

AIR BAG

**7430-00/7430-04/8530-08/8810-00/8810-01/8810-03/
8810-06/8810-08/8810-11/8810-16/8810-20/**

INDEX**AIR BAG SYSTEM****GENERAL INFORMATION**

1. SPECIFICATIONS.....	3
2. CAUTIONS FOR AIR BAG SYSTEM.....	4

OVERVIEW AND OPERATING PROCESS

1. AIR BAG SYSTEM OVERVIEW.....	7
2. AIR BAG SYSTEM LAYOUT.....	8
3. AIR BAG SYSTEM OPERATING PROCESS.....	10
4. AIR BAG SYSTEM SELF DIAGNOSIS...	25
5. EVENT DATA RECORDER (EDR) (EDR: EVENT DATA RECORDER).....	33
6. CIRCUIT DIAGRAM.....	34

REMOVAL AND INSTALLATION

8810-00 HOW TO CHECK THE SYSTEM AFTER FAULT CODE.....	57
8810-01 AIR BAG UNIT (SDM).....	59
8810-03 DRIVER AIR BAG.....	61
8530-08 CONTACT COIL.....	64
8810-06 PASSENGER AIR BAG.....	69
8810-08 DRIVER KNEE AIR BAG.....	71
8810-11 CURTAIN AIR BAG.....	73
8810-16 FRONT IMPACT SENSOR.....	76
8810-16 SIDE IMPACT SENSOR.....	78

CODING PROCESS

1. AIR BAG VARIANT CODING.....	80
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CONFIGURATION AND FUNCTIONS

8810-01 AIR BAG UNIT (SDM).....	36
8810-03 DRIVER AIR BAG.....	39
8810-06 PASSENGER AIR BAG.....	41
8810-08 DRIVER KNEE AIR BAG.....	43
8810-11 CURTAIN AIR BAG.....	45
8810-20 SIDE AIR BAG.....	47
7430-00 SEAT BELT PRETENSIONER....	49
7430-04 ANCHOR PRETENSIONER.....	51
8810-16 FRONT IMPACT SENSOR.....	53
8810-16 FRONT IMPACT SENSOR.....	55

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AIR BAG**8810-00****GENERAL INFORMATION****1. SPECIFICATIONS**

Item	Category	Specification
Air bag unit (SDM)	Operation voltage range	8.0 V ~ 16.0 V
	Voltage for system diagnosis and SDM self diagnosis	8.0 V ~ 16.0 V
	Voltage for communication between front and side impact sensors	7.0 V ~ 16.0 V
	Storage temperature	-40°C ~ 90°C
	Operating temperature	-40°C ~ 85°C
Air bag module	Resistance at -35 to +85°C	2.0 ± 0.3 Ω
	Non-ignition current at +85°C	0.4 A for 10 seconds
	All-ignition current at -35°C	1.2 A for 2 ms
Seat belt pretensioner and anchor pretensioner	Resistance at -35 to +85°C	2.15 ± 0.35 Ω
	Non-ignition current at +85°C	0.2 A for 10 seconds
	All-ignition current at -35°C	0.8 A for 2 ms
Front and side impact sensors	Operating temperature	-40°C ~ 125°C
	Power voltage	5.0 ~ 11.0 V
	Measurement range	5.0 ~ 11.0 V
Contact Coil	Rated voltage	12.0 V
	Operation voltage range	9.0 V ~ 16.0 V
	Air bag circuit resistance	0.23 to 1.0 Ω
	Current capacity	5.0 A
	Rotation	2.1 rotations for each (LH/RH) direction
Replacement interval		Change at every 10 years

Modification basis	
Application basis	
Affected VIN	

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2. CAUTIONS

► Cautions for air bag maintenance

1. Whenever installing or removing the devices related to the air bag system, disconnect the negative battery cable and wait for at least 30 seconds.
2. Do not connect a tester probe to the inflator to measure the resistance of the component of the air bag system. The detonator of the inflator may explode due to a sudden extra power supplied by the tester.
3. Note that the used components related to the air bag system, especially the air bag unit, should be packed in an air tight container and prevent it from any impact or damage.
4. When there is any deployed air bag (including curtain air bag, seat belt pretensioner and anchor pretensioner), the entire system including the air bag unit should be replaced. The deployed air bag unit should not be reused since it has status data when it is deployed, and the data cannot be cleared with a diagnostic device.
5. The air bag/seat belt pretensioner/anchor pretensioner contain explosive charges, so handle carefully when disposing or replacing them.

► Cautions for operation

1. Do not modify, change or apply impact on any air bag component. The air bag may be deployed abruptly, causing serious injuries.
2. Children and infants should ride in a rear seat. Seating in the passenger seat with carrying a child or infant is strictly prohibited. An infant or a child could be severely injured by the air bag deployment. A child restraint system must not be installed on the front seat. An infant or a child could be severely injured by the air bag deployment when it is fitted to the passenger seat.
Do not place any objects on the air bag inflation location. You may get injured by those objects during deployment.
3. Never put your arms around the front seat from behind, lean on the front seatback, or put your arms out of the window. You can severely injured when the side air bag deploys.
Never lean on the door since it becomes very dangerous when the side air bag deploys.
4. The side air bag deploys when there is a severe side collision.
Do not slam the front door to close it. The side air bag may deploy unexpectedly.
5. When an occupant fastens the seat belt in an unstable or inclined posture, the air bag system cannot protect the occupant properly. Moreover, the occupant can be injured by the air bag.
Do not move your seat too close to the steering wheel or dashboard. Being too close to the steering wheel or instrument panel during the air bag deployment could cause serious injury, including death. Hold only the outer rim of the steering so that the air bag can inflate without any hindrance.
Do not place your face or chest near the steering wheel and dashboard. Also, do not allow anyone to place their hands, leg or face on the dashboard. The air bag cannot work properly. Do not hold and operate the steering wheel by crossing your arms. You could get seriously injured when the air bag deploys.

Modification basis	
Application basis	
Affected VIN	

12. A large quantity of non-toxic gas (nitrogen gas) is generated with a loud noise when the air bag/seat belt pretensioner/anchor pretensioner deploys. If these airborne particles irritate your skin, eyes, nose, or throat, rinse the area with cool water. If the irritation continues, see your doctor.
13. The windshield glass may be broken when the passenger air bag deploys.
14. The air bag is a unit to save an occupant's life from a sudden accident and it inflates at a very fast speed by gas with high temperature, which might cause injury, such as an abrasion, bruise and burn depending on the accident conditions.
15. The air bag components will be very hot after deployment. Do not touch them.
16. The deployed air bag/seat belt pretensioner/anchor pretensioner cannot deploy again. It will work when an additional impact is applied. Once the air bag/seat belt pretensioner/anchor pretensioner are triggered, the triggered air bag assembly should be removed from the vehicle and replaced with a new one.
17. The air bag warning lamp is illuminated for 3 to 7 seconds after the engine is started to check the system. If this warning lamp remains ON, then the system may be defective. Have the air bag system checked immediately by Ssangyong Dealer or Ssangyong Authorized Service Operation.
18. Incorrect inspection can result in serious injuries or malfunctions in the air bag/seat belt pretensioner/anchor pretensioner systems.

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OVERVIEW AND OPERATING PROCESS

1. OVERVIEW

The air bag system is divided into front air bag system and side air bag system. The system protects the occupant's body by deploying the air bags in the event of a collision. The system consists of total 11 inflators including the inflators of the seat belt pretensioner and anchor pretensioner, air bag unit (SDM), and 4 impact sensors on the front side and both sides of the vehicle. The air bag unit (SDM) determines the operation of each air bag module, seat belt pretensioner and anchor pretensioner using the crash signals from the front and side impact sensors in the event of a collision. The front and side air bag systems are operated independently, and the body control module (BCM) activates the auto door unlock function and various lamps including hazard warning lamp and room lamps, when the crash signal from the SDM is received to notify others of emergency situation and let the occupant escape easily. The SDM is equipped with self diagnosis function, and it performs the diagnosis on the internal/external devices of the air bag system for a certain period of time after IGN ON. And it monitors the air bag system regularly and turns on the air bag warning lamp on the instrument cluster when a fault is found in the system, to notify the driver. The SDM has event data recorder (EDR) function that stores the driving information data transmitted through CAN communication from various units (vehicle speeds, engine rpm, brake application, etc.) in a crash or near crash event, when the acceleration sensor in the air bag unit detects a sharp acceleration change, regardless of the air bag deployment.

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2. LAYOUT

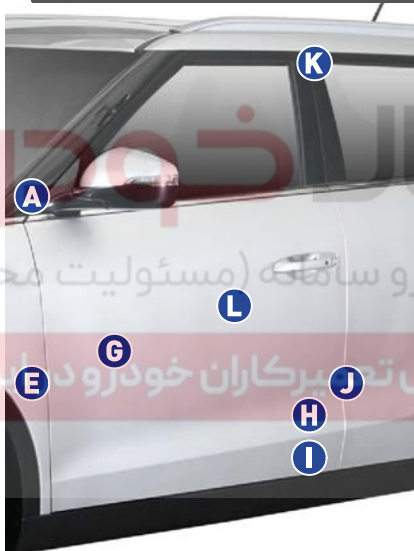
<p>A Driver air bag</p>  <p>The air bag is installed at the center of the steering wheel. The inflator of this air bag is ignited momentarily in the event of a collision and deploys the air bag cushion.</p>	<p>B Passenger air bag</p>  <p>This air bag is installed in the upper side of the instrument panel on the passenger side. It activates in the same way of the driver air bag in a collision.</p>	<p>D Front impact sensor</p>  <p>These sensors are fitted at the bottom of both LH and RH headlamp inside the front bumper, and output signals that activates the front air bag system.</p>	
<p>C Air bag warning lamp</p>  <p>This lamp notifies the driver about the result of the diagnosis and faults.</p>			
<p>E Driver's knee air bag</p>  <p>The knee air bag fitted to the center of the lower main panel is deployed to protect the driver's knees and legs in a collision.</p>	<p>F BCM</p>  <p>When the BCM receives the crash signal from the air bag unit (SDM), it activates the auto door unlock, hazard warning flasher and room lamps.</p>		

G**Air bag unit (SDM)**

The air bag units are located on the underside of the front console and rear side of the TGS lever, and it monitors the air bag system and determines the air bag deployment in the event of a collision.

H**Seat belt pretensioner**

The seat belt pretensioners of all seats are operated at the same time, in the event of a collision. They pull the seat belt and holds the occupants in the seat to prevent the second impact.

**I****Anchor pretensioner**

These are operated with the seat belt pretensioner in the event of a collision. They pull the seat belt and holds the occupants in the seat to prevent the second impact.

J**Side impact sensor**

The side impact sensors are fitted at the bottom of both LH and RH B-pillars, and output signals that activates the side air bag system.

K**Curtain air bag**

The curtain air bags are installed to the upper end of both doors. The air bag provides head protection for the front and rear outboard occupants in a side collision.

L**Side air bag**

The side air bags are installed in the outer sides of the driver and passenger seats, which are operated based on the collision signal from the side impact sensor.

Modification basis	
Application basis	
Affected VIN	

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3. OPERATING PROCESS

1) Air Bag System Input/Output

The air bag unit (SDM) performs the internal/external diagnosis on the air bag system for about 6 seconds after IGN ON. The air bag unit is ready to deploy air bag after this diagnosis, and when a certain level of collision occurs, it determines the deployment of the air bag using the signals from the impact sensors, deploys the corresponding air bag, and stores the collision data and EDR data. The body control module (BCM) activates the auto door unlock function and various lamps including hazard warning lamp and room lamps, when the crash signal from the SDM is received to notify others of emergency situation and let the occupant escape easily.



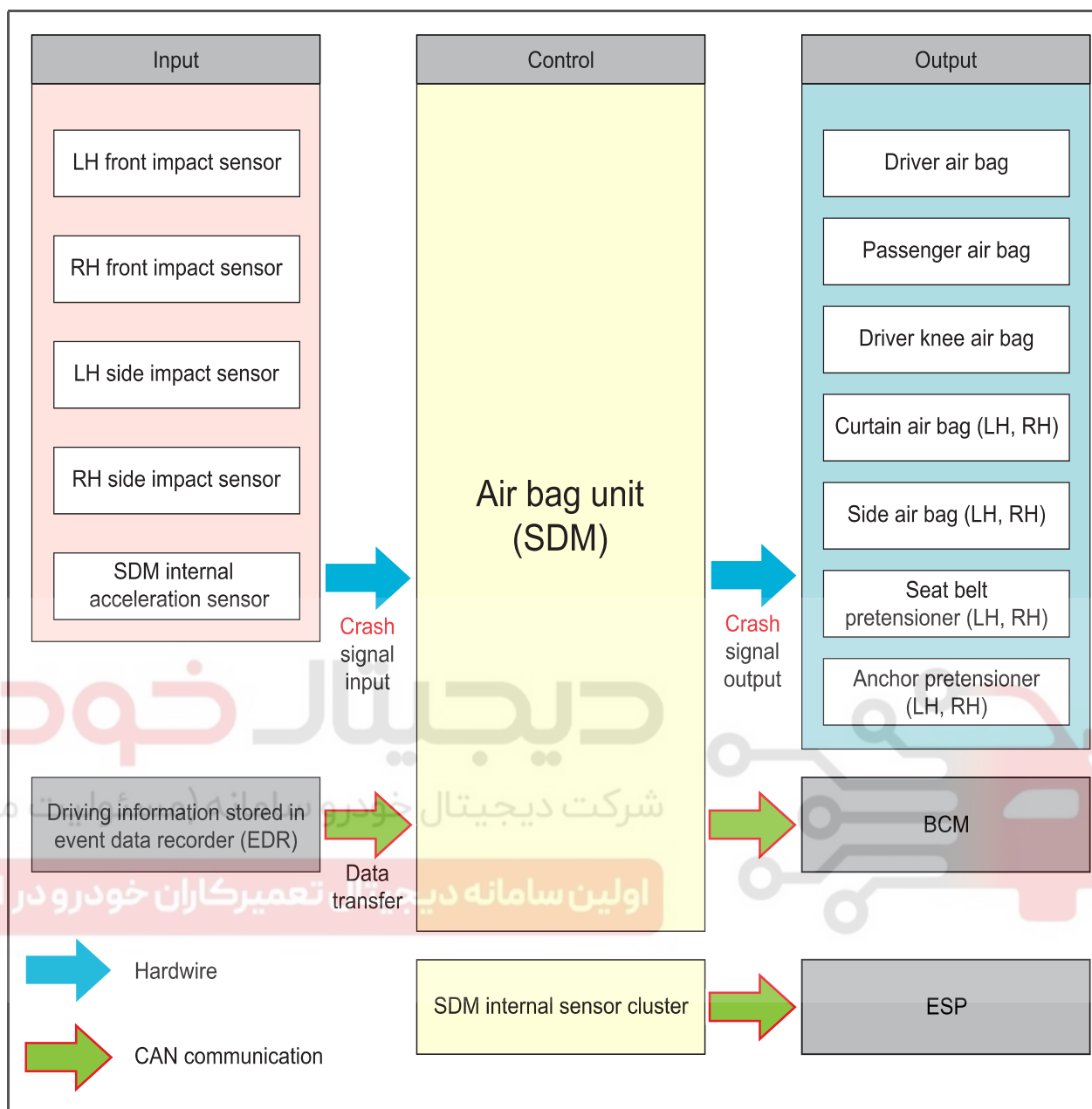
NOTE

Major functions

- Detects frontal and side collision (Rear-end collision only with EDR trigger)
- Activates the front air bag, side air bag, curtain air bag, belt pretensioners and anchor pretensioners
- Indicates system readiness and faults to the driver by means of a fault warning lamp
- Facilitates servicing capability via a serial diagnostic communication interfaces
- Records crash data and DTCs
- Keeps power for deployment of air bag even when the power to the air bag unit is cut off due to the collision
- Event data recorder (EDR)

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Application basis	
Affected VIN	



CAUTION

The front air bags and side air bags are activated independently according to the area and amount of an impact.

Modification basis	
Application basis	
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2) Front Air Bag System Operating Process

(1) Front air bag system deployment conditions

► The air bag will be deployed when:

- the impact or type of a frontal collision is too much for the seat belt to protect the occupant.

► The air bag can be deployed when:

- there is underbody impact from the road surface, impact against the curb at a very high speed, or dropping impact onto the road surface with a large angle.

► The air bag will not be deployed when:

- the vehicle rolls over or tips over sideward, or a side/rear collision occurs.
- the impact of the collision is low enough for the seat belt to protect the occupant properly.

► The air bag will be hardly deployed when:

- a collision to diagonal direction (not a frontal collision) occurs or the vehicle tips over.
- a minor collision which the air bag sensor cannot detect occurs (impact is lower than that of operating condition).
- a collision against narrow objects, such as a telegraph pole or a tree, occurs.
- the vehicle goes into a drainage or a puddle.
- the vehicle wedges under a truck or a trailer or collides with the underbody of a heavy-duty vehicle.
- the hood is hit by falling stones.
- the air bag warning lamp is on.

(2) Front air bag system deployment

When a collision occurs the air bag unit receives the signal from the front impact sensor and ignites the front air bag to deploy the driver and driver knee air bags, passenger air bag, seat belt pretensioner and anchor pretensioner.

Item	Impact to (front)
Driver air bag	Ignited
Driver knee air bag	Ignited
Passenger air bag	Ignited
Seat belt pretensioner - Driver side	Ignited
Seat belt pretensioner - Passenger side	Ignited
Anchor pretensioner - Driver side	Ignited
Anchor pretensioner - Driver side	Ignited

(3) Component change after deployment

Air bag unit (SDM) and connection wirings (including connectors), anchor pretensioner and connection wirings (including connectors), all front air bags, instrument panel, front impact sensor and other damaged components

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Application basis	
Affected VIN	

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3) Side Air bag System Operating Process

(1) Side air bag system deployment conditions

► The air bag will be deployed when:

- a severe oblique collision occurs with a specific severity, angle, speed, and position.

► The air bag can be deployed when:

- the vehicle rolls over or tips over sideward with a severe impact.
- the vehicle is stationary or a frontal collision occurs at low speed.
- a rear collision occurs.
- a front collision occurs, which occupants cannot be protected by seat belt.

► The air bag will not be deployed when:

- the vehicle is stationary or a frontal collision occurs at low speed.
- a rear collision occurs.
- the impact of the collision is low enough for the seat belt to protect the occupant properly.

► The air bag will be hardly deployed when:

- a collision with oblique impact to the front seat direction or a frontal collision to the diagonal direction occurs.
- a frontal or rear collision occurs.
- the vehicle rolls over or tips over sideward with a minor impact.
- the air bag warning lamp is on.

(2) Side air bag system deployment

The side air bag system is activated in the event of a left side or right side collision. The seat side air bags are installed to the driver and passenger seat (one on each seat) and the curtain air bags are installed in the end of the roof located on the upper sides of both doors. The side air bags and the curtain air bags are operated by the same signal. The air bags of the driver seat and passenger seat are operated separately according to the impact position (left side, right side).

Item	Impact to (side)	
	LH	RH
Side air bag - Driver side	Ignited	Not ignite
Side air bag - Passenger side	Not ignite	Ignited
Curtain air bag - Driver side	Ignited	Not ignite
Curtain air bag - Passenger side	Not ignite	Ignited
Seat belt pretensioner - Driver side	Ignited	Not ignite
Seat belt pretensioner - Passenger side	Not ignite	Ignited
Anchor pretensioner - Driver side	Not ignite	Not ignite
Anchor pretensioner - Driver side	Not ignite	Not ignite

(3) Component change after deployment

► Side air bag deployed

Deployed side air bag, air bag unit (SDM), side impact sensor, seat belt pretensioner and connection wirings (including connectors), air bag wiring, other damaged trim and seat components

► Curtain air bag deployed

Deployed curtain air bag, air bag unit (SDM) and connection wiring, side impact sensor, seat belt pretensioner and connection wirings (including connectors), damaged trim, roof and headlining

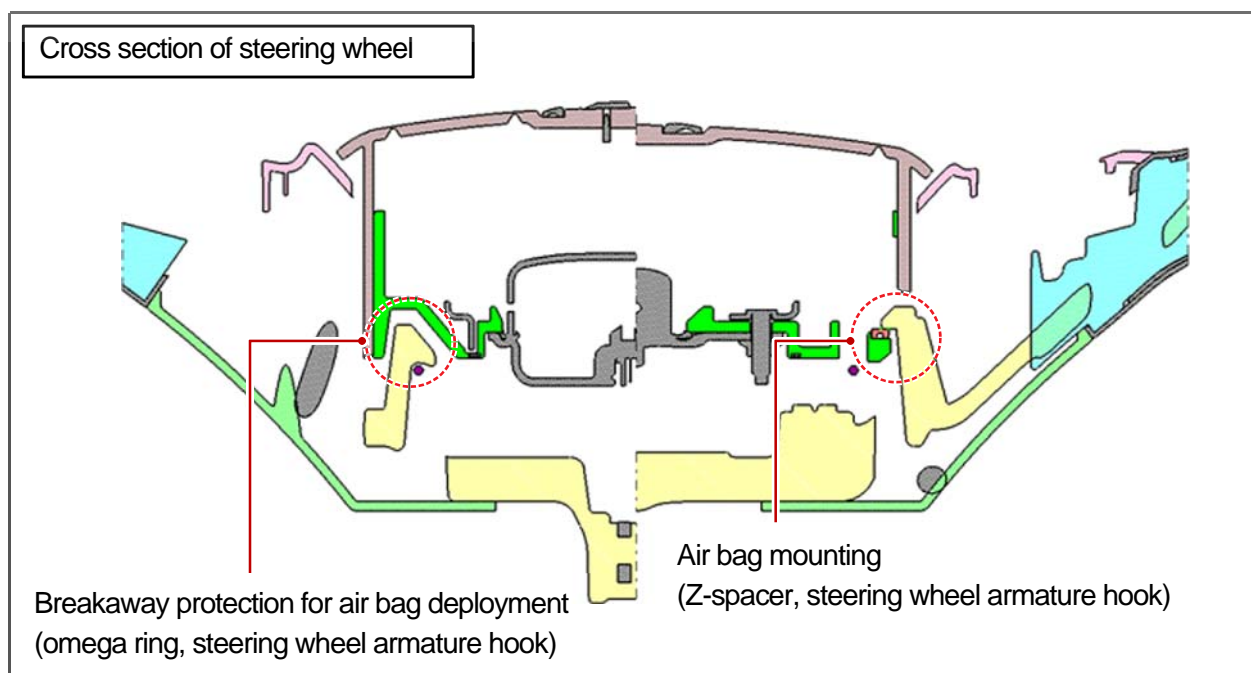
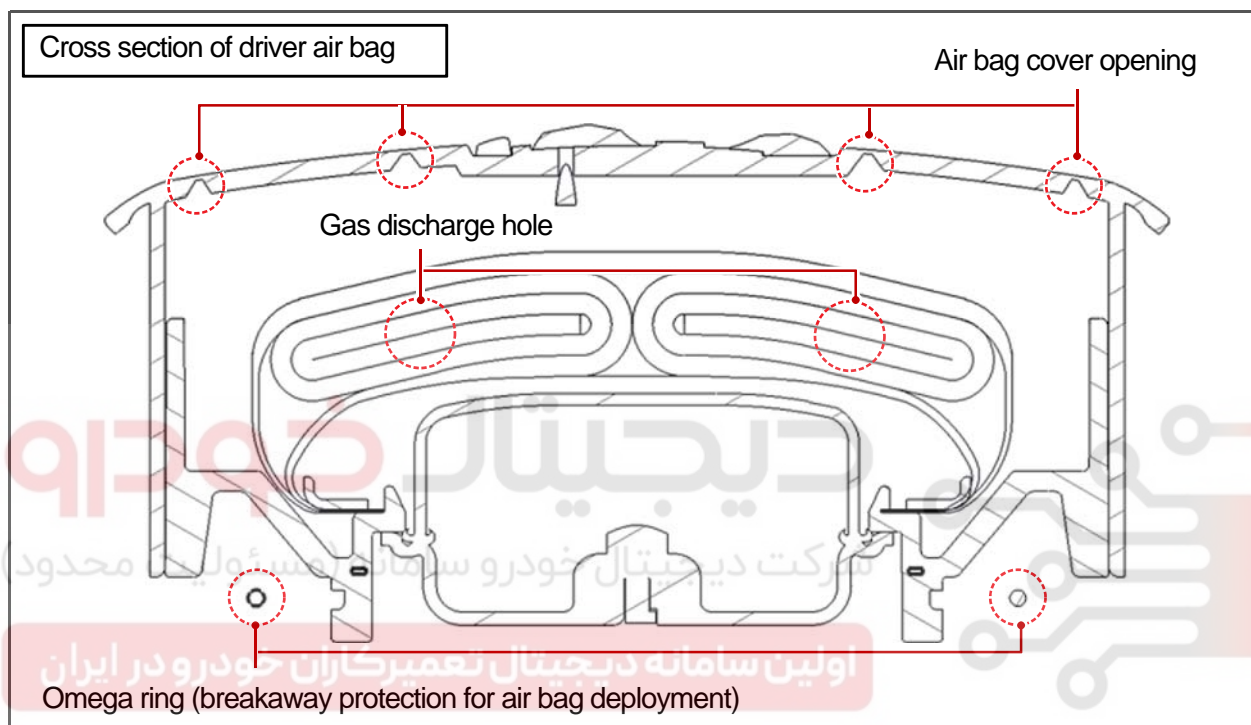
Modification basis	
Application basis	
Affected VIN	

3) Deployment Procedure

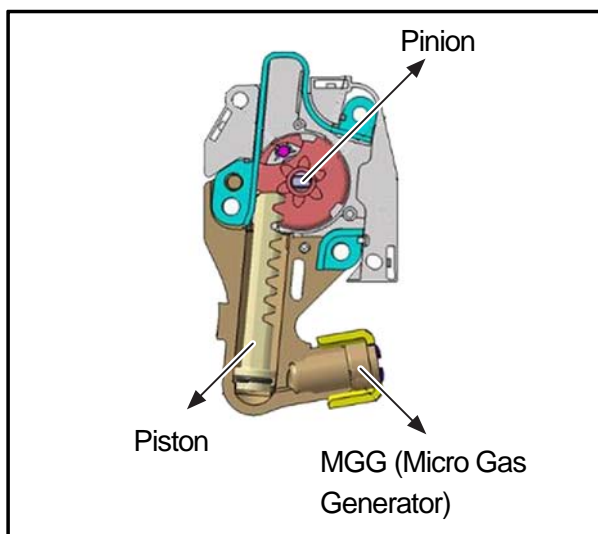
► General deployment of air bag

In general, the air bag unit transmits the ignition current to the ignition device of the corresponding air bag inflator when a collision signal from the impact sensor is sent to the air bag unit

When the ignition device of the inflator is ignited, the gas generator generates nitrogen gas by being burned, and this gas inflates the air bag cushion through the filter. The nitrogen gas used to inflate the air bag exhausts through the vent hole immediately.

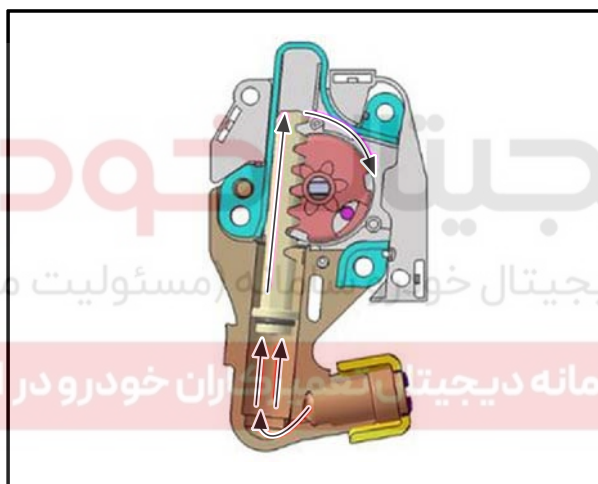


► Seat belt pretensioner deployment



1. Original status

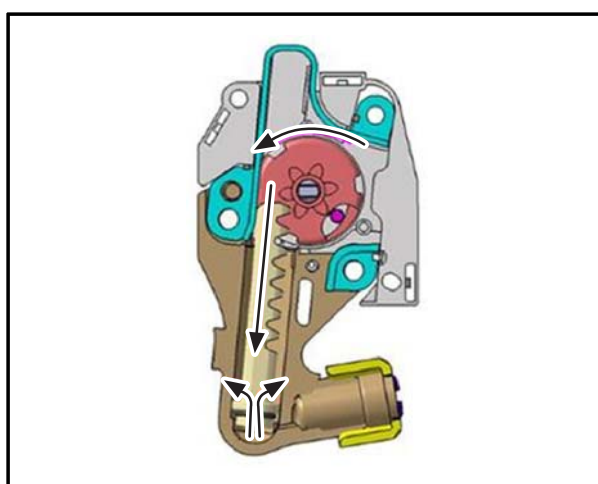
The piston and pinion in the seat belt pretensioner are disengaged and the tension of the return spring in it holds the occupant.



2. Operation of pretensioner

When the ignition current is transmitted from the air bag unit to the ignition device of the seat belt pretensioner, gas is generated from the inflator and this pushes up the piston.

When the piston gear engages with the pinion gear, the clutch is integrated and winds the seat belt.



3. Operation of load limiter

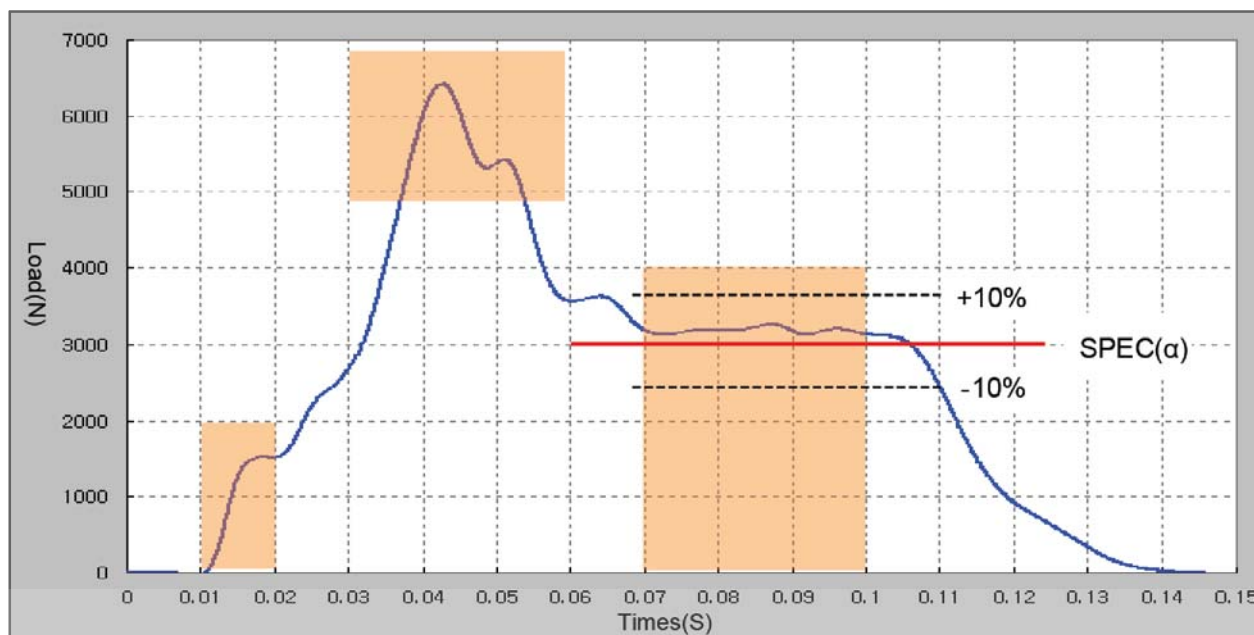
When the load on the seat belt increases and the inner device starts being deformed, the pinion rotates in reverse direction and the piston moves downward. The residual pressure is released through the vent hole of the piston when the piston moves down. The gears of pinion and piston are disengaged when the piston is located at the lowest position.

Modification basis	
Application basis	
Affected VIN	

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T I V O L I



Specifications	
Pretensioner requirement	(A) Initial pulling load: 1.5 kN or above (Max. value before reaching 0.02 s)
	(B) Overshoot (residual pressure reduction)
	Pulling distance: 80 mm or longer
Load limiter	Single load limiter (Range: 2 ~ 6 kN)
	(C) Operation of load limiter (0.07~0.1 s): within $\alpha \pm 10\%$

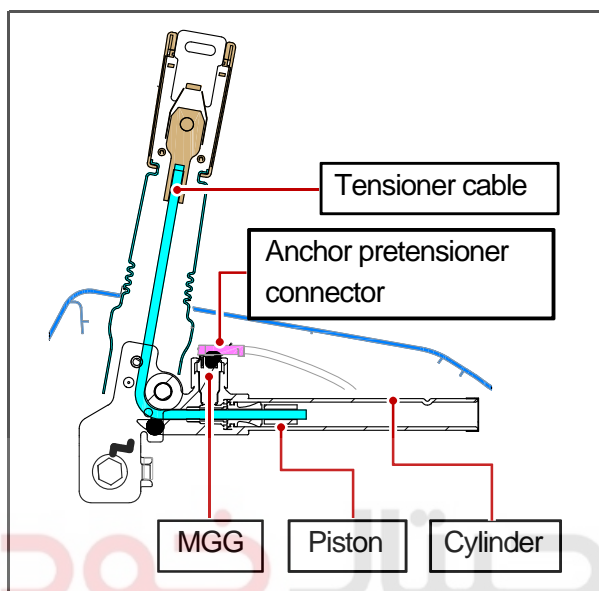
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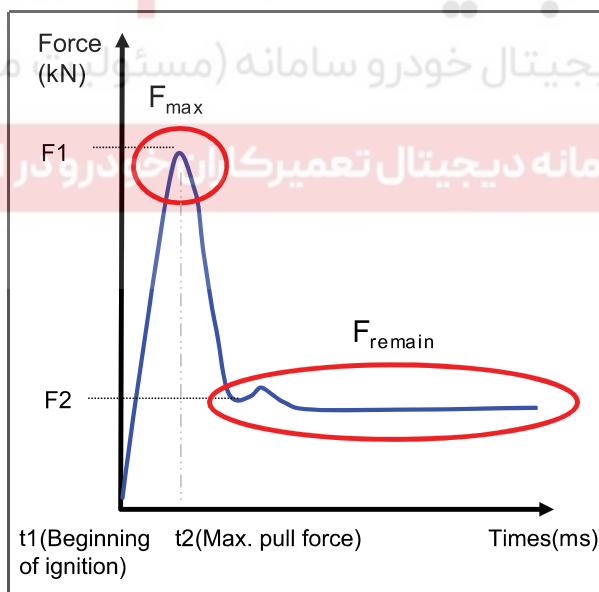
Modification basis	
Application basis	
Affected VIN	

► Deployment of anchor pretensioner

The anchor pretensioner retracts the seat belt instantly by igniting the inflator in the anchor pretensioner when the air bag system is activated. It also improves the safety effect of the seat belt by preventing the front seat occupants from moving forward and keeping occupants in a stable posture on collision.



- In the event of vehicle collision, when the pretensioner deployment signal is received from the air bag module, the gas produced by the micro gas generator (MGG) pushes the piston in the cylinder.
- This pulls the tensioner cable integrated with the piston, and also the seat belt fastened to the anchor pretensioner buckle.
- While the seat belt pretensioner restrains the chest area, the anchor pretensioner restrains the pelvic area to minimize the shock.



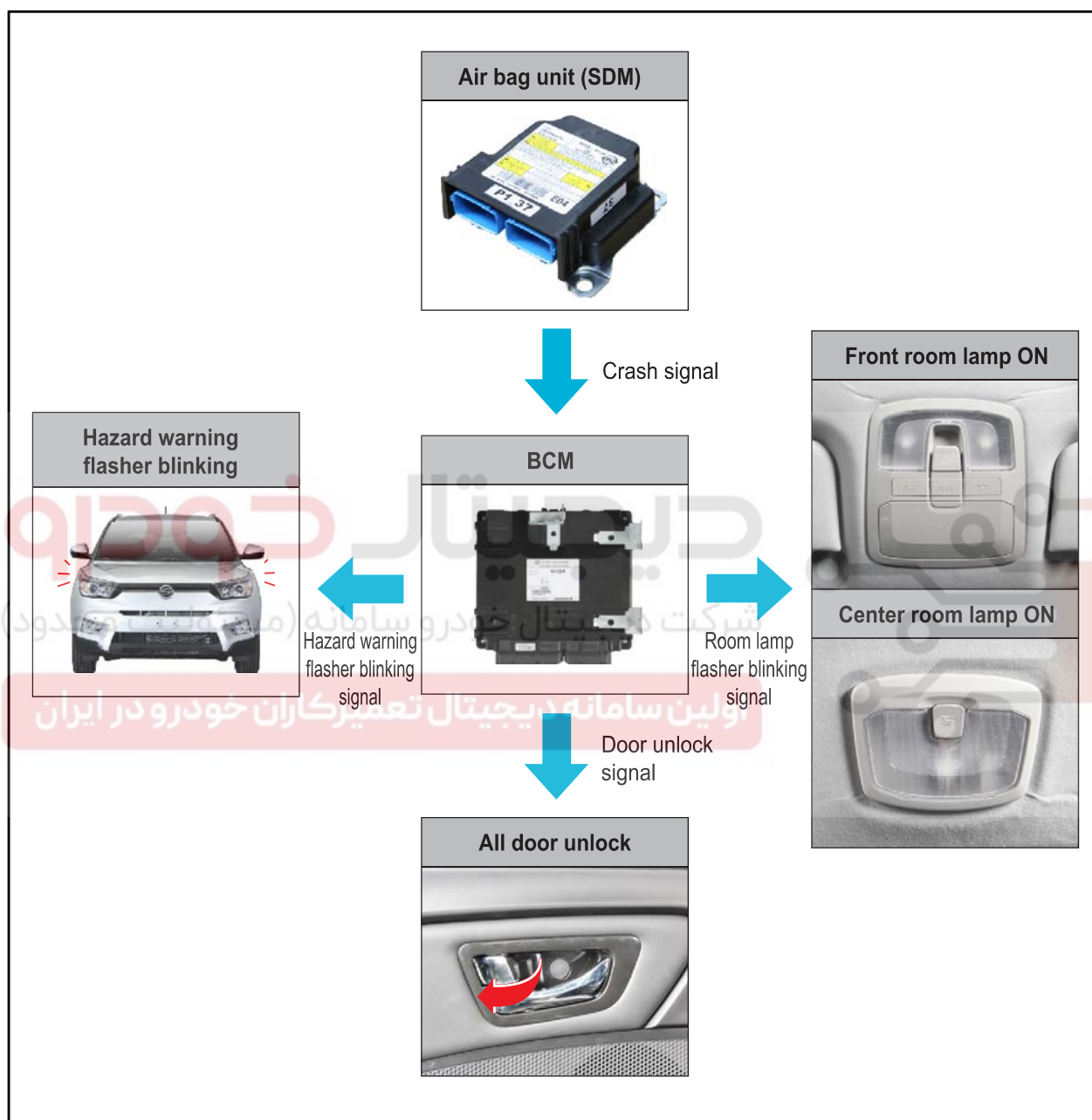
Required performance of anchor pretensioner

Item	Demand value	
Pulling load	F1	Max. value: 4.5 kN or below
		3 ms after reaching max. value : 3.5 kN or below
	F2	0.7 kN < F2 < 1.2 kN
Pulling distance	At least 80 mm	
Operating time	Required to reach within 7 ms ($t_2 - t_1 \leq 7$ ms) (-30°C ~ 85°C)	

Modification basis	
Application basis	
Affected VIN	

4) Air Bag Deployment Signal to BCM

The air bag deployment signal from the air bag unit is sent to the BCM. This signal triggers the flash of the hazard warning lamp to notify others of emergency situation, and is used as a signal that turns on the room lamps and activates auto door unlock function for the occupants.



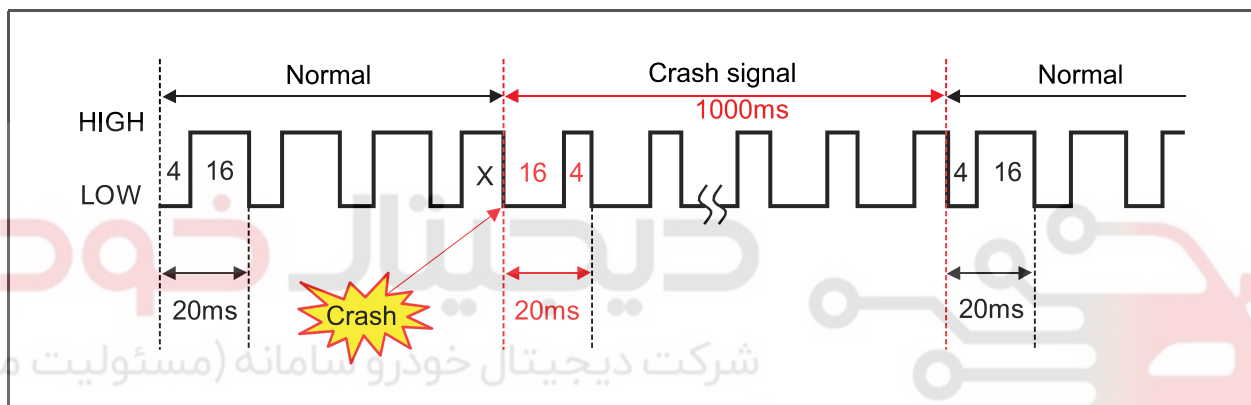
(1) Crash output from air bag unit (SDM)

► Input

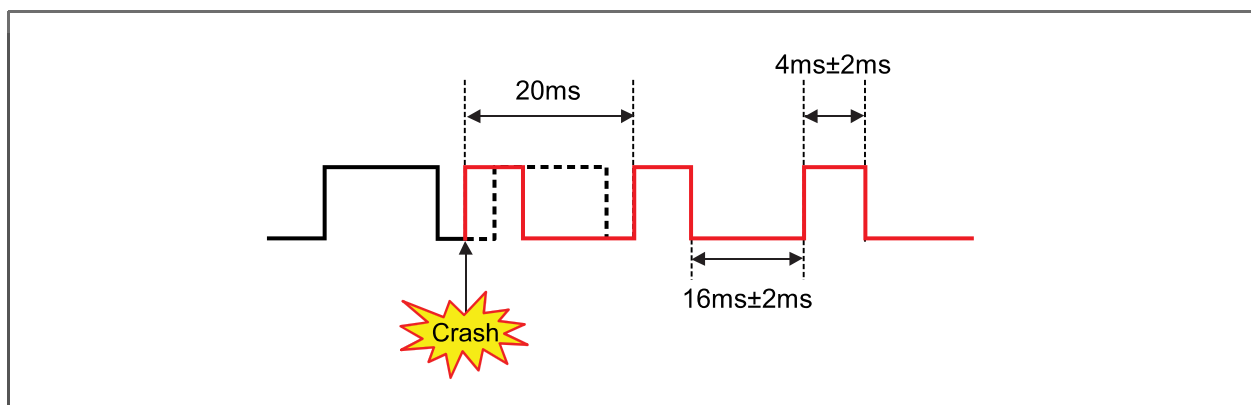
- Front impact sensor signal
- Side impact sensor signal
- SDM internal acceleration sensor value

► Output

The crash signal is output in 20 ms intervals. During normal operation, 80% duty is output as a high signal and 20% duty as a low signal. In the event of collision, the crash signal is output immediately regardless of normal signal cycle as shown in the figure below. When this happens, on the contrary to normal actuation signal, 20% duty is output as a high signal for 1 second in total.

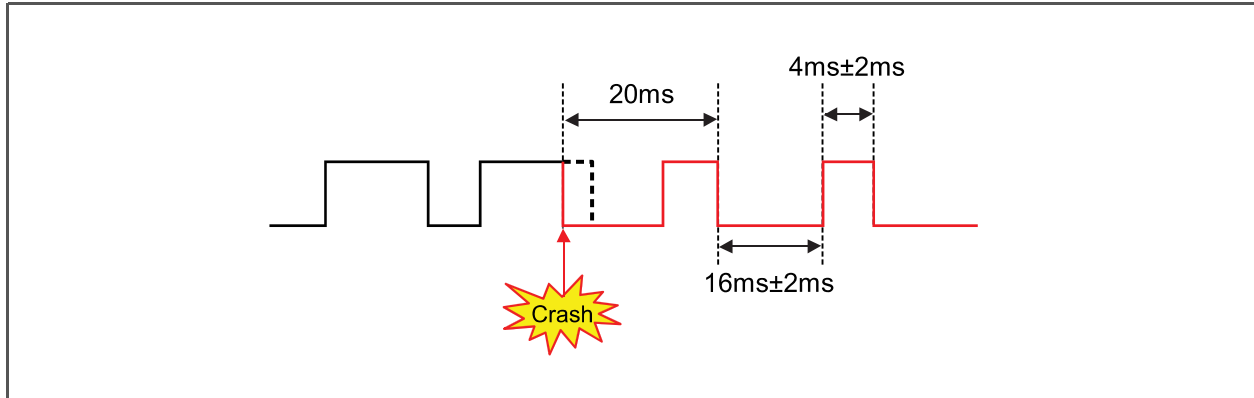


When the LOW signal is outputting at the moment the collision occurs, the crash signal will be switched to HIGH and 50 cycles completed in a second.



Modification basis	
Application basis	
Affected VIN	

When the HIGH signal is outputting at the moment the collision occurs, the crash signal will be switched to LOW and 50 cycles completed in a second.



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Modification basis	
Application basis	
Affected VIN	

► AUTO UNLOCK upon receiving air bag deployment signal

No. 1 operation.

A. Air bag deployment signal is not input for initial 7 seconds (T4) after IGN ON

No. 2 operation.

B. When the air bag deployment signal (OFF→ON) is received 7 seconds (T4) after the ignition is turned ON.

C. The UNLOCK relay is activated for 5 seconds (T3)

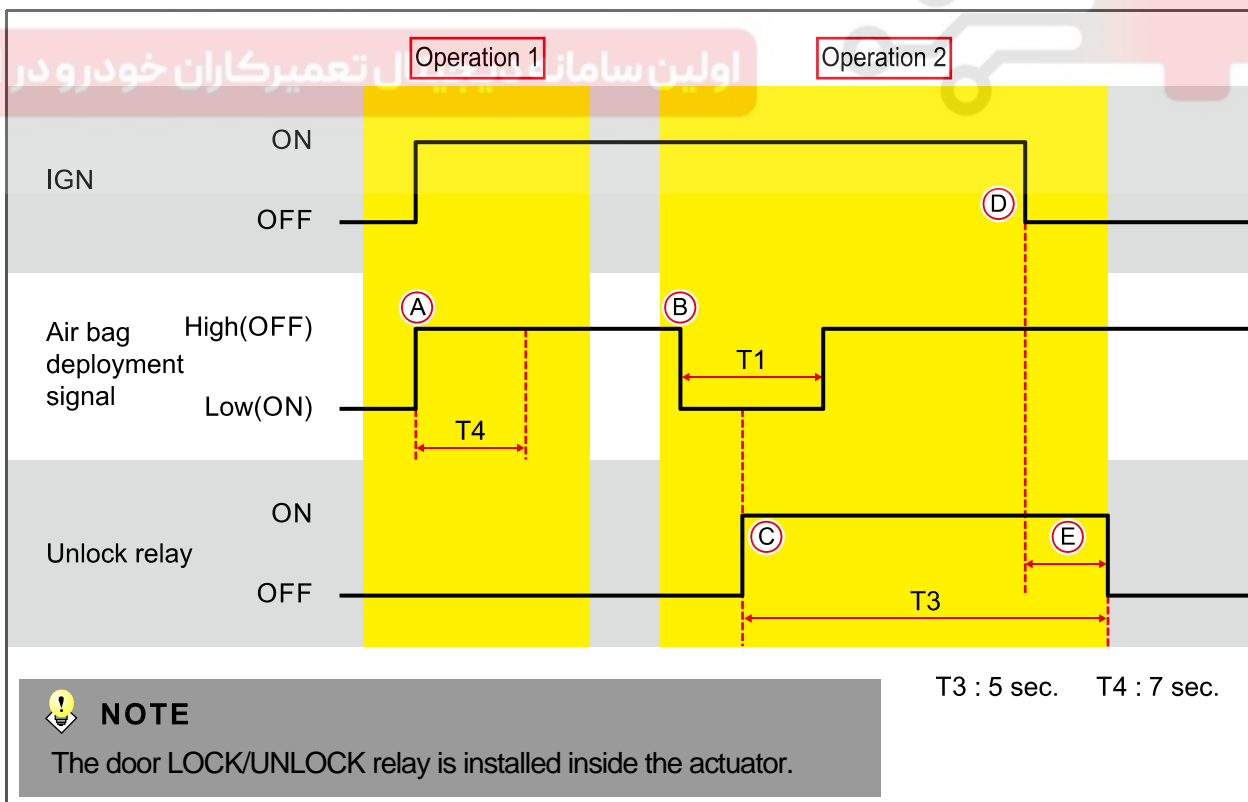
D. When the ignition is turned OFF during the 5 seconds (T3) of UNLOCK relay activation.

E. The UNLOCK relay is activated for the remaining time.



NOTE

- The room lamp comes on when the air bag deployment signal is input except when the room lamp switch is turned off.
- The hazard warning lamp flashes at this time.
- Resetting the AUTO door UNLOCK function turns off the battery power (cutting off BCM power).
- If any DTC exists when the BCM is supplied with power, the No. 2 operation is performed.
- Clear the DTC and turn off the battery power (BCM off) to reset the system.
- The air bag is deployed as long as one of either crash signal from hardware or crash signal from CAN is received.



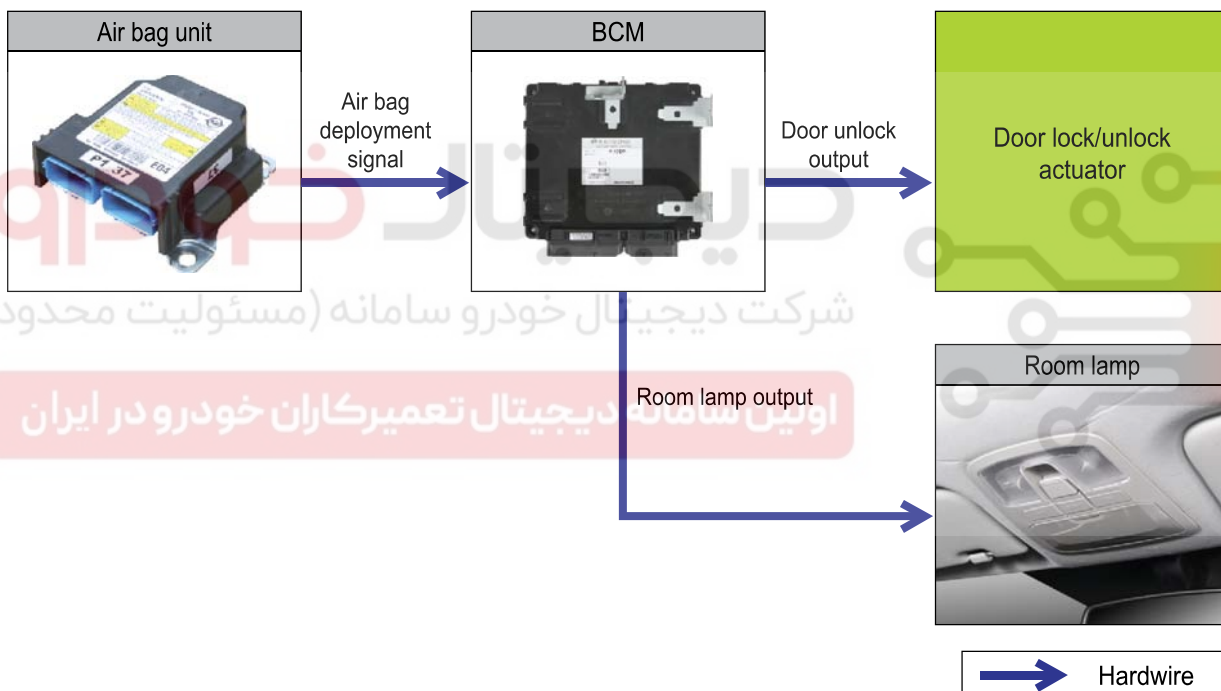
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Affected VIN	

⚠ CAUTION

1. The UNLOCK by the air bag deployment signal takes priority over the LOCK/UNLOCK control from other functions.
2. The LOCK/UNLOCK requests from other functions during or after the UNLOCK output by the air bag signal are ignored. However, the LOCK control is carried out when the ignition switch is turned to the "OFF" position.
3. The same request during the LOCK/UNLOCK output is ignored. However, the UNLOCK by the air bag deployment signal or operation by the smart key is carried out.
4. When LOCK and UNLOCK outputs occur at the same time, the LOCK output is carried out and UNLOCK is ignored.

System diagram

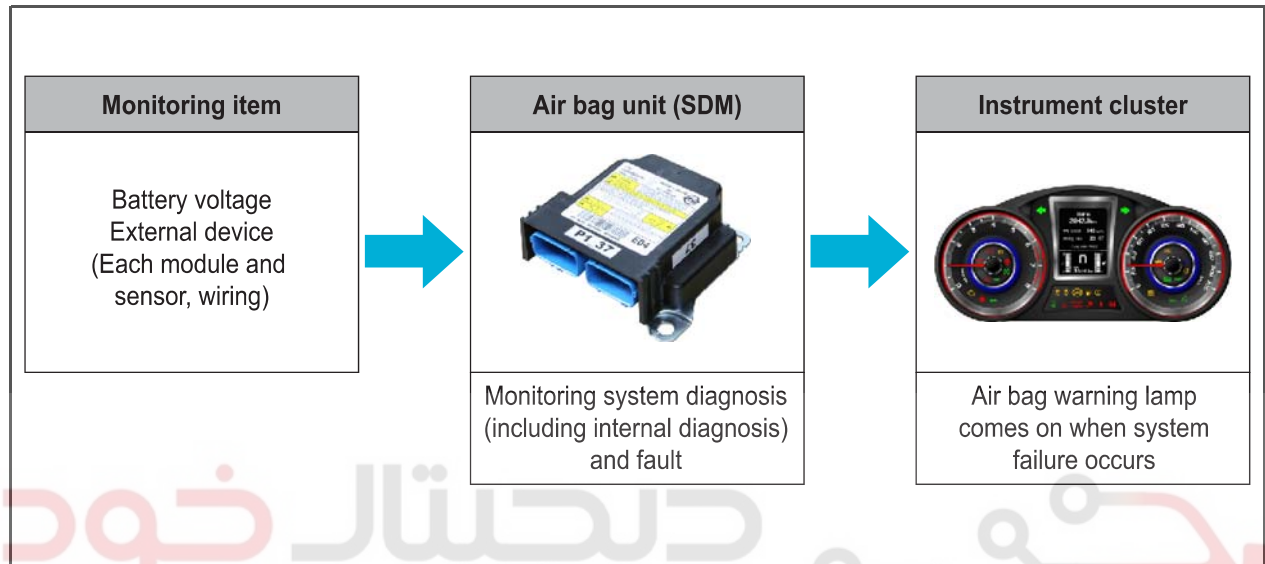
- IGN ON/Room lamp switch in any position other than OFF



4. SELF DIAGNOSIS

1) Air Bag Unit (SDM) Self Diagnosis

The air bag unit monitors the internal/external devices of the air bag system including battery voltage, limits certain functions of the air bag, and turns on the air bag warning lamp on the instrument cluster according to the conditions.



دیجیتال خودرو
شرکت دیجیتال خودرو سامانه (مسئولیت محدود)

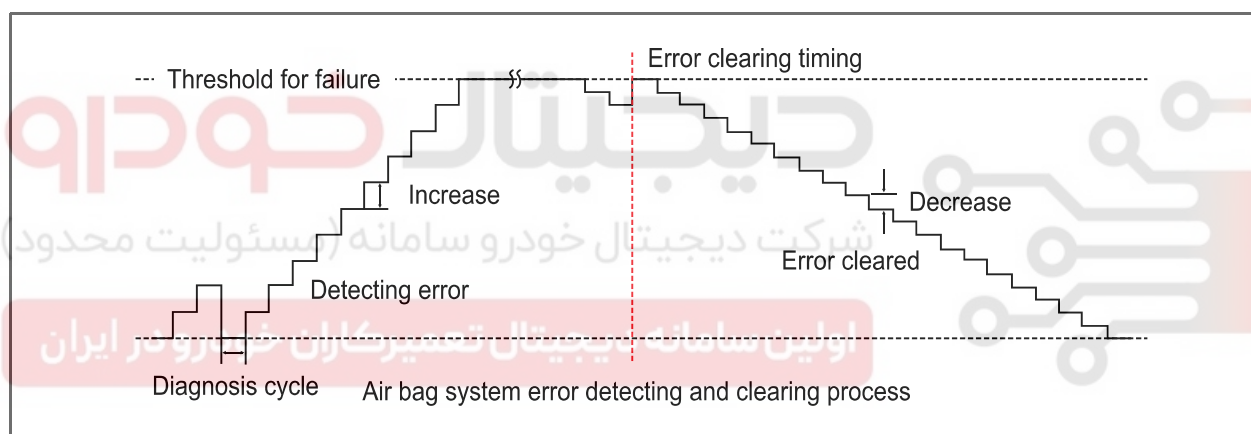
اولین سامانه دیجیتال تعمیرکاران خودرو در ایران

Modification basis	
Application basis	
Affected VIN	

► Conditions for detecting and clearing faults

The time for detecting errors and clearing the errors is as follows:

Monitoring system	Diagnosis cycle	Time for detecting	Time for clearing	Clearing fault by
Inflator circuit	300 ms	3 sec. (10 times)	6 sec. (20 times)	Using diagnostic device
Warning lamp circuit	100 ms	1 sec. (10 times)	2 sec. (20 times)	Using diagnostic device
Impact sensor	IGN ON	1 sec.	2 ~ 4 sec. (next IGN)	Using diagnostic device
Impact record (air bag deployment)	-	Immediately	-	Replacing SDM(diagnostic device doesn't help)
SDM internal fault	-	Immediately	-	Replacing SDM(diagnostic device doesn't help)



2) Air Bag Warning Lamp

The air bag unit turns on the air bag warning lamp on the instrument cluster for 6 seconds after IGN ON while performing self diagnosis for the air bag system. If no fault is found in the system, it turns off the warning lamp. After this, the unit monitors the system regularly, and notifies the driver by turning on the air bag warning lamp when a fault is found in the system.

Air bag warning lamp



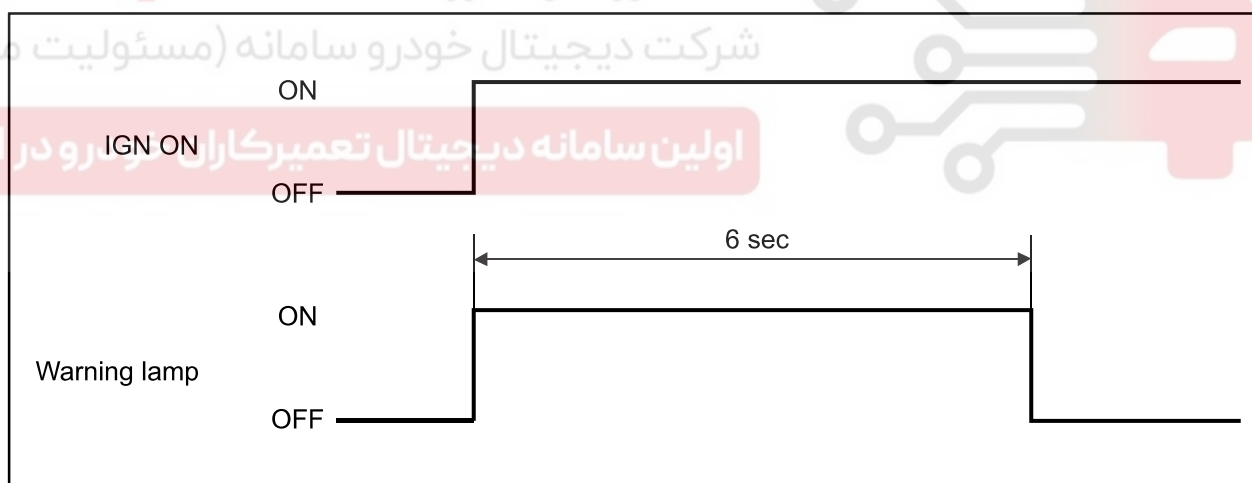
* The air bag warning lamp comes on when:

- diagnosis is performed for the inside/external devices of the system when the ignition is turned on
- the air bag system is malfunctioning
- the air bag unit and a diagnostic equipment communicate each other
- frontal or side crash occurs (impact detected by impact sensor)

(1) Air bag warning lamp ON at initial IGN ON

► System normal

Comes on for 6 seconds after IGN ON and then goes out.



NOTE

- ON time: 6 sec. \pm 10%
- OFF time: 1 sec. \pm 10%

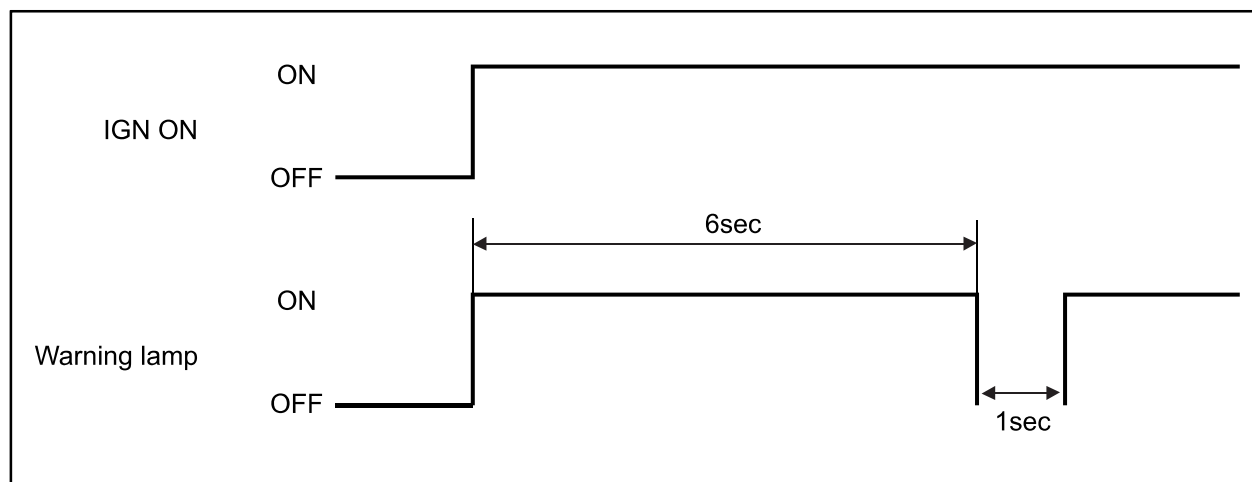
Modification basis	
Application basis	
Affected VIN	

AIR BAG

TIVOLI 2015.03

► System malfunctioning

Comes on for 6 seconds after IGN ON and goes out for 1 second, and then remains on.



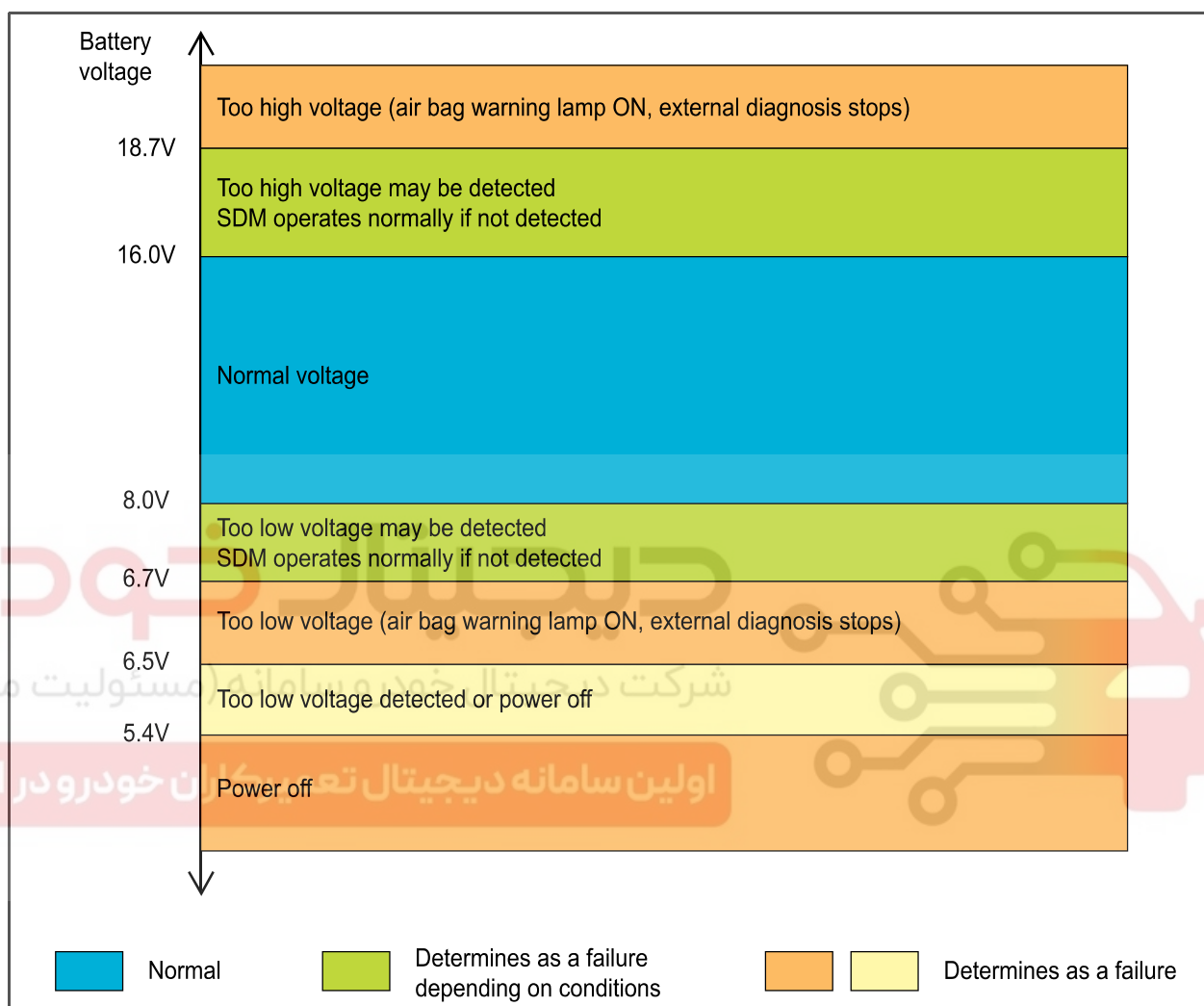
(2) Air bag warning lamp operation during driving

The air bag warning lamp comes on when the air bag unit (SDM) detects a system malfunction. The warning lamp goes out when the malfunction disappears.



3) Supply Voltage Monitoring

The air bag unit monitors the battery voltage continuously while the ignition is turned on. It limits certain functions of the air bag system and outputs DTC and air bag warning lamp signal according to the result of the monitoring.



⚠ CAUTION

Abnormal voltage of the air bag unit (too high/too low) is determined to be fault only when the signal is detected for continuous 4 seconds.

💡 NOTE

Emergency power function

The SDM has an emergency power function that ensures the internal operation of the central unit and buffering firing circuits for a minimum of 150 ms after loss of battery power. Full emergency power capability is available after the minimum specified operating voltage has been applied to the SDM power line for 10 seconds, and from this point, air bag deployment and EDR are enabled.

Modification basis	
Application basis	
Affected VIN	

4) Internal monitoring

The air bag unit checks the status of the air bag system and monitors the system for internal errors. If an error is detected by self diagnosis, this unit disables part of the air bag system functions and outputs a diagnostic trouble code (DTC) and air bag warning lamp signal.

- Watchdog

The micro controller is monitored periodically. And if a fault is found, micro controller is reset, inflator ignition function is limited, and the air bag warning lamp comes on.

- Internal acceleration sensor test

The air bag unit checks internal acceleration sensor when the ignition is turned on. The air bag unit determines the deployment of the air bag for the collision signal input after the diagnosis.

- Non-volatile memory (NVM) test

The air bag unit checks the values stored in the memory. If the values are not correct, the air bag unit sets a diagnostic trouble code (DTC) and turns on the air bag warning lamp.

► Air bag operations for errors

Internal errors	Air bag operation	
	Front air bag system	Side air bag system
X-axis acceleration sensor error	Disabled	Disabled
Y-axis acceleration sensor error		Disabled
X acceleration sensor error		Available
ROM checksum error		Disabled
RAM checksum error		Disabled
NVM checksum error		Disabled

5) External monitoring

The air bag unit supplies a certain level of test current and monitors the resistance of the inflator circuit within a specified range to deploy the air bag. It limits certain functions of the air bag, sets a DTC and turns on the air bag warning lamp according to the conditions.

Item \ Unit	Driver/ passenger air bag	Driver knee air bag	Curtain air bag	Side air bag	Seat belt pretensioner	Anchor pretensioner
Resistance at -35 ~ +85°C	2.0 ± 0.3 Ω				2.15 ± 0.35 Ω	
Non-ignition current at +85°C	0.4A for 10 seconds				0.2A for 10 seconds	
All-ignition current at -35°C	1.2 A for 2 ms				0.8 A for 2 ms	

► Air bag unit resistance monitoring

Item \ Unit	Driver/ passenger air bag	Driver knee air bag	Curtain air bag	Side air bag	Seat belt pretensioner	Anchor pretensioner
Below 1.0 Ω	Low resistance detected					
1.0 Ω ~ 1.5 Ω	Not clearly detected low resistance					
1.5 Ω ~ 6.0 Ω	Normal resistance					
6.0 Ω ~ 7.0 Ω	Not clearly detected high resistance					
7.0 Ω or above	High resistance detected					

Normal
 Determines as a failure depending on conditions
 Determines as a failure

Modification basis	
Application basis	
Affected VIN	

AIR BAG

TIVOLI 2015.03

► Impact sensor monitoring

The air bag unit supplies a certain level of test current to monitor the front and side impact sensors. If the wiring is open/short circuited or no signal is input, or communication is malfunctioning, it sets a DTC and turns on the air bag warning lamp.

Faults	Detecting failure		Time for clearing
	Fault condition	Time for detecting	
Normal errors	Incorrect ID after IGN ON	Approx. 1 sec.	Approx. 2 sec. (next IGN)
	Faulty sensor after IGN ON		
	Communication error		
Incorrect ID	Inconsistent ID after IGN ON		Approx. 2 sec.
Communication error	Communication data error		
	Open/Short circuit (B+)		approx. 2 to 4 seconds
Short Circuit to Ground	Short Circuit to Ground		

6) DTC and Air Bag Deployment Data Storing

► DTC storing

All DTCs of air bag system are stored in the air bag unit. Maximum number of DTCs that can be stored is 16. If a new DTC is set after 16 DTCs are stored, the oldest stored code is erased first.

► Airbag deployment data storing

The air bag deployment data is stored in the air bat unit. Maximum number of data that can be stored is 7.



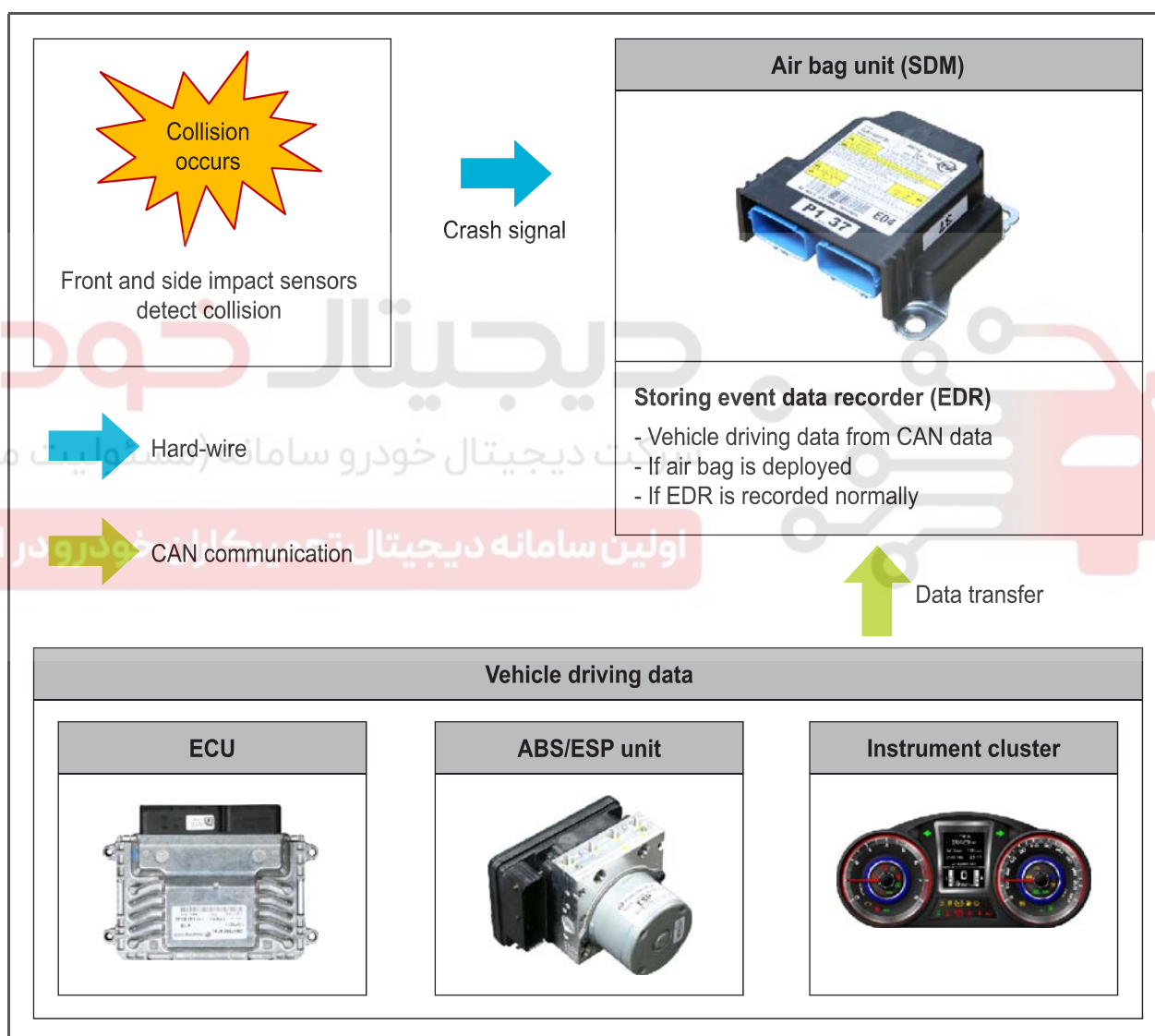
NOTE

- The DTCs related to "low battery voltage" are not accumulated.
- The air bag deployment data due to a collision cannot be cleared. The air bag unit should be replaced.

Modification basis	
Application basis	
Affected VIN	

5. EVENT DATA RECORDER (EDR)

The event data recorder (EDR) stores the driving information data in a crash or near crash event, when the acceleration sensor in the air bag unit detects a sharp acceleration change which meets the EDR operating conditions, regardless of the air bag deployment. The air bag unit always stores the driving information data and updates the data with new one periodically. If a collision is detected by front and side impact sensors, the acceleration sensor in the SDM detects the change in acceleration. The air bag unit stores the information on internal acceleration sensor, driving status (ECU, ABS/ESP unit, CAN data from instrument cluster), and air bag deployment at this time.

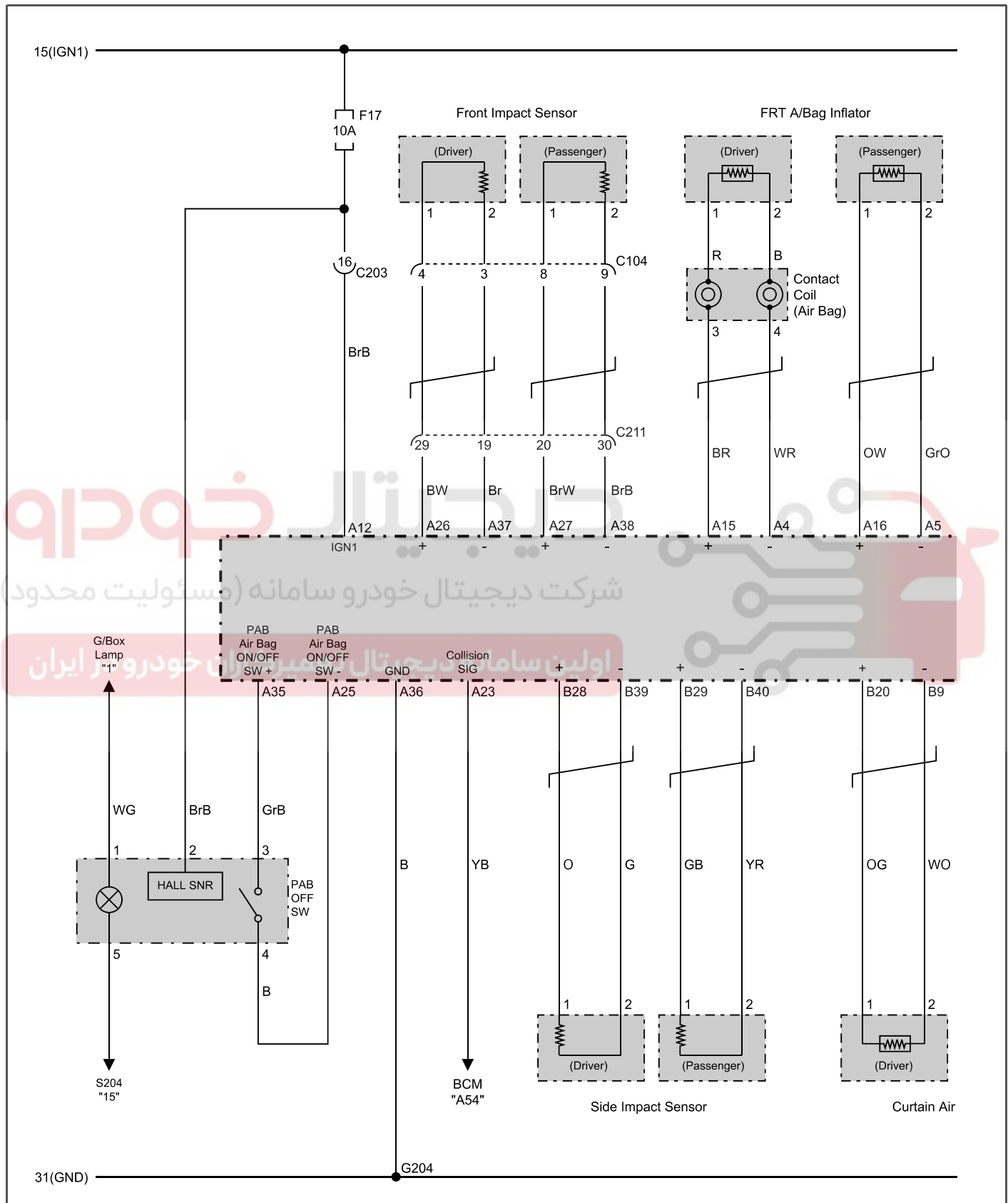


NOTE

The EDR stores the driving information also when the acceleration sensor in the air bag unit detects a sharp acceleration change in the event of a rear-end collision.

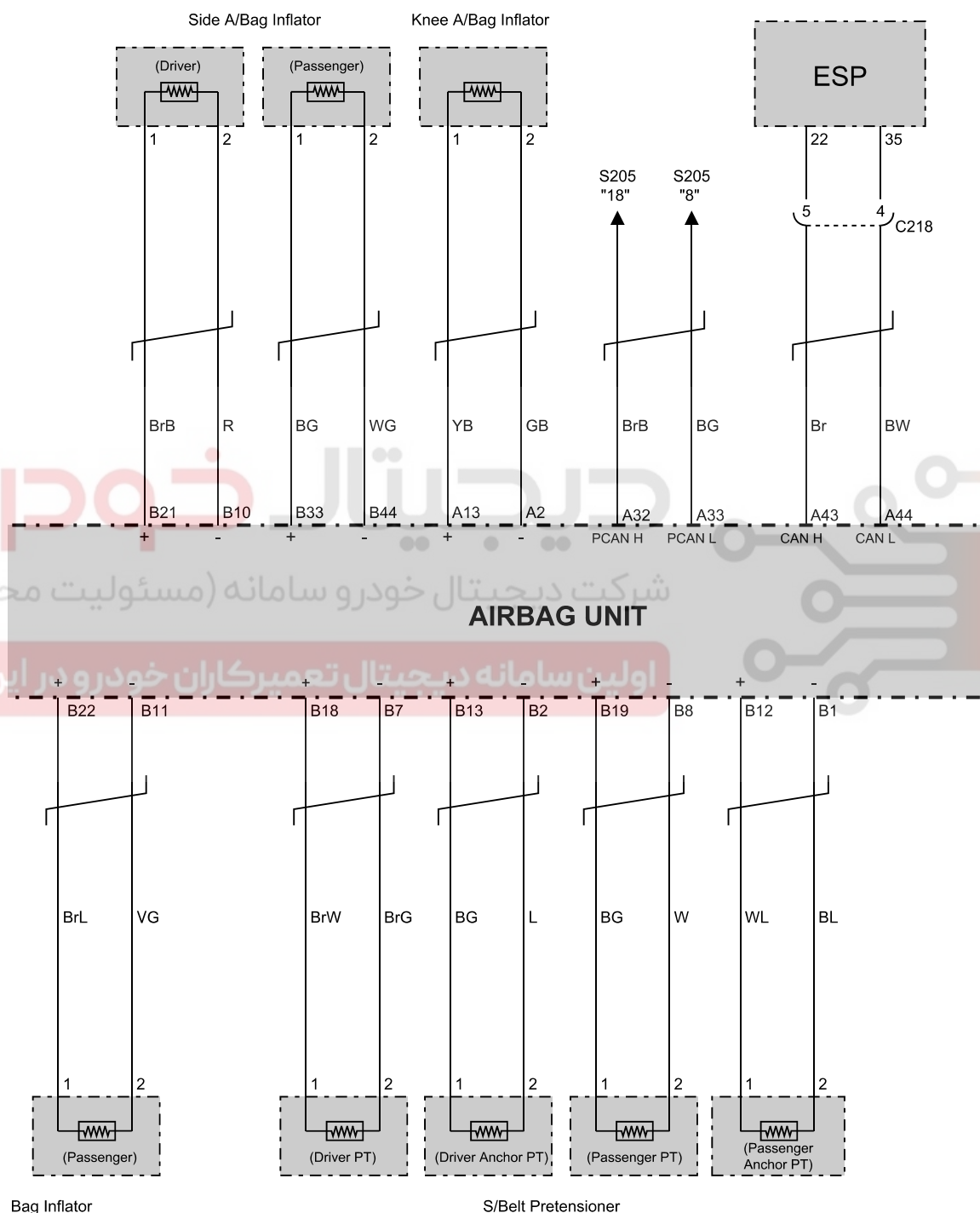
Modification basis	
Application basis	
Affected VIN	

6. CIRCUIT DIAGRAM



Modification basis	
Application basis	
Affected VIN	

15(IGN1)



Bag Inflator

S/Belt Pretensioner

31(GND)

Modification basis	
Application basis	
Affected VIN	

AIR BAG

TIVOLI 2015.03

CONFIGURATION AND FUNCTIONS

S.G.N.

8810-01 AIR BAG UNIT (SDM)

1) Mounting Location and Components

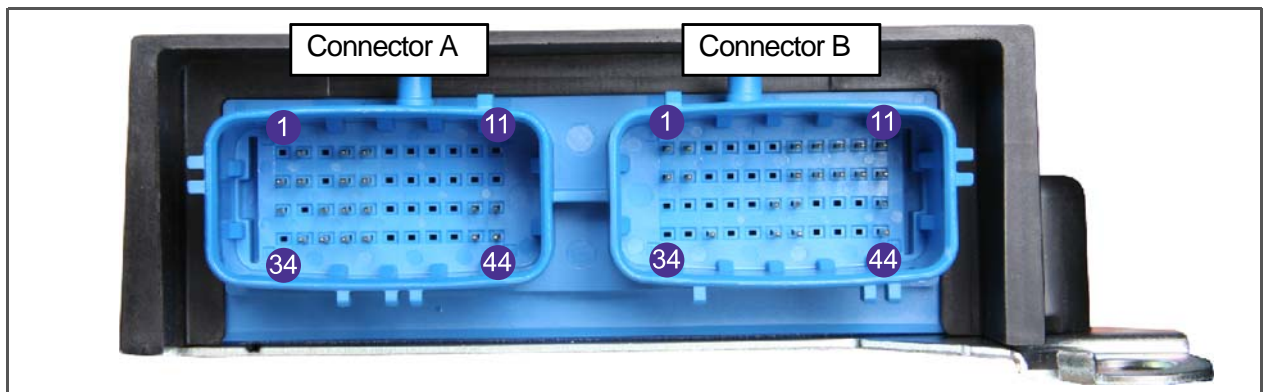
The air bag modules are mounted on the bottom of the front console and back side of the TGS lever.



Air bag unit (SDM)

Courtesy lens fitted	Component
	

2) Connector Pin Description



► Connector A

Pin No.	Function	Pin No.	Function
1	-	23	Air bag deployment signal
2	Driver knee air bag -	24	-
3	-	25	PAB ON/OFF Switch
4	Driver air bag -	26	Driver front impact sensor +
5	Passenger air bag -	27	Passenger front impact sensor +
6	-	28	-
7	-	29	-
8	-	30	-
9	-	31	-
10	-	32	CAN high (P-CAN)
11	-	33	CAN low (P-CAN)
12	IGN +	34	-
13	Driver knee air bag +	35	-
14	-	36	Ground -
15	Driver air bag +	37	Driver front impact sensor -
16	Passenger air bag +	38	Passenger front impact sensor -
17	-	39	-
18	-	40	-
19	-	41	-
20	-	42	-
21	-	43	CAN high (ESP)
22	-	44	CAN low (ESP)

Modification basis	
Application basis	
Affected VIN	

AIR BAG

TIVOLI 2015.03

► Connector B

Pin No.	Function	Pin No.	Function
1	Passenger anchor pretensioner -	23	-
2	Driver anchor pretensioner -	24	-
3	-	25	-
4	-	26	-
5	-	27	-
6	-	28	Driver side impact sensor +
7	Driver seat belt pretensioner -	29	Passenger side impact sensor +
8	Passenger seat belt pretensioner -	30	-
9	Driver curtain air bag -	31	-
10	Driver side air bag -	32	-
11	Passenger curtain air bag -	33	Passenger side air bag +
12	Passenger anchor pretensioner +	34	-
13	Driver anchor pretensioner +	35	-
14	-	36	Ground -
15	-	37	-
16	-	38	-
17	-	39	Driver side impact sensor -
18	Driver seat belt pretensioner +	40	Passenger side impact sensor -
19	Passenger seat belt pretensioner +	41	-
20	Driver curtain air bag +	42	-
21	Driver side air bag +	43	-
22	Passenger curtain air bag +	44	Passenger side air bag -

S.G.N.

8810-03 DRIVER AIR BAG**1) Mounting Location and Components**

The driver air bag is located at the center of the steering wheel.

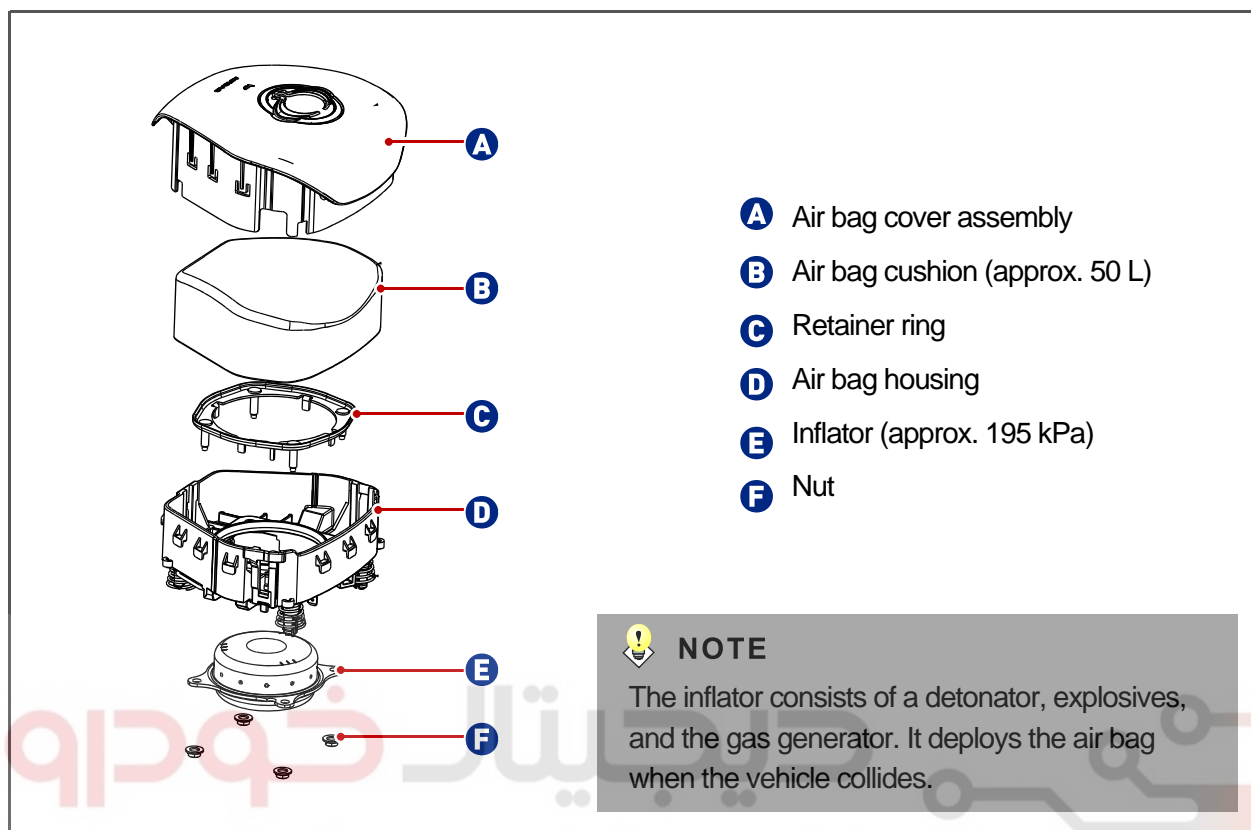
**Driver air bag**

Modification basis	
Application basis	
Affected VIN	

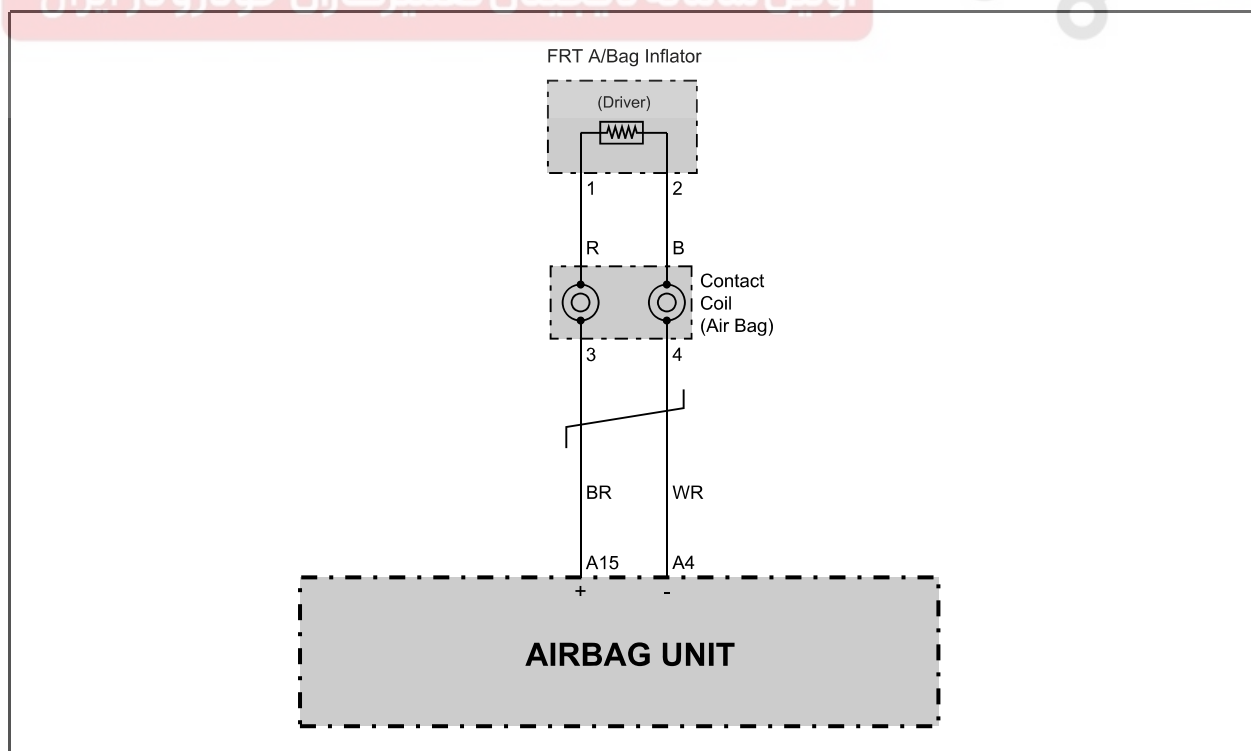
AIR BAG

TIVOLI 2015.03

2) Driver Air Bag Components



3) Circuit Diagram



S.G.N.

8810-06 PASSENGER AIR BAG**1) Mounting Location and Components**

The passenger air bag module is installed in the instrument panel, over the glove box. This air bag is an invisible type that is not visible from the outside of the panel.

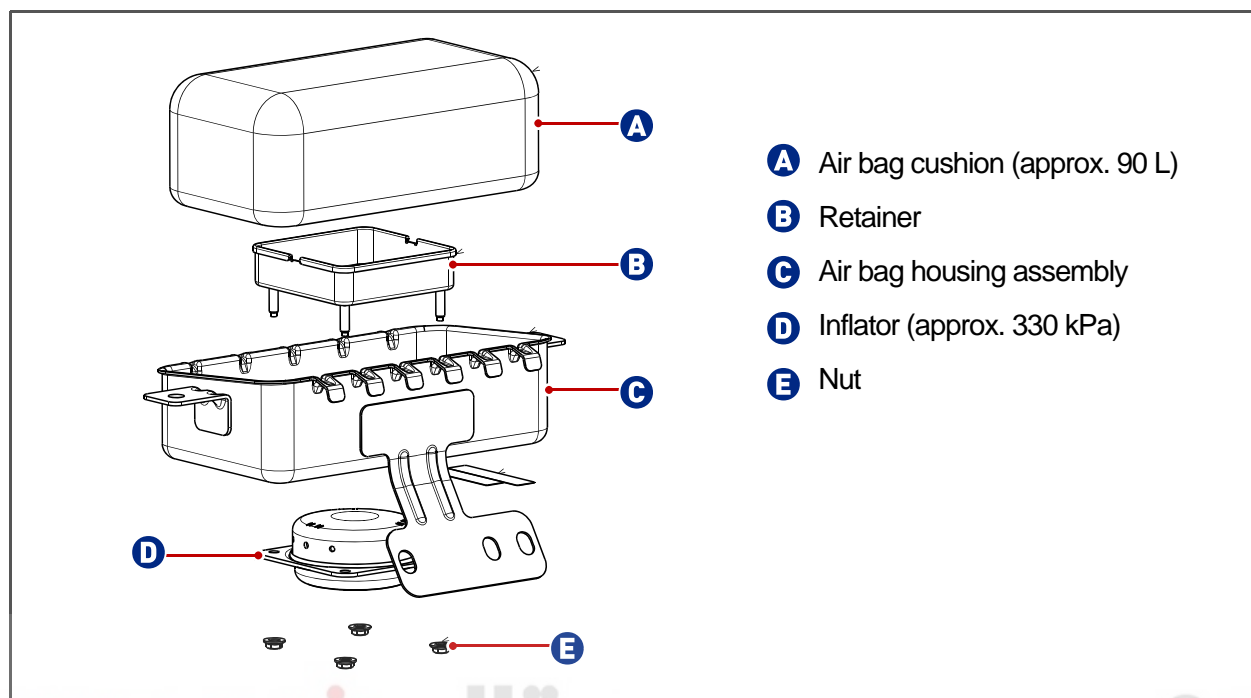
**Passenger air bag****Front view****Rear view**

Modification basis	
Application basis	
Affected VIN	

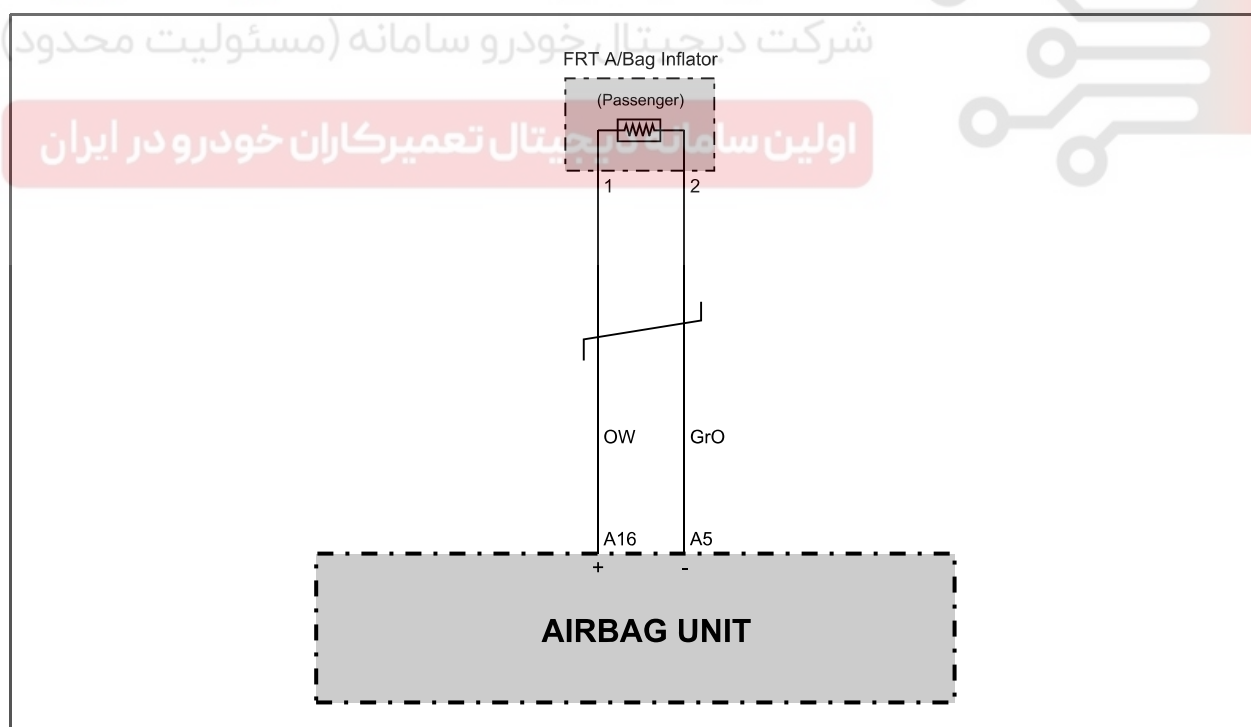
AIR BAG

TIVOLI 2015.03

2) Passenger Air Bag Components



3) Circuit Diagram



S.G.N.

8810-08 DRIVER KNEE AIR BAG**1) Mounting Location and Components**

The driver knee air bag is fitted on the center of the bottom of the lower main panel.

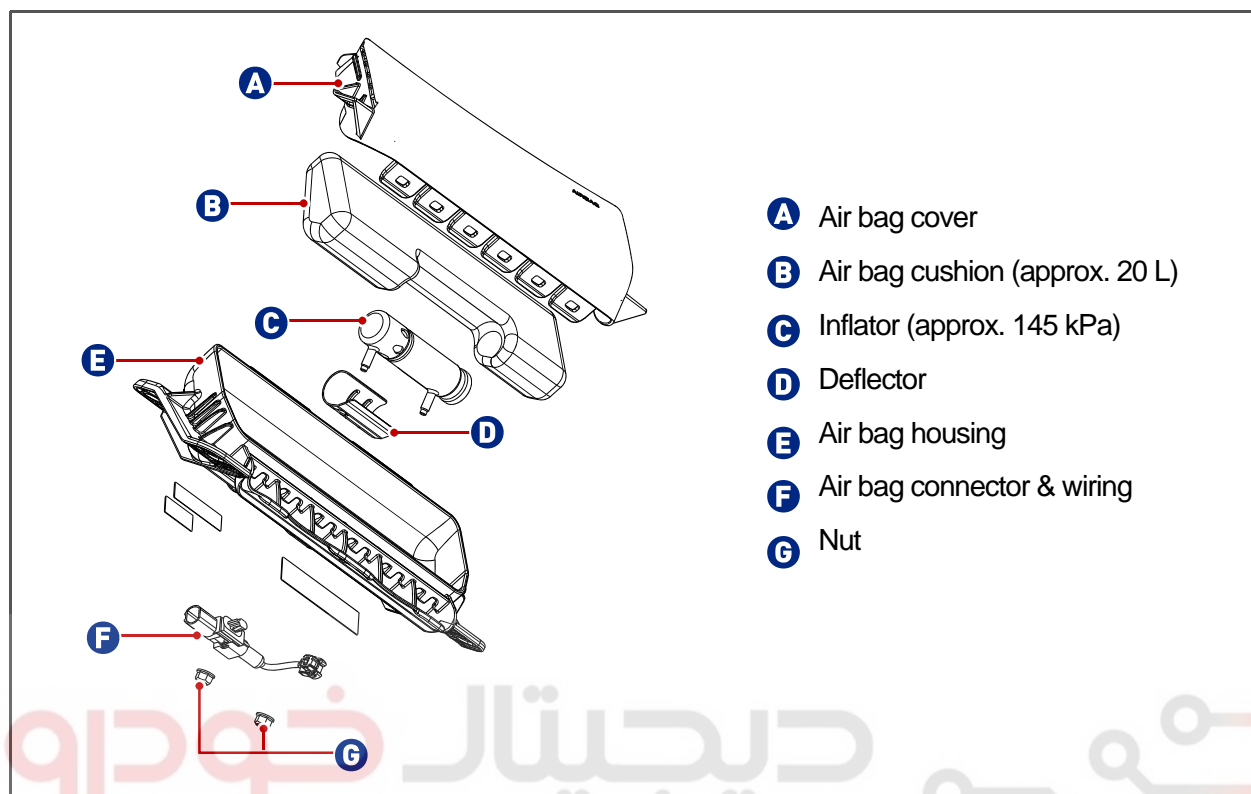
**Driver's knee air bag**

Modification basis	
Application basis	
Affected VIN	

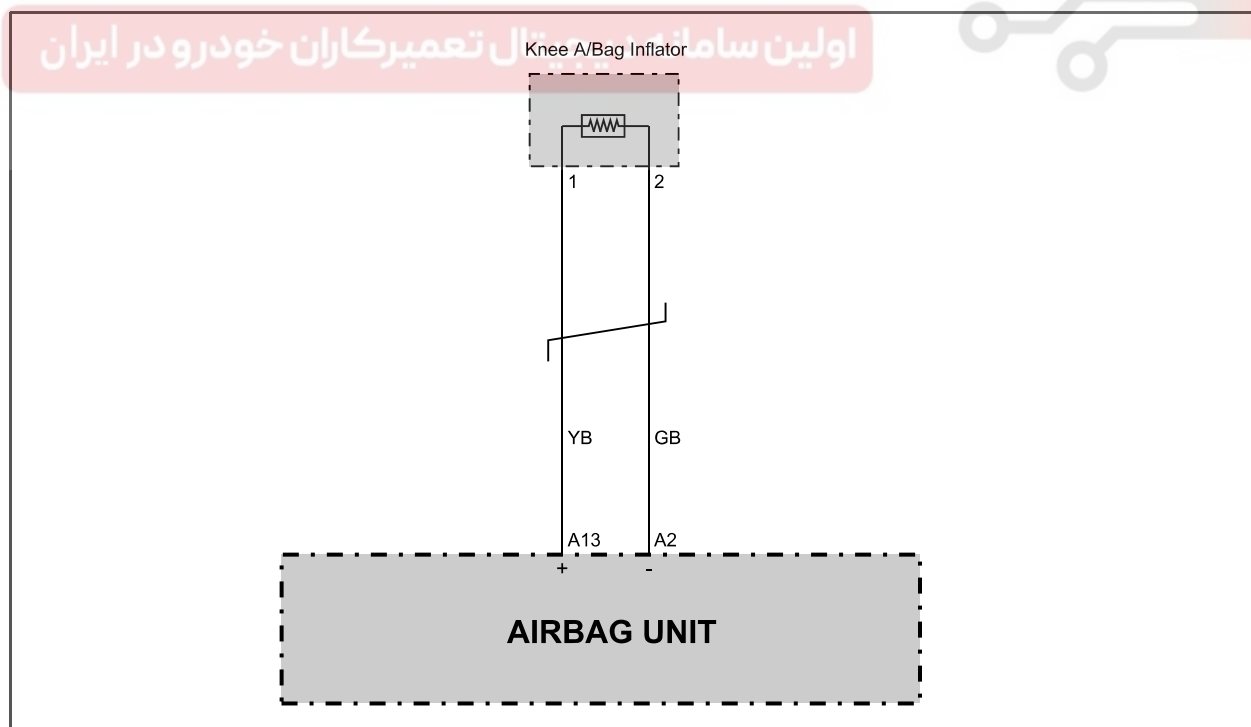
AIR BAG

TIVOLI 2015.03

2) Schematic Diagram



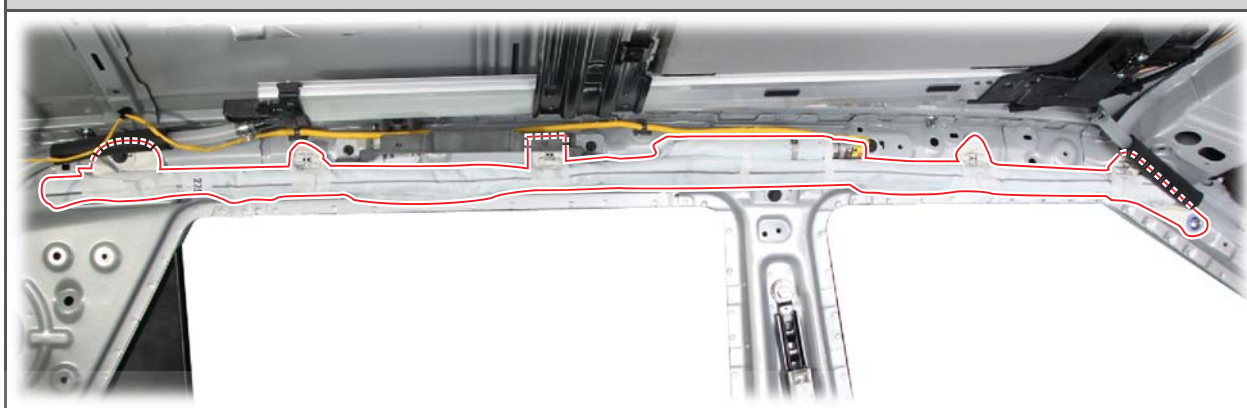
3) Circuit Diagram



S.G.N.

8810-11 CURTAIN AIR BAG**1) Mounting Location and Components**

The curtain air bag is one of the side air bag system and mounted on the roof rail, inside of the headlining side, one on each side.

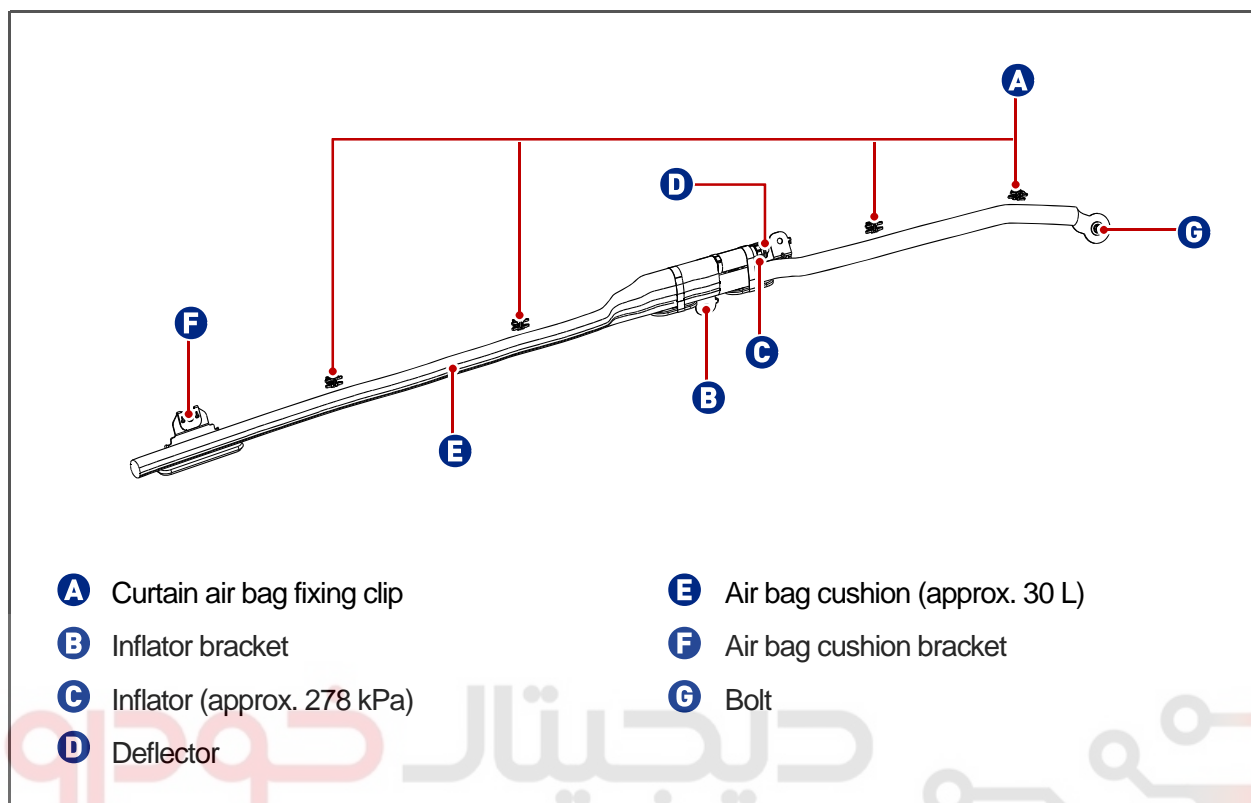
Installed curtain air bag**Deployed curtain air bag**

Modification basis	
Application basis	
Affected VIN	

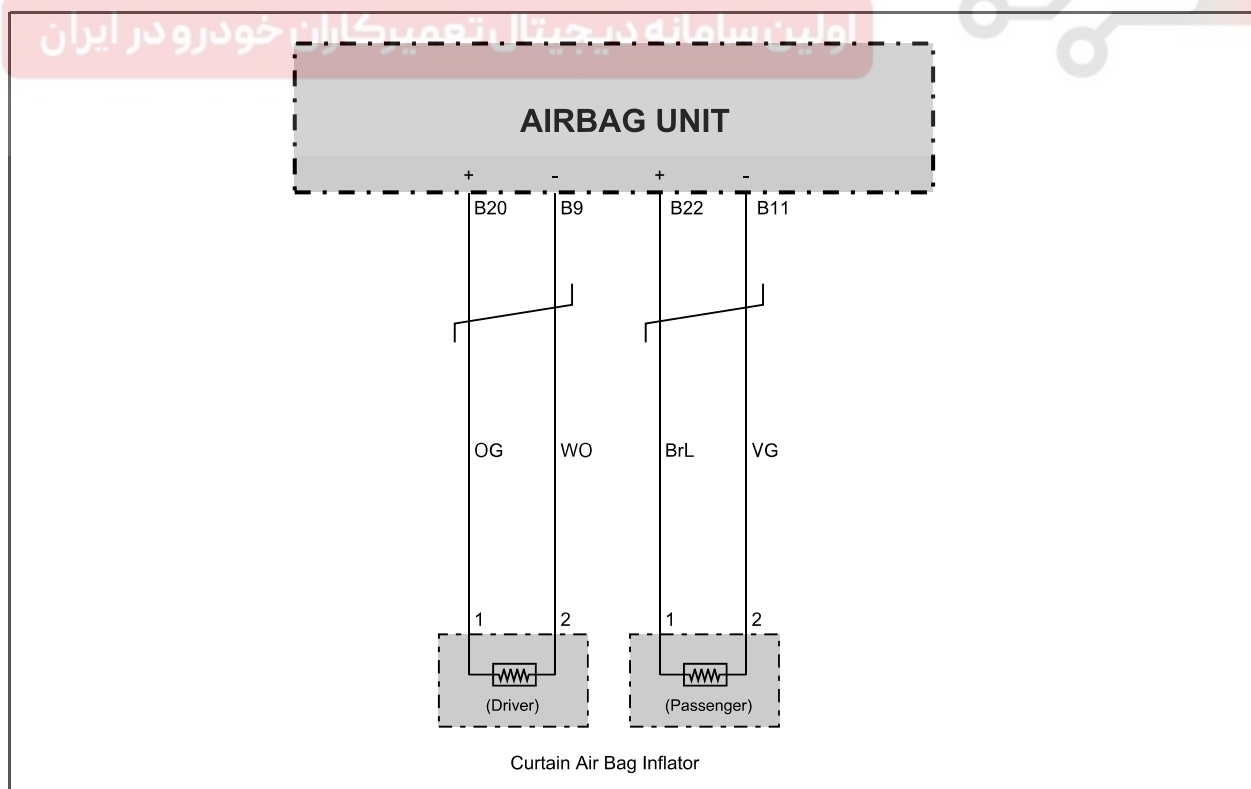
AIR BAG

TIVOLI 2015.03

2) Schematic Diagram



3) Circuit Diagram



S.G.N.

8810-20 SIDE AIR BAG**1) Mounting Location and Components**

The side air bags are installed on the center of both the driver and passenger seat sides.

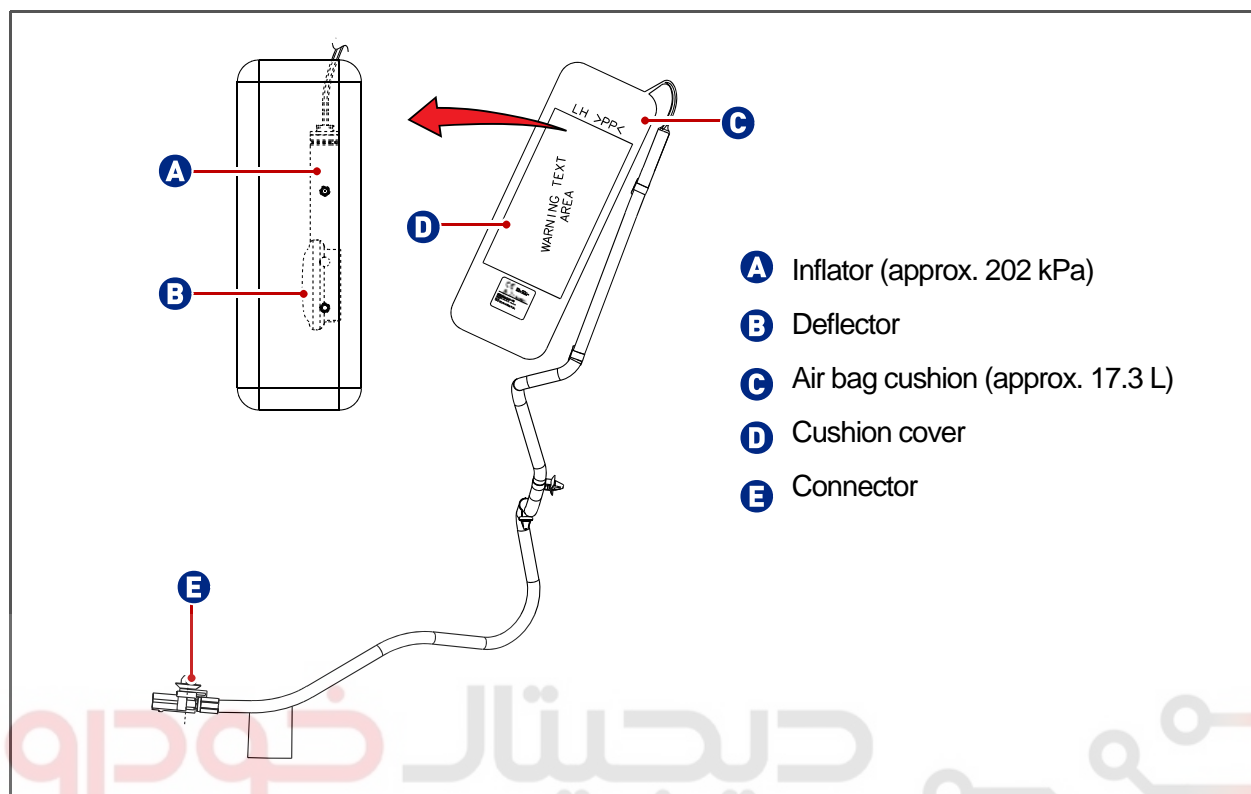


Modification basis	
Application basis	
Affected VIN	

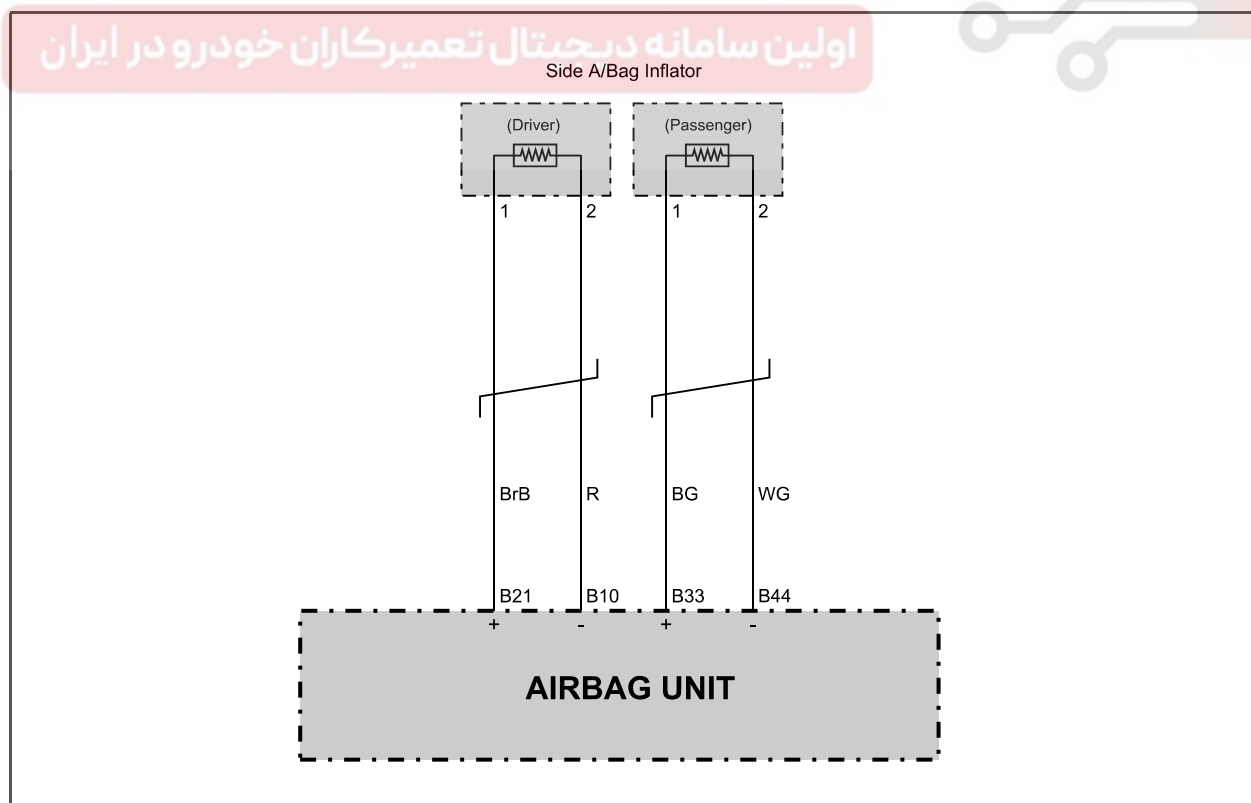
AIR BAG

TIVOLI 2015.03

2) Schematic Diagram



3) Circuit Diagram



S.G.N.

7430-00 SEAT BELT PRETENSIONER**1) Mounting Location and Components**

The seat belt pretensioners are installed at the lower section of the B-pillar on both the driver and passenger sides.

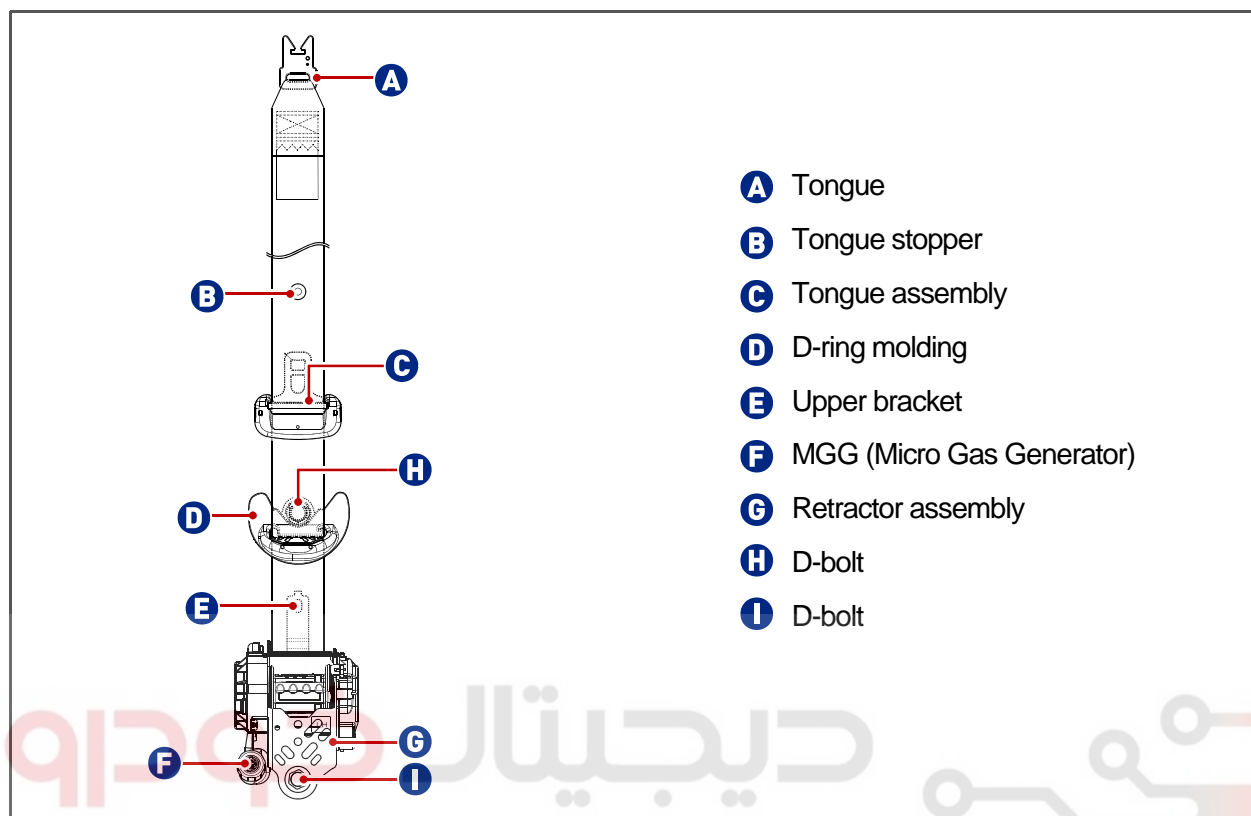
**Seat belt pretensioner**

Modification basis	
Application basis	
Affected VIN	

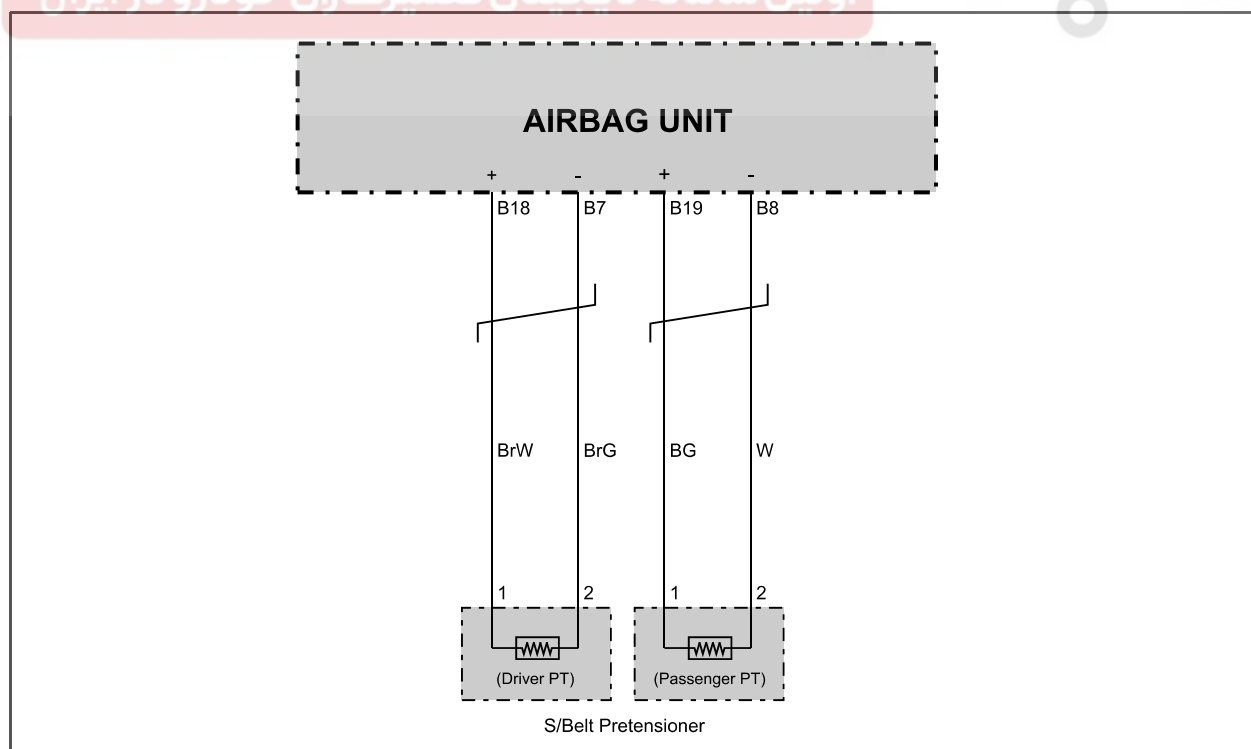
AIR BAG

TIVOLI 2015.03

2) Schematic Diagram



3) Circuit Diagram



S.G.N.

7430-04 ANCHOR PRETENSIONER**1) Mounting Location and Components**

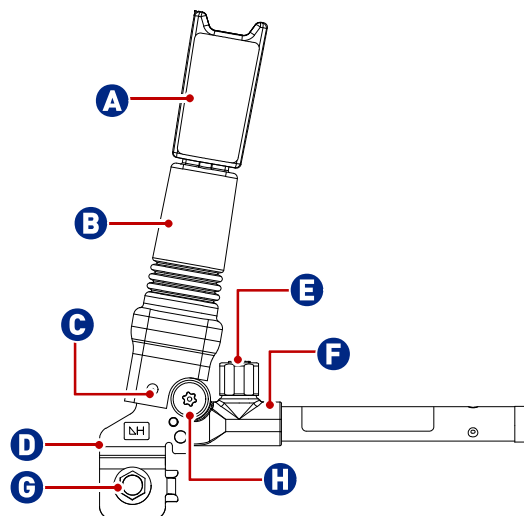
The anchor pretensioners are installed at the lower section of the B-pillar on both the driver and passenger sides.



Modification basis	
Application basis	
Affected VIN	

AIR BAG
TIVOLI 2015.03

2) Schematic Diagram



A Anchor connector assembly

B Boot

C Blind rivet

D Bracket

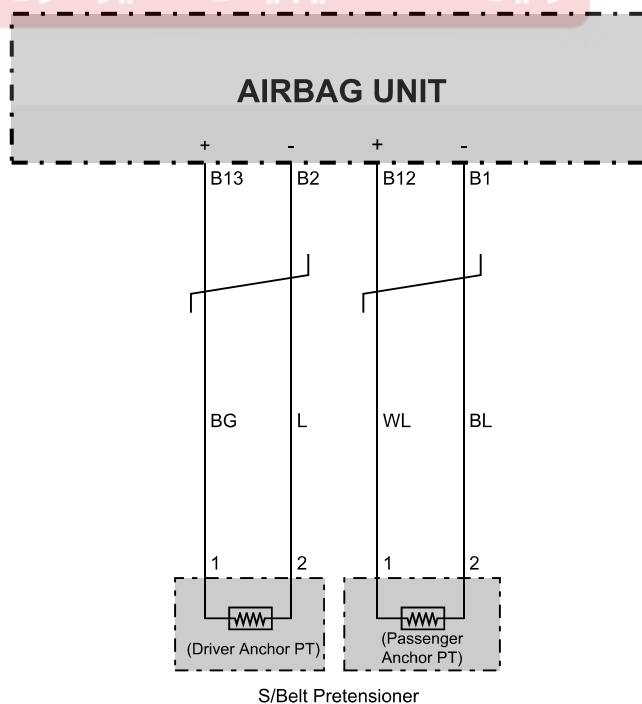
E MGG

F Mechanism assembly

G D-bolt

H Torx bolt

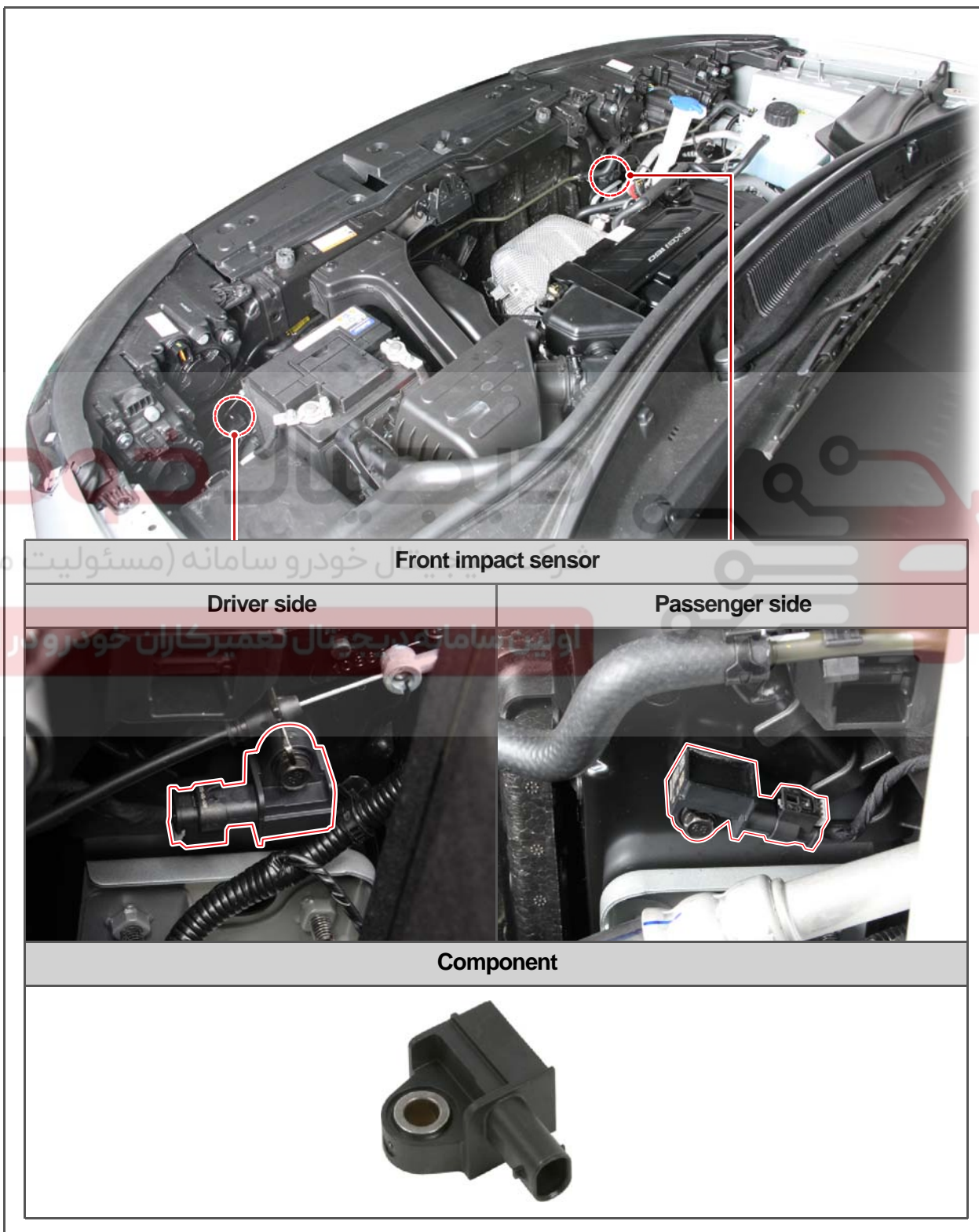
3) Circuit Diagram



S.G.N.

8810-16 FRONT IMPACT SENSOR**1) Mounting Location and Components**

The front impact sensor is located on the frame under the headlamp.



Modification basis	
Application basis	
Affected VIN	

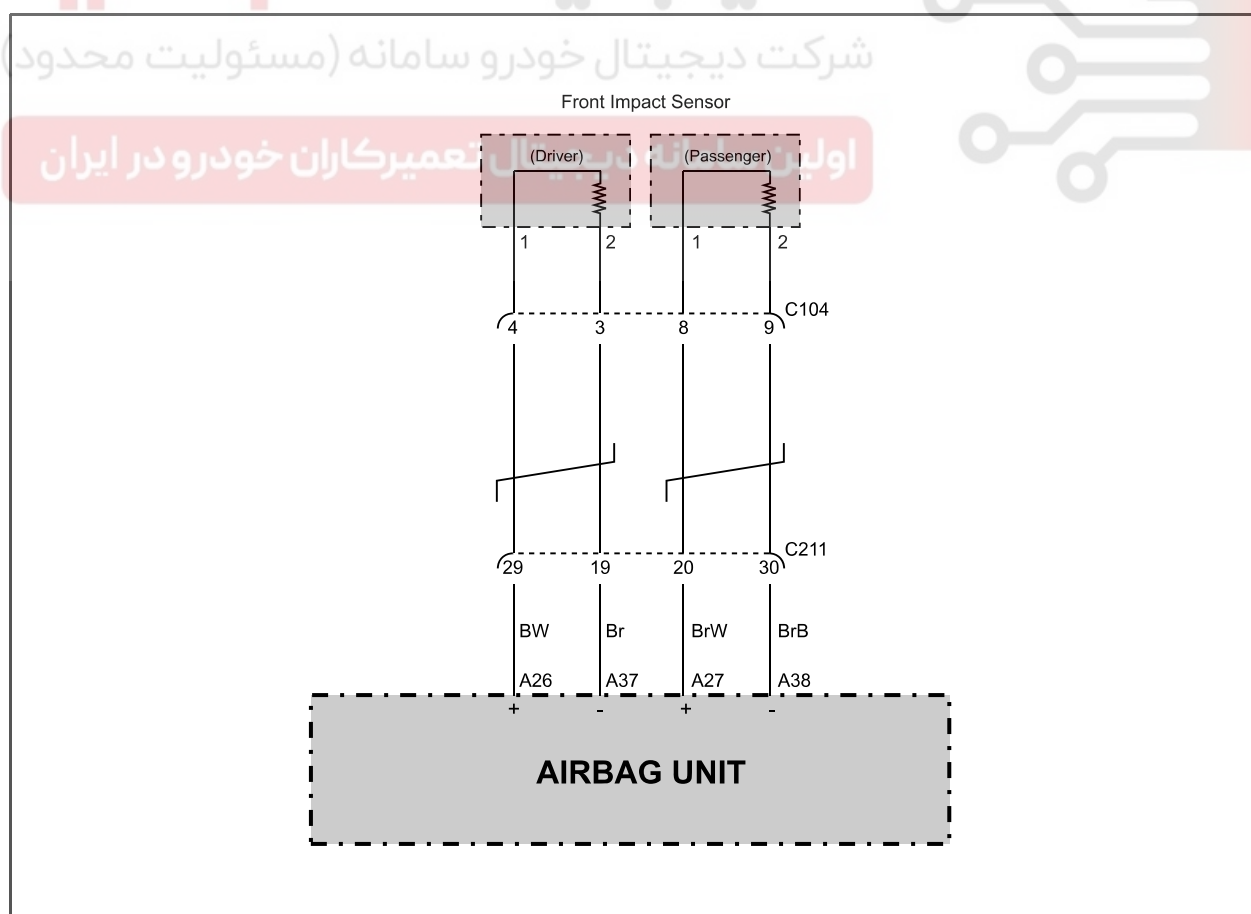
AIR BAG
TIVOLI 2015.03

2) Connector Pin Description



Pin No.	Function
1	Signal
2	Ground -

3) Circuit Diagram



S.G.N.

8810-16 SIDE IMPACT SENSOR**1) Mounting Location and Components**

The side impact sensors are installed at the lower section of the B-pillar on both the driver and passenger sides.

**Side impact sensor**

Modification basis	
Application basis	
Affected VIN	

AIR BAG

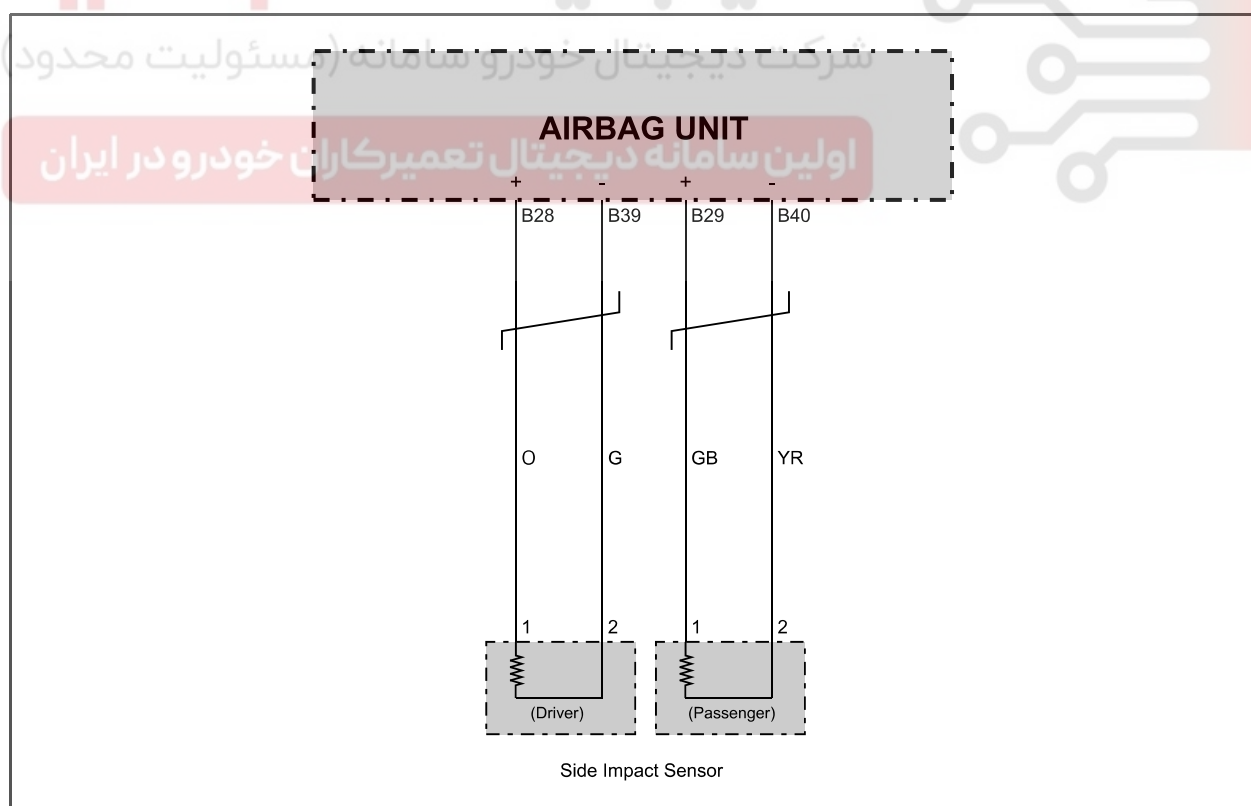
TIVOLI 2015.03

2) Connector Pin Description



Pin No.	Function
1	Signal
2	Ground -

3) Circuit Diagram



REMOVAL AND INSTALLATION

8810-00

HOW TO CHECK THE SYSTEM AFTER FAULT CODE

The SDM stores the fault codes generated. Follow the below check procedure, otherwise the air bag can be deployed.

► Air bag check procedure



1. Check the air bag system for fault codes that have been generated using a diagnostic device.

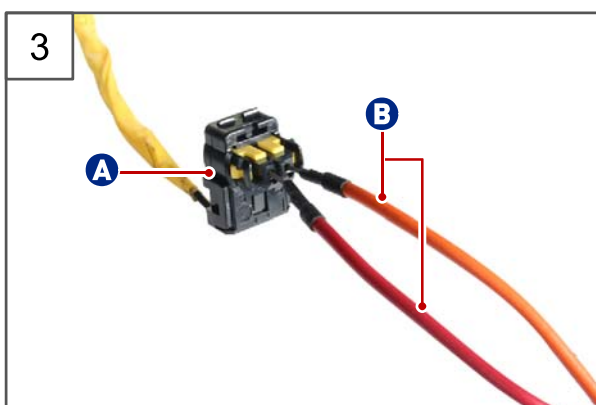


2. If the driver's air bag module has any related fault code, turn the ignition off and free the driver's air bag module to disconnect the connector.



NOTE

Refer to "DRIVER AIR BAG MODULE" under "REMOVAL AND INSTALLATION" in "AIR BAG SYSTEM" chapter.



3. Connect a T connector (B) to the driver's air bag module connector (A).

T connector



Modification basis	
Application basis	
Affected VIN	

4

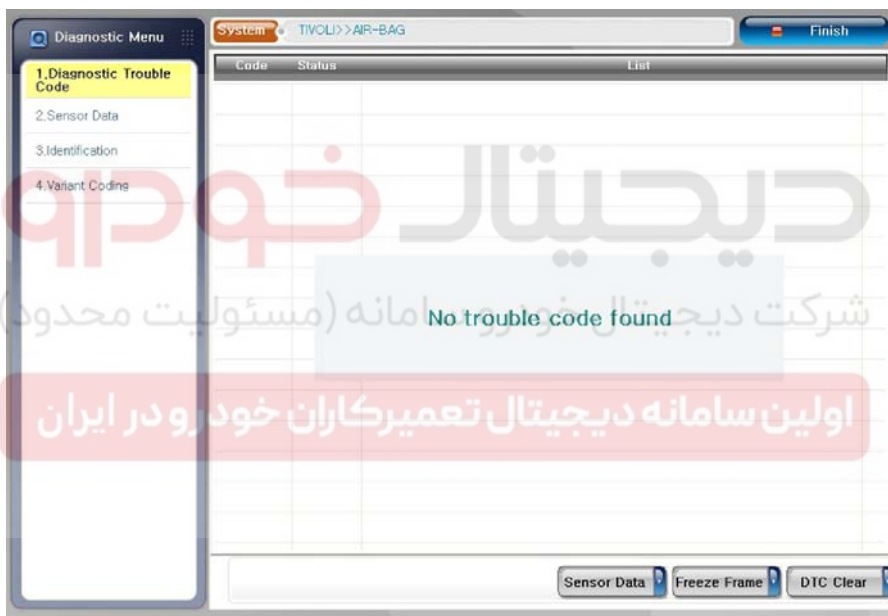


4. Fit a dummy resistor ($2\ \Omega$) in the T connector.

T connector connections



5. Turn the ignition on again to clear the fault code(s) and check if the fault code(s) reoccur(s).



NOTE

If no fault code is generated, then the driver's air bag module is defective. If the same fault code(s) reoccur(s), then check the wirings to the SDM.



CAUTION

Using a resistance meter to check the air bag module and pretensioner can deploy the air bag. Always follow the specified procedure.

S.G.N.

8810-01 AIR BAG UNIT (SDM)

Preceding work

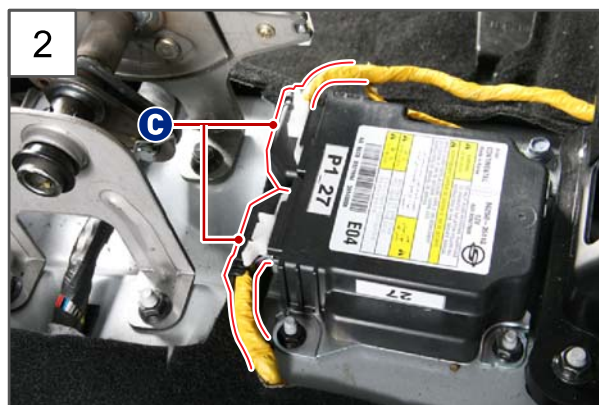
- Disconnect the negative battery cable.

**Air bag unit (SDM)**

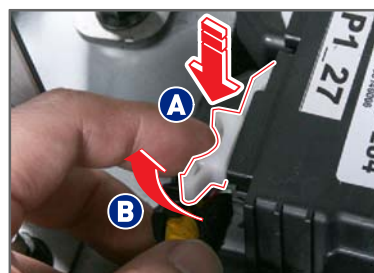
1. Remove the front console assembly.

NOTE

Refer to "FRONT CONSOLE ASSEMBLY" under "REMOVAL AND INSTALLATION" in "BODY INTERIOR" chapter.



2. Press the locking part of the air bag unit (SDM) to the arrow (A) direction and turn over it to the arrow (B) direction to disconnect the connector (C).



Modification basis	
Application basis	
Affected VIN	

AIR BAG
TIVOLI 2015.03

02-60

8810-01

T I V O L I



3. Unscrew the 3 mounting nuts (10 mm) for air bag unit (SDM).

Tightening torque $9 \pm 1.5\text{Nm}$



4. Remove the air bag unit (SDM).



5. Install in the reverse order of removal.

AIR BAG

TIVOLI 2015.03

Modification basis	
Application basis	
Affected VIN	

S.G.N.

8810-03 DRIVER AIR BAG**Preceding work**

- Disconnect the negative battery terminal and wait for at least 30 seconds before starting the work.

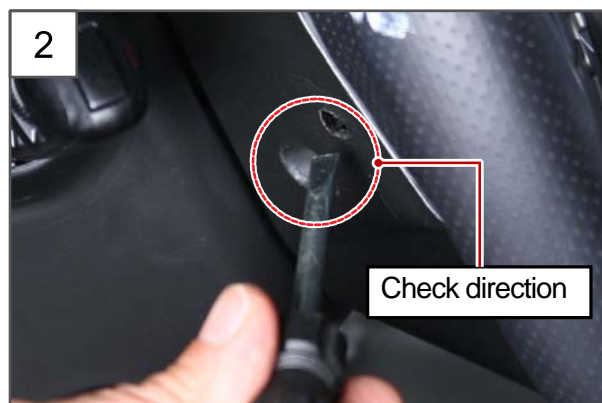


1. Remove the driver air bag module from the steering wheel as follows:

Modification basis	
Application basis	
Affected VIN	

AIR BAG

TIVOLI 2015.03

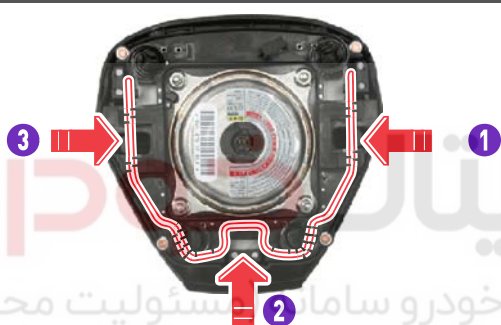


2. Insert a flat-bladed screwdriver or something similar into the 3 holes at rear side of the steering wheel and press the snap rings securing the driver air bag module in sequence to remove the air bag module.

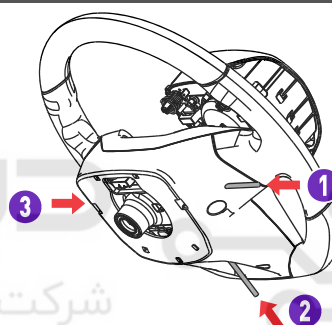
⚠ CAUTION

When inserting the screwdriver, make sure that no open circuit exists due to an interference of the wiring in driver air bag module.

Inside of driver air bag module



Outside of driver air bag module

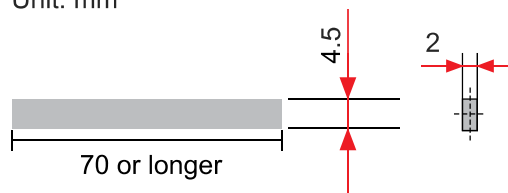


Unfasten snap ring

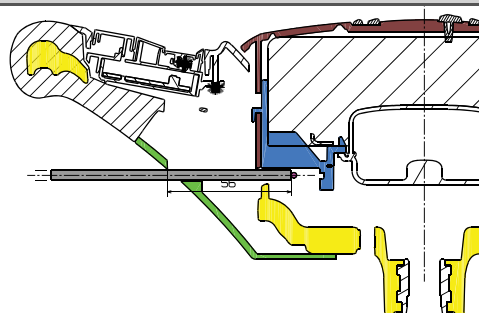


Tool size

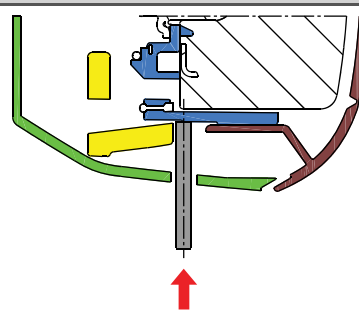
Unit: mm



Cross-sectional diagrams 1 and 3 (with tool inserted)



Cross-sectional diagram 2 (with tool inserted)





3. Lift out the driver air bag module and disconnect the connectors (A) and (B).

(A) Horn connector

(B) Driver air bag module connector



4. Remove the driver's air bag module.



5. Install in the reverse order of removal.

Modification basis	
Application basis	
Affected VIN	

AIR BAG

TIVOLI 2015.03

02-64

8530-08

T I V O L I

S.G.N.

8530-08

CONTACT COIL

Preceding work

- Disconnect the negative battery terminal and wait for at least 30 seconds before starting the work.



1. Remove the driver air bag.

⚠ **NOTE**

Refer to "DRIVER AIR BAG" under "REMOVAL AND INSTALLATION" in "AIR BAG SYSTEM" chapter.



2. Disconnect the steering wheel connector (A).

AIR BAG

TIVOLI 2015.03

Modification basis	
Application basis	
Affected VIN	



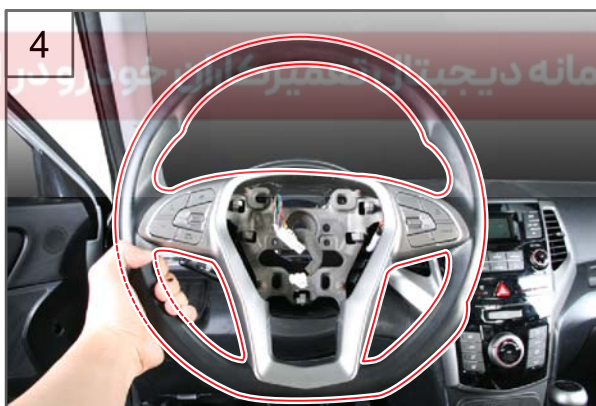
3. Unscrew the one steering wheel mounting nut (22 mm) and remove the washer.

Tightening torque 39.2 ~ 49.0Nm



NOTE

Paint marks on the steering wheel so that the center is aligned when installing the steering wheel.



4. Remove the steering wheel.



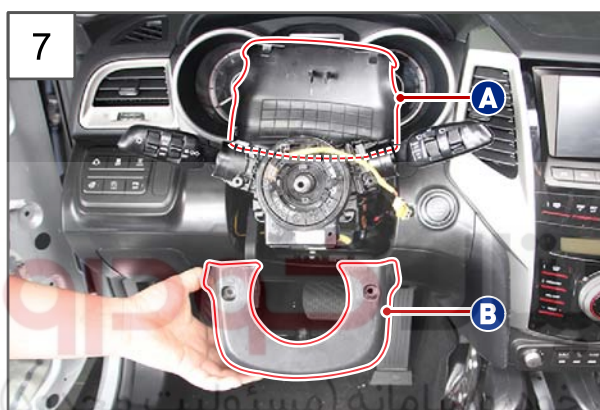
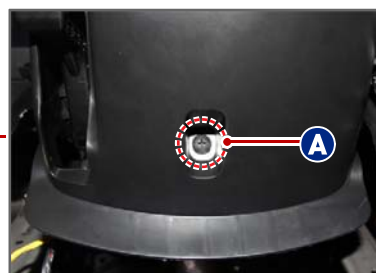
5. Unscrew the 2 mounting screws for the shroud lower panel.

Modification basis	
Application basis	
Affected VIN	

AIR BAG
TIVOLI 2015.03



6. Unscrew the one mounting screw (A) for shroud lower panel under the steering wheel, and push down the steering column tilting lever in the direction of the arrow.



7. Detach the shroud upper panel (a) and lower panel (B) and remove the shroud lower panel.

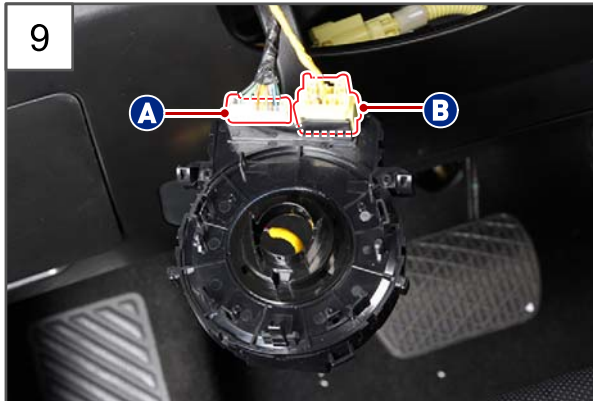


8. Disengage the mountings (3 points) and lift out the contact coil assembly from the column shaft.

Fixed parts of contact coil assembly



Modification basis	
Application basis	
Affected VIN	



9. Remove the connectors (A) and (B) from the contact coil assembly.



10. Remove the contact coil assembly.



11. Install in the reverse order of removal.

CAUTION

Always follow the precautions when fitting the contact coil.

Modification basis	
Application basis	
Affected VIN	

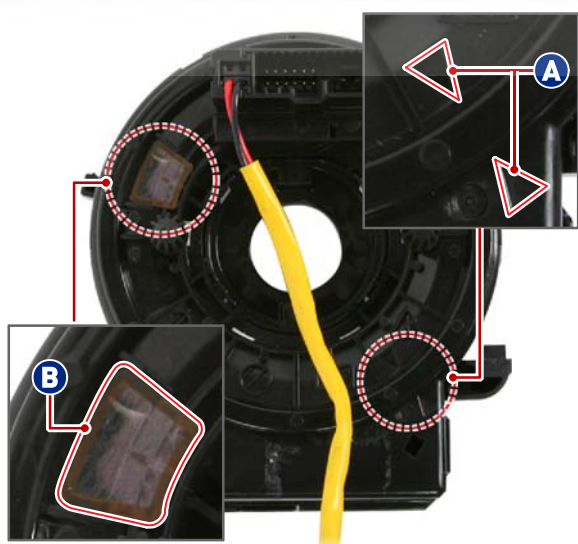
Precautions for fitting contact coil



1. Turn the contact coil clockwise until it reaches stop.



2. Turn it anti-clockwise about 3.5 turns.



3. When the assembly marks (A) (▶◀) are aligned, check that the contact coil line is visible through the sight glass (B).

⚠ CAUTION

If the contact coil is not aligned correctly, the steering wheel may not be able to rotate properly during turning. This kind of restricted turning ability may cause the vehicle to crash or damage the contact coil and prevent the air bags from deploying in a crash event.

S.G.N.

8810-06

PASSENGER AIR BAG

Preceding work

- Disconnect the negative battery terminal and wait for at least 30 seconds before starting the work.



1. Remove the instrument panel.

**NOTE**

Refer to "INSTRUMENT PANEL" under "REMOVAL AND INSTALLATION" in "BODY INTERIOR".

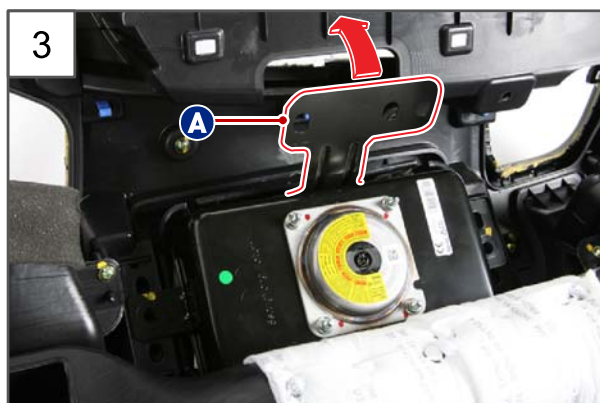


2. Unscrew the 2 passenger air bag mounting bolts (10 mm) from the rear side of the instrument panel.

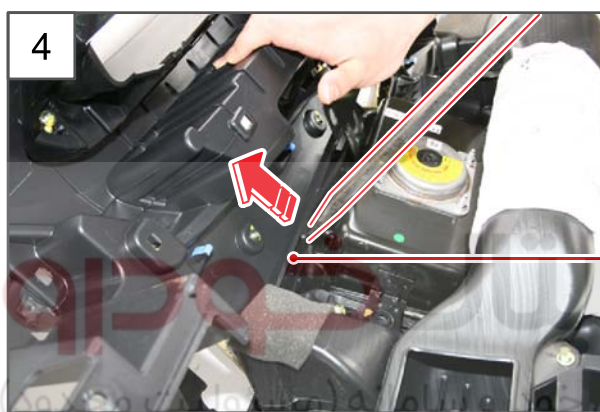
Modification basis	
Application basis	
Affected VIN	

AIR BAG

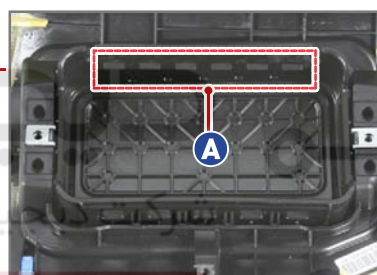
TIVOLI 2015.03



3. Press the mounting bracket (A) for the passenger air bag gently to the arrow direction.



4. Turn over the (A) part of the RH main upper crash pad assembly securing the passenger air bag in turn using a screwdriver.



5. Remove the passenger air bag.



6. Install in the reverse order of removal.

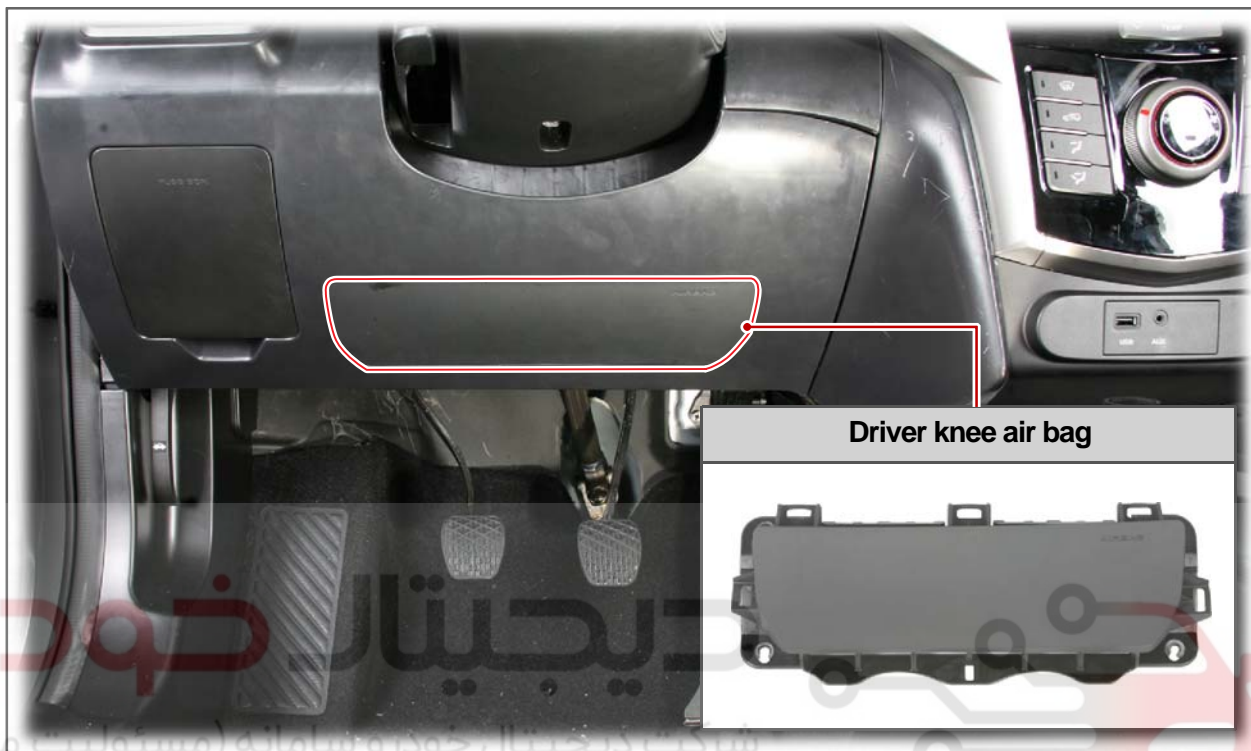
S.G.N.

8810-08

DRIVER KNEE AIR BAG

Preceding work

- Disconnect the negative battery terminal and wait for at least 30 seconds before starting the work.

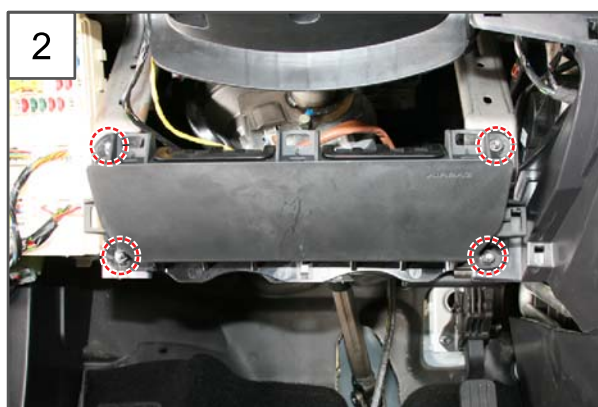


1. Remove the lower main panel.



NOTE

Refer to "LH LOWER MAIN PANEL" under "REMOVAL AND INSTALLATION" in "BODY INTERIOR" chapter.



2. Unscrew the 4 mounting nuts (10 mm) for the driver knee air bag.

Tightening torque 5.8 ~ 11.7Nm

Modification basis	
Application basis	
Affected VIN	

AIR BAG
TIVOLI 2015.03

02-72

8810-00

T I V O L I



3. Lift out the driver knee air bag and disconnect its connector.



4. Remove the driver's knee airbag.



5. Install in the reverse order of removal.

AIR BAG

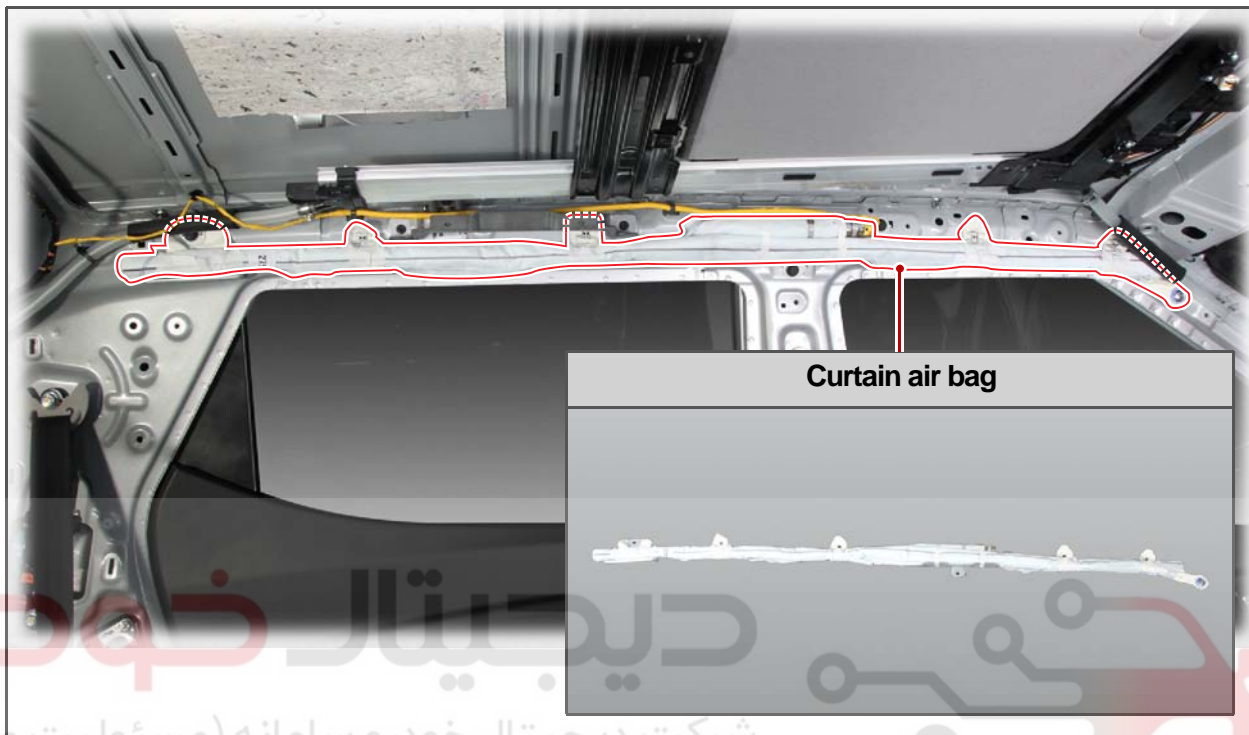
TIVOLI 2015.03

Modification basis	
Application basis	
Affected VIN	

S.G.N.

8810-11 CURTAIN AIR BAG**Preceding work**

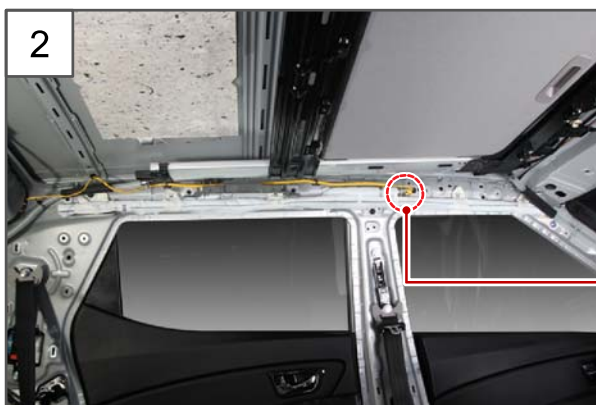
- Disconnect the negative battery terminal and wait for at least 30 seconds before starting the work.



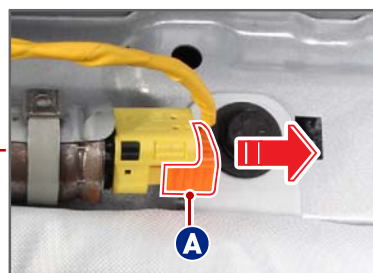
1. Remove the headlining assembly.

NOTE

Refer to "HEADLINING ASSEMBLY" under "REMOVAL AND INSTALLATION" in "BODY INTERIOR".

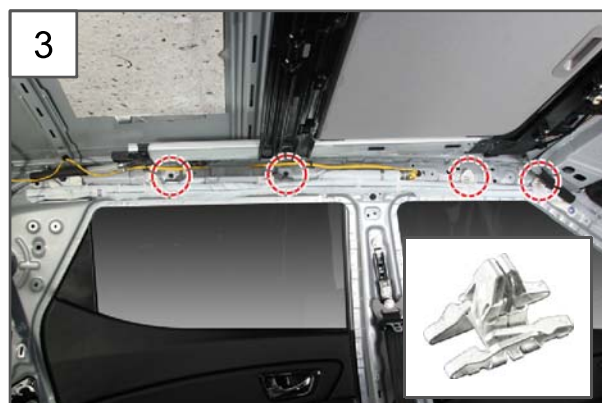


2. Unlock the locking part (A) of the curtain air bag connector to the arrow direction to remove it.

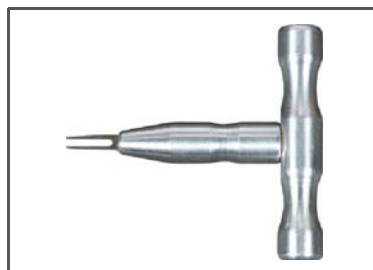


Modification basis	
Application basis	
Affected VIN	

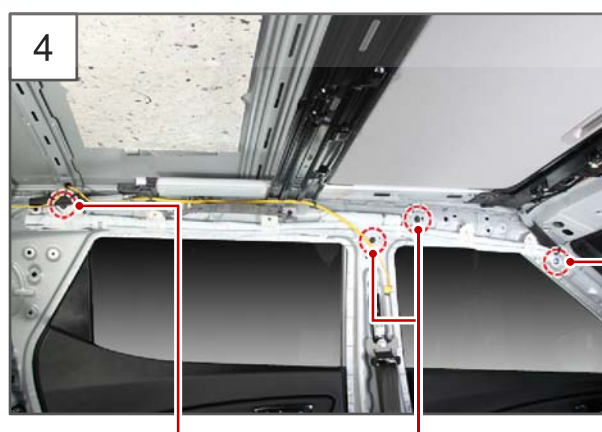
AIR BAG
TIVOLI 2015.03



3. Insert the special tool into the curtain air bag fixing clip all the way to the arrow (A) direction and undo the 4 fixing clips to the arrow (B) direction.



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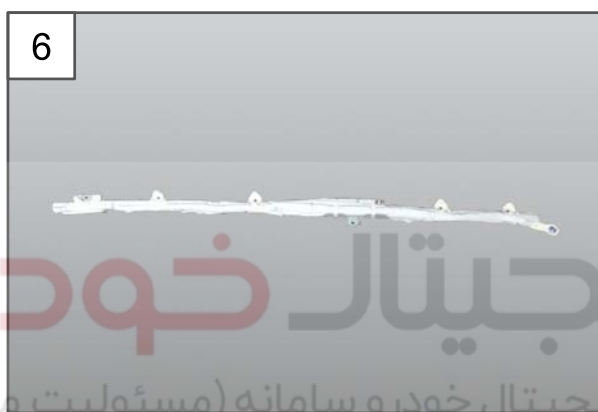
4. Unscrew the 4 curtain air bag mounting bolts (10 mm).

Tightening torque 5.8 ~ 7.8Nm





5. Remove the curtain air bag.



6. Install in the reverse order of removal.

AIR
CONDITIO

AIR BAG

SEAT/SEA
T BELTSUNROO
FBODY
INTERIORBODY
EXTERIOBODY
DIMENSIBODY
WELDING

دیجیتال خودرو
شرکت دیجیتال خودرو سامانه (مسئولیت محدود)

اولین سامانه دیجیتال تعمیرکاران خودرو در ایران

Modification basis	
Application basis	
Affected VIN	

AIR BAG

TIVOLI 2015.03

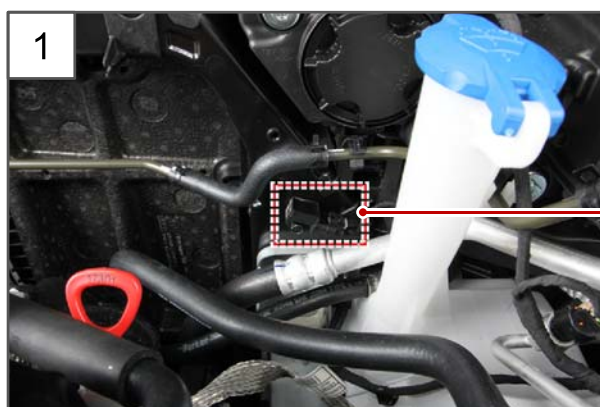
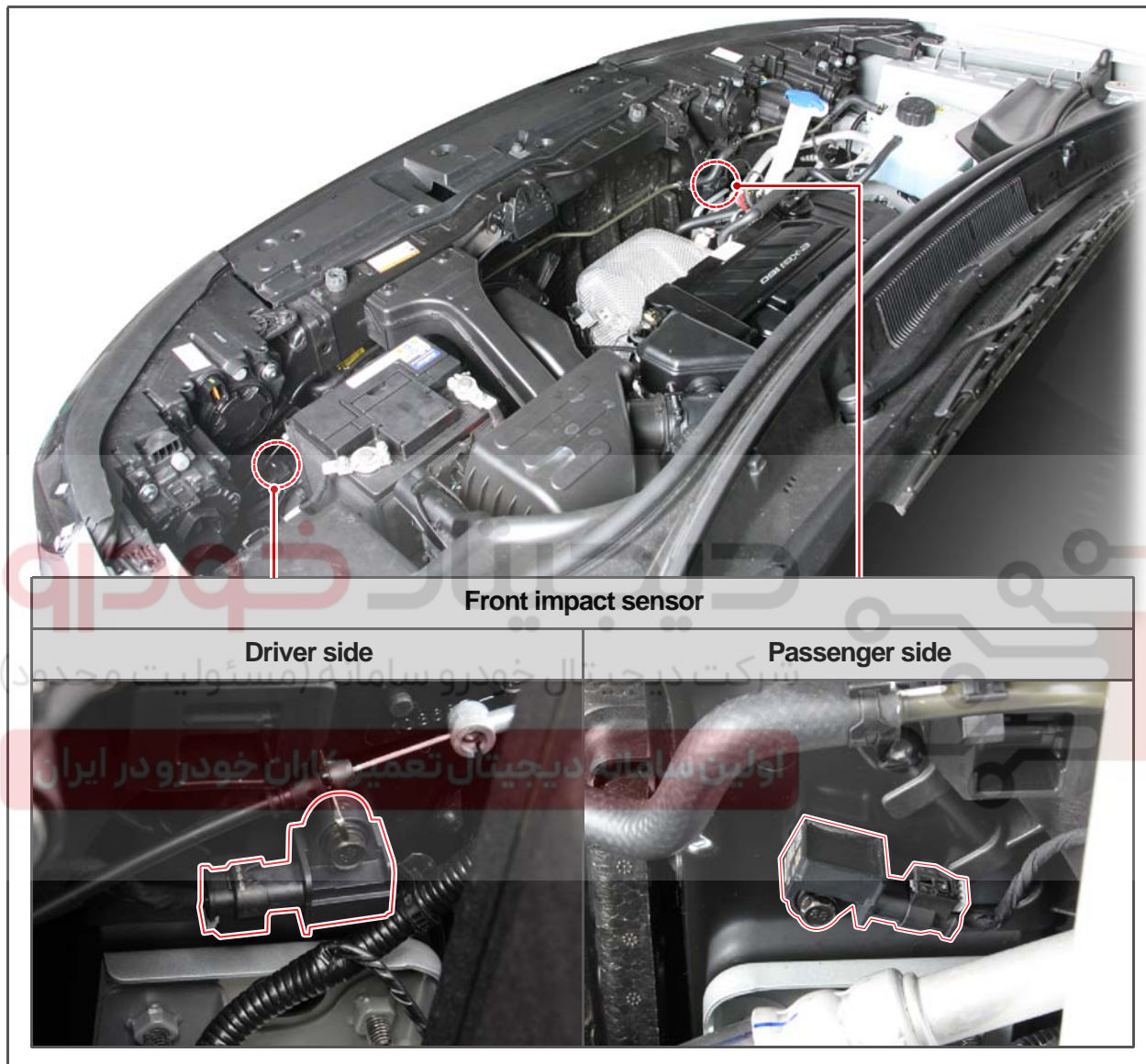
S.G.N.

8810-16

FRONT IMPACT SENSOR

Preceding work

- Disconnect the negative battery terminal and wait for at least 30 seconds before starting the work.



1. Disconnect the front impact sensor connector (A).



Modification basis	
Application basis	
Affected VIN	



2. Unscrew the one mounting bolt (10 mm) for the front impact sensor.

Tightening torque $9 \pm 1\text{Nm}$



3. Remove the front impact sensor.



4. Install in the reverse order of removal.

Modification basis	
Application basis	
Affected VIN	

AIR BAG

TIVOLI 2015.03

S.G.N.

8810-16

SIDE IMPACT SENSOR

Preceding work

- Disconnect the negative battery terminal and wait for at least 30 seconds before starting the work.

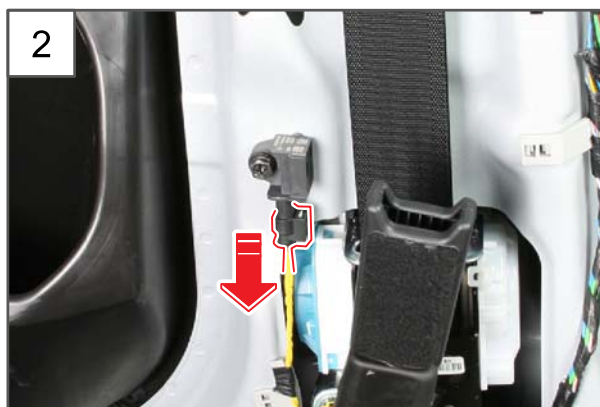


1. Remove the B-pillar lower trim.



NOTE

Refer to "B-PILLAR UPPER TRIM" under "REMOVAL AND INSTALLATION" in "BODY INTERIOR" chapter.



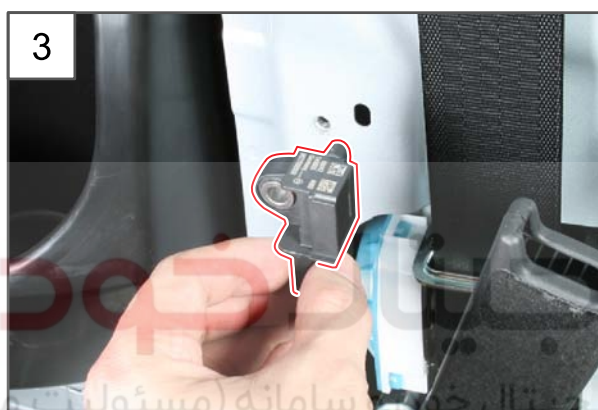
2. Disconnect the side impact sensor connector.

Modification basis	
Application basis	
Affected VIN	



2. Unscrew the one mounting bolt (10 mm) for the side impact sensor.

Tightening torque $9 \pm 1\text{Nm}$



3. Remove the side impact sensor.



4. Install in the reverse order of removal.

Modification basis	
Application basis	
Affected VIN	

AIR BAG

TIVOLI 2015.03

CODING PROCESS

1. AIR BAG VARIANT CODING

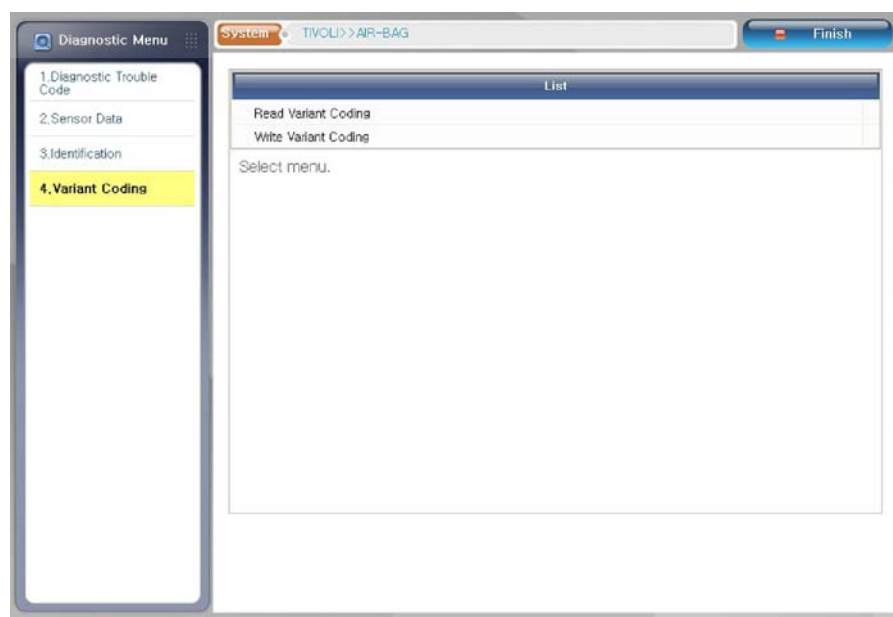
► Perform the coding when the SDM or any air bag and pretensioner have been replaced.

1. Turn the ignition on, select vehicle type and system (AIR BAG) on the diagnostic program and click on "Diagnosis".



اولین سامانه دیجیتال تعمیرکاران خودرو در ایران

2. Select the menu Change Variant Coding under "Variant Coding".



AIR BAG

TIVOLI 2015.03

Modification basis	
Application basis	
Affected VIN	

3. Press the [Start] button.

Diagnostic Menu

System: TIVOLI >> AIR-BAG

Finish

Coding Information

DAB	PAB
Front Side airbag_Driver	Front Side airbag_Passenger
Curtain airbag_Driver	Curtain airbag_Passenger
Driver knee airbag	Front Impact sensor_Passenger
Front Impact sensor_Driver	Front Side Impact sensor_Driver
Front Side Impact sensor_Passenger	Anchor Pretensioner_Driver
Anchor Pretensioner_Passenger	Pretensioner_Driver
Pretensioner_Passenger	PAB On/Off switch

If the expression information is incorrect, please change to suit the content of this item.
When you select the 'Start' button coding is done.

Previous Start

4. When the message "Variant Coding Completed" is displayed, turn the ignition off and on and click Verify.

Diagnostic Menu

System: TIVOLI >> AIR-BAG

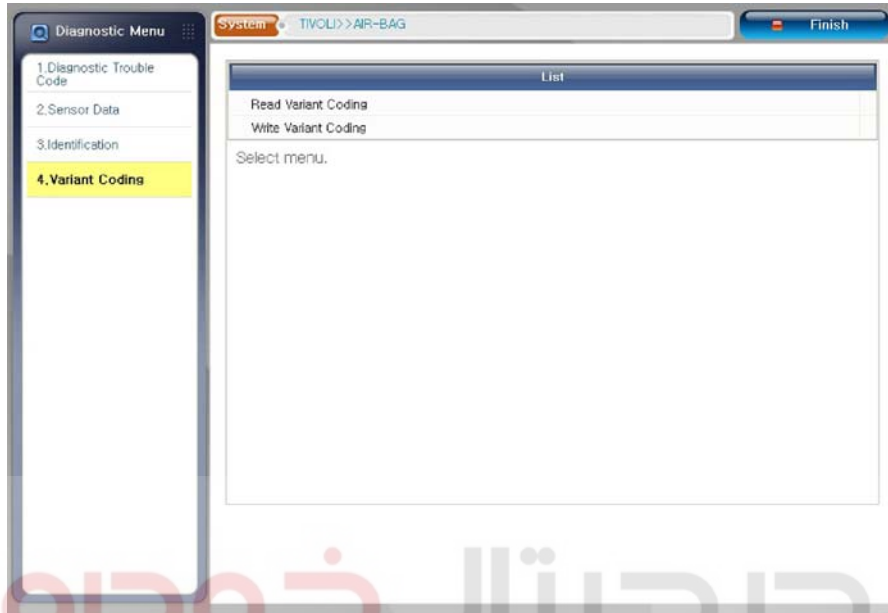
Finish

<< Wait for 15 sec. >>

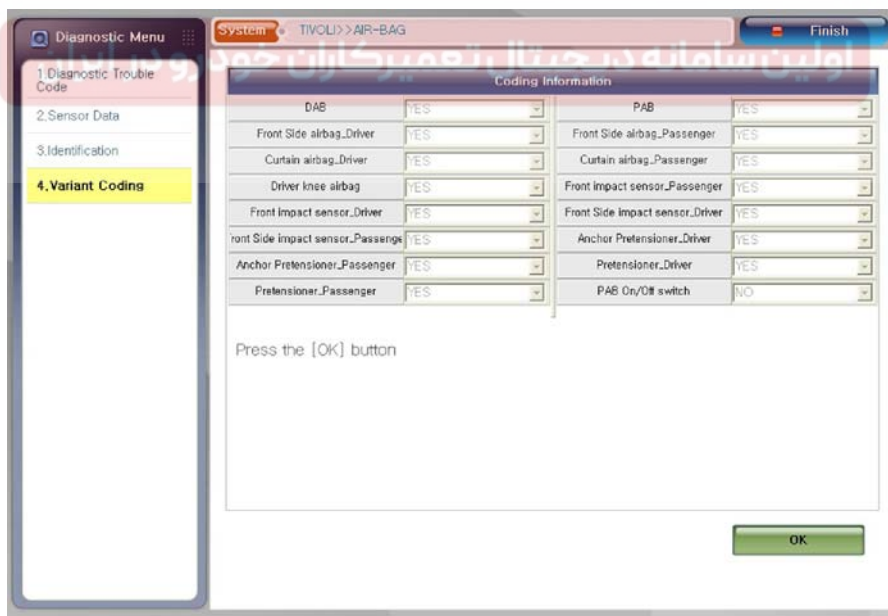
Remaining Time: 14 sec.

Modification basis	
Application basis	
Affected VIN	

5. When the variant coding is completed, click the menu Verify Variant Coding under "Variant Coding".



6. Check that the coding has been carried out correctly.



NOTE

If the message 'With' is displayed on the corresponding column of the air bag and pretensioner for each part, the variant coding has been carried out correctly.