BRAKE SYSTEM

4210-54/4810-01/4810-09/4830-01/4830-02 /4840-01/4841-01/4841-02/4850-00/4850-02 /4850-03/4850-09/4910-01

GENERAL INFORMATION

OVERVIEW AND OPERATING PROCESS

CONFIGURATION AND FUNCTION

REMOVAL AND INSTALLATION

GENERAL INFORMATION

1. SYSTEM OVERVIEW

1) Terms and Definition

- CBS: Conventional Brake System
- ABS: Anti-Lock Brake System
- EBD: Electronic brake-Force Distribution
- ESP: Electronic Stability Program
- ABD: Automatic Braking Differential
- ASR: Acceleration Slip Regulation
- AYC: Active Yaw Control (Understeer and Oversteer Control)
- HBA: Hydraulic Brake Assistant
- ARP: Active Rollover Protection
- HSA: Hill Start Assistant

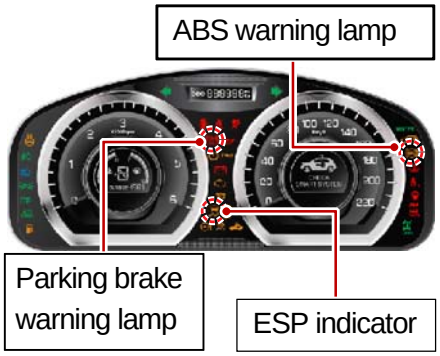
2) Functions

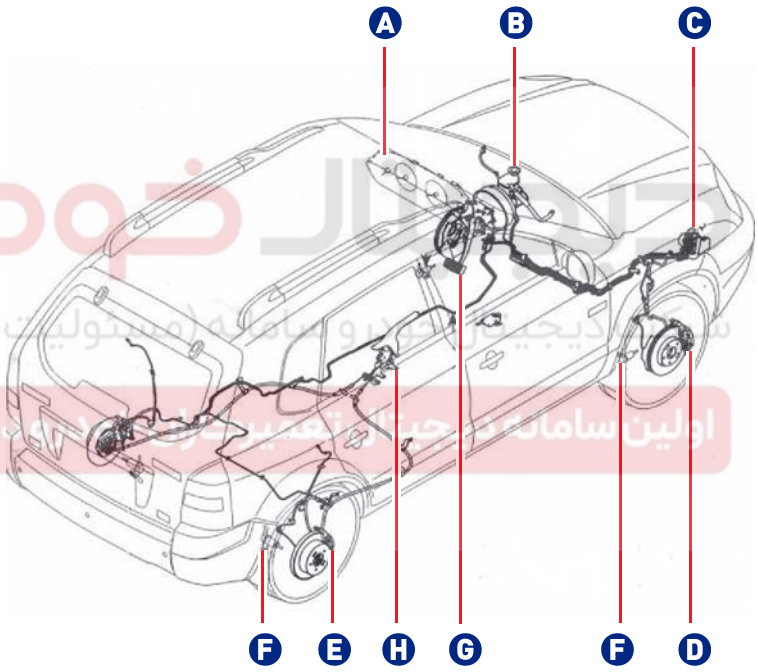
<table>
<tr><th>Function</th><th>Vehicle with CBS</th><th>Vehicle with ABS/EBD</th><th>Vehicle with ESP</th></tr>
<tr><td>ABS</td><td rowspan="8">Not applied</td><td>Applied</td><td rowspan="8">Applied</td></tr>
<tr><td>EBD</td><td>Applied</td></tr>
<tr><td>ABD</td><td rowspan="6">Not applied</td></tr>
<tr><td>ASR</td></tr>
<tr><td>AYC</td></tr>
<tr><td>HBA</td></tr>
<tr><td>ARP</td></tr>
<tr><td>HSA</td></tr>
</table>

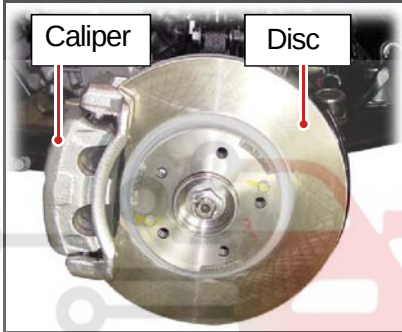
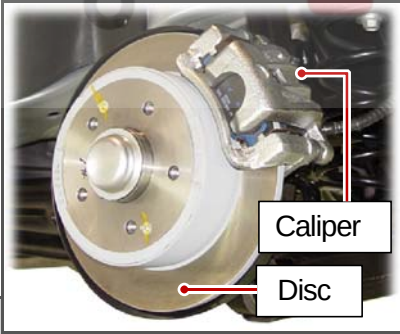
3) Parts Arrangement

Part name	Vehicle with CBS	Vehicle with ABS/EBD	Vehicle with ESP
HECU	Not applied	Applied	Applied
Front wheel speed sensor			
Rear wheel speed sensor			
ABS warning lamp			
EBD indicator			
Longitudinal G sensor		2WD: N/A, 4WD: Applied	Not applied
Sensor cluster (Yaw rate sensor, lateral/longitudinal G sensor)		Not applied	Applied
ESP indicator			
ESP OFF switch and warning lamp			
Steering wheel angle sensor			

4) Component

A. Meter cluster-ABS, EBD, ESP indicator/warning lamp	B. Master cylinder and booster	C. HECU
		



D. Front brake assembly	E. Rear brake assembly
	

F. Front/rear wheel speed sensor		G. Brake pedal	H. Parking brake
Front/rear-4WD	Rear-2WD		
			

Modification basis	
Application basis	
Affected VIN	

2. SPECIFICATION (DSL ONLY)

Unit	Description	Specification
Front brake	Type	Ventilated disc
	Outer diameter of disc	Ø298 mm
	Inner diameter of caliper cylinder	Ø43.0 x 2 mm
	Thickness of disc	26 mm (wear limit: 24 mm)
	Thickness of brake pad	10.5 mm (wear limit: 2 mm)
	Pad wear indicator	Mechanical type
Rear brake	Type	Solid disc
	Outer diameter of disc	2WD: Ø262 mm, 4WD: Ø284 mm
	Thickness of disc	10 mm (wear limit: 8.4 mm)
	Thickness of brake pad	10 mm (wear limit: 2 mm)
	Pad wear indicator	Mechanical type
Brake booster	Type	Vacuum assist type
	Size	8” + 9” (Tandem)
Master cylinder	Type	Tandem (level sensor installed)
	Inner diameter of cylinder	Ø25.4 mm
Brake pedal	Maximum operating stroke	140 ± 3 mm
	Pedal ratio	3.8 : 1
	Free play	3 to 10 mm
Parking brake	Type	Mechanically expanded rear lining
	Operating type	Hand operated type
	Inner diameter of drum	2WD: Ø168 mm, 4WD: Ø190 mm
Brake oil	Specification	DOT4
	Capacity	0.7 to 0.8 liters

NOTE

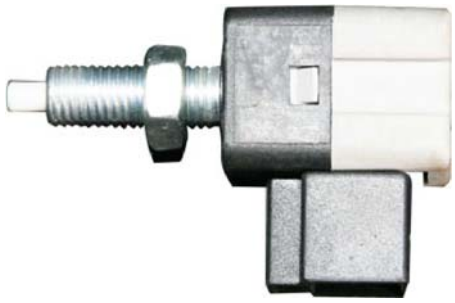
Service interval for brake fluid: Change every other year.

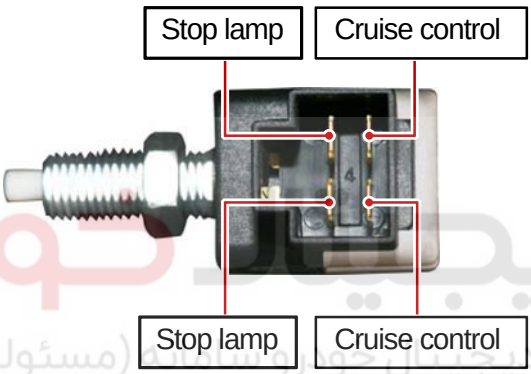
Modification basis	
Application basis	
Affected VIN	

3. MAJOR CHANGES

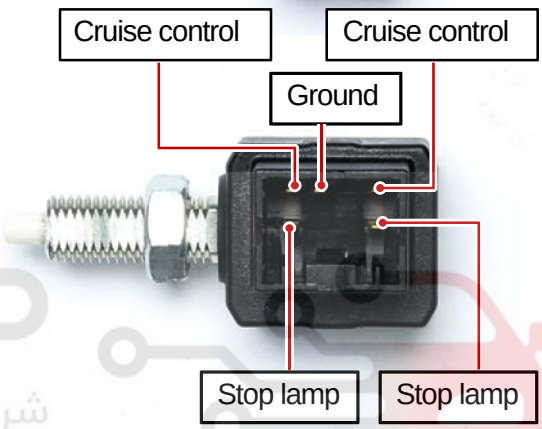
4810-09	BRAKE SWITCH

Old





New



- New brake switch introduced (contact type → contactless type)

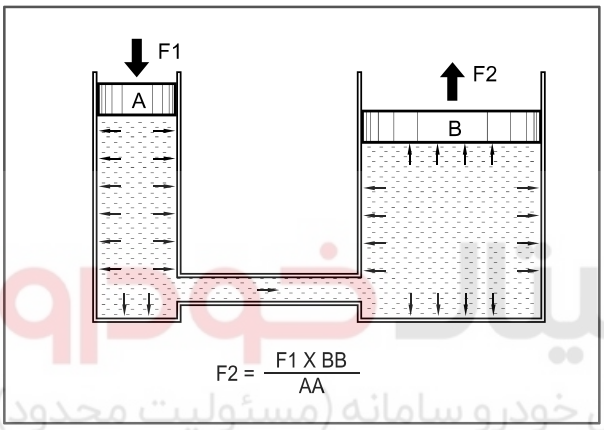
Modification basis	
Application basis	
Affected VIN	

OVERVIEW AND OPERATING PROCESS

1. OVERVIEW

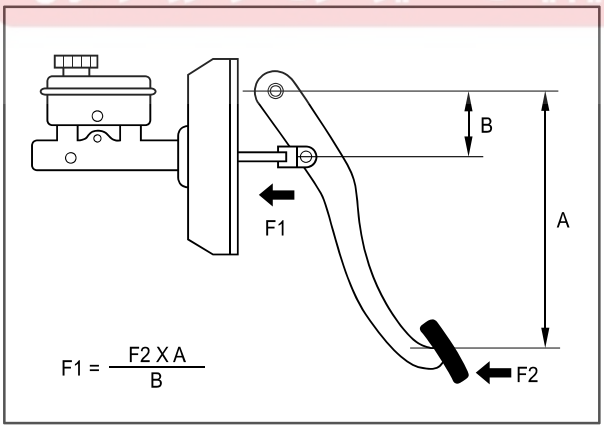
Even though a driver cuts off the power, while driving, the vehicle continues to move due to the law of inertia. Therefore, a braking device is needed to stop the vehicle. The brake system normally uses the frictional discs that converts the kinetic energy to the thermal energy by frictional operation. The brake system consists of the brake disc (front wheel), brake disc or drum (rear wheel), parking brake (mechanical type), master cylinder, booster, pedal and supply lines (pipes and hoses).

▶ Hydraulic brake



This system uses the leverage effect and Pascal's principle. When depressing the brake pedal, the pedal pressure is increased by booster and is delivered to master cylinder to generate hydraulic pressure. The hydraulic pressure generated by the master cylinder is delivered to the brake caliper through the brake pipes or hoses. This hydraulic pressure pushes the brake calipers, accordingly the caliper pads are contacted to brake disc to generate the braking force.

▶ Brake pedal

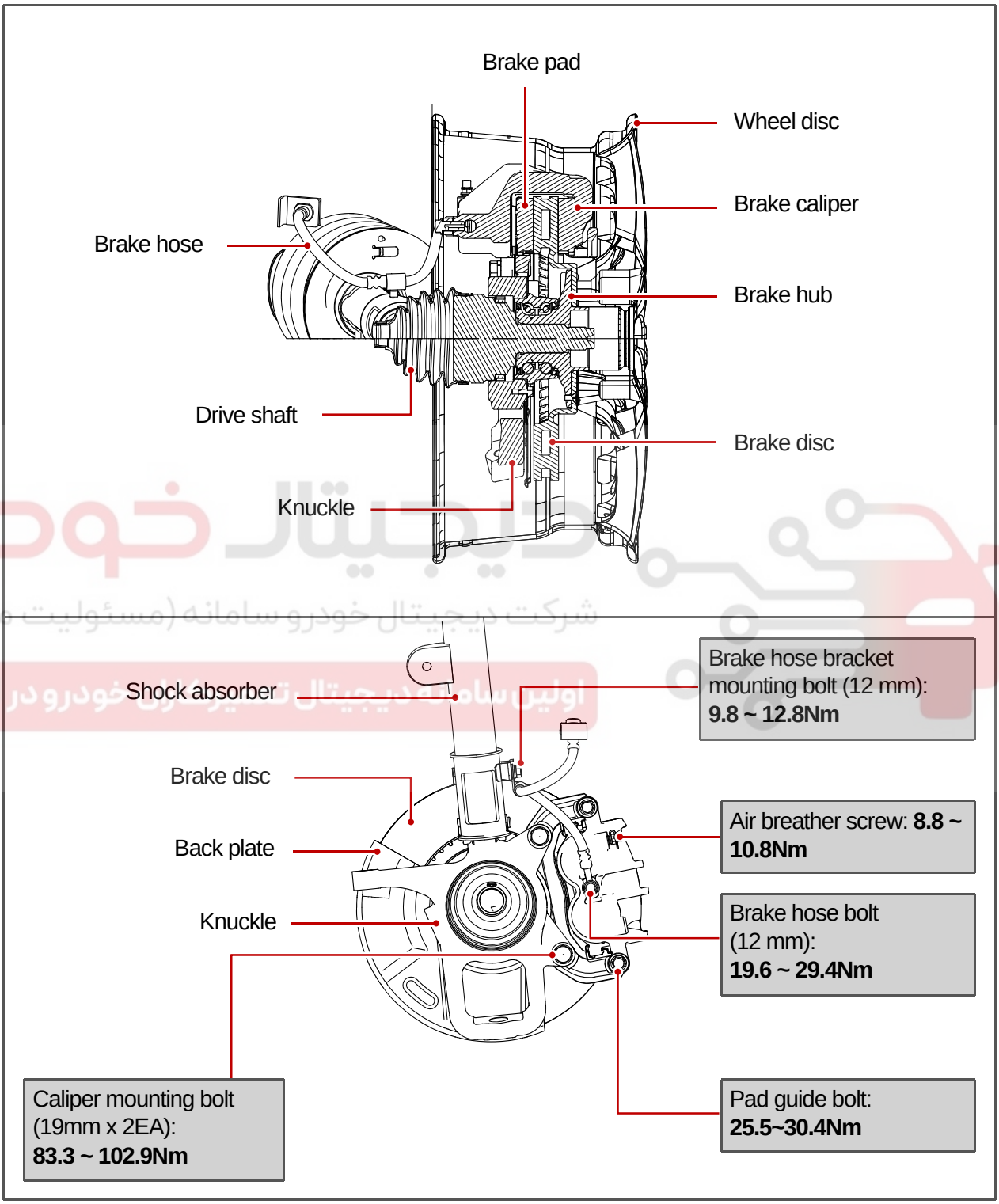


Brake pedal uses the leverage effect to apply bigger force to the brake master cylinder.

Modification basis	
Application basis	
Affected VIN	

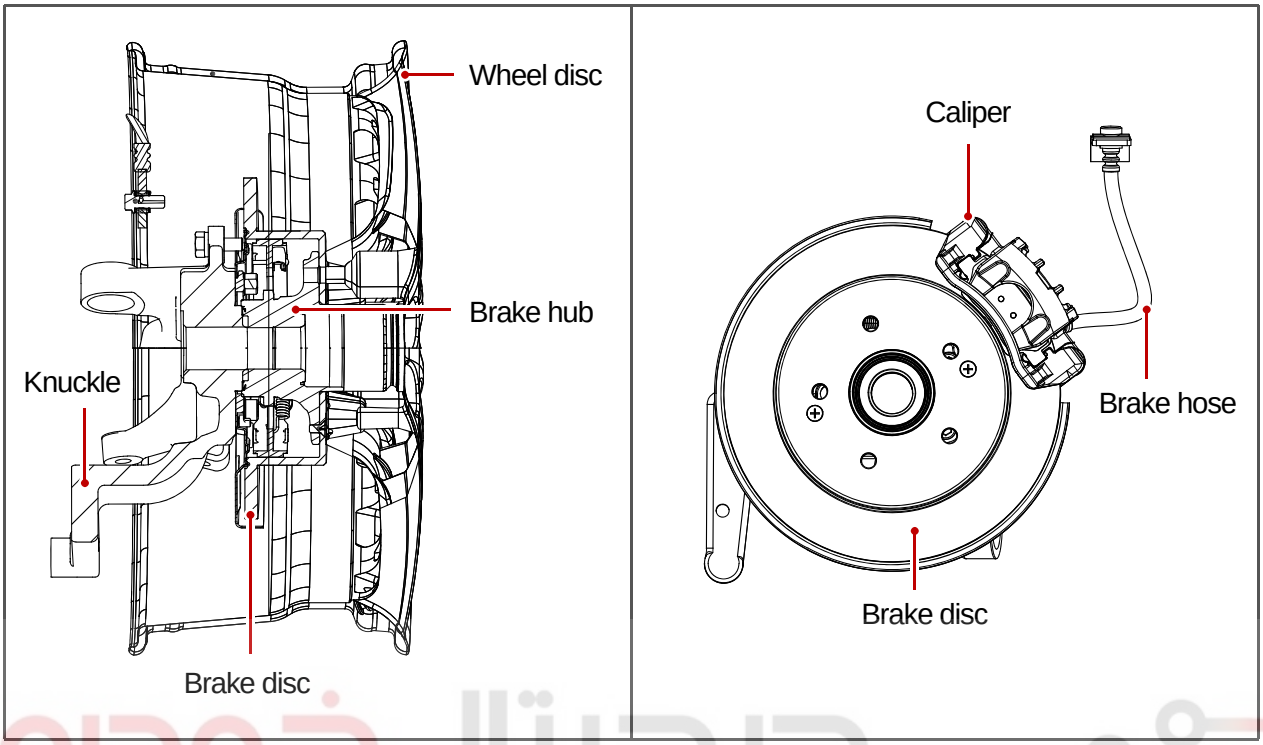
2. SECTIONAL DIAGRAM

▶ **Front disc brake**



Modification basis	
Application basis	
Affected VIN	

▶ **Rear disc brake**



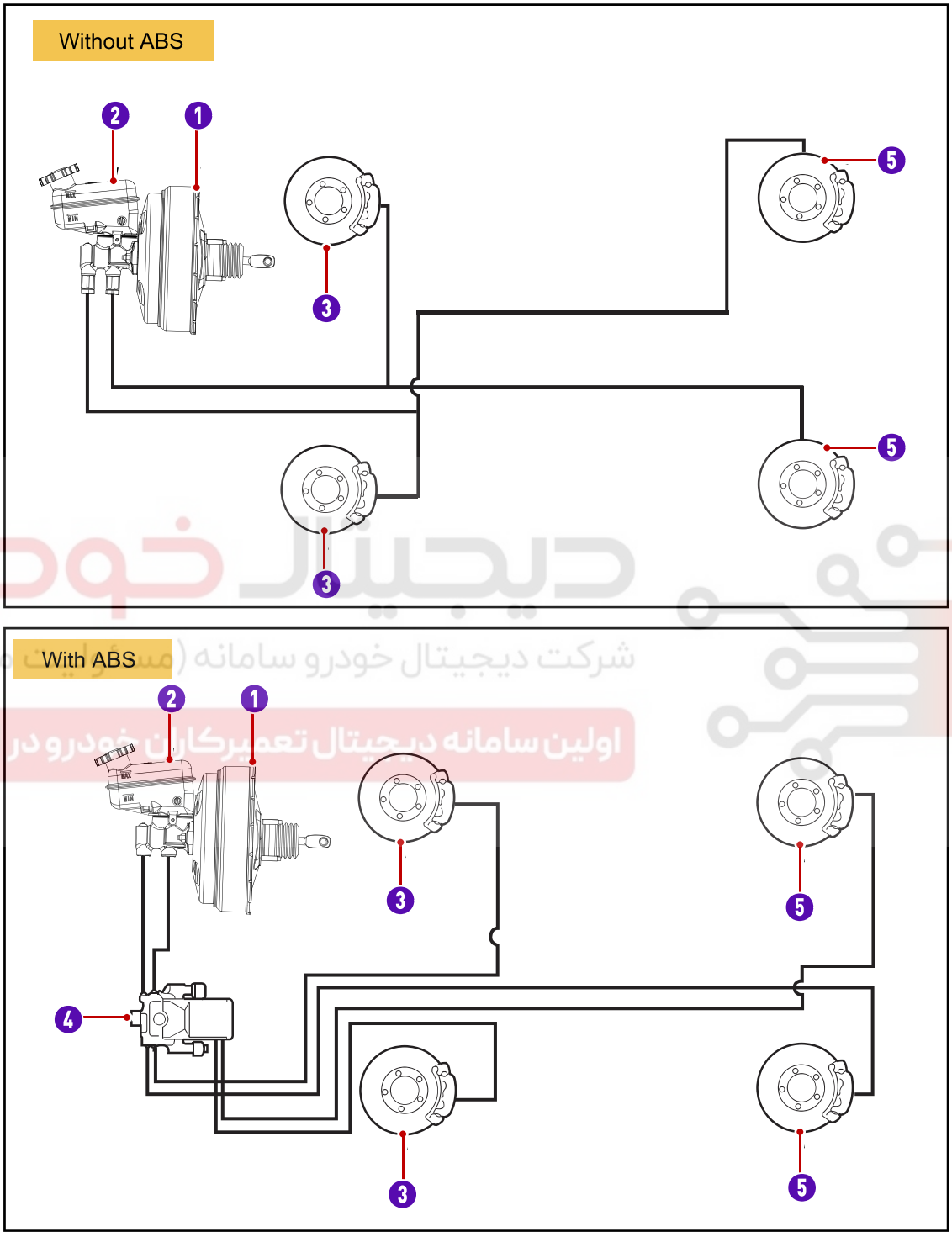
1) Tightening torque

Fastener	Tightening torque	Remark
Brake pad guide bolt	25.5 ~ 30.4Nm	14 mm x 2EA
Brake caliper mounting bolt	52.9 ~ 63.7Nm	17 mm x 2EA
Brake hose bolt	19.6 ~ 29.4Nm	12mm
Brake hose bracket mounting bolt	9.8 ~ 12.8Nm	12mm
Air breather screw	8.8 ~ 10.8Nm	-

Modification basis	
Application basis	
Affected VIN	

3. SYSTEM LAYOUT

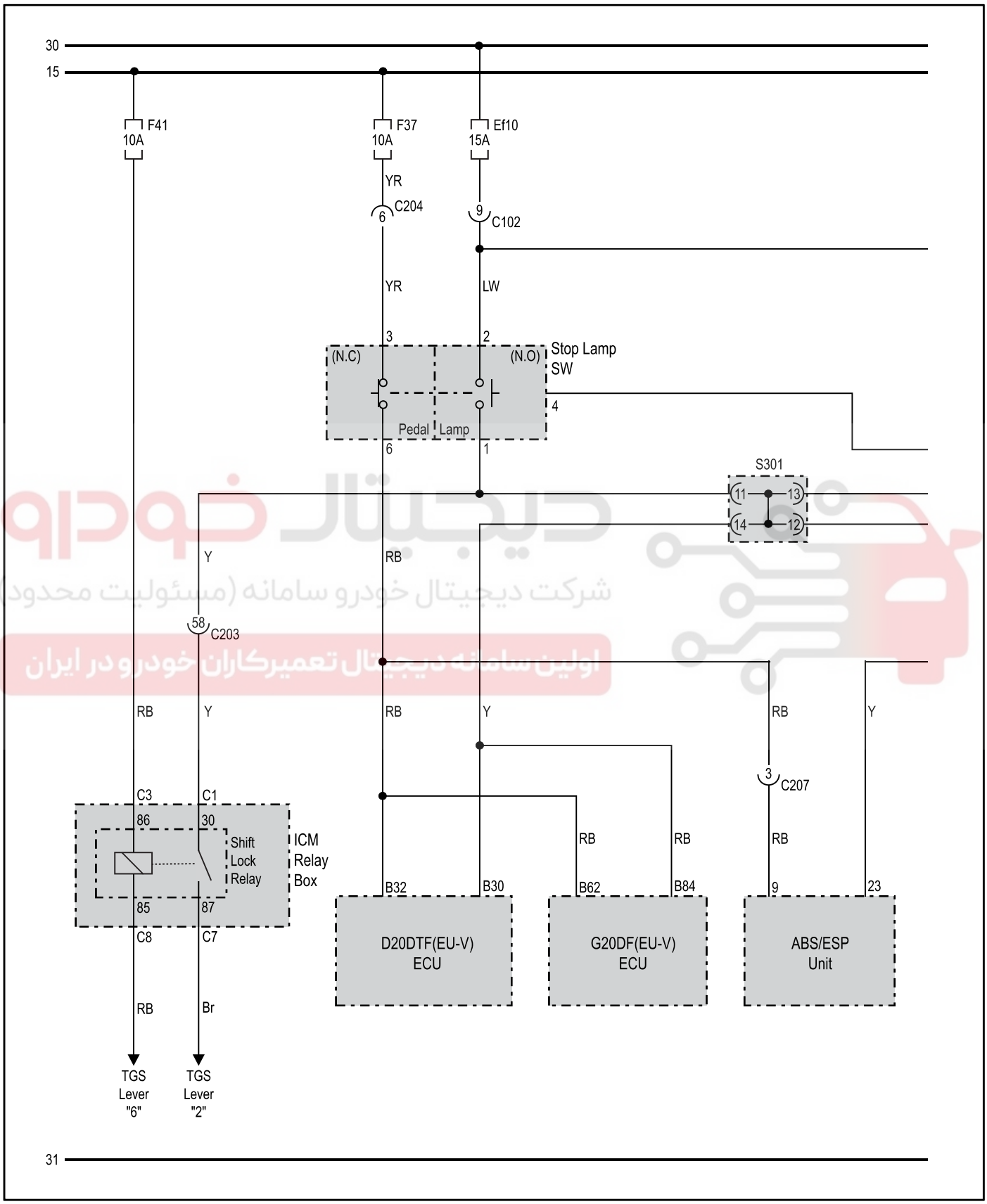
▶ **Hydraulic line**



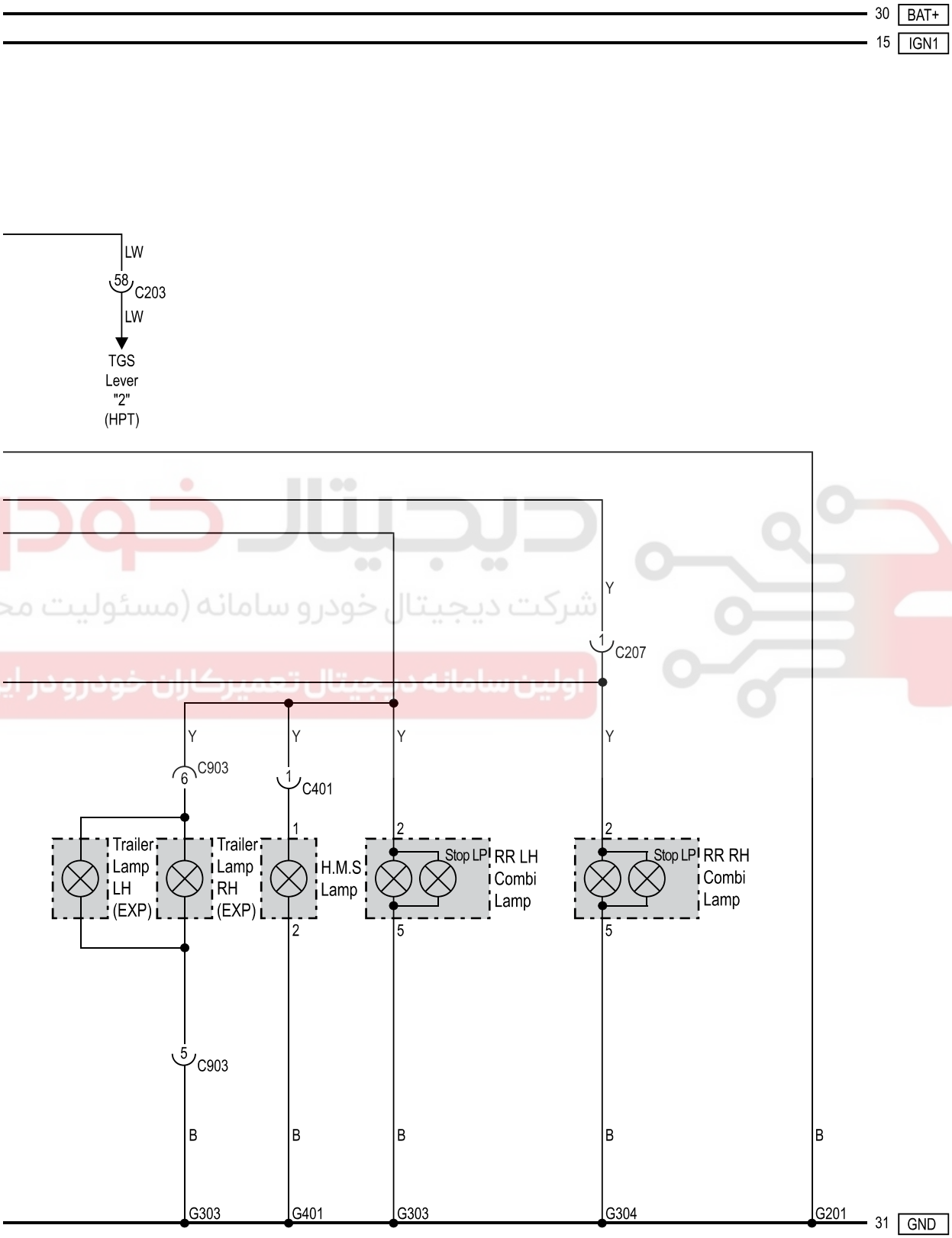
1. Brake booster
2. Brake reservoir and master cylinder
3. Front disc brake and caliper
4. HECU (Hydraulic & Electric Control Unit)
5. Rear disc brake and caliper

Modification basis	
Application basis	
Affected VIN	

4. CIRCUIT DIAGRAM OF STOP LAMP



Modification basis	
Application basis	
Affected VIN	

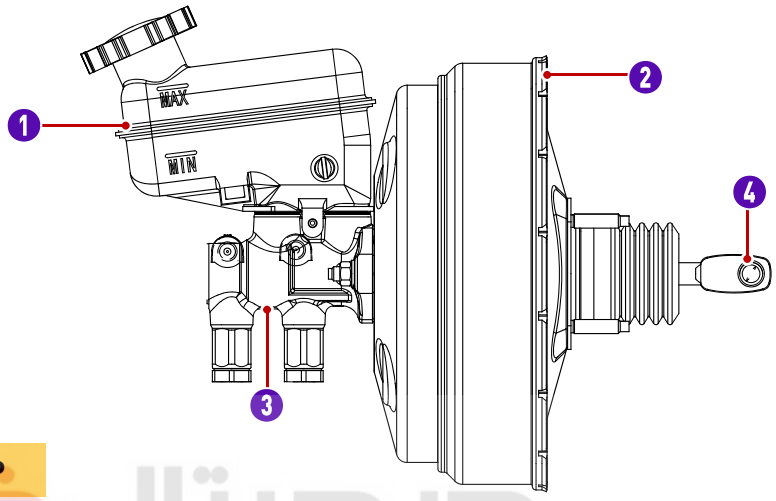


Modification basis	
Application basis	
Affected VIN	

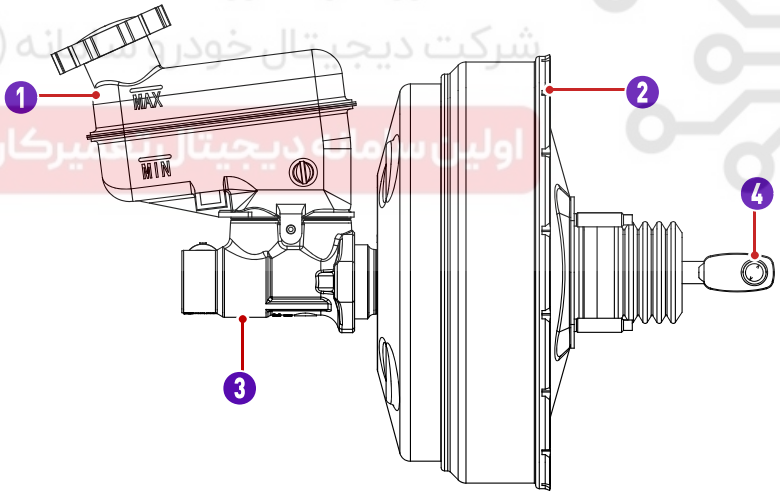
CONFIGURATION AND FUNCTION

S.G.N. 4850-01 MASTER CYLINDER AND BOOSTER

Vehicle without ABS



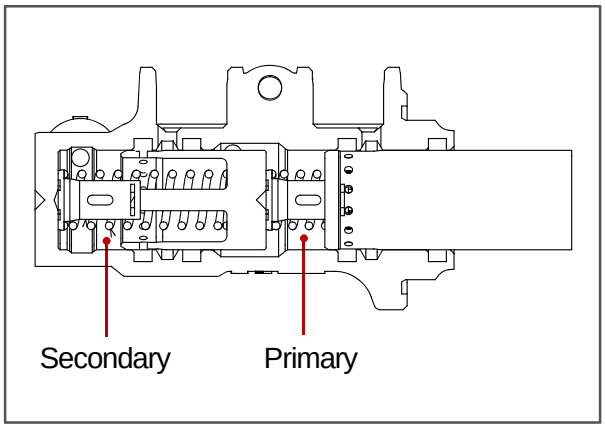
Vehicle with ABS/ESP



1. Brake fluid reservoir
2. Master cylinder
3. Booster
4. Push rod

Modification basis	
Application basis	
Affected VIN	

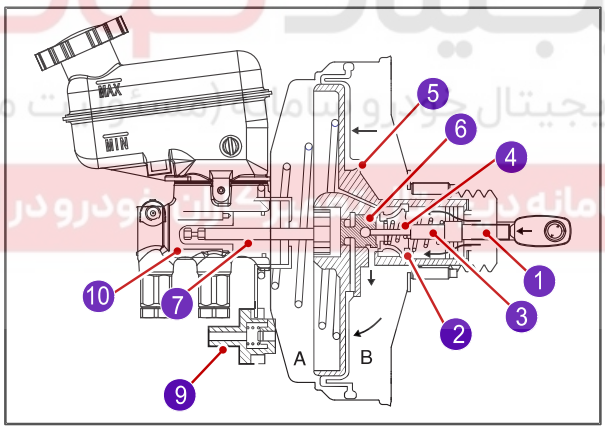
▶ Master cylinder



The brake master cylinder is designed to convert the force from the brake master cylinder to the high hydraulic pressure. The brake system uses the tandem type master
cylinder with in-line 2 pistons. The in-line 2 pistons generate the hydraulic pressure. The piston cup on the piston keeps the sealing conditions in cylinder and prevents the oil leaks. The hydraulic pressure generated by the primary piston is delivered to the front wheels, and the hydraulic pressure generated by the secondary piston is delivered to the rear wheels.

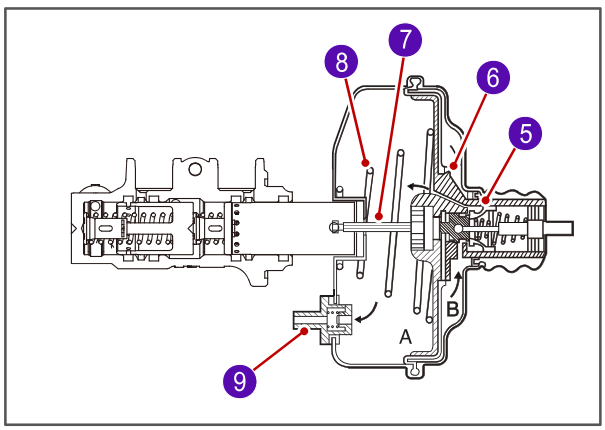
▶ Brake booster

The brake booster is a power assist device for brake system. It relieves the pedal depressing force by using the pressure difference between the vacuum pressure generated by vacuum pump in intake manifold and the atmospheric pressure.



1. **Pressure distribution at working**

When depressing the brake pedal, the push rod (1) in booster pushes the poppet (2) and valve plunger (3). The poppet (2) pushes the power piston seat (5) resulting in closing the vacuum valve (9). The chamber (A) and (B) in power cylinder are isolated and the valve plunger (3) is separated from the poppet (2). And then the air valve (6) opens and air flows into the chamber (B) through filter. Then, the power piston (5) pushes the master cylinder push rod (7) to assist the brake operation.

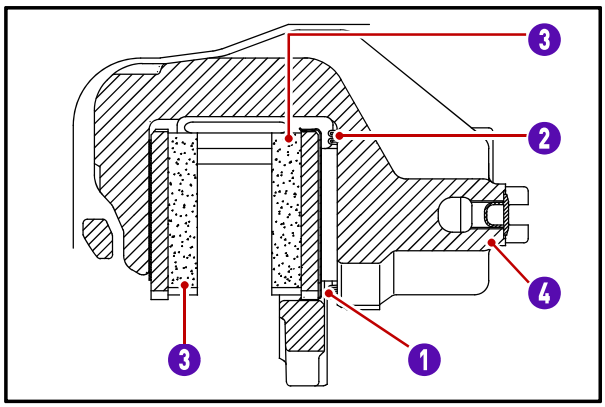


2. **Pressure distribution after working**

When releasing the brake pedal, the valve plunger (3) returns back to the original position by return spring (4) and the air valve (6) closes. At this time, the vacuum valve (9) opens and the pressure difference between chamber (A) and (B) in power cylinder is eliminated. Accordingly, the power piston (5) returns back to original position by the reaction of master cylinder (10) and the diaphragm return spring (8).

S.G.N. 4830-01

FRONT BRAKE CALIPER/DISC

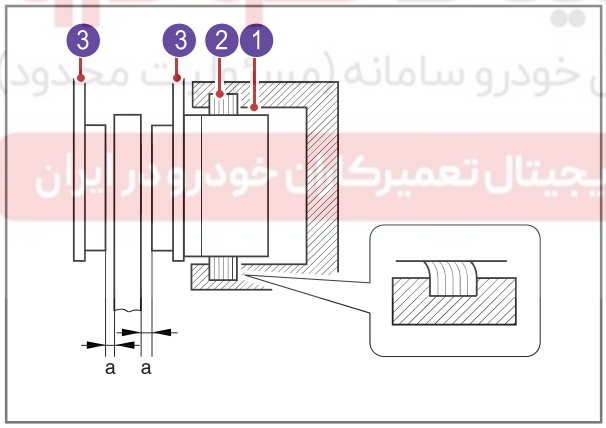


1. Piston
2. Piston seal
3. Pad
4. Caliper

The disc brake is normally used for front wheels, however, currently it is also used for rear wheels. The floating caliper type disc brake installed in this vehicle has only one brake cylinder at one side of caliper. The hydraulic pressure generated by master cylinder pushes the piston to contact the pad against the disc. The caliper is moved to contact to the opposite pad. The brake disc features:

- Excellent radiation due to it is exposed to ambient air
- Less braking force changes
- No uneven braking
- Simple structure and operation

▶ Adjustment of clearance



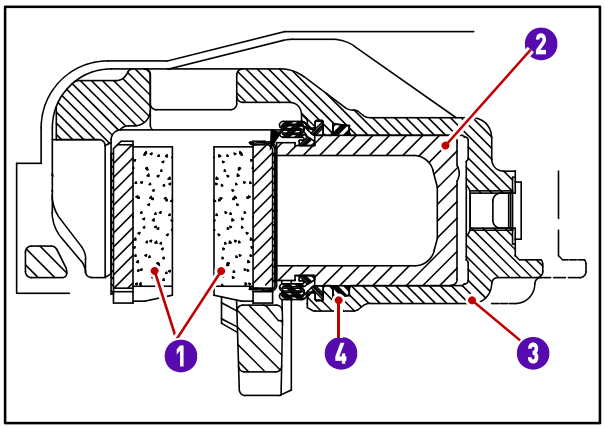
1. Piston
2. Piston seal
3. Pad
a. Clearance

When the hydraulic pressure is applied to the piston, the piston moves to push the pad. The piston seal, which extent considerable pressure against the piston, moves with cylinder. However, the piston seal shape is deformed since the piston seal is fixed at the cylinder groove as shown in below figure. When the pressure is released from the piston, the piston comes back to its original position by a restoring and elastic force of the seal.
When the pad wear is excessive, the piston seal cannot reach to the desired point because the seal's deformation is limited.
Accordingly, the piston always comes back by the deformed distance of piston seal, it keeps the initial clearance.

Modification basis	
Application basis	
Affected VIN	

S.G.N. 4841-01

REAR DISC BRAKE

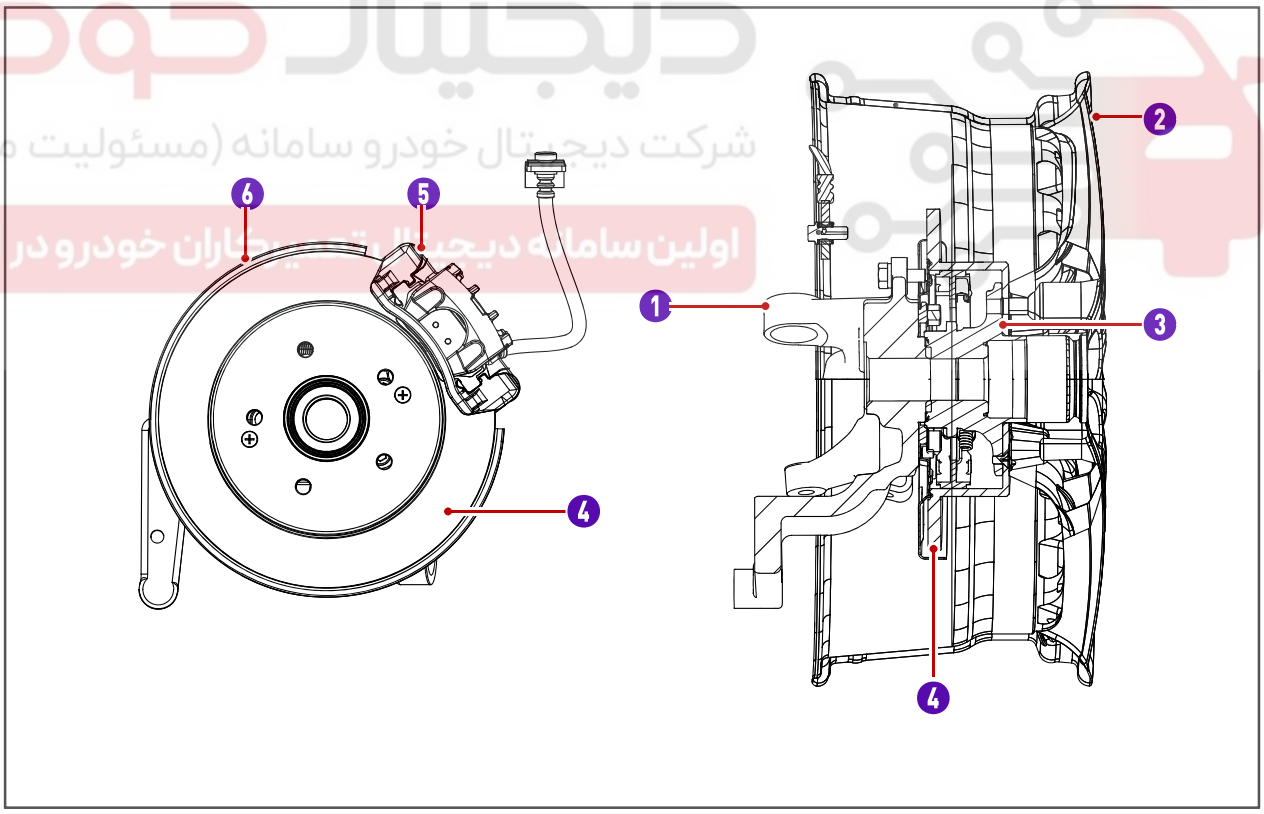


1. Brake pad
2. Piston
3. Caliper
4. Piston seal

The disc brake is normally used for front wheels, however, currently it is also used for rear wheels. The floating caliper type disc brake installed in this vehicle has only one brake cylinder at one side of caliper. The hydraulic pressure generated by master cylinder pushes the piston to contact the pad against the disc. The caliper is moved to contact to the opposite pad.
The brake disc features:

- Excellent radiation due to it is exposed to ambient air
- Less braking force changes
- No uneven braking
- Simple structure and operation

▶ Components



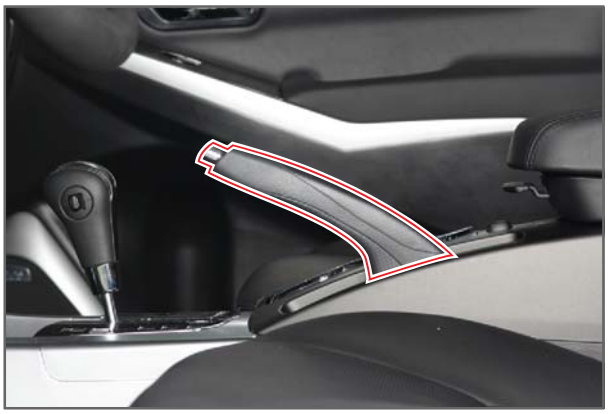
1. Knuckle
2. Wheel
3. Hub
4. Disc
5. Caliper assembly
6. Back plate

Modification basis	
Application basis	
Affected VIN	

S.G.N. 4910-01

PARKING BRAKE

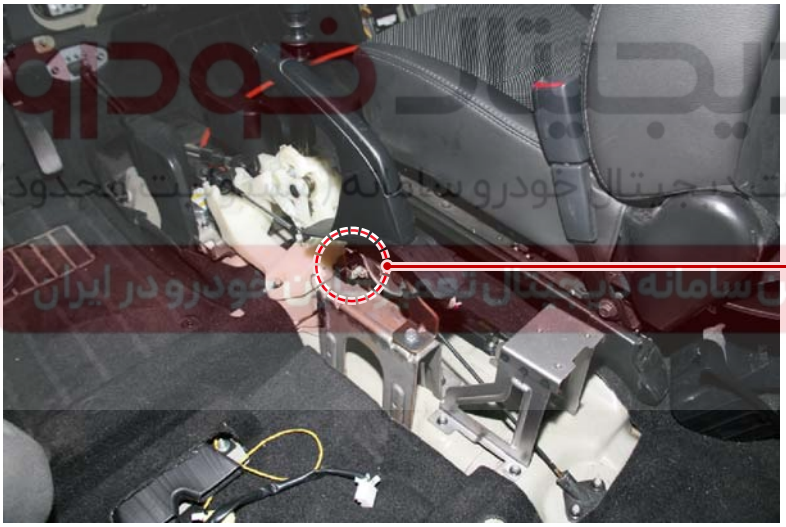
1) Overview



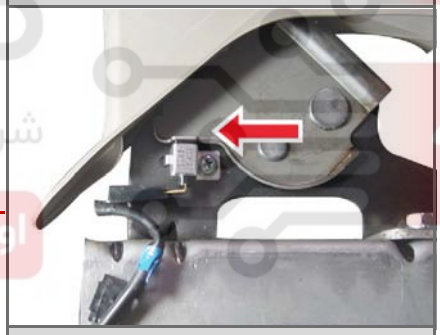
The parking brake is the mechanical device to hold the vehicle. When pulling up the lever, the parking brake cable between the lever and the rear drum brake trailing shoe pulls the parking brake lining to contact to drum.

2) Parking Brake Switch and Warning Lamp

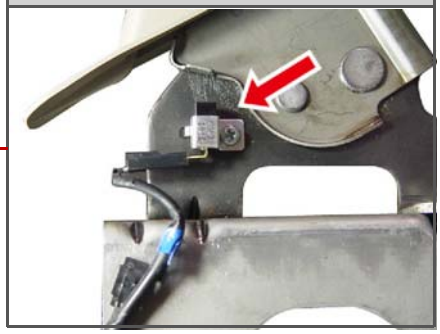
When pulling up the parking brake lever with the ignition ON, the parking brake indicator comes on.



Released



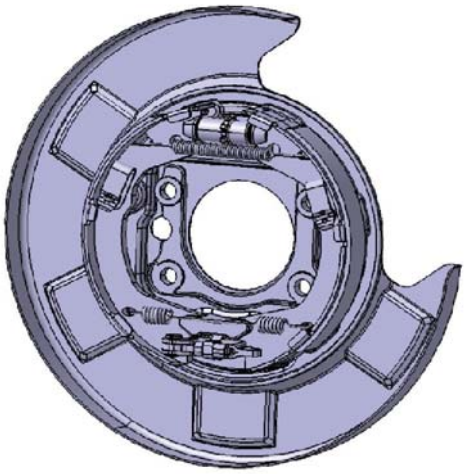
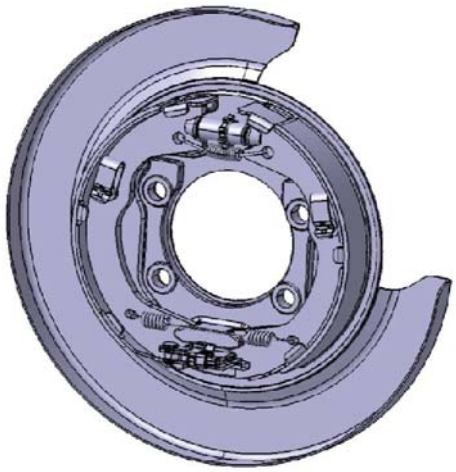
Applied



Warning lamp

Modification basis	
Application basis	
Affected VIN	

3) Inside View

2WD	4WD
	

Modification basis	
Application basis	
Affected VIN	

REMOVAL AND INSTALLATION

S.G.N. 4850-00 TROUBLESHOOTING

Problem	Possible Cause	Action
Noise or vehicle vibration when applied	Incorrectly mounted back plate or caliper	Repair
	Loosened bolt of back plate or caliper	Retighten
	Uneven wear of brake disc	Replace
	Brake pad contamination	Clean or replace
	Sticking brake pad on contact surface	Replace
	Wear or hardening of brake pad	Replace
	Excessive clearance between caliper and pad	Repair
	Uneven contact of pad	Repair
	Lack of lubrication in sliding parts	Lubricate
	Improper operation of caliper	Replace
	Dust cover missing	Repair
	Loosened suspension mounting bolt	Retighten
Pulls to one side when braking	Unbalanced tire pressure between left and right	Adjust
	Poor contact of brake pad	Repair
	Oil or grease on brake pad	Replace
	Scratch, uneven wear, distortion of brake disc	Replace
	Improperly installed brake caliper	Repair
	Improper operation of auto adjuster	Repair
	Crack or distortion of brake pad	Replace
Poor braking	Oil leak or contamination	Repair or replace
	Air in brake line	Bleed air
	Improper operation of brake booster	Repair
	Poor contact of brake pad	Repair
	Oil or grease on brake pad	Replace
	Improper operation of auto adjuster	Repair
	Clogged brake line	Repair
	Improper operation of proportioning valve	Repair

Modification basis	
Application basis	
Affected VIN	

Problem	Possible Cause	Action
Increased pedal stroke	Air in brake line	Bleed air
	Oil leak	Repair
	Worn brake pad	Replace
	Excessive clearance between push rod and master cylinder	Adjust
	Worn or damaged piston seal	Replace
Brake dragging	Parking brake is not fully released	Release
	Incorrect adjustment of parking brake	Adjust
	Incorrectly adjusted clearance of parking brake shoe	Adjust
	Faulty brake pedal return spring	Replace
	Incorrectly adjusted free play of brake pedal	Adjust
	Faulty master cylinder	Replace
	Lack of lubrication in sliding parts	Lubricate
	Faulty brake booster (vacuum leak)	Repair
Poor parking brake	Wear, hardening or poor contact of brake pad	Replace
	Oil or water on lining	Repair or replace
	Fixed or broken parking brake cable	Replace
	Excessive stroke of brake lever	Adjust notch
	Faulty auto clearance adjuster	Repair

Modification basis	
Application basis	
Affected VIN	

S.G.N. 4850-00

BRAKE OPERATION AND NOISE

This section describes the noise phenomena occurred possibly in the brake system operation. Distinguish between the information given below and the actual problems and then, inspect the vehicle and take appropriate measures.

▶ Noise symptoms and Causes

Symptom 1. If depressing the brake pedal when the engine is cold, "screeching" sound always occurs and, after driving for a while, the sound disappears.

This usually occurs in the morning. When the temperature goes down, the dew condensation phenomenon sets moisture on the brake disc as the window frost forms. Due to this moisture, the iron within the brake disc and pad oxidizes, forming undetectable micro-rusts on the disc surface. When starting the engine under this condition, noise may sound due to the friction of micro-rusts. When operating the brake several times, the disc temperature goes up and the micro-rusts come off and the noise goes away. Depending on the driving conditions, noise gets louder when slightly depressing the brake pedal and oppositely, noise is smaller when deeply depressing the brake pedal. This is simply a physical phenomenon, called "morning effect" in professional terms, and does not imply any problems with the brake system.

Symptom 2. Slip or screech after the brake pad replacement.

This usually occurs when the bed-in is not made between the disc and the pad's friction material. The bed-in is a state that the brake system normally works and gives no noise out, when, after about 300 km city driving, the contact area of the pad friction material is enlarged and the disk is in complete contact with the pad's friction material. Therefore, for some time after the brake disk/pad replacement, the brake system poorly operates or noise (abnormal sound) occurs due to the partial contact.

Symptom 3. "Groaning" sound occurs in the automatic transmission vehicle when slightly taking the foot off the brake pedal to slowly start after waiting for the signal, or slightly depressing the brake pedal.

This is the noise "Creep groan" that occurs when, in both the automatic and manual transmission, slightly releasing the brake pedal in the neutral gear at downhill roads.
It frequently occurs at the low braking power and low speed, through the following process. When operating the brake system at low speed and low pressure, adhesion and slip repeatedly take place between the brake disk and the friction material, and this makes the braking power inconstant, instantly increasing or decreasing, and gives out the brake noise.
It is also a physical phenomenon and has no relation with the brake performance.

Modification basis	
Application basis	
Affected VIN	

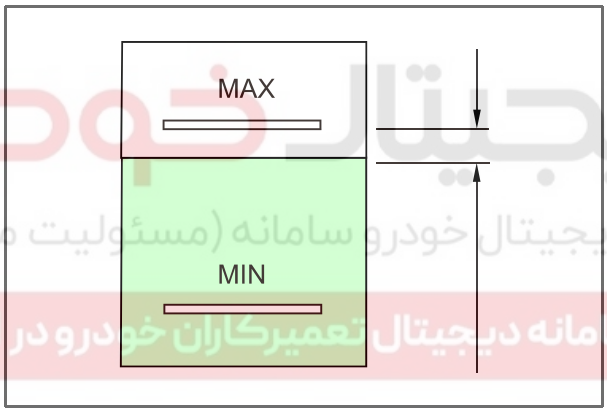
S.G.N.
9210-04 BRAKE FLUID CHECK

NOTE
- Change interval: every 2 years
- Specified oil: DOT4

▶ Checking brake fluid level

The brake fluid level should be between MAX and MIN marks on the brake reservoir tank. If the level is below MIN mark, check the brake pad and brake system for oil leaks and add up the brake fluid.

CAUTION
If the level is below MIN mark, it could be because the brake pad is worn.



CAUTION
Avoid mixing the different brake fluids. It may cause the brake system damage.

Modification basis	
Application basis	
Affected VIN	

▶ Check Brake System For Oil Leak

When the oil level in the brake reservoir tank is low, check the brake system line for oil leak and add up the brake fluid or replace the corresponding part.

▶ Checking brake fluid contamination level

You can determine the level of brake fluid contamination by its color with the naked eye. The color changes in the order of Light gold, Brown and Black according to the contamination level. Replace the brake fluid according to the change interval or contamination level.

▶ Check for water in brake fluid

- The water in the brake system is fatal; If there is 3% of water in the brake fluid, the boiling point for brake fluid drops by about 25%, which results in the frequent vapor lock.
- It is normal that the new brake fluid has about 3% moisture after approx. 18 months, while the one used for several years has about 7~10% moisture.
- The water circulates the brake line along with the brake fluid and causes corrosion on a line and deformation or aging on the master cylinder, different rubbers in the brake line, brake caliper and parts of the piston.

Modification basis	
Application basis	
Affected VIN	

S.G.N. 9210-04

BRAKE FLUID CHANGE

NOTE

- Change interval: every 2 years
- Specified oil: DOT4
- The brake fluid is exposed to the high temperature repeatedly. Long-term usage of the brake fluid may affect the braking performance due to discoloration and viscosity change. Always change the brake fluid every 2 year for obtaining a reliable braking force.

CAUTION

- Do not re-use the drained brake fluid.
- Avoid mixing the different brake fluids and use only specified brake fluid. It may cause the brake system damage.
- After finishing the work, make sure the brake fluid level is between MAX and MIN marks in the reservoir tank (0.7~0.8 liters).
- Make sure that no foreign materials get into the system when changing the brake fluid and working on the brake system.
- Avoid getting brake fluid on your body or other vehicle parts. In case of contact, wash with plenty of water.
- Apply the parking brake firmly prior to starting the work.
- Two people are needed to carry out this work.

1

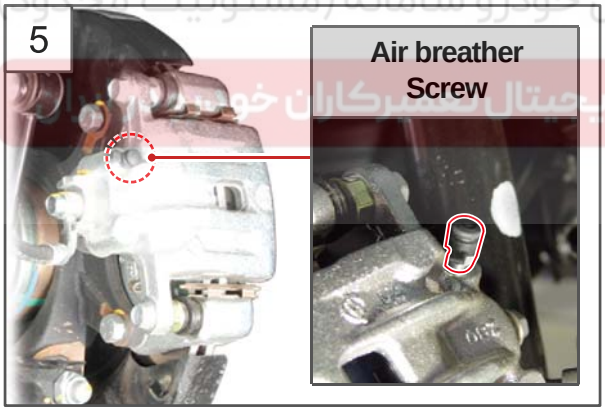
1. Open the cap of the brake reservoir tank and drain the oil completely using an oil pump.

2

2. Fill the brake reservoir tank with the brake fluid up to the MAX mark.

Modification basis	
Application basis	
Affected VIN	

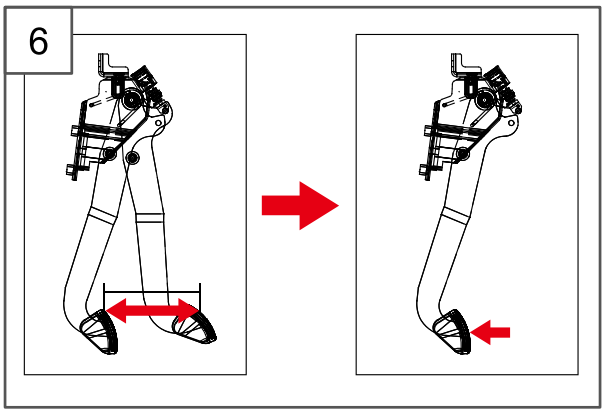
3. Start the vehicle and install the diagnostic device.
4. Under the start-up screen, click on "Air Bleeding" in the "Vehicle Name" → "System" → "ESP Diagnosis".



5. Select "Rear right path" in the Diagnostics menu, unscrew the caliper air bleeder screw at the rear right hand side, connect the transparent hose.

NOTE

Brake fluid change order: 1. Rear right → 2. Front left → 3. Rear left → 4. Front right

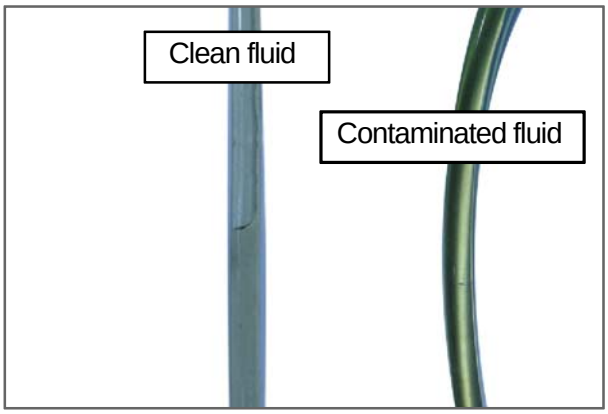


6. The mechanic A should depress the brake pedal repeatedly while the mechanic B drain the brake fluid by removing the brake air bleeder screw until the contaminated fluid will be drained, and tighten the screw.

CAUTION

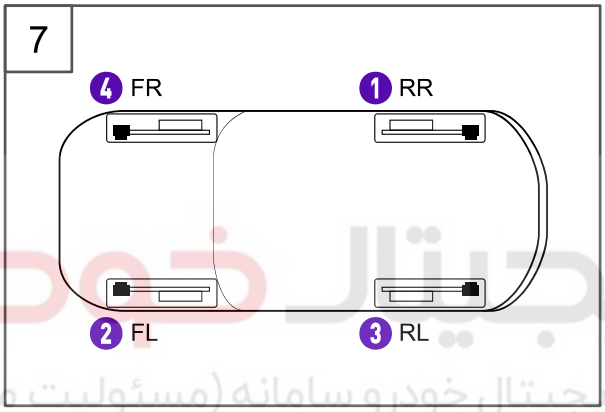
Carry out the brake fluid change while keeping filling with the brake fluid so that the reservoir tank does not run out of fluid.

Modification basis	
Application basis	
Affected VIN	



NOTE

You can check the drained fluid for contamination through the transparent hose.



7. Carry out also brake fluid change on the rest of the wheels in the order shown in the figure (1. rear right → 2. front left → 3. rear left → 4. front right) using the method described above.

8. After finishing the work, visually check the brake operation and fluid leakage, and fill the brake reservoir tank with the brake fluid to the correct level (between MIN and MAX).

Modification basis	
Application basis	
Affected VIN	

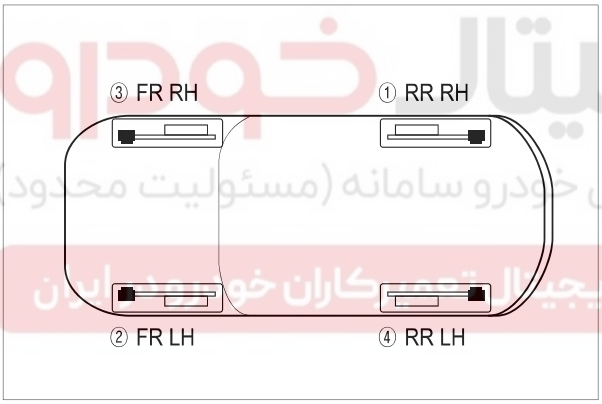
S.G.N. 4850-00 AIR BLEEDING

CAUTION

1. Never reuse the used brake fluid.
2. Use only specifies brake fluid. Add brake fluid between MAX and MIN lines on the reservoir (0.7 to 0.8 liters).
3. Avoid mixing of the different brake fluids when changing or adding it, since it may damage the corresponding parts of the vehicle.
4. Be careful not to splash the brake fluid on painted area or body.
5. Make sure that any foreign material does not get into brake line.
6. Always work with another staff.
7. Always start to bleed the air at the farthest wheel from the brake master cylinder. Observe the sequence number as shown in the above figure.

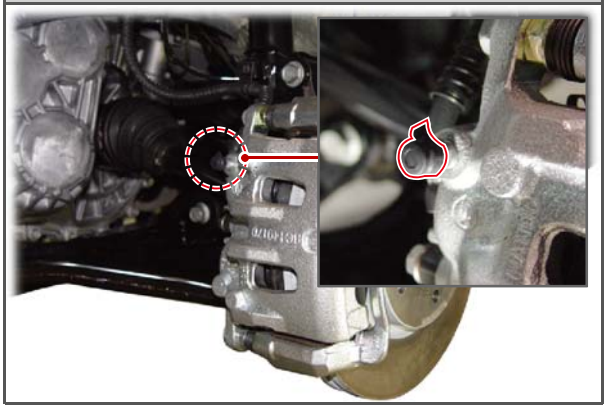
NOTE

Specified oil: DOT4

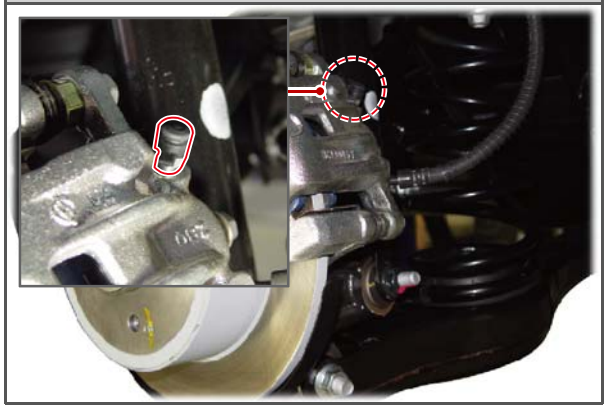


1. Apply the parking brake and start the engine when the shift lever is at "P" position.
2. Place an empty container under the air bleed screw and connect the hose.
3. Fill the reservoir with brake fluid and pump the brake pedal several times. Then keep it depressed.
4. Loosen the bleed screw (A) and collect the bleeding brake fluid in the container.
5. Repeat the step 3 and 4 until clear brake fluid comes out of air bleed screw.
6. Perform the same procedures at each wheel.
7. Fill the brake fluid as specified.
8. Check for oil leaks.

Air bleed screw for front brake



Air bleed screw for rear brake

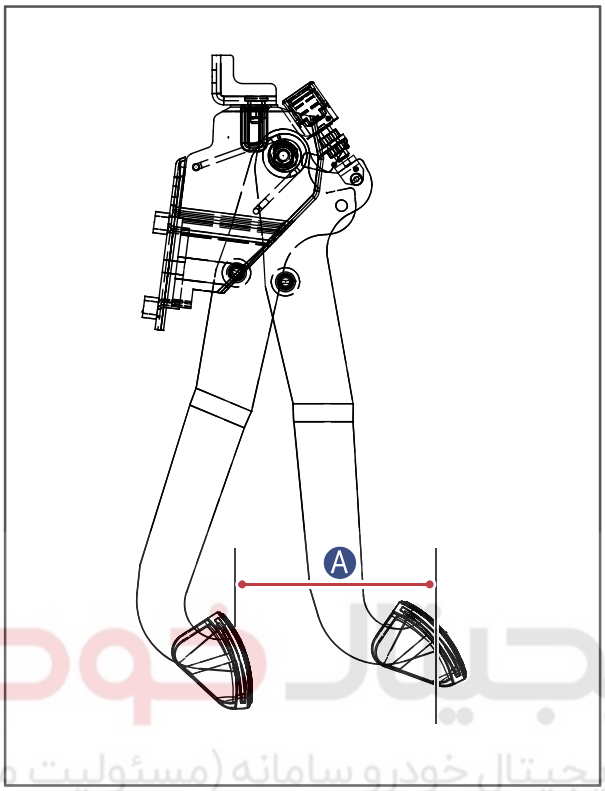


Modification basis	
Application basis	
Affected VIN	

S.G.N. 4810-01

BRAKE PEDAL CHECK

1) Pedal Height/Maximum Stroke



Check the brake pedal with below procedures:

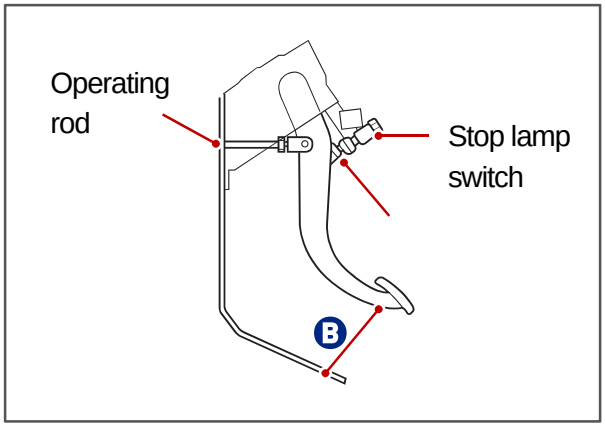
1. Start the engine.
2. Depress the brake pedal around 3 times.
3. Depress the brake pedal with approx. 30 kg and measure the distance (A) between the upper surface of pedal pad and the lower dash panel.
4. If the measured value is below the specified value, check the following causes: Pad wear, Shoe wear, Air in brake system, Defective automatic clearance adjuster of rear brake shoe.
5. If the measured value is out of the specified range, adjust the length of push rod by using lock nut in the brake booster push rod.

▶ **Maximum stroke**

Specified value (A)	140±3 mm

CAUTION

If the value is out of the specified range, adjust the maximum stroke by using stop lamp and lock nut.



▶ **Pedal height**

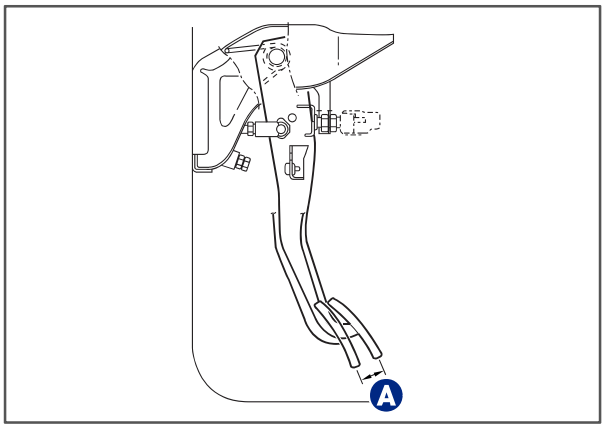
Specified value (B)	155 mm (from carpet)

CAUTION

If the value is out of the specified range, adjust the pedal height by using lock nut of stop lamp switch.

Modification basis	
Application basis	
Affected VIN	

2) Pedal Free Play

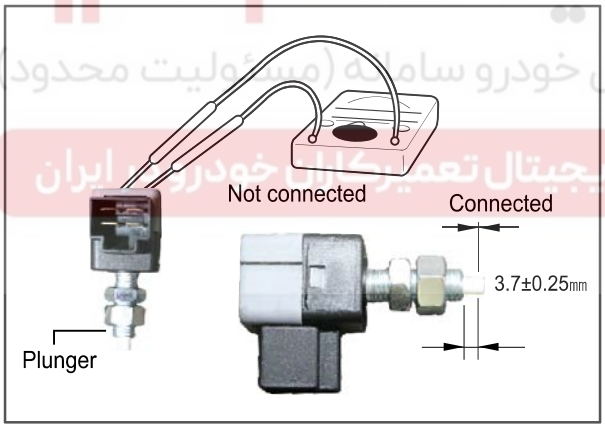


Depress the brake pedal several times with engine stopped to discharge the vacuum pressure of the power booster. Measure the pedal free play while pressing the brake pedal by hand.

Specified value (A)	3 to 10 mm

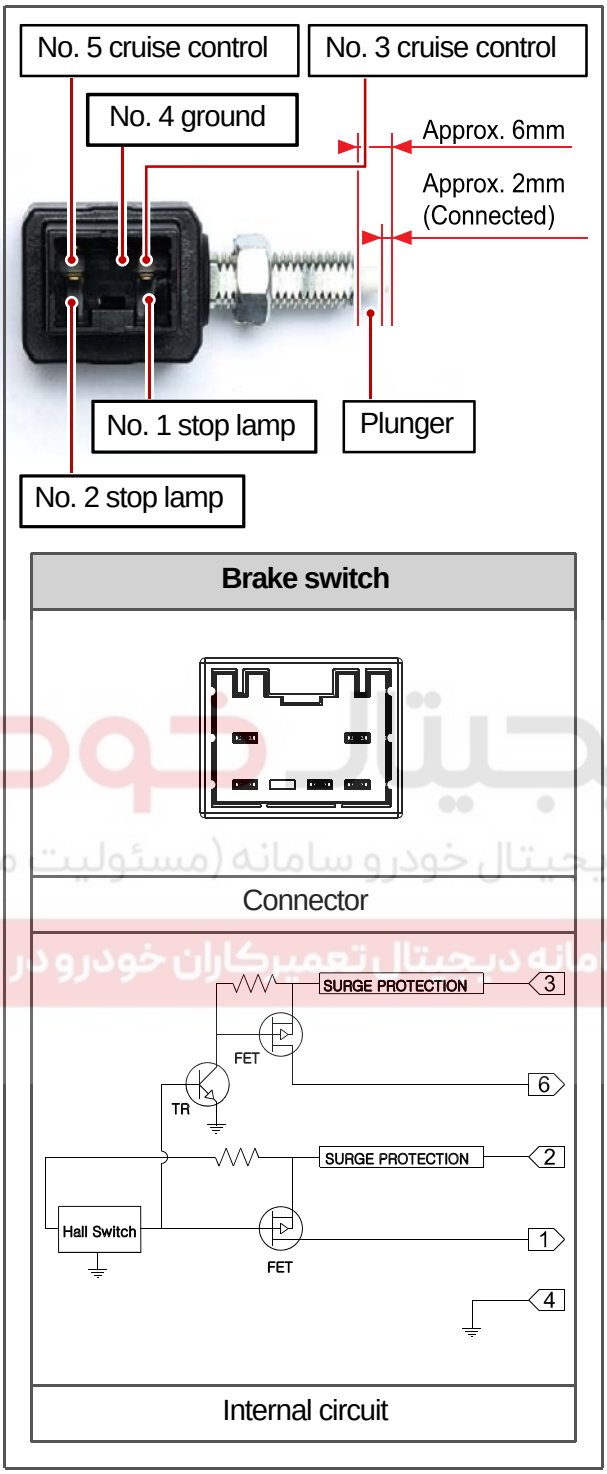
If the free play is below the specified value, check if the clearance between the outer case of the stop lamp and the brake pedal is within the specified range. If the clearance is out of the specified range, the clearance between the clevis pin and the brake pedal arm is too large. Check the components and repair if needed.

3) Stop Lamp Switch Check



Connect the multimeter to stop lamp switch connector and check if the continuity exists when pushing in the plunger. If the continuity doesn't exist, the stop lamp switch is normal.

Modification basis	
Application basis	
Affected VIN	



The contactless type stop lamp switch consists of the internal TR circuit. Therefore, perform the stop lamp switch check with voltage (12 V) applied as follows:

- Measurement condition

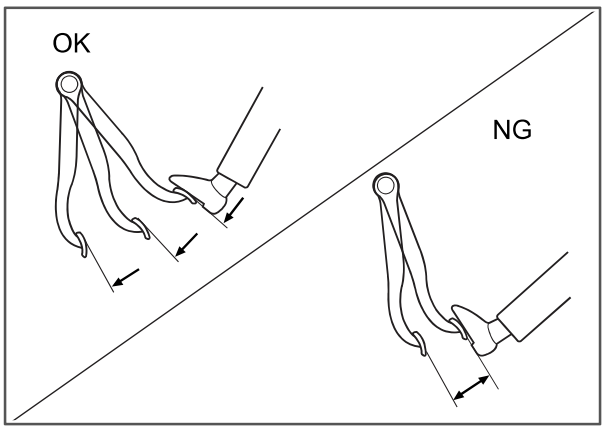
Pin No.	Function	Measurement condition
No. 1	stop lamp	-
No. 2	stop lamp	12 V ON
No. 3	cruise control	12 V ON
No. 4	ground	Grounded
No. 5	-	-
No. 6	cruise control	-

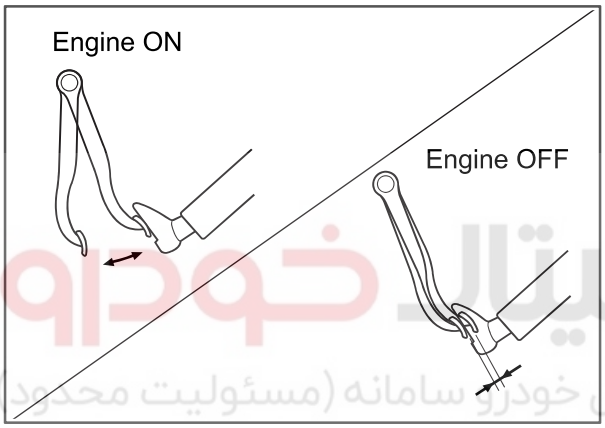
- Detection condition

Plunger Status	Terminal No. 1 ↔ Ground (N.O)	Terminal No. 6 ↔ Ground (N.C)
Not pressed	0 V	Approx. 12 V
Press of 2 mm thick or more	Approx. 12 V	0 V

Modification basis	
Application basis	
Affected VIN	

S.G.N.
4850-03 BRAKE BOOSTER CHECK





1. Let the engine run for 1 to 2 minutes and stop it. If the brake pedal stroke is shortened as pumping the brake pedal, the system is normal. If not, the system is defective.
2. Depress the brake pedal several times with engine off. If the brake goes down when starting engine with pedal depressed, the system is normal. If not, the system is defective.
3. Depress the brake pedal when the engine is running. If the pedal height is not changed when stop the engine, the system is normal. If not, the system is defective.

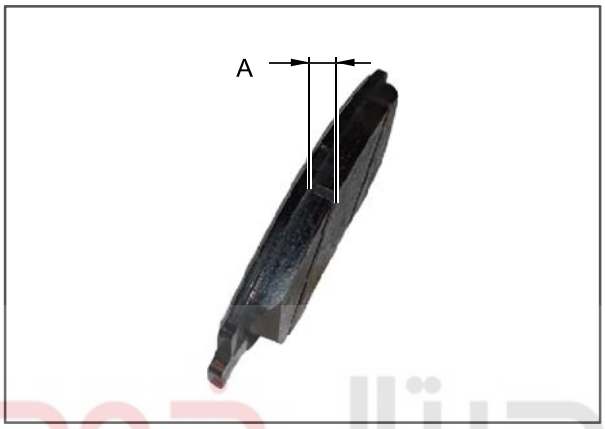
Modification basis	
Application basis	
Affected VIN	

S.G.N. 4830-01

FRONT BRAKE CHECK

Clean the dissembled components and visually check the followings:

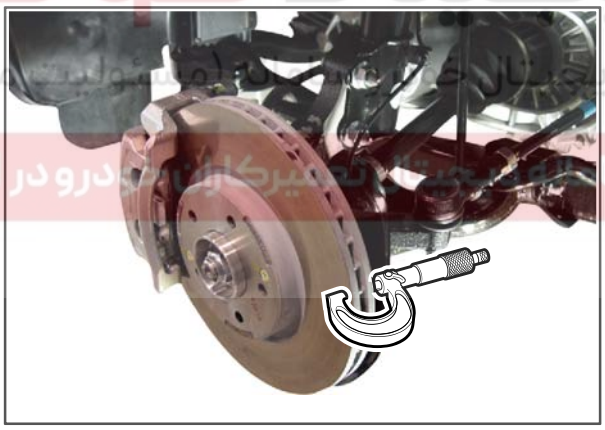
- Wear, rust and damage on the cylinder and piston
- Damage, crack and wear on cylinder body and guide pin
- Uneven wear and oil contamination
- Damage and tear on boot
- Scratch and bending on disc plate



1) Pad Thickness

1. Remove the tire.
2. Measure the pad thickness and replace it if it is below the wear limit.

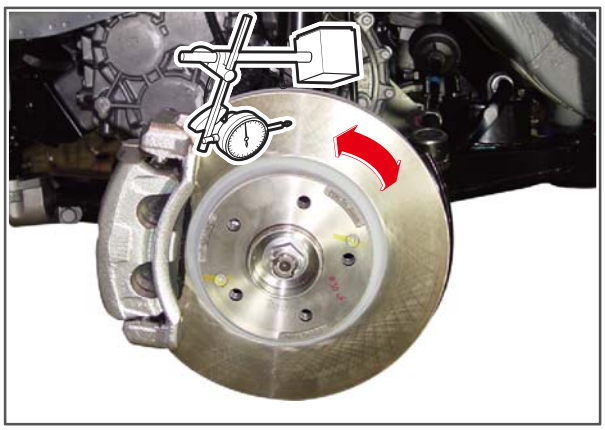
New pad	Wear limit
10.5 mm	2 mm



2) Disc Thickness

1. Measure the disc thickness at over four points.
2. If any of measured points is below the wear limit, replace the brake disc with new one.

New disc	Wear limit
26 mm	24 mm



3) Disc Run-Out

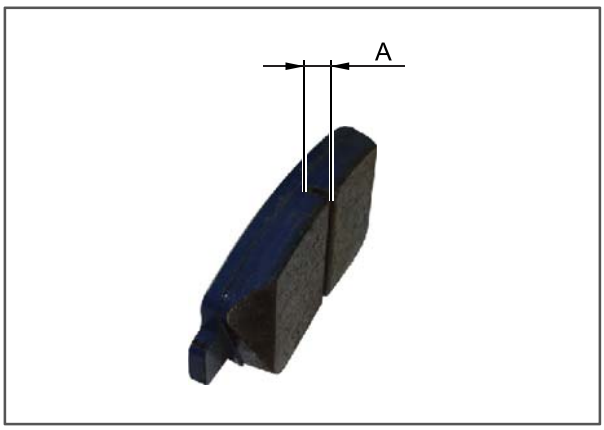
1. Install the dial gauge on the side of brake disc and measure the run-out while rotating the brake disc.
2. If the measured value exceeds the limit, replace the brake disc with new one. Otherwise, it may cause the pedal vibration and shimmy when braking.

Limit	0.025 mm (before installation)
	0.06 mm (when installed)

Modification basis	
Application basis	
Affected VIN	

S.G.N. 4210-54

REAR BRAKE CHECK



1) Pad Thickness

1. Remove the tire.
2. Measure the pad thickness and replace it if it is below the wear limit.

New pad	Wear limit
10 mm	2 mm

2) Disc thickness

1. Measure the disc thickness at over four points.
2. If any of measured points is below the wear limit, replace the brake disc with new one.

New disc	Wear limit
10 mm	8.4 mm

3) Disc Run-Out

1. Install the dial gauge on the side of brake disc and measure the run-out while rotating the brake disc.
2. If the measured value exceeds the limit, replace the brake disc with new one. Otherwise, it may cause the pedal vibration and shimmy when braking.

Limit	0.065 mm (before installation)
	0.03 mm (when installed)

Modification basis	
Application basis	
Affected VIN	

S.G.N. 4910-01

PARKING BRAKE CHECK

1) Checking the Brake Force

1. Count the number of the clicks (notches) when pulling up the parking brake with 19 kg of force.

Specified notches	5

2. If the clicks are over or below the specified value, adjust the clicks to the specified value with the parking brake adjusting nut.
3. Check the parking brake force after adjustment.

4. If the parking brake force is not enough, check the parking brake lever and cable. Replace the components if needed.

CAUTION

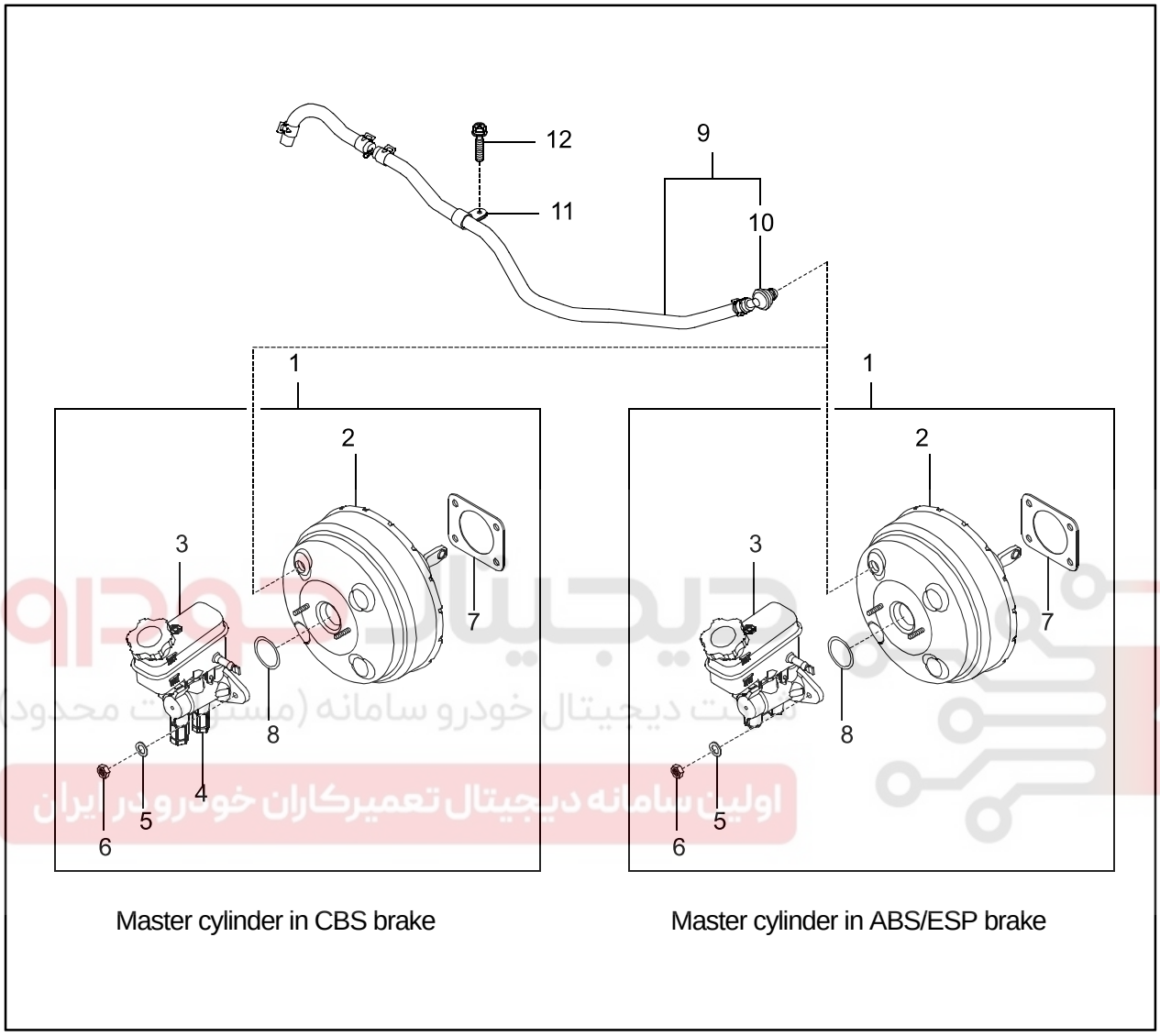
Never park the vehicle only with the parking brake on the stiff hill. It may cause roll down of the vehicle due to release of the parking brake. Must put the wheel blocks under the wheels.

Modification basis	
Application basis	
Affected VIN	

S.G.N. 4850-09

BRAKE BOOSTER VACUUM HOSE

▶ **Disel**



Master cylinder in CBS brake

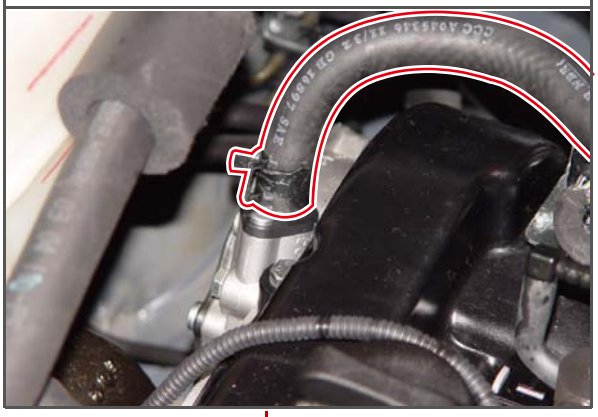
Master cylinder in ABS/ESP brake

1. Brake master assembly
2. Booster assembly
3. Master cylinder assembly
4. Valve
5. Washer
6. Nut
7. Booster mounting seal
8. O-ring
9. Booster vacuum hose assembly
10. Booster non-return valve
11. Clip
12. Screw

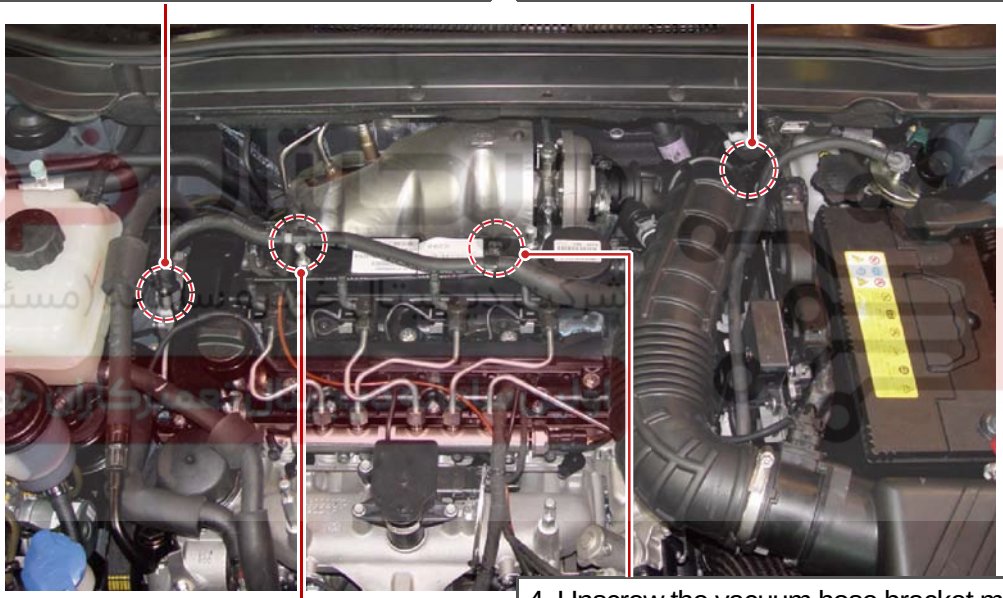
Modification basis	
Application basis	
Affected VIN	

▶ **Disel**

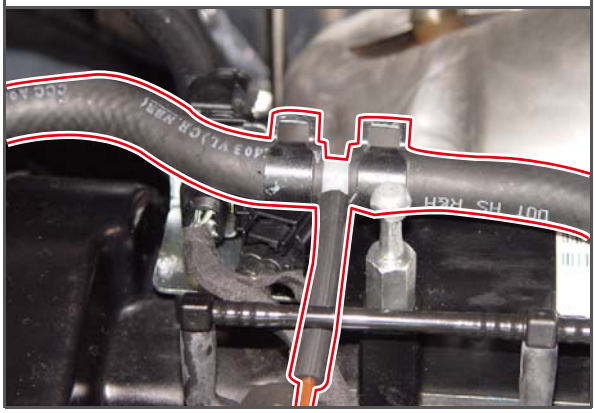
1. Disconnect the vacuum hose to the vacuum modulator.



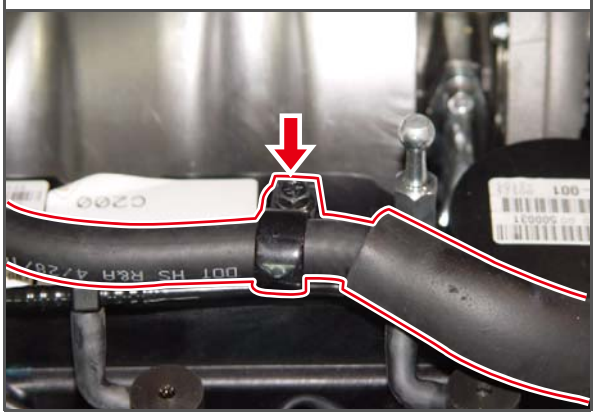
2. Disconnect the vacuum hose from the brake booster.



3. Disconnect the vacuum hose to the vacuum modulator.



4. Unscrew the vacuum hose bracket mounting bolt (10 mm) to remove the vacuum hose assembly. Install in the reverse order of removal.

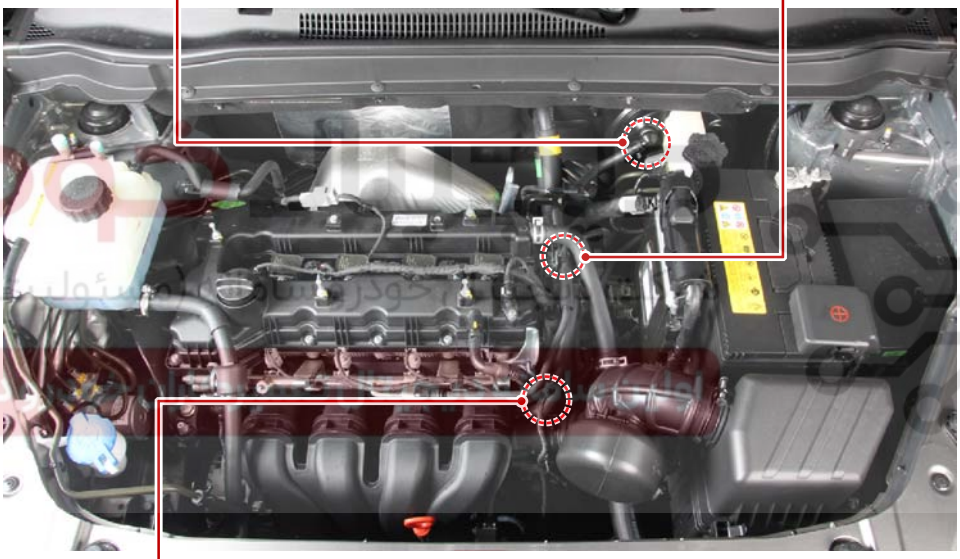


Modification basis	
Application basis	
Affected VIN	

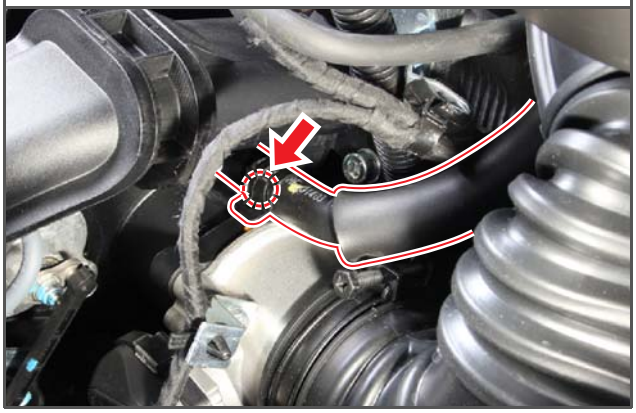
▶ **Gasoline**

1. Disconnect the vacuum hose from the brake booster.

2. Disconnect the vacuum hose at bottom of ventilation hose.



3. Release the hose clamp at bottom of intake manifold and remove the vacuum hose.
Install the vacuum hose in the reverse order of removal.

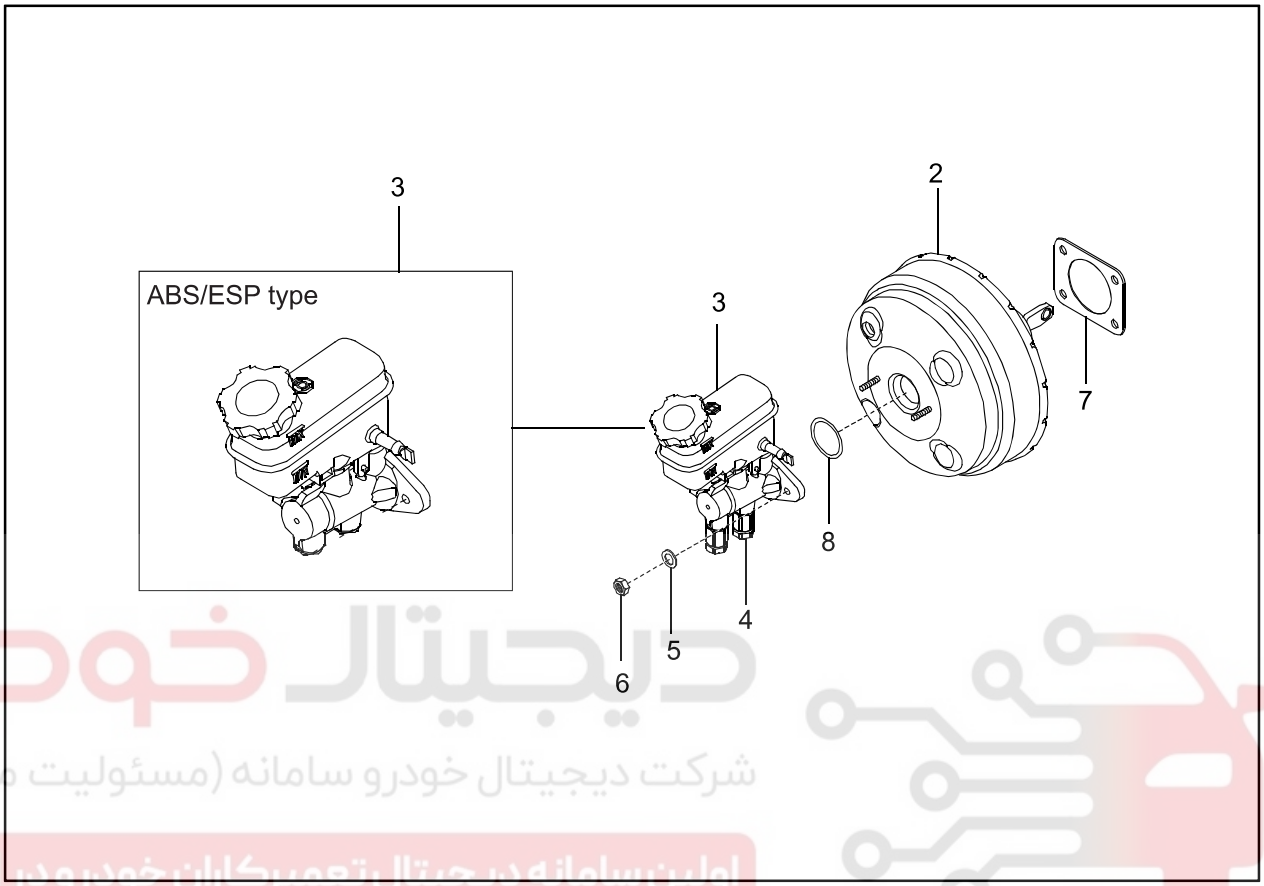


Modification basis	
Application basis	
Affected VIN	

S.G.N. 4850-03

MASTER CYLINDER

▶ **Component**



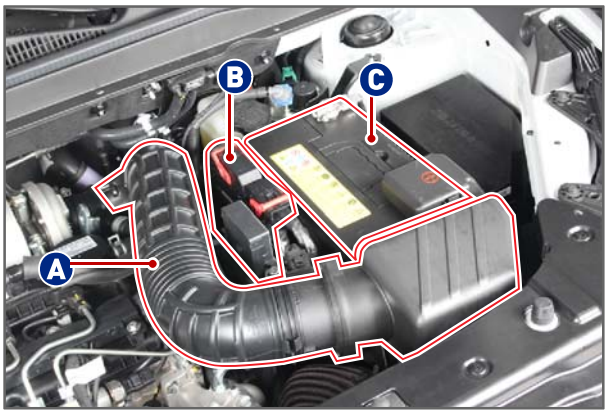
2. Booster assembly
3. Master cylinder assembly
4. Valve (only for CBS)
5. Washer
6. Nut
7. Booster mounting seal
8. O-ring

NOTE

Description for master cylinder in this chapter is based on ABS/ESP equipped vehicle. For CBS, all the procedures except the appearance of master cylinder are same with that of ABS/ESP.

Modification basis	
Application basis	
Affected VIN	

Preceding work Disconnect the negative cable from the battery.

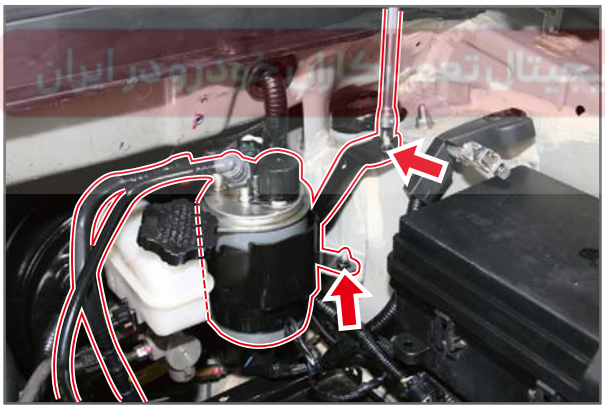


1. Remove the air cleaner duct (A), engine ECU assembly (B) and battery assembly (C) from the engine compartment. (For details, refer to the Chapter "Engine".)

2. Open the brake fluid reservoir cap and drain the brake fluid in the fluid reservoir using the suction device.

CAUTION

Make sure that the brake fluid does not get on other parts when draining it.



3. Unscrew the two bracket mounting nuts (10 mm) on the fuel filter assembly to remove the fuel filter assembly. (DSL ONLY)

Tightening torque 5.9 to 9.8 Nm

4. Disconnect the level switch connector (A) from the brake fluid reservoir.

Modification basis	
Application basis	
Affected VIN	

5. Unscrew the brake pipe nuts (14 mm) on the HECU of the brake master cylinder.

CAUTION

Place a piece of cloth or shop rag under the pipe in order to prevent the brake fluid from getting on other parts as the fluid remaining in the pipe may flow out. The opening of the removed pipe should be sealed with plastic bag, etc.

Tightening torque 14.7 to 18.6 Nm (for ABS)

Tightening torque 20.0 to 24.0 Nm (for ESP)

6. Disengage the clamp for the hose connected to the clutch master cylinder from the brake fluid reservoir and disconnect the hose from the reservoir.

CAUTION

Place a piece of cloth or shop rag under the hose in order to prevent the brake fluid from getting on other parts as the fluid remaining in the hose may flow out. The opening of the removed hose should be covered with plastic bag, etc.

7. Unscrew the two brake master cylinder mounting nuts (12 mm).

Tightening torque 12.8 to 16.7 Nm

Modification basis	
Application basis	
Affected VIN	

8. Remove the brake master cylinder from the brake booster.

9. Install in the reverse order of removal.

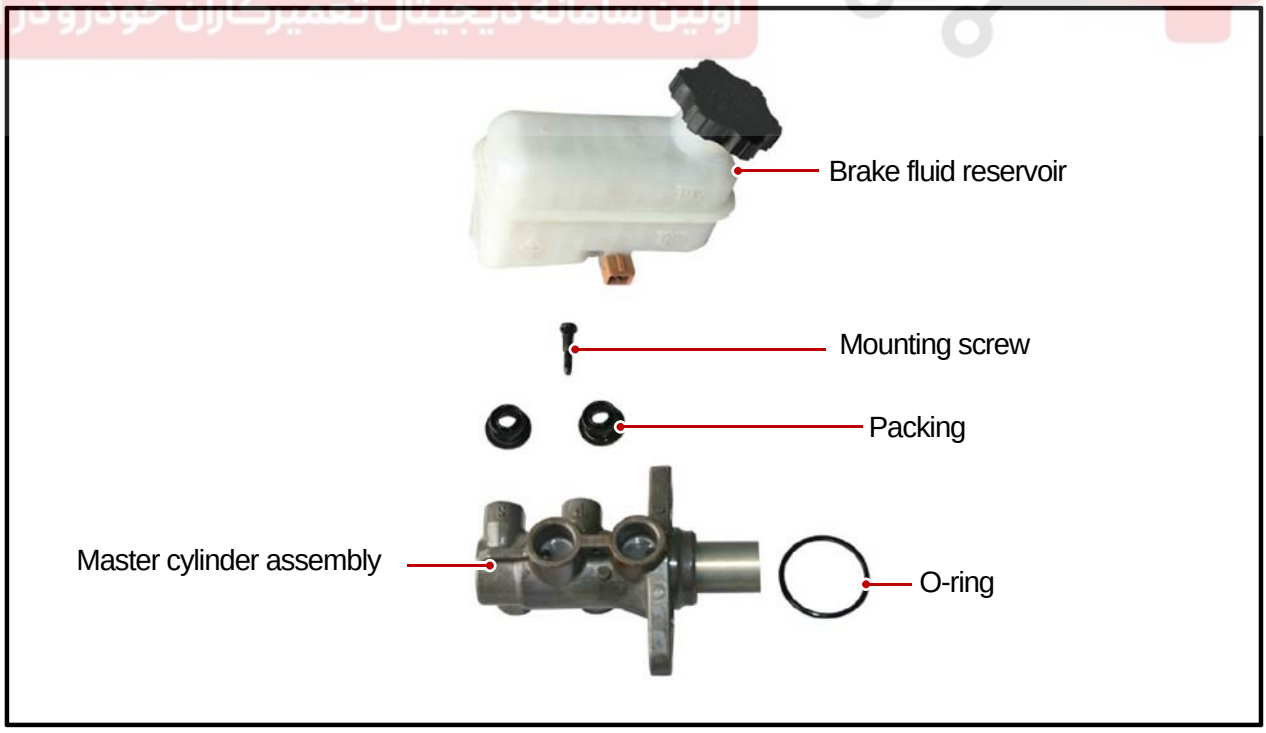
Modification basis	
Application basis	
Affected VIN	

▶ Disassembling and assembling of break fluid reservoir

1. Unscrew the fluid reservoir mounting screw from the removed master cylinder.

2. Remove the fluid reservoir from the master cylinder.

3. Install in the reverse order of removal.

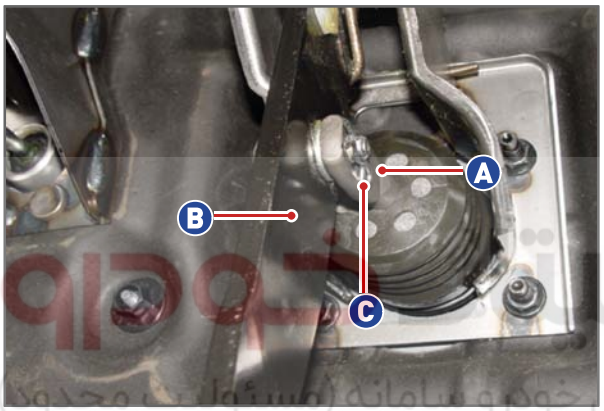


Modification basis	
Application basis	
Affected VIN	

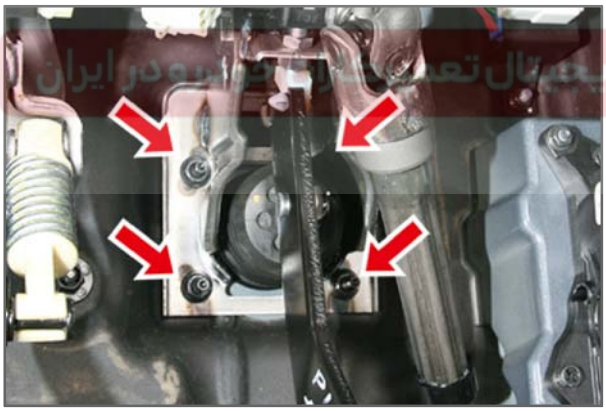
S.G.N. 4850-02 BRAKE BOOSTER

Preceding work Disconnect the negative cable from the battery.

1. Remove the master cylinder (A).



2. Remove the split pin (C) inserted into the push rod (A) and pedal (B) of the brake booster. (For more details, refer to the section "Pedal" of Chapter "Brake System".)



3. Unscrew the 4 brake booster mounting nuts (12 mm).

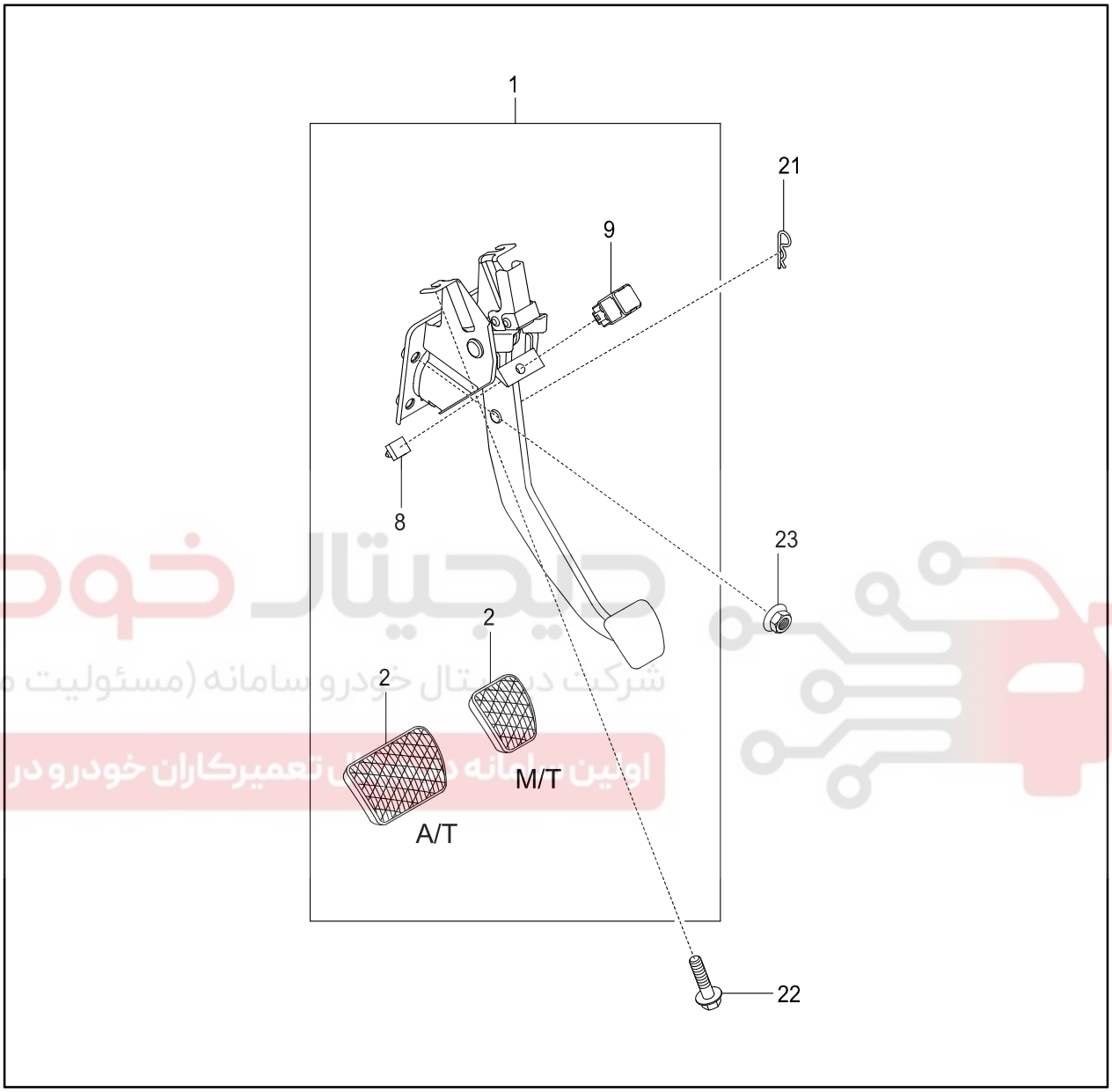
Tightening torque 17.6 to 21.6 Nm

4. Remove the brake booster from the vehicle body.
5. Install in the reverse order of removal.

Modification basis	
Application basis	
Affected VIN	

S.G.N.
4810-01 BRAKE PEDAL

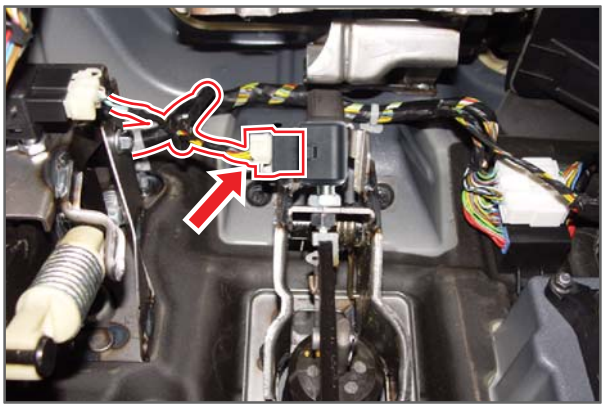
▶ **Schematic diagram**



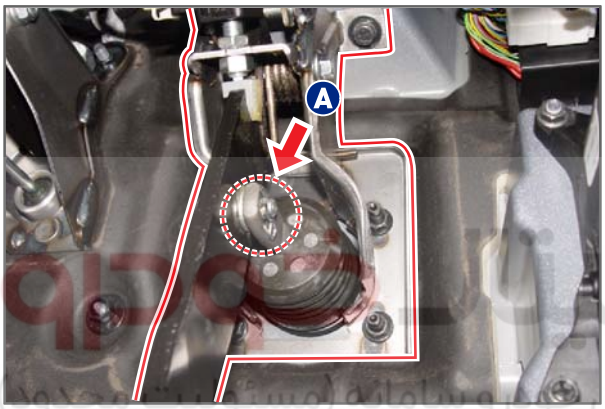
1. Brake pedal box assembly
2. Brake pedal pad
8. Stopper pad
9. Stop lamp switch
21. Split pin
22. Bolt
23. Nut

Modification basis	
Application basis	
Affected VIN	

Preceding work - Disconnect the negative battery terminal.



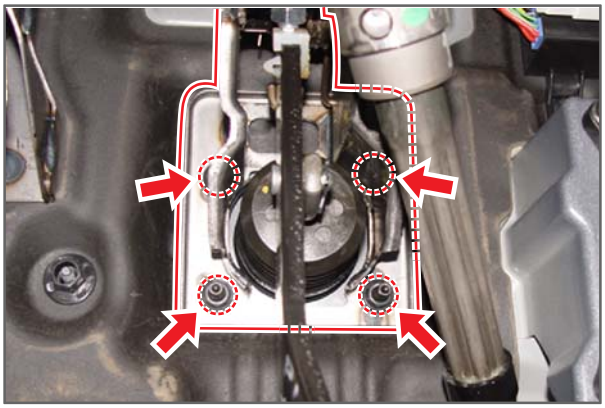
1. Disconnect the stop lamp switch connector (A).



2. Remove the split pin connecting the brake pedal to the booster pushrod.

3. Unscrew the two upper mounting bolts (12 mm) on the brake pedal bracket.

Tightening torque 17.6 to 21.6 Nm

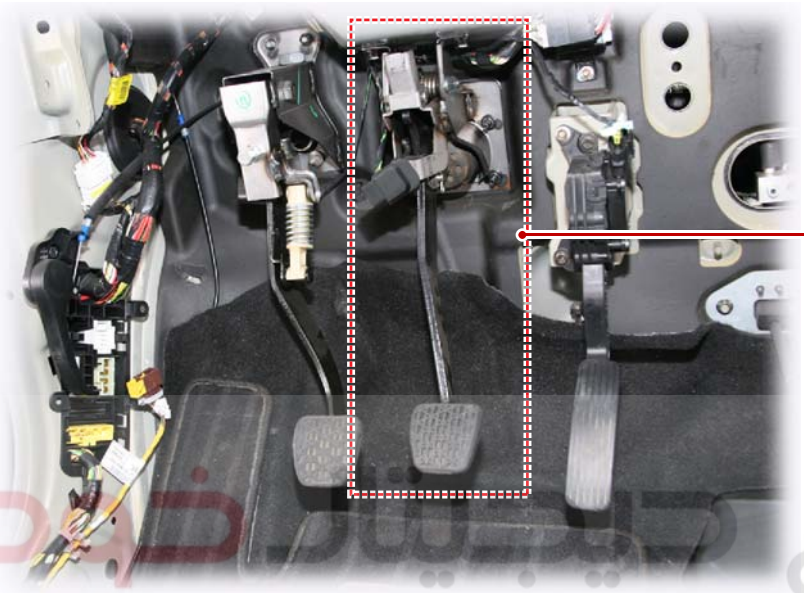


4. Unscrew the 4 mounting nuts (12 mm) on the booster of the brake pedal bracket and remove the brake pedal assembly.

Tightening torque 17.6 to 21.6 Nm

Modification basis	
Application basis	
Affected VIN	

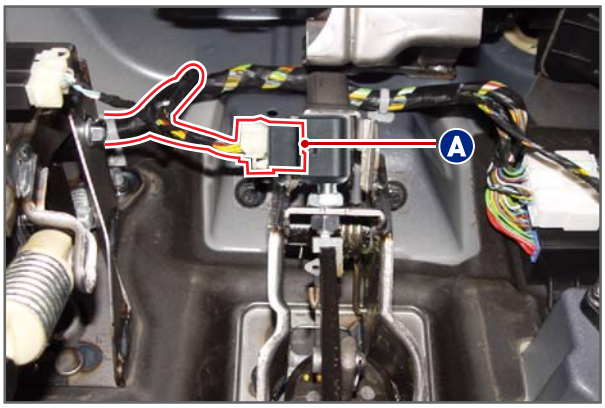
5. Install in the reverse order of removal.

Fitted pedal	Brake pedal component
	

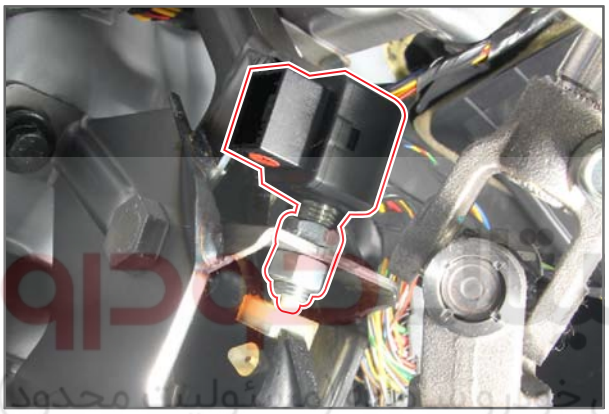
Modification basis	
Application basis	
Affected VIN	

S.G.N. 4810-09

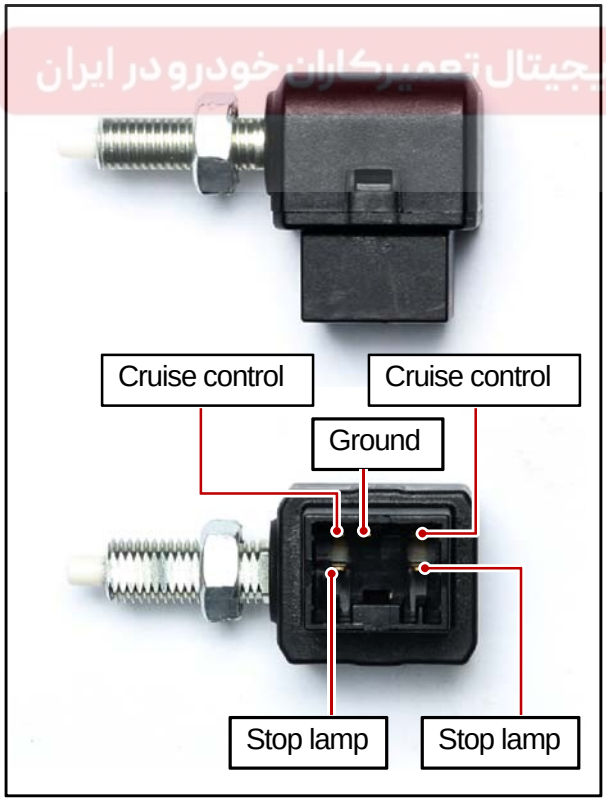
STOP LAMP



1. Disconnect the negative (-) battery terminal and stop lamp switch connector (A).



2. Unscrew the mounting nut on the stop lamp switch to remove it.

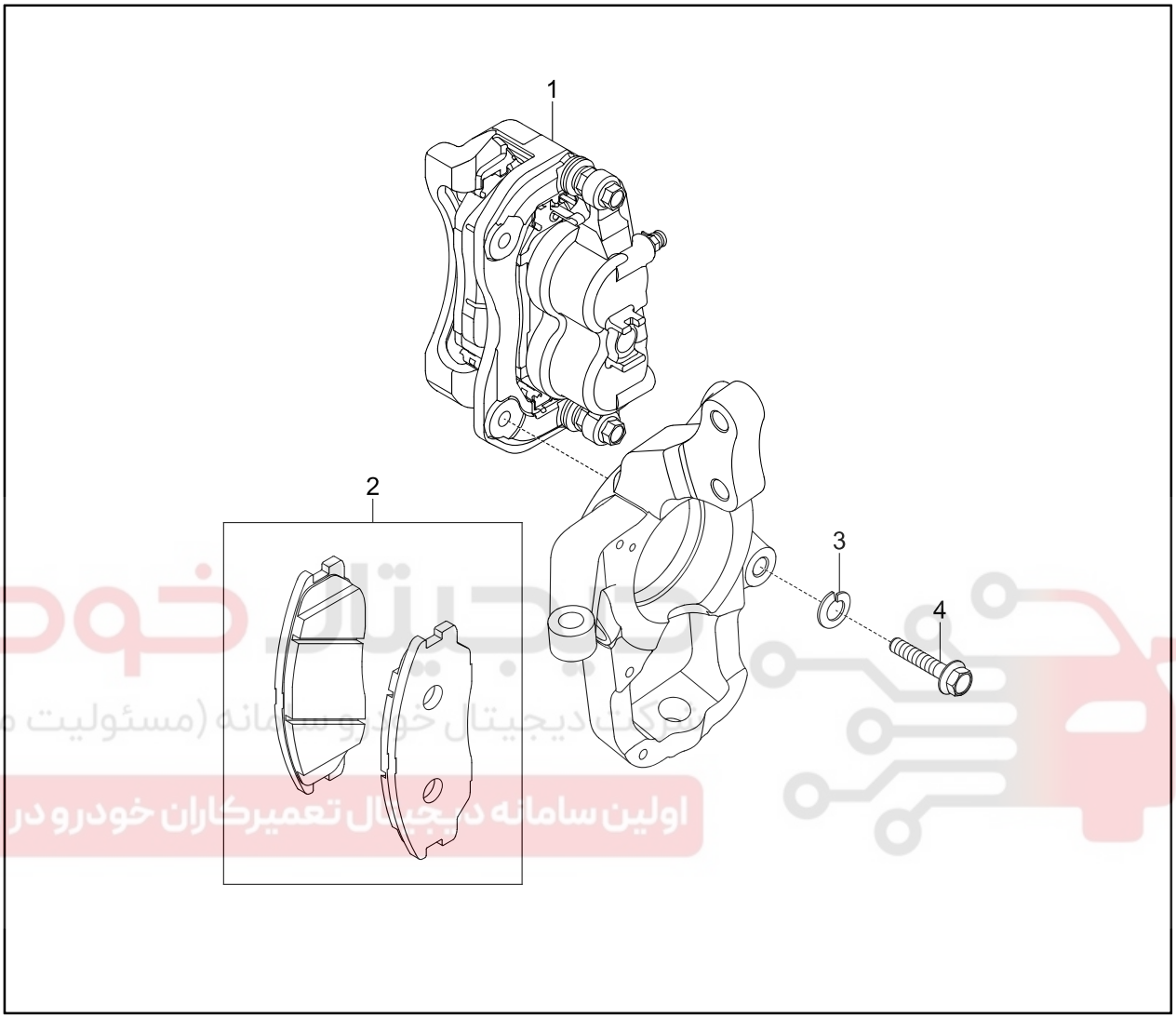


3. Install in the reverse order of removal.

Modification basis	
Application basis	
Affected VIN	

S.G.N.
4830-01 FRONT BRAKE CALIPER/DISC

▶ **Component**

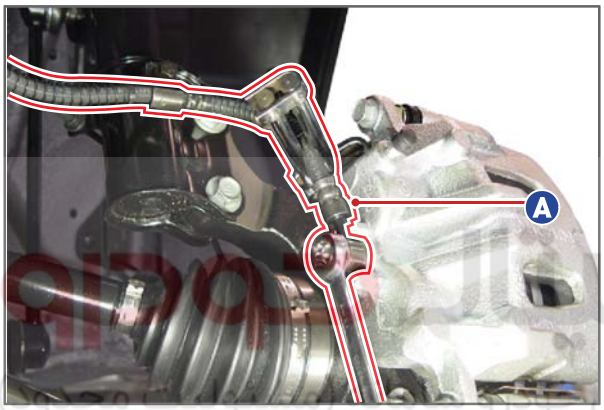


1. Brake caliper assembly
2. Brake pad
3. Washer
4. Bolt

Modification basis	
Application basis	
Affected VIN	

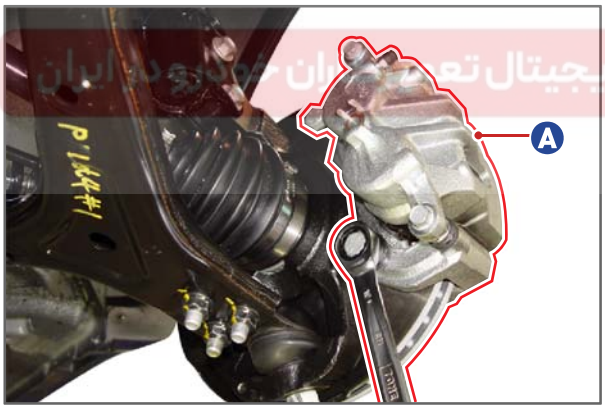
▶ Brake caliper

Preceding work
1. Disconnect the negative cable from the battery.
2. Remove the tire.



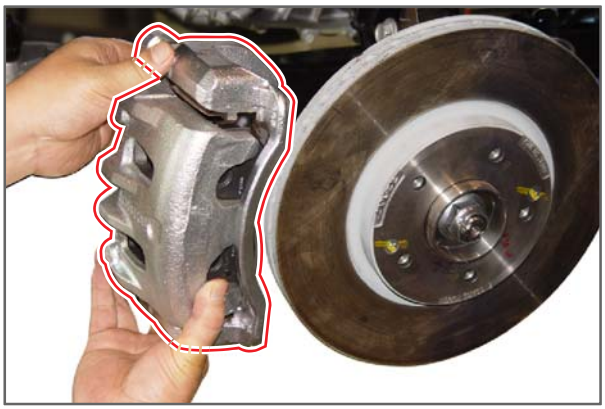
1. Unscrew the brake hose (A) mounting bolt (12 mm) on the brake caliper and disconnect the brake hose from the caliper.

Tightening torque 19.6 to 29.4 Nm



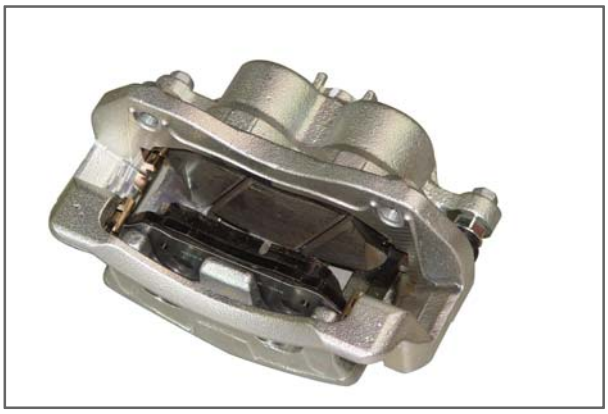
2. Unscrew the two mounting bolts (19 mm) on the brake caliper (A).

Tightening torque 83.3 to 102.9 Nm



3. Remove the brake caliper from the brake disc.

Modification basis	
Application basis	
Affected VIN	



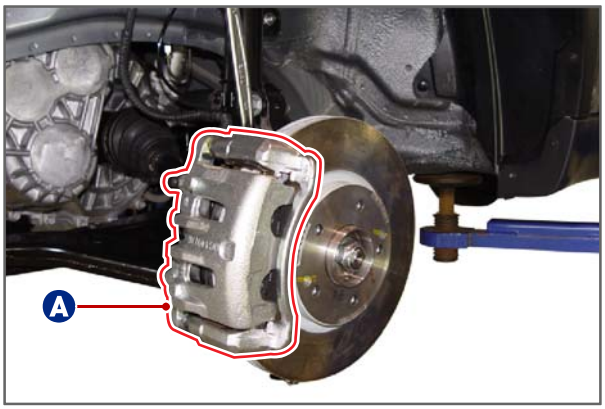
4. Install in the reverse order of removal.

CAUTION

Always perform bleeding after installing the brake caliper.

Modification basis	
Application basis	
Affected VIN	

▶ Brake disc

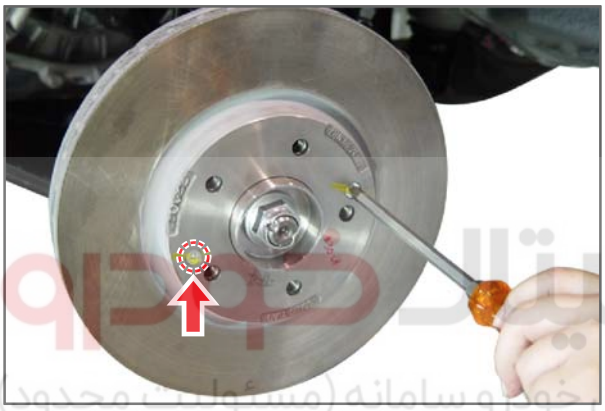


Preceding work

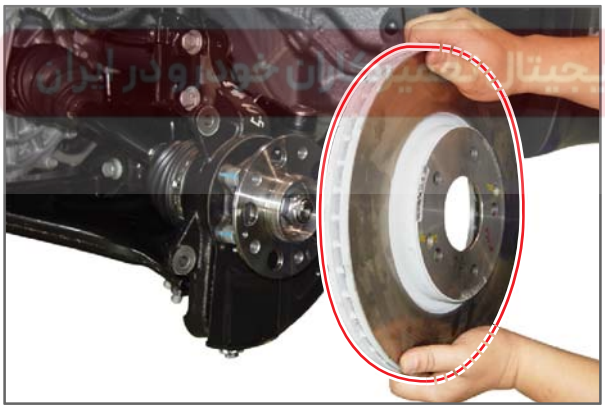
1. Disconnect the negative cable from the battery.
2. Remove the tire.

1. Unscrew the two mounting bolts (19 mm) on the brake caliper (A).

Tightening torque 83.3 to 102.9 Nm



2. Unscrew the two brake disc mounting screws.



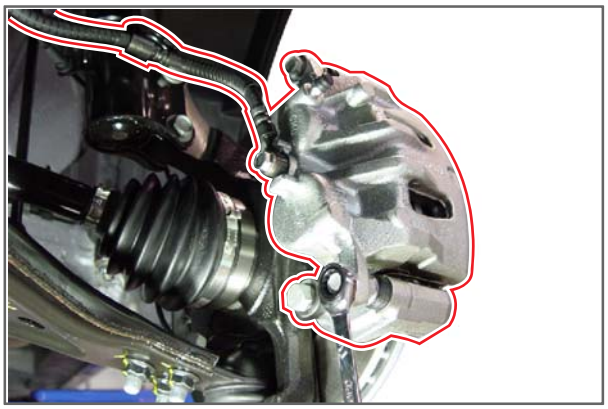
3. Remove the brake disc from the knuckle.

4. Install in the reverse order of removal.

Modification basis	
Application basis	
Affected VIN	

S.G.N. 4830-02

FRONT BRAKE PAD CHANGE

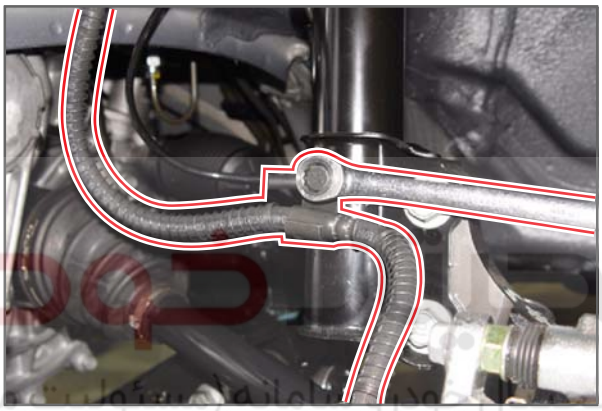


Preceding work

1. Disconnect the negative cable from the battery.
2. Remove the tire.

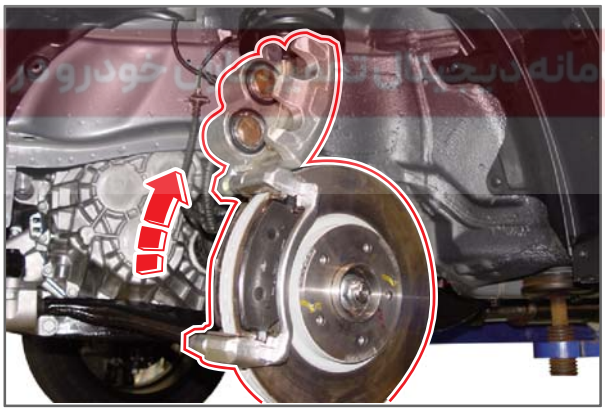
1. Unscrew the lower mounting bolt (14 mm) for the brake caliper cylinder.

Tightening torque 25.5 to 30.4 Nm

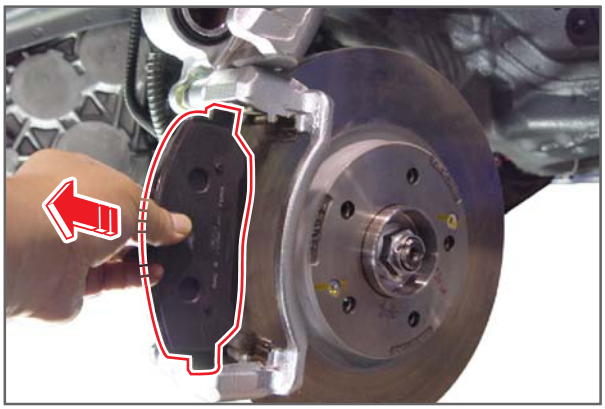


2. Unscrew the bracket mounting bolt (12 mm) fitted to the shock absorber and pry off the brake hose (A).

Tightening torque 9.8 to 12.8 Nm

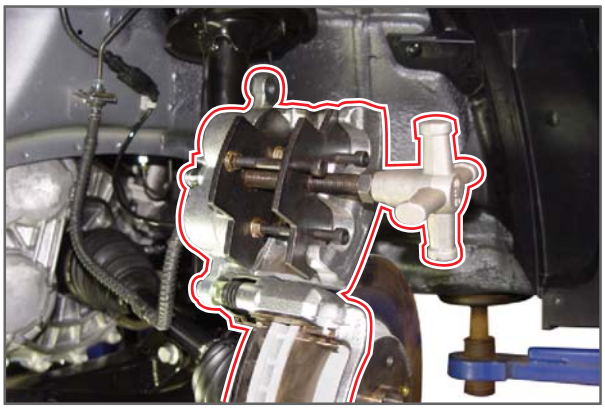


3. Lift up the brake caliper cylinder.

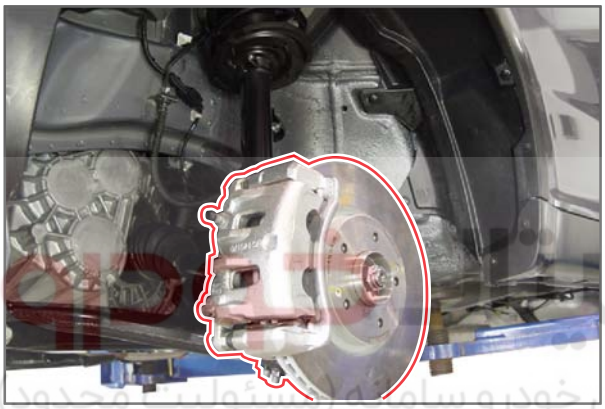


4. Remove the brake pads and replace them with new ones.

Modification basis	
Application basis	
Affected VIN	



5. After replacing the brake pads, install a special tool on the caliper cylinder in order to press against the piston.

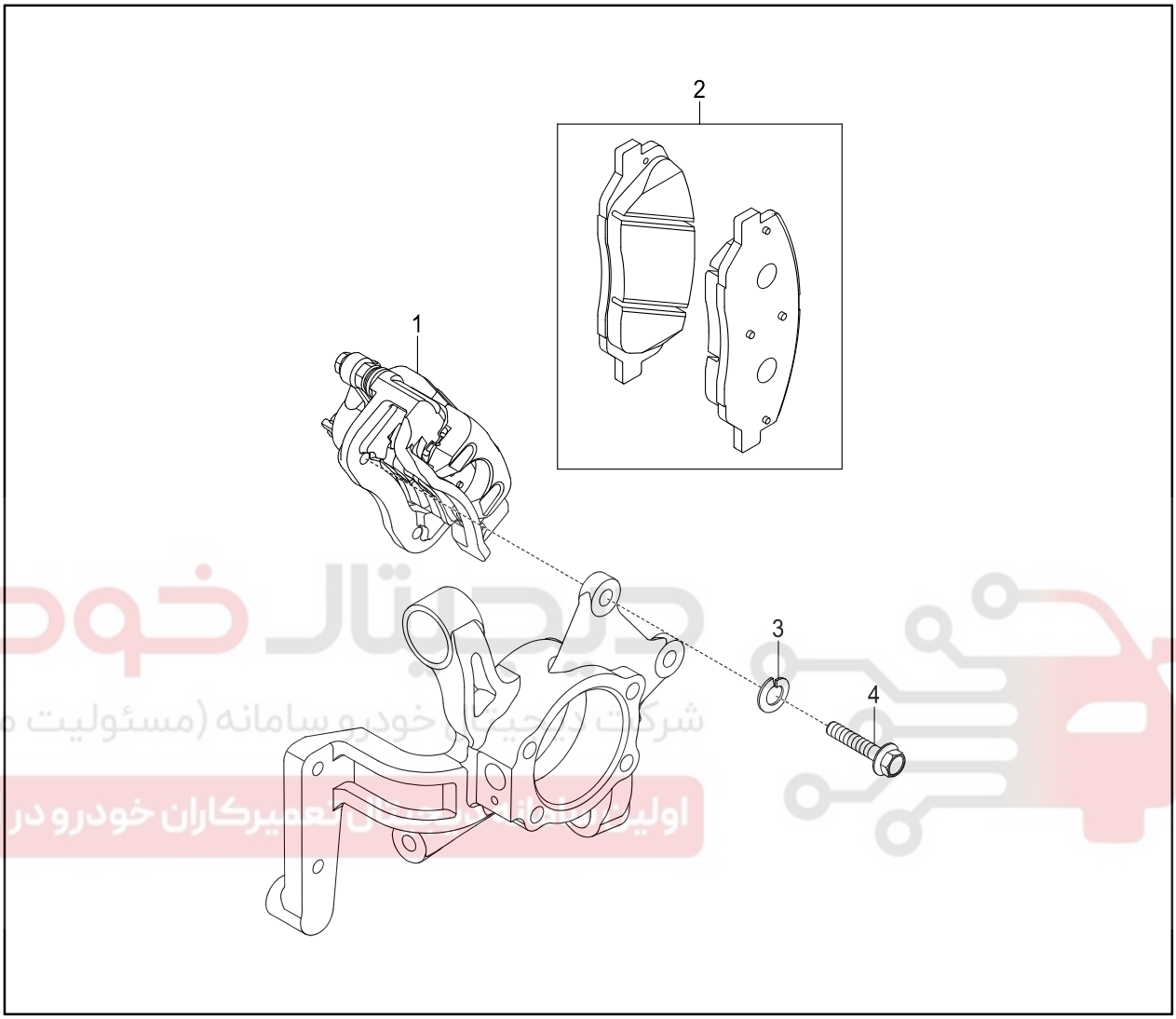


6. Fit the brake caliper cylinder, tighten the mounting bolts and depress the brake pedal several times.

Modification basis	
Application basis	
Affected VIN	

S.G.N.
4841-01 REAR BRAKE CALIPER/DISC

▶Component

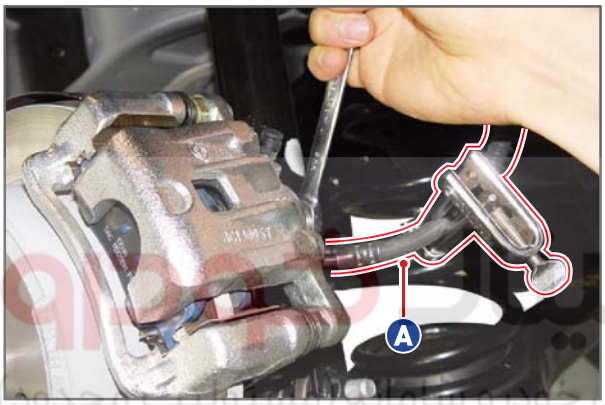


1. Brake caliper assembly
2. Brake pad
3. Washer
4. Bolt

Modification basis	
Application basis	
Affected VIN	

▶ Brake caliper

Preceding work
1. Disconnect the negative cable from the battery.
2. Remove the tire.

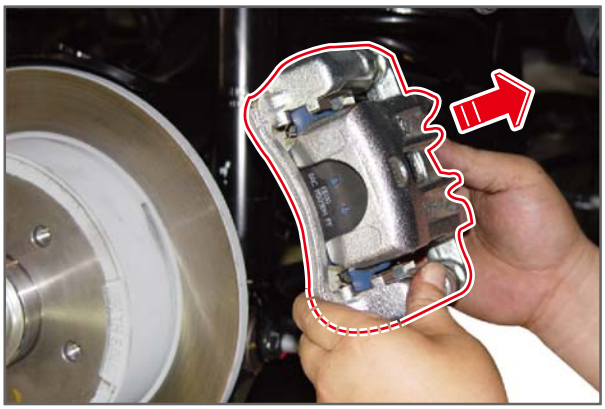


1. Unscrew the brake hose (A) mounting bolt (12 mm) on the brake caliper and disconnect the brake hose from the caliper.

Tightening torque 19.6 to 29.4 Nm

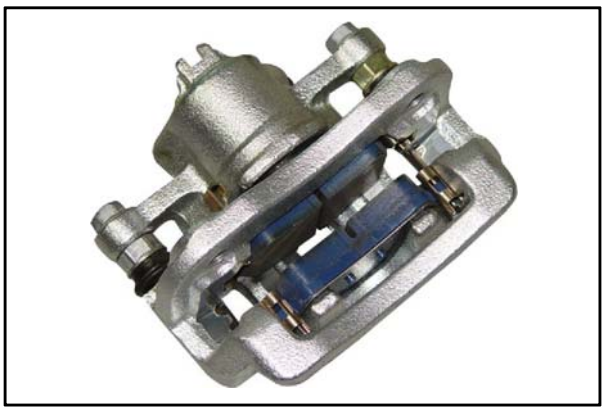
2. Unscrew the two mounting bolts (17 mm) on the brake caliper.

Tightening torque 52.9 to 63.74 Nm



3. Remove the brake caliper from the brake disc.

Modification basis	
Application basis	
Affected VIN	



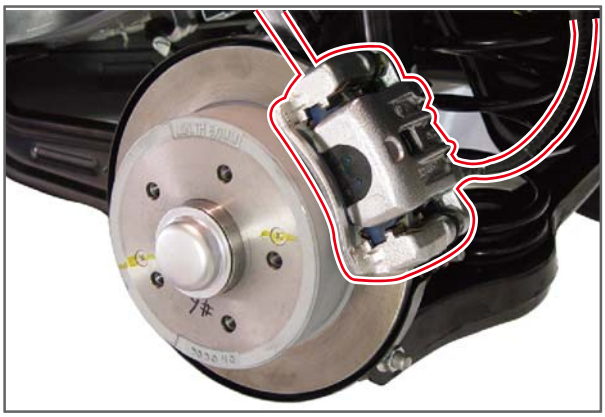
4. Install in the reverse order of removal.

CAUTION

Always perform the air bleeding after installing the brake caliper.

Modification basis	
Application basis	
Affected VIN	

▶ Brake disc

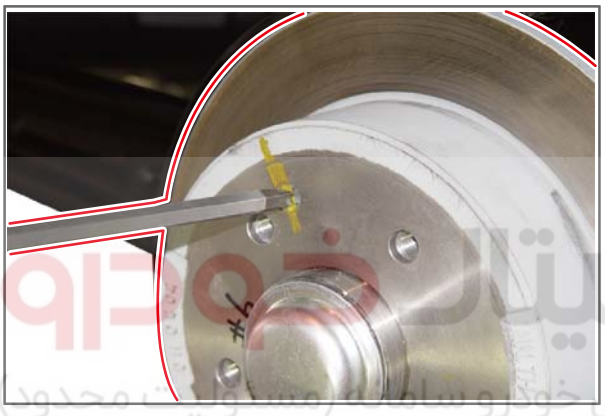


Preceding work

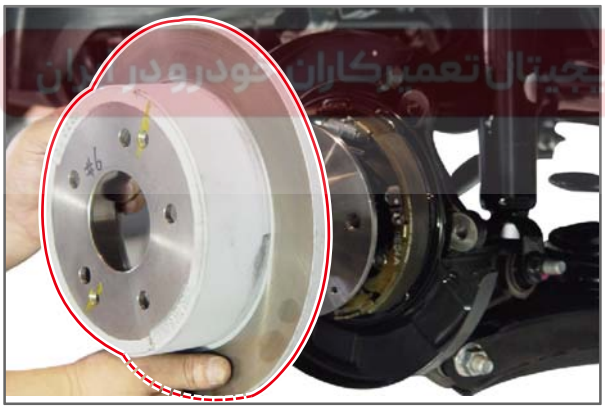
1. Disconnect the negative cable from the battery.
2. Remove the tire.

1. Unscrew the two mounting bolts (17 mm) on the brake caliper.

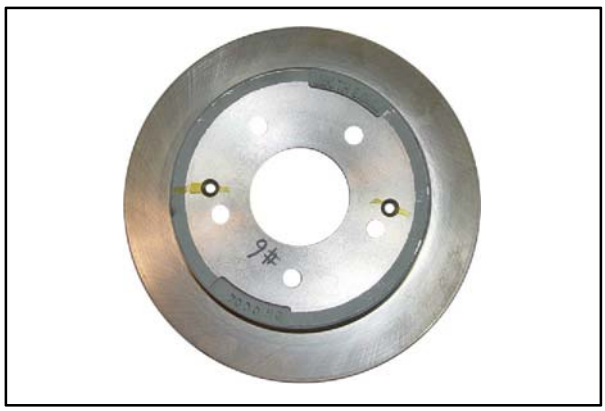
Tightening torque 52.9 to 63.74 Nm



2. Unscrew the two brake disc mounting screws.



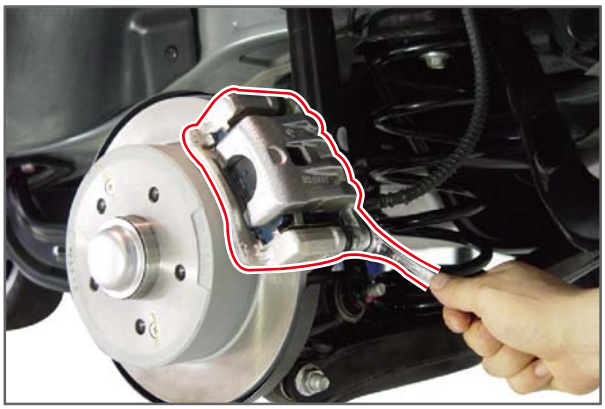
3. Remove the brake disc from the knuckle.



4. Install in the reverse order of removal.

Modification basis	
Application basis	
Affected VIN	

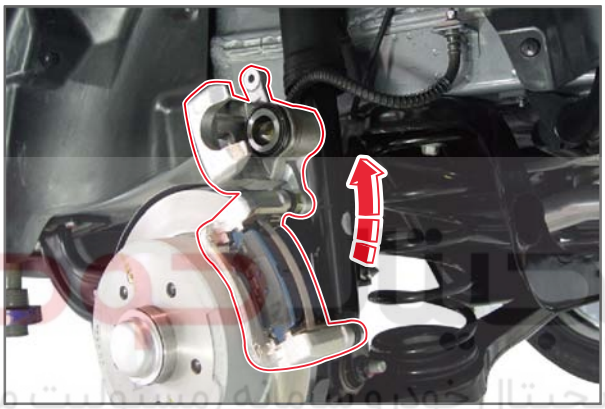
S.G.N.
4841-02 REAR BRAKE PAD



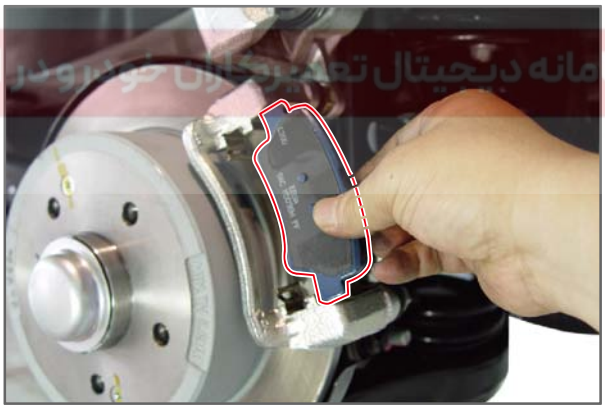
Preceding work
1. Disconnect the negative cable from the battery.
2. Remove the tire.

1. Unscrew the lower mounting bolt (14 mm) for the brake caliper cylinder.

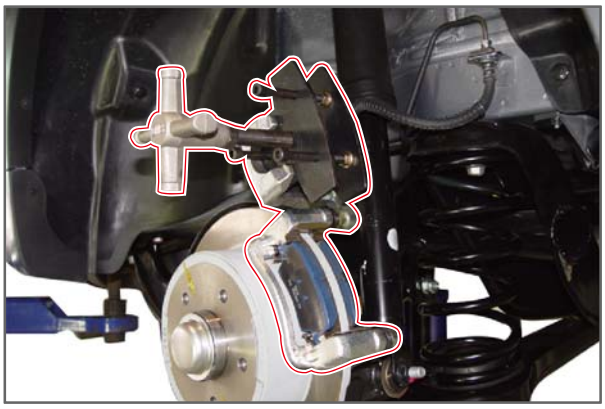
Tightening torque 25.5 to 30.4 Nm



2. Lift up the brake caliper cylinder.



3. Remove the brake pads and replace them with new ones.

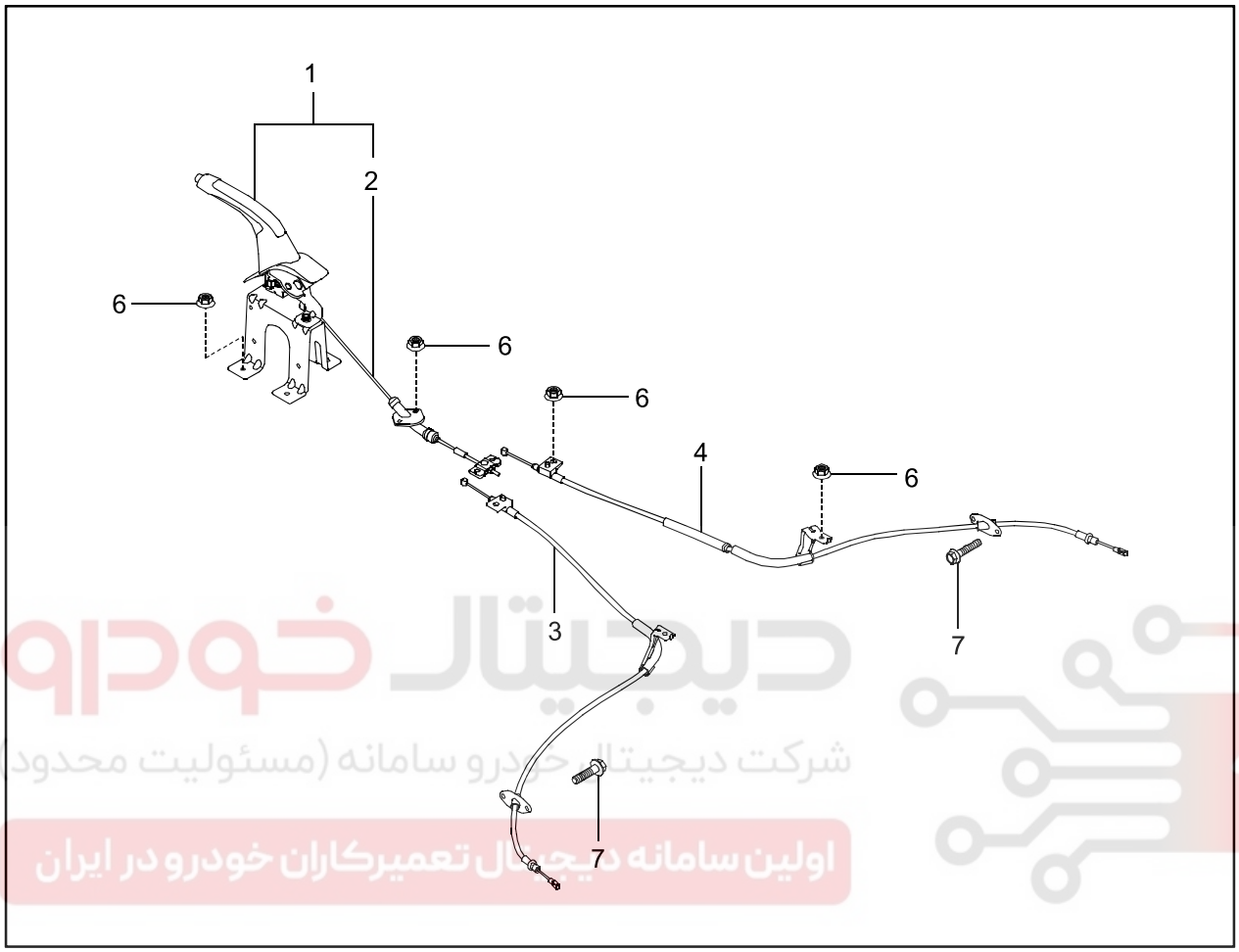


4. After replacing the brake pads, install a special tool on the caliper cylinder in order to press against the piston.
5. Fit the brake caliper cylinder, tighten the mounting bolts and depress the brake pedal several times.

Modification basis	
Application basis	
Affected VIN	

S.G.N.
4910-01 PARKING BRAKE CABLE

▶ **Component**



1. Parking brake lever assembly
2. Front cable assembly
3. Rear cable assembly
4. Rear cable assembly
6. Nut
7. Bolt

Modification basis	
Application basis	
Affected VIN	

Preceding work

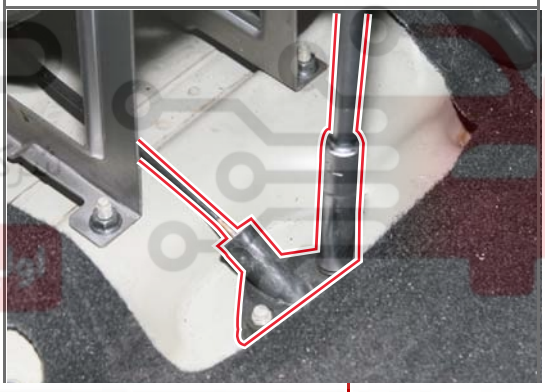
1. Disconnect the negative cable from the battery.
2. Lift up the vehicle with a lift by paying attention to the safety.
3. Release the parking brake.
4. Remove the center console assembly. For more details, refer to the Chapter "Body".

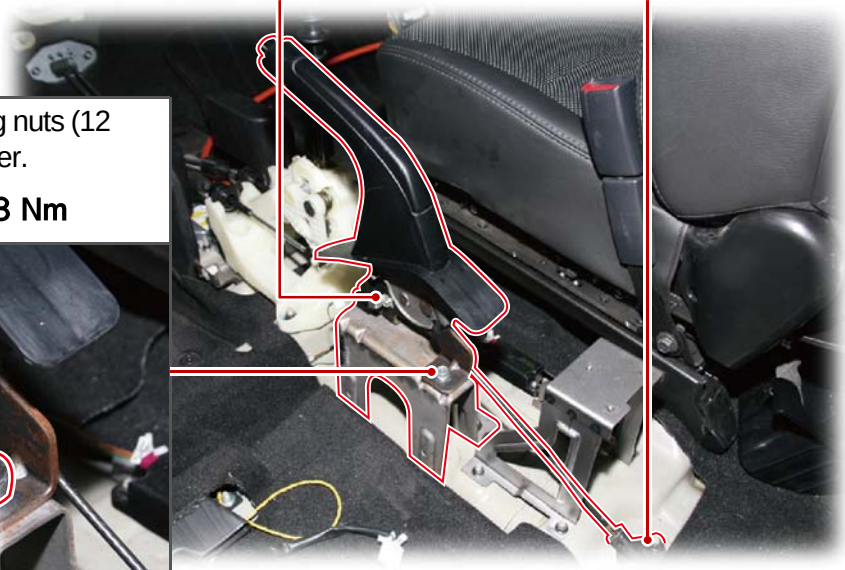
1. With the center console removed, remove the followings:

(1) Disconnect the connector for the parking brake warning lamp switch.

(3) Unscrew the two bracket mounting nuts (12 mm) for the front parking brake cable.

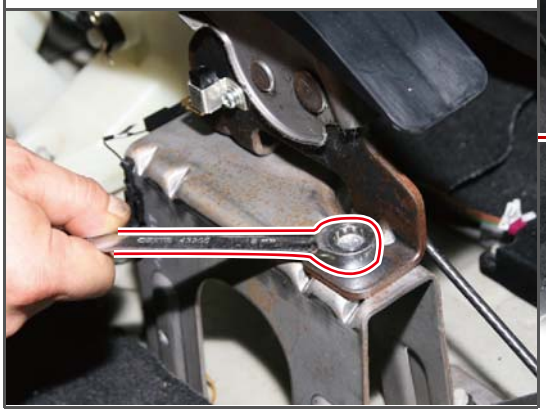
Tightening torque 9.8 to 11.8 Nm



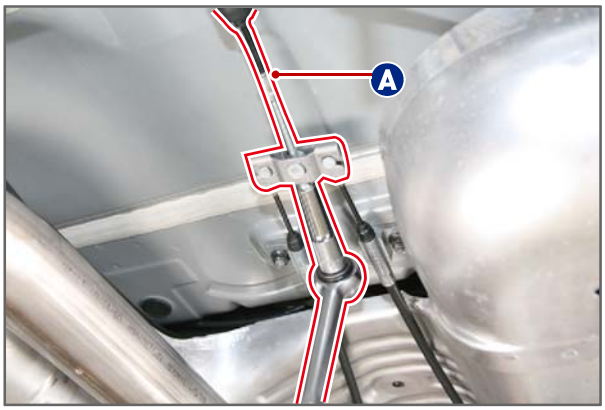


(2) Unscrew the two mounting nuts (12 mm) for the parking brake lever.

Tightening torque 8 to 11.8 Nm



Modification basis	
Application basis	
Affected VIN	

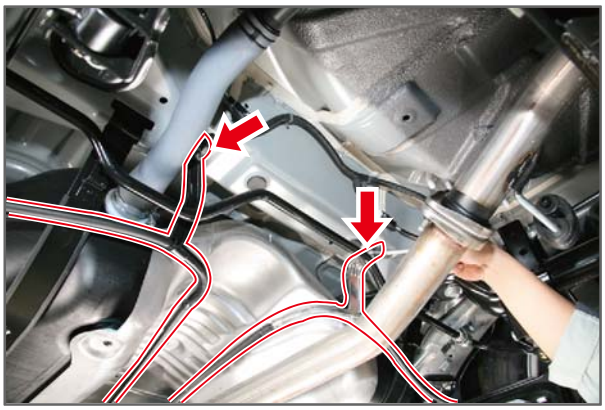


2. Disconnect the front parking brake cable (A) from the vehicle under floor.

3. Remove the parking brake assembly from inside.

4. Unscrew the two bracket mounting nuts (12 mm) for the rear parking brake cable (A).

Tightening torque 9.8 to 12.7 Nm



5. Unscrew the bracket mounting nuts (12 mm) for the right- and left-side rear parking brake cables.

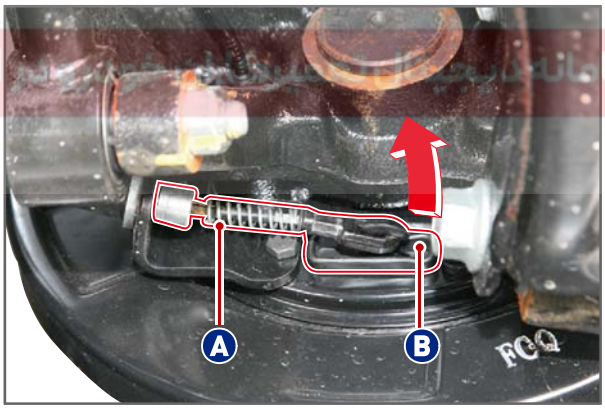
Tightening torque 9.8 to 12.7 Nm

Modification basis	
Application basis	
Affected VIN	

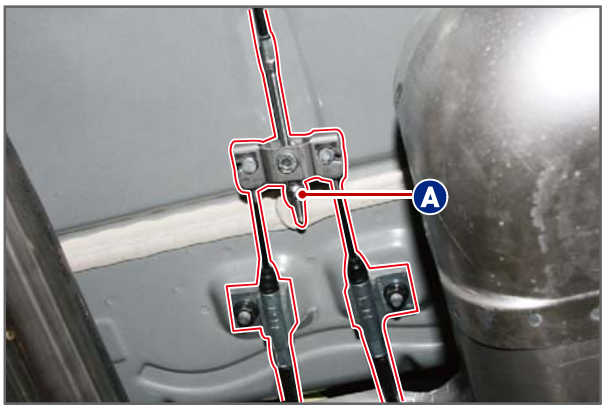
6. Unscrew the bracket mounting bolts (12 mm) for the parking brake cable on the trailing arm.

Tightening torque 9.8 to 12.7 Nm

7. Remove the split pin (A) for the parking brake cable.



8. Disconnect the parking brake cable (A) from the parking brake operating lever (B).



9. Disconnect the parking brake cable from the vehicle.
10. Install in the reverse order of removal.

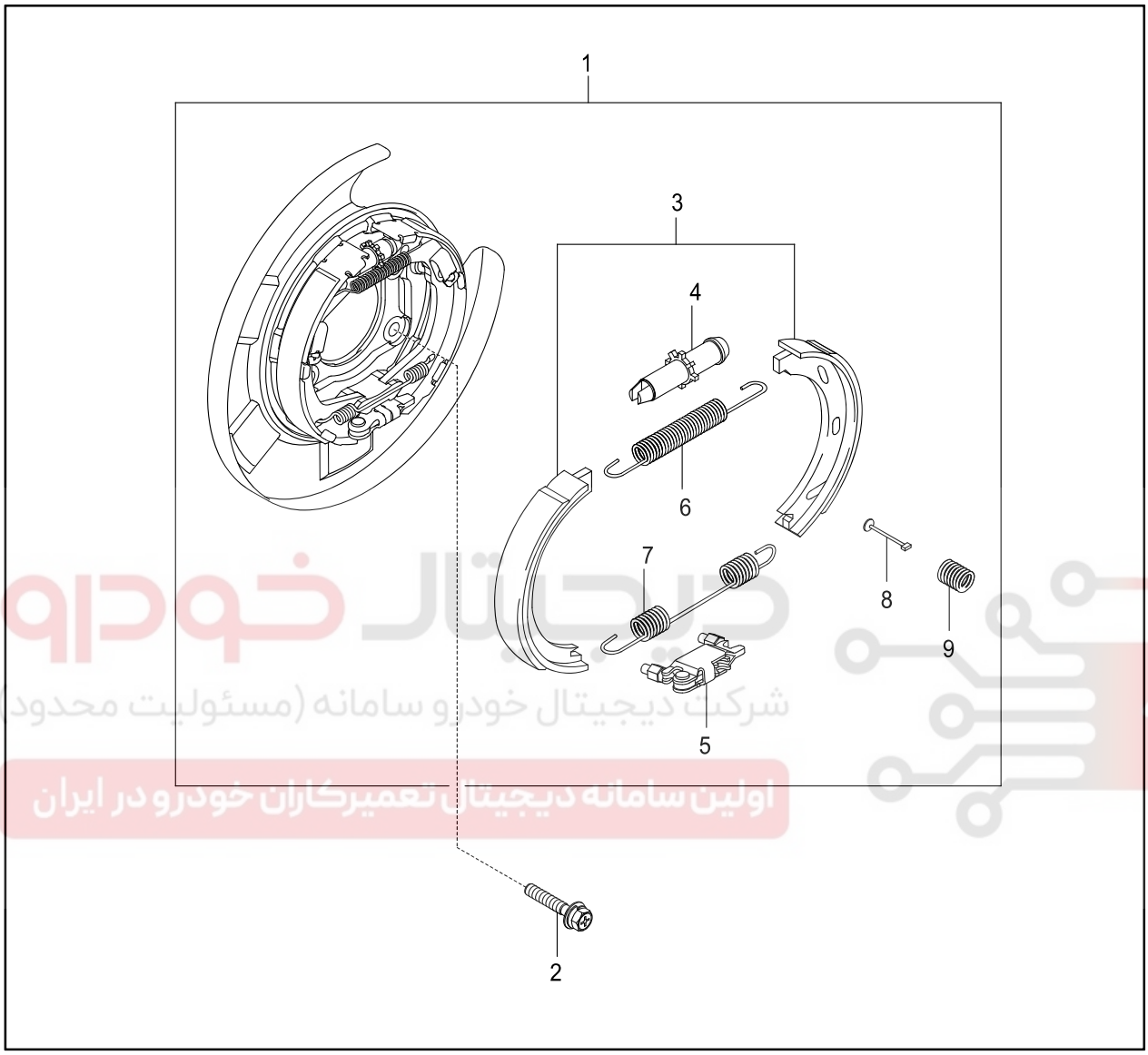
CAUTION

1. Connect the parking brake cable and check the functionality of the parking brake switch and warning lamp.
2. Check the operation status and adjust the cable tension with the adjusting nut on the equalizer (A), if needed.

Modification basis	
Application basis	
Affected VIN	

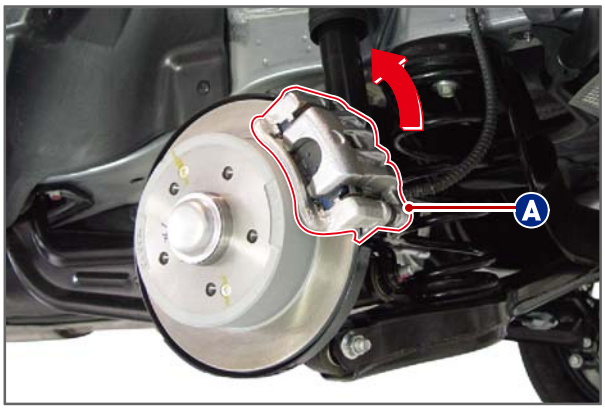
S.G.N.
4840-01 PARKING BRAKE

▶ **Component**



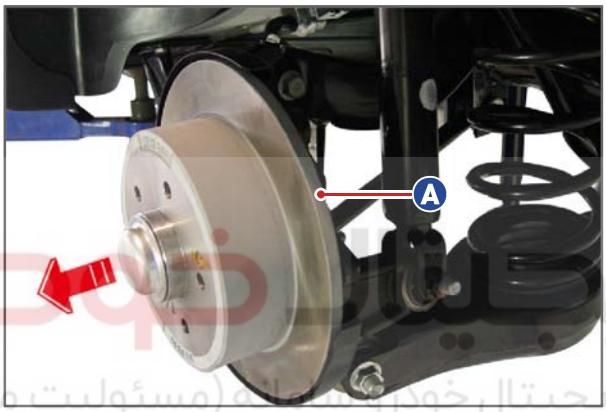
1. Parking brake drum
5. Bolt
20. Parking brake drum shoe
21. Adjuster assembly
22. Operating lever assembly
23. Tension spring
24. Tension spring
25. Pin
26. Spring

Modification basis	
Application basis	
Affected VIN	

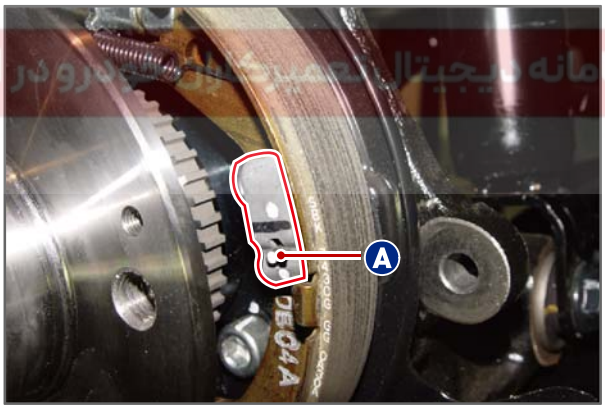


Preceding work

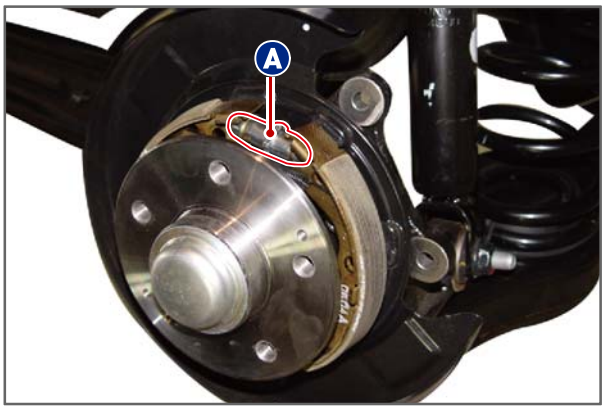
1. Lift up the vehicle with a lift by paying attention to the safety and remove the tire.
2. Release the parking brake.
3. Unscrew the mounting bolt on the rear brake caliper and keep the caliper assembly (A) in a safe place.



1. Remove the brake disc (A).

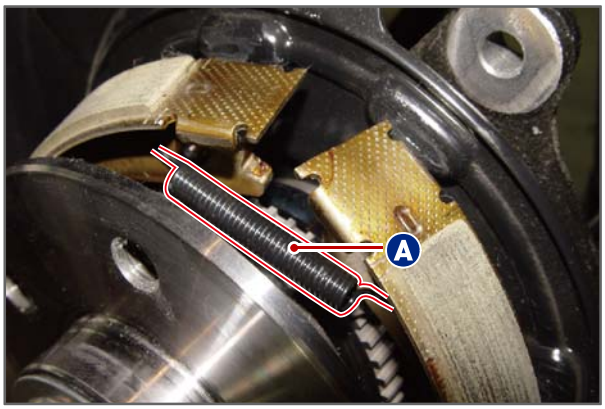


2. Remove the split pin (A) for the right- and left-side brake shoes.



3. Remove the adjuster assembly (A) fitted to the upper part of the parking brake.

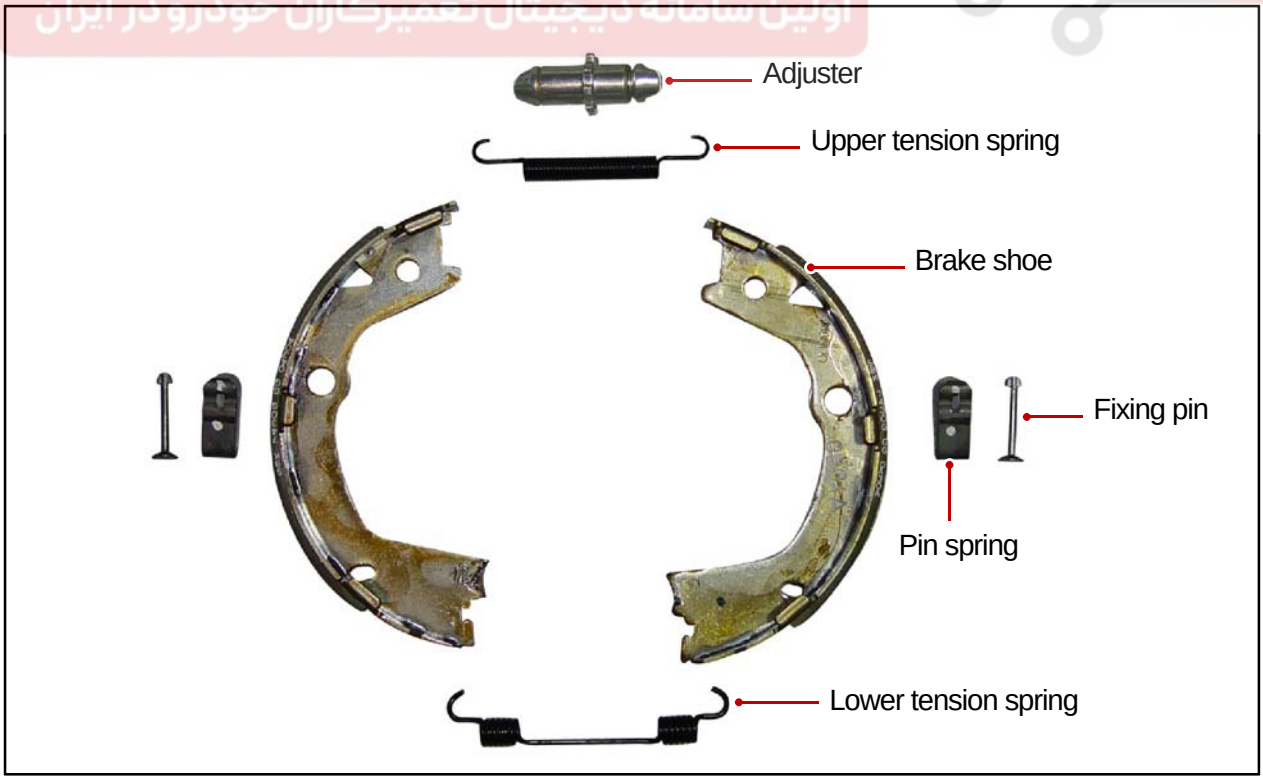
Modification basis	
Application basis	
Affected VIN	



4. Remove the tension spring (A) fitted to the upper part of the parking brake.

5. Remove the lower tension spring, shoe and operating lever from the back plate, while prying off the right and left brake shoes.

6. Install in the reverse order of removal.



Modification basis	
Application basis	
Affected VIN	

a. Apply grease to the shoe and its contact surface of the back plate when installing. (Same positions on the right and left sides)

b. Check for stiffness or abnormal wear of the brake shoe, and check that the linings are free from the oil.
Replace the brake shoe with new one if it's not OK.

Modification basis	
Application basis	
Affected VIN	

Memo