# 6 Brake System

# 6.1 Warnings and Notices

## 6.1.1 Warnings and Notices

ABS Component Handling Warning

Warning!

Warning: Certain components in the Anti-lock Brake System (ABS) are not intended to be serviced individually. Attempting to remove or disconnect certain system components may result in personal injury and/or improper system operation. Only those components with approved removal and installation procedures should be serviced.

Brake Dust Warning

Warning!

Warning: Avoid taking the following actions when you service wheel brake parts:

- Do not grind brake linings.
- Do not sand brake linings.
- Do not clean wheel brake parts with a dry brush or with compressed air.

Warning!

Warning: Some models or aftermarket brake parts may contain fibers which can become airborne in dust. Breathing dust with fibers may cause serious bodily harm. Use a water-dampened cloth in order to remove any dust on brake parts. Equipment is available commercially in order to perform this washing function. These wet methods prevent fibers from becoming airborne.

Brake Fluid Warning

Warning!

Warning: Do not use fluid from an open container that may be contaminated with water. Incorrect or contaminated fluid could result in system failure, loss of vehicle control and personal injury.

Brake Fluid Irritant Warning

Warning!

Warning: Brake fluid may be irritating to the skin or eyes. In case of contact, take the following actions:

- Eye contact--rinse eyes thoroughly with water.
- Skin contact--wash skin with soap and water.

Brake Pipe Replacement Warning

Warning!

Warning: Carefully route and retain replacement brake pipes. Always use the correct fasteners and in the original location for replacement brake pipes. Failure to properly route and retain brake pipes may cause damage to the brake pipes and brake system resulting in personal injury.

Adding Fluid to the Brake System Notice

Note

Notice: When adding fluid to the brake master cylinder reservoir, use DOT-4 brake fluid from a clean, sealed brake fluid container. The use of any type of fluid other than the recommended type of brake fluid may cause contamination which could result in damage to the internal rubber seals and/or rubber linings of hydraulic brake system components.

Brake Caliper Notice

Note

Notice: Support the caliper with a piece of wire to prevent damage to the brake line.

# 6.2 Front Brake

## 6.2.1 Specifications

### 6.2.1.1 Fastener Tightening Specifications

| Applications | Model | Specifications | |
|---|---|---|---|
| | | Metric (Nm) | US English (lb-ft) |
| Brake Hose Bolts | M10 × 15 | 11-20 | 8.1-14.8 |
| Brake Caliper Bolts | M8 × 22 | 25-35 | 18.5-25.9 |
| Brake Caliper Bracket Bolts | M10 × 23 | 100-110 | 74.0-81.4 |

### 6.2.1.2 Front Disc Brake Parts Specifications

| Applications | Specifications | |
|---|---|---|
| | Metric (mm) | US English (in) |
| Scrapped Front Brake Disc Thickness | 24.0 | 0.980 |
| Front Brake Disc Acceptable Face Run Out | 0.05 | 0.002 |
| Front Brake Disc Thickness - New | 26.0 | 1.020 |
| Front Brake Pads Standard Thickness | 11.0 | 0.433 |
| Front Brake Pads Minimum Thickness | 2.0 | 0.078 |

## 6.2.2 Description and Operation

### 6.2.2.1 Description and Operation

Front Disc Brake System Components:

Front disc brake system consists of the following components:

Brake Pad:Apply the force from the hydraulic brake caliper mechanical output on the brake disc friction surface.

Brake Pad Guide:Installed between the the disc brake pad and the brake pad mounting bracket to keep the brake pad moving smooth and to eliminate the noise.

Brake Disk:The disc brake pad and the brake disc surface friction mechanical output slows down the tires and wheels assembly rotation speed, enables the vehicle's braking.

Brake Caliper:Receive the hydraulic pressure from the brake master cylinder, converts the hydraulic pressure to mechanical output force acting on the brake pads; When the master cylinder returns its position, the brake caliper piston returns to its position.

Brake Caliper and Brake Pad Mounting Bracket:It is used to fix the disc brake pad and brake caliper in place to maintain the correct correlation with the hydraulic brake caliper. When the mechanical output is applied on the brake pad, it makes the brake pad slide.

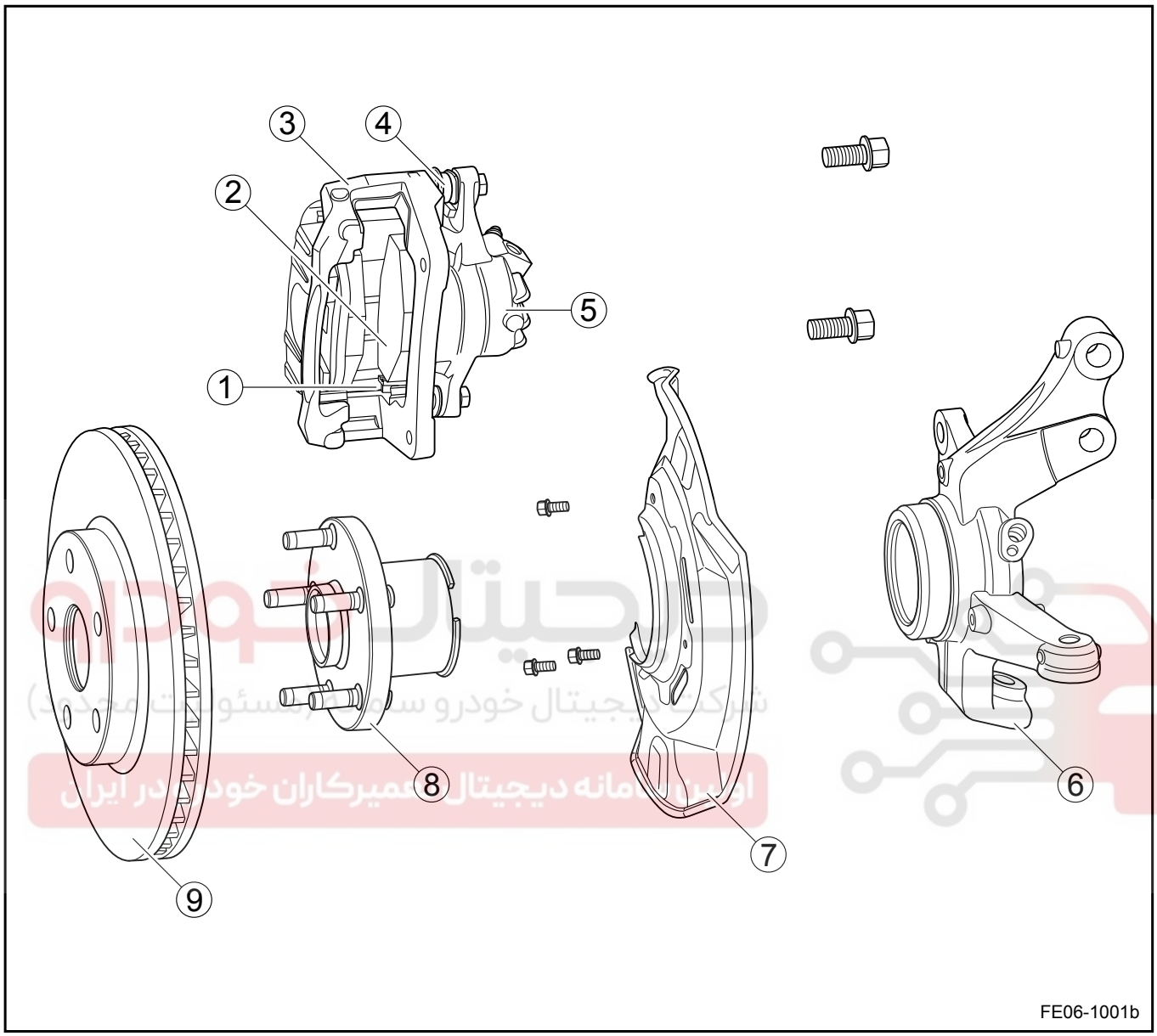
Brake Caliper Floating Pin:It is used to install the hydraulic brake caliper, fix the brake caliper in place to maintain the correct correlation with the with the brake caliper bracket. When the mechanical output is applied on the brake caliper, it makes the the brake caliper slide in relation to the brake pad.

Front Disc Brake System Operation:

The mechanical output from the hydraulic brake caliper piston is applied on the brake pad. When the piston pushes the inside brake pad from outside, at the same time, the brake caliper pulls the outer brake pads inward, so that the output power is evenly distributed. The brake pad applies the output force to the brake disc friction surface on both sides, thus slowing down the tire and wheel assembly speed. Whether the brake lining guide and the floating brake caliper pin are working properly is very important to evenly distribute the braking force.

## 6.2.3 Disassemble View

### 6.2.3.1 Disassemble View



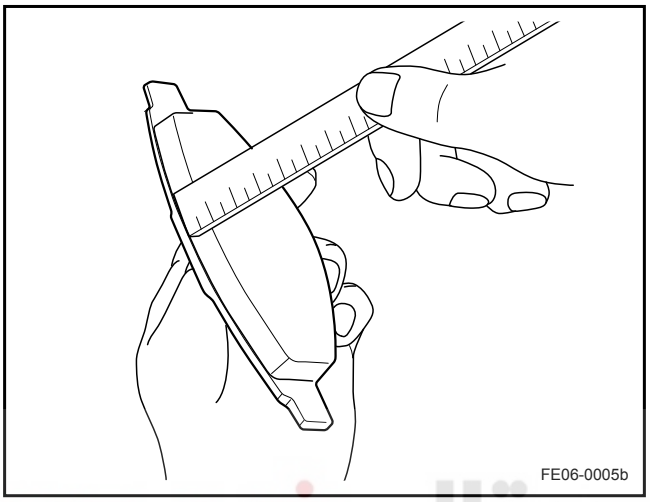

Legend

1. Brake Pad Guide
2. Brake Pad
3. Brake Caliper Mounting Bracket
4. Floating Pin Seal
5. Brake Caliper
6. Steering Knuckle
7. Disc Brake Dust Cover
8. Wheel Hub Assembly
9. Brake Disc

## 6.2.4 Diagnostic Information and Procedures

### 6.2.4.1 Brake Pad Inspection

1. Regularly check the brake pad, measure the brake pad according to the graphic shown below. If the measurement is not within the specification, replace the brake pad.
2. If the brake pad needs to be replaced, replace the disc brake pads on the same axle at the same time.
3. Check whether the disc brake pad friction surface is cracked, broken or damaged.




### 6.2.4.2 Brake Caliper Inspection

1. Check whether the brake caliper housing is cracking, severely worn or damaged. If the above conditions exist, replace the brake caliper.
2. Check whether the brake caliper piston dust cover seal is cracked, broken, punctured, aging, and improperly installed in the brake caliper body. If there is any of the above conditions, replace the brake caliper.
3. Check whether there is brake fluid leak on the brake caliper piston dust cover seal surrounding and the disc brake pad. If there is brake fluid leaking sign, replace the brake caliper.
4. Check whether the brake caliper piston enters into the caliper cylinder smoothly and completely. The movement should be smooth. If the brake caliper piston is stuck or hard to reach the cylinder bottom, replace the brake caliper.

### 6.2.4.3 Brake Guide Inspection

- Check the brake guide for the existence of deficiencies, severe corrosion, installing convex tongue bent.
- If any of the above is found, replace the disc brake guide. Make sure that the brake pad slide smoothly on the disc brake pad guide without blocking.

### 6.2.4.4 Floating Brake Caliper Pin Inspection

Check the brake caliper pin floating whether the following conditions exist:

- Catching
- Stuck
- Jacket Cracking or Broken
- Jacket Missing

If any of the above is found, replace the brake caliper and the dust cover seal.

### 6.2.4.5 Brake Disc Surface and Worn Inspection

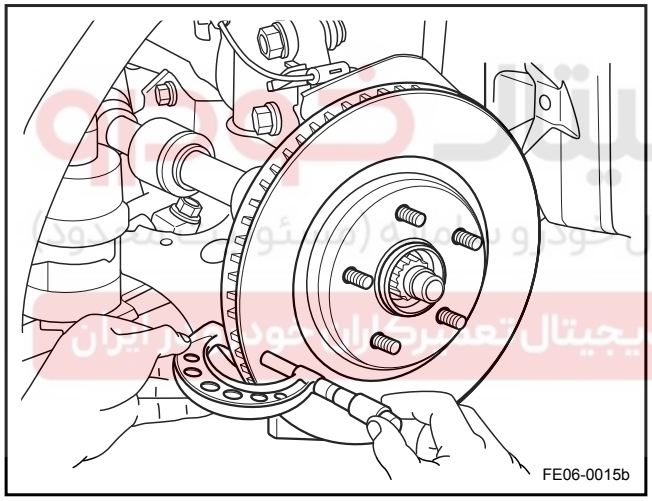
1. Clean the brake disc brake friction surface with industrial alcohol or a permitted equivalent detergent.
2. Check the brake disc friction surface for the following conditions:
   - Severe corrosion and / or pitting
   - Minor Surface Rust
   - Cracking and / or Sunburn
   - Serious Color Changing (Blue)
   - Deep scratches on the brake disc friction surface

If one or more of the above exists, then the brake disc needs to be repaired or replaced.

Note

After the brake disk surface repair or replacement, the brake pad needs to be replaced.

### 6.2.4.6 Brake Disc Thickness Measurement




1. Clean the brake disc brake friction surface with industrial alcohol or similar cleaning agent .
2. With a micrometer to measure and record evenly distributed 4 or more points minimum thickness along the circumference of the brake disc. Make sure that only measure the brake pad lining contacting area. For each measurement, the micrometer and the brake disc outer edge distance must be equal.
3. If the brake disc thickness exceeds the specifications, replace the brake disc.

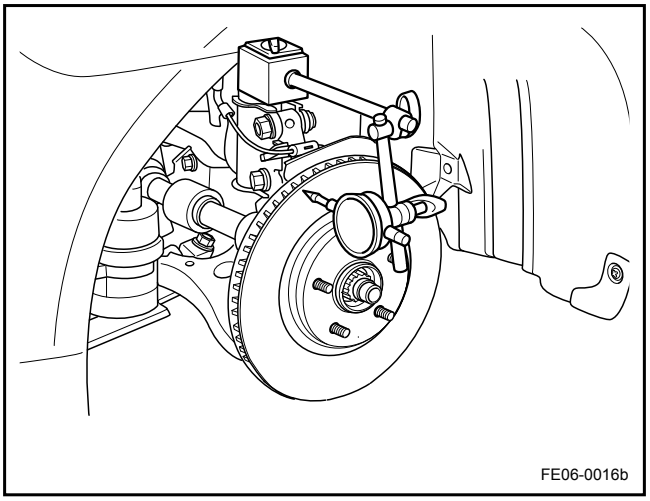
Note

After the brake disk repair or replacement, the brake pad should be replaced.

### 6.2.4.7 Brake Disc Assembly Rear Face Run Out Measurement

Note

When removing the brake disc from the wheel hub / axle flange, remove the rust or dirt from the wheel hub / axle flange and the brake disc mating surface, otherwise, it could lead to brake disc assembly rear face excessive run out, lead to the brake pulsation.




1. Remove the brake disc from the vehicle. Refer to 6.2.5.3 Brake Disc Replacement and / or 6.3.5.3 Brake Disc Replacement - Rear.
2. Clean the brake disc friction surface with industrial alcohol or similar cleaning agent .
3. Install the brake disc to the wheel brake disc / axle flange.
4. Manually install the nuts and tighten the nuts with a wrench.
5. Install the dial indicator base to the steering knuckle and place the dial indicator measuring head, so that it contacts with the brake disc friction surface and is at 90 °, and is from the brake disc outer edge about 13 mm (Metric) 0.5 in (US English)
6. Rotate the brake disc, until the dial indicator reading reaches the minimum, and then dial the indicator to zero.
7. Rotate the brake disc, until the dial indicator reading reaches the maximum.
8. Mark and record the face run out.
9. After install the brake disc assembly, compare the face run out with the specifications.
   Standard Value: 0.05 mm (Metric) 0.002 in (US English)
10. If the brake disc assembly rear face run out exceeds the specifications after installation, check the bearing axial clearance and the wheel axle run out. If the bearing axial clearance and the wheel axle run out is normal, and brake disc thickness is within the prescribed limits, adjust the brake disc surface in order to ensure proper flatness.

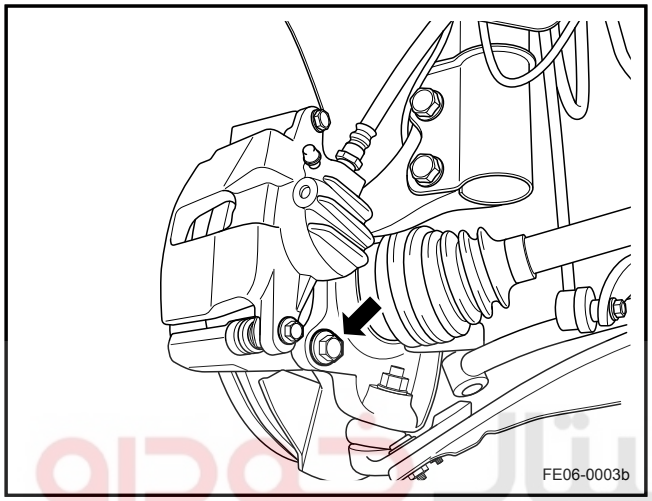
## 6.2.5 Removal and Installation

### 6.2.5.1 Brake Pad Replacement - Front

Removal Procedure:

Warning!

Refer to 'Vehicle Lifting Warning" in "Warnings and Notices".
Refer to "Brake Dust Warning" in "Warnings and Notices".

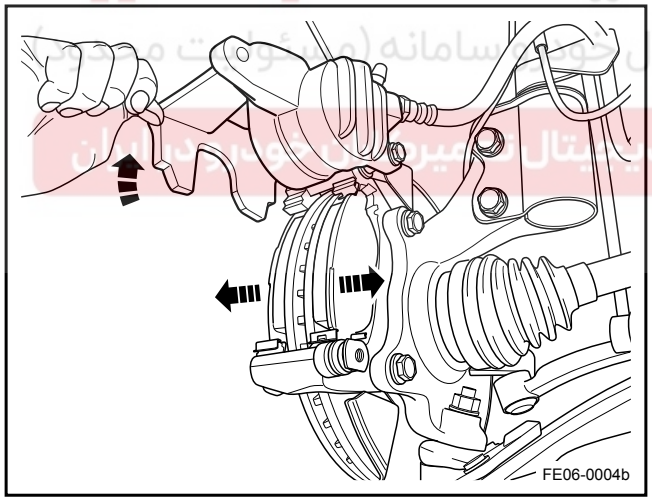



1. Lift and support the vehicle. Refer to 1.3 Lifting and Jacking the Vehicle.

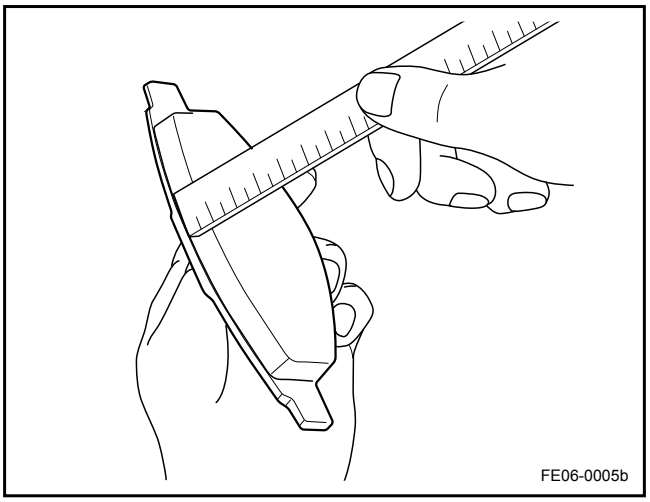
   Note

   In order to maintain wheel balance, before the tire removal, mark the tire relative to the wheel position.

2. Remove the front wheel. Refer to 4.4.5.1 Wheel Replacement.
3. Remove brake caliper lower assembly bolts.




4. Flip the caliper upward.
5. Remove the brake pad.



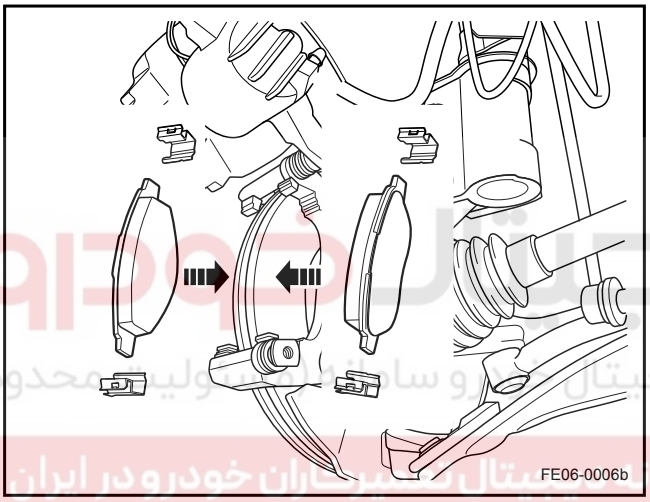

6. Check the brake pad.

   Standard Thickness: 11.0 mm (0.433 in)
   Minimum Thickness: 2.0 mm (0.078 in)

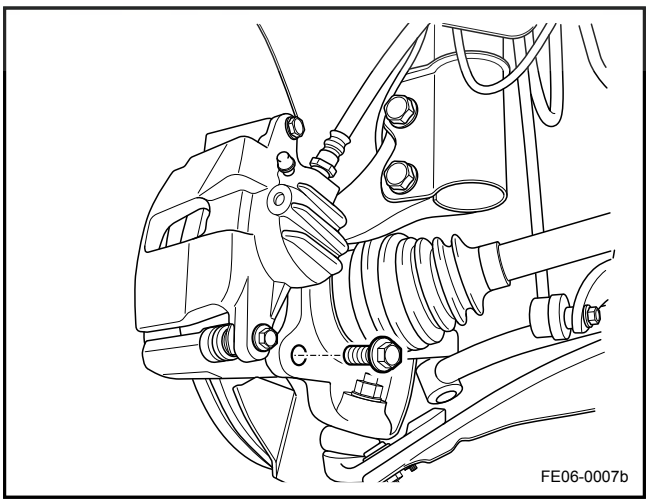
   Note

   If the brake pad lining thickness is less than the minimum value, replace the front brake pad.

Installation Procedure:




1. Check the brake pad lining thickness.
2. Install the brake pad into the caliper.




3. When necessary, use a dedicated tool to push the piston inside.

   Note

   Carefully drop down the brake caliper assembly and install the lower assembly bolts, do not damage the piston dust seals.

4. Install the bolt assembly the bolt assembly to the bottom of the drop-down brake caliper and .

   Torque: 30 Nm (Metric) 22.2 lb-ft (US English)

5. Align the marks made when removing the wheels and install the front wheels.
6. Lower the vehicle.

   Note

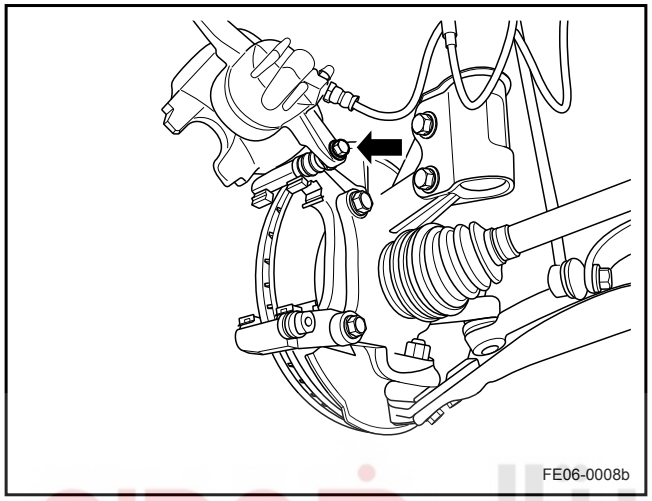
   The left and right front brake pad replacement is similar.

## 6.2.5.2 Brake Caliper Replacement - Front

Removal Procedure:

Warning!

Refer to 'Vehicle Lifting Warning" in "Warnings and Notices".
Refer to "Brake Fluid Effects on Paint and Electrical Components Notice in "Warnings and Notices".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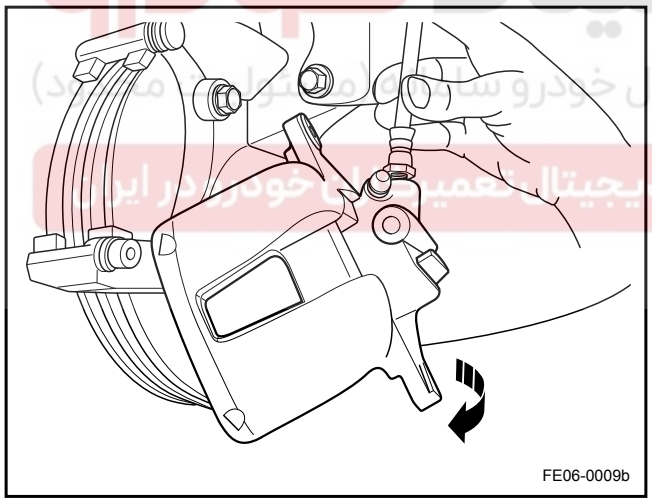
1. Lift and support the vehicle. Refer to 1.3 Lifting and Jacking the Vehicle.

   Note

   In order to maintain wheel balance, before the tire removal, mark the tire relative to the wheel position.

2. Remove the front wheels. Refer to 4.4.5.1 Wheel Replacement.
3. Remove the brake pad. Refer to 6.2.5.1 Brake Pad Replacement - Front.
4. Remove the brake caliper upper assembly bolts and remove the brake caliper.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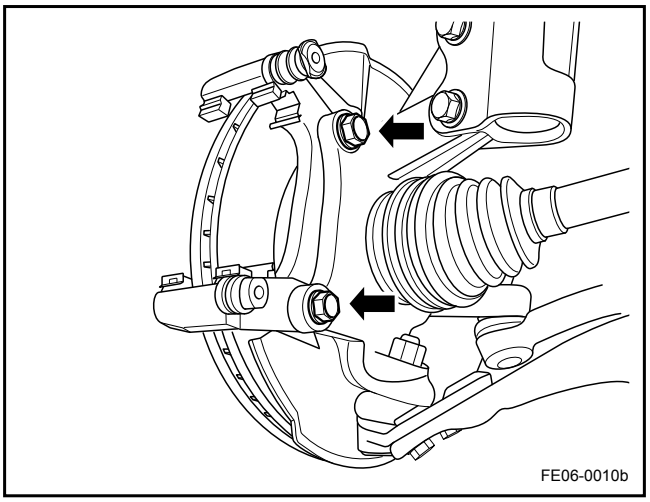
5. Remove the brake caliper brake hose inlet retaining bolts, remove the brake caliper. Plug the brake caliper inlet brake hose to prevent the brake fluid loss or contamination.

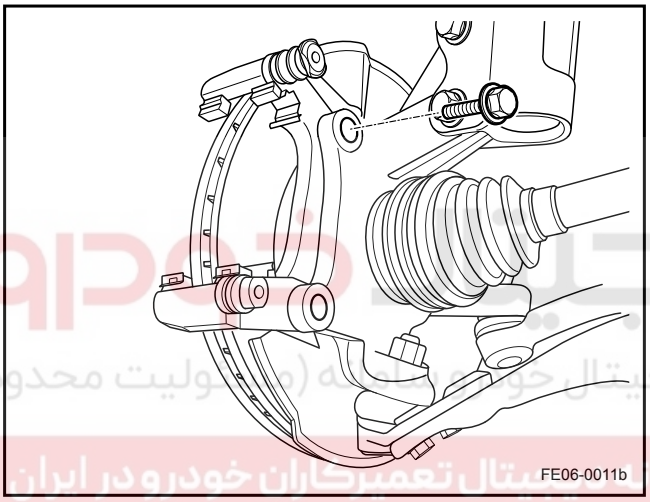
   Note

   Rotate to remove the brake caliper, separate the brake hose import bolt from brake caliper inlet to prevent damage to the brake hose.



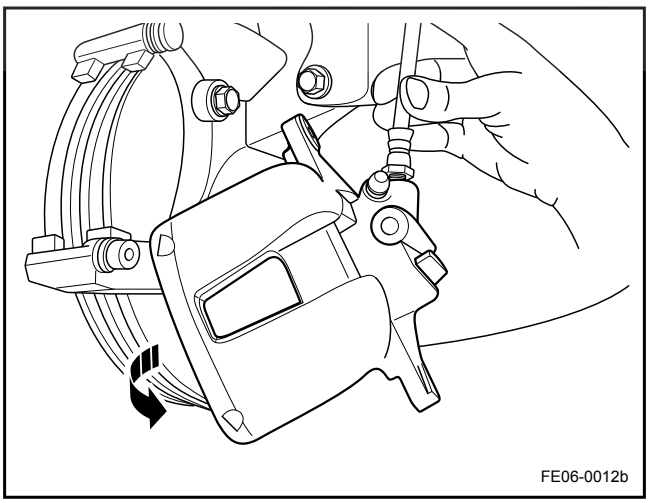

6. Remove the brake caliper bracket bolts and remove the brake caliper bracket.

Installation Procedure:




1. Install the brake caliper bracket.

   Torque: 105 Nm (Metric) 77.7 lb-ft (US English)

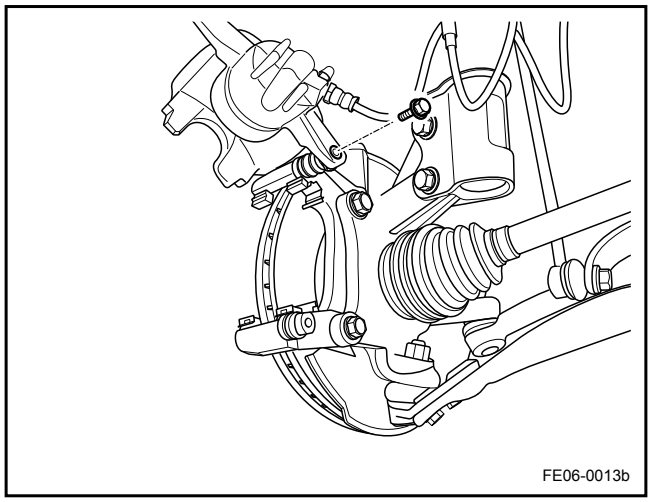



2. Install the brake caliper brake hose inlet bolts.

   Note

   Rotate to install the brake caliper, install the bolt into the brake caliper inlet to prevent damage to the brake hose.

   Torque: 16 Nm (Metric) 11.8 lb-ft (US English)




3. Install the brake caliper and tighten the brake caliper upper assembly bolts.

   Torque: 30 Nm (Metric) 22.2 lb-ft (US English)

4. Install the brake pad.

5. Install the front wheels.

6. Lower the vehicle.

7. Add clean brake fluid to the master cylinder to the required level.

8. Bleed air in the brake system. Refer to 6.4.5.5 Hydraulic Brake System Exhaust Procedure.

   Note

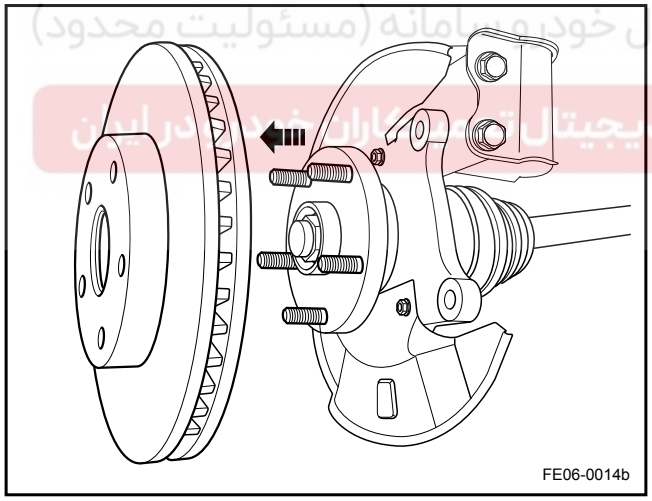
   Left and right front brake caliper replacement is similar.

## 6.2.5.3 Brake Disc Replacement

Removal Procedure:

Warning!

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




1. Lift and support the vehicle. Refer to 1.3 Lifting and Jacking the Vehicle.

   Note

   In order to maintain wheel balance, before the tire removal, mark the tire relative to the wheel position.

2. Remove the front wheels. Refer to 4.4.5.1 Wheel Replacement.

3. Remove the brake pad. Refer to 6.2.5.1 Brake Pad Replacement - Front.

4. Remove the brake caliper. Refer to 6.2.5.2 Brake Caliper Replacement - Front.

   Note

   Remove the brake caliper without having to remove the brake hose. Using a wire to hang the brake caliper in order to avoid damage to the brake hose.

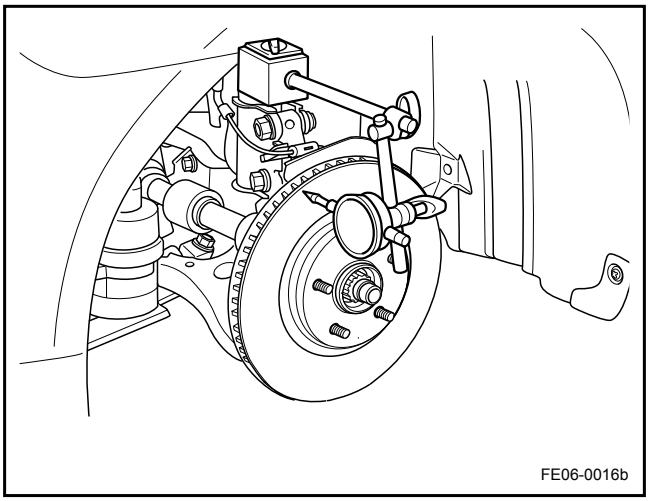
5. Remove the brake disc.

   Note

   Mark the location on the brake disc and the wheel axle.

6. Check the front brake disc thickness if the thickness is less than minimum, then replace the front brake disc.

   Standard Thickness: 26.0 mm (1.02 in)
   Minimum Thickness: 24.0 mm (0.98 in)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7. Check the brake disc run out.
   a. Install the front brake disc.
   b. Use special tools and wheel nut to tighten the brake disc.

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

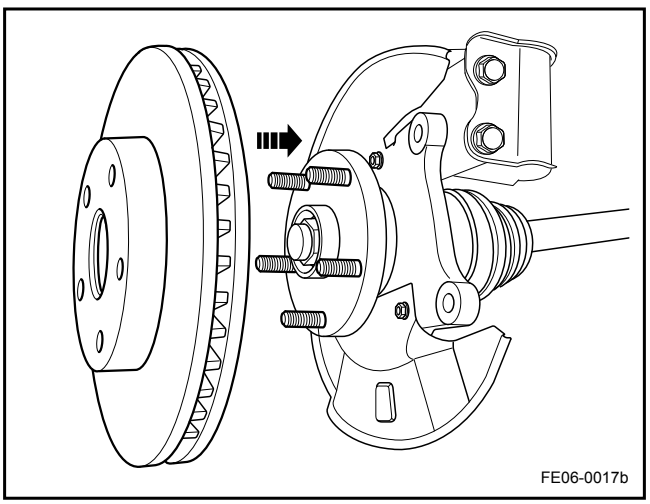
   c. Install a dial indicator on the shock absorber, away from the wheel axle and the speed sensor.

      Using the dial indicator to measure the brake disc run out on the brake disc 13 mm (0.53 in) from the outer edge.
      Largest brake disc run out: 0.05 mm (0.0020 in)
      Note

      If the brake disc
      If the run out is more than maximum, firstly change the brake disc and axle installation location so that the brake disc run out is the smallest. if after changing the installation location, the brake disc run out is still bigger than the maximum value, check up the wheel axle bearing gap. if the bearing clearance and wheel axle hub run out is normal, or the brake disc thickness is within the specified limits, grind the brake disc. if the brake disc thickness is less than the minimum, replace the brake disc.



Installation Procedure: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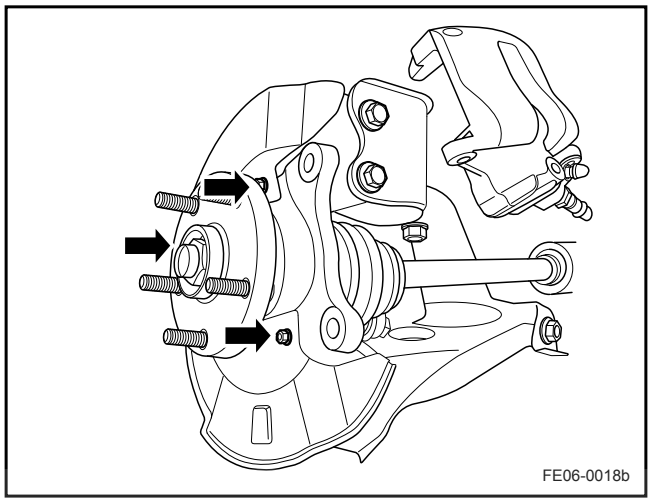
1. Align the brake disc and the wheel axle mark, install the brake disc.
2. Install the brake caliper.
3. Install the brake pad.
4. Install the front wheels.
5. Lower the vehicle.

   Note

   The left and right front brake disc replacement is similar.




## 6.2.5.4 Disc Brake Dust Cover Replacement

Removal Procedure:

Warning!

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

1. Lift and support the vehicle. Refer to 1.3 Lifting and Jacking the Vehicle.

   Note

   In order to maintain wheel balance, before the tire removal, mark the tire relative to the wheel position.

2. Remove the front wheels. Refer to 4.4.5.1 Wheel Replacement.

3. Remove the brake pad. Refer to 6.2.5.1 Brake Pad Replacement - Front.

   Note

   Refer to "Brake Caliper Notice" in "Warnings and Notices".

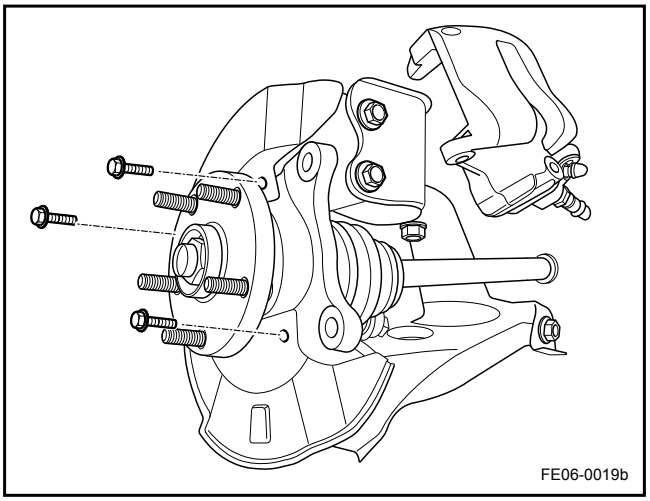
4. Remove the brake caliper. Refer to 6.2.5.2 Brake Caliper Replacement - Front.

   Note

   Remove the brake caliper without having to remove the brake hose. Using a wire to support the brake caliper to avoid damage to the brake hose.

5. Remove the brake disc. Refer to 6.2.5.3 Brake Disc Replacement.

6. Remove the disc brake dust cover retaining bolts and remove the disc brake dust cover.




Installation Procedure:

1. Install the disc brake dust cover, tighten the retaining bolts.

   Torque: 14 Nm (Metric) 10.4 lb-ft (US English)

2. Install the brake disc.
3. Install the brake caliper.
4. Install the brake pad.
5. Install the front wheels.
6. Lower the vehicle.

   Note

   The left and right front disc brake dust cover replacement is similar.

# 6.3 Rear Brake

## 6.3.1 Specifications

### 6.3.1.1 Fastener Tightening Specifications

| Applications | Model | Specifications | |
|---|---|---|---|
| | | Metric (Nm) | US English (lb-ft) |
| Brake Hose Bolt | M10 × 15 | 11-20 | 8.1-14.8 |
| Brake Caliper Bolts | M8 × 22 | 25-35 | 18.5-25.9 |
| Brake Caliper Bracket Bolts | M10 × 23 | 100-110 | 74.0-81.4 |

### 6.3.1.2 Rear Disc Brake Parts Specifications

| Applications | Specifications | |
|---|---|---|
| | Metric (mm) | US English (in) |
| Scrapped Rear Brake Disc Thickness | 8.5 | 0.334 |
| Rear Brake Disc Acceptable Run Out | 0.05 | 0.002 |
| Rear Brake Disc Thickness - New | 10 | 0.390 |
| Rear Brake Pad Standard Thickness | 11.0 | 0.433 |
| Rear Brake Pad Minimum Thickness | 2.0 | 0.078 |

## 6.3.2 Description and Operation

### 6.3.2.1 Description and Operation

Rear disc brake system components:

Rear disc brake system consists of the following components:

Brake Pad:Apply the mechanical output force from the hydraulic brake caliper on the brake disc friction surface.

Brake Pad Guide:Installed between the brake pad and brake pad mounting bracket to ensure the brake pads move smoothly and eliminate noise.

Brake Disk:Use the disc brake pad mechanical output force on the brake disc surface to slow down the tires and wheels rotation speed, achieve the vehicle braking.

Brake Caliper:Receive the braking fluid pressure from the brake master cylinder, converts the fluid pressure to the mechanical output force applying to the brake pad. When the master cylinder returns, enables the brake piston return.

Brake Caliper to Brake Pad Bracket:Used to fix the disc brake pad to the brake caliper and maintain the correct brake pad to brake caliper correlation. When the mechanical output force is applied to the brake pad, it makes the brake pad slide.

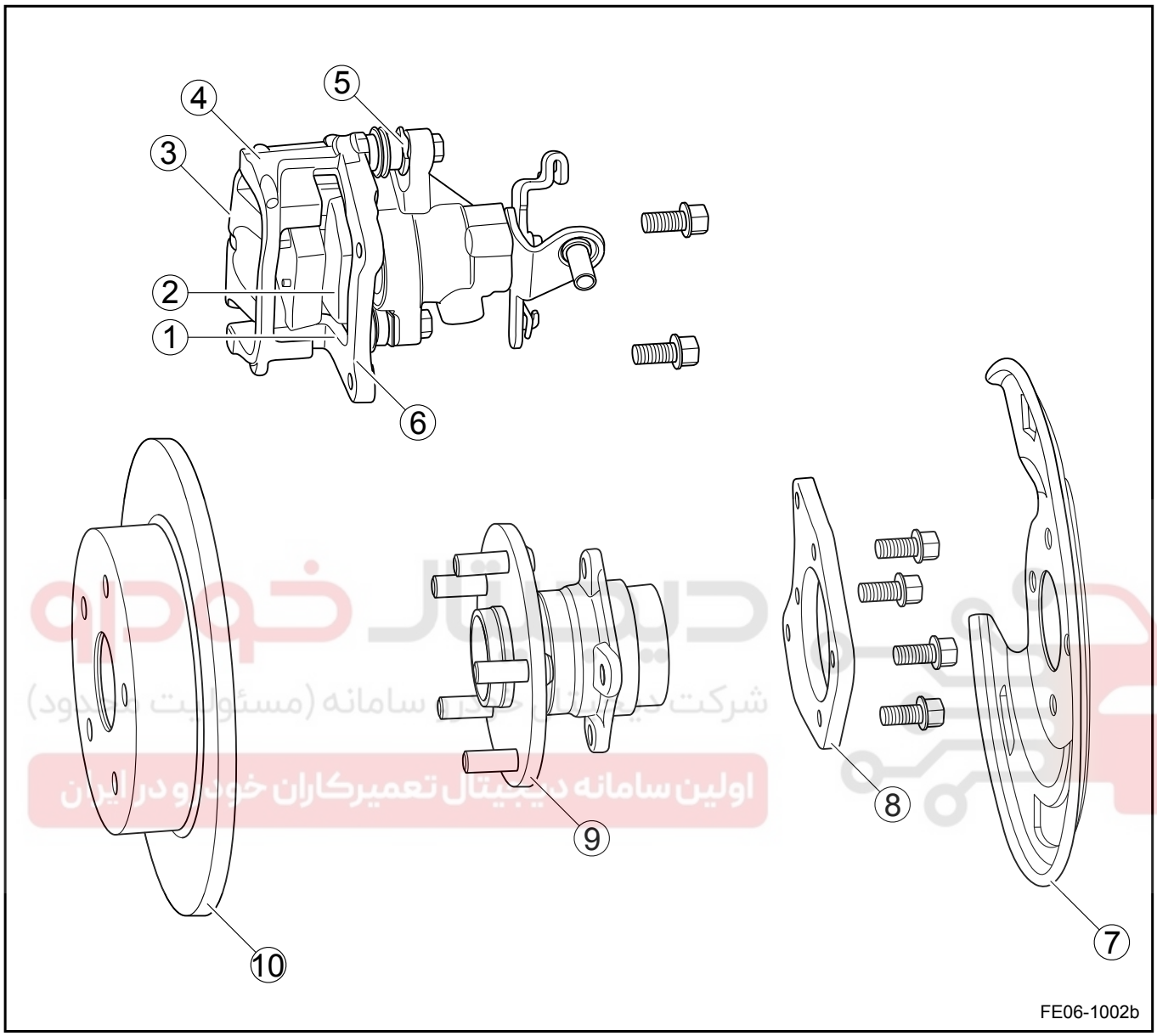
Floating Disc Brake Caliper Pin:Used to install the hydraulic brake caliper, and fix the caliper with the brake caliper bracket in place to maintain the with the correct location. When the mechanical output force is applied, it makes the brake caliper slide in relation to the brake pad.

Rear disc brake system operation:

Mechanical output force from the hydraulic brake caliper piston is applied on the brake pads. When the piston pushes the brake pad inward, the brake caliper pulls the outer brake pad inward at the same time. The output is evenly distributed. The brake pad applied the output force to the brake disc friction surface on both sides of the, and thus slows down the tire and wheel assembly speed. Whether the brake pad and the brake caliper are working properly is very important to the braking force distribution.

## 6.3.3 Disassemble View

### 6.3.3.1 Disassemble View




Legend

1. Brake Pad Guide
2. Brake Pad
3. Brake Caliper
4. Brake Caliper Mounting Bracket
5. Floating Pin Dust Cover
6. Brake Caliper Mounting Bracket
7. Disc Brake Dust Cover
8. Flange
9. Wheel Assembly
10. Brake Disc

## 6.3.4 Diagnostic Information and Procedures

### 6.3.4.1 Diagnostic Information and Procedures

For rear brake Diagnostic Information and Procedures, please refer to6.2.4 Diagnostic Information and Procedures.

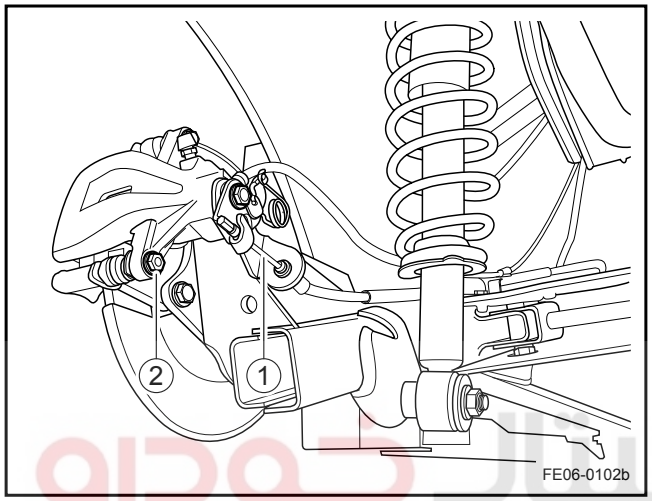
## 6.3.5 Removal and Installation

### 6.3.5.1 Brake Pad Replacement - Rear

Removal Procedure:

Warning!

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




1. Lift and support the vehicle. Refer to 1.3 Lifting and Jacking the Vehicle.

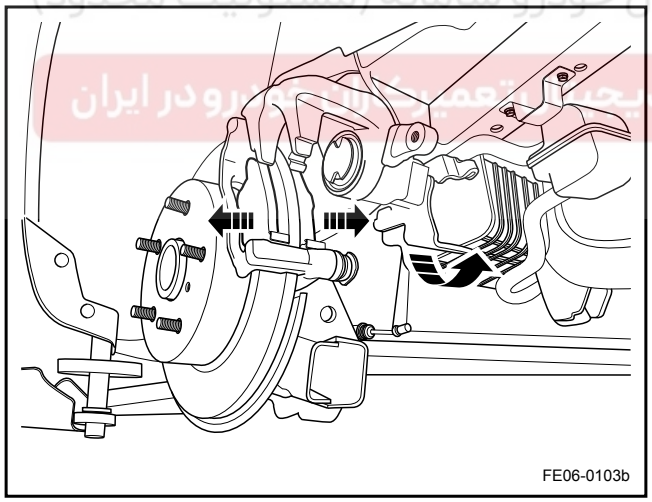
   Note

   In order to maintain wheel balance, before the tire removal, mark the wheel to the wheel relative position.

2. Remove the rear wheels. Refer to 4.4.5.1 Wheel Replacement.

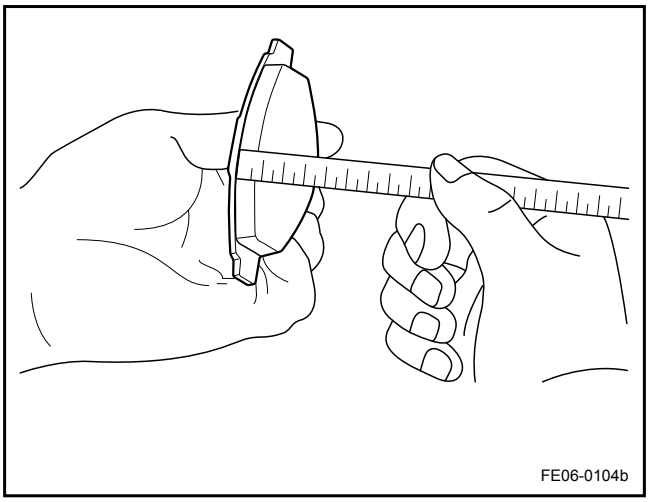
3. Disconnect the park brake from the rear caliper. Refer to 6.5.5.3 Park Brake Control Mechanism Cable Assembly Replacement.

4. Remove the rear brake caliper lower assembly bolts (2).




5. Flip the brake caliper upward.

6. Remove the rear brake pad.



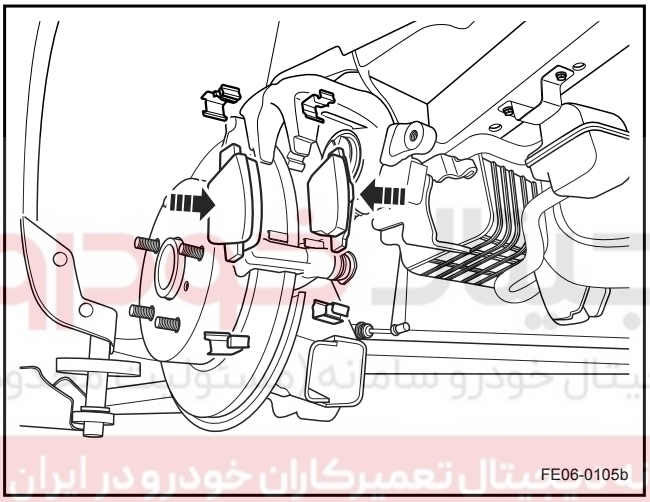

7. Check the brake pad thickness.

   Standard Thickness: 11.0 mm (0.433 in)
   Minimum Thickness: 2.0 mm (0.078 in)
   If the rear brake pad lining thickness is less than minimum, replace the rear brake pad.

   Note

   After replacing with new brake lining block, check the rear brake disc wear.

Installation Procedure:

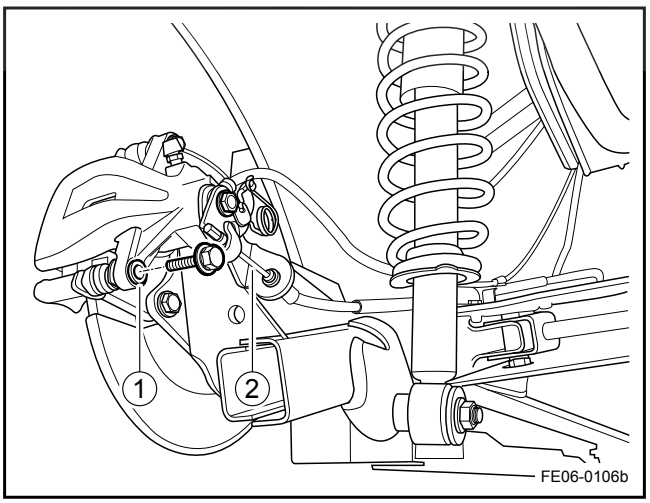



1. Check the rear brake pad lining thickness.

   Note

   Brake caliper piston gap should face the level direction.

2. Install the brake pad into the caliper.




3. Where necessary, use a suitable tool to push the piston.

   Note

   Carefully pull down the brake caliper assembly and install the bolts, do not to damage the piston dust seals.

4. Pull down the brake caliper and install the assembly bolt (1).

   Torque: 30 Nm (Metric) 22.2 lb-ft (US English)

   Note

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

5. Install the park brake cable (2).

6. Align the marks made during the wheel removal, install the rear wheels.

7. Lower the vehicle.

Note

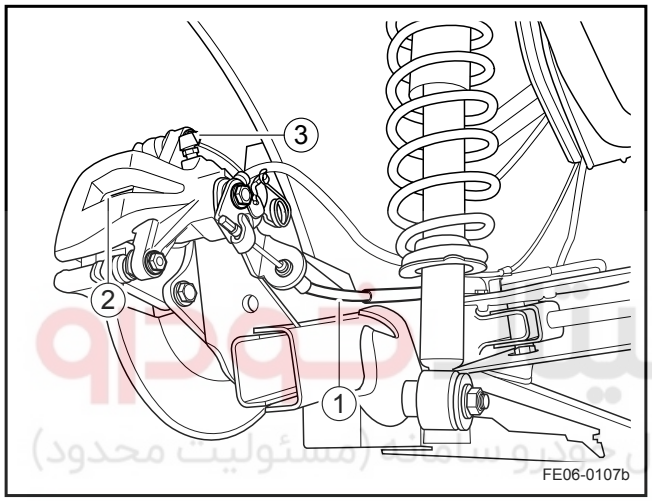
Left and right rear brake pad replacement is similar.

## 6.3.5.2 Brake Caliper Replacement - Rear

Removal Procedure:

Warning!

Refer to "Vehicle Lifting Warning" in "Warnings and Notices".
Refer to "Brake Fluid Effects on Paint and Electrical Components Notice" in "Warnings and Notices".

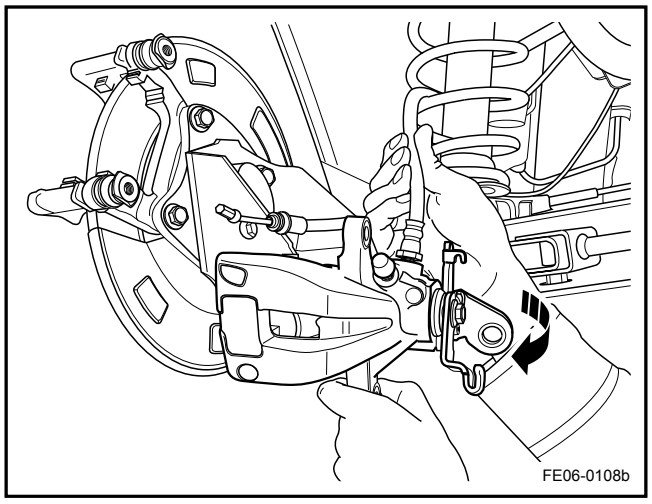



1. Lift and support the vehicle. Refer to 1.3 Lifting and Jacking the Vehicle.

Note

In order to maintain wheel balance, before the tire removal, mark the wheel to the wheel relative position.

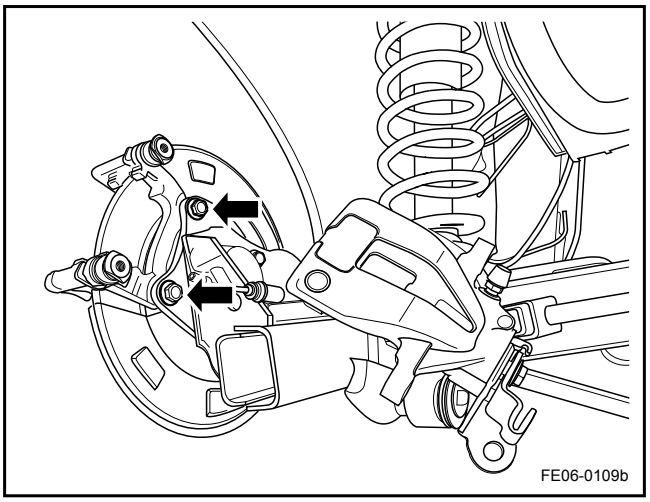
2. Remove the rear wheels. Refer to 4.4.5.1 Wheel Replacement.
3. Disconnect the park brake cable from the rear calipers. Refer to 6.5.5.3 Park Brake Control Mechanism Cable Assembly Replacement.
4. Remove the brake pad (2). Refer to 6.3.5.1 Brake Pad Replacement - Rear.
5. Remove the brake caliper upper assembly bolts, remove the brake caliper (3).




6. Remove the brake hose inlet retaining bolts, remove the brake caliper. Plug the brake caliper inlet and the brake hose, to prevent the brake fluid loss or contamination.

Note

Rotate to remove the brake caliper, separate the brake hose inlet bolt from the brake caliper fluid inlet to prevent damage to the brake hose.

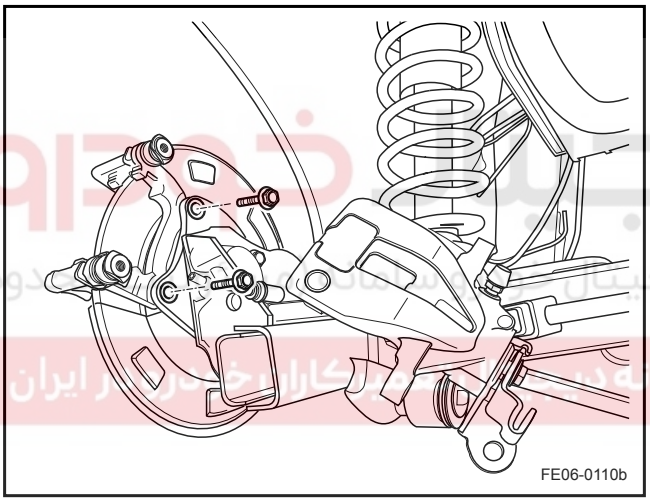



7. Remove the brake caliper bracket.

Installation Procedure:

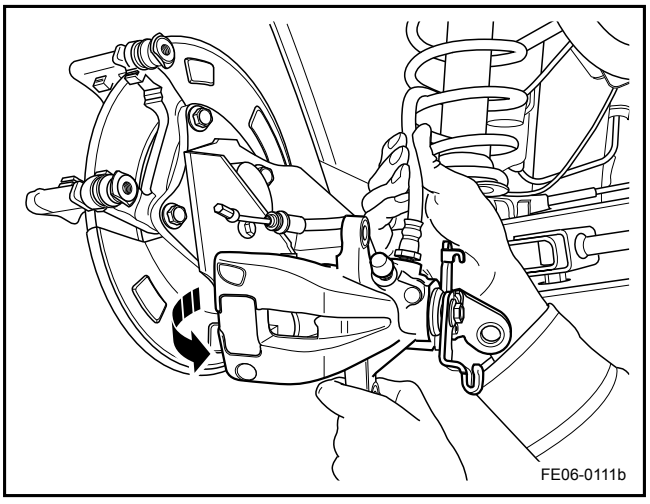
Warning!

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




1. Install the brake caliper bracket.

   Torque: 105 Nm (Metric) 77.7 lb-ft (US English)

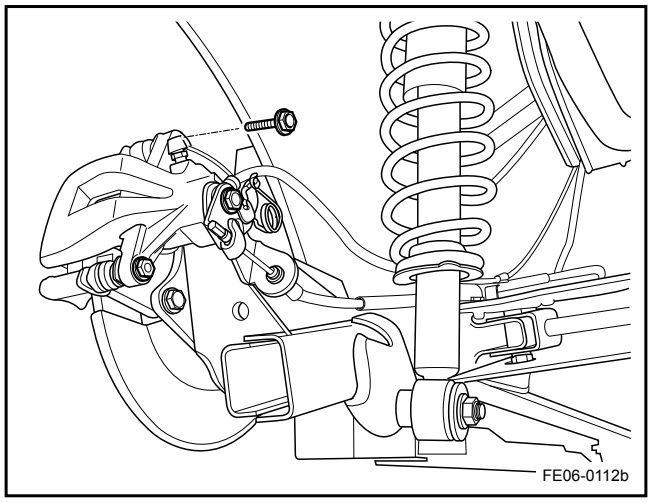



2. Install the brake caliper brake hose inlet bolt.

   Torque: 16 Nm (Metric) 11.8 lb-ft (US English)

   Note

   Rotate to install the brake caliper, install the brake hose inlet bolt to the brake caliper inlet to prevent damage to the brake hose.




3. Install the brake caliper and tighten the brake caliper upper assembly bolts.

   Torque: 30 Nm (Metric) 22.2 lb-ft (US English)

4. Install the brake pad.
5. Install the park brake cable.
6. Install the rear wheels.
7. Lower the vehicle.
8. Add clean brake fluid to the master cylinder tank to the correct level.
9. Bleed air in the brake system. Refer to 6.4.5.5 Hydraulic Brake System Exhaust Procedure.

   Note

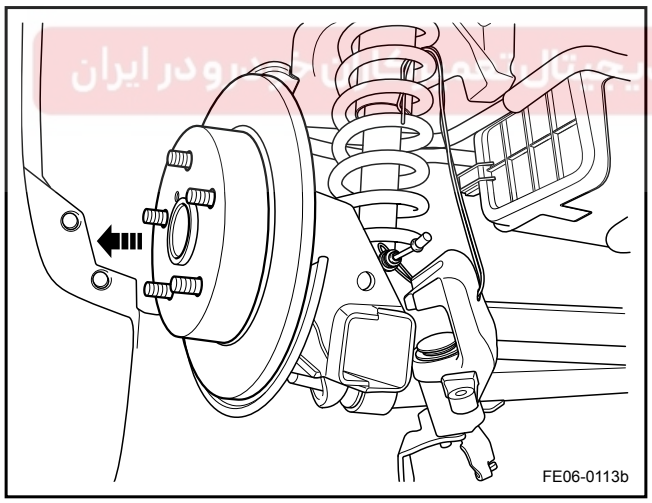
   Left and right rear brake caliper replacement is similar.

## 6.3.5.3 Brake Disc Replacement - Rear

Removal Procedure:

Warning!

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




1. Lift and support the vehicle. Refer to 1.3 Lifting and Jacking the Vehicle.

   Note

   In order to maintain wheel balance, before the tire removal, mark the wheel to the wheel relative position.

2. Remove the rear wheels. Refer to 4.4.5.1 Wheel Replacement.
3. Disconnect 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 pad. 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.

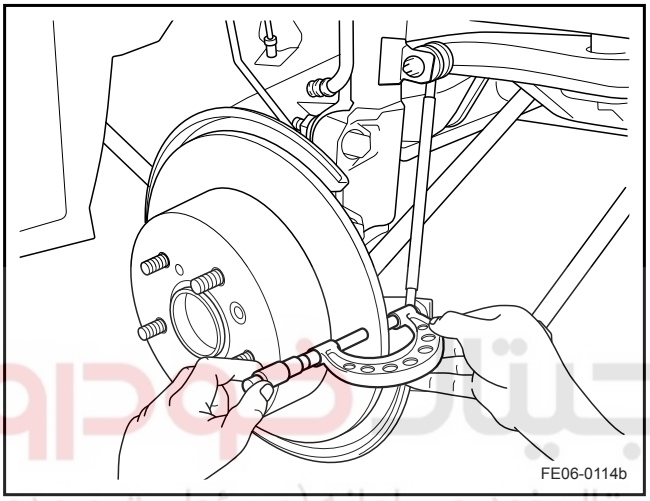
   Note

   Remove the brake caliper without having to remove the brake hose. Use a wire to support the brake caliper to avoid damage to the brake hose.

6. Remove the brake disc.

   Note

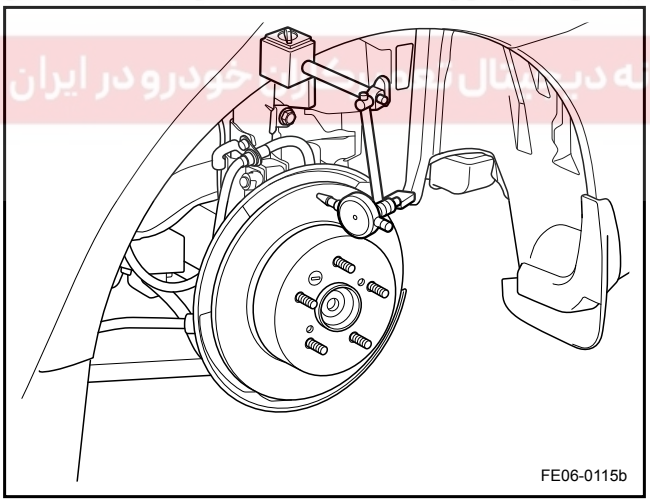
   Mark on the brake disc and wheel axle.


FE06-0114b

7. Check the brake disc thickness.

   Standard Thickness: 10.0 mm (0.390 in)
   Minimum Thickness: 8.5 mm (0.334 in)

   If the brake disc thickness is less than minimum, replace the rear brake disc.


FE06-0115b

8. Check the brake disc run out.

   - Install the brake disc.
   - Use a special tools and wheel nut to tighten the brake disc.

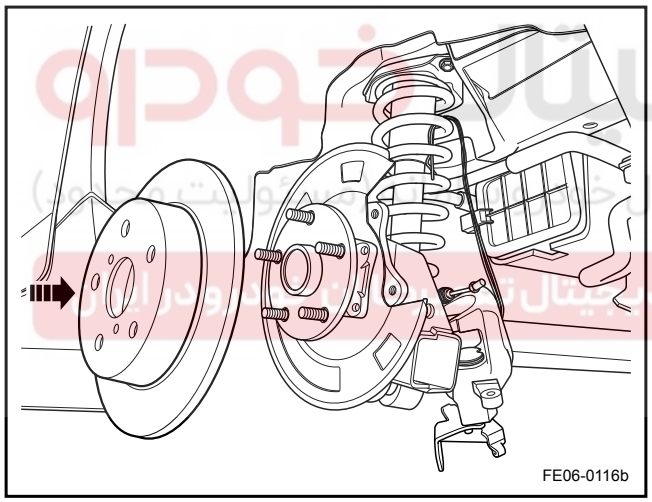
     Torque: 110 Nm (Metric) 81.4 lb-ft (US English)

– Use the dial indicator to measure the brake disc run out on the brake disc 10 mm (0.39 in) from the outer edge.

The largest brake disc run out: 0.05 mm (0.002 in)

Note

If the brake disc
If the run out is more than maximum, firstly change the brake disc and axle installation location so that the brake disc run out is the smallest. If after changing the installation location, the brake disc run out is still bigger than the maximum value, check up the wheel axle bearing gap. If the bearing clearance and wheel axle hub run out is normal, or the brake disc thickness is within the specified limits, grind the brake disc. If the brake disc thickness is less than the minimum, replace the brake disc.




Installation Procedure:

1. Align the brake disc and wheel axle with the mark, install the brake disc.
2. Install the brake caliper.
3. Install the brake pad.
4. Install the park brake cable.
5. Install the rear wheels.
6. Lower the vehicle.

Note

Left and right rear brake disc replacement is similar.

# 6.4 Hydraulic Brake

## 6.4.1 Specifications

### 6.4.1.1 Fastener Tightening Specifications

| Applications | Model | Specifications | |
|---|---|---|---|
| | | Metric (Nm) | US English (lb-ft) |
| Brake Master Cylinder Retaining Nut | M8 | 20-30 | 14.8-22.2 |
| Brake Master Cylinder Tube Connecting Nut | M10 | 11-21 | 8.1-15.5 |
| Brake Hose Connecting Nut | M10 | 11-21 | 8.1-15.5 |
| Vacuum Booster U-shape Clip Locking Nut | M10 | 15-25 | 11.1-18.5 |
| Vacuum Booster Retaining Nut | M8 | 20-25 | 14.8-18.5 |
| Clutch / Brake Pedal Assembly Lower Retaining Bolt | M8 × 16 | 20-25 | 14.8-18.5 |
| Clutch / Brake Pedal Assembly Upper Retaining Bolt | M8 × 15 | 20-25 | 14.8-18.5 |
| Clutch / Brake Pedal Assembly Retaining Nut | M8 | 16-26 | 11.8-19.2 |
| Pedal Installation Screw | M10 × 130 | 30-40 | 22.2-29.6 |
| Pedal Installation Nut | M10 | 30-40 | 22.2-29.6 |

## 6.4.2 Description and Operation

### 6.4.2.1 Description and Operation

Hydraulic braking system includes the following components:

Brake Pedal:Receives, amplifies and transmits braking system input from the driver.

Brake Pedal Putter:Transmits amplified brake pedal input force into the vacuum booster.

Vacuum Booster:Braking system input force is amplified through the brake pedal and passed to the vacuum booster, boosted by the vacuum brake booster and then transmitted to the master cylinder. Vacuum booster boosts the braking force by vacuum to help reduce the driver braking effort.

Vacuum Hose:Used for transmission of the vacuum booster required vacuum source.

Brake Master Cylinder Tank:Filled with the hydraulic brake fluid used by the system.

Brake Master Cylinder:Converts the mechanical input to hydraulic output pressure. Hydraulic pressure from the master cylinder output assigned to the two hydraulic fluid channels, providing braking fluid pressure to diagonal wheels.

Hard brake pipe and brake hose:Pass brake fluid flow to hydraulic brake system components.

Brake Wheel Cylinder:Converts the hydraulic input pressure to mechanical output force.



#### System Operation

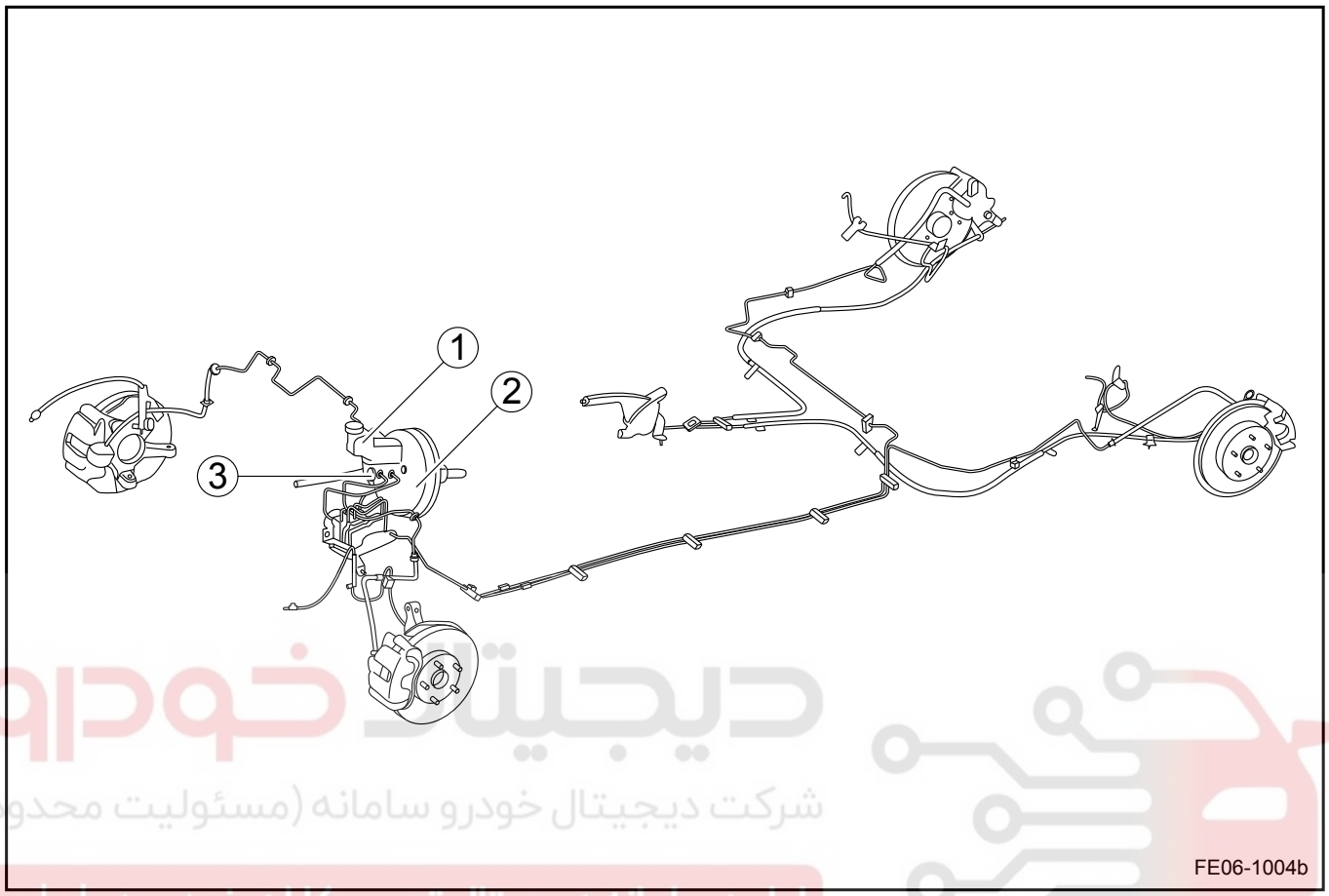
The mechanical force from the brake pedal is converted to fluid pressure by the master cylinder, through the hydraulic electronic control unit (ie HECU) , and through the brake pipes and hoses transferred to the braking cylinder. Brake Cylinder then converts the hydraulic pressure to the mechanical force. So the brake pad presses the brake disc to achieve the vehicle braking.

#### Brake Fluid Level Low Warning Lamp

Instrument cluster detects the low brake fluid level (signal circuit low voltage), and lights up the brake fluid level low warning lamp.

## 6.4.3 Component Locator

### 6.4.3.1 Component Locator






Legend

1. Brake Master Cylinder Tank
2. Vacuum Booster
3. Brake Master Cylinder

## 6.4.4 Diagnostic Information and Procedures

### 6.4.4.1 Diagnostic Notes

1. Be careful when replacing various components, it may affect the brake system performance and lead to driving danger. Use Geely genuine parts.
2. When servicing the brake system, keeping venues and parts clean is very important.
3. If brake fluid leakage is found, must disassemble components. If any unusual circumstance is found, replace with new components.
4. When removing brake components, wrap brake pipe joints to prevent dust, dirt and other impurities entering into the pipe.
5. When removing or installing brake pipes, do not damage or deform the brake pipes.
6. When installing brake pipes or brake hose, make sure do not distort or bend.
7. Brake hose must be away from the shock absorber oil, grease and so on.
8. After installing brake hardware, the pipes and brake hoses should not interfere with other components.
9. Do not let brake fluid adhere to the surface of the body such as painting. If the brake fluid leaks to the paint surface, promptly remove it.

### 6.4.4.2 Fault Symptom Table

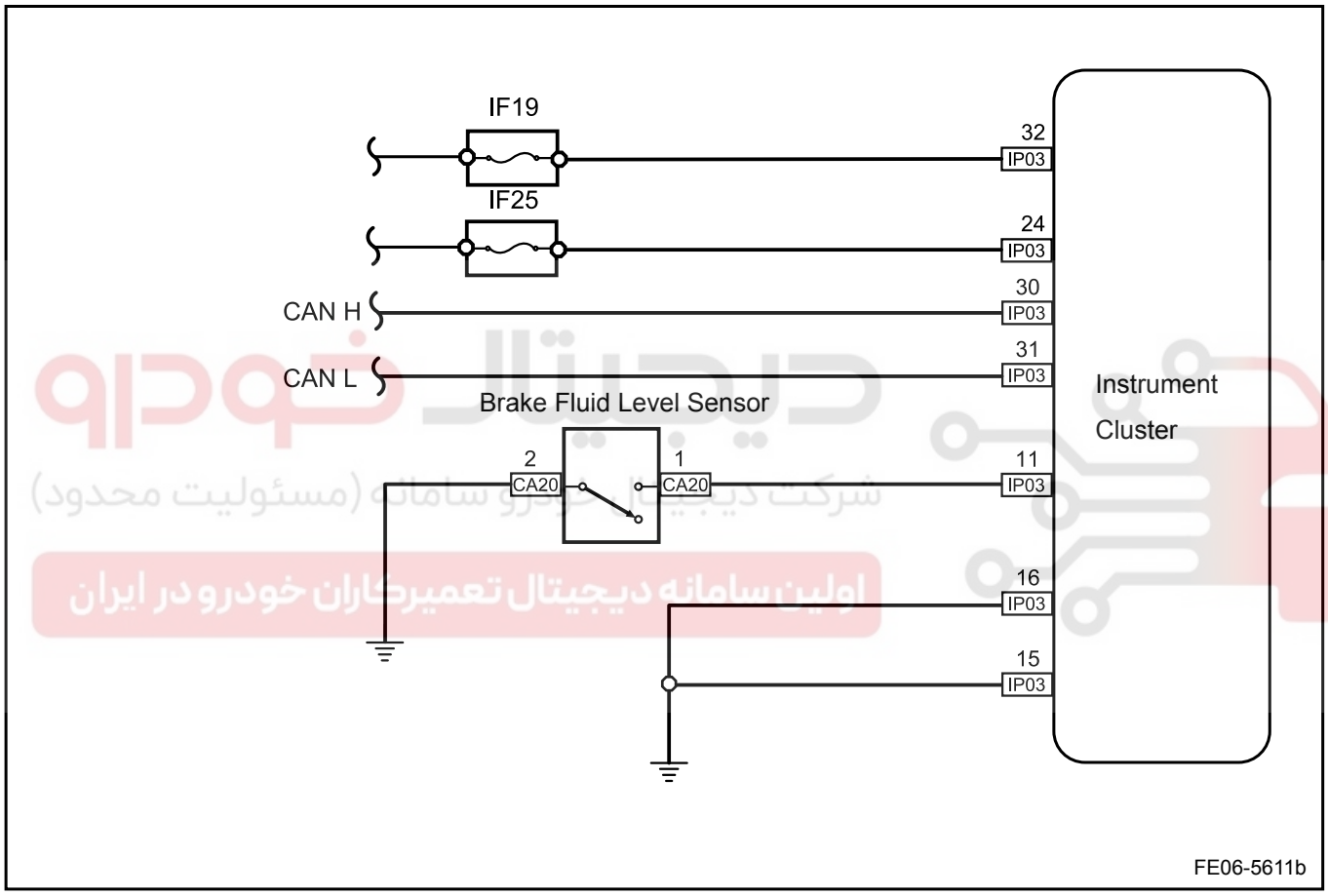
| Symptoms | Suspected Parts | Measures / Refer to |
|---|---|---|
| Brake Warning Lamp Always On | 1. Brake Surface | Refer to 6.4.4.3 Brake Warning Lamp Always On |
| | 2. Brake Fluid Level Sensor | Refer to 6.4.4.3 Brake Warning Lamp Always On |
| | 3. Brake Fluid Level Sensor Wiring Harness | Refer to 6.4.4.3 Brake Warning Lamp Always On |
| Brake System Noise | 1. Brake Pads (Broken, Twisted, Dirty, Smooth) | Refer to the front and rear brake Diagnostic Information and Procedures in the6.2.4.1 Brake Pad Inspection |
| | 2. Brake caliper bracket bolts (Loose) | Check the brake caliper bracket bolts |
| | 3. Brake caliper bolts (Loose) | Check the brake caliper bolts |
| | 4. Brake disc (Front) | Refer to 6.2.4.5 Brake Disc Surface and Worn Inspection |
| | 5. Brake Disc Guide (Loose) | Refer to the front and rear brake Diagnostic Information and Procedures in the6.2.4.3 Brake Guide Inspection |
| | 6. Brake Caliper Floating Pin (Worn) | Refer to the front and rear brake Diagnostic Information and Procedures in the6.2.4.4 Floating Brake Caliper Pin Inspection |
| Brake Deviation | 1. Piston (Fixed, and Block) | Refer to the front and rear brake Diagnostic Information and Procedures in the6.2.4.2 Brake Caliper Inspection |

| Symptoms | Suspected Parts | Measures / Refer to |
|---|---|---|
| | 2. Brake Disc | Refer to the front and rear brake Diagnostic Information and Procedures in the6.2.4.5 Brake Disc Surface and Worn Inspection |
| | 3. Brake Pad (Rupture, Distort or Grease) | Refer to the front and rear brake Diagnostic Information and Procedures in the6.2.4.1 Brake Pad Inspection |
| | 4 Brake Pipe, Hose (Distortion, Deformation) | Check the brake pipe, hose |
| Brake Pedal Too Hard | 1. Hydraulic brake booster system (Vacuum Leaks, Ineffective) | Check the hydraulic vacuum booster |
| | 2. Brake pipe, Hose (Distortion, Deformation) | Check the brake pipe, hose. |
| brake and brake pedal too soft | 1. Brake System Brake Fluid Leak | Check for brake fluid leak. |
| Brake and Brake Pedal Too Soft | 2. Air in the brake system | Refer to Removal and Installation6.4.5.5 Hydraulic Brake System Exhaust Procedure |
| | 3. Brake Disc | Refer to the front and rear brake Diagnostic Information and Procedures in the6.2.4.5 Brake Disc Surface and Worn Inspection |
| | 4. brake pads (broken, twisted, excessive wear or oil stains) | Refer to the front and rear brake Diagnostic Information and Procedures in the6.2.4.1 Brake Pad Inspection |
| | 5 Brake Master Cylinder (Internal Leakage) | Check the brake master cylinder. |
| Braking Lag | 1. Brake Pedal Free Travel Too Short | Refer to Removal and installation6.4.5.8 Brake Pedal Replacement |
| | 2. Brake Rod Travel (Can not adjust) | Refer to the Parking System Removal and Installation6.5.5.4 Park Brake Control Mechanism Adjustment |
| | 3. Front Park Brake Cable (Stuck) | Refer to 6.5.5.3 Park Brake Control Mechanism Cable Assembly Replacement |
| | 4. Left and Right Park Brake Cable (Stuck) | Refer to 6.5.5.3 Park Brake Control Mechanism Cable Assembly Replacement |
| | 5. Brake Lining Block (Catching) | Refer to the front and rear brake Diagnostic Information and Procedures in the6.2.4.1 Brake Pad Inspection |

| Symptoms | Suspected Parts | Measures / Refer to |
|---|---|---|
| | 6. Piston (Fixed, Catching) | Refer to the front and rear brake Diagnostic Information and Procedures in the6.2.4.2 Brake Caliper Inspection |
| | 7. Vacuum Booster Catching | Check the vacuum booster. |
| | 8. Brake Master Cylinder (Malfunction) | Check the brake master cylinder. |

## 6.4.4.3 Brake Warning Lamp Always On

Schematic:




Diagnostic Steps:

| | |
|---|---|
| Step 1 | Check the brake fluid surface. |

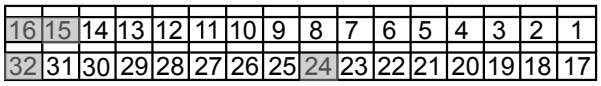
(a) Check whether the brake fluid surface is normal.

No → Fill the brake fluid to the MAX

Yes

| | |
|---|---|
| Step 2 | Check the wiring harness (instrument cluster - power, ground). |

Instrument Cluster Harness Connector IP03




FE09-5105b

(a) Turn the ignition switch to OFF.
(b) Disconnect the battery negative cable.
(c) Disconnect the instrument cluster connector IP03.
(d) Connect the battery negative cable.
(e) Turn the ignition switch to ON (IG).
(f) Measure voltage between connector IP03 terminals No. 24,32 and the body ground with a multimeter.
Standard Voltage: 11-14 V
(g) Turn the ignition switch to OFF.
(h) Measure voltage between connector IP03 terminals No. 15,16 and the body ground with a multimeter.
Standard Resistance: Less than 1 Ω

Is the voltage specified value?

No → Check the fuses, repair or replace the wiring harness.

Yes

| Step 3 | Check the brake fluid level sensor. |
|---|---|

(a) Disconnect the brake fluid level sensor wiring harness connector.
(b) Measure resistance between the brake fluid level sensor two terminals with a multimeter.
Standard Resistance: 10 kΩ or higher

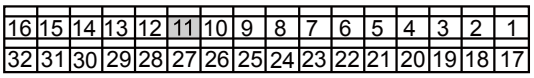
Is the resistance specified value?

No → Replace the brake fluid liquid level sensor. Refer to 6.4.5.7 Brake Fluid Level Sensor Replacement

Yes

| Step 4 | Check the brake fluid level sensor wiring harness. |
|---|---|

Instrument Cluster Harness Connector IP03



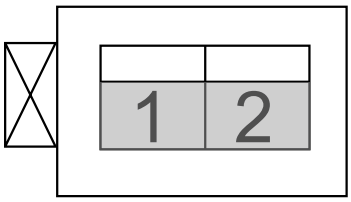

FE06-5609b

(a) Disconnect the instrument cluster harness connector IP03.
(b) Measure resistance between IP03 terminal No.11 and CA20 terminal No.1 with a multimeter.
(c) Measure resistance between CA20 terminal No.2 and the body ground with a multimeter.
Standard Resistance: Less than 1 Ω

Is the resistance specified value?

No → Repair or replace the wiring harness.

Brake Fluid Level Sensor Harness Connector CA20




FE06-5608b

Yes

| | |
|---|---|
| Step 5 | Replace the instrument cluster. |

(a) Replace the instrument cluster. Refer to 11.7.7.1 Instrument Cluster Replacement.

(b) Confirm the repair is completed.

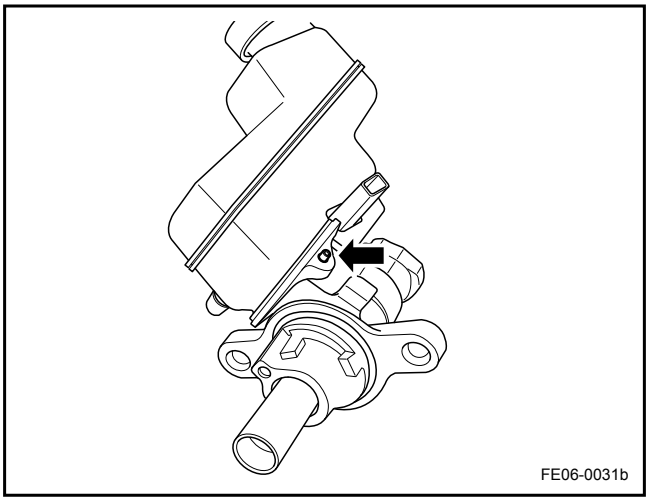
Next

| | |
|---|---|
| Step 6 | System normal. |

## 6.4.5 Removal and Installation

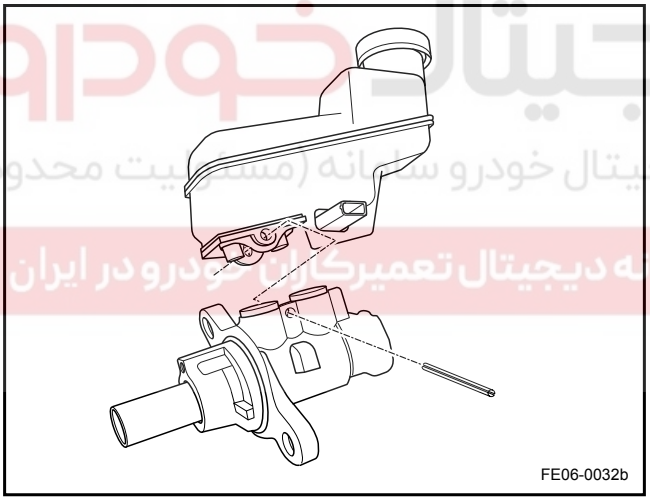
### 6.4.5.1 Brake Master Cylinder Tank Replacement

Removal Procedure:


FE06-0031b

1. Remove the brake master cylinder. Refer to 6.4.5.2 Brake Master Cylinder Replacement.
2. Remove the brake master cylinder and the tank connecting pin. From the brake master cylinder tank remove and replace the seals.

Installation Procedure:


FE06-0032b

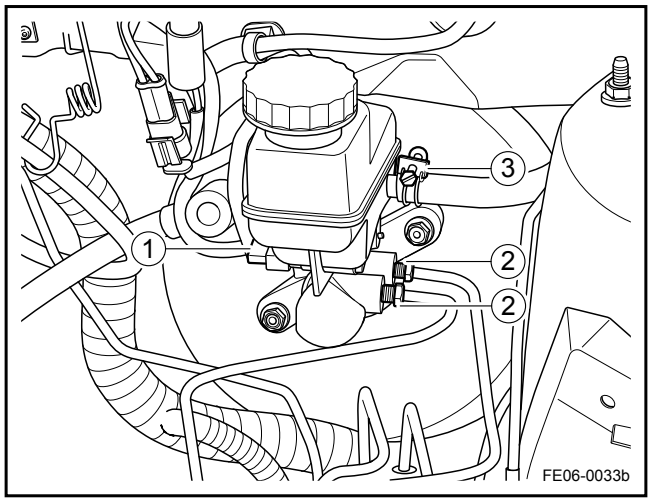
1. Apply clean brake fluid to lubricate tank seals.
2. Install the lubricated seal into the brake master cylinder.
3. Install the tank to the brake master cylinder and install the connecting pin.
4. Install the brake master cylinder with the tank.

### 6.4.5.2 Brake Master Cylinder Replacement

Removal Procedure:

Warning!

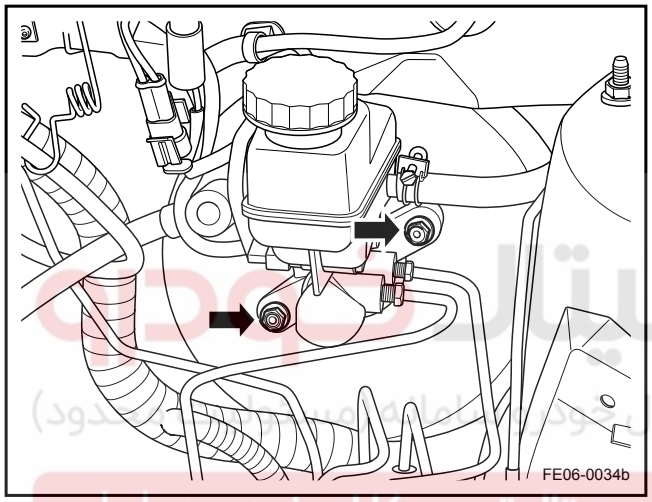
Refer to 'Battery Disconnect Warning" in "Warnings and Notices".



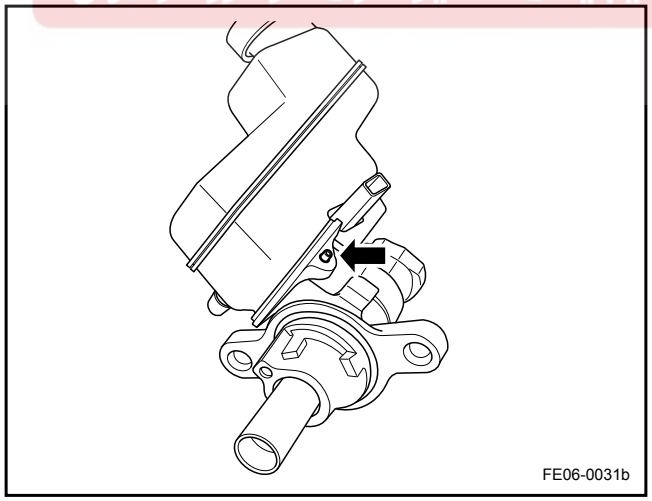

1. Disconnect the battery negative cable. Refer to 2.11.8.1 Battery Disconnection.
2. Drain the brake fluid.

   Note

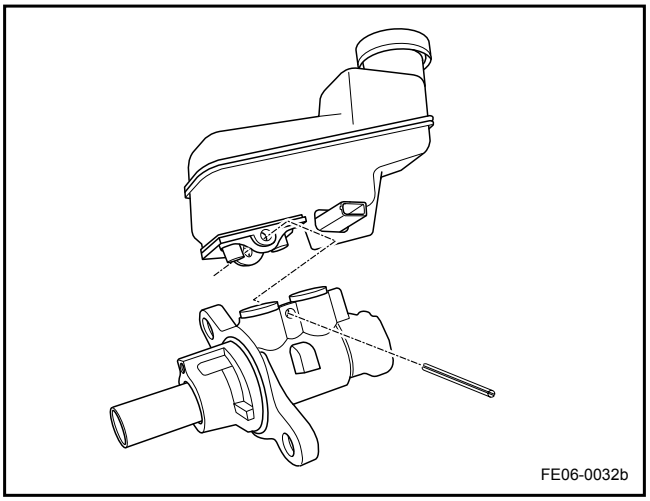
   Refer to "Brake Fluid Effects on Paint and Electrical Components Notice" in "Warnings and Notices".
3. Disconnect the brake fluid level sensor wiring harness connector (1), and remove the brake pipe connector nut (2).
4. Loosen clutch master cylinder to the tank hose clip (3), and pull the hose from the tank.




5. Plug the brake pipe openings to prevent brake fluid loss and contamination.
6. Remove the brake master cylinder retaining nuts.
7. Remove the brake master cylinder with the tank, place the brake master cylinder on a clean table.

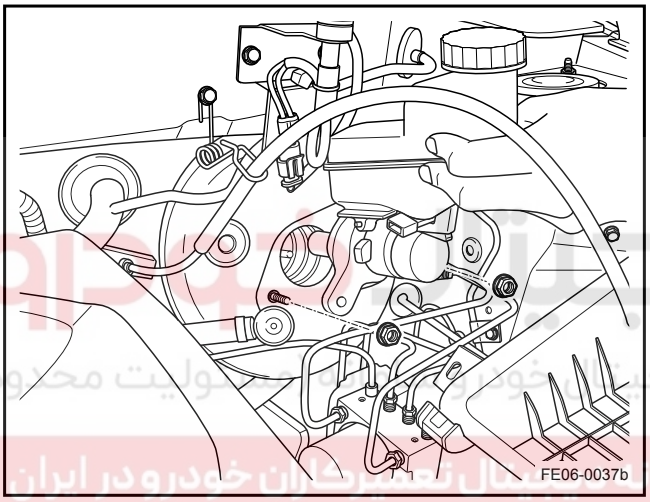



8. Remove the tank and the brake master cylinder connection pin, separate the tank and the brake master cylinder.
9. Remove the brake master cylinder.


FE06-0032b

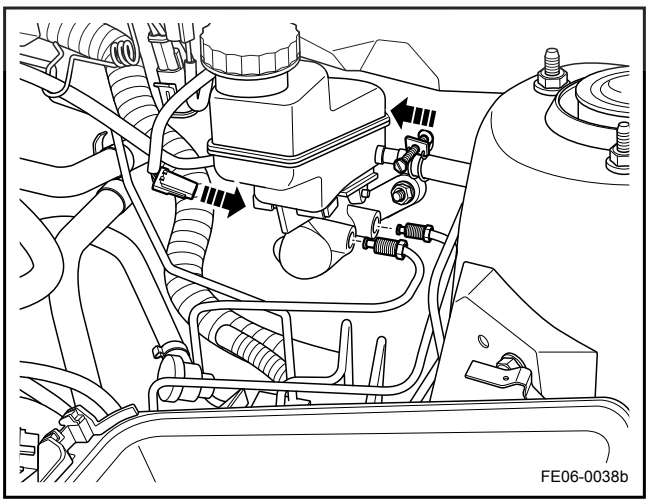
Installation Procedure:

1. Install the brake master cylinder to the tank connecting pin.


FE06-0037b

2. Install the brake master cylinder with the tank into the vacuum booster.
3. Tighten the brake master cylinder retaining nuts.

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


FE06-0038b

4. Connect the brake fluid level sensor harness connector, fix with the clutch master cylinder hose to the tank, tighten the brake pipe connecting nut.

   Torque: 16 Nm (Metric) 11.9 lb-ft (US English)
5. Add brake fluid.

   Note

   Refer to "Adding Fluid to the Brake System Notice" in "Warnings and Notices".
6. Bleed air in the brake system. Refer to 6.4.5.5 Hydraulic Brake System Exhaust Procedure.
7. Bleed air in the clutch system. Refer to 3.2.6.3 Hydraulic Clutch Bleeding.
8. Check for leaks.
9. Re-examine the brake fluid.

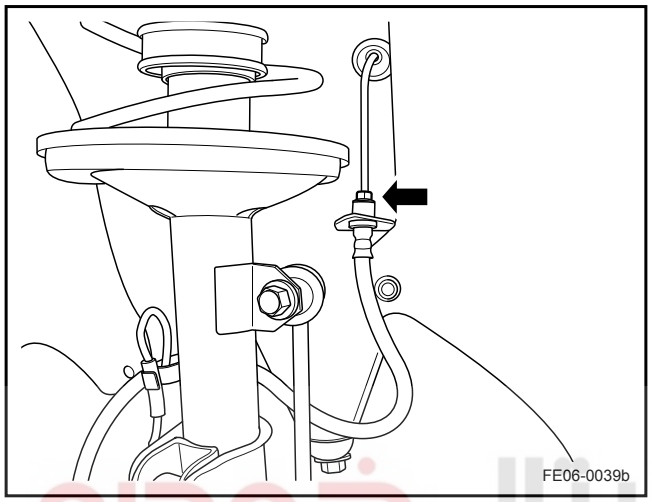
10. Connect the battery negative cable.

## 6.4.5.3 Brake Hose Replacement (Front)

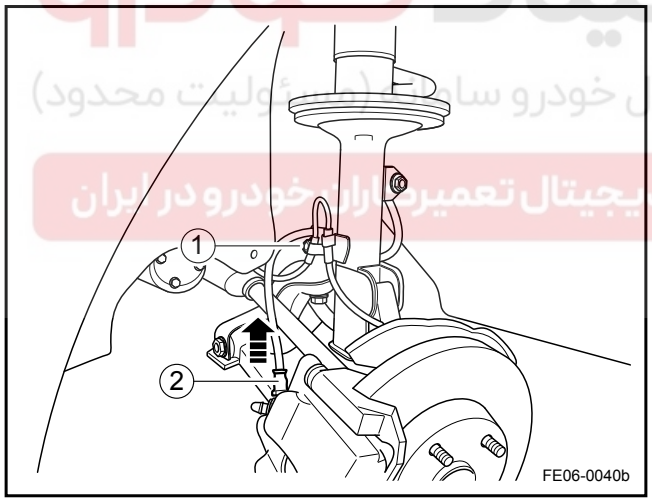
Removal Procedure:

Note

Refer to "Brake Fluid Effects on Paint and Electrical Components Notice" in "Warnings and Notices".




1. Drain the brake fluid.
2. Lift and support the vehicle. Refer to 1.3 Lifting and Jacking the Vehicle.
3. Remove the front wheels. Refer to 4.4.5.1 Wheel Replacement.
4. Remove the brake hose and brake pipe connecting bolts, pull out the spring, and remove the brake hose from the bracket.

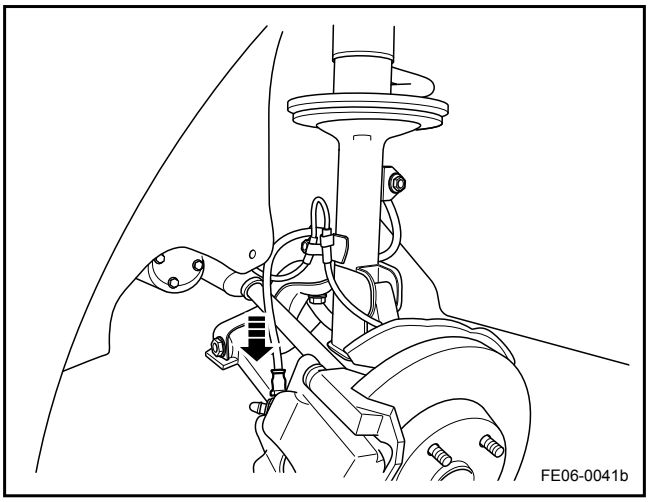



5. Remove the brake hose bolts (1), disconnect the brake hose from the shock absorber, remove the brake hose to the brake cylinder connecting bolt (2).
6. Remove the front brake hose.

Installation Procedure:

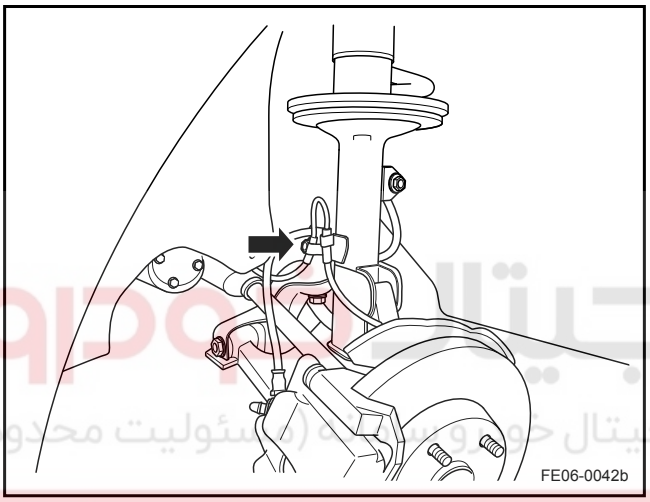
Warning!

Refer to "Brake Pipe Replacement Warning" in "Warnings and Notices".

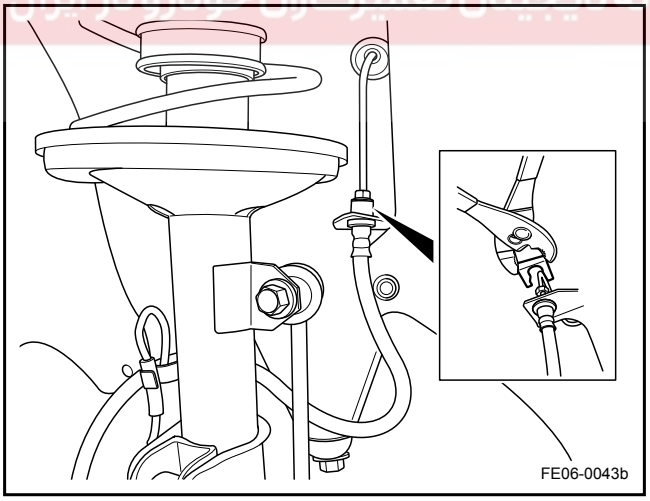



1. Install the brake hose to the brake cylinder and tighten the bolts.

   Torque: 16 Nm (Metric) 11.9 lb-ft (US English)




2. Fix the brake hose.




3. Connect the brake hose and the brake pipe and tighten the bolt, install the spring.

   Torque: 16 Nm (Metric) 11.9 lb-ft (US English)

4. Install the wheels.

   Note

   Refer to "Adding Fluid to the Brake System Notice" in "Warnings and Notices".

5. Fill the brake fluid.

6. Check fluid leak.

   Note

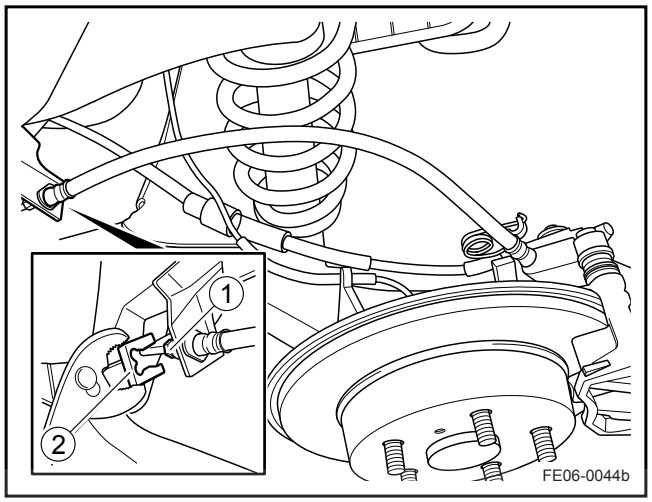
   Front left and right brake hose replacement is similar.

## 6.4.5.4 Brake Hose Replacement (Rear)

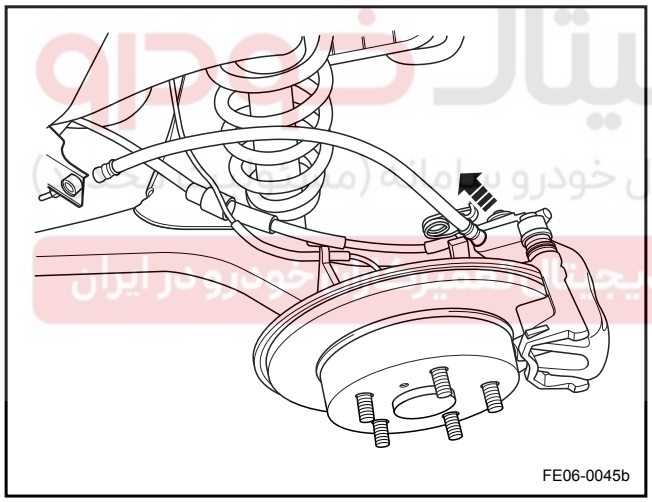
Removal Procedure:

Note

Refer to "Brake Fluid Effects on Paint and Electrical Components Notice in ""Warnings and Notices".




1. Drain the brake fluid.
2. Lift and support the vehicle. Refer to1.3Lifting and Jacking the Vehicle.
3. Remove the rear wheels, taking into account4.4.5.1Wheel Replacement.
4. Remove the bolts, separate the brake pipe and brake hose (1).
5. Pull out the spring, pull out brake hose (2) from the bracket.

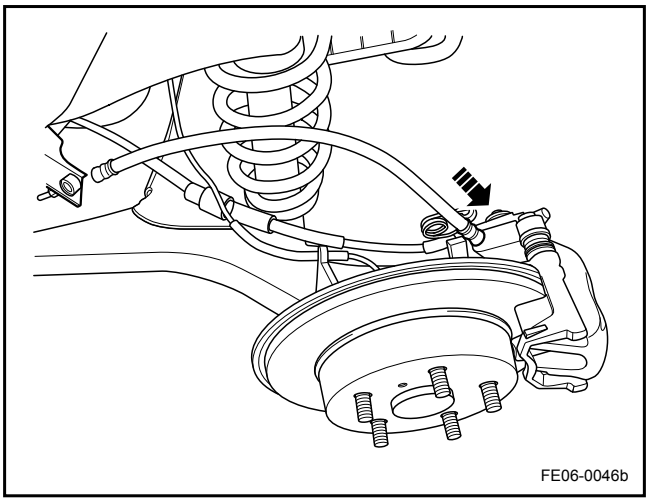



6. Remove the bolts, disconnect the the brake hose from the rear brake slave cylinder.
7. Remove the rear brake hose.

Installation Procedure:

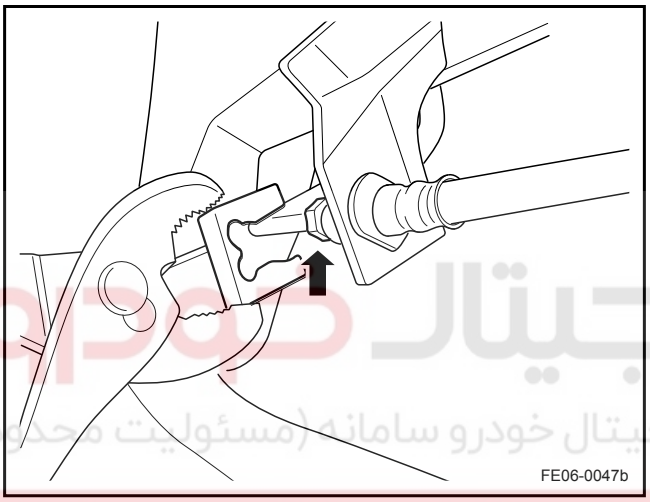
Warning!

Refer to "Brake Pipe Replacement Warning" in "Warnings and Notices".




1. Install the brake hose to the rear brake cylinder and tighten the bolts.

   Torque: 16 Nm (Metric) 11.9 lb-ft (US English)




2. Connect the brake hoses and the brake pipe and tighten the bolts, install the spring.
3. Install the wheels.

   Note

   Refer to "Brake Fluid Effects on Paint and Electrical Components Notice" in "Warnings and Notices".
4. Fill the brake fluid.
5. Check brake fluid leak.

   Note

   Rear brake left and right brake hose replacement is similar.



## 6.4.5.5 Hydraulic Brake System Exhaust Procedure

Note

Refer to "Adding Fluid to the Brake System Notice" in "Warnings and Notices".

Note

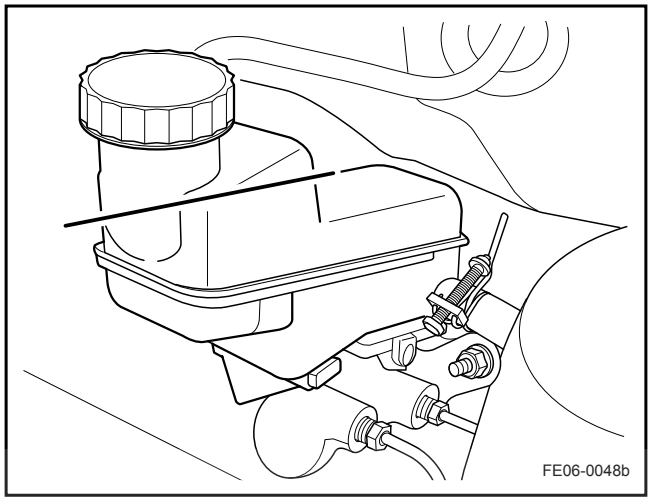
Air can not be discharged in hydraulic brake regulator manually. If the air enters the ABS hydraulic brake regulator or the installed ABS hydraulic brake adjuster is not fully filled with fluid, using a scan tool to exhaust brake system air. The factory ABS hydraulic brake adjuster is fully filled with fluid, and air is exhausted. In the normal service regulator procedure, the air will not enter the ABS hydraulic brake regulator, in this case, carry out the manual exhaust program.

Note

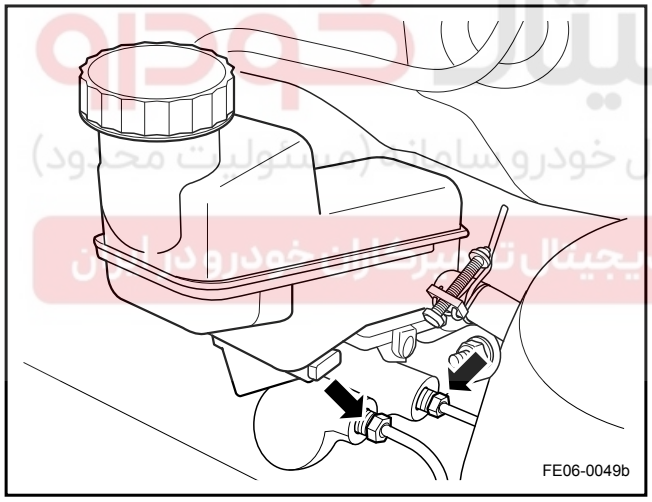
If it is not suspected that air enters the master cylinder, start from step 5. Otherwise, start from step 2.

Note

Refer to "Brake Fluid Effects on Paint and Electrical Components Notice" in "Warnings and Notices".



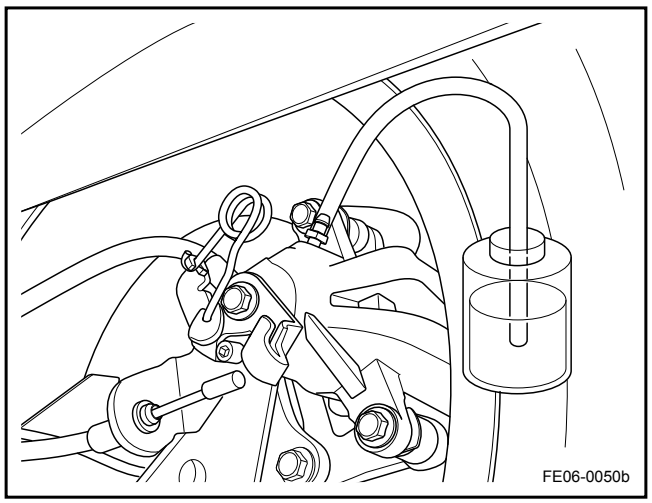

1. Shut down the engine, press the brake pedal several times until the completely eliminate the booster pressure.
2. Fill the brake fluid to the master cylinder tank. in the exhaust operations, leave the master cylinder tank fluid level at least more than half.
3. Slowly press the brake pedal to the end, and hold the position.




4. Loosen one brake master cylinder pipe, tighten the connection when the brake fluid flows out.

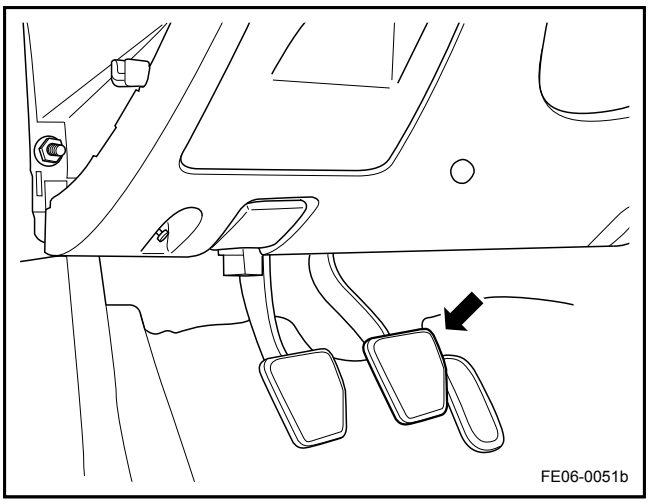
   Torque: 16 Nm (Metric) 11.9 lb-ft (US English)
5. Loosen the other brake master cylinder pipe, tighten the connection when the brake fluid flows out.

   Torque: 16 Nm (Metric) 11.9 lb-ft (US English)
6. Repeat steps 2 to step 5 three to four times.

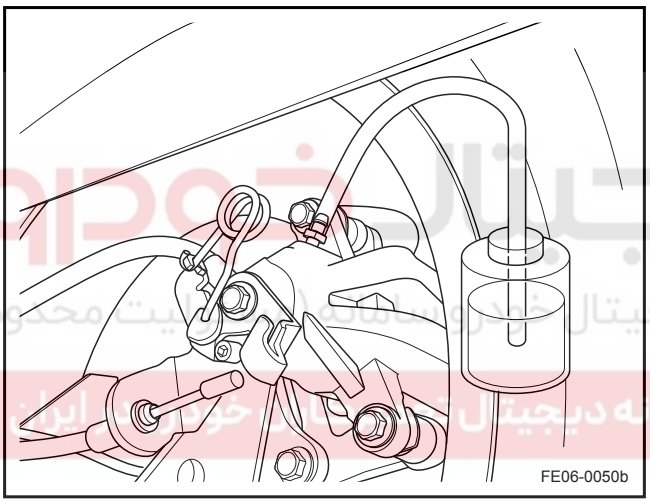



7. Remove the air discharge screw dust cover, connect a transparent tube to the right rear brake caliper air discharge screw. The tube is immersed in a transparent

container with brake fluid inside. Discharge the right rear brake caliper air according to the following steps.




8. Slowly press the brake pedal, do not press the brake pedal abruptly.



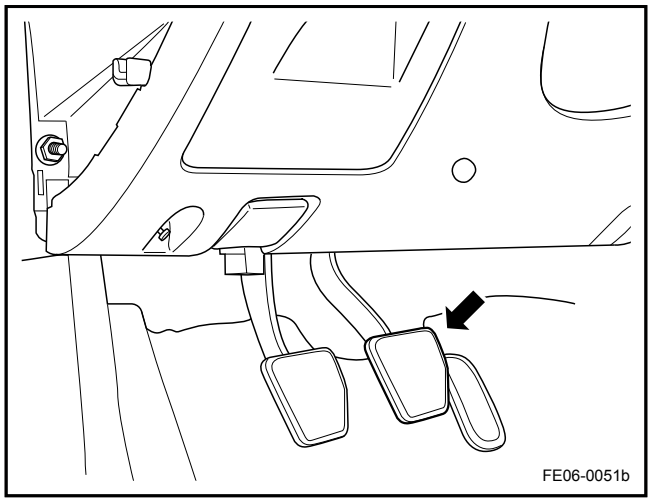

9. Press the brake pedal, at the same time, loosen the air discharge screw, exhaust the air in the brake caliper.
10. When bubbles emerge in the brake fluid container, slightly tighten the air discharge screw.
11. Slowly release the brake pedal.
12. Wait for 20 s, repeat steps 6-9 until all the air is discharged.
13. Loosen the air discharge screw, if the bubble no longer appears in the container, this indicates that the air has been fully discharged.

    Note

    In the exhaust process, leave the master cylinder tank fluid level at least more than half.

14. Tighten the air discharge screw.

    Torque: 6.5 Nm (Metric) 4.8 lb-ft (US English)



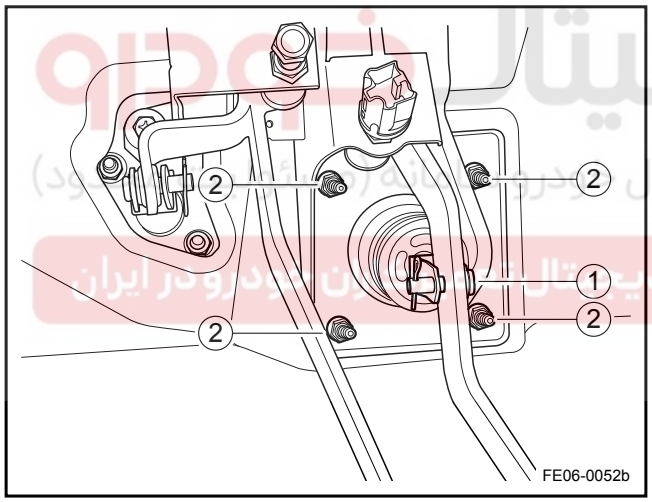

15. Discharge air in sequence of the left front, left rear and right front brake caliper. Follow the steps 5-12.
16. After discharging all the brake caliper air, check whether the brake pedal is soft and whether the pedal has no resistance at all. repeat the entire discharge process, until the pedal is normal.

## 6.4.5.6 Vacuum Booster Replacement

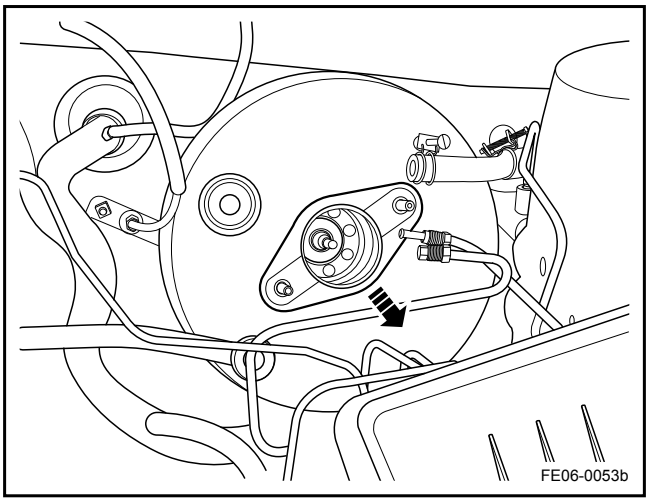
Removal Procedure:

Warning!

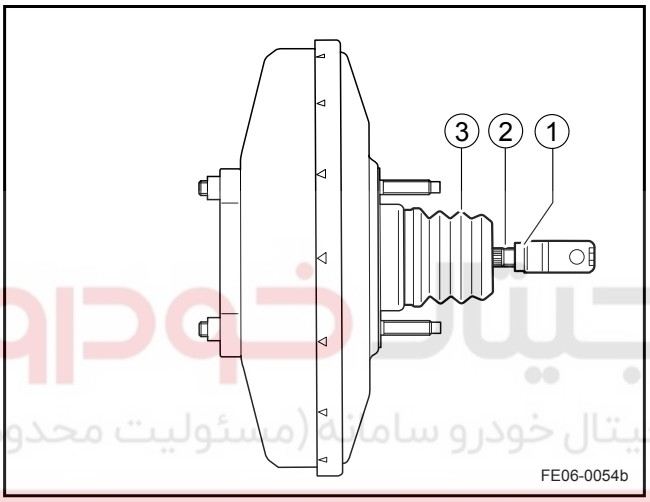
Refer to "Battery Disconnect Warning" in "Warnings and Notices".




1. Disconnect the battery negative cable. Refer to 2.11.8.1 Battery Disconnection.
2. Remove the brake fluid tank and the brake master cylinder assembly. Refer to 6.4.5.2 Brake Master Cylinder Replacement.
3. Remove the vacuum hose.
4. Remove the Instrument panel lower left panel. Refer to 12.8.3.1 Instrument Panel Replacement.
5. Separate the vacuum booster rod U-shape clip and the brake pedal.
6. Remove the clutch / brake pedal assembly retaining nuts (2).




7. Remove the vacuum booster.

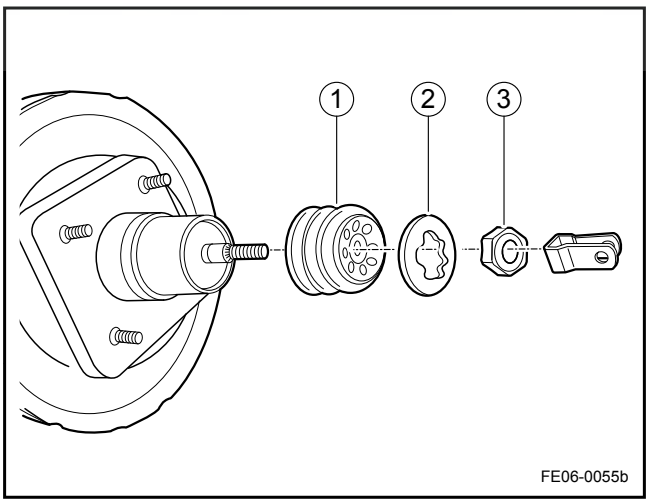



8. Release the connecting rod U-shape clip locking nut, remove the U-shape clip and the locking nut (1).
9. Remove the spring clip (2).
10. Remove the rubber sleeve and gasket (3).

Note

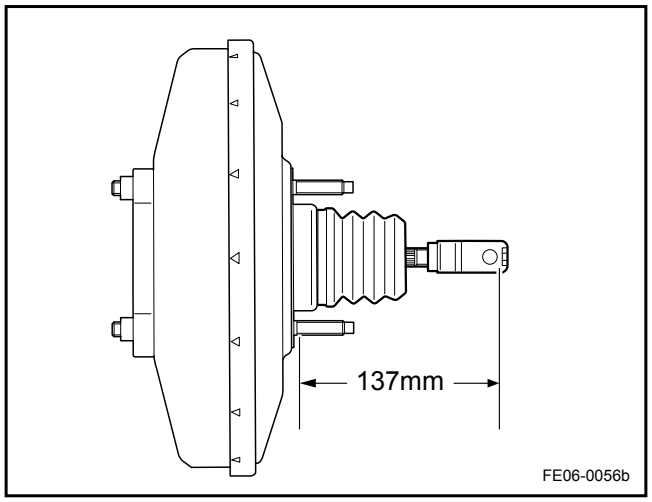
If the rubber sleeve is damaged or aging, replace it and the gasket.






Installation Procedure:

1. Install a new gasket, install the rubber sleeve to the booster rod.
2. Install the spring clip (2).
3. Install the U-shape clip and the U-shape rod locking nut, and tighten the nut 3.

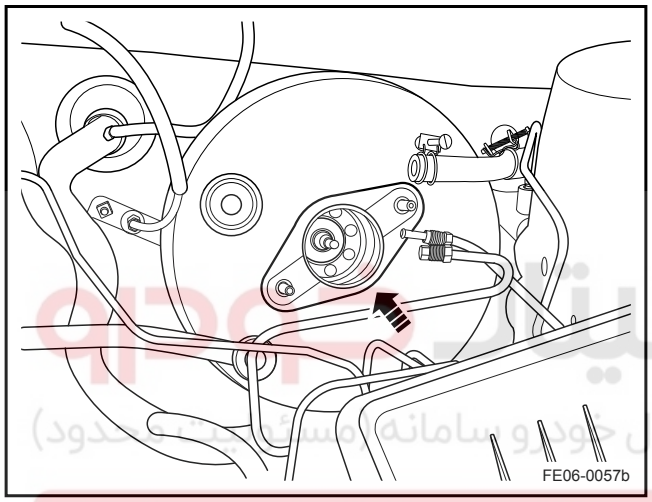



4. Adjust the U-shape rod clip travel.

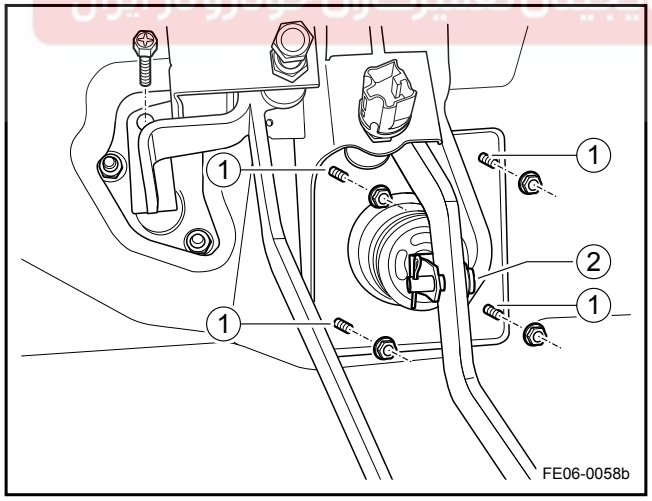
   U-shape rod clip and the booster rear end distance:137 mm (5.39 in).

5. Tighten the U-shape clip lock nut.

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




6. Install the vacuum booster.




7. Tighten the clutch / brake pedal assembly retaining nuts (1).

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

8. Connect the vacuum booster U-shape rod clip and the brake pedal (2).

9. Install the Instrument panel lower left panel.

10. Install the vacuum hose.

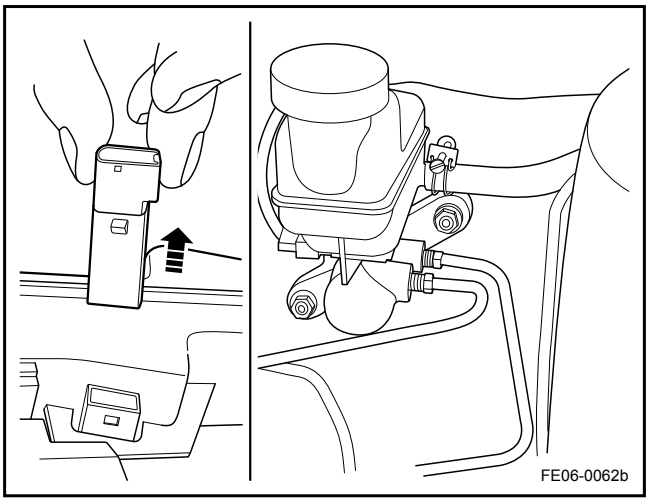
11. Install the brake fluid tank and the brake master cylinder assembly.

## 6.4.5.7 Brake Fluid Level Sensor Replacement

Removal Procedure:

Warning!

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

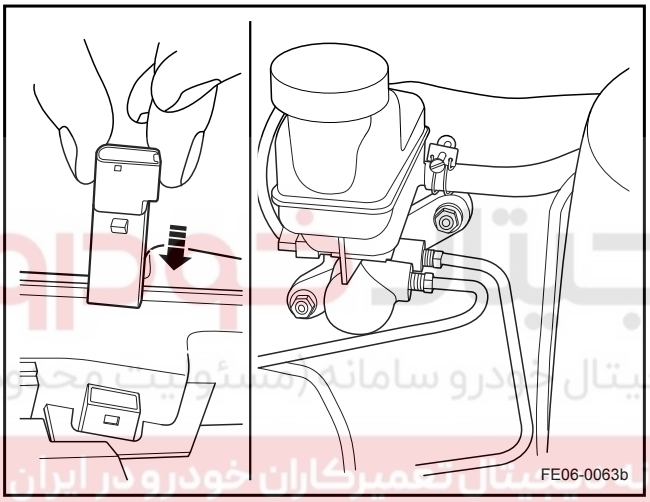



1. Disconnect the battery negative cable. Refer to 2.11.8.1 Battery Disconnection.
2. Disconnect the brake fluid level sensor wiring harness connector.
3. Remove the brake fluid level sensor from the brake fluid tank bottom.

Note

No need to discharge brake fluid.

Installation Procedure:

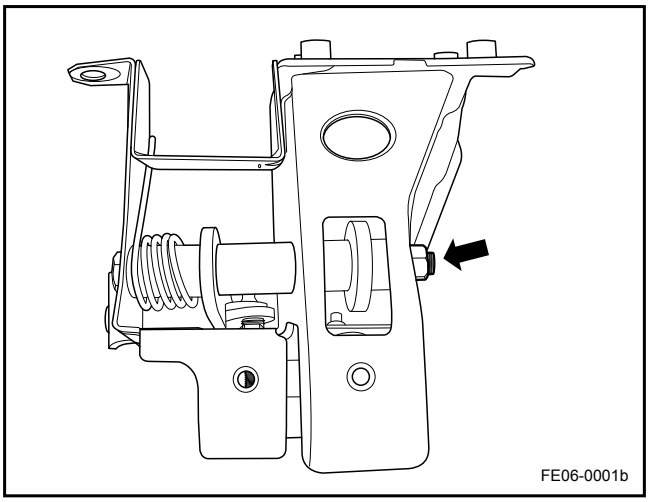



1. Install the brake fluid level sensor to the tank.
2. Connect the brake fluid level sensor wiring harness connector.
3. Connect the battery negative cable.

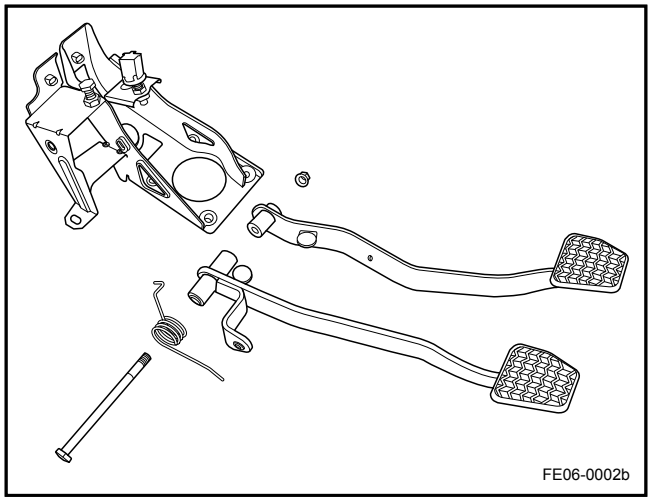


## 6.4.5.8 Brake Pedal Replacement

Removal Procedure:




1. Remove the clutch / brake pedal assembly. Refer to 3.2.6.1 Clutch Pedal Replacement.
2. Remove the clutch / brake pedal assembly, remove the nut and remove the pedal installation bolt.
3. Remove the brake pedal.




Installation Procedure:

1. Install the brake pedal and clutch pedal.
2. Install the pedal bolt and nut.

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

   Note

   Apply grease to the pedal axle and the return spring.
3. Install the clutch / brake pedal assembly.

# 6.5 Parking System

## 6.5.1 Specifications

### 6.5.1.1 Fastener Tightening Specifications

| Applications | Model | Specifications | |
|---|---|---|---|
| | | Metric (Nm) | US English (lb-ft) |
| Park Brake Control Mechanism Switch Assembly Retaining Screw | ST4.2 × 15 | 4.5 | 3.3 |
| Park Brake Control Mechanism Assembly Rod Assembly To Body Retaining Bolt | M8 × 25 | 16-26 | 13.3-16.2 |
| Park Brake Cable Retaining Bolts | M6 × 14 | 6-12 | 4.4-8.9 |

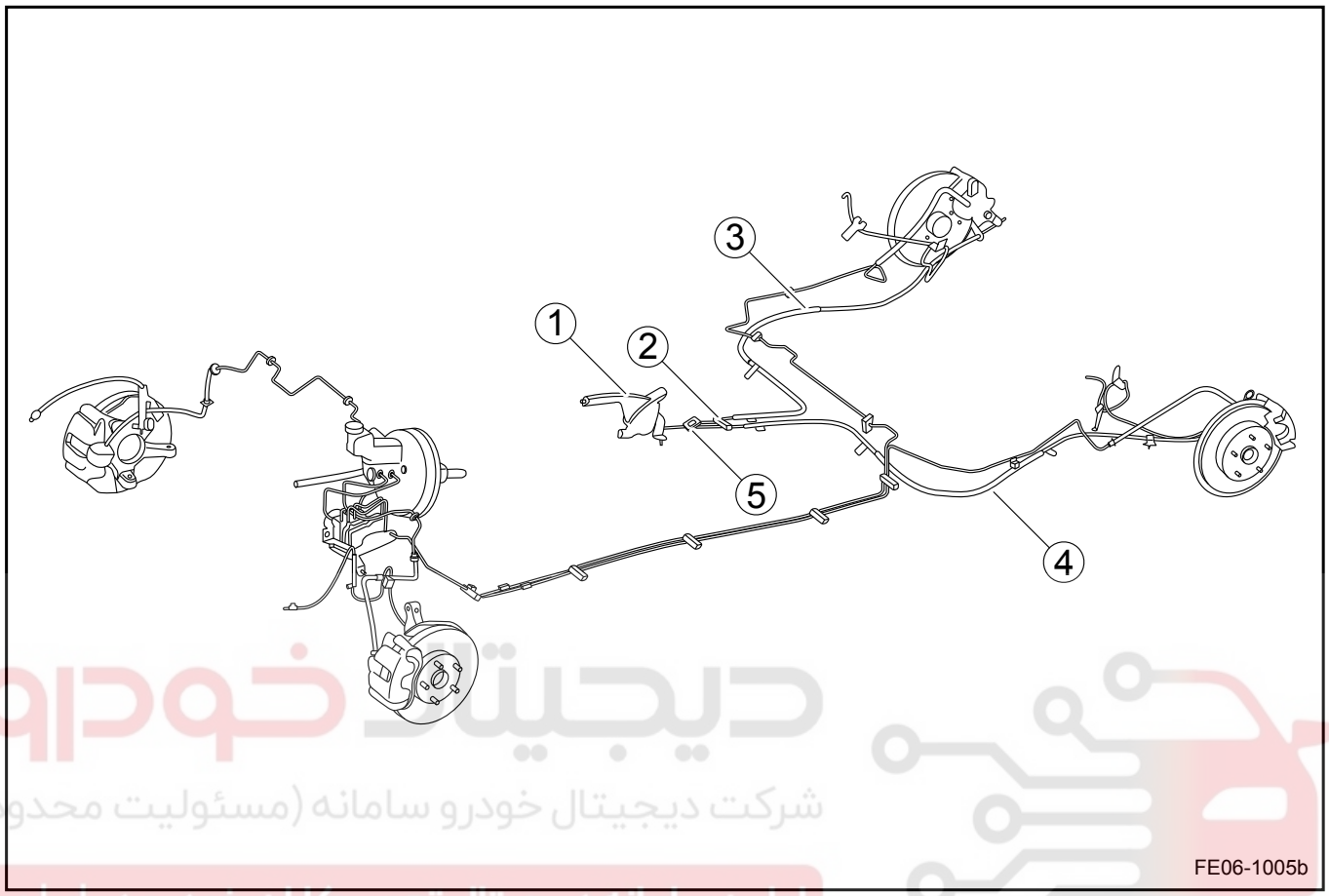
## 6.5.2 Description and Operation

### 6.5.2.1 Description and Operation

Park brake system is a mechanical system that operates the rear disc brake caliper rod through the park brake cable. Pull the cable to activate the system. The park brake pull handle controls rear disc brake caliper piston work through the cable. When the park brake is applied and the ignition switch is turned on, the park brake indicator light in the instrument cluster will be turned on. Pull up the park brake handle and press the button on the handle to drop down the handle and release the park brake. The park brake indicator light in the instrument cluster will be turned off.

## 6.5.3 Component Locator

### 6.5.3.1 Component Locator






Legend

1. Park Brake Control Mechanism Assembly
2. Park Brake Front Cable
3. Right Rear Park Brake Cable With Bracket Assembly
4. Left Rear Park Brake Cable With Bracket Assembly
5. Pull Cable Adjuster

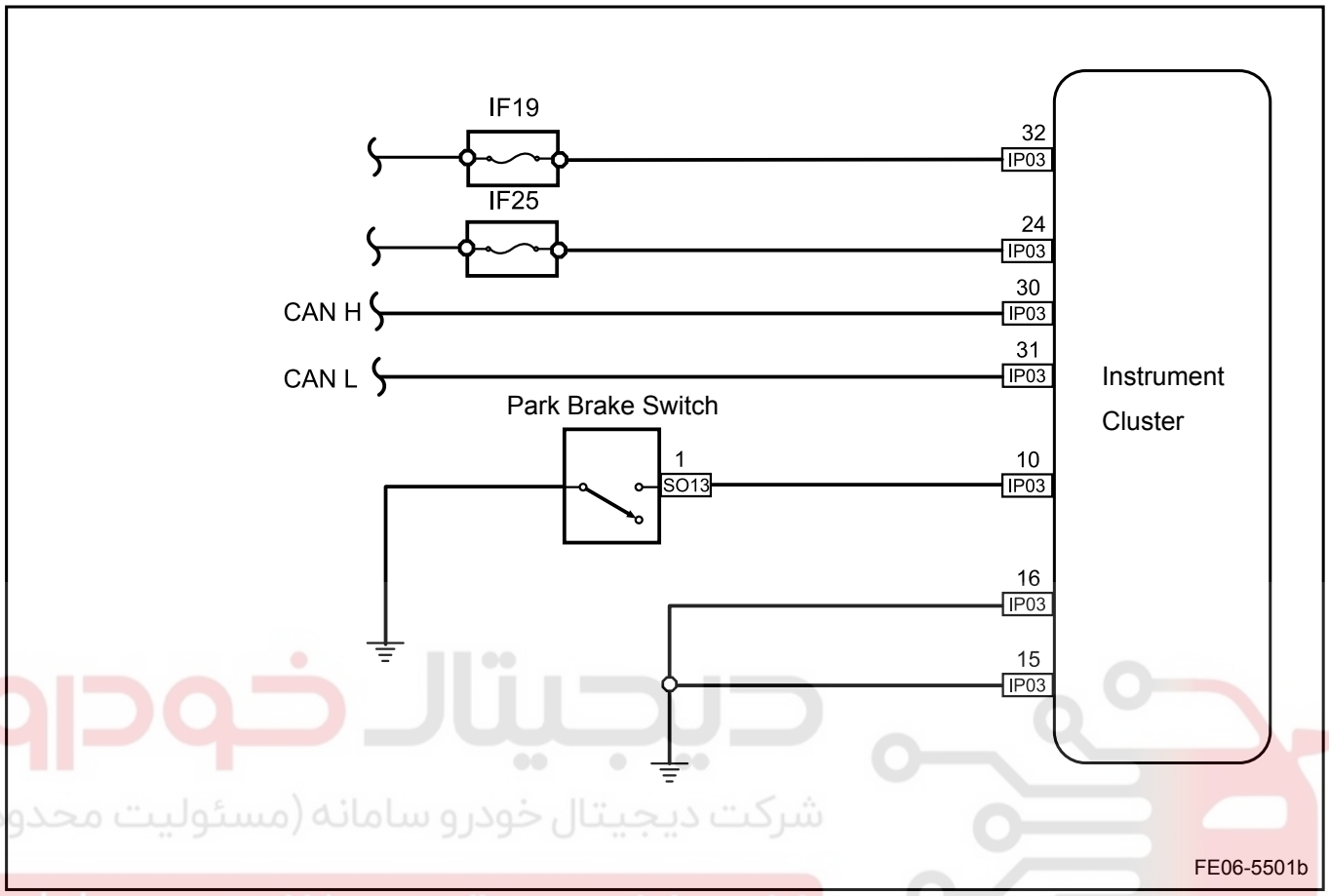
## 6.5.4 Diagnostic Information and Procedures

### 6.5.4.1 Fault Symptom Table

| Symptoms | Suspected Parts | Measures / Refer to |
|---|---|---|
| Park Brake Dragging | 1. Park Brake Handle Travel Too Small | Refer to 6.5.5.4 Park Brake Control Mechanism Adjustment |
| | 2. Park Brake Front Cable (Stuck) | Refer to 6.5.5.3 Park Brake Control Mechanism Cable Assembly Replacement |
| | 3. Left and Right Park Brake Cable (Stuck) | Refer to 6.5.5.3 Park Brake Control Mechanism Cable Assembly Replacement |
| | 4. Rear Disc Brake Pads (Broken or Distorted) | Refer to the rear brake system 6.2.4.1 Brake Pad Inspection |
| | 5. Rear Disc Brake Caliper Failure (Can not return) | Refer to the rear brake system 6.2.5.2 Brake Caliper Replacement - Front |
| Park Brake Failure | 1. Park Brake Handle Travel Too Great | Refer to 6.5.5.4 Park Brake Control Mechanism Adjustment |
| | 2. Park Brake Front Cable (Stuck, Broken) | Refer to 6.5.5.3 Park Brake Control Mechanism Cable Assembly Replacement |
| | 3. Left and Right Park Brake Cable (Stuck, Broken) | Refer to 6.5.5.3 Park Brake Control Mechanism Cable Assembly Replacement |
| | 4. Rear Disc Brake Pads (Wear and tear to the limit) | Refer to the rear brake system 6.2.4.1 Brake Pad Inspection |
| | 5. Rear Disc Brake Caliper Failure | Refer to the rear brake system 6.2.4.2 Brake Caliper Inspection |

## 6.5.4.2 Park Brake Warning Lamp Malfunction

Schematic:






Diagnostic Steps:

| | |
|---|---|
| Step 1 | Check the park brake switch. |

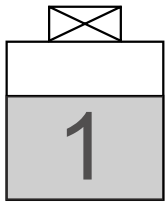
(a) Disconnect the brake switch connector SO13.
(b) Check the park brake switch ground.
(c) Pull up the park brake handle, check whether the switch is off.

No → Repair, adjust or replace the park brake switch

Yes

| | |
|---|---|
| Step 2 | Check the wiring harness between SO01-SO13. |

Park Brake Switch Harness Connector SO13



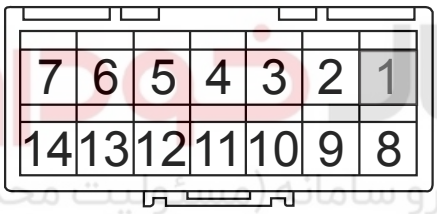

FE06-5502b

(a) Disconnect the harness connectors IP49 and SO01 connection.
(b) Measure resistance between SO01 terminal No.1 and SO13 terminal No.1 with a multimeter.
Standard Resistance: Less than 1 Ω
(c) Measure resistance between SO01 terminal No.1 and the body ground with a multimeter.
Standard Resistance: 10 kΩ or higher

Is the resistance specified value?

No → Repair or replace the wiring harness

To Instrument Cluster Harness Connector SO01

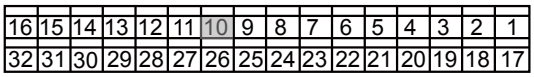



FE06-5503b

Yes

| Step 3 | Check the wiring harness between the IP03-IP49. |
|---|---|

Instrument Cluster Harness Connector IP03

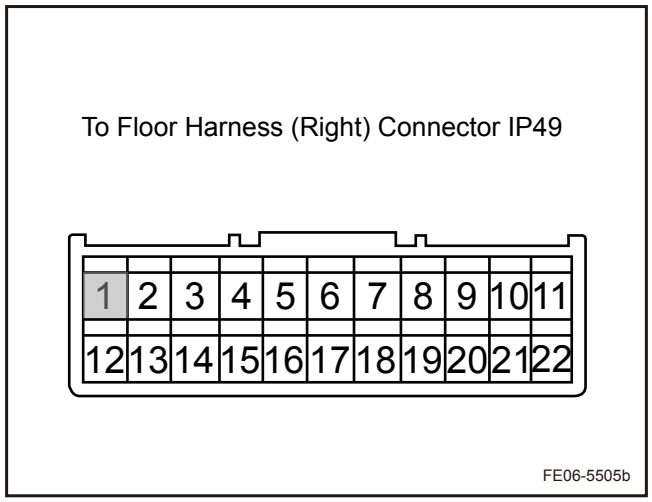



FE06-5504b

(a) Disconnect the instrument cluster harness connector IP03.
(b) Measure resistance between the IP03 terminal 10 and IP49 terminal 1 with a multimeter.
Standard Resistance: Less than 1 Ω
(c) Measure resistance between the IP03 terminal 10 and the body ground with a multimeter.
Standard Resistance: 10 kΩ or higher

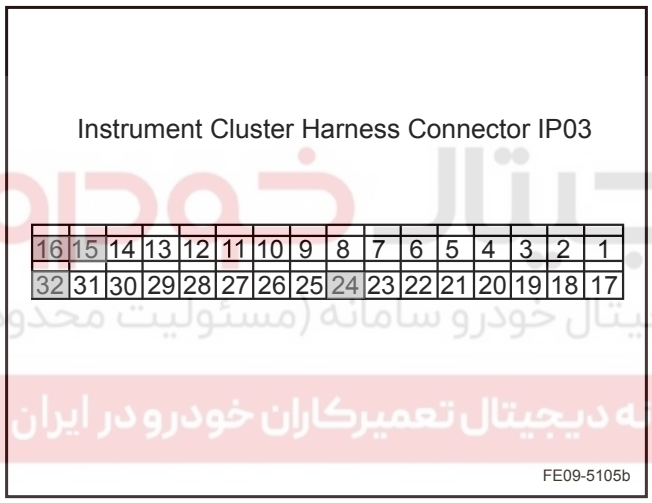
Is the resistance specified value?

No → Repair or replace the wiring harness




Yes

| | |
|---|---|
| Step 4 | Check the wiring harness (instrument cluster - power, ground). |




(a) Turn the ignition switch to OFF.
(b) Disconnect the battery negative cable.
(c) Disconnect the instrument cluster connector IP03.
(d) Connect the battery negative cable.
(e) Turn the ignition switch to ON (IG).
(f) Measure voltage between the connector IP03 terminals No. 24,32 and the body ground respectively, with a multimeter
Standard Voltage Value: 11-14 V
(g) Turn the ignition switch to OFF.
(h) Measure resistance between the connector IP03 terminals No.15,16 and the body ground respectively, with a multimeter
Standard Resistance: Less than 1 Ω

Is the value the specified value?

No → Check the fuses, repair or replace the wiring harness

Yes

| | |
|---|---|
| Step 5 | Replace the instrument cluster. |

(a) Replace the instrument cluster. Refer to 11.7.7.1 Instrument Cluster Replacement.
(b) Confirm that the repair is completed.

Next

| | |
|---|---|
| Step 6 | System normal. |

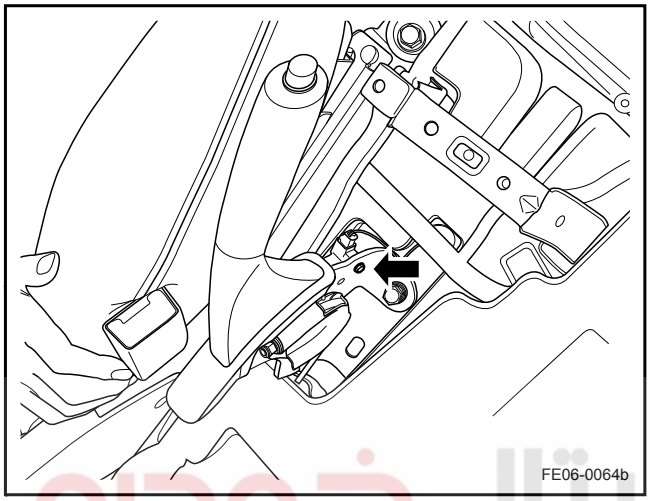
## 6.5.5 Removal and Installation

### 6.5.5.1 Park Brake Control Mechanism Switch Replacement

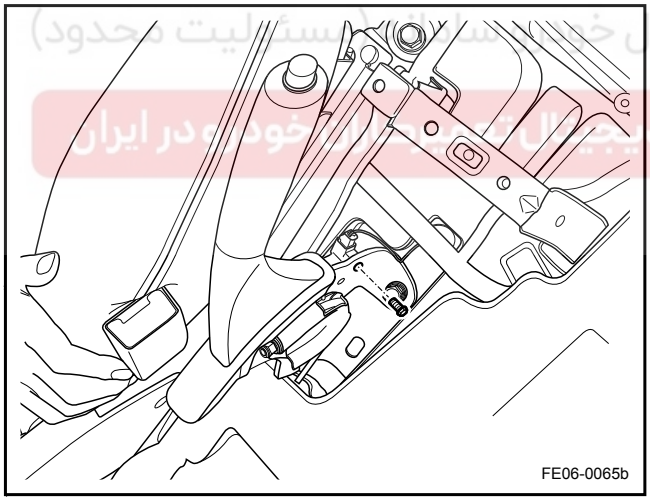
Removal Procedure:

Warning!

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




1. Disconnect the negative battery cable and wait for the 90s and above. Refer to 2.11.8.1 Battery Disconnection.
2. Release the park brake control mechanism assembly.
3. Remove the center console. Refer to 3.3.8.9 Shift Lever Replacement.
4. Disconnect the park brake control mechanism switch wiring harness connector.
5. Remove the park brake control mechanism switch retaining bolts.



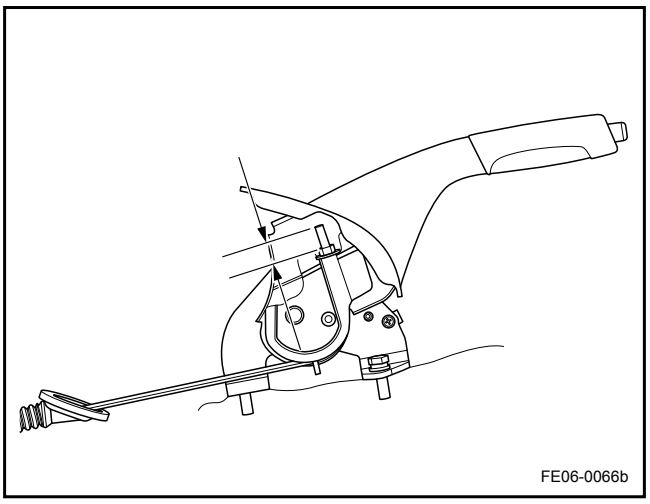

Installation Procedure:

1. Install the park brake control mechanism switch retaining bolts.

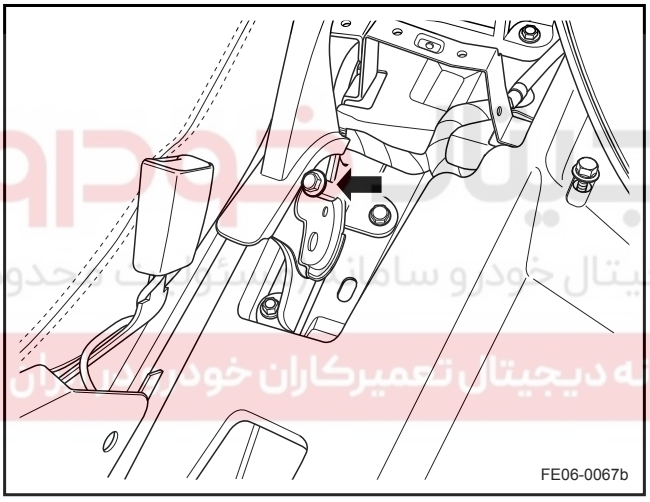
   Torque: 21 Nm (Metric) 15.5 lb-ft (US English)
2. Connect the park brake control mechanism switch wiring harness connector.
3. Install the center console.
4. Apply the park brake control mechanism.
5. Connect the battery negative cable.

### 6.5.5.2 Park Brake Control Mechanism Assembly Replacement

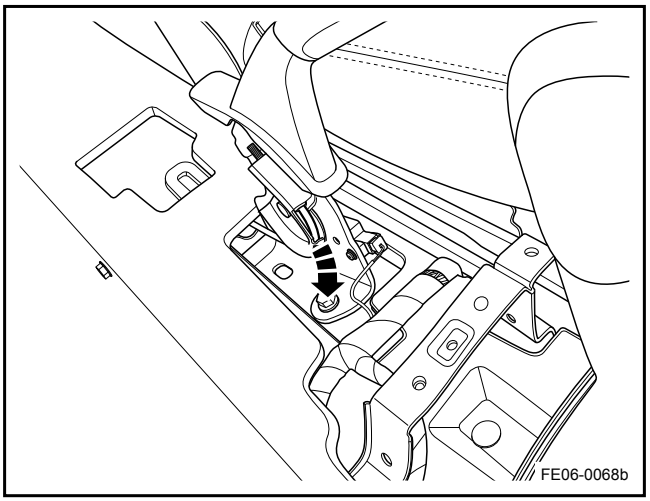
Removal Procedure:



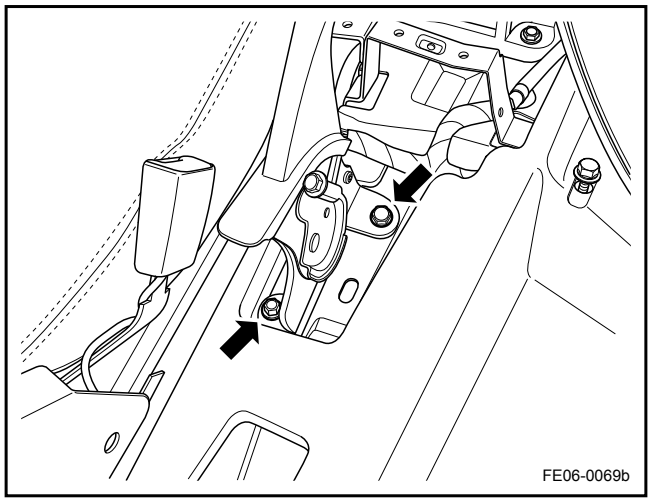

1. Release the park brake control mechanism assembly.
2. Remove the center console. Refer to 3.3.8.9 Shift Lever Replacement.
3. Disconnect the park brake control mechanism switch wiring harness connector.
4. Measure the thead length between to the handle top to the hexagonal nut and record it.




5. Remove the park brake control mechanism assembly cable adjuster nut and gasket.

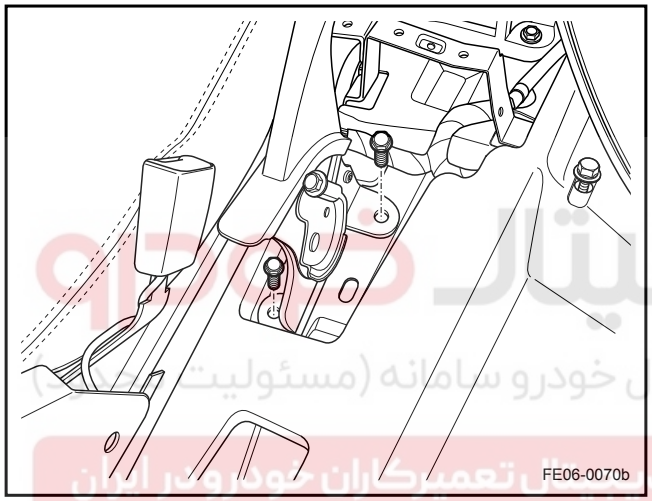



6. Open the park brake control mechanism assembly park brake handle installation pad and pull out of the park brake cable.




7. Remove the park brake control mechanism assembly handle assembly to the body bottom retaining bolts.
8. Remove the park brake control mechanism assembly handle assembly.

Installation Procedure:



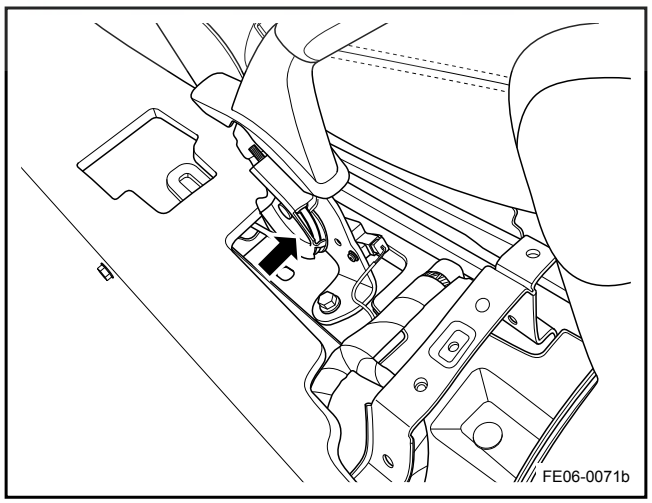

1. Install the park brake control mechanism assembly handle assembly.

   Note

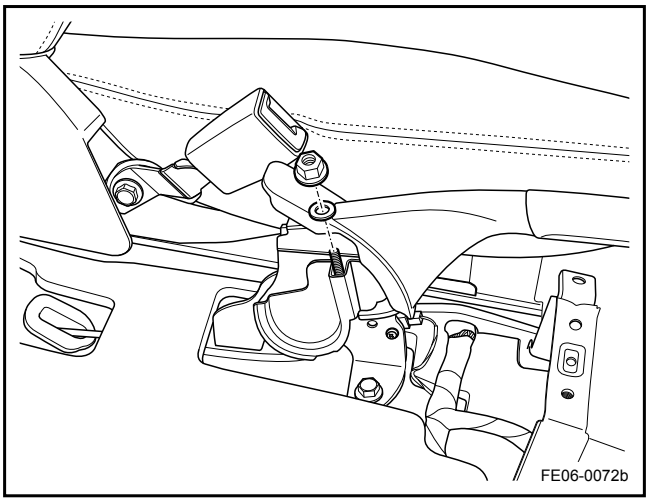
   Refer to "Fastener Notice" in "Warnings and Notices".

2. Install the park brake control mechanism assembly handle assembly to the body bottom retaining bolts.

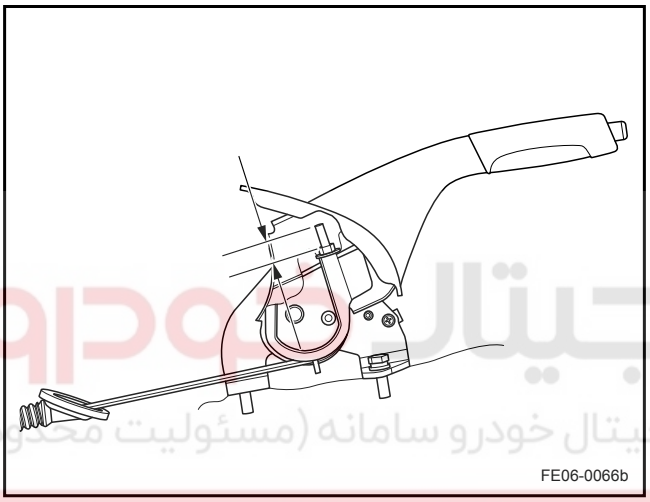
   Torque: 21 Nm (Metric) 15.5 lb-ft (US English)




3. Install the park brake control mechanism assembly park brake handle installation pad and install the park brake handle assembly.




4. Install park brake control mechanism assembly cable adjuster nut and gasket.




5. Adjust the thead length between to the handle top to the hexagonal nut according to the record, adjust the brake control mechanism assembly cable.
6. Apply the park brake control mechanism.
7. If necessary, adjust the park brake control mechanism assembly.
8. Install the center console.

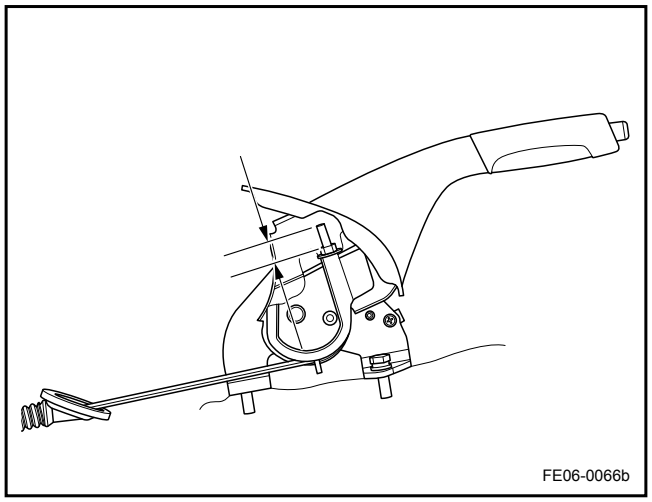


## 6.5.5.3 Park Brake Control Mechanism Cable Assembly Replacement

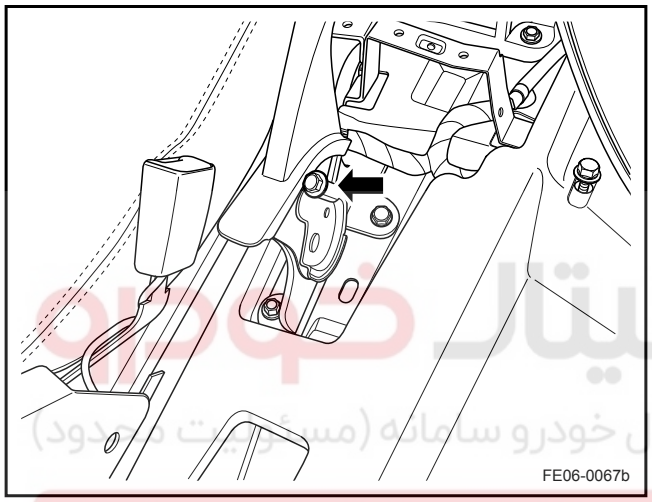
Removal Procedure:

Warning!

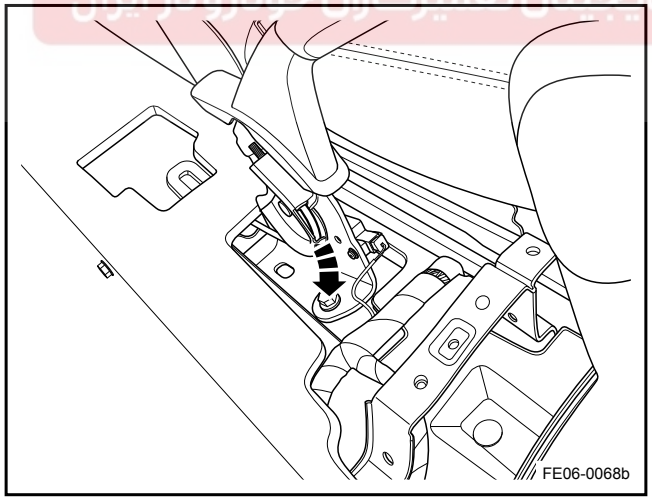
Refer to "Vehicle Lifting Warning" in "Warnings and Notices".



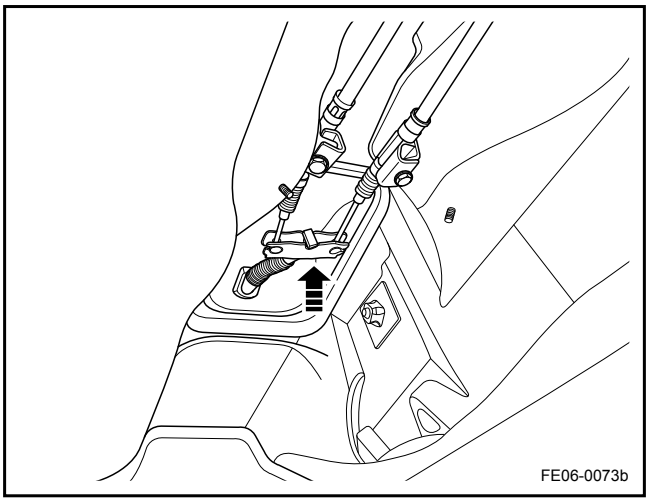

1. Release the park brake control mechanism.
2. Remove the center console. Refer to 3.3.8.9 Shift Lever Replacement.
3. Disconnect the park brake control mechanism switch wiring harness connector.
4. Measure the thead length between to the handle top to the hexagonal nut and record it.



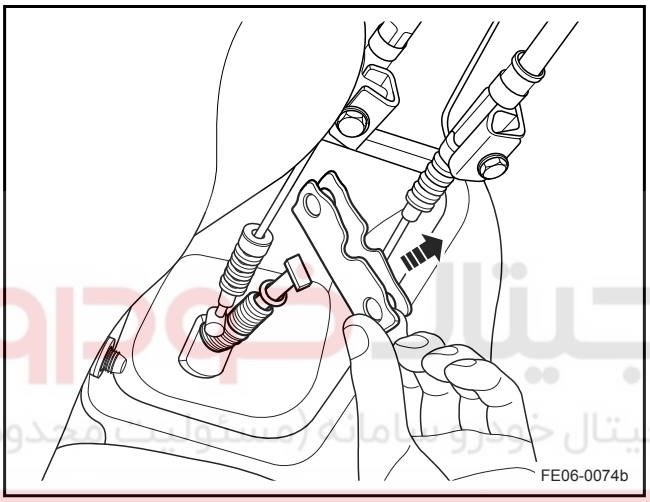

5. Remove the park brake cable adjustment nut and gasket.



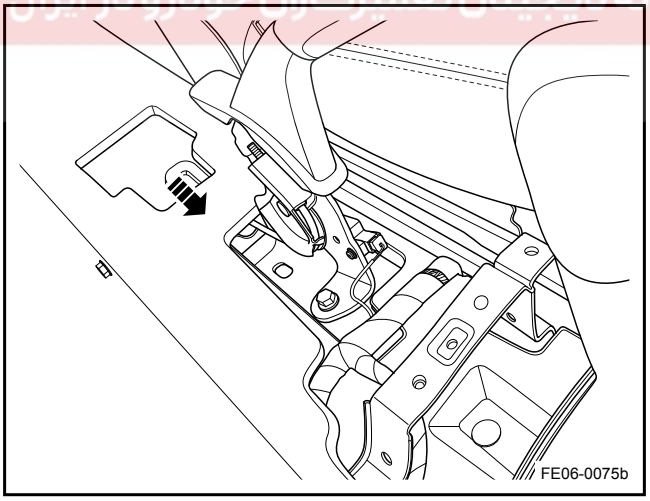

6. Open the park brake control mechanism assembly park brake cable installation piece, pull out of the park brake cable.



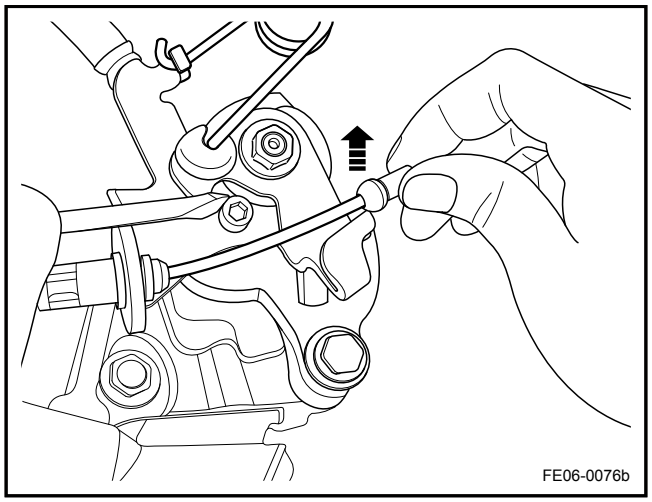

7. Lift and support the vehicle. Refer to 1.3 Lifting and Jacking the Vehicle.
8. Remove the front muffler and the heat shield. Refer to 2.7.6.3 Front Muffler Replacement.
9. Disconnect the left and right rear park brake cable from the adjuster.



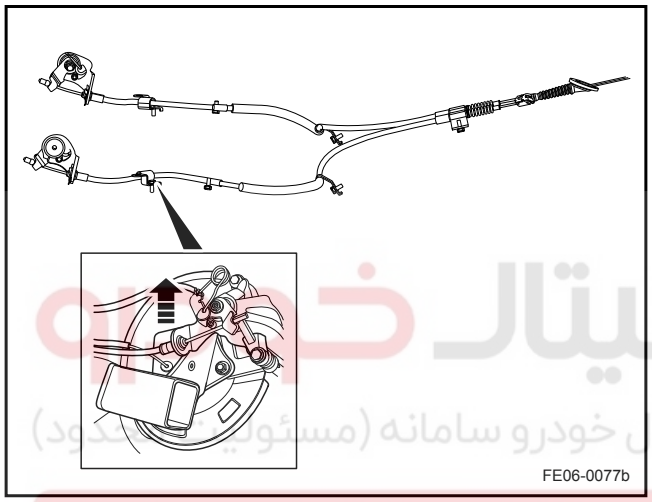

10. Rotate the cable adjuster, remove the park brake cable adjuster from the front of the park brake.




11. Lower the vehicle and remove the park brake cable from inside the vehicle.



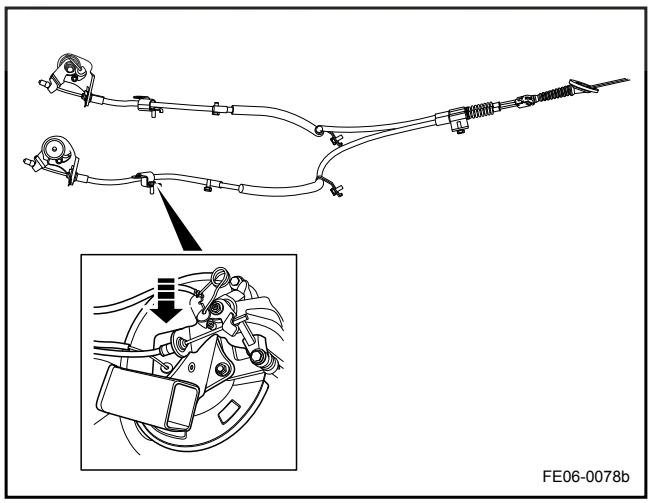

12. Lift and support the vehicle.
13. Disconnect the left and right rear park brake cable from the rear calipers.




14. Remove the left and right rear brake cable retaining bolts and springs.
15. Remove the left and right rear park brake cable.

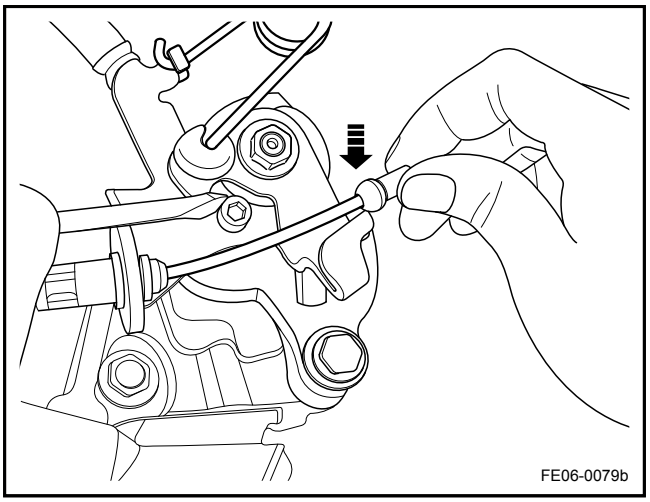


Installation Procedure:

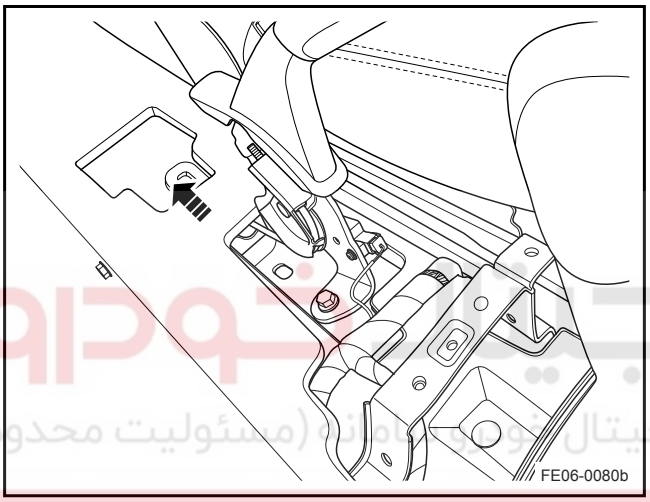



1. Install the left and right rear park brake cable.
2. Install the left and right rear brake cable retaining bolts and springs.

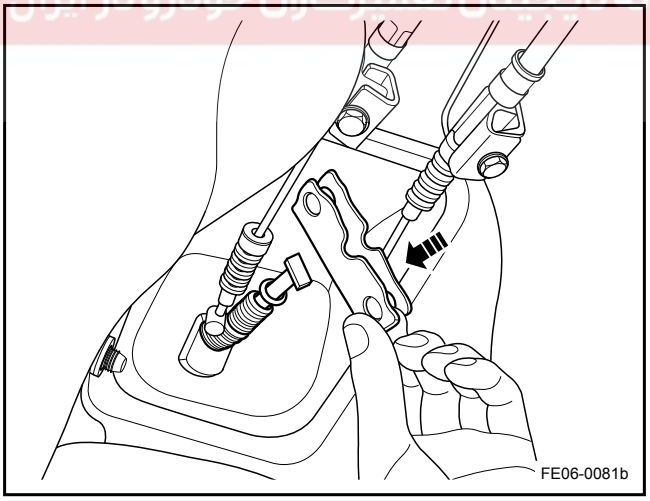
   Torque: 9 Nm (Metric) 6.6 lb-ft (US English)



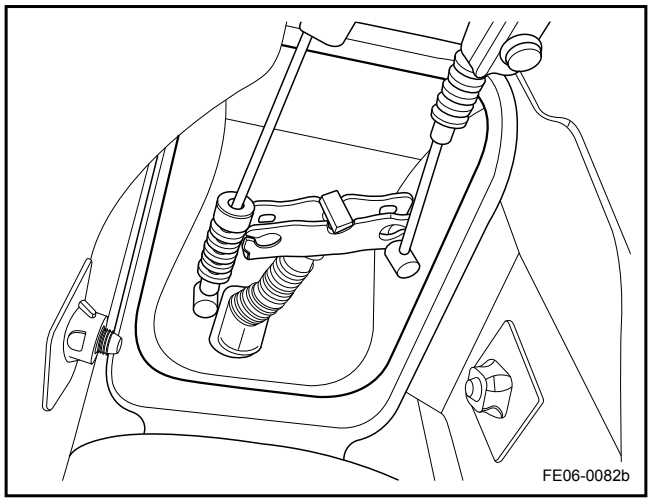

3. Install the left and right rear park brake cables to the rear brake calipers.



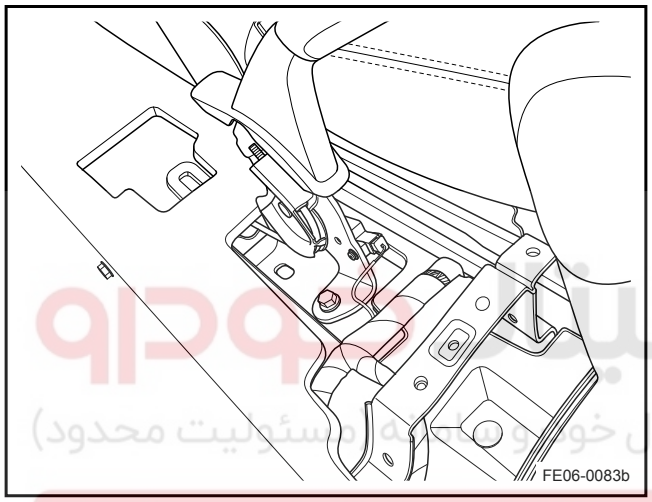

4. Lower the vehicle.
5. Install the front park brake cable to the vehicle from the vehicle bottom and install the dust cover.



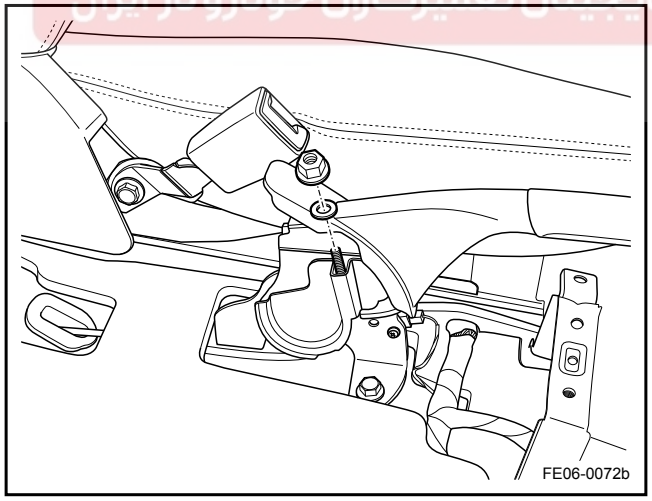

6. Lift and support the vehicle.
7. Install the park brake cable adjuster to the front park brake cable.



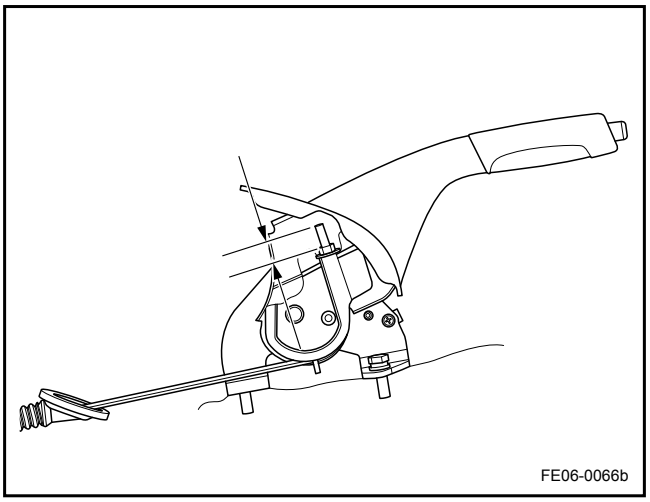

8. Install the left and right rear park brake cable to the cable adjuster.
9. Install the front muffler and the heat shield.
10. Lower the vehicle.




11. Install the park brake control mechanism cable assembly and press the installation piece to install the park brake cable assembly.




12. Install the park brake cable control mechanism adjust nut and washer.



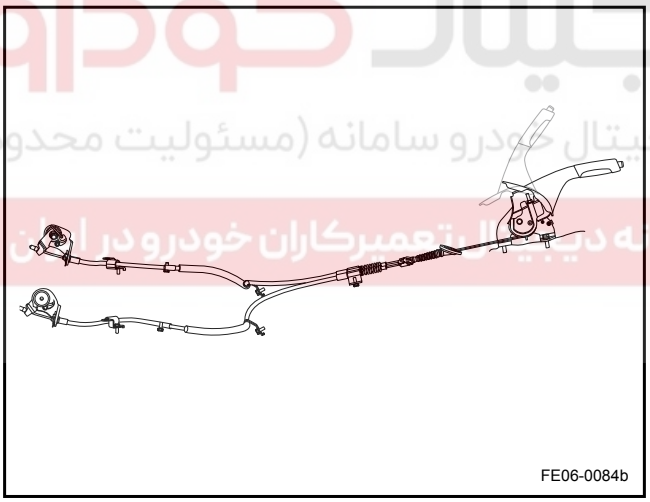

13. Adjust the thead length between to the handle top to the hexagonal nut according to the record, adjust the park brake cable assembly.
14. If necessary, adjust the brake control mechanism assembly. Refer to 6.5.5.4 Park Brake Control Mechanism Adjustment.
15. Apply the park brake control mechanism.
16. Install the center console.

## 6.5.5.4 Park Brake Control Mechanism Adjustment

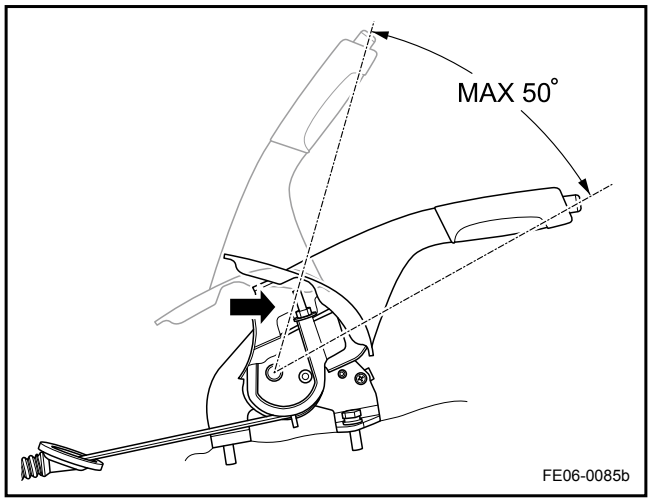
Adjustment Procedure:

Warning!

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




1. Release the park brake assembly control mechanism.
2. Lift the vehicle. 1.3 Lifting and Jacking the Vehicle.
3. Check whether the park brake mechanism cable assembly is able to move freely.




4. Lower the vehicle.
5. Remove the center console cup holder. Refer to 3.3.8.9 Shift Lever Replacement.
6. Apply the park brake, remove the center console cup holder, lay down the park brakes, exposing the brake cable adjuster nut.
7. Slightly lift the vehicle, so that the wheels are free to rotate.
8. Tighten the park brake cable adjuster nut assembly, until the wheels are hard to rotate.
9. Loosen the nut until the rear wheels can just rotate freely.
10. Lower the vehicle.
11. Apply the park brake, install the center console cup holder.

# 6.6 ABS / TCS / EBD / ESP

## 6.6.1 Specifications

### 6.6.1.1 Fastener Tightening Specifications

| Applications | Model | Specifications | |
|---|---|---|---|
| | | Metric (Nm) | US English (lb-ft) |
| Wheel Speed Sensor Harness Connector Bolts | M6 × 18 | 19-22 | 14-16.3 |
| ABS Bracket Strengthening Plate Assembly Nut | M8 | 23-30 | 17-22.2 |

### 6.6.1.2 Wheel Speed Sensor Technical Specifications

| Wheel Speed Sensor | Description |
|---|---|
| Sensor Type | Hall-type Speed Sensor |
| Voltage | 4.5-20 V |
| Signal Current | Low: 7 ± 20% mA, High: 14 ± 20% mA |
| Gap Between The Signal Plate and The Sensor | Front Axle 1.56 mm (0.06 in) Rear Axle 0.738 mm (0.03 in) |

## 6.6.2 Description and Operation

## 6.6.2.1 Description and Operation

This vehicle is equipped with anti-lock braking system (ABS) and electronic brake-force distribution (EBD) system. In addition to in the original brake system, the following components are added:

Hydraulic Electronic Control Unit (HECU):

Note

Between hydraulic electronic control unit installation bolts and bracket, there are rubber anti-vibration pads, which are used to avoid the hydraulic electronic control unit being affected by the vehicle vibration. The hydraulic electronic control unit can not be disassembled, and must be replaced as an assembly.

The hydraulic electronic control unit (HECU) controls system function and detect faults. When the ignition switch is turned on and there are no anti-lock braking system DTC codes, the system provides power to the relay, so the battery positive voltage is provided to the solenoid valve and pump. Hydraulic electronic control unit (HECU) continuously tests the wheels status to control wheel slip rate within a certain range so as to maintain the vehicle stability. Hydraulic control piping uses diagonal configuration, so that from the brake master cylinder one channel fluid flows along the left front to right rear wheel, the other flows from the right front to the left rear wheel. Two channels are isolated, so that when one brake channel fails or leaks, the other will make sure the continuous braking ability. Hydraulic electronic control unit (HECU) includes the following main components:

- ABS control module
- ABS Pump and Relay
- Inlet Valve, each valve controls one wheel
- Outlet Valve, each valve controls one wheel
- Electromagnetic Coil Relay

### Wheel Speed Sensor:

Wheel speed sensor is a Hall-type speed sensor. With the wheels rotating, ABS control module uses the wheel speed signal to calculate the wheel speed. Wheel speed sensor can be individually replaced, but the signal plate (Gear) is fitted on the axle and must be replaced together with the axle.

### Brake Lamp Switch:

Press the brake pedal, the brake lamps are lit, while signals are sent to the ABS brake control module.

### ABS Warning Lamp:

Located on the instrument cluster, light to notify the driver the ABS failure when the following events occurs:

- ABS control module detects the ABS system malfunction, the instrument cluster receives a request for lighting the ABS warning lamp through the CAN bus from the ABS control module.
- Instrument cluster carry out self-test in the beginning of each ignition cycle, the indicator light about 3s.
- Instrument cluster detects the communication to the ABS control module is lost.

### EBD Warning Lamp:

Located on the instrument cluster, light to notify the driver EBD failure. When the ABS Warning Lamp is lit, but EBD warning lamp is not lit, the system will still have EBD function. When the ABS Warning Lamp and EBD warning lamp are all lit, ABS and EBD function all fail.

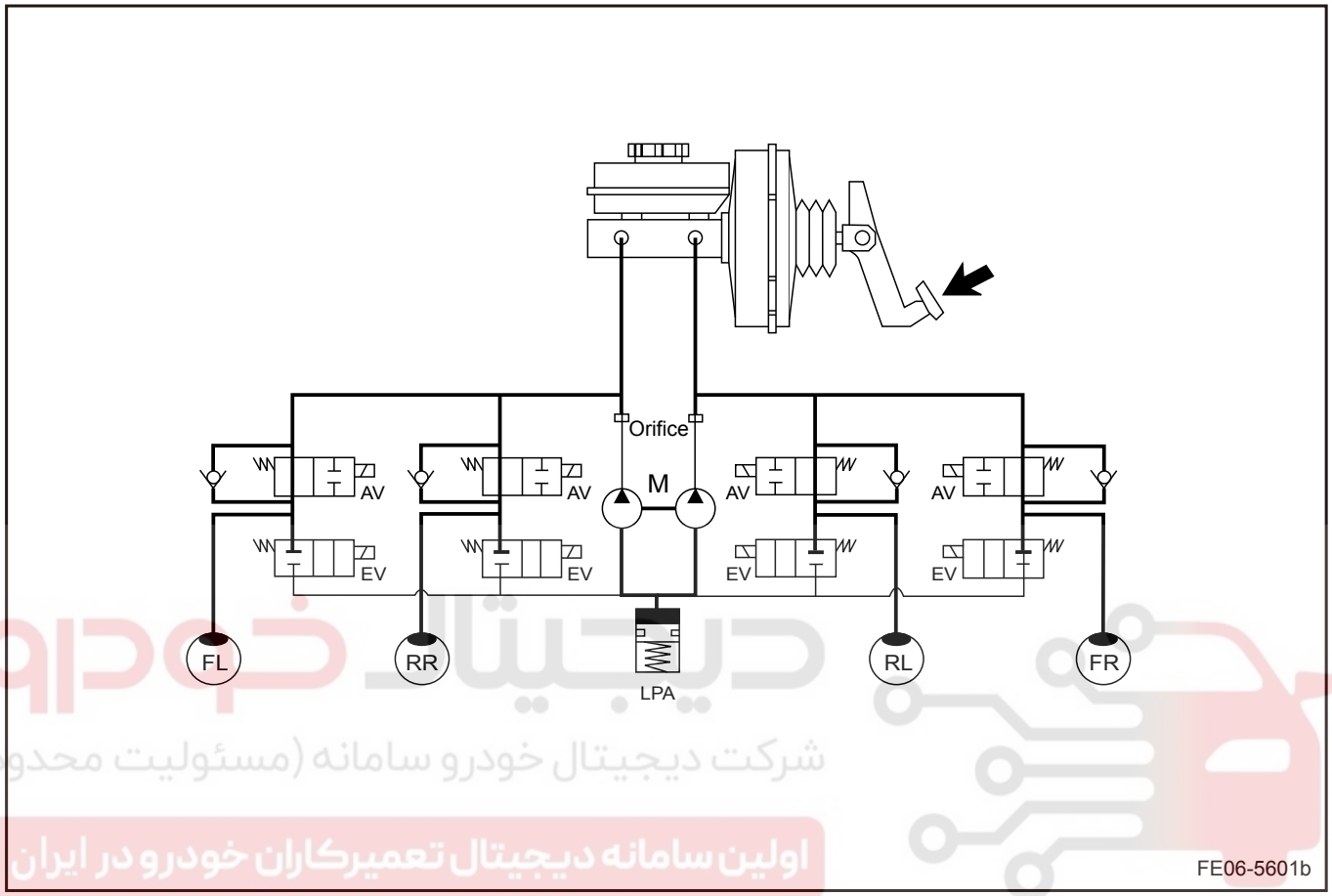
### Self-diagnostic Test:

ABS control module performs a self-diagnostic test each time the ignition switch is turned to on. As long as the ABS is provided power and in a working status, it monitors the performance. Once a fault is detected, it will trigger an alarm until the fault disappears. ABS error code will be stored in memory until being manually erased.

## 6.6.3 System Working Principle

### 6.6.3.1 System Working Principle

Anti-lock Braking System (ABS) Hydraulic Piping Diagram






Legend

1. AV-Inlet Solenoid Valve
2. EV-Outlet Solenoid Valve
3. LPA-Low Pressure Accumulator
4. M-Motor
5. FL-Left Front Wheel
6. RR-Right Rear Wheel
7. RL-Left Rear Wheel
8. FR-Right Front Wheel

## Anti-lock Braking System (ABS)

In the anti-lock braking period, anti-lock braking system controls each wheel braking fluid pressure to prevent wheel slip. Each wheel is equipped with a separate and specific hydraulic fluid line solenoid valve. Anti-lock braking system can reduce, maintain or increase brake fluid pressure to each wheel. However, the anti-lock braking system can not make the pressure exceed the pressure provided by the brake master cylinder. During the anti-lock braking, a series of rapid pulse can be felt on the brake pedal. When the ABS control module detects the speed sensor input and tries to prevent wheel slip, each solenoid valve position rapidly changes. ABS pump starts working, resulting pulse. Pedal pulse only appears during the anti-lock braking, and disappears during the normal braking or parking. For vehicles equipped with anti-lock braking system, apply normal force on the brake pedal can stop the vehicle. Anti-lock braking system can effectively shorten the braking distance and maintain the vehicle stability. During the anti-lock braking, brake system pressure is adjusted in three stages.

### Pressure Maintaining

When the wheel spins, ABS control module closes the inlet valve and keeps the valve closed and isolated from the system. It maintains the braking fluid pressure without increasing or decreasing.

### Pressure Decrease

When the wheel spins, ABS control module reduces the pressure to individual wheels during deceleration. The inlet valve is closed, while the outlet valve is open. The excess fluid is stored in the accumulator until the ABS pump returns the fluid to the master cylinder.

### Pressure Increase

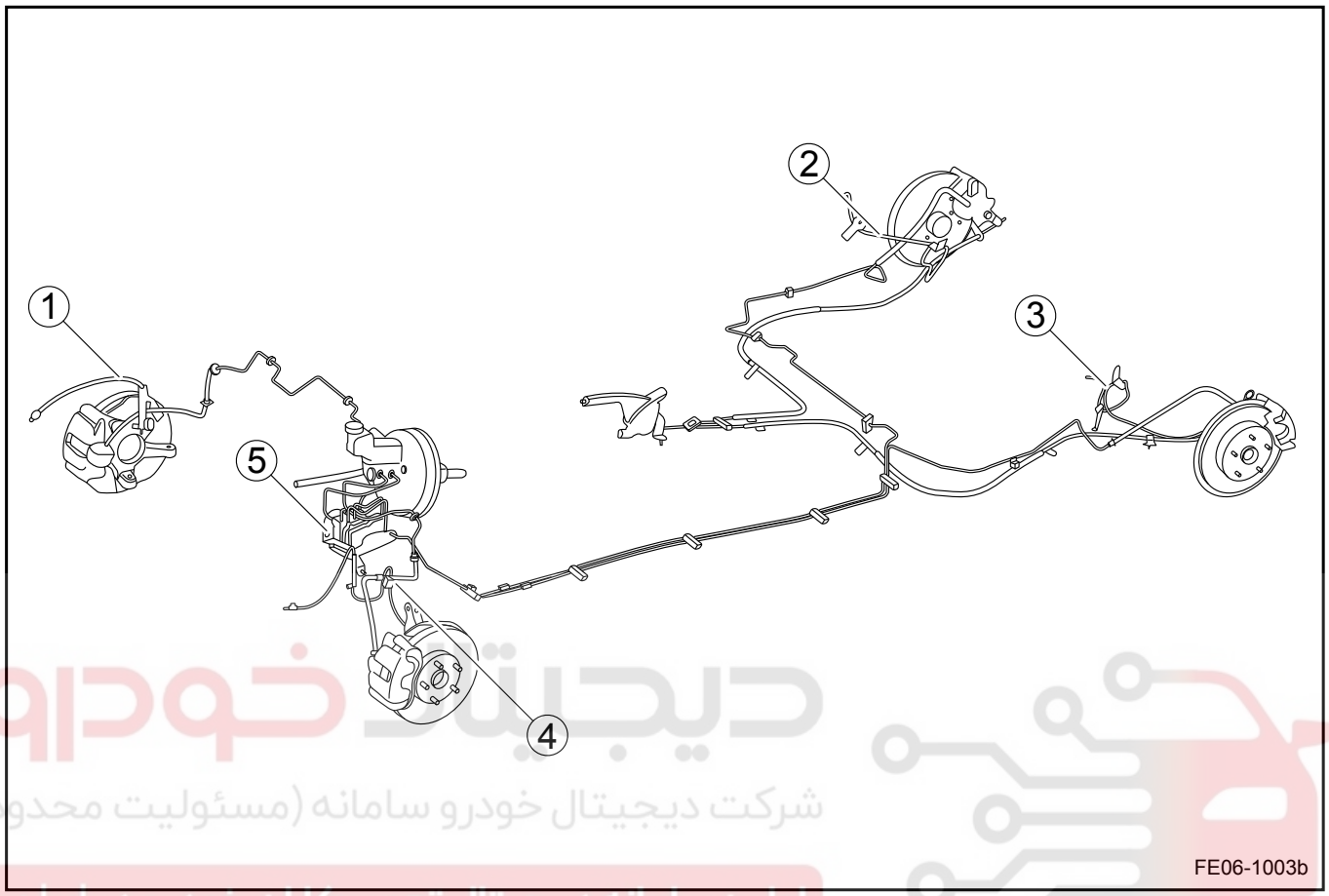
When the wheel does not spin, ABS control module gradually increases the braking pressure to each wheel to reduce wheel speed. The inlet valve is open, while the outlet valve is closed. The increased pressure is provided by the brake master cylinder.

## Electronic Brake Force Distribution (EBD)

Each wheel attached ground conditions may be different, then the ground friction coefficient will be different. During braking, the vehicle gravity center will change, so the vehicle is prone to skid when braking, tilt and roll and so forth. EBD's function is to calculate four tires friction difference as a result of different adhesion coefficients at the braking moment, then adjust the hydraulic unit electromagnetic valve. The valve adjusts as the preset program to match the system power to the friction (adhesion), ensure vehicle braking smooth and safety. Under the emergency braking situation, before the ABS action EBD has balanced each wheel grip, to prevent tail-flick and the lateral movement. EBD is actually an additional ABS function. Based on road and load changes, it automatically adjusts the braking force distribution, improves and the ABS efficiency.

## 6.6.4 Component Locator

### 6.6.4.1 Component Locator

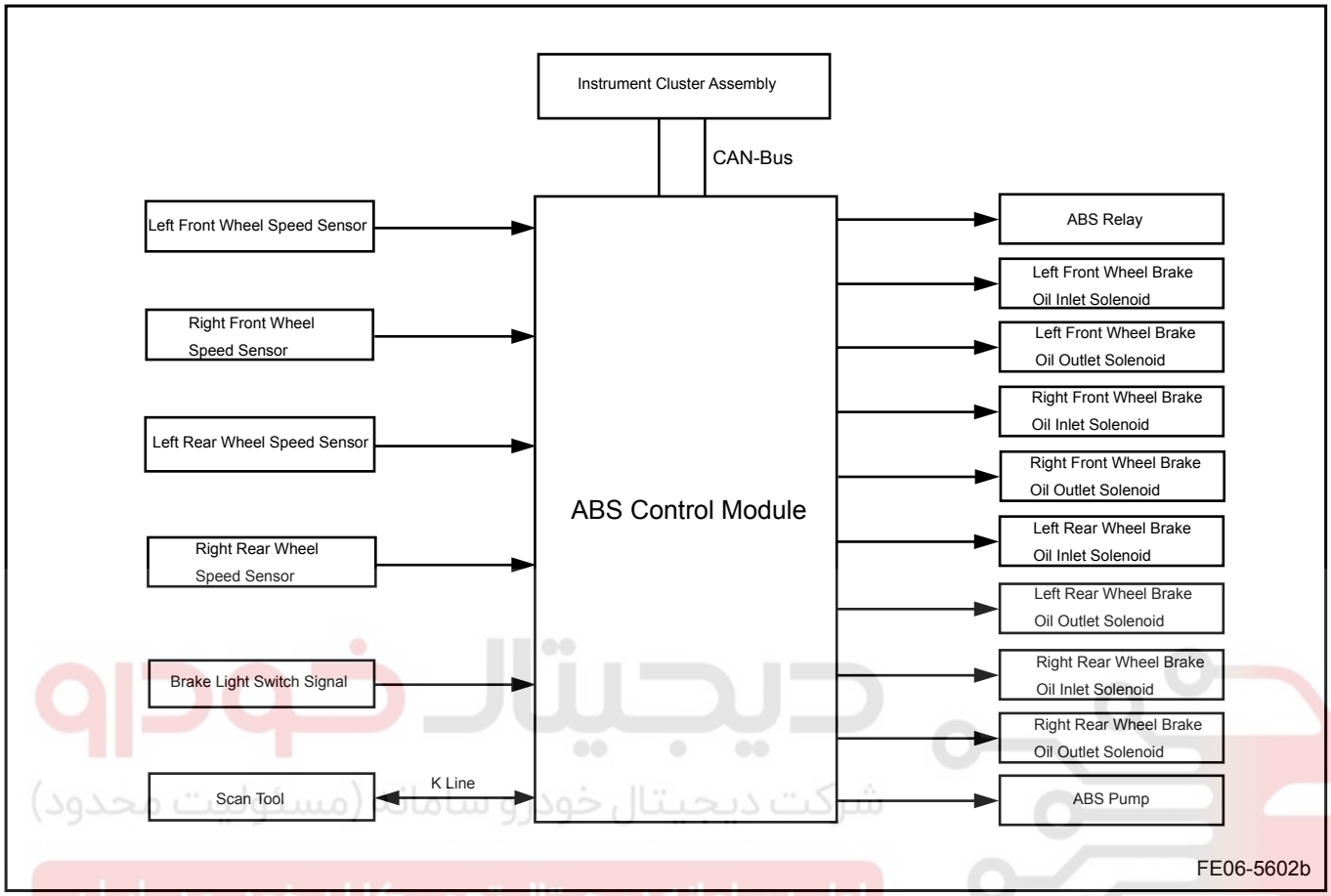



Legend

1. Right Front Wheel Speed Sensor
2. Right Rear Wheel Speed Sensor
3. Left Rear Wheel Speed Sensor
4. Left Front wheel Speed Sensor
5. Hydraulic Electronic Control Unit (HECU)

## 6.6.5 Schematic

### 6.6.5.1 Schematic



## 6.6.6 Diagnostic Information and Procedures

### 6.6.6.1 Diagnosis Description

Read DTC codes through the vehicle data-link connector (DLC data-link connector). Use ABS control module data table, through reading scan tool displayed data, to read the switches and sensors function without removing any component. Reading the data is the first diagnostic step and is also one of the ways to reduce diagnostic time.

### 6.6.6.2 Visual Inspection

- Confirm Fault Symptom

  In the diagnostic process, the most difficult situation is that no symptoms appear. In this case, you must thoroughly analyze the described malfunction. and then simulate the malfunction occurring conditions and circumstances. Even for a very experienced technician, if carry out the diagnostic without verify the malfunctions first, it is possible to ignore a number of important things, and make wrong judgment. This will cause the diagnostic can not continue.

- Check the easy to access system components to identify whether there is a significant damage or a potential malfunction.

- Connectors connection and vibration should be thoroughly examined. If possible, for vibrations caused malfunction, it is recommended to use the vibration method.

  1. With a finger, gently shake the sensor that may be faulty and check for malfunction.
  2. Gently shake the sensor in the vertical and horizontal directions.
  3. Gently shake the sensor wiring harness in the vertical and horizontal directions.

### 6.6.6.3 DTC Code (DTC) List

| DTC code | Description |
|---|---|
| C1101 | ECU Power Supply Voltage: High Voltage |
| C1102 | ECU Power Supply Voltage: Low Voltage |
| C1200 | Wheel Speed Sensor, Left Front: Open / Short |
| C1201 | Wheel Speed Sensor, Left Front: Scope, Performance, Intermittent Fault |
| C1202 | Wheel Speed Sensor, Left Front: Invalid / No Signal |
| C1203 | Wheel Speed Sensor, Right Front: Open / Short |
| C1204 | Wheel Speed Sensor, Right Front: Scope, Performance, Intermittent Fault |
| C1205 | Wheel Speed Sensor, Right Front: Invalid / No Signal |
| C1206 | Wheel Speed Sensor, Left Rear: Open / Short |
| C1207 | Wheel Speed Sensor, Left Rear: Scope, Performance, Intermittent Fault |
| C1208 | Wheel Speed Sensor, Left Rear: Invalid / No Signal |
| C1209 | Wheel Speed Sensor, Right Rear: Open / Short |
| C1210 | Wheel Speed Sensor, Right Rear: Scope, Performance, Intermittent Fault |
| C1211 | Wheel Speed Sensor, Right Rear: Invalid / No Signal |
| C1213 | Wheel Speed Sensor Frequency Error (General wheel speed sensor fault, slip or tooth error) |
| C1604 | ECU Hardware Malfunction |

| DTC code | Description |
|---|---|
| C1605 | CAN Hardware Malfunction |
| C1616 | CAN Bus Malfunction |
| C2112 | Valve Relay Malfunction |
| C2308 | Valve Malfunction, Left Front Inlet Valve |
| C2312 | Valve Malfunction, Left Front Outlet Valve |
| C2316 | Valve Malfunction, Right Front Inlet Valve |
| C2320 | Valve Malfunction, Right Front Outlet Valve |
| C2324 | Valve Malfunction, Left Rear Inlet Valve |
| C2328 | Valve Malfunction, Left Rear Outlet Valve |
| C2332 | Valve Malfunction, Right Rear Inlet Valve |
| C2336 | Valve Malfunction, Right Rear Outlet Valve |
| C2402 | Return Pump Malfunction (Electrical and Electronic Malfunction) |

### 6.6.6.4 Scan Tool and The Vehicle Can Not Communicate

Connect scan tool to the data-link connector (DLC data-link connector), turn the ignition switch to ON, operate the scan tool, if the display shows the communication error message, then the vehicle or the scan tool has a malfunction.

- If the scan tool connected with another vehicle shows normal, then check the original vehicle DLC.
- If the scan tool is still unable to establish communication, then the problem may be in the scan tool, for the specific circumstances. Refer to11.17 Data Communication System.

### 6.6.6.5 Fault Symptom Table

If the scan tool shows the normal codes, but the fault still exists, check the circuit whether there are various fault symptoms according to sequence in the following table, and then refer to the appropriate maintenance program to fix the fault.

| Symptoms | Suspected Parts | Repair Program |
|---|---|---|
| ABS Inoperative | 1. Check DTC, confirm that there is no historical and current DTC code. | Use scan tool to access the module |
| | 2.IG2 Power Supply Circuit (ABS module wiring harness connector CA13 terminal 32) | Refer to 6.6.6.8 ABS Warning Lamp Always Oncheck the ABS control module in the wiring harness connector inspection (CA13 terminal 32 voltage) |
| | 3. Front Speed Sensor Circuit | Refer to 6.6.6.11 Wheel Speed Sensor Fault Diagnosis |
| | 4. Rear Speed Sensor Circuit | Refer to 6.6.6.11 Wheel Speed Sensor Fault Diagnosis |

| Symptoms | Suspected Parts | Repair Program |
|---|---|---|
| | 5. Use scan tool active test function to check the hydraulic electronic control unit. If it is abnormal, check whether there is leakage in hydraulic pipes. | Refer to 6.6.6.6 Active Test and Data Flow |
| | 6. If the suspect parts are confirmed as normal, but the symptoms still occur, replace the hydraulic electronic control unit. | Refer to 6.6.7.1 Hydraulic Electronic Control Unit Replacement |
| ABS Can Not Run Effectively | 1. Check DTC, confirm that there is no historical and current fault code. | Use scan tool to access the module |
| | 2. Front Speed Sensor Circuit | Refer to 6.6.6.11 Wheel Speed Sensor Fault Diagnosis |
| ABS Can Not Run Effectively | 3. Rear Speed Sensor Circuit | Refer to 6.6.6.11 Wheel Speed Sensor Fault Diagnosis |
| ABS Can Not Run Effectively | 4. Brake Lamp Switch Circuit | 1. Confirm the brake lamps are working properly, otherwise refer to 11.4.7.8 Brake Lamp Inoperative<br>2. Press the brake pedal. ABS module wiring harness connector CA13 terminal 30 voltage is the power supply voltage . |
| | 5. Use scan tool active test function to test the hydraulic electronic control unit. If it is abnormal, check whether there is leakage in hydraulic pipes. | Refer to 6.6.6.6 Active Test and Data Flow |
| | 6. If the suspected parts circuit are confirmed as normal, but the symptoms still occur, replace the hydraulic electronic control unit. | Refer to 6.6.7.1 Hydraulic Electronic Control Unit Replacement |
| ABS Warning Lamp Fault (Always On) | 1. Instrument Cluster | Refer to 6.6.6.8 ABS Warning Lamp Always On |
| | 2. Hydraulic Electronic Control Unit | Refer to 6.6.6.8 ABS Warning Lamp Always On |
| ABS Warning Lamp Fault (Always Off) | Instrument Cluster | Refer to 6.6.6.9 ABS Warning Lamp Always Off |
| Brake Warning Lamp Fault (Always On) | Brake Warning Lamp Circuit | Refer to 6.4.4.3 Brake Warning Lamp Always On |

## 6.6.6.6 Active Test and Data Flow

### Active Test

Suggestions:

Use scan tool active test function without removing any component to run relays, actuators and other components. Carry out the active test first can reduce the diagnostic time.

Data table can be displayed during active test.

1. Connect scan tool to the vehicle.
2. Turn the ignition switch to ON (IG).
3. Carry out the active test according to the display.

| Display | Test Parts | Control | Test Notes |
|---|---|---|---|
| ABS Warning Lamp | ABS Warning Lamp lit or not (ON / OFF) | Warning lamp on and off (ON / OFF) | Observe the instrument cluster |
| Pump Motor | Pump motor action or no action | Pump motor action or no action | No motor working sound |
| Left Front Inlet Valve | ABS solenoid work or not work | Electromagnetic coil working or not working | Electromagnetic coil working sound can be heard |
| Right Front Inlet Valve | ABS solenoid working or not working | Electromagnetic coil working or not working | Electromagnetic coil working sound can be heard |
| Left Rear Inlet Valve | ABS solenoid working or not working | Electromagnetic coil working or not working | Electromagnetic coil working sound can be heard |
| Right Rear Inlet Valve | ABS solenoid working or not working | Electromagnetic coil working or not working | Electromagnetic coil working sound can be heard |
| Left Front Outlet Valve | ABS solenoid working or not working | Electromagnetic coil working or not working | Electromagnetic coil working sound can be heard |
| Left Rear Outlet Valve | ABS solenoid working or not working | Electromagnetic coil working or not working | Electromagnetic coil working sound can be heard |
| Right Front Outlet Valve | ABS solenoid working or not working | Electromagnetic coil working or not working | Electromagnetic coil working sound can be heard |
| Right Rear Outlet Valve | ABS solenoid working or not working | Electromagnetic coil working or not working | Electromagnetic coil working sound can be heard |

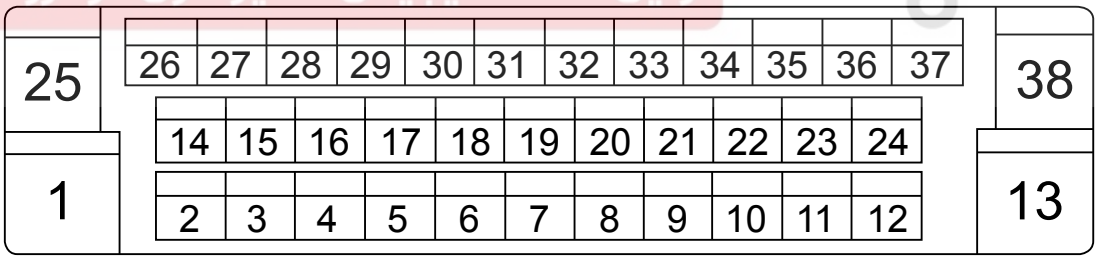
### Data Flow

| Name | Status |
|---|---|
| Left Front Wheel Speed | 1 km/h |
| Right Front Wheel Speed | 1 km/h |
| Left Rear Wheel Speed | 1 km/h |
| Right Rear Wheel Speed | 1 km/h |
| Vehicle Speed | 1 km/h |
| Left Front Inlet Solenoid Valve | Termination |

| Name | Status |
|---|---|
| Left Front Outlet Solenoid Valve | Termination |
| Right Front Inlet Solenoid Valve | Termination |
| Right Front Outlet Solenoid Valve | Termination |
| Left Rear Inlet Solenoid Valve | Termination |
| Left Rear Outlet Solenoid Valve | Termination |
| Right Rear Inlet Solenoid Valve | Termination |
| Right Rear Outlet Solenoid Valve | Termination |
| ABS pump Status | OFF |
| BCS Status (Brake Light Status) | OFF |
| Battery Voltage | 12.08 V |

## 6.6.6.7 ABS Control Module Terminal List

ABS Module Harness Connector CA13

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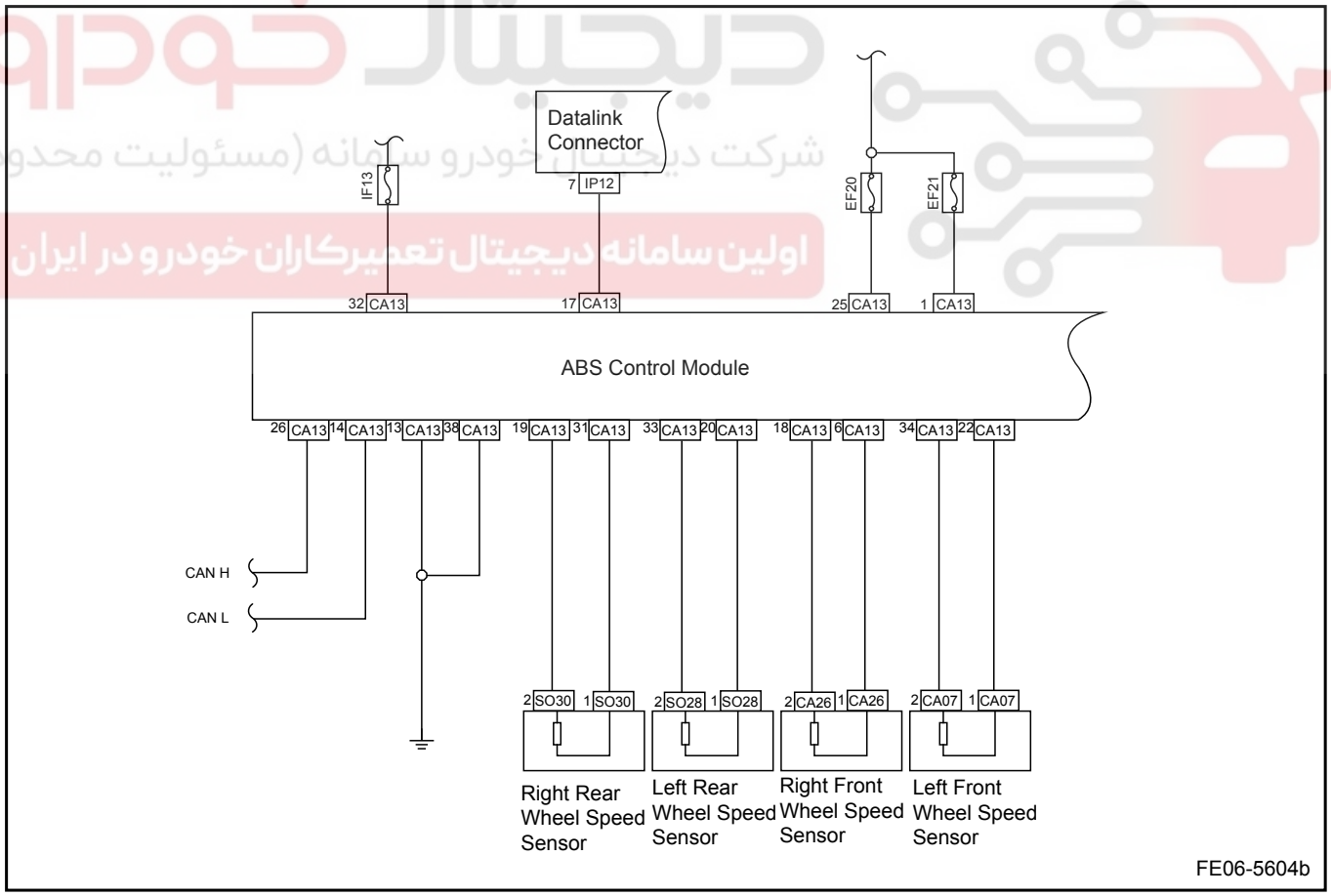
| Terminal ID | Name | Wiring | Terminal Descriptions | Status | Specified Conditions |
|---|---|---|---|---|---|
| 1 | ALT | 4.0 R | Power Supply | | |
| 2 | Empty | Empty | Empty | | |

| Terminal ID | Name | Wiring | Terminal Descriptions | Status | Specified Conditions |
|---|---|---|---|---|---|
| 3 | Empty | Empty | Empty | | |
| 4 | ABS Lamp | 0.5 Gr | Empty | ABS Output Signal | Active |
| 5 | Empty | Empty | Empty | | |
| 6 | WSFR | 0.5 Y/R | Right Front Wheel Speed Sensor | | |
| 7 | Empty | Empty | Empty | | |
| 8 | Empty | Empty | Empty | | |
| 9 | Empty | Empty | Empty | | |
| 10 | Empty | Empty | Empty | | |
| 11 | Empty | Empty | Empty | | |
| 12 | Empty | Empty | Empty | | |
| 13 | GND | 4.0 B | Ground | | |
| 14 | CAN_L | 0.5 Gr | CAN Low | Suspended | |
| 15 | Empty | Empty | Empty | | |
| 16 | EBD Lamp | Empty | ABS Warning Lamp | ABS Output Signal | Active |
| 17 | Diagnostic | 0.5 Gr/P | K-line | Data Link Connector | |
| 18 | WPFR | 0.5 W/R | Right Front Wheel Speed Sensor | | |
| 19 | WPRR | 0.5 W/G | Right Rear Wheel Speed Sensor | | |
| 20 | WSRL | 0.5 Y/L | Left Rear Wheel Speed Sensor | | |
| 21 | Empty | Empty | Empty | | |
| 22 | WSFL | 0.5 Y | Left Front Wheel Speed Sensor | | |
| 23 | Empty | Empty | Empty | | |
| 24 | Empty | Empty | Empty | | |
| 25 | ALT | 2.5 R/L | Power Supply | | |
| 26 | CAN_H | 0.5 L/W | CAN High | Suspended | |
| 27 | Empty | Empty | Empty | | |
| 28 | Empty | Empty | Empty | | |
| 29 | Empty | Empty | Empty | | |
| 30 | + BRAKE LIGHT SW | 0.5 Gr | Brake Switch | Input ABS | |

| Terminal ID | Name | Wiring | Terminal Descriptions | Status | Specified Conditions |
|---|---|---|---|---|---|
| 31 | WSRR | 0.5 Y/G | Right Rear Wheel Speed Sensor | | |
| 32 | IG2 | 0.85 G/Y | ON Power Supply | | |
| 33 | WPRL | 0.5 W/L | Left Rear Wheel Speed Sensor | | |
| 34 | WPFL | 0.5 W | Left Front Wheel Speed Sensor | | |
| 35 | Empty | Empty | Empty | | |
| 36 | Empty | Empty | Empty | | |
| 37 | Empty | Empty | Empty | | |
| 38 | GND | 2.5 B | Empty | | |

## 6.6.6.8 ABS Warning Lamp Always On

Schematic:



Diagnostic Steps:

| | |
|---|---|
| Step 1 | Use scan tool to access ABS control module. |

(a) Check the DTC.

Yes → Repair according to the DTC.

No

| | |
|---|---|
| Step 2 | Check the battery. |

(a) Measure battery voltage with a multimeter.
Standard Voltage Value: 11-14 V

Is the voltage specified value?

No → Charge the battery, or check the charging system.

Yes

| | |
|---|---|
| Step 3 | Check the ABS control module harness connector. |

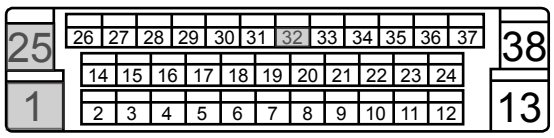
(a) Check whether the wiring harness connector is connected correctly.

No → Properly connect the harness connectors.

Yes

| | |
|---|---|
| Step 4 | Check the ABS control module harness connector (terminal voltage). |

ABS Control Module Harness Connector




FE06-5605b

(a) Turn off the ignition switch.
(b) Disconnect the control module harness connector.
(c) Turn on the ignition switch.
(d) Measure voltage between the CA13 terminals 1,25,32 and the body ground with a multimeter.
Standard Voltage Value: 11-14 V

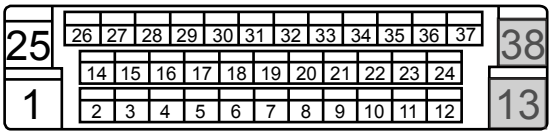
Is the voltage specified value?

No → Check the fuses, repair or replace the wiring harness

Yes

| | |
|---|---|
| Step 5 | Check the ABS control module harness connector (ground terminal Continuity). |

ABS Control Module Harness Connector CA13




FE06-5606b

(a) Measure resistance between the connector CA13 terminals 13.38 and the body ground with a multimeter.
Standard Resistance: Less than 1 Ω

Is the resistance specified value?

No → Repair or Replace the wiring harness or the connectors.

Yes

| | |
|---|---|
| Step 6 | Replace the hydraulic electronic control unit assembly. |

(a) Replace the hydraulic electronic control unit. Refer to 6.6.7.1 Hydraulic Electronic Control Unit Replacement.
(b) Connect the battery positive cable.
(c) Turn on the ignition switch to confirm whether the ABS Warning Lamp is lit.

Yes → System normal

No

| | |
|---|---|
| Step 7 | Check the instrument cluster. |

(a) Connect scan tool.
(b) In the functional test, select "Active test."
Active Test: ABS

| Display | Test Parts |
|---|---|
| ABS Warning Lamp | ABS Warning Lamp Lit or Not Lit (ON / OFF) |

(c) Check whether the ABS Warning Lamp is working properly.

Yes → System normal

No

| | |
|---|---|
| Step 8 | Replace the instrument cluster control unit. |

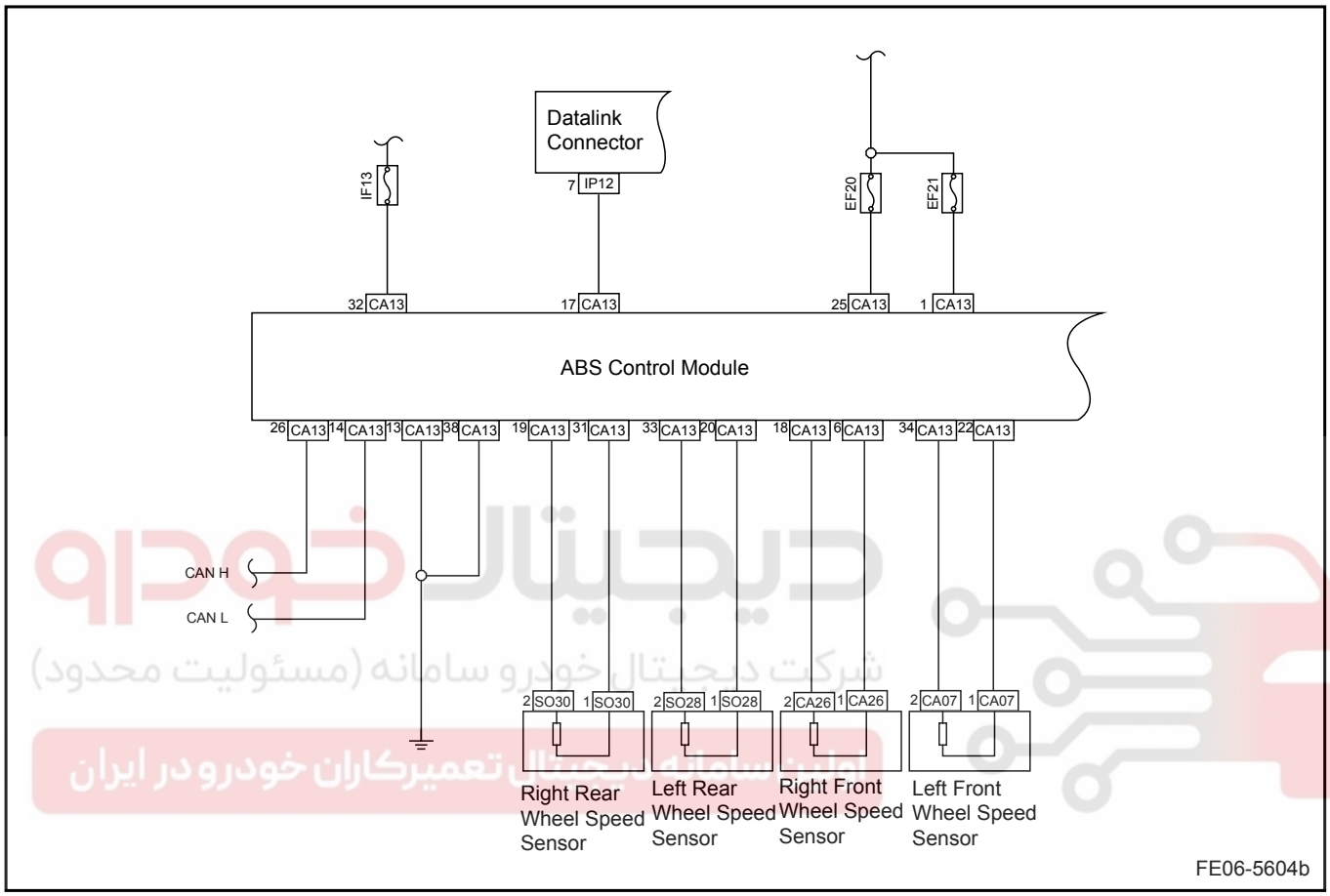
(a) Disconnect the battery negative cable. Refer to 2.11.8.1 Battery Disconnection.
(b) Replace the instrument cluster control unit. Refer to 11.7.7.1 Instrument Cluster Replacement.
(c) Confirm that the repair is completed.

Next

| | |
|---|---|
| Step 9 | System normal. |

## 6.6.6.9 ABS Warning Lamp Always Off

Schematic:




Diagnostic Steps:

| | |
|---|---|
| Step 1 | Check the battery. |

(a) Measure the battery voltage.
Standard Voltage Value: 11-14 V

Is the voltage specified value?

No → Check and replace the battery or the charging system.

yes

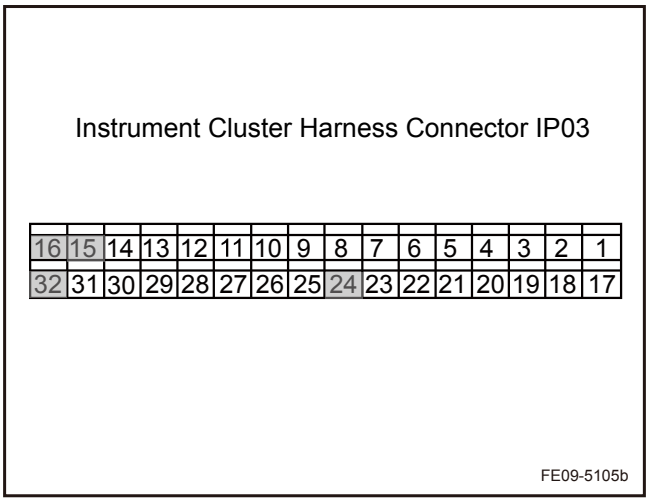
| | |
|---|---|
| Step 2 | Check the instrument cluster connector. |

(a) Turn the ignition switch to OFF.
(b) Disconnect the negative battery cable.
(c) Check whether the connectors are properly connected to the instrument cluster.

No → Properly connect the connector.

Yes

| Step 3 | Check the wiring harness (instrument cluster - power, ground). |
|---|---|




(a) Turn the ignition switch to OFF.
(b) Disconnect the battery negative cable.
(c) Disconnect the instrument cluster harness connector IP03.
(d) Connect the battery negative cable.
(e) Turn the ignition switch to ON (IG).
(f) Measure voltage between the connector IP03 terminals 24,32 and the body ground respectively with a multimeter.
Standard Voltage Value: 11-14 V
(g) Turn the ignition switch to OFF.
(h) Measure resistance between the connector IP03 terminals 15,16 and the body ground respectively with a multimeter.
Standard Resistance: Less than 1 Ω

Is the resistance specified value?

No → Check the fuses, repair or replace the wiring harness.

Yes

| Step 4 | Check the instrument cluster. |
|---|---|

(a) Connect scan tool, turn the ignition switch to ON (IG).
(b) In the functional test, select "Active test."
Active Test: ABS Warning Lamp

| Display | Test Parts |
|---|---|
| ABS Warning Lamp | ABS Warning Lamp lit or not lit (ON / OFF) |

(c) Check whether the ABS Warning Lamp is working properly.

Yes → System normal

No

| Step 5 | Replace the instrument cluster. |
|---|---|

(a) Replace instrument cluster. Refer to 11.7.7.1 Instrument Cluster Replacement.
(b) Check whether the ABS Warning Lamp is working properly.

Yes → System normal

No

| Step 6 | Replace the hydraulic electronic control unit. |
|---|---|

(a) Replace the ABS control module. Refer to 6.6.7.1 Hydraulic Electronic Control Unit Replacement.
(b) Check whether the ABS Warning Lamp is working properly.

(c) Confirm that the repair is completed.

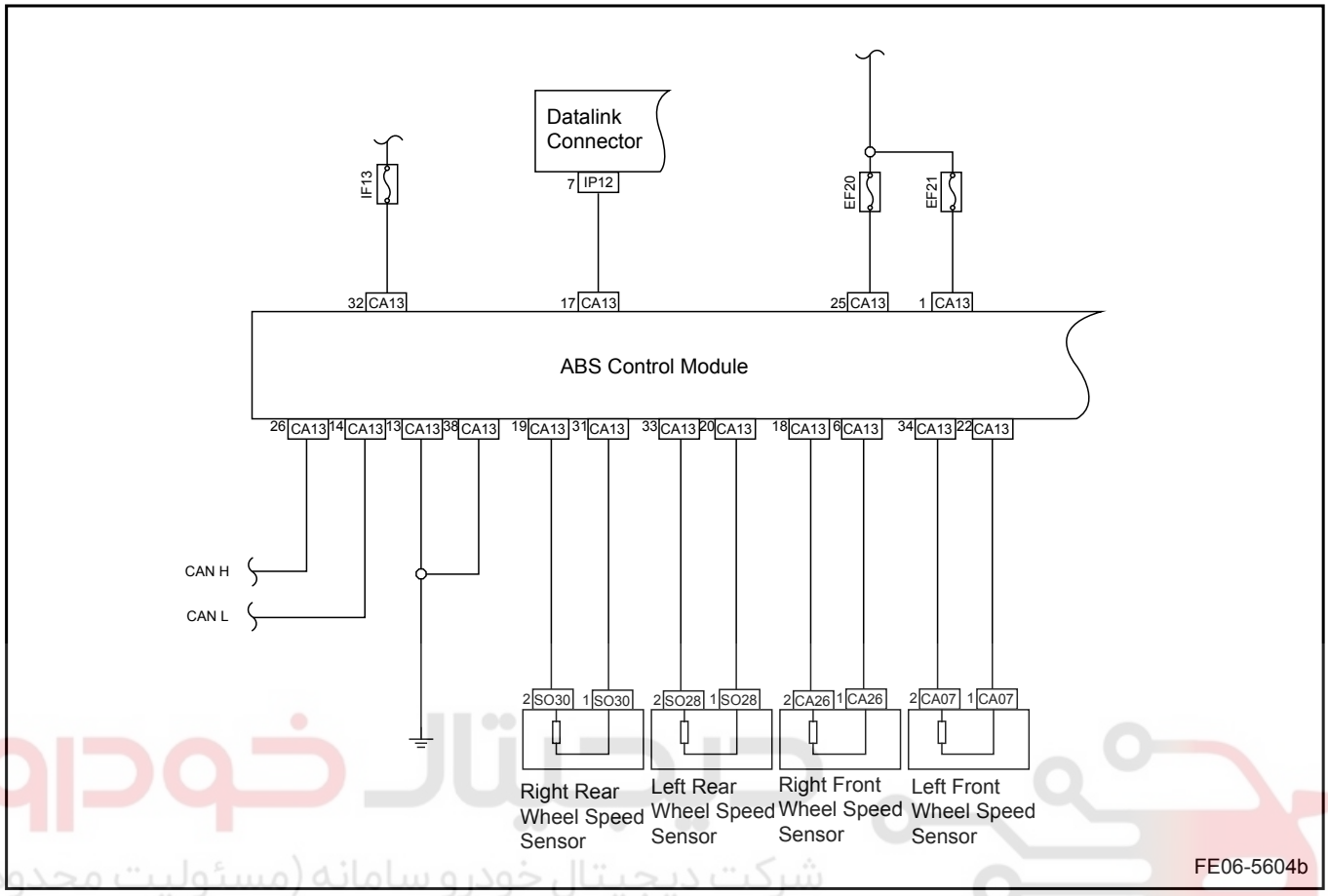
Next

| | |
|---|---|
| Step 7 | System normal. |

## 6.6.6.10 Power Failure and Hydraulic Electronic Control Unit Assembly Internal Fault Diagnosis

| DTC code | Description |
|---|---|
| C1101 | ECU Power Supply Voltage: High Voltage |
| C1102 | ECU Power Supply Voltage: Low Voltage |
| C2112 | Valve Relay Fault |
| C2308 | Valve Malfunction, Left Front Inlet Valve |
| C2312 | Valve Malfunction, Left Front Outlet Valve |
| C2316 | Valve Malfunction, Right Front Inlet Valve |
| C2320 | Valve Malfunction, Right Front Outlet Valve |
| C2324 | Valve Malfunction, Left Rear Inlet Valve |
| C2328 | Valve Malfunction, Left Rear Outlet Valve |
| C2332 | Valve Malfunction, Right Backward Valve |
| C2336 | Valve Malfunction, Right Rear Inlet Valve |
| C2402 | Return Pump Malfunction (Electrical and Electronic Failure) |

Schematic:




Diagnostic Steps:

| | |
|---|---|
| Step 1 | Check the battery. |

(a) Measure the battery voltage.
Standard Voltage Value: 11-14 V

Is the voltage specified value?

No → Check and replace the battery or the charging system.

Yes

| | |
|---|---|
| Step 2 | Check the ABS control module harness connector. |

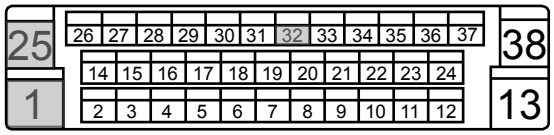
(a) Check whether the wiring harness connector is connected correctly.

No → Properly connect harness connectors.

Yes

| | |
|---|---|
| Step 3 | Check the ABS control module harness connector (terminal voltage). |

ABS Control Module Harness Connector

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(a) Turn off the ignition switch.
(b) Disconnect the control module harness connector.
(c) Turn on the ignition switch.
(d) Measure voltage between the harness connector CA13 terminals 1,25 32 and the body ground with a multimeter.
Standard Voltage Value: 11-14 V

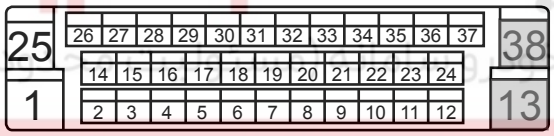
Is the voltage specified value?

No → Check the fuses, repair or replace the wiring harness

Yes

| | |
|---|---|
| Step 4 | Check the ABS control module harness connector (ground terminal continuity). |

ABS Control Module Harness Connector CA13




FE06-5606b

(a) Measure resistance between the harness connector CA13 terminals 13, 38 and the body ground with a multimeter.
Standard Resistance: Less than 1 Ω

Is the resistance specified value?

No → Repair or Replace the wiring harness or the connector.

Yes

| | |
|---|---|
| Step 5 | Replace the hydraulic electronic control unit |

(a) Replace the ABS control module assembly. Refer to 6.6.7.1 Hydraulic Electronic Control Unit Replacement.
(b) Connect the battery negative cable.
(c) Turn the ignition switch, to confirm whether the ABS Warning Lamp lit out.
(d) Confirm that the repair is completed.

Next

| | |
|---|---|
| Step 6 | System normal. |

## 6.6.6.11 Wheel Speed Sensor Fault Diagnosis

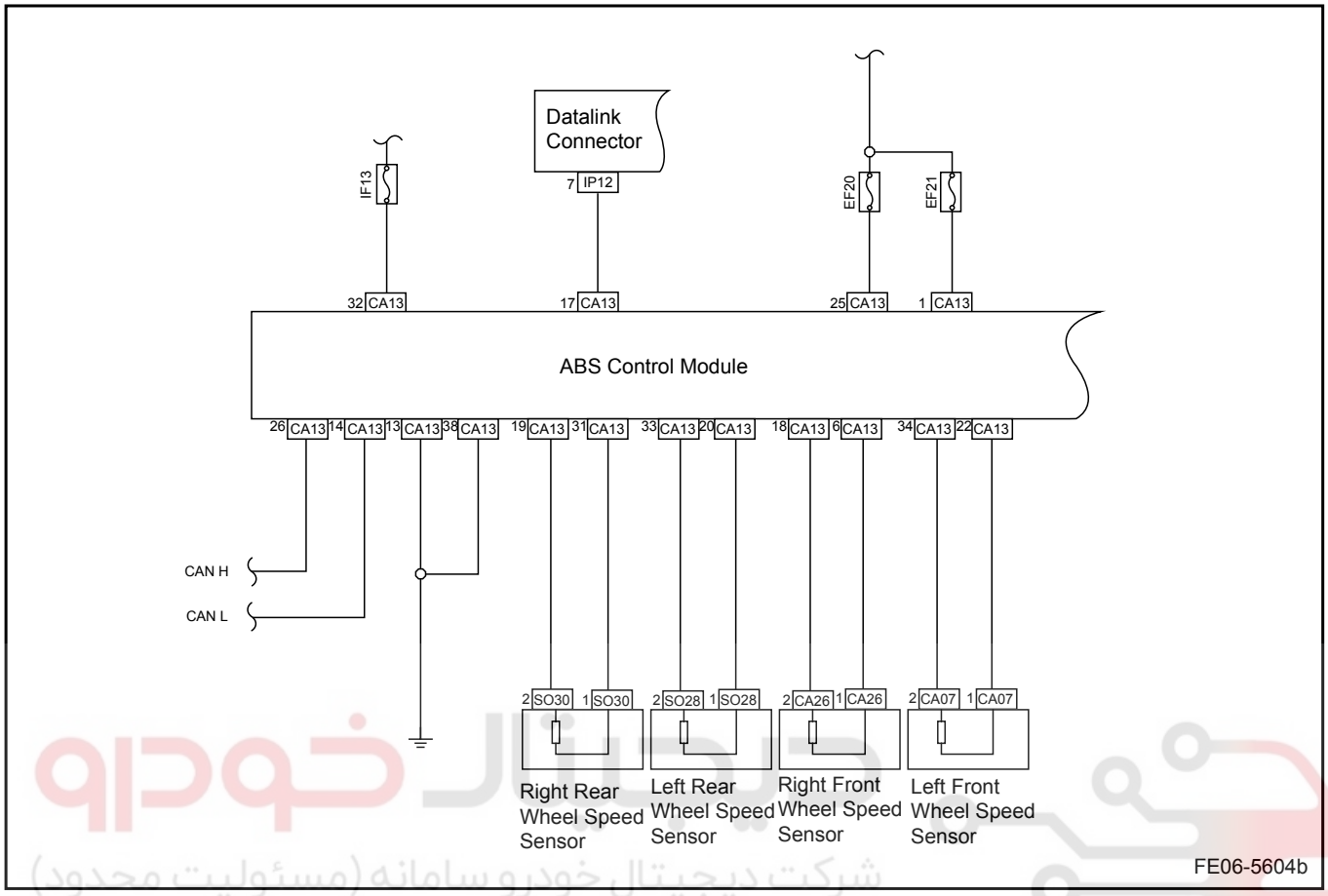
| DTC code | Description |
|---|---|
| C1200 | Wheel Speed Sensor, Left Front: Open / Short |

| DTC code | Description |
|---|---|
| C1201 | Wheel Speed Sensor, left Front: Scope, Performance, Intermittent Fault |
| C1202 | Wheel Speed Sensor, Left Front: Invalid / No Signal |
| C1203 | Wheel Speed Sensor, Right Front: Open / Short |
| C1204 | Wheel Speed Sensor, Right Front: Scope, Performance, Intermittent Fault |
| C1205 | Wheel Speed Sensor, Right Front: Invalid / No Signal |
| C1206 | Wheel Speed Sensor, Left Rear: Open / Short |
| C1207 | Wheel Speed Sensor, Left Rear: Scope, Performance, Intermittent Fault |
| C1208 | Wheel Speed Sensor, Left Rear: Invalid / No Signal |
| C1209 | Wheel Speed Sensor, Right Rear: Open / Short |
| C1210 | Wheel Speed Sensor, Right Rear: Scope, Performance, Intermittent Fault |
| C1211 | Wheel Speed Sensor, Right Rear: Invalid / No Signal |
| C1213 | Wheel Speed Sensor Frequency Error (general wheel speed sensor fault, slip or tooth error) |

Note

This manual is only for the left front wheel speed sensor fault diagnosis, other sensor diagnostic methods are similar. Please refer to the "left Front wheel Speed Sensor Fault Diagnosis."

Schematic:




Diagnostic Steps:

| | |
|---|---|
| Step 1 | Check the left front wheel speed sensor harness connector. |

(a) Check whether the left front wheel speed sensor wiring harness connector is connected correctly.

No → Properly connect harness connectors.

Yes

| | |
|---|---|
| Step 2 | Check the left front wheel speed sensor installation. |

(a) Check whether the left front wheel speed sensor is installed correctly.

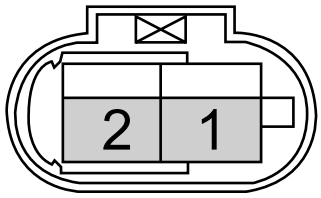
Tightening Torque: 19 Nm (Metric) 14 lb-ft (US English)

No → Correctly install the left front wheel speed sensor.

Yes

| | |
|---|---|
| Step 3 | Check the left front wheel speed sensor. |

Left Front Wheel Speed Sensor Harness Connector CA07




FE06-5610b

(a) With a multimeter measure the left front wheel speed sensor according to the table below.

(b) Confirm the voltage and current is complied with the standard value.

Note

Turn the wheel with hand when measuring.

Warning!

Do not place finger into a rotating wheel, otherwise, it may result in personal injury.

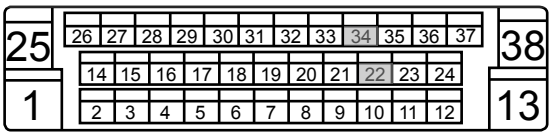
| Wheel Speed Sensor | Description |
|---|---|
| Sensor Type | Hall Type Speed Sensor |
| Signal Current | Low: 7 ± 20% mA, High: 14 ± 20% mA |
| Gap Between The Sensor and The Signal Plate | Front Axle 1.56 mm (0.061 in); Rear Axle 0.738 mm (0.029 in) |

Yes → Go to step 5

No

| Step 4 | Check the left front wheel speed sensor and ABS control module wiring harness. |
|---|---|

ABS/ESP Harness Connector CA13




FE06-5607b

(a) Disconnect the left front wheel speed sensor harness connector.

(b) Disconnect the ABS control module harness connector.

(c) Measure resistance between the connector CA13 terminal 34 and CA07 terminal 2 with a multimeter.

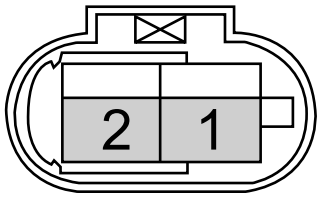
(d) Measure resistance between the connector CA13 terminal 22 and CA07 terminal 1 with a multimeter.
Standard Resistance: Less than 1 Ω

(e) Measure resistance between the connector CA13 terminals 34, 22 and the body ground.
Standard Resistance:10 kΩ or higher

Is the resistance specified value?

No → Repair or Replace the wiring harness

Left Front Wheel Speed Sensor Harness Connector CA07




FE06-5610b

Yes

| | |
|---|---|
| Step 5 | Check the left front wheel speed sensor. |

(a) Confirm that there is no short circuit between the sensor terminals with a multimeter.
(b) Resistance between the sensor two terminals and the body ground are infinity.

Is the resistance specified value?

No → Replace the left front wheel speed sensor

Yes

| | |
|---|---|
| Step 6 | Check the left front wheel speed sensor probe. |

(a) Remove the left front wheel speed sensor. Refer to 6.6.7.2 Wheel Speed Sensor Replacement (Front).
(b) Check whether the sensor probe is scratched or contaminated by foreign matter and dirt.

Yes → Clean or replace the sensor.

No

| | |
|---|---|
| Step 7 | Check the left front wheel speed sensor ring gear. |

(a) Check whether the left front wheel speed sensor ring gear is deformed, or whether there are teeth missing.

Yes → Replace the left front wheel speed sensor ring gear

No

| | |
|---|---|
| Step 8 | Replace the hydraulic electronic control unit. |

(a) Replace the hydraulic electronic control unit. Refer to 6.6.7.1 Hydraulic Electronic Control Unit Replacement
(b) Confirm that the repair is completed.

Next

| | |
|---|---|
| Step 9 | System normal. |

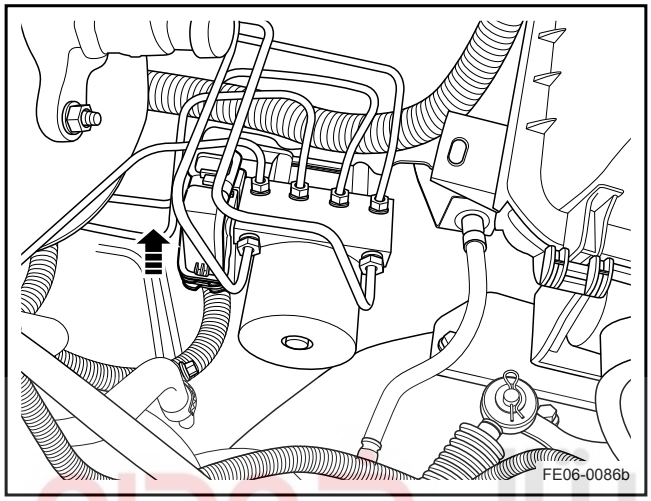
## 6.6.7 Removal and Installation

### 6.6.7.1 Hydraulic Electronic Control Unit Replacement

Removal Procedure:

Warning!

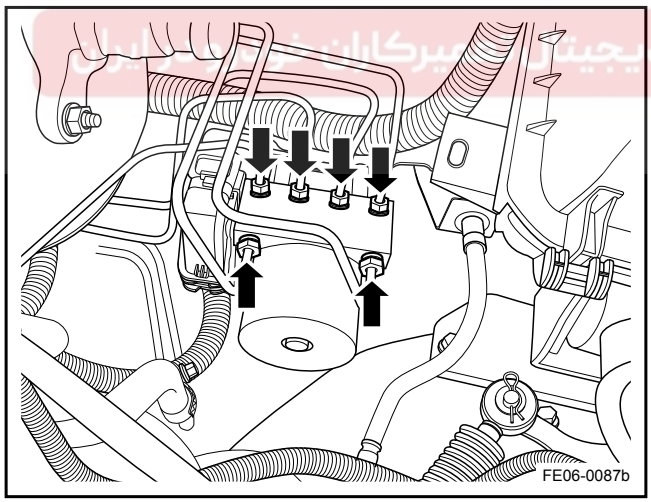
Refer to "Battery Disconnect Warning" in "Warnings and Notices" .



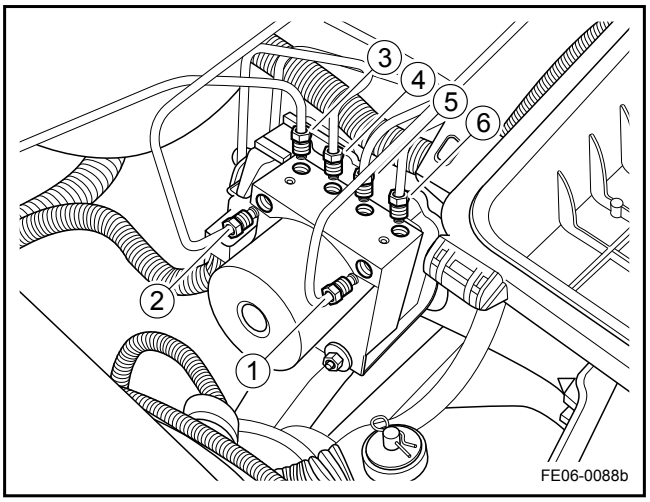

1. Disconnect the battery negative cable. Refer to 2.11.8.1 Battery Disconnection.
2. Remove the air filter and air filter to the throttle pipe.
3. Press plug, pull the zipper upward, disconnect the brake regulator wiring harness connector.
4. Drain the brake fluid.
5. Use a cloth to cover the wiring harness connector sockets and plugs to avoid contact with brake fluid.

Note

Refer to "Brake Fluid Effects on Paint and Electrical Components Notice" in "Warnings and Notices".



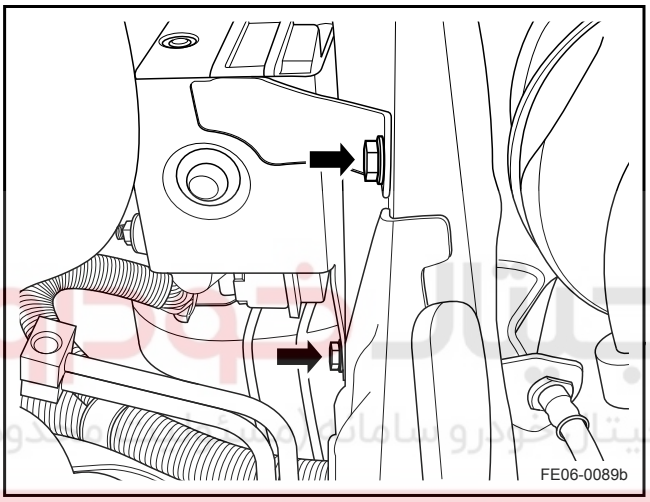

6. Remove brake fluid pipe connecting nuts from the brake adjuster, and immediately wipe the brake fluid overflow.




7. Use tags or make marks to identify the locations for re-connection.

   Tip:

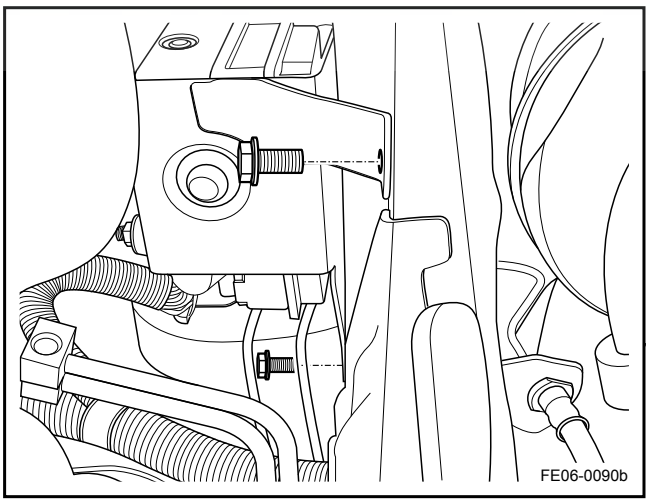
   1. To the No. 1 Brake Master Cylinder
   2. To the No. 2 Brake Master Cylinder
   3. To the Right Front Brake Cylinder
   4. To the Left Rear Brake Cylinder
   5. To the Right Rear Brake Cylinder
   6. To the Left Front Brake Cylinder




8. Lift and support the vehicle. Refer to 1.3 Lifting and Jacking the Vehicle.
9. Remove the engine bottom shield. Refer to 12.10.1.7 Left and Right Engine Bottom Shield Replacement.
10. Remove the brake adjuster bracket retaining bolts.
11. Remove the hydraulic electronic control unit.

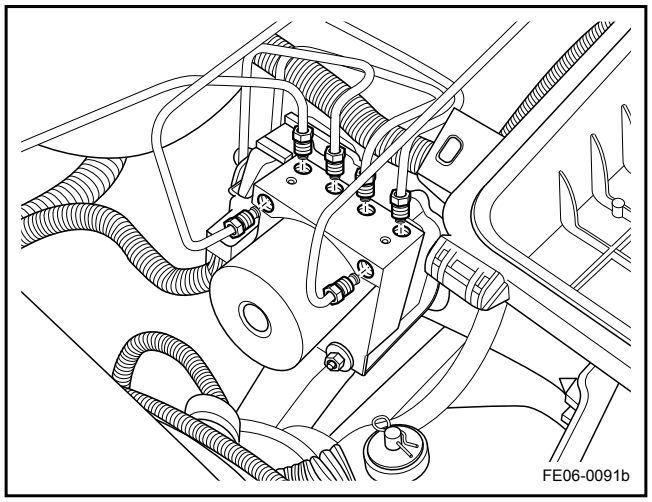


Installation Procedure:



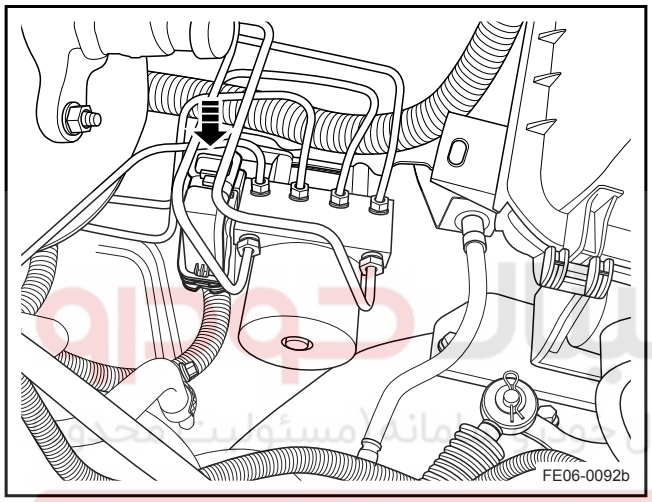

1. Install the hydraulic electronic control unit and tighten the bolts.

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




2. Install the brake hard pipe joints, and tighten the nuts.

   Torque: 16 Nm (Metric) 11.9 lb-ft (US English)




3. Push down the lock, connect the hydraulic electronic control unit wiring harness connector.
4. Fill the brake fluid.

   Note

   Refer to "Adding Fluid to the Brake System Notice" in "Warnings and Notices".

5. Discharge air from the hydraulic brake system.
6. Check whether the brake system is leaking.
7. Install the engine bottom shield.
8. Connect the battery negative cable.

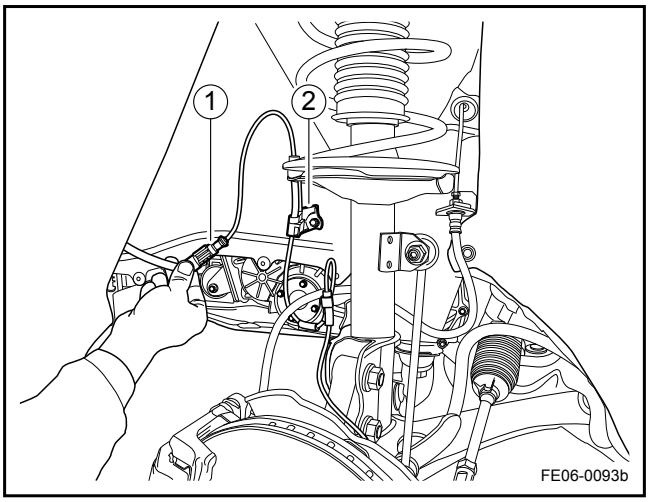


## 6.6.7.2 Wheel Speed Sensor Replacement (Front)

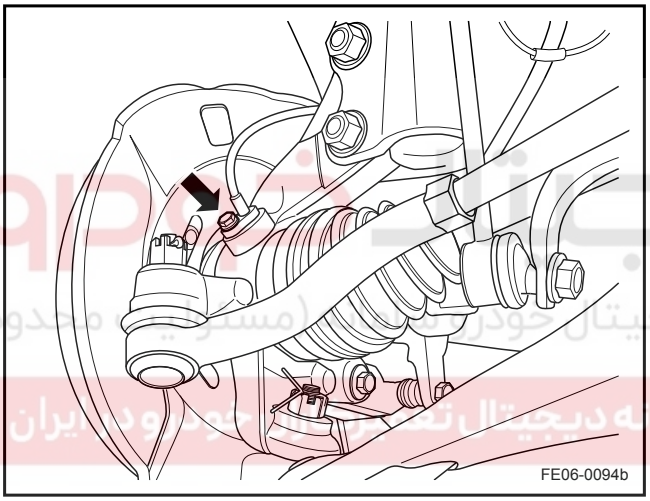
Removal Procedure:

Warning!

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

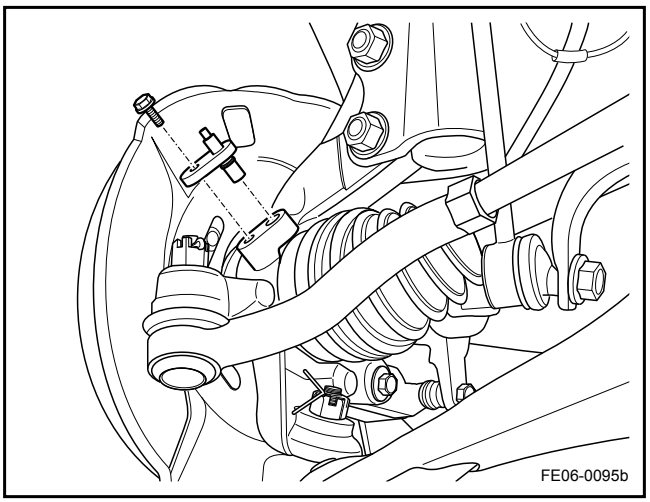



1. Remove the battery negative cable. Refer to 2.11.8.1 Battery Disconnection.
2. Lift and support the vehicle. Refer to 1.3 Lifting and Jacking the Vehicle.
3. Remove the front wheels. Refer to 4.4.5.1 Wheel Replacement.
4. Disconnect the front wheel speed sensor wiring harness from the shock absorber.
5. Remove the front fender liner. Refer to 12.10.1.8 Front Wheelhouse Liner Replacement.
6. Disconnect the front wheel speed sensor harness connector (1) from the back of the front fender liner. Remove the sensor wiring harness bolt (2).



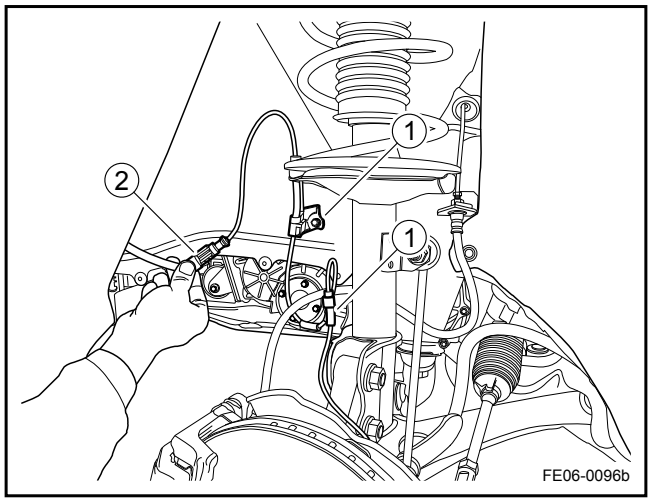

7. Remove the front wheel speed sensor retaining bolt.
8. Remove the front wheel speed sensor.

Installation Procedure:




1. Install the front wheel speed sensor and using the bolt with a flat washer to tighten.

   Torque: 19 Nm (Metric) 14 lb-ft (US English)




2. Fix the front wheel speed sensor wiring harness (1).
3. Connect the front wheel speed sensor harness connector (2).
4. Install the front fender liner.
5. Lower the vehicle.
6. Connect the battery negative cable.
7. Install the front wheels.

Note

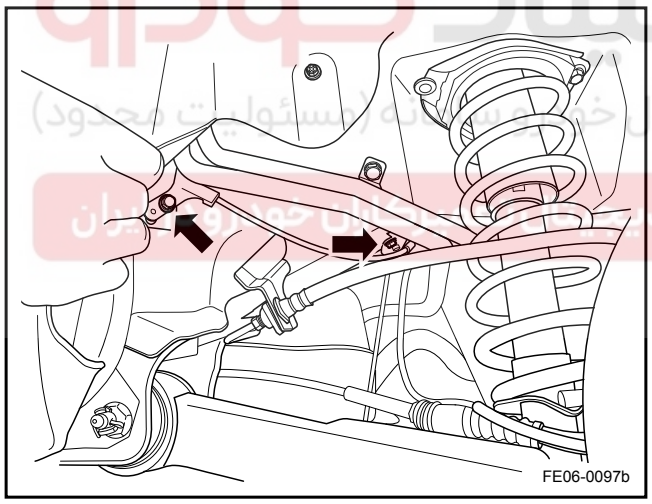
Left front and right front wheel speed sensor replacement is similar.

## 6.6.7.3 Wheel Speed Sensor Replacement (Rear)

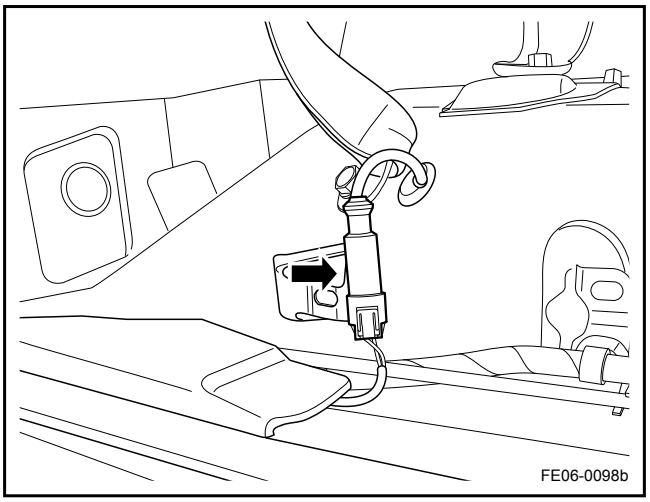
Removal Procedure:

Warning!

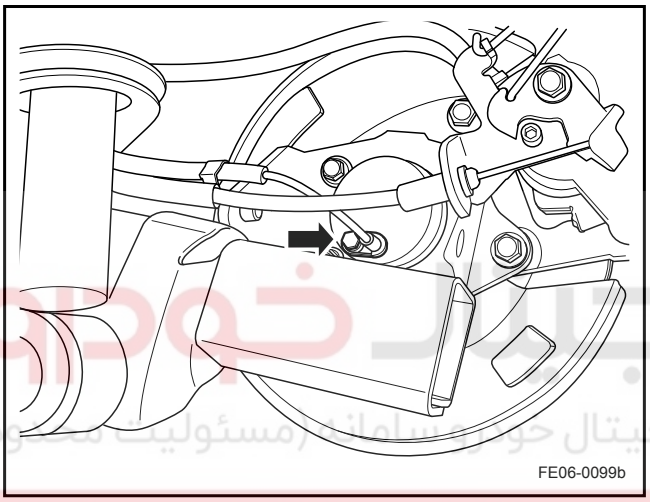
Refer to "Battery Disconnect Warning" in "Warnings and Notices" .




1. Disconnect the battery negative cable. Refer to 2.11.8.1 Battery Disconnection.
2. Lift and support the vehicle. Refer to 1.3 Lifting and Jacking the Vehicle.
3. Remove the rear wheels. Refer to 4.4.5.1 Wheel Replacement.
4. Disconnect the rear wheel speed sensor wiring harness from the rear suspension.
5. Remove the rear wheel speed sensor wiring harness to rear axle retaining bolts.
6. Remove the rear seat back. Refer to 12.7.3.6 Rear Seat Armrest Assembly Replacement.



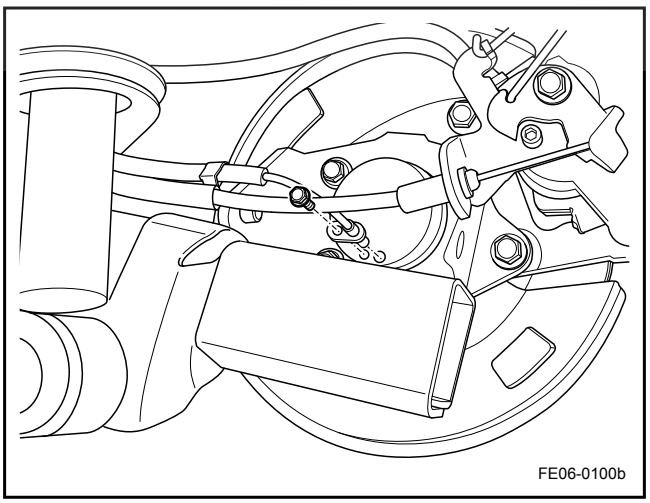

7. Disconnect the rear wheel speed sensor wiring harness connector.




8. Remove the rear wheel speed sensor retaining bolts.
9. Remove the rear wheel speed sensor.

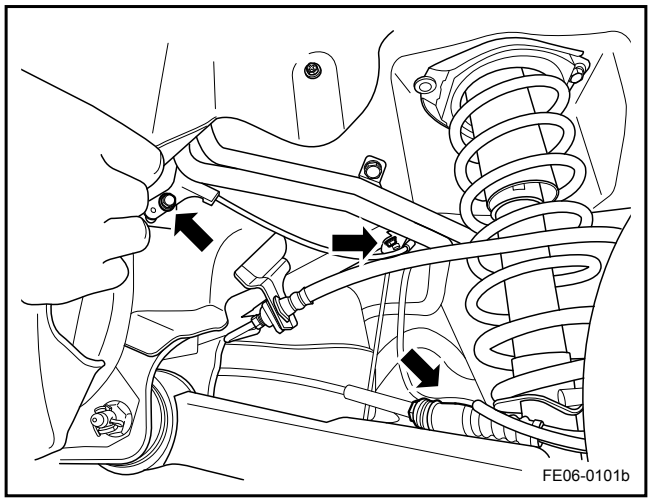


Installation Procedure:

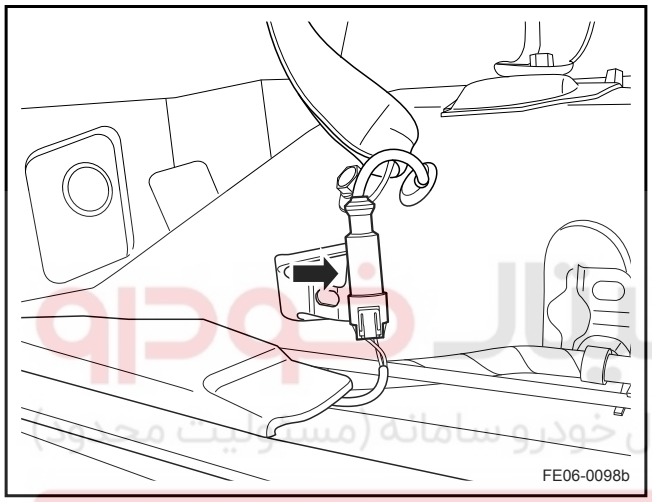



1. Install the rear wheel speed sensor and use the bolt with a flat washer to tighten.

   Torque: 19 Nm (Metric) 14 lb-ft (US English)




2. Connect the rear wheel speed sensor wiring harness.




3. Run through the rear wheel speed sensor wiring harness from the passenger compartment and connect the wiring harness connector.
4. Install the rear seat back.
5. Connect the battery negative cable.
6. Install the rear wheels.

Note

Left and right rear wheel speed sensor replacement is similar.

# 6.7 TPMS

## 6.7.1 Specifications

### 6.7.1.1 Fastener Tightening Specifications

| Applications | Model | Specifications | |
|---|---|---|---|
| | | Metric (Nm) | US English (lb-ft) |
| TPMS Module Bolts | M6 × 14 | 8-10 | 6.0-7.4 |

### 6.7.1.2 Sensor Specifications

| Applications | Specifications |
|---|---|
| Weight | 36-38 g |
| Shell Material | PBT +30% GF |
| Material | Polybutadiene |
| Put the valve rod into the mold for a second injection, final assembly dimensions | Length: 72.2-73.2 mm (2.85-2.88 in)<br>Width: 36.3-37.3 mm (1.43-1.47 in)<br>Height: 24.8-25.8 mm (0.98-1.02 in) |
| Valve Material | Electric Aluminum |
| Installation Location | Inside tires, on the valve lip |
| Valve Nut Torque | 8-10 Nm (6-7.4 lb-ft) |
| Working Voltage | Long-life (normal working life 5 years) 3 V battery |

## 6.7.2 Description and Operation

### 6.7.2.1 Tire Pressure Monitoring System Overview

In the current auto industry there are two kinds of tire pressure monitoring system (TPMS): Direct and indirect. Direct TPMS can detect the real pressure of automobile tires. Indirect TPMS tires by checking out some of the technical parameters to infer tire pressure. Direct TPMS tire pressure and temperature can be accurately detected. TPMS is aimed at alerting the driver when one or more tire pressure is below the warning pressure level. Direct TPMS is divided into two types: high-end system and low-end system. Low-end system will alert the driver when the tire pressure is below the warning level, while the high-end systems can not only alert the driver but also show which tire tire pressure is not normal. This vehicle TPMS is a low-end direct TPMS system provided by Lier Company.

### 6.7.2.2 The Composition Of Tire Pressure Monitoring System

TPMS system is composed of the following components

- TPMS Control Unit
- TPMS Sensors (one for each wheel) (does not include spare tire)
- TPMS tire pressure management system and the TREAD tire pressure warning indicator lights

#### TPMS Control Unit

Note

Tire Pressure Monitoring System receiver can provide excellent installation flexibility to meet a broader range of installation requirements. This flexibility of installation can be achieved by the metal bracket connected to the shell. Bracket connection with the shell allows the bracket to pass through the shell side and to be locked without the use of additional fixtures.

When the vehicle ignition circuit is connected, TPMS control unit micro-control unit and the RF receiver circuit are activated. The control unit continuously monitors the TPMS sensors wireless signals. TPMS receiver unit can store TPMS sensor id code (identification code, differentiate each sensor). When the TPMS receiver unit receives a signal, it will check whether the received information contained id code is consistent with the stored id code. If they match, TPMS receiver unit will input the information to the TPMS alarm algorithm. This algorithm will evaluate each tire pressure and temperature changes over time, and make a decision on the potential danger caused by tire deflation, remind the driver through the tire pressure (TREAD) warning lamp. In addition to handling the TPMS sensors signals, TPMS control unit can also conduct its own self-test on its circuit and working status. If a fault is detected, TPMS control unit will continue to light the TPMS malfunction warning lamp, to remind the driver.

#### TPMS Sensor

Each tire is equipped with a TPMS sensor, through the valve installed on the wheel rim. TPMS sensor is a battery powered component, regularly measures the tire pressure, temperature and acceleration information. Pressure, temperature and acceleration information will be converted by the TPMS sensor unit micro-control unit into a digital form. Acceleration information is used to determine whether the vehicle is stationary or moving. TPMS sensor is equipped with radio-frequency transmitting circuit for periodically sending information to the TPMS control unit.

#### Tire Pressure Management System Indicator (TPMS) and Tire Pressure Warning Lamp (TREAD)

TPMS control unit can provide two consecutive current drive capability of 200 mA, respectively, to drive two warning lamps. When the tire pressure drops below a warning level pressure, TPMS receiver will continuously light the TREAD warning lamp to remind the driver. Throughout the course of the ignition cycle, TREAD alarm indicator status will be maintained. When the TPMS is faulty, TPMS receiver unit will continuously light the Tire Pressure Management System (TPMS) warning lamp. TPMS receiver unit has a self-diagnostic function, its features include: warning lamp diagnostic tests, EEPROM data accuracy check, vehicle power supply voltage measurement, warning lamp circuit failure, TPMS sensors low voltage status monitoring, TPMS sensor fault condition monitoring, TPMS sensor learn mode, the installation of not monitored tire.

When the tire low voltage alarm and system failures arise at the same time, the tire low voltage alarm has a higher priority.

## 6.7.3 System Working Principle

### 6.7.3.1 System Working Principle

TMPS Function Description

1. Reset

   During the initial power-up or the voltage is below the reset threshold, TPMS control unit will be in a non-operational services status, in reset status. Once the voltage reaches an acceptable value, TPMS control unit will be released from the reset status, the module will enter the normal status.

2. Initialization Mode (System Self-test)

   When the ignition is turned to ON, the initialization starts. The system will initialize I / O ports, registers, internal variables, data storage address.

3. Start Mode

   In the start mode, TPMS supports systems running:

   a. Receive WE Sensors RF Data Frame

      TPMS control unit continuously receives and deals with TPMS sensors RF data frame.

   b. Verify Sensor Received WE Frame Data

      Upon receiving a radio frequency emitted by the WE sensor data frame, TPMS control unit will firstly verify the legitimacy of the message received. Sensor information will be sent through an early warning algorithms for processing.

   c. Process Each Received Valid TPMS Sensor Message

      Once a low tire pressure is detected, tire pressure warning lamp will be lit (TREAD).

   d. Continuously Monitors The K-Bus Request

      TPMS control unit must be activated prior to use of the K-bus.

   e. Vehicle Moving (Wheel Speed Sensor)

      Monitor whether there is a tire without speed sensor or the spare tire is used on the vehicle.

4. Diagnostic Mode

   When connecting scan tool to communicate through the K-bus, TPMS control unit enters into the diagnostic mode.

5. Sleep Mode

   When the system enters into sleep mode, it will enter a low power consumption mode. When entering sleep mode, it does not receive and process sensor information, or the diagnosis command, until the ignition is detected turned on, the system exits sleep mode.

   - Wake-up Condition

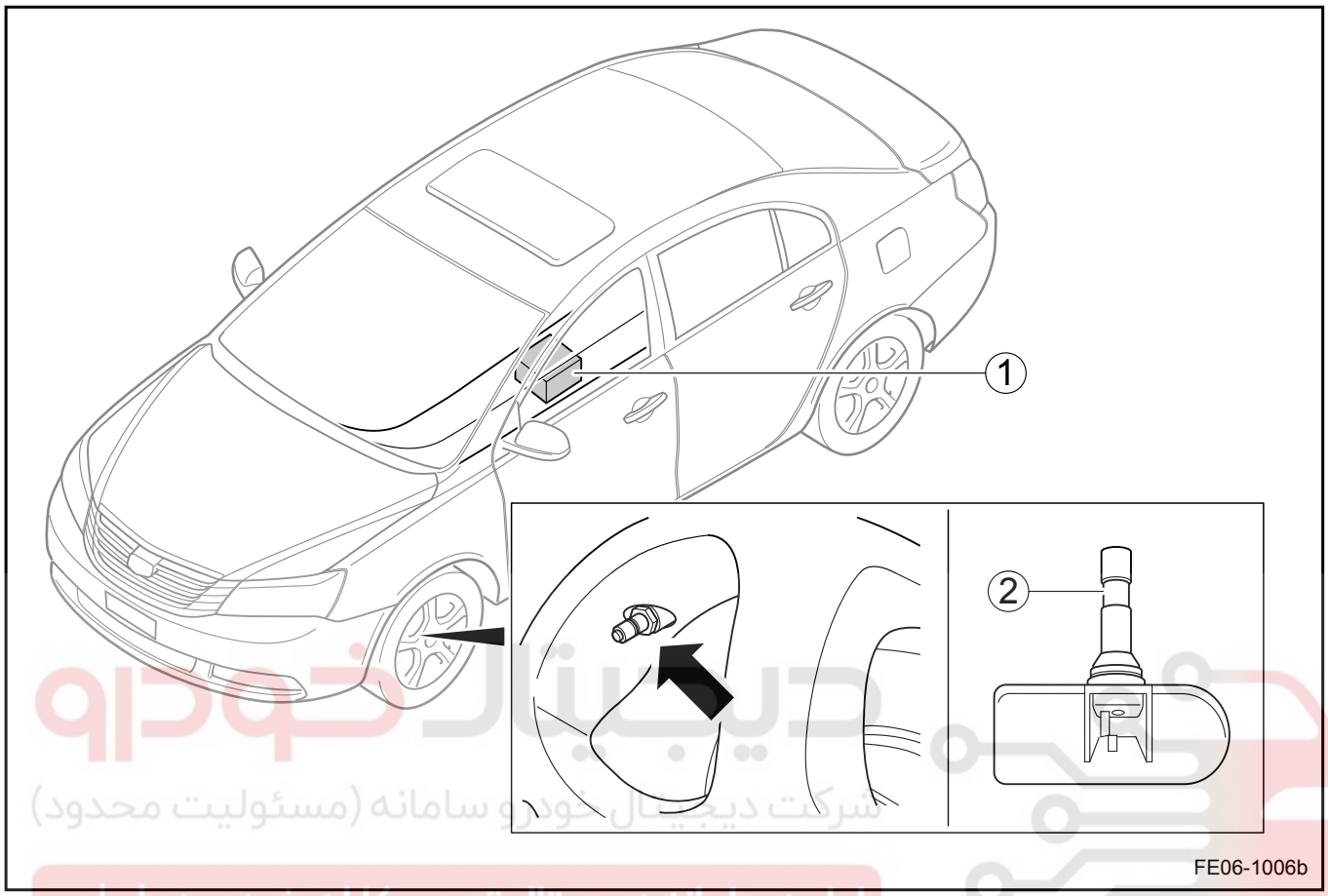
     When the ignition input signal changes from the ignition off (OFF) to ignition on (ON), the TPMS control unit exits sleep mode.

   - Sleep Condition

     When the TPMS control unit detects that the ignition input information is off (OFF) and no pending received RF information, TPMS control unit will enter into sleep mode.

## 6.7.4 Component Locator

### 6.7.4.1 Component Locator

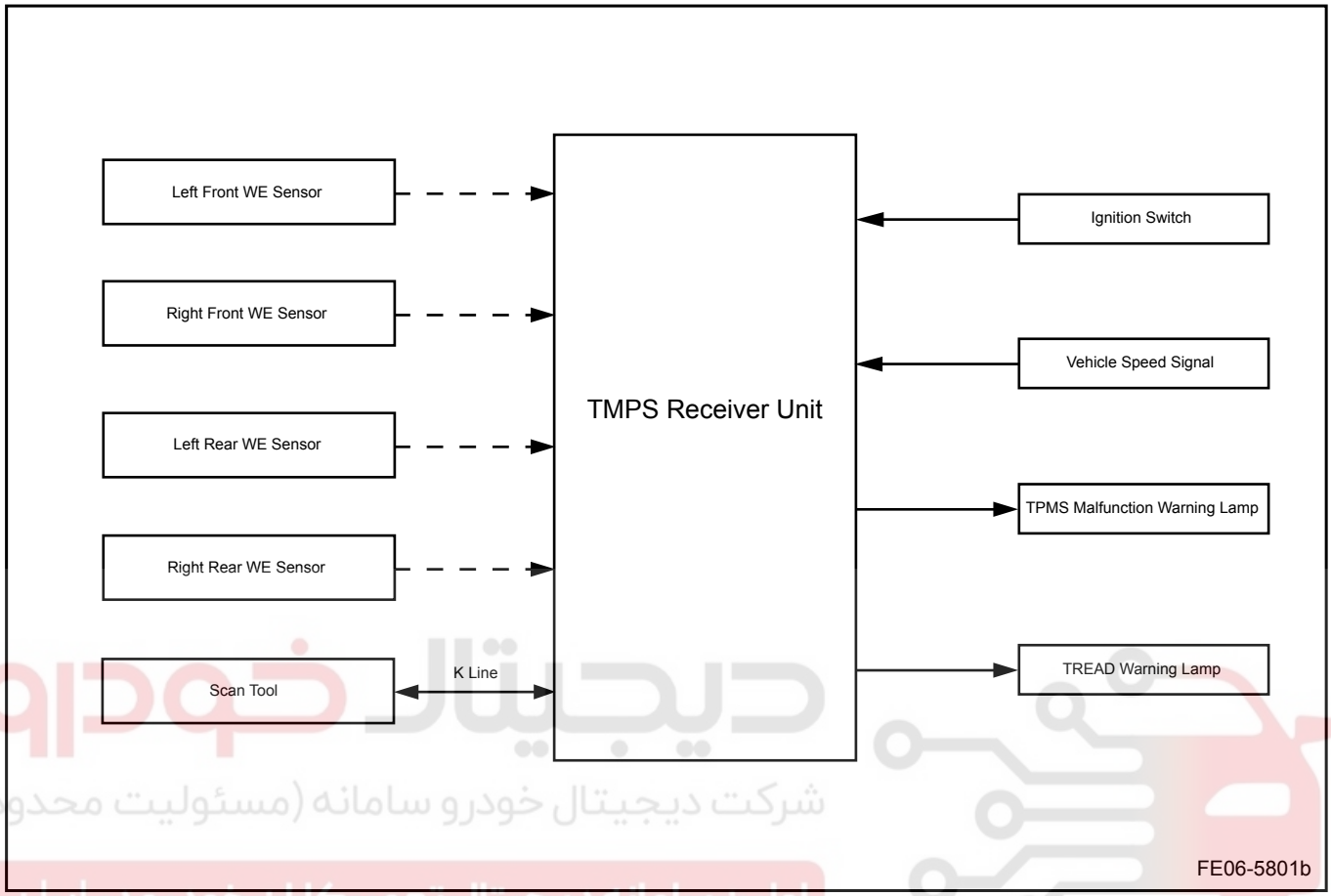



Legend

1. TPMS Control Module
2. TPMS Sensor

## 6.7.5 Schematic

### 6.7.5.1 Schematic



## 6.7.6 Diagnostic Information and Procedures

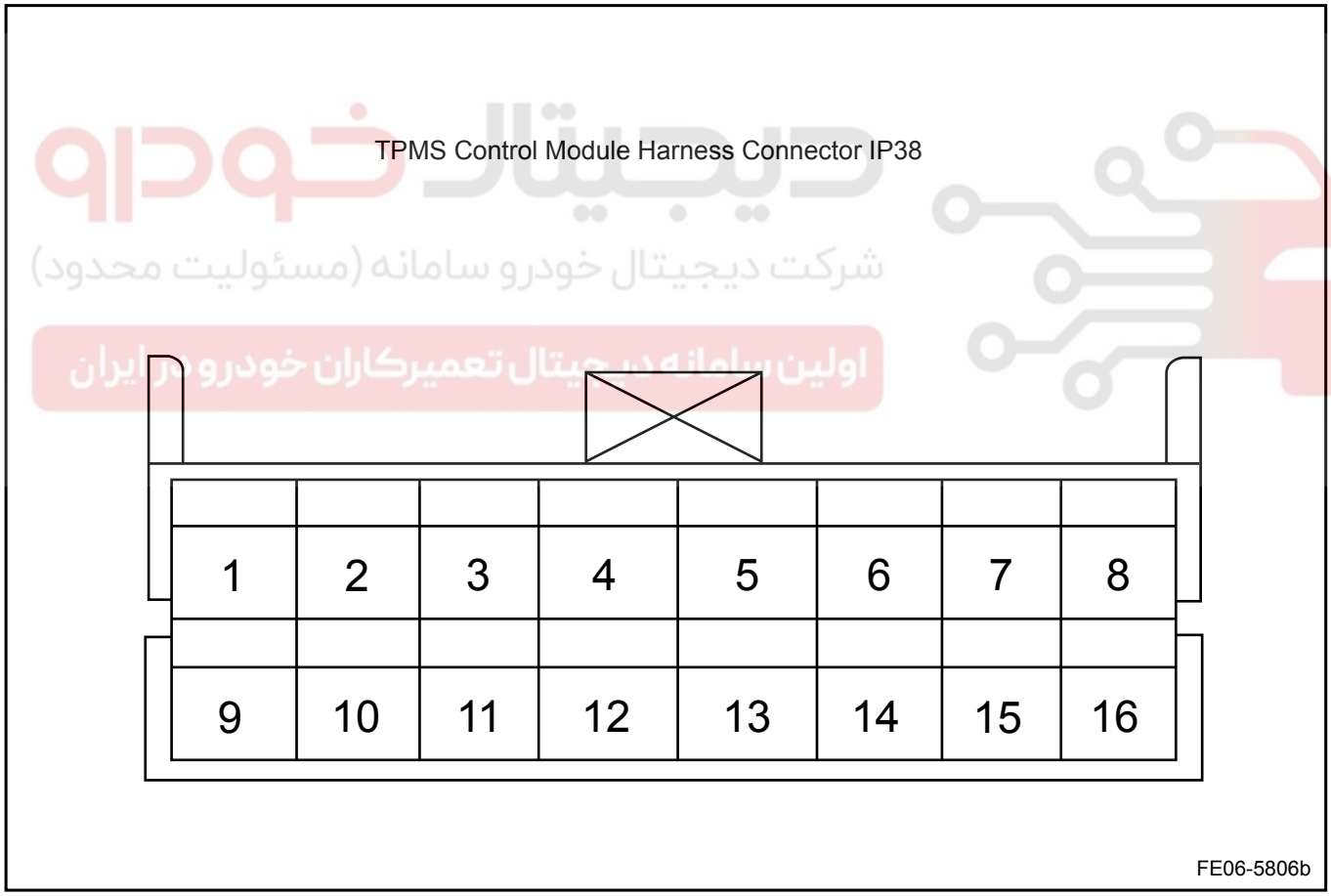
### 6.7.6.1 Sensor Learn

Scan tool sends the learn commands with sensor serial numbers to command the sensor into the learn process through the K-line. When the sensor is triggered, TPMS control unit can receive a corresponding sensor id. Trigger Tool needs to manually trigger the TPMS sensors to send id. Learn id number is related to the sensor serial number. Learned sensor must be associated with a sensor number.

In this system, each sensor corresponding tire fixed location is shown in the following order:

| Sensor # | Wheel Sensor Position |
|---|---|
| Sensor 1 | Left Front |
| Sensor 2 | Right Front |
| Sensor 3 | Left Rear |
| Sensor 4 | Right Rear |

### 6.7.6.2 TPMS Control Module Terminal List




| Pin | Function | I / O | Maximum Current | Logic | | Description |
|---|---|---|---|---|---|---|
| | | | | On | Off | |
| 01 | -- | -- | -- | -- | -- | -- |

| Pin | Function | I / O | Maximum Current | Logic | | Description |
|---|---|---|---|---|---|---|
| | | | | On | Off | |
| 02 | -- | -- | -- | -- | -- | -- |
| 03 | -- | -- | -- | -- | -- | -- |
| 04 | -- | -- | -- | -- | -- | -- |
| 05 | K-line | IN/OUT | -- | L | H | K_BUS |
| 06 | -- | -- | -- | -- | -- | -- |
| 07 | Ignition | IN | 12 mA | H | L | - |
| 08 | Power Supply | POWER | 200 mA | -- | -- | -- |
| 09 | -- | -- | -- | -- | -- | -- |
| 10 | -- | -- | -- | -- | -- | -- |
| 11 | -- | -- | -- | -- | -- | -- |
| 12 | -- | -- | -- | -- | -- | -- |
| 13 | TPMS Warning Lamp | OUT | 200 mA | H | L | TPMS Receiver Unit Drive |
| 14 | TREAD Warning Lamp | OUT | 200 mA | L | H | TREAD Receiver Unit Drive |
| 15 | Speed Information | IN | 1 mA | L | H | - |
| 16 | Ground | POWER | 2 A | -- | -- | -- |



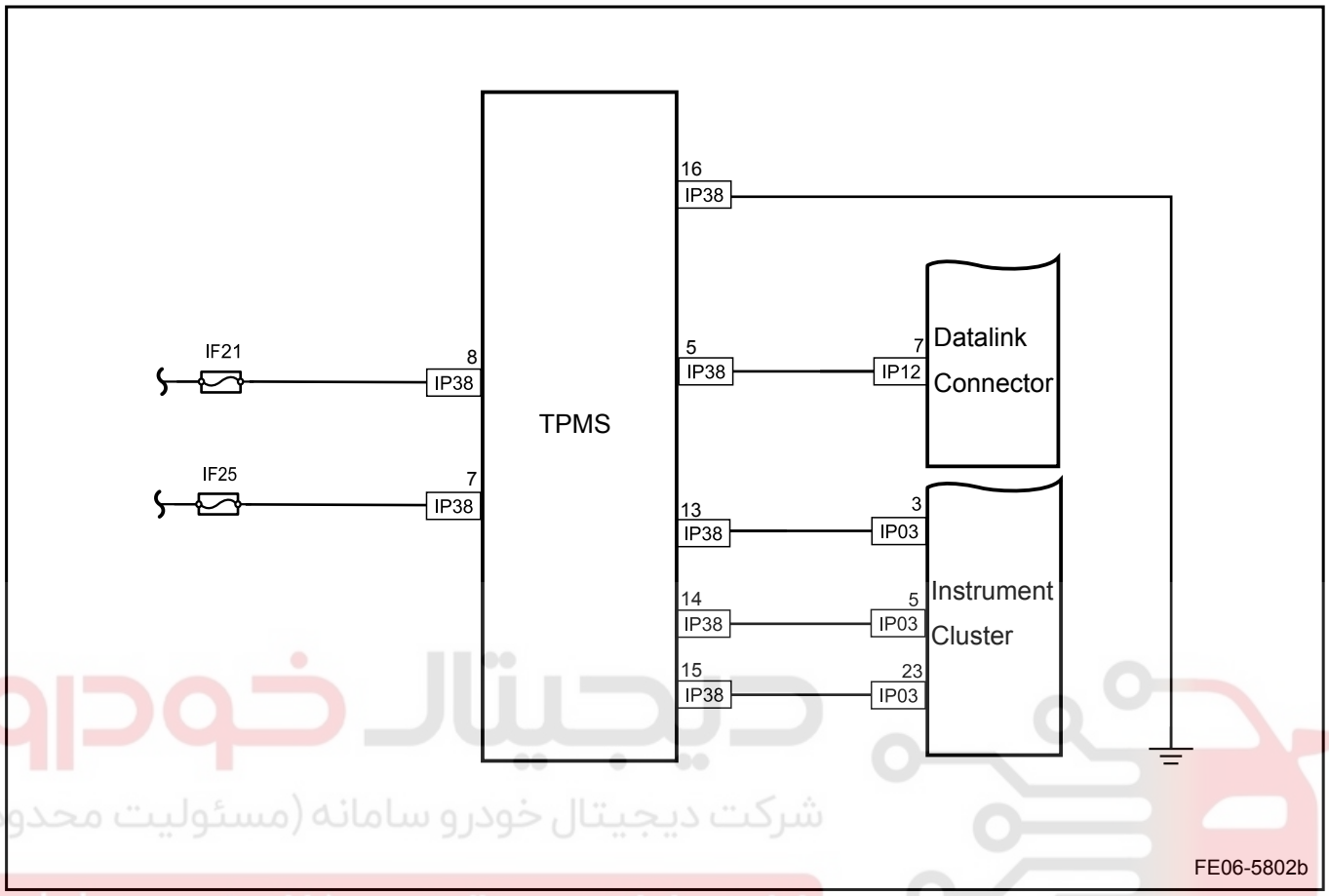
### 6.7.6.3 DTC Code (DTC) List

| DTC Code | DTC Code Descriptions |
|---|---|
| C1121 | Left Front Wheel Sensor Battery Voltage Low |
| C1122 | Right Front Wheel Sensor Battery Voltage Low |
| C1123 | Left Rear Wheel Sensor Battery Voltage Low |
| C1124 | Right Rear Wheel Sensor Battery Voltage Low |
| C1312 | Left Front Wheel Sensor Is Not Emitting |
| C1313 | Right Front Wheel Sensor Is Not Emitting |
| C1314 | Left Rear Wheel Sensor Is Not Emitting |
| C1315 | Right Rear Wheel Sensor Is Not Emitting |
| C1316 | Spare Wheel Sensor Is Not Emitting |
| C1322 | Left Front Wheel Sensor Too Hot and Off |
| C1323 | Right Front Wheel Sensor Too Hot and Off |

| DTC Code | DTC Code Descriptions |
|---|---|
| C1324 | Left Rear Wheel Sensor Too Hot and Off |
| C1325 | Right Rear Wheel Sensor Too Hot and Off |
| C1332 | Left Front Wheel Sensor Malfunction |
| C1333 | Right Front Wheel Sensor Malfunction |
| C1334 | Left Rear Wheel Sensor Malfunction |
| C1335 | Right Rear Wheel Sensor Malfunction |
| C1126 | Battery Voltage Low |
| C1127 | Battery Voltage High |
| C1660 | No Actuation |
| C1668 | Watchdog Reset |
| C2510 | Tire Pressure Warning Lamp (TREAD) |
| C2511 | Tire Pressure Management System Indicator (TPMS) Circuit Malfunction |
| C1661 | EEPROM Checksum Error |
| C1301 | Not Monitored Tire Installed |
| C1212 | Speed Sensor Malfunction |

## 6.7.6.4 Tire Pressure Monitoring System (TPMS) Indicator Always On

Schematic:






Diagnostic Steps:

| | |
|---|---|
| Step 1 | 1. Use scan tool to access the TPMS control. |

(a) Check the DTC.

Yes → Repair according to the DTC.

No

| | |
|---|---|
| Step 2 | Check the battery voltage. |

(a) Measure the battery voltage with a multimeter.
Standard Voltage: 12-14 V

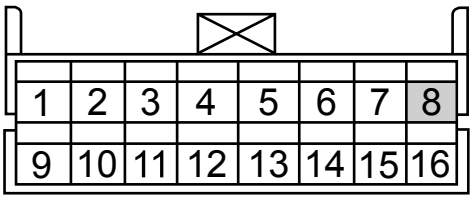
Is the voltage specified value?

No → Check and replace the battery or the charging system.

Yes

| | |
|---|---|
| Step 3 | Check TPMS control unit power supply. |

TPMS Control Module Harness Connector IP38




FE06-5803b

(a) Disconnect the battery negative cable. Refer to 2.11.8.1 Battery Disconnection.
(b) Disconnect TPMS control unit harness connector.
(c) Connect the battery negative cable.
(d) Measure voltage between TPMS control unit harness connector IP38 terminal 8 and the body ground with a multimeter.
Standard Voltage: 12-14 V

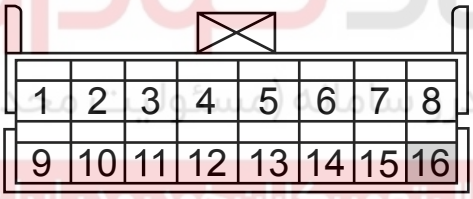
Is the voltage specified value?

No → Check the fuses, repair or replace the wiring harness.

Yes

| | |
|---|---|
| Step 4 | Check TPMS control unit ground. |

TPMS Control Module Harness Connector IP38




FE06-5804b

(a) Measure resistance between IP38 terminal 16 and the body ground with a multimeter.
Standard Resistance: Less than 1 Ω

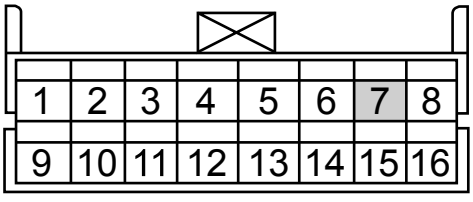
Is the resistance specified value?

No → Repair or Replace the wiring harness.

Yes

| | |
|---|---|
| Step 5 | Check TPMS control unit ignition switch signal. |

TPMS Control Module Harness Connector IP38




FE06-5805b

(a) Turn the ignition switch to the ON position.
(b) Measure voltage between connector IP38 terminal 7 and the body ground with a multimeter.
Standard Voltage: 12-14 V

Is the voltage specified value?

Note: The circuit does not provide TPMS receiver unit working current, it is only used as a logic level input.

No → Check the fuses, repair or replace the wiring harness.

Yes

| | |
|---|---|
| Step 6 | Replace the TPMS control unit. |

(a) Disconnect the battery negative cable. Refer to 2.11.8.1 Battery Disconnection.
(b) Replace the TPMS control unit. Refer to 6.7.7.1 TPMS Control Unit Replacement.
(c) Confirm that the repair is completed.

Next

| | |
|---|---|
| Step 7 | System normal. |

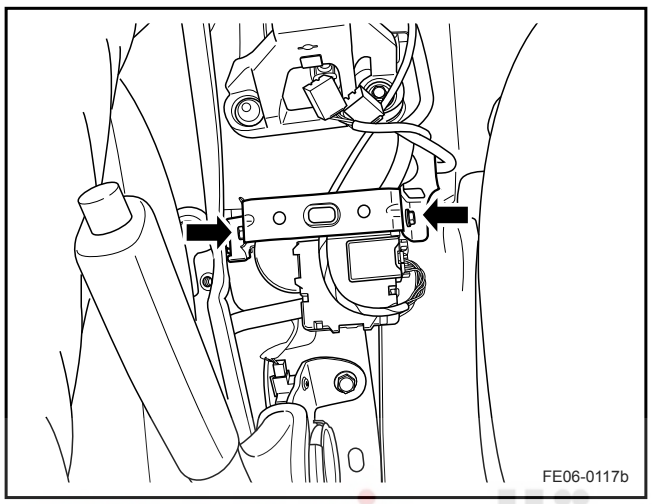
## 6.7.7 Removal and Installation

### 6.7.7.1 TPMS Control Unit Replacement

Removal Procedure:

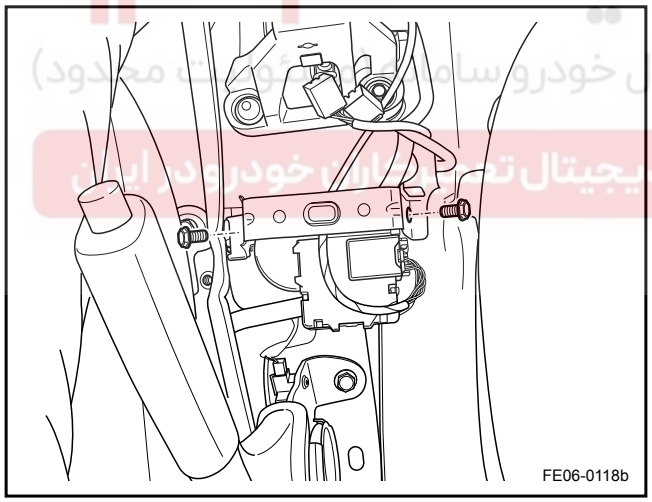
Warning!

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




1. Disconnect the battery negative cable. Refer to 2.11.8.1 Battery Disconnection.
2. Remove the center console. Refer to 3.3.8.9 Shift Lever Replacement.
3. Disconnect TPMS control unit wiring harness connector.
4. Remove the TPMS control unit retaining bolts.

Installation Procedure:




1. Install the TPMS control unit retaining bolts.

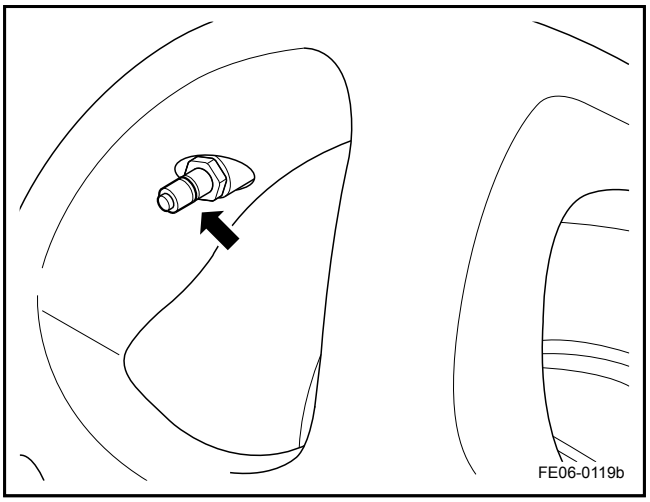
   Torque: 9 Nm (Metric) 6.7 lb-ft (US English)
2. Connect TPMS control unit wiring harness connector.
3. Install the center console.
4. Connect the battery negative cable.

### 6.7.7.2 TPMS Sensor Replacement

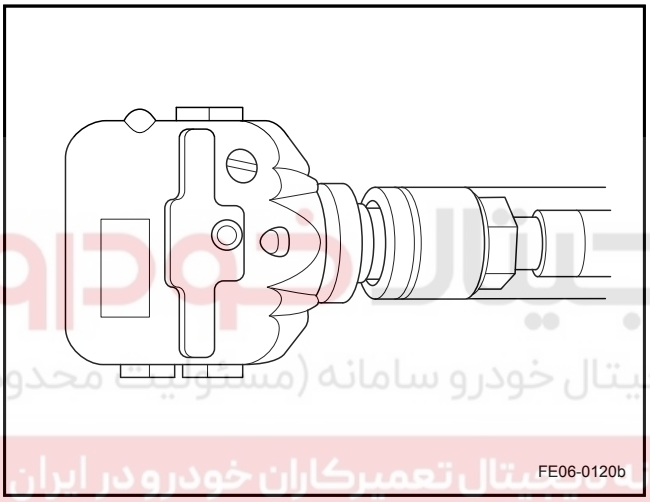
Removal Procedure:

Warning!

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




1. Remove the battery negative cable. Refer to 2.11.8.1 Battery Disconnection.
2. Lift and support the vehicle. Refer to 1.3 Lifting and Jacking the Vehicle.
3. Remove the wheels. Refer to 4.4.5.1 Wheel Replacement.
4. Remove the tires.
5. Remove the TPMS sensor.




Installation Procedure:

1. Install the TPMS sensor.

   Note

   Make sure that the sealing rubber and steel ring sensor are installed properly to ensure tires sealing.
2. Install the tires.
3. Carry out tires balancing detection and correction.
4. Install the wheels.
5. Lower the vehicle.
6. Connect the battery negative cable.

## 6.7.8 Special Tools and Equipment

### 6.7.8.1 Trigger Tool