip plier to disassemble 3rd and 4th gear synchronizer snap spring.

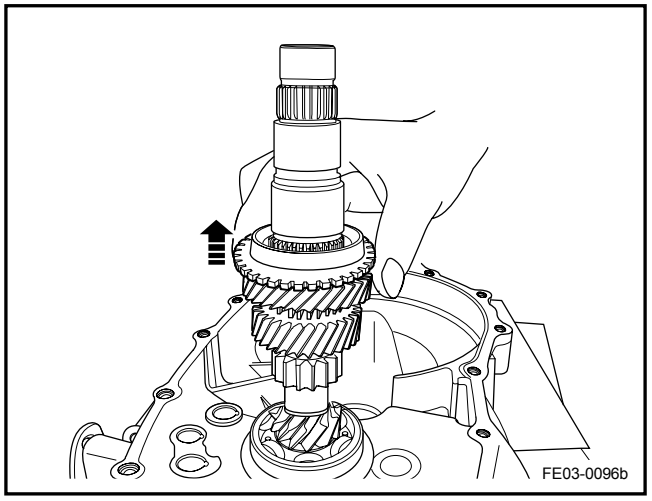
Note: before disassembling, first take out 4th gear synchronizer ring. Otherwise, it is very difficult to take out snap ring.



12. Take out 3rd and 4th synchronizer.



13. Take out 3rd gear and needle bearing.



14. It is final state after input shaft is removed.

Radial runout for input shaft:

≤0.1mm (4.0×10^{-3}in)

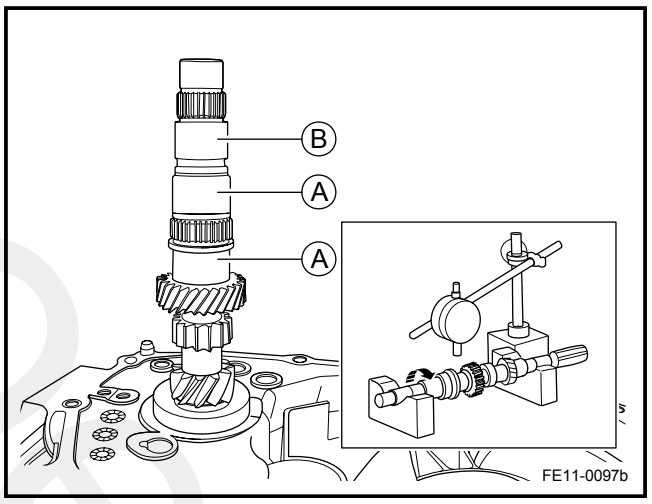
Wear and tear for input shaft

Minimum diameter of surface A:

33.925mm (1335×10^{-3}in)

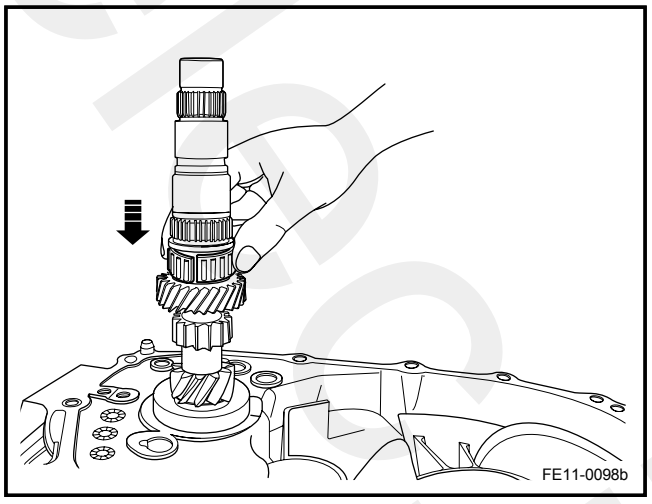
Minimum diameter of surface B:

30.925mm (1217×10^{-3}in)

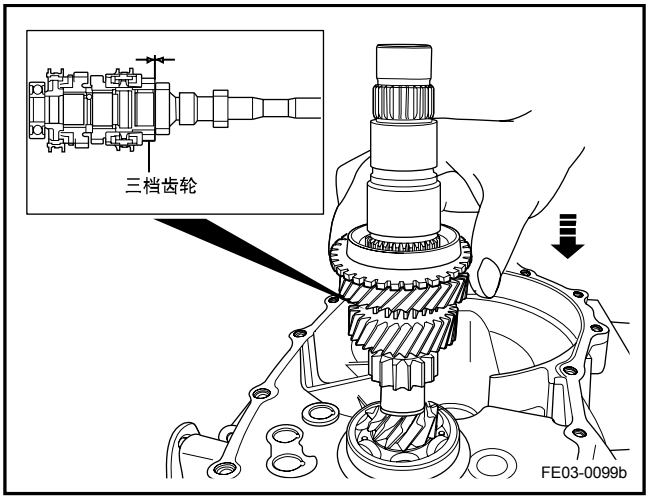


Installation Procedure:

1. Install 3rd gear needle bearing.

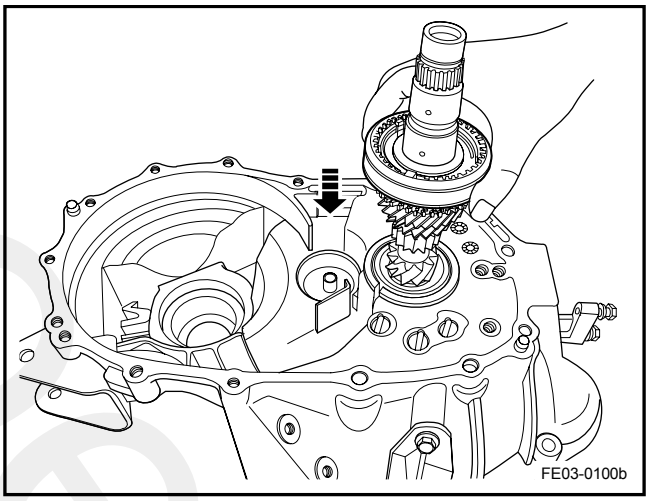


2. Install 3rd gear.

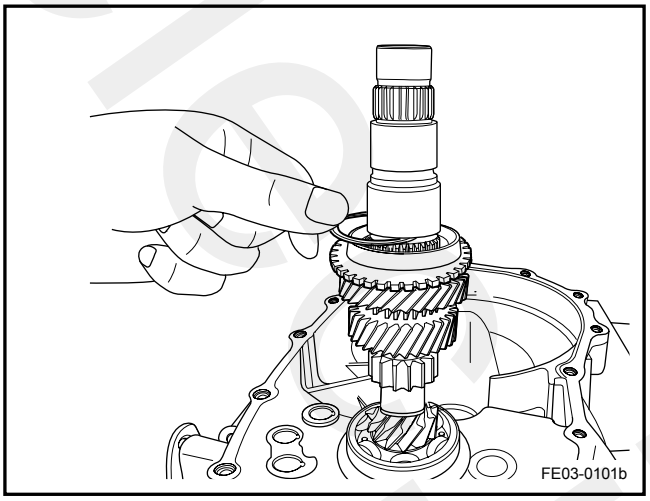


3. Install 3rd and 4th gear synchronizers.

Note: do not install 3rd and 4th gear synchronizer rings at the same time. First install 3rd gear synchronizer ring. Otherwise, it is very difficult to install 3rd and 4th gear synchronizer snap springs. A chamfer on the synchronizer shall be face to rear end of the transmission.

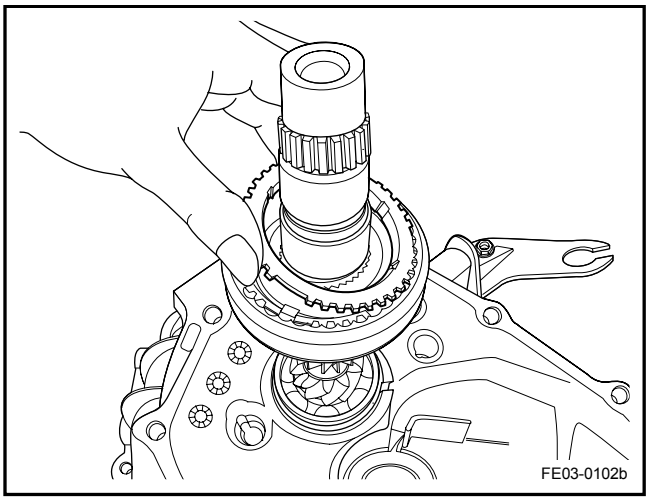


4. Install 3rd and 4th gear synchronizer snap springs.

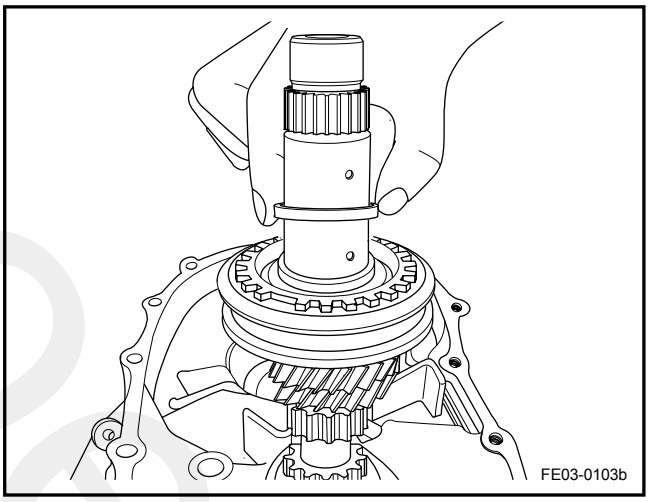


5. Install 4th gear synchronizer ring.

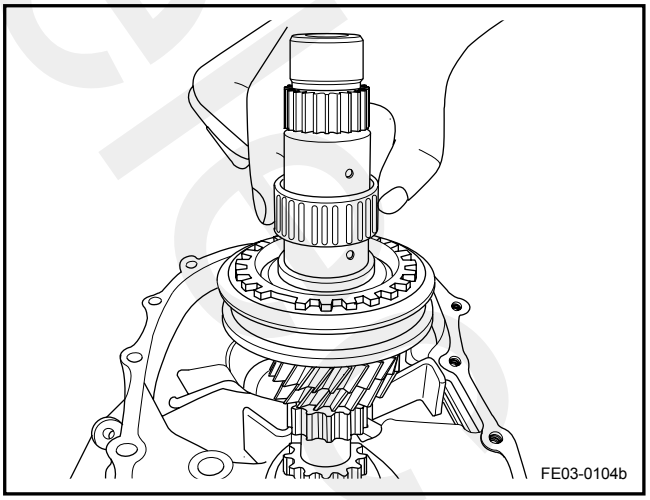
Note: The groove on the synchronizer ring shall be inserted into drive wheel of the synchronizer.



6. Install 4th gear needle bearing washer.



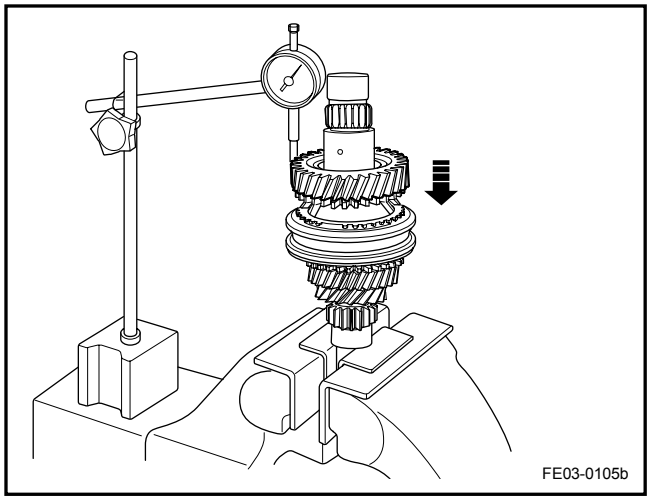
7. Install 4th gear needle bearing.



8. Install 4th gear.

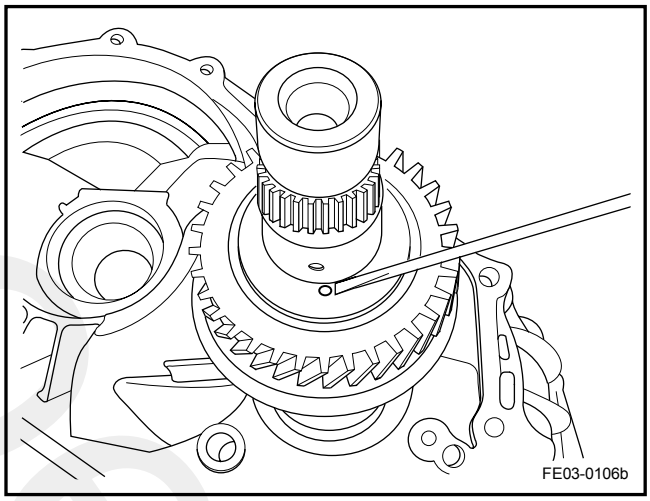
Radial clearance for input shaft 4th gear:

0.1-0.23mm(4.0-14.6×10^{-3}in)

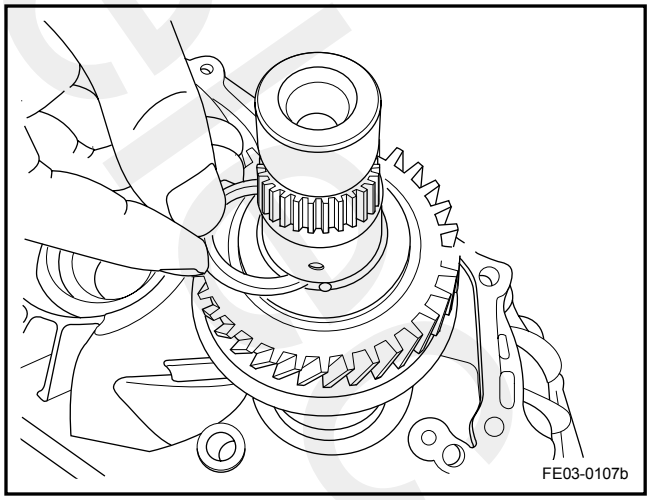


9. Install 4th gear ring.

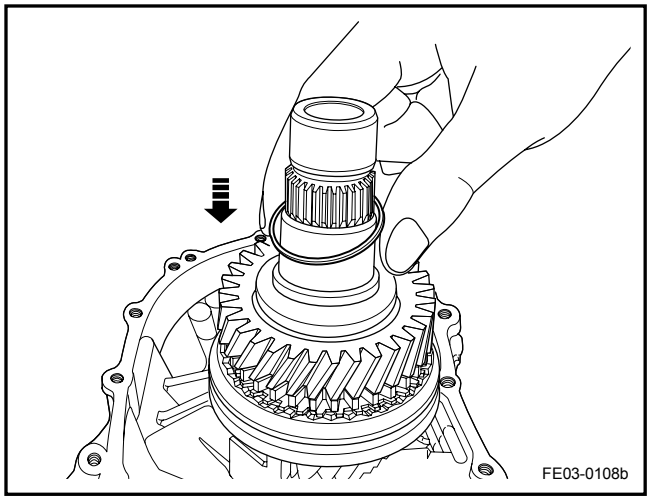
Note: The direction of limit ball on the ring shall be the same as that of the ring.



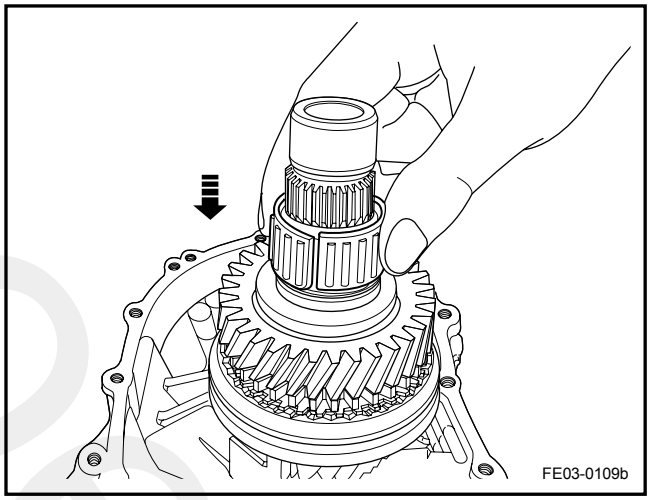
10. Install 4th gear snap spring.



11. Install 5th gear needle bearing washer.



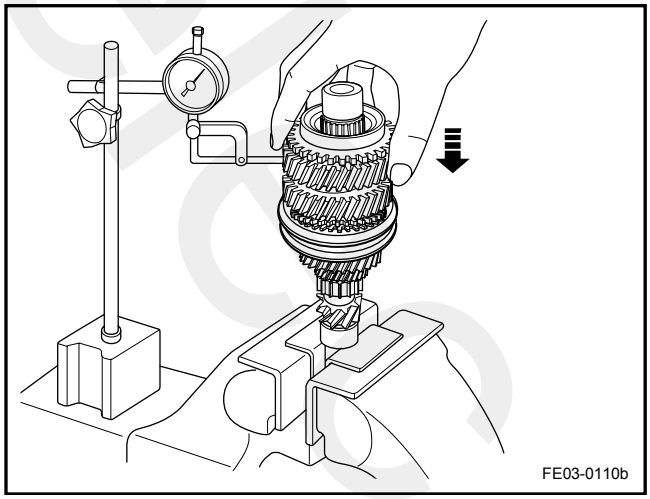
12. Install 5th gear needle bearing.



13. Install 5th gear.

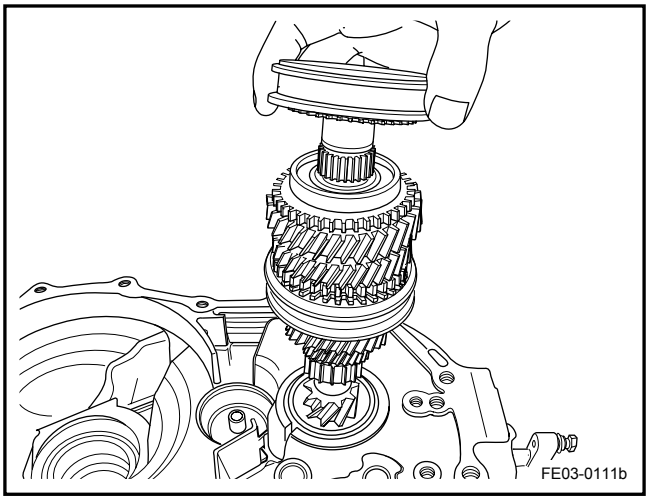
Radial clearance for input shaft 5th gear:

0.1-0.23mm(4.0-9.1×10^{-3}in)



14. Install 5th gear synchronizer.

Note: the synchronizer is directional. One surface with a projection shall face to rear end of the transmission.

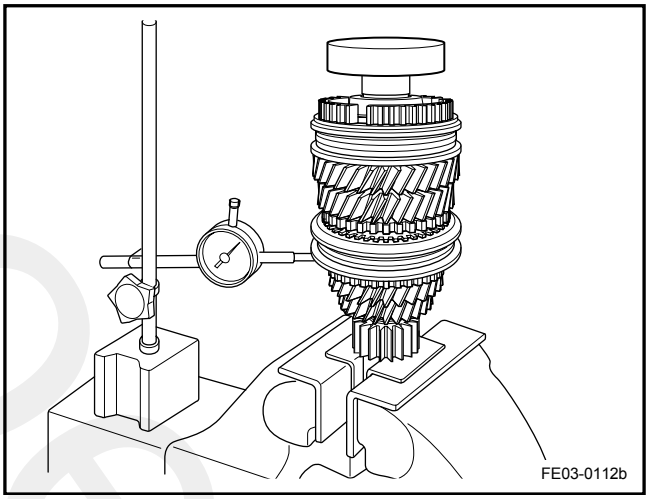


15. Install rear support bearing of input shaft.

Radial clearance for input shaft 4th and 5th gear:

≤0.1mm(4.0×10-3in)

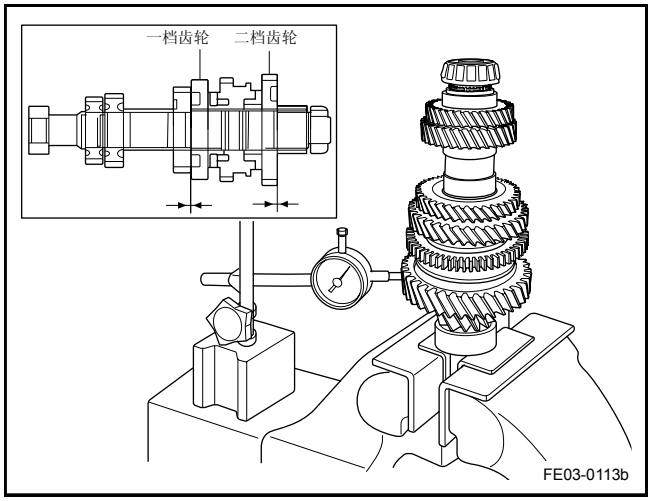
Note: the synchronizer is directional. One surface with seal ring shall face to rear end of the transmission.



16. Install input shaft assembly.
17. Install shift fork shaft.
18. Install gearshift control mechanism.
19. Install transmission assembly.

3.3.8.9 Output Shaft Disassemble and Assemble

Removal Procedure:



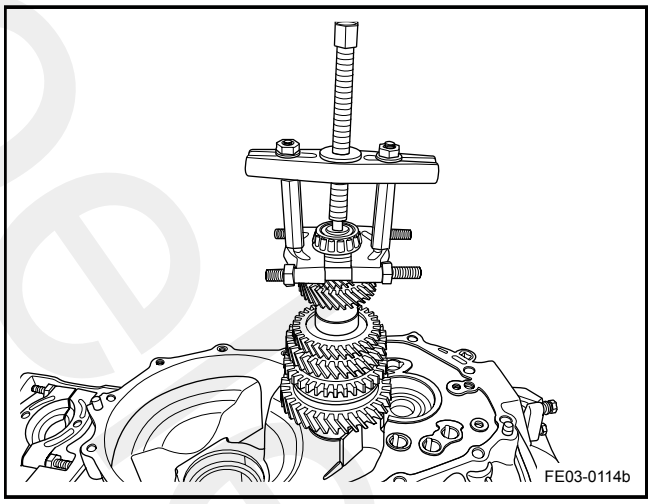
1. Remove transmission assembly, refer to 3.3.8.3/3.3.8.4 Transmission Assembly Replacement.
2. Remove gearshift control mechanism, refer to 3.3.8.5 Gearshift Control Mechanism Replacement.
3. Remove shift fork shaft, refer to 3.3.8.7 Shift Fork Shaft Replacement.
4. Remove output shaft assembly inside the transmission.

Axial clearance for 1st and 2nd gear of input shaft:

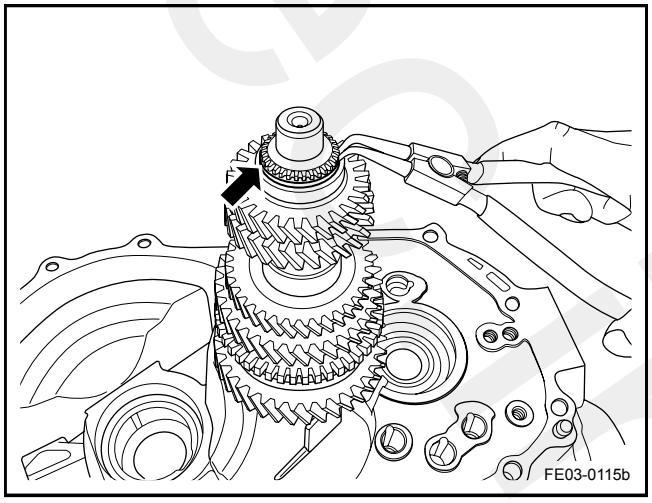
1st gear: 0.1-0.27mm(4.0-10.6×10^{-3}in）

2nd gear: 0.1-0.27mm(4.0-10.6×10^{-3}in）

Radial runout for 1st and 2nd gear of input shaft: ≤0.1mm(4.0×10^{-3}in）

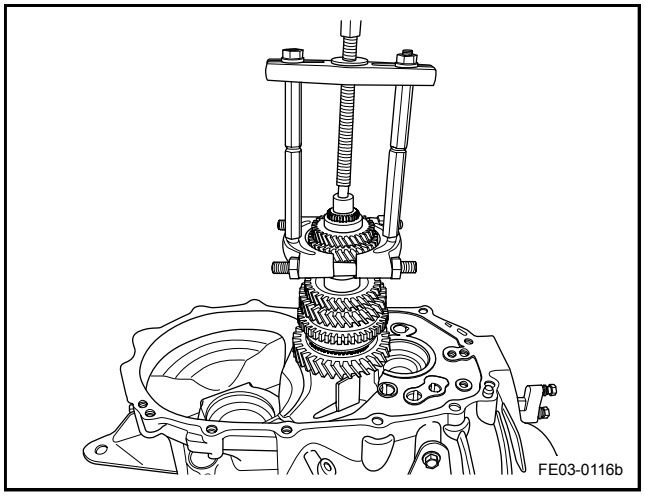


5. Use special tool, “bearing puller” to pull out rear support axle of input shaft.

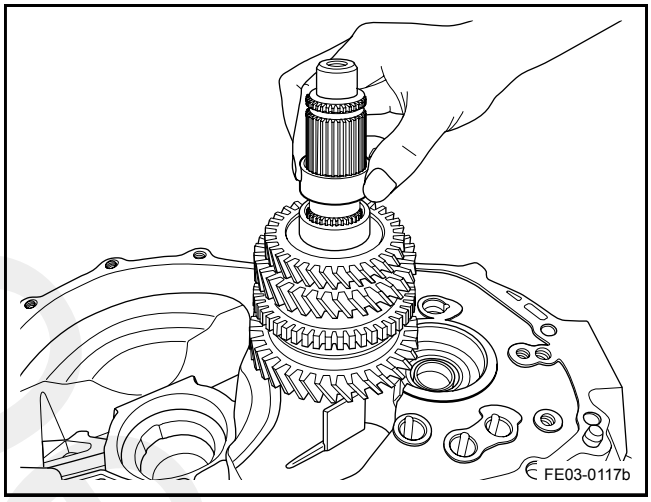


6. Use circip plier to take out 5th gear snap spring.

7. Use special tool, “bearing puller” to pull out output shaft 5th and 4th gear.

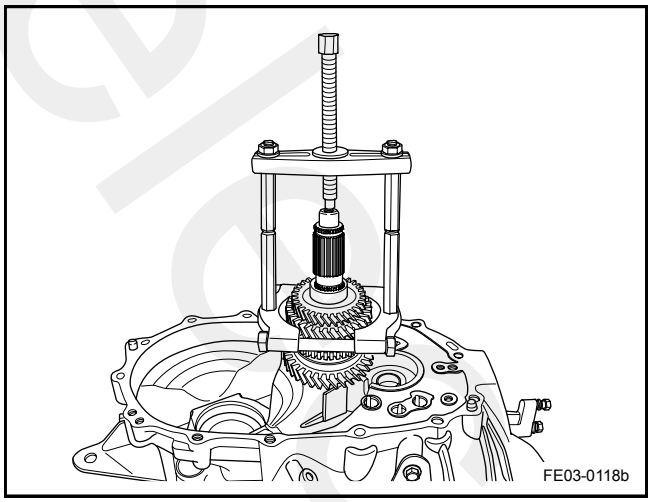


8. Take out bushing for output 4th and 3rd gear.



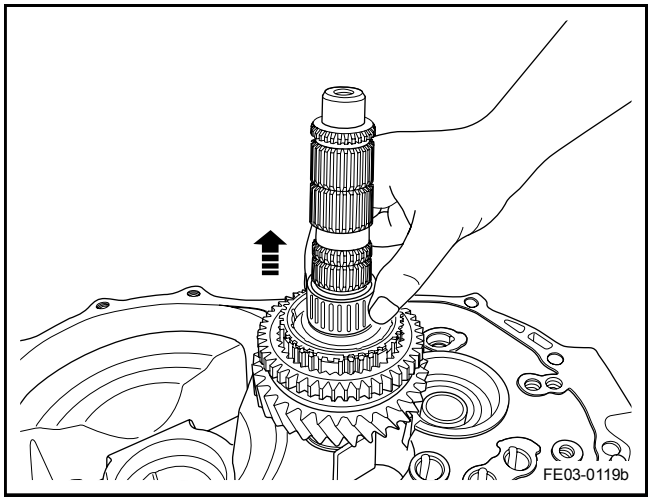
9. Use special tool, “bearing puller” to pull out output shaft 3rd gear.

Note: the clearance between output shaft 3rd gear and 2nd gear is very small. Pull out output shaft 3rd gear separately after a certain distance.

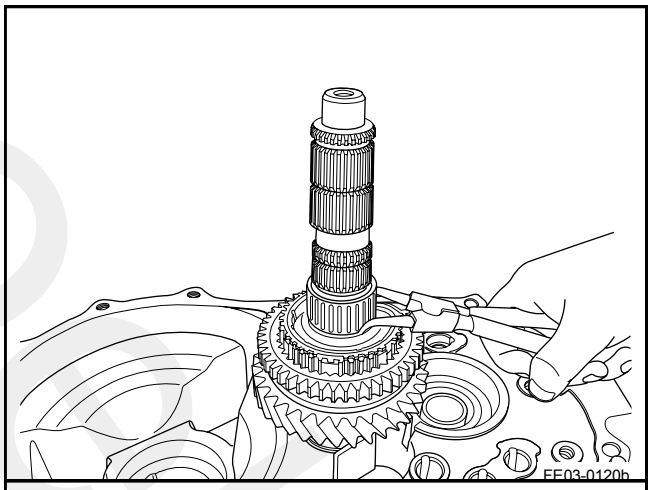


10. Take out output shaft 2nd gear, bearing and retaining ring of the bearing.

Note: there is no opening in the needle bearing. It can be taken out directly.

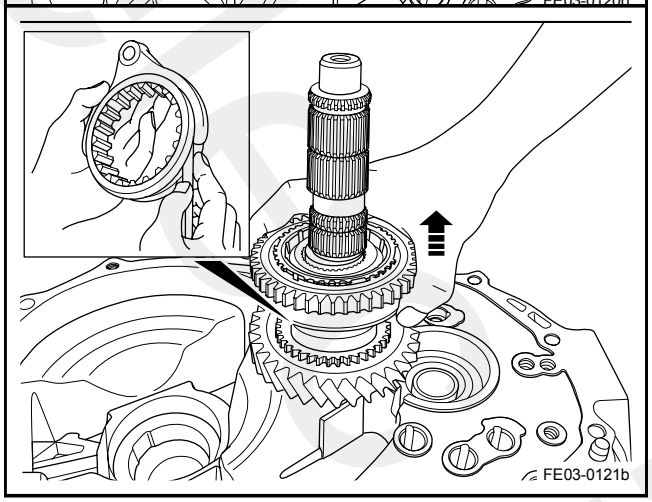


11. Use circlip plier to take out 1st and 2nd synchronizer snap springs.

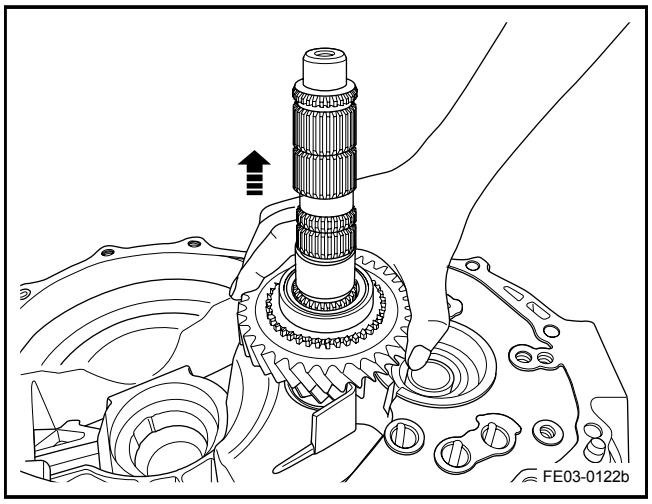


12. Take out 1st and 2nd synchronizers.

The distance between gear sleeve and shift fork: 0.6mm (23.6×10^{-3}in）

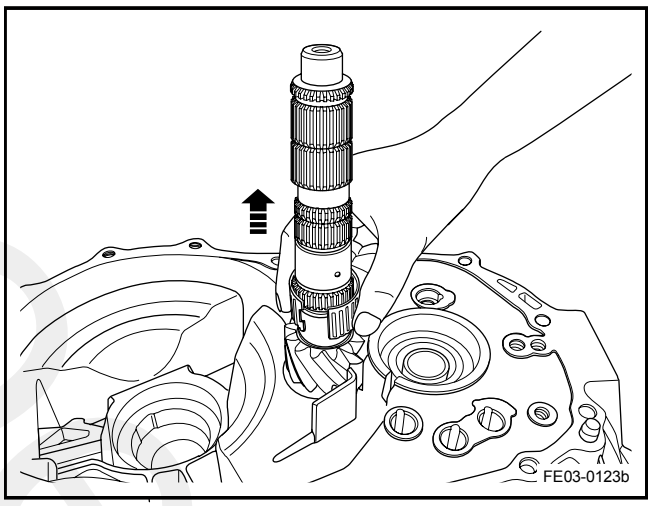


13. Take out output shaft 1st gear.



14. Take out output shaft 1st gear needle bearing.

Note: there is an opening in the bearing. Do not remove it forcedly. Otherwise, the bearing may be damaged.

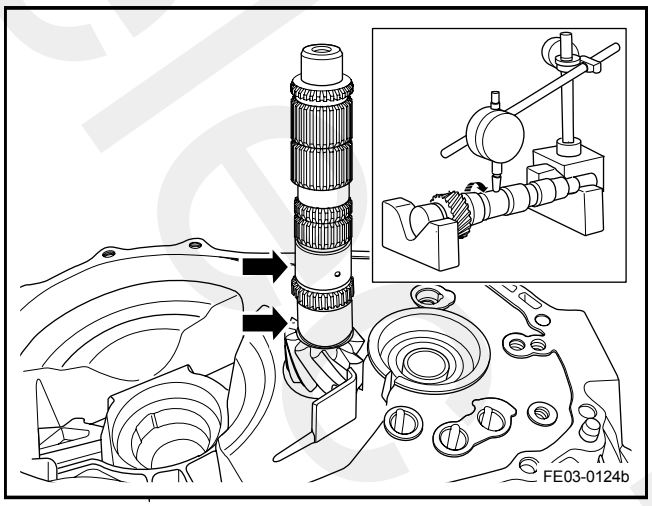


15. It is final state after output shaft is removed completely.

Wear and tear for main shaft:

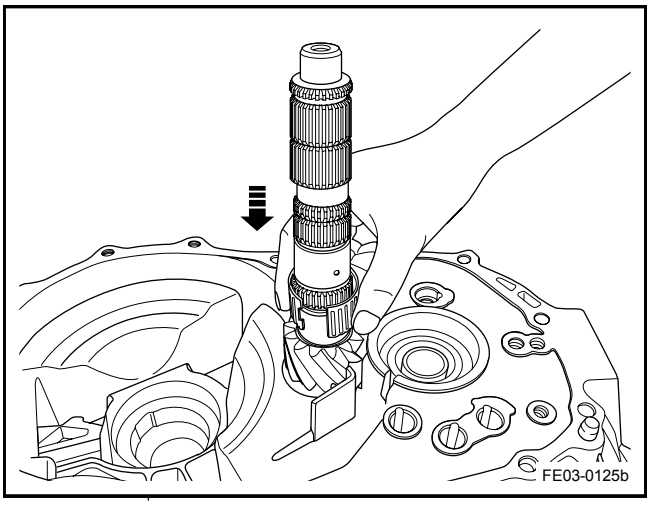
Minimum diameter is 33.925mm (1335×10^{-3}in）

Radial runout of main shaft: ≤0.1mm(4.0×10^{-3}in）

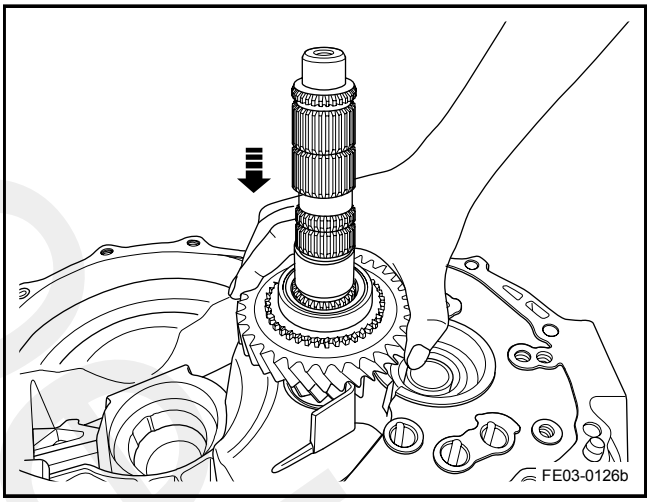


Installation Procedure:

1. Install output shaft 1st gear needle bearing.

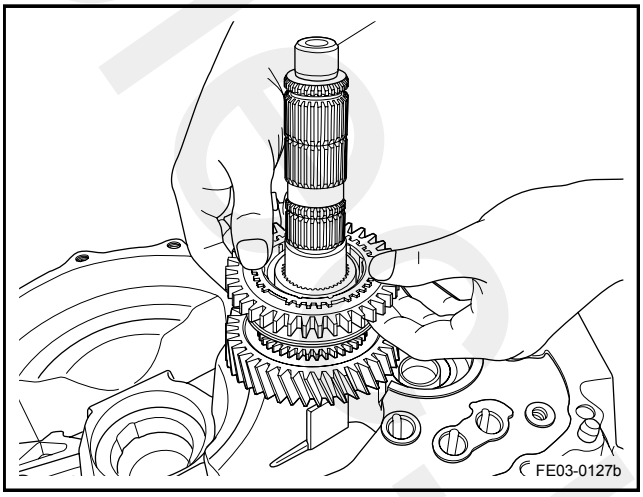


2. Install output shaft 1st gear.

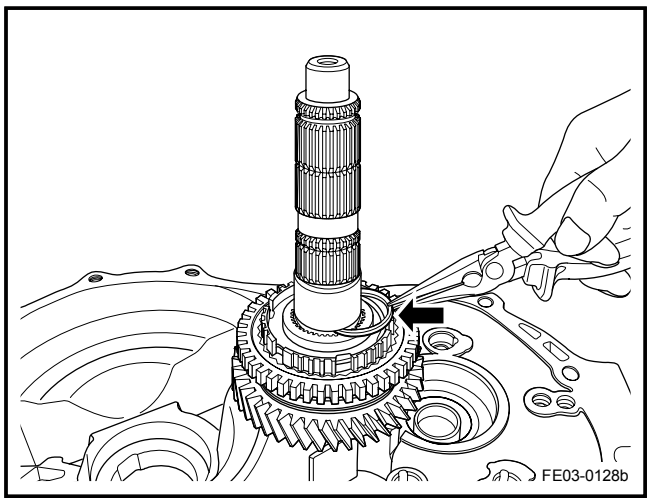


3. Install 1st and 2nd gear synchronizers.

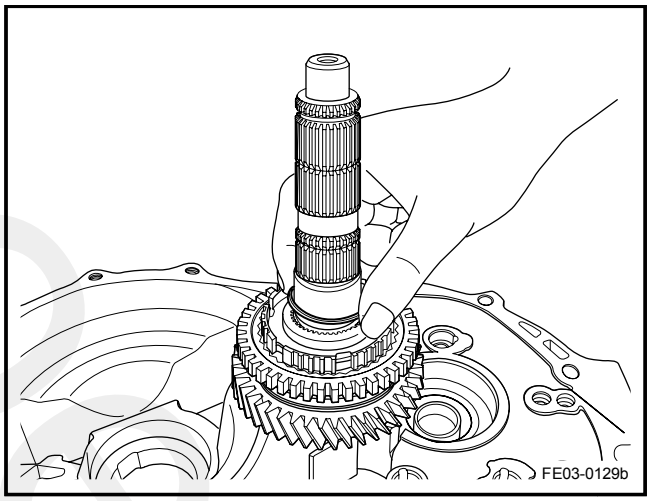
Note: Gear surface shall face to rear end of the transmission.



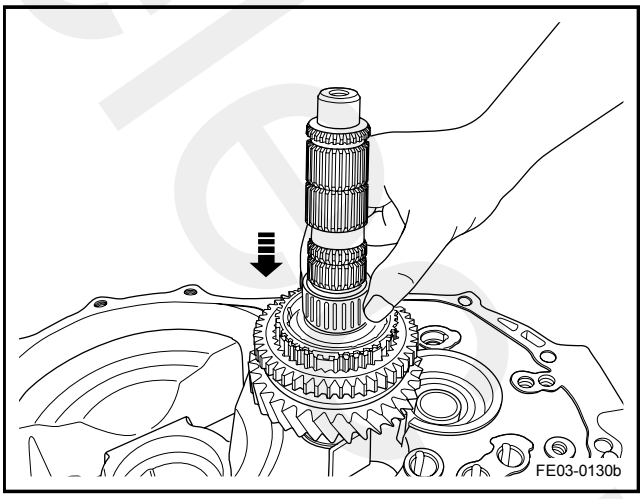
4. Install 1st and 2nd gear synchronizer snap springs.



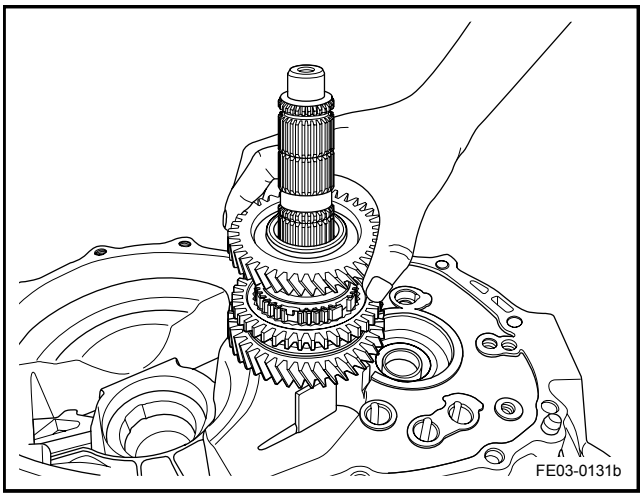
5. Install retaining ring of output shaft 2nd gear needling bearing.



6. Install output shaft 2nd gear needle bearing.

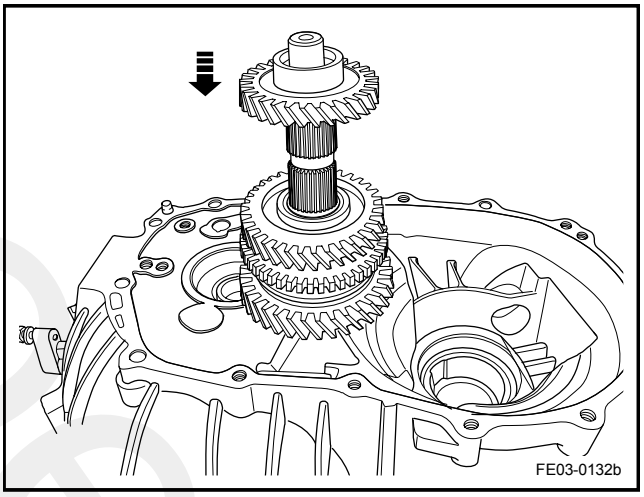


7. Install output shaft 2nd gear.

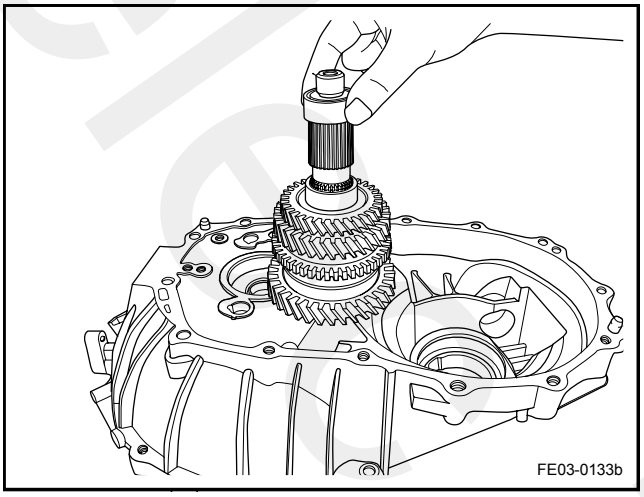


8. Install output shaft 3rd gear.

Note: Use a pressing machine to press in output shaft 3rd gear. One surface with a projection shall be upward.

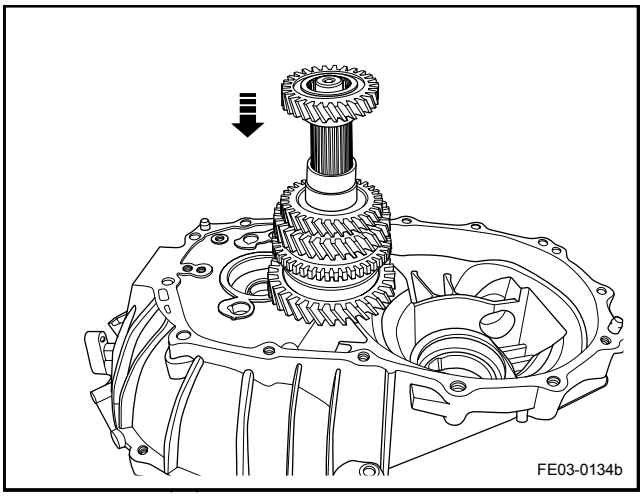


9. Install bushing for output shaft 3rd and 4th gear.



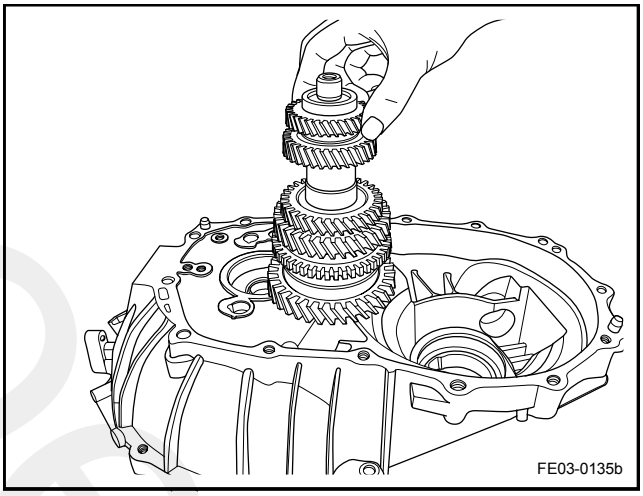
10. Install output shaft 4th gear.

Note: Use a pressing machine to press in output shaft 4th gear. One surface with a projection shall be downward.

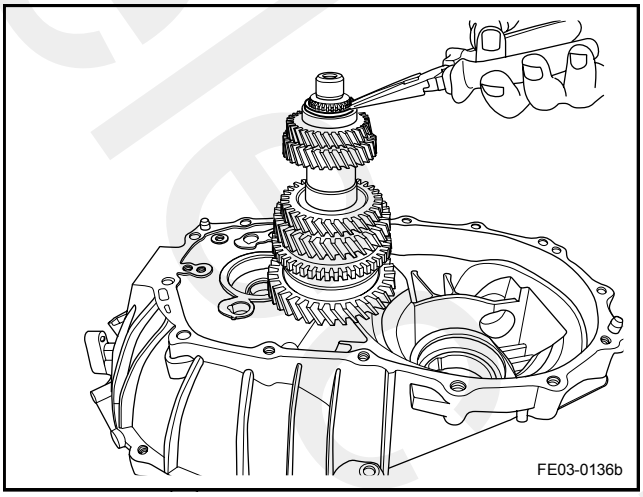


11. Install output shaft 5th gear.

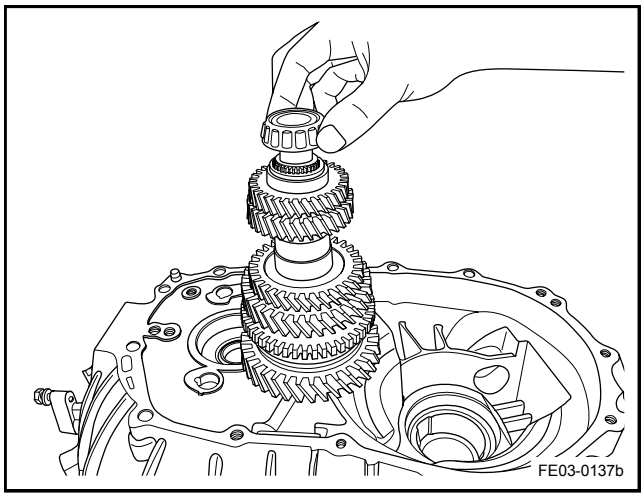
Note: Use a pressing machine to press in output shaft 5th gear. One surface with a projection shall be upward.



12. Install output shaft 5th gear snap spring.



13. Install rear support bearing of output shaft.

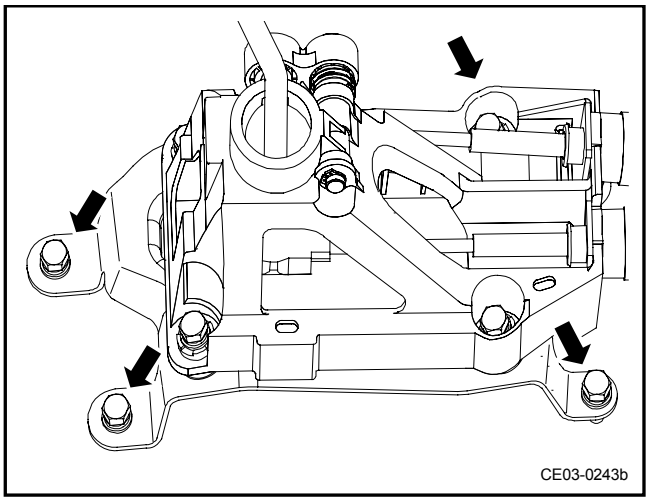


14. Install output shaft assembly.
15. Install shift fork shaft.
16. Install gearshift control mechanism.
17. Install transmission assembly.

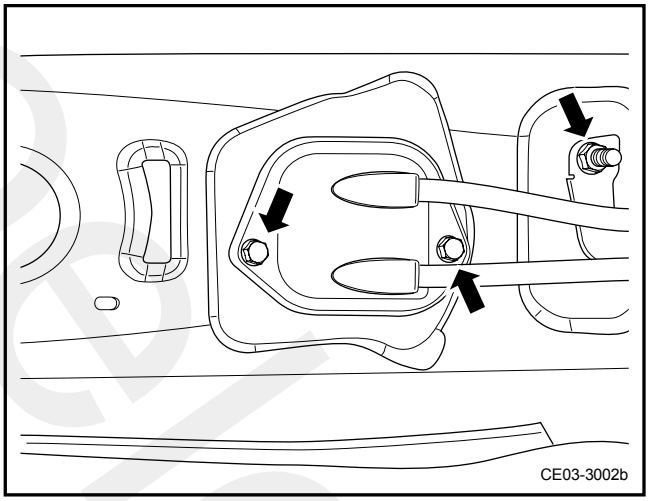
3.3.8.10 Replacement for Gearshift Lever Assembly

Removal Procedure:

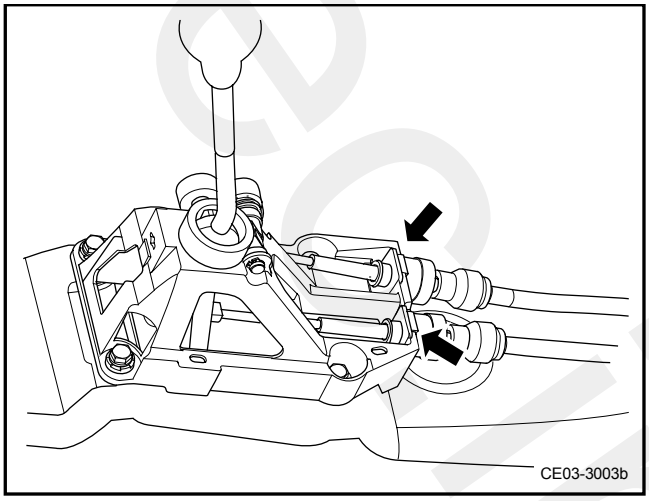
1. Remove gearshift knob, sleeve and gearshift.
2. Remove auxiliary fasia console, refer to 12.8.3.4 Auxiliary Fasia Console Replacement.
3. Remove 4 retaining bolts between manual gearshift assembly and floor.



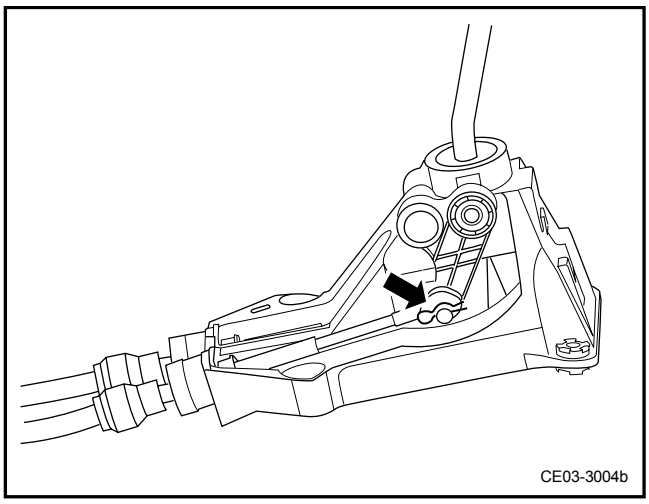
4. Remove retaining bolts of flexible shaft seal pressing plate of selector lever.



5. Remove locking pin and flat washer between flexible shaft of selector lever and rocker arm of the transmission.
6. Disconnect flexible shaft of selector lever and manual gearshift.

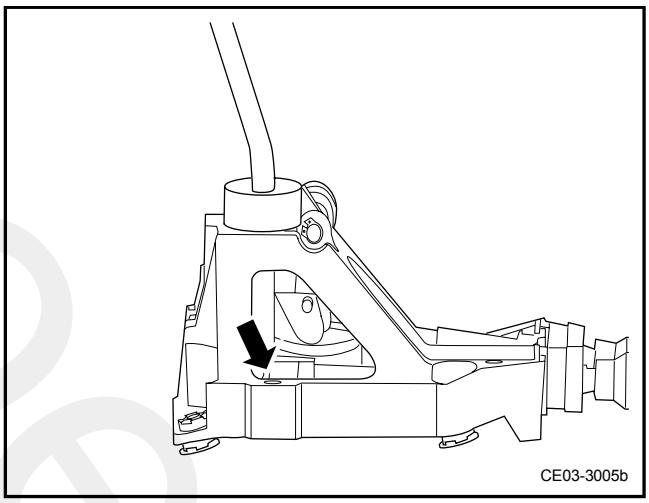


7. Remove locking pin between flexible shaft of selector lever and gearshift.
8. Disconnect flexible shaft of selector lever and gearshift.



Installation Procedure:

1. Connect flexible shaft for gearshift and gearshift lever of shifter.
2. Install locking pin between selector flexible shaft and gear shifter assembly.
3. Connect shift and selector flexible shaft assembly and manual gear shifter.



4. Install locking pin and flat washer between shift and selector flexible shaft and rocker arm of the transmission.
5. Install retaining bolts of flexible shaft seal pressing plate of selector lever.
6. Install 4 retaining bolts between manual gearshift assembly and floor.
7. Install auxiliary fasia console.
8. Remove gearshift knob, sleeve and gear shifter.

3.4 Automatic Transmission（ZA142）

3.4.1 Specification

3.4.1.1 Fastener Specifications

Fastener Name	Model	Specification	
		Metric（N.m）	US English（lb-ft）
Hexagon flange bolts	Q1840840	16～26	9.9～16.2
Hexagon head bolt, spring washer and flat washer assembly	Q1460835	16～26	9.9～16.2
Hexagon head bolt, spring washer and flat washer assembly	Q1460820	16～26	9.9～16.2
Hexagon flange bolt	Q1840840	16～26	9.9～16.2
2-type hexagon nut	Q360B06	6～12	3.7～7.5
Hexagon flange bolt	Q32006	16～26	9.9～16.2
Retaining bolts for center plate		45～55	33.2～40.6
Retaining bolts for flexible plate	M10×15	40～50	29.5～36.9
Retaining bolts for gearshift flexible shaft		6.9～13.7	5.2～10.1

3.4.1.2 Transmission Oil Specification

Model	Transmission oil capacity (L)	Transmission oil brand
ZA142	4.7	DEXRONIII

3.4.2 Description and Operation

3.4.2.1 Definition for Each Gear of Automatic Transmission

ZA142 automatic transmission joystick has six gears, including (P.R.N.D.2.L)

P（Park）- Park:

It is located in the front of the joystick. At this position, park lock mechanism of automatic transmission locks output shaft of the transmission so that drive wheel cannot rotate and the vehicle cannot move. At the same time, gearshift actuator makes automatic transmission in neutral state. When the joystick leaves P (Park) , park lock mechanism is released.

R（Reverse）- Reverse:

When the vehicle stops, put the vehicle into R gear, it will move backwards.

N（Neutral）- Neutral:

Between Reverse and Drive, when joystick is at neutral position, gearshift actuator acts like Park, that is, to make automatic transmission in neutral state. At this moment, although engine power is transferred to automatic transmission through input shaft, each gear only runs idly and output shaft has no power take-off.

D（Drive）- Drive:

After it is at Neutral, 4 gears with different drive ratios can be achieved. During the course of driving, hydraulic control system of automatic transmission can shift gears automatically according to vehicle speed, openness of throttle valve and the set gearshift rule.

2- Second Gear:

Control system of automatic transmission limits the range of D (Drive). When the joystick is at 2 Gear, automatic transmission shall shift gears only between 1^{st}, 2^{nd} and 3^{rd} gear.

L- Low Gear:

When the joystick is at L, automatic transmission is fixed between 1^{st} and 2^{nd} gear.

3.4.2.2 Proper Use and Operation for Vehicle

Note:

- ***After the engine is started, wait for a few seconds and put into gear.***
- ***In winter, after the engine is started, preheat for 1 minute.***
- ***When stepping, step on brake pedal, press lock button and put into gear. Finally, release park brake and step on the accelerator slowly to speed up.***
- ***First put into gear and step on accelerator pedal. It is forbidden to put into gear while stepping on the accelerator or first step on the accelerator and then put***

into gear.

Driving on General Road:

In order to reduce fuel consumption, put the vehicle into D (Drive), keep accelerator openness within the range of less than 1/2 openness as far as possible. When driving at variable speed and overtaking a car on the road, it is better to turn joystick from D to 2, then step on the accelerator. After overtaking, turn the joystick from 2 to D.

Reversing:

After the vehicle stops stably, turn the joystick to R position. When reversing on a flat road, release accelerator pedal completely to reverse at idle speed.

Driving on a slope:

When climbing or going downhill at a long distance, select 2^{nd} gear, the vehicle will shift gears automatically among 1^{st}, 2^{nd} and 3^{rd} gears according to throttle openness and vehicle speed so as to avoid unnecessary shifting into high gears. When going downhill, engine brake result can be used. When climbing or going downhill sharply, select L (Low), now the vehicle is always between 1^{st} and 2^{nd} gear so that engine brake result is utilized to the highest extent.

Driving on snowy or muddy road:

When the wheels are slipping at D (Drive), turn the joystick to L (Low) or 2^{nd} gear, limit highest gears of automatic transmission, use accelerator openness to control wheel speed.

Temporary Parking:

When the vehicle parks temporarily at a cross road due to traffic signals or traffic jam, keep the joystick at D (Drive) and only use braking park so that the vehicle can restart only brake pedal is released. If the vehicles parks for a long time, it is better to turn the joystick to N (Neutral) and tension parking brake to avoid hydraulic oil of automatic transmission from becoming overheated.

Vehicle Parking:

When parking, step on brake pedal, turn the joystick to P (Park) after the vehicle stops stably and tension parking brake, turn off ignition switch.

3.4.2.3 Notices for ZA142 Automatic Transmission

In order to take full advantages of automatic transmission and avoid earlier damage due to improper operation, the following attentions shall be paid when driving the vehicle equipped with ZA142 automatic transmission:

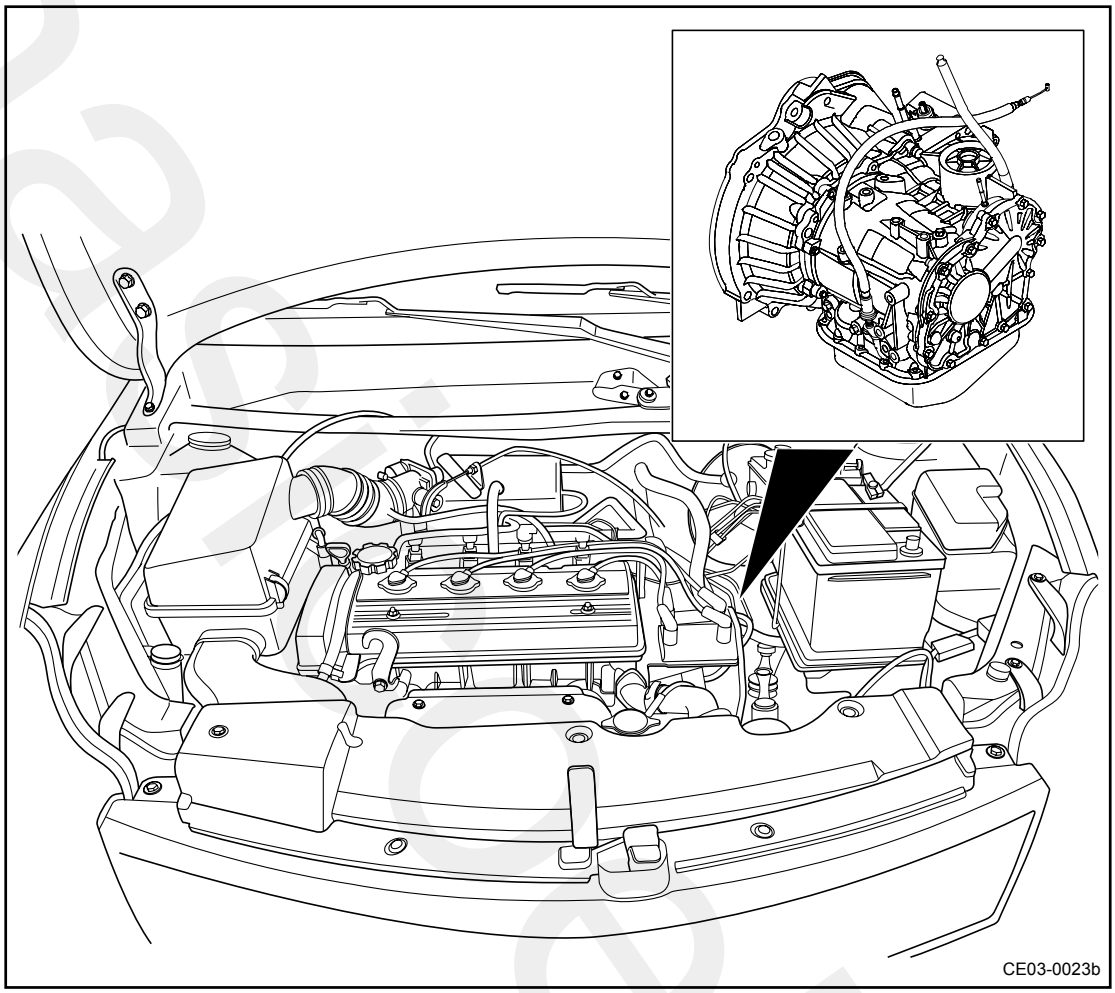
- ***When driving, the joystick can be turned among D (Drive), 2 and L (Low). But it***

is forbidden to select N when going downhill. Because the engine runs idly, oil pump capacity in automatic transmission through the pump driven by the engine is reduced and gears in automatic transmission still run at a high speed, these parts may be damaged because of poor lubrication.

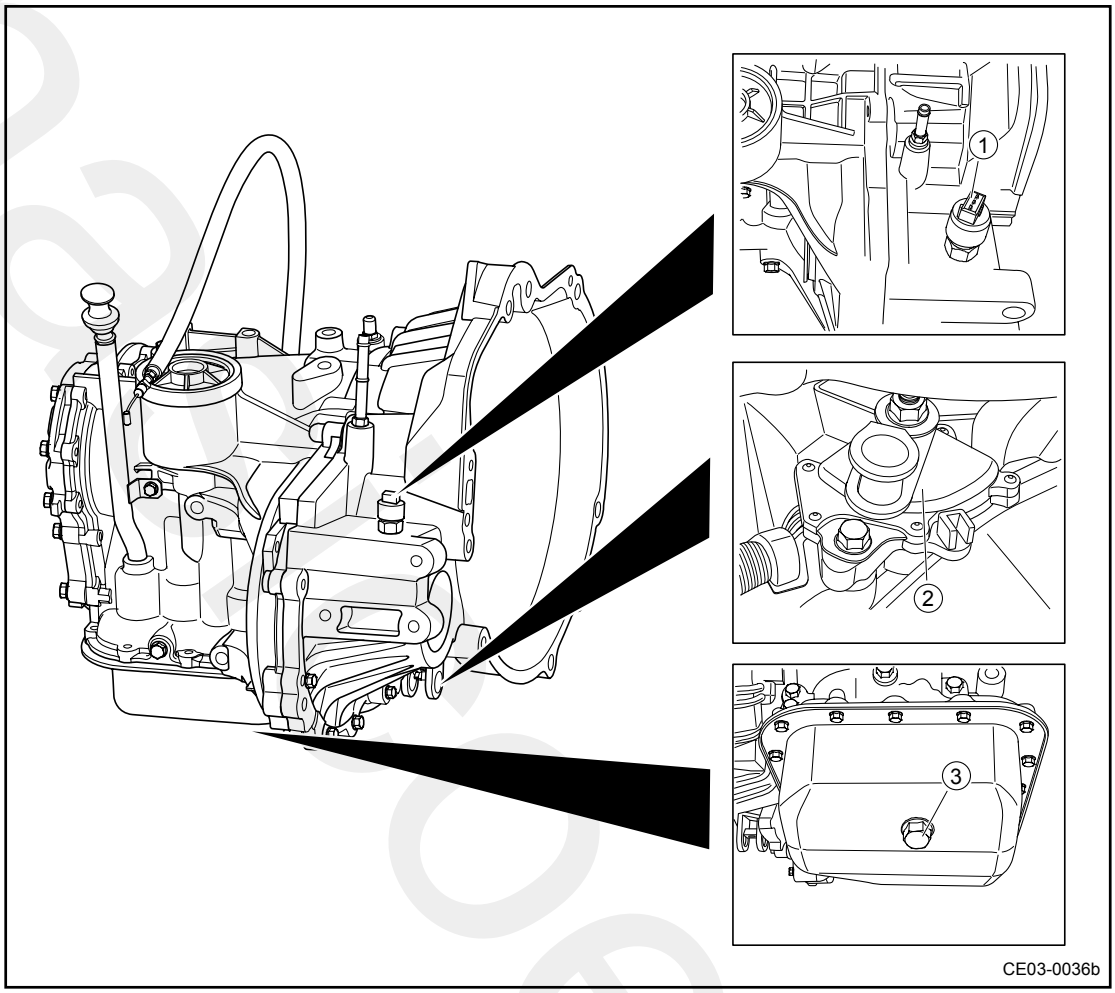
- *When driving, it is forbidden to step on the accelerator suddenly except special requirements. Otherwise, gear shifting will be uncomfortable. During the course of driving, do not step on the accelerator violently at the moment when automatic transmission upshifts or downshifts. Otherwise, it will increase the impact of gearshift.*
- *It is emphasized that it is forbidden to shift from D (Drive) to R (Reverse) or from R (Reverse) to D (Drive). Otherwise, it may damage friction lining and brake band of automatic transmission.*
- *Joystick can be turned to P (Park) only after the vehicle stops stably. Otherwise, automatic transmission will send a harsh noise and park lock mechanism will be damaged.*
- *Idle speed that has been set shall be followed. Too high or low idle speed will affect the result of automatic transmission. Too high idle speed will cause strong displacement when put the vehicle into gear. Too low idle speed will make the vehicle move back when the brake is released but the accelerator is not stepped on immediately on the slope, which makes startup on the slope more difficult.*
- *In order to prevent automatic transmission from being damaged due to improper operation, automatic transmission joystick is provided with a lock button. When shifting gears, the lock button shall be pressed. Otherwise, the joystick will be locked. ① Shifting from any gear to R. In addition, when shifting gears among D, 2 and L, if gear shifting is made in "L →2→D" order (from low gear to high gear), it is not limited by vehicle speed. But if gear shifting is made in "D →2→L" order, it shall be made in turn.*
- *The vehicle equipped with automatic transmission cannot be started by means of traction.*
- *When being dragged, gearshift shall be at N, with traction speed less than 50km/h and the distance less than 50km. If the distance is longer, it is necessary to place front wheel on the tractor truck.*

3.4.3 Component Location

3.4.3.1 Automatic Transmission Position



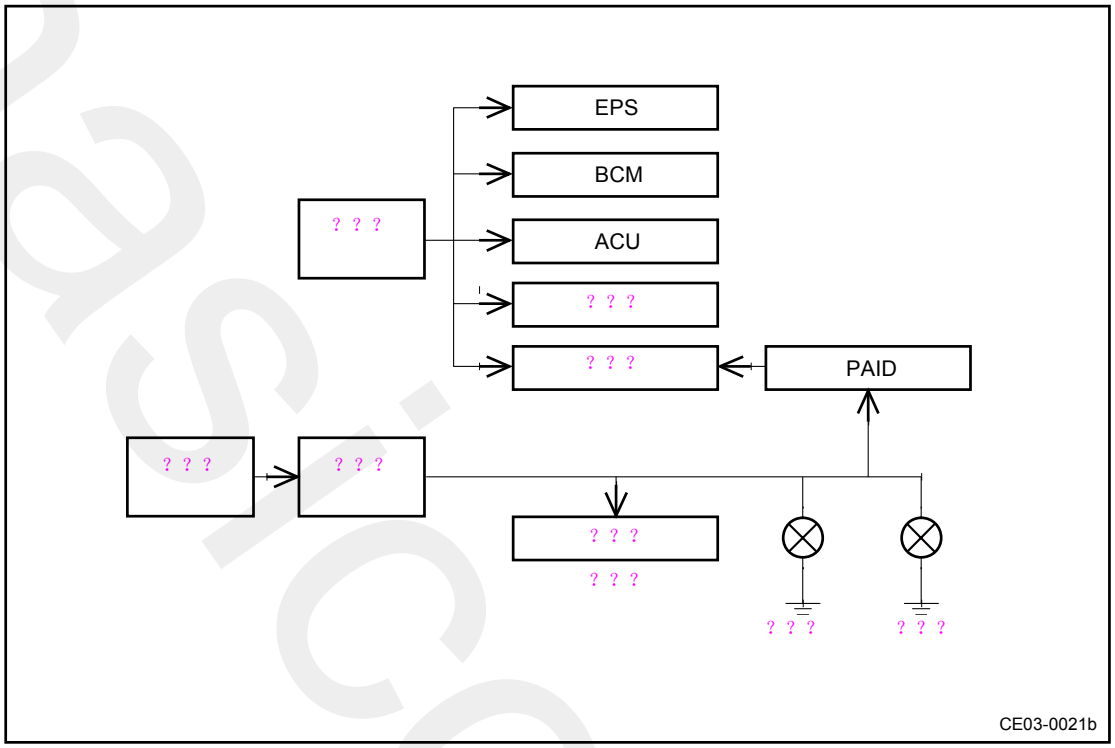
3.4.3.2 Positions for Gear Select Switch and Vehicle Speed Sensor



1. Vehicle Speed Sensor
2. Gear Select Switch
3. Oil Drain Plug for Automatic Transmission

3.4.4 Electric Schematic

3.4.4.1 Electric Schematic of Reverse Switch and Vehicle Speed Sensor



3.4.5 Diagnostic Information and Procedures

3.4.5.1 Diagnosis Description

Refer to 3.4.2 Description and Operation. Get familiar with the contents of system functions and operation before starting system diagnostic, so that it will help to determine the correct diagnostic steps, more importantly, it will also help to determine whether the customer described situation is normal.

3.4.5.2 Visual Inspection

Common faults of transmission include difficult gear shifting, gear stuck, gear collision and abnormal noise from grinding. However, the above faults also arise from drive system faults. Therefore, it is necessary to differentiate them during the course of maintenance.

Before maintenance, make general check on transmission and clutch:

- Check if the transmission and pipeline leak;
- Check transmission oil level, oil viscosity and color; check if oil is dirty or contains metal grain to preliminarily determine if components in the transmission are stuck or damaged;
- Check if the transmission and peripheral parts, bolts and nuts are loose or fall off;
- Put the vehicle into gear for check to determine vehicle state when the fault occurs so as to make further diagnosis.

Before eliminating abnormal noise of the transmission, it is necessary to differentiate abnormal noise of torque converter, drive shaft and engine. At the same time, abnormal noise from external parts shall be excluded.

Before eliminating abnormal noise of the transmission, the following items shall be identified:

- Noise when driving on the road

  It includes noise from tyres, road, wheel bearing, engine and exhaust system. The noise may be different due to vehicle size, type and damping material in the body.

- Noise in drive shaft system

  Drive shaft system, used as a mechanical device, may generate a little noise when operating normally. In order to identify abnormal noise:

  1. To drive on a good road to reduce tyre friction and noise from body vibration;
  2. To drive for a long distance to preheat lubrication oil enough;
  3. Record vehicle speed and transmission gear when noise occurs;
  4. To determine if there is any noise when the vehicle drives under the following

conditions:

- Accelerating slowly or quickly;
- On a flat road, throttle valve shall be opened a little to keep running at a constant speed;
- The vehicle is slipping when it is put into gear through the transmission and throttle valve is closed.

5. When the vehicle stops but the engine still runs, check if there is any abnormal noise.

- Bearing Noise

1. Differential Gear or Bearing Noise

   Noise from differential side bearing and noise from wheel bearing can be confused easily. Because differential side bearing has pre-tightening force, even the wheels are off the ground, noise from differential side bearing still exists as long as the differential and drive shaft are running.

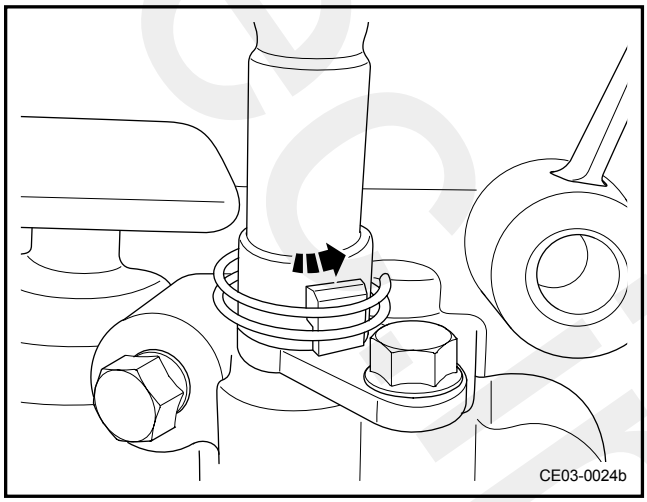
2. Wheel Bearing Noise

   When the transmission is in Neutral and the vehicle is sliding, wheel bearing will send friction sound. Because wheel bearing has no pre-tightening force, noise from wheel bearing will reduce greatly when the wheels are off the ground.

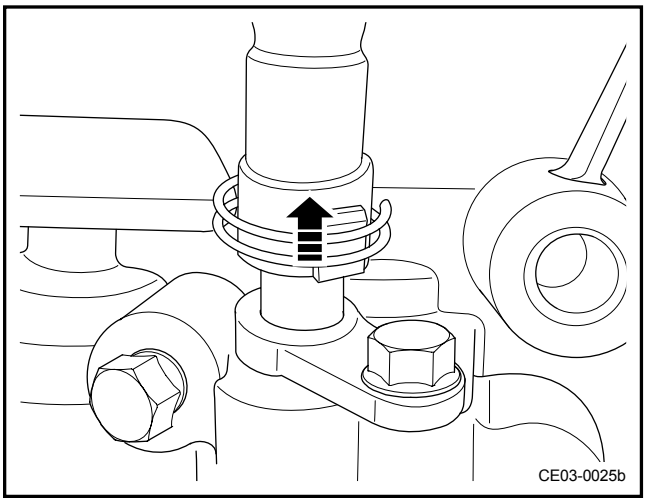
- Internal wear and deformation of the bearing, bearing race sag; tiny grain in the bearing and race; or foreign matter in the bearing and race which leads to locking; bearing and race becoming loose due to wear and tear; which reduce noise or make the system operate abnormally.

3.4.5.3 Throttle Valve Cable Adjustment

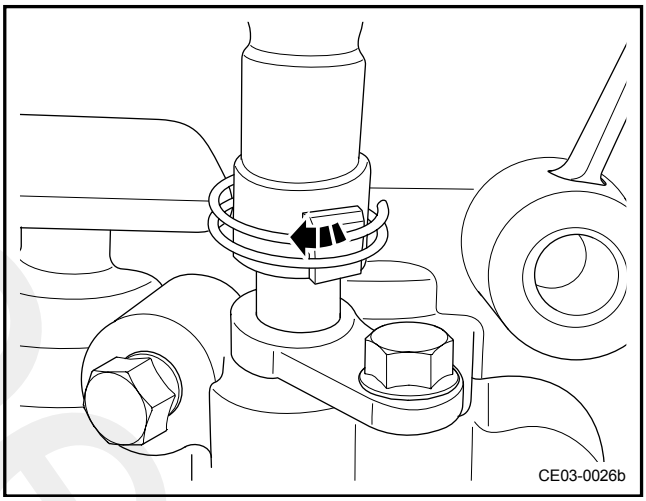
First, use a plier to clamp hexagonal position at the lower of throttle valve cable. Then rotate the cable 60°～90°.



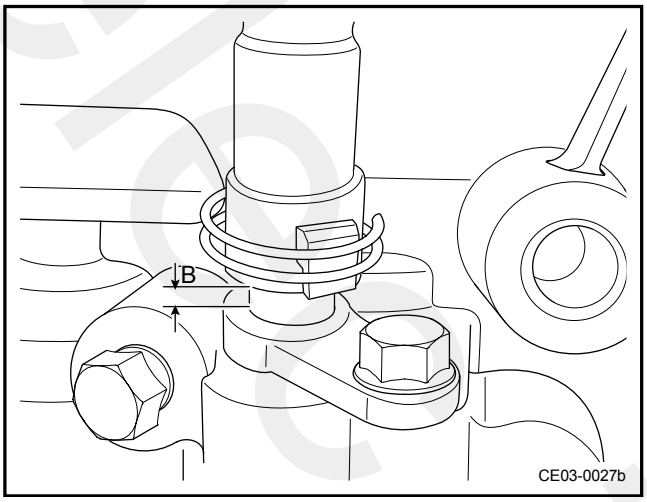
Lift up throttle valve cable to make adjustable part of throttle valve cable move to the highest position.



Turn back 60～90° and clamp it.



In the end, step on accelerator pedal completely. When throttle valve sends “click, click” sound, observe the distance B at the lower of throttle valve. If it is B=2～8mm, throttle valve adjustment is over. If not, repeat it until it meets this requirement.



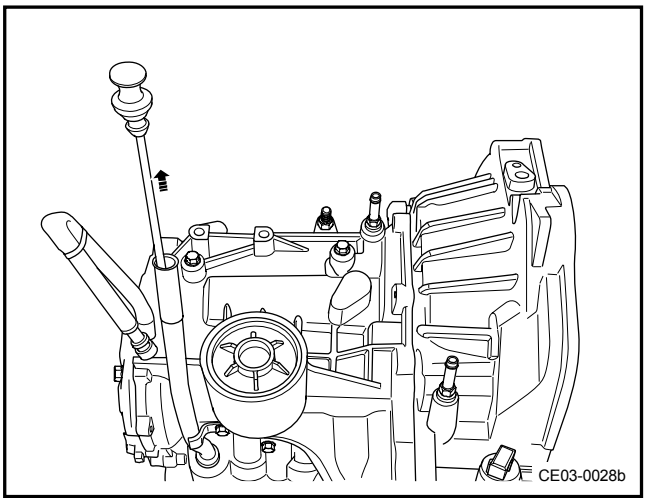
3.4.5 Removal and Installation

3.4.5.1 Transmission fluid Level Inspection

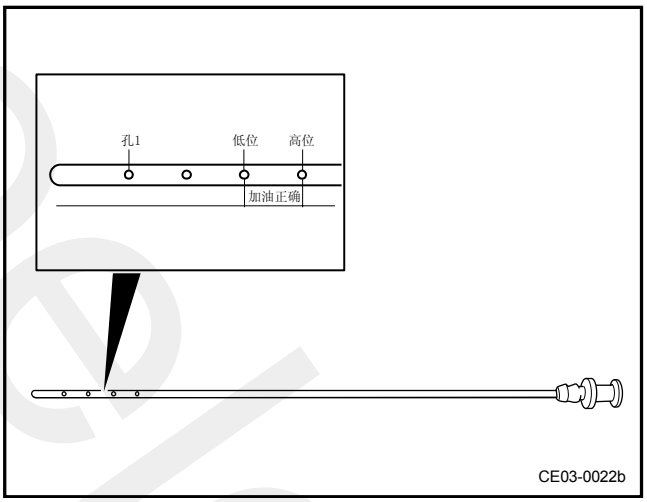
Inspection Procedure:

Note: If the transmission fluid temperature is too high during the inspection, it may cause burns!

1. Park the vehicle on a level ground, wait for the transmission fluid cooling down, remove the transmission fill plug and check the transmission fluid level.



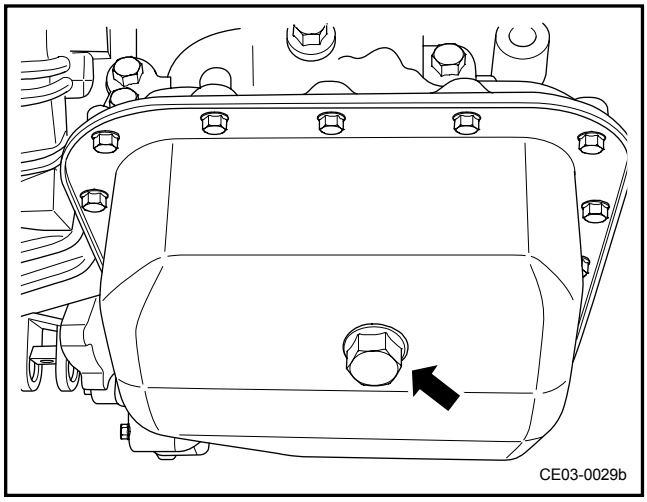
2. Check if oil level is normal.
3. If the liquid level is too low, fill transmission oil through filler port until oil overflows.



Note: first turn the joystick to "P", then start the engine, pull out oil dipstick, fill 4.5L (at present, oil quantity for cooler, water tank and oil pipe cannot be calculated, therefore, oil quantity is estimated value for reference only) ATF oil (*note: ATF temperature is 50℃~60℃*) into the transmission through filler port, turn the joystick in the order of *P→R→N→D→2→L*, then from L to P (stay for more than 10 seconds at each position). Now, insert oil dipstick into filler pipe and then take it out after it is plugged. Remove oil on the dipstick, insert the dipstick into filler pipe again and take it out after it is plugged. Now observe oil level. If oil level is between the third round hole and the fourth round hole, it is acceptable. Then insert oil dipstick into filler pipe and plug it. When the temperature of the transmission increases to 80℃, if the oil level is around the fourth round hole, it is normal.

Note:"ATF" is only used for automatic transmission. The brand is DEXRONⅢ.

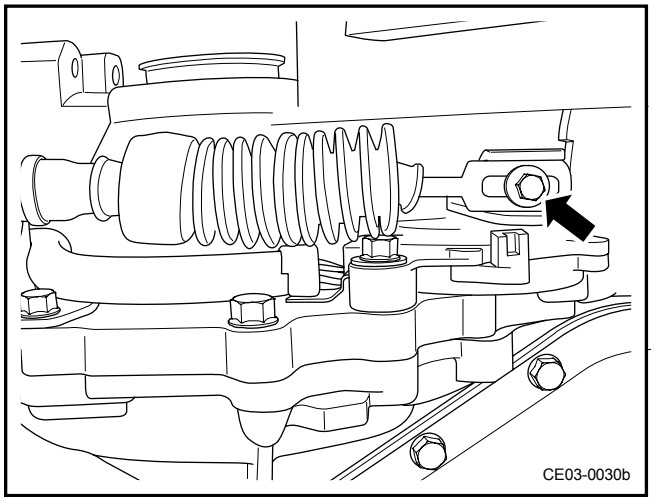
4. If needed to replace the transmission fluid, remove the transmission fluid plug and drain out the transmission fluid.



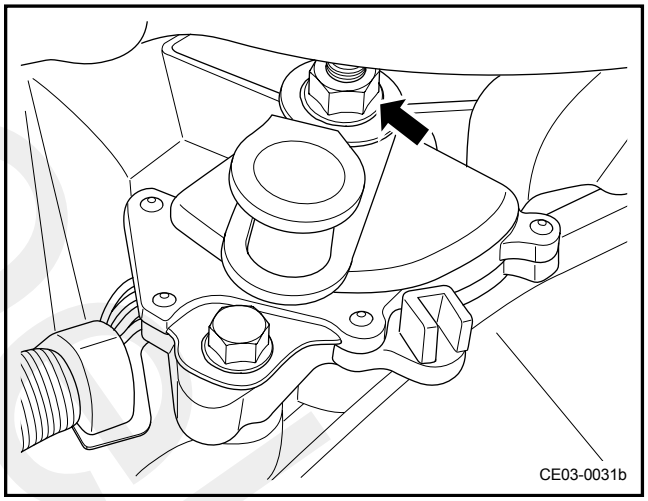
3.4.5.2 Replacement of Gear Switch

Removal Procedure:

1. Disconnect battery negative cable. Refer to 2.12.6.1 Battery Disconnection Procedure.
2. Disconnect gear switch harness.
3. Remove retaining bolts of flexible shaft for gearshift.

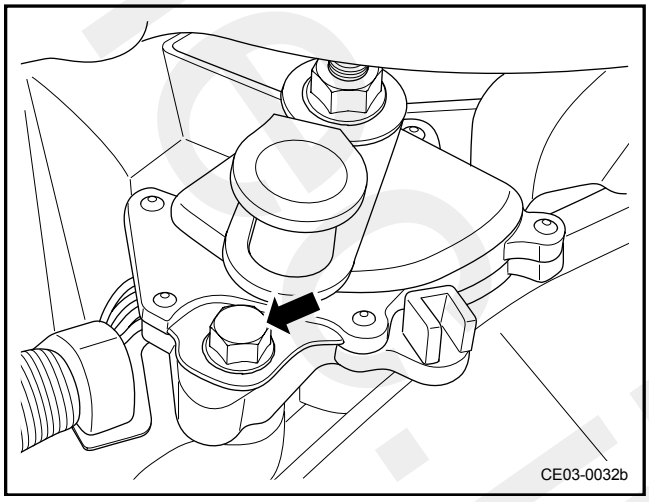


4. Remove retaining nut of flexible shaft support for gearshift and flexible shaft support for gearshift.
5. Remove gear switch retaining bolt.
6. Remove gear switch.



Installation Procedure:

1. Install gear selector switch and retaining bolts of gear selector switch.
2. Install flexible shaft support of gearshift and retaining nut of flexible shaft support for gearshift.
3. Install flexible shaft for gearshift and retaining bolts of flexible shaft for gearshift.

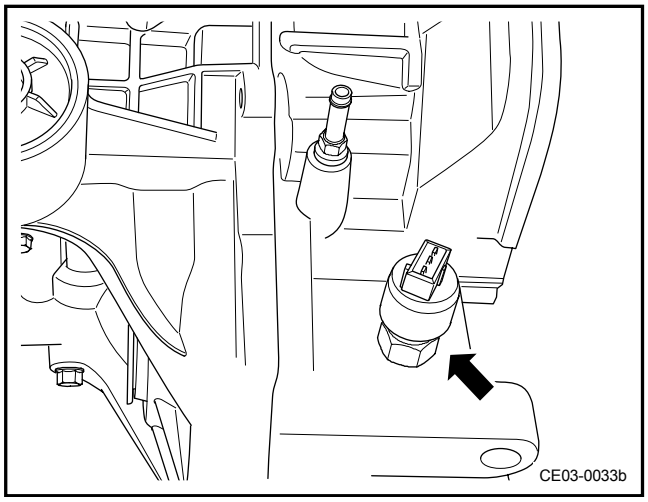


4. Connect harness connector of gear selector switch.
5. Connect the battery negative cable

3.4.5.3 Vehicle Speed Sensor Replacement

Removal Procedure:

1. Disconnect battery negative cable. Refer to 2.12.6.1 Battery Disconnection Procedure.
2. Disconnect vehicle speed sensor harness connector.
3. Remove vehicle speed sensor.



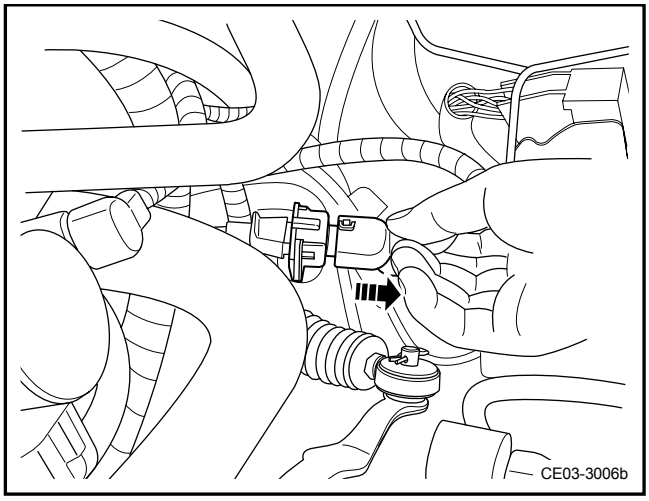
Installation Procedure:

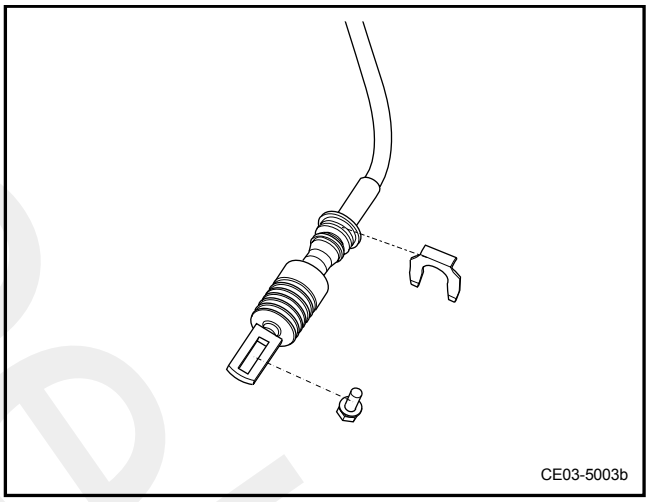
1. Install vehicle speed sensor.
2. Connect vehicle speed sensor harness connector.
3. Connect the battery negative cable.

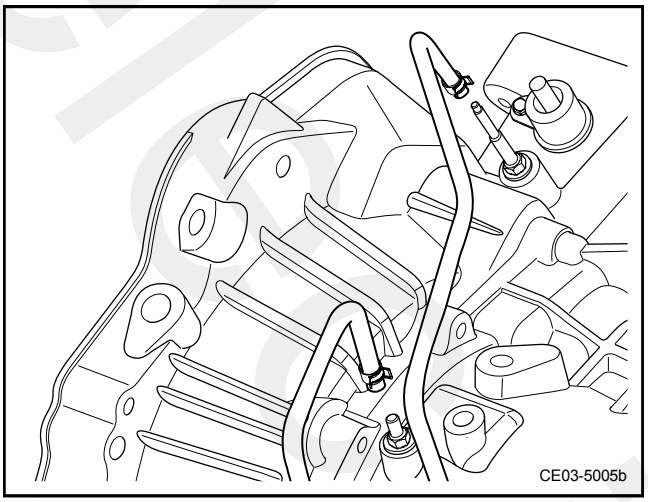
3.4.5.4 Transmission Assembly Replacement

Removal Procedure:

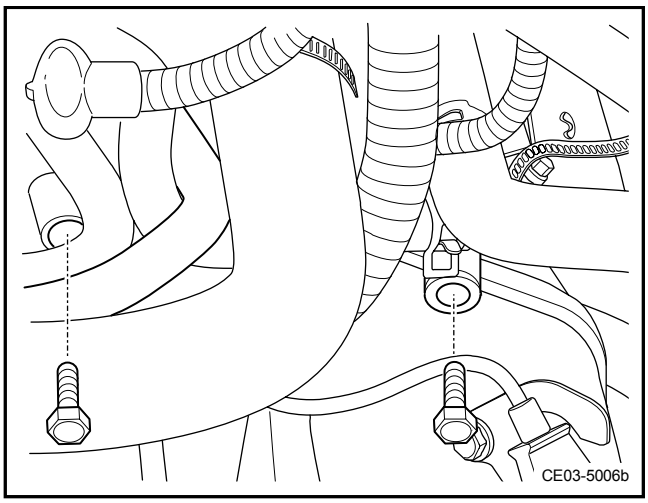
1. Disconnect battery negative cable. Refer to 2.12.6.1 Battery Connection Procedure.
2. Remove battery bottom plate, Refer to 2.12.6.2 Battery Replacement.
3. Remove air filter element base;
4. Disconnect reverse lamp switch connector;
5. Disconnect vehicle speed sensor harness connector;
6. Disconnect rotating speed sensor connector;
7. Remove retaining bolt of flexible shaft for gearshift
8. Remove fixed bracket of gearshift lever;
9. Remove fixed clip of selector lever cable.
10. Remove throttle valve cable.
11. Remove oil inlet hose and oil outlet hose of automatic transmission.



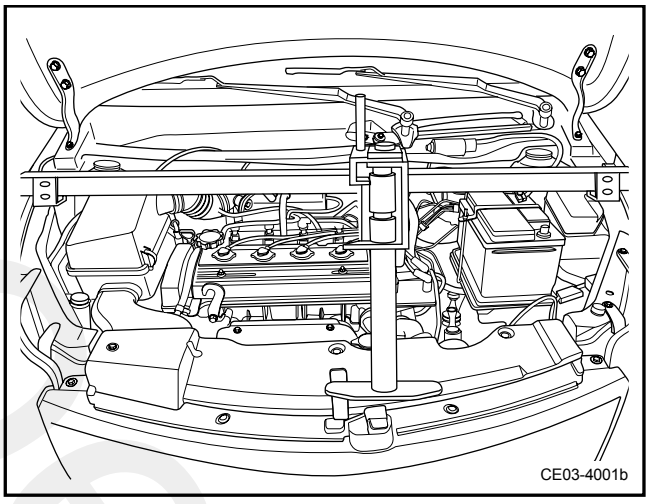




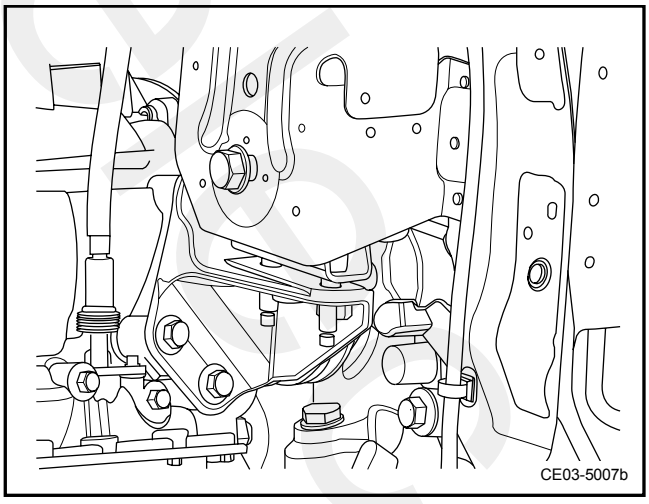
12. Remove start motor cable and retaining bolts;
13. Remove upper connecting bolt of transmission;



14. Use special tool to fix the engine;



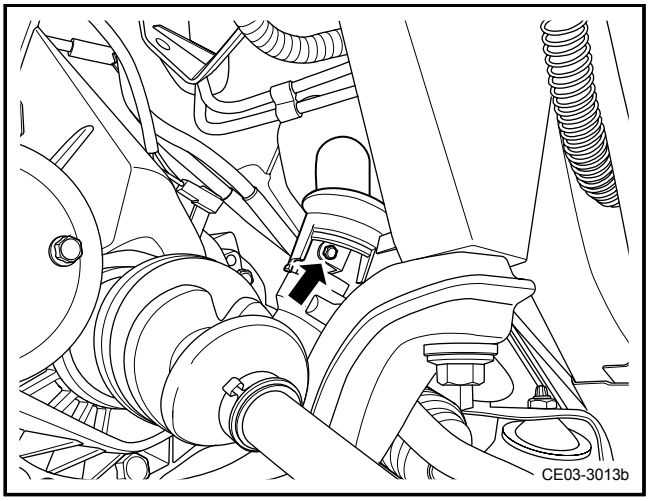
15. Remove front suspension support and bolts of power train;

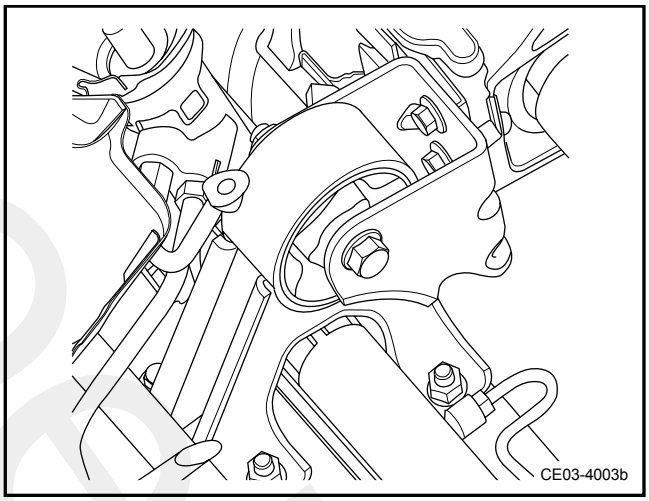


16. Remove two front wheel tires.
17. Lift the vehicle.

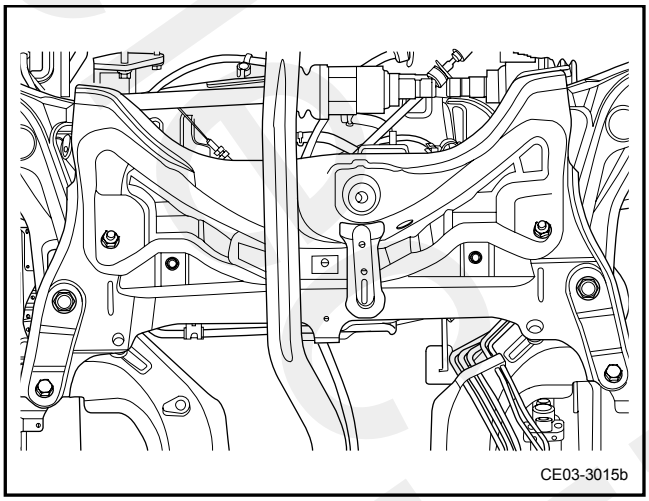
Warning: Refer to "Vehicle Lifting Warning" in "Warnings and Notices".

18. Remove transmission fluid drain bolt and re-install after draining out the transmission fluid. Refer to 3.3.8.1 Transmission fluid Level Inspection.
19. Remove steering gear lateral pin bolt.
20. Remove rear suspension support and bolt for power train;

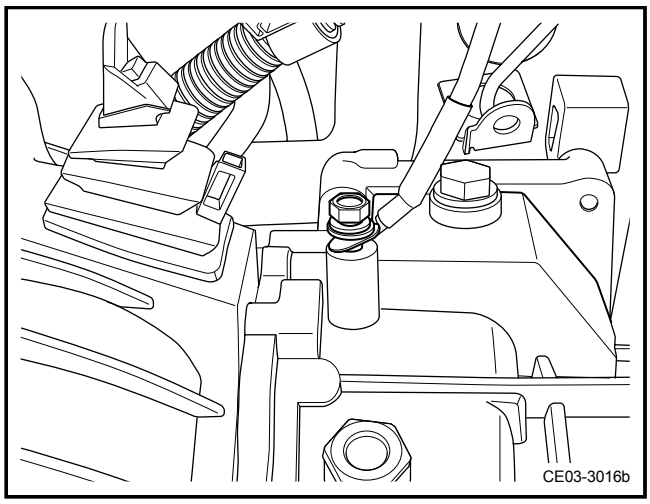




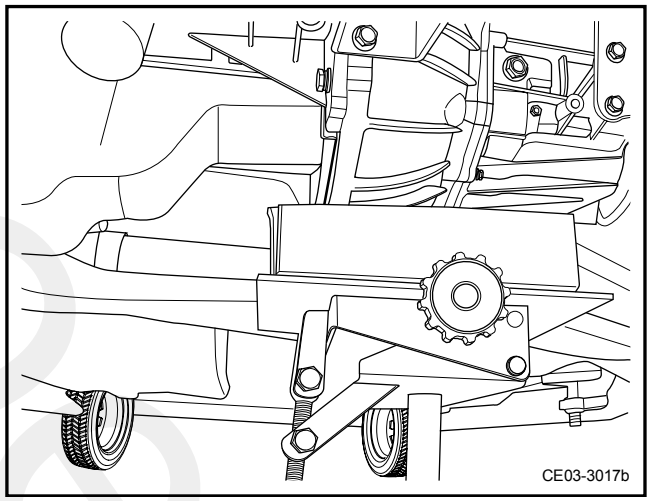
21. Remove front girder sub-frame and related connecting parts. Refer to 12.6.4.2 Subframe Replacement;



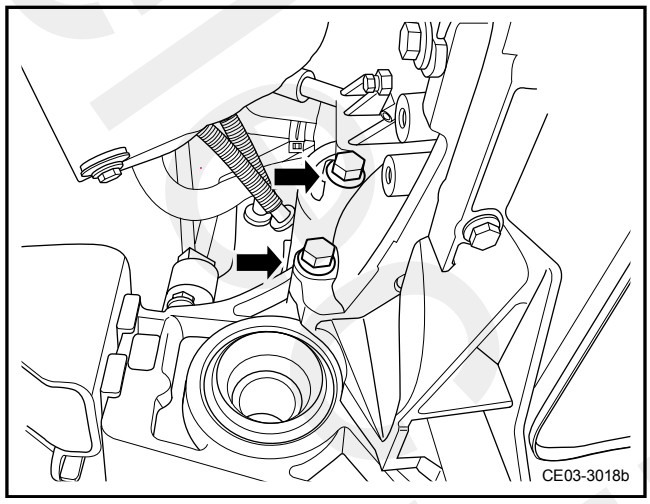
22. Remove left and right driving shafts; Refer to 5.3.4.1 Drive Shaft Replacement
23. Remove transmission negative cable;



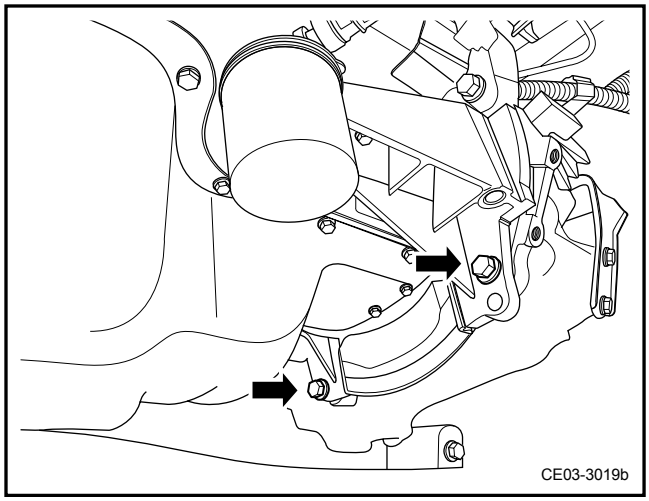
24. Support the transmission with jack;



25. Remove transmission rear connecting bolt;

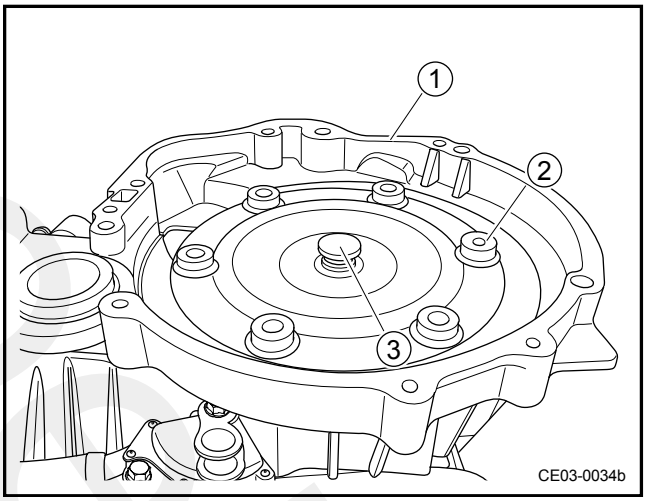


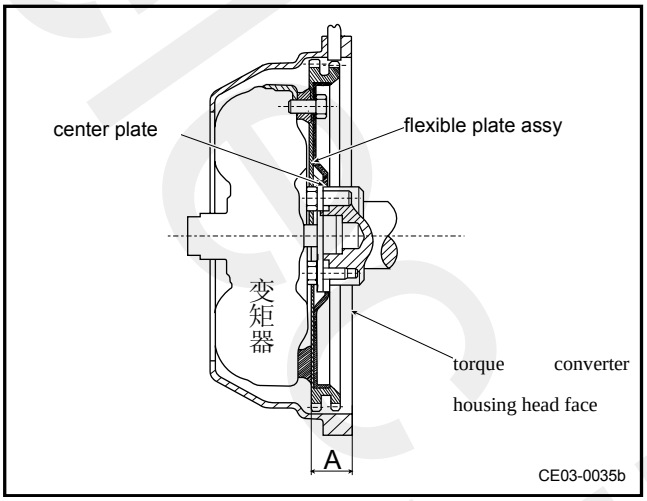
26. Remove lower transmission connecting bolt;
27. Remove Transmission assembly.



Installation Procedure:

1. Lift the transmission assembly with flat jack;
2. First check if torque converter is in the right position in the transmission, the detailed method as follows:
   Measure the distance between six locating end (2) of torque converter and torque converter housing end (1), check if it is A≥28mm. If it is A<28 mm, install according to the following method: use left hand to hold up locating pillar (3) at the center of torque converter and align it with input shaft as far as possible, and use right hand to rotate torque converter and push it inside at the same time until A≥28 mm.

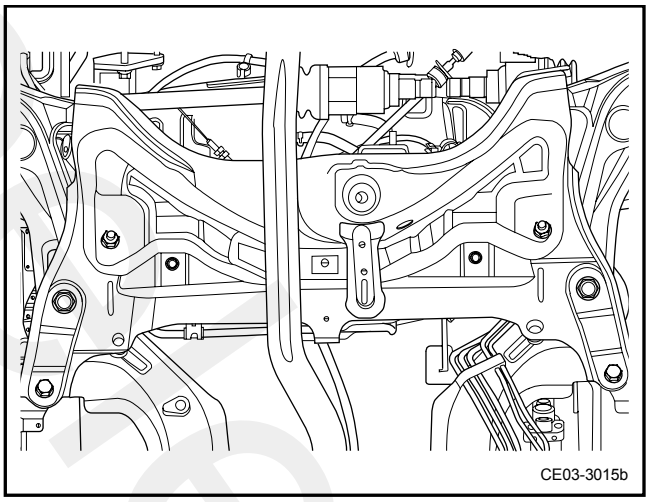




3. Install flexible plate assembly and center plate on the engine crankshaft end surface with 6 bolts according to the direction as shown in the diagram. Tightening torque is 45～55Nm. Rotate one of 6 holes on outer ring of flexible plate, i.e. long hole to the bottom of engine to make preparations for torque

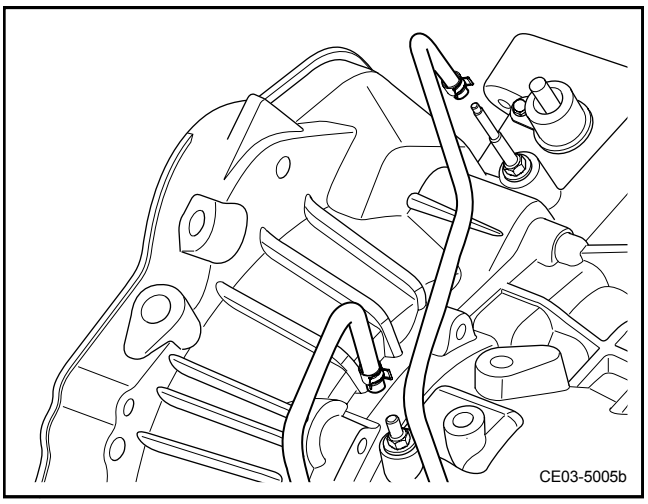
converter.

4. Connect transmission assembly and the engine. The method is the same as that of manual transmission. Connect the bolt after the transmission and engine are in good contact. It is forbidden to move torque converter axially in the transmission (ensure size A is not changed). Then connect the starter to torque converter housing.
5. Connect flexible plate and torque converter with 6 bolts. The procedure: screw one bolt in one hole of torque converter through long hole of flexible plate, then rotate engine pulley to screw other five bolts in torque converter; finally, tighten six bolts with a torque wrench, with 40～50Nm tightening torque.
6. Install transmission rear connecting bolt;
7. Install transmission lower connecting bolt and starter motor retaining bolt and cable.
8. Remove flat jack;
9. Install transmission body negative cable;
10. Install left and right driving shafts;
11. Install front girder sub-frame and related connecting parts.



12. Install front wheel tires;
13. Remove engine support special tool;
14. Install transmission upper connecting bolt;
15. Install rear suspension support and bolt for power train;
16. Install front suspension support and bolt for power train;
17. Install oil inlet/outlet hose of automatic transmission.
18. Install throttle valve cable.
19. Install flexible shaft of gearshift.
20. Install rotating speed sensor connector;

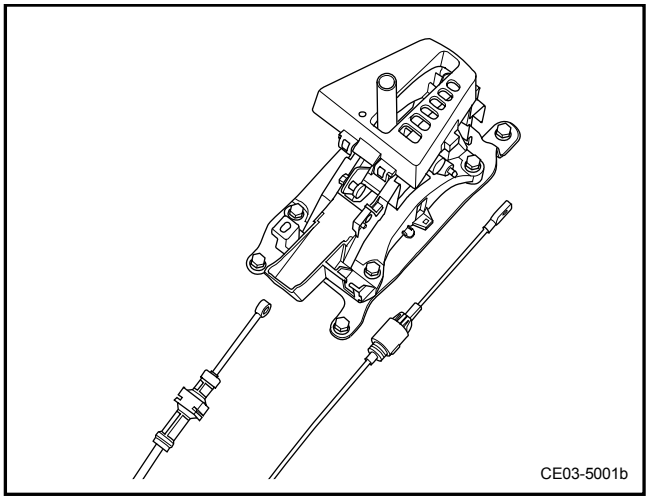
21. Install vehicle speed sensor connector;
22. Remove reverse lamp switch connector;
23. Install battery bottom plate.
24. Connect the battery negative cable



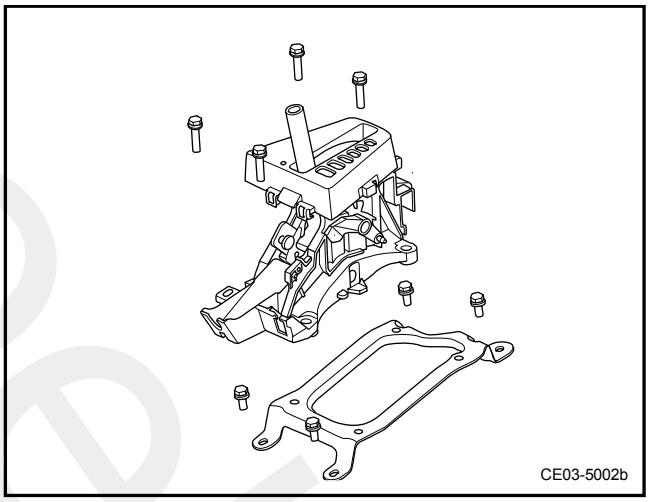
3.4.5.5 Replacement for Gearshift Lever Assembly

Removal Procedure:

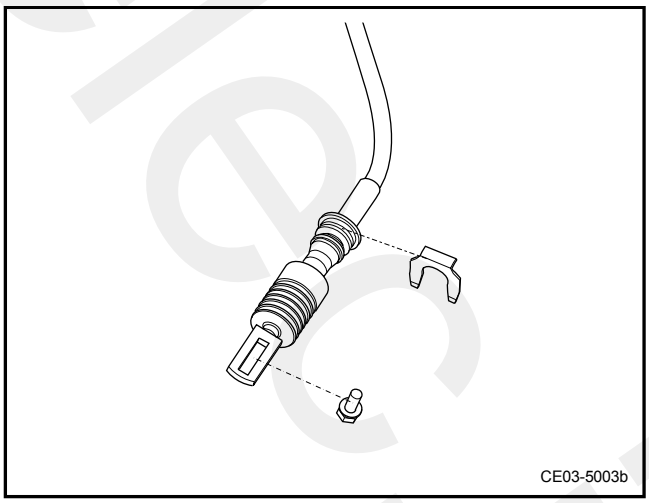
1. Remove auxiliary fasia console above the gearshift, refer to 12.8.3.4 Auxiliary Fasia Console Replacement.
2. Remove flexible shaft from gearshift lever and remove key limit cable from gearshift lever and ignition switch.



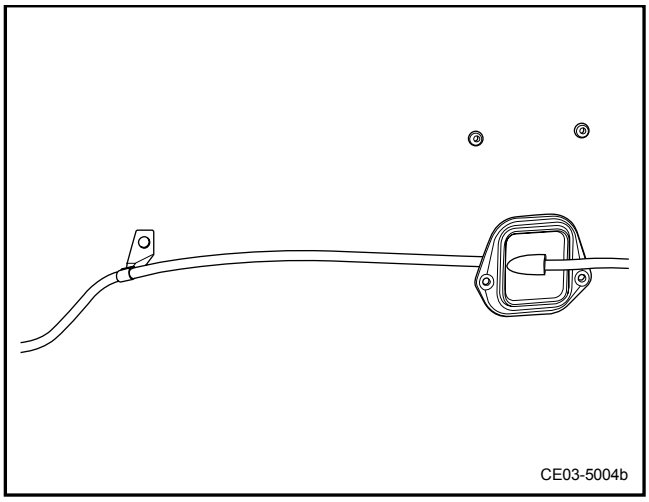
3. Loosen four bolts between gearshift lever base and its support, and then remove gearshift lever. Loosen four bolts between gearshift lever support and body floor, and then remove gearshift lever support.



4. Take out U plate from fixed support of flexible shaft for gearshift at the end of the transmission, loosen nuts between gearshift rocker arm for the transmission and flexible shaft for gearshift.

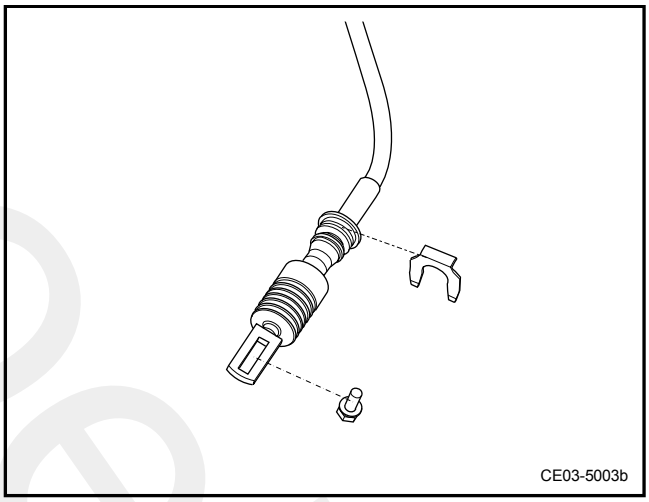


5. Loosen pipe clamp and support of flexible shaft for gearshift and bolts of sealing plate for flexible shaft. Remove flexible shaft for gearshift from body floor.



Installation Procedure:

1. Install flexible shaft for gearshift.
2. Install U plate on the fixed support of flexible shaft for gearshift at the end of the transmission, and nuts between gearshift rocker arm for the transmission and flexible shaft for gearshift.



3. Install gearshift support and tighten bolts.
4. Install gear shifter assembly and tighten bolts.
5. Install flexible shaft for gearshift on gear shifter.
6. Install limit cable of the key on gear shifter and ignition switch.
7. Install auxiliary fascia console.