4 Suspension System

4.1 Warnings and Notices

4.1.1 Warnings and Notices

Assistant Driving Warning

Warning!

Warning: An assistant should drive the vehicle while the technician checks for the location of the reported condition. Otherwise, personal injury could result.

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.

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.

Excessive Adhesive on Flywheel Bolts Notice

Note

Notice: Apply the proper amount of the sealant to the fastener when assembling this component. Excessive use of the sealant can prohibit the component from being assembled properly or allow the fastener to loosen. A component or fastener that is not assembled properly can loosen or fall off leading to extensive engine damage.

4.2 Front Suspension

4.2.1 Specifications

4.2.1.1 Fastener Tightening Specifications

Applications	Model	Specifications		Notes
		Metric (Nm)	US English (lb-ft)	
Front Subframe Bolts	M14 × 1.5 × 95	160-200	118.0-147.5	
Rear Subframe Bolts	M14 × 1.5 × 55	160-200	118.0-147.5	
Cross Member Front Bolts	M10 × 1.25 × 18	65-85	47.9-62.7	
Steering Rod Ball Pin Groove Nut	M10 × 1.25	44-54	32.5-39.8	Turn the nut 60 ° if the pin can not be installed.
Front Shock Absorber Upper Nuts	M8 × 1.25	36-42	26.6-31	
Lower Control Arm Ball Joint Connecting Bolts	M10 × 1.25 × 16	131-159	96.6-117.3	
Lower Control Arm Ball Joint Connecting Nuts	M12 × 1.25	131-159	96.6-117.3	
Lower Control Arm Front Bolts	M14 × 1.5 × 95	160-200	118.0-147.5	Drop the wheels and then tighten to the specified torque
Lower Control Arm Rear Bolts	M14 × 1.5 × 95	160-200	118.0-147.5	Drop the wheels and then tighten to the specified torque
Front Stabilizer Bar Connecting Nuts	M12 × 1.25	69-79	50.9-58.3	
Ball Groove Nut	M14 × 1.5	131-158	96.6-116.5	Turn the nut 60 ° if the pin can not be installed.
Shock Absorber Upper Bracket and Piston Rod Nut	M14 × 1.5	60-80	44.3-59.0	
Stabilizer Bar Bracket and Front Subframe Connecting Nut	M10	45-55	33.2-40.6	
Front Axle Wheel Hub Nut (drive shaft)	M22 × 1.5	201-231	148.2-170.4	Fixed Locking Nut

4.2.1.2 General Specifications

Applications	Specifications

	Metric (mm)	US English (in)
Front Wheel Upper Run Out	80	3.1
Front Wheel Lower Run Out	80	3.1

4.2.2 Description and Operation

4.2.2.1 Description and Operation

The function of the front suspension system is to maximize the friction between tires and road surface, provide good steering control and stability, ensure passenger comfort. It is able to absorb the energy of the wheel vertical acceleration, so when the wheels move up and down along the bumpy road the frame and body will not be interfered. This vehicle uses independent strut front suspension, which includes the following components: springs, shock absorbers and the stabilizer bar.

4.2.3 System Working Principle

4.2.3.1 Suspension System Terms

1. Sprung Load:

- Sprung load refers to the weight supported by the spring.
- Sprung load should be larger than the non-Sprung Load to get the normal handling performance.

Sprung Load Examples:

a. Body and Frame

b. Load or Cargo

c. Fuel Tank

Spring Components:

a. Frame (Including the subframe)

b. Body (Including the whole body)

c. Power System (Engine, Transmission, Differential, Drive Axle)

d. Steering

2. Non-Sprung Load:

- Non-Sprung load refers to the weight not supported by the spring
- The less the non-Sprung Load the better, in order to ensure the normal handling and ride comfort.

Non-Sprung Load Examples:

a. Wheels and Tires

b. Wheel Bearings and Hub

c. Axle and Steering Knuckle

d. brake parts (mounted on wheels)

Non-Sprung Load Components:

a. Wheels / Tires, Ball Joint, Bearings, Control Arm, Beam, Cross Members, Overall Drive Axle

b. Stabilizer Bar, Control Rod, etc.

c. Shaft, Steering Knuckle, Brake, etc.

d. Non-Sprung load is small then the suspension response is good.

3. Components Between Sprung Load and Non-Sprung Load:

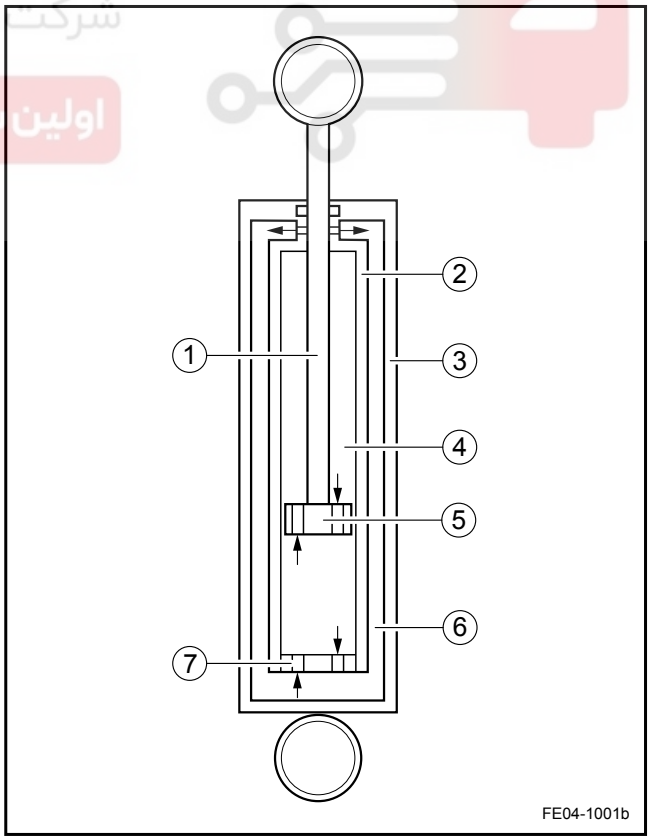
Steering rod, drive axle, stabilizer bar and other components installed between the sprung load and the non-sprung load.

4.2.3.2 Suspension System Component Working Principle

1. Spring:

Spring stiffness will affect the Sprung Load response quality during driving. If the spring is soft, it can eliminate bumps and provide a very smooth driving feel, but in the process of braking and acceleration, it feels crawling and crouching. In the corner, it intends to roll and tumble. If the spring is firm, it feels less smooth on bumpy roads, but the body movement is very small, which means that even in the corner, you can also drive the vehicle fast. The spring itself is simple. Designing, implementing these devices and finding balance between the passenger comfort and vehicle handling performance is not easy. Smooth driving feel can not be achieved alone by the spring. The spring absorbing energy ability is excellent, but the dissipation ability is less impressive. Therefore, the suspension system uses a device called on shock absorber. If the damping structure is not used, spring will bounce at an uncontrolled rate and release the energy it absorbed through bumping and continue to bounce at its own frequency until it runs out all the energy. Built on the spring, the suspension allows the vehicle to drive on bumpy roads without losing control.

2. Shock Absorber:



1. Piston Rod
2. Inner Cylinder

3. Outer Tube
4. Hydraulic Chamber
5. Piston and Valve
6. Liquid Storage Space
7. Inner Cylinder Bottom Valve

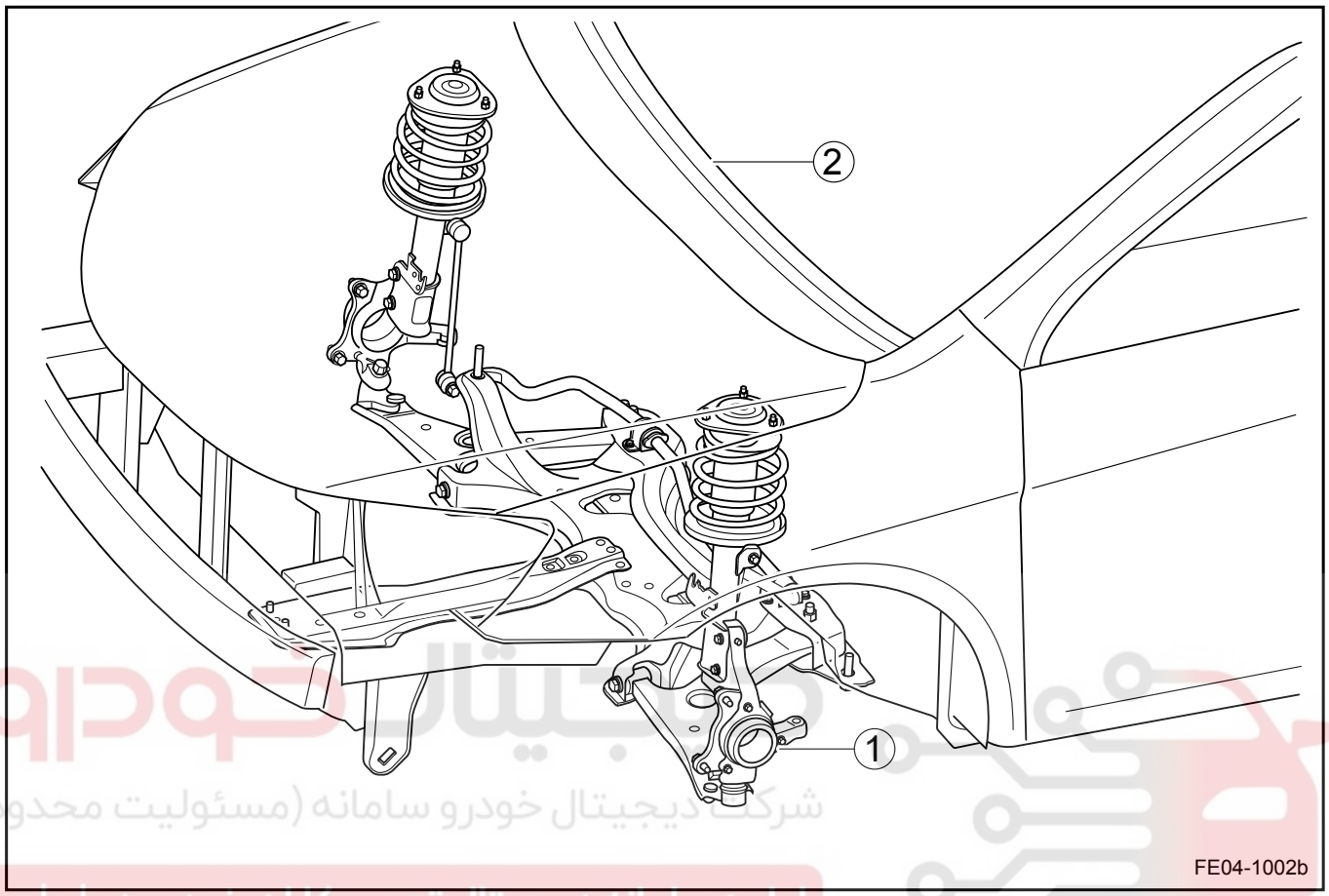
It controls the unwanted spring movement through a process known as damping. Shock absorber converts the suspension kinetic energy to heat dissipated by the hydraulic fluid to slow and weaken the vibration movement. Shock absorber upper bearing is connected to the frame (ie. Sprung Load), lower bearing is connected to the axle (ie. non-Sprung Load). In the double-cylinder design, one of the most common types of shock absorber is that the upper bearing is connected to the piston rod, piston rod is connected to the piston and piston is in the cylinder filled with hydraulic fluid. Inner cylinder is known as the pressure cylinder, outer cylinder is known as the reservoir cylinder. Reservoir cylinder stores the extra hydraulic fluid. When the wheels encounter bumps along the road and the spring is compressed or stretched, the spring energy passes through the bearing to the shock absorber, and passes down through the piston rod to the piston. There are holes on the piston. When the piston moves up and down in the pressure cylinder, hydraulic fluid may leak through these holes. Because these holes are very small, so even under a lot of pressure only a small amount hydraulic fluid can leak through. This slows down the velocity of the piston, so it slows down the spring movement. Shock Absorber's work consists of two cycles - compression cycle and extension cycle. Compression cycle is when the piston moves downward to compress the hydraulic fluid beneath it; extension cycle is when the piston moves upward to compress the hydraulic fluid on the top. For a typical vehicle, the extension cycle resistance is greater than its compression cycle. Moreover, please note that compression cycle control is related to the non-sprung load movement, while the extension cycle control is related to heavier Sprung Load movement. All modern shock absorbers come with speed-sensing capabilities - the faster the suspension speed, the greater the resistance shock absorber provides. This makes the shock absorber can be adjusted according to road conditions and controls the vehicle to eliminate unwanted movements, including bounce, roll, brake dive and acceleration squat and so on.

3. Stabilizer Bar:

It is used in conjunction with the shock absorber to provide additional stability for the driving vehicle. Stabilizer is a metal bar across the axle, effectively connecting the suspension on both sides together. When a wheel moves up and down on the suspension, stabilizer bar will pass the movement to the other wheel. This can make driving more stable and reduce the vehicle inclination. In particular, it is capable to compensate the vehicle rollover tendency when the vehicle is turning.

4.2.4 Component Locator

4.2.4.1 Component Locator



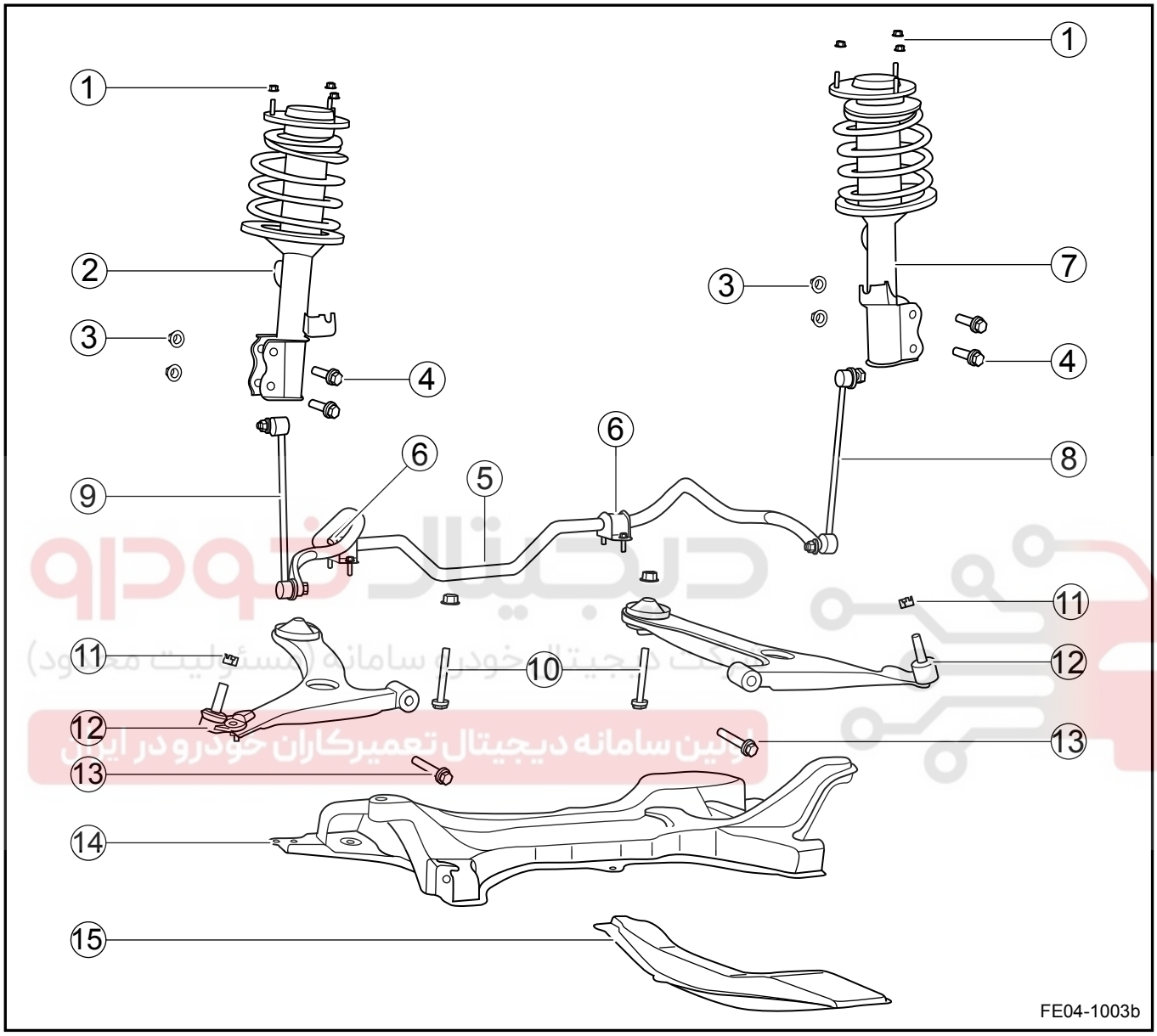
Legend

1. Front Suspension
2. Body

4.2.5 Disassemble View

4.2.5.1 Disassemble View

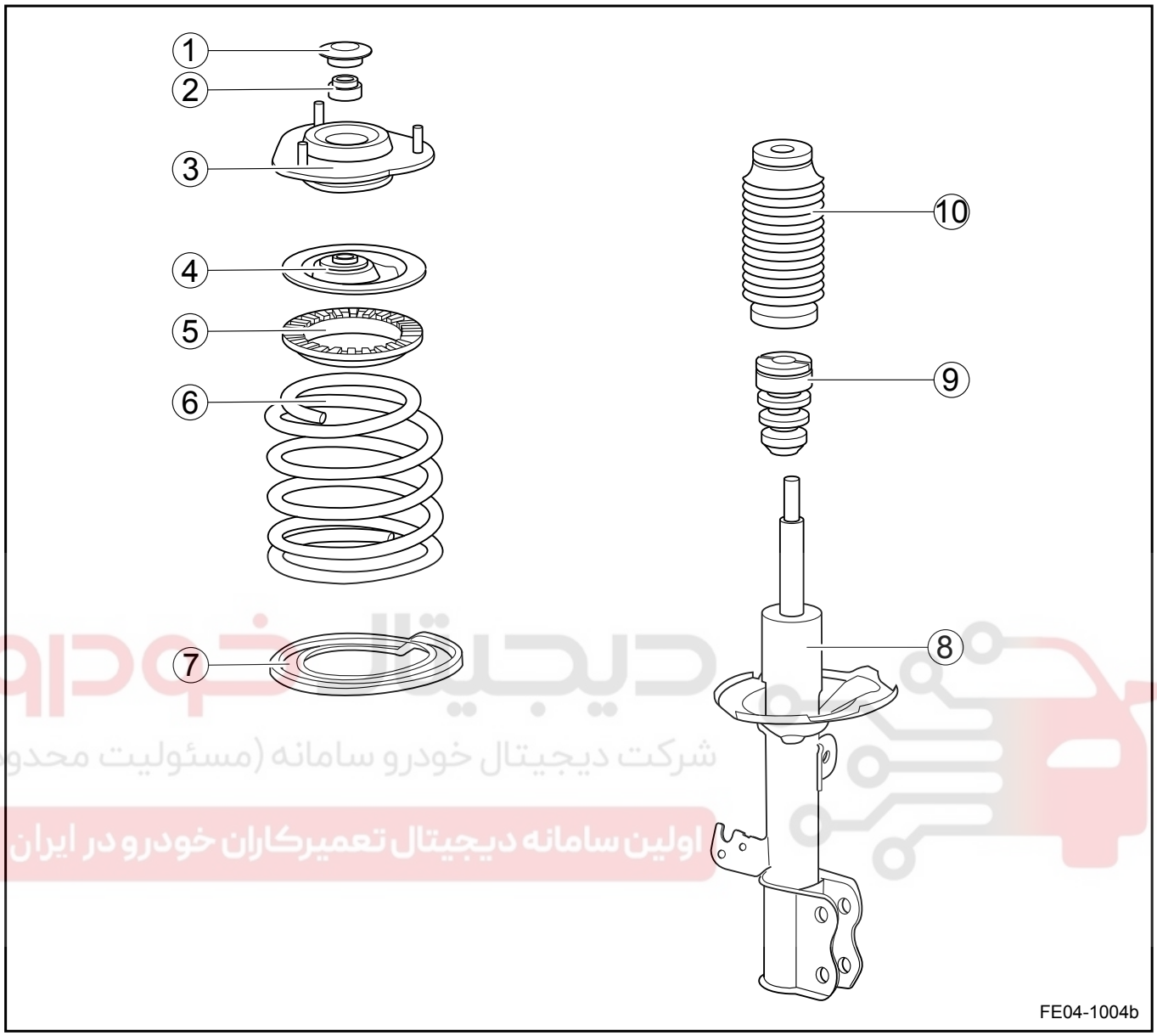
Front Suspension



Legend

1. Front Strut Assembly Upper Nuts
2. Right Front Strut Assembly
3. Front Shock Absorber and Steering Knuckle Connecting Nuts
4. Front Shock Absorber and Steering Knuckle Connecting Bolts
5. Front Stabilizer Bar
6. Front Stabilizer Bracket, Bushings and Bolts
7. Left Front Strut Assembly
8. Left Front Stabilizer Bar Link Assembly
9. Right Front Stabilizer Bar Link Assembly
10. Lower Control Arm Rear Connecting Bolts
11. Ball Groove Nuts
12. Lower Control Arm Ball Joint
13. Lower Control Arm Front Connecting Bolts
14. Subframe
15. Crossmember

Front Strut Assembly



Legend

1. Front Strut Upper Mount Dust Cover
2. Locking Nut
3. Front Strut Upper Mount
4. Front Coil Spring Upper Mount
5. Front Coil Spring Upper Vibration Isolation Pad
6. Front Suspension Coil Spring
7. Front Coil Spring Lower Vibration Isolation Pad
8. Front Shock Absorber Assembly
9. Front Shock Absorber
10. Front Shock Absorber Dust Cover

4.2.6 Diagnostic Information and Procedures

4.2.6.1 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 symptoms diagnostic procedures, it will also help to determine whether the customer described condition in normal. Refer to4.2.2 Description and Operationto confirm the correct procedures for system diagnostics.

4.2.6.2 Shock Absorber Inspection

1. Shock absorber is too soft

Step 1	Check whether the tire pressure is normal?

No → Adjust tire pressure to the standard value according to the tire label.

Yes

Step 2	Check whether the vehicle is overloaded?

No → Consult with the user. Explain to the user what is the vehicle normal load.

Yes

Step 3	Check whether the shock absorber compression rebound effect is normal?

Quickly press and release the bumper corner closest to the shock absorber being tested. Compare the compression and rebound with a similar vehicle.

No → Replace the shock absorber. Refer to 4.2.7.3 Front Strut Assembly Replacement, 4.3.7.1 Rear Strut Assembly Replacement

Yes

Step 4	System normal.

2. Shock Absorber Noise

Step 1	Check whether the shock absorber is installed correctly. check whether all shock absorber components are working correctly (Make sure there is no loose or other abnormal situation).

No → If necessary, replace the shock absorber.

Yes

Step 2	Check whether the shock absorber compression and rebound effect is normal?

Quickly press and release the bumper corner closest to the shock absorber being tested. Compare the compression and rebound with a similar vehicle.

No → Replace the shock absorber. Refer to 4.2.7.3 Front Strut Assembly Replacement, 4.3.7.1 Rear Strut Assembly Replacement

Yes

Step 3	System normal.

3. Shock Absorber Oil Leaks

Step 1	Check whether there is slight oil leakage. If the leaking is very slight, it is normal.

Next

Step 2	Check the shock absorber seals when fully extended. Check whether the dust cover is damaged and so on.

Yes → Replace the shock absorber. Refer to 4.2.7.3 Front Strut Assembly Replacement, 4.3.7.1 Rear Strut Assembly Replacement

No

Step 3	Check whether there is excessive oil on the shock absorber?

Yes → Replace the shock absorber. Refer to 4.2.7.3 Front Strut Assembly Replacement, 4.3.7.1 Rear Strut Assembly Replacement

No

Step 4	System normal.

4.2.6.3 Ball Pin and Steering Knuckle Inspection

Warning!

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

Step 1	Raise the vehicle front end, so that the front suspensions are in a free hanging state.

Next

Step 2	Hold the top and bottom of the tire.

Next

Step 3	Turn the tire inward and outward at the top

Next

Step 4	Check whether there is gap, whether the steering knuckle moves horizontally in relation to the control arm?

Next

Step 5	If there are following conditions, replace the ball joint.

(a) Ball joint loose.
(b) Ball joint seal broken.
(c) Ball stud and steering knuckle disconnected.
(d) Ball stud loose in the steering knuckle.
(e) Press the ball stud, it twists.

Next

Step 6	Components normal.

4.2.6.4 Ball Stud Inspection

During each inspection, check whether the ball stud is tightly installed in the steering knuckle.

Check whether the ball stud is worn:

A. Shake the wheel and the ball stud or nut movement in the steering knuckle.

B. Check slotted nut fastening torque. Nut loose indicates that ball joint withstands stress or there is a hole in the steering knuckle.

Replace the worn or damaged ball joint or steering knuckle. Refer to 4.2.7.7 Lower Control Arm Ball Joint Replacement, 4.2.7.8 Steering Knuckle Replacement.

4.2.6.5 Friction Too Great Inspection

Follow the procedures to check whether the front suspension friction is too great:

Step 1	Raise the front bumper and lift the vehicle as high as possible.

Next

Step 2	Slowly lower down the bumper for the vehicle front end to resume its height.

Next

Step 3	Measure the distance between the ground and the bumper center.

Next

Step 4	Push the bumper and then slowly release to allow the vehicle to resume its height.

Next

Step 5	Measure the distance between the ground and the bumper center.

Next

Step 6	The two measured values difference should be less than 12.7 mm (0.5 in). If the distance exceeds this limit, check the control arm, shock absorber and ball joint for damage or wear and tear.

4.2.6.6 Ride Diagnostic (Too Soft or Hard)

1. Too Soft

Step 1	Check whether the shock absorber is worn. If necessary, replace the shock absorber.

Next

Step 2	Check whether the coil spring is broken or loose. If necessary, replace the spring.

2. Too Hard

Step 1	Check whether the shock absorber is installed correctly, whether the shock absorber suits the vehicle. If necessary, replace the shock absorber.

Next

Step 2	Check whether the coil spring is the correct type. If necessary, replace the coil spring.

4.2.6.7 Body Tilt or Sway When Cornering

Step 1	Check whether the stabilizer bar link is loose. Tighten the stabilizer bar link to the strut assembly connecting nuts to the specified torque.

Next

Step 2	Check whether the shock absorber and the coil spring are wear and tear. If necessary, replace the shock absorber and tighten the shock absorber retaining nuts.

Next

Step 3	Check whether the vehicle is overload. Provide the user a reasonable explanation.

Next

Step 4	Check whether the coil spring is broken or loose. If necessary, replace them.

4.2.6.8 Noise Diagnostics

Step 1	Check whether the ball joint and the steering rod lubrication is inadequate?

Yes

Replace the ball joint or the steering rod. Refer to 4.2.7.6 Stabilizer Bar Link Replacement

No

Step 2	Check whether the suspension components are damaged?

Yes

Replace the damaged suspension components.

No

Step 3	Check whether there is lower control arm wear and tear?

Yes → Replace the lower control arm bush. Refer to 4.2.7.2 Lower Control Arm Bushing Replacement

No

Step 4	Check whether the Stabilizer Bar link is loose?

Yes → Tighten the stabilizer bar link bolts.

No

Step 5	Check whether the shock absorber or coil spring vibration isolation pad are intact. Check whether the installation is correct. Check the existence of damage and so on?

Yes → Replace the faulty components.

No

Step 6	Check whether the coil spring installation is incorrect?

Yes → Install the coil spring.

No

Step 7	Check whether the stabilizer bar bushing is wear and tear?

Yes → Replace the stabilizer bar bushing. Refer to 4.2.7.5 Stabilizer Bar Replacement

No

Step 8	Find a same model vehicle. Assess whether the noise is the normal operating noise.

Yes

Step 9	System normal.

4.2.6.9 Vehicle Front End Height Abnormal

Step 1	Check whether the coil spring is broken or loose. If necessary, replace it.

Next

Step 2	Check whether the vehicle is overloaded. If necessary, explain to the user the overload damage.

Next

Step 3	Check whether the coil spring is not correct or too soft. Replace with Geely genuine coil spring.

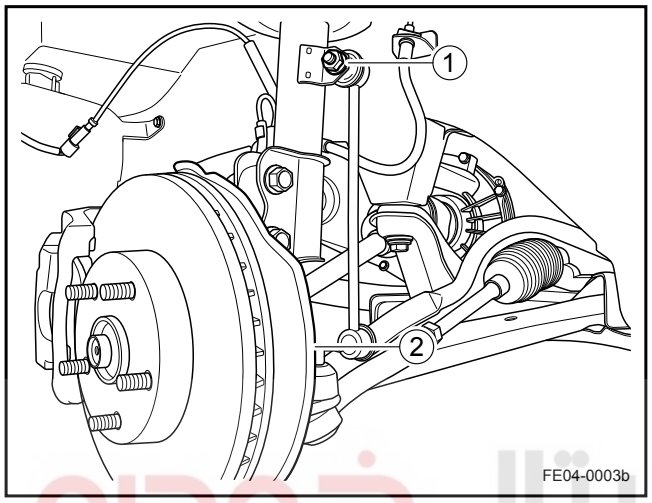
4.2.7 Removal and Installation

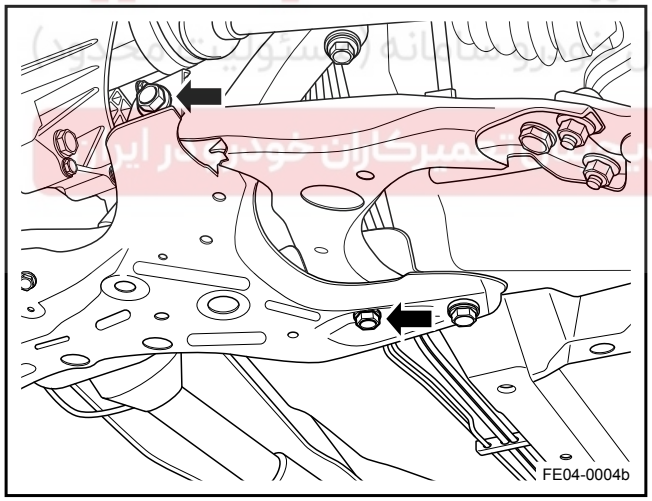
4.2.7.1 Lower Control Arm Replacement

Removal Procedure:

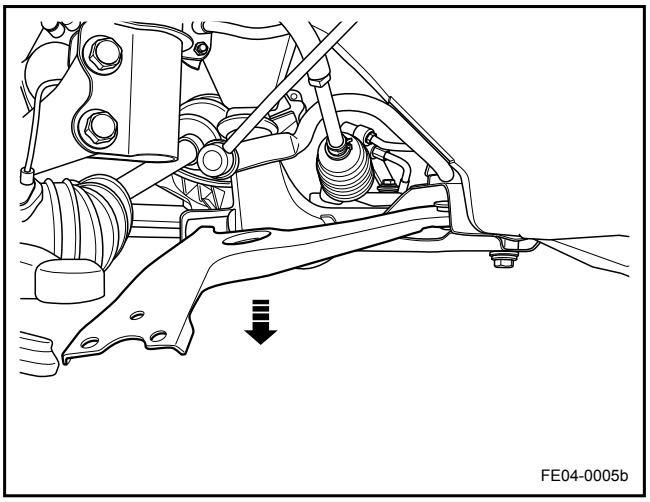
Note

Before the following removal procedure, remove the ignition key from the ignition switch first and turn to lock the steering wheel.





1. Lift and support the vehicle.
2. Remove the front wheels. Refer to 4.4.5.1 Wheel Replacement.
3. Remove the lower control arm ball joint. Refer to 4.2.7.7 Lower Control Arm Ball Joint Replacement.
4. Remove the left and right stabilizer link to the shock absorber connecting nut (1).
5. Remove the steering tie rod ball nut and remove the steering tie rod from the steering knuckle (2).
6. Rotate the stabilizer bars and the steering gear to make room for the lower control arm removal.
7. Remove lower control arm to the subframe retaining bolts.

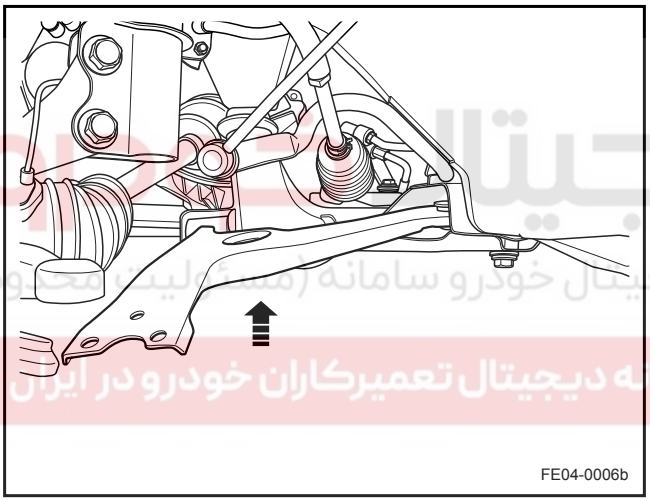


8. Remove the lower control arm.

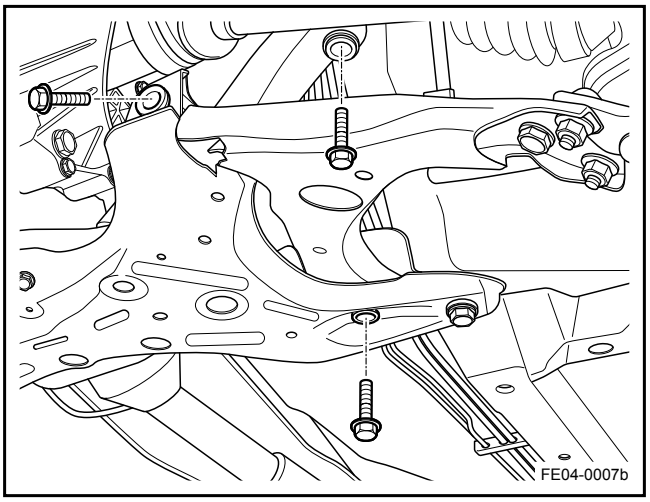
Installation Procedure:

Note

Refer to "Fastener Notice" in "Warnings and Notices".



1. Install the lower control arm to the subframe.

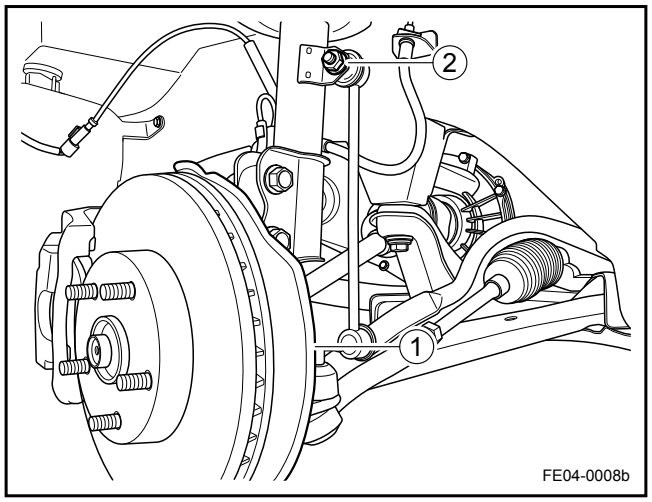


2. Tighten the lower control arm to the subframe retaining bolts.

   Note

   Lower down the wheel and then tighten the bolts to the required torque.

   Torque: 180 Nm (Metric) 133 lb-ft (US English)



3. Install the lower control arm ball joint.
4. Install the steering tie rod ball nut (1).
5. Rotate the Stabilizer bars to the correct position and tighten the left and right Stabilizer bar link connection nuts (2).

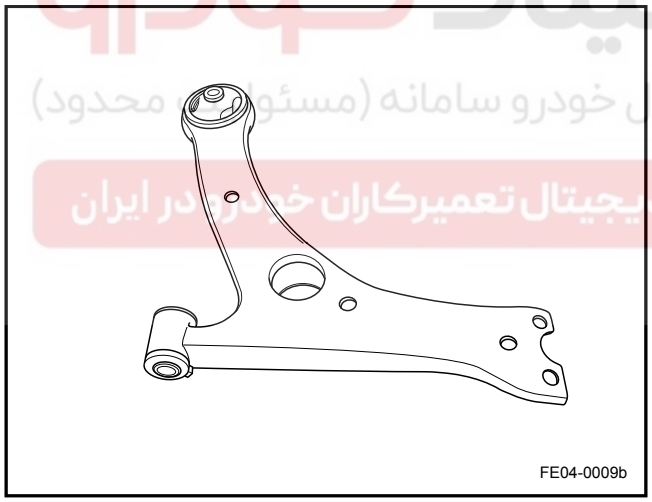
   Torque: 75 Nm (Metric) 55 lb-ft (US English)
6. Install the front wheels.
7. Lower the vehicle.

4.2.7.2 Lower Control Arm Bushing Replacement

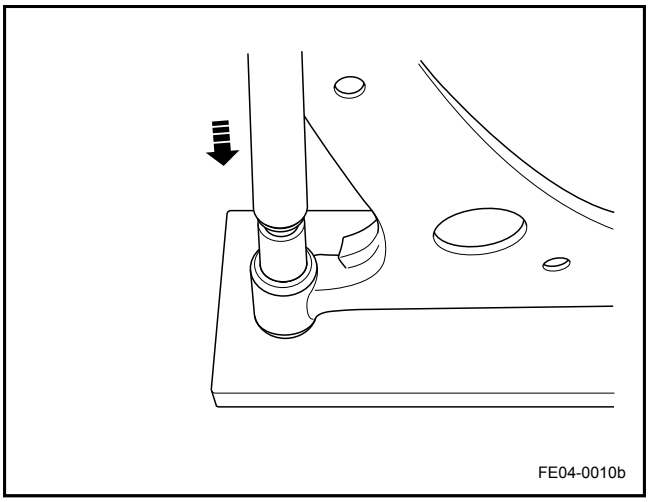
Removal Procedure:

Note

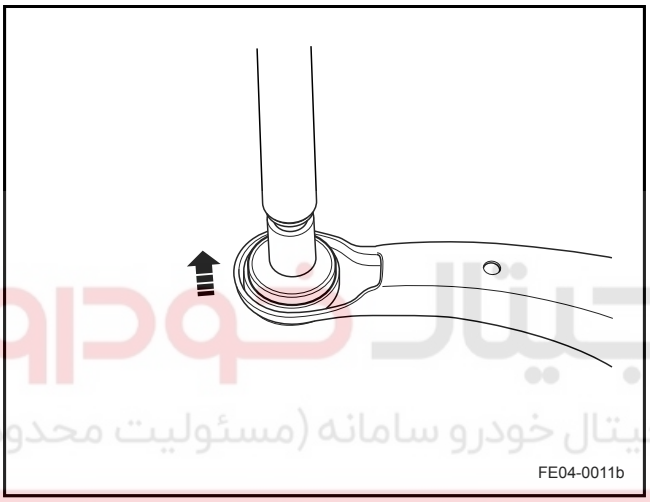
Bushings are only allowed to replace once. If the bushing is faulty a second time, replace the lower control arm assembly.



1. Remove the lower control arm ball joint. Refer to 4.2.7.7 Lower Control Arm Ball Joint Replacement.
2. Remove the lower control arm assembly. Refer to 4.2.7.1 Lower Control Arm Replacement.

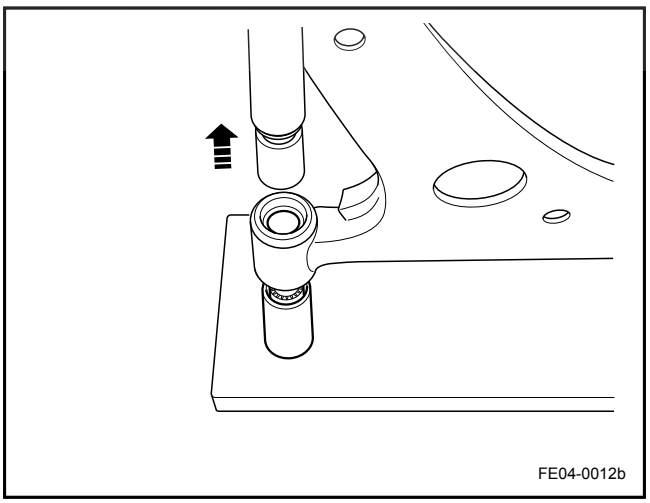


3. Use the bushing removal tool to remove the lower control arm front bush.

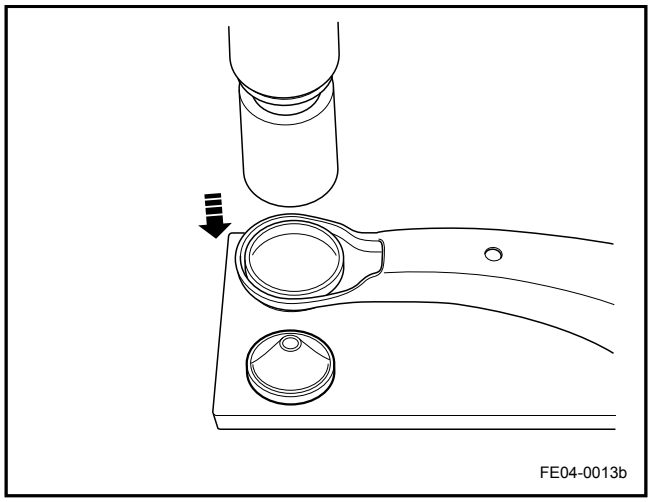


4. Use the bushing removal tool to remove the lower control arm rear bush.

Installation Procedure:



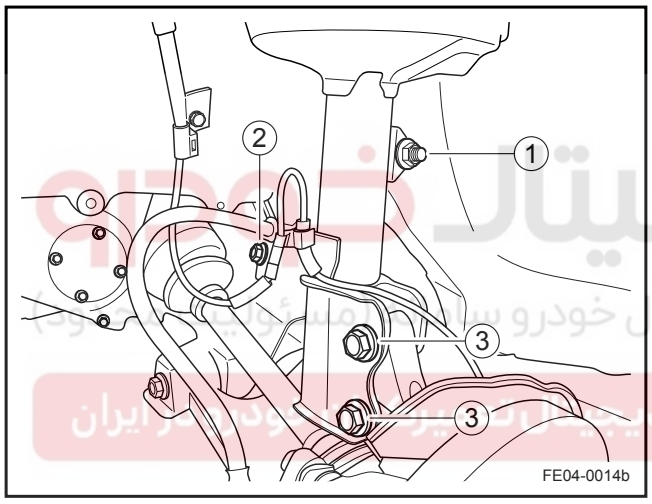
1. Apply the multi-use grease on the lower control arm rear axle, press the bushing into the lower control arm rear axle.



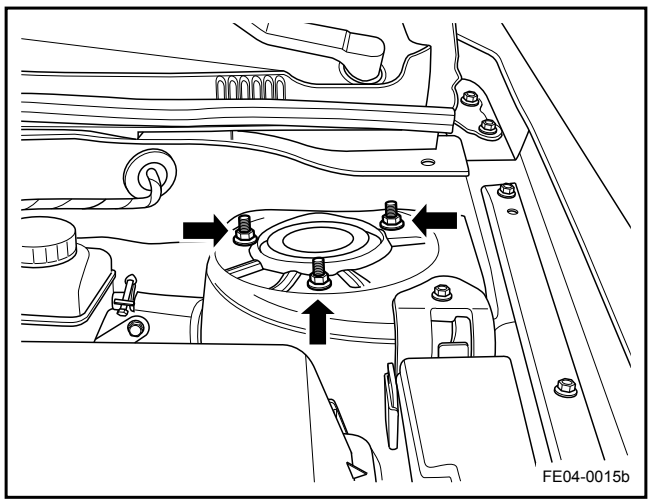
2. Apply the multi-use grease on the lower control arm front axle, press the bushing into the lower control arm front axle.
3. Install the lower control arm assembly.
4. Install the lower control arm ball joint.

4.2.7.3 Front Strut Assembly Replacement

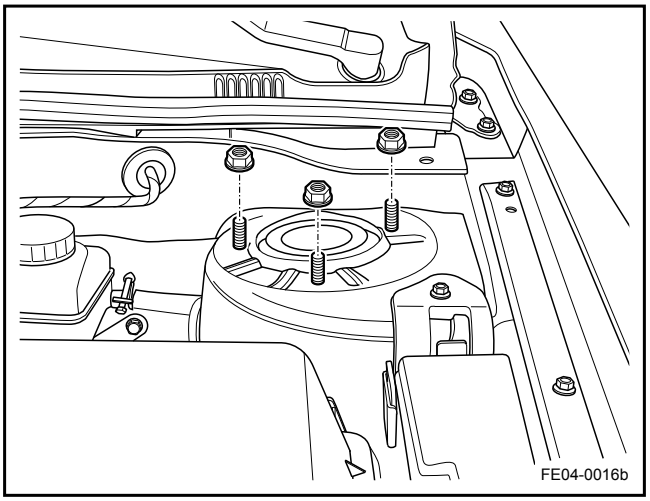
Removal Procedure:

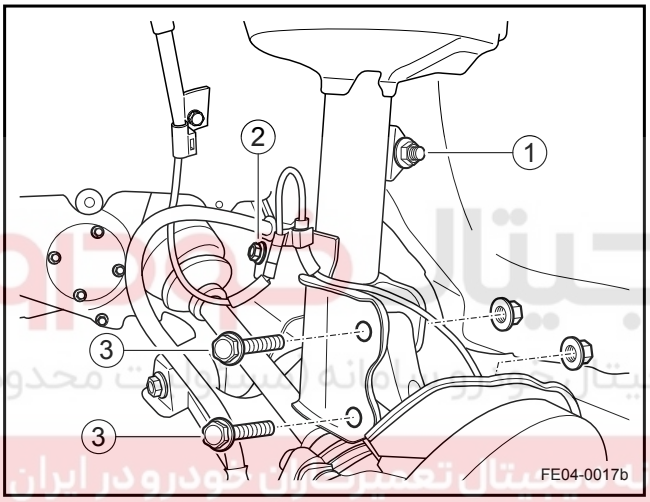


1. Lift and support the vehicle.
2. Remove the wheels. Refer to 4.4.5.1 Wheel Replacement.
3. Remove the front stabilizer bar link with a connection to the shock absorber connecting nut (1), loose the front stabilizer bar link from the shock absorber.
4. Remove the front wheel speed sensor to the front brake pipe bracket bolt (2).
5. Loosen the front brake pipe and the wheel speed sensor from the shock absorber.
6. Remove the steering knuckle to the front shock absorber connection bolts (3).



7. Remove the front shock absorber upper retaining nuts.
8. Remove the front strut assembly from the front wheelhouse.





Installation Procedure:

1. Install the front shock absorber assembly and tighten the upper retaining nuts.

   Note

   Operate carefully to avoid damage or scratch to the paint while moving coil spring. Damaged paint will cause premature malfunction.
   Refer to "Fastener Notice" in "Warnings and Notices".

   Torque: 40 Nm (Metric) 29.6 lb-ft (US English)

2. Install the front shock absorber to the steering knuckle and tighten the bolts (3).

   Torque: 135 Nm (Metric) 100 lb-ft (US English)

3. Fix the front brake hoses and the wheel speed sensor wiring harness to the front shock absorber and tighten bolts (2).

4. Install the stabilizer bar link to the shock absorber and tighten the nut (1).

   Torque: 75 Nm (Metric) 55 lb-ft (US English)

5. Install the front wheels.

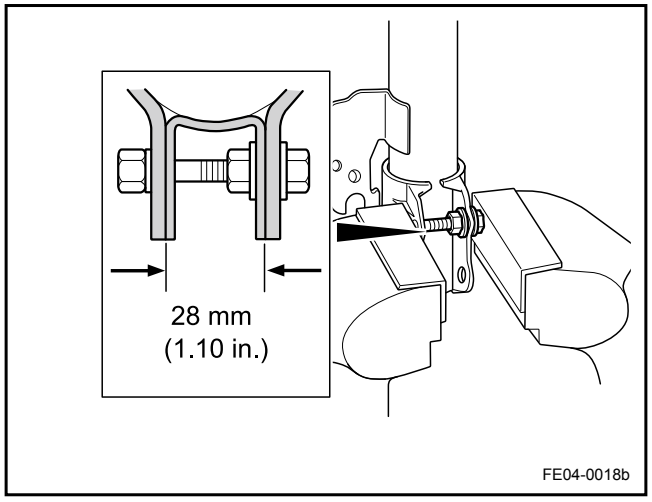
6. Lower the vehicle.

   Note

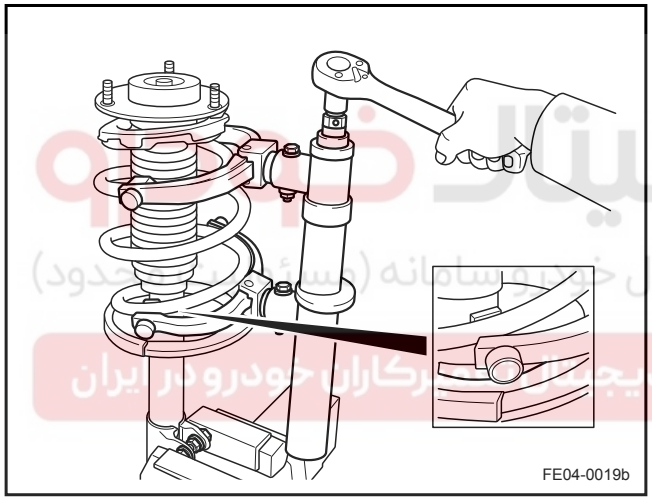
   The left front and right front shock absorber replacement is similar.

4.2.7.4 Front Shock Absorber Components and Spring Replacement

Removal Procedure:



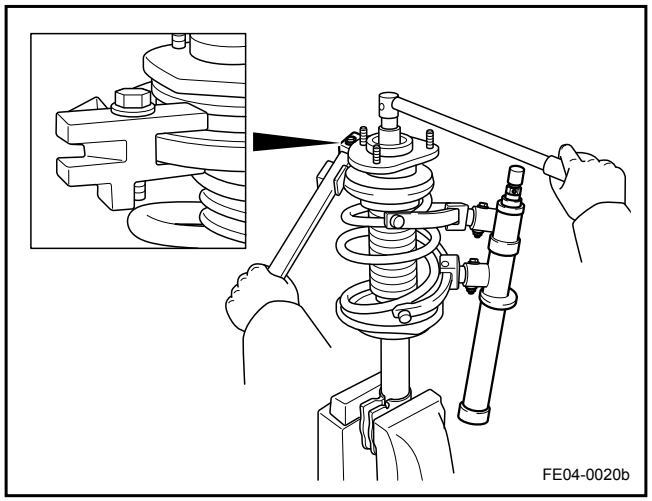
1. Install two nuts and one bolt to the shock absorber bracket, and then fix the front shock absorber assembly on a table vice.



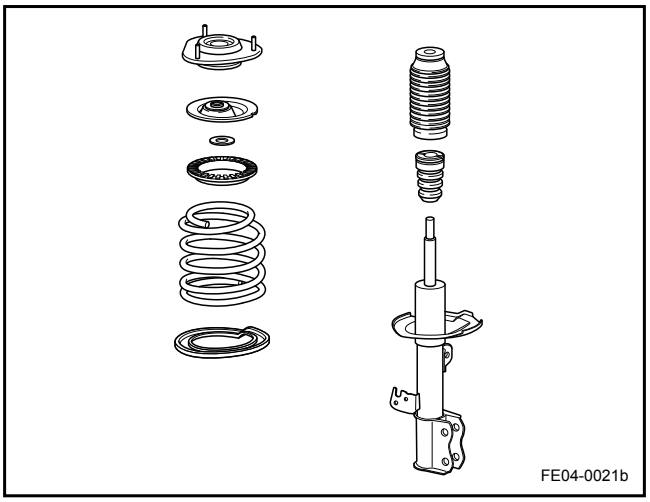
2. Use the spring compression tool to compress the coil spring.

   Note

   Do not use pneumatic wrenches, otherwise it will damage the compression tool.

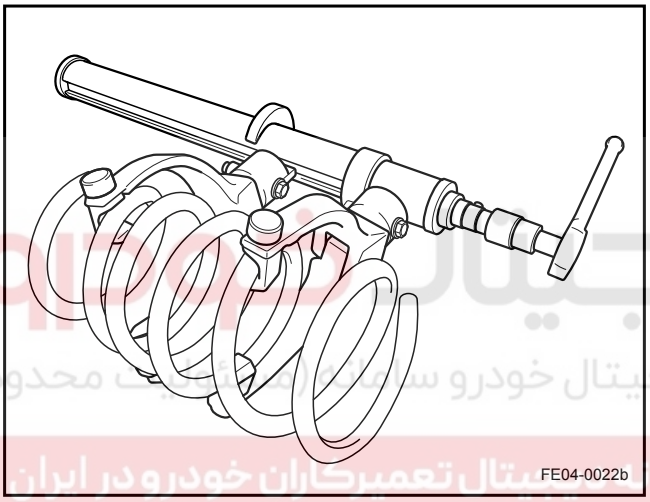


3. Remove the front shock absorber dust cover. Use a suitable tool to fix the spring mount and remove the locking nut.

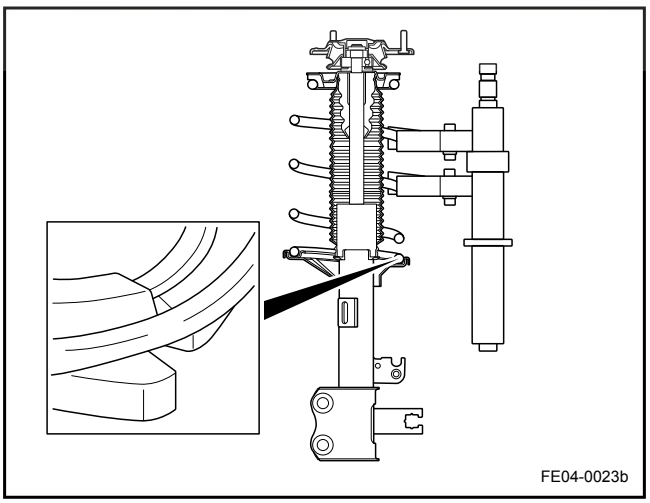


4. Remove the front shock absorber upper mount,front coil spring upper mount, the front coil spring upper vibration insulator pad, the front suspension coil spring, the front shock absorber dust cover, the front shock absorber buffer block and the front coil spring lower vibration insulator pad.

Installation Procedure:



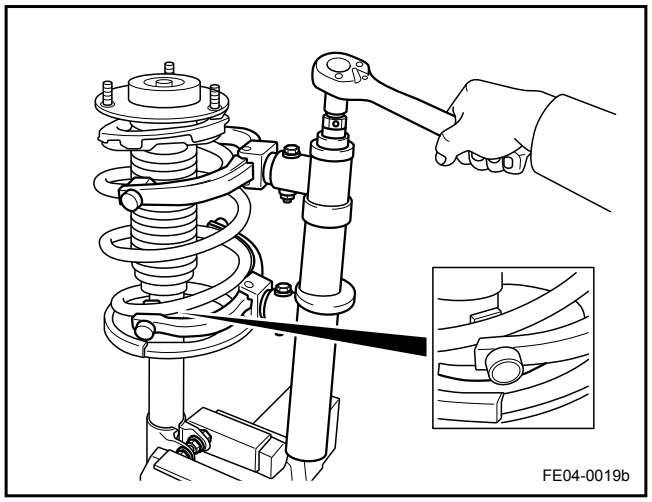
1. Use the spring compression tool to compress the coil spring.



2. On the front shock absorber bracket, install the front coil spring lower vibration insulation pad, front shock absorber buffer block, the front shock absorber dust cover, the front suspension coil spring, the front coil spring upper vibration insulation pad, the front coil spring upper mount and the front shock absorber assembly.

Note

Install the coil spring bottom to the shock absorber spring mount notch.



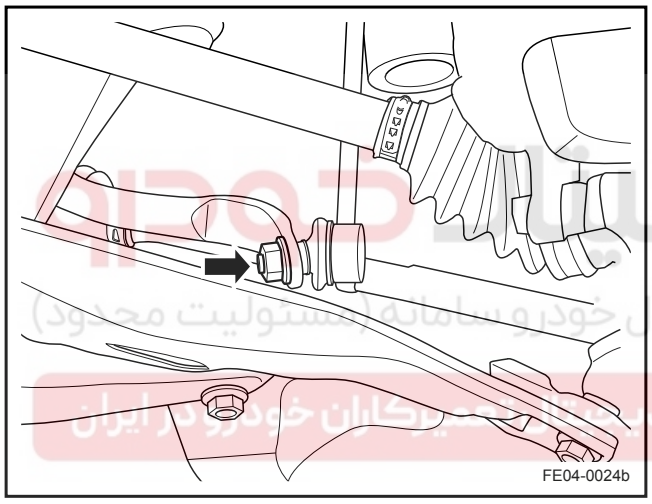
3. Install the locking nut and install the front shock absorber dust cover.

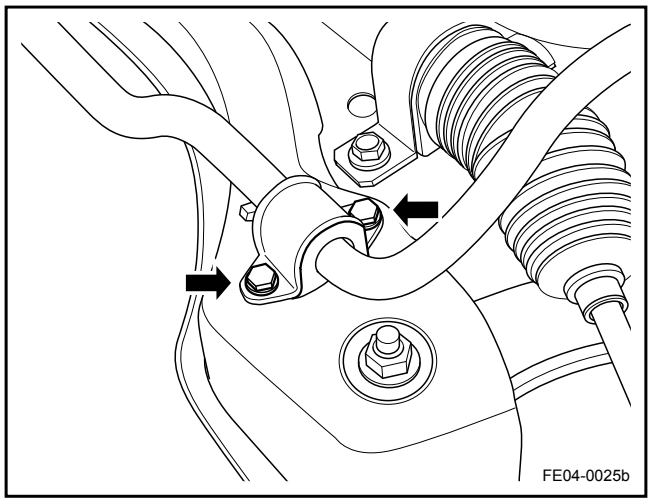
   Torque: 70 Nm (Metric) 51.8 lb-ft (US English)

4.2.7.5 Stabilizer Bar Replacement

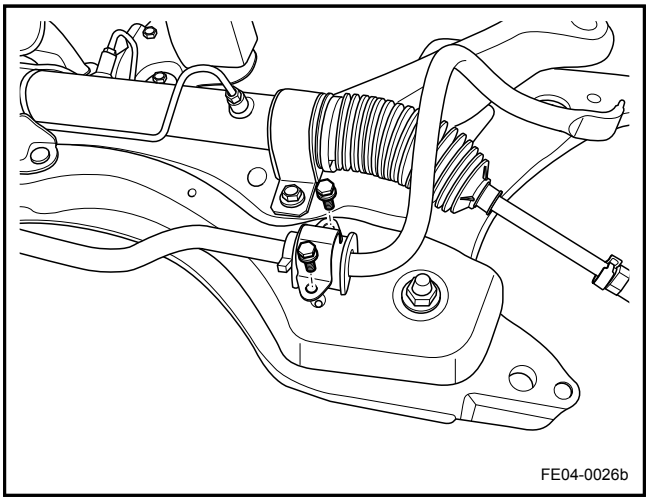
Removal Procedure:

1. Lift and support the vehicle.
2. Remove the wheels. Refer to 4.4.5.1 Wheel Replacement.
3. Remove the stabilizer bar to the stabilizer bar left and right link nut.
4. Remove the subframe. Refer to 12.6.4.2 Subframe Replacement.





5. Remove the Stabilizer Bar U-shape bracket and bushing.
6. Remove the Stabilizer Bar.

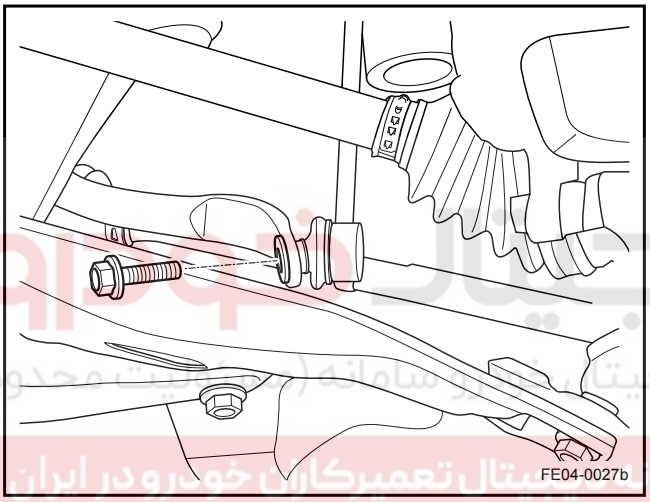

FE04-0026b

Installation Procedure:

1. Install the bushing to the stabilizer bar, and then install the U-shape bracket and tighten the bolts.

   Torque: 50 Nm (Metric) 37 lb-ft (US English)

2. Install the subframe.


FE04-0027b

3. Install the Stabilizer Bar to the Stabilizer Bar left and right link nut.

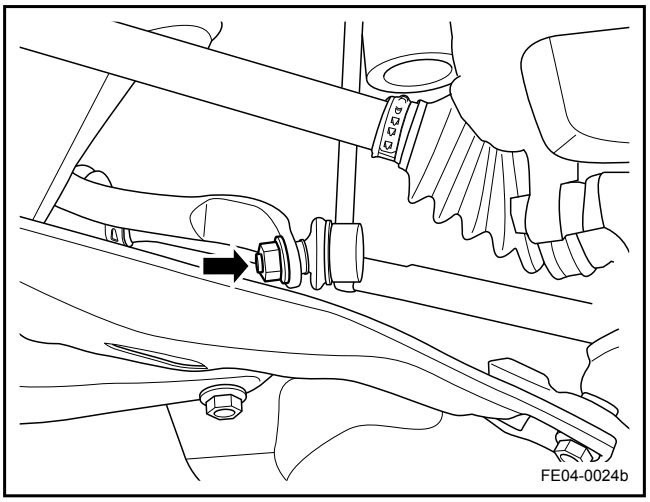
   Torque: 75 Nm (Metric) 55 lb-ft (US English)

4. Install the wheels.

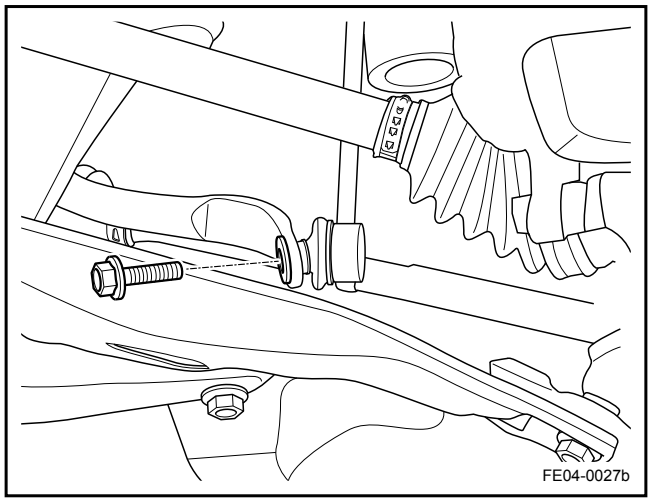
5. Lower the vehicle.

4.2.7.6 Stabilizer Bar Link Replacement

Removal Procedure:

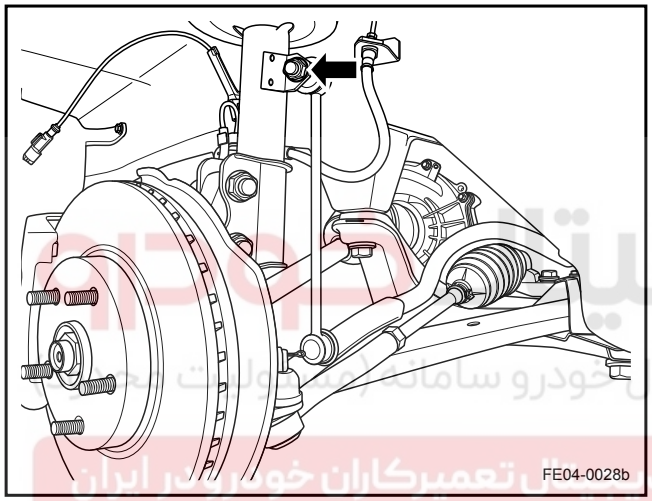

FE04-0024b

1. Lift and support the vehicle.
2. Remove the wheels. Refer to 4.4.5.1 Wheel Replacement.
3. Remove the Stabilizer Bar Link to the shock absorber connecting nut. Loose the Stabilizer Bar Link from the front shock absorber.



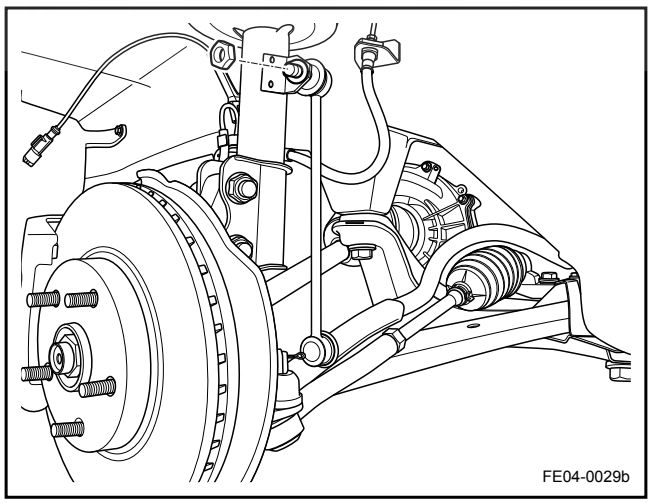
4. Remove the Stabilizer Bar Link to the stabilizer bar connecting nut.
5. Remove the Stabilizer Bar Link.

Installation Procedure:



1. Install the Stabilizer Bar Link to the stabilizer bar and tighten the nut.

   Torque: 74 Nm (Metric) 54 lb-ft (US English)

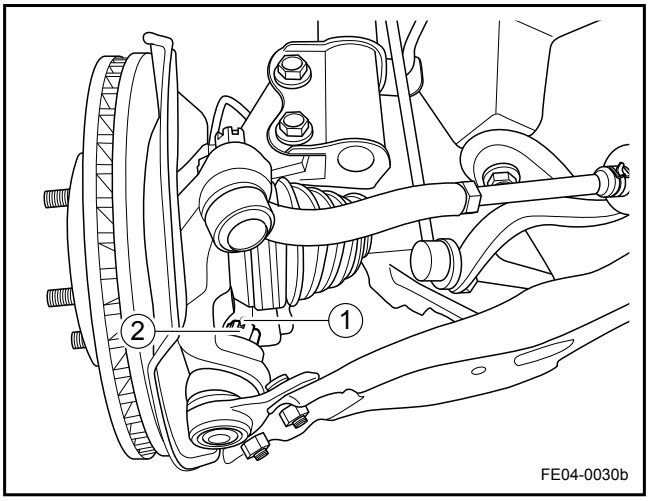


2. Install the Stabilizer Bar Link to the shock absorber and the tighten the connecting nut.

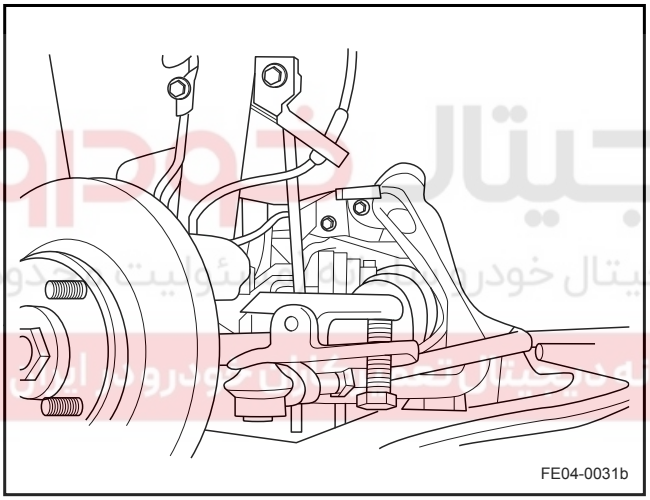
   Torque: 75 Nm (Metric) 55 lb-ft (US English)
3. Install the wheels.
4. Lower the vehicle.

4.2.7.7 Lower Control Arm Ball Joint Replacement

Removal Procedure:



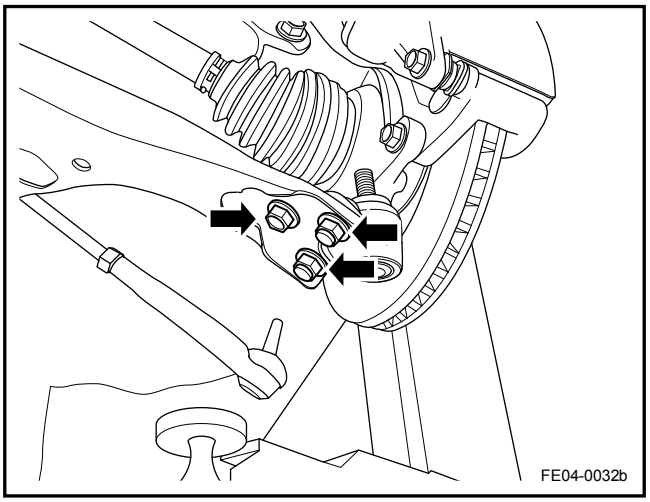
1. Lift and support the vehicle.
2. Remove the front wheels. Refer to 4.4.5.1 Wheel Replacement.
3. Remove the the ball joint opening pin (1) and the nut (2).



4. Use a universal tool to separate the ball joint and the steering knuckle.

   Note

   Only use a universal tool to separate the ball joint and the steering knuckle. Do not use a hand hammer or pry bar to remove the ball joint. If the recommended tool is not used, it will lead to the ball joint and seal damage.

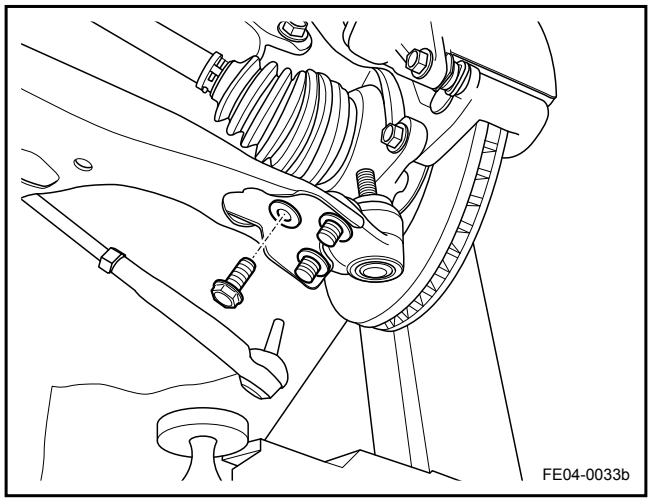


5. Remove the ball of retaining nuts and bolts.
6. Remove the ball joint.

Installation Procedure:

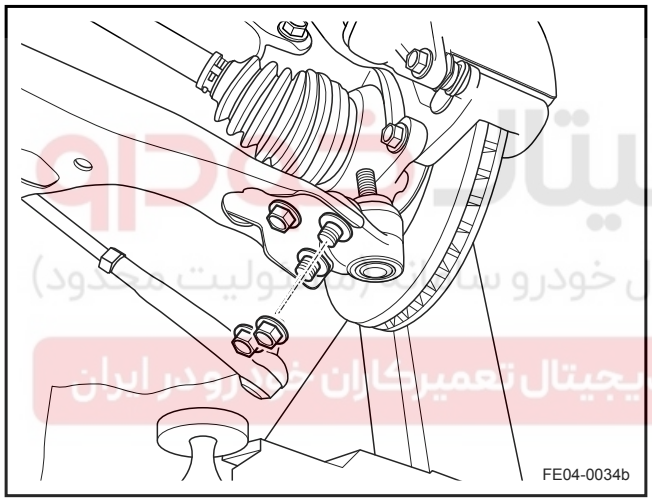
Note

Refer to "Fastener Notice" in "Warnings and Notices".



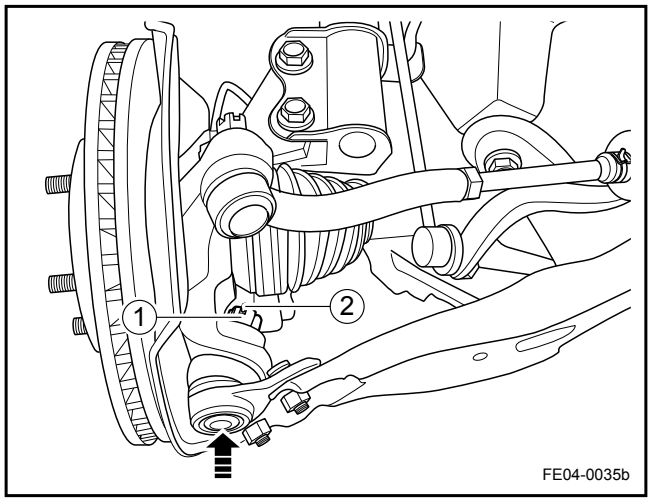
1. Install the ball joint to the lower control arm and tighten the bolts.

   Torque: 145 Nm (Metric) 107.3 lb-ft (US English)



2. Tighten the ball joint nuts.

   Torque: 145 Nm (Metric) 107.3 lb-ft (US English)



3. Install the ball inside to the steering knuckle and tighten the slotted hex nut (1) and the opening pin (2).

   Torque: 145 Nm (Metric) 107.3 lb-ft (US English)

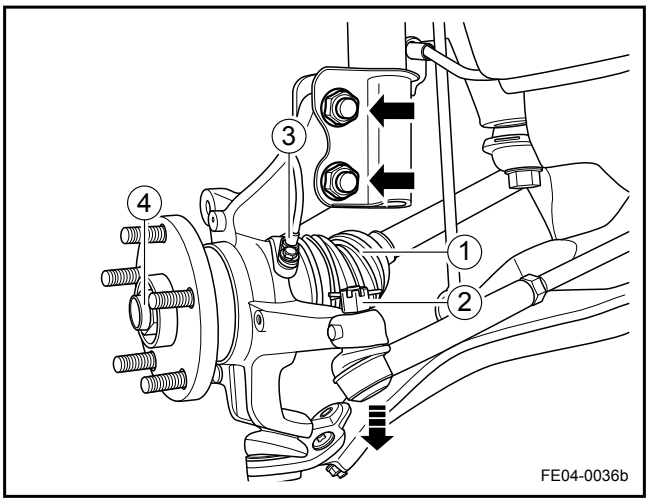
4. Install the front wheels.

5. Lower the vehicle.

   Note

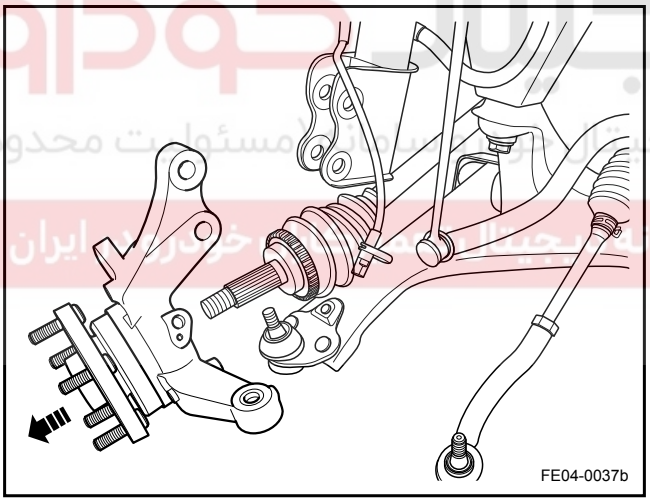
   Left and right front ball joint replacement is similar.

4.2.7.8 Steering Knuckle Replacement

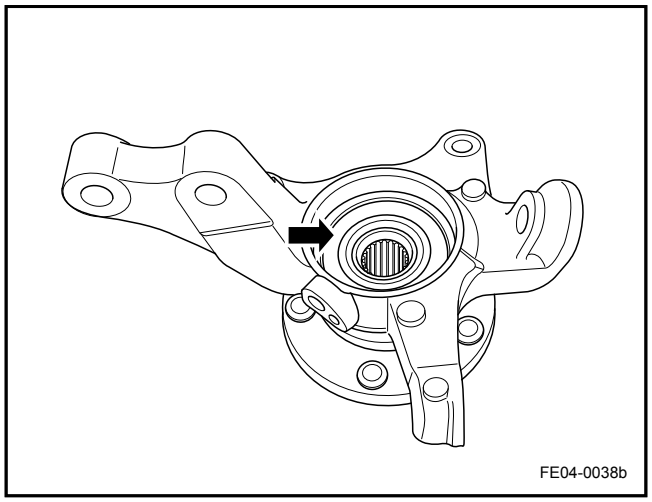


Removal Procedure:

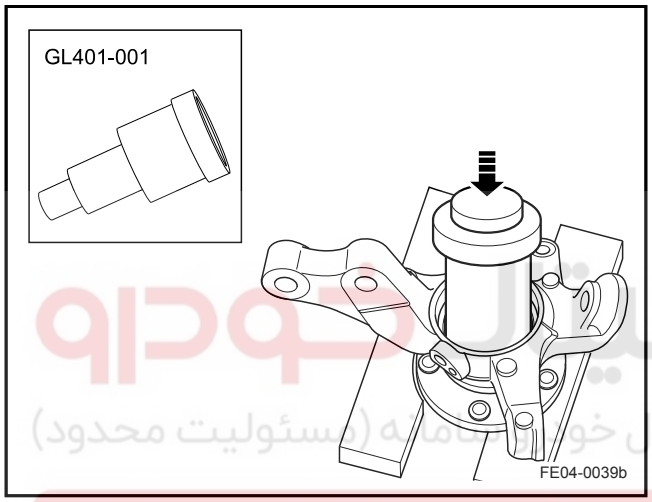
1. Lift and support the vehicle.
2. Remove the front wheels. Refer to 4.4.5.1 Wheel Replacement.
3. Remove the ball joint. Refer to 4.2.7.7 Lower Control Arm Ball Joint Replacement.
4. Remove the steering tie rod to the steering knuckle opening pin (1) and slotted hex nut (2). Separate the steering tie rod.
5. Remove the wheel speed sensor retaining bolt (3). Remove the wheel speed sensor from the steering knuckle.
6. Remove the front wheel hub nut (4).
7. Remove the steering knuckle to the shock absorber bolts. Remove the steering knuckle from the shock absorber.



8. Remove the steering knuckle with the front wheel hub.

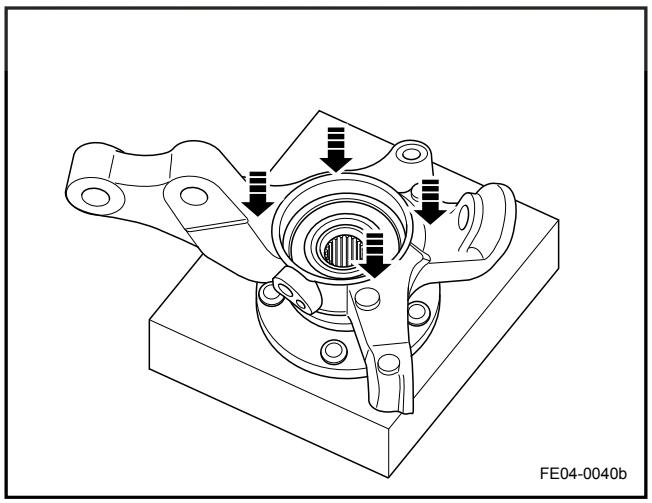


9. Remove the front wheel hub retaining ring.



10. Use the special tool GL401-001 to remove the front wheel hub from the steering knuckle.

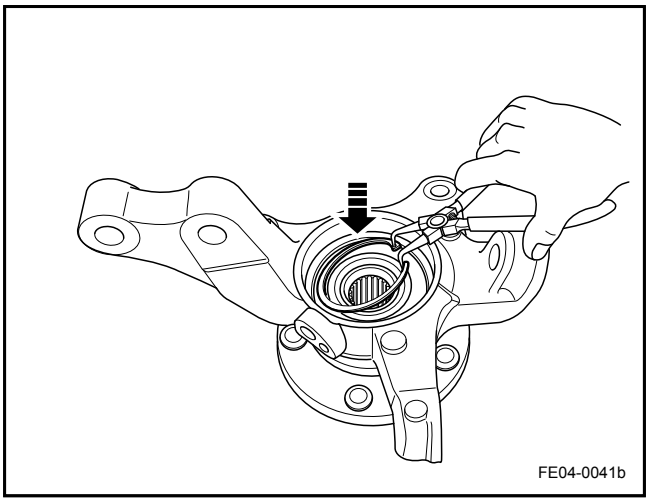
Installation Procedure:



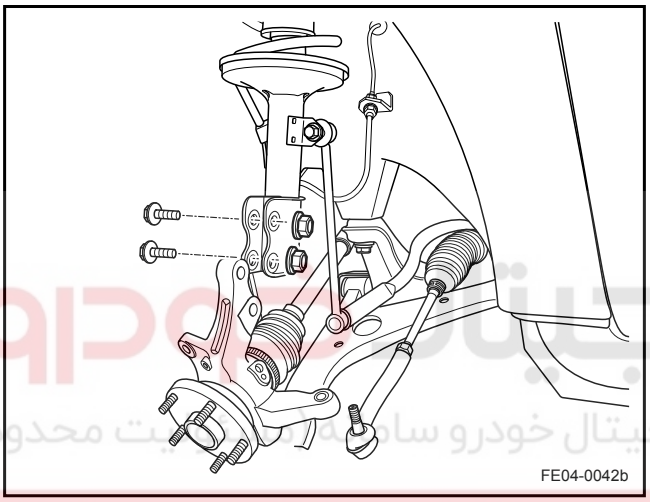
1. Place a piece of wood under the front wheel hub and install the front wheel hub to the steering knuckle.

   Note

   Refer to "Fastener Notice" in "Warnings and Notices".



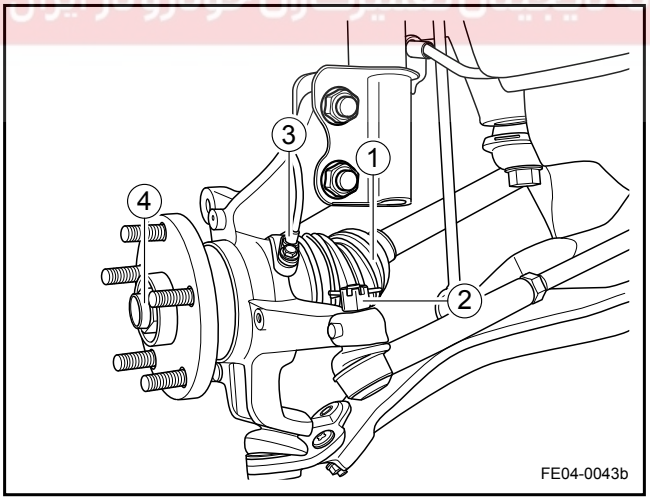
2. Install the front wheel hub retaining ring.



3. Install the steering knuckle with the front wheel hub. Tighten the steering knuckle to the shock absorber connecting bolts.

   Torque: 135 Nm (Metric) 99 lb-ft (US English)

4. Install the ball joint.



5. Tighten the nut (4).

   Torque: 216 Nm (Metric) 160 lb-ft (US English)

6. Connect the wheel sensor harness connector and the tighten the bolt (3).

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

7. Tighten the steering tie rod hexagonal opening nut (2) and insert the pin (1).

   Torque: 50 Nm (Metric) 37 lb-ft (US English)

8. Install the front wheels.

9. Lower the vehicle.

   Note

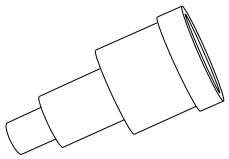
   Left and right steering knuckle replacement is similar.

4.2.7.9 Front Wheel Hub Replacement

Refer to 4.2.7.8 Steering Knuckle Replacement.

4.2.8 Special Tools and Equipment

4.2.8.1 Special Tool List

Serial Number	Illustration	Tool Number	Tool Name
1	 FE01-2025b	GL401-001	Front Wheel Hub Bearings Removal Tool

4.3 Rear Suspension

4.3.1 Specifications

4.3.1.1 Fastener Tightening Specifications

Applications	Model	Specifications		Notes
		Metric (Nm)	US English (lb-ft)	
Rear Shock Absorber Upper Mount Bolts	M10 × 1.25 × 25	75-85	55.3-62.7	
Rear Shock Absorber Upper Mount Nuts	M10 × 1.25	75-85	55.3-62.7	
Rear Shock Absorber Lower Sleeve Retaining Nuts	M14 × 1.5	135-165	99.6-121.7	Tighten after drop the wheels
Rear Stabilizer Bar Bolt	M12 × 55	135-165	99.6-121.7	
Rear Stabilizer Nut	M12	135-165	99.6-121.7	
Rear Control Arm Bolts	M12 × 1.25 × 135	130-160	95.9-118.0	Tighten after dropping the wheels

4.3.2 Description and Operation

4.3.2.1 Description and Operation

The rear suspension adopts the vertical swing arm and torsion beam structure. It includes: the axle with a torsion beam and a vertical arm, two strut assemblies (including the shock absorber and coil spring). The axle support assembly is connected to the underbody through the control arm rubber bushings. The insulating frame and the underbody crossmember form an integrated part. The wheel axle and body structure maintain the connection. Stabilizer bar is connected to each control arm and forms an integrated part with the axle.

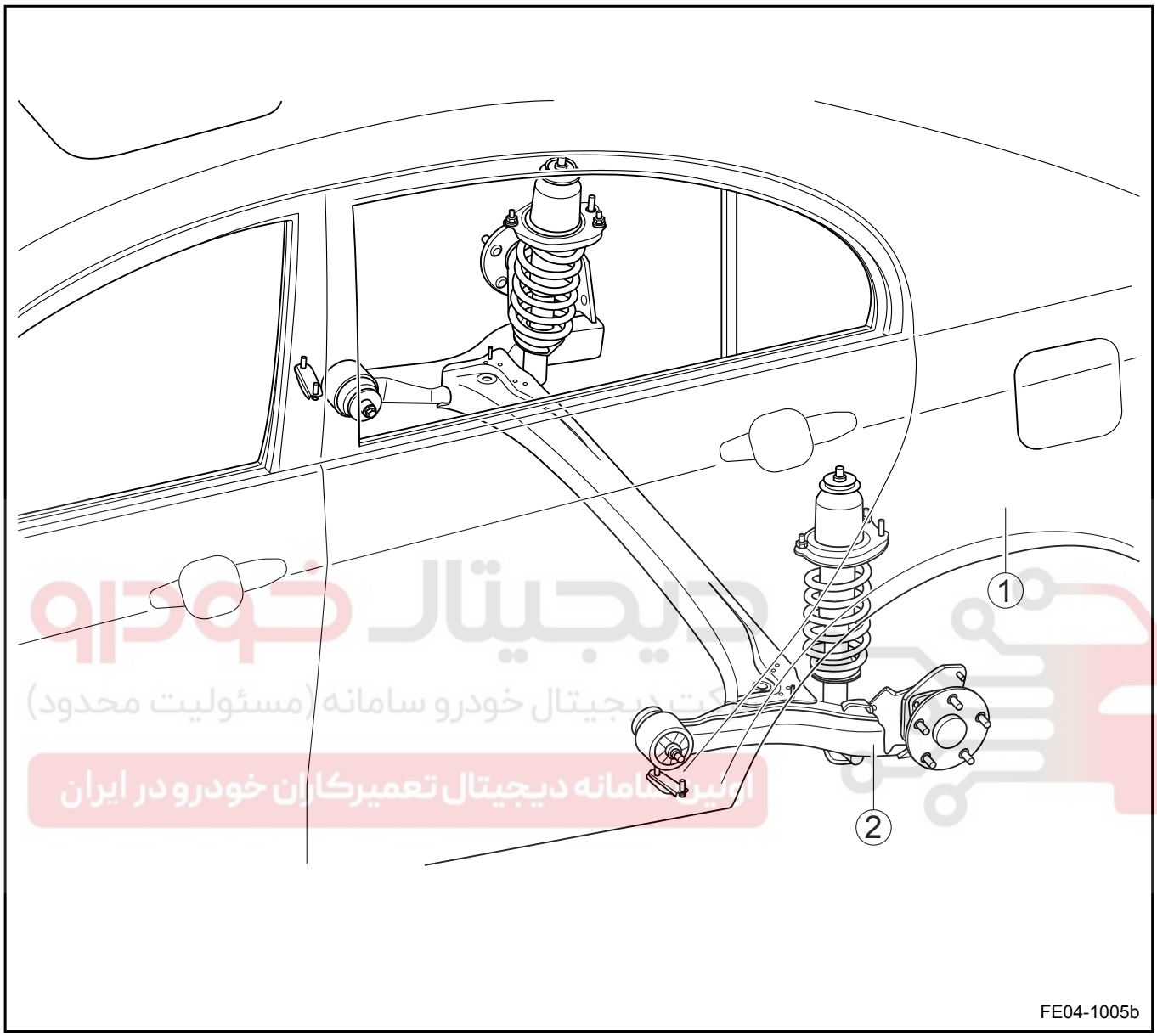
4.3.3 System Working Principle

4.3.3.1 System Working Principle

Refer to4.2.3 System Working Principle.

4.3.4 Component Locator

4.3.4.1 Component Locator



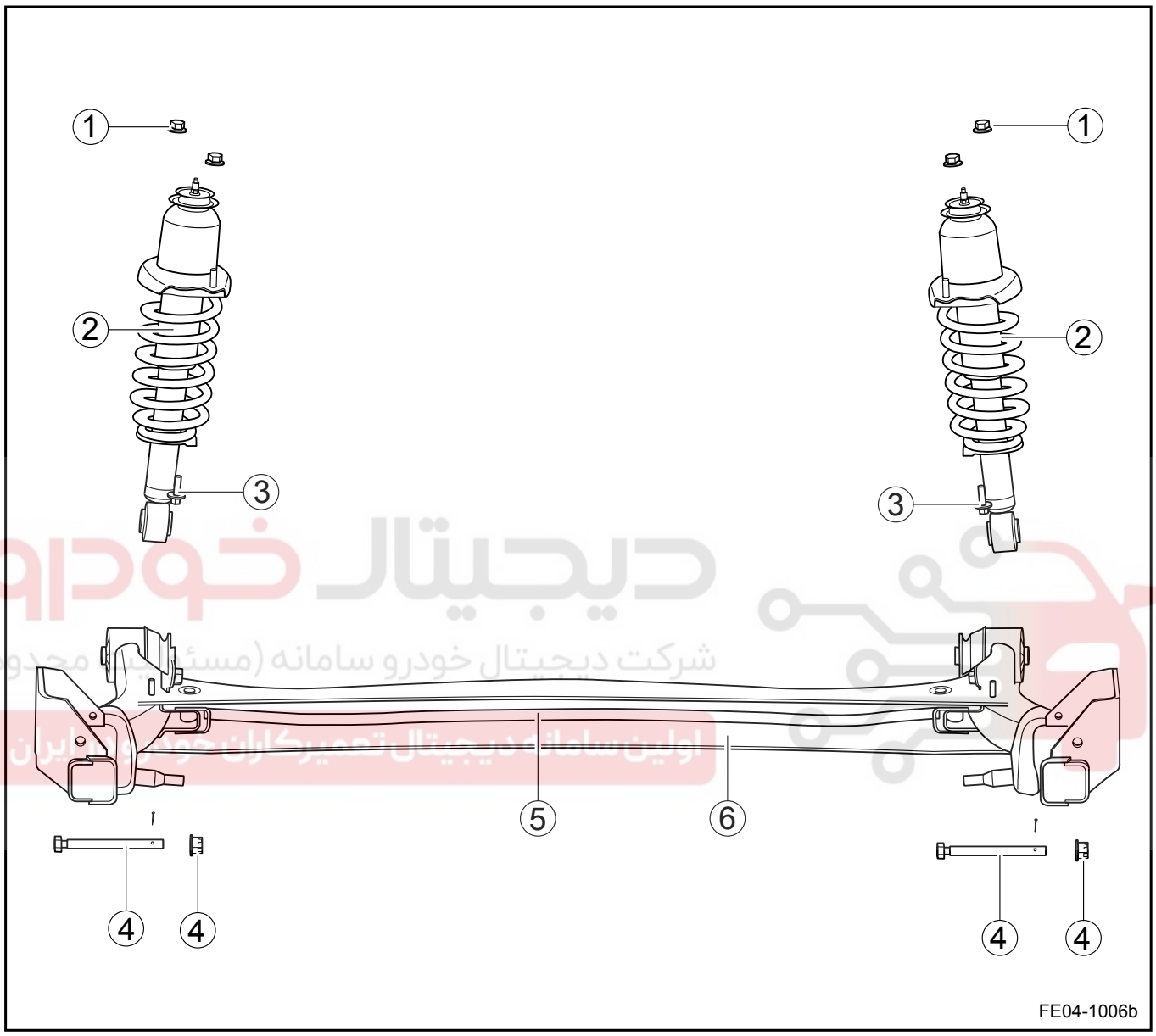
Legend

1. Body
2. Rear Suspension

4.3.5 Disassemble View

4.3.5.1 Disassemble View

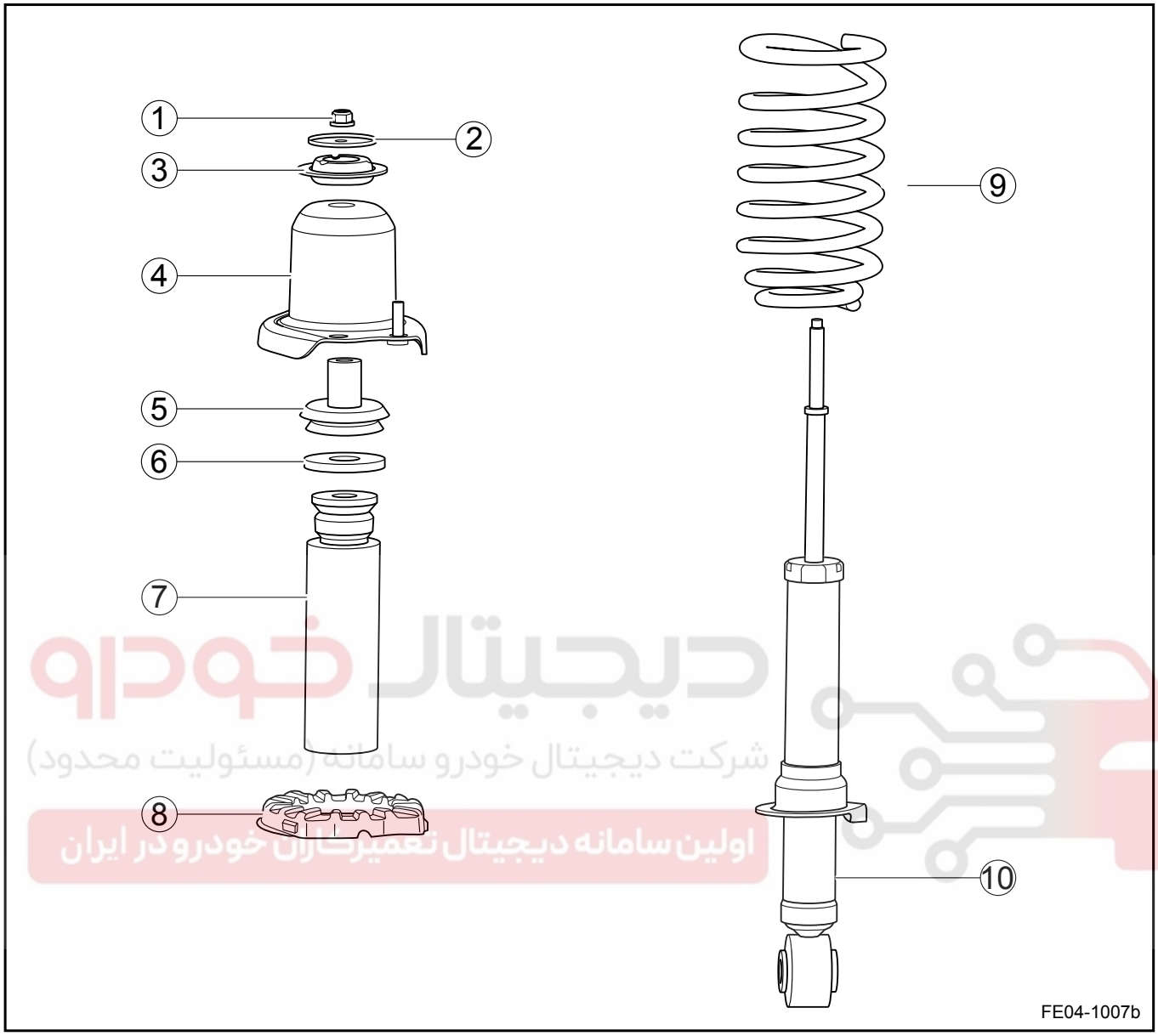
Rear Suspension



Legend

1. Rear Strut Assembly Upper Retaining Nuts
2. Rear Strut Assembly
3. Rear Strut Assembly Upper Locking Bolts
4. Rear Axle to Body Retaining Bolts and Nuts
5. Rear Stabilizer Bar Assembly
6. Rear Axle Assembly

Rear Strut Assembly



Legend

1. Hex Flange Locking Nuts
2. Upper Mount Plate
3. Rear Shocker Absorber Upper Mount
4. Rear Shocker Absorber Bracket Assembly
5. bearing components under the post-shock absorber
6. Lower Mount Plate
7. Rear Shock Absorber
8. Rear Coil Spring Upper Mat
9. Rear Coil Spring
10. Rear Shock Absorber Assembly

4.3.6 Diagnostic Information and Procedures

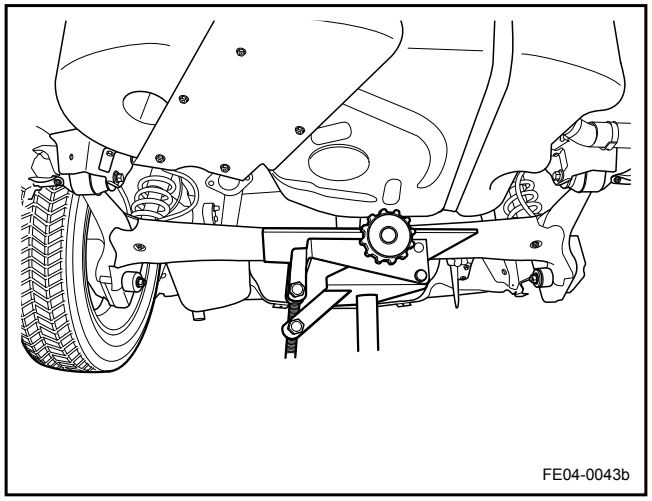
4.3.6.1 Diagnostic Information and Procedures

Refer to4.2.6 Diagnostic Information and Procedures.

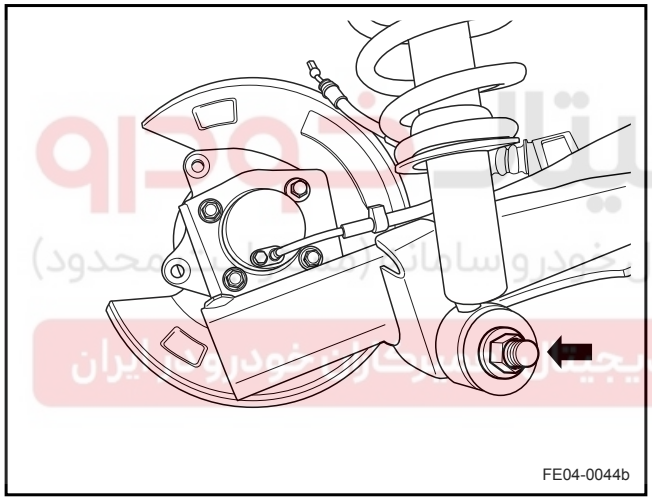
4.3.7 Removal and Installation

4.3.7.1 Rear Strut Assembly Replacement

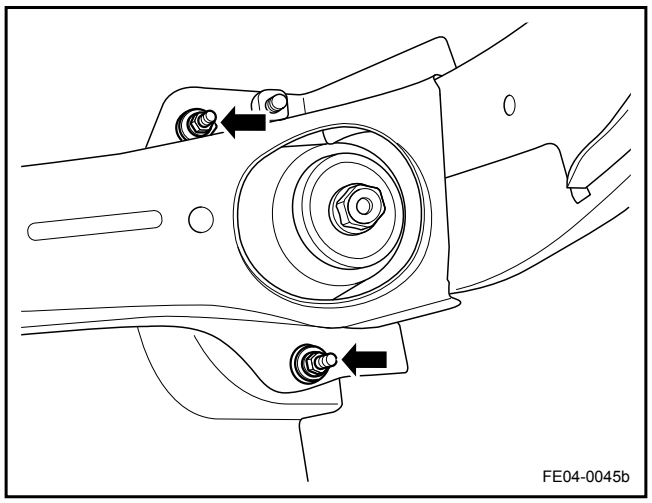
Removal Procedure:


FE04-0043b

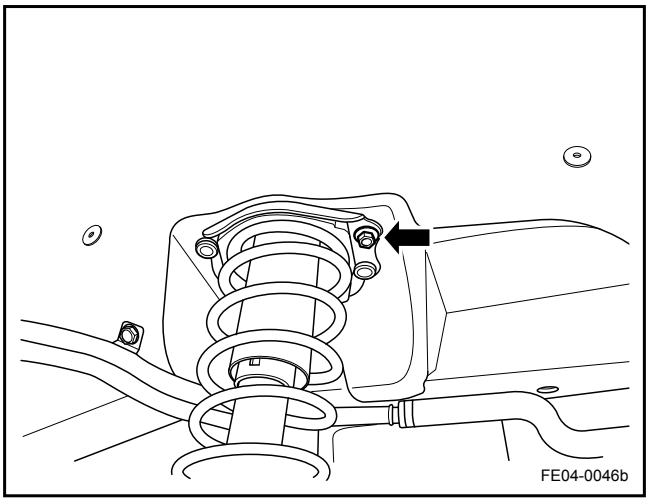
1. Remove the rear wheels. Refer to 4.4.5.1 Wheel Replacement.
2. Lift and support the vehicle.
3. Use a jack to support the live rear axle.


FE04-0044b

4. Remove the rear shock absorber to the rear axle nut.

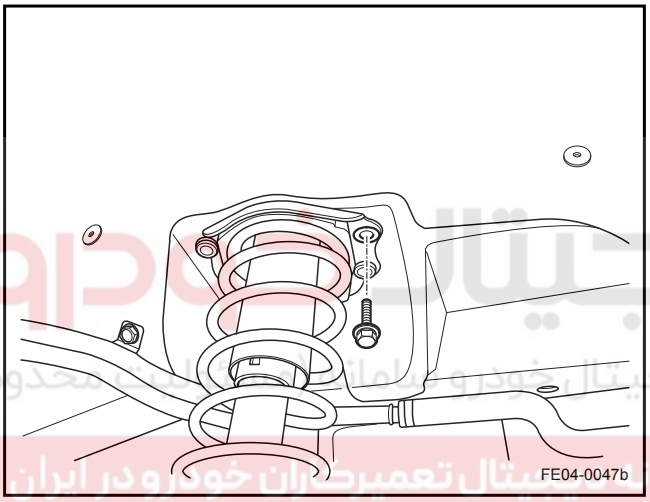

FE04-0045b

5. Remove the rear compartment trim panel or hatchback trim panel. Refer to 12.9.1.9 Rear Compartment Trim Panel Replacement,.
6. From the rear compartment, remove the rear shock absorber upper nuts.



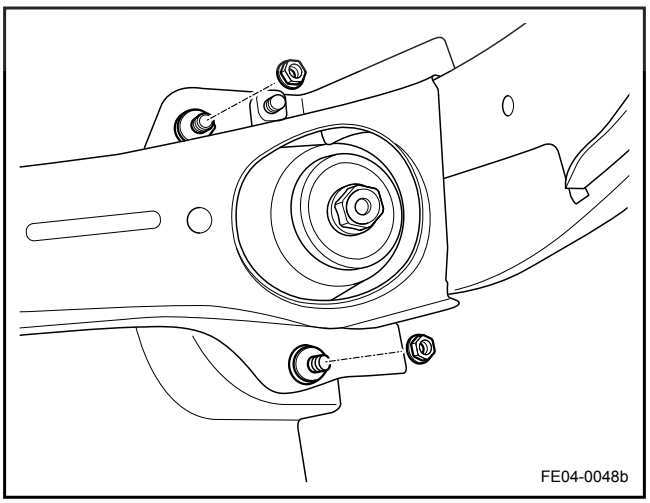
7. Remove the rear shock absorber upper bolts and remove the rear shock absorber.

Installation Procedure:



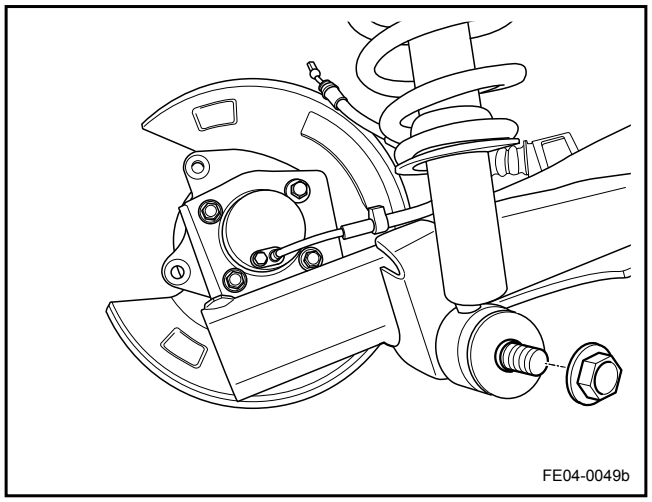
1. Install the rear shock absorber and tighten the rear shock absorber upper bolts.

   Torque: 80 Nm (Metric) 59.2 lb-ft (US English)



2. From the rear compartment, install the rear shock absorber upper nuts.

   Torque: 80 Nm (Metric) 59.2 lb-ft (US English)

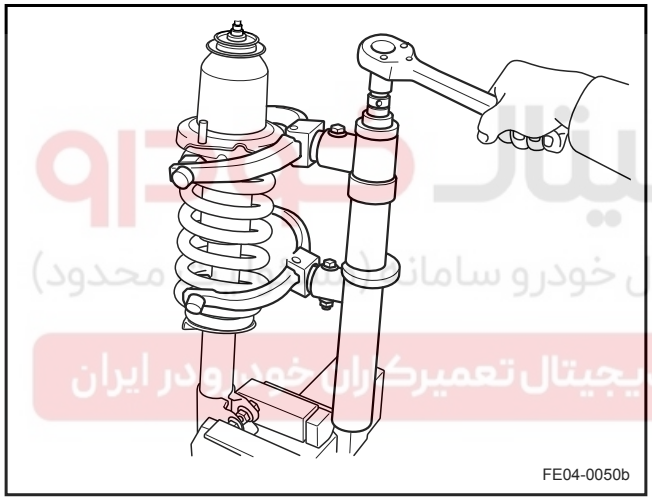


3. Install the rear compartment trim panel or hatchback trim panel.
4. Install the rear shock absorber to the rear axle nut.

   Torque: 150 Nm (Metric) 110.1 lb-ft (US English)
5. Remove the jack.
6. Install the rear wheels.
7. Lower the vehicle.

4.3.7.2 Rear Shock Absorber Component and Spring Replacement

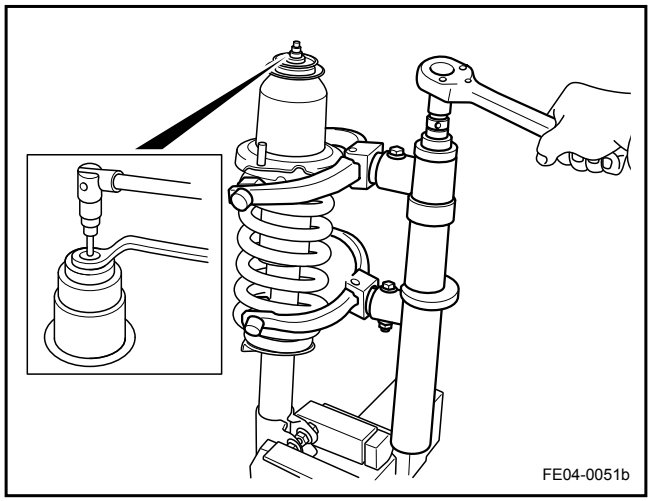
Removal Procedure:



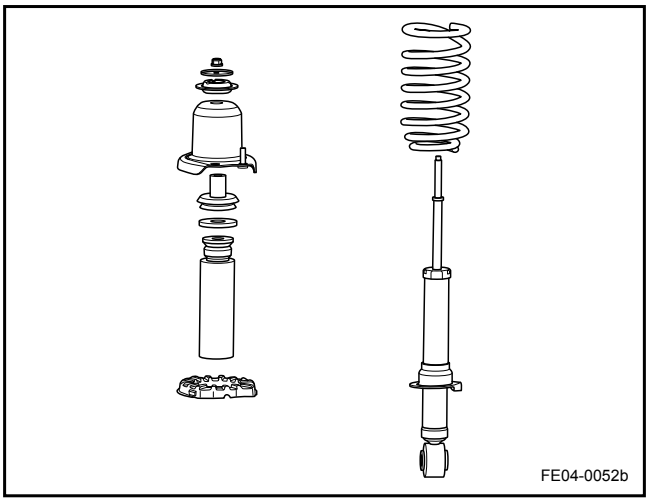
1. Use the spring compression tool to compress the coil spring.

   Note

   Do not use pneumatic wrenches, otherwise it will damage the spring compression tool.

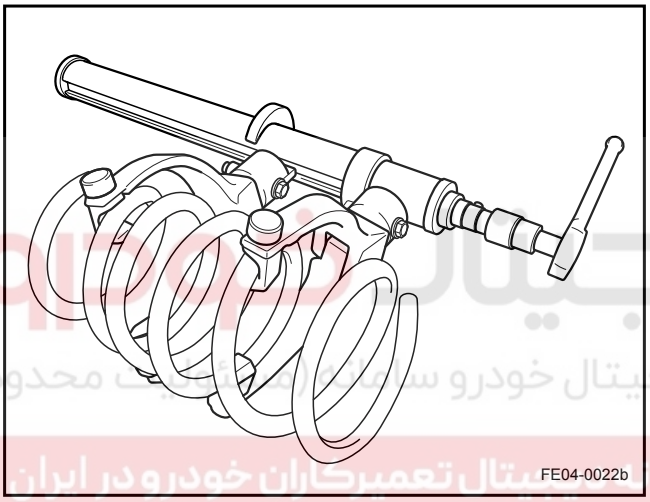


2. Use a Hexagon wrench to fix the piston rod and remove the lock nut.

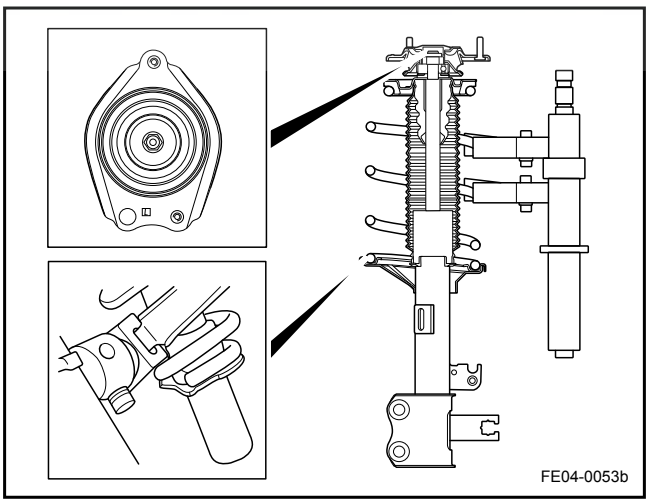


3. Remove the upper mount upper plate, the rear shock absorber upper mount, the rear shock absorber mounting bracket assembly, the upper coil spring pad, the rear shock absorber dust cover and the rear coil spring.

Installation Procedure:



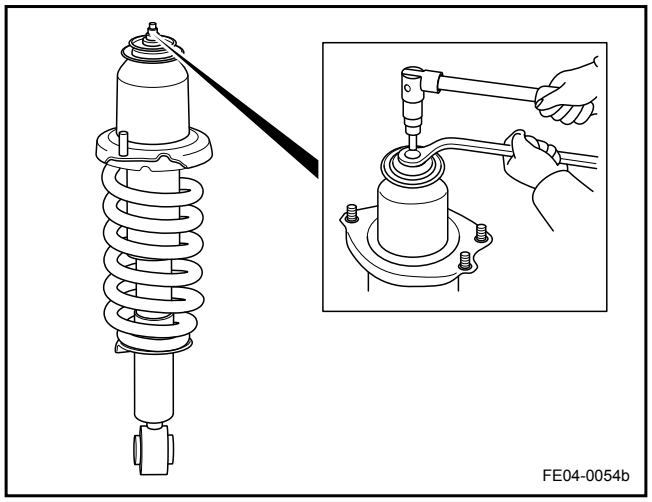
1. Use the spring compression tool to compress the coil spring.



2. Install the rear shock absorber coil spring, the rear shock absorber dust cover, the upper coil spring pad, the shock absorber mounting bracket assembly, the rear shock absorber upper mount and the upper mount upper plate.

Note

Install the shock absorber mounting bracket assembly as shown.
Install the coil spring bottom into the notch.

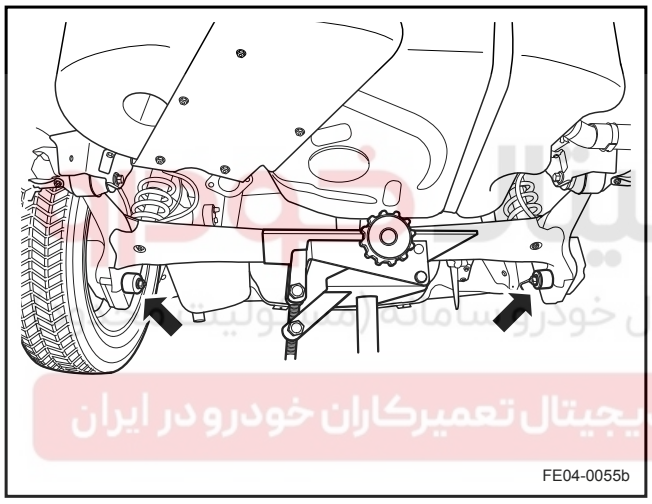


3. Install the locking nut, do not tighten at this stage.
4. Remove the spring compression tool and examine the spring frame direction.
5. Use a Hexagon wrench to tighten the piston rod and locking nut.

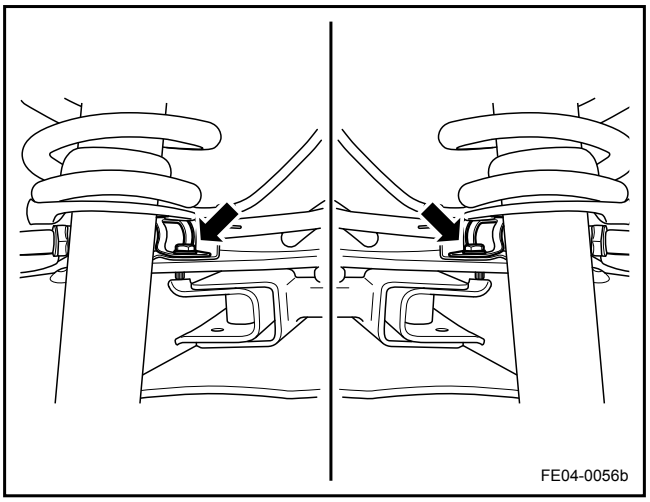
   Torque: 45 Nm (Metric) 33.3 lb-ft (US English)

4.3.7.3 Rear Axle Assembly Replacement

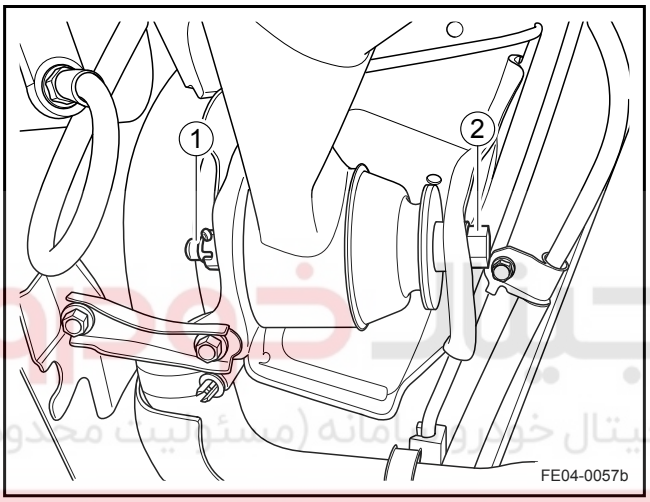
Removal Procedure:



1. Remove the left and right rear wheels. Refer to 4.4.5.1 Wheel Replacement.
2. Lift and support the vehicle.
3. Use a jack to support the rear axle.
4. Remove the left and right rear shock absorber to the rear axle retaining nuts.
5. Remove the left and right rear brake pads. Refer to 6.3.5.1 Brake Pad Replacement - Rear.
6. Remove the left and right rear brake caliper. Refer to 6.3.5.2 Brake Caliper Replacement - Rear.
7. Remove the left and right rear brake disc. Refer to 6.3.5.3 Brake Disc Replacement - Rear.
8. Remove the left and right rear wheel hub. Refer to 4.3.7.5 Rear Wheel Hub Replacement.

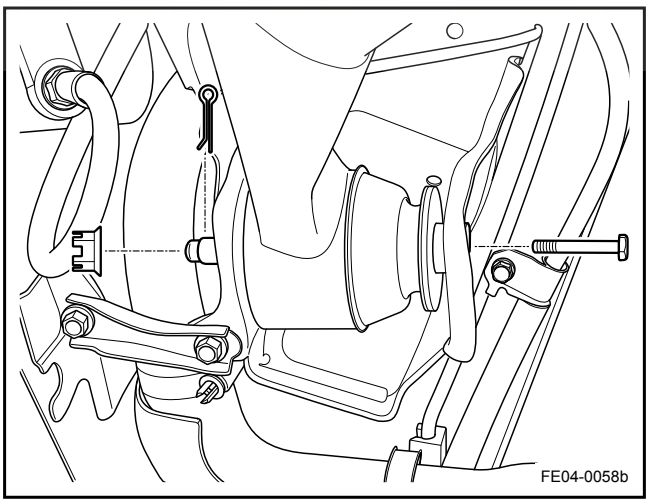


9. Remove the left and right side park brake cable bracket.



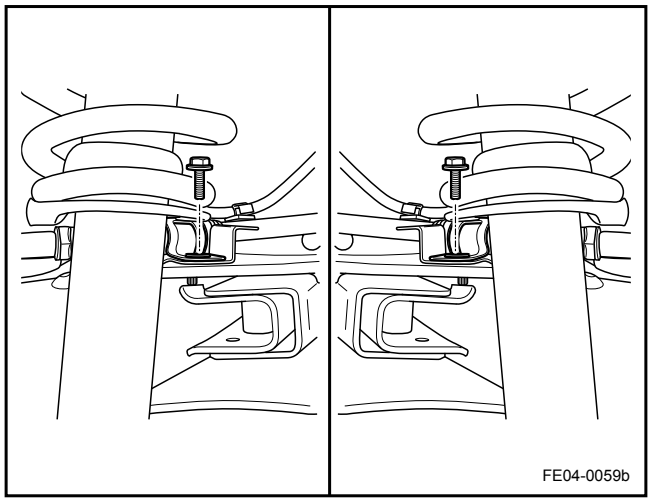
10. Remove the left rear axle assembly to the body connecting bolt pin (1).
11. Remove the left rear axle assembly to the body connecting bolts (2) .
12. Remove the right rear axle assembly to the body connecting pins and bolts, the same way as the left side.
13. Remove the rear axle assembly.

Installation Procedure:



1. Lift the rear axle assembly and install the rear axle assembly.
2. Install the left rear axle assembly to the body connecting bolts

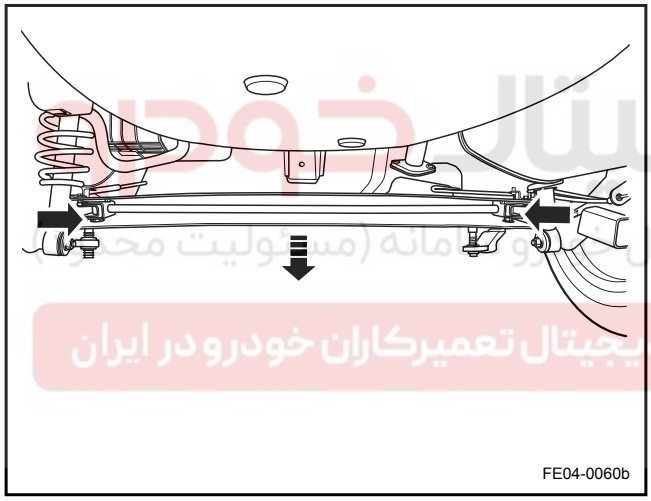
   Torque: 145 Nm (Metric) 107.3 lb-ft (US English)
3. Install the left rear axle assembly to the body connecting bolts and pin.
4. Install the right side of the rear axle assembly to the body connecting bolts and pin, the same way as the left side.



5. Install the left and right side park brake cable bracket.
6. Install the left and right rear wheel hub.
7. Install the left and right rear brake disc.
8. Install the left and right rear brake caliper.
9. Install the left and right rear brake pads.
10. Install the left and right rear shock absorber to the rear axle retaining nut.
11. Remove the jack.
12. Install the left and right rear wheel.
13. Lower the vehicle.

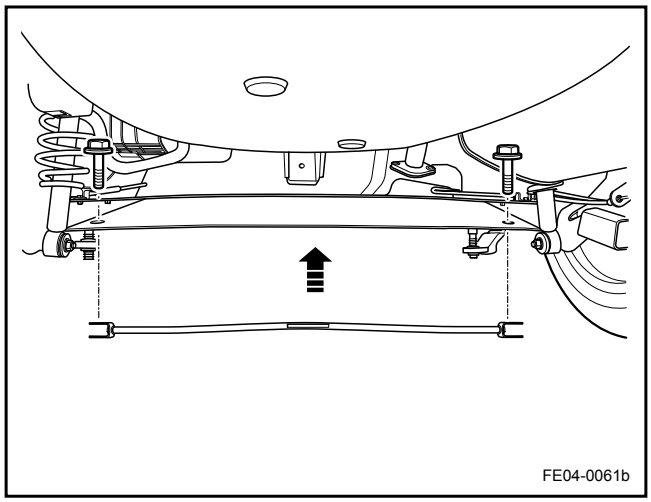
4.3.7.4 Rear Stabilizer Bar Replacement

Removal Procedure:



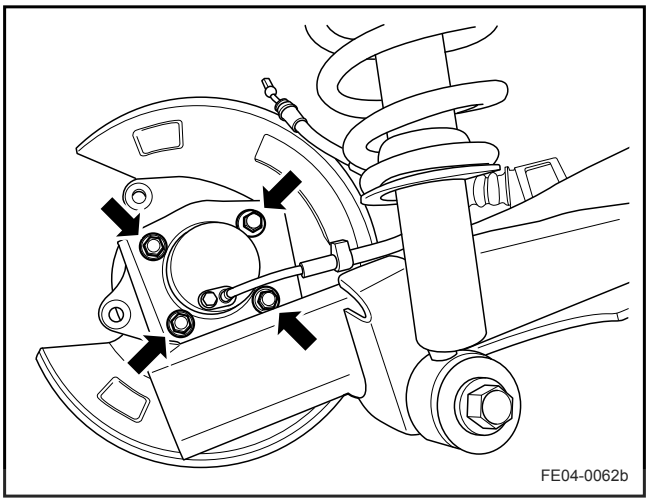
1. Lift and support the vehicle.
2. Remove the left and right rear stabilizer bar installation bolts.
3. Remove the stabilizer bar.

Installation Procedure:



1. Install the stabilizer bar.
2. Tighten the left and right rear stabilizer bar installation bolts.

   Torque: 150 Nm (Metric) 110.1 lb-ft (US English)
3. Lower the vehicle.



4.3.7.5 Rear Wheel Hub Replacement

Removal Procedure:

Warning!

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

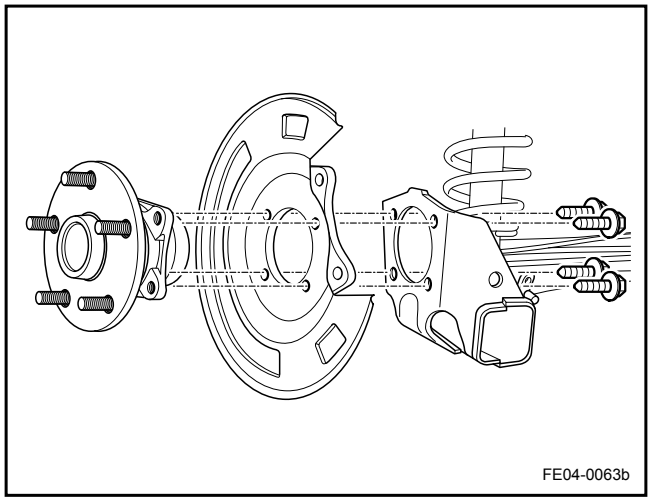
1. Lift and support the vehicle.
2. Remove the rear wheels. Refer to 4.4.5.1 Wheel Replacement.
3. Remove the park brake cable from the rear calipers. Refer to 6.5.5.3 Park Brake Control Mechanism Cable Assembly Replacement.
4. Remove the brake pads. Refer to 6.3.5.1 Brake Pad Replacement - Rear.

   Note

   Refer to "Brake Caliper Notice" in "Warnings and Notices".
5. Remove the brake caliper. Refer to 6.3.5.2 Brake Caliper Replacement - Rear.

   Note

   Remove the brake caliper without having to remove the brake hose. Use a wire to hang the brake caliper in order to avoid damage to the brake hose.
6. Remove the brake disc. Refer to 6.3.5.3 Brake Disc Replacement - Rear.
7. Remove the rear wheel speed sensor. Refer to 6.6.7.3 Wheel Speed Sensor Replacement (Rear).
8. Remove the rear wheel hub retaining bolts.
9. Remove the rear wheel hub and the dust cover.

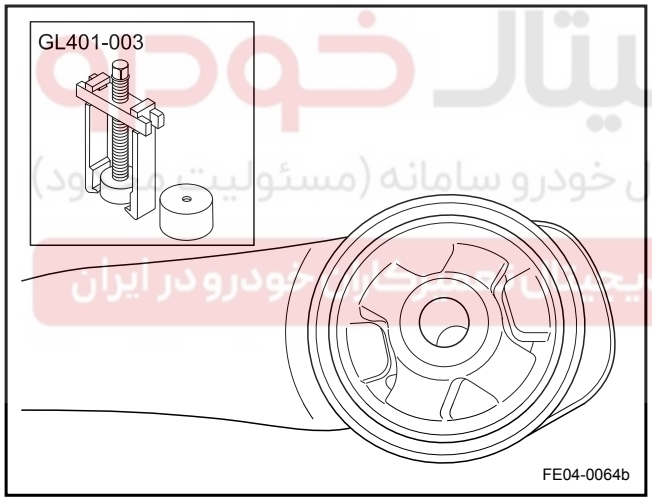


Installation Procedure:

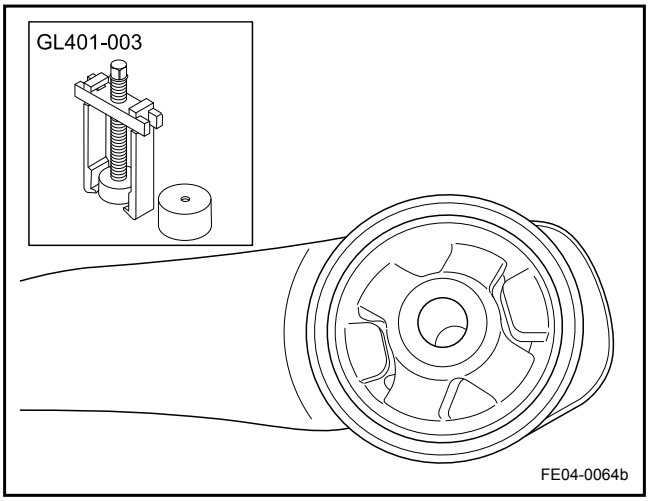
1. Install the rear wheel hub and the dust cover.
2. Tighten the rear wheel hub retaining bolts.
   Torque: 80 Nm (Metric) 59.2 lb-ft (US English)
3. Install the rear wheel speed sensor.
4. Install the brake disc.
5. Install the brake caliper.
6. Install the brake pad.
7. Install the park brake cable.
8. Install the rear wheel.
9. Lower the vehicle.

4.3.7.6 Rear Axle Sleeve Replacement

Removal Procedure:



1. Remove the rear axle assembly. Refer to 4.3.7.3 Rear Axle Assembly Replacement.
2. Use a special tool GL401-003 to remove the rear axle sleeve.

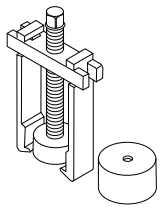


Installation Procedure:

1. Use a special tool GL401-003 to install the rear axle sleeve.
2. Install the rear axle assembly.

4.3.8 Special Tools and Equipment

4.3.8.1 Special Tool List

Serial Number	Illustration	Tool Number	Tool Name
1	 FE01-2027b	GL401-003	Rear Axle Sleeve Removal Tool

4.4 Wheels and Tires

4.4.1 Specifications

4.4.1.1 Fastener Tightening Specifications

Applications	Model	Specifications	
		Metric (Nm)	US English (lb-ft)
Wheel Nut	M12	100-120	74-89

4.4.1.2 Tire Specifications

Specifications	205/65R15-94H 215/55R16-93V
Cold Pressure (Front / Rear)	210/200 kPa (Metric) 30/29 psi (US English)
Rim	15 × 6.5 J, 16 × 7 J

Tire Pressure Conversion Table					
kPa	psi	kPa	psi	kPa	psi
140	20	185	27	235	34
145	21	190	28	240	35
155	22	200	29	250	36
160	23	205	30	275	40
165	24	215	31	310	45
170	25	220	32	345	50
180	26	230	33	380	55

4.4.1.3 Front Suspension Positioning Specifications

Note

The following parameters refer to the whole vehicle technical parameters.

Maximum Front Corner	Left Internal / External	40 ± 2° / 33.8 ± 2°
	Right Internal / External	40 ± 2° / 33.8 ± 2°
Camber		0°± 45'
Kingpin Inclination		12°7' ± 45'
Caster		2°33' ± 45'
Front Wheel Toe		0°± 13'

Front Tread	1,502 ± 10 mm / 59 ± 0.39 in

4.4.1.4 Rear Suspension Positioning Specifications

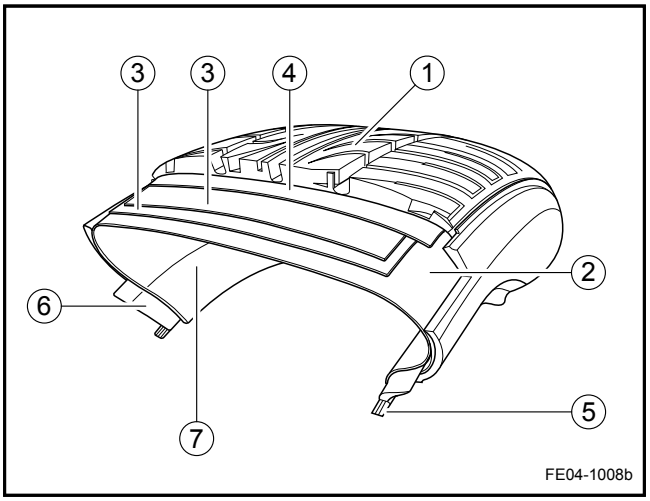
Note

The following parameters refer to the whole vehicle technical parameters.

Rear Wheel Toe	4' ± 30 '
Rear Camber	- 44 ' ± 30'
Rear Tread	1,492 mm / 58.7 in (Hatchback)
	1,483 mm / 58.4 in (Sedan)
Wheelbase	2,620 mm / 103 in

4.4.2 Description and Operation

4.4.2.1 Tire Structure



1. Tread

The tread is the tire and road surface contacting part. Through the friction it enables the vehicle driving, braking and performances. It should have good wear resistance, puncture resistance, impact resistance and heat dissipation properties.

2. Carcass

The main part that supports the load. It should have good impact resistance and good resistance to flex.

3. Belt

The steel cord between the tread and the carcass that protects matrix, it prevents the tread deformation, maintains the contact with the ground, improves wear resistance and driving stability.

4. Cap Ply

A special ply on top of the belt, it prevents the belt from moving, prevents the belt detached at high speeds and maintains the tire size at high speeds.

5. Bead

Hanging plastic wire winding according to a certain shape (square or hexagonal shape), it fixes the tire on the rim.

6. Triangle Strips

The filling material on the steel cord, it prevents the bead spread and slows down the impact on the bead and prevents the air entering into the molding.

7. Inner Liner

Component that maintains the air tightness in a tubeless tire, made from special rubber, equivalent to the role of tube.

4.4.2.2 Tire Sidewall Mark Meaning and the Pressure Instructions

Tire Sidewall Mark Meaning

Example: 205/60R15 91V

205 - Nominal Cross-section Width (Unit: mm)

60 - Flat Rate (High Aspect Ratio :%)

R - Radial Structure

15 - Nominal Rim Diameter (Unit: in)

91 - Load Index

V - Speed (240 km/h)

Common Speed Rating Table:

Speed Rating	Maximum Speed (km/h)
S	180
T	190
H	210
V	240
W	270
Y	300
ZR	240 or higher

Tire Pressure Instructions

Tire pressure has a decisive influence on the tire wear, fuel consumption, fault and damage. For safety, driver must maintain standard tire pressure and regularly check the tire pressure.

- The tire load capacity is corresponding to the tire inflation pressure, which must be adjusted to a reasonable value based on the vehicle load conditions.Climate and seasonal changes should not be a reason for the tire pressure adjustment.
- During the initial use, a new tire outer sizes will change due to the heated generated by flex, making tire pressure reduced. After driving 24 hours or 2,000-3,000 km, check and adjust the tire pressure.
- Long time high-speed driving will increase tire pressure by 10% -15%.

1. Insufficient Tire Pressure

Insufficient tire pressure will accelerate tire sidewall deformation, increase heat, dramatically reduce tire life, and cause the following issues as well as security risks:

a. Excessive shoulder wear

b. Increased possibility of tire protrusion.

c. Reduce the adhesion between the various components leading to de-lamination.

d. Tire sidewall damage.

e. Tire run out too great, resulting in bead rim between abnormal friction between the rim and the tire and rim damage.

f. Increased rolling resistance and fuel consumption.

2. Excessive Tire Pressure

Excessive tire pressure will reduce the tire tread and ground contacting area, increase tire stiffness, decrease the buffer, and cause the following issues as well as security risks:

a. Tire central tread excessive wear.

b. Increased possibility of tire rupture and puncture under external shocks.

c. Reduced maneuverability due to reduced ground contacting area, prone to tail-flick, slide.

d. Reduced ride comfort.

e. Reduced smoothness. Long-term driving under excessive tire pressure will damage the vehicle chassis.

3. Uneven Tire Pressure On the Same Suspension:

a. Uneven braking force.

b. Steering deviation.

c. Reduced maneuverability.

d. Deviation when accelerating.

e. Deviation when driving.

4.4.2.3 Tire Transposition

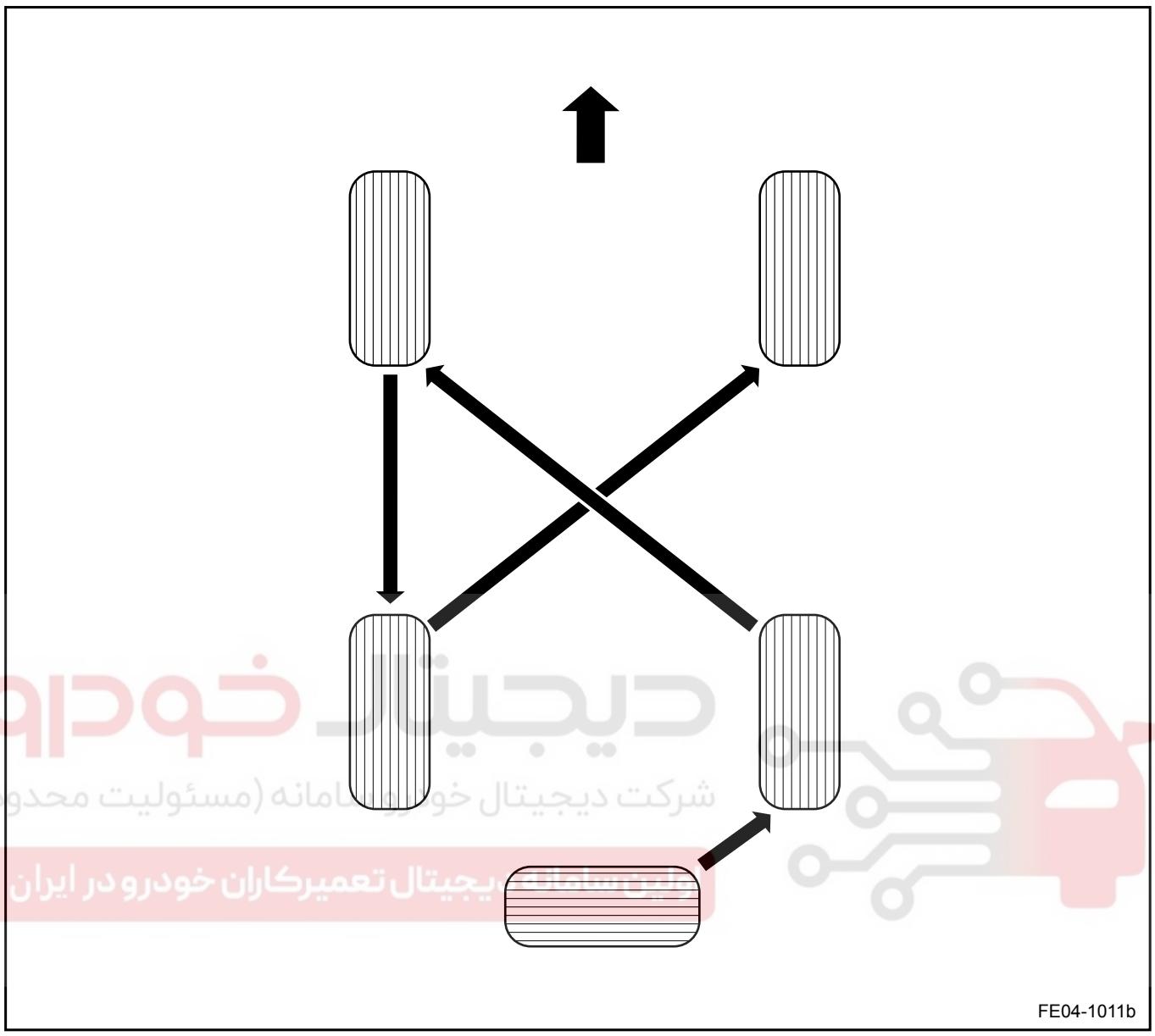
Front and rear tires wear will be different due to different load. In order to avoid the single direction tires wear and tear, regular tire transposition will make tires wear even, extending tire life. It is recommended that rotate tires every 5,000-8,000 km. The main purposes of tire transposition are:

A. Ensure even tire wear, fatigue, stability and fuel economy.

B. Check tire conditions during tire transposition, regularly check for damage to prevent accidents.

Tire Transposition Method as Shown:

Transposition with A Spare Tire



Parallel transposition, Diagonal transportation refer to1.4.2.5 Tire Rotation DescriptionTransposition Method.

4.4.3 System Working Principle

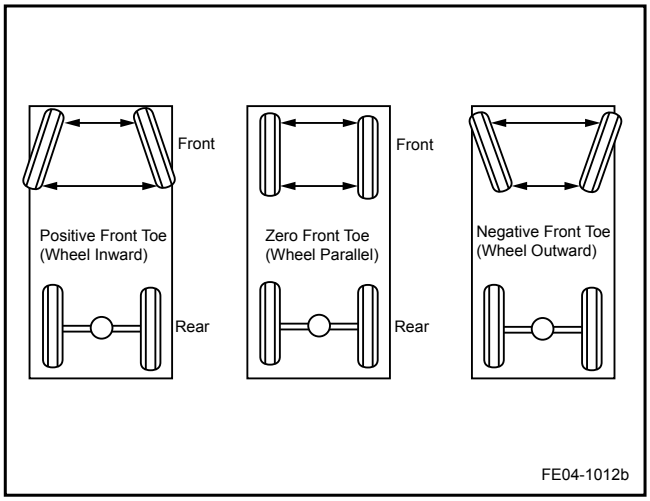
4.4.3.1 Wheel Alignment

Driver turning the steering wheel turn the vehicle to the desired direction. However, if driving on the straight road, driver must adjust the steering wheel from time to time in order to maintain the vehicle straight-line driving, or turning at a corner, driver makes a lot of effort, the driver will be under physical and mental stress. To address this problem and to prevent premature tire wear, according to certain requirements, wheels are installed on a vehicle body (or chassis) at a certain angle. These angles are called as "Wheel Alignment". It is a comprehensive term referring to the front and rear axles, wheels, steering components and suspension components relative angles.

Correct wheel alignment makes the steering easy. On the straight road, the driver only needs minor adjust to the steering wheel to keep the vehicle move straight ahead, and only a little effort to turn the vehicle. In other words, if various angles constitutes the "wheel alignment" are adjusted correctly, the turning will be easy. But even if one of them is adjusted improperly, it may have the following problems: steering problems; poor steering stability; poor steering wheel return; reduced tires life.

Vehicle positioning angles include: front toe, camber, caster, kingpin inclination angle, steering angle, tolerance angle, forward angle, grinding tire radius. These angles and size depend on the vehicles suspension systems, drive system (Front-engine front-wheel drive or front-engine rear-wheel drive, two-wheel drive or four-wheel drive), and the steering system (manual or power steering shift). Adjusting these elements will optimize the driving performance and steering stability and prolong the service life of components. Maintenance is usually recommended only for front toe adjustment.

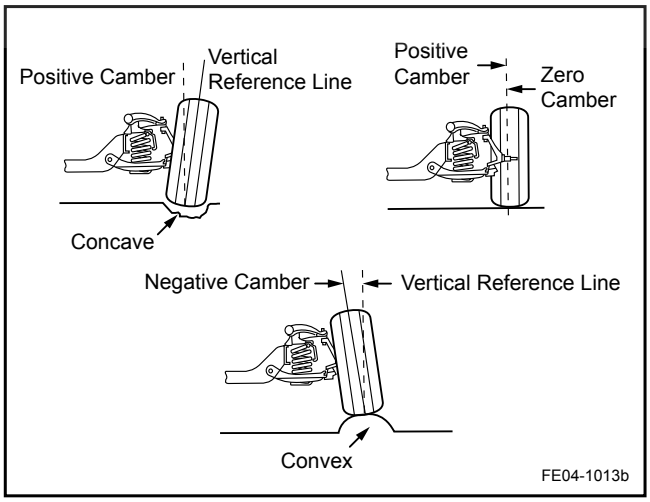
1. Front Toe



Front toe is used to measure wheel rotation, or deviation from the vehicle centerline. Another way to understand the front toe is that two front wheels distance relative to the same vehicle rear wheels distance. If all the wheels are completely parallel, then these two measurements should be equal and the front toe should be zero. If the front wheels tilt inward, the front toe is positive. When the front wheels tilt outward, the front toe is negative. Positive and the negative front toes are usually referred to as the front wheel toe-in and front wheel toe-out.

Front toe function is to compensate for tire drag due to camber and road surface resistance caused the inward or outward rolling trend to keep the vehicle straight ahead.

2. Camber



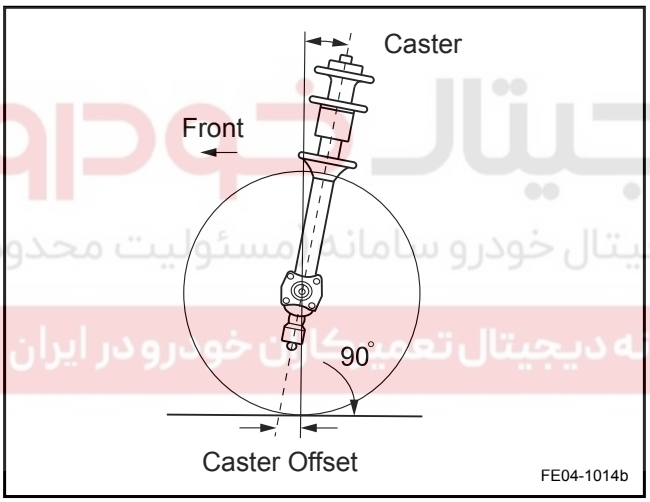
Camber is the vertical reference line of tires relative angle, when a wheel is tilted outward at the top, the camber is positive. When a wheel is tilted inward at the top, the camber is negative. Camber settings can affect the vehicle direction control and tire wear.

A variety of suspension and steering devices are designed to keep the wheels perpendicular to the ground and move along the straight road to minimize the tire tread wear and deliver the traction, when starting the vehicle.

Improper camber settings will cause excessive tire wear or uneven wear. Excessive positive camber will cause the outer tire tread wear, when the load is higher at the outer tread side, it will cause such uneven wear.

Excessive negative camber will cause the inner tire tread wear, when the load is higher at the inner tread side, it will cause uneven wear.

3. Caster



Caster is the kingpin axis forward or backward tilt angle. Caster is observed from the side when measure the angle between the steering axis and the vertical line.

Backward tilt from the vertical line, is called as positive caster. Forward tilt is called the negative caster. The steering axis center line intersects with the ground, tire contacts the road surface at a central point. The distance between these two points is called the caster. Caster can provide straight road driving stability: if the vehicle has a positive caster, when turning, the left journal will have a tendency to move downward. (This is due to the journal rotation along the tilted axis.). However, because the journal is fixed to the wheel assembly, besides the ground prevents it from moving down, the journal will not actually move down, the left steering knuckle will be forced to move up and down. This allows the body to rise slightly. After turning, the steering wheel is release, the raised body weight will force the steering knuckle move down, and make the journal back to the original straight ahead position.

4.4.4 Diagnostic Information and Procedures

4.4.4.1 Diagnosis Description

Refer to4.4.2 Description and Operationget familiar with the system functions and operation before start system diagnostics, so that it will help to determine the correct diagnostic steps, more importantly, it will also help to determine whether the customer described situation is normal.

4.4.4.2 Visual Inspection

1. Check installed after market equipment that may affect the wheels and tires.
2. Check the easy to access system components to identify whether there is a damage or a potential malfunction.
3. Check the existence of the following conditions:
   A. Obvious tire and wheel run out.
   B. Apparent drive axle bounce.
   C. Incorrect tire pressure.
   D. Incorrect vehicle front end height.
   E. Wheel bent or damage.
   F. Debris on the tires or wheels.
   G. Abnormal or excessive tire wear.
   H. Tire defects include tire deformation caused by collision, tread separation or muster - slight tire sidewalls indentation is normal and does not affect the driving ability.

4.4.4.3 Initial Inspection Before Tire Positioning

Note

Before the tire positioning, carry out the following inspection steps, otherwise, it may lead to incorrect positioning and other fault.

Step 1	Check whether the tire inflation pressure is abnormal and the tire wear is abnormal?

Yes → Adjust the tire pressure to the specified value. If necessary, replace the tire.

No

Step 2	Check whether the wheel bearings is loose?

Yes → Check whether the wheel bearing is loose. If necessary, replace the wheel bearing. Refer to 4.2.7.9 Front Wheel Hub Replacement

No

Step 3	Check whether the lower control arm ball joint and steering tie rod ball joint is loose?

Yes → Tighten the nuts. if necessary, replace the lower control arm ball joint and steering tie rod ball joint.

No

Step 4	Check whether the wheel and tire run out is abnormal?

Yes → Measure and correct the tire run out.

No

Step 5	Check whether the vehicle front end height is abnormal?

Yes → Adjust the vehicle front end height.

No

Step 6	Check whether the strut assembly is installed correctly?

Yes → Replace the strut assembly. Refer to 4.2.7.3 Front Strut Assembly Replacement

No

Step 7	Check whether the lower control arm is loose?

Yes → Tighten the lower control arm connecting bolts. If necessary, replace the lower control arm bushing. Refer to 4.2.7.2 Lower Control Arm Bushing Replacement

No

Step 8	Check whether the vehicle Curb Weight is normal, whether it is overloading?

Yes → Restore the the vehicle factory Curb Weight.

No

Step 9	Carry out four tires positioning.

4.4.4.4 Wheel Bearing Diagnostic

Warning!

Please road test the vehicle safely and comply with all traffic laws and regulations. Do not try operation that might jeopardize the vehicle control. A breach to the safety precautions can result in serious personal injury and damage to the vehicle.

Step 1	Road test the vehicle to verify the fault.

Tip: When the sealed wheel bearing is damaged, foreign matter will enter the bearing and damage the bearing. When the bearing rotates under external stress, it will send out hum noise similar to the aircraft taking off. The noise only occurs when vehicle is driving. The noise is stable. The noise increases as the the vehicle speed increases.

Next

Warning!

To avoid the vehicle damage, serious personal injury or even death, using a jack to support the vehicle when remove the major components from the vehicle.

Step 2	Confirm whether the noise is from the wheel bearings. If it can not be determined during the road test, lift and support the vehicle.

Next

Step 3	Check whether wheels are bent?

Yes → Replace the wheels. Refer to 4.4.5.1 Wheel Replacement

No

Step 4	Check whether the wheels are in imbalance?

Yes → Carry out the wheel balancing.

No

Warning!

When rotating the wheel with hand, hold the tire with. If the location is not correct, it is likely to cause bodily injury.

Note

The front wheel bearing is pressed into the steering knuckle. The rear wheel bearing is inside brake drums and wheel bearing assembly. If the inside seat ring and the rear wheel bearing are separated, it will lead to the noise.

Step 5	Rotate the tire and wheel assembly, listen to the wheel bearings noise.

Yes → Replace the wheel bearings. Refer to 4.2.7.9 Front Wheel Hub Replacement

No

Step 6	Shake the wheel with hands, check whether the wheel bearing is loose?

Yes → Replace the wheel bearings. Refer to 4.2.7.9 Front Wheel Hub Replacement

No

Step 7	Compare with a the same model normal vehicle to confirm whether the noise is a normal operating noise.

4.4.4.5 Wheel Vibration Diagnostic

1. Tire Dynamic Balancing

The tire balancing is the most easy to check procedure. If vibrations occurs at high vehicle speed, conduct dynamic balance first. Firstly, carry out the double-sided dynamic balancing under the vehicle to correct tire and wheel assembly imbalance. Correct the brake disc or wheel covers imbalance on vehicle. If the balance does not eliminate the high speed vibration, or if the vibration occurs at the low speed, the vibration is likely caused by run out.

2. Run Out

Tires, wheels or the connection between the wheels and the vehicle may lead to run out. In order to inspect the possibility of run out the wheel produced. Refer to the following wheels run out diagnostic procedure.

Warning!

Please road test the vehicle safely and comply with all traffic laws and regulations. Do not try operation that might jeopardize the vehicle control. A breach to the safety precautions can result in serious personal injury and damage to the vehicle.

Step 1	Road test the vehicle to verify the fault. Whether the customer described vibration is a fault?

No → Replace the front wheel bearings. Refer to 4.2.7.9 Front Wheel Hub Replacement

Yes

Step 2	Determine the speed when the vibration occurs. Is vibration occurring at 65 km/h or above?

No → Go to step 5

Yes

Step 3	Carry out the off-vehicle tire dynamic balance. Road test the vehicle to confirm the existence of the fault?

No → The fault has been fixed.

Yes

Step 4	Carry out final on-vehicle balance. road test the vehicle to confirm the existence of fault?

No → The fault has been fixed.

Yes

Step 5	Check the wheels free face and radial run out (Standard Value: 1.0 mm / 0.0394 in). Is the value specified value?

No → Go to step 8

Yes

Step 6	Check whether there is an imbalance in transmission?

Thoroughly examine the drive axle and the constant-velocity joints.

	No	Replace the faulty components.

Yes

Step 7	Check the wheel flange run out(Standard Value: 0.26 mm /0.0102 in). Is the value specified value?

	No	Replace wheel hub assembly. Refer to 4.2.7.9 Front Wheel Hub Replacement

Yes

Step 8	Remove the wheel assembly. Remove the tires. measure the wheel run out (Standard Value: 0.8 mm / 0.03 in), Is the value specified value?

	No	Replace the wheels. Refer to 4.4.5.1 Wheel Replacement

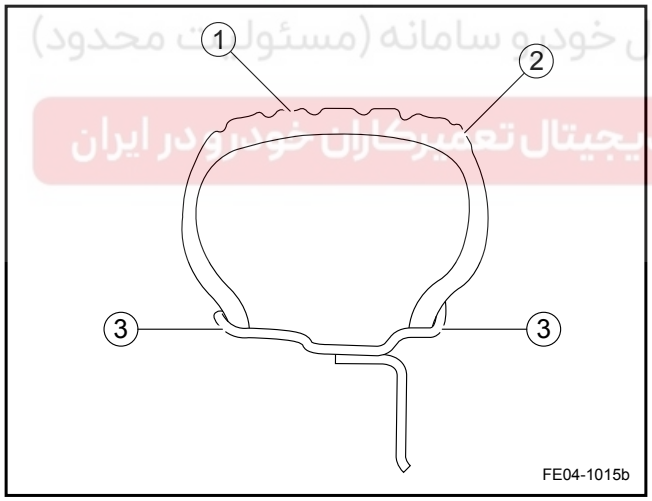
Yes

Step 9	Replace the tires.

Next

Step 10	Confirm whether the fault has been excluded.

4.4.4.6 Wheels Run Out Inspection



Measure the wheel run out with a dial indicator on-vehicle or off-vehicle. Make sure the installation surface is correct. Measurements can be carried out with or without tires installed. Measure radial and face run out inside and outside the wheel rim. install a dial gage on the wheel and tire assembly, slowly turn wheels a circle and record the dial indicator readings. if the measured value exceeds the following specifications, and the wheel balance can not eliminate the vibration, then replace the wheel.

Steel Wheels
Radial Run Out: 0.8 mm (0.03 in)
Face Run Out: 1 mm (0.04 in)

Aluminum Wheels
Radial Run Out: 0.8 mm (0.03 in)
Face Run Out: 0.8 mm (0.03 in)

Steel and Aluminum Wheels
Free Radial Run Out: 1.5 mm (0.06 in)

4.4.4.7 Tire Abnormal Wear Diagnostic

There are many reasons for abnormal and premature tire wear, including the inflation pressure is incorrect, no regular tire rotation, bad driving habits or the wheel alignment is incorrect. If the tire wear and there is a need to re-adjust the wheel position, as long as within the specifications, make sure to adjust the toe as close to zero as possible.

If there are following conditions, rotate tires:

A. Front tire wear is different from the rear tire.

B. Left front and right front tire wear is different.

C. Left rear and right rear tire wear is different.

If there are following conditions, check the wheel alignment:

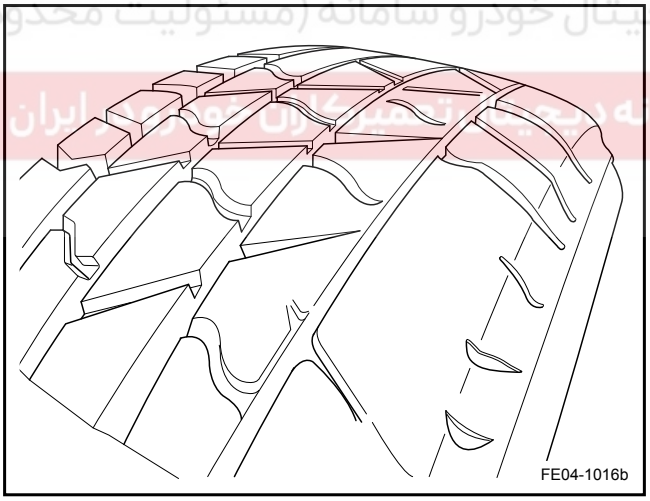
A. Left front and right front tire wear is different.

B. Any front tire uneven tread wear.

C. Front tire tread has feather scratches.

Several typical tire wear situations are shown as following:

1. Eccentric Worn



Reasons:

A. Axles, bearings and other rotating parts malfunction.

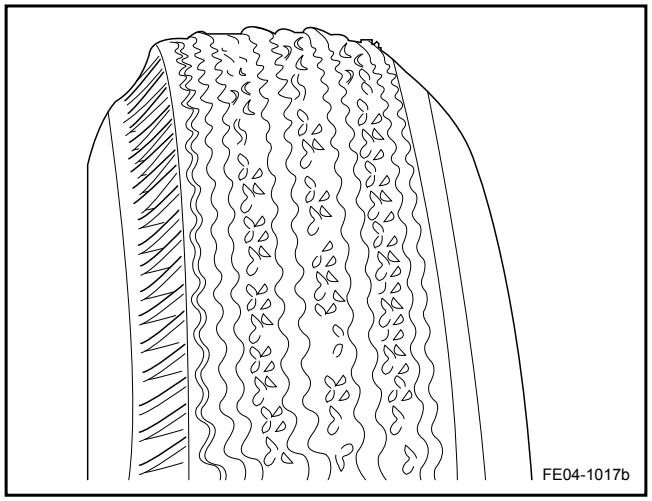
B. Braking system.

C. Emergency start, emergency braking.

D. Uneven wheel weight center.

E. Tire and wheel rim sizes do not match.

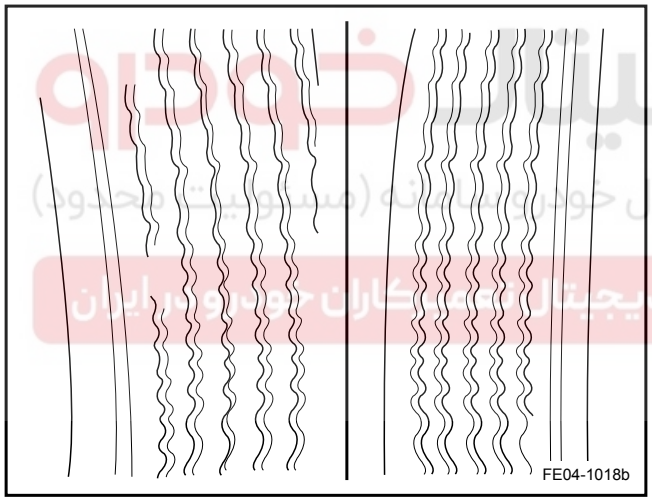
2. Sidewall Feather Worn Pattern



Reasons:

A. Toe value is incorrect.

3. Abnormal Wear and Tear:

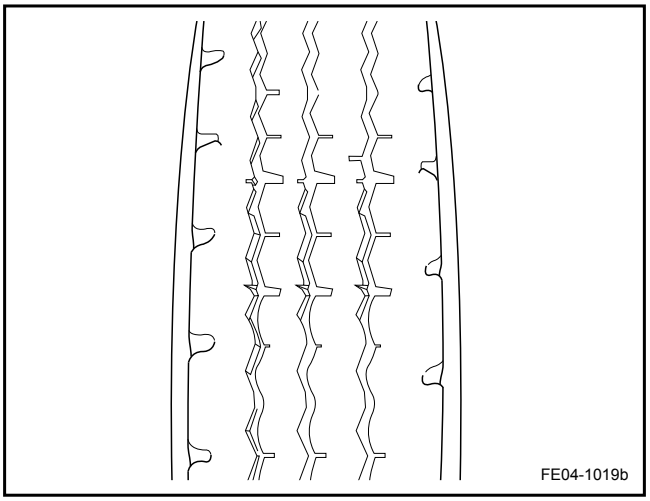


Reasons:

A. Camber is incorrect.

B. Toe value is incorrect.

4. Abnormal Wear and Tear:



Reasons:

A. Dynamic balance is incorrect.

B. Four wheel position is incorrect.

4.4.4.8 Excessive Tire Wear Diagnostic

Step 1	Check whether the wheel positioning is normal?
No	Adjust the wheel positioning.
Yes	
Step 2	Access to the vehicle maintenance records, should tire rotation be carried out? Have tires been rotated as specified?
No	Rotate tires. Refer to the4.4.2.3 Tire Transposition
Yes	
Step 3	Check whether the tire balance is normal, tire pressure is normal?
No	Adjust the tire pressure to the standard value. Carry out the tire balancing.
Yes	
Step 4	No overload situation.
No	Explain to the user the importance of maintaining a reasonable load.
Yes	
Step 5	Check whether the coil spring is working properly?

	No	Replace the coil spring. Refer to 4.2.7.4 Front Shock Absorber Components and Spring Replacement

Yes

Step 6	Check whether the strut assembly is working properly?

	No	Replace the faulty component.

Yes

Step 7	Check whether the lower control arm is working properly? (wear, loosen, etc.)

	No	Replace the lower control arm. Refer to 4.2.7.1 Lower Control Arm Replacement

Yes

Step 8	Check whether the wheel bearing is working properly? (wear, loose, etc.)

	No	Replace the wheel bearing. Refer to 4.2.7.9 Front Wheel Hub Replacement

Yes

Step 9	Check whether the lower control arm ball joint and the steering tie rod ball joint are working properly? (Wear, Loose, etc.)

	No	Tighten the nuts. If necessary, replace the the lower control arm ball joint and the steering tie rod ball joint.

Yes

Step 10	Check whether the wheel run out is normal? Refer to 4.4.4.6 Wheels Run Out Inspection.

	No	Reassemble the tires. If necessary, replace the tires or wheels.

Yes

Step 11	Confirm that failure has been ruled out.

4.4.4.9 Vehicle Waddle Diagnostic

Step 1	Check whether the tire balance is normal, tire pressure is normal?

	No	Adjust the tire pressure to the standard value, carry out the tire balancing.

Yes

Step 2	Check whether the wheel positioning is normal?

No → Readjust the wheel positioning.

Yes

Step 3	Check whether the tire wear is normal?

No → Replace the tire. Note: After replace the tires, immediately carry out the wheel positioning.

Yes

Step 4	Check whether the wheel run out is normal?

No → Measure the wheel flange run outs. If necessary, replace the wheel hub.

Yes

Step 5	Check whether the steering tie rod ball joint is working properly? (wear, loose, etc.)

No → Tighten the nuts. If necessary, replace the steering tie rod ball joint.

Yes

Step 6	Check whether the lower control arm ball joint is working properly? (wear, loose, etc.)

No → Tighten the nuts. If necessary, replace the lower control arm ball joint. Refer to 4.2.7.7 Lower Control Arm Ball Joint Replacement

Yes

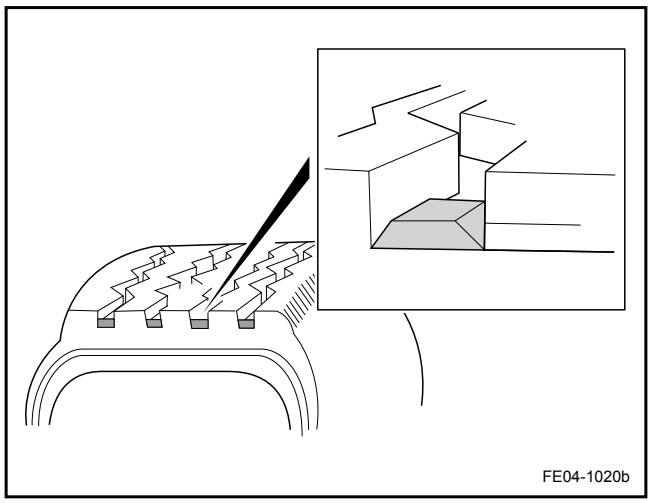
Step 7	Check whether the wheel run out is too great?

No → Measure the wheel run out, re-assemble the wheels and tires. If necessary, replace the damaged parts.

Yes

Step 8	Confirm that the fault has been fixed.

4.4.4.10 Tire Wear Indicator



Original tires have embedded tread wear indicator, which indicates when the tires need to be replaced. When the tire tread becomes shallow, these marks appear as bands. When three out of six indicators appear, it is recommended to replace the tire.

4.4.4.11 Radial Tire Deviation Correction

1. Fault Definitions:

When the vehicle is driving a straight line at a certain speed, without external force on the steering wheel, the vehicle deviates from the original direction to the left or the right direction.

2. Vehicle Deviation Benchmark :

A. When the vehicle is driving a straight line at a certain speed, it is necessary to impose force on the steering wheel to prevent its clockwise or counterclockwise rotation.

B. When the vehicle is driving a straight line at a certain speed, release the steering wheel, the vehicle deviates to the left or the right direction (usually travel 100 m (3,940 in) from the original travel direction 1 m (39.4 in) or above).

Note

Before correct the deviation, check the following basic items

A. Check whether the front and rear brakes are dragging.

B. Check on the same suspension, whether the tire wear difference is too great.

C. Check on the same suspension, whether the tire pressure difference is too great.

If there is any abnormal item, please adjust to the normal state before road testing the vehicle. Confirm whether the fault has been excluded.

3. Correction Procedure:

Warning!

Please road test the vehicle safely and comply with all traffic laws and regulations. Do not try operation that might jeopardize the vehicle control. A breach to the safety precautions can result in serious personal injury and damage to the vehicle.

Step 1	Road test the vehicle to determine whether the vehicle is deviating?

No → Explain to customers the definition of deviation. According to different road conditions, vehicles may be deviating in a short time, giving a false impression

Yes

Step 2	Check whether the toe value is normal?

No → Readjust the vehicle front wheel toe value. If necessary, adjust the wheel positioning.

Yes

Step 3	Check whether the vehicle wheel positioning parameters are the specified value?

No → Carry out the wheel positioning.

Yes

Step 4	Compare all positional parameters with specifications in the table. Complied with specifications?

No → Go to step 10

Yes

Step 5	Rotate tires.

(a) Rotate the left front wheel assembly and the left rear wheel assembly.
(b) Road test the vehicle.
Whether the vehicle is still deviating?

No → System normal

Yes

Step 6	Rotate tires.

(a) Rotate the left front wheel assembly and the left rear wheel assembly and replace the left front tire.
(b) Road test the vehicle.
Whether the vehicle is still deviating?

No → System normal

Yes

Step 7	Rotate tires.

(a) Rotate the right front wheel assembly and the right rear wheel assembly.
(b) Road test the vehicle.
Whether the vehicle is still deviating?

No → System normal

Yes

Step 8	Rotate tires.

(a) Rotate the right front wheel assembly and the right rear wheel assembly and replace the right front tire.
(b) Road test the vehicle.
Whether the vehicle is still deviating?

No → System normal

Yes

Step 9	Return to the diagnosis starting point.
Step 10	Check the axle, suspension system components, for existence of bending damage?

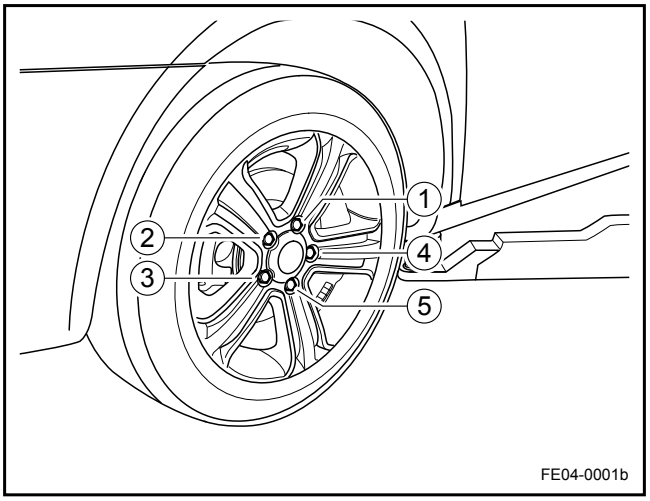
No → Go to step 1

Yes

Step 11	Adjust the axle. If necessary, replace the damaged parts to confirm The fault has been fixed..

4.4.5 Removal and Installation

4.4.5.1 Wheel Replacement



Removal Procedure:

1. Loosen wheel nut.
2. Lift and support the vehicle.
3. Remove the wheel nut.
4. Remove the wheel.

Installation Procedure:

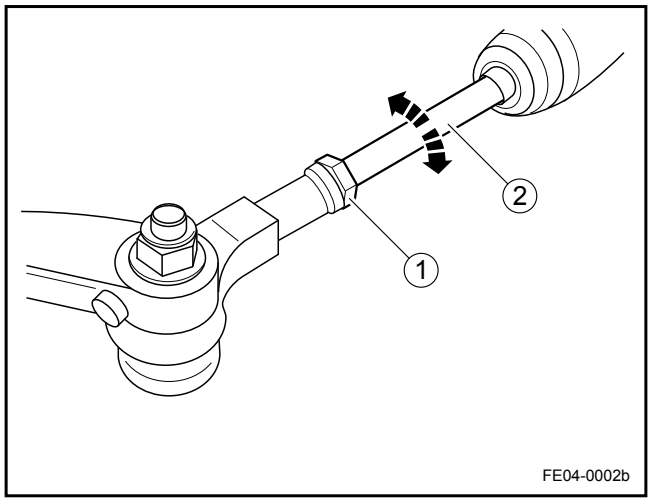
1. Install the wheel.
2. Install the wheel nuts according to the sequence 1-5-2-4-3 as shown in the graphic, slightly tighten the nuts.
3. Lower the vehicle.
4. Tighten the wheel nuts according to the sequence 1-5-2-4-3 as shown in the graphic.

   Torque: 110 Nm (Metric) 81.4 lb-ft (US English)

4.4.5.2 Front Toe Adjustment

Note

Make sure that the vehicle is parked on a even ground. Make sure that the front wheels are in the straight position.



1. Check both ends of toe settings.

   Equipment: Wheel Positioning System

2. Lift and support the vehicle.
3. Release rod retaining nuts at both ends.
4. Clockwise or counter-clockwise rotate the same amount at both ends to adjust the front toe setting (2).
5. Tighten the rod retaining nuts at both ends.