3 Transmission / Drive Axle

3.1 Warnings and Notices

3.1.1 Warnings and Notices

Battery Disconnect Warning

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!

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!

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!

Warning: Approved safety glasses and gloves should be worn when performing this procedure to reduce the chance of personal injury.

Road Test Warning

Warning!

Warning: Road test 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

Notice: 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 Notice

Note

Notice: Use the correct fastener in the 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 specified. These coatings affect fastener torque and joint clamping force and may damage the fastener. Use the correct tightening sequence and specifications when installing fasteners in order to avoid damage to parts and systems.

Sealant Notice

Note

Notice: 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 Specifications

3.2.1.1 Fastener Tightening Specifications

Applications	Model	Specifications	
		Metric (Nm)	US English (lb-ft)
Clutch Cylinder Bolts	M8 × 1.25 × 25	18-22	13.3-16.2
Clutch Master Cylinder Assembly Retaining Nut	M8	16-26	11.8-19.2
Clutch Cylinder Oil Pipe Bracket Bolts	M8 × 1.25 × 16	18-22	13.3-16.2
Clutch / Brake Pedal Assembly Retaining Nut	M8	16-26	11.8-19.2
Clutch Pressure Plate and Driven Plate Bolts	M8 × 1.25 × 14	22-33	16.2-24.3

3.2.1.2 General Specifications

Applications	Specifications	
	Metric (mm)	Inch (in)
Oil (Hydraulic Clutch)	DOT4	
Clutch Pedal Working Travel	128	5.0
Clutch Pedal Free Travel	6-12	0.2-0.5
Clutch Pressure Plate Outer Diameter	256	10.1
Clutch Driven Plate Outer Diameter	212	8.3
Clutch Disc Wear Limit (Rivet Head Depth)	0.5	0.02
Flywheel Plane Run Out (Clutch Driven Plate Mating Surface)	0.06	0.0024

3.2.2 Description and Operation

3.2.2.1 Description and Operation

The clutch 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 and 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, split shaft, fork and split bearings. When the clutch pedal is pressed, the isolation bearings are pushed. Bearings then pushes the separation rod within the pressure plate and then the clutch is separated.

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.

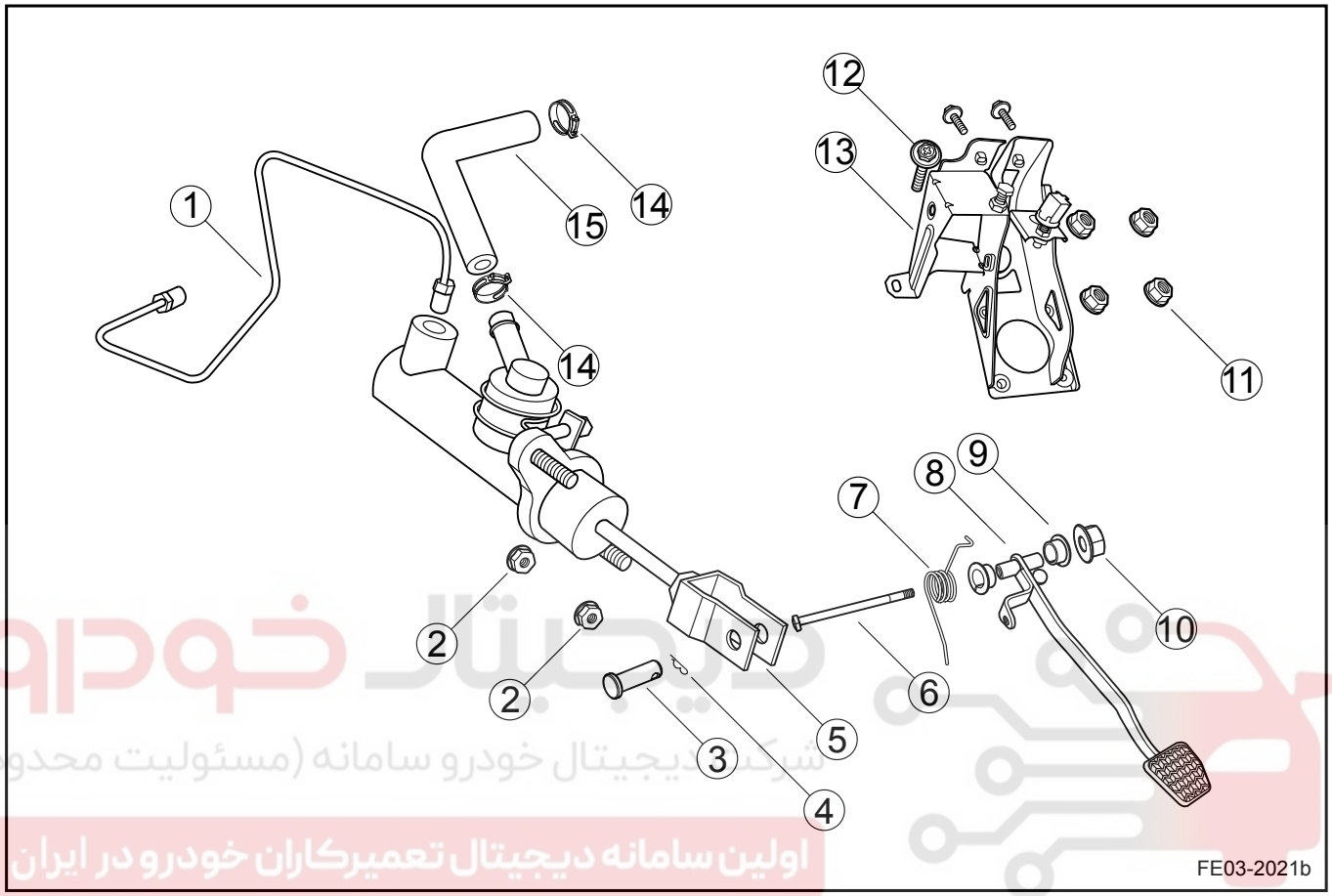
3. Prevent the Transmission System Overload:

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 powertrain 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

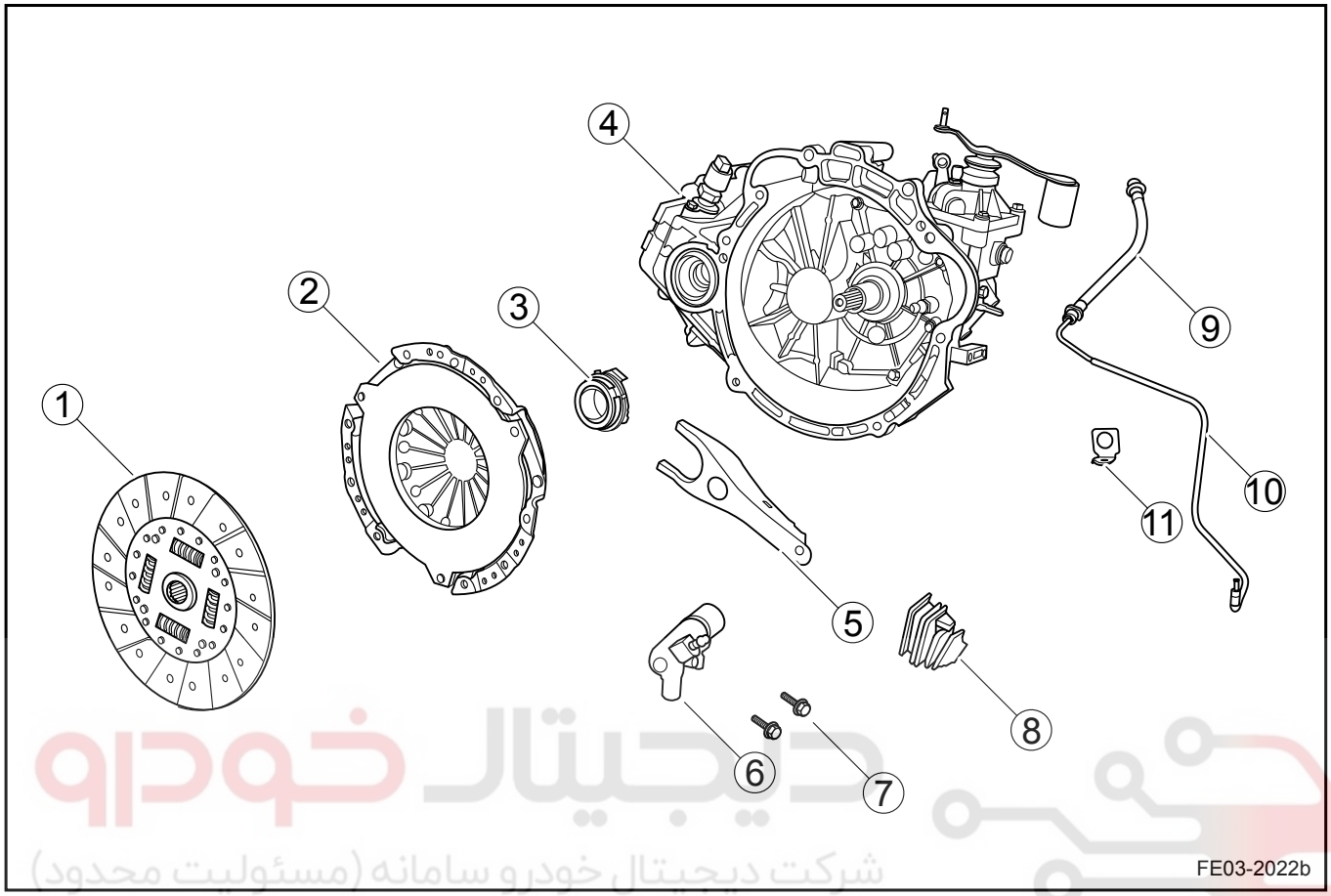
Clutch



Legend

1. Master Cylinder Oil Outlet Components
2. Clutch Master Cylinder Retaining Nuts
3. Pin φ8 × 24
4. Lock Pin
5. Clutch Master Cylinder Assembly
6. Clutch Pedal and Brake Pedal Bolts
7. Clutch Pedal Return Spring
8. Clutch Pedal
9. Lubrication Sleeve
10. Pedal Retaining Nut
11. Clutch Pedal and Brake Pedal Bracket Mounting Nut
12. Clutch Pedal and Brake Pedal Bracket Mounting Bolt
13. Clutch Pedal Bracket
14. Screw Driving Double Steel Wire Hoop
15. Master Cylinder Oil Inlet Hose

Clutch Body



Legend

1. Clutch Driven Plate
2. Clutch Pressure Plate
3. Release Bearings
4. Transmission Assembly
5. Separation Fork
6. Clutch Cylinder
7. Clutch Cylinder Bolts
8. Separation Fork Jacket
9. Clutch Hydraulic Hose
10. Clutch 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 "Description and Operation" and start system diagnostics. When a malfunction occurs. Refer to "Description and Operation " as it will help determine the correct symptom diagnostic procedures, so that it will also help to determine whether the customer described condition is normal. Refer to3.2.2 Description and Operationto confirm the correct procedures for system diagnostics.

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

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

Step 1	check whether there are obstacles under the clutch pedal?

(a) Check whether the floor blocks the clutch pedal travel.
(b) Check whether installed after market equipment, such as rubber flooring, etc. affecting the clutch pedal travel.

Yes → Repair the faulty part.

No

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

Yes → Go to step 8

No

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

(a) Check the pedal bushing for wear and tear.

Yes → Replace pedal bush.

No

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

Yes → Replace the clutch master cylinder. Refer to 3.2.6.2 Clutch Master Cylinder Replacement

No

Step 5	Bleed the clutch hydraulic system. Refer to 3.2.6.3 Hydraulic Clutch Bleeding, Does clutch fork resume normal actions?

Yes → System normal

No

Step 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 slave cylinder. Refer to 3.2.6.7 Clutch Slave Cylinder Replacement

No

Step 7	Clutch master cylinder 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 slave cylinder. Refer to 3.2.6.7 Clutch Slave Cylinder Replacement

No

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

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

No

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

Yes → Replace the clutch pressure plate. Refer to 3.2.6.5 Clutch Assembly Replacement

No

Step 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. Refer to 3.2.6.5 Clutch Assembly Replacement

No

Step 11	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.

Step 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 3.2.6.4 Clutch Pedal Free Travel Adjustment.

Next

Step 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 pipe.

No

Step 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

Step 4	Check whether the clutch master cylinder is binding?

Yes → Replace the clutch master cylinder. Refer to 3.2.6.2 Clutch Master Cylinder Replacement

No

Step 5	Check whether the Clutch Driven plate is overheating?

Yes → Cool the clutch driven plate.

No

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

Next

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

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

No

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

Yes → Replace the clutch pressure plate or flywheel. Refer to 3.2.6.5 Clutch Assembly Replacement and 2.6.8.17 Flywheel Replacement

No

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

Next

Step 10	Diagnostic completed.

3.2.5.4 Clutch Pedal Hard to Push

Note

If the clutch oil is not correct, replace the clutch master cylinder, clutch working cylinder, bleed the system and fill the correct oil.

Step 1	Check whether clutch hydraulic oil is correct? (Check whether the brake system is working properly)

Next

Step 2	Check whether the clutch oil is contaminated.

(a) Check whether there is water in clutch oil.
(b) Check whether there is dust or debris in the clutch oil.
(c) Check whether the clutch oil is subject to the incorrect oil contamination. If the oil is contaminated, replace clutch master cylinder and clutch slave cylinder.
(d) Flush hydraulic system and fill the correct oil.

Next

Step 3	Check whether the clutch hydraulic hose is twisted or damaged.

Next

Step 4	Check the clutch pressure plate, clutch driven plate.

Next

Step 5	Diagnostic completed.

3.2.5.5 Clutch Pedal Does Not Return

Step 1	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

Step 2	Check whether the clutch master cylinder is binding?

Yes → Replace the clutch master cylinder. Refer to 3.2.6.2 Clutch Master Cylinder Replacement

No

Step 3	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 3.2.6.4 Clutch Pedal Free Travel Adjustment.

Next

Step 4	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 pipe.

No

Step 5	Check whether clutch fork or split is binding?

Yes → Separate bearings separate Fork. Refer to 3.2.6.6 Clutch Pilot Bearing Replacement

No

Step 6	Check whether the pressure plate spring is too soft. Replace the clutch pressure plate.

Next

Step 7	Diagnostic completed.

3.2.5.6 Clutch Bearings Noisy When Release

Step 1	Check whether the bearing is binding?

Yes → Clean and re-lubricate bearings. Check whether the bearing is damaged.

No

Step 2	Check whether the fork is installed incorrectly. Remove and re-install the correct fork.

Next

Step 3	Diagnostic completed.

Clutch Rattle

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

Yes → Replace the clutch pressure plate

No

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

Next

Step 3	Check whether there is engine oil in Clutch Driven plate block?

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

No

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

Next

Step 5	Diagnostic completed.

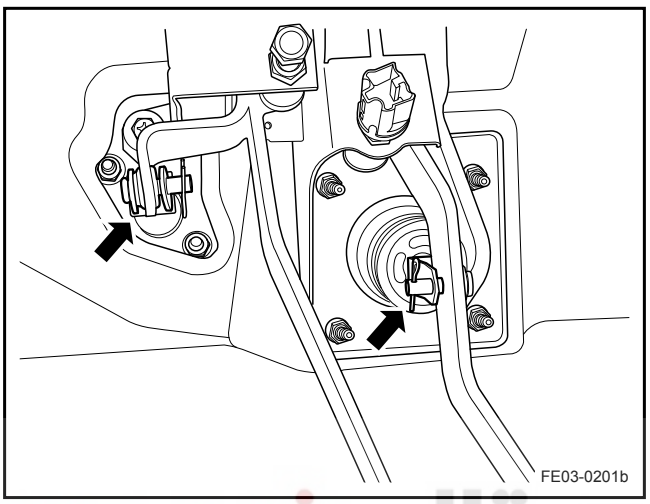
3.2.6 Removal and Installation

3.2.6.1 Clutch Pedal Replacement

Removal Procedure:

Warning!

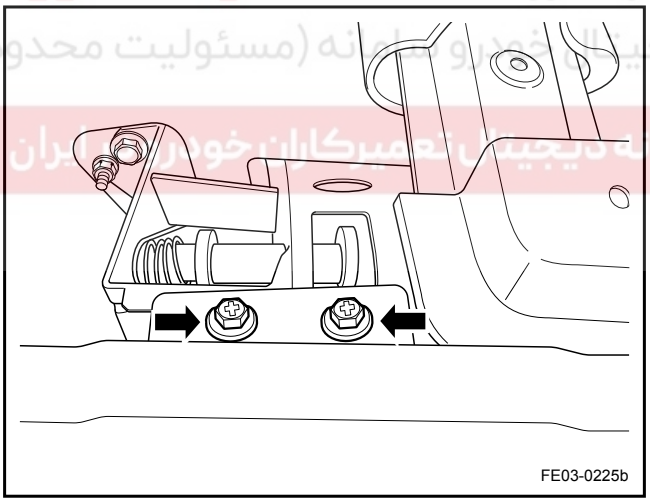
Refer to "Battery Disconnection Warning" in "Warnings and Notices".

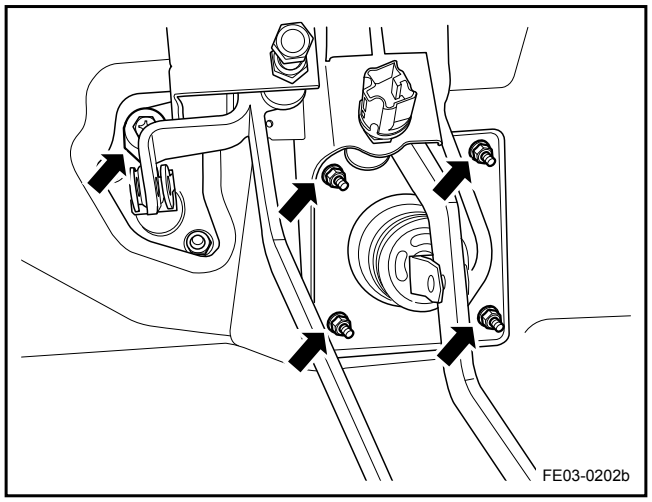


1. Disconnect the battery negative cable. Refer to 2.11.8.1 Battery Disconnection.
2. Remove the instrument panel. Refer to 12.8.3.1 Instrument Panel Replacement.

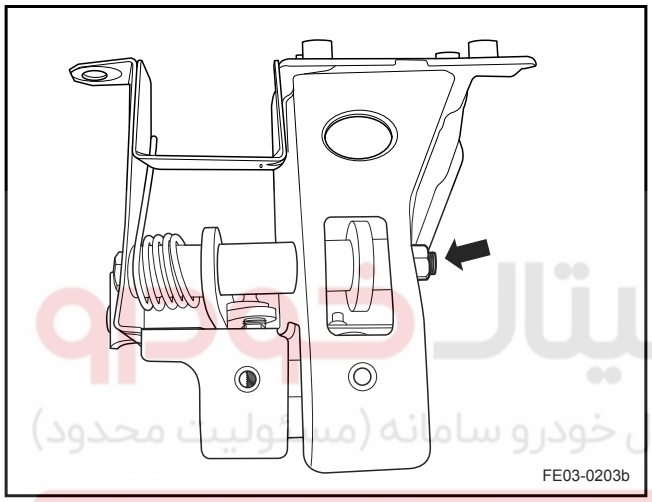
   Note

   Please use trim repair tools, otherwise interior trims will easily be scratched.
3. Disconnect brake switch wiring harness connector.
4. Separate the clutch master cylinder piston rod U-shaped clip and the clutch pedal.
5. Separate the vacuum brake booster rod U-shaped clip and brake pedal.
6. Remove the clutch pedal assembly upper retaining bolts.

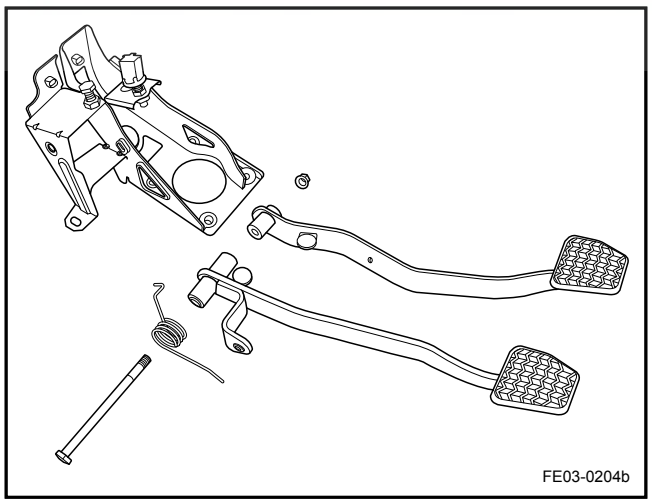




7. Remove clutch / brake pedal assembly bolt and nuts.



8. Remove the clutch / brake pedal assembly, remove screws and pull retaining nuts out of the pedal.
9. Remove the return spring and clutch pedal.



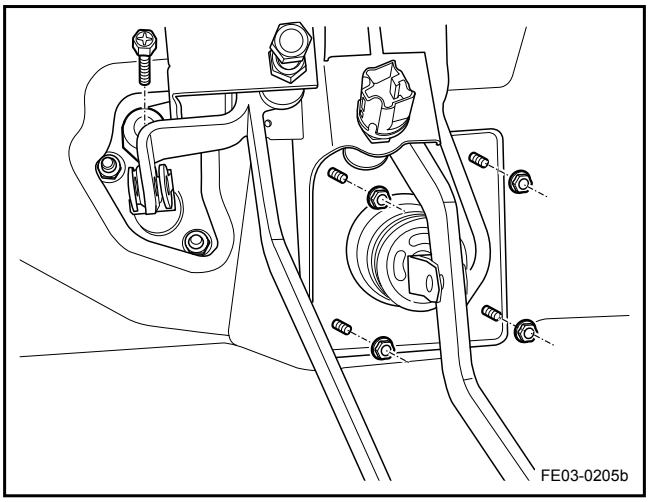
Installation Procedure:

1. Install the return spring and clutch pedal.
2. Install the pedal screws and nuts.

   Torque: 35 Nm (Metric) 25.9 lb-ft (US English)

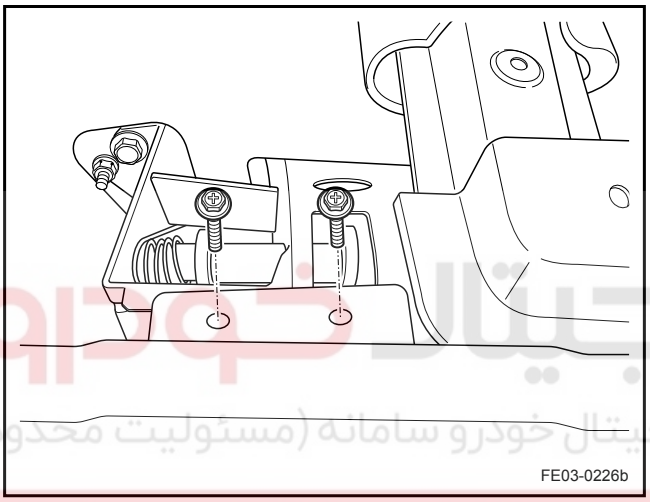
   Note

   Apply grease on the pedal axle and the return spring.



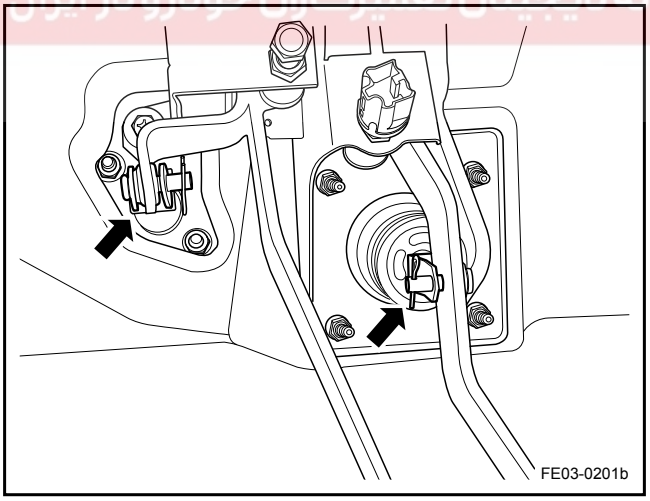
3. Install clutch / brake pedal assembly bolt and nuts.

   Torque: 23 Nm (Metric) 17.0 lb-ft (US English)



4. Install clutch pedal assembly upper retaining bolts.

   Torque: 23 Nm (Metric) 17.0 lb-ft (US English)



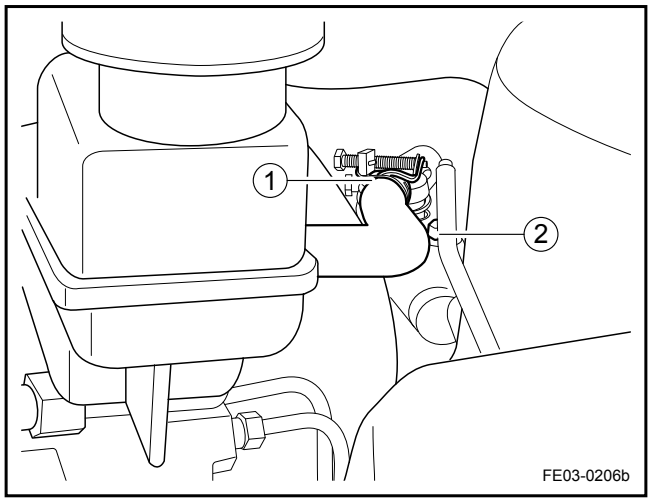
5. Install the vacuum brake booster rod U-shaped clip and the brake pedal connecting pin.
6. Install the clutch master cylinder piston rod U-shaped clip and the clutch pedal connecting pin.
7. Connect brake switch harness connector.
8. If necessary, adjust the clutch pedal free travel.
9. Install the instrument panel.
10. Connect the battery negative cable.

3.2.6.2 Clutch Master Cylinder Replacement

Removal Procedure:

Warning!

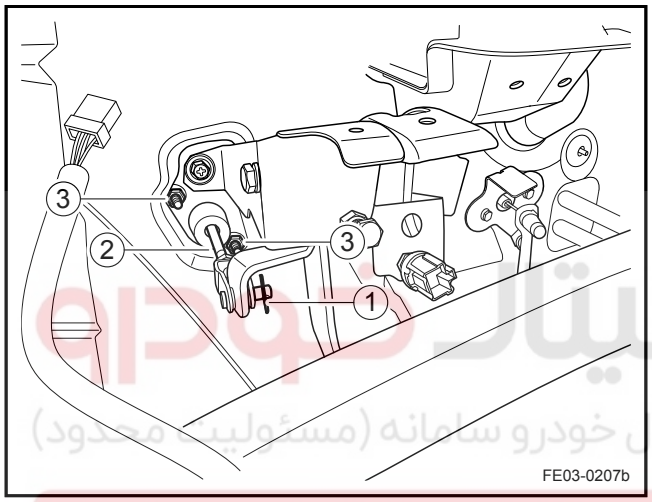
Refer to "Battery Disconnection Warning" in "Warnings and Notices".



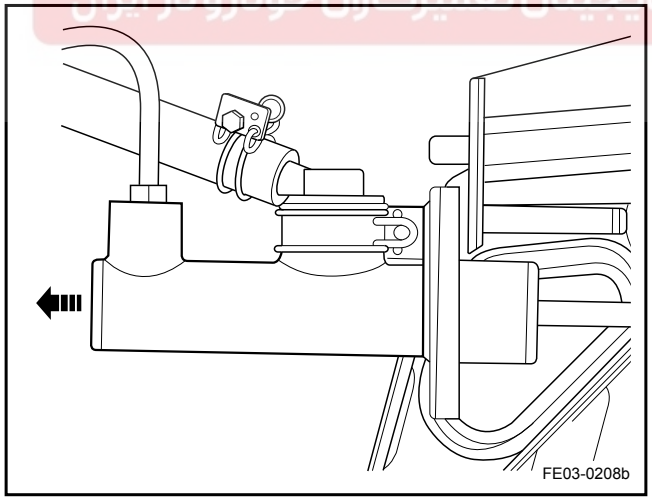
1. Disconnect the battery negative cable. Refer to 2.11.8.1 Battery Disconnection.
2. Remove Instrument panel lower left panel. Refer to 12.8.3.1 Instrument Panel Replacement.

   Note

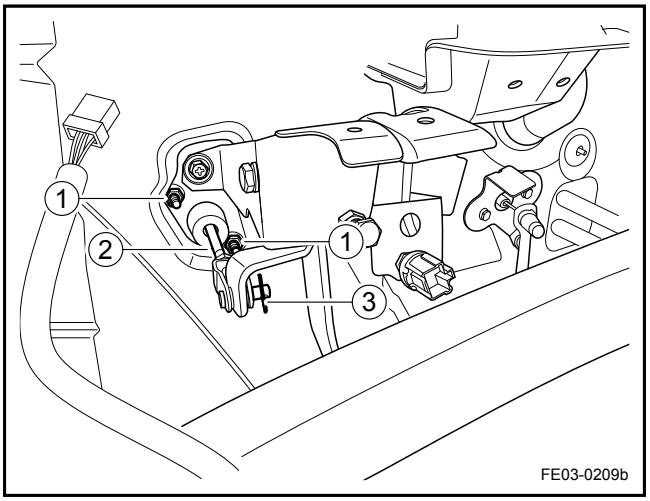
   Before disconnecting the cylinder, release the clutch / brake fluid.
3. Loose thread on the master cylinder drive dual wire hoop, Remove tank to the master cylinder oil inlet hose (1).
4. Disconnect clutch master cylinder metal connector (2).

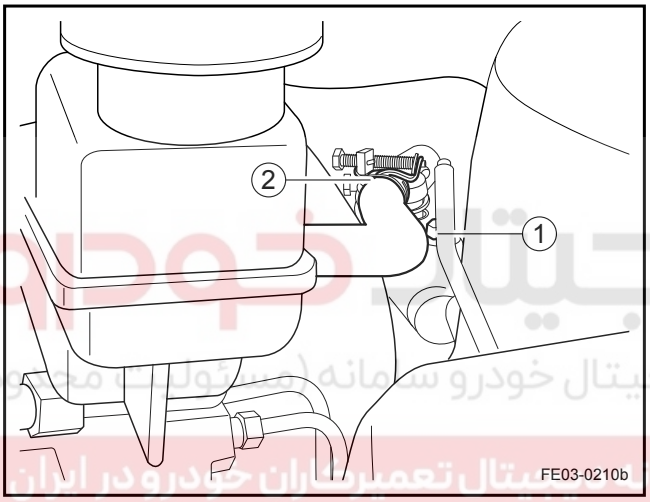


5. Remove pin (1) from the clutch pedal and the piston rod U-shaped clip, and pull out connecting pin (1).
6. Release the clutch master cylinder piston rod and the piston rod between the U-shaped clip locking nut, piston rod U-shaped clip from the clutch master cylinder piston rod on the screw of 2.
7. Remove the clutch master cylinder retaining nuts (3).



8. Pull out of master cylinder along the direction of the engine compartment.





Installation Procedure:

1. Install clutch master cylinder and tighten clutch master cylinder retaining nuts (1).

   Torque: 23 Nm (Metric) 17.0 lb-ft (US English)

2. Install piston rod U-shaped clip to the clutch master cylinder piston rod, and tighten the clutch master cylinder piston rod and the piston rod U-shaped locking nut (20.

   Torque: 11 Nm (Metric) 8.1 lb-ft (US English)

3. Install connecting pin (3) between the clutch pedal and the piston rod U-shaped clip, lock the pin (3).

4. Connect the clutch master cylinder metal connector 1.

   Torque: 10 Nm (Metric) 7.4 lb-ft (US English)

5. Install the master cylinder oil inlet hoses, tighten the steel clamp (2).

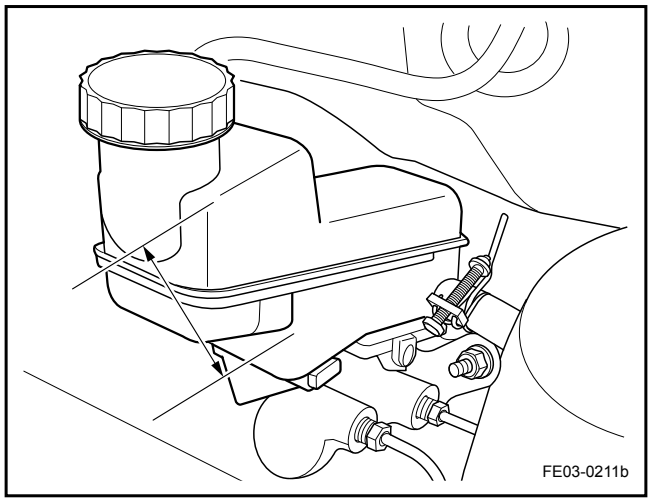
   Torque: 14 Nm (Metric) 10.3 lb-ft (US English)

6. Bleed air.
7. Adjust the clutch pedal.
8. Install Instrument panel lower left shield panel.
9. Fill the clutch / brake fluid to the MAX (maximum) mark.
10. Connect the battery negative cable.

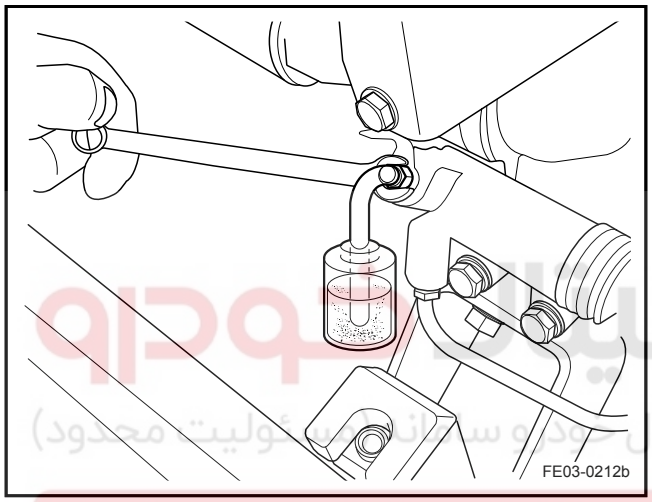
3.2.6.3 Hydraulic Clutch Bleeding

Note

Brake fluid is corrosive and it will damage electrical connectors and paint. Use a suitable container and fender cover to prevent exposure to brake fluid. Use cotton cloth to wipe spilled fluid.
It is prohibited to refill brake fluid to the clutch master cylinder brake fluid reservoir, because the used brake fluid may be mixed with the air, impurities and moisture.

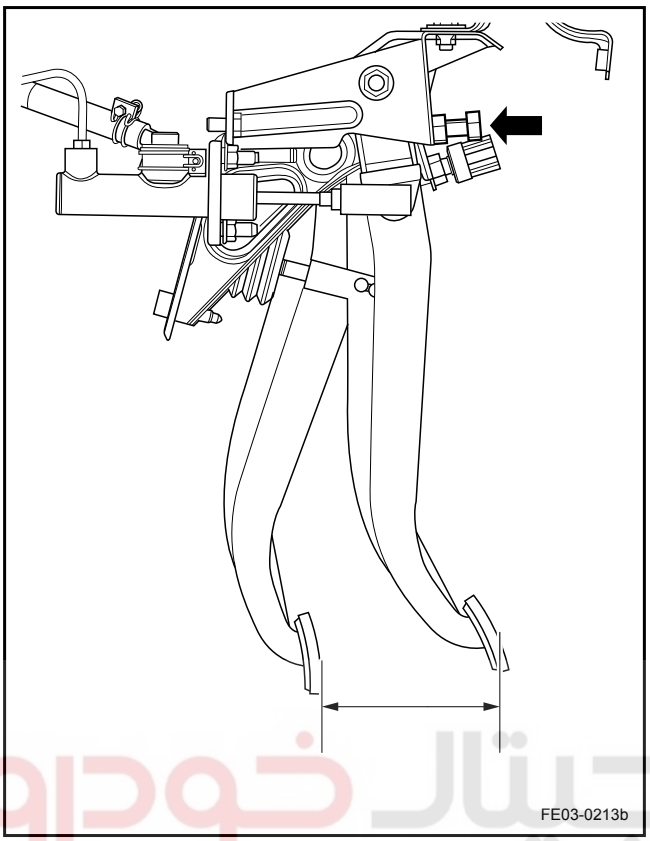


1. During the hydraulic system bleeding, make sure the clutch / brake fluid level is between reservoir minimum (MIN) and maximum (MAX) marker.

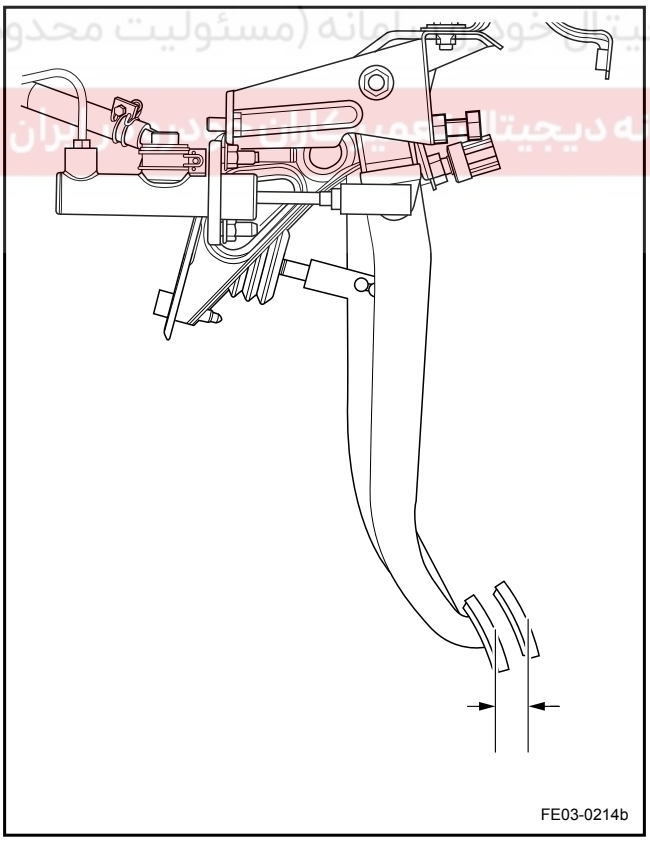


2. Connect one end of the vinyl plastic hose to the bleeder nipple, the other end to a half full brake fluid container.
3. Slowly press the clutch pedal several times.
4. Release the bleeder nipple screws, until the fluid begins to flow, and then tighten the bleeder nipple screws.
5. Repeat step 3 until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

3.2.6.4 Clutch Pedal Free Travel Adjustment



1. Measure clutch pedal travel. Press the clutch pedal to the end. Measure the distance between the start position and the end position.
2. Adjust the clutch pedal travel. Release the locking nut and rotate the bolt. Clutch pedal travel should be more than128 mm (5.0 in). Tighten the lock nut after adjustment.



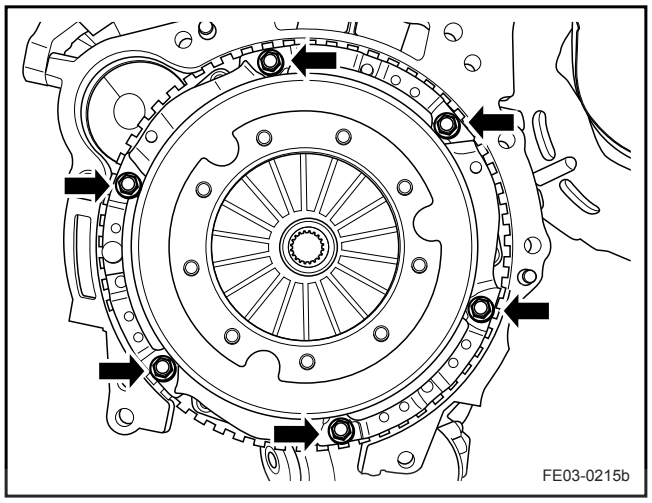
3. Determine the clutch pedal free travel, with a hand gently press the clutch pedal and determine the distance while there is a resistance feel.
4. Adjust the clutch pedal free travel. Release the lock nut and turn. Clutch pedal free travel should be between 6 and 12 mm (0.2-0.5 in)Tighten the lock nut after adjustment.

3.2.6.5 Clutch Assembly Replacement

Removal Procedure:

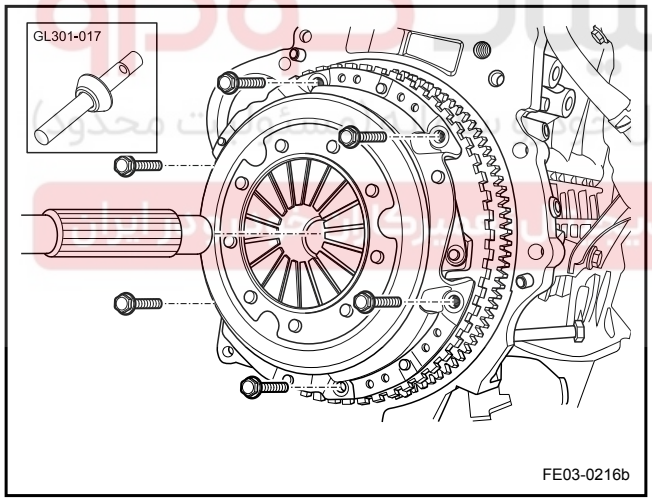
Warning!

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



1. Disconnect the battery negative cable. Refer to 2.11.8.1 Battery Disconnection.
2. Lift the vehicle.
3. Remove the engine bottom shield. Refer to 12.10.1.7 Left and Right Engine Bottom Shield Replacement.
4. Remove the transmission assembly. Refer to 3.3.8.3 Transmission Assembly Replacement.
5. Remove clutch bolts, the clutch pressure plate and clutch driven plate.

Installation Procedure:



1. Apply grease on the clutch plate spline.
2. With a special tool GL301-017, align the clutch pressure plate and drive plate with the flywheel.
3. Install pressure plate bolts and tighten.

   Torque: 25 Nm (Metric) 18.5 lb-ft (US English)

   Note

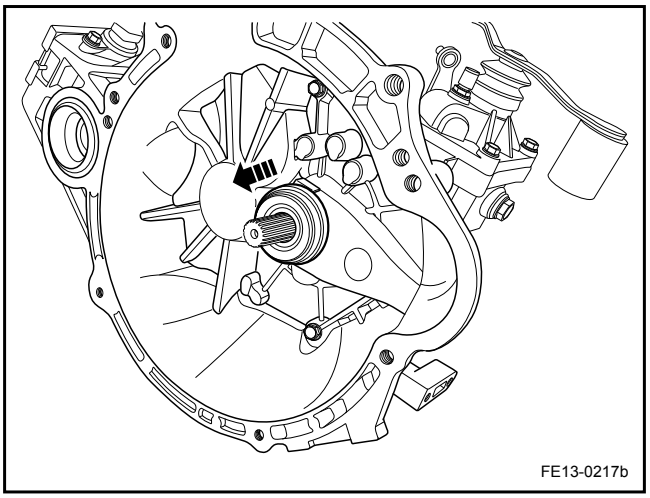
   Install bolts in diagonal order.
4. Remove the special tool GL301-017.
5. Install the transmission assembly.
6. Install the engine bottom shield.
7. Lower the vehicle.
8. Connect the battery negative cable.

3.2.6.6 Clutch Pilot Bearing Replacement

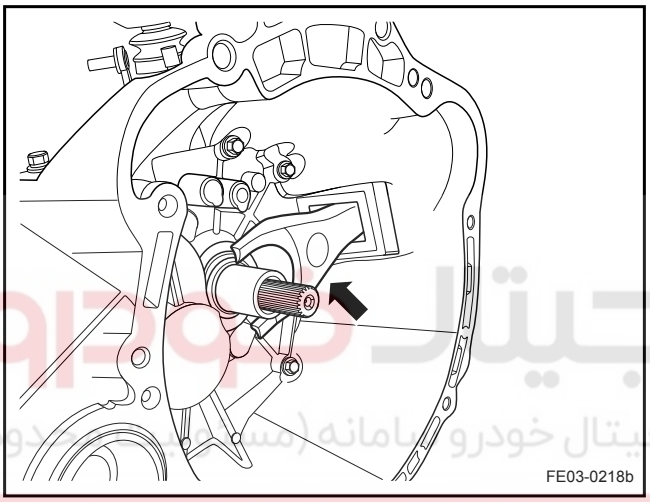
Removal Procedure:

Warning!

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

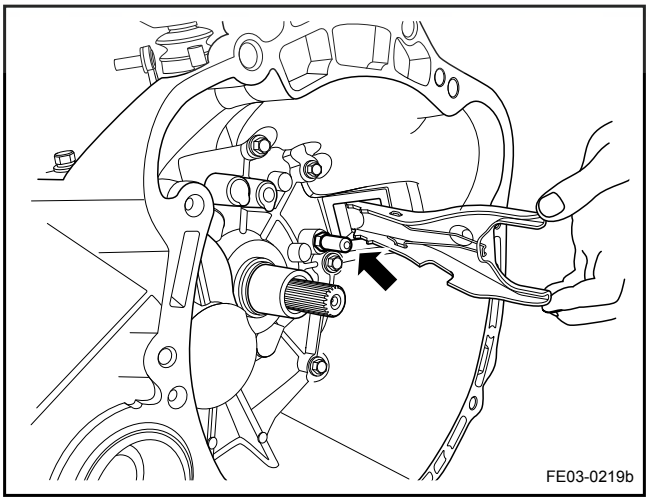


1. Disconnect the battery negative cable. Refer to 2.11.8.1 Battery Disconnection
2. Lift the vehicle.
3. Remove the engine bottom shield. Refer to 12.10.1.7 Left and Right Engine Bottom Shield Replacement.
4. Remove the transmission assembly. Refer to 3.3.8.3 Transmission Assembly Replacement.
5. Remove the pilot bearing from the transmission input shaft.

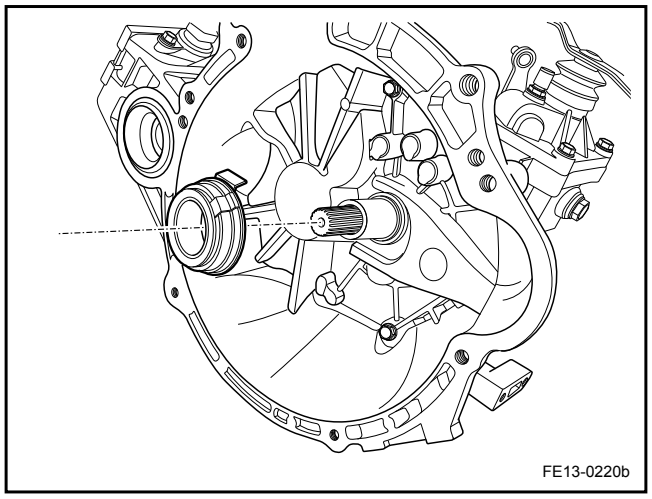


6. Separate and remove the fork.

Installation Procedure:



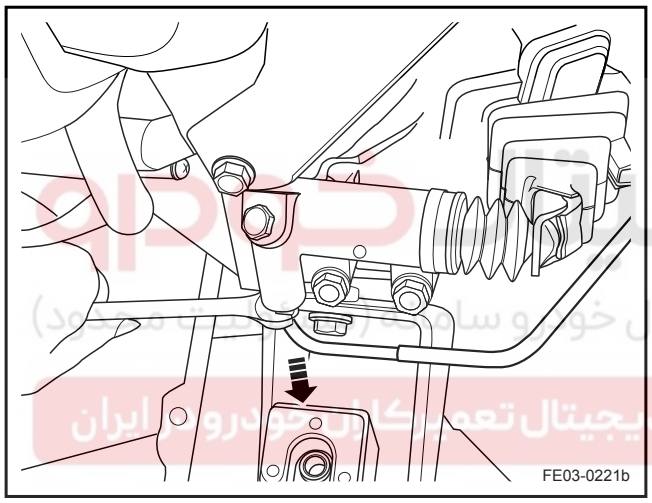
1. Install the fork to the dust cover.



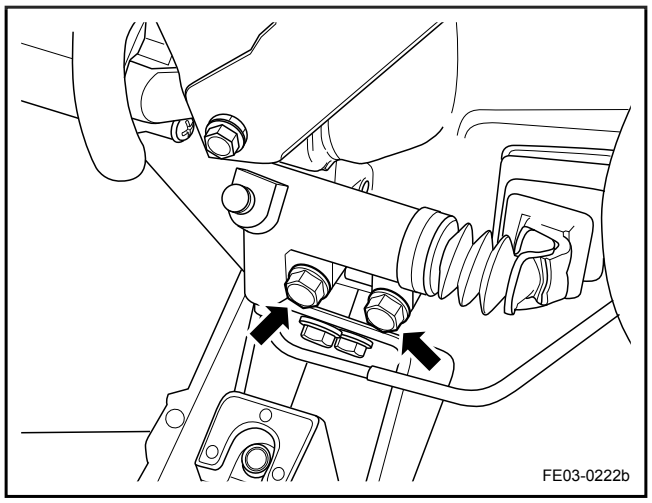
2. Install the pilot bearing to the transmission input shaft.
3. Install the transmission assembly.
4. Install the engine bottom shield.
5. Lower the vehicle.
6. Connect the battery negative cable.

3.2.6.7 Clutch Slave Cylinder Replacement

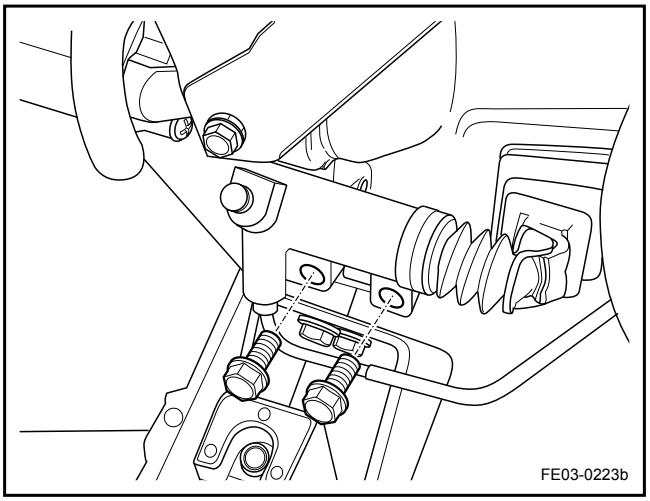
Removal Procedure:

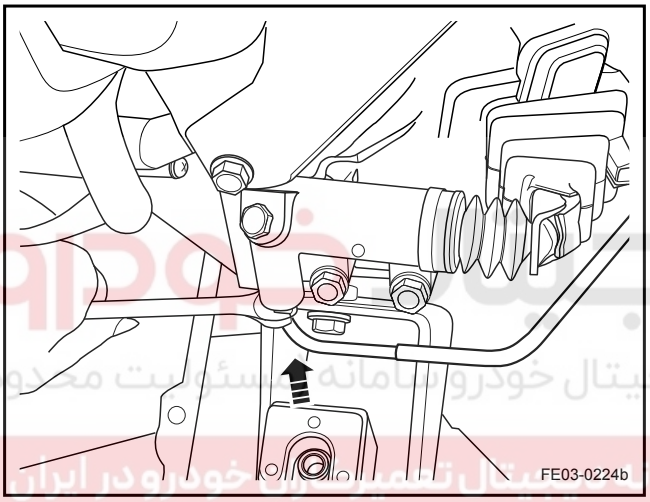


1. Remove the bolts and Disconnect the tube from the clutch slave cylinder.



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: 20 Nm (Metric) 14.8 lb-ft (US English)

2. Connect the clutch fluid tube to the clutch slave cylinder and tighten the bolts.

   Torque: 10 Nm (Metric) 7.4 lb-ft (US English)

3. Apply grease to the rod joints and be careful not to make the dust cover dirty.

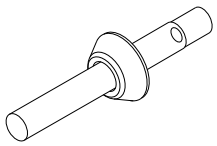
4. Hydraulic clutch bleeding. Refer to 3.2.6.3 Hydraulic Clutch Bleeding.

5. Adjust the clutch pedal. Refer to 3.2.6.4 Clutch Pedal Free Travel Adjustment.

6. Fill brake fluid to the fluid reservoir Maximum mark.

3.2.7 Special Tools and Equipment

3.2.7.1 Special Tools List

Serial Number	Illustration	Tool Number	Description
1	 FE01-2021b	GT301-017	Clutch Installation Tool

3.3 Manual Transmission

3.3.1 Specifications

3.3.1.1 Fastener Tightening Specifications

Applications	Model	Specifications	
		Metric (Nm)	US English (lb-ft)
Manual-Shift Assembly Retaining Bolts	M8 × 40	20-26	15-19
Engine and Transmission Connecting Bolts (Upper)	M12 × 50	96-110	71-81
Engine and Transmission Connecting Bolt (Middle)	M10 × 45	53-65	39-48
Engine and Transmission Connecting Bolt (Lower)	M10 × 40	53-65	39-48
Transmission Left Bracket Bolts	M10 × 22	47-57	35-42
Transmission Left Bracket Screw and Nut	M10 × 100	47-57	35-42
Transmission Front Bracket Bolts	M10 × 22	47-57	35-42
Transmission Front Bracket Screw and Nut	M10 × 90	47-57	35-42
Vehicle Speed Sensor Driven Gear Locking Bolt	M8 × 15	20-26	15-19
Transmission Front Bracket Bolts	M10	47-57	35-42
Transmission Front Bracket Screw and Nut	M12 × 100	70-90	52-67
Transmission Casing Retaining Bolt	M8 × 35	20-26	15-19
Shift Control Mechanism Retaining Bolt	M8 × 35	20-26	15-19
Cover Connecting Bolts	M6 × 15	7-11	5-8
Gear Shaft Self-Locking Bolt	M18 × 25	37-40	27-30
Reverse idler Locking Bolts	M8 × 35	20-26	5-19
Fork Bolts	M8 × 15	20-26	5-19
Fluid Level Inspection Hole Bolt	M18 × 10	28-30	21-22
Fluid Drain Plug Bolt	M18 × 10	28-30	21-22

3.3.1.2 Manual Transmission Specifications

Manual Transmission Specifications

Applications	Specifications
Gear Ratio	
1st Gear	3.182
2nd Gear	1.895

Applications	Specifications
3rd Gear	1.25
4th Gear	0.909
5th Gear	0.78
Reverse	3.083
Main Reduction Ratio	4.308
Maximum Speed	≥185 km/h (115 mph)
0-100 km/h Acceleration Time	≤12 s
Max.Grade Ability	≤40%
Gear Oil Capacity	2.2 L
Lubricant	Comply with GB13895, API quality grade GL-4, Viscosity: SAE 75W-90, 80W-90, 85W-90
Type or Model	JL-S170B

Dimensions

Size Parameters	Specifications	
	Metric (mm)	US English (in × 10^{-3})
Input Shaft Third Gear Axial Clearance	0.1-0.35	3.937 -13.780
Input Shaft Fifth Gear Axial Clearance	0.1-0.50	3.937-19.685
Input Shaft Fourth Gear, Fifth Gear Gear Radial Clearance	≥0.058	≥3.346
Input Shaft Fourth Gear Axial Clearance	0.1-0.55	3.937-21.654
Input Shaft Axial Runout	≥0.03	≥1.181
Synchronizer Back End and The Gear Ring Surface Distance	≤0.8	≤31.496
Gear Shift and Fork Sleeve Distance	≥0.35	≥13.780
Input Shaft Wear and Tear: Minimum Diameter	33.985 and 30.985	1,337.989 and 1,219.879
Main Shaft 1st Gear and 2nd Gear Axial Clearance	0.1-0.35	3.937-13.780
Main Shaft 1st Gear and 2nd Gear Runout	≥0.056	≥2.205
Main Shaft Runout	≥0.03	≥1.181
Spindle Wear and Tear: Minimum Diameter	33.985	1,337.989
Gear Cover Oil Seal (Side) Surface To The Seal Hole Surface	2.0-2.5	78.740-98.425

Size Parameters	Specifications	
	Metric (mm)	US English (in × 10^{-3})
Gear Cover Oil Seal (Upper) Surface To The Seal Hole Surface	0-0.5	0-19.685

3.3.2 Description and Operation

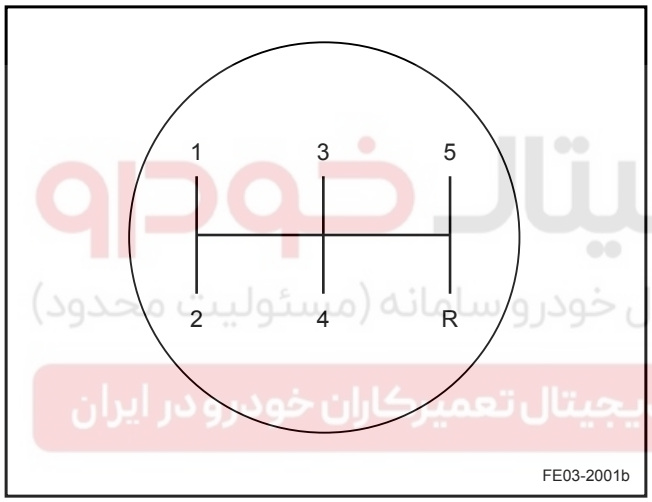
3.3.2.1 Transmission System Operation

Warning!

During the diagnostic and repair process, we must strictly follow the safety operating standards, in order to prevent personnel injury and damage to the vehicle. Refer to "Vehicle lifting Warning" and " Road Test Warning" in "Warnings and Notices".

During the transmission service, it is necessary to prevent dust entering the system. we must use the transmission service special tools, not only we can improve the service efficiency and quality, but also prevent unnecessary vehicle damage.
The manual transmission is a regular full-mesh five-speed transmission synchronizer.

Shift control is shown as in the graphic:



Basic components includes

- Transmission Case
- Ring Gear and Differential Assembly
- Shift Control Assembly
- Input Shaft
- Input Shaft Gear
- Main Shaft
- Main Shaft Gear

Shift Control Assembly

Shift control assembly is to select the gear through the fork movement. Self-locking bolt is used to prevent the gear jumping out. Between the 5th/reverse gear fork and the 1st/2nd gear fork, and between the 5th/reverse gear fork and the 3rd/4th gear fork, there are interlock pin to prevent engaging two gears at the same time, so as to ensure transmission work properly.

Gear

Forward Gear

Forward gear disengaged by a group of shift fork to control the sliding lock ring synchronizer.

Reverse Gear

Reverse gear is not synchronized, using a sliding idler wheel. When the reverse gear is engaged, sliding idler pulley will be meshing with the input shaft and main shaft reverse gear reverse output gear at the same time, to transmit the input torque to the main shaft output, and so that the main shaft rotation is opposite to that when the forward gears are engaged, thus reversing the vehicle.

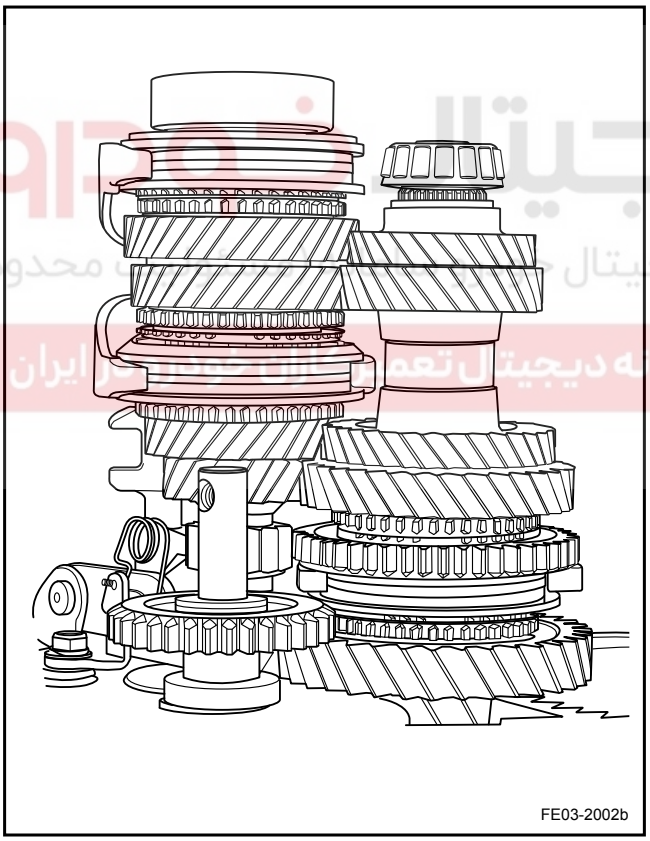
3.3.3 System Working Principle

3.3.3.1 Shifting Working Principle

Because the engine output torque and speed range is relatively narrow, unable to meet the complex requirements of the vehicle under the conditions of a big range of traction and speed changes, the role of transmission is to expand the driving wheel torque and speed range by changing the transmission ratio, therefore to adapt to constantly changing conditions.

This vehicle's transmission is a five-speed manual transmission with two axles. There are five forward gears, a reverse gear, and a neutral gear. Gear shift control is achieved by controlling the shift shaft. The shift shaft and the shift fork make the selected synchronizer and gear mesh. The input shaft torque and speed is delivered to the main shaft, to the differential, and to the drive axle and wheels.

Neutral Gear Working Status:

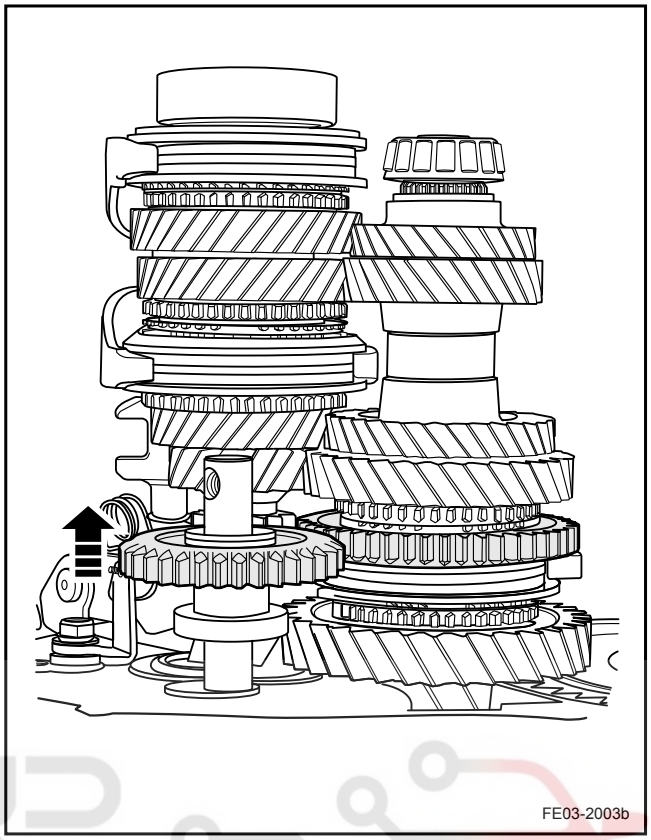


FE03-2002b

The shift control does shift the shift shaft and the shift fork. Synchronizer and the neutral gear are not meshing. Reverse idler wheel and the input shaft reverse gear and main shaft output gear are not mesh, No main shaft torque and speed output.

Reverse

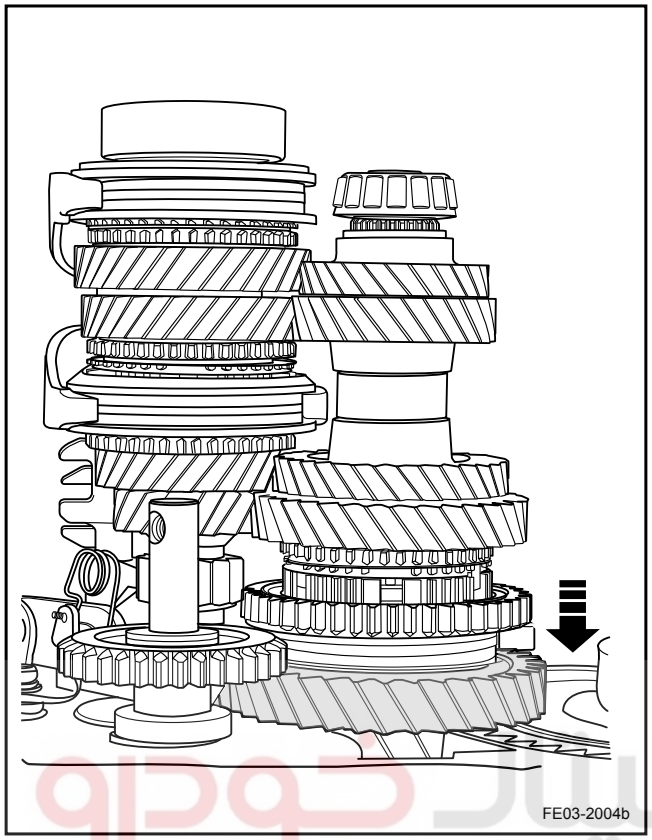
Reverse Gear Working Status:



FE03-2003b

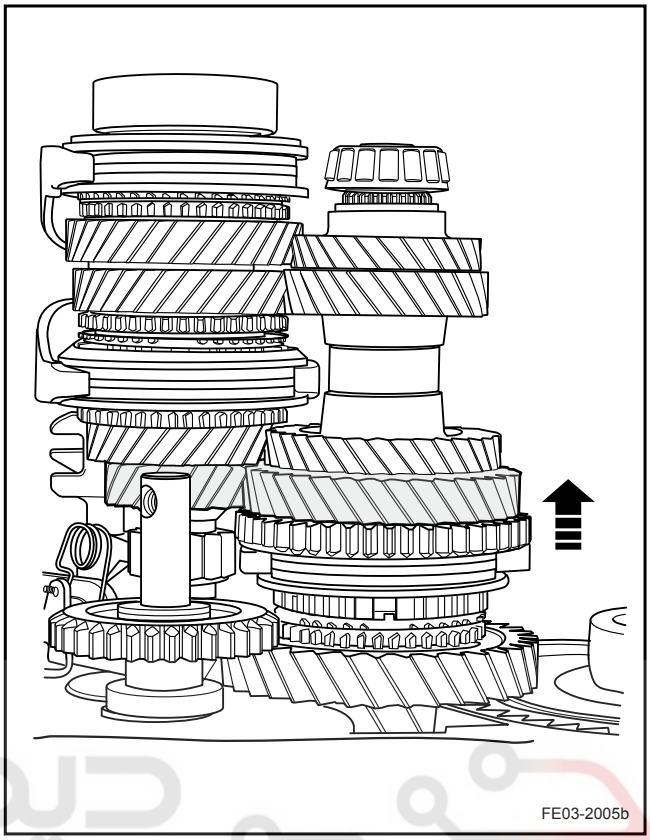
The shift control makes the 5th/Reverse shift shaft and fork move to rear end of the transmission. Reverse idler wheel and the input shaft reverse gear and main shaft output gear are meshing. Main shaft input and output torque and speed is the same direction.

1st Gear Working Status:



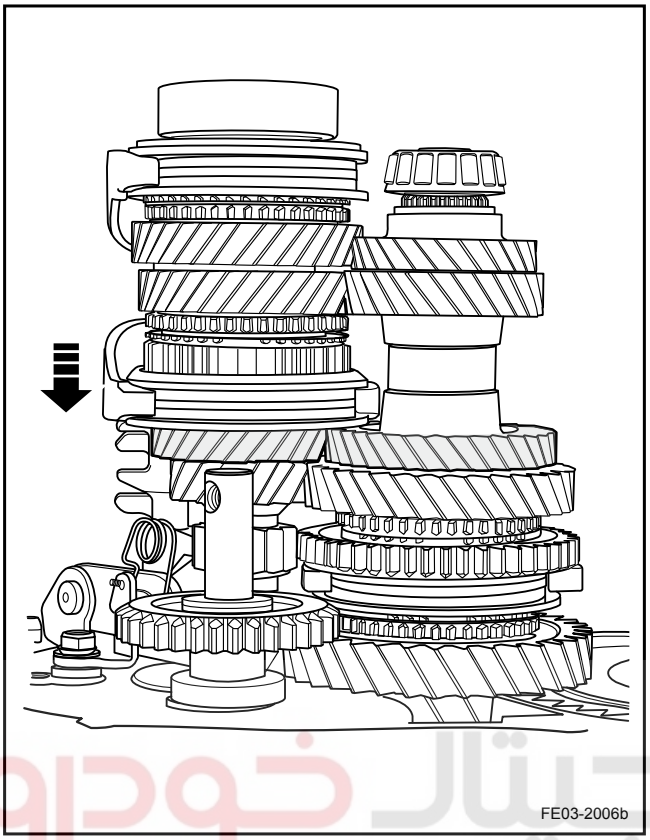
The shift control makes the 1st/2nd shift shaft and fork move to the front end of the transmission. The 1st/2nd gear synchronizer and 1st gear are meshing. Main shaft receives the input torque from the 1st gear and outputs torque and speed opposite to the input shaft.

2nd Gear Working Status:



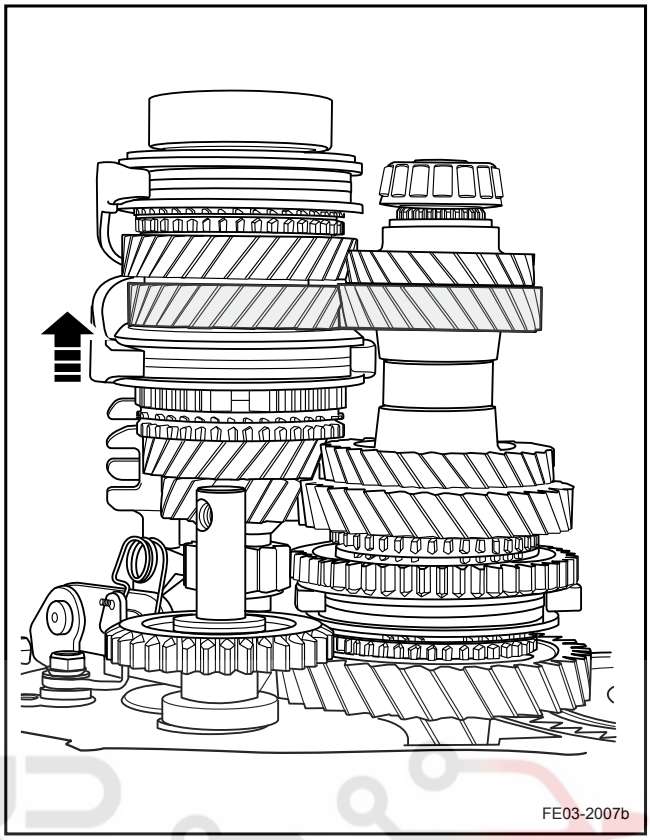
The shift control makes the 1st/2nd shift shaft and fork move to the rear end of the transmission. The 1st/2nd gear synchronizer and 2nd gear are meshing. Main shaft receives the input torque from the 2nd gear and outputs torque and speed opposite to the input shaft.

3rd Gear Working Status:



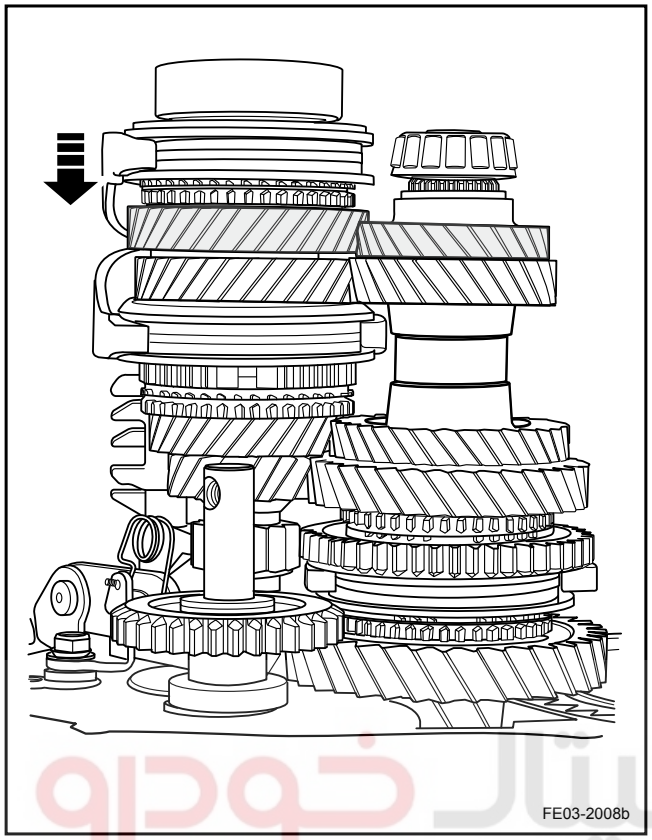
The shift control makes the 3rd/4th shift shaft and fork move to the left side (front end) of the transmission. The 3rd/4th gear synchronizer and 3rd gear are meshing. Main shaft receives the input torque from the 3rd gear and outputs torque and speed opposite to the input shaft.

4th Gear Working Status:



The shift control makes the 5th/Reverse shift shaft and fork move to the left side (rear end) of the transmission. The 3rd/4th gear synchronizer and 4th gear are meshing. Main shaft receives the input torque from the 4th gear and outputs torque and speed opposite to the input shaft.

5th Gear Working Status:



The shift control makes the 5th/Reverse shift shaft and fork move to the left side (front end) of the transmission. The 5th/ Reverse gear synchronizer and 5th gear are meshing. Main shaft receives the input torque from the 5th gear and outputs torque and speed opposite to the input shaft.

3.3.3.2 Vehicle Speed Sensor Working Principle

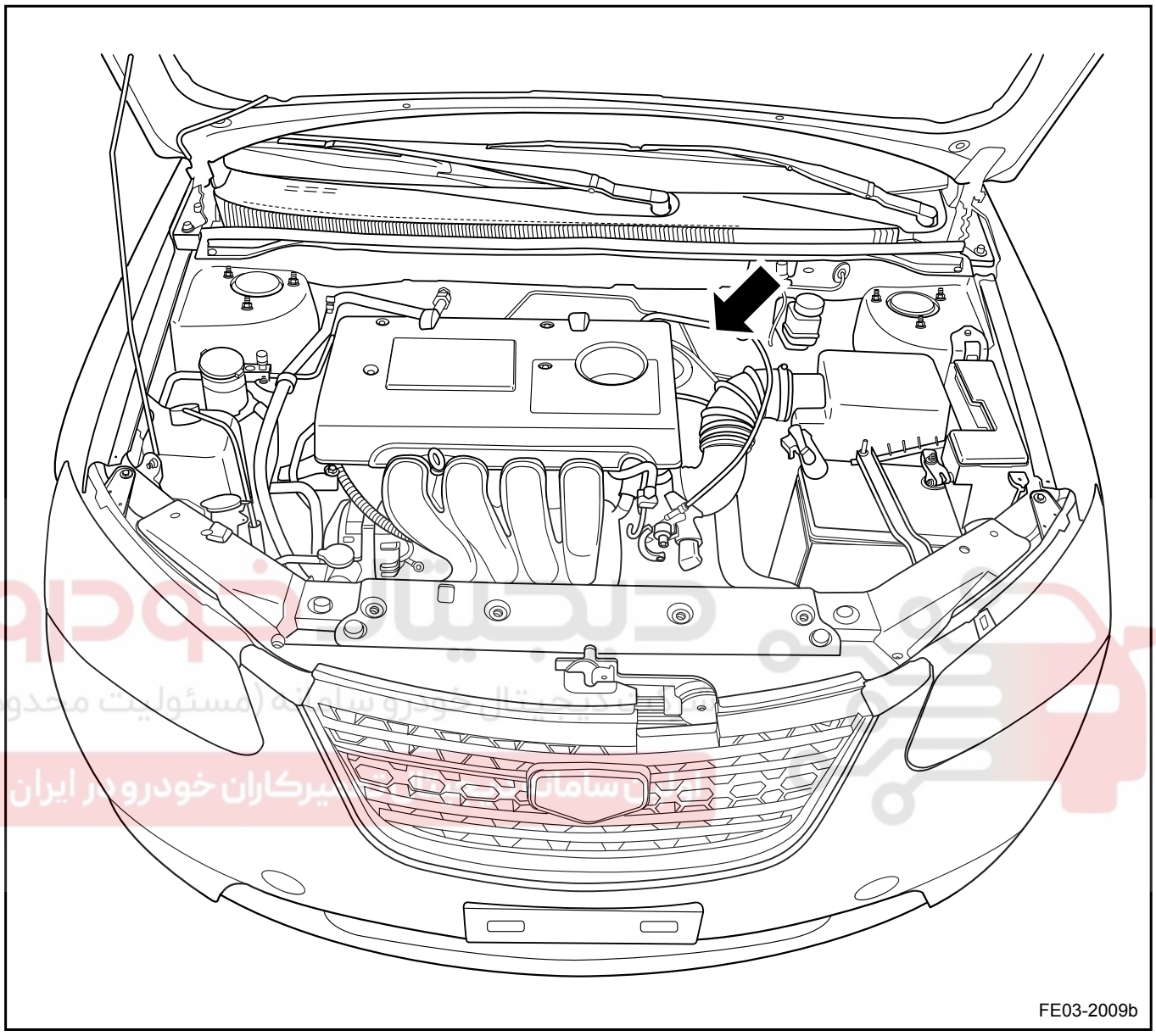
Vehicle speed sensor is a Hall sensor, installed on the drive gear shaft. When the transmission main shaft rotates, the vehicle speed sensor operates, so that the vehicle speed sensor generates signals and sends the signal to the instrument panel.

3.3.3.3 Reverse Switch Working Principle

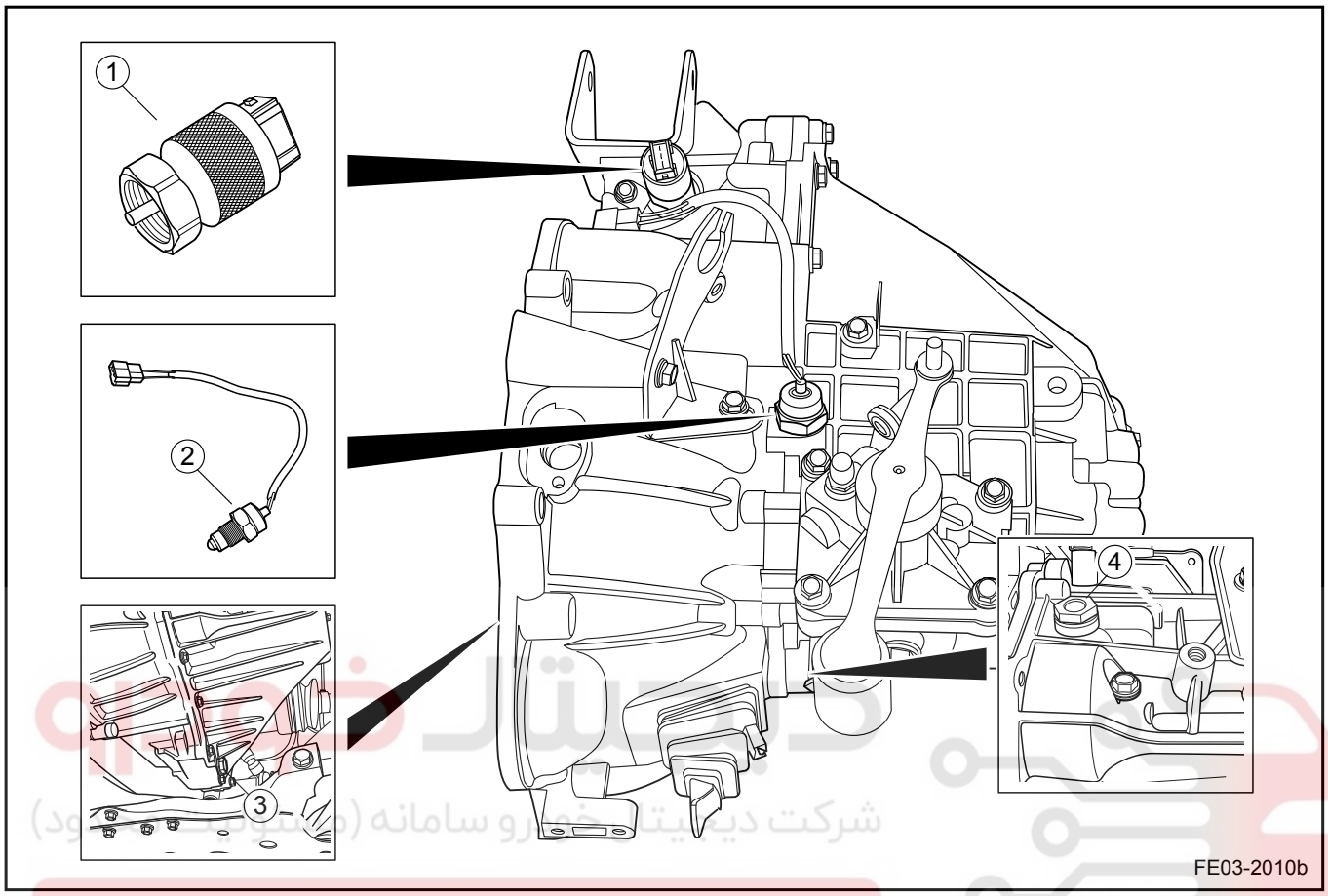
Reverse switch is a normally open switch. When the reverse gear is engaged, the reverse fork will squeeze reverse switch contact, making reverse switch closed, then the reversing light circuit is completed and reversing light is lit.

3.3.4 Component Locator

3.3.4.1 Transmission Assembly Location



3.3.4.2 Vehicle Speed Sensor, Reverse Switch
Location

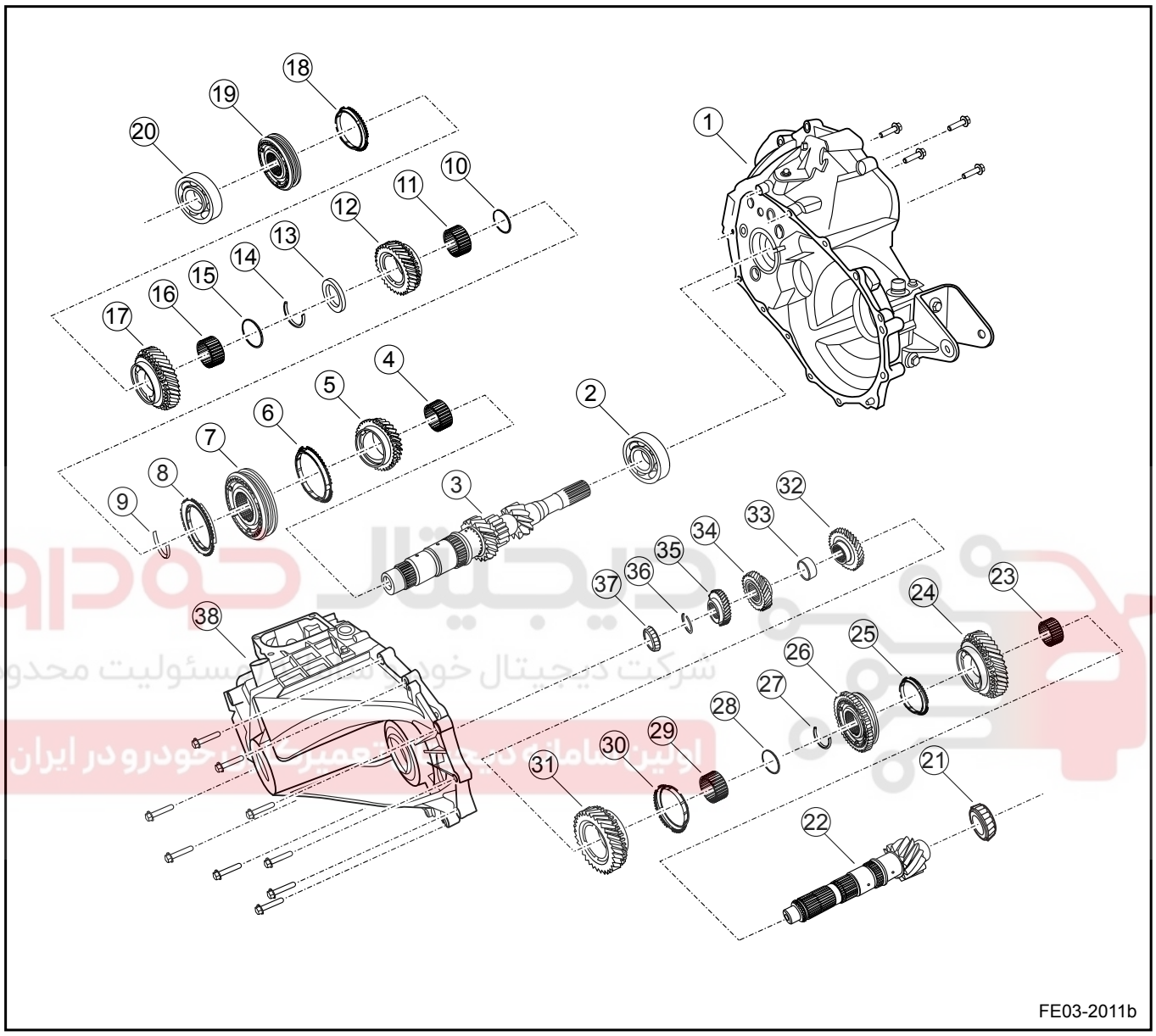


Legend

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

3.3.5 Disassemble View

3.3.5.1 Gear Components and Gear Box Disassemble View

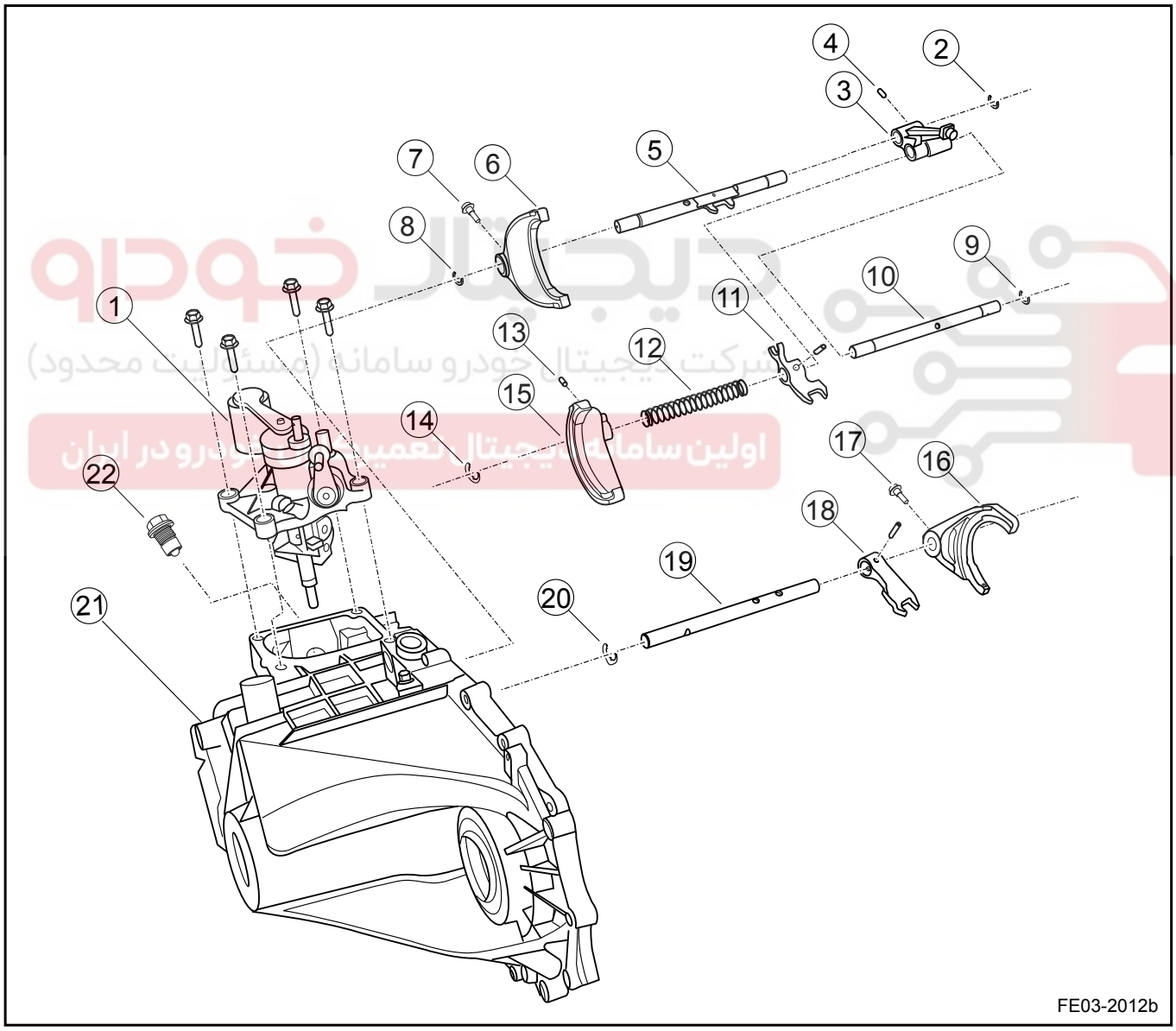


Legend

1. Transmission Front End Case
2. Input Shaft Front Bearing
3. Input Shaft
4. 3rd Gear Bearing
5. 3rd Gear
6. 3rd Gear Synchronizer Ring
7. 3rd/4th Gear Synchronizer
8. 4th Gear Synchronizer Ring
9. 3rd/4th Gear Synchronizer Snap Ring
10. 4th Gear Bearing Washer
11. 4th Gear Bearing
12. 4th Gear
13. 4th Gear Locking Ring
14. 4th Gear Snap Ring
15. 5th Gear Bearing Washer
16. 5th Gear Bearing
17. 5th Gear
18. 5th Gear Synchronizer Ring
19. 5th Gear Synchronizer
20. Input Shaft Rear Bearing

21. Main Shaft Front Bearing
22. Main Shaft
23. 1st Gear Bearing
24. 1st Gear
25. 1st Gear Synchronizer Ring
26. 1st/2nd Gear Synchronizer
27. 1st/2nd Gear Synchronizer Snap Ring
28. 2nd Gear Bearing Washer
29. 2nd Gear Bearing
30. 2nd Gear Synchronizer Ring
31. 2nd Gear
32. 3rd Gear Output Gear
33. 3rd/4th Output Gear Bush
34. 4th Gear Output Gear
35. 5th Output Gear
36. 5th Output Gear Snap Ring
37. Main Shaft Rear Bearings
38. Transmission Rear Case

3.3.5.2 Control Mechanism, Fork Component Disassemble View



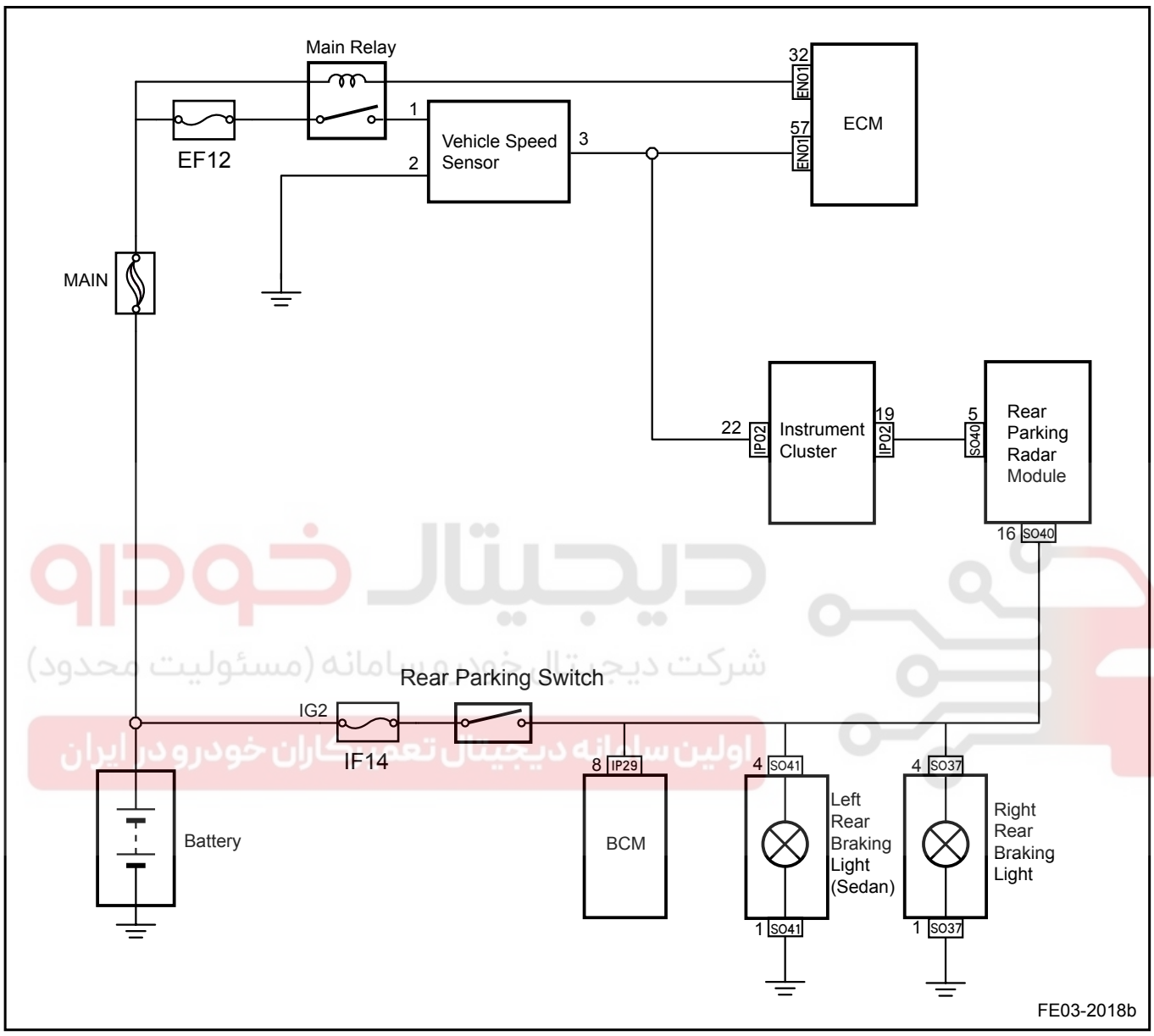
Legend

1. Gearshift
2. 3rd/4th Gear Fork Shaft Front Snap Ring

3. 3rd/4th Gear and 5th/Reverse Installation Sleeve
4. Interlocking Pin
5. 3rd/4th Gear Fork Shaft
6. 3rd/4th Gear Fork
7. 3rd/4th Gear Fork Retaining Screw
8. 3rd/4th Gear Shaft Rear Snap Ring
9. 5th/Reverse Gear Shaft Front Snap Ring
10. 5th/Reverse Gear Shift Fork
11. 5th/Reverse Gear Installation Sleeve
12. 5th Fork Springs
13. Interlocking Pin
14. 5th/Reverse Gear Shaft Rear Snap Ring
15. 5th Fork
16. 1st/2nd Gear Fork
17. 1st/2nd Gear Fork Retaining Screw
18. 1st/2nd Gear Installation Sleeve
19. 1st/2nd Gear Fork Shaft
20. 1st/2nd Gear Fork Shaft Snap Ring
21. Transmission Rear Case
22. Gear Shaft Self-Locking Bolt

3.3.6 Schematic

3.3.6.1 Reverse Switch, Vehicle Speed Sensor Circuit Schematic



3.3.7 Diagnostic Information and Procedures

3.3.7.1 Diagnosis Description

Refer to3.3.2 Description and Operationget familiar with the contents of system functions and operation before start 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 the situation is normal.

3.3.7.2 Visual Inspection

Transmission common malfunctions are: hard to shift, gear stuck, gear collision and grinding noise other abnormal sound. The clutch, drive system malfunction can also cause the above symptoms. During the service, we need carefully analyze and distinguish.

1. Prior to transmission repair, carry out the clutch general inspection:

A. Check transmission, clutch pipe for fluid leaking.

B. Check the transmission fluid level, transmission fluid viscosity and color, check for dirt and metal debris. Determine whether there have been internal components stuck, burning or broken.

C. Check transmission and the surrounding components. Check for bolts and nuts loose or falling off.

D. Road test and engage gears to confirm the vehicle conditions for further diagnostic.

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

3. Before repair the transmission abnormal sound, identify the following items:

A. Road Noise

Such as tires, road, wheel bearings, engine and exhaust system generated noise. The noise varies due to vehicle size, type and body insulation materials, etc..

B. Drive Shaft System Noise

Drive shaft system as a mechanical device, can not be without sound during the operation. There will be some sound during the operation. Confirm the abnormal noise:

a. Choose a good road surface in order to reduce tires friction and body vibration generated noise.

b. Drive a distance long enough to completely warm up the lubricant.

c. Record speed and transmission gear when the noise occurs.

d. Stop vehicle and shut down the engine, whether there is abnormal sound.

e. Determine whether there is noise when driving the vehicle in the following conditions:

I. Slow acceleration or sudden acceleration.

II. On a even road, keep the throttle slightly open and maintain constant speed when driving.

III. Transmission is put in gear and the throttle closed when cruising.

C. Bearing Noise

a. Differential Gear or Bearing Noise

Differential bearings noise and the wheel bearing noise is likely to be mixed up. As the differential bearings have a pre-load force, even if the wheels leave the road, as long as the differential and drive shaft are in operation, the differential bearings noise will not be significantly reduced.

b. Wheel Bearing Noise

When the transmission is in neutral gear and the vehicle is sliding, the wheel bearing issue a continuous roar or friction sound. Since there is no wheel bearing pre-load force, when the wheels leave the ground the wheel bearing noise will be significantly reduced.

D. Bearing internal wear, deformation, indentation in bearing ring, micro-abrasive entering into the bearing and its seat ring, foreign matter entering into the bearing and the seat ring is locked, bearing and its seat ring due to wear and tear become loose, these will have the noise and thus 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, if necessary, replace these them.

Symptoms	Suspected Parts	Refer to
Hard to shift	1. Clutch	Clutch system3.2.5 Diagnostic Information and Procedures.
	2. Transmission Gearshift Lever	3.3.8.9 Shift Lever Replacement.
	3. Transmission Shift Control Cable	3.3.8.9 Shift Lever Replacement.
	4. Transmission Shift Control Assembly	3.3.8.4 Shift Control Assembly Replacement, 3.3.8.5 Shift Control Assembly Disassemble and Assemble.
	5. Faulty Gear or Synchronizer	3.3.8.3 Transmission Assembly Replacement, 3.3.8.6 Shift Shaft Replacement,3.3.8.7 Input Shaft Disassemble and Assemble,3.3.8.8 Main shaft Disassemble and Assemble.

Diagnostic Steps:

Step 1	Check the shift lever operation.

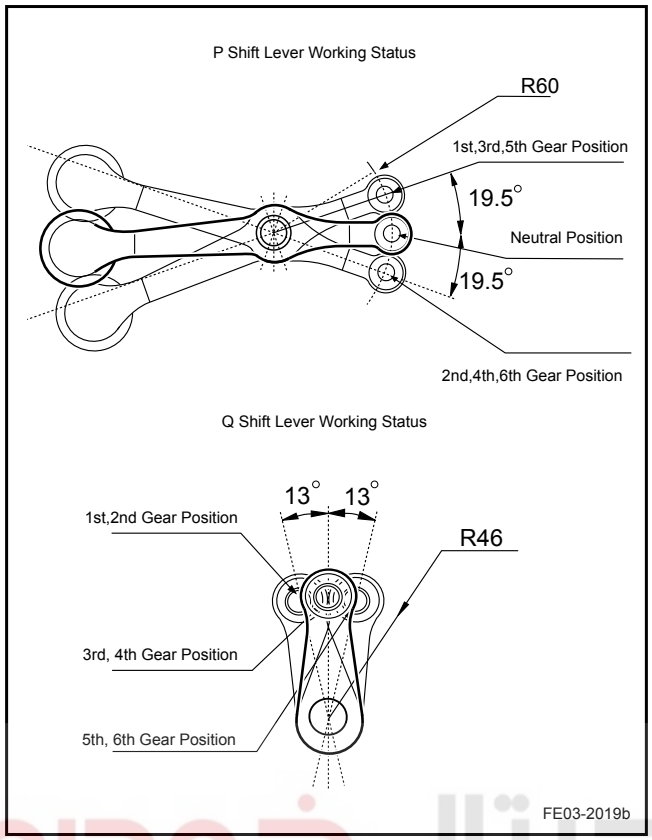
(a) Shut down the engine.

(b) Shift rod hard to engage or disengage gears.

No → Go to step 6

Yes

Step 2	Check shifting force and shift control travel.



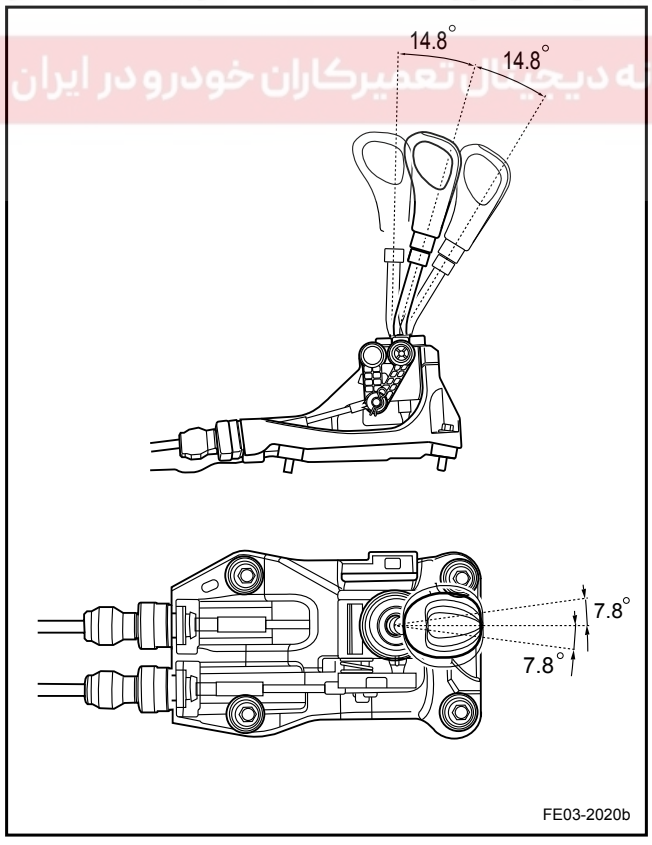
(a) Operate the shift lever. Shifting force is20-30 N (4.5-6.7 LB). Transmission shift control travel should meet the range shown in the graphic.

Yes

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

No

Step 3	Check shifting force and shift control travel.



(a) Disconnect manual shift control cable and transmission control assembly connections.

(b) Operate the shift lever. Check whether the shift control cable can stretch freely and easily.

(c) Transmission shift lever selectional force is<8 N (1.8 LB), shifting force is<4 N (0.9 LB). Transmission shift control travel should meet the range shown in the graphic.

Yes

Adjust or replace the gear control cable. Repair or replace the transmission shift control assembly or fork.

No

Step 4	Check transmission shift control cable movement.

(a) Disconnect cable between the shift lever and the transmission control cable connection.
(b) Check whether the transmission control cable is difficult to stretch or broken.

Yes > Replace the transmission shift control cable.

No

Step 5	Replace the shift lever.

(a) Is shifting problem resolved?

Yes > System normal

No

Step 6	Check the clutch.

(a) With the engine running, transmission is placed in neutral gear.
(b) Press the clutch pedal to the end, check whether the lever can easily engage or disengage the reverse gear.

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

Yes

Step 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 are damaged.
(c) Replace the synchronizer or the gear.
(d) Confirm repair completed.

Next

Step 8	System normal.

3.3.7.4 Jumping Out Of Gear

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

Symptoms	Suspected Parts	Refer to
Off Gear	1. Engine Mount	2.6.8.7 Engine Mount Replacement.
	2. Shift Lever	3.3.8.9 Shift Lever Replacement.
	3. Shift Control Cable	3.3.8.9 Shift Lever Replacement.

Symptoms	Suspected Parts	Refer to
	4. Shift Control Assembly	3.3.8.4 Shift Control Assembly Replacement,3.3.8.5 Shift Control Assembly Disassemble and Assemble.
	5. Shift Fork and Locking Mechanism	3.3.8.6 Shift Shaft Replacement.

Diagnostic Steps:

Step 1	Check the transmission and the engine mount.

(a) When engine is running, is it jittering.
(b) Serious jitter will cause the engine stall.

Yes → Tighten or replace the transmission and engine mount.

No

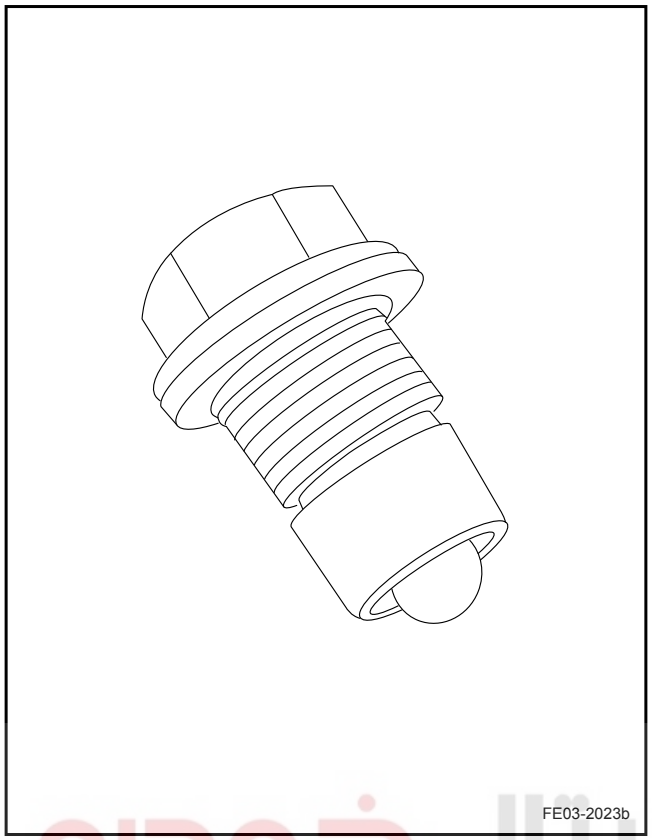
Step 2	Check shift control assembly.

(a) Whether the connection between transmission shift control cable and the transmission shift control assembly is firm.
(b) Whether the connection between the shift lever and the transmission control cable is firm.

No → Tighten or replace the transmission gear or shift lever.

Yes

Step 3	Check transmission gear self-locking nut.



(a) Is the gear self-locking nut installed correctly?

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

Yes

Step 4	Check the shift control assembly.

(a) Remove the shift control assembly to check for wear and tear or deformation.

Yes → Replace the shift control assembly.

No

Step 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

Step 6	System normal.

3.3.7.5 Hard to Disengage

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

Symptoms	Suspected Parts	Refer to
Hard to Disengage	1. Shift Lever	3.3.8.9 Shift Lever Replacement.

	2. Transmission Shift Control Cable	3.3.8.9 Shift Lever Replacement.
	3. Shift Control Assembly	3.3.8.4 Shift Control Assembly Replacement,3.3.8.5 Shift Control Assembly Disassemble and Assemble.
	4. Shift Fork and The Lock Mechanism	3.3.8.3 Transmission Assembly Replacement,3.3.8.6 Shift Shaft Replacement,3.3.8.7 Input Shaft Disassemble and Assemble,3.3.8.8 Main shaft Disassemble and Assemble.
	5. Synchronizer	3.3.8.3 Transmission Assembly Replacement,3.3.8.6 Shift Shaft Replacement,3.3.8.7 Input Shaft Disassemble and Assemble,3.3.8.8 Main shaft Disassemble and Assemble.

Diagnostic Steps:

Step 1	Check transmission shift control system.

(a) Disconnect transmission shift control cable and transmission control connections.
(b) Check the shift lever for catching. The normal gear selection force is<8N (1.8LB), engaging a gear force is<4N (0.9LB).
(c) Check the transmission shift control for damaged ables and catching.

Yes → Repair or replace the shift lever or shift control cable.

No

Step 2	Check the shift control assembly.

(a) Engage and disengage gears.
(b) Check the shift control assembly for catching.
(c) Repair or replace damaged shift fork, or synchronizer.
(d) Confirm repair completed.

Next

Step 3	System normal.

3.3.7.6 Abnormal Sound When Running

Diagnostic Steps:

Step 1	Check abnormal sound.

(a) Stop the vehicle, shut down the engine, place transmission in neutral gear.
(b) Check whether the abnormal sound stops.

Yes → Go to step 4

No

Step 2	Check the clutch abnormal sound.

(a) Press the clutch to the end.
(b) Check whether the abnormal sound stops.

No → clutch system abnormal sound diagnostic, engine abnormal sound diagnostic

Yes

Step 3	Check the transmission internal components.

(a) Remove and disassemble the transmission.
(b) Check for gear group bearing, input shaft gears, each gears / bearings, main shaft bearings damage.
(c) Replace the faulty transmission components.
(d) Confirm whether the system is normal.

Yes → System normal

No

Step 4	Check drive shaft system and front suspension.

(a) Place transmission in neutral gear and release the hand brake.
(b) Lift the vehicle.
(c) Rotate the wheels. Check the drive axle, drive axle bearings whether there is abnormal sound.

Note

The vehicle is lifted at this time. The noise may disappear because the front suspension, drive axle and its bearings load decrease. Check whether the abnormal sound appears only when the axle and the front suspension are under load.

(d) Replace the damaged drive axle or drive axle bearings.
(e) Confirm repair completed.

Next

Step 5	System normal.

- Engage in reverse when driving, there is gear collision or grinding sound.

  Remove the transmission. Inspect and replace the faulty gear, synchronizer or the bearing.

- Engage in reverse when driving, there is a dull metal sound.

  Check the clutch and confirm there is no fault. Refer to "Clutch System"3.2.5 Diagnostic Information and Procedures. Remove the transmission. Inspect and replace the faulty synchronizer.

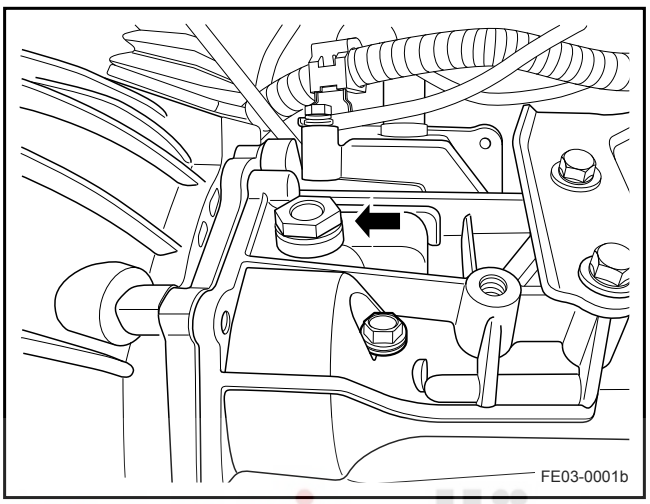
3.3.8 Removal and Installation

3.3.8.1 Transmission Fluid Level Inspection

Inspection Procedure:

Note

If inspect the transmission fluid when the transmission fluid temperature is too high, it may cause burns.

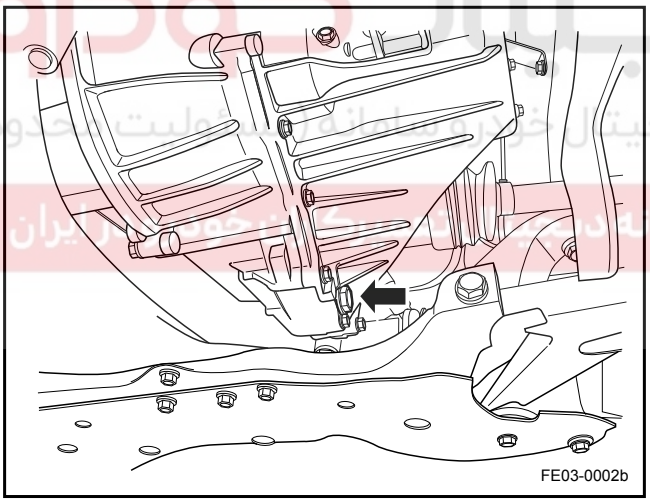


1. Park the vehicle on a level ground, wait for the transmission fluid cooling down, remove the transmission fill plug and check the transmission fluid level (Arrow shown in the graphic).

   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 to until the fluid begins to flow out.

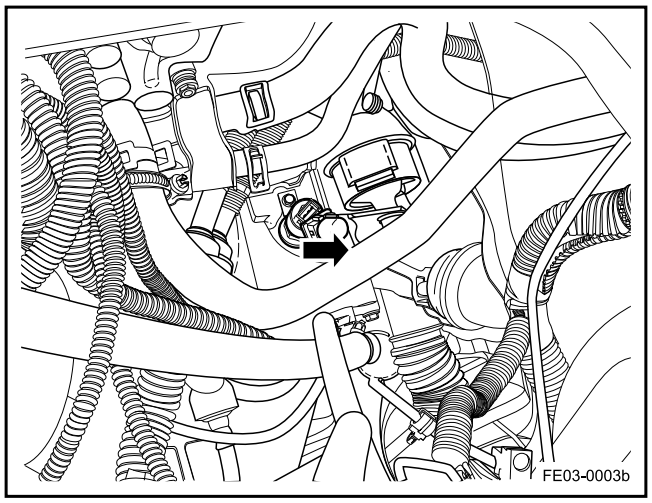
3. Reinstall and tighten transmission fluid plug.



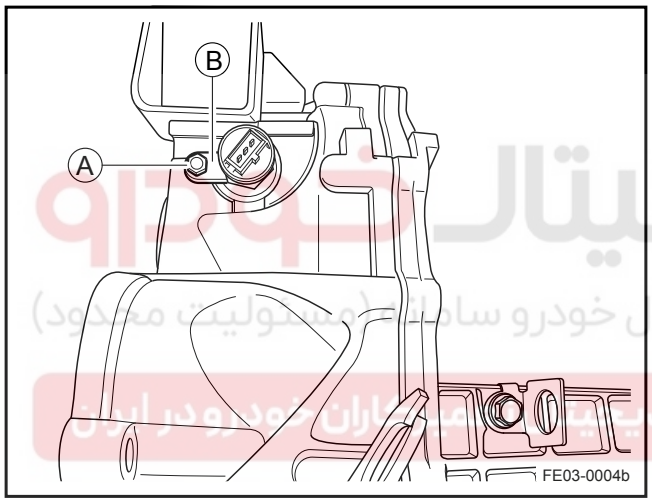
4. If needed, replace the transmission fluid. Remove the transmission fluid plug, drain the transmission fluid (Arrow shown in the graphic).

3.3.8.2 Vehicle Speed Sensor Replacement

Removal Procedure:



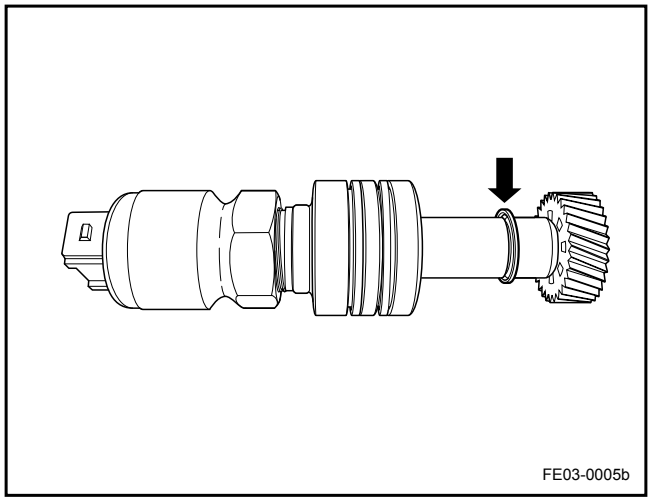
1. Disconnect the battery negative cable. Refer to 2.11.8.1 Battery Disconnection.
2. Disconnect the vehicle speed sensor wiring harness connector.



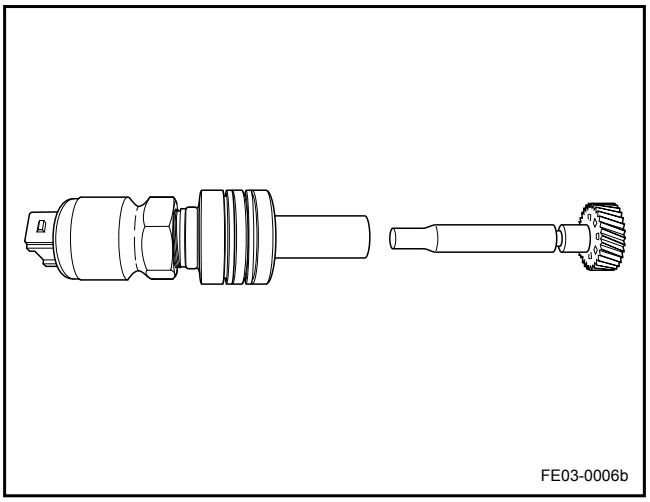
3. Remove the vehicle speed sensor retaining bolt A.

   Note

   The washer B shown in the graphic is movable.

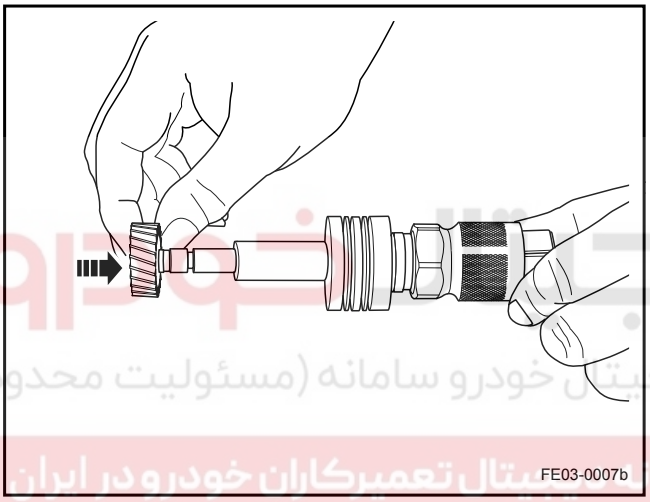


4. As shown in Figure
   Remove the retaining ring as shown in the graphic, dissemble the vehicle speed sensor driven gear.

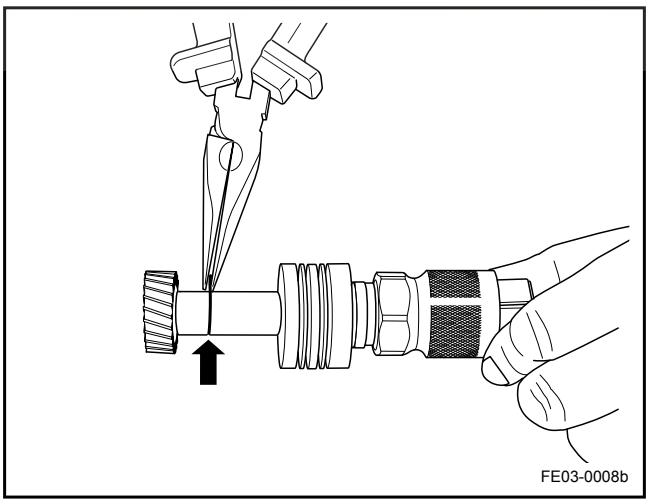


5. Dissemble vehicle speed sensor.

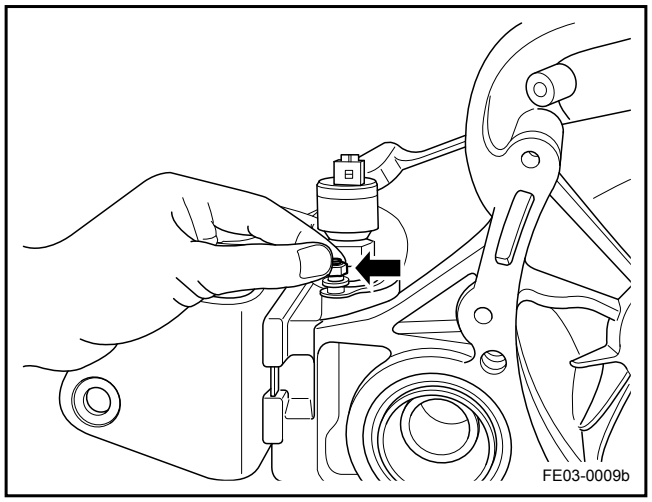
Installation Procedure:



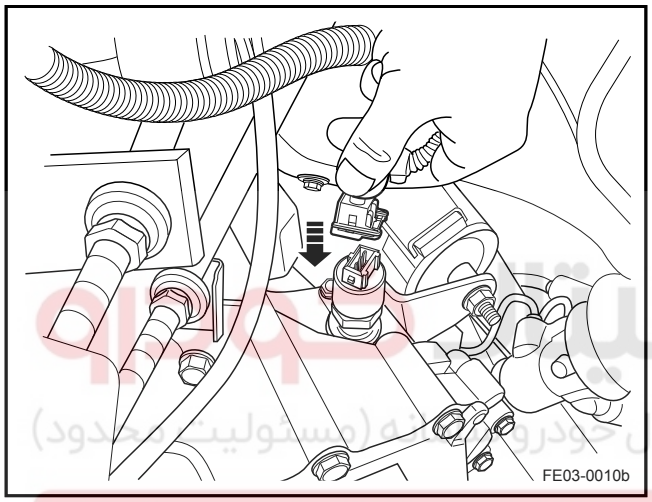
1. Install the vehicle speed sensor driven gear.



2. Install the driven gear retaining ring.



3. Install the vehicle speed sensor and tighten the bolt, note the location of the washer.



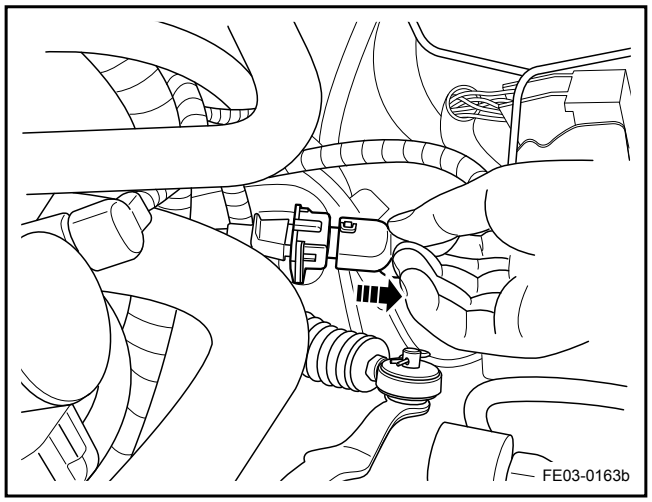
4. Connect the vehicle speed sensor harness connector, as shown in the graphic.
5. Connect the battery negative cable.

3.3.8.3 Transmission Assembly Replacement

Removal Procedure:

Warning!

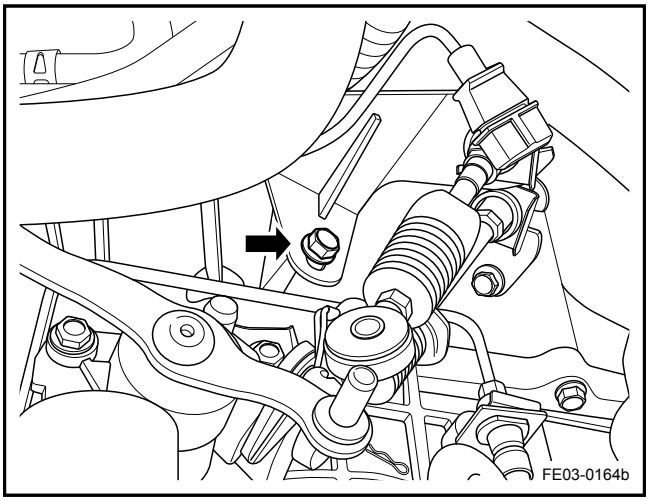
Refer to "Vehicle Lifting Warning" in "Warnings and Notices".



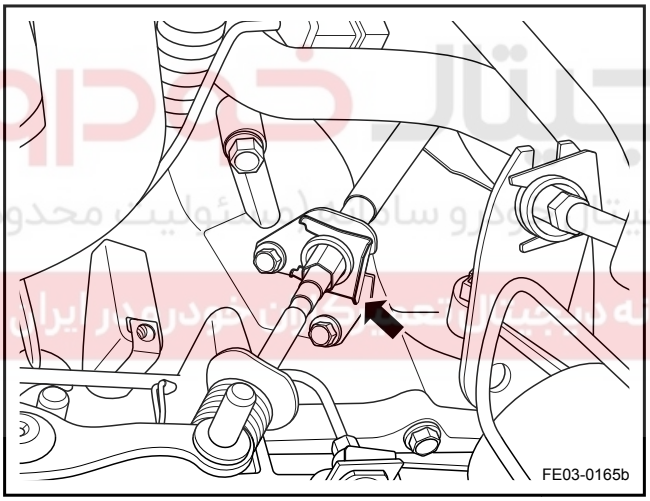
1. Remove the battery negative cable. Refer to 2.11.8.1 Battery Disconnection.
2. Remove the battery. Refer to 2.11.8.2 Battery Replacement.
3. Remove the air filter bracket.
4. Disconnect
   Disconnect the reverse lamp switch wiring harness connector.
5. Disconnect the vehicle speed sensor wiring harness connector.

6. Disconnect the crankshaft position sensor wiring harness connector.

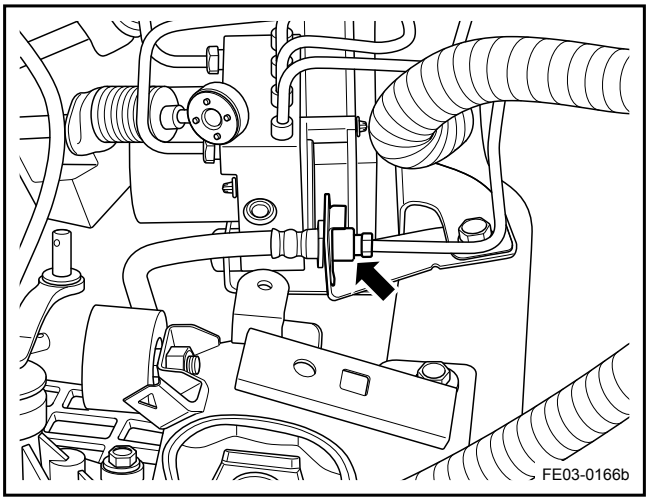
7. Remove the gearshift lever pull bolt. Refer to 3.3.8.4 Shift Control Assembly Replacement.



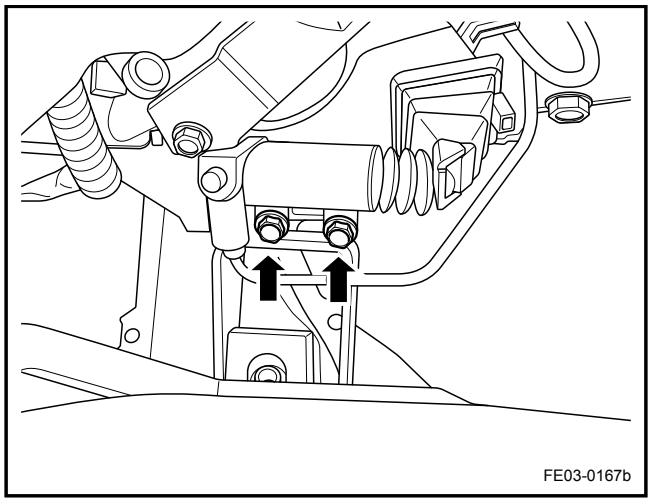
8. Remove the selector shaft bracket.



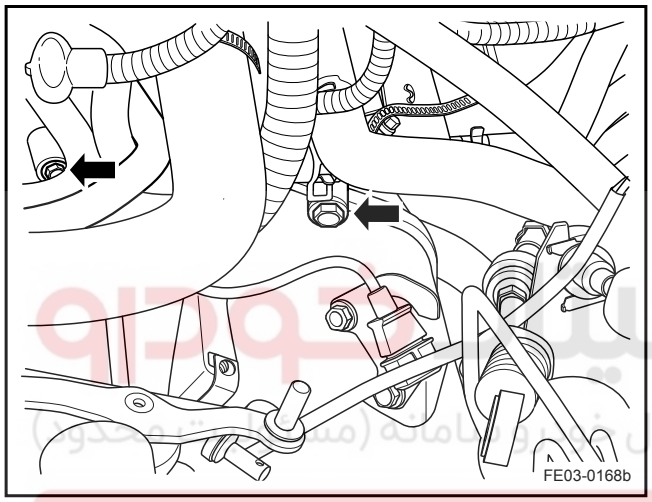
9. Remove the selector shaft retaining pin.



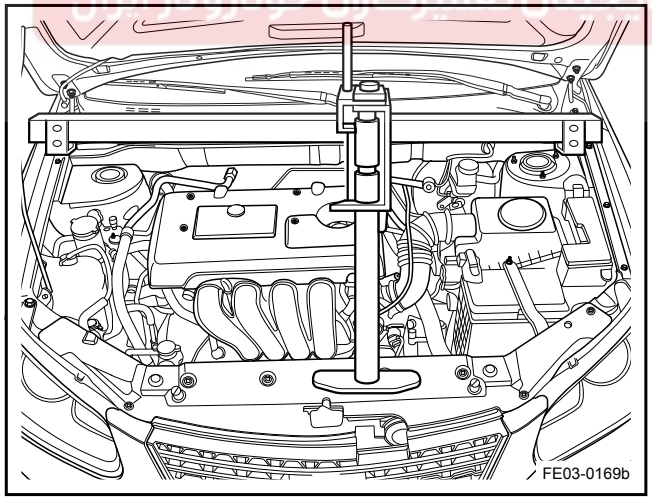
10. Remove the clutch slave cylinder tube.



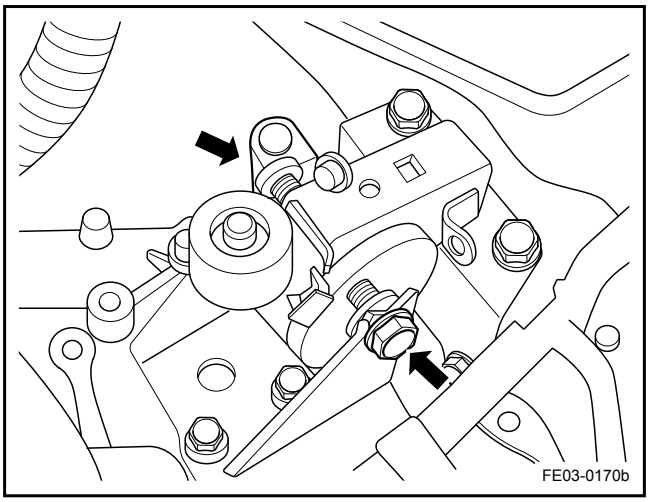
11. Remove the clutch slave cylinder retaining bolts.
12. Remove the starter cable and the retaining bolts. Refer to 2.11.8.4 Starter Replacement.



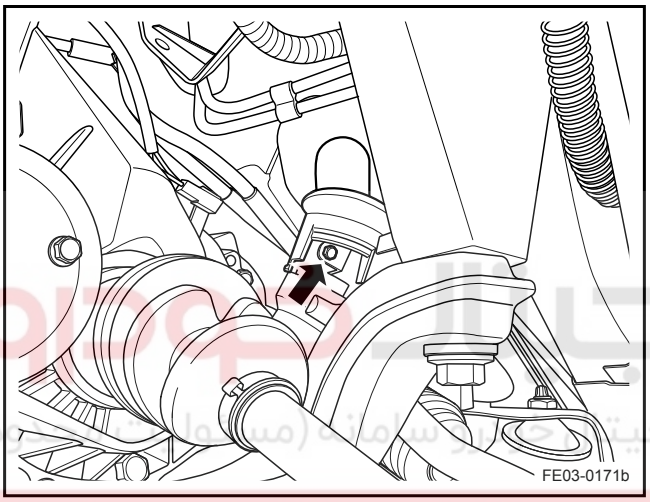
13. Remove the transmission upper connecting bolts.



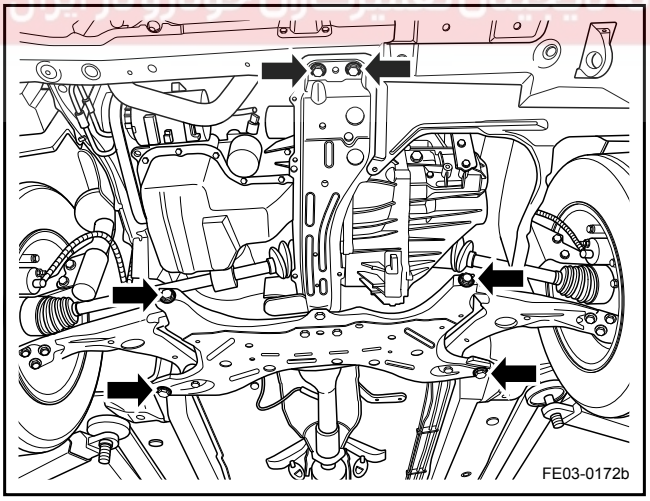
14. With an engine hoisting tool, fix the engine.



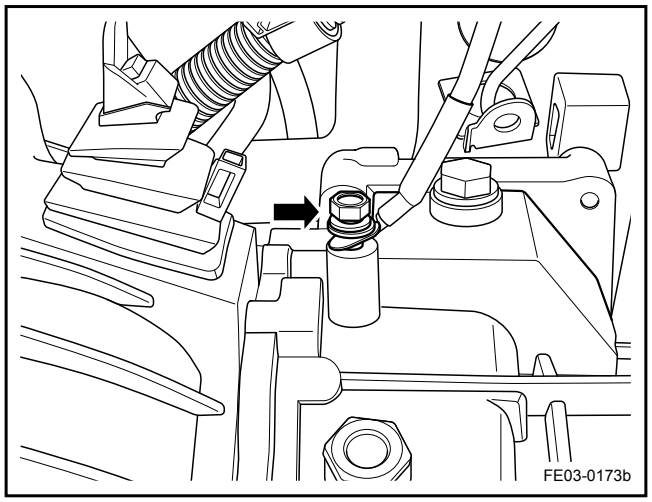
15. Remove transmission left bracket assembly.
16. Remove the front wheels.
17. Lift the vehicle.
18. Remove the transmission fluid plug, after draining the transmission fluid, clean and install the transmission plug. Refer to 3.3.8.1 Transmission Fluid Level Inspection.



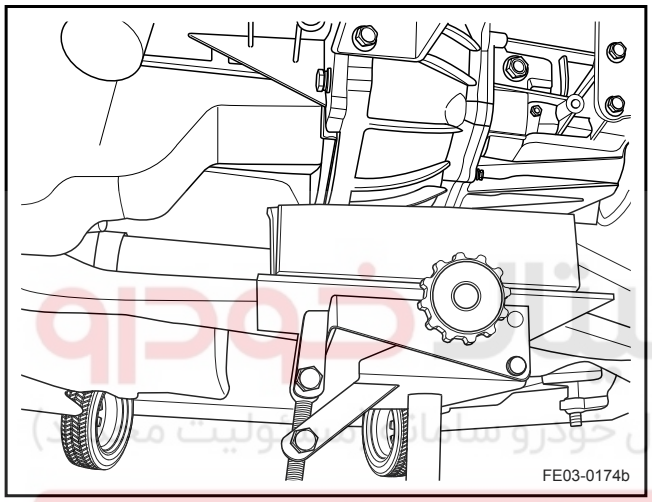
19. Remove the steering horizontal bolts.



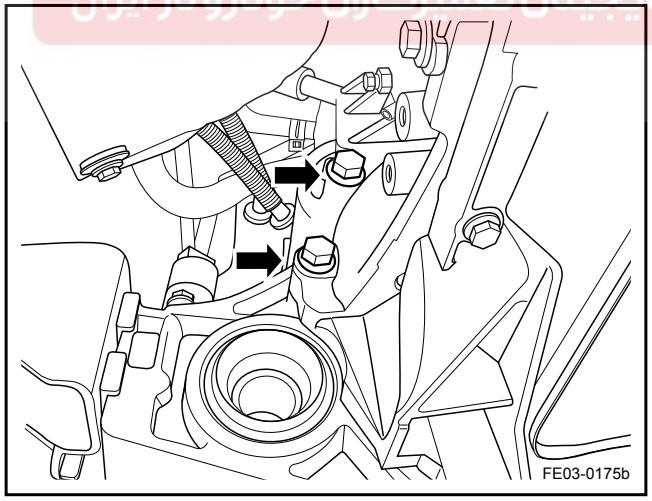
20. Remove the front sub frame and related components. Refer to 12.6.4.3 Cross Member Replacement and 12.6.4.2 Subframe Replacement.
21. Remove the left and right side drive shafts. Refer to 5.3.4.1 Drive Shaft Replacement.



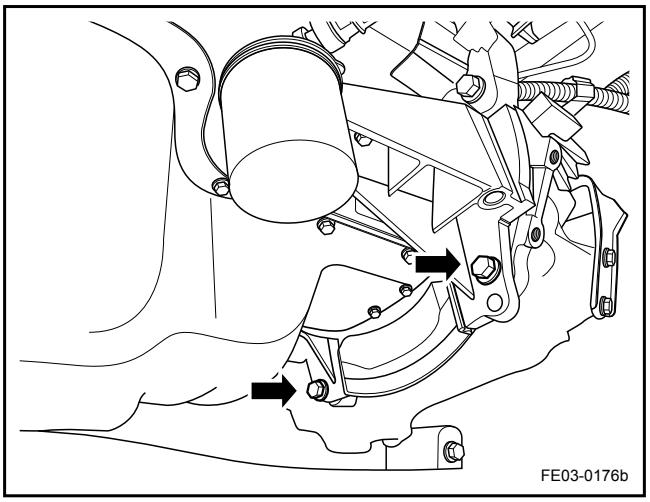
22. Remove the transmission case ground cable.



23. Use a jack to support the transmission.

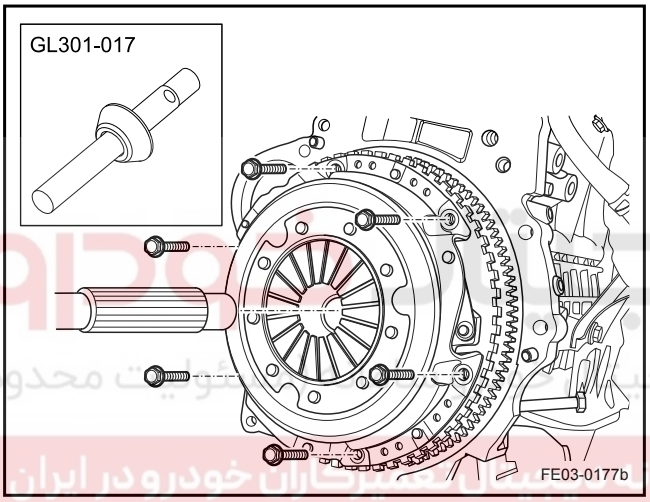


24. Remove the transmission rear connecting bolts.

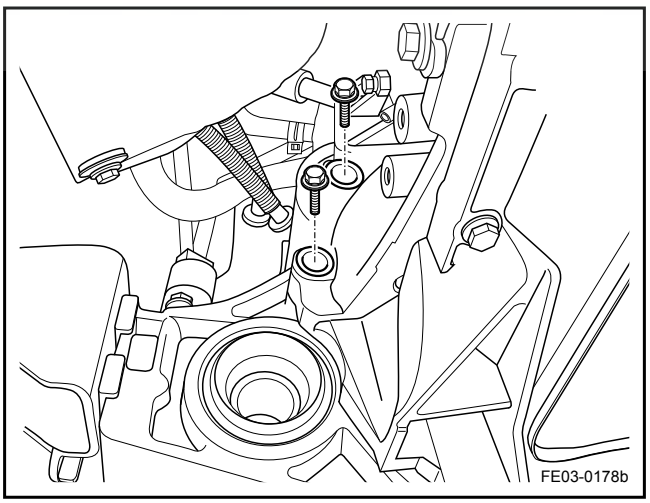


25. Remove the transmission bottom connecting bolts.
26. Remove the transmission assembly.

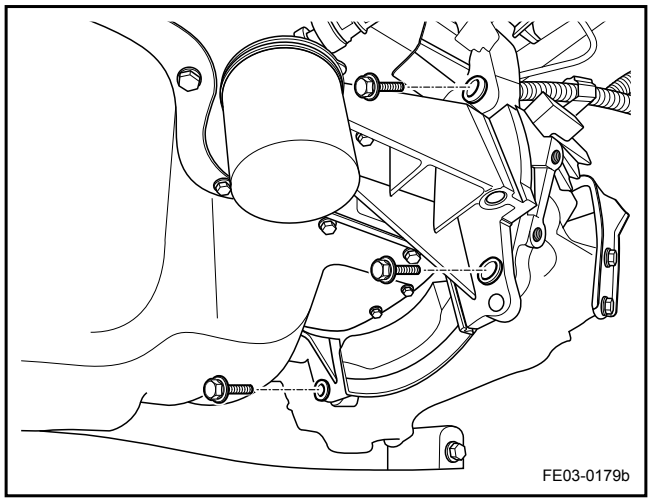
Installation Procedure:



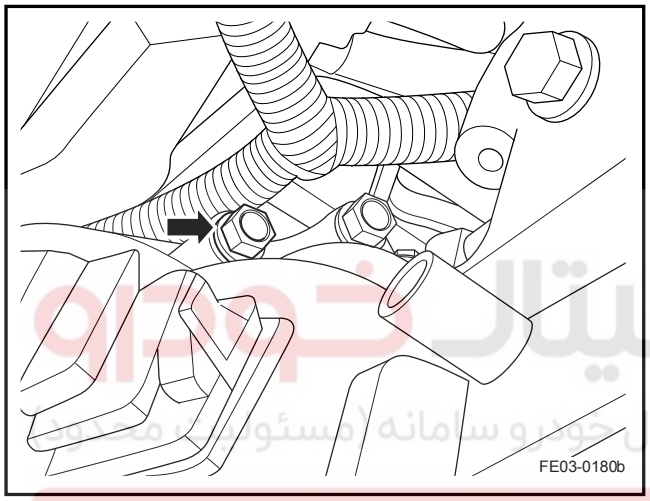
1. Use a flat-panel jack to support the transmission assembly.
2. Insert the transmission input shaft into the clutch plates. Push the transmission to the engine side, pay attention to locating pin position.



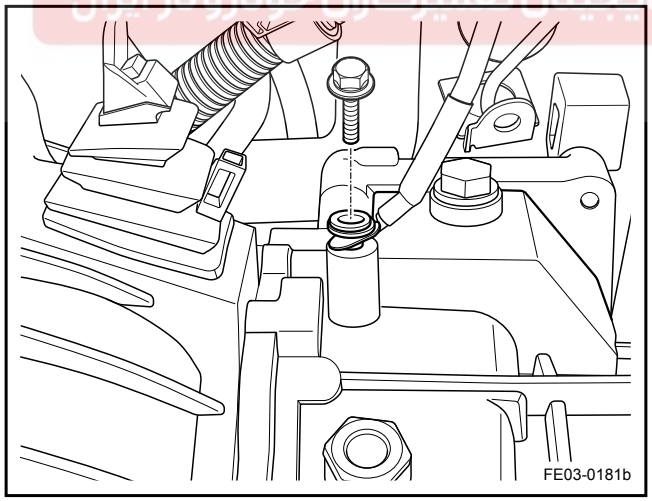
3. Install the transmission rear connecting bolts.



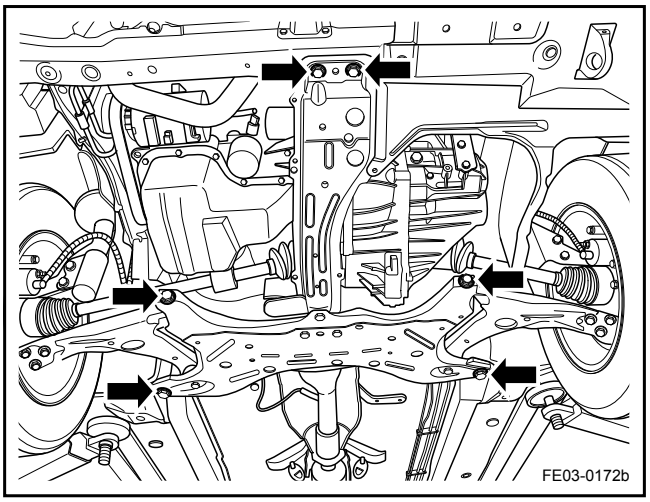
4. Install the transmission rear connecting bolts and the starter motor bottom retaining bolts.



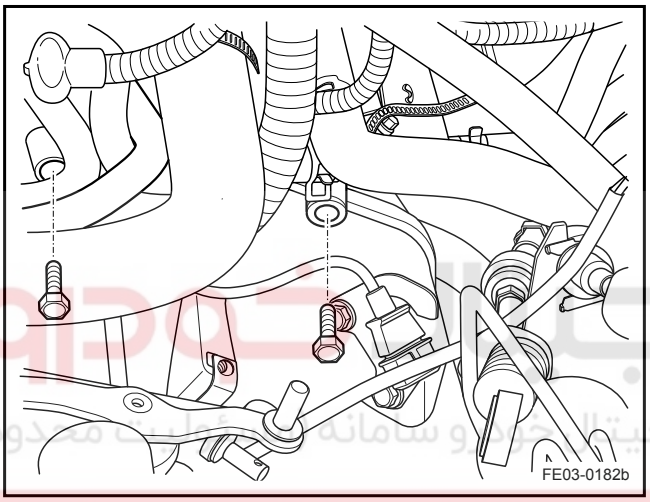
5. Install the starter motor upper retaining bolts and cables.
6. Remove the flat-panel jack.



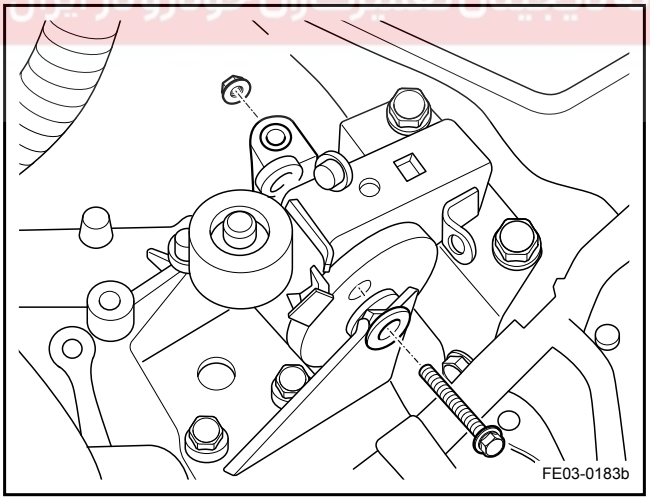
7. Install the transmission case ground cable.
8. Install the left and right drive shafts.



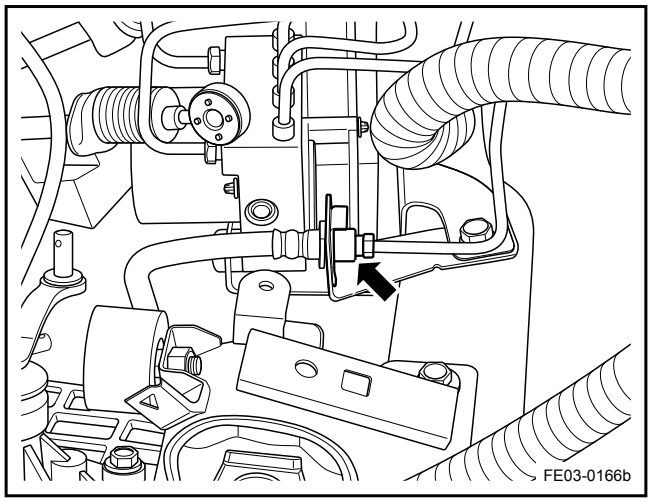
9. Install the front sub frame and related components.
10. Install the front wheels.
11. Remove the engine hoisting tool.



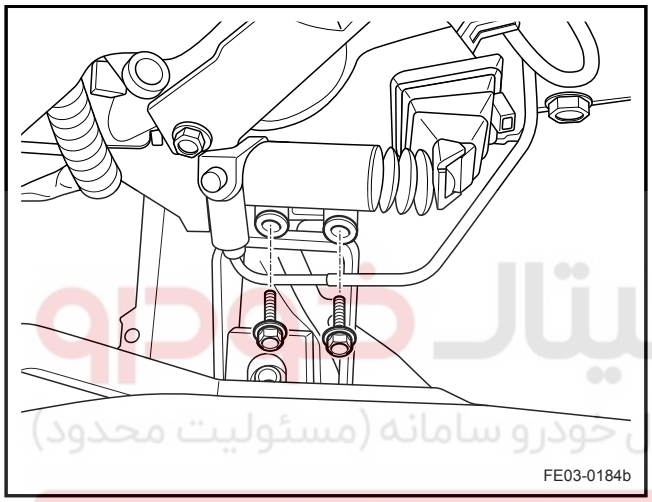
12. Install the transmission upper retaining bolts.



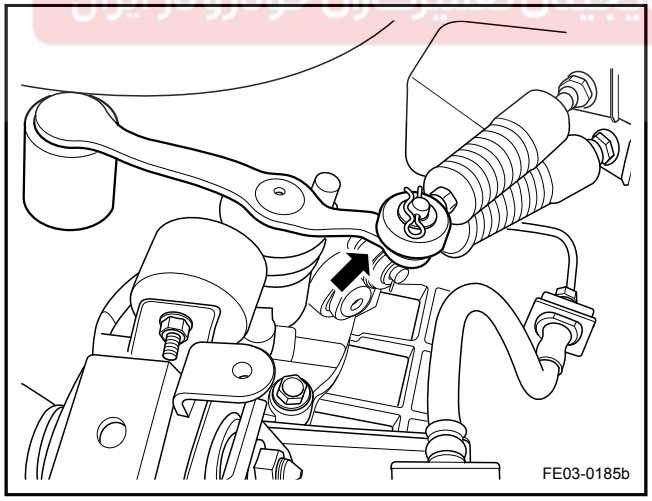
13. Install the transmission left bracket assembly.



14. Install the clutch slave cylinder tube.



15. Install the clutch slave cylinder and bleed the air.



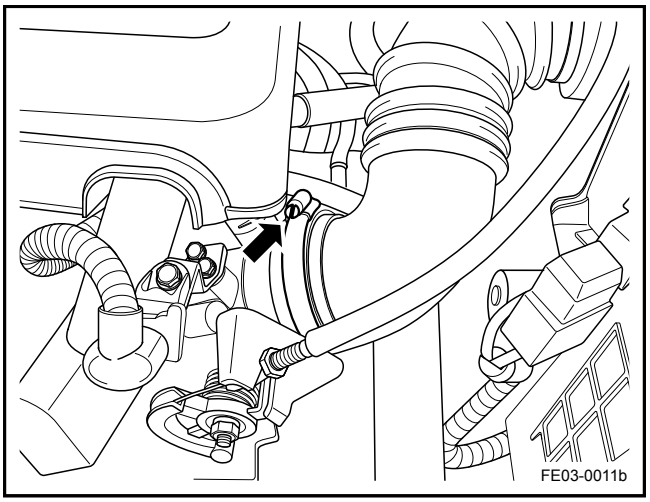
16. Install the gearshift control mechanism.
17. Connect the crankshaft position sensor wiring harness connector.
18. Connect the vehicle speed sensor wiring harness connector.
19. Connect the reverse lamp switch harness connector.
20. Install the battery bracket.
21. Connect the battery negative cable.

3.3.8.4 Shift Control Assembly Replacement

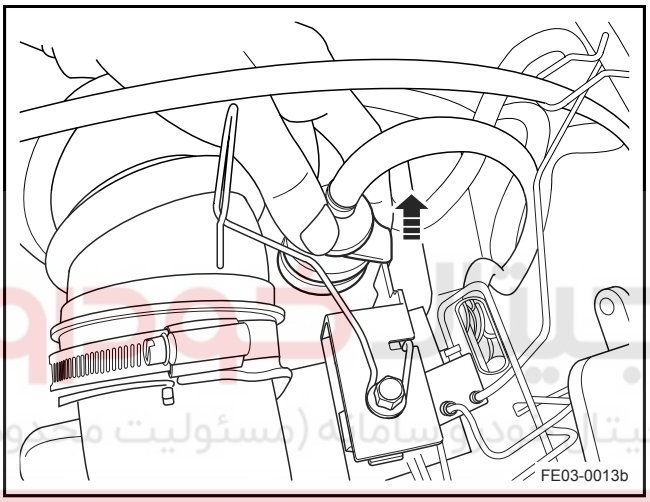
Removal Procedure:

Warning!

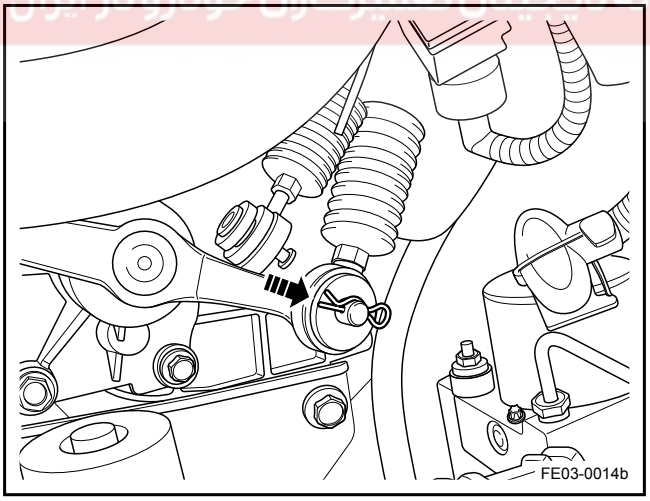
Refer to "Battery Disconnection Warning" in "Warnings and Notices".



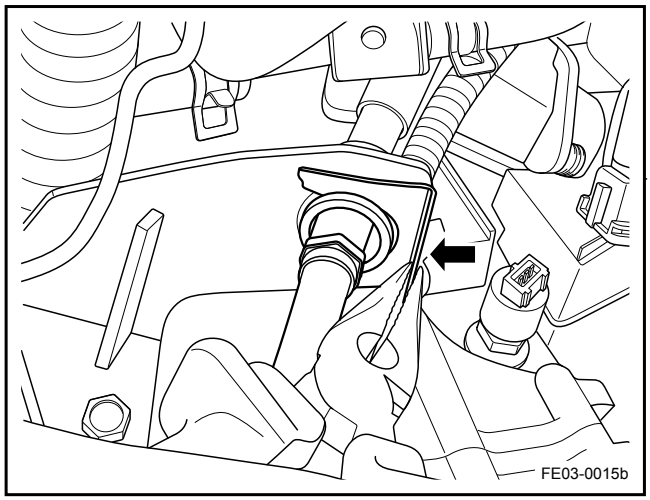
1. Disconnect the battery negative cable. Refer to 2.11.8.1 Battery Disconnection.
2. Remove the intake pipe clamp.



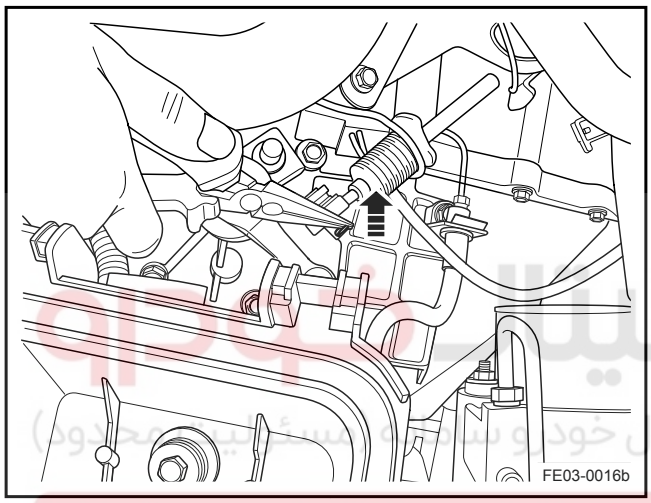
3. Remove the Canister solenoid valve components from the Canister solenoid valve bracket.



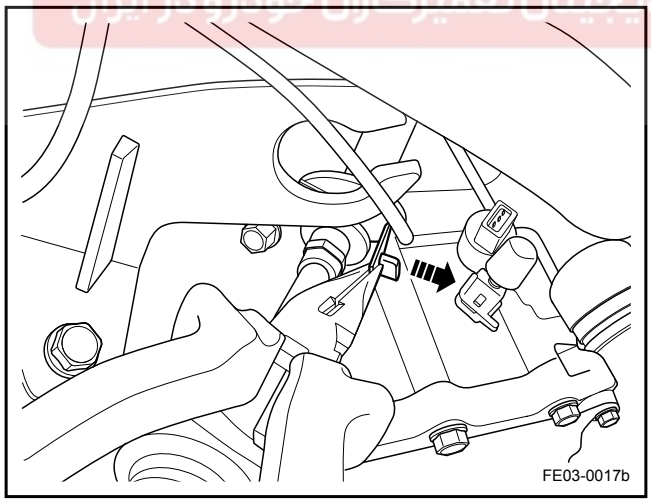
4. Remove the selector shaft rod retaining pin.



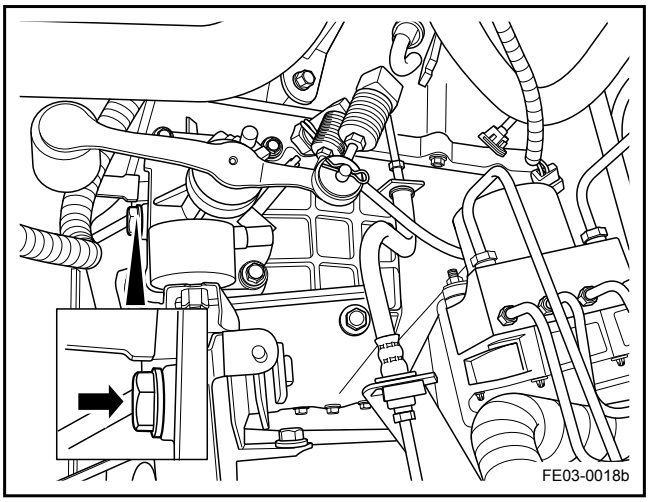
5. Remove the selector shaft locating pin and the selector shaft rod.



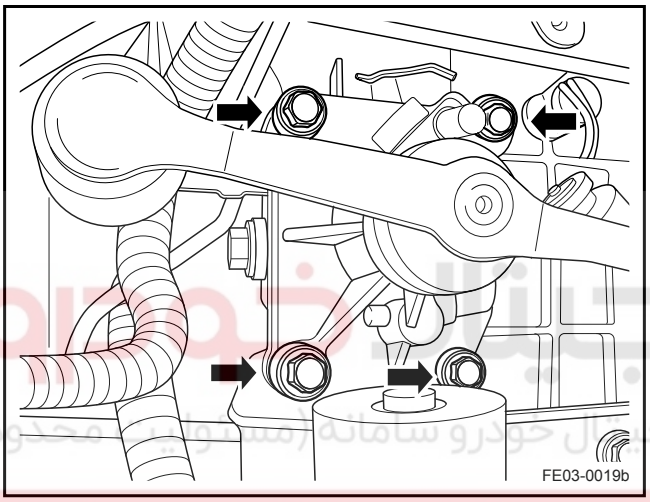
6. Remove the selector shaft rod bolt.



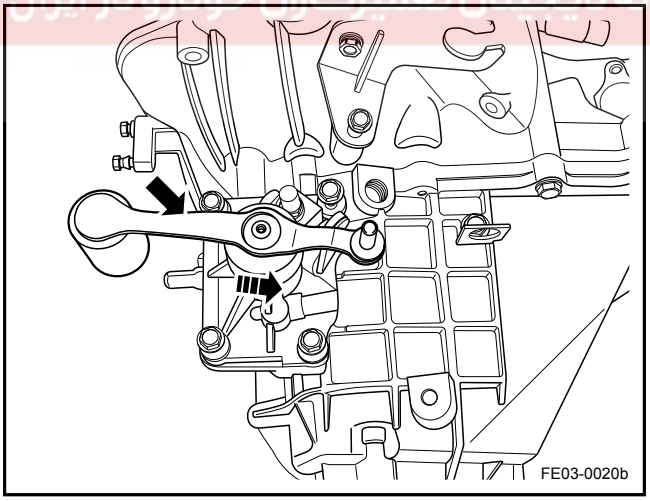
7. Remove the selector shaft locating pin and the selector shaft rod.



8. Remove the selector shaft self-locking bolt.



9. Remove the four bolts as shown in the graphic.

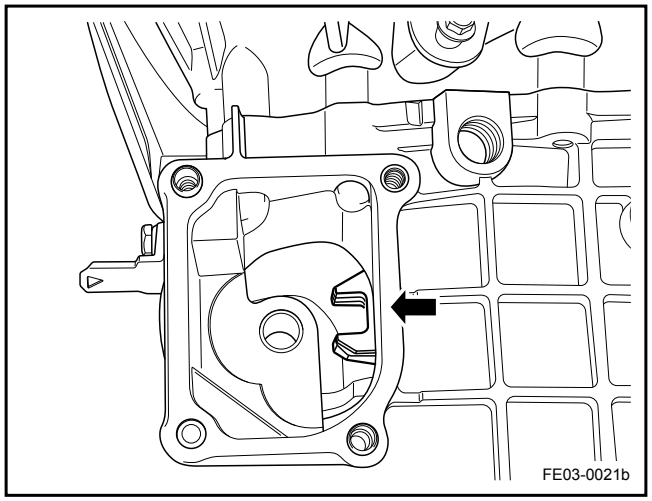


10. Remove the shift control assembly.

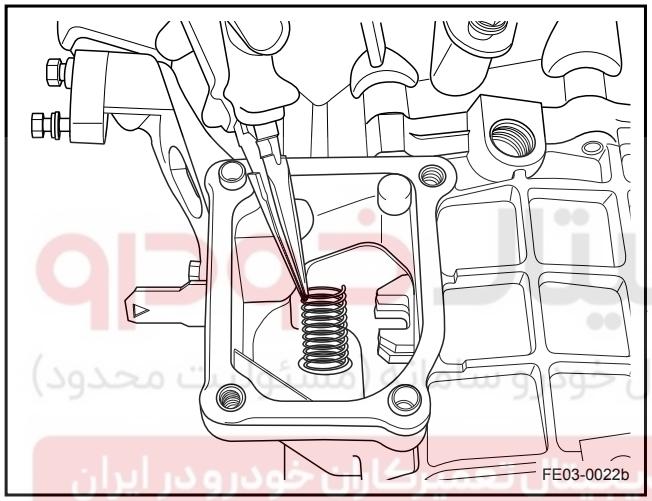
Note

The gear must be at neutral position as shown in the graphic, otherwise the shift control assembly is unable to remove. During the removal, make sure the return spring within the transmission is in a free state, otherwise it may fall into the transmission case.

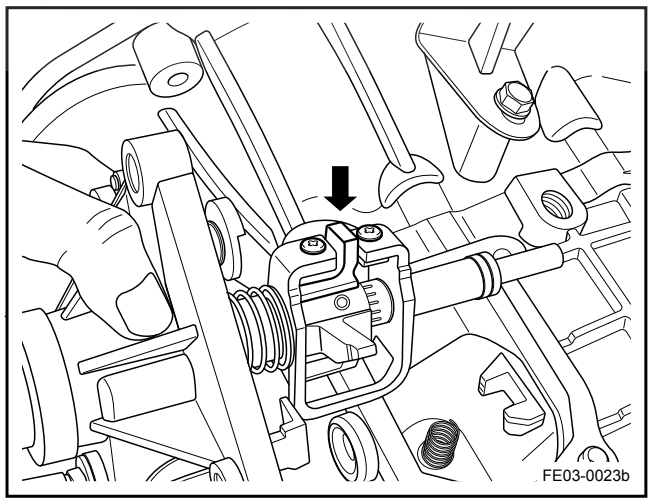
Installation Procedure:



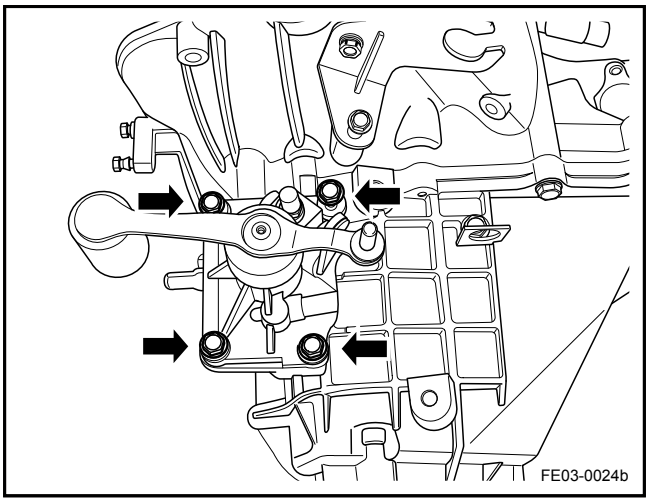
1. Confirm the gear is at neutral position as shown in the graphic.



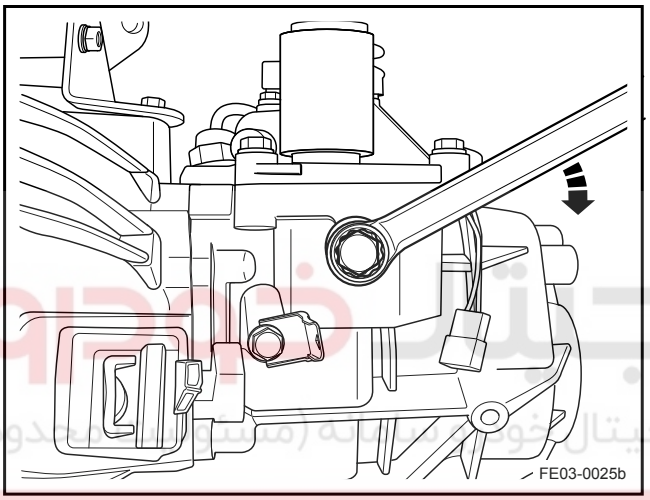
2. Install the return spring to the fixed hole and confirm it is installed into place.



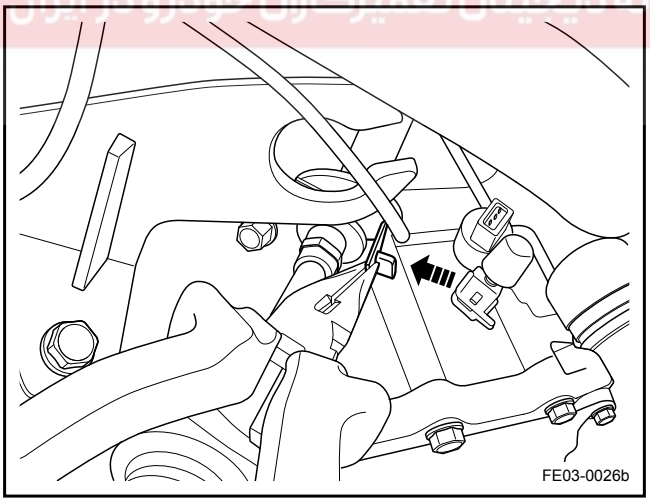
3. Before installation, confirm the shift control assembly and the control slider are at the same level.



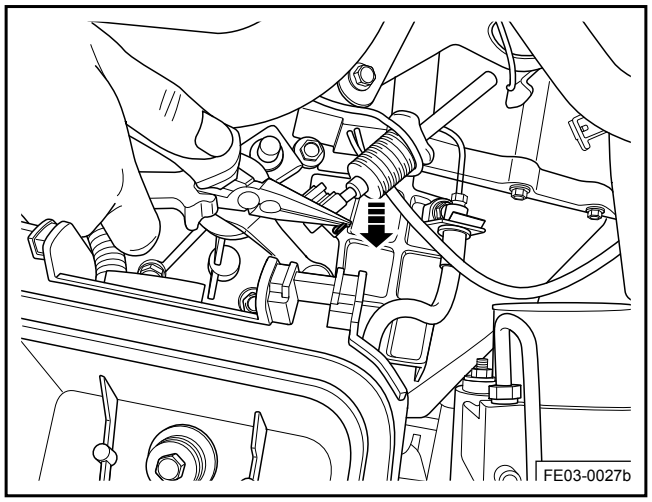
4. Before installation, apply sealant evenly on the mating surface. Install the shift control assembly and tighten the four retaining bolts.



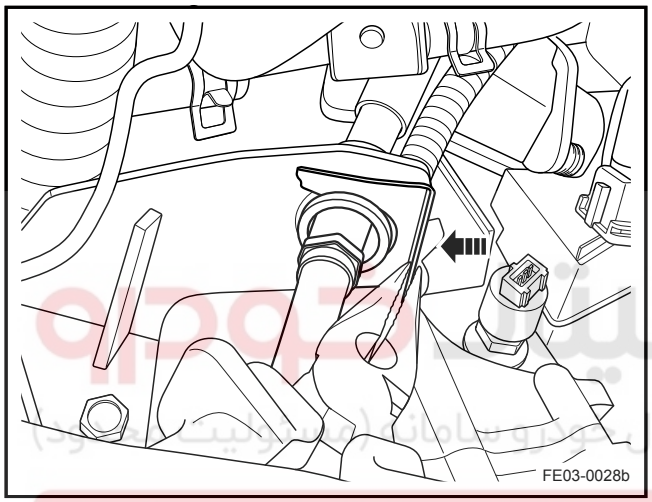
5. Install and tighten the selector shaft self-locking bolt.



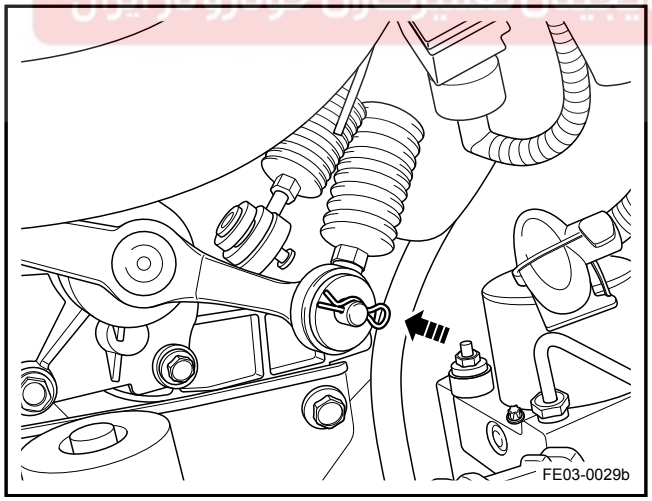
6. Install the selector shaft rod locating pin.



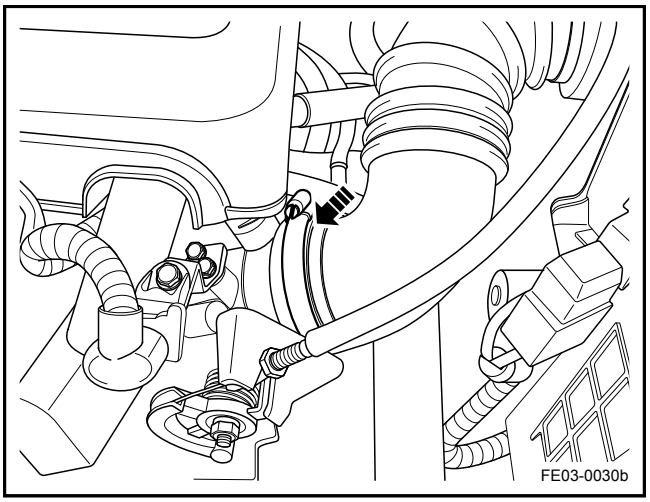
7. Install the selector shaft rod retaining pin.



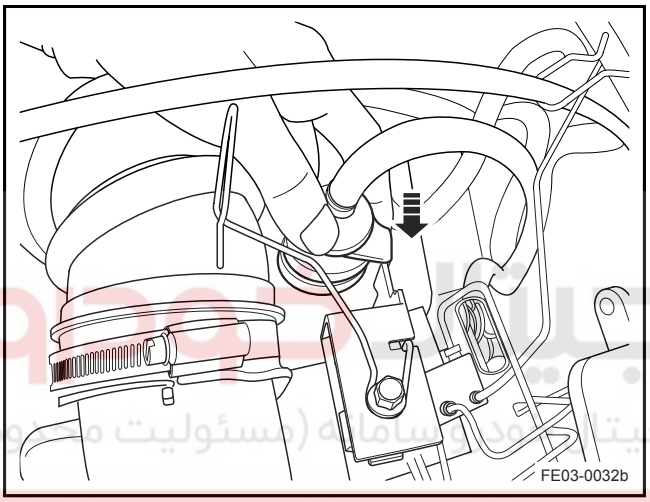
8. Install the selector shaft rod locating pin.



9. Install the selector shaft rod retaining pin.



10. Install the air intake duct and tighten the clamp.



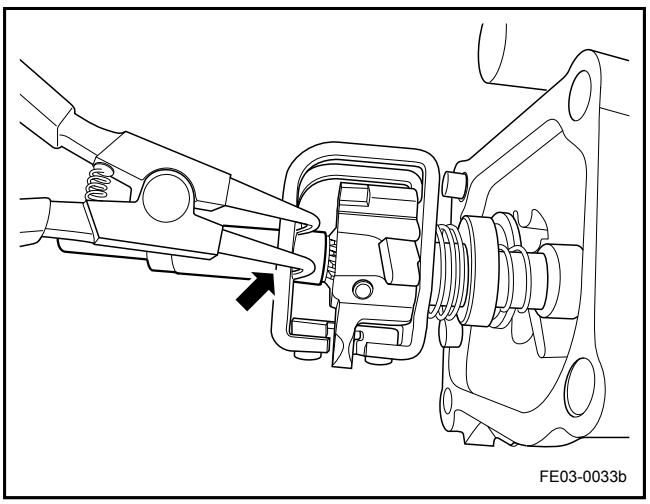
11. Install the Canister solenoid valve bracket.

12. Connect the battery negative cable.

3.3.8.5 Shift Control Assembly Disassemble and Assemble

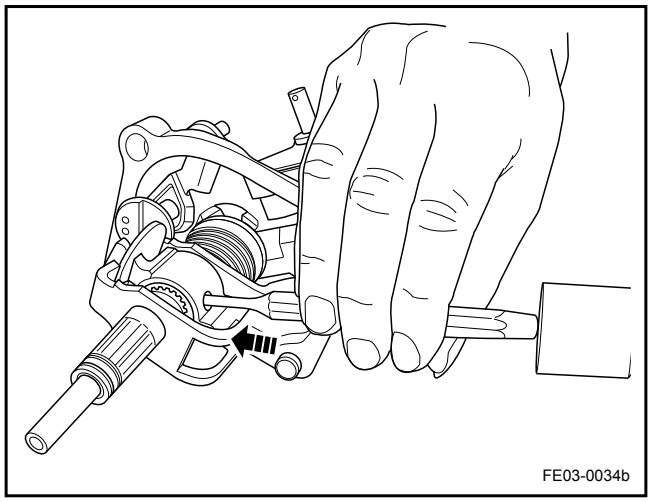
Disassemble Procedure:

Warning!

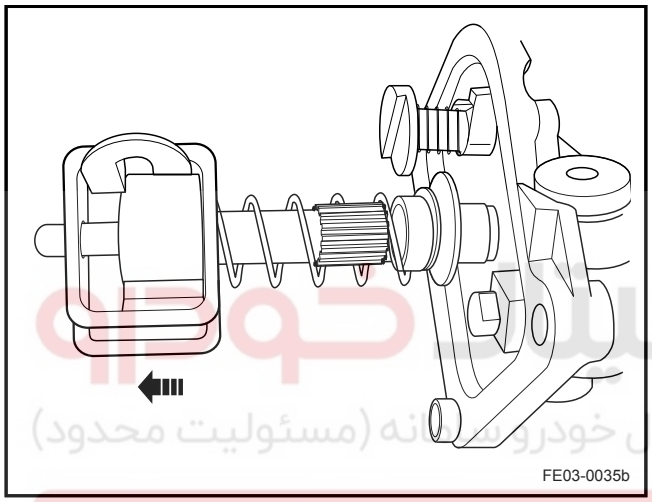


1. Remove the shift control assembly. Refer to 3.3.8.4 Shift Control Assembly Replacement.

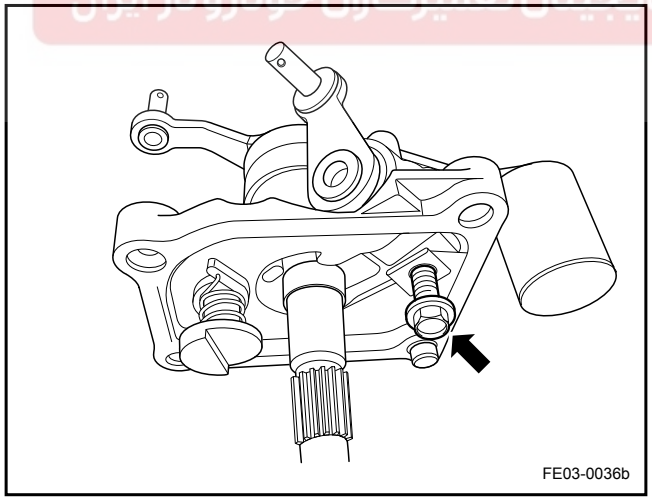
2. With a plier, remove the shift control outer retaining ring.



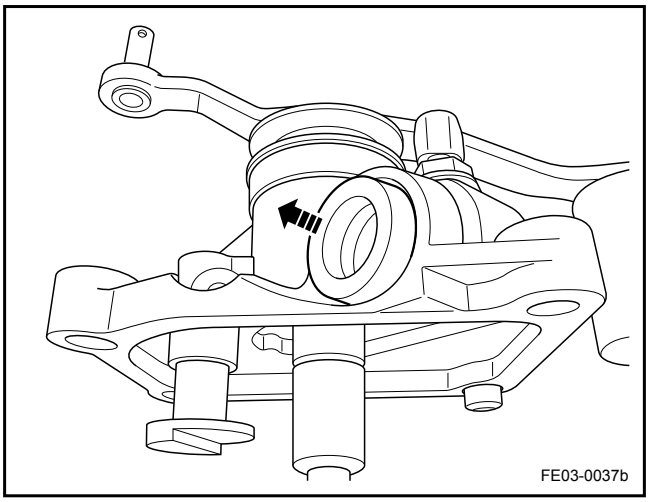
3. Remove the shift control locking pin.



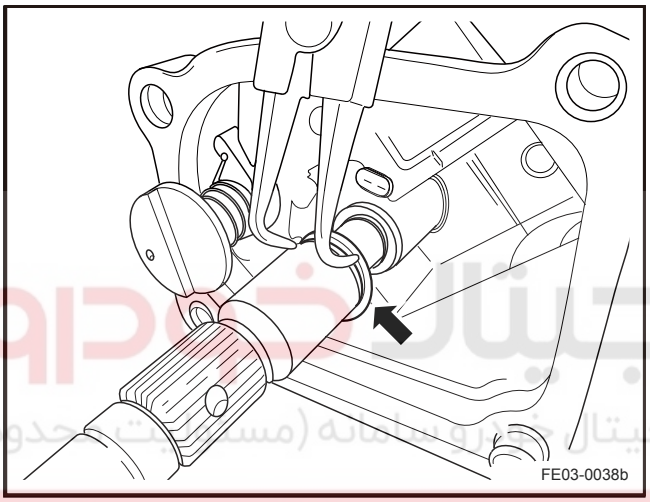
4. Remove the selector shaft sleeve.



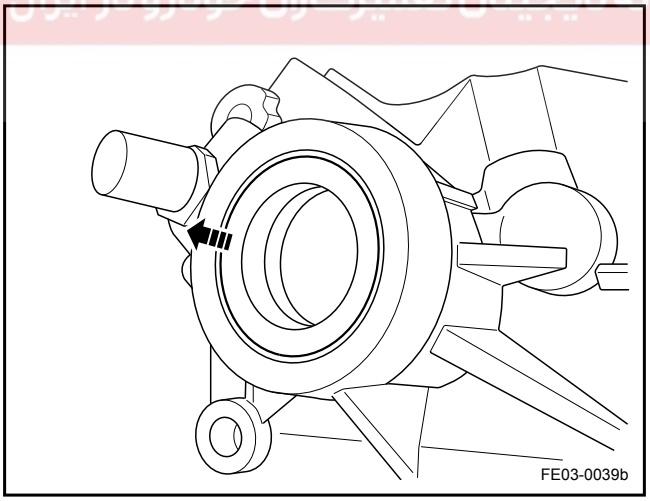
5. Remove the selector shaft retaining bolts.



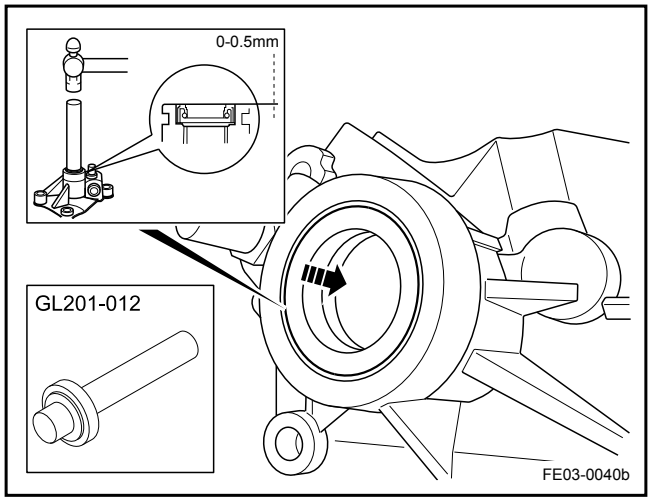
6. Remove the selector shaft oil seal as shown in the graphic.



7. With a plier, remove the shift control inner retaining ring.



8. Remove the selector shaft oil seal to complete the shift control assembly disassemble.

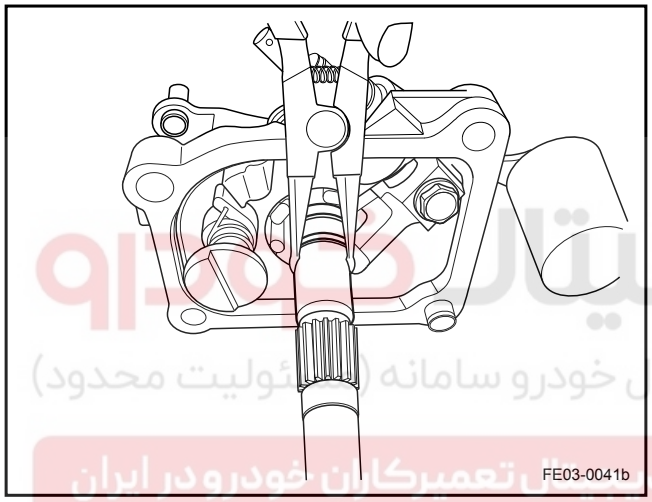


Assemble Procedure:

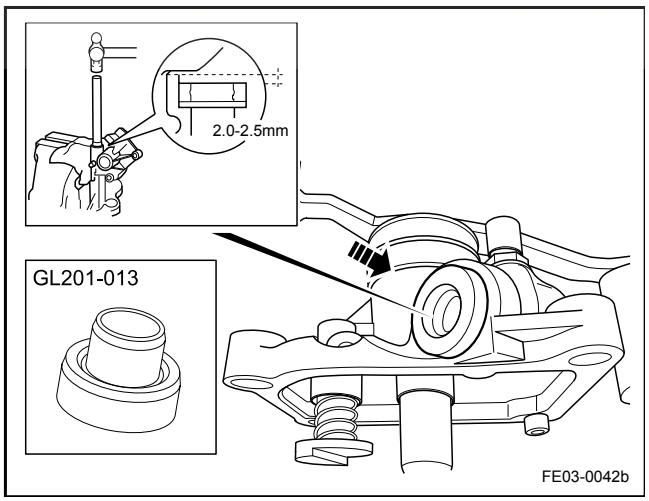
1. With a special tool GL201-012, install the selector shaft oil seal.

   Seal Face To Face Seal Hole Distance:
   0-0.5 mm (0-19.685 × 10^{-3} in)

2. Install the selector shaft.

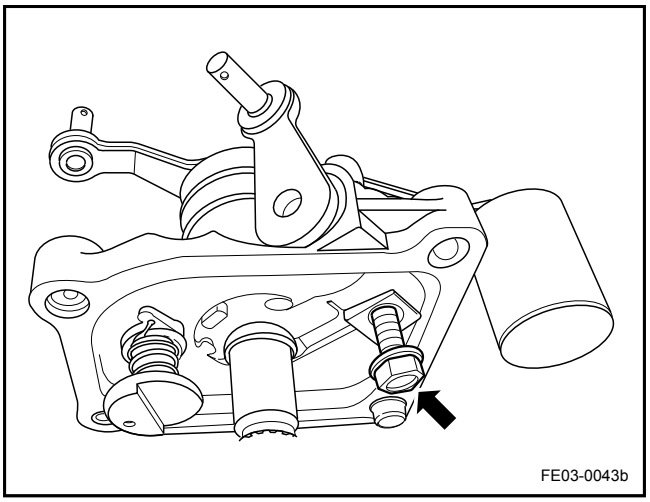


3. Install the selector shaft inner retaining ring.



4. With a special tool GL201-013, install the selector shaft oil seal.

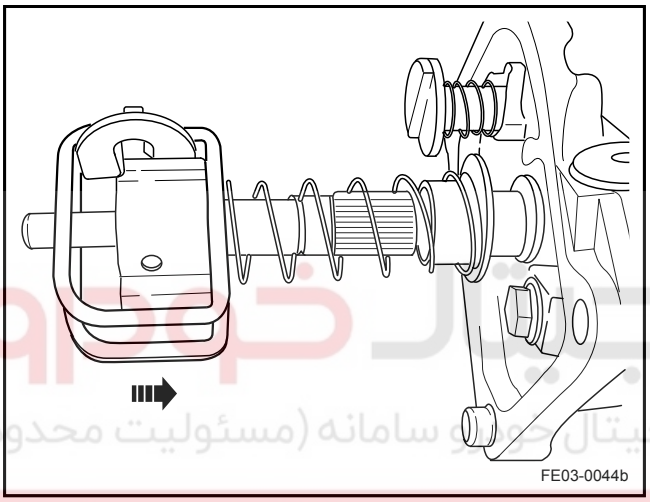
   Seal Surface To Seal Hole Surface Distance:
   2.0-2.5 mm (78.740-98.425 × 10^{-3} in)



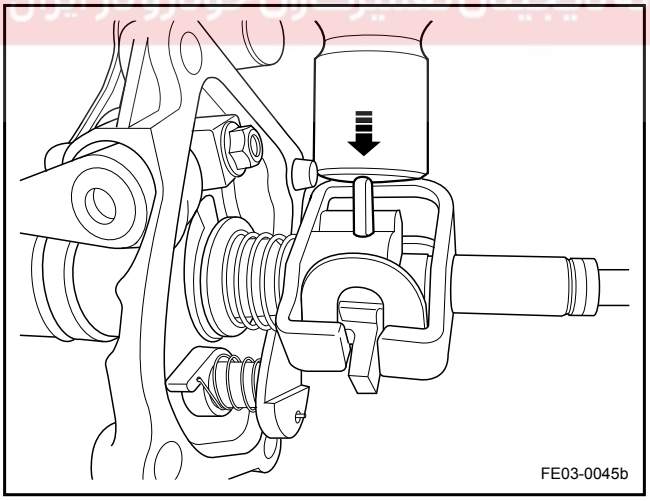
5. Install the selector shaft and tighten the bolts.

Note

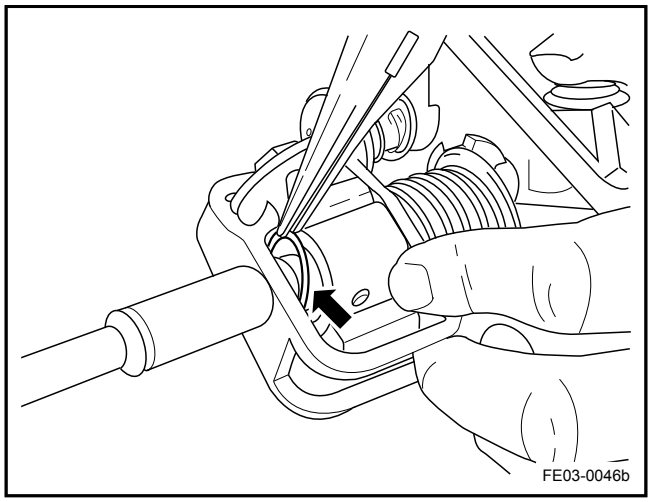
Do not damage the oil seal.



6. Install the selector shaft sleeve.



7. Install the selector shaft sleeve locking pin.

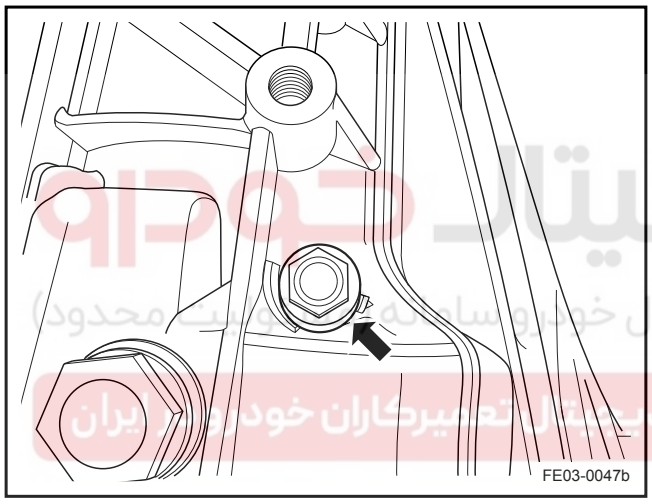

FE03-0046b

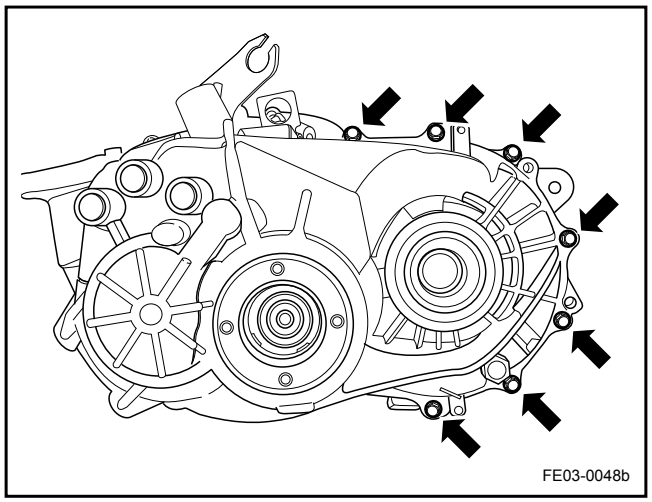
8. Install the selector shaft outer retaining ring.
9. Complete the shift control assembly assemble.

3.3.8.6 Shift Shaft Replacement

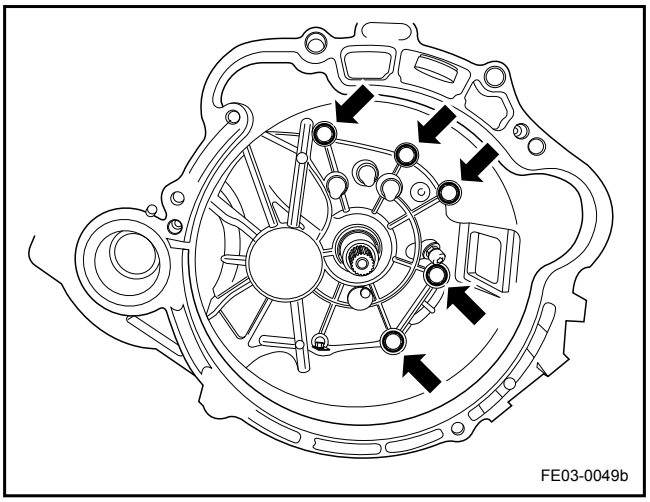
Removal Procedure:

1. Remove the transmission assembly. Refer to 3.3.8.3 Transmission Assembly Replacement.
2. Remove the shift control assembly. Refer to 3.3.8.4 Shift Control Assembly Replacement.
3. Remove the reverse gear locating bolt.

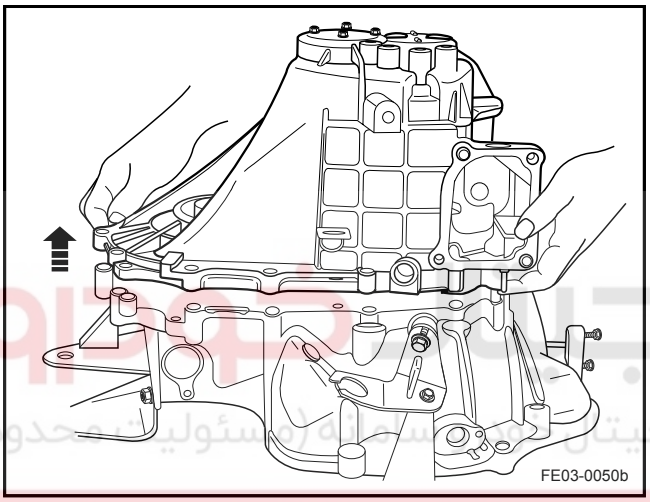

FE03-0047b


FE03-0048b

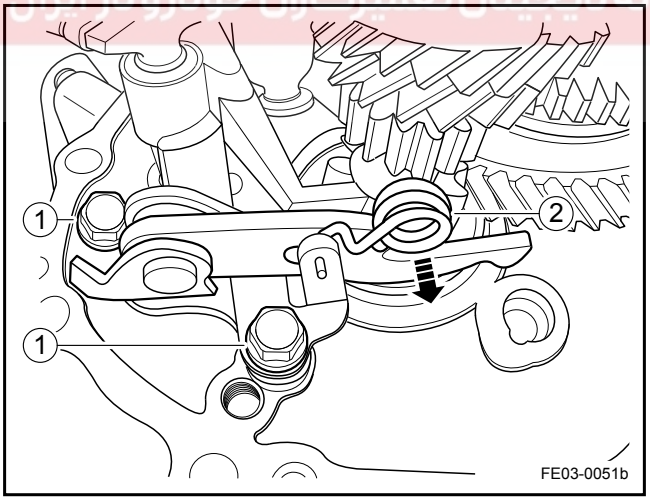
4. Remove the transmission case external connecting bolts.



5. Remove the transmission case internal connecting bolts.



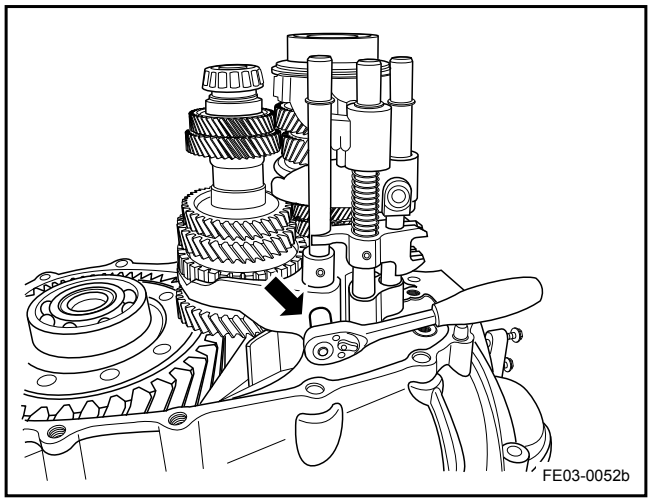
6. Remove the transmission rear case.



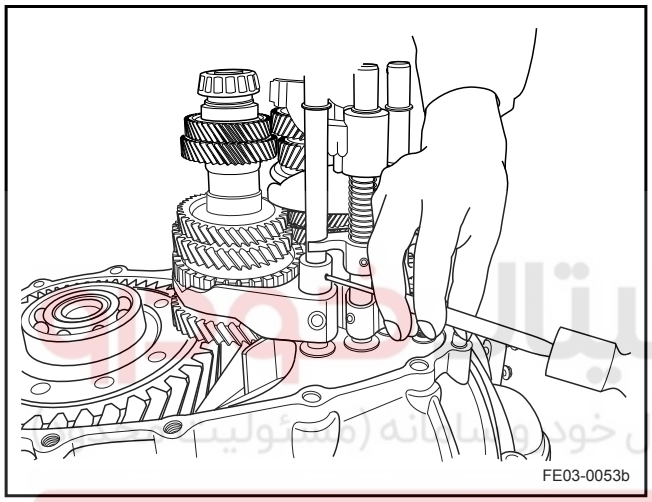
7. Remove the reverse shift rod.

Note

Before remove the retaining bolt (1), remove the return spring end (2).



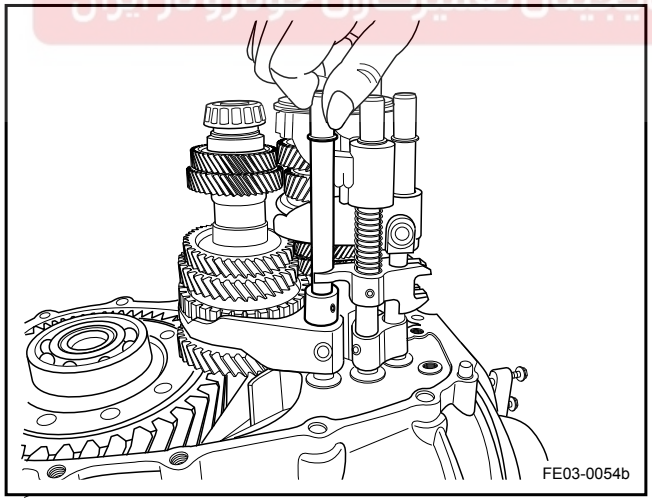
8. Remove the 1st/2nd shift shaft retaining bolts.



9. Remove the 1st/2nd shift shaft locking pin.

Note

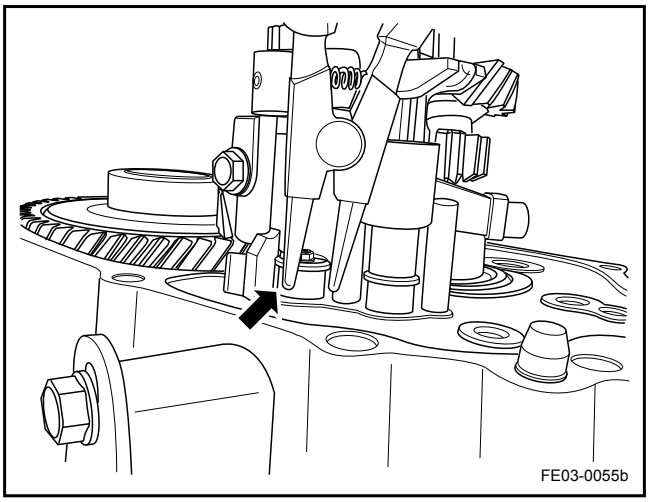
Use a specified tool, otherwise the locking pin may lock and can not be removed.



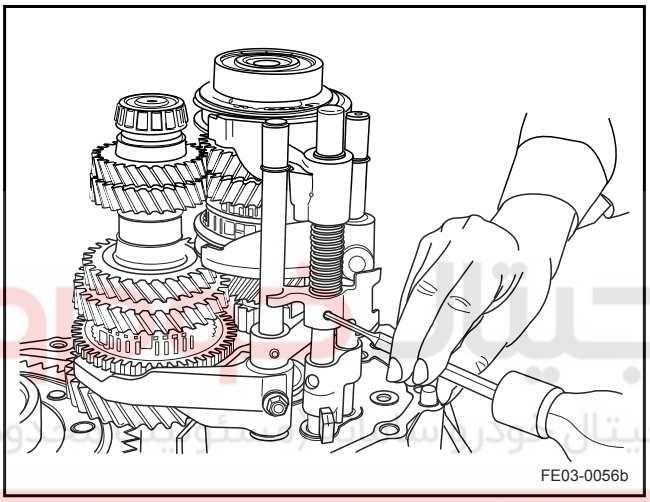
10. Rotate the 1st/2nd shift shaft 180° and pull upward to remove it. Pay attention to 5th and reverse shift shaft locking pin.

Note

The shift shaft and fork fitting is highly precise. During the removal, it is prohibited to force the shift shaft, as this will cause the shift shaft bending and can not be used.



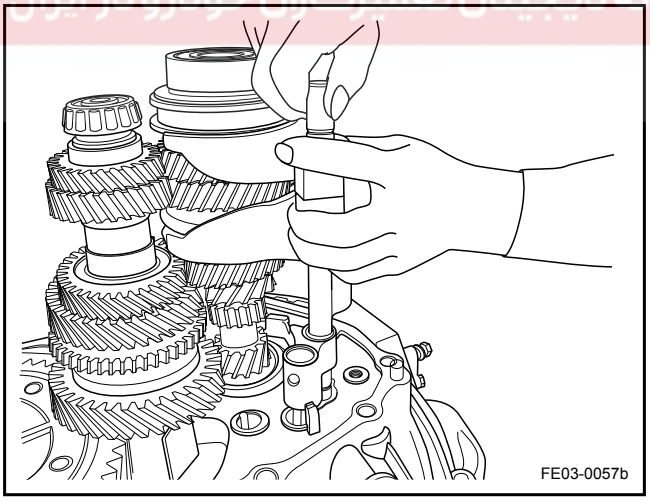
11. With a plier, remove the 5th and reverse shift shaft bottom retaining ring.



12. Remove the 5th and reverse shift shaft locking pin.

Note

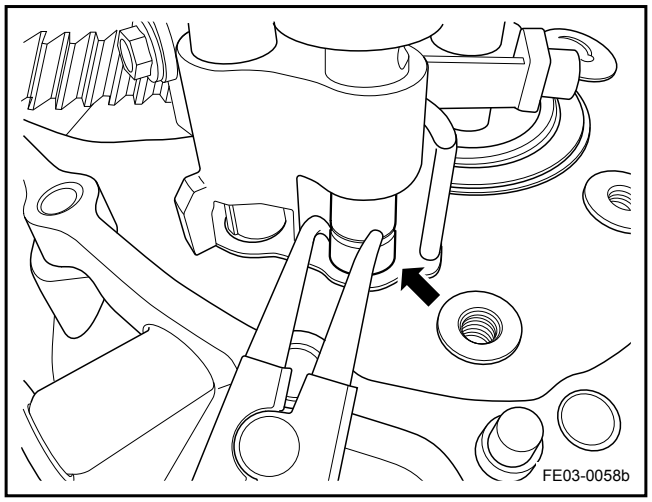
Use a specified tool, otherwise the locking pin may lock and can not be removed.



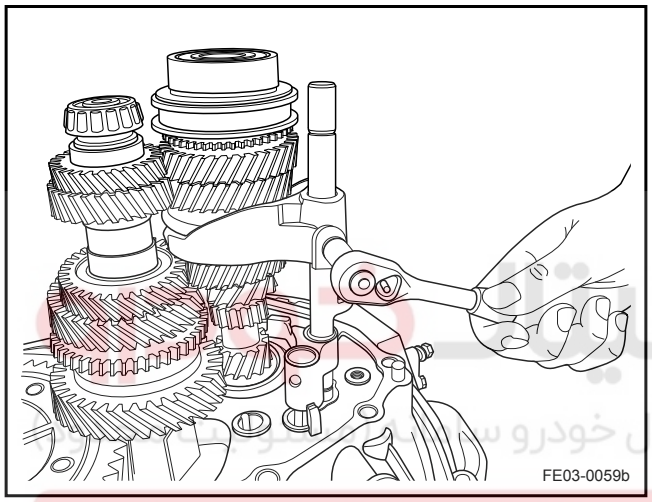
13. Rotate the 5th and reverse shift shaft 180° and pull upward to remove it. Prevent dropping the locking pin.

Note

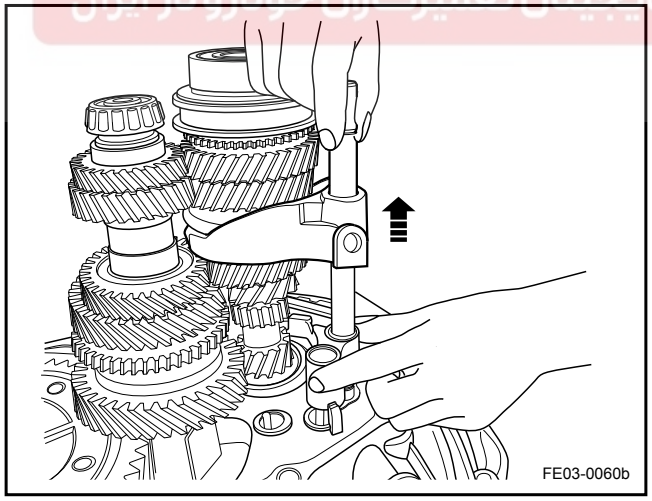
The shift shaft and fork fitting is highly precise. During the removal, it is prohibited to force the shift shaft, as this will cause the shift shaft bending and can not be used. During the removal, hold the middle spring by hand to prevent the fork spring pop-up.



14. With a plier, remove the 3rd/4th shift shaft bottom retaining ring.



15. Remove the 3rd/4th shift shaft retaining bolts.

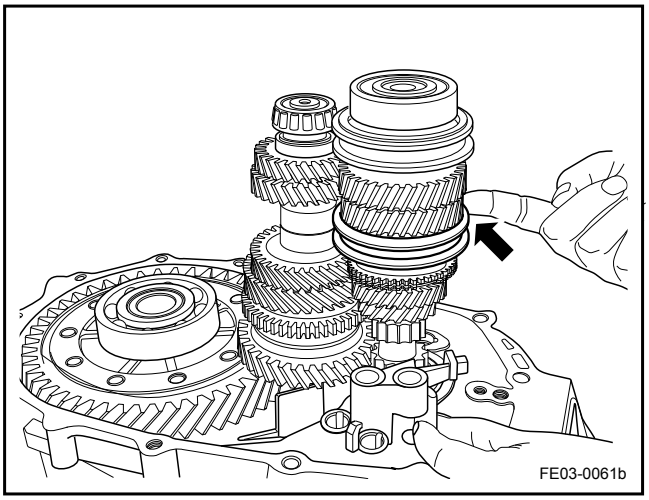


16. Engage the 3rd/4th gear synchronizer to the 4th gear. Remove the 3rd/4th shift shaft and other components.

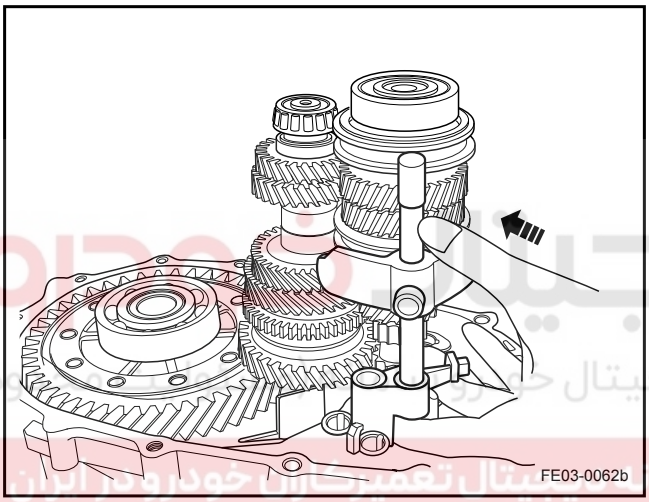
Note

The shift shaft and fork fitting is highly precise. During the removal, it is prohibited to force the shift shaft, as this will cause the shift shaft bending and can not be used. During the removal, hold the middle spring by hand to prevent the fork spring pop-up.

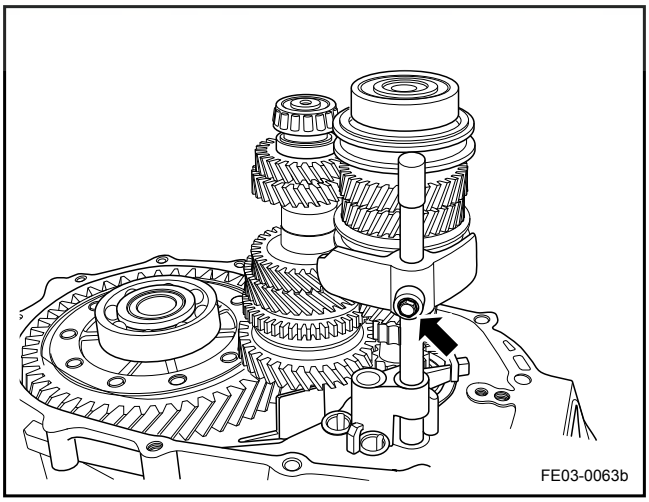
Installation Procedure:



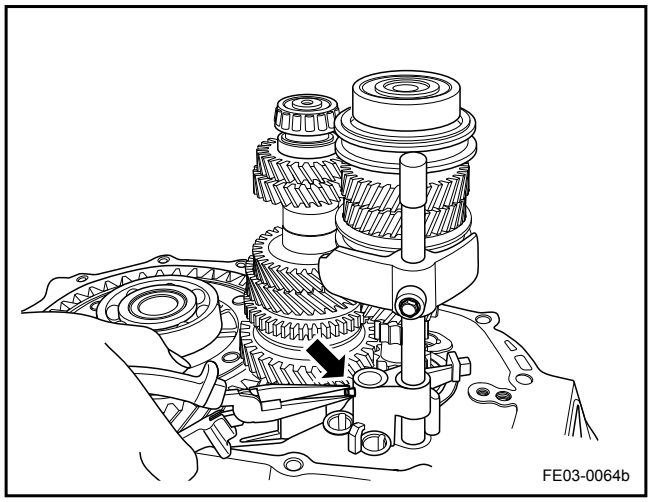
1. Engage the 3rd/4th gear synchronizer to the 4th gear.



2. Install the 3rd/4th shift shaft and other components.



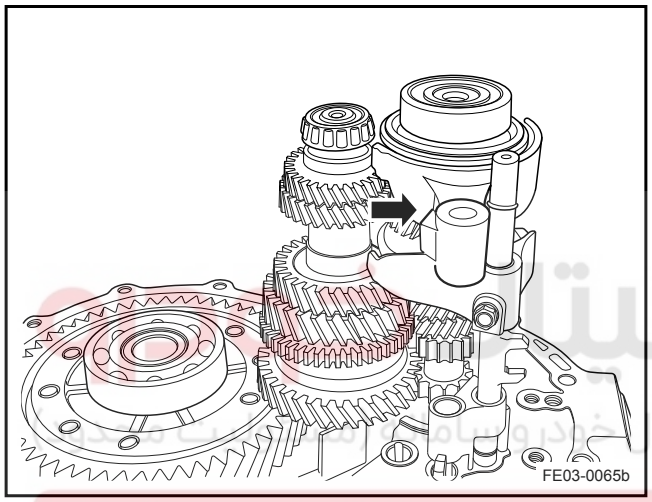
3. Install the 3rd/4th shift shaft retaining bolts.



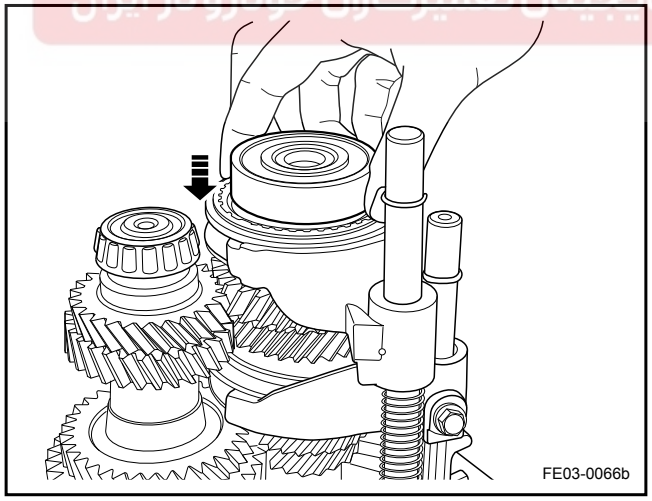
4. Install the 3rd/4th shift shaft and 5th shift shaft interlocking pin.

   Note

   The 3rd/4th shift shaft groove is aligned with the pin hole.



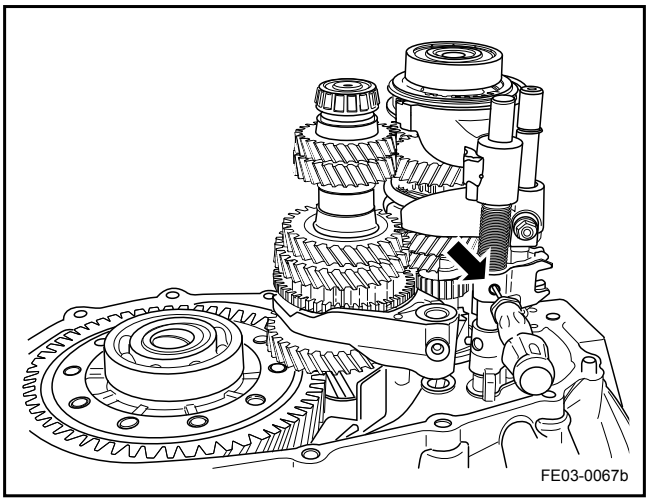
5. Install the 5th gear synchronizer.



6. Install the 5th shift shaft.

   Note

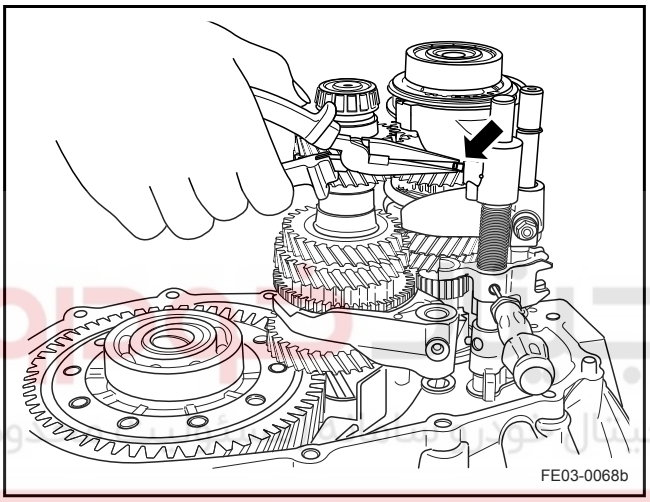
   Hold the 5th gear synchronizer to prevent the synchronizer pop-up.



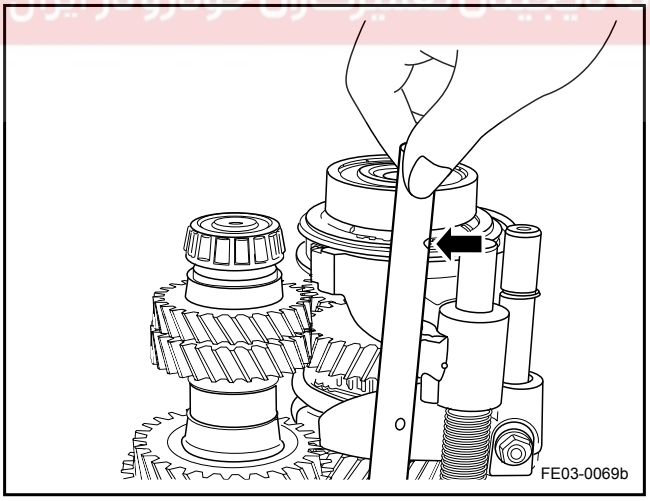
7. Insert a screwdriver into the locking pin hole, temporarily fix the 5th shift shaft.

Note

The shift shaft groove is aligned with the pin hole.



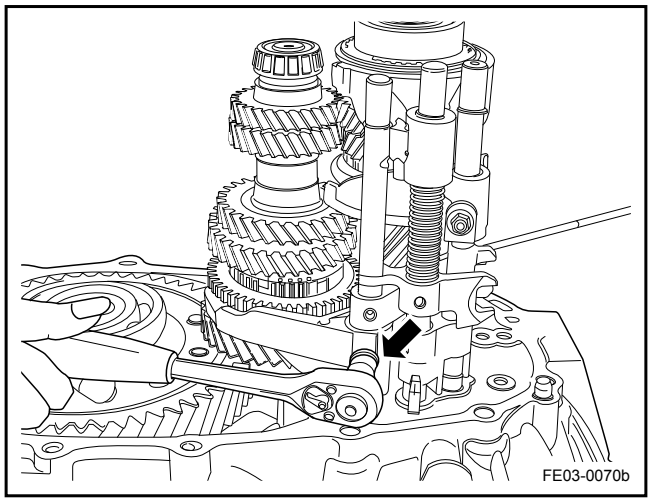
8. Install the 1st/2nd and 5th/reverse shift shaft interlocking pins.



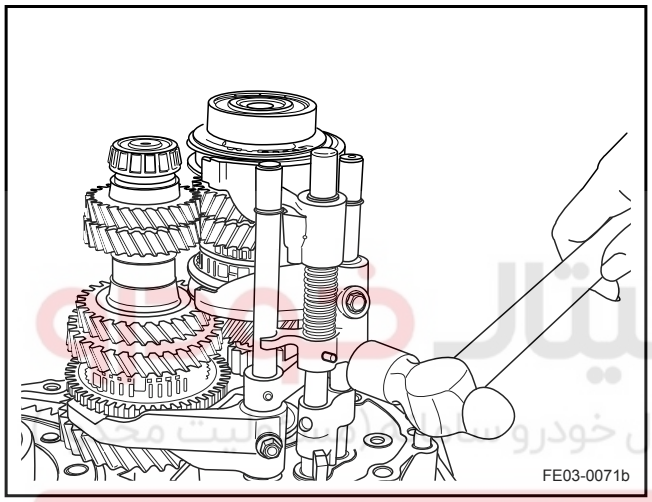
9. Install the 1st/2nd shift shaft.

Note

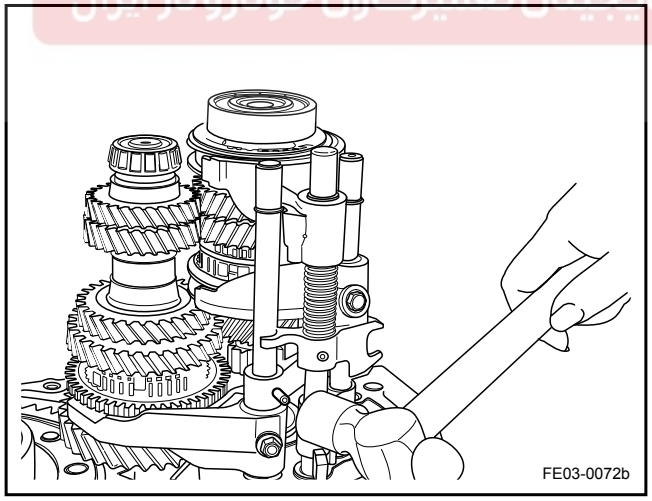
The shift shaft groove is aligned with the pin hole.



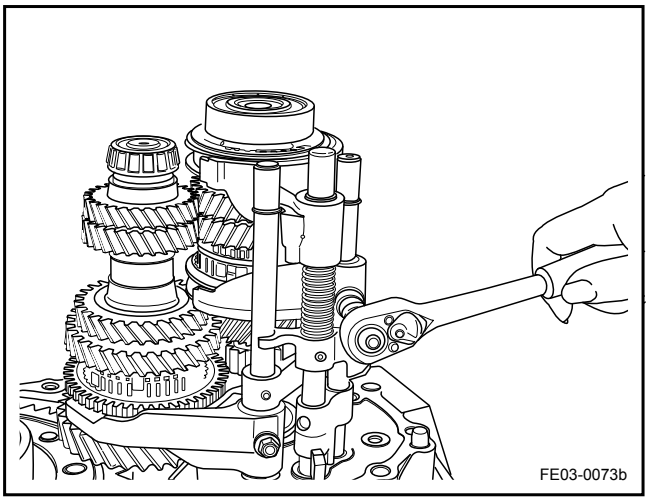
10. Install the 1st/2nd shift shaft retaining bolts.



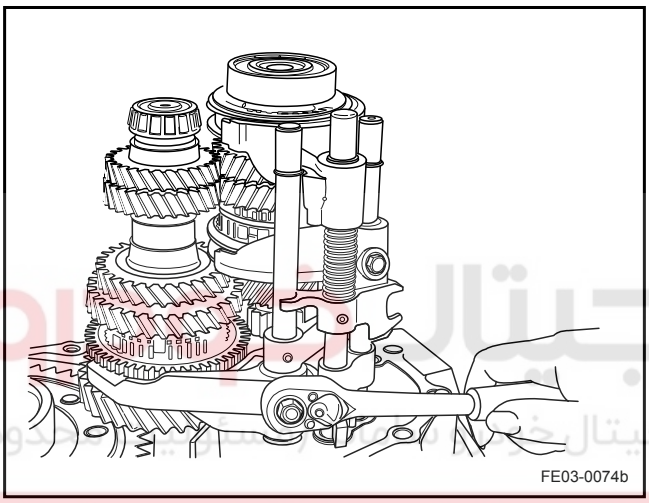
11. Install the 5th/reverse shift shaft locking pin.



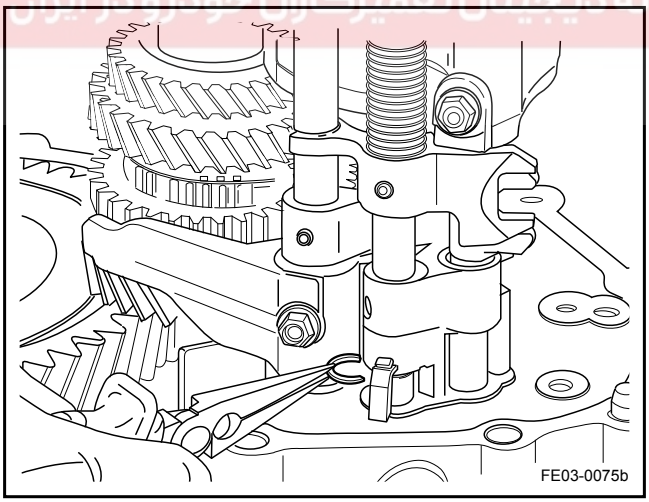
12. Install the 1st/2nd shift shaft locking pin.



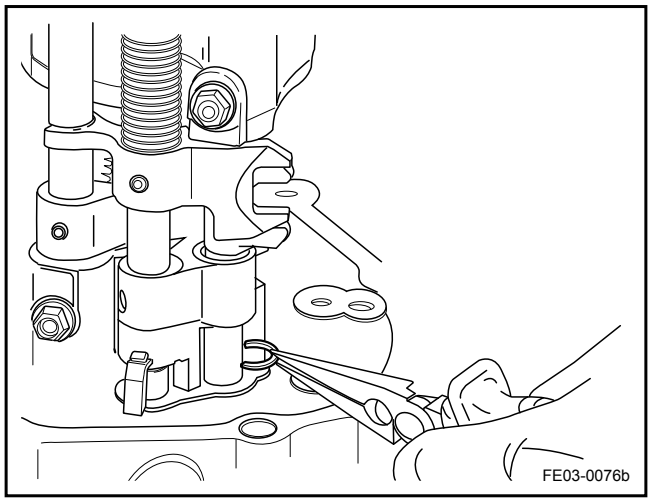
13. Tighten the 3rd/4th shift shaft retaining bolts.



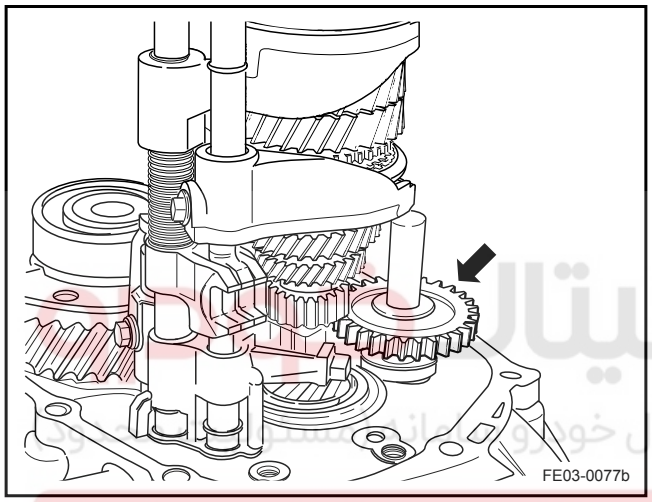
14. Tighten the 1st/2nd shift shaft retaining bolts.



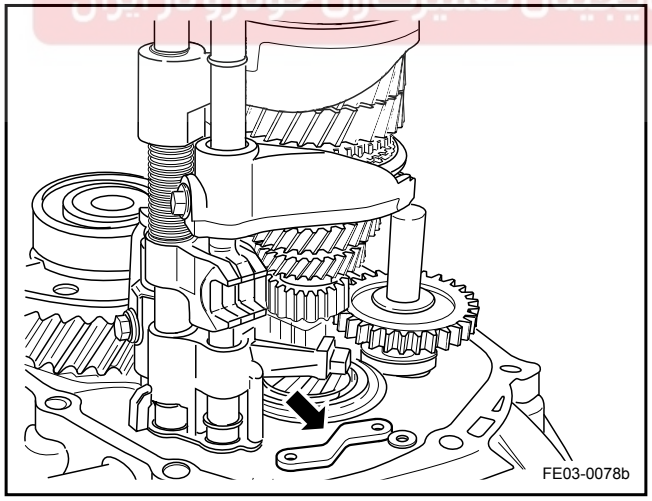
15. Install the 5th/reverse lower limit ring.



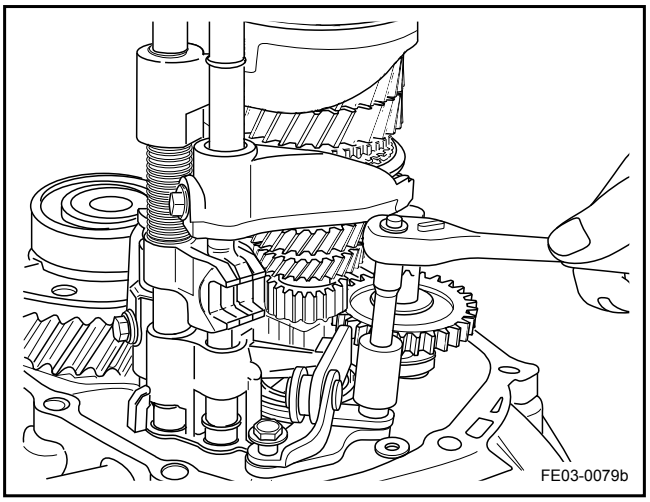
16. Install the 3rd/4th lower limit ring.



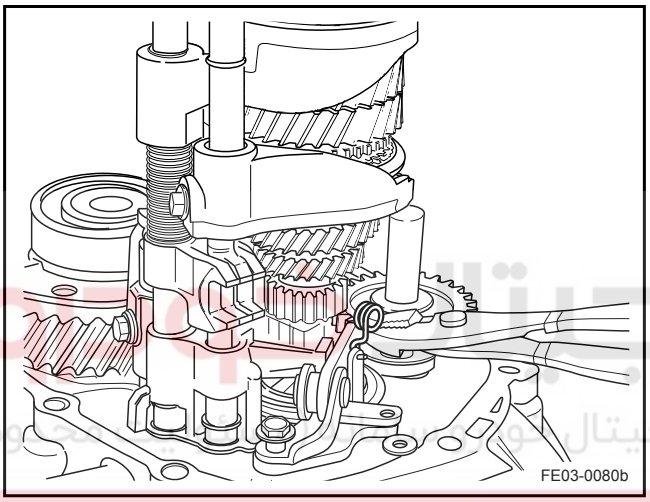
17. Install the reverse gear and shaft.



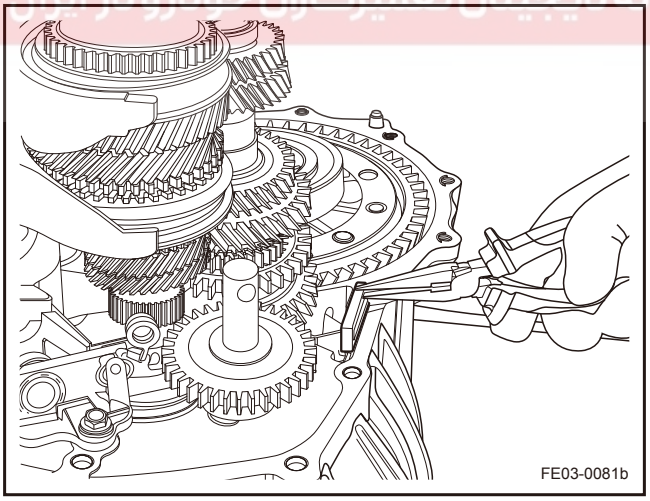
18. Install the reverse shift shaft and the washer.



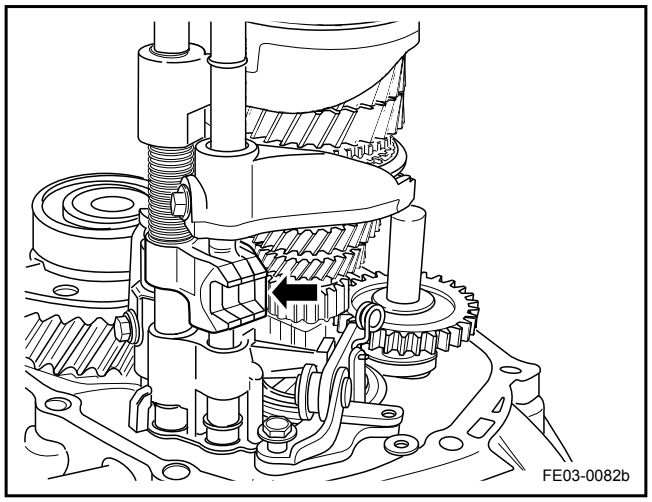
19. Install and tighten the reverse shift shaft retaining bolts.



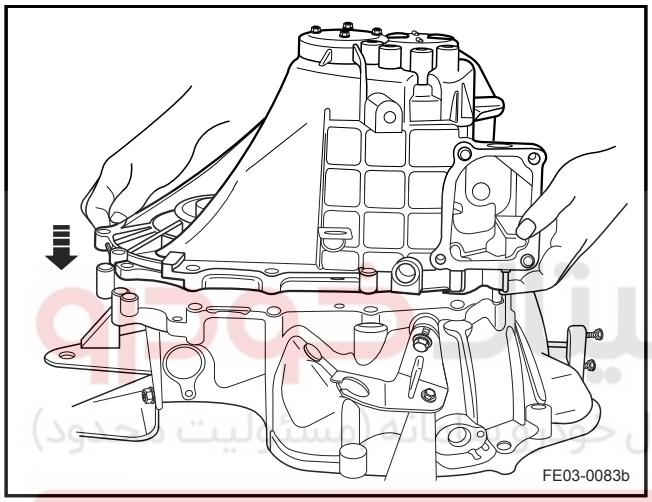
20. Install the reverse shift shaft return spring.



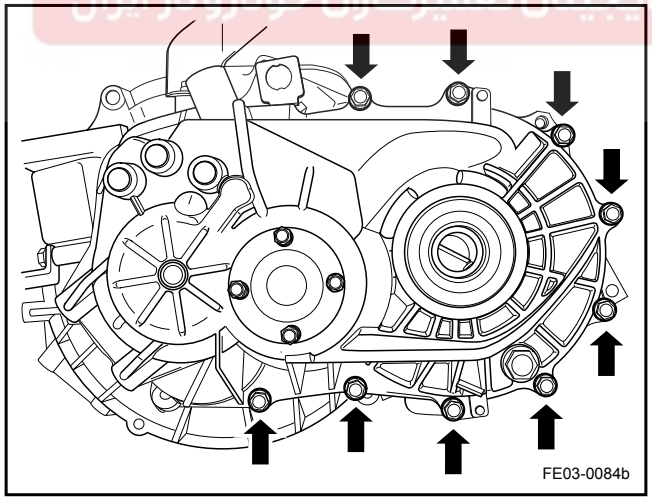
21. Install the transmission case inner magnet.



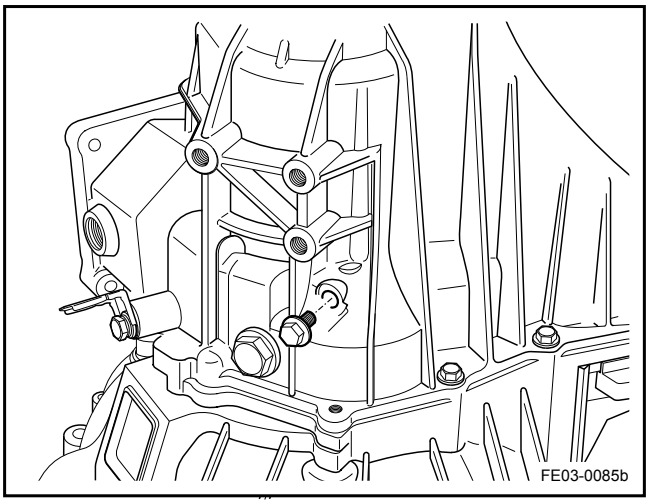
22. As shown in the graphic, confirm that all shift shafts are in neutral (all forks are at the same level).



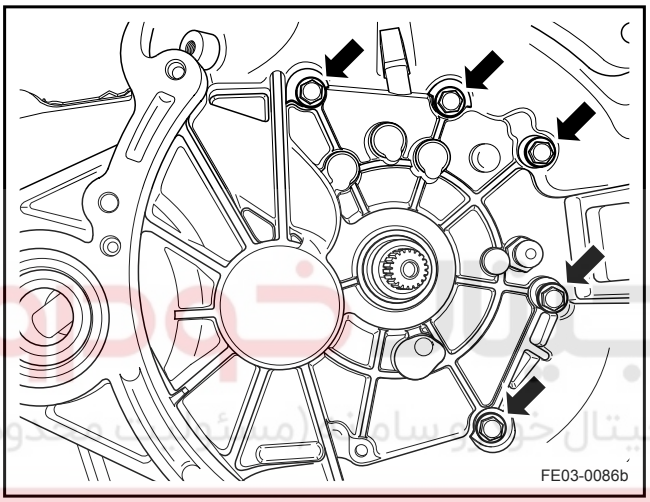
23. Install the transmission rear case.



24. Install and tighten the transmission case external retaining bolts.



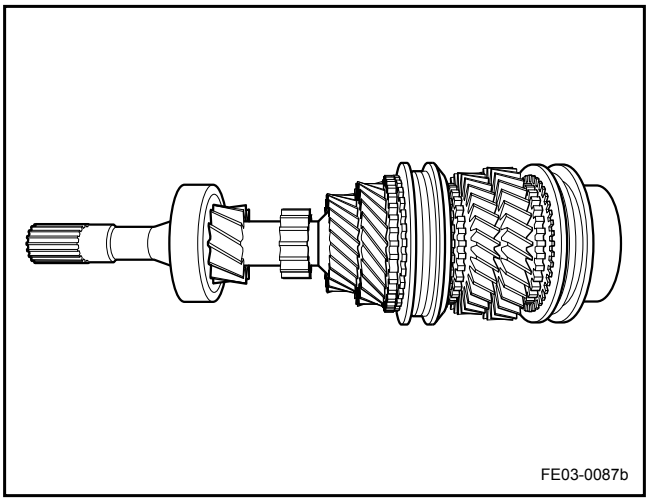
25. Install and tighten reverse gear shaft retaining bolt.



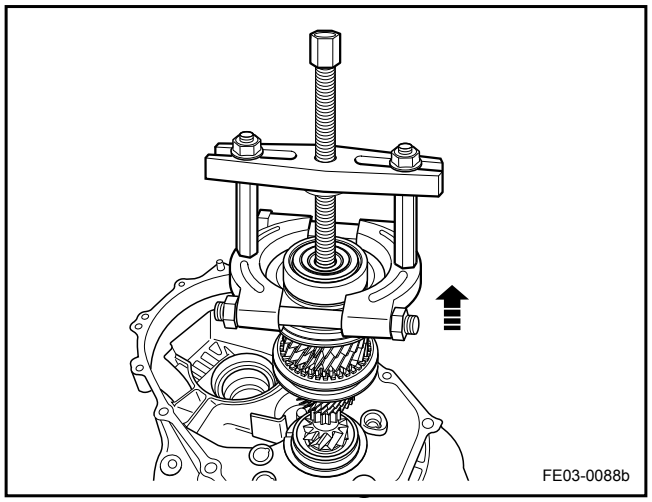
26. Install and tighten the transmission case internal retaining bolts.
27. Install the shift control assembly.
28. Install the transmission.

3.3.8.7 Input Shaft Disassemble and Assemble

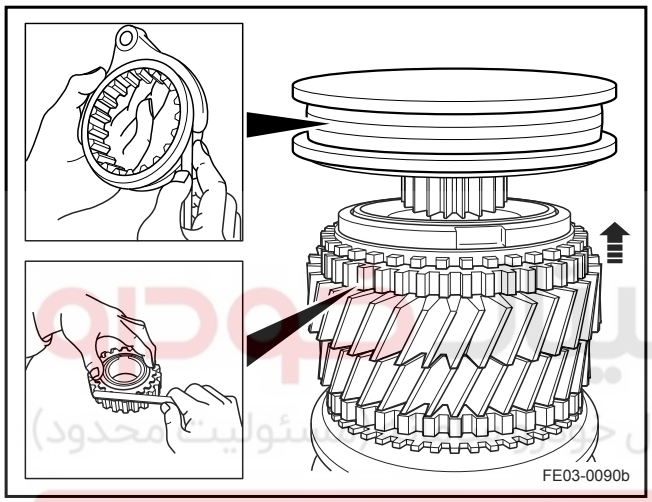
Removal Procedure:



1. Remove the transmission. Refer to 3.3.8.3 Transmission Assembly Replacement.
2. Remove shift control assembly. Refer to 3.3.8.4 Shift Control Assembly Replacement.
3. Remove the shift shaft. Refer to 3.3.8.6 Shift Shaft Replacement.
4. Remove the input shaft assembly from the transmission.



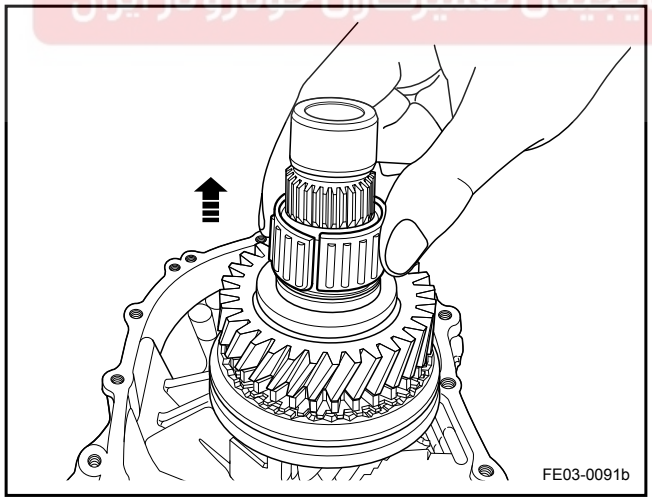
5. Pull out the input shaft rear bearing with a bearing puller.



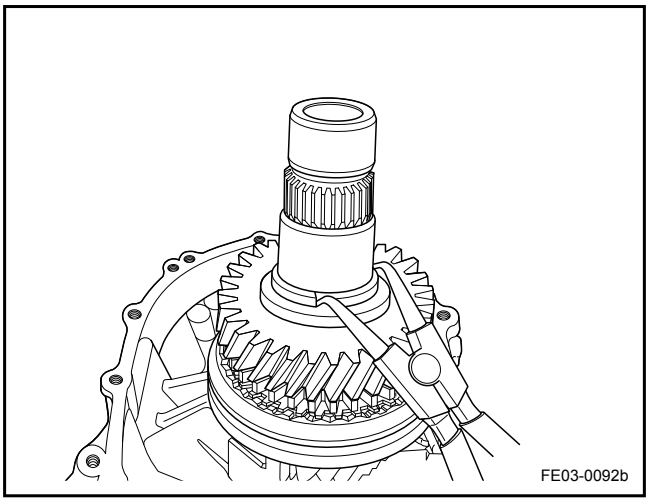
6. Remove the 5th gear synchronizer assembly.

   Gear Synchronizer Sleeve and The Shift Fork Distance: ≤0.35 mm (13.780×10^{-3} in)

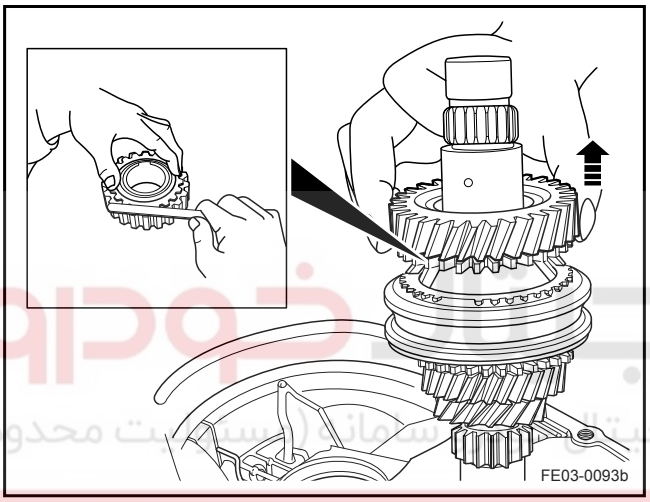
   Synchronizer Back and the Gear Surface Distance: ≥0.8 mm (31.496×10^{-3} in)



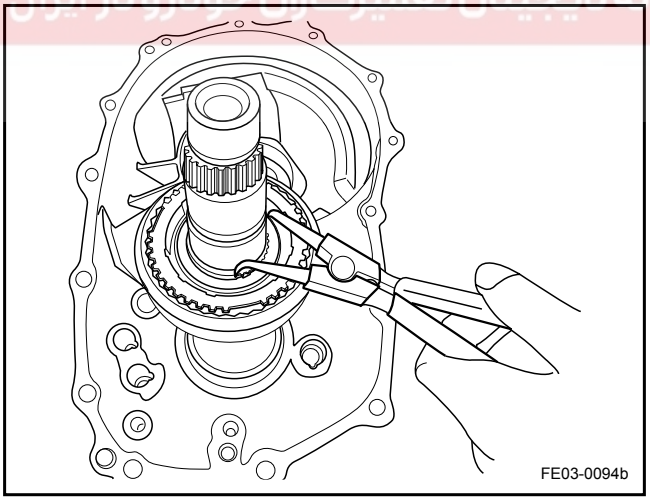
7. Remove the 5th gear, needle roller bearing and needle roller bearing washer.



8. Remove the 4th gear fourth retaining ring and washer with a plier.



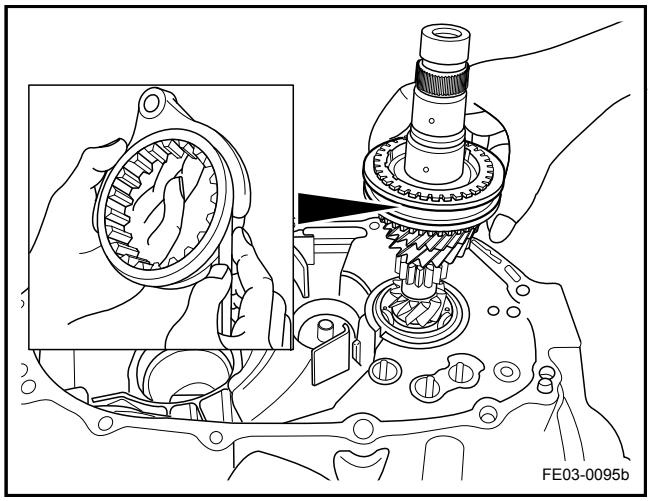
9. Remove the 4th gear, needle bearing and needle bearing washer.



10. Remove the 3rd/4th gear synchronizer snap ring with a plier.

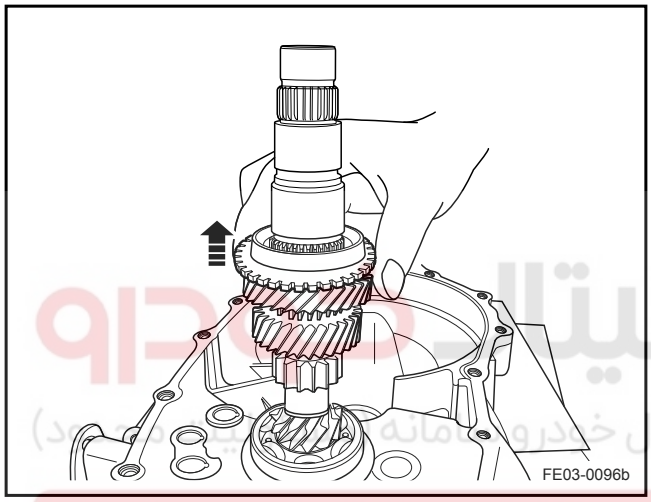
Note

Remove the synchronizer first if the snap ring is hard to remove.

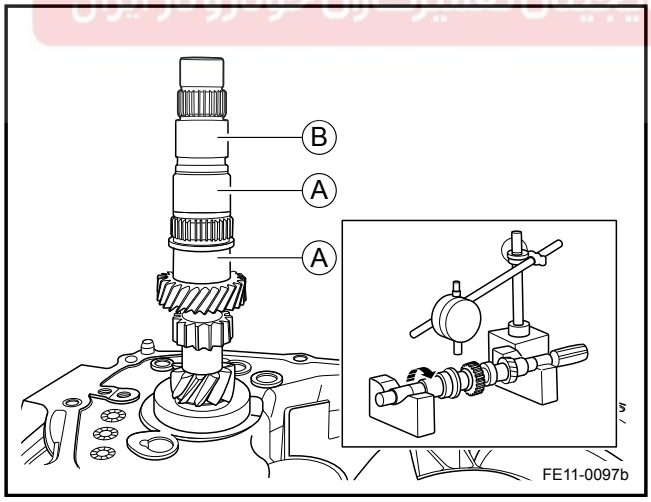


11. Remove the 3rd/4th gear synchronizer.

    Synchronizer Sleeve and Shift Fork Distance:
    ≤0.35 mm (13.780 × 10^{-3} in)



12. Remove the 3rd gear, needle bearing and needle bearing washer.



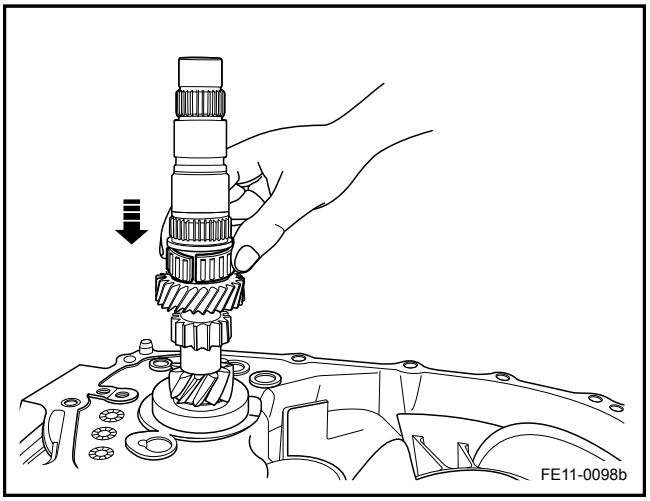
13. After the removal, the input shaft final state is:

    Input Shaft Runout:
    ≤0.03 mm (1.181 × 10^{-3} in)

    Input Shaft Wear Surface A Minimum Diameter:
    33.985 mm (1,337.989 × 10^{-3} in)

    Surface B Minimum Diameter:
    30.985 mm (1,219.879 × 10^{-3} in)

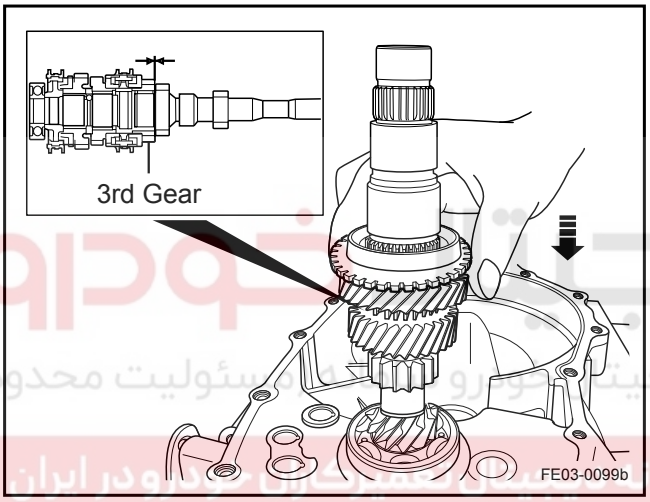
Installation Procedure:



1. Install the 3rd gear, needle bearing and needle bearing washer.

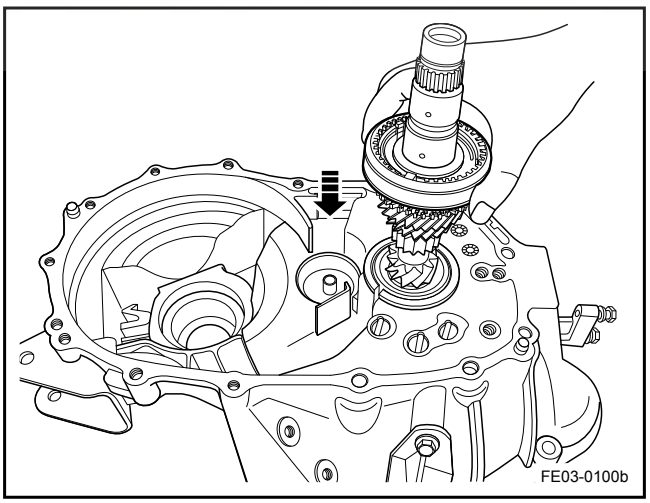
   Note

   Apply a small amount of transmission fluid to bearing journal before installation.



2. Install the 3rd gear.

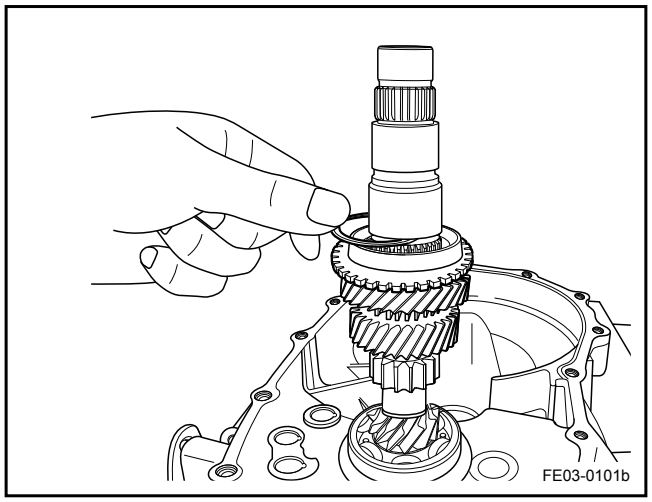
   Input Shaft 3rd Gear Axial Clearance:
   0.1-0.35 mm (3.937-13.780 × 10^{-3} in)



3. Install the 3rd/4th gear synchronizer.

   Note

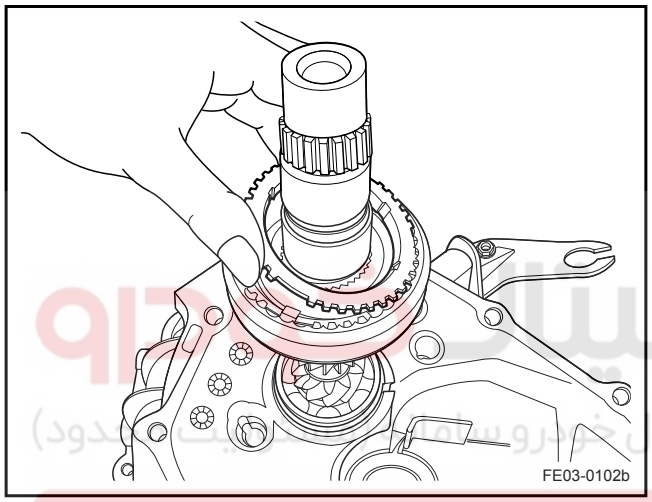
   Do not install the 4th gear synchronizer together, otherwise, it is difficult to install the 3rd/4th synchronizer snap ring. Chamfered side of the synchronizer should face the rear of the transmission.



4. Install the 3rd/4th gear synchronizer snap ring.

Note

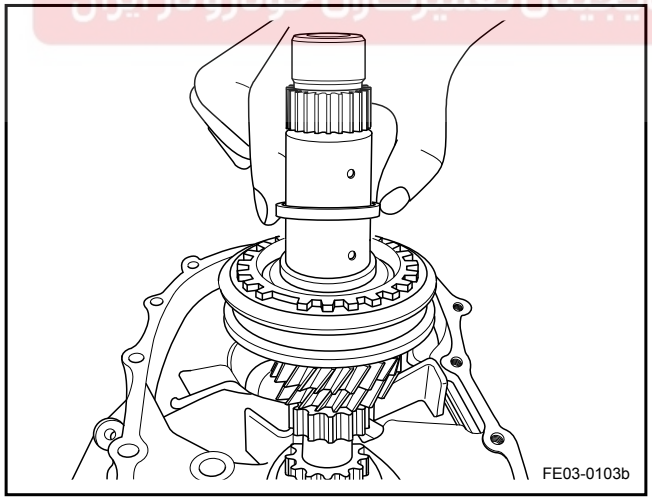
If it is difficult to install the snap ring, install the snap ring before installing the synchronizer.



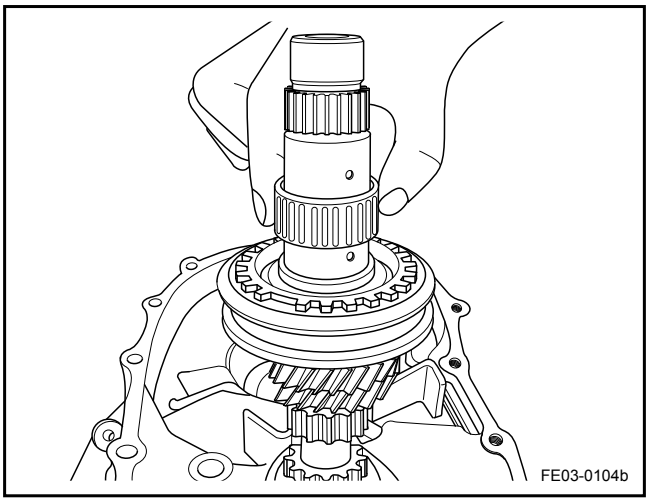
5. Install the 4th gear synchronizer

Note

Synchronizer groove should fit in the synchronizer ring.



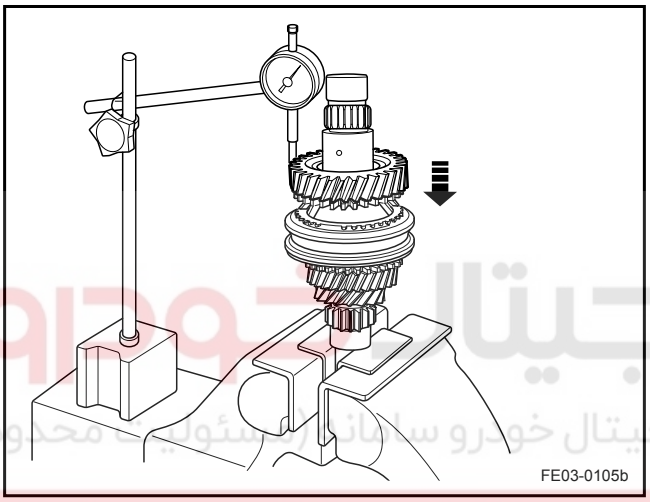
6. Install the 4th gear needle bearing washer.



7. Install the 4th gear needle bearing.

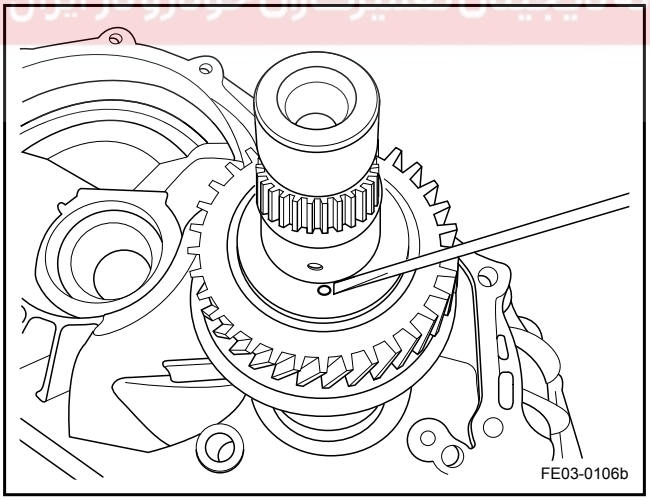
Note

Apply a small amount of transmission fluid to the bearing journal before installation.



8. Install the 4th gear.

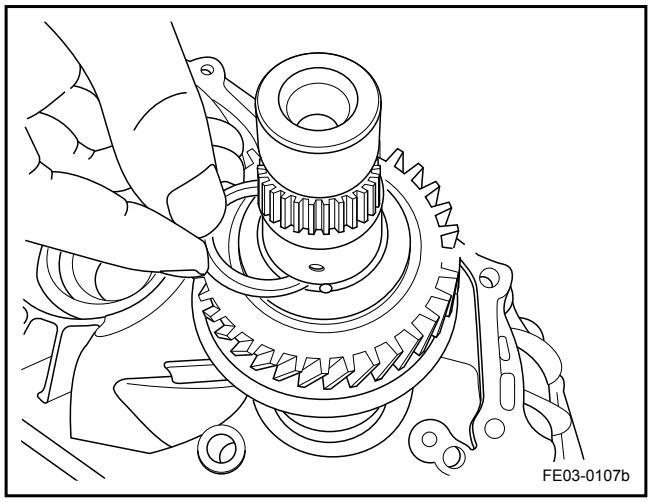
Input Shaft 4th Gear Axial Clearance:
0.1-0.55 mm (3.937-21.654 × 10^{-3} in)



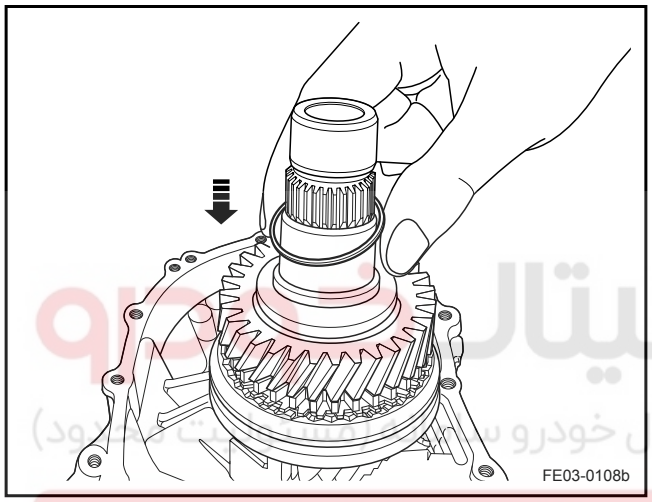
9. Install the 4th gear synchronizer hub.

Note

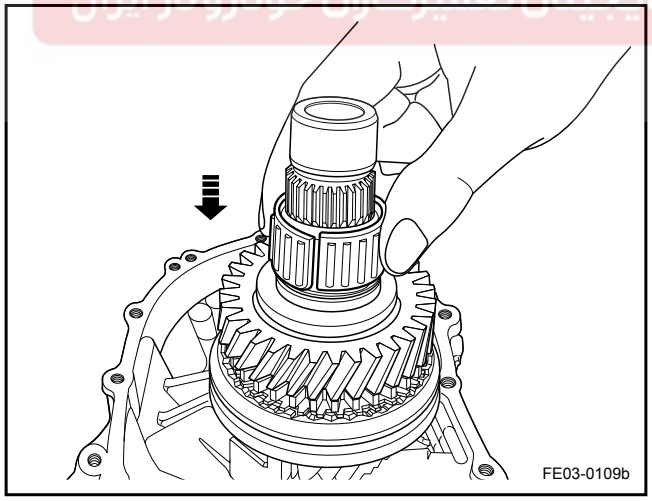
The dent ball should be aligned with the hole.



10. Install the 4th gear snap ring.



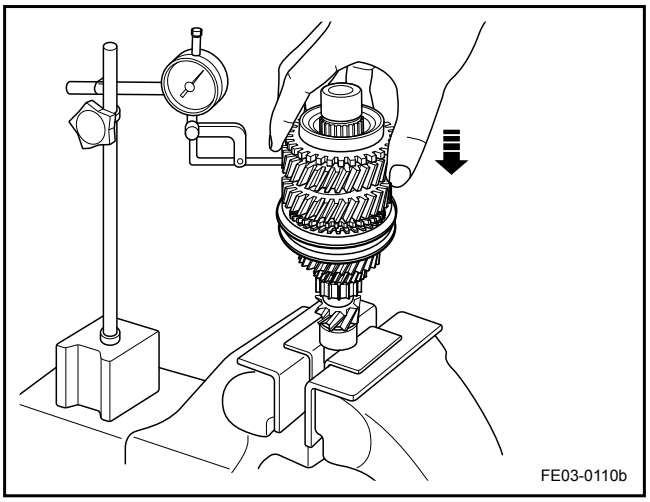
11. Install the 5th gear needle bearing washer.



12. Install the 5th gear needle bearing.

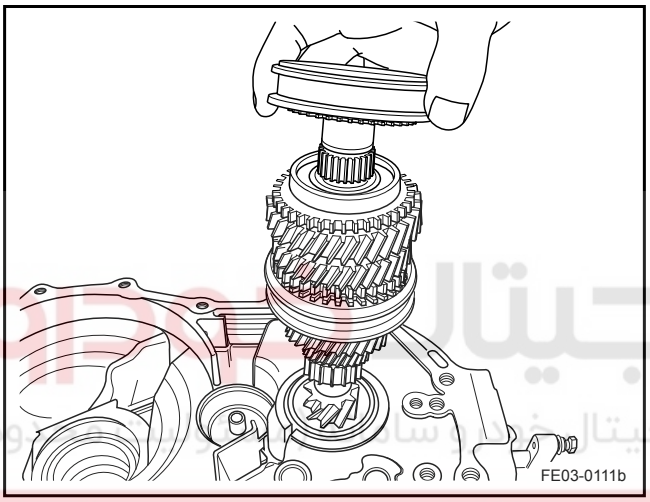
Note

Apply a small amount of transmission fluid to the bearing journal before installation.



13. Install the 5th gear.

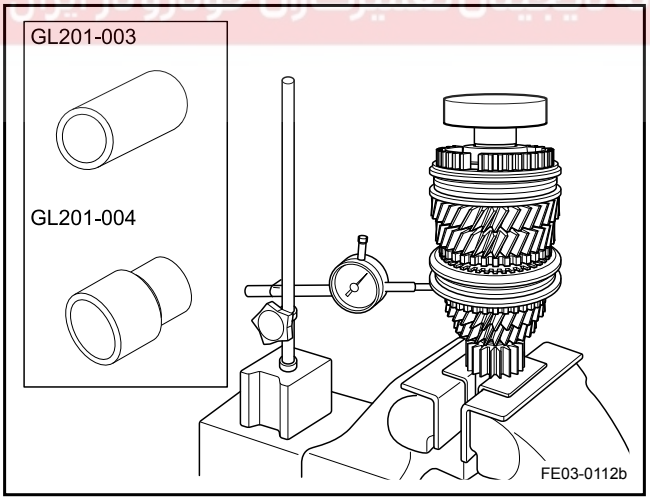
    Input Shaft 5th Gear Axial Clearance:
    0.1-0.50 mm (3.937-19.685 × 10^{-3} in)



14. Install the 5th gear synchronizer.

    Note

    The synchronizer is directional, the convex side should face the rear of the transmission.



15. Install the input shaft rear bearing with special tools GL201-003 and GL201-004.

    Input Shaft 4th Gear and 5th Gear Radial Clearance:
    ≤0.058 mm (3.346 × 10^{-3} in)

    Note

    The bearing is directional, the transmission fluid seal side should face the rear of the transmission.

16. Install the input shaft assembly.

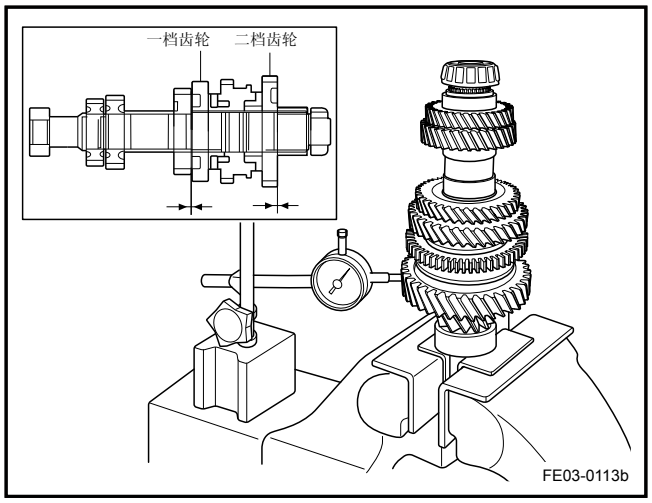
17. Install the shift shaft.

18. Install the shift control assembly.

19. Install the transmission.

3.3.8.8 Main shaft Disassemble and Assemble

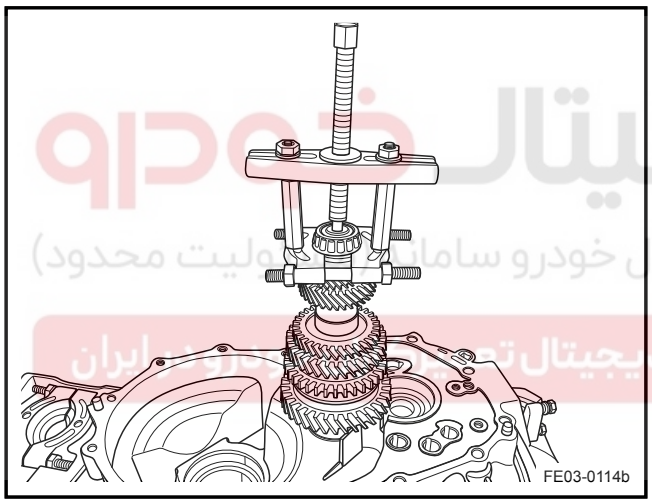
Removal Procedure:



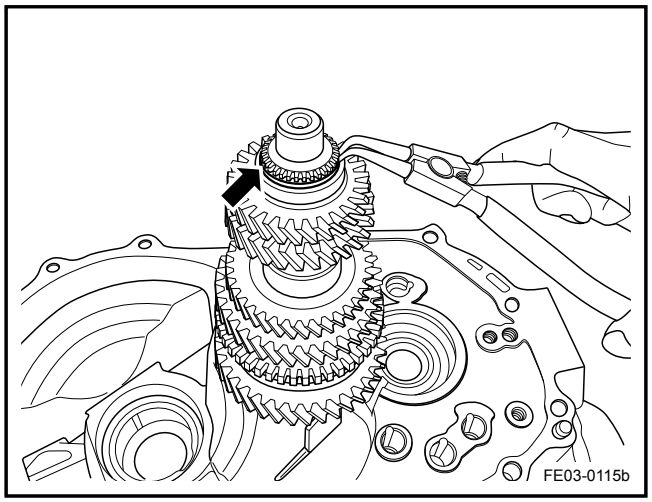
1. Remove the transmission. Refer to 3.3.8.3 Transmission Assembly Replacement.
2. Remove the shift control assembly. Refer to 3.3.8.4 Shift Control Assembly Replacement.
3. Remove the shift shaft. Refer to 3.3.8.6 Shift Shaft Replacement.
4. Remove the main shaft from inside the transmission.

   Main shaft 1st Gear and 2nd Gear Axial Clearance:
   1st Gear: 0.1-0.35 mm (3.937-13.780 × 10^{-3} in)
   2nd Gear: 0.1-0.35 mm (3.937-13.780 × 10^{-3} in)

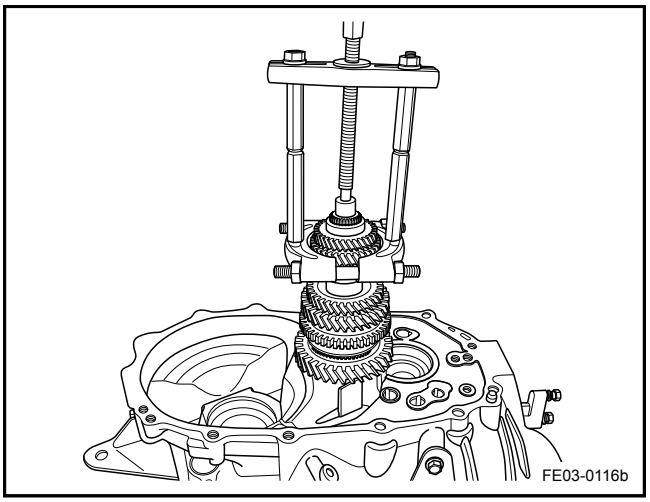
   Main shaft 1st Gear and 2nd Gear Runout:
   ≤0.056 mm (2.205 × 10^{-3} in)



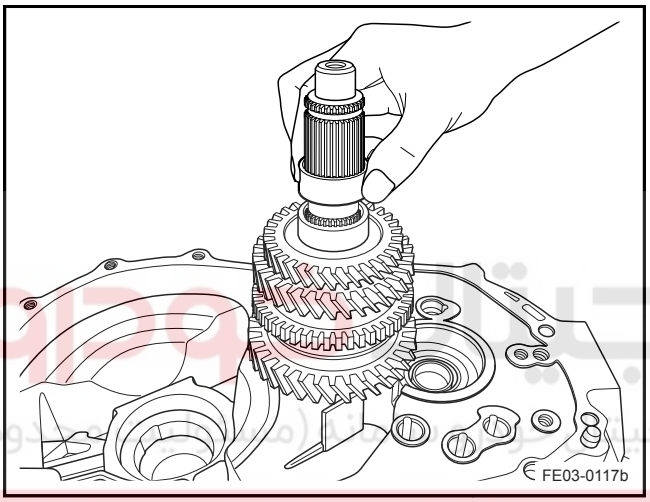
5. Pull out the main shaft rear bearing with a universal bearing puller.



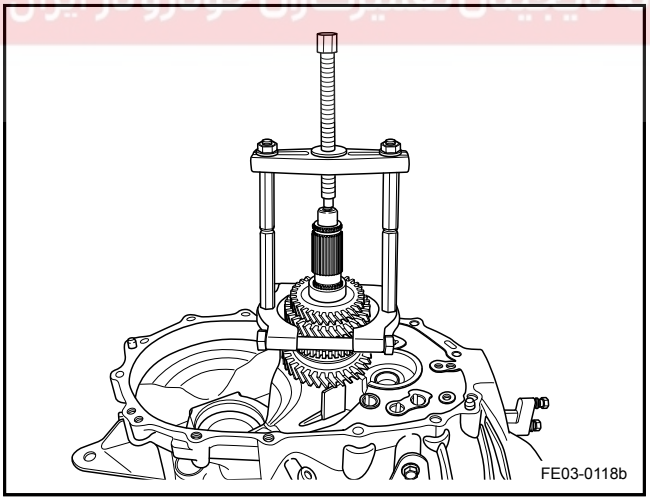
6. Remove the 5th gear snap ring with a plier.



7. Pull out the 4th gear and the 5th gear with a universal bearing puller.



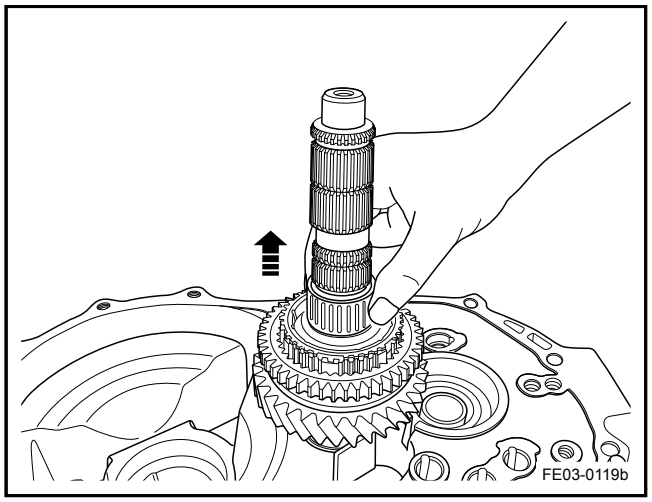
8. Remove the 3rd gear and the 4th gear sleeve.



9. Pull out the 3rd gear with a universal bearing puller.

Note

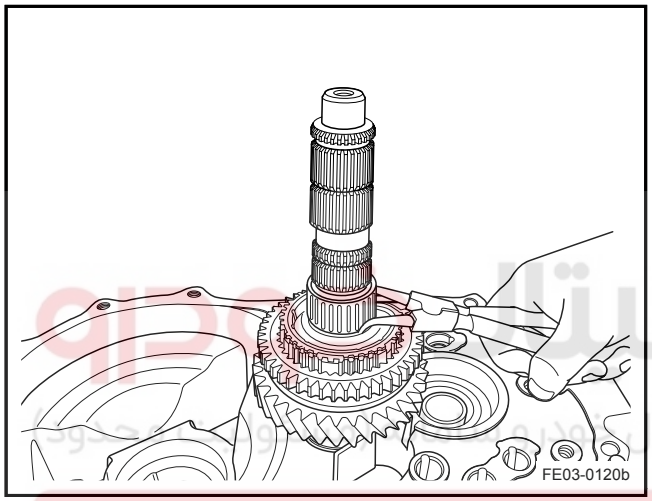
The gap between the 2nd gear and the 3rd gear is very small. Pulling out after a certain distance, then pull the 3rd gear separately.



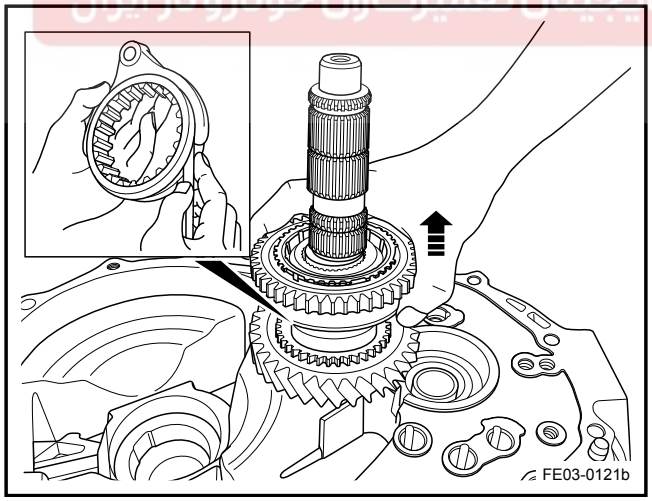
10. Remove the 2nd gear bearing.

    Note

    This needle bearing has no opening and can be directly removed.

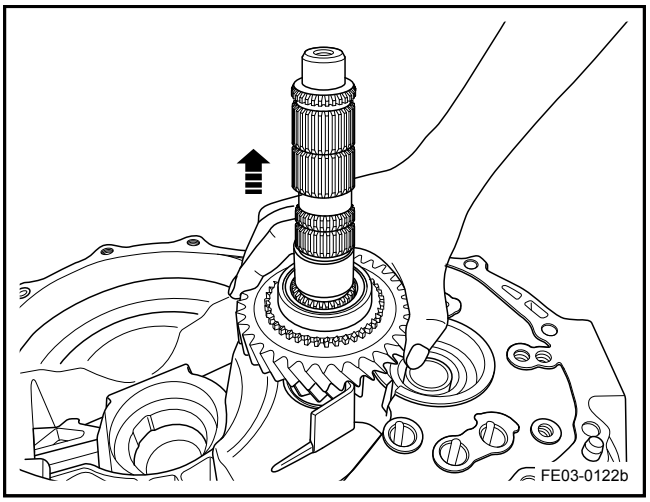


11. Remove the 1st and 2nd gear synchronizer snap ring with a plier.

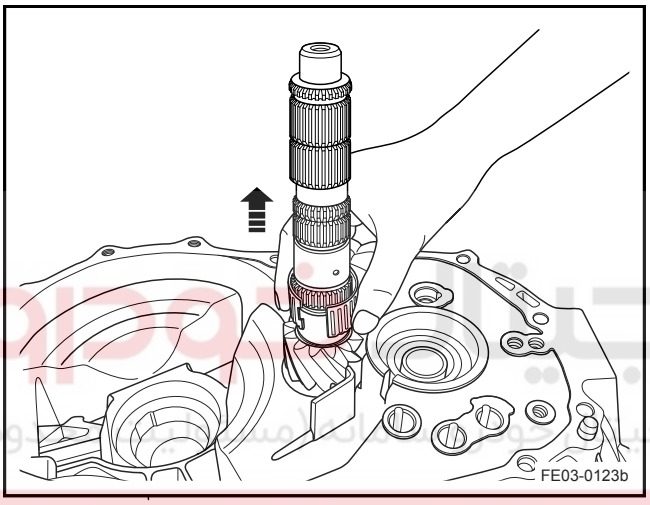


12. Remove the 1st and 2nd gear synchronizer.

    Gear Synchronizer Sleeve and Shift Fork Distance: ≤0.35 mm (13.780×10^{-3} in)



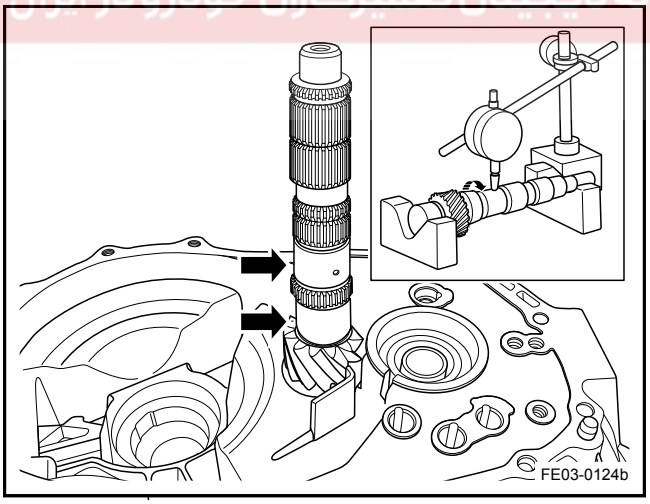
13. Remove the 1st gear.



14. Remove the 1st gear needle bearing.

Note

The bearing has only one opening. Do not force to remove, as it may damage the bearing.



15. After disassemble, the main shaft final state is:

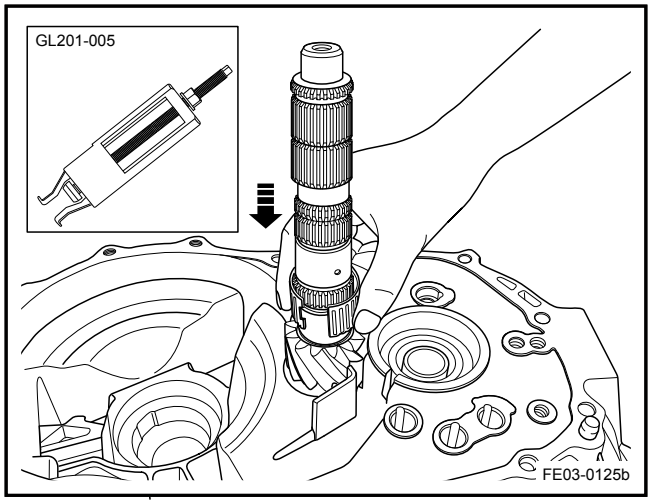
Main shaft Wear:

Minimum Diameter 33.985 mm (1,337.989 × 10^{-3} in)

Main shaft Runout:

≤0.03 mm (1.181 × 10^{-3} in)

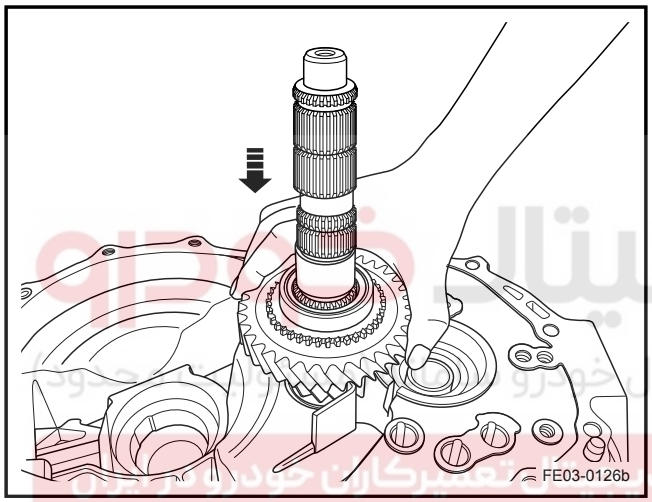
Installation Procedure:



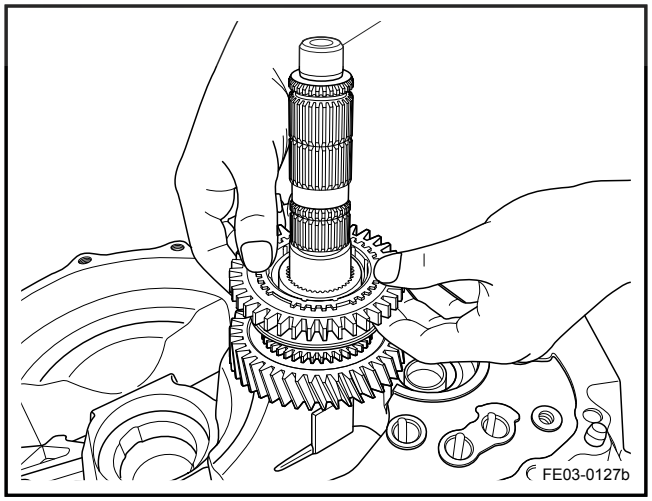
1. Install the 1st gear needle bearing.

   Note

   Apply a small amount of transmission fluid to the bearing journal before installation.
   If the bearings need to be replaced, the bearing outer ring also need to be replaced. During the removal, please use a special tool GL201-005.



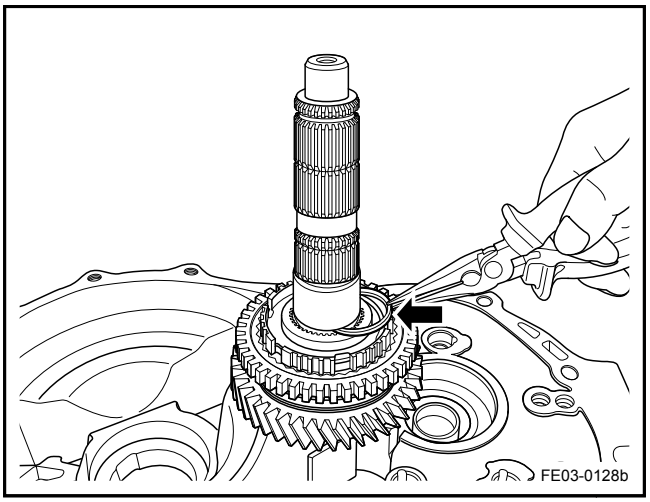
2. Install the 1st gear.



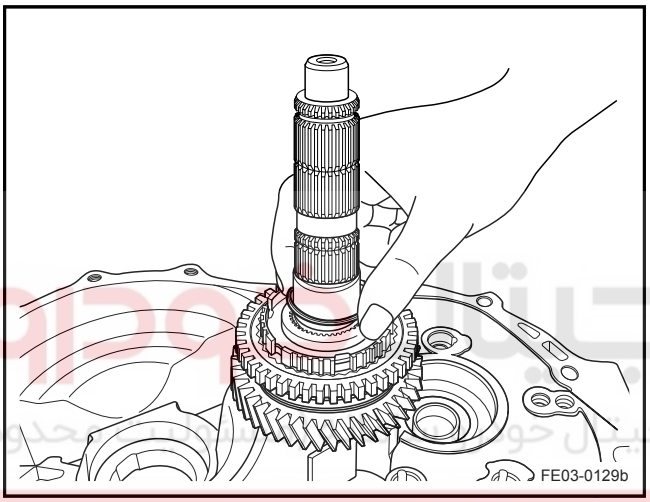
3. Install the 1st and 2nd gear synchronizer.

   Note

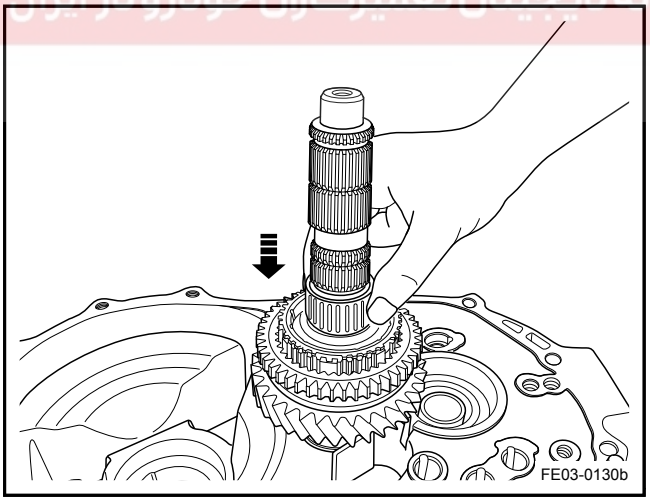
   Gear side should face the rear of the transmission.



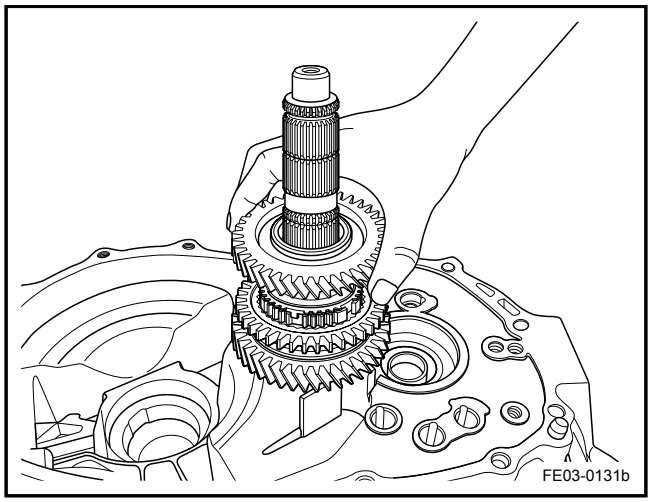
4. Install the 1st and 2nd gear synchronizer snap ring.



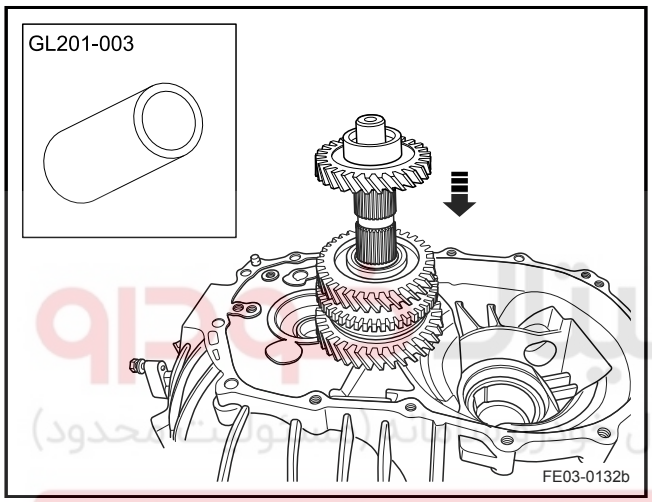
5. Install the 2nd gear needle bearing snap ring.



6. Install the 2nd gear needle bearing.



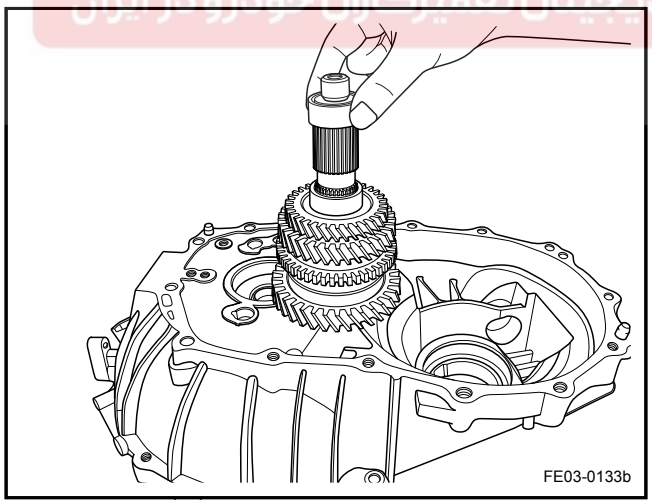
7. Install the 2nd gear.



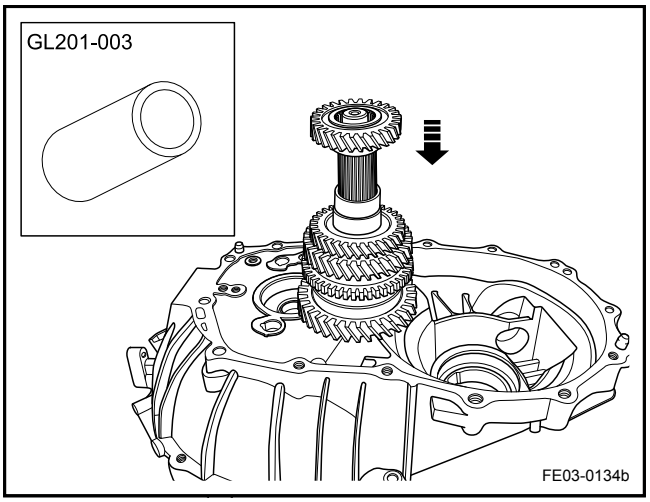
8. Install the 3rd gear with a special tool GL201-003.

Note

The 3rd gear need to be pressed into the position, with the convex side up.



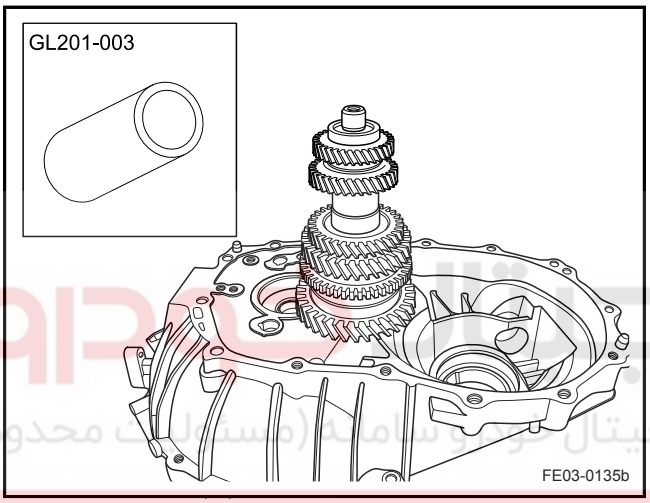
9. Install the sleeve between the 3rd gear and the 4th gear.



10. Install the 4th gear with a special tool GL201-003.

    Note

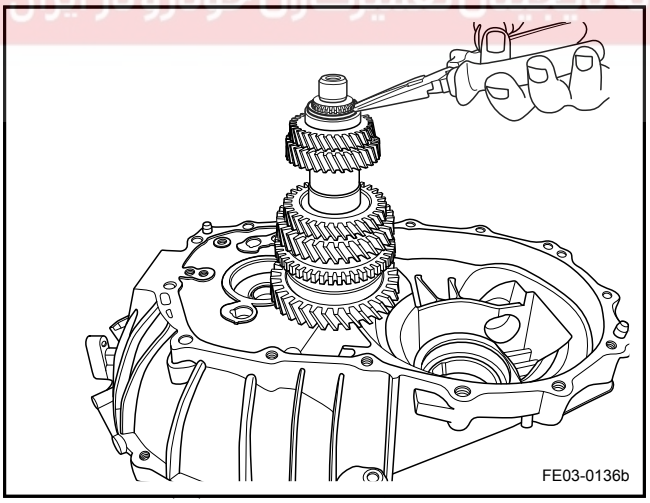
    The 4th gear need to be pressed into the position, with the convex side up.



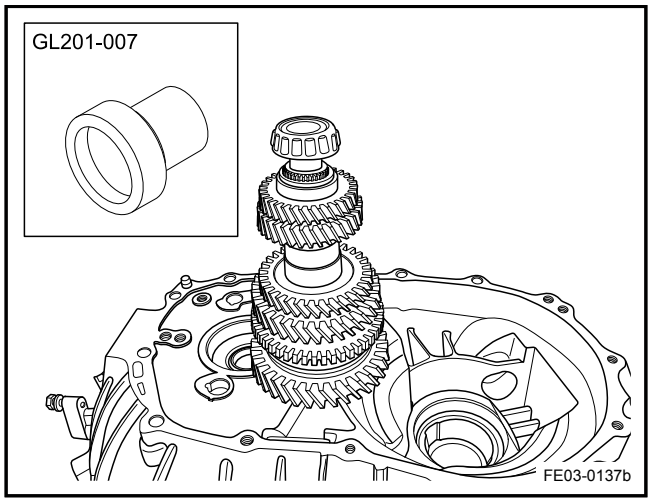
11. Install the 5th gear with a special tool GL201-003.

    Note

    The 5th gear need to be pressed into the position, with the convex side up.



12. Install the 5th gear snap ring.



13. Install the main shaft rear bearing with a special tool GL201-007.

    Note

    If the bearings need to be replaced, the bearing outer ring also need to be replaced. During the removal, please use a special tool GL201-006. After the installation of the transmission rear case, please use a special tool GL201 - 008 to adjust the bearing pre-load.

14. Install the main shaft assembly.

15. Install the shift shaft.

16. Install the shift control assembly.

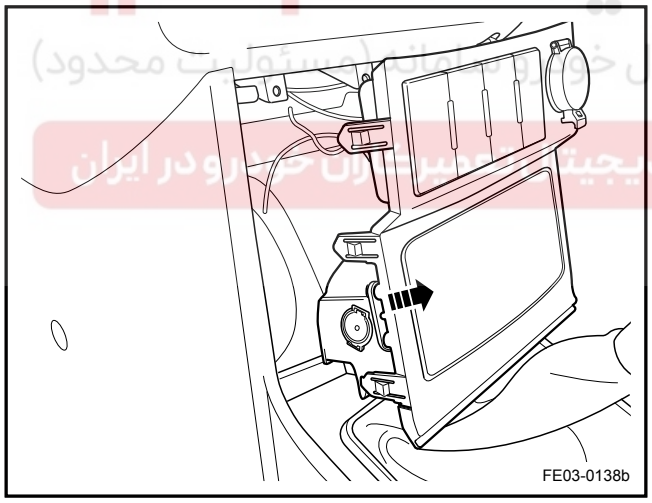
17. Install the transmission.

3.3.8.9 Shift Lever Replacement

Removal Procedure:

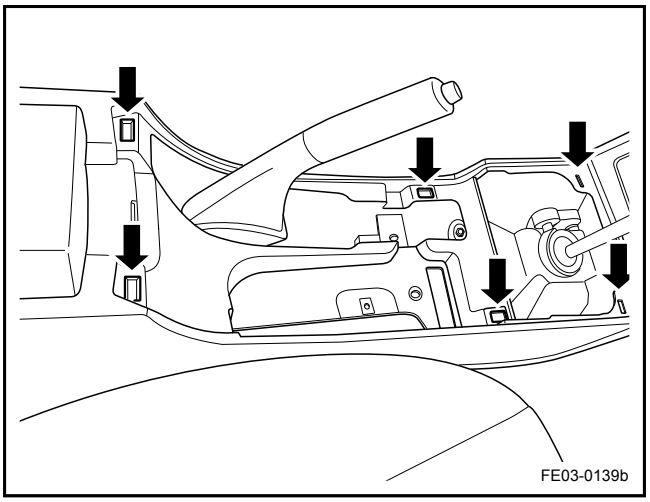
Warning!

Refer to "Battery Disconnect Warning" in "Warnings and Notices".



1. Disconnect the battery negative cable.2.11.8.1 Battery Disconnection.

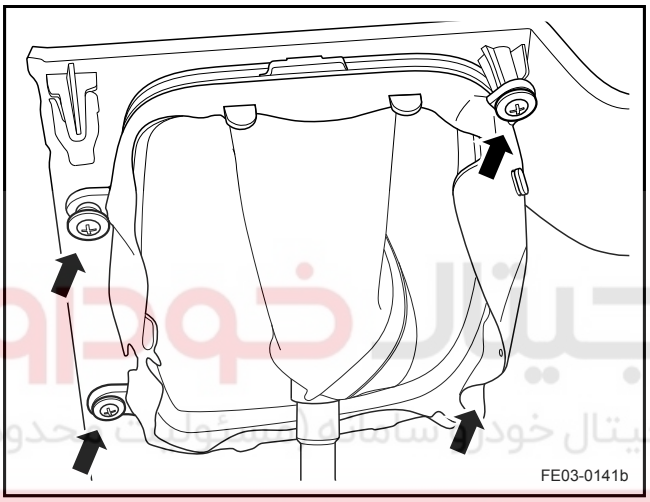
2. Remove the center console upper panel and Disconnect the harness connector.



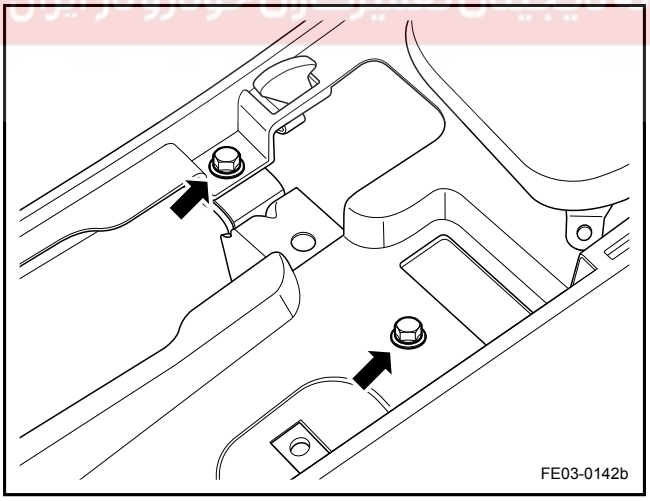
3. Remove the center console cup holder. There are six clips, as shown in the graphic.

Note

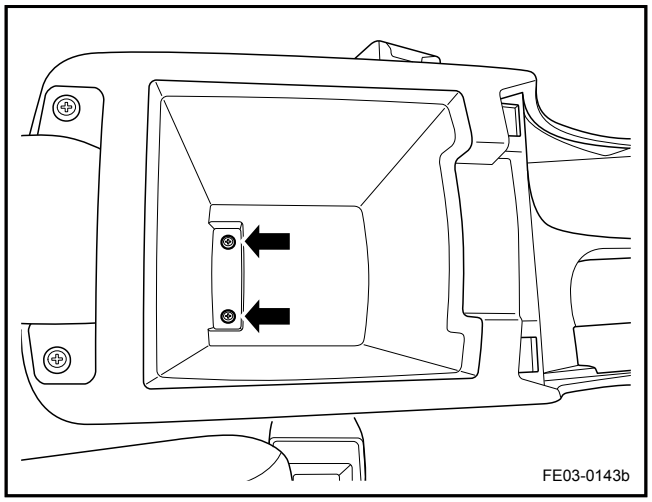
Disconnect the heated seat switch harness connector first with high-spec vehicles.



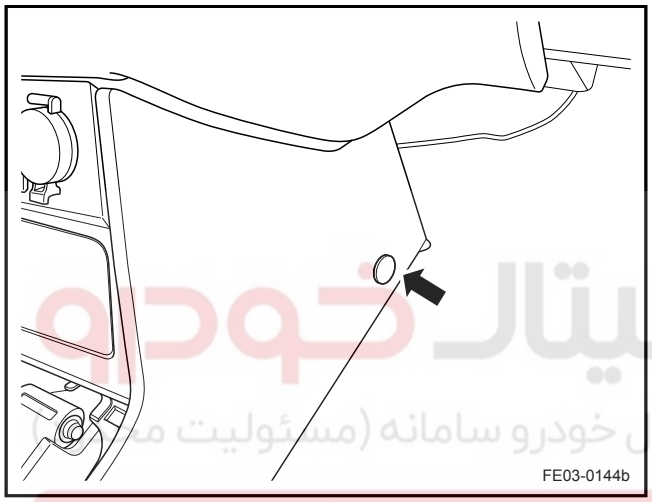
4. Remove the leather gearshift lever mounting screws, separate the lever holster from the center console cup holder .



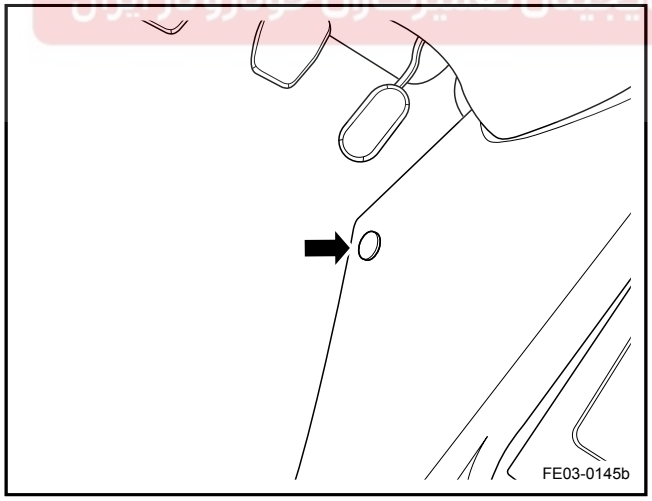
5. Remove the center console central retaining bolts.



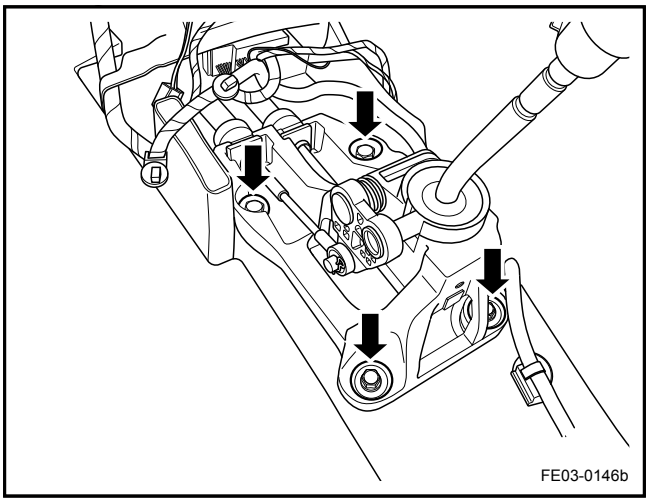
6. Remove the center console storage box retaining bolts.



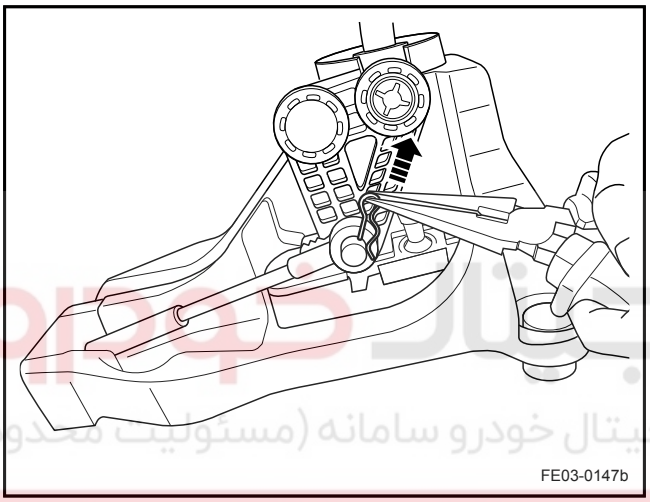
7. Remove the center console passenger side retaining clip.



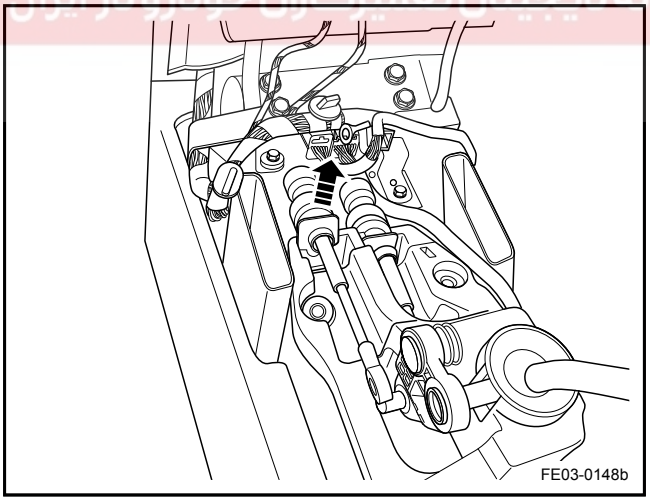
8. Remove the center console driver side retaining clip.



9. After the center console removal, remove the retaining bolts as shown in the graphic.



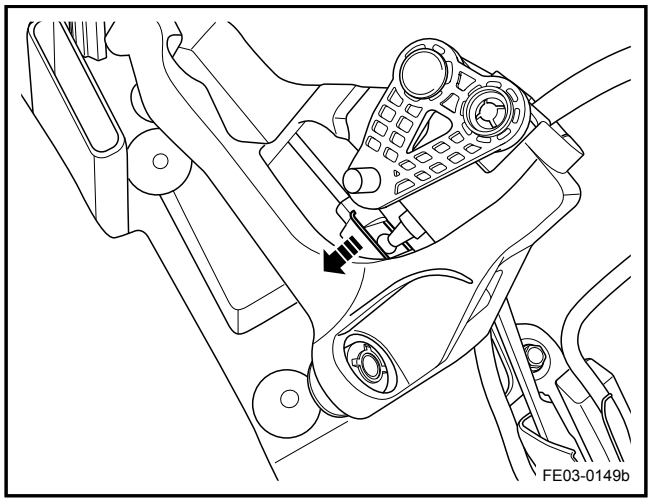
10. Remove the shift lever locking pin with a plier.



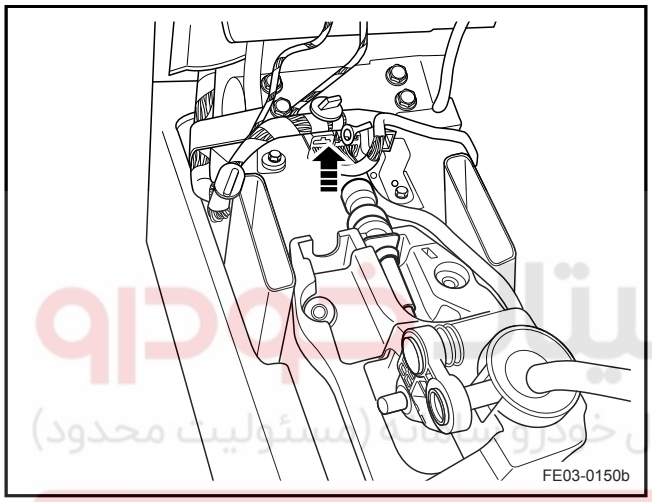
11. Remove the shift lever rod sleeve.

Note

Pull the shift lever rod upward to remove it as an assembly. The black sleeve is part of the assembly.



12. Move the black springs on both sides with a flat blade screwdriver. Remove the shift lever.

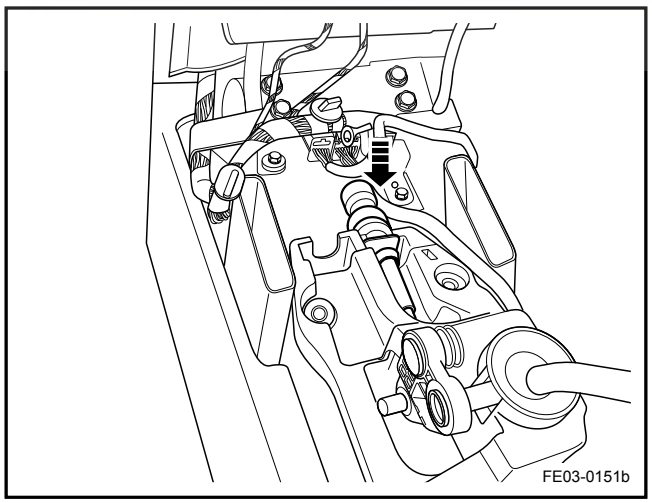


13. Remove the shift lever rod sleeve.

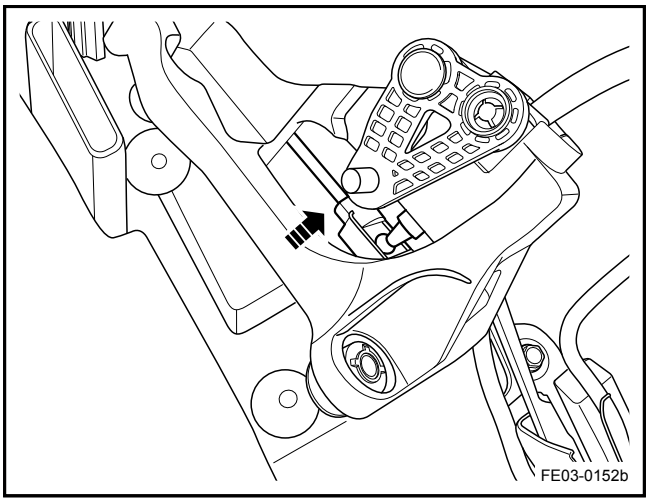
Note

Pull the shift lever rod upward to remove it as an assembly. The black sleeve is part of the assembly.

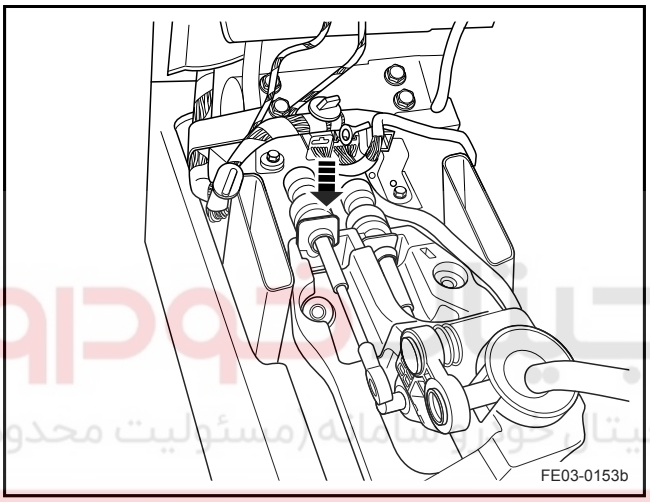
Installation Procedure:



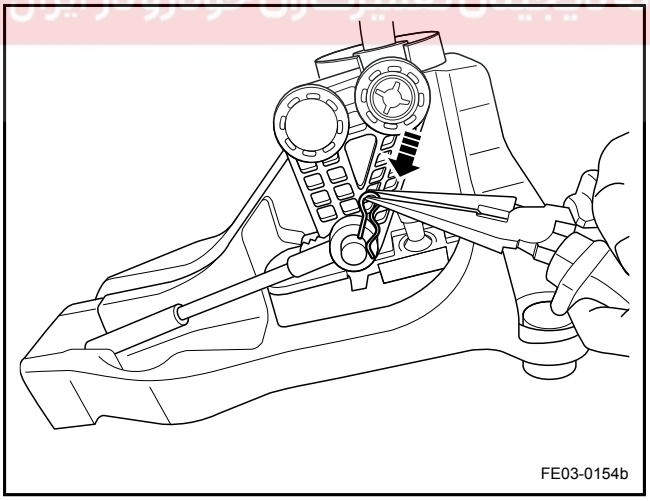
1. Press the shift lever rod into the sleeve.



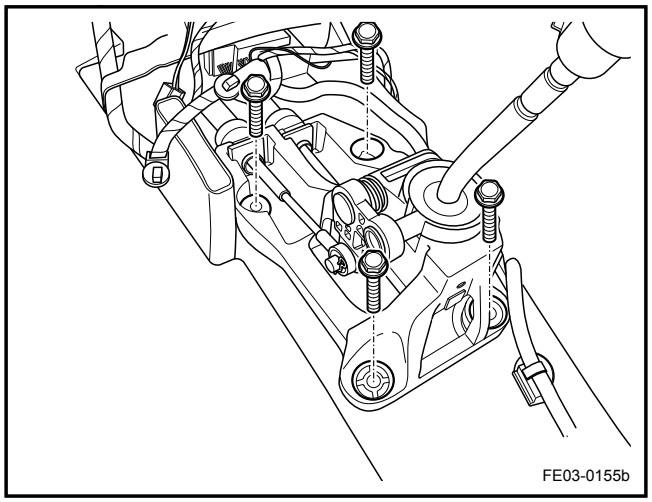
2. Press the shift lever rod to the end of the shift lever and confirm the installation.



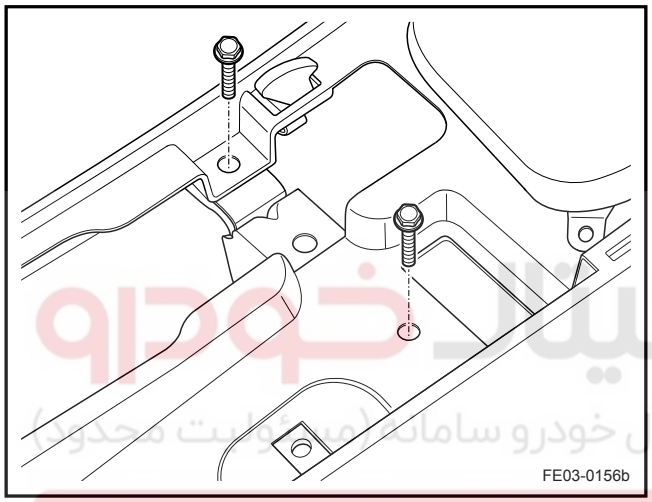
3. Install the shift lever sleeve, press the sleeve.



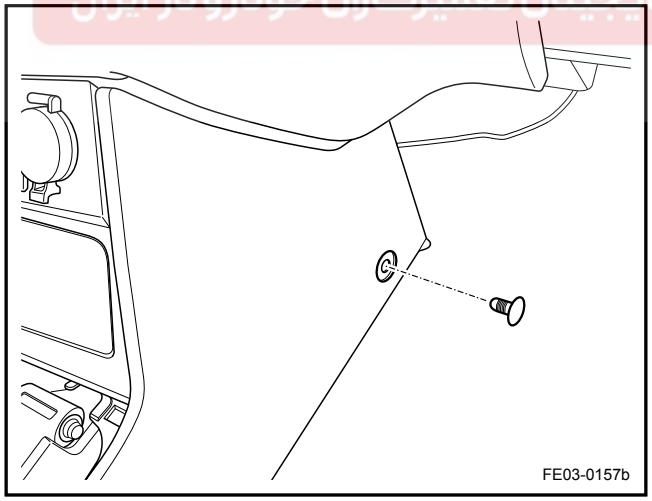
4. Press the shift lever rod locking pin.



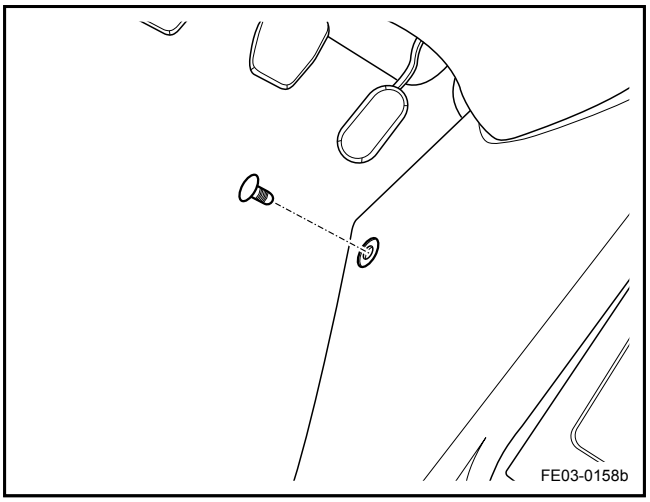
5. Install and tighten the shift lever retaining bolts. Confirm the shift operations are normal.



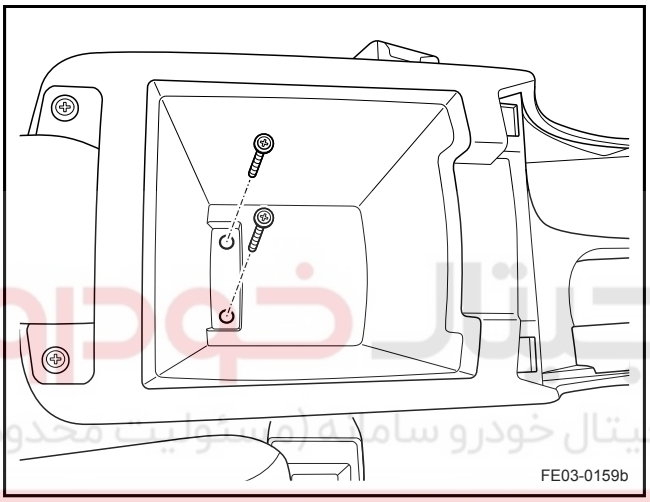
6. Install the center console and tighten retaining bolt.



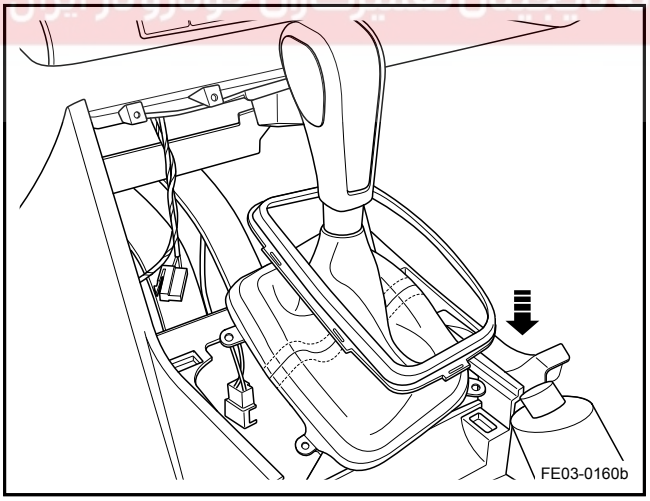
7. Install the center console passenger side retaining clip.



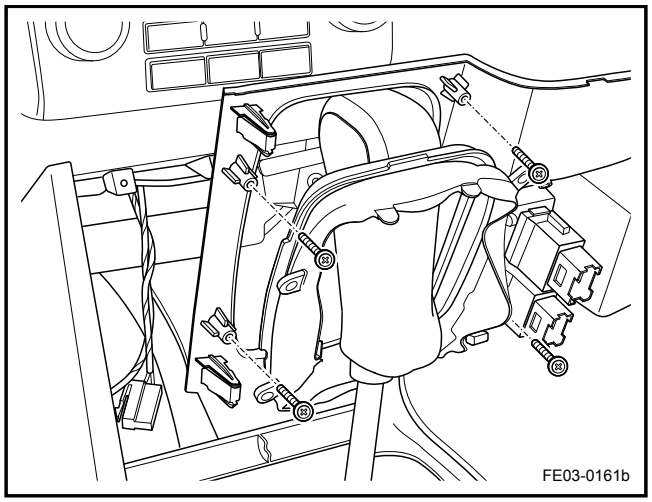
8. Install the center console driver side retaining clip.



9. Install the central console storage box retaining bolts.



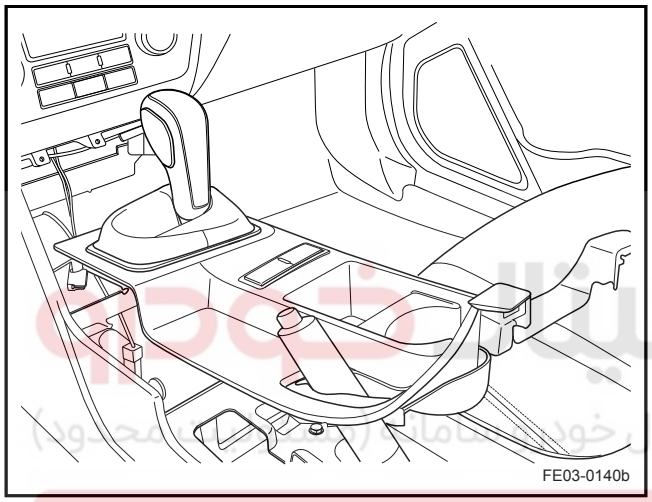
10. Install the shift lever leather holster.



11. Install the lever holster with the central console cup holder and tighten screws.

    Note

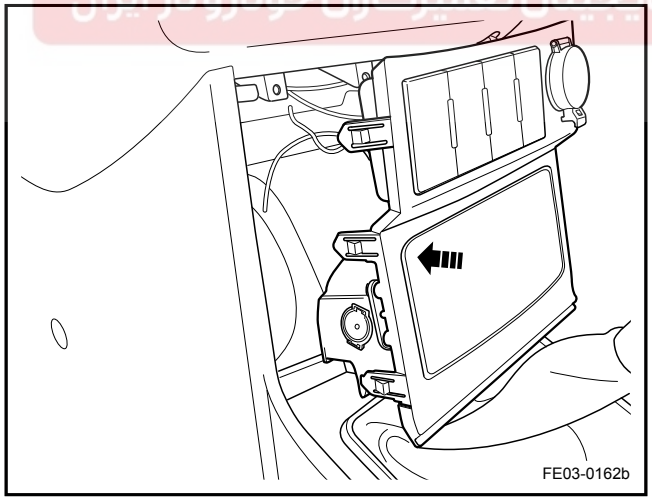
    Connect the heated seat switch wiring harness connector in high-spec vehicles.



12. Press the center console cup holder and confirm that six clips are in place.

    Note

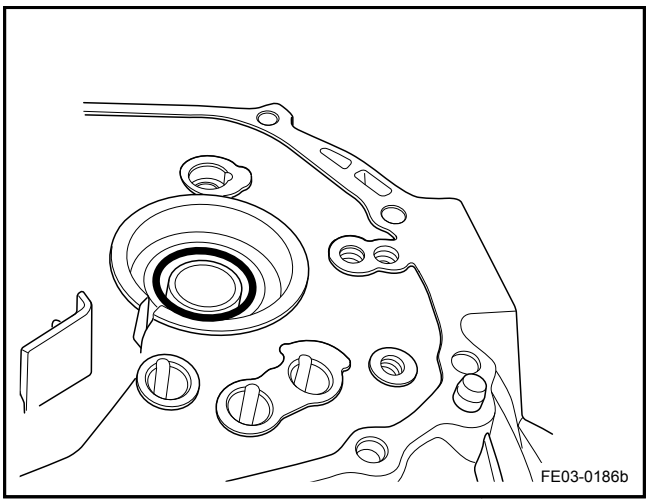
    Disconnect the heated seat switch wiring harness connector first in high-spec vehicles.



13. Install the center console upper panel and connect the wiring harness connector.

14. Connect the battery negative cable.

3.3.8.10 Transmission Input Shaft Oil Seal Replacement

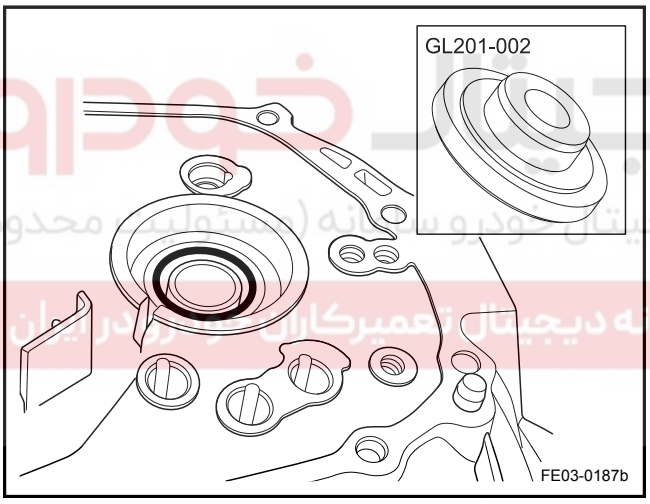


Removal Procedure:

1. Remove the transmission. Refer to 3.3.8.3 Transmission Assembly Replacement.
2. Remove the input shaft. Refer to 3.3.8.7 Input Shaft Disassemble and Assemble.
3. Remove the input shaft oil seal.

   Note

   Do not damage transmission fluid seal mounting surface.

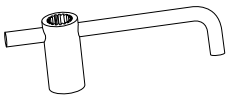
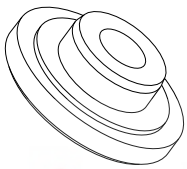
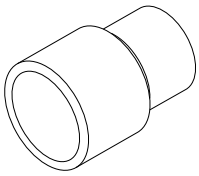


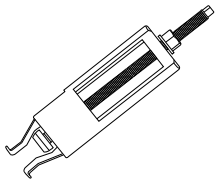
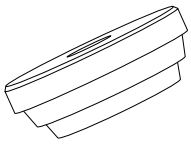
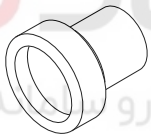
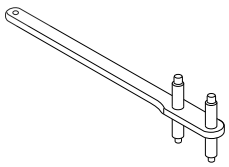
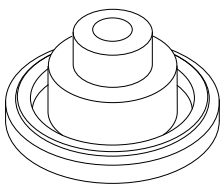
Installation Procedure:

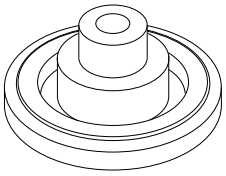
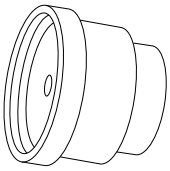
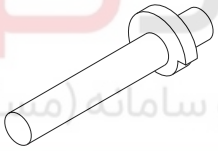
1. Install the transmission input shaft oil seal with a special tool GL201-002.
2. Install the transmission input shaft.
3. Install the transmission.

3.3.9 Special Tools and Equipment

3.3.9.1 Special Tools List

Serial Number	Illustration	Tool Number	Description
1	 FE01-2001b	GL201-001	Input Shaft Locking Tool
2	 FE01-2002b	GL201-002	Input Shaft Oil Seal Installation Tool
3	 FE01-2003b	GL201-003	Input and Output Shaft Parts Installation Tool
4	 FE01-2004b	GL201-004	Input Shaft Bearing Removal Tool

Serial Number	Illustration	Tool Number	Description
5	 FE01-2005b	GL201-005	Output Shaft Clutch Bearing Outer Ring Removal Tool
6	 FE01-2006b	GL201-006	Output Shaft Bearing Outer Ring Installation Tool
7	 FE01-2007b	GL201-007	Output Shaft Bearing Removal Tool
8	 FE01-2008b	GL201-008	Output Shaft Adjustment Tool
9	 FE01-2009b	GL201-009	Differential Clutch Housing Oil Seal Removal Tool

Serial Number	Illustration	Tool Number	Description
10	 FE01-2010b	GL201-010	Differential Transmission Housing Oil Seal Removal Tool
11	 FE01-2011b	GL201-011	Differential Bearing Removal Tool
12	 FE01-2028b	GL201-014	Shift Lever and Gear Selector Oil Seal Installation Tool