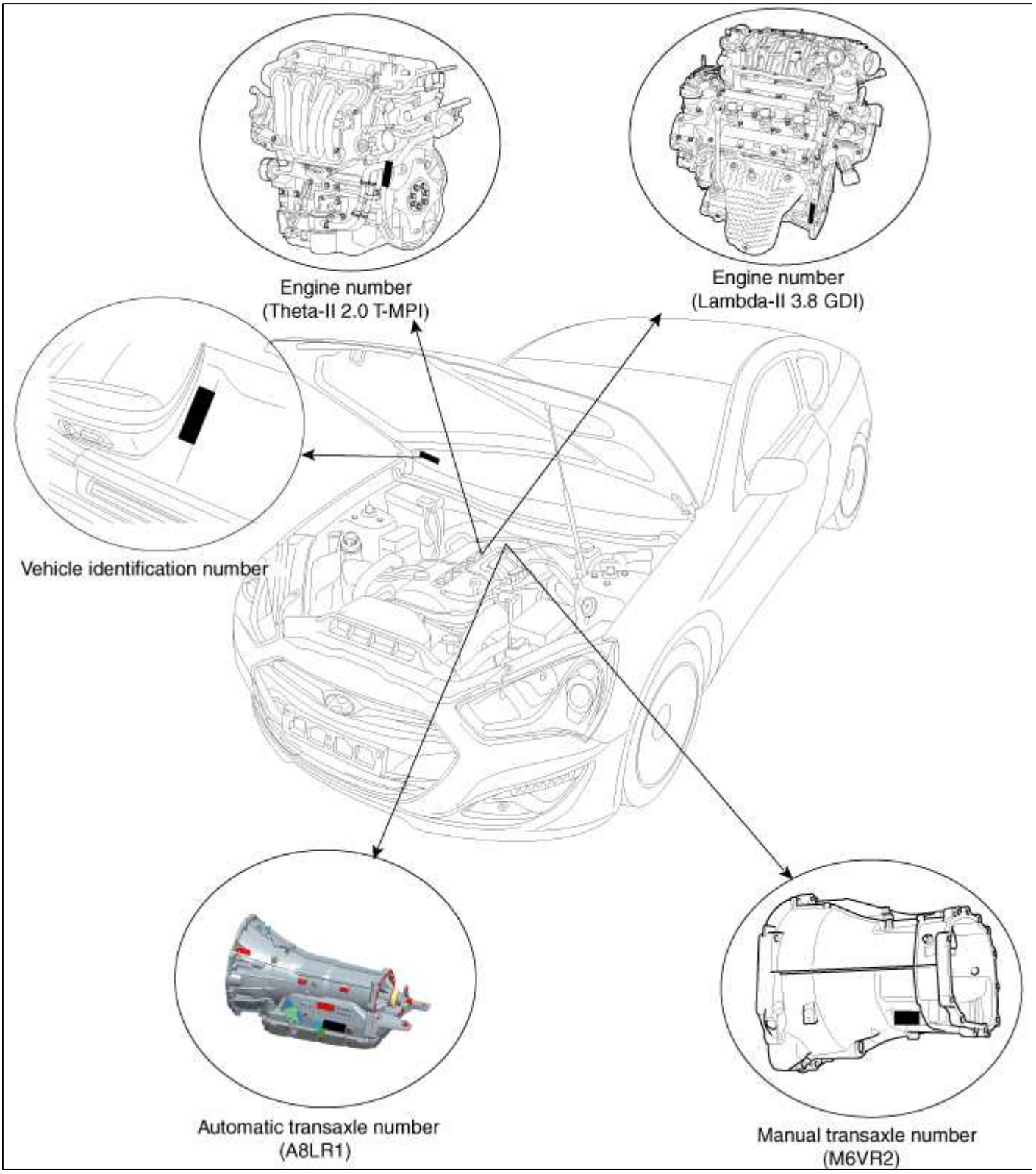
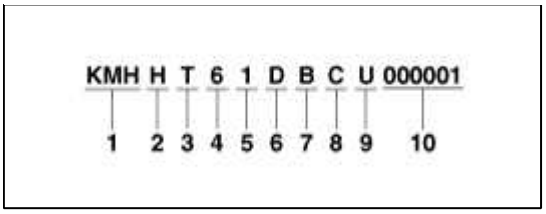
GENESIS COUPE(BK) > 2013 > G 2.0 T-MPI > General Information

General Information > General Information > General Information

Identification Number Locations



Identification Number Description
Vehicle Identification Number



1. World Manufacturer Identifier (WMI)
   - KMF : Commercial vehicle (Van)
   - KMH : Passenger vehicle or MPV(Multipurpose Passenger Vehicle)/SUV(Sports Utility Vehicle)/RV(Recreational Vehicle)
   - KMJ : Van
   - KM8 : MPV/SUV/RV (For U.S.A, Canada, Mexico)
2. Vehicle line
   - H : GENESIS COUPE
3. Model & Series
   - S : Low grade (L)
   - T : Middle-Low grade (GL)
   - U : Middle grade (GLS, JSL, TAX)
   - V : Middle-High grade (HGS)
   - W : High grade (TOP)
4. Body/Cabin type, Gross Vehicle Weight Rating
   KMF (Commercial vehicle / Van)
   Except U.S.A, Canada, Mexico, Gulf Cooperation Council, China
   - X : Standard Cabin / Semi-Bonnet
   - Y : Double Cabin / Bonnet
   - Z : Super Cabin / Box
   For U.S.A, Canada, Mexico, Gulf Cooperation Council, China
   - 3 : Standard Cabin Class-E 4×2 / Semi-Bonnet Class-E 4×2
   - 4 : Standard Cabin Class-E 4×4 / Semi-Bonnet Class-E 4×4
   - 5 : Standard Cabin Class-F 4×2 / Semi-Bonnet Class-F 4×2
   - 6 : Standard Cabin Class-F 4×4 / Semi-Bonnet Class-F 4×4
   - 7 : Double Cabin Class-E 4×2 / Bonnet Class-E 4×2
   - 8 : Double Cabin Class-E 4×4 / Bonnet Class-E 4×4
   - 9 : Double Cabin Class-F 4×2 / Bonnet Class-F 4×2
   - 0 : Double Cabin Class-F 4×4 / Bonnet Class-F 4×4
   - A : Super Cabin Class-E 4×2 / Box Class-E 4×2
   - B : Super Cabin Class-E 4×4 / Box Class-E 4×4
   - C : Super Cabin Class-F 4×2 / Box Class-F 4×2
   - D : Super Cabin Class-F 4×4 / Box Class-F 4×4
   KMH
   - 1 : Limousine
   - 2 : Sedan - 2 door
   - 3 : Sedan - 3 door
   - 4 : Sedan - 4 door
   - 5 : Sedan - 5 door
   - 6 : Coupe
   - 7 : Convertible
   - 8 : Wagon
   - 9 : Commercial Van
   - 0 : Pick-Up
   KMJ

- 1 : Box
- 2 : Bonnet
- 3 : Semi-Bonnet

KM8

- 1 : Wagon 4×2 Class-A
- 2 : Wagon 4×2 Class-B
- 3 : Wagon 4×2 Class-C
- 4 : Wagon 4×2 Class-D
- 5 : Wagon 4×2 Class-E
- 6 : Wagon 4×2 Class-F
- 7 : Wagon 4×2 Class-G
- A : Wagon 4×4 Class-A
- B : Wagon 4×4 Class-B
- C : Wagon 4×4 Class-C
- D : Wagon 4×4 Class-D
- E : Wagon 4×4 Class-E
- F : Wagon 4×4 Class-F
- G : Wagon 4×4 Class-G

5. Restraint system, Brake system

KMH, KM8

Except U.S.A, Canada, Mexico

- 0 : Both side - None
- 1 : Both side - Active belt
- 2 : Both side - Passive belt

For U.S.A, Canada, Mexico

Code	Seat belt	Front air bag		Knee air bag		Side air bag			Curtain air bag		
		Driver's	Passenger's	Driver's	Passenger's	1st row	2nd row	3rd row	1st row	2nd row	3rd r
A	○	○	○	×	×	○	×	×	○	○	×
B	○	○	○	×	×	×	×	×	×	×	×
C	○	○	○	×	×	○	×	×	○	○	○
D	○	○	○	×	×	○	○	×	○	○	×
E	○	○	×	×	×	×	×	×	×	×	×
F	○	○	○	×	×	○	×	×	×	×	×
N	○	×	×	×	×	×	×	×	×	×	×

KMJ

Except U.S.A, Canada, Mexico

- 7 : Hydraulic brake system
- 8 : Pneumatic brake system
- 9 : Mixed brake system

For U.S.A, Canada, Mexico

- X : Hydraulic brake system
- Y : Pneumatic brake system
- Z : Mixed brake system

KMF

Except U.S.A, Canada, Mexico

- 7 : Hydraulic brake system

- 8 : Pneumatic brake system
- 9 : Mixed brake system

For U.S.A, Canada, Mexico

Code	Restraint system											Brake system		
	Seat belt	Front air bag		Knee air bag		Side air bag			Curtain air bag			Hydrauric	Pneumatic	Mi
		Driver's	Passenger's	Driver's	Passenger's	1st row	2nd row	3rd row	1st row	2nd row	3rd row			
X	○	×	×	×	×	×	×	×	×	×	×	○	-	-
V	○	○	×	×	×	×	×	×	×	×	×	○	-	-
W	○	○	○	×	×	×	×	×	×	×	×	○	-	-

6. Engine type
   - D : Gasoline engine 2.0 (Theta-II T-MPI)
   - J : Gasoline engine 3.8 (Lambda-II GDI)
7. Check digit or Driver's side & Transmission

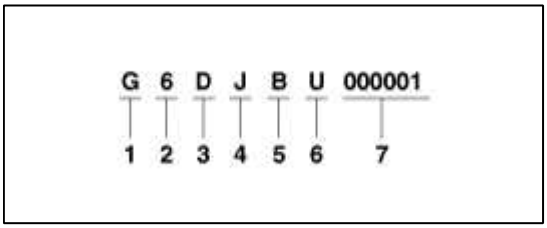
   Except U.S.A, Canada, Mexico, Gulf Cooperation Council, China, Yemen
   - A : LHD & MT
   - B : LHD & AT
   - C : LHD & MT+Transfer
   - D : LHD & AT+Transfer
   - E : LHD & CVT
   - L : RHD & MT
   - M : RHD & AT
   - N : RHD & MT+Transfer
   - S : RHD & AT+Transfer
   - T : RHD & CVT

   For U.S.A, Canada, Mexico, Gulf Cooperation Council, China, Yemen
   - Check digit : 0 ~ 9, ×
8. Production year
   - B : 2011, C : 2012, D : 2013, E : 2014 …
9. Plant of production
   - A : Asan (Korea)
   - C : Cheonju (Korea)
   - U : Ulsan (Korea)
10. Vehicle production sequence number
    - 000001 ~ 999999

Paint Code

Code	Color
NAA	Ceramic White
NBA	Space Black
NCA	Sleek Silver
NDA	Gray Titanum
NEA	Blue Diamond
NFA	Dynamic Yellow
NGA	Super Red
NHA	Blue Sapphire
NJA	Lime Green

Engine Number

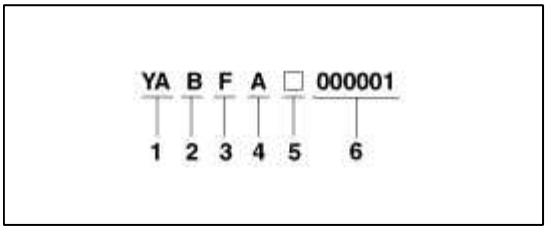


1. Engine fuel
   - G : Gasoline
2. Engine range
   - 4 : 4 cycle 4 cylinder
   - 6 : 4 cycle 6 cylinder
3. Engine development order
   - D : Lambda engine
   - K : Theta engine
4. Engine capacity
   - J : Lambda 3778 cc (Lambda-II GDI)
   - F : Theta-II 1998 cc (Theta-II T-MPI)
5. Production year
   - B : 2011, C : 2012, D : 2013, E : 2014 …
6. Plant of production
   - A : Asan (Korea)
   - B : Beijing (China)
   - H : Hwasung (Korea)
   - K : Montgomery (U.S.A)
   - M : Chennai (India)
   - P : Poseung (Korea)
   - S : Sohari (Korea)
   - T : Izmit (Turkey)
   - U : Ulsan (Korea)
   - W : Shandong (China)
   - Z : Zilina (Slovakia)
   - 1 : Yancheng (China)

7. Engine production sequence number
   - 000001 ~ 999999

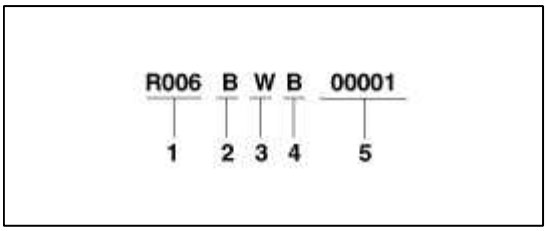
Transaxle Number

Automatic



1. Model
   - YA : A8LR1
2. Production year
   - B : 2011, C : 2012, D : 2013, E : 2014...
3. Engine
   - F : Lambda-II 3.8 GDI
   - G : Theta-II 2.0 T-MP
4. Detailed classification
   - A : Lambda-II 3.8 GDI / Theta-II 2.0 T-MPI
5. Spare
6. Transaxle production sequence number
   - 000001 ~ 999999

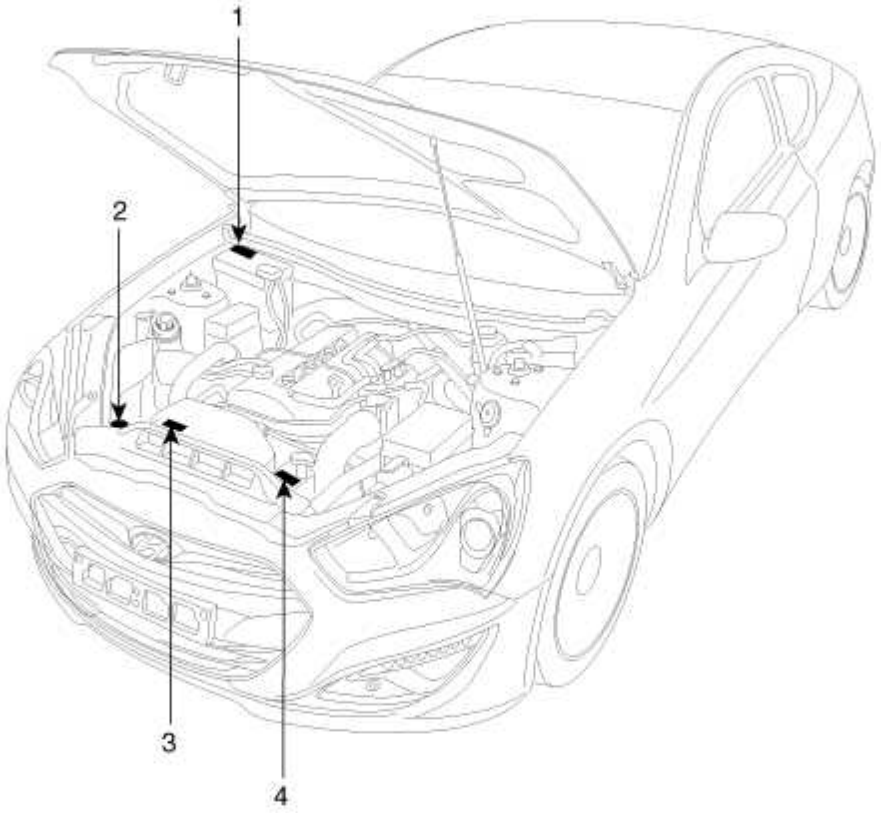
Manual



1. Assembly code
   - R006 : Theta-II 2.0 T-MPI
   - R007 : Lambda-II 3.8 GDI
2. Production year
   - B : 2011, C : 2012, D : 2013, E : 2014...
3. Plant of production
   - W : Wia (Korea)

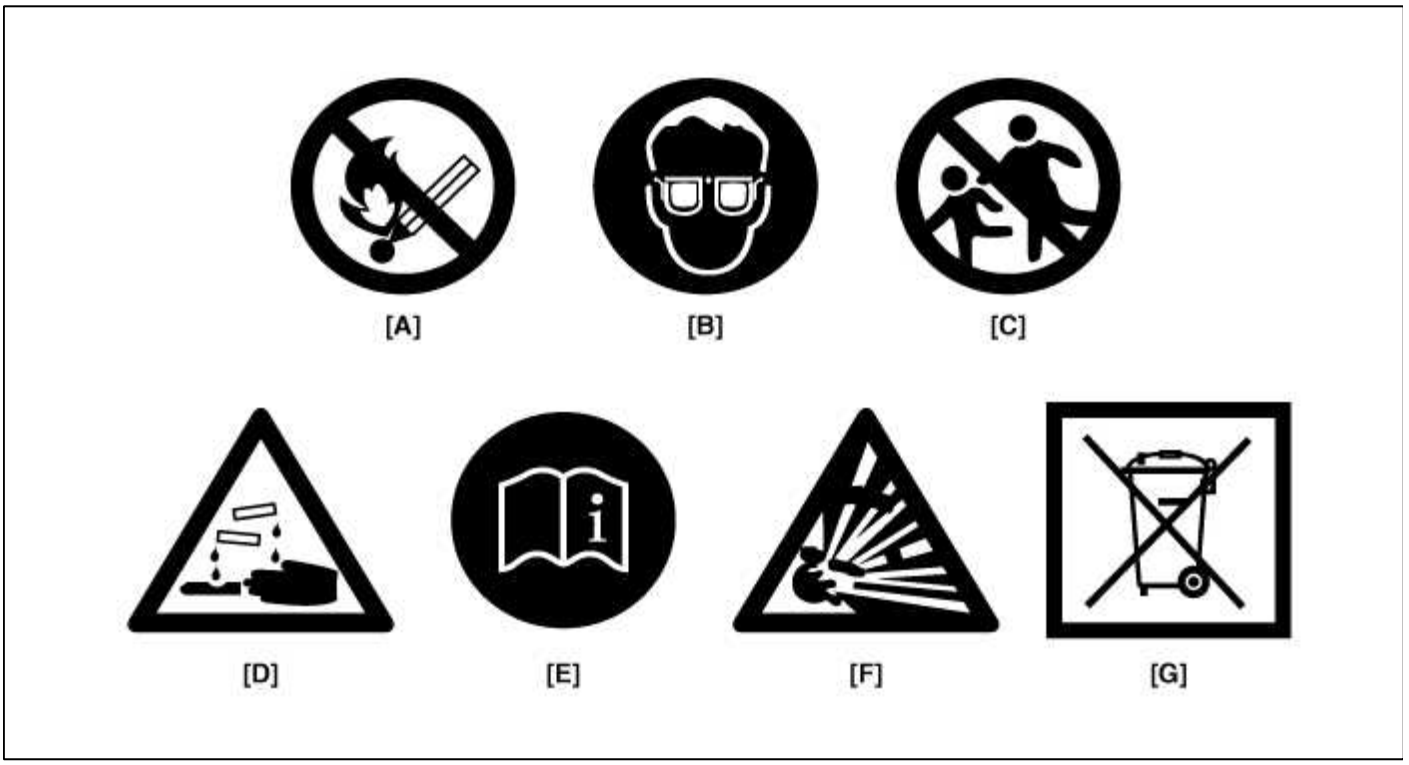
4. Production month
   - 1 : January
   - 2 : February
   - 3 : March
   - 4 : April
   - 5 : May
   - 6 : June
   - 7 : July
   - 8 : August
   - 9 : September
   - A : October
   - B : November
   - C : December
5. Transaxle production sequence number
   - 00001 ~ 99999

Warning / Caution Label Locations



1. Radiator Cap Caution 2. Battery Caution	3. Fan Caution 4. Coolant Level Caution

Battery Caution Label Describtion



Warning / Caution Label (Cont'd)

A.
Keep lighted cigarettes and all other flames or sparks away from the battery.

B.
Wear eye protection when charging or working near a battery. Always provide ventilation when working in an enclosed space.

- When lifting a plastic-cased battery, excesive pressure on acid to leak resulting in personal injury. Lift with a battery carrier or with your hands on opposite corners.
- Never attempt to change the battery when the battery cables are connected.
- The electrical ignition system works with high voltage.
  Never touch these components with the engine running or the ignition switched on.

C.
Keep batteries out of the reach of children because batteries contain highly corrosive SULFURIC ACID. Do not allow battery acid to contact your skin, eyes, clothing or paint finish.

D.
If any electrolyte gets into your eyes, flush your eyes with clean water for at least 15 minutes and get immediate medical attention. If possible, continue to apply water with a sponge or cloth until medical attention is received.
If electrolyte gets on your skin, throughly wash the contacted area. If you feel a pain or a burning sensation, get medical attention immediately.

E.
Always read the following instructions carefully when handing a battery.

F.
Hydrogen, which is a highly combustible gas, is always presents in battery cells and may explode if ignited.

G.
An improperly disposed battery can be harmful to the environment and human health.
Always confirm local regurations for battery disposal.

Handling And Storage The Battery

Battery Itself	• Batteries should be stored in cool, dry (27 degrees Celsius) places and out of direct sunlight. • MF batteries are tightly sealed to prevent acid leakage. However, tilting the battery to an angle of 45 degrees can cause acid to leak through the vents on the sides. Therefore, batteries should always be stored in their upright positions. Prevent placing any aqueous or solid (i.e. conductors) bodies on top of the battery. • It is extremely dangerous to use tools, such as hammers, on the battery terminals when connecting cables to the mounted battery.
Battery on Vehicle	• When storing the vehicle for long periods of time, make sure to remove the memory fuse at junction box to prevent natural discharging. • Also, run the engine for battery charging within 1 month if the memory fuse wasn't removed from the start of vehicle storing. If the memory fuse was removed, run the engine for battery charging within 3 months from the start of vehicle storing.

NOTE

After reconnecting or recharging a discharged battery, the ESC OFF indicator may illuminate.
In this case, turn the handle half way to the left and right whilst the ignition switch is in the ON position.
Then, restart the engine after the ignition is OFF.
The ESC OFF indicator may turn OFF.
If the ESC OFF indicator does not turn OFF, have the system checked refering to DTC. (Refer to the BR group.)

Lift And Support Points

WARNING

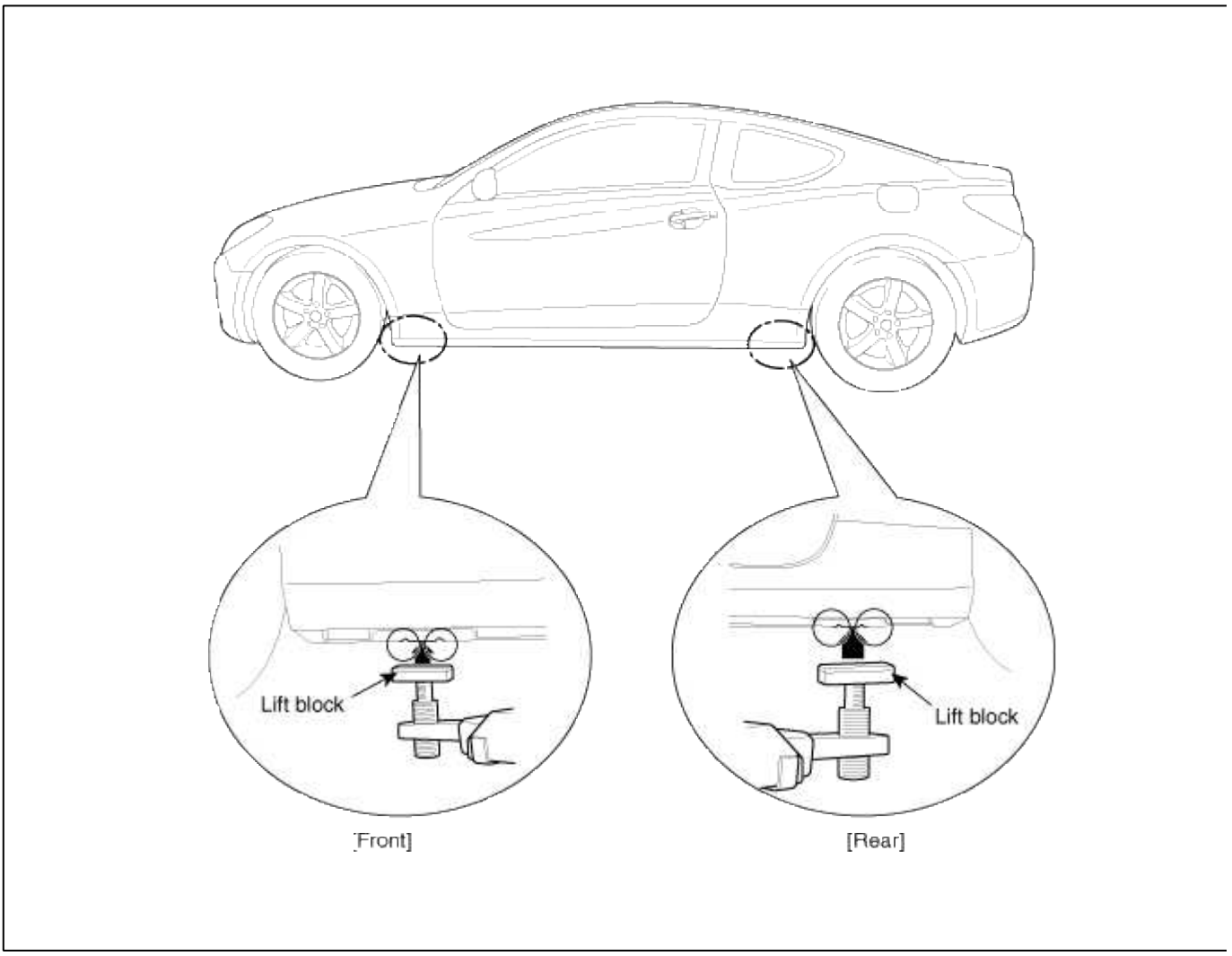
When heavy rear components such as suspension, fuel tank, spare tire, tailgate and trunk lid are to be removed, place additional weight in the luggage area before hoisting. When substatial weight is removed from the rear of the vehicle, the center of gravity may change and cam cause the vehicle to tip forward on the hoist.

NOTE

- Since each tire/wheel assembly weights approximately 30lbs (14kg), placing the front wheels in the luggage area can assist with the weight distribution.
- Use the same support points to support the vehicle on safety stands.

1. Place the lift blocks under the support points as shown in the illustration.
2. Raise the hoist a few inches (centimeters) and rock the vehicle to be sure it is firmly supported.

3. Raise the hoist to full height to inspect the lift points for secure support.



Towing

If the vehicle needs to be towed, call a professional towing service. Never tow vehicle with just a rope or chain. It is very dangerous.

Emergency Towing

There are three popular methods of towing a vehicle :

- The operator loads the vehicle on the back of truck. This is best way of transporting the vehicle.
- The tow truck uses two pivoting arms that go under the tires of the driving axle and lift them off the ground. The other two wheels remain on the ground.
- The tow truck uses metal cables with hooks on the ends. These hooks go around parts of the frame or suspension, and the cables lift that end of the vehicle off the ground. The vehicle's suspension and body can be seriously damaged if this method of towing is attempted.

If the vehicle cannot be transported by flat-bed, should be towed with the wheels of the drivig axle off the ground and do the following :

Manual Transaxle

- Release the parking brake.
- Shift the Transaxle to neutral

Automatic Transaxle

- Release the parking brake.
- Start the engine.
- Shift to [D] position, then [N] position.

- Turn off the engine.

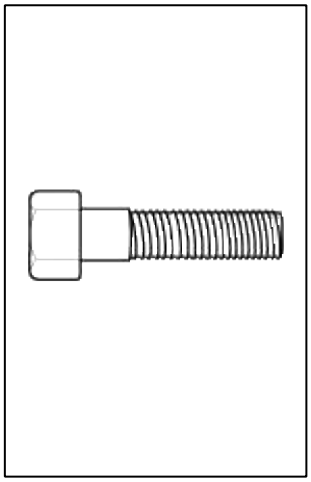
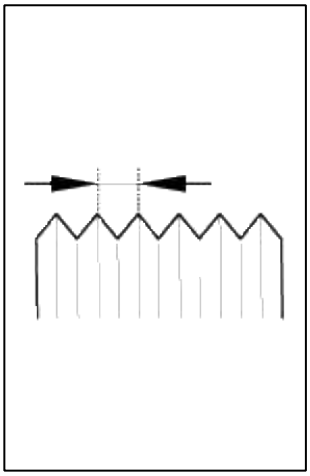
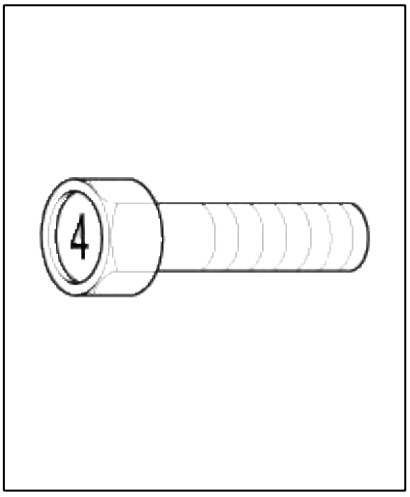
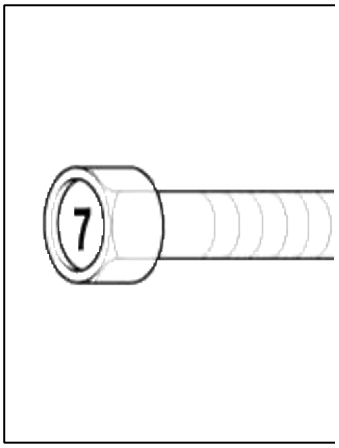
CAUTION

- The vehicle equipped with full-time 4WD should be only transported on a flat-bed.
- Improper towing preparation will damage the transaxle. follow the above procedure exactly. If you cannot shift the transaxle or start the engine(automatic transaxle), your vehicle must be transported on a flatbed.
- It is the best to tow vehicle no farther than 30km (19miles), and keep the speed below 50km/h (30mph). (For the full-time 4WD vehicle, limit the towing to 1.5km (1mile) and 15km/h (10mph)
- Trying to lift or tow your vehicle by the bumpers will cause serious damage. The bumpers are not designed to support the vehicle's weight.

Front :

Rear :

Tightening Torque Table Of Standard Parts

Bolt niminal diameter (mm)	Pich (mm)	Torque Nm (kg.cm, lb.ft)	
		Head Mark 4	Head Mark 7
			
M5	0.8	3 ~ 4 (30 ~ 40, 2.2 ~ 2.9)	5 ~ 6 (50 ~ 60, 3.6 ~ 4.
M6	1.0	5 ~ 6 (50 ~ 50, 3.6 ~ 4.3)	9 ~ 11 (90 ~ 110, 6.5 ~
M8	1.25	12 ~ 15 (120 ~ 150, 9 ~ 11)	20 ~ 25 (200 ~ 250, 14. 18.0)
M10	1.25	25 ~ 30 (250 ~ 300, 18 ~ 22)	30 ~ 50 (300 ~ 500, 22 ~
M12	1.25	35 ~ 45 (350 ~ 450, 25 ~ 33)	60 ~ 80 (600 ~ 800, 43 ~
M14	1.5	75 ~ 85 (750 ~ 850, 54 ~ 61)	120 ~ 140 (1,200 ~ 1,400 100)
M16	1.5	110 ~ 130 (1,100 ~ 1,300, 80 ~ 94)	180 ~ 210 (1,800 ~ 2,100 ~ 150)
M18	1.5	160 ~ 180 (1,600 ~ 1,800, 116 ~ 130)	260 ~ 300 (2,600 ~ 3,000 ~ 215)
M20	1.5	220 ~ 250 (2,200 ~ 2,500, 160 ~ 180)	360 ~ 420 (3,600 ~ 4,200 ~ 300)
M22	1.5	290 ~ 330 (2,900 ~ 3,300, 210 ~ 240)	480 ~ 550 (4,800 ~ 5,500 ~ 400)
M24	1.5	360 ~ 420 (3,600 ~ 4,200, 260 ~ 300)	610 ~ 700 (6,100 ~ 7,000 ~ 505)

NOTE

- The torques shown in the table are standard values under the following conditions :
• Nuts and bolts are made of galvanized steel bar.
• Galvanized plain steel washers are inserted.
• All nuts, bolts and plain washers are dry.
- The torques shown in the table are not applicable :
• When spring washers, toothed washers and the like are inserted.
• If plastic parts are fastened.
• If self-tapping screws or self-locking nuts are used.
• If threads and surfaces are coated with oil.
- If you reduce the torques in the table to the percentage indicated below, under the following conditions, if will be the standard value.
• If spring washers are used : 85%
• If threads and bearing surfaces are stained with oil : 85%

General Service Information

Protection Of The Vehicle

Always be sure to cover fenders, seats, and floor areas before starting work.

CAUTION

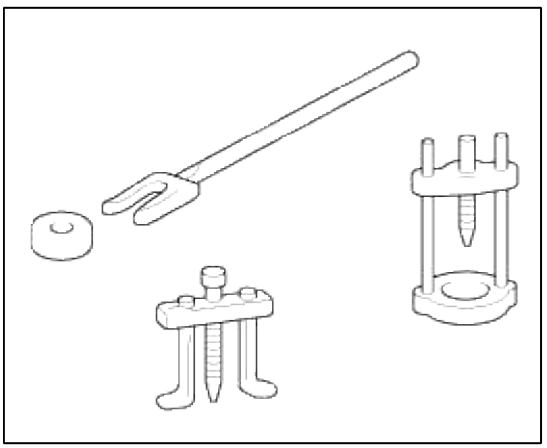
The support rod must be inserted into the hole near the edge of the hood whenever you inspect the engine compartment to prevent the hood from falling and causing possible injury.
Make sure that the support rod has been released prior to closing the hood. Always check to be sure the hood is firmly latched before driving the vehicle.

Preparation Of Tools And Mesuring Equipment

Be sure that all necessary tools and measuring equipment are available starting work.

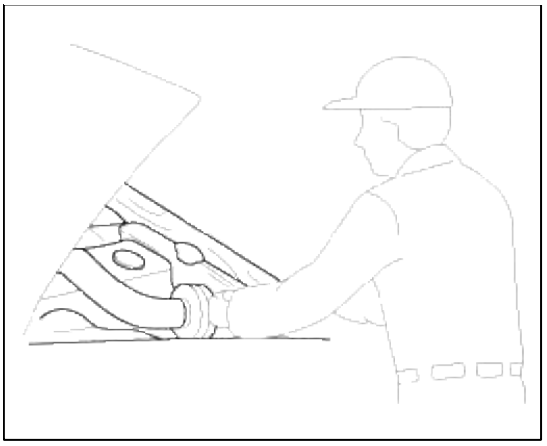
Special Tools

Use special tools when they are required.



Removal Of Parts

First find the cause of the problem and then determine whether removal or disassembly before starting the job.

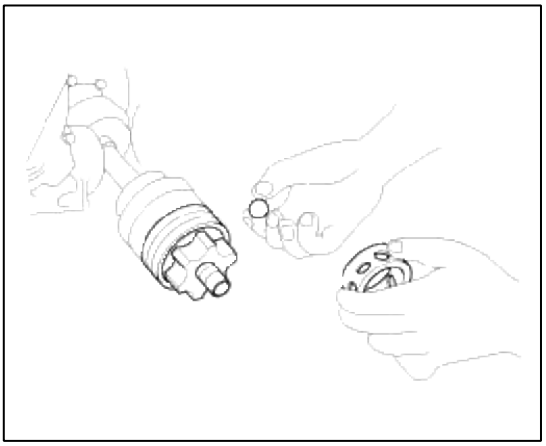


Disassembly

If the disassembly procedure is complex, requiring many parts to be disassembled, all parts should be disassembled in a way that will not affect their performance or external appearance.

1. **Inspection of parts**

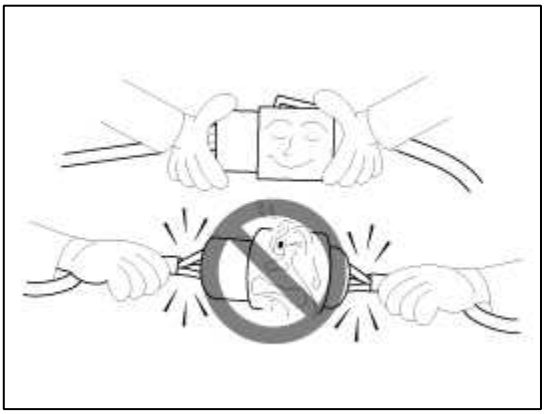
   Each part, when removed, should be carefully on suspected for malfunction, deformation, damage, and other problems.



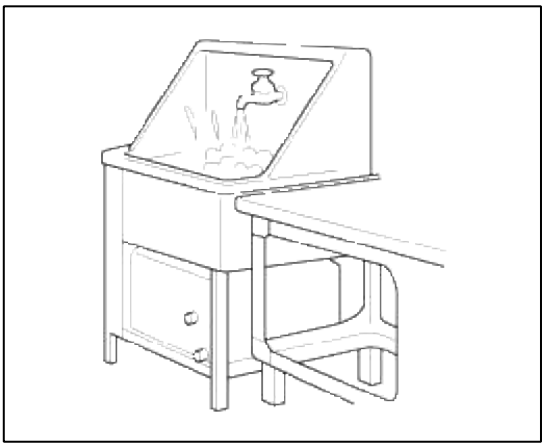
2. **Arrangement of parts**

   All disassembled parts should be carefully arranged for effective reassembly.

   Be sure to separate and correctly identify the parts to be replaced from those that will be used again.



3. **Cleaning parts for reuse**
   All parts to be used again should be carefully and thoroughly cleaned by an appropriate method.

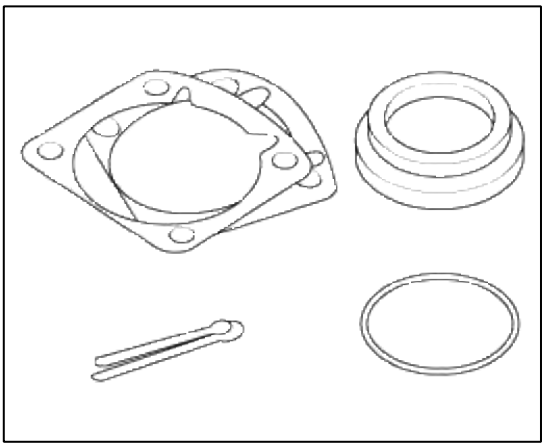


Parts
When replacing parts, use HYUNDAI genuine parts.

Replacement
Standard values, such as torques and certain adjustments, must be strictly observed in the reassembly of all parts.
If removed, the following parts should always be replaced with new ones.

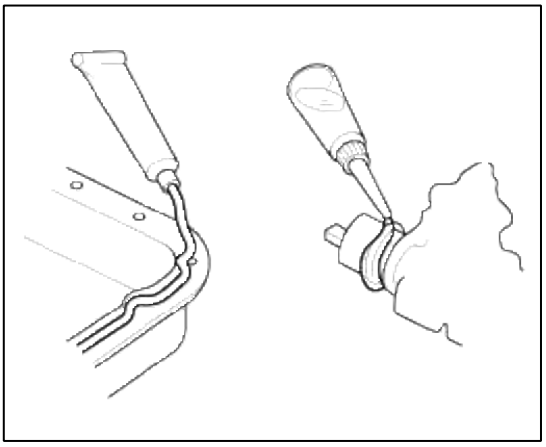
1. Oil seals
2. Gaskets
3. O-rings
4. Lock washers
5. Cotter pins (split pins)

6. Plastic nuts



Depending on their location.

7. Sealant should be applied to gaskets.
8. Oil should be applied to the moving components of parts.
9. Specified oil or grease should be applied to the prescribed locations (oil seals, etc) before assembly.

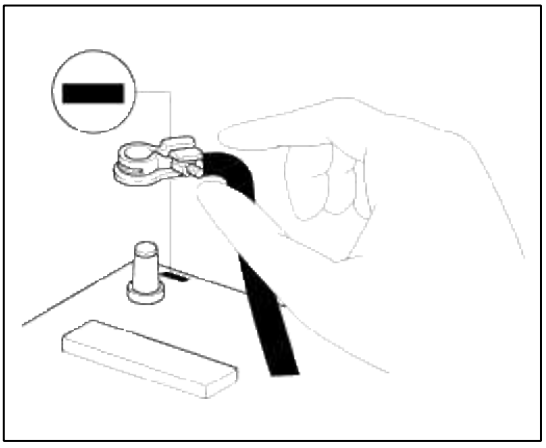


Adjustment

Use gauges and testers to adjust correctly the parts to standard values correctly.

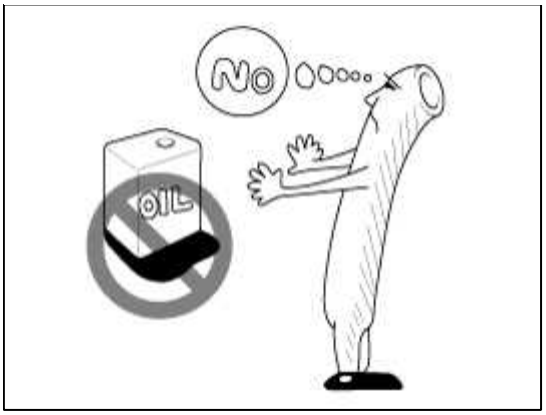
Electrical System

1. Be sure to disconnect the battery cable from the negative (-) terminal of the battery.
2. Never pull on the wires when disconnecting connectors.
3. Locking connectors will click when the connector is secure.
4. Handle sensors and relays carefully. Be careful not to drop them against other parts.



Ruber Parts And Tubes

Always prevent gasoline or from touching rubber parts or tubing.

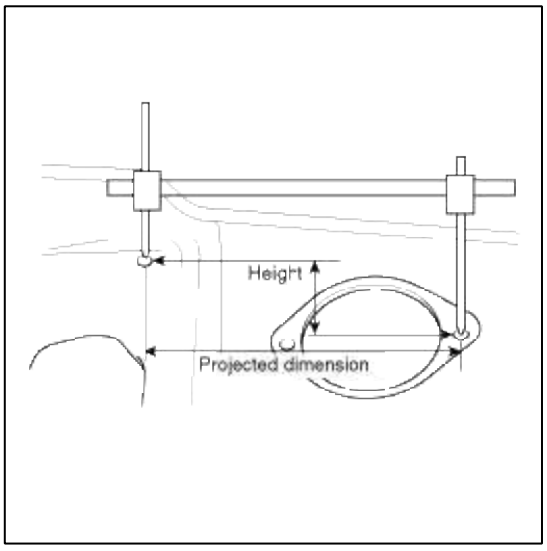


Measuring Body Dimensiongs

1. Basically, all measurements in this manual are taken with a tracking gauge.
2. When a measuring tape is used, check to be sure there is no elongation, twisting or bending.
3. For measuring dimensions, both projected dimensions and actual - measurement dimensions are used in this manual.

Dimensions Projected

1. These are the dimensions measured when the measurement points are projected from the vehicle's surface, and are the reference dimensions used for used for body alterations.
2. If the length of the tracking gauge probes is adjustable, measure it by lengthening one of two probes as long as the different value in height of the two surface.

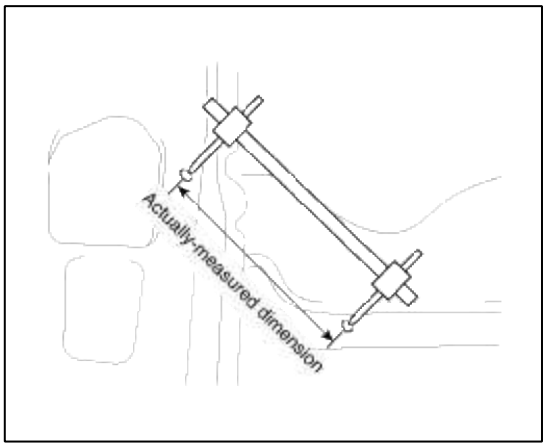


Measuring Actual Dimensions

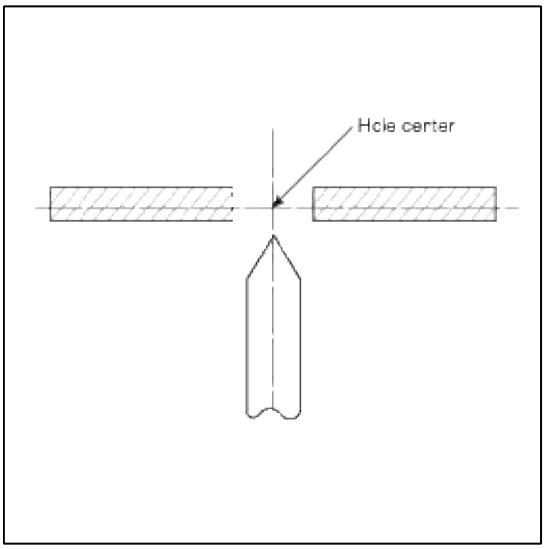
1. These dimensions indicate the actual linear distance between measurement points, and are used as the reference dimensions when a tracking gauge is used for measurement.

2. First adjust both probes to the same length (A=A') before measurement.

> NOTE
>
> Check the probes and gauge itself to make sure there is no free play.



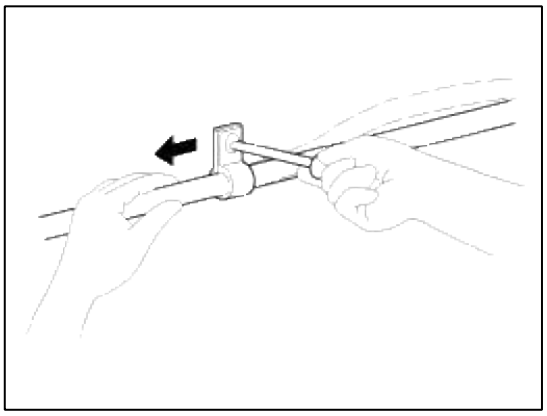
Measurement Point
Measurements should be taken at the center of the hole.



Checking Cables And Wires

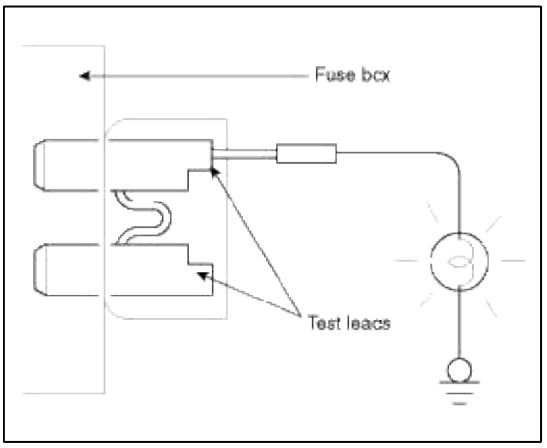
1. Check the terminal for tightness.
2. Check terminals and wires for corrosion from battery electrolyte, etc.
3. Check terminals and wires for open circuits.
4. Check wire insulation and coating for damage, cracks and degrading.
5. Check the conductive parts of terminals for contact with other metallic parts (vehicle body and other parts).
6. Check grounded parts to verify that there is complete continuity between their attaching bolt(s) and the vehicle's body.
7. Check for incorrect wiring.
8. Check that the wiring is so clamped to the prevent contact with sharp corners of the vehicle body, etc. or hot parts (exhaust manifold, etc.)
9. Check that the wiring is clamped firmly to provide enough clearance from the fan pulley, fan belt and other rotating or moving parts.

10. Check that the wiring has a little space so that it can vibrate between fixed and moving parts such as the vehicle body and the engine.



Check Fuses

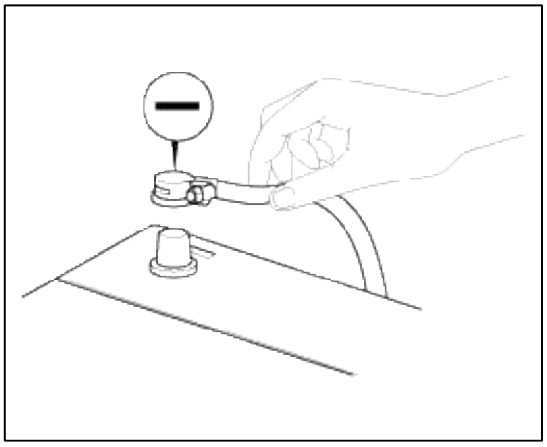
A blade type fuse test taps provided to allow checking the fuse itself without removing if from the fuse box. The fuse is good if the test lamp lights up when one lead is connected to the test taps (one at a time) and the other lead is grounded. (Turn the ignition switch so that the fuse circuit becomes operative)



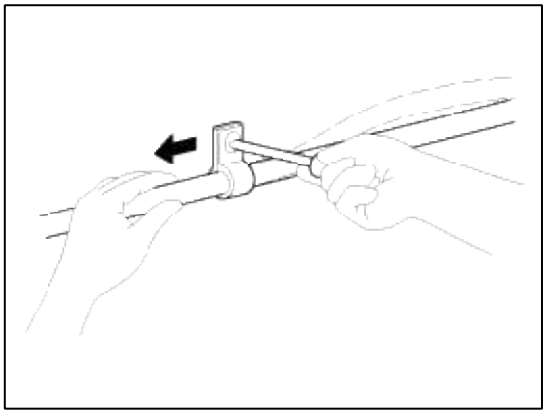
Serivicing The Electrical System

1. Prior to servicing the electrical system, be sure to turn off the ignition switch and disconnect the battery ground cable.

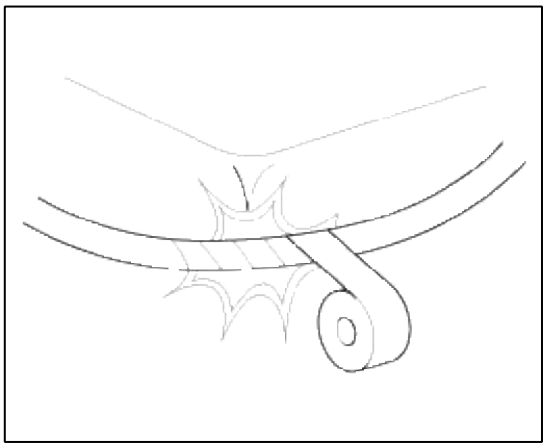
> NOTE
>
> In the course of MFI or ELC system diagnosis, when the battery cable is removed, any diagnostic trouble code retained by the computer will be cleared. There fore, if necessary, read the diagnostic before removing the battery cable.



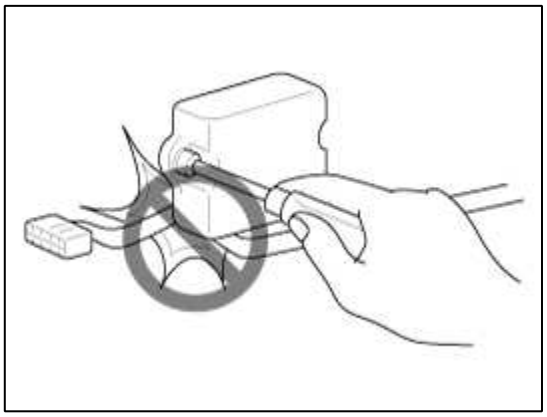
2. Attach the wiring harnesses with clamps so that there is no slack. However, for any harness which passes the engine or other vibrating parts of the vehicle, allow some slack within a range that does not allow the engine vibrations to cause the harness to come into contact with any of the surrounding parts and then secure the harness by using a clamp.



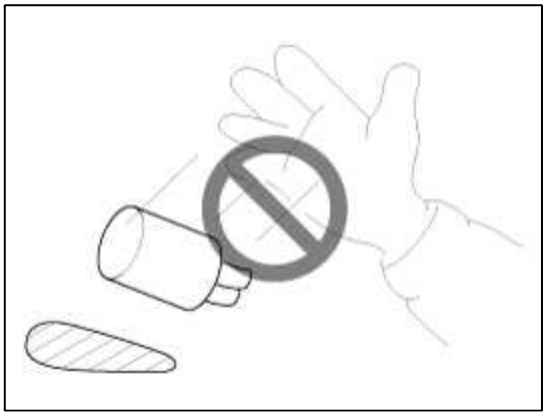
3. If any section of a wiring harness interferes with the edge of a parts, or a corner, wrap the section of the harness with tape or something similar in order to protect if from damage.



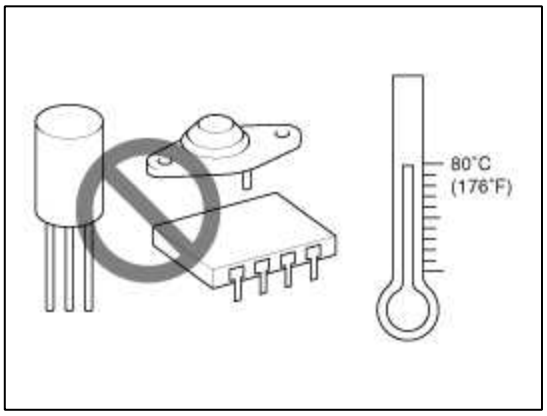
4. When installing any parts, be careful not to pinch or damage any of the wiring harness.



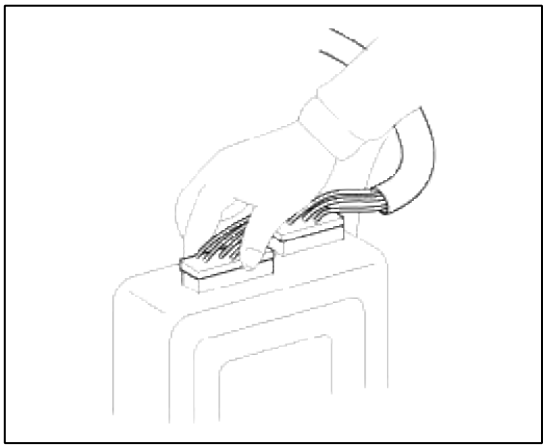
5. Never throw relays, sensors or electrical parts, or expose them to strong shock.



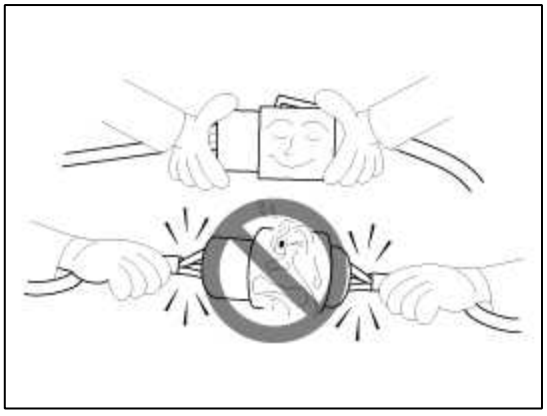
6. The electronic parts used in the computer, relays, etc. are readily damaged by heat. If there is a need for service operations that may cause the temperature to exceed 80°C (176°F), remove the electronic parts before hand.



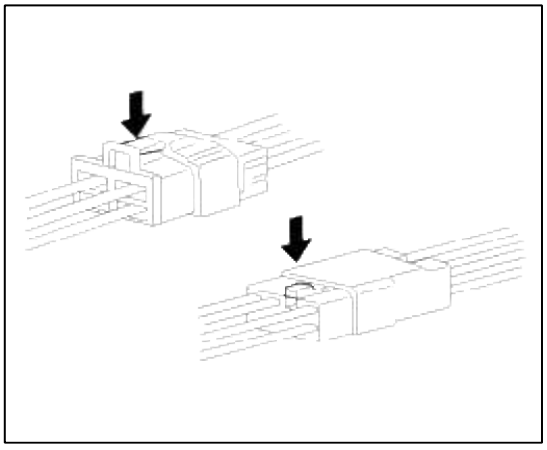
7. Loose connectors cause problems. Make sure that the connectors are always securely fastened.



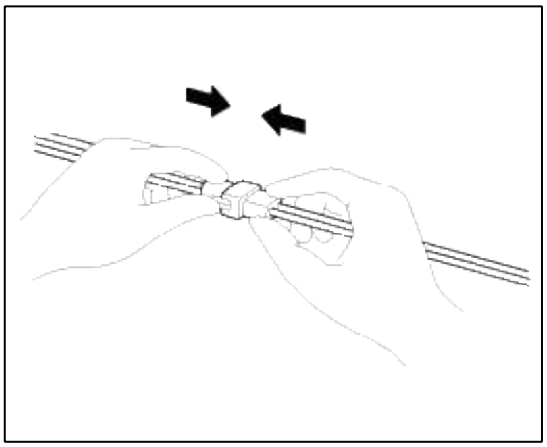
8. When disconnecting a connector, be sure to grip only the connector, not the wires.



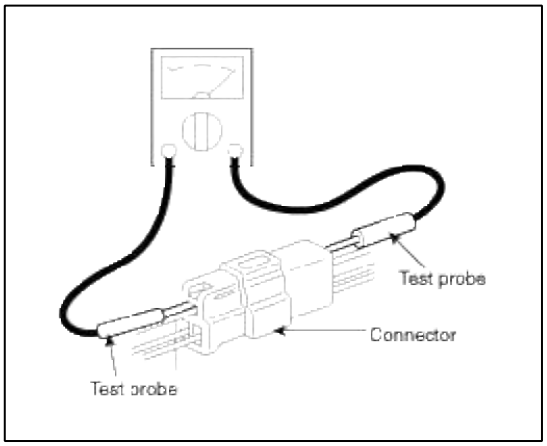
9. Disconnect connector which have catches by pressing in the direction of the arrows shown the illustration.



10. Connect connectors which have catches by inserting the connectors until they make a clicking sound.



11. When using a circuit tester to check continuity or voltage on connector terminals, insert the test probe into the harness side. If the connector is a sealed connector, insert the test probe through the hole in the rubber cap until contacts the terminal, being careful not to damage the insulation of the wires.



12. To avoid overloading the wiring, take the electrical current load of the optional equipment into consideration, and determine the appropriate wire size.

Noeminal size	SAE gauge No.	Permissible current	
		In engine compartment	Other areas
0.3mm²	AWG 22	-	5A
0.5mm²	AWG 20	7A	13A
0.85mm²	AWG 18	9A	17A
1.25mm²	AWG 16	12A	22A
2.0mm²	AWG 14	16A	30A
3.0mm²	AWG 12	21A	40A
5.0mm²	AWG 10	31A	54A

Precautions For Catalytic Converter

CAUTION

If a large amount of unburned gasolined gasoline flow into the converter, it may overheat and create a fire hazard. To prevent this observe the following precations and explain them to your customer.

1. Use only unleaded gasoline.
2. Do not run the engine while the car is at rest for a long time. Avoid running the engine at fast idle for more than 10minutes and idle speed for more than 20 minutes.

3. Avoid start-jump tests. Do start-jumps only when absolutely necessary. Perform this test as rapidly as possible and, while testing, never race the engine.
4. Do not measure engine compression for and extended time. Engine compression tests must be made as rapidly as possible.
5. Avoid coasting with the ignition turned and during prolonged braking.
6. Do not dispose of used catalytic converter together with parts contaminated with gasoline or oil.

GENESIS COUPE(BK) > 2013 > G 2.0 T-MPI > Automatic Transaxle System

Automatic Transaxle System > General Information > Specifications

Specifications

Item		Specifications
Transmission type		A8LR1
Engine model		Gasoline 2.0 TCI
Torque converter type		3-element, 1-stage, 2-phase type
Oil pump system		Internal gear type
Friction elements		Clutch: 4EA
		Brake: 2EA
		OWC : 1EA
Planetary gear		3EA
Gear ration	1st	3.964
	2nd	2.468
	3rd	1.61
	4th	1.176
	5th	1
	6th	0.832
	7th	0.652
	8th	0.565
	Reverse	2.273
Final gear ratio		4.181
Accumulator		6EA
Solenoid valve		9EA
Shift lever position		4 Range (P,R,N,D)
Oil filter		1EA

* VFS: Variable Force Solenoid

Sensors

Input Speed Sensor

Type: Hall effect sensor

Specifications

Operation condition (°C)°F		((-)40 ~ 150)) -40 ~ 302
Air gap(mm)in.		1.3(0.0512)
Output voltage (V)	High	1.4
	Low	0.7

Middle Speed Sensor

Type: Hall effect sensor

Specifications

Operation condition (°C)°F		((-)40 ~ 150)) -40 ~ 302
Air gap(mm)in.		1.3(0.0512)
Output voltage (V)	High	1.4
	Low	0.7

Output Speed Sensor

Type: Hall effect sensor

Specifications

Operation condition (°C)°F		((-)40 ~ 150)) -40 ~ 302
Air gap(mm)in.		1.3(0.0512)
Output voltage (V)	High	1.4
	Low	0.7

Oil Temperature Sensor

Type: Negative thermal coefficient type

Specifications

Temp.[(°C)°F]	**Resistance (kΩ)**
(-40)-40	139.5
(-20)-4.0	47.4
(0)32.0	18.6
(20)68.0	8.10
(40)104.0	3.80
(60)140.0	1.98
(80)176.0	1.08
(100)212.0	0.63
(120)248.0	0.38
(140)284.0	0.25
(150)302.0	0.16

Inhibitor Switch

Type: Combination of output signals from 4 terminals

Specifications

Power supply (V)	12
Output type	Pin to Pin

Solenoid Valves

Direct control VFS[UD/C, 27/B, 6/C]

Control type : Normal low type

Control Pressure kpa (kgf/cm², psi)	0 ~ 1569.06 (0 ~ 16,0 ~ 227.57)
Current value (mA)	0 ~ 1100
Internal resistance (Ω)	5.0 ~ 5.6

Direct control VFS[8LR/B]

Control type : Normal low type

Control Pressure kpa (kgf/cm², psi)	0 ~ 2108.42 (0 ~ 21.5 ~ 305.80)
Current value (mA)	0 ~ 1100
Internal resistance (Ω)	5.0 ~ 5.6

Direct control VFS[4&OD/C]

Control type : Normal high type

Control Pressure kpa (kgf/cm², psi)	0 ~ 1569.06 (0 ~ 16,0 ~ 227.57)
Current value (mA)	0 ~ 1100
Internal resistance (Ω)	5.0 ~ 5.6

Direct control VFS[35R/C]

Control Type : Normal high type

Control Pressure kpa (kgf/cm², psi)	0 ~ 2108.42 (0 ~ 21.5 ~ 305.80)
Current value (mA)	0 ~ 1100
Internal resistance(Ω)	5.0 ~ 5.6

Line Pressure Control VFS

Control type : Normal high type

Control Pressure kpa (kgf/cm², psi)	0 ~ 500.14 (0 ~ 5.1,0 ~ 72.54)
Current value (mA)	0 ~ 850
Internal resistance (Ω)	4.8 ~ 5.4

Damper Clutch Control VFS

Control type : Normal low type

Control Pressure kpa (kgf/cm², psi)	0 ~ 500.14 (0 ~ 5.1, 0 ~ 72.54)
Current value (mA)	0 ~ 850
Internal resistance (Ω)	4.8 ~ 5.4

ON/OFF Solenoid Valve

Control type : Normal low type

Control pressure kpa (kgf/cm², psi)	539.36 (5.5, 78.23)
Internal resistance (Ω)	10 ~ 11

Solenoid Valve Operation Table

	UD/C	4&OD/C	35R/C	27/B	8LR/B	6/C	ON/OFF
P		O		O			O
N		O	O		O		O
1	O	O	O				
2	O	O	O	O			
3	O	O					
4	O		O				
5							
6			O			O	
7			O	O			
8			O		O		
LOW	O	O	O		O		
REV		O			O		O

O : Connected status

Tightening Torques

Item	N.m	Kgf.m	lb-ft
TCM installation mounting bolt	9.8 ~ 11.8	1.0 ~ 1.2	7.2 ~ 8.7
Shift lever assembly bolt	8.8 ~ 13.7	0.9 ~ 1.4	6.5 ~ 10.1
Inhibitor switch mounting bolt	9.8 ~ 11.8	1.0 ~ 1.2	7.2 ~ 8.7
Oil drain plug	22.6 ~ 24.5	2.3 ~ 2.5	16.6 ~ 18.1
Oil check plug	22.6 ~ 24.5	2.3 ~ 2.5	16.6 ~ 18.1
Torque converter mounting bolt	45.1 ~ 52.0	4.6 ~ 5.3	33.3 ~ 38.3
Automatic transaxle upper mounting bolt (TM=>Eng)	63.7 ~ 83.4	6.5 ~ 8.5	47.0 ~ 61.5
	34.3 ~ 46.1	3.5 ~ 4.7	25.3 ~ 34.0
Automatic transaxle lower mounting bolt (Eng=>TM)	42.2 ~ 48.1	4.3 ~ 4.9	31.1 ~ 35.4
Stater motor mounting bolt	49.0 ~ 63.7	5.0 ~ 6.5	36.2 ~ 47.0
Stater motor mounting nut	42.2 ~ 53.9	4.3 ~ 5.5	31.1 ~ 39.8

Lubricants

Item	Specified lubricant	Quantity
Transaxle fluid	GS CALTEX ATF SP-IV-RR Hyundai Genuine ATF SP-IV-RR	9.6L (2.535 U.S gal., 10.14 U.S.qt., 8.45 Imp.qt.)

Automatic Transaxle System > Automatic Transaxle System > Repair procedures

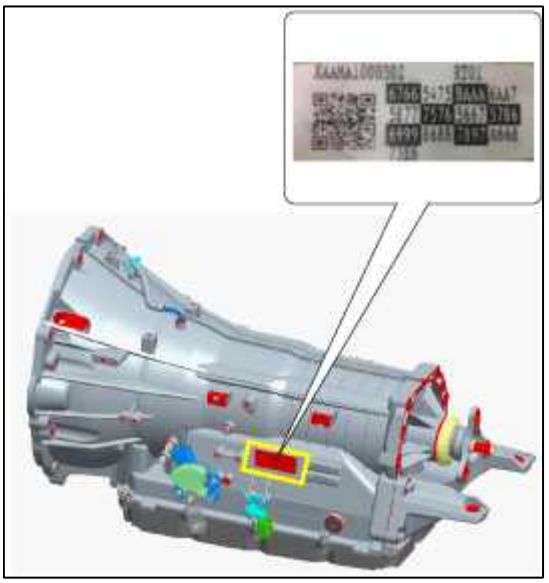
EOL Input

Description

When shift shock is occurred or parts related with the transaxle are replaced, EOL should be performed.
In the following case, EOL is required.

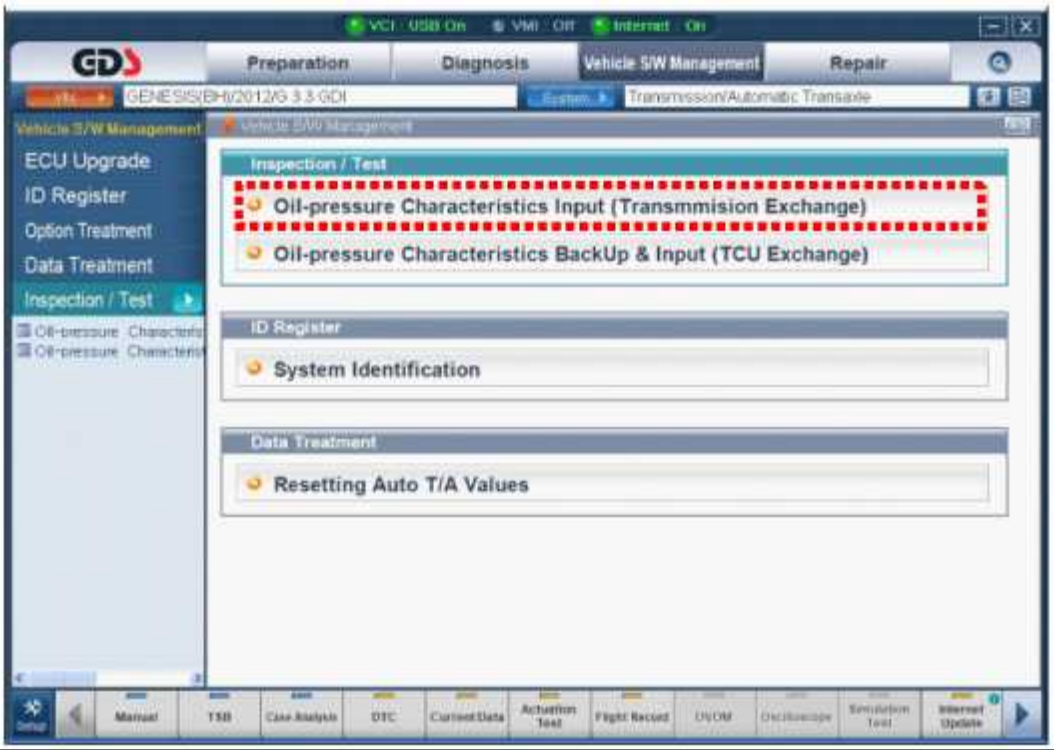
- Transaxle assembly replacement
- TCM replacement

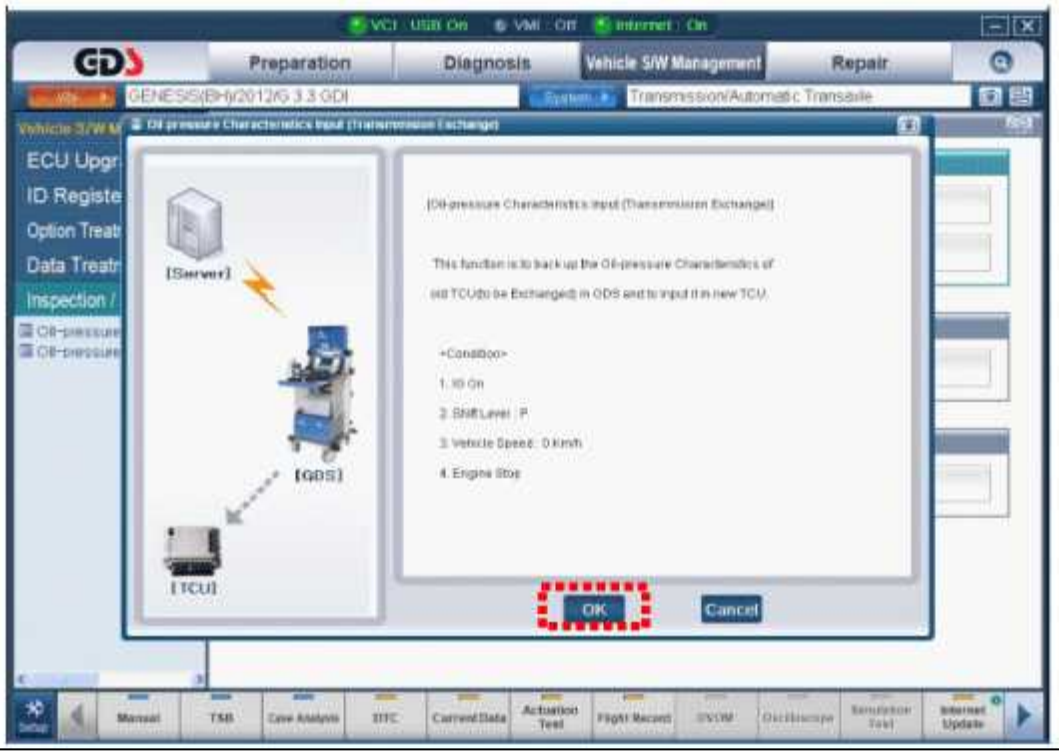
Bar code location



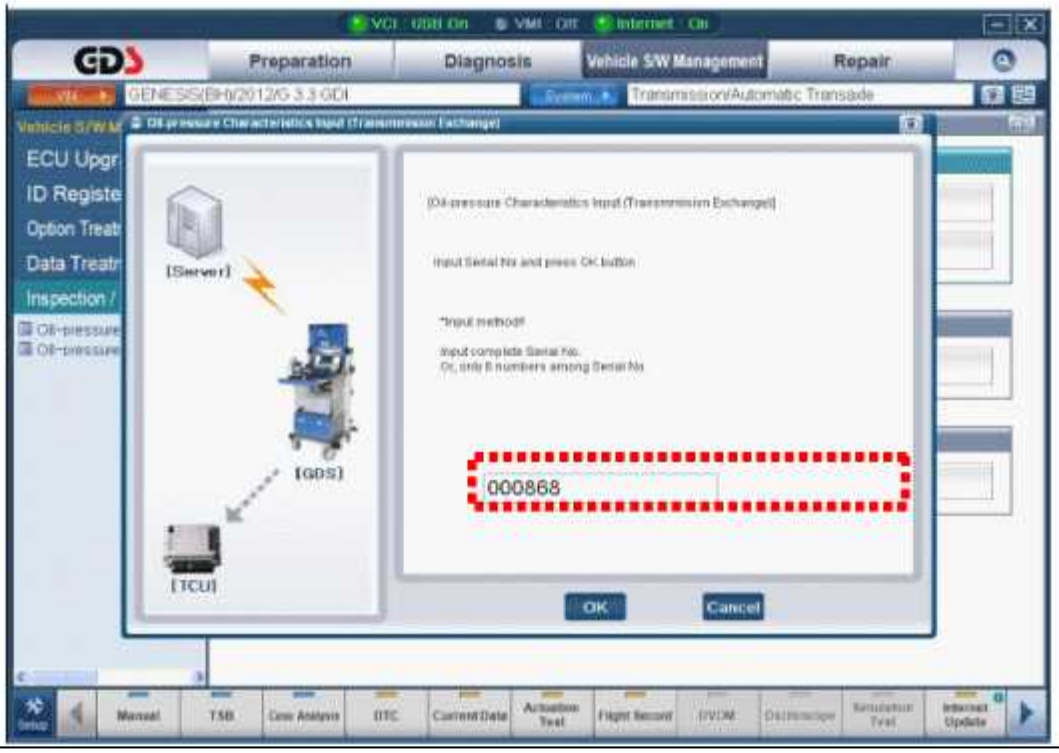
EOL Input procedure

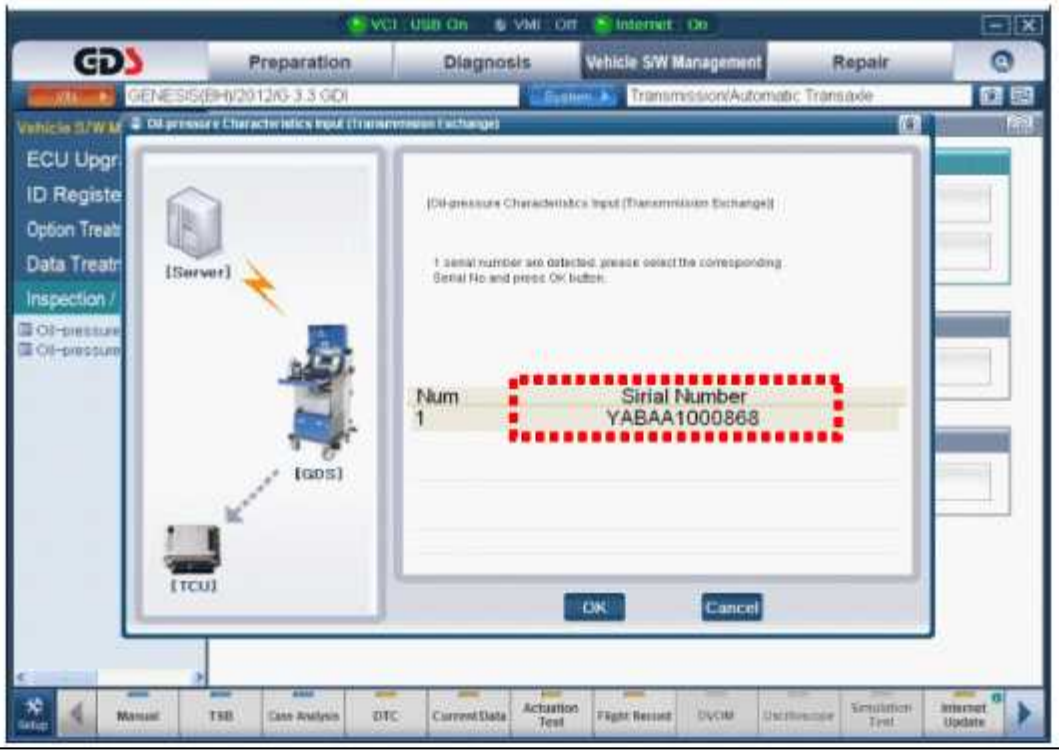
- Transaxle assembly replacement


Preparation
Diagnosis
Vehicle S/W Management
Repair
GENESIS(BH)2012/G 3.3 GDI
Transmission/Automatic Transaxle
ECU Upgrade
ID Register
Option Treatment
Data Treatment
Inspection / Test
Inspection / Test
Oil-pressure Characteristics Input (Transmmision Exchange)
Oil-pressure Characteristics BackUp & Input (TCU Exchange)
ID Register
System Identification
Data Treatment
Resetting Auto T/A Values

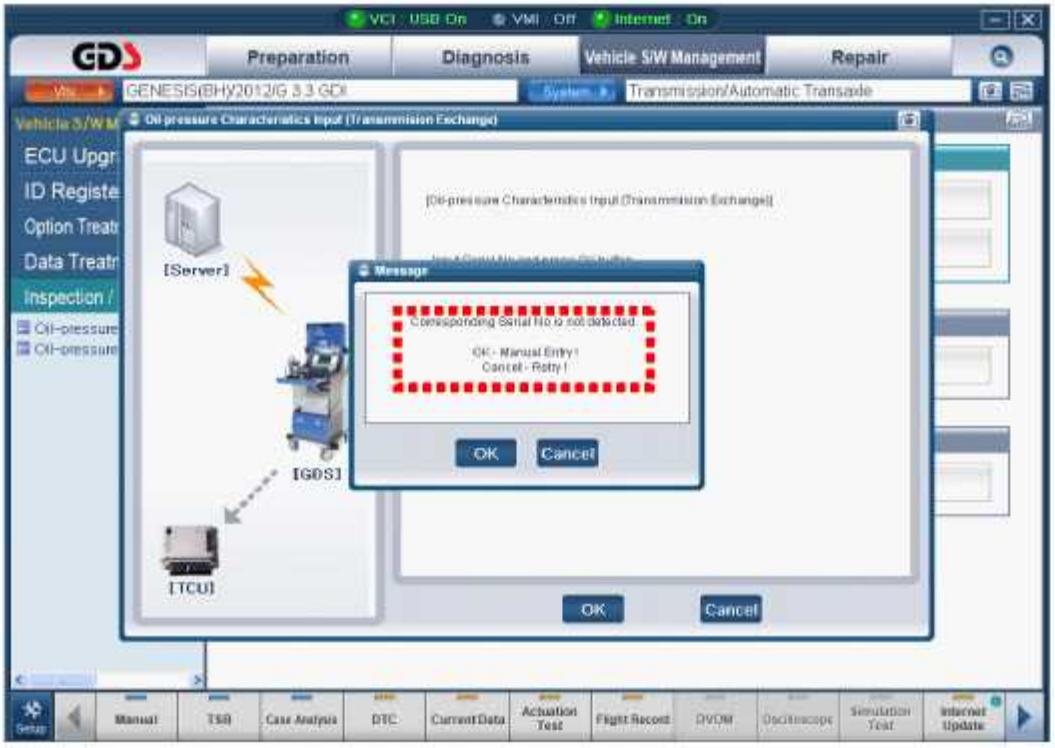

Preparation
Diagnosis
Vehicle S/W Management
Repair
GENESIS(BH)2012/G 3.3 GDI
Transmission/Automatic Transaxle
Oil-pressure Characteristics Input (Transmmision Exchange)
[Server]
[GDS]
[TCU]
[Oil-pressure Characteristics Input (Transmmision Exchange)]
This function is to back up the Oil-pressure Characteristics of old TCU(to be Exchanged) in ODS and to input it in new TCU.
<ConditIon>
1. IG On
2. Shift Lever : P
3. Vehicle Speed : 0 Km/h
4. Engine Stop
OK
Cancel

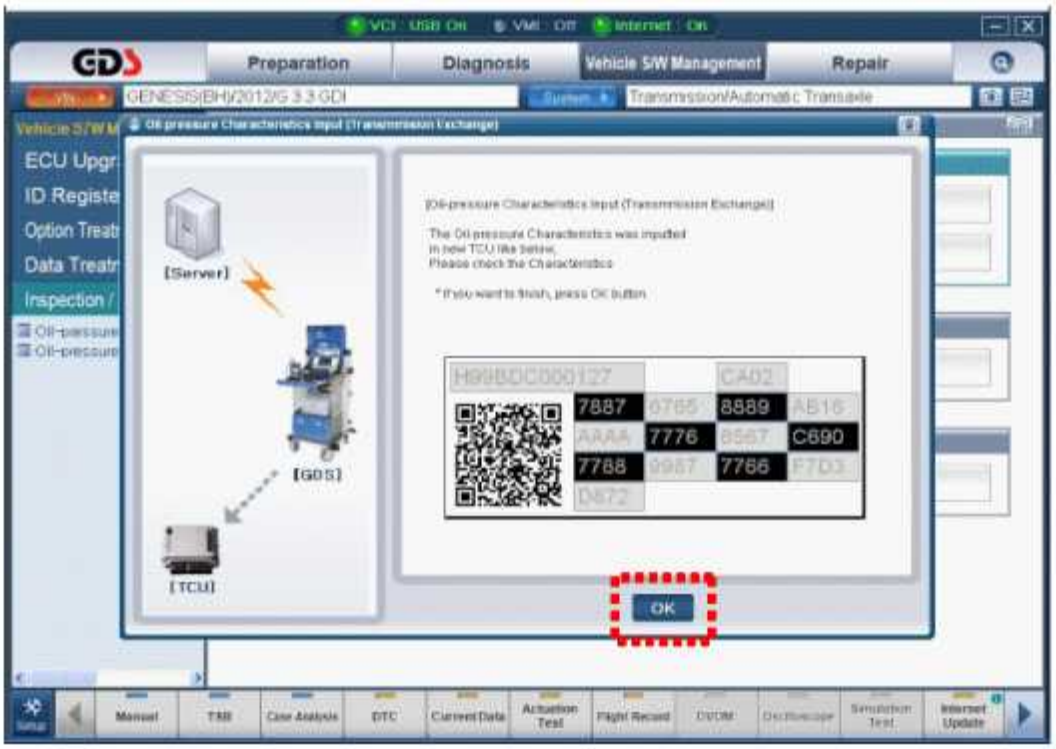
Internet :On



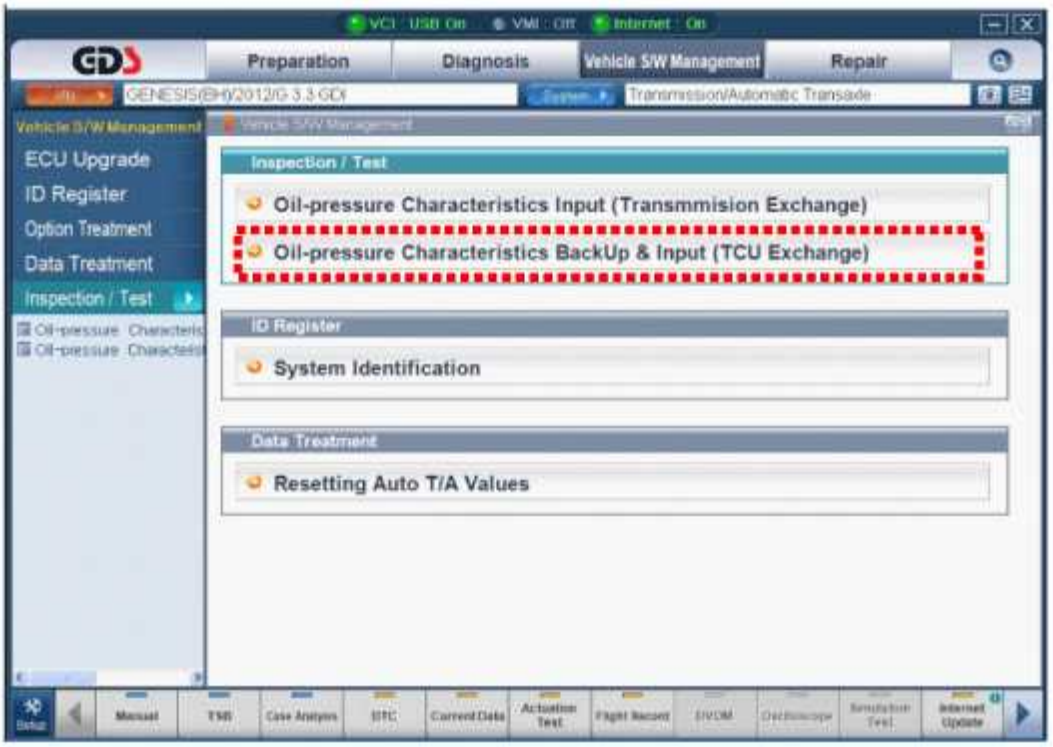


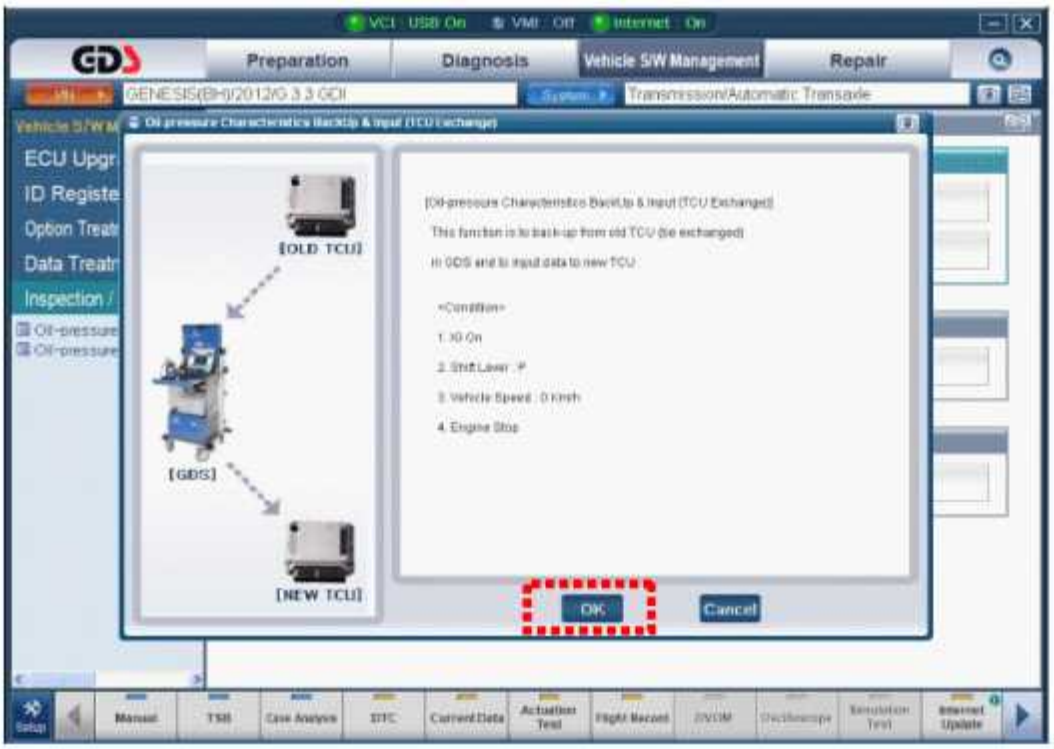
Internet :Off

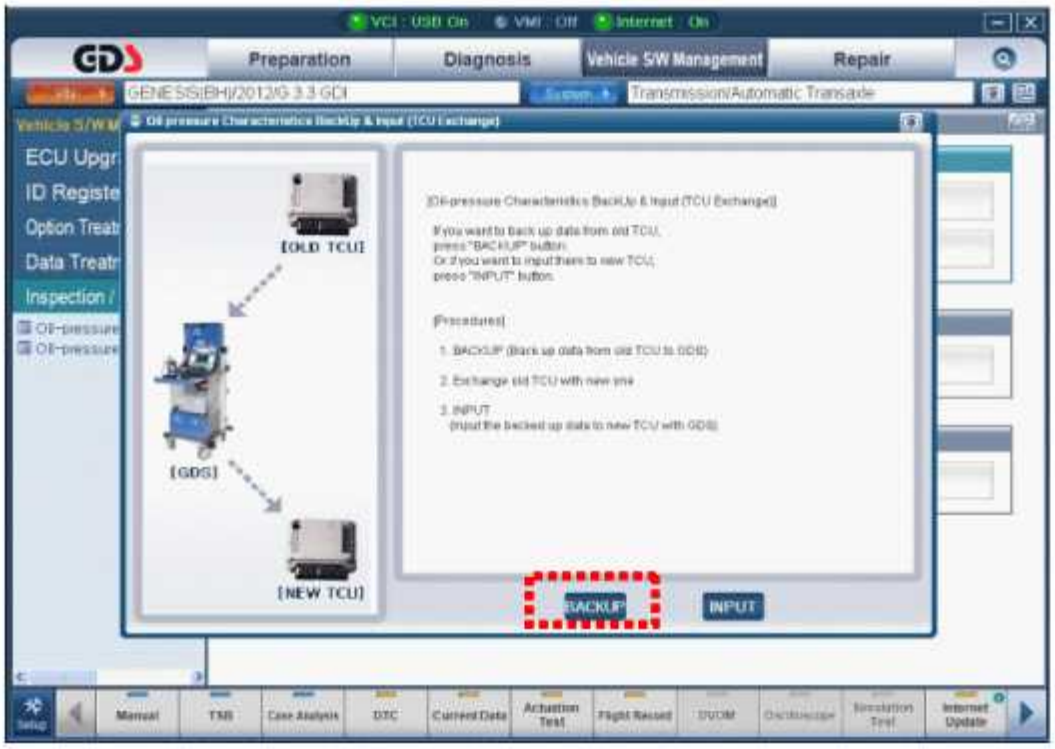


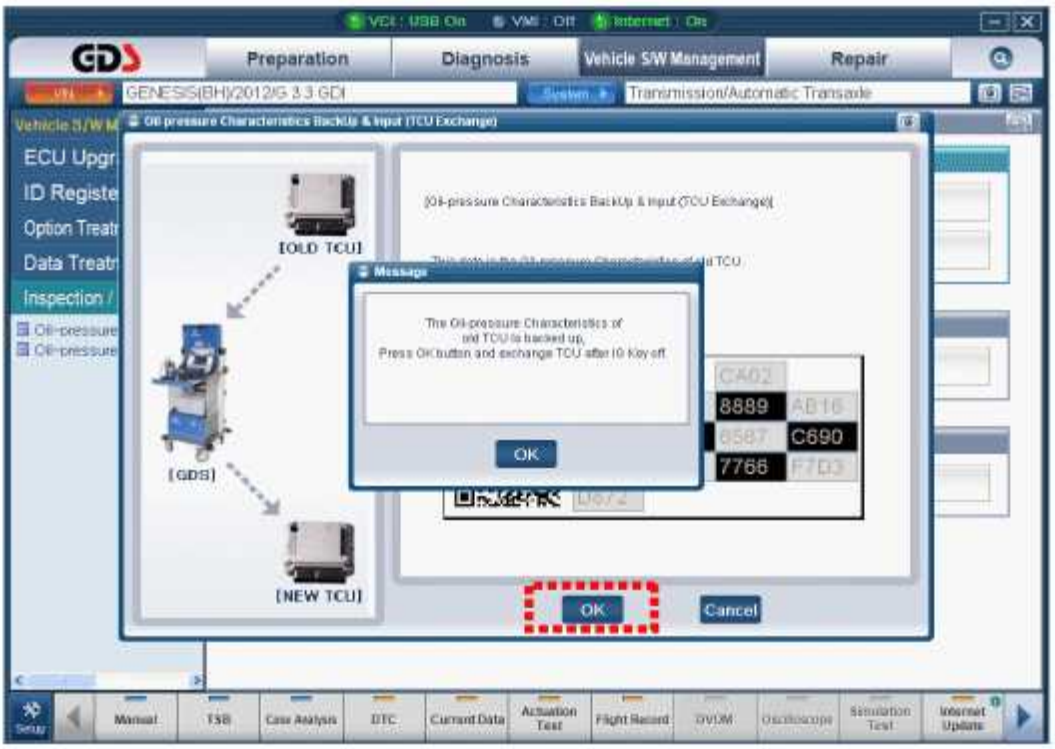


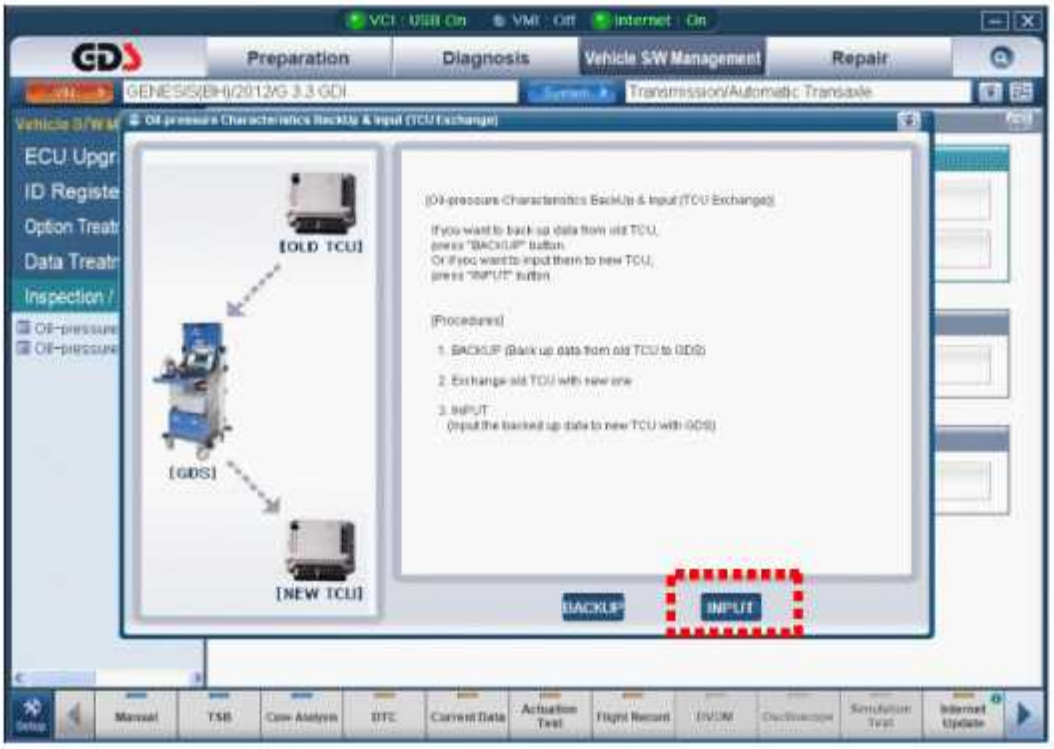
• TCM replacement

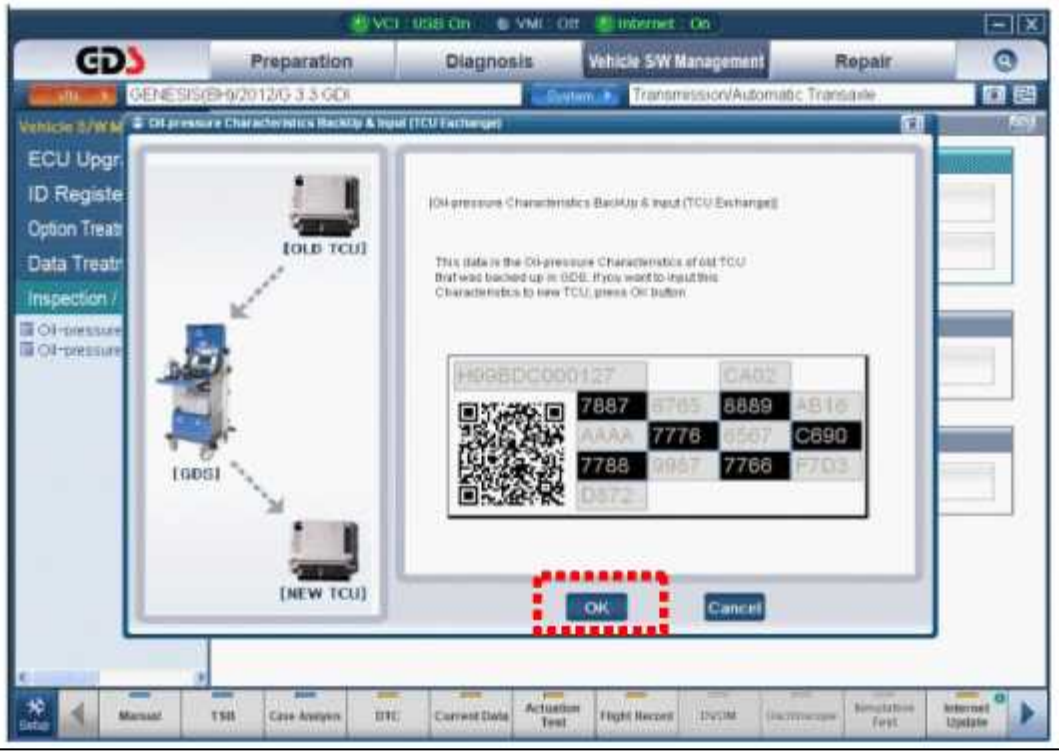

VCI : USB On
VMI : Off
Internet : On
Preparation
Diagnosis
Vehicle S/W Management
Repair
GENESIS(BH)/2012/G 3.3 GDI
Transmission/Automatic Transaxle
Vehicle S/W Management
ECU Upgrade
ID Register
Option Treatment
Data Treatment
Inspection / Test
Inspection / Test
Oil-pressure Characteristics Input (Transmmision Exchange)
Oil-pressure Characteristics BackUp & Input (TCU Exchange)
ID Register
System Identification
Data Treatment
Resetting Auto T/A Values


Preparation
Diagnosis
Vehicle S/W Management
Repair
[OLD TCU]
[GDS]
[NEW TCU]
OK
Cancel


VCI : USB On
VMI : Off
Internet : On
Preparation
Diagnosis
Vehicle S/W Management
Repair
GENESIS(BH)/2012/G 3.3 GDI
Transmission/Automatic Transaxle
Oil-pressure Characteristics Backup & Input (TCU Exchange)
ECU Upgr
ID Registe
Option Treat
Data Treatr
Inspection /
Oil-pressure
Oil-pressure
[OLD TCU]
[GDS]
[NEW TCU]
[Oil-pressure Characteristics Backup & Input (TCU Exchange)]
If you want to back up data from old TCU,
press "BACKUP" button.
Or if you want to input them to new TCU,
press "INPUT" button.
[Procedures]
1. BACKUP (Back up data from old TCU to GDS)
2. Exchange old TCU with new one
3. INPUT
(Input the backed up data to new TCU with GDS)
BACKUP
INPUT
Manual
TSB
Case Analysis
DTC
Current Data
Actuation Test
Flight Record
DVOM
Oscilloscope
Simulation Test
Internet Update


VCI : USB On
VMI : Off
Internet : On
Preparation
Diagnosis
Vehicle S/W Management
Repair
GENESIS(BH)/2012/G 3.3 GDI
Transmission/Automatic Transaxle
Oil-pressure Characteristics Backup & Input (TCU Exchange)
ECU Upgr
ID Registe
Option Treat
Data Treatr
Inspection /
Oil-pressure
Oil-pressure
[OLD TCU]
[GDS]
[NEW TCU]
[Oil-pressure Characteristics Backup & Input (TCU Exchange)]
Message
This Oil-pressure Characteristics of
old TCU is backed up.
Press OK button and exchange TCU after IG Key off.
OK
C402
8889
A016
8587
C690
7766
F7D3
U072
OK
Cancel
Manual
TSB
Case Analysis
DTC
Current Data
Actuation Test
Flight Record
DVOM
Oscilloscope
Simulation Test
Internet Update


VCI : USB On
VMI : Off
Internet : On
GDS
Preparation
Diagnosis
Vehicle S/W Management
Repair
GENESIS(BH)/2012/G 3.3 GDI
Transmission/Automatic Transaxle
Oil-pressure Characteristics BackUp & Input (TCU Exchange)
ECU Upgr
ID Registe
Option Treat
Data Treatr
Inspection /
Oil-pressure
Oil-pressure
[OLD TCU]
[GDS]
[NEW TCU]
(Oil-pressure Characteristics BackUp & Input (TCU Exchange))
If you want to back up data from old TCU,
press "BACKUP" button.
Or if you want to input them to new TCU,
press "INPUT" button.
(Procedures)
1. BACKUP (Back up data from old TCU to GDS)
2. Exchange old TCU with new one
3. INPUT
(Input the backed up data to new TCU with GDS)
BACKUP
INPUT
Manual
TSB
Case Analysis
DTC
Current Data
Actuation Test
Flight Record
DVOM
Oscilloscope
Simulation Test
Internet Update


VCI : USB On
VMI : Off
Internet : On
GDS
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Diagnosis
Vehicle S/W Management
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GENESIS(BH)/2012/G 3.3 GDI
Transmission/Automatic Transaxle
Oil-pressure Characteristics BackUp & Input (TCU Exchange)
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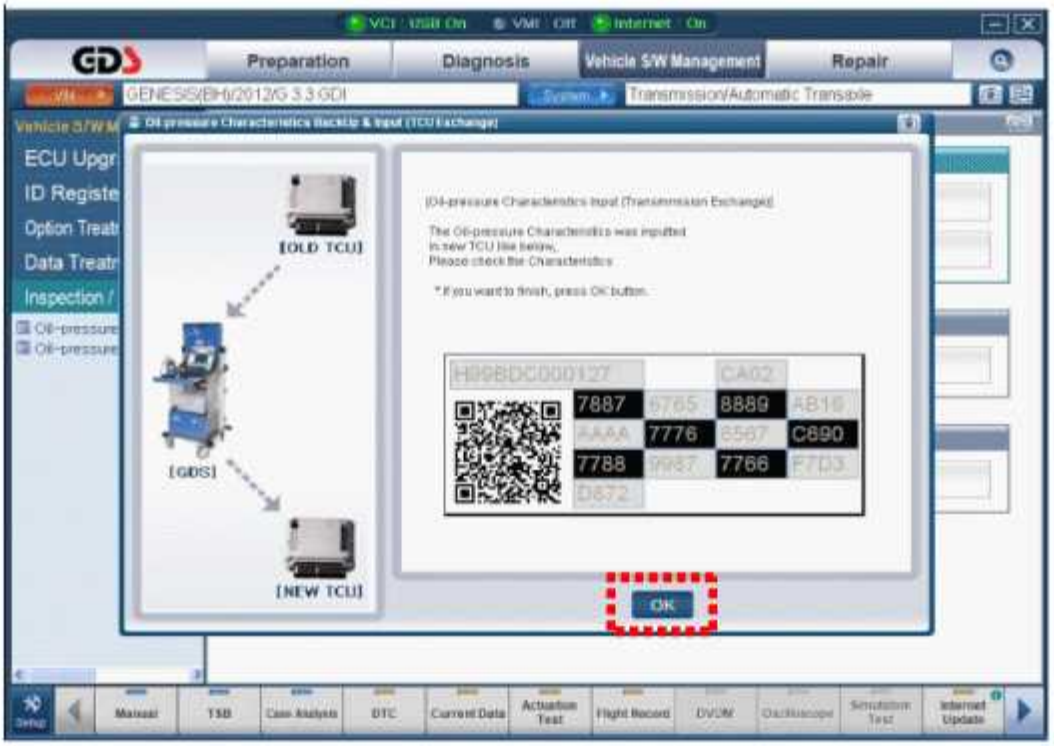
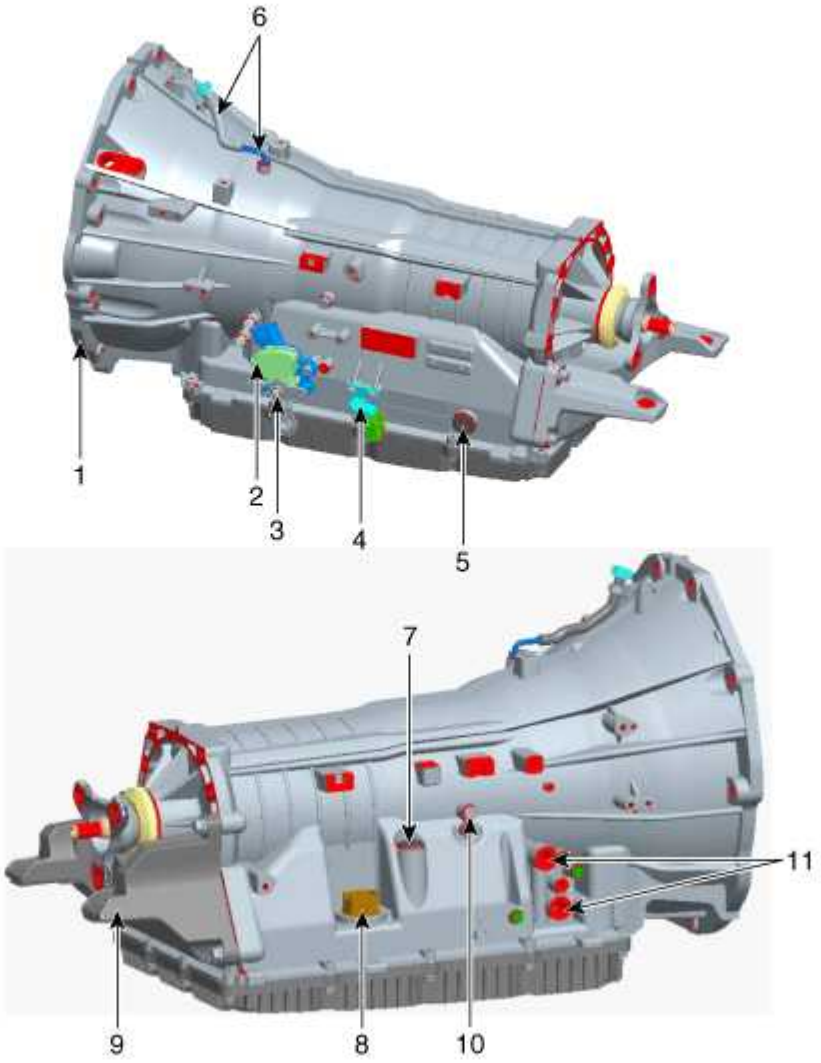
Oil-pressure
Oil-pressure
[OLD TCU]
[GDS]
[NEW TCU]
(Oil-pressure Characteristics BackUp & Input (TCU Exchange))
This data is the Oil-pressure Characteristics of old TCU
that was backed up in GDS. If you want to input this
Characteristics to new TCU, press OK button.
7887
8889
AAAA
7776
C890
7788
7766
OK
Cancel
Manual
TSB
Case Analysis
DTC
Current Data
Actuation Test
Flight Record
DVOM
Oscilloscope
Simulation Test
Internet Update



Automatic Transaxle System > Automatic Transaxle System > Automatic Transaxle > Components and Components Location

Components Location



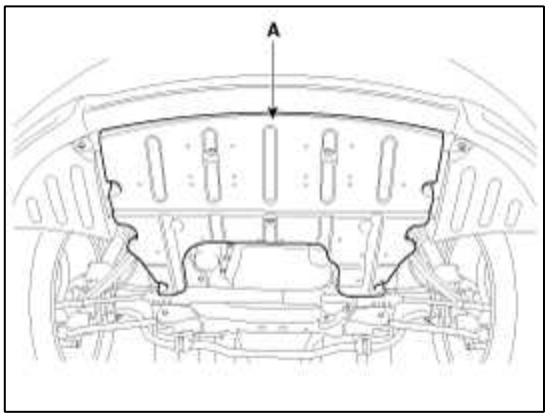
1. Automatic transmission case 2. Inhibitor switch 3. Manual control lever 4. Shift cable bracket 5. Oil injection hall 6. Air breather hose & pipe	7. Oil injection hall (in factory) 8. E Module connector 9. Support bracket 10. Check plug 11. Oil cooler port

Automatic Transaxle System > Automatic Transaxle System > Automatic Transaxle > Repair procedures

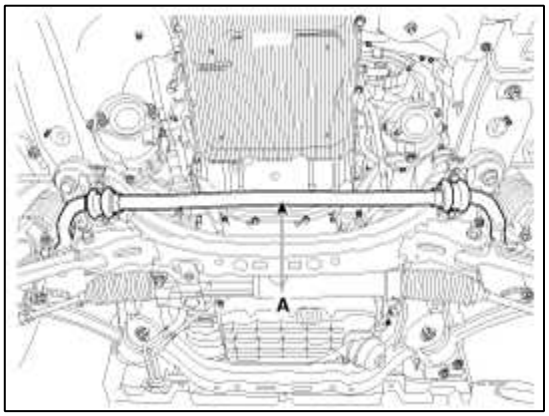
Removal

1. Disconnect (-) terminal from the battery.

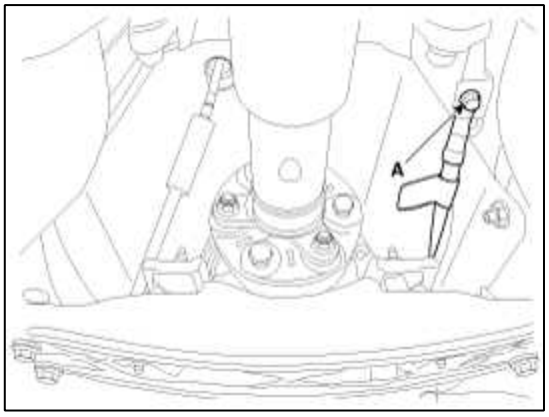
2. Remove the under cover (A).



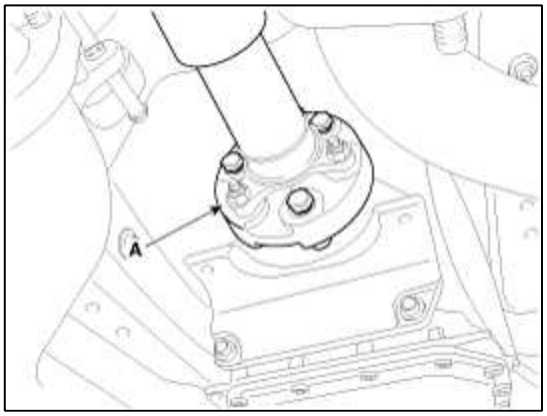
3. Remove the front stabilizer bar (A).
(Refer to "front suspension system"in SS group)



4. Disconnect the ground wire (A) by removing the bolt.

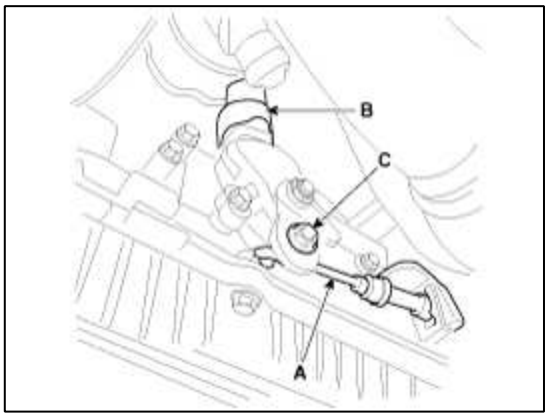


5. Remove the propellar shaft assembly.
(Refer to "Propellar shaft" in DS group)

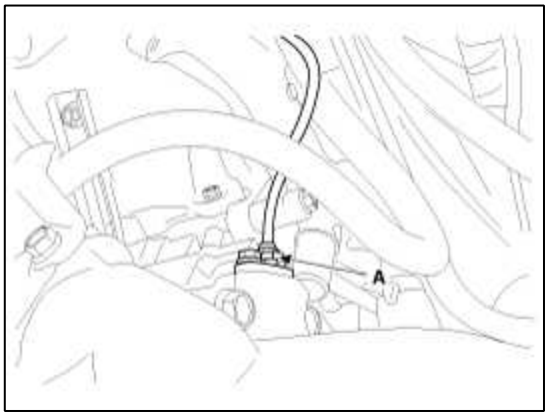


6. Disconnect the inhibitor connector (B) and then remove the shift cable (A) by removing nut (C).

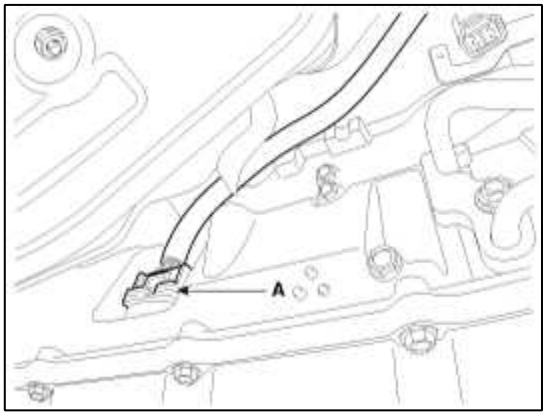
Tightening torque :
13.7 ~ 17.7 N.m (1.4 ~ 1.8 kgf.m, 10.1 ~ 13.0 lb-ft)



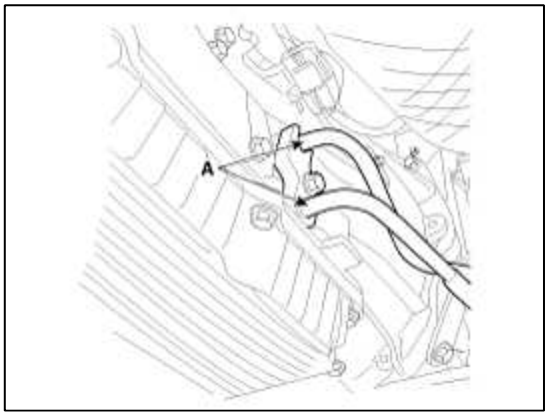
7. Remove the CKP sensor (A).



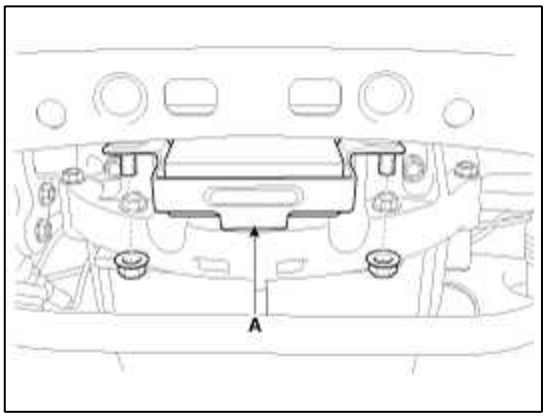
8. Disconnect the solenoid valve connector (A).



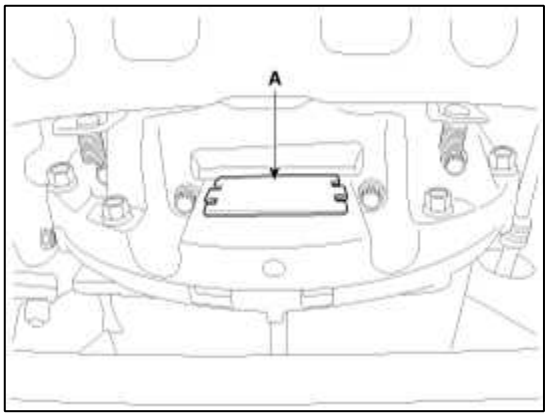
9. Remove the oil cooler tubes (A).



10. Remove the dynamic damper (A) from the cross member.

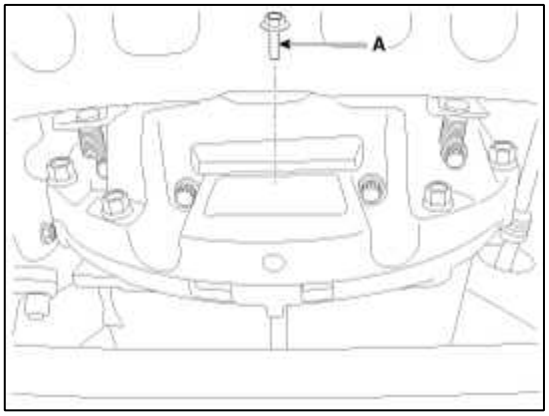


11. Remove the dust cover (A).



12. Remove the torque converter mounting bolts (A-6ea) by rotating the crank shaft.

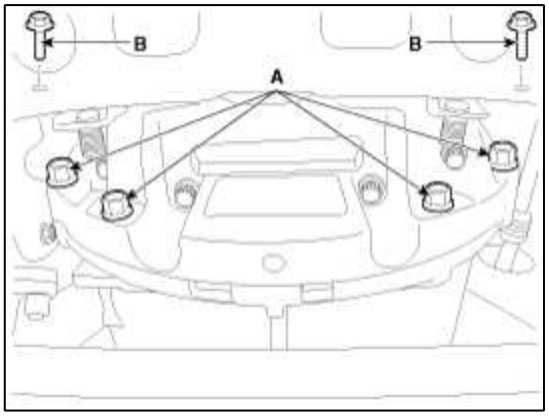
Tightening torque :
45.1 ~ 52.0 N.m (4.6 ~ 5.3 kgf.m, 33.3 ~ 38.3 lb-ft)



13. Using a jack support the transmission assembly.

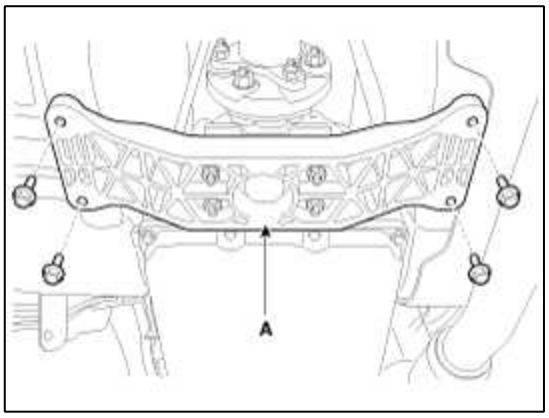
14. Remove the mounting bolts (A-4ea, B-2ea) lower in the engine side.

Tightening torque :
(A) 42.2 ~ 48.1 N.m (4.3 ~ 4.9 kgf.m, 31.1 ~ 35.4 lb-ft)
(B) 34.3 ~ 46.1 N.m (3.5 ~ 4.7 kgf.m, 25.3 ~ 34.0 lb-ft)



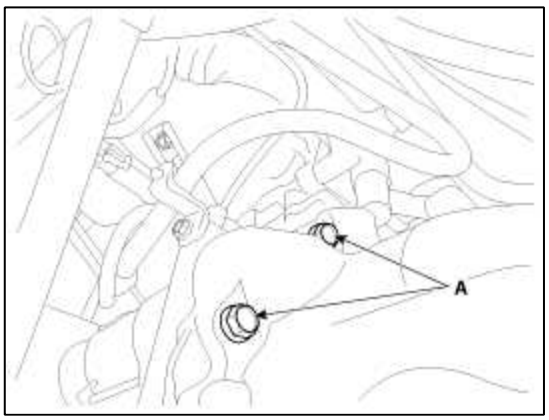
15. Remove the cross member (A) by removing bolts.

Tightening torque :
49.0 ~ 63.7 N.m (5.0 ~ 6.5 kgf.m, 36.2 ~ 47.0 lb-ft)



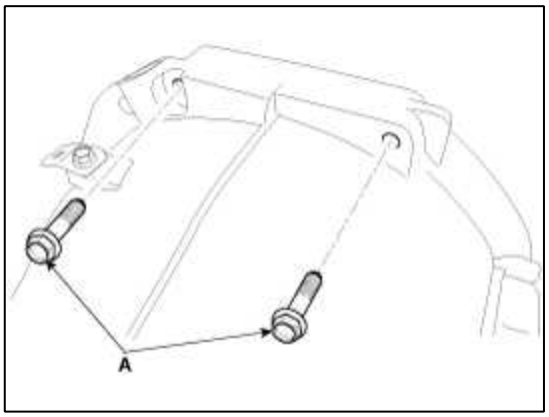
16. Remove the starter motor mounting bolts (A).

Tightening torque :
(A) 50 ~ 65 N.m (5.0 ~ 6.5 kgf.m, 36.2 ~ 47.0 lb-ft)



17. Remove the mounting bolts (A) on the transmission side.

Tightening torque:
42.2 ~ 53.9 N.m (4.3 ~ 5.5 kgf.m, 31.1 ~ 39.8 lb-ft)



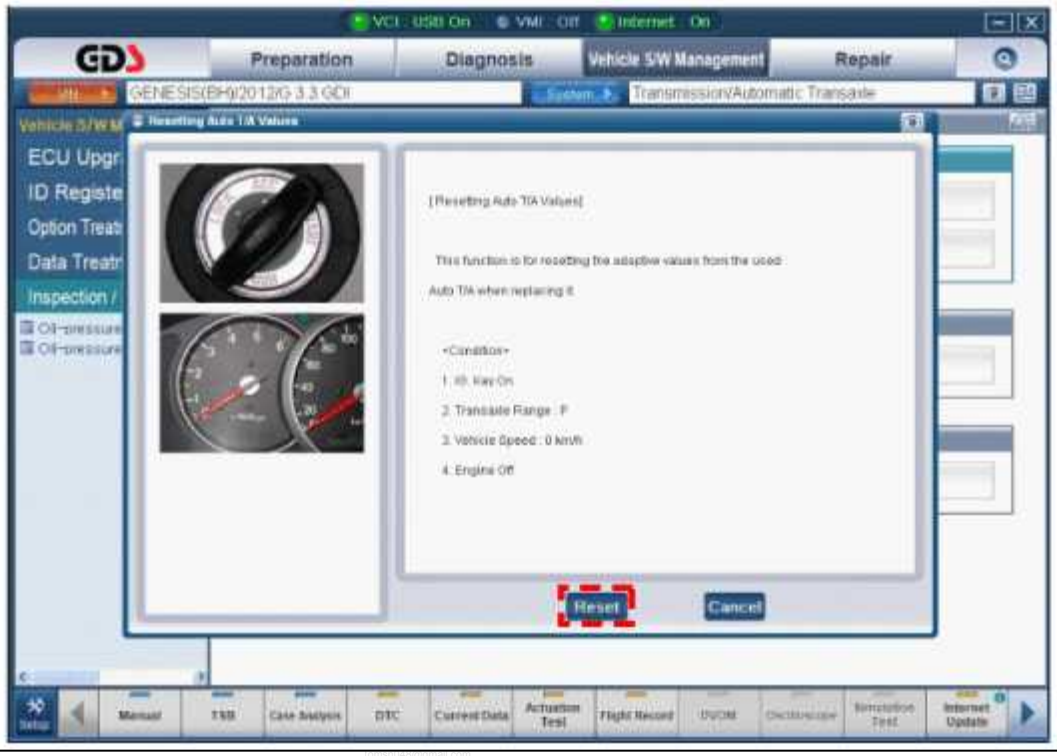
Installation

1. Installation is the reverse of removal.

NOTE

After replacement or reinstallation procedure of the automatic transmission assembly, perform the procedures b

- Adding automatic transmission fluid. (Refer to "automatic transmission system" in this group.)
- After servicing the automatic transmission or TCM, clear the diagnostic trouble codes (DTC) using the GDS
  Diagnostic trouble codes (DTC) cannot be cleared by disconnecting the battery.
  When deleting diagnostic trouble code, use the GDS.
- When replacing the automatic transmission, reset the automatic transmissions values by using the GDS.
- After exchanging automatic transmission, input the EOL(End of line).
  (Refer to "Repair procedures" in this group)
- Perform TCM learning after replacing the transmission to prevent slow transmission response, jerky accelera
  jerky startup. (Refer to "Automatic transmission control system (Repair procedures)" in this group)



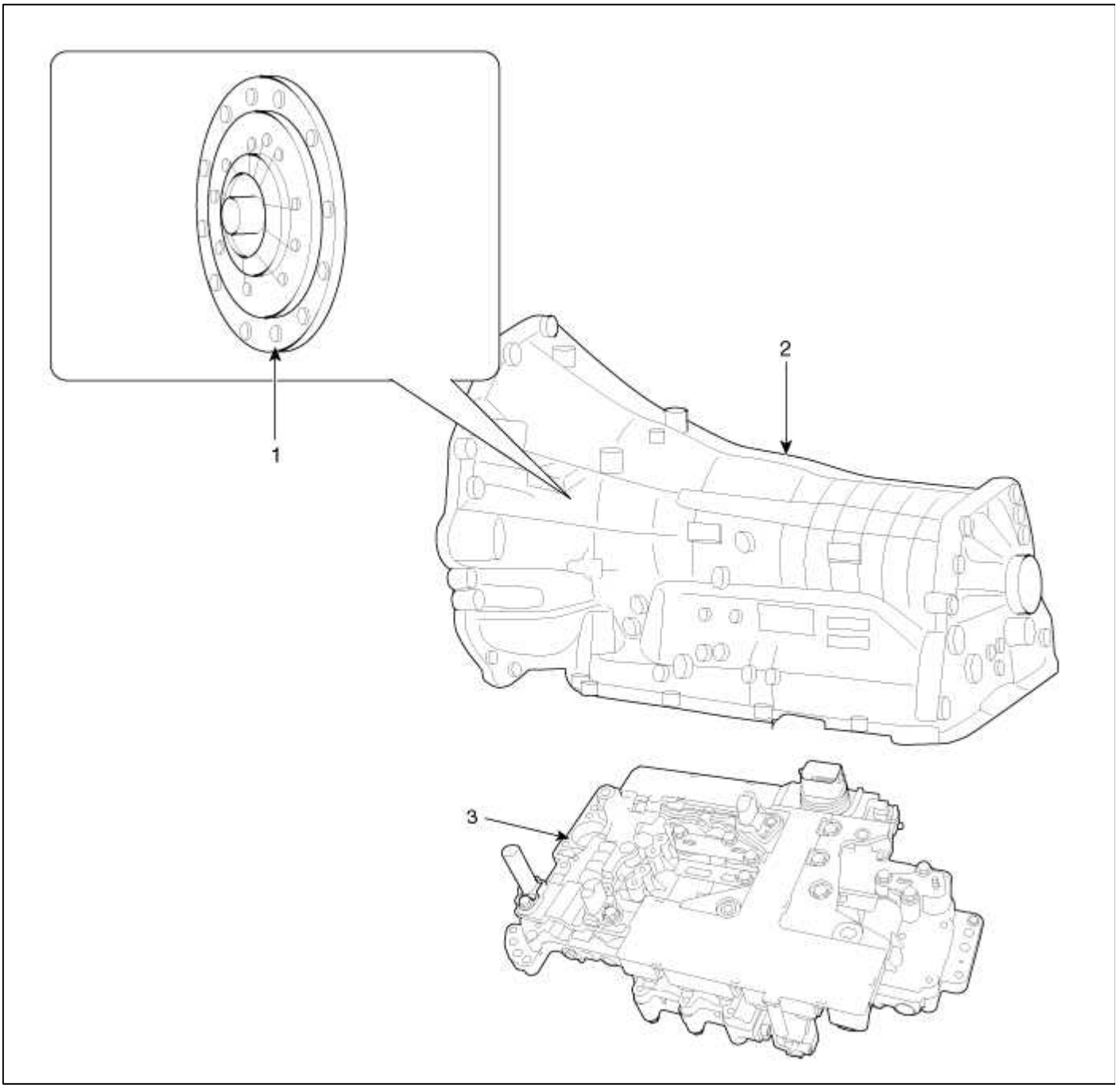
Automatic Transaxle System > Hydraulic System > Description and Operation

Description

The hydraulic system consists of oil, an oil filter, an oil pump, and a valve body (valves and solenoid valves). The oil pump is powered by the engine. ATF passes through the oil filter and gets distributed along the oil channels. The oil becomes highly pressurized as it exits the oil pump and passes through the line pressure valve before being fed to the clutch & brake control valve, clutch, and brakes. TCM controls the hydraulic pressure using solenoid valves and controls clutch and brake operations.

Automatic Transaxle System > Hydraulic System > Components and Components Location

Components Location



1. Oil pump assembly 2. Automatic transmission	3. Valve body assembly 4. Oil pan

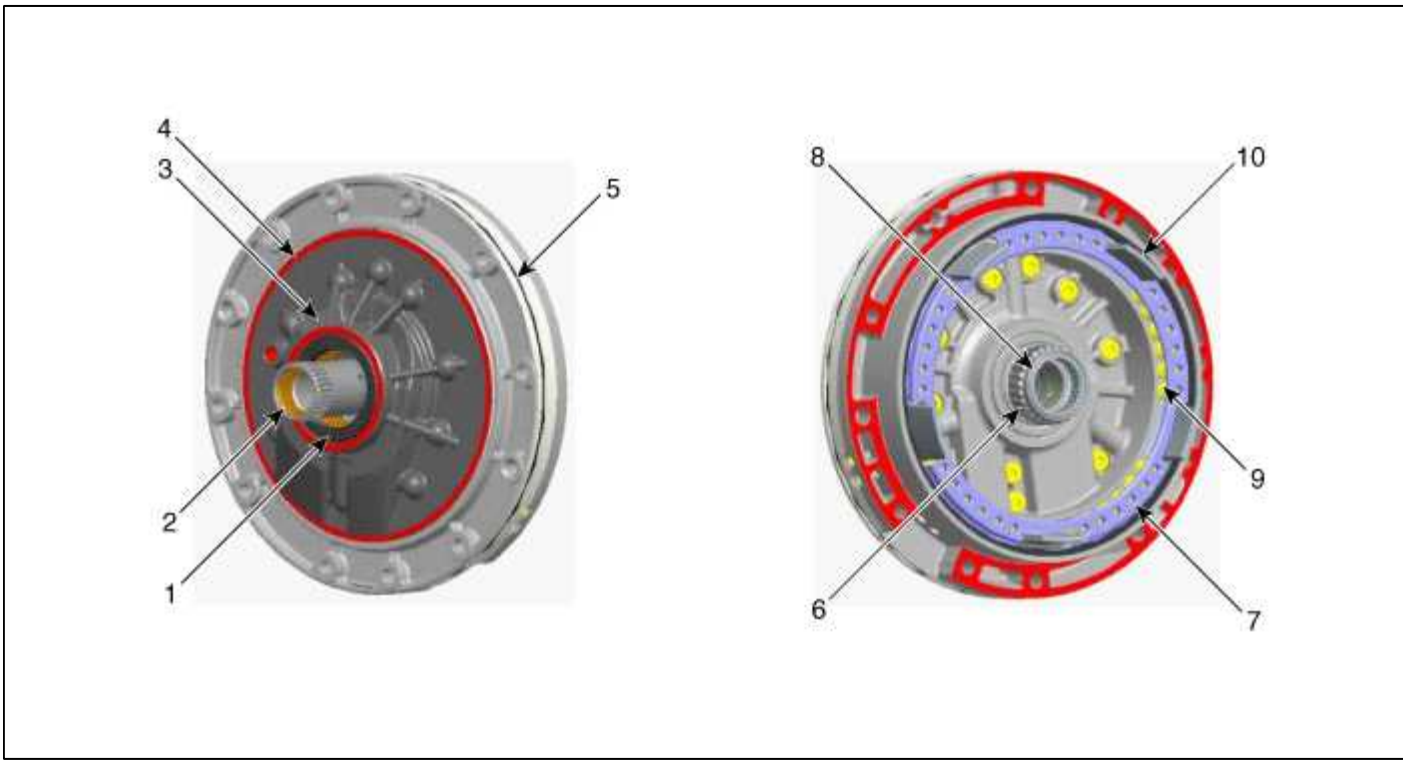
Automatic Transaxle System > Hydraulic System > Oil Pump > Description and Operation

Description

The oil pump rotation builds the hydraulic pressure needed for the lubrication of the various parts of the automatice transmission and operation of the clutch and brakes.
The oil also circulates through the torque converter and the cooler.

Automatic Transaxle System > Hydraulic System > Oil Pump > Components and Components Location

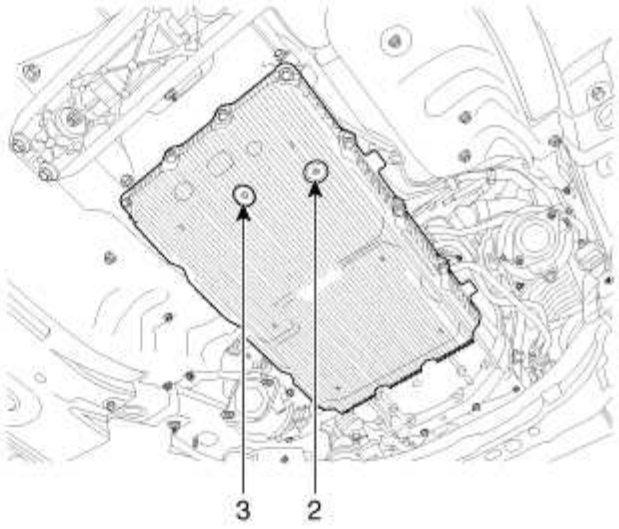
Components Location



1. Oil seal 2. Reaction shaft 3. Housing 4. Cover 5. O-Ring	6. Reaction shaft 7. Snap ring 8. Niddle bearing 9. 8LR/B return spring 10. 8LR/B piston

Automatic Transaxle System > Hydraulic System > Fluid > Components and Components Location

Components Location



1. Oil injection hole 2. Oil level plug	3. Oil drain piug

Automatic Transaxle System > Hydraulic System > Fluid > Repair procedures

Service Adjustment Procedure

Oil level Check

NOTE

A check of ATF level is not normally required during scheduled services. If an oil leak is found, perform the oil level check procedure after repairs are completed.

CAUTION

When checking the oil level, be careful not to enter dust, foreign matters, etc. from fill hole.

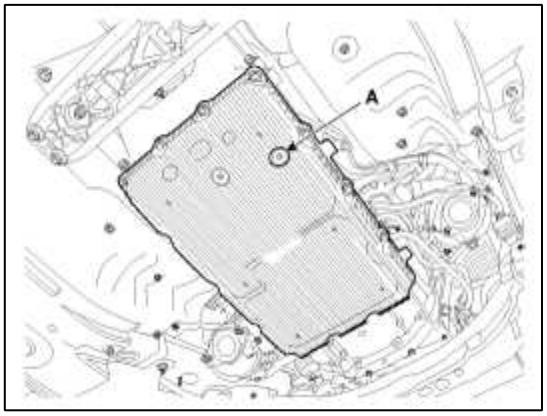
1. Start the engine. (Don’t step on brake and accelerator simultaneously).
2. Confirm that the temperature of the A/T oil temperature sensor is 50~60°C(122~140°F) with the GDS.

3. Shift the shift lever slowly from "P" to"D" to "P" at idle. Repeat one time.
   Shift the select lever to "N".

> CAUTION
>
> Keep on each speed position more than 2 sec.

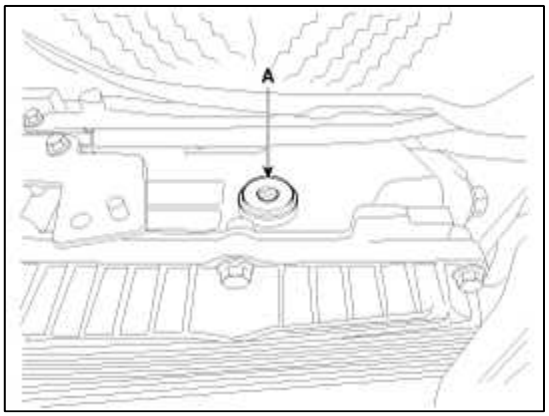
4. Lift the vehicle, then remove the oil level plug (A) from the valve body cover.

> CAUTION
>
> At this time, the vehicle must be at a level state.



5. If there is no oil drain or the amount of oil drain is very low (within 20cc).
   Add ATF SP-IV-RR 650cc to the ATF injection hole (A).

> CAUTION
>
> If oil start to overflow from the oil level plug, you must stop adding oil.



6. If the oil flows out of the overflow plug in thin steady stream, the oil level is correct.
   Then finish the procedure and tighten the oil plug.

> NOTE
>
> Oil level check (excess or shortage) method
> - Excess: Drain quantity exceeds 500cc per mininute.(Let oil flow until oil stream becoms thin)
> - Shortage: If there is no drain after adding 650cc of ATF.(Add more ATF oil until oil starts to drain)

> CAUTION
>
> If there is no damage at the automatic transaxle and the oil cooler, the oil cooler hose, transaxle case, valve body tightening state are normal, ATF must drip out after performing above 1 to 6 procedures. After performing above 1 to 6 procedures, if the oil doesn't drip out, inspect the automatic transaxle assembly.

> CAUTION
>
> Replace the gasket of the oil level plug and use new one whenever loosening the oil level plug.

Oil level check plug tightening torque:
22.6 ~ 24.5 N.m (2.3 ~ 2.5 kgf.m, 16.6 ~ 18.1 lb-ft)

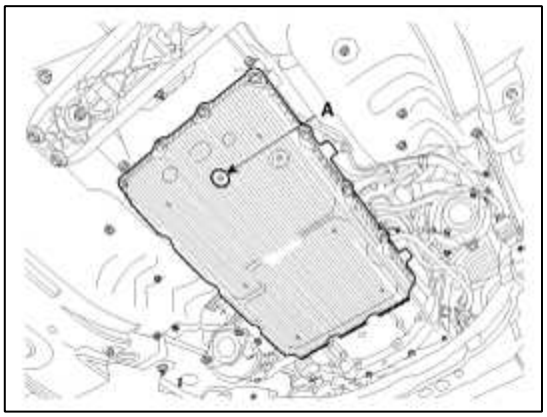
7. After ATF level check or exchange, be sure to remove ATF of outside automatic transmission.
   (be especially sure to remove residual ATF between automatice transmission case and oil pan)
8. Put down the vehicle with the lift.

Replacement

> NOTE
>
> ATF of 8 speed automatic transaxle doesn't need to be replaced in normal usage. If the vehicle is used severely in business or personal use, replace ATF every 100,000 miles.
> Severe usage is defined as
> - Driving in rough road (Bumpy, Gravel, Snowy, Unpaved road, etc)
> - Driving in mountain road, ascent/descent
> - Repetition of short distance driving
> - More than 50% operation in heavy city traffic during hot weather above 30°C(89.6°F) .
> - Police, Taxi, Commercial type operation or trailer towing, etc

1. Remove the drain plug (A) and reinstall the drain plug after draining ATF totally.

Drain plug tightening torque:
22.6 ~ 24.5 N.m (2.3 ~ 2.5 kgf.m, 16.6 ~ 18.1 lb-ft)



CAUTION

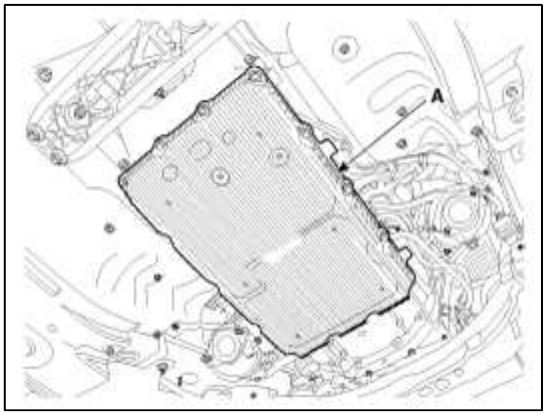
The gasket of the drain plug use new one.

2. Fill the oil about 7.0 liters through oil injection hole.
3. Check the oil level.
   (Refer to "Hydraulic system (Fluid)" in this group)

Automatic Transaxle System > Hydraulic System > Oil Fillter > Repair procedures

Replacement

1. Draining ATF totally.
2. Remove the oil pan (A).



3. Must be replaced by new oil pan.

NOTE

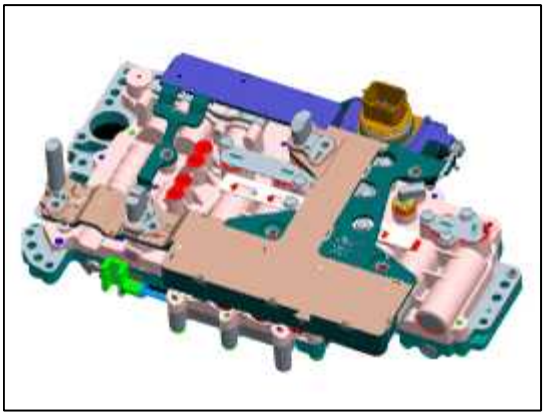
Not replaceable filters integrated oil pan.

4. Adding automatic transmission fluid.
   (Refer to "automatic transaxle system" in this group.)

Automatic Transaxle System > Hydraulic System > Valve Body > Description and Operation

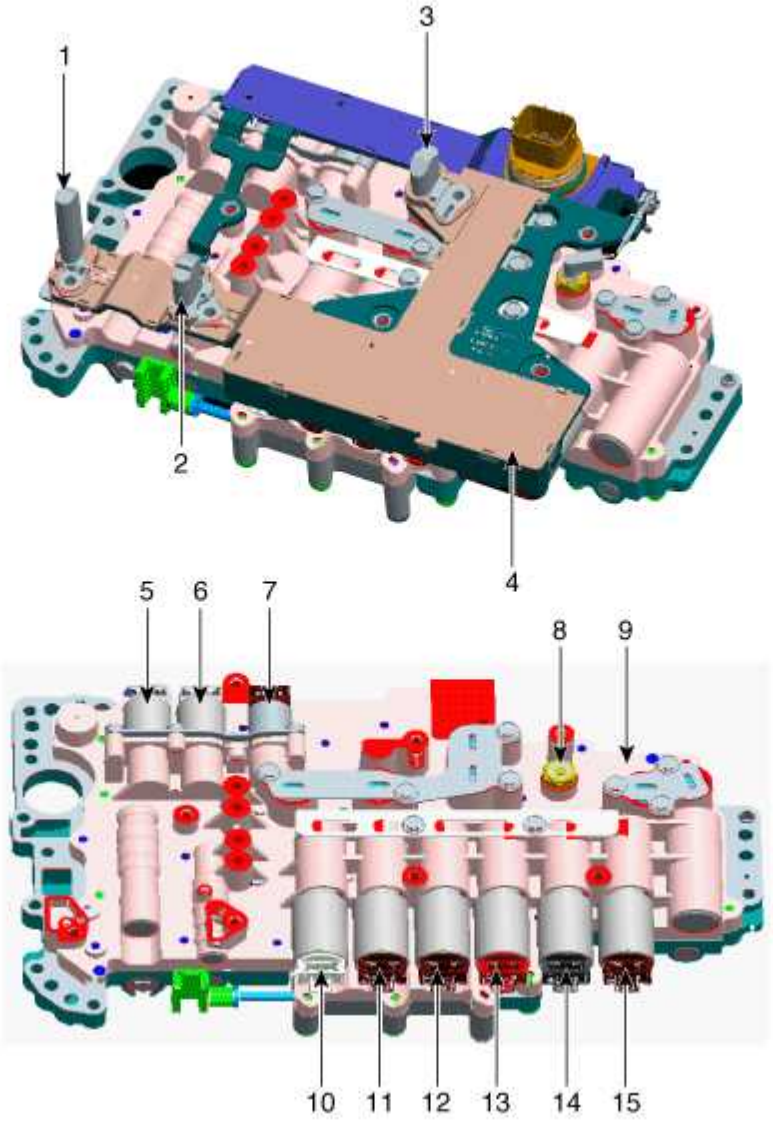
Description

The valve body is essential to automatic transaxle control and consists of various valves used to control the oil feed from the oil pump. Specifically, these valves consist of pressure regulator valves, oil redirection valves, shift valves, and manual valves. The body also features electronic solenoid valves that ensure smooth gear changes.



Automatic Transaxle System > Hydraulic System > Valve Body > Components and Components Location

Components Location



1. Input speed sensor 2. Middle speed sensor 3. Output speed sensor 4. E Module 5. Line presure control solenoid valve 6. Demper clutch control solenoid valve 7. ON/OFF solenoid valve 8. Presure switch	9. Valve body assembly 10. 8LR/B control solenoid valve 11. 6/C control solenoid valve 12. 27/B control solenoid valve 13. 35R/C control solenoid valve 14. 4&OD/C control solenoid valve 15. UD/C control solenoid valve

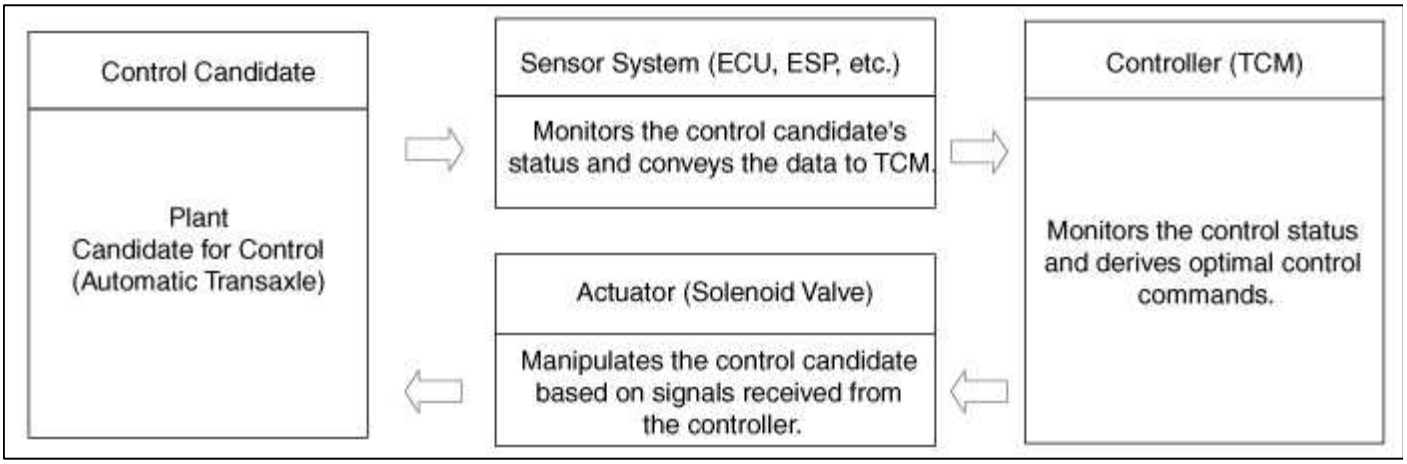
Automatic Transaxle System > Automatic Transaxle Control System > Description and Operation

Description

Automatic transaxle system relies on various measurement data to determine the current control status and extrapolate the necessary compensation values. These values are used to control the actuators and achieve the desired control output. If a problem with the drivetrain, including the transaxle, has been identified, perform self-diagnosis and basic transaxle inspection (oil and fluid inspection) and then check the control system's components

using the diagnosis tool.

Control System Composition



Fault Diagnosis

Features a fail-safe mechanism that prevents dangerous situations from developing in the event of a transaxle failure. The limp home mode engages if the transaxle malfunctions. In this mode, the transaxle operates at a minimal functionality level, making it possible for the vehicle to reach a service center.
Fail-Safe: Allows the vehicle to be driven safely in the event of a malfunction.
Limp Home: Maintains minimal functionality (*) in the event of a malfunction, making it possible for the vehicle to reach a service center.
(*) Minimal Functionality: Drive (fixed gear setting), Reverse, and Neutral

Self-diagnosis

TCM is in constant communication with the control system's components (sensors and solenoids). If an abnormal signal is received for longer than the predefined duration, TCM recognizes a fault, stores the fault code in memory, and then sends out a fault signal through the self-diagnosis terminal. Such fault codes are independently backed up and will not be cleared even if the ignition switch is turned off, the battery is disconnected, or the TCM connector is disconnected.

CAUTION

- Disconnecting a sensor or an actuator connector while the ignition switch is in the "On" position generates a diagnostic trouble code (DTC) and commits the code to memory. In such event, disconnecting the battery will not clear the fault diagnosis memory. The diagnosis tool must be used to clear the fault diagnosis memory.
- Before removing or installing any part, read the diagnostic trouble codes and then disconnect the battery negative (-) terminal.
- Before disconnecting the cable from battery terminal, turn the ignition switch to OFF. Removal or connection of the battery cable during engine operation or while the ignition switch is ON could cause damage to the TCM.
- When checking the generator for the charging state, do not disconnect the battery '+' terminal to prevent the ECM from damage due to the voltage.
- When charging the battery with the external charger, disconnect the vehicle side battery terminals to prevent damage to the TCM.

Checking Procedure (Self-diagnosis)

CAUTION

- When battery voltage is excessively low, diagnostic trouble codes can not be read. Be sure to check the battery for voltage and the charging system before starting the test.
- Diagnosis memory is erased if the battery or the TCM connector is disconnected. Do not disconnect the battery before the diagnostic trouble codes (DTC) are completely read and recorded.

Inspection Procedure (Using the GDS)

1. Turn OFF the ignition switch.
2. Connect the GDS to the data link connector on the lower crash pad.
3. Turn ON the ignition switch.
4. Use the GDS to check the diagnostic trouble code.
5. Repair the faulty part from the diagnosis chart.
6. Erase the diagnostic trouble code.
7. Disconnect the GDS.

CAUTION

- Perform TCM learning after replacing the automatic transaxle to prevent slow automatic transaxle response, jerky acceleration and jerky startup. (Refer to "Automatic transaxle control system (Repair procedures)" in this group)
- Adding automatic transaxle fluid. (Refer to "automatic transaxle system" in this group.)
- After servicing the automatic transaxle or TCM, clear the diagnostic trouble code (DTC) using the GDS tool. Diagnostic trouble codes (DTC) cannot be cleared by disconnecting the battery.

Automatic Transaxle System > Automatic Transaxle Control System > Repair procedures

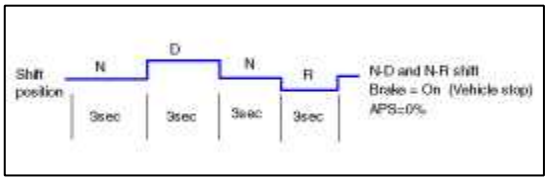
Adjustment

TCM Learning

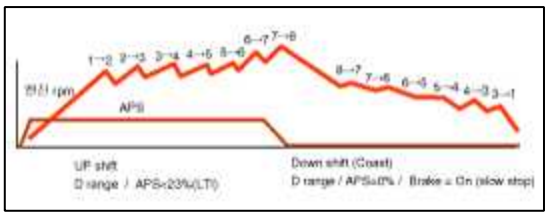
When shift shock is occurred or parts related with the transaxle are replaced, TCM learning should be performed. In the following case, TCM learning is required.

- Transaxle assembly replacement
- TCM replacement
- TCM upgrading

1. TCM learning condition
   A. ATF temperature: 30 ~ 95°C (86 ~ 203°F)
2. TCM learning procedure
   A. Stop learning
   - Repeat the below shift pattern four times or more with stepping on the brake.

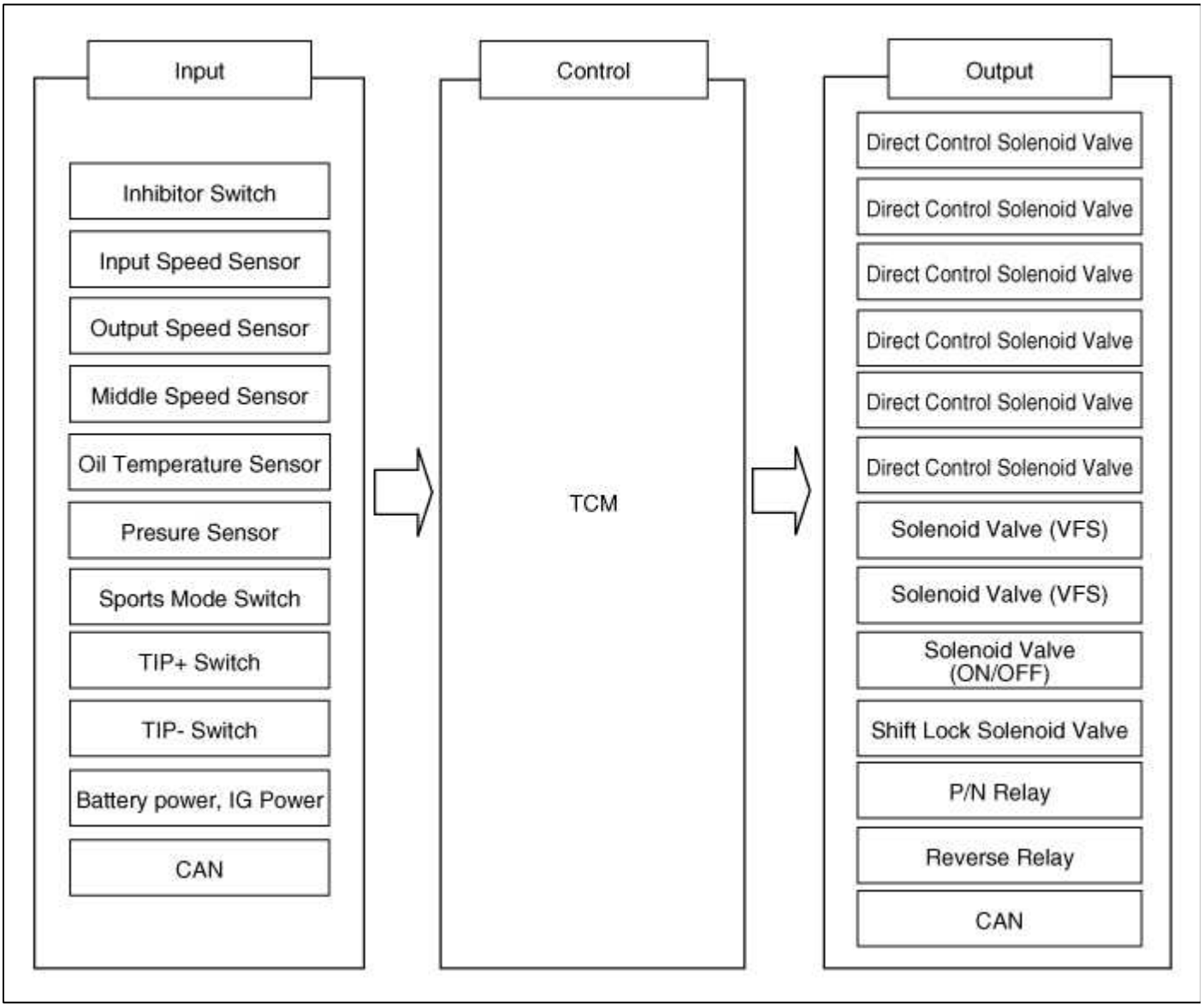


   B. Driving learning
   1. Drive the vehicle through all gears at D range. Drive from stop to 1st to 2nd to 3rd to 4th to 5th to 6th to 7th to 8th with keeping fixed throttle open.
   2. Down shift from 8th to 7th, 7th to 6th, 6th to 5th, 5th to 4th, 4th to 3rd, 3rd to 2nd, 2nd to 1st.
   3. Repeat the above driving pattern four times or more.
      Up-shift throttle open : 15 ~ 30%



Automatic Transaxle System > Automatic Transaxle Control System > Schematic Diagrams

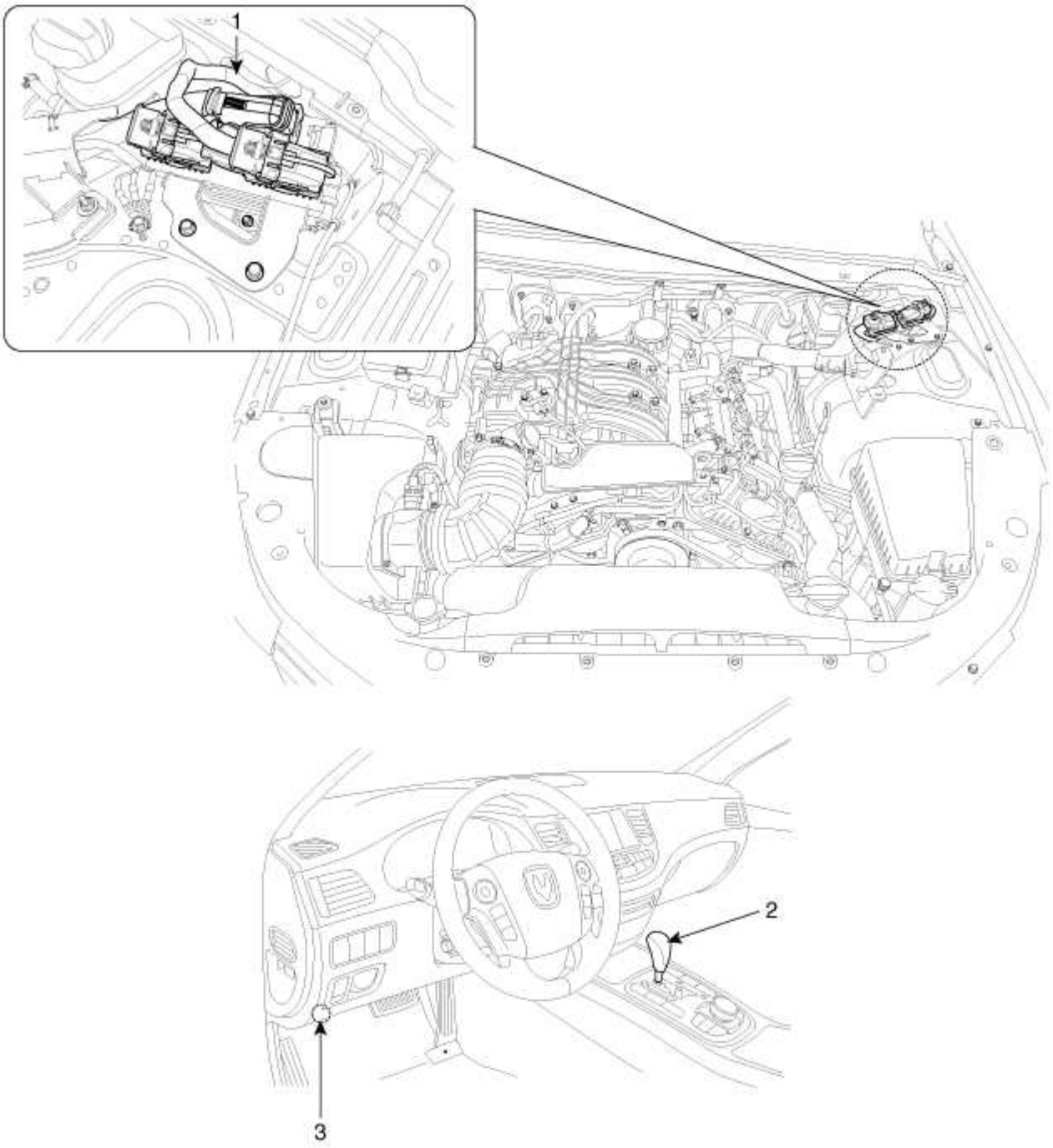
Circuit Diagram



Automatic Transaxle System > Automatic Transaxle Control System > Components and Components Location

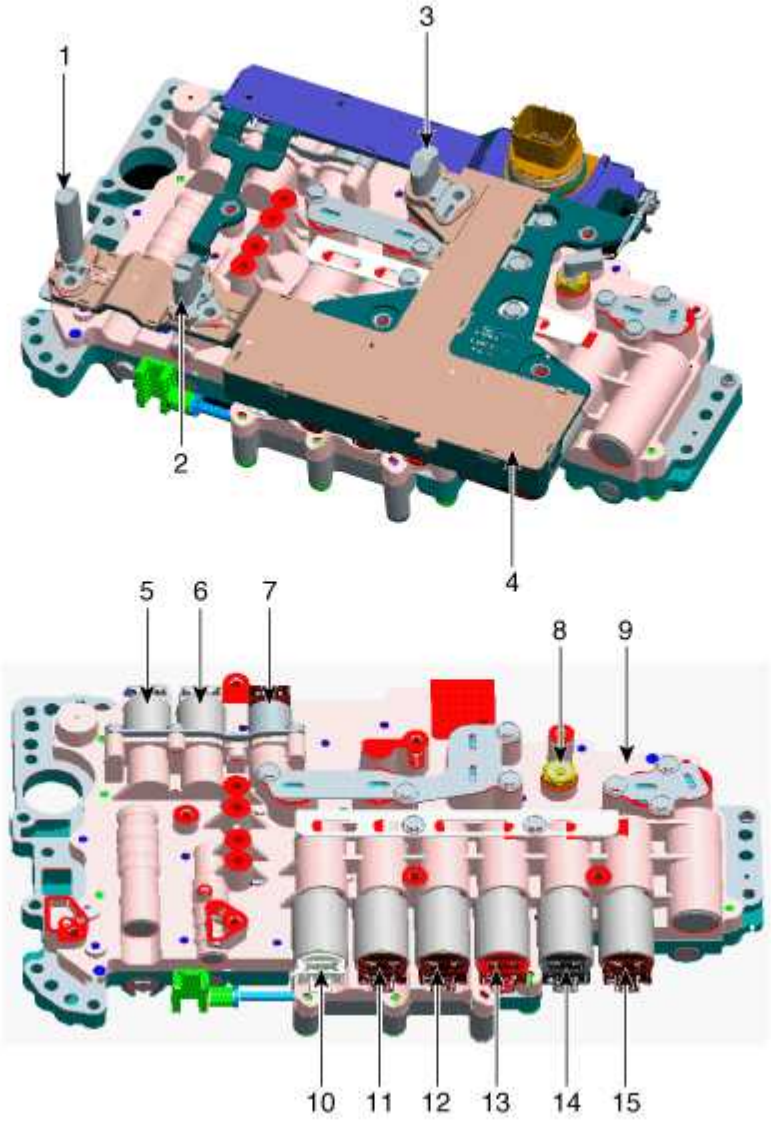
Components Location

[Vehicle Components]



1. Transmission Control Module(TCM) 2. Shift lever	3. Date Link Connector (DLC)

[Transmission Components]



1. Input speed sensor 2. Middle speed sensor 3. Output speed sensor 4. E Module assembly 5. Line presure control solenoid valve 6. Demper clutch control solenoid valve 7. ON/OFF solenoid valve 8. Presure switch	9. Valve body assembly 10. 8LR/B control solenoid valve 11. 6/C control solenoid valve 12. 27/B control solenoid valve 13. 35R/C control solenoid valve 14. 4&OD/C control solenoid valve 15. UD/C control solenoid valve

Automatic Transaxle System > Automatic Transaxle Control System > Transaxle Control Module (TCM) > Description and Operation

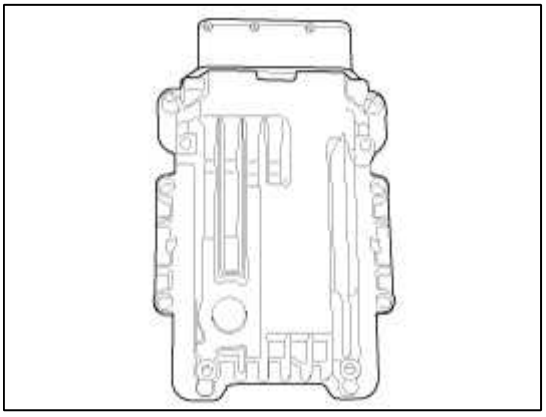
Description

Transaxle Control Module (TCM) is the automatic transaxle's brain. The module receives and processes signals from various sensors and implements a wide range of transaxle controls to ensure optimal driving conditions for the driver.

TCM is programmed for optimal response to any on-road situation. In the event of a transaxle failure or malfunction, TCM stores the fault information in memory so that the technician may reference the code and quickly repair the transaxle.

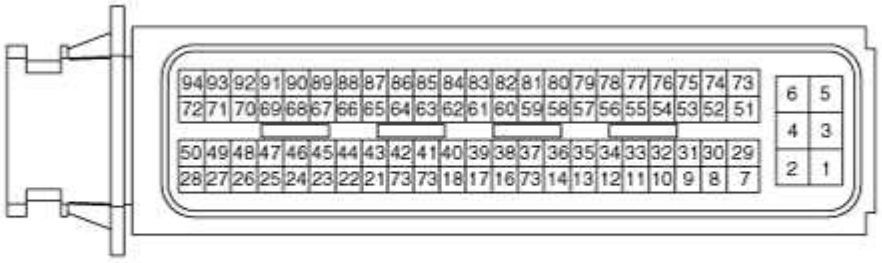
Functions

- Monitors the vehicle's operating conditions to determine the optimal gear setting.
- Performs a gear change if the current gear setting differs from the identified optimal gear setting.
- Determines the need for damper clutch (D/C) activation and engages the clutch accordingly.
- Calculates the optimal line pressure level by constantly monitoring the torque level and adjusts the pressure accordingly.
- Diagnoses the automatic transaxle for faults and failures.



Automatic Transaxle System > Automatic Transaxle Control System > Transaxle Control Module (TCM) > Schematic Diagrams

1. TCM Connector and Terminal Function



CLG-TG

2. TCM Terminal Function

Connector [CLG-TG]

Pin	Description	Pin	Description
1	Battery power	48	-
2	Battery power	49	-
3	Power(IG 1)	50	27 Brake control solenoid valve
4	Ground	51	-
5	Ground	52	ON/OFF solenoid valve
6	Ground	53	-

7	-	54	Input speed sensor signal
8	-	55	Middle speed sensor signal
9	-	56	Output speed sensor signal
10	-	57	-
11	-	58	-
12	-	59	-
13	Inhibitor switch signal "S1"	60	-
14	Oil temperature sensor (+)	61	Sports mode select switch
15	-	62	-
16	Sports mode up switch	63	-
17	Sports mode down switch	64	-
18	Presure switch	65	CAN communication line (LOW)
19	-	66	-
20	-	67	-
21	Inhibitor switch signal "S2"	68	-
22	Inhibitor switch signal "S4"	69	-
23	Inhibitor switch signal "S3"	70	Solenoid supply power 2
24	-	71	-
25	-	72	-
26	-	73	Solenoid supply power(4&OD/C,35R/C,6/C,L/P)
27	-	74	-
28	-	75	-
29	Solenoid supply power(UD/C,27/B,8LR/B,D/C)	76	-
30	Input speed sensor power	77	-
31	Middle speed sensor power	78	-
32	-	79	-
33	-	80	-
34	-	81	-
35	-	82	-
36	-	83	-
37	-	84	-
38	Oil temperature sensor (-)	85	CCP CAN Low
39	-	86	CCP CAN High
40	-	87	CAN communication line (High)
41	35R Clutch control solenoid valve	88	-

42	8LR Brake control solenoid valve	89	-
43	Underdrive clutch control solenoid valve	90	-
44	6Speed clutch control solenoid valve	91	-
45	Line presure control solenoid valve	92	-
46	Damper clutch control solenoid valve	93	Output speed sensor power
47	4&OD Clutch control solenoid valve	94	-

3. TCM Terminal input/output signal

Pin	Description	Condition	Input/Output Value	
			Type	Level
1	Battery power	ON	Power	0V/Battery voltage level
2		OFF		9V < Battery voltage level < 16V
3	Power (IG 1)	ON	Input	Battery voltage level
		OFF		0V voltage level
4	Ground	-	Ground	0V(GND level)
5	Ground	-	Ground	0V(GND level)
6	Ground	-	Ground	0V(GND level)
7	-	ON	Output	About 1V
		OFF		Battery voltage level
8	-	-	Output	0V/Battery voltage level
				9V < Battery voltage level <16V
9	-	-	-	-
10	-	ON	Pulse input	About 9V~11V voltage level
		OFF		0V voltage level
11	-	-	-	-
12	-	-	-	-
13	Inhibitor switch signal "S1"	ON	Input	Battery voltage level
		OFF		0V(GND)
14	Oil temperature sensor (+)	-	Input	Maximum 5V voltage level
15	-	-	-	-
16	Sports mode up switch	ON	Input	0V(GND)
		OFF		Battery voltage level
17	Sports mode down switch	ON	Input	0V(GND)
		OFF		Battery voltage level
18	Presure switch	-	Input	0V/Battery voltage level

19	-	-	-	-
20	-	-	-	-
21	Inhibitor switch signal "S2"	ON	Input	Battery voltage level
		OFF		0V(GND)
22	Inhibitor switch signal "S4"	ON	Input	Battery voltage level
		OFF		0V(GND)
23	Inhibitor switch signal "S3"	ON	Input	Battery voltage level
		OFF		0V(GND)
24	-	-	-	-
25	-	-	-	-
26	-	-	Output	0V/Battery voltage level
				9V < Battery voltage level <16V
27	-	-	-	-
28	-	-	Output	0V/Battery voltage level
				9V < Battery voltage level <16V
29	Solenoid supply power (UD/C,27/B,8LR/B,D/C)	-	Power	Battery voltage level
				9V < Battery voltage level <16V
30	Input speed sensor power	ON	Output	About 9V voltage level
		OFF		0V
31	Middle speed sensor power	ON	Output	About 9V voltage level
		OFF		0V
32	-	-	-	-
33	-	-	-	-
34	-	-	-	-
35	-	-	-	-
36	-	-	-	-
37	-	-	-	-
38	Oil temperature sensor (-)	-	Input	Minimum 0V voltage level
39	-	-	-	-
40	-	-	-	-
41	35R Clutch control solenoid valve	-	Output	0V/Battery voltage level
				9V < Battery voltage level <16V

42	8LR Brake control solenoid valve	-	Output	0V/Battery voltage level 9V < Battery voltage level <16V
43	Underdrive clutch control solenoid valve	-	Output	0V/Battery voltage level 9V < Battery voltage level <16V
44	6Speed clutch control solenoid valve	-	Output	0V/Battery voltage level 9V < Battery voltage level <16V
45	Line presure control solenoid valve	-	Output	0V/Battery voltage level 9V < Battery voltage level <16V
46	Damper clutch control solenoid valve	-	Output	0V/Battery voltage level 9V < Battery voltage level <16V
47	4&OD Clutch control solenoid valve	-	Output	0V/Battery voltage level 9V < Battery voltage level <16V
48	-	-	-	-
49	-	-	-	-
50	27 Brake control solenoid valve	-	Output	0V/Battery voltage level 9V < Battery voltage level <16V
51	-	-	-	-
52	ON/OFF solenoid valve	-	Output	0V/Battery voltage level 9V < Battery voltage level <16V
53	-	ON	Output	0V
		OFF		Battery voltage level
54	Input speed sensor signal		Pulse input	Low : About 0.7V, High : 1.4V
	NTU1			Maximum/Minimum Frequency : 9kHz/0Hz
55	Middle speed sensor signal		PulseInput	Low : About 0.7V, High : 1.4V
	NTU2			Maximum/Minimum Frequency : 9kHz/0Hz
	Output speed sensor signal			Low : About 0.7V, High : 1.4V

56	NAB		PulseInput	Maximum/Minimum Frequency : 9kHz/0Hz
57	-	-	-	-
58	-	-	-	-
59	-	-	-	-
60	-	-	-	-
61	Sports mode select switch	Sports mode	Input	0V/Battery voltage level
		Other		9V < Battery voltage level <16V
62	-	-	-	-
63	-	-	-	-
64	-	-	-	-
65	CAN communication line (LOW)	-	-	-
66	-	-	-	-
67	-	-	-	-
68	-	-	-	-
69	-	-	-	-
70	Solenoid supply power 2	-	Power	Battery voltage level
				9V < Battery voltage level <16V
71		-	-	-
72		-	-	-
73	Solenoid supply power (4&OD/C,35R/C,6/C,L/P)	-	Power	Battery voltage level
				9V < Battery voltage level <16V
74		-	-	-
75		-	-	-
76		-	-	-
77		-	-	-
78		-	-	-
79		-	-	-
80		-	-	-
81		-	-	-
82		-	-	-
83		-	-	-
84		-	-	-

85		-	-	-
86		-	-	-
87	CAN communication line (High)	-	-	-
88				
89				
90				
91				
92		-	-	-
93	Output speed sensor power	ON	Output	About 9V voltage level
		OFF		0V
94				

Automatic Transaxle System > Automatic Transaxle Control System > Transaxle Control Module (TCM) > Repair procedures

Inspection

TCM Problem Inspection Procedure

1. TEST TCM GROUND CIRCUIT: Measure resistance between TCM and chassis ground using the backside of TCM harness connector as TCM side check point. If the problem is found, repair it.

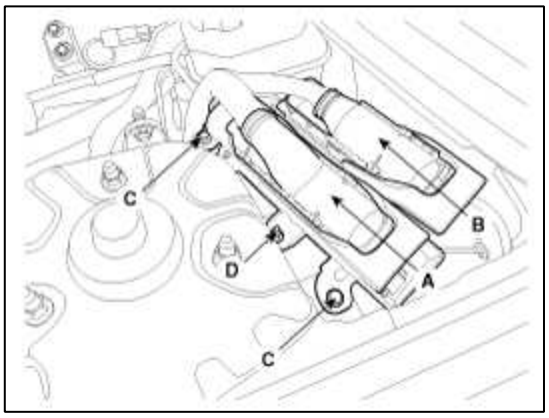
   Specification: Below 1Ω

2. TEST TCM CONNECTOR: Disconnect the TCM connector and visually check the ground terminals on TCM side and harness side for bent pins or poor contact pressure. If the problem is found, repair it.
3. If problem is not found in Step 1 and 2, the TCM could be faulty. If so, make sure there were no DTC's before swapping the TCM with a new one, and then check the vehicle again. If DTC's were found, examine this first before swapping TCM.
4. RE-TEST THE ORIGINAL TCM: Install the original TCM (may be broken) into a known-good vehicle and check the vehicle.
   If the problem occurs again, replace the original TCM with a new one. If problem does not occur, this is intermittent problem (Refer to “Intermittent Problem Inspection Procedure” in Basic Inspection Procedure).

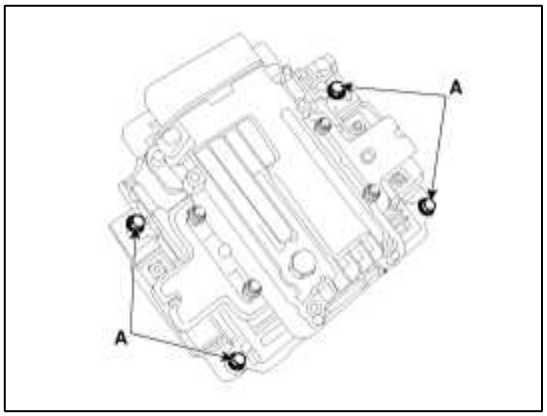
Removal

1. Turn ignition switch OFF and disconnect the negative (-) battery cable.
2. Disconnect the ECM connector (A).
3. Disconnect the TCM connector (B).

4. Remove the ECM & TCM bracket installation bolts (C) and nut (D).



5. Remove the ECM from bracket after remove the installation bolts (A).



Installation

1. Installation is reverse of removal.

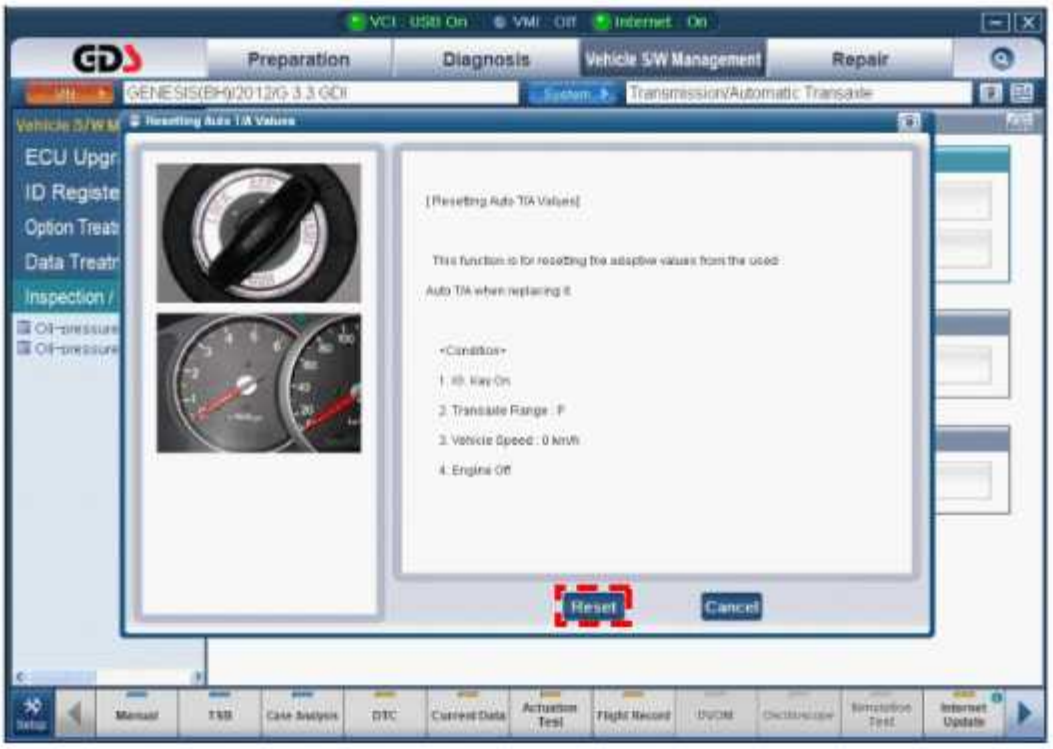
CAUTION

A. In the case of the vehicle equipped with immobilizer or button engine start system, perform "Key Teaching" procedure together. (Refer to "Immobilizer" or "Button Engine Start System in BE group).

B. After exchanging TCM, input the EOL (End of line).
(Refer to "Repair procedures" in this group)

C. When replacing the TCM, reset the automatic transmissions values by using the GDS.

D. Perform TCM learning after replacing the TCM.

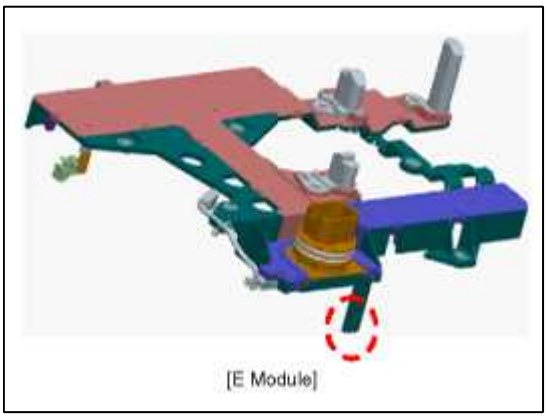


Automatic Transaxle System > Automatic Transaxle Control System > Transaxle Oil Temperature Sensor > Description and Operation

Description

Transaxle oil temperature sensor monitors the automatic transaxle fluid's temperature and conveys the readings to TCM.

It is an NTC (Negative Thermal Coefficient) sensor whose resistance has an inversely proportional relationship with the temperature level. Data produced by this sensor is used to identify damper clutch activation and deactivation zones within the low temperature and high temperature range and to compensate hydraulic pressure levels during gear changes.



[E Module]

Automatic Transaxle System > Automatic Transaxle Control System > Transaxle Oil Temperature Sensor > Specifications

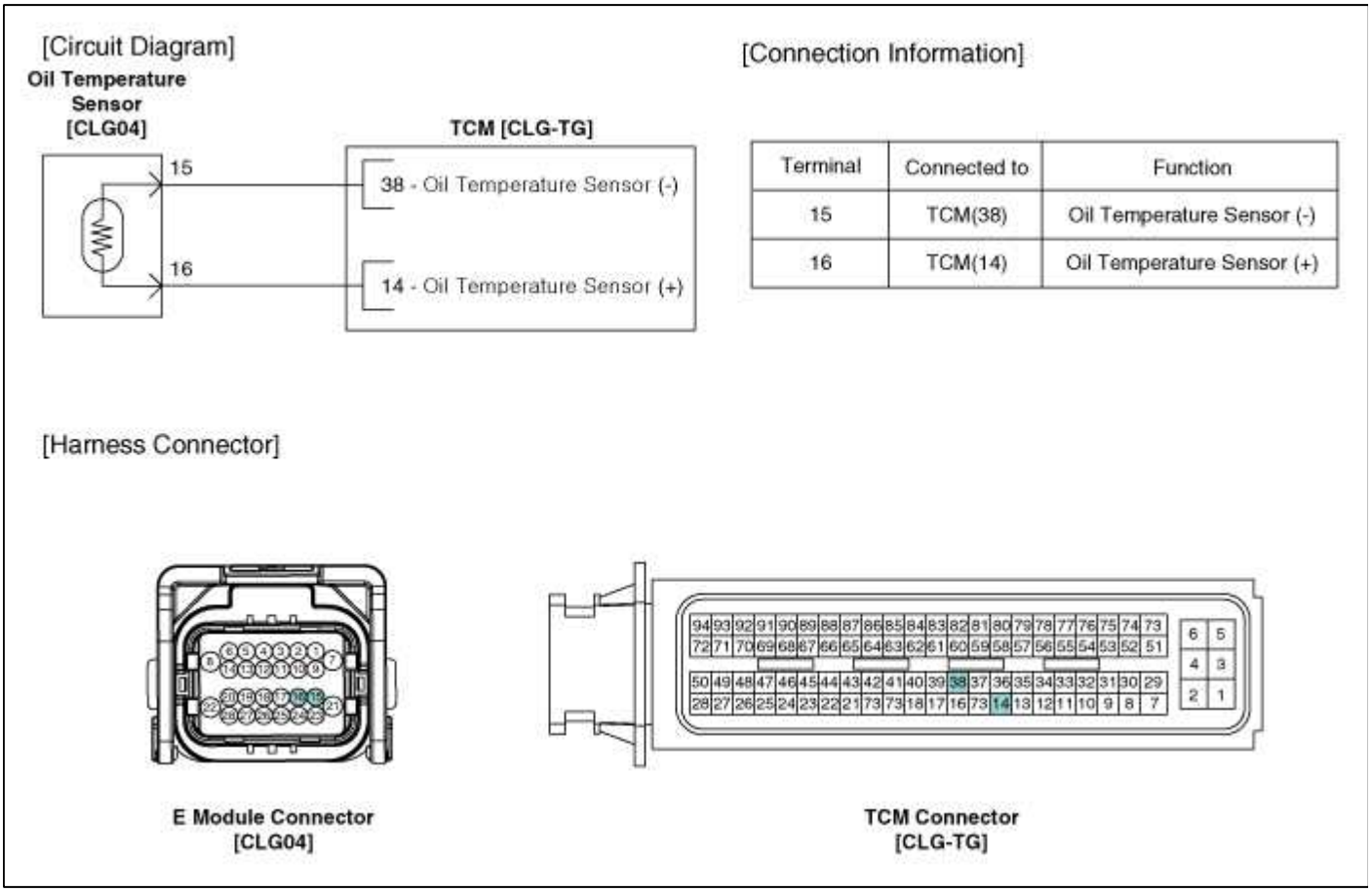
Specifications

Type: Negative Thermal Coefficient Type

Temp.[(°C)°F]	Resistance (kΩ)
(-40)-40	139.5
(-20)-4.0	47.4
(0)32.0	18.6
(20)68.0	8.1
(40)104.0	3.8
(60)140.0	1.98
(80)176.0	1.08
(100)212.0	0.63
(120)248.0	0.38
(140)284.0	0.25
(150)302.0	0.16

Automatic Transaxle System > Automatic Transaxle Control System > Transaxle Oil Temperature Sensor > Schematic Diagrams

Circuit Diagram



Automatic Transaxle System > Automatic Transaxle Control System > Transaxle Oil Temperature Sensor > Repair procedures

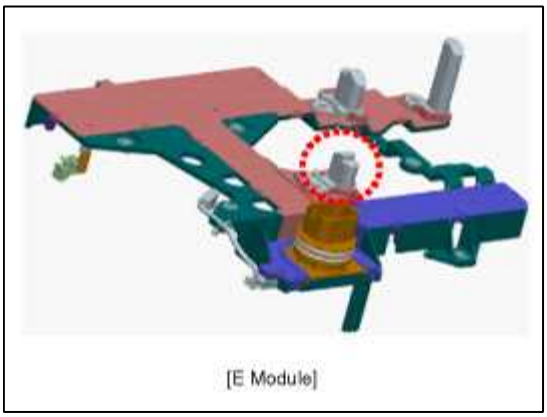
Inspection

1. Turn ignition switch OFF.
2. Disconnect the E Module connector.
3. Measure resistance between sensor signal terminal and sensor ground terminal.
4. Check that the resistance is within the specification.

Automatic Transaxle System > Automatic Transaxle Control System > Output Speed Sensor > Description and Operation

Description

The output speed sensor is a vital unit that measures the rate of rotation of the transaxle's turbine shaft and output shaft, and delivers the readings to the TCM. The sensor provides critical input data that's used in feedback control, damper clutch control, gear setting control, line pressure control, clutch activation pressure control, and sensor fault analysis.



[E Module]

Automatic Transaxle System > Automatic Transaxle Control System > Output Speed Sensor > Specifications

Specifications

Type: Hall effect sensor

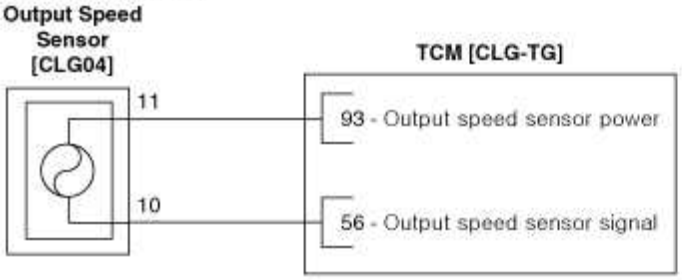
Specifications

Operation condition (°C)°F		((-)40~150)) -40~302
Air gap(mm)in.		1.3(0.0512)
Output voltage	High	1.4
	Low	0.7

Automatic Transaxle System > Automatic Transaxle Control System > Output Speed Sensor > Schematic Diagrams

Circuit Diagram

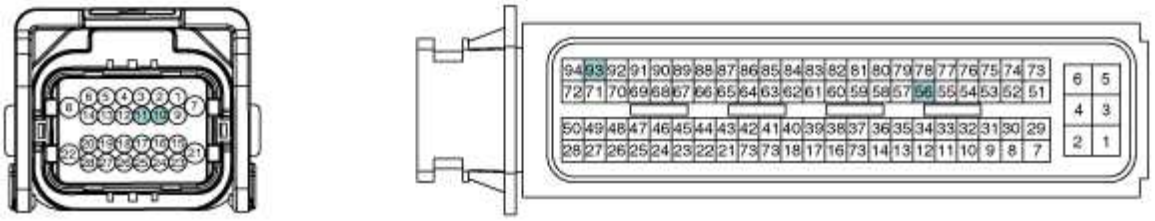
[Circuit Diagram]



[Connection Information]

Terminal	Connected to	Function
11	TCM(93)	Output speed sensor power
10	TCM(56)	Output speed sensor signal

[Harness Connector]



E Module Connector [CLG04]

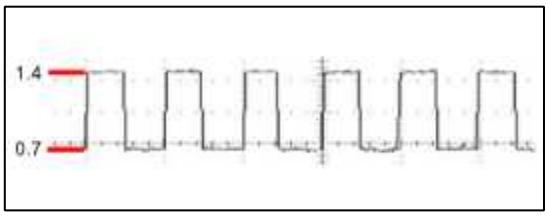
TCM Connector [CLG-TG]

Automatic Transaxle System > Automatic Transaxle Control System > Output Speed Sensor > Repair procedures

Inspection

1. Check signal waveform of output speed sensor using the GDS.

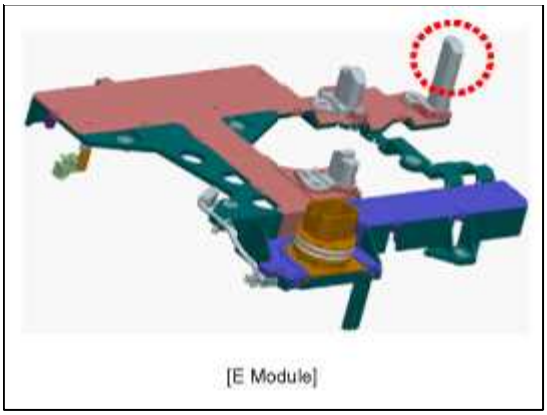
Specification: Refer to "Signal Wave Form" section.



Automatic Transaxle System > Automatic Transaxle Control System > Input Speed Sensor > Description and Operation

Description

Input speed sensor is a vital unit that measures the rate of rotation of the input shaft inside the transaxle and delivers the readings to the TCM. The sensor provides critical input data that's used in feedback control, damper clutch control, gear setting control, line pressure control, clutch activation pressure control, and sensor fault analysis.



[E Module]

Automatic Transaxle System > Automatic Transaxle Control System > Input Speed Sensor > Specifications

Specifications

Type: Hall effect sensor

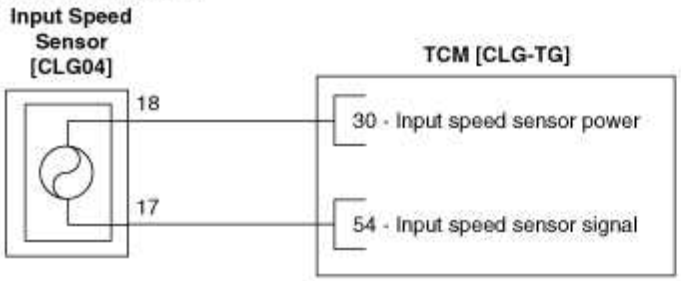
Specifications

Operation condition (°C)°F		((-)40~150)) -40~302
Air gap(mm)in.		1.3(0.0512)
Output voltage	High	1.4
	Low	0.7

Automatic Transaxle System > Automatic Transaxle Control System > Input Speed Sensor > Schematic Diagrams

Circuit Diagram

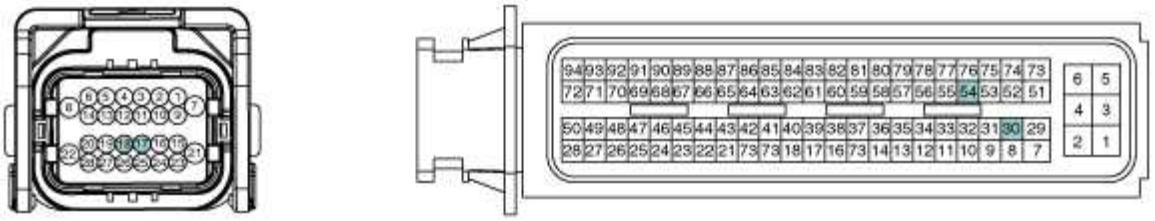
[Circuit Diagram]



[Connection Information]

Terminal	Connected to	Function
18	TCM(30)	Input speed sensor power
17	TCM(54)	Input speed sensor signal

[Harness Connector]



E Module Connector [CLG04]

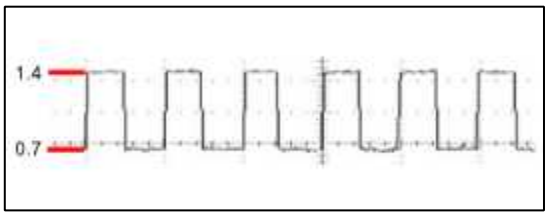
TCM Connector [CLG-TG]

Automatic Transaxle System > Automatic Transaxle Control System > Input Speed Sensor > Repair procedures

Inspection

1. Check signal waveform of Input speed sensor using the GDS.

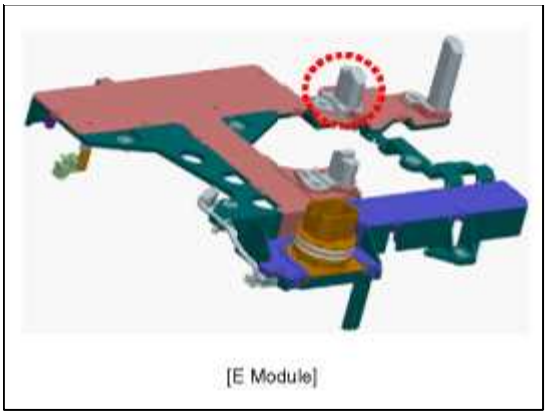
Specification: Refer to "Signal Wave Form" section.



Automatic Transaxle System > Automatic Transaxle Control System > Middle Speed Sensor > Description and Operation

Description

Middle speed sensor is a vital unit that measures the rate of rotation of the input shaft inside the transaxle and delivers the readings to the TCM.



[E Module]

Automatic Transaxle System > Automatic Transaxle Control System > Middle Speed Sensor > Specifications

Specifications

Type: Hall effect sensor

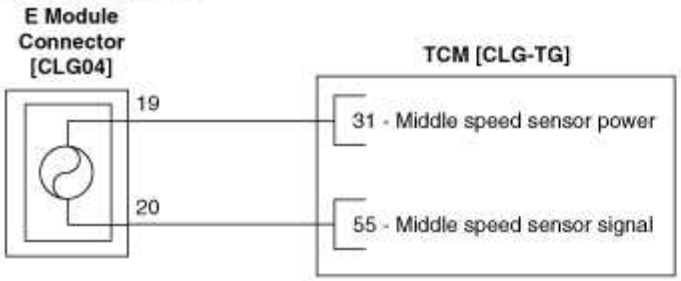
Specifications

Operation condition (°C)°F		((-)40~150)) -40~302
Air gap(mm)in.		1.3(0.0512)
Output voltage(V)	High	1.4
	Low	0.7

Automatic Transaxle System > Automatic Transaxle Control System > Middle Speed Sensor > Schematic Diagrams

Circuit Diagram

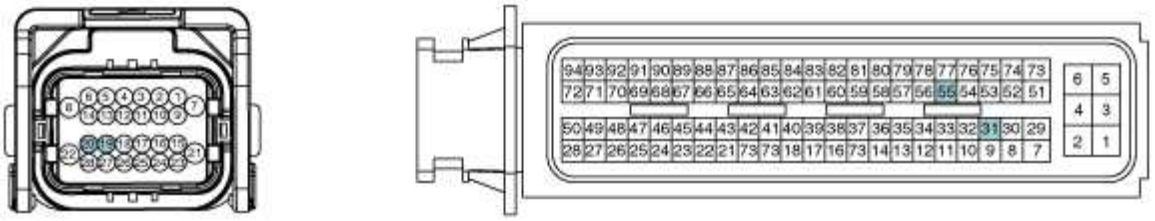
[Circuit Diagram]



[Connection Information]

Terminal	Connected to	Function
19	TCM(31)	Middle speed sensor power
20	TCM(55)	Middle speed sensor signal

[Harness Connector]



E Module Connector [CLG04]

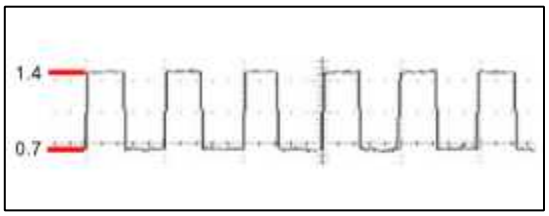
TCM Connector [CLG-TG]

Automatic Transaxle System > Automatic Transaxle Control System > Middle Speed Sensor > Repair procedures

Inspection

1. Check signal waveform of middle speed sensor using the GDS.

Specification: Refer to "Signal Wave Form" section.



Automatic Transaxle System > Automatic Transaxle Control System > Presure Switch > Description and Operation

Description

Presure switch is attached to the valve body. This check the production of hydraulic.

[Valve body assembly]

Automatic Transaxle System > Automatic Transaxle Control System > Presure Switch > Specifications

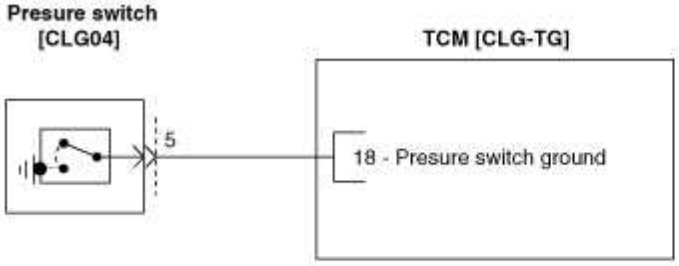
Specifications

	Specifications (20°C(68°F))
OFF => ON	146 ± 40 kPa
ON => OFF	50 kPa

Automatic Transaxle System > Automatic Transaxle Control System > Presure Switch > Schematic Diagrams

Circuit Diagram

[Circuit Diagram]

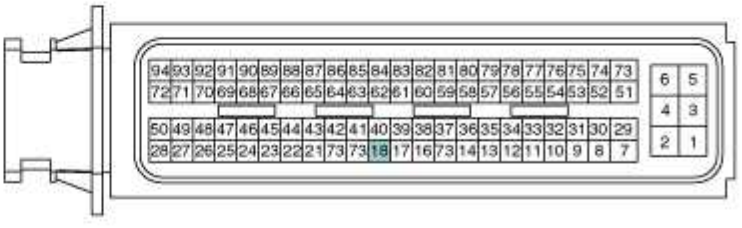


[Connection Information]

Terminal	Connected to	Function
19	TCM(18)	Presure switch ground

[Harness Connector]

E Module Connector
[CLG04]



TCM Connector
[CLG-TG]

Automatic Transaxle System > Automatic Transaxle Control System > Presure Switch > Repair procedures

Inspection

1. Turn ignition switch OFF.
2. Disconnect the E Module connector.
3. Measure resistance between switch signal terminal and switch ground terminal.
4. Check that the resistance is within the specification.

Automatic Transaxle System > Automatic Transaxle Control System > 6 Speed Clutch Control Solenoid Valve > Description and Operation

Description

6 Clutch control solenoid valve is attached to the valve body. This variable force solenoid valve directly controls the hydraulic pressure inside the 6 Clutch.

[Valve body assembly]

Automatic Transaxle System > Automatic Transaxle Control System > 6 Speed Clutch Control Solenoid Valve > Specifications

Specifications

Direct control VFS[6/C]

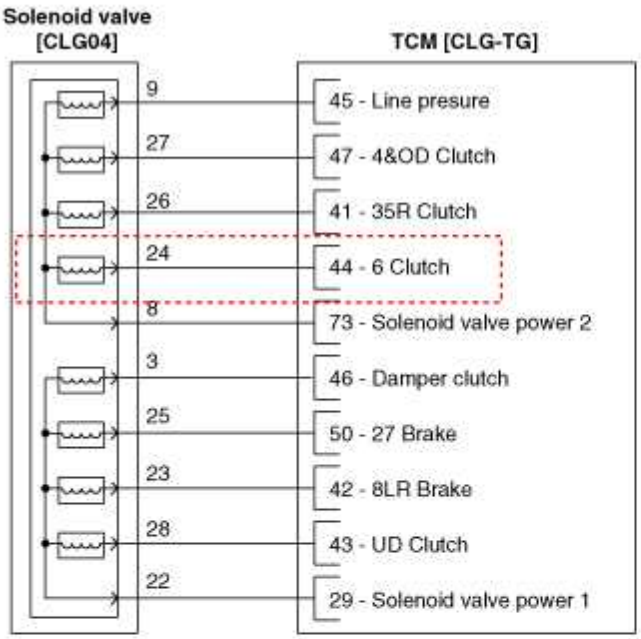
Control type : Normal low type

Control Pressure kpa (kgf/cm², psi)	0~1569.06 (0~16,0~227.57)
Current value(mA)	0~1100
Internal resistance(Ω)	5.0~5.6

Automatic Transaxle System > Automatic Transaxle Control System > 6 Speed Clutch Control Solenoid Valve > Schematic Diagrams

Circuit Diagram

[Circuit Diagram]

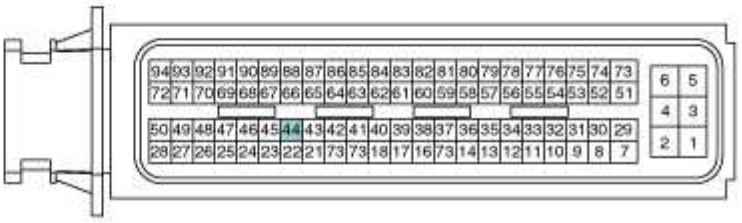


[Connection Information]

Terminal	Connected to	Function
9	TCM(45)	Line presure control
27	TCM(47)	4&OD Clutch control
26	TCM(41)	35R Clutch control
24	TCM(44)	6 Clutch control
8	TCM(73)	Solenoid valve power 2
3	TCM(46)	Damper clutch control
25	TCM(50)	27 Brake control
23	TCM(42)	8LR Brake control
28	TCM(43)	UD Clutch control
22	TCM(29)	Solenoid valve power 1

[Harness Connector]

E Module Connector
[CLG04]



TCM Connector
[CLG-TG]

Automatic Transaxle System > Automatic Transaxle Control System > 6 Speed Clutch Control Solenoid Valve > Repair procedures

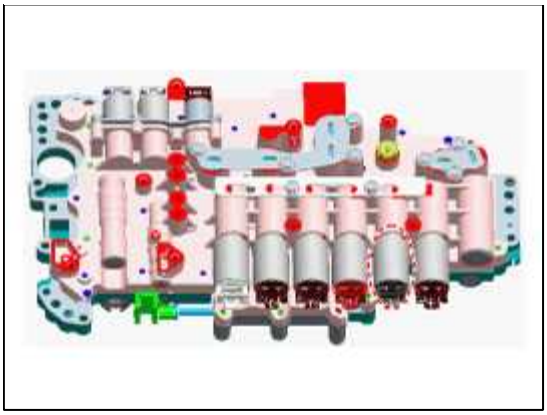
Inspection

1. Turn ignition switch OFF.
2. Disconnect the E Module connector.
3. Measure resistance between valve signal terminal and valve ground terminal.
4. Check that the resistance is within the specification.

Automatic Transaxle System > Automatic Transaxle Control System > 4&OD Clutch Control Solenoid Valve > Description and Operation

Description

4&OD Clutch control solenoid valve is attached to the valve body. This variable force solenoid valve directly controls the hydraulic pressure inside the 4&OD Clutch.



Automatic Transaxle System > Automatic Transaxle Control System > 4&OD Clutch Control Solenoid Valve > Specifications

Specifications

Direct control VFS[4&OD/C]

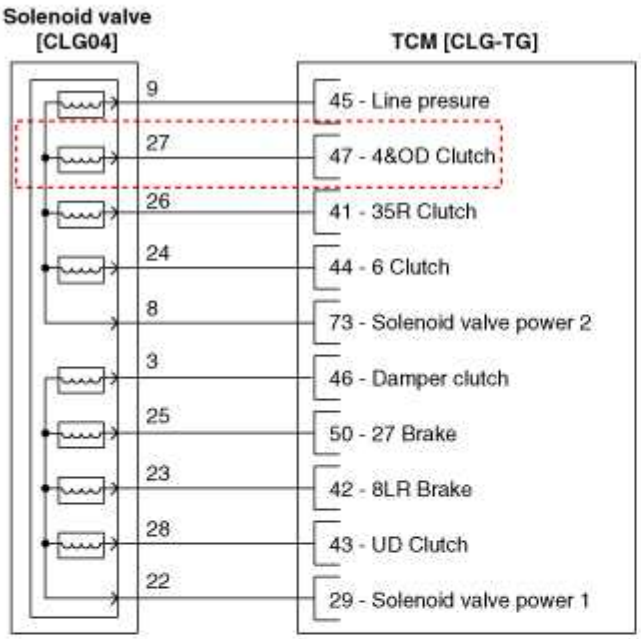
Control type : Normal low type

Control Pressure kpa (kgf/cm², psi)	0~1569.06 (0~16,0~227.57)
Current value(mA)	0~1100
Internal resistance(Ω)	5.0~5.6

Automatic Transaxle System > Automatic Transaxle Control System > 4&OD Clutch Control Solenoid Valve > Schematic Diagrams

Circuit Diagram

[Circuit Diagram]

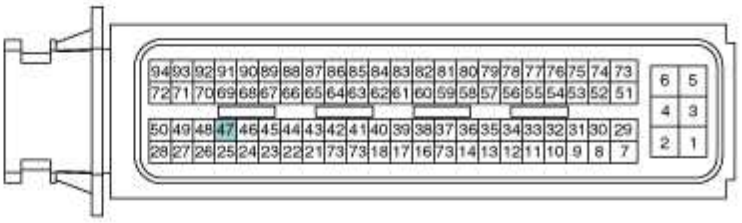


[Connection Information]

Terminal	Connected to	Function
9	TCM(45)	Line presure control
27	TCM(47)	4&OD Clutch control
26	TCM(41)	35R Clutch control
24	TCM(44)	6 Clutch control
8	TCM(73)	Solenoid valve power 2
3	TCM(46)	Damper clutch control
25	TCM(50)	27 Brake control
23	TCM(42)	8LR Brake control
28	TCM(43)	UD Clutch control
22	TCM(29)	Solenoid valve power 1

[Harness Connector]

E Module Connector
[CLG04]



TCM Connector
[CLG-TG]

Automatic Transaxle System > Automatic Transaxle Control System > 4&OD Clutch Control Solenoid Valve > Repair procedures

Inspection

1. Turn ignition switch OFF.
2. Disconnect the E Module connector.
3. Measure resistance between valve signal terminal and valve ground terminal.
4. Check that the resistance is within the specification.

Automatic Transaxle System > Automatic Transaxle Control System > 35R Clutch Control Solenoid Valve(35R/C_VFS) > Description and Operation

Description

35R Clutch control solenoid valve is attached to the valve body. This variable force solenoid valve directly controls the hydraulic pressure inside the 35R Clutch.

Automatic Transaxle System > Automatic Transaxle Control System > 35R Clutch Control Solenoid Valve(35R/C_VFS) > Specifications

Specifications

Direct control VFS[35R/C]

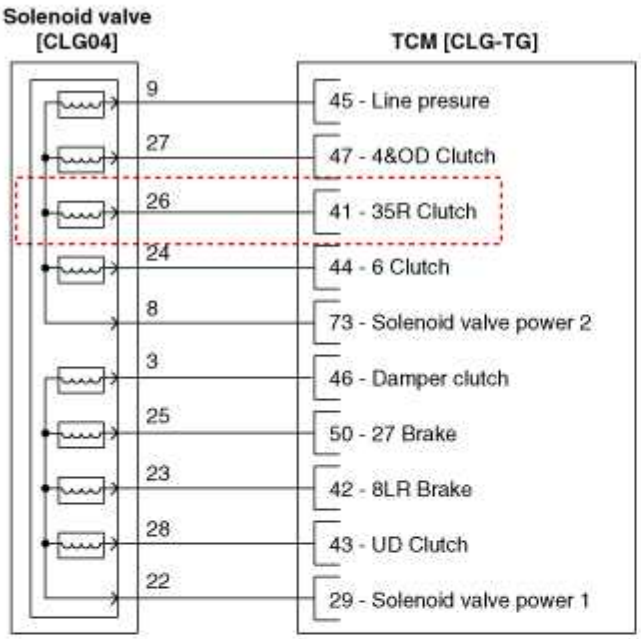
Control Type : Normal high type

Control Pressure kpa (kgf/cm², psi)	0~2108.42 (0~21.5~305.80)
Current value(mA)	0~1100
Internal resistance(Ω)	5.0~5.6

Automatic Transaxle System > Automatic Transaxle Control System > 35R Clutch Control Solenoid Valve(35R/C_VFS) > Schematic Diagrams

Circuit Diagram

[Circuit Diagram]

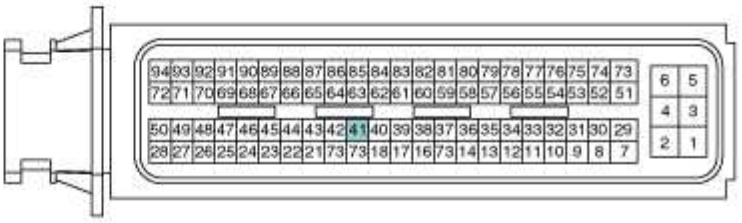


[Connection Information]

Terminal	Connected to	Function
9	TCM(45)	Line presure control
27	TCM(47)	4&OD Clutch control
26	TCM(41)	35R Clutch control
24	TCM(44)	6 Clutch control
8	TCM(73)	Solenoid valve power 2
3	TCM(46)	Damper clutch control
25	TCM(50)	27 Brake control
23	TCM(42)	8LR Brake control
28	TCM(43)	UD Clutch control
22	TCM(29)	Solenoid valve power 1

[Harness Connector]

E Module Connector
[CLG04]



TCM Connector
[CLG-TG]

Automatic Transaxle System > Automatic Transaxle Control System > 35R Clutch Control Solenoid Valve(35R/C_VFS) > Repair procedures

Inspection

1. Turn ignition switch OFF.
2. Disconnect the E Module connector.
3. Measure resistance between valve signal terminal and valve ground terminal.
4. Check that the resistance is within the specification.

Automatic Transaxle System > Automatic Transaxle Control System > 27 Brake Control Solenoid Valve > Description and Operation

Description

27 Brake control solenoid valve is attached to the valve body. This variable force solenoid valve directly controls the hydraulic pressure inside the 27 Brake.

Automatic Transaxle System > Automatic Transaxle Control System > 27 Brake Control Solenoid Valve > Specifications

Specifications

Direct control VFS[27/B]

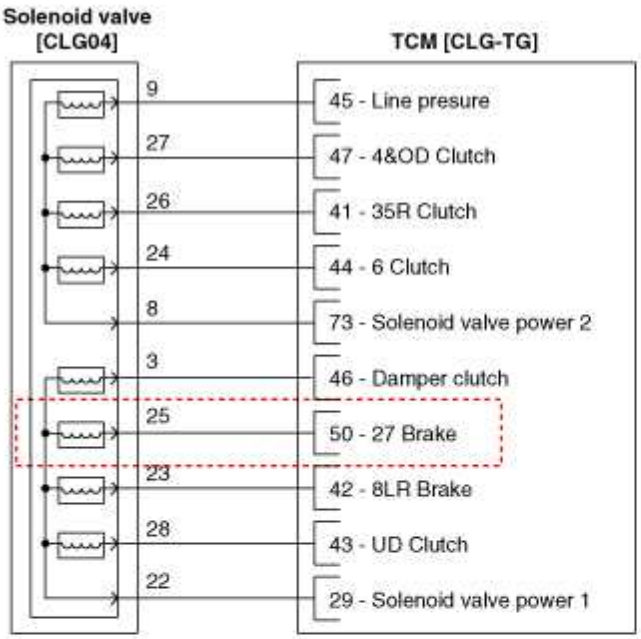
Control type : Normal low type

Control Pressure kpa (kgf/cm², psi)	0~1569.06 (0~16,0~227.57)
Current value(mA)	0~1100
Internal resistance(Ω)	5.0~5.6

Automatic Transaxle System > Automatic Transaxle Control System > 27 Brake Control Solenoid Valve > Schematic Diagrams

Circuit Diagram

[Circuit Diagram]

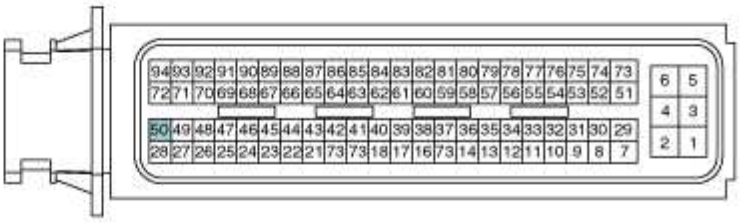


[Connection Information]

Terminal	Connected to	Function
9	TCM(45)	Line presure control
27	TCM(47)	4&OD Clutch control
26	TCM(41)	35R Clutch control
24	TCM(44)	6 Clutch control
8	TCM(73)	Solenoid valve power 2
3	TCM(46)	Damper clutch control
25	TCM(50)	27 Brake control
23	TCM(42)	8LR Brake control
28	TCM(43)	UD Clutch control
22	TCM(29)	Solenoid valve power 1

[Harness Connector]

E Module Connector
[CLG04]



TCM Connector
[CLG-TG]

Automatic Transaxle System > Automatic Transaxle Control System > 27 Brake Control Solenoid Valve > Repair procedures

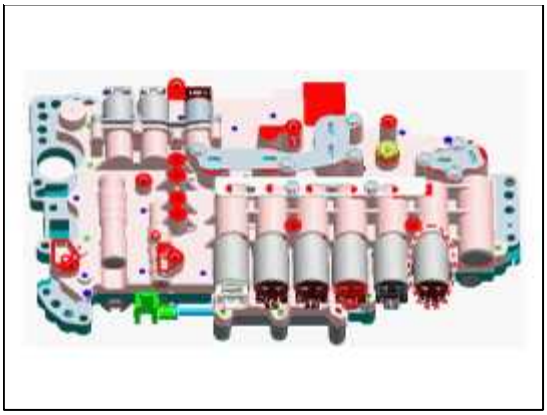
Inspection

1. Turn ignition switch OFF.
2. Disconnect the E Module connector.
3. Measure resistance between valve signal terminal and valve ground terminal.
4. Check that the resistance is within the specification.

Automatic Transaxle System > Automatic Transaxle Control System > Underdrive Brake Control Solenoid Valve(UD/B_VFS) > Description and Operation

Description

UD Clutch control solenoid valve is attached to the valve body. This variable force solenoid valve directly controls the hydraulic pressure inside the UD Clutch.



Automatic Transaxle System > Automatic Transaxle Control System > Underdrive Brake Control Solenoid Valve(UD/B_VFS) > Specifications

Specifications

Direct control VFS[UD/C]

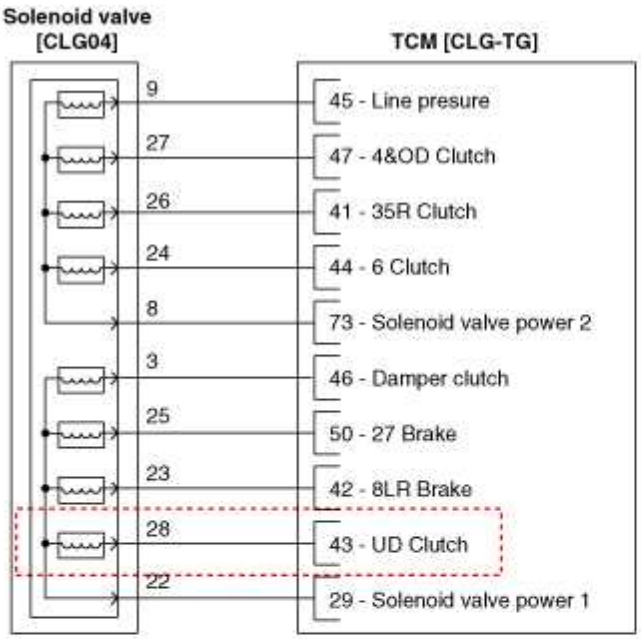
Control type : Normal low type

Control Pressure kpa (kgf/cm², psi)	0~1569.06 (0~16,0~227.57)
Current value(mA)	0~1100
Internal resistance(Ω)	5.0~5.6

Automatic Transaxle System > Automatic Transaxle Control System > Underdrive Brake Control Solenoid Valve(UD/B_VFS) > Schematic Diagrams

Circuit Diagram

[Circuit Diagram]

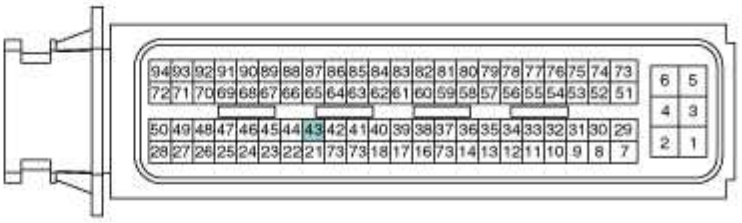


[Connection Information]

Terminal	Connected to	Function
9	TCM(45)	Line presure control
27	TCM(47)	4&OD Clutch control
26	TCM(41)	35R Clutch control
24	TCM(44)	6 Clutch control
8	TCM(73)	Solenoid valve power 2
3	TCM(46)	Damper clutch control
25	TCM(50)	27 Brake control
23	TCM(42)	8LR Brake control
28	TCM(43)	UD Clutch control
22	TCM(29)	Solenoid valve power 1

[Harness Connector]

E Module Connector
[CLG04]



TCM Connector
[CLG-TG]

Automatic Transaxle System > Automatic Transaxle Control System > Underdrive Brake Control Solenoid Valve(UD/B_VFS) > Repair procedures

Inspection

1. Turn ignition switch OFF.
2. Disconnect the E Module connector.
3. Measure resistance between valve signal terminal and valve ground terminal.
4. Check that the resistance is within the specification.

Automatic Transaxle System > Automatic Transaxle Control System > 8LR Brake Control Solenoid Valve > Description and Operation

Description

8LR Brake control solenoid valve is attached to the valve body. This variable force solenoid valve directly controls the hydraulic pressure inside the 8LR Brake.

Automatic Transaxle System > Automatic Transaxle Control System > 8LR Brake Control Solenoid Valve > Specifications

Specifications

Direct control VFS[8LR/B]

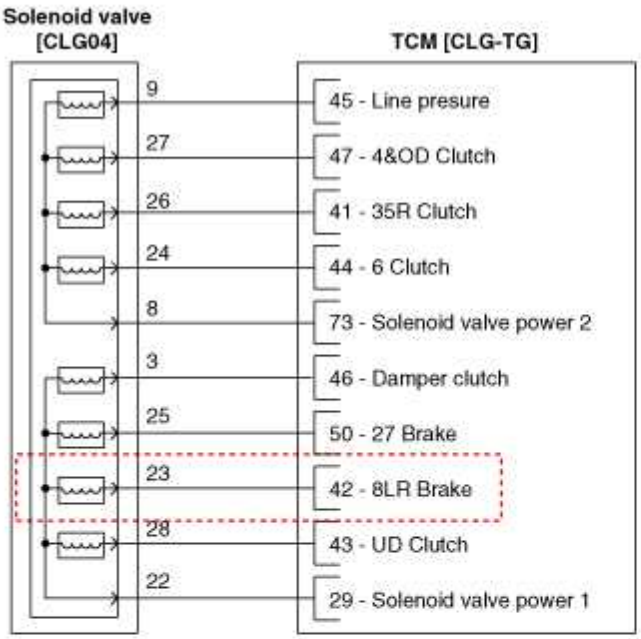
Control Type : Normal low type

Control Pressure kpa (kgf/cm², psi)	0~2108.42 (0~21.5~305.80)
Current value(mA)	0~1100
Internal resistance(Ω)	5.0~5.6

Automatic Transaxle System > Automatic Transaxle Control System > 8LR Brake Control Solenoid Valve > Schematic Diagrams

Circuit Diagram

[Circuit Diagram]

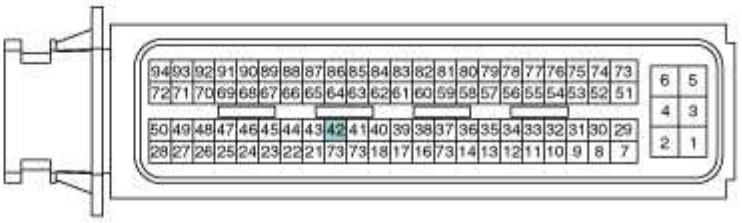


[Connection Information]

Terminal	Connected to	Function
9	TCM(45)	Line presure control
27	TCM(47)	4&OD Clutch control
26	TCM(41)	35R Clutch control
24	TCM(44)	6 Clutch control
8	TCM(73)	Solenoid valve power 2
3	TCM(46)	Damper clutch control
25	TCM(50)	27 Brake control
23	TCM(42)	8LR Brake control
28	TCM(43)	UD Clutch control
22	TCM(29)	Solenoid valve power 1

[Harness Connector]

E Module Connector
[CLG04]



TCM Connector
[CLG-TG]

Automatic Transaxle System > Automatic Transaxle Control System > 8LR Brake Control Solenoid Valve > Repair procedures

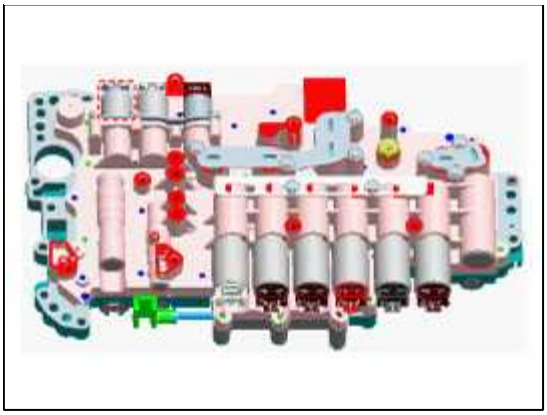
Inspection

1. Turn ignition switch OFF.
2. Disconnect the E Module connector.
3. Measure resistance between valve signal terminal and valve ground terminal.
4. Check that the resistance is within the specification.

Automatic Transaxle System > Automatic Transaxle Control System > Line Pressure Control Solenoid Vale > Description and Operation

Description

Line presure control solenoid valve is attached to the valve body. This variable force solenoid valve directly controls the hydraulic pressure inside the line presure .



Automatic Transaxle System > Automatic Transaxle Control System > Line Pressure Control Solenoid Vale > Specifications

Specifications

Line Pressure Control VFS

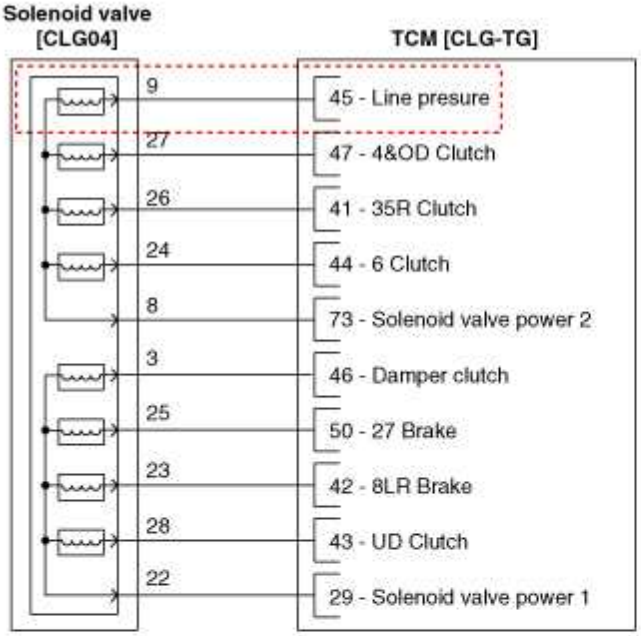
Control type : Normal high type

Control Pressure kpa (kgf/cm², psi)	0~500.14 (0~5.1,0~72.54)
Current value(mA)	0~850
Internal resistance(Ω)	4.8~5.4

Automatic Transaxle System > Automatic Transaxle Control System > Line Pressure Control Solenoid Vale > Schematic Diagrams

Circuit Diagram

[Circuit Diagram]

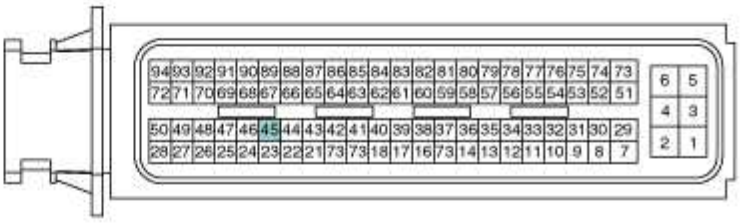


[Connection Information]

Terminal	Connected to	Function
9	TCM(45)	Line presure control
27	TCM(47)	4&OD Clutch control
26	TCM(41)	35R Clutch control
24	TCM(44)	6 Clutch control
8	TCM(73)	Solenoid valve power 2
3	TCM(46)	Damper clutch control
25	TCM(50)	27 Brake control
23	TCM(42)	8LR Brake control
28	TCM(43)	UD Clutch control
22	TCM(29)	Solenoid valve power 1

[Harness Connector]

E Module Connector
[CLG04]



TCM Connector
[CLG-TG]

Automatic Transaxle System > Automatic Transaxle Control System > Line Pressure Control Solenoid Vale > Repair procedures

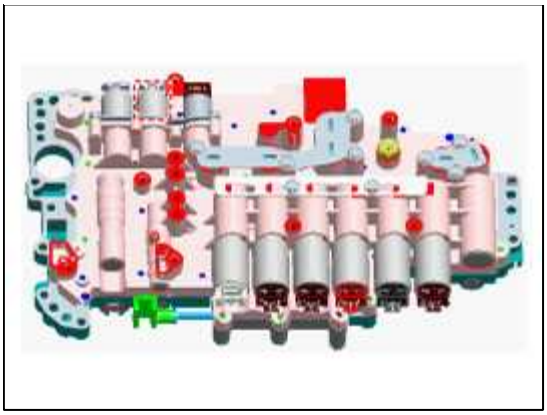
Inspection

1. Turn ignition switch OFF.
2. Disconnect the E Module connector.
3. Measure resistance between valve signal terminal and valve ground terminal.
4. Check that the resistance is within the specification.

Automatic Transaxle System > Automatic Transaxle Control System > Damper Clutch Control Solenoid Valve > Description and Operation

Description

Damper Clutch control solenoid valve is attached to the valve body. This variable force solenoid valve directly controls the hydraulic pressure inside the Damper Clutch.



Automatic Transaxle System > Automatic Transaxle Control System > Damper Clutch Control Solenoid Valve > Specifications

Specifications

Damper Clutch Control VFS

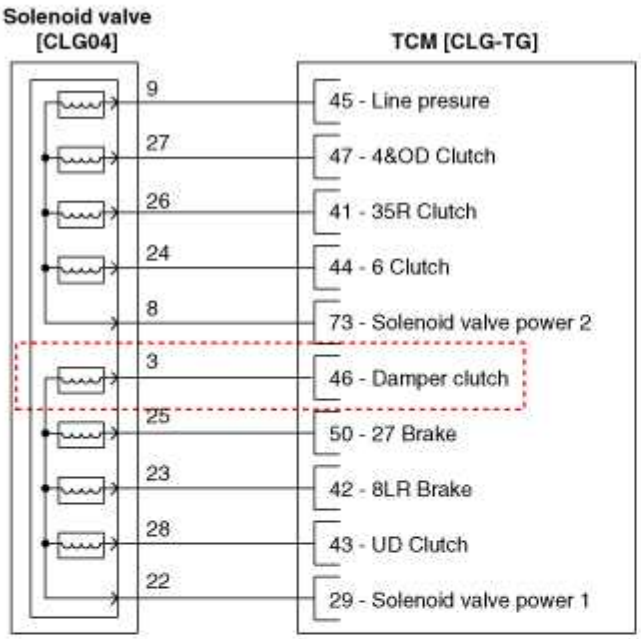
Control type : Normal low type

Control Pressure kpa (kgf/cm², psi)	0~500.14 (0~5.1,0~72.54)
Current value(mA)	0~850
Internal resistance(Ω)	4.8~5.4

Automatic Transaxle System > Automatic Transaxle Control System > Damper Clutch Control Solenoid Valve > Schematic Diagrams

Circuit Diagram

[Circuit Diagram]

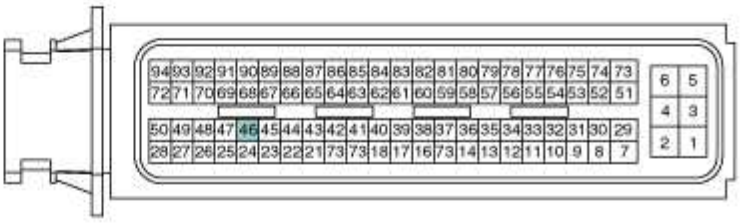


[Connection Information]

Terminal	Connected to	Function
9	TCM(45)	Line presure control
27	TCM(47)	4&OD Clutch control
26	TCM(41)	35R Clutch control
24	TCM(44)	6 Clutch control
8	TCM(73)	Solenoid valve power 2
3	TCM(46)	Damper clutch control
25	TCM(50)	27 Brake control
23	TCM(42)	8LR Brake control
28	TCM(43)	UD Clutch control
22	TCM(29)	Solenoid valve power 1

[Harness Connector]

E Module Connector
[CLG04]



TCM Connector
[CLG-TG]

Automatic Transaxle System > Automatic Transaxle Control System > Damper Clutch Control Solenoid Valve > Repair procedures

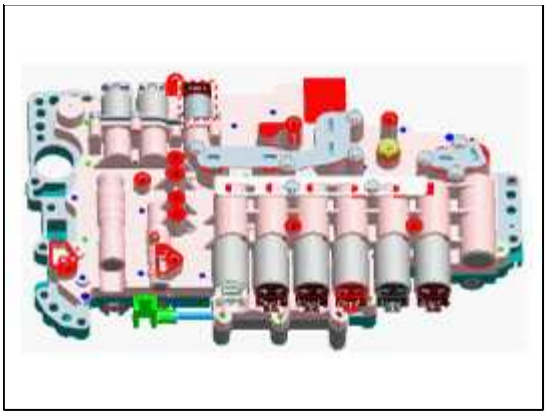
Inspection

1. Turn ignition switch OFF.
2. Disconnect the E Module connector.
3. Measure resistance between valve signal terminal and valve ground terminal.
4. Check that the resistance is within the specification.

Automatic Transaxle System > Automatic Transaxle Control System > ON/OFF Solenoid Valve > Description and Operation

Description

ON/OFF solenoid valve is attached to the valve body and is an on/off solenoid valve that is used to change gears.



Automatic Transaxle System > Automatic Transaxle Control System > ON/OFF Solenoid Valve > Specifications

Specifications

ON/OFF Solenoid Valve

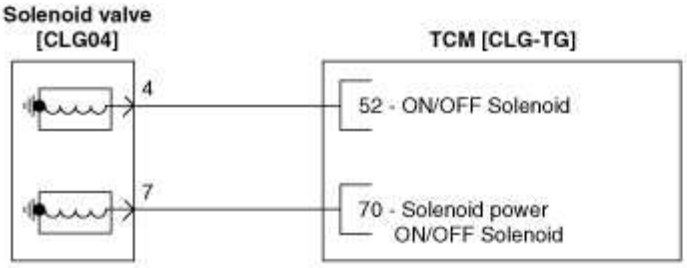
Control type : Normal low type

Control pressure kpa (kgf/cm², psi)	539.36 (5.5, 78.23)
Internal resistance(Ω)	10~11

Automatic Transaxle System > Automatic Transaxle Control System > ON/OFF Solenoid Valve > Schematic Diagrams

Circuit Diagram

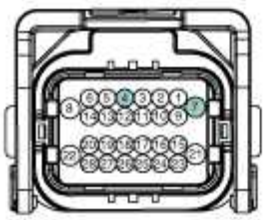
[Circuit Diagram]



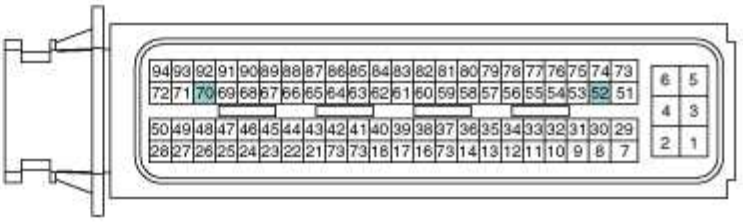
[Connection Information]

Terminal	Connected to	Function
4	TCM(52)	ON/OFF Solenoid
7	TCM(70)	Solenoid power

[Harness Connector]



E Module Connector
[CLG04]



TCM Connector
[CLG-TG]

Automatic Transaxle System > Automatic Transaxle Control System > ON/OFF Solenoid Valve > Repair procedures

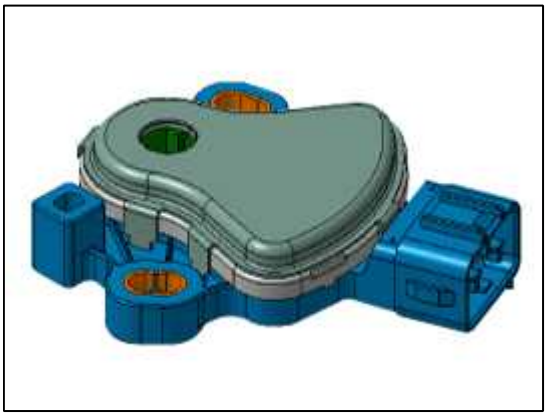
Inspection

1. Turn ignition switch OFF.
2. Disconnect the E Module connector.
3. Measure resistance between valve signal terminal and valve ground terminal.
4. Check that the resistance is within the specification.

Automatic Transaxle System > Automatic Transaxle Control System > Inhibitor Switch > Description and Operation

Description

Inhibitor Switch monitors the lever's position(PRND) and is used to control gear setting signals.



Automatic Transaxle System > Automatic Transaxle Control System > Inhibitor Switch > Specifications

Specifications

Type: Combination of output signals from 4 terminals

Power supply (V)	12
Output type	Pin to Pin

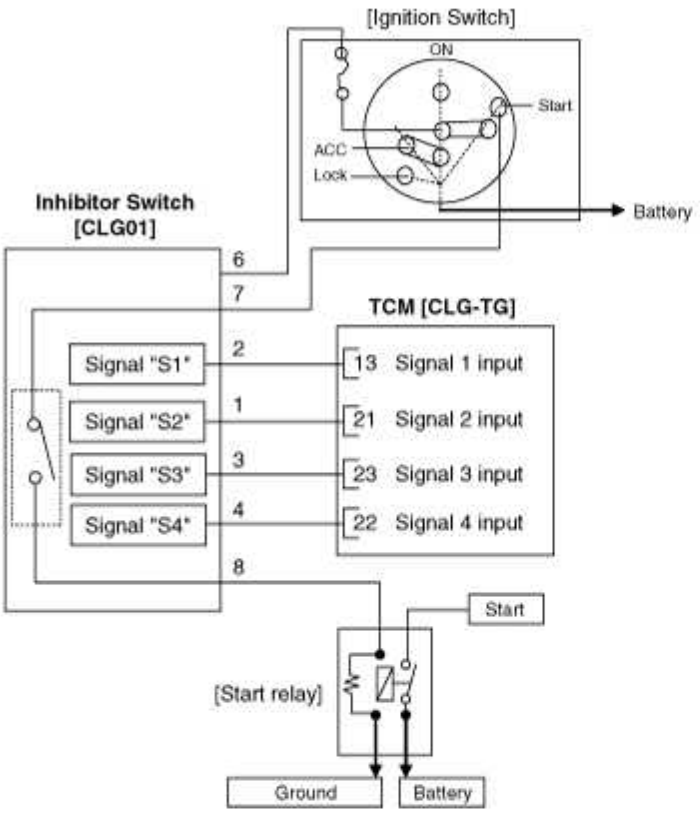
Signal Code Table

PIN No.	P	P-R	R	R-N	N	N-D	D
S1	12V	12V	O	O	O	O	O
S2	O	12V	12V	12V	O	O	O
S3	O	O	O	12V	12V	12V	O
S4	O	O	O	O	O	12V	12V

Automatic Transaxle System > Automatic Transaxle Control System > Inhibitor Switch > Schematic Diagrams

Circuit Diagram

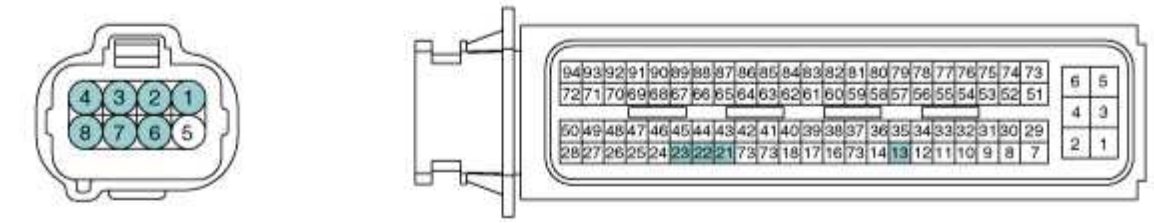
[Circuit Diagram]



[Connection Information]

Terminal	Connected to	Function
1	TCM (21)	Signal 2 input
2	TCM (13)	Signal 1 input
3	TCM (23)	Signal 3 input
4	TCM (22)	Signal 4 input
6	Ignition switch	IG 1
7	Ignition switch	Start power(ON) 12V
8	Start relay	Start relay

[Harness Connector]



Inhibitor Switch Connector
[CLG01]

TCM Connector
[CLG-TG]

Automatic Transaxle System > Automatic Transaxle Control System > Inhibitor Switch > Repair procedures

Inspection

NOTE

- Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.

Power Circuit Inspection

1. Disconnect the Inhibitor swtich connector.
2. Ignition KEY "ON"" & Engine "OFF".

3. Measure voltge between supplied power and ground at inhibitor circuit.

Specification : Approx. 12V

Signal Circuit Inspection

1. Connect the Inhibitor switch connector.
2. Ignition KEY "ON" & Engine "OFF".
3. Measure voltages between each terminal and chassis ground during shift lever changed "P, R, N, D".

Specification : See below "Signal Code Table"

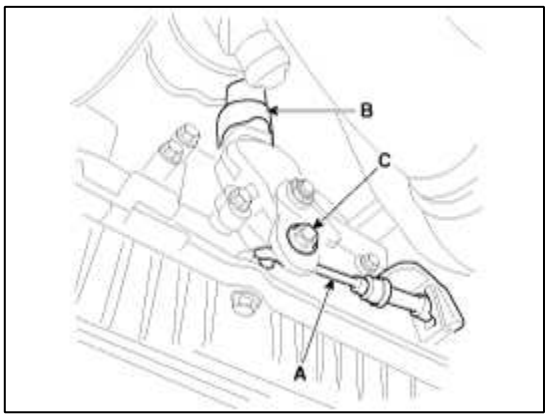
Signal Code Table

	P	P-R	R	R-N	N	N-D	D
Signal "1"	12V	12V	0	0	0	0	0
Signal "2"	0	12V	12V	12V	0	0	0
Signal "3"	0	0	0	12V	12V	12V	0
Signal "4"	0	0	0	0	0	12V	12V

Removal

1. Turn ignition switch OFF and disconnect the negative (-) battery cable.
2. Disconnect the inhibitor connector (B) and then remove the shift cable (A) by removing nut (C).

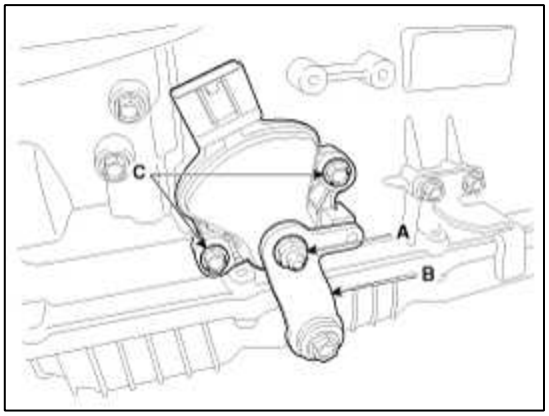
Tightening torque:
13.7 ~ 17.7 N.m (1.4 ~ 1.8 kgf.m, 10.1 ~ 13.0 lb-ft)



3. Remove the manual control lever (B) after removing a nut (A).

4. Remove the inhibitor switch assembly after removing the bolts (C).

Tightening torque:
[A] 16.7 ~ 25.5 N.m (1.7 ~ 2.6 kgf.m, 12.3 ~ 18.8 lb-ft)
[C] 9.8 ~ 11.8 N.m (1.0 ~ 1.2 kgf.m, 7.2 ~ 8.7 lb-ft)

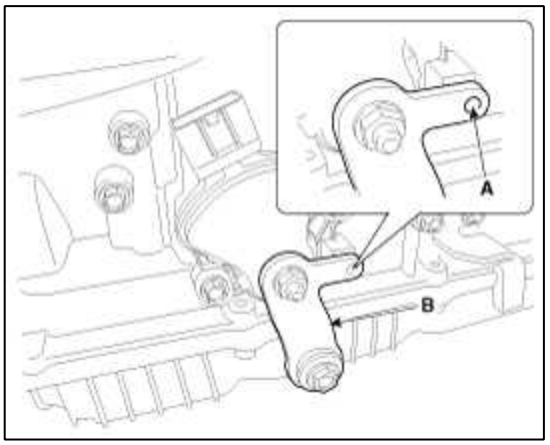


Installation

1. Installation is the reverse of removal.

NOTE

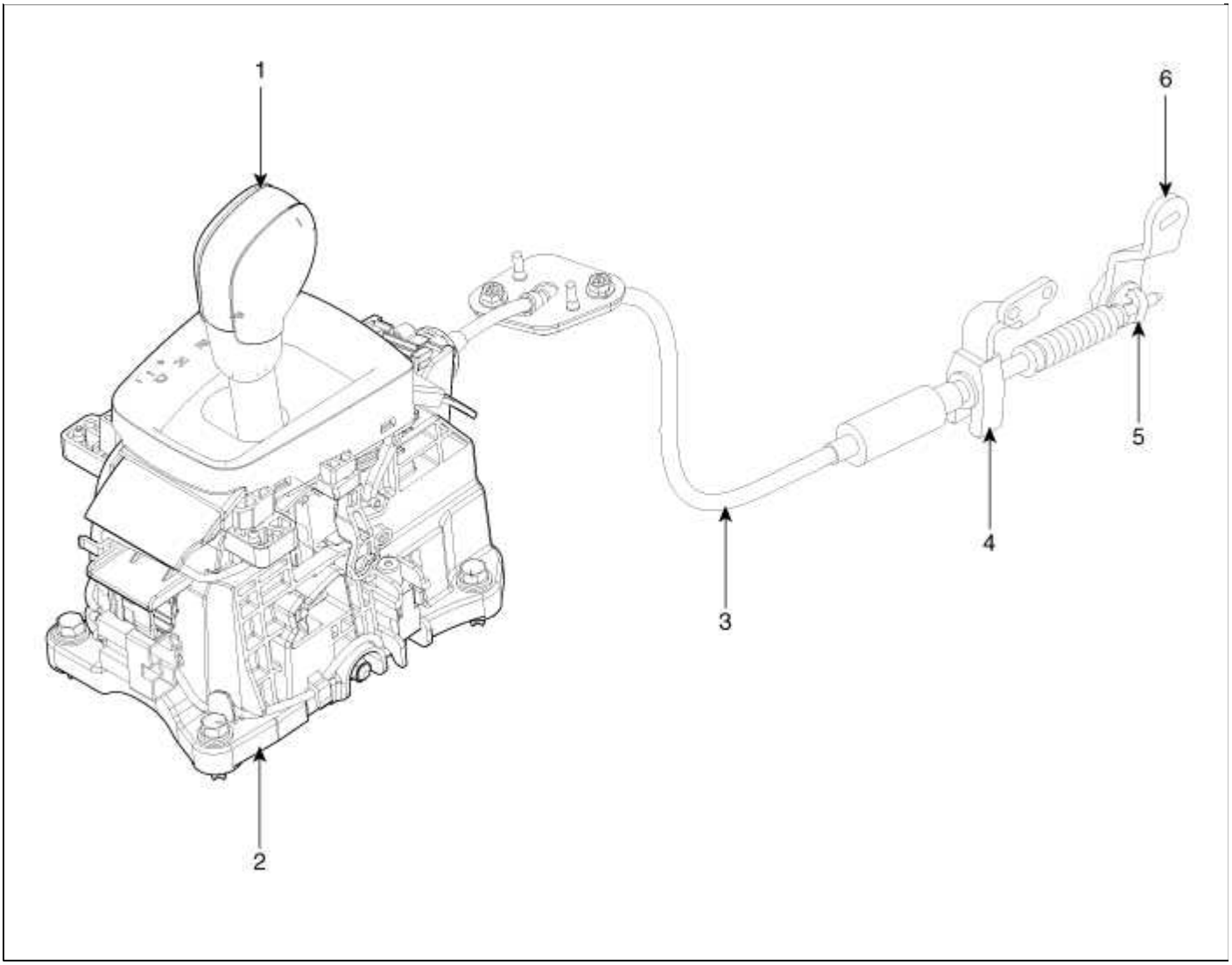
- Assembly the control lever (B) after seeting hole (A) aligning.



- Install the shift cable after adjust the FREE PLAY of cable.

Automatic Transaxle System > Automatic Transaxle Control System > Shift Lever > Components and Components Location

Components



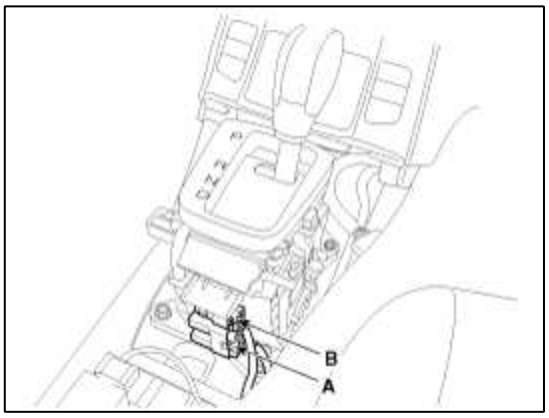
1. Shift lever knob 2. Shift lever assembly 3. Shift cable	4. Bracket 5. Special bolt 6. Manual lever

Automatic Transaxle System > Automatic Transaxle Control System > Shift Lever > Repair procedures

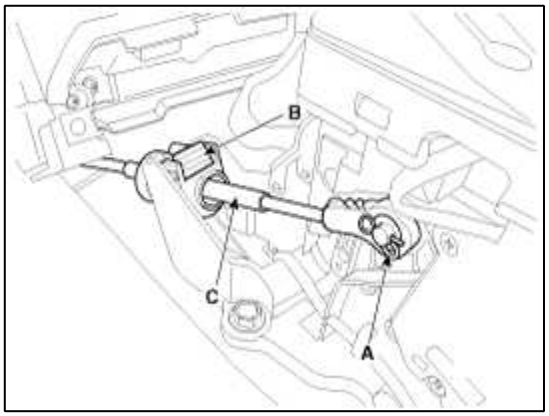
Removal

1. Disconnect (-) terminal from the battery.
2. Remove the console assembly.
   (Refer to Body - "console")

3. Disconnect the sport mode connector (A) and indicator connector (B).

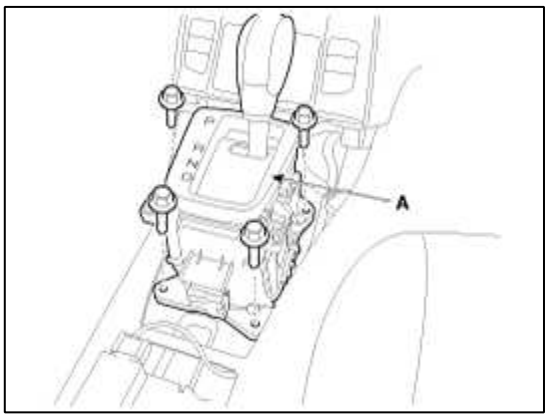


4. Take off the clip (A) and remove the shift cable assembly (C) by pressing the guide (B).



5. Remove the shift lever assembly (A) by removing the bolts.

Tightening torque :
9 ~ 14 N.m (0.9 ~ 1.4 kgf.m, 6.51 ~ 10.12 lb-ft)



Installation

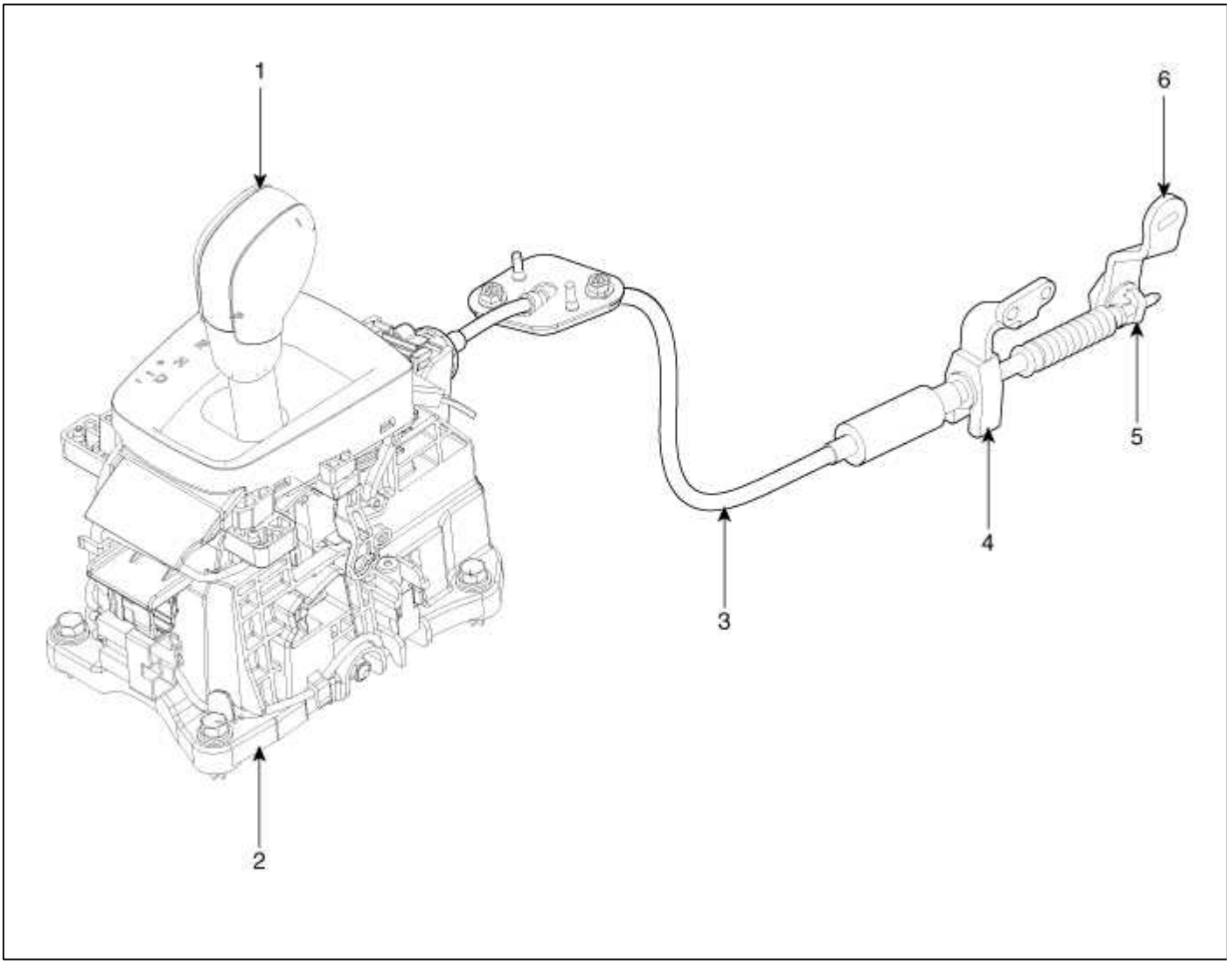
1. Installation is the reverse order of removal.

CAUTION

- When installing, set room side Shift lever and T/M side manual control lever to N position.
- After installing, check to be sure that this part operates as designed at each range of T/M side corresponding to each position of room lever.

Automatic Transaxle System > Automatic Transaxle Control System > Shift Cable > Components and Components Location

Components



1. Shift lever knob 2. Shift lever assembly 3. Shift cable	4. Bracket 5. Special bolt 6. Manual lever

Automatic Transaxle System > Automatic Transaxle Control System > Shift Cable > Repair procedures

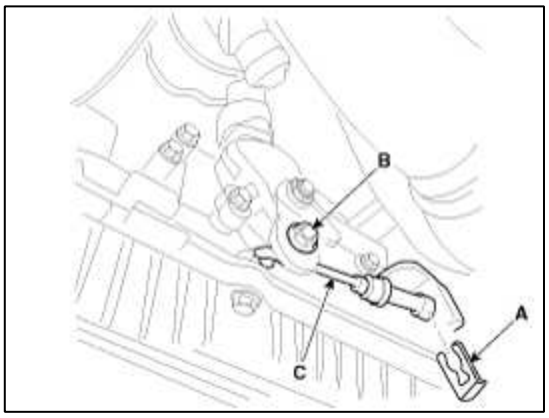
Inspection

1. Check the damage and operation of the control cable.
2. Check the damage of the boot.
3. Check the damage and corrosion of the bushing.
4. Check the damage or weakening of the spring.

Removal

1. Disconnect (-) terminal from the battery.

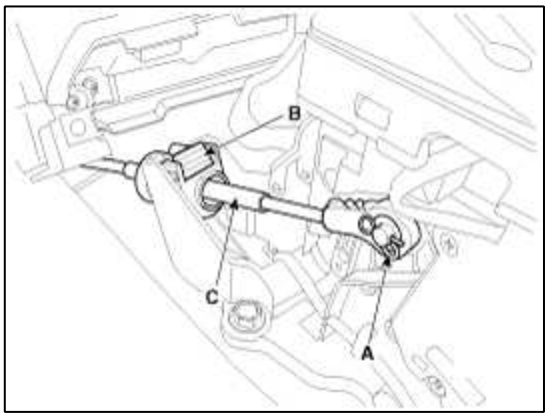
2. Loosen the nut (B) and then remove the shift cable (C) by removing the clip (A).



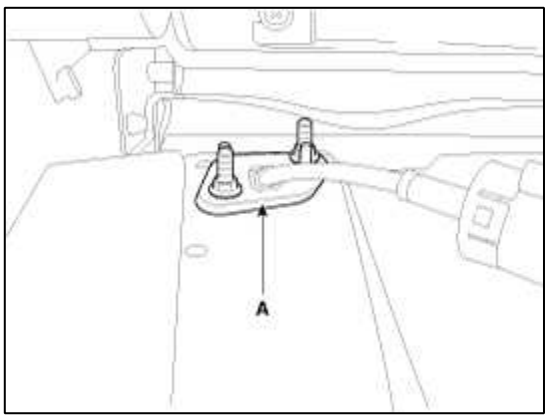
NOTE

Do not reuse the clip (A).

3. Remove the console assembly.
   (Refer to Body - "console")
4. Take off the clip (A) and remove the shift cable assembly (C) by pressing the guide (B).



5. Remove the retainer (A).



Installation

1. Installation is the reverse order of removal.

CAUTION

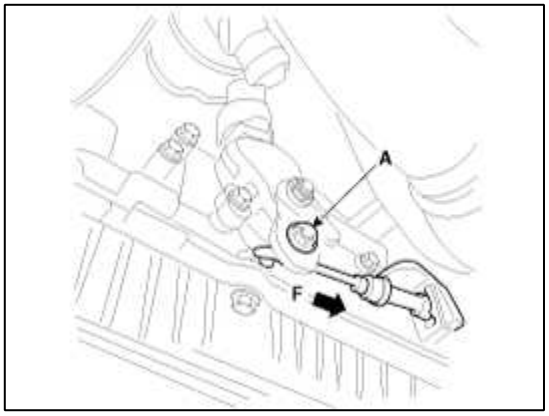
- When installing, set room side Shift lever and T/M side manual control lever to N position.
- When installing, adjust the shift cable.
- After installing, check to be sure that this part operates as designed at each range of T/M side corresponding to each position of room lever.

Adjustment

How To Adjust Shift Cable

1. Set room side Shift lever and T/M side manual control lever to N position.
2. Insert the shift cable to the bracket and hold it with a new clip.
3. Push cable to "F" direction shown to eliminate FREE PLAY.
4. Firmly hold the special bolt with a spaner and tighten the nut with the specified torque.

Tightening torque :
13.7 ~ 17.7 N.m (1.4 ~ 1.8 kgf.m, 10.1 ~ 13.0 lb-ft)



GENESIS COUPE(BK) > 2013 > G 2.0 T-MPI > Body (Interior and Exterior)

Body (Interior and Exterior) > General Information > Specifications

Specifications

Item		Specification
Hood	Type	Rear hinged, gas lifter type
Front Door	Construction	Front hinged, full door construction
	Regulator system	Wire drum type
	Locking system	Pin-fork system
Trunk Lid	Type	Torsior bar type
Seat Belts	Front	3 point type with Emergency Locking Retractor (E.L.R)
	Rear	2 point type with Emergency Locking Retractor (E.L.R)

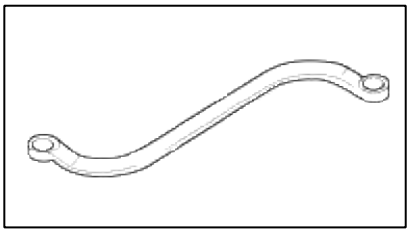
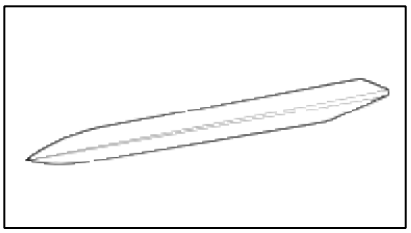
Tightening Torques

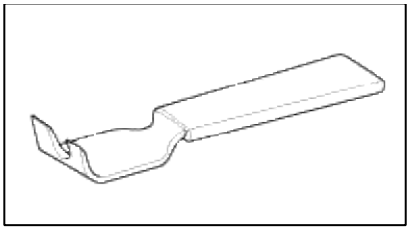
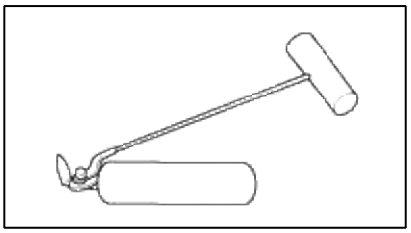
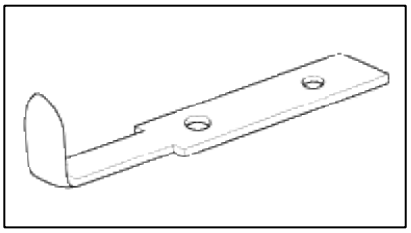
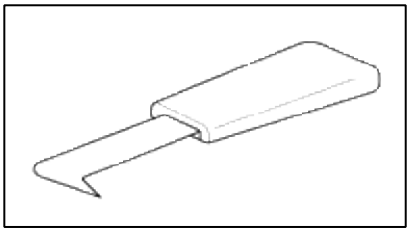
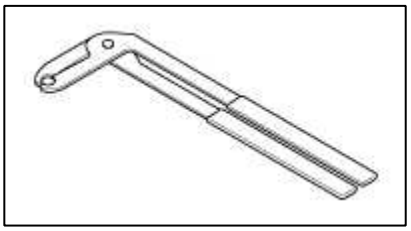
Items		N.m	Kgf.m	lb-ft
Front door	Door hinge to body	33.3 ~ 41.2	3.4 ~ 4.2	24.6~ 30.4
	Door hinge to door	21.6 ~ 26.5	2.2 ~ 2.7	15.9 ~ 19.5
	Door checker to door	6.9 ~ 10.8	0.7 ~ 1.1	5.1 ~ 8.0
	Door checker to body	16.7 ~ 21.6	1.7 ~ 2.2	12.3 ~ 15.9
	Door glass mounting bolt	3.9 ~ 2.9	0.4 ~ 1.2	11.8 ~ 8.7
	Outside handle cover mounting bolt	6.9 ~ 10.8	0.7 ~ 1.1	5.1 ~ 8.0
	Latch mounting bolts	6.9 ~ 10.8	0.7 ~ 1.1	5.1 ~ 8.0
	Door channel mounting nuts	3.9 ~ 5.9	0.4 ~ 0.6	2.9 ~ 4.3
	Door module mounting bolts	6.9 ~ 10.8	0.7 ~ 1.1	5.1 ~ 8.0
	Door striker mounting bolts	16.7 ~ 21.6	1.7 ~ 2.2	12.3 ~ 15.9
Trunk lid	Trunk lid hinge to body	6.9 ~ 8.8	0.7 ~ 0.9	5.1 ~ 6.5
	Trunk lid hinge to trunk lid	6.9 ~ 8.8	0.7 ~ 0.9	5.1 ~ 6.5
	Trunk lid latch mounting bolts	6.9 ~ 10.8	0.7 ~ 1.1	5.1 ~ 8.0
	Trunk lid striker mounting bolts	6.9 ~ 10.8	0.7 ~ 1.1	5.1 ~ 8.0
Hood	Hood hinge to body	21.6 ~ 26.5	2.2 ~ 2.7	15.9 ~ 19.5
	Hood hinge to hood	21.6 ~ 26.5	2.2 ~ 2.7	15.9 ~ 19.5
	Hood latch to body	7.8 ~ 11.8	0.8 ~ 1.2	5.8 ~ 8.7
Seat	Front seat mounting bolts	49.0 ~ 63.7	5.0 ~ 6.5	36.2 ~ 47.0
	Front seat frame mounting bolts	49.0 ~ 63.7	5.0 ~ 6.5	36.2 ~ 47.0
	Rear seat cushion mounting bolts	34.3 ~ 53.9	3.5 ~ 5.5	25.3 ~ 39.8

	Rear seat back mounting bolts	34.3 ~ 53.9	3.5 ~ 5.5	25.3 ~ 39.8
	Rear seat latch mounting bolts	19.6 ~ 29.4	2.0 ~ 3.0	14.5 ~ 21.7
Seat belt	Height adjuster mounting bolts	39.2 ~ 53.9	4.0 ~ 5.5	28.9 ~ 39.8
	Front seat belt upper anchor mounting bolt	39.2 ~ 53.9	4.0 ~ 5.5	28.9 ~ 39.8
	Front seat belt lower anchor mounting bolt	39.2 ~ 53.9	4.0 ~ 5.5	28.9 ~ 39.8
	Front seat belt retractor mounting bolt	39.2 ~ 53.9	4.0 ~ 5.5	28.9 ~ 39.8
	Rear seat belt lower anchor mounting bolt	39.2 ~ 53.9	4.0 ~ 5.5	28.9 ~ 39.8
	Rear seat belt retractor mounting bolt	39.2 ~ 53.9	4.0 ~ 5.5	28.9 ~ 39.8
	Seat belt buckle mounting bolt	39.2 ~ 53.9	4.0 ~ 5.5	28.9 ~ 39.8
Outside rearview mirror	Outside rearview mirror mounting nuts	6.9 ~ 10.8	0.7 ~ 1.1	5.1 ~ 8.0
Wiper arm	Wiper arm mounting nuts	22.6 ~ 26.5	2.3 ~ 2.7	16.6 ~ 19.5
Sunroof	Sunroof mounting nuts	3.9 ~ 5.9	0.4 ~ 0.6	2.9 ~ 4.3
	Sunroof mounting bolts	6.9 ~ 10.8	0.7 ~ 1.1	5.1 ~ 8.0

Body (Interior and Exterior) > General Information > Special Service Tools

Special Service Tools

Tool (Number and name)	Illustration	Use
09793-21000 Door hinge adjusting wrench		Adjustment, removal and installation of the door hinge
09800-21000 Ornament remover		Trim removal
09853-31000		Headliner clip removal

Headliner clip remover		
09861-31100 Sealant cut-out tool		Cutting windshield sealant (use with 09861-31200)
09861-31200 Sealant cutting blade		Cutting windshield sealant (use with 09861-31100)
09861-31000 Windshield molding remover		Windshield moding removal
09880-4F000 Hog ring clip installer		Hog ring clip installation

Body (Interior and Exterior) > General Information > Troubleshooting

Troubleshooting

Symptom	Suspect Area	Remedy (Refer to page)
Water leaks from sunroof	Dirt accumulation in drain tube	Remove dirt from drain
	Clogged drain tube	Blow air into drain to remove dirt
	Broken or dislocated drain tube, defective or cracked clip	Check tube installation and flange contact
	Deteriorated roof lid weatherstrip	Replace
	Excessive roof lid-to-body clearance and improperly fitted weatherstrip	Adjust
Wind noise around sunroof	Loose or deformed deflector, gaps in body work	Retighten adjust or replace
Noise heard when opening. closing sunroof	Foreign particles lodged in guide rail	Check drive cable and guide rails for foreign particles
	Loose guide rails and lid	Retighten
Motor runs but sunroof does not move or moves only partially	Foreign particles lodged in guide rail	Adjust or replace
	Incorrect engagement of motor pinion with drive cable	
	Decrease in motor`s clutch slipping force	
	Increased sunroof sliding resistanceor interference of sunroof with drive cables, weatherstrip, etc. due tomal adjustment of sunroof	
Noise in motor (clutch slipping noise from motor when sunroofIs fully opened or closed is not an unusual noise	Incorrect engagement of motor pinion with drive cable	Check pinion installation and
		retighten motor
	Worn out or damaged motor pinion bearing	Replace motor assembly
	Worn out or deformed drive cable	Replace
Door glass fails to operate up and down	Incorrect window glass installation	Adjust position
	Damaged or faulty regulator arm or regulator	Correct or replace
Door does not open or close completely	Incorrect door installation	Adjust position
	Defective door check assembly	Correct or replace
	Door hinge requires grease	Apply grease
Hood does not open or close completely	Striker and latch not properly aligned	Adjust
	Incorrectly installed hood	Adjust
	Incorrect hood bumper height	Adjust
Water leak through windshield end rear window	Defective seal	Fill with sealant
	Defective flange	Correct

Body (Interior and Exterior) > Body Dimensions > General Information

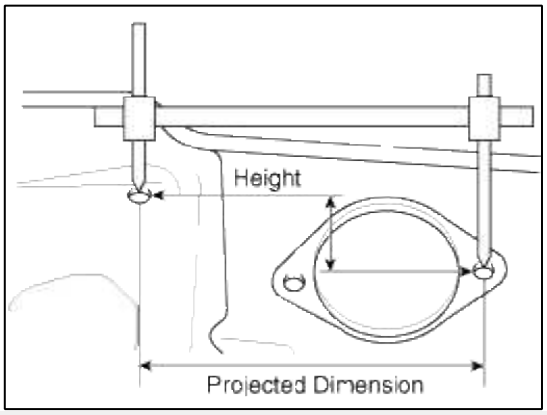
General

1. Basically, all measurements in this manual are taken with a tracking gauge.
2. When a measuring tape is used, check to be sure there is no elongation, twisting or bending.
3. For measuring dimensions, both projected dimension and actual-measurement dimension are used in this manual.

Measurement Method

Projected Dimensions

1. These are the dimensions measured when the measurement points are projected into the reference plane, and are the reference dimensions used for body alterations.
2. If the length of the tracking gauge probes are adjustable, make the measurement by lengthening one probe by the amount equivalent to the difference in height of the two surfaces.

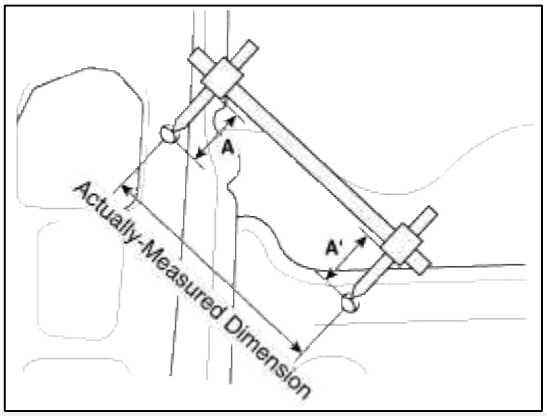


Actual-Measurement Dimensions

1. These dimensions indicate the actual linear distance between measurement points, and are the reference dimensions for use if a tracking gauge is used for measurement.
2. Measure by first adjusting both probes to the same length (A=A').

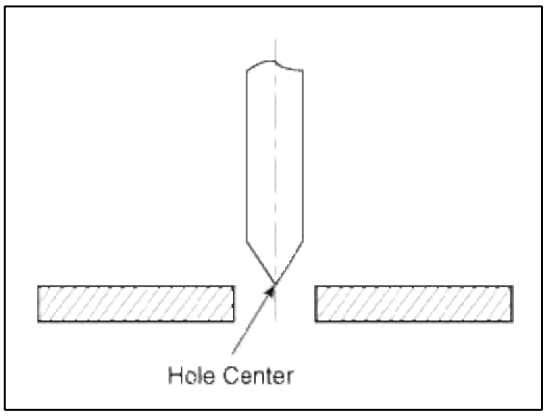
CAUTION

Check the probes and gauge itself to make sure there is no free play.



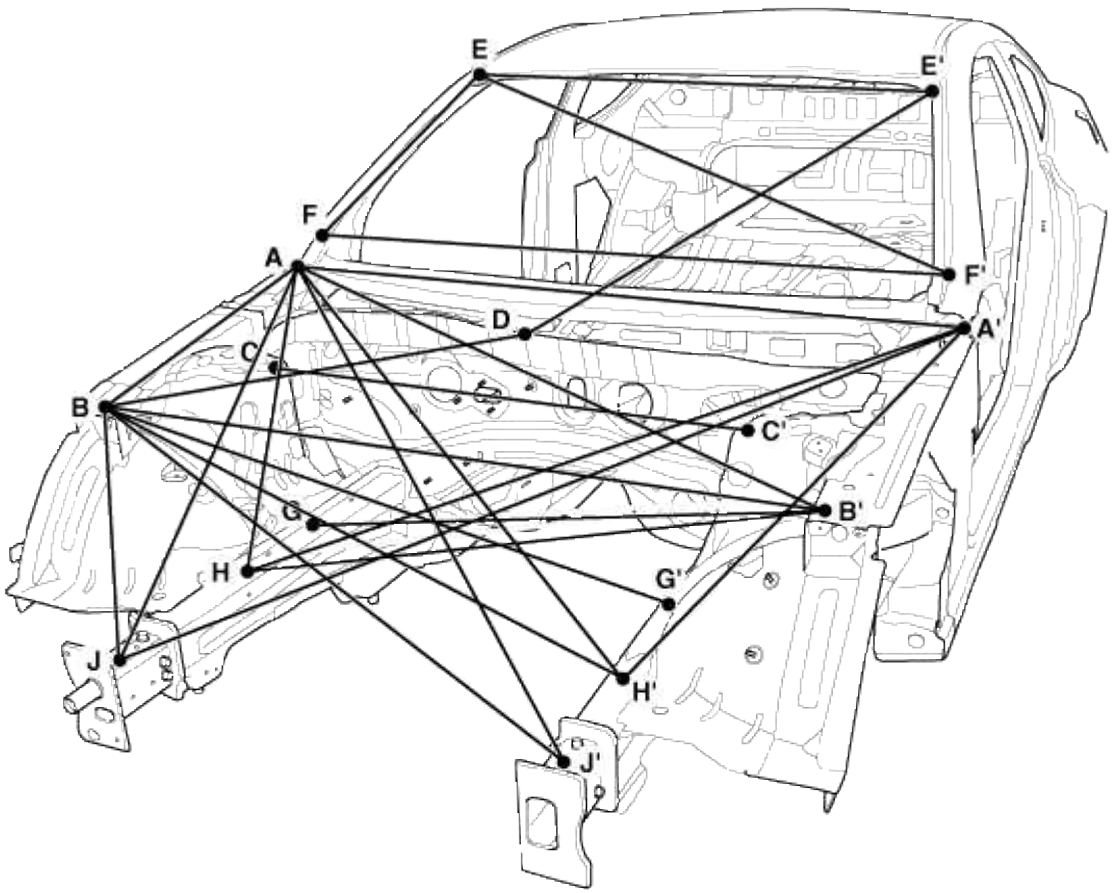
Measurement Point

1. Measurements should be taken at the hole center.



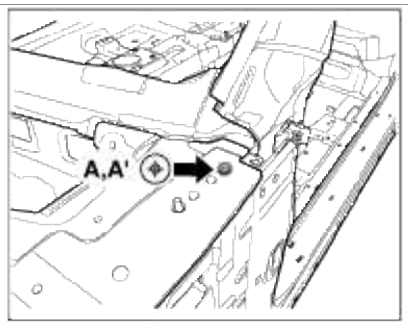
Body (Interior and Exterior) > Body Dimensions > Front Body > Body Repair

Front Body A

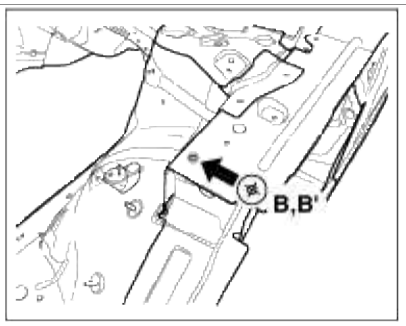


* These dimensions indicated in this figure are actual-measurement dimensions.

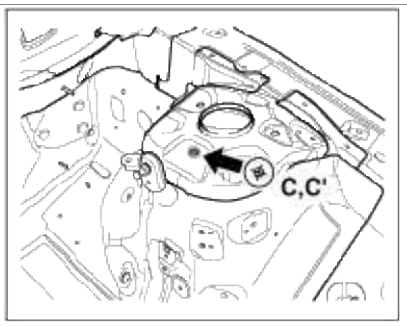
Point symbol	A-A'	A-B / A'-B'	A-B' / A'-B	A-H	A'-H'	A-H'	A'-H	A-J / A'-J'
Length(mm)	1596	719	1683	940	942	1525	1513	1248
Point symbol	A-J' / A'-J	B-B'	B-D / B'-D	B-G'	B'-G	B-H'	B'-H	B-J / B'-J'
Length(mm)	1711	1450	850	1213	1210	1217	1206	595
Point symbol	B-J' / B'-J	C-C'	D-E / D-E'	E-E'	E-F / E'-F'	E'-F / E-F'	F-F'	
Length(mm)	1265	1087	1222	1209	695	1527	1528	



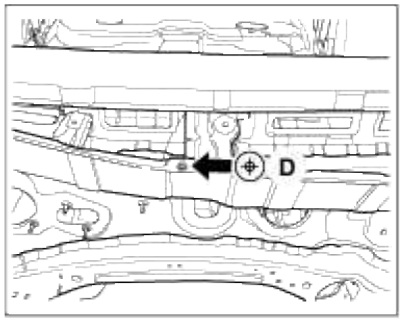
Hood hinge mounting hole
(ø13)



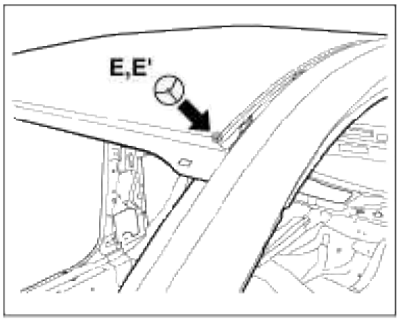
Front end module mounting hole
(ø9)



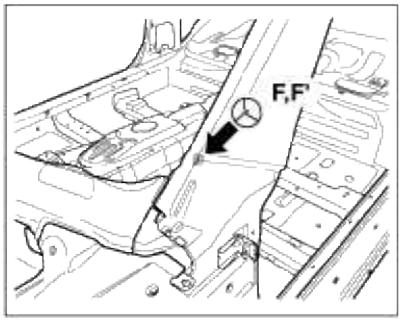
Front suspension mounting hole
(ø11)



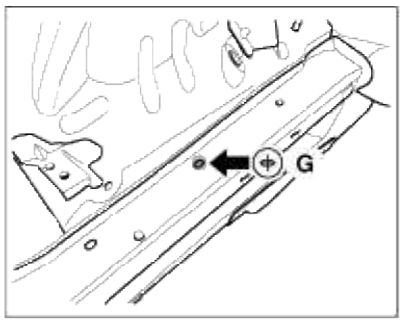
Cowl top cover mounting hole
(ø7)



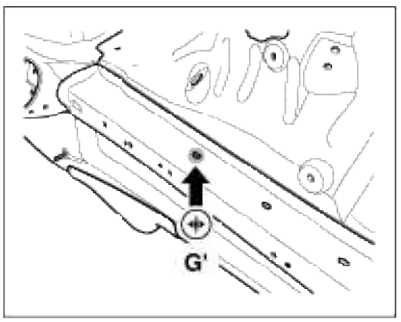
Roof panel front corner



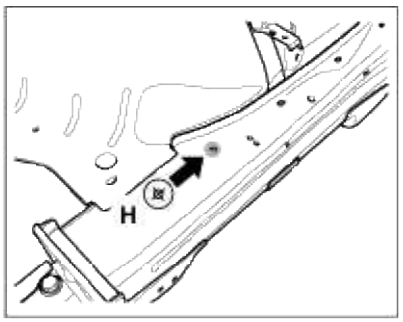
Front pillar outer corner



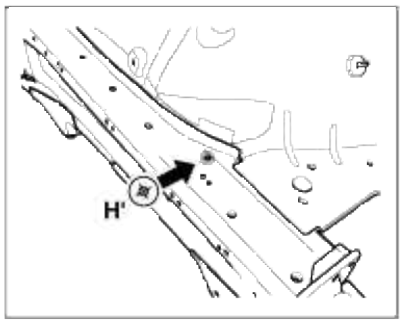
Wiring harness mounting hole
(7X12)



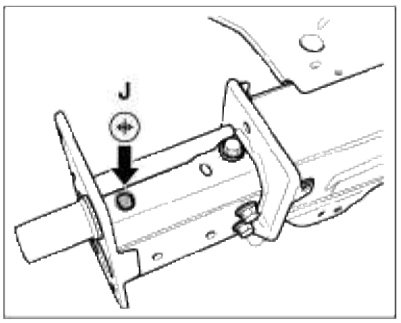
Wiring harness mounting hole
(7X12)



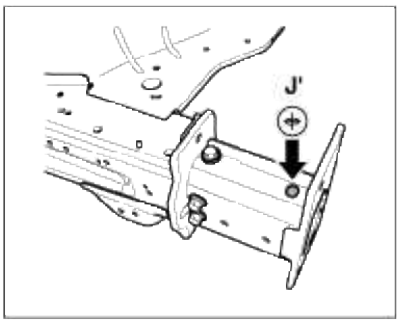
Front side member tocling hole
(ø7)



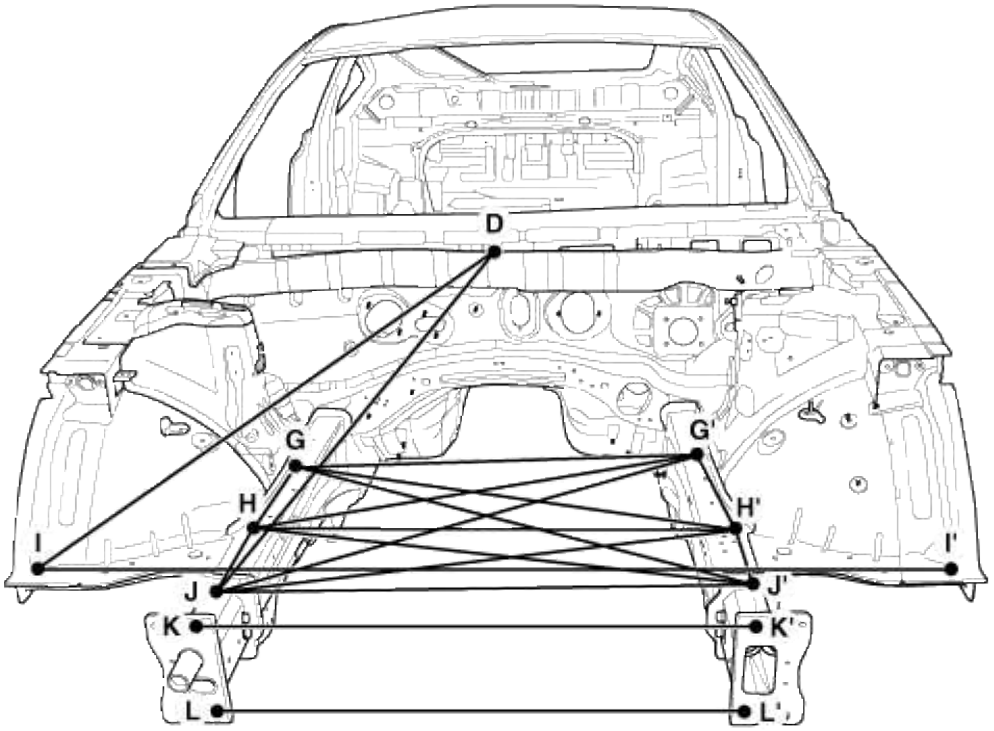
Front side member tooling hole
(ø7)



Front crash member tooling hole
(12X16)

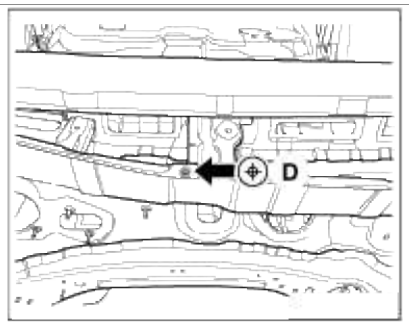


Front crash member tooling hole
(12X16)

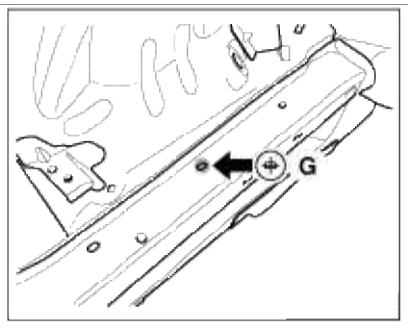


* These dimensions indicated in this figure are actual-measurement dimensions.

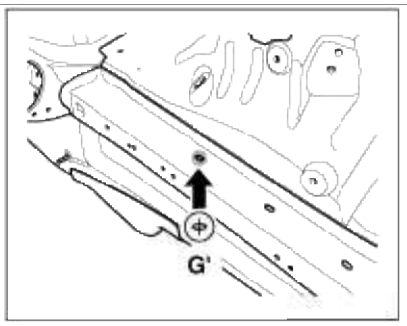
Point symbol	D-I / D-I'	D-J / D-J'	G-G'	G-H	G'-H'	G-H'	G'-H	G-J'
Length(mm)	1096	1034	848	282	331	923	919	1063
Point symbol	G'-J	H-H'	H-J	H'-J'	H-J'	H'-J	I-I'	J-J'
Length(mm)	1083	891	349	341	938	944	1544	860
Point symbol	K-K'	L-L'						
Length(mm)	851	832						



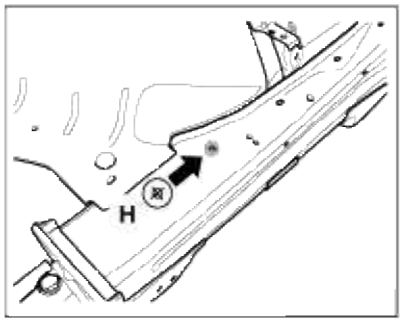
Cowl top cover mounting hole
(ø7)



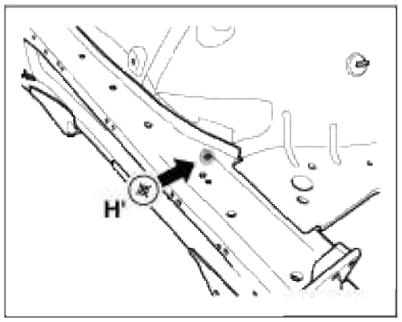
Wiring harness mounting hole
(7X12)



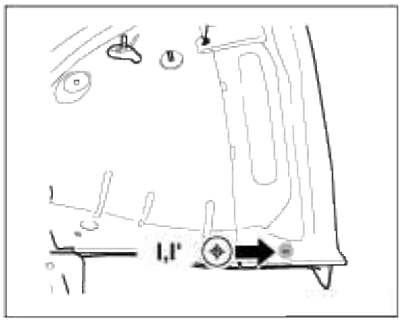
Wir ng harness mounting hole
(7X12)



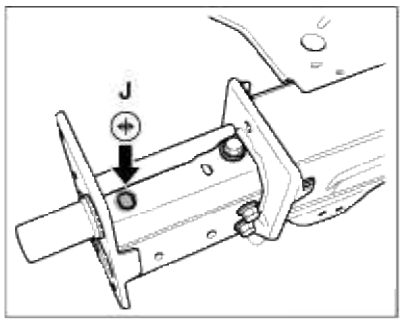
Front side member tooling hole
(ø7)



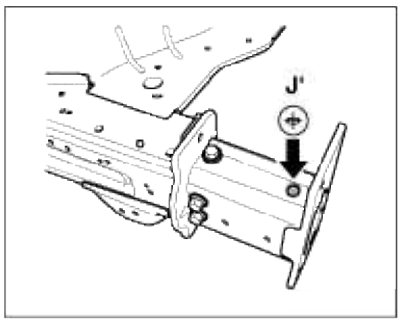
Front side member tooling hole
(ø7)



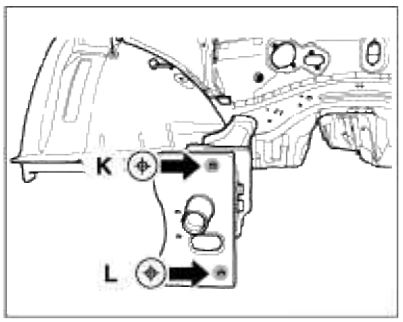
Fender apron panel tooling hole
(ø7)



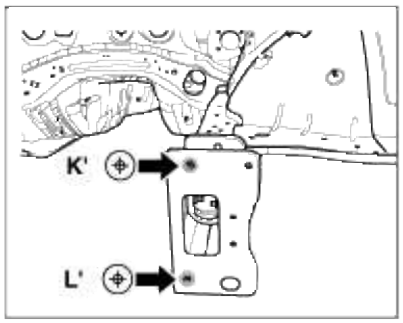
Front crash member tooling hole
(7X12)



Front crash member tooling hole
(7X12)



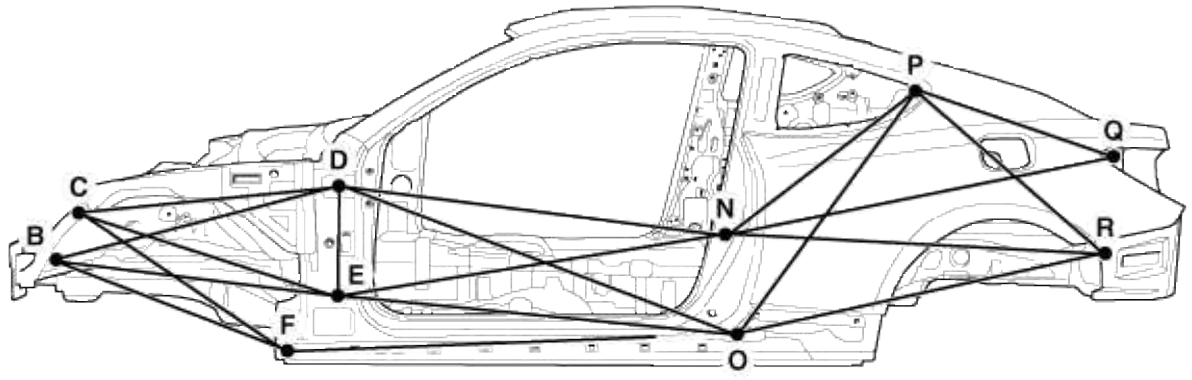
Front end module mounting hole
(ø9)



Front end module mounting hole
(ø9)

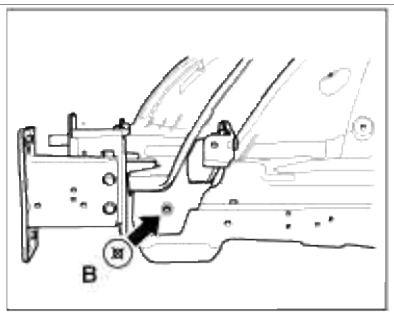
Body (Interior and Exterior) > Body Dimensions > Side Body > Body Repair

Side Body A

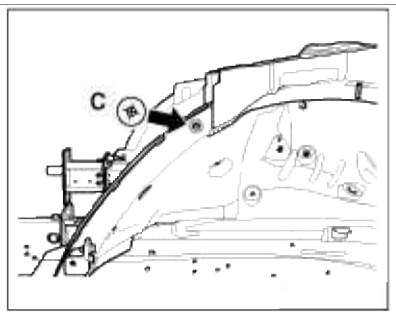


* These dimensions indicated in this figure are actual-measurement dimensions.

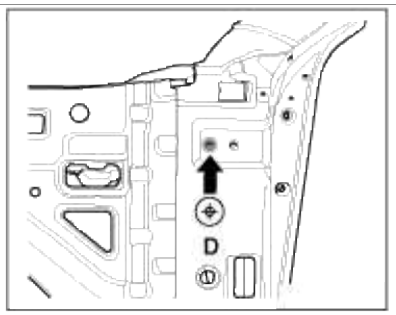
Point symbol	B-D	B-E	B-F	C-D	C-E	C-F	D-E	D-N
Length(mm)	1080	1037	917	836	885	838	365	1322
Point symbol	D-O	E-N	E-O	F-O	N-P	N-Q	N-R	O-P
Length(mm)	1430	1318	1346	1493	832	1350	1285	1027
Point symbol	O-R	P-Q	P-R					
Length(mm)	1268	694	841					



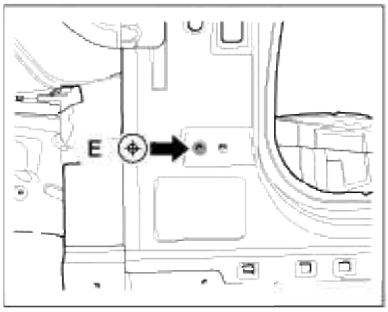
Fender apron panel tooling hole (ø7)



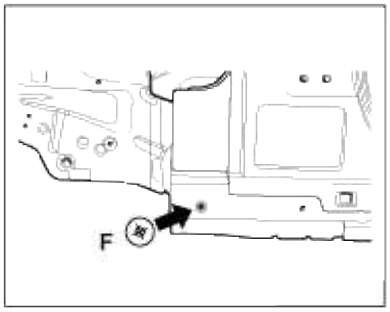
Fender apron panel tooling hole (ø7)



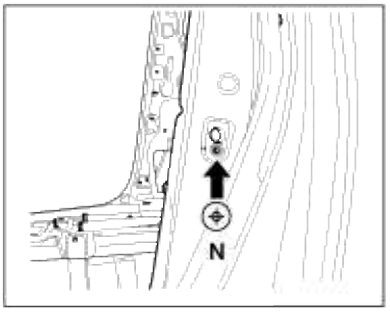
Front door hinge upper mounting hole (ø13)



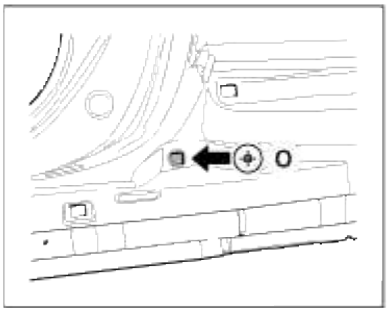
Front door hinge lower mounting hole (ø13)



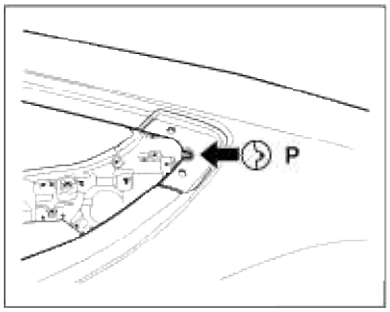
Fender mounting hole (ø6.6)



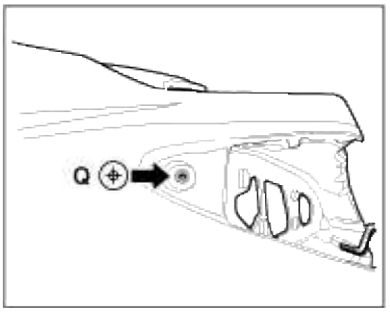
Front door switch mounting hole (ø8)



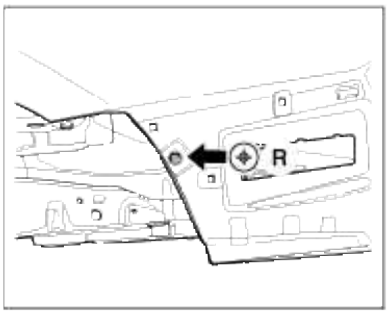
Side garnish mount ng hole (12X12)



Quarter fixed glass mounting notch

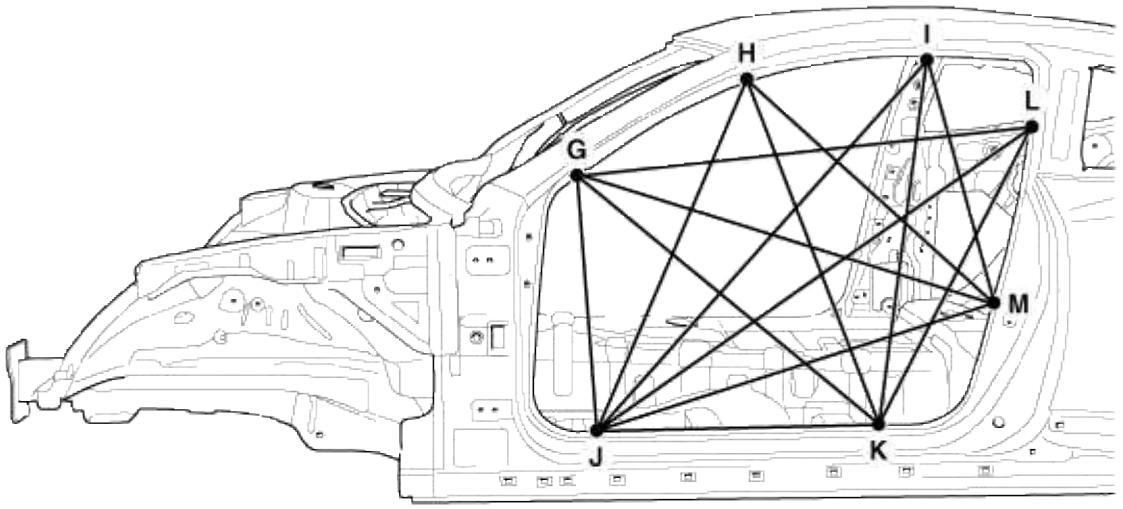


Rear combination lamp mounting hole (ø5)



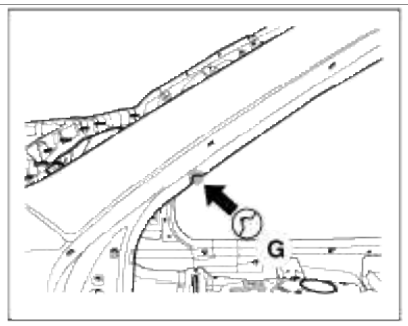
Rear bumper mounting hole (ø13)

Side Body B

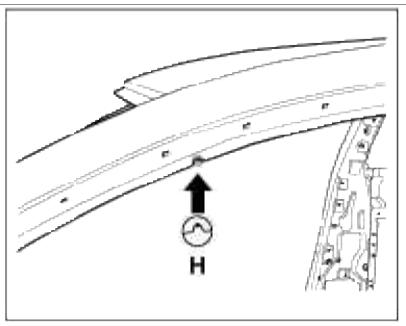


* These dimensions indicated in this figure are actual-measurement dimensions.

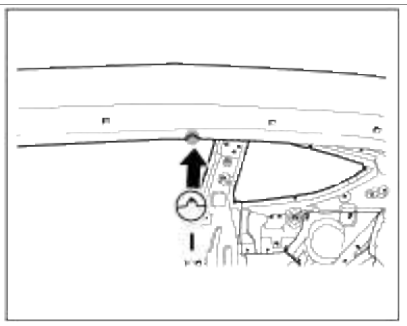
Point symbol	G-J	G-K	G-L	G-M	H-J	H-K	H-M	I-J
Length(mm)	646	982	1127	1078	945	924	824	1259
Point symbol	I-K	I-M	J-K	J-L	J-M	K-L		
Length(mm)	941	638	700	1321	1031	851		



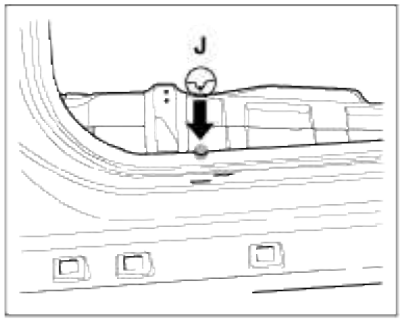
Side outer panel notch



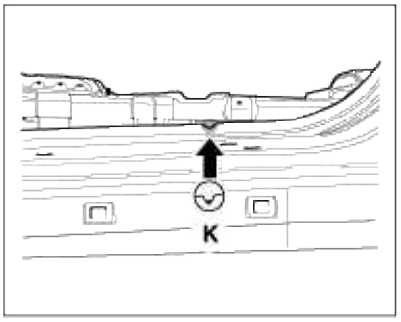
S de outer panel notch



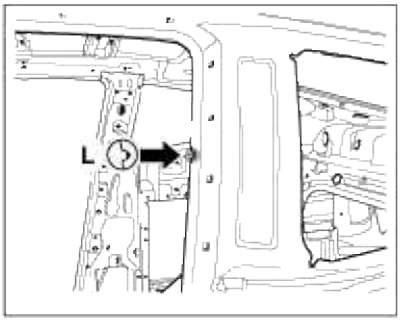
Side outer panel notch



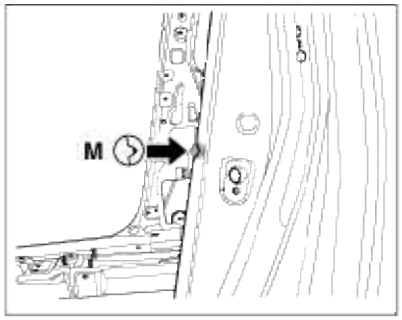
Side outer panel notch



S de outer panel notch



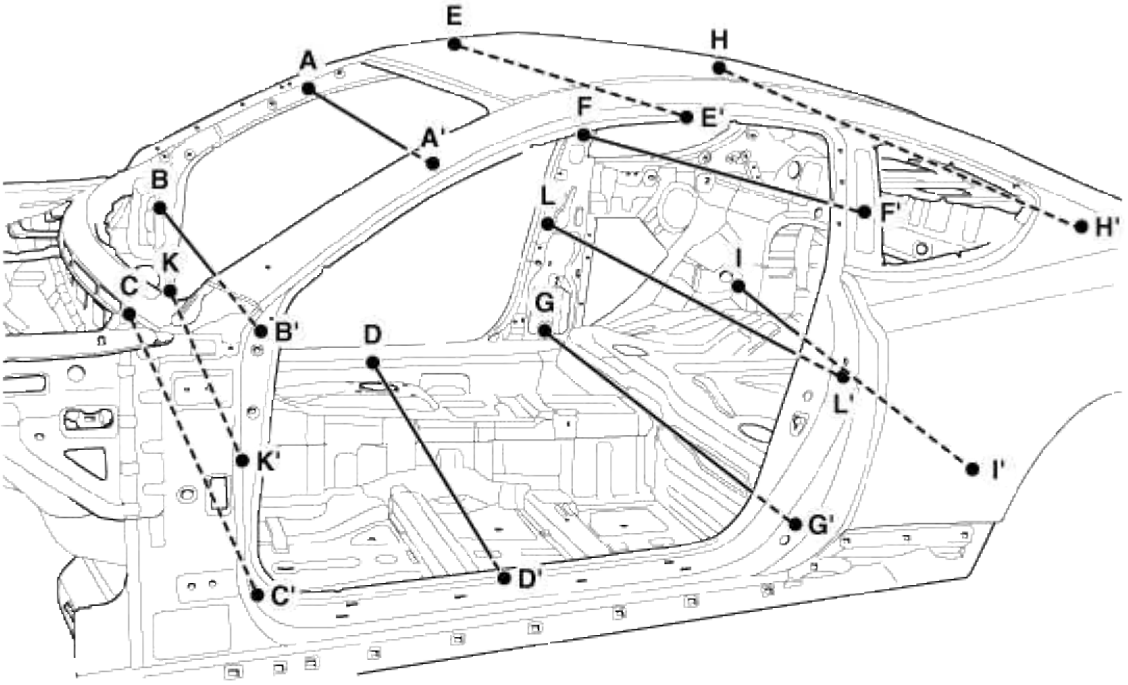
Side outer panel notch



Side outer panel notch

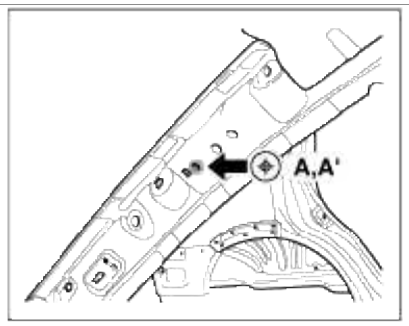
Body (Interior and Exterior) > Body Dimensions > Interior > Body Repair

Interior A

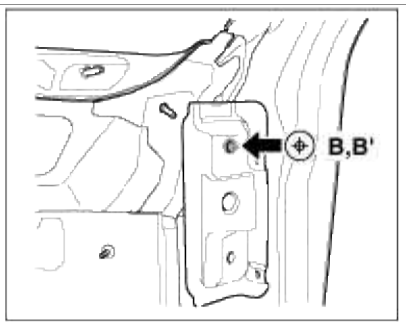


* These dimensions indicated in this figure are actual-measurement dimensions.

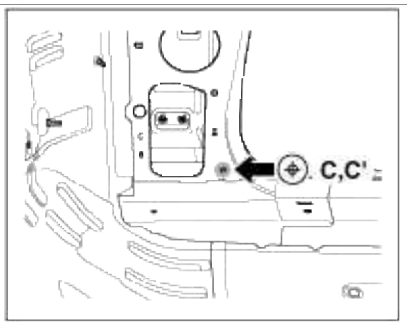
Point symbol	A-A'	B-B'	C-C'	D-D'	E-E'	F-F'	G-G'	H-H'
Length(mm)	1325	1418	1483	1433	1194	1373	1476	1150
Point symbol	I-I'	K-K'	L-L'					
Length(mm)	1109	1558	1604					



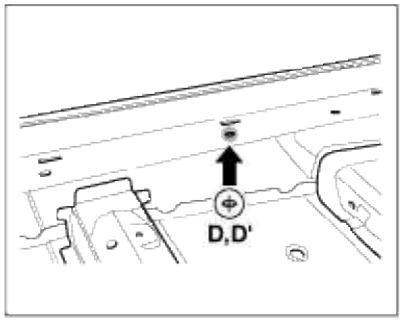
Curtain airbag mounting hole (ø6.6)



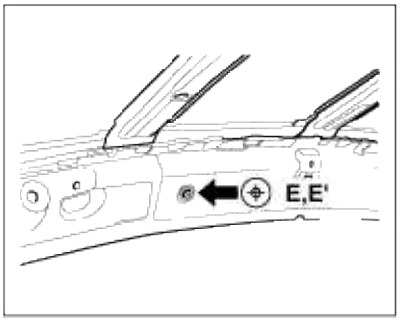
Cowl crossbar mounting hole (ø9)



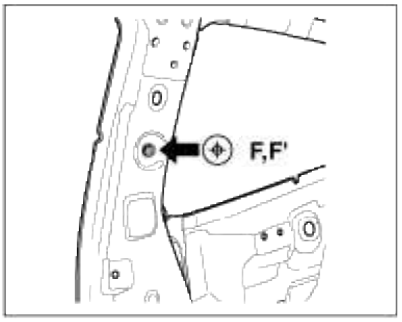
Cowl side trim mounting hole (ø8.5)



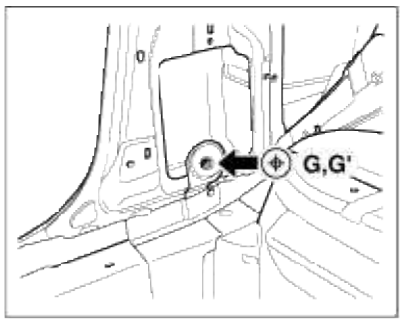
Side sill inner panel tooling hole (7X12)



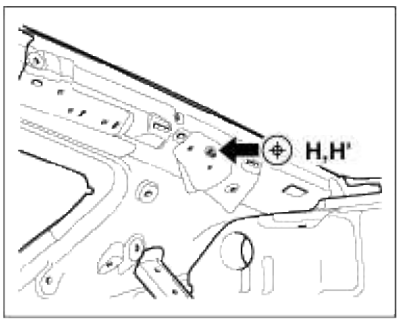
S de inner panel tooling hole (ø10)



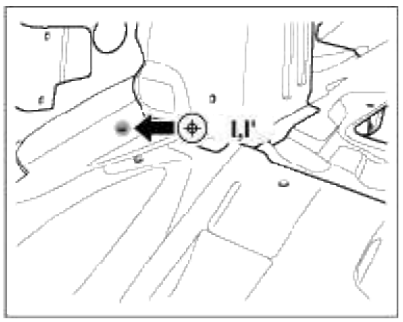
Front seatbelt anchor mounting hole (ø15)



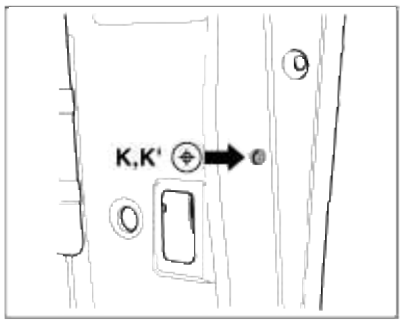
Front seatbelt retractor mounting hole (ø12)



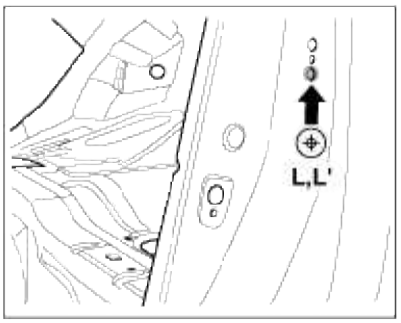
Quarter inner panel tooling hole (ø6.6)



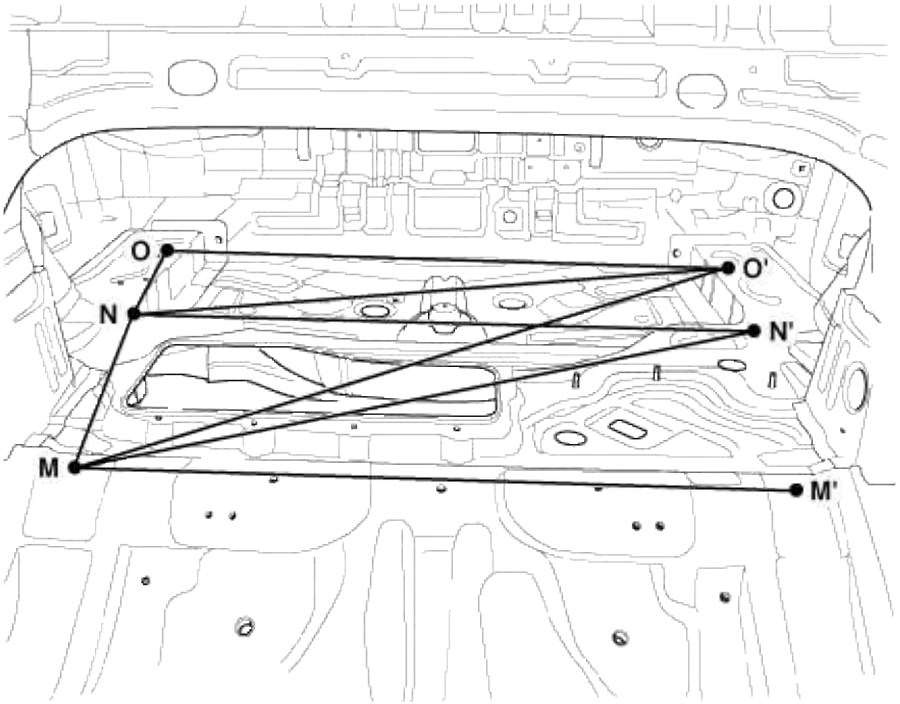
Rear floor panel tooling hole (ø8)



Front door checker mounting hole (ø13)

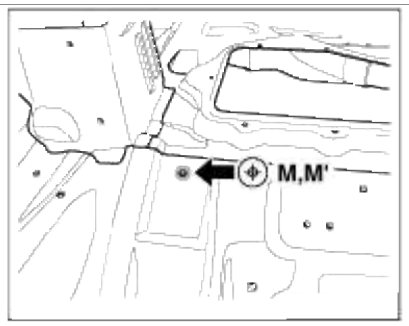


Front door striker mounting hole (ø11)

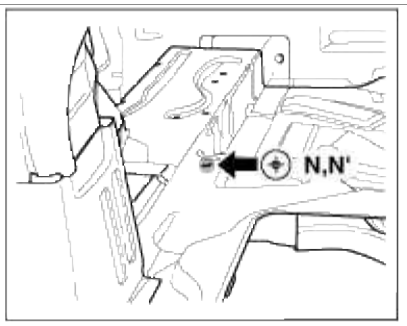


* These dimensions indicated in this figure are actual-measurement dimensions.

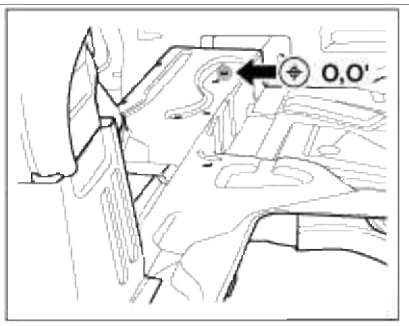
Point symbol	M-M'	M'-N' / M-N	M'-N / M-N'	M'-O / M-O'	N-N'	N-O / N'-O'	N'-O / N-O'	O-O'
Length(mm)	770	454	956	1219	920	371	1049	1046



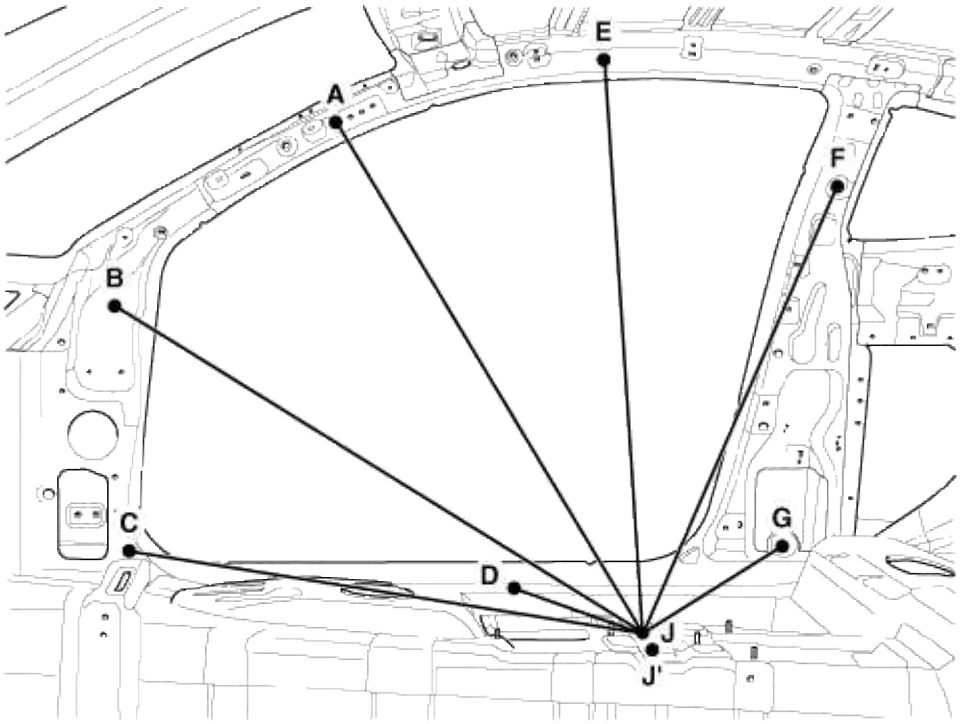
Rear floor panel tooling hole (ø9)



Rear floor panel tooling hole (8.5X8.5)

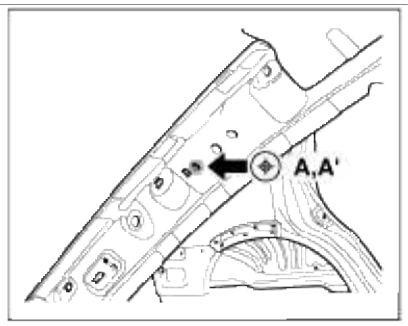


Spair tire well tooling hole (ø10)

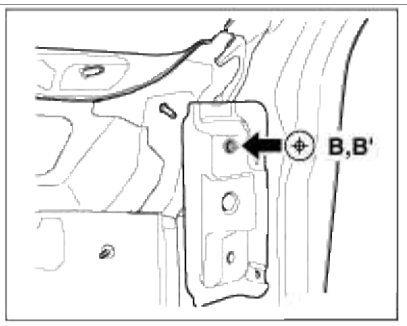


* These dimensions indicated in this figure are actual-measurement dimensions.

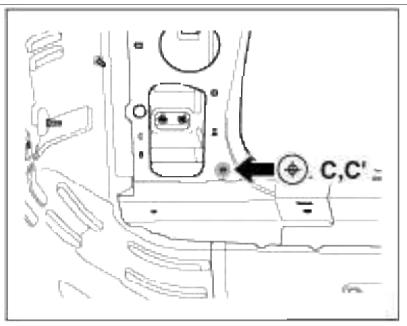
Point symbol	J-A / J'-A'	J-B	J'-B'	J-C / J'-C'	J-D / J'-D'	J-E / J'-E'	J-F / J'-F'	J-G / J'-G'
Length(mm)	1093	1156	1146	1105	717	1051	1057	825



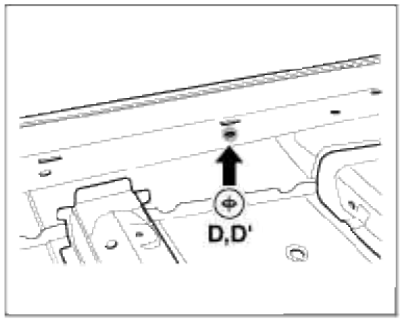
Curtain airbag mounting hole (ø6.6)



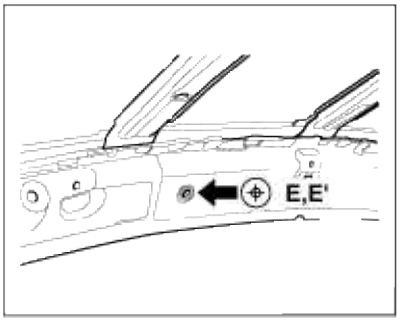
Cowl crossbar mounting hole (ø9)



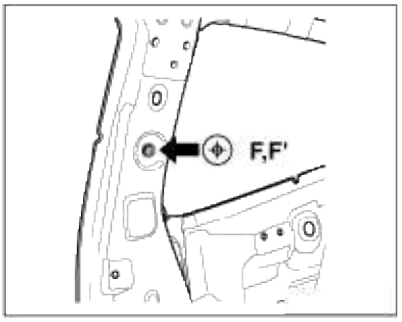
Cowl side trim mounting hole (ø8.5)



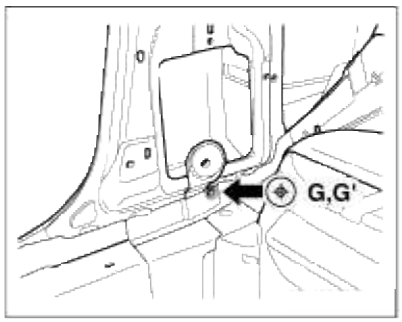
Side sill inner panel tooling hole (ø6)



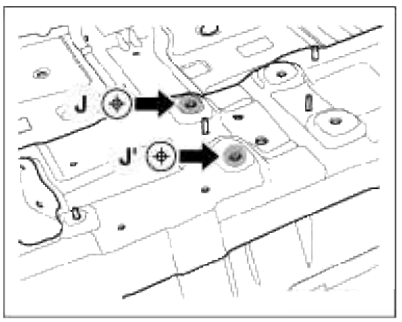
S de inner panel tooling hole (ø10)



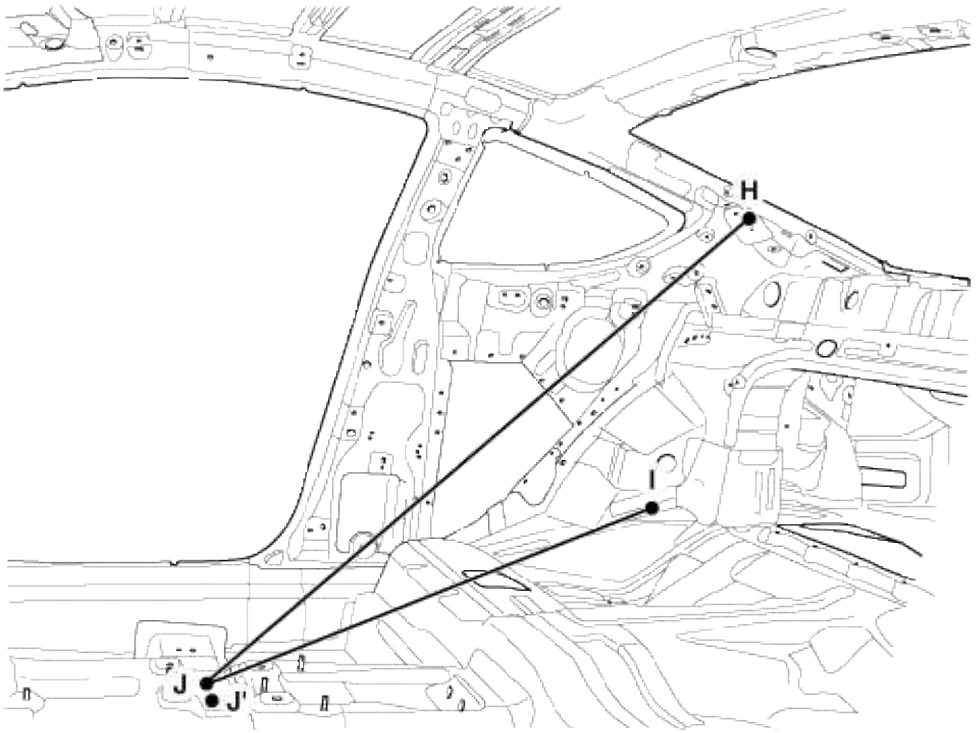
Front seatbelt anchor mounting hole (ø15)



Front seatbelt retractor mounting hole (ø12)

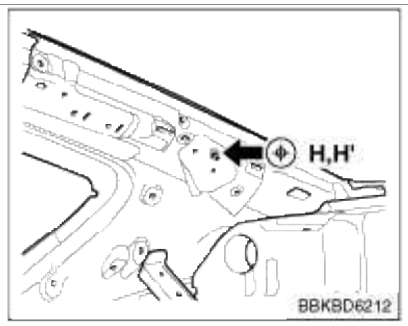


Parking brake lever mounting hole (ø10)

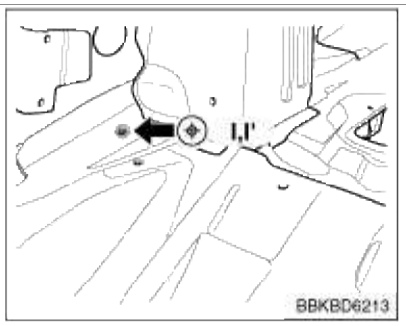


* These dimensions indicated in this figure are actual-measurement dimensions.

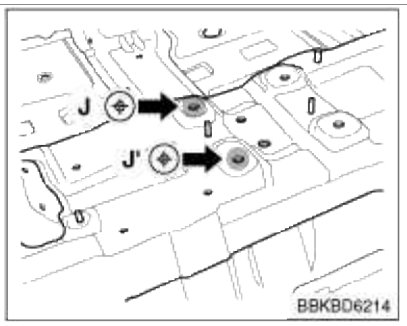
Point symbol	J-H / J'-H'	J-I / J'-I'						
Length(mm)	1475	1138						



Quarter pillar inner panel tooling hole (ø6.6)

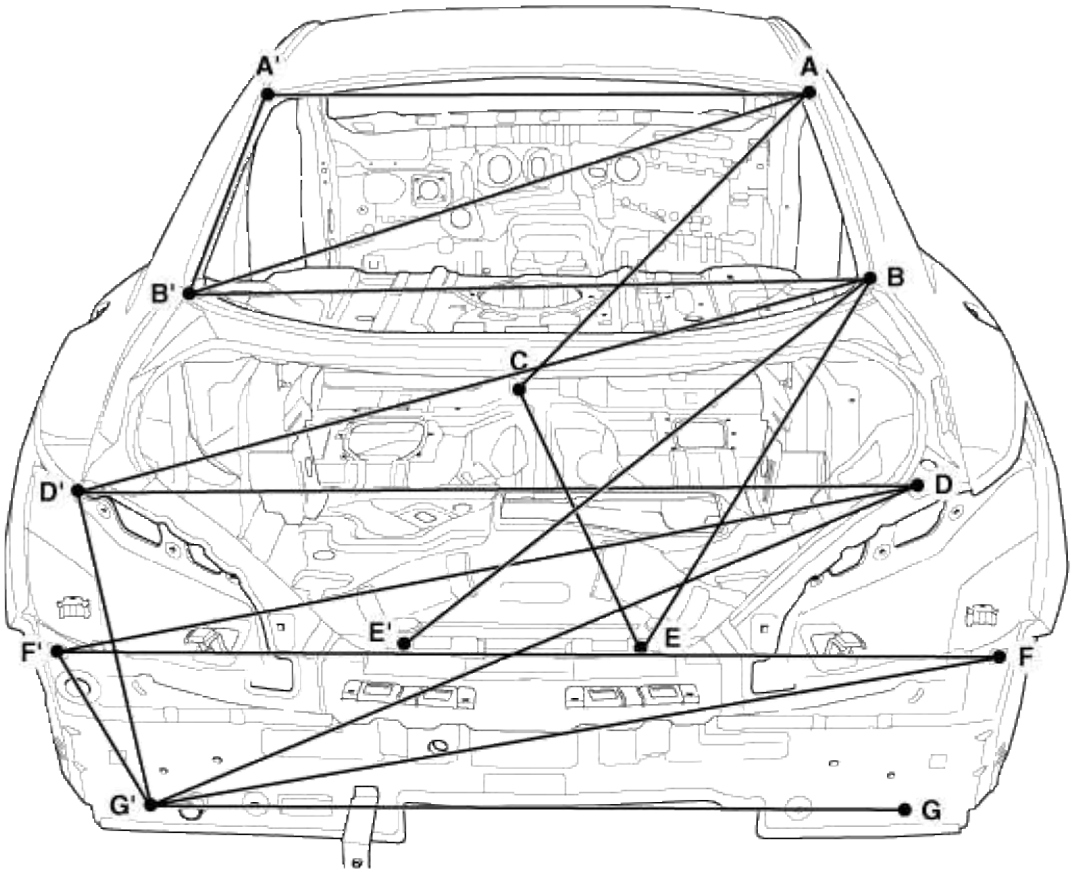


Rear floor panel tooling hole (ø8)



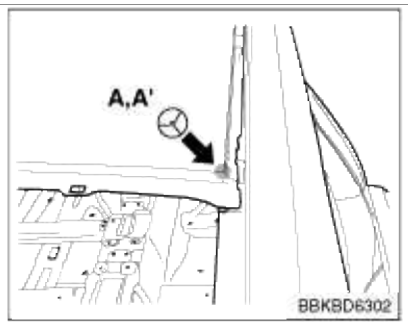
Parking brake lever mounting hole (ø9)

Body (Interior and Exterior) > Body Dimensions > Rear Body > Body Repair

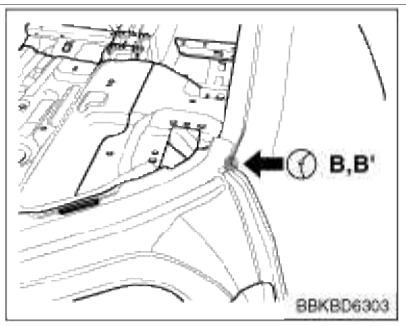


* These dimensions indicated in this figure are actual-measurement dimensions.

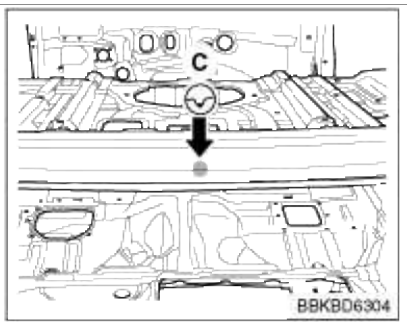
Point symbol	A-A'	A-B / A'-B'	A-B' / A'-B	A-C / A'-C	B-B'	B'-D / B-D'	B'-E' / B-E	B-E' / B'-E
Length(mm)	1099	787	1360	1180	1119	1273	732	968
Point symbol	C-E / C-E'	D-D'	D-F' / D'-F'	D-G / D'-G'	D-G' / D'-G	F-F'	F-G / F'-G'	F-G' / F'-G
Length(mm)	448	1259	1336	512	1305	1367	283	1282
Point symbol	G-G'							
Length(mm)	1144							



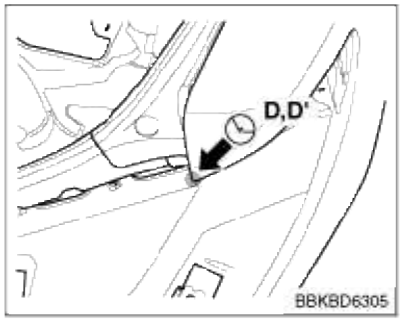
Roof panel rear corner



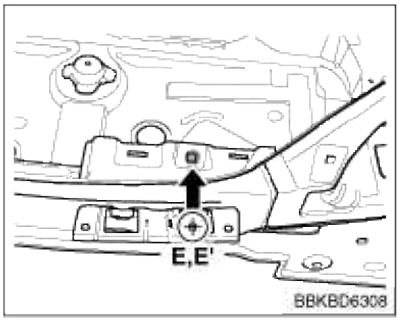
S de outer panel rear corner



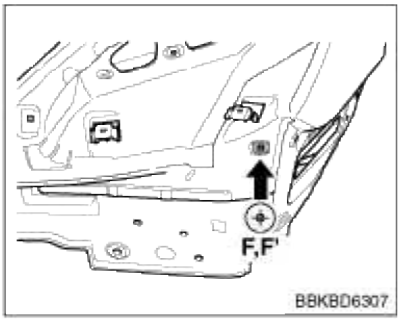
Rear package tray panel notch



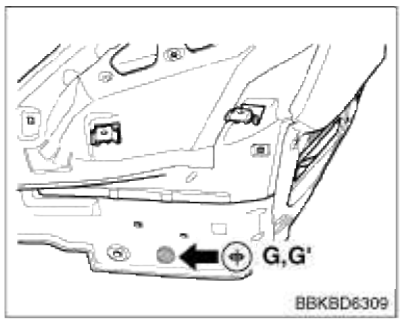
Side outer rear corner



Transverse rear trim mounting hole
(10X10)



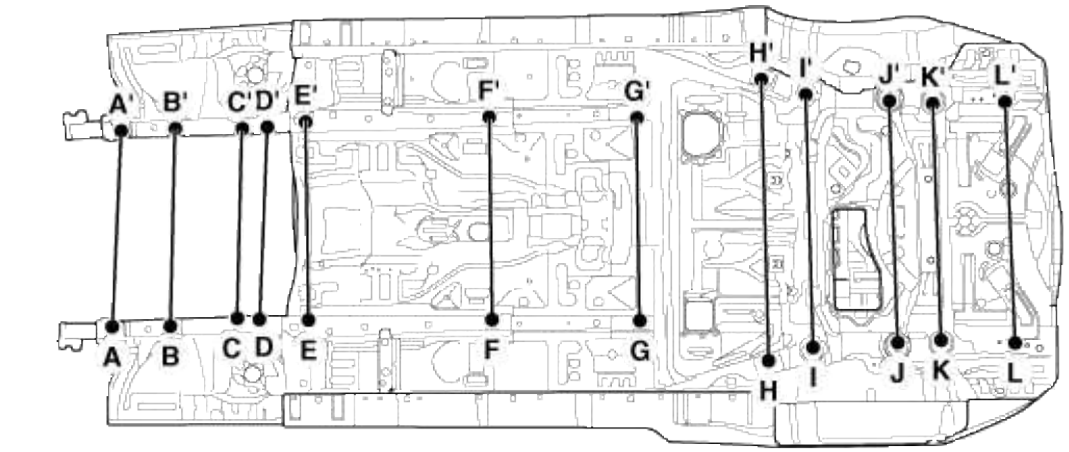
Rear bumper mounting hole
(8.5X8.5)

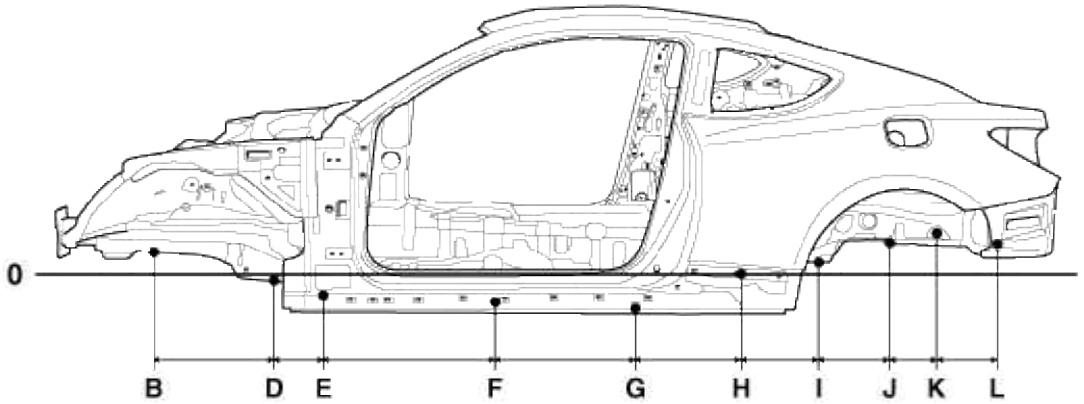


Back panel tooling hole
(18X16)

Body (Interior and Exterior) > Body Dimensions > Under Body > Body Repair

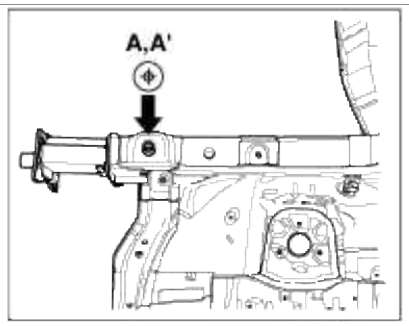
Projected Dimensions



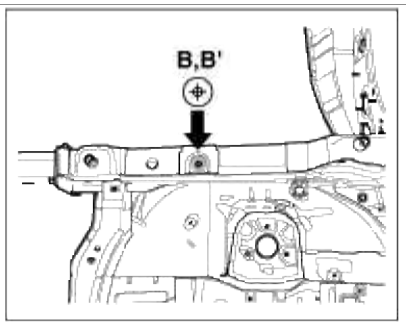


* These dimensions indicated in this figure are actual-measurement dimensions.

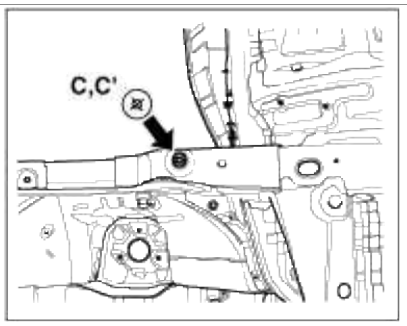
Point symbol	A-A'	B-B'	C-C'	D-D'	E-E'	F-F'	G-G'	H-H'
Length(mm)	868	860	818	830	848	859	860	1206
Point symbol	I-I'	J-J'	K-K'	L-L'	O-B	O-D	O-E	O-F
Length(mm)	1076	1038	1014	1046	62.5	-50	-119.7	-147.2
Point symbol	O-G	O-H	O-I	O-J	O-K	O-L	B-D	D-E
Length(mm)	-151.4	16.7	57.2	104.2	123.2	129.4	425	210
Point symbol	E-F	F-G	G-H	H-I	I-J	J-K	K-L	
Length(mm)	786	595	504	193	351	181	304	



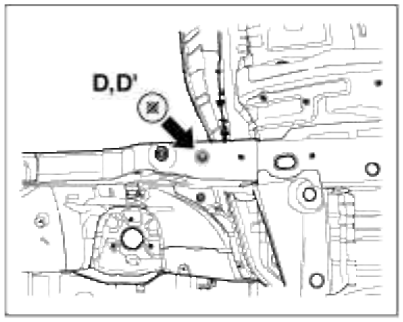
Front sub frame mounting pipe
(ø25)



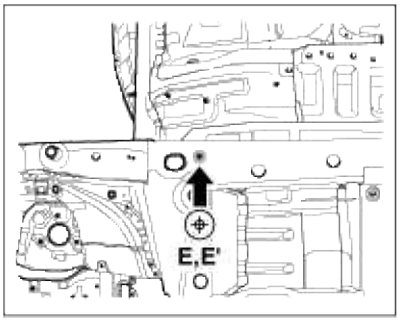
Front sub frame mounting hole
(ø16)



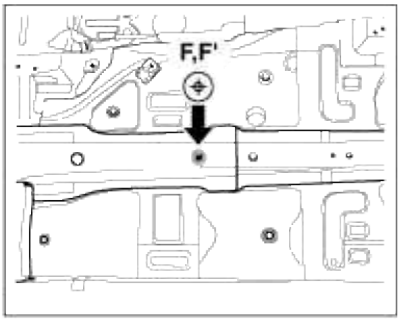
Front sub frame mounting pipe
(ø27)



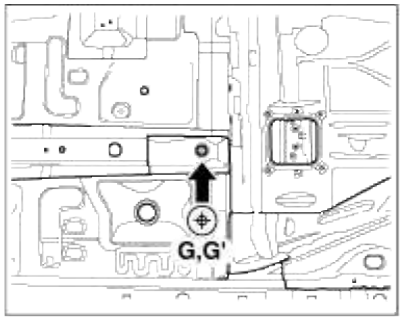
Tooling hole
(ø15)



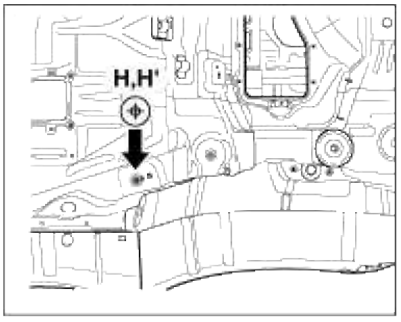
Tooling hole
(ø8)



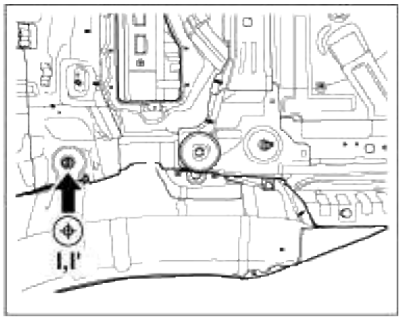
Tooling hole
(ø14)



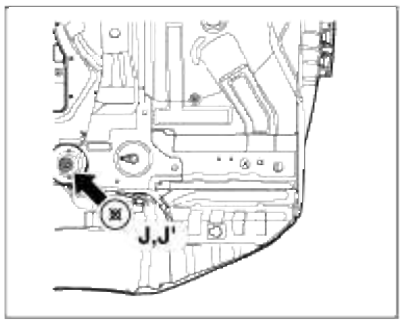
Tooling & paint dra n hole
(ø20)



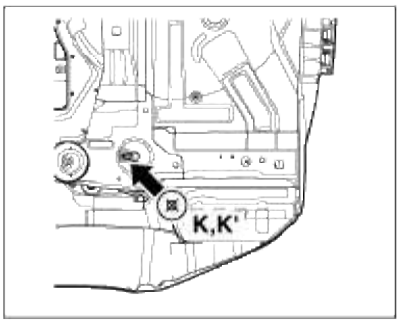
Trailing arm mounting hole
(ø13)



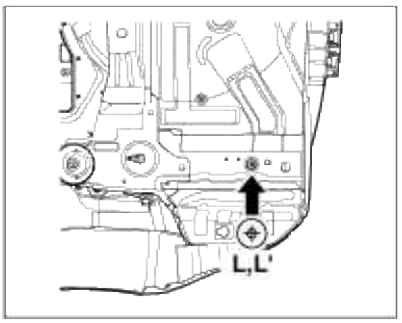
Rear sub frame mounting pipe
(ø28)



Spring mounting hole
(ø20)

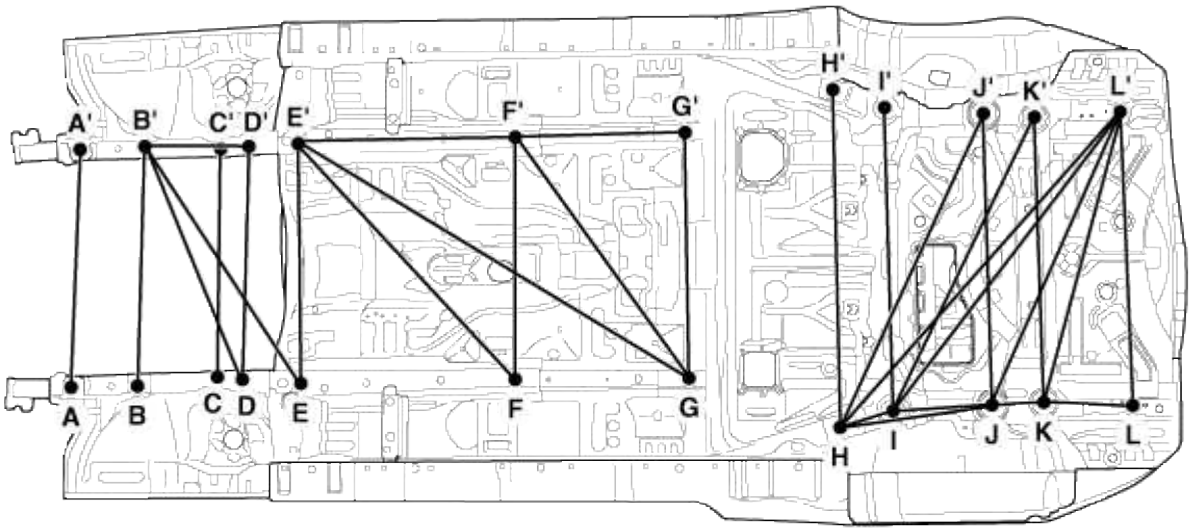


Rear sub frame mounting bolt



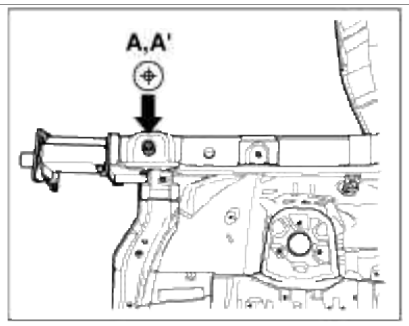
Tooling hole
(ø25)

Actual-Measurement Dimensions

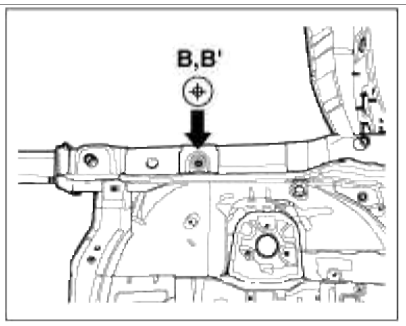


* These dimensions indicated in this figure are actual-measurement dimensions.

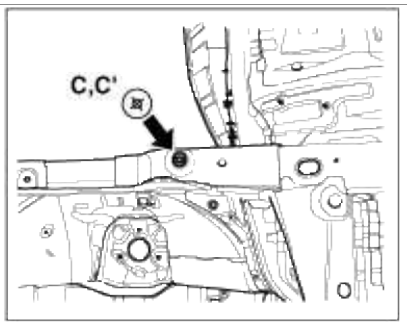
Point symbol	A-A'	B-B'	C-C'	B-D / B'-D'	B-D' / B'-D	B-E' / B'-E	D-D'	E-E'
Length(mm)	868	860	818	440	953	1080	830	848
Point symbol	E-F / E'-F'	E-F' / E'-F	E-G' / E'-G	F-F'	F-G / F'-G'	F-G' / F'-G	G-G'	H-H'
Length(mm)	786	1161	1624	859	595	1046	860	1206
Point symbol	H-J / H'-J'	H-J' / H'-J	H-L' / H'-L	I-I'	I-J / I'-J'	I-K' / I'-K	I-L' / I'-L	J-J'
Length(mm)	558	1251	1530	1076	355	1175	1353	1038
Point symbol	J-K / J'-K'	J-L / J'-L'	J-L' / J'-L	K-K'	K-L / K'-L'	K-L' / K'-L	L-L'	
Length(mm)	182	486	1150	1014	305	1074	1046	



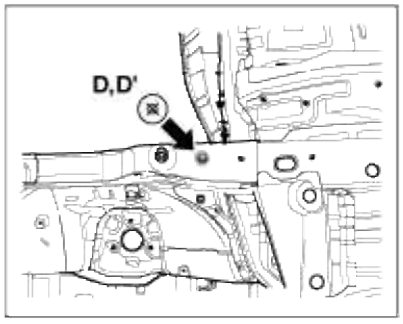
Front sub frame mounting pipe (ø25)



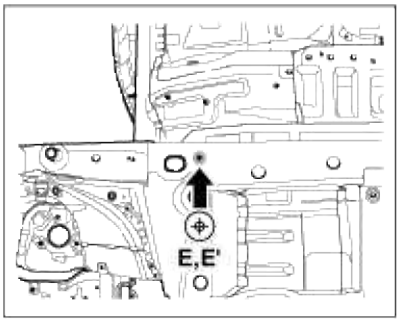
Front sub frame mounting hole (ø16)



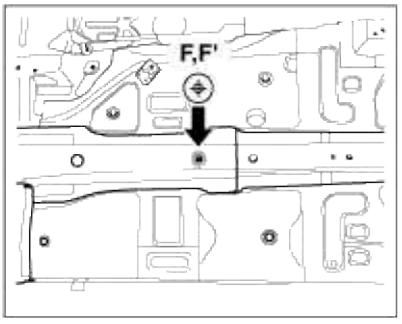
Front sub frame mounting pipe (ø27)



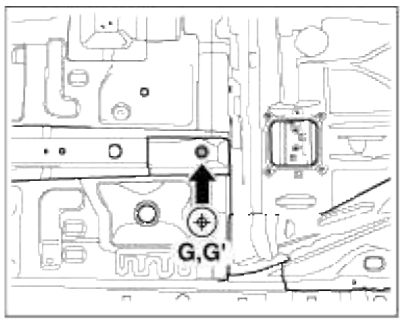
Tooling hole (ø15)



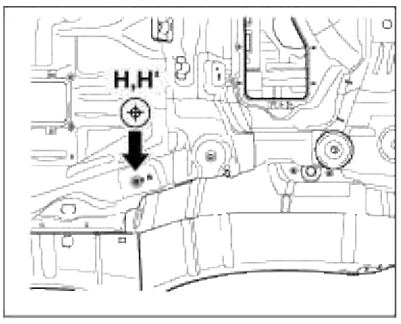
Tooling hole (ø8)



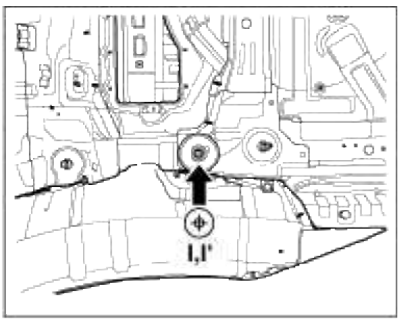
Tooling hole (ø14)



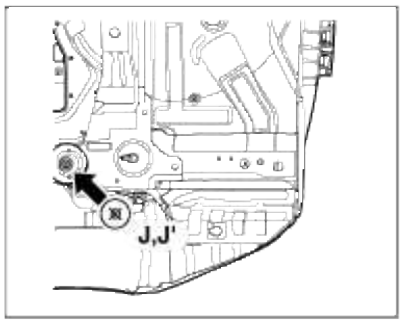
Tooling & paint dra n hole (ø20)



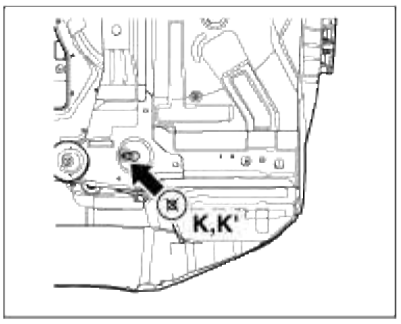
Trailing arm mounting hole (ø13)



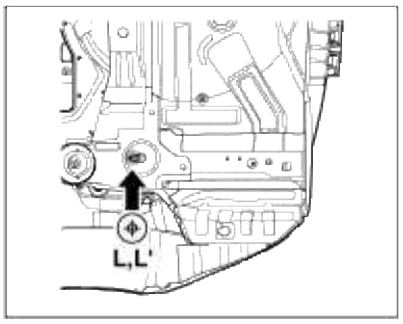
Rear sub frame mounting pipe (ø28)



Spring mounting hole (ø20)



Rear sub frame mounting bolt



Tooling hole (ø25)

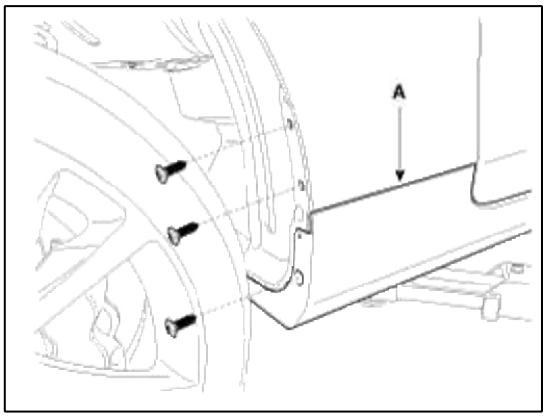
Body (Interior and Exterior) > Exterior > Fender > Repair procedures

Replacement

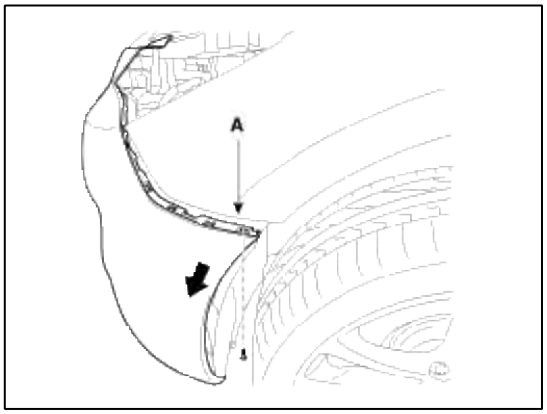
NOTE

- Be careful not to damage the hood and body.
- When removing the clips, use a clip remover.

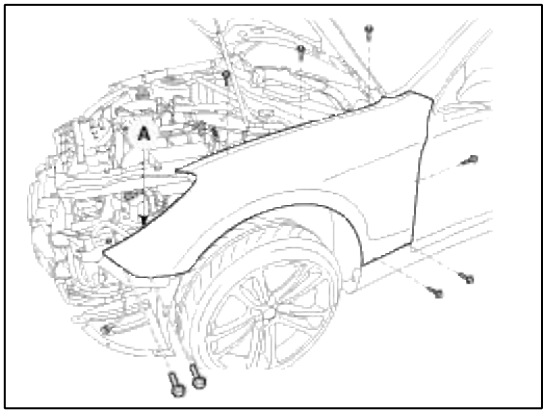
1. Remove the front bumper.
   (Refer to the BD group - "Front Bumper")
2. Remove the head lamps.
   (Refer to the BE group - "Head Lamps")
3. Remove the side sill molding (A).
4. Loosening the wheel guard mounting screws.



5. Remove the front bumper mounting screw (A).



6. After loosening the fender mounting bolts, remove the fender (A).



7. Installation is the reverse of removal.

Body (Interior and Exterior) > Exterior > Hood > Repair procedures

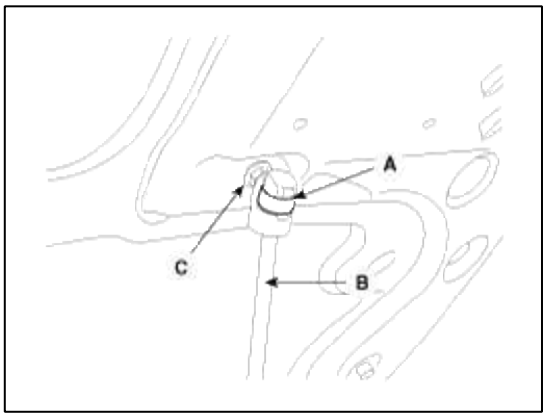
Replacement

Hood Assembly Replacement

NOTE

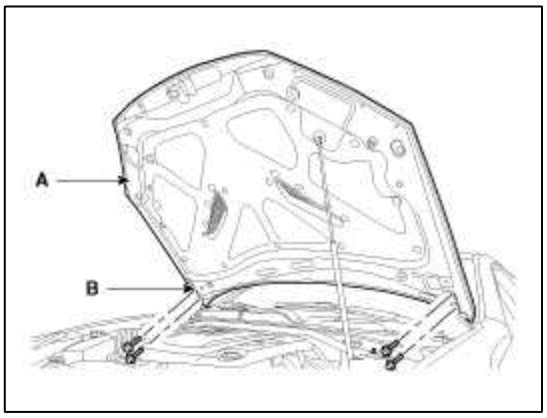
- When removing and installing the hood, an assistant is necessary.
- Be careful not to damage the hood and body.
- When removing the clips, use a clip remover.

1. Using a screwdriver, slightly lift the socket clips (A) of both ends on the lifter (B), and then remove the lifter from the bracket (C).



2. After loosening the hood hinge (B) mounting bolts, remove the hood panel (A).

Tightening torque :
21.6~26.5 N.m (2.2~2.7 kgf.m, 15.9~19.5 lb-ft)



3. Installation is the reverse of removal.

NOTE

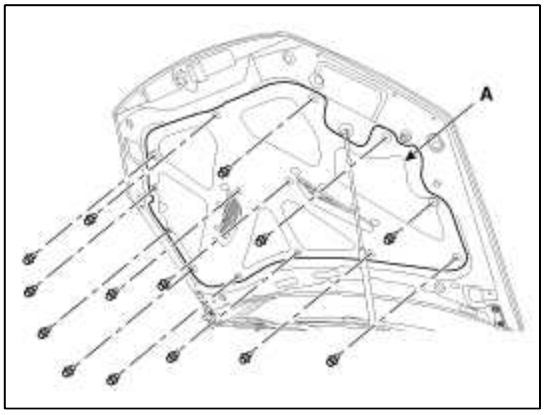
- Make sure the hood opens properly and locks securely.
- Adjust the hood alignment.

Hood Insulator Pad Replacement

1. Using a clip remover, detach the clips, and remove the hood insulator pad (A).

CAUTION

- Be careful not to scratch the hood panel.



2. Installation is the reverse of removal.

NOTE

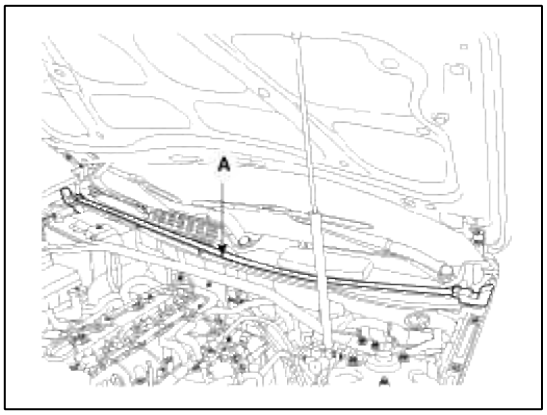
- Replace any damaged clips.

Hood Weatherstrip Replacement

1. Remove the hood weatherstrip (A).

CAUTION

- Take care not to scratch the hood weatherstrip.



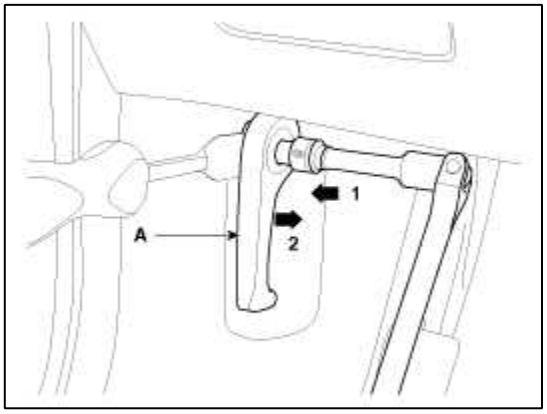
2. Installation is the reverse of removal.

NOTE

- Replace any damaged clips.

Hood Latch Release Handle Replacement

1. Remove the hood latch release handle (A).



2. Installation is the reverse of removal.

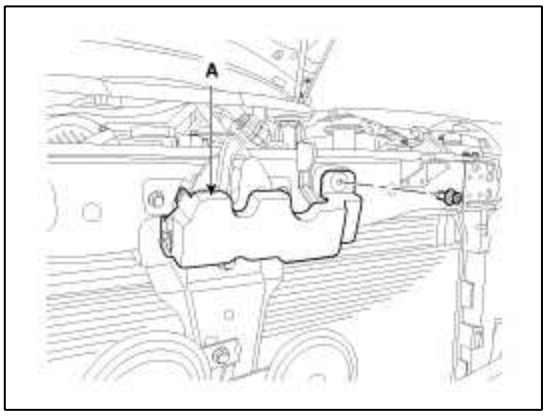
NOTE

- Make sure the hood latch cable is connected properly.
- Make sure the hood locks securely.

Hood Latch Replacement

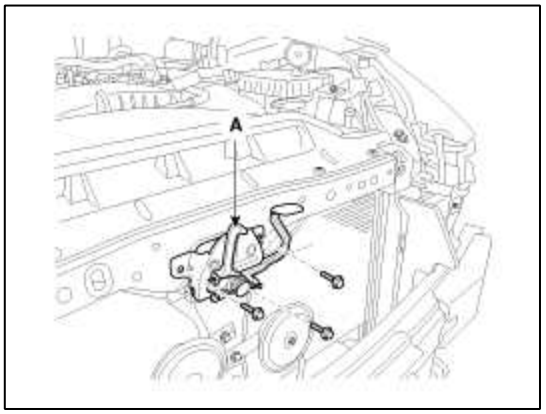
1. Remove the front bumper cover.
   (Refer to the BD group - "Front Bumper")

2. Detach the clips, then remove the hood latch cover (A).

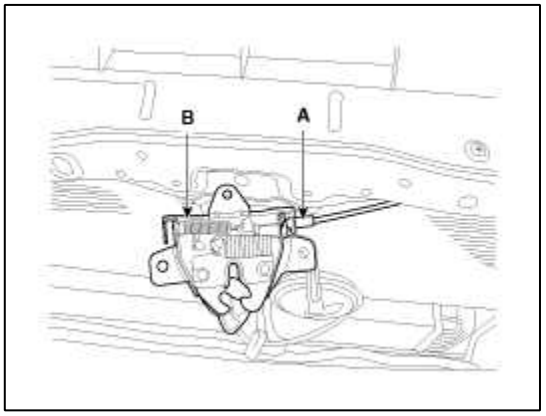


3. Remove the hood latch (A) mounting bolts.

Tightening torque :
7.8~11.8 N.m (0.8~1.2 kgf.m, 5.8~8.7 lb-ft)



4. Disconnect the hood latch cable (A) and remove the latch (B).



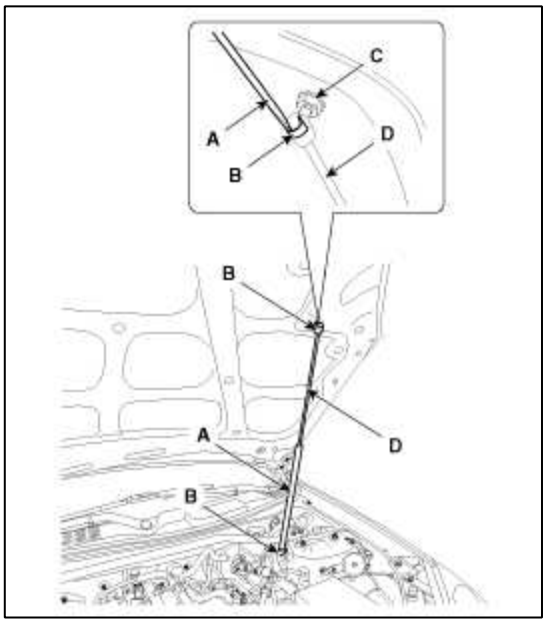
5. Installation is the reverse of removal.

NOTE

- Make sure the hood latch cable is connected properly.
- Make sure the hood locks securely.

Hood Lift Replacement

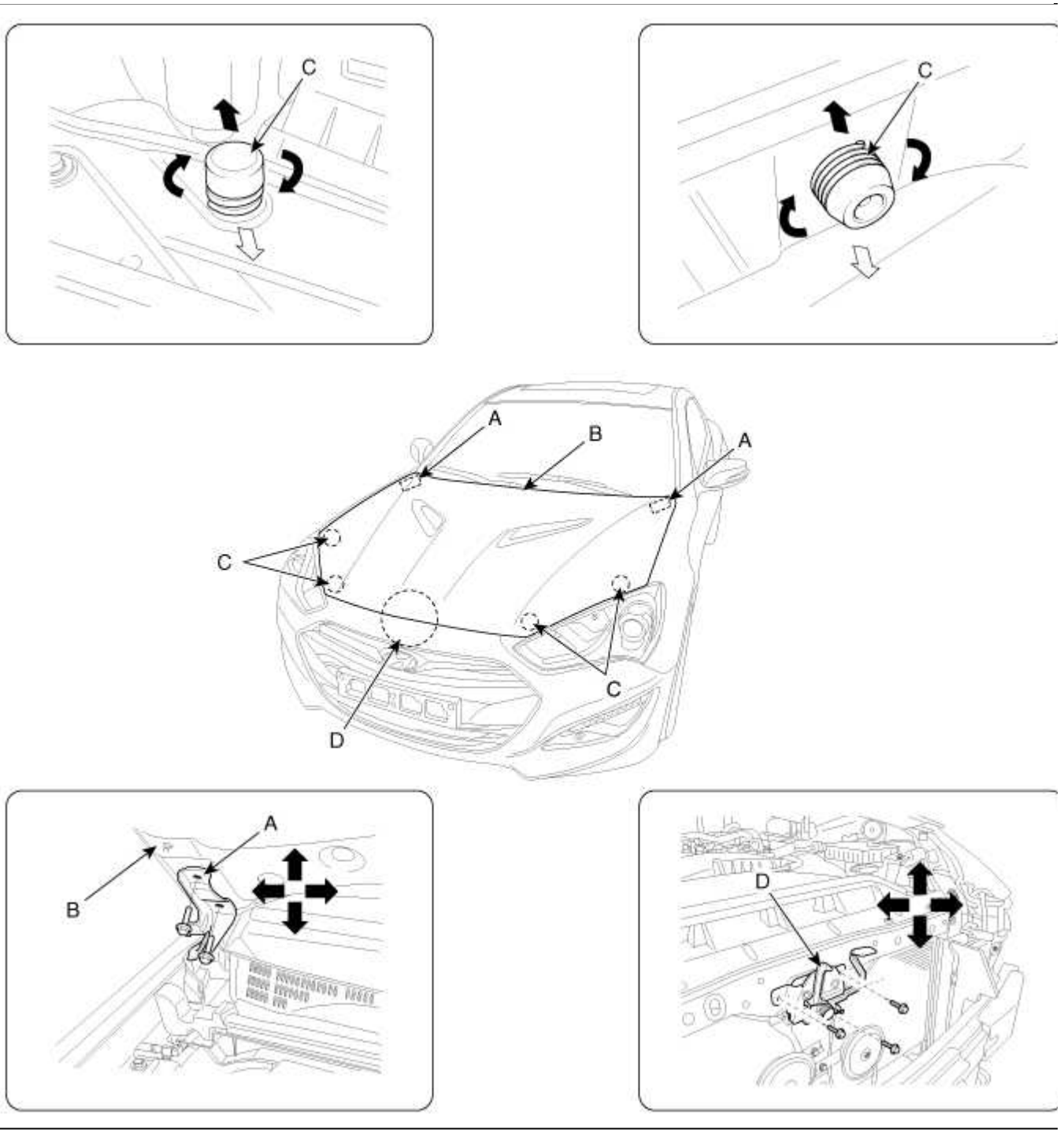
1. Using a screwdriver (A), lift up slightly the socket clips (B) of both ends on the lifter (D), and then remove the lifter from the bracket (C).



2. Installation is the reverse of removal.

Adjustment

1. After loosening the hinge (A) mounting bolt, adjust the hood (B) by moving it up or down, or right or left.
2. Adjust the hood height by turning the hood overslam bumpers (C).
3. After loosening the hood latch (D) mounting bolts, adjust the latch by moving it up or down, or right or left.



Body (Interior and Exterior) > Exterior > Trunk Lid > Repair procedures

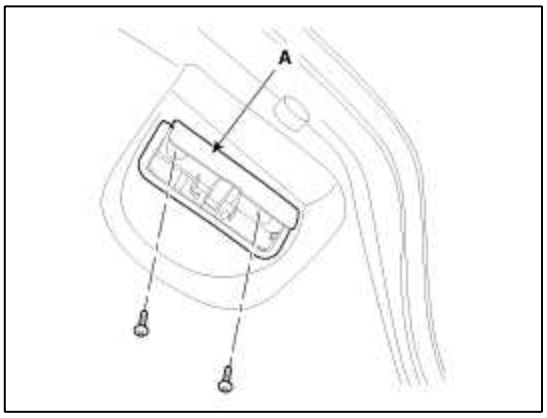
Replacement

Trunk Lid Replacement

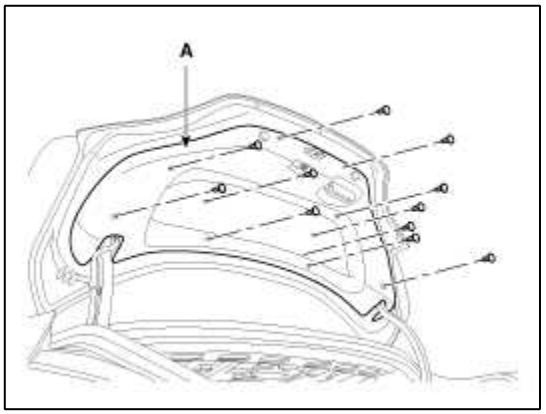
NOTE

- When removing and installing the trunk lid, an assistant is necessary.
- Wear gloves to protect hands from injury.

1. After loosening the mounting screws, then remove the trunk lid full handle (A).

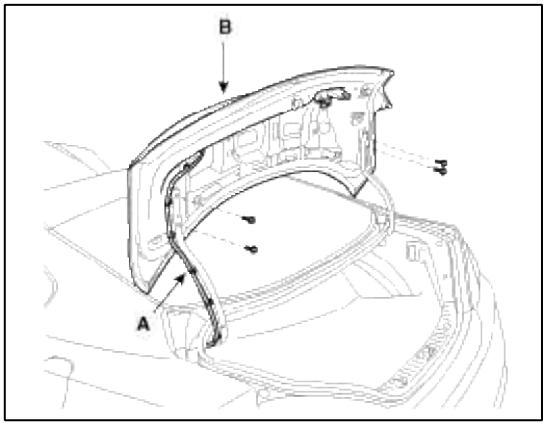


2. Detach the clips, then remove the trunk lid trim (A).



3. Disconnect the wiring harness (A) and connectors.
4. After loosening the mounting bolts, then remove the trunk lid (B).

Tightening torque :
6.9~8.8 N.m (0.7~0.9 kgf.m, 5.1~6.5 lb-ft)



5. Installation is the reverse of removal.

NOTE

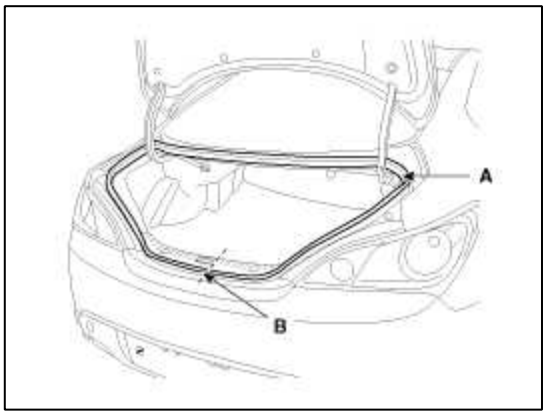
- Replace any damaged clips.

Trunk lid weatherstrip replacement

1. Remove the trunk lid weatherstrip (A).

CAUTION

- Do not apply sealant to the body.



2. Installation is the reverse of removal.

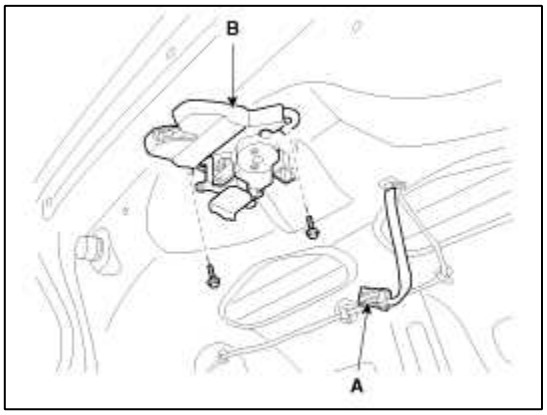
NOTE

- Install the weatherstrip aligned with center line (B).

Trunk lid latch replacement

1. Remove the trunk lid trim.
2. Disconnect the connector (A).
3. After loosening the mounting bolts, then remove the trunk lid latch assembly (B).

Tightening torque :
6.9~10.8 N.m (0.7~1.1 kgf.m, 5.1~8.0 lb-ft)



4. Installation is the reverse of removal.

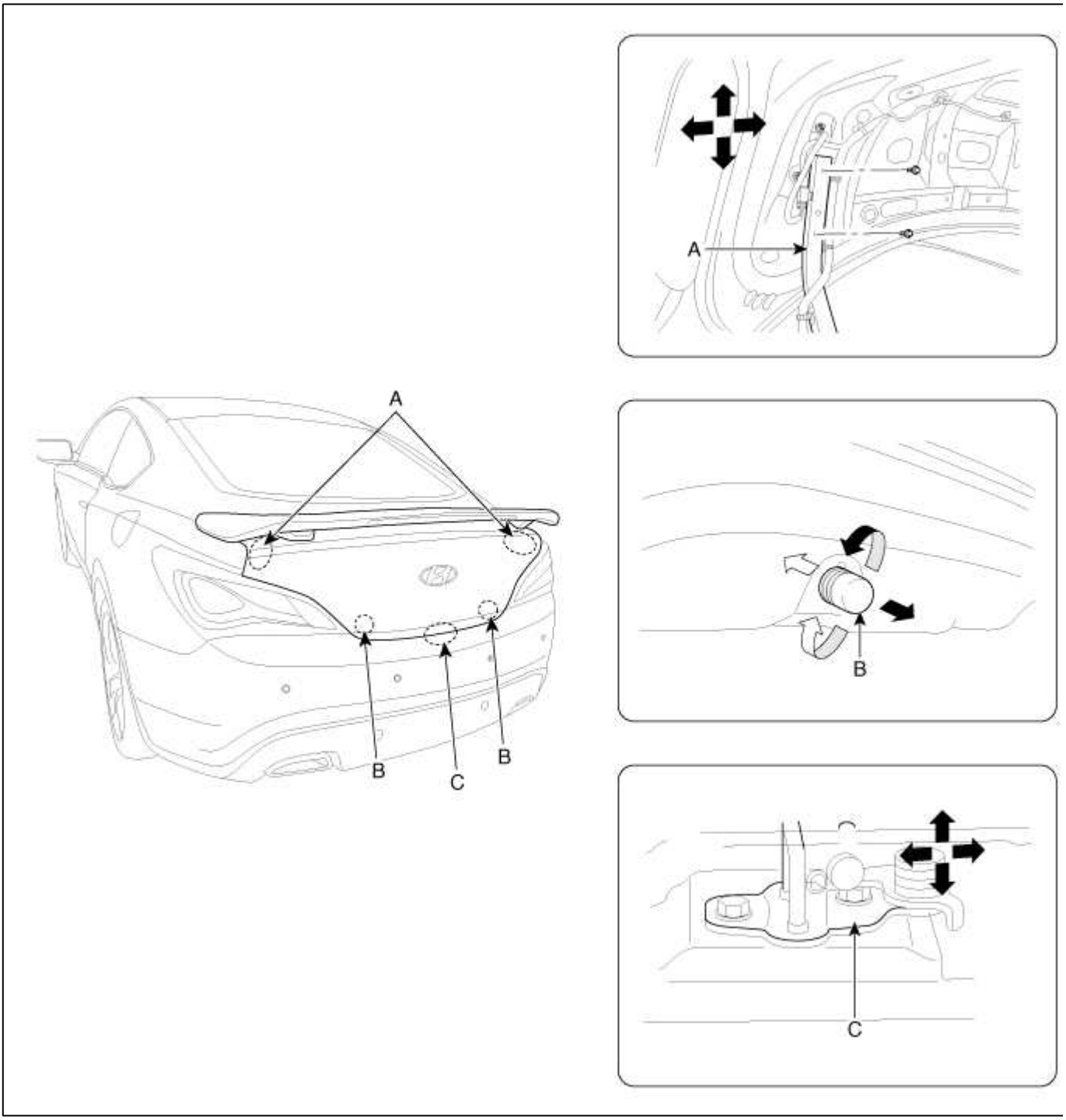
NOTE

- Make sure trunk lid looks/unlocks and opens/closes properly.

Adjustment

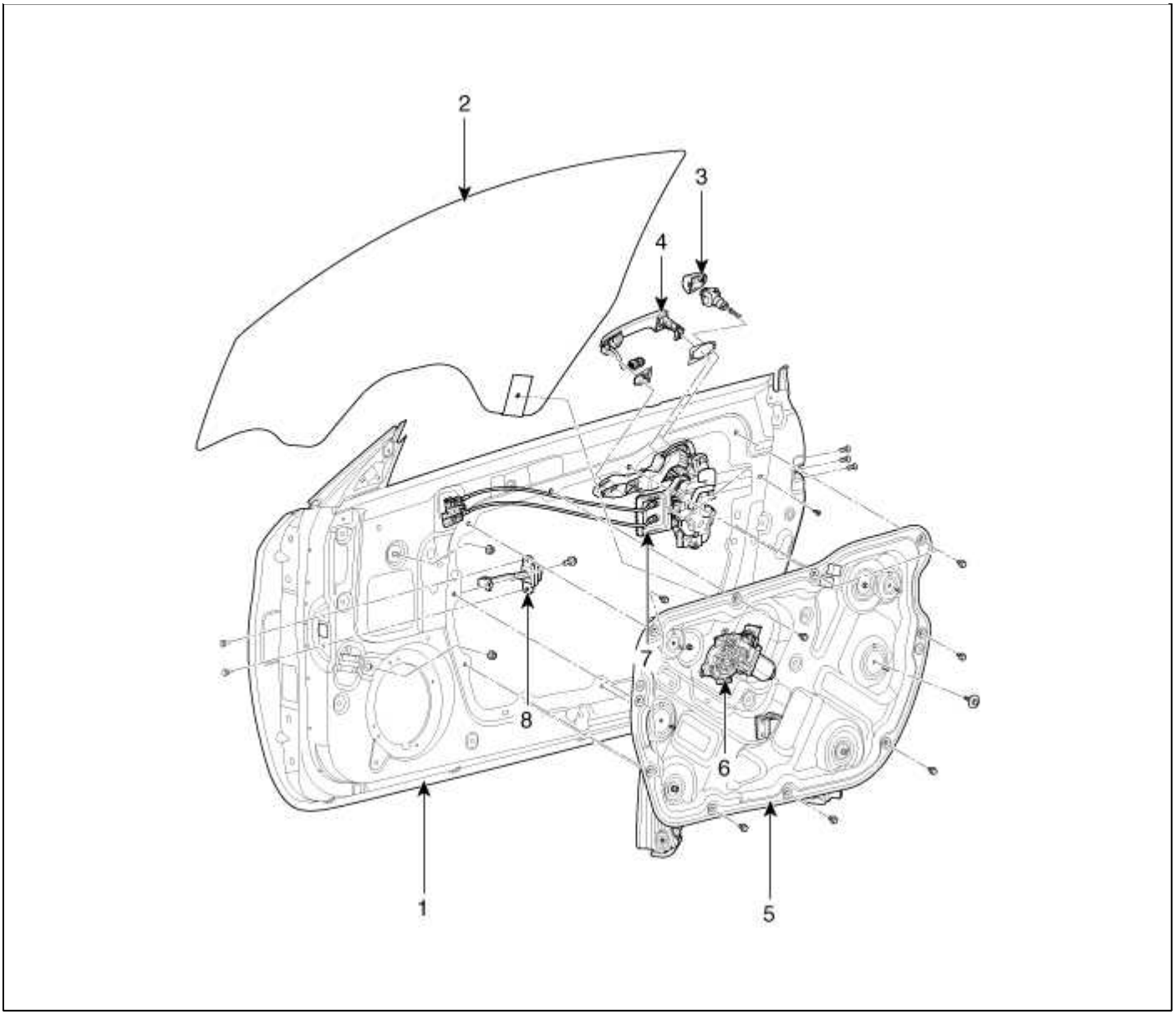
1. After loosening the trunk lid hinge (A) mounting bolt, adjust the trunk lid by moving it up or down, or right or left.
2. Adjust the trunk lid height by turning the trunk lid overslam bumpers (B).

3. After loosening the striker (C) mounting bolts, adjust the striker by moving it up or down, or right or left.



Body (Interior and Exterior) > Exterior > Front Door > Components and Components Location

Components



1. Front door panel 2. Front door window glass 3. Front door outside handle cover 4. Front door outside handle	5. Front door module 6. Front door power window motor 7. Front door latch 8. Front door checker

Body (Interior and Exterior) > Exterior > Front Door > Repair procedures

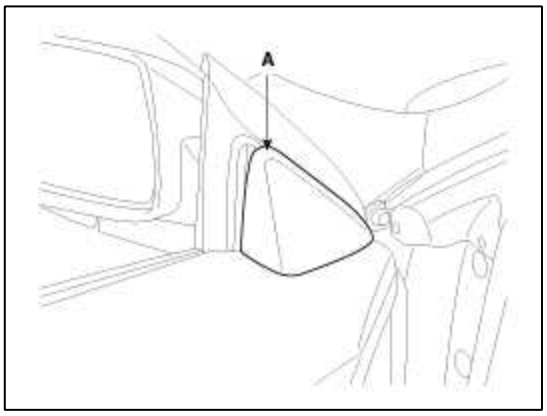
Replacements

Front Door Trim Replacement

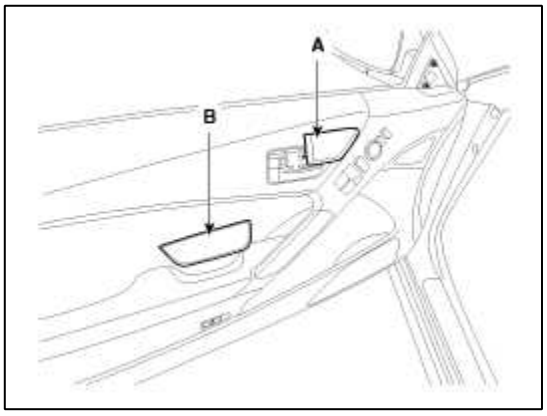
CAUTION

- Take care not to scratch the door trim and other parts.
- Put on gloves to protect your hands.

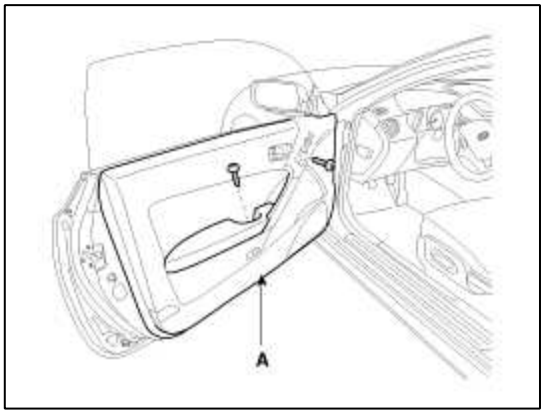
1. Using a screwdriver or remover, remove the front door quadrant inner cover (A).



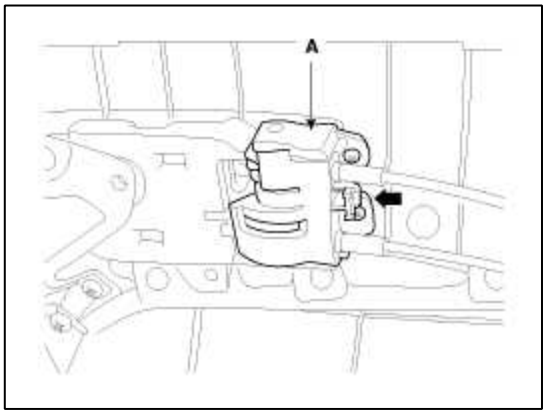
2. Remove the front door inside handle cover (A) and front door trim pad (B).



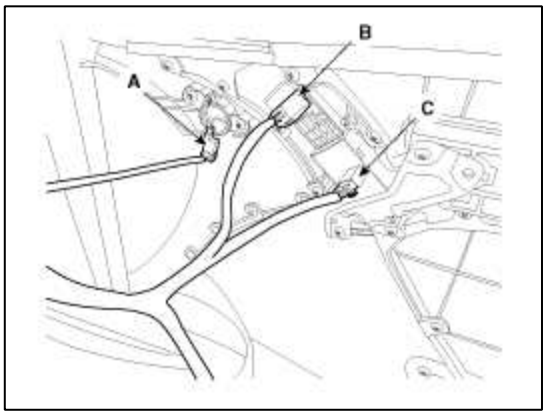
3. After loosening the mounting screws, then remove the front door trim (A).



4. Disconnect the front door inside handle cage (A).



5. Disconnect the twitter speaker connector (A), outside rear view mirror switch connector (B), power window switch connector (C).



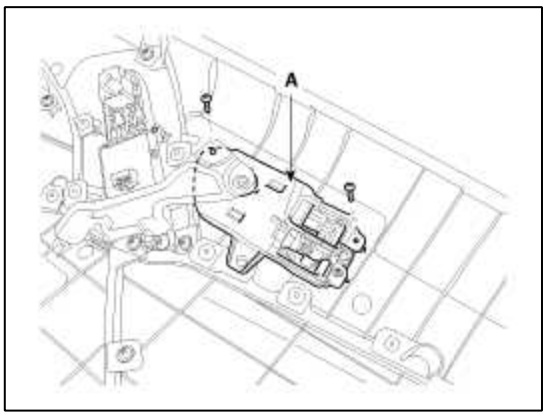
6. Installation is the reverse of removal.

NOTE

- Make sure of connectors is plugged in properly and each rod is connected securely.
- Make sure the door locks/unlocks and opens/closes properly.
- Replace any damaged clips.

Inside Handle Replacement

1. Remove the front door trim.
2. After loosening the mounting screws, then remove the front door inside handle (A).



3. Installation is the reverse of removal.

NOTE

- Replace any damaged clips.
- Make sure the door locks/unlocks and opens/closes properly.

Glass Replacement

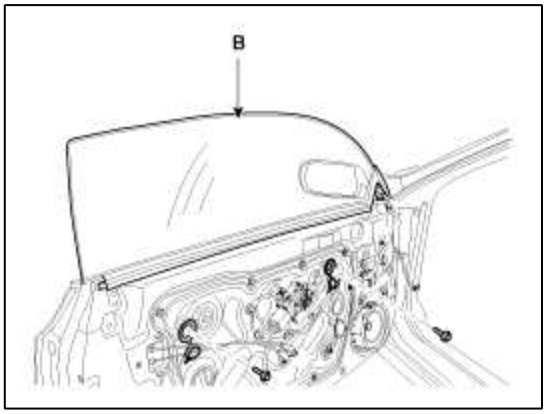
1. Remove the front door trim.
2. Remove the glass mounting hole plug.

NOTE

- Use the door switch to align the mounting hole/bolt with the hole in the door.
- If unable to operate the window motor, remove the motor and align the hole by hand.
- Be careful not to drop the glass and/or scratch the glass surface.

3. Carefully move the glass (B) until you can see the bolts, then loosen them. Separate the glass from the glass run and carefully pull the glass out through the window slot.

Tightening torque :
3.9 ~ 2.9 N.m (0.4 ~ 1.2 kgf.m, 11.8 ~ 8.7 lb-ft)



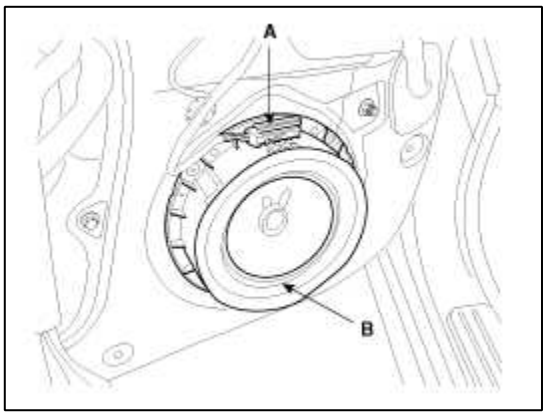
4. Installation is the reverse of removal.

NOTE

- Roll the glass up and down to see if it moves freely without binding.
- Adjust glass position as needed.
- Make sure the door locks/unlocks and opens/closes properly.
- Replace any damaged clips.

Speaker Replacement

1. Remove the front door trim.
2. Disconnect the speaker connector (A).
3. Drill out the rivets to remove the speaker (B).



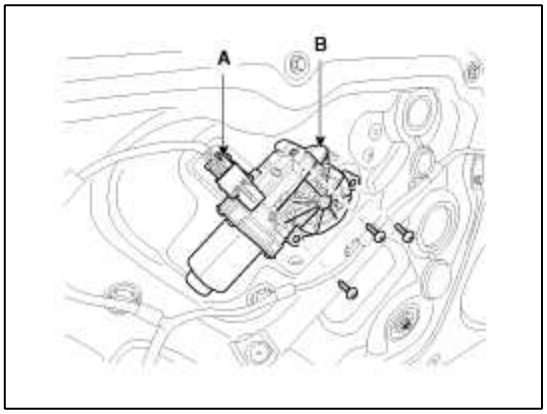
4. Installation is the reverse of removal.

NOTE

- Use sheet metal screws to secure the speaker.
- Make sure connectors are connected properly and each rod is connected securely.
- Make sure the door locks/unlocks and opens/closes properly.
- Replace any damaged clips.

Power Window Motor Replacement

1. Remove the front door trim.
2. Disconnect the power window motor connector (A).
3. After loosening the mounting screws, then remove the power window motor (B).



4. Installation is the reverse of removal.

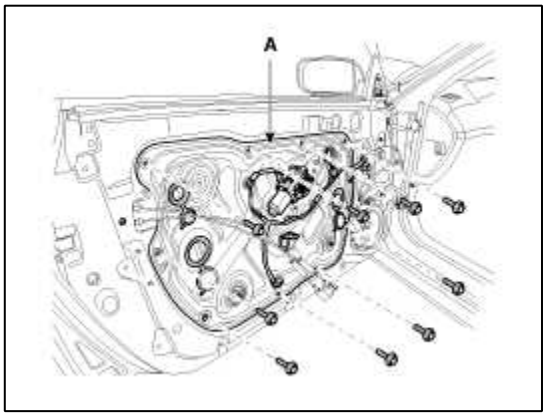
NOTE

- The area of rotational parts and springs should be applied with sufficient grease.
- Roll the glass up down to see if it move freely without binding.
- Make sure the door locks/unlocks and opens/closes properly.
- Replace any damaged clips.

Door Module Replacement

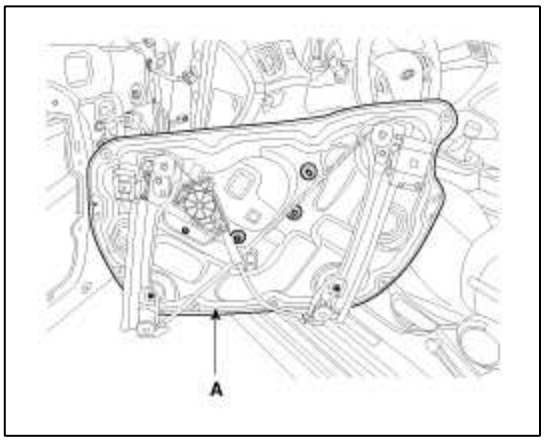
1. Remove the front door trim.
2. Remove the front door window glass.
3. Loosen the door latch mounting screws.
4. After loosening the mounting bolts, then remove the front door module (A).

Tightening torque :
6.9 ~ 10.8 N.m (0.7 ~ 1.1 kgf.m, 5.1 ~ 8.0 lb-ft)



5. Disconnect the front door module wiring harness.

6. Remove the front door module (A).



7. Installation is the reverse of removal.

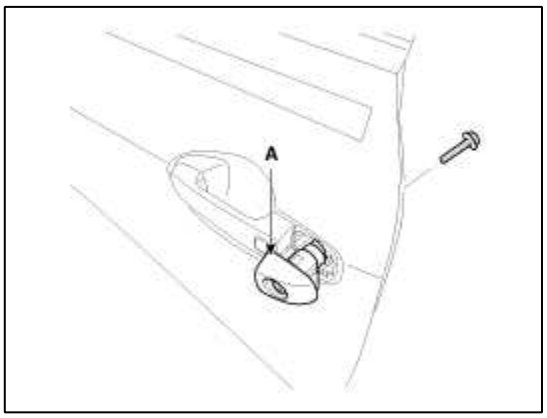
NOTE

- The area of whole parts should be applied with sufficient grease.
- Make sure the connector is plugged in properly and each rod is connected securely.
- Make sure the door locks/unlocks and opens/closes properly.
- Replace any damaged clips.

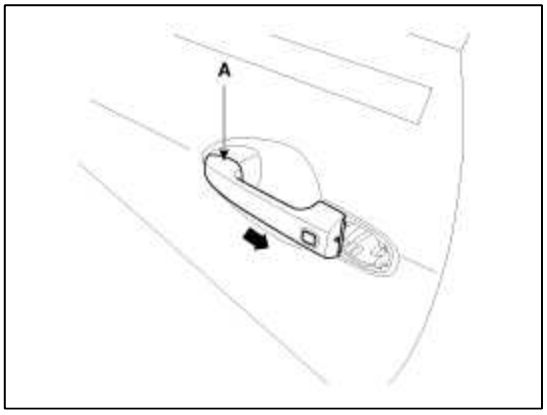
Outside Handle Replacement

1. Remove the front door trim.
2. After loosening the mounting bolt, then remove the outside handle cover (A).

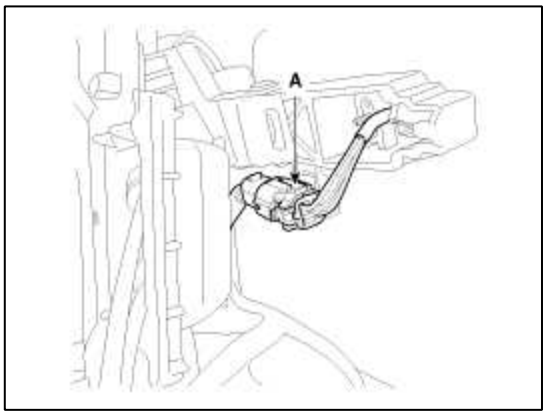
Tightening torque :
6.9 ~ 10.8 N.m (0.7 ~ 1.1 kgf.m, 5.1 ~ 8.0 lb-ft)



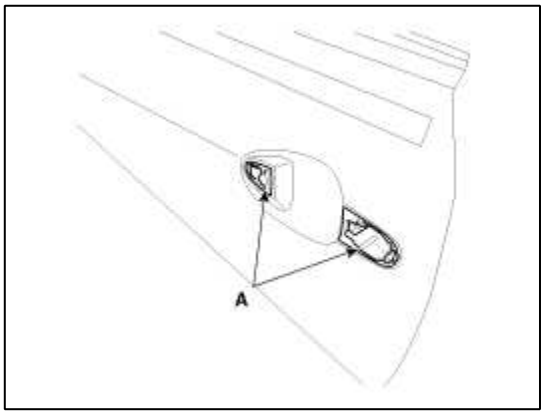
3. Remove the outside handle (A) by sliding it rearward.



4. Disconnect the outside handle connector (A).



5. Remove the outside handle bushing (A).



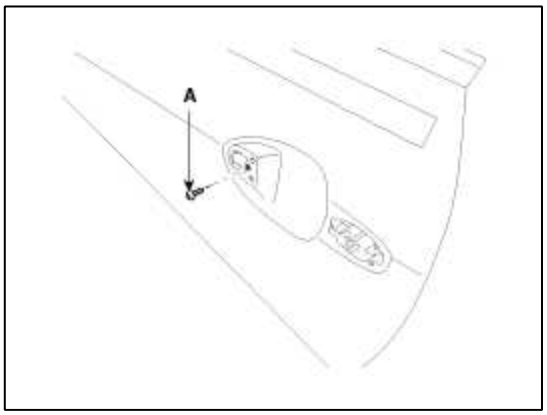
6. Installation is the reverse the removal.

NOTE

- Make sure the door locks/unlocks and opens/closes properly.
- Make sure the connector is plugged in properly and each rod is connected securely.

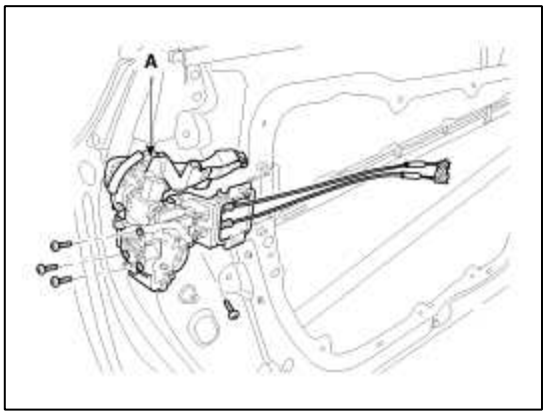
Door Latch Replacement

1. Remove the front door trim.
2. Remove the front door window glass.
3. Remove the front door module.
4. Reomove the outside handle.
5. Loosen the mounting screw (A).

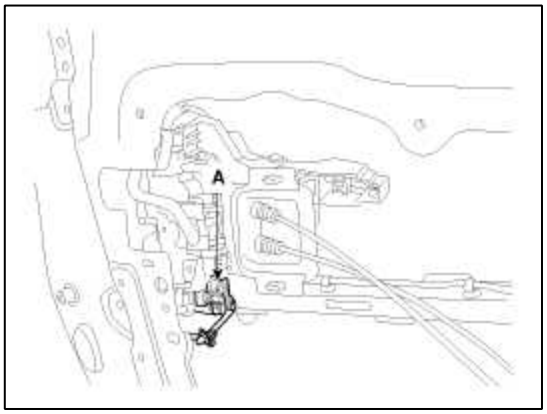


6. After loosening the mounting screws, then remove the front door latch (A).

Tightening torque :
6.9 ~ 10.8 N.m (0.7 ~ 1.1 kgf.m, 5.1 ~ 8.0 lb-ft)



7. Disconnect the front door latch connector (A).



8. Installation is the reverse of removal.

NOTE

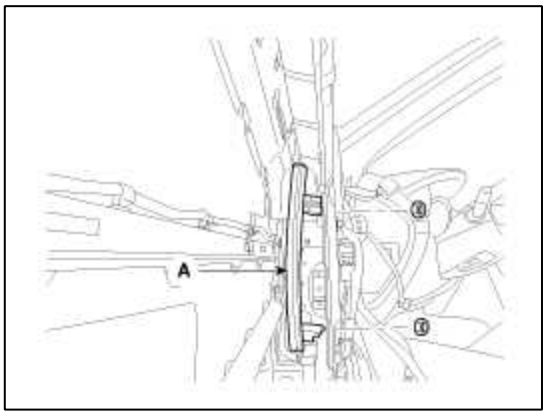
- Make sure the door locks/unlocks and opens/closes properly.
- Make sure the connector is plugged in properly and each rod is connected securely.

Door Channel Replacement

1. Remove the front door trim.
2. Remove the front door window glass.
3. Remove the front door module.

4. After loosening the mounting nuts, then remove the door channel (A).

Tightening torque :
3.9 ~ 5.9 N.m (0.4 ~ 0.6 kgf.m, 2.9 ~ 4.3 lb-ft)



5. Installation is the reverse of removal.

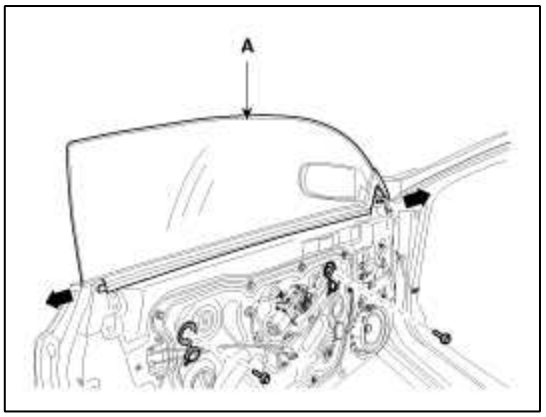
Adjustment

Glass Adjustment

NOTE

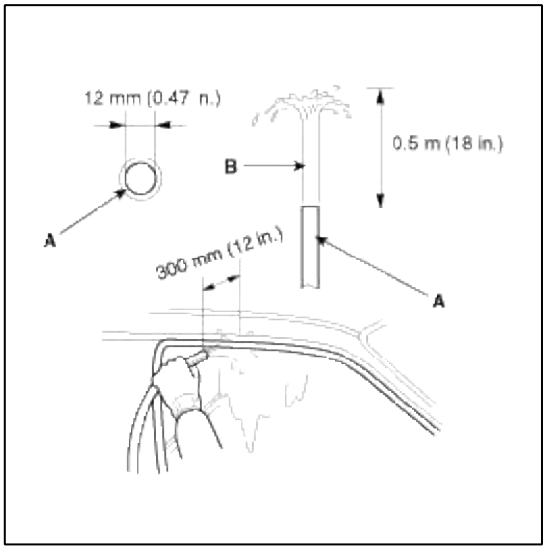
- Check the glass run channel for damage or deterioration, and replace them as needed.

1. Remove the front door trim.
2. Remove the glass mounting hole plug.
3. Carefully move the glass (A) until the glass mounting bolts are visible, then loosen them.



4. Check that the glass moves smoothly.
5. Raise the glass fully, and check for gaps. Check that the glass contacts the glass run channel evenly.

6. Check for water leaks. Run water over the roof and on the sealing area as shown, and note these items:
   A. Use a 12mm (1/2in.) diameter hose (A).
   B. Adjust the rate of water flow as shown (B).
   C. Do not use a nozzle.
   D. Hold the hose about 300mm(12in.) away from the door.

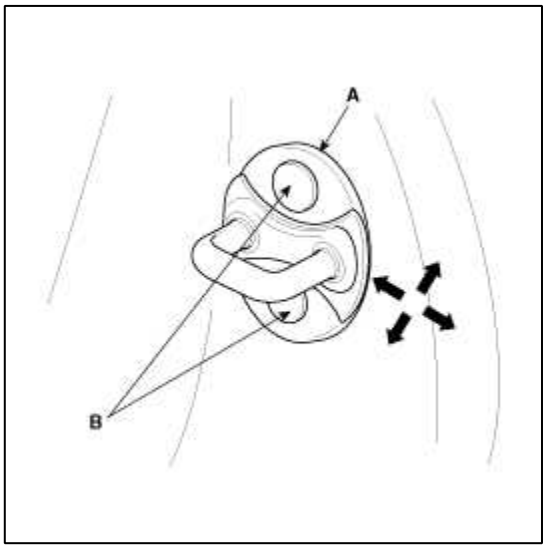


Door Striker Adjustment

Make sure the door latches securely without slamming it. If necessary adjust the striker (A): The striker nuts are fixed. The striker can be adjusted up or down, and in or out.

1. Loosen the screws (B) just enough for the striker to move.

Tightening torque :
(B) : 16.7 ~ 21.6 N.m (1.7 ~ 2.2 kgf.m, 12.3 ~ 15.9 lb-ft)



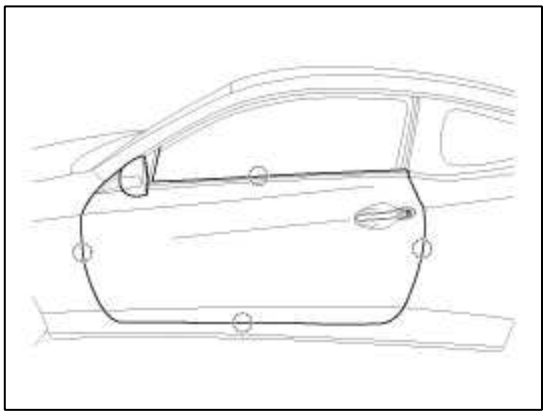
2. Tap on the striker with a plastic hammer to adjust the striker. The striker will not move much, but will give some adjustment.
3. Hold the outer handle out, and push the door against the body to be sure the striker allows a flush fit. If the door latches properly, tighten the screws and recheck.

Door Position Adjustment

NOTE

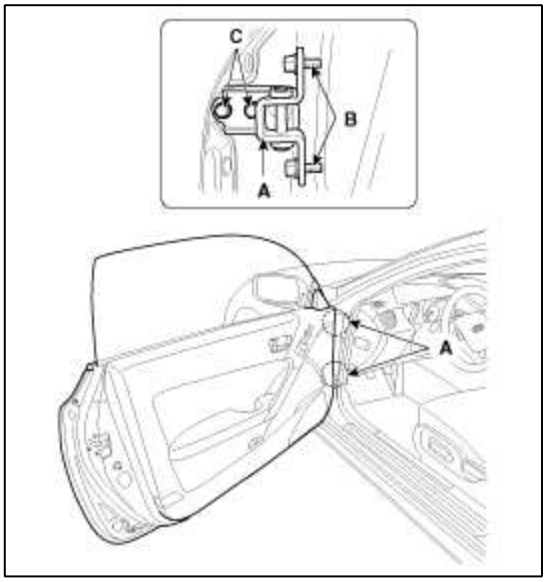
- After installing the door, check for a flush fit with the Body, then check for equal gaps between the front, rear, and bottom, door edges and the body. Check that the door and body edges are parallel. Before adjusting, replace the mounting bolts.

1. Check that the door and body edges are parallel.



2. Place the vehicle on a firm, level surface when adjusting the doors.
3. Adjust at the hinges (A) :
   A. Loosen the door mounting bolts slightly, and move the door in or out until it aligns flush with the body.
   B. Loosen the hinge mounting bolts slightly, and move the door backward or forward, up or down as necessary to equalize the gaps.
   C. Place a shop towel on the jack to prevent damage to the door when adjusting the door.

Tightening torque :
(B) : 21.6 ~ 26.5 N.m (2.2 ~ 2.7 kgf.m, 15.9 ~ 19.5 lb-ft)
(C) : 33.3 ~ 41.2 N.m (3.4 ~ 4.2 kgf.m, 24.6 ~ 30.4 lb-ft)



4. Grease the pivot portions of the hinges indicated.
5. Check for water leaks.

Body (Interior and Exterior) > Exterior > Body Side Moldings > Repair procedures

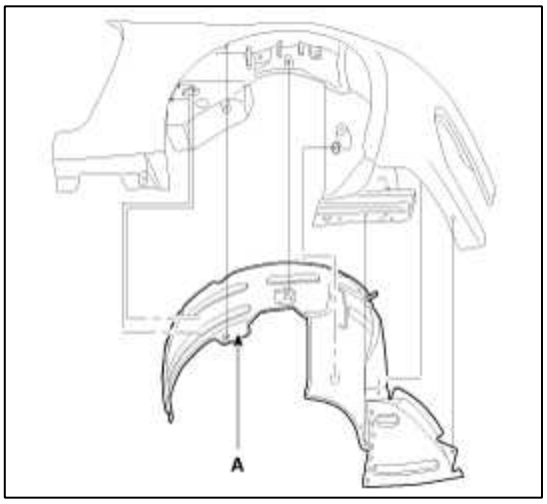
Replacement

Front Wheel Guard Replacement

NOTE

- When prying with a flat-tip screwdriver, wrap with protective tape, and apply protective tape around the related parts, to prevent damaged.
- Put on gloves to protect your hands.
- Take care not to scratch the body surface.

1. Remove the front tire.
2. After loosening the mounting clips and screws, then remove the front wheel guard (A).



3. Installation is the reverse of removal.

NOTE

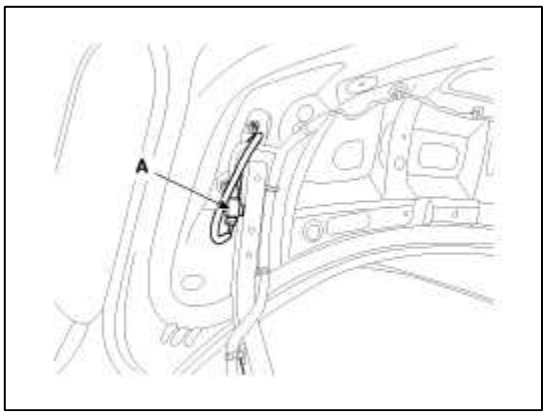
- Replace any damage clips.

Rear Spoiler Replacement

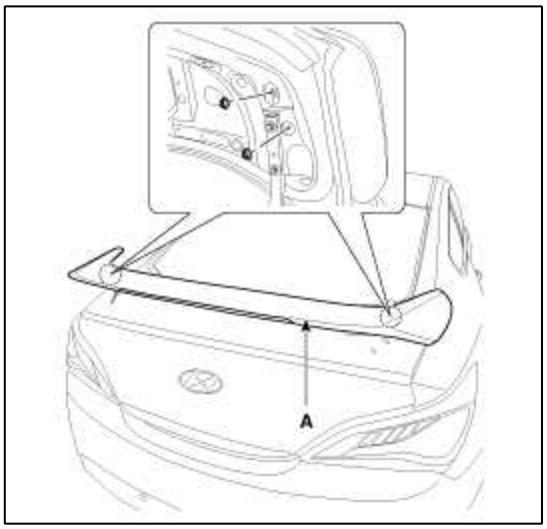
NOTE

- When prying with a flat-tip screwdriver, wrap it with protective tape, and apply protective tape around the related parts, to prevent damaged.
- Put on gloves to protect your hands.
- Take care not to scratch the body surface.

1. Remove the trunk lid trim
   (Refer to the BD group - "Trunk Lid")
2. Disconnect the high mounted stop lamp connector (A).



3. After loosening the mounting nuts, then remove the rear spoiler (A).



4. Installation is the reverse of removal.

NOTE

- Make sure of connectors is plugged in properly and each rod is connected securely.
- Replace any damaged clips.

Body (Interior and Exterior) > Exterior > Sunroof > Repair procedures

Replacements

Glass Replacement

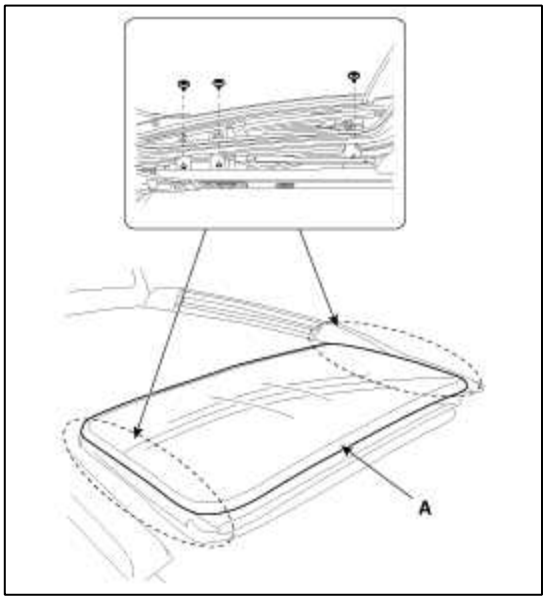
NOTE

- Put on glove to protect your hands.

1. Remove the glass (A) by lifting it up.

CAUTION

- Do not damage the roof panel.



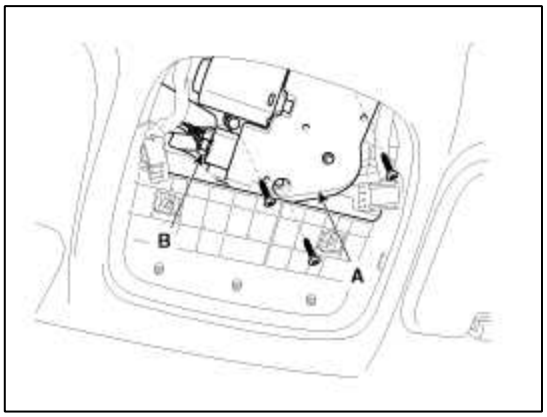
2. Installation is the reverse of removal.

Motor Replacement

CAUTION

• Confirm the position of guide whether it is closed or not when you remove the motor.

1. Remove the overhead console.
   (Refer to the BD group - "Roof Trim")
2. Disconnect the motor connector (B), remove the screws and then remove the motor (A).



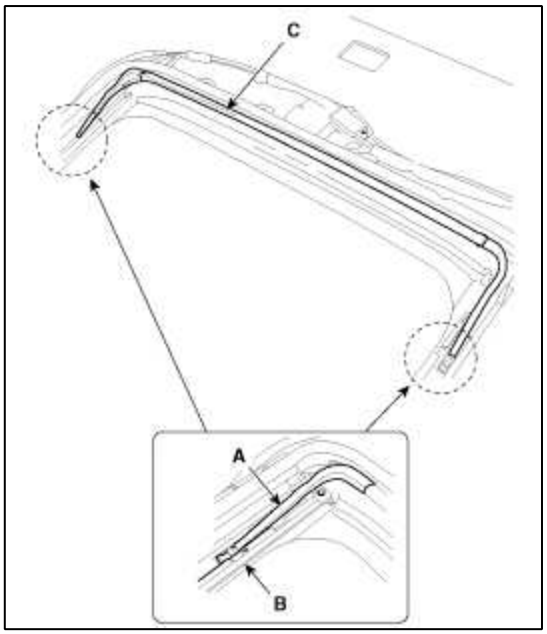
3. Installation is the reverse of removal.

CAUTION

• Make sure to initialize the motor.

Deflector Replacement

1. Open the glass fully.
2. Disconnect the deflector link (A) from the frame (B), and then remove the deflector (C).



3. Installation is the reverse of removal.

Sunroof Assembly Replacement

1. Remove the front seat assembly.
   (Refer to the BD group - "Front Seat")
2. Remove the rear seat assembly.
   (Refer to the BD group - "Rear Seat")
3. Remove the Interior trim.
   (Refer to the BD group - "Interior Trim")

4. Remove the roof trim.
   (Refer to the BD group - "Roof Trim")
5. Remove the sunroof glass.
6. Disconnect the drain tubes (B).
7. After loosening the mounding bolts and nuts, remove the sunroof assembly (A).

Tightening torque :
(C) : 6.9 ~ 10.8 N.m (0.7 ~ 1.1 kgf.m, 5.1 ~ 8.0 lb-ft)
(D) : 3.9 ~ 5.9 N.m (0.4 ~ 0.6 kgf.m, 2.9 ~ 4.3 lb-ft)

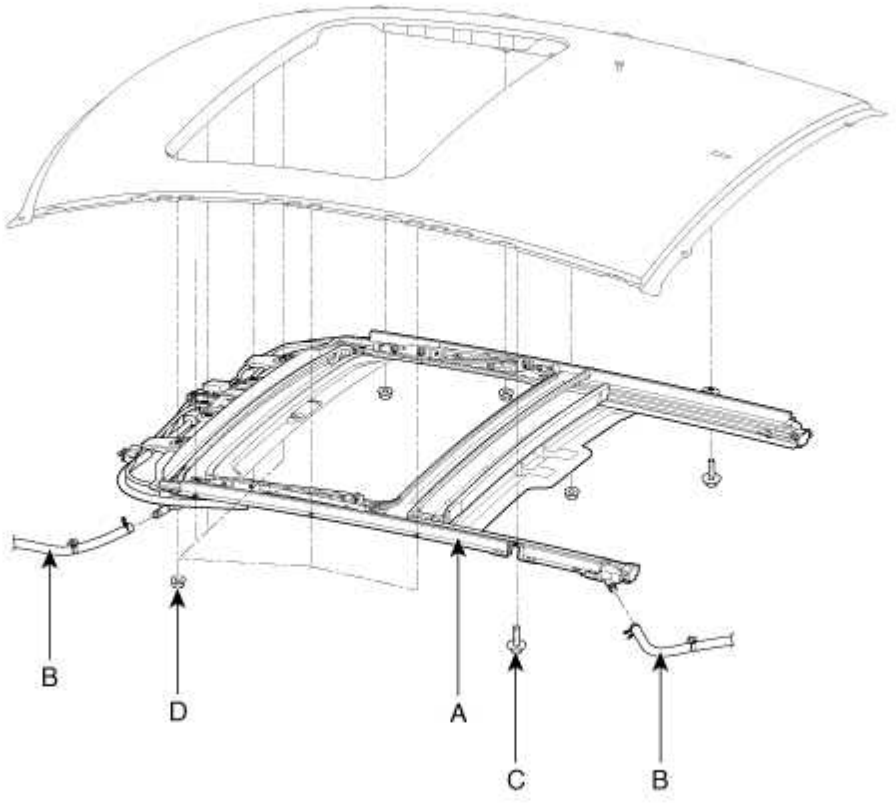
CAUTION

- Take care not to scratch the interior trims and other parts.

8. Installation is the reverse of removal.

CAUTION

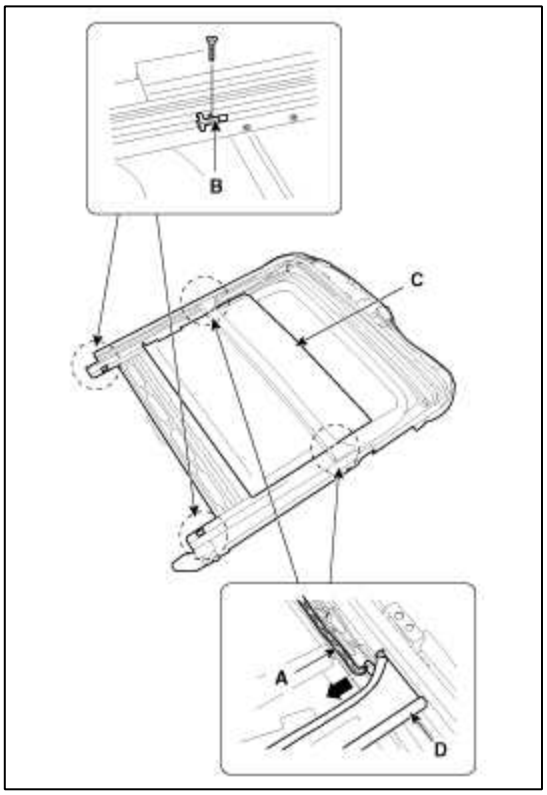
- Make sure to initialize the motor.



Sunshade And Drip Rail Replacement

1. Remove the sunroof assembly.
2. Remove the drip link (A) and sunshade stopper (B).

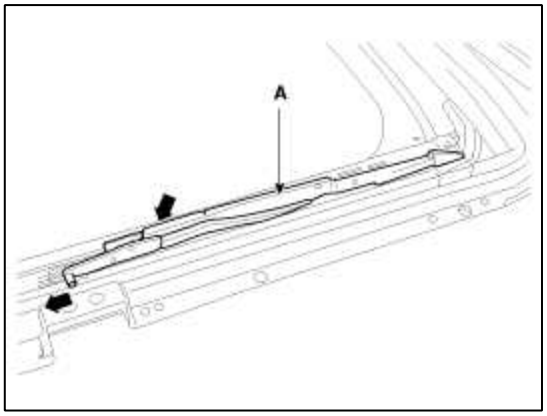
3. Remove the sunshade (C) and drip rail (D).



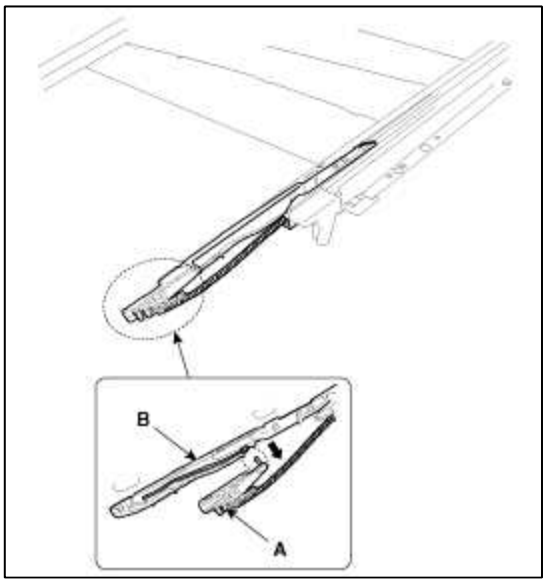
4. Installation is the reverse of removal.

Guide Assembly Replacement

1. Remove the sunroof assembly.
2. Lower and slide the guide assembly (A) to the rear to remove.



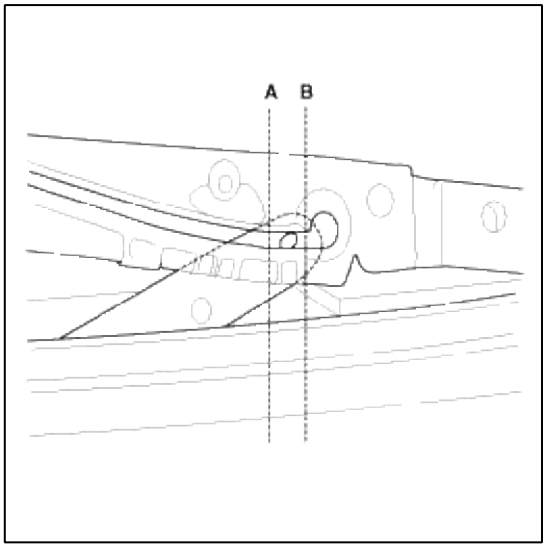
3. Remove the guide (A) and slide (B).



4. Installation is the reverse of removal.

NOTE

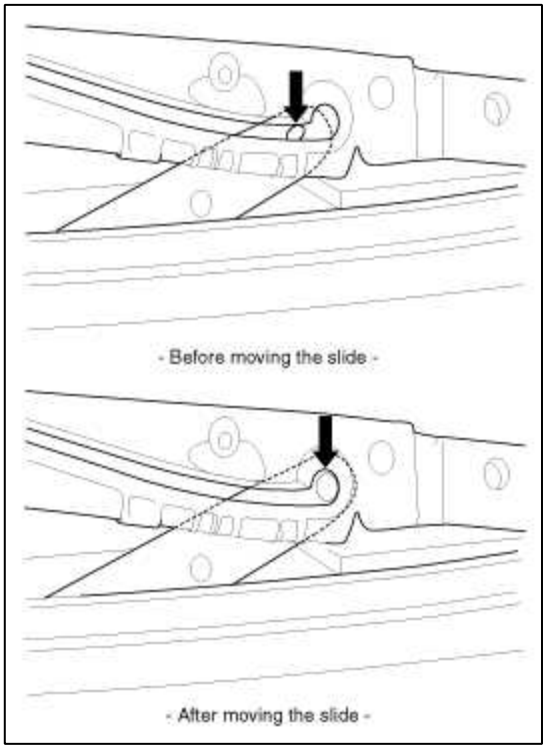
- Make sure to align the slide with the center of“A” and “B”
- Make sure to initialize the motor.



Adjustment

How To Initialize

1. Check that the glass has been installed.
   A. Finished height adjustment.
2. Push the UP switch. (Keep on pushing the switch)
   A. Press and hold the UP button for more than 15 seconds until the sunroof moved to tilt up state and hard stop position.



3. Release the sunroof UP button with in 15 seconds. And then press and hold the UP button once again within 15 seconds until the sunroof do as follows.
   A. Tilt up → Slide Open → Slide Close

4. Then release the lever.
5. When the sunroof is closed completely, turn OFF the UP switch initialize the motor completely.

When To Initialize The Motor

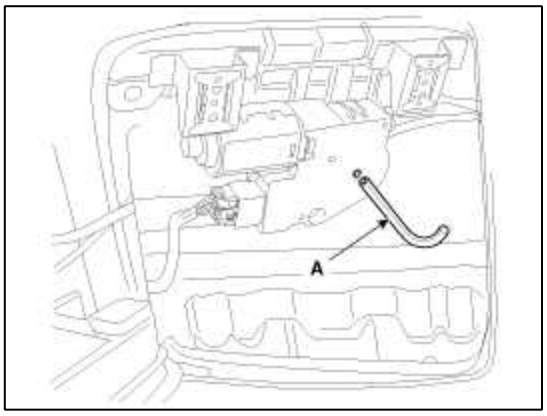
1. After initial vehicle assembly.
2. If the initial value is erased or damaged because of short power electric discharge during operation.
3. After using the manual handle.

Operating The Sunroof Emergency Handle

1. Use the sunroof emergency handle to close or open the sunroof manually if the sunroof cannot be closed electronically due to motor or controller electrical malfunction.
2. Operating method.
   A. Remove the overhead console.
   B. Push the emergency handle up into the hexagonal drive (A) of the sunroof motor. You must push hard enough to disengage the motor clutch; otherwise the emergency handle will slip due to incomplete fit in the motor.
   C. Carefully turn the emergency handle clockwise to close the sunroof.
   D. After closing the sunroof, wiggle the handle back and forth as you remove the tool from the motor, to ensure the motor clutch reengages.
   E. A 5mm hex socket may be used in place of the emergency handle, with a" Speeder" type handle.

CAUTION

- Do not use power tools to operate the sunroof.
- Damage to the components may occur.



Body (Interior and Exterior) > Exterior > Mirror > Repair procedures

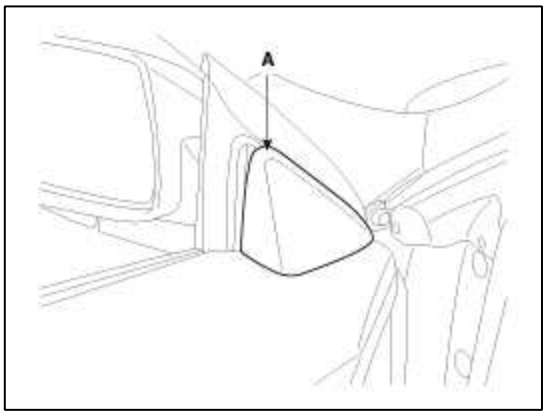
Replacement

Outside Rear View Mirror Relplacement

NOTE

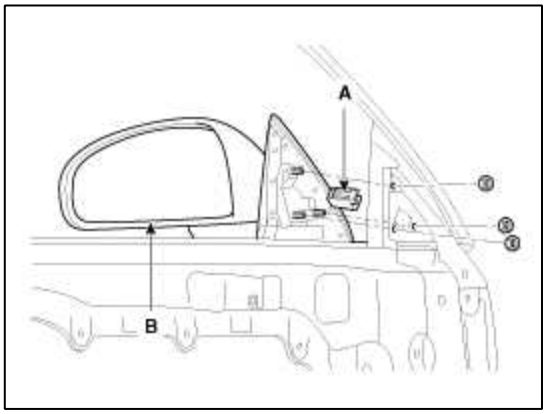
- When prying with a flat-up screwdriver, wrap it with protective tape, and apply protective tape around the related parts, to prevent damage.
- Put on gloves to protect your hands.

1. Using a screwdriver or remover, remove the front door quadrant inner cover (A).



2. Disconnect the outside rear view mirror connector (A).
3. After loosening the mounting nuts, then remove the outside rear view mirror (B).

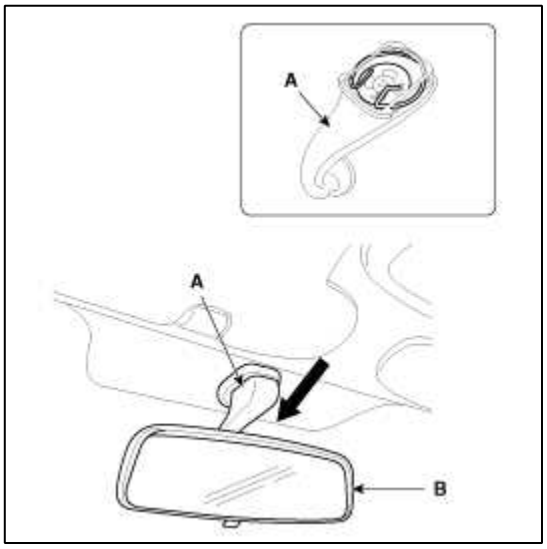
Tightening torque :
6.9~10.8N.m(0.7~1.1kgf.m, 5.1~8.0 lb-ft)



4. Installation is the reverse of removal.

Inside Rear View Mirror Replacement

1. Push the inside rear view mirror base (A) down to remove to inside rear view mirror assembly (B).

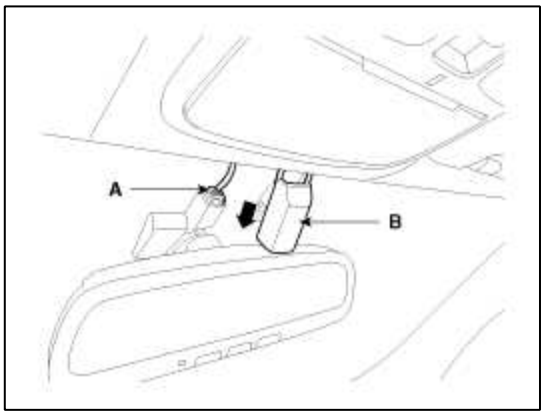


2. Installation is the reverse of removal.

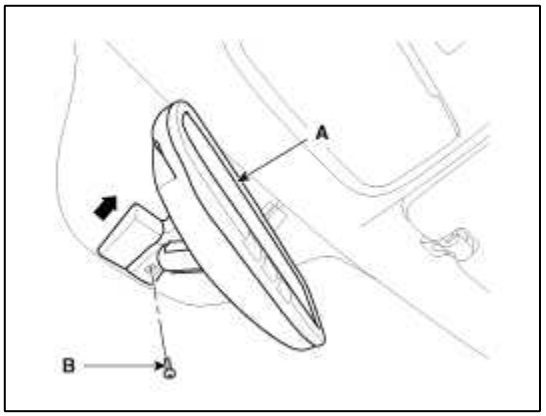
ECM Mirror Replacement

1. Remove the ECM mirror cover (B).

2. Disconnect the ECM mirror connector (A).



3. Loosen the mounting screw (B), push the ECM mirror base up to remove the ECM mirror assembly (A).



4. Installation is the reverse of removal.

NOTE

- Make sure all connectors are connected in properly.

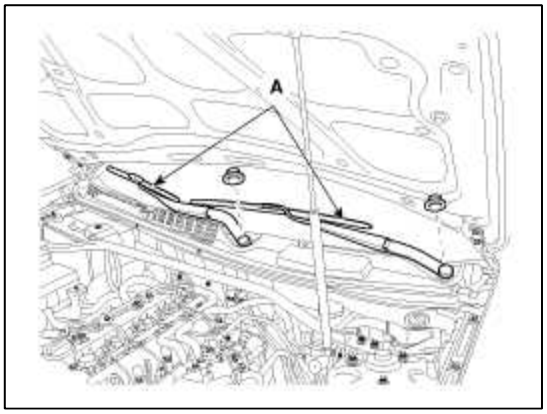
Body (Interior and Exterior) > Exterior > Cowl Top Cover > Repair procedures

Replacement

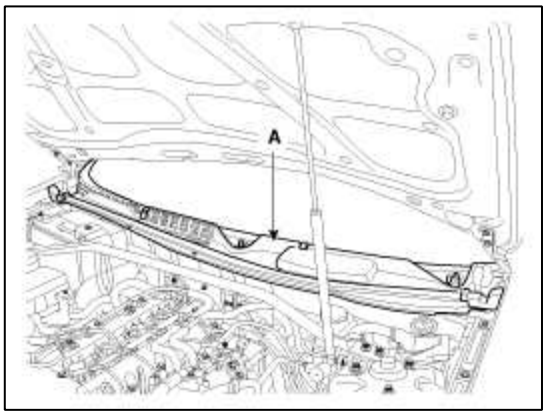
Cowl Top Cover Replacement

1. Remove the wiper arm caps.
2. After loosening the mounting nuts, then remove the wiper arm (A).

Tightening torque :
22.6 ~ 26.5 N.m (2.3 ~ 2.7 kgf.m, 16.6 ~ 19.5 lb-ft)



3. Detach the clips, then remove the cowl top cover (A).



4. Installation is the reverse of removal.

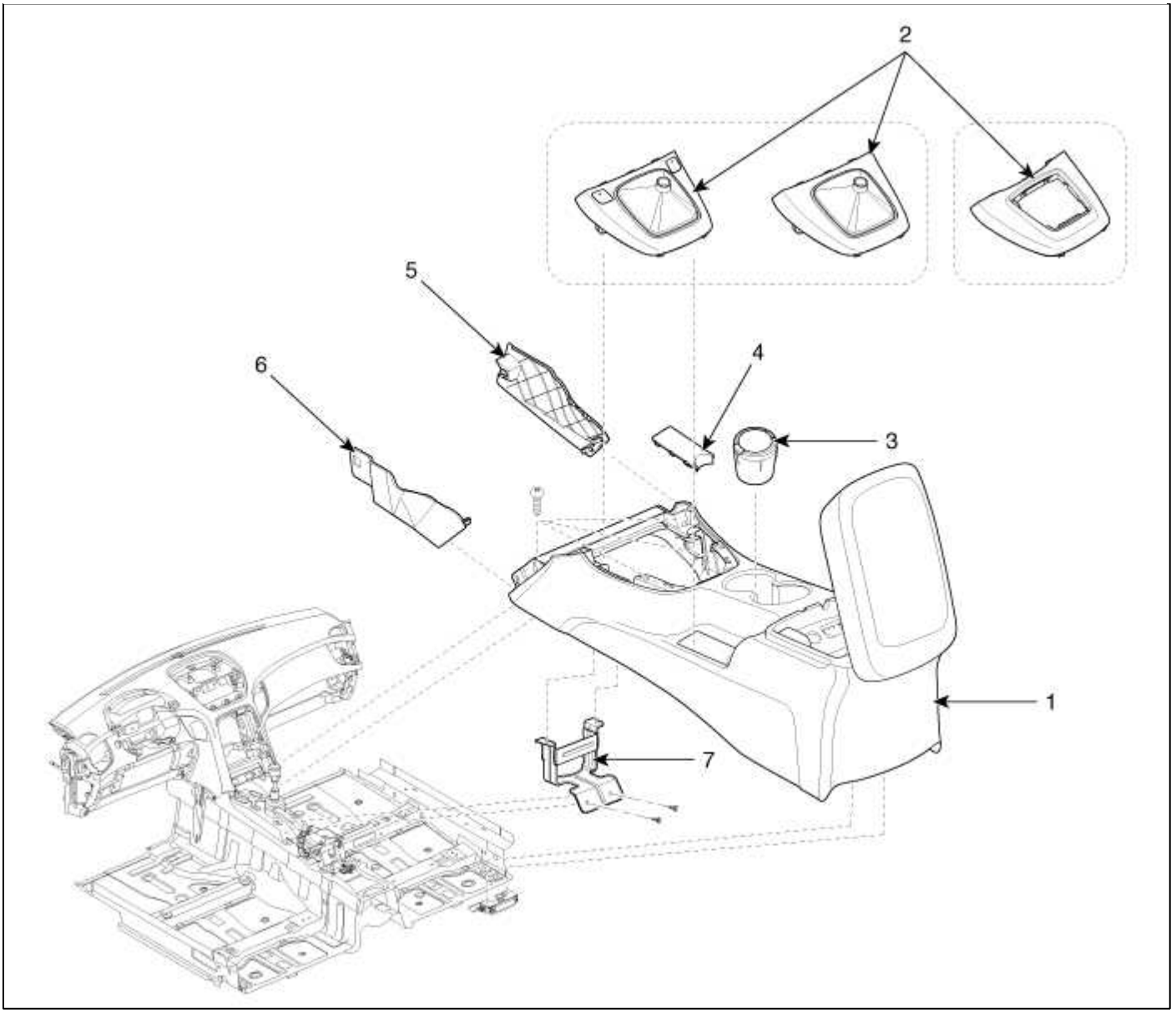
NOTE

- Replace any damage clips.

Body (Interior and Exterior) > Interior > Console > Components and Components Location

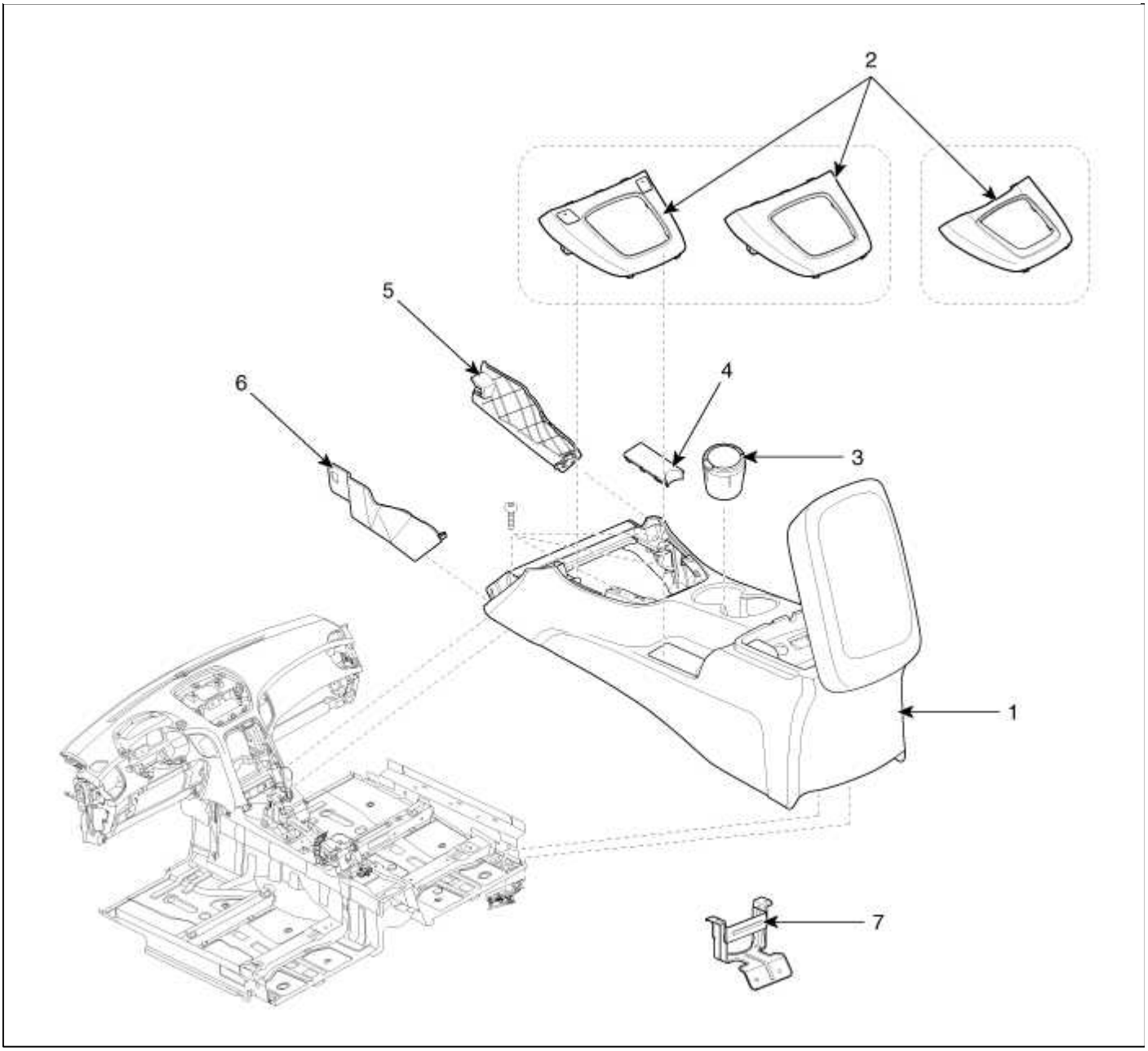
Components

[M/T]



1. Floor console assembly 2. Console upper cover [M/T] 3. Ash tray assembly 4. Parking brake cover	5. Console extension side cover [RH] 6. Console extension side cover [LH] 7. Console rear mounting bracket

[A/T]



1. Floor console assembly 2. Console upper cover [A/T] 3. Ash tray assembly 4. Parking brake cover	5. Console extension side cover [RH] 6. Console extension side cover [LH] 7. Console rear mounting bracket

Body (Interior and Exterior) > Interior > Console > Repair procedures

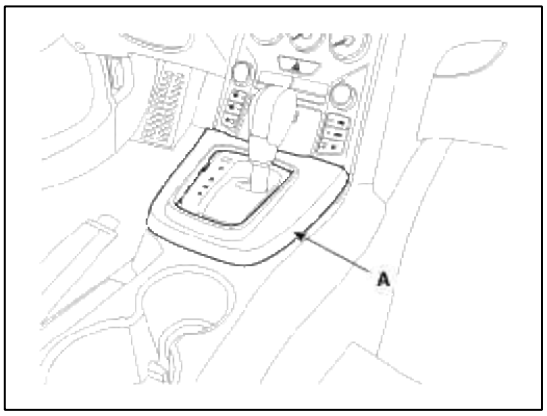
Replacement

Floor Console Replacement

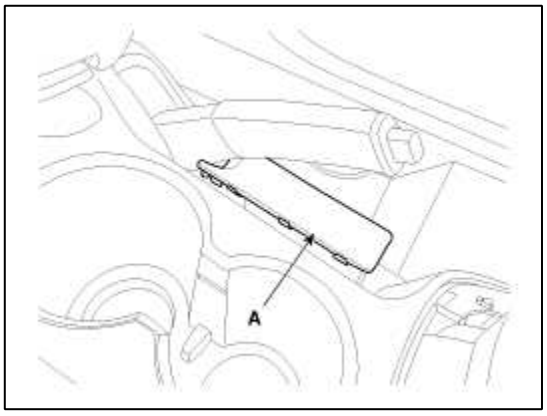
NOTE

- When prying with a flat-tip screwdriver, wrap it with protective tape, and apply protective tape around the related parts, to prevent damage.
- Put on gloves to protect your hands.

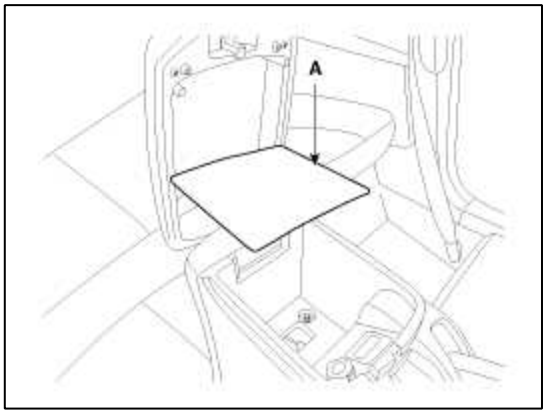
1. Using a screwdriver or remover, remove the console upper cover (A).



2. Using a screwdriver or remover, remove the parking brake cover (A).

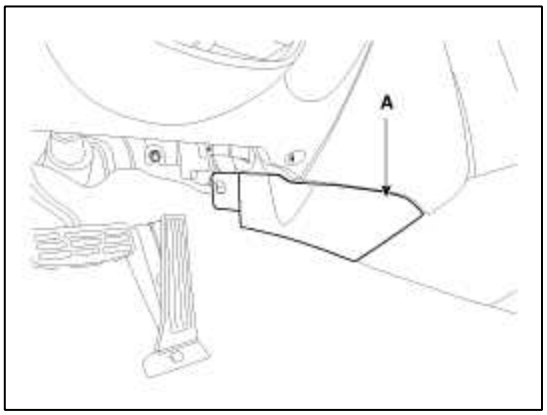


3. Remove the console tray mat (A).

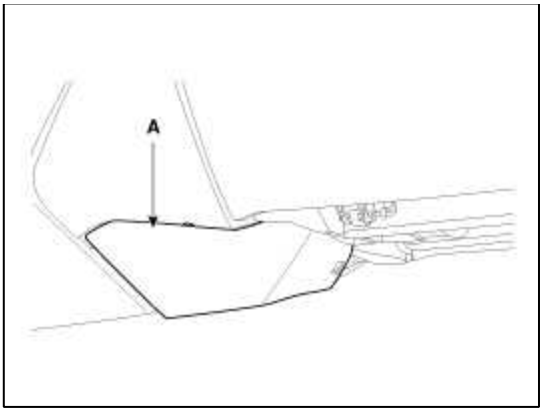


4. Remove the console extension side cover (A).

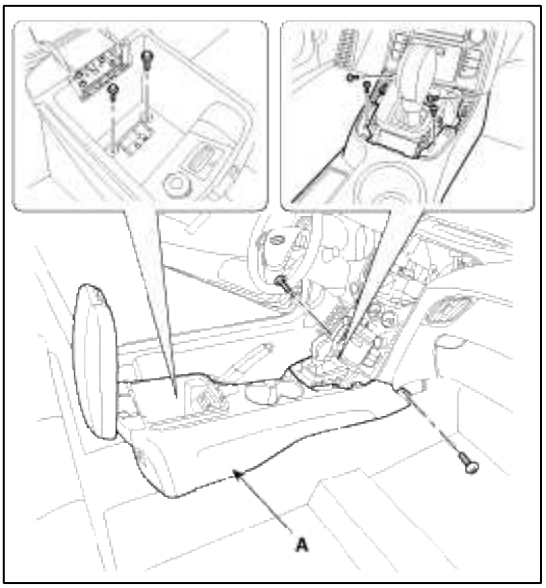
[LH]



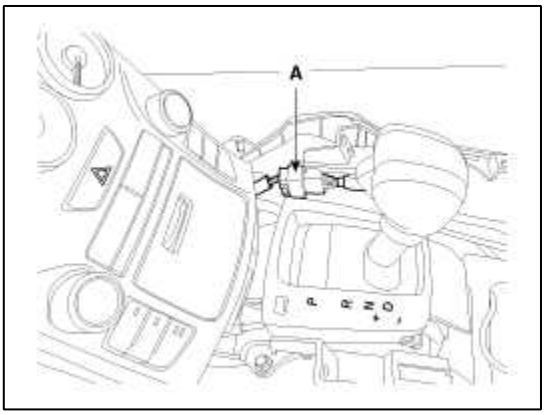
[RH]



5. After loosening the mounting screws and bolts, then remove the floor console assembly (A).



6. Disconnect the floor console main connector (A).



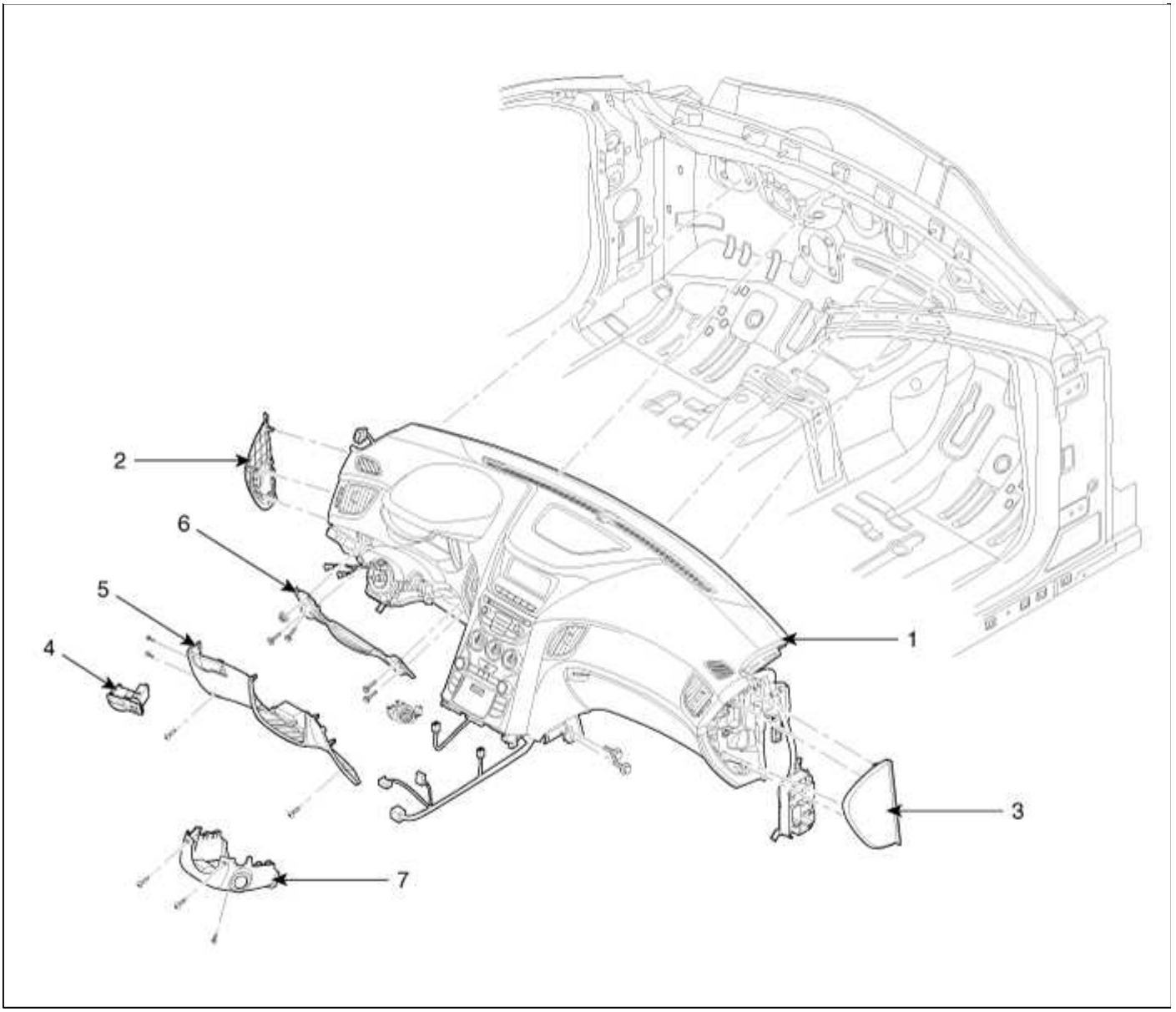
7. Installation is the reverse of removal.

NOTE

- Make sure all connectors are connected in properly.
- Replace any damaged clips.

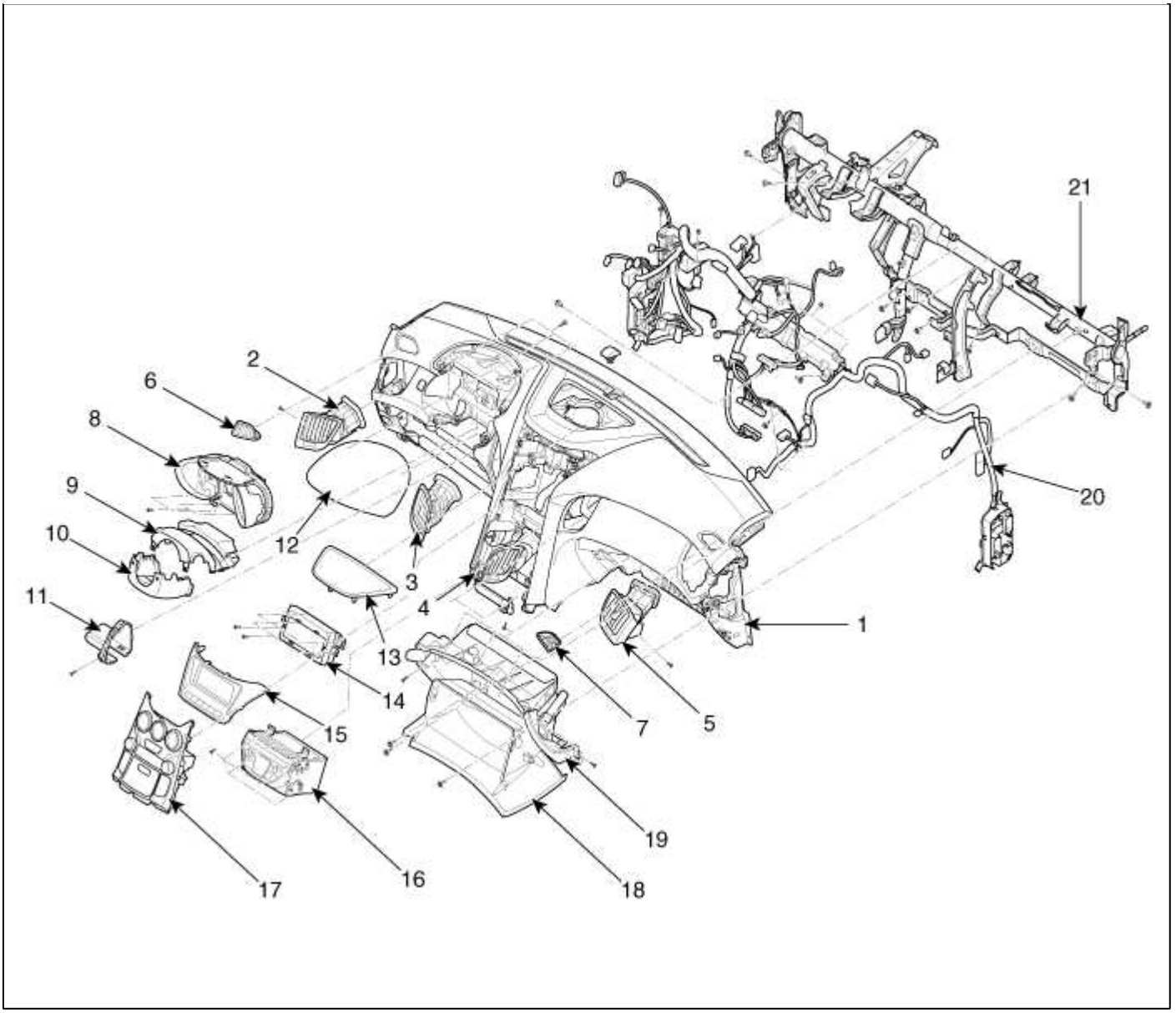
Body (Interior and Exterior) > Interior > Crash Pad > Components and Components Location

Components (1)



1. Main crash pad assembly	5. Crash pad lower panel
2. Crash pad side cover [LH]	6. Reinforce panel
3. Crash pad side cover [RH]	7. Steering column lower shroud
4. Crash pad lower switch	

Components (2)



1. Main crash pad assembly	8. Cluster assembly	15. Center fascia upper panel
2. Side airvent duct [LH]	9. Steering column upper shroud	16. Audio unit assembly
3. Center airvent duct [LH]	10. Steering column lower shroud	17. Cluster fascia lower panel
4. Center airvent duct [RH]	11. Shower duct	18. Glove box
5. Side airvent duct [RH]	12. Cluster fascia upper panel	19. Glove box housing
6. Side def nozzle [LH]	13. Center speaker grille	20. Crash pad main wring harness
7. Side def nozzle [RH]	14. Monitor assembly	21. Cowl cross bar assembly

Body (Interior and Exterior) > Interior > Crash Pad > Repair procedures

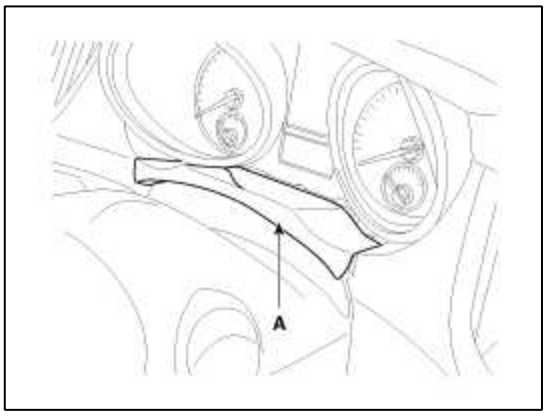
Replacement

Cluster Replacement

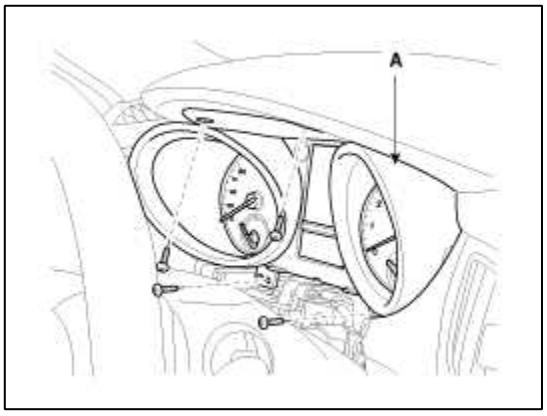
NOTE

- When prying with a flat-tip screwdriver, wrap it with protective tape, and apply protective tape around the related parts, to prevent damage.
- Take care not to scratch the body surface
- Put on gloves to protect your hands.

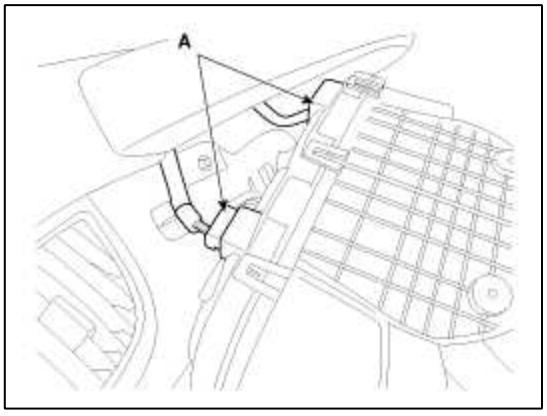
1. Using a screwdriver or remover, remove the cluster fascia lower panel (A).



2. After loosening the mounting screws, then remove the cluster assembly (A).



3. Disconnect the connector (A).



4. Installation is the reverse the removal.

NOTE

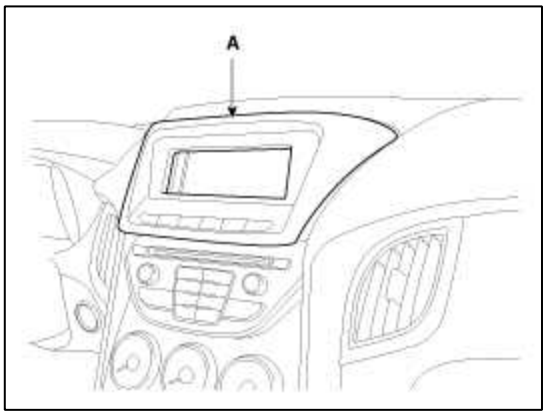
- Make sure the connector is connected properly.
- Replace any damaged clips.

Center Fascia Panel Replacement

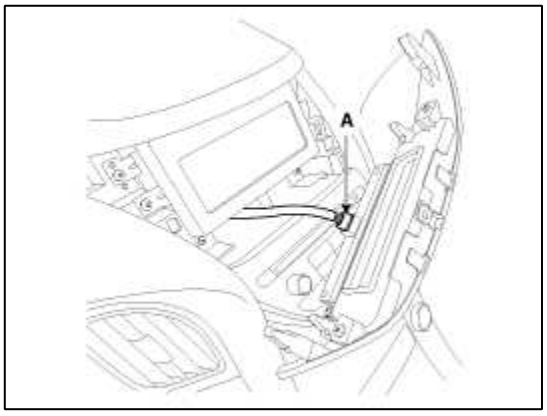
NOTE

- When prying with a flat-tip screwdriver, wrap it with protective tape, and apply protective tape around the related parts, to prevent damage.
- Take care not to scratch the body surface
- Put on gloves to protect your hands.

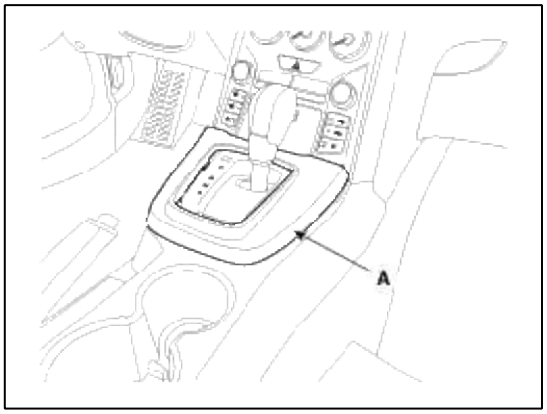
1. Using a screwdriver or remover, remove the center fascia upper panel (A).



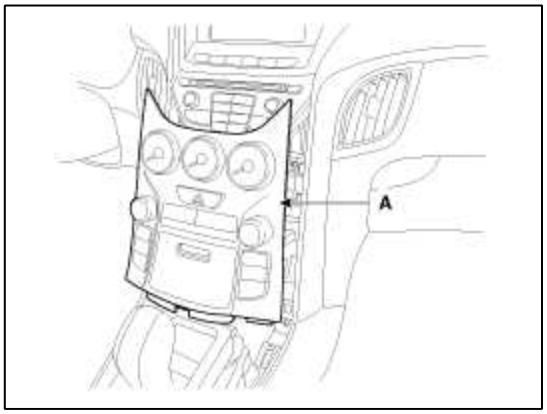
2. Disconnect the connector (A).



3. Using a screwdriver or remover, remove the console upper cover (A).

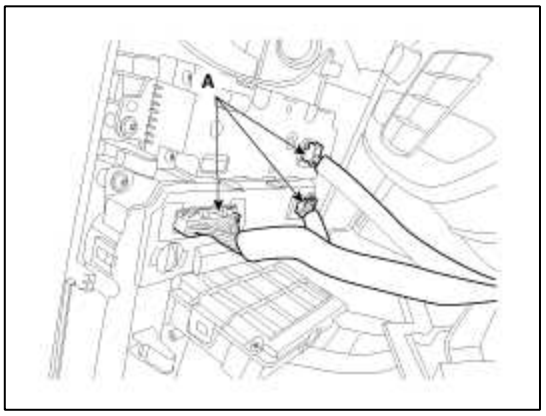


4. Using a screwdriver or remover, remove the center fascia lower panel (A).

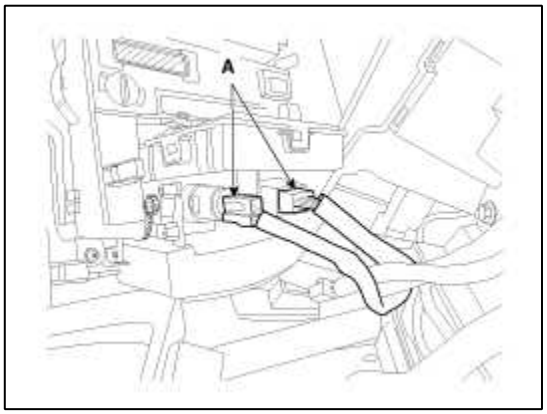


5. Disconnect the connectors (A).

[Upper]



[Lower]



6. Installation is the reverse of removal.

NOTE

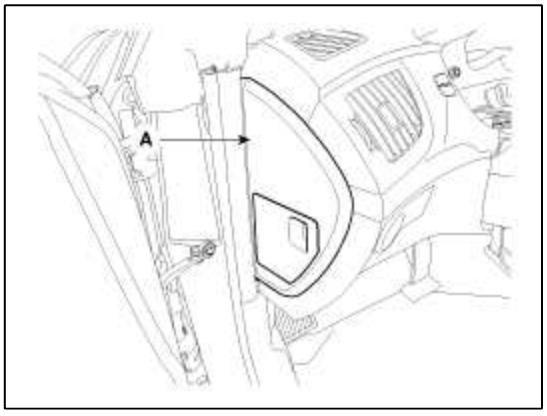
- Make sure the connector is connected properly.
- Replace any damaged clips.

Crash Pad Lower Panel Replacement

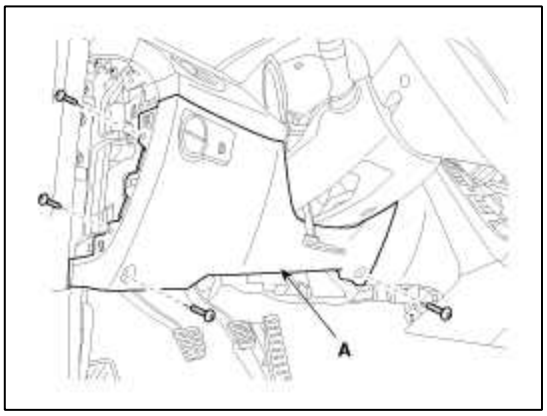
NOTE

- When prying with a flat-tip screwdriver, wrap it with protective tape, and apply protective tape around the related parts, to prevent damage.
- Take care not to scratch the body surface
- Put on gloves to protect your hands.

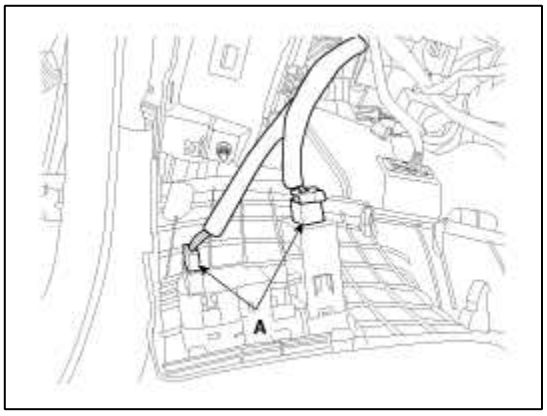
1. Using a screwdriver or remover, remove the crash pad side cover (A).



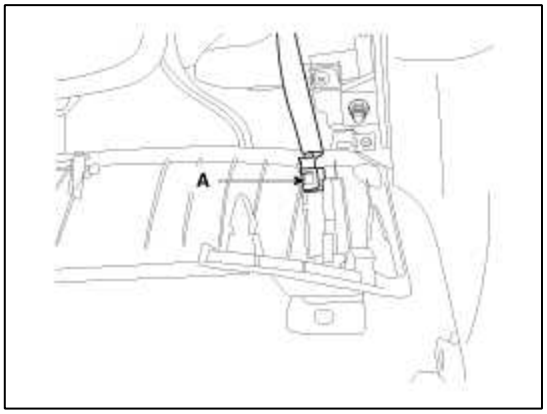
2. After loosening the mounting screws, then remove the crash pad lower panel (A).



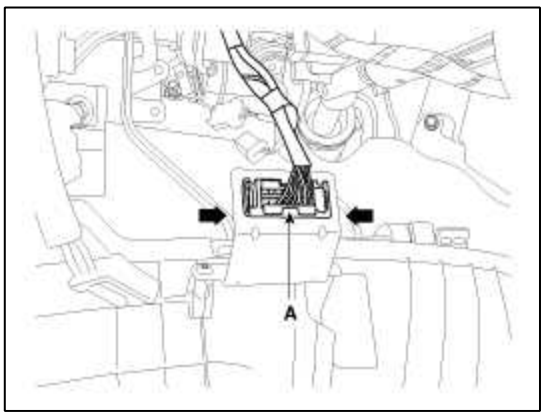
3. Disconnect the crash pad lower switch connectors (A).



4. Disconnect the start/stop button connector (A).



5. Disconnect the diagnosis connector (A).



6. Installation is the reverse of removal.

NOTE

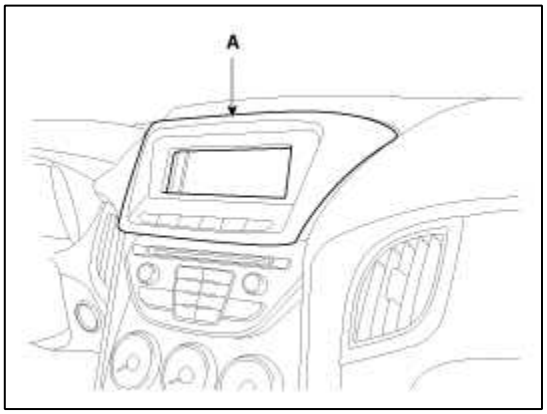
- Make sure the connector is connected properly.
- Replace any damaged clips.

Audio Unit Assembly Replacement

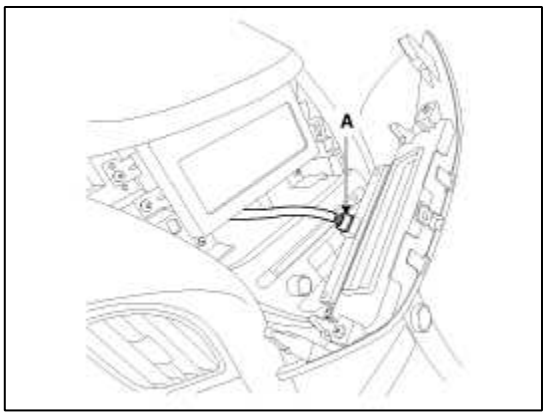
NOTE

- When prying with a flat-tip screwdriver, wrap it with protective tape, and apply protective tape around the related parts, to prevent damage.
- Take care not to scratch the body surface
- Put on gloves to protect your hands.

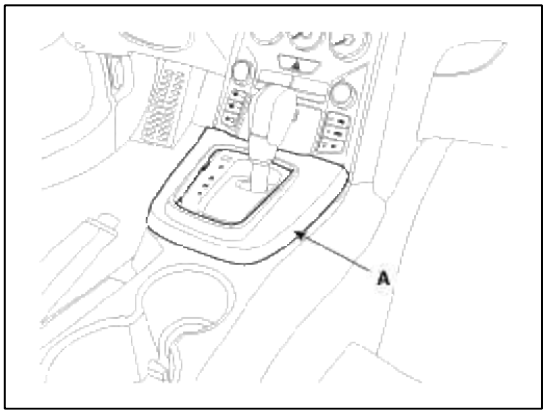
1. Using a screwdriver or remover, remove the center fascia upper panel (A).



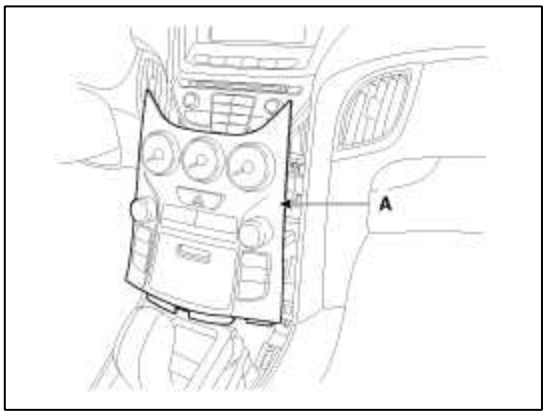
2. Disconnect the connector (A).



3. Using a screwdriver or remover, remove the console upper cover (A).

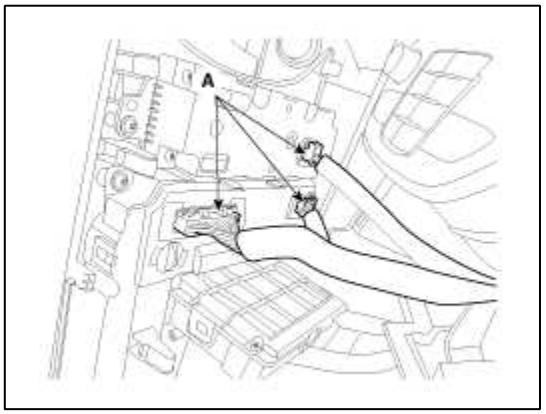


4. Using a screwdriver or remover, remove the center fascia lower panel (A).

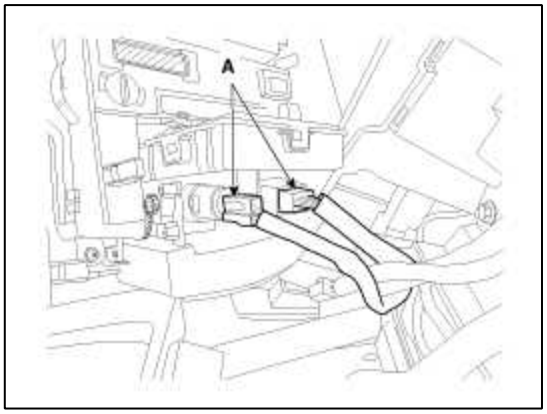


5. Disconnect the connectors (A).

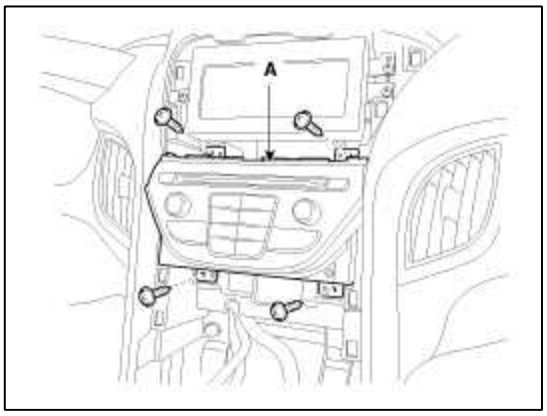
[Upper]



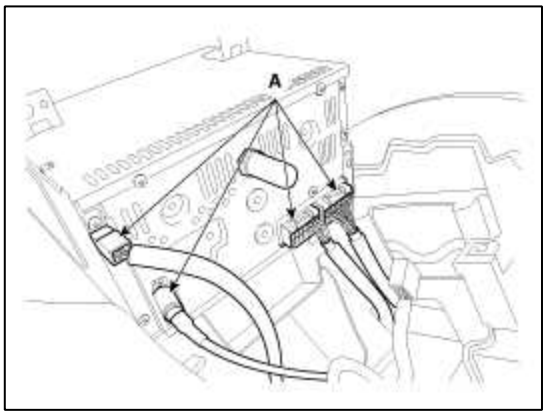
[Lower]



6. After loosening the mounting screws, then remove the audio unit assembly (A).



7. Disconnect the audio unit connectors (A).



8. Installation is the reverse of removal.

NOTE

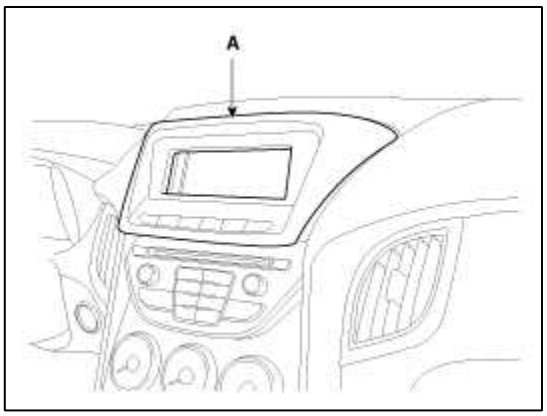
- Make sure the connector is connected properly.
- Replace any damaged clips.

Monitor Assembly Replacement

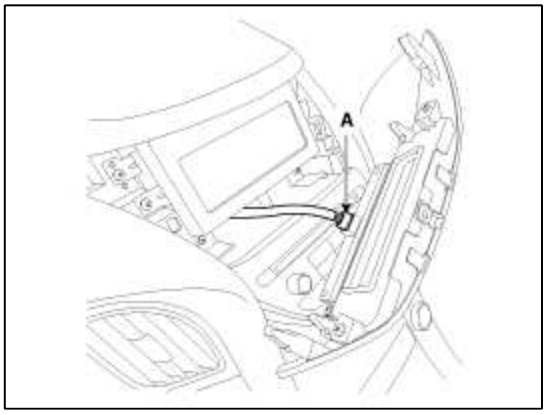
NOTE

- When prying with a flat-tip screwdriver, wrap it with protective tape, and apply protective tape around the related parts, to prevent damage.
- Take care not to scratch the body surface
- Put on gloves to protect your hands.

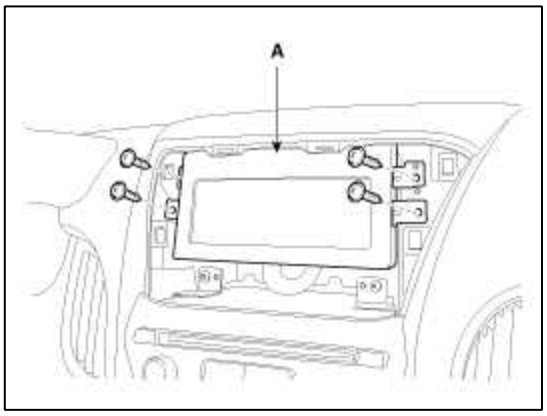
1. Using a screwdriver or remover, remove the center fascia upper panel (A).



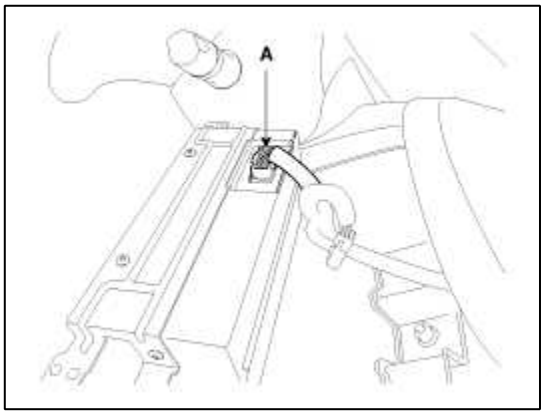
2. Disconnect the connector (A).



3. After loosening the mounting screws, then remove the monitor assembly (A).



4. Disconnect the monitor connector (A).



5. Installation is the reverse of removal.

NOTE

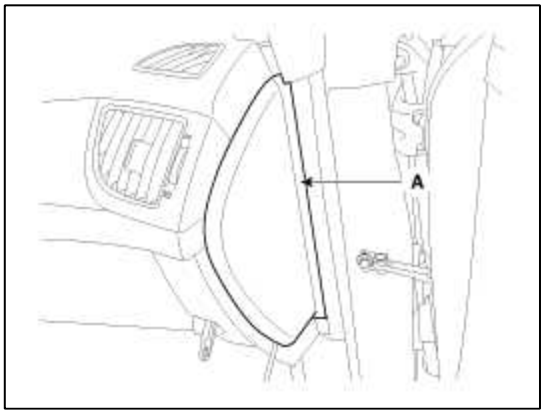
- Make sure the connector is connected properly.
- Replace any damaged clips.

Glove Box Housing Replacement

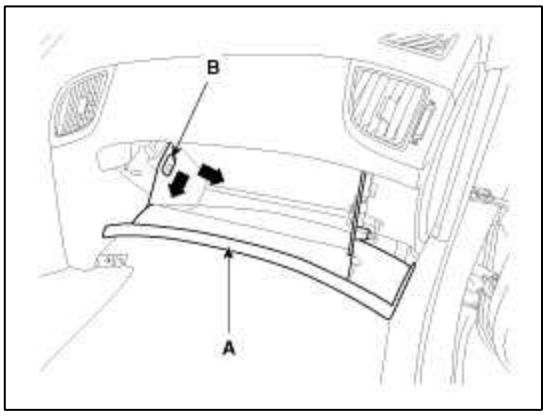
NOTE

- When prying with a flat-tip screwdriver, wrap it with protective tape, and apply protective tape around the related parts, to prevent damage.
- Take care not to scratch the body surface
- Put on gloves to protect your hands.

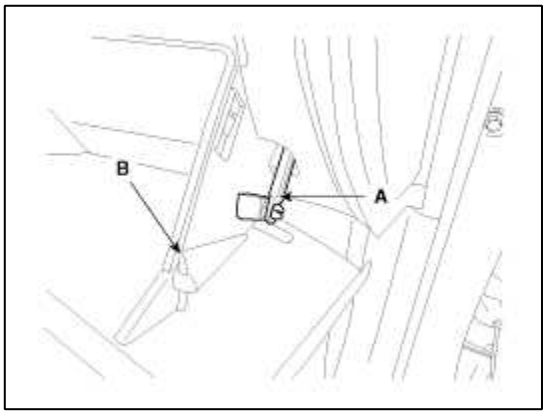
1. Using a screwdriver or remover, remove the crash pad side cover (A).



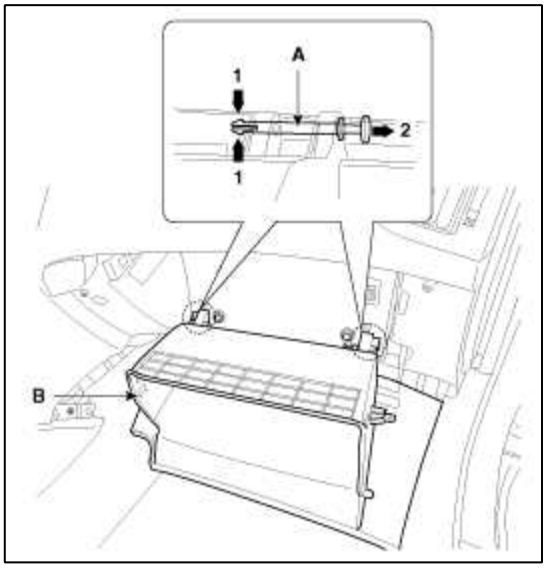
2. Disconnect the stopper (B) from the glove box (A).



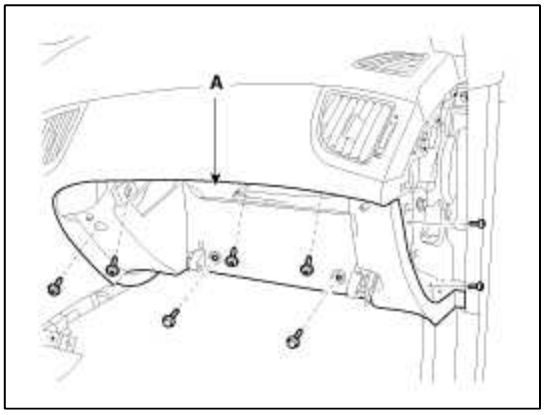
3. Disconnect the air damper (A) from the glove box (B).



4. Disconnect the pin (A) and then remove the glove box (B).



5. After loosening the mounting screws and bolts, then remove the glove box housing (A).



6. Installation is the reverse of removal.

NOTE

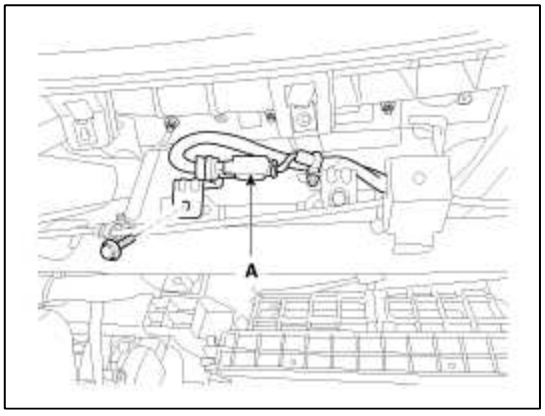
- Replace any damaged clips.

Main Crash Pad Replacement

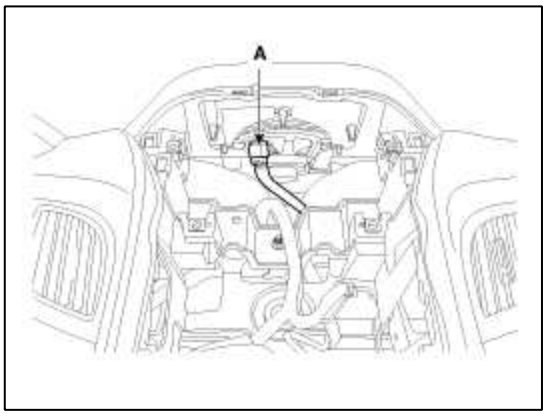
NOTE

- When prying with a flat-tip screwdriver, wrap it with protective tape, and apply protective tape around the related parts, to prevent damage.
- Take care not to scratch the body surface
- Put on gloves to protect your hands.

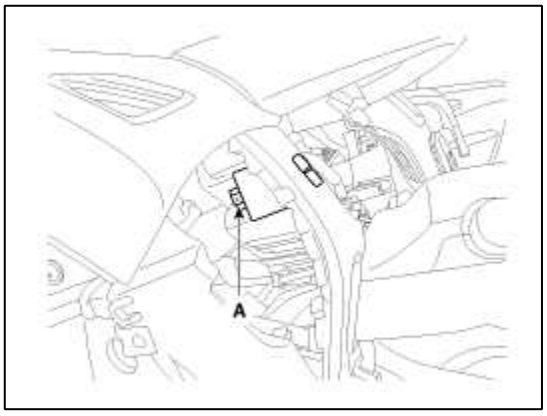
1. Remove the front seat assembly.
   (Refer to the BD group – "Front Seat")
2. Remove the front pillar trim.
   (Refer to the BD group – "Interior Trim")
3. Remove the floor console assembly
   (Refer to the BD group – "Console")
4. Remove the front door scuff trim.
   (Refer to the BD group – "Interior Trim")
5. Remove the cowl side trim.
   (Refer to the BD group - Interior Trim")
6. Remove the crash pad side cover [LH, RH].
7. Remove the cluster fascia lower panel.
8. Remove the cluster assembly.
9. Remove the crash pad lower panel.
10. Remove the center fascia upper panel.
11. Remove the center fascia lower panel.
12. Remove the monitor assembly.
13. Remove the audio unit assembly.
14. Remove the glove box.
15. Remove the glove box housing.
16. Remove the steering column shroud.
17. Disconnect the steering column connectors.
    (Refer to the ST group - "Steering Column and Shaft")
18. Down the steering column after loosening the mounting bolts.
    (Refer to the ST group - "Steering Column and Shaft")
19. Disconnect the passenger`s airbag connector (A).
20. Loosen the mounting bolts.



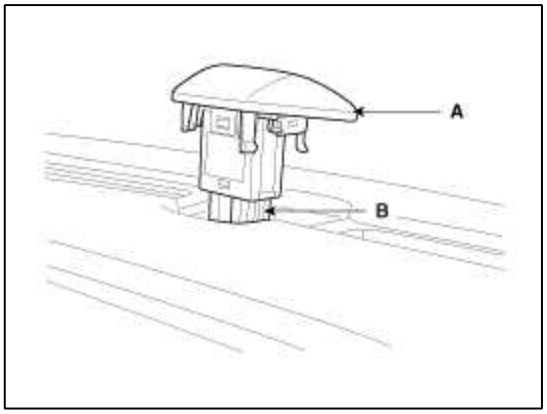
21. Disconnect the center speaker connector (A).



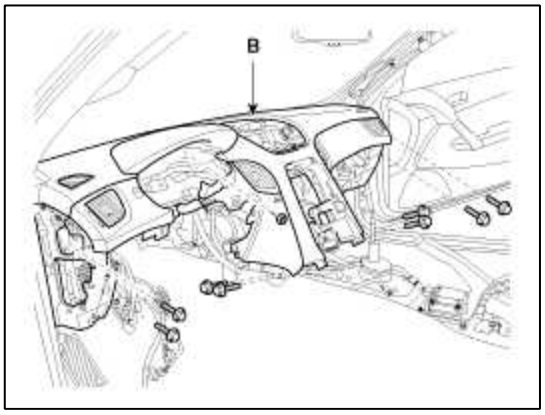
22. Disconnect the trip switch connector (A).



23. Using a screwdriver or remover, remove the photo sensor (A).
24. Disconnect the photo sensor connector (B).



25. After loosening the mounting bolts and nuts, then remove the main crash pad assembly (B).



26. Installation is the reverse of removal.

NOTE

- Make sure the crash pad fits onto the guide pins correctly.
- Before tightening the bolts, make sure the crash pad wire harnesses are not pinched.
- Make sure the connectors are plugged in properly, and the antenna lead is connected properly.
- Enter the anti- theft code for the radio, then enter the customer`s radio station presets.

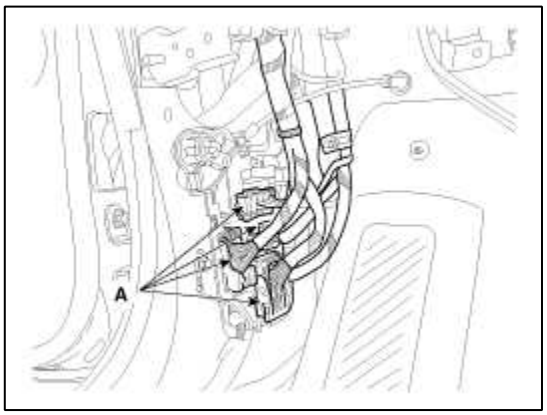
Cowl Cross Bar Replacement

NOTE

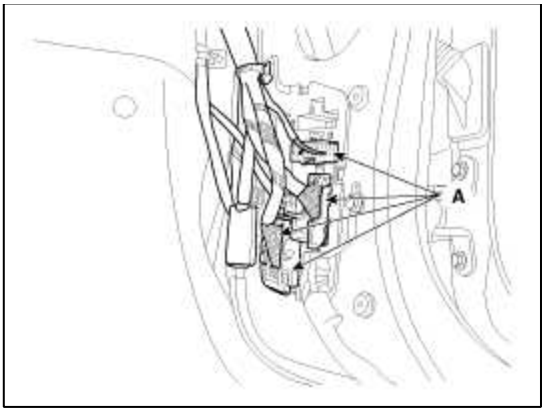
- When prying with a flat-tip screwdriver, wrap it with protective tape, and apply protective tape around the related parts, to prevent damage.
- Take care not to scratch the body surface
- Put on gloves to protect your hands.

1. Remove the front seat assembly.
   (Refer to the BD group – “Front Seat”)
2. Remove the front pillar trim.
   (Refer to the BD group – “Interior Trim”)
3. Remove the floor console assembly
   (Refer to the BD group – “Console”)
4. Remove the front door scuff trim.
   (Refer to the BD group – “Interior Trim”)
5. Remove the cowl side trim.
   (Refer to the BD group - Interior Trim”)
6. Remove the cowl top cover.
   (Refer to the BD group - Cowl Top Cover”)
7. Remove the main crash pad.
8. Disconnect the blower unit connectors.
   (Refer to the HA group - "Air conditioning system, Heater, Blower")
9. Disconnect the multi box connectors (A).

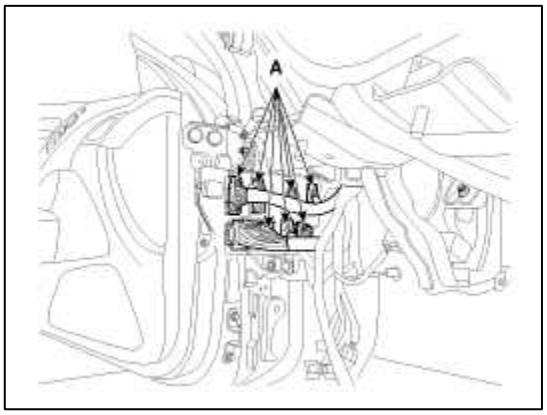
[Driver's]



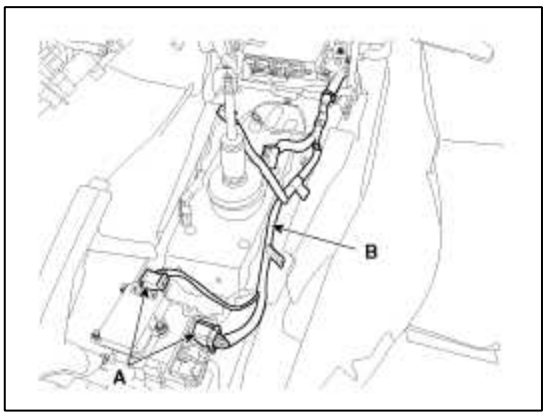
[Passenger's]



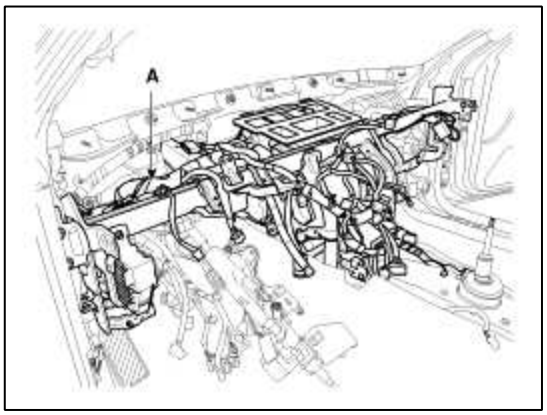
10. Disconnect the passenger compartment junction box connectors (A).



11. Disconnect the airbag control module (SRSCM) connectors (A).
12. Remove the airbag control module wiring mounting clips (B).



13. After loosening the mounting bolts and nuts, then remove the cowl cross bar assembly (A).



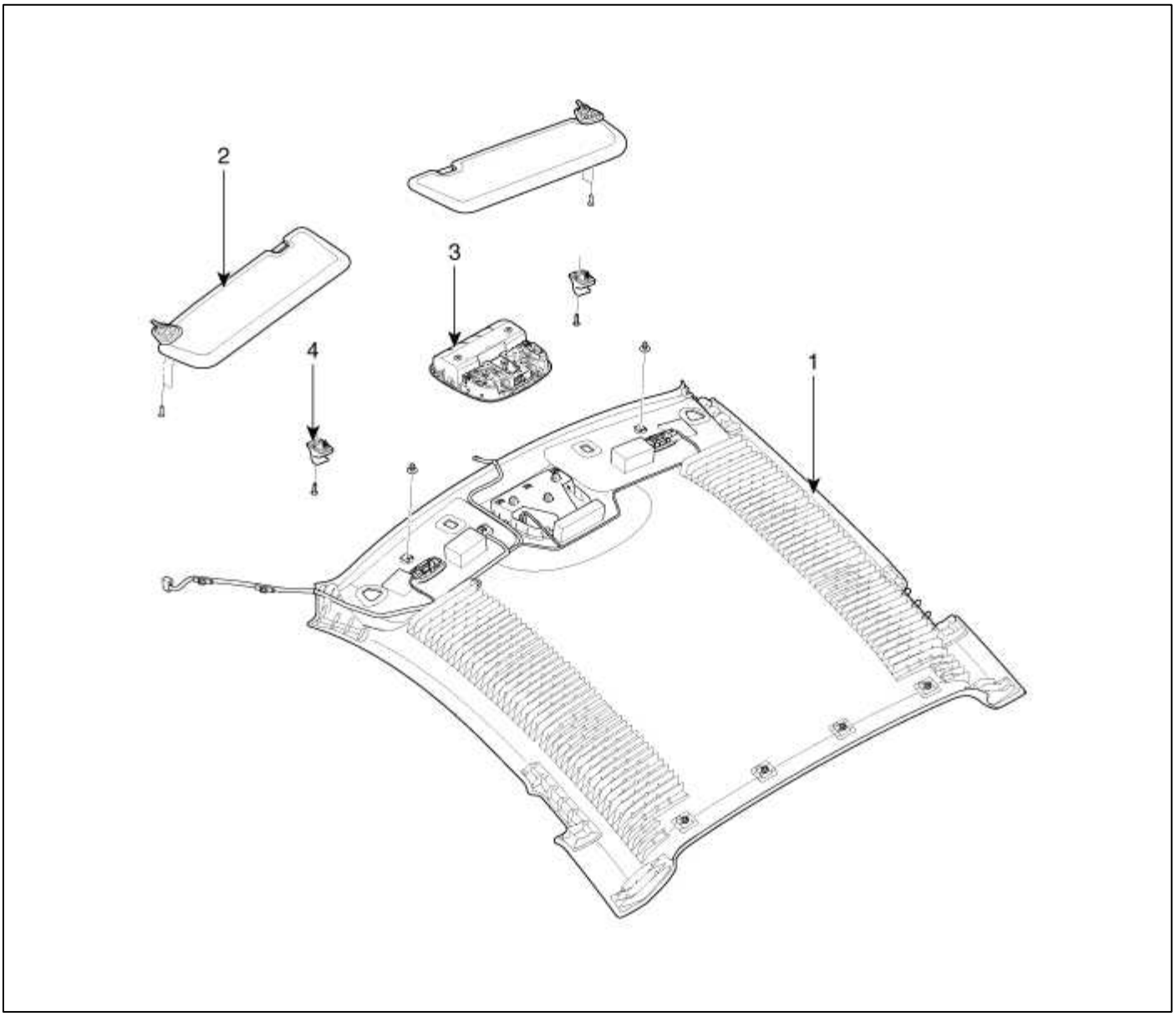
14. Installation is the reverse of removal.

NOTE

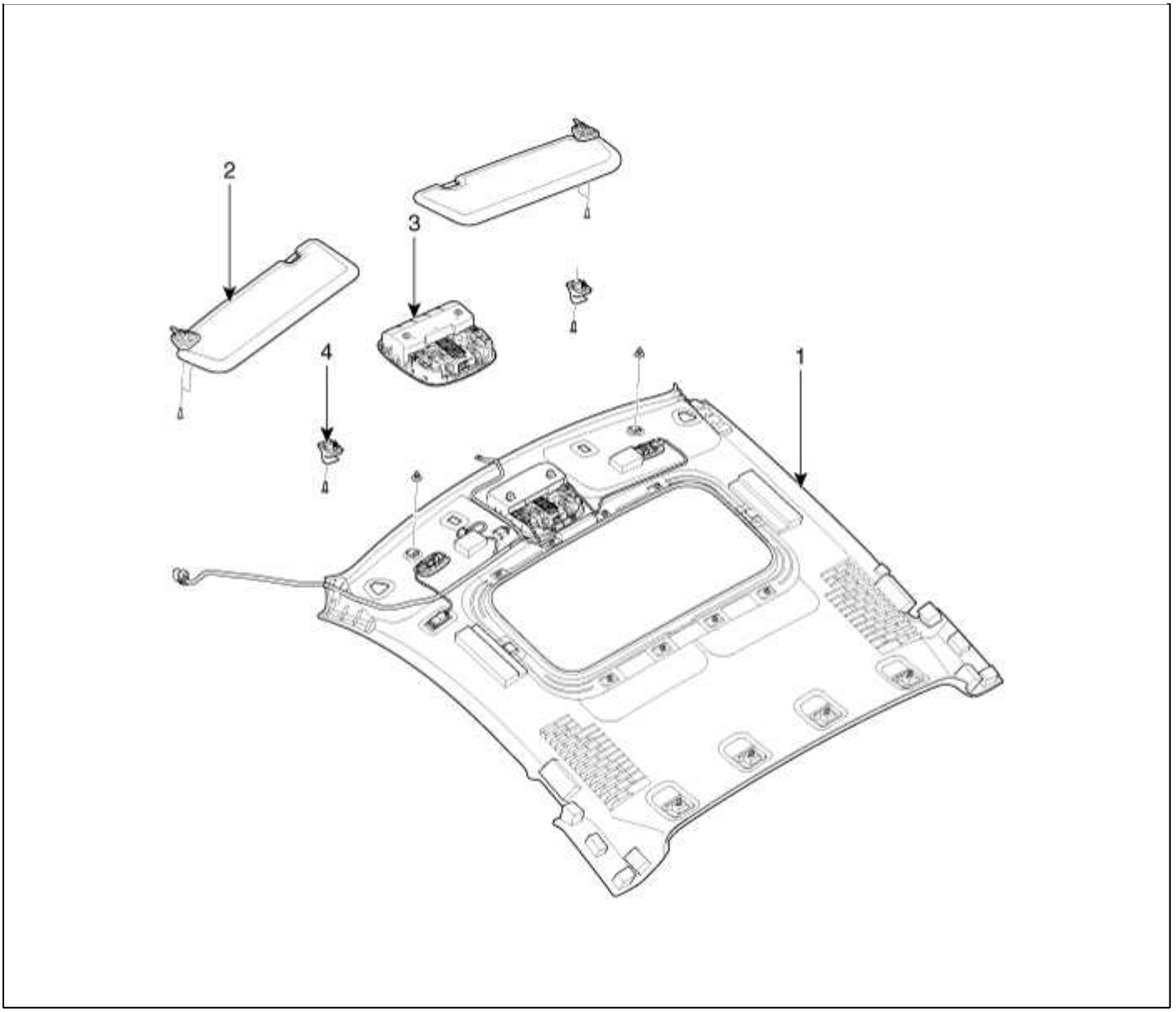
- Make sure the cowl cross bar fits onto the guide pins correctly.
- Before tightening the bolts, make sure the crash pad wire harnesses are not pinched.
- Make sure the connectors are plugged in properly, and the antenna lead is connected properly.

Body (Interior and Exterior) > Interior > Roof Trim > Components and Components Location

Components



1. Roof trim 2. Sunvisor	3. Overhead console 4. Sunvisor retainer



1. Roof trim 2. Sunvisor	3. Overhead console 4. Sunvisor retainer

Body (Interior and Exterior) > Interior > Roof Trim > Repair procedures

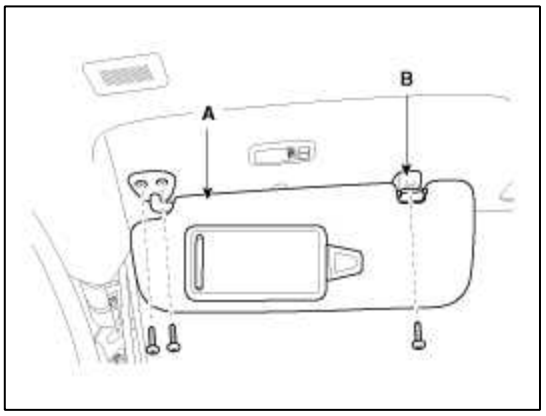
Replacement

Sunvisor Replacement

NOTE

- Use a plastic panel removal tool to remove interior trim pieces to protect from marring the surface.
- Put on gloves to protect your hands.

1. Loosen the mounting screws, then remove the sunvisor (A) and retainer (B).



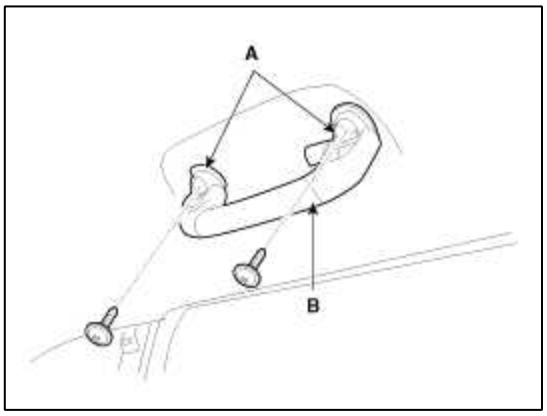
2. Installation is the reverse of removal.

Assist Handle Replacement

NOTE

- Use a plastic panel removal tool to remove interior trim pieces to protect from marring the surface.
- Put on gloves to protect your hands.

1. Remove the covers (A) and screws, then remove the assist handle (B).



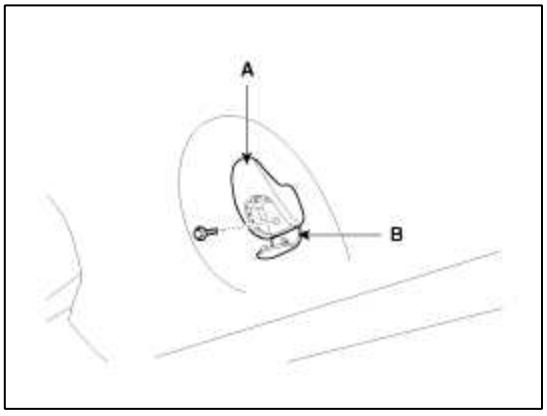
2. Installation is the reverse of removal.

Garment Hook Assembly Replacement

NOTE

- Use a plastic panel removal tool to remove interior trim pieces to protect from marring the surface.
- Put on gloves to protect your hands.

1. Remove the cover (B).
2. After loosening the mounting bolt, then remove the garment hook assembly (A).



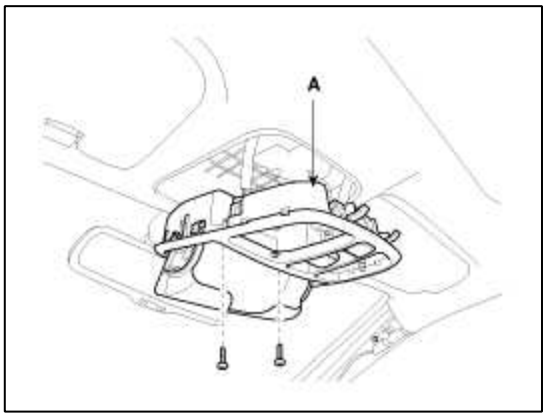
3. Installation is the reverse of removal.

Overhead Console Replacement

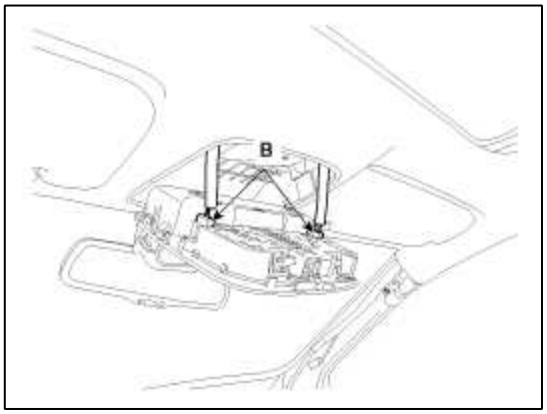
NOTE

- Use a plastic panel removal tool to remove interior trim pieces to protect from marring the surface.
- Put on gloves to protect your hands.

1. After loosening the mounting screws, then remove the overhead console assembly (A).



2. Disconnect the connectors (B).



3. Installation is the reverse of removal.

NOTE

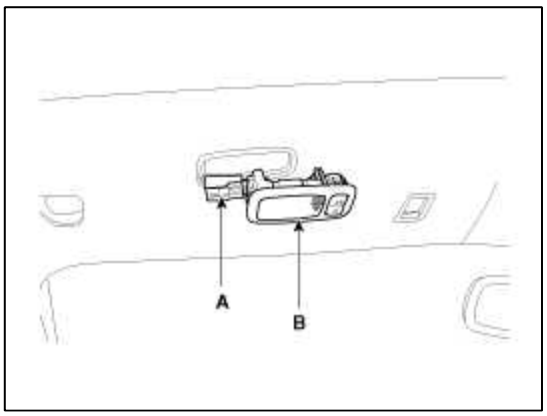
- Make sure the connector is connected properly.

Vanity Lamp Replacement

NOTE

- Use a plastic panel removal tool to remove interior trim pieces to protect from marring the surface.
- Put on gloves to protect your hands.

1. Using a screwdriver or remover, remove the vanity lamp (B).
2. Disconnect the vanity lamp connector (A).



3. Installation is the reverse of removal.

NOTE

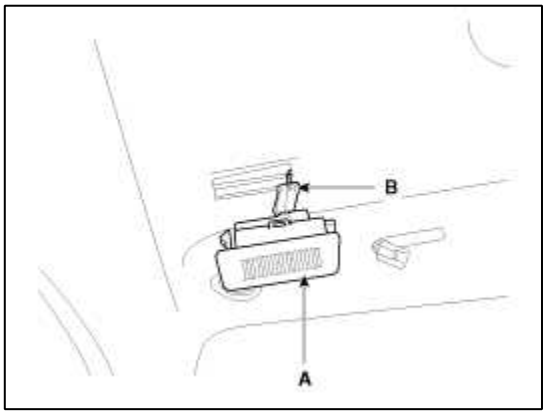
- Make sure the connector is connected properly.

Hands Free Mic Replacement

NOTE

- Use a plastic panel removal tool to remove interior trim pieces to protect from marring the surface.
- Put on gloves to protect your hands.

1. Using a screwdriver or remover, remove the hands free mic (A).
2. Disconnect the hands free mic connector (B).



3. Installation is the reverse of removal.

NOTE

- Make sure the connector is connected properly.

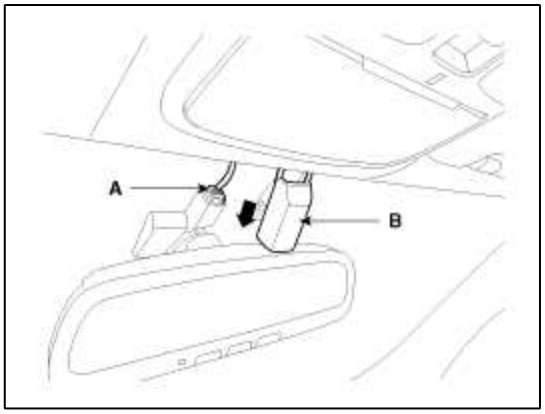
Roof Trim Replacement

NOTE

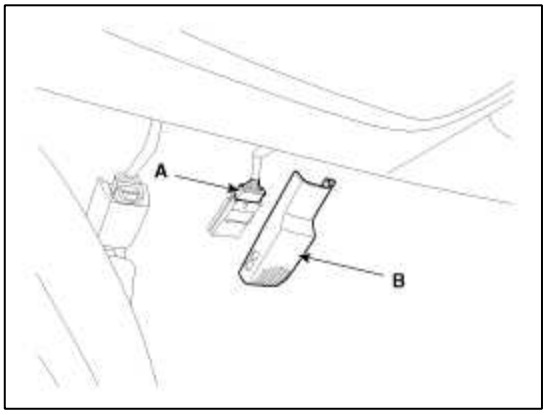
- When prying with a flat-tip screwdriver, wrap it with protective tape, and apply protective tape around the related parts, to prevent damage.
- Put on gloves to protect your hands.

1. Remove the front seat assembly.
   (Refer to the BD group – “Front Seat”)
2. Remove the rear seat assembly.
   (Refer to the BD group – “Rear Seat”)
3. Remove the sunvisor and retainer.
4. Remove the overhead console.
5. Remove the assist handle.
6. Remove the garment hook assembly.
7. Remove the front pillar trim.
   (Refer to the BD group - " Interior Trim")
8. Remove the front door scuff trim.
   (Refer to the BD group - " Interior Trim")
9. Remove the rear door scuff trim.
   (Refer to the BD group - " Interior Trim")

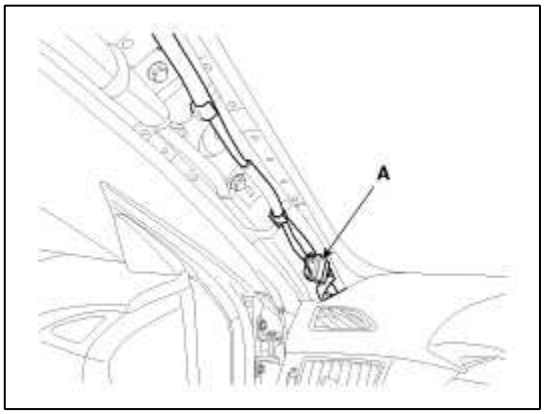
10. Remove the center pillar lower trim.
    (Refer to the BD group - " Interior Trim")
11. Remove the center pillar upper trim.
    (Refer to the BD group - " Interior Trim")
12. Remove the rear pillar trim.
    (Refer to the BD group - " Interior Trim")
13. Remove the ECM mirror cover (B).
14. Disconnect the ECM mirror connector (A).



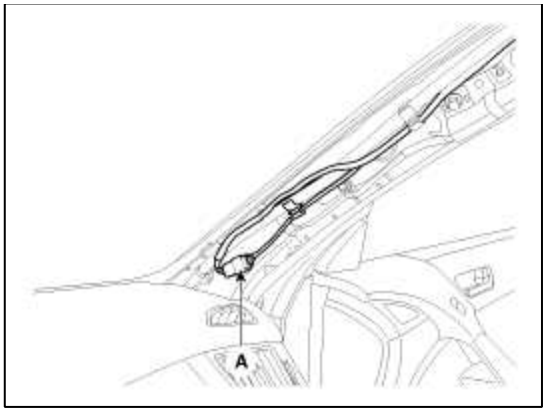
15. Remove the auto defog sensor cover (B).
16. Disconnect the auto defog sensor connector (A).



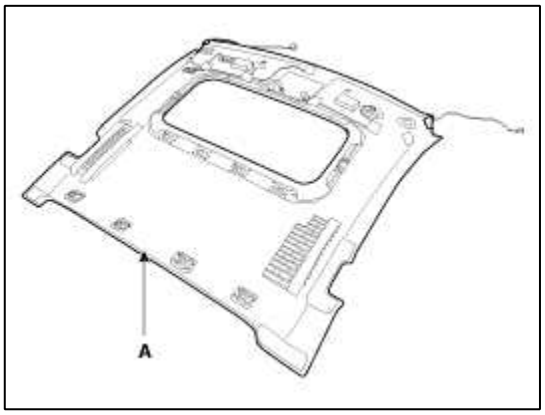
17. Disconnect the connector (A) and the mounting clips in the front pillar.
    [Driver's]



[Passenger's]



18. Remove the clips and roof trim (A).



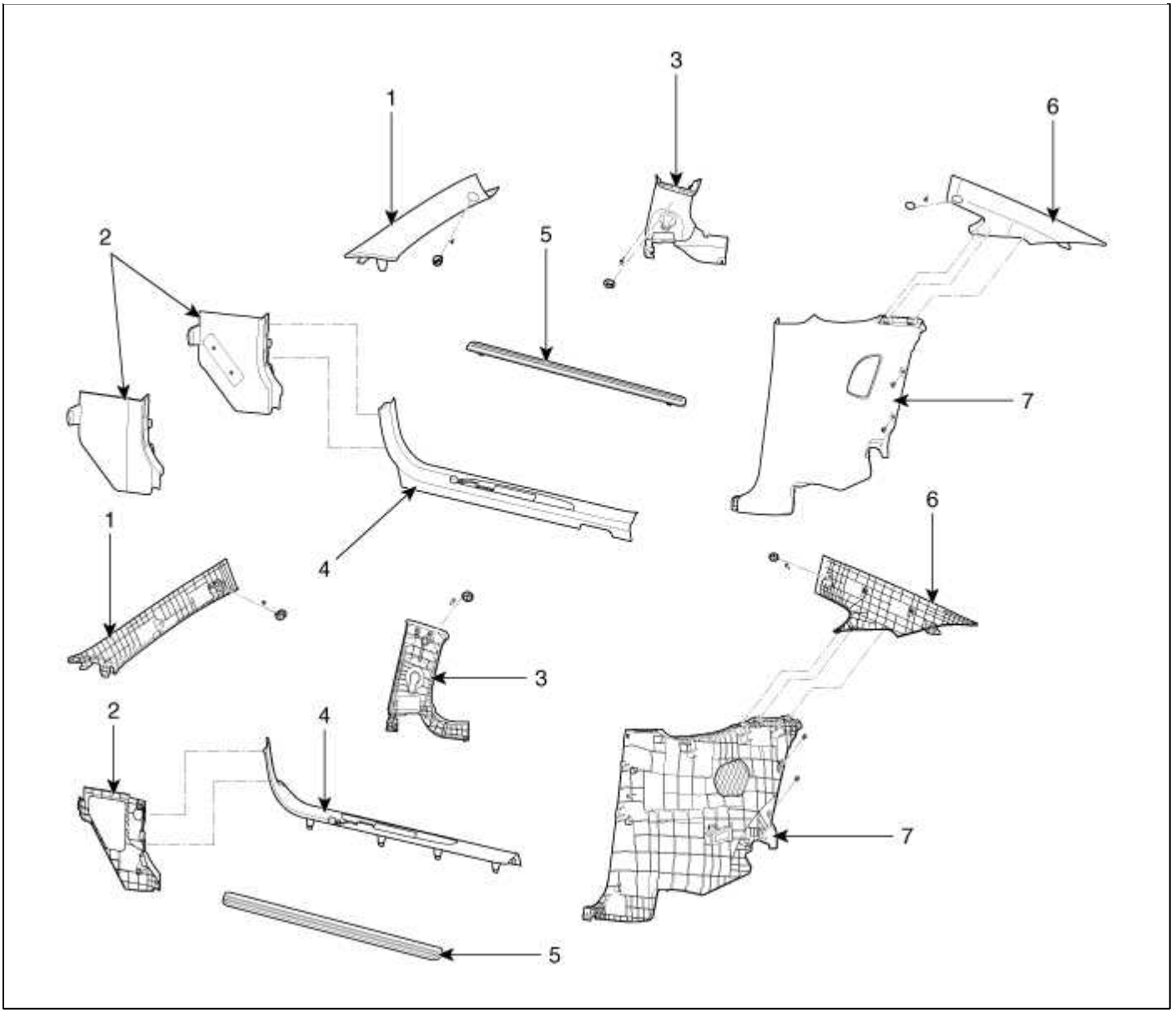
19. Installation is the reverse of removal.

NOTE

- Make sure the connectors are plugged in properly.
- Replace any damage clips.

Body (Interior and Exterior) > Interior > Interior Trim > Components and Components Location

Components



1. Front pillar trim	5. Front door step trim
2. Cowl side trim	6. Rear pillar trim
3. Center pillar upper trim	7. Center pillar lower trim
4. Front door scuff trim	

Body (Interior and Exterior) > Interior > Interior Trim > Repair procedures

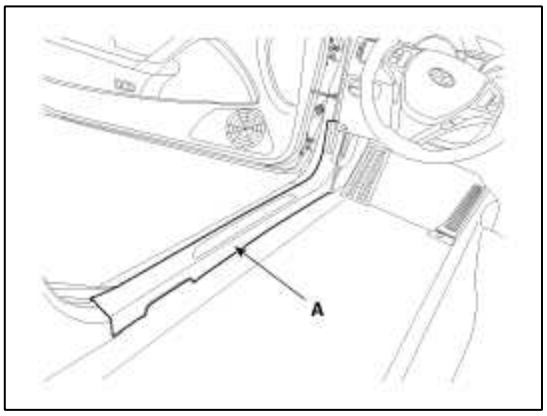
Replacement

Door Scuff Trim Replacement

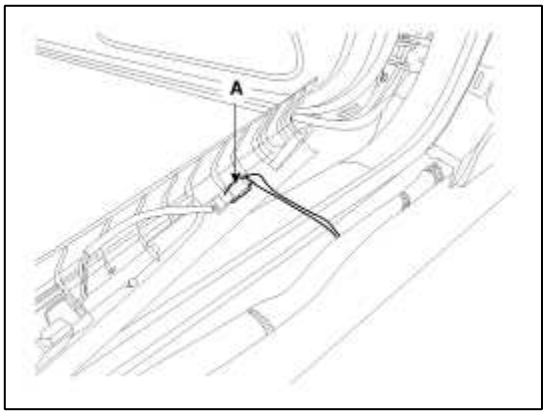
NOTE

- Put on gloves to protect your hands.
- When prying with a flat-tip screwdriver, wrap it with protective tape to prevent damage.
- Take care not to bend or scratch the trim and panels.

1. Using a screwdriver or remover, remove the front door scuff tirm (A).



2. Disconnect the connector (A).



3. Installation is the reverse of removal.

NOTE

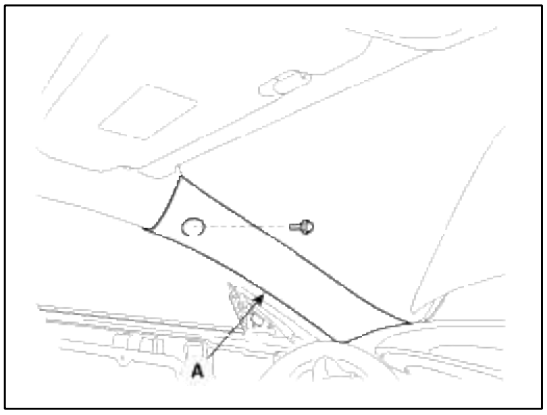
- Make sure the connector is connected properly.
- Replace any damaged clips.

Front Pillar Trim Replacement

NOTE

- Put on gloves to protect your hands.
- Use a plastic panel removal tool to remove interior trim pieces to protect from marring the surface.
- Take care not to bend or scratch the trim and panels.

1. After loosening the mounting bolt, then remove the front pillar trim (A).



2. Installation is the reverse of removal.

NOTE

- Replace any damaged clips.

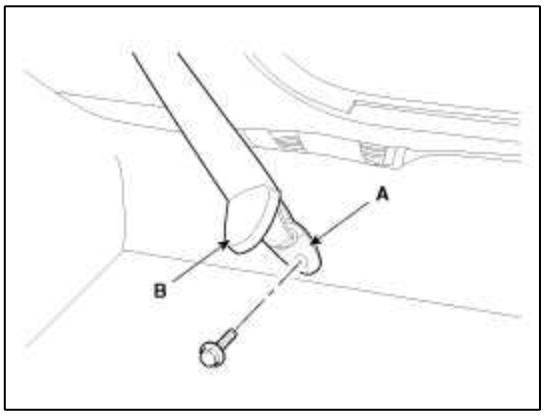
Center Pillar Trim Replacement

NOTE

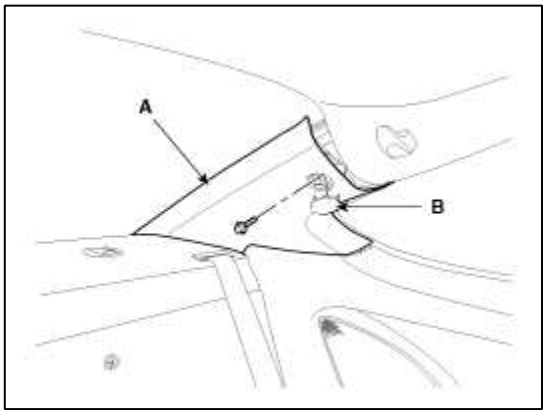
- Put on gloves to protect your hands.
- Use a plastic panel removal tool to remove interior trim pieces to protect from marring the surface.
- Take care not to bend or scratch the trim and panels.

1. Remove the rear seat assembly.
   (Refer to the BD group – "Rear Seat")
2. Remove the front door scuff trim.
3. Remove the front seat belt lower anchor cover (B).
4. After loosening the mounting bolt, then remove the front seat belt lower anchor (A).

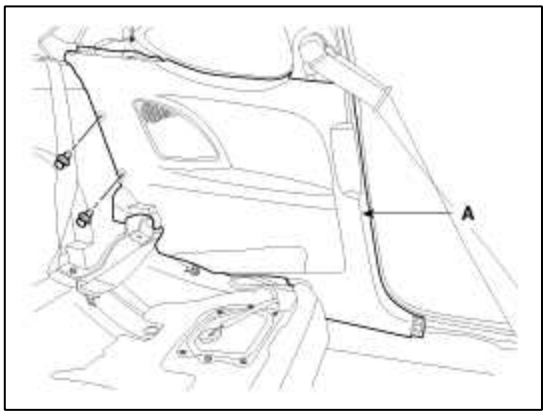
Tightening torque :
39.2 ~ 53.9 N.m (4.0 ~ 5.5 kgf.m, 28.8 ~ 39.8 lb-ft)



5. Remove the cap (B).
6. After loosening the mounting bolt, then remove the rear pillar trim (A).

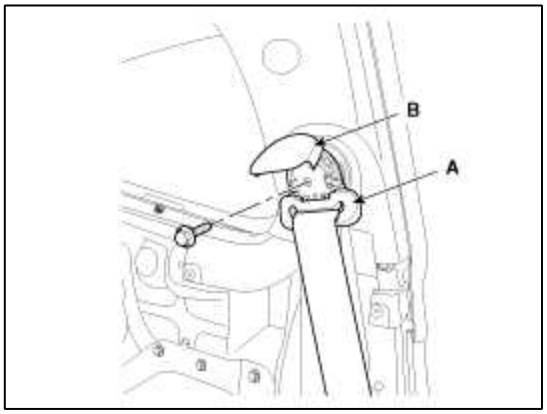


7. Remove the mounting clips and then center pillar lower trim (A).

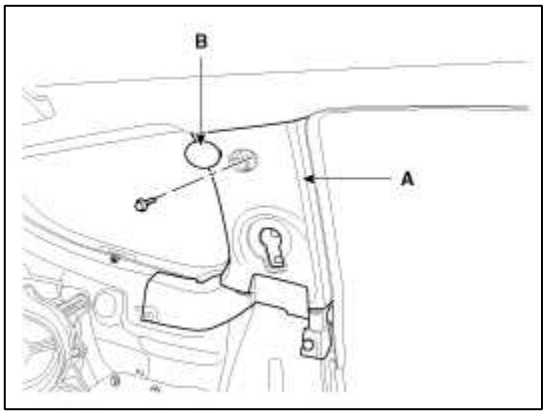


8. Remove the front seat belt upper anchor cover (B).
9. After loosening the mounting bolt, then remove the front seat belt upper anchor (A).

Tightening torque :
39.2 ~ 53.9 N.m (4.0 ~ 5.5 kgf.m, 28.8 ~ 39.8 lb-ft)



10. Remove the cap (B).
11. After loosening the mounting bolt, then remove the center pillar upper trim (A).



12. Installation is the reverse of removal.

NOTE

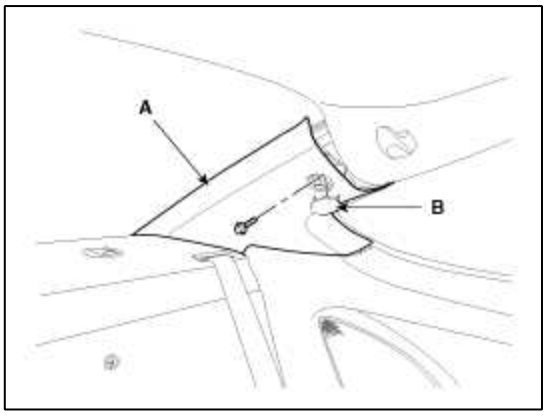
- Replace any damaged clips.

Rear Pillar Trim Replacement

NOTE

- Put on gloves to protect your hands.
- Use a plastic panel removal tool to remove interior trim pieces to protect from marring the surface.
- Take care not to bend or scratch the trim and panels.

1. Remove the cap (B).
2. After loosening the mounting bolt, then remove the rear pillar trim (A).



3. Installation is the reverse of removal.

NOTE

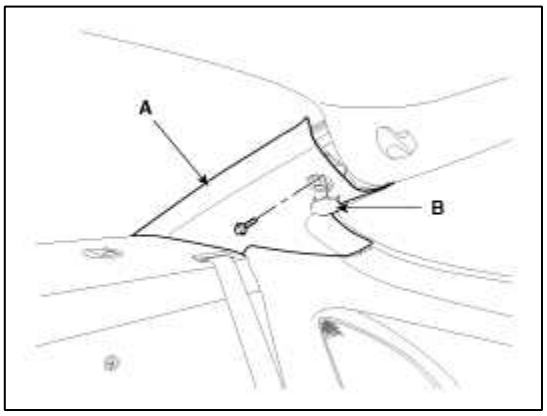
- Replace any damaged clips.

Package Tray Trim Replacement

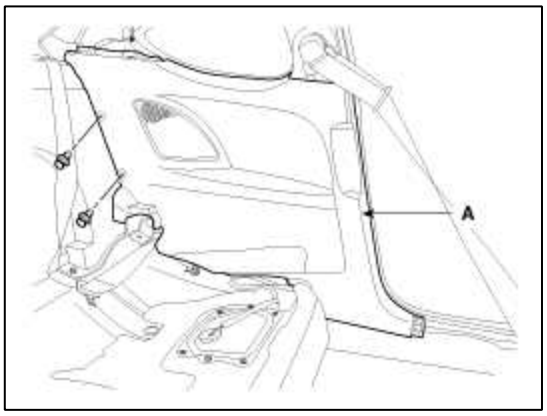
NOTE

- Put on gloves to protect your hands.
- Use a plastic panel removal tool to remove interior trim pieces to protect from marring the surface.
- Take care not to bend or scratch the trim and panels.

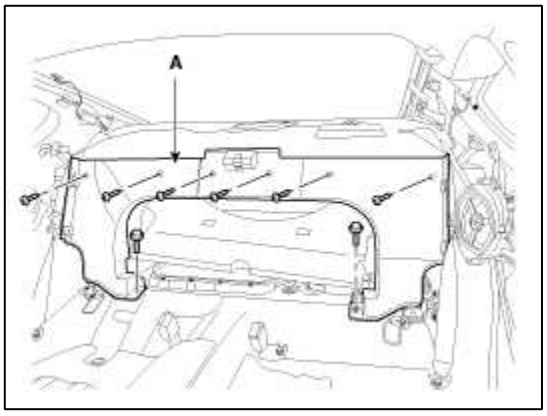
1. Remove the rear seat assembly.
   (Refer to the BD group – “Rear Seat”)
2. Remove the front door scuff trim.
3. Remove the cap (B).
4. After loosening the mounting bolt, then remove the rear pillar trim (A).



5. Remove the mounting clips and then center pillar lower trim (A).

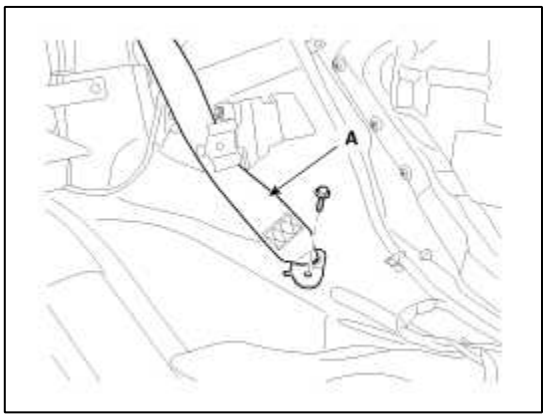


6. After loosening the mounting screws and bolts, then remove the luggage partition tray trim (A).

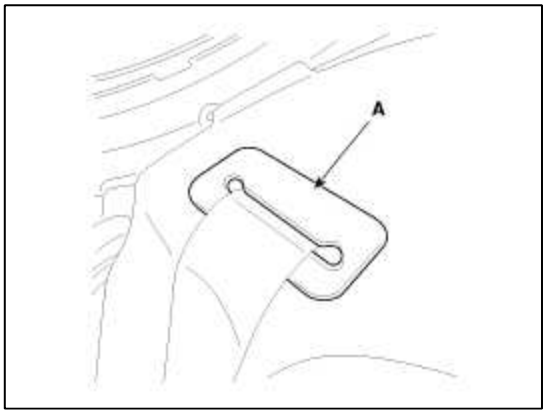


7. After loosening the mounting bolt, then remove the rear seat belt lower anchor (A).

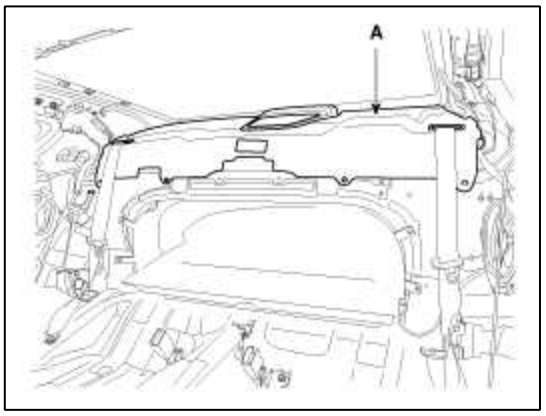
Tightening torque :
39.2 ~ 53.9 N.m (4.0 ~ 5.5 kgf.m, 28.8 ~ 39.8 lb-ft)



8. Remove the rear seat belt upper anchor cover (A).



9. Remove the package tray trim (A).



10. Installation is the reverse of removal.

NOTE

- Replace any damaged clips.

Body (Interior and Exterior) > Interior > Trunk Trim > Repair procedures

Replacement

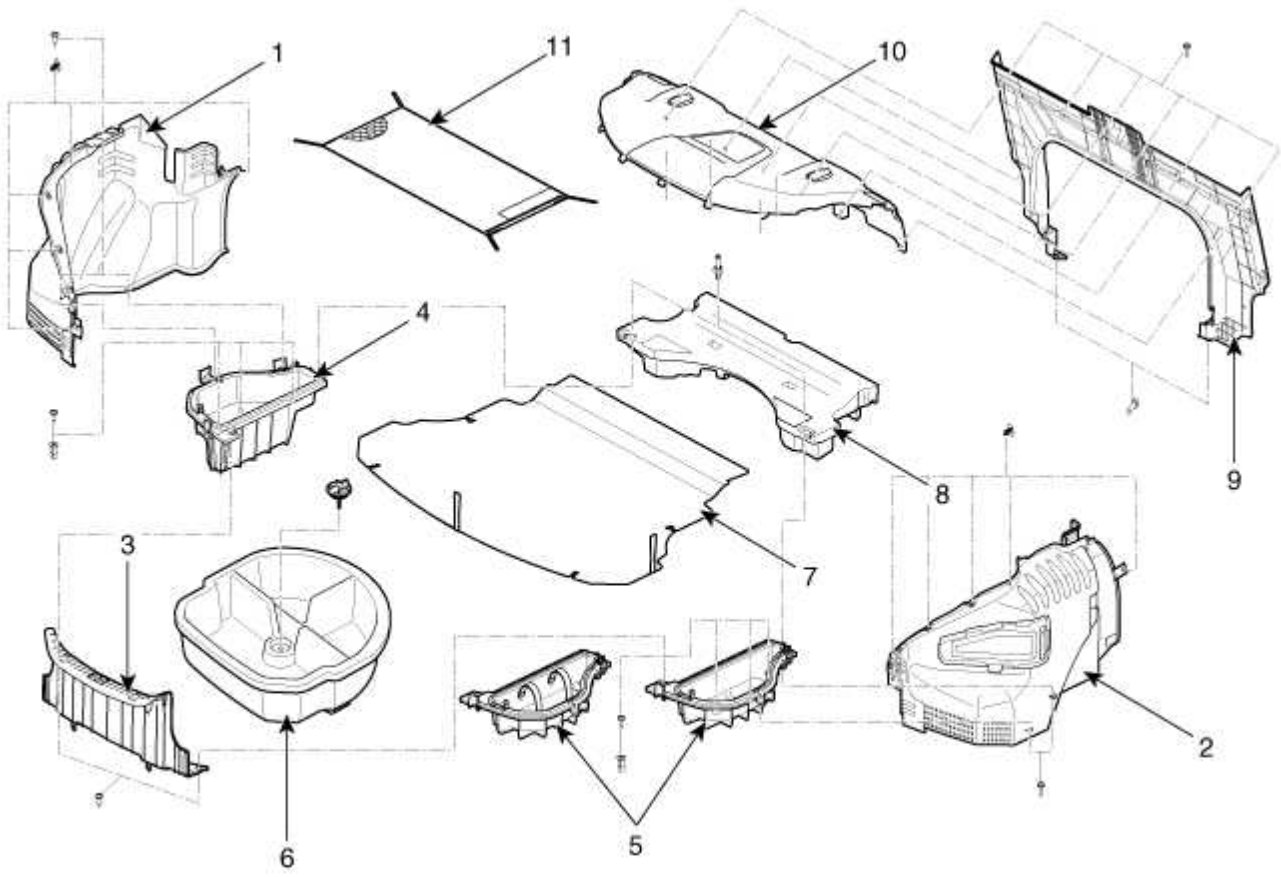
NOTE

- Put on gloves to protect your hands.
- Use a plastic panel removal tool to remove interior trim pieces to protect from marring the surface.
- Take care not to bend or scratch the trim and panels.

1. Remove the trunk trim.
2. Installation is the reverse of removal.

NOTE

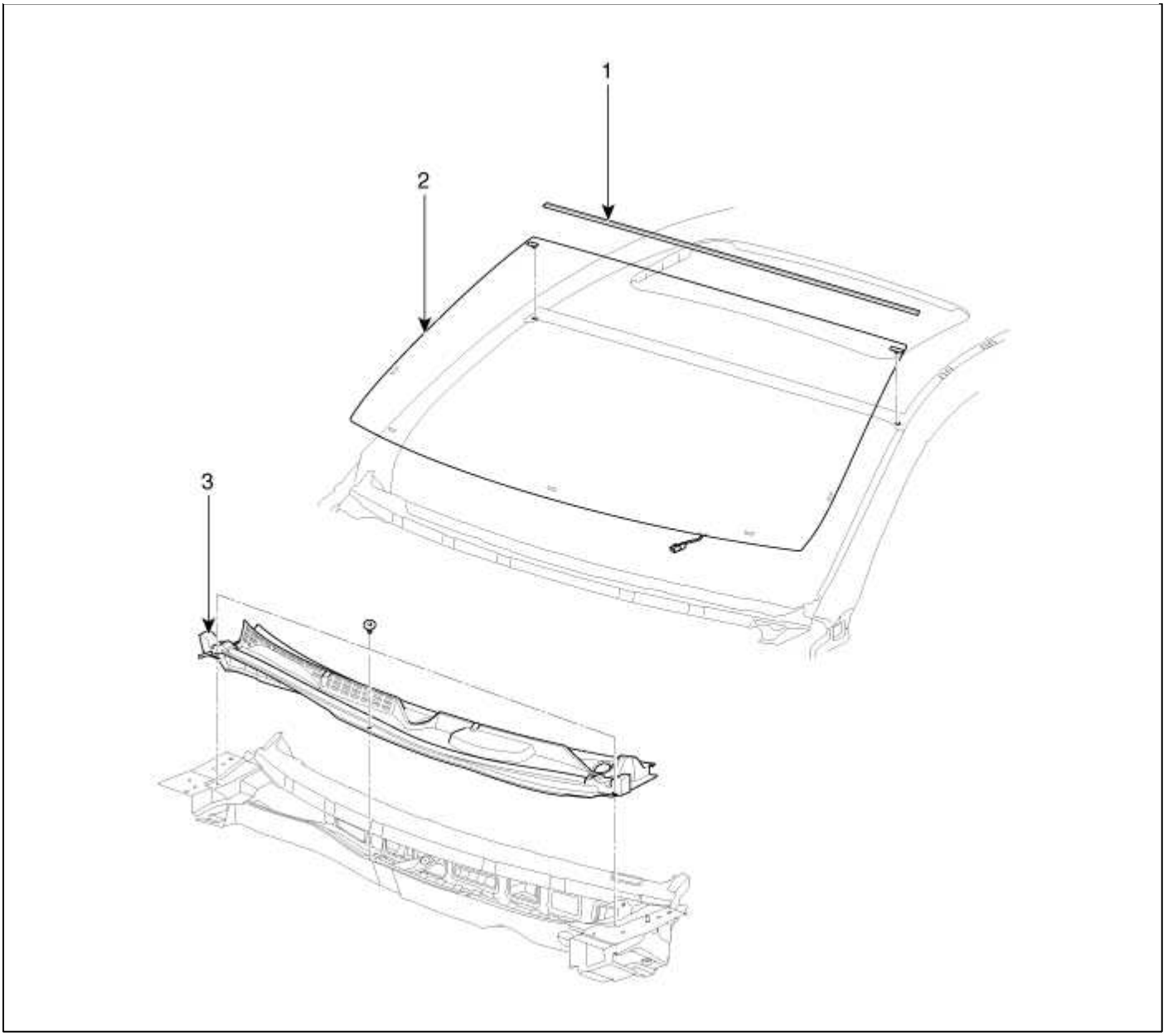
- Replace any damaged clips.



1. Luggage side trim [LH]	7. Luggage covering complete assembly
2. Luggage side trim [RH]	8. Luggage covering pad
3. Rear transverse trim	9. Luggage partition tray trim
4. Luggage tray [LH]	10. Package tray trim
5. Luggage tray [RH]	11. Luggage net
6. Luggage center tray	

Body (Interior and Exterior) > Interior > Windshield Glass > Components and Components Location

Components



1. Windshield molding	2. Windshield glass 3. Cowl top cover

Body (Interior and Exterior) > Interior > Windshield Glass > Repair procedures

Replacement

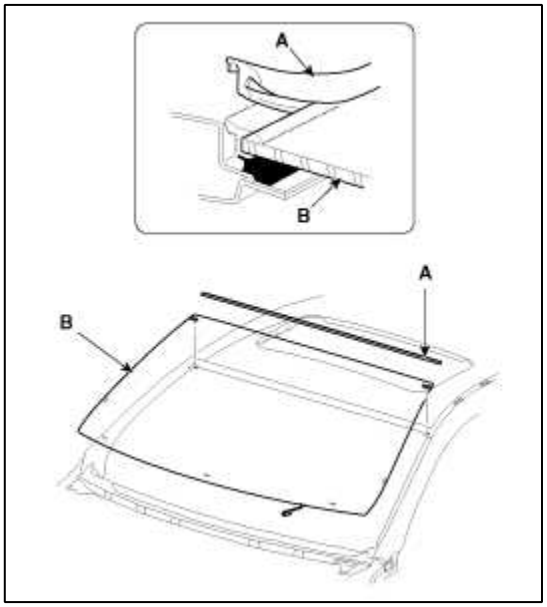
Removal

NOTE

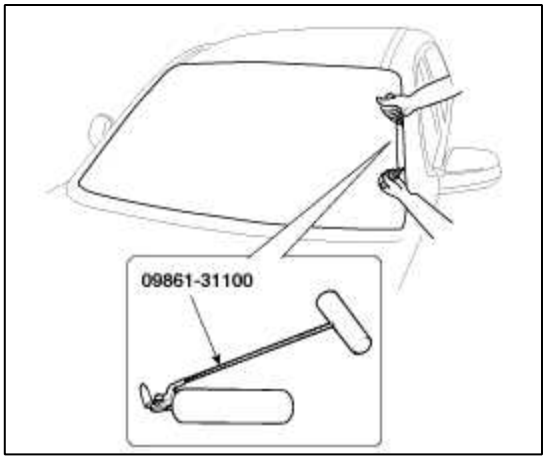
- Put on gloves to protect your hands.
- Use seat covers to avoid damaging any surfaces.

1. Remove the front pillar trim.
   (Refer to the BD group - "Interior Trim")
2. Remove the inside rear view mirror.
   (Refer to the BD group - "Mirror")
3. Remove the rain sensor.
   (Refer to the BE group - "Rain Sensor")

4. Remove the auto defog sensor.
   (Refer to the HA group - "Auto Defog Sensor")
5. Remove the windshield wiper arm.
   (Refer to the BD group - "Cowl Top Cover")
6. Remove the cowl top cover.
   (Refer to the BD group - "Cowl Top Cover")
7. Disconnect the windshield glass deicer connector.
   (Refer to the BE group - "Windshield Deicer")
8. Remove the windshield molding (A) from the edge of the windshield glass (B).
   If necessary, cut the windshield molding with a utility knife.



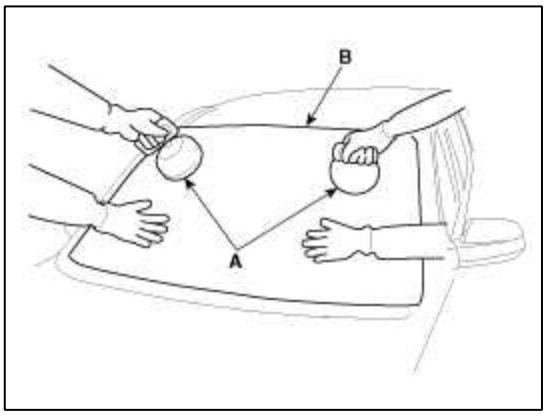
9. Cut out the windshield sealant using the sealant cutting tool (09861-31100).



CAUTION

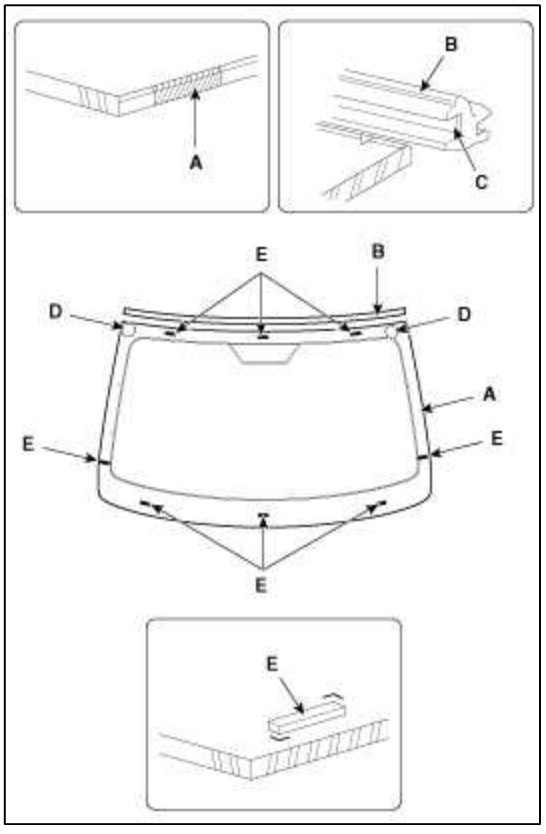
- Do not scrape down to the painted surface of the body; damaged paint will interfere with proper bonding.
- Remove the rubber dam and fastereners from the body.
- Mask off surrounding surfaces before painting.

10. Remove the windshield glass (B) carefully using the glass holder (A).

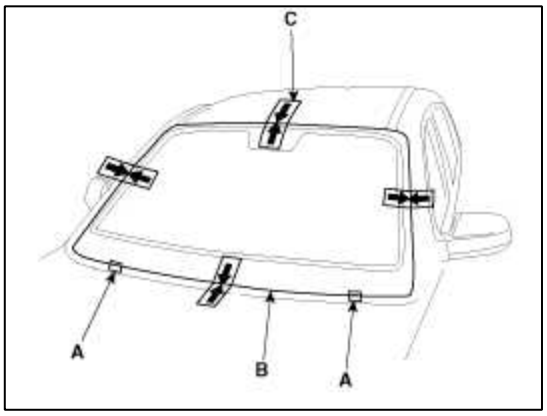


Installtion

1. With a knife, scrape the old adhesive smooth to a thickness of about 2mm (0.08 in.) on the bonding surface around the entire windshield opening flange :
   A. Do not scrape down to the painted surface of the body; damaged paint will interfere with proper bonding.
   B. Remove the rubber dam and fastereners from the body.
   C. Mask off surrounding surfaces before painting.
2. Clean the bonding surface with a sponge dampened in alcohol. After cleaning, keep oil, grease and water from getting on the clean surface.
3. Install the windshield glass (A) upper molding (B) and fasteners (C). Do not allow any gaps.



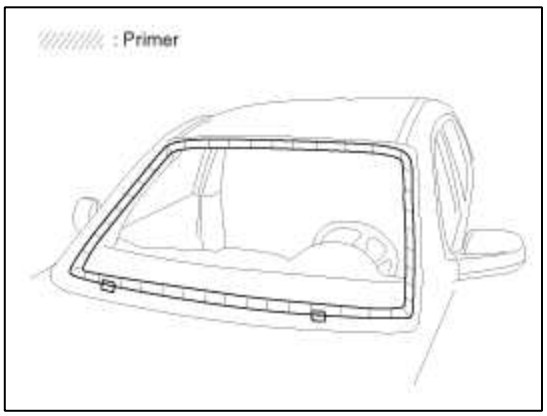
4. Install the spacer (A) install the windshield glass (B) temporarily with marking sure to position them on the center, and then place the alignment mark (C).



5. With a sponge, apply a light coat of body primer to the original adhesive remaining around the windshield opening flange. Let the body primer dry for at least 10 minutes.

NOTE

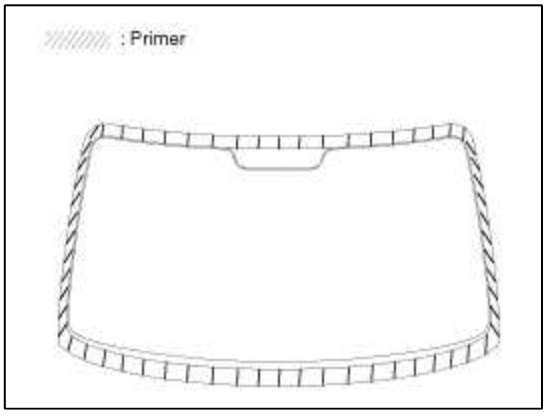
- Do not apply glass primer to the body, and be careful not to mix up glass and body primer sponges.
- Never touch the primed surfaces with your hands.
- Mask off the dashboard before painting the flange.



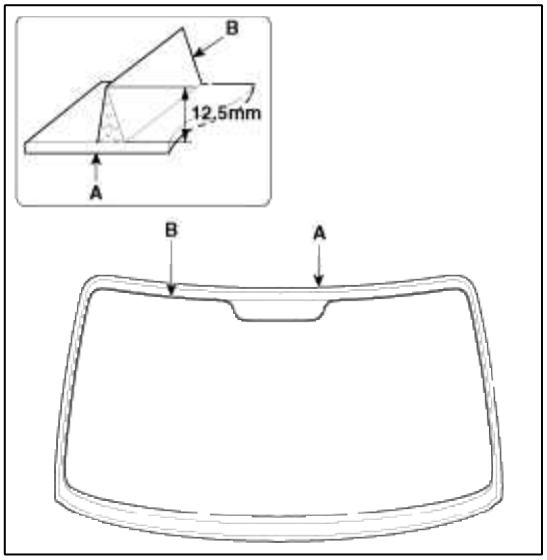
6. Apply a light coat of glass primer to the outside of the fasteners.

NOTE

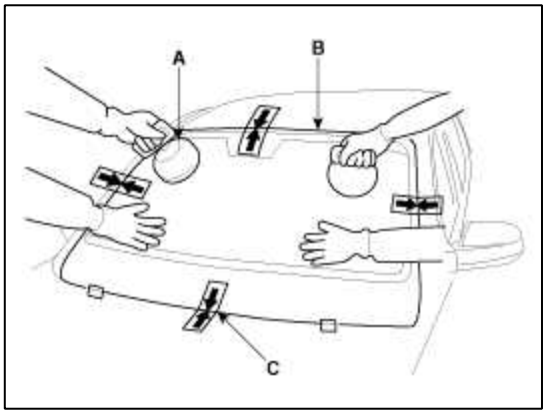
- Never touch the primed surface with your hand. If you do, the adhesive may not bond to the glass properly, causing a leak after the windshield glass is installed.
- Do not apply body primer to the glass.
- Keep water, dust, and abrasive materials away from the primer.



7. Pack adhesive into the cartridge without air pockets to ensure continuous delivery. Put the cartridge in a caulking gun, and run a bead of adhesive (B) around the edge of the windshield glass (A) between the fastener and molding as shown. Apply the adhesive within 30 minutes after applying the glass primer. Make a slightly thicker bead at each corner.



8. Use suction cups (A) to hold the windshield glass (B) over the opening, align it with the alignment marks (C) made in step 15, and set it down on the adhesive. Lightly push on the windshield until its edges are fully seated on the adhesive all the way around. Do not open or close the doors until the adhesive is dry.

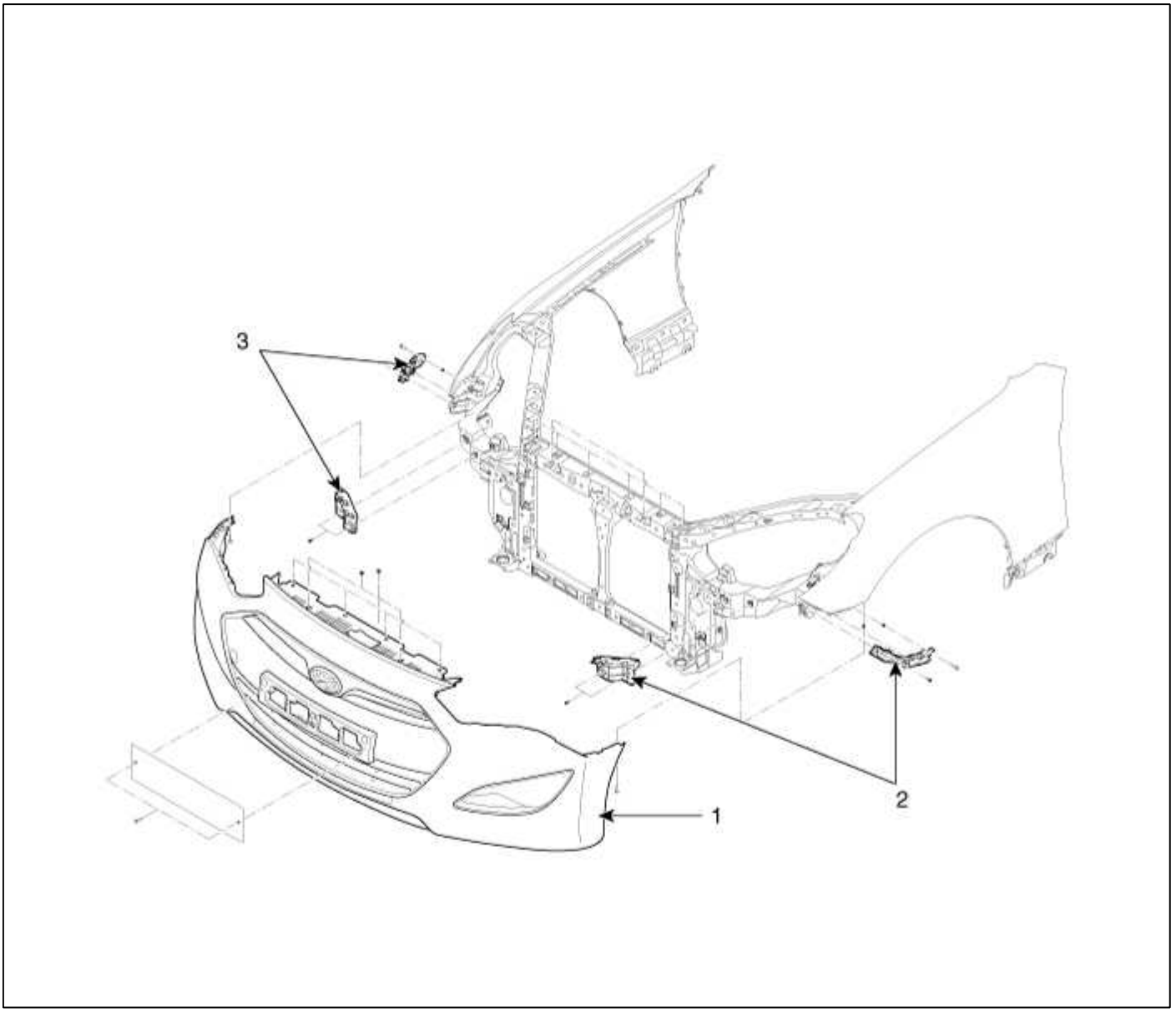


9. Scrape or wipe the excess adhesive off with a putty knife or towel. To remove adhesive from a painted surface or the windshield, wipe with a soft shop towel dampened with alcohol.
10. Let the adhesive dry for at least one hour, then spray water over the roof and check for leaks. If a leak occurs, let it dry, then seal with sealant :
    A. Let the vehicle stand for at least four hours after windshield installation. If the vehicle must be driven within 4 hours, it must be driven slowly.
    B. Keep the windshield dry for the first hour after installation.
11. Install the windshield glass deicer connector.
    (Refer to the BE group - "Windshield Deicer")
12. Install the cowl top cover.
    (Refer to the BD group - "Cowl Top Cover")
13. Install the windshield wiper arm.
    (Refer to the BD group - "Cowl Top Cover")
14. Install the auto defog sensor.
    (Refer to the HA group - "Auto Defog Sensor")
15. Install the rain sensor.
    (Refer to the BE group - "Rain Sensor")
16. Install the inside rear view mirror.
    (Refer to the BD group - "Mirror")

17. Install the front pillar trim.
    (Refer to the BD group - "Interior Trim")

Body (Interior and Exterior) > Bumper > Front Bumper > Components and Components Location

Components



1. Front bumper cover 2. Front bumper side bracket [LH]	3. Front bumper side bracket [RH]

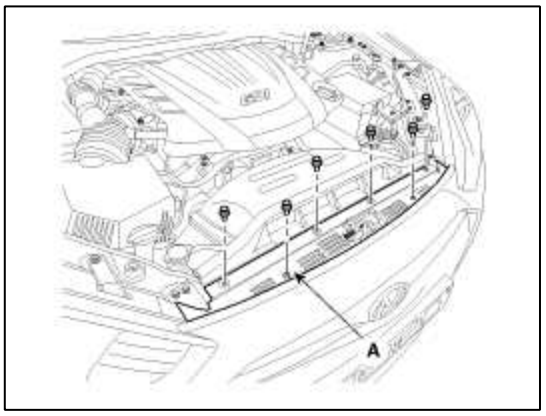
Body (Interior and Exterior) > Bumper > Front Bumper > Repair procedures

Replacement

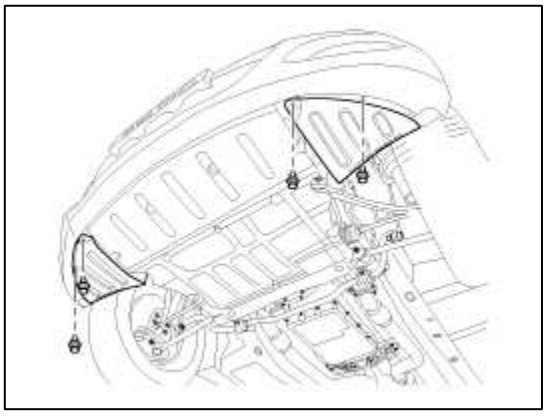
NOTE

- Put on gloves to protect your hands.
- Use a plastic panel removal tool to remove interior trim pieces to without marring the surface.
- Take care not bend or scratch the cover and other parts.

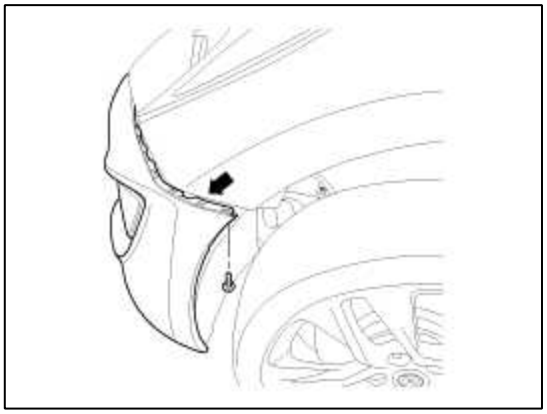
1. Loosen the radiator upper cover (A) mounting clips.



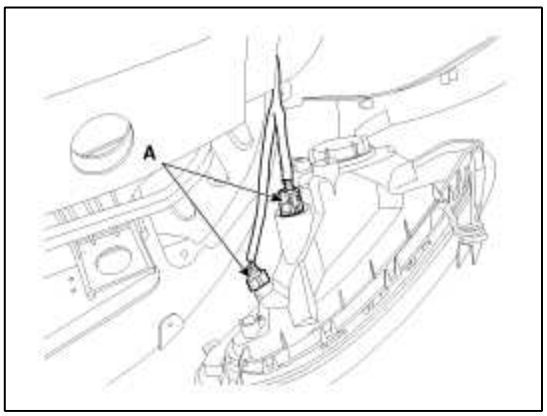
2. Remove the front bumper lower mounting clips.



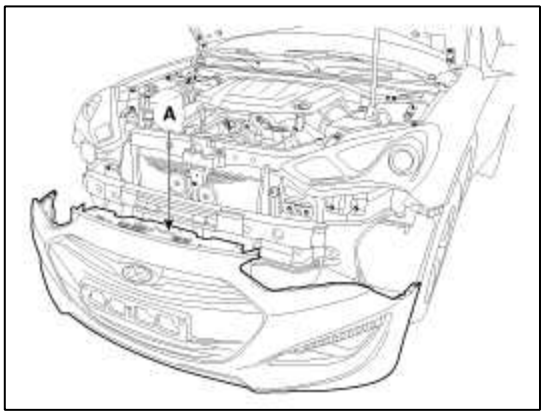
3. After loosening the front bumper side's mounting screw, then disconnect the side's.



4. Disconnect the fog lamp connectors (A).



5. Remove the front bumper cover (A).



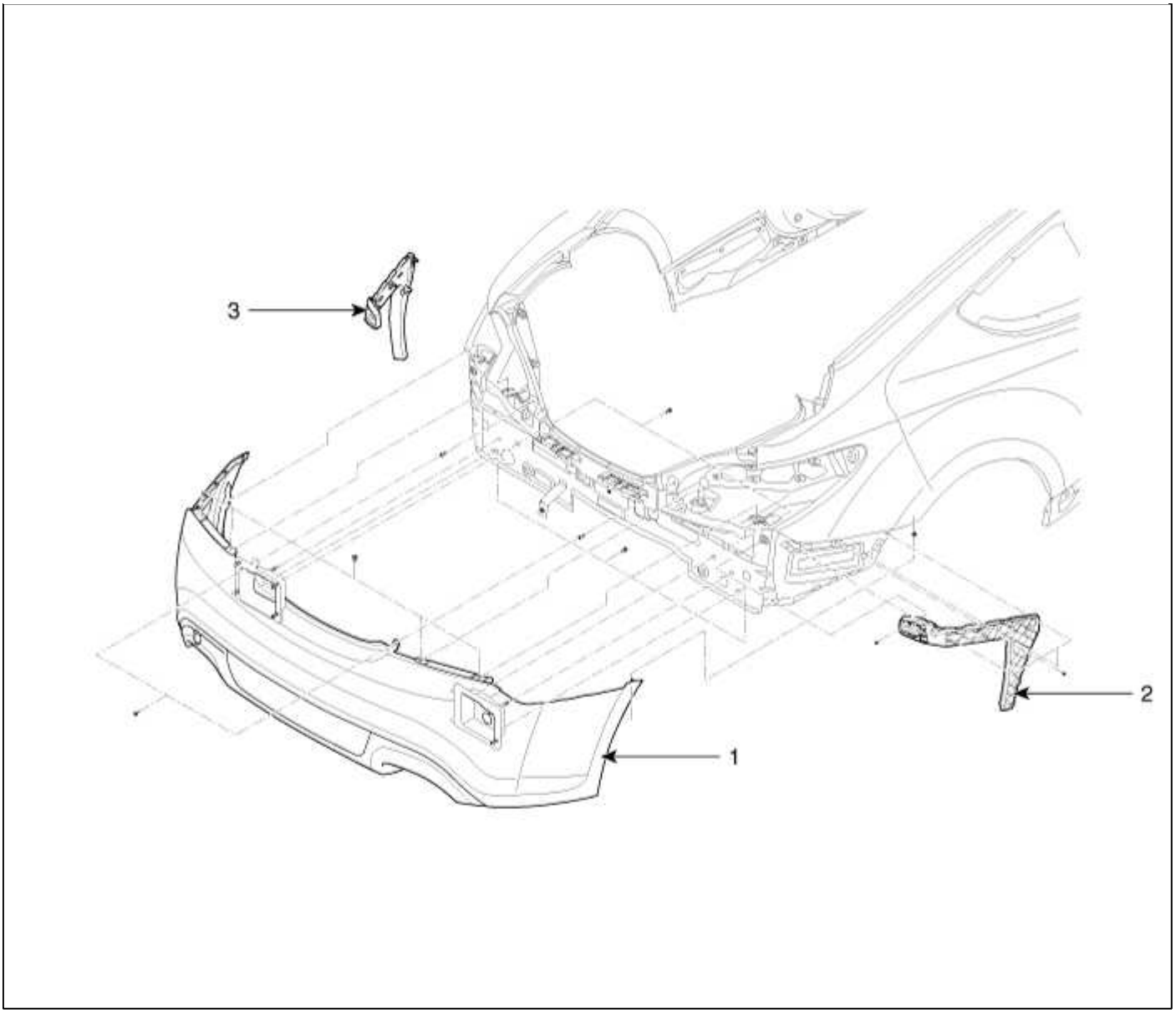
6. Installation is the reverse of removal.

NOTE

- Make sure the connector is plugged in properly.
- Replace any damaged clips.

Body (Interior and Exterior) > Bumper > Rear Bumper > Components and Components Location

Components



1. Rear bumper cover 2. Rear bumper side bracket [RH]	3. Rear bumper side bracket [LH]

Body (Interior and Exterior) > Bumper > Rear Bumper > Repair procedures

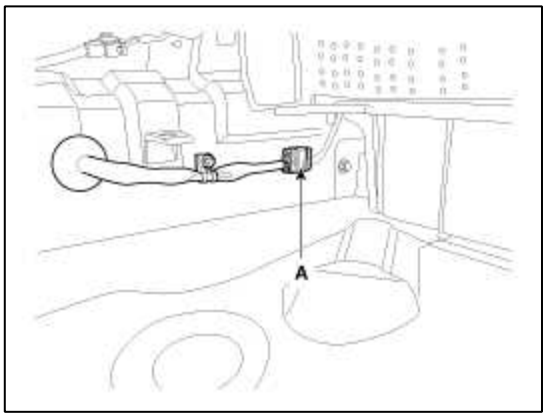
Replacement

NOTE

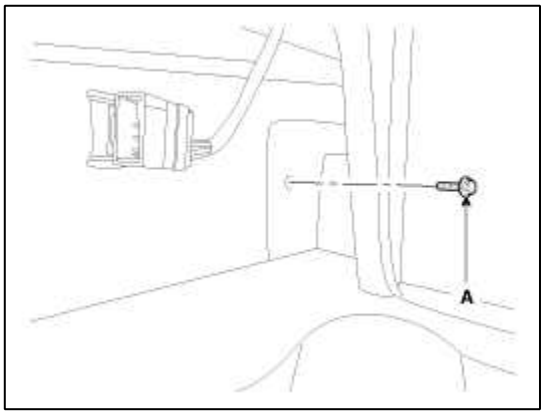
- Put on gloves to protect your hands.
- Use a plastic panel removal tool to remove interior trim pieces to without marring the surface.
- Take care not bend or scratch the cover and other parts.

1. Remove the rear transverse trim.
   (Refer to the BD group - "Trunk Trim")
2. Remove the luggage side trim.
   (Refer to the BD group - "Trunk Trim")

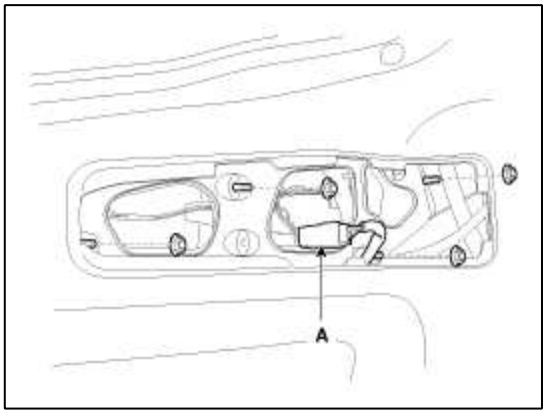
3. Disconnect the rear bumper main connector (A).



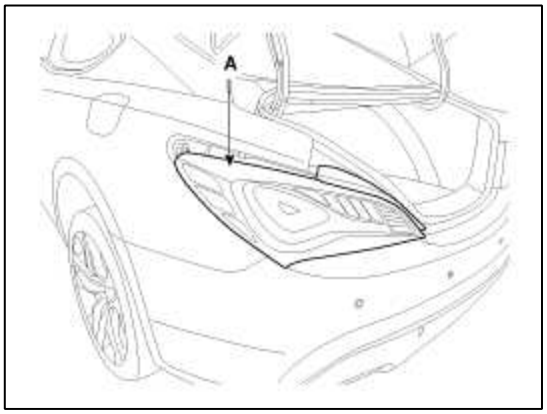
4. Loosen the trunk inner mounting bolt (A).



5. Disconnect the connector (A), and then loosen the rear combination lamp mounting nuts.

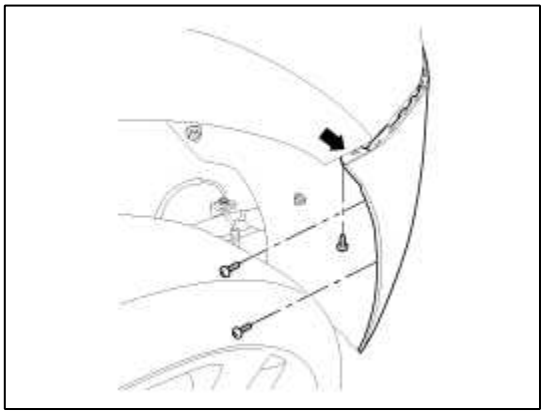


6. Remove the rear combination lamp (A).

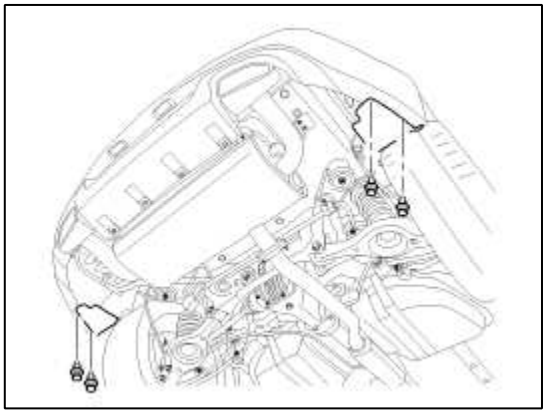


7. Loosen the mounting screw and clips.

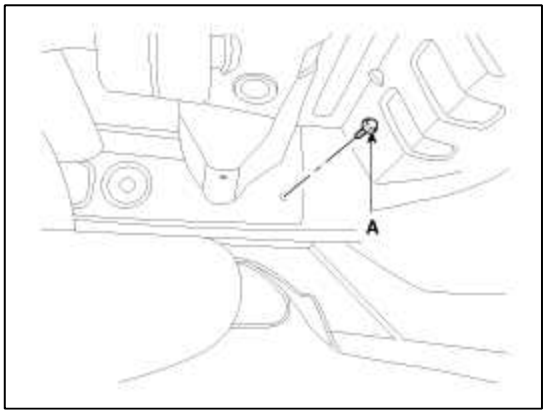
8. After loosening the rear bumper side's mounting screw, then disconnect the side's.



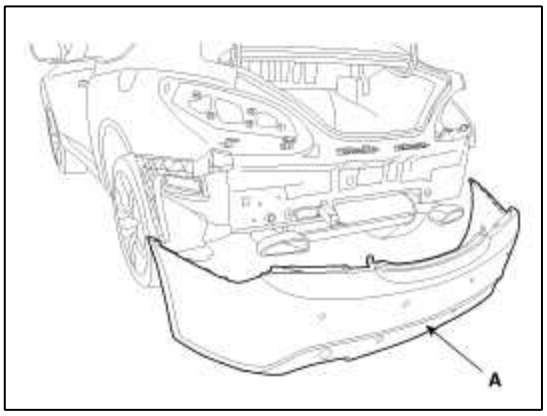
9. Remove the rear bumper lower mounting clips.



10. Loosen the mounting bolt (A).



11. Remove the rear bumper cover (A).



12. Installation is the reverse of removal.

NOTE

- Make sure the connector is plugged in properly.
- Replace any damaged clips.

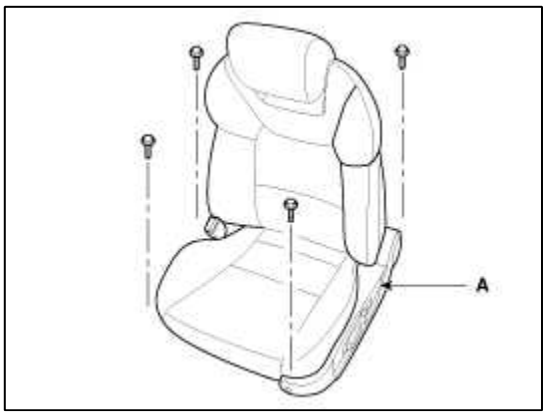
Body (Interior and Exterior) > Seat & Power Seat > Front Seat > Repair procedures

Replacement

Front Seat Assembly Replacement

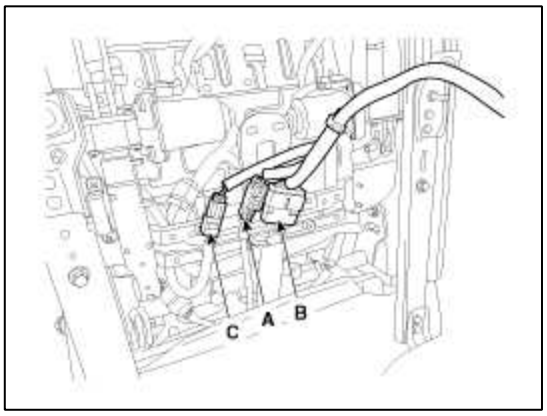
1. Remove the front foot cover.
2. After loosening the front seat assembly mounting bolts, remove the front seat assembly (A).

Tightening torque :
49.0 ~ 63.7N.m (5.0 ~ 6.5kgf.m, 36.2~47.0lb-ft)

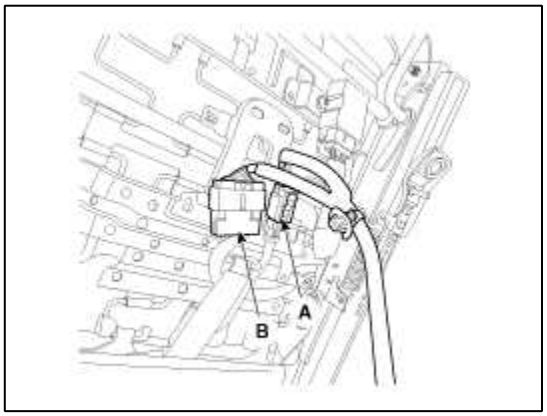


3. Disconnect the airbag connector (A), seat warmer connector (B), seat buckle connector (C).

[Driver's]



[Passenger's]



4. Installation is the reverse of removal.

CAUTION

Seat Mounting Bolt Installation Procedure

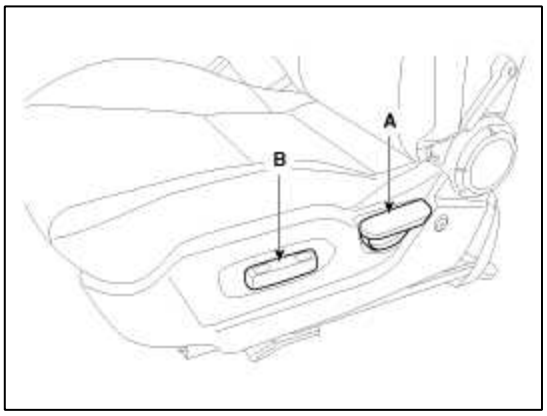
- Set the into the most rearward position. Check then each slide is locked, and then Tighten the front mounting bolt temporarily.
- Set the seat into most forward position. Check that each slide is locked, and then Tighten the rear mounting bolt completely.
- Set the seat into the most rearward position. Check the front mounting bolt completely.
- Check that the seat operates back and forth smoothy and the locking portion locks properly.

Recliner Cover Replacement

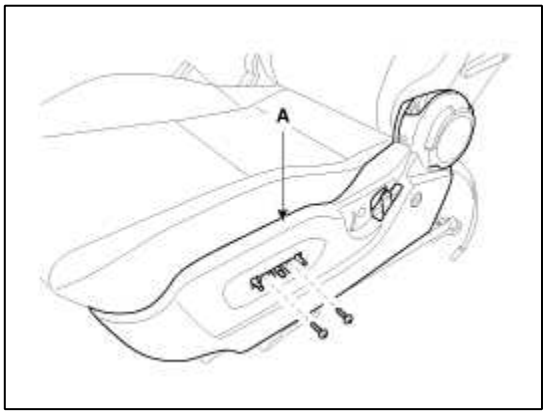
NOTE

- Use a plastic panel removal tool to remove interior trim pieces to protect from marring the surface.
- Take care not to bend or scratch the trim and panels.
- Put on gloves to protect your hands.

1. Remove the recliner lever (A) and height lever (B).



2. After loosening the mounting screws, then remove the recliner cover (A).
3. Disconnect the connector.



4. Installation is the reverse of removal.

NOTE

- Make sure the connector is plugged in properly.
- Replace any damaged clips.

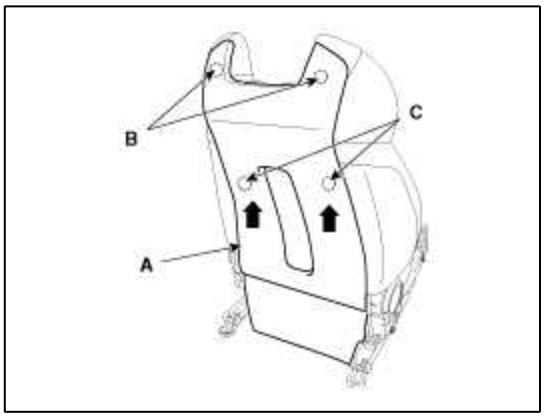
Front Seat Back Cover Replacement

NOTE

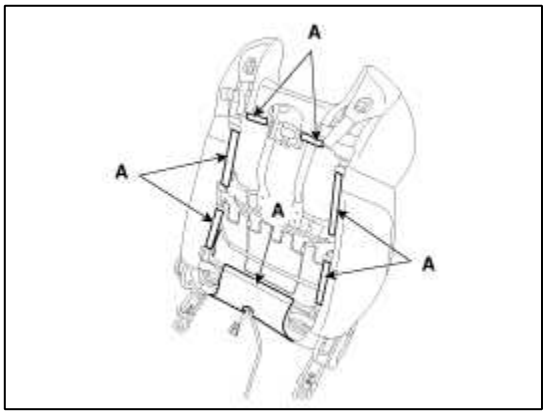
- Use a plastic panel removal tool to remove interior trim pieces to protect from marring the surface.
- Take care not to bend or scratch the trim and panels.
- Put on gloves to protect your hands.

1. Remove the front seat assembly.
2. Remove the recliner cover.
3. Remove the front seat headrest.
4. Remove the lumber support level.

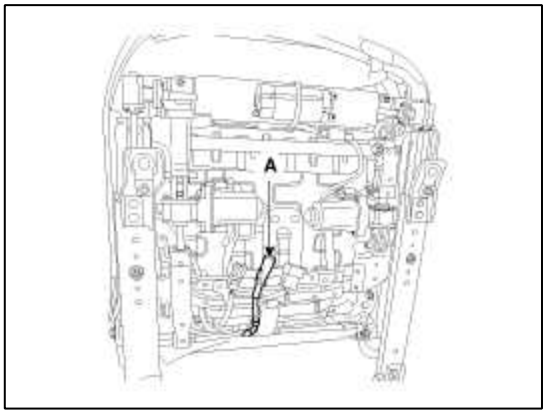
5. After disconnecting the clips (C) and (B), remove the front seat back board (A).



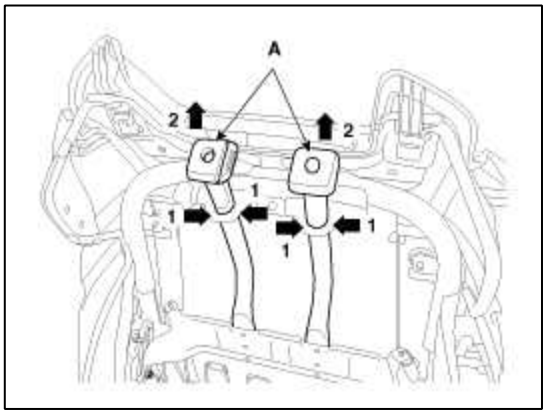
6. Push the protecter (A) by the seat back frame.



7. Disconnect the airbag connectors (A).

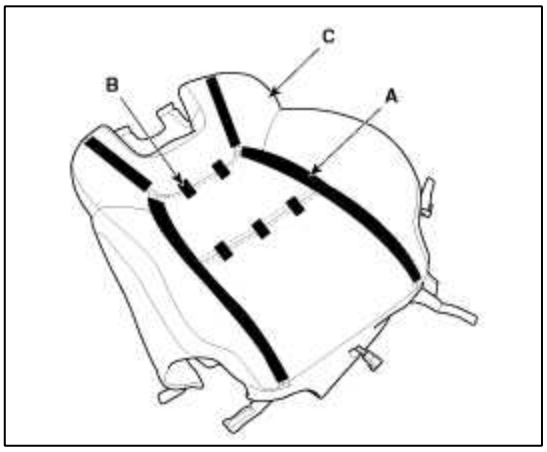


8. Pull out the headrest guides (A) while pinching the end of the guides, and remove them.



9. Remove the front seat back cover from the frame.

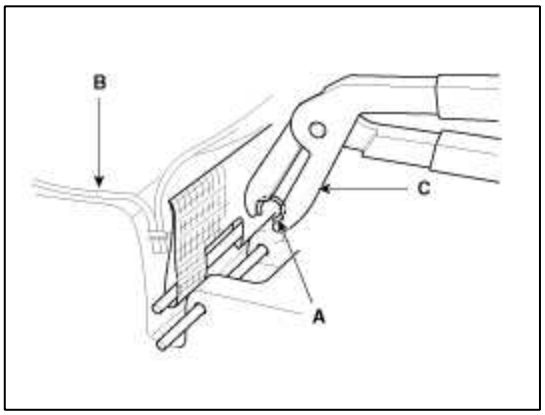
10. After removing the velcro tape (A) and hog-ring clip (B) on the front of seat back and remove the front seat back cover (C).



11. Installation is the reverse of removal.

NOTE

- To prevent wrinkles, make sure the material is stretched evenly over the cover (B) before securing the hog-ring clips (A).
- Replace the hog ring clips with new ones using special tool [C (09880-4F000)].

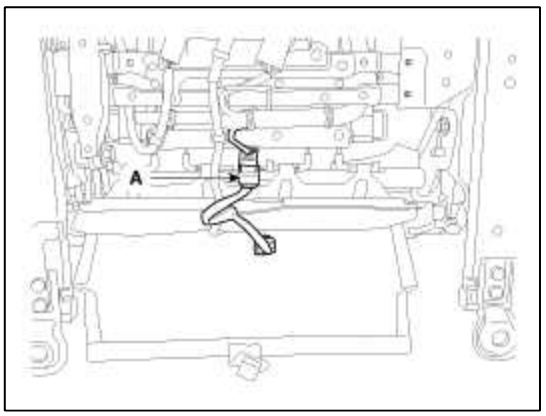


Front Seat Cushion Cover Replacement

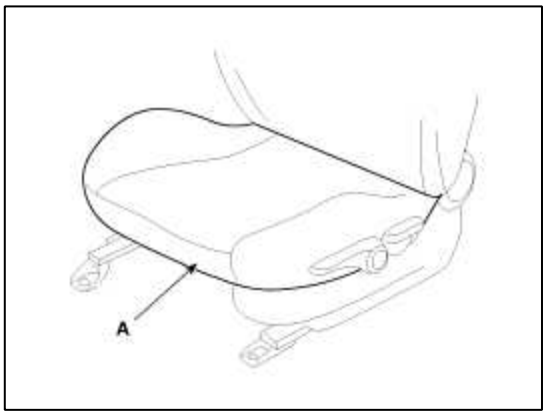
NOTE

- Use a plastic panel removal tool to remove interior trim pieces to protect from marring the surface.
- Take care not to bend or scratch the trim and panels.
- Put on gloves to protect your hands.

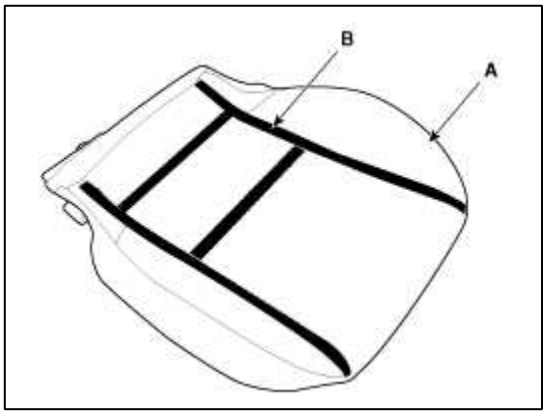
1. Remove the front seat assembly.
2. Remove the recliner cover.
3. Disconnect the connector (A).



4. Push the protecter, and then front seat cushion cover (A) from the frame.



5. After removing the velcro tape (B) on the front of seat cushion and remove the front seat cushion cover (A).



6. Installation is the reverse of removal.

NOTE

- Make sure the connector is plugged in properly.
- Replace any damaged clips.

Front Seat Frame Replacement

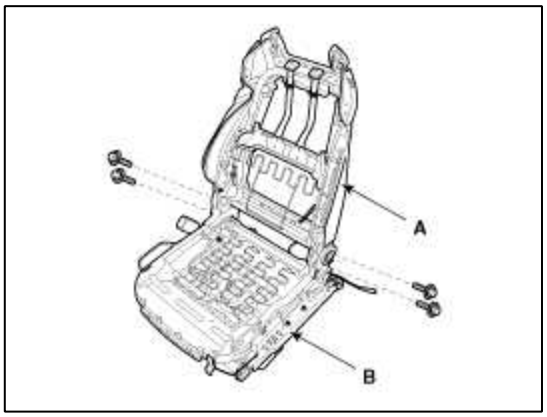
NOTE

- Use a plastic panel removal tool to remove interior trim pieces to protect from marring the surface.
- Take care not to bend or scratch the trim and panels.
- Put on gloves to protect your hands.

1. Remove the front seat assembly.
2. Remove the recliner cover.
3. Remove the front seat back cover.
4. Remove the front seat cushion cover.

5. After loosening the mounting bolts, then disconnect the seat back frame (A) and seat cushion frame (B).

Tightening torque :
49.0 ~ 63.7N.m (5.0 ~ 6.5kgf.m, 36.2~47.0lb-ft)



6. Installation is the reverse of removal.

NOTE

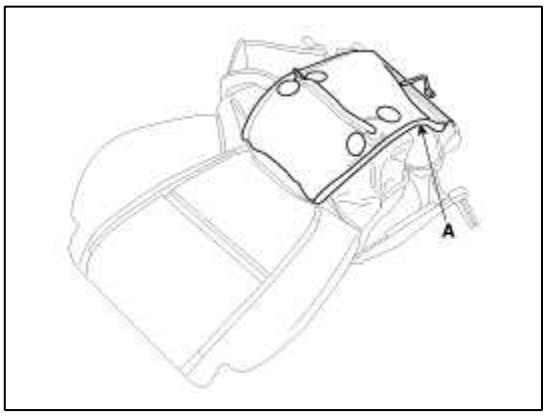
- Remove the side air bag for replacing side air bag installation seat.
- Before service, be fully aware of precautions and service procedure relevant to air bag.
  (Refer to the RT group - "Airbag")

Front Seat Back Heater Replacement

NOTE

- Use a plastic panel removal tool to remove interior trim pieces to protect from marring the surface.
- Take care not to bend or scratch the trim and panels.
- Put on gloves to protect your hands.

1. Remove the front seat assembly.
2. Remove the front seat back cover.
3. Remove the front seat back heater (A).



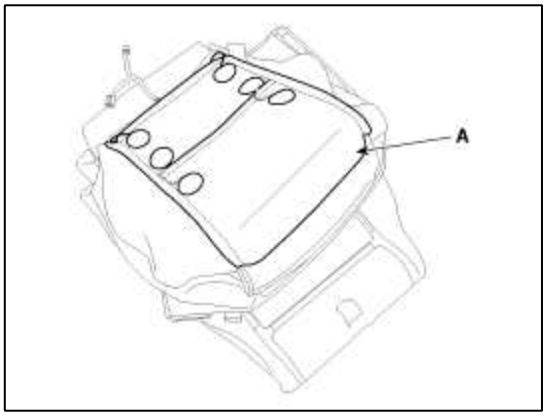
4. Installation is the reverse of removal.

Front Seat Cushion Heater Replacement

NOTE

- Use a plastic panel removal tool to remove interior trim pieces to protect from marring the surface.
- Take care not to bend or scratch the trim and panels.
- Put on gloves to protect your hands.

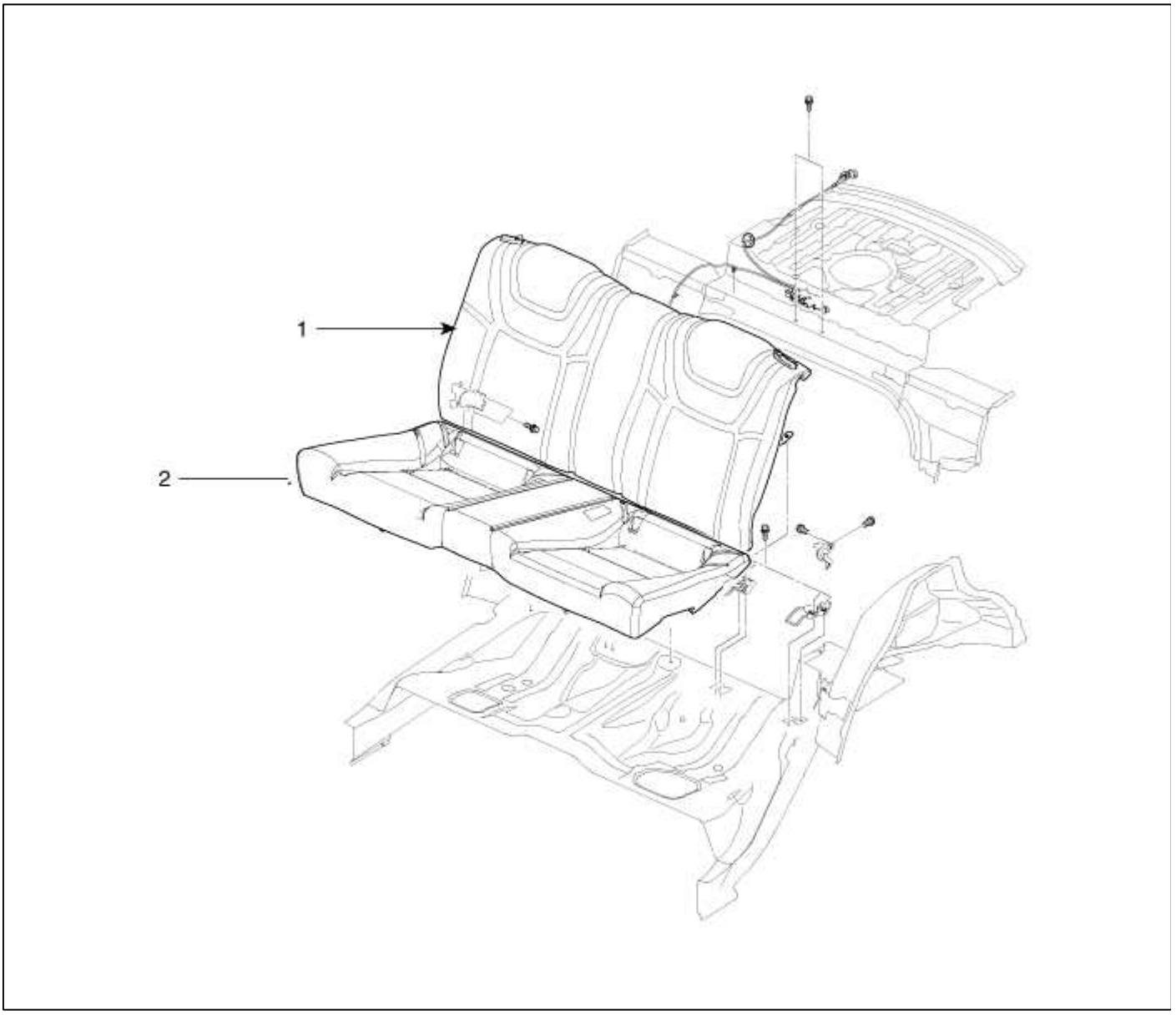
1. Remove the front seat assembly.
2. Remove the front seat cushion cover.
3. Remove the front seat cushion heater (A).



4. Installation is the reverse of removal.

Body (Interior and Exterior) > Seat & Power Seat > Rear Seat > Components and Components Location

Components



1. Rear seat back assembly	2. Rear seat cushion assembly

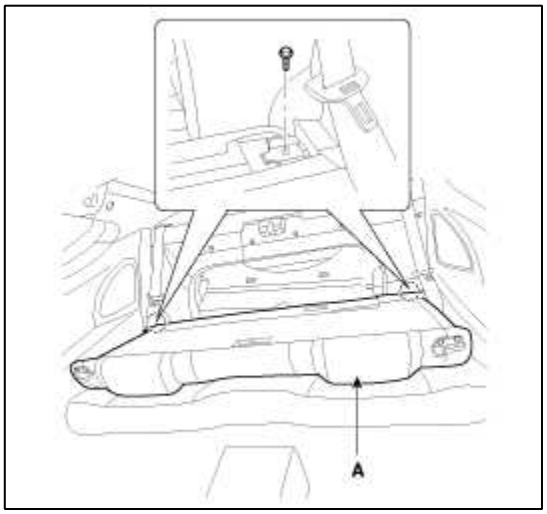
Body (Interior and Exterior) > Seat & Power Seat > Rear Seat > Repair procedures

Replacement

Rear Seat Assembly Replacement

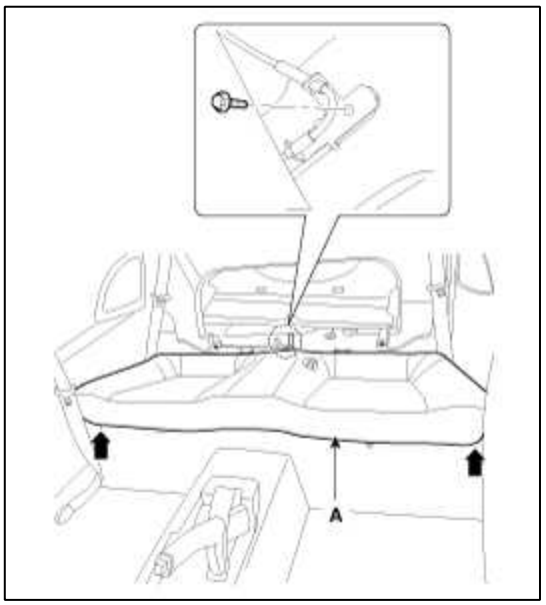
1. After loosening the mounting bolts, then remove the rear seat back (A).

Tightening torque :
34.3 ~ 53.9 N.m (3.5 ~ 5.5 kgf.m, 25.3 ~ 39.8 lb-ft)



2. After loosening the mounting bolts, then remove the rear seat cushion (A).

Tightening torque :
34.3 ~ 53.9 N.m (3.5 ~ 5.5 kgf.m, 25.3 ~ 39.8 lb-ft)



3. Installation is the reverse of removal.

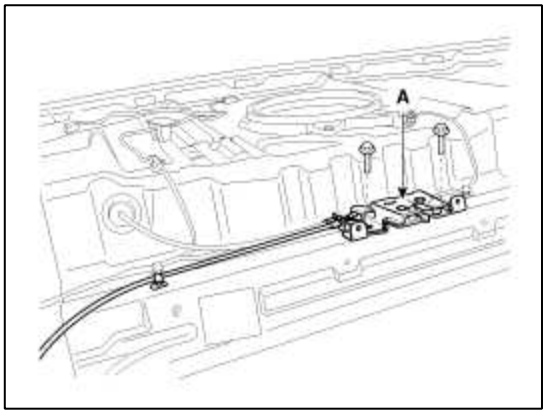
Rear Seat Latch Replacement

NOTE

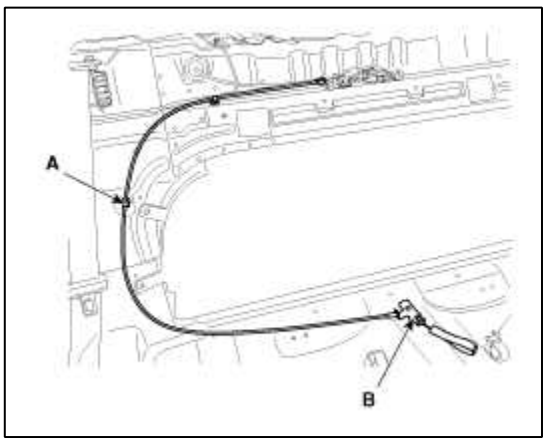
- Use a plastic panel removal tool to remove interior trim pieces to protect from marring the surface.
- Take care not to bend or scratch the trim and panels.
- Put on gloves to protect your hands.

1. Remove the rear seat back assembly.
2. Remove the front door scuff trim.
   (Refer to the BD group – “Interior Trim”)
3. Remove the rear pillar trim.
   (Refer to the BD group – “Interior Trim”)
4. Remove the center pillar lower trim.
   (Refer to the BD group – “Interior Trim”)
5. Remove the luggage partition tray trim.
   (Refer to the BD group – “Interior Trim”)
6. Remove the package tray trim.
   (Refer to the BD group – “Interior Trim”)
7. After loosening the mounting bolts, then remove the rear seat latch assembly (A).

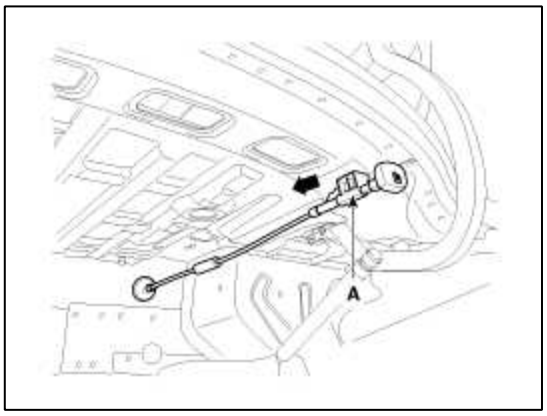
Tightening torque :
19.6 ~ 29.4 N.m (2.0 ~ 3.0 kgf.m, 14.5 ~ 21.7 lb-ft)



8. Remove the rear seat latch cable (A).



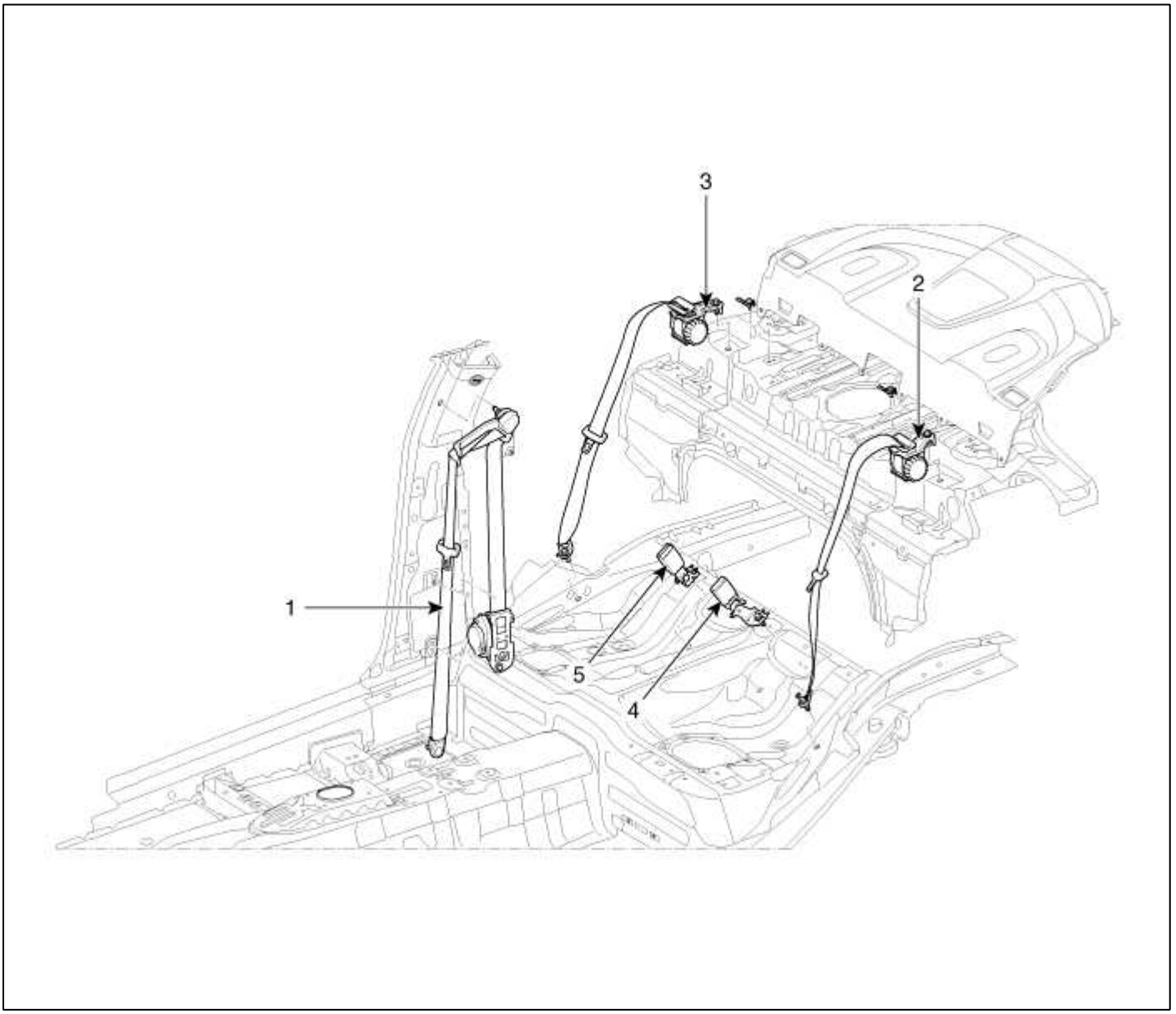
9. Remove the rear seat back folding handle (A).



10. Installation is the reverse of removal.

Body (Interior and Exterior) > Seat Belt > Front Seat Belt > Components and Components Location

Components



1. Front seat belt 2. Rear seat belt [LH] 3. Rear seat belt [RH]	4. Rear seat belt buckle [LH] 5. Rear seat belt buckle [RH]

Body (Interior and Exterior) > Seat Belt > Front Seat Belt > Repair procedures

Replacement

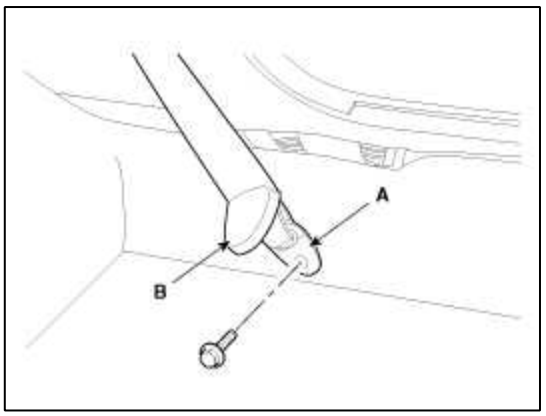
Front Seat Belt Replacement

CAUTION

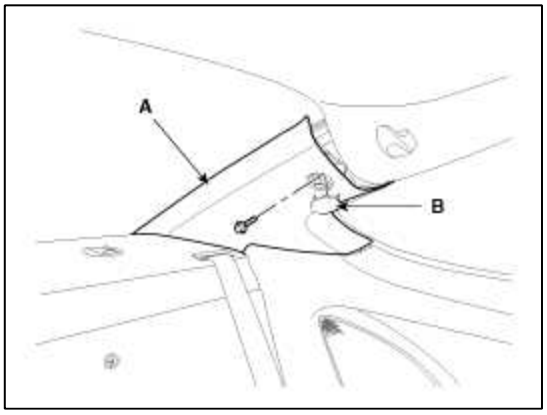
- When installing the belt, make sure not to damaged the pretensioner.

1. Remove the front seat assembly.
   (Refer to the BD group - "Front Seat")
2. Remove the rear seat assembly.
   (Refer to the BD group - "Front Seat")
3. Remove the front door scuff trim
   (Refer to the BD group - "Interior Trim")
4. Remove the front seat belt lower anchor cover (B).
5. After loosening the mounting bolt, then remove the front seat belt lower anchor (A).

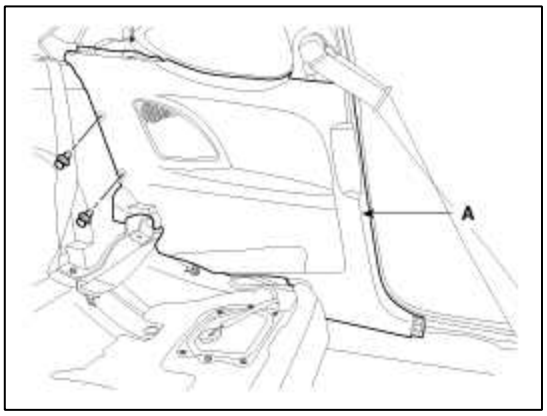
Tightening torque :
39.2 ~ 53.9 N.m (4.0 ~ 5.5 kgf.m, 28.8 ~ 39.8 lb-ft)



6. Remove the cap (B).
7. After loosening the mounting bolt, then remove the rear pillar trim (A).

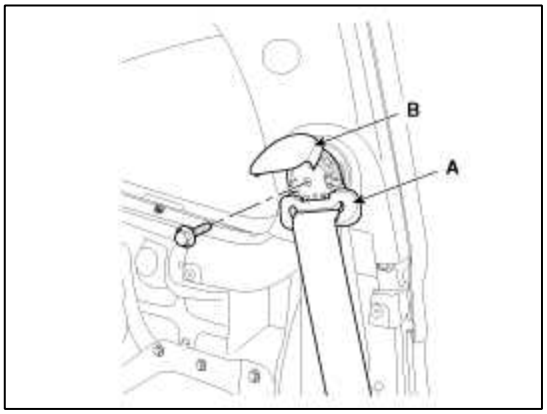


8. Remove the mounting clips and then center pillar lower trim (A).



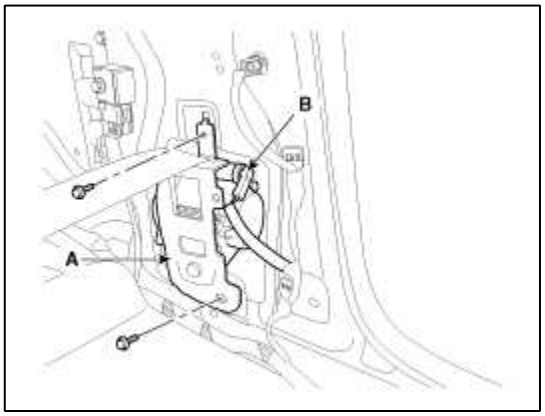
9. Remove the front seat belt upper anchor cover (B).
10. After loosening the mounting bolt, then remove the front seat belt upper anchor (A).

Tightening torque :
39.2 ~ 53.9 N.m (4.0 ~ 5.5 kgf.m, 28.8 ~ 39.8 lb-ft)



11. After disconnecting the pretensioner connector lock pin, remove the front seat belt pretensioner connector (B), loosen the mounting bolts, then remove the front seat belt pretensioner (A).

Tightening torque :
39.2 ~ 53.9 N.m (4.0 ~ 5.5 kgf.m, 28.8 ~ 39.8 lb-ft)



12. Installation is the reverse of removal.

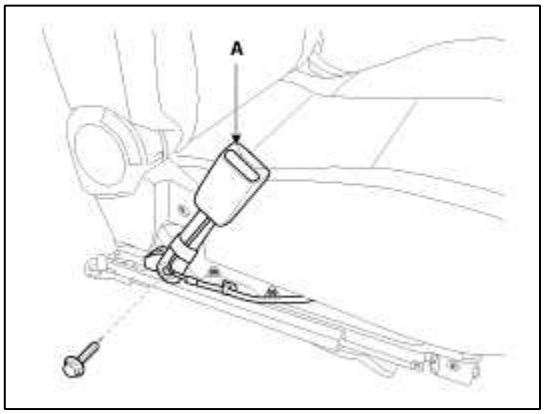
NOTE

- Make sure the connector is plugged in properly.
- Replace any damaged clips.

Front Seat Belt Buckle Replacement

1. Remove the front seat assembly.
   (Refer to the BD group - "Front Seat")
2. After loosening the mounting bolt, then remove the front seat belt buckle (A).

Tightening torque :
39.2 ~ 53.9 N.m (4.0 ~ 5.5 kgf.m, 28.9 ~ 39.8 lb-ft)



3. Installation is the reverse of removal.

Body (Interior and Exterior) > Seat Belt > Rear Seat Belt > Repair procedures

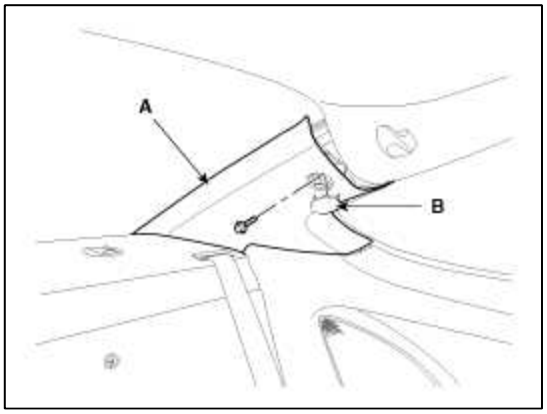
Replacement

Rear Seat Belt Replacement

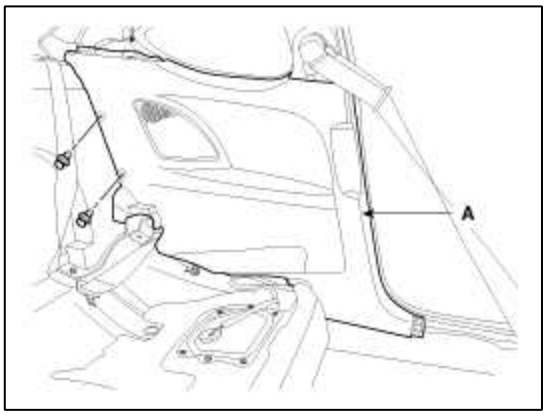
CAUTION

- When installing the belt, make sure not to damage the retractor.

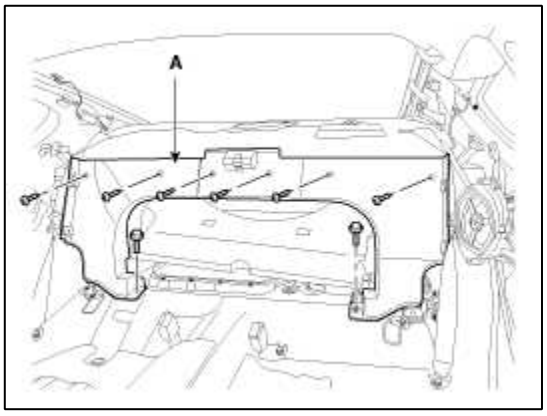
1. Remove the rear seat assembly.
   (Refer to the BD group – “Rear Seat”)
2. Remove the front door scuff trim.
   (Refer to the BD group - "Interior Trim")
3. Remove the cap (B).
4. After loosening the mounting bolt, then remove the rear pillar trim (A).



5. Remove the mounting clips and then center pillar lower trim (A).

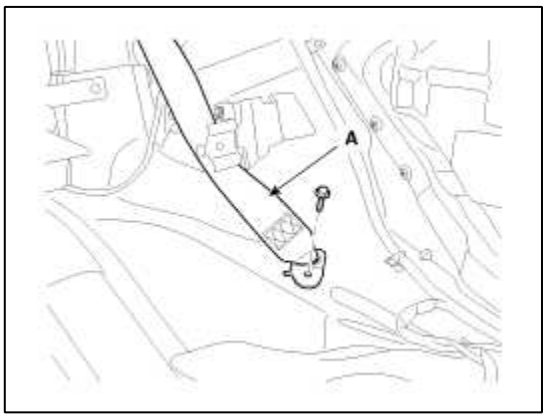


6. After loosening the mounting screws and bolts, then remove the luggage partition tray trim (A).

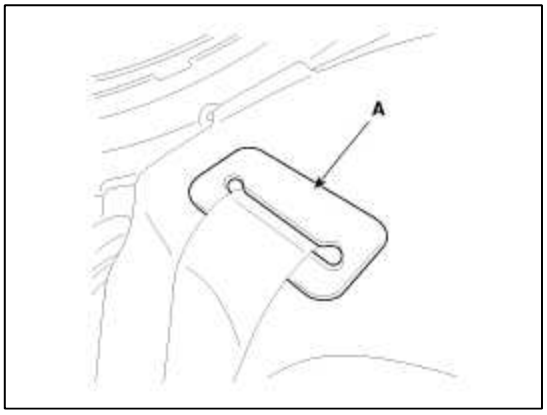


7. After loosening the mounting bolt, then remove the rear seat belt lower anchor (A).

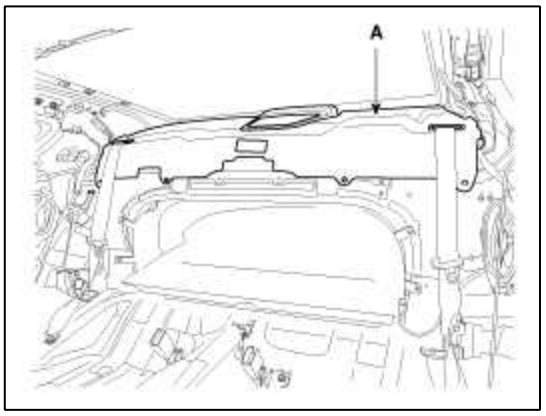
Tightening torque :
39.2 ~ 53.9 N.m (4.0 ~ 5.5 kgf.m, 28.8 ~ 39.8 lb-ft)



8. Remove the rear seat belt upper anchor cover (A).

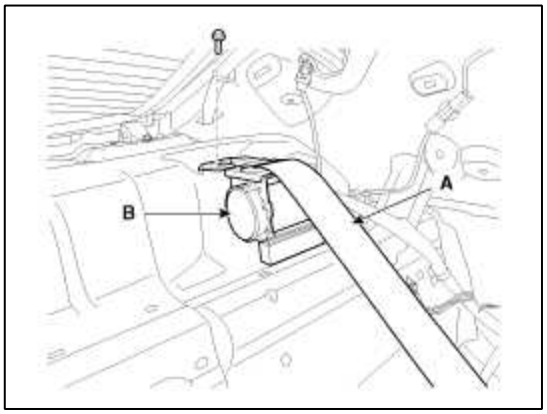


9. Remove the package tray trim (A).



10. After loosening the mounting bolt, then remove the rear seat belt (A) and rear seat belt retractor (B).

Tightening torque :
39.2 ~ 53.9 N.m (4.0 ~ 5.5 kgf.m, 28.8 ~ 39.8 lb-ft)



11. Installation is the reverse of removal.

NOTE

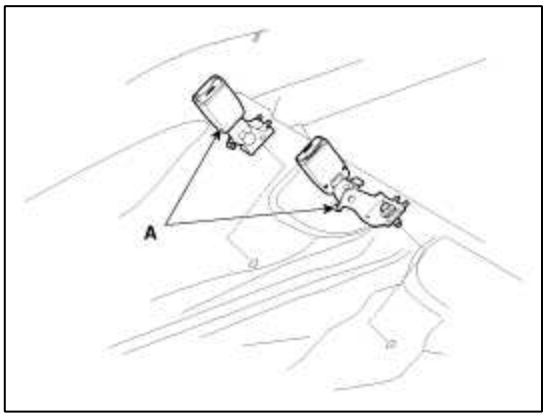
- Make sure the connector is plugged in properly.
- Replace any damaged clips.

Rear Seat Belt Buckle Replacement

1. Remove the rear seat cushion assembly.
   (Refer to the BD group – “Rear Seat”)

2. After loosening the mounting bolt, then remove the rear seat belt buckle (A).

Tightening torque :
39.2 ~ 53.9 N.m (4.0 ~ 5.5 kgf.m, 28.9 ~ 39.8 lb-ft)



3. Installation is the reverse of removal.

GENESIS COUPE(BK) > 2013 > G 2.0 T-MPI > Body Electrical System

Body Electrical System > General Information > General Information

General Troubleshooting Information

Before Troubleshooting

1. Check applicable fuses in the appropriate fuse/relay box.
2. Check the battery for damage, state of charge, and clean and tight connections.
   (Refer to the Engine Electrical System - Battery)

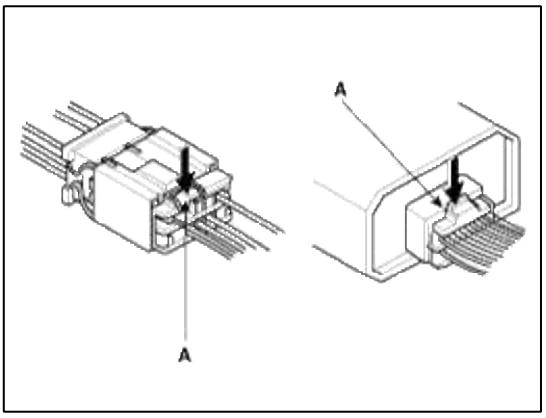
NOTE

- Do not quick-charge a battery unless the battery ground cable has been disconnected, otherwise you will damage the alternator diodes.
- Do not attempt to crank the engine with the battery ground cable loosely connected or you will severely damage the wiring.

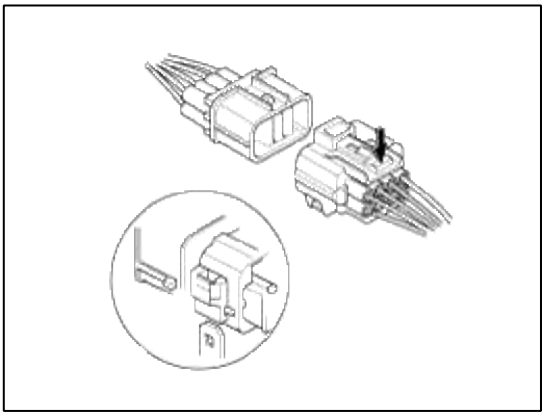
3. Check the alternator belt tension.

Handling Connectors

1. Make sure the connectors are clean and have no loose wire terminals.
2. Make sure multiple cavity connectors are packed with grease (except watertight connectors).
3. All connectors have push-down release type locks (A).

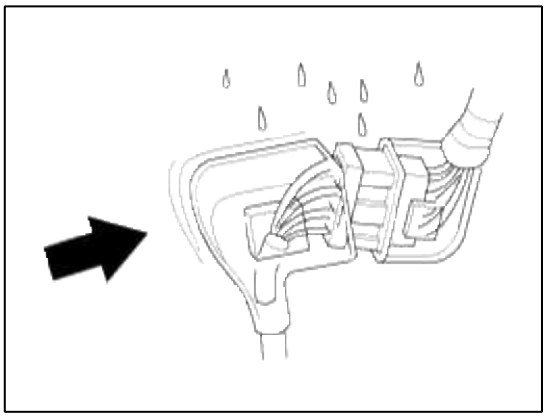


4. Some connectors have a clip on their side used to attach them to a mount bracket on the body or on another component. This clip has a pull type lock.
5. Some mounted connectors cannot be disconnected unless you first release the lock and remove the connector from its mount bracket (A).

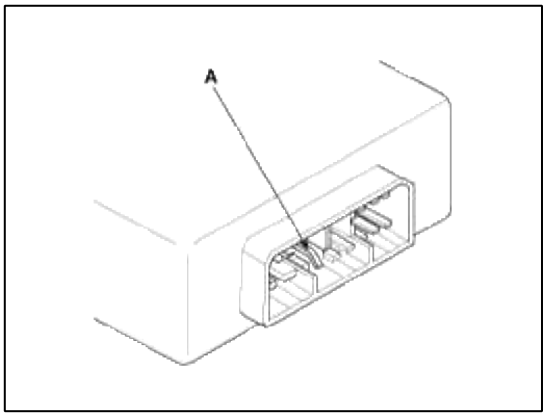


6. Never try to disconnect connectors by pulling on their wires; pull on the connector halves instead.

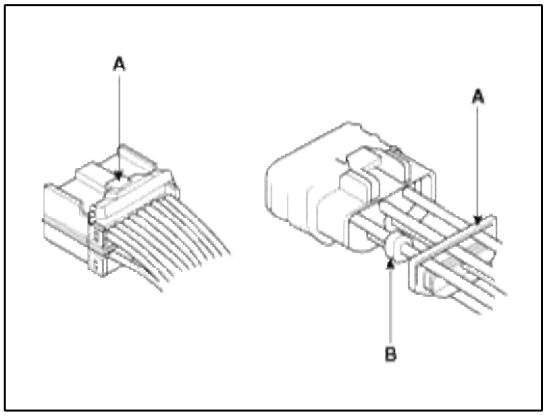
7. Always reinstall plastic covers.



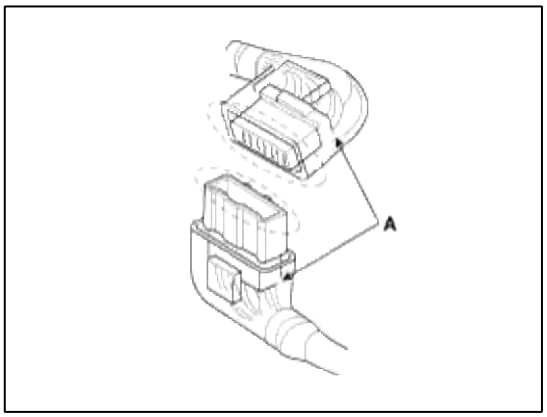
8. Before connecting connectors, make sure the terminals (A) are in place and not bent.



9. Check for loose retainer (A) and rubber seals (B).

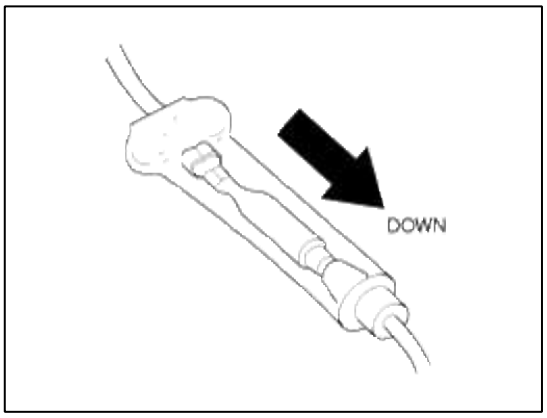


10. The backs of some connectors are packed with grease. Add grease if necessary. If the grease (A) is contaminated, replace it.



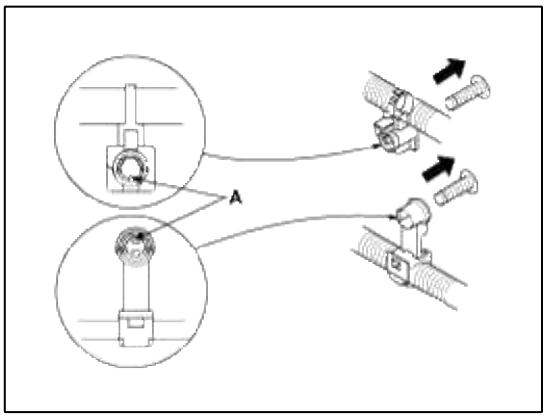
11. Insert the connector all the way and make sure it is securely locked.

12. Position wires so that the open end of the cover faces down.

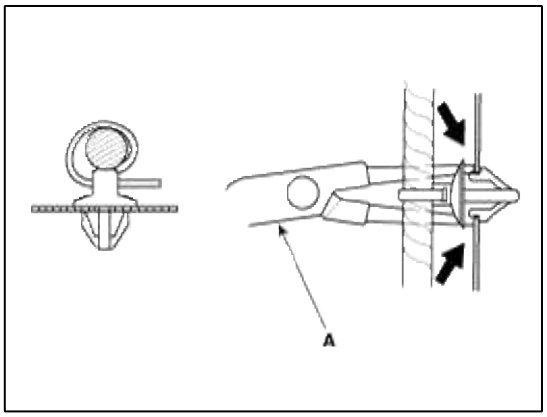


Handling Wires And Harnesses

1. Secure wires and wire harnesses to the frame with their respective wire ties at the designated locations.
2. Remove clips carefully; don't damage their locks (A).

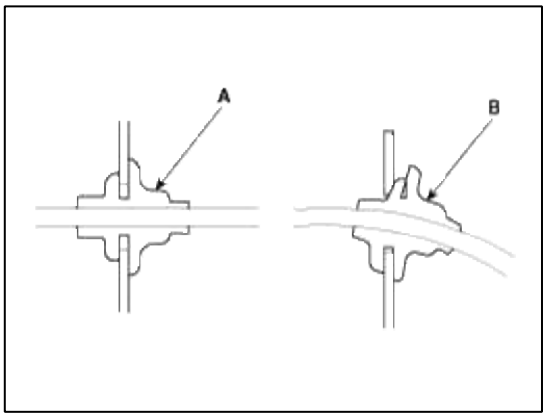


3. Slip pliers (A) under the clip base and through the hole at an angle, and then squeeze the expansion tabs to release the clip.



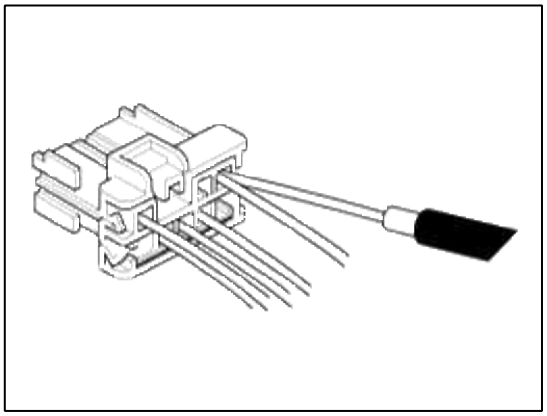
4. After installing harness clips, make sure the harness doesn't interfere with any moving parts.
5. Keep wire harnesses away from exhaust pipes and other hot parts, from sharp edges of brackets and holes, and from exposed screws and bolts.

6. Seat grommets in their grooves properly (A). Do not leave grommets distorted (B).

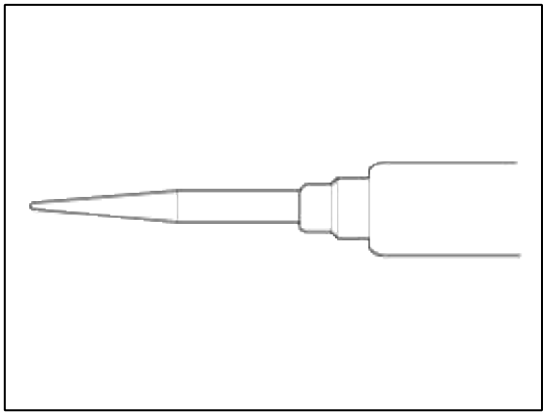


Testing And Repairs

1. Do not use wires or harnesses with broken insulation.
   Replace them or repair them by wrapping the break with electrical tape.
2. After installing parts, make sure that no wires are pinched under them.
3. When using electrical test equipment, follow the manufacturer's instructions and those described in this manual.
4. If possible, insert the remover tool from the wire side (except waterproof connector).



5. Use a remover tool with a tapered tip.



   Refer to the user's guide in the wiring repair kit II (Pub. No. : 0K000 003 A05)

Five-step Troubleshooting

1. Verify the complaint
   Turn on all the components in the problem circuit to verify the customer complaint. Note the symptoms. Do not begin disassembly or testing until you have narrowed down the problem area.
2. Analyze the schematic
   Look up the schematic for the problem circuit.
   Determine how the circuit is supposed to work by tracing the current paths from the power feed through the circuit components to ground. If several circuits fail at the same time, the fuse or ground is a likely cause.
   Based on the symptoms and your understanding of the circuit operation, identify one or more possible causes of the problem.

3. Isolate the problem by testing the circuit.
   Make circuit tests to check the diagnosis you made in step 2. Keep in mind that a logical, simple procedure is the key to efficient troubleshooting.
   Test for the most likely cause of failure first. Try to make tests at points that are easily accessible.
4. Fix the problem
   Once the specific problem is identified, make the repair. Be sure to use proper tools and safe procedures.
5. Make sure the circuit works
   Turn on all components in the repaired circuit in all modes to make sure you've fixed the entire problem. If the problem was a blown fuse, be sure to test all of the circuits on the fuse. Make sure no new problems turn up and the original problem does not recur.

Battery Reset

Description

When reconnecting the battery cable after disconnecting, recharging battery after discharged or installing the memory fuse located on the driver's side panel after removing, be sure to reset systems mentioned on the below table.
In addition, when replacing or reinstalling their fuses after removing, they should be reset according to the below table. Please refer to the below table when servicing.

SYSTEM	RESETTING
Auto up/down window	Whenever the battery is disconnected, discharged or the related fuse is replaced or reinstalled, reset the Auto up/down window system according to the procedure below. 1) Turn the ignition switch to the ON position. 2) Pull up the power window switch in order that the window can close completely, and then keep pulling up the power switch for about 1 second.
Sunroof	Whenever the vehicle battery is disconnected or discharged, or you use the emergency handle to operate the sunroof, you have to reset your sunroof system as follows : 1. Turn the ignition key to the ON position and then close the sunroof completely. 2. Release the sunroof control lever. 3. Press and hold the CLOSE button for more than 10 seconds until the sunroof closed and it has moved slightly. 4. Release the sunroof control lever. 5. Press and hold the CLOSE button once again within 5 seconds until the sunroof do as follows; A. Tilt → Slide Open → Slide Close Then release the lever. 6. Reset procedure of panorama system is finished.
Trip computer	When the battery is disconnected and reconnected, the set functions of the trip computer become initialized. So, you need to explain this information to the customer.
Clock	When the battery is disconnected and reconnected, the clock becomes initialized. So, the clock should be reset.
Audio	When the battery is disconnected and reconnected, the customer's radio stations become initialized. So, you need to record the customer's radio stations prior to service, and after service, set the customer's radio stations into the audio.

Body Electrical System > Audio > Specifications

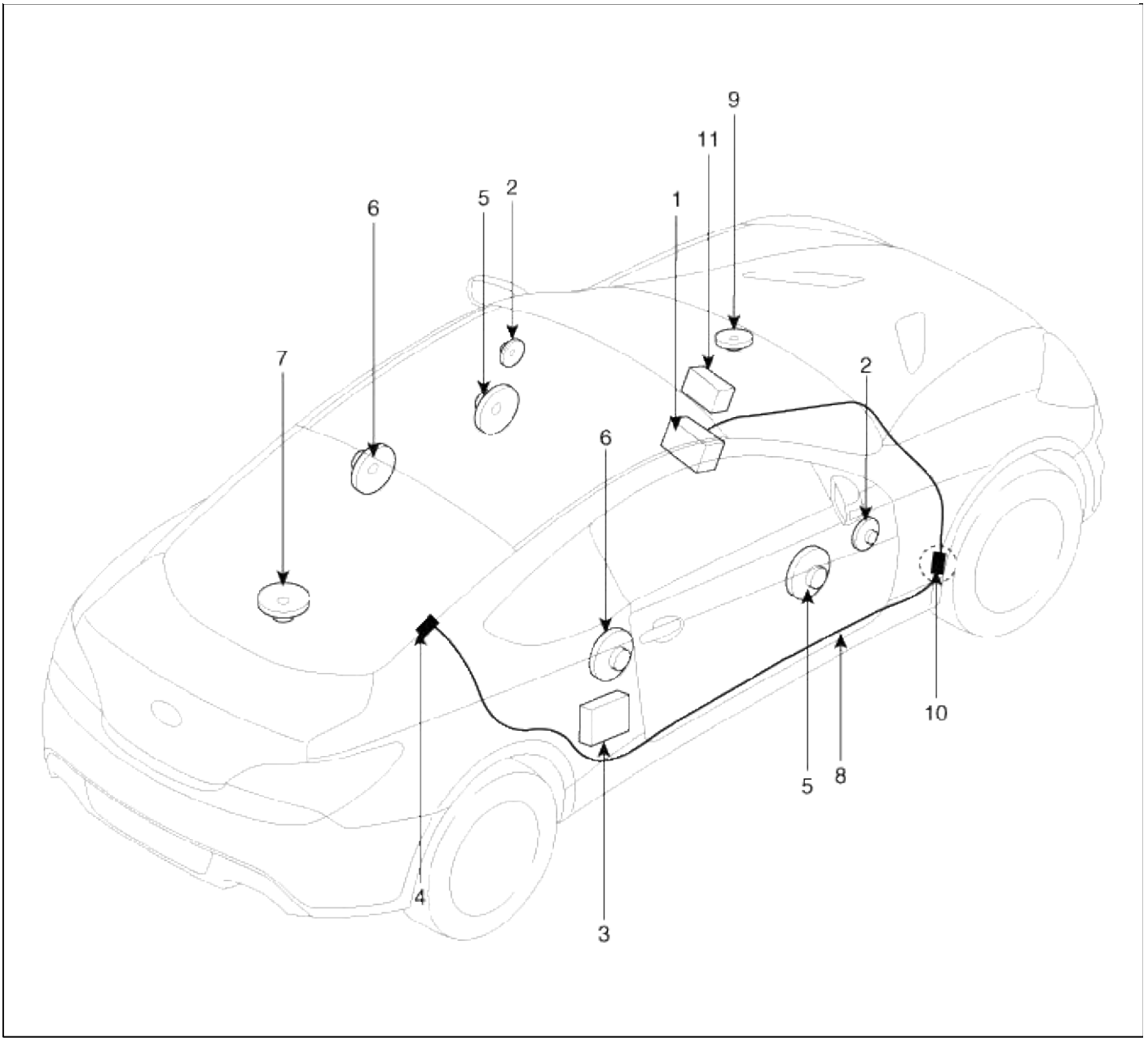
Specification

Audio

Item		Specification	
Model		RADIO/CD/MP3/XM	RADIO/CDC/MP3/XM
Power supply		DC 14.4 V	DC 14.4 V
Rated output		Max. 43 W x 4	Max. 3.2 Vrms
Antenna		80 PF 75 Ω	
Tuning type		PLL synthesized tuning	
Other		Internal Amplifier	External Amplifier
Frequency range / Channel space	FM	87.5 ~ 107.9 MHz/200 KHz	
	AM	NAS, CAN : 530 ~ 1710 KHz/9 KHz, GUAM : 531~1701 KHz/9 KHz	

Body Electrical System > Audio > Components and Components Location

Component Location

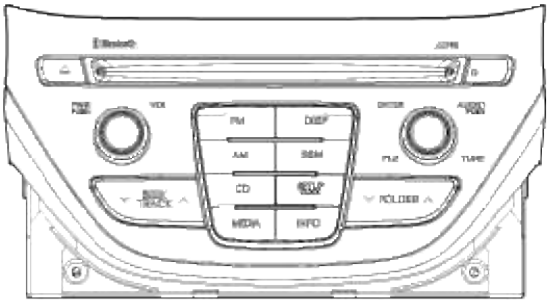


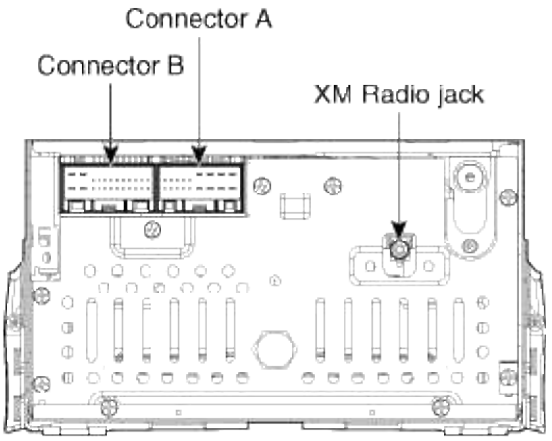
1. Audio unit 2. Tweeter speaker 3. External amp 4. Glass antenna 5. Front door speaker 6. Rear speaker	7. Woofer speaker 8. Antenna feeder cable 9. Crash pad center speaker 10. Feeder cable joint connector 11. Audio monitor 12. Aux jack

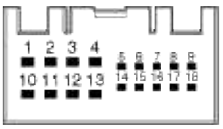
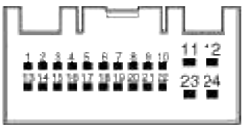
Body Electrical System > Audio > Audio Unit > Components and Components Location

Components

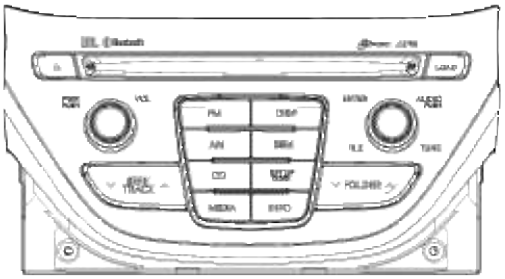
[RADIO/CD/MP3 - Internal AMP]

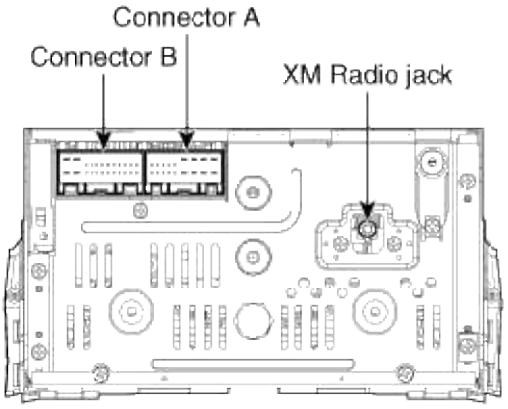


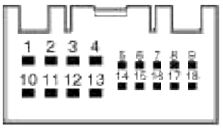
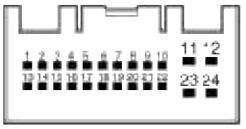


		
Pin No.	Connector A	Connector B
1	Speaker RL (+)	CAN High
2	Speaker FL (+)	-
3	Speaker FR (+)	Temp
4	Speaker RR (+)	Steering remote
5	-	-
6	-	USB D (+)
7	-	USB/iPod VDD
8	Illumination (+)	AUX R Input
9	-	AUX GND
10	Speaker RL (-)	MIC (+) (Bluetooth)
11	Speaker FL (-)	ACC
12	Speaker FR (-)	B (+)
13	Speaker RR (-)	CAN Low
14	-	-
15	-	-
16	External keyboard	Vehicle speed
17	Illumination (-)	Steering remote GND
18	Remote antenna	USB D (-)
19		USB / iPod GND
20		AUX detect
21		AUX L Input
22		MIC (-) (Bluetooth)
23		-
24		Power GND

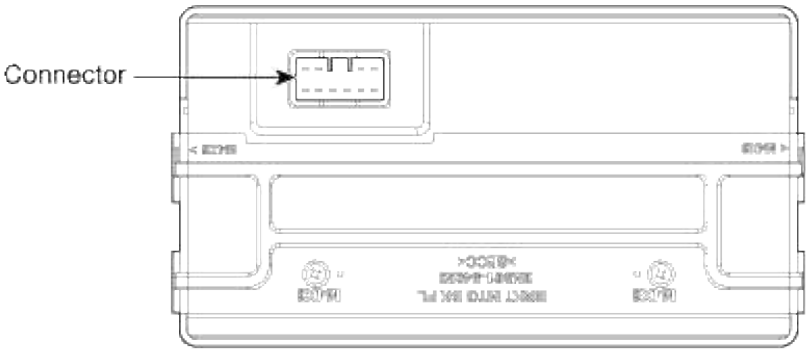
[RADIO/CD/MP3 - External AMP]

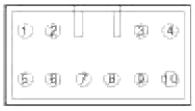




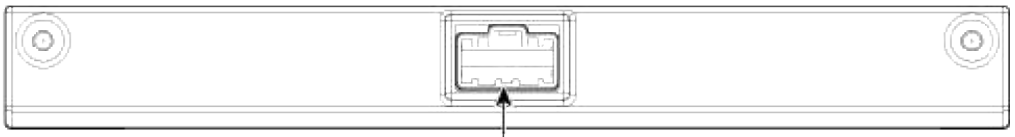
		
Pin No.	Connector A	Connector B
1	-	CAN High
2	-	-
3	-	Temp
4	-	Steering remote
5	SPDIF GND	-
6	SPDIF DN	USB D (+)
7	-	USB / iPod VDD
8	Illumination (+)	AUX R Input
9	-	AUX GND
10	-	MIC + (Bluetooth)
11	-	ACC
12	-	B+
13	-	CAN Low
14	-	-
15	SPDIF DP	-
16	External keyboard	Vehicle speed
17	Illumination (-)	Steering remote GND
18	Remote antenna	USB D (-)
19		USB / iPod GND
20		AUX DETECT
21		AUX L Input
22		MIC - (Bluetooth)
23		-
24		Power GND

[Audio Monitor]

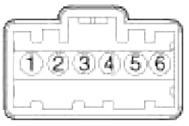


Connector	No.	Name	No.	Name
	1	ILL (-)	6	-
	2	-	7	CAN -
	3	-	8	CAN +
	4	Power ground	9	ACC
	5	IL_ (+)	10	Battery

[External Keyboard]



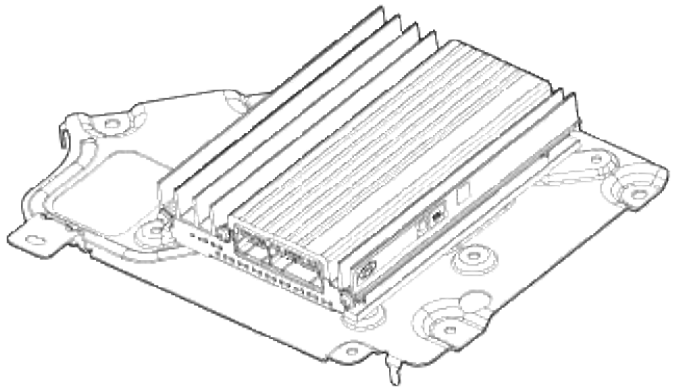
Connector

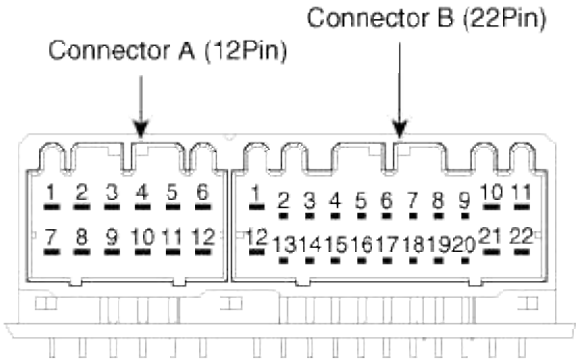


Connector

Pin No.	Description
1	Power GND
2	External keyboard
3	-
4	-
5	Illumination (+)
6	Illumination (-)

[External Amplifier]





No.	Connector A	Connector B
1	Front left door(+)	Front center(+)
2	Front Right door(+)	-
3	Rear left door(+)	-
4	Rear Right door(+)	-
5	Subwoofer 2(+)	NAVI(+)
6	Subwoofer 1(+)	ACC
7	Front left door(-)	CAN (-)
8	Front Right door(-)	CAN (+)
9	Rear left door(-)	-
10	Rear Right door(-)	Battery
11	Subwoofer 2(-)	Battery
12	Subwoofer 1(-)	Front center(-)
13		-
14		-
15		-
16		NAVI(-)
17		SPDIF Signal
18		SPDIF (-)
19		SPDIF (+)
20		-
21		GND
22		GND

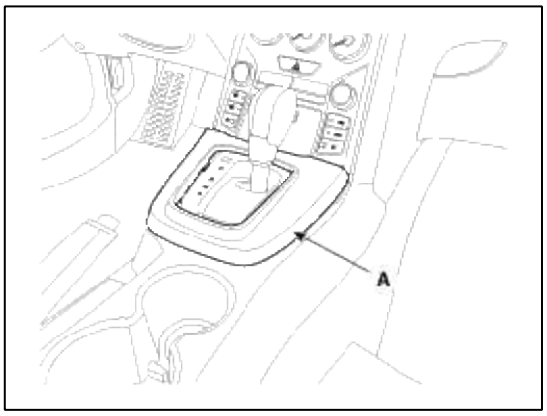
Body Electrical System > Audio > Audio Unit > Repair procedures

Removal

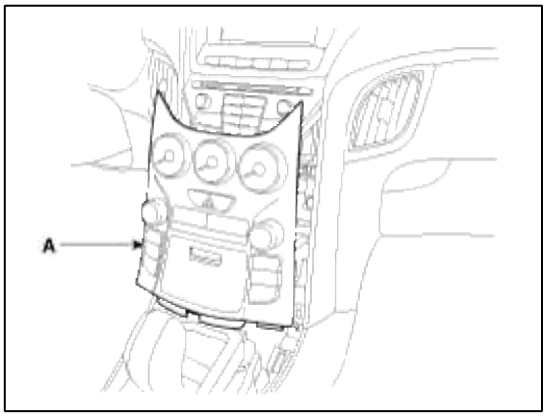
Audio Head Unit

1. Disconnect the negative (-) battery terminal.

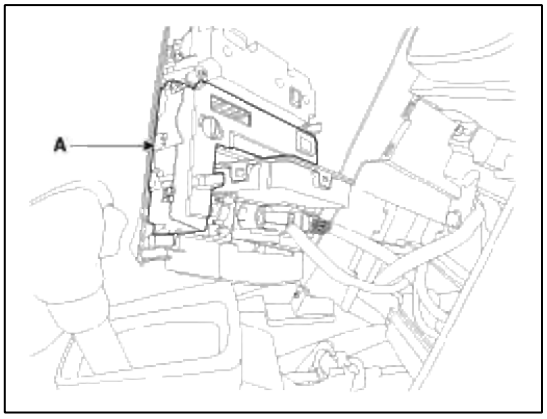
2. Remove the console upper cover(A).



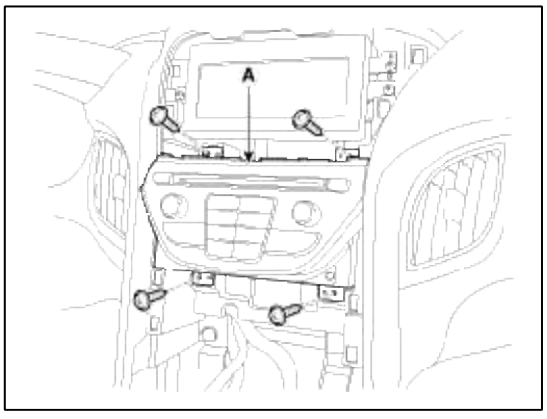
3. Remove the center fascia lower panel(A).
(Refer to the BD group - "Crash pad")



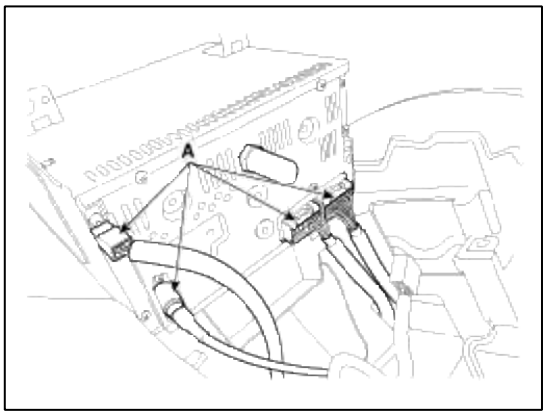
4. Remove the connectors and cables (A).



5. Remove the mounting screws then remove the audio head unit(A).

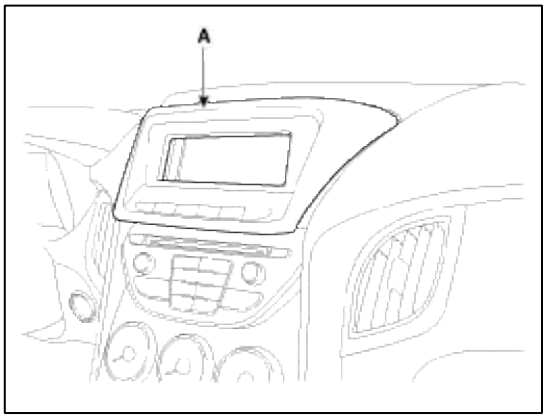


6. Remove the connectors and cable(A).

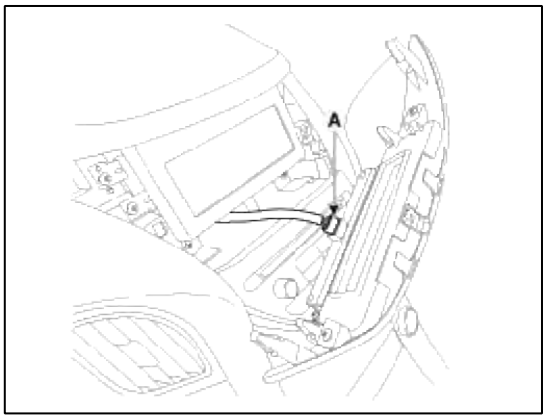


Audio Monitor

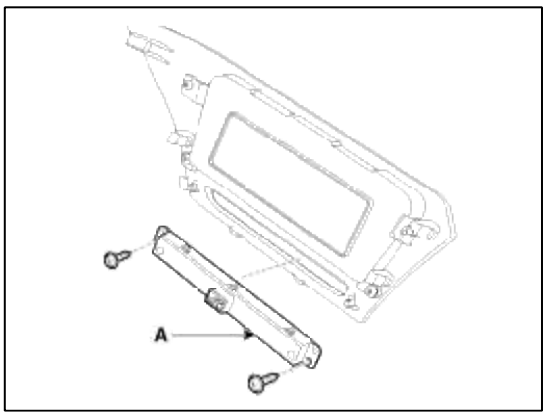
1. Disconnect the negative (-) battery terminal.
2. Remove the center fascia upper panel (A).
   (Refer to the BD group - "Crash pad")



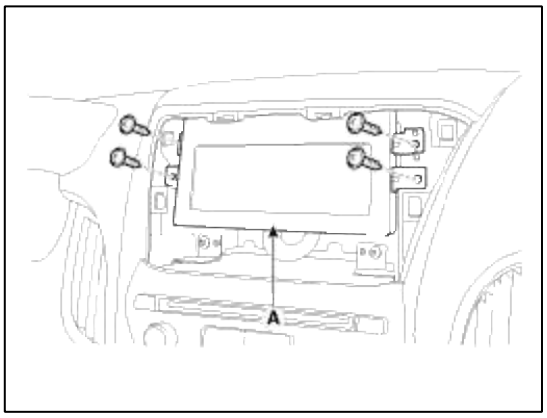
3. Disconnect the connector (A) from external keyboard.



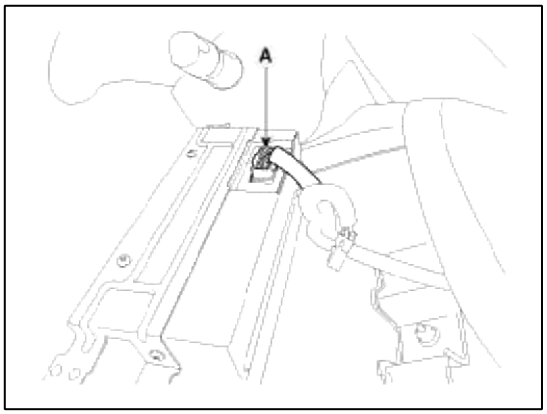
4. Remove the external keyboard (A) after loosening the mounting screws.



5. Remove the audio monitor (A) after loosening the mounting screws.

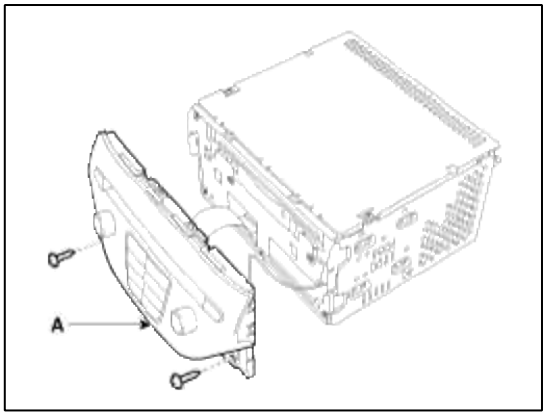


6. Disconnect the connector (A) from audio monitor.

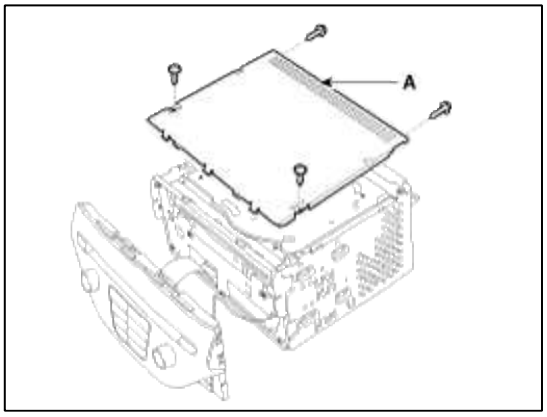


Disassembly

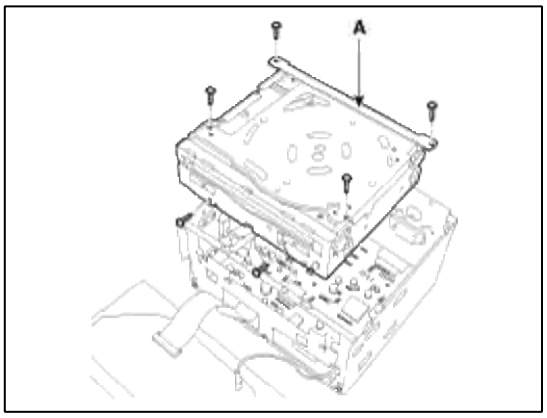
1. Remove the front panel (A) after loosening the mounting screws.



2. Remove the upper cover (A) after loosening the mounting screws.



3. Remove the CD deck (A) after loosening the mounting screws.



Reassembly

1. Reassemble the deck to the audio unit.
2. Reassemble the upper cover.
3. Reassemble the front panel.
4. Reassemble the audio brackets.

> NOTE
>
> Make sure the film connector and cable jack are plugged in properly.

Installation

Audio Head Unit

1. Connect the audio unit connectors and cables.
2. Install the audio unit.
3. Install the center fascia lower panel.
4. Install the console upper cover.
5. Check the audio system.

> NOTE
>
> Make sure the audio head unit connectors are plugged in properly and the antenna cable is connected properly.

Audio Monitor

1. Install the audio monitor.
2. Install the upper cover and connect the external keyboard connector.
3. Install the center fascia upper panel.

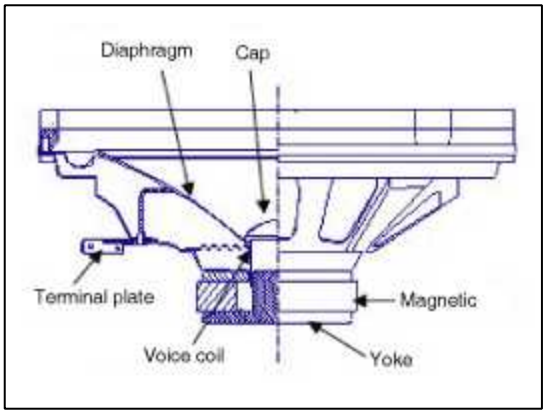
Body Electrical System > Audio > Speakers > Repair procedures

Inspection

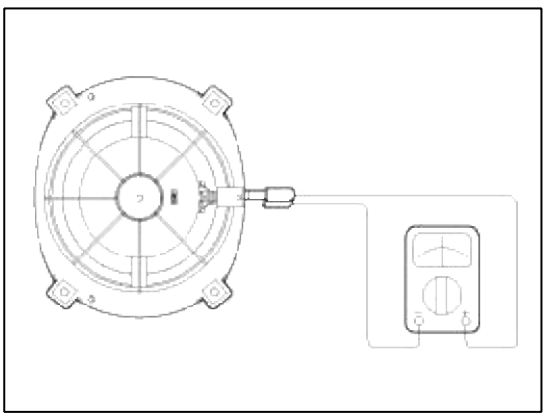
1. Troubleshooting for Speaker

(1) Basic inspection of speaker

Inspect the sound from speaker after verifying that the speaker mounting screws is removed and the wiring connector is connected precisely to remove vibration transmitted from body trims and surrounding parts.



(2) Case Troubleshooting

No.	Case	Inspection/Remedy
1	Trembling sound	1. Before replacing the speaker, inspect that the mounting screw is installed normally. 2. After re-installing the speaker, verify that no trembling sound is heard. 3. When hearing a trembling sound again, replace the speaker with new one.
2	Noise	1. Check if the wiring connector is connected normally. If not, reconnect the wiring connector. 2. In case of radio static, check if there is a noise from CD. 3. When a noise is heard on turning radio and CD on, replace the speaker with new one. NOTE In case there is only radio static, this causes from poor radio reception. Thus the speaker needs no repair and replacement.
3	Poor working	Inspection of the wiring connection between the battery and the speaker 1. Before replacing the speaker, inspect the wiring connection between the battery and the speaker is normal. 2. Check the supplying power to the speaker and the resistance, then inspect the sound quality. ■ Specified impedance : 2 ~ 4Ω  3. If the speaker works poorly, replace it with new one.

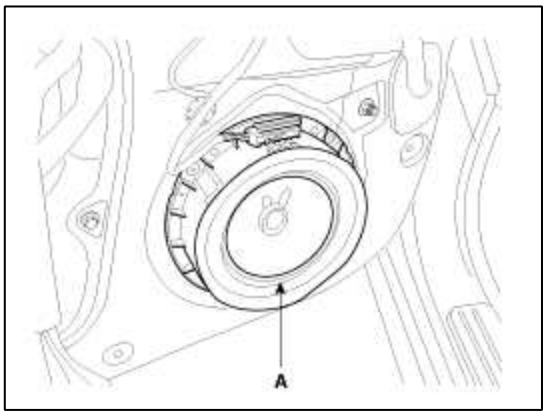
CAUTION

During handling of speaker
- During dealing of speaker
- Do not damage the speaker with impact as like a drop and a throw.
- Be careful not to spill water and oil over the speaker.
- Caution during handling of speaker because the material of diaphragm is paper which is easy to be torn by impact and external force.
- Modifying audio system can damage the speakers.
- And, in this case the speakers are not covered by the manufacturer's warranty.

Removal

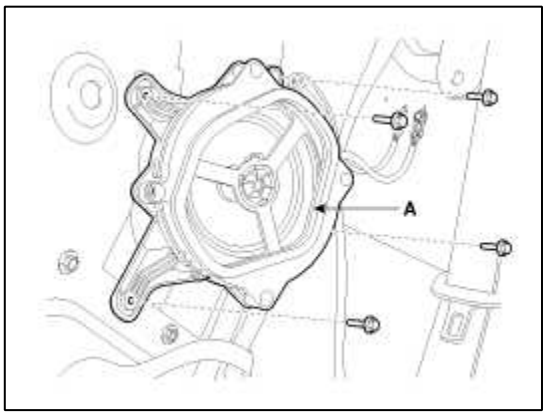
Front Speaker

1. Remove the front door trim panel.
   (Refer to the Body group - "Front door")
2. Remove the front speaker (A) after loosening 4 rivets.



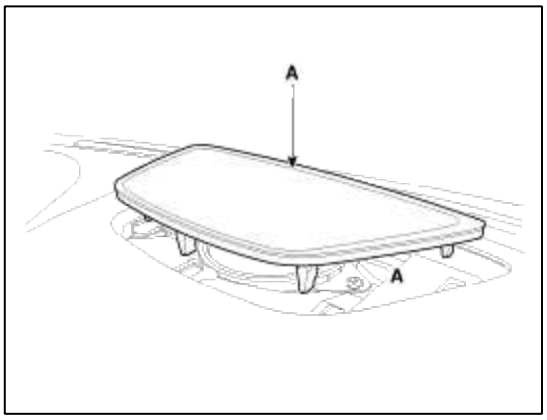
Rear Speaker

1. Remove the rear seat.
   (Refer to the Body group - "Rear seat")
2. Remove the rear side trim and then remove the rear speaker (A) after removing 4 bolts.

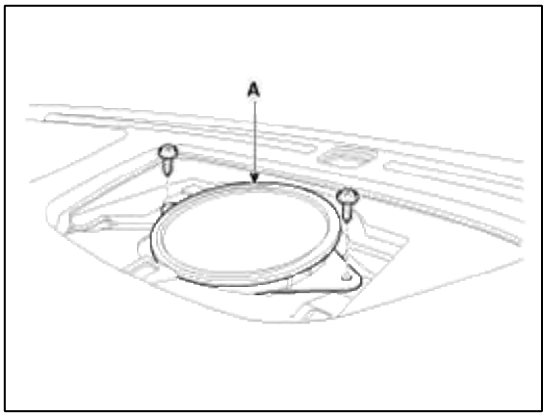


Crash pad center speaker

1. Remove the center speaker cover(A).

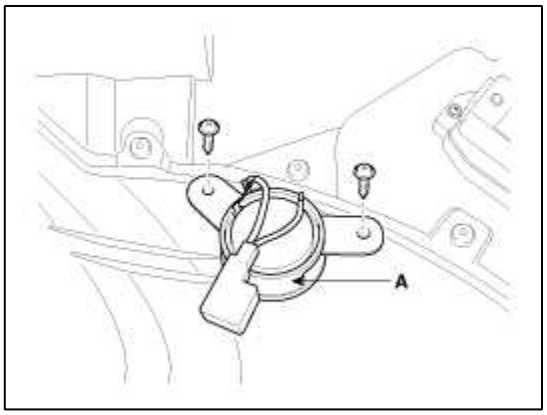


2. Remove the center speaker(A) after loosening the mounting screws.



Tweeter Speaker

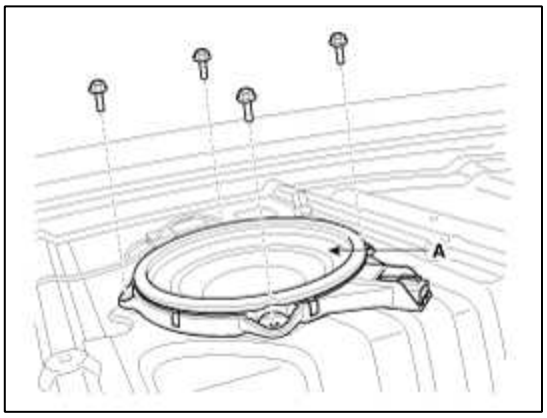
1. Remove the front door trim(A).
   (Refer to the Body group - "Front door")
2. Remove the tweeter speaker(A) from the front door trim after disconnecting the connector.



Woofer Speaker

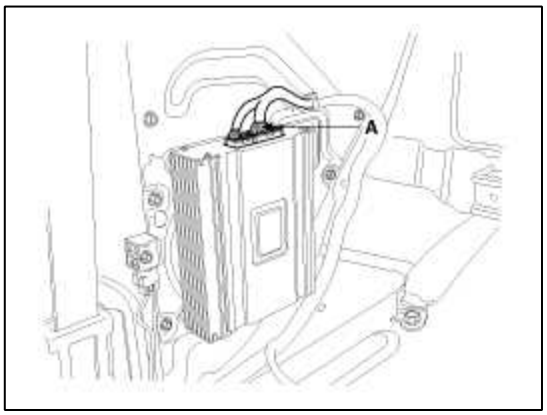
1. Fold the rear seat forward.
   (Refer to the Body group - "Rear seat")
2. Remove the rear package tray.
   (Refer to the Body group - "Interior trim")

3. Remove the woofer speaker (A) after removing 4 bolts.

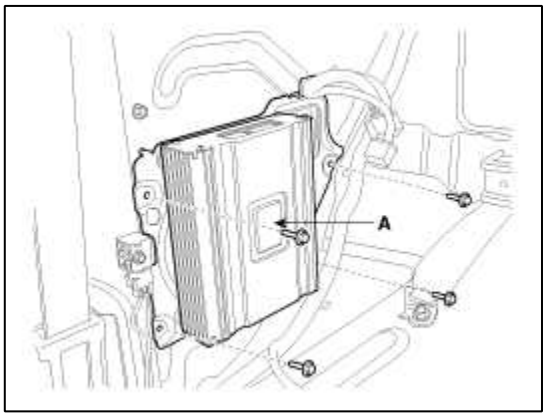


External Amp

1. Remove the rear seat.
   (Refer to BD group - "Rear seat")
2. Remove the rear right side trim.
3. Remove the external amplifier connector(A) from the rear right quarter panel.



4. Remove the external amplifier(A) after loosening the mounting bolts.



Installation

Front Speaker

1. Install the front speaker with rivets.
2. Install the front door trim.

Rear Speaker

1. Install the rear speaker.
2. Install the rear side trim.
3. Install the rear seat.

Crash pad center speaker

1. Install the center speaker.
2. Install the center speaker cover.

Tweeter Speaker

1. Install the tweeter speaker after connecting the tweeter speaker connector.
2. Install the front door trim.

Woofer Speaker

1. Install the woofer speaker after connecting the connector.
2. Install the rear package tray and rear seat assembly.

External Amp

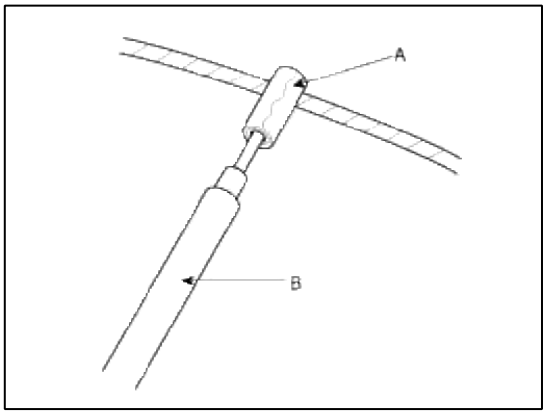
1. Install the external amplifier after connecting the connector.
2. Install the rear right side trim.

Body Electrical System > Audio > Antenna > Repair procedures

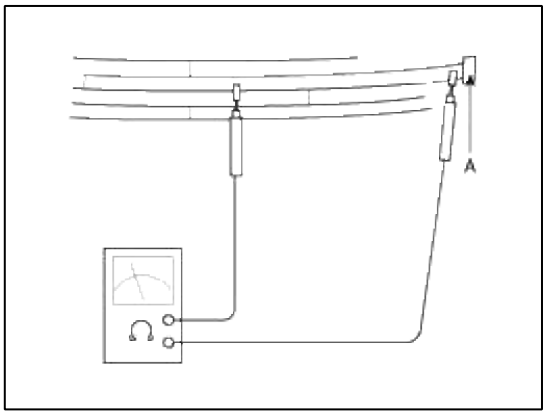
Inspection

Glass Antenna Test

1. Wrap aluminum foil (A) around the tip of the tester probe (B) as shown.



2. Touch one tester probe to the glass antenna terminal (A) and move the other tester probe along the antenna wires to check that continuity exists.

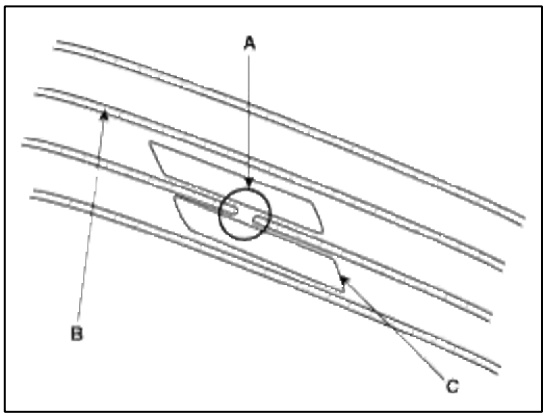


Glass Antenna Repair

NOTE

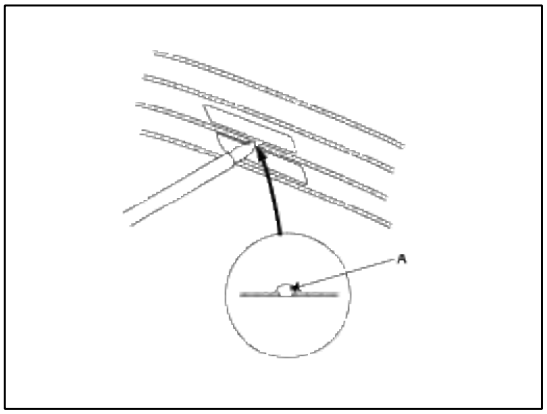
To make an effective repair, the broken section must be no longer than one inch.

1. Lightly rub the area around the broken section (A) with fine steel wool, and then clean it with alcohol.



2. Carefully mask above and below the broken portion of the glass antenna wire (B) with cellophane tape (C).
3. Using a small brush, apply a heavy coat of silver conductive paint (A) extending about 1/8″on both sides of the break. Allow 30 minutes to dry.

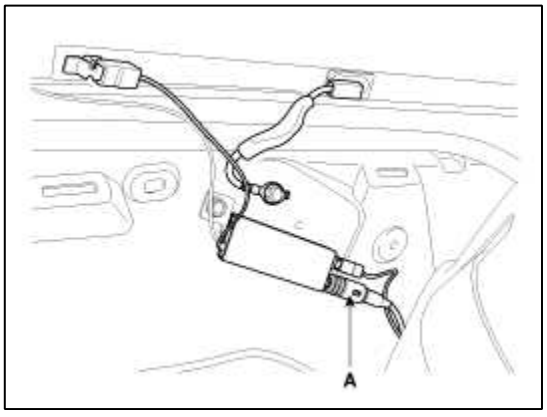
> NOTE
>
> Thoroughly mix the paint before use.



4. Check for continuity in the repaired wire.
5. Apply a second coat of paint in the same way. Let it dry three hours before removing the tape.

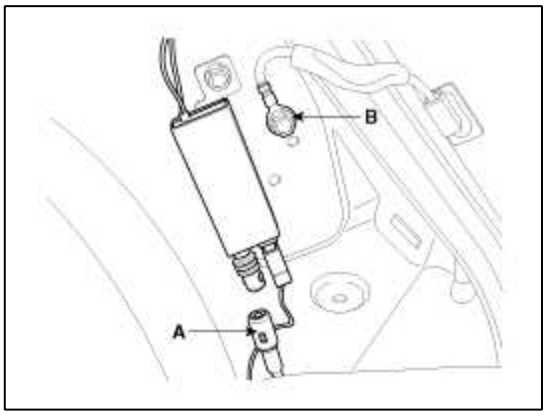
Glass Antenna Circuit Inspection

1. Remove the right side rear quarter trim.
   Then disconnect the antenna feeder cable(A) from the glass antenna amp.

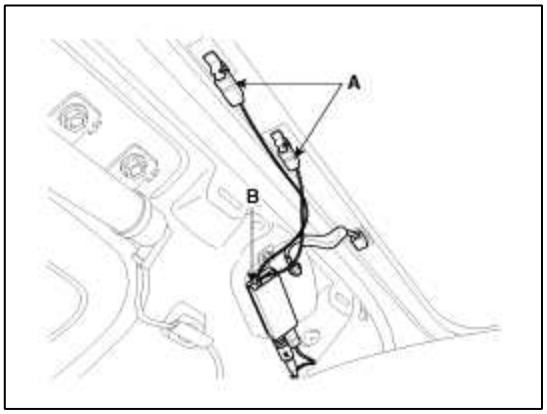


2. Turn the radio ON.
   Measure the voltage between terminal 2 of the harness side feeder cable(A) and body ground(B).

OK : approximately 12V (ACC+)



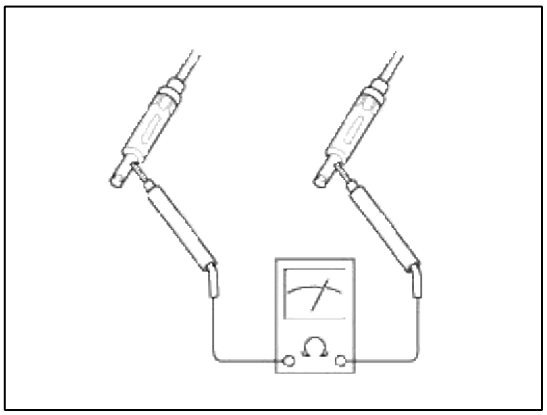
3. Disconnect the 2P connector of radio wiring from the glass antenna amp.
4. Check for continuity between terminals of harness side connector(B) and antenna grid terminals(A).



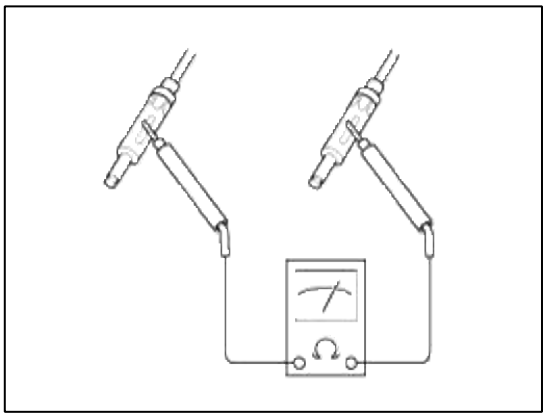
5. Check the grid lines for continuity.
6. When a poor radio reception is not repaired through the above inspection methods, replace the amp.
   If the radio reception is still poor, check the radio cable for short and radio head unit for failure.

Antenna Cable

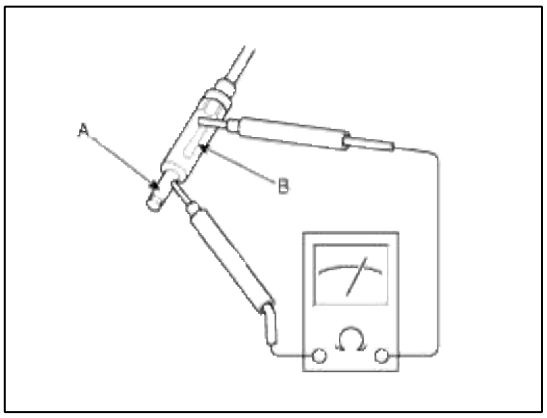
1. Remove the antenna jack from the audio unit and antenna.
2. Check for continuity between the center poles of antenna cable.



3. Check for continuity between the outer poles of antenna cable. There should be continuity.



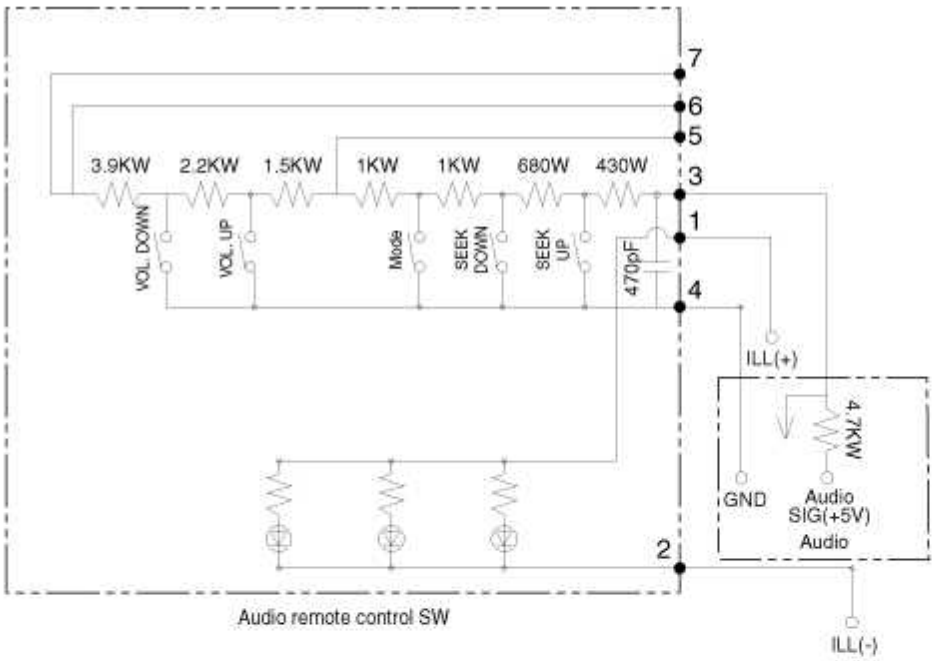
4. If there is no continuity, replace the antenna cable.
5. Check for continuity between the center pole (A) and outer pole (B) of antenna cable. There should be no continuity.

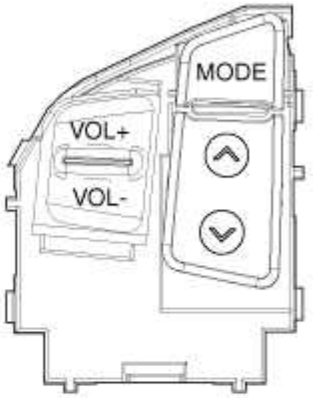


6. If there is continuity, replace the antenna cable.

Body Electrical System > Audio > Audio Remote Control > Schematic Diagrams

Circuit Diagram



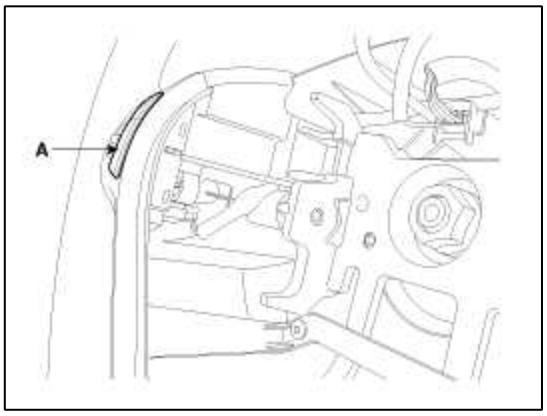


Pin No.	Name
1	ILL (+)
2	ILL (-)
3	Audio (+)
4	Audio (-)
5	Mute Out
6	-
7	-
8	-

Body Electrical System > Audio > Audio Remote Control > Repair procedures

Inspection

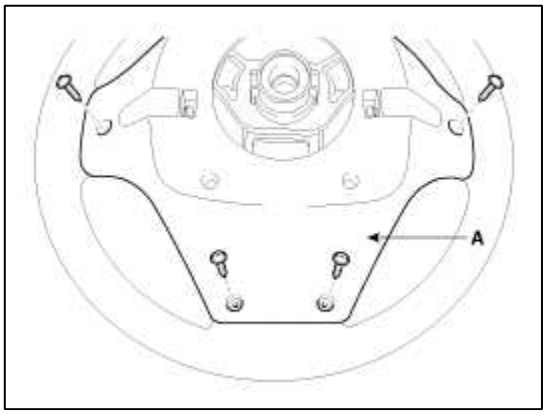
1. Check the audio remote control switch(A) for resistance between No.3 and No.4 terminals in each switch position.



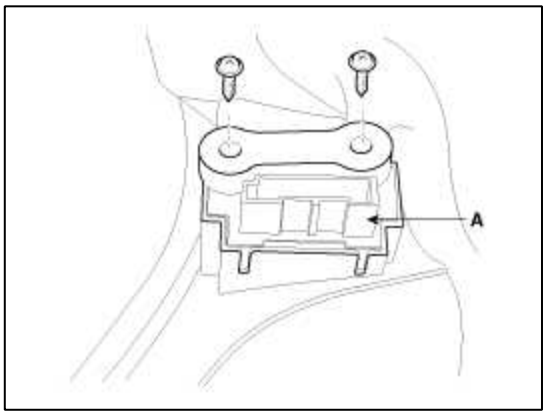
Switch	Connector terminal	Resistance (±5%)
Volume Down	3 - 4	6.81 kΩ
Volume Up	3 - 4	4.61 kΩ
Seek Up	3 - 4	430 Ω
Seek Down	3 - 4	1.11 kΩ
Mode	3 - 4	2.11 kΩ

Removal

1. Disconnect the negative (-) battery terminal.
2. Remove the driver airbag module.
   (Refer to the airbag group)
3. Remove the steering wheel.
   (Refer to ST group - "Steering column & shaft")
4. Remove the steering wheel cover after loosening the 4 screws.



5. Remove the audio remote control switch (A) after removing the steering wheel remote control switch connector and 2 screws.



Installation

1. Reassemble the steering wheel remote control switch after connecting the connector.
2. Reassemble the steering wheel.
3. Reassemble the driver airbag module.

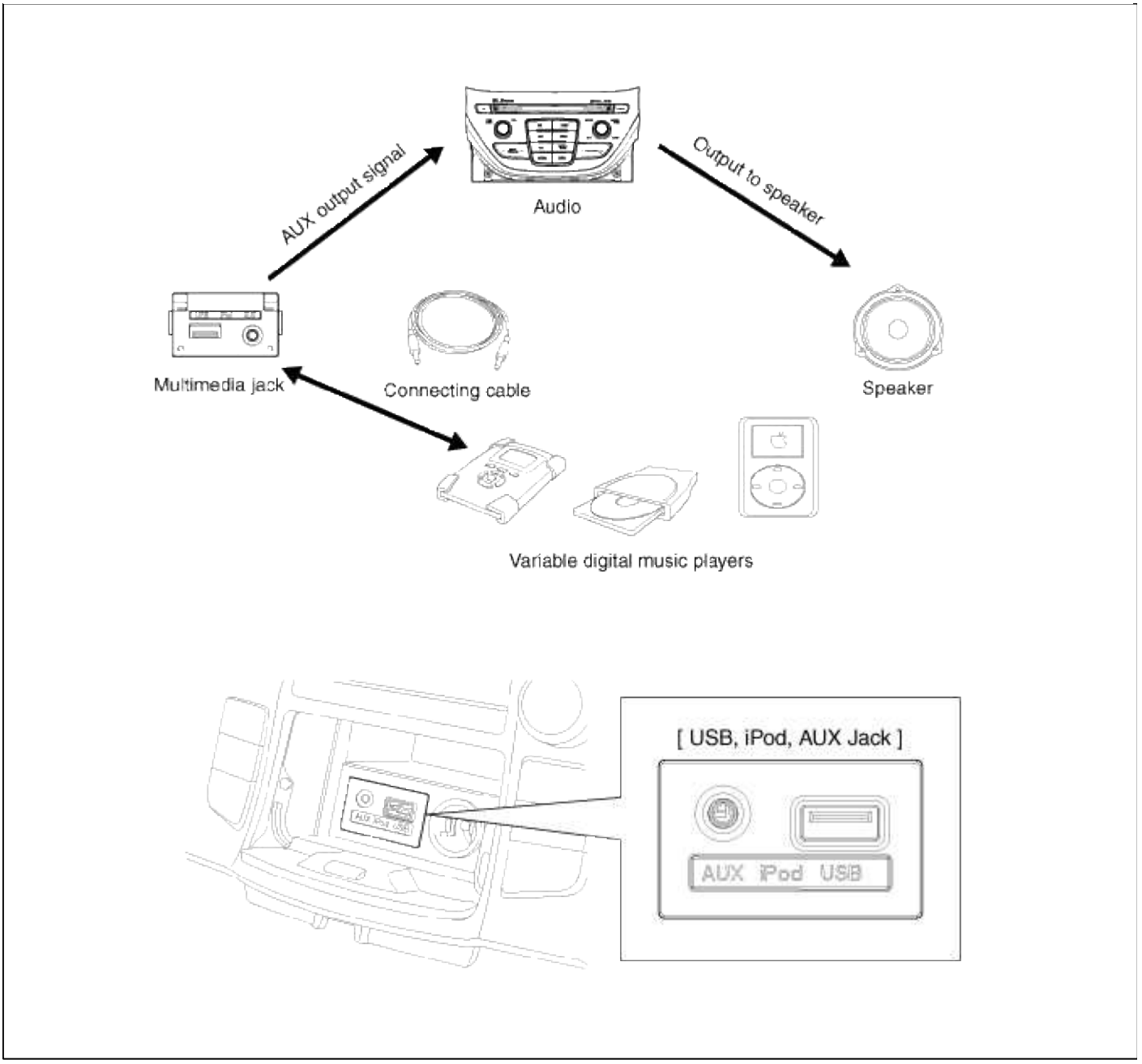
> NOTE
>
> Make sure the audio remote control switch and the airbag module connectors are plugged in properly.

Body Electrical System > Audio > AUX(Auxiliary) Jack > Description and Operation

Description

The multimedia jack on the console upper cover is for customers who like to listen to external portable music players like the MP3, iPod and etc., through the vehicle's sound system when it is linked to this jack. The customer has this added option.

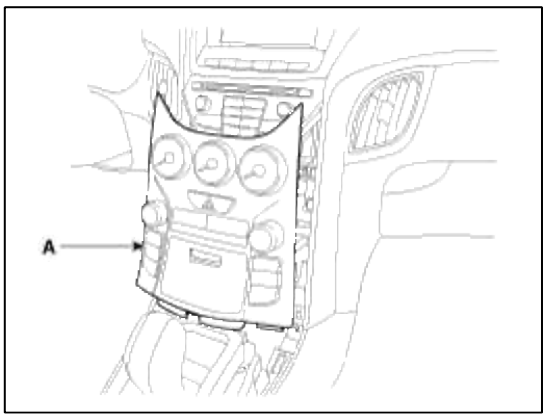
In case of distortions from media connected to the AUX source, the audio unit may not be defect but the output level of the used media does not match the specification of the AUX input.



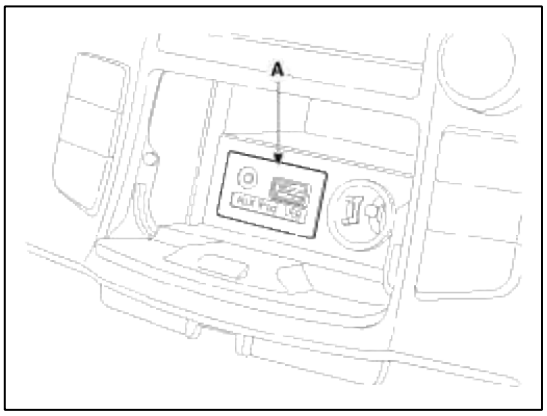
Body Electrical System > Audio > AUX(Auxiliary) Jack > Repair procedures

Removal

1. Disconnect the negative (-) battery terminal.
2. Remove the center fascia lower panner (A).
   (Refer to BD group - "Crash pad")



3. Remove the multimedia jack(A) from the center fascia lower pannel after disconnecting the connertor.



Installation

1. Install the multimedia jack.
2. Connect the AUX jack connector.
3. Install the center fascia lower pannel.

> NOTE
>
> Make sure the Aux connector and the console connectors are plugged in properly.

Body Electrical System > Audio > Troubleshooting

Troubleshooting

Customer Complaint Analysis Check Sheet

TROUBLE IN	☐ ALL ☐ AM ☐ FM ☐ CD ☐ MP3 ☐ CD changer ☐ AMP ☐ Others
TROUBLE OCCURS	☐ Always ☐ Engine start ☐ Engine Running ☐ Cold ☐ Warm ☐ Sometimes ☐ Most of the time ☐ Engine off
TYPE OF TROUBLE	☐ Will not play ☐ Weak ☐ Squealing noise ☐ Display/illumination poor ☐ CD skips & jumps ☐ CD will not eject or insert ☐ Others (Describe) :
OTHERS	▶ Customer complaint contents : ▶ Have you checked customer's defects :
★ Using the customer complaint analysis check sheet for reference, ask the customer for as much detail as possible about the problem.	

There are four areas where a problem can occur: wiring harness, the radio, the CD player, and speaker. Troubleshooting enables you to confine the problem to a particular area.

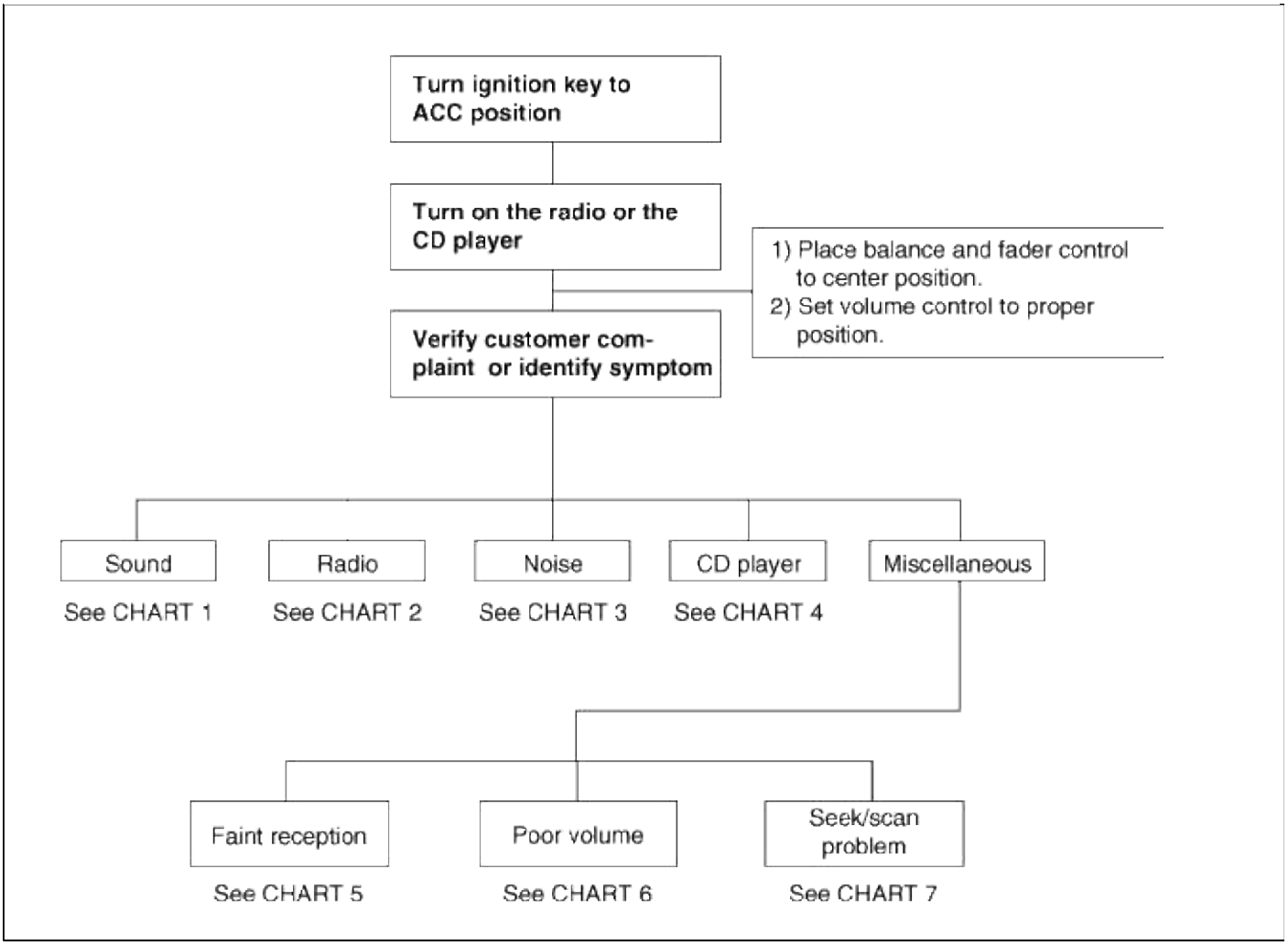
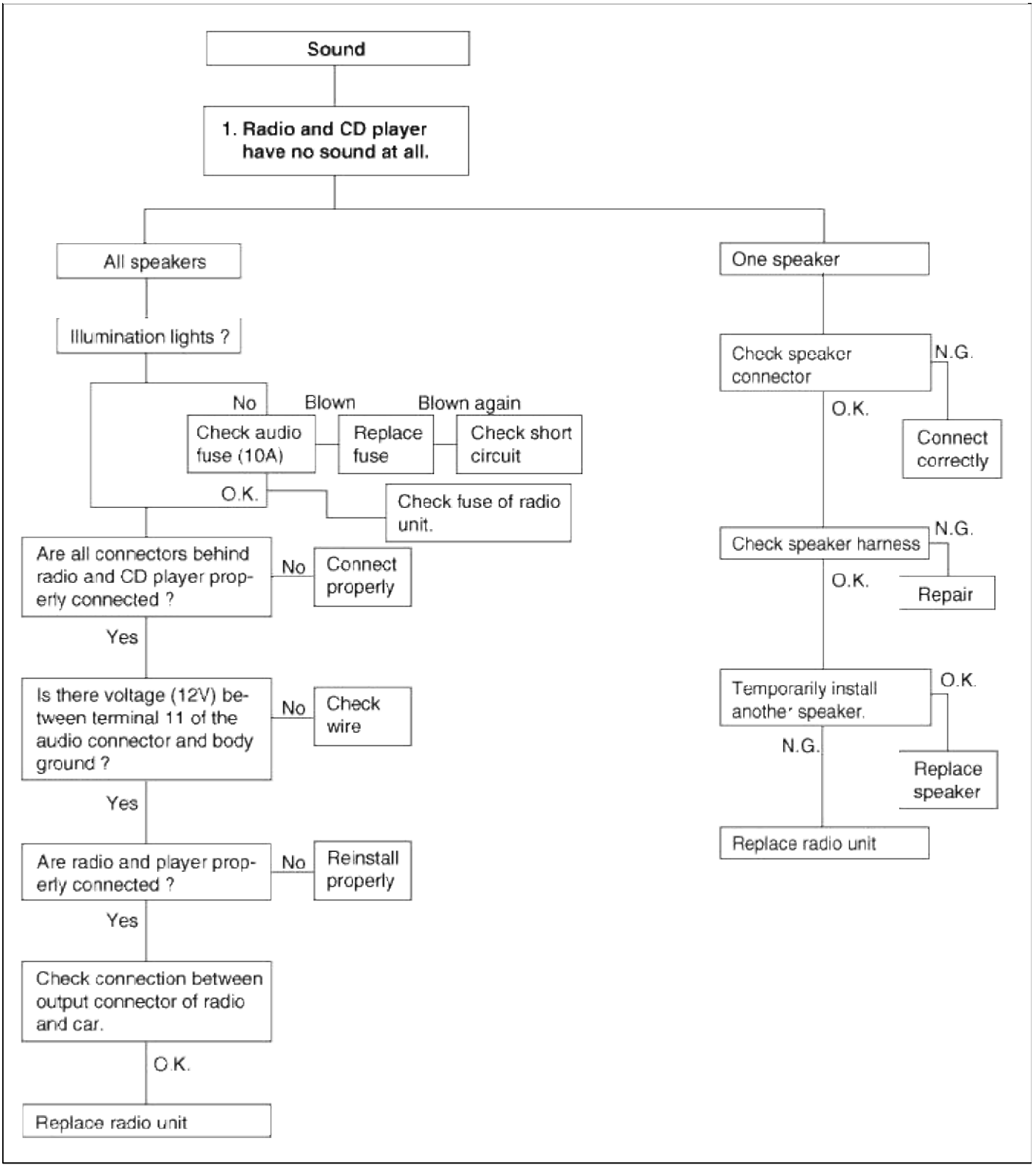


Chart 1


Sound
1. Radio and CD player have no sound at all.
All speakers
Illumination lights ?
No
Blown
Blown again
Check audio fuse (10A)
Replace fuse
Check short circuit
O.K.
Check fuse of radio unit.
Are all connectors behind radio and CD player properly connected ?
No
Connect properly
Yes
Is there voltage (12V) between terminal 11 of the audio connector and body ground ?
No
Check wire
Yes
Are radio and player properly connected ?
No
Reinstall properly
Yes
Check connection between output connector of radio and car.
O.K.
Replace radio unit
One speaker
Check speaker connector
N.G.
O.K.
Connect correctly
Check speaker harness
N.G.
O.K.
Repair
Temporarily install another speaker.
O.K.
N.G.
Replace speaker
Replace radio unit

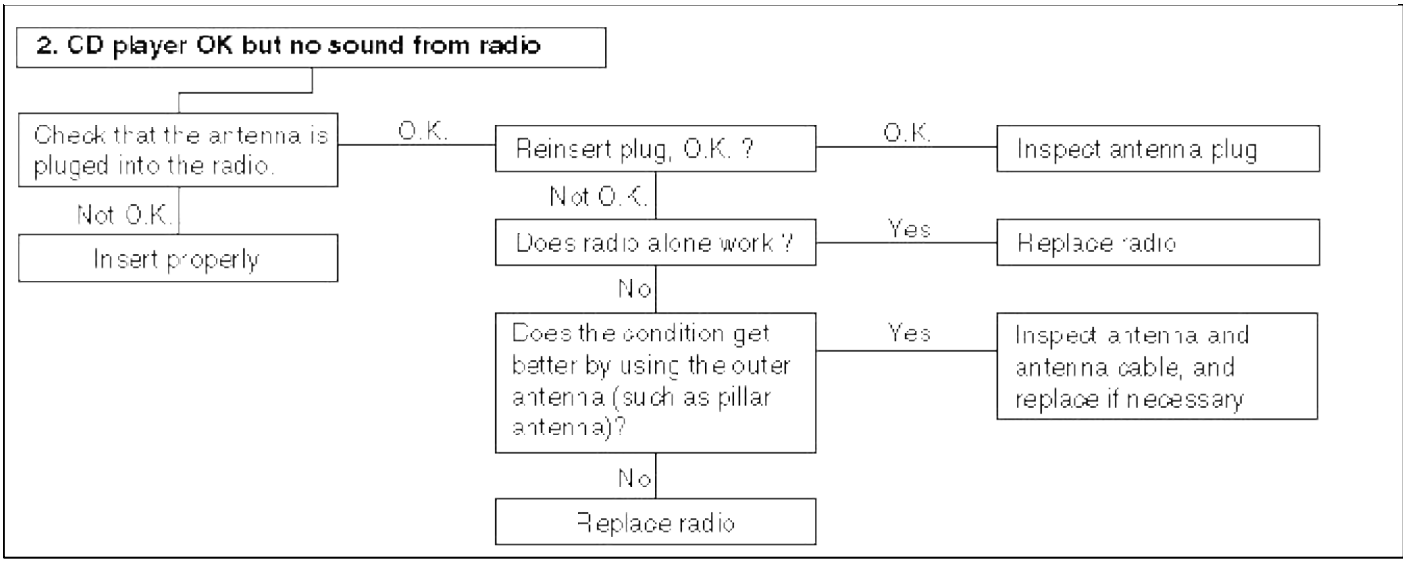


Chart 2

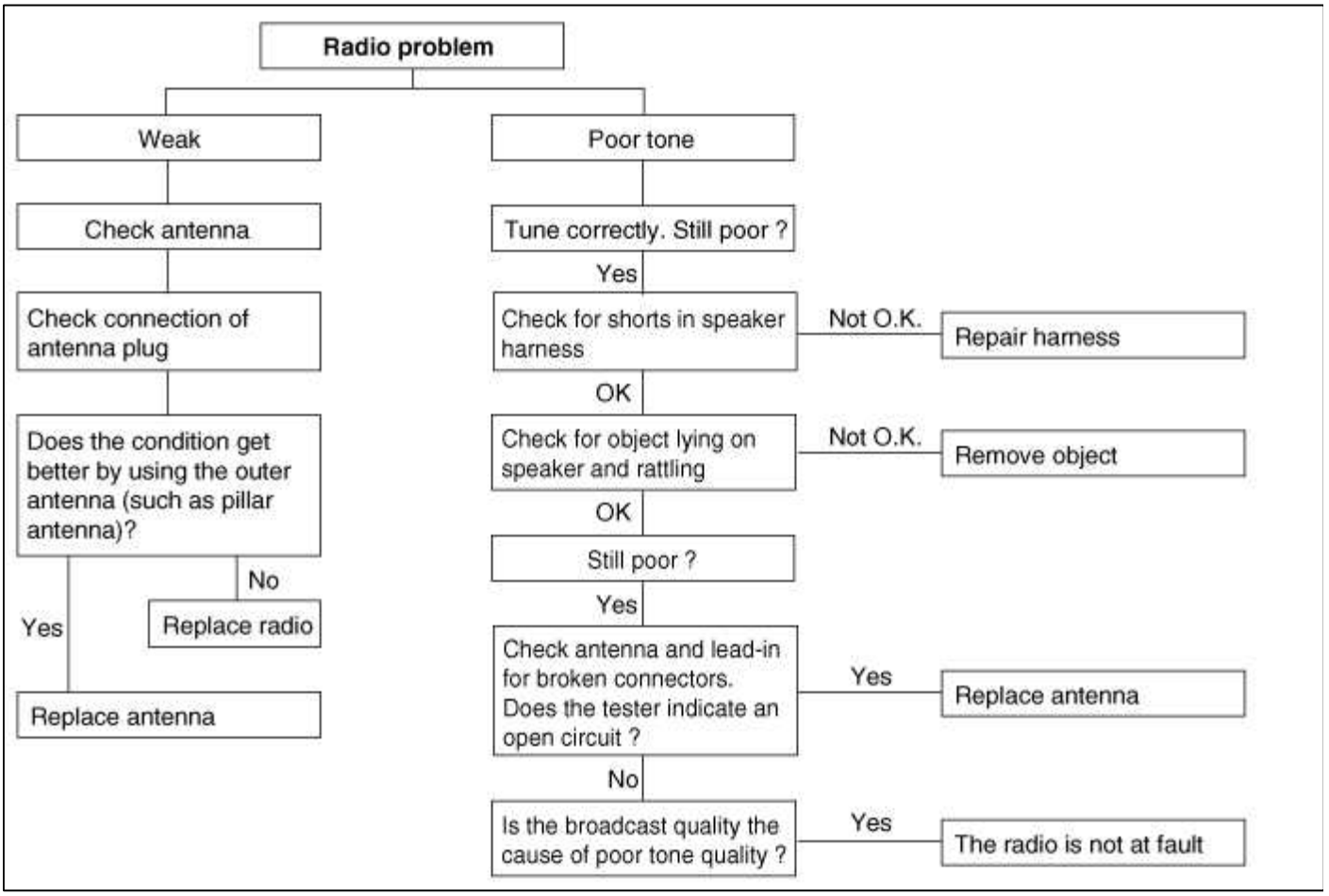


Chart 3

1. RADIO

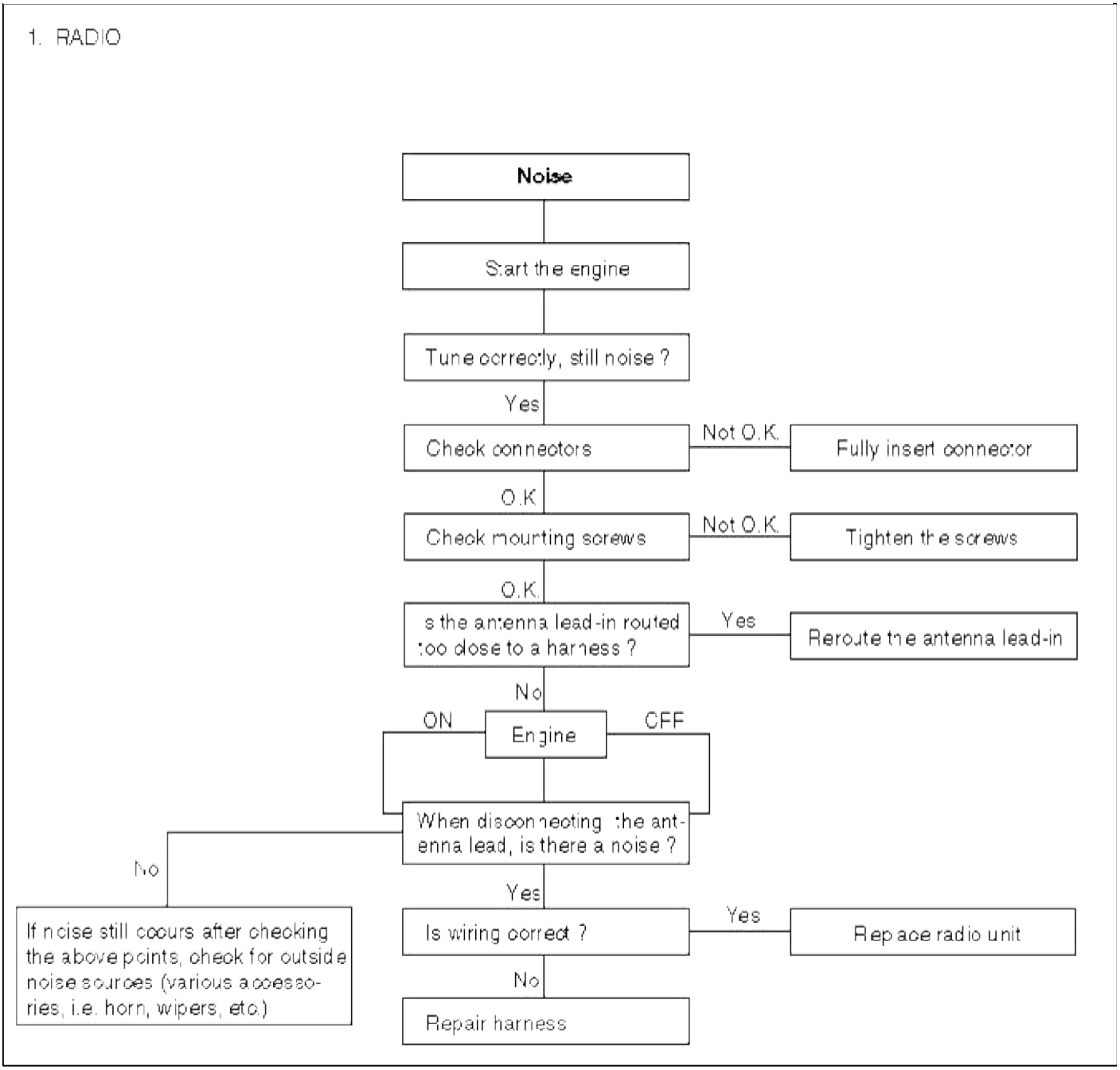
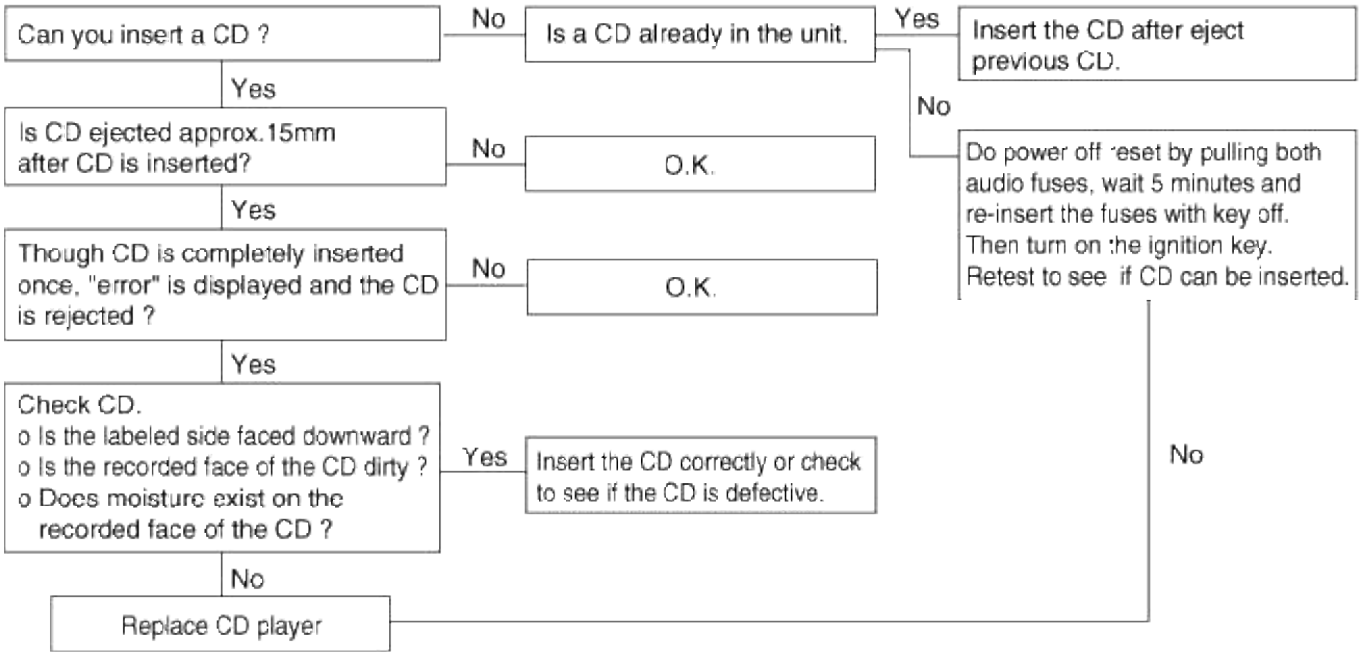
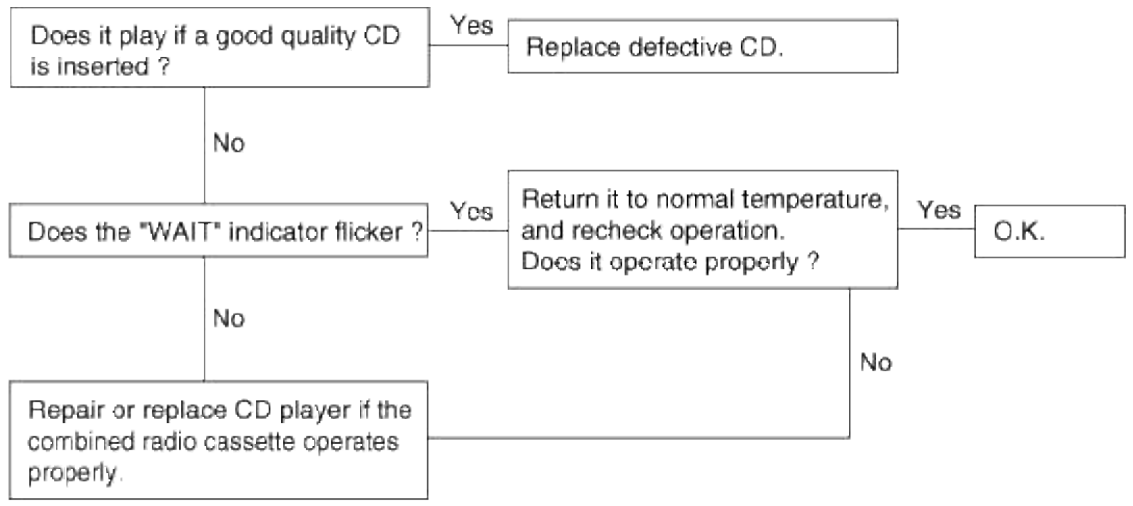


Chart 4

1. CD WILL NOT BE ACCEPTED

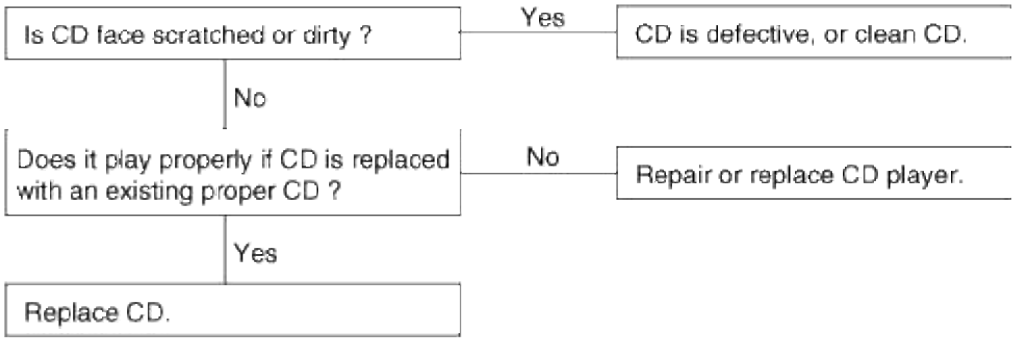


2. NO SOUND

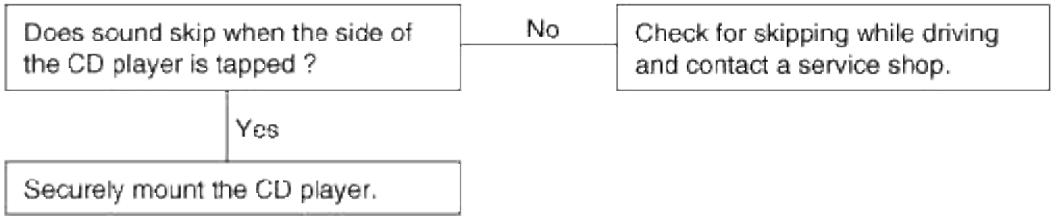


3. CD SOUND SKIPS

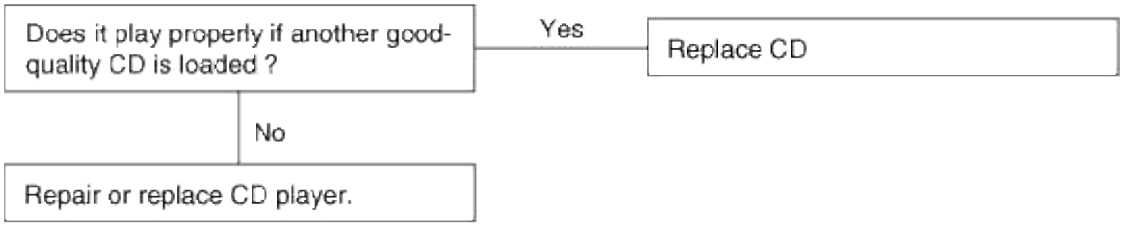
1) Sound sometimes skips when parking.



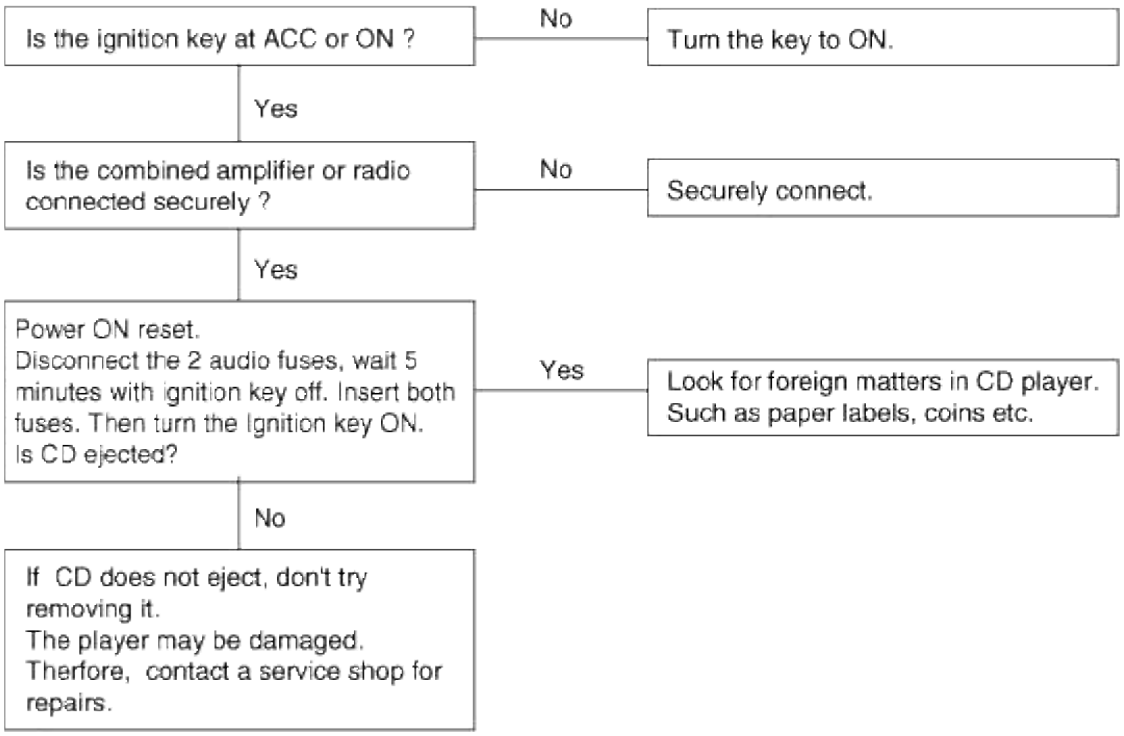
2) Sound sometimes skips when driving.
(Stop vehicle, and check it.)
(Check by using a CD which is free of scratches, dirt or other damage.)



4. SOUND QUALITY IS POOR



5. CD WILL NOT EJECT



6. NO SOUND FROM ONE SPEAKER

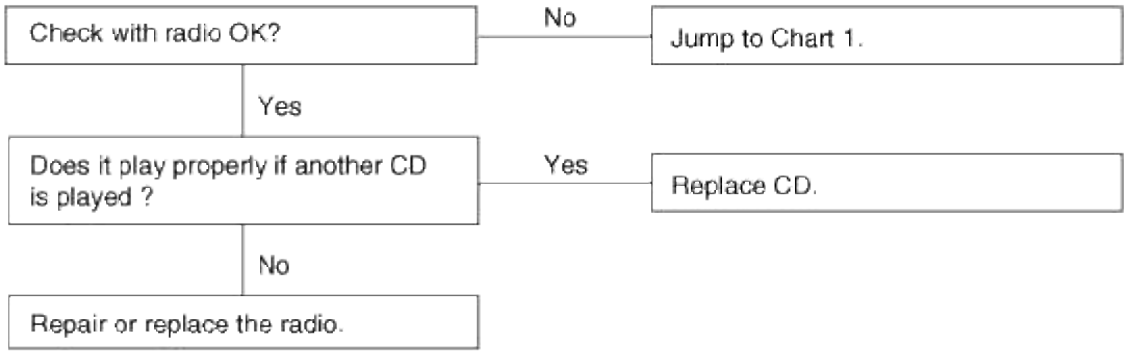


Chart 5

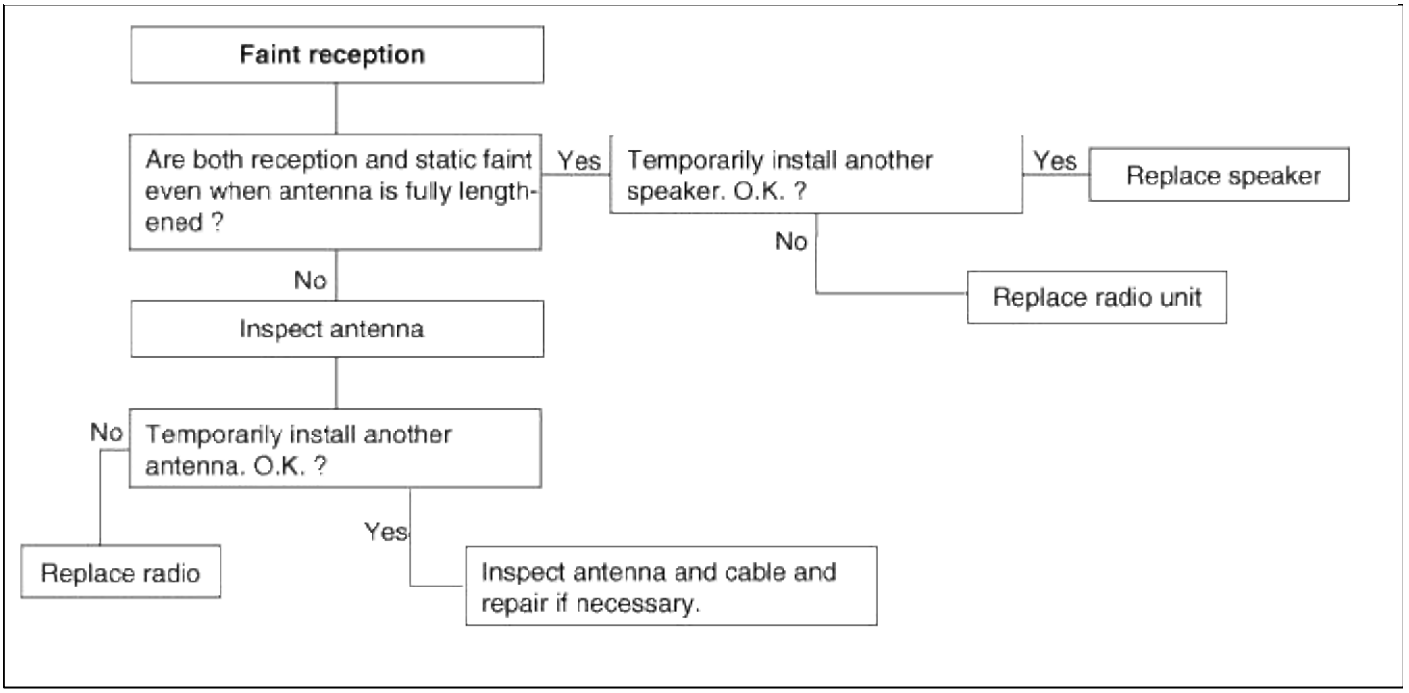


Chart 6

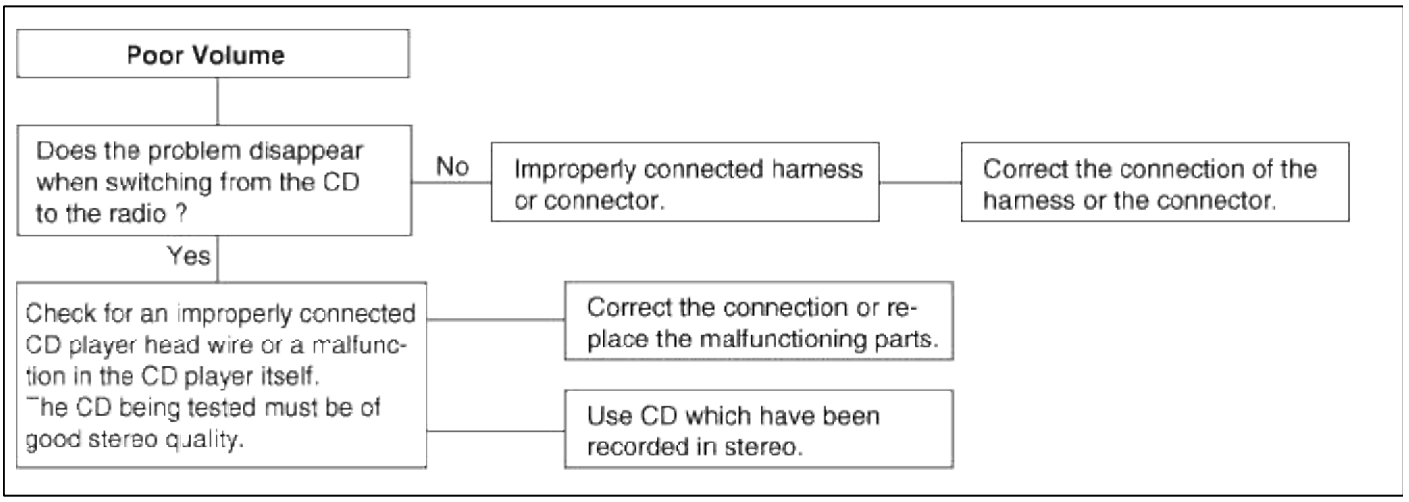
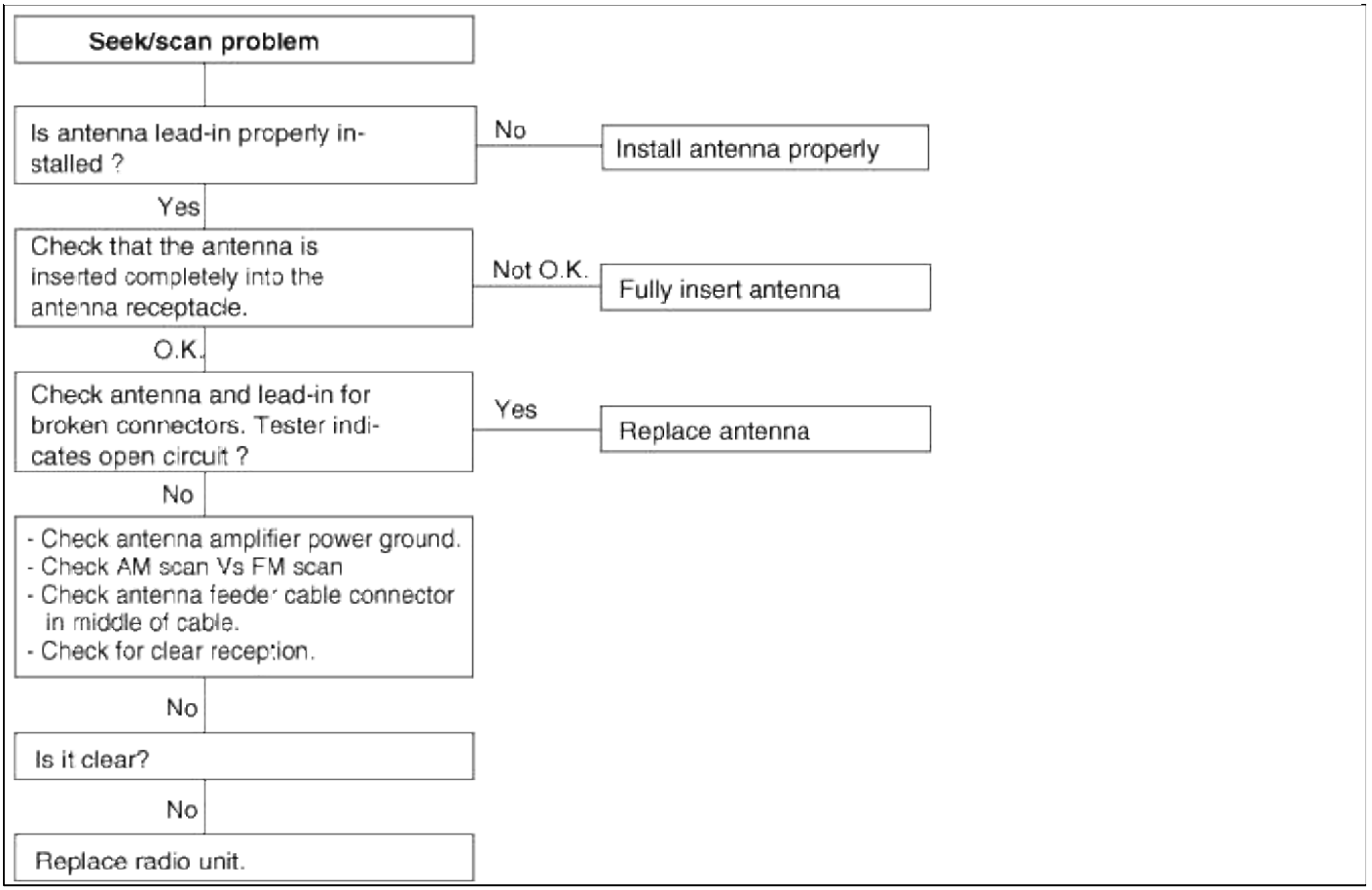


Chart 7



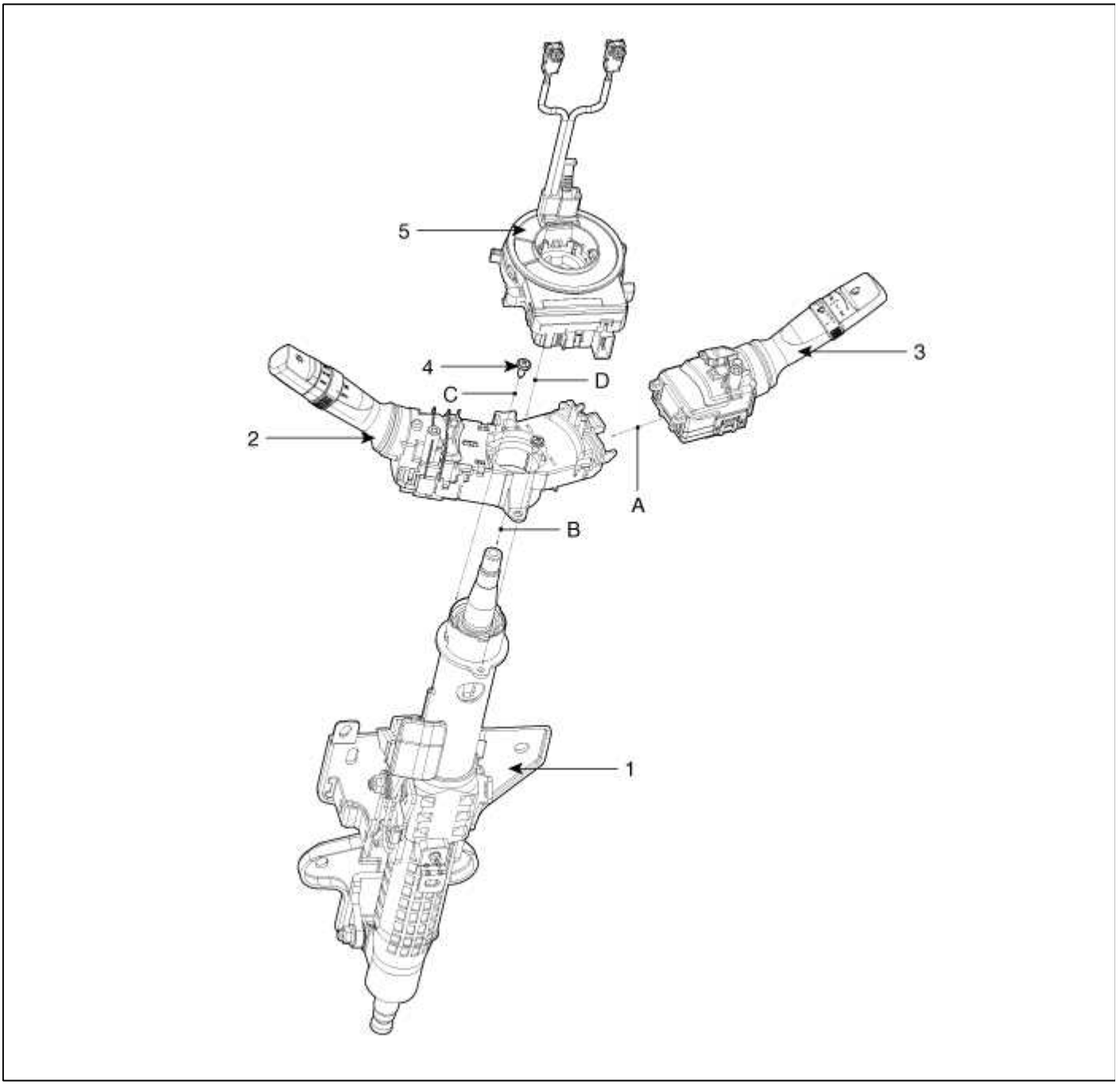
Body Electrical System > Multifunction switch > Specifications

Specifications

Items		Specifications
Rated voltage		DC 12V
Operating temperature range		-30°C ~ +80°C (-22 ~ +176°F)
Rated load	Dimmer & passing switch	High : 0.2A (Relay load) Low : 0.2A (Relay load) Passing : 0.2A (Relay load)
	Lighting switch	Lighting : 0.2A (Relay load)
	Turn signal & lane change switch	6.6 ± 0.5A (Lamp load)
	Front & rear fog lamp switch	0.2A (Relay load)
	Wiper & mist switch	Low, High : 4.5A (Motor load) Intermittent : 0.22 ± 0.5A (Relay load) Lock : Max. 28A (Motor load)
	Washer switch	4A (Motor load)
	Variable intermittent volume switch	Max. 25mA

Body Electrical System > Multifunction switch > Components and Components Location

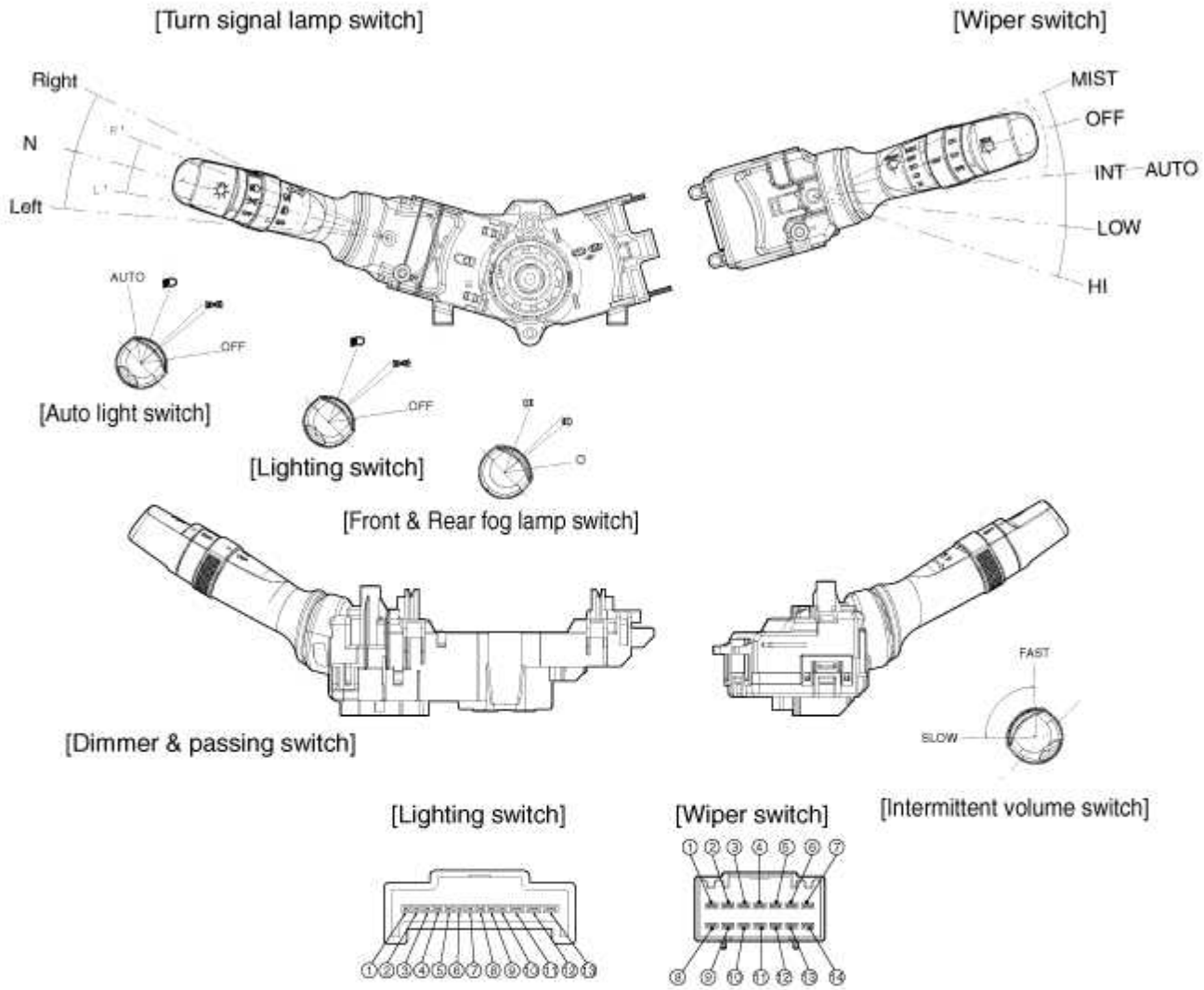
Component (1)



* Installation order : A→B→C→D

1. Steering column shaft 2. Lighting switch 3. Wiper and washer switch	4. Screw 5. Clock spring

Component (2)



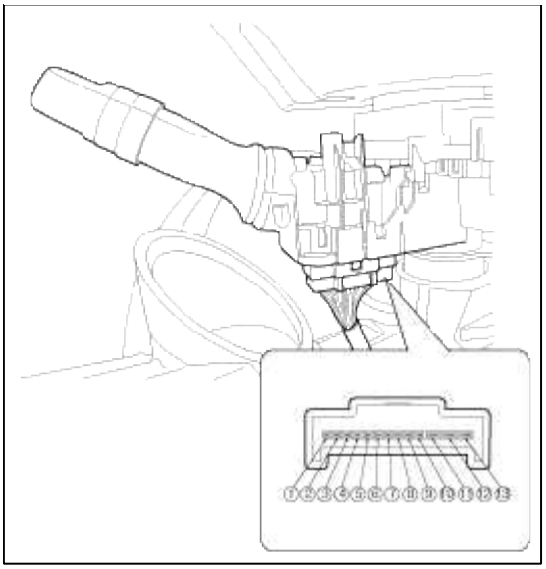
Connector	Pin NO.	Name	Connector	Pin NO.	Name
Lighting SW (13pin)	1	Tail lamp sw	Wiper & washer SW (14pin)	1	Mist sw
	2	Lighting sw ground		2	Wiper parking
	3	Auto light sw		3	Wiper low speed
	4	H/lamp sw		4	Intermittent volume base
	5	Fog sw base		5	Intermittent time base
	6	Front fog sw		6	-
	7	Rear fog sw		7	-
	8	Head lamp low beam		8	Intermittent wiper sw
	9	Head lamp high beam		9	Wiper high speed
	10	Dimmer sw base		10	IGN(2)- Front washer & wiper
	11	Turn signal lamp - left		11	Front washer
	12	Turn signal base		12	-
	13	Turn signal lamp - right		13	-
				14	-

Body Electrical System > Multifunction switch > Repair procedures

Inspection

Lighting Switch Inspection

With the multi function switch in each position, make sure that continuity exists between the terminals below. If continuity is not as specified, replace the multi-function switch.



Lighting Switch (Auto Light)

Position \ Terminal	1	4	3	2
OFF				
I	○			○
II	○	○		○
AUTO			○	○

Lighting Switch

Position \ Terminal	1	4	2
OFF			
I	○		○
II	○	○	○

Dimmer And Passing Switch

Position \ Terminal	2	9	8	10
HU		○		○
HL			○	○
P	○	○		○

HU : Head lamp high beam
HL : Head lamp low beam
P : Head lamp passing switch

Turn Signal Switch

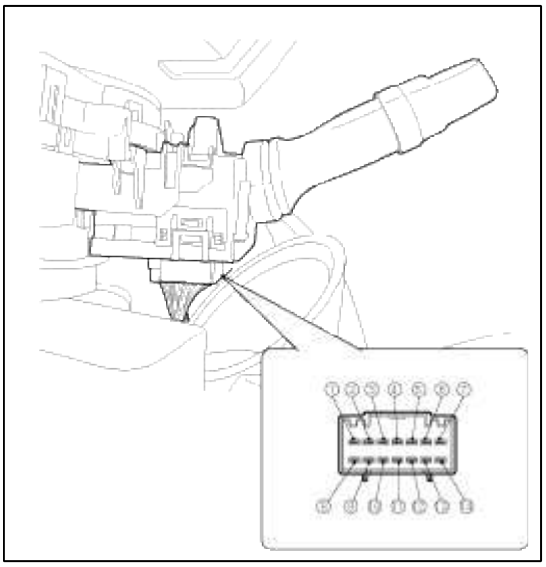
Hazard switch	Trun signal switch \ Terminal	13	12	11
OFF	L		○	○
	N			
	R	○	○	

Front & Rear Fog Lamp Switch

Position \ Terminal	5	6	9
OFF			
Front	○——	——○	
Rear	○——	——○	——○

Wiper And Washer Switch Inspection

With the multi function switch in each position, make sure that continuity exists between the terminals below. If continuity is not as specified, replace the multi-function switch.



Wiper Switch

Position \ Terminal	9	3	2	1	10	8	4	5
MIST		○—○		○—○				
OFF		○—○						
INT		○—○			○—○		○~○	
LOW		○——	——	——	——○			
HI	○——	——	——	——	——○			

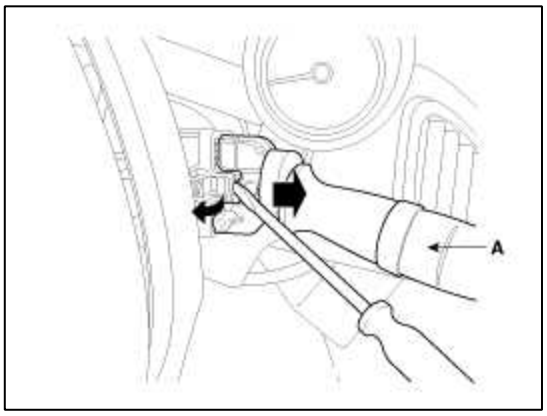
Washer Switch

Position \ Terminal	11	10
OFF		
ON	○——	——○

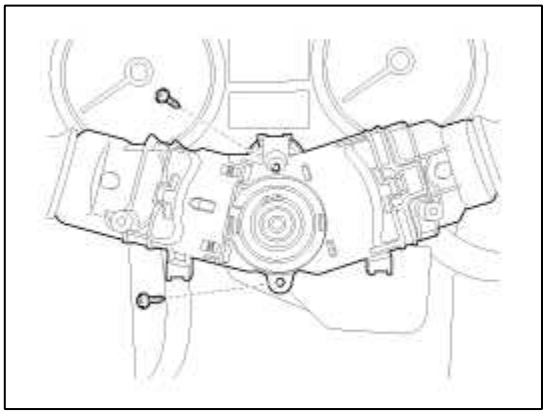
Removal

1. Disconnect the negative (-) battery terminal.
2. Remove the steering wheel.
   (Refer to ST group - "Steering column & shaft")
3. Remove the steering column upper and lower shrouds after removing 3 screws.

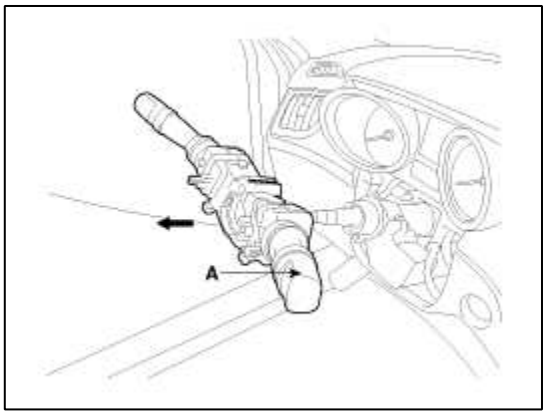
4. If necessary of removing the wiper & washer switch, release the lock of wiper switch using tool without removing the steering wheel.



5. Remove the clock spring.
   (Refer to RT group - "Airbag Module")
6. Loosen the screws from the multifunction switch assembly.



7. Remove the multifunction switch assembly(A) after loosening the connectors.



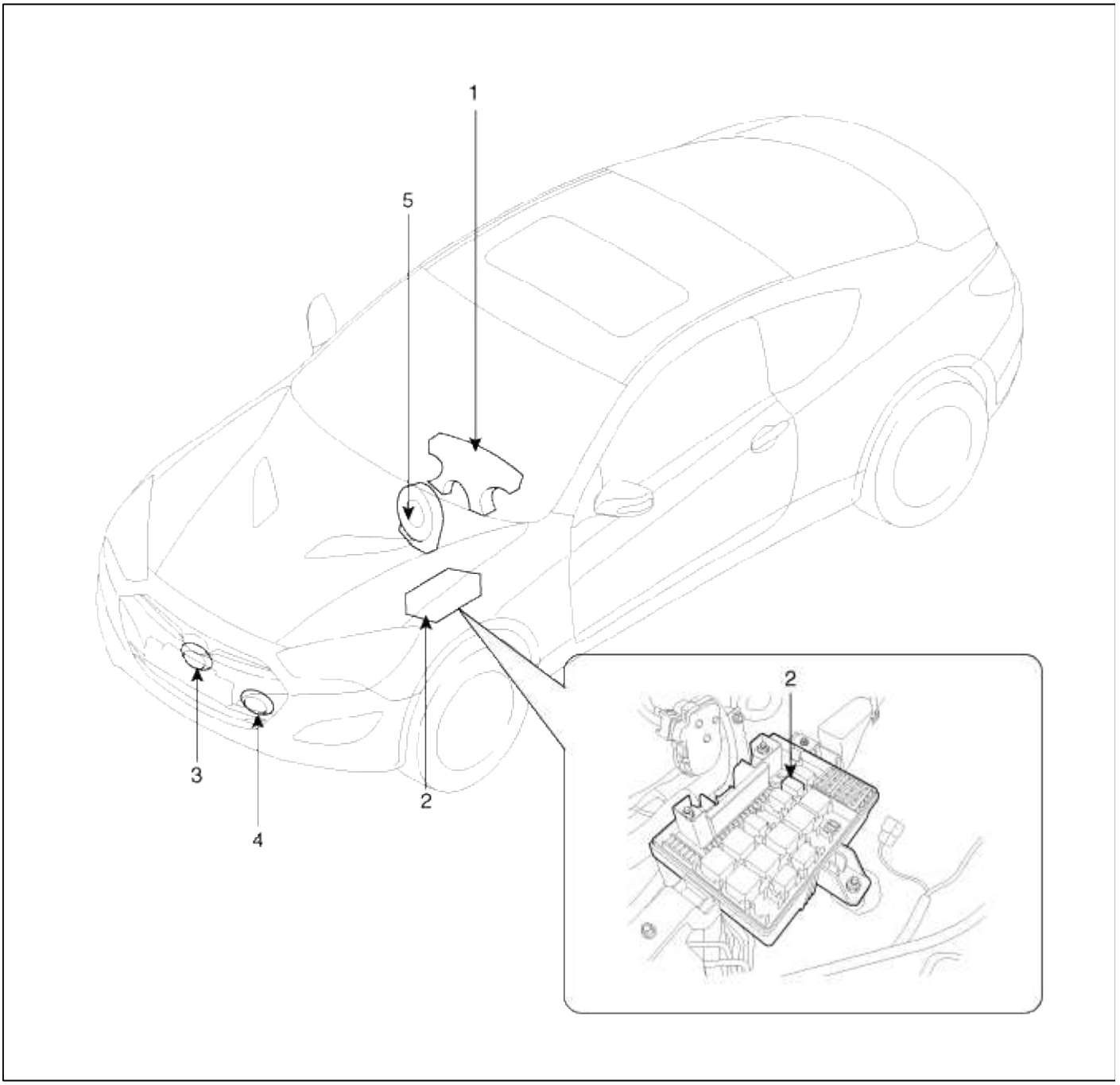
Installation

1. Install the multifunction switch.
2. Install the clock spring.
3. Install the steering column upper and lower shrouds.
4. Install the steering wheel.

> NOTE
>
> Make sure the multifunction switch connectors are plugged in properly.

Body Electrical System > Horn > Components and Components Location

Component Location



1. Horn switch 2. Horn relay (Engine room compartment) 3. Horn (Low pitch)	4. Horn (High pitch) 5. Clock spring

Body Electrical System > Horn > Repair procedures

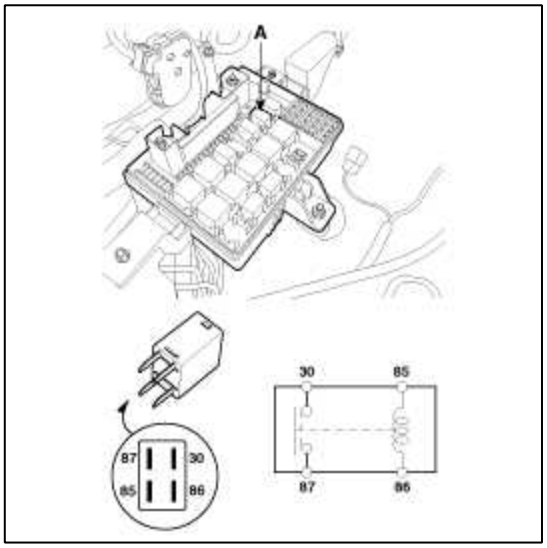
Inspection

Test the horn by connecting battery voltage to the 1 terminal and ground the 2 terminal.
The horn should make a sound. If the horn fails to make a sound, replace it.

Horn Relay Inspection

1. Remove the horn relay (A) from the engine room relay box.

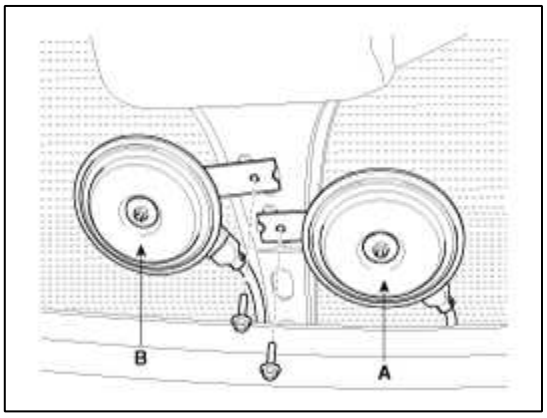
2. There should be continuity between the No.30 and No.87 terminals when power and ground are connected to the No.85 and No.86 terminals.
3. There should be no continuity between the No.30 and No.87 terminals when power is disconnected.



Terminal / Position	30	87	85	86
Disconnected			○	○
Connected	○	○	⊖	⊕

Removal

1. Remove the front bumper.
   (Refer to the Body group - "Front bumper")
2. Remove the bolt and disconnect the horn connector, then remove the high pitch horn(A) and the low pitch horn(B).



Installation

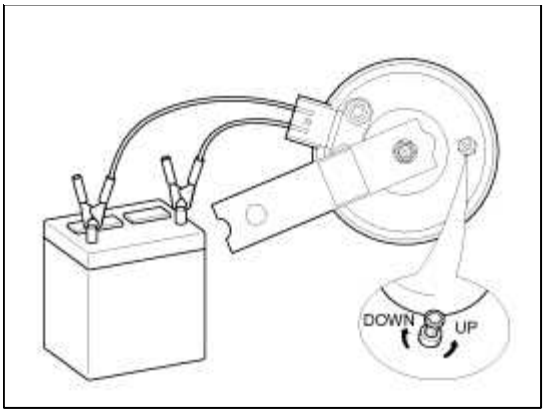
1. Connect the horn connector, then reassemble the high pitch horn and low pitch horn.
2. Reassemble the front bumper.

Adjustment

Operate the horn, and adjust the tone to a suitable level by turning the adjusting screw.

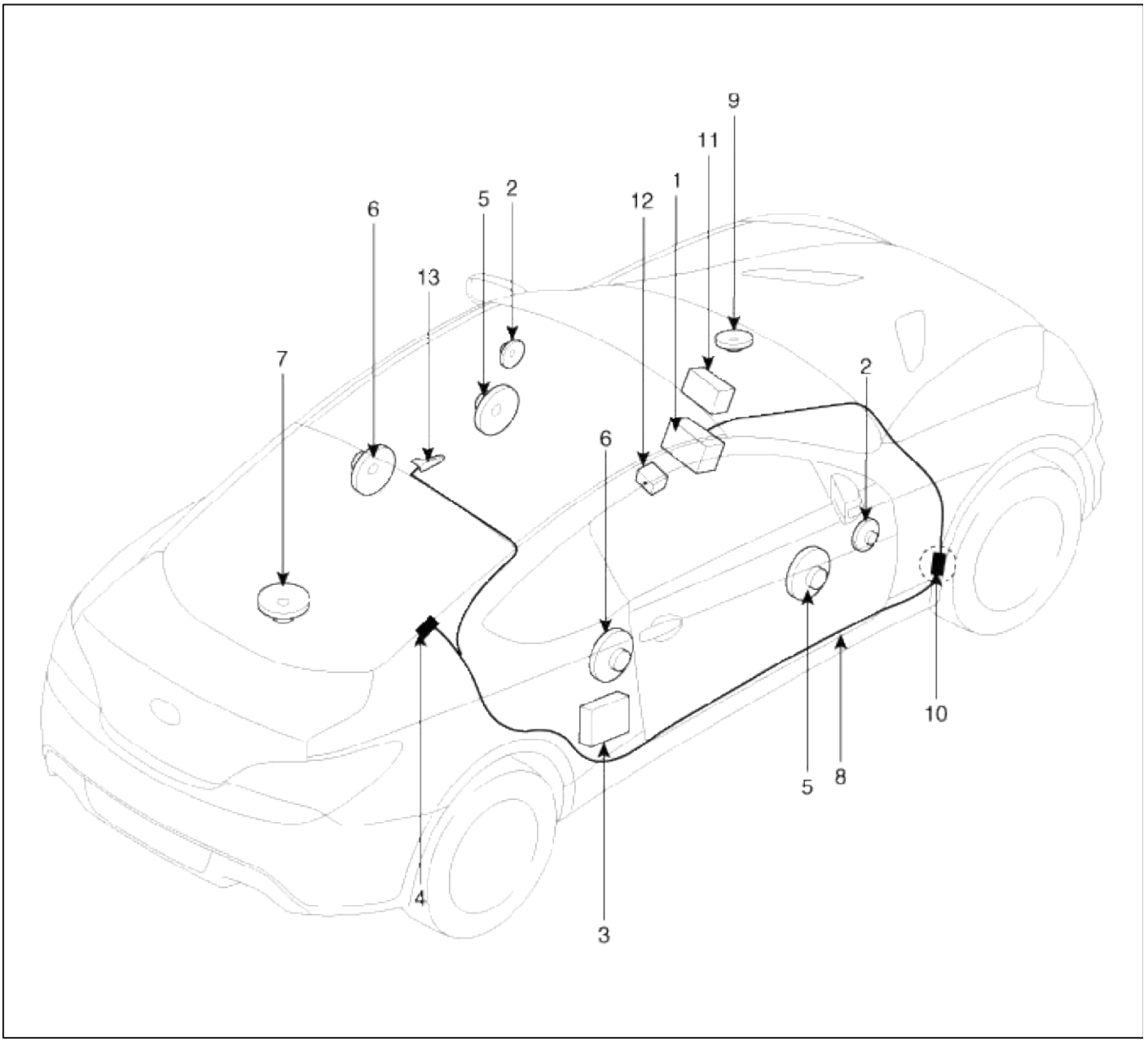
NOTE

After adjustment, apply a small amount of paint around the screw head to keep it from loosening.



Body Electrical System > AVN System > Components and Components Location

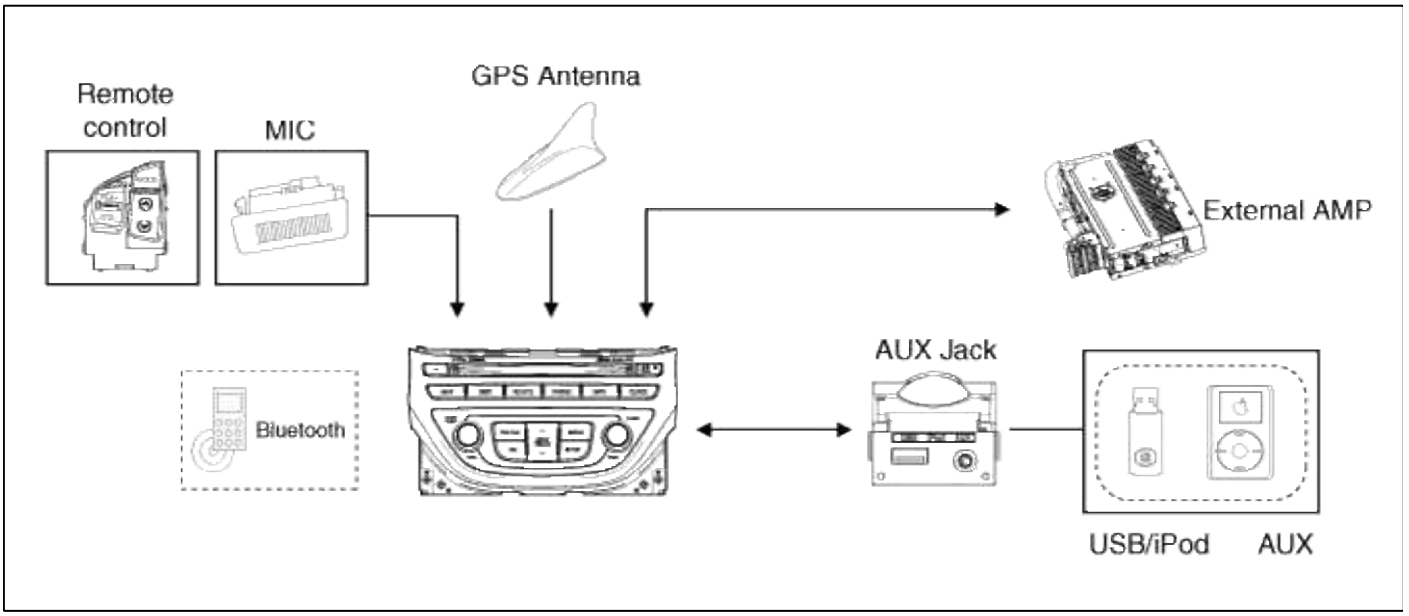
Component Location



1. AVN (A/V & Navigation) head unit 2. Tweeter speaker 3. External Amplifier 4. Glass antenna (Radio) 5. Front door speaker 6. Rear door speaker 7. Woofer speaker	8. Antenna feeder cable 9. Crash pad center speaker 10. Feeder cable joint connector 11. Multi display 12. Aux jack 13. Roof antenna (GPS)

Body Electrical System > AVN System > Schematic Diagrams

System Block Diagram



Body Electrical System > AVN System > Description and Operation

Limitations Of The Navigation system

GPS Signal Reception State

As the GPS satellite frequency is received/transmitted in straight lines, reception may not work if hiding devices are placed on or near the GPS antenna or when traveling through the following locations.

- Tunnels

- Basement parking structures

- Underneath an overpass

- Roads within forested areas

- Areas near high rise buildings

- Roads within canyons

Vehicle Position Display

1. If multipass errors occur due to reflections from buildings or related causes, the current position mark on the navigation may differ from the actual position of the vehicle.

2. The position of the vehicle on the navigation may be different from the actual position if the vehicle is under the occur, driving for a short period of time will vehicle through map matching or GPS information (several minutes may be necessary in certain cases).
   A. When driving on a Y-shaped road with a narrow angle, the current position may be displayed in the opposite direction.
   B. If the vehicle is loaded onto a car transport vehicle, the current position mark may be stalled on the last position prior to loading.
   C. When driving on a spiral-shaped road.
   D. When driving in mountain regions with sharp turns or sudden brakes.
   E. When entering a road after having been in an underground parking structure, building parking structure, or turnable with many rotations.
   F. When the tires have recently been replaced (Especially upon use of spare or studless tires)
   G. If the battery terminal is removed.
   H. When driving in city streets, the current position may be displayed on the opposite side or on an off-road position.
   I. When changing the zoom level from the maximum zoom in level to a different zoom level, the current position mark may be displayed on a different road.
   J. When driving in heavy traffic with frequent go and stops in traffic or intersections.
   K. When driving under slippery conditions, such as heavy sand, snow, etc.
   L. When driving with the tire chain in place.
   M. When using a tire with an incorrect size specification.
   N. When the tire pressure for the 4 tires are different.
   O. When the replacement tire is a worn or used tire (Especially studless tires having passed a 2nd seasons, etc.)
   P. When driving near high-rise buildings
   Q. If a roof carrier has been installed
   R. When driving under high speeds or having calculated a long-distance route.

Route Guidance

Unsuitable route guidance situation may caused by the following search conditions or the driving position.

- Guidance to go straight may be given while driving on a straight road.
- Guidance may not be given even when having turned at an intersection.
- There are certain intersections in which guidance may not occur.
- A route guidance signaling entrance into a no enter zone may occur (No enter zone, road under construction, etc.)
- Guidance may be given to a position removed from the actual destination if roads to reach the actual destination do not exist or are too narrow.
- Faulty voice guidance may be given if the vehicle breaks from the designated route (ex : if a turn is made at an intersection while the navigation provided guidance to go straight).
- Map Data may be missing or incorrect causing route guidance to not be given.

Route Re-calculation

The following phenomena may occur after conducting route recalculation.

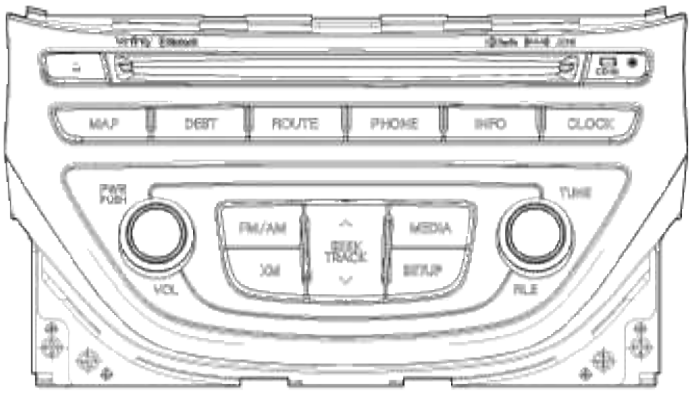
- Guidance may be given to a position differing from the current position when turning at an intersection.
- Route recalculation may take a longer period of time when driving under high speeds.
- A route guidance signaling for a U-Turn in a No U-Turn location may occur.
- A route guidance signaling entrance into a no enter zone may occur (No enter zone, road under construction, etc).
- Guidance may be given to a position removed from the actual destination do not exist or are too narrow.
- Faulty voice guidance may be given if the vehicle breaks from the designated route (ex : if a turn is made at an intersection while the navigation provided guidance to go straight)

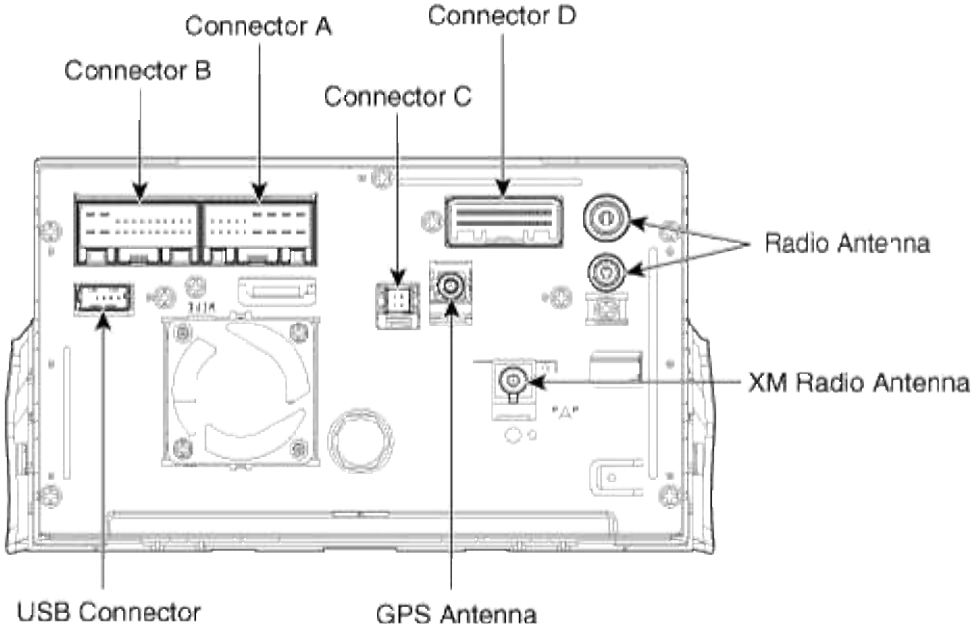
Body Electrical System > AVN System > AVN Head Unit > Components and Components Location

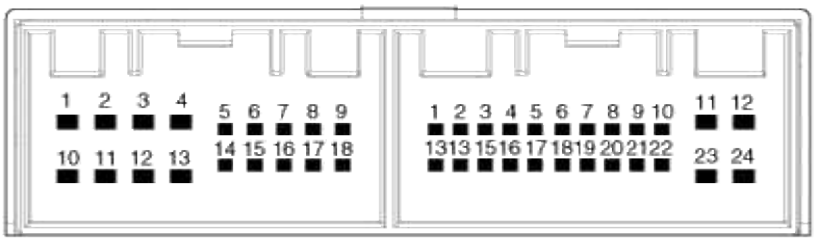
Components

AVN (A/V & Navigation) Head Unit

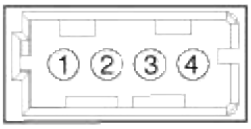
[AVN Head Unit]

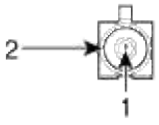


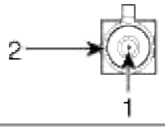


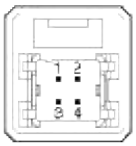


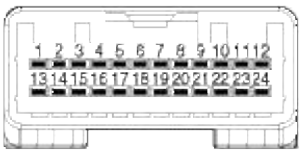
Pin No.	Connector A	Connector B
1	-	MM CAN High
2	-	-
3	-	-
4	-	Steering remote
5	SPDIF GND	-
6	SPDIF (+)	-
7	ALT L	AUX Video
8	Illumination (+)	AUX R IN
9	R Position	AUX GND
10	-	MIC+ (Bluetooth)
11	-	ACC+
12	NAVI Voice (-)	B+
13	NAVI Voice (+)	MM CAN Low
14	-	Auto Light
15	SPDIF (-)	P Position
16	Door key unlock	Vehicle speed
17	Illumination (-)	Remote GND
18	Remote antenna ON	-
19		AUX Video GND
20		AUX DETECT
21		AUX L IN
22		MIC- (Bluetooth)
23		Power GND
24		Power GND

USB Connector	NO	Description	NO	Description
	1	USB GND	3	USB D (-)
	2	USB D (+)	4	USB VCC

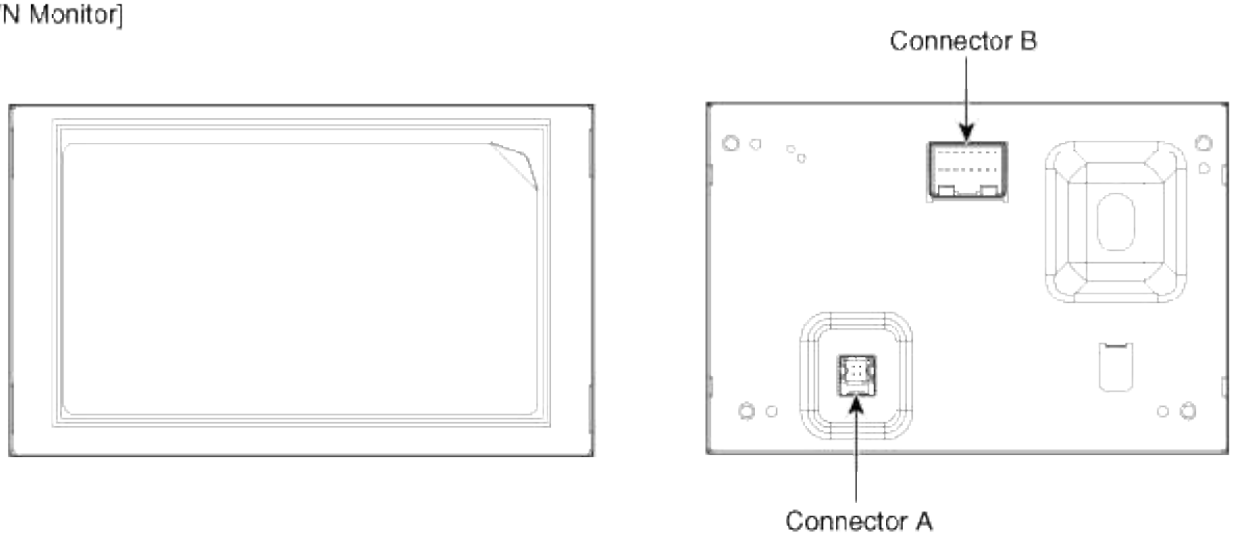
XM Antenna	NO	Description	NO	Description
	1	XM Signal	2	GND

GPS Antenna	NO	Description	NO	Description
	1	GPS Signal	2	GND

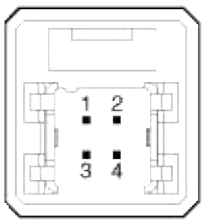
Connector C	NO	Description	NO	Description
	1	LVDS (-)	3	GND
	2	GND	4	LVDS (+)

Connector D	NO	Description	NO	Description
	1	-	13	LVDS LOCK
	2	-	14	BL ON
	3	-	15	RS485 RX(+)
	4	-	16	RS485 RX(-)
	5	-	17	GND
	6	-	18	RS485 TX(+)
	7	-	19	RS485 TX(-)
	8	-	20	-
	9	LVDS _ PDN	21	-
	10	-	22	-
	11	-	23	-
	12	-	24	-

[AVN Monitor]

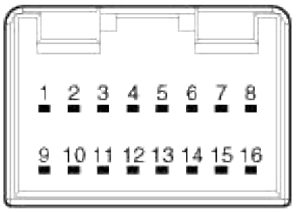


Connector A



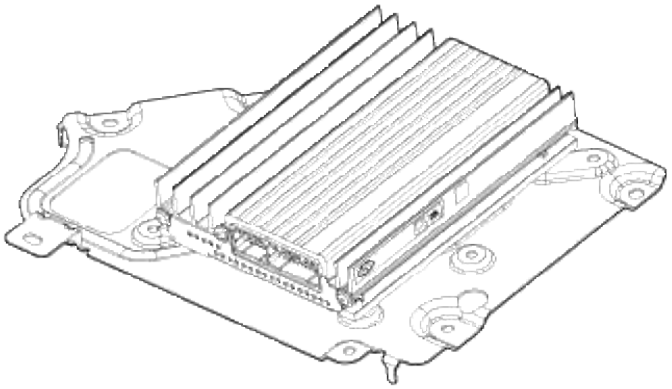
Pin No.	Description
1	GND
2	LVDS(-)
3	LVDS(+)
4	GND

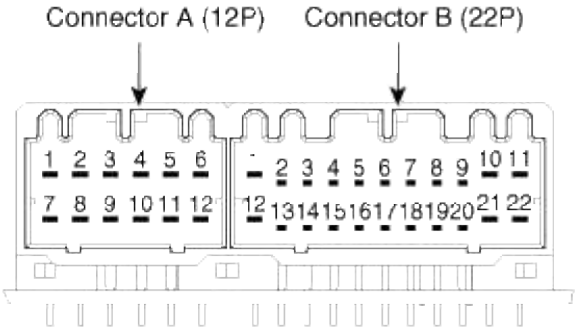
Connector B



Pin No.	Description	Pin No.	Description
1	Battery(+)	9	GND
2	Illumination(+)	10	BI ON/OFF
3	Illumination(-)	11	LVDS PDN
4	GND	12	LVDS LOCK
5	ACC	13	RS485 RX(+)
6	-	14	RS485 RX(-)
7	-	15	RS485 TX(+)
8	-	16	RS485 TX(-)

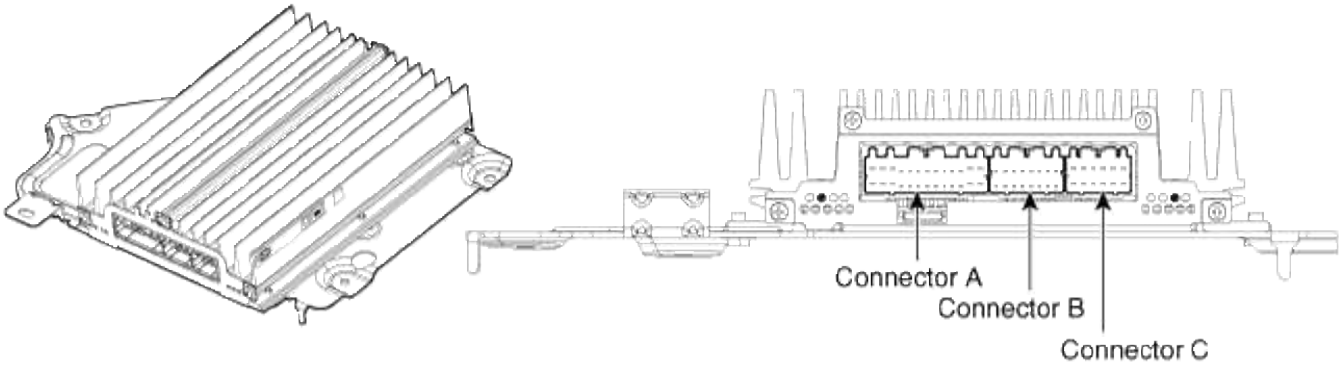
[External AMP]

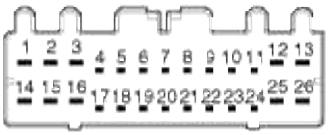
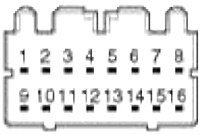
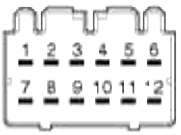




No.	Connector A (12P)	Connector B (22P)
1	Front left door (+)	Center speaker (+)
2	Front right door (+)	-
3	Rear left door (+)	-
4	Rear right door (+)	-
5	SubWoofer 2 (+)	NAVI (+)
6	SubWoofer 1 (+)	ACC
7	Front left door (-)	CAN (-)
8	Front right door (-)	CAN (+)
9	Rear left door (-)	-
10	Rear right door (-)	Battery (+)
11	SubWoofer 2 (-)	Battery (+)
12	SubWoofer 1 (-)	Center speaker (-)
13		-
14		-
15		-
16		NAVI (-)
17		SPDIF Signal
18		SPDIF (-)
19		SPDIF (+)
20		-
21		GND
22		GND

[External AMP]



No.	Connector A (26P)	Connector B (16P)	Connector C (12P)
			
1	B (+)	-	SubWoofer 2 (+)
2	B (+)	-	SubWoofer 1 (+)
3	-	-	Rear right door (+)
4	-	-	Rear left door (+)
5	CAN (+)	-	Front right door (+)
6	CAN (-)	-	Front left door (+)
7	ACC	Center speaker (+)	SubWoofer 2 (-)
8	-	-	SubWoofer 1 (-)
9	-	-	Rear right door (-)
10	-	-	Rear left door (-)
11	NAVI (+)	-	Front right door (-)
12	-	-	Front left door (-)
13	-	-	
14	GND	-	
15	GND	Center speaker (-)	
16	-	-	
17	-		
18	SPDIF (+)		
19	SPDIF (-)		
20	SPDIF Signal		
21	-		
22	-		
23	-		
24	NAVI (-)		
25	-		
26	-		

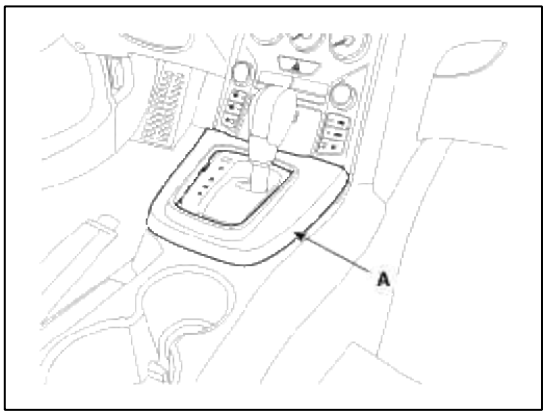
Body Electrical System > AVN System > AVN Head Unit > Repair procedures

Removal

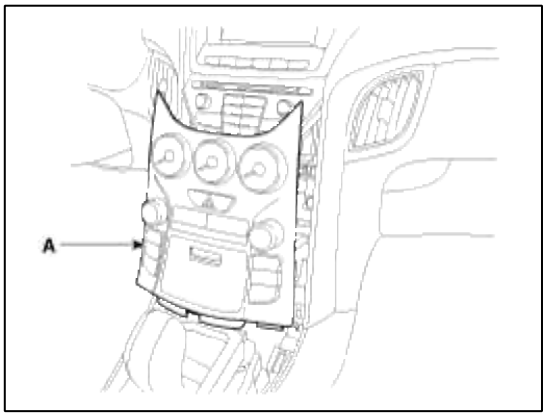
AVN Head Unit

1. Disconnect the negative (-) battery terminal.

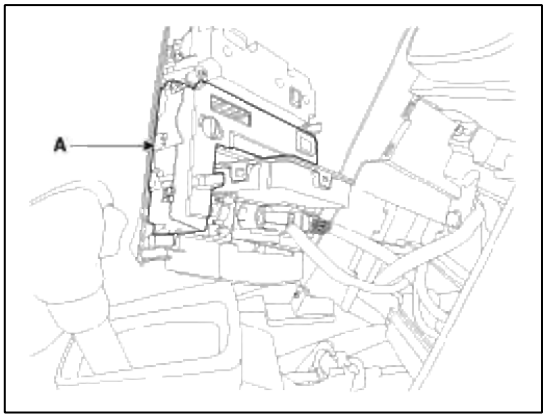
2. Remove the console upper cover(A).



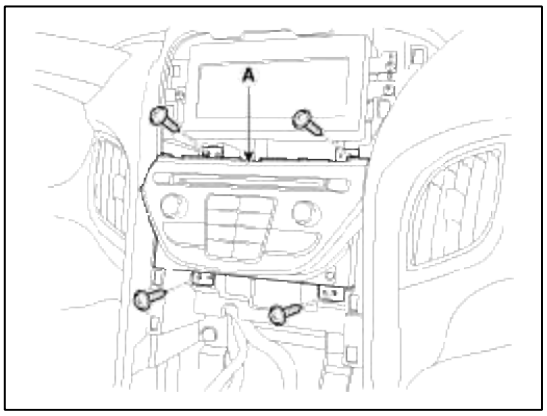
3. Remove the center fascia lower panel(A).
(Refer to the BD group - "Crash pad")



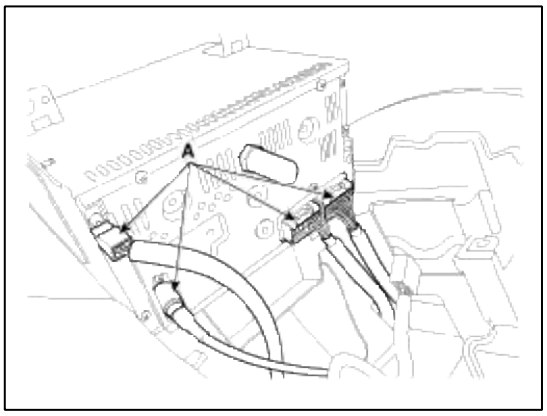
4. Remove the connectors and cables from center fascia lower panel(A).



5. Remove the mounting screws then remove the AVN head unit(A).

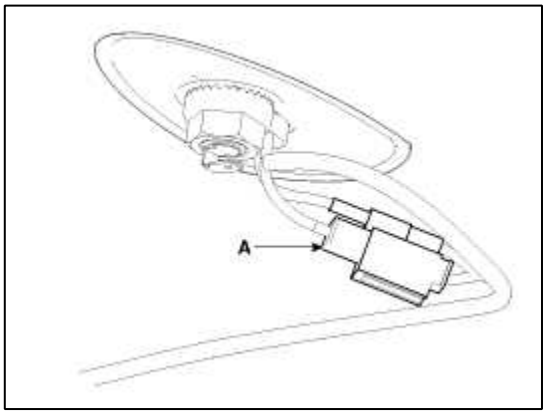


6. Remove the connectors and cable(A).

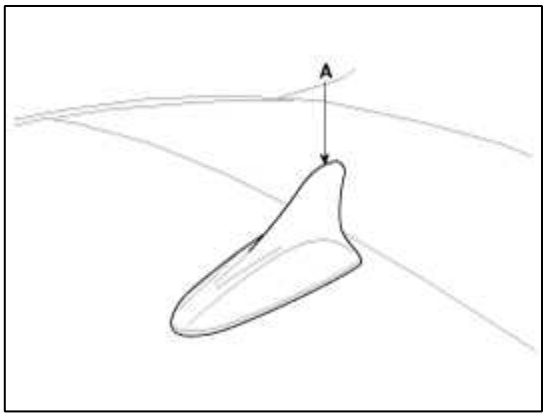


Roof Antenna

1. Remove the rear roof trim.
   (Refer to the BD group - "Roof Trim")
2. Disconnect the cable and connector (A) from roof antenna.



3. Remove the roof antenna after loosening the nut.



Installation

AVN Head Unit

1. Connect the AVN unit connectors and cables.
2. Install the AVN unit.
3. Install the center fascia lower panel.
4. Install the console upper cover.
5. Check the AVN system.

> NOTE
>
> Make sure the AVN head unit connectors are plugged in properly and the antenna cable is connected properly.

Roof Antenna

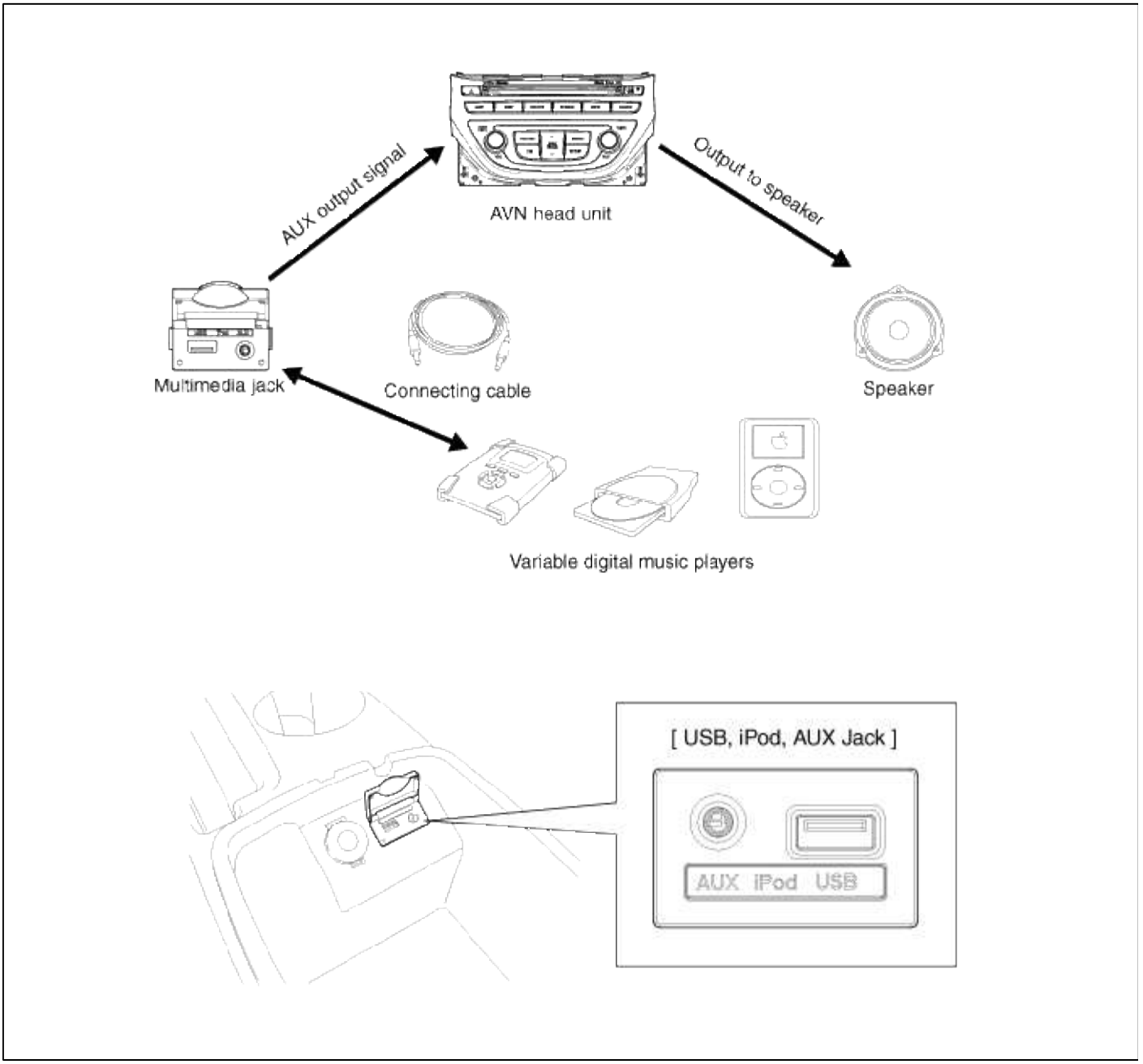
1. Install the roof antenna and connect the cable and connector.
2. Install the rear roof trim.

Body Electrical System > AVN System > AUX(Auxiliary) Jack > Description and Operation

Description

The multimedia jack on the console upper cover is for customers who like to listen to external portable music players like the MP3, iPod and etc., through the vehicle's sound system when it is linked to this jack. The customer has this added option.

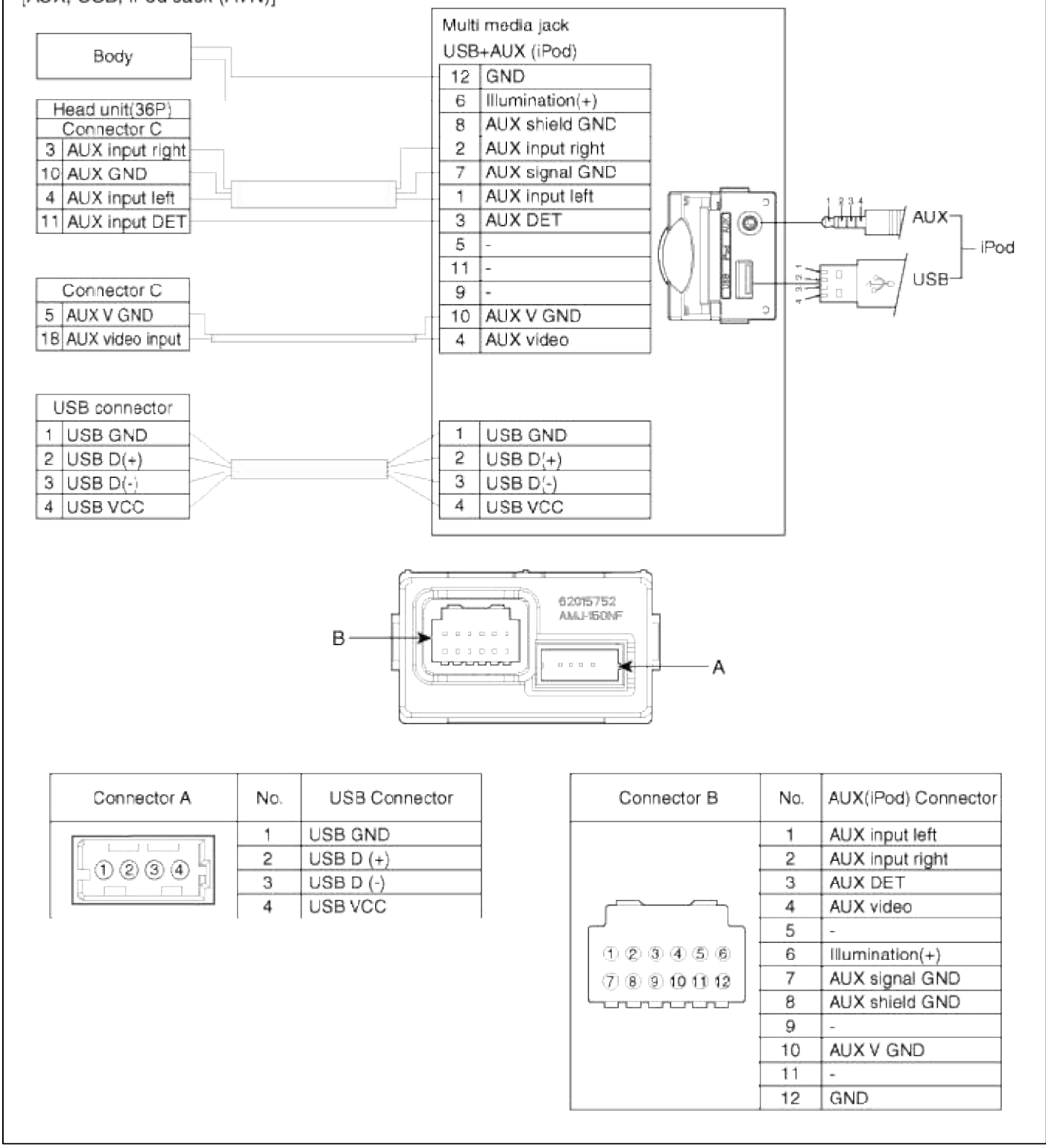
In case of distortions from media connected to the AUX source, the audio unit may not be defect but the output level of the used media does not match the specification of the AUX input.



Body Electrical System > AVN System > AUX(Auxiliary) Jack > Schematic Diagrams

Circuit Diagram

[AUX, USB, iPod Jack (AVN)]



Connector A	No.	USB Connector
① ② ③ ④	1	USB GND
	2	USB D (+)
	3	USB D (-)
	4	USB VCC

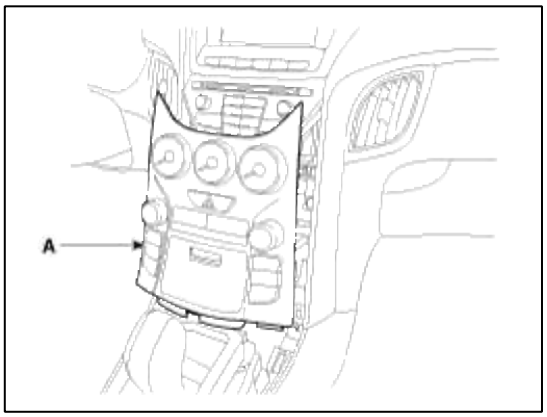
Connector B	No.	AUX(iPod) Connector
① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨ 10 11 12	1	AUX input left
	2	AUX input right
	3	AUX DET
	4	AUX video
	5	-
	6	Illumination(+)
	7	AUX signal GND
	8	AUX shield GND
	9	-
	10	AUX V GND
	11	-
	12	GND

Body Electrical System > AVN System > AUX(Auxiliary) Jack > Repair procedures

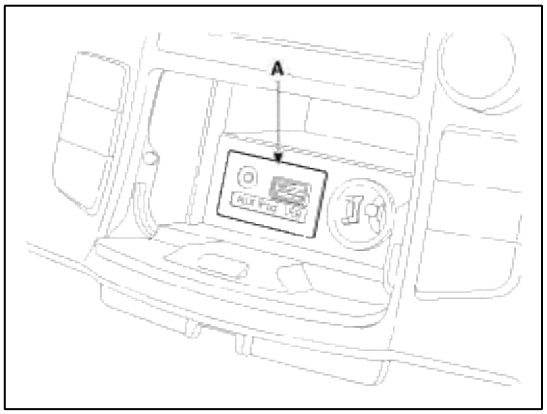
Removal

1. Disconnect the negative (-) battery terminal.

2. Remove the center fascia lower panner (A).
   (Refer to BD group - "Crash pad")



3. Remove the multimedia jack(A) from the center fascia lower pannel after disconnecting the connertor.



Installation

1. Install the multimedia jack.
2. Connect the AUX jack connector.
3. Install the center fascia lower pannel.

> NOTE
>
> Make sure the Aux connector and the console connectors are plugged in properly.

Body Electrical System > AVN System > Troubleshooting

Troubleshooting Guide

Before Thinking The Product Has Malfunctioned
Try the suggestions listed below.

Problem	Function
There are small red, blue, or green dots on the screen	Because the LCD is manufactured with technology requiring high point density, a pixel deficiency or lighting may occur within 0.01% of total pixels.
The sound or image is not working	• Has the switch for the vehicle been turned to [ACC] or [ON]? • Has the SYSTEM been turned OFF?
The video is being displayed but sound is not working	• Has the volume been set to a low level? • Has the volume been set on mute?
When the power is turned on, the corners of the screen are dark	• The display looking somewhat darker after prolonged periods of use is a normal phenomenon with LCD panels. It is not a malfunction. • If the screen is very dark, contact your point of purchase or the nearest service center.
Sound is working from only one speaker	• Is the position of FAL/BAL sound controls or volume adjusted to only one side?
Sound and video does not work in AUX mode	Is the audio and video connector jacks fully inserted into the AUX terminal?
The external device is not working	Is the external device connected with a standard connector cable?
The road is missing	Some map data may be missing or incorrect.
The road name is spoken incorrectly	The TTS(Text To Speech) engine speaks the street name based off of the phonetic spelling. This will continuously be update with the map datebase.

Troubleshooting

Problem	Possible Cause	Solution
The power does not turn on.	The fuse is disconnected.	Replace with a suitable fuse. If the fuse is disconnected again, please contact your point of purchase or service center.
	Device is not properly connected.	Check to see that the device has been properly connected.
XM only goes through one category	The XM mode is in category.	Press the mode button to change to channel mode.
The CD does not play.	The DISC has not been inserted or has been inserted upside down.	Insert the disc properly so that the sides are facing the correct direction.
	The DISC has been contaminated.	Wipe dirt dirt and other foreign substances from the DISC.
	The vehicle battery is low.	Charge the battery. If the problem persists, please contact your point of purchase or service center.
	A disc which is not supported by the device has been inserted.	Insert a disc which is supported for play by the device.
The sound does not	• The volume level is set the	• Adjust the volume level.

work.	lowest level. • The connector is not properly connected. • The device is currently fast-forwarding, rewinding, scanning, or playing in slow mode.	• Check the connection state. • The sound will not work when the device is fast-forwarding, rewinding, scanning, or playing in slow mode.
The sound or video quality is low.	• The DISC is dirty or scrached. • Vibration is occuring from the position in which the conversion switch has been installed. • The color and tone quality of the image is low.	• Wipe off water or dirt from the DISC. Do not use a disc which has been scrached. • The sound may be short-circuited and the image distorted if the device begins to vibrate. The device will return to normal operation once the vibration has stopped. • Aging of the video display and deterioration in performance may cause certain quality degradations.
The USB does not work.	• USB memory is damaged. • USB memory has been contaminated. • A separately purchased USB HUB is being used. • A USB extension cable is being used. • A USB which is not a Metal Cover Type USB Memory is being used. • A HDD type, CF, SD Memory is being used. • There are no music files which can be played.	• Please use after formatting the USB into FAT 12/16/32 format. • Remove any foreign substances on the contact surface of the USB memory and multimedia terminal. • Directly connect the USB memory with the multimedia terminal on the vehicle. • Directly connect the USB memory with the multimedia terminal on the vehicle. • Use a standard USB memory. • Use a standard USB memory. • Only MP3, WMA file formats are supported. Please use only the supported music file formats.
The iPod is not recognized even though it has been connected.	• There are no titles which can be played. • The iPod firmware version has not been properly updated. • The iPod device does not recognize downloads.	• Use iTunes to download and save MP3 files into the iPod. • Use iTunes to update the firmware version and reconnect the iPod with the device. • Reset the iPod and reconnect with the device.

Body Electrical System > Smart key System > Specifications

Specification

Smart Key Unit

Items	Specification
Rated voltage	DC 12V
Operating voltage	DC 9 ~ 16V
Operating temperature	-30°C ~ 75°C (-22°F ~ 167°F)
Load	Max. 2mA

RF Receiver

Items	Specification
Frequency	315 MHz
Antenna type	FSK (Frequency Shift Keying)

Smart Key FOB

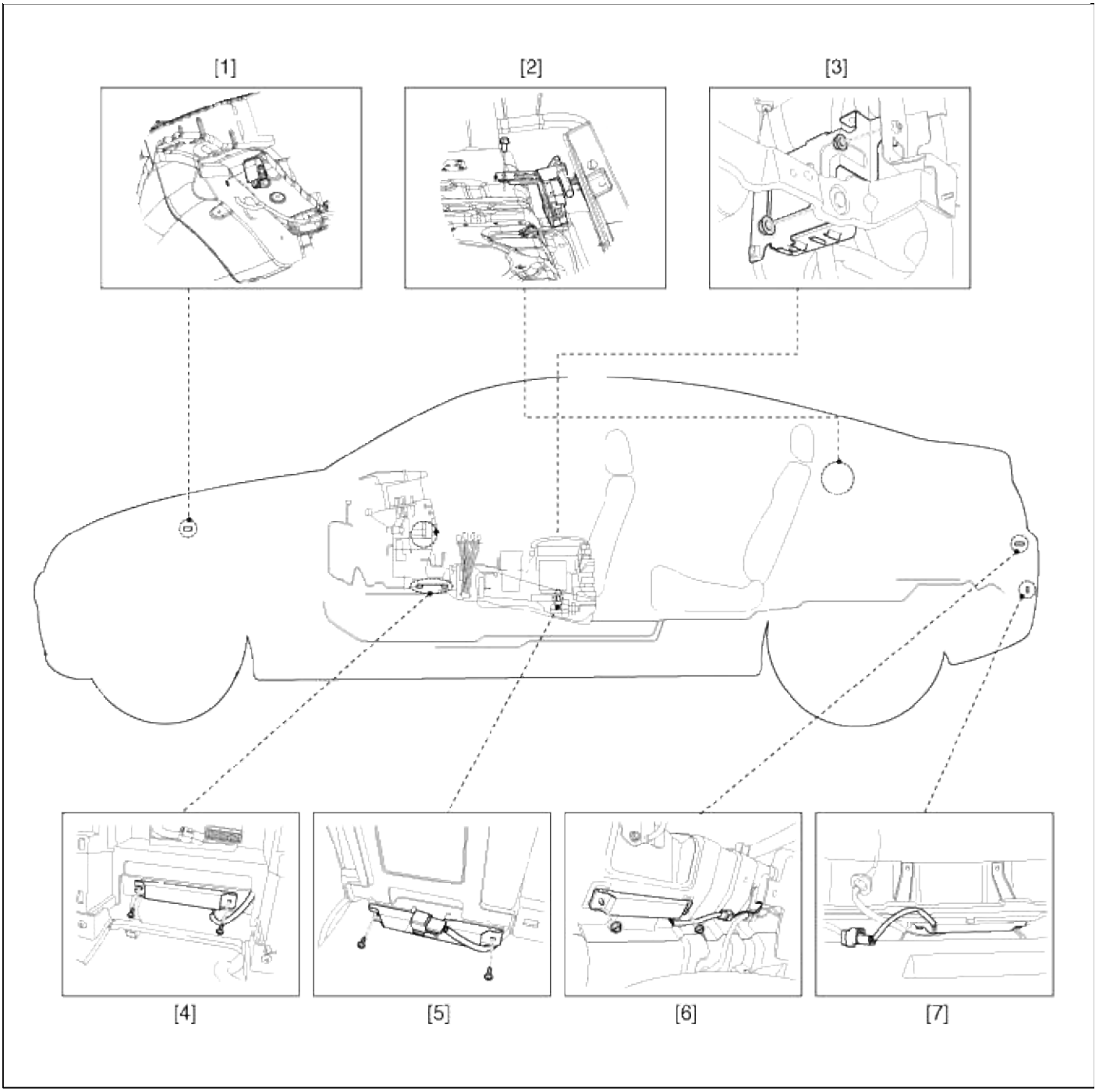
Items	Specification
Battery	Lithium battery 3V 1EA
Distance	30m
Battery life	More than 2years (10 times / a day)
Push buttons	Door lock / unlock, Trunk lid / Panic
Frequency(Rx)	125 kHz
Frequency(Tx)	315 MHz
Numbers	2EA

Antenna

Items	Specification
Rated voltage	DC 12V
Operating voltage	DC 9 ~ 16V
Operating temperature	-30°C ~ 75°C (-22°F ~ 167°F)
Frequency	125kHz
Numbers	Interior(3EA), Door(2EA), Bumper(1EA)

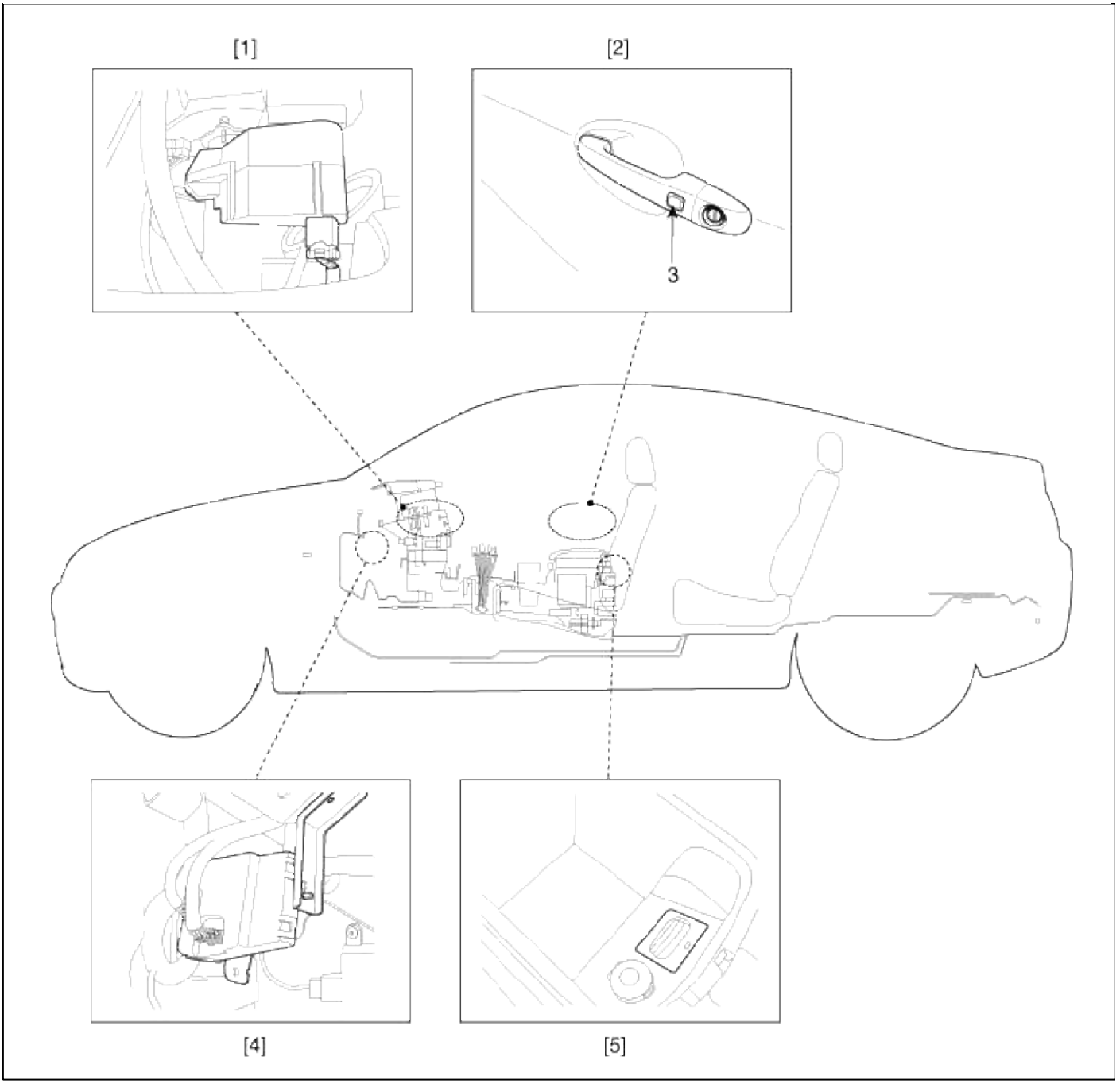
Body Electrical System > Smart key System > Components and Components Location

Component Location (1)



1. Buzzer 2. RF receiver 3.SMART KEY unit 4. Interior antenna 1	5. Interior antenna 2 6. Trunk antenna 7. Bumper antenna

Component Location (2)



1. Electronic Steering Column Lock (ESCL) 2. Door outside handle 3. Door outside handle button	4. PDM 5. FOB holder

Body Electrical System > Smart key System > Description and Operation

Description

The SMART KEY system is a system that allows the user to access and operate a vehicle in a very convenient way. To access the vehicle, no traditional key or remote control unit is needed.

The user carries a SMART KEY FOB which does not require any conscious actions by the user (e.g. operate a RKE button). The SMART KEY system is triggered by pressing a push button in the door handle.

After being triggered the vehicle sends out a request in a limited range. If the SMART KEY FOB receives this request, it automatically sends a response to the vehicle. Then the system decides whether to perform a particular

action (unlocking, locking…) or remain inactive.
In a similar manner the vehicle's Electrical Steering Column Lock (ESCL) is released. Again, a communication between the vehicle and the SMART KEY FOB is needed before any actions will be performed.
The System offers the following features :

- passive unlock via door driver side and passenger side
- passive locking via door driver side and passenger side
- passive start
- passive access trunk via the trunk lid switch at the trunk
- passive locking via tailgate
- max. 2 fobs can be handled by the system
- immobilizer backup antenna driver integrated into FOB-HOLDER for TP authentication (i.e. limp home mode)
- communication with engine management system
- communication with SRX
- LF-RF communication

1. Passive unlock
   The system allows the user to access (unlock) the vehicle without performing any actions with the SMART KEY FOB. This feature could be different depending on platform as follows:
   A. Pressing Push button in door handle
2. Passive locking
   The system allows the user to lock the vehicle by pushing a button on door handle with the SMART KEY FOB.
3. Button start
   The system allows the user to release ESCL and to switch the power modes (Off, Accessory, Ignition), as well as to start and stop the vehicle's engine without performing any actions with the SMART KEY FOB. See Button Engine Start system specification.
4. LIMP HOME Mode
   Additionally, the system offers so called "limp home mode", which is the user can operate all vehicle functions by inserting the key into the FOB HOLDER.

Smart Key ECU (SMK ECU)
The SMK ECU manages all functions related to "Passive Unlock", "Passive Lock" and "Passive Authorization for Engine Start Operation".
It reads the inputs (Push button in door handle, Start Stop Button (SSB), PARK position Switch), controls the outputs (e.g. exterior and interior antennas), and communicates via the CAN/LIN (depends on the vehicle) as well as a single line interface to further devices of the car.
It reads the inputs (Push button in door handle, Start Stop Button (SSB), PARK position Switch), controls the outputs (e.g. exterior and interior antennas), and communicates via the CAN as well as a single line interface to further devices of the car.
For communication with the SMART KEY FOB, SMK ECU generates a request (challenge) as an encoded and modulated 125 kHz signal at the inductive antenna outputs and receives the SMART KEY FOB's response via the external RF receiver.
The main functional blocks of the SMK ECU are:

- Power supply
- Microcontroller with FLASH Memory
- Single Line Interface to SRX
- Single Line Interface to EMS
- Input stage
- LF antenna amplifier/driver
- CAN communication with BCM
- LIN communication with other unit (depending on platform)

The LF antenna amplifier/driver generates a 125 kHz sinusoidal carrier signal which is distributed to the different

antennas.

Smart Key FOB

The system supports up to 2 SMART KEY FOBs.

The main functions of the SMART KEY FOB are:

- Passive functionality: receives LF-challenge and sends automatically RF response.
- Classic RKE function by action up to 6 push buttons.
- Transponder-functionality in case of a flat battery or a disturbed communication.
- LED for operation feedback and battery monitoring.

NOTE

The FOB's LED indicator may continue to light even with a low transmitter battery.
If the performance or range of the FOB is less than expected, check the transmitter battery.

Antennas

1. Emitting LF Antennas:
   Inductive antennas in and at the vehicle are used to transform the current, driven by the SMK ECU antenna driver, into a 125 kHz magnetic field, which is the carrier for the SMART KEY challenge.
   Three antennas cover the vehicle's exterior: two antennas in the Door Handles (DS and PS) cover the area around the doors; one antenna in the rear bumper covers the area around the trunk.
   Up to three antennas cover the vehicle's interior and the trunk interior: two in the passenger compartment and one in the trunk.
2. Bidirectional Immobilizer Antenna (for Limp Home):
   The Immobilizer Backup Antenna is used for sending and receiving data: it emits a magnetic field (125 - 135 kHz challenge) and receives changes in the field strength (response of Transponder).
3. External Receiver
   The SMART KEY FOB's response is received via the external RF receiver, which is connected to the SMK ECU via a serial communication Line.
   The SMK ECU provides a connector pin for the serial communication Line.

Door Handle

The front door handles of the two doors (driver door / passenger door) are equipped with emitting LF-antennas to emit the 125 kHz signals. The front door handles are also equipped with a push button.

Push Button

The push button in door handle serves as a trigger to indicate the user's intent to unlock or lock the vehicle.

The push buttons are installed at front doors, integrated into the door handles.

Another button is installed at the trunk lid.

Operation

Passive Functions

The system allows the user to access the vehicle without having to perform any actions (e.g. RKE button pressing) with the SMART KEY FOB. It is sufficient that a valid SMART KEY FOB is located within a defined and limited range with respect to the vehicle. So the system is capable of detecting and authenticating a SMART KEY FOB in the ranges as specified below.

Operating Range

The SMART KEY FOB receives and interprets a challenge sent from the vehicle via the exterior antennas in a free space range of min. 0.7m measured around the exterior antennas which are integrated in the door handles; refer to the below given picture. The trunk access range is also min. 0.7m measured from the antenna position.

The SMART KEY FOB receives and interprets a challenge sent from the vehicle via the exterior antennas in a free space range of min. 0.7m measured around the exterior antennas which are integrated in the door handles; refer to the below given picture

Passive Access (Passive Entry)

Pressing one of the push buttons in the door handles when all doors locked indicates the operator's intent to access

the vehicle and thus triggers the system for unlock

Passive Locking (Exit)

Pressing one of the push buttons in the door handles when one of the following condition is fulfilled:

- At least one door is unlocked and two_steps timer is not running or
- Two_steps timer is running and one of the push button except Front Left side is triggered

indicates the operator's intent to lock the vehicle and thus triggers the system for a lock.

Passive Open Tailgate

Pressing the Trunk Lid Switch when trunk is closed indicates the operator's intent to open the trunk and thus triggers the system. Subsequently, the SMK ECU sends a LF-challenge to the SMART KEY FOB via the exterior bumper antenna. The SMART KEY FOB answers with a RF-response. If the received response matches the expected answer, SMK ECU sends a "trunk open" message via the CAN network.

Passive Trunk Warning

Whenever the trunk is closed, SMK ECU uses a suitable search strategy to avoid trunk buzzer warning by a fob outside the vehicle. Then SMK searches for a SMART KEY FOB in the interior of the trunk. If a valid SMART KEY FOB is found in the trunk, the SMK ECU activates SMK external buzzer (TBD) to inform the user that the trunk has been closed with a fob inside the trunk.

SMK will send the trunk open command to BCM for trunk reopening if Trunk reopening bit is set(BK)For this functionality, a "valid" SMART KEY FOB means any SMART KEY FOB that belongs to the vehicle, even if it's DEACTIVATED.

NOTE

- A blind spot in the trunk similar to any RF disturbance may lead to no trunk warning. Due to the penetration of the bumper antenna into the trunk area the lid may open without an Identification Device outside.
- A blind spot in the trunk similar to any RF disturbance may lead to no trunk warning

Smart Key Reminder 1

1. Preconditions:
   All terminals OFF & at least one door open & locking status is not locked checked by SMK periodically every 100ms, as long as CAN/LIN active.
2. Event:
   At least 1 door knob status changed from unlock to lock.
3. SMK actions:
   A. IF NO FOB-IN ACTIVE
      SMK performs a search for the fobs in the interior of the vehicle. The same LF-strategy has to be used as it is defined for the ID out warning (registering only, no authentication
   B. IF FOB-IN ACTIVE
      SMK sends request toward PDM to search valid TP
   If no fob or no TP has been found, no action is required.
   If any valid fob or valid TP has been found, SMK unlocks the vehicle by sending a CAN Key Reminder unlock message with the fob number.
   If any valid fob has been found, SMK unlocks the vehicle by sending a CAN/LIN Key Reminder unlock message with the fob number.

Smart Key Reminder 2

1. Preconditions:
   All terminals OFF & any door (including trunk) open & no FOB-IN & no locking status (checked by SMK periodically every 100ms, as long as CAN/LIN active)
2. Vehicle action:
   Closing last door or trunk with knobs locked state, or with a locking in progress

3. SMK actions:
   Before elapsing 500ms after the closing if all doors are locked then:
   A. IF NO FOB-IN ACTIVE
      SMK performs a search for the fobs in the interior of the vehicle.
      The same LF-strategy has to be used as it is defined for the ID out warning (registering only, no authentication)
   B. IF FOB-IN ACTIVE
      SMK sends request toward PDM to search valid TP
   If no fob has been found, no action is required.
   If any valid fob or valid TP has been found, SMK sends unlock command via CAN and activates ext. buzzer warning.
   If any valid fob has been found, SMK sends unlock command via CAN/LIN and activates ext. buzzer warning.

Smart Key Door Lock Warning

Door Lock Warning 1

1. Preconditions:
   While (at least one door knob is unlocked) & (ACC ON or IGN ON) & (No FOB-IN) :
   A. (All doors are closed) & (trunk closed)
2. Event:
   A. User presses the push button in door handle or trunk
3. SMK actions:
   SMK performs a search for the fobs outside of the vehicle; the same LF-strategy has to be used as it is defined for "Scenario Access with I/O Distinction".

Door Lock Warning 2

1. Preconditions:
   Same as passive locking precondition but with at least one door open.
2. Event:
   User presses the door handle Push button .
3. SMK actions:
   SMK performs a search for the fobs outside of the vehicle; the same LF-strategy has to be used as it is defined for "Scenario Access with I/O Distinction".
   If no fob has been found, no action is required.
   If the preconditions are no longer valid during buzzer active time (3 seconds), the SMK ECU stops the buzzer immediately.

Door Lock Warning 3

1. Preconditions:
   Same as passive locking precondition
2. User action:
   A. User presses the door handle Push button
3. SMK ECU actions:
   A. If ATWS(Anti Theft Warning System) is in DISARM status, SMK ECU performs a search for the fob inside of the vehicle (use "Door Lock Warning 3" scenario)

If no fob has been found, the passive locking is performed.
If any valid fob has been found, SMK ECU activates the external buzzer.
If the activity timer elapsed or ACC ON or IGN1 ON or NOT All door closed or FOB-IN, the SMK ECU stops the buzzer immediately.
After searching of inside fob, SMK ECU also performs a search for fobs outside of the vehicle.

Smart Key Lamp Warning

1. SMK actions:
   As long as the preconditions are valid, the SMK ECU performs a periodical search for the fobs in the interior of the vehicle; the same LF-strategy has to be used as it is defined for the ID out warning (registering only, no authentication); periodical means, the search is done every 3 seconds.
   If no fob has been found, the SMK ECU starts Key out indicator lamp activation as all preconditions are valid and will perform another search 3 seconds later.

If any valid fob has been found, the SMK ECU stops the Key out indicator lamp and will (if one door is open) perform another search 3 seconds later; if no door is open then it's only at the next When the preconditions are still valid, the search resumes by opening of one door.

Failsafe Functions (Backup For Limp Home)

In case of a discharged battery of the SMART KEY FOB or disturbed transmission, the following functions are available:

- Unlocking / locking of doors or trunk (or tailgate depending of the vehicle configuration): use of mechanical key

User Information Functions

ID OUT Warning

1. Preconditions:
   A. (ACC or IGN1) & (any door open or trunk open)
2. Event:
   The last opened door is closed
3. SMK action:
   SMK searches for a SMART KEY FOB in the interior.
   A. If no valid SMART KEY FOB is found, the SMK activates external buzzer and also sends ID OUT WNG via CAN (exterior buzzer warning and internal buzzer warning).
   B. If a door is opened and closed again during terminals on and inside valid fob, SMK re-enables the authentication and stops the warning. If the terminal is in ACC, SMK shall turn on immobilizer lamp.

NOTE

If there is a LF error (LF overheating or LF antenna failure), the system will have the same behavior as it is with no fob found.

Immobilizer Lamp

Removing the PIF from the MSL and reinserting the PIF and pushing the MSL Knob will switch the lamp on again.

Fob Battery Low Voltage Detection

To detect fob low battery condition, certain battery voltage measurement and low voltage detection strategy are implemented into fob. The measurement of the battery voltage will be done if fob button is pressed or if a LF measurement command is received.

If the fob has detected a low battery voltage, the LED will not be switched on at button press.

Learning Description

In this chapter, the learning procedure for SMK, PDM, ESCL and FOBs is described.

For the learning of the SMK, PDM, ESCL and FOBs, it's necessary to have a connection to the diagnostic tool.

Learning MODE

Whatever the mode, the learning procedures are managed by the SMK.

Prior to start learning service, Fob-In signal must be active and the vehicle secret code (called as PIN code) should be known.

Teaching MODE

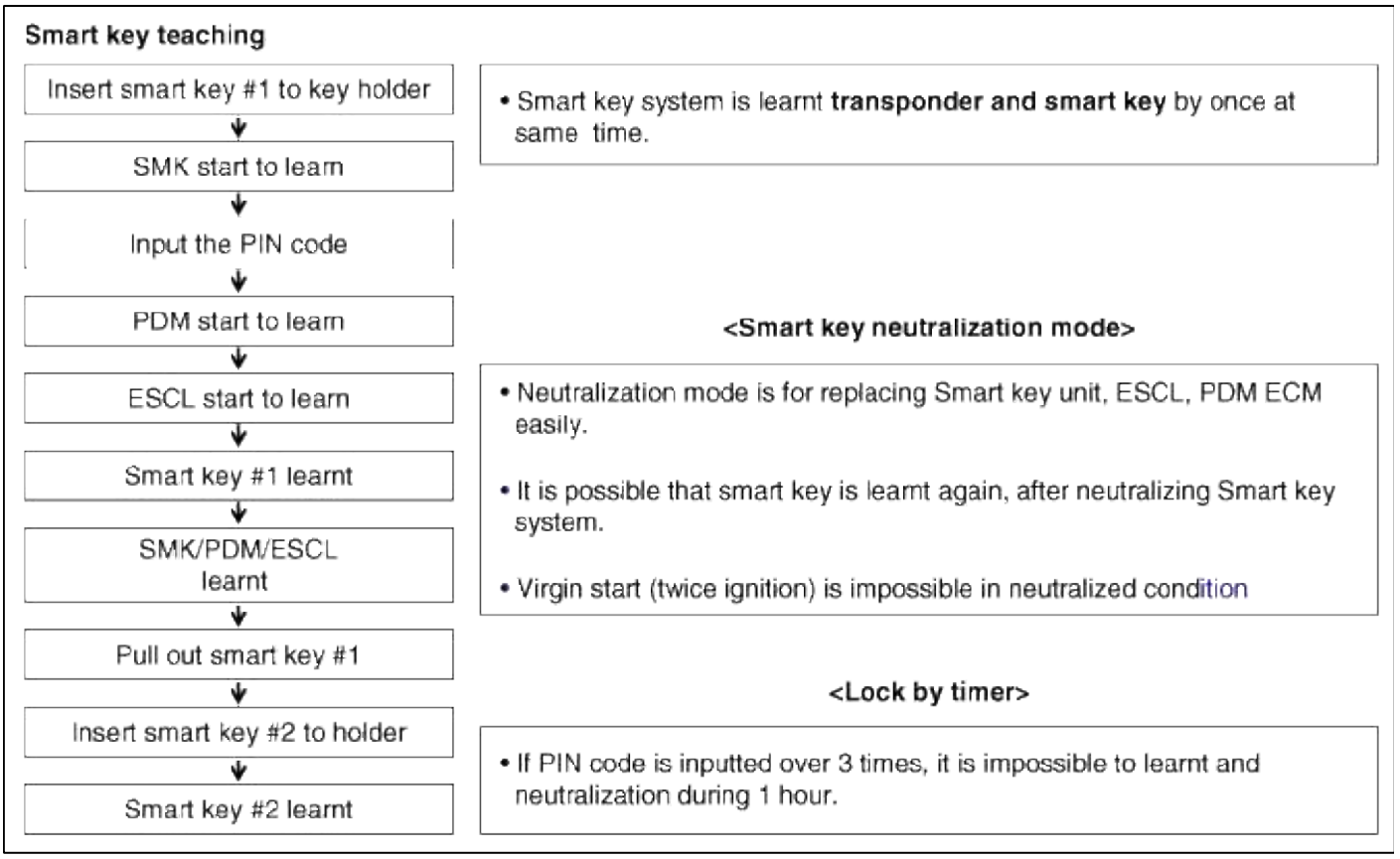
This mode is used by the dealers in order to replace SMK and/or PDM and/or ESCL and/or the set of keys, or to register additional keys for an existing system. That means the system already has been learnt with certain PIN Code. The PIN Code is fixed for the life time of the vehicle, therefore the same PIN Code must be used in this mode. Otherwise learning will be failed

Teaching MODE Procedure Description (Step By Step)

Objective: Key teaching procedure at service station

Initial state:

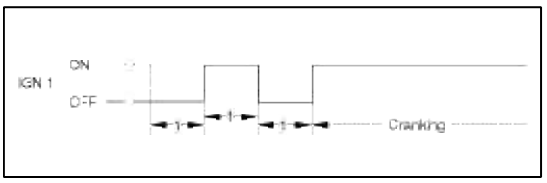
- SMK replacement: SMK is not learnt, PDM and ESCL and SMART FOB are already learnt with same PIN code
- PDM replacement: PDM is not learnt, SMK and ESCL and SMART FOB are already learnt with same PIN code
- ESCL replacement: ESCL is not learnt, SMK and PDM and SMART FOB are already learnt with same PIN code
- Additional or new keys teaching: SMK and PDM and ESCL are already learnt with same PIN code



Starting After Replacing (Virgin Start)

Starting is possible by following process after replacing new smart key unit , PDM, FOB key or ESCL.

- It is for starting at virgin condition
- All related parts are virgin condition (Smart key, IPM, PDM, ESCL ECM)
- ESCL is always unlock at virgin
- When virgin smart key is inserted in smart key holder, possible to start, IG ON and ACC position
- Press brake pedal in P or N range
- After inserting virgin smart key to holder, push start button once.



Body Electrical System > Smart key System > Repair procedures

Inspection

Self Diagnosis With GDS

Smart key system defects can be quickly diagnosed with the GDS. GDS operates actuator quickly to monitor, input/output value and self diagnosis.

The following three features will be major problem in SMART KEY system.

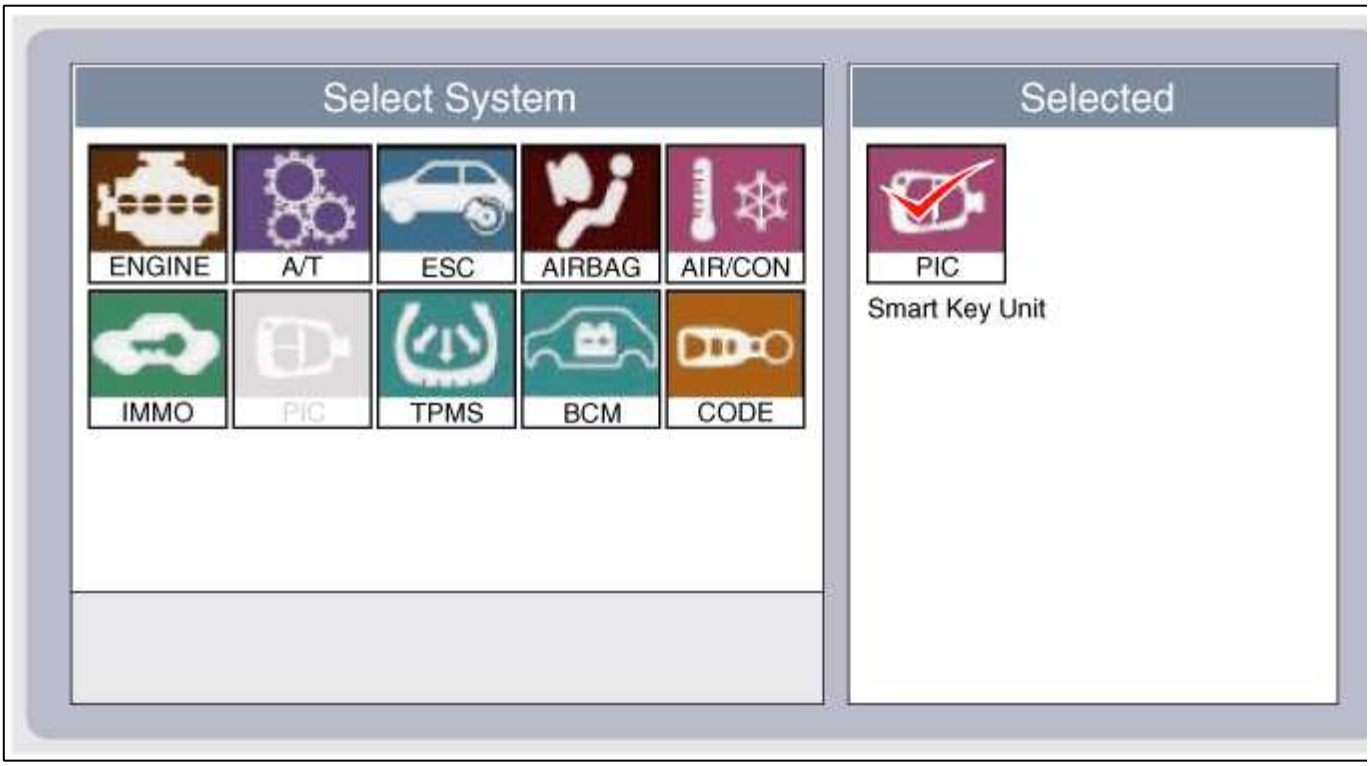
1. Problem in SMART KEY unit input.
2. Problem in SMART KEY unit.
3. Problem in SMART KEY unit output.

The following three diagnostic solutions will be the main solution process to a majority of concerns.

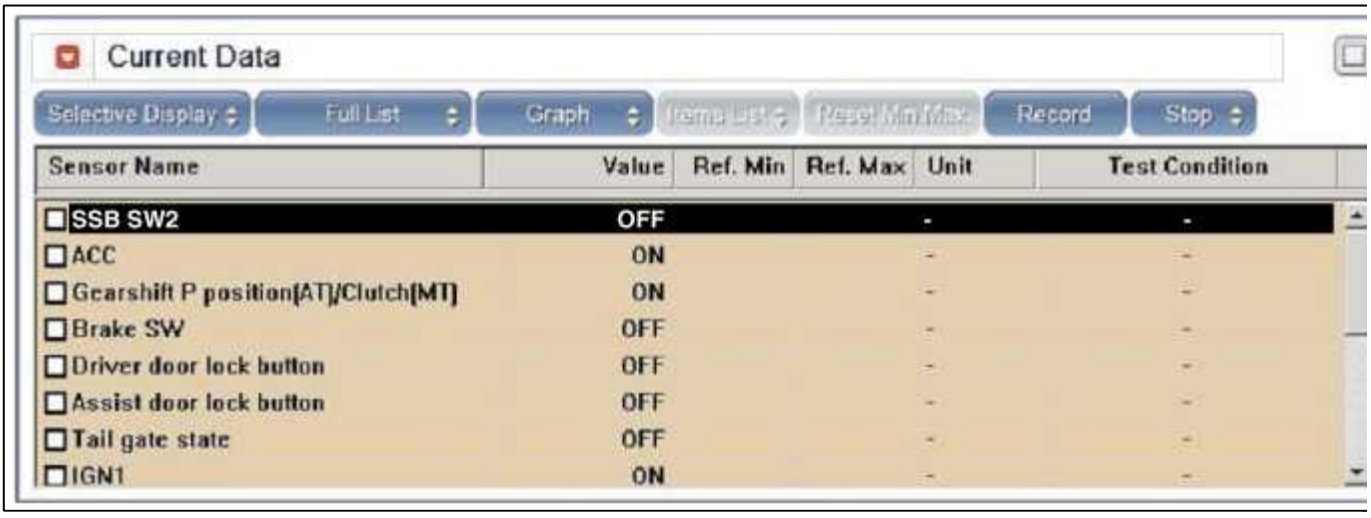
1. SMART KEY unit Input problem : switch diagnosis
2. SMART KEY unit problem : communication diagnosis
3. SMART KEY unit Output problem : antenna and switch output diagnosis

Switch Diagnosis

1. Connect the cable of GDS to the data link connector in driver side crash pad lower panel, turn the power on GDS.
2. Select the vehicle model and then SMART KEY system.



3. Select the "SMART KEY unit".
4. After IG ON, select the "Current data".



5. You can see the situation of each switch on scanner after connecting the "current data" process.

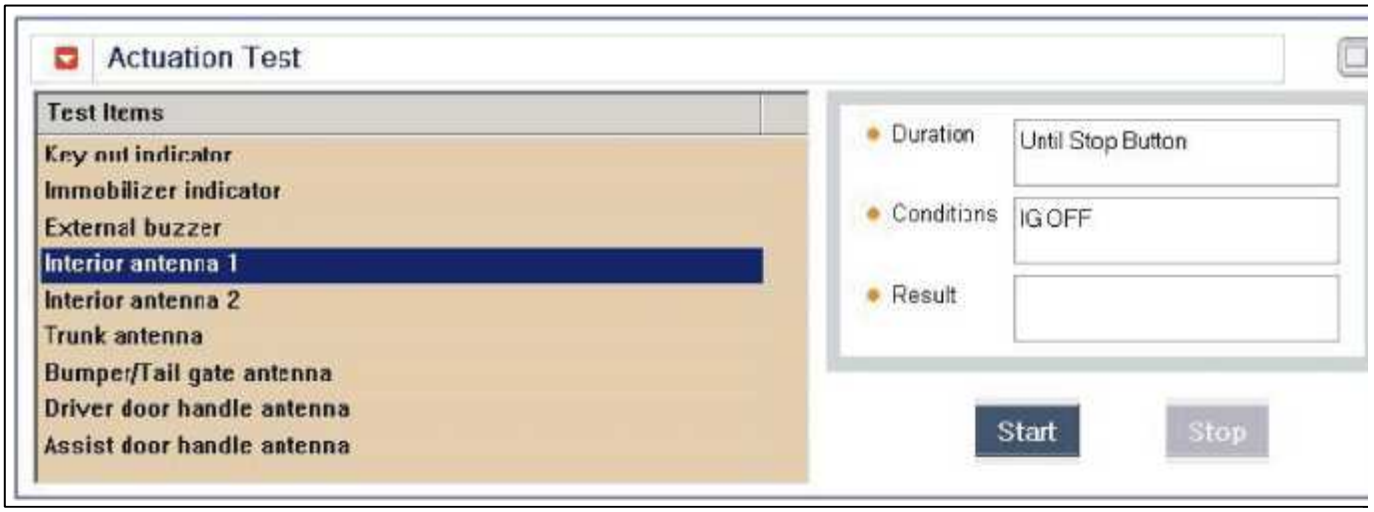
Display	Description
FL Toggle switch	ON : Push button is ON in the driver door handle.
FR Toggle switch	ON : Push button is ON in the assist door handle.
Trunk switch	ON : Trunk button is ON.
Gear P Position	ON : Shift lever is P position.
IGN 1	ON : IGN switch is IG position.
ACC	ON : IGN switch is ACC position.
Push Knob switch	ON : Push knob switch is ON.
External Buzzer	ON : Buzzer is ON.

Communication Diagnosis With GDS (Self Diagnosis)

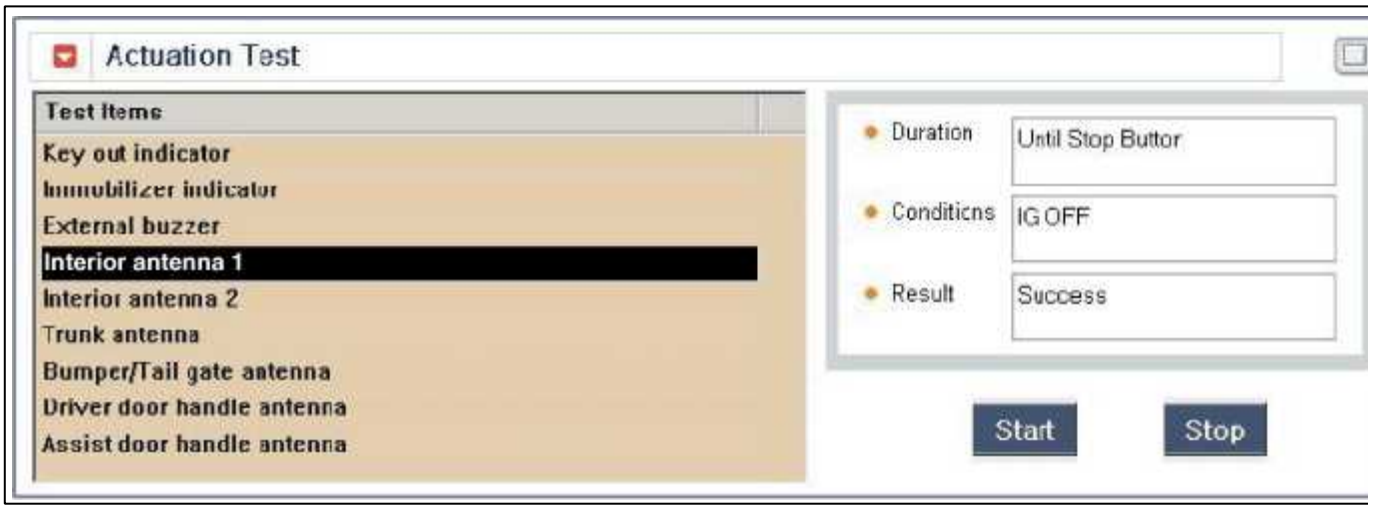
1. Communication diagnosis checks that the each linked components operates normal.
2. Connect the cable of GDS to the data link connector in driver side crash pad lower panel.
3. After IG ON, select the "DTC".

Antenna Actuation Diagnosis

1. Connect the cable of GDS to the data link connector in driver side crash pad lower panel.
2. After IG ON, select the "ACTUATION TEST".



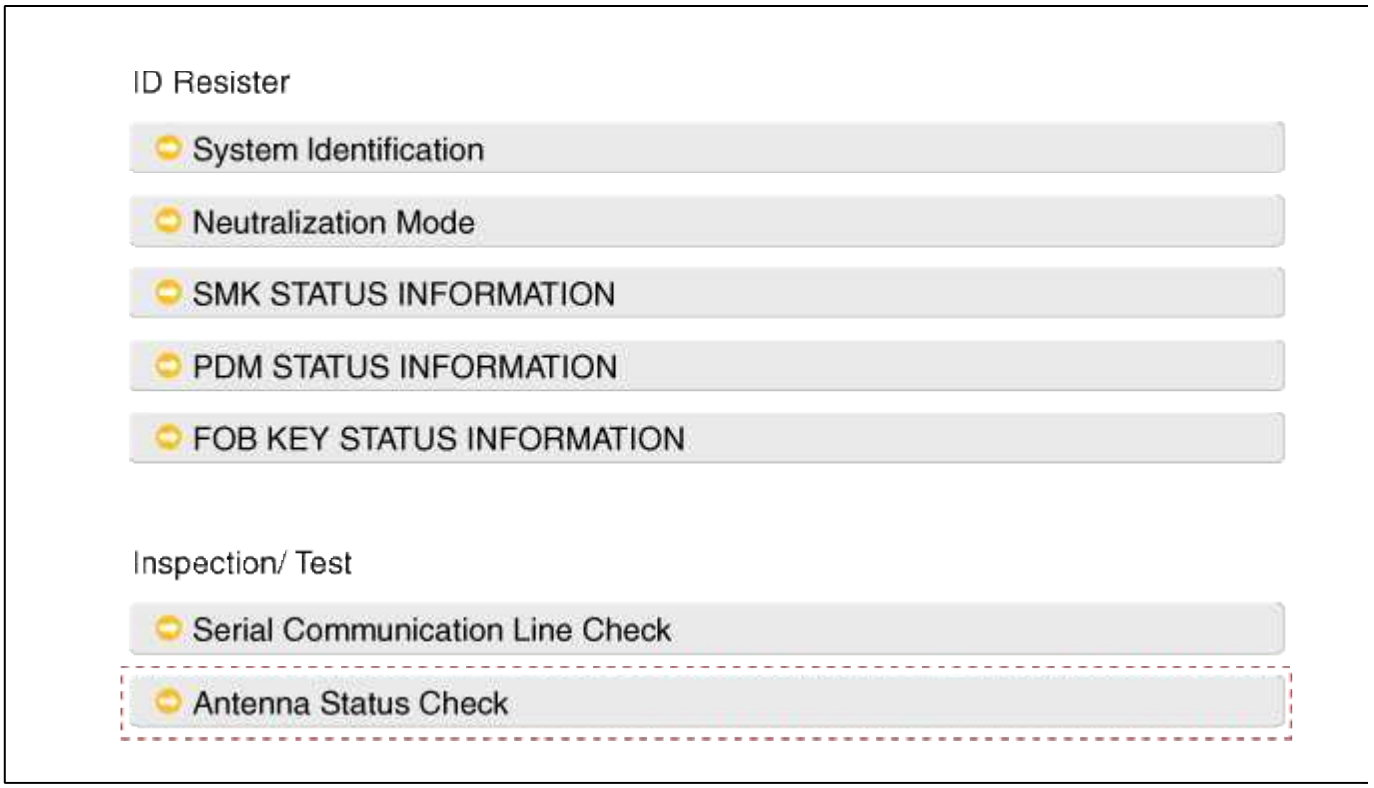
3. Set the smart key near the related antenna and operate it with a GDS.



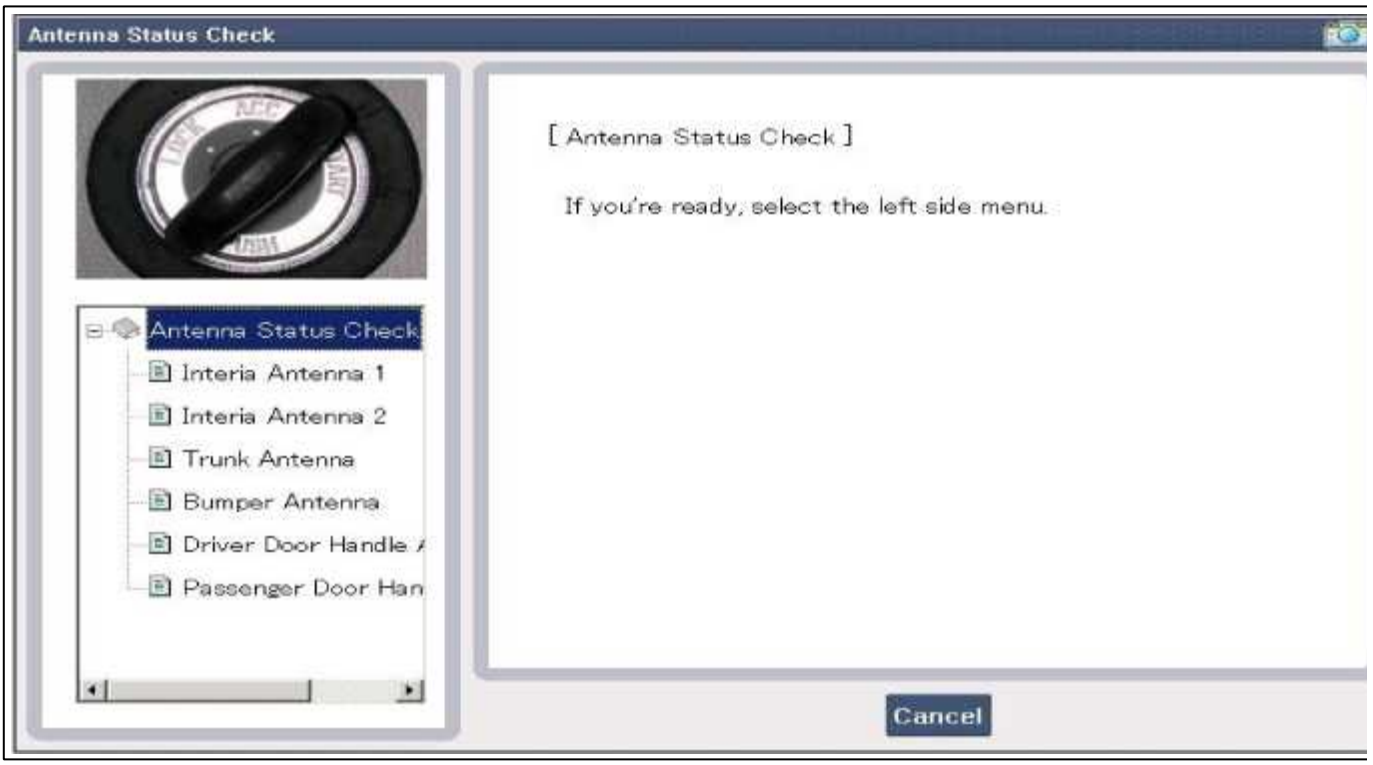
4. If the LED of smart key is blinking, the smart key is normal.
5. If the LED of smart key is not blinking, check the voltage of smart key battery.
6. Antenna actuation
   A. INTERIOR Antenna 1
   B. INTERIOR Antenna 2
   C. Trunk antenna
   D. BUMPER/Antenna
   E. DRV_DR Antenna
   F. AST_DR Antenna

Antenna Status Check

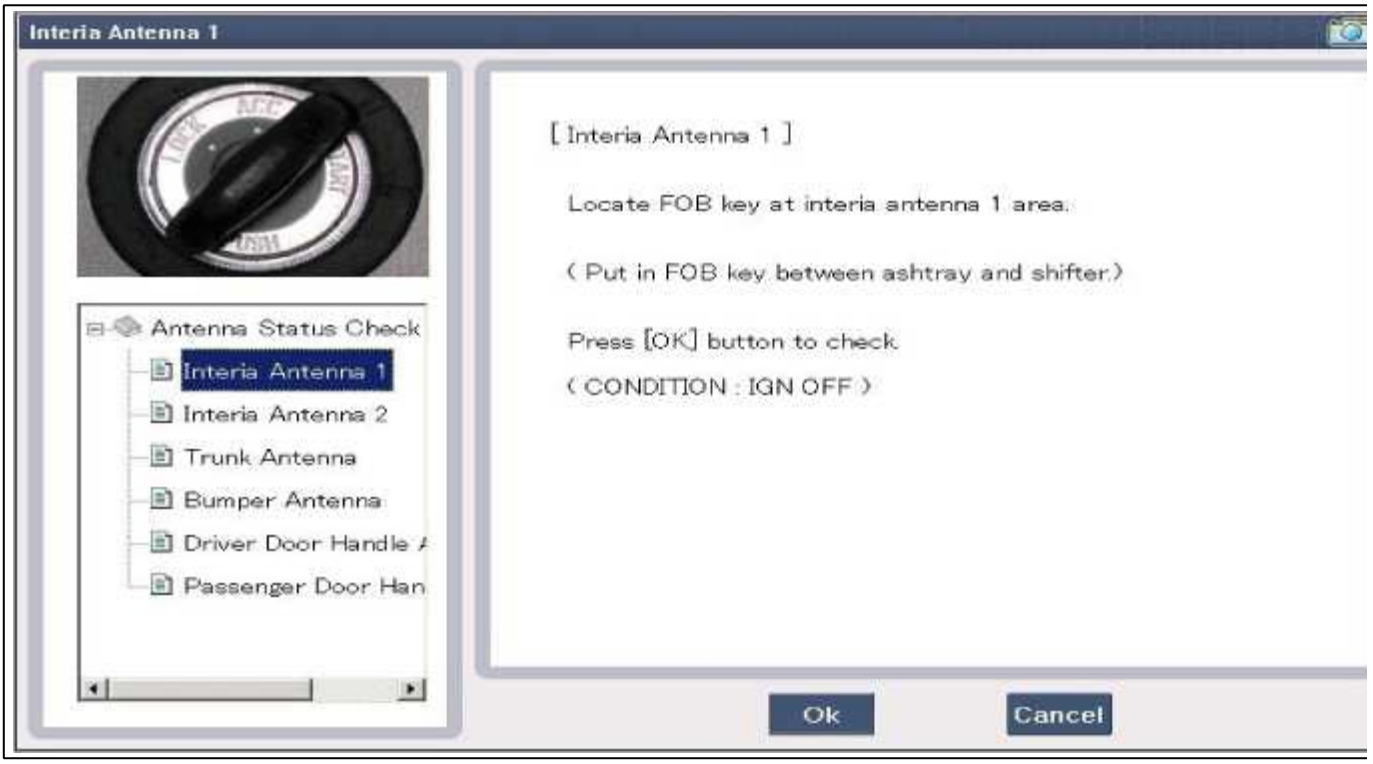
1. Connect the cable of GDS to the data link connector in driver side crash pad lower panel.
2. Select the "Antenna Status Check".



3. After IG ON, select the "Antenna Status Check".



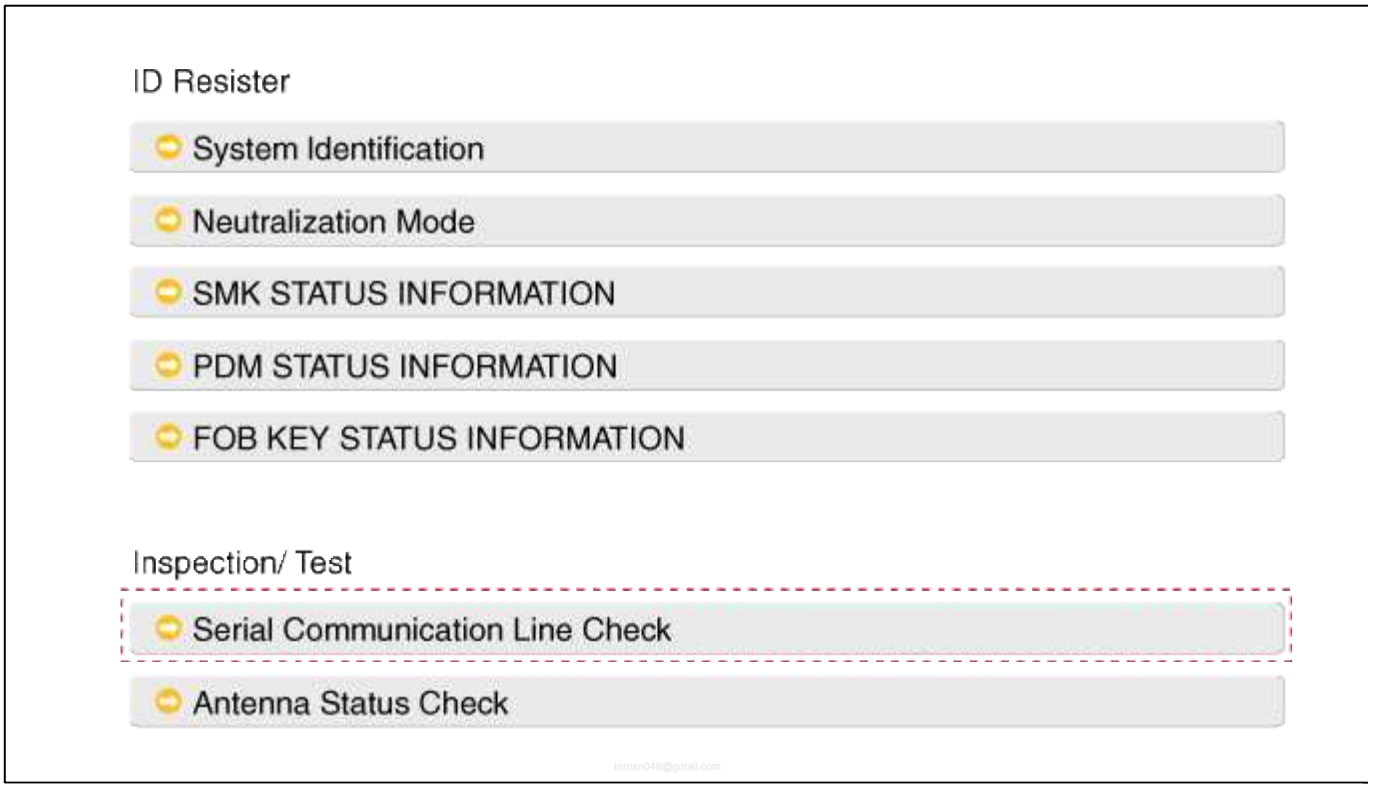
4. Set the smart key near the related antenna and operate it with a GDS.



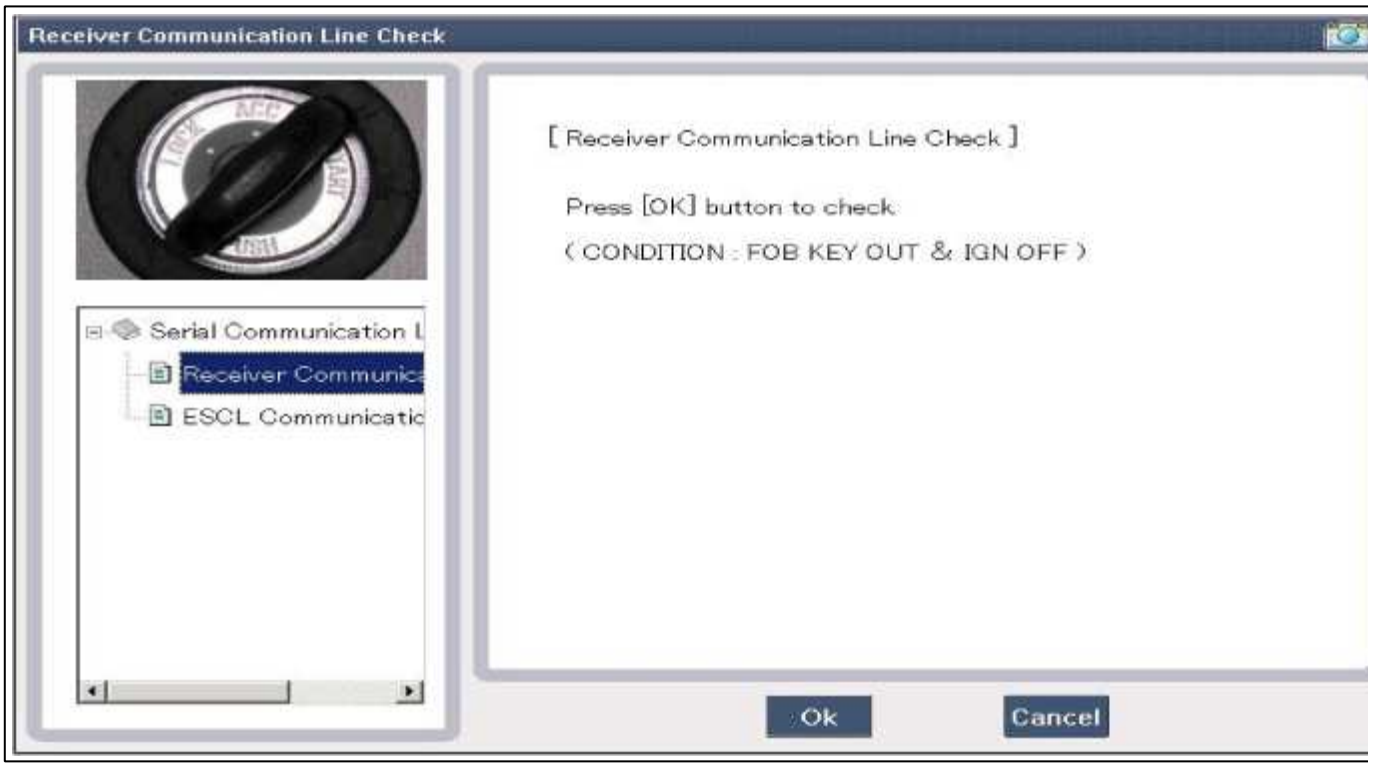
5. If the smart key runs normal , the related antenna, smart key(transmission, reception) and exterior receiver are normal.
6. Antenna status
   A. INTERIOR Antenna 1
   B. INTERIOR Antenna 2
   C. Trunk antenna
   D. BUMPER/Antenna
   E. DRV_DR Antenna
   F. AST_DR Antenna

Serial Communication Status Check

1. Connect the cable of GDS to the data link connector in driver side crash pad lower panel.
2. Select the "Serial Communication Line Check".



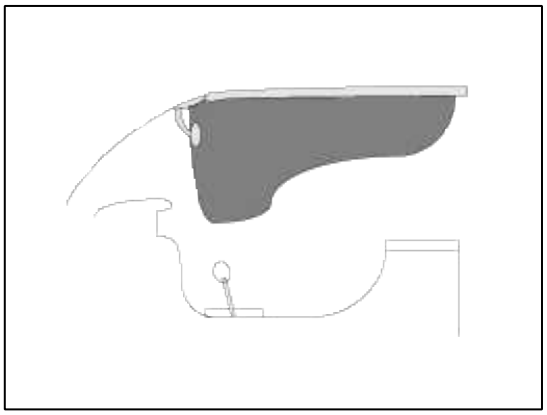
3. After IG ON, select the "Receiver Communication Line Check".



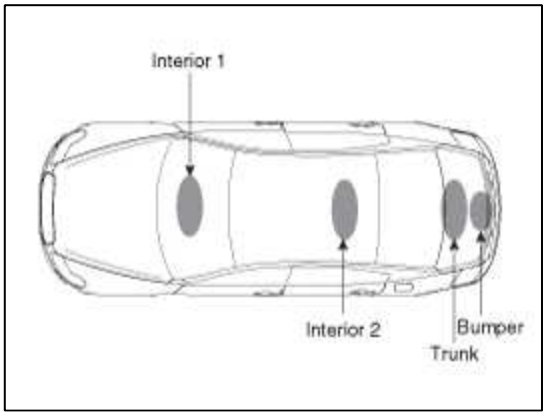
4. Check the serial communication line with a GDS.
5. If the smart key runs normal, the communication of smart key unit, exterior receiver are normal.
6. If the smart key runs abnormal, check the following items.
   A. Disconnection or no response of the exterior receiver communication line.
   B. The exterior receiver communication line disconnection and ground connection.

Interior Antenna Actuation Check

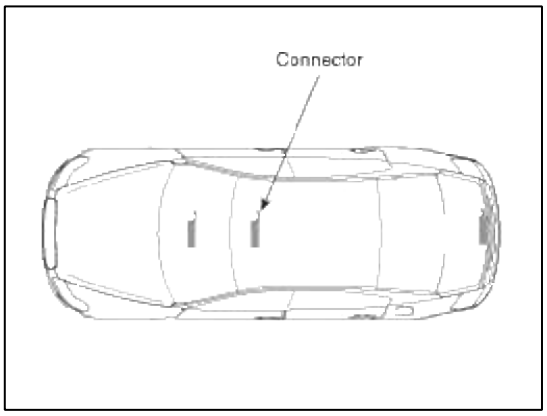
1. Set the smart key in the following shade area and check the IG ON.



2. If the ignition is ON, the antenna runs normal.
3. Check the interior antenna ignition mode.
4. Set the smart key in the following shade area and actuate the antenna. Check the LED of smart key is blinking.

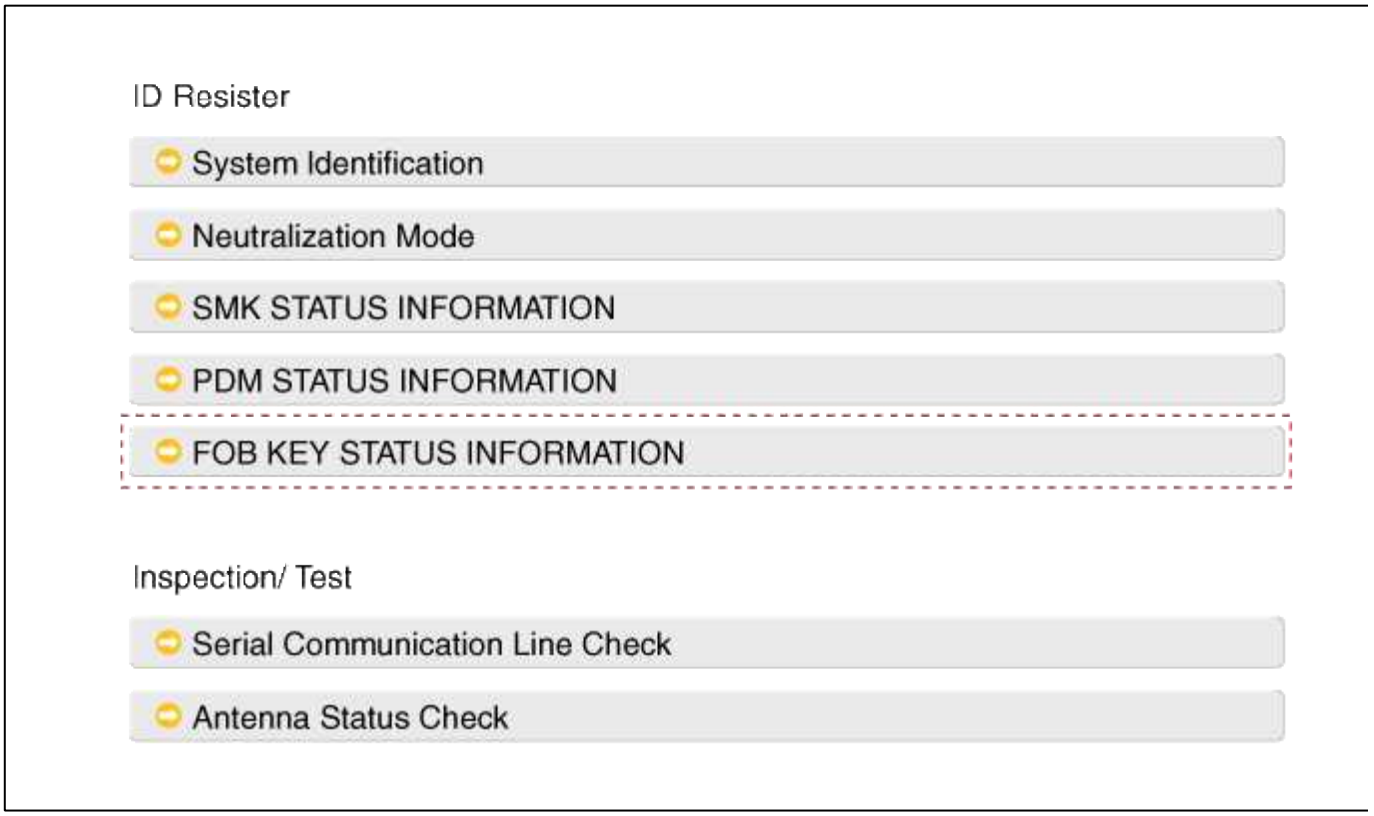


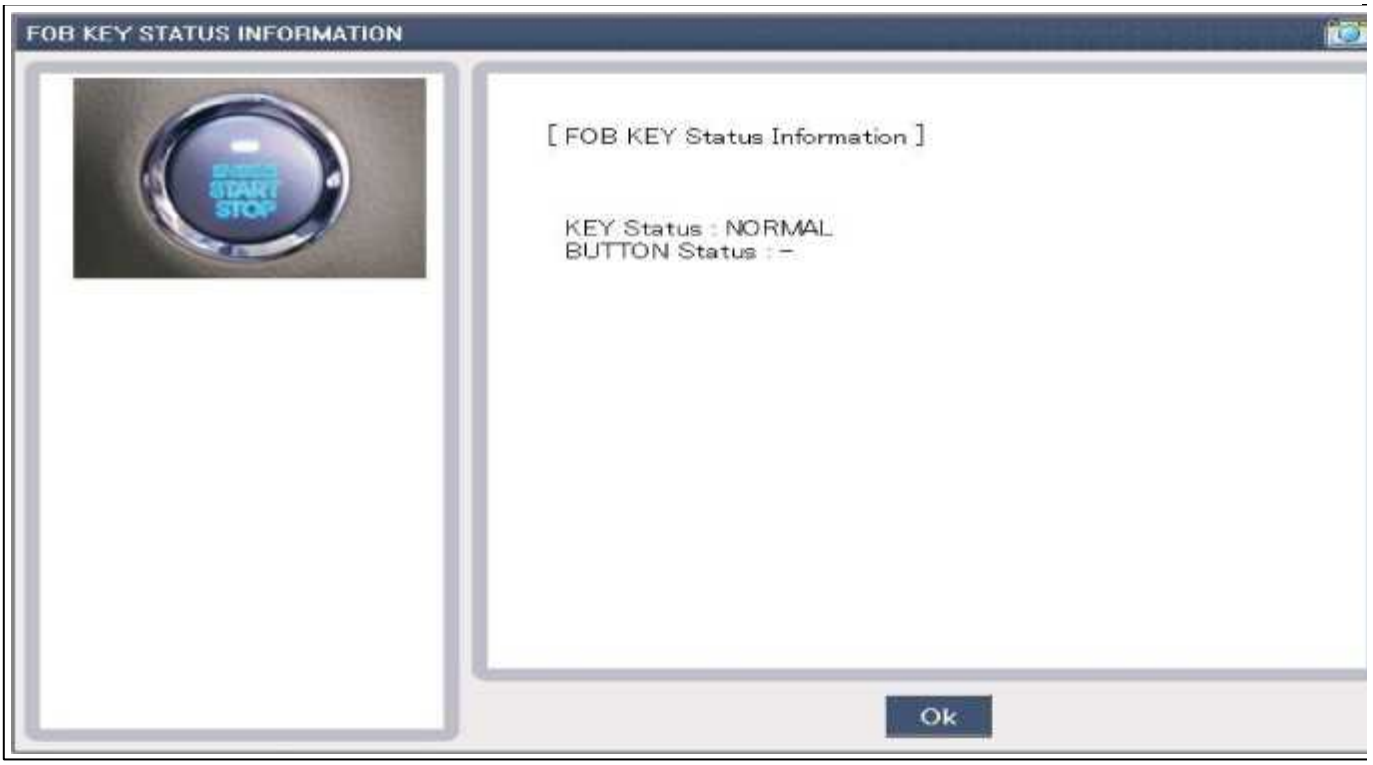
5. If the LED of smart key is not blinking, check the antenna in shade area.



FOB Status Check

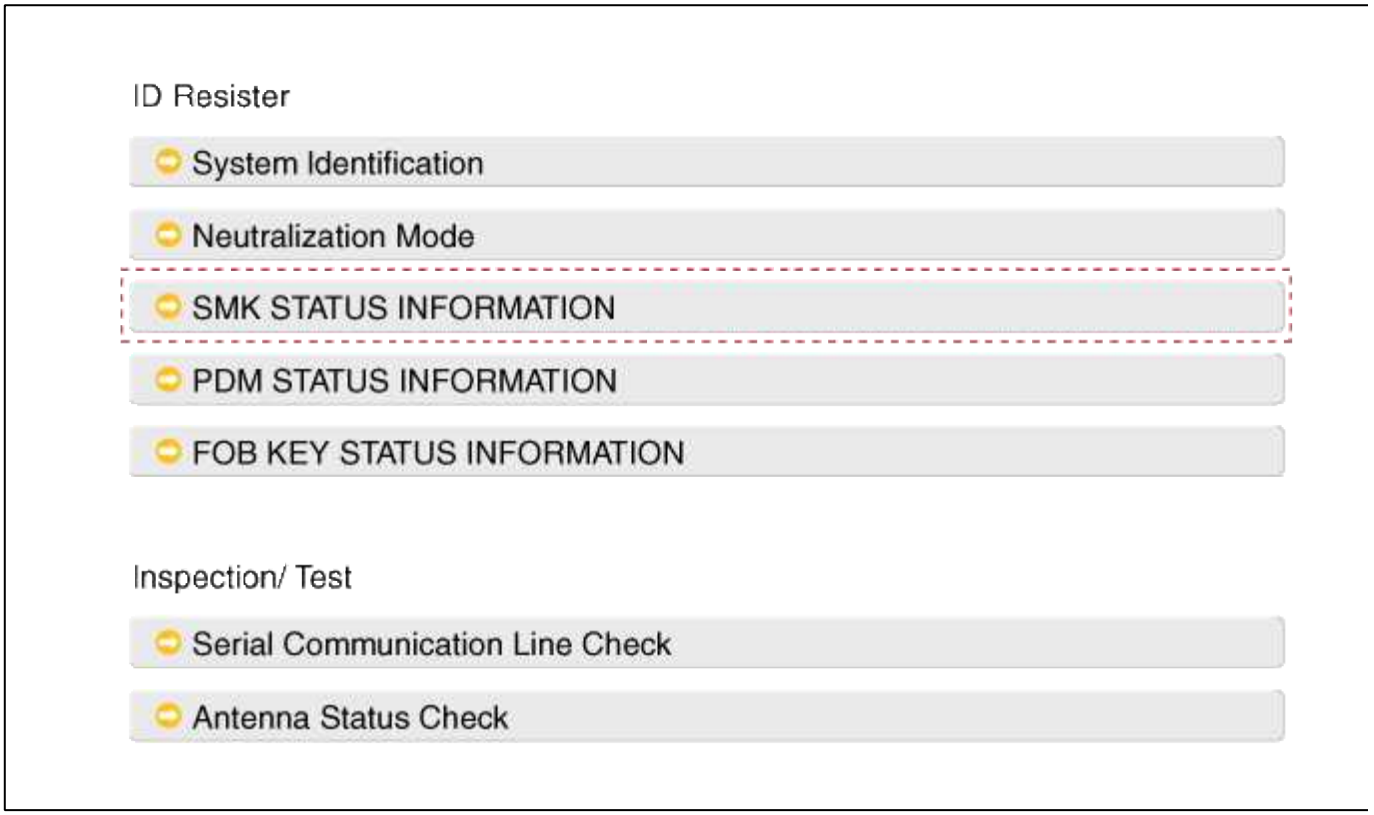
1. Connect the cable of GDS to the data link connector in driver side crash pad lower panel.
2. After IG ON, select the "FOB KEY STATUS INFO".

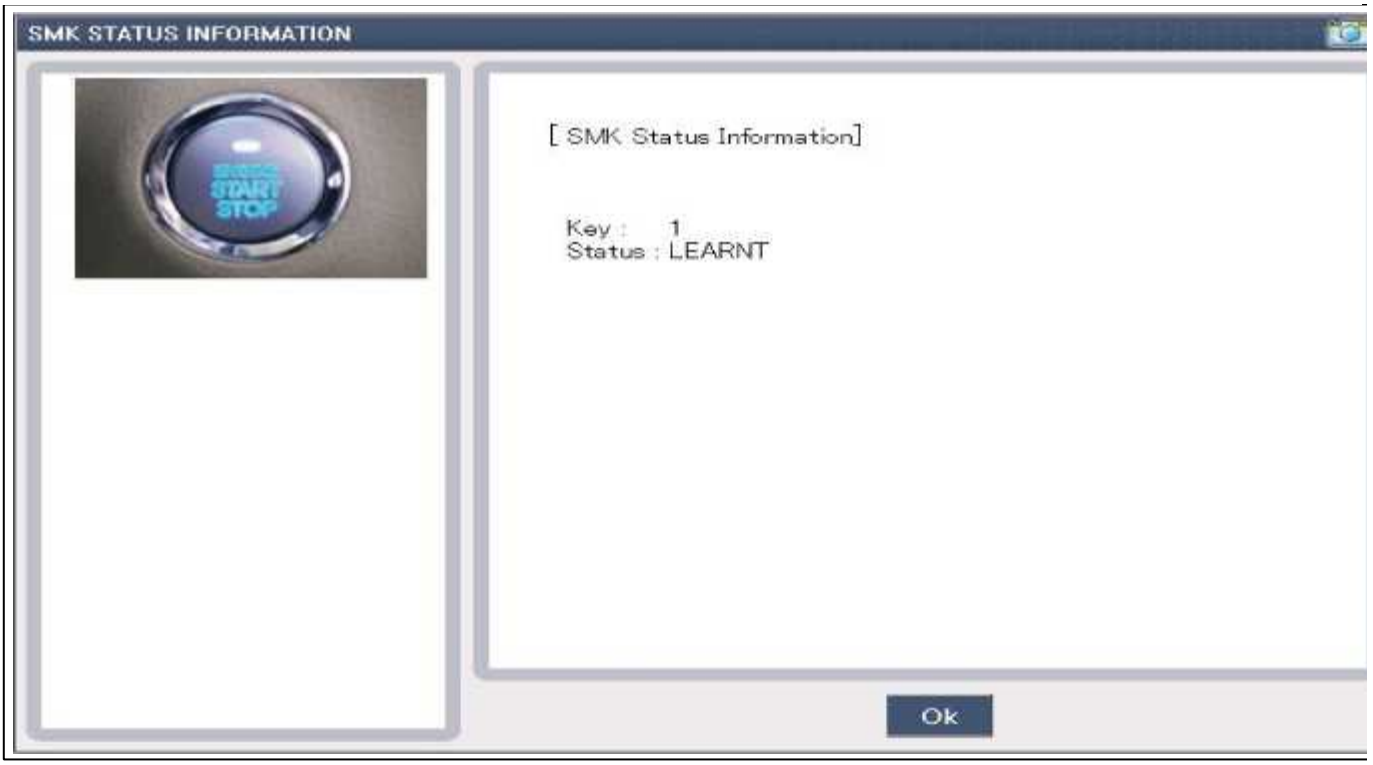




Smart Key Status Check

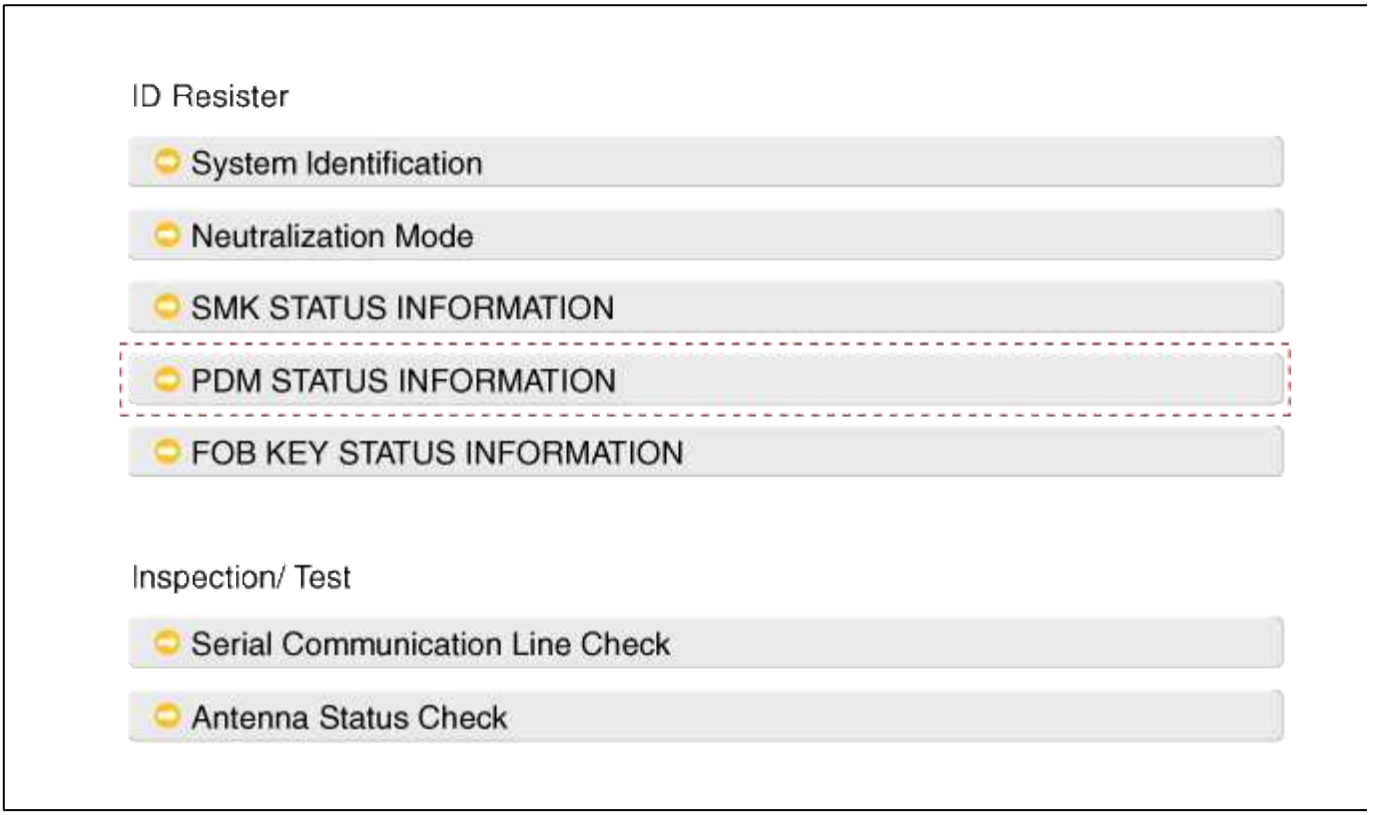
1. Connect the cable of GDS to the data link connector in driver side crash pad lower panel.
2. After IG ON, select the "SMK STATUS INFO".

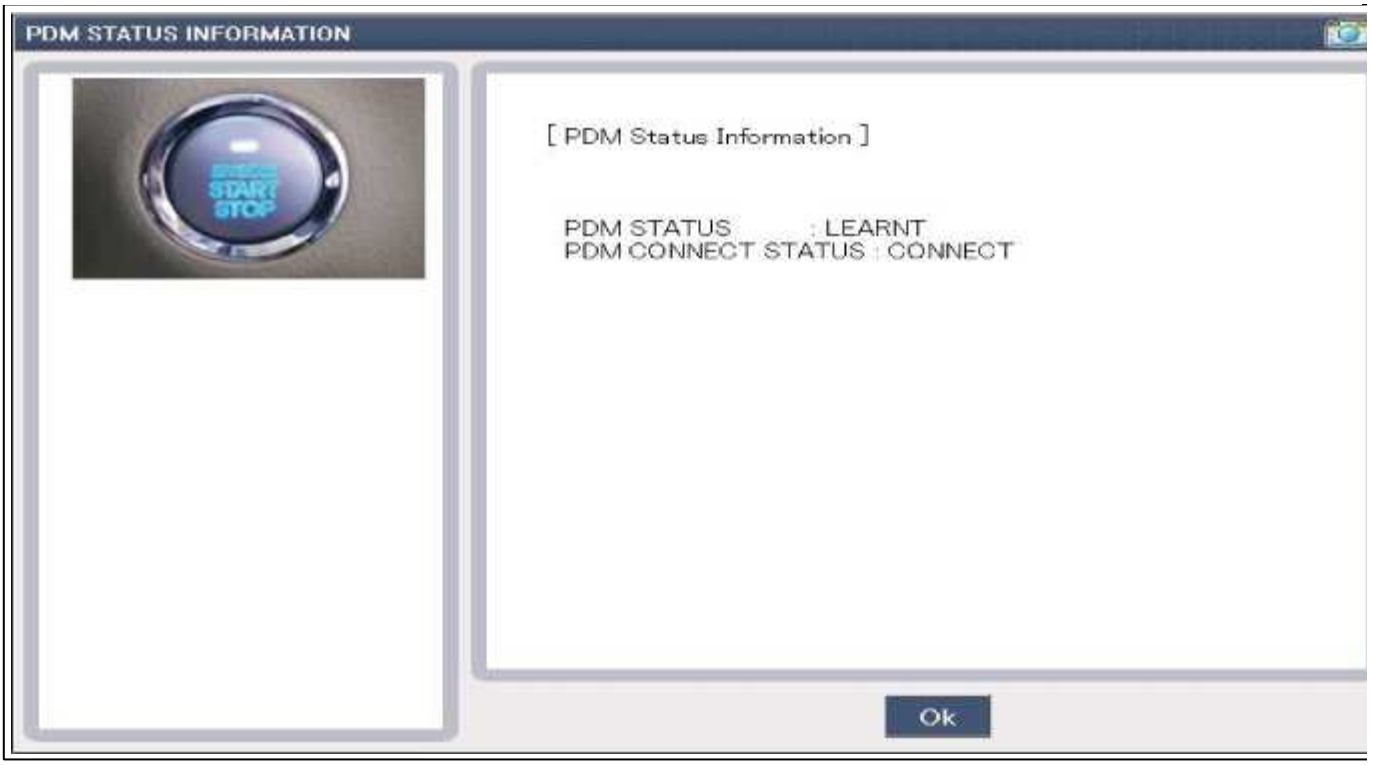




PDM Status Check

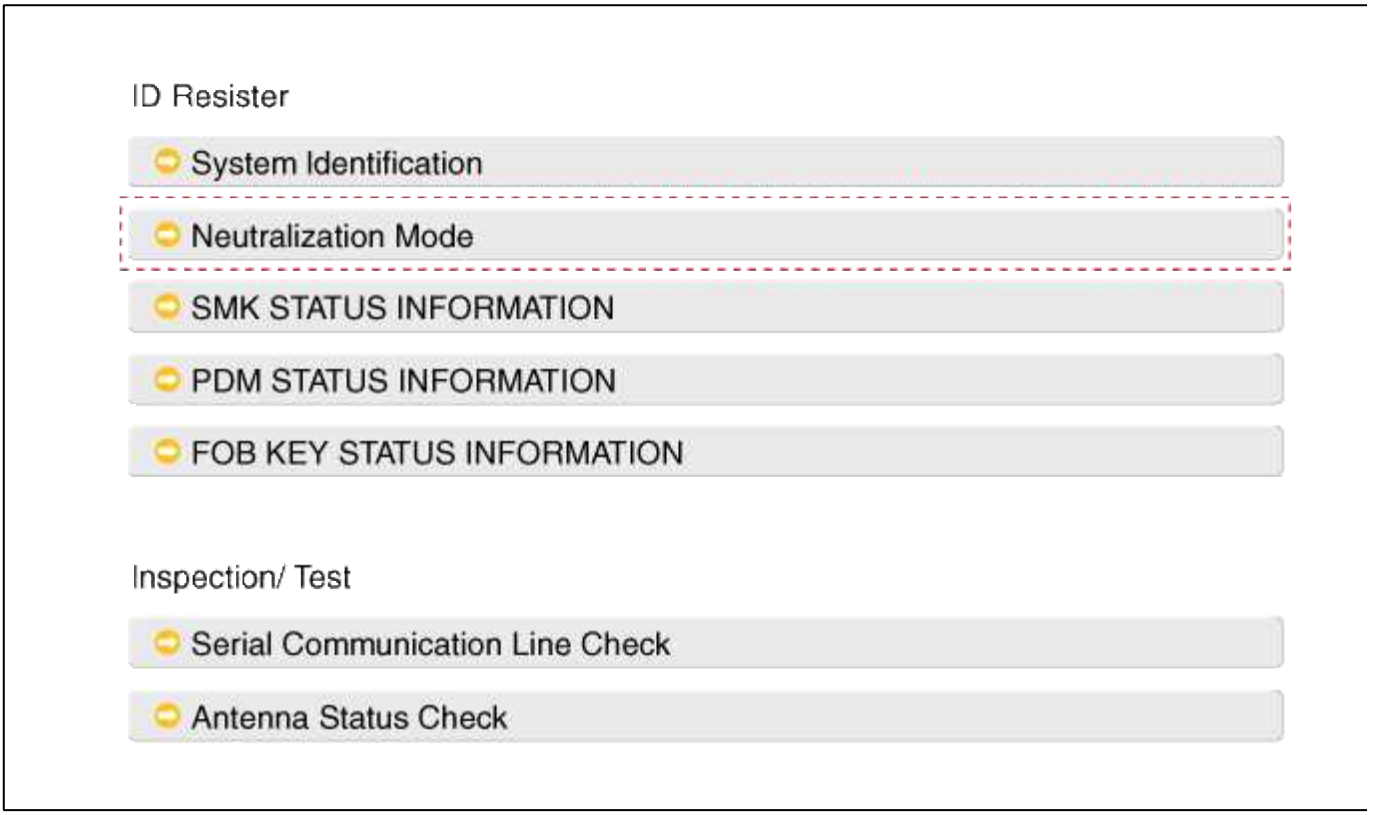
1. Connect the cable of GDS to the data link connector in driver side crash pad lower panel.
2. After IG ON, select the "PDM STATUS INFO".

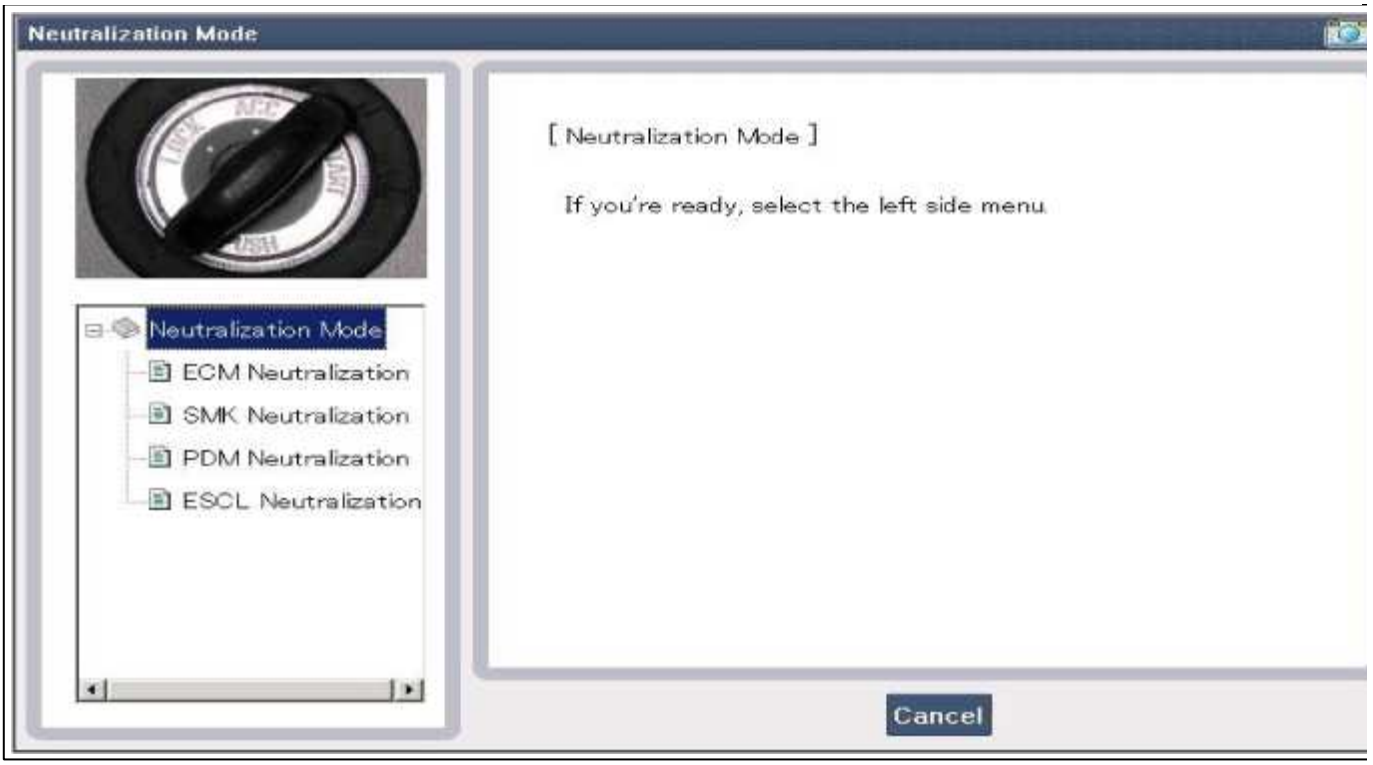


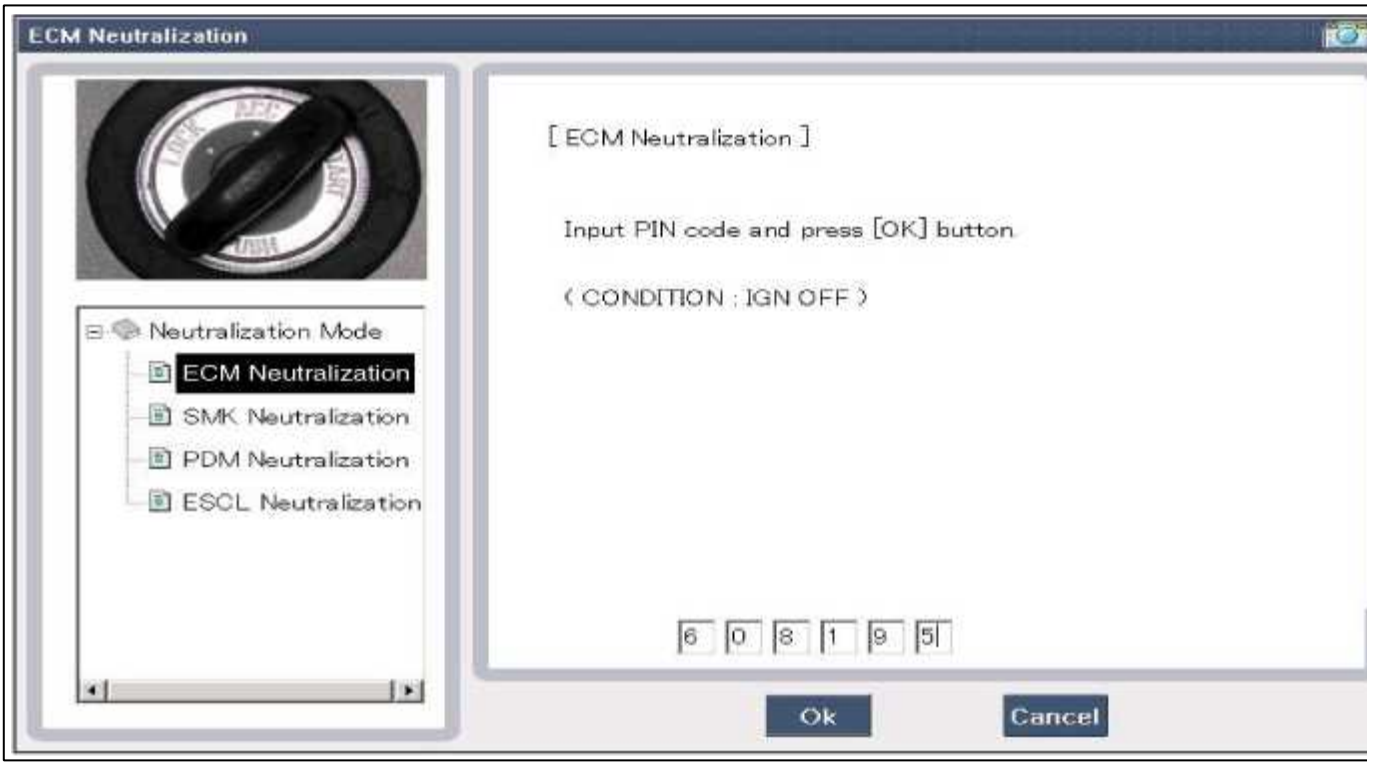


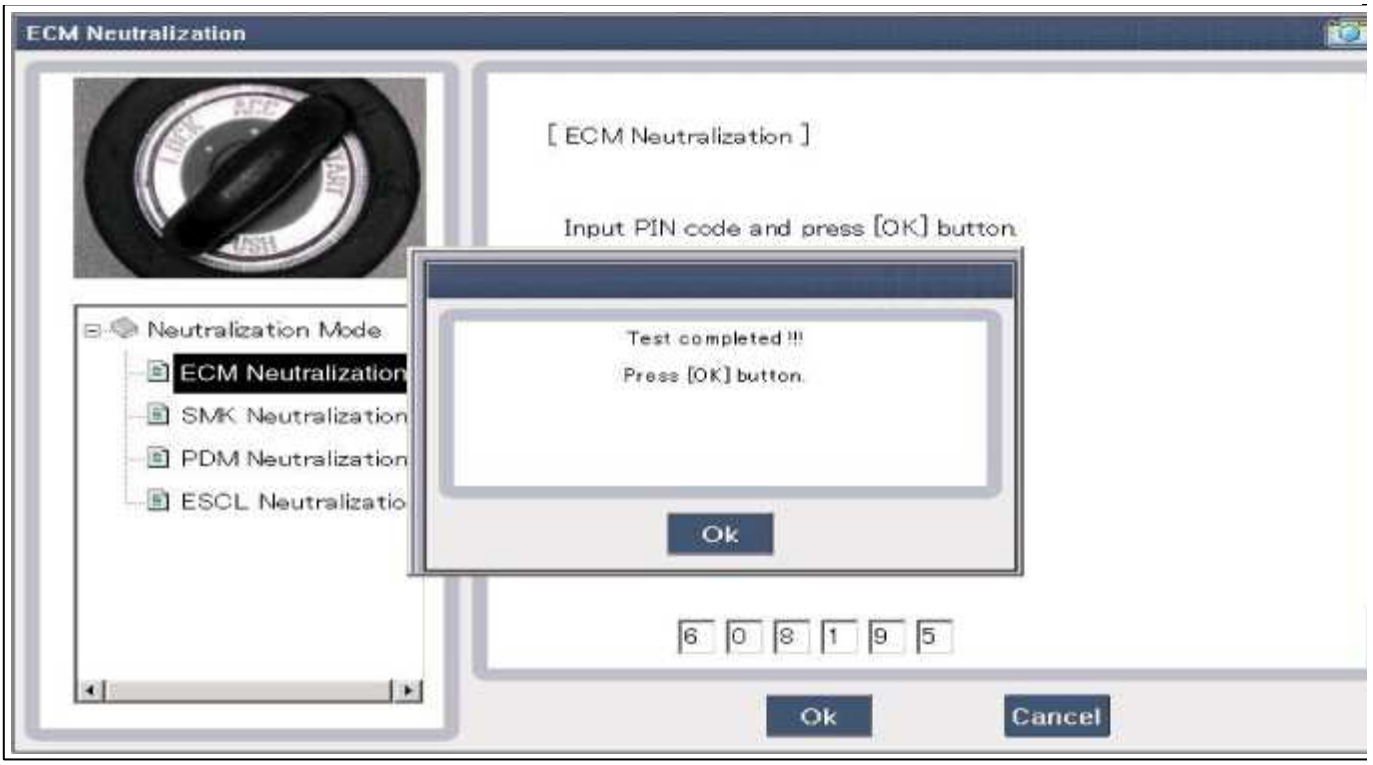
Neutralization Status Check

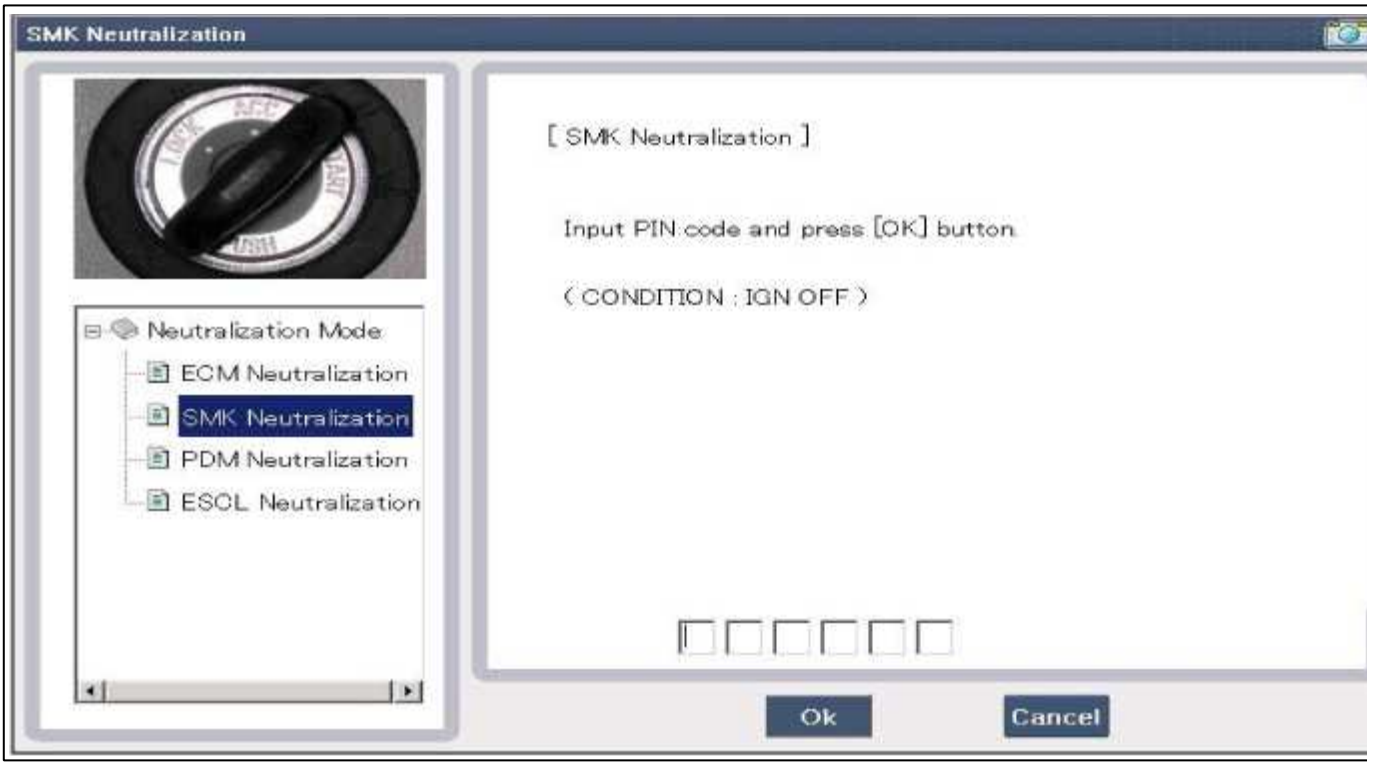
1. Connect the cable of GDS to the data link connector in driver side crash pad lower panel.
2. After IG ON, select the "Neutralization mode".

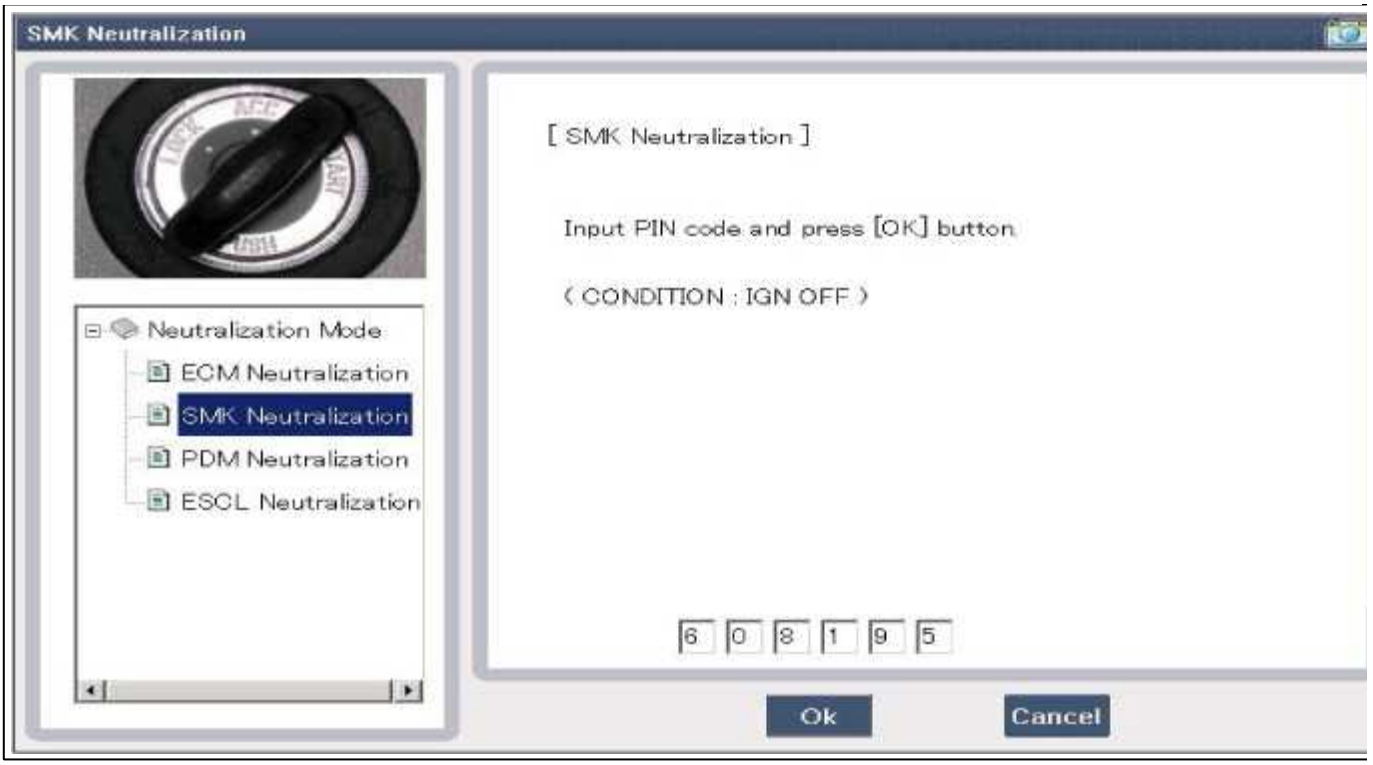


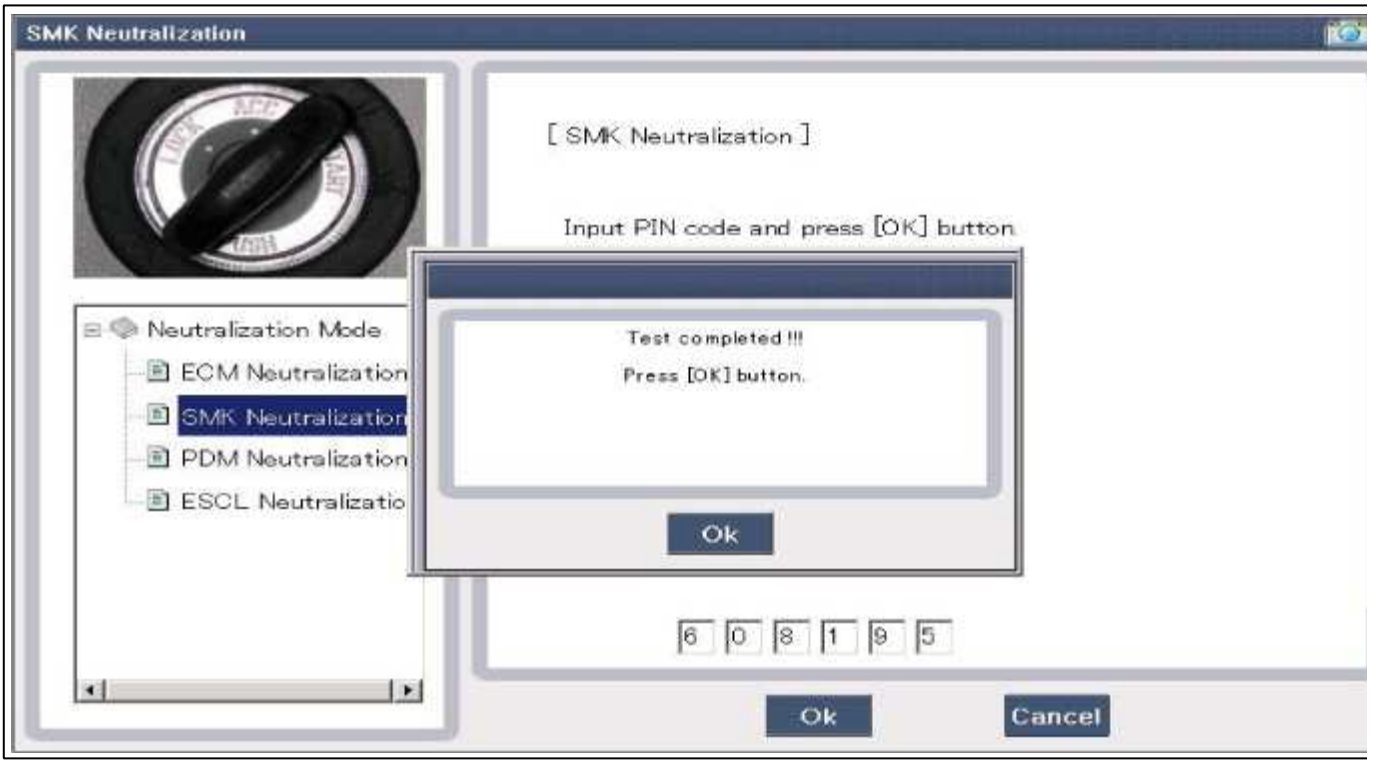


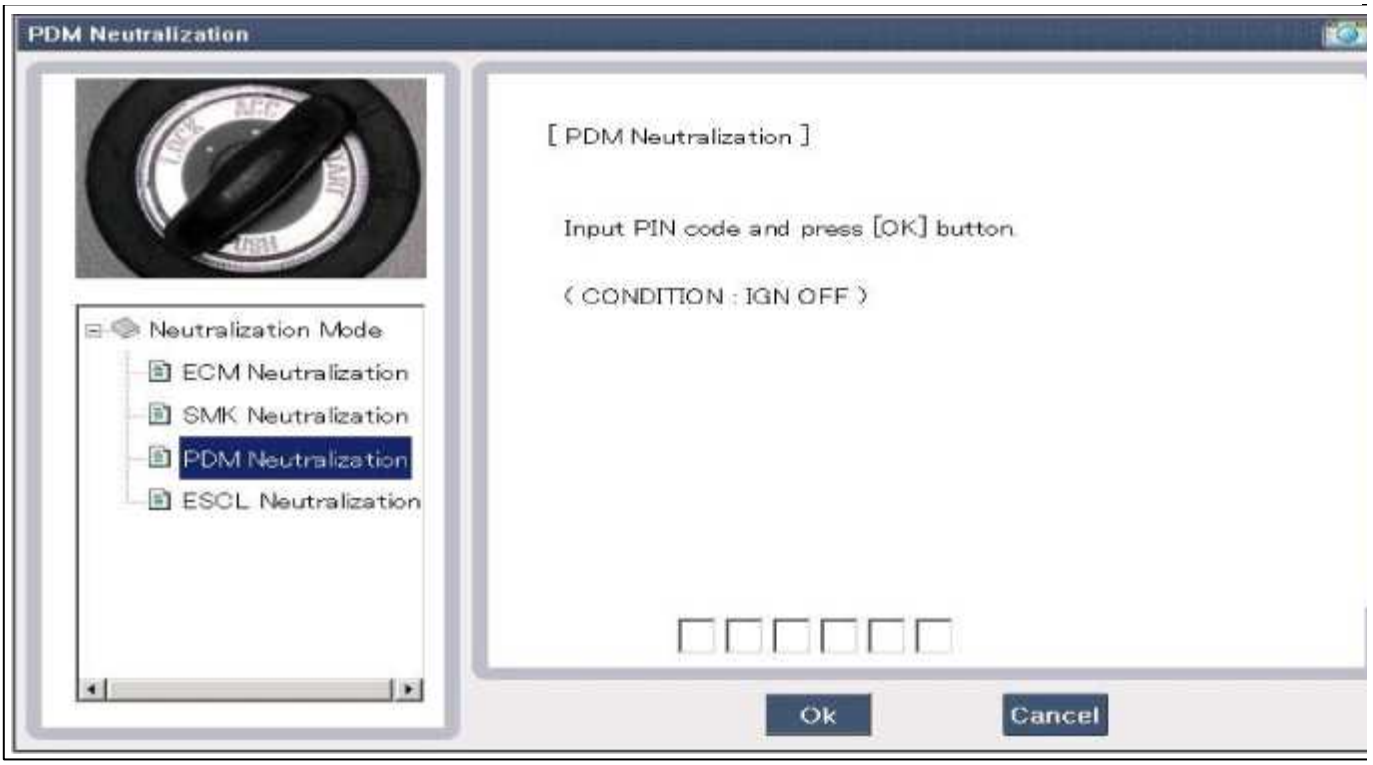


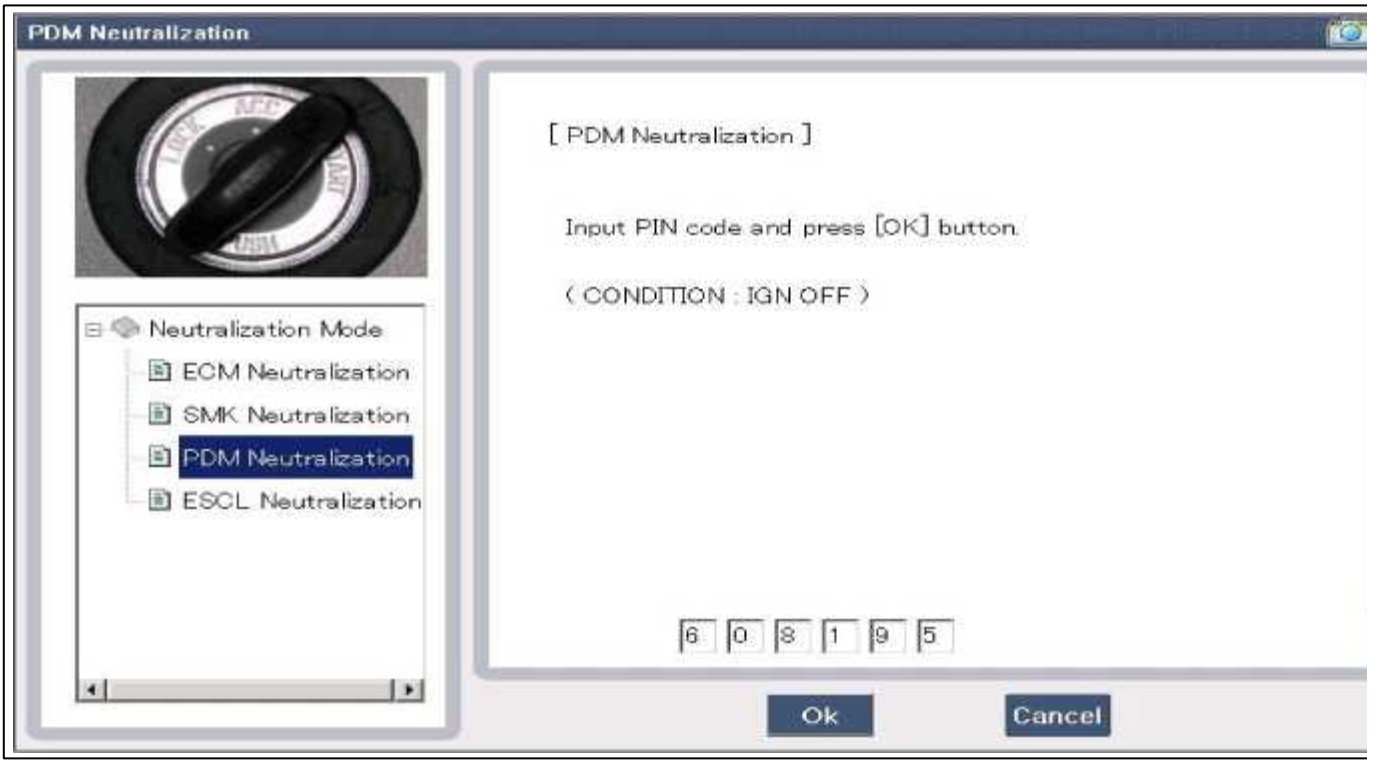

ECM Neutralization
[ECM Neutralization]
Input PIN code and press [OK] button.
Neutralization Mode
ECM Neutralization
SMK Neutralization
PDM Neutralization
ESCL Neutralizatio
Test completed !!!
Press [OK] button.
Ok
6 0 8 1 9 5
Ok
Cancel

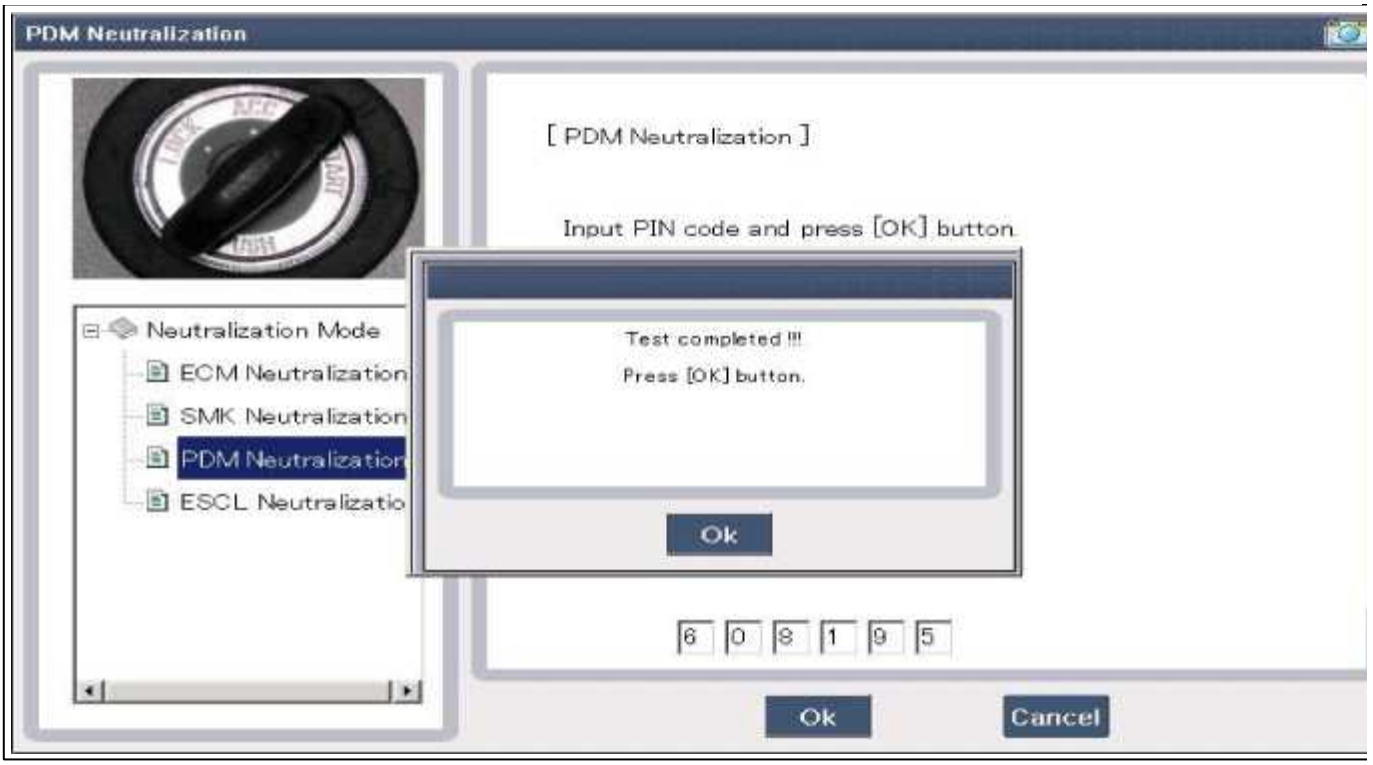

SMK Neutralization
[SMK Neutralization]
Input PIN code and press [OK] button.
(CONDITION : IGN OFF)
Neutralization Mode
ECM Neutralization
SMK Neutralization
PDM Neutralization
ESCL Neutralization
Ok
Cancel


SMK Neutralization
Neutralization Mode
ECM Neutralization
SMK Neutralization
PDM Neutralization
ESCL Neutralization
[SMK Neutralization]
Input PIN code and press [OK] button.
(CONDITION : IGN OFF)
6 0 8 1 9 5
Ok
Cancel


SMK Neutralization
Neutralization Mode
ECM Neutralization
SMK Neutralization
PDM Neutralization
ESCL Neutralizatio
[SMK Neutralization]
Input PIN code and press [OK] button.
Test completed !!!
Press [OK] button.
Ok
6 0 8 1 9 5
Ok
Cancel


PDM Neutralization
Neutralization Mode
ECM Neutralization
SMK Neutralization
PDM Neutralization
ESCL Neutralization
[PDM Neutralization]
Input PIN code and press [OK] button.
(CONDITION : IGN OFF)
Ok
Cancel


PDM Neutralization
Neutralization Mode
ECM Neutralization
SMK Neutralization
PDM Neutralization
ESCL Neutralization
[PDM Neutralization]
Input PIN code and press [OK] button.
(CONDITION : IGN OFF)
6 0 8 1 9 5
Ok
Cancel



Input Switch List

No	Item name	Unit
1	SSB SW2	-
2	ACC	-
3	IGN1	-
4	Gear 'P' Position	-
5	Brake SW	-
6	FL Door Lock Button	-
7	FR Door Lock Button	-
8	Trunk Lid SW	-
9	Battery Voltage	-
10	Alternator Voltage	-
11	KEY out Indicator Lamp	-
12	Immobilizer Lamp	-
13	External Buzzer	-
14	ESCL Enable	-

Actuator List

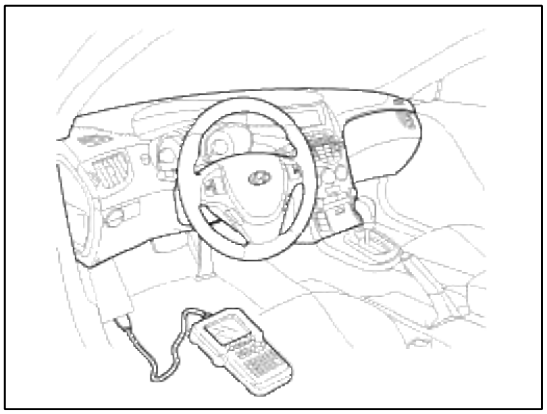
No.	Item name	Condition
1	KEY out Indicator Lamp	Ignition switch ON Engine off
2	Immo.indicator Lamp	Ignition switch ON Engine off
3	External Buzzer	Ignition switch ON Engine off
4	Interior Antenna 1 Active	Ignition switch ON Engine off
5	Interior Antenna 2 Active	Ignition switch ON Engine off
6	Interior Antenna 3 Active	Ignition switch ON Engine off
7	Bumper/trunk Antenna Active	Ignition switch ON Engine off
8	DRV_DR Antenna Active	Ignition switch ON Engine off
9	AST_DR Antenna Active	Ignition switch ON Engine off

Body Electrical System > Smart key System > Smart key > Repair procedures

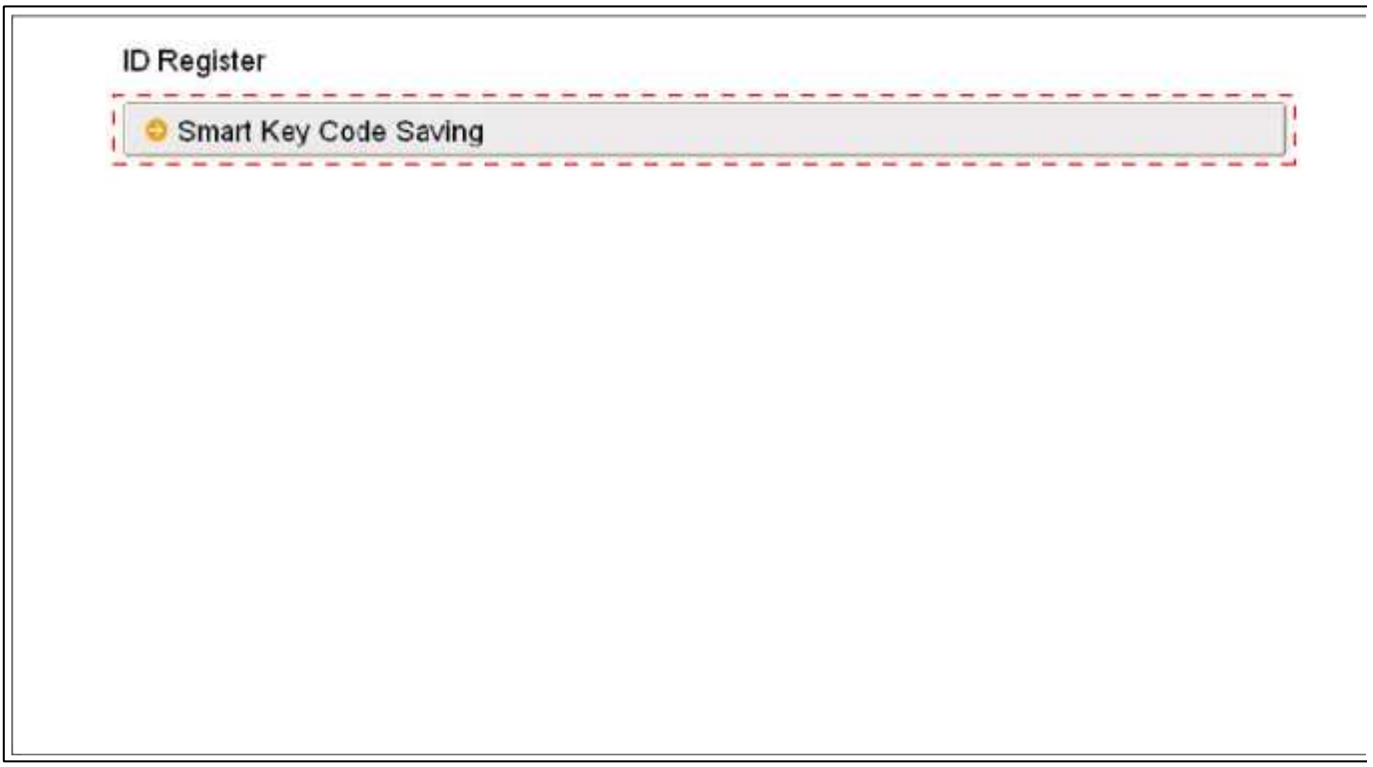
Smart Key

Smart Key Code Saving

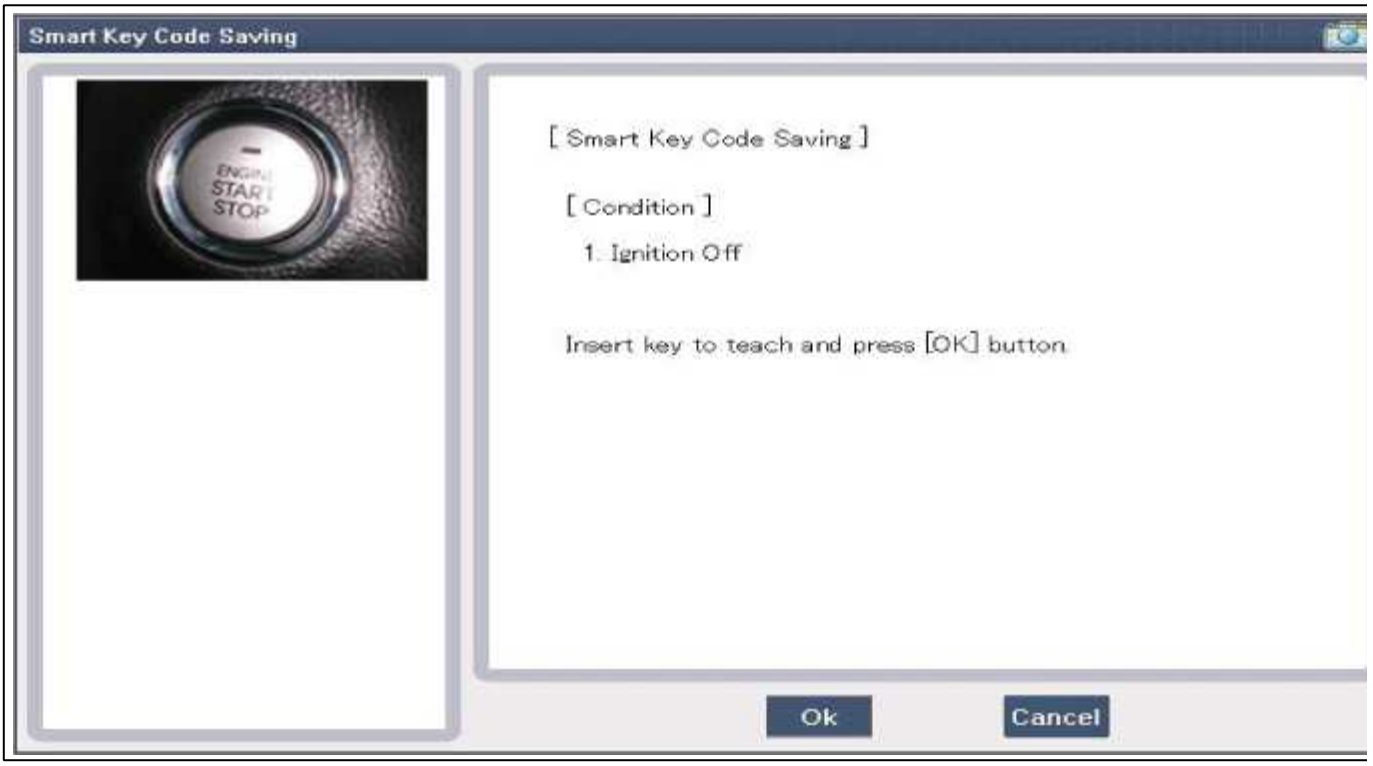
1. Connect the DLC cable of scan tool to the data link connector (16 pins) in driver side crash pad lower panel, turn the power on scan tool.



2. Select the vehicle model and then do "Smart key code saving".

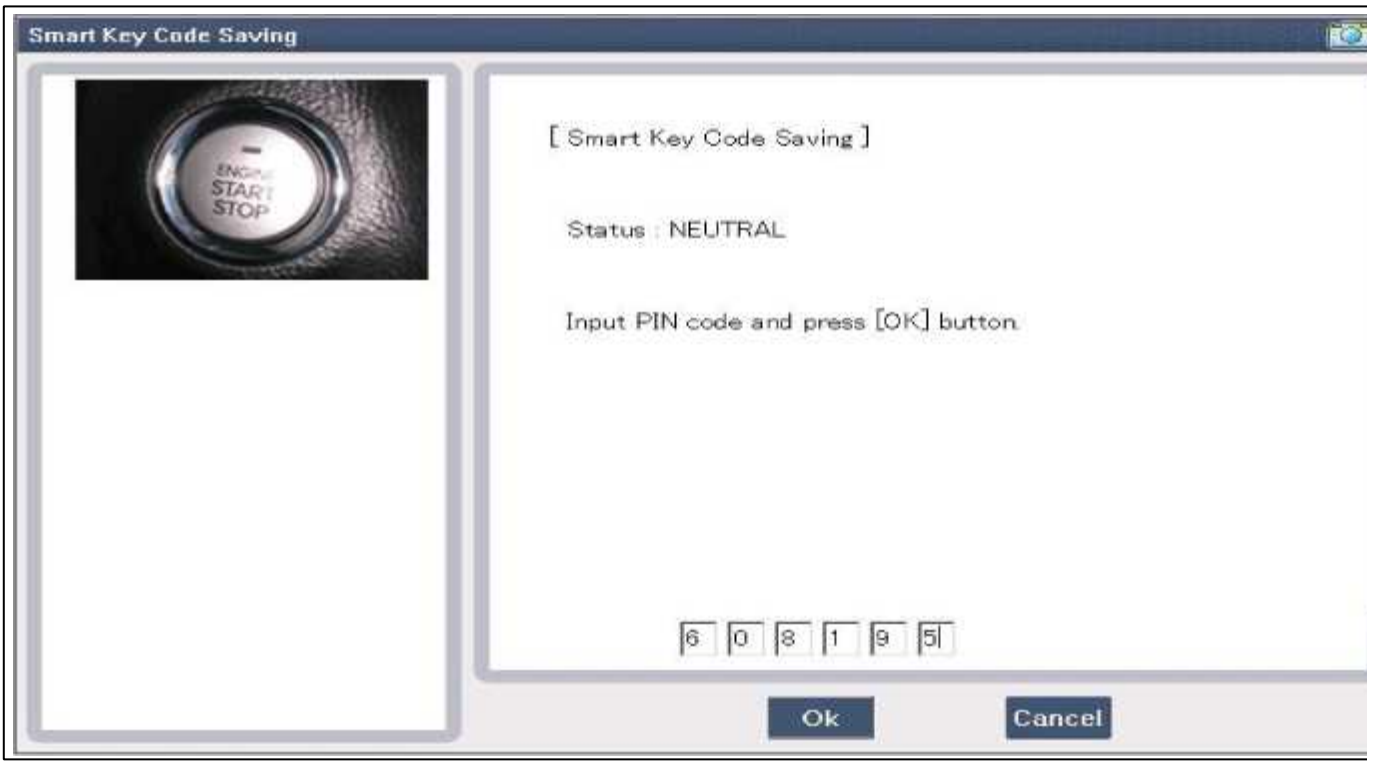


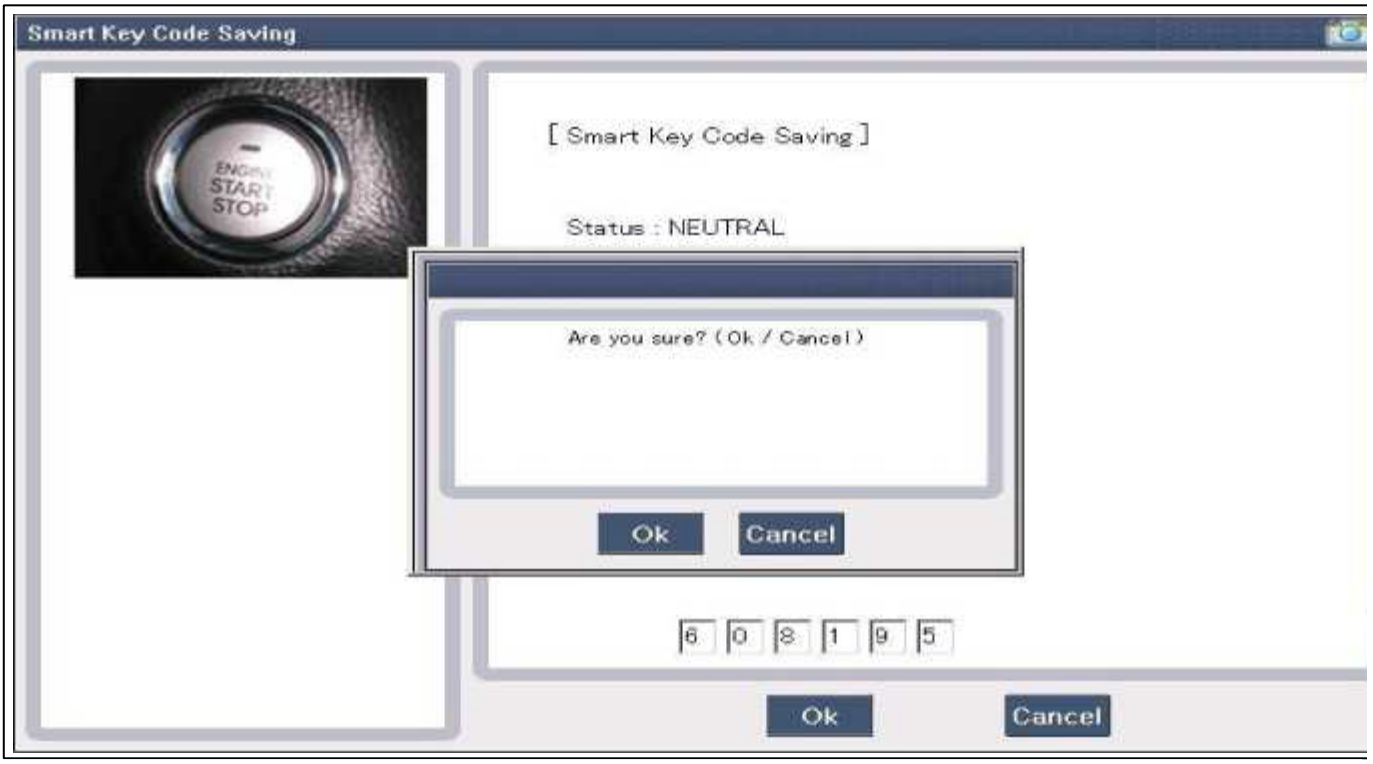
3. After selecting "Smart key teaching" menu, push "Enter" key, then the screen will be shown as below.



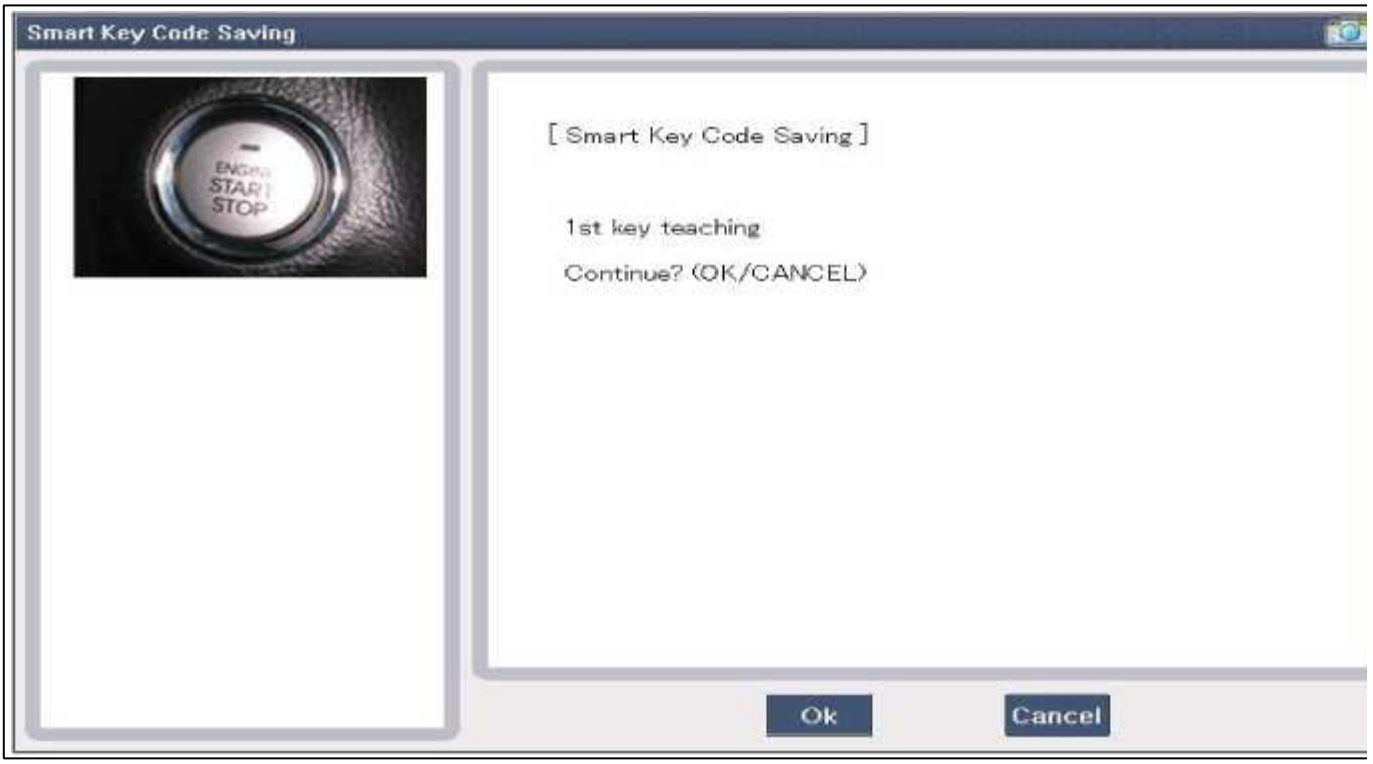
4. After inserting the teaching key, push "ENTER" key.

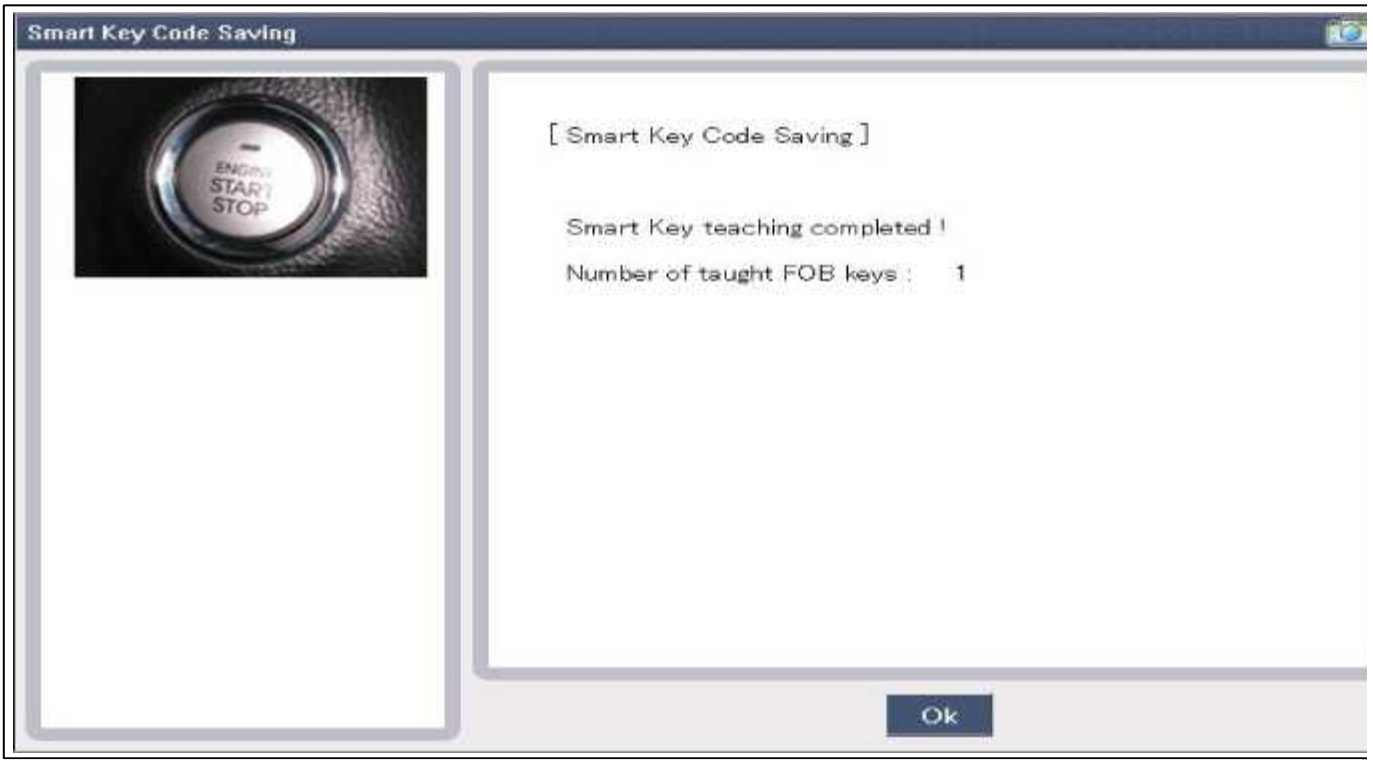
5. Input the "Pin code" for first key teaching.



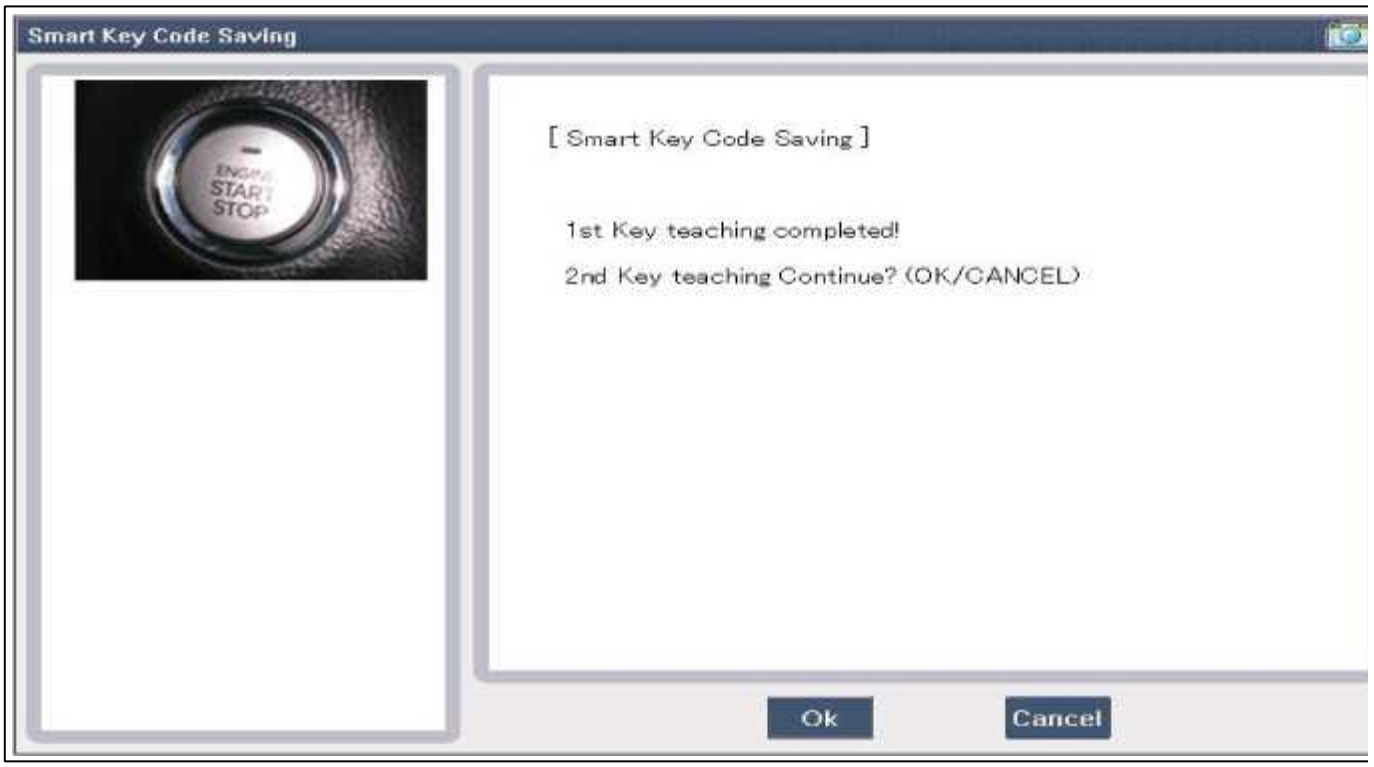


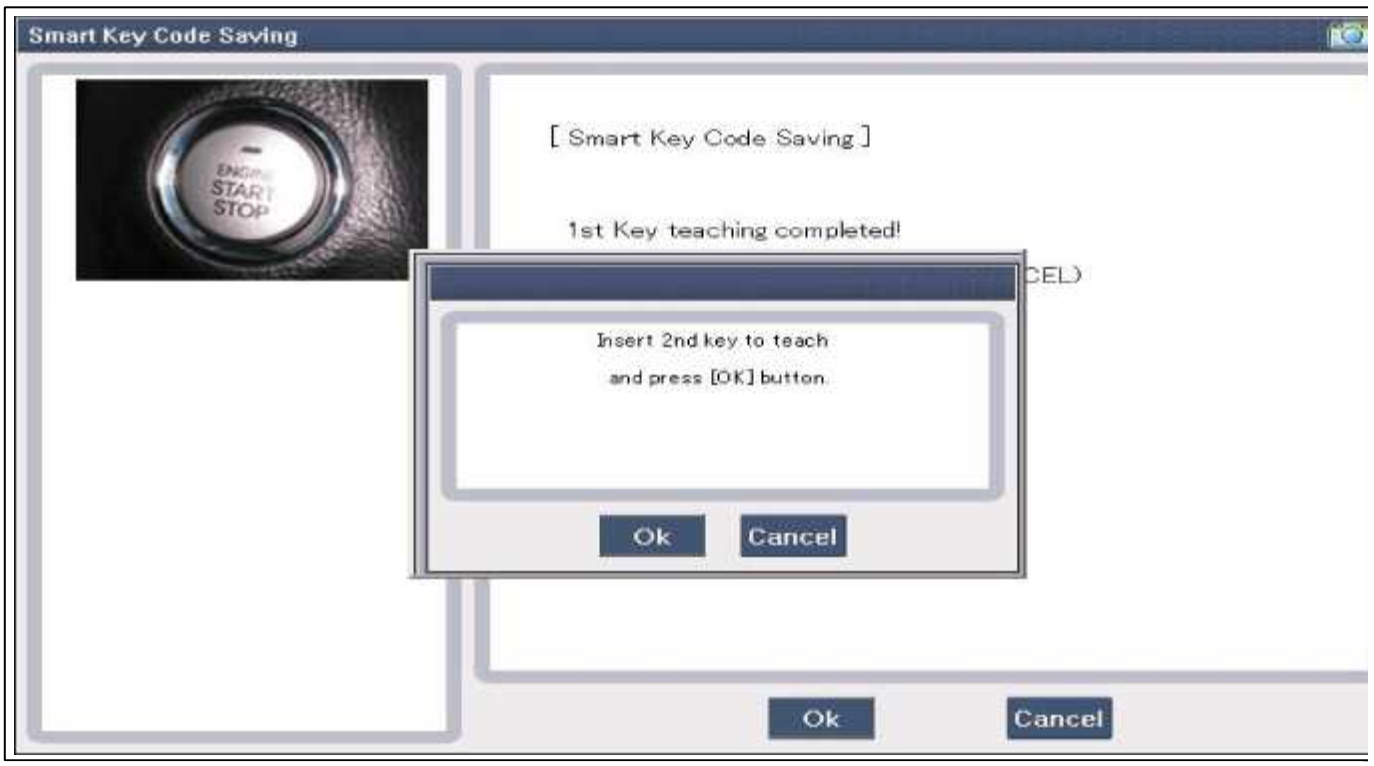
6. Confirm the message "First key teaching completed".



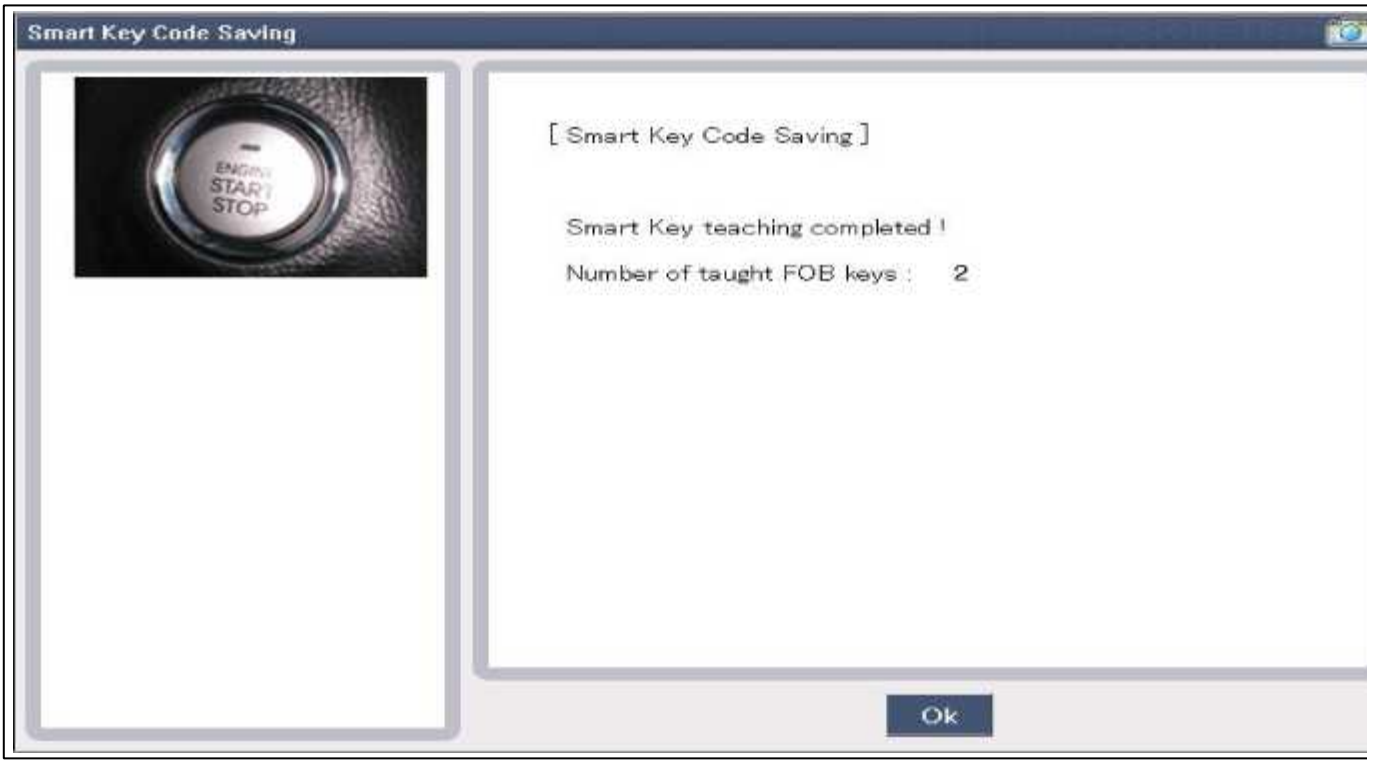


7. Input the "Pin code" for second key teaching.





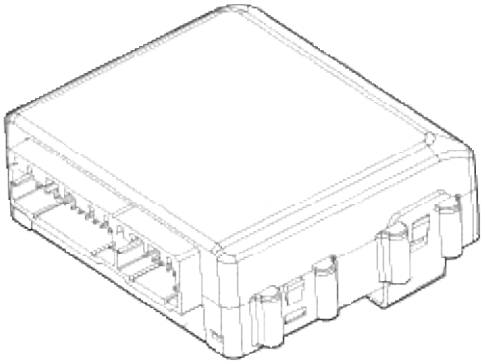
8. Confirm the message "Second key teaching completed".

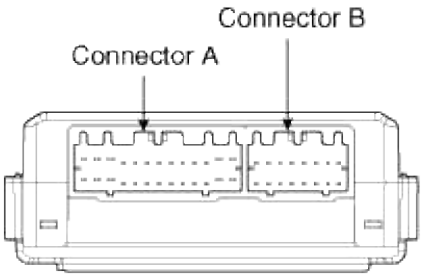


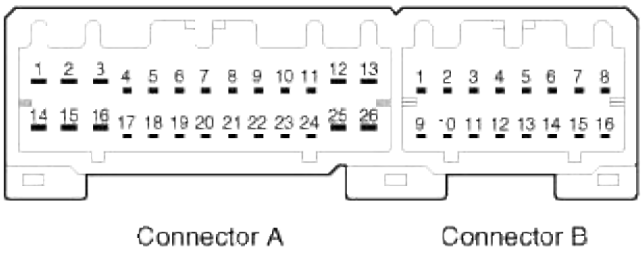
9. Then the screen will be shown as below when key teaching process is completed.

Body Electrical System > Smart key System > Smart key unit > Components and Components Location

Component (1)



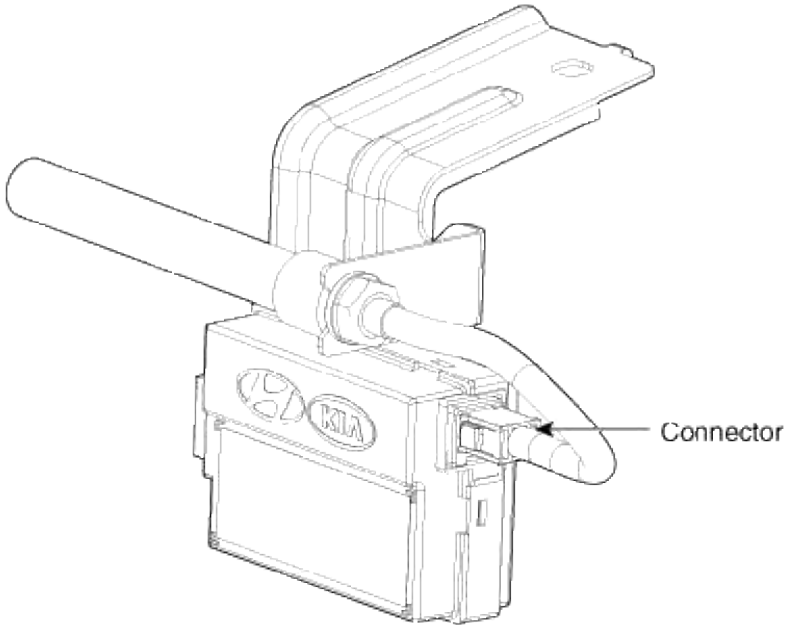


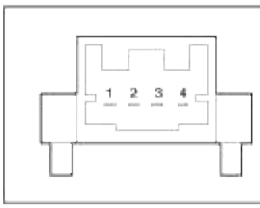


Connector Pin Information

Pin	Connector A	Pin	Connector B
1	Battery	1	Interior 2 antenna 2
2	Immobilizer Indicator	2	Interior 1 antenna 2
3	GND 1	3	-
4	-	4	-
5	Trunk lid	5	Trunk antenna 1
6	Front left door lock / unlock	6	Bumper antenna 1
7	External buzzer	7	Front right side antenna 1
8	-	8	Front left side antenna 1
9	ACC	9	Interior 2 antenna 1
10	CAN high	10	Interior 1 antenna 1
11	CAN low	11	-
12	ESCL Communication	12	-
13	RF Communication	13	Trunk antenna 2
14	IGN 1	14	Bumper antenna 2
15	P position	15	Front right side antenna 2
16	GND 2	16	Front left side antenna 2
17	-		
18	ESCL Enable		
19	-		
20	Front right door lock / unlock		
21	-		
22	Diagnosis		
23	SSB switch		
24	Brake		
25	EMS COM		
26	-		

Component (2)

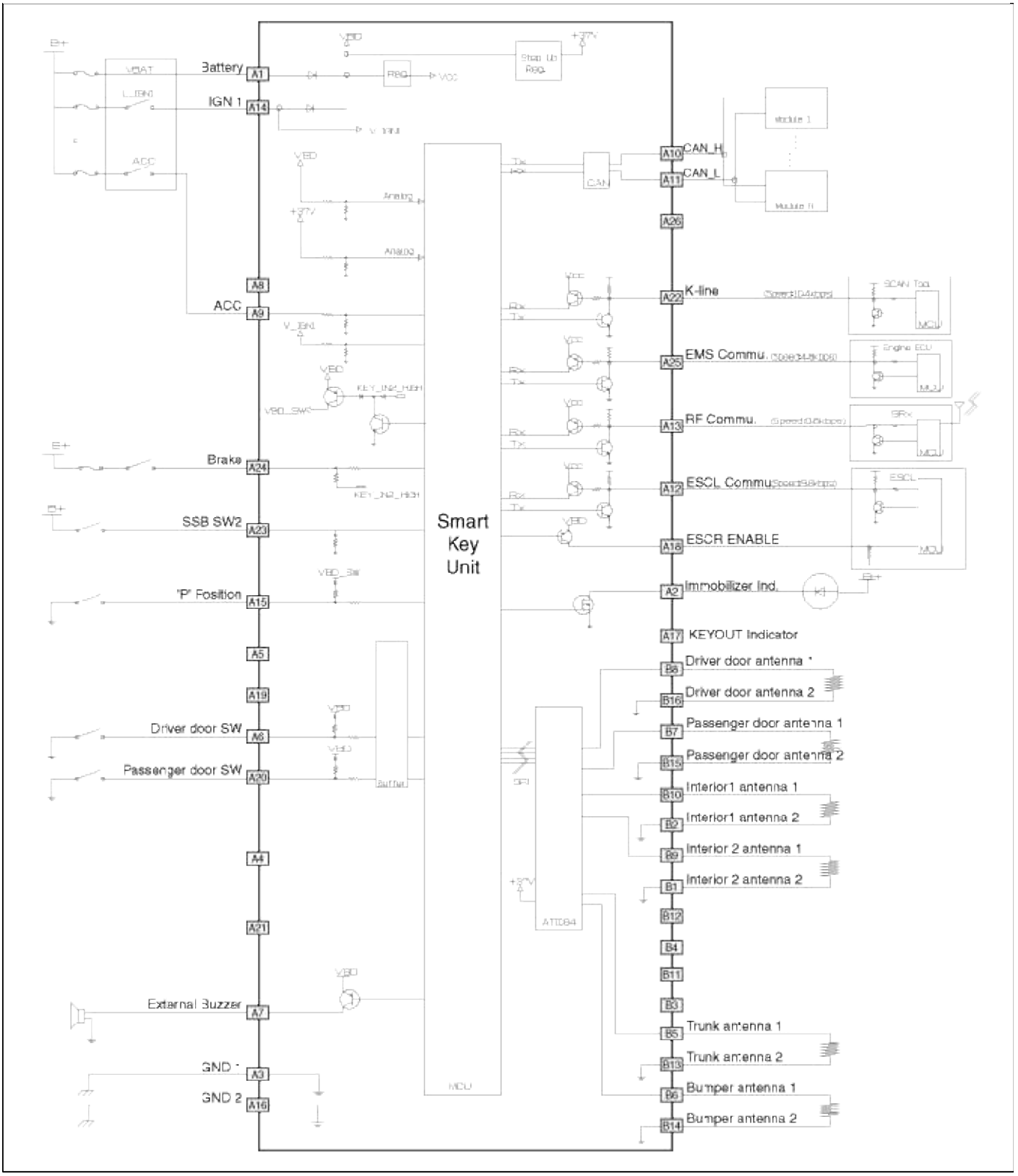




No.	Name
1	Data
2	-
3	Power
4	Ground

Body Electrical System > Smart key System > Smart key unit > Schematic Diagrams

Circuit Diagram



Body Electrical System > Smart key System > Smart key unit > Repair procedures

Inspection

Smart Key Unit

- Refer to the BE group - inspection / self diagnosis with scan tool.

Smart Key Switch

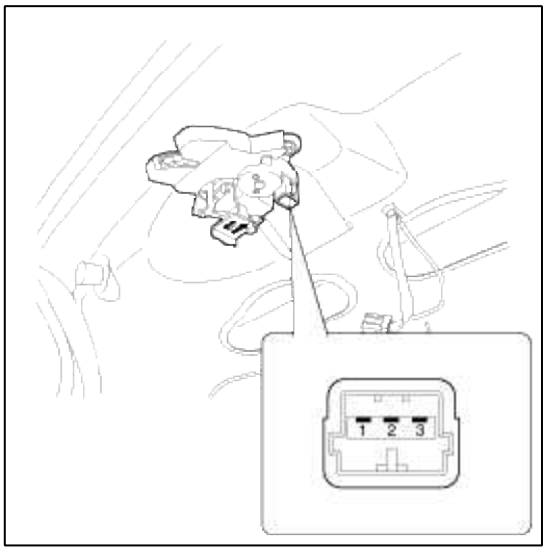
- Refer to the BE group - inspection / self diagnosis with scan tool.

Antenna

- Refer to the BE group - inspection / self diagnosis with scan tool.

Trunk Lid Open Switch

1. Remove the trunk trim.
   (Refer to BD group - "Trunk trim")
2. Check for continuity between the Trunk actuator terminals.



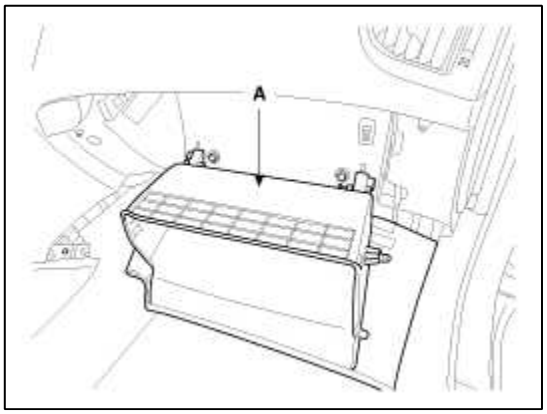
3. If continuity is not specified, inspect the switch

Terminal / Position	1	3
Unlock		
Lock	○	○

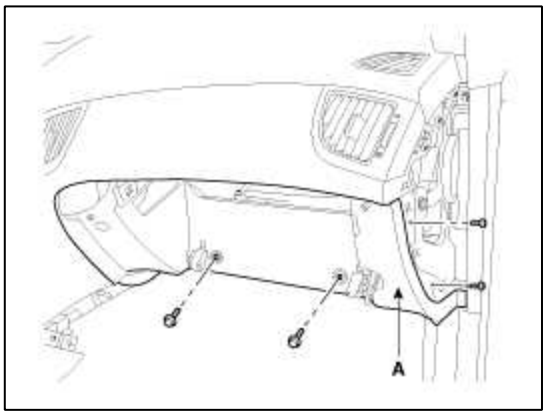
Removal

Smart key unit

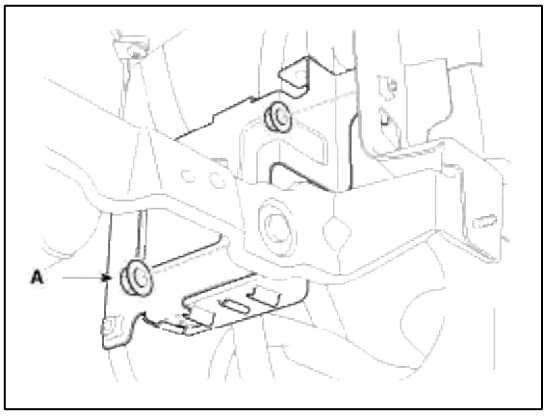
1. Disconnect the negative(-) battery terminal.
2. Remove the glove box (A).
   (Refer to BD group - "Crash pad")



3. Remove the glove box housing (A) after loosening the mounting screws.

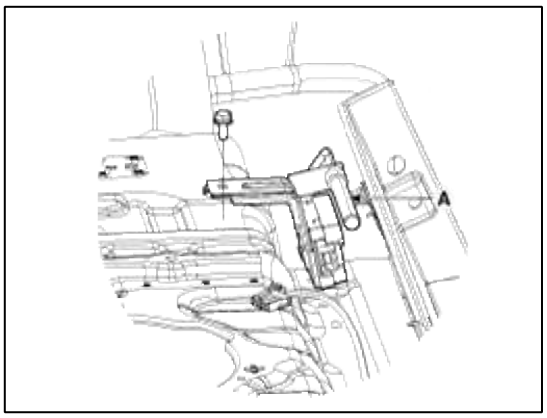


4. Loosen the nuts (2EA) from the smart key unit (A) after disconnecting the connector.



RF Receiver

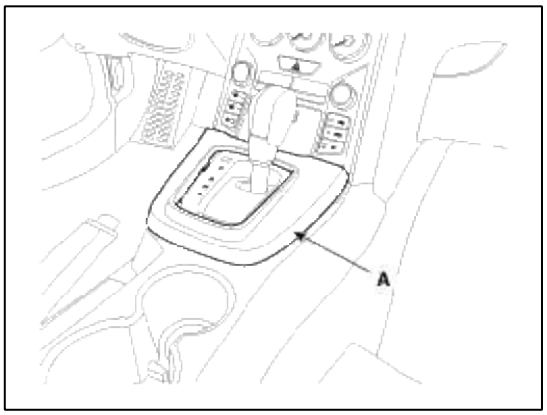
1. Disconnect the negative(-) battery terminal.
2. Remove the rear seat.
   (Refer to BD group - "Rear Seat")
3. Remove the package tray trim.
   (Refer to BD group - "Rear Seat")
4. Disconnect the connector after loosening the RF receiver (A) bolt (1EA).



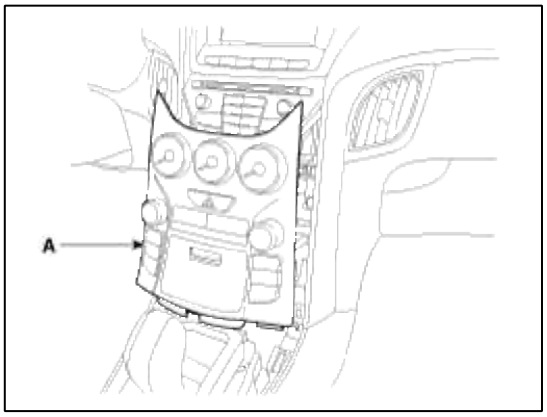
Interior 1 Antenna

1. Disconnect the negative(-) battery terminal.

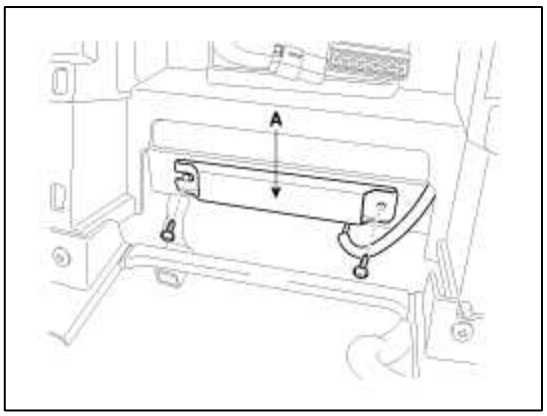
2. Remove the console upper cover (A).
   (Refer to BD group - "Console")



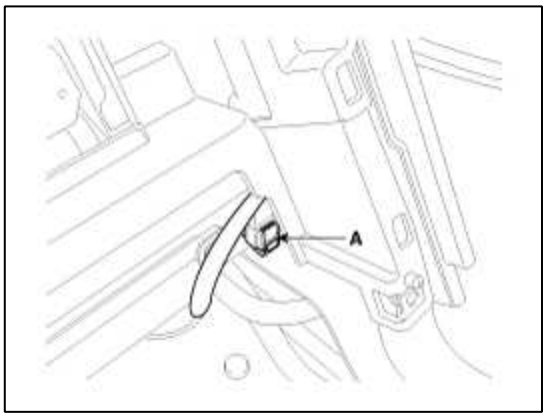
3. Remove the center fascia lower panel (A).
   (Refer to BD group - "Crash pad")



4. Loosen the interior 1 antenna (A) screws (2EA) located in front of the console.



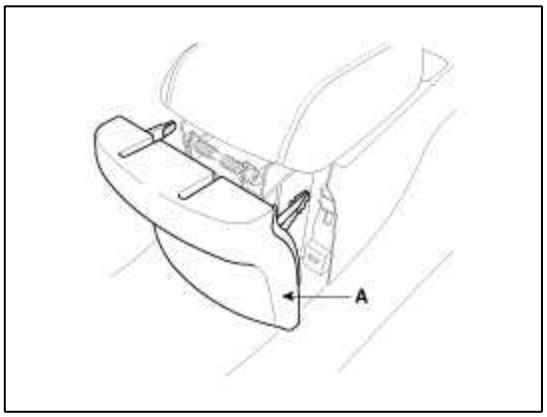
5. Remove the interior 1 antenna (A) after disconnect the connector.



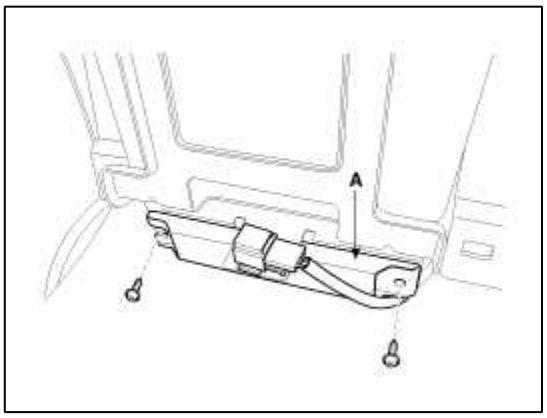
Interior 2 Antenna

1. Disconnect the negative(-) battery terminal.

2. Remove the console rear cover (A).
   (Refer to BD group - "Console")

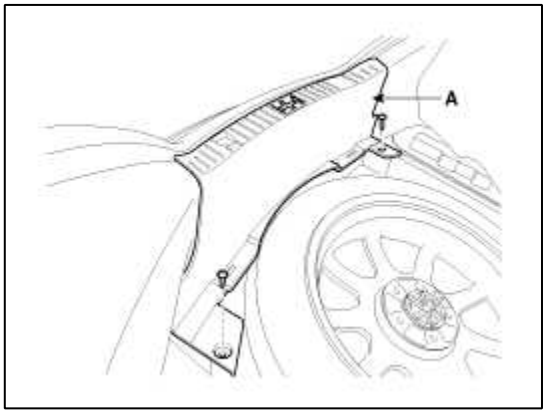


3. Disconnect the interior 2 antenna connector located at the console rear side, then remove the interior 2 antenna (A) after loosening screws (2EA).

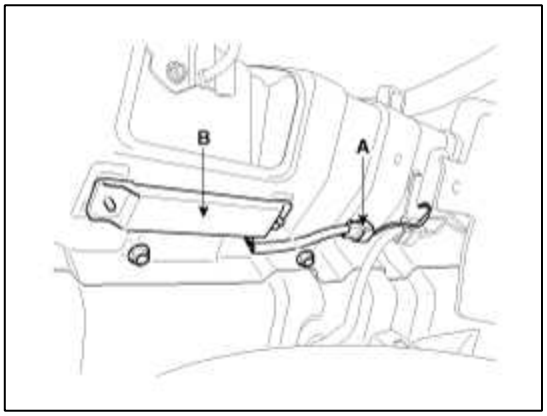


Interior 3 Antenna

1. Disconnect the negative(-) battery terminal.
2. Remove the trunk panel (A) after loosening the mounting screws.

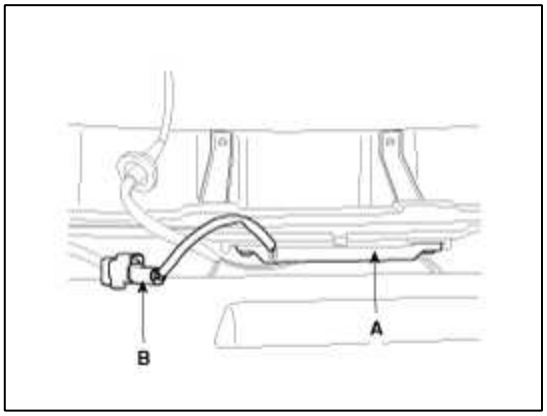


3. Disconnect the interior 2 antenna connector (A) and remove the interior 3 antenna (B) after loosening nut (2EA).



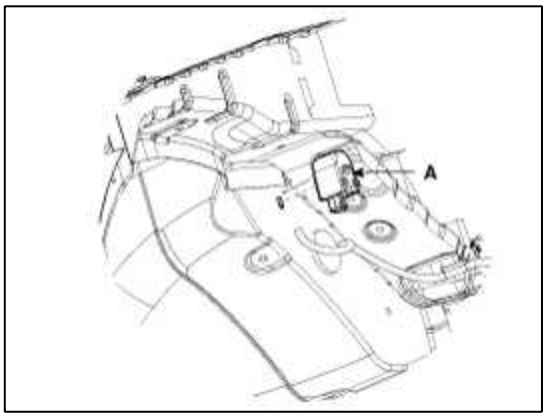
Exterior Bumper Antenna

1. Disconnect the negative(-) battery terminal.
2. Remove the rear bumper.
   (Refer to BD group - "Rear bumper")
3. Disconnect the antenna connector (B) and remove the exterior bumper antenna (A) after loosening the nuts (2EA).



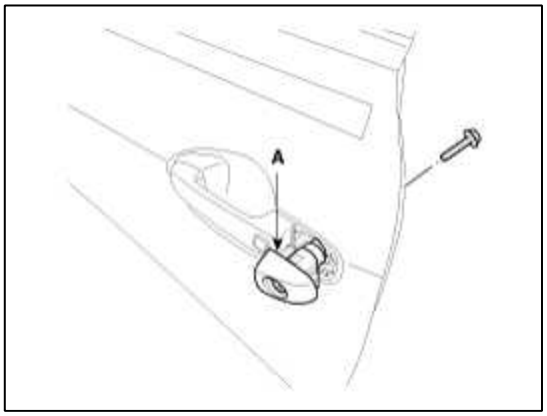
Buzzer

1. Disconnect the negative(-) battery terminal.
2. Remove the left side fender.
   (Refer to BD group - "Fender")
3. Remove the external buzzer (A).

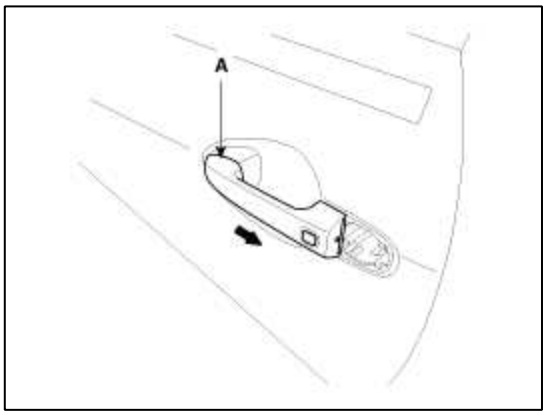


Door Outside Handle

1. Disconnect the negative (-) battery terminal.
2. Disconnect the connector after removing the door trim.
   (Refer to the Body group - "Front door")
3. After loosening the mounting bolt, then remove the key holder (A).



4. Remove the outside handle (A) by sliding it rearward.



Installation

Smart Key Unit

1. Install the smart key unit.
2. Install the smart key unit mounting nut and connector.
3. Install the glove box housing.
4. Install the glove box.
5. Install the negative (-) battery terminal and check the smart key system.

RF Receiver

1. Install the RF receiver.
2. Install the glove box housing.
3. Install the glove box.
4. Install the negative (-) battery terminal and check the smart key system.

Interior 1 Antenna

1. Install the interior 1 antenna.
2. Install the center fascia lower panel.
3. Install the console upper cover.
4. Install the negative (-) battery terminal and check the smart key system.

Interior 2 Antenna

1. Install the interior 2 antenna.
2. Install the console rear cover after connecting the connector.
3. Install the negative (-) battery terminal and check the smart key system.

Interior 3 Antenna

1. Install the interior 3 antenna.
2. Install the trunk panel.
3. Install the negative (-) battery terminal and check the smart key system.

Exterior Bumper Antenna

1. Install the exterior bumper antenna.
2. Install the rear bumper.
3. Install the negative (-) battery terminal and check the smart key system.

Buzzer

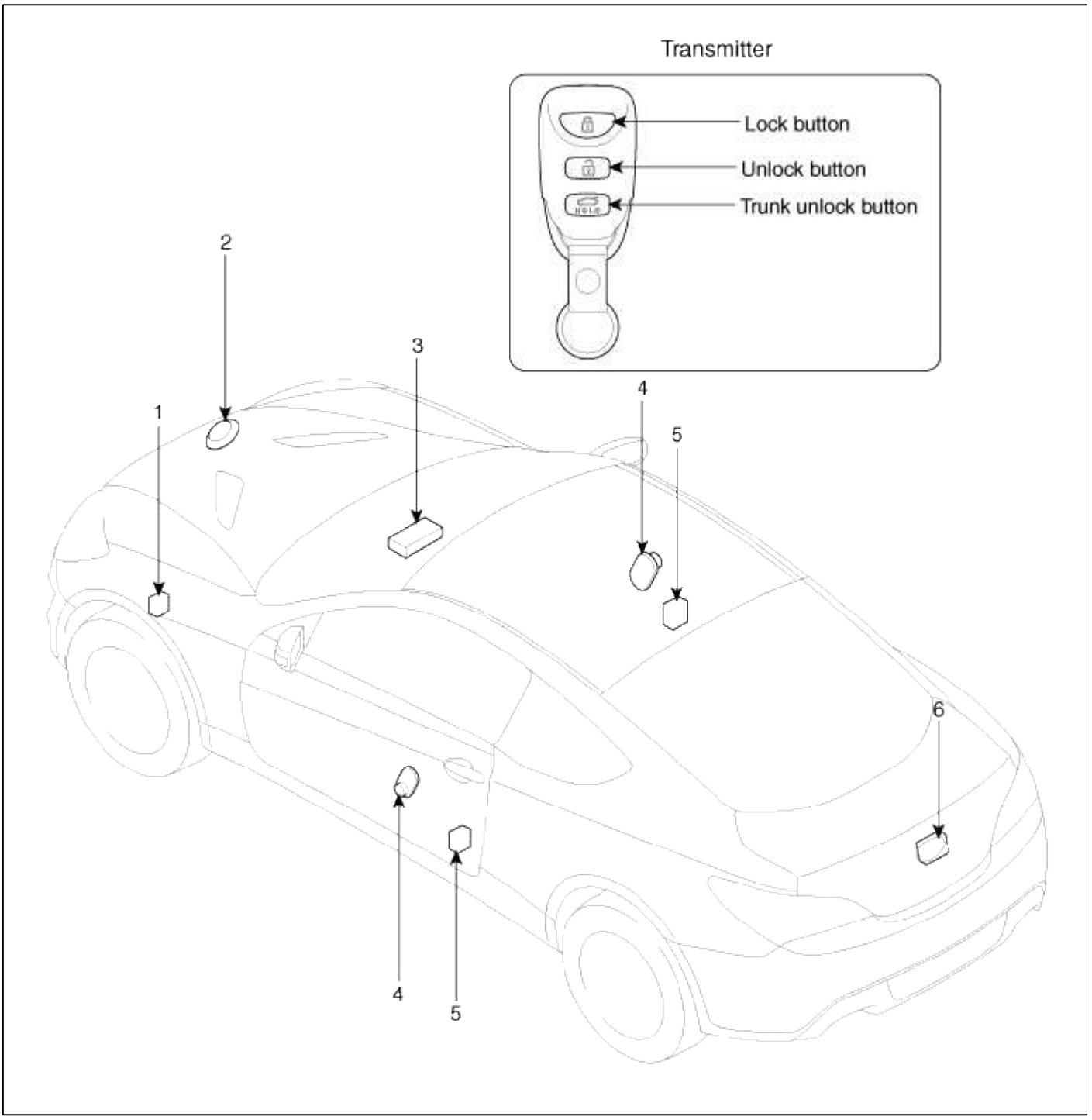
1. Install the buzzer.
2. Install the left side fender.
3. Install the negative (-) battery terminal and check the smart key system.

Door Outside Handle

1. Install the outside handle.
2. Install the door trim.
3. Install the negative (-) battery terminal and check the smart key system.

Body Electrical System > Keyless Entry And Burglar Alarm > Components and Components Location

Component Location



1. Hood switch 2. Horn 3. Body Control Module (BCM)	4. Front door switch 5. Front door lock actuator & switch 6. Trunk lid lock actuator

Body Electrical System > Keyless Entry And Burglar Alarm > Description and Operation

Description

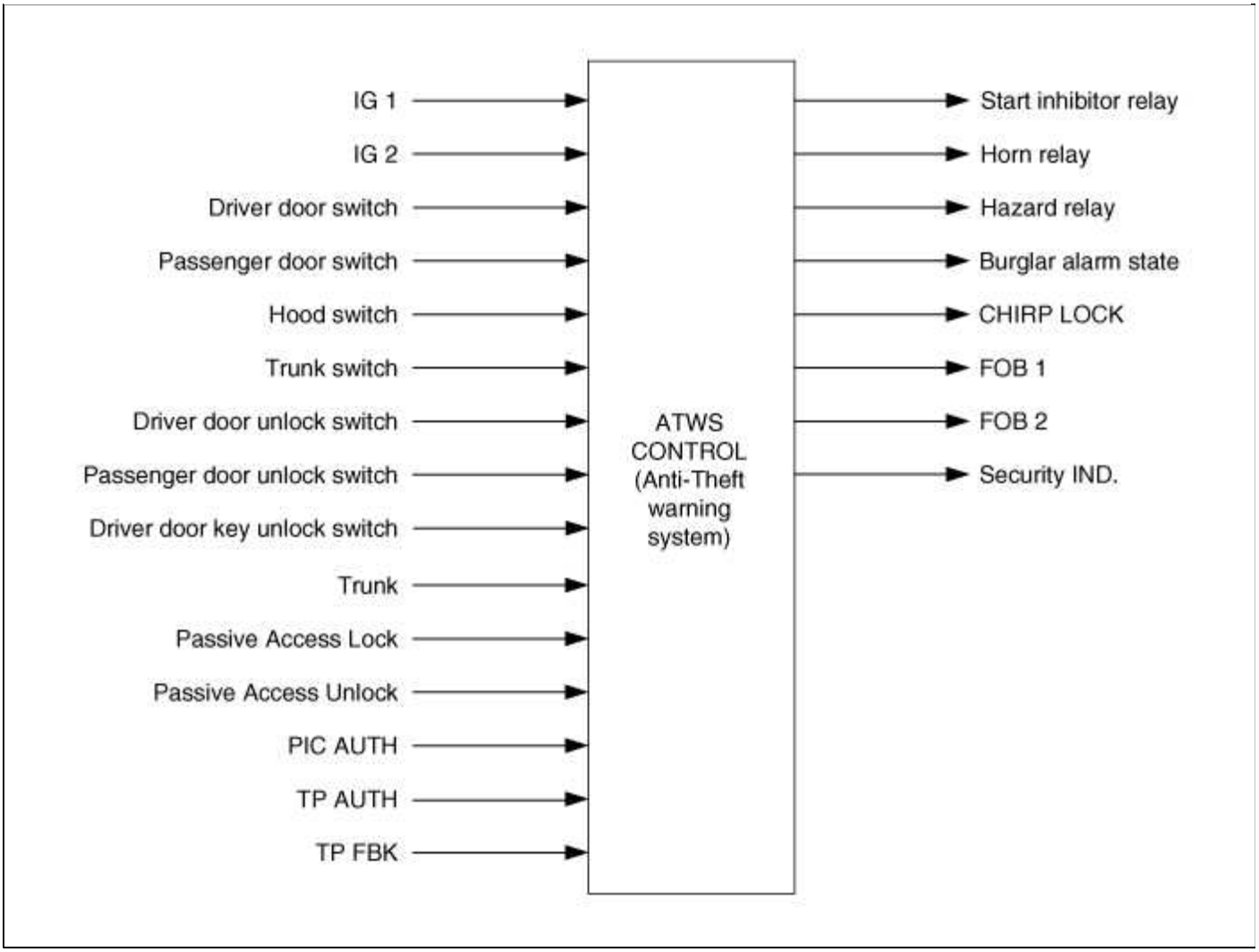
Burglar Alarm System

The burglar alarm system is armed automatically after the doors, hood, and trunk lid are closed and locked.
The system is set off when any of the following things below occurs:

- A door is forced open.
- A door is unlocked without using the transmitter.
- The trunk lid is opened without using the key.
- The hood is opened.
- The engine starter circuit and battery circuit are bypassed by breaking the ignition switch.

When the system is set off, the alarm (horn) sounds and the hazard lamp flash for about two minutes or until the system is disarmed by unlocking the transmitter.
For the system to arm, the ignition switch must be off and the key removed. Then, the body control module must receive signals that the doors, hood, and trunk lid are closed and locked. When everything is closed and locked, none of the control unit inputs are grounded.
The door switches, hood switch and trunk lid switch are all close and lock the doors with the remote transmitter and then the system arms immediately.
If anything is opened or improperly unlocked after the system is armed, the body control module gets a ground signal from that switch, and the system is set off.
If one of the switches is misadjusted or there is a short in the system, the system will not arm. As long as the body control module continues to get a ground signal, it thinks the vehicle is not closed and locked and will not arm.
The receiver is integrated in the body control module.
Keyless Entry System
The burglar alarm system is integrated with the keyless entry system. The keyless entry system allows you to lock and unlock the vehicle with the remote transmitter. When you push the LOCK button, all doors lock. When you push the UNLOCK button all doors unlock.
The room lamp, if its switch is in the center position, will come on when you press the UNLOCK button. If you do not open a door, the light will go off in about 30 seconds, the doors will automatically relock, and the burglar alarm system will rearm. If you relock the doors with the remote transmitter within 30 seconds, the light will go off immediately.
You cannot lock or unlock the doors with the remote transmitter if the key is in the ignition switch.
The system will signal you when the doors lock and unlock by flashing the hazard lamp once when they lock, and twice when they unlock.

Data Flow



Transmitter(TX) Spec

1. Transmission Distance : 30m or more from outside of the car
2. Registration procedure of the transmitter
   (1) In registration mode, it shall be possible to register up to Max 4EA.
   (2) At re-registration, data are registered newly after deleting the previous TX DATA

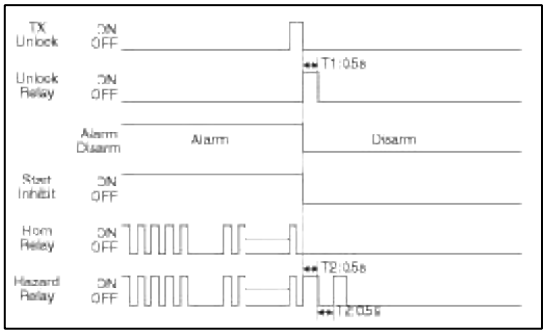
No.	Saved CODE	CODE to change	Changed CODE
1	A	C	C (A is deleted)
2	A, B, C, D	E	E (A, B, C, D is deleted)
3	A, B	C, D, E	C, D
4	A, B	C, C, D	C

   (3) For the registration procedures by using GDS, refer to "TRANSMITTER CODE REGISTRATION".
3. Transmitter signal & Receiver Spec
   (1) Transmission signal
      A. Transmit relevant transmission DATA (Transmission frame) twice by pushing TX SW.
      B. Only LOCK signal is output when pushing TX LOCK SW and UNLOCK SW at the same time.

Functions

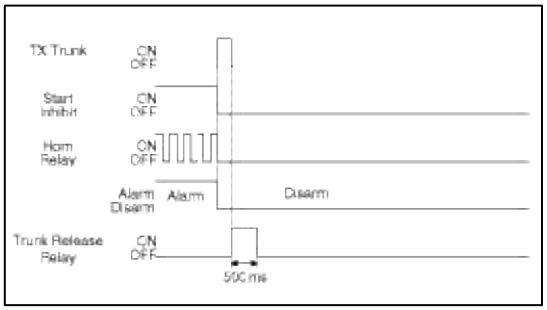
1. **Disarm**
   Condition 1

State	Description
Initial Condition	ALARM
Event	- IGN KEY ON during 30sec or ALT"L"=on during 3 sec.
	NON SMK(Smart key) - Any door open&TX UNLOCK - TX TRUNK-TX Lock & Lock confirm Failed
	SMK : - Any door open & RKE CMD=UNLOCK/Passive Access Unlock=1 - RKE_TRUNK=1-TP(Transponder)AUTH=1 / PIC AUTH=1 / TP FBK=X2 (X:Don't care) - RKE CMD=LOCK/Passive Access Lock=1 & Lock confirm Failed
	Mechanical Key OPTION Enable: - Mechanical UNLOCK - Mechanical LOCK&Lock confirm Failed
Action	The state goes to DISARM state - Horn Relay, Hazard Relay, Start Inhibit Relay OFF - TX Unlock →Unlock Relay on for 0.5 sec →Hazard Relay on (twice)



T1 : 0.5s

T2 : 0.5s +-0.1s



Condition 2

State	Description
Initial Condition	DISARMstate & (IGN KEY OUT) & Any Door open
Event	NON SMK : - Any door open & TX UNLOCK
	SMK : - Any door open & RKE CMD=UNLOCK / Passive Access Unlock=1 / RKE TRUNK=1 / Trunk reopen=1 - TP AUTH=1 / PIC AUTH=1 / TP FBK=X2 (X:Don't care)
Action	No state change - TX UNLOCK, RKE CMD=UNLOCK, Passive Access Unlock=1 →Hazard Relay for 0.5s ON/OFF(twice)

Condition 3

State	Description
Initial Condition	ARM WAIT state
Event	- Any door open or Hood Switch OPEN or Trunk switch OPEN - Any door is unlocked - Key In switch ON
	SMK : TP AUTH=1 / PIC AUTH=1 / TP FBK=X2
	Mechanical Key OPTION Enable: M UNLOCK
Action	The state goes to DISARM state - M-unlock →Hazard relay for 0.5 sec. ON/OFF(twice)

Condition 4

State	Description
Initial Condition	AUTOLOCK TIMER1 STATE
Event	- Any door open or Hood Swithc OPEN or Trunk Switch OPEN - Key In Switch ON - AUTO LOCK & Lock confirmation failure
	NON SMK spec: - AUTO LOCK & Lock confirmation failure
	SMK spec: - RKE CMD=LOCK / Passive Access Lock=1& Lock confirmation failure - TP AUTH=1 / PIC AUTH=1 / TP FBK=X2
	Mechanical Key option Enable: - Mechanical LOCK & Lock confirmation failure
Action	The state goes to DISARM state

Condition 5

State	Description
Initial Condition	AUTOLOCK TIMER2 STATE
Event	- Any door open - Key In Switch ON - AUTO LOCK & Lock confirmation failure - Hood Switch Open and Memory Hood was Close - Trunk Switch Open and Memory Trunk was Close
	NON SMK : - TX LOCK& Lock confirmation failure
	SMK : - RKE CMD=LOCK/ Passive Access Lock=1& Lock confirmation failure - TP AUTH=1/ PIC AUTH=1 / TP FBK=X2
	Mechanical Key option Enable: Mechanical LOCK & Lock confirmation failure
Action	The state goes to DISARM state

Condition 6

State	Description
Initial Condition	ARMSTATE
Event	EXCEPT CHINA SPEC: - IGN KEY ON
	SMK : - TP AUTH=1 / PIC AUTH=1 / TP FBK=X2
	Mechanical Key option Enable: - Mechanical UNLOCK
Action	The state goes to DISARM state - M-unlock →Hazard relay for 0.5 sec. ON/OFF(twice)

Condition 7

State	Description
Initial Condition	REARM state
Event	Execpt china spec: - IGN KEY ON during 30sec or ALT ”L”=on during 3 sec.
	NON SMK : - TX LOCK & Lock confirmation failure - TX TRUNK
	SMK : - TP AUTH=1 / PIC AUTH=1 / TP FBK=X2 - RKE CMD=LOCK / PassiveAccess Lock=1 & Lock confirmation failure - RKE TRUNK=1 / Trunk reopen=1
	Mechanical Key option Enable: - Mechanical UNLOCK - Hazard relay for 0.5 sec. ON/OFF(twice) - Mechanical LOCK & Lock confirmation failure
Action	The state goes to DISARM state Start Inhibit Relay OFF

Condition 8

State	Description
Initial Condition	PREARM state
	- Key In Switch ON - All entrance closed & Any Door is unlocked - Any Door open & Tx Unlock
	NON SMK: - Any door open & TX UNLOCK
	SMK : - TP AUTH=1 / PIC AUTH=1 / TP FBK=X2 - Any door open & C RKE CMD=UNLOCK/ Passive Access Unlock=1
	Mechanical Key option Enable : - MECHANICAL UNLOCK
Action	The state goes to DISARMECHANICAL state - Hazard Relay for 0.5s ON/OFF(twice)

Condition 9

State	Description
Initial Condition	ARMHOLD
	- IGN KEY ON
	SMK : - TP AUTH=1 / PIC AUTH=1 / TP FBK=X2
	Mechanical Key option Enable: - MECHANICAL UNLOCK
Action	The state goes to DISAR state - M-unlock →Hazard relay for 0.5 sec. ON/OFF(twice)

2. **Arm**

Condition 1

State	Description
Initial Condition	ARM state
Event	NON SMK : - TX LOCK
	SMK: - RKE CMD=LOCK / Passive Access Lock=1
Action	No state change HazardRly 1Time on(1sec)

Condition 2

State	Description
Initial Condition	ARM WAIT state
Event	- Afte ARM WAIT TIMER finished
Action	The state goes to ARM state

Condition 3

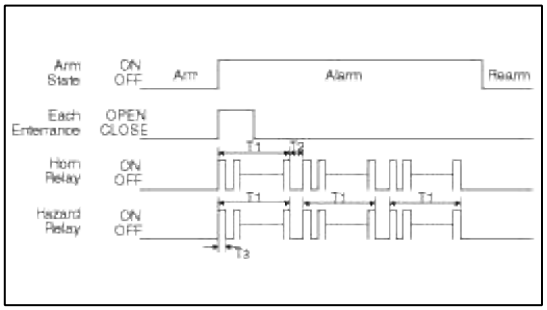
State	Description
Initial Condition	ARMHOLD state
Event	Trunk close for at least Trunk Release Time Out(default 30sec) in ARMWAIT state
Action	The state goes to ARM state

3. **Alarm**

Condition 1

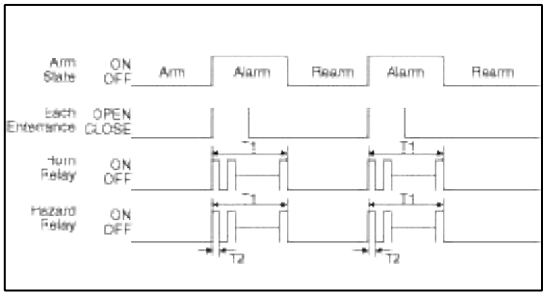
State	Description
Initial Condition	ARM state
Event	Any door open or Hood Switch open or Trunk Switch open
	China spec ; Key In Switch ON or IG1 ON or IG2 ON Fob in (SMK Spec.)
Action	The state goes to ALARM state - Engine Start Inhibit is ON - GEN, M/E, CHINA AREA : The horn is ON one time for 27sec(±2sec) - The hazard is driven also (During Horn driving)

Non-middle East Area



T1 : 27s(±2sec),
T2 : 10s(±2sec),
T3 : 0.5s ± 0.1sec

Middle East, GEN/EC, CHINA-Area



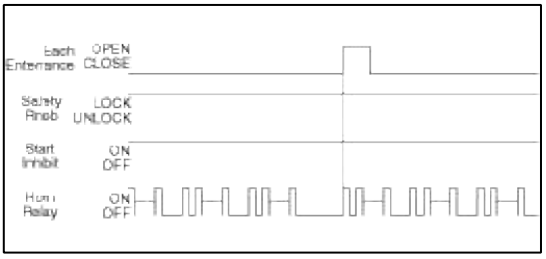
T1 : 27s ± 2sec
T2 : 0.5s ± 0.1sec

Condition 2

State	Description
Initial Condition	REARM state
Event	Any door open or Hood Switch OPEN or Trunk Switch OPEN
Action	The state goes to ALARM state GEN, M/E, CHINA AREA : The horn is ON one time for 27sec(±2sec) The hazard is driven also (During Horn driving)

Condition 3

State	Description
Initial Condition	ARMHOLD state
Event	Any door open or Hood Switch OPEN
Action	The state goes to ALARM state GEN, M/E, CHINA AREA : The horn is ON one time for 27sec(±2sec) The hazard is driven also (During Horn driving).



4. **Arm Wait Mode**

Condition 1

State	Description
Initial Condition	ARMWAIT state
Event	NON SMK : - TX LOCK
	SMK: - RKE CMD = LOCK / Passive Access Lock=1
Action	No state change Hazard Relay 1Time on(1sec)

Condition 2

State	Description
Initial Condition	DISARM state & IGN KEY OUT & All entrances closed(DOORS, HOOD and TRUNK)
Event	NON SMK: - Tx Lock & locked confirmed
	SMK: - RKE CMD=LOCK / Passive Access Lock=1 & locked confirmed
	Mechanical Key option Enable: - MECHANICAL LOCK & locked confirmed - DOOR LOCK state : Any door open → All door closed
Action	- The state goes to ARMWAIT State - Start ARMWAITTIMER - Hazard Relay 1Time on(1sec)

Condition 3

State	Description
Initial Condition	ALARM state & All entrances closed(DOORS, HOOD and TRUNK)
Event	NON SMK: - Tx Lock & locked confirmed
	SMK : - RKE CMD=LOCK / Passive Access Lock=1 & locked confirmed
	Mechanical Key option Enable: - MECHANICAL LOCK & locked confirmed
Action	- The state goes to ARMWAIT State - Horn Relay, Start Inhibit Relay = OFF - Hazard Relay 1Time on(1sec) (MECHANICAL LOCK : Except) - Start ARMWAIT TIMER

Condition 4

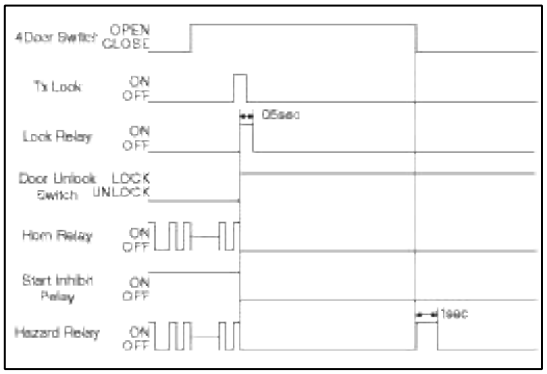
State	Description
Initial Condition	AUTOLOCK TIMER1 state
Event	AUTOLOCK & locked confirmed
	NON SMK: - Tx Lock & locked confirmed
	SMK: - RKE CMD=LOCK / Passive Access Lock=1 & locked confirmed
	Mechanical Key option Enable: MECHANICAL LOCK & locked confirmed
Action	- The state goes to ARMWAIT State - Hazard Relay 1Time on(1sec) - Start ARMWAIT TIMER

Condition 5

State	Description
Initial Condition	PREARM state
Event	All door closed and (Trunk Switch CLOSE & TRUNK MARK=CLEAR) & Hood Switch CLOSE & DOOR LOCK
Action	- The state goes to ARMWAIT State - Hazard Relay 1Time on(1sec) - Start ARMWAIT TIMER

Condition 6

State	Description
Initial Condition	REARM state
Event	NON SMK : TX LOCK & locked confirmed
	SMK : - RKE CMD=LOCK/ Passive Access Lock=1 & locked confirmed
	Mechanical Key option Enable: - MECHANICAL LOCK & locked confirmed
Action	- The state goes to ARMWAIT State - Hazard Relay 1Time on(1sec) (MECHANICAL LOCK : Except) - Start Inhibit Relay OFF - Start ARMWAIT TIMER



5. **Rearm Mode**

Condition 1

State	Description
Initial Condition	ALARM state
Event	All entrance is closed & ALARM Patten finished
Action	The state goes to REARM state

6. **Autolocktimer1 Mode**

Condition 1

State	Description
Initial Condition	ARM state
Event	NON SMK : TX UNLOCK
	SMK : RKE CMD=UNLOCK / Passive Access Unlock=1
Action	- The state goes to AUTO LOCK TIMER1 state - Start AUTO LOCK TIMER1 - Hazard Relay Twice on (0.5s ON/0.5s OFF)

Condition 2

State	Description
Initial Condition	AUTO-LOCK TIMER1 state
Event	AUTOLOCK TIMER1 finished
	NON SMK: TX UNLOCK
	SMK: RKE CMD=UNLOCK / Passive Access Unlock=1
Action	No change state
	CASE1: AUTOLOCK TIMER1 Finished AUTOLOCK
	CASE2: TX UNLOCK, RKE CMD=UNLOCK, Passive Access Unlock=1 Hazard Relay Twice on(0.5s ON/0.5s OFF) Restart AUTOLOCK TIMER1

Condition 3

State	Description
Initial Condition	ARM WAIT state
Event	NON SMK : TX UNLOCK
	SMK: RKE CMD=UNLOCK / Passive Access Unlock=1
Action	- The state goes to AUTO LOCK TIMER1 state - Start AUTO LOCK TIMER1 - Hazard Relay Twice on(0.5s ON/0.5s OFF).

Condition 4

State	Description
Initial Condition	DISARM state & All entrances closed(DOORS, HOOD & TRUNK) & IGN KEY OUT
Event	NON SMK: TX UNLOCK
	SMK: RKE CMD=UNLOCK/ Passive Access Unlock=1
Action	- The state goes to AUTO LOCK TIMER1 state - Start AUTO LOCK TIMER1 - Hazard Relay Twice on(0.5s ON/0.5s OFF).

Condition 5

State	Description
Initial Condition	ALARM state & All door closed and Trunk Switch CLOSE, Hood Switch CLOSE
Event	NON SMK: TX UNLOCK
	SMK: RKE CMD=UNLOCK / Passive Access Unlock=1
Action	- The state goes to AUTO LOCK TIMER1 state - Start AUTO LOCK TIMER1 - Hazard Relay Twice on(0.5s ON/0.5s OFF). - Start Inhibit Relay off / Horn Relay off

Condition 6

State	Description
Initial Condition	REARM state
Event	NON SMK: TX UNLOCK
	SMK: RKE CMD=UNLOCK/ Passive Access Unlock=1
Action	The state goes to AUTO LOCK TIMER1 state - Start AUTO LOCK TIMER1 - Hazard Relay Twice on(0.5s ON/0.5s OFF). - Start Inhibit Relay off

7. **Autolocktimer2 Mode**

Condition 1

State	Description
Initial Condition	AUTO-LOCK TIMER2 state
Event	Finished AUTOLOCK TIMER2
	NON SMK: TX UNLOCK
	SMK: RKE CMD=UNLOCK/ Passive Access Unlock=1
Action	No change state
	CASE1: AUTOLOCK TIMER2 finished AUTOLOCK
	CASE2: TX UNLOCK, RKE CMD=UNLOCK, Passive Access Unlock=1 - Start AUTO LOCK TIMER2 - Hazard Relay Twice on(0.5s ON/0.5s OFF).

Condition 2

State	Description
Initial Condition	DISARM state & IGN KEY OUT & (Trunk or Hood Switch OPEN) state
Event	NON SMK : TX UNLOCK
	SMK: RKE CMD=UNLOCK/ Passive Access Unlock=1
Action	- The state goes to AUTO LOCK TIMER2 state - Start AUTO LOCK TIMER2 - Hazard Relay Twice on(0.5s ON/0.5s OFF). - Memo Hood/ Trunk state

Condition 3

State	Description
Initial Condition	ALARM state & All door closed & (Trunk or Hood Switch OPEN) state
Event	NON SMK: TX UNLOCK
	SMK: RKE CMD=UNLOCK / Passive Access Unlock=1
Action	- The state goes to AUTO LOCK TIMER2 state - Horn Relay, Start Inhibit Relay = OFF - Start AUTO LOCK TIMER2 - Hazard Relay Twice on(0.5s ON/0.5s OFF). - Memo Hood/Trunk state

Condition 4

State	Description
Initial Condition	PREARM state & All door closed & (Trunk Switch or Hood OPEN)state
Event	NON SMK: TX UNLOCK
	SMK: RKE CMD=UNLOCK / Passive Access Unlock=1
Action	- The state goes to AUTO LOCK TIMER2 state - Start AUTO LOCK TIMER2 - Hazard Relay Twice on(0.5s ON/0.5s OFF). - Memo Hood/Trunk state

Condition 5

State	Description
Initial Condition	ARMHOLD state
Event	NON SMK: TX UNLOCK
	SMK: RKE CMD=UNLOCK / Passive Access Unlock=1
Action	- The state goes to AUTO LOCK TIMER2 state - Start AUTO LOCK TIMER2 - Hazard Relay Twice on(0.5s ON/0.5s OFF). - Memo Hood/Trunk state

8. **Prearm Mode**

Condition 1

State	Description
Initial Condition	AUTO-LOCK TIMER2 state
Event	AUTO LOCK & locked confirmed
	NON SMK: TX LOCK & locked confirmed
	SMK : RKE CMD=LOCK/ Passive Access Lock=1 & locked confirmed
	Mechanical Key option Enable: MECHANICAL LOCK & locked confirmed
Action	The state goes to PREARM state

Condition 2

State	Description
Initial Condition	DISARM state & IGN KEY OUT
Event	NON SMK: - Any door open or Hood Switch OPEN or Trunk Switch OPEN state & locked confirmed
	SMK : - Any door open or Hood Switch OPEN or Trunk Switch OPEN state RKE CMD=LOCK / Passive Access Lock=1 & locked confirmed
	Mechanical Key option Enable: MECHANICAL LOCK & locked confirmed ALL DOOR LOCK state (Any door open → All doors closed) and (Trunk Switch OPEN or Hood Switch OPEN)
Action	The state goes to PREARM state

Condition 3

State	Description
Initial Condition	ALARM state& IGN KEY OUT and(Any door open or Hood Switch OPEN or TrunkSwitch OPEN)
Event	NON SMK : TX LOCK & locked confirmed
	SMK : RKE CMD=LOCK/ Passive Access Lock=1 & locked confirmed
	Mechanical Key option Enable: MECHANICAL LOCK & locked confirmed
Action	The state goes to PREARM state Horn Relay, Hazard Relay, Start Inhibit Relay → OFF

Condition 4

State	Description
Initial Condition	ARMHOLD state
Event	NON SMK: TX LOCK & locked confirmed
	SMK: RKE CMD=LOCK/ Passive Access Lock=1 & locked confirmed
	Mechanical Key option Enable: MECHANICAL LOCK locked confirmed
Action	The state goes to PREARM state

Condition 5

State	Description
Initial Condition	ARMWAIT state
Event	NON SMK: TX TRUNK
	SMK: RKE TRUNK=1 / Trunk reopen=1
Action	The state goes to PREARM state Start TRUNKTIMER TRUNK MARK = Set

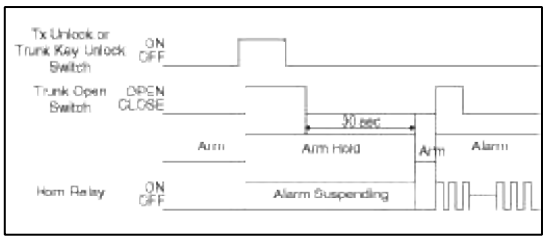
Condition 6

State	Description
Initial Condition	PREARM state
Event	Trunk Switch OPEN TRUNKTIMER expired (Trunk Release Time Out: 30s)
Action	No state change CASE Trunk Switch OPEN : • Stop to TRUNKTIMER. • TRUNK MARK = Clear CASE TRUNKTIMER expired • TRUNK MARK = Clear

9. **Armhold Mode**

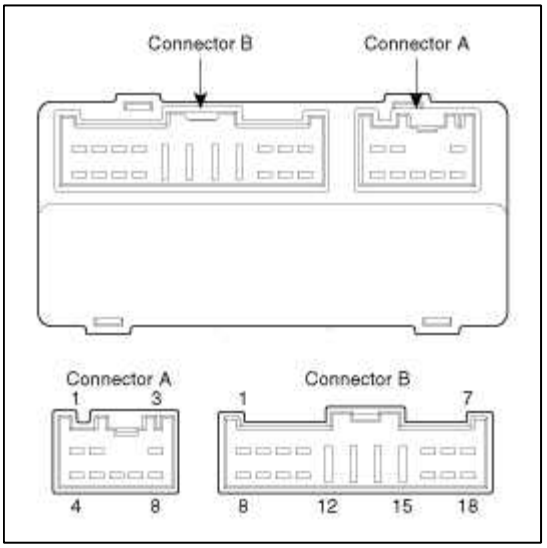
Condition 1

State	Description
Initial Condition	ARM state
Event	NON SMK: TX TRUNK
	SMK: RKE TRUNK=1 / Trunk reopen=1
Action	The state goes to ARMHOLD state



Body Electrical System > Keyless Entry And Burglar Alarm > Repair procedures

Inspection



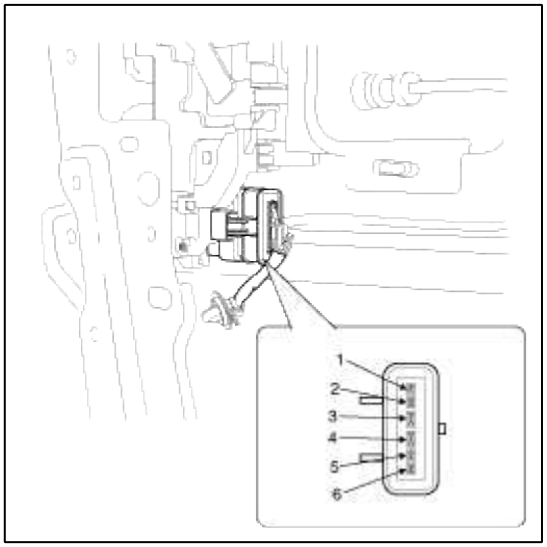
Burglar Alarm

Check for continuity between the terminals.

1. There should be no continuity between the No.11 and No.10 terminals when power and ground are connected to the No.11 and No.4 in the ICM relay B terminals.
2. There should be continuity between the No.11 and No.10 terminals when power is disconnected.

Front Door Lock Actuator Inspection

1. Remove the front door trim.
   (Refer to the Body group - "Front door")
2. Remove the front door module.
3. Disconnect the 6P connector from the actuator.

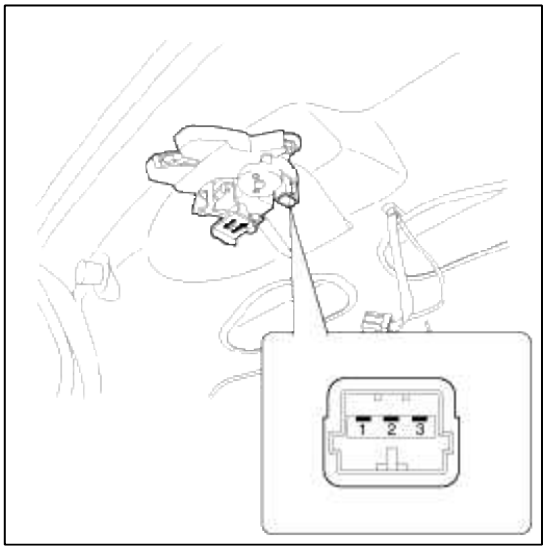


4. Check actuator operation by connecting power and ground according to the table. To prevent damage to the actuator, apply battery voltage only momentarily.

Position \ Terminal		4	3
Front left	Lock	⊕	⊖
	Unlock	⊖	⊕
Front right	Lock	⊖	⊕
	Unlock	⊕	⊖

Trunk Lid Release Actuator Inspection

1. Remove the trunk lid trim panel.
   (Refer to the Body group - "Trunk lid")
2. Disconnect the 3P connector from the actuator.

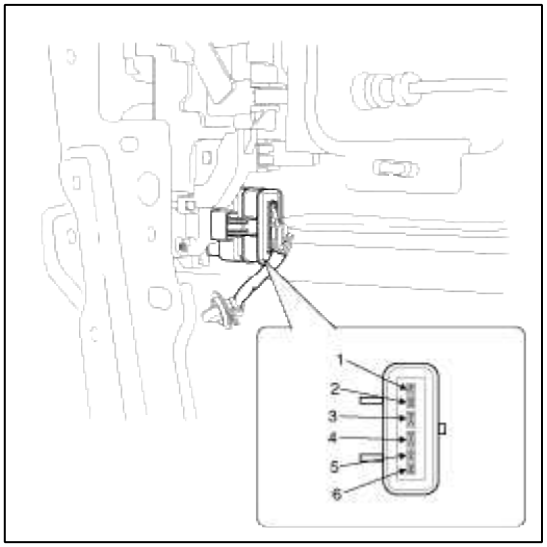


3. Check actuator operation by connecting power and ground according to the table. To prevent damage to the actuator, apply battery voltage only momentarily.

Position \ Terminal	1	2
Lock release(Open)	⊖	⊕

Front Door Lock Switch Inspection

1. Remove the front door trim panel.
   (Refer to the Body group - "Front door")
2. Remove the front door module.
3. Disconnect the 6P connector from the actuator.

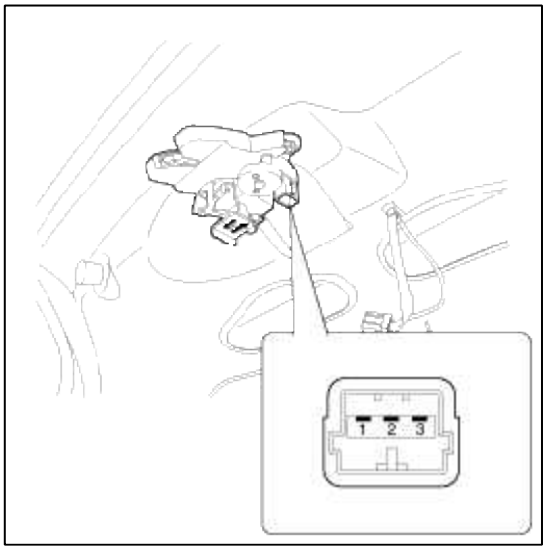


4. Check for continuity between the terminals in each switch position according to the table.

Position \ Terminal		5	6	1	2
Front left	Lock				
	Unlock	○——	——○		
Front right	Lock				
	Unlock			○——	——○

Trunk Lid Open Switch Inspection

1. Remove the trunk lid trim.
   (Refer to the Body group - "Trunk lid")
2. Disconnect the 3P connector from the actuator.

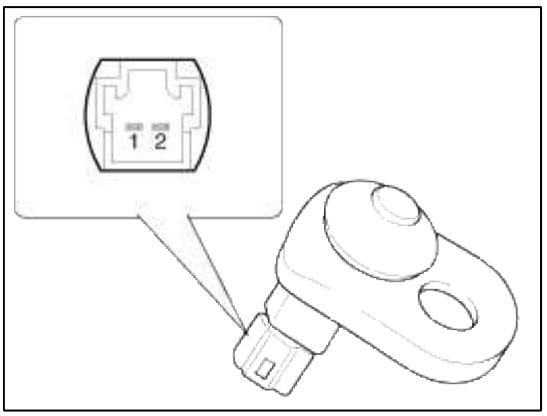


3. Check for continuity between the terminals in each switch position according to the table.

Position \ Terminal	1	3
Lock release(Open)	○	○

Door Switch Inspection

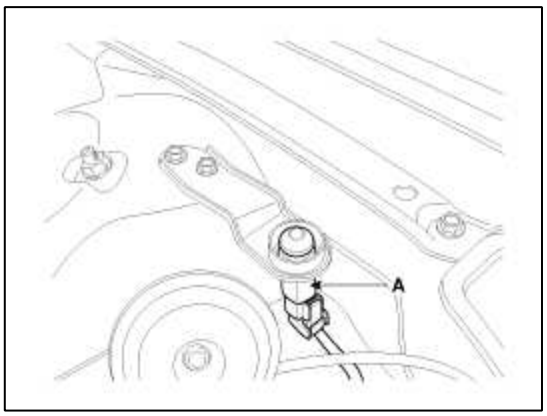
Remove the door switch and check for continuity between the terminals.



Position \ Terminal	1	2	Body (Ground)
Free(Door open)	○	○	○
Push(Door close)			

Hood Switch Inspection

1. Disconnect the 1P connector from the hood switch(A).



2. Check for continuity between the terminals and ground according to the table.

Position \ Terminal	2	1
Hood open (Free)	○	○
Hood close (Push)		

Body Electrical System > Keyless Entry And Burglar Alarm > Transmitter > Specifications

Specifications

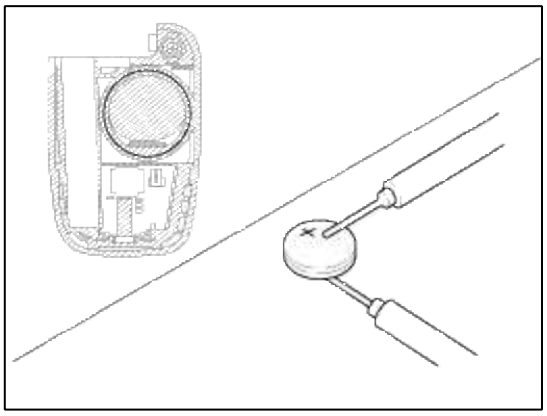
Items	Specifications
Keyless entry transmitter Power source	Lithium 3V battery (1EA, CR2032)
Transmissible distance	10m or more
Life of battery	2 years or more (at 20 times per day)
Button	Door lock Door unlock Trunk lid open Panic
Transmission frequency	315 MHz

Body Electrical System > Keyless Entry And Burglar Alarm > Transmitter > Repair procedures

Inspection

1. Check that the red light flickers when the door lock or unlock button is pressed on the transmitter.
2. Remove the battery and check voltage if the red light doesn't flicker.

Standard voltage : 3V



3. Replace the transmitter battery with a new one, if voltage is below 3V then try to lock and unlock the doors with the transmitter by pressing the lock or unlock button five or six times.
4. If the doors lock and unlock, the transmitter is O.K, but if the doors don't lock and unlock, register the transmitter code, then try to lock and unlock the doors.
5. If the doors lock and unlock, the transmitter is O.K, but if the doors don't lock and unlock, replace the transmitter.

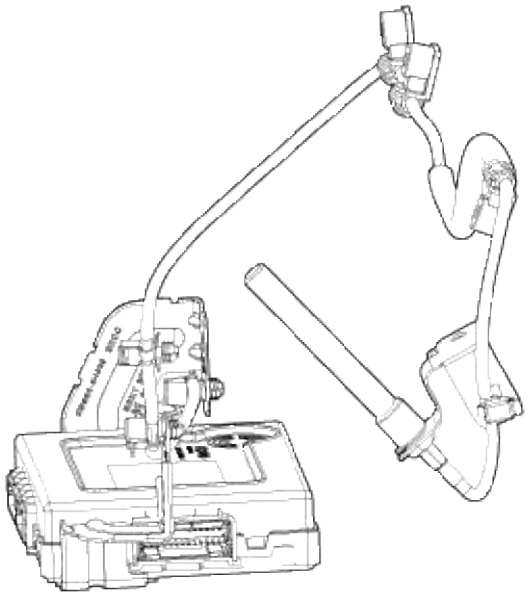
Body Electrical System > BCM (Body Control Module) > Body Control Module (BCM) > Specifications

Specifications

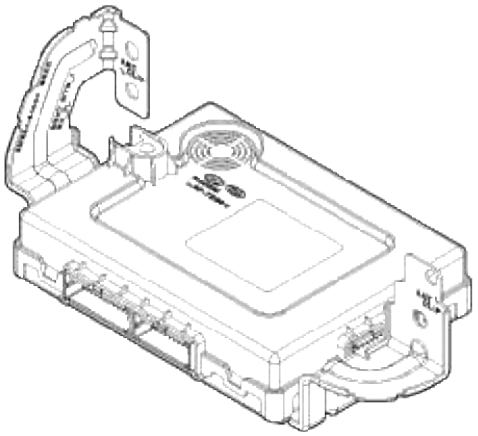
Items	Specifications
Rated voltage	DC 12V
Operating voltage	DC 9 ~ 16V
Operating temperature	-22°F~167°F(-30°C~ 75°C)
Insulation resistance	100MΩ or more
Dark current	Less than 3mA (SMK : 5.5mA)

Body Electrical System > BCM (Body Control Module) > Body Control Module (BCM) > Components and Components Location

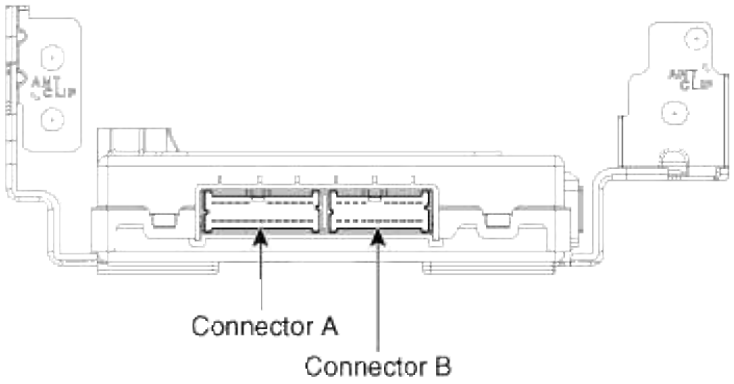
Component

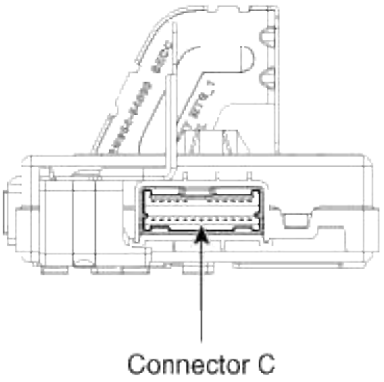


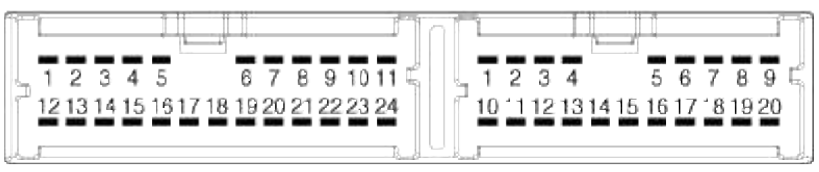
[RKE]



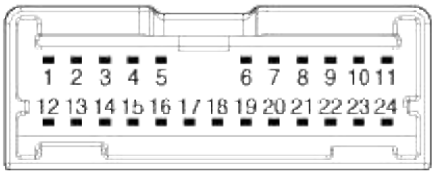
[SMK]







Connector A Connector B



Connector C

Body Electrical System > BCM (Body Control Module) > Body Control Module (BCM) > Schematic Diagrams

BCM Connector Terminals

Function	Input/Output	Connector No	Description	Active	ON/OFF vlotage level
	B+	A1	Supply power to BCM	Power	Operating Voltage 9V ~

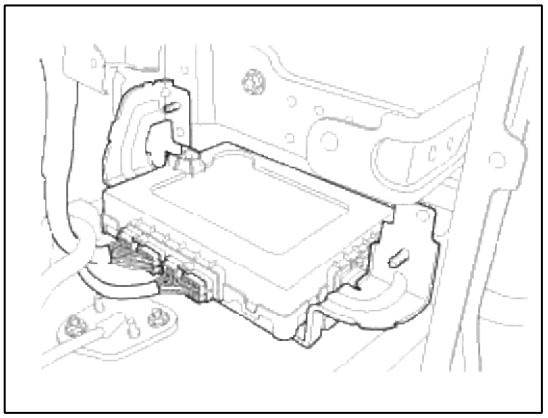
			BCM		16V
Power	POWER_GND	A24	Ground	GND	
	SIGNAL_GND	A11	Ground	GND	
	V_AutoLightPWR	B8	Auto light sensor power	Power	
	AutoLight_GND	B20	Auto light sensor ground	GND	
Analog Input	A_IGN1	A12	Ignition1 voltage signal input	High	7V above/4V below
	A_IGN2	A2	Ignition2 voltage signal input	High	7V above/4V below
	A_ACC	A13	Accessory voltage signal input	High	7.8V above/7.1V below
	A_WiperIntVolume	B16	Wiper intermittent volume input	AD	
	A_AutoLightSnsr	B9	Auto light sensor signal input	AD	
Logic	L_BreakSW	A14	Break switch signal input	High	7V above/4V below
	L_WasherSW	A4	Front Washer switch signal input	High	7V above/4V below
	L_MistSW	A15	Mist switch signal input	High	7V above/4V below
	L_WiperIntSW	A5	Front Intermittent switch signal input	High	7V above/4V below
	L_KeyInSW	A18	Key In switch signal input	Low	2V below/OPEN (Reference:6V above)
	L_PASSW	A6	PAS ON/OFF switch signal input	Low	2V below/OPEN (Reference:6V above)
	L_PASOpt	A7	PAS Option switch signal input	Low	2V below/OPEN (Reference:6V above)
	L_HeadLampLowSW	A9	Head Lamp Low switch signal input	Low	2V below/OPEN (Reference:6V above)
	L_SideABGOpt	A17	Side Air Bag Option switch signal input	Low	2V below/OPEN (Reference:6V above)
	L_TailSW	A19	Tail Lamp switch signal input	Low	2V below/OPEN (Reference:6V above)

Logic Input	L_HazardSW	A20	Hazard switch signal input	Low	2V below/OPEN (Reference:6V above)
	L_AutoLightSW	A21	Auto Light switch signal input	Low	2V below/OPEN (Reference:6V above)
	L_HeadLampHISW	A22	Head Lamp High Lamp switch signal input	Low	2V below/OPEN (Reference:6V above)
	L_RearFogSW	B1	Rear Fog Lamp switch signal input	Low	2V below/OPEN (Reference:6V above)
	L_TurnSigRHSW	B2	Turn Signal Right switch signal input	Low	2V below/OPEN (Reference:6V above)
	L_DefoggerSW	B3	Defogger switch signal input	Low	2V below/OPEN (Reference:6V above)
	L_KeyInterLockSW	B4	Key Interlock switch signal input	Low	2V below/OPEN (Reference:6V above)
	L_FrontFogSW	B10	Fornt Fog Lamp switch signal input	Low	2V below/OPEN (Reference:6V above)
	L_TurnSigLHSW	B11	Turn Signal Left switch signal input	Low	2V below/OPEN (Reference:6V above)
PWM Input	P_CrashInput	A8	Crash Input signal	PWM	
	P_MTSRx	B17	MTX Rx Input signal	PWM	
Communication	S_DiagK	A10	Diagnostic Communication line K for Tester	Data	
	CAN_H	B5	Can network communication line (high)	Data	
	CAN_L	B6	Can network communication line (low)	Data	
	LIN_PASData	B7	LIN network communication line	Data	
	O_SafetyPWECU	C5	Safety Power Window ECU output	Low	
	O_HeadLampLowSig	C6	Head Lamp Low signal output	Low	

Output	O_AV_TAIL	C7	Navi wakeup signal output	Low	
	O_KeyHoleILL	C8	Key Hole Illumination output	Low	
	O_ATMSOL	C10	ATM Solenoid Relay output	Low	
	O_KeySol	C11	Key Interlock Solenoid Relay output	Low	
	O_WiperRly	C16	Wiper Relay output	Low	
	O_HeadLampWasher	C17	Head Lamp Washer Relay output	Low	
	O_RearFogRly	C19	Rear Fog Relay output	Low	
	O_MTS_Tx(O_NaviWakeUp)	C21	MTS signal output (Navi Wake UO Signal Output)	Low	
	O_SecurityIND	C22	Security Indicator Relay output	Low	
	O_RoomLamp	C23	Room Lamp output		
	O_TURNSIGFRLH	C1	Turn signal front left signal output	High	
	O_TURNSIGFRRH	C2	Turn signal front right signal output	High	
	O_TURNSIGRRLH	C3	Turn signal rear left signal output	High	
	O_TURNSIGRRRH	C4	Turn signal rear right signal output	High	
	O_PASIND	C9	Turn signal front left signal output	High	
Power	V_Turn	C12	Turn signal IPS power		
		C13			

Body Electrical System > BCM (Body Control Module) > Body Control Module (BCM) > Description and Operation

Description

Body control module (A) receives various input switch signals controlling time and alarm functions for the intermittent wiper timer, washer timer, rear defogger timer, seat belts warning, central door lock, ignition key reminder, power window, door warning, tail lamp, crash door unlock, ignition key hole illumination, rear fog lamp control and keyless entry & burglar alarm.	

Function

1. Wiper & Washer Control
   (1) Front Washer Interlocking Wiper Control
   If washer switch (WasherSW) is ON at the status of IGN2 ON, Wiper turn ON. If washer switch is OFF, wiper turn ON for 2.5~3.8 seconds and then turn OFF.
   (2) Front Wiper Intermittent Control
   If front wiper INT switch is ON at the status of IGN2 ON, wiper turn ON according to INT volume.
   (3) Front Wiper MIST Control
   If front wiper MIST switch is ON at the status of IGN2 ON, wiper turn ON continually.
   (4) Rear Washer Interlocking Rear Wiper Control
   If rear washer switch is ON at the status of IGN2 ON, Wiper turn ON. If rear washer switch is OFF, rear wiper turn ON for 2.5~3.8 seconds and then turn OFF.
   (5) Rear Wiper Control
   If rear wiper switch is ON at the status of IGN2 ON, rear wiper turn ON continually.
   (6) Rear Wiper Intermittent Control
   If rear wiper INT switch is ON at the status of IGN2 ON, rear wiper turn ON according to INT volume.
2. Warning
   (1) Seat Belt Reminder (Front)
   IGN1 ON → Indicator ON for 6 sec → Indicator turn ON continually if the seat belt switch is OFF
   IGN1 ON → Indicator ON for 7 sec → Indicator turn OFF if the seat belt switch is ON
   If the vehicle speed is over 20km/h and seat belt switch is OFF, the warning sound ON and Indicator blink.
   If the vehicle speed is over 20km/h and warning sound ON, the warning sound OFF after seat belt switch ON.
   If the seat belt switch is ON, the warning sound OFF and Indicator turn OFF.
   (2) Seat Belt Reminder (Rear)
   IGN1 ON → Indicator turn ON when the seat belt switch is OFF
   IGN1 ON → Indicator turn ON when the seat belt switch is OFF → ALT'L ON → Indicator turn OFF after 35 sec
   In above situaton, if the vehicle speed is over 9 km/h, indicator turn ON again for 35 sec
   If the vehicle speed is over 25 km/h and rear seat belt is OFF, indicator warning ON.
   (3) Parking Brake Start Warning
   If the vehicle speed is over 10 km/h & parking brake switch ON & IGN ON, the parking brake waring sound is ON.

3. Rear defogger
   (1) If rear defogger switch turns ON after Alt L is ON while IGN1 is ON, turn the defogger relay output ON for 20min.
   (2) If rear defogger switch turns ON again while defogger relay output is ON, turn the defogger relay output OFF.
   (3) Also turn defogger output OFF in case of Alt L OFF or IGN1 OFF while the defogger relay output is ON.
4. Power Window Timer
   (1) Turn the safety and power window ECU output ON when turning IGN1 ON.
   (2) Turn safety power window ECU output OFF after keeping safety power window ECU output for 30sec when IGN1 is OFF.
   (3) Turn safety power window ECU OFF immediately when opening the driver door or assist door within the condition (2) above.
5. Exterior Lamp Control
   (1) Tail Lamp Auto Cut
   If the key out and driver door is opened while the key or ACC or IGN ON and tail lamp switch ON, turn the tail lamp relay OFF automatically.
   When turning tail lamp switch ON again from OFF after the automatic blackout, the tail lamp relay will be turned ON and Tail Lamp Auto Cut function will be cancelled.
   (2) Auto Light Control
   If the value of Auto Light Signal is input value of LIGHT ON at the status of IGN1 ON and the auto light switch ON, turn the light ON in 2.5sec ± 100msec.
   If the value of Auto Light Signal is LIGHT OFF and the auto light switch ON, turn the light OFF after 5sec.
   (3) Front Fog Lamp control
   Turn the front fog lamp ON when pressing the front fog lamp switch when IGN2 ON and Tail Lamp Relay turn ON.
   (4) Head lamp low control
   Turn the head lamp relay ON when turning the head lamp switch ON while IGN1 is ON.
   (5) Escort
   Turn the head lamp relay ON for 20 sec when turning the key OFF while the head lamp is ON.
   The head lamp relay ON for 30 sec when opening the driver door while the head lamp is ON for 20 sec.
   The head lamp relay OFF immediately when pressing the door lock button twice with RKE(or FOB) while the head lamp is ON.
   (6) Static Bending Light
   When the driver turn the steering wheel and IGN1 ON and head lamp ON, the static bending light turn ON.
   The opposite side lamp is ON when the prohibit R is ON.
   The static bending light turn ON for 2 min at least.
   The static bending light turn ON according to the vehicle speed and steering wheel angle.
   (7) Head Lamp Welcome Function
   The head lamp low and tail lamp ON for 15 sec when pressing the door lock button twice with RKE(or FOB) while all doors are closed, locked, the key out and the head lamp switch (or auto light switch) is ON.
   If the lock/unlock with RKE(or FOB) or IGN1 & head lamp switch (or auto light switch) OFF while head lamp low and tail lamp ON, the head lamp is OFF.
   (8) Turn Signal Lamp Control
   Turn the turn sgnal lamp ON when turning the turn signal lamp switch ON and IGN2 ON.
   Triple turn signal operates when the turn signal switch OFF bofore signal lamp operating 3 times.

(9) Hazard Lamp Control
Turn the hrzard lamp ON when turning the hazard lamp switch ON.

6. Interior Lamp Control

(1) Room Lamp Control
If 4 doors are closed & RKE(or FOB) unlocked or 4 doors are closed & KEY ON → OFF, turn the room lamp ON for 30 sec.
If IGN key OFF and door is opend, turn the room lamp ON for 20 min.
If IGN ON while the room lamp ON for 20 min, keep the room lamp ON.
If the door is closed while the room lamp ON for 20 min, keep the room lamp ON for 30 sec.
If the door is locked while the room lamp ON for 30 sec, the room lamp is decaying.

(2) Room Lamp Auto Cut
Romm lamp turn ON when the ACC and IGN ON.
If ACC OFF, turn the room lamp ON for 20 min.
If vehicle enter the ARMWAIT, the room lamp ON for 3 sec and OFF.

7. Door Lock/unlock Control

(1) Central Reminder
Turn the central door unlock ON when the lock inputed while the key OUT and door is opened.

(2) IGN Key Reminder
Turn the door unlock relay output ON when the knob is locked while the key IN and driver (or assist) door is opened.

(3) Passive Reminder
Turn the central door unlock ON when receiving the passive unlock signal.

(4) Crash Door Unlock
Keep the central unlock output for 5 sec when receiving the crash signal while the key IN or ACC ON or IGN ON.
Crash door unlock function has priority to LOCK/UNLOCK control by other functions

(5) Auto Door Lock By Vehicle Speed Change
All door lock signal is output if vehicle speed is 15km/h when the IGN1 ON and Alt L ON.

(6) Auto Door Lock By Shift Lever Change
All door lock signal is output if shift lever is changed from P to R/N/D position while the IGN1 ON and all doors are closed.

(7) Auto Door Unlock By Key In Condition
All door unlock signal is output if the IGN KEY IN→OUT while the door knob is locked.

(8) Auto Door Unlock By Shift Lever Change
All door unlock signal is output if shift lever is changed from R/N/D to P position while the IGN1 ON and all doors are closed.

(9) AVN Wakeup Function
AVN wakeup signal is output if door unlock signal is inputed by RKE(or FOB) while the KEY OFF.

(10) Tailgate Release
Tailgate release relay is ON if tailgate open switch is ON while all door unlocked.

8. Anti-theft

(1) If all door is locked with RKE(or FOB) and knob is locked while all door lock and key out, the vehicle enter the ARMWAIT for 30 sec.

(2) The vehicle enter the ARM after 30 sec from ARMWAIT mode.

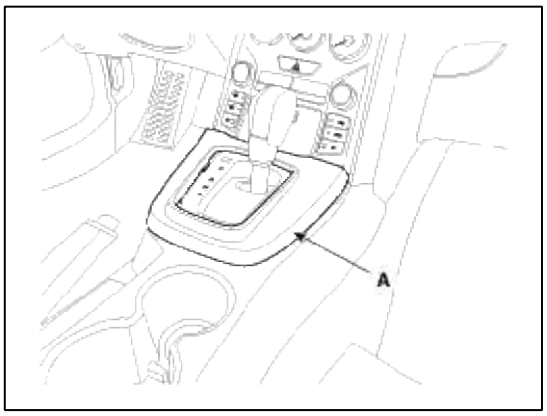
(3) If the door or hood or tailgate is opened in ARM mode, the arlarm is ON for 27sec.

9. Head Lamp Washer Function
   (1) If the front wiper and washer switch ON, the head lamp washer operates.
   (2) Head lamp washer operrates for 1.5 sec and it need the 15 min for next operation.
10. One Touch Triple Turn Signal
    Triple turn signal operates when the turn signal switch OFF bofore signal lamp operating 3 times.
11. ATM Shift Lock Control
    Shift lever can be changed to the another position when IGN1 ON and brake pedal is pressed.

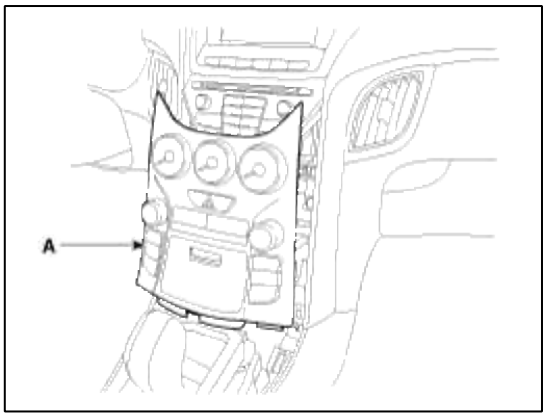
Body Electrical System > BCM (Body Control Module) > Body Control Module (BCM) > Repair procedures

Removal

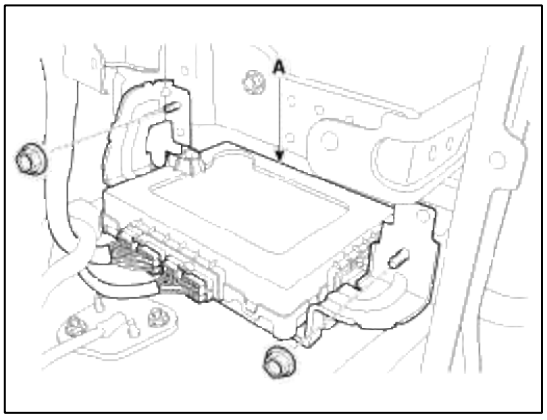
1. Disconnect the negative (-) battery terminal.
2. Remove the console upper cover(A).



3. Remove the center fascia lower panel(A).



4. Remove the body control module(A) after loosening 2 nuts and disconnecting the connectors.

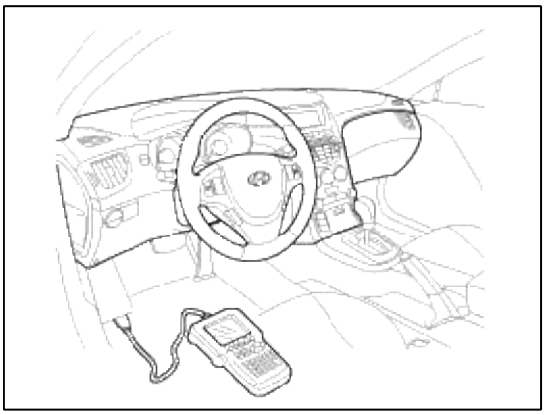


Installation

1. Install the body control module.

2. Install the center fascia lower panel.
3. Install the console upper cover.

Trouble Diagnostics When Using GDS



1. The body control module can diagnose by using the GDS more quickly.
   The BCM communicates with the GDS and then reads the input/output value and drives the actuator.
2. To diagnose the BCM function, select the menu of model and body control module.
3. To consult the present input/output value of BCM, "Current DATA". It provides information of BCM input/output conditions of power supply, turn signal/brake lamp, headlamp, door, locks, outside mirror, wiper, auto-light and transmitters etc.
   A. BCM Service data

Current Data

Standard Display | Full List | Graph | Items List | Reset Min.Max. | Record | Stop

Sensor Name	Value	Unit
Key in switch[Manual Key Type]	IN	-
ACC	ON	-
IGN1	ON	-
IGN2	ON	-
Tail Lamp Switch	OFF	-
Head Lamp Switch	OFF	-
Auto Light Switch	OFF	-
Head Lamp High Switch	OFF	-
Front Fog Switch	OFF	-
Washer Switch	OFF	-
INT Switch	OFF	-
Mist Switch	OFF	-
Key Inter Lock Switch[Manual Key Type]	ON	-
Room Lamp Output	ON	-
Foot Lamp Output	ON	-
Ignition Key Hole Illumination[Manual Key Type]	OFF	-
Auto Light Power	ON	-
AV Tail Output	ON	-
Key Inter Lock Solenoid[Manual Key Type]	OFF	-
Security LED	OFF	-
Navigation wakeup signal	OFF	-

Current Data

Standard Display | Full List | Graph | Items List | Reset Min.Max. | Record | Stop

Sensor Name	Value	Unit
Security LED	OFF	-
Navigation wakeup signal	OFF	-
Wiper low relay	OFF	-
Head lamp low signal output	OFF	-
Parking brake switch	PARK	-
Defogger SW	OFF	-
Glove Box Sw	OFF	-
Inhibit R SW	OFF	-
Glove Box Lamp Output	OFF	-
ATM solenoid(Automatic Transmission)	OFF	-
Battery voltage monitoring input	13.20	V
Int Volume	2.47	V
Auto light sensor	0.00	V
RK RX Status	NO RX	-
Number of RK(+RK)	1	-
Auto Door Lock Status	DISABLE	-
Auto door unlock	DR DOOR UNLO...	-
2-Turn Unlock	ENABLE	-
Arm/Disarm by door key(+RK)	ENABLE	-
Horn answer back(+RK)	DISABLE	-
Auto Light Control	ENABLE	-

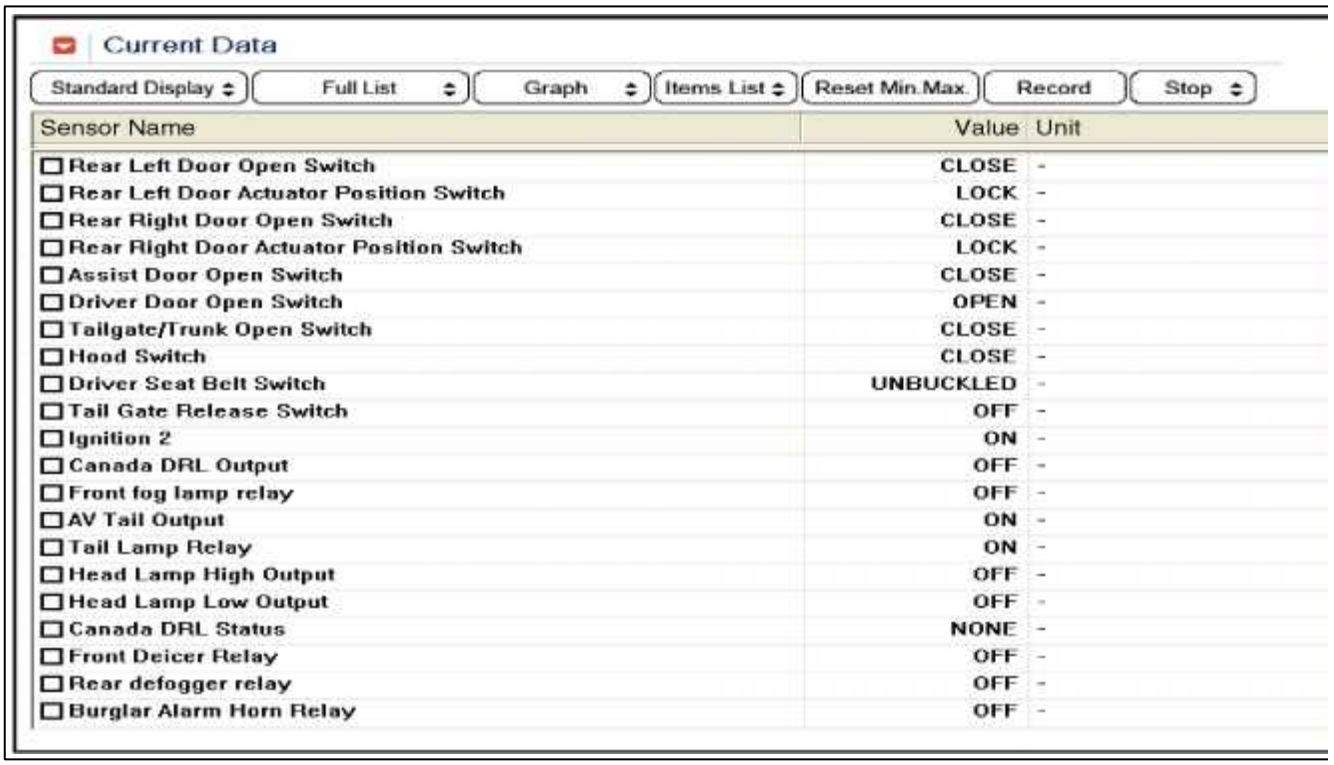
B. CLU(Cluster) Service data

Current Data

Standard Display | Full List | Graph | Items List | Reset Min.Max. | Record | Stop

Sensor Name	Value	Unit
Ignition 1	ON	-
Ignition 2	ON	-
Cruise Main Indicator	OFF	-
Front fog Indicator	OFF	-
High Beam Indicator	OFF	-
Door open Indicator	ON	-
P Inhibit output	ON	-
R Inhibit output	OFF	-
Seat belt indicator	OFF	-
N Inhibit ouput	OFF	-
D Inhibit output	OFF	-
FUEL_INPUT	5.0	L
Battery Voltage on CLU	14.4	V

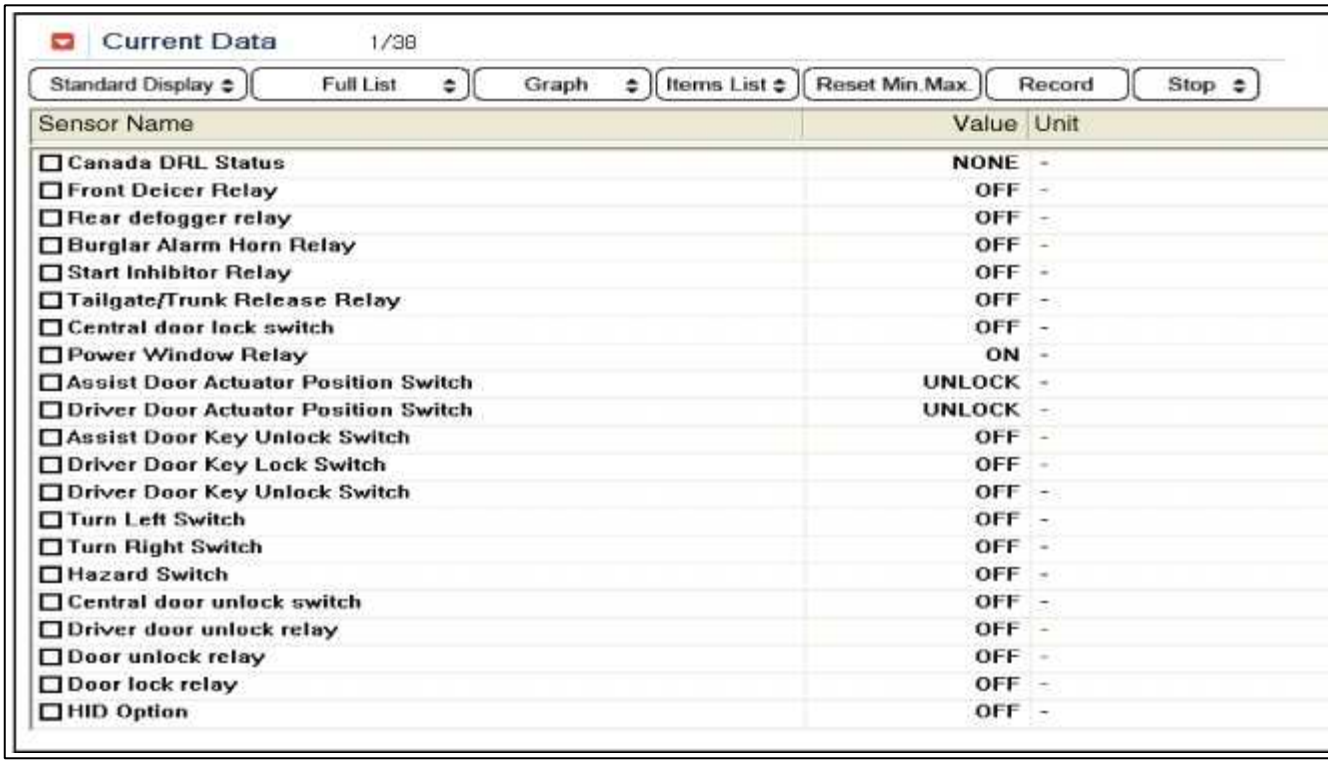
C. SJB(Smart junction box) Service data



Current Data

Standard Display | Full List | Graph | Items List | Reset Min.Max | Record | Stop

Sensor Name	Value	Unit
Rear Left Door Open Switch	CLOSE	-
Rear Left Door Actuator Position Switch	LOCK	-
Rear Right Door Open Switch	CLOSE	-
Rear Right Door Actuator Position Switch	LOCK	-
Assist Door Open Switch	CLOSE	-
Driver Door Open Switch	OPEN	-
Tailgate/Trunk Open Switch	CLOSE	-
Hood Switch	CLOSE	-
Driver Seat Belt Switch	UNBUCKLED	-
Tail Gate Release Switch	OFF	-
Ignition 2	ON	-
Canada DRL Output	OFF	-
Front fog lamp relay	OFF	-
AV Tail Output	ON	-
Tail Lamp Relay	ON	-
Head Lamp High Output	OFF	-
Head Lamp Low Output	OFF	-
Canada DRL Status	NONE	-
Front Deicer Relay	OFF	-
Rear defogger relay	OFF	-
Burglar Alarm Horn Relay	OFF	-

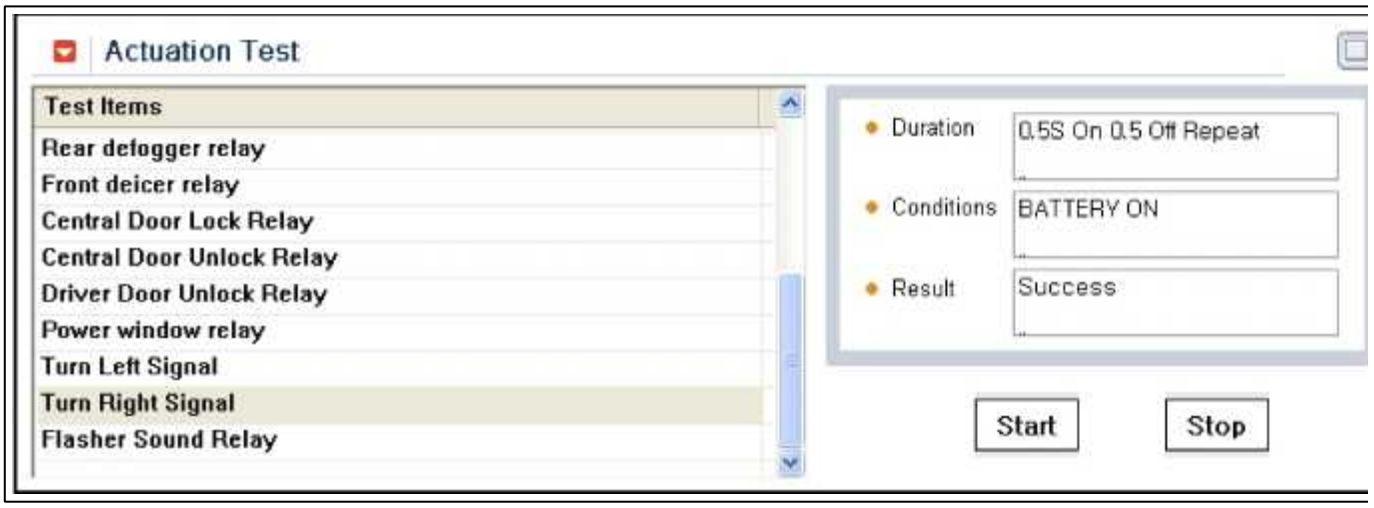


Current Data 1/38

Standard Display | Full List | Graph | Items List | Reset Min.Max | Record | Stop

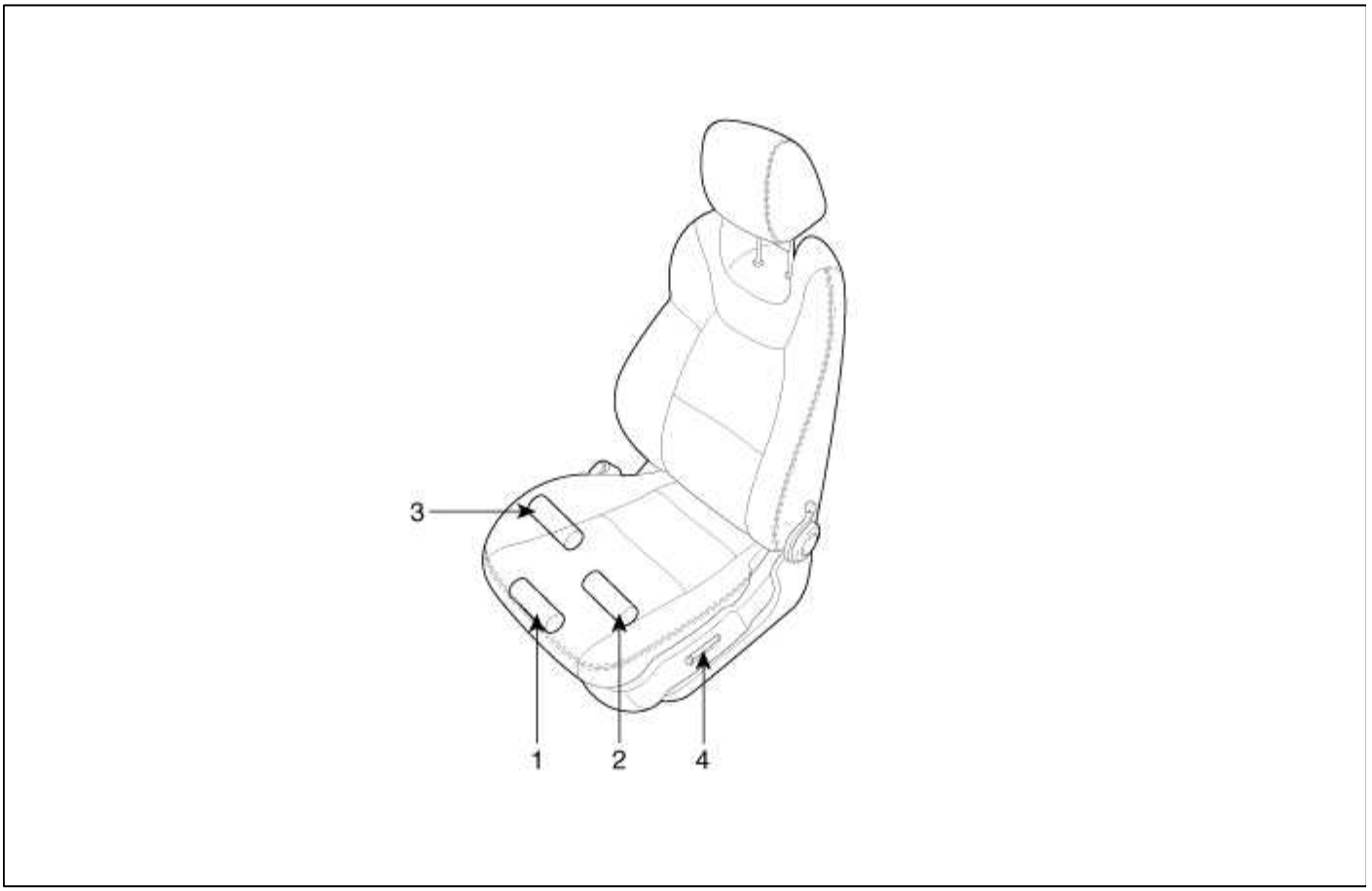
Sensor Name	Value	Unit
Canada DRL Status	NONE	-
Front Deicer Relay	OFF	-
Rear defogger relay	OFF	-
Burglar Alarm Horn Relay	OFF	-
Start Inhibitor Relay	OFF	-
Tailgate/Trunk Release Relay	OFF	-
Central door lock switch	OFF	-
Power Window Relay	ON	-
Assist Door Actuator Position Switch	UNLOCK	-
Driver Door Actuator Position Switch	UNLOCK	-
Assist Door Key Unlock Switch	OFF	-
Driver Door Key Lock Switch	OFF	-
Driver Door Key Unlock Switch	OFF	-
Turn Left Switch	OFF	-
Turn Right Switch	OFF	-
Hazard Switch	OFF	-
Central door unlock switch	OFF	-
Driver door unlock relay	OFF	-
Door unlock relay	OFF	-
Door lock relay	OFF	-
HID Option	OFF	-

4. To perform compulsory operation on BCM input factors, select "ACTUATION TEST".



Body Electrical System > Seat Electrical > Components and Components Location

Component Location



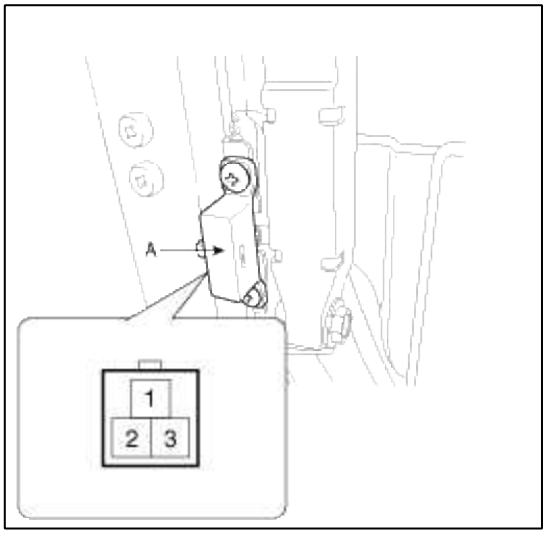
1. Slide motor 2. Front height motor	3. Rear height motor 4. Power seat switch

Body Electrical System > Seat Electrical > Power Seat Motor > Repair procedures

Inspection

Slide Motor Limit Switch

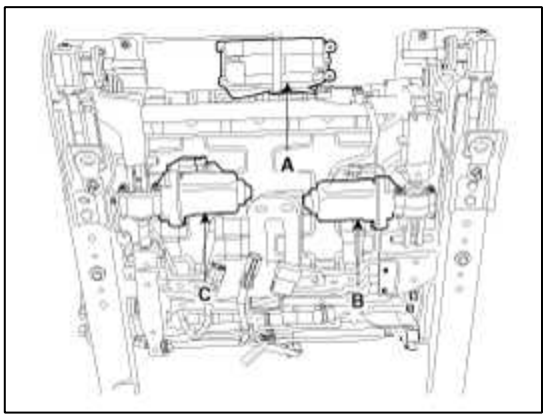
1. Disconnect the limit switch (A) and operate the limit switch.
2. Check for continuity between the terminals.
3. Make sure that the seat operation is normal in the reverse after the maximum operation.
4. If there is an abnormality, replace the limit switch.



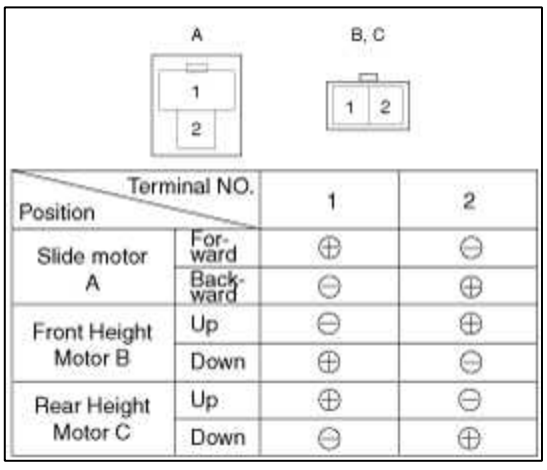
Position \ Terminal NO.	1	2	3
Frontward	○		○
Backward	○	○	

Power Seat Motor

1. Disconnect the connectors(A) for each motor.



2. With the battery connected directly to the motor terminals, check if the motors run smoothly.
3. Reverse the connections and check that the motor turns in reverse.
4. If there is an abnormality, replace the motors.

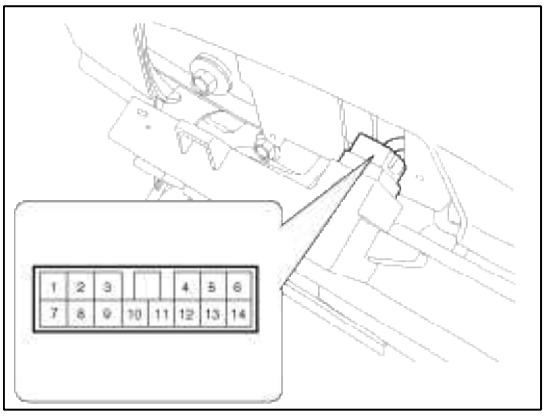


Position \ Terminal NO.		1	2
Slide motor A	For-ward	⊕	⊖
	Back-ward	⊖	⊕
Front Height Motor B	Up	⊖	⊕
	Down	⊕	⊖
Rear Height Motor C	Up	⊕	⊖
	Down	⊖	⊕

Body Electrical System > Seat Electrical > Power Seat Control Switch > Repair procedures

Inspection

With the power seat switch in each position, make sure that continuity exists between the terminals below. If continuity is not as specified, replace the power seat switch.

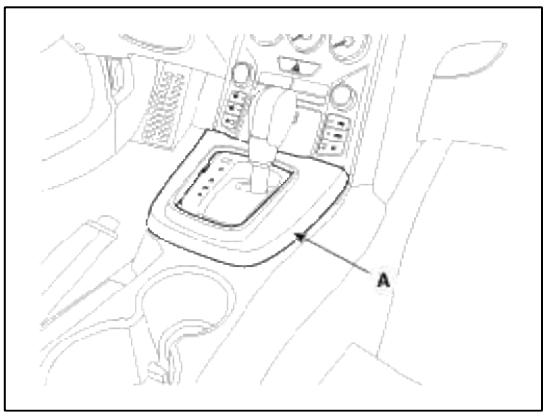


	Front height switch			Slide switch			Rear height switch			Name
	Up	N	Down	Forward	N	Backward	Up	N	Down	
11	○		○	○		○	○		○	B+
12					○	○				Backward slide motor
14				○	○					Forward slide motor
4					○					Backward slide limit
13					○					Forward slide limit
8	○	○								Front height motor (Up)
9		○	○							Front height motor (Down)
3		○								Front height limit (Up)
10		○								Front height limit (Down)
2							○	○		Rear height motor (Up)
5								○	○	Rear height motor (Down)
1								○		Rear height limit (Up)
6								○		Rear height limit (Down)

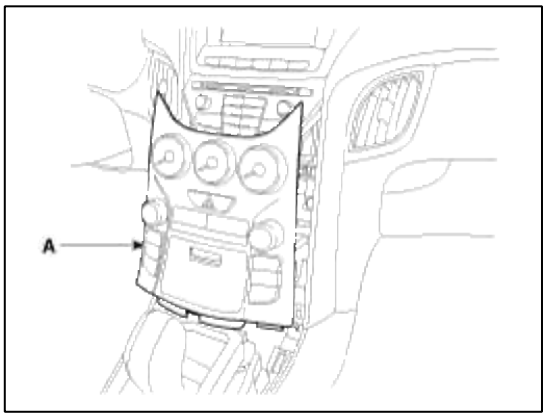
Body Electrical System > Seat Electrical > Seat Heater Switch > Repair procedures

Removal

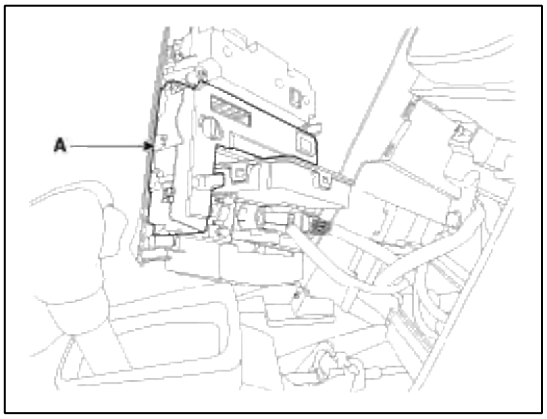
1. Disconnect the negative(-) battery terminal.
2. Remove the console upper cover (A).
   (Refer to the BD group - "Console")



3. Remove the center fascia lower panel (A).
   (Refer to the BD group - "Crash pad")



4. Remove the heater control unit (A) after disconnecting the connectors and cables.

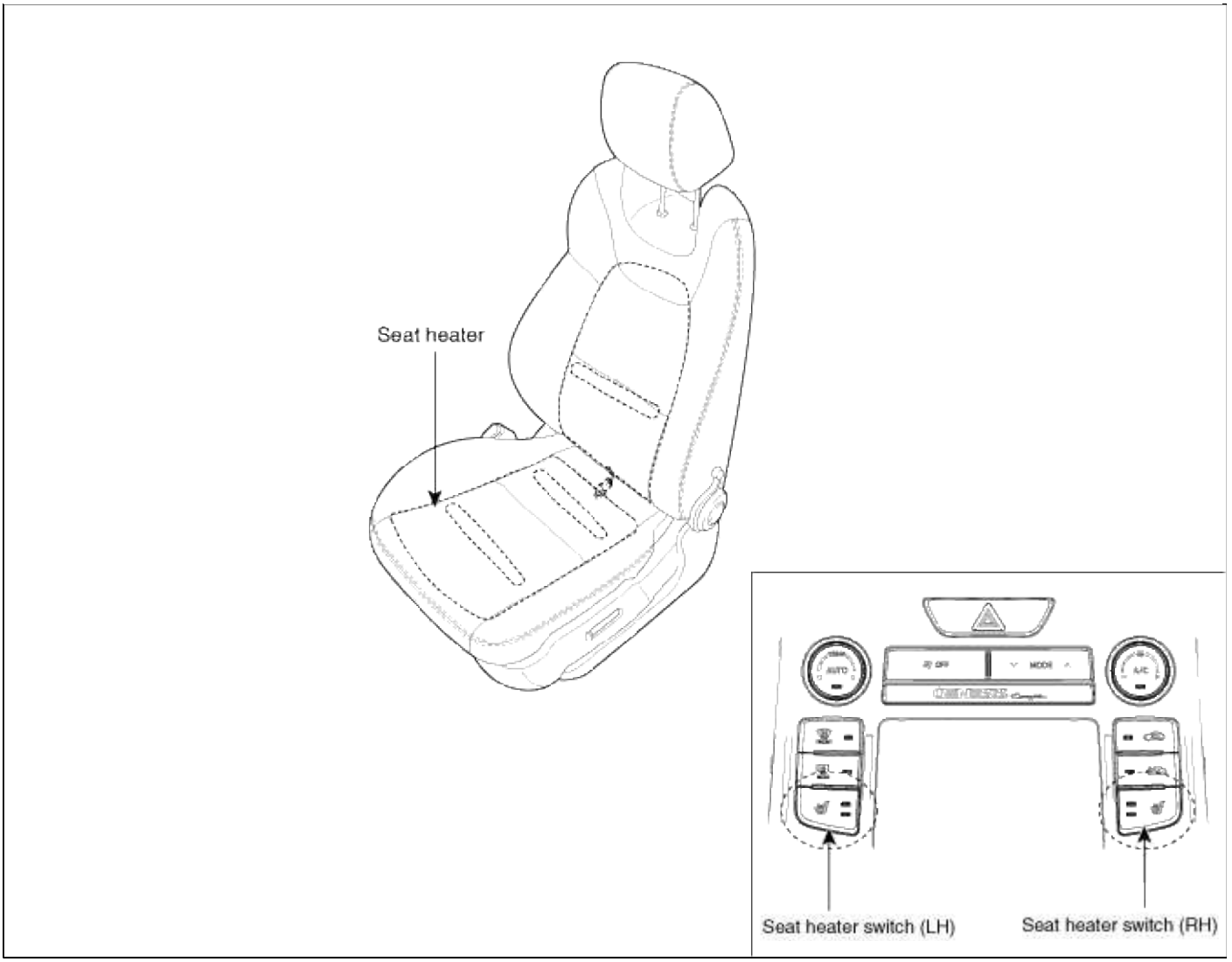


Installation

1. Install the heater control unit.
2. Install the center fascia lower panel and console upper cover.

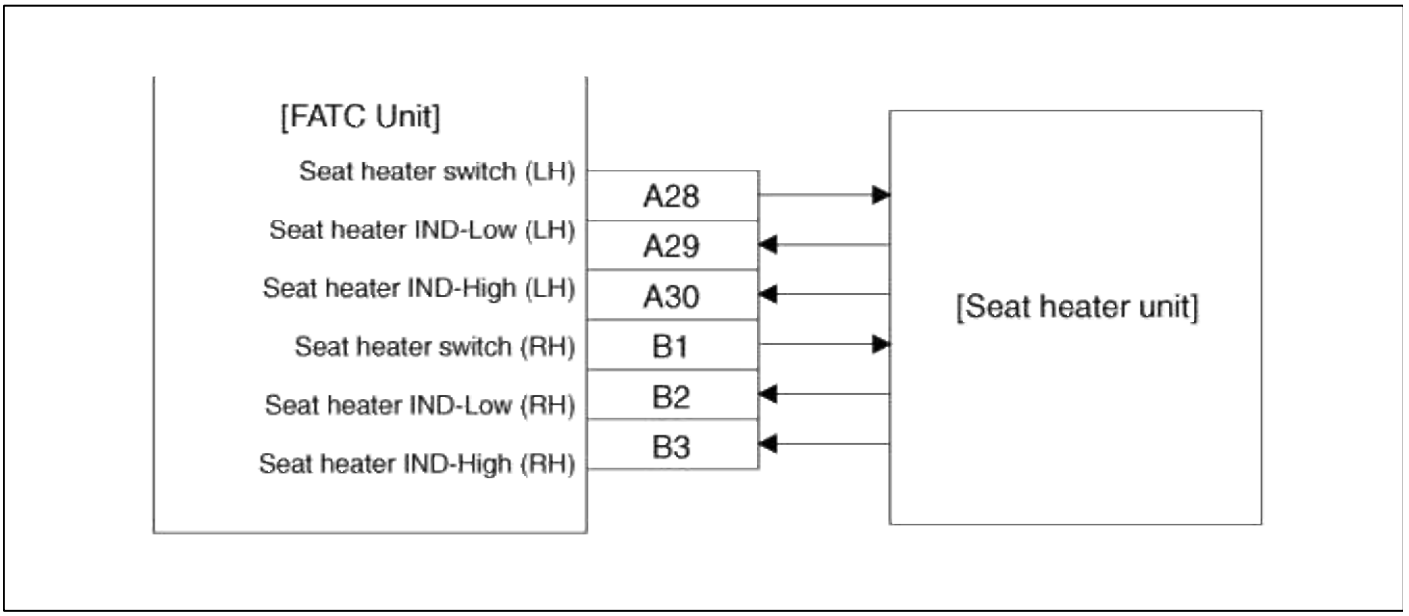
Body Electrical System > Seat Electrical > Seat Heater > Components and Components Location

Component Location



Body Electrical System > Seat Electrical > Seat Heater > Schematic Diagrams

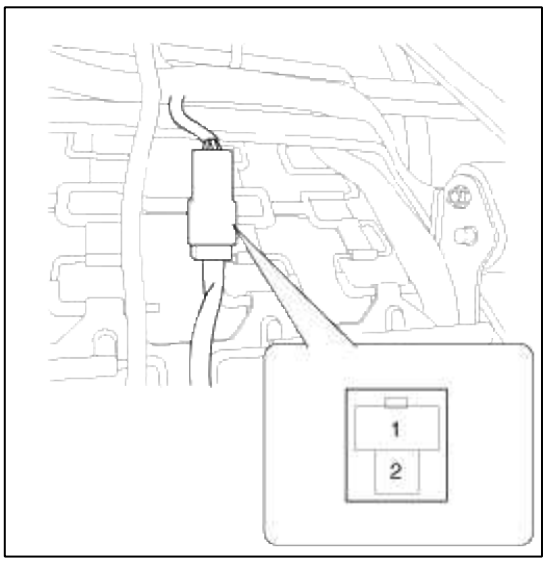
Circuit Diagram



Body Electrical System > Seat Electrical > Seat Heater > Repair procedures

Inspection

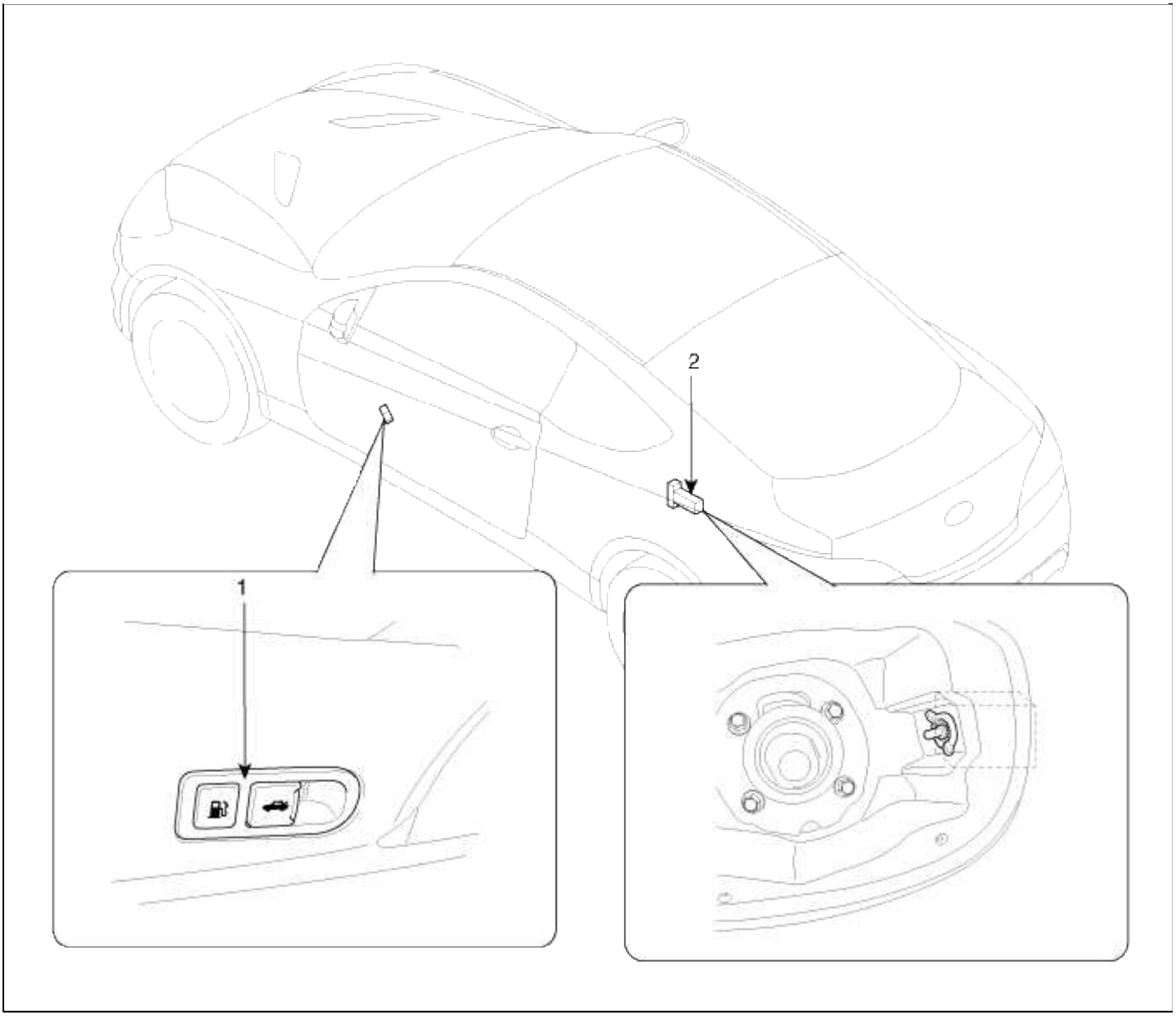
1. Check for continuity and measure the resistance between No.1 and NO.2 terminals.



Standard value: 2.43Ω ± 10% / SET
(Cushion: 1.22Ω ± 10%, Back: 1.21Ω ± 10%)

Body Electrical System > Fuel Filler Door > Components and Components Location

Component Location



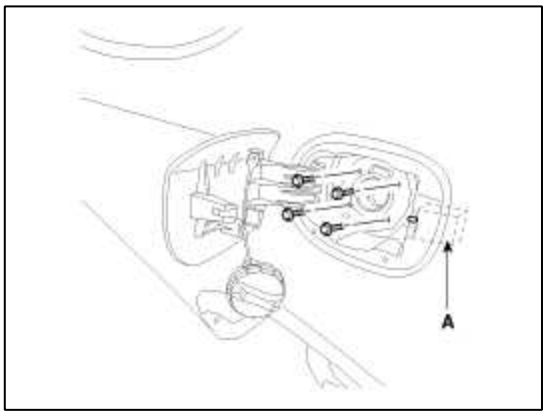
1. Fuel filler door open switch	2. Fuel filler door release actuator

Body Electrical System > Fuel Filler Door > Fuel Filler Door Release Actuator > Repair procedures

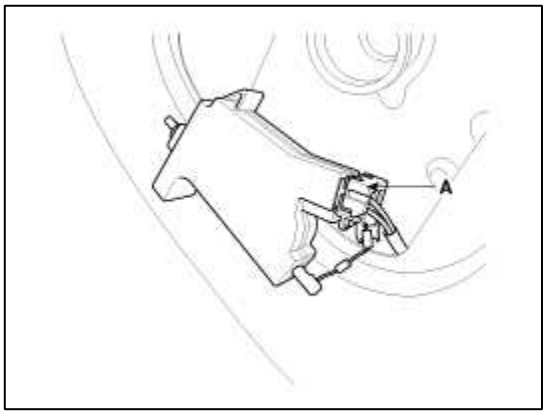
Inspection

1. Remove the fuel filler door housing.
   (Refer to BD group - "Interior trim")

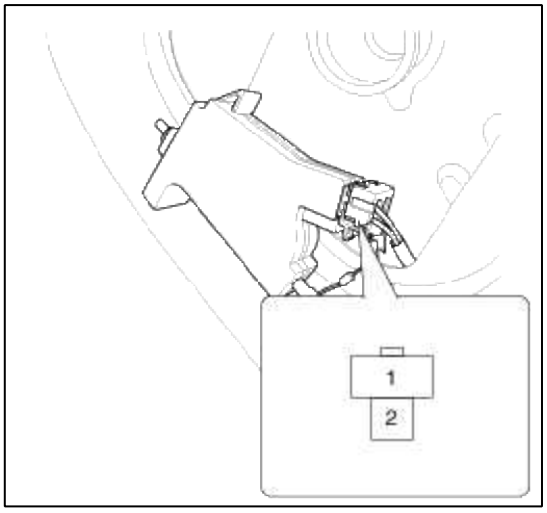
2. Loosen the mounting bolts and remove the fuel filler door release actuator(A).



3. Disconnect the fuel filler door connector(A).



4. Check for continuity between terminal No. 1 and No. 2. If there is no continuity replace the fuel filler door release actuator(A).

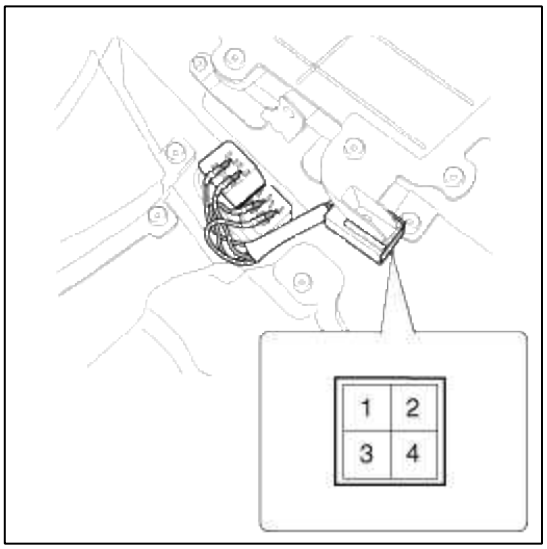


Body Electrical System > Fuel Filler Door > Fuel Filler Door Open Switch > Repair procedures

Inspection

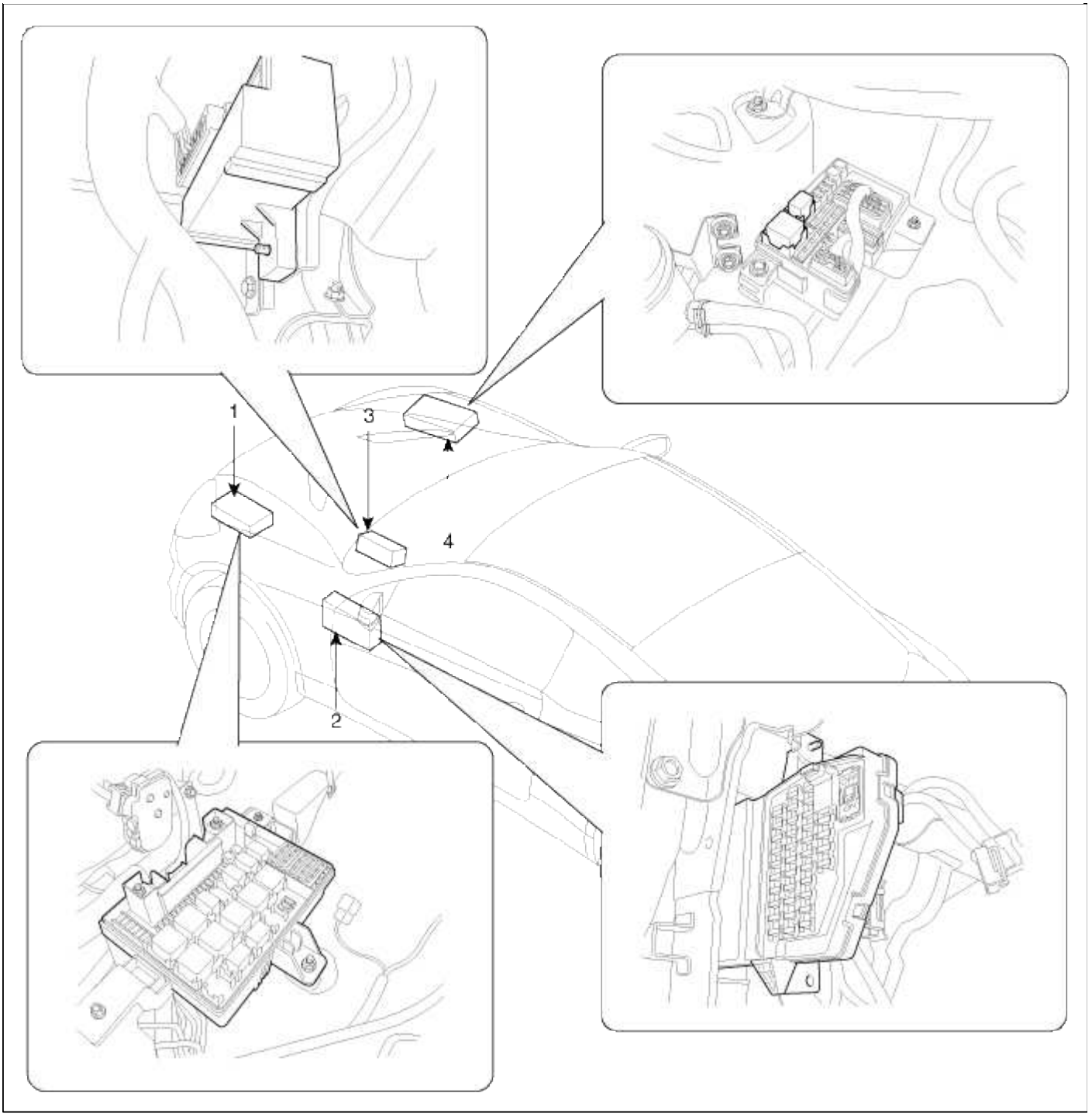
1. Remove the front door trim panel.
   (Refer to the Body group - "Front door")
2. Disconnect the switch connector.
3. Check the switch for continuity between the No. 1 and No. 2 terminals.

4. If the continuity is not as specified, replace the switch.



Body Electrical System > Fuses And Relays > Components and Components Location

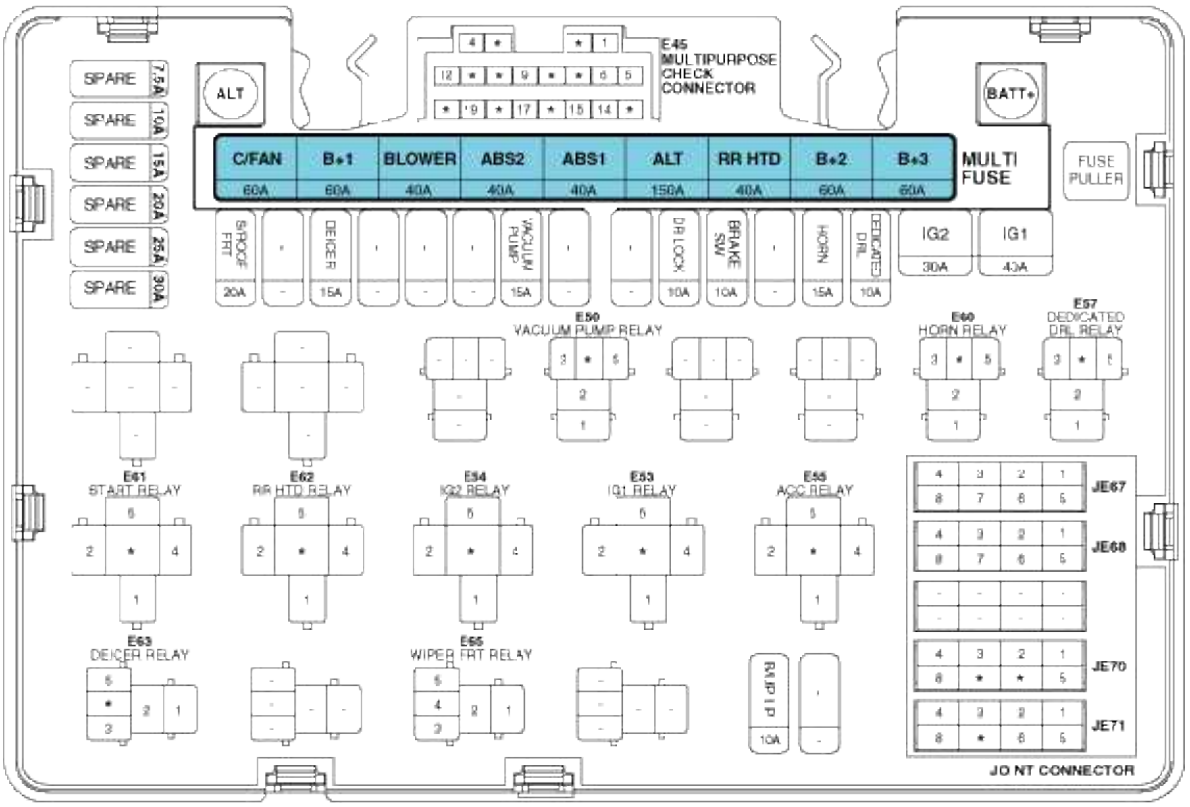
Component Location



1. Engine room relay box 2. Passenger compartment junction box	3. ICM relay box 4. Engine room sub-box

Body Electrical System > Fuses And Relays > Relay Box (Engine Compartment) > Components and Components Location

Components



Relay Type

NO.	Name	Type
E50	Vacuum Pump Relay	Plug Micro
E53	IG1 Relay	Plug Mini
E54	IG2 Relay	Plug Mini
E55	ACC Relay	Plug Mini
E57	Dedicated	Plug Micro
E60	DRL Relay,Horn Relay	Plug Micro
E61	Srart Relay	Plug Mini
E62	RR HTD Relay	Plug Mini
E63	Deicer Relay	Plug Micro
E65	Wiper FRT Relay	Plug Micro

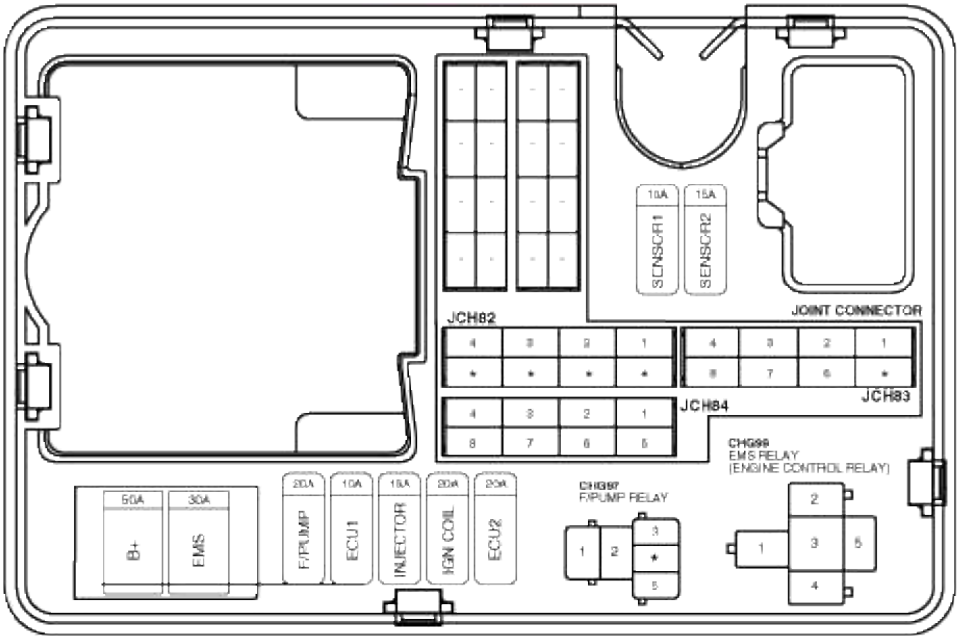
※ USE THE DESIGNATED FUSE AND RELAY ONLY

Circuit (E/R Junction Box LH)

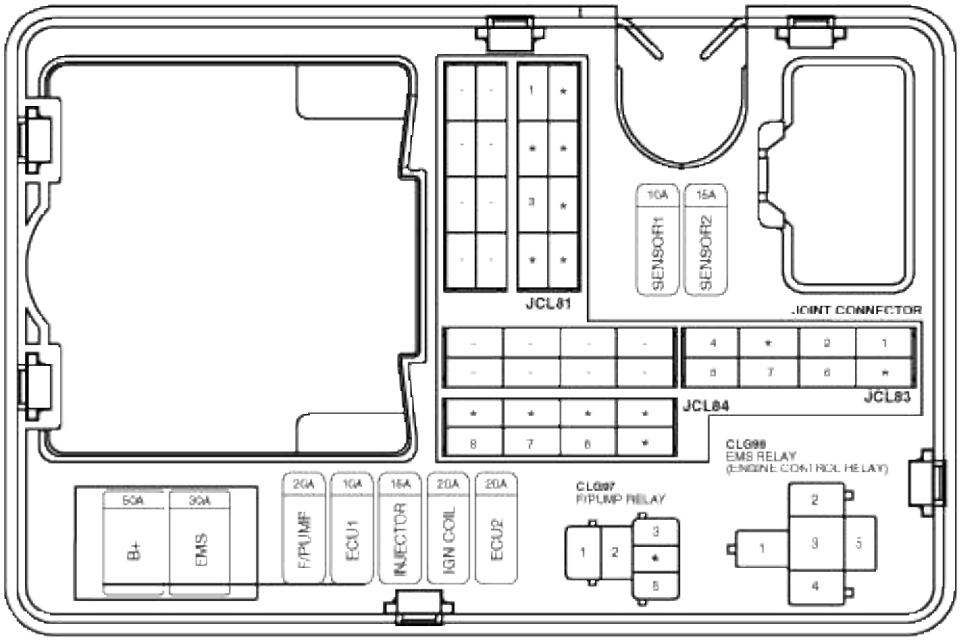
Description		(A)	Circuit Protected
MULTI FUSE	C/FAN	60A	Cooling Fan (High) Relay, Cooling Fan (Low) Relay
	B+1	60A	Smart Junction Box ((Fuse : S/HEATER, AMP, SAFETY POWER WINDOW LH/RH), IPS 2, IPS Control Module)
	BLOWER	40A	Smart Junction Box (Blower Relay)
	ABS2	40A	Multipurpose Check Connector, ESC Module
	ABS1	40A	Multipurpose Check Connector, ESC Module
	ALT	150A	Alternator, Multi Fuse (ABS1, ABS2, BLOWER, B+1, C/FAN), Fuse (S/ROOF FRT, DEICER, VACUUM PUMP)
	RR HTD	40A	RR HTD Relay
	B+2	60A	Smart Junction Box ((Fuse : HAZARD, PDM1, MODULE5, STOP LP, TRUNK, PDM2), IPS 1, ARISU 2, IPS Control Module)
	B+3	60A	Smart Junction Box ((Fuse : AUDIO, DRV P/SEAT, ROOM LP, MEMORY1, MEMORY2), ARISU 1, IPS Contro Module Leak Current Autocut Device Switch, Leak Current Autocut Device Relay)
FUSE	IG2	30A	Start Relay IG2 Relay, Ignition Switch
	IG1	40A	IG1 Relay, ACC Relay, Ignition Switch
	S/ROOF FRT	20A	Sunroof Control Module
	DEICER	15A	Deicer Relay
	VACUUM PUMP	15A	Vacuum Pump Relay (G4KF A/T)
	DR LOCK	10A	Smart Junction Box (Door Lock Relay, Door Unlock Relay), ICM Relay Box (Two Turn Unlock Relay)
	BRAKE SW	10A	Stop Lamp Switch
	HORN	15A	Horn Relay
	DEDICATED DRL	10A	Dedicated DRL Relay
	B/UP LP	10A	M/T - Back-Up Lamp Switch A/T - Rear Combination Lamp LH/RH, Electro Chromic Mirror, A/V & Navigation Head Unit

※ USE THE DESIGNATED FUSE AND RELAY ONLY

G4KF : THETA 2.0L TCI



G6DJ : LAMBDA II 3.8L GDI



※ USE THE DESIGNATED FUSE AND RELAY ONLY

Circuit (E/R Junction Box RH)

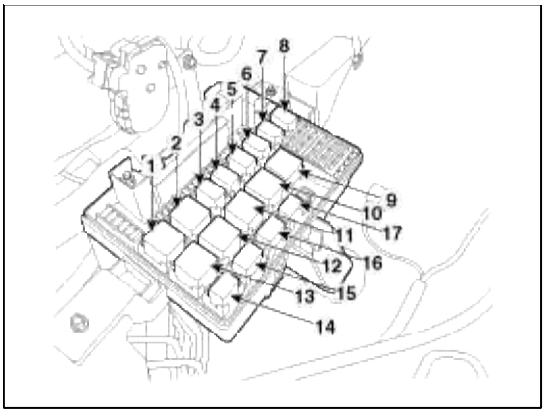
Fuse Name	(A)		Circuit Protected
B+	50A		Fuse (EMS 30A, ECU1 10A, F/PUMP 20A)
EMS	30A		Engine Control Relay
F/PUMP	20A		F/Pump Relay
ECU 1	10A	G4KF	ECM, TCM
		G6DJ	ECM, TCM, Injector Drive Box
INJECTOR	15A	G4KF	F/Pump Relay, Injector #1/#2/#3/#4
		G6DJ	F/Pump Relay, Fuel Pump Relay (Low), ECM
IGN COIL	20A	G4KF	Ignition Coil #1/#2/#3/#4, Condenser
		G6DJ	Ignition Coil #1/#2/#3/#4/#5/#6, Condenser #1/#2
ECU 2	20A	G4KF	ECM
		G6DJ	Injector Drive Box
SENSOR 1	10A	G4KF	Cooling Fan (High)/(Low) Relay, Oxygen Sensor (Up)/(Down)
		G6DJ	Cooling Fan (High)/(Low) Relay, ECM, Oxygen Sensor #1/#2/#3/#4
SENSOR 2	15A	G4KF	Camshaft Position Sensor #1/#2, RCV Control Solenoid Valve, Immobilizer Module, Canister Close Valve Purge Control Solenoid Valve, Crankshaft Position Sensor, Oil Control Valve #1/#2
		G6DJ	ECM, Oil Control Valve #1/#2/#3/#4, Purge Control Solenoid Valve, Immobilizer Module, Canister Close Valve

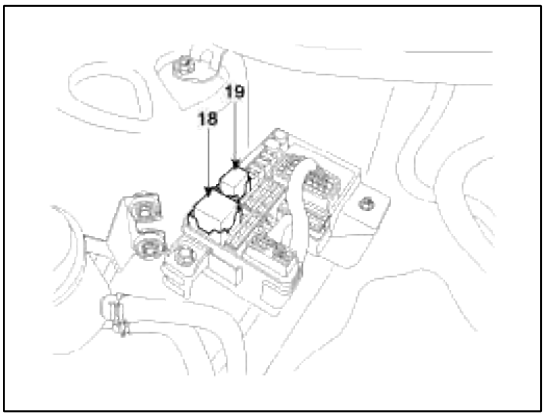
※USE THE DESIGNATED FUSE AND RELAY ONLY

Body Electrical System > Fuses And Relays > Relay Box (Engine Compartment) > Repair procedures

Inspection

1: -	11: IG2 relay
2: -	12: Rear heater relay
3: -	13: Start relay
4: Vacumm pump relay	14: Front deicer relay
5: -	15: Head lamp washer relay
6: -	16: Front wiper relay
7: Horn relay	17: -
8: Dedicated DRL relay	18: EMS relay
9: ACC relay	19: Fuel pump relay
10: IG1 relay	

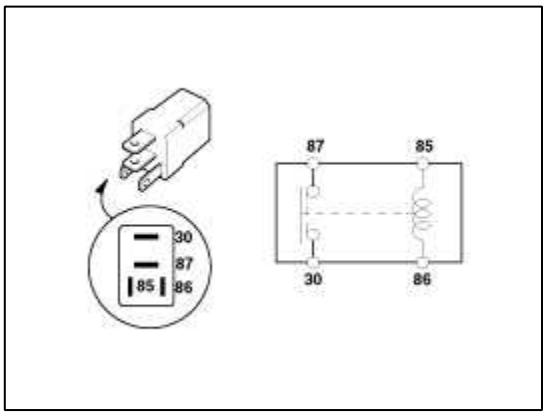




Power Relay Test (Type A)
Check for continuity between the terminals.

1. There should be continuity between the No.30 and No.87 terminals when power and ground are connected to the No.85 and No.86 terminals.
2. There should be no continuity between the No.30 and No.87 terminals when power is disconnected.

[A] Type:	
4: Vacumm pump relay	14: Front deicer relay
7: Horn relay	15: Head lamp washer relay
8: Dedicated DRL relay	19: Fuel pump relay

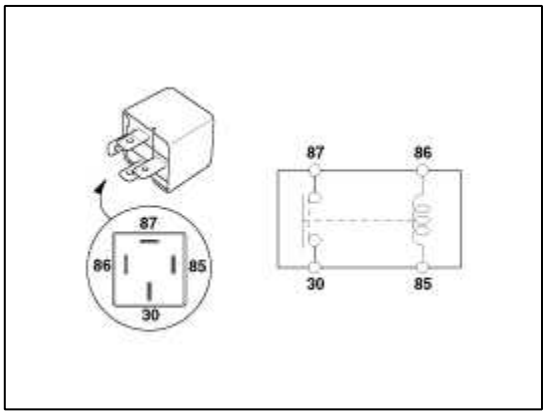


Terminal / Power	85	86	87	30
Disconnected	○	○		
Connected	⊖	⊕	○	○

Power Relay Test (Type B)
Check for continuity between the terminals.

1. There should be continuity between the No.30 and No.87 terminals when power and ground are connected to the No.85 and No.86 terminals.
2. There should be continuity between the No.30 and No.87a terminals when power is disconnected.

[B] Type:	12: Rear heater relay
9: ACC relay	13: Start relay
10: IG1 relay	
11: IG2 relay	



Terminal / Power	86	85	87	30
Disconnected	○	○		
Connected	⊖	⊕	○	○

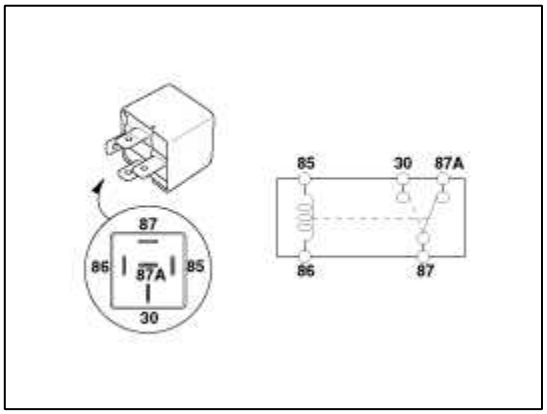
Power Relay Test (Type C)

Check for continuity between the terminals.

1. There should be continuity between the No.30, 87a and No.87 terminals when power and ground are connected to the No.85 and No.86 terminals.
2. There should be no continuity between the No.30, 87a and No.87 terminals when power is disconnected.

[C] Type :

18: EMS relay



Terminal / Power	86	85	87	87a	30
Disconnected	○	○			
Connected	⊖	⊕	○	○	○

Power Relay Test (Type D)

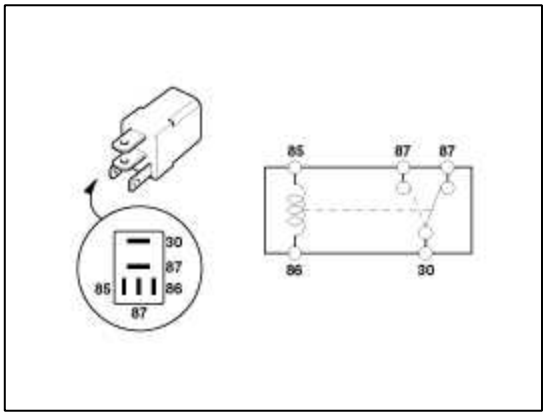
Check for continuity between the terminals.

1. There should be continuity between the No.30 and No.87 terminals when power and ground are connected to the No.85 and No.86 terminals.

2. There should be continuity between the No.30 and No.87 terminals when power is disconnected.

[D] Type:

16. Front wiper relay



Terminal / Power	85	86	30	87	87
Disconnected			○	○	
Connected	⊖	⊕	○	○	

Fuse Inspection

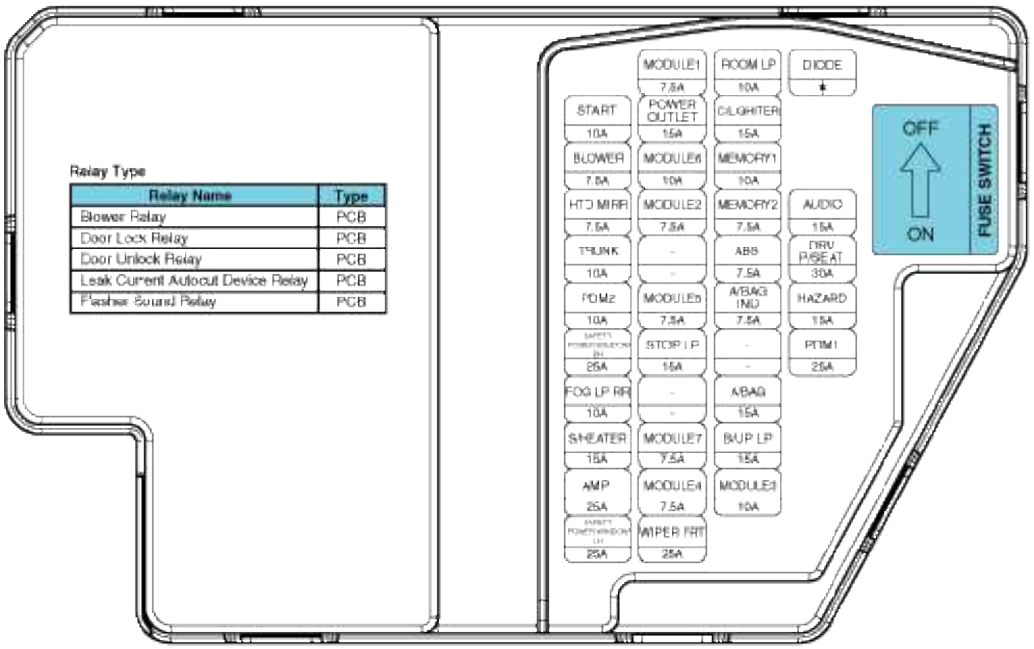
1. Be sure there is no play in the fuse holders, and that the fuses are held securely.
2. Are the fuse capacities for each circuit correct?
3. Are there any blown fuses?

   If a fuse is to be replaced, be sure to use a new fuse of the same capacity. Always determine why the fuse blew first and completely eliminate the problem before installing a new fuse.

Body Electrical System > Fuses And Relays > Relay Box (Passenger Compartment) > Components and Components Location

Components

< FRONT >



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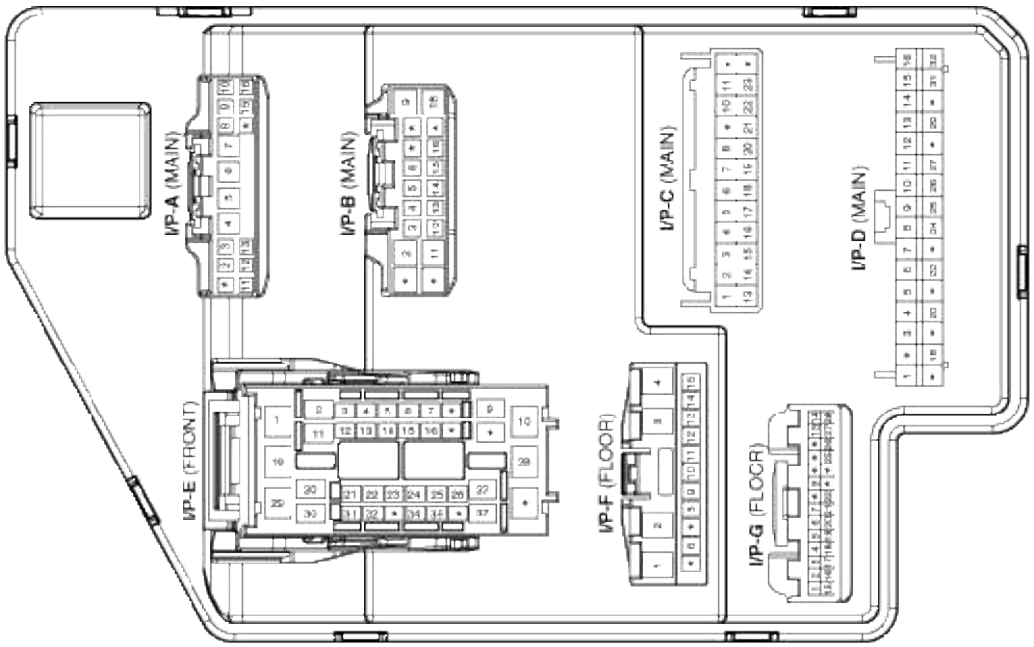


※ USE THE DESIGNATED FUSE AND RELAY ONLY

Circuit (Smart Junction Box)

Fuse Name	(A)	Circuit Protected
AUDIO	15A	Audio, A/V & Navigation Head Unit, Multi Gauge, Multi Monitor Front Monitor, MTS Module
DRV P/SEAT	30A	Driver Seat Manual Switch, Driver Lumber Support Switch
HAZARD	15A	BCM, Flasher Sound Relay
PDM1	25A	PDM
ROOM LP	10A	Driver/Passenger Door Lamp, Trunk Room Lamp Driver/Passenger Door Scuff Lamp, Vanity Lamp LH/RH Map Lamp
C/LIGHTER	15A	Front Power Outlet
MEMORY1	10A	BCM, Data Link Connector, Auto Light & Photo Sensor Ignition Key ILL & Door Warning Switch, Electro Chromic Mirror Instrument Cluster (IND, MICOM), A/C Control Module Tire Pressure Monitoring Module
MEMORY2	7.5A	RF Receiver
ABS	7.5A	E/R Junction Box LH (Multipurpose Check Connector) ESC Module, ESC & PAS Switch, Steering Angle Sensor
A/BAG IND	7.5A	Instrument Cluster (Air Bag IND.)
A/BAG	15A	SRS Control Module, A/C Control Module, PODS Module
B/UP LP	15A	Back-Up Lamp Switch, TCM, Transaxle Range Switch
MODULE3	10A	ECM, PDM, Smart Key Control Module, Injector Drive Box (G4DJ)
MODULE1	7.5A	AMP, Audio, A/V & Navigation Head Unit, Multi Monitor, MTS Module Front Monitor, Map Lamp, Power Outside Mirror Switch
POWER OUTLET	15A	Console Power Outlet
MODULE6	10A	BCM, PDM, Smart Key Control Module

Fuse Name	(A)	Circuit Protected
MODULE2	7.5A	IPS Control Module, Instrument Cluster (IND, MICOM), BCM ATM Shift Lever IND., Multifunction Switch (Remote Control) Multi Gauge, Cruise Clutch Pedal Position Switch, A/C Control Module Auto Head Lamp Leveling Device Unit, Stop Lamp Switch Driver/Passenger Seat Warmer Module, Electro Chromic Mirror MTS Module, Tire Pressure Monitoring Module Head Lamp Leveling Device Actuator LH/RH Front Parking Assist Sensor LH/RH Rear Parking Assist Sensor Side LH/RH Rear Parking Assist Sensor Center LH/RH
MODULE5	7.5A	Sport Mode Switch (A/T), Key Solenoid
STOP LP	15A	Stop Signal Relay
MODULE7	7.5A	Blower Relay, Sunroof Control Module, A/C Control Module Cluster Ionizer (Auto A/C)
MODULE4	7.5A	BCM, PDM, IPS Control Module, Vacuum Switch E/R Junction Box LH (Vacuum Pump Relay)
WIPER FRT	25A	MultiFunction Switch (Wiper), Front Wiper Motor E/R Junction Box LH (Wiper FRT Relay)
START	10A	E/R Junction Box LH (Start Relay), Ignition Lock Switch, PDM Transaxle Range Switch ECM (G6DJ), B/Alarm Relay
BLOWER	7.5A	A/C Control Module
HTD MIRR	7.5A	A/C Control Module, Driver/Passenger Power Outside Mirror
TRUNK	10A	Trunk Lid & Fuel Filler Door Switch, IGM Relay Box (Trunk Lid Relay)
PDM2	10A	PDM, Smart Key Control Module, Start Stop Button Switch, FOB Holder
SAFETY POWER WINDOW RH	25A	Passenger Safety Power Window Module
FOG LP RR	10A	(Not Used)
S/HEATER	15A	Driver/Passenger Seat Warmer Module
AMP	25A	AMP (HACO/JBL)
SAFETY POWER WINDOW LH	25A	Driver Safety Power Window Module

※ 지정된 퓨즈 및 릴레이를 사용하십시오

Body Electrical System > Fuses And Relays > Relay Box (Passenger Compartment) > Repair procedures

Fuse Inspection

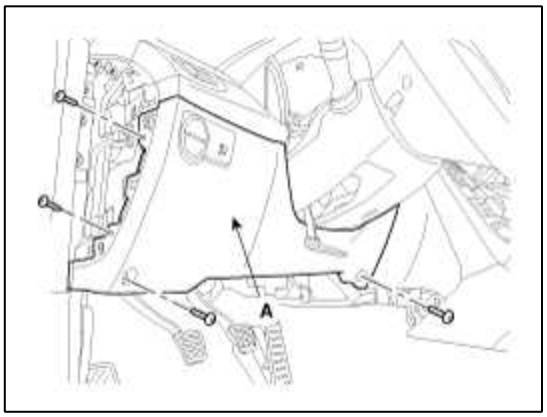
1. Be sure there is no play in the fuse holders, and that the fuses are held securely.
2. Are the fuse capacities for each circuit correct?
3. Are there any blown fuses?
   If a fuse is to be replaced, be sure to use a new fuse of the same capacity. Always determine why the fuse blew first and completely eliminate the problem before installing a new fuse.

Replacement

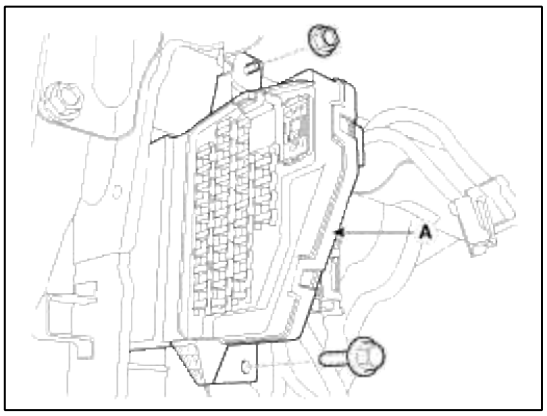
Passenger Compartment Junction Box

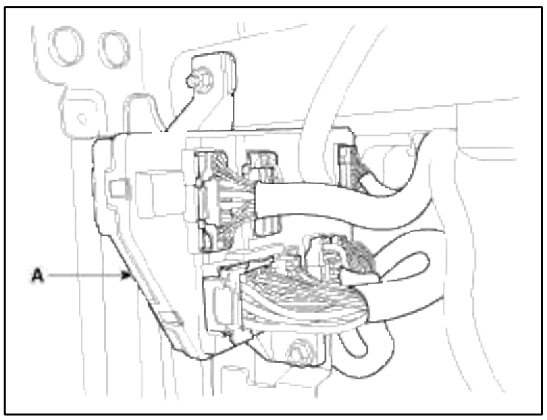
1. Disconnect the negative(-) battery terminal.

2. Remove the crash pad lower panel (A).
   (Refer to BD group - "Crash pad")



3. Remove the passenger compartment junction box (A) after loosening the mounting nut and bolt and disconnecting the connectors.

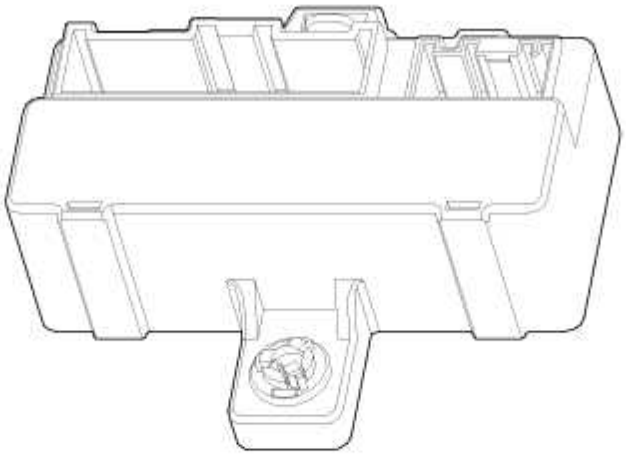


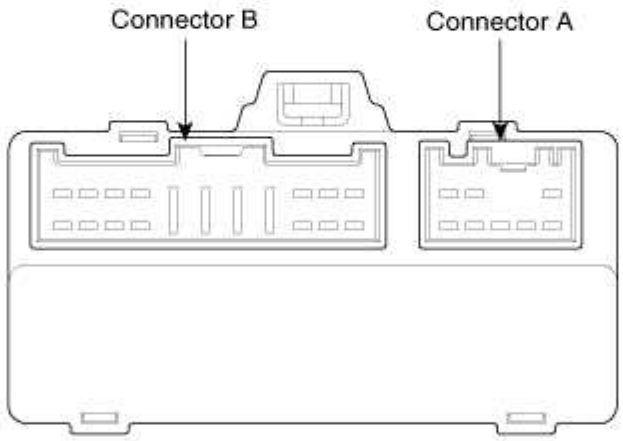


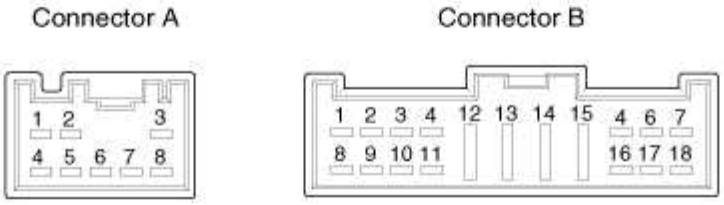
4. Installation is the reverse of removal.

Body Electrical System > Fuses And Relays > ICM (Integrated Circuit Module) Relay Box > Components and Components Location

Component



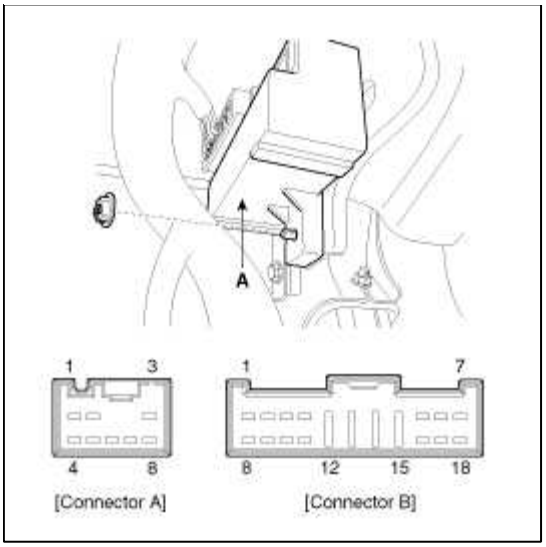




Body Electrical System > Fuses And Relays > ICM (Integrated Circuit Module) Relay Box > Description and Operation

Description

The ICM is united with many kinds of relay and installed inside the driver crash pad lower panel.



Body Electrical System > Fuses And Relays > ICM (Integrated Circuit Module) Relay Box > Repair procedures

Inspection

Trunk Lid Relay

Check for continuity between the terminals.

1. There should be continuity between the No.13 and No.12 terminals when power and ground are connected to the No.13 and No.3 in the ICM relay B terminals.
2. There should be no continuity between the No13 and No.12 terminals when power is disconnected.

Burglar Alarm Horn

Check for continuity between the terminals.

1. There should be continuity between the No.8 and No.9 terminals when power and ground are connected to the No.8 and No.1 in the ICM relay B terminals.
2. There should be no continuity between the No.8 and No.9 terminals when power is disconnected.

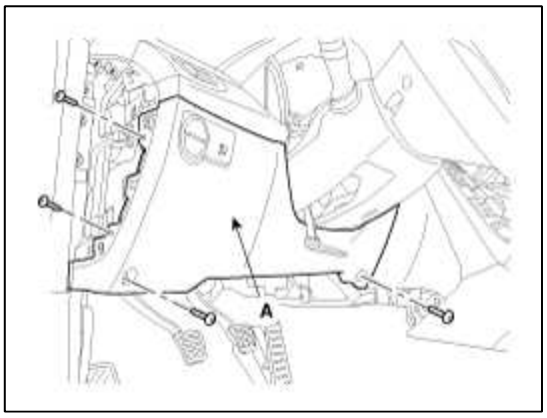
Burglar Alarm

Check for continuity between the terminals.

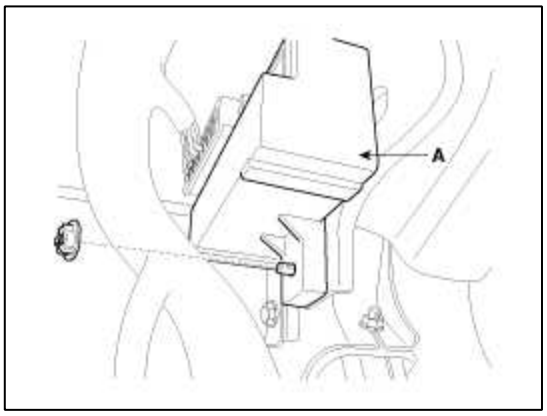
1. There should be no continuity between the No.11 and No.10 terminals when power and ground are connected to the No.11 and No.4 in the ICM relay B terminals.
2. There should be continuity between the No.11 and No.10 terminals when power is disconnected.

Removal

1. Disconnect the negative(-) battery terminal.
2. Remove the crash pad lower panel(A).
   (Refer to BD group - "Crash pad")



3. Remove the ICM relay box(A) after disconnecting the connector and removing the mounting nut.

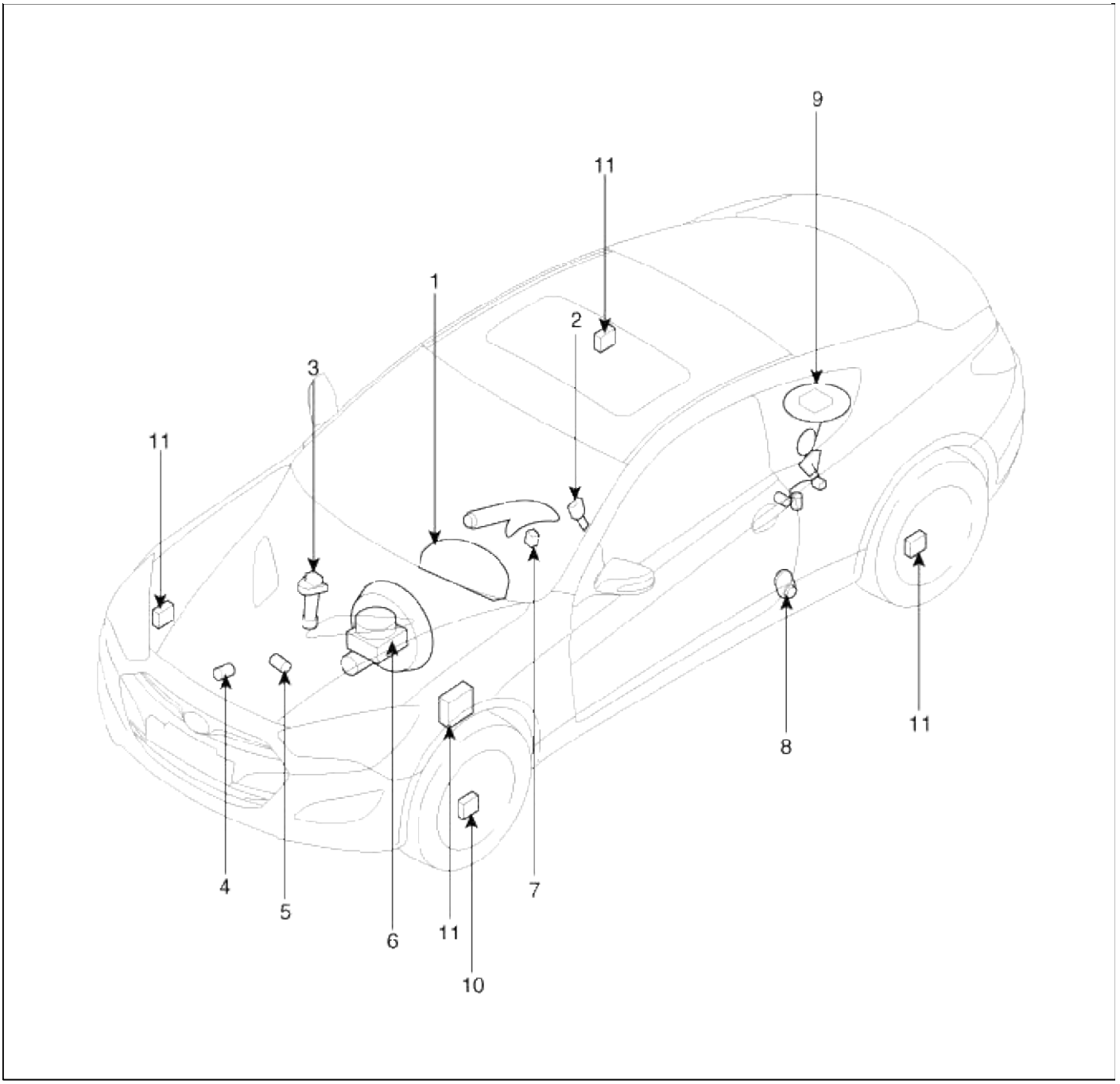


Installation

1. Install the ICM relay box.
2. Install the crash pad lower panel.

Body Electrical System > Indicators And Gauges > Components and Components Location

Component Location



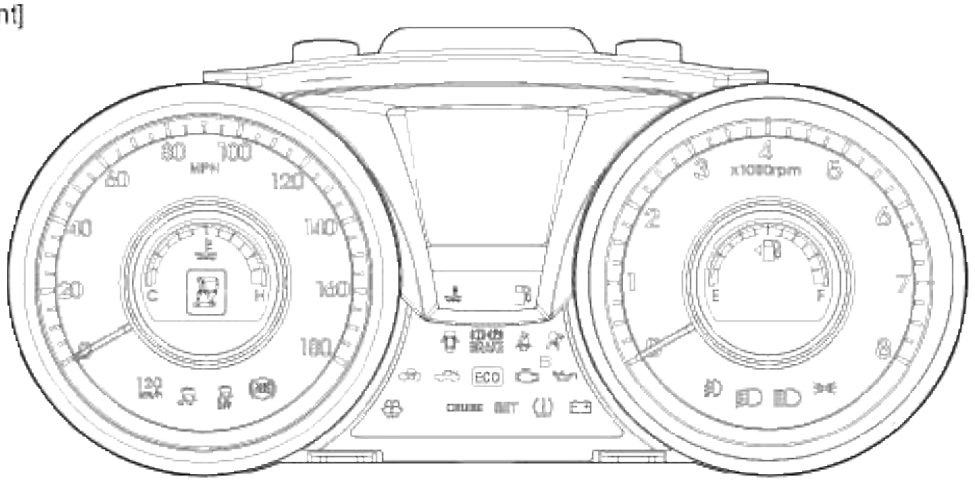
1. Cluster assembly 2. Seat belt switch 3. Vehicle speed sensor 4. Engine coolant temperature sender 5. Oil pressure switch 6. Brake fluid level warning switch	7. Parking brake switch 8. Door switch 9. Fuel gauge sender 10. Wheel speed sensor 11. ABS ECU

Body Electrical System > Indicators And Gauges > Instrument Cluster > Components and Components Location

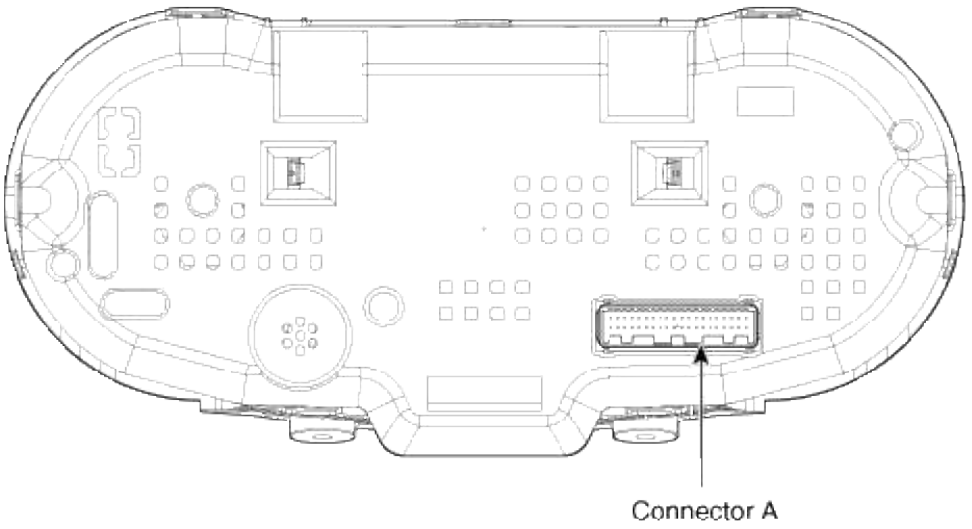
Components

[Supervision]

[Front]

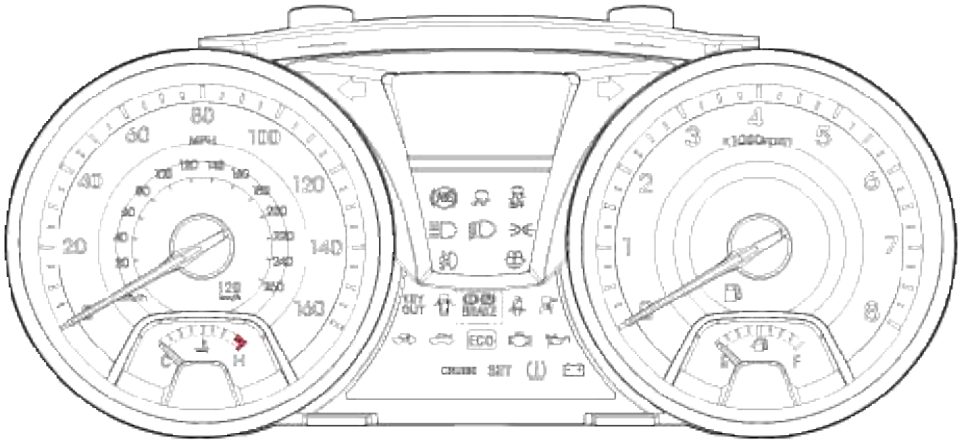


[Rear]

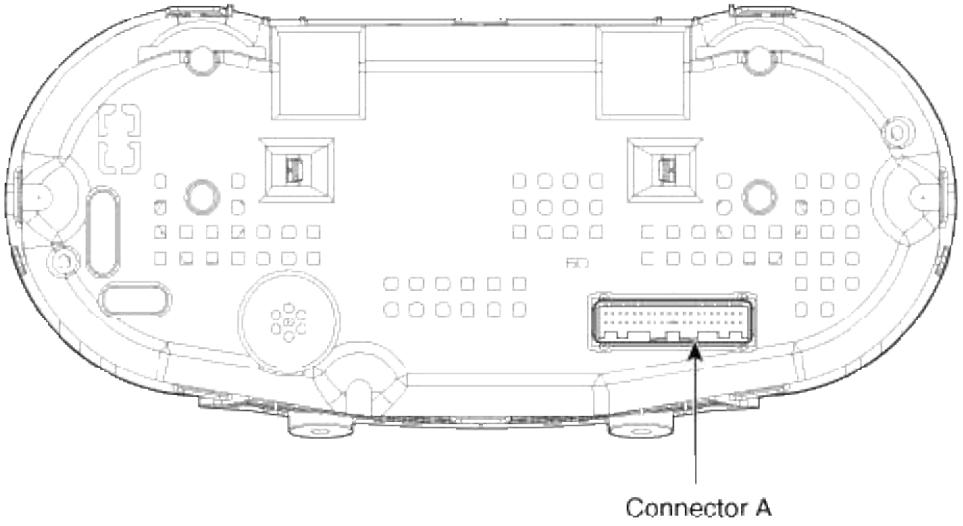


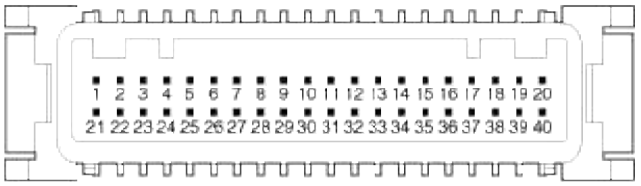
[General]

[Front]



[Rear]



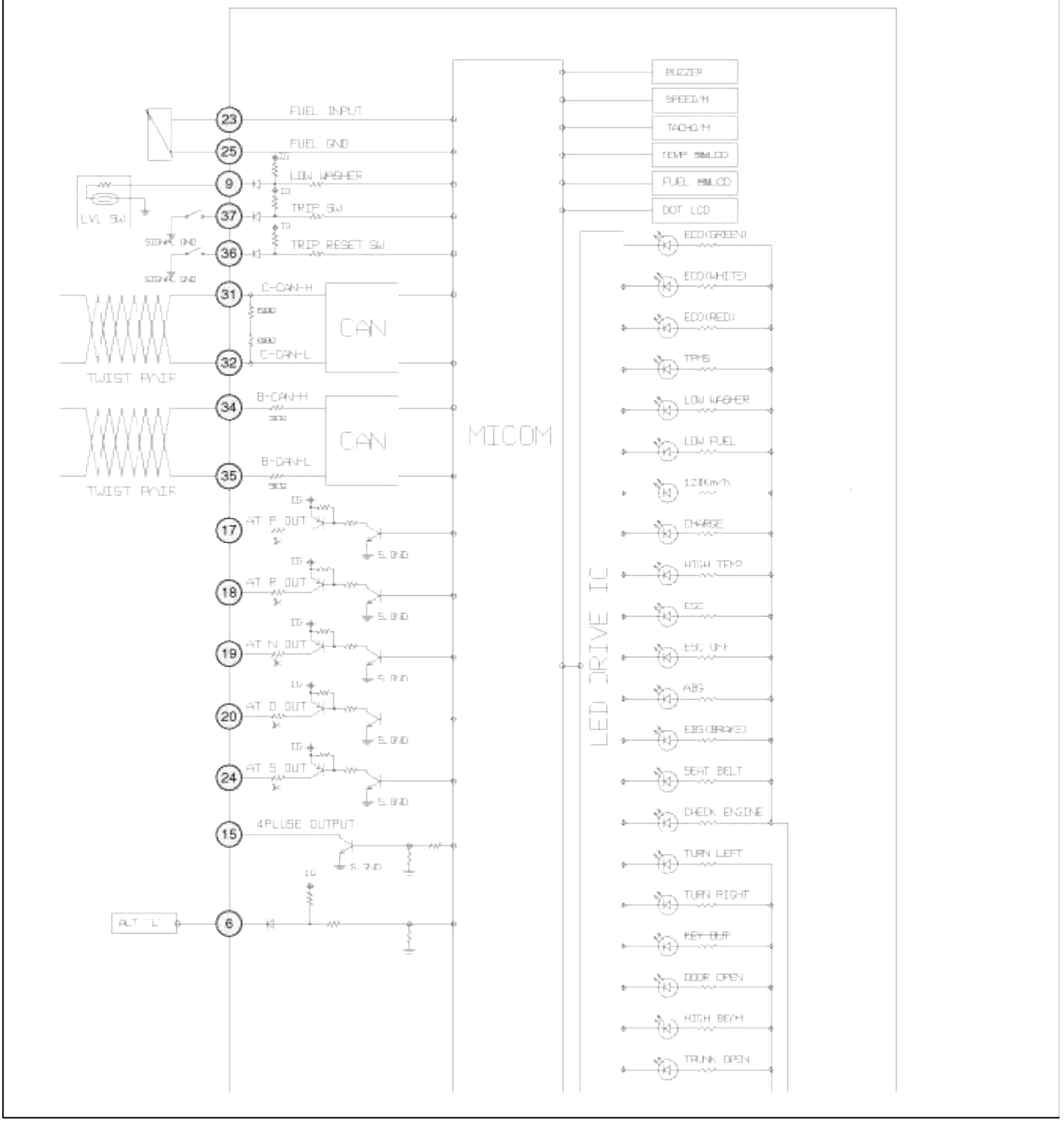


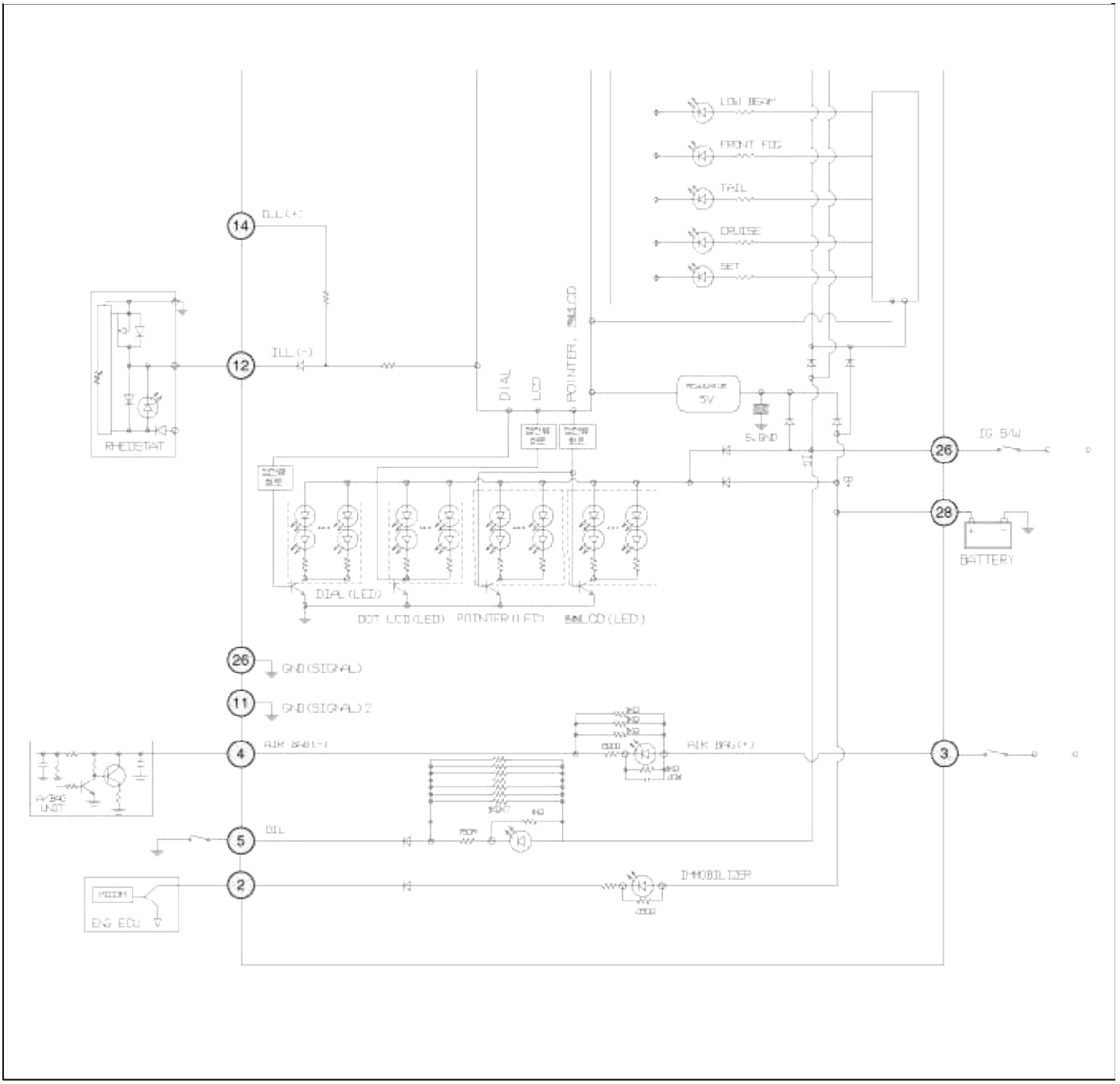
Connector A

No	Description	Remarks	No	Description	Remarks
1	-		21	-	
2	Immobilizer	Input	22	-	
3	Airbag +	Input	23	Fuel +	Input
4	Airbag -	Input	24	AT position S	Output
5	Oil pressure	Input	25	Fuel -	Input
6	Battery charge	Input	26	Signal GND	Input
7	-		27	-	
8	-		28	Battery +	Input
9	Washer fluid	Input	29	Ignition +	Input
10	-		30	-	
11	Signal GND2	Input	31	C CAN High	Input/Output
12	Illumination -	Input	32	C CAN Low	Input/Output
13	-		33	-	
14	Illumination +	Input	34	B CAN High	Input/Output
15	4P Out	Output	35	B CAN Low	Input/Output
16	-		36		Input
17	AT position P	Output	37		Input
18	AT position R	Output	38	-	
19	AT position N	Output	39	-	
20	AT position D	Output	40	-	

Body Electrical System > Indicators And Gauges > Instrument Cluster > Schematic Diagrams

Circuit Diagram


FUEL INPUT
FUEL GND
LOW WASHER
TRIP SW
TRIP RESET SW
C-CAN-H
C-CAN-L
CAN
TWIST PAIR
B-CAN-H
B-CAN-L
CAN
TWIST PAIR
AT P OUT
AT P OUT
AT N OUT
AT D OUT
AT S OUT
4PLUSE OUTPUT
MICOM
BUZZER
SPEED/M
TACHO/M
DOT LCD
ECO(GREEN)
ECO(WHITE)
ECO(RED)
TPMS
LOW WASHER
LOW FUEL
CHARGE
HIGH TEMP
ESC
ESC OFF
ABS
SEAT BELT
CHECK ENGINE
TURN LEFT
TURN RIGHT
KEY BUZ
DOOR OPEN
HIGH BEAM
TRUNK OPEN
LED DRIVE IC



Body Electrical System > Indicators And Gauges > Instrument Cluster > Repair procedures

Inspection

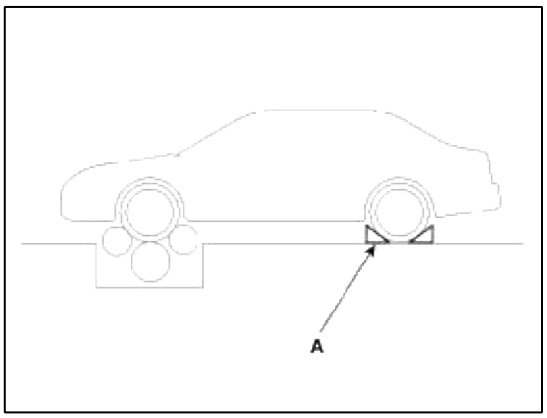
Speedometer

1. Adjust the pressure of the tires to the specified level.
2. Drive the vehicle onto a speedometer tester. Use wheel chocks(A) as appropriate.

3. Check if the speedometer indicator range is within the standard values.

> CAUTION
>
> Do not operate the clutch suddenly or increase/ decrease speed rapidly while testing.

> NOTE
>
> Tire wear and tire over or under inflation will increase the indication error.



[km/h-CANADA]

Velocity (km/h)	20	40	60	80	100	120	140
Tolerance (km/h)	+3.0 0	+3.3 0	+3.4 0	+3.8 0	+4.1 0	+4.9 0	+5.2 0
Velocity (km/h)	160	180	200	220	240	260	280
Tolerance (km/h)	+5.7 0	+6.2 0	+6.5 0	+6.7 0	+6.9 0	+7.1 0	- -

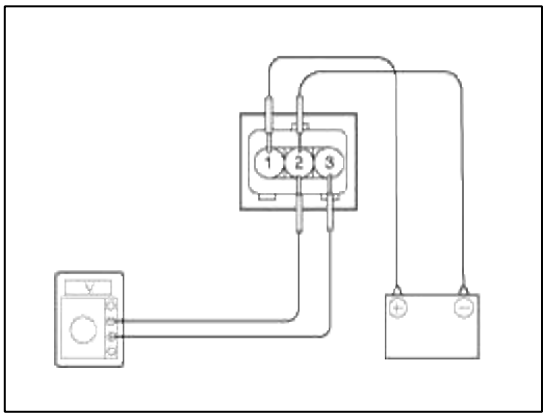
[MPH-USA]

Velocity (MPH)	10	20	40	60	80
Tolerance (MPH)	+2.3 0	+2.4 0	+2.5 0	+2.6 0	+2.7 0
Velocity (MPH)	100	120	140	160	
Tolerance (MPH)	+2.8 0	+2.9 0	+3.0 0	+3.3 0	

Vehicle Speed Sensor

1. Connect the positive (+) lead from battery to terminal 1 and negative (-) lead to terminal 2.
2. Connect the positive (+) lead from tester to terminal 3 and the negative (-) lead to terminal 2.
3. Rotate the shaft.
4. Check that there is voltage change from approx. 0V to 11V or more between terminals 3 and 2.

5. The voltage change should be 4 times for every revolution of the speed sensor shaft.
   If operation is not as specified, replace the sensor.



Tachometer

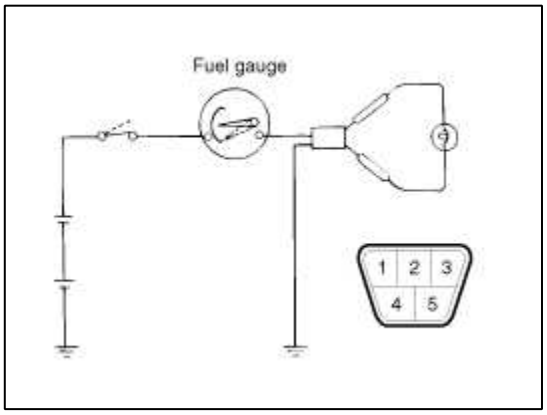
1. Connect the scan tool to the diagnostic link connector or install a tachometer.
2. With the engine started, compare the readings of the tester with that of the tachometer. Replace the tachometer if the tolerance is exceeded.

> CAUTION
>
> 1. Reversing the connections of the tachometer will damage the transistor and diodes inside.
> 2. When removing or installing the tachometer, be careful not to drop it or subject it to severe shock.

Revolution(rpm)	1,000	2,000	3,000	4,000
Tolerance(rpm)	±100	±100	±100	±100
Revolution(rpm)	5,000	6,000	7,000	8,000
Tolerance(rpm)	±100	±100	±100	±100

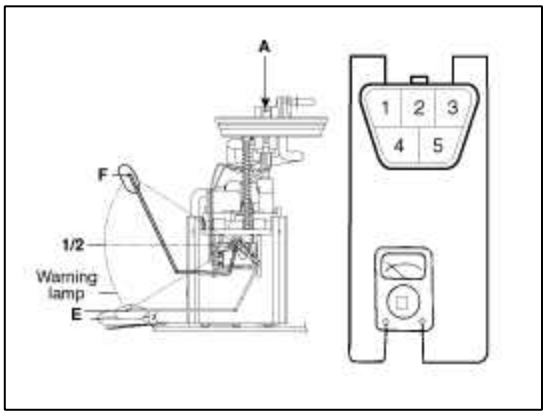
Fuel Gauge

1. Disconnect the fuel sender connector from the fuel sender.
2. Connect a 3.4 watt, 12V test bulb to terminals 1 and 3 on the wire harness side connector.
3. Turn the ignition switch to the ON, and then check that the bulb lights up and the fuel gauge needle moves to full.



Main Fuel Gauge Sender

1. Using an ohmmeter, measure the resistance between terminals 1 and 3 of sender connector (A) at each float level.



2. Also check that the resistance changes smoothly when the float is moved from "E" to "F"

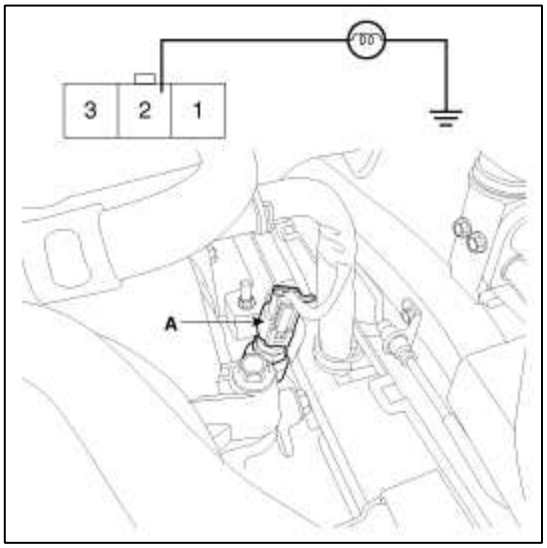
Position	Resistance(Ω)
SEG 1	193.4 ± 2
Warning lamp	186.8 ± 2
SEG 6	112.1 ± 2
SEG 12	13.5 ± 2

3. If the height resistance is unsatisfied, replace the fuel sender as an assembly.

> **CAUTION**
>
> After completing this test, wipe the sender dry and reinstall it in the fuel tank.

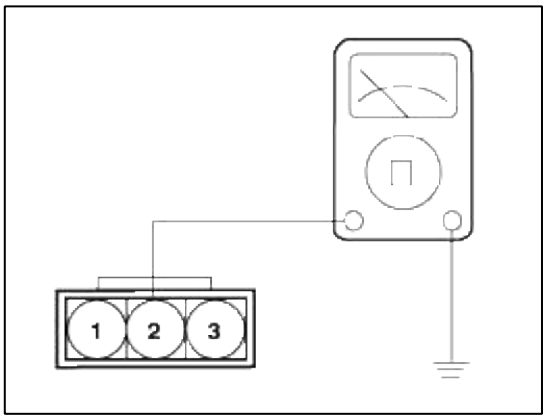
Engine Coolant Temperature Gauge

1. Disconnect the wiring connector (A) from the engine coolant temperature sender in the engine compartment.
2. Turn the ignition switch ON. Check that the gauge needle indicates cool. Turn the ignition switch OFF.
3. Connect a 12V, 3.4 watt test bulb between the harness side connector and ground.
4. Turn the ignition switch ON.
5. Verify that the test bulb flashes and that the indicator moves to HOT.
   If operation is not as specified, replace the engine coolant temperature gauge. Then recheck the system.



Engine Coolant Temperature Sender

1. Using an ohmmeter, measure the resistance between the terminal 2 and ground.

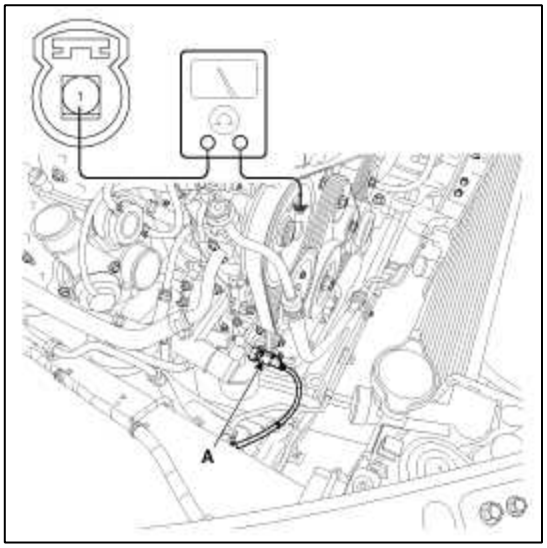


2. If the resistance value is not as shown in the table, replace the temperature sender.

Temperature [°F(°C)]	131(55)	160(71) ~ 230(110)	257(125)
Gauge angle (°)	-45	-70 ± 25	+35

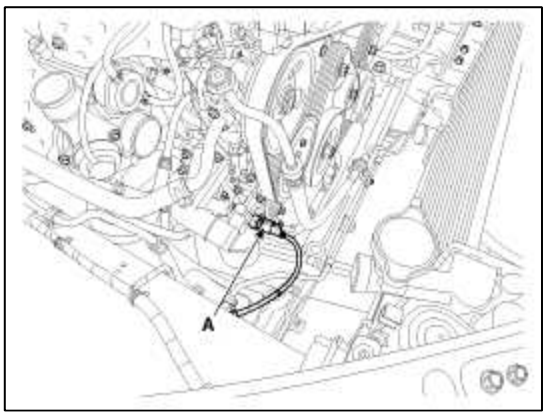
Oil Pressure Switch

1. Check that there is continuity between the oil press switch terminal (A) and ground with the engine off.
2. Check that there is no continuity between the terminal and ground with the engine running.
3. If operation is not as specified, replace the switch.



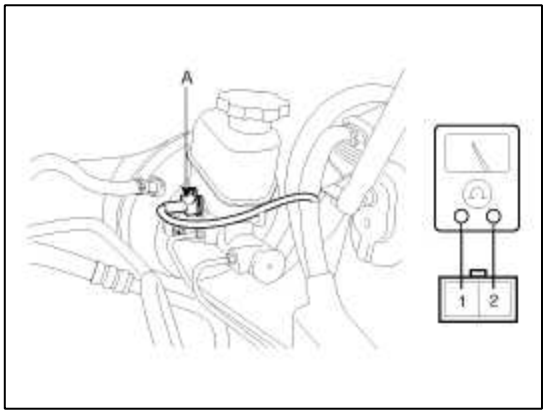
Oil Pressure Warning Lamp

1. Disconnect the connector (A) from the warning switch and ground the terminal on the wire harness side connector.
2. Turn the ignition switch ON. Check that the warning lamp lights up. If the warning lamp doesn't light, test the bulb or inspect the wire harness.



Brake Fluid Level Warning Switch

1. Remove the connector(A) from the switch located at the brake fluid reservoir.
2. Verify that continuity exists between switch terminals 1 and 2 while pressing the switch (float) down with a rod.



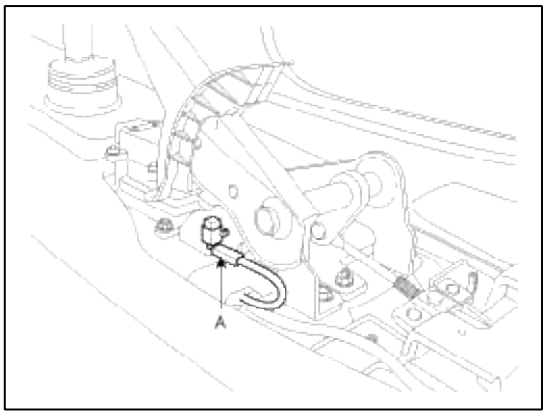
Brake Fluid Level Warning Lamp

1. Ignition "ON"
2. Release the parking brake.
3. Remove the connector from the brake fluid level warning switch.
4. Ground the connector at the harness side.
5. Verify that the warning lamp lights.

Parking Brake Switch

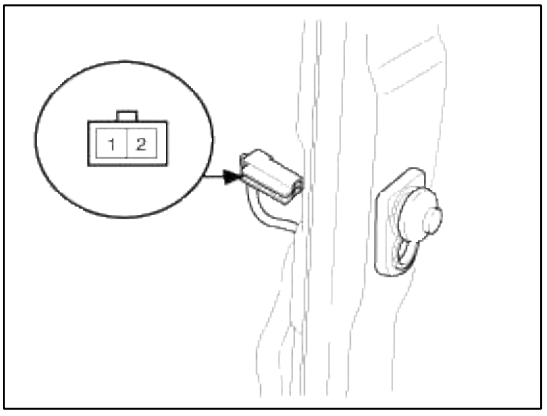
The parking brake switch (A) is a pulling type. It is located under the parking brake lever. To adjust, move the switch mount up and down with the parking brake lever released all the way.

1. Check that there is continuity between the terminal and switch body with the switch ON (Lever is pulled).
2. Check that there is no continuity between the terminal and switch body with the switch OFF (Lever is released). If continuity is not as specified, replace the switch or inspect its ground connection.



Door Switch

Remove the door switch and check for continuity between the terminals.



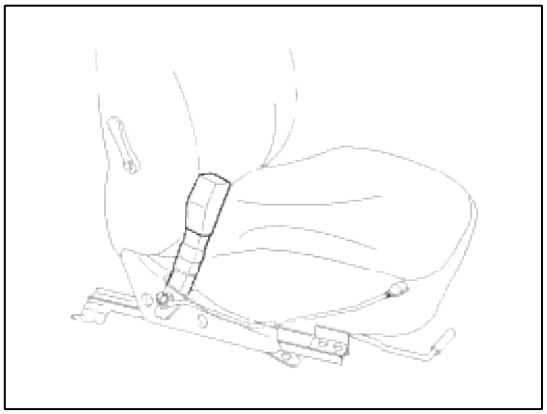
[Front Door Switch]

Position \ Terminal	1	2	Body (Ground)
Free(Door open)	○	○	○
Push(Door close)			

Seat Belt Switch

1. Remove the connector from the switch.
2. Check for continuity between terminals.

Seat belt condition	Continuity
Fastened	Non-conductive (∞Ω)
Not fastened	Conductive (Ω)



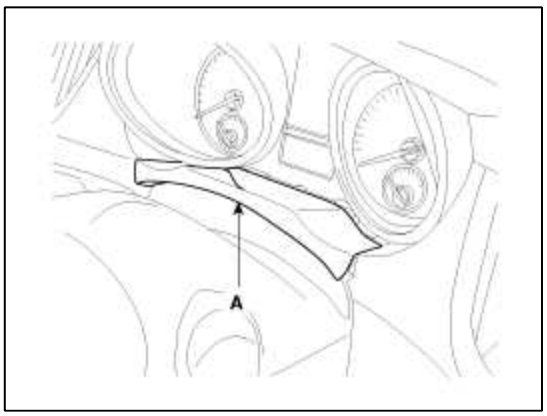
Seat Belt Warning Lamp

With the ignition switch turned ON, verify that the lamp glows.

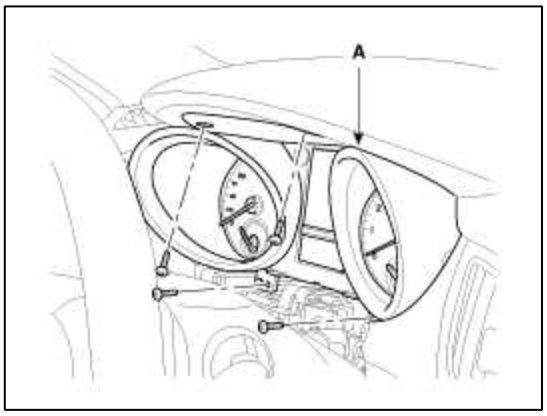
Seat belt condition	Warning lamp
Fastened	OFF
Not fastened	ON

Removal

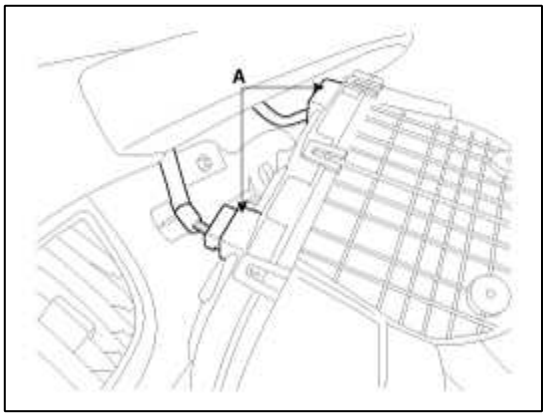
1. Disconnect the negative (-) battery terminal.
2. Tilt the steering column down.
3. Remove the cluster fascia lower panel(A).



4. Remove the cluster(A) after loosening the screws.



5. Disconnect the cluster connector (A), then remove the cluster.



Installation

1. Install the cluster to the cluster housing.
2. Install the cluster fascia lower panel.

Body Electrical System > Indicators And Gauges > Troubleshooting

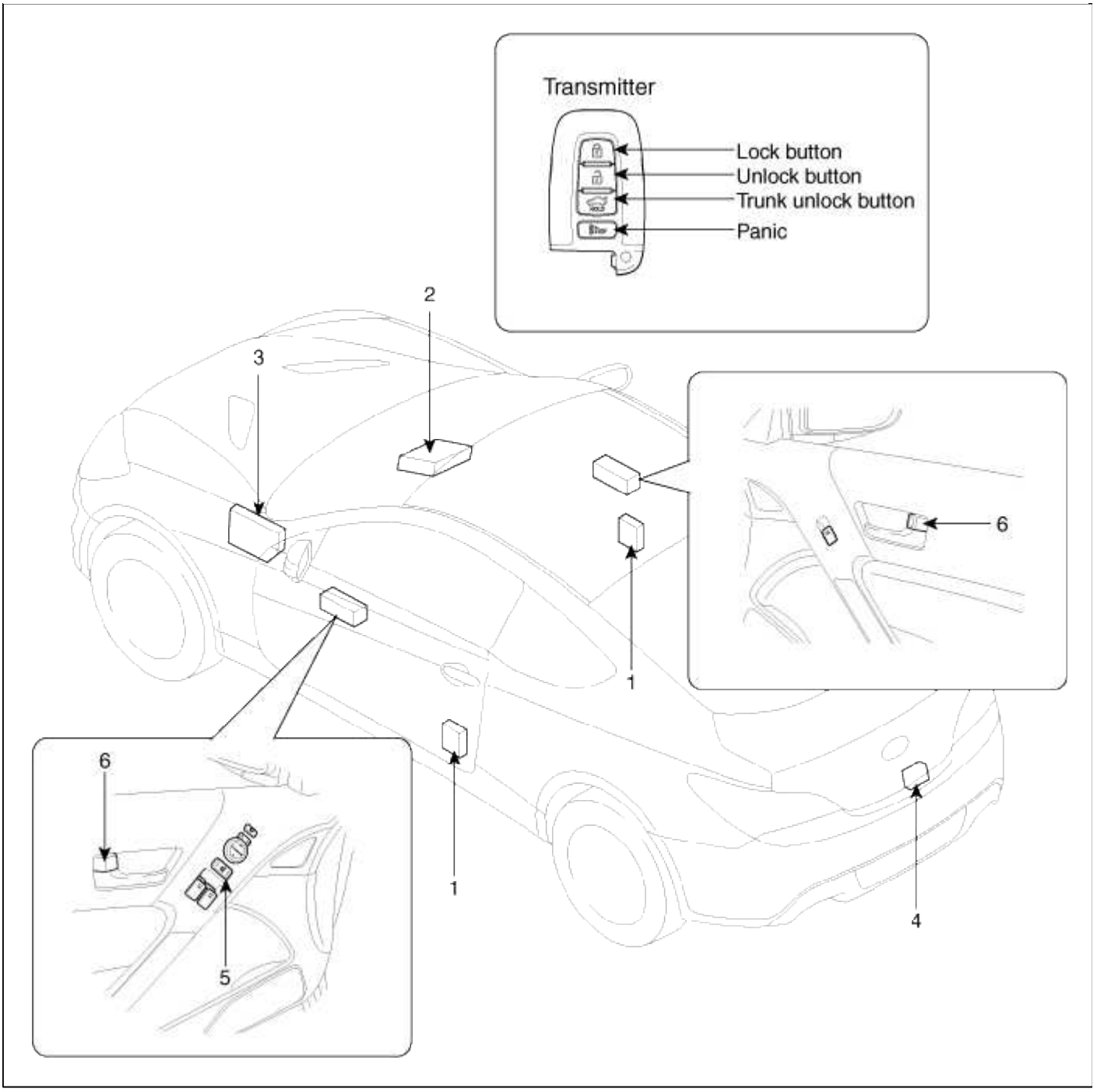
Troubleshooting

Symptom	Possible cause	Remedy
Speedometer does not operate	Cluster fuse (10A) blown	Check for short and replace fuse
	Speedometer faulty	Check speedometer
	Vehicle speed sensor faulty	Check vehicle speed sensor
	Wiring or ground faulty	Repair if necessary
Tachometer does not operate	Cluster fuse (10A) blown	Check for short and replace fuse
	Tachometer faulty	Check tachometer
	Wiring or ground faulty	Repair if necessary
Fuel gauge does not operate	Cluster fuse (10A) blown	Check for short and replace fuse
	Fuel gauge faulty	Check gauge
	Fuel sender faulty	Check fuel sender

	Wiring or ground faulty	Repair if necessary
Low fuel warning lamp does not light up	Cluster fuse (10A) blown	Check for short and replace fuse
	Bulb burned out	Replace bulb
	Fuel sender faulty	Check fuel sender
	Wiring or ground faulty	Repair if necessary
Water temperature gauge does not operate	Cluster fuse (10A) blown	Check for short and replace fuse
	Water temperature gauge faulty	Check gauge
	Water temperature sender faulty	Check sender
	Wiring or ground faulty	Repair if necessary
Oil pressure warning lamp does not light up	Cluster fuse (10A) blown	Check for short and replace fuse
	Oil pressure switch faulty	Check switch
	Wiring or ground faulty	Repair if necessary
Parking brake warning lamp does not light up	Cluster fuse (10A) blown	Check for short and replace fuse
	Brake fluid level warning switch faulty	Check switch
	Parking brake switch faulty	Check switch
	Wiring or ground faulty	Repair if necessary
Open door warning lamp and trunk lid warning lamp do not light up	Memory fuse (15A) blown	Check for short and replace fuse
	Door switch faulty	Check switch
	Wiring or ground faulty	Repair if necessary
Seat belt warning lamp does not light up	Cluster fuse (10A) blown	Check for short and replace fuse
	Seat belt switch faulty	Check switch
	Wiring or ground faulty	Repair if necessary

Body Electrical System > Power Door Locks > Components and Components Location

Component Location



1. Front door lock actuator & switch 2. Body control module 3. Junction box (Door lock/unlock relay)	4. Trunk lid release actuator 5. Door lock switch 6. Door lock knob

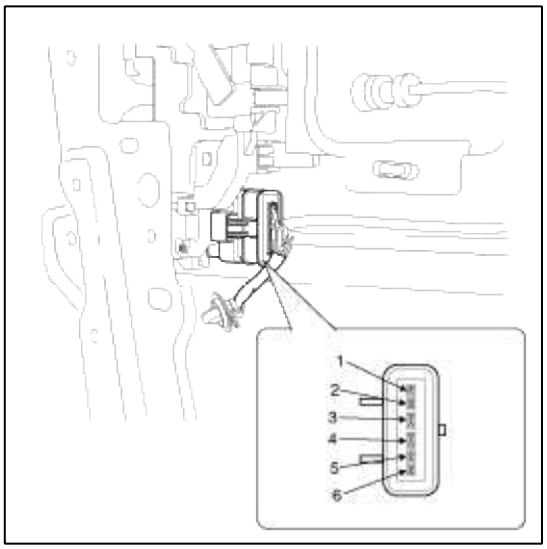
Body Electrical System > Power Door Locks > Power Door Lock Actuators > Repair procedures

Inspection

Front Door Lock Actuator Inspection

1. Remove the front door trim.
   (Refer to the Body group - front door)
2. Remove the front door module.

3. Disconnect the 6P connector from the actuator.

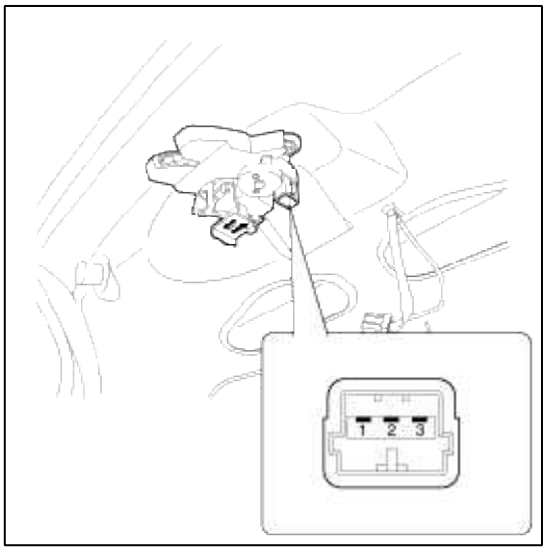


4. Check actuator operation by connecting power and ground according to the table. To prevent damage to the actuator, apply battery voltage only momentarily.

Position \ Terminal		3	4
Front left	Lock	⊖	⊕
	Unlock	⊕	⊖
Front right	Lock	⊕	⊖
	Unlock	⊖	⊕

Trunk Lid Release Actuator Inspection

1. Remove the trunk lid trim panel.
   (Refer to the Body group - trunk lid)
2. Disconnect the 3P connector from the actuator.



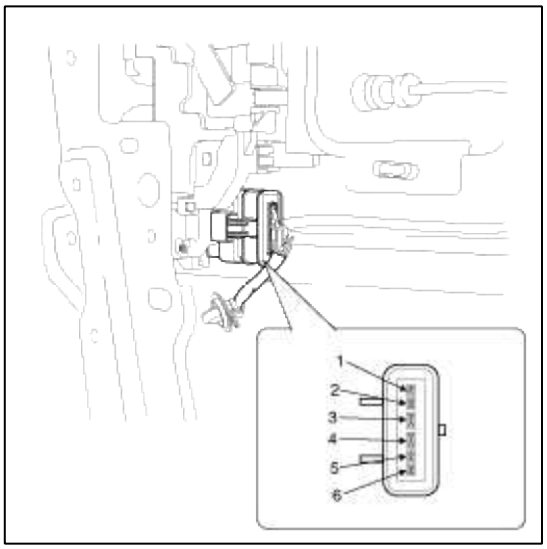
3. Check actuator operation by connecting power and ground according to the table. To prevent damage to the actuator, apply battery voltage only momentarily.

Position \ Terminal	1	2
Lock release(Open)	⊖	⊕

Front Door Lock Switch Inspection

1. Remove the front door trim panel.
   (Refer to the Body group - front door)
2. Remove the front door module.

3. Disconnect the 6P connector from the actuator.

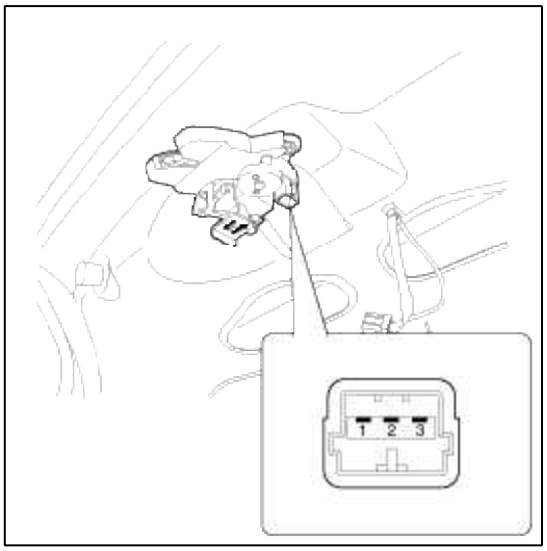


4. Check for continuity between the terminals in each switch position according to the table.

Position \ Terminal		5	6	1	2
Front left	Lock				
	Unlock	○——	——○		
Front right	Lock				
	Unlock			○——	——○

Trunk Lid Open Switch Inspection

1. Remove the trunk lid trim panel. (Refer to the Body group - trunk lid)
2. Disconnect the 3P connector from the actuator.



3. Check for continuity between the terminals in each switch position according to the table.

Position \ Terminal	1	3
Lock		
Lock release(Open)	○——	——○

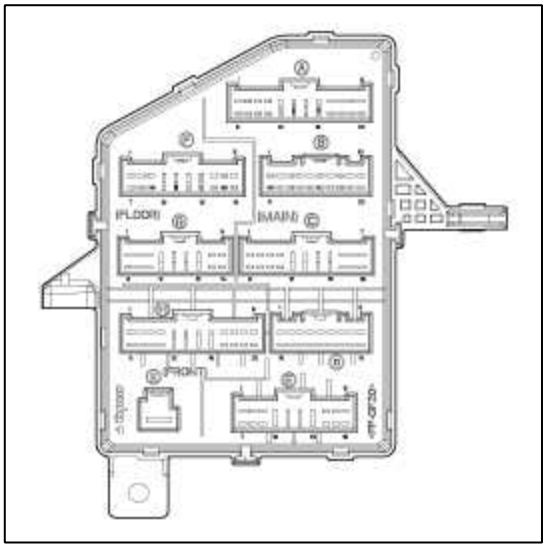
Body Electrical System > Power Door Locks > Power Door Lock Relay > Repair procedures

Inspection

1. Disconnect the negative (-) battery terminal.
2. Remove the junction box.
3. Check for continuity between the terminals.

Door Lock

1. There should be continuity between the No.2 terminal in the I/P-F and No.2 terminal in the I/P-E when power and ground are connected to the No.14 terminal in the I/P-E and No.1 terminal in the I/P-K.
2. There should be no continuity between the No.2 terminal in the I/P-F and No.2 terminal in the I/P-E when power is disconnected.



Terminal / Power	I/P-F (2 or 8)	I/P-E (2)	I/P-E (14)	I/P-K (1)
Disconnected			○ ——— ○	
Connected	○ ——— ○		⊖ ——— ⊕	

Door Unlock

1. There should be continuity between the No.3 terminal in the I/P-F and No.2 terminal in the I/P-E when power and ground are connected to the No.3 terminal in the I/P-E and No.1 terminal in the I/P-E.
2. There should be no continuity between the No.3 terminal in the I/P-F and No.2 terminal in the I/P-E when power is disconnected.

Terminal / Power	I/P-F (3 or 9)	I/P-E (2)	I/P-E (3)	I/P-K (1)
Disconnected			○ ——— ○	
Connected	○ ——— ○		⊖ ——— ⊕	

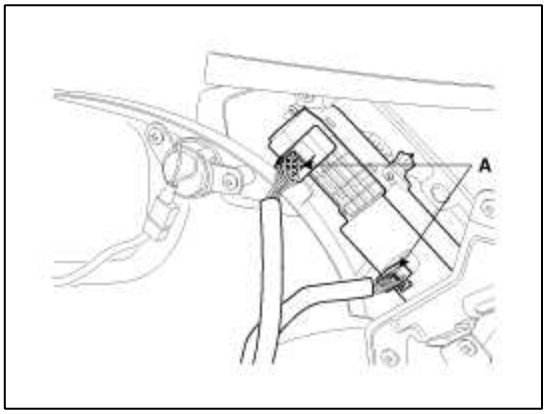
Body Electrical System > Power Door Locks > Power Door Lock Switch > Repair procedures

Replacement

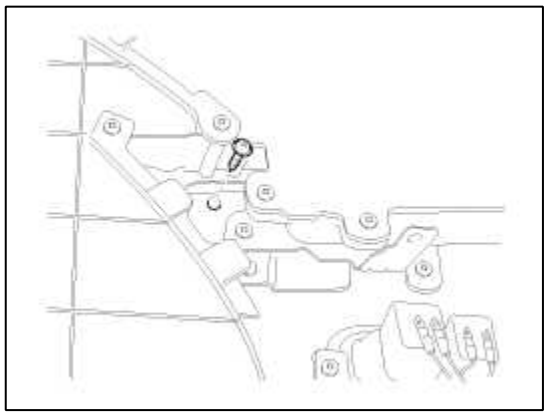
Front Door Lock Switch

1. Disconnect the negative(-) battery terminal.

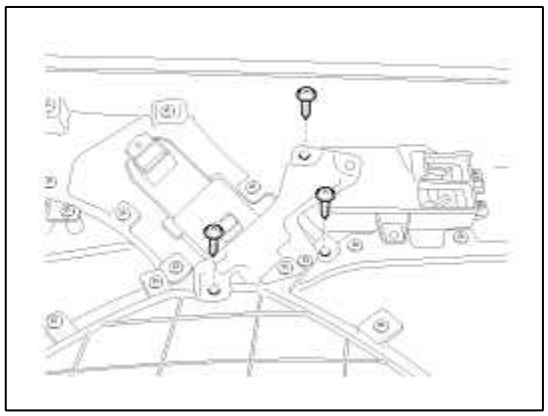
2. Remove the front door trim panel.
   (Refer to Body group - "Front door")
3. Disconnect the module connector(A) from the wiring harness.



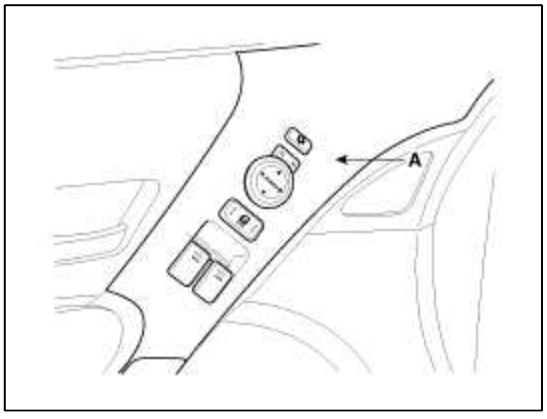
A. Loosen the screw(1EA).



B. Remove the grip handle cover then loosen the upper screw.
C. Loosen the screws(3EA).

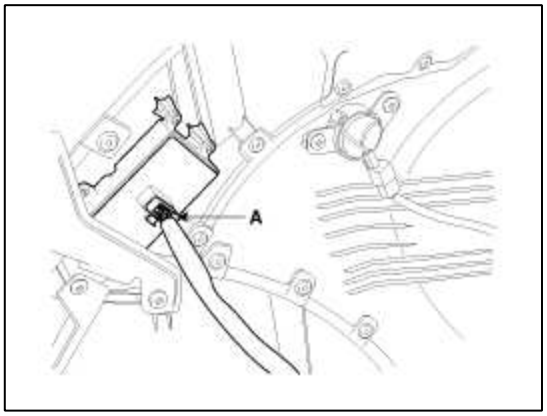


D. Remove the power window switch bracket.
E. Loosen the screws from the bracket.
4. Remove the power window switch module(A) from the front door trim panel.

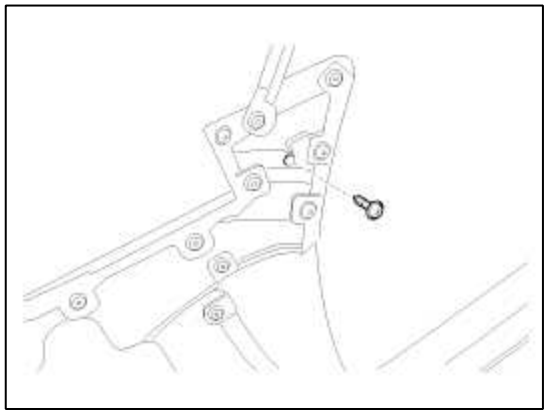


Passenger Door Lock Switch

1. Disconnect the negative(-) battery terminal.
2. Remove the door trim panel.
   (Refer to Body group - "Front door")
3. Disconnect the module connector(A).

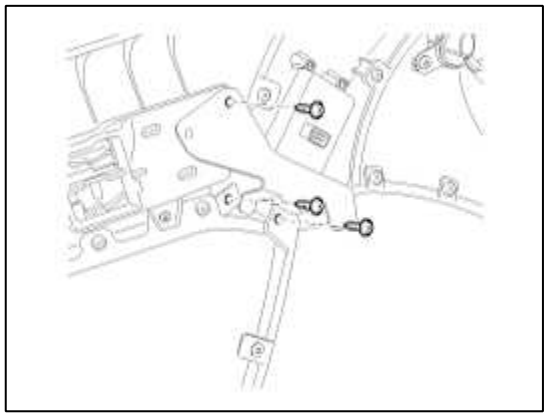


A. Loosen the screw(1EA).



B. Remove the grip handle cover then loosen the upper screw.

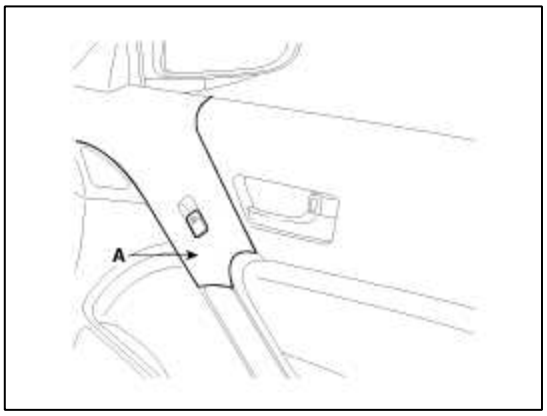
C. Loosen the screws(3EA).



D. Remove the power window switch bracket.

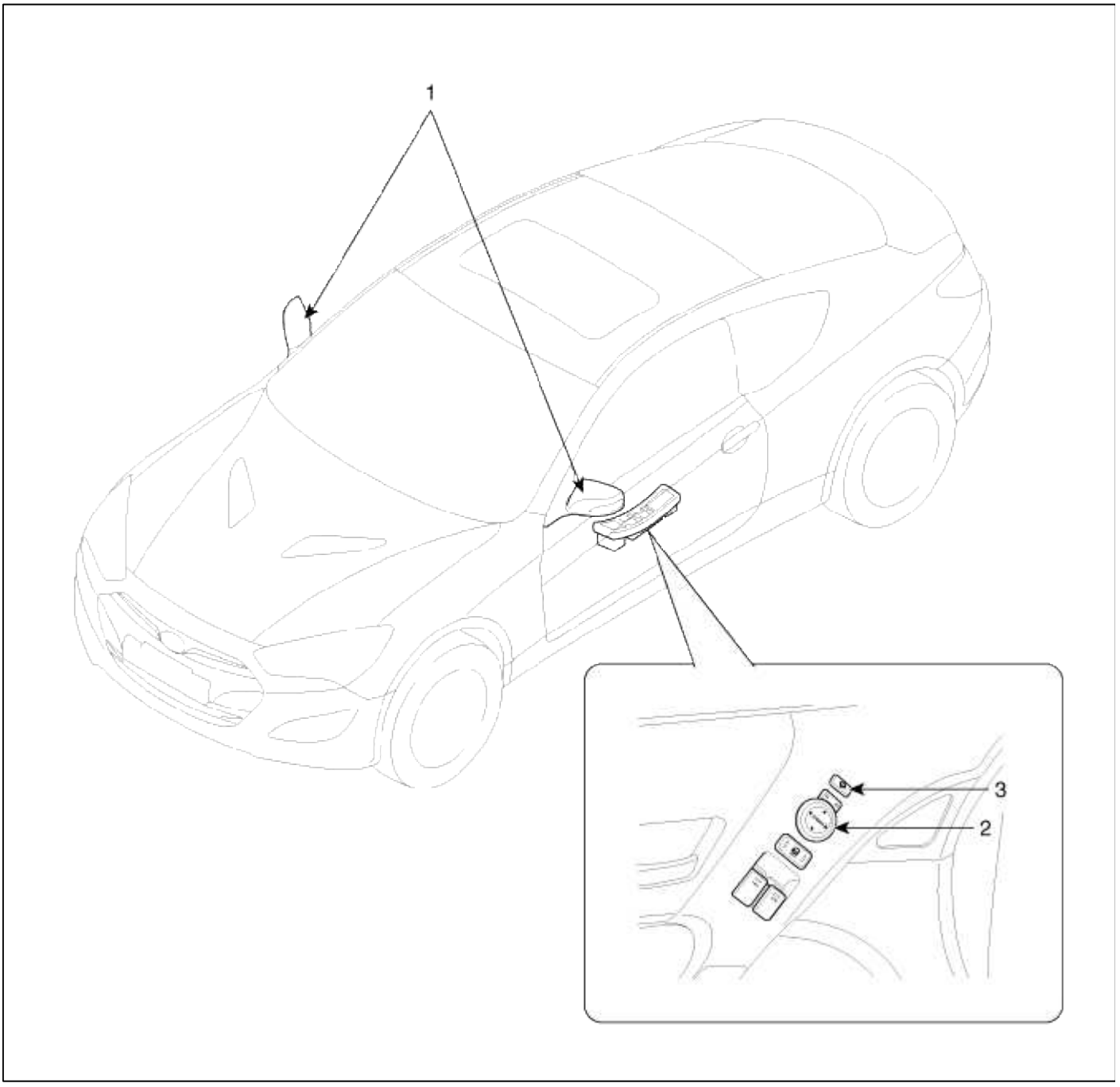
E. Loosen the screws from the bracket.

4. Remove the power window switch module(A) from the front door trim panel.



Body Electrical System > Power Door Mirrors > Components and Components Location

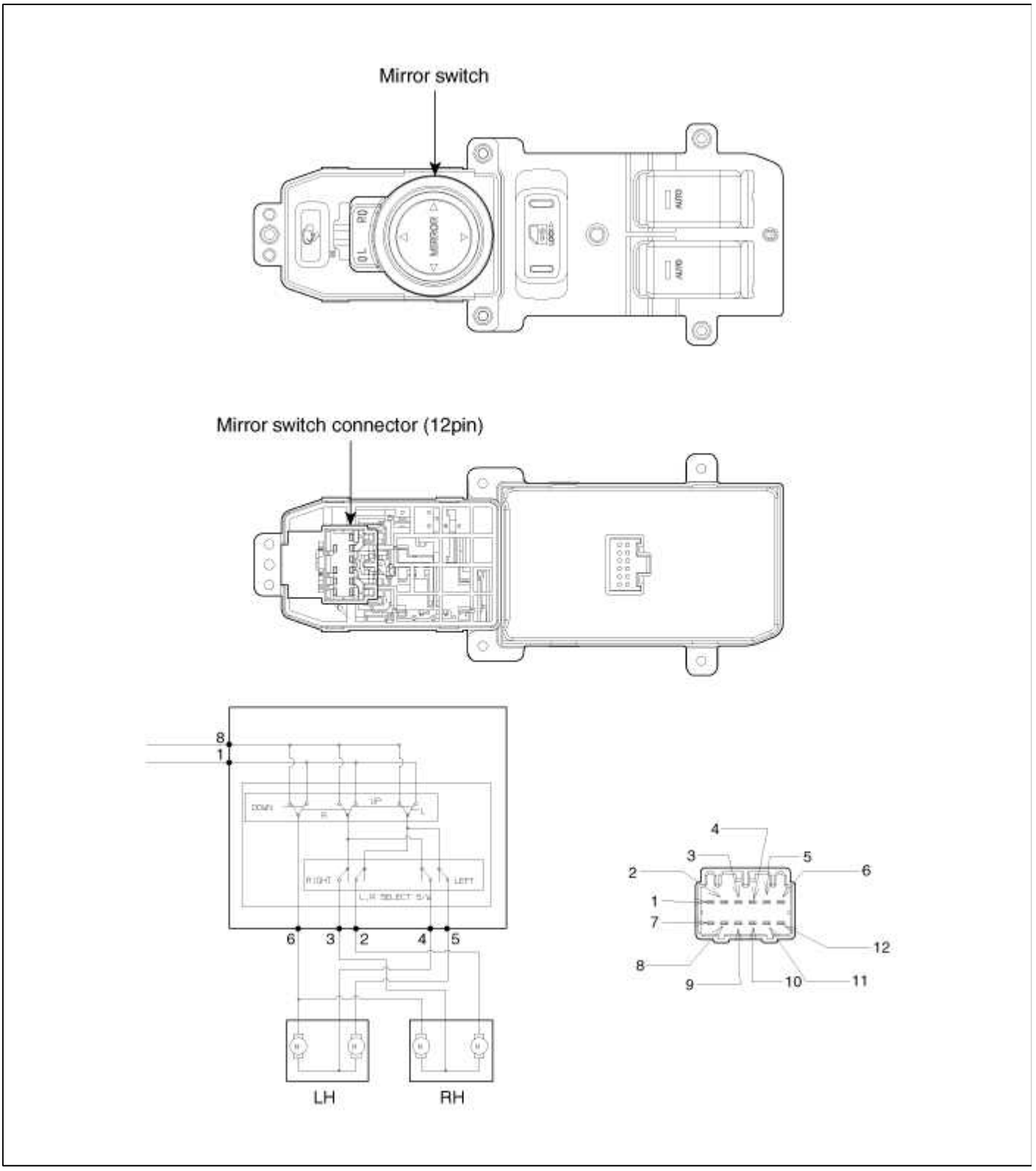
Component Location



1. Power door mirror	2. Power door mirror switch

Body Electrical System > Power Door Mirrors > Power Out Side Mirror Switch > Components and Components Location

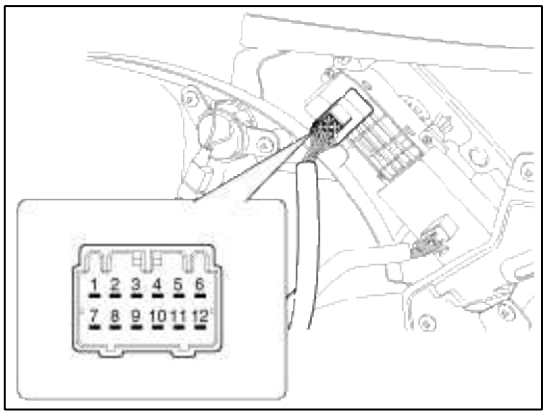
Component



Body Electrical System > Power Door Mirrors > Power Out Side Mirror Switch > Repair procedures

Inspection

1. Disconnect the negative (-) battery terminal.
2. Remove the front door trim panel.
   (Refer to the Body group - "Front door")
3. Disconnect the 12P connector from the switch.



4. Check for continuity between the terminals in each switch position according to the table.

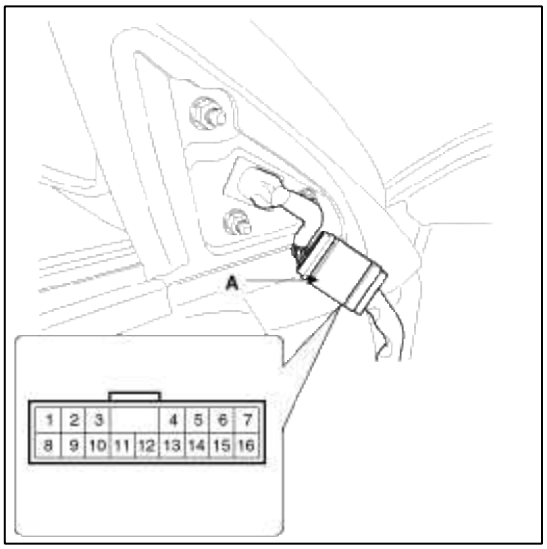
Item	Terminal / Position	4	5	3	2	6	1	7	9
Left	UP	○	○				○	○	
	DOWN	○	○			○	○		
	OFF	○	○			○		○	
	LEFT	○				○	○	○	
	RIGHT	○				○	○	○	
Right	UP			○	○		○	○	
	DOWN			○	○	○	○		
	OFF			○	○	○		○	
	LEFT			○		○	○	○	
	RIGHT			○		○	○	○	

Body Electrical System > Power Door Mirrors > Power Door Mirror Actuator > Repair procedures

Inspection

1. Remove the front door quadrant delta cover.
   (Refer to the Body group - "Front door")

2. Disconnect the power door mirror connector from the harness.



3. Apply battery voltage to each terminal as shown in the table and verify that the mirror operates properly.

Position \ Terminal	7	16	6	B+	GND
UP	○	○		○	○
DOWN	○	○	○	○	○
OFF	○	○		○	
RIGHT	○		○	○	○
LEFT	○	○	○	○	○

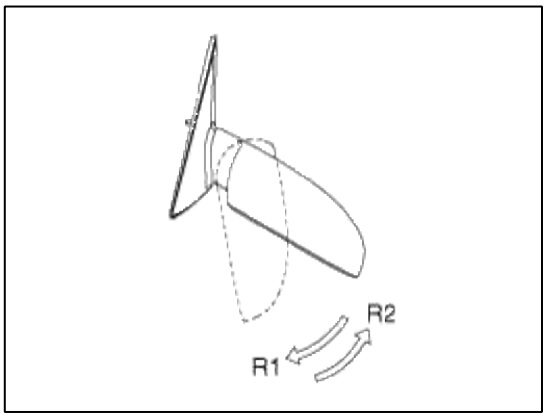
Mirror Heater Inspection

Position \ Terminal	4	13
Heater	○	○

Side Repeater Lamp

Position \ Terminal	12	11
Lamp	B	E

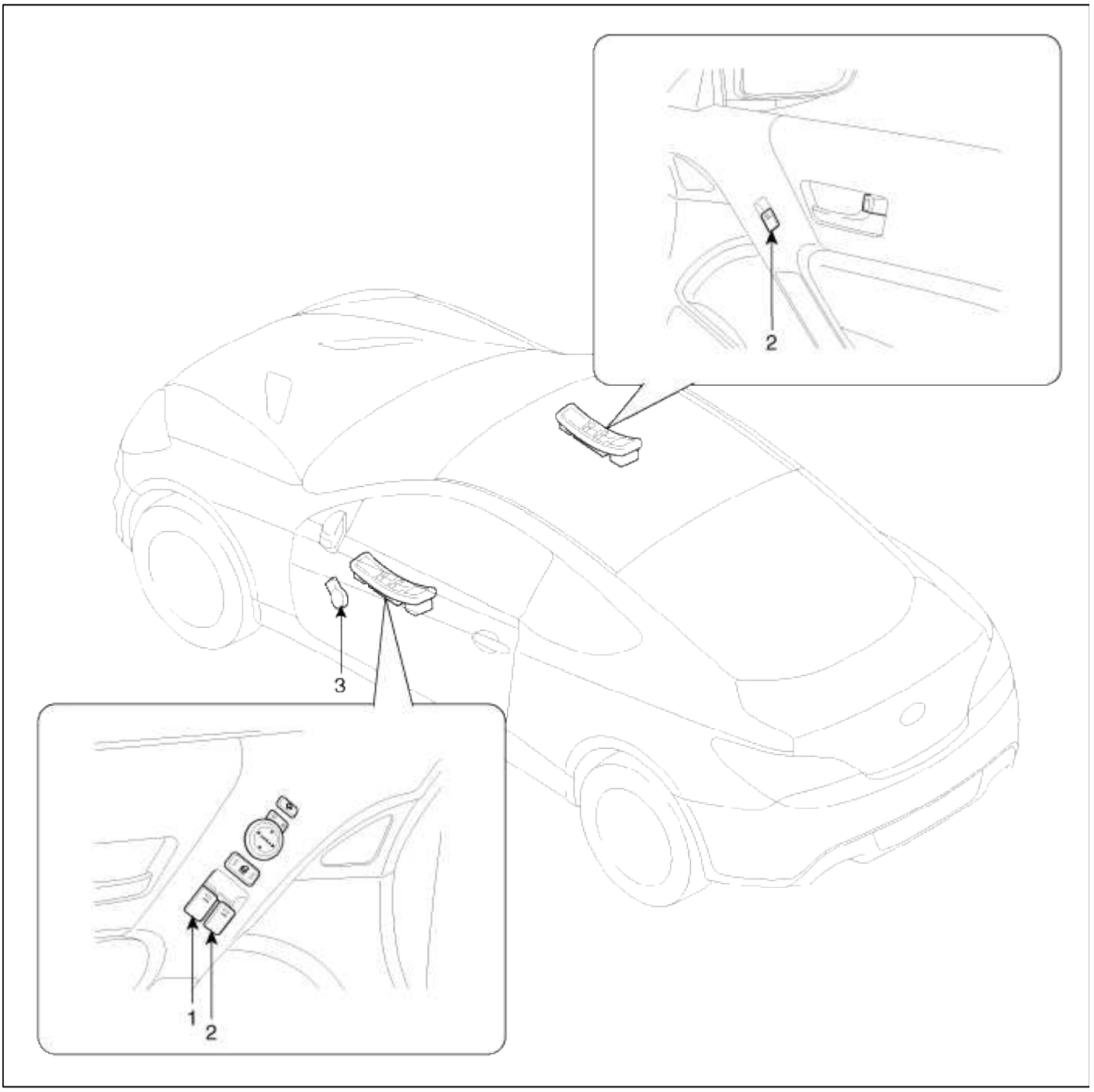
Folding Mirror



Position \ Terminal	B(+)	GND(-)	14	5
Folding (R1)	○		○	○
Unfolding (R2)	○	○	○	

Body Electrical System > Power Windows > Components and Components Location

Component Location



1. Driver power window main switch 2. Passenger power window switch	3. Front window motor (Safety window)

Body Electrical System > Power Windows > Description and Operation

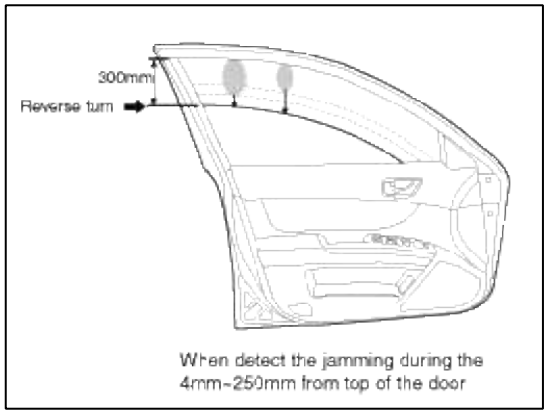
Function Of Safety Power Window

When driver door power window auto-up switch is operated, safety function is activated.

1. Safety function condition

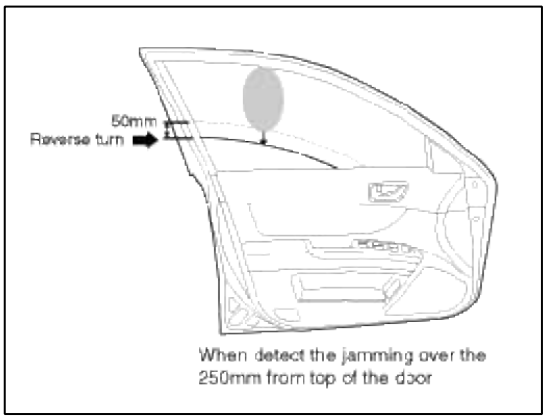
When detect the force of 100N (using the 10N/mm spring) during the window rising, window is reversed.

2. Length of window reversing (except holding the auto-up switch)
   A. When detect the jamming during the 4mm ~ 250mm from top of the door.
      → Window is reversed until 300mm from top of the door.



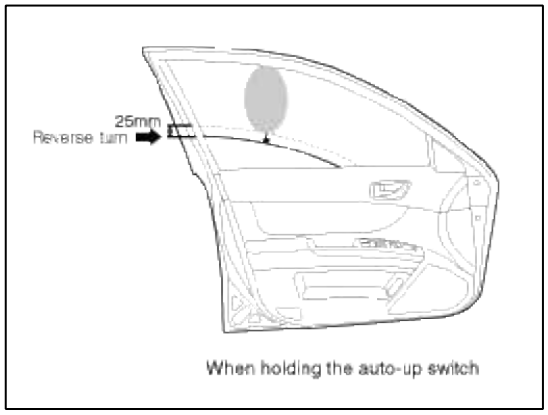
When detect the jamming during the 4mm~250mm from top of the door

   B. When detect the jamming over the 250mm from top of the door.
      → Window is reversed until 20mm from jamming position.



When detect the jamming over the 250mm from top of the door

3. Length of window reversing (holding the auto-up switch)
   A. When detect the jamming during holding the auto-up switch.
      → Window is reverse until 25mm from jamming position.
   B. Auto-up function is not available during the 5 seconds from above condition.
      → When holding the auto-up switch, window is operated as a manual-up function. (Safety function is not activated.)
   C. When holding the auto-up switch after 5 seconds from above condition.
      → Window is reverse until 25mm from jamming position.



When holding the auto-up switch

4. Safety function is not available area
   Safety function is not available during the 4mm from top of the door.

Initializing Method Of The Safety Power Window

1. Initializing of Battery Connection
   When the battery is not connected the vehicle over the 5 minutes, safety power window switch need the initializing.
   (1) Power window operation before initializing
      A. Manual-Up/Down function is available
      B. Auto-Up function is not available
         (When holding the auto-up/down switch, window is operated as a manual-up/down.)
   (2) Initializing method
      Close the window in window open position, and holding the switch in window full close position over the 0.2 second.
      (If start the closing the window in window full close position, initializing could be failed.)
   (3) If initialize the safety power window in jamming status, could occur below conditions.
      A. Safety function is not available
2. Initializing of fail safe mode
   (1) If the window moved by compulsion and motor have a problem, power window switch could be entering the fail safe mode for user's safety.
   (2) Power window operation in fail mode
      A. Auto/Manual-Down function is available
      B. Auto/Manual-Up function is not available
         (When auto/manual-up is operated, window is rising 20mm and is stopped the moving.)

Short Drop

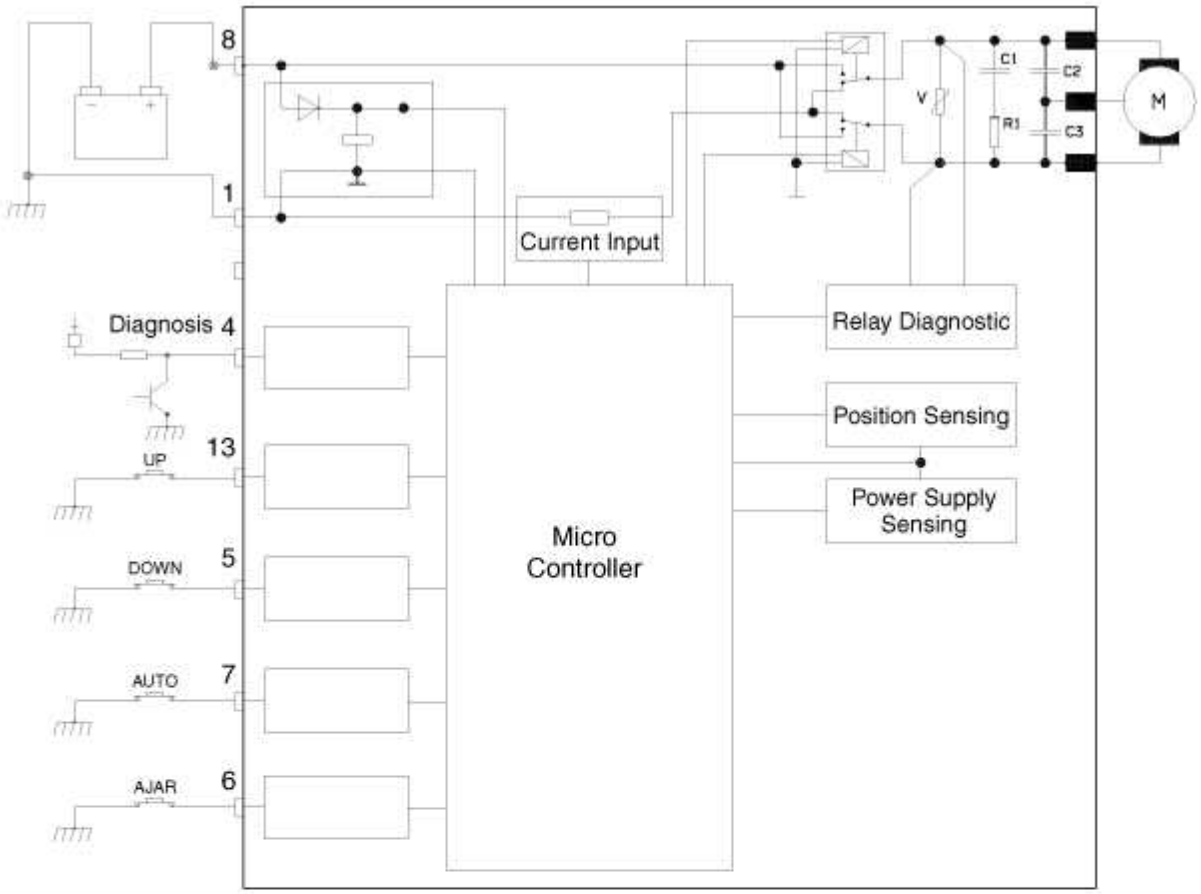
The short drop (SD) functionality is linked to the door ajar signal. In case of door opened, the door ajar signal (low level) will be received by the ECU. As a result the upper stop position will be changed from upper mechanical block position to the short drop position (EEPROM parameter). Short drop commandos will be executed independent of multi function line state.

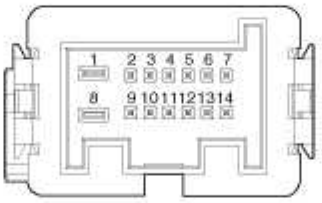
Window lifter behavior due to door ajar signal:

Window	Event	Action
Closed	Door opened → Short drop active	Glass moves down to SD position
Over SD position	Door opened → Short drop active	Glass moves down to SD position
Below SD position	Door opened → Short drop active	Glass will not move, but upper stop position will be changed to SD position
SD position	Door opened → Short drop active	Glass will not move, but upper stop position will be changed to SD position
SD position	Door closed → Short drop inactive	Glass will move to upper block position, upper stop position is equal to mechanical stop SD position
Below SD position	Door closed → Short drop inactive	Glass will not move, but upper stop position will change to mechanical stop position

Body Electrical System > Power Windows > Power Window Motor > Schematic Diagrams

Circuit Diagram





Pin No.	Name
1	Battery GND
4	Diagnostic Line
5	Down Switch
6	AJAR Switch
7	Auto Switch
8	Battery
13	Up Switch

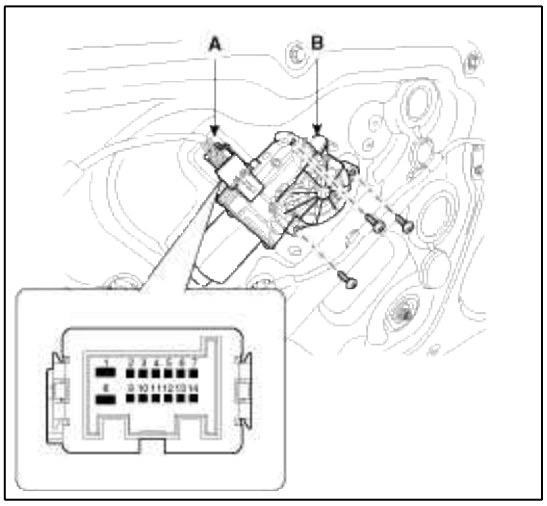
Body Electrical System > Power Windows > Power Window Motor > Repair procedures

Inspection

Front Power Window Motor

1. Remove the front door trim panel.
   (Refer to the Body group - "Front door")

2. Disconnect the connector from the motor.



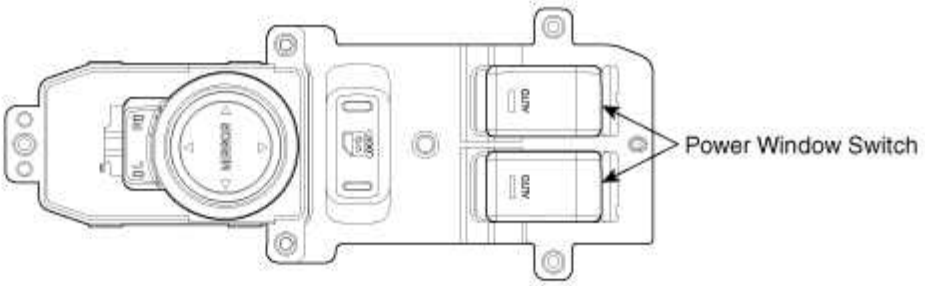
3. Connect the terminal No.4 directly to battery voltage (12V) and check that the motor operates smoothly. If the operation is abnormal, replace the motor.

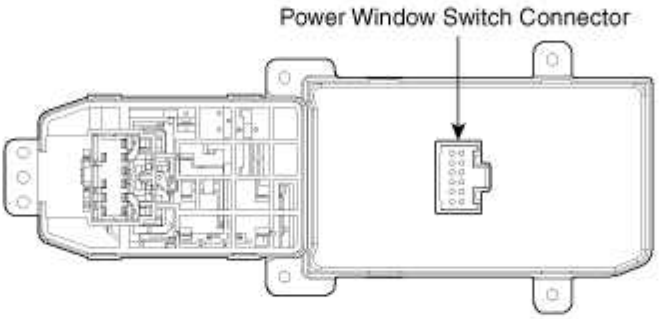
Position \ Terminal		13	1(GND)	5
LH	UP	○	○	
	DOWN		○	○
RH	UP	○	○	
	DOWN		○	○

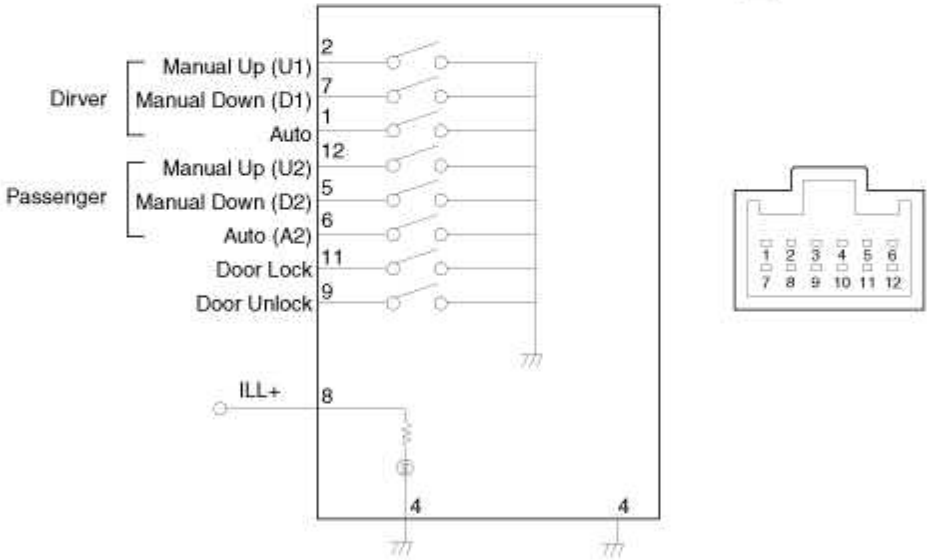
Body Electrical System > Power Windows > Power Window Switch > Schematic Diagrams

Circuit Diagram

Driver Power Window Switch

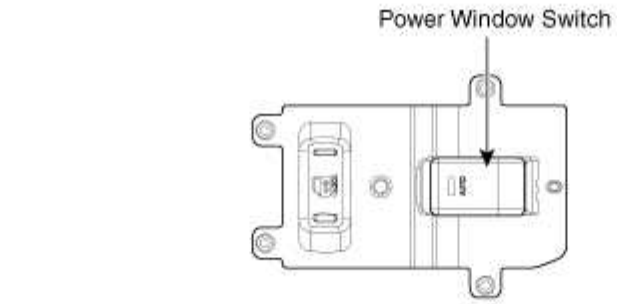


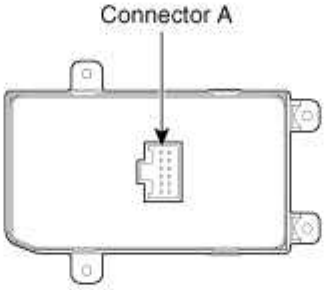


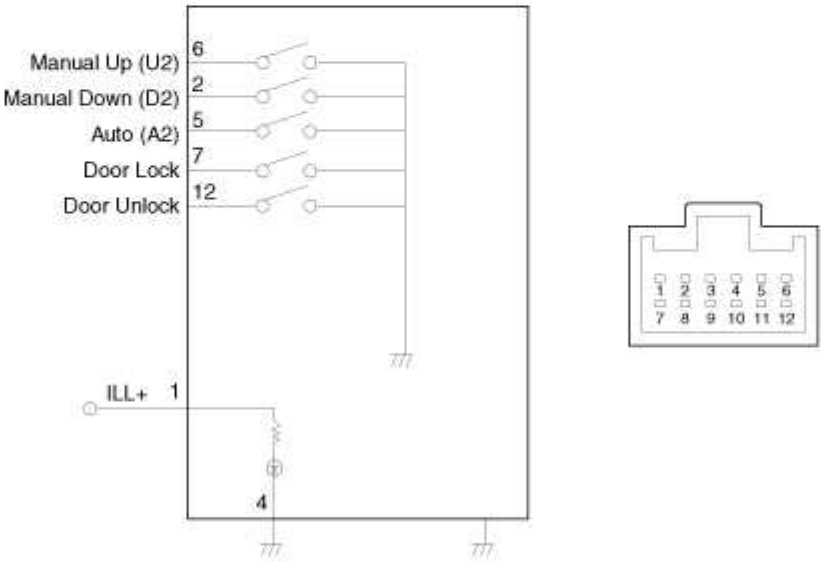


Pin No.	Name	Pin No.	Name
1	Auto (Driver)	7	Manual Down (Driver)
2	Manual Up (Driver)	8	ILL (+)
3	-	9	Door Unlock
4	GND	10	-
5	Manual Down (Passenger)	11	Door Lock
6	Auto Down (Passenger)	12	Manual Up (Passenger)

Assist Power Window Switch







Pin No.	Name	Pin No.	Name
1	ILL (+)	7	Door Lock
2	Manual Down	8	-
3	-	9	-
4	GND	10	-
5	Auto	11	-
6	Manual Up	12	Door Unlock

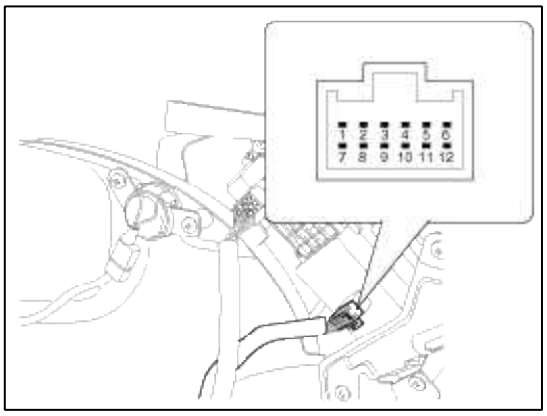
Body Electrical System > Power Windows > Power Window Switch > Repair procedures

Inspection

Power Window Main Switch Inspection

1. Disconnect the negative (-) battery terminal.
2. Remove the front door trim panel.
   (Refer to the Body group - front door)

3. Disconnect the 12P connector from the switch.

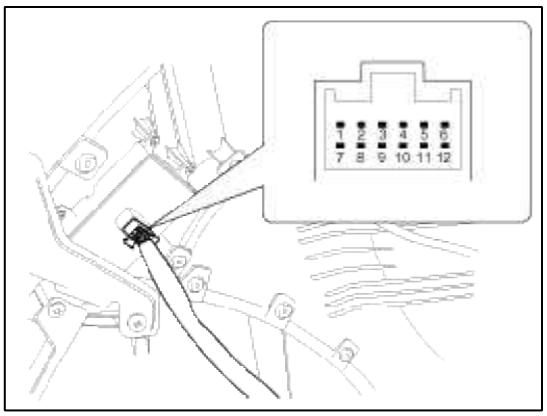


4. Check for continuity between the terminals in each switch position according to the table. If the continuity condition is not normal, replace the switch.

Position	Terminal	1	2	4 (GND)	5	6	7	12
Driver	Manual Up		○	○				
	Manual Down			○			○	
	Auto	○		○				
Passenger	Manual Up			○				○
	Manual Down			○	○			
	Auto			○		○		

Assist Power Window Switch Inspection

1. Disconnect the negative (-) battery terminal.
2. Remove the front door trim panel.
   (Refer to the Body group - front door)
3. Disconnect the 12P connector from the switch.

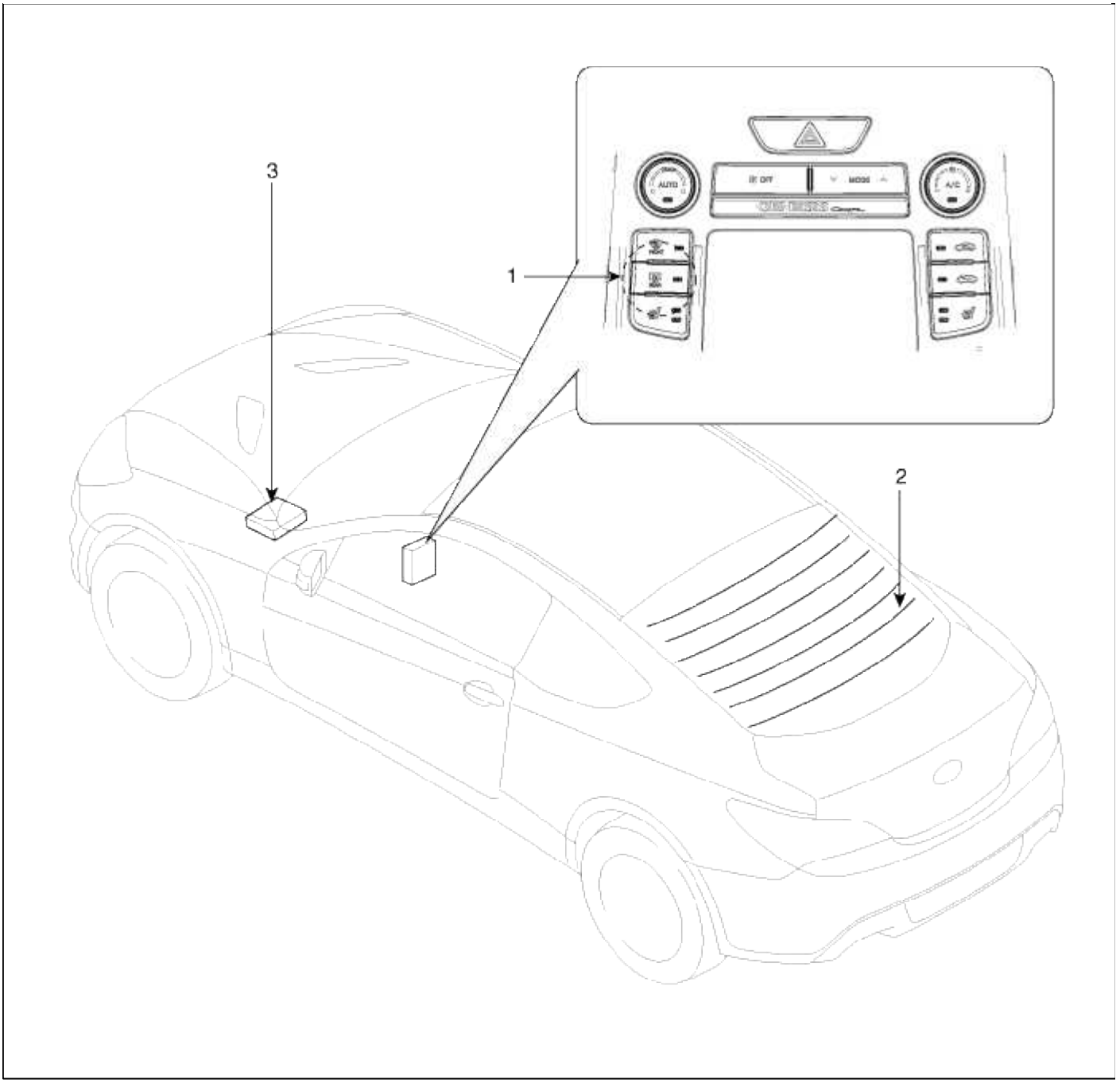


4. Check for continuity between the terminals in each switch position according to the table. If the continuity condition is not normal, replace the switch.

Position \ Terminal	2	4 (GND)	5	6
Manual Up		○		○
Manual Down	○	○		
Auto		○	○	

Body Electrical System > Rear Glass Defogger > Components and Components Location

Component Location



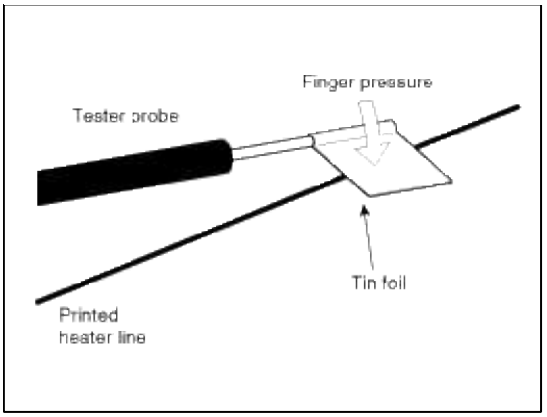
1. Rear window defogger switch (A/C controller) 2. Rear window defogger	3. Body control module (Rear window defogger relay)

Body Electrical System > Rear Glass Defogger > Rear Glass Defogger Printed Heater > Repair procedures

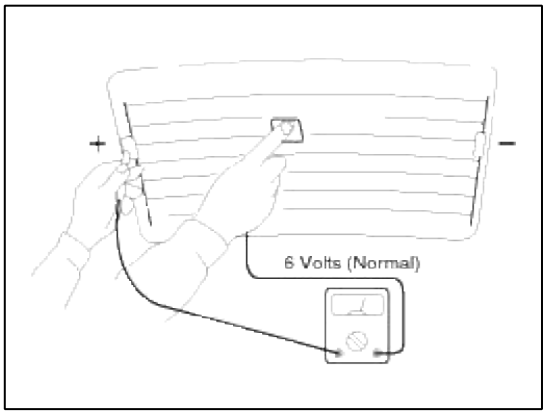
Inspection

CAUTION

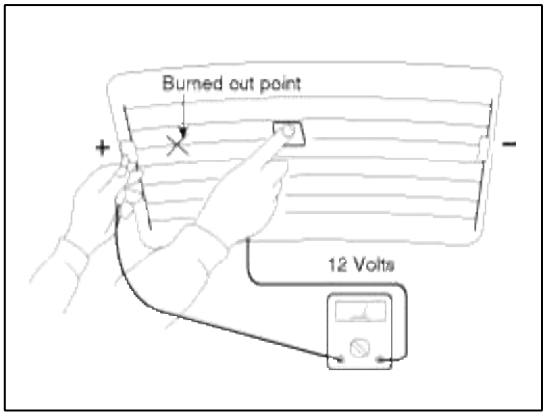
Wrap tin foil around the end of the voltmeter test lead to prevent damaging the heater line. Apply finger pressure on the tin foil, moving the tin foil along the grid line to check for open circuits.



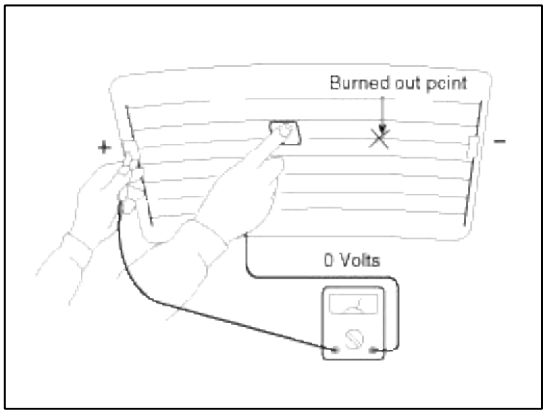
1. Turn on the defogger switch and use a voltmeter to measure the voltage of each heater line at the glass center point. If a voltage of approximately 6V is indicated by the voltmeter, the heater line of the rear window is considered satisfactory.



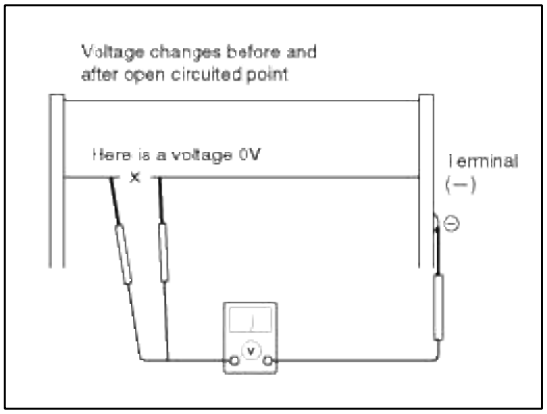
2. If a heater line is burned out between the center point and (+) terminal, the voltmeter will indicate 12V.



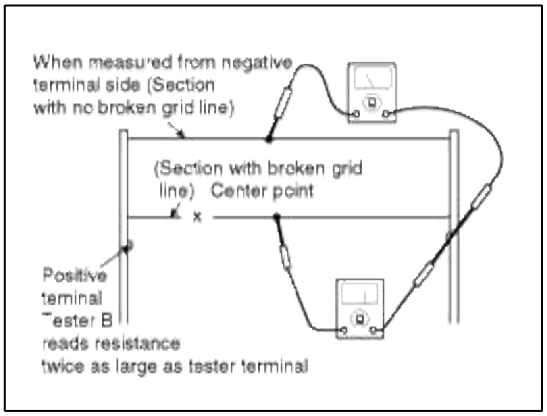
3. If a heater line is burned out between the center point and (-) terminal, the voltmeter will indicate 0V.



4. To check for open circuits, slowly move the test lead in the direction that the open circuit seems to exist. Try to find a point where a voltage is generated or changes to 0V. The point where the voltage has changed is the open-circuit point.



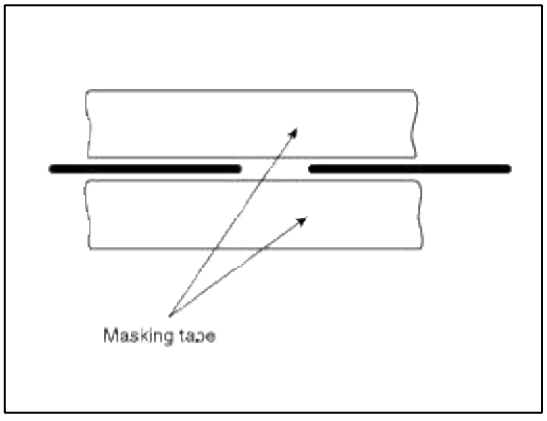
5. Use an ohmmeter to measure the resistance of each heater line between a terminal and the center of a grid line, and between the same terminal and the center of one adjacent heater line. The section with a broken heater line will have a resistance twice as that in other sections. In the affected section, move the test lead to a position where the resistance sharply changes.



Repair Of Broken Heater Line

Prepare the following items:

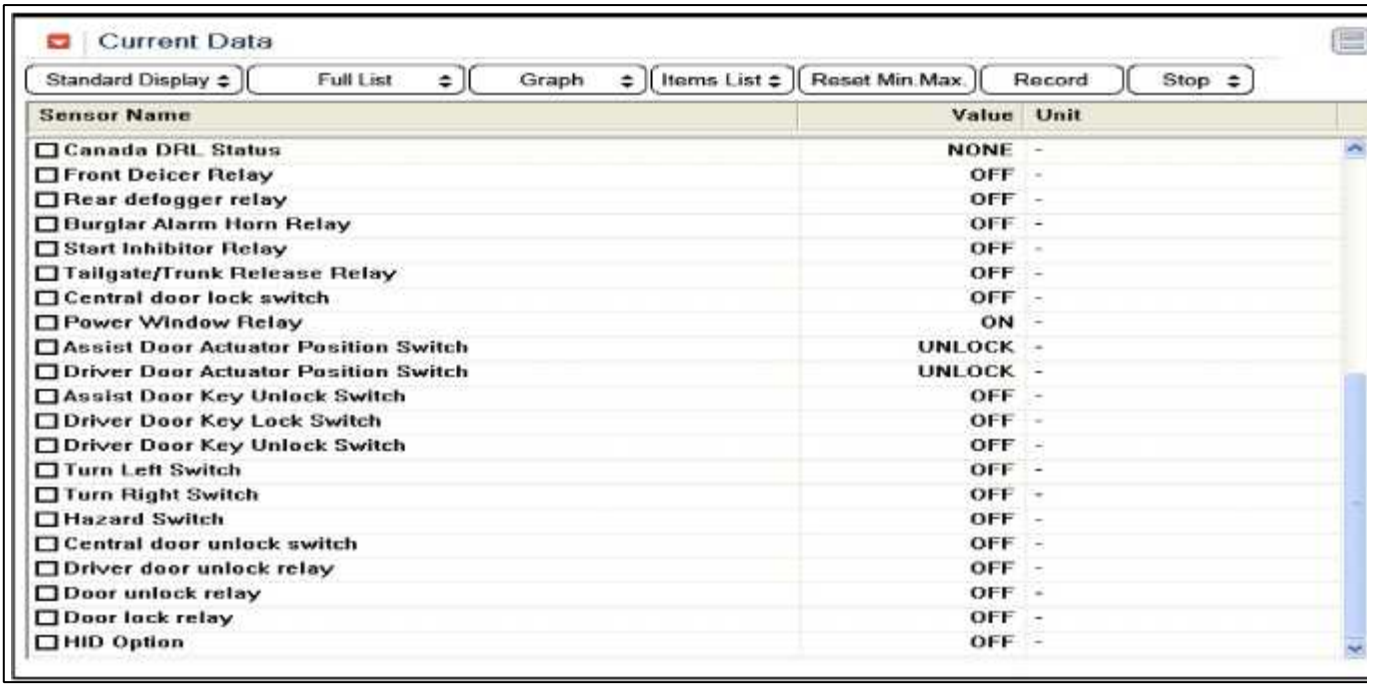
1. Conductive paint.
2. Paint thinner.
3. Masking tape.
4. Silicone remover.
5. Using a thin brush:
   Wipe the glass adjacent to the broken heater line, clean with silicone remover and attach the masking tape as shown. Shake the conductive paint container well, and apply three coats with a brush at intervals of about 15 minutes apart. Remove the tape and allow sufficient time for drying before applying power. For a better finish, scrape away excess deposits with a knife after the paint has completely dried. (Allow 24 hours).



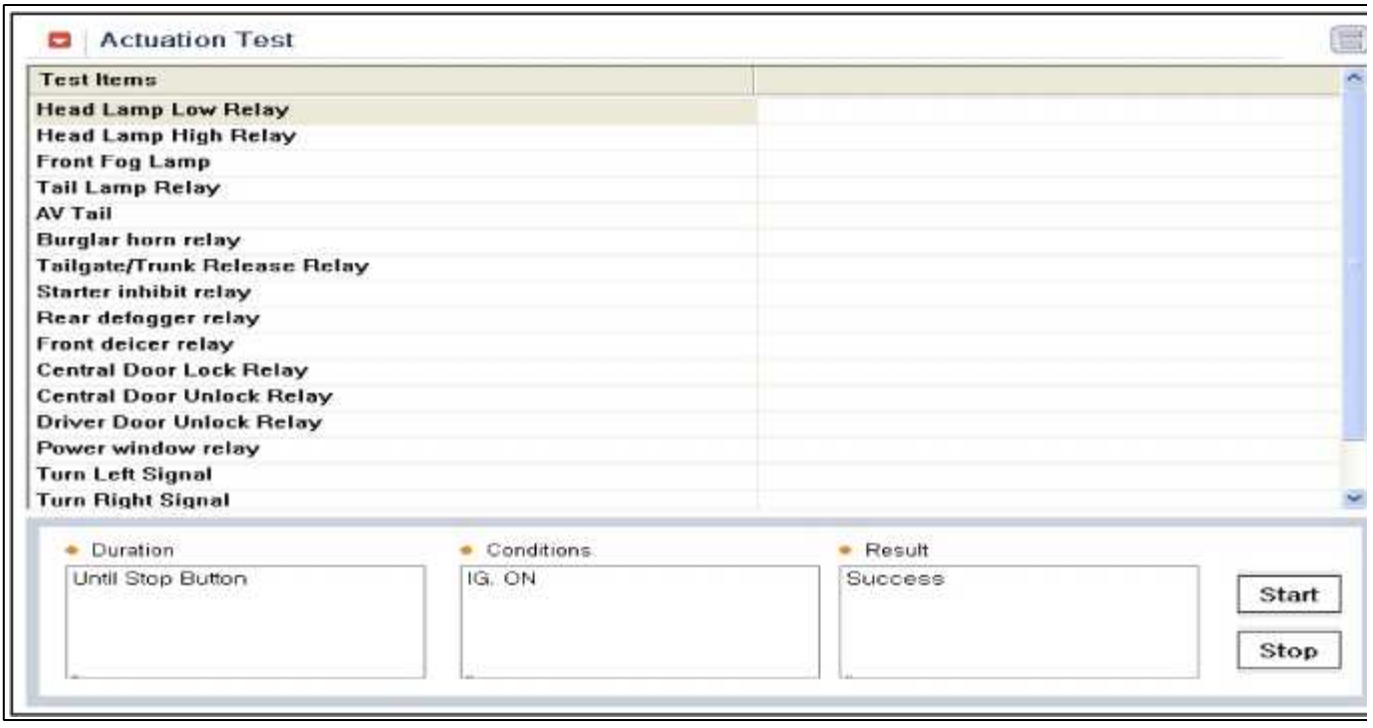
Body Electrical System > Rear Glass Defogger > Rear Glass Defogger Switch > Repair procedures

Inspection

1. The rear glass defogger switch inputs can be checked using the GDS.
2. To check the input value of rear glass defogger switch, select option "Body Control Module".
3. To consult the present input/output value of BCM, "Current DATA". It provides information of BCM input/output conditions of rear defogger relay.



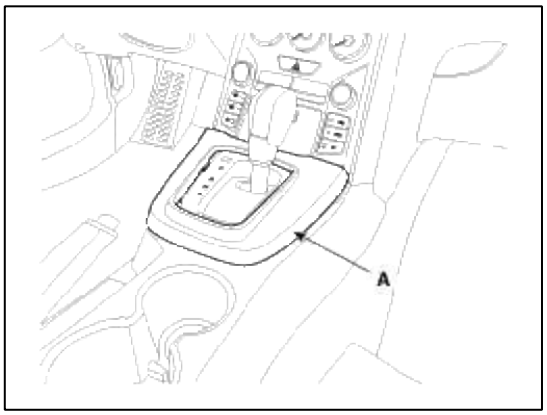
4. To check the input value of rear glass defogger switch in force mode, select option "Actuation Test of smart junctio box".



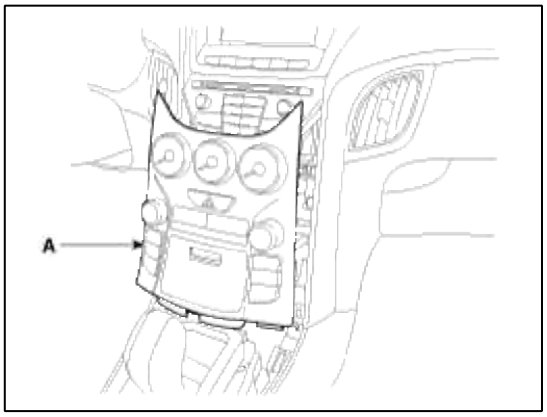
Removal

1. Disconnect the negative(-) battery terminal.

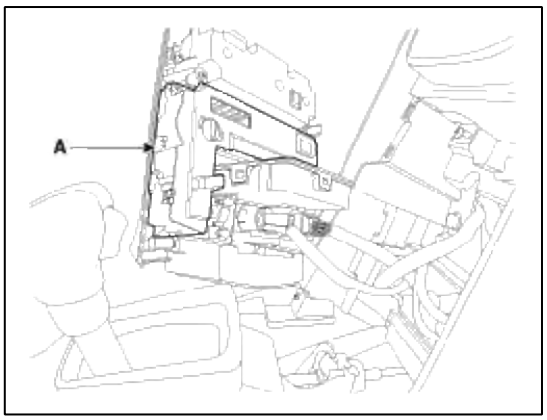
2. Remove the console upper cover (A).
   (Refer to the BD group - "Console")



3. Remove the center fascia lower panel (A).
   (Refer to the BD group - "Crash pad")



4. Disconnect the heater control unit (A) connectors and cables.



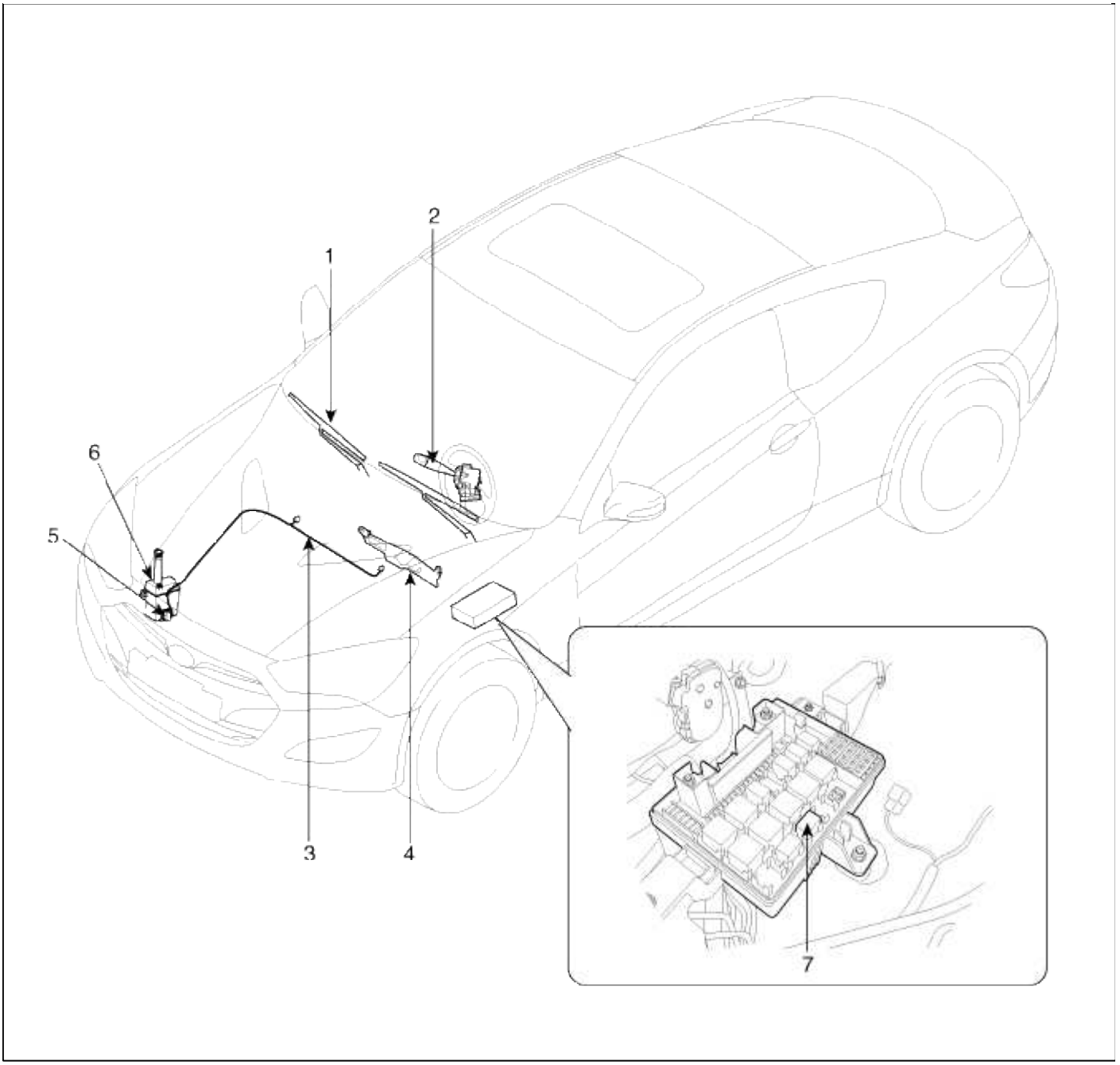
5. Remove the heater control unit contained the rear window defogger switch from the center fascia panel.

Installation

1. Install the heater control unit.
2. Install the center fascia lower panel.
3. Install the console upper cover.

Body Electrical System > Windshield Wiper/Washer > Components and Components Location

Component Location

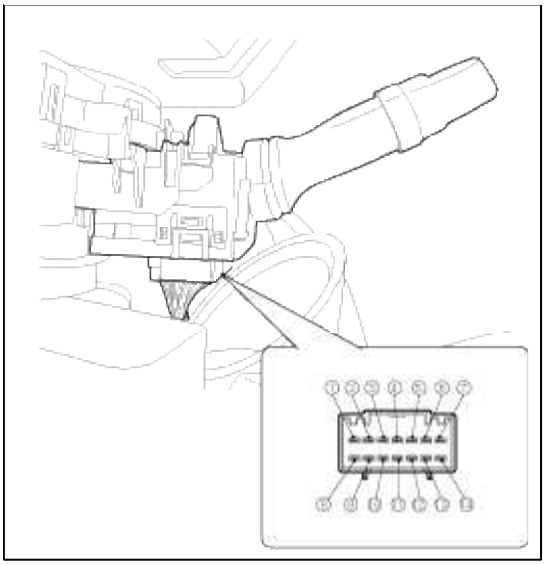


1. Windshield wiper arm & blade 2. Wiper & washer switch 3. Windshield washer hose 4. Windshield wiper motor & linkage	5. Washer motor 6. Washer reservoir 7. Wiper relay (Engine room relay box)

Body Electrical System > Windshield Wiper/Washer > Windshield Wiper-Washer Switch > Repair procedures

Inspection

Check for continuity between the terminals while operating the wiper and washer switch. If it is not normal condition, replace wiper and wiper switch.



Wiper Switch

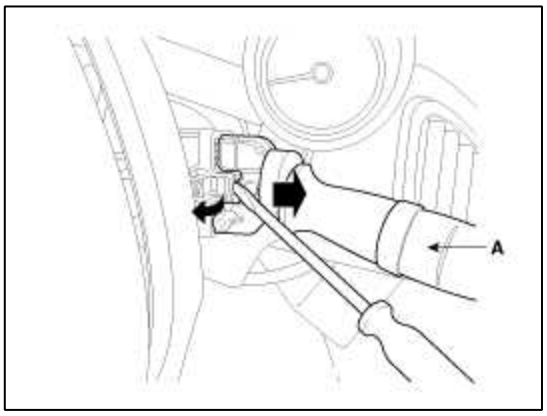
Terminal / Position	3	9	2	8	10	1	4	5
MIST	○		○		○	○		
OFF	○		○					
INT	○		○	○	○		○	○
LOW	○				○			
HI		○			○			

Washer Switch

Terminal / Position	10	11
OFF		
ON	○	○

Removal

1. Remove the steering column upper and lower shrouds after removing 3 screws.
2. Remove the wiper switch(A) by releasing the part.

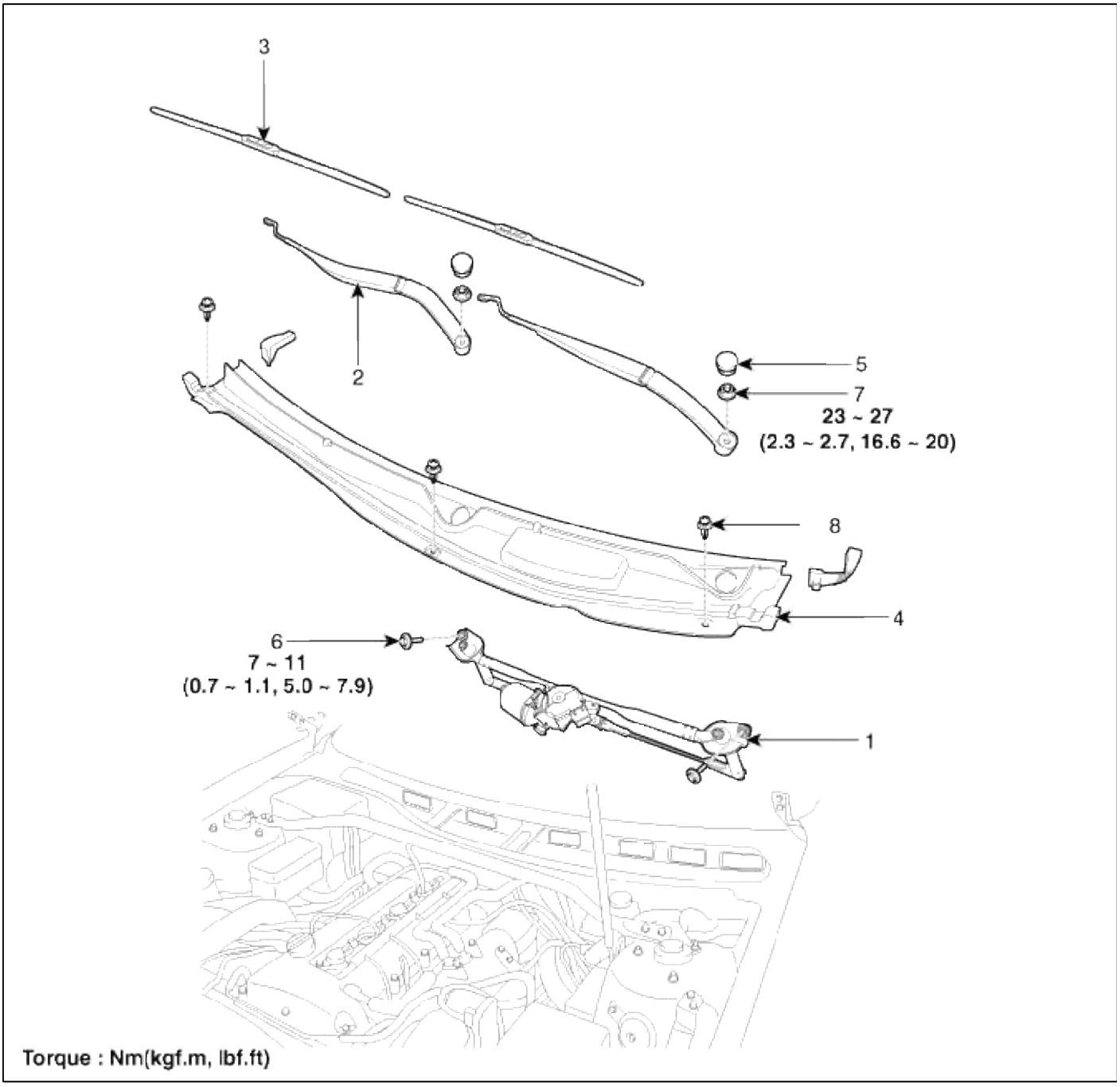


Installation

1. Install the wiper switch.
2. Install the steering column upper and lower shrouds.

Body Electrical System > Windshield Wiper/Washer > Front Wiper Motor > Components and Components Location

Component Location



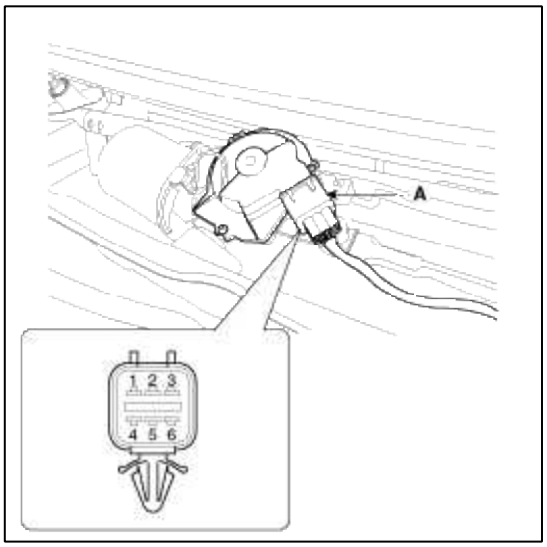
1. Wiper motor & linkage assembly 2. Wiper arm 3. Wiper blade 4. Cowl top cover	5. Cap 6. Bolt 7. Nut 8. Rivet

Body Electrical System > Windshield Wiper/Washer > Front Wiper Motor > Repair procedures

Inspection

Speed Operation Check

1. Remove the connector (A) from the wiper motor.

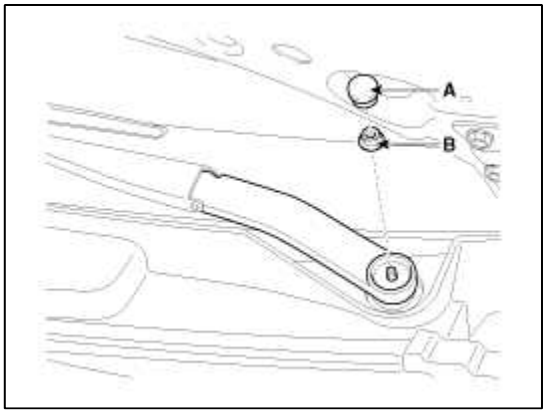


2. Attach the positive (+) lead from the battery to terminal 5 and the negative (-) lead to terminal 2.
3. Check that the motor operates properly.

Position \ Terminal	4	5	3	1
OFF	○	—	—	○
LOW		○	—	○
HIGH		○	○	

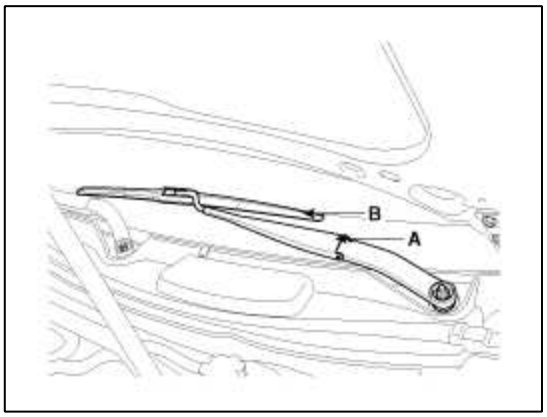
Removal

1. Remove the wiper arm mounting nut (B) after removing the wiper cap (A).

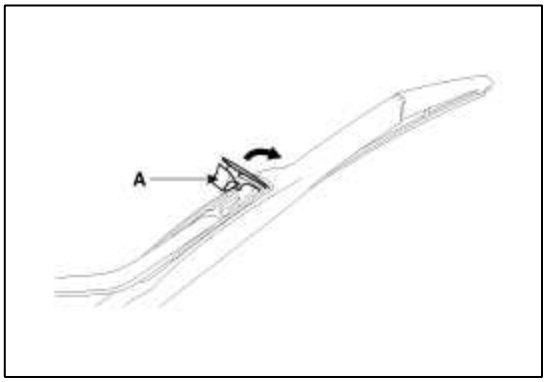


2. Remove the windshield wiper arm (A) and blade (B).

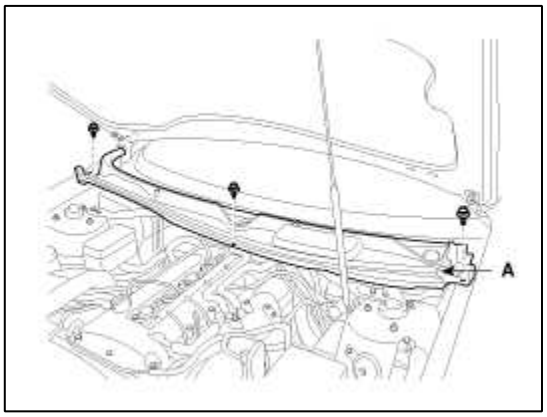
Tightening torque :
23~27 Nm (2.3~2.7 kgf.m, 16.6~20 lbf.ft)



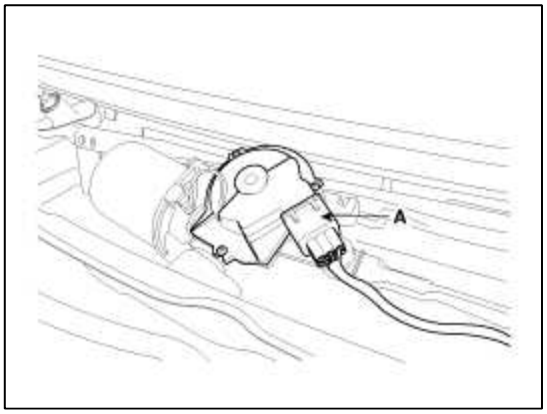
3. If necessary of removing the wiper blade, push in the bottom of the wiper blade clip (A) and remove the wiper blade from the inside radius of the wiper arm.



4. Remove the weather strip then remove the cowl top cover (A) after removing 3 rivets.

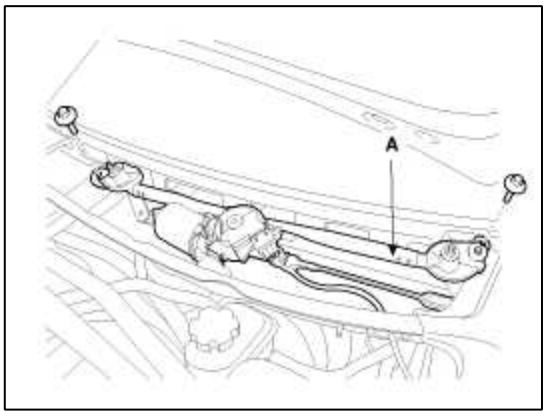


5. Disconnect the wiper motor connector (A).



6. Remove the windshield wiper motor and linkage assembly (A) after removing 2 bolts.

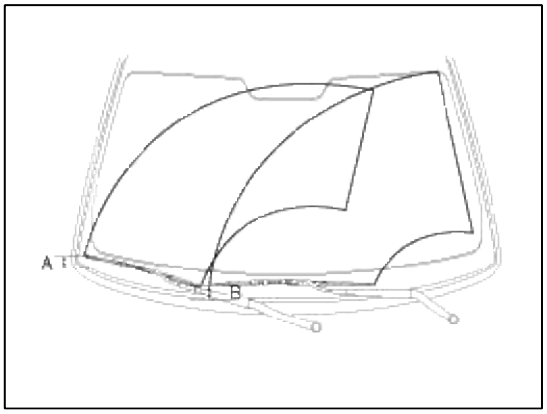
Tightening torque :
7~11Nm (0.7~1.1, kgf.m, 5.0~7.9 lbf.ft)



Installation

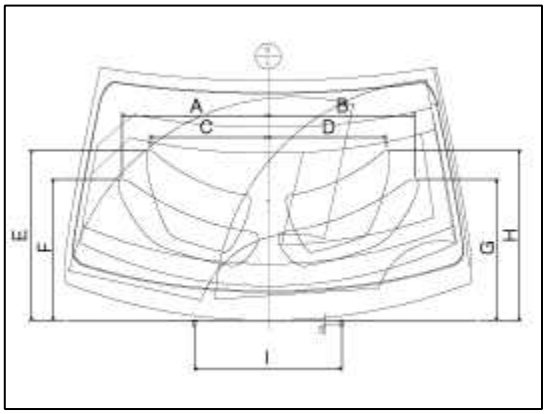
1. Install the wiper arm and blade to the specified position.

Specified position	A	B
Distance [in (mm)]	1.49 ± 0.2 (38 ± 5)	1.97 ± 0.2 (50.1 ± 5)



2. Set the washer nozzle on the specified spray position.

Specified position	Distance [in (mm)]
A	21.1 (535)
B	21.1 (535)
C	17.0 (432)
D	17.0 (432)
E	24.4 (620)
F	20.3 (515)
G	20.3 (515)
H	24.4 (620)
I	21.3 (540)



Body Electrical System > Windshield Wiper/Washer > Front Washer Motor > Repair procedures

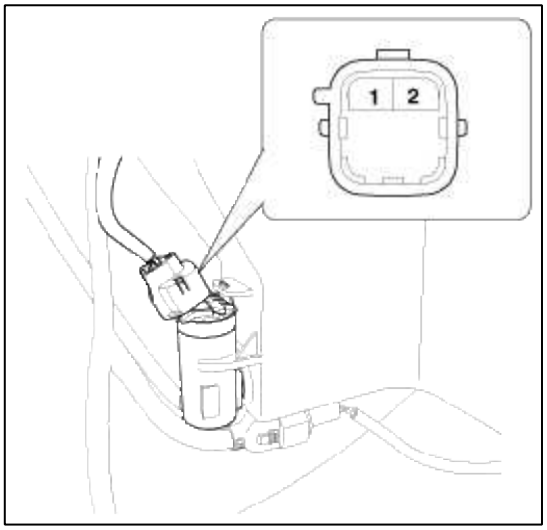
Inspection

1. With the washer motor connected to the reservoir tank, fill the reservoir tank with water.

> NOTE
>
> Before filling the reservoir tank with water, check the filter for foreign material or contamination. if necessary, clean the filter.

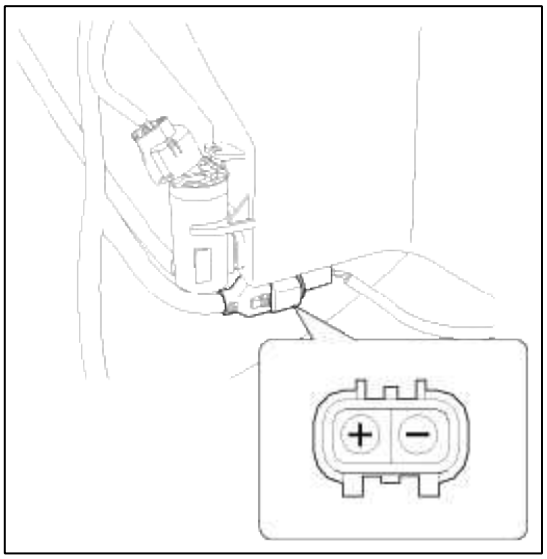
2. Connect positive (+) battery cables to terminal 1 and negative (-) battery cables to terminal 2 respectively.
3. Check that the motor operates normally and the washer motor runs and water sprays from the front nozzles.

4. If they are abnormal, replace the washer motor.
   Connector No.1 : Windshield washer(+),
   2 : Ground



Washer Fluid Level Sensor Switch

1. Disconnect the negative(-) battery terminal.
2. Drain the washer fluid less than 650 cc.
3. Check for continuity between the No. 1 and No.2 terminal in each float position.
   There should be continuity when the float is down.
   There should be no continuity when the float is up.
4. If the continuity is not as specified, replace the washer fluid level switch



Terminal / Position	1	2
Over 650cc		
Under 650cc	○	○

(Tolerance : -50cc ~ +100cc)

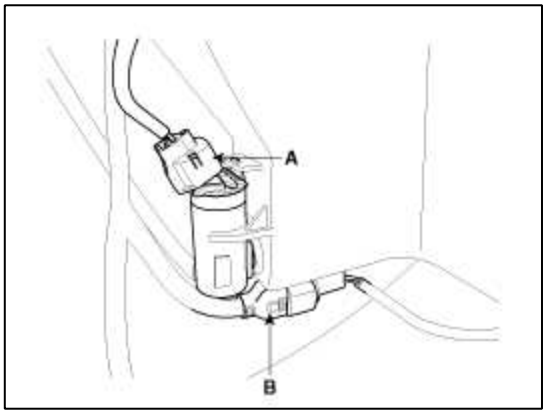
Removal

CAUTION

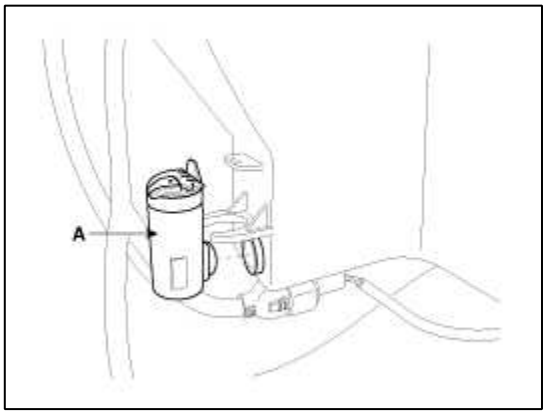
- When servicing the washer pump, be careful not to damage the washer pump seal.
- Do not operate the washer pump before filling the washer reservoir.
  Failure to do so could result in premature pump failure.

1. Disconnect the negative (-) battery terminal.

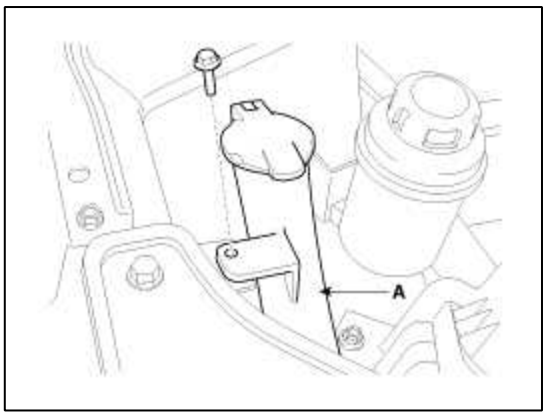
2. Remove the front bumper.
   (Refer to BD group - "Front bumper")
3. Remove the washer hose and disconnect the washer motor connector(A) and level sensor connector(B).



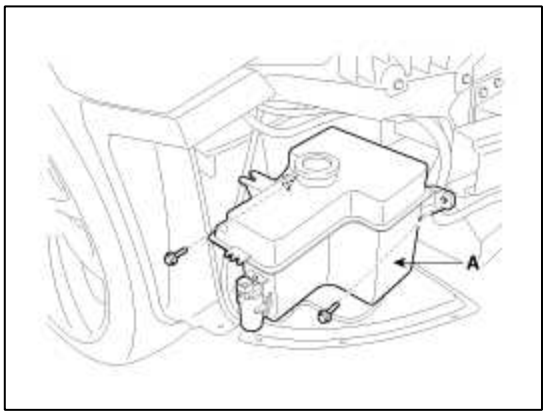
4. Remove the washer motor(A).



5. Remove the funnel part(A) of reservoir after loosening the mounting bolt(1EA).



6. Remove the washer reservoir (A) after removing 2 bolts.



Installation

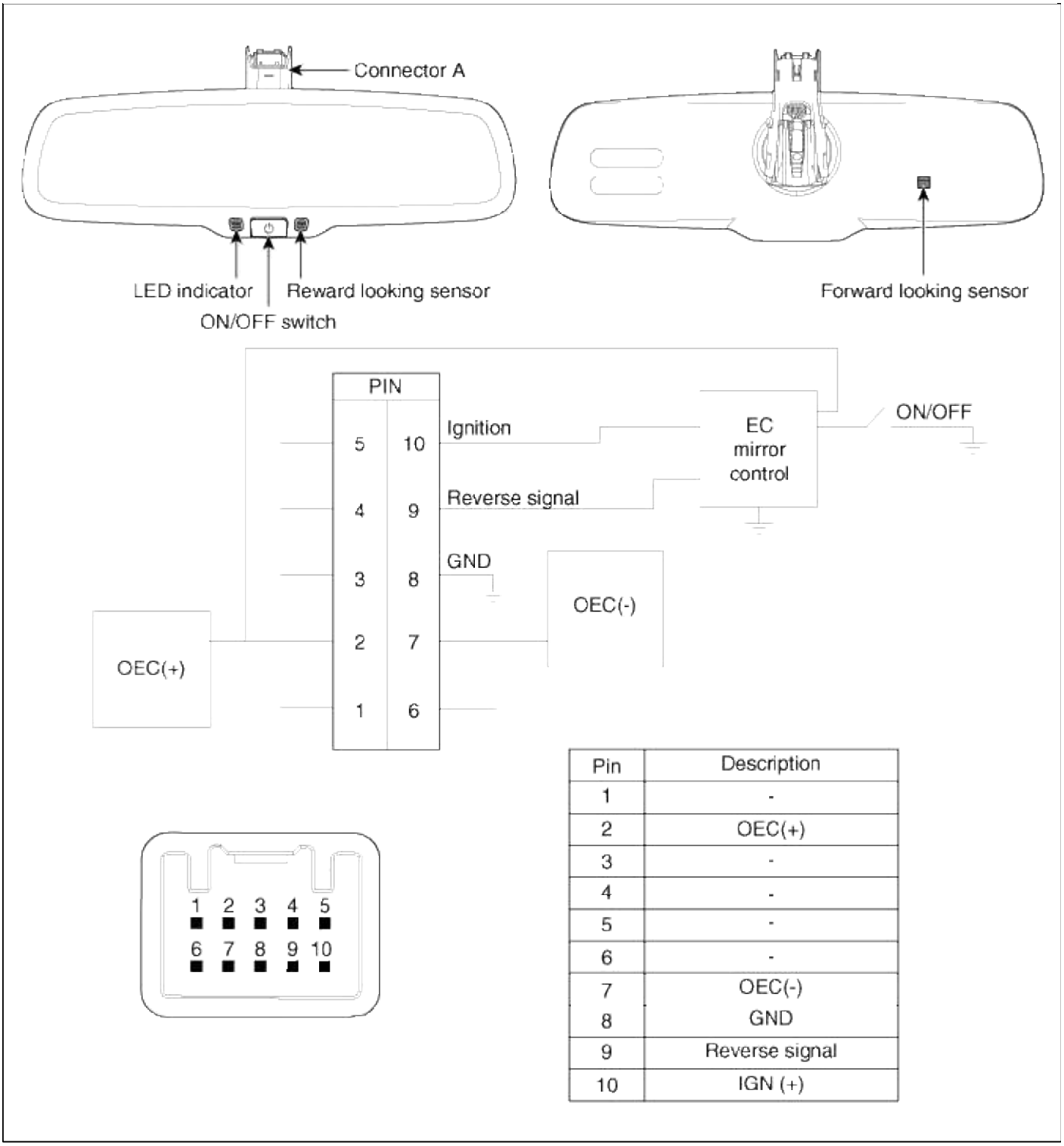
1. Install the washer reservoir.

> NOTE
>
> Before installing the pump motor, check the filter for foreign material or contamination. if necessary, clean the filter into the pump motor.

2. Install the funnel.
3. Install the washer motor.
4. Install the washer hose.
5. Connect the washer motor connector and level sensor connector.
6. Install the front bumper.

Body Electrical System > Electro chromic Inside Rear View Mirror > Components and Components Location

Components



Pin	Description
1	-
2	OEC(+)
3	-
4	-
5	-
6	-
7	OEC(-)
8	GND
9	Reverse signal
10	IGN (+)

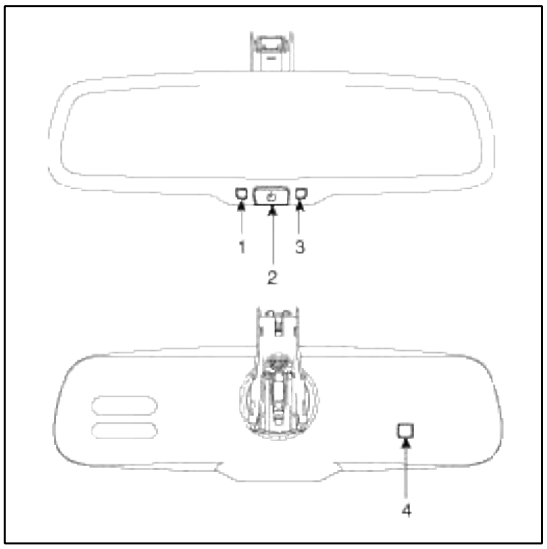
Body Electrical System > Electro chromic Inside Rear View Mirror > Description and Operation

Description

The ECM (Electro Chromatic inside rear view Mirror) is for dimming the reflecting light from a vehicle behind at night, in order the user not to be dazzled by the light. The forward facing sensor detects brightness of the surroundings, while the rearward looking sensor detects the strength of the reflecting light so that adjusts the reflexibility of the mirror in the range of 7~85%. But, when the reverse gear is engaged, it stops functioning.

1. The forward facing sensor sees if the brightness of the surroundings is low enough for the mirror to operate its function.
2. The rearward looking sensor detects glaring of the reflecting light from a vehicle behind.

3. The ECM is darkened to the level as determined by the rearward looking sensor. When the glaring is no longer detected, the mirror stops functioning.
   1. LED indicator
   2. ON/OFF Switch
   3. Rearward looking sensor
   4. Forward facing sensor



Body Electrical System > Electro chromic Inside Rear View Mirror > Repair procedures

Inspection

Check it by the procedure below to see if the function of the ECM is normal.

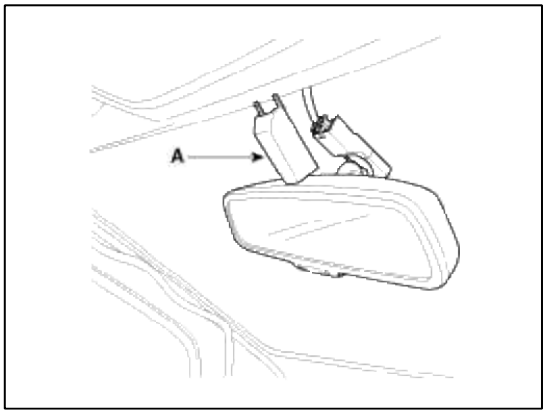
1. Turn the ignition key to the "ON" position.
2. Cover the front sensor to stop functioning.
3. Shine a light at the rear sensor.
4. The ECM should be darkened as soon as the rear sensor detects the light.

> NOTE
>
> If this test is performed in daytime, the ECM may be darkened as soon as the front sensor is covered.

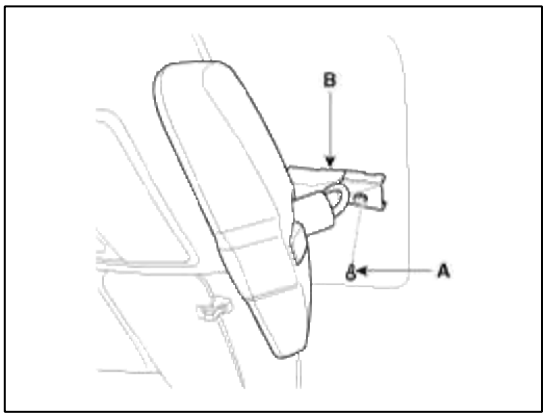
5. When the reverse gear is engaged, the ECM should not be darkened.
6. When heading lights to both the front and rear sensors, the ECM should not be darkened.

Removal

1. Remove the mirror wiring cover (A).



2. Remove the screw (A) and disconnect the mirror connector (B).



NOTE

Take care not to damage the mounting bracket during removal.

Installation

1. Install the mirror assembly.
2. Install the mirror wiring cover and connector.

Body Electrical System > Electro chromic Inside Rear View Mirror > Compass Mirror > Description and Operation

Description

The compass feature is designed to be integrated into an electro chromic interior rearview mirror.
The mirror assembly shall display a compass heading.
The compass mirror then take the sensor information to determine static field strengths and rotating field information to determine an accurate compass heading.

Specification

Item	Standard value
Rate voltage	DC 12V
Operating voltage range	DC9 ~ 16V
Operating temperature range	-30 ~ +65°C
Direction display	8
Renewal time	2 sec.

Switch Point Accuracy

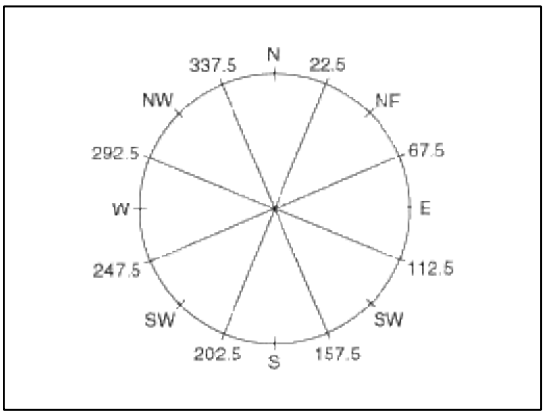
The compass module shall, while compensating for the vehicle magnetic fields, until the Earth's varying magnetic fields to determine direction.

[Switch points]

Switch point	Heading ± 10°
N - NE	22.5
NE - E	67.5
E - SE	112.5
SE - S	157.5
S - SW	202.5
SW - W	247.5
W - NW	292.5
NW - N	337.5

NOTE

There should be hysteresis at each switch point.
Switch points between the 8 cardinal directions, these switch points are ± 10°



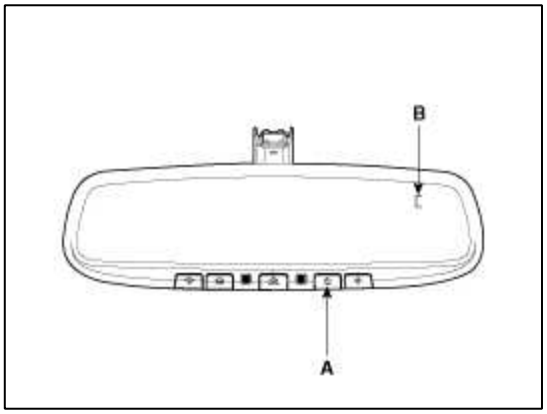
Compass display interval
Compass display should be updated at every two seconds.

Function

The compass can be turned ON and OFF and will remember the last state when the ignition is cycled. To turn the display feature ON/OFF :

1. Press and release the feature control button (A) to turn the display feature OFF.

2. Press and release the feature control button (A) again to turn the display back ON.
   Additional options can be set with press and hold sequences of the feature control button (A) and are detailed below.



There is a difference between magnetic north and true north. The compass in the mirror can compensate for this difference when it knows the magnetic zone in which it is operating. This is set either by the dealer or by the user.

Body Electrical System > Electro chromic Inside Rear View Mirror > Compass Mirror > Repair procedures

Adjustment

Calibration procedure

If the display read "C", calibrate the compass.

1. Driving the vehicle in a circle at less than 8km/h 3 times or until the compass heading appears.
2. Driving in a circle in right-handed direction and opposite direction are possible, and if the calibration is completed, the compass heading will appear.
3. Keep driving in a circle until a commpass heading appears.

To adjust the Zone setting :

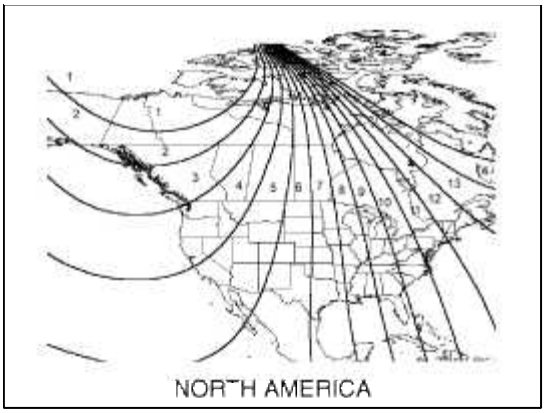
1. Determine the desired zone number based upon your current location on the zone maps.
2. Press and hold the Feature Control button for more than 6 but less than 9 seconds, the current zone number will appear on the display (B).
3. Pressing and holding the feature control button (A) again will cause the numbers to increment (Note: they will repeat …13, 14, 15, 1, 2,..). Releasing the button when the desired zone number appears on the display will set the new zone.
4. Within about 5 seconds the compass will start displaying a compass heading again.

To re-calibrate the compass :

There are some conditions that can cause changes to the vehicle magnets. Items such as installing a ski rack or a antenna or even some body repair work on the vehicle can cause changes to the vehicle's magnetic field. In these situations, the compass will need to be re-calibrated to quickly correct for these changes.

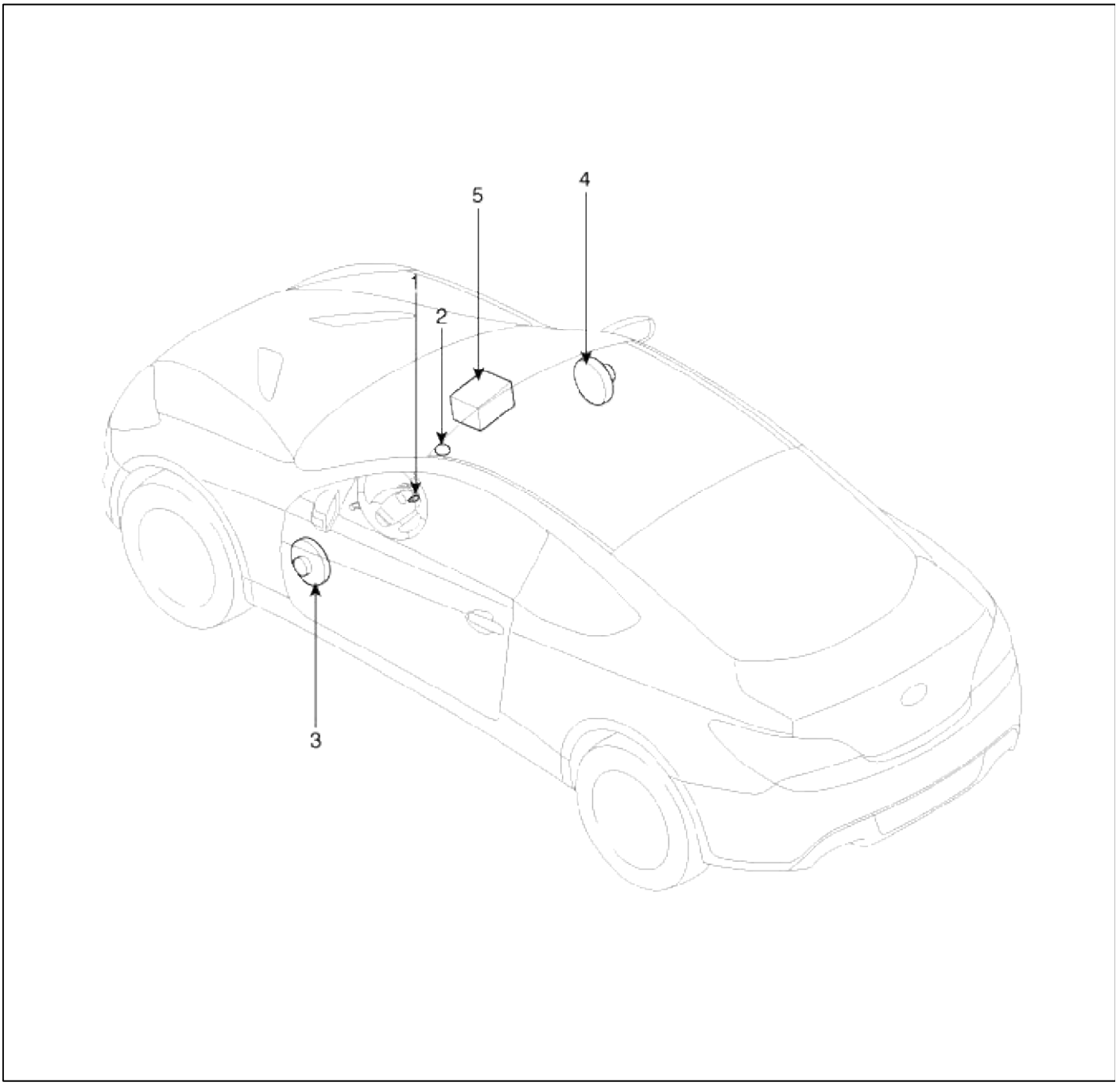
1. Press and hold the feature control button (A) for more than 9 seconds. When the compass memory is cleared, a "C" will appear in the display (B).
2. To calibrate the compass, drive the vehicle is 2 complete circles at less than 8 KPH (5 MPH).

Zone Map



Body Electrical System > Hands Free System > Components and Components Location

Components



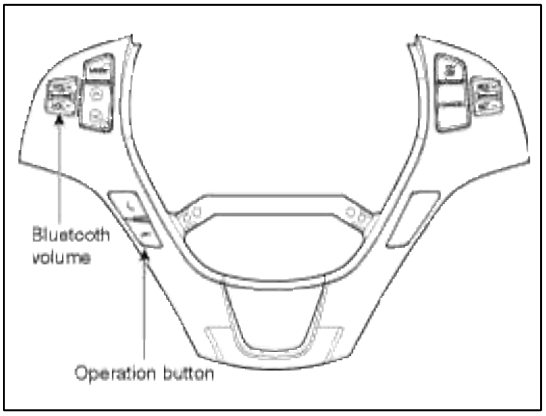
1. Hands free call switch 2. Mic 3. Front left speaker	4. Front right speaker 5. Audio head unit (hands free control)

There is no hands free jack. This system supports Bluetooth(wireless system).

Body Electrical System > Hands Free System > Description and Operation

Function

Bluetooth Phone Operation



General Features

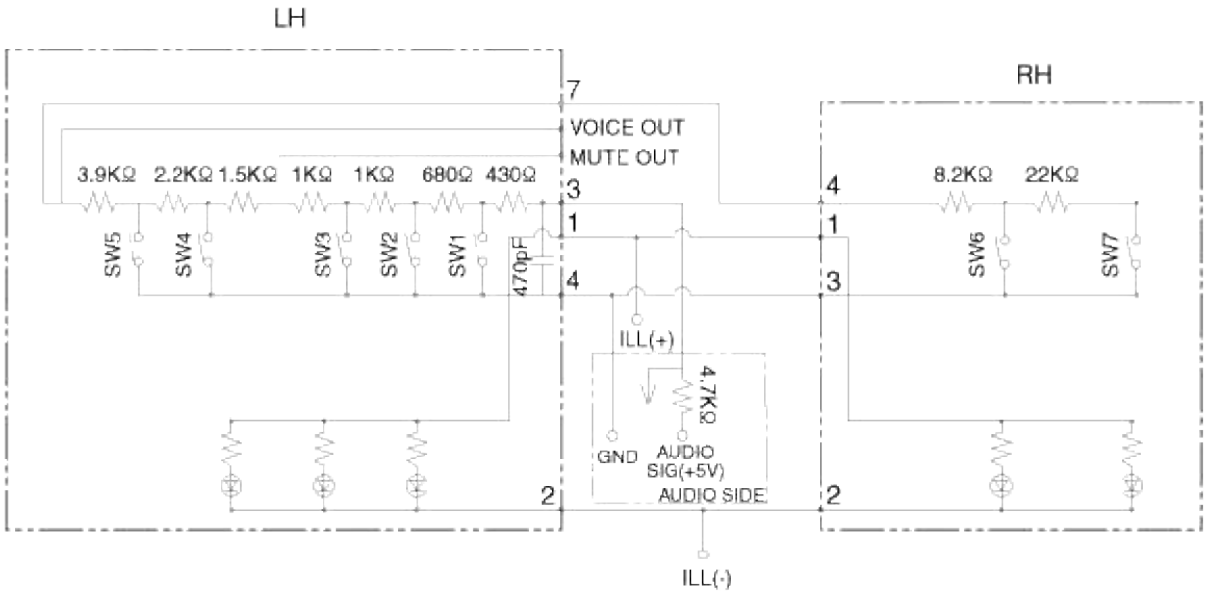
- This audio system supports Bluetooth hands-free and stereo headset features.
- HANDS-FREE feature: Making or receiving calls wirelessly.
- STEREO-HEADSET feature: Playing music from cellular phones (that supports A2DP feature) wirelessly.

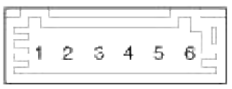
NOTE

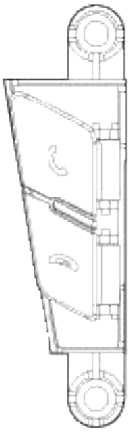
1. The phone must be paired to the system before using Bluetooth features.
2. Only one selected (connected) cellular phone can be used with the system at a time.
3. Some phones are not fully compatible with this system.

Body Electrical System > Hands Free System > Hands Free Switch > Schematic Diagrams

Circuit Diagram







[LH]

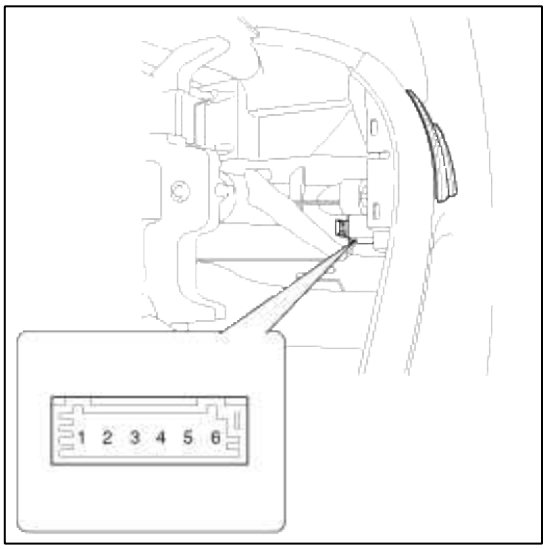
Pin NO.	Connector
1	-
2	-
3	Bluetooth in
4	Audio(-)
5	ILL(-)
6	ILL(+)

[LH]

Body Electrical System > Hands Free System > Hands Free Switch > Repair procedures

Inspection

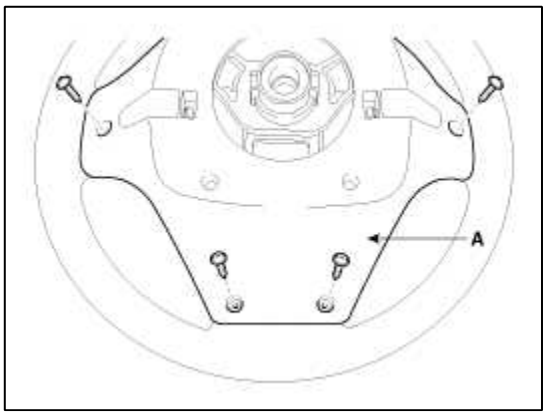
1. Check the hands free remote control switch for resistance between No.3 and No.4 terminals in each switch position.



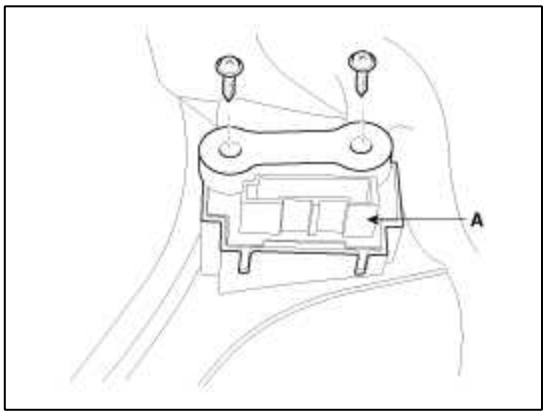
Switch	Connector terminal	Resistance (±5%)
END	3 - 4 (LH)	18.91 kΩ
CALL	3 - 4 (LH)	40.91 kΩ

Removal

1. Disconnect the negative (-) battery terminal.
2. Remove the driver airbag module.
   (Refer to the airbag group)
3. Remove the steering wheel.
   (Refer to ST group - "Steering column & shaft")
4. Remove the steering wheel cover after loosening the 4 screws.



5. Remove the hands free remote control switch (A) after removing the steering wheel remote control switch connector and 2 screws.



Installation

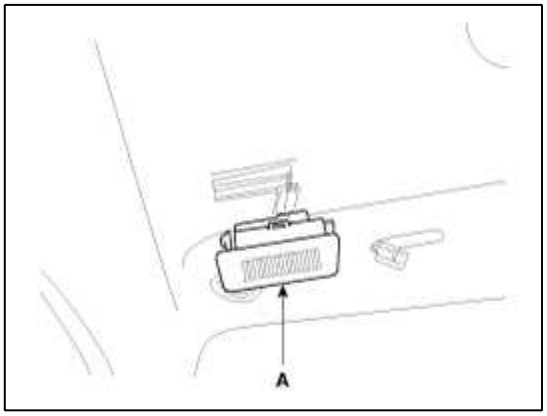
1. Reassemble the steering wheel remote control switch after connecting the connector.
2. Reassemble the steering wheel.
3. Reassemble the driver airbag module.

> NOTE
>
> Make sure the hands free remote control switch and the airbag module connectors are plugged in properly.

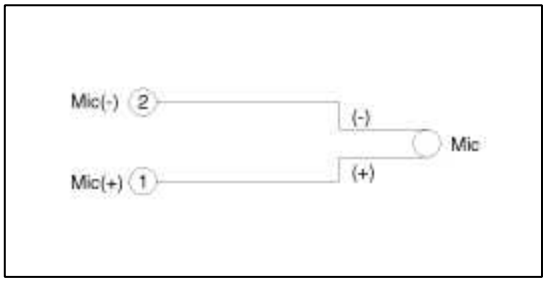
Body Electrical System > Hands Free System > Hands Free Mic > Repair procedures

Inspection

1. Disconnect the negative(-) battery terminal.
2. Remove the hands free mic (A) after loosening the connector from loof top.

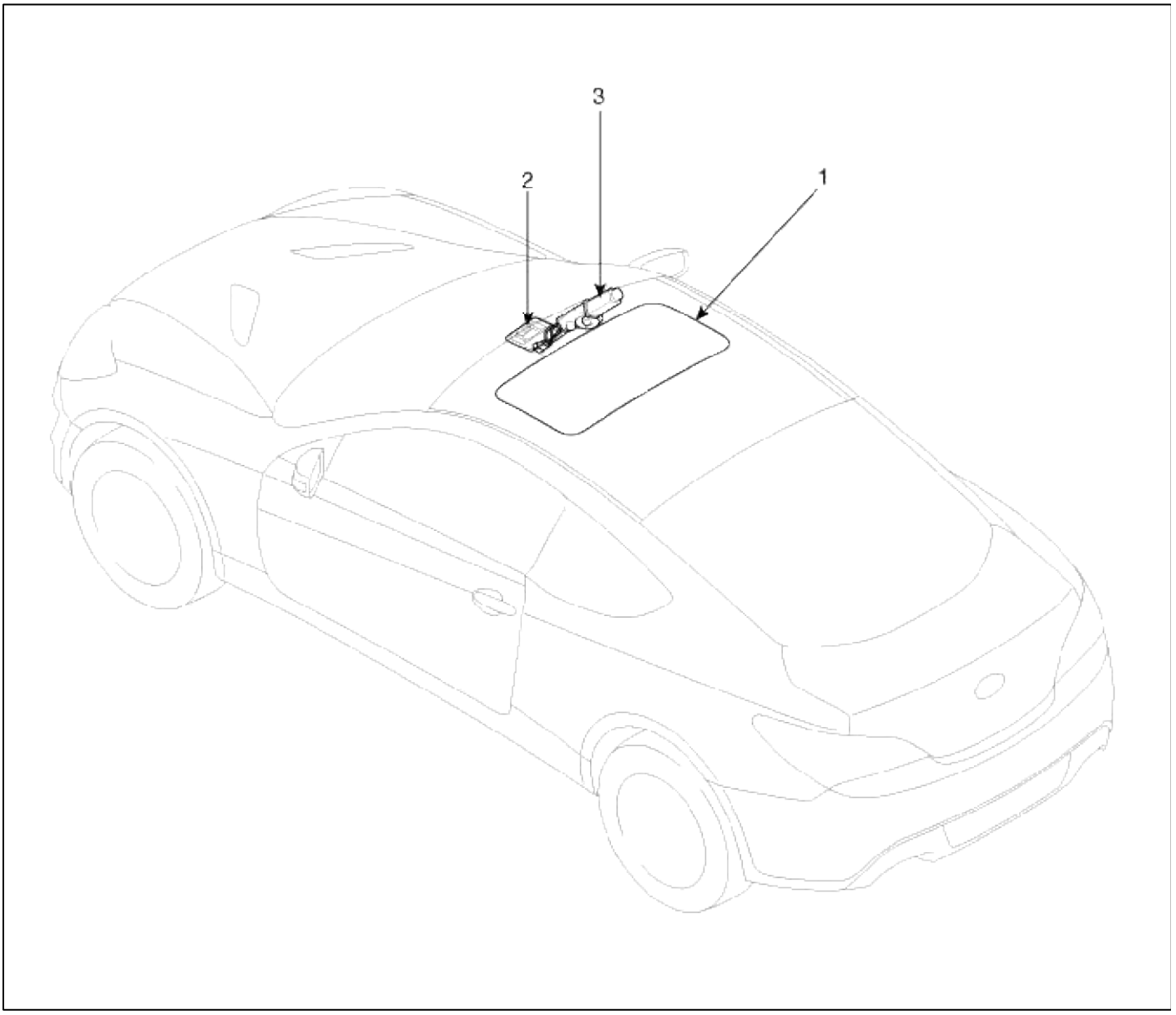


3. Check the continuity of Mic between terminals.



Body Electrical System > Sun Roof > Components and Components Location

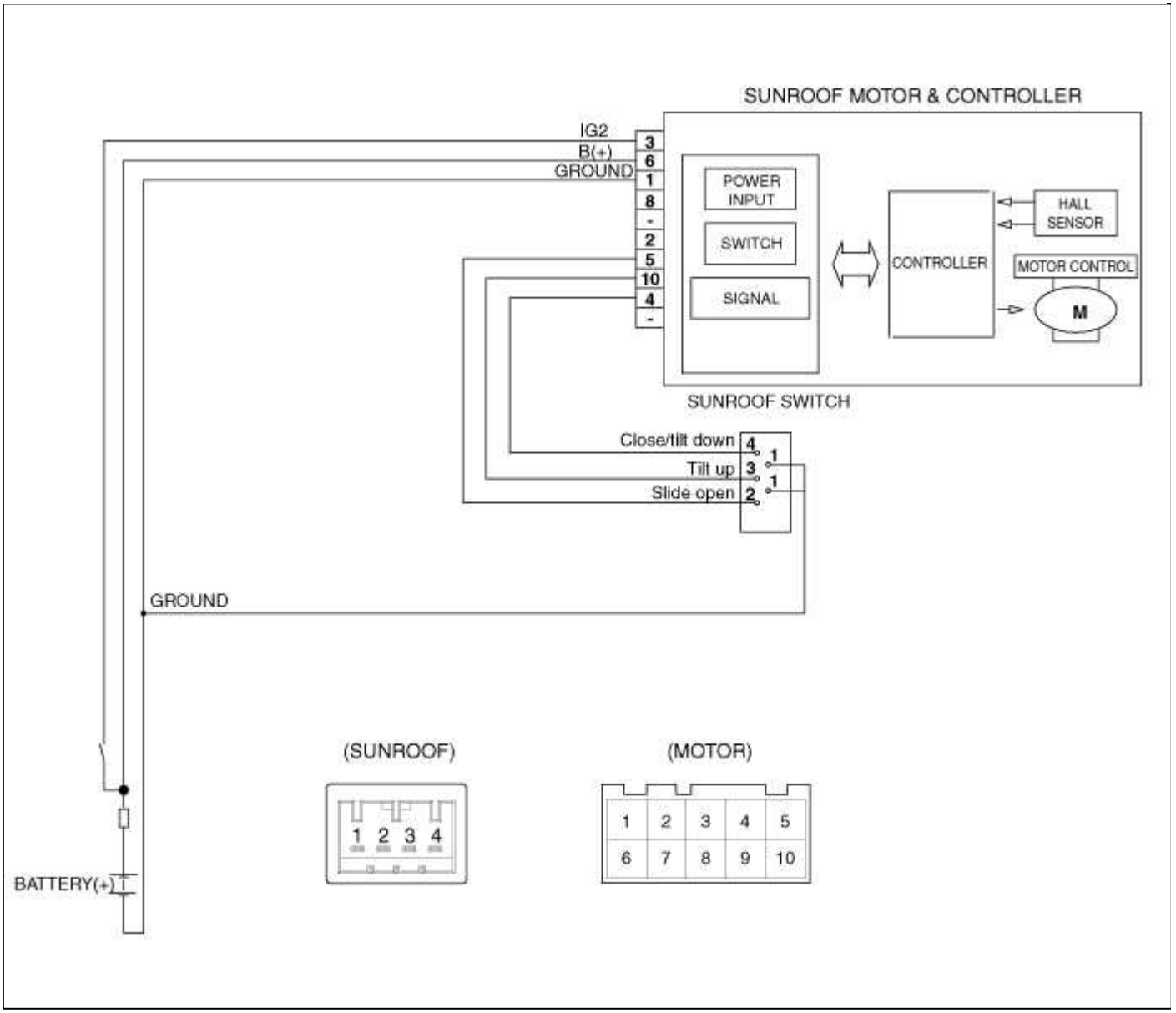
Component Location



1. Sunroof 2. Sunroof switch	3. Sunroof motor & controller

Body Electrical System > Sun Roof > Schematic Diagrams

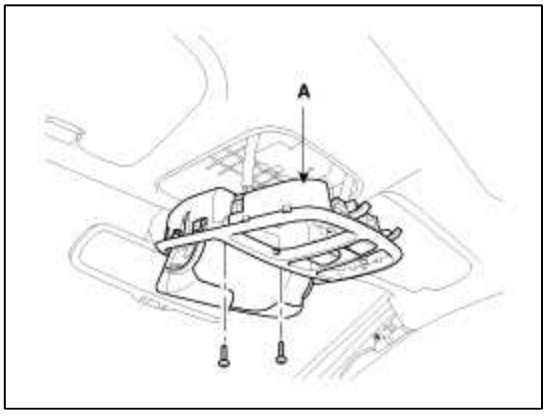
Circuit Diagram



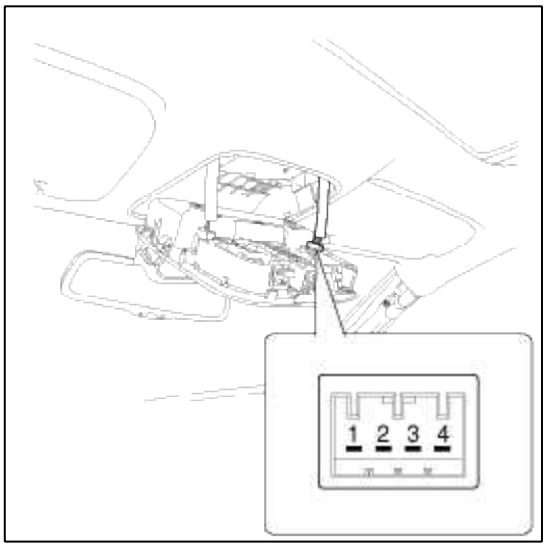
Body Electrical System > Sun Roof > Sunroof Switch > Repair procedures

Inspection

1. Disconnect the negative (-) battery terminal.
2. Open the sunglass case cover from the overhead console then remove the 2 screws holding the overhead console (A).



3. Disconnect the connector. Check for continuity between the terminals. If the continuity is not as specified, replace the sunroof switch.

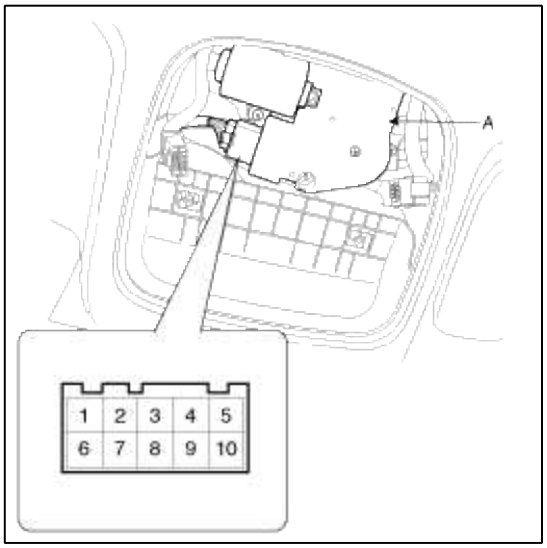


Position \ Terminal	1	2	3	4
Manual open	○	○		
Auto open	○	○	○	
Manual close Tilt down	○			○
Auto close	○		○	○
Manual tilt up	○		○	
Manual tilt down	○			○

Body Electrical System > Sun Roof > Sunroof Motor > Repair procedures

Inspection

1. Disconnect the negative (-) battery terminal.
2. Open the sunglass case cover from the overhead console then remove the 2 screws holding the overhead console. Disconnect the connector then remove the overhead console lamp assembly from the headliner.
3. Disconnect the sunroof motor(A) connector.



4. Ground the terminals as below table, and check that the sunroof unit operates as below table.

Terminal / Position	3	4	5	10
Manual open	⊕		⊖	
Auto open	⊕		⊖	⊖
Manual close Manual tilt down	⊕	⊖		⊖
Auto close	⊕	⊖		⊖
Manual tilt up	⊕			⊖
Manual tilt down	⊕	⊖	⊖	

5. Make these input tests at the connector
   If any test indicates a problem, find and correct the cause, then recheck the system.
   If all the input tests prove OK, the sunroof motor must be faulty; replace it.

Terminal	Test condition	Test: Desired result
3	IG2 ON	Check for voltage to ground: There should be battery voltage.
1	Under all conditions	Check for continuity to ground: There should be continuity.
6	Under all conditions	Check for voltage to ground: There should be battery voltage.

Replacement

Resetting The Sunroof

Whenever the vehicle battery is disconnected or discharged, or you use the emergency handle to operate the sunroof, you have to reset your sunroof system as follows :

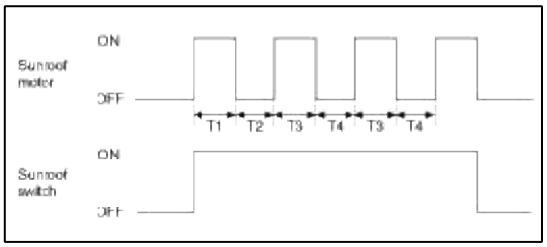
1. Turn the ignition key to the ON position and then close the sunroof completely.
2. Release the sunroof control lever.
3. Press and hold the CLOSE button for more than 10 seconds until the sunroof closed and it has moved slightly.
4. Release the sunroof control lever.
5. Press and hold the CLOSE button once again within 5 seconds until the sunroof do as follows;
   A. Tilt → Slide Open → Slide Close
      Then release the lever.
6. Reset procedure of panorama system is finished.

Protecting Motor From Overheating

In order to protect the sunroof motor from overheating from continuous motor operation, the sunroof ECU controls the Run-time and Cool-time of the motor as follows:

1. The Sunroof ECU detects the Run- time of motor
2. Motor can be operated continuously for the 1st run-time(120 ± 10sec.).
3. The continuous operation of motor stops after the 1st Run-time(120 ± 10sec.).
4. Then Motor is not operated for the 1st Cool-time(18 ± 2sec.).
5. Motor is operated for the 2nd Run-time(10 ± 2sec.) at the continued motor operation after 1st Cool-time(18 ± 2sec.)
6. The continuous operation of motor stops operating after the 2nd Run-time(10 ± 2sec.)
7. Motor is not operated for the 2nd Cool-time(18 ± 2sec.).

8. Motor repeats the 2nd run-time and 2nd cool-time at the continued motor operation.
   A. In case that motor is not operated continuously, the run-time is increased.
   B. The Run-Time of motor is initialized to "0" if the battery or fuse is reconnected after being disconnected, discharged or blown.



T1 : 120 ± 10 sec., T2 : 18 ± 2 sec.,
T3 : 10 ± 2 sec., T4 : 18 ± 2 sec.

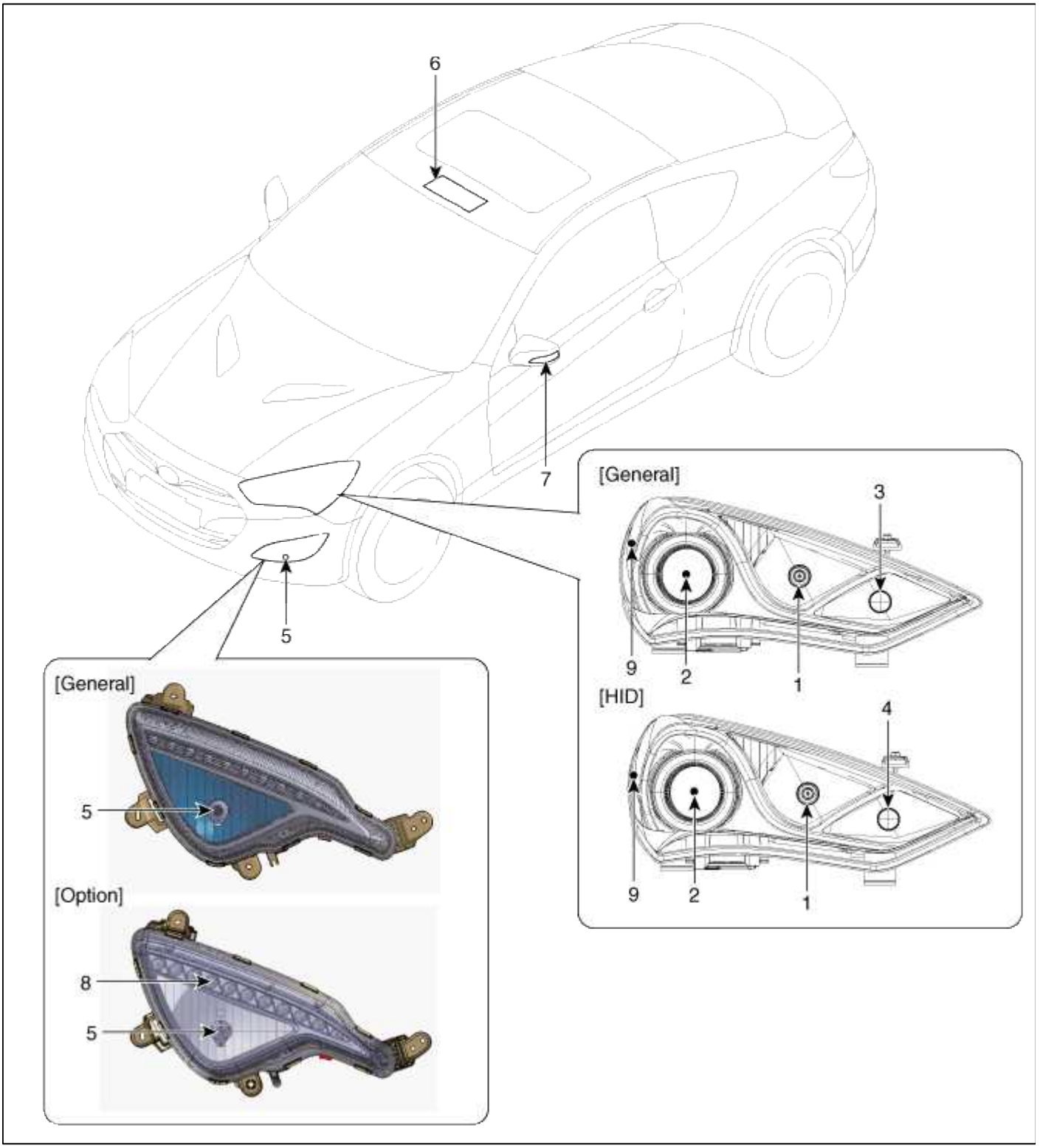
Body Electrical System > Lighting System > Specifications

Specification

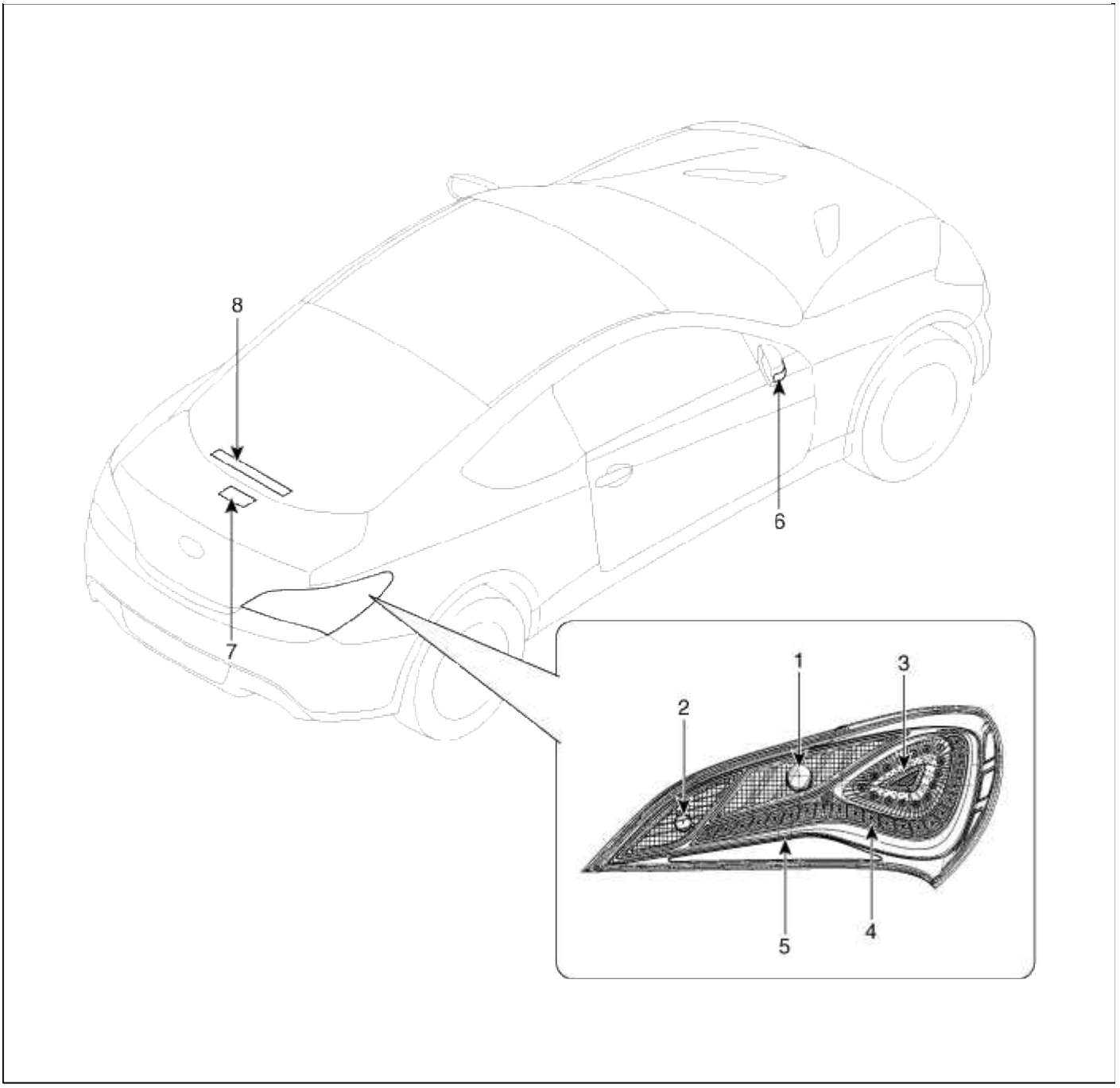
Items			Bulb watt (W)	Bulb type
Front	Head lamp (High)		55	H7
	Head lamp (Low)	General	55	H7
		HID	35	D1S
	Turn signal / Position lamp		28/8	PY28/8WLL
	Front fog lamp		35	H8
	Daytime running light		LED	-
	Side marker		5	W5WLL
Rear	Stop / Tail lamp		LED	-
	Back up lamp		16	W16W
	Turn signal lamp		27	PY27WL
	Tail lamp		LED	-
	Side marker		LED	-
	License plate lamp		5 x 2	W5W
Others	Overhead console lamp		10 x 2	W10W
	Luggage lamp		5	Festoon
	Vanity lamp		5	Festoon
	Glove box lamp		5	Festoon
	High mounted stop lamp		LED	-

Body Electrical System > Lighting System > Components and Components Location

Component Location



1. Head lamp (High)	4. Front turn signal lamp	7. Trun signal lamp (Mirror)
2. Head lamp (Low)	5. Front fog lamp	8. DRL
3. Turn signal / Position	6. Map lamp	9. Side marker

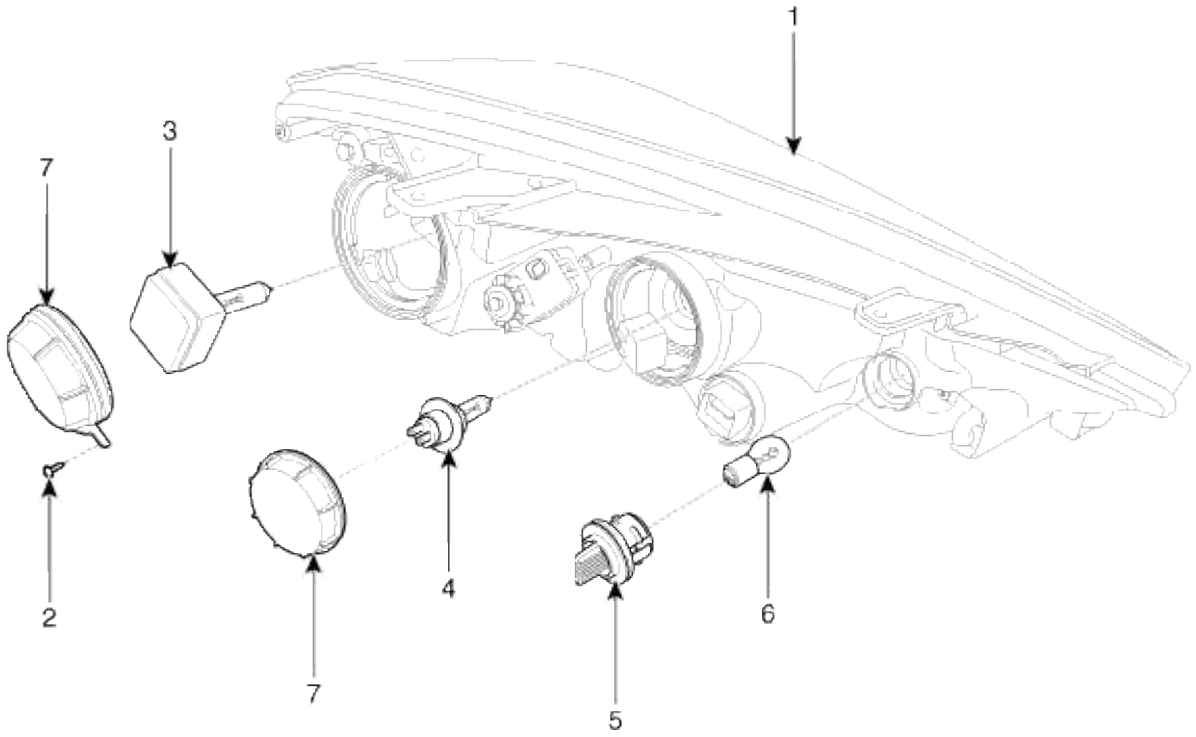


1. Turn signal lamp 2. Back up lamp 3. Tail / Stop lamp 4. Tail / Stop lamp	5. Rear fog lamp 6. Turn signal lamp (Mirror) 7. Luggage lamp 8. High mounted stop lamp

Body Electrical System > Lighting System > Head Lamps > Components and Components Location

Component

[HID]

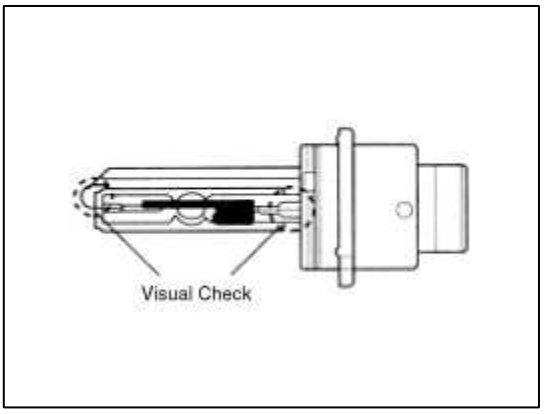


1. Head lamp assembly housing 2. Screw 3. Head lamp (Low) lamp 4. Headlamp (High) lamp	5. Socket 6. Turn signal/Tail lamp 7. Dust cover

Body Electrical System > Lighting System > Head Lamps > Repair procedures

Inspection

1. Check-points upon head lamp failure (HID)
   (1) Check the battery voltage. (Low beam will be on when the battery voltage above 9V.)
   (2) Check the fuse and relay.
   (3) Check the polarity of ballast. (If the polarity are changed, low beam doesn't lighten)
   (4) Check the bulb connector securely.
   (5) Visually bulb checking (no filament): damaged glass, damaged for upper parts and lower parts of glass tube.
   (6) After (1)~(5), replace the ballast and the ignitor. (ballast assembly).



2. Service procedure and warning (HID)

No.	Item	Service procedures	Warning	Remarks
1	Replacement of lamp assembly	1. Disconnect the power connector from the lamp. 2. Remove and replace the lamp assembly. 3. Connect the power connector.	• Disconnect the head lamp power connector to avoid high voltage.	• Other description is the same as the halogen bulbs.
2	Replacement of the Bulb	1. Disconnect the power connector from the lamp. (head lamp, turn signal, head lamp leveling device) 2. Remove the lamp assembly. 3. Remove the ballast and dust cover. 4. Remove the bulb socket and replace the bulb. 5. Installation is the reverse of removal.	• Disconnect the head lamp power connector to avoid high voltage. • Be careful not to damage the bulb and use genuine bulbs only. • Do not apply excessive force and fit it correctly.	
		1. Disconnect the power connector from the lamp.		

3	Replacement of the Ballast (with built-in ignitor)	2. Remove the lamp and then the ballast and the dust cover. 3. Remove the head lamp leveling device and then the bulb socket. 4. Connect the bulb socket on the replacement ballast and install the leveling device. 5. Installation is the reverse of removal.	• Disconnect the head lamp power connector to avoid high voltage.	• Replace the ballast only and install the used lamp. • Replace the sub assembly except the ballast.
4	Others	1. Power supply should be according to the rated capacity. 2. Use the rated fuse and wire. 3. Bulb socket shall be free from moisture or dirt. 4. Do not apply the ballast severe shock, water, or extreme	• All parts should be serviced only at specified service centers.	• HID lamp should not be installed on other cars (Dangerous, fire may occur.)

CAUTION

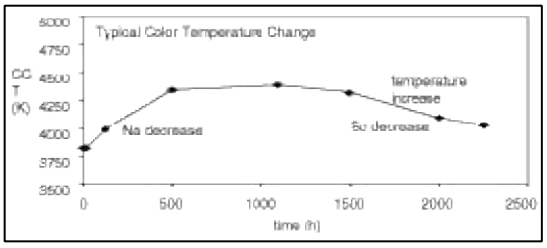
HID lamp shall not be used on other cars.(Fire may occur.)
Fire may occur when HID lamp initially lights due to the fact that arc-discharge generates high voltage (max. 30,000V) and high current (12-13A), and are different from the halogen lamp specification.

3. Understanding of color change by replacement of HID bulb.

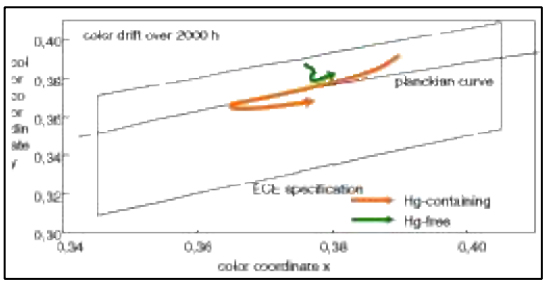
(1) The cause of HID color change.

(Change of color is HID feature)

A. The change of color occur during mixing three Elements in the HID bulb.



B. Color Coordinates by Lifetime



C. Chemical compounds in an arc tube :

1. Xenon gas(an inert gas , protection of arc tube)
2. Mercury(increase voltage, protection of arc tube, blue in the first 3 second)
3. Metal halide

- Natrium(Yellow) : 0.12mg
- Scandium(Blue) : 0.06mg
- Iodine(Halogen) : 0.02mg

(2) Change of Color by Lighting Up Time

A. It needs 4 seconds at least for stabilization.
At first, you can see the blue for 3 seconds because of Mercury.

B. After stabilization, change of color occur by metal halide.

- 0 Hour : Yellow(Na is more than Sc.)
- 10 Hour : Bright Blue (Na and Sc are similar ratio.)
- 1000Hour more : Blue (Sc is more than Na.)

C. The end of lifetime : When HID used up Natrium and Scandium, a beam of light will be dark suddenly. so you can see the red, purple and turn on and off.

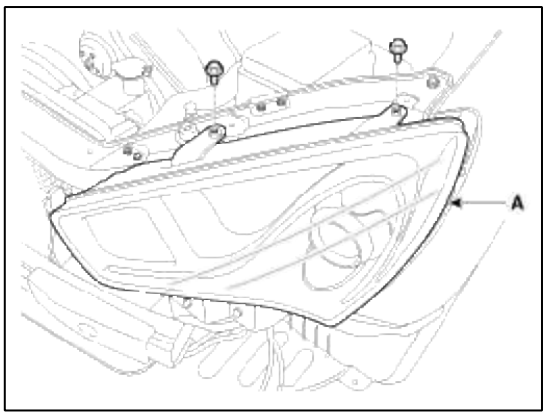
Characteristic

1. Durable for vibration as there is no filament.
2. HID lamp had a more long life than halogen lamp.
3. Does not operate if polarity is changed.
4. Operating input voltage : 9-16V

Removal

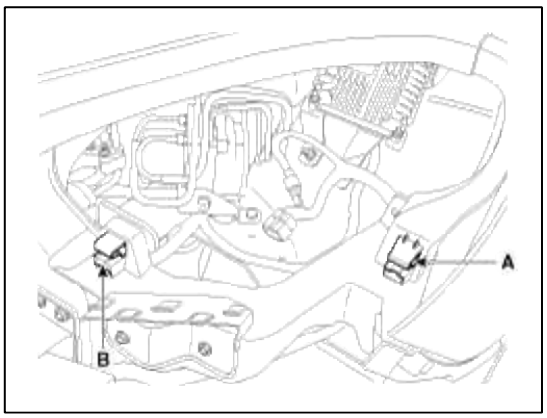
Head Lamp Assembly

1. Disconnect the negative (-) battery terminal.
2. Remove the front bumper.
(Refer to BD group - "Front bumper")
3. Remove the head lamp assembly(A) after loosening the mounting bolt(2EA).

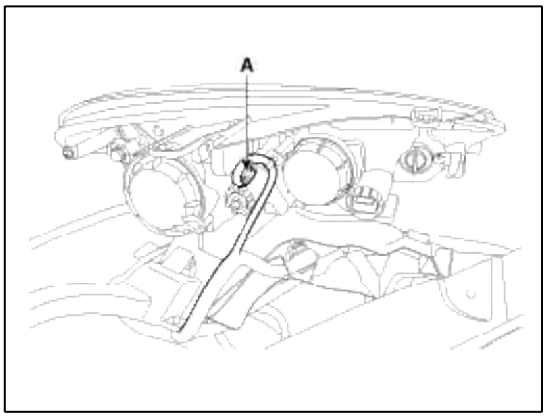


NOTE

Take care that holding clip (A, B) is not to be damaged.



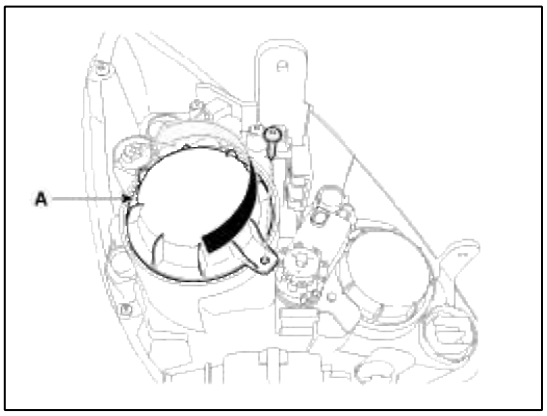
4. Disconnect the head lamp connectors(A) (HID only).



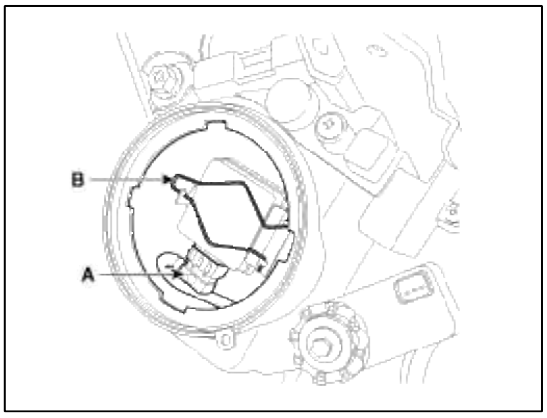
5. Remove the bulb caps from the head lamp assembly after turning in the counter clock-wise direction.

Head Lamp Bulb (Low)

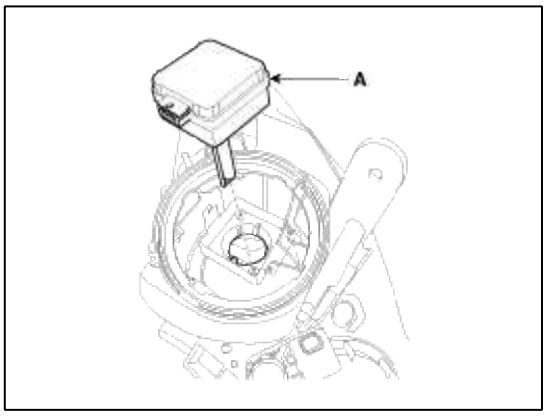
1. Disconnect the head lamp connector.
2. Remove the dust cover (A) after loosening the screw (HID only).



3. Remove the bulb connector (A) and Ignitor fixing clip (B) (HID only).



4. Remove the Ignitor & bulb (A) (HID only).



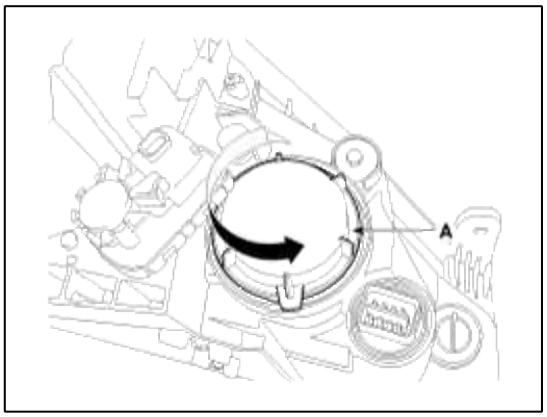
CAUTION

Turn the head lamp switch off to avoid high voltage
Be careful not to damage the bulb and use genuine bulbs only

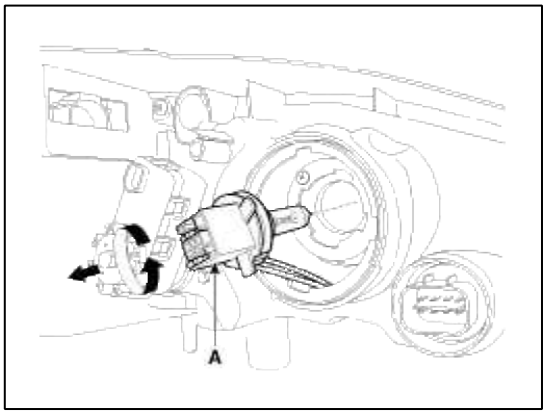
- Do not apply excessive force and fit it correctly.
- Confirm the bulb locking

Head Lamp Bulb (High)

1. Disconnect the head lamp connector.
2. Turn the dust cover (A) counterclockwise and remove it.



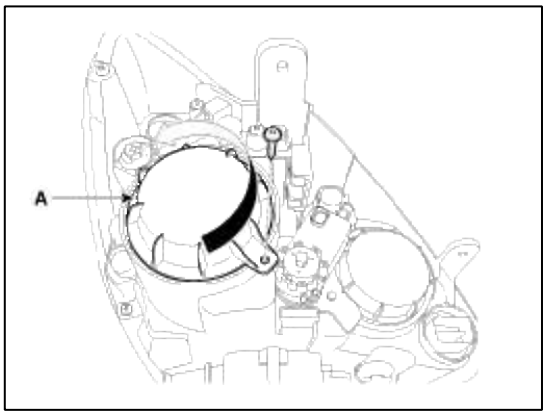
3. Turn the bulb socket (A) counterclockwise and remove it.



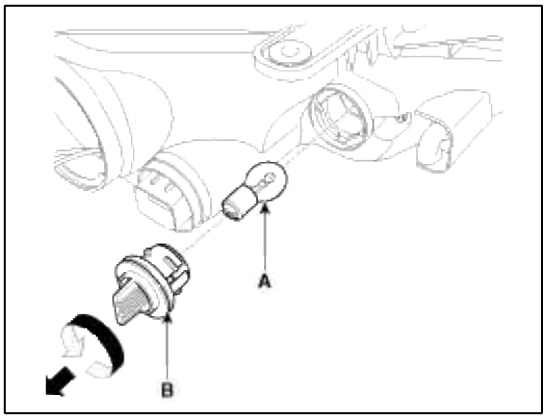
Head Lamp Bulb (Turn signal)

1. Disconnect the head lamp connector.

2. Remove the dust cover (A) after loosening the screw (HID only).

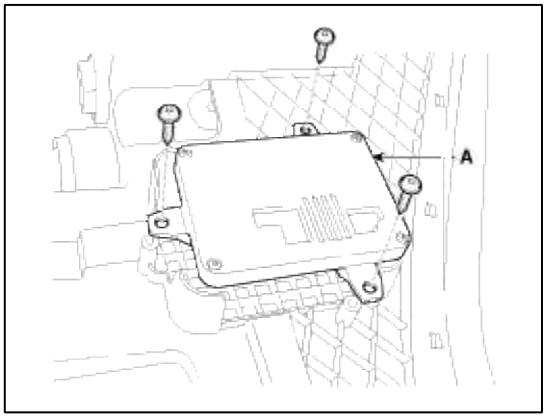


3. Turn the bulb socket (B) counterclockwise and the remove the turn signal bulb (A).



Ballast

1. Turn the head lamp switch off.
2. Remove the head lamp assembly.
3. Disconnect the head lamp connector.
4. Remove the ballast (A) after loosening the screws (3EA).



CAUTION

- HID lamp shall not be used on other cars.(Fire may occur.)
- Fire may occur when HID lamp initially lights due to the fact that arc-discharge generates high voltage (max. 20,000V) and high current (12-13A), and are different from the halogen lamp specification.
- Install the dust cover after confirming the locking state between bulb and bulb holder.
- When testing the HID head lamp, turn the power on or off with switch between power supply and lamp because of high voltage.
- Do not operate the head lamp switch with the bulb not installed, because it generates spark momently.

Installation

Head Lamp Assembly

1. Install the head lamp assembly after connecting the connector.
2. Install the radiator under cover.
3. Connect the negative (-) battery terminal.

Head Lamp Aiming Instructions

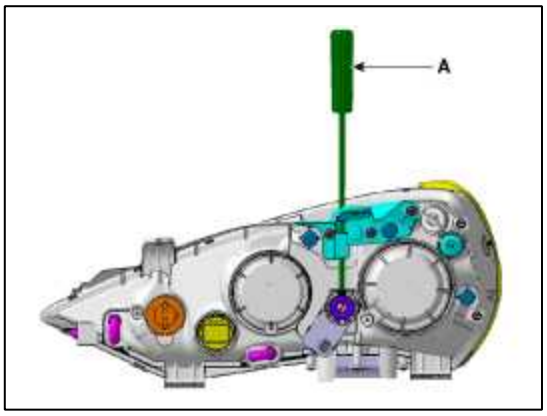
The head lamps should be aimed with the proper beam-setting equipment, and in accordance with the equipment manufacturer's instructions.

NOTE

If there are any regulations pertinent to the aiming of head lamps in the area where the vehicle is to be used, adjust so as to meet those requirements.

Alternately turn the adjusting gear to adjust the head lamp aiming. If beam-setting equipment is not available, proceed as follows:

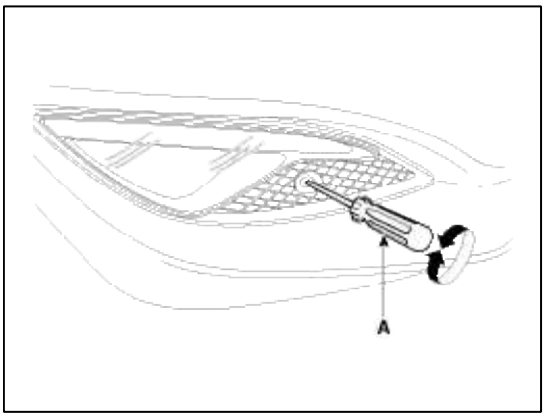
1. Inflate the tires to the specified pressure and remove any loads from the vehicle except the driver, spare tire, and tools.
2. The vehicle should be placed on a flat floor.
3. Draw vertical lines (Vertical lines passing through respective head lamp centers) and a horizontal line (Horizontal line passing through center of head lamps) on the screen.
4. With the head lamp and battery in normal condition, aim the head lamps so the brightest portion falls on the horizontal and vertical lines.
   Make vertical(A) adjustments to the lower beam using the adjusting wheel.



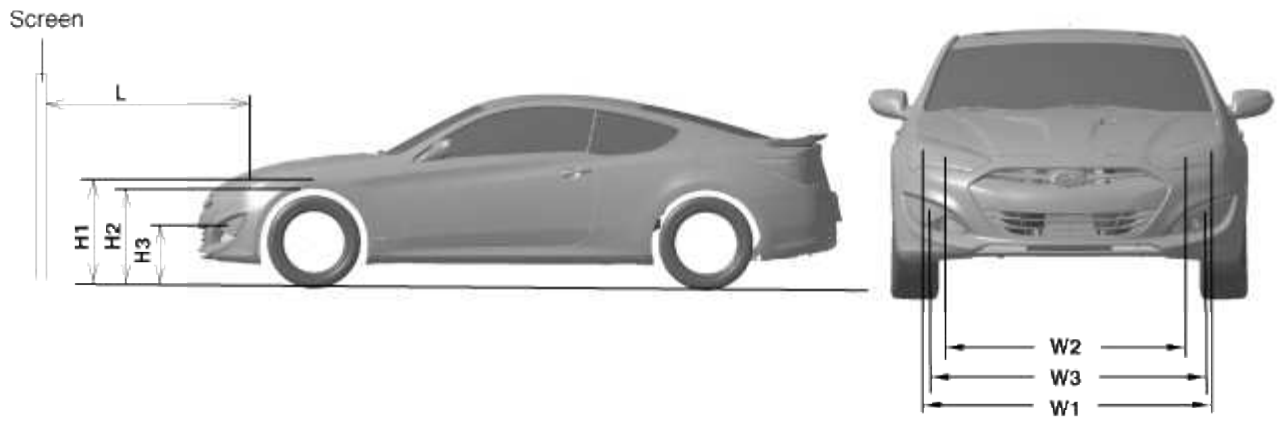
Front Fog Lamp Aiming

The front fog lamps should be aimed as the same manner of the head lamps aiming.

With the front fog lamps and battery normal condition, aim the front fog lamps by turning the adjusting screw(A) with a driver.



Head Lamp And Fog Lamp Aiming Point

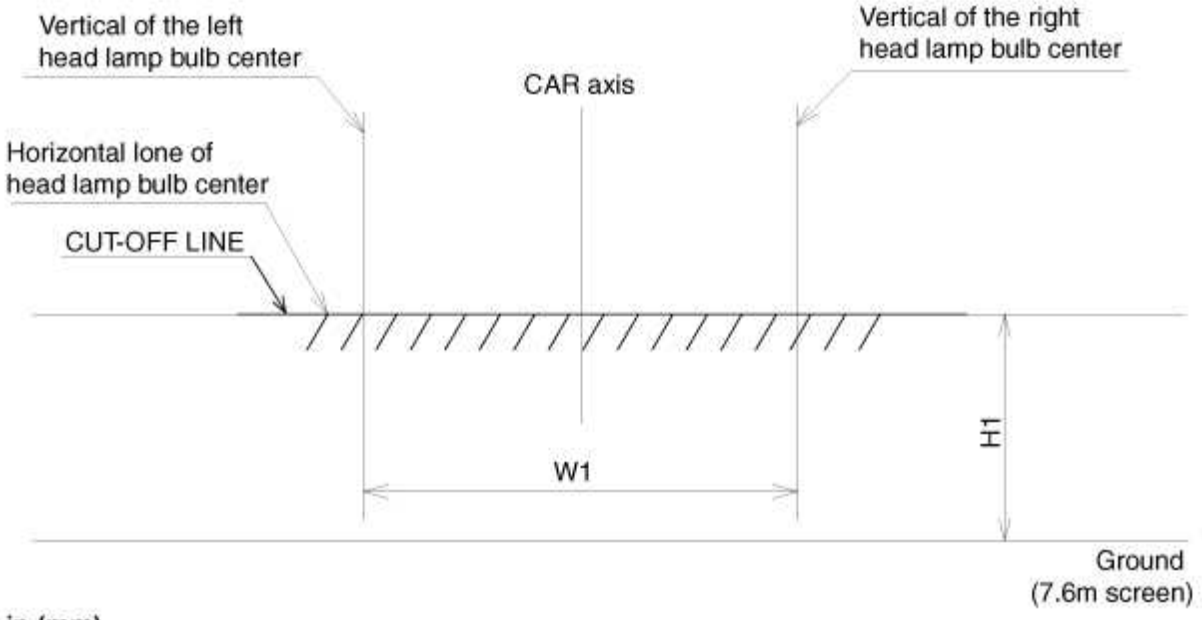


H1 : Height between the head lamp bulb center and ground (Low beam)
H2 : Height between the head lamp bulb center and ground (High beam)
H3 : Height between the fog lamp bulb center and ground
W1 : Distance between the two head lamp bulbs centers (Low beam)
W2 : Distance between the two head lamp bulbs centers (High beam)
W3 : Distance between the two fog lamp bulbs centers
L : Distance between the head lamp bulb center and screen

Unit : in(mm)

Vehicle condition	H1	H2	H3	W1	W2	W3	L
Without driver	27.7(704)	27.6(701)	15.5(394)	59.84 (1,519)	48.7 (1,238)	59.8 (1,519)	Refer to aiming condition
With driver	27.4(696)	27.3(693)	15.2(386)				

1. General Type (VOR)
   A. Turn the low beam on without driver aboard.
   B. The cut-off line should be projected in the allowable range (shaded region) shown in the picture.
   C. If head lamp leveling device is equipped, adjust the head lamp leveling device switch with 0 positions.



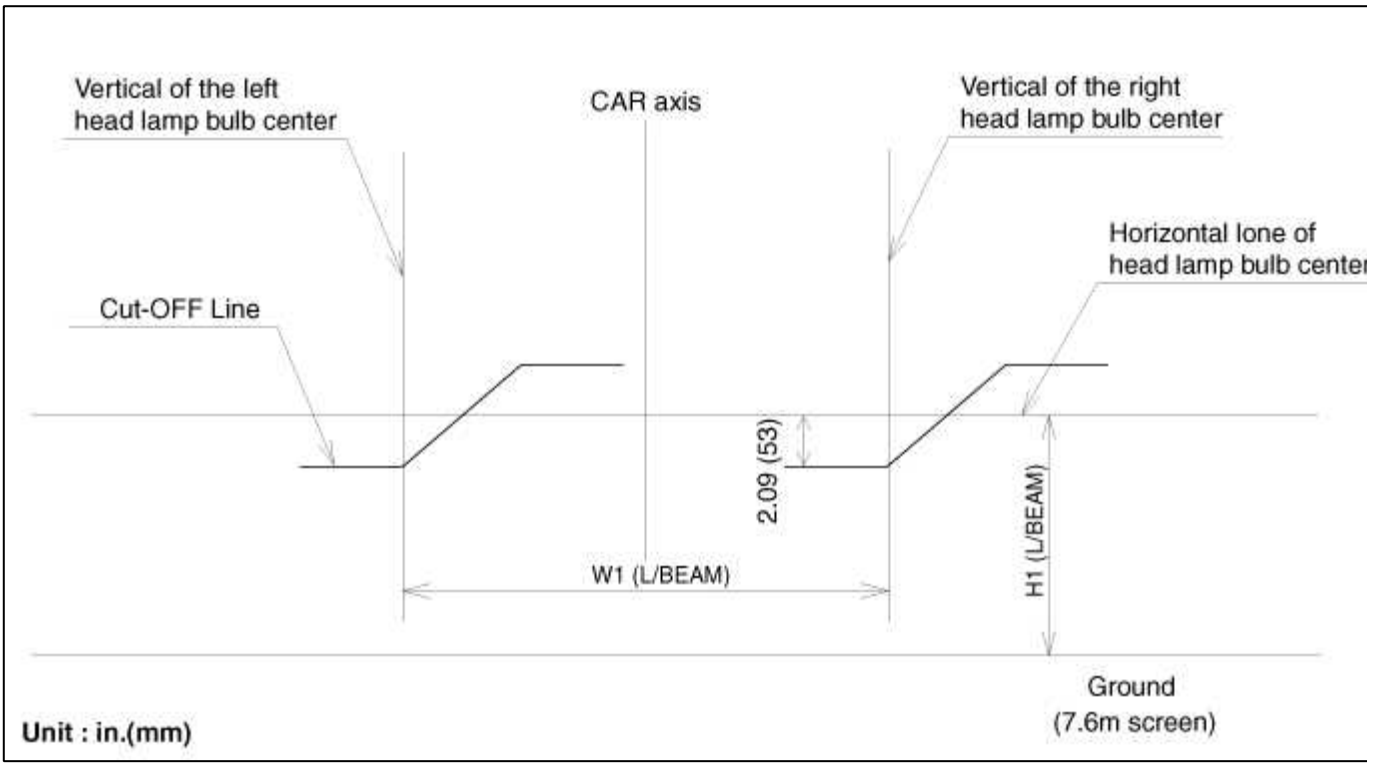
Unit : in.(mm)

2. HID Type (VOL)

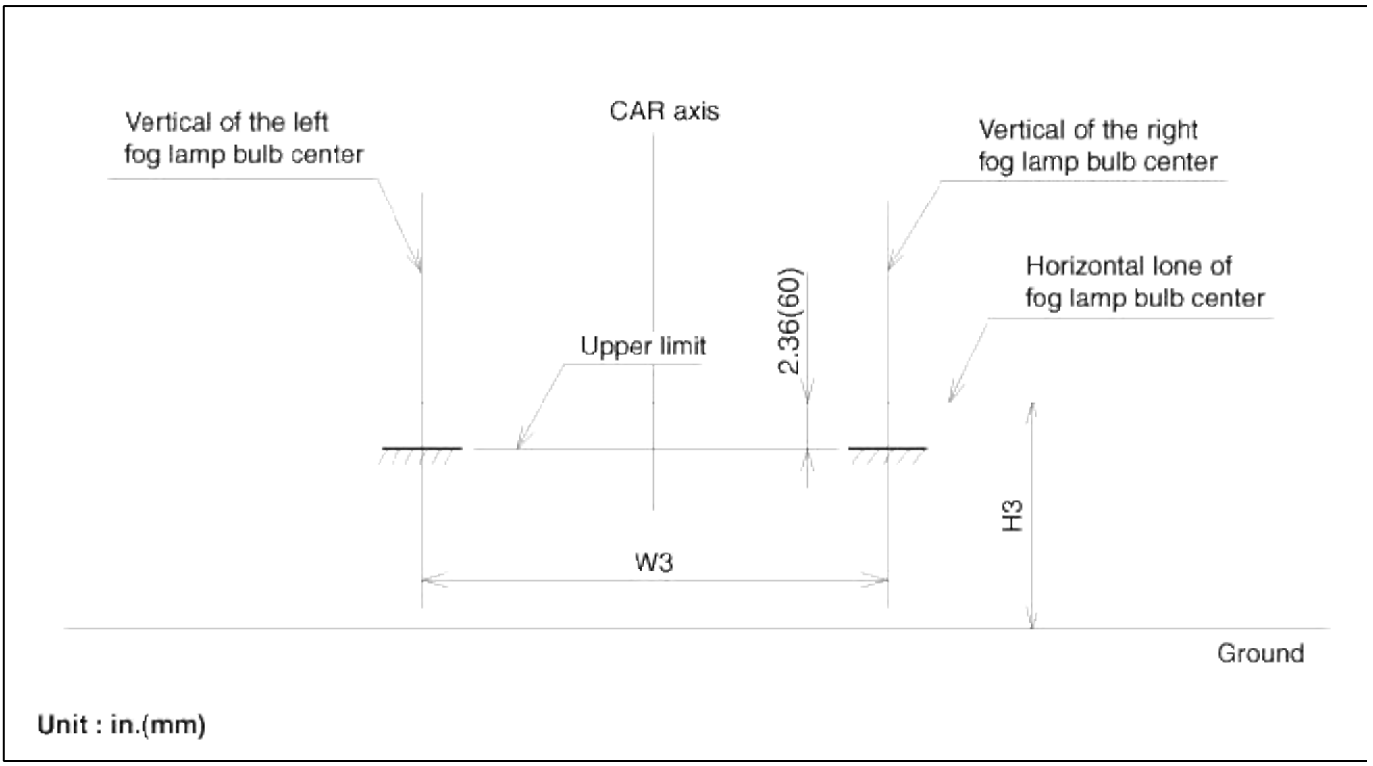
A. Turn the low beam on without driver aboard.

B. The cut-off line should be projected in the cut-off line shown in the picture.

C. If head lamp leveling device is equipped, adjust the head lamp leveling device switch with 0 positions.



3. Turn the front fog lamp on without the driver aboard.
The cut-off line should be projected in the allowable range (shaded region)

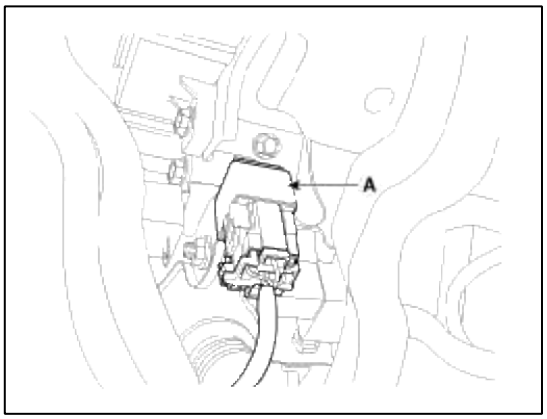


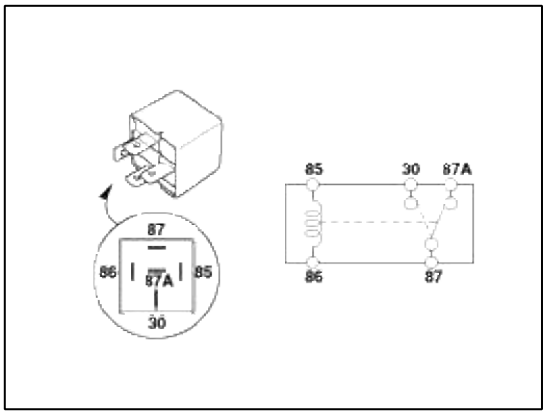
Body Electrical System > Lighting System > Rear combination lamp > Repair procedures

Inspection

Stop Lamp Relay

1. Check for continuity between the terminals.

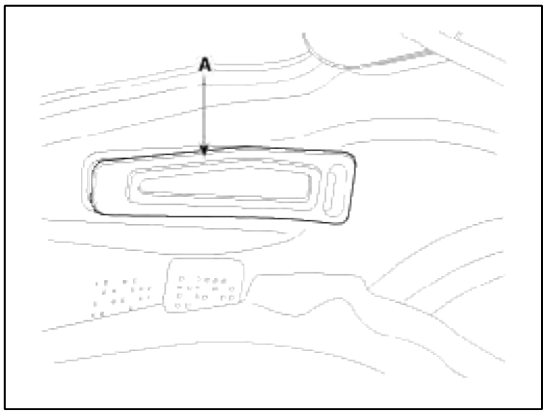




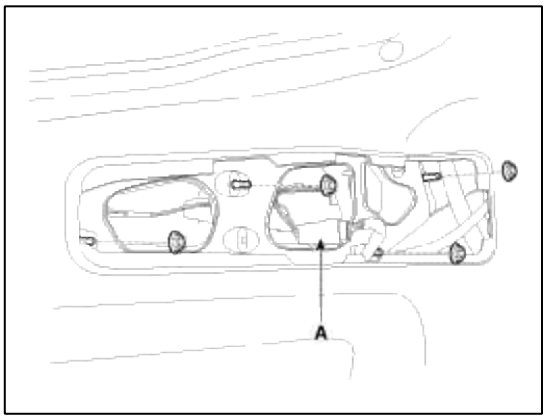
Terminal / Power	86	85	87	87a	30
Disconnected	○	○			
Connected	⊖	⊕	○	○	○

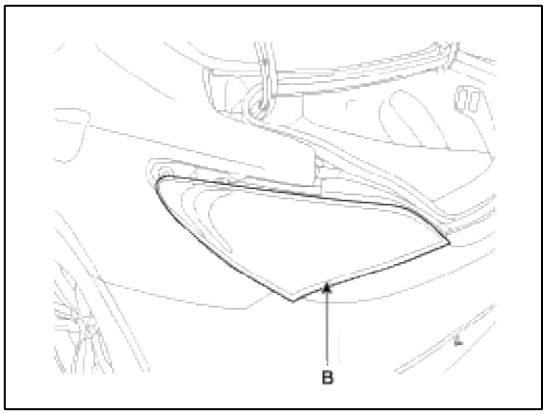
Removal

1. Disconnect the negative (-) battery terminal.
2. Remove the rear combination lamp cover (A).

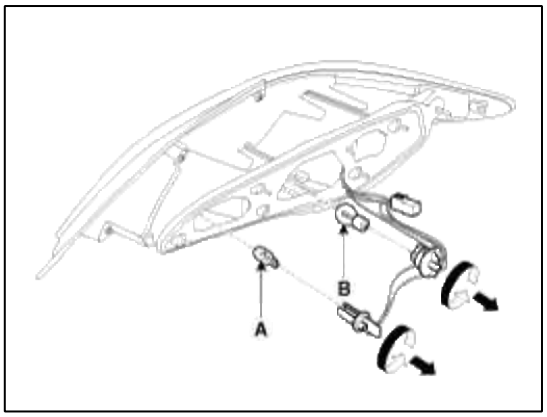


3. Loosen the rear combination lamp mounting nuts (4EA) and disconnect the connector (A) then remove the rear combination lamp assembly (B).





4. If necessary to replace the bulb, replace the bulb turning the cap in the counter clock-wise direction without removal of rear combination lamp assembly.
   A : Back up lamp, B : Turn signal lamp



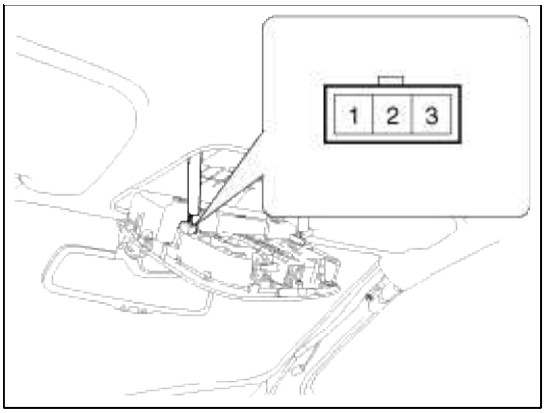
Installation

1. Install the rear combination lamp assembly after replacing the bulbs.

Body Electrical System > Lighting System > Overhead Console Lamp > Repair procedures

Inspection

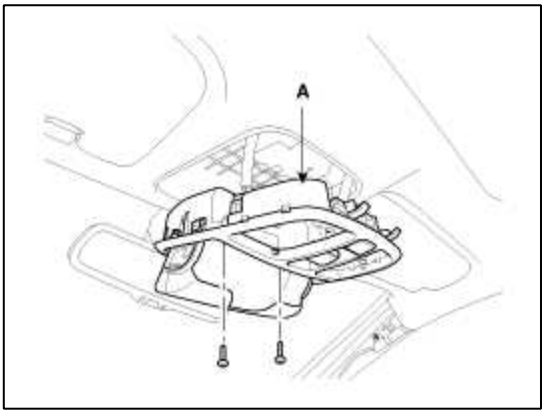
Remove the overhead console lamp assembly then check for continuity between terminals. If the continuity is not as specified, replace the map lamp switch.



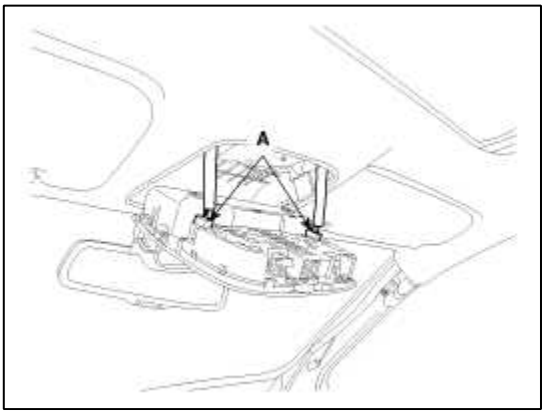
Terminal / Position	1	3	2
ON	○	⊗	○
DOOR		⊗	○
OFF			

Removal

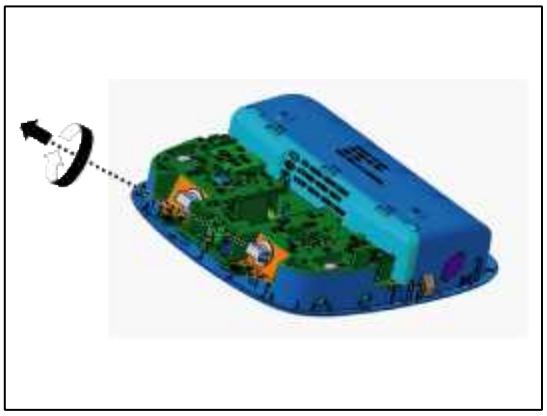
1. Disconnect the negative (-) battery terminal.
2. Loosen 2 screws holding the overhead console(A).



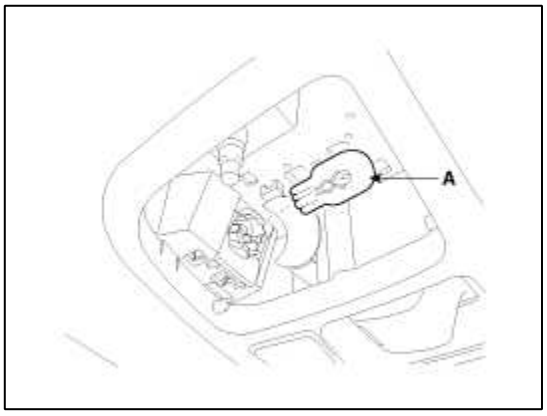
3. Disconnect the connectors(A) of sunroof switch then remove the overhead console lamp assembly.



4. Replace the bulb after turning the socket in the conunterclockwise direction.



5. If necessary to replace the bulb(A) only, replace the bulb after opening the overhead console lens.



Installation

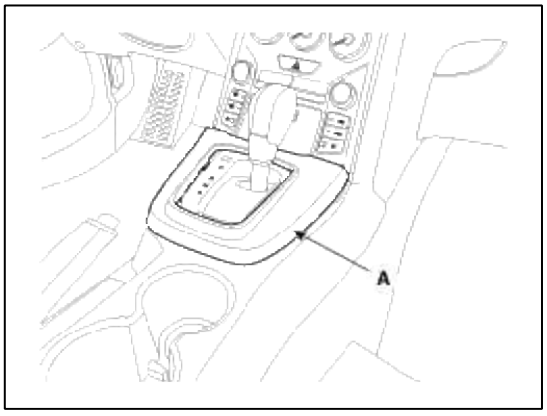
1. Install the overhead console lamp after connecting the sunroof switch connector and lamp connector.
2. Install the lens.(If lens is removed.)
3. Tighten the screws.

Body Electrical System > Lighting System > Hazard Lamp Switch > Repair procedures

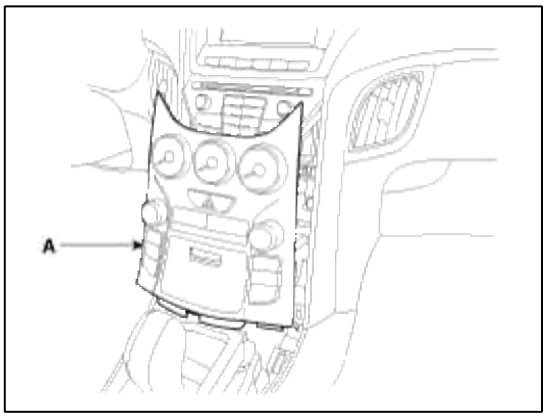
Removal

Hazard Lamp Switch

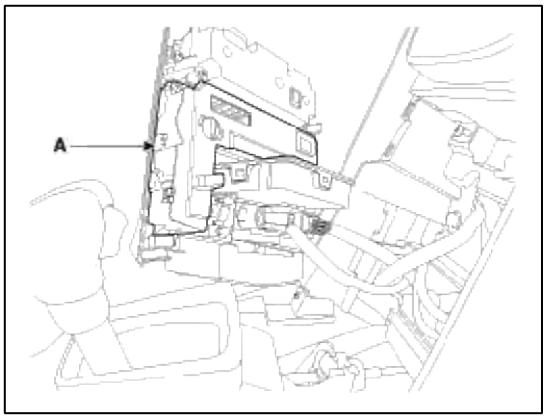
1. Disconnect the negative (-) battery terminal.
2. Remove the console upper cover(A).
   (Refer to Body group - "Console")



3. Remove the center fascia lower panel(A).



4. Disconnect the heater control unit connectors and cables.



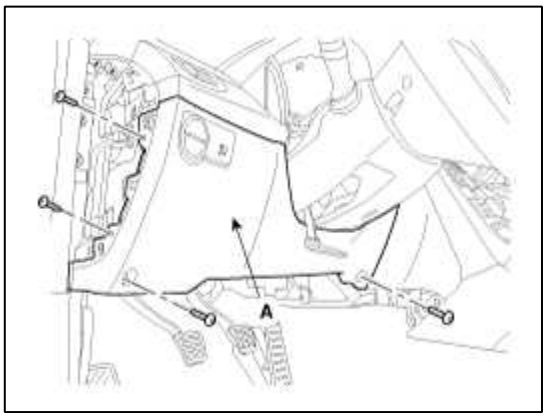
Installation

1. Install the heater control unit.
2. Install the center fascia lower panel and console upper cover.

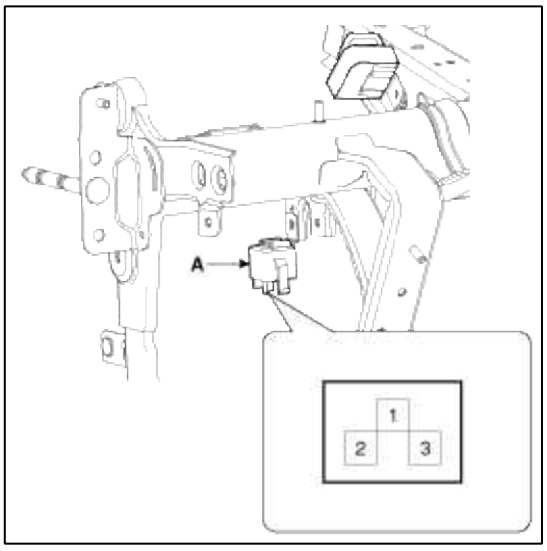
Body Electrical System > Lighting System > Flasher Unit > Repair procedures

Inspection

1. Disconnect the negative (-) battery terminal.
2. Remove the driver crash pad lower panel (A).



3. Remove the flasher unit (A) after loosening the bolt and disconnecting the connector.



4. Connect the positive (+) lead from the battery to terminal 2 and the negative (-) lead to terminal 3.
5. Connect the two turn signal lamps in parallel to terminals 1 and 3. Check that the bulbs turn on and off.

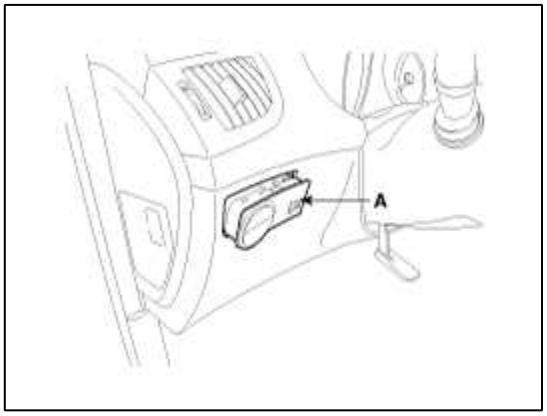
NOTE

The turn signal lamps should flash 60 to 120 times per minute. If one of the front or rear turn signal lamps has an open circuit, the number of flashes will be more than 120 per minute. If operation is not as specified, replace the flash unit.

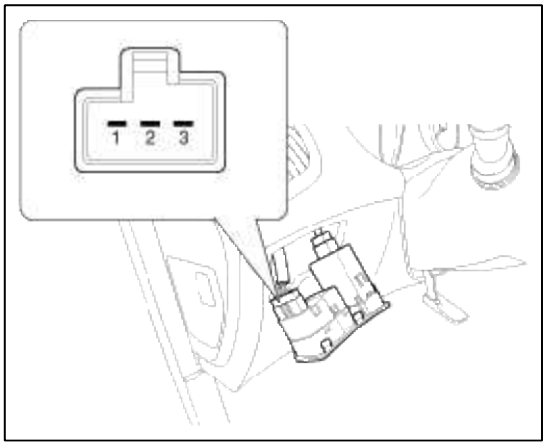
Body Electrical System > Lighting System > Rheostat > Repair procedures

Inspection

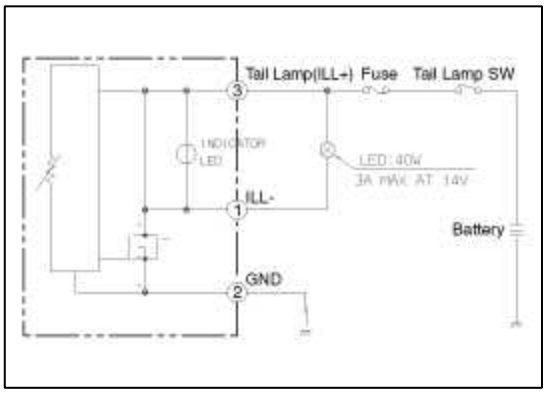
1. Disconnect the negative (-) battery terminal.
2. Remove the lower crash pad switch (A) from the side crash pad cover by using the scraper.



3. Disconnect the rheostat connector from lower crash pad switch.



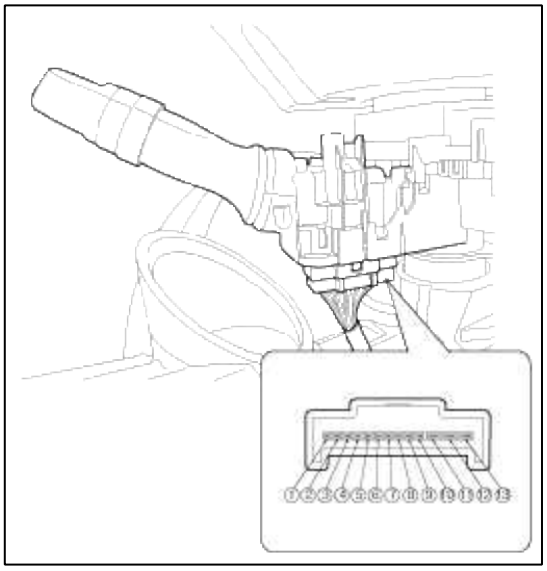
4. Check for intensity. If the light intensity of the lamps changes smoothly without any flickering when the rheostat is turned, it can be assumed that the rheostat is normal.



Body Electrical System > Lighting System > Front Fog Lamps > Repair procedures

Inspection

1. Disconnect the negative(-) battery terminal.
2. Remove the lighting switch of the multi-function switch. (Refer to the multi-function switch)
3. With the front fog lamp switch, make sure that continuity exists between the terminals below. If continuity is not as specified, replace the multi-function switch.



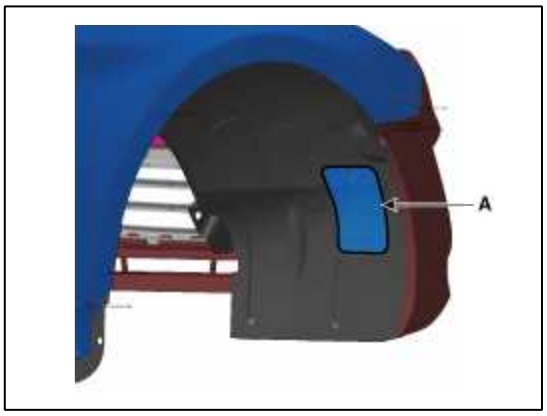
Front Fog Lamp

Terminal / Position	5	6
OFF		
ON	○	○

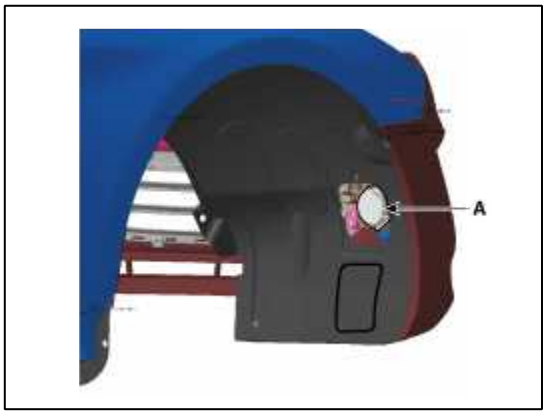
Removal

1. Disconnect the negative (-) battery terminal.

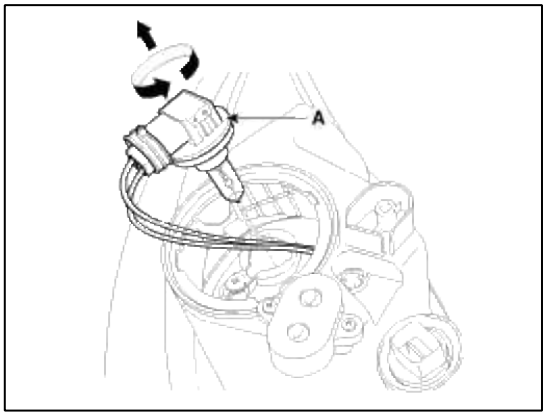
2. Open the front wheel guard service cover (A).



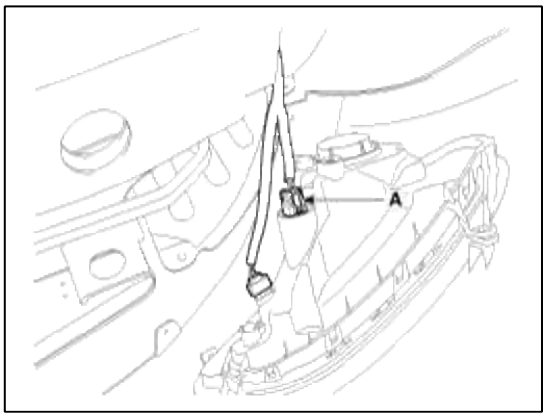
3. Remove the dust cover (A) in the service cover.



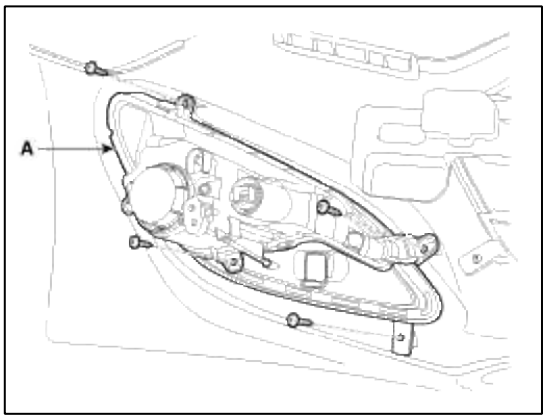
4. Replace the front fog bulb turning it in the counterclockwise direction.



5. Remove the front bumper when it need to remove the front fog lamp assembly. (Refer to BD group - "Front Bumper")
6. Disconnect the front fog lamp connector (A).



7. Remove the front fog lamp assembly (A) after loosening the screws.



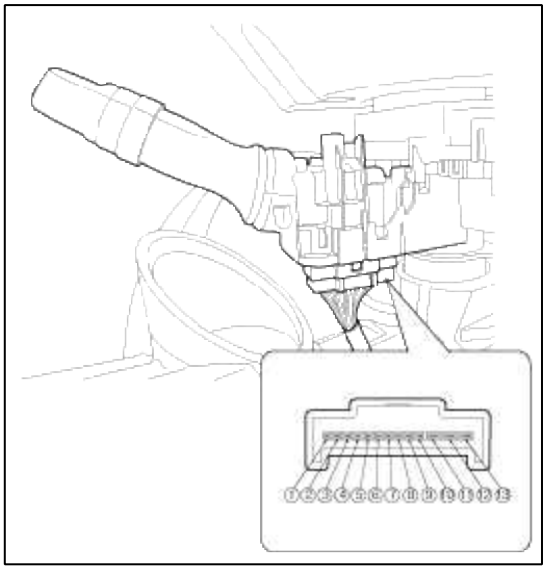
Installation

1. Install the front fog bulb and dust cover.
2. Reconnect the lamp connector.
3. Install the front bumper.

Body Electrical System > Lighting System > Rear Fog Lamps > Repair procedures

Inspection

1. Disconnect the negative(-) battery terminal.
2. Remove the lighting switch of the multi-function switch. (Refer to the multi-function switch)
3. With the rear fog lamp switch, make sure that continuity exists between the terminals below.
   If continuity is not as specified, replace the multi-function switch.



Rear Fog Lamp

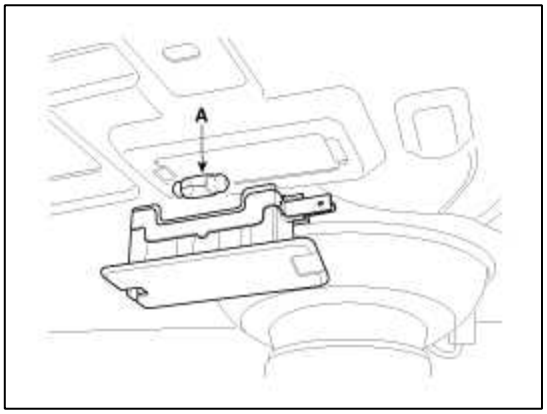
Terminal / Position	5	6	9
OFF			
Front	○	○	
Rear	○	○	○

For the removal and installation of rear fog lamp, please refer to the rear combination lamp.

Body Electrical System > Lighting System > Luggage Room Lamps > Repair procedures

Removal

1. Disconnect the negative (-) battery terminal.
2. Remove the luggage room lamp with a flat-tip screwdriver and disconnect the 2P connector.
3. Remove the bulb (A).



Installation

1. Install the bulb.
2. Install the luggage lamp.

Body Electrical System > Lighting System > Troubleshooting

Troubleshooting

Symptom	Possible cause	Remedy
One lamp does not light (all exterior)	Bulb burned out	Replace bulb
	Socket, wiring or ground faulty	Repair if necessary
Head lamps do not light	Bulb burned out	Replace bulb
	Ignition fuse (LOW:15A, HIGH:15A) blown	Check for short and replace fuse
	Head lamp fuse (15A) blown	Check for short and replace fuse
	Head lamp relay faulty	Check relay
	Lighting switch faulty	Check switch
	Wiring or ground faulty	Repair if necessary
Tail lamps and license plate lamps do not light	Bulb burned out	Replace bulb
	Tail lamp fuse (20A) blown	Check for short and replace fuse
	Tail lamp relay faulty	Check relay
	Lighting switch faulty	Check switch
	Wiring or ground faulty	Repair if necessary
Stop lamps do not light	Bulb burned out	Replace bulb
	Stop lamp fuse (15A) blown	Check for short and replace fuse
	Stop lamp switch faulty	Adjust or replace switch
	Wiring or ground faulty	Repair if necessary

Stop lamps do not turn off	Stop lamp switch faulty	Repair or replace switch
Instrument lamps do not light (Tail lamps light)	Rheostat faulty	Check rheostat
	Wiring or ground faulty	Repair if necessary
Turn signal lamp does not flash on one side	Bulb burned out	Replace bulb
	Turn signal switch faulty	Check switch
	Wiring or ground faulty	Repair if necessary
Turn signal lamps do not light	Bulb burned out	Replace bulb
	Turn signal lamp fuse (10A) blown	Check for short and replace fuse
	Flasher unit faulty	Check flasher unit
	Turn signal switch faulty	Check switch
	Wiring or ground faulty	Repair if necessary
Hazard warning lamps do not light	Bulb burned out	Replace bulb
	Hazard warning lamp fuse (15A) blown	Check for short and replace fuse
	Flasher unit faulty	Check flasher unit
	Hazard switch faulty	Check switch
	Wiring or ground faulty	Repair if necessary
Back up lamps do not light	Bulb burned out	Replace bulb
	Back up lamp fuse (10A) blown	Check for short and replace fuse
	Back up lamp switch (M/T) faulty	Check switch
	Transaxle range switch (A/T) faulty	Check switch
	Wiring or ground faulty	Repair if necessary
Front fog lamps do not light	Bulb burned out	Replace bulb
	Front fog lamp fuse (15A) blown	Check for short and replace fuse
	Front fog lamp relay faulty	Check relay
	Front fog lamp switch faulty	Check switch
	Wiring or ground faulty	Repair if necessary
Map lamp does not light	Bulb burned out	Replace bulb
	Room lamp fuse (10A) blown	Check for short and replace fuse
	Map lamp switch faulty	Check switch
	Wiring or ground faulty	Repair if necessary
Luggage room lamp does not light	Bulb burned out	Replace bulb
	Room lamp fuse (10A) blown	Check for short and replace fuse

	Luggage room lamp switch faulty	Check switch
	Wiring or ground faulty	Repair if necessary

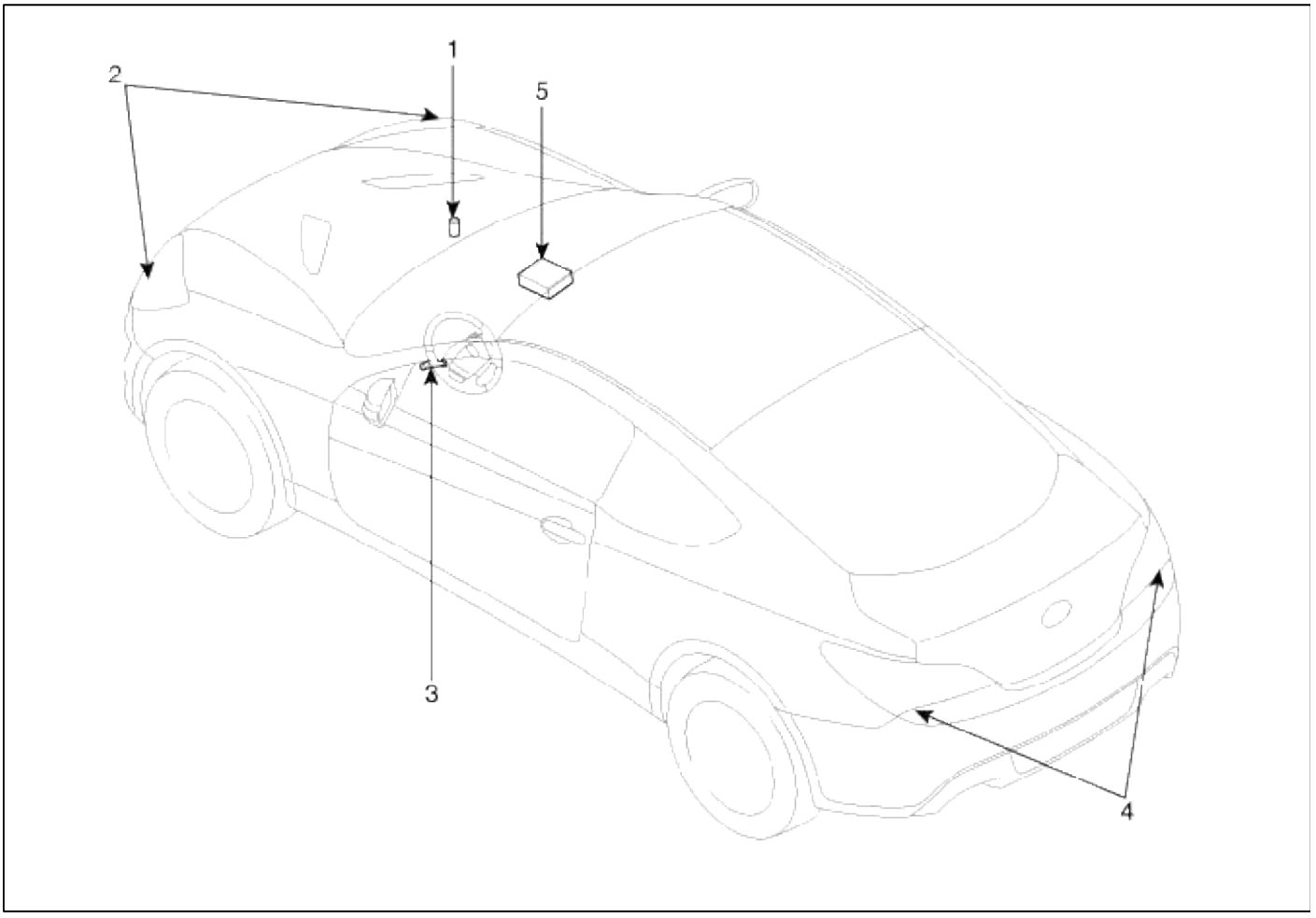
Body Electrical System > Auto Lighting Control System > Specifications

Specifications

Items		Specifications
Rated voltage		5V
Load		Max. 1mA
Detection illuminations	Tail lamp	ON : 0.82 ± 0.05V OFF :1.65 ± 0.05V
	Head lamp	ON : 0.48 ± 0.05V OFF : 0.92 ± 0.05V

Body Electrical System > Auto Lighting Control System > Components and Components Location

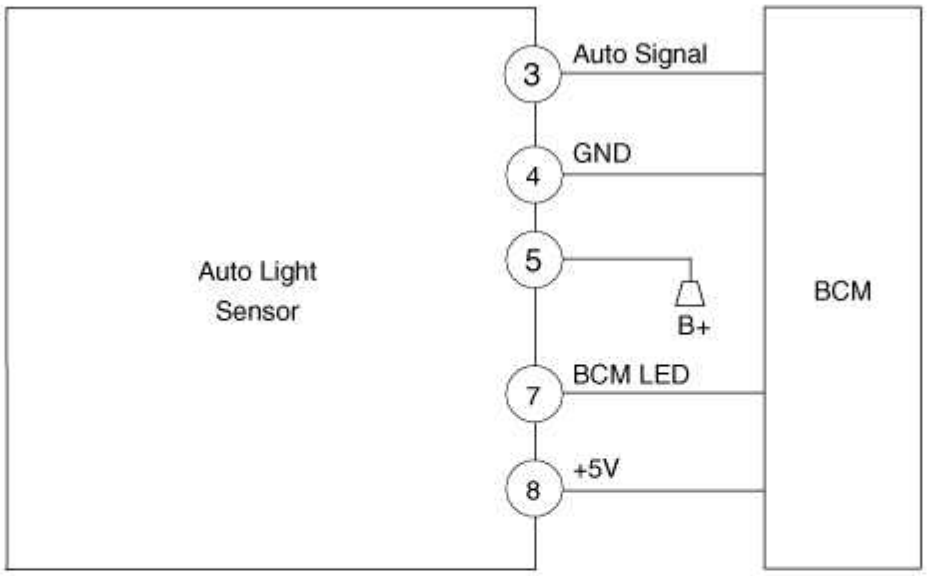
Component Location

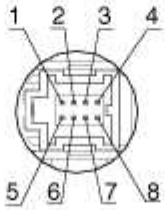


1. Auto light sensor 2. Head lamps 3. Lighting switch (Auto)	4. Tail lamps 5. Body control module (BCM)

Body Electrical System > Auto Lighting Control System > Schematic Diagrams

Circuit Diagram



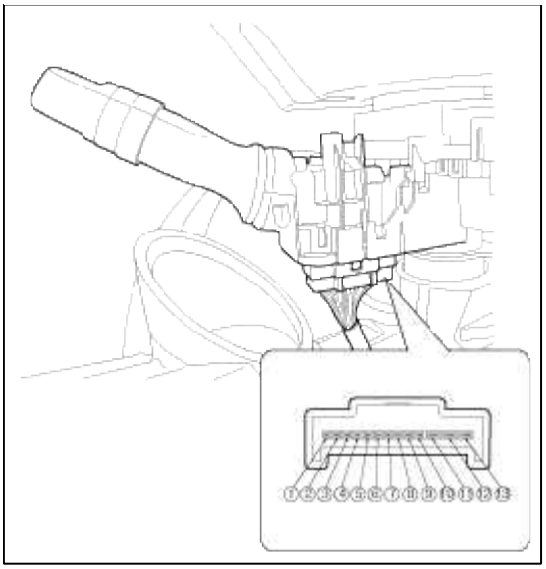


[Auto Light Unit Side Connector]

Body Electrical System > Auto Lighting Control System > Auto Light Switch > Repair procedures

Inspection

Operate the auto light switch, then check for continuity between terminals of multi-function switch connector.



Terminal / Position	1	4	3	2
OFF				
I	○			○
II	○	○		○
AUTO			○	○

Body Electrical System > Auto Lighting Control System > Auto Light Sensor > Repair procedures

Inspection

In the state of IGN1 ON, when multi function switch module detects auto light switch on, tail lamp relay output and head lamp low relay output are controlled according to auto light sensor's input.

The auto light control doesn't work if the pin sunlight supply (5V regulated power from Ignition 1 power to sunlight sensor) is in short circuit with the ground.

If IGN1 ON, The BCM monitors the range of this supply and raises up a failure as soon as the supply’s voltage is out of range. Then this failure occurs and as long as this is present, the head lamp must be turned on without taking care about the sunlight level provided by the sensor.

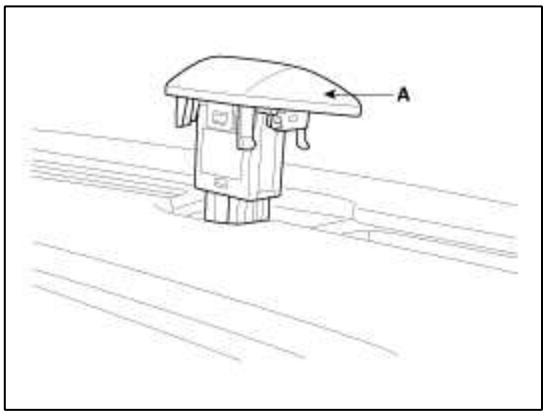
This is designed to prevent any head lamp cut off when the failure occurs during the night.

	Tail lamp	Head lamp
ON	0.82 ± 0.05V	0.48 ± 0.05V
OFF	1.65 ± 0.05V	0.92 ± 0.05V

Removal

1. Disconnect the negative (-) battery terminal.

2. Remove the photo & auto light sensor(A) from crash pad upper side by using screw (-) driver.



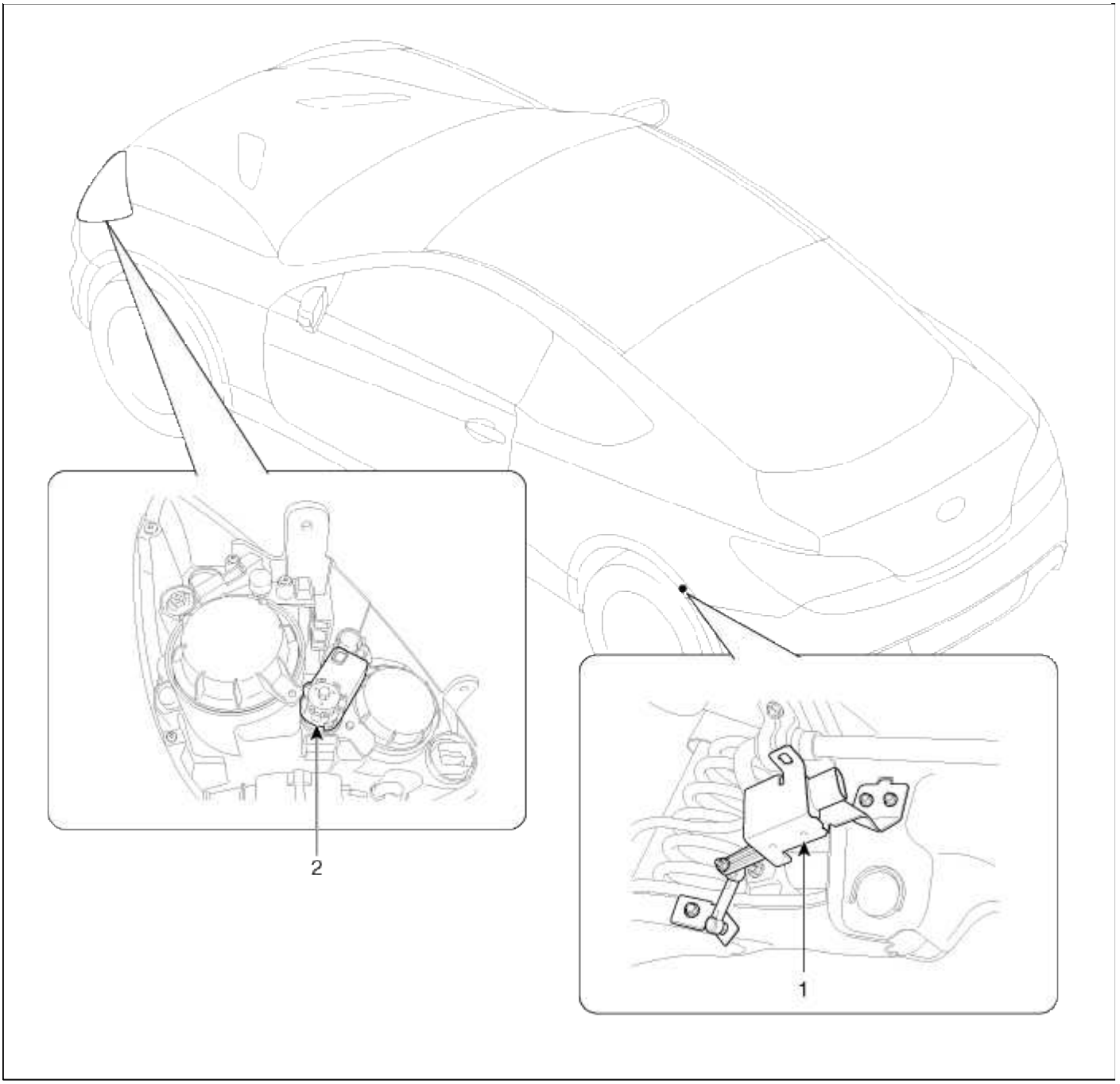
3. Remove the auto light connector.

Installation

1. Reconnect the auto light connector.
2. Install the auto light sensor.

Body Electrical System > Auto Head Lamp Leveling Device > Components and Components Location

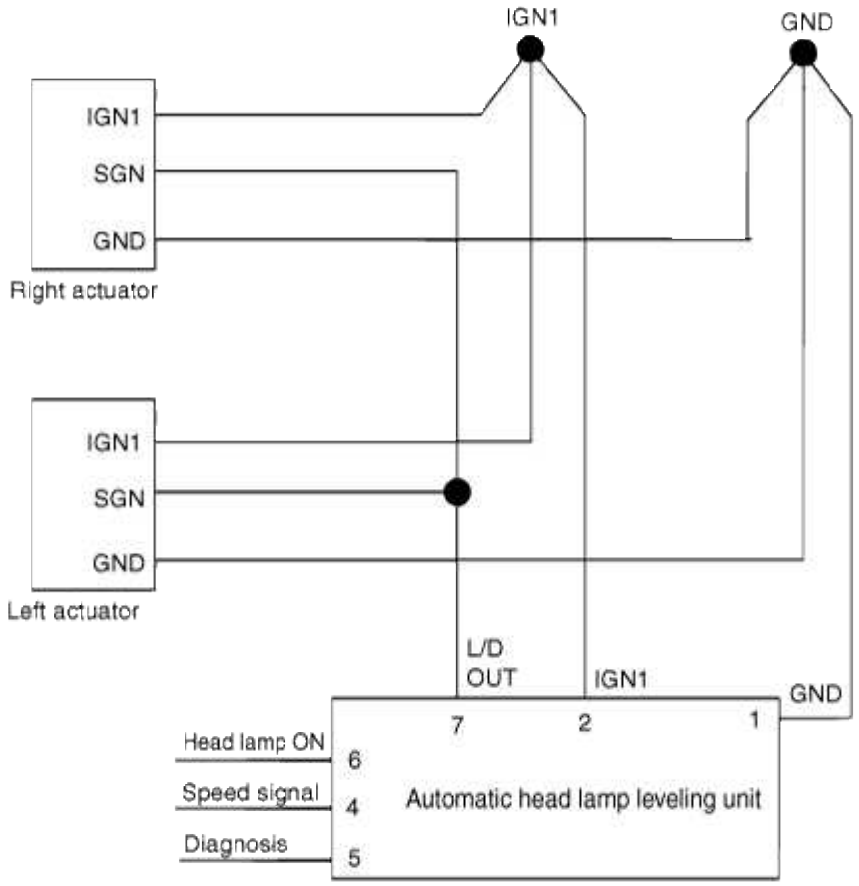
Component Location



1. Head lamp leveling unit	2. Head lamp leveling actuator

Body Electrical System > Auto Head Lamp Leveling Device > Auto Head lamp leveling Unit > Schematic Diagrams

Circuit Diagram



PIN CONNECTION

Terminal	Description
1	Ground
2	IGN1
3	-
4	Speed signal
5	Diagnosis
6	Head lamp ON
7	Leveling actuator
8	-

Body Electrical System > Auto Head Lamp Leveling Device > Auto Head lamp leveling Unit > Description and Operation

Description

According to driving environment and loading state of vehicle, head lamp lighting direction is changed to keep the driver's visibility range and to protect the driver's vision from glare, aiming at safety driving.

Sensor integrated ECU mounting on the rear center arm drives the actuator mounting on the head lamp since sensing the input signal following the vehicle's statically changes.

Head lamp beam is automatically operated by chassis tilt.

Operation

Operating Procedure

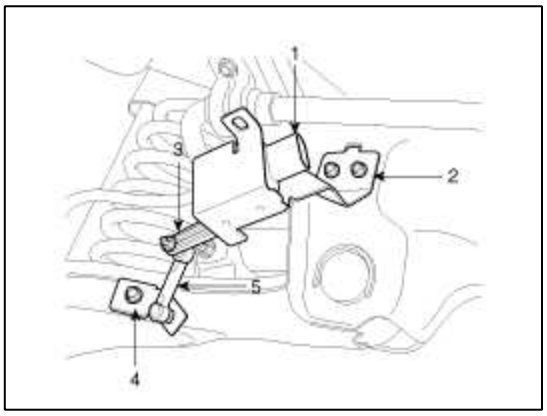
1. Suspension angle change resulted from vehicle's load change.
2. Sensor angle change.
3. Microprocessor calculates necessary head lamp angle change amount.
4. Sending a proper signal to head lamp leveling device and driving actuator.

Operating Condition

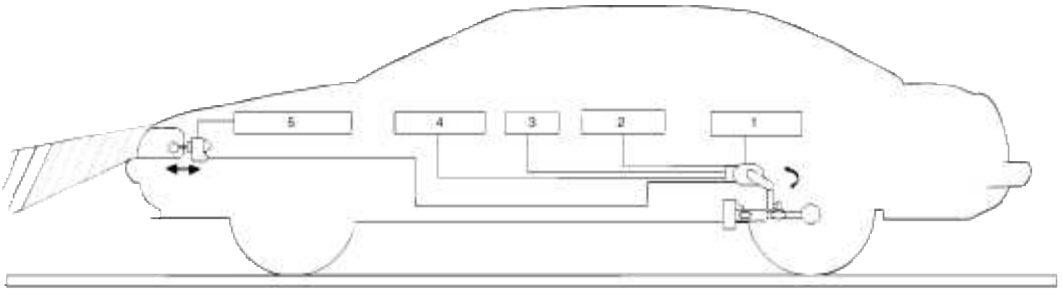
1. Ignition on
2. Low beam on
3. On stop : If sensor lever change is 2° and above, head lamp is operated after max. 1.5 sec.
4. On driving : If vehicle velocity is over 4km/h(2.48mile/h), velocity change is not over 0.8-1.6km/h(0.5 ~ 1.0mile/h) per second, and loading condition is changed, then head lamp is operated.

Components

1. Auto head lamp leveling unit
   1. Leveling unit & sensor
   2. Sensor mounting bracket
   3. Sensor linkage
   4. Linkage bracket
   5. Assist arm



   A. Using a Micro-processor, percept the operation lever's mechanical angle change or speed signal.
   B. As an actuator control device of inner control program, mounting on the rear center arm.
2. Actuator
   A. Change the head lamp lighting direction up or down since automatic head lamp leveling unit sensing the input signal following the vehicle's statically changes.

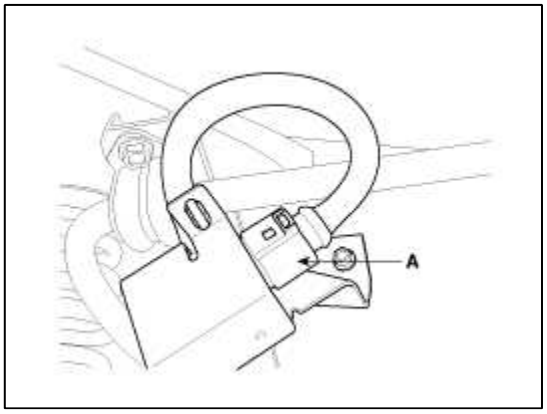


1. Automatic head lamp leveling unit
2. Speed signal (T/M)
3. Diagnosis
4. Head lamp ON
5. Actuator

Body Electrical System > Auto Head Lamp Leveling Device > Auto Head lamp leveling Unit > Repair procedures

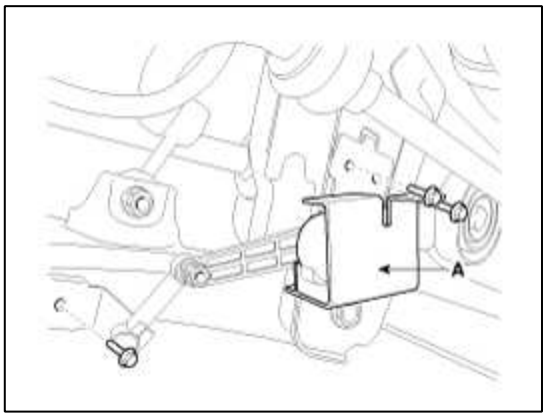
Removal

1. Remove the head lamp leveling unit connector(A).



2. Loosen the mounting bolts (3EA) of automatic head lamp leveling unit assembly.

Tightening torque :
3 ~ 5 Nm (30 ~ 50 kg.cm, 2.21 ~ 3.68 lbf.ft)



3. Remove the head lamp leveling unit assembly.

Installation

1. Install the head lamp leveling unit.
2. Reconnect the head lamp leveling unit connector.

Inspection

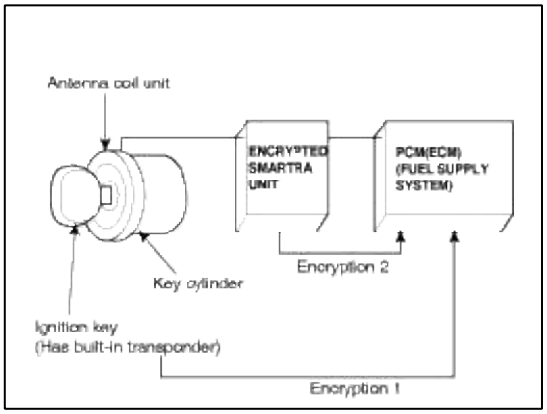
1. Ignition "ON".
2. Turn on the head lamp switch.
3. Check for operation. If the aim of the head lamps changes smoothly when the head lamp leveling switch is turned.
4. If the operation does not work well, inspect the connector and terminals to be sure they are all making good contact.
   If the terminals are bent, loose or corroded, repair them as necessary, and recheck the system.
   If the terminals look OK, go to step 5.
5. Substitute with a known-good head lamp assembly and check for proper operation.

Body Electrical System > Immobilizer System > Description and Operation

Description

The immobilizer system will disable the vehicle unless the proper ignition key is used, in addition to the currently available anti-theft systems such as car alarms, the immobilizer system aims to drastically reduce the rate of auto theft.

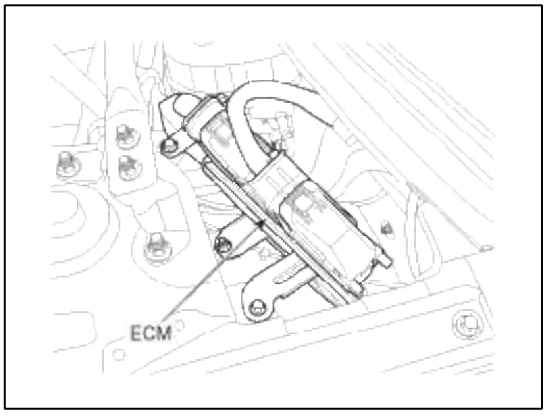
1. Encrypted SMARTRA type immobilizer
   A. The SMARTRA system consists of a passive challenge - response (mutual authentication)transponder located in the ignition key, an antenna coil, a encoded SMARTRA unit, an indicator light and the PCM(ECM).
   B. The SMARTRA communicates to the PCM(ECM) (Engine Control Module) via a dedicated communications line. Since the vehicle engine management system is able to control engine mobilization, it is the most suitable unit to control the SMARTRA.
   C. When the key is inserted in the ignition and turned to the ON position, the antenna coil sends power to the transponder in the ignition key. The transponder then sends a coded signal back through the SMARTRA unit to the PCM(ECM).
   D. If the proper key has been used, the PCM(ECM) will energize the fuel supply system. The immobilizer indicator light in the cluster will simultaneously come on for more than five seconds, indicating that the SMARTRA unit has recognized the code sent by the transponder.
   E. If the wrong key has been used and the code was not received or recognized by the PCM(ECM) the indicator light will continue blinking for about five seconds until the ignition switch is turned OFF.
   F. If it is necessary to rewrite the PCM(ECM) to learn a new key, the dealer needs the customer's vehicle, all its keys and the Hi-scan (pro) equipped with an immobilizer program card. Any key that is not learned during rewriting will no longer start the engine.
   G. The immobilizer system can store up to eight key codes.
   H. If the customer has lost his key, and cannot start the engine, contact Hyundai motor service station.



Components Operations

PCM (Power Train Control Module)

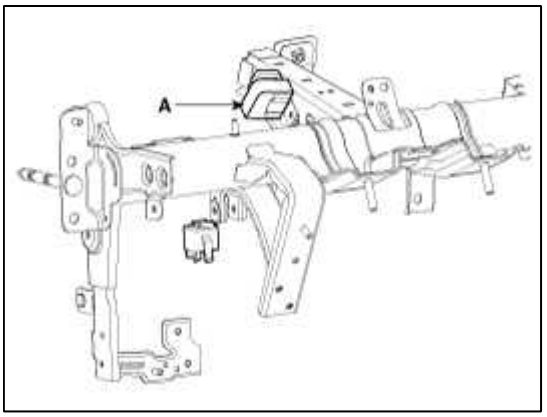
1. The PCM(ECM) (A) carries out a check of the ignition key using a special encryption algorithm, which is programmed into the transponder as well as the PCM(ECM) simultaneously. Only if the results are equal, the engine can be started. The data of all transponders, which are valid for the vehicle, are stored in the PCM(ECM). ERN (Encrypted Randorn Number) value between EMS and encrypted smartra unit is checked and the validity of coded key is decided by EMS.



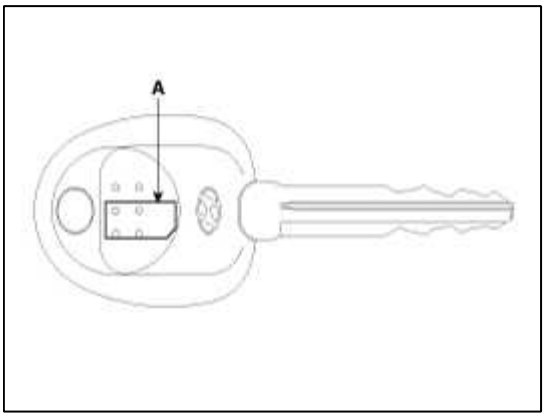
ENCRYPTED SMARTRA unit (A)

The SMARTRA carries out communication with the built-in transponder in the ignition key. This wireless

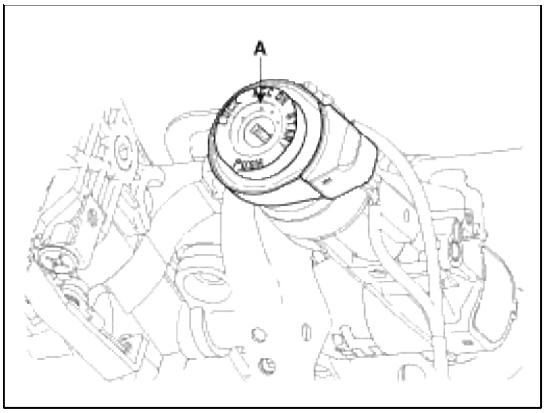
communication runs on RF (Radio frequency of 125 kHz). The SMARTRA is mounted behind of the crash pad close to center cross bar.
The RF signal from the transponder, received by the antenna coil, is converted into messages for serial communication by the SMARTRA device. And, the received messages from the PCM(ECM) are converted into an RF signal, which is transmitted to the transponder by the antenna.
The SMARTRA does not carry out the validity check of the transponder or the calculation of encryption algorithm. This device is only an advanced interface, which converts the RF data flow of the transponder into serial communication to the PCM(ECM) and vice versa.



TRANSPONDER (Built-in keys)
The transponder (A) has an advanced encryption algorithm. During the key teaching procedure, the transponder will be programmed with vehicle specific data. The vehicle specific data are written into the transponder memory. The write procedure is once only; therefore, the contents of the transponder can never be modified or changed.



Antenna coil
The antenna coil (A) has the following functions.
- The antenna coil supplies energy to the transponder.
- The antenna coil receives signal from the transponder.
- The antenna coil sends transponder signal to the SMARTRA.
  It is located directly in front of the steering handle lock.



Body Electrical System > Immobilizer System > Repair procedures

Replacement

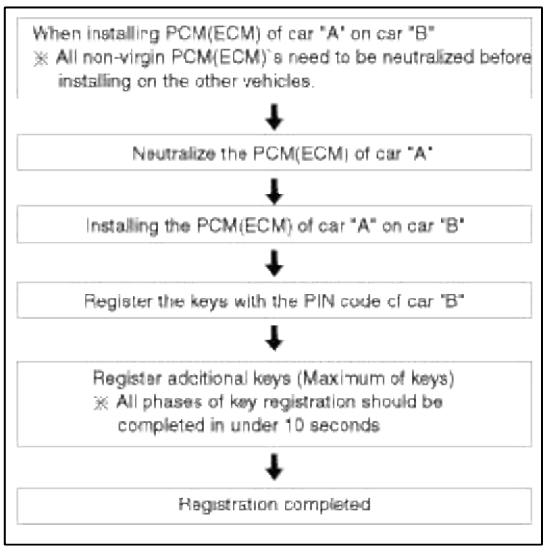
Problems And Replacement Parts:

Problem	Part set	Scan tool required?
All keys have been lost	Blank key (4)	YES
Antenna coil unit does not work	Antenna coil unit	NO
ECM does not work	PCM(ECM)	YES
Ignition switch does not work	Ignition switch with Antenna coil unit	YES
Unidentified vehicle specific data occurs	Key, PCM(ECM)	YES
SMARTRA unit does not work	SMARTRA unit	YES

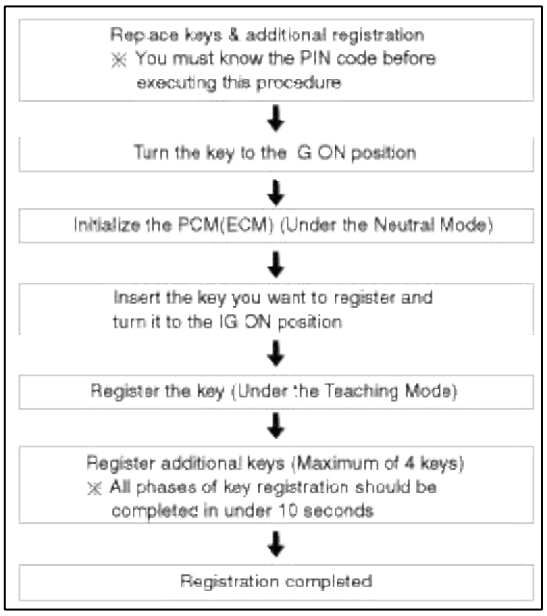
Replacement Of Ecm And Smartra

In case of a defective ECM, the unit has to be replaced with a "virgin" or "neutral" ECM. All keys have to be taught to the new ECM. Keys, which are not taught to the ECM, are invalid for the new ECM (Refer to key teaching procedure). The vehicle specific data have to be left unchanged due to the unique programming of transponder.
In case of a defective SMARTRA, it needs teaching the smartra. A new SMARTRA device replaces the old one and smartra need teaching.

1. Things to remember before a replacement (PCM(ECM))



2. Things to remember before a replacement (Keys & Additional registration)



NOTE

1. When there is only one key registered and you wish to register another key, you need to re-register the key which was already registered.
2. When the key #1 is registered and master key #2 is not registered, Put the key #1 in the IG/ON or the start position and remove it. The engine can be started with the unregistered key #2.
   (Note that key #2 must be used within 10 seconds of removing key #1)
3. When the key #1 is registered and key #2 is not registered, put the unregistered master key #2 in the IG/ON or the start position.
   The engine cannot be started even with the registered key #1.
4. When you inspect the immobilizer system, refer to the above paragraphs 1, 2 and 3.
   Always remember the 10 seconds zone.
5. If the pin code & password are entered incorrectly on three consecutive inputs, the system will be locked for one hour.
6. Be cautious not to overlap the transponder areas.
7. Problems can occur at key registration or vehicle starting if the transponders should overlap.

Neutralizing Of ECM

The PCM(ECM) can be set to the "neutral" status by a tester.

A valid ignition key is inserted and after ignition on is recorded, the PCM(ECM) requests the vehicle specific data from the tester. The communication messages are described at "Neutral Mode" After successfully receiving the data, the PCM(ECM) is neutralized.

The ECM remains locked. Neither the limp home mode nor the "twice ignition on" function, is accepted by the PCM(ECM).

The teaching of keys follows the procedure described for the virgin PCM(ECM). The vehicle specific data have to be unchanged due to the unique programming of the transponder. If data should be changed, new keys with a virgin transponder are requested.

This function is for neutralizing the PCM(ECM) and Key. Ex) when lost key, Neutralize the PCM(ECM) then teach keys.

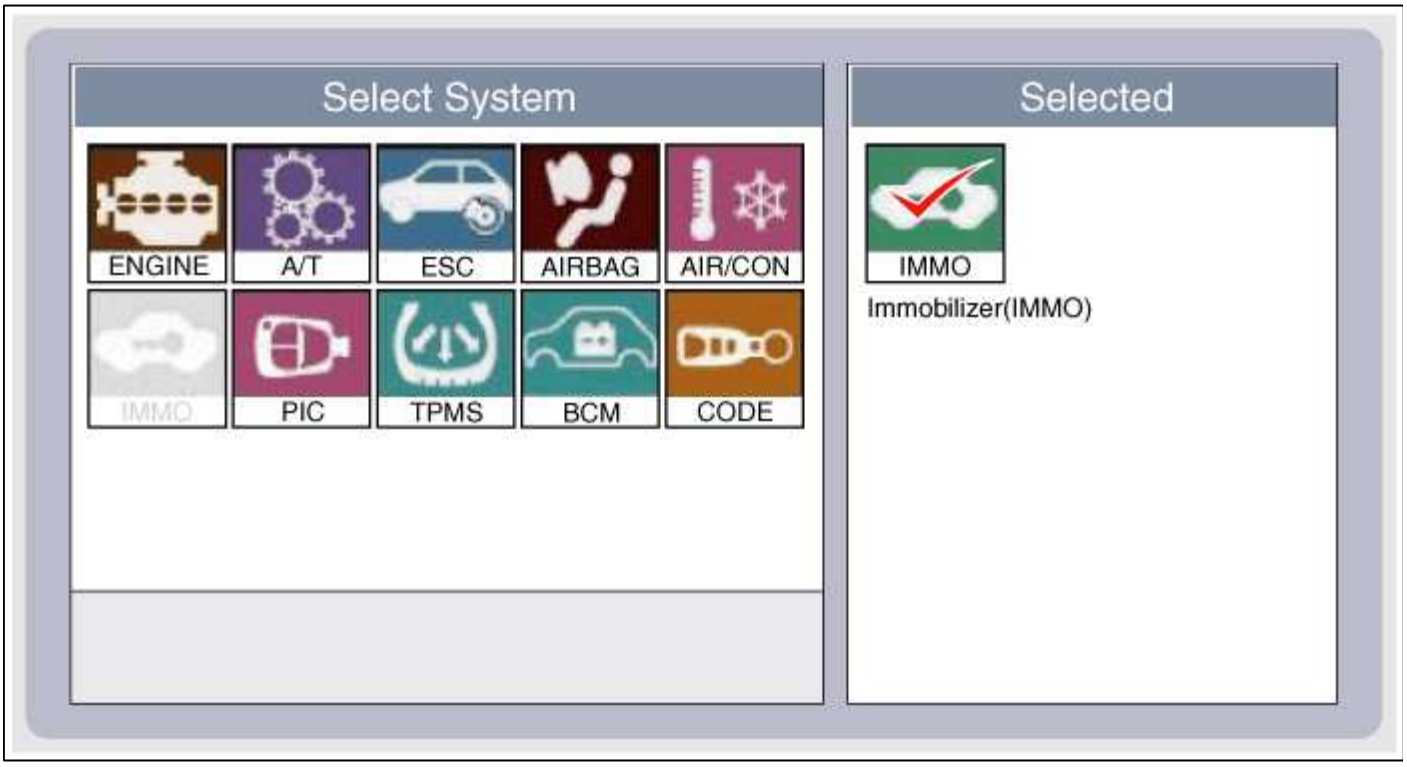
(Refer to the Things to do when Key & PIN Code the PCM(ECM) can be set to the "neutral" status by a scanner.

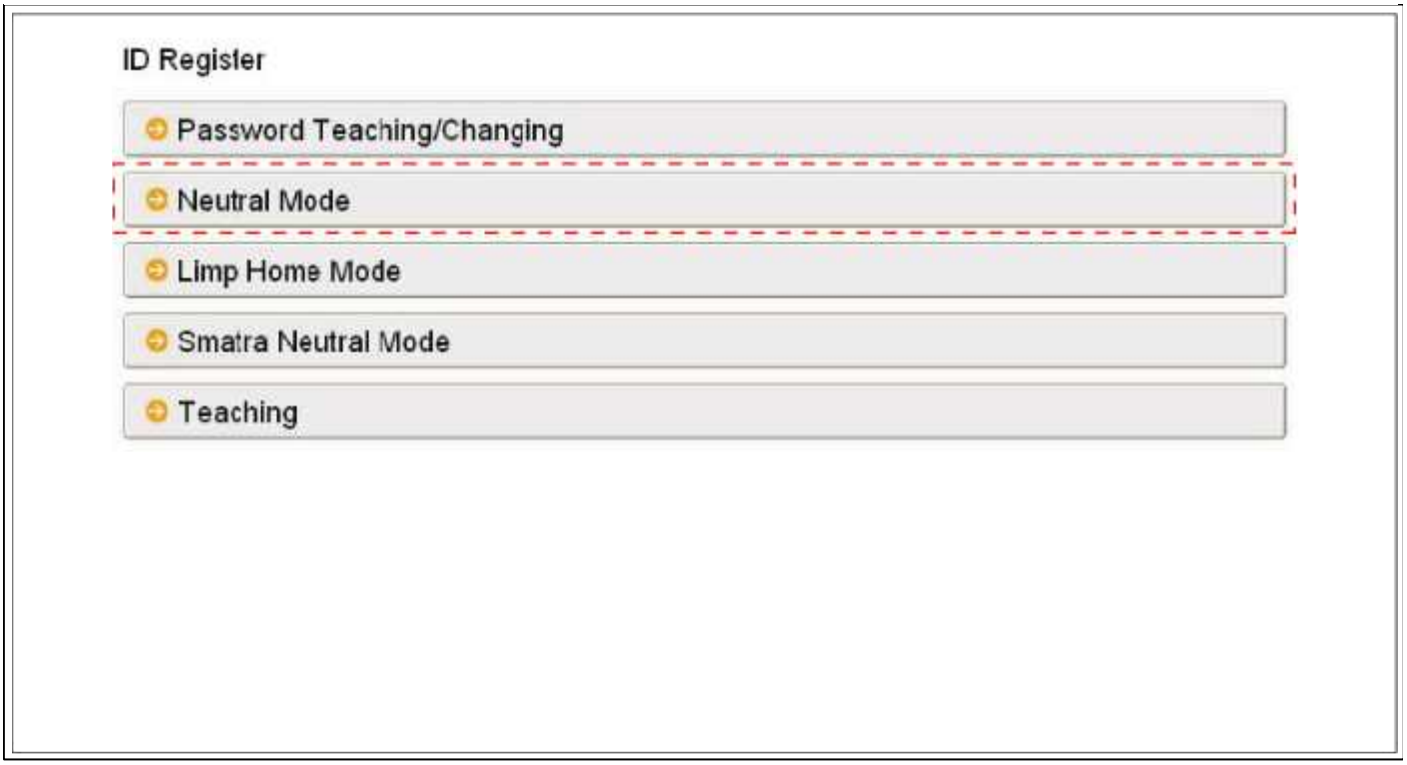
If wrong vehicle specific data have been sent to SMATRA three times continuously or intermittently, the SMATRA will reject the request to enter neutral mode for one hour. Disconnecting the battery or other manipulation cannot reduce this time. After connecting the battery the timer starts again for one hour.

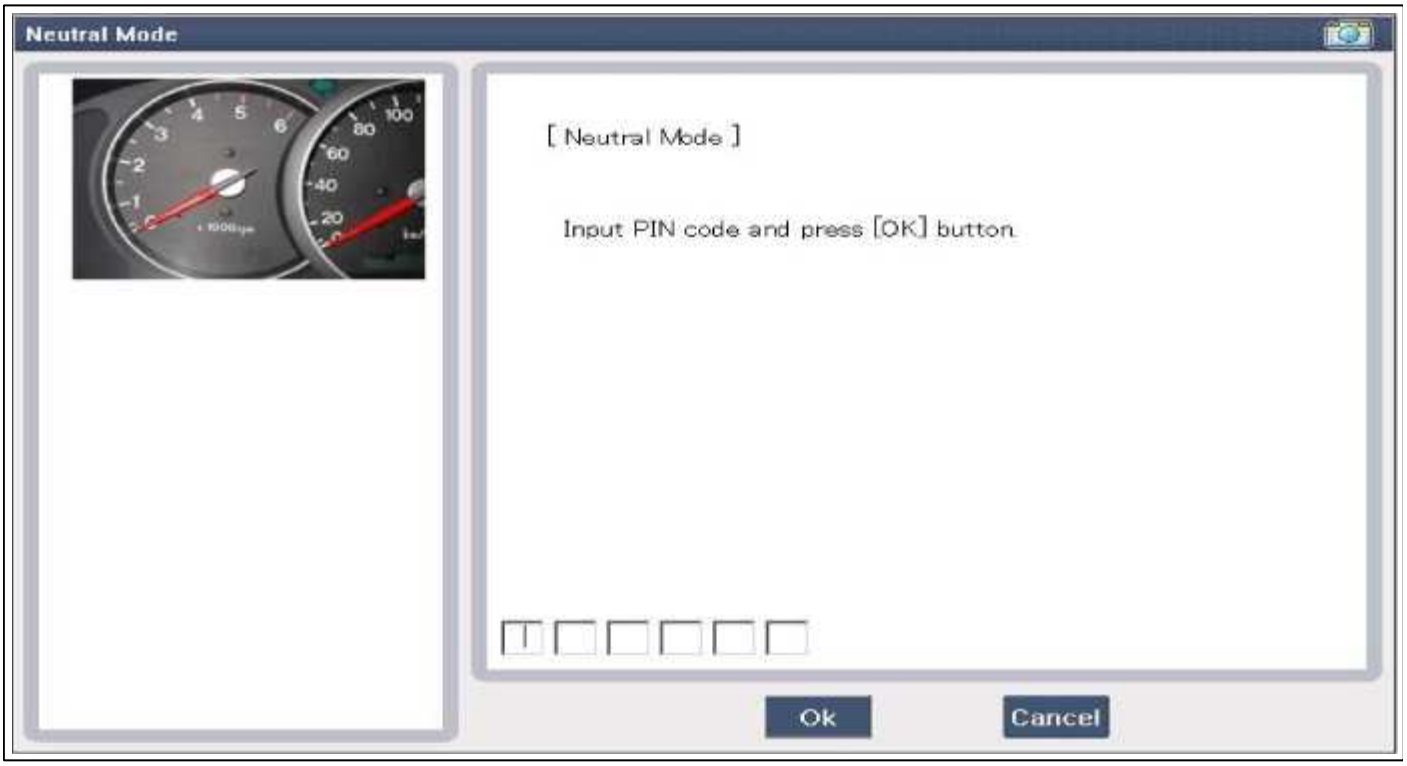
NOTE

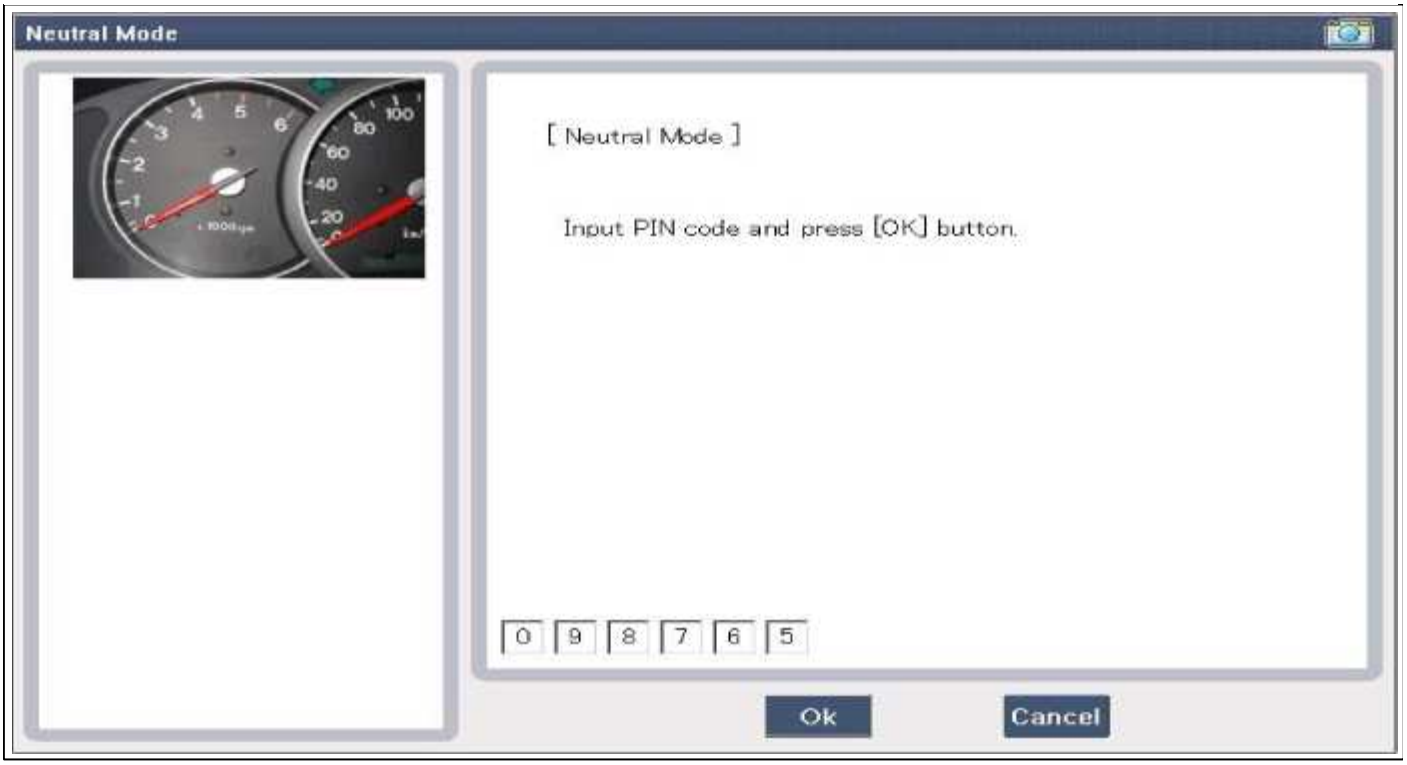
- Neutralizing setting condition
  - In case of PCM(ECM) status "Learnt" regardless of user password "Virgin or Learnt"
  - Input correct PIN code by scanner.
  - Neutralizing meaning .
    : PIN code (6) & user password (4) deletion.
    : Locking of ECM (except key teaching permission)
- Neutralizing meaning:
  - PIN Code(6) & User P/Word(4) deletion
  - Locking of EMS(except Key Learning permission)

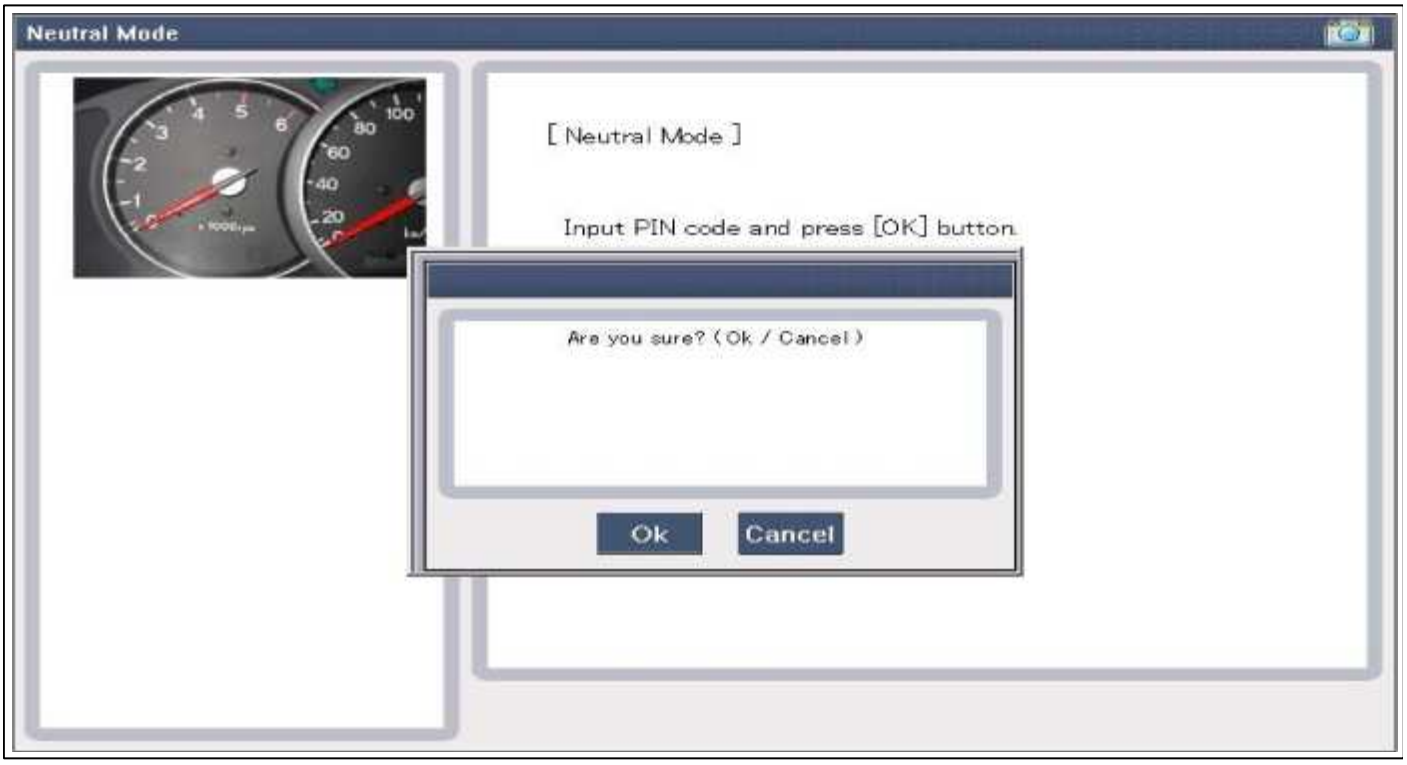
Function / EMS	Engine Running			Learning	
	Learnt Key	Limp home	Twice Ignition	Key	User Password
Neutral	No	No	No	Yes	No

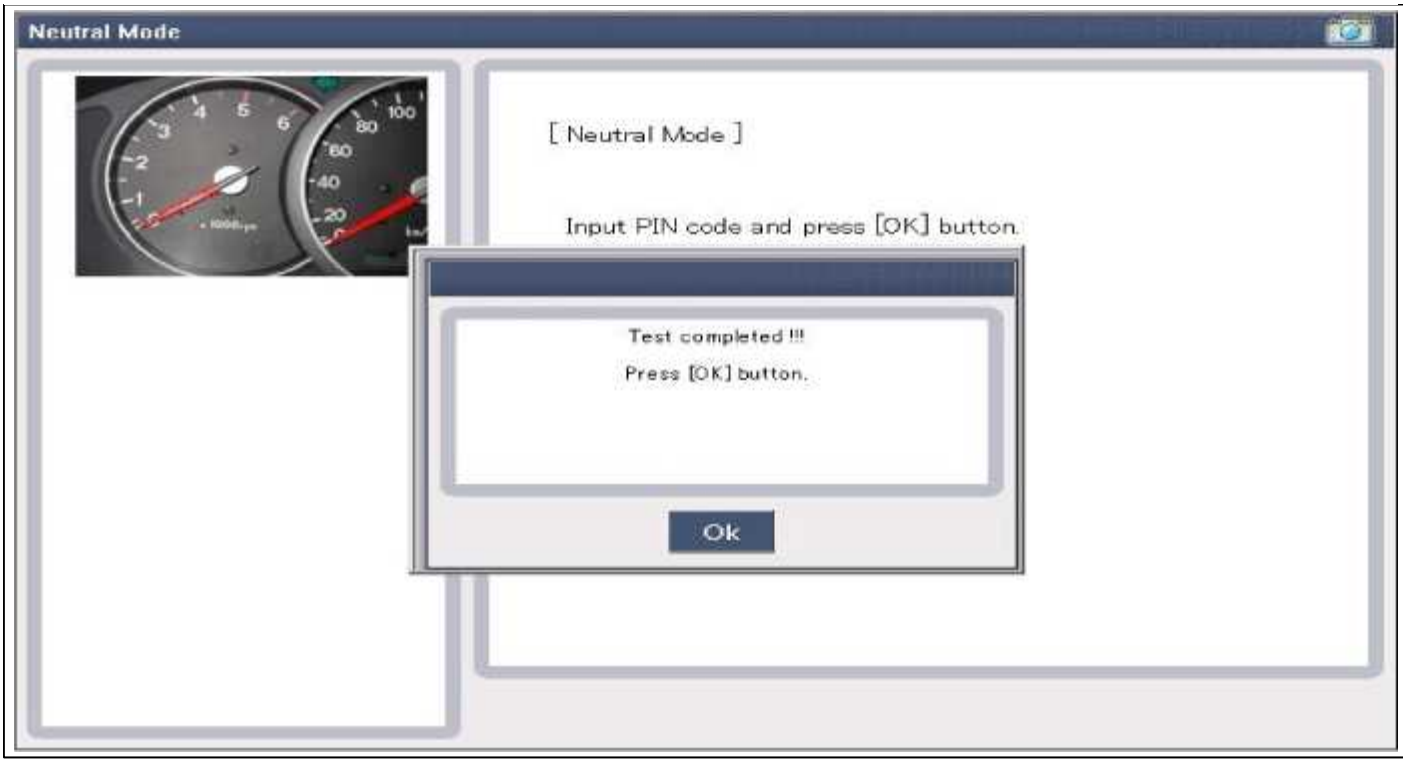


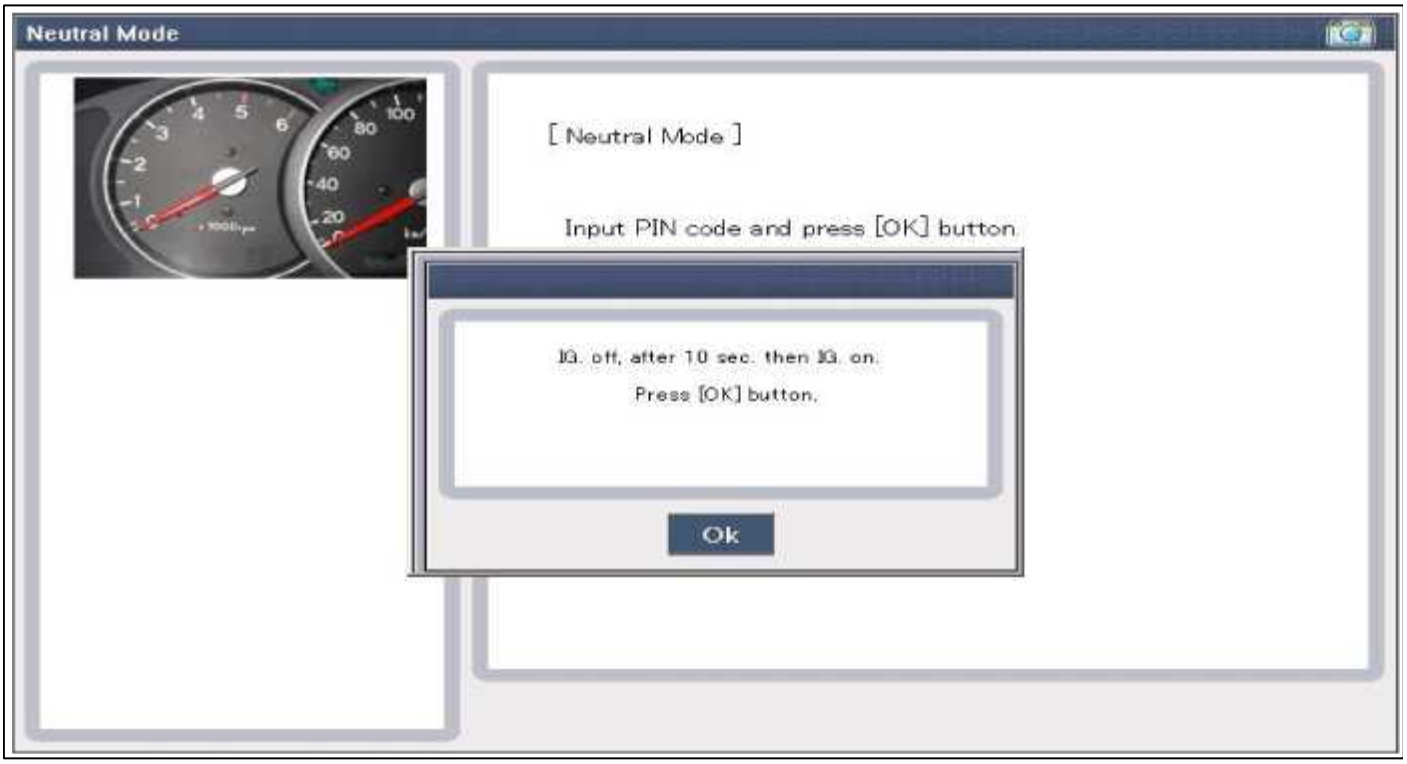

ID Register
Password Teaching/Changing
Neutral Mode
Limp Home Mode
Smatra Neutral Mode
Teaching

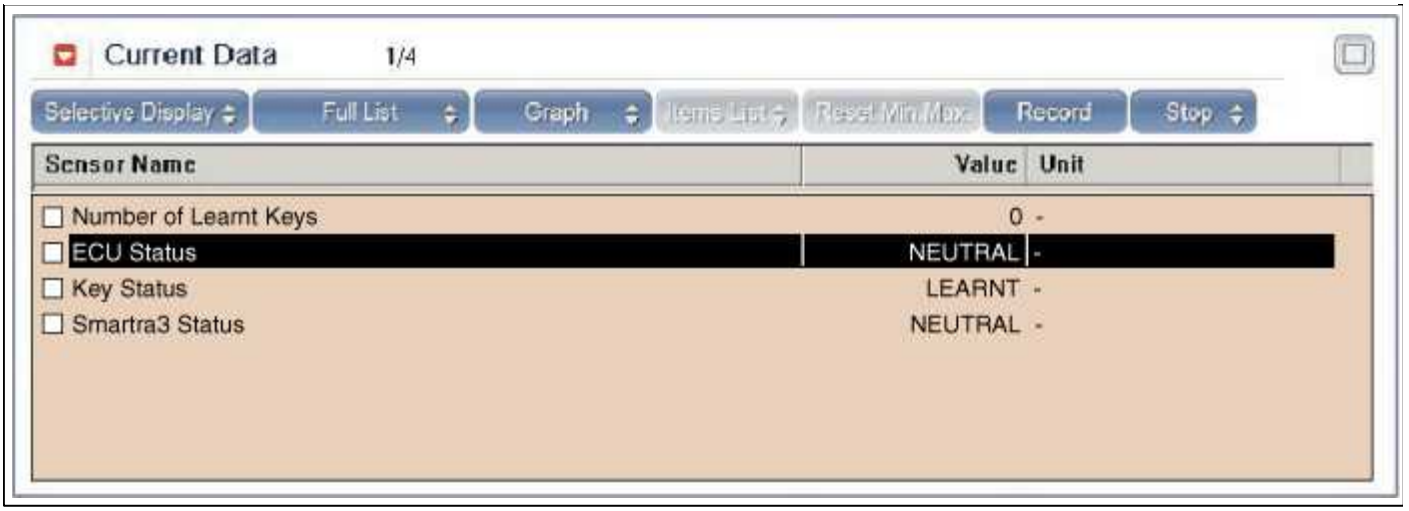

Neutral Mode
[Neutral Mode]
Input PIN code and press [OK] button
Ok
Cancel






Neutral Mode
[Neutral Mode]
Input PIN code and press [OK] button.
Test completed !!!
Press [OK] button.
Ok


Neutral Mode
[Neutral Mode]
Input PIN code and press [OK] button.
IG. off, after 10 sec. then IG. on.
Press [OK] button.
Ok



Neutralizing Of SMARTRA

The EMS can be set to the status "neutral" by tester

Ignition key (regardless of key status) is inserted and after IGN ON. If receiving the correct vehicle password from GST, SMARTRA can be neutralized. The neutralization of SMARTRA is possible if DPN is same as the value inputted by GST.

In case that the SMARTRA status is neutral, the EMS keeps the lock state. And the start is not possible by "twice ignition".

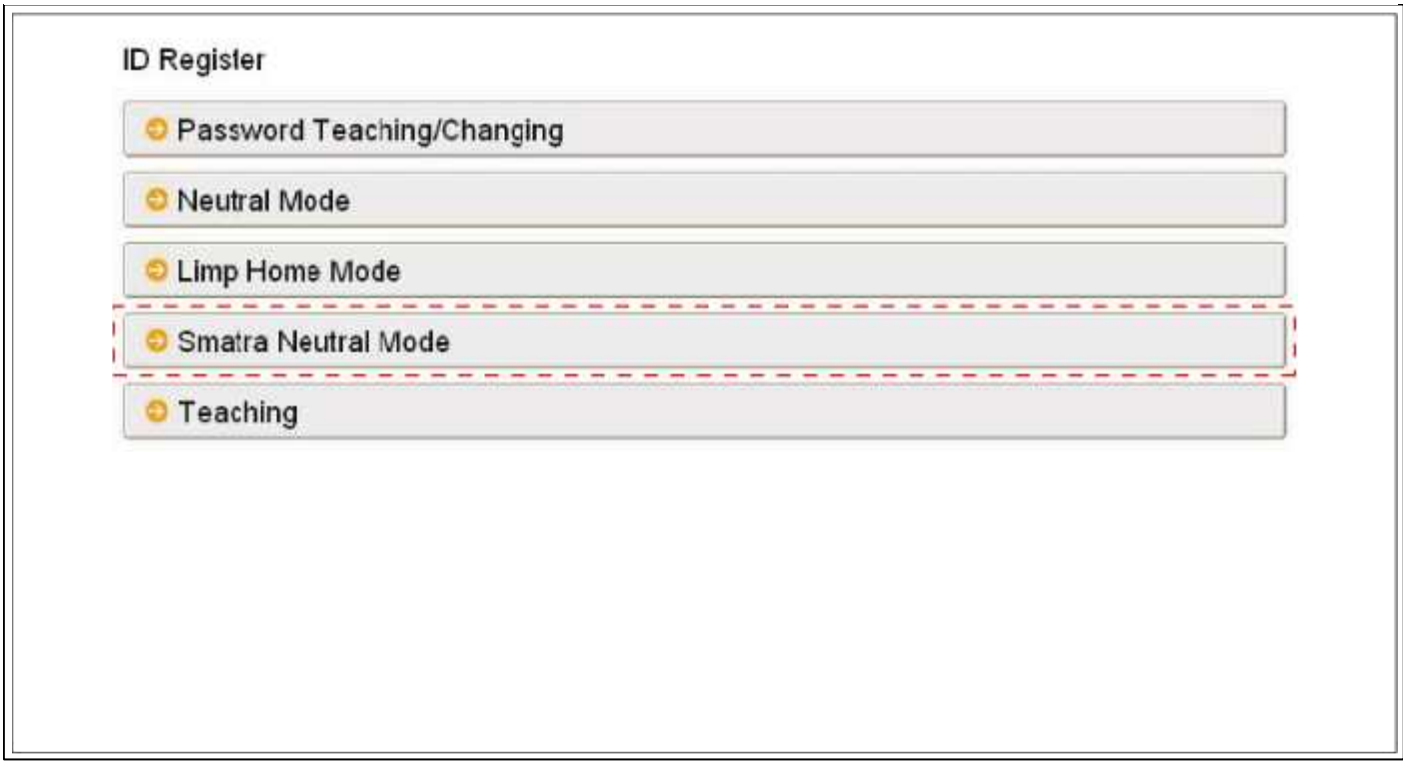
In case of changing the vehicle password, new virgin transponder must be only used. And in case of virgin key, after Learning the key of vehicle password, it can be used.

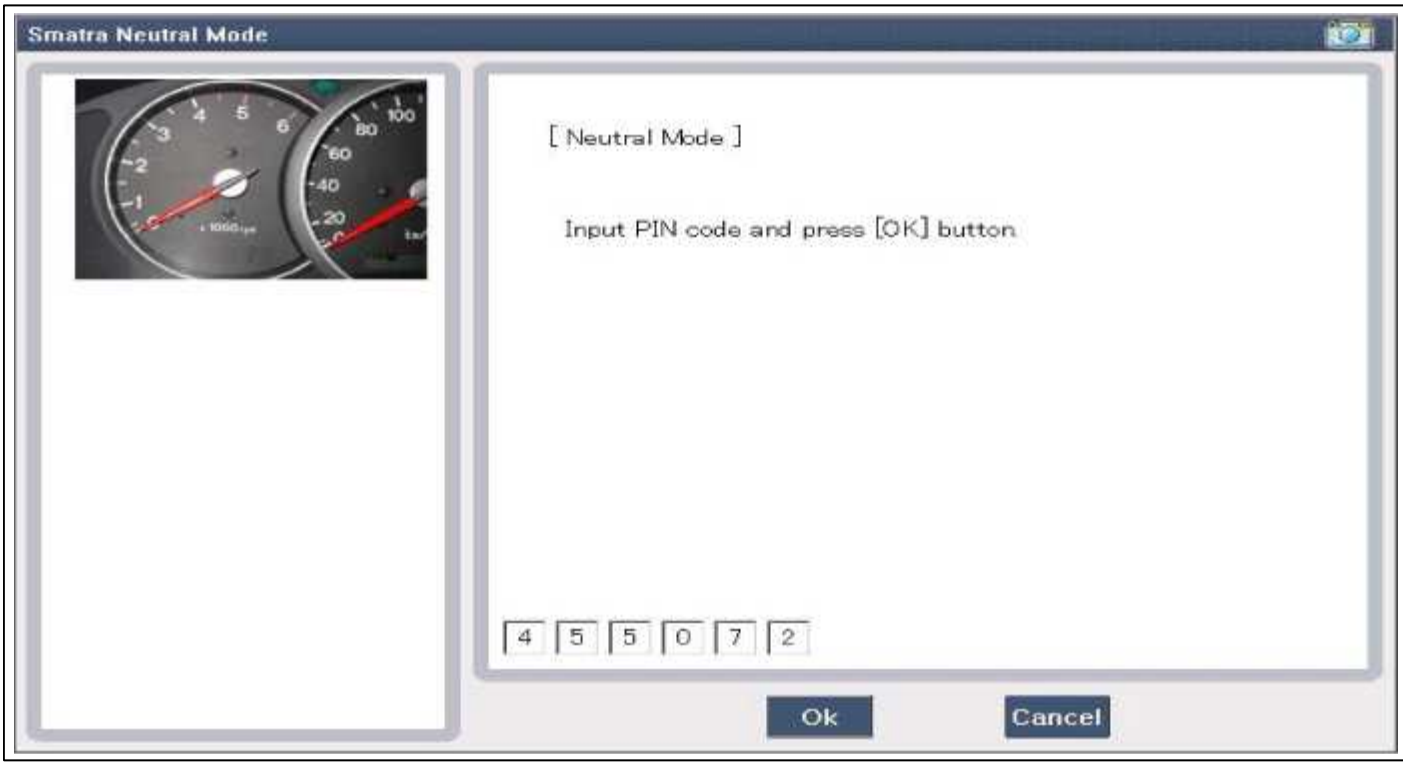
If wrong vehicle specific data have been sent to SMATRA three times continuously or intermittently, the SMATRA will reject the request to enter neutral mode for one hour. Disconnecting the battery or other manipulation cannot reduce this time. After connecting the battery the timer starts again for one hour.

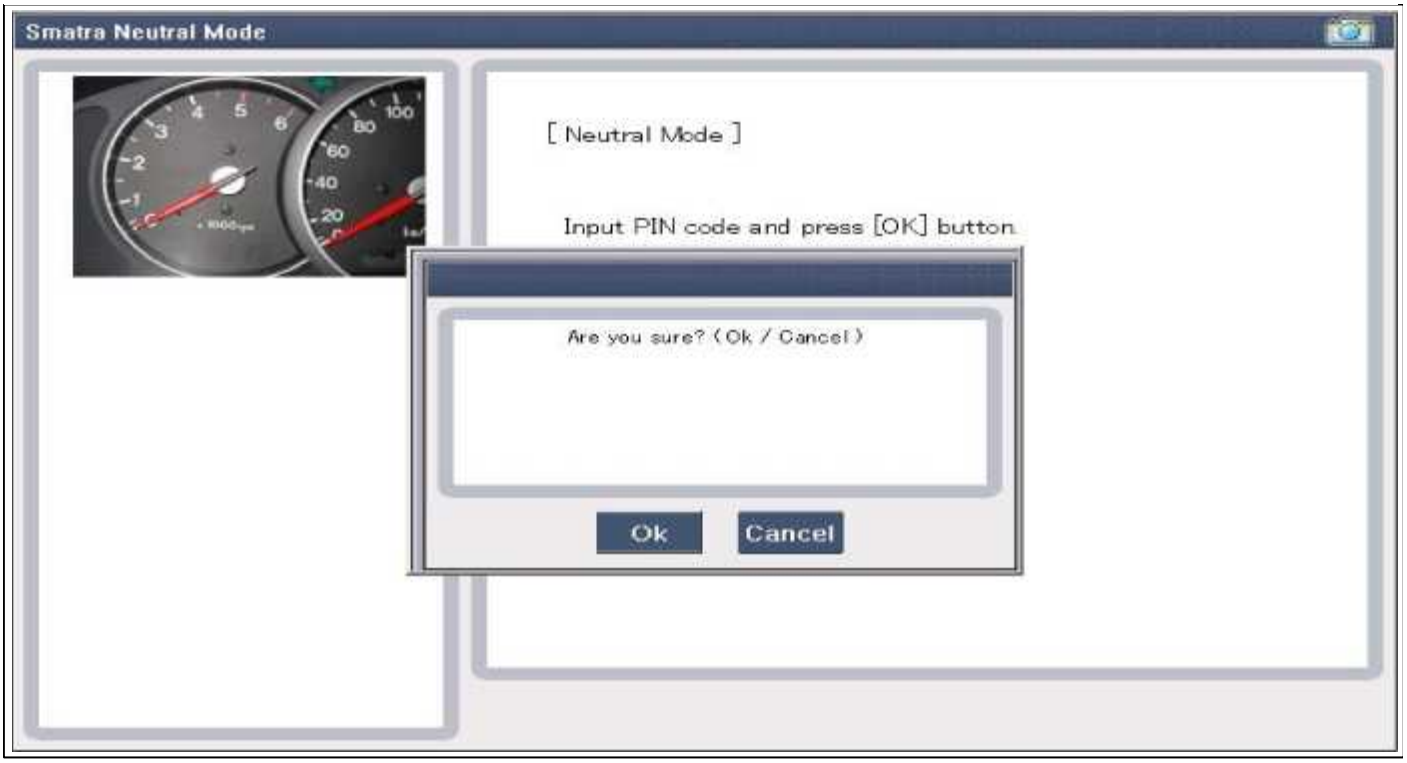
NOTE

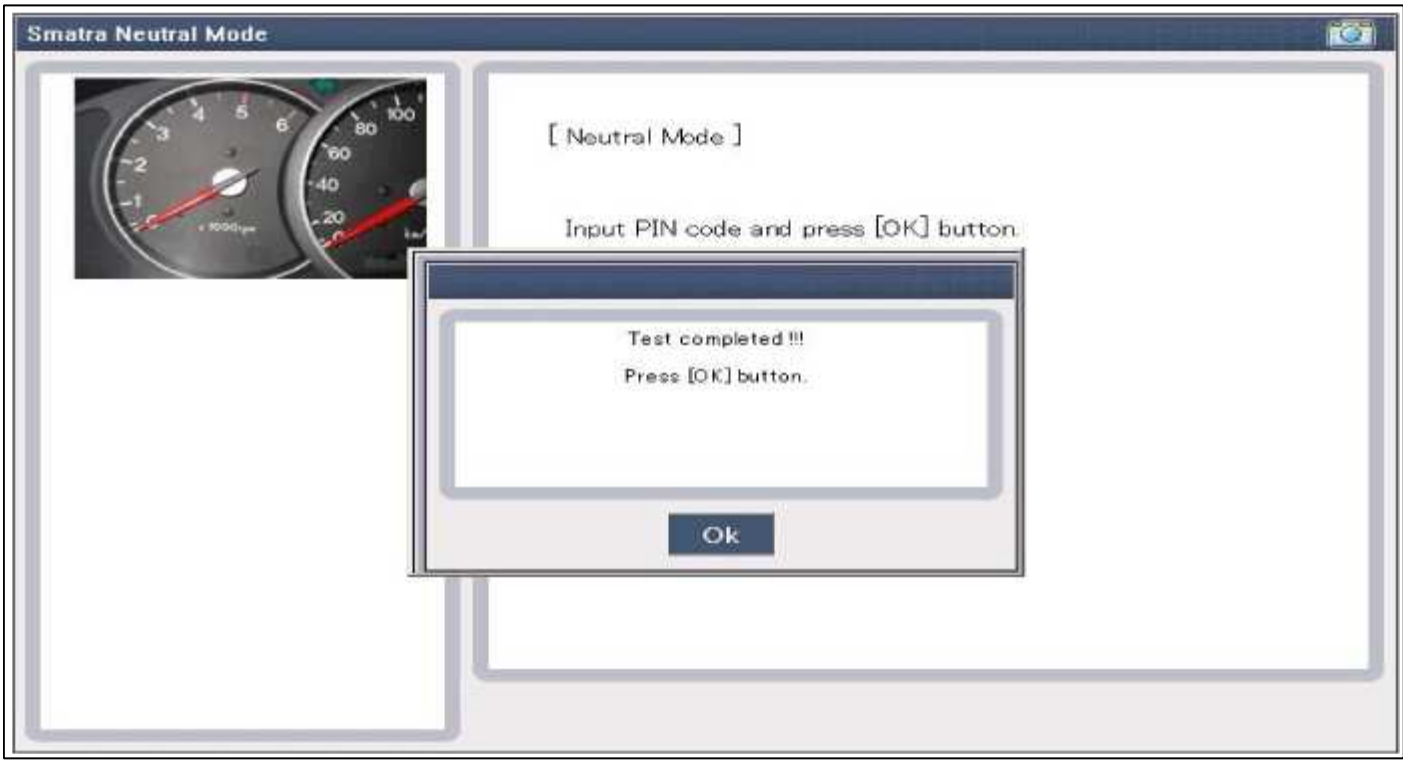
- Neutralizing Setting condition :
  - In case of "SMARTRA status", "Learnt"
  - Input correct Pin code by tester
- Neutralizing meaning :
  - Vehicle password(DPN Code) & SEK Code deletion.
  - Permission of New DPN Learning.

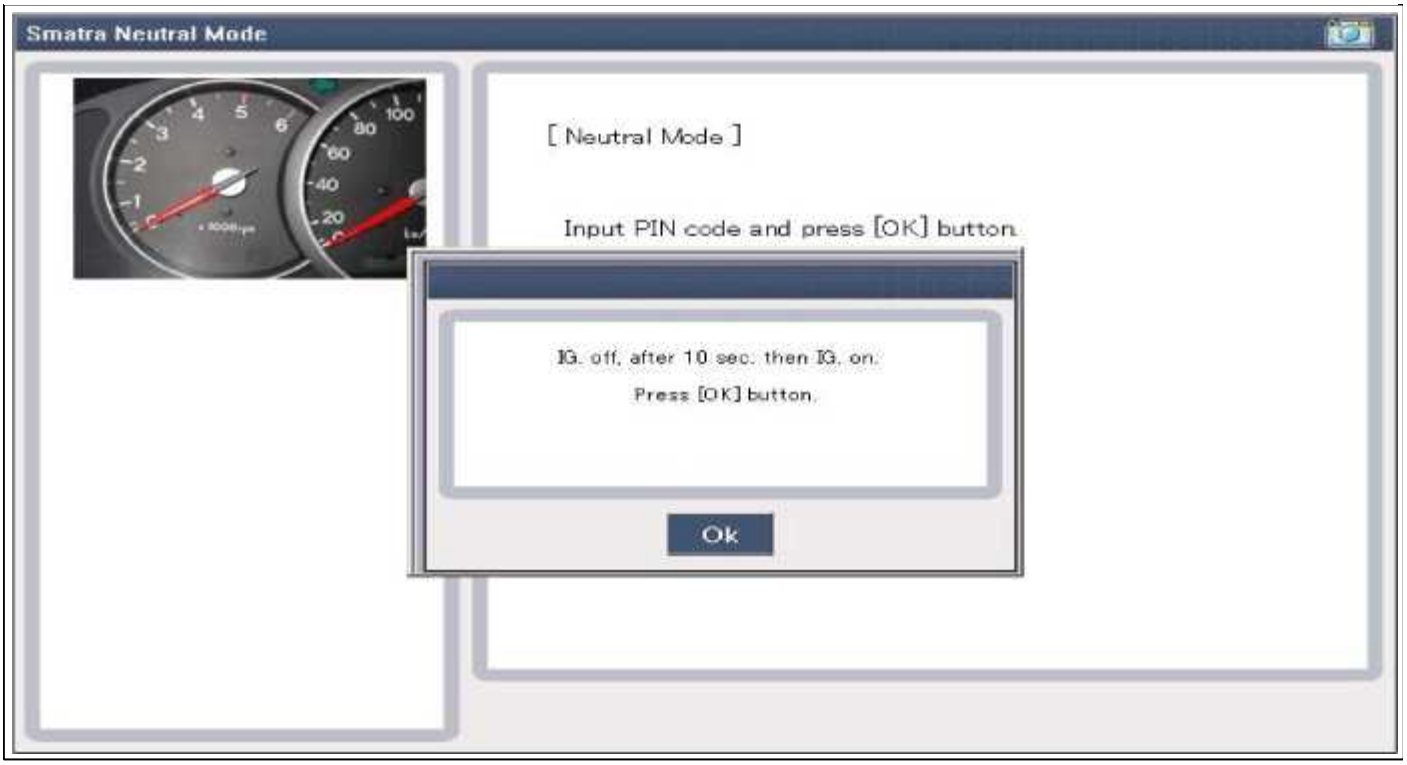
Function / SMARTRA	Engine Running			Learning	
	Learnt Key	Limp home	Twice Ignition	Key	User Password
Neutral	No	Yes (EMS learnt)	No	Yes	No

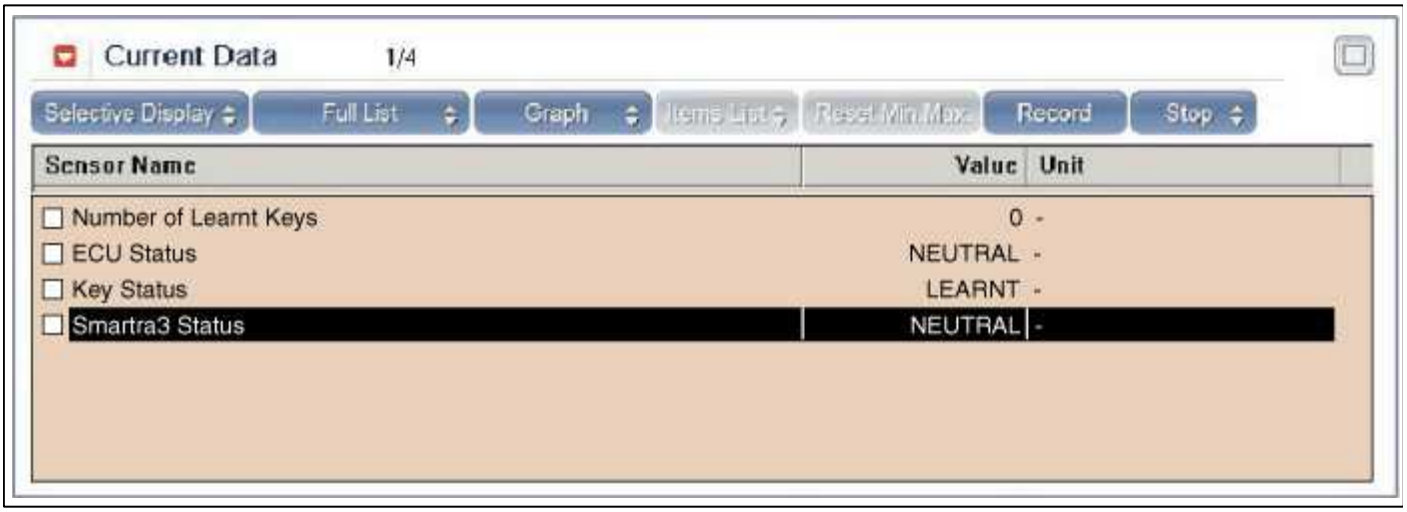

ID Register
Password Teaching/Changing
Neutral Mode
Limp Home Mode
Smatra Neutral Mode
Teaching


Smatra Neutral Mode
[Neutral Mode]
Input PIN code and press [OK] button
4 5 5 0 7 2
Ok
Cancel









Teaching Procedures

1. Key Teaching Procedure

Key teaching must be done after replacing a defective PCM(ECM) or when providing additional keys to the vehic owner.

The procedure starts with an PCM(ECM) request for vehicle specific data (PIN code: 6digits) from the tester. Th "virgin" PCM(ECM) stores the vehicle specific data and the key teaching can be started. The "learnt" PCM(ECM compares the vehicle specific data from the tester with the stored data. If the data are correct, the teaching can pr If incorrect vehicle specific data have been sent to the PCM(ECM) three times, the PCM(ECM) will reject the re of key teaching for one hour. This time cannot be reduced by disconnecting the battery or any other manipulation. reconnecting the battery, the timer starts again for one hour.

The key teaching is done by ignition on with the key and additional tester commands. The PCM(ECM) stores the relevant data in the EEPROM and in the transponder. Then the PCM(ECM) runs the authentication required for confirmation of the teaching process. The successful programming is then confirmed by a message to the tester.

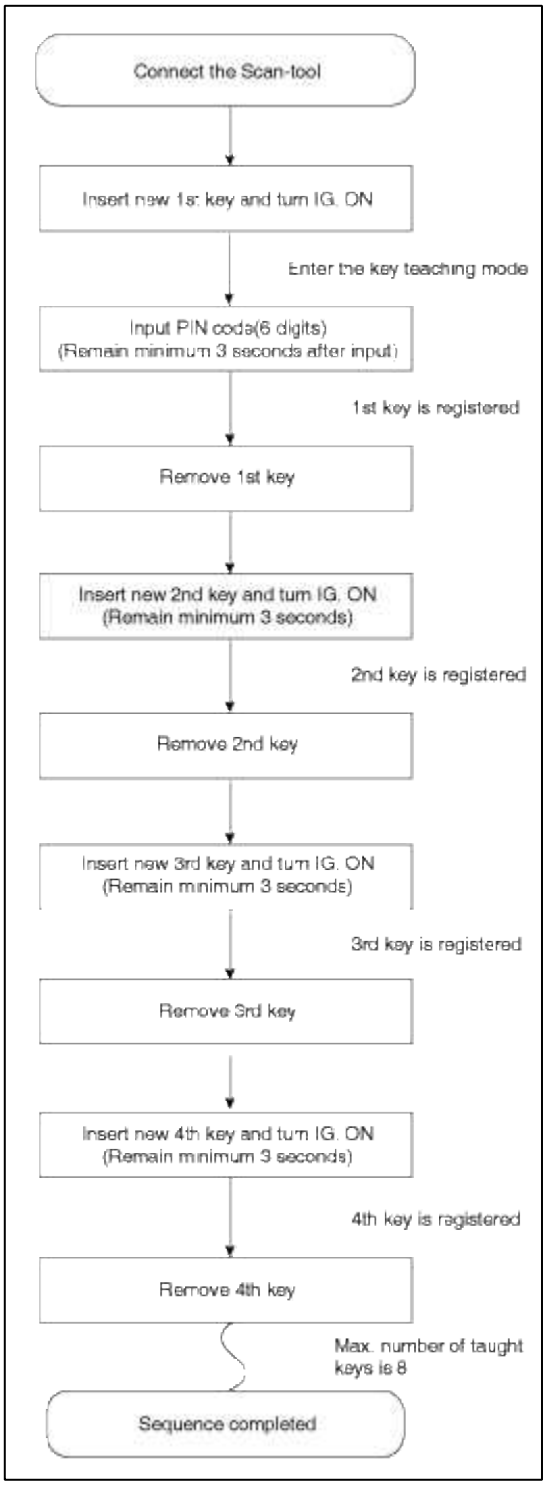
If the key is already known to the PCM(ECM) from a previous teaching, the authentication will be accepted and t EEPROM data are updated. There is no changed transponder content (this is impossible for a learnt transponder)

The attempt to repeatedly teach a key, which has been taught already during the same teaching cycle, is recognize the PCM(ECM). This rejects the key and a message is sent to the tester.

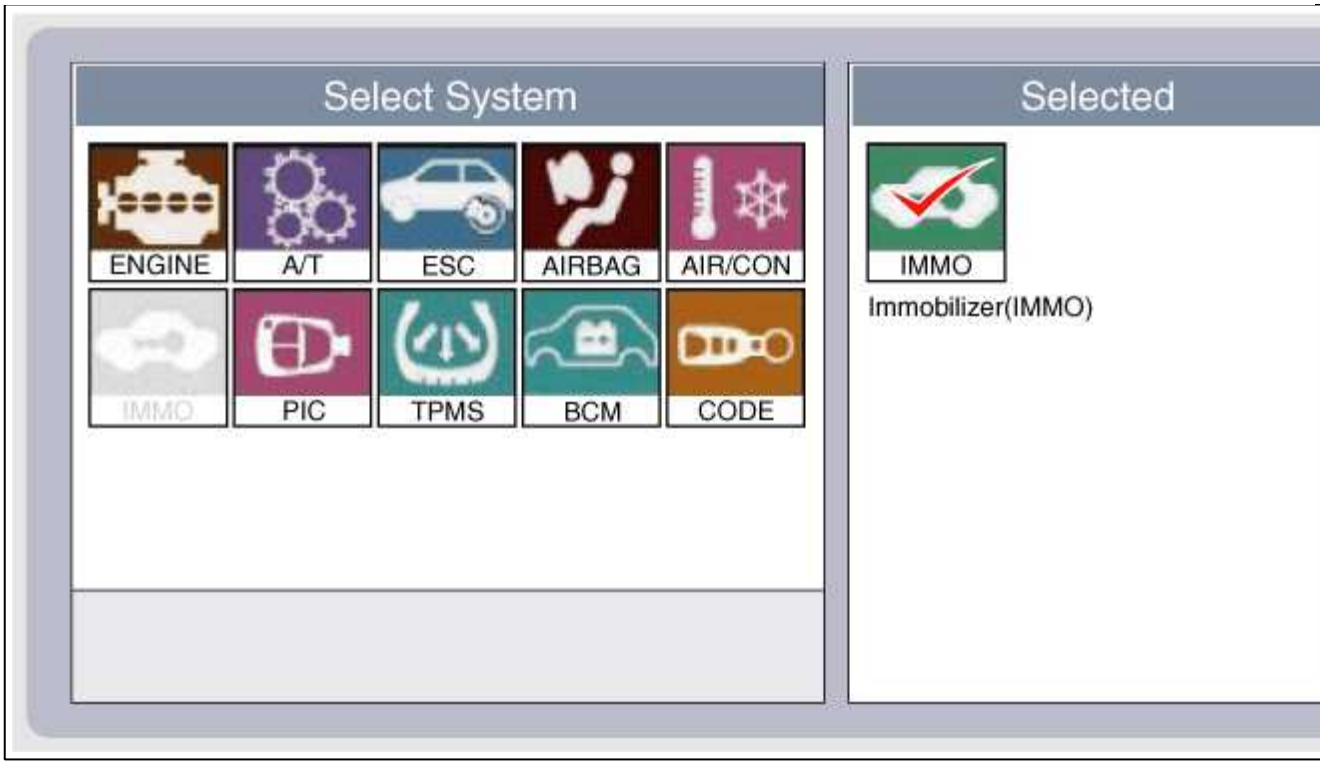
The PCM(ECM) rejects invalid keys, which are presented for teaching. A message is sent to the tester. The key c
invalid due to faults in the transponder or other reasons, which result from unsuccessful programming of data. If the
PCM(ECM) detects different authenticators of a transponder and an PCM(ECM), the key is considered to be inv
The maximum number of taught keys is 8
If an error occurs during the Immobilizer Service Menu, the PCM(ECM) status remains unchanged and a specific
code is stored.
If the PCM(ECM) status and the key status do not match for teaching of keys, the tester procedure will be stoppe
a specific fault code will be stored at PCM(ECM).

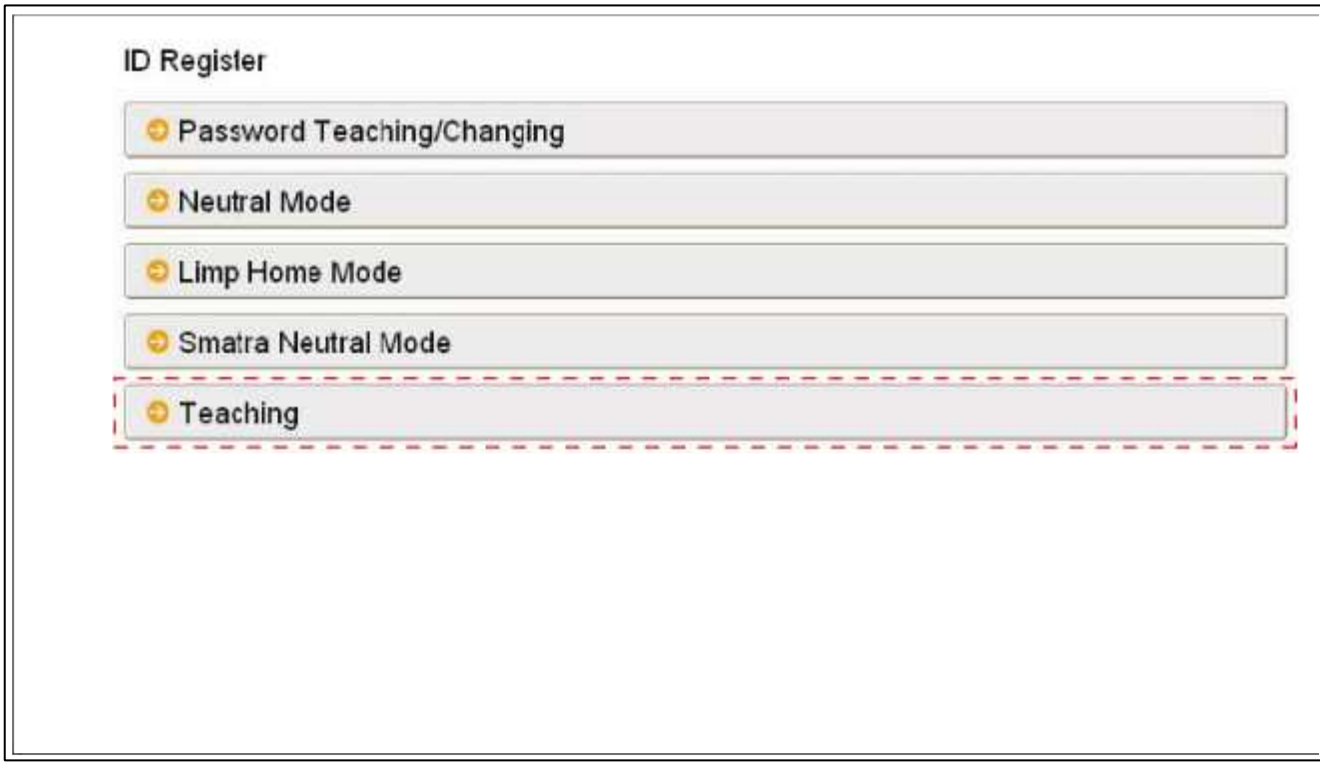
NOTE

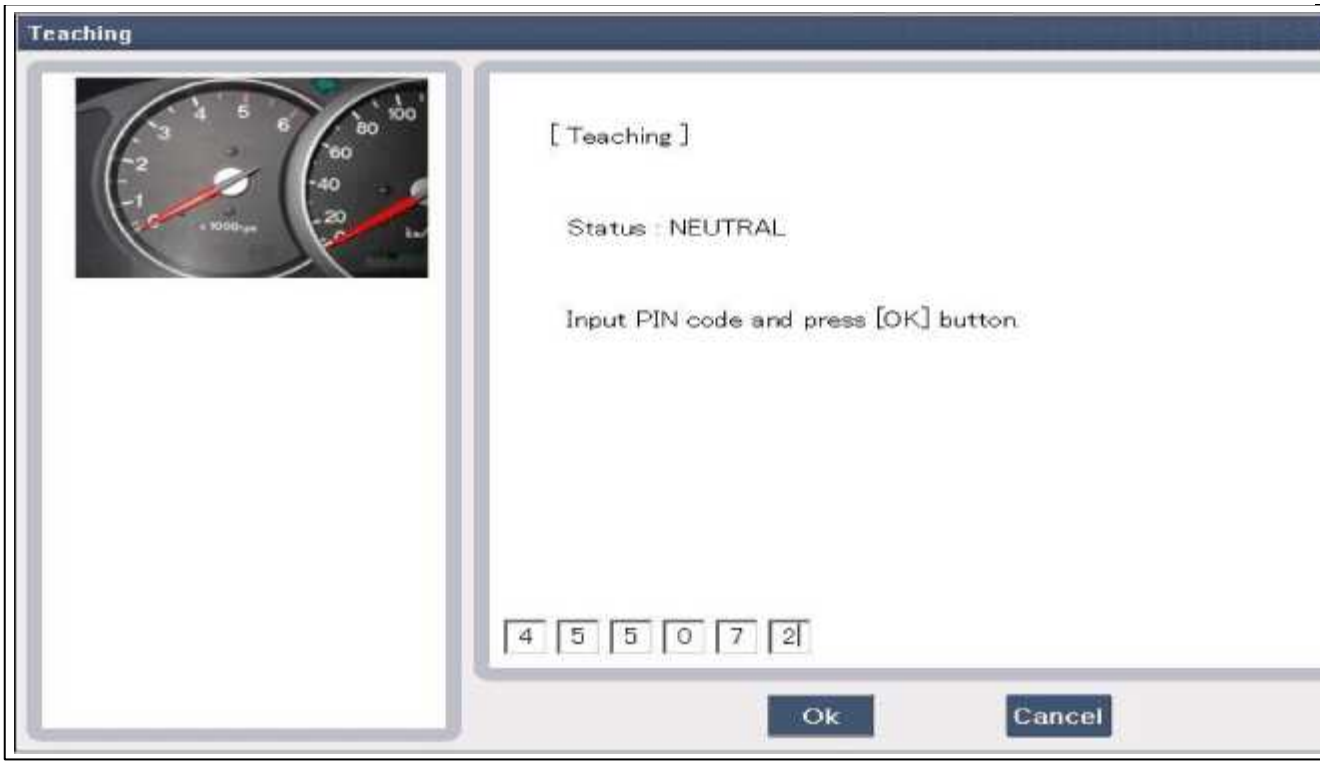
When teaching the 1st key, Smartra registers at the same time.

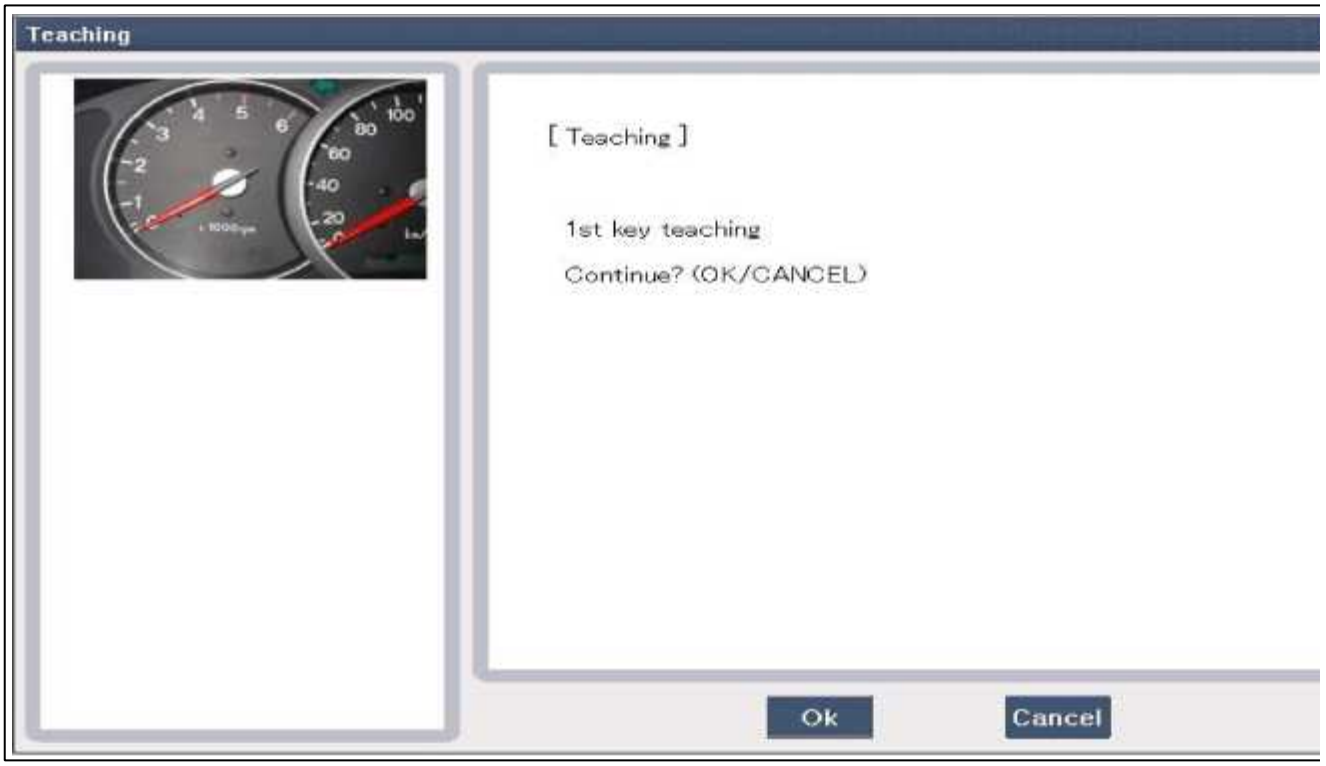


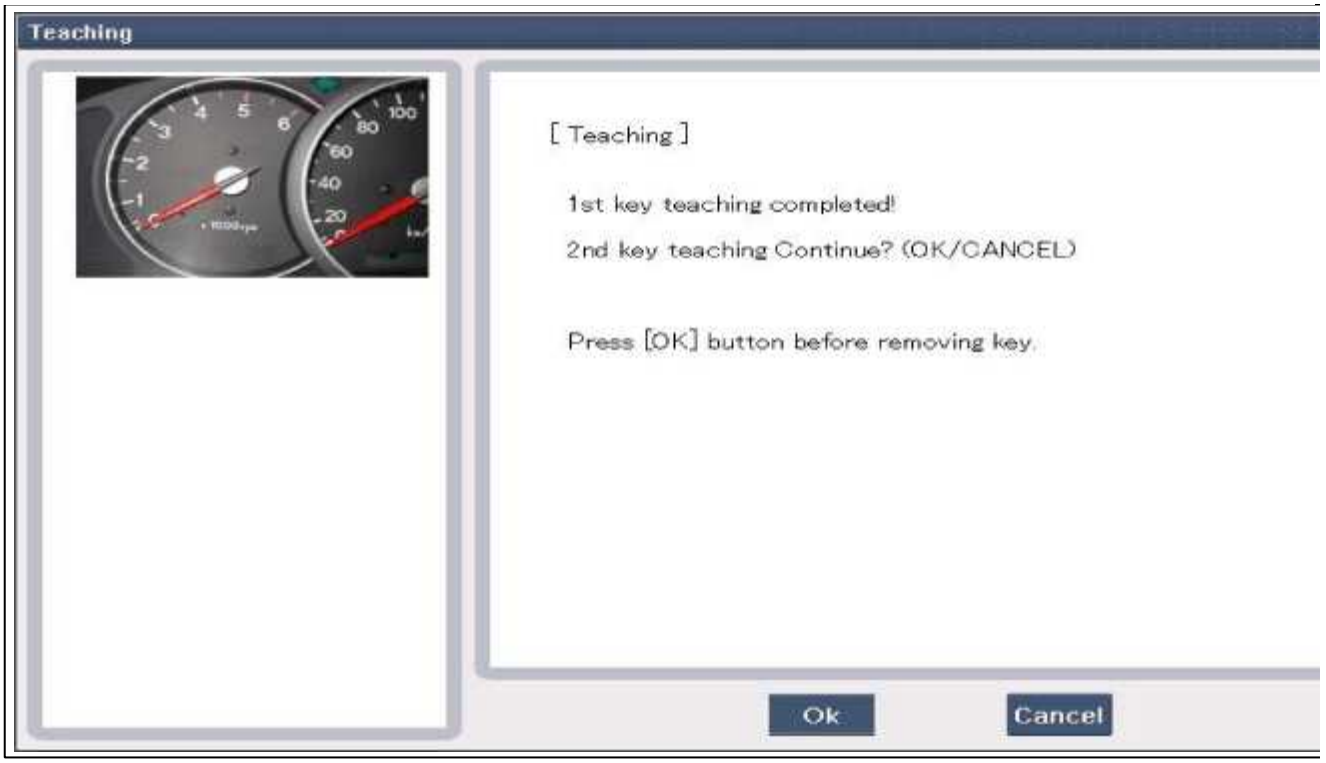
(1) PCM(ECM) learnt status.

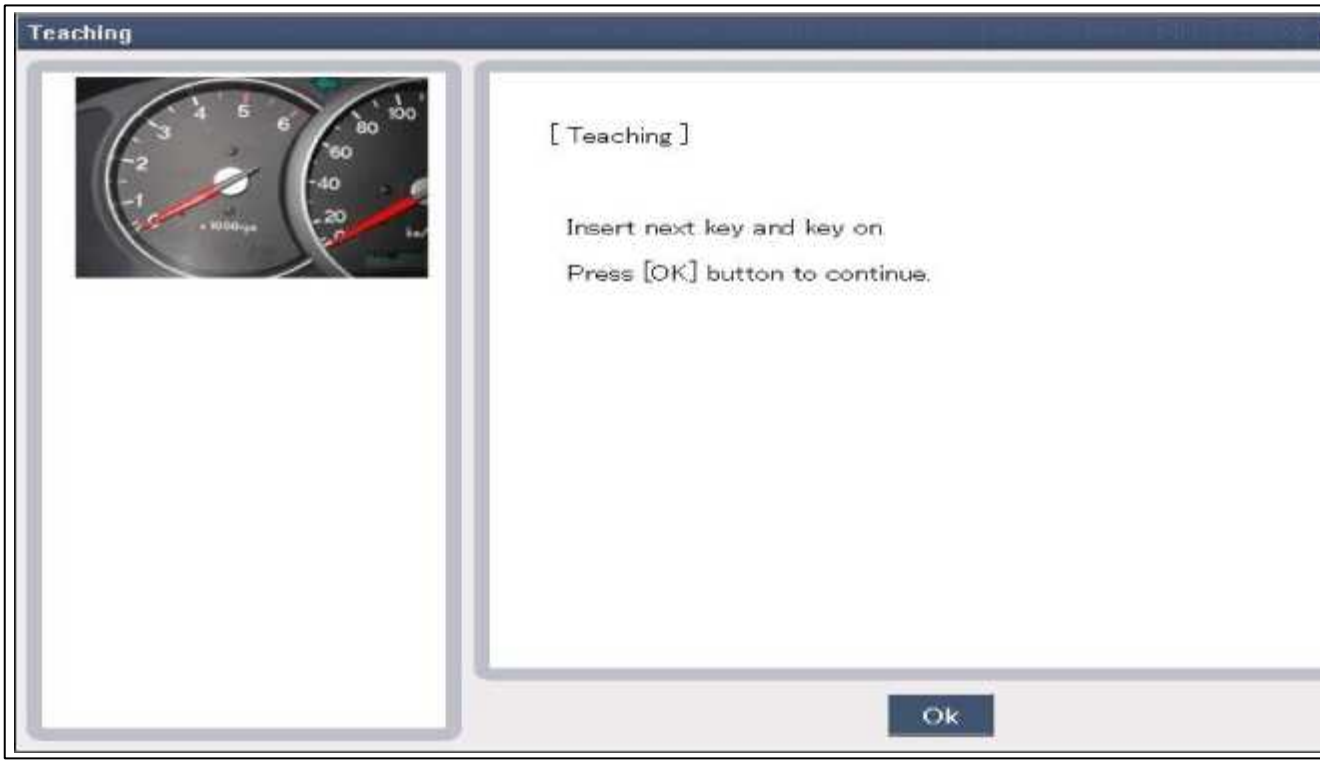

Select System
ENGINE
A/T
ESC
AIRBAG
AIR/CON
IMMO
PIC
TPMS
BCM
CODE
Selected
IMMO
Immobilizer(IMMO)

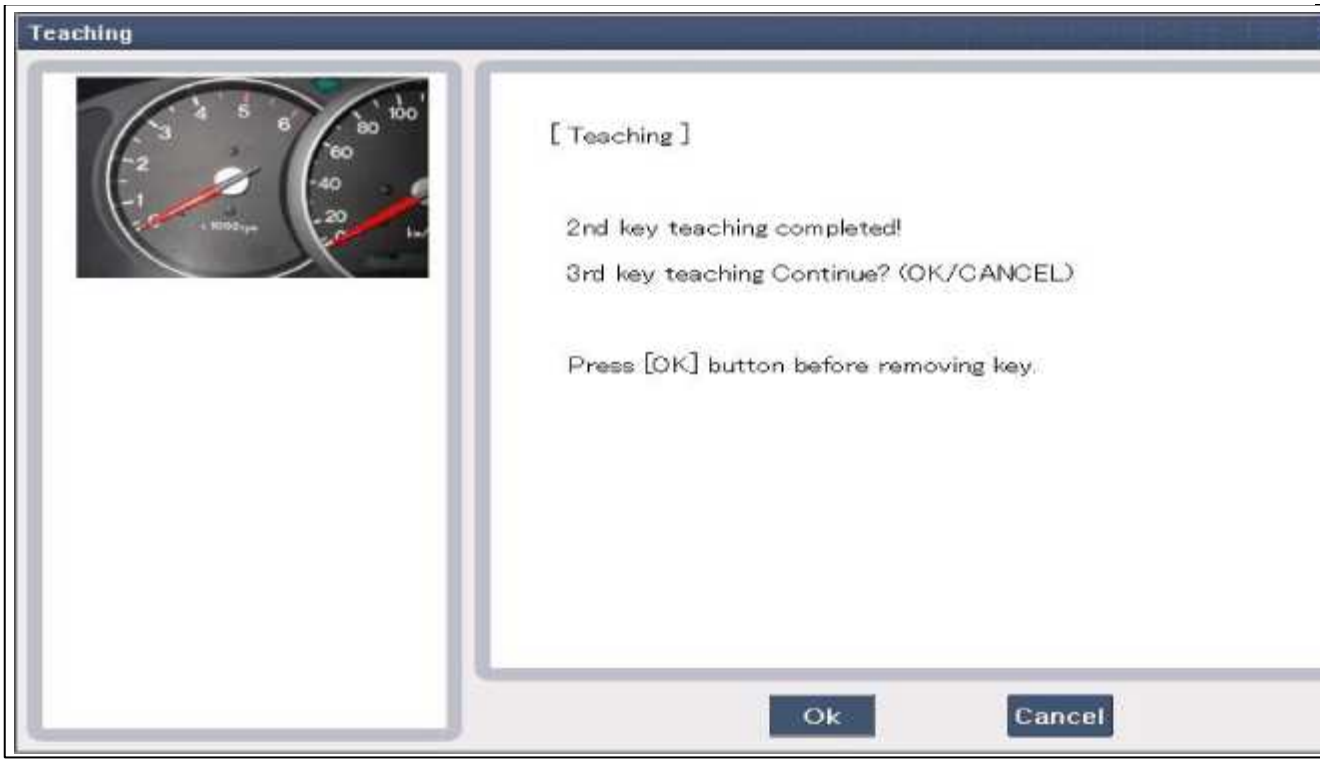

ID Register
Password Teaching/Changing
Neutral Mode
Limp Home Mode
Smatra Neutral Mode
Teaching

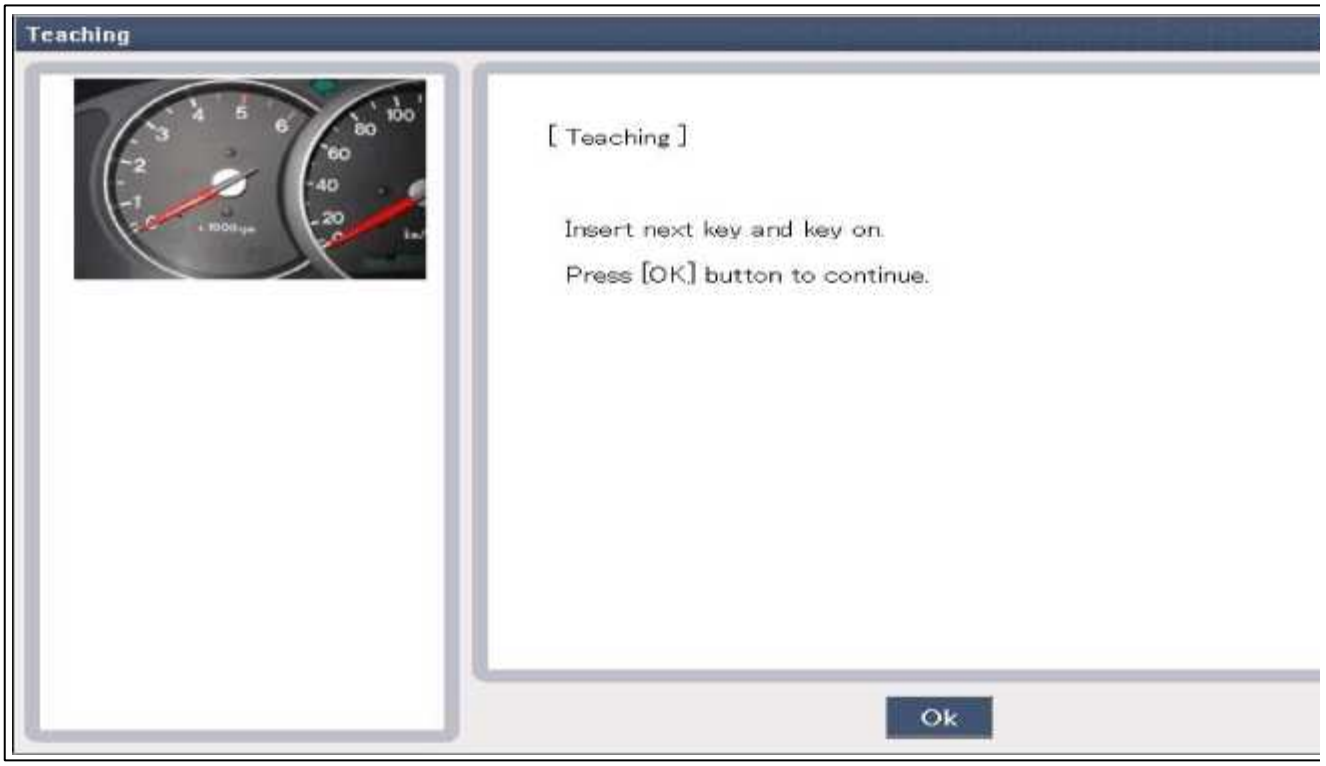


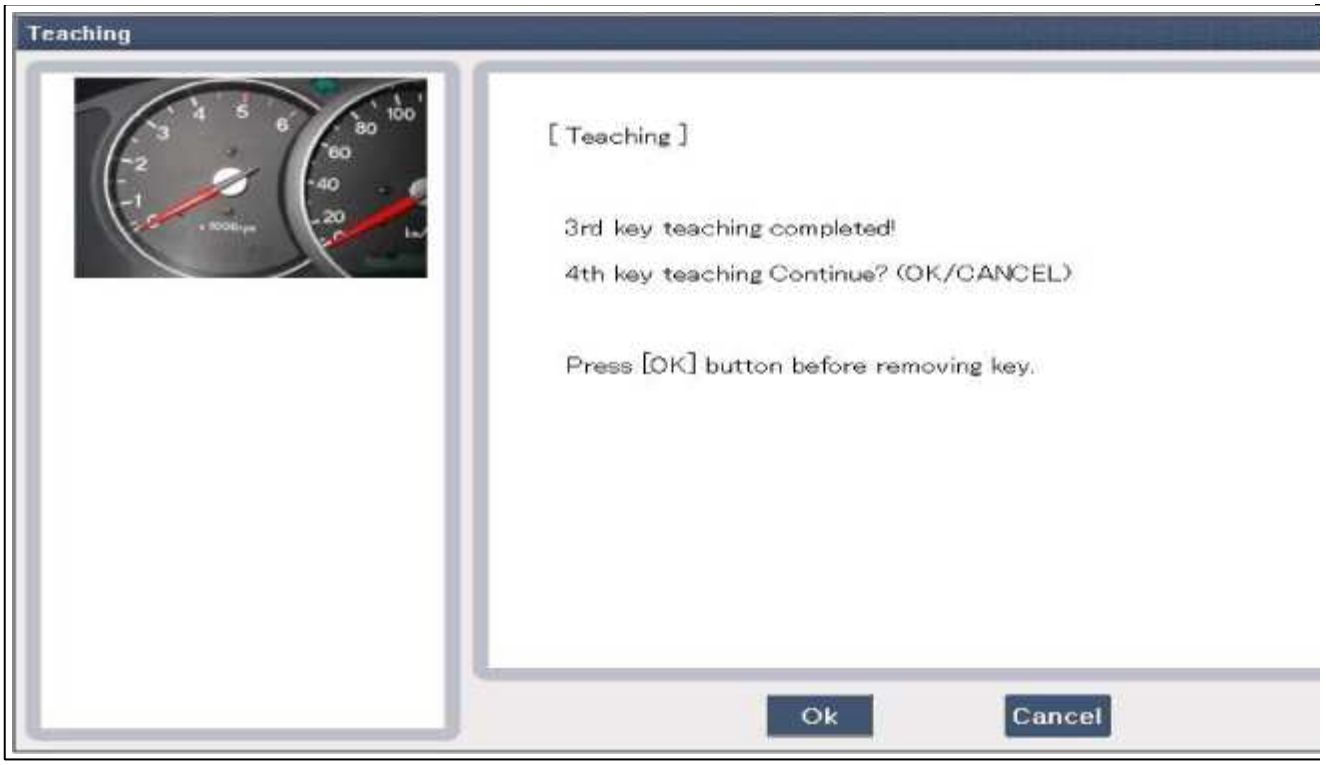


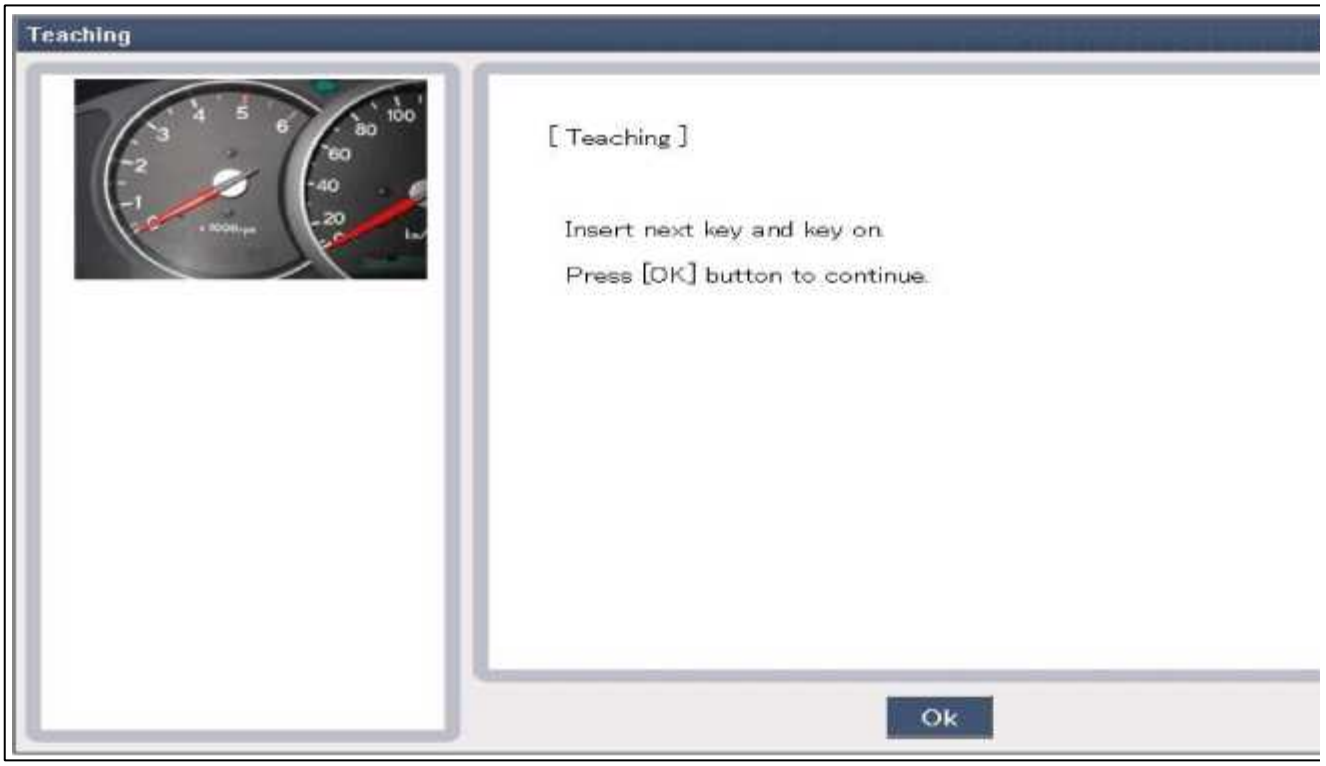

Teaching
[Teaching]
1st key teaching completed!
2nd key teaching Continue? (OK/CANCEL)
Press [OK] button before removing key.
Ok
Cancel

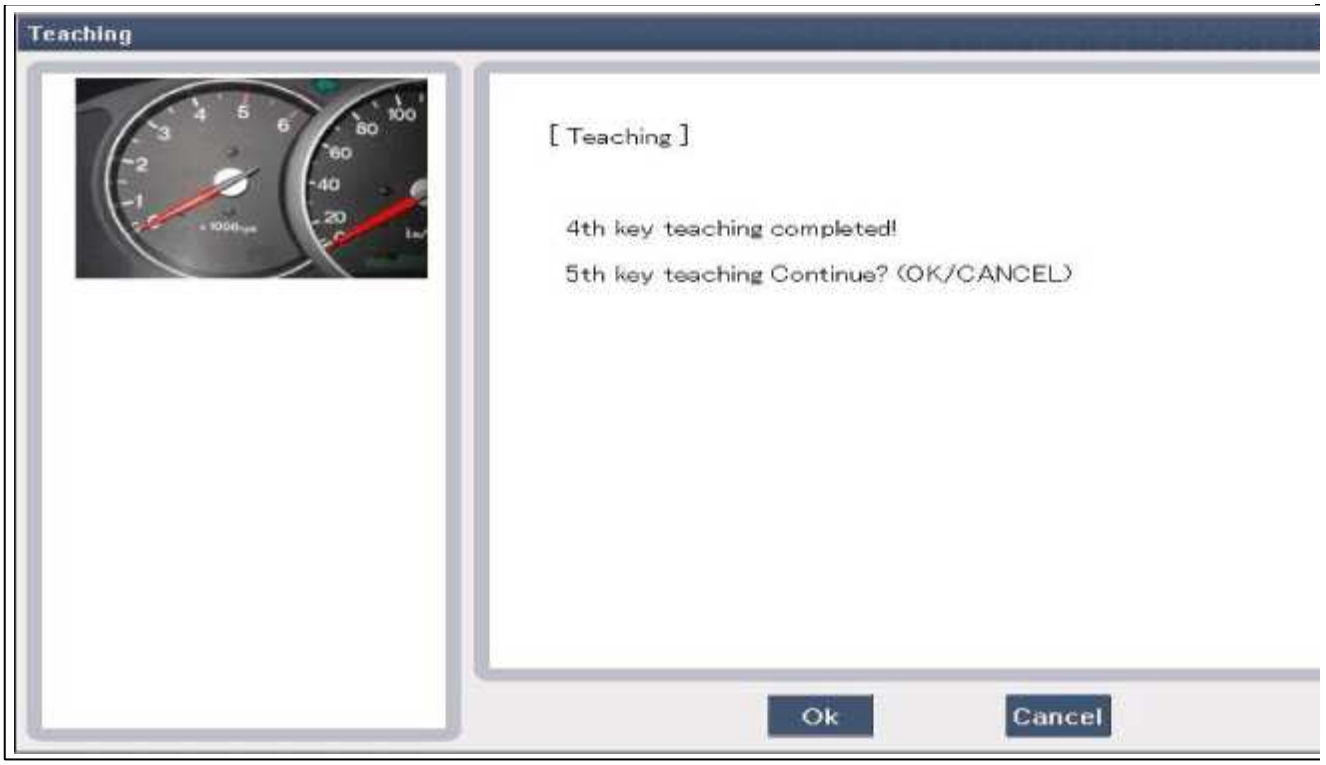

Teaching
[Teaching]
Insert next key and key on
Press [OK] button to continue.
Ok






Teaching
[Teaching]
3rd key teaching completed!
4th key teaching Continue? (OK/CANCEL)
Press [OK] button before removing key.
Ok
Cancel


Teaching
[Teaching]
Insert next key and key on.
Press [OK] button to continue.
Ok



(2) PCM(ECM) virgin status.

After replacing new "PCM(ECM)" GDS displays that PCM(ECM) is virgin status in Key Teaching mode. "VIRGIN" status means that PCM(ECM) has not matched any PIN code before.

2. User Password Teaching Procedure

The user password for limp home is taught at the service station. The owner of the vehicle can select a number wit digits.

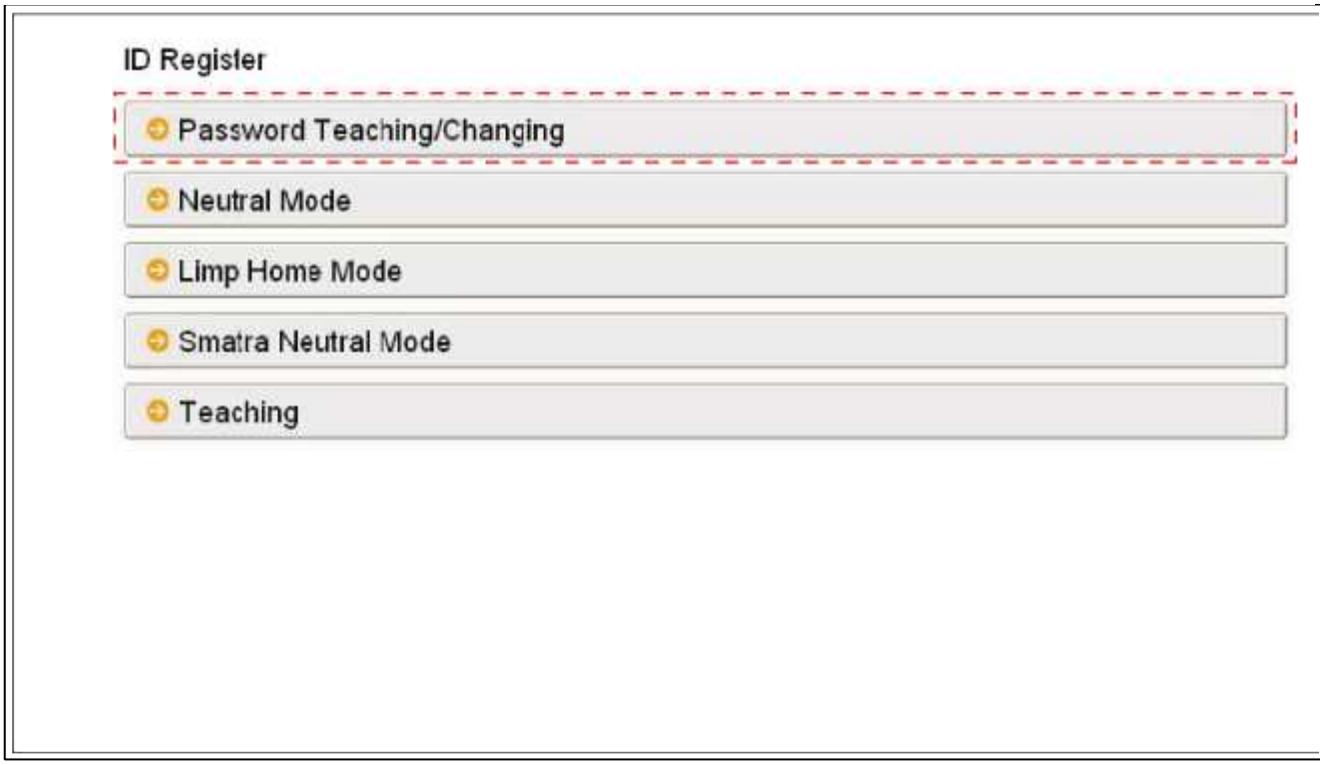
The user password teaching is only accepted by a "learnt" PCM(ECM). Before first teaching of user password to PCM(ECM), the status of the password is "virgin" No limp home function is possible.

The teaching is started by ignition on, with a valid key(learnt key) and sending the user password by tester. After successful teaching, the status of the user password changes from "virgin" to "learnt"

The learnt user password can also be changed. This can be done if the user password status is "learnt" and the tes sends authorization of access, either the old user password or the vehicle specific data. After correct authorization PCM(ECM) requests the new user password. The status remains "learnt" and the new user password will be valic the next limp home mode.

If wrong user passwords or wrong vehicle specific data have been sent to the PCM(ECM) three times continuous intermittently, the PCM(ECM) will reject the request to change the password for one hour. This time cannot be re by disconnecting the battery or any other actions. After reconnecting the battery, the timer starts again for one hou

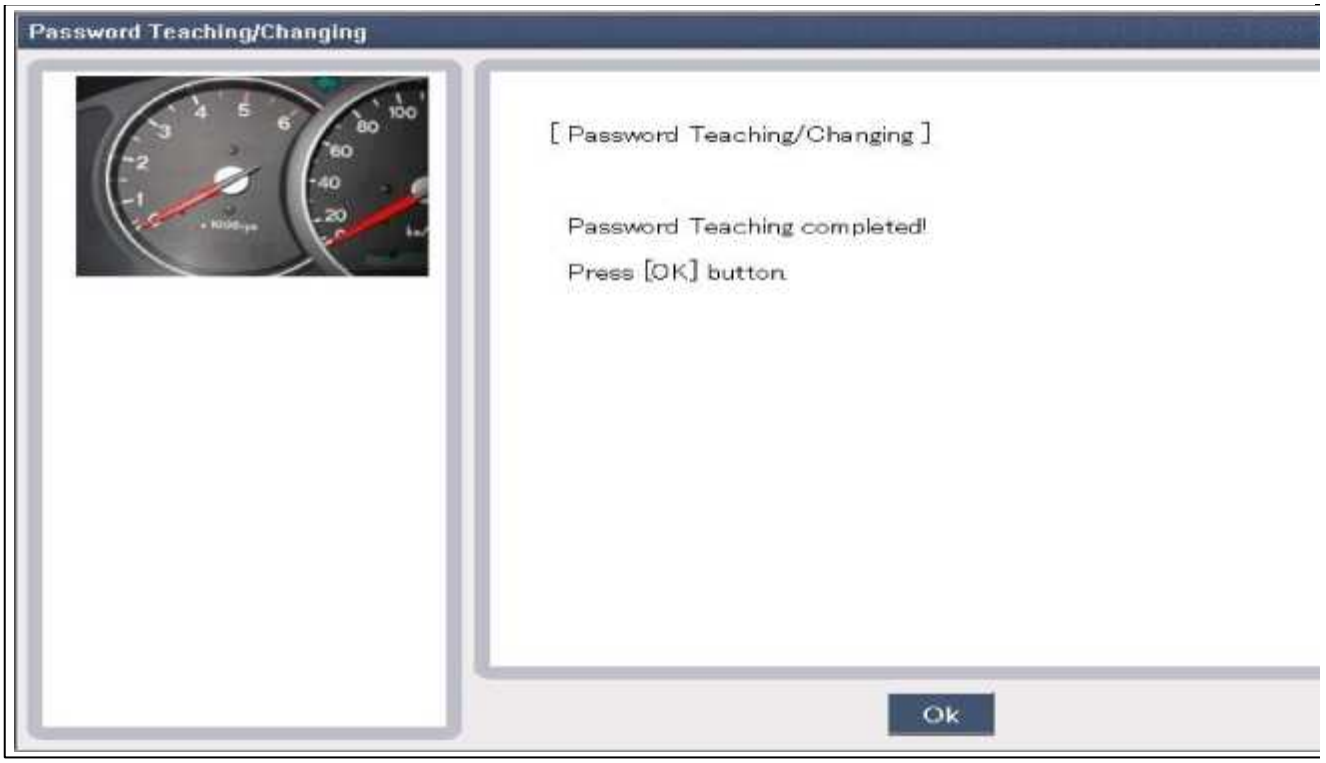
(1) User password teaching


ID Register
Password Teaching/Changing
Neutral Mode
Limp Home Mode
Smatra Neutral Mode
Teaching


Password Teaching/Changing
[Password Teaching/Changing]
Password Status : Virgin
Input new password and press [OK] button.
Ok
Cancel

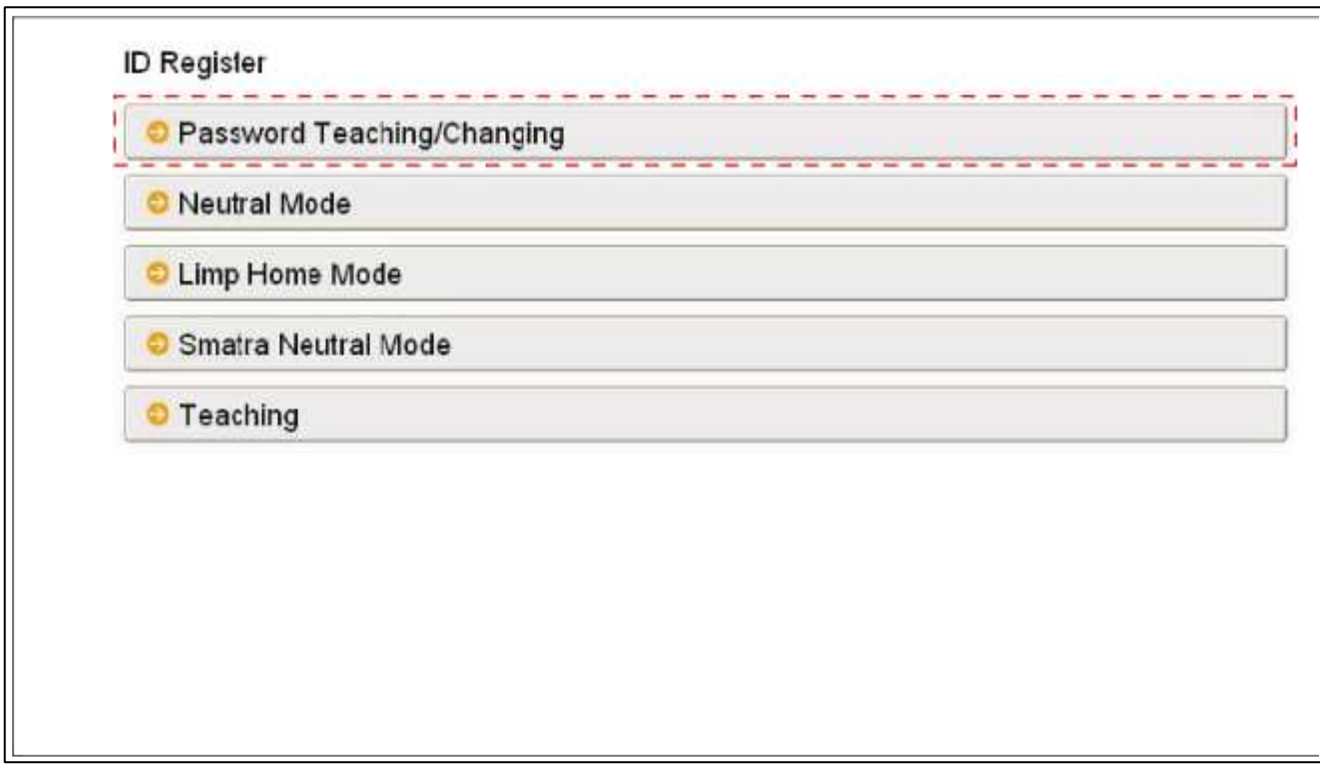

Password Teaching/Changing
[Password Teaching/Changing]
Password Status : Virgin
Input new password and press [OK] button
1 1 1 1
Ok
Cancel

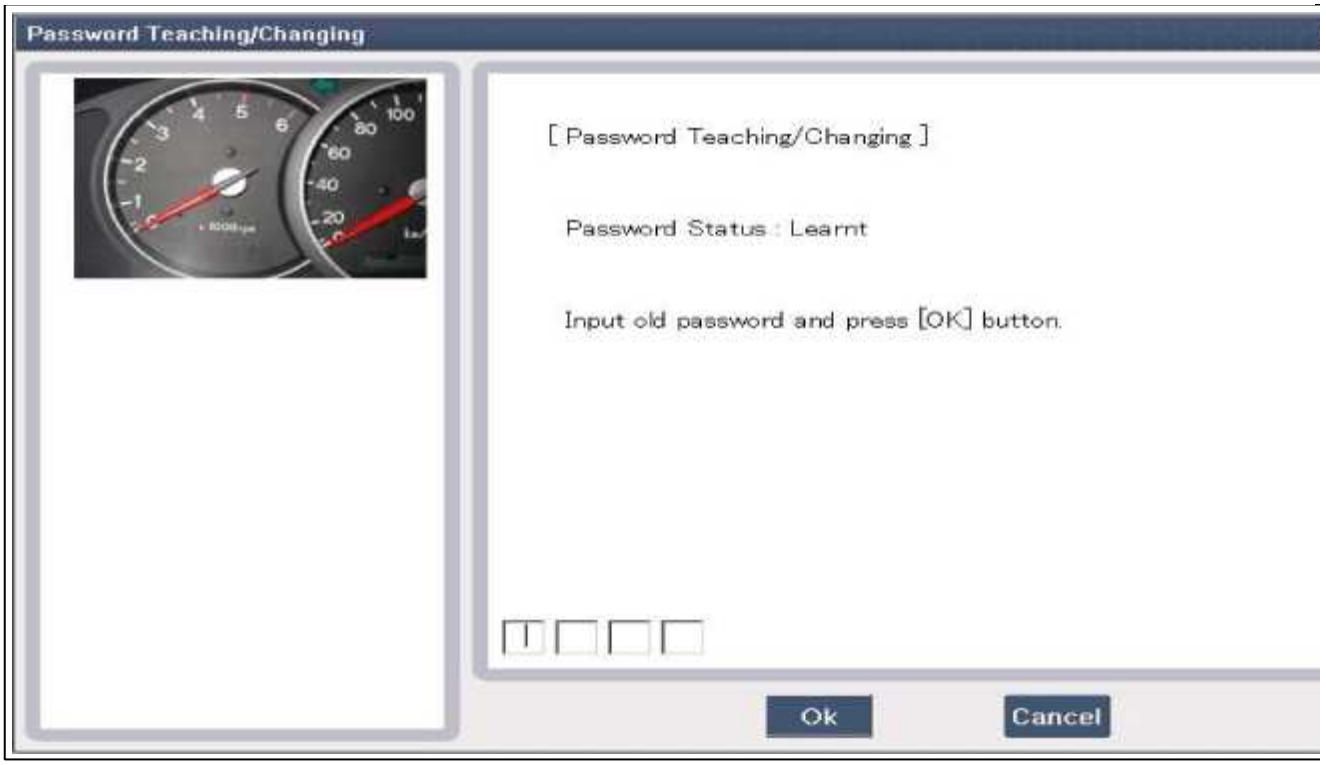

Password Teaching/Changing
[Password Teaching/Changing]
Password Status : Virgin
Are you sure? (Ok/Cancel)
[Condition : IG. On, ENG. Off]
Ok
Cancel

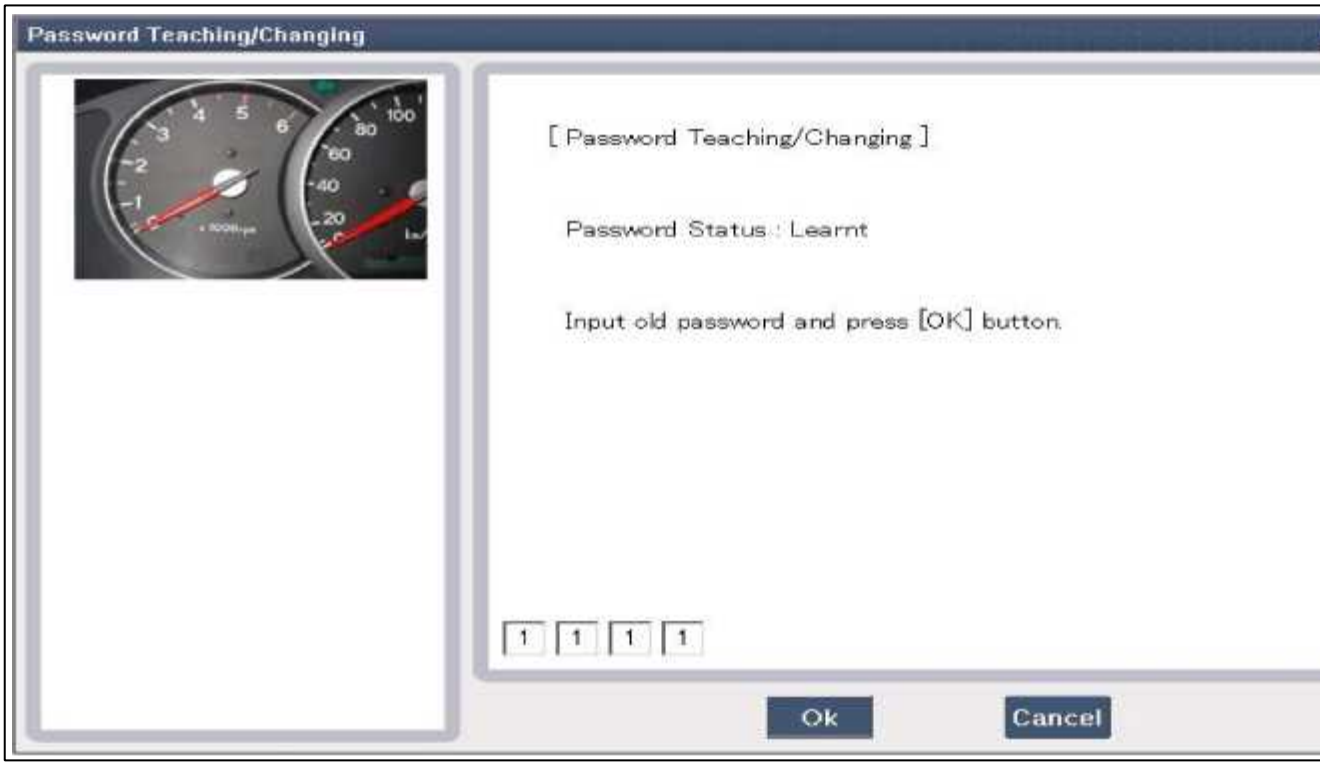


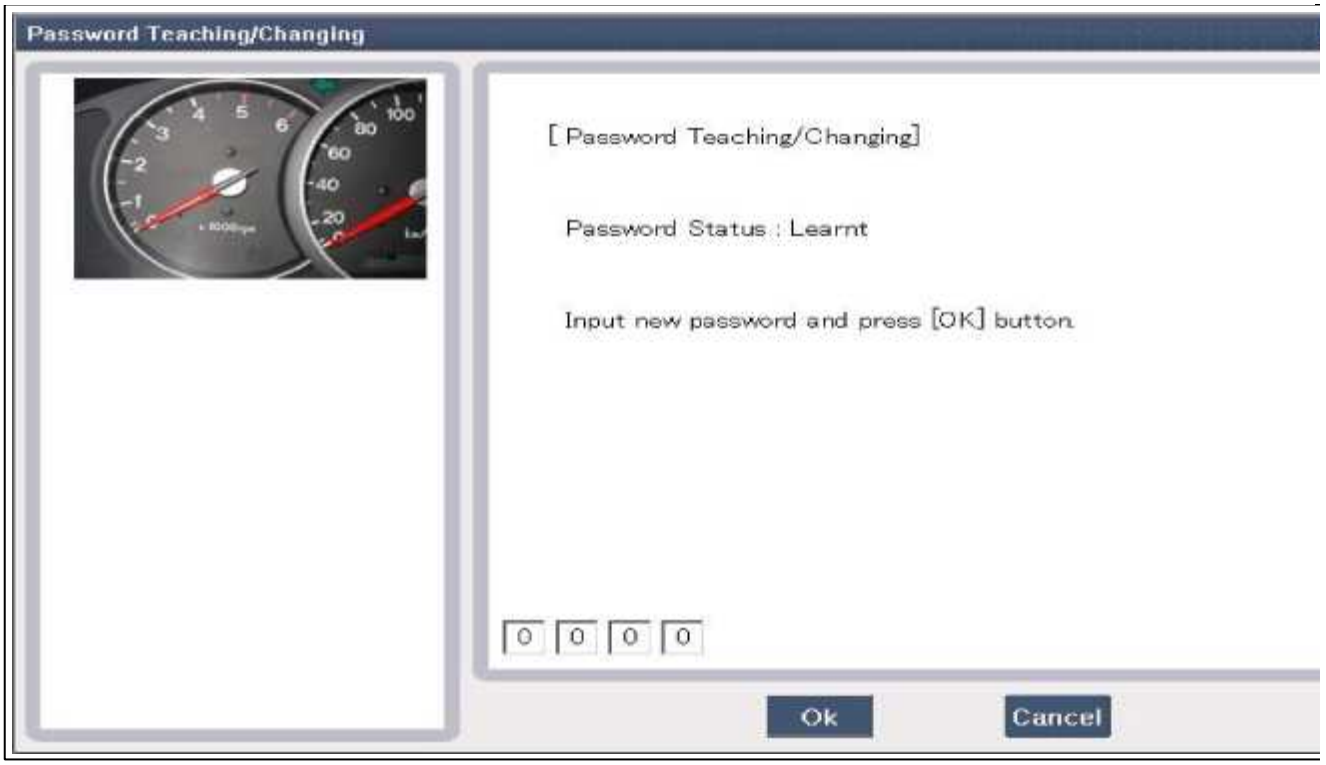
In case of putting wrong password, retry from first step after 10 seconds.

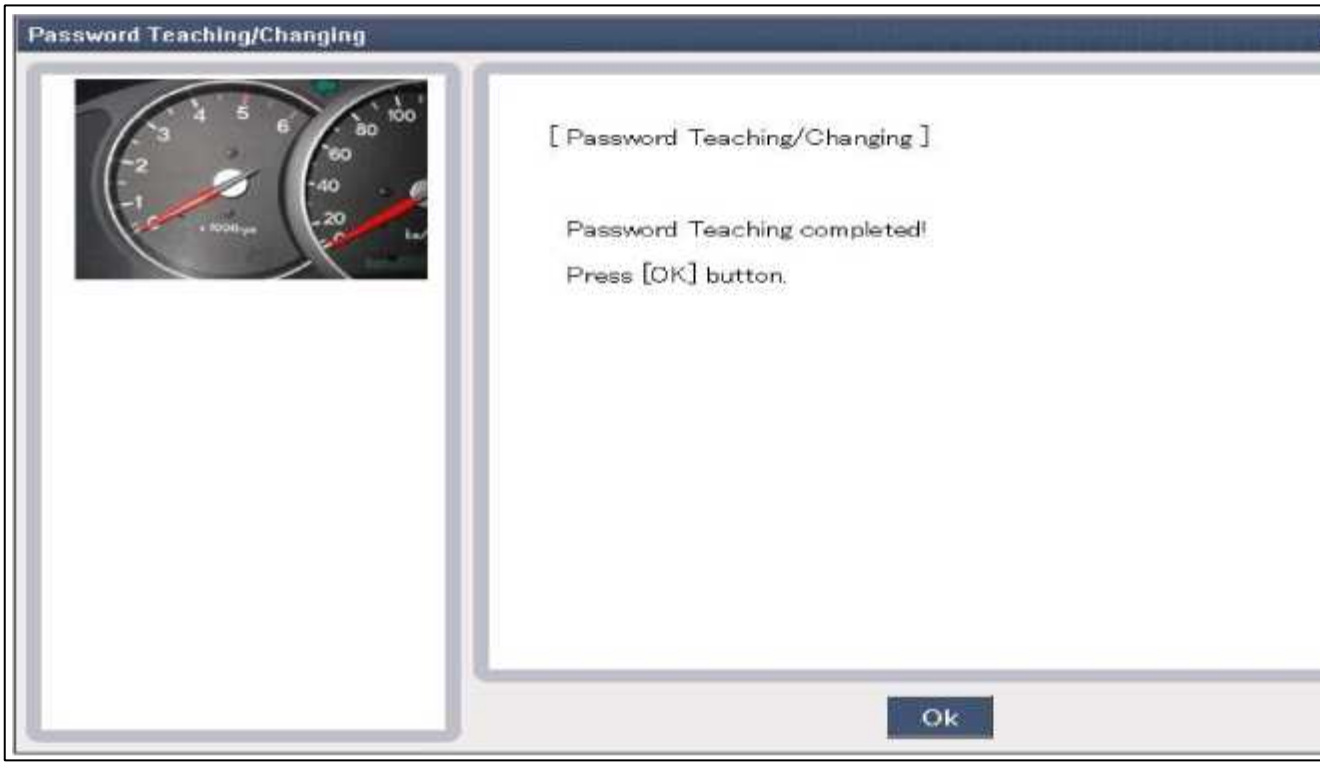
(2) User password changing









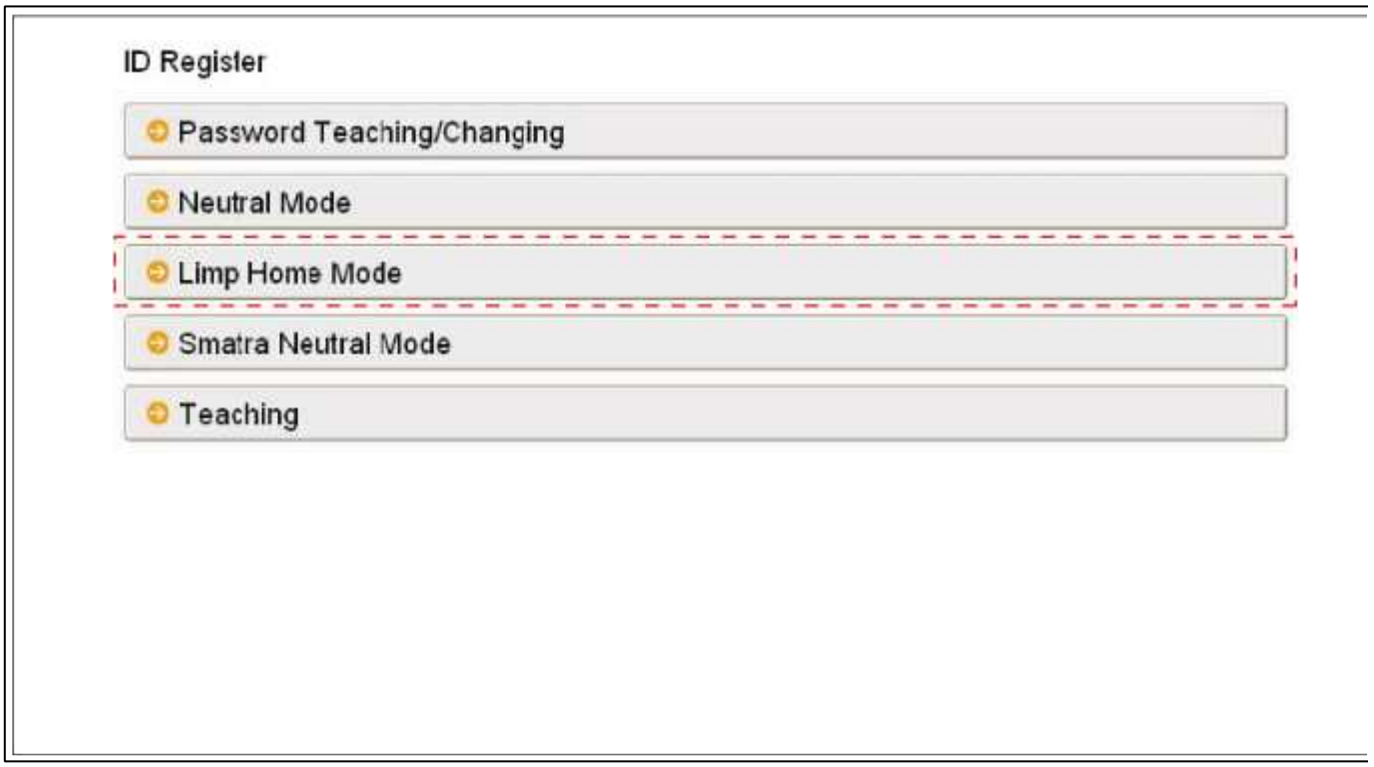


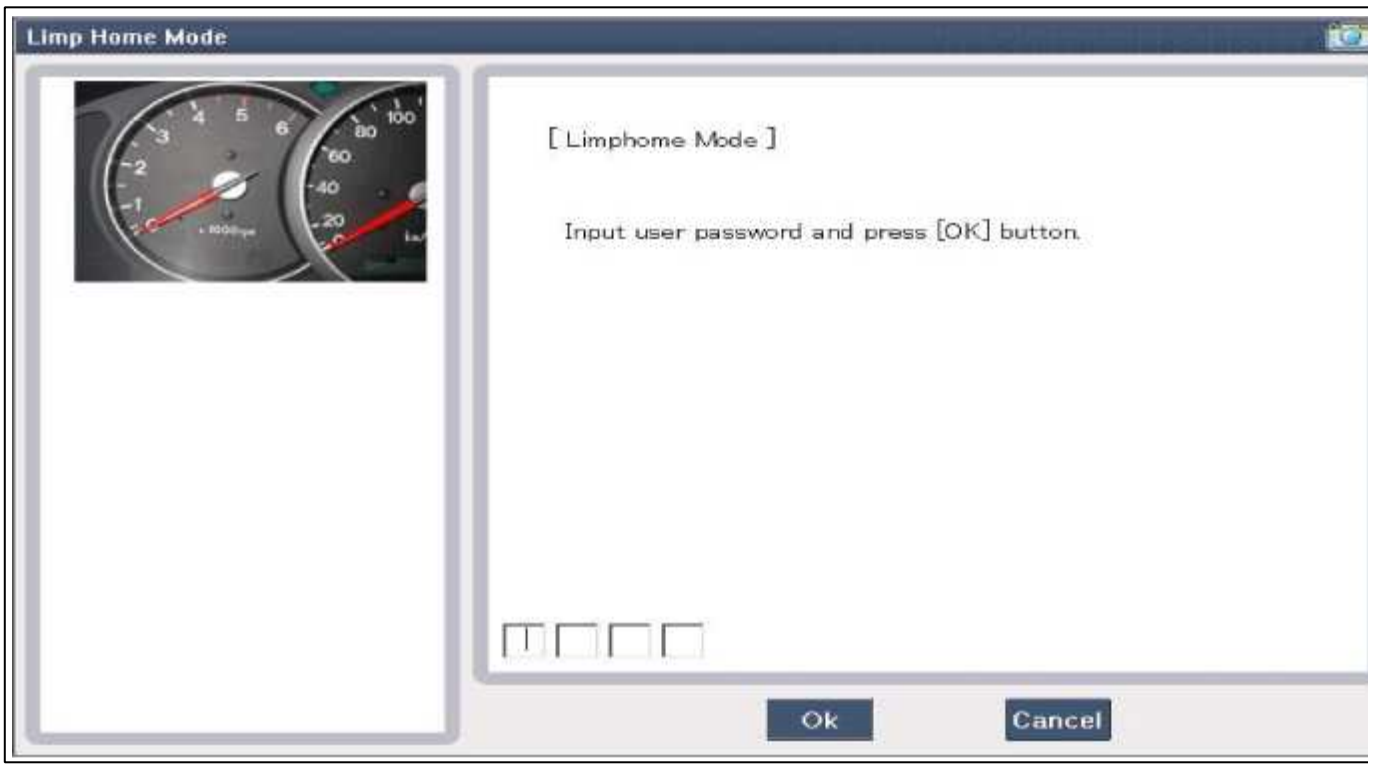
Limp Home Function

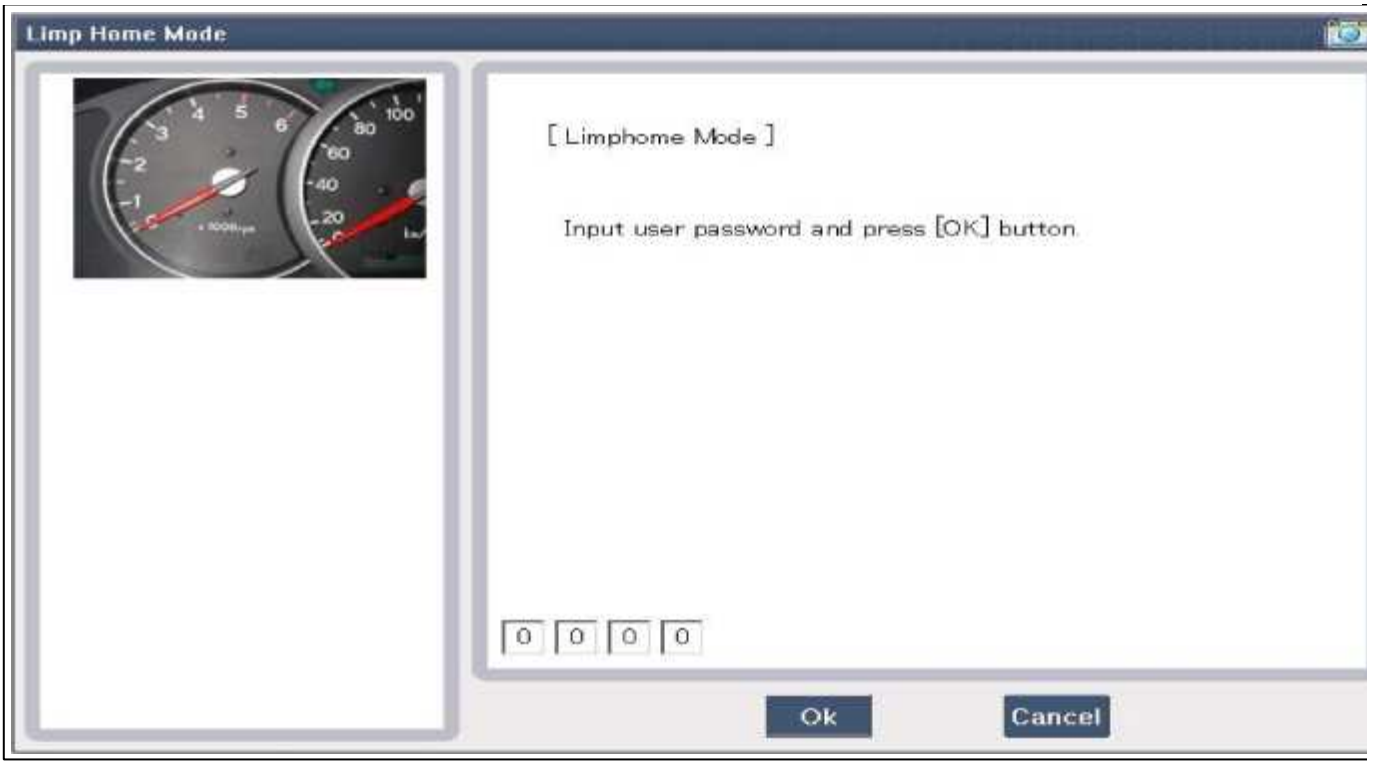
1. Limp Home By Tester

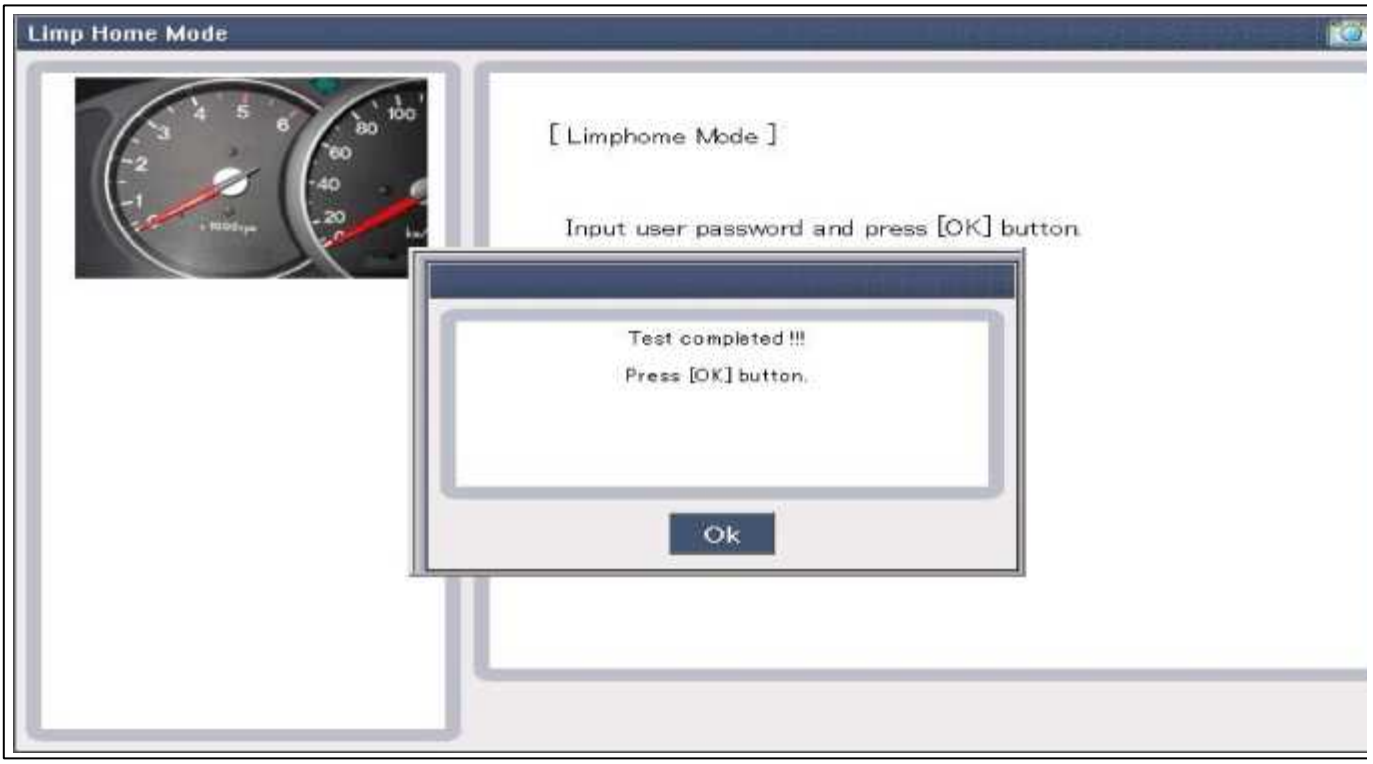
If the PCM(ECM) detects the fault of the SMARTRA or transponder, the PCM(ECM) will allow limp home function of the immobilizer. Limp home is only possible if the user password (4 digits) has been given to the PCM(ECM) before. This password can be selected by the vehicle owner and is programmed at the service statio
The user password can be sent to the PCM(ECM) via the special tester menu.
Only if the PCM(ECM) is in status "learnt" and the user password status is "learnt" and the user password is corre the PCM(ECM) will be unlocked for a period of time (30 sec.). The engine can only be started during this time. After the time has elapsed, engine start is not possible.
If the wrong user password is sent, the PCM(ECM) will reject the request of limp home for one hour. Disconnecti the battery or any other action cannot reduce this time. After connecting the battery to the PCM(ECM), the timer

starts again for one hour.









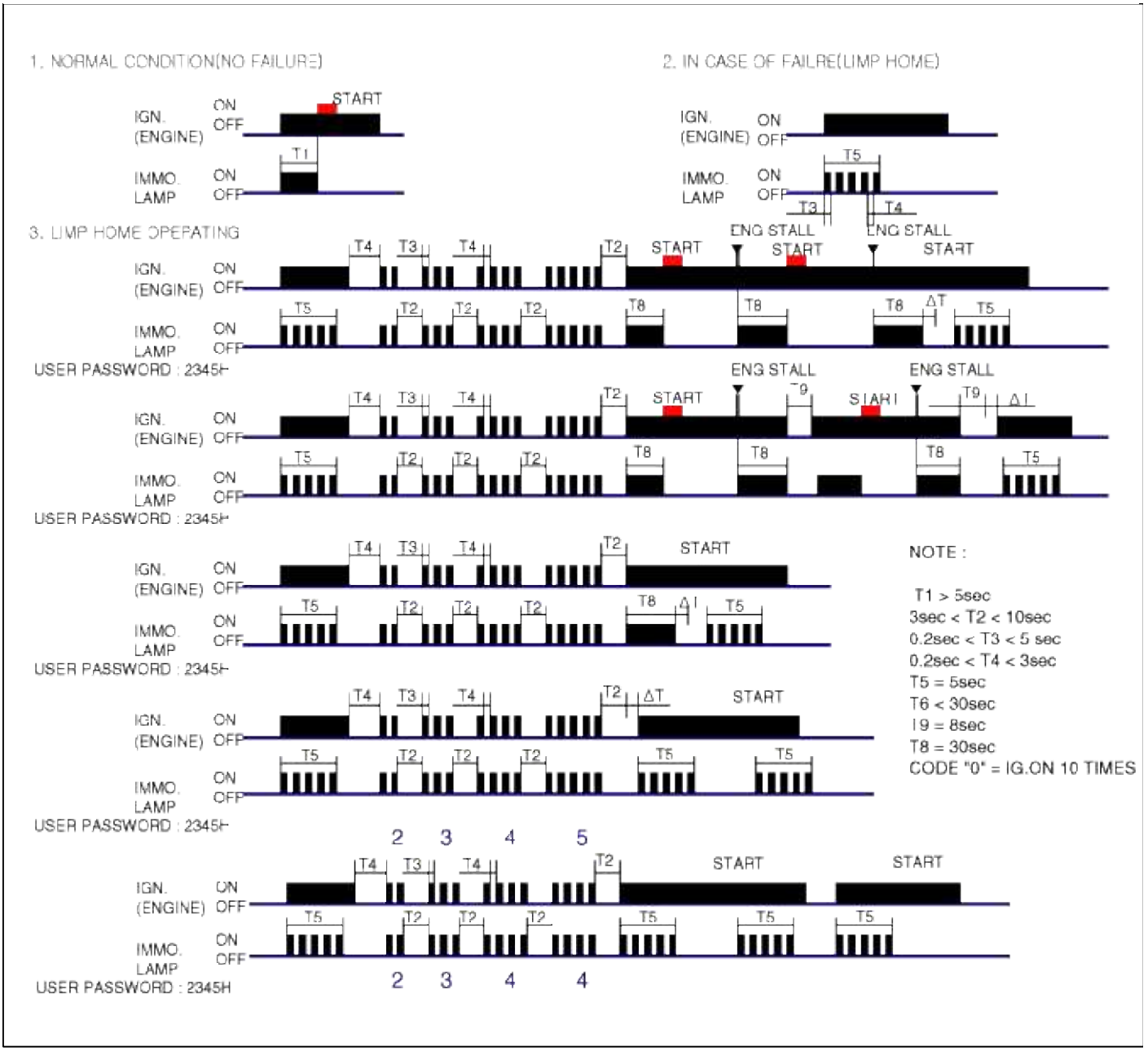
2. Limp Home By Ignition Key

The limp home can be activated also by the ignition key. The user password can be input to the PCM(ECM) by a special sequence of ignition on/off.

Only if the PCM(ECM) is in status "learnt" and the user password status is "learnt" and the user password is correct, the PCM(ECM) will be unlocked for a period of time (30 sec.).

The engine can be started during this time. After the time has elapsed, engine start is not possible. After a new password has been input, the timer (30 sec.) will start again.

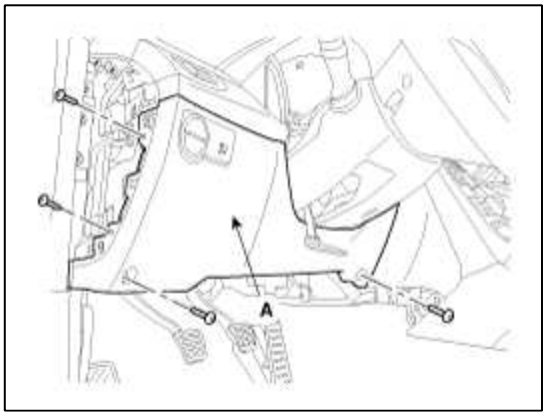
After ignition off, the PCM(ECM) is locked if the timer has elapsed 8 seconds. For the next start, the input of the user password is requested again.



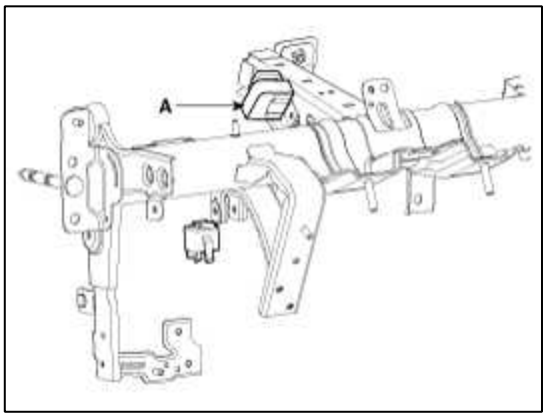
Body Electrical System > Immobilizer System > Immobilizer Control Unit > Repair procedures

Replacement

1. Disconnect the negative (-) battery terminal.
2. Remove the crash pad lower panel (A).



3. Disconnect the 5P connector of the SMARTRA unit and then remove the SMARTRA unit (A) after loosening the screw.

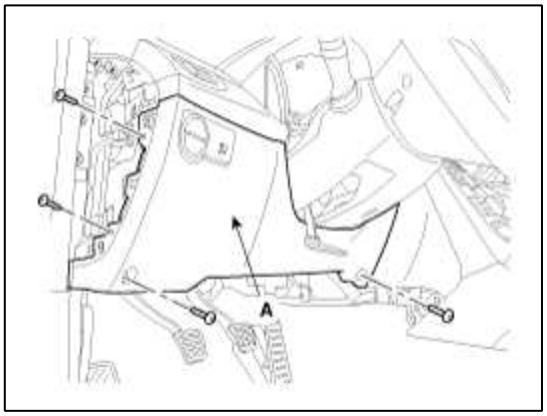


4. Installation is the reverse of removal procedure.

Body Electrical System > Immobilizer System > Antenna Coil > Repair procedures

Replacement

1. Disconnect the negative (-) battery terminal.
2. Remove the crash pad lower panel (A).



3. Remove the steering column shaft (Refer to the ST group).
4. Disconnect the 6P connector of the coil antenna and then remove the coil antenna after loosening the screw.
5. Installation is the reverse of removal procedure.

Body Electrical System > Immobilizer System > Troubleshooting

Diagnosis Of Immobilizer Faults

- Communication between the ECM and the SMARTRA.
- Function of the SMARTRA and the transponder.
- Data (stored in the ECM related to the immobilizer function.

The following table shows the assignment of immobilizer related faults to each type:

Immobilizer Related Faults	Fault types	Diagnostic codes
PCM(ECM) fault	1. Non-Immobilizer-EMS connected to an Immobilizer	P1610
Transponder key fault	1. Transponder not in password mode 2. Transponder transport data has been changed.	P1674 (Transponder status error)
Transponder key fault	1. Transponder programming error	P1675 (Transponder programming error)
SMARTRA fault	1. Invalid message from SMARTRA to PCM(ECM)	P1676 (SMARTRA message error)
SMARTRA fault	1. Virgin SMARTRA at learnt EMS 2. Neutral SMARTRA at learnt EMS 3. Incorrect the Authentication of EMS and SMARTRA 4. Locking of SMARTRA	P169A (SMARTRA Authentication fail)
SMARTRA fault	1. No response from SMARTRA 2. Antenna coil error 3. Communication line error (Open/Short etc.) 4. Invalid message from SMARTRA to PCM(ECM)	P1690 (SMARTRA no response)
Antenna coil fault	1. Antenna coil open/short circuit	P1691 (Antenna coil error)
Immobilizer indicator lamp fault	1. Immobilizer indicator lamp error (Cluster)	P1692 (Immobilizer lamp error)
Transponder key fault	1. Corrupted data from transponder 2. More than one transponder in the magnetic field (Antenna coil) 3. No transponder (Key without transponder) in the magnetic field (Antenna coil)	P1693 (Transponder no response error/invalid response)
PCM(ECM) fault	1. Request from PCM(ECM) is invalid (Protocol layer violation- Invalid request, check sum error etc.)	P1694 (PCM(ECM) message error)
PCM(ECM) internal permanent memory (EEPROM) fault	1. PCM(ECM) internal permanent memory (EEPROM) fault 2. Invalid write operation to permanent memory (EEPROM)	P1695 (PCM(ECM) memory error)
Invalid key fault	1. Virgin transponder at PCM(ECM) status "Learnt"Learnt (Invalid) Transponder at PCM(ECM) status "Learnt"(Authentication fail)	P1696 (Authentication fail)
Hi-Scan fault	1. Hi-Scan message error	P1697
Locked by timer	1. Exceeding the maximum limit of Twice IGN ON (32 times)	P1699 (Twice IG ON over trial)

Body Electrical System > Front/Rear Parking Assist System > Specifications

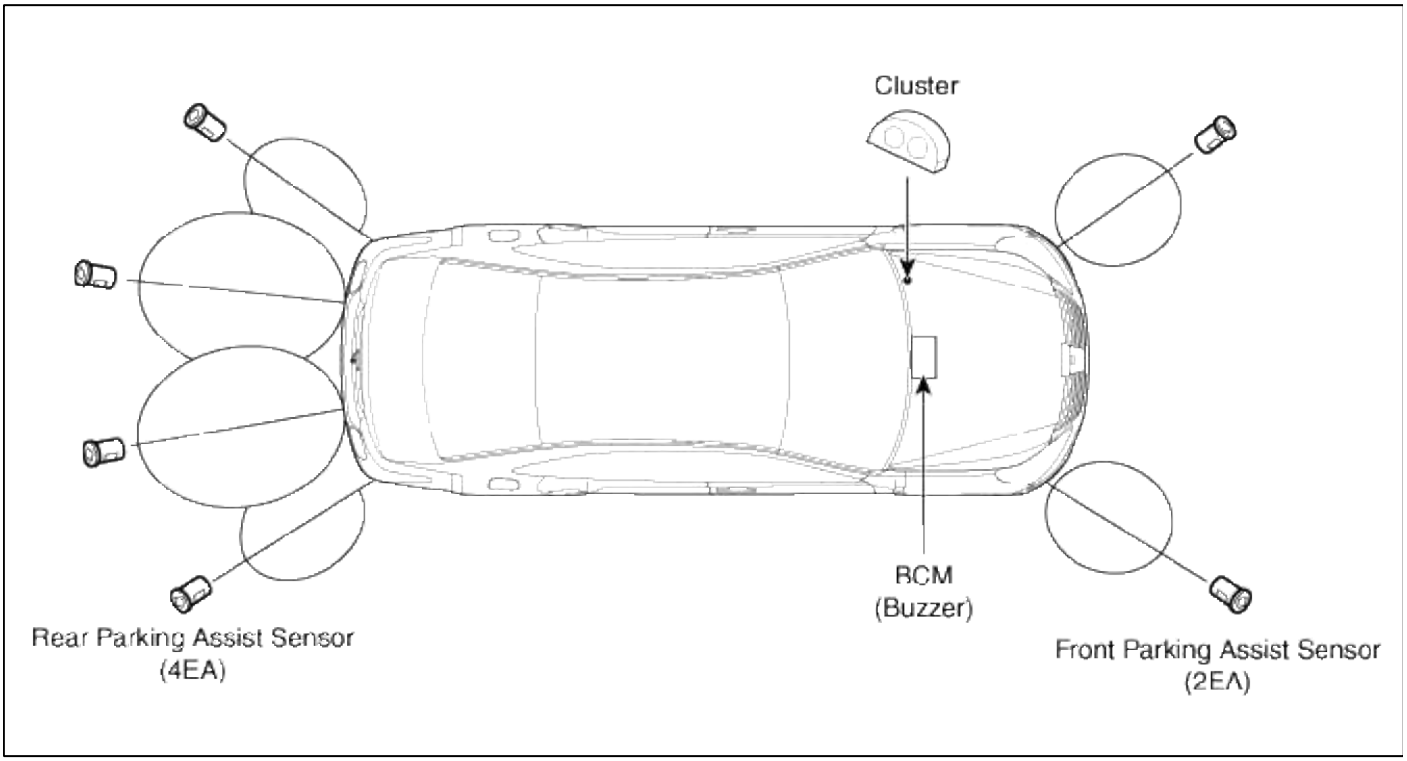
Specification

Item			Specification
Ultrasonic sensor	Voltage rating		DC 12 V
	Detecting range		30 cm ~ 120 cm
	Operation voltage		DC 9 ~ 16 V
	Operation current		MAX 300 mA
	Operation temperature		-30°C ~ +80°C (-22°C ~ +176°C)
	Operation frequency		8 ± 5 KHz
	Number of sensors	Front	2
		Rear	4

Rear parking assist control unit function is built in BCM (body control unit).

Body Electrical System > Front/Rear Parking Assist System > Components and Components Location

Component Location



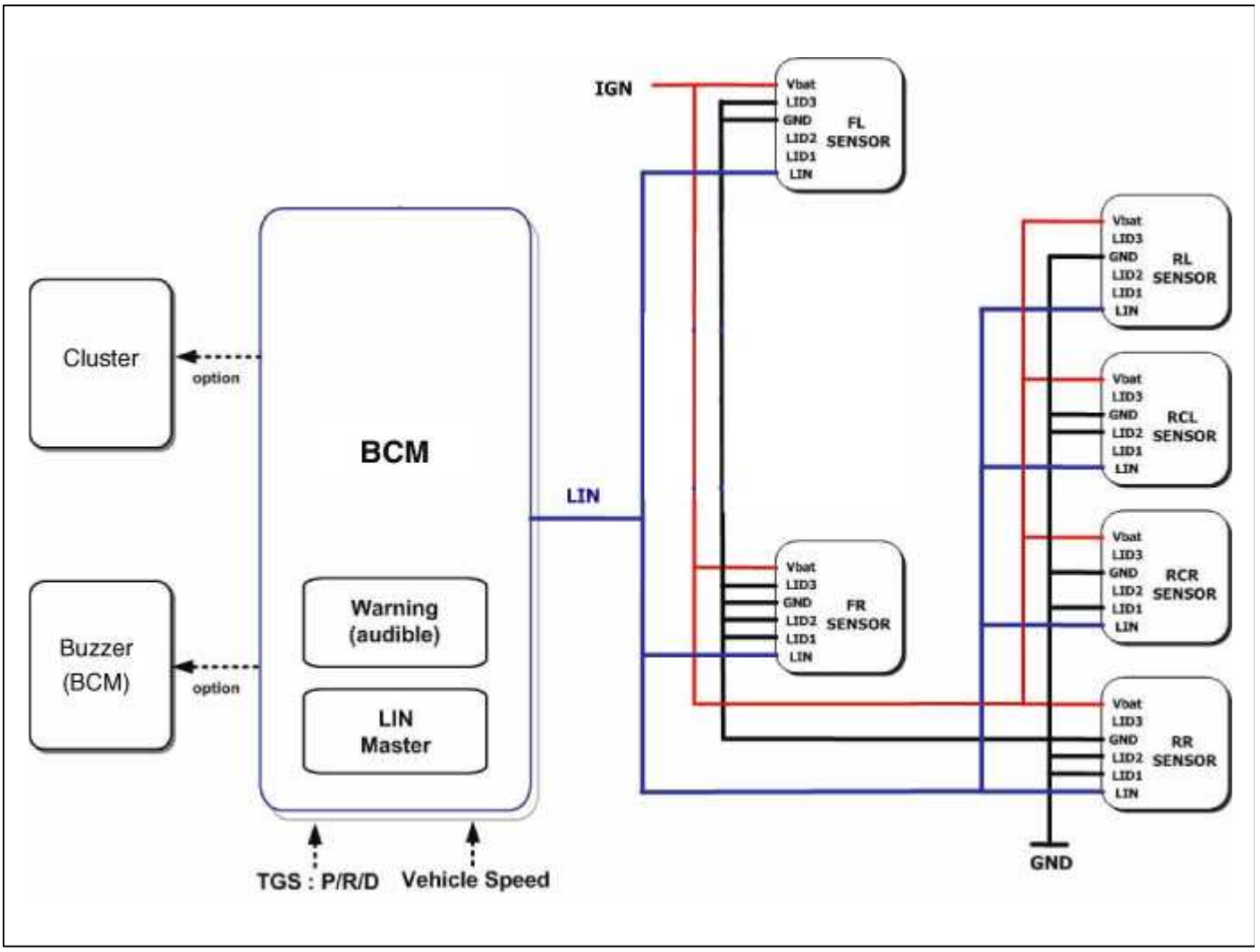
Rear parking assist control unit function is built in BCM (body control unit).

Body Electrical System > Front/Rear Parking Assist System > Description and Operation

System Overview

RPAS(Rear Parking Assist System) is an electronic driving aid device warning driver to be cautious when they park

or speed low after detecting an object on side and behind of vehicle by using the feature of ultrasonic waves.
PAS consists of Six(Front:2, Rear:4) PAS sensors which are detecting the obstacles and transmit the result separated into three warning levels, the first, second and third to BCM by Lin communication. BCM decides the alarm level by the transmitted communication message from the slave sensors, then operate the buzzer or transmits the data for display.
System Block Diagram



System Operation Specification.

1. INIT mode
   (1) System initializing time is 500ms after IGN1+ R Gear.
   (2) RPAS recognizes LID and sets the sensor ID up during initialization.
   (3) RPAS activates each sensor and then executes the diagnosis after finishing initialization of BCM
   (4) R-PAS Starting buzzer" is normally worked, when sensor does not send an error message and after finishing error diagnosis.
   (5) If any failure is received from the any sensors, R-PAS Starting Buzzer" does not work but the failure alarm is operated for a moment.
   If you have display option, warning sign is also shown on it.
   (6) Buzzer for sensor failure is operated once, but display is shown continuously until it is repaired completely.

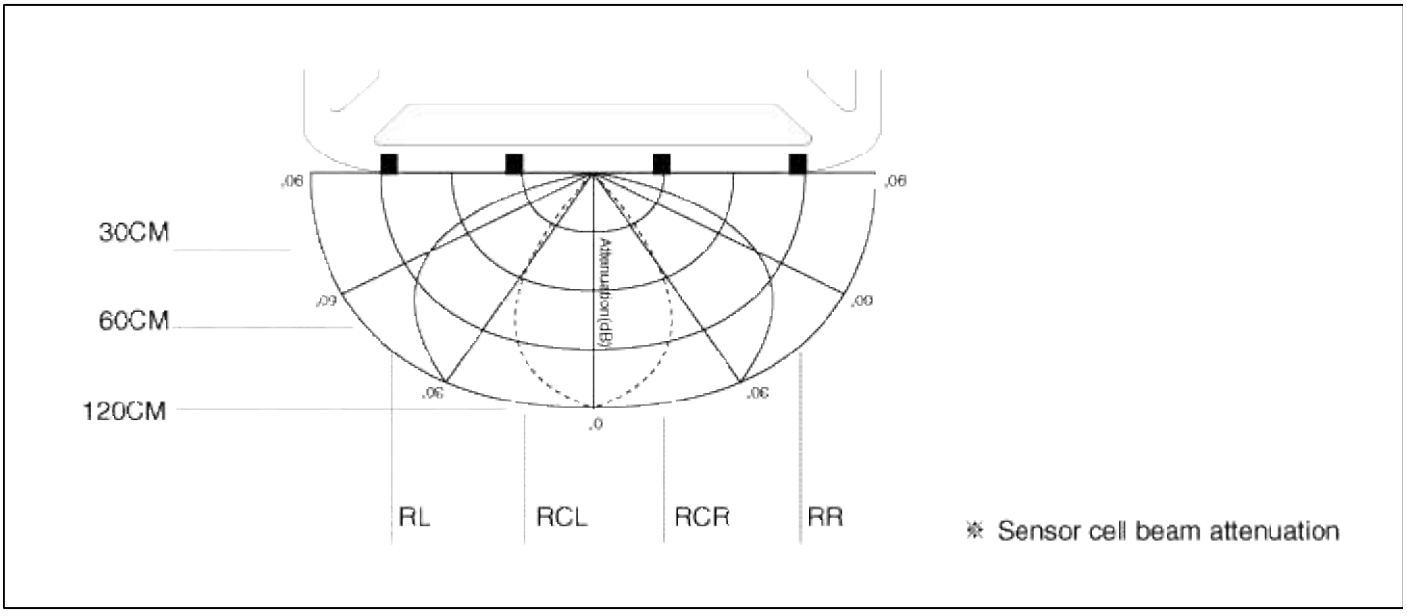
2. NORMAL Mode
   (1) LIN communication starts and keeps the routine after IGN1 ON+R gear
   (2) BCM send a message once to each sensor for operating request to check the initial status of the system and four sensors response at a time. At this time, if there is no problem, the alarm starts after 500ms of R gear shifting at 300ms intervals.
   (3) After initialization, normal mode starts 100ms later after finishing alarm output.
   (4) Alarm for obstacles is divided into 3 levels.
   The first and second are intermittent sound, and the third alarms continuously (Front sensor have second and third alarms.)
   (5) The efficient vehicle speed of RPAS operation is under 10Km/h.
   (6) Refer to 'Digital PAS Project LIN communication' for the more detailed communication specification.

Sensing Area

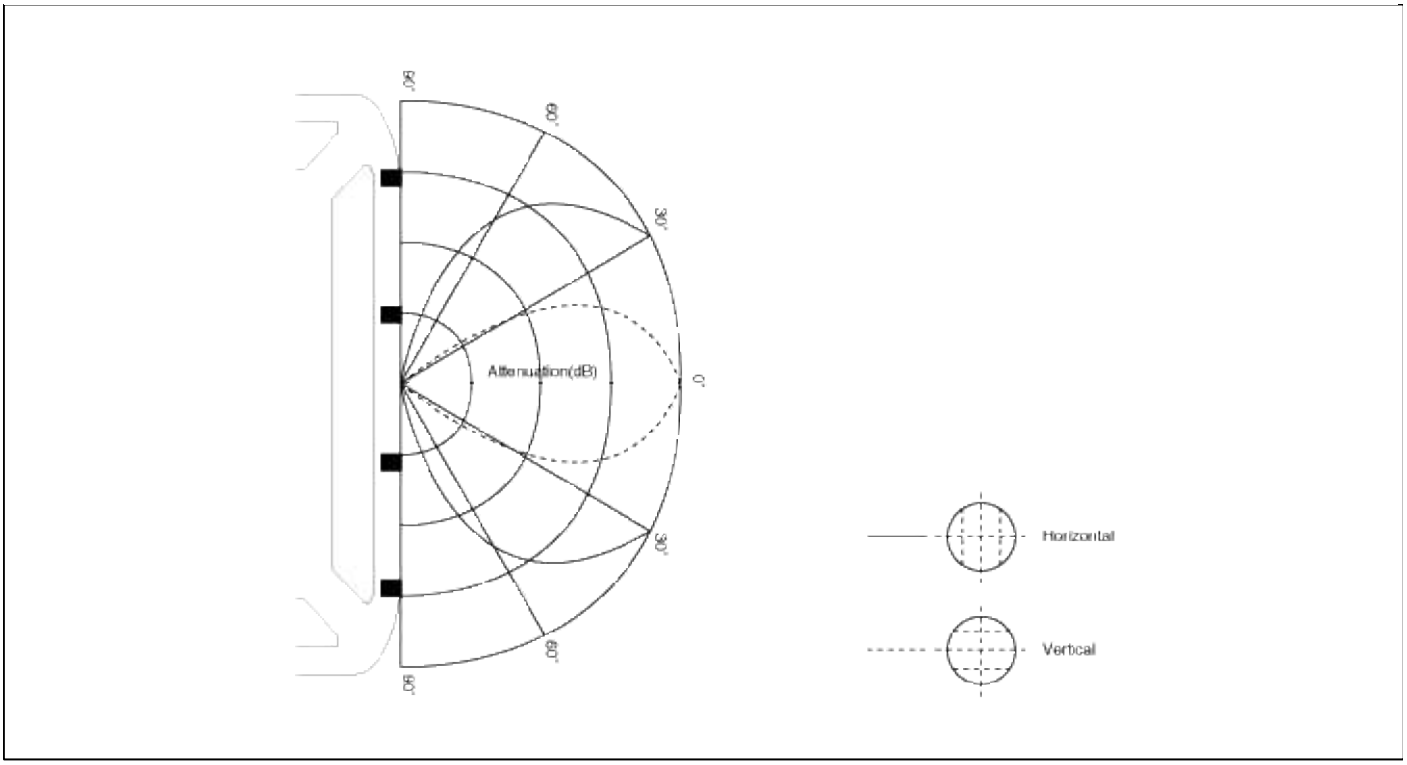
1. Measurement condition – PVC pole (diameter 75mm, length 3m), normal temperature
2. Distance range detected objects (Measured directly in front of sensor)

Position	Level	Distance range	
		cm	inch
Front	2nd	31 ~ 60 (±15)	12.2 ~ 23.6 (±5.9)
	3rd	0 ~ 30 (±10)	Less than 11.8 (±3.9)
Rear	1st	61 ~120 (±15)	24.0 ~ 47.2 (±5.9)
	2nd	31 ~ 60 (±15)	12.2 ~ 23.6 (±5.9)
	3rd	Less than 30 (±10)	Less than 11.8 (±3.9)

Horizontal Sensing Area



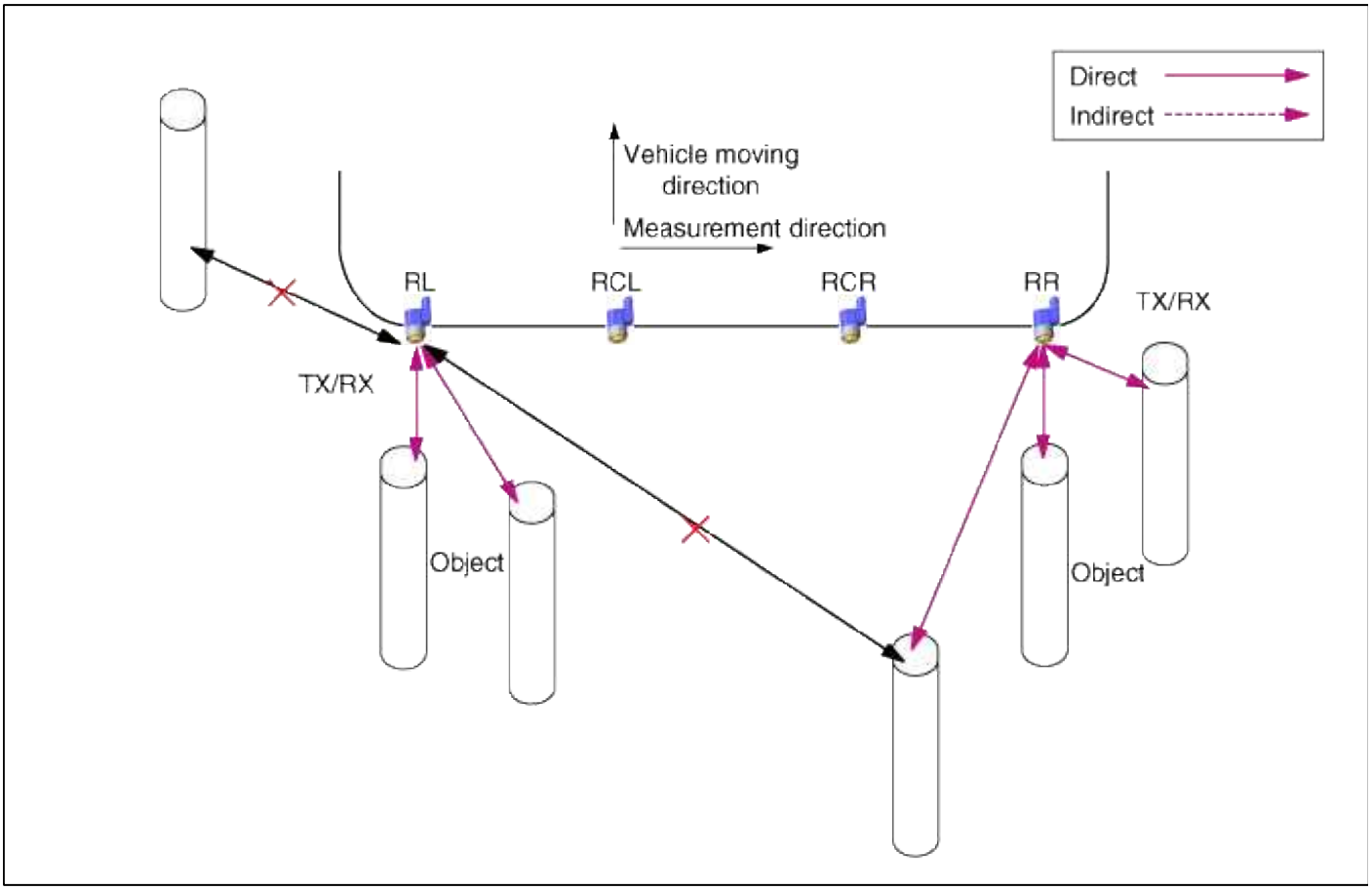
Vertical Sensing Area



Distance Measurement

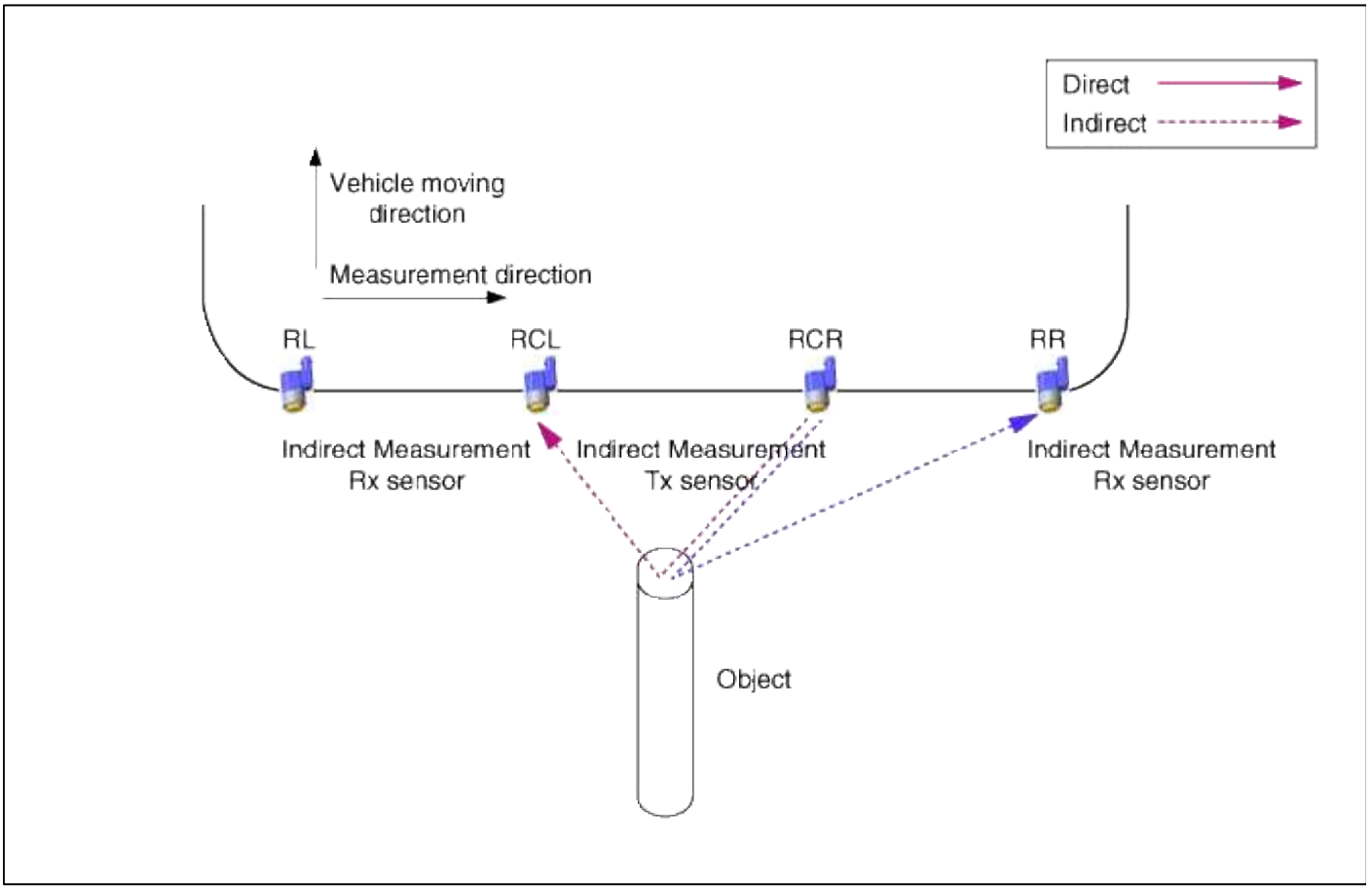
Direct Measurement

Transmission and Reception are executed with one sensor
(RL, RCL, RCR, RR each sensor execution)



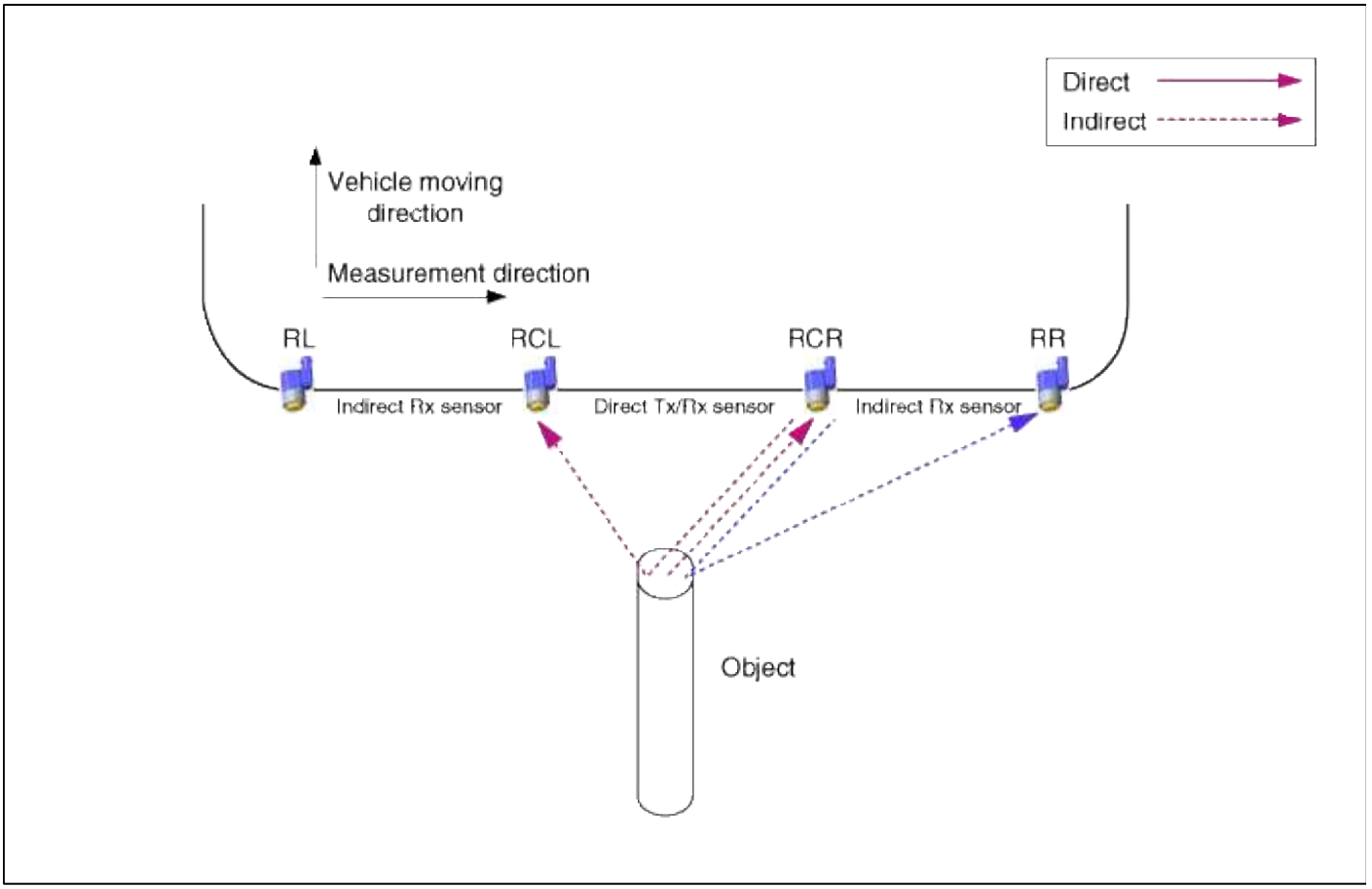
Indirect Measurement

(RCL → RL, RCL → RCR, RCR → RCL, RCR → RR Execution in order)
With two or three sensors, one of them sends the transmission and the others get the reception.



Direct and Indirect Measurement at once

With two or three sensors, the one sensor performs both transmission and reception, and others perform only reception.



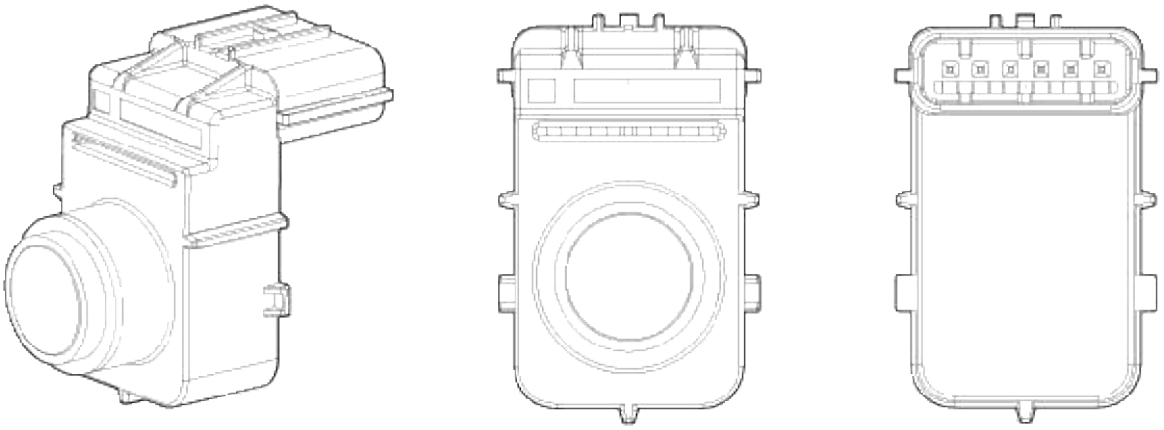
RPAS alarm system

When the RPAS sensor detects the object, warning is operated by audible alarm device as like buzzer. RPAS sensor sends data to BCM with LIN communication and BCM implements audible warning for each RPAS SENSOR by priority. And it performs a role of gateway only when it sends visible alarm device such as Cluster.

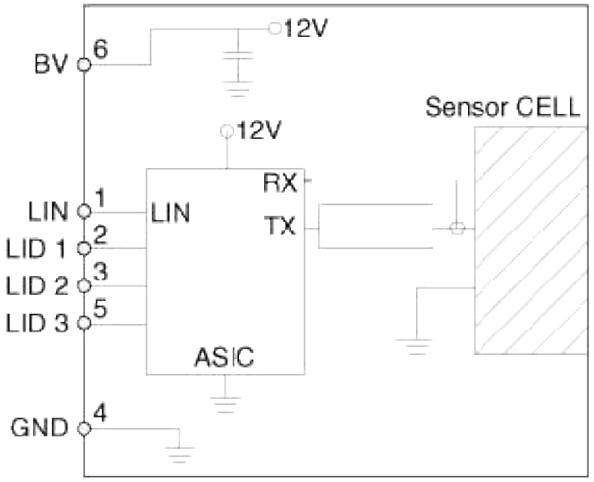
- Sensor buzzer/display information processing method of BCM In case of RL/RR sensor information, the BCM handles each sensor information directly about Display and buzzer output function. Buzzer output of CL/CR sensor, BCM handles center combination information by priority both sensor.

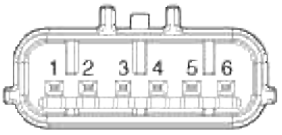
Body Electrical System > Front/Rear Parking Assist System > Parking Assist Sensor > Components and Components Location

Component



Circuit Diagram





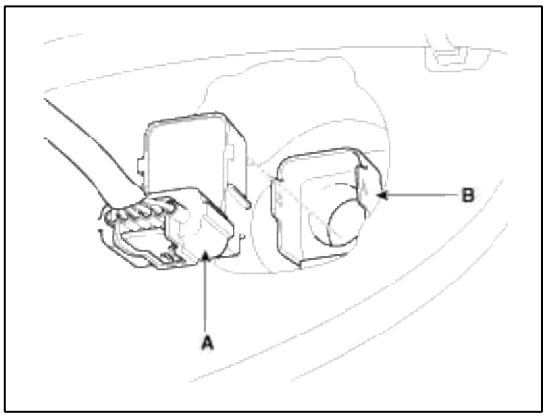
NO	Name
1	LIN
2	LID 1
3	LID 2
4	GND
5	LID 3
6	B+

Body Electrical System > Front/Rear Parking Assist System > Parking Assist Sensor > Repair procedures

Removal

1. Remove the rear bumper.
   (Refer to the Body group - "Rear bumper")
2. Disconnect the connector from the rear bumper.

3. Pull out the sensor (A) by opening the sensor holder (B) out.

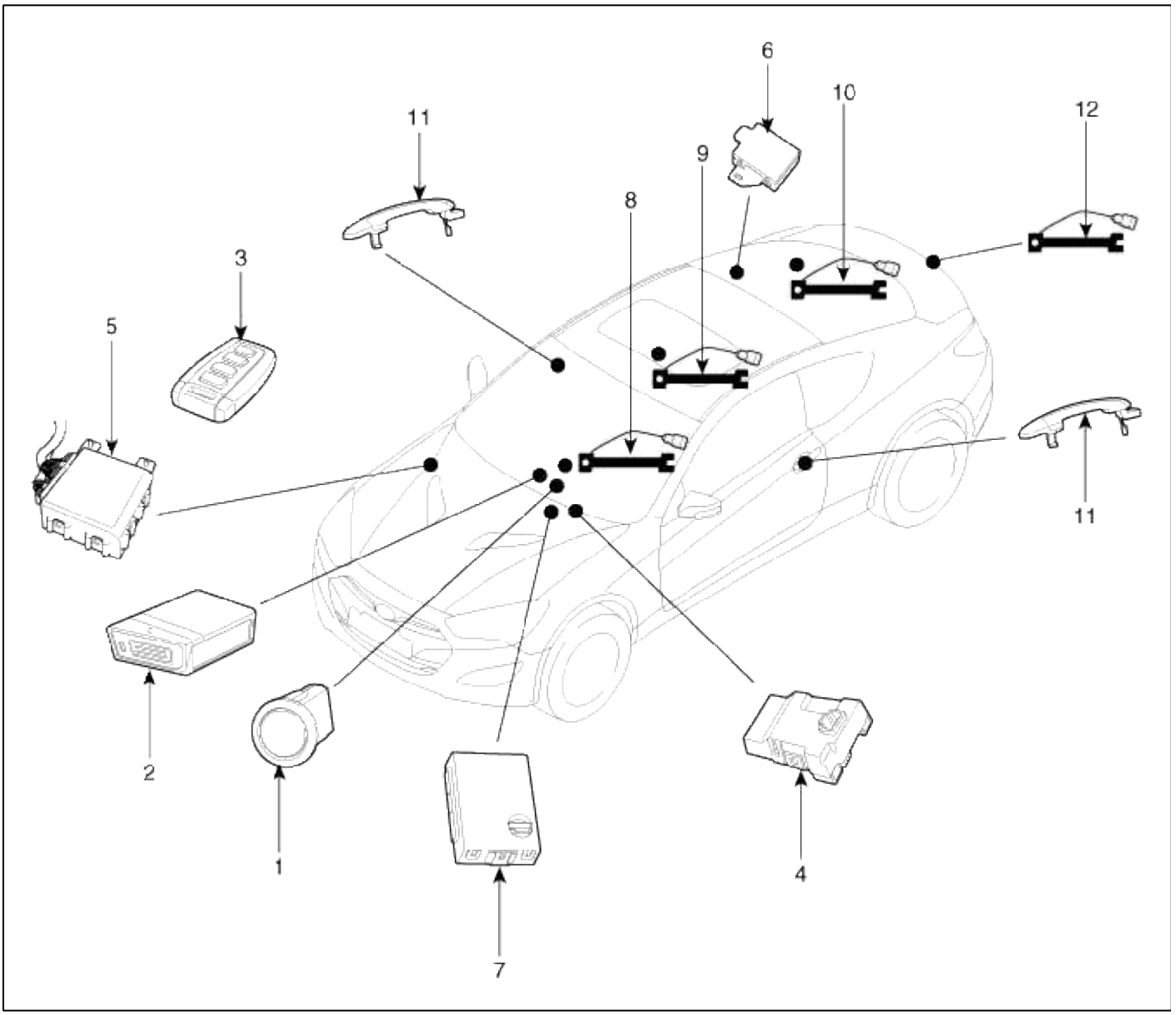


Installation

1. Install the rear ultra sensor after connecting the connector.
2. Install the rear bumper.

Body Electrical System > Button Engine Start System > Components and Components Location

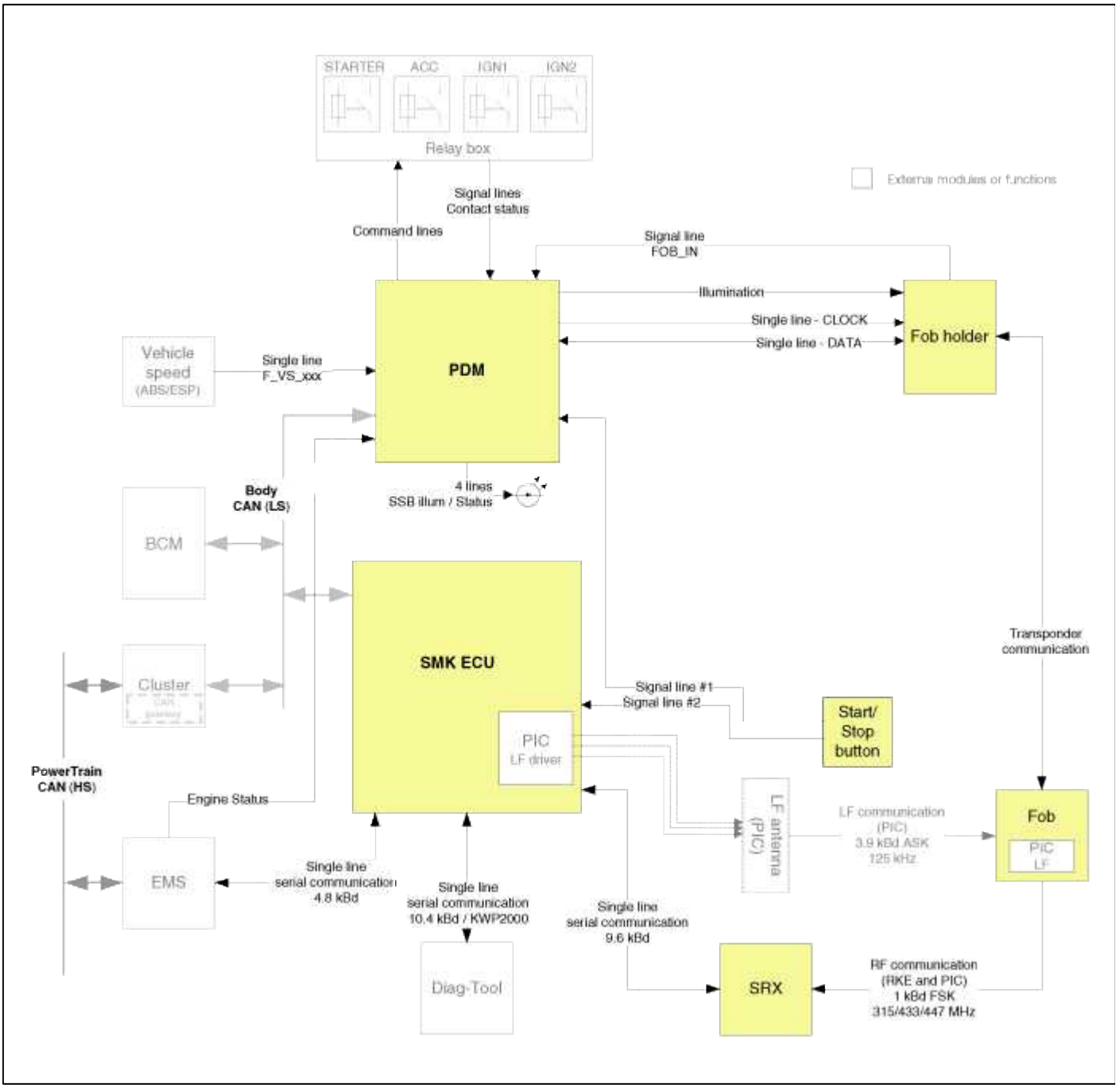
Component Location



1. Start Stop Button(SSB) 2. FOB key holder 3. FOB key 4. PDM(Power Distribution Module) 5. Smart key unit 6. RF receiver	7. Body control module 8. Interior antenna 1 9. Interior antenna 2 10. Interior antenna 3 11. Door handle & door antenna 12. Bumper antenna

Body Electrical System > Button Engine Start System > Schematic Diagrams

Circuit Diagram



Body Electrical System > Button Engine Start System > Description and Operation

Description

System Overview

The System offers the following features:

- Human machine interface through a 1-stage button, for terminal switching and engine start.
- Control of external relays for ACC / IGN1 / IGN2 terminal switching and STARTER, without use of mechanical ignition switch.
- Indication of vehicle status through LED or explicit messages on display.
- Immobilizer function by LF transponder communication between fob and fob holder.
- Redundant architecture for high system dependability .
- Interface with Low Speed CAN vehicle communication network.
- Interface with LIN vehicle communication network depending on platform .

The RKE and SMART KEY functions are not considered part of this Button Engine Start system and are specified in separated system.

System Main Function

- Switching of ACC / IGN1 / IGN2 terminals.
- Control of the STARTER relay BAT line (high side) based on communication with EMS ECU.
- Management of the Immobilizer function.
- Management of BES warning function.

Button Engine Start System

The Button Start System allows the driver to operate the vehicle by simply pressing a button (called as SSB) instead of using a standard mechanical key.

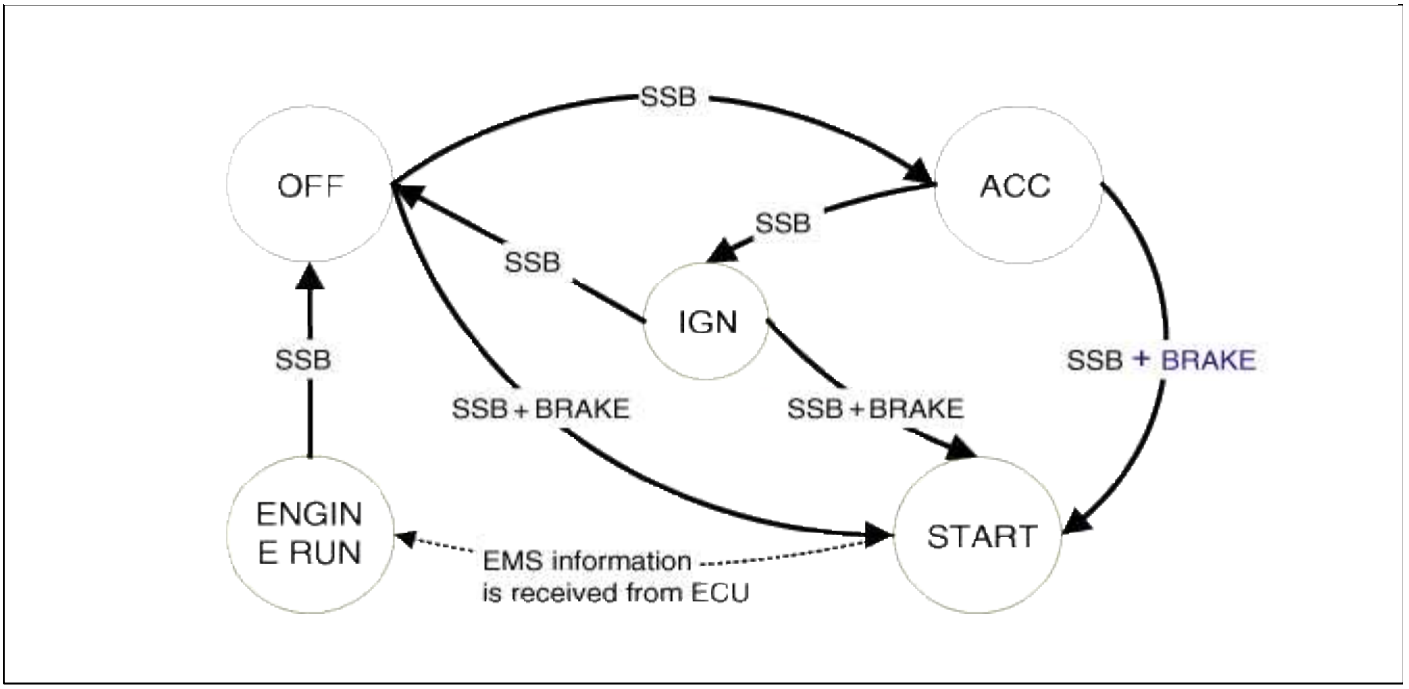
If the driver press the SSB while prerequisites on brakes, fob authentication and transmission status are satisfied, the BES System will proceed with the locking/unlocking of the steering column, the control of the terminal, and the cranking of the engine.

The driver can release the SSB as soon as this sequence initiated. After positive response from immobilizer interrogation, the system will activate the starter motor and communicate with the EMS to check the engine running status for starter release.

The driver will be able to stop the engine by a short push on the SSB if the vehicle is already in standstill. Emergency engine stop will be possible by a long press of the SSB or 3 consecutive presses in case the vehicle is in ENGINE RUNNING.

If the conditions for engine cranking are not satisfied while a push on the SSB is detected and a valid fob authenticated, the system will unlock the steering column and switch the terminals to IGN. Another push on the SSB will be necessary to start the engine.

In case of a vehicle equipped with SMART KEY system, fob authentication will not require any action from the driver. For limp home start or in case of vehicle without SMART KEY, the driver will have to insert the fob into the fob holder.



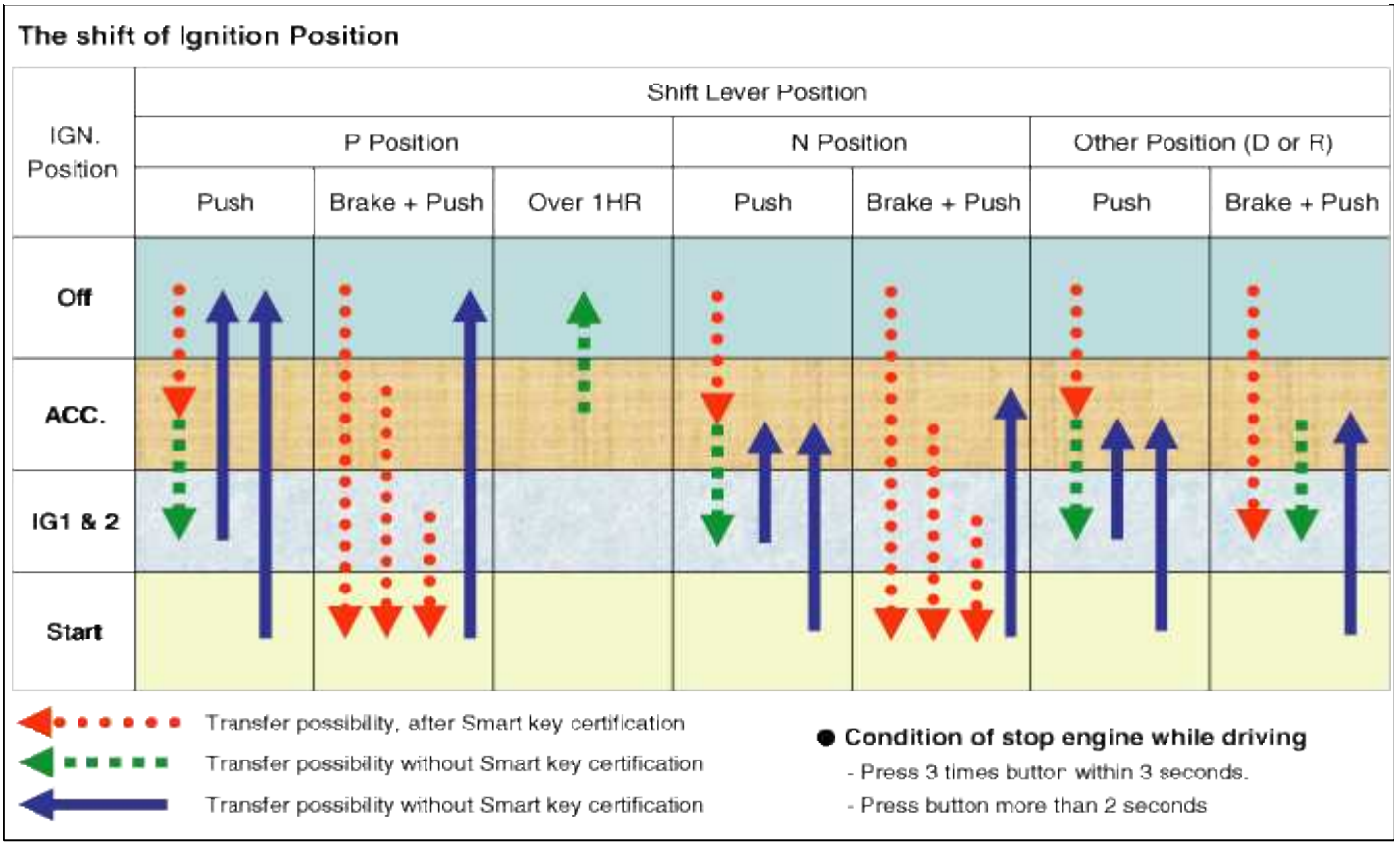
- Control Ignition and engine ON/OFF by Sending signal to IPM and PDM.
- Display status by LED Lamp ON/OFF. (Amber or Blue)

Indicator ON/OFF Condition At Ignition Key Off Condition

No.	Character lamp	Conditions
1	Indicator Lamp ON	Door open, Tail lamp ON, ACC, IG ON
2	Indicator Lamp 30sec ON → Lamp OFF	Door close, Tail lamp OFF, IG OFF
3	Indicator Lamp OFF	Remote LOCK, Passive LOCK
4	Rheostat at tail lamp ON (Illumination lamp)	

Indicator ON/OFF Condition According To Ignition Key's Position

No.	Ignition conditions	Start Button LED status
1	IG OFF	LED OFF
2	IG ACC	Amber color LED ON
3	IG ON (Engine OFF)	Blue color LED ON
4	Cranking	Maintain LED status before cranking
5	Engine running	LED OFF



Wireless Communication

Electromagnetic waves are used to exchange information between the vehicle and the FOB. Two types of RKE Key can supplement the BES system:

- Non-smart key RKE
- SMART KEY FOB

Currently the BES system comprises with SMART KEY FOB always.

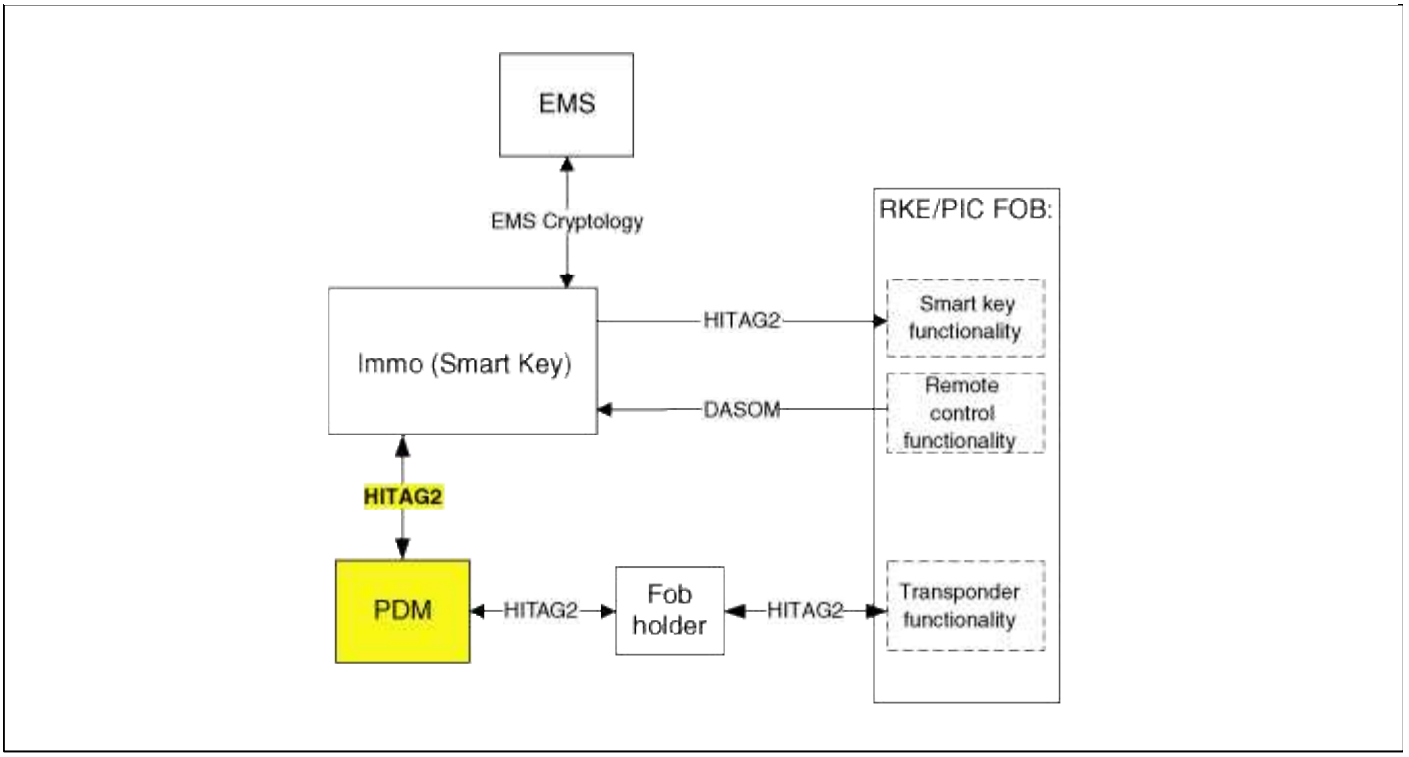
The transmitter, receiver and antennas required for the communication between the fob and the vehicle will differ depending on functionalities and regional areas.

The RKE and SMART KEY functions are in separated documents. Refer to Smart key system for more detailed information about SMART KEY function.

Smart Key

The SMK manages all function related to:

- "Start Stop Button (SSB) monitoring",
- "Immobilizer communication" (with Engine Management System unit for immobilizer release),
- "Authentication server" (Validity of Transponder and in case of Smart Key option Passive Fob authentication),
- "System consistency monitoring",
- "System diagnosis",
- Control of display message / warning buzzer .



The unit behaves as Master role in the whole system.
In case of SMART KEY application, for example “Passive Access”, “Passive Locking” and “Passive Authorization are integrated for Terminal switching Operations”.
It collects information about vehicle status from other modules (vehicle speed, alarm status, driver door open...), read the inputs (e.g. SSB, Lock Button and PARK position Switch), controls the outputs (e.g. exterior and interior antennas), and communicates with others devices via the CAN network as well as a single line interfaces.
The diagnosis and learning of the components of the BES System are also handled by the SMK.
PDM
The PDM manages the functions related to the "terminal control" by activating external relays for ACC, IGN1 and IGN2. This unit is also responsible for the control of the STARTER relay.
The PDM is also controlling the illumination of the SSB as well as the "system status indicator", which consists of 2 LEDs of different color. The illumination of the fob holder is also managed by the PDM.
The PDM reads the inputs (Engine fob_in, vehicle speed, relays contact status), controls the outputs (Engine relay output drivers), and communicates with others devices via the CAN.
The internal architecture of the PDM is defined in a way that the control of the terminal is secured even in case of failure of one of the two microcontrollers, system inconsistency or interruption of communication on the CAN network.
In case, failure of one of the two controllers, the remaining controller shall disable the starter relay. The IGN1 and IGN2 terminals relays shall be maintained in the state memorized before the failure and the driver shall be able to switch those IGN terminals off by pressing the SSB with EMERGENCY_STOP pressing sequence. However, engine restart will not be allowed. The state of the ACC relay will depend on the type of failure.
The PDM is diagnosed through the SMK MUT service, using the CAN network.
The main functions of the PDM are:

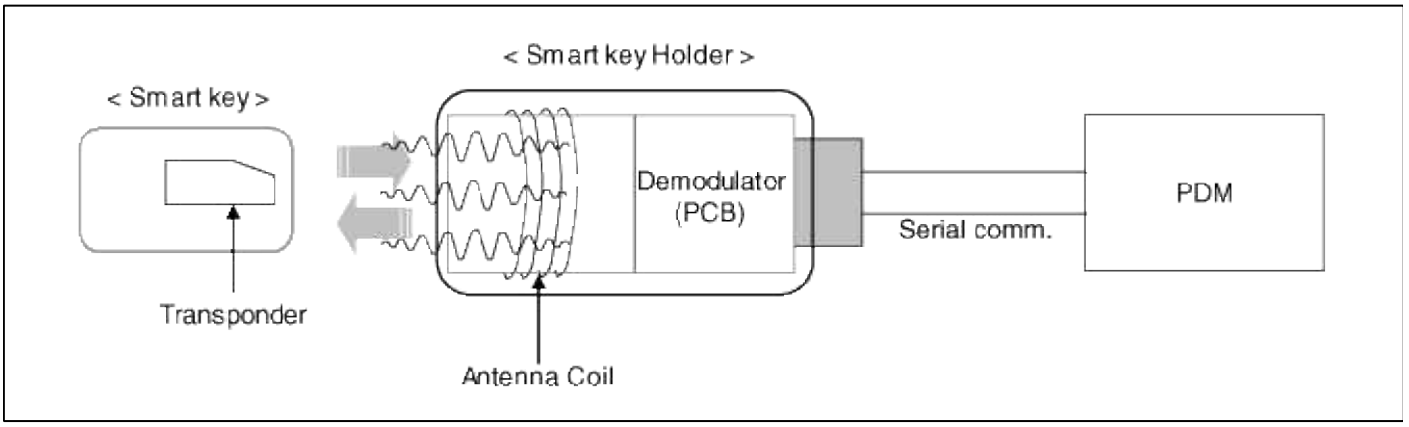
- Control of Terminal relays
- Monitoring of the Vehicle speed received from sensor or ABS/ESP ECU.
- Control of SSB LEDs (illumination, clamp state) and FOB HOLDER illumination.
- Control of the base station located in fob holder through direct serial interface.
- System consistency monitoring to diagnose SMK failure and to switch to relevant limp home mode.
- Providing vehicle speed information

Fob Holder
This unit is used for transponder authentication. In case of a vehicle equipped with Smart key, this transponder

authentication is necessary in case of failure of the passive fob authentication (Engine loss of RF or LF link with the fob).
The Fob holder module integrates a slot where to insert the fob. The fob is maintained in position with a push-push mechanical locking (not electrically driven) and a signal (FOB_IN) is sent back to the PDM as soon as its insertion is detected.
The power supply of the fob holder is active only if a communication is initiated by the PDM.
The insertion of the fob into the holder and the communication with the transponder should be possible regardless of the insertion direction of fob to the holder (buttons facing up or bottom).
A lighting device is also integrated for illumination of the Fob Holder and it is driven directly by the PDM,
The main functions of the Fob holder are:

- Transponder base station
- Fob mechanical lock
- Illumination

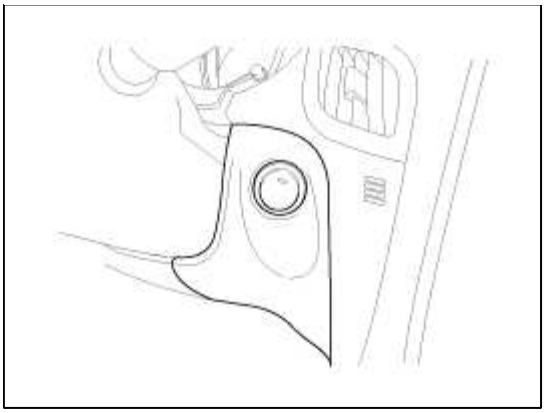
Transponder



External Receiver(SRX)
The data transmitted by the RKE or Smart key Fob is received by an external RF receiver called as SRX. This receiver will be same as that one for the SMK applications, with respect to electronics, housing, connector and software.
This receiver is connected to the SMK via a serial communication line.
Terminal And Starter Relays
Relays will be used to switch the terminals ACC / IGN1 / IGN2. Those normally-open relays will be driven by the PDM and located either in the passenger or engine compartment depending on the vehicle architecture.
Only one relay coil is connected to the terminal outputs of the PDM.
Those relays should integrate a resistor connected in parallel to the coil in order to reduce the transients during commutation.
Start/Stop Button(SSB)
A single stage push button is used for the driver to operate the vehicle. Pressing this button allows:

- To activate the power modes ‘Off’, ’Accessory’, ‘Ignition’ and 'Start' by switching the corresponding terminals
- To start the engine
- To stop the engine

The contact will be insured by a micro-switch and a backlighting is provided to highlight the marking of the button whenever necessary.
Two (2) LED colors are located in the center of the button to display of the status of the system. Another illumination LED is also integrated into the SSB for the lighting of the "Engine Start/Stop" characters.



BES System State Chart

System STATES in LEARNT MODE

In learnt mode, the BES System can be set in 6 different sates, depending on the status of the terminals and Engine status:

System State	Terminal Status	Engine status
1. OFF - Locked	OFF	Stopped
2. OFF - Unlocked	OFF	Stopped
3. ACC	ACC	Stopped
4. IGN	IGN1, IGN2, ACC	Stopped
5. Start	IGN1, Start	Cranking
6. IGN - Engine	IGN1, IGN2, ACC	Running (means "self-running")

Referring to the terminals, the system states described in the table above are same as those one found in a system based on a mechanical ignition switch. The one of distinction with Mechanical-Ignition-Switch based system is that the BES system allows specific transition from [OFF] to [START] without going through [ACC] and [IGN] states.

System STATES IN VIRGIN MODE

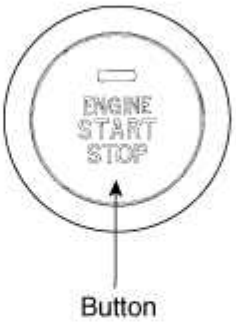
The BES System can be set in 5 different states (OFF LOCKED is not available in virgin mode), depending on the status of the terminals and Engine status:

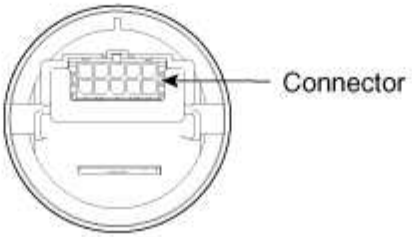
System State	Terminal Status	Engine status
1. OFF - UNLOCKED	OFF	Stopped
2. ACC	ACC	Stopped
3. IGN	IGN1, IGN2, ACC	Stopped
4. Start	IGN1, START with special pattern of activation see Chap 6.2.1 for details	Cranking
5. IGN - Engine	IGN1, IGN2, ACC	Running (means "self-running")

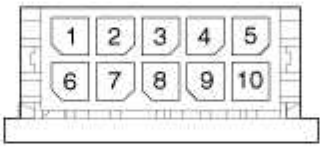
Referring to the terminals, the system states described in the table above are same as those one found in a system based on a mechanical ignition switch. The one of distinction with Mechanical-Ignition-Switch based system is that the BES system allows specific transition from [OFF] to [START] without going through [ACC] and [IGN] states.

Body Electrical System > Button Engine Start System > Start/Stop Button > Components and Components Location

Component





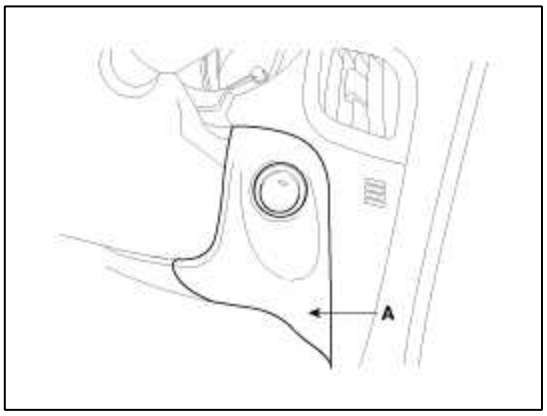
Connector (10 pins)			
Pin No.	Description	Pin No.	Description
1	Start/Stop button switch1(PDM)	6	Battery
2	Battery illumination	7	Start/Stop button switch2(IPM)
3	Start/Stop button LED Amber(PDM)	8	Start/Stop button LED Blue(PDM)
4	Start/Stop button illum. GND(PDM)	9	Rheostat
5	Start/Stop button illum. power	10	-

Body Electrical System > Button Engine Start System > Start/Stop Button > Repair procedures

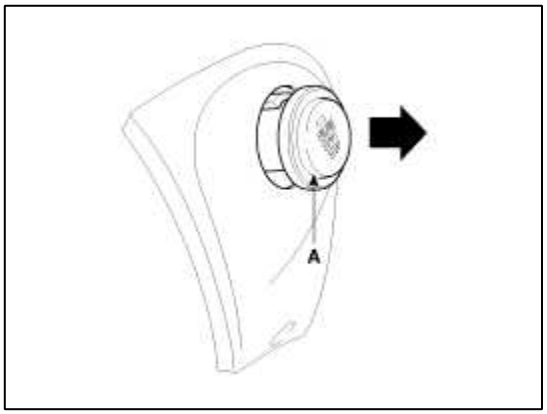
Removal

1. Disconnect the negative(-) battery terminal.

2. Remove the start/stop button cover(A).



3. Remove the start/stop button (A).

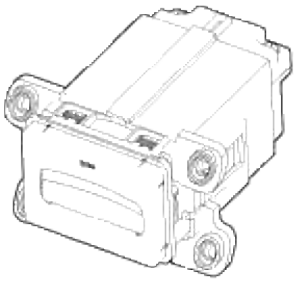


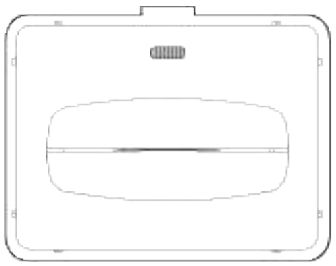
Installation

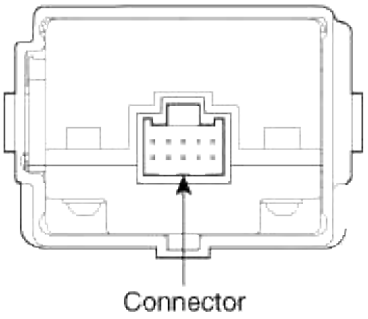
1. Install the start/stop button.
2. Install the start/stop button cover.

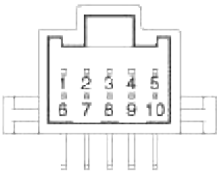
Body Electrical System > Button Engine Start System > Fob Holder > Components and Components Location

Component







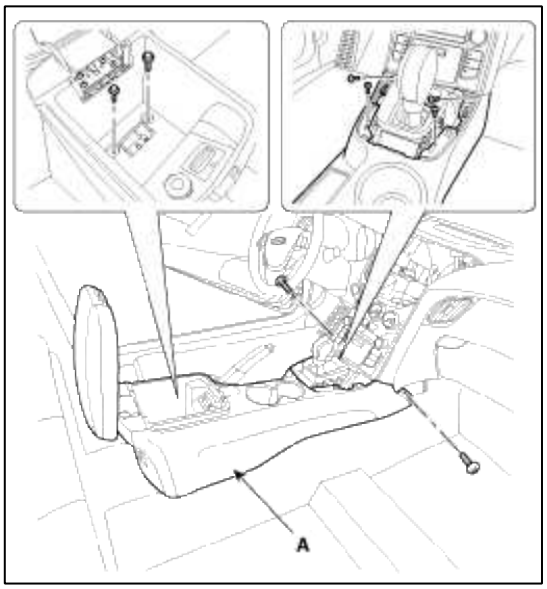
Connector (10 pins)			
Pin No.	Description	Pin No.	Description
1	-	6	Battery
2	Immobilizer clock	7	Immobilizer data
3	Holder illumination(PDM)	8	Illumination battery
4	-	9	Fob in (PDM)
5	GND	10	-

Body Electrical System > Button Engine Start System > Fob Holder > Repair procedures

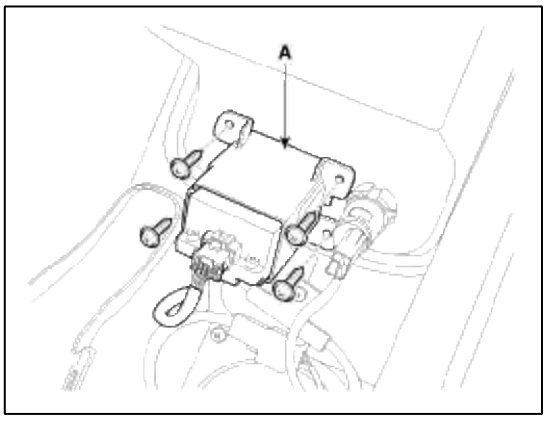
Removal

1. Disconnect the negative(-) battery terminal.

2. Remove the console assembly (A).
   (Refer to BD group - "Console")



3. Disconnect the connector and remove the fob holder(A) after loosening the mounting screws.

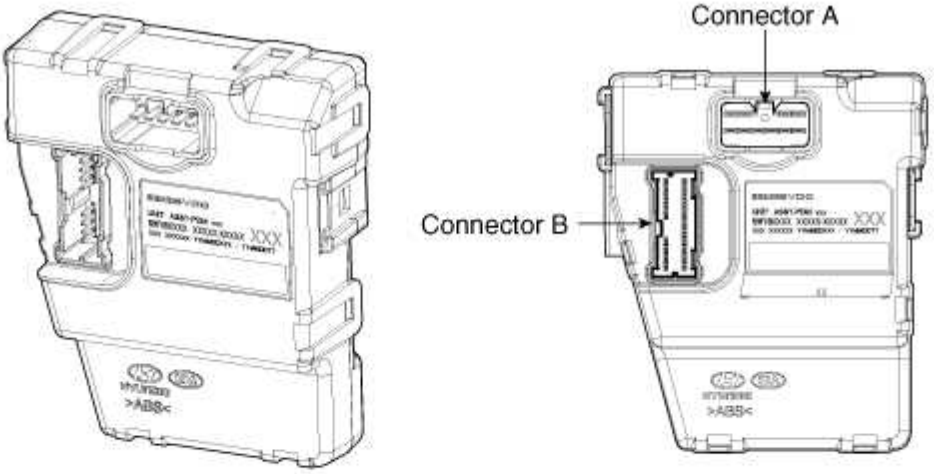


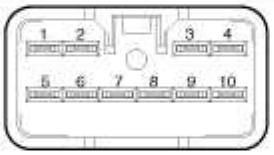
Installation

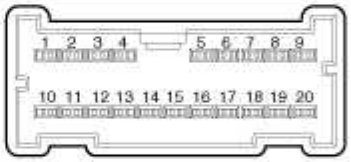
1. Install the fob holder assembly.
2. Install the console assembly.

Body Electrical System > Button Engine Start System > PDM(Power Distribution Module) > Components and Components Location

Component





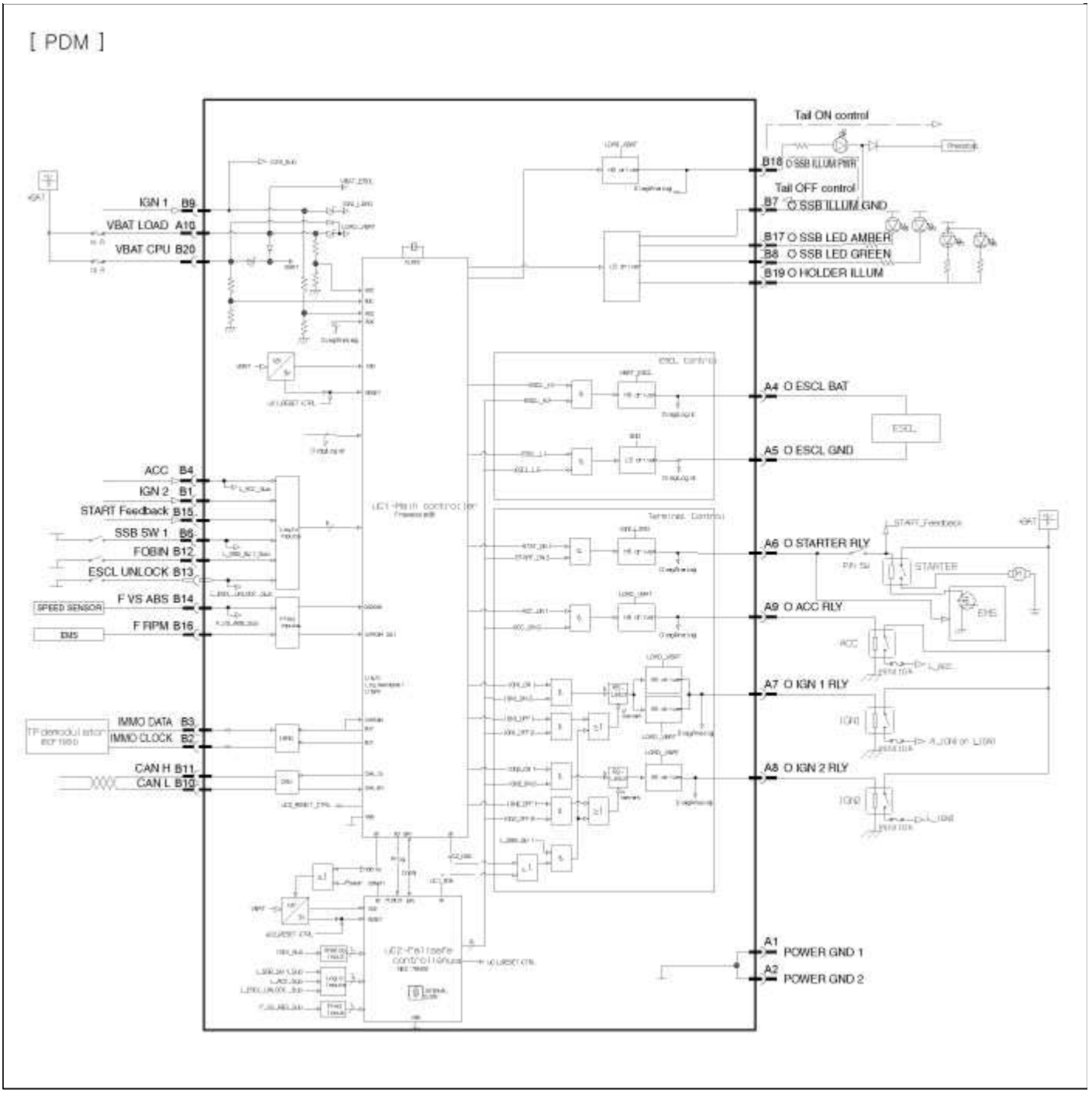


Pin No.	Connector A (10 pin)	Connector B (20 pin)
1	Power ground 1	IGN2
2	Power ground 2	Immobilizer clock
3	-	Immobilizer data
4	ESCL battery	ACC
5	ESCL ground	-
6	Starter relay	SSB switch1
7	IGN1 relay	SSB illumination ground
8	IGN2 relay	SSB LED green
9	ACC relay	IGN1
10	Battery load	CAN L
11		CAN H
12		Fob in
13		ESCL unlock
14		Vehicle speed
15		Start Feed back
16		RPM data (EMS)
17		SSB LED amber
18		SSB illumination power
19		Holder illumination
20		CPU battery

Body Electrical System > Button Engine Start System > PDM(Power Distribution Module) > Schematic Diagrams

System Circuit Diagram

[PDM]



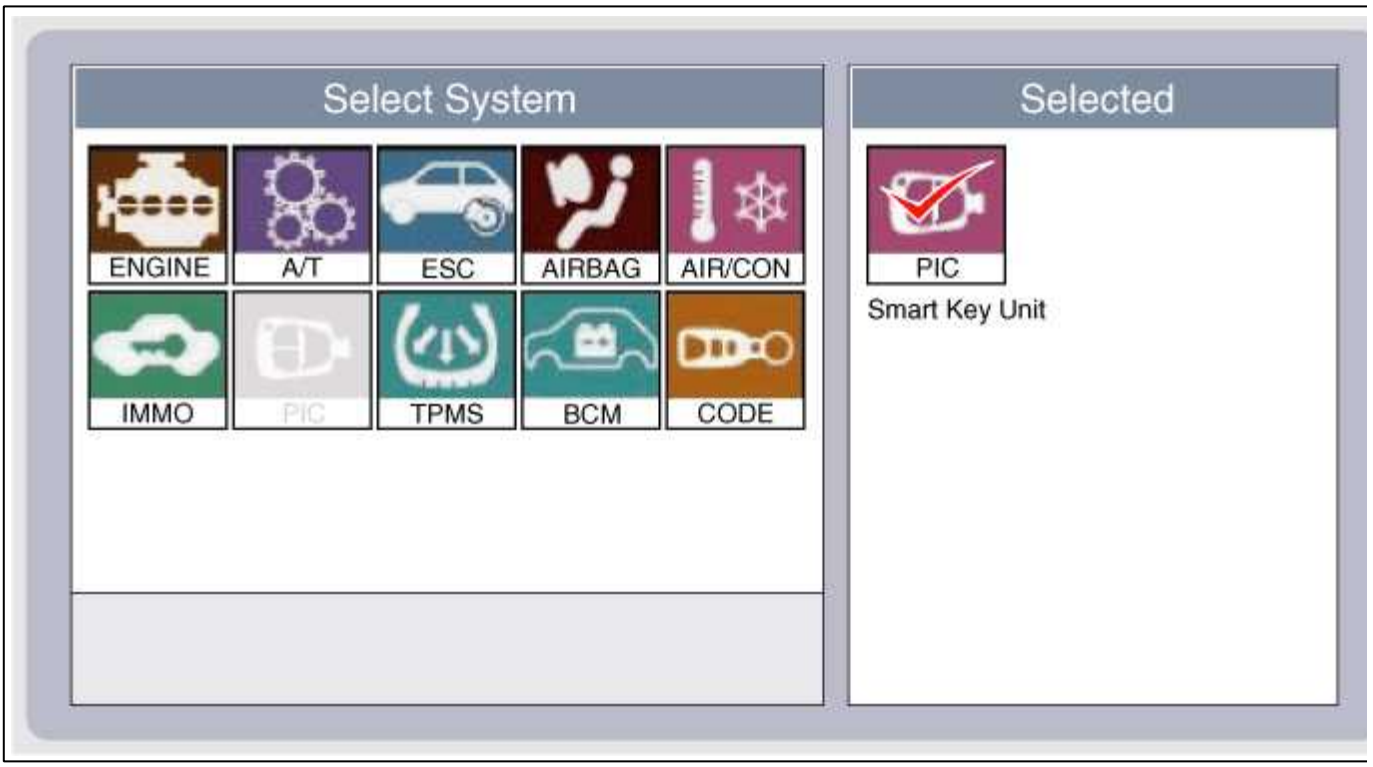
Body Electrical System > Button Engine Start System > PDM(Power Distribution Module) > Repair procedures

Inspection

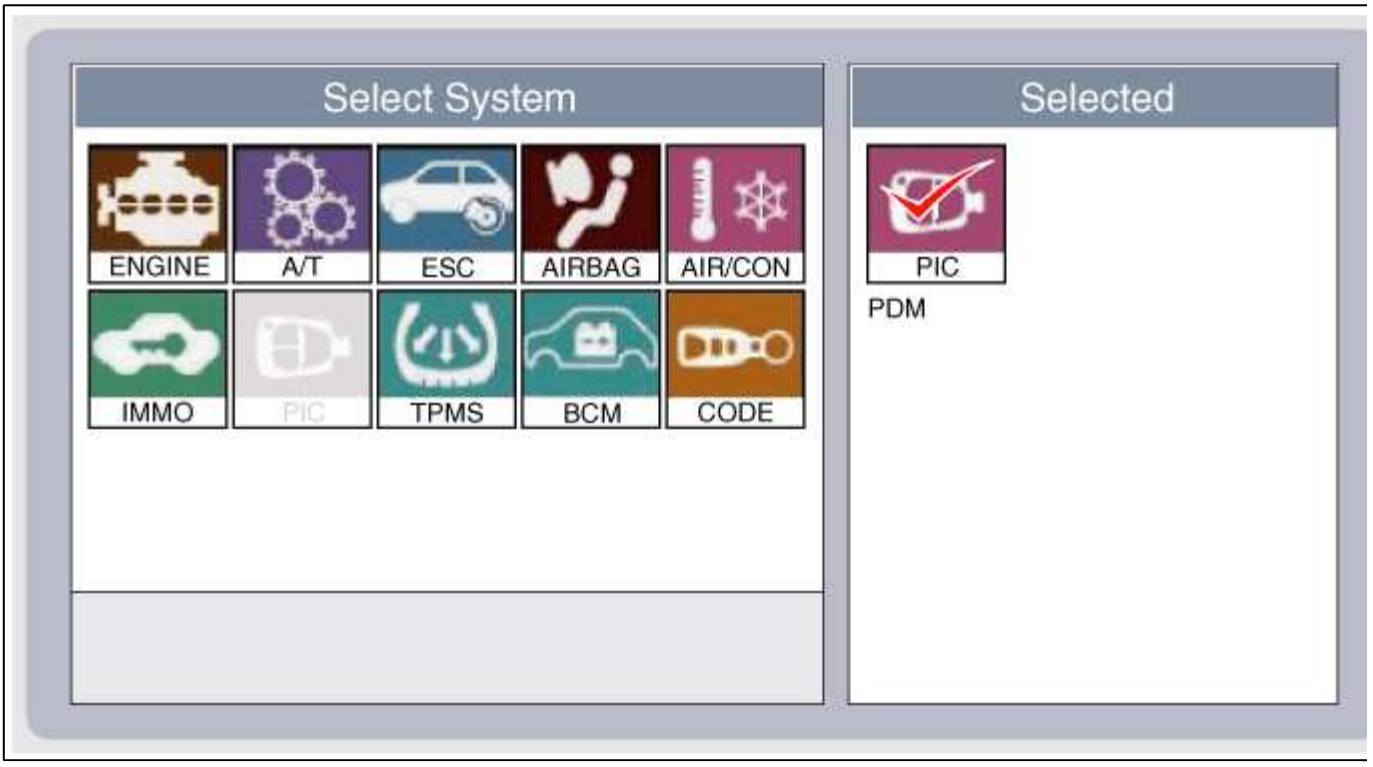
PDM Diagnosis With GDS

1. It will be able to diagnose defects of Smart key with GDS quickly.
   GDS can operates actuator forcefully, input/output value monitoring and self diagnosis.

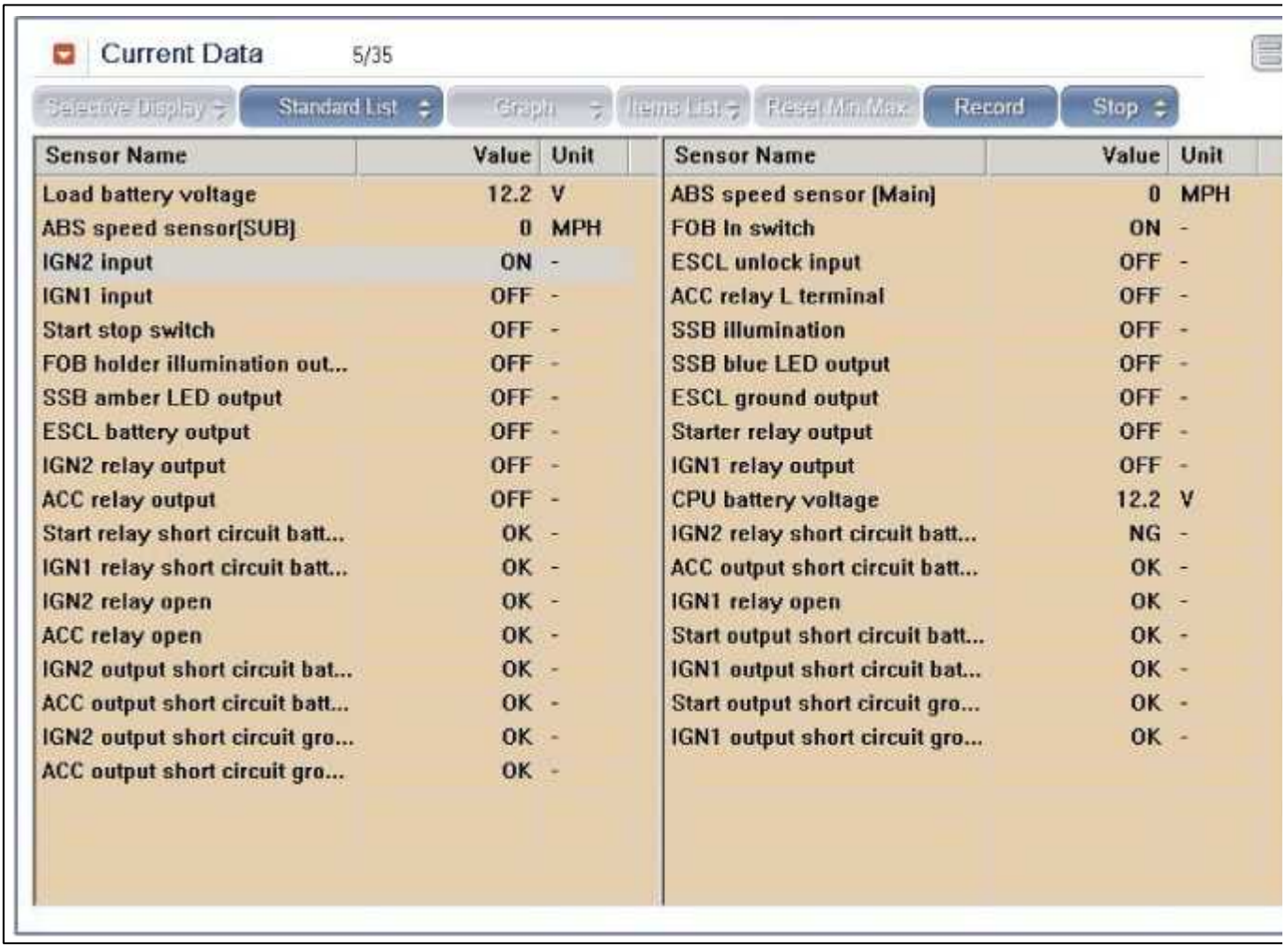
2. Select model and "Smart key system (Button start)" menu if you want to check PDM.



3. Select "PDM" in the manu.

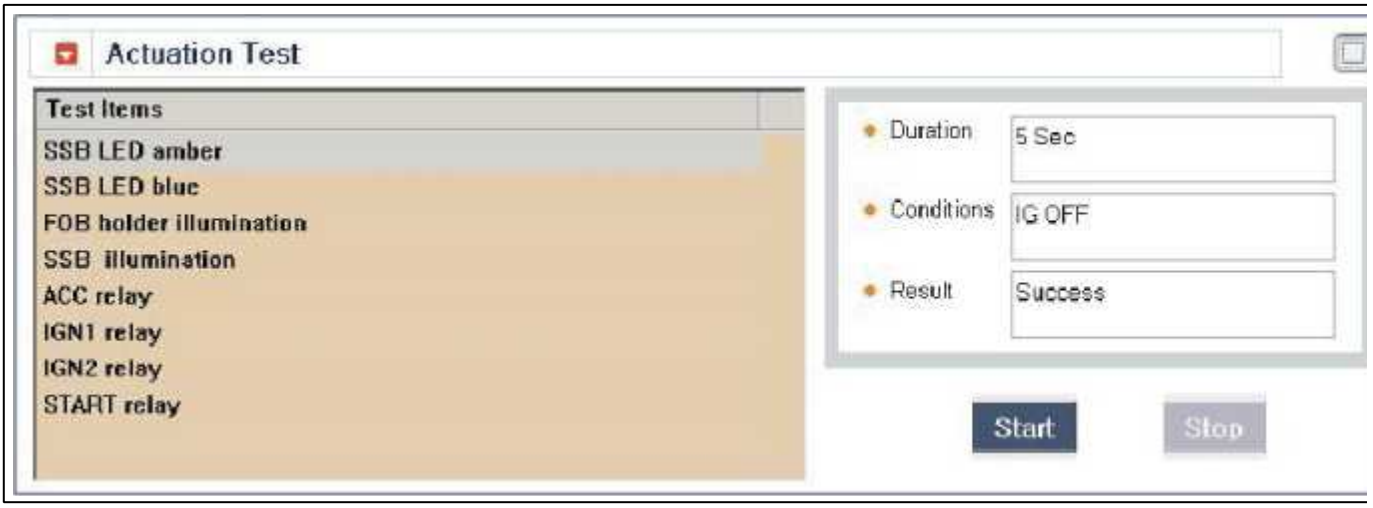


4. Select "Current Data", if you want to check current data of PDM.
   It provides the input/output status of each module.



Sensor Name	Value	Unit	Sensor Name	Value	Unit
Load battery voltage	12.2	V	ABS speed sensor (Main)	0	MPH
ABS speed sensor[SUB]	0	MPH	FOB In switch	ON	-
IGN2 input	ON	-	ESCL unlock input	OFF	-
IGN1 input	OFF	-	ACC relay L terminal	OFF	-
Start stop switch	OFF	-	SSB illumination	OFF	-
FOB holder illumination out...	OFF	-	SSB blue LED output	OFF	-
SSB amber LED output	OFF	-	ESCL ground output	OFF	-
ESCL battery output	OFF	-	Starter relay output	OFF	-
IGN2 relay output	OFF	-	IGN1 relay output	OFF	-
ACC relay output	OFF	-	CPU battery voltage	12.2	V
Start relay short circuit batt...	OK	-	IGN2 relay short circuit batt...	NG	-
IGN1 relay short circuit batt...	OK	-	ACC output short circuit batt...	OK	-
IGN2 relay open	OK	-	IGN1 relay open	OK	-
ACC relay open	OK	-	Start output short circuit batt...	OK	-
IGN2 output short circuit bat...	OK	-	IGN1 output short circuit bat...	OK	-
ACC output short circuit batt...	OK	-	Start output short circuit gro...	OK	-
IGN2 output short circuit gro...	OK	-	IGN1 output short circuit gro...	OK	-
ACC output short circuit gro...	OK	-			

5. If you want to check PDM data operation forcefully, select "Actuation test".



Input/output Current Data

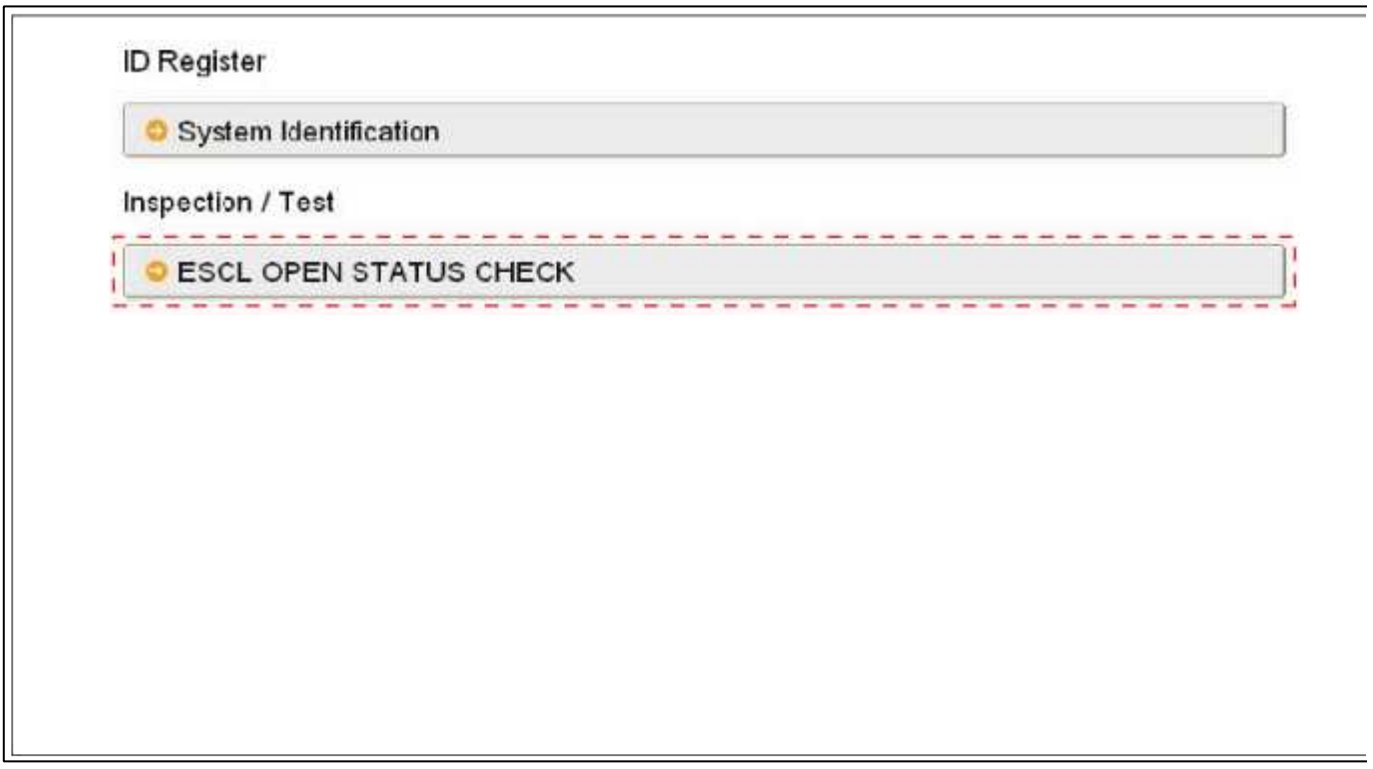
NO	Description	Unit
1	Load Battery Voltage	V
2	Abs Speed Sensor(main)	Km/h
3	Start Stop Button SW	OFF/ON
4	ACC input	OFF/ON
5	IGN1 Input	OFF/ON
6	IGN2 Input	OFF/ON
7	Fob In Switch	RELEASE/INSERT
8	Start Relay Monitoring Input	
9	SSB Ember LED Output	OFF/ON
10	SSB Blue LED Output	OFF/ON
11	Fob Holder Illumination Output	OFF/ON
12	SSB Illumination Output	OFF/ON
13	ACC Relay Output	OFF/ON
14	IGN1 Relay Output	OFF/ON
15	IGN2 Relay Output	OFF/ON
16	Start Relay S1 Output	OFF/ON
17	-	-
18	-	-
19	CPU Battery Voltage	V
20	Engine Speed	DATA*1.0
21	ACC Relay SCB	OFF/ON
22	IGN1 Relay SCB	OFF/ON
23	IGN2 Relay SCB	OFF/ON
24	Start Relay SCB	OFF/ON
25	SCC Relay Open	OFF/ON
26	IGN1 Relay Open	OFF/ON
27	IGN2 Relay Open	OFF/ON
28	ACC Output SCB	OFF/ON
29	IGN1 Output SCB	OFF/ON
30	IGN2 Output SCB	OFF/ON
31	Start Output SCB	OFF/ON
32	ACC Output SCG	OFF/ON
33	IGN1 Output SCG	OFF/ON
34	IGN2 Output SCG	OFF/ON
35	Start Output SCG	OFF/ON

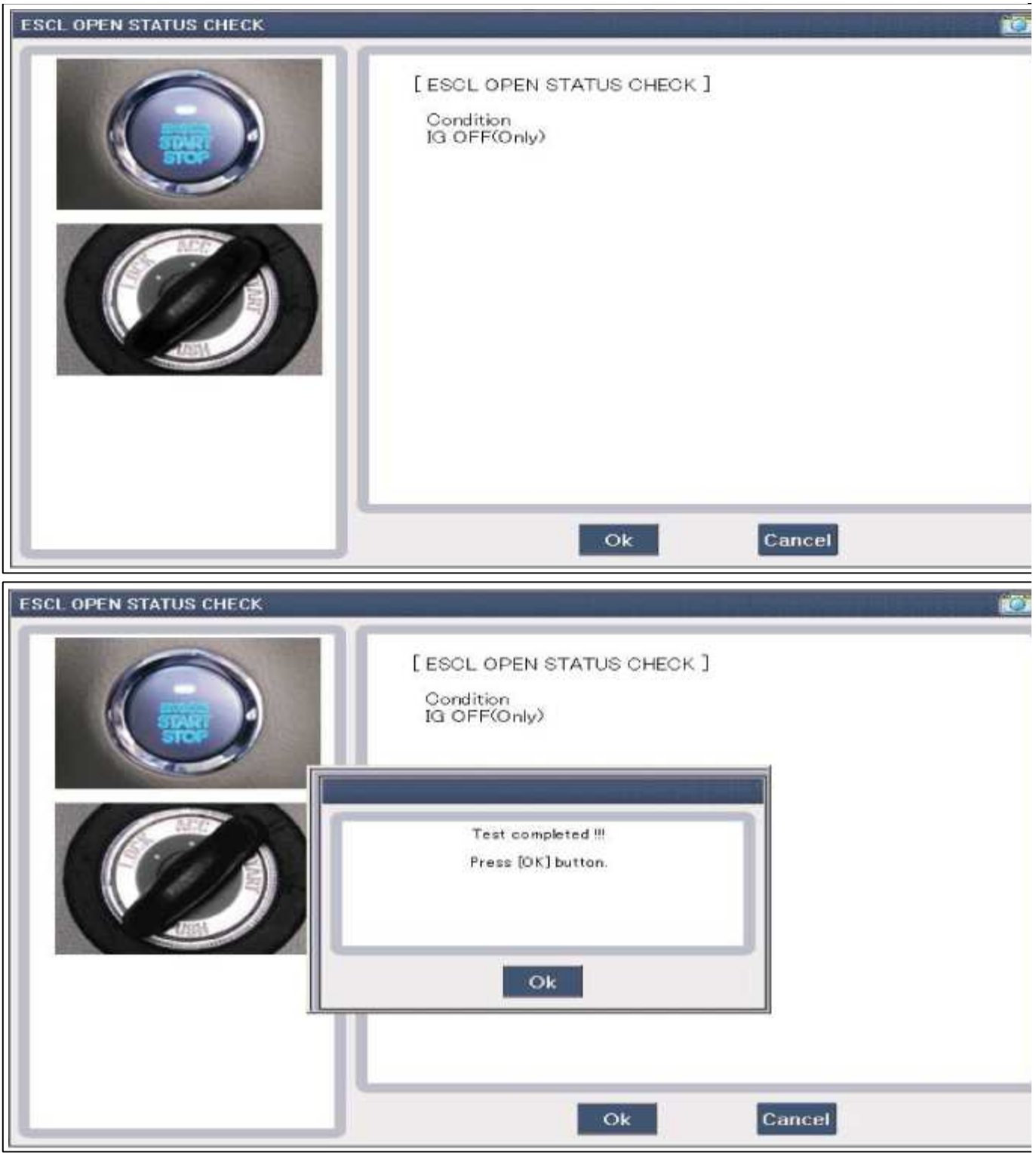
Actuation Test

No.	Description
1	SSB Ember LED
2	SSB Blue LED
3	Fob Holder Illumination
4	SSB Illumination
5	ACC Output
6	ING1 Output
7	ING2 Output
8	Start Output
9	-

ESCL OPEN STATUS CHECK

1. Select the "ESCL open status check" menu if you want to check ESCL open.

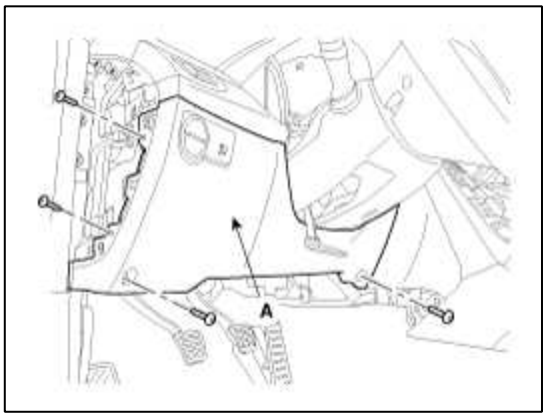




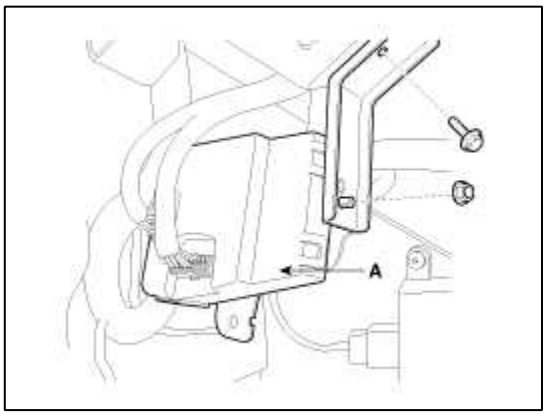
Removal

1. Disconnect the negative(-) battery terminal.

2. Remove the crash pad lower panel(A).
   (Refer to Body group-"Crash pad")



3. Disconnect the power distribution module(PDM) connector.
4. Remove the power distribution module(A) after loosening nut and bolt.



Installation

1. Install the power distribution module.
2. Install the crash pad lower panel.

GENESIS COUPE(BK) > 2013 > G 2.0 T-MPI > Brake System

Brake System > General Information > Specifications

Specifications

Item		Specification	
Master cylinder	Type	Tandem	
	Cylinder I.D.	23.81mm (0.94in)	
	Piston stroke	43±1mm (1.69±0.039in)	
	Fluid level switch	Provided	
Brake booster	Type	7" + 8" Tandem	
	Boosting ratio	9 : 1	
Front Disc brake	Caliper Type	General Disc Brake	Brembo Disc Brake
	Type	Ventilated disc	Ventilated disc
	Disc O.D	320mm(12.60in)	340mm(13.39in)
	Disc thickness	28mm(1.10in)	28mm(1.10in)
	Caliper piston	Single	4piston
	Cylinder I.D	Φ60mm(2.36in)	Φ(42mm+42mm(1.65in+1.65in))X2
Rear Disc brake	Caliper Type	General Disc Brake	Brembo Disc Brake
	Type	Solid disc	Ventilated disc
	Disc O.D	314mm(12.36in)	330mm(12.99in)
	Disc thickness	13mm(0.51in)	20mm(0.79in)
	Caliper piston	Single	4piston
	Cylinder I.D	Φ42.9mm(1.69in)	Φ(32mm+28mm(1.26in+1.10in))X2
Parking brake	Type	DIH (Drum in hat)	
	Drum I.D.	Ø 190mm (7.48in)	

NOTE

O.D. : Outer Diameter
I.D : Inner Diameter

Specification (ESC)

Part	Item	Standard value	Remark
HECU	System	4 Channel 4 Sensor (Solenoid)	Total control (ABS, EBD, TCS, ESC)
	Type	Motor, valve relay intergrated type	
	Operating Voltage	10 ~ 16V	
	Operating Temperature	-40 ~ 120°C(-40 ~ 248°F)	
	Motor power	270W	
Warning lamp	Min. Operating Voltage	12V	
	Max. Current consumption	Max. 200mA	
Active Wheel speed sensor	Supply voltage	DC 4.5 ~ 20V	
	Output current low	5.9 ~ 8.4mA	
	Output current high	11.8~ 16.8mA	
	Output range	1 ~ 2500Hz	
	Tone wheel	Front : 46 teeth Rear : 47 teeth	
	Air gap	0.5 ~ 1.5mm	
Steering Wheel Angle Sensor	Operating Voltage	8 ~ 16V	
	Current consumption	Max. 100mA	
	Output measurement range	-780 ~ +799.9°	
	Operating Angular velocity	1500°/sec	
Yaw rate& Lateral G sensor (CAN TYPE)	Operating Voltage	8 V ~ 17V	
	Current Consumption	Max. 140mA	
	Yaw rate sensor measurement range	-75 ~ 75°/sec	
	Lateral G sensor measurement range	-1.5 ~ 1.5gN	

Service Standard

Items			Standard vale
Brake pedal stroke			AT : 132.1mm (5.20in) MT : 132.9mm (5.23in)
Stop lamp clearance			1.0 ~ 1.5mm (0.04 ~ 0.06in)
Brake pedal free play			3 ~ 8 mm (0.12 ~ 0.13in)
Parking brake lever stroke when lever assembly is pulled with 196N (20Kg, 44lb force)			5 Notch
Front brake disc	disc thickness	General	28mm(1.10in)
		Brembo	28mm(1.10in)
	pad thickness	General	11mm(0.43in)
		Brembo	8.5mm(0.33in)
Rear brake disc	disc thickness	General	13mm(0.51in)
		Brembo	20mm(0.79in)
	pad thickness	General	9mm(0.35in)
		Brembo	9.1mm(0.36in)

Tightening Torques

Items		N.m	kgf.m	lb-ft
Master cylinder to brake booster		12.7 ~ 16.7	1.3 ~ 1.7	9.4 ~ 12.3
Brake booster mounting nuts		12.7 ~ 15.7	1.3 ~ 1.6	9.4 ~ 11.6
Air bleeding screw	General	6.9 ~ 12.7	0.7 ~ 1.3	5.1 ~ 9.4
	Brembo	16.7 ~ 19.6	1.7 ~ 2.0	12.3 ~ 14.5
Brake tube flare nuts		12.7 ~ 16.7	1.3 ~ 1.7	9.4 ~ 12.3
Front caliper guide rod bolts		21.6 ~ 31.4	2.2 ~ 3.2	15.9 ~ 23.1
Rear caliper guide rod bolts		21.6 ~ 31.4	2.2 ~ 3.2	15.9 ~ 23.1
Front caliper assembly to knuckle	General	78.5 ~ 98.1	8.0 ~ 10.0	57.9 ~ 72.3
	Brembo	88.3 ~ 103.0	9.0 ~ 10.5	65.1 ~ 75.9
Rear caliper assembly to knuckle		78.5 ~ 98.1	8.0 ~ 10.0	57.9 ~ 72.3
Brake hose to caliper		24.5 ~ 29.4	2.5 ~ 3.0	18.1 ~ 21.7
Brake pedal member bracket bolts		12.7 ~ 15.7	1.3 ~ 1.6	9.4 ~ 11.6
Brake pedal shaft nut		8.8 ~ 13.7	0.9 ~ 1.4	6.5 ~ 10.1
Stop lamp switch lock nut		7.8 ~ 9.8	0.8 ~ 1.0	5.8 ~ 7.2
Wheel speed sensor mounting bolt		6.9 ~ 10.8	0.7 ~ 1.1	5.1 ~ 8.0
HECU bracket mounting bolt		16.7 ~ 25.5	1.7 ~ 2.6	12.3 ~ 18.8

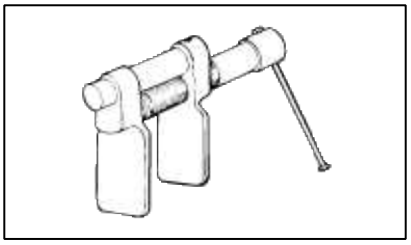
Yaw rate&G sensor mounting bolts	7.8 ~ 10.8	0.8 ~ 1.1	5.8 ~ 8.0

Lubricants

Items	Recommended	Quantity
Brake fluid	DOT 3 or DOT 4	As required
Brake pedal bushing and bolt	Chassis grease	As required
Parking brake shoe and backing plate contacting surface	Heat resistance grease	As required
Front caliper guide rod and boot	AI-11P	1.2 ~ 1.7g
Rear caliper guide rod and boot	AI-11P	0.8 ~ 1.3g

Brake System > General Information > Special Service Tools

Special Service Tools

Tool (Number and Name)	Illustration	Use
09581-11000 Piston expander		Spreading the front disc brake piston

Brake System > General Information > Troubleshooting

Troubleshooting

Problem Symptoms Table

Use the table below to help you find the cause of theproblem. The numbers indicate the priority of the likecause of the problem. Check each part in order.

If necessary, replace these parts.

Symptom	Suspect Area	Reference
Lower pedal or spongy pedal	1. Brake system (Fluid leaks) 2. Brake system (Air in) 3. Piston seals (Worn or damaged) 4. Rear brake shoe clearance(Out of adjustment) 5. Master cylinder (Inoperative)	repair air·bleed replace adjust replace
Brake drag	1. Brake pedal free play (Minimum) 2. Parking brake lever travel (Out of adjustment) 3. Parking brake wire (Sticking) 4. Rear brake shoe clearance(Out of adjustment) 5. Pad or lining (Cracked or distorted) 6. Piston (Stuck) 7. Piston (Frozen)	adjust adjust repair adjust replace replace replace

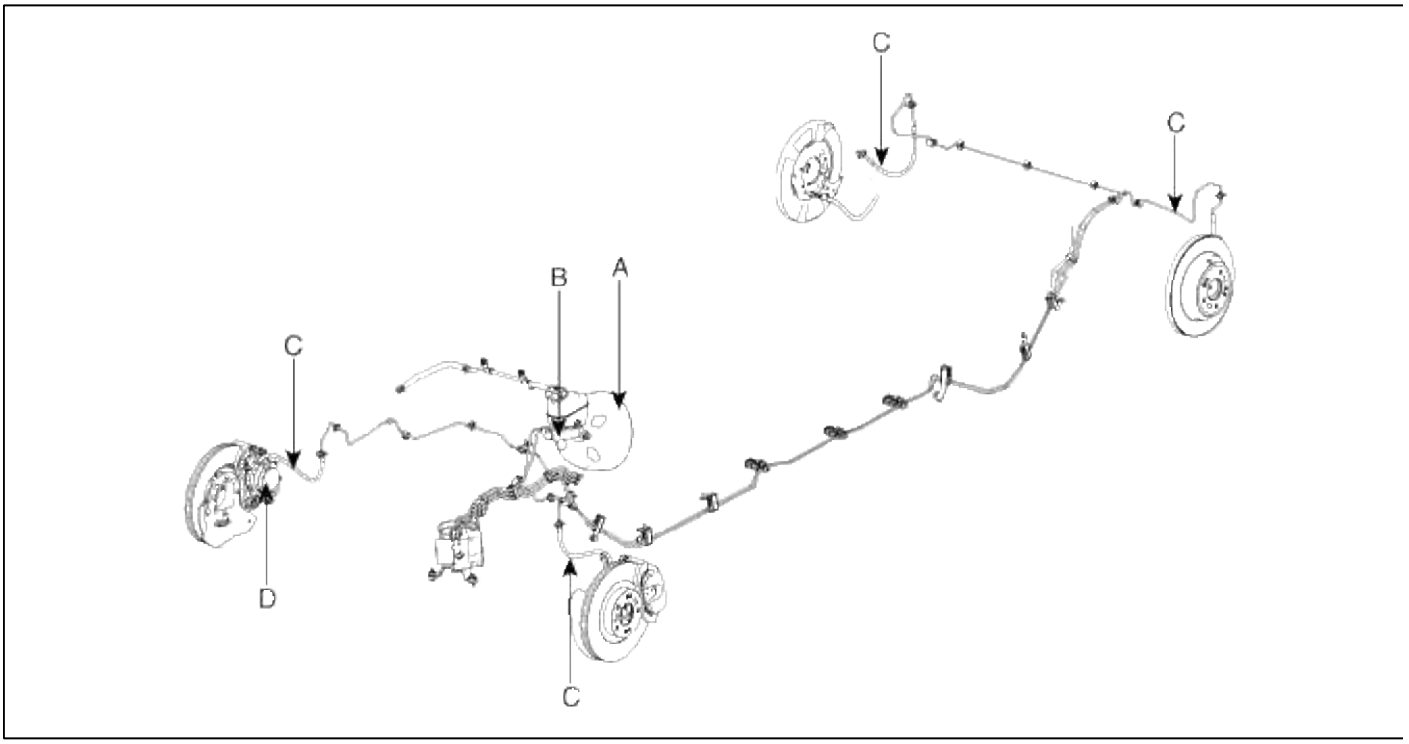
	8. Anchor or Return spring (Inoperative) 9. Booster system (Vacuum leaks) 10. Master cylinder (Inoperative)	replace repair replace
Brake pull	1. Piston (Sticking) 2. Pad or lining (Oily) 3. Piston (Frozen) 4. Disc (Scored) 5. Pad or lining (Cracked or distorted)	replace replace replace replace replace
Hard pedal but brake inefficient	1. Brake system (Fluid leaks) 2. Brake system (Air in) 3. Pad or lining (Worn) 4. Pad or lining (Cracked or distorted) 5. Rear brake shoe clearance(Out of adjustment) 6. Pad or lining (Oily) 7. Pad or lining (Glazed) 8. Disc (Scored) 9. Booster system (Vacuum leaks)	repair air·bleed replace replace adjust adjust replace replace repair
Noise from brake	1. Pad or lining (Cracked or distorted) 2. Installation bolt (Loosen) 3. Disc (Scored) 4. Sliding pin (Worn) 5. Pad or lining (Dirty) 6. Pad or lining (Glazed) 7. Anchor or Return spring (Faulty) 8. Brake pad shim (Damage) 9. Shoe hold-down spring (Damage)	replace adjust replace replace clean replace replace replace replace
Brake fades	1. master cylinder	replace
Brake vibration, pulsation	1. brake booster 2. pedal free play 3. master cylinder 4. caliper 5. master cylinder cap seal 6. damaged brake lines	replace adjust replace replace replace replace
Brake Chatter	Brake chatter is usually caused by loose or worn components, or glazed or burnt linings. Rotors with hard spots can also contribute to brake chatter. Additional causes of chatter are out-of-tolerance rotors, brake lining not securely attached to the shoes, loose wheel bearings and contaminated brake lining.	

Brake System > Brake System > Repair procedures

Operation and Leakage Check

Check all of the following items

Component	Procedure
Brake Booster (A)	Check brake operation by applying the brakes during a test drive. If the brakes do not work properly, check the brake booster. Replace the brake booster as an assembly if it does not work properly or if there are signs of leakage.
Piston cup and pressure cup inspection (B)	• Check brake operation by applying the brakes. Look for damage or signs of fluid leakage. Replace the master cylinder as an assembly if the pedal does not work properly or if there is damage or signs of fluid leakage. • Check for a difference in brake pedal stroke between quick and slow brake applications. Replace the master cylinder if there is a difference in pedal stroke.
Brake hoses (C)	Look for damage or signs of fluid leakage. Replace the brake hose with a new one if it is damaged or leaking.
Caliper piston seal and piston boots (D)	Check brake operation by applying the brakes. Look for damage or signs of fluid leakage. If the pedal does not work properly, the brakes drag, or there is damage or signs of fluid leakage, disassemble and inspect the brake caliper. Replace the boots and seals with new ones whenever the brake caliper is disassembled.



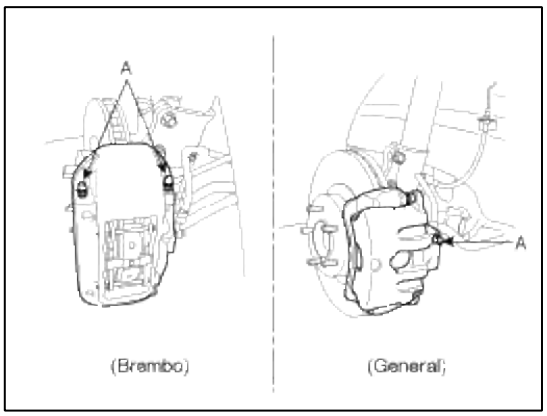
Brake System Bleeding

CAUTION

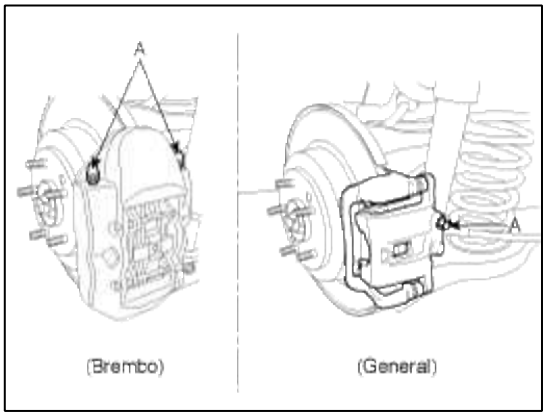
- Do not reuse the drained fluid.
- Always use genuine DOT3/DOT4 brake Fluid.
  Using a non-genuine DOT3/DOT4 brake fluid can cause corrosion and decrease the life of the system.
- Make sure no dirt or other foreign matter is allowed to contaminate the brake fluid.
- Do not spill brake fluid on the vehicle, it may damage the paint; if brake fluid does contact the paint, wash it off immediately with water.
- The reservoir on the master cylinder must be at the MAX (upper) level mark at the start of bleeding procedure and checked after bleeding each brake caliper. Add fluid as required.

1. Make sure the brake fluid in the reservoir is at the MAX(upper) level line.
2. Have someone slowly pump the brake pedal several times, and then apply pressure.
3. Loosen the right-rear brake bleed screw (A) to allow air to escape from the system. Then tighten the bleed screw securely.

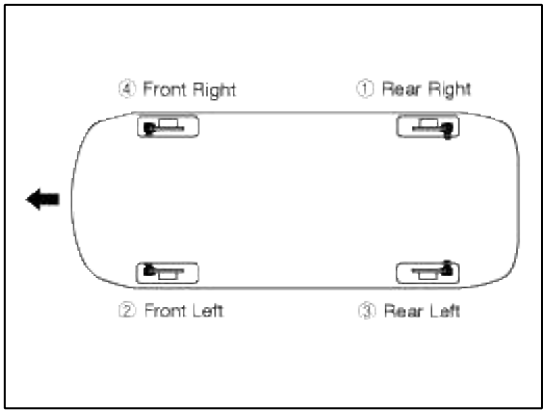
Front



Rear



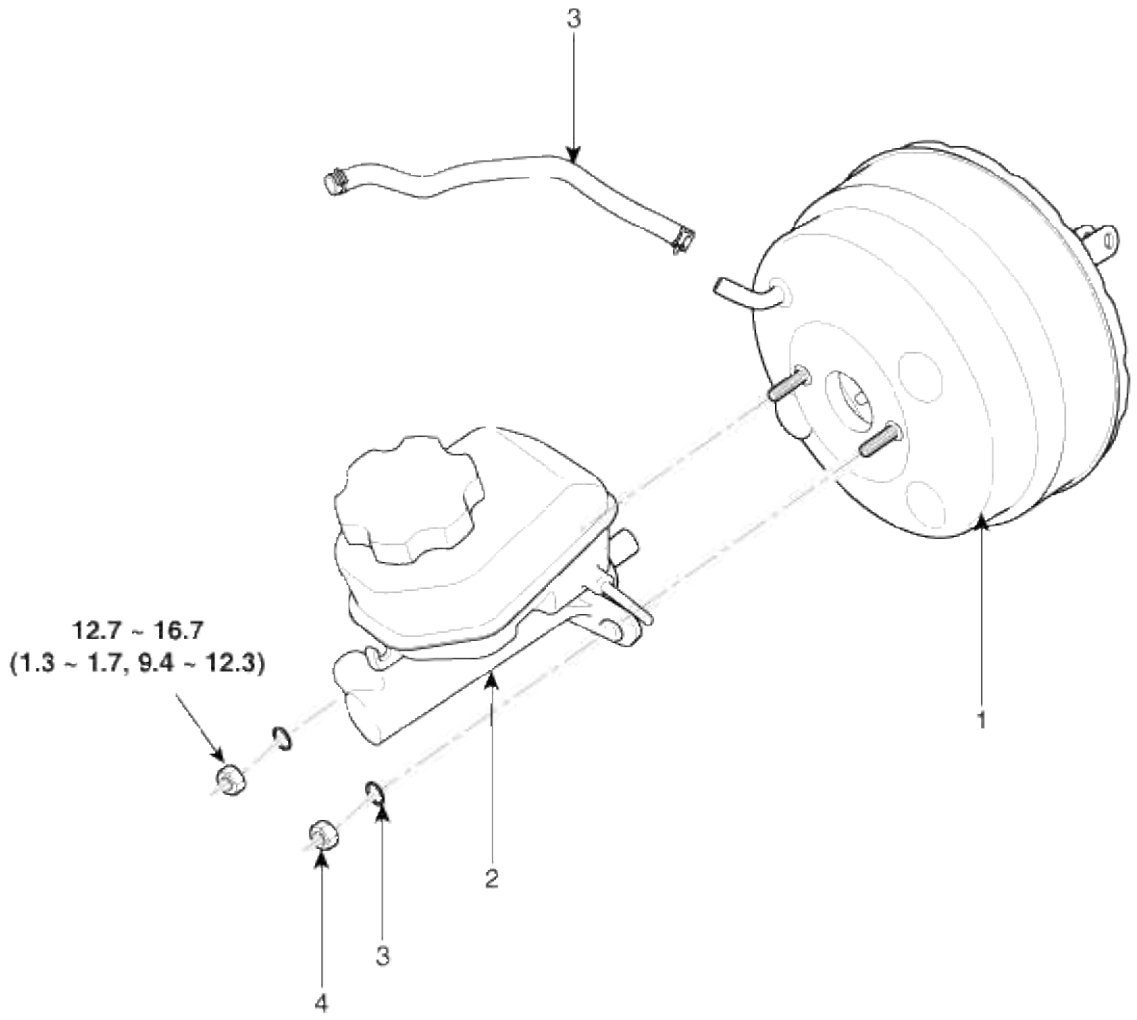
4. Repeat the procedure for wheel in the sequence shown below until air bubbles no longer appear in the fluid.



5. Refill the master cylinder reservoir to MAX(upper) level line.

Brake System > Brake System > Brake Booster > Components and Components Location

Components



Torque : N.m (kgf.m, lb-ft)

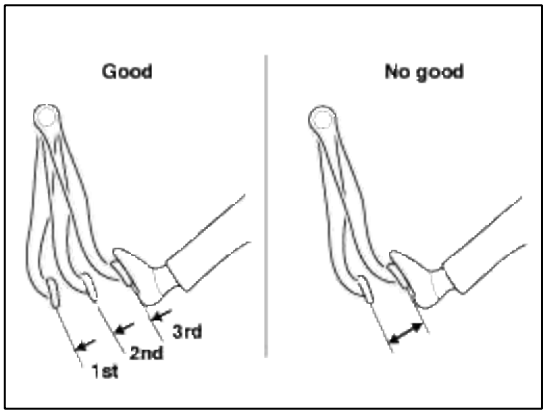
1. Brake booster 2. Master cylinder assembly 3. Washer	4. Nut 5. Vacuum hose

Brake System > Brake System > Brake Booster > Repair procedures

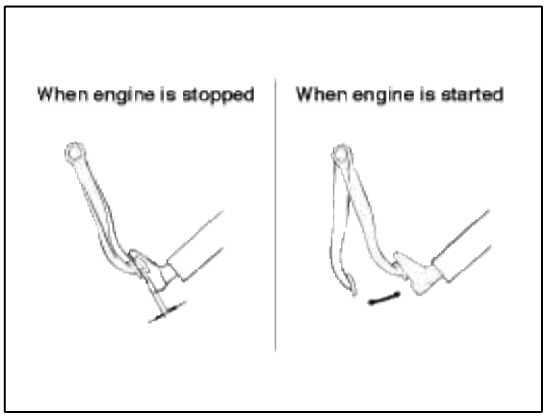
Brake Booster Operating Test

For simple checking of the brake booster operation, carry out the following tests.

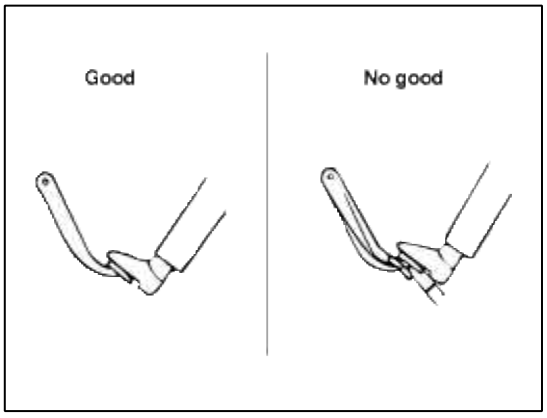
1. Run the engine for one or two minutes, and then stop it. If the pedal depresses fully the first time but gradually becomes higher when depressed succeeding times, the booster is operating properly, if the pedal height remains unchanged, the booster is inoperative.



2. With the engine stopped, step on the brake pedal several times.
   Then step on the brake pedal and start the engine. If the pedal moves downward slightly, the booster is in good condition. If there is no change, the booster is inoperative.



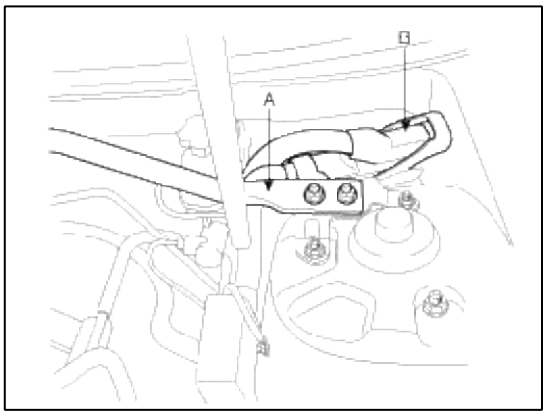
3. With the engine running, step on the brake pedal and then stop the engine.
   Hold the pedal depressed for 30 seconds. If the pedal height does not change, the booster is in good condition, if the pedal rises, the booster is inoperative.
   If the above three tests are okay, the booster performance can be determined as good.
   Even if one of the above three tests is not okay, check the check valve, vacuum hose and booster for malfunction.



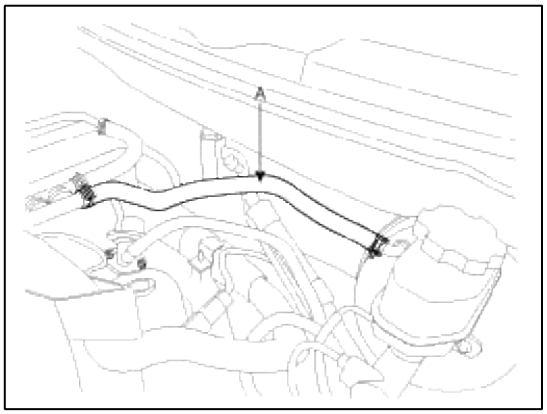
Removal

1. Turn ignition switch OFF and disconnect the negative (-) battery cable.

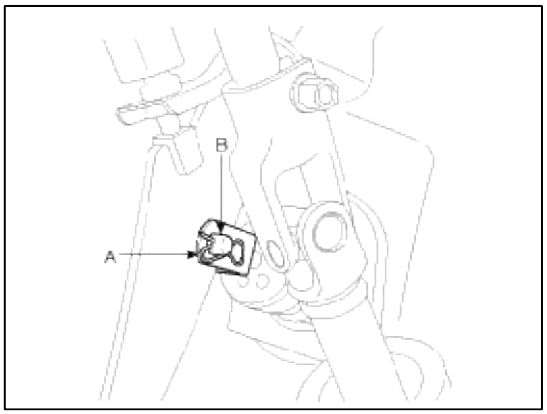
2. Remove the strut bar (A).



3. Disconnect the ECM connector (B). And then take the protector of control harness off.
4. Disconnect the vacuum hose (A) from the brake booster.

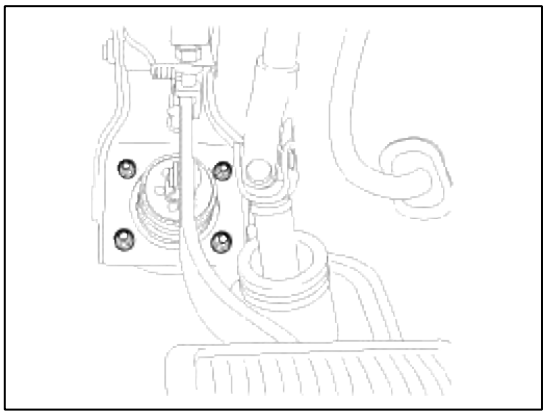


5. Remove the master cylinder.
   (Refer to Master cylinder)
6. Remove the snap pin (A) and clevis pin (B).



7. Remove the mounting nuts.

Tightening torque :
12.7 ~ 15.7 N.m (1.3 ~ 1.6 kgf.m, 9.4 ~ 11.6 lb-ft)



8. Remove the brake booster.

Inspection

1. Inspect the check valve in the vacuum hose.

> CAUTION
>
> Do not remove the check valve from the vacuum hose.

2. Check the boot for damage.

Installation

1. Installation is the reverse of removal.

> CAUTION
>
> - Before installing the pin, apply the grease to the joint pin.
> - Use a new snap pin whenever installing.

2. After installing, bleed the brake system.
   (Refer to Brake system bleeding)
3. Adjust the brake pedal height and free play.
   (Refer to Brake pedal height and free play adjustment)

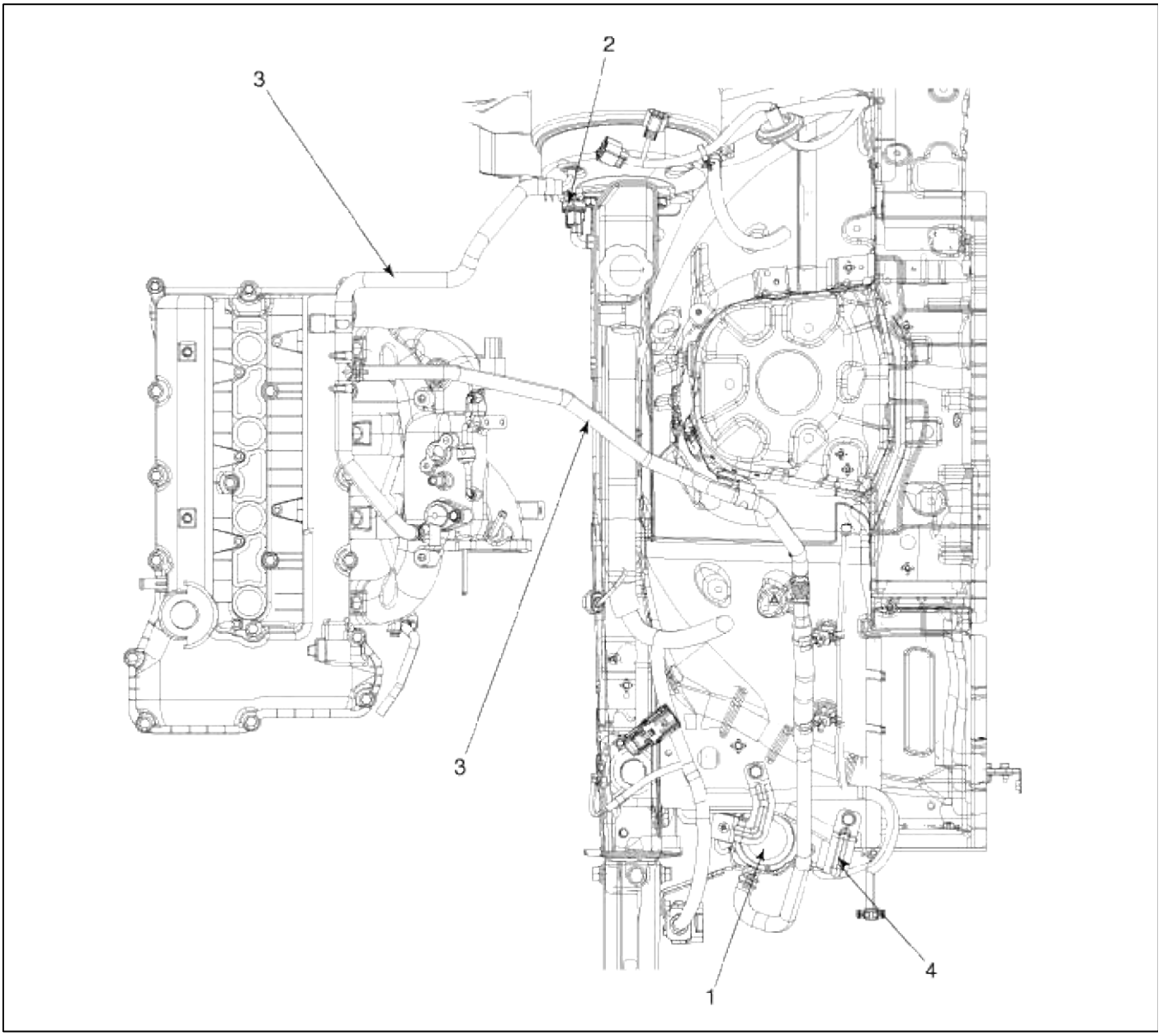
Brake System > Brake System > Vacuum Pump (2.0 A/T & ESC Only) > Description and Operation

Description

The Vacuum Pump System is set up in a vehicle in order to make the vacuum enough when a driver presses the brake pedal on the high ground. To operate this system, the vacuum pump is installed on a vehicle.
If the vacuum is not sufficient to press the brake pedal, the HECU senses it through the vacuum switch, which is installed on booster. And then the HECU supplies the power to the vacuum pump by grounding the circuit of the vacuum pump relay. When the vacuum pump is supplied with electric power, it makes the vacuum and supplements it to the booster.

Brake System > Brake System > Vacuum Pump (2.0 A/T & ESC Only) > Components and Components Location

Components



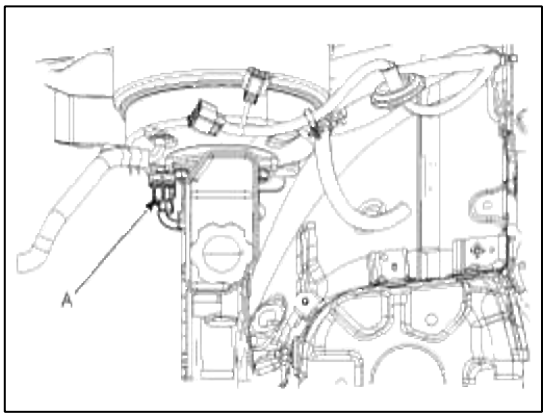
1. Vacuum pump 2. Vacuum switch	3. Vacuum hose 4. Vacuum pump bracket

Brake System > Brake System > Vacuum Pump (2.0 A/T & ESC Only) > Repair procedures

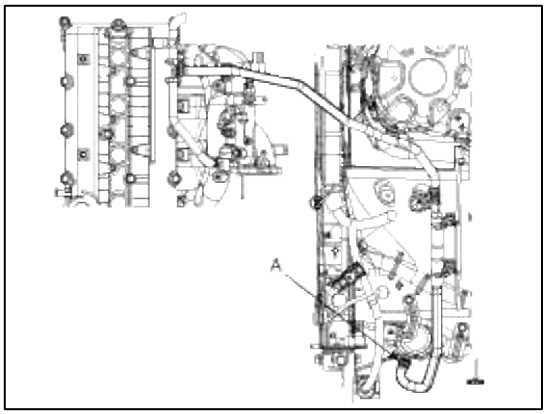
Removal

1. Remove the front bumper cover.
   (Refer to Body group – "Bumper")

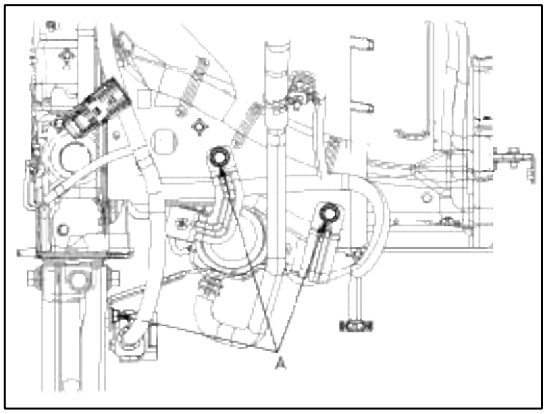
2. Disconnect the Vacuum pump connector (A).



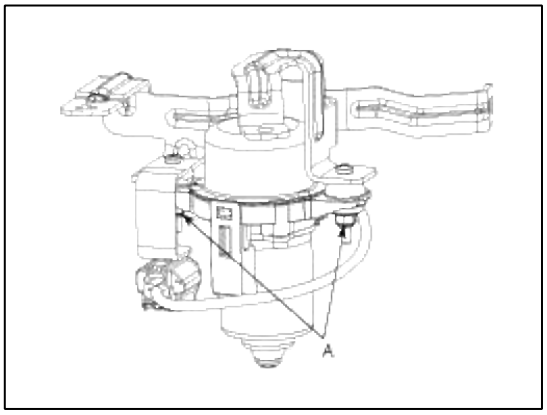
3. Remove the Vacuum hose (A).



4. Remove the mounting bracket bolt (A).

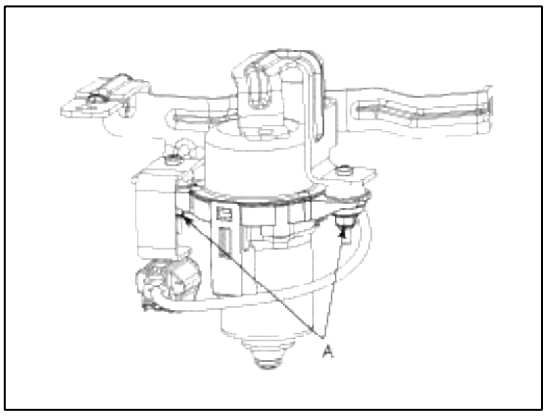


5. Remove the 2 nuts (A) and then remove the bracket from Vacuum pump.

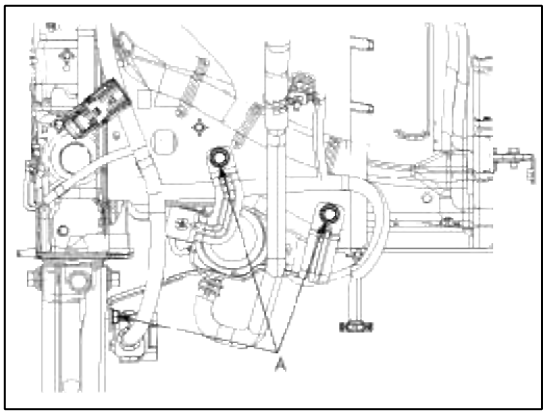


Installation

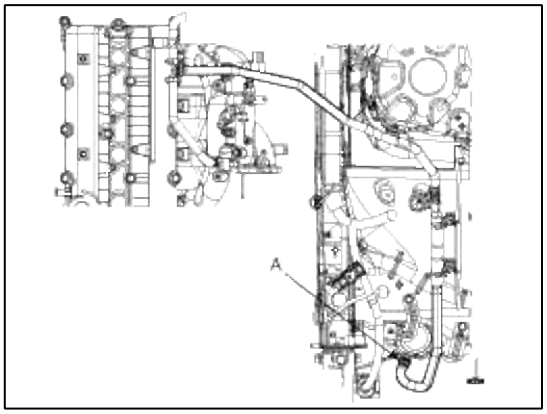
1. Install the Vacuum pump to the bracket.



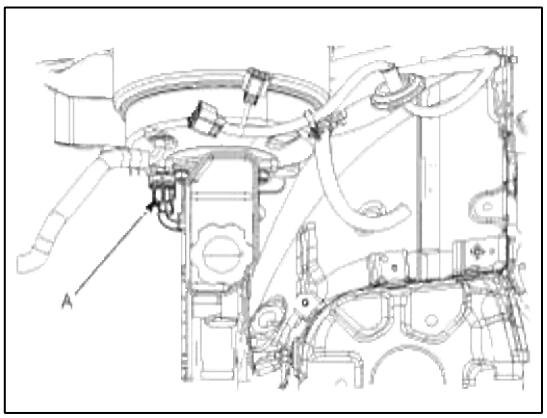
2. Install the Vacuum pump & bracket bolt.



3. Install the Vacuum hose.



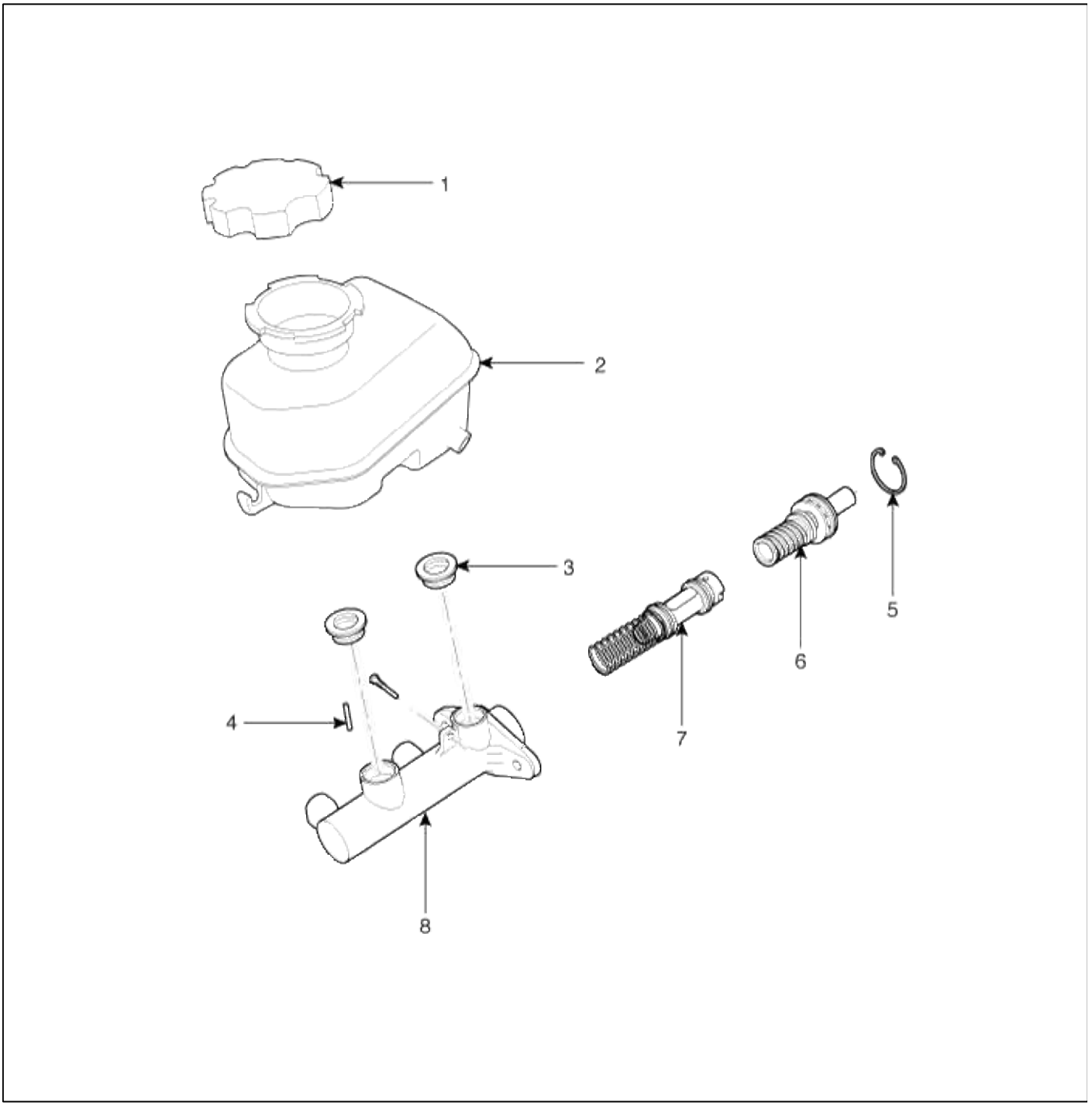
4. Connect the Vacuum pump connector.



5. Install the front bumper cover.
   (Refer to Body group – "Bumper")

Brake System > Brake System > Master Cylinder > Components and Components Location

Components

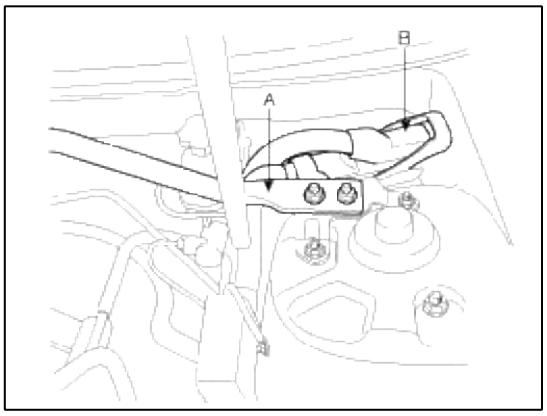


1. Reservoir cap 2. Reservoir 3. Grommet 4. Cylinder pin	5. Retainer 6. Primary piston assembly 7. Secondary piston assembly 8. Master cylinder body

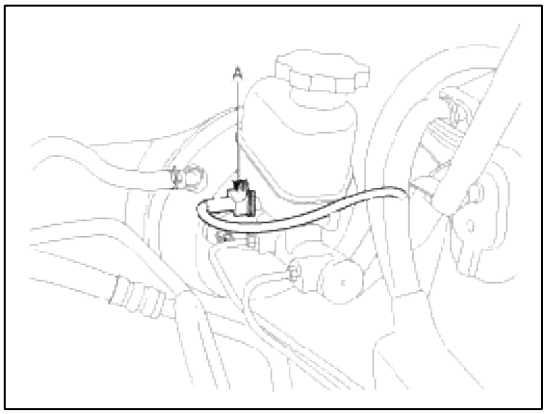
Brake System > Brake System > Master Cylinder > Repair procedures

Removal

1. Turn ignition switch OFF and disconnect the negative (-) battery cable.
2. Remove the strut bar (A).



3. Disconnect the ECM connector (B). And then take the protector of control harness off.
4. Disconnect the brake fluid level switch connector (A) from the reservoir.

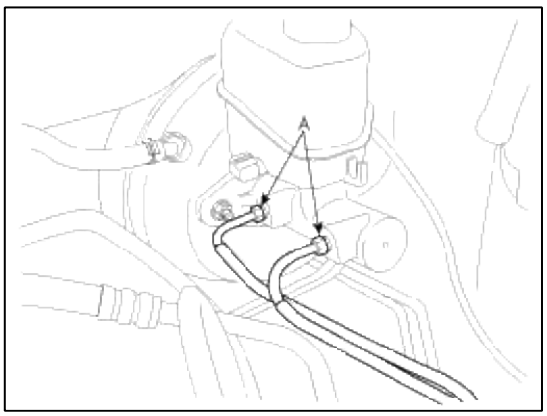


5. Remove the brake fluid from the master cylinder reservoir with a syringe.

> CAUTION
>
> • Do not spill brake fluid on the vehicle, it may damage the paint; if brake fluid does contact the paint, wash it off immediately with water.

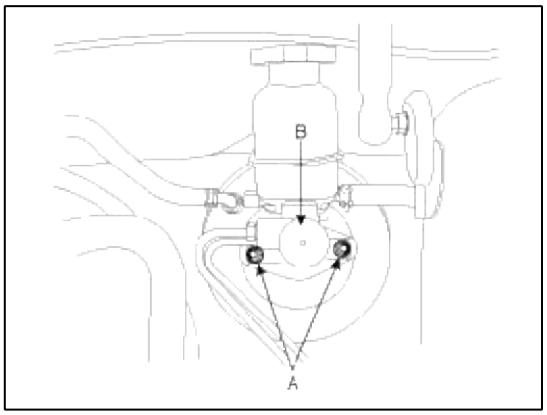
6. Disconnect the brake tube (B) from the master cylinder by loosening the tube flare nut.

Tightening torque :
ABS : 12.7 ~ 16.7 N.m (1.3 ~ 1.7 kgf.m, 9.4 ~ 12.3 lb-ft)
ESC : 18.6 ~ 22.6 N.m (1.9 ~ 2.3 kgf.m, 13.7 ~ 16.7 lb-ft)



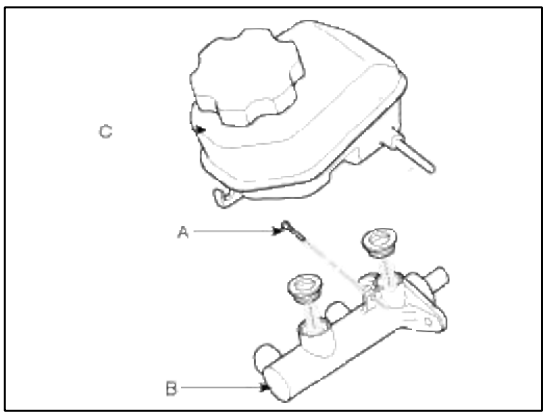
7. Remove the master cylinder (B) from the brake booster after loosening the mounting nuts (C).

Tightening torque :
12.7 ~ 16.7 N.m (1.3 ~ 1.7 kgf.m, 9.4 ~ 12.3 lb-ft)

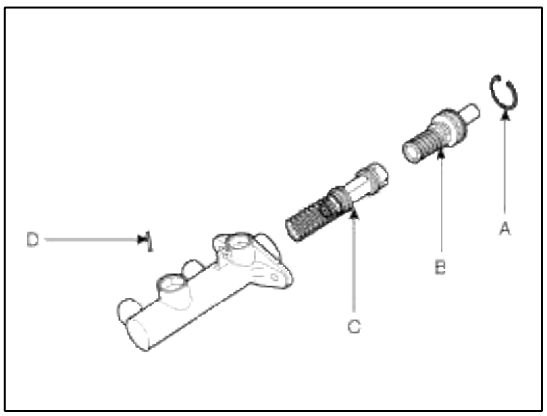


Disassembly

1. Remove the reservoir cap and drain the brake fluid into a suitable container.
2. Remove the reservoir (C) from the master cylinder (B), after remove mounting screw (A).



3. Remove the retainer ring (A) by using the snap ring pliers.
4. Remove the primary piston assembly (B).
5. Remove the pin (D) with the secondary piston(C) pushed completely using a screwdriver. Remove the secondary piston assembly (C).



NOTE

Do not disassemble the primary and secondary piston assembly.

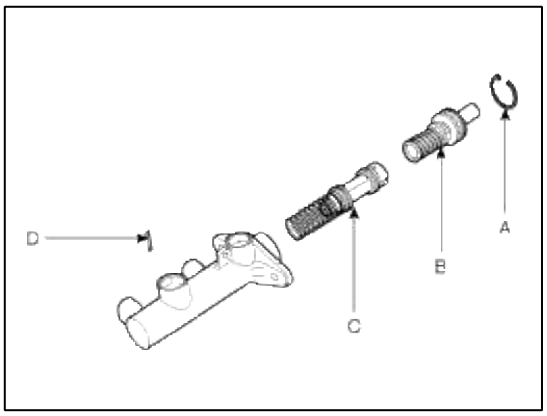
Inspection

1. Check the master cylinder bore for rust or scratching.
2. Check the master cylinder for wear or damage. If necessary, clean or replace the cylinder.

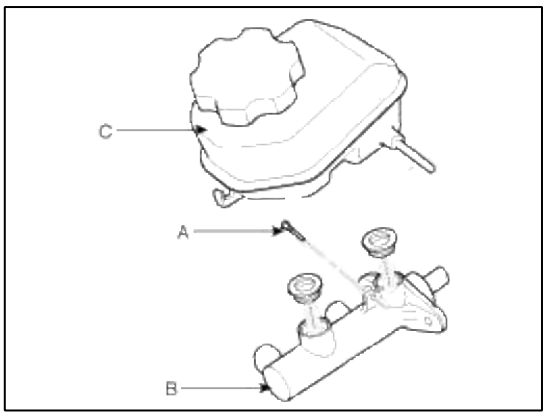
> CAUTION
>
> • If the cylinder bore is damaged, replace the master cylinder assembly.
> • Wash the contaminated parts in alcohol.

Reassembly

1. Apply genuine brake fluid to the rubber parts of the cylinder kit and grommets.
2. Carefully insert the springs and pistons in the proper direction.
3. Press the secondary piston (C) with a screwdriver and install the cylinder pin (D).



4. Install the retainer ring (A) after installing primary piston assembly (B).
5. Mount two grommets.
6. Install the reservoir (C) on the cylinder (B), and then install the mounting screw (A).

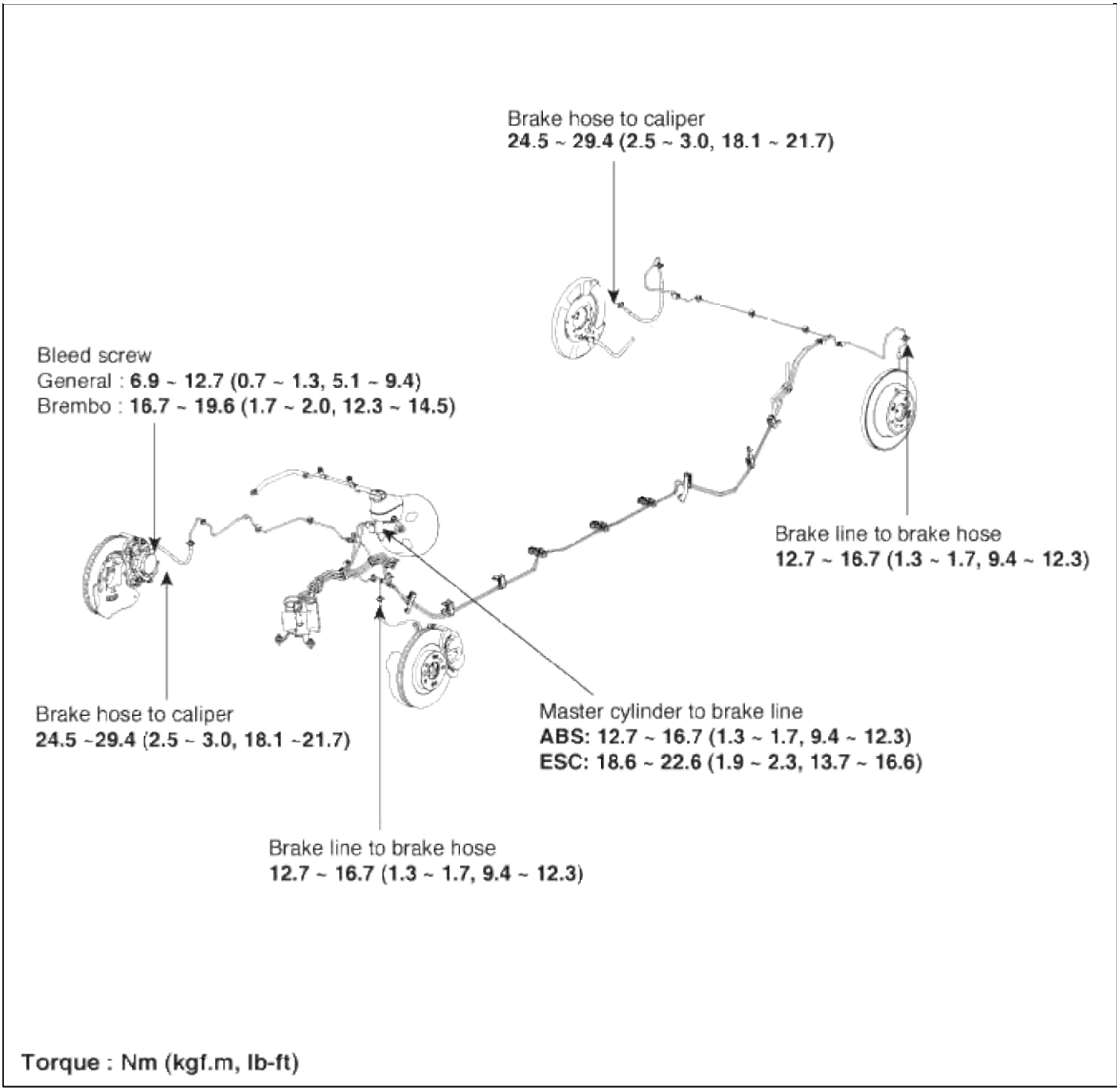


Installation

1. Installation is the reverse of removal.
2. After installation, bleed the brake system.
   (Refer to Brake system bleeding)

Brake System > Brake System > Brake Line > Components and Components Location

Components



WARNING

When installing brake hose, be sure to comply with the torque specification to prevent twisted hose.

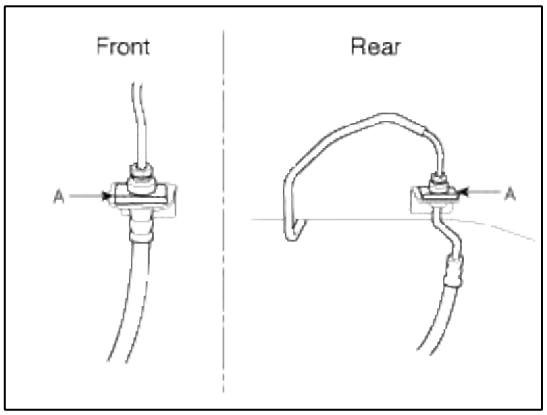
Brake System > Brake System > Brake Line > Repair procedures

Removal

1. Remove the wheel & tire.

2. Remove the brake hose clip (A).

Front



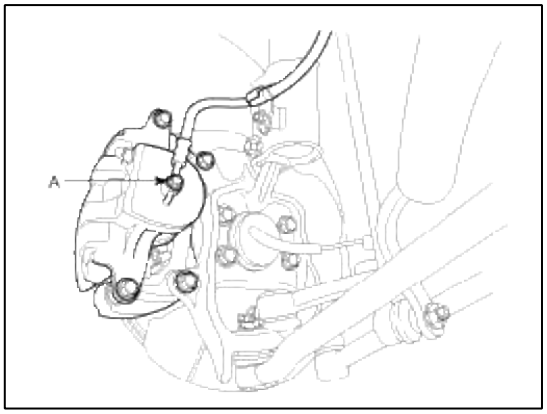
3. Disconnect the brake tube by loosening the tube flare nut.

Tightening torque :
12.7 ~ 16.7 N.m (1.3 ~ 1.7 kgf.m, 9.4 ~ 12.3 lb-ft)

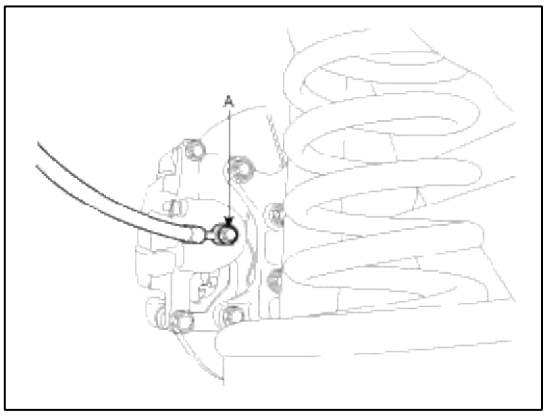
4. Disconnect the brake hose from the brake caliper by loosening the bolt.

Tightening torque :
24.5 ~ 29.4 N.m (2.5 ~ 3.0 kgf.m, 18.1 ~ 21.7 lb-ft)

Front



Rear



Inspection

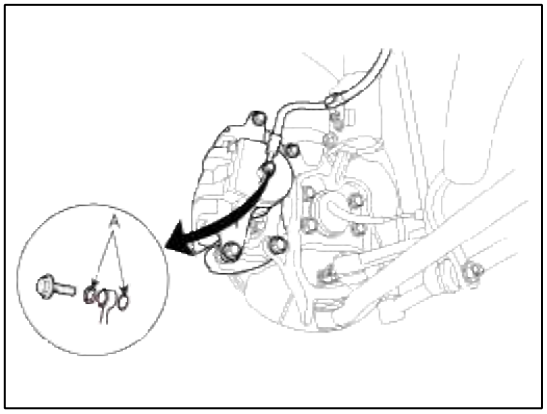
1. Check the brake tubes for cracks, crimps and corrosion.

2. Check the brake hoses for cracks, damage and fluid leakage.
3. Check the brake tube flare nuts for damage and fluid leakage.
4. Check the brake hose mounting bracket for crack or deformation.

Installation

1. Installation is the reverse of removal.

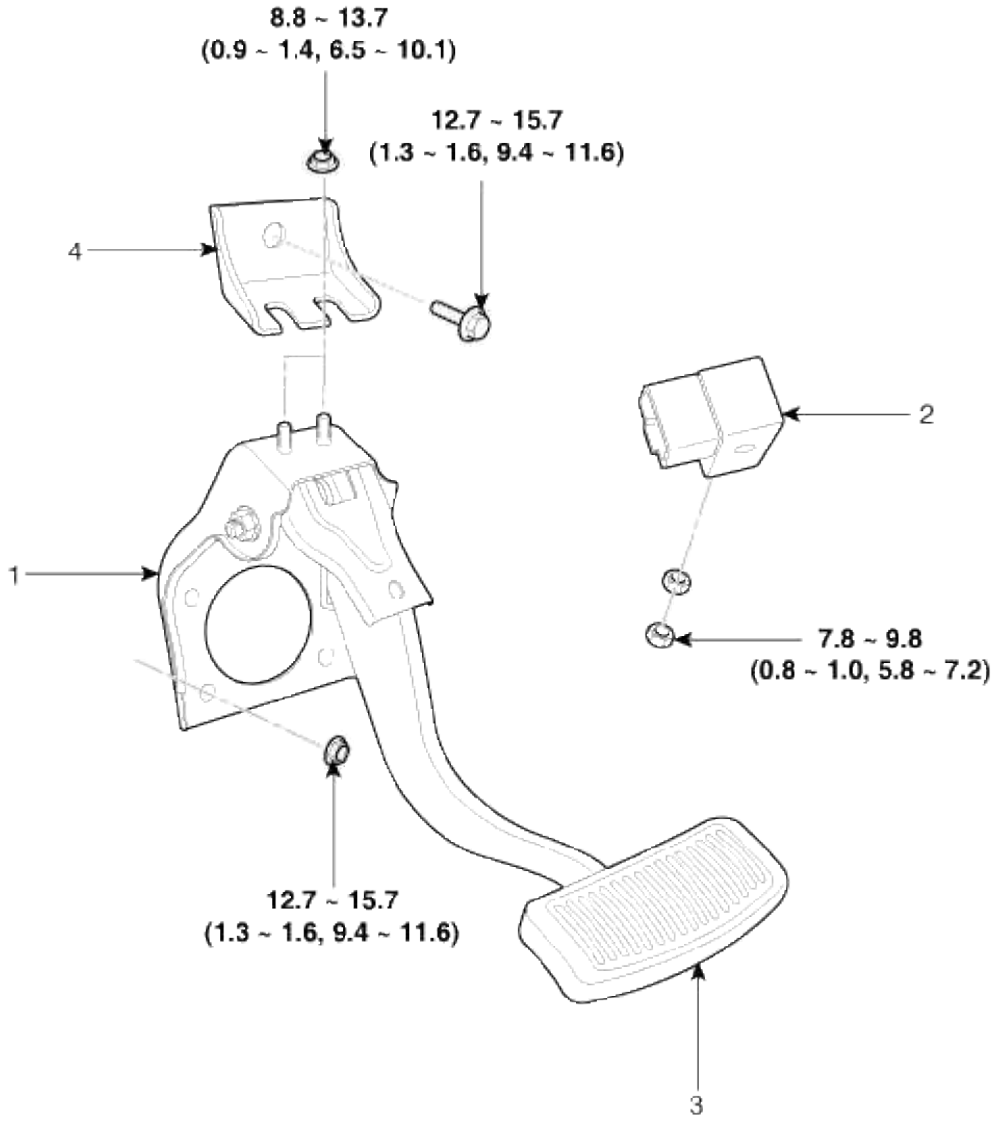
> CAUTION
>
> Use a new washer (A) whenever installing.



2. After installation, bleed the brake system.
   (Refer to Brake system bleeding)
3. Check the spilled brake oil.

Brake System > Brake System > Brake Pedal > Components and Components Location

Components



Torque : N.m (kgf.m, lb-ft)

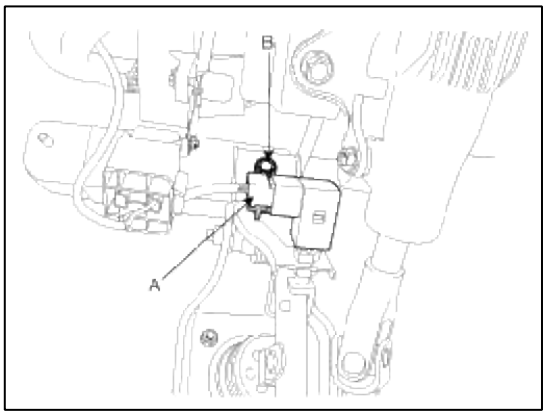
1. Brake pedal member assembly 2. Stop lamp switch	3. Brake pedal 4. Brake bracket

Brake System > Brake System > Brake Pedal > Repair procedures

Removal

1. Remove the lower crash pad.
   (Refer to Body group - "Crash pad")

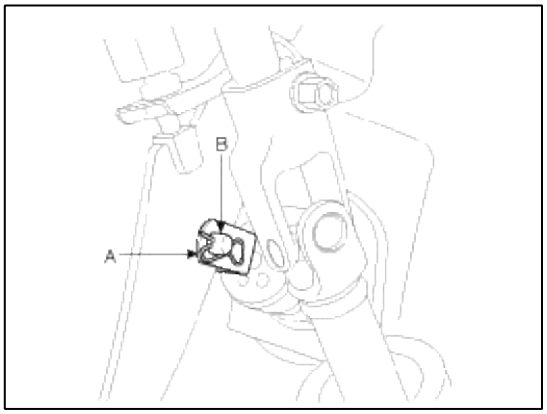
2. Disconnect the stop lamp switch connector (A).



3. Remove the mounting bracket bolt (B).

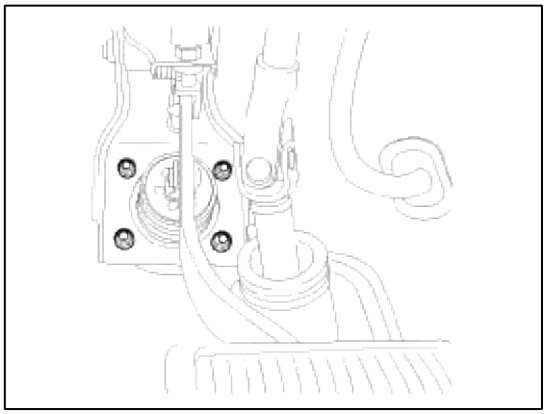
Tightening torque :
12.7 ~ 15.7 N.m (1.3 ~ 1.6 kgf.m, 9.4 ~ 11.6 lb-ft)

4. Remove the snap pin (A) and clevis pin (B).



5. Remove the brake pedal member assembly mounting nuts and then remove the brake pedal assembly.

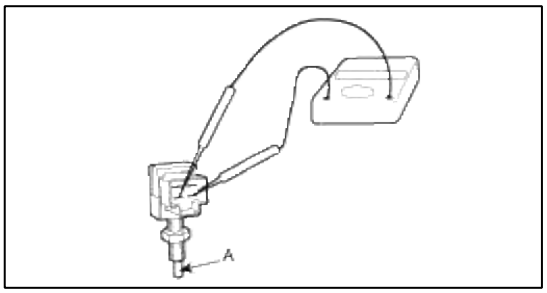
Tightening torque :
12.7 ~ 15.7 N.m (1.3 ~ 1.6 kgf.m, 9.4 ~ 11.6 lb-ft)



Inspection

1. Check the bushing for wear.
2. Check the brake pedal for bending or twisting.
3. Check the brake pedal return spring for damage.

4. Check the stop lamp switch.
   (1) Connect a circuit tester to the connector of stop lamp switch, and check whether or not there is continuity when the plunger of the stop lamp switch is pushed in and when it is released.
   (2) The stop lamp switch is in good condition if there is no continuity when plunger (A) is pushed.



Installation

1. Installation is the reverse of removal.

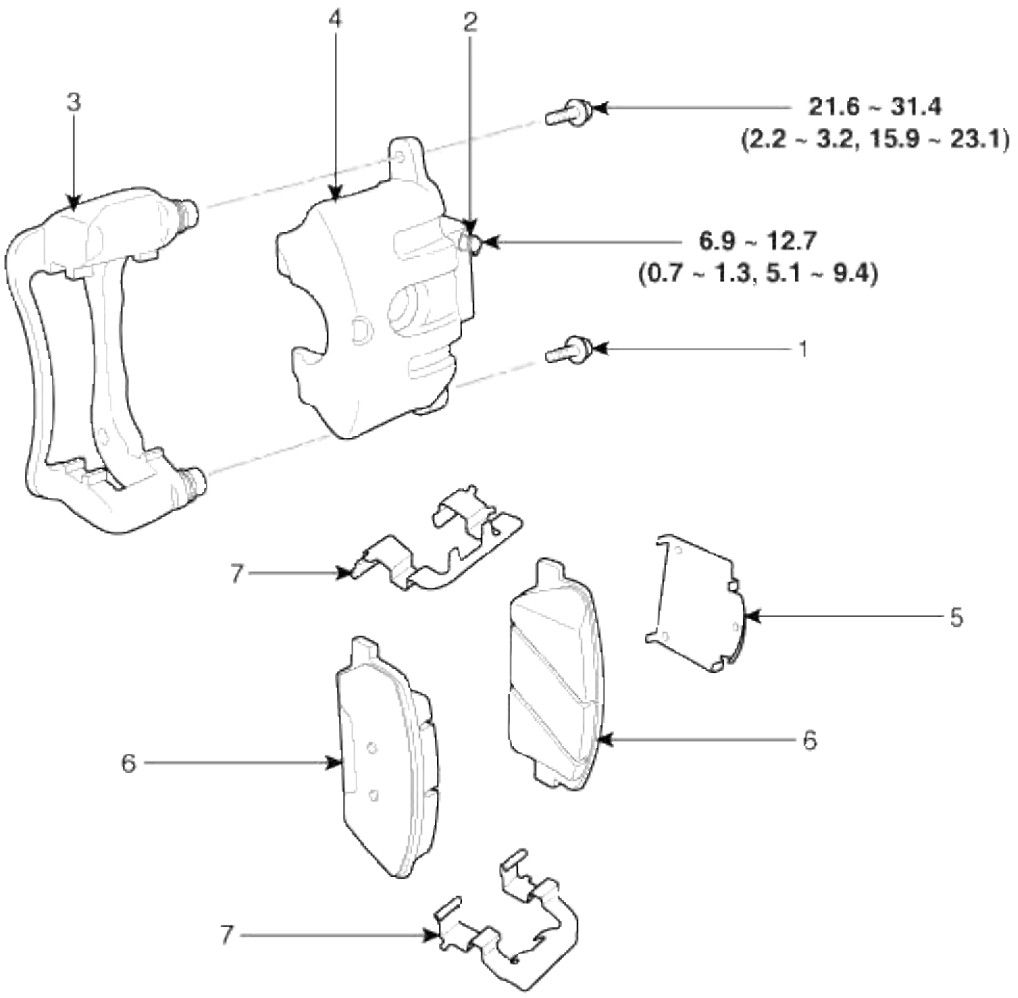
CAUTION

- Before installing the pin, apply the grease to the clevis pin.
- Use a new snap pin whenever installing.

2. Check the brake pedal operation.

Brake System > Brake System > Front Disc Brake > Components and Components Location

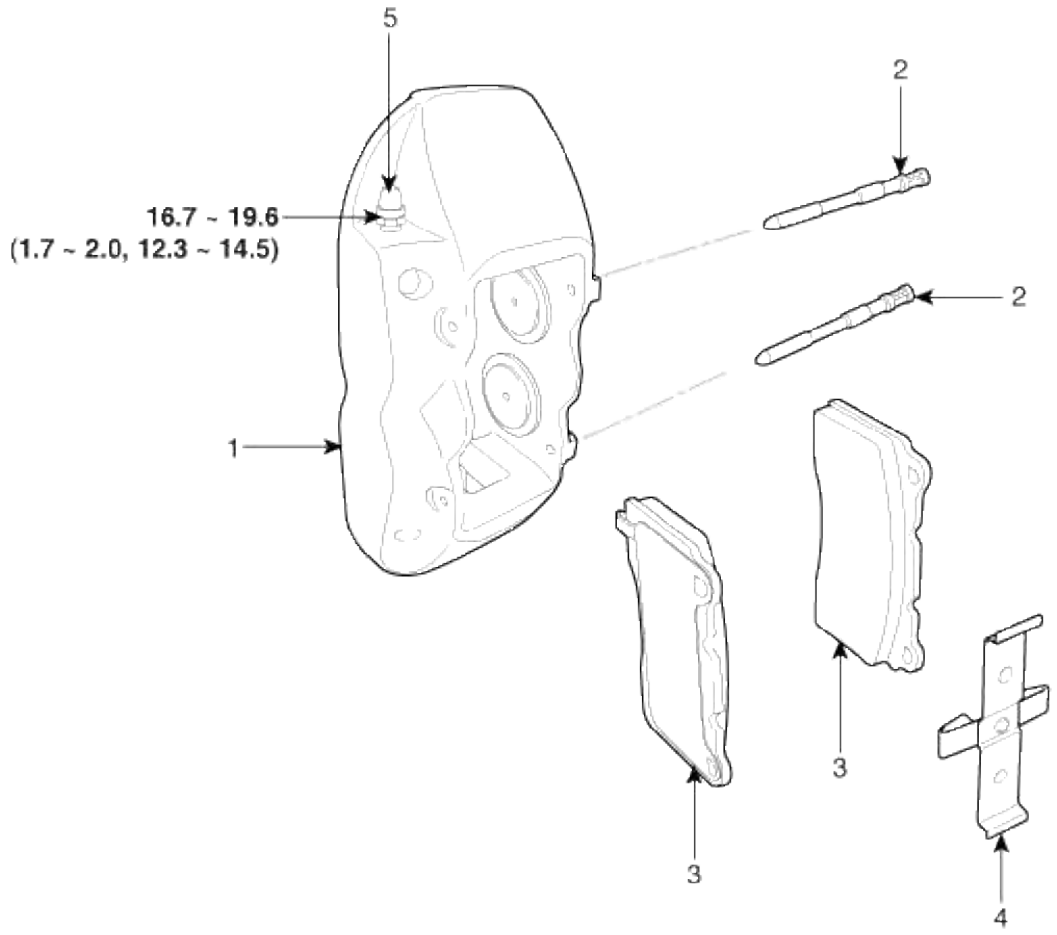
Components (1)



Torque : N.m (kgf.m, lb-ft)

1. Guide rod bolt 2. Bleed screw 3. Caliper bracket 4. Caliper body	5. Inner pad shim 6. Brake pad 7. Pad retainer

Components (2)



Torque : N.m (kgf.m, lb-ft)

1. Caliper body 2. Guide pin 3. Brake pad	4. Retraction spring 5. Bleed screw

Brake System > Brake System > Front Disc Brake > Repair procedures

Removal

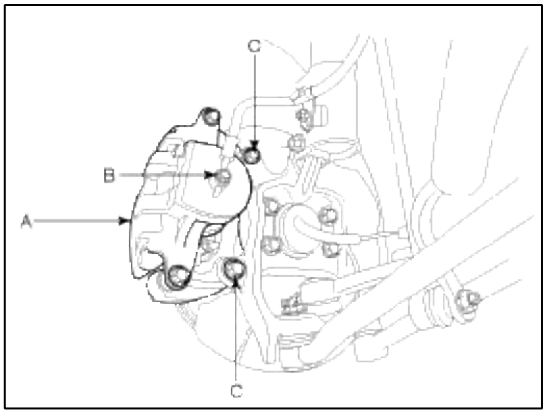
General caliper type

1. Remove the front wheel & tire.

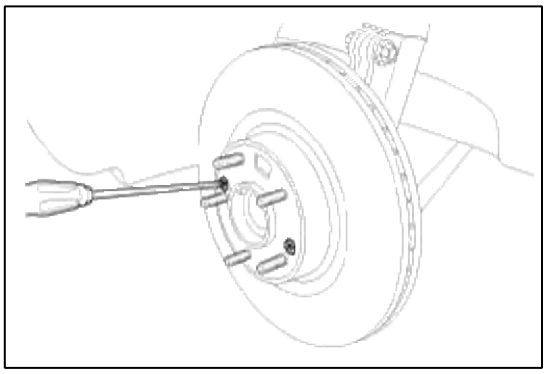
Tightening torque :
88.3 ~ 107.9 N.m (9.0 ~ 11.0 kgf.m, 65.1 ~ 79.6 lb-ft)

2. Loosen the hose eye-bolt (B) and caliper mounting bolts (C), then remove the front caliper assembly (A).

Tightening torque
Brake hose to caliper (B):
24.5 ~ 29.4 N.m (2.5 ~ 3.0 kgf.m, 18.1 ~ 21.7 lb-ft)
Caliper assembly to knuckle (C):
78.5 ~ 98.1 N.m (8.0 ~ 10.0 kgf.m, 57.9 ~ 72.3 lb-ft)



3. Remove the front brake disc by loosening the screws.



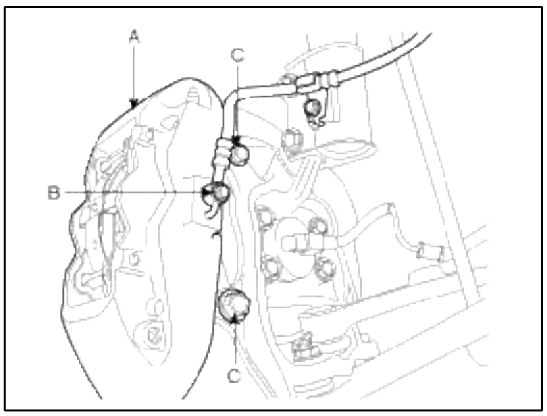
Brembo caliper type

1. Remove the front wheel & tire.

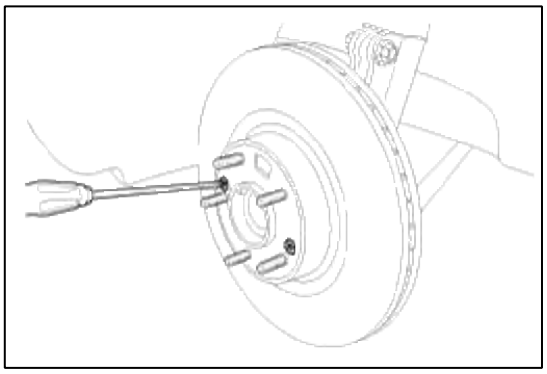
Tightening torque :
88.3 ~ 107.9 N.m (9.0 ~ 11.0 kgf.m, 65.1 ~ 79.6 lb-ft)

2. Loosen the hose eye-bolt (B) and caliper mounting bolts (C), then remove the front caliper assembly (A).

Tightening torque
Brake hose to caliper (B):
24.5 ~ 29.4 N.m (2.5 ~ 3.0 kgf.m, 18.1 ~ 21.7 lb-ft)
Caliper assembly to knuckle (C):
88.3 ~ 103.0 N.m (9.0 ~ 10.5 kgf.m, 65.1 ~ 75.9 lb-ft)



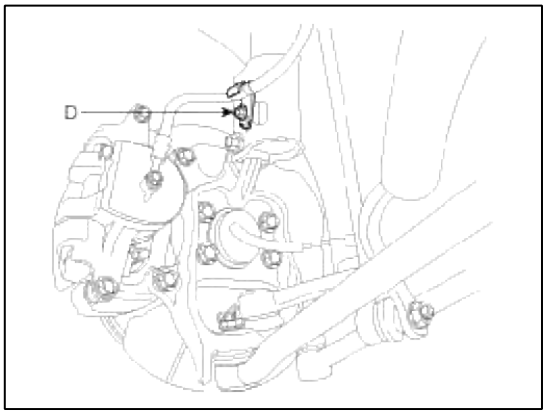
3. Remove the front brake disc by loosening the screws.



Replacement

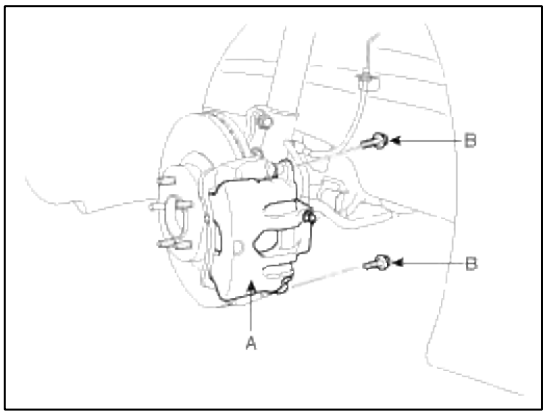
Front Brake Pads (General caliper type)

1. Remove the brake hose mounting bracket (knuckle mounting part : D).

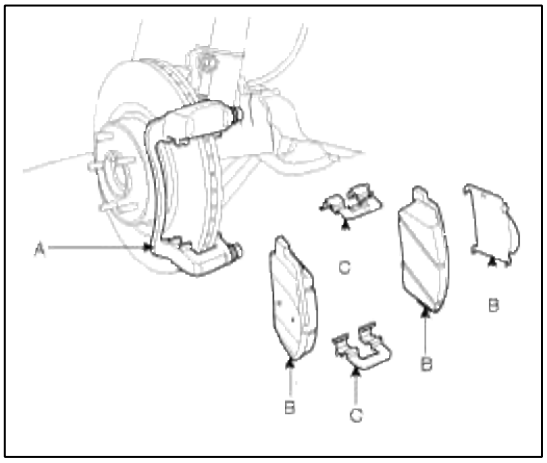


2. Loosen the guide rod bolt (B) and remove the caliper body (A).

Tightening torque :
21.6 ~ 31.4 N.m (2.2 ~ 3.2 kgf.m, 15.9 ~ 23.1 lb-ft)

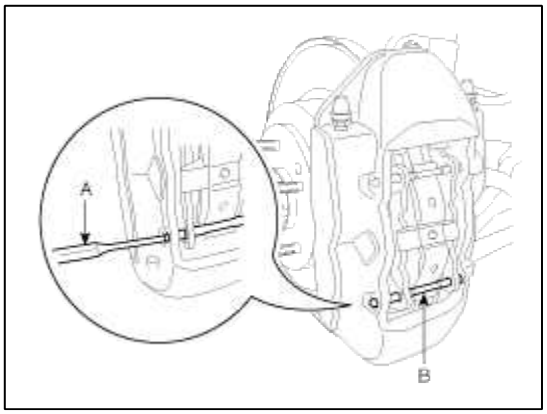


3. Replace pad shim (B), pad retainers (C) and brake pads (B) in the caliper bracket (A).

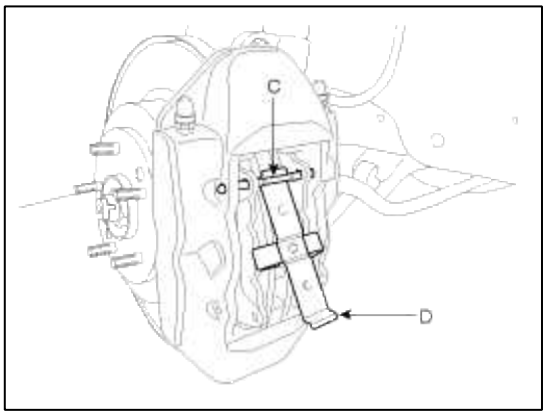


Front Brake Pads (Brembo caliper type)

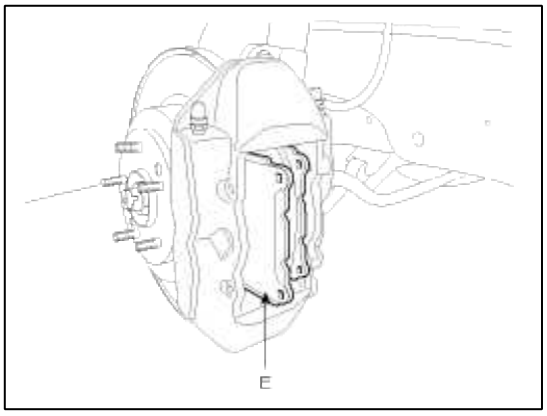
1. Remove the guide pin (B) of the lower part with the pin punch (A).



2. Remove the guide pin (C) of the upper part and retraction spring (D).



3. Replace brake pads (E) at the caliper body.

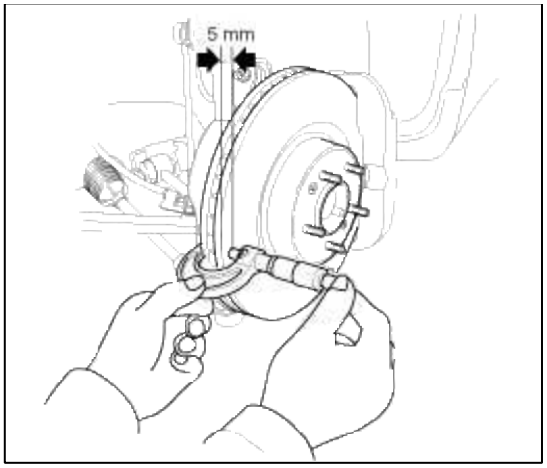


Inspection

Front Brake Disc Thickness Check

1. Check the brake pads for wear and fade.
2. Check the brake disc for damage and cracks.
3. Remove all rust and contamination from the surface, and measure the disc thickness at 8 points, at least, of same distance (5mm) from the brake disc outer circle.

Brake disc thickness
General caliper type
Standard: 28mm (1.10in)
Service limit: 26.4mm (1.04in)
Deviation: Less than 0.005mm (0.0002in) - circumference
Less than 0.01mm (0.0004in) - radius
Brembo caliper type
Standard: 28mm (1.10in)
Service limit: 26mm (1.02in)
Deviation: Less than 0.01mm (0.0004in) - circumference
Less than 0.04mm (0.0016in) - radius



4. If wear exceeds the limit, replace the discs and pad assembly left and right of the vehicle.

Front Brake Pad Check

1. Check the pad wear. Measure the pad thickness and replace it, if it is less than the specified value.

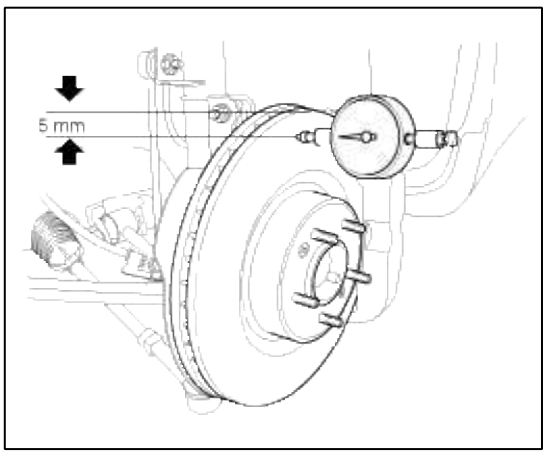
Pad thickness
General caliper type
Standard value : 11mm (0.43in)
Service limit : 2.0mm (0.0787in)
Brembo caliper type
Standard value : 8.5mm (0.33in)
Service limit : 2.0mm (0.0787in)

2. Check that grease is applied, to sliding contact points and the pad and backing metal for damage.

Front Brake Disc Runout Check

1. Place a dial gauge about 5mm (0.2 in.) from the outer circumference of the brake disc, and measure the runout of the disc.

Brake disc runout
Limit : 0.035mm (0.00137in.) or less (new one)



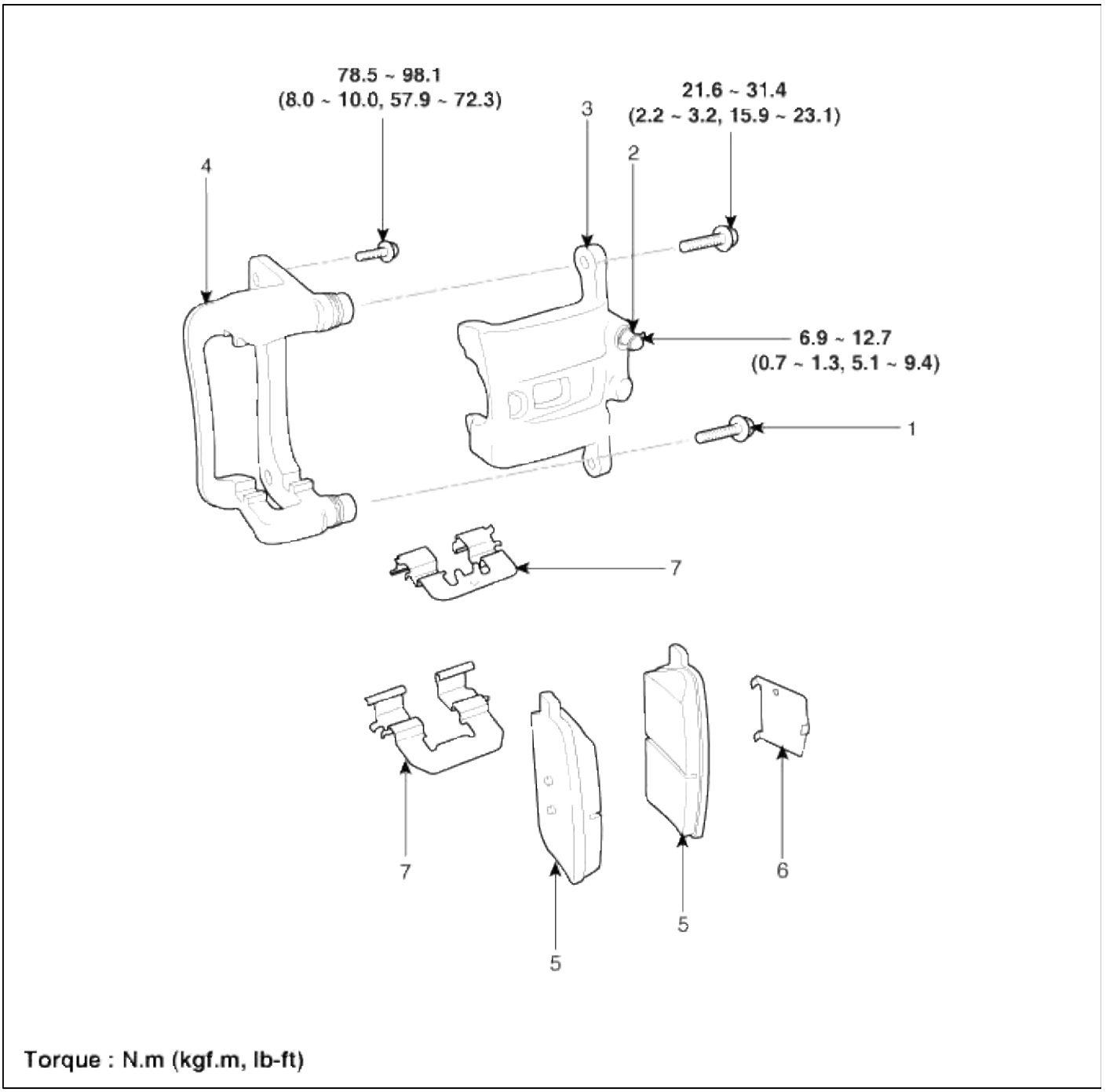
2. If the run out of the brake disc exceeds the limit specification, replace the disc, and then measure the run out again.
3. If the run out does not exceed the limit specification, install the brake disc after turning it and then check the run out of the brake disc again.
4. If the run out cannot be corrected by changing the position of the brake disc, replace the brake disc.

Installation

1. Installation is the reverse of removal.
2. Use a SST (09581-11000) when installing the brake caliper assembly.
3. After installation, bleed the brake system.
   (Refer to Brake system bleeding)

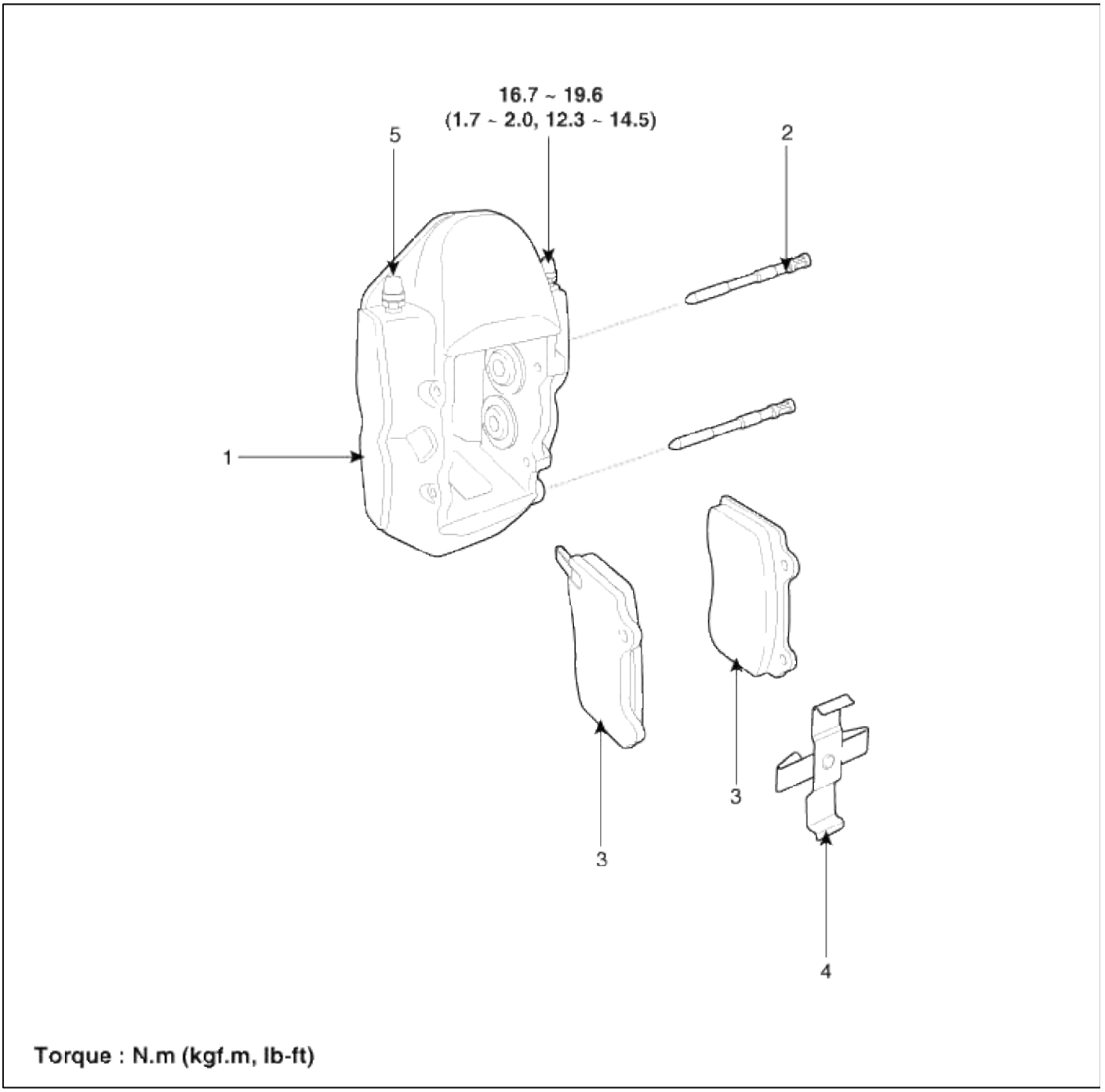
Brake System > Brake System > Rear Disc Brake > Components and Components Location

Components (1)



1. Guide rod bolt	5. Inner pad shim
2. Bleed screw	6. Brake pad
3. Caliper body	7. Pad retainer
4. Caliper bracket	

Components (2)



1. Caliper body 2. Guide pin 3. Brake pad	4. Retraction spring 5. Bleed screw

Brake System > Brake System > Rear Disc Brake > Repair procedures

Removal

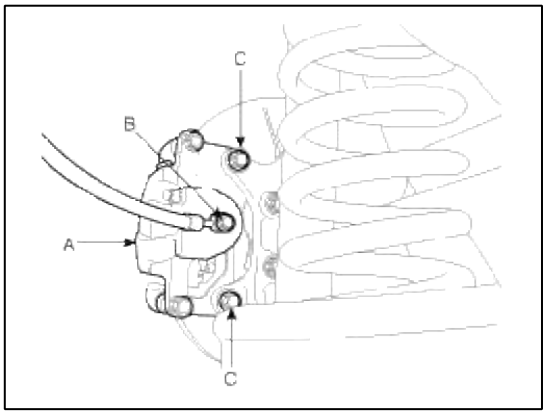
General caliper type

1. Remove the rear wheel & tire.

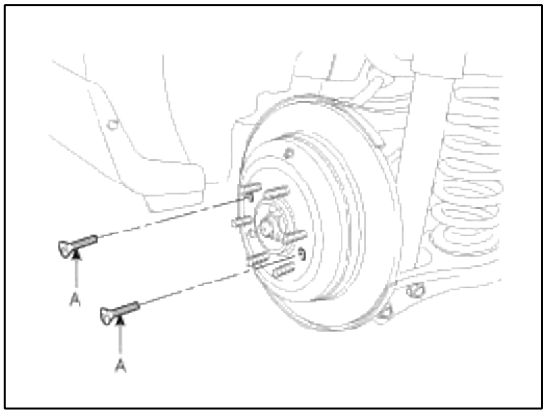
Tightening torque :
88.3 ~ 107.9 N.m (9.0 ~ 11.0 kgf.m, 65.1 ~ 79.6 lb-ft)

2. Loosen the hose eye-bolt (B) and caliper mounting bolts (C), then remove the rear caliper assembly (A).

Tightening torque
Brake hose to caliper (B):
24.5 ~ 29.4 N.m (2.5 ~ 3.0 kgf.m, 18.1 ~ 21.7 lb-ft)
Caliper assembly to carrier (C):
78.5 ~ 98.1 N.m (8.0 ~ 10.0 kgf.m, 57.9 ~ 72.3 lb-ft)



3. Remove the rear brake disc by loosening the screws (A).



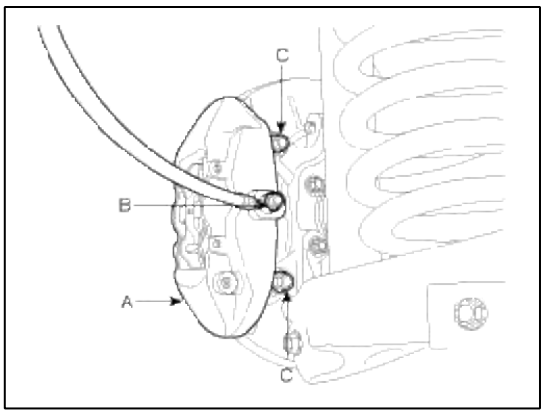
Brembo caliper type

1. Remove the rear wheel & tire.

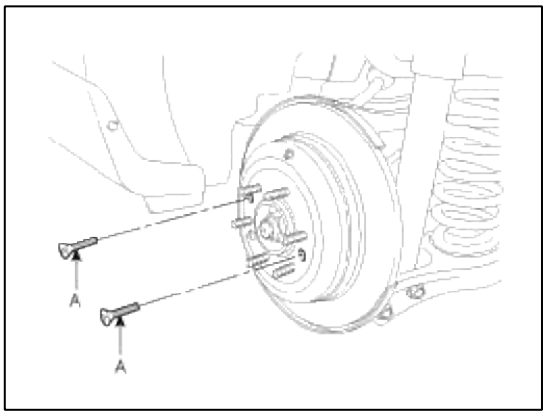
Tightening torque :
88.3 ~ 107.9 N.m (9.0 ~ 11.0 kgf.m, 65.1 ~ 79.6 lb-ft)

2. Loosen the hose eye-bolt (B) and caliper mounting bolts (C), then remove the rear caliper assembly (A).

Tightening torque
Brake hose to caliper (B):
24.5 ~ 29.4 N.m (2.5 ~ 3.0 kgf.m, 18.1 ~ 21.7 lb-ft)
Caliper assembly to carrier (C):
78.5 ~ 98.1 N.m (8.0 ~ 10.0 kgf.m, 57.9 ~ 72.3 lb-ft)



3. Remove the rear brake disc by loosening the screws (A).

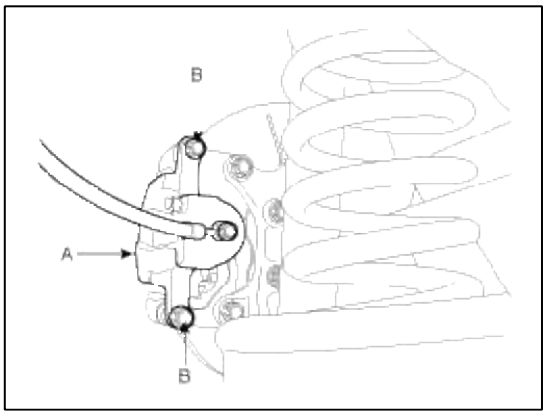


Replacement

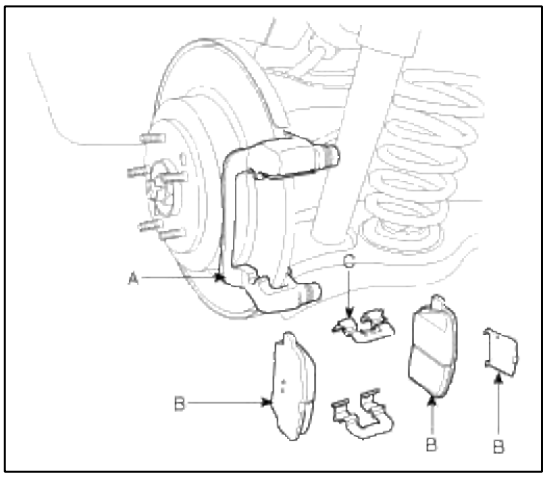
Rear Brake Pads (General caliper type)

1. Loosen the guide rod bolt (B) and remove the caliper body (A).

Tightening torque :
21.6 ~ 31.4 N.m (2.2 ~ 3.2 kgf.m, 15.9 ~ 23.1 lb-ft)



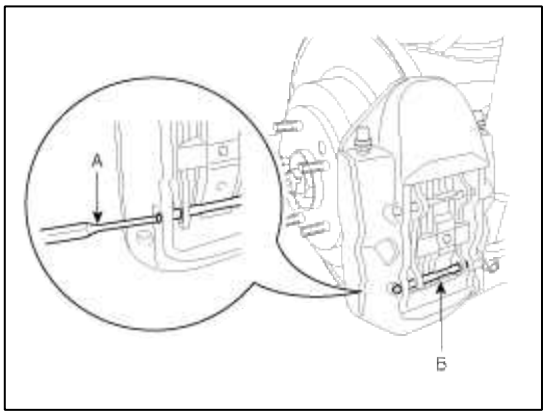
2. Replace pad shim, pad retainers (C) and brake pads (B) in the caliper bracket (A).



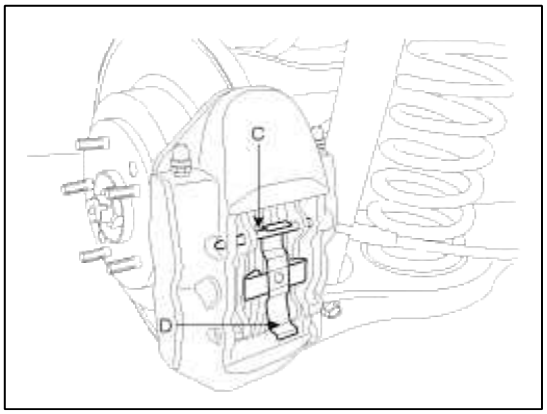
Rear Brake Pads (Brembo caliper type)

1. Remove the guide pin (B) of the lower part with the pin punch (A).

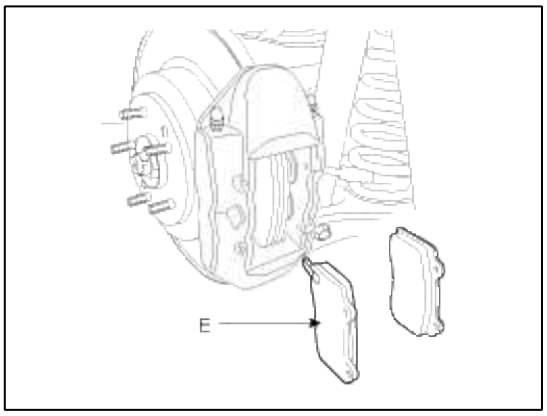
Tightening torque :
21.6 ~ 31.4 N.m (2.2 ~ 3.2 kgf.m, 15.9 ~ 23.1 lb-ft)



2. Remove the guide pin (C) of the upper part and the retraction spring (D).



3. Replace brake pads (E) at the caliper body.



Inspection

Rear Brake Disc Thickness Check

1. Check the brake pads for wear and fade.
2. Check the brake disc for damage and cracks.
3. Remove all rust and contamination from the surface, and measure the disc thickness at 8 points, at least, of same distance (5mm) from the brake disc outer circle.

Brake disc thickness

General caliper type

Standard: 13mm (0.51in)

Service limit: 11.4mm (0.45in)

Deviation: Less than 0.005mm (0.0002in) - circumference

Less than 0.01mm (0.00039in) - radius

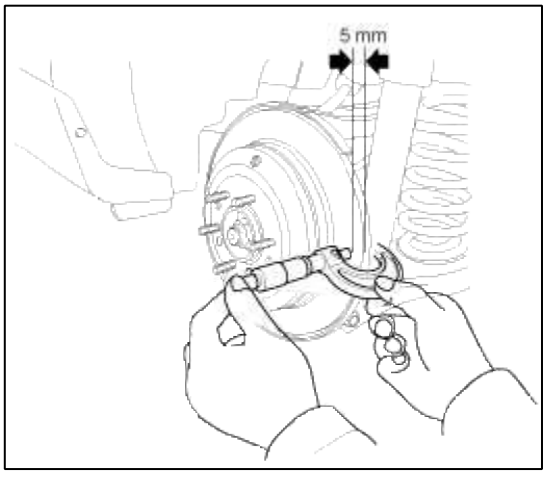
Brembo caliper type

Standard: 20mm (0.79in)

Service limit: 18mm (0.71in)

Deviation: Less than 0.01mm (0.0004in) - circumference

Less than 0.04mm (0.0016in) - radius



4. If wear exceeds the limit, replace the discs and pad assembly left and right of the vehicle.

Rear Brake Pad Check

1. Check the pad wear. Measure the pad thickness and replace it, if it is less than the specified value.

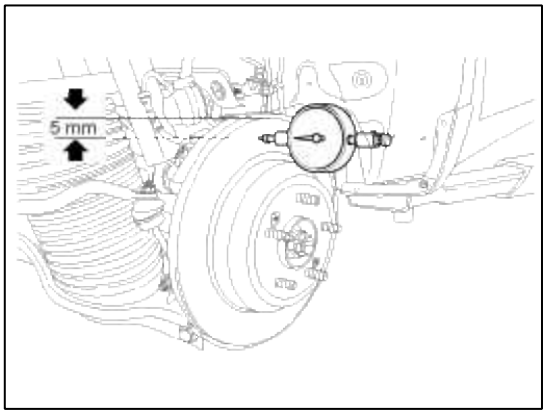
Pad thickness
General caliper type
Standard value: 9mm (0.354in)
Service limit : 2.0mm (0.0787in)
Brembo caliper type
Standard value : 9.1mm (0.358in)
Service limit : 2.0mm (0.0787in)

2. Check that grease is applied, to sliding contact points and the pad and backing metal for damage.

Rear Brake Disc Runout Check

1. Place a dial gauge about 5mm (0.2 in.) from the outer circumference of the brake disc, and measure the runout of the disc.

Brake disc runout
Limit: 0.035mm (0.00137in.) or less (new one)



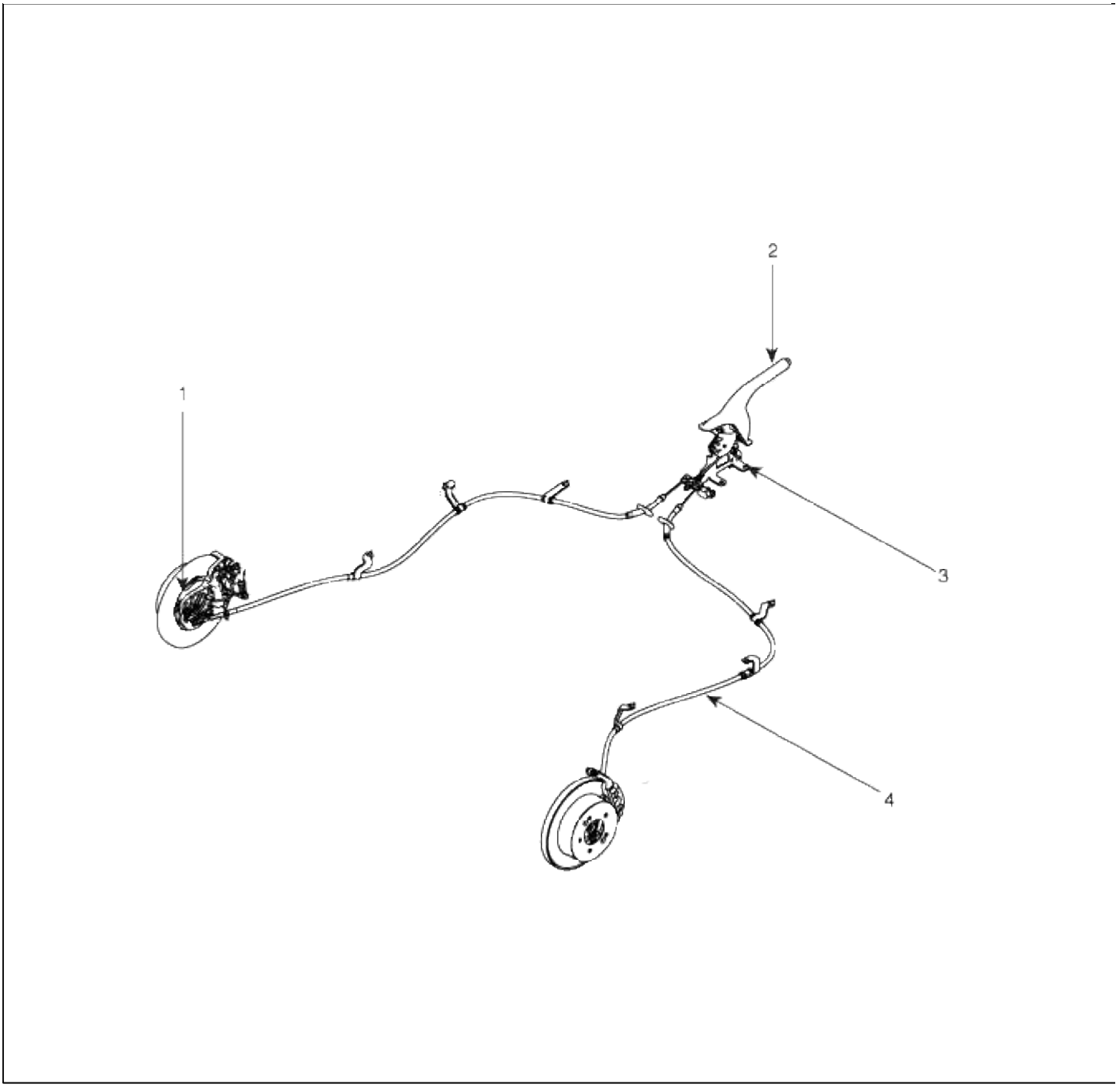
2. If the runout of the brake disc exceeds the limit specification, replace the disc, and then measure the runout again.
3. If the runout exceeds the limit specification, install the brake disc after turning it 180° and then check the runout of the brake disc again.
4. If the runout cannot be corrected by changing the position of the brake disc, replace the brake disc.

Installation

1. Installation is the reverse of removal.
2. Use a SST (09581-11000) when installing the brake caliper assembly.
3. After installation, bleed the brake system.
   (Refer to Brake system bleeding)

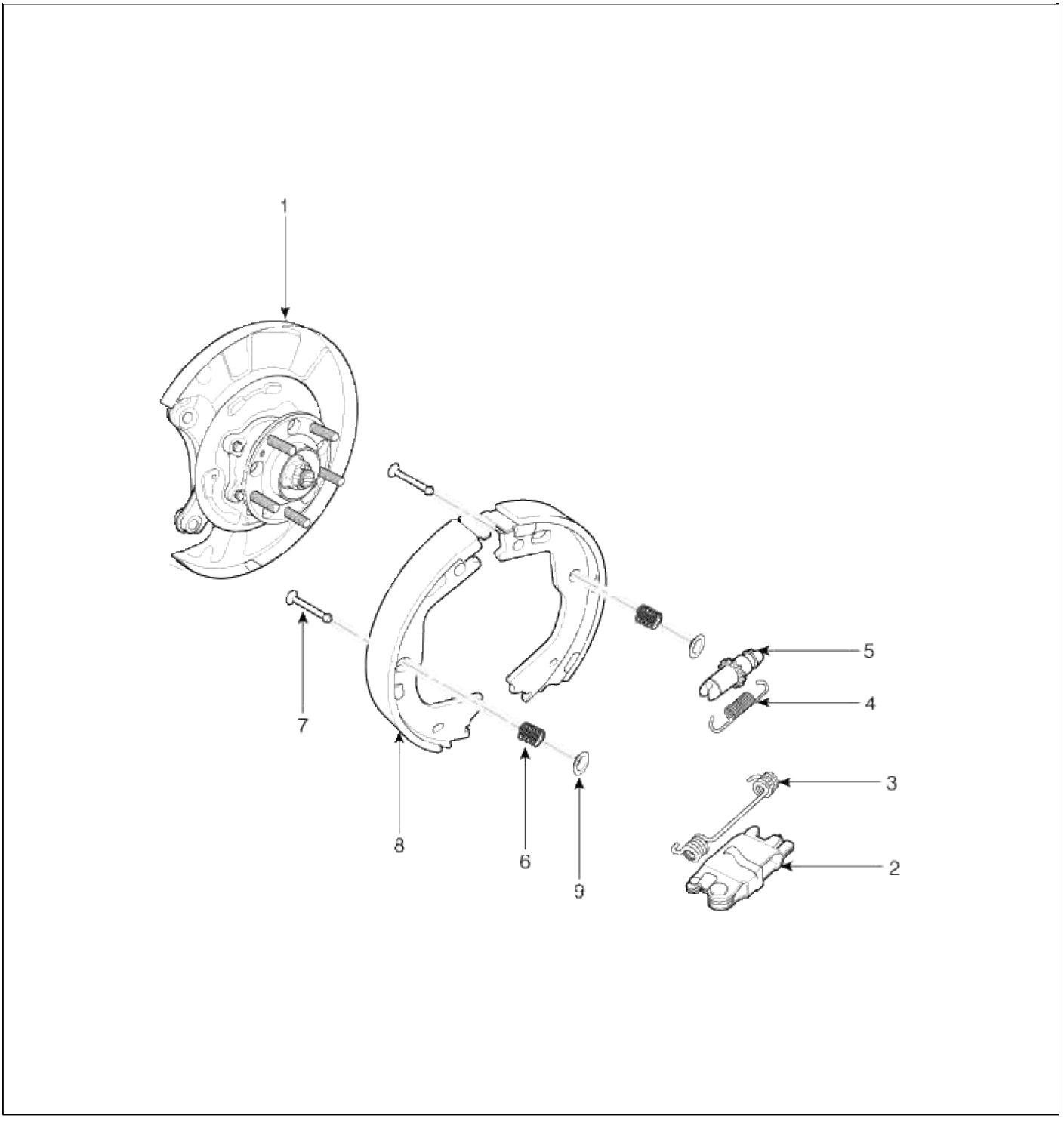
Brake System > Parking Brake System > Parking Brake Assembly > Components and Components Location

Components (1)



1. Rear parking brake 2. Parking brake lever	3. Parking brake switch 4. Parking brake cable

Components (2)



1. Backing plate	4. Lower spring	7. Shoe hold down pin
2. Operating lever	5. Adjuster	8. Parking brake shoe
3. Upper spring	6. Shoe hold down spring	9. Cup washer

Brake System > Parking Brake System > Parking Brake Assembly > Repair procedures

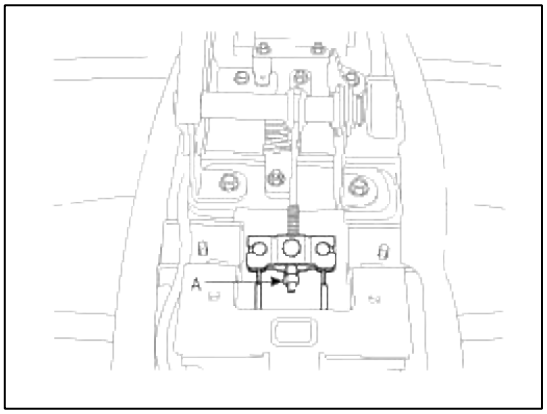
Removal

Parking Brake Lever

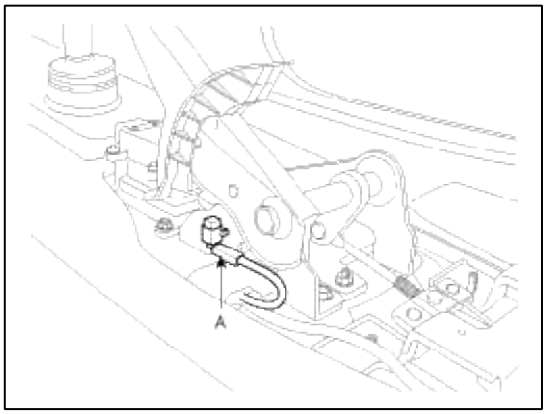
NOTE

The parking brake cables must not be bent or distorted. This will lead to stiff operation and premature failure.

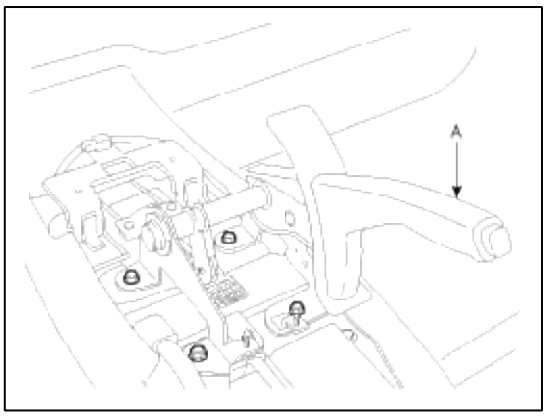
1. Remove the floor console.
   (Refer to Body group - "Floor console")
2. Loosen the adjusting nut (A) and the parking brake cables.



3. Disconnect the connector (A) of parking brake switch.



4. Remove the parking brake lever assembly (A) with loosening the bolts.

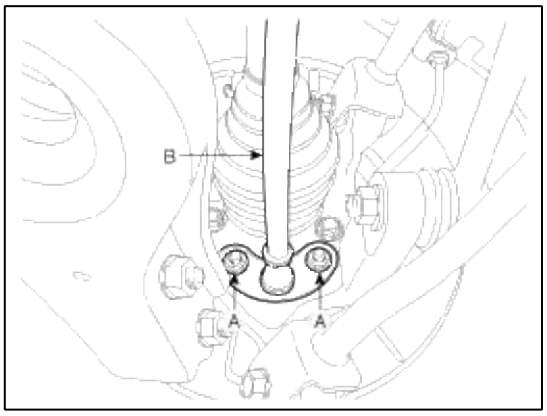


Parking Brake Shoe

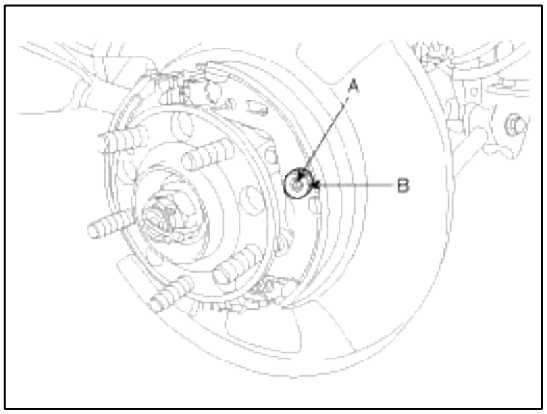
1. Raise the vehicle, and make sure it is securely supported.
2. Remove the rear tire and wheel.
3. Remove the brake caliper and Rear disc brake.
   (Refer to "Rear disc brake removal")

4. Remove the parking brake cable (B), after removing the bolt (A).

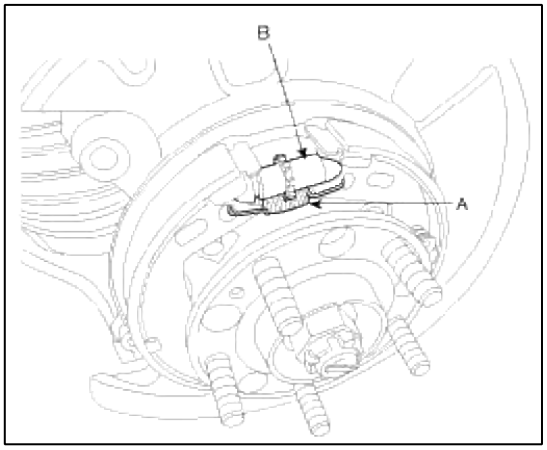
Tightening torque :
53.9 ~ 63.7 N.m (5.5 ~ 6.5 kgf.m, 39.8 ~ 47.0 lb-ft)



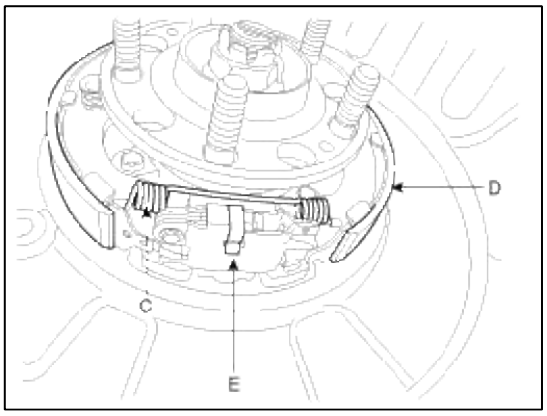
5. Remove the shoe hold down pin (A) and the spring (B) by pushing the retainer spring and turning the pin.



6. Remove the adjuster assembly (B) and the lower return spring (A).



7. Remove the upper return spring (C) and the brake shoes (D).

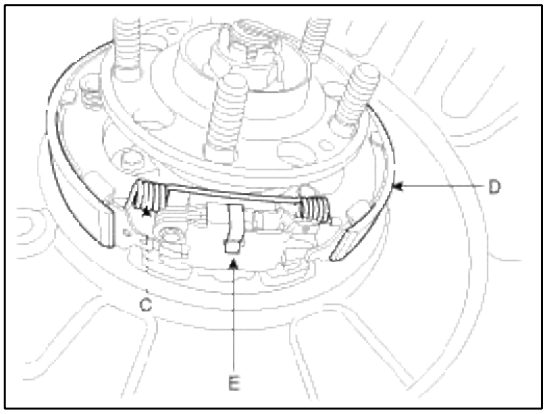


8. Remove the operating lever assembly (E).

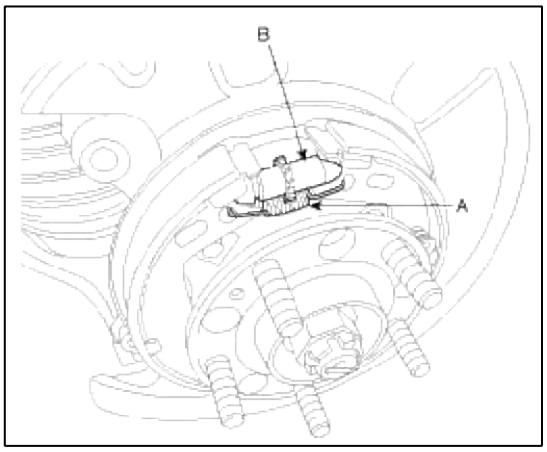
Installation

Parking Brake Shoe

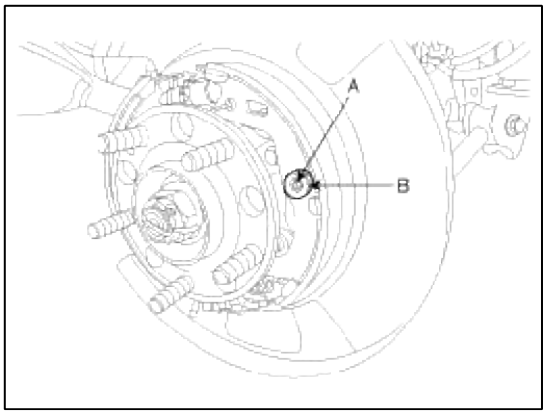
1. Install the operating lever assembly (E).



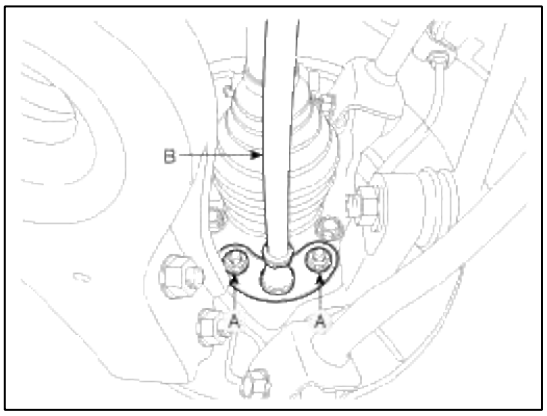
2. Install the upper return spring (C) and the brake shoes (D).
3. Install the adjuster assembly (B) and the lower return spring (A).



4. While pressing the spring, install the brake shoe hold down pin (A) and spring (B).



5. Install the parking brake cable (B), then install the bolt (A).

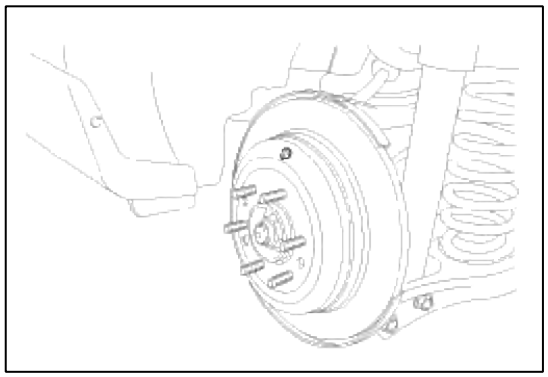


NOTE

How to install the DIH cable (Quick Fit type)

1. Put the inner cable into the knuckle hole in DIH lever operating direction when installing the cable (B).
2. Confirm by pulling the cable that cable is fixed certainly before installing the bolt (A).

6. Install the rear brake disc, then adjust the rear brake shoe clearance.
   (1) Remove the plug from the disc.



   (2) Rotate the toothed wheel of adjuster by a screw driver until the disc is not moving, and then return it by 5 notches in the opposite direction.
   (3) Install the plug.
7. Install the brake caliper assembly. (Refer to "Rear brake installation")
8. Install the tire and wheel.
9. If the parking brake shoe or the brake disc are replaced a newly one, perform the brake shoe bed-in procedure.
   (1) While operating the parking brake pedal for 69N (7kgf, 15lbf) effort, drive the vehicle 500 meters (0.31 miles) at the speed of 60kph (37.3 mph).
   (2) Repeat the above procedure more than two times.
   (3) Must be held on at 30% uphill.

CAUTION

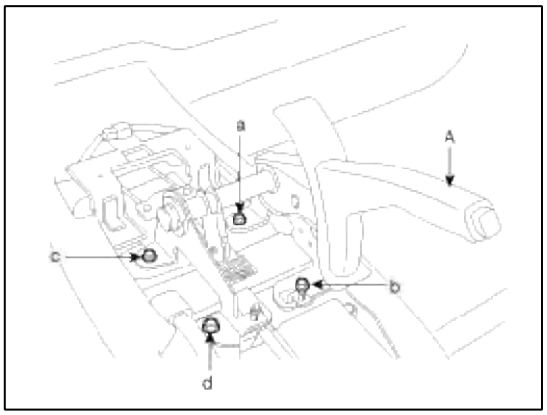
After adjusting parking brake, notice following matter;

1. Must be free from troubles when the parking pedal is operated at 686 N (70 kgf, 154 lb).
2. Check that all parts move smoothly.
3. The parking brake indicator lamp must be on after the parking pedal is worked and must be off after the pedal is released.

Parking Brake Lever

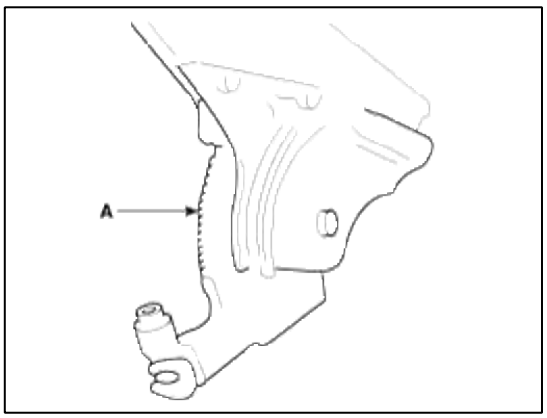
1. Install the parking brake lever assembly, then tighten the mounting bolts in alphabetic order.

Tightening torque :
8.8 ~ 13.7 N.m (0.9 ~ 1.4 kgf.m, 6.5 ~ 10.1 lb-ft)



2. Apply a coating of the specified grease to each sliding parts (A) of the ratchet plate or the ratchet pawl.

Specified grease :
Multi purpose grease RheoGel 429 (MS511-54, LT2)

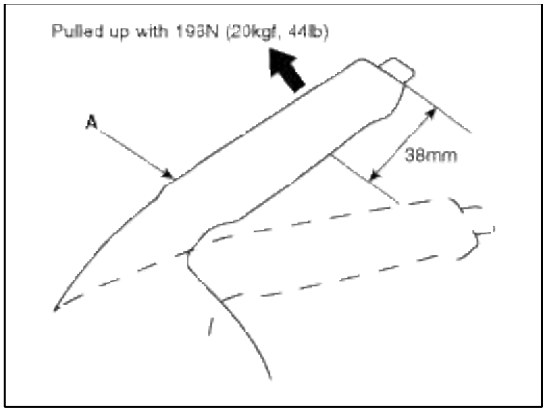


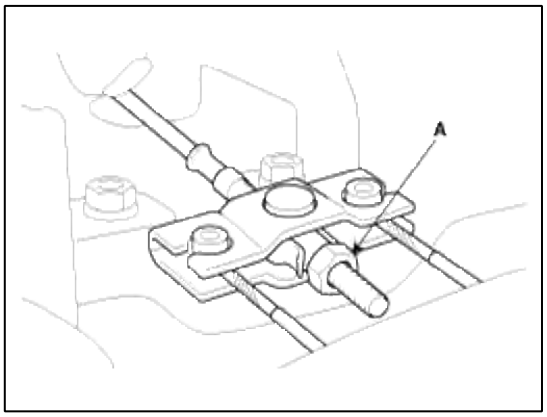
3. Install the parking brake cable adjuster, then adjust the parking brake lever stroke by turning adjusting nut (A).

Parking brake lever stroke :
5 cliks (Pull the lever with 20kg)

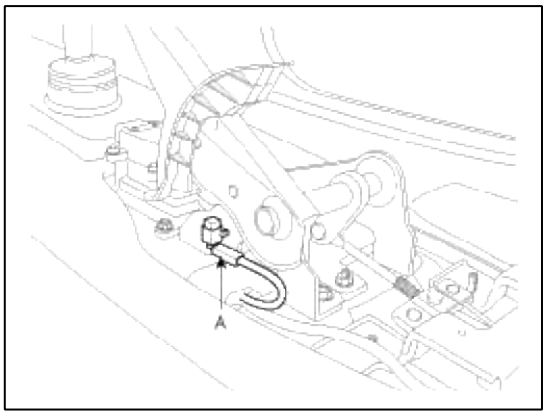
NOTE

After repairing the parking brake shoe, adjust the brake shoe clearance, and then adjust the parking brake lever stroke. (Refer to "Parking brake shoe installation")





4. Release the parking brake lever fully, and check that parking brakes do not drag when the rear wheels are turned. Readjust if necessary.
5. Make sure that the parking brakes are fully applied when the parking brake lever is pulled up fully.
6. Reconnect the connector (A) of parking brake switch.



NOTE

Inspect the continuity of parking brake switch.

When the brake lever is pulled : continuity
When the brake lever is released : no continuity

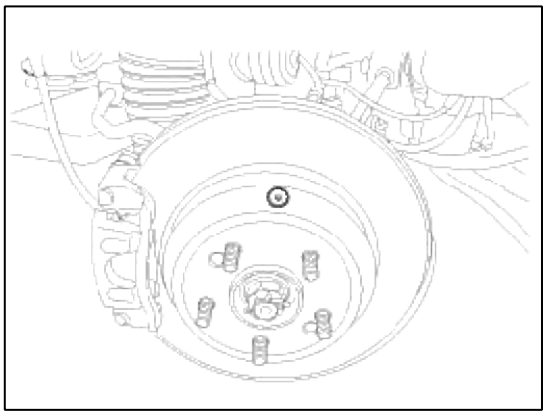
7. Install the floor console.
   (Refer to Body group - "Floor console")

Adjustment

Parking Brake Shoe Clearance Adjustment

1. Raise the vehicle, and make sure it is securely supported.
2. Remove the rear tire and wheel.

3. Remove the plug from the disc.



4. Rotate the toothed wheel of adjuster by a screw driver until the disc is not moving, and then return it by 5 notches in the opposite direction.
5. Install the plug on disc and then rear wheel & tire.

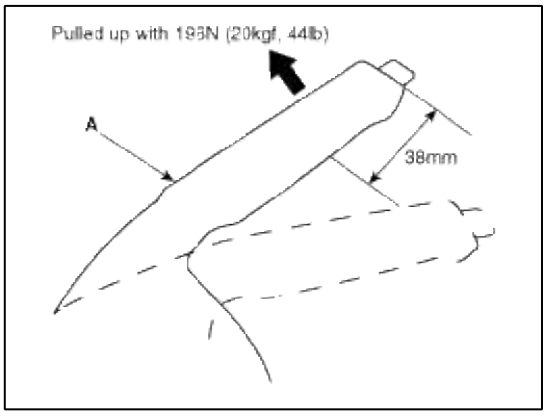
Parking Brake Lever Stroke Adjustment

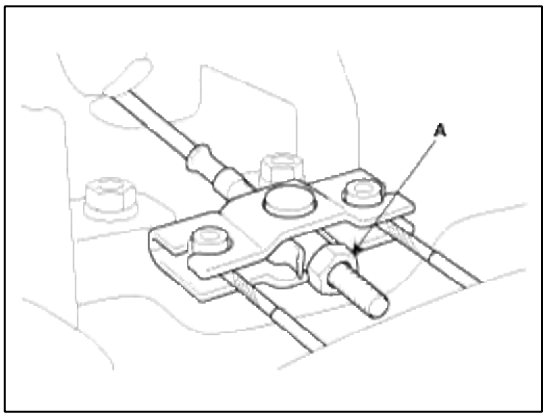
1. Raise the vehicle, and make sure it is securely supported.
2. Remove the floor console.
   (Refer to Body group - "Floor console")
3. Adjust the parking brake lever stroke by turning adjusting nut (A).

Parking brake lever stroke :
5 cliks (Pull the lever with 20kg)

NOTE

After repairing the parking brake shoe, adjust the brake shoe clearance, and then adjust the parking brake lever stroke. (Refer to "Parking brake shoe installation")



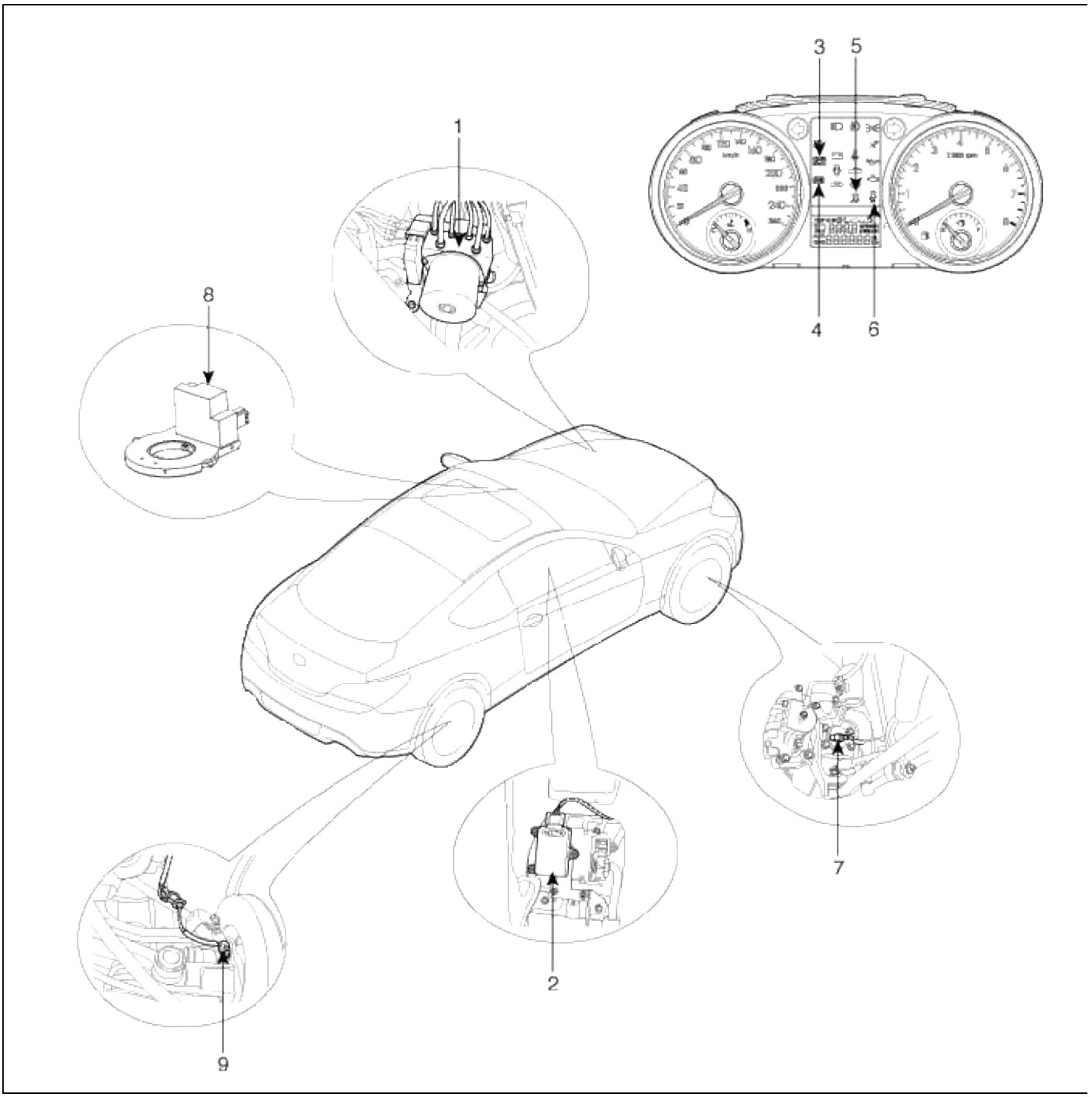


4. Release the parking brake lever fully, and check that parking brakes do not drag when the rear wheels are turned. Readjust if necessary.

5. Make sure that the parking brakes are fully applied when the parking brake lever is pulled up fully.
6. Install the floor console.
   (Refer to Body group - "Floor console")

Brake System > ESC(Electronic Stability Control) System > Components and Components Location

Components

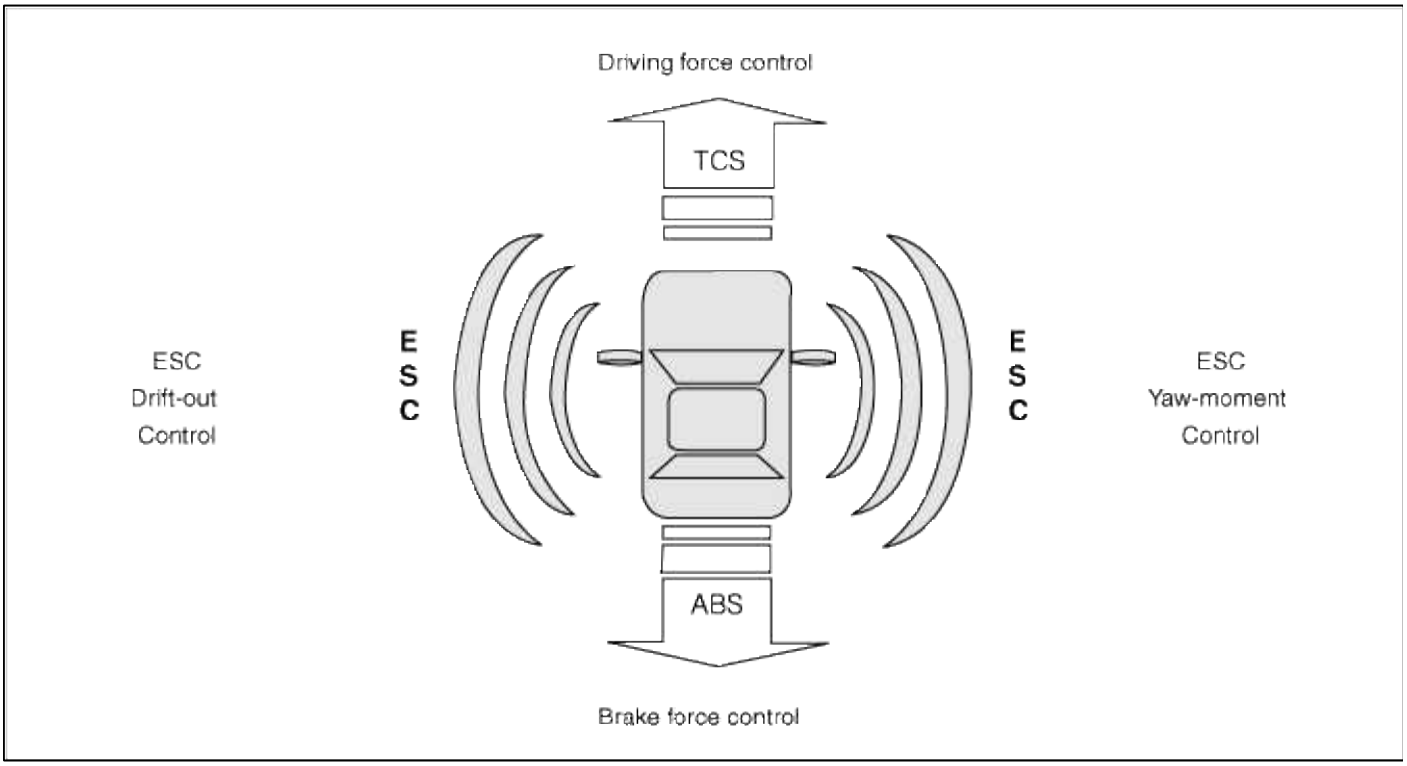


1. HECU module 2. Yaw rate & Lateral G sensor 3. Parking brake/EBD warning lamp 4. ABS warning lamp 5. ESC function / warning lamp	6. ESC OFF warning lamp 7. Front wheel speed sensor 8. Steering angle sensor 9. Rear wheel speed sensor

Brake System > ESC(Electronic Stability Control) System > Description and Operation

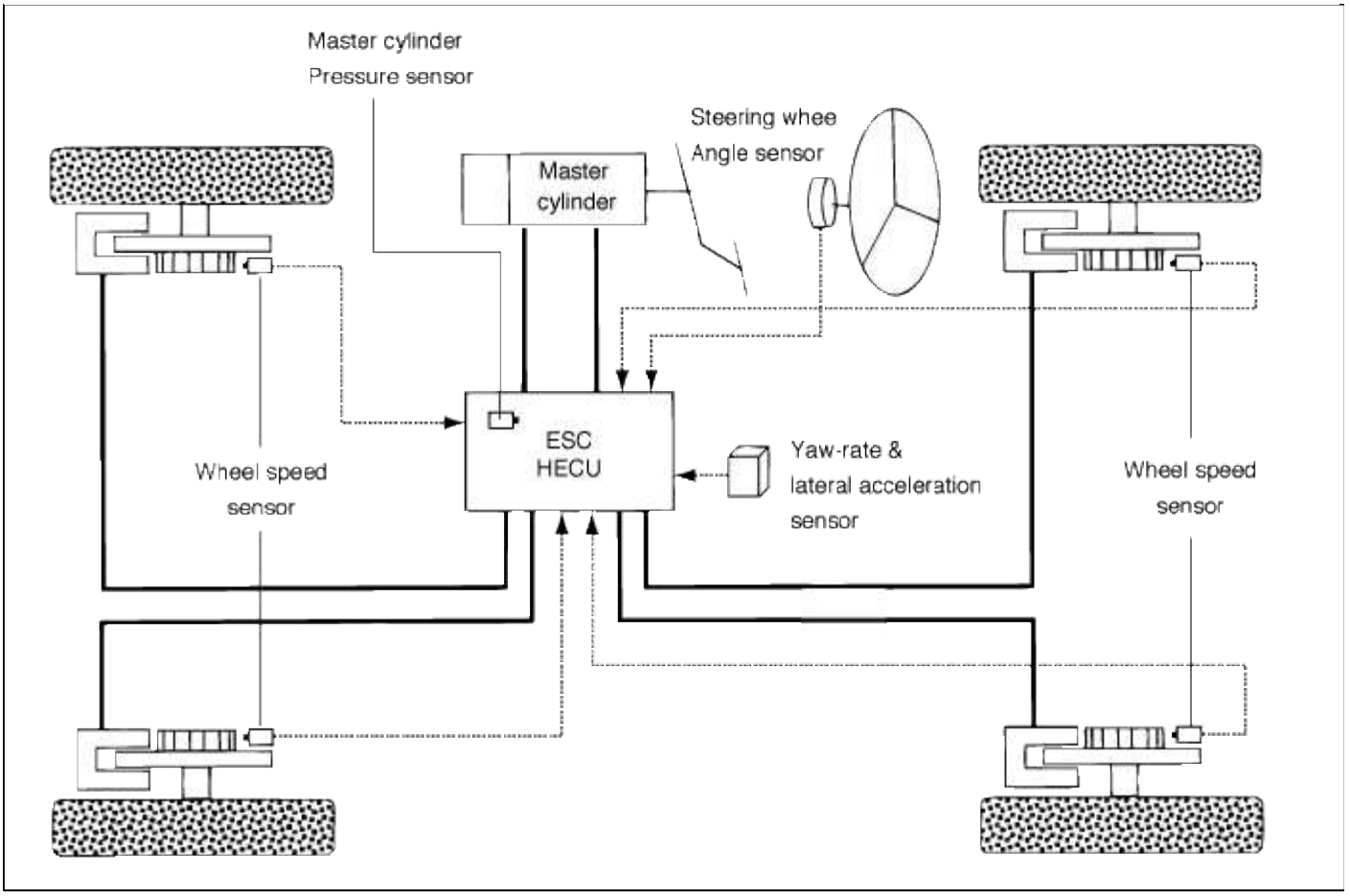
Description of ESC

Optimum driving safety now has a name : ESC, the Electronic Stability Control.
ESC recognizes critical driving conditions, such as panic reactions in dangerous situations, and stabilizes the vehicle by wheel-individual braking and engine control intervention.
ESC adds a further function known as AYC(Active Yaw Control) to the ABS, TCS, EBD and EDC functions. Whereas the ABS/TCS function controls wheel slip during braking and acceleration and, thus, mainly intervenes in the longitudinal dynamics of the vehicle, active yaw control stabilizes the vehicle about its vertical axis.
This is achieved by wheel individual brake intervention and adaptation of the momentary engine torque with no need for any action to be taken by the driver.
ESC essentially consists of three assemblies : the sensors, the electronic control unit and the actuators.
The stability control feature works under all driving and operating conditions. Under certain driving conditions, the ABS/TCS function can be activated simultaneously with the ESC function in response to a command by the driver.
In the event of a failure of the stability control function, the basic safety function, ABS, is still maintained.

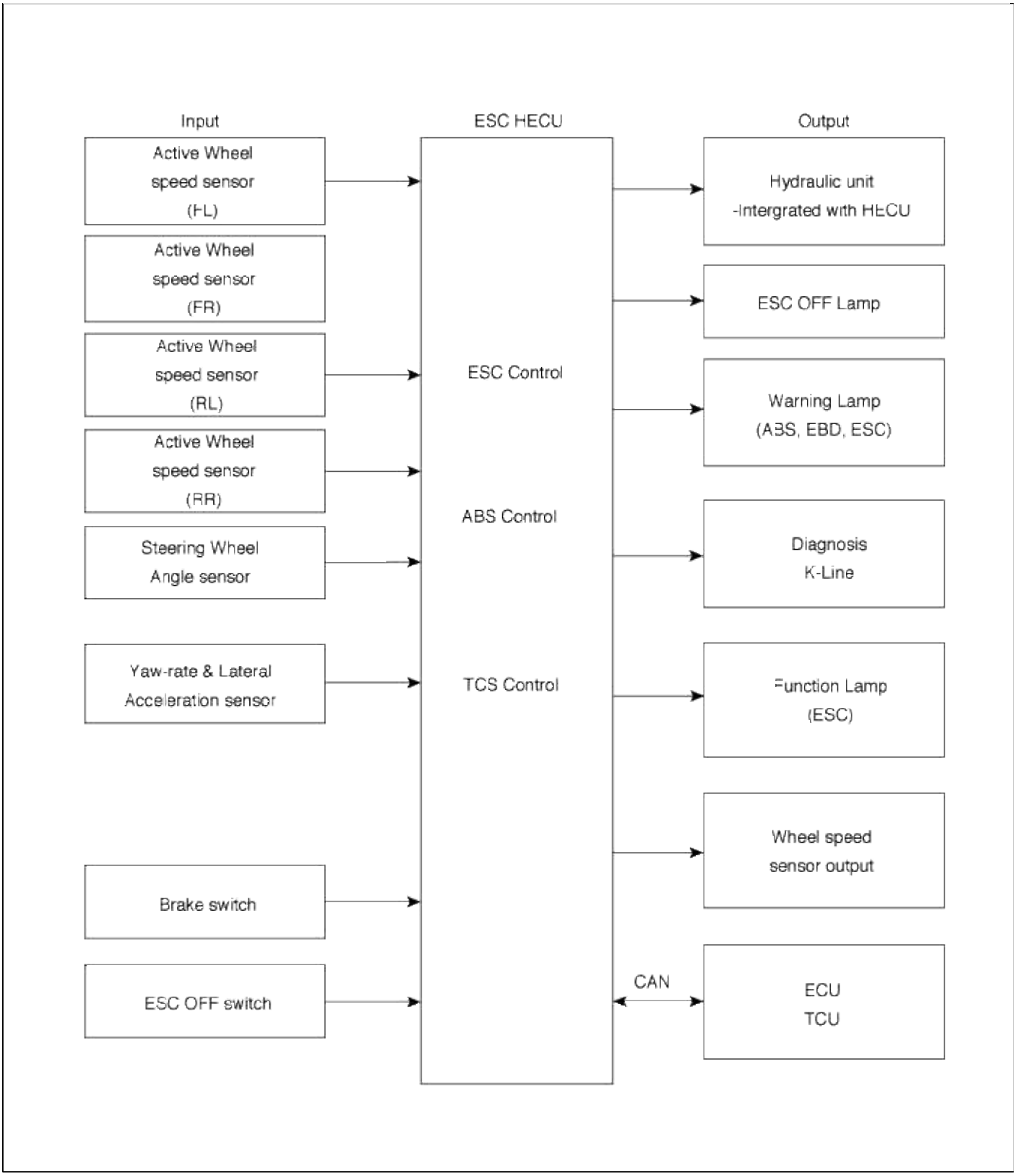


Description of ESC control

ESC system includes ABS/EBD, TCS and AYC function.
ABS/EBD function : The ECU changes the active sensor signal (current shift) coming from the four wheel sensors to the square wave.By using the input of above signals, the ECU calculates the vehicle speed and the acceleration & deceleration of the four wheels.And, the ECU judges whether the ABS/EBD should be actuated or not.
TCS function prevents the wheel slip of drive direction by adding the brake pressure and engine torque reduction via CAN communication.TCS function uses the wheel speed sensor signal to determine the wheel slip as far as ABS function.
AYC function prevents unstable maneuver of the vehicle. To determine the vehicle maneuver, AYC function uses the maneuver sensor signals(Yaw Rate Sensor, Lateral Acceleration Sensor, Steering Wheel Angle Sensor).If vehicle maneuver is unstable (Over Steer or Under Steer), AYC function applies the brake pressure on certain wheel, and send engine torque reduction signal by CAN.
After the key-on, the ECU continually diagnoses the system failure. (self-diagnosis)If the system failure is detected, the ECU informs driver of the system failure through the BRAKE/ABS/ESC warning lamp. (fail-safe warning)

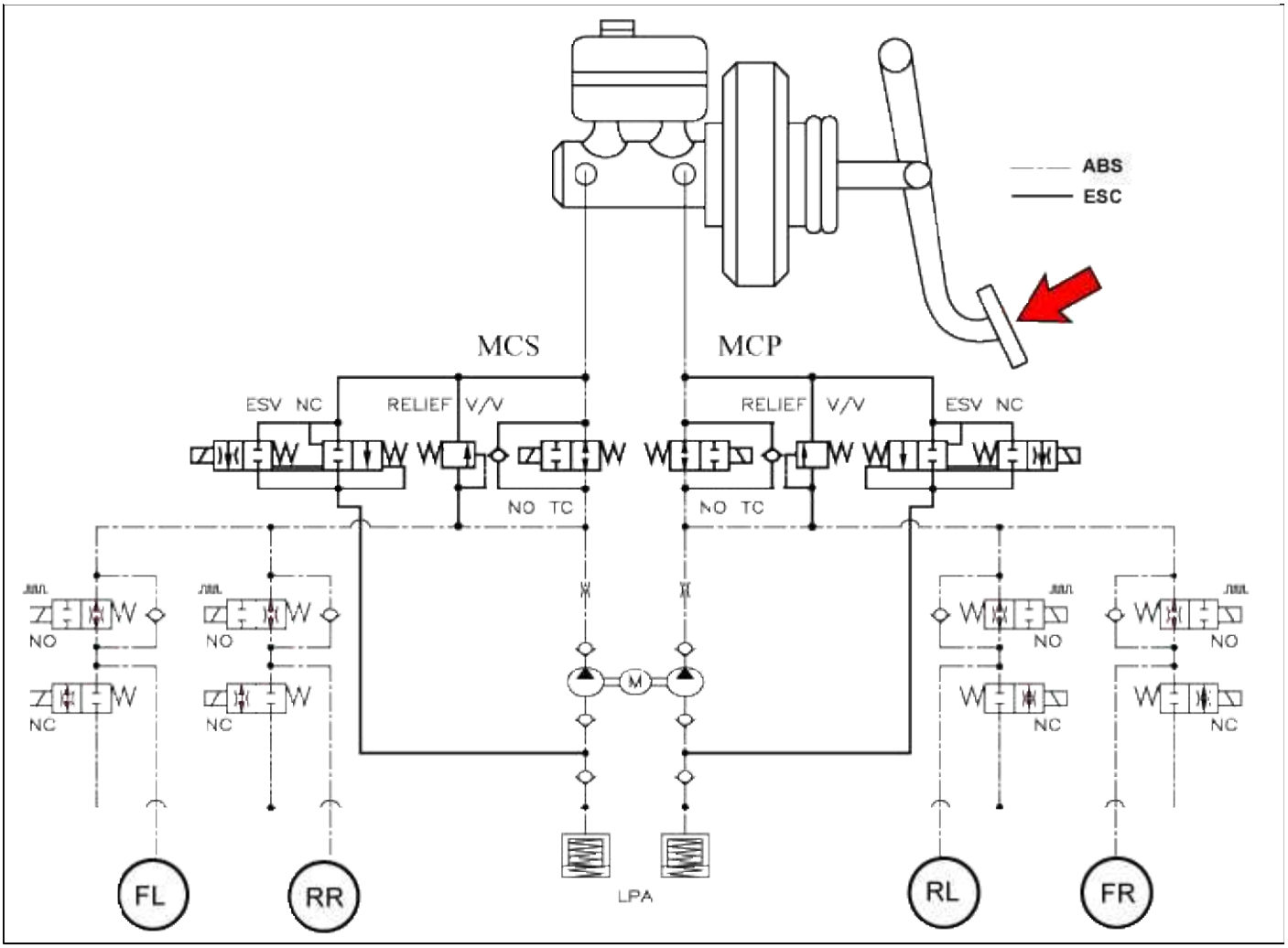


Inputand output diagram



ESC Operation mode

ESC Hydraulic system diagram

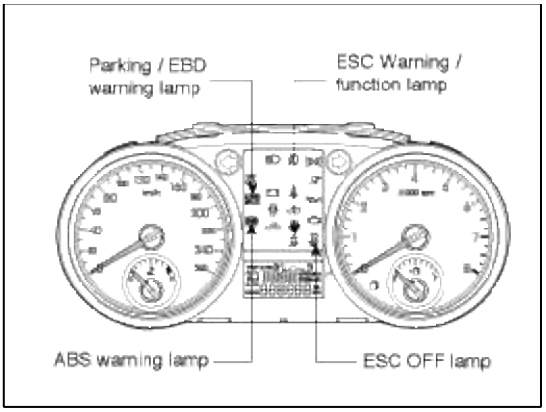


1. ESC Non-operation : Normal braking.

Solenoid valve	Continuity	Valve	Motor pump	TC Valve
IN (NO)	OFF	OPEN	OFF	OFF
OUT (NC)	OFF	CLOSE		

2. ESC operation

Solenoid valve		Continuity	Valve	Motor pump	TC Valve
Understeering (Only inside of rear wheel)	IN(NO)	OFF	OPEN	ON	ON
	OUT(NC)	OFF	CLOSE		
Oversteering (Only outside of front wheel)	IN(NO)	OFF	OPEN		
	OUT(NC)	OFF	CLOSE		



ABS Warning lamp module

The active ABS warning lamp module indicates the self-test and failure status of the ABS. The ABS warning lamp shall be on:

- During the initialization phase after IGN ON. (continuously 3 seconds).
- In the event of inhibition of ABS functions by failure.
- During diagnostic mode.
- When the ECU Connector is seperated from ECU.

EBD/Parking brake warning lamp module

The active EBD warning lamp module indicates the self-test and failure status of the EBD. However, in case the Parking Brake Switch is turned on, the EBD warning lamp is always turned on regardless of EBD functions. The EBD warning lamp shallbe on:

- During the initialization phase after IGN ON. (continuously 3 seconds).
- When the Parking Brake Switch is ON or brake fluid level is low.
- When the EBD function is out of order .
- During diagnostic mode.
- When the ECU Connector is seperated from ECU.

ESC Warning lamp (ESC system)

The ESC warning lamp indicates the self-test and failure status of the ESC.

The ESC warning lamp is turned on under the following conditions :

- During the initialization phase after IGN ON. (continuously 3 seconds).
- In the event of inhibition of ESC functions by failure.
- When driver trun off the ESC function by on/off switch.
- During diagnostic mode.

ESC Function lamp (ESC system)

The ESC function lamp indicates the self-test and operating status of the ESC.

The ESC Function lamp operates under the following conditions :

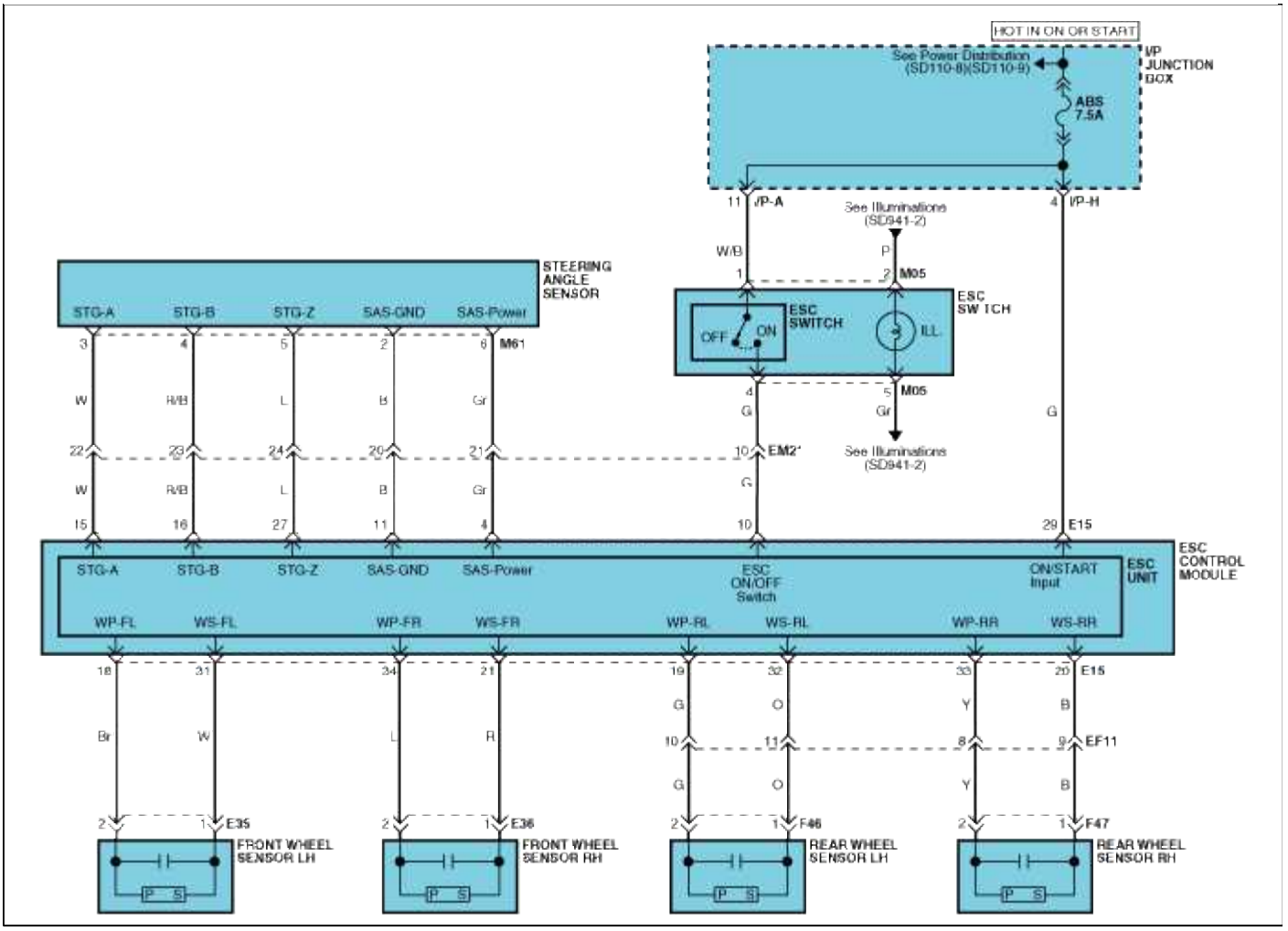
- During the initialization phase after IGN ON. (continuously 3 seconds).
- When the ESC control is operating. (Blinking - 2Hz)

ESC On/Off switch (ESC system)

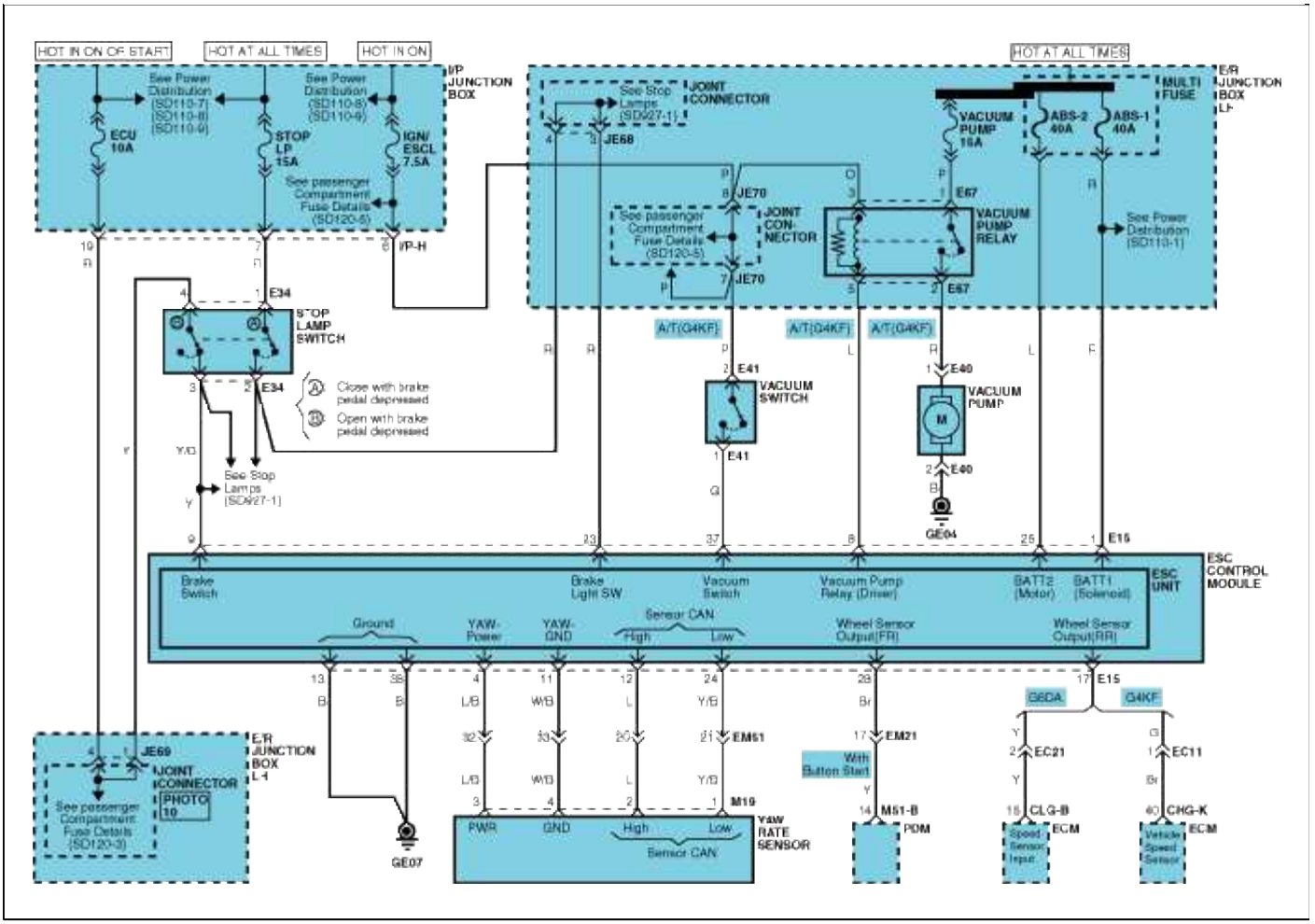
The ESC On/Off Switch shall be used to toggle the ESC function between On/Off states based upon driver input. The On/Off switch shall be a normally open, momentary contact switch.Closed contacts switch the circuit to ignition. Initial status of the ESC function is on and switch toggle the state.

Brake System > ESC(Electronic Stability Control) System > Schematic Diagrams

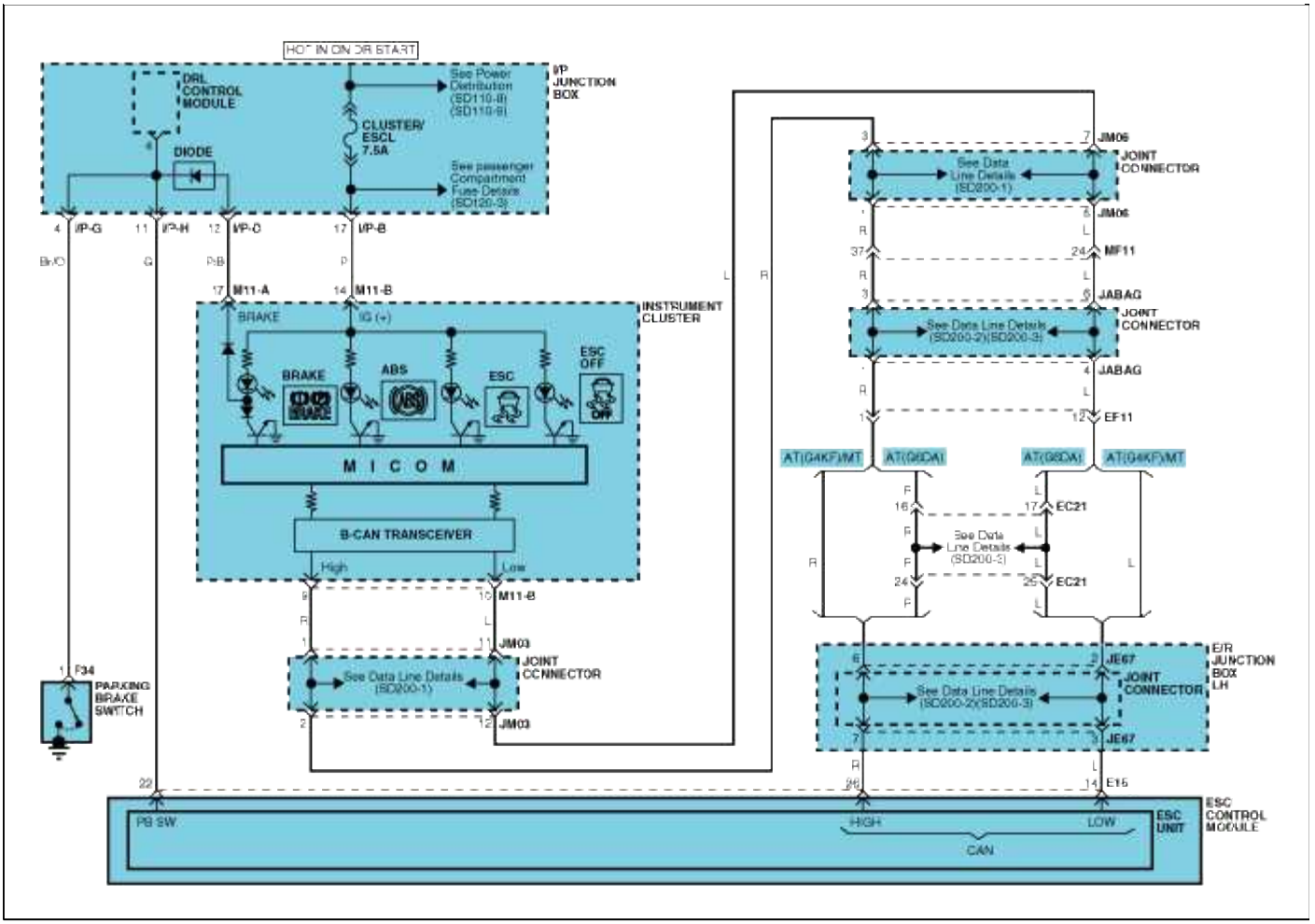
Circuit Diagram - ESC (1)



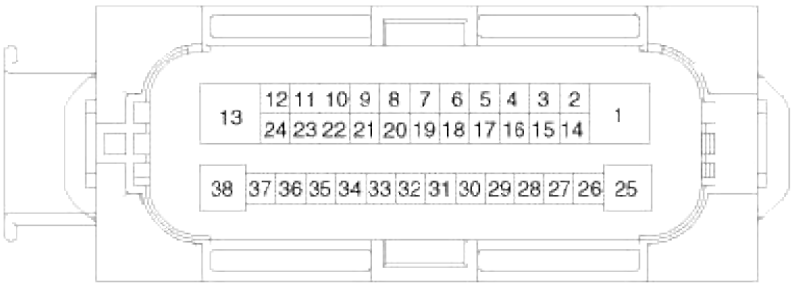
Circuit Diagram - ESC (2)



Circuit Diagram - ESC (3)



ESP Connector Input/Output



Connector Terminal		Specification
No	Description	
29	IGNITION1(+)	High level of wake up voltage :4.5V < V < 16.0V Low level of wake up voltage : V < 2.4V Max. current : I < 50mA
25	POS. BATTERY 1.(SOLENOID)	Over voltage range : 17.0 ± 0.5V Operating voltage range : 10.0 ± 0.5V < V < 16.0 ± 0.5V Low voltage range : 7.0 ± 0.5V < V < 9.5 ± 0.5V Max. current : I < 40A

		Max. leakage current : I < 0.25mA
1	POS. BATTERY 2.(MOTOR)	Operating voltage range: 10.0 ± 0.5V < V < 16.0 ± 0.5V Rush current : I < 110A Max. current : I < 40A Max. leakage current : I < 0.25mA
38	GROUND	Rated current : I <550mA Max. current: I < 40A
13	PUMP MOTOR GROUND	Rush current : I < 110A Max. current : I < 40A
23	BRAKE LIGHT SWITCH	Input voltage (Low) : V < 2V Input voltage (High) : V > 6V Max. Input current : I < 3mA
9	BRAKE SWITCH	
11	SENSOR GROUND	Rated current : I <250mA
4	SENSOR POWER	Max. current Capability : I < 250mA Max. voltage : V_BAT1 -0.8V
10	ESC ON/OFF SWITCH	Input voltage (Low) : V < 2V Input voltage (High) : V > 6V Max input current : I < 5mA (@12.8V)
22	PARKING BRAKE SWITCH	
37	VACCUM SWITCH	
8	VACCUM PUMP DRIVE	Max. Input current : 200mA Max. output voltage (Low) : V < 1.2V
28	SENSOR FRONT RIGHT OUTPUT	External pull up resistance :1 KΩ < R Output duty :50 ± 20%
17	SENSOR REAR RIGHT OUTPUT	
14	CAN BUS LINE(LOW)	Max. Input current : I < 10mA
26	CAN BUS LINE(HIGH)	
18	SENSOR FRONT LEFT POWER	Output voltage : V_BAT1 -0.6V ~ V_BAT1 -1.1V Output current : Max. 30mA
34	SENSOR FRONT RIGHT POWER	
19	SENSOR REAR LEFT POWER	
33	SENSOR REAR RIGHT POWER	
31	SENSOR FRONT LEFT SIGNAL	Input current Low : 5.9 ~ 8.4mA Input current High :11.8 ~ 16.8mA Frequency range :1 ~ 2500Hz Input duty : 50 ± 10%
21	SENSOR FRONT RIGHT SIGNAL	
32	SENSOR REAR LEFT SIGNAL	
20	SENSOR REAR RIGHT SIGNAL	
12	CAN SENSOR LINE (HIGH)	Max. input current : I < 10mA
24	CAN SENSOR LINE (LOW)	
15	STEERING ANGLE SENSOR PHASE A	Input duty (STG A, STG B) : 50 ± 10% phase Differenoe (STG A, STG B) 2 ± 0.6deg High voltage : 3.0V < VH < 4.1V Low voltage : 1.3V < VL < 2.0V
16	STEERING ANGLE SENSOR PHASE B	
27	STEERING ANGLE SENSOR PHASE Z	

Brake System > ESC(Electronic Stability Control) System > Troubleshooting

Failure Diagnosis

1. In principle, ESC and TCS controls are prohibited in case of ABS failure.
2. When ESC or TCS fails, only the failed system control is prohibited.
3. However, when the solenoid valve relay should be turned off in case of ESC failure, refer to the ABS fail-safe.
4. Information on ABS fail-safe is identical to the fail-safe in systems where ESC is not installed.

Memory of Fail Code

1. It keeps the code as far as the backup lamp power is connected. (O)
2. It keeps the code as far as the HCU power is on. (X)

Failure Checkup

1. Initial checkup is performed immediately after the HECU power on.
2. Valve relay checkup is performed immediately after the IG2 ON.
3. It executes the checkup all the time while the IG2 power is on.

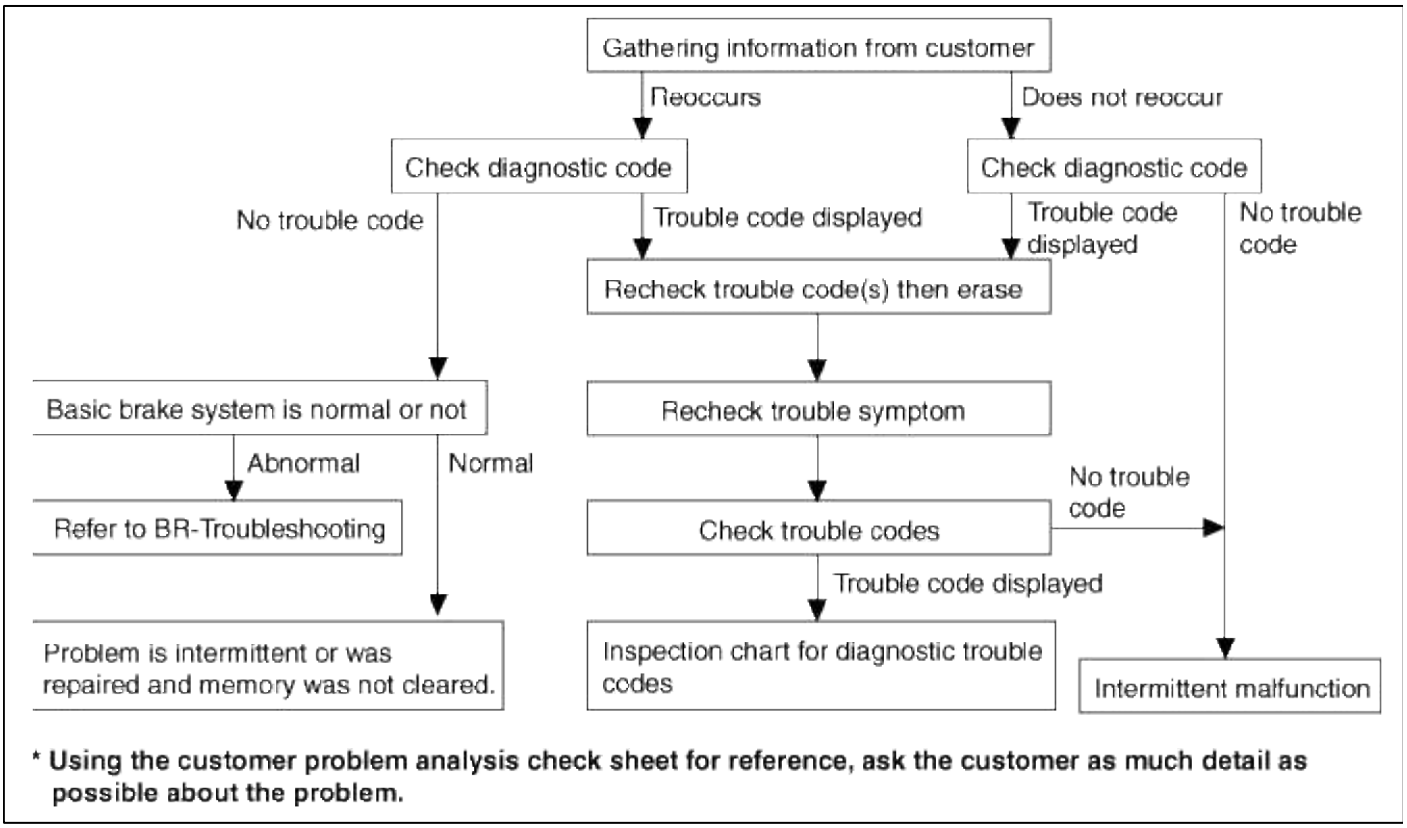
Countermeasures In Fail

1. Turn the system down and perform the following actions and wait for HECU power OFF.
2. Turn the valve relay off.
3. Stop the control during the operation and do not execute any until the normal condition recovers.

Warning Lamp ON

1. ESC operation lamp turn on for 3sec after IGN ON.
2. ESC operation lamp blinks when ESC Act.
3. ESC OFF lamp turn on in case of
   A. ESC Switch OFF
   B. ESC Failure Detect
   C. 3sec after IGN ON

Standard flow of diagnostic troubleshooting



Notes with regard to diagnosis

The phenomena listed in the following table are not abnormal.

Phenomenon	Explanation
System check sound	When starting the engine, a thudding sound can sometimes be heard coming from inside the engine compartment. This is because the system operation check is being performed.
ABS operation sound	1. Sound of the motor inside the ABS hydraulic unit operation (whine). 2. Sound is generated along with vibration of the brake pedal (scraping). 3. When ABS operates, sound is generated from the vehicle chassis due to repeated brake application and release (Thump : suspension; squeak: tires)
ABS operation (Long braking distance)	For road surfaces such as snow-covered and gravel roads, the braking distance for vehicles with ABS can sometimes be longer than that for other vehicles. Accordingly, advise the customer to drive safely on such roads by lowering the vehicle speed.
Diagnosis detection conditions can vary depending on the diagnosis code. When checking the trouble symptom after the diagnosis code has been erased, ensure that the requirements listed in "Comment" are met.	

ABS Check sheet

ABS Check Sheet

Inspector's Name

Customer's Name		Registration No.	
		Registration Year	/ /
		VIN.	
Date Vehicle Brought In	/ /	Odometer	Km Miles

Date the Problem First Occurred	/ /
Frequency of Occurence of Problem	☐ Continuous ☐ Intermittent (times a day)

Symptoms	☐ ABS does not operate.	
	☐ ABS does not operate efficiently.	☐ Intermittent (times a day)
	ABS Warning Light Abnormal	☐ Remains ON ☐ Does not light up

Diagnostic Trouble Code Check	1st Time	☐ Normal Code	☐ Malfunction Code (Code)
	2nd Time	☐ Normal Code	☐ Malfunction Code (Code)

Problem symptoms table

Symptom	Suspect Area
ABS does not operate.	Only when 1.~4. are all normal and the problem is still occurring, replace the HECU. 1. Check the DTC reconfirming that the normal code is output. 2. Power source circuit. 3. Speed sensor circuit. 4. Check the hydraulic circuit for leakage.
ABS does not operate intermittently.	Only when 1.~4. are all normal and the problem is still occurring, replace the ABS actuator assembly. 1. Check the DTC reconfirming that the normal code is output. 2. Wheel speed sensor circuit. 3. Stop lamp switch circuit. 4. Check the hydraulic circuit for leakage.
Communication with GDS is not possible. (Communication with any system is not possible)	1. Power source circuit 2. CAN line
Communication with GDS is not possible. (Communication with ABS only is not possible)	1. Power source circuit 2. CAN line 3. HECU
When ignition key is turned ON (engine OFF), the ABS warning lamp does not light up.	1. ABS warning lamp circuit 2. HECU
Even after the engine is started, the ABS warning lamp remains ON.	1. ABS warning lamp circuit 2. HECU

CAUTION

During ABS operation, the brake pedal may vibrate or may not be able to be depressed. Such phenomena are due to intermittent changes in hydraulic pressure inside the brake line to prevent the wheels from locking and is not an abnormality.

ABS Does Not Operate.

Detecting condition

Trouble Symptoms	Possible Cause
Brake operation varies depending on driving conditions and road surface conditions, so diagnosis can be difficult. However if a normal DTC is displayed, check the following probable cause. When the problem is still occurring, replace the ESC control module.	- Faulty power source circuit - Faulty wheel speed sensor circuit - Faulty hydraulic circuit for leakage - Faulty HECU

Inspection procedures

DTC Inspection

1. Connect the GDS with the data link connector and turn the ignition switch ON.
2. Verify that the normal code is output.
3. Is the normal code output?

NO	Check the power source circuit.
YES	Erase the DTC and recheck using GDS.

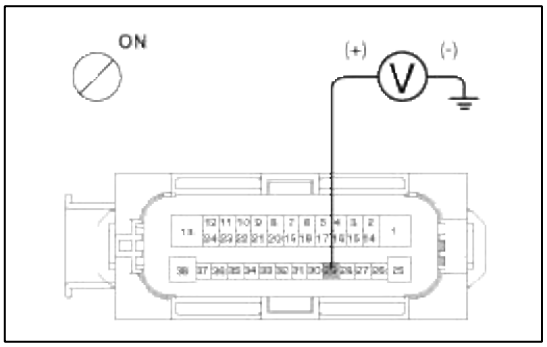
Check the power source circuit

1. Disconnect the connector from the ESC control module.
2. Turn the ignition switch ON, measure the voltage between terminal 29 of the ESC control module harness side connector and body ground.

Specification: approximately B+

3. Is the voltage within specification?

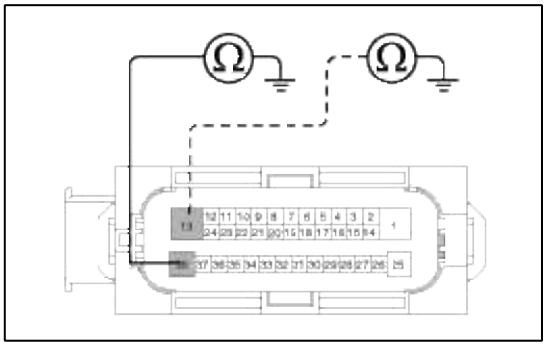
YES	Check the ground circuit.
NO	Check the harness or connector between the fuse (10A) in the engine compartment junction block and the ESC control module. Repair if necessary.



Check the ground circuit

1. Disconnect the connector from the ESC control module.
2. Check for continuity between terminals 13, 38 of the ESC control module harness side connector and ground point.
3. Is there continuity?

YES	Check the wheel speed sensor circuit.
NO	Repair an open in the wire and ground point.



Check the wheel speed sensor circuit

1. Refer to the DTC troubleshooting procedures.
2. Is it normal?

YES	Check the hydraulic circuit for leakage.
NO	Repair or replace the wheel speed sensor.

Check the hydraulic circuit for leakage

1. Refer to the hydraulic lines.
2. Inspect leakage of the hydraulic lines.
3. Is it normal?

YES	The problem is still occurring, replace the ESC control module.
NO	Repair the hydraulic lines for leakage.

ABS Does Not Operate (Intermittently).

Detecting condition

Trouble Symptoms	Possible Cause
Brake operation varies depending on driving conditions and road surface conditions, so diagnosis can be difficult. However if a normal DTC is displayed, check the following probable cause. When the problem is still occurring, replace the ESC control module.	- Faulty power source circuit - Faulty wheel speed sensor circuit - Faulty hydraulic circuit for leakage - Faulty HECU

Inspection procedures

DTC Inspection

1. Connect the GDS with the data link connector and turn the ignition switch ON.
2. Verify that the normal code is output.
3. Is the normal code output?

NO	Check the wheel speed sensor circuit.
YES	Erase the DTC and recheck using GDS.

Check the wheel speed sensor circuit

1. Refer to the DTC troubleshooting procedures.
2. Is it normal?

YES	Check the stop lamp switch circuit.
NO	Repair or replace the wheel speed sensor.

Check the stop lamp switch circuit

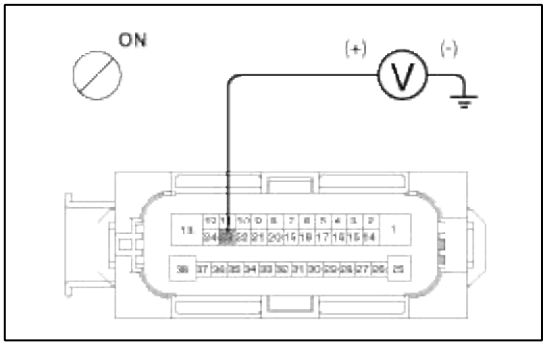
1. Check that stop lamp lights up when brake pedal is depressed and turns off when brake pedal is released.

2. Measure the voltage between terminal 23 of the ESC control module harness side connector and body ground when brake pedal is depressed.

Specification : approximately B+

3. Is the voltage within specification?

YES	Check the hydraulic circuit for leakage.
NO	Repair the stop lamp switch. Repair an open in the wire between the ESC control module and the stop lamp switch.



Check the hydraulic circuit for leakage

1. Refer to the hydraulic lines.
2. Inspection leakage of the hydraulic lines.
3. Is it normal?

YES	The problem is still occurring, replace the ESC control module.
NO	Repair the hydraulic lines for leakage.

Communication with GDS is not possible.
(Communication with any system is not possible)

Detecting condition

Trouble Symptoms	Possible Cause
Possible defect in the power supply system (including ground) for the diagnosis line.	- An open in the wire - Poor ground - Faulty power source circuit

Inspection procedures

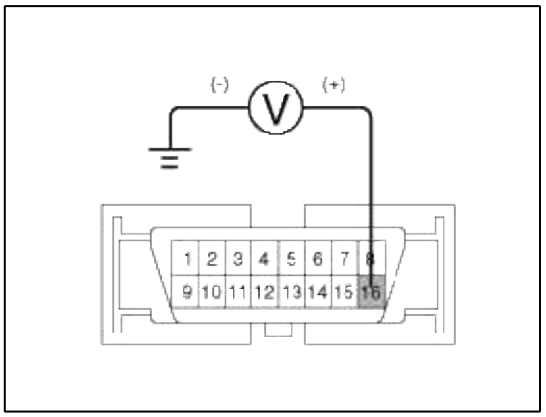
Check The Power Supply Circuit For The Diagnosis

1. Measure the voltage between terminal 16 of the data link connector and body ground.

Specification : approximately B+

2. Is voltage within specification?

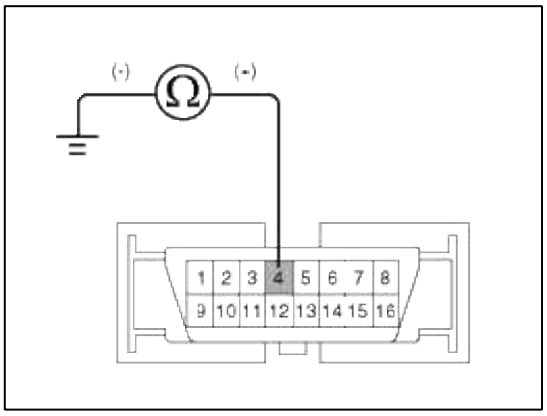
YES	Check the ground circuit for the diagnosis.
NO	Repair an open in the wire. Check and replace fuse (15A) from the engine compartment junction block.



Check the ground circuit for the diagnosis

1. Check for continuity between terminal 4 of the data link connector and body ground.
2. Is there continuity?

NO	Repair an open in the wire between terminal 4 of the data link connector and ground point.



Communication with GDS is not possible.
(Communication with ABS only is not possible)

Detecting condition

Trouble Symptoms	Possible Cause
When communication with GDS is not possible, the cause may be probably an open in the HECU power circuit or an open in the diagnosis output circuit.	- An open in the wire - Faulty HECU - Faulty power source circuit

Inspection procedures

Check for Continuity in the Diagnosis Line

1. Disconnect the connector from the ESC control module.
2. Check for continuity between terminals 26, 14 of the ESC control module connector and 6, 14 of the data link connector.

3. Is there continuity?

YES	Check the power source of ESC control module.
NO	Repair an open in the wire.

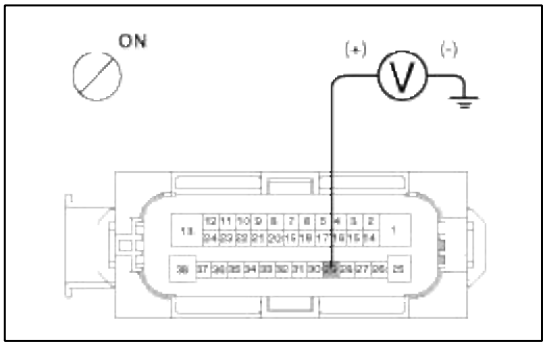
Check the power source of ESC control module

1. Disconnect the connector from the ESC control module.
2. Turn the ignition switch ON, measure the voltage between terminal 29 of the ESC control module harness side connector and body ground.

Specification : approximately B+

3. Is voltage within specification?

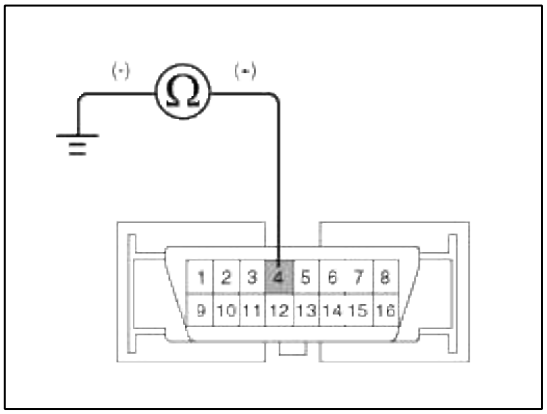
YES	Check for poor ground.
NO	Check the harness or connector between the fuse (10A) in the engine compartment junction block and the ESC control module. Repair if necessary.



Check for poor ground

1. Check for continuity between terminal 4 of the data link connector and ground point.

YES	Replace the ESC control module and recheck.
NO	Repair an open in the wire or poor ground



When Ignition Key Is Turned ON (engine OFF), The ABS Warning Lamp Does Not Light Up.

Detecting condition

Trouble Symptoms	Possible Cause
When current flows in the HECU the ABS warning lamp turns from ON to OFF as the initial check. Therefore if the lamp does not light up, the cause may be an open in the lamp power supply circuit, a blown bulb, an open in the both circuits between the ABS warning lamp and the HECU, and the faulty HECU.	- Faulty ABS warning lamp bulb - Blown fuse is related to ABS in the engine compartment junction block - Faulty ABS warning lamp module - Faulty HECU

Inspection procedures

Problem verification

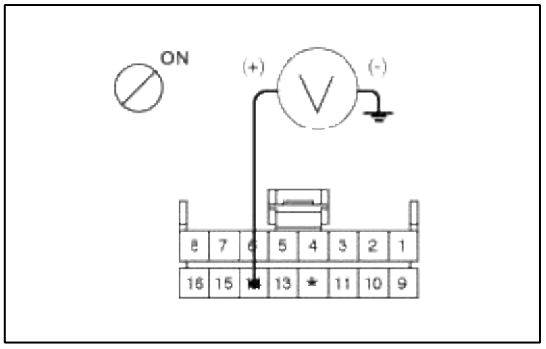
1. Disconnect the connector from the ESC control module and turn the ignition switch ON.
2. Does the ABS warning lamp light up?

YES	Inspect again after replacing the ESC HECU.
NO	Check the power source for the ABS warning lamp.

Check the power source for the ABS warning lamp

1. Disconnect the instrument cluster connector (M11-B) and turn the ignition switch ON.
2. Measure the voltage between terminal (M11-B) 14 of the cluster harness side connector and body ground.

Specification : approximately B+



3. Is voltage within specification?

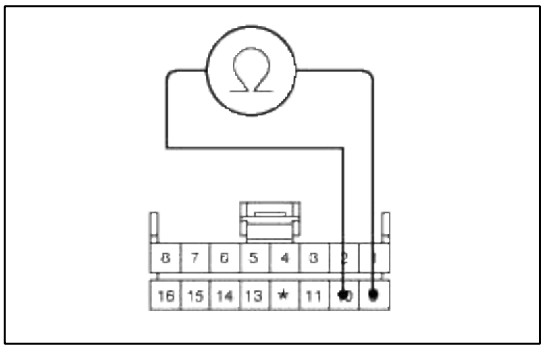
YES	Check the CAN circuit resistance for ABS warning lamp.
NO	Check for blown fuse.

Check the can circuit resistance for ABS warning lamp

1. Disconnect the instrument cluster connector (M11-B) and turn the ignition switch OFF.

2. Measure the resistance between terminal (M11-B) 9 and 10 of the cluster harness side connector.

Specification : 60Ω



3. Is resistance within specification?

YES	Repair ABS warning lamp bulb or instrument cluster assembly.
NO	Check the CAN circuit wiring for ABS warning lamp.

Check the can circuit wiring for ABS warning lamp

1. Disconnect the instrument cluster connector (M11-B) and HECU connector, and then turn the ignition switch OFF.
2. Check for continuity between terminal (M11-B) 9 of the cluster harness side connector and terminal 14 of HECU harness side.
   Check for continuity between terminal (M11-B) 10 of the cluster harness side connector and terminal 26 of HECU harness side.

Specification : Below 1Ω

3. Is resistance within specification?

YES	Repair short of wiring between terminal 14, 26 of HECU harness connector and ABS warning lamp module.
NO	Repair open of wiring between terminal 14, 26 of HECU harness connector and ABS warning lamp module.

Even After The Engine Is Started, The ABS Warning Lamp Remains ON.

Detecting condition

Trouble Symptoms	Possible Cause
If the HECU detects trouble, it lights the ABS warning lamp while at the same time prohibiting ABS control. At this time, the HECU records a DTC in memory.Even though the normal code is output, the ABS warning lamp remains ON, then the cause may be probably an open or short in the ABS warning lamp circuit.	- An open in the wire - Faulty instrument cluster assembly - Faulty ABS warning lamp module - Faulty HECU

Inspection procedures

Check DTC Output

1. Connect the GDS to the 16P data link connector located behind the driver's side kick panel.
2. Check the DTC output using GDS.

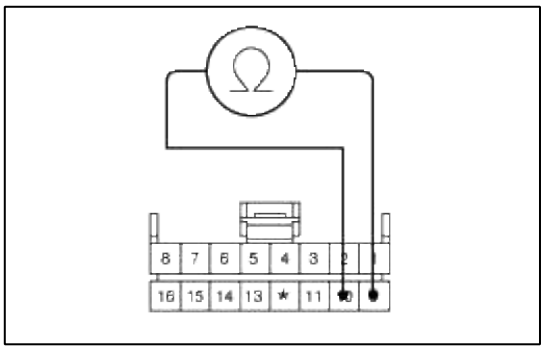
3. Is DTC output?

YES	Perform the DTC troubleshooting procedure (Refer to DTC troubleshooting).
NO	Check the CAN circuit resistance for ABS warning lamp.

Check the can circuit resistance for ABS warning lamp

1. Disconnect the instrument cluster connector (M11-B) and turn the ignition switch OFF.
2. Measure the resistance between terminal (M11-B) 9 and 10 of the cluster harness side connector.

Specification : 60Ω



3. Is resistance within specification?

YES	Repair ABS warning lamp bulb or instrument cluster assembly.
NO	Check the CAN circuit wiring for ABS warning lamp.

Check the can circuit wiring for ABS warning lamp

1. Disconnect the instrument cluster connector (M11-B) and HECU connector, and then turn the ignition switch OFF.
2. Check for continuity between terminal (M11-B) 9 of the cluster harness side connector and terminal 14 of ESC HECU harness side.
   Check for continuity between terminal (M11-B) 10 of the cluster harness side connector and terminal 26 of ESC HECU harness side.

Specification : Below 1Ω

3. Is there continuity?

YES	Repair short of wiring between terminal 14, 26 of HECU harness connector and ABS warning lamp module.If no trouble in wiring, inspect again after replacing the HECU.
NO	Repair short of wiring between terminal 14, 26 of HECU harness connector and ABS warning lamp module.If no trouble in wiring, inspect again after replacing the HECU.

Bleeding of Brake System

This procedure should be followed to ensure adequate bleeding of air and filling of the ESC unit, brake lines and master cylinder with brake fluid.

1. Remove the reservoir cap and fill the brake reservoir with brake fluid.

> **CAUTION**
>
> If there is any brake fluid on any painted surface, wash it off immediately.

> **NOTE**
>
> When pressure bleeding, do not depress the brake pedal.
> Recommended fluid..... DOT3 or DOT4

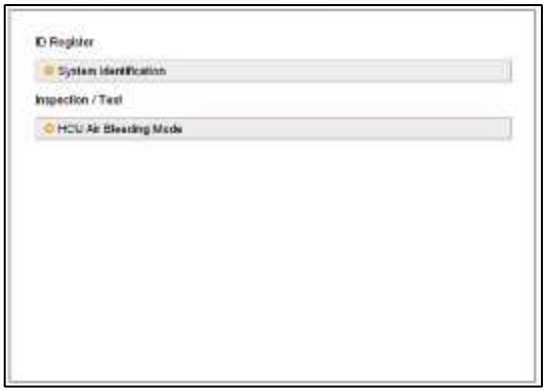
2. Disconnect the vacuum switch connector.
   (2.0 AT & ESC Only)
3. Connect a clear plastic tube to the wheel cylinder bleeder plug and insert the other end of the tube into a half filled clear plastic bottle.
4. Connect the GDS to the data link connector located underneath the dash panel.
5. Select and operate according to the instructions on the GDS screen.

> **CAUTION**
>
> You must obey the maximum operating time of the ABS motor with the GDS to prevent the motor pump from burning.

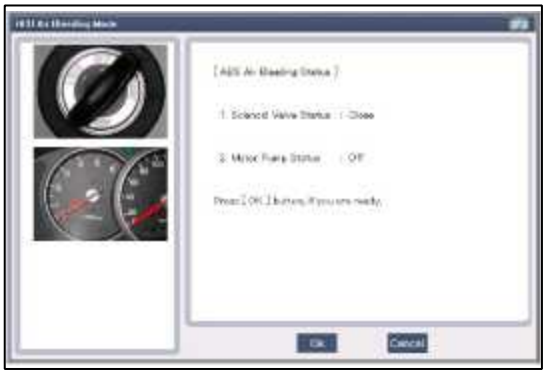
(1) Select vehicle name.

(2) Select Anti-Lock Brake system.

(3) Select HCU air bleeding mode.



(4) Press "OK" to operate motor pump and solenoid valve.

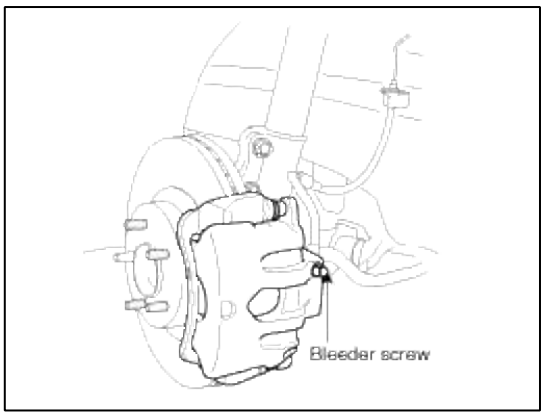


(5) Wait 60 sec. before operating the air bleeding.
(If not, you may damage the motor.)

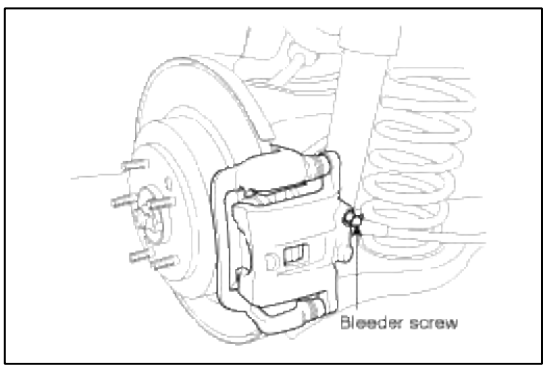
(6) Perform the air bleeding.

6. Pump the brake pedal several times, and then loosen the bleeder screw until fluid starts to run out without bubbles. Then close the bleeder screw.

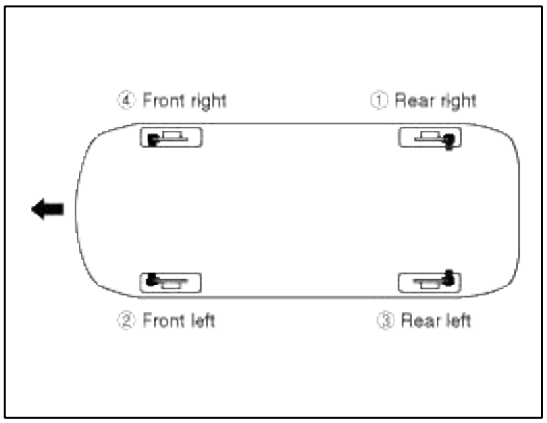
Front



Rear



7. Repeat step 5 until there are no more bubbles in the fluid for each wheel.



8. Tighten the bleeder screw.

Bleed screw tightening torque:
6.9 ~ 12.7N.m (0.7 ~ 2.0kgf.m, 5.1 ~ 9.5lb-ft)

9. Connect the vacuum switch connector.
(2.0 AT & ESC Only)

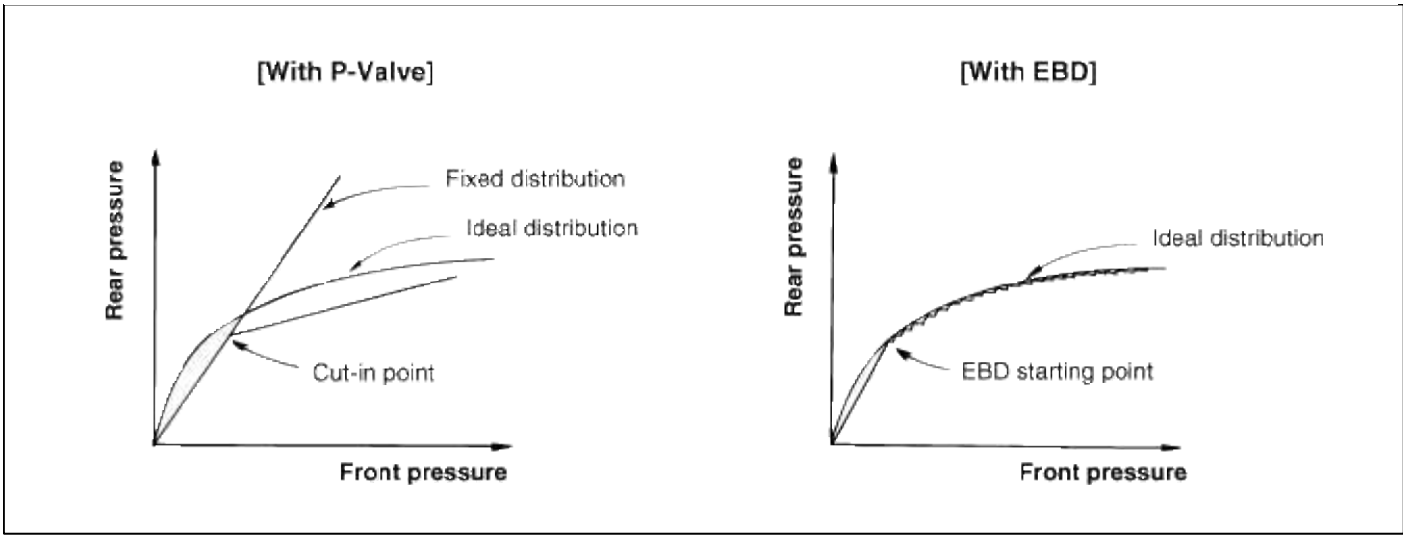
Brake System > ESC(Electronic Stability Control) System > EBD(Electronic Brake-force Distribution) > Description and Operation

EBD(Electronic brake-force distribution) Operation

The EBD system (Electronic Brake force Distribution) as a sub-system of the ABS system is to control the effective adhesion utilization by the rear wheels.
It further utilizes the efficiency of highly developed ABS equipment by controlling the slip of the rear wheels in the partial braking range.
The brake force is moved even closer to the optimum and controlled electronically, thus dispensing with the need for the proportioning valve.
The proportioning valve, because of a mechanical device, has limitations to achieve an ideal brake force distribution tothe rear wheels as well as to carry out the flexible brake force distribution proportioning to the vehicle load or weight increasing. And in the event of malfunctioning, driver cannot notice whether it fails or not.
EBD controlled by the ABS Control Module, calculates the slip ratio of each wheel at all times and controls the brake pressure of the rear wheels not to exceed that of the front wheels.
If the EBD fails, the EBD warning lamp (Parking brake lamp) lights up.
Advantages

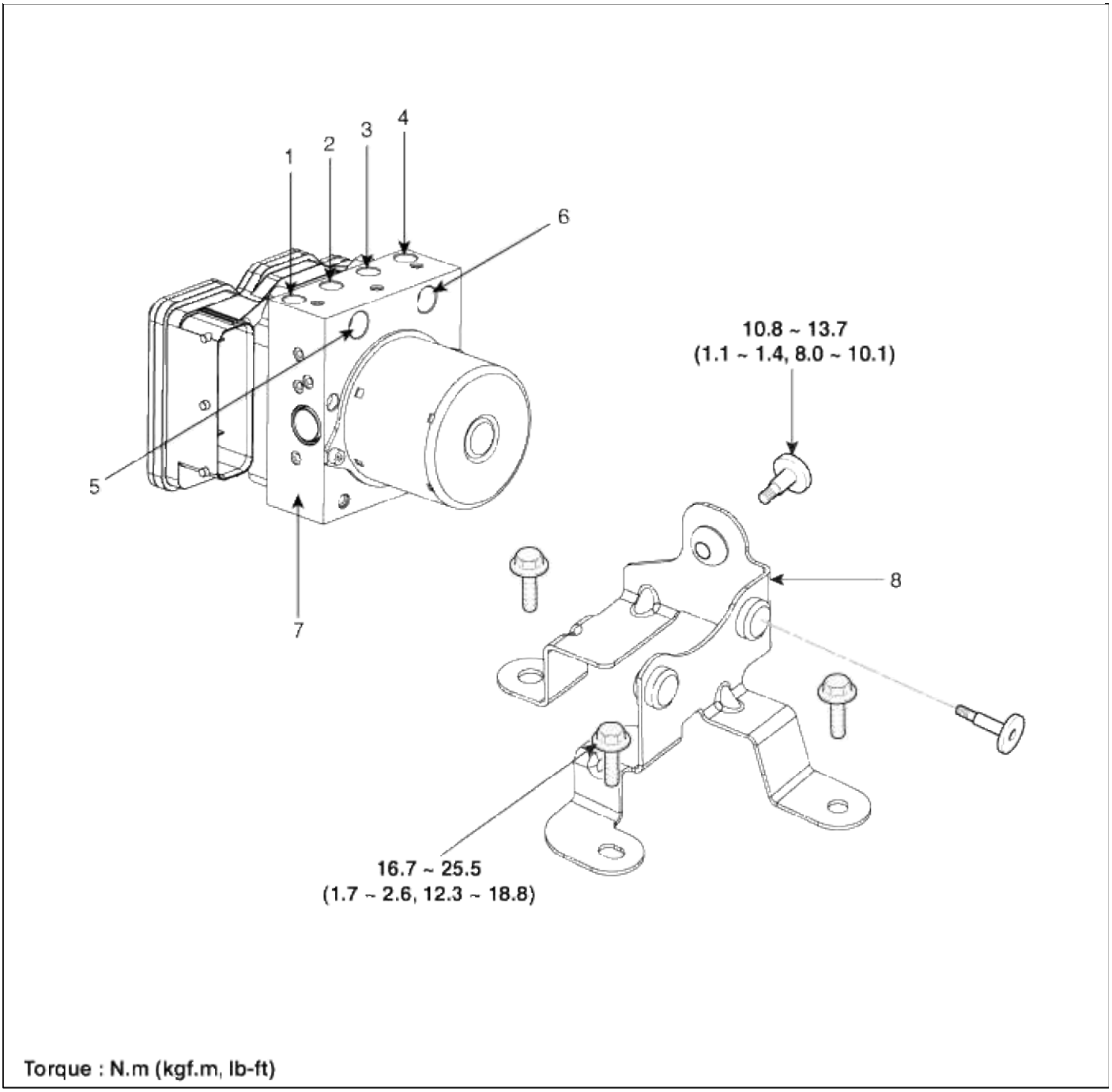
- Function improvement of the base-brake system.
- Compensation for the different friction coefficients.
- Elimination of the proportioning valve.
- Failure recognition by the warning lamp.

Comparison between proportioning valve and EBD



Brake System > ESC(Electronic Stability Control) System > ESC Control Module > Components and Components Location

Components



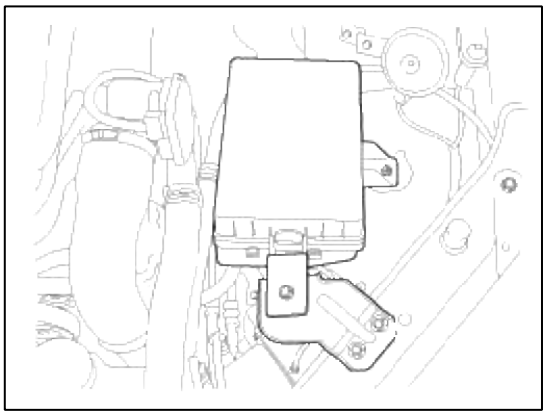
1. Front-left tube 2. Rear -right tube 3. Rear-left tube 4. Front-right tube	5. MC2 6. MC1 7. ESC control module (HECU) 8. Bracket

Brake System > ESC(Electronic Stability Control) System > ESC Control Module > Repair procedures

Removal

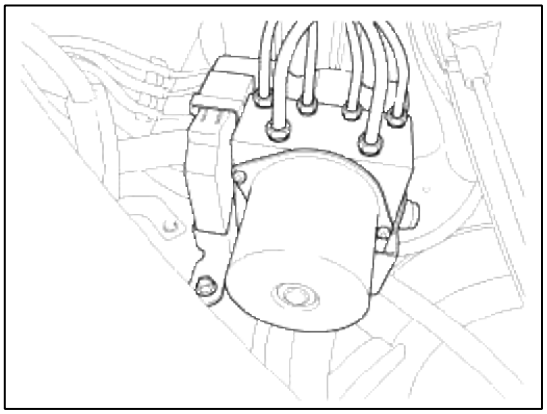
1. Turn the ignition switch OFF and disconnect the negative (-) battery cable.

2. Remove the engine room junction box and bracket.



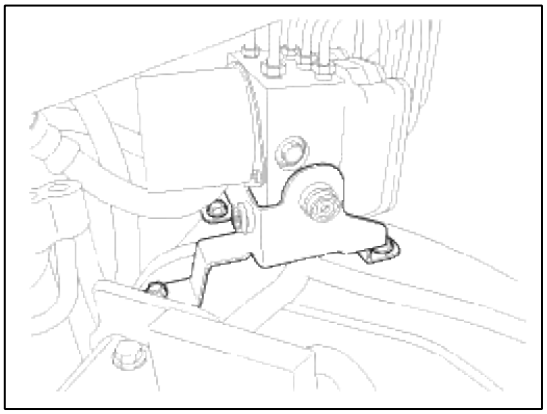
3. Disconnect the brake tubes from the HECU by unlocking the nuts counterclockwise with a spanner.

Tightening torque:
ABS : 12.7 ~ 16.7 N.m (1.3 ~ 1.7 kgf.m, 9.4 ~ 12.3 lb-ft)
ESC : 18.6 ~ 22.6 N.m(1.9 ~ 2.3 kgf.m, 13.7 ~ 16.6 lb-ft)



4. Pull up the lock of the HECU connector, then disconnect the connector.
5. Loosen the HECU bracket bolt(3EA), then remove HECU and bracket.

Tightening torque:
16.7 ~ 25.5 N.m (1.7 ~ 2.6 kgf.m, 12.3 ~ 18.8 lb-ft)



CAUTION

1. Never attempt to disassemble the HECU.
2. The HECU must be transported and stored in.
3. Never shock to the HECU.

6. Remove the 3 bolts, then remove the bracket from HECU.

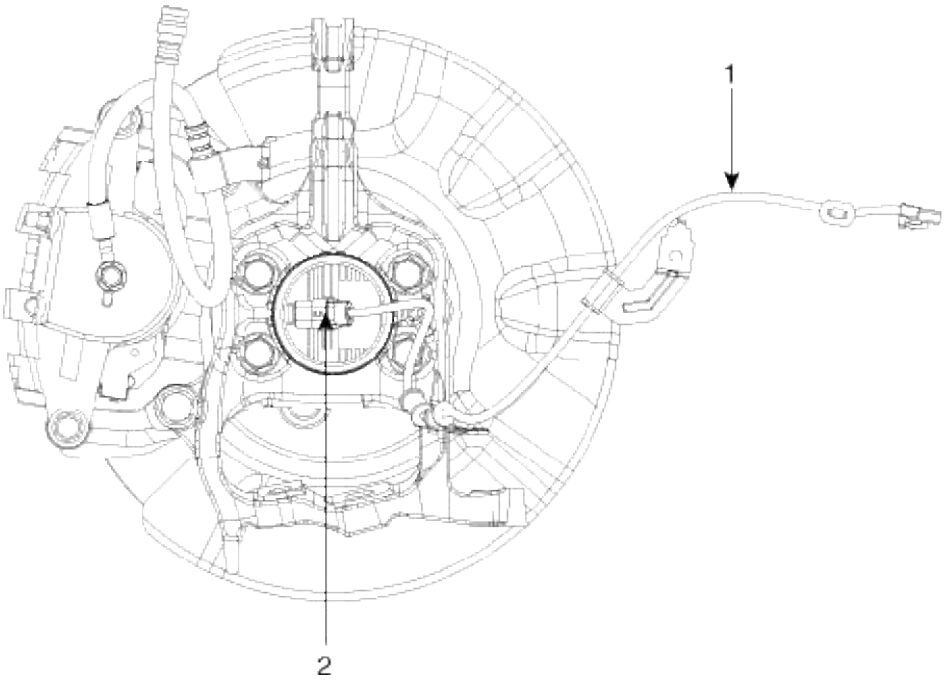
Tightening torque:
10.8 ~ 13.7 N.m (1.1 ~ 1.4 kgf.m, 8.0 ~ 10.1 lb-ft)

Installation

1. Installation is the reverse of removal.
2. Tighten the HECU mounting bolts and nuts to the specified torque.

Brake System > ESC(Electronic Stability Control) System > Front Wheel Speed Sensor > Components and Components Location

Components

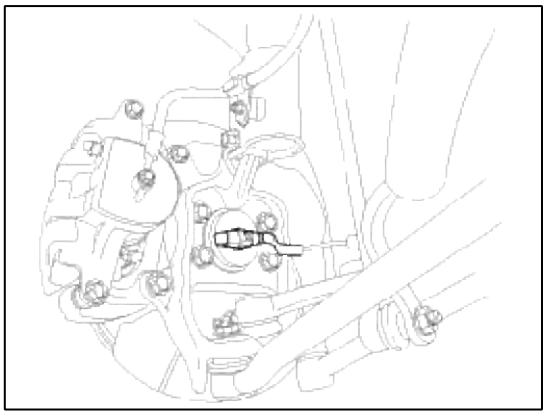


1. Front wheel speed sensor cable
2. Front wheel speed sensor

Brake System > ESC(Electronic Stability Control) System > Front Wheel Speed Sensor > Repair procedures

Removal

1. Remove the connector after removing the front wheel speed sensor clip.

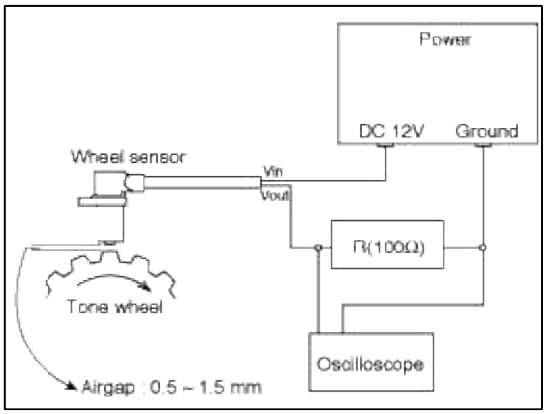


2. Remove the front wheel speed sensor.
   (Refer to Driveshaft and axle group - "Front axle assembly")
3. Installation is the reverse of removal.

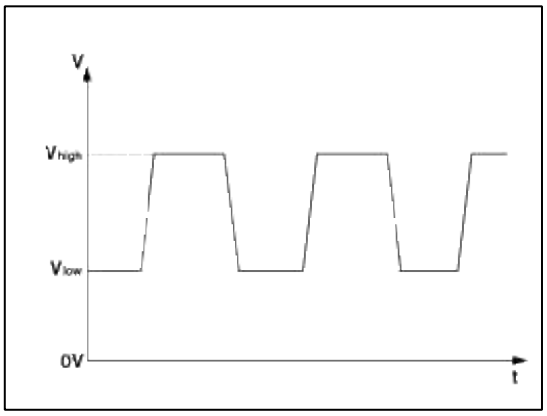
Inspection

1. Measure the output voltage between the terminal of the wheel speed sensor and the body ground.

> CAUTION
>
> In order to protect the wheel speed sensor, when measuring output voltage, a 100 Ω resister must be used as shown.



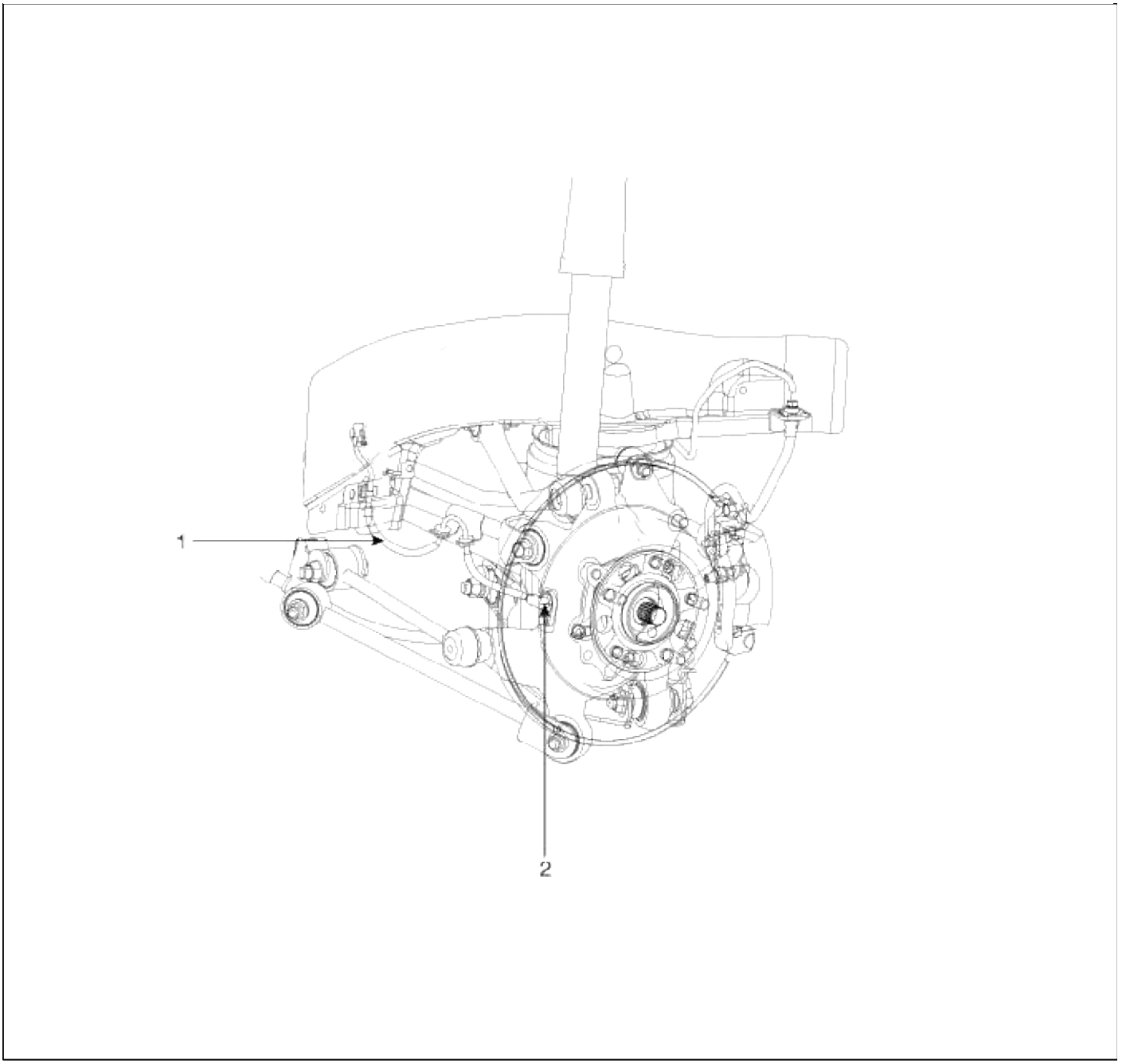
2. Compare the change of the output voltage of the wheel speed sensor to the normal change of the output voltage as shown below.



V_low : 0.59V ~ 0.84V
V_high : 1.18V ~ 1.68V
Frequency range : 1 ~ 2,500Hz

Brake System > ESC(Electronic Stability Control) System > Rear Wheel Speed Sensor > Components and Components Location

Components



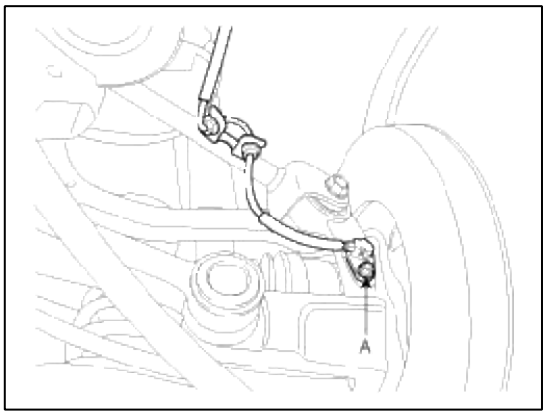
1. Rear wheel speed sensor cable
2. Rear wheel speed sensor

Brake System > ESC(Electronic Stability Control) System > Rear Wheel Speed Sensor > Repair procedures

Removal

1. Remove the rear wheel speed sensor mounting bolt (A).

Tightening torque:
6.9 ~ 10.8 N.m (0.7 ~ 1.1 kgf.m, 5.1 ~ 8.0 lb-ft)



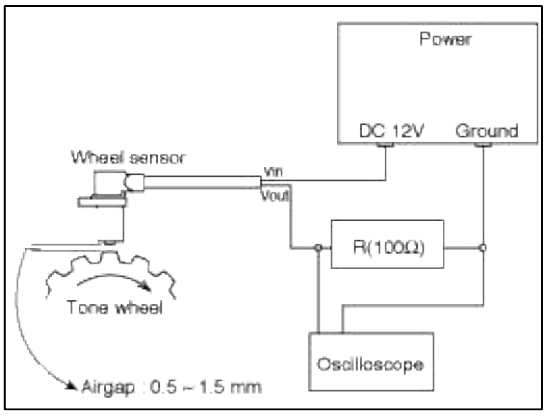
2. Remove the rear wheel guard.
3. Disconnect the rear wheel speed sensor connector (A). And remove the rear wheel speed sensor.
4. Installation is the reverse of removal.

Inspection

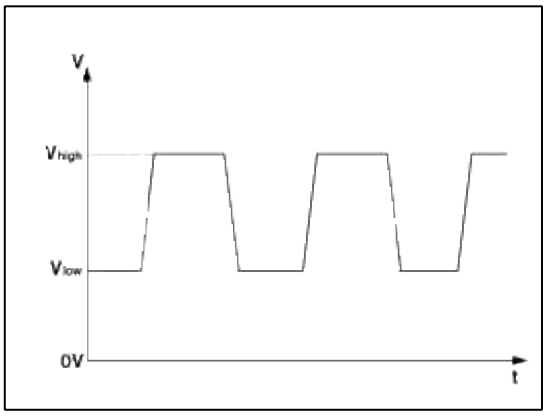
1. Measure the output voltage between the terminal of the wheel speed sensor and the body ground.

CAUTION

In order to protect the wheel speed sensor, when measuring output voltage, a 100 Ω resister must be used as shown.



2. Compare the change of the output voltage of the wheel speed sensor to the normal change of the output voltage as shown below.

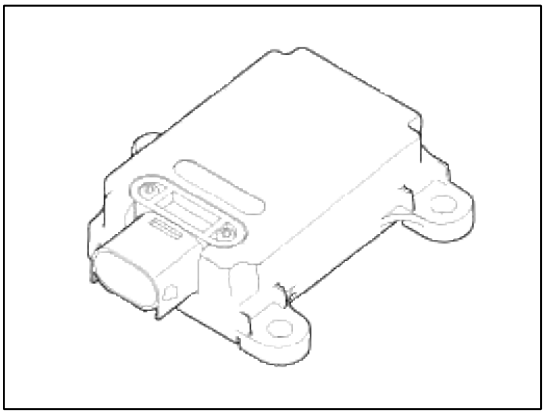


V_low : 0.59V ~ 0.84V
V_high : 1.18V ~ 1.68V
Frequency range : 1 ~ 2,500Hz

Brake System > ESC(Electronic Stability Control) System > Yaw-rate and Lateral G Sensor > Description and Operation

Description

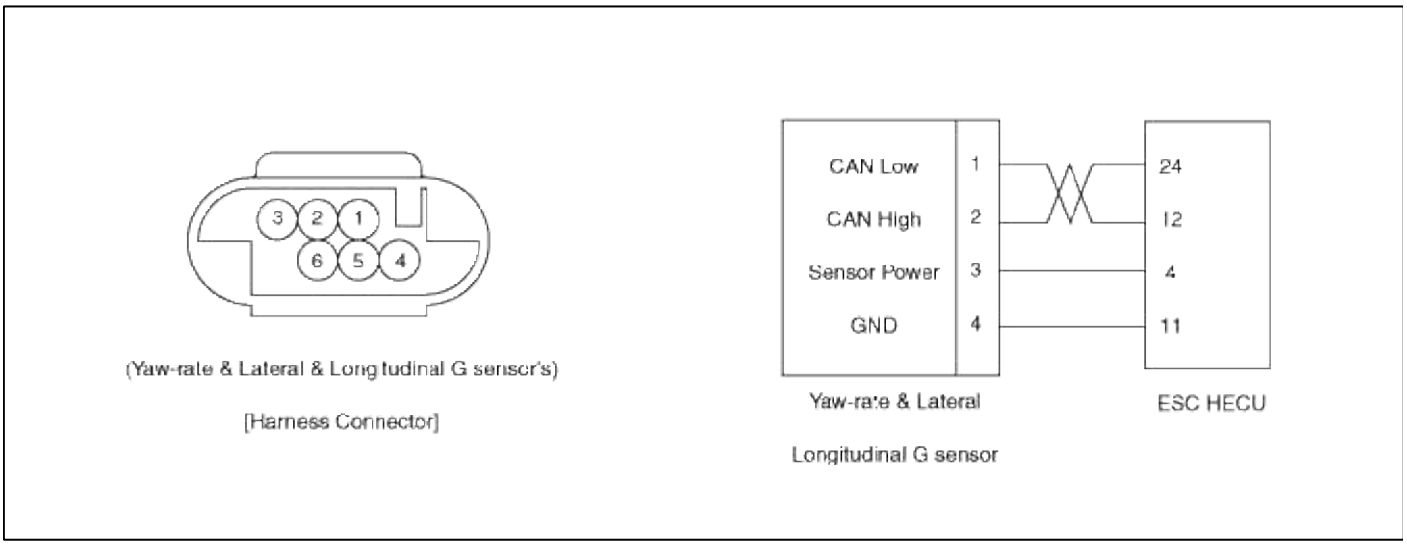
When the vehicle is turning with respect to a vertical axis the yaw rate sensor detects the yaw rate electronically by the vibration change of plate fork inside the yaw rate sensor.
If yaw velocity reaches the specific velocity after it detects the vehicle' yawing, the ESC control is reactivated.
The later G sensor senses vehicle's lateral G. A small element inside the sensor is attached to a deflectable lever arm by later G.
Direction and magnitude of lateral G loaded to vehicle can be known with electrostatic capacity changing according to lateral G.
It interchanges signals with HECU through extra CAN line which only used for communication between HECU and sensor.



Specifications

Description		Specification	Remarks
Operating voltage		8 ~ 17V	
Output signal		CAN Interface	
Operating temperature		-40 ~ 85°C(-40 ~ 185°F)	
Yaw-rate sensor	Measurement range	-75 ~ 75°/sec	
	Frequency response	18 ~ 22Hz	
Lateral G sensor	Measurement range	-1.5 ~ 1.5g	
	Frequency response	50Hz±60%	

External Diagram



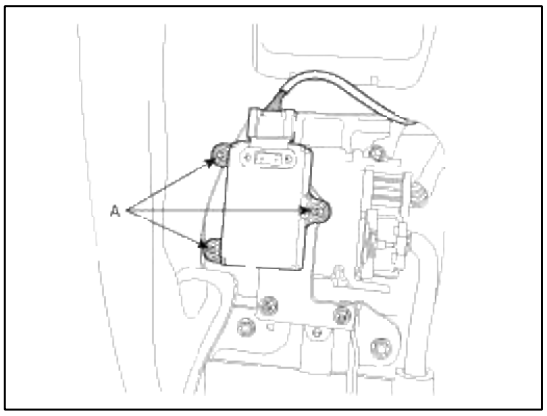
Brake System > ESC(Electronic Stability Control) System > Yaw-rate and Lateral G Sensor > Repair procedures

Removal

1. Turn ignition switch OFF and disconnect the negative (-) battery cable.
2. Remove the floor console.
   (Refer to Body group - "Console")
3. Disconnect the yaw rate & lateral G sensor connector.

4. Remove the mounting bolts (A).

Tightening torque:
7.9 ~ 10.8 N.m (0.8 ~ 1.1 kgf.m, 5.8 ~ 8.0 Ib-ft)



5. Installation is the reverse of removal.

Brake System > ESC(Electronic Stability Control) System > ESP OFF Switch > Description and Operation

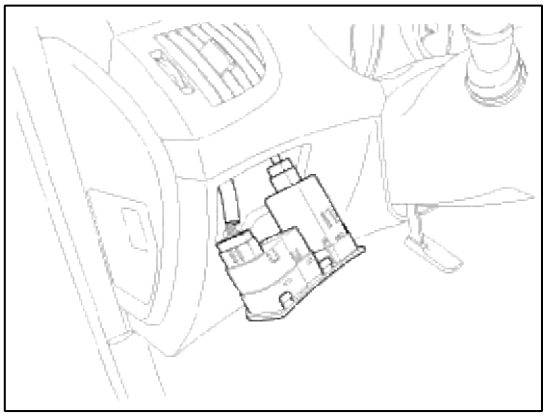
Description

1. The ESC OFF switch is for the user to turn off the ESC system.
2. The ESC OFF lamp is on when ESC OFF switch is engaged.

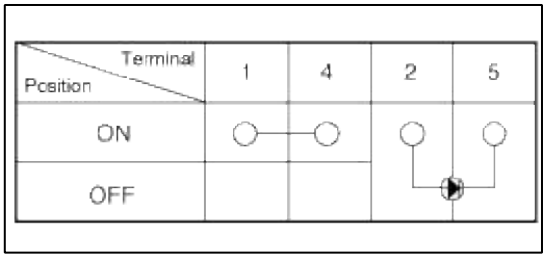
Brake System > ESC(Electronic Stability Control) System > ESP OFF Switch > Repair procedures

Inspection

1. Turn ignition switch OFF and disconnect the negative (-) battery cable.
2. Remove the crash pad side cover.
   (Refer to Body group - "Crash pad")
3. Remove the crash pad lower panel.
   (Refer to Body group - "Crash pad")
4. Remove the lower crash pad switch assembly by using the scraper and then disconnect the connectors.



5. Check the continuity between the switch terminals as the ESC OFF switch is engaged.



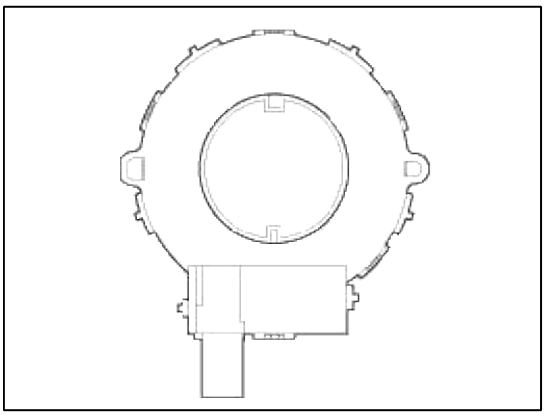
Brake System > ESC(Electronic Stability Control) System > Steering Wheel Angle Sensor > Description and Operation

Description

The steering angle sensor detects the angle of the steering wheel in order to which direction a user chooses. The sensor is detached on the MPS(Mutil-Function Switch) under the steering wheel.

Measureing principle

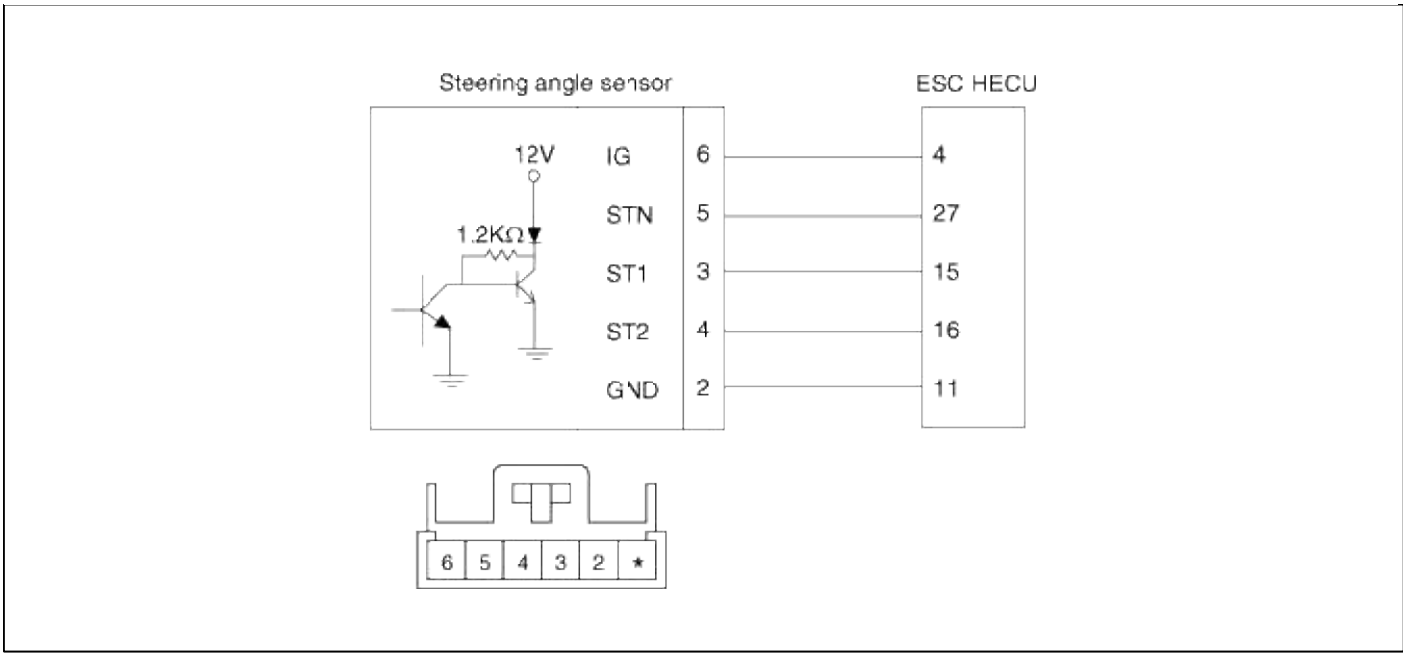
The split of the steering angle sensor detects a steering angle of the steering wheel by a ON/OFF pulse caused by whether or not the LED lights go through the hole of the split, rotating as the steering wheel revolves. There are three LEDs, two(ST1, ST2) for detecting a steering direction, and the other for the neutral position.The HECU calculates the steering angle by the pulse from the steering angle sensor.



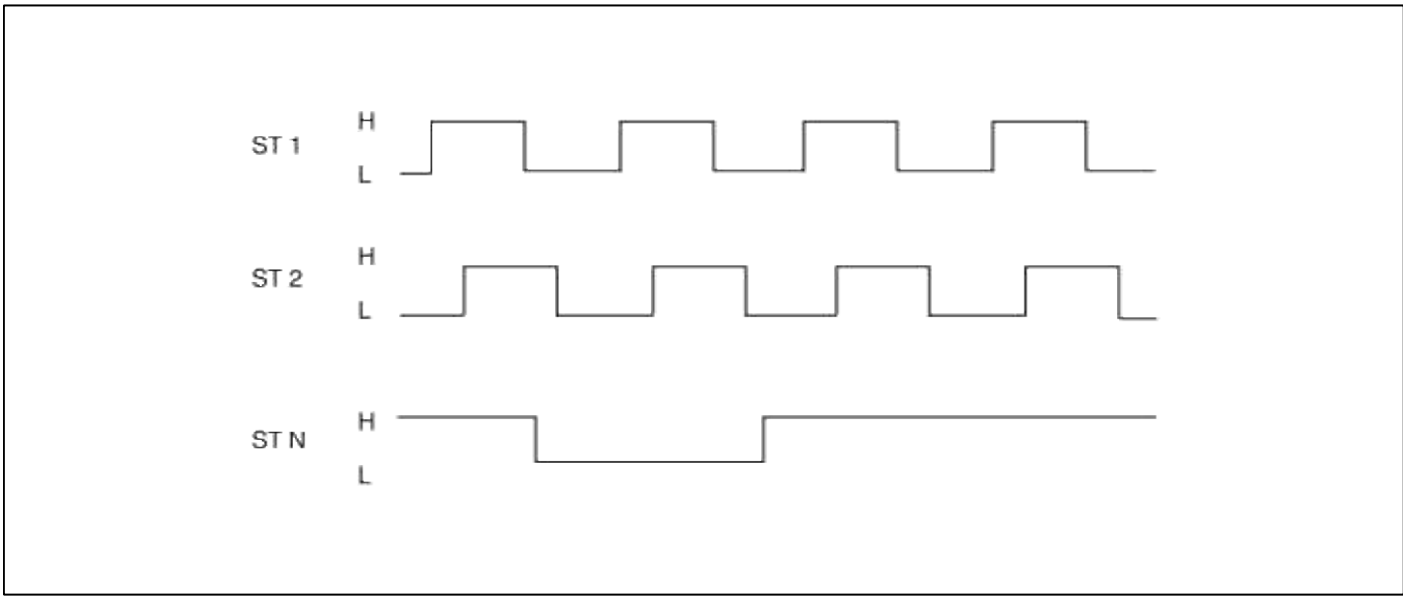
Specification

Description	Specification
Operating voltage	8 ~ 16 V
Operating temperature	-30 ~ 75 °C
Current consumption	Max.100 mA
Steering angle velocity	Max. ± 1500 °/sec

Circuit diagram(Steering wheel angle sensor)



Output characteristic



No.	Input		Output	Steering direction	Remark
1	ST1	L	L	Right	
	ST2	L	H		
	ST1	L	H	Left	
	ST2	L	L		
2	ST1	L	L	Left	
	ST1	H	L		
	ST1	L	H	Right	
	ST2	H	H		
3	ST1	H	H	Left	
	ST2	L	H		

3	ST1	H	L	Right	
	ST2	L	L		
4	ST1	H	H	Right	
	ST2	H	L		
	ST1	H	L	Left	
	ST2	H	H		

GENESIS COUPE(BK) > 2013 > G 2.0 T-MPI > Clutch System

Clutch System > General Information > Specifications

Specifications

Items		Specification	
Engine type		Gasoline 2.0 TCI	Gasoline 3.8 MPI/GDI
Transmission type		M6VR2	M6VR2
Clutch operation method		Hydraulic type	
Clutch disc	Type	Single dry with diaphragm	
	Facing diameter (outside x inside)mm (in)	Ø240 × 155 (Ø9.44 × 6.10)	
Clutch cover assembly		Diaphragm spring strap	
Clutch master cylinder * I.D. mm (in)		15.87 (0.6248)	

* I.D: Inside diameter

Service Standard

Items	Standard value
Clutch pedal height [Without carpet]	196.7mm (7.75in)
Clutch pedal free play	6 ~ 13mm (0.24 ~ 0.51in)
Clutch disc thickness [When free]	8.4 ± 0.3mm (0.33 ± 0.012in)
Clutch pedal stroke	130.7mm (5.14in)
Clutch disc rivet sink	0.3mm (0.012in)
Diaphragm spring end height difference	0.5mm (0.019in)
Clutch master cylinder clearance to piston	0.15mm (0.006in)

Tightening Torques

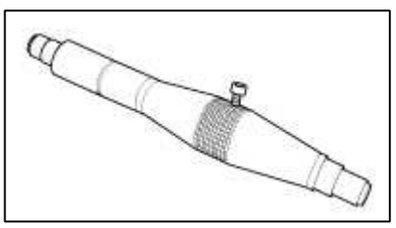
Items		kgf.m	lb-ft
Clutch pedal assembly	13 ~ 16	1.3 ~ 1.6	9.4 ~ 11.6
Clutch pedal Ignition lock switch nut	8 ~ 10	0.8 ~ 1.0	5.8 ~ 7.2
Clutch disc cover assembly	25 ~ 36	2.5 ~ 3.6	18.1~ 26.0

Lubricants

Items	Specified lubricants	Quantity
Inner surface of clutch disc spline	CASMOLY L9508	As required
Inner surface of clutch master cylinder and outer circumference of piston assembly	Brake fluid DOT 3 or DOT 4	As required
Clutch master cylinder push rod, clevis pin and washer	Wheel bearing grease SAE J310, NLGI No.2V	As required
Clutch pedal shaft and bushings	Chassis grease SAE J310a, NLGI No.1	As required

Clutch System > General Information > Special Service Tools

Special Service Tools

Tool (Number and name)	Illustration	Use
09411-1P000 Clutch disc guide		Installation of the clutch disc.

Clutch System > General Information > Troubleshooting

Troubleshooting

Trouble symptom		Suspect area	Remedy
Clutch slipping • Car will not respond to engine speed during acceleration • Insufficient vehicle speed • Lack of power during uphill driving		Insufficient pedal free play	Adjust
		Clogged hydraulic system	Correct or replace parts
		Excessive wear of clutch disc facing	Replace
		Hardened clutch disc facing, or oil on surface	Replace
		Damaged pressure plate or flywheel	Replace
		Weak or broken pressure spring	Replace
Difficult gear shifting (gear noise during shifting)		Excessive pedal free play	Adjust
		Hydraulic system fluid leaks, air trapping or clogging	Repair or replace parts
		Unusual wear or corrosion of the clutch disc spline	Replace
		Excessive vibration (distortion) of the clutch disc	Replace
Clutch noisy	When the clutch is not used	Insufficient play of the clutch pedal	Adjust
		Excessive wear of the clutch disc facing	Replace

	A noise is heard when the clutch is disengaged	Insufficient grease on the sliding surface of the bearing sleeve	Repair
		Improperly installed clutch assembly	Repair
	A noise is heard when the car suddenly rolled up with the clutch partially engaged	Damaged pilot bushing	Replace
Hard pedal effort		Insufficient lubrication of the clutch pedal	Repair
		Insufficient lubrication of the spline part of clutch disc	Repair
Hard to shift or will not shift		Excessive clutch pedal free play	Adjust the pedal free play
		Clutch disc out of place, runout is excessive or lining broken	Inspect the clutch disc
		Spline on the input shaft or clutch disc dirty or burned	Repair as necessary
		Faulty of the clutch pressure plate	Replace the clutch cover
Clutch slips		Insufficient clutch pedal free play	Adjust the pedal free play
		Clogged of the hydraulic system	Repair or replace parts
		Clutch disc lining oily or worn out	Inspect the clutch disc
		Faulty pressure plate	Replace the clutch cover
Clutch grabs/chatters		Clutch disc lining oily or worn out	Inspect the clutch disc
		Faulty the pressure plate	Replace the clutch cover
		Bent clutch diaphragm spring	Replace the clutch cover
		Worn or broken torsion spring	Replace the clutch disc
		Engine mounts loose	Repair as necessary
Clutch noisy		Damaged the clutch pedal bushing	Replace the clutch pedal bushing
		Loose part inside housing	Repair as necessary

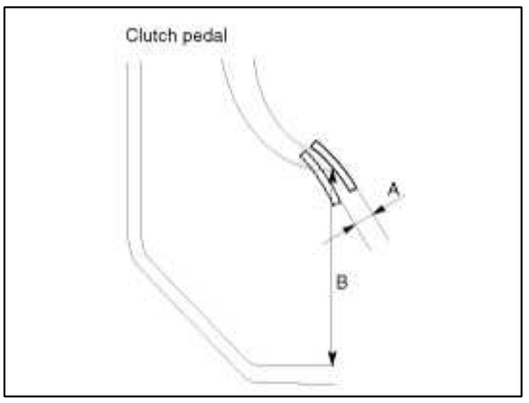
Clutch System > Clutch System > Repair procedures

Service Adjustment Procedure

Clutch Pedal Inspection And Adjustment

1. Measure the clutch pedal height (from the face of the pedal pad to the floorboard) and the clutch pedal clevis pin play (measured at the face of the pedal pad.)

Standard value
(A) : 6 ~ 13mm (0.24 ~ 0.51in)
(B) : 196.9mm (7.75in)

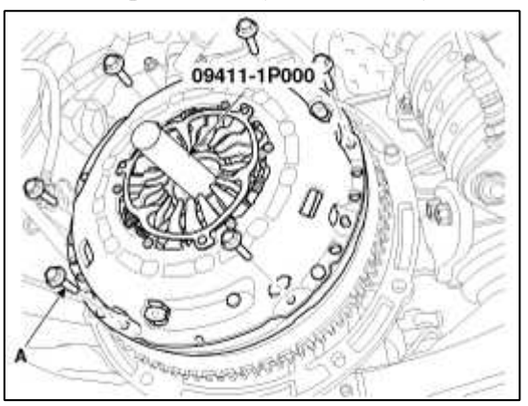


2. If the clutch pedal freeplay and height is not within the standard value range, adjust as follows:

Clutch System > Clutch System > Clutch Cover And Disc > Repair procedures

Removal

1. Remove the transmission assembly.
   (Refer to Manual transmission removal in MT group)
2. Insert the special tool (09411-1P000) in the clutch disc to prevent the disc from shifting.



3. Loosen the bolts(6ea) which attach the clutch cover to the flywheel in a star pattern.
   Loosen the bolts in succession, one or two turns at a time, to avoid bending the cover.

NOTE

Do not clean the clutch disc or the release bearing with cleaning solvent.

Inspection

Clutch Disc Cover Assembly

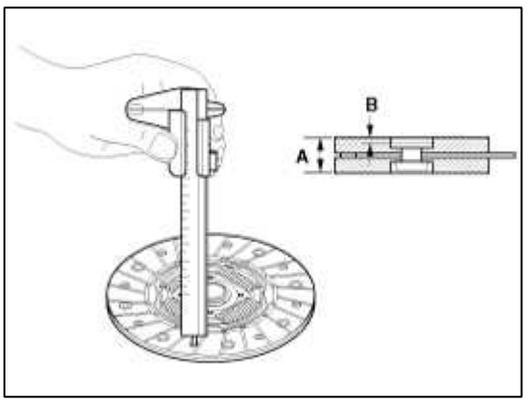
1. Check the diaphragm spring end for wear and uneven height.
2. Check the pressure plate surface for wear, cracks and color change.
3. Check the rivets for looseness and replace the clutch cover assembly if necessary.

Clutch Disc

1. Check the clutch facing for loose rivets, uneven contact, deterioration due to seizure, adhesion of oil, or grease, and replace the clutch disc if defective.

2. Measure the thickness of the disc when free.

Standard value
Clutch disc thickness (A) [when free] :
8.4 ± 0.3mm [0.33 ±0.012in]
Limit :
Clutch disc rivet depth (B) : 0.3mm [0.012in]



3. Check for the torsion spring play and damage and if defective, replace the clutch disc.
4. Clean the splines on the input shaft and install the clutch disc.
   If the disc does not slide smoothly or if play is excessive, replace the clutch disc and/or the input shaft.

Clutch Release Bearing

CAUTION

The release bearing is packed with grease. Do not use cleaning solvent or oil.

Standard grease : CASMOLY L9508

1. Check the bearing for seizure, damage or abnormal noise. Also check the diaphragm spring contacting points for wear.
2. Replace the bearing if the release fork contacting points are worn abnormally.

Clutch Release Fork

If there is abnormal wear at the point of contact with the bearing, replace the release fork assembly.

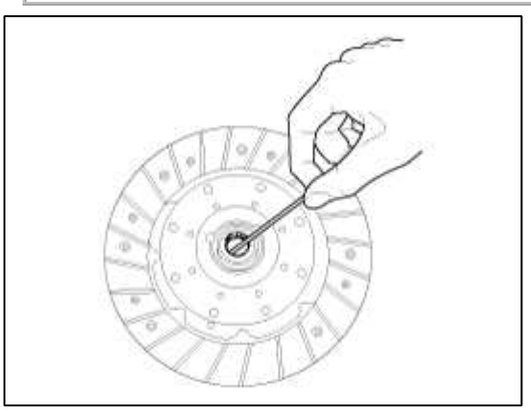
Installation

1. Apply multipurpose grease to the spline of the disc.

Grease : CASMOLY L 9508

CAUTION

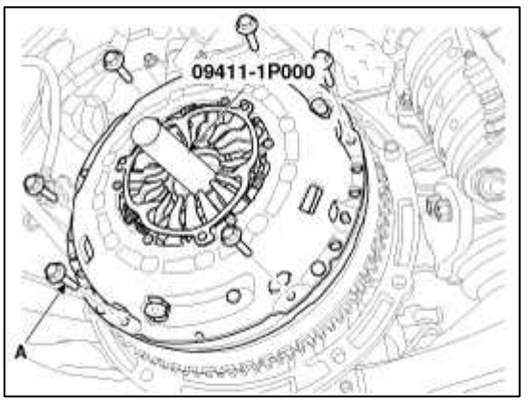
When installing the clutch, apply grease to each part, but be careful not to apply excessive grease.
It can cause clutch slippage and vibration (judder).



2. Install the clutch disc assembly to the flywheel using the special tool (09411-1P000).

3. Install the clutch cover assembly to the flywheel and temporarily tighten the bolts one or two steps at a time in a star pattern.

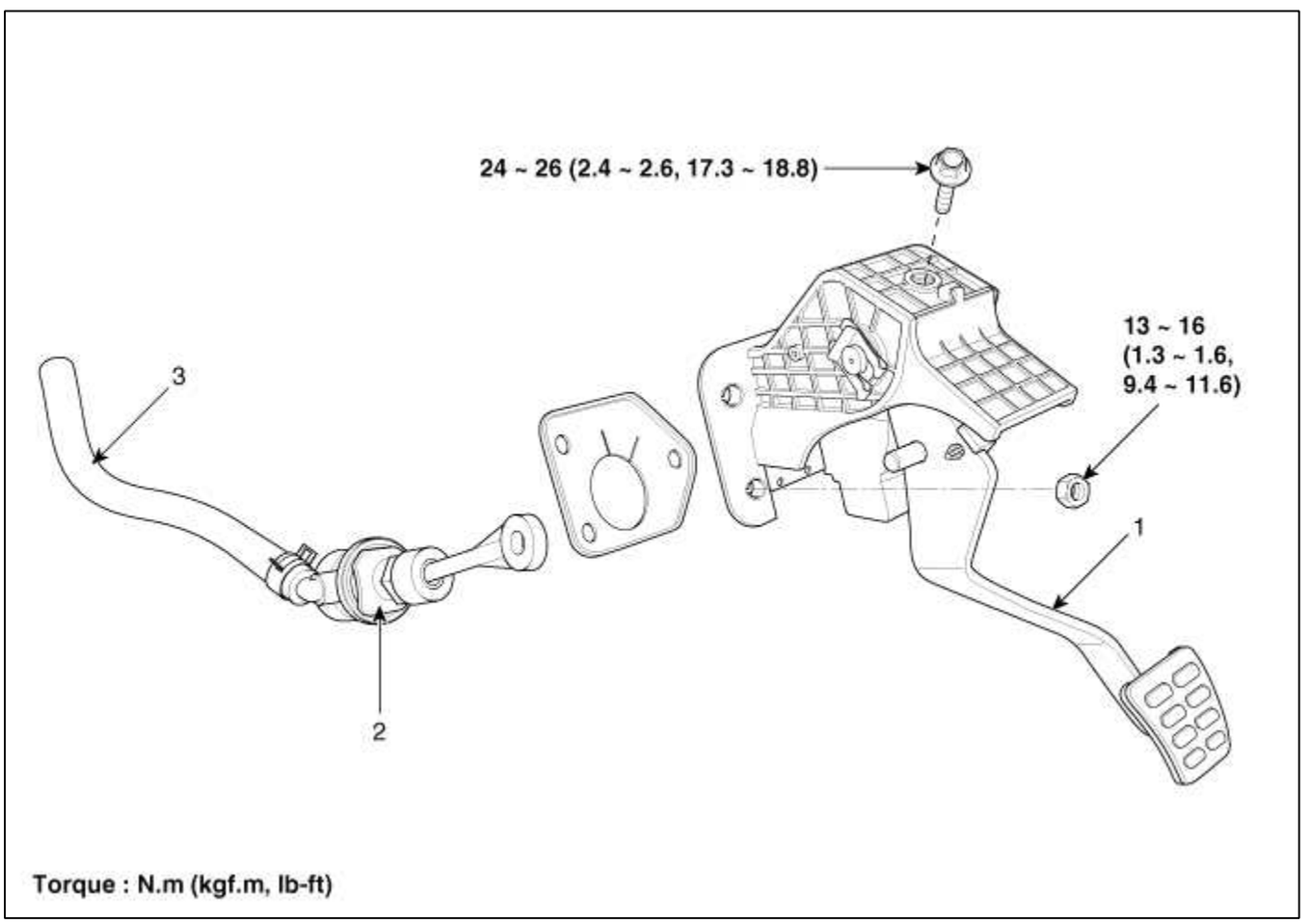
Tightening torque :
Clutch disc cover bolt :
25 ~ 36Nm (2.5 ~ 3.6kgf.m, 18.1 ~ 26.0lb-ft)



4. Remove the clutch disc guide (09411-1P000).
5. Install the transmission assembly to the engine. (Refer to Manual transmission installation in MT group)

Clutch System > Clutch System > Clutch Master Cylinder > Components and Components Location

Components

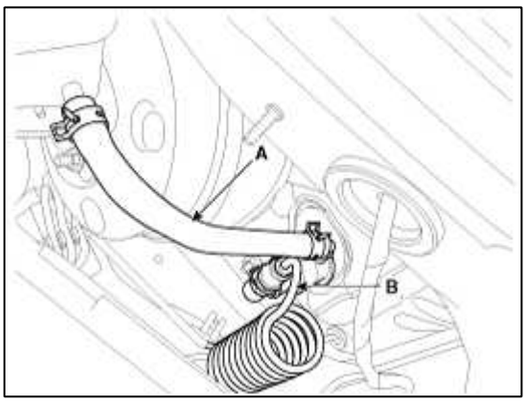


1. Clutch pedal assembly **2. Clutch master cylinder assembly**	**3. Clutch fluid hose**

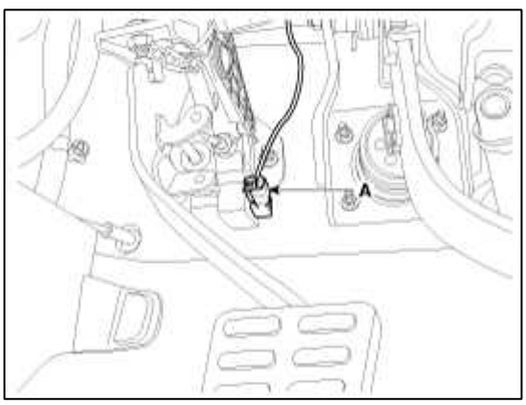
Clutch System > Clutch System > Clutch Master Cylinder > Repair procedures

Removal

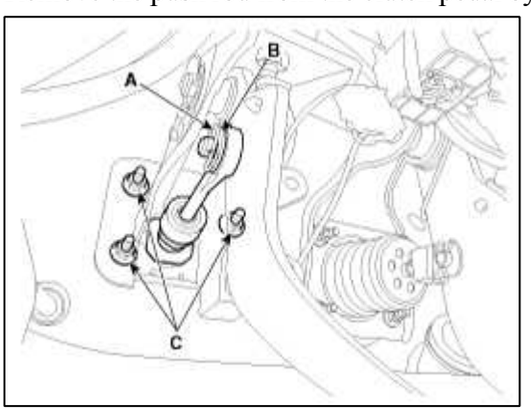
1. Remove the flexible hose (A) from the brake reserve tank.



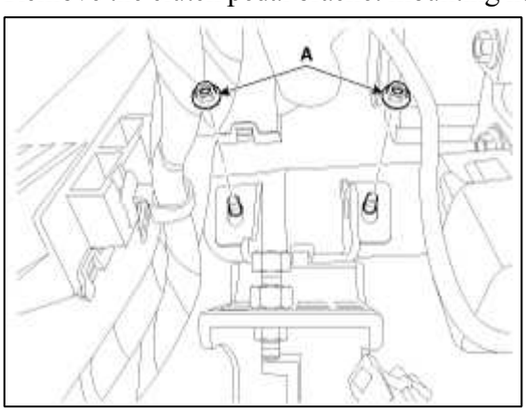
2. After pulling out a clip, disconnect the clutch tube (B) from the master cylinder.
3. Disconnect the ignition lock switch connector (A).



4. Remove the push rod from the clutch pedal by removing the snap pin (A) and washer (B).



5. Remove the clutch pedal mounting nut (C-3ea).
6. Remove the clutch pedal bracket mounting nut (A-2ea).



7. Remove the clutch master cylinder from the clutch pedal assembly by rotating the clutch master cylinder 45 degree counter clockwise.

Inspection

1. Check the inside of the cylinder body for rust, pitting or scoring.
2. Check the piston cup for wear or distortion.
3. Check the piston for rust, pitting or scoring.
4. Check to make sure the clutch line tube is not clogged or restricted in any way.

5. Measure the master cylinder inside diameter and the piston outside diameter with a cylinder gauge micrometer.

> NOTE
>
> Measure the inside diameter of the master cylinder at three places (bottom, middle, and top) in a perpendicular direction.

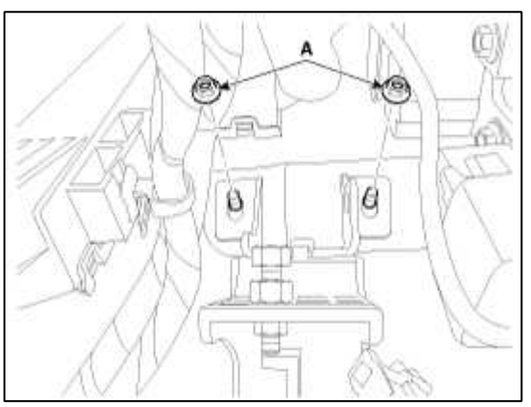
6. If the master cylinder-to-piston clearance exceeds the limit, replace the master cylinder and/or piston assembly.

Limit : 0.15 mm (0.006 in)

Installation

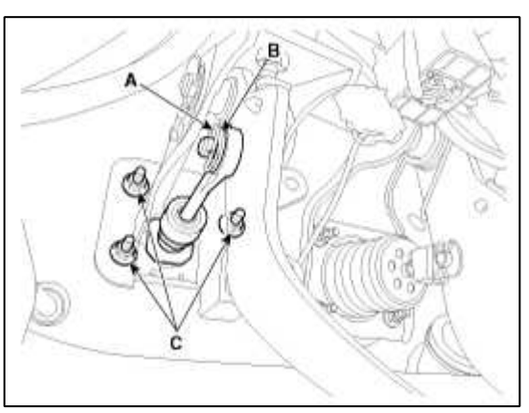
1. Install the clutch master cylinder to the clutch pedal assembly by rotating the clutch master cylinder 45 degree clockwise.
2. Install the clutch pedal bracket mounting nut (A-2ea).

Tightening torque :
13 ~ 16 N.m (1.3 ~ 1.6 kgf.m, 9.4 ~ 11.6 lb-ft)



3. Install the clutch pedal mounting nut (C-3ea).

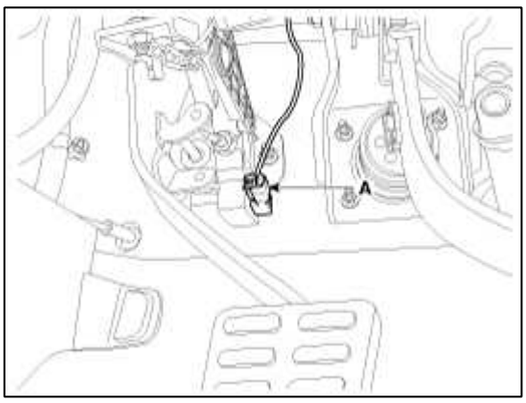
Tightening torque :
13 ~ 16 N.m (1.3 ~ 1.6 kgf.m, 9.4 ~ 11.6 lb-ft)



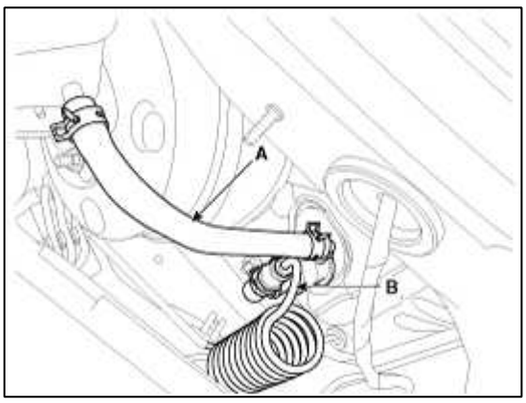
4. Install the push rod to the clutch pedal by installing the snap pin (A) and washer (B).

Wheel bearing grease : SAE J310, NLGI No.2

5. Connect the ignition lock switch connector (A).



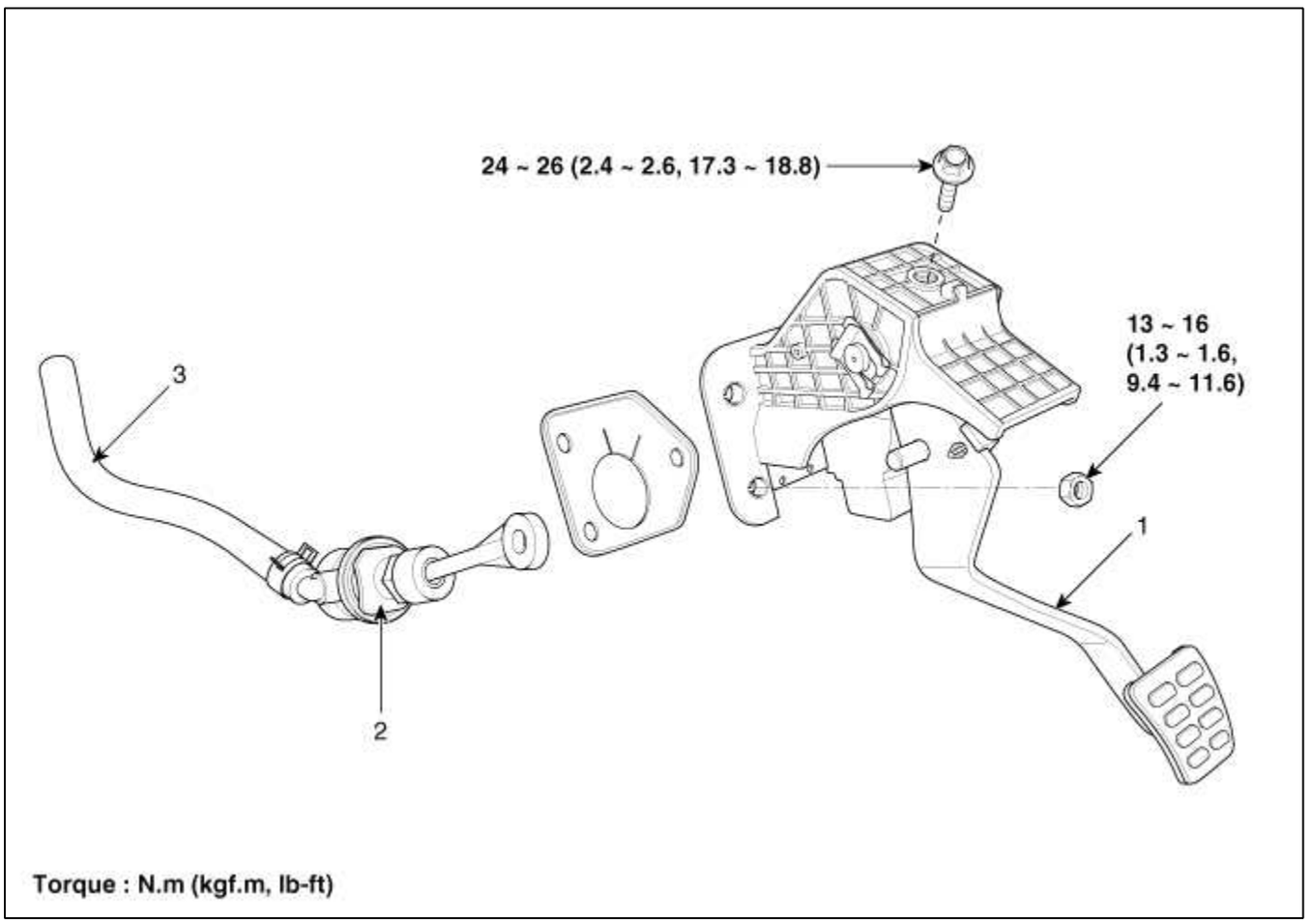
6. Install the flexible hose (A) to the brake reserve tank.



7. Connect the clutch tube (B) to the master cylinder and insert a clip.
8. Refill the brake fluid.
9. Bleed the air in the clutch system.
   (Refer to bleeding in service adjustment procedure)

Clutch System > Clutch System > Clutch Pedal > Components and Components Location

Components

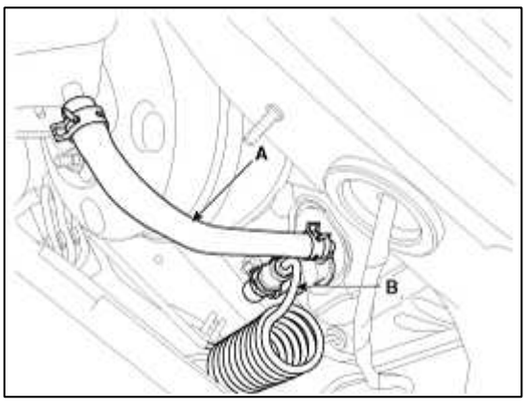


1. Clutch pedal assembly **2. Clutch master cylinder assembly**	**3. Clutch fluid hose**

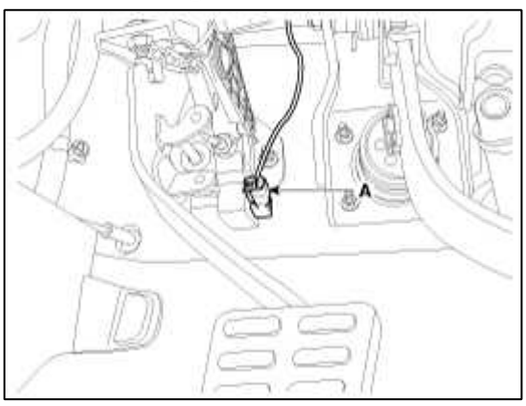
Clutch System > Clutch System > Clutch Pedal > Repair procedures

Removal

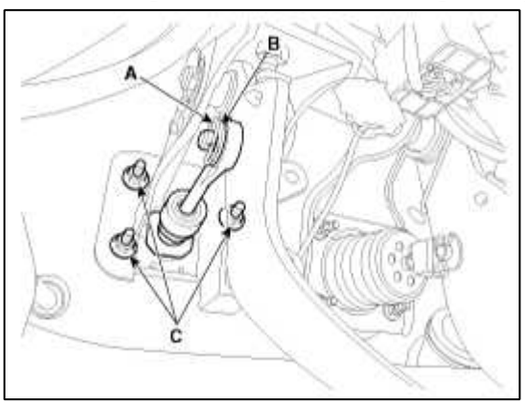
1. Remove the flexible hose (A) from the brake reserve tank.



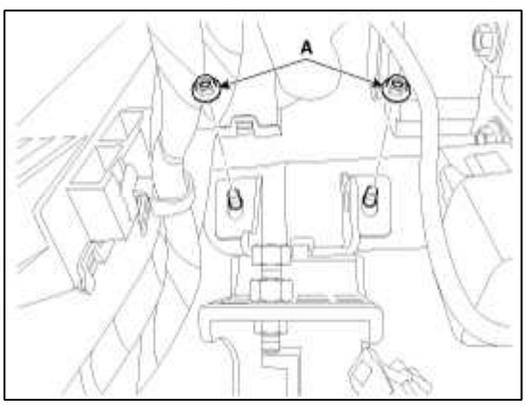
2. After pulling out a clip, disconnect the clutch tube (B) from the master cylinder.
3. Disconnect the ignition lock switch connector (A).



4. Remove the push rod from the clutch pedal by removing the snap pin (A) and washer (B).



5. Remove the clutch pedal mounting nut (C-3ea).
6. Remove the clutch pedal bracket mounting nut (A-2ea).



7. Remove the clutch master cylinder from the clutch pedal assembly by rotating the clutch master cylinder 45 degree counter clockwise.

Inspection

Clutch Pedal Assembly

1. Check the pedal shaft and bushing for wear.
2. Check the clutch pedal for bending or torsion.
3. Check the return spring for damage or deterioration.
4. Check the pedal pad for damage or wear.

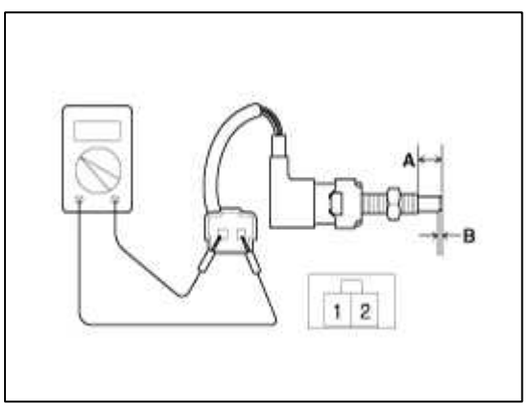
Ignition lock switch inspection

Remove the ignition lock switch and check for continuity between the terminals. If the continuity is not as specified, replace the switch.

Terminal / Condition	1	2
Pushed(ON)	○———	———○
Free(OFF)		

Standard value

Full stroke(A) : 12.0 ± 0.3mm (0.472 ± 0.012 in.)
ON-OFF point (B) : 2.0 ± 0.3mm (0.078 ± 0.012 in)

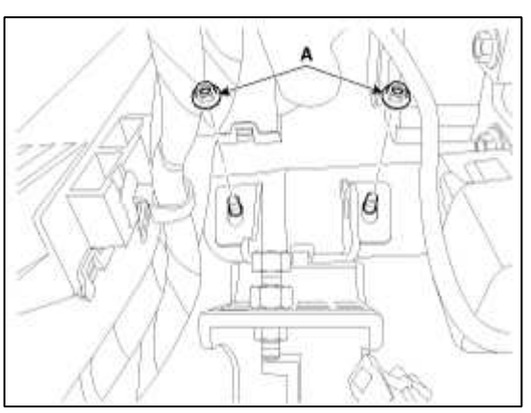


Installation

1. Install the clutch master cylinder to the clutch pedal assembly by rotating the clutch master cylinder 45 degree clockwise.
2. Install the clutch pedal bracket mounting nut (A-2ea).

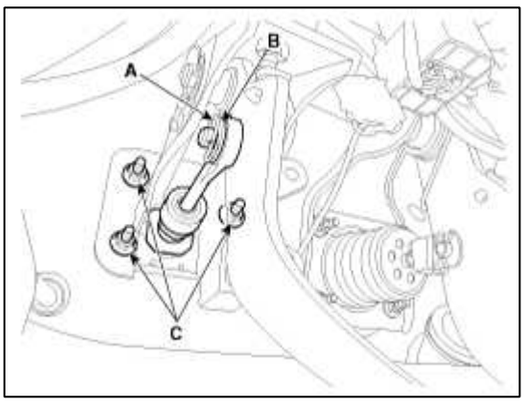
Tightening torque :

13 ~ 16 N.m (1.3 ~ 1.6 kgf.m, 9.4 ~ 11.6 lb-ft)



3. Install the clutch pedal mounting nut (C-3ea).

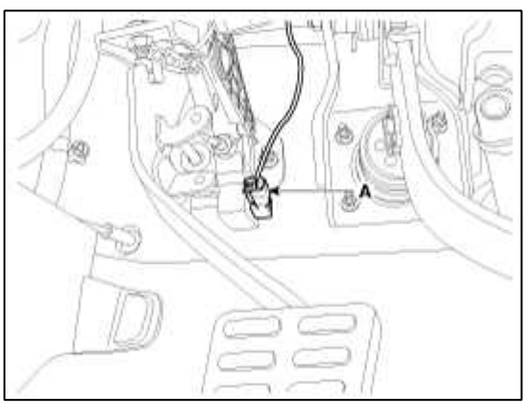
Tightening torque :
13 ~ 16 N.m (1.3 ~ 1.6 kgf.m, 9.4 ~ 11.6 lb-ft)



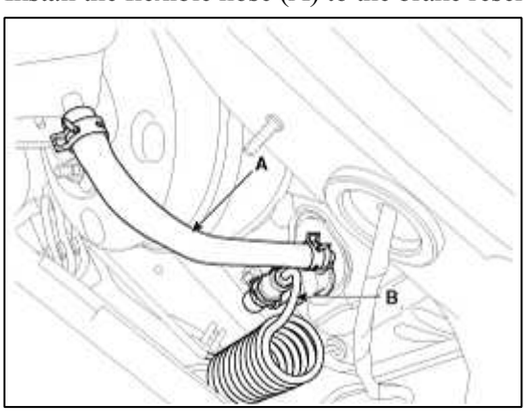
4. Install the push rod to the clutch pedal by installing the snap pin (A) and washer (B).

Wheel bearing grease : SAE J310, NLGI No.2

5. Connect the ignition lock switch connector (A).



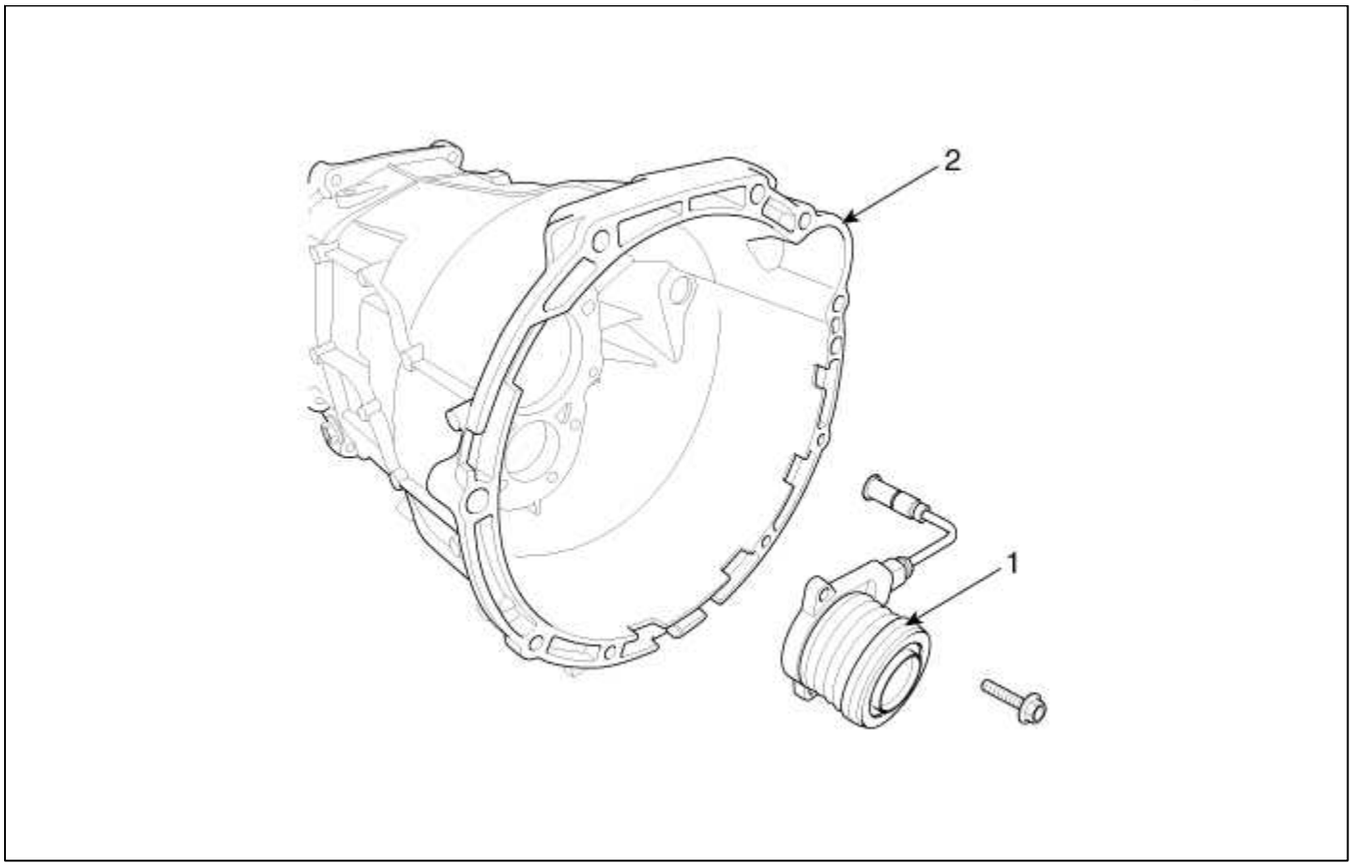
6. Install the flexible hose (A) to the brake reserve tank.



7. Connect the clutch tube (B) to the master cylinder and insert a clip.
8. Refill the brake fluid.
9. Bleed the air in the clutch system.
   (Refer to bleeding in service adjustment procedure)

Clutch System > Clutch System > Concentric Slave Cylinder Assembly > Components and Components Location

Components

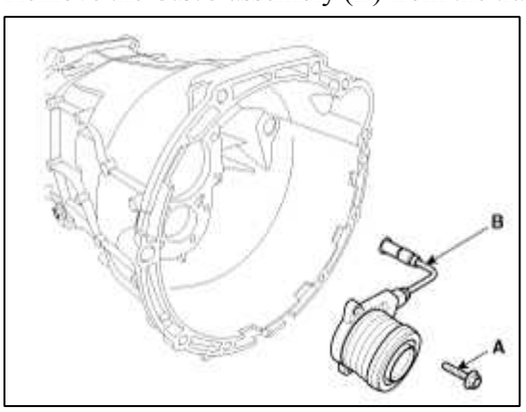


1. C.S.C (Concentric Slave Cylinder) assembly	2. Manual transaxle case

Clutch System > Clutch System > Concentric Slave Cylinder Assembly > Repair procedures

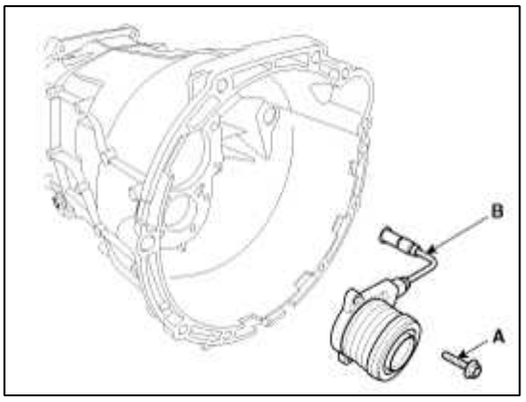
Removal

1. Remove the transaxle assembly.
   (Refer to Manual transaxle removal in MT group)
2. Remove the C.S.C assembly (B) from the transaxle case by removing bolts (A-3ea).



Installation

1. Install the C.S.C assembly (B) to the transaxle case by installing bolts (A-3ea).



2. Install the transaxle assembly.
   (Refer to Manual transaxle installation in MT group)
3. Bleed the air in the C.S.C system.
   (Refer to C.S.C Adjustment Procedure)

C.S.C Adjustment Procedure

C.S.C(Concentric Slave Cylinder) Air Bleeding

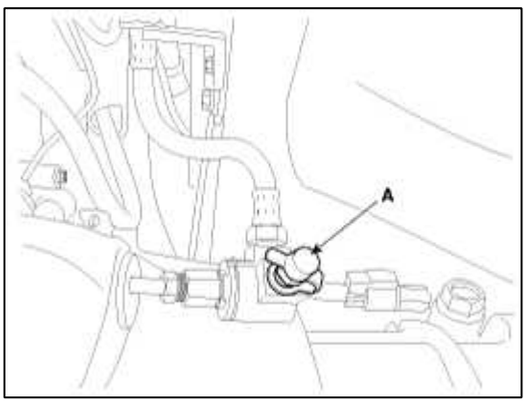
1. After disconnecting a cap from the concentric slave cylinder air bleeder, insert a vinyl hose in the plug.
2. Loosening the plug screw, press and release the clutch pedal about 10 times.

> CAUTION
>
> Hold the air bleeder body not to rotate with a spanner.
> The holding is needed when the plug loosened or tightened.

3. Tighten the plug during the clutch pedal pressed.
   Afterwards, raise the pedal with a hand.

Tightening torque :
8 ~ 10 Nm (0.8 ~ 1.0 kgf.m, 2.8 ~ 7.2 lb-ft)

4. After pressing the clutch pedal 3 times more, loosen the plug and retighten it with the pedal pressed. Raise it again, then.
5. Repeat the step 4 two or three times. (until there is no bubble in the fluid)



GENESIS COUPE(BK) > 2013 > G 2.0 T-MPI > Driveshaft and axle

Driveshaft and axle > General Information > Specifications

Specification

Items		Inner side		Outer side	
Rear drive shaft	Joint type	TSJ		BJ	
	Max. permissible angle	28.5°		15°	
	Backlash	M/T : 0.4° below A/T : 0.4° below			
Differential	Oil type	Hypoid gear oil, MS 517-15 GT (API GL-5, SAE 75W/90)			
	Oil capacity (L)	About 1.4L ± 0.05L			
	Reduction gear type	Hypoid gear			
	Reduction gear ratio	Theta 2.0 T-MPI AT	Theta 2.0 T-MPI MT	Lambda 3.8 GDI AT	Lambda 3.8 GDI MT
		4.181	3.538	4.181	3.538
	Differential gear backlash mm(in.)	0.10 ~ 0.15mm (0.0039 ~ 0.0059 in.)			

Tightening Torque

Items		Nm	Kgf.m	lb-ft
Front	Wheel nut	88.3 ~ 107.9	9.0 ~ 11.0	65.1 ~ 79.6
	Strut assembly lower mounting bolt	137.2 ~ 160	14.0 ~ 16.0	101.1 ~ 115.7
	Break caliper mounting bolt	49 ~ 58.8	5.0 ~ 6.0	36.1 ~ 43.3
	Wheel speed sensor mounting bolt	6.9 ~ 10.8	0.7 ~ 1.1	5.1 ~ 8.0
	Break disc mounting screw	4.9 ~ 5.9	0.5 ~ 0.6	3.6 ~ 4.3
	Hub assembly mounting bolt	78.5 ~ 98.1	8.0 ~ 10.0	57.9 ~ 72.3
	Lower arm ball joint mounting bolt	98.1 ~ 117.7	10.0 ~ 12.0	72.3 ~ 86.8
	Tie rod end ball joint mounting nut	78.4 ~ 88.2	8.0 ~ 9.0	57.8 ~ 65.0
Rear	Wheel nut	88.3 ~ 107.9	9.0 ~ 11.0	65.0 ~ 75.6
	Driveshaft castle nut	196.1 ~ 255.0	20.0 ~ 26.0	144.7 ~ 188.1
	Shock absorber upper mounting bolt	137.3 ~ 156.9	14.0 ~ 16.0	101.3 ~ 115.7
	Shock absorber upper mounting nut	137.3 ~ 156.9	14.0 ~ 16.0	101.3 ~ 115.7

Break caliper mounting bolt	49.1 ~ 58.8	5.0 ~ 6.0	36.1 ~ 43.4
Wheel speed sensor mounting bolt	6.9 ~ 10.8	0.7 ~ 1.1	5.1 ~ 8.0
Break disc mounting screw	4.9 ~ 5.9	0.5 ~ 0.6	3.6 ~ 4.3
Hub assembly mounting bolt	78.5 ~ 88.3	8.0 ~ 9.0	57.9 ~ 65.1
Upper arm ball joint mounting nut	78.5 ~ 88.3	8.0 ~ 9.0	57.9 ~ 65.1
Lower arm mounting bolt	137.3 ~ 156.9	14.0 ~ 16.0	101.3 ~ 115.7
Assist arm ball joint mounting nut	98.1 ~ 117.7	10.0 ~ 12.0	72.3 ~ 86.8
Trailing arm mounting bolt	98.1 ~ 117.7	10.0 ~ 12.0	72.3 ~ 86.8

CAUTION

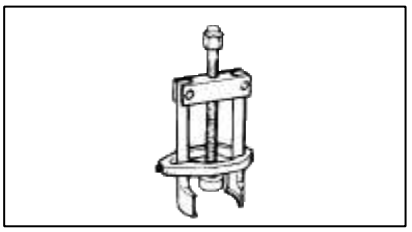
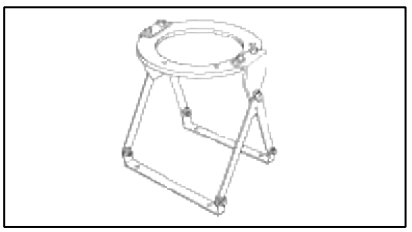
Replace self-locking nuts with new ones after removal.

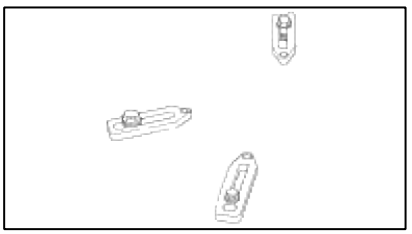
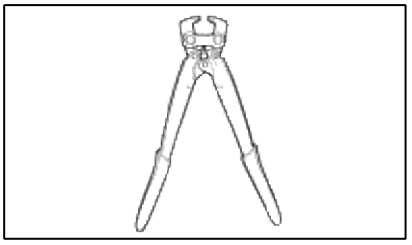
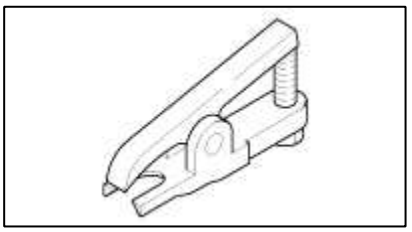
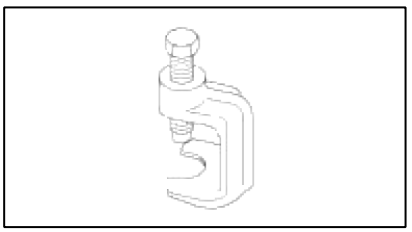
Lubricants

Items		Lubricants	Quantity
Rear driveshaft	BJ	RBA	115 ± 5g
	TSJ	RBA	130 ± 5g

Driveshaft and axle > General Information > Special Service Tools

Special Service Tools

Tool(Number and Name)	Illustration	Use
09495-33000Puller		Removal of spider assembly from a drive shaft.
09517-43401Working base		Support for the differential carrier

09517-43500Adapter		Support for the differential carrier(Use with 09517-43401)
09495-3K000Band installer		Installation of ear type boot band
09568-34000Ball joint remover		Removal of the rear upper arm ball joint
09568-4A000Ball joint remover		Removal of the front lower arm and tie rod end ball joint

Driveshaft and axle > General Information > Troubleshooting

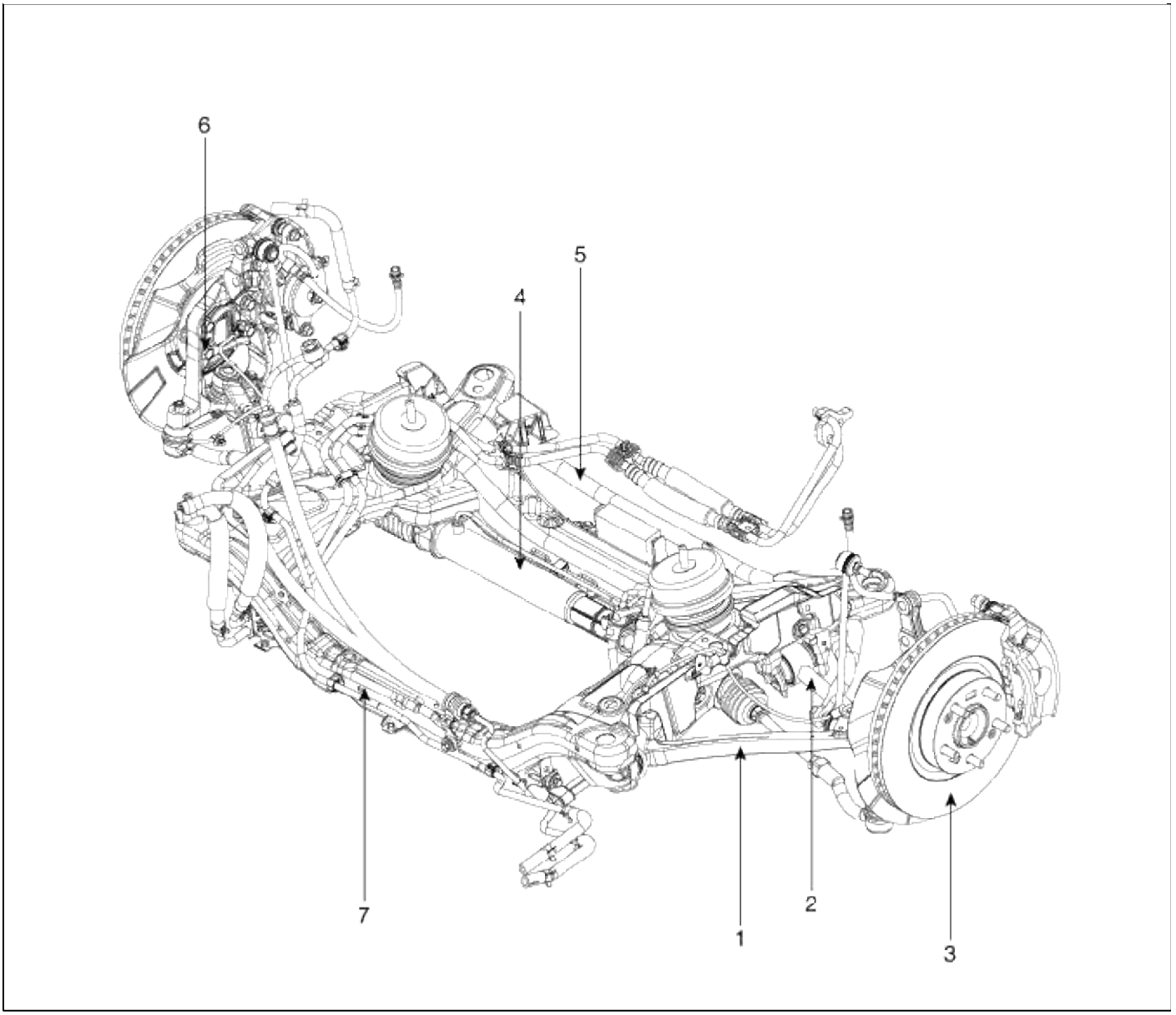
Troubleshooting

Trouble Symptom	Probable cause	Remedy
Vehicle pulls to one side	Scoring of driveshaft ball joint	Replace
	Wear, rattle or scoring of wheel bearing	Replace
	Defective front suspension and steering	Adjustment or Replace
	Tire inflation	Adjustment
	Tire pull, rotate tires	Adjustment
	Front camber/caster value	Adjustment
	Brakes dragging	Adjustment
	Road test on flat road (no crown)	Adjustment
	Etc	Adjustment
Vibration	Wear, damage or bending of driveshaft	Replace
	Driveshaft rattle and hub serration	Replace

	Wear, rattle or scratching of wheel bearing	Replace
Shimmy	Defective wheel balance	Adjustment or Replace
	Defective front suspension and steering	Adjustment or Replace
Excessive noise	Wear, damage or bending of driveshaft	Replace
	Rattle of driveshaft and worn hub splines	Replace
	Wear, rattle or scoring of wheel bearing	Replace
	Loose hub nut	Adjustment or Replace
	Defective front suspension and steering	Adjustment or Replace

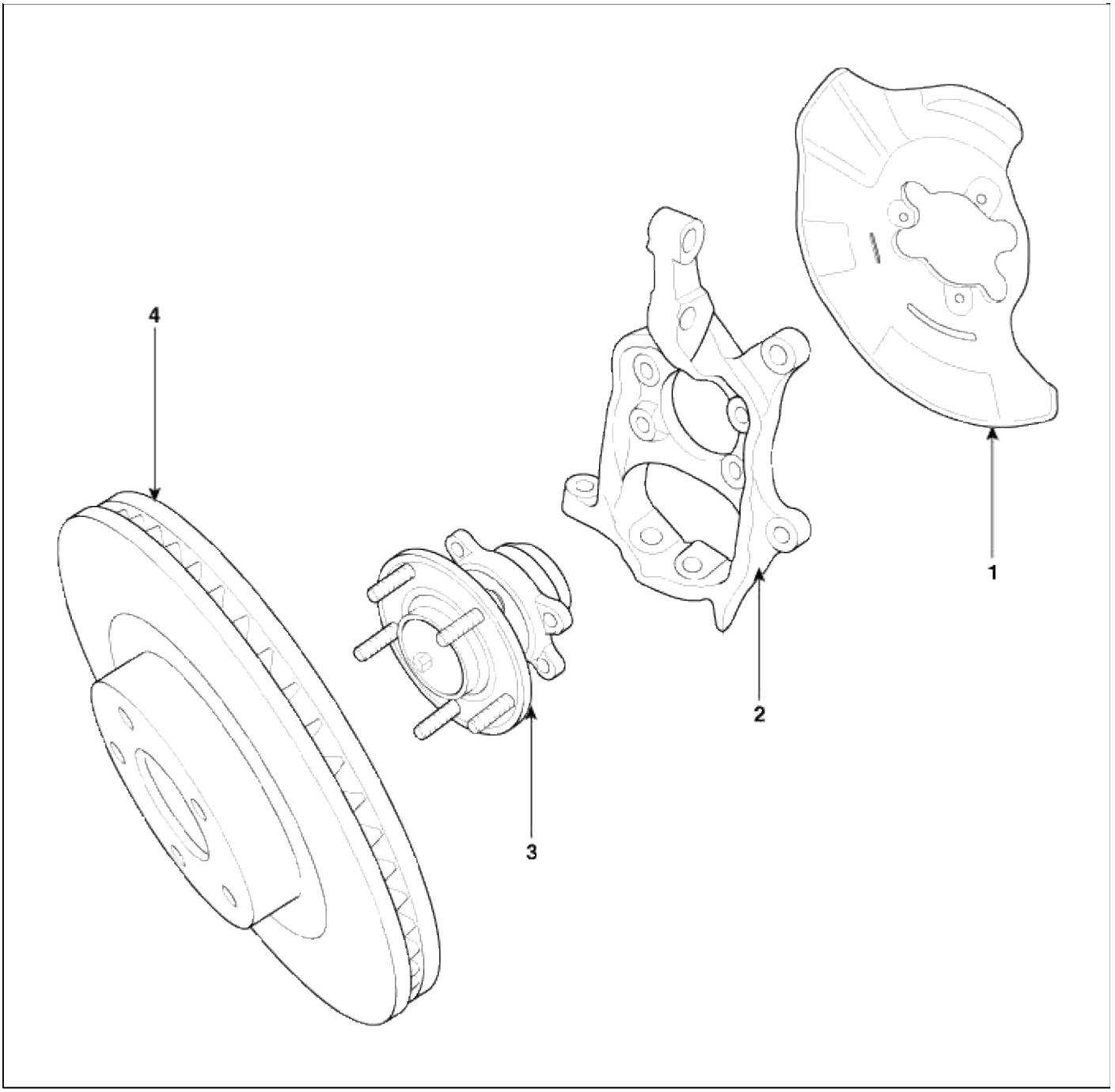
Driveshaft and axle > Front Axle Assembly > Front Hub / Knuckle / Tone Wheel > Components and Components Location

Component Locations



1. Tension arm 2. Lateral arm 3. Front disc 4. Steering gear box	5. Stabilizer bar 6. Front axle 7. Sub frame

Component



1. Dust cover 2. Knuckle	3. Hub assembly 4. Brake disc

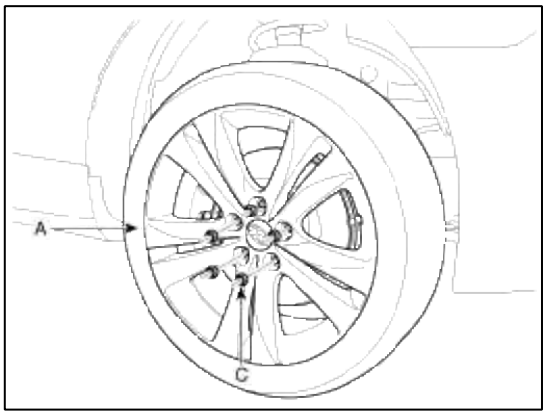
Driveshaft and axle > Front Axle Assembly > Front Hub / Knuckle / Tone Wheel > Repair procedures

Replacement

1. Loosen the wheel nuts slightly. Raise the vehicle, and make sure it is securely supported.

2. Remove the front wheel and tire(A) from front hub .

Tightening torque :
88.3 ~ 107.9 N.m (9.0 ~ 11.0 kgf.m, 65.1 ~ 79.6 lb-ft)

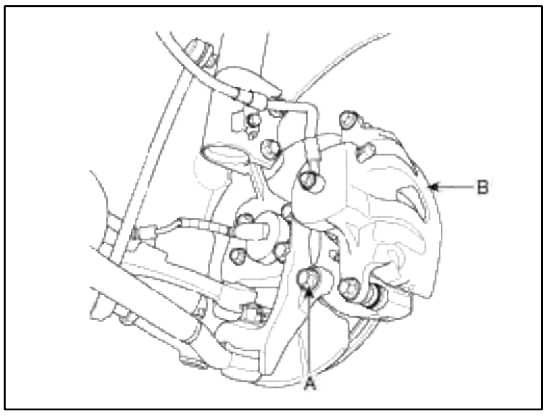


CAUTION

Be careful not to damage to the hub bolts when removing the front wheel and tire.

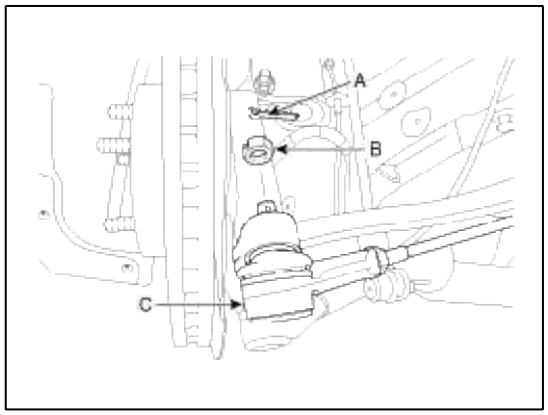
3. Remove the brake caliper mounting bolts (A), and then place the brake caliper assembly (B) with wire.

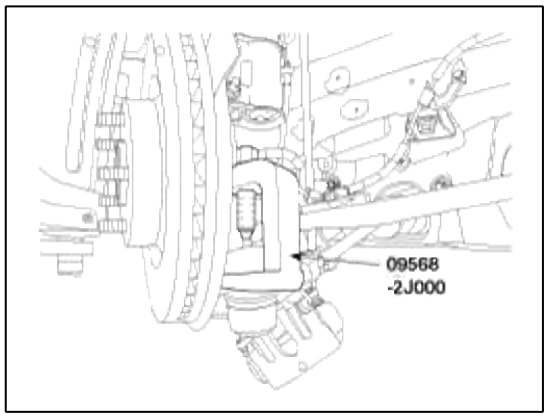
Tightening torque :
49 ~ 58.8 N.m (5.0 ~ 6.0 kgf.m, 36.1 ~ 43.3 lb-ft)



4. Remove the tie rod end ball joint from the knuckle.
   (1) Remove the split pin.
   (2) Remove the castle nut.
   (3) Disconnect the ball joint(A) from knuckle(B) using the special tool (09568-4A000).

Tightening torque :
78.4 ~ 88.2 N.m (8.0 ~ 9.0 kgf.m, 57.8 ~ 65.0 lb-ft)





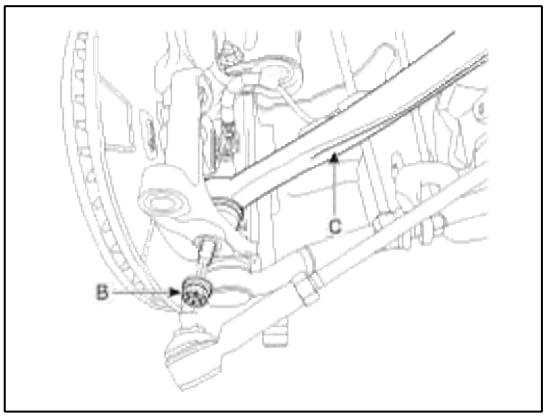
CAUTION

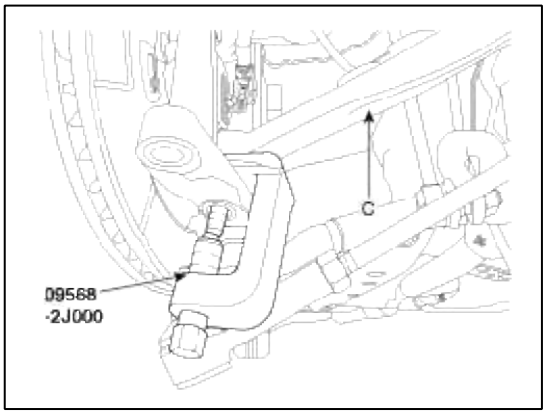
Apply a few drops of oil to the special tool. (Boot contact part)

5. Loosen the tension arm mount bolt(A), and then remove the tension arm(B).
   (1) Remove the split pin.
   (2) Remove the castle nut.

(3) Disconnect the ball joint(A) from tension arm(B) using the special tool (09568-4A000).

Tightening torque :
78.4 ~ 88.2 N.m (8.0 ~ 9.0 kgf.m, 57.8 ~ 65.0 lb-ft)



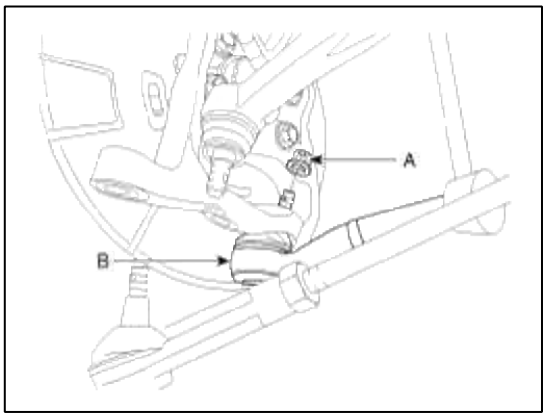


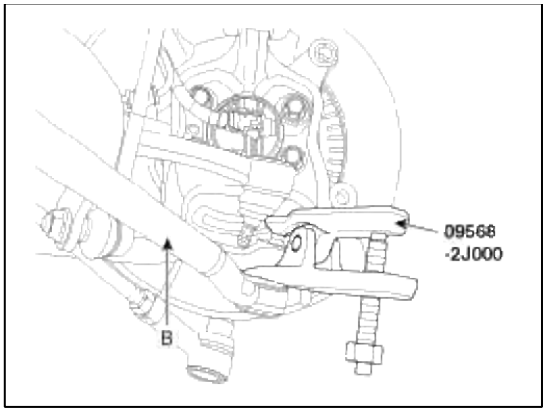
CAUTION

Be careful not to damage the boot and rotor teeth.

6. Loosen the lateral mount nut(A) and then disconet the laterral arm(B).

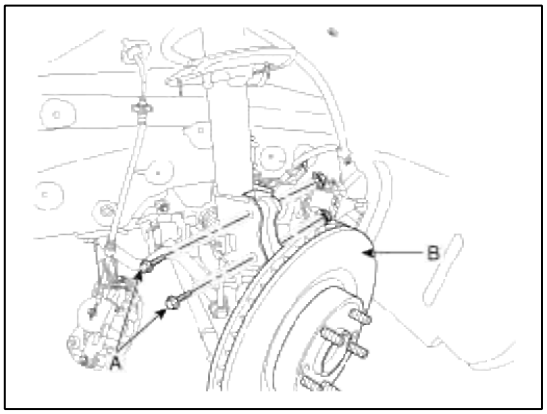
Tightening torque :
90 ~ 110 N.m (9.0 ~ 11.0 kgf.m, 65 ~ 79.5 lb-ft)



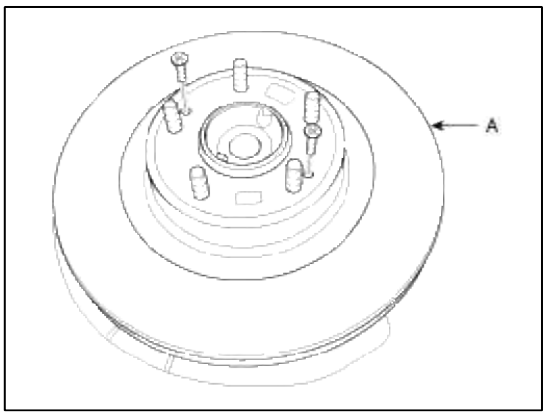


7. Remove the strut mounting bolt and then remove the knuckle assembly(A).

Tightening torque :
6.9 ~ 10.8 N.m (14 ~ 16 kgf.m, 5.1 ~ 8.0 lb-ft)

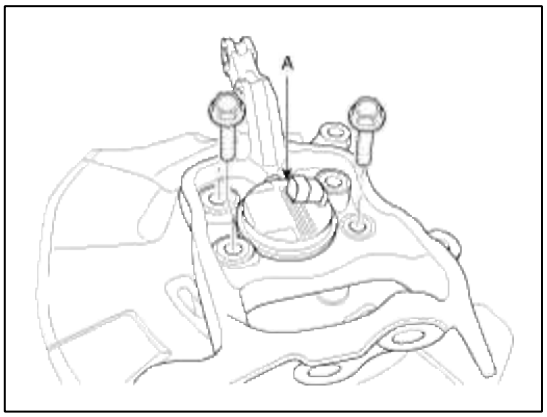


8. Remove the brake disc(A) from knuckle.

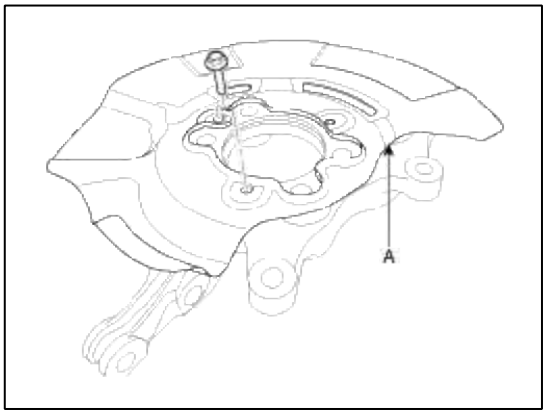


9. Remove the hub assembly(A) from knuckle assembly.

Tightening torque :
80 ~ 100 N.m (8.0 ~ 10.0 kgf.m, 57.8 ~ 72.3 lb-ft)



10. Loosen the dust cover mount bolts and then remove the dust cover(B).



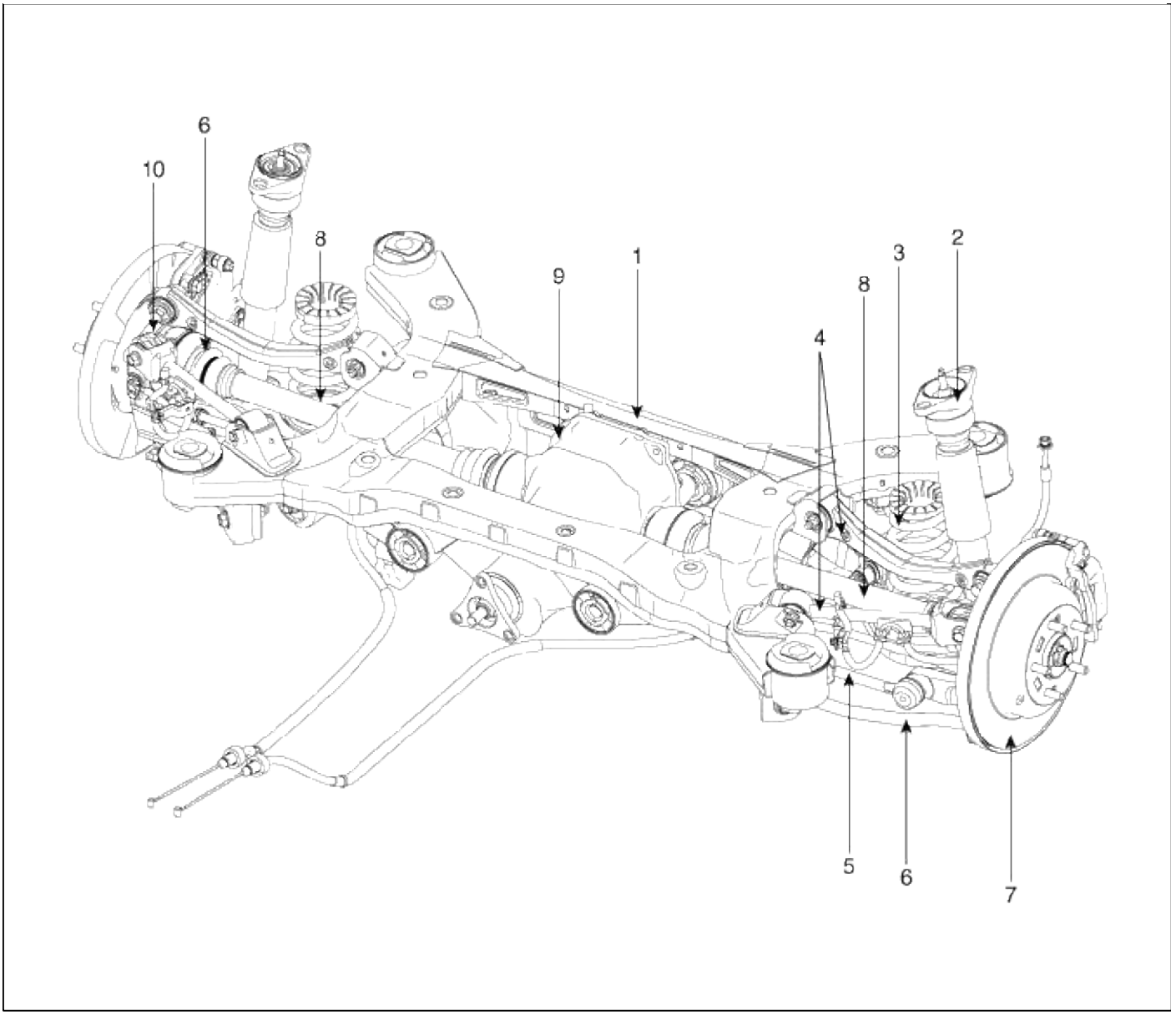
11. Installation is the reverse order of removal.

Inspection

1. Check the hub for cracks and the splines for wear.
2. Check the brake disc for scoring and damage.
3. Check the knuckle for cracks.
4. Check the bearing for cracks or damage.

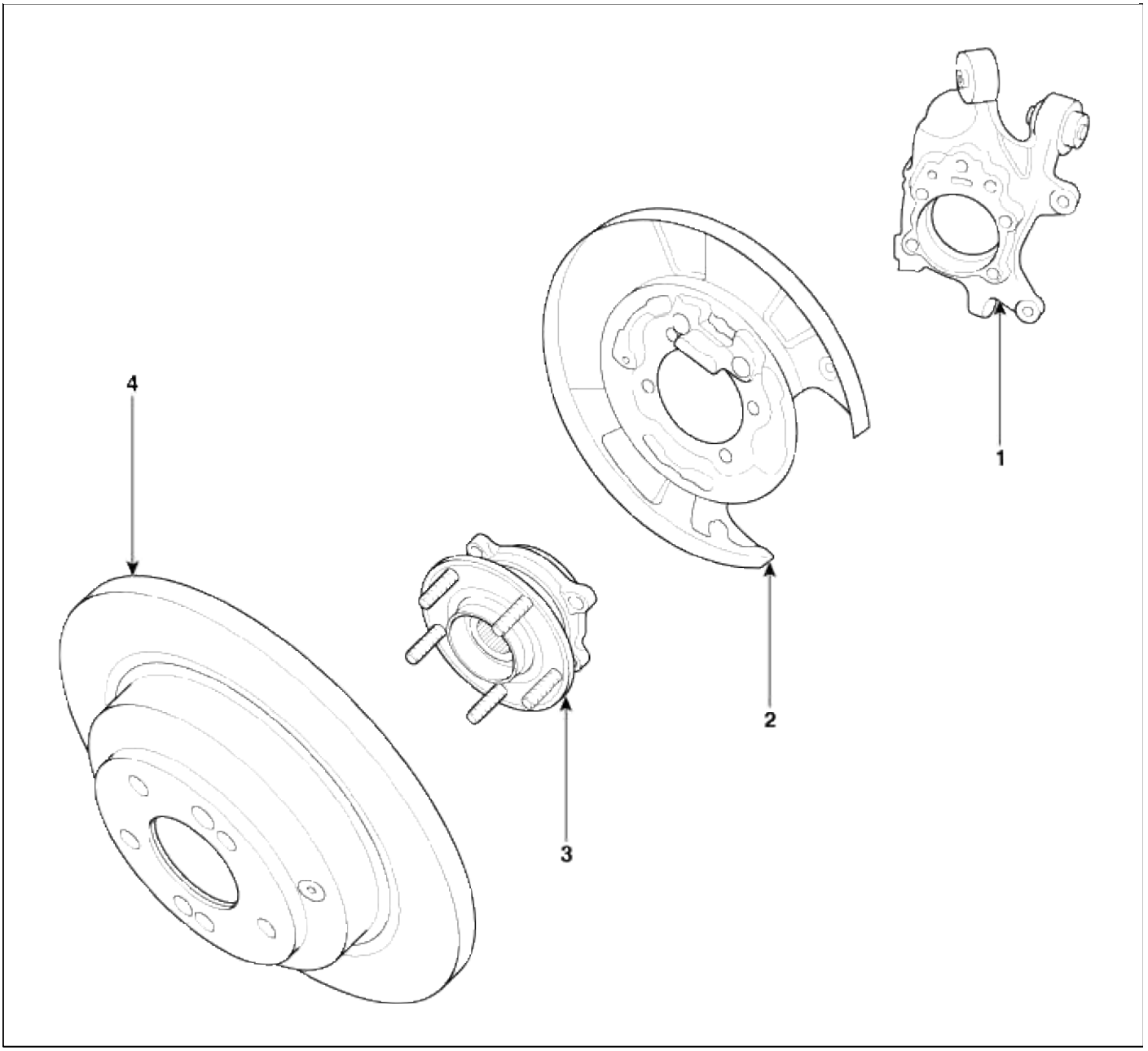
Driveshaft and axle > Rear Axle Assembly > Rear Hub - Carrier > Components and Components Location

Component Locations



1. Sub frame 2. Rear shock absorber 3. Coil spring 4. Rear upper arm 5. Assist arm	6. Trailing arm 7. Rear disc 8. Rear drive shaft 9. Differential assembly 10. Rear axle

Components



1. Rear carrier assembly 2. Rear dust cover	3. Rear hub assembly 4. Rear brake disc

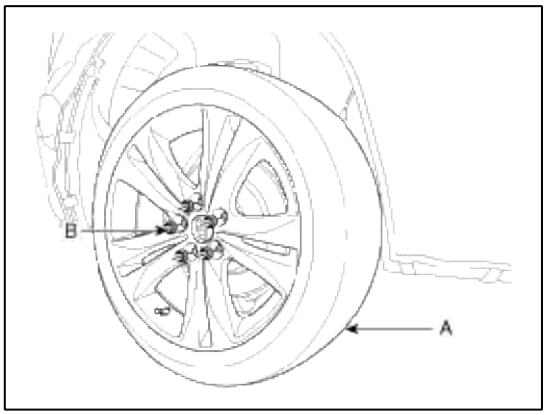
Driveshaft and axle > Rear Axle Assembly > Rear Hub - Carrier > Repair procedures

Replacement

1. Loosen the wheel nuts slightly. Raise the vehicle, and make sure it is securely supported.

2. Remove the rear wheel and tire(A) from rear hub .

Tightening torque :
88.3 ~ 107.9 N.m (9.0 ~ 11.0 kgf.m, 65.1 ~ 79.6 lb-ft)

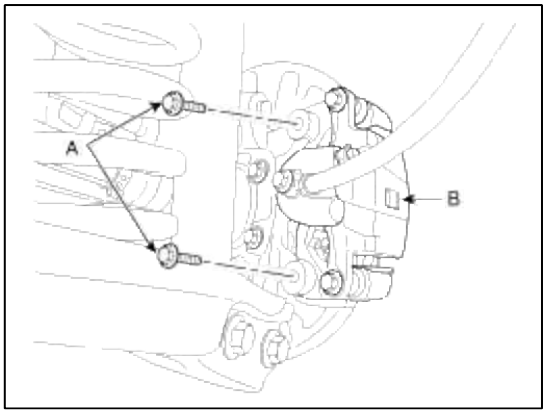


CAUTION

Be careful not to damage to the hub bolts when removing the rear wheel and tire.

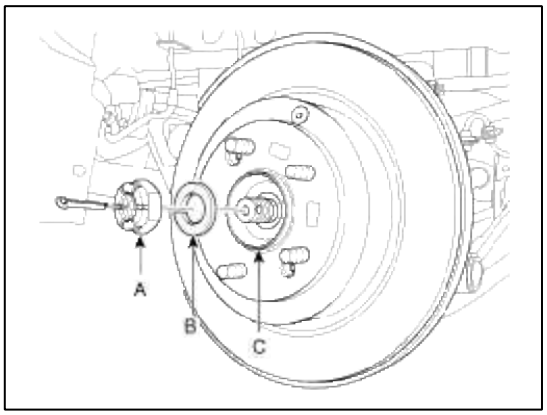
3. Remove the brake caliper mounting bolts (A), and then place the brake caliper assembly (B) with wire as shown in the illustration.

Tightening torque :
49 ~ 58.8 N.m (5.0 ~ 6.0 kgf.m, 36.1 ~ 43.3 lb-ft)



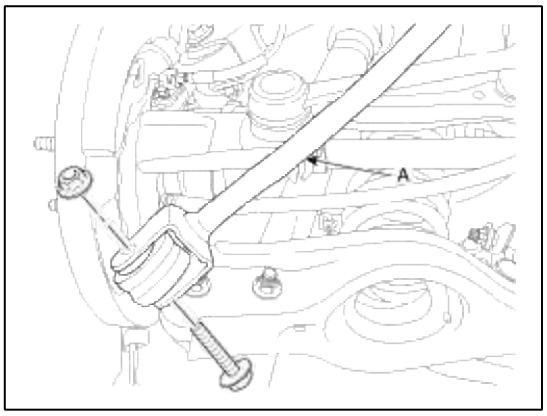
4. Remove the split pin(A), then remove castle nut(B) and washer(C) from the front hub under applying the break.

Tightening torque :
196.1 ~ 255.0 N.m (20.0 ~ 26.0 kgf.m, 144.7 ~ 188.1 lb-ft)



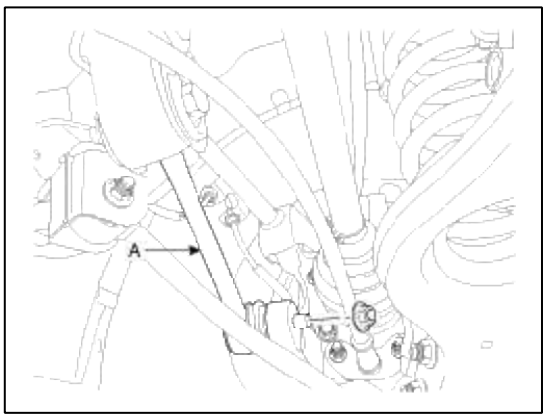
5. Remove the rear break lining. (Refer to BR group-Rear Brake)
6. Loosen the trailing arm mount bolt & nut and than remove the trailing arm(A).

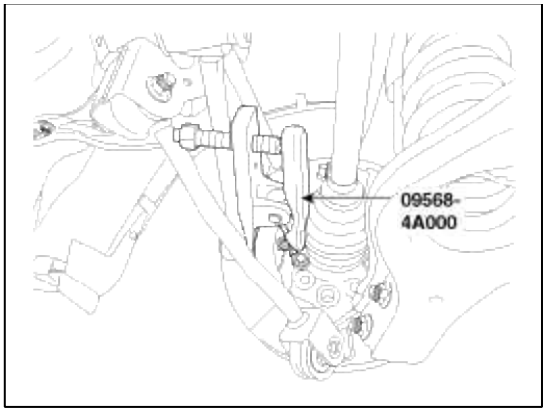
Tightening torque :
98.1 ~ 117.7 N.m (10.0 ~ 12.0 kgf.m, 72.3 ~ 86.8 lb-ft)



7. Loosen the assist arm mount nut and than disconnect the assist arm(A).

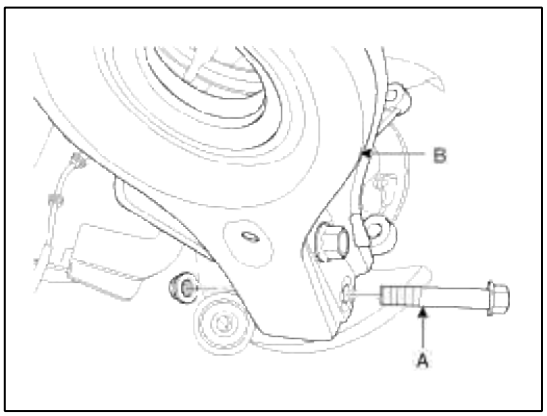
Tightening torque :
98.1 ~ 117.7 N.m (10.0 ~ 12.0 kgf.m, 72.3 ~ 86.8 lb-ft)





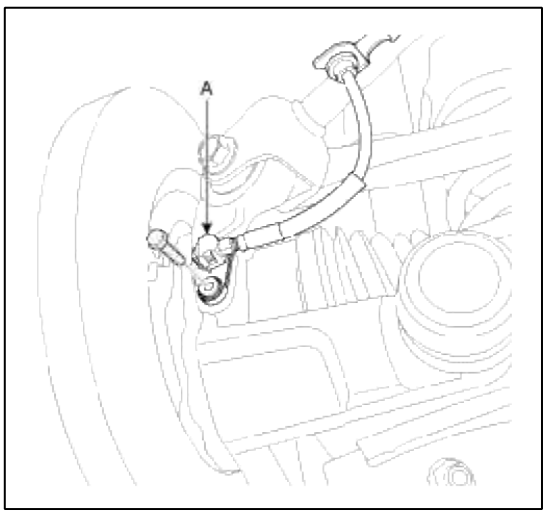
8. Remove lower arm mount bolt(A) and than remove the lower arm(B).

Tightening torque :
140 ~ 160 N.m (14.0 ~ 16.0 kgf.m, 101.2 ~ 115.7 lb-ft)

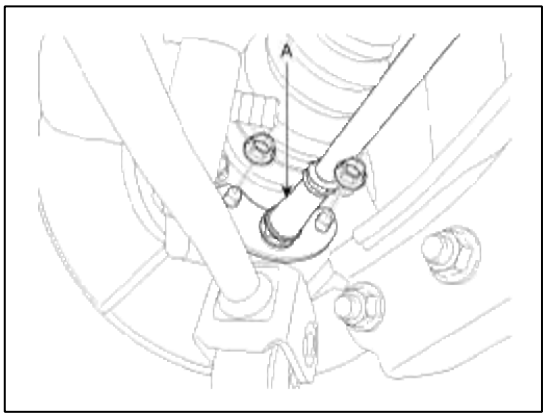


9. Remove the wheel speed sensor(A).

Tightening torque :
6.9 ~ 10.8 N.m (0.7 ~ 1.1 kgf.m, 5.1 ~ 8.0 lb-ft)

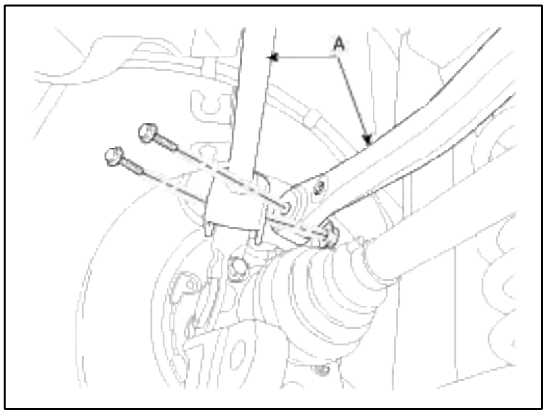


10. Loosen the brake cable mount nuts and than remove the brake cable(A).



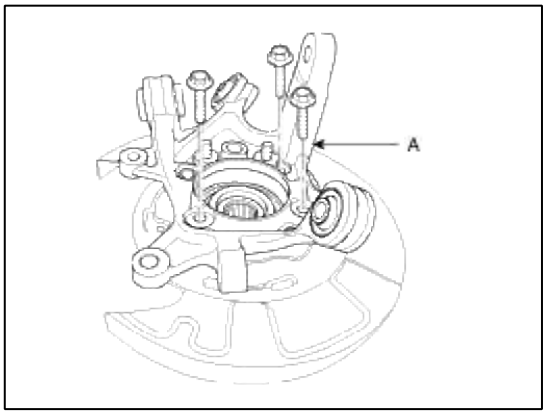
11. Loosen the upper arm(A) link mount bolt & nut and then remove the carrier assembly(B).

Tightening torque :
78.5 ~ 88.3 N.m (8.0 ~ 9.0 kgf.m, 57.9 ~ 65.1 lb-ft)



12. Remove the hub assembly mount bolts from the rear axle carrier(A).

Tightening torque :
78.5 ~ 88.3 N.m (8.0 ~ 9.0 kgf.m, 57.9 ~ 65.1 lb-ft)



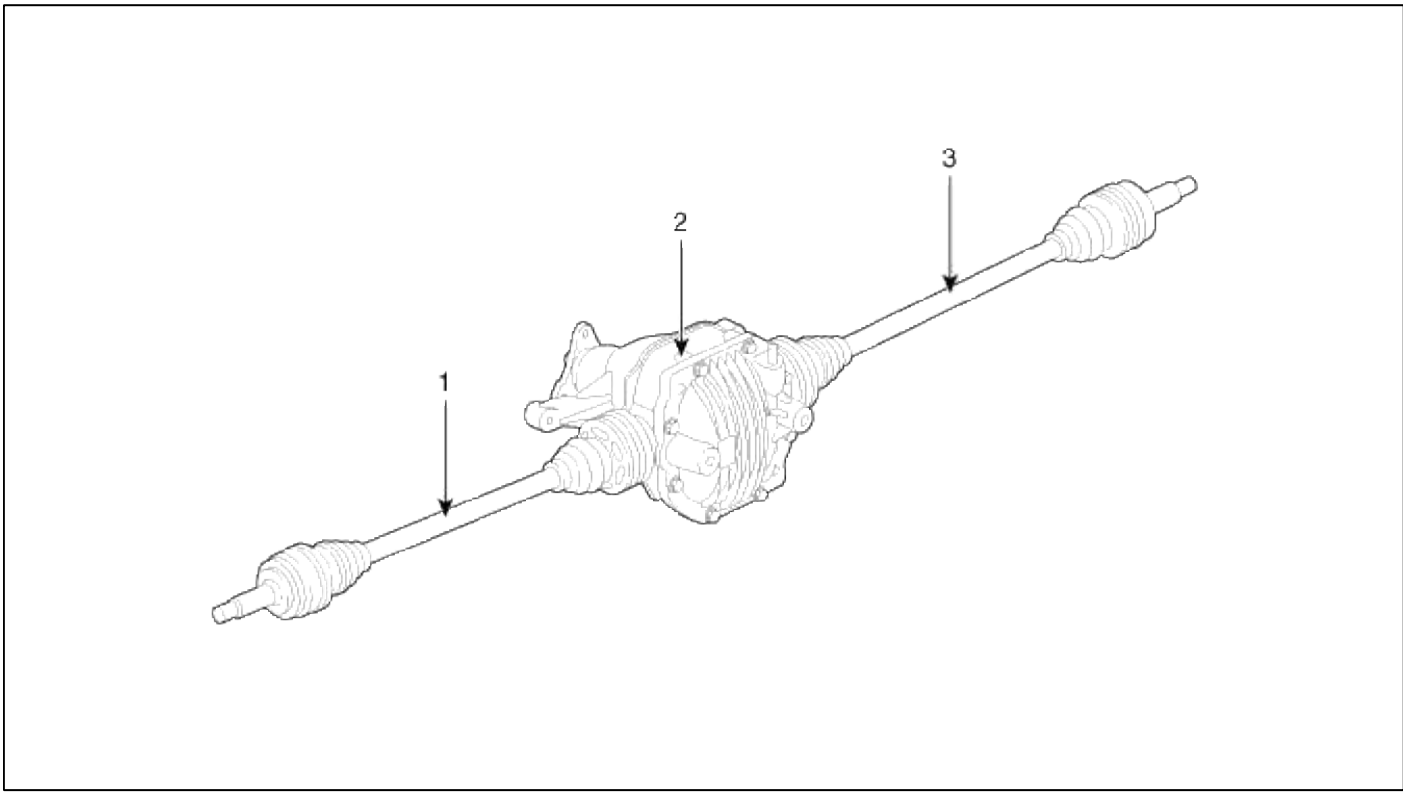
13. Installation is the reverse order of removal.

Ispection

1. Check the hub for cracks and the splines for wear.
2. Check the brake disc for scoring and damage.
3. Check the knuckle for cracks.
4. Check the bearing for cracks or damage.

Driveshaft and axle > Rear Driveshaft Assembly > Rear Driveshaft > Components and Components Location

Component Location



1. Drive shaft (LH) 2. Drive shaft (RH)	3. Defferential assembly

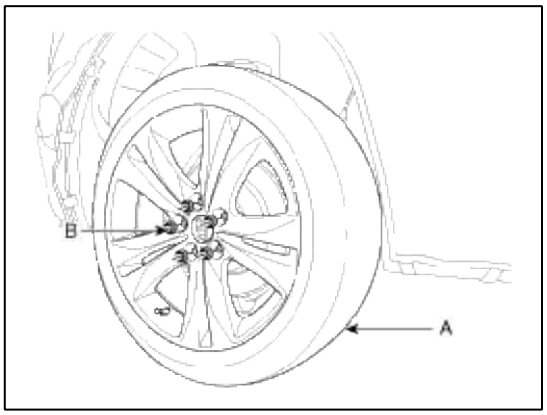
Driveshaft and axle > Rear Driveshaft Assembly > Rear Driveshaft > Repair procedures

Replacement

1. Loosen the wheel nuts slightly. Raise the vehicle, and make sure it is securely supported.

2. Remove the rear wheel and tire(A) from rear hub .

Tightening torque :
88.3 ~ 107.9 N.m (9.0 ~ 11.0 kgf.m, 65.1 ~ 79.6 lb-ft)

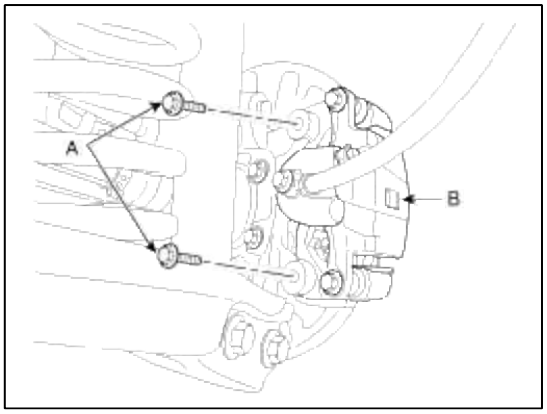


CAUTION

Be careful not to damage to the hub bolts when removing the rear wheel and tire.

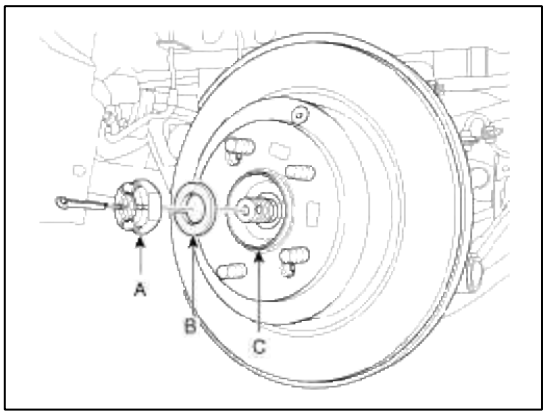
3. Remove the brake caliper mounting bolts (A), and then place the brake caliper assembly (B) with wire as shown in the illustration.

Tightening torque :
49.0 ~ 58.8 N.m (5.0 ~ 6.0 kgf.m, 36.1 ~ 43.3 lb-ft)



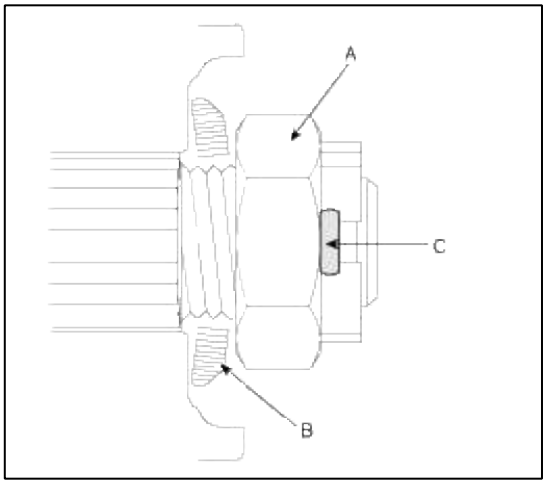
4. Remove the split pin(A), then remove castle nut(B) and washer(C) from the front hub under applying the break.

Tightening torque :
200 ~ 280 N.m (20.0 ~ 28.0 kgf.m, 144.6 ~ 202.5 lb-ft)



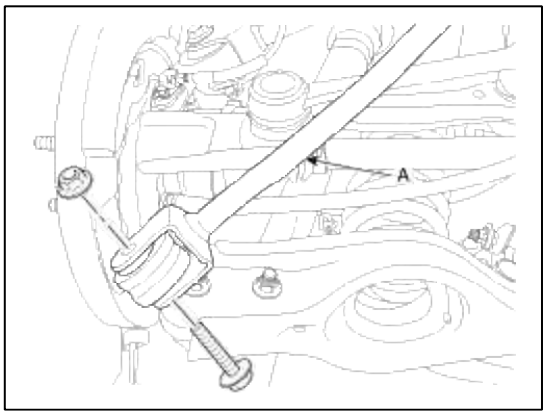
CAUTION

The washer (B) should be assembled with convex surface outward when installing the castle nut (A) and split pin (C).

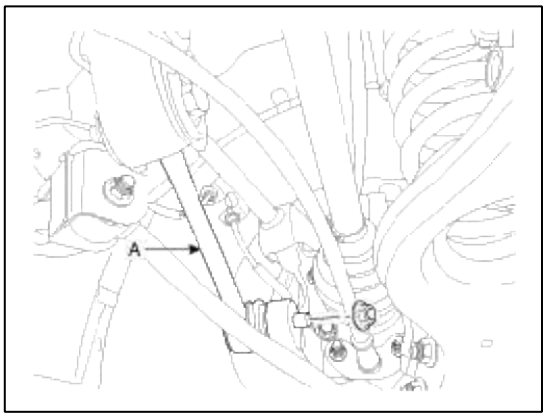


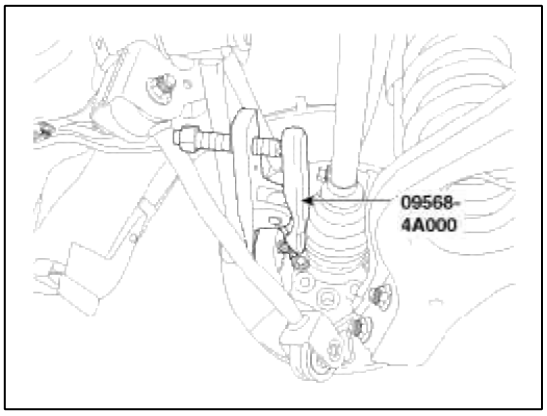
5. Remove the rear break lining (Refer to BR group-Front brake).
6. Loosen the trailing arm mount bolt & nut and than remove the trailing arm (A).

Tightening torque :
98.1 ~ 117.7 N.m (10.0 ~ 12.0 kgf.m, 72.3 ~ 86.8 lb-ft)



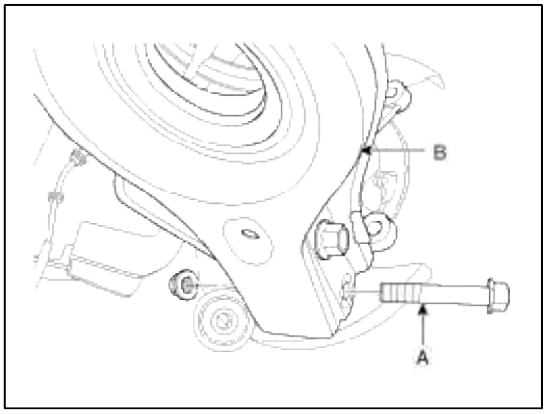
7. Loosen the assist arm mount nut and than disconnect the assist arm(A).





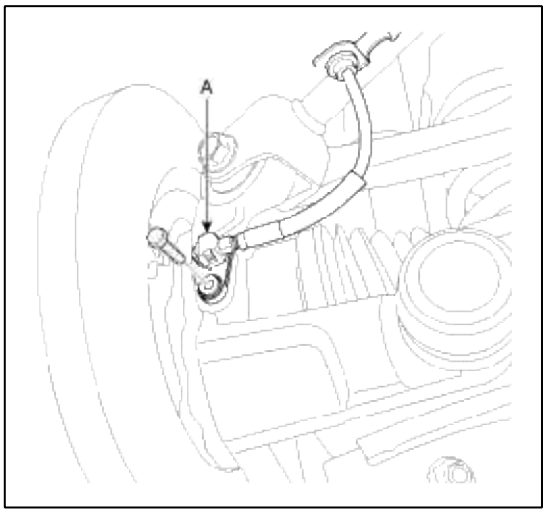
8. Remove lower arm mount bolt(A) and than remove the lower arm(B).

Tightening torque :
140 ~ 160 N.m (14.0 ~ 16.0 kgf.m, 101.2 ~ 115.7 lb-ft)

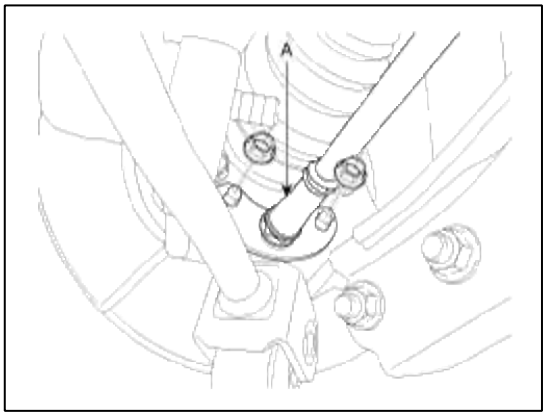


9. Remove the wheel speed sensor(A).

Tightening torque :
6.9 ~ 10.8 N.m (0.7 ~ 1.1 kgf.m, 5.1 ~ 8.0 lb-ft)

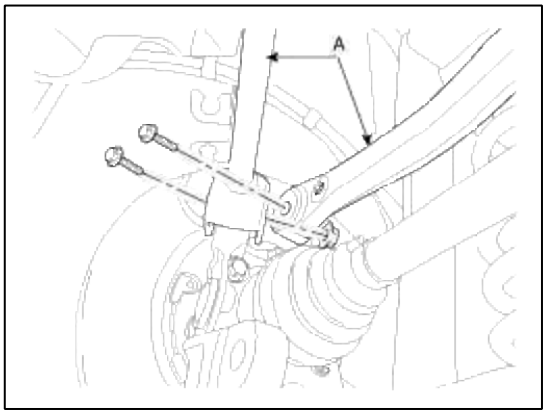


10. Loosen the brake cable mount nuts and than remove the brake cable(A).

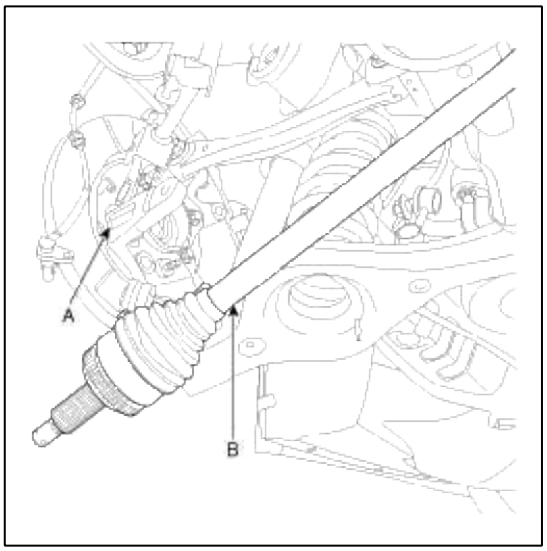


11. Loosen the upper arm(A) link mount bolt & nut and then remove the carrier assembly(B).

Tightening torque :
78.5 ~ 88.3 N.m (8.0 ~ 9.0 kgf.m, 57.9 ~ 65.1 lb-ft)

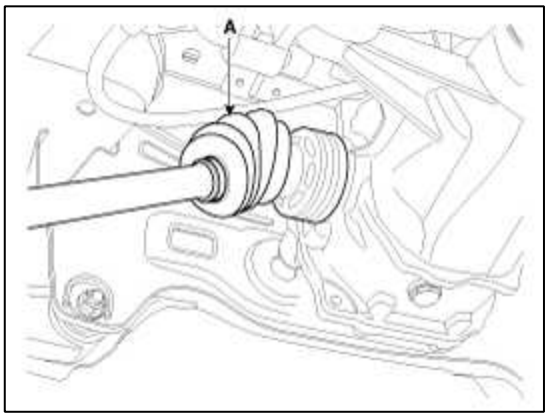


12. Push the rear axle carrier (A) outward and separate the driveshaft (B) from the axle hub.



13. Remove driveshaft (A)from differential after loosen bolt(6ea).

Tightening torque :
8.8 ~ 9.8 N.m (0.9 ~ 1.0 kgf.m, 6.5 ~ 7.2 lb-ft)



CAUTION

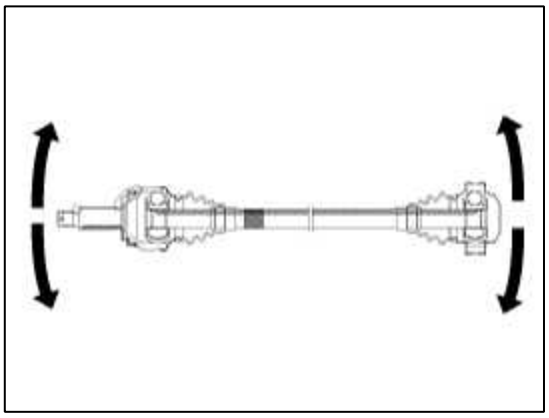
- Use a pry bar(A) being careful not to damage the differential and joint.
- Do not insert the pry bar(A) too deep, as this may cause damage to the oil seal.
- Do not pull the driveshaft by excessive force it may cause components inside the joint kit to dislodge resulting in a torn boot or a damaged bearing.
- Plug the hole of the differential case with the oil seal cap to prevent contamination.
- Support the driveshaft properly.
- Replace the retainer ring whenever the driveshaft is removed from the differential case.
- Do not take the drive shaft a part. Please, replace drive shaft with assembly.

14. Installation is the reverse order of removal.

Inspection

1. Check the driveshaft boots for damage and deterioration.
2. Check the ball joint for wear and damage.
3. Check the splines for wear and damage.

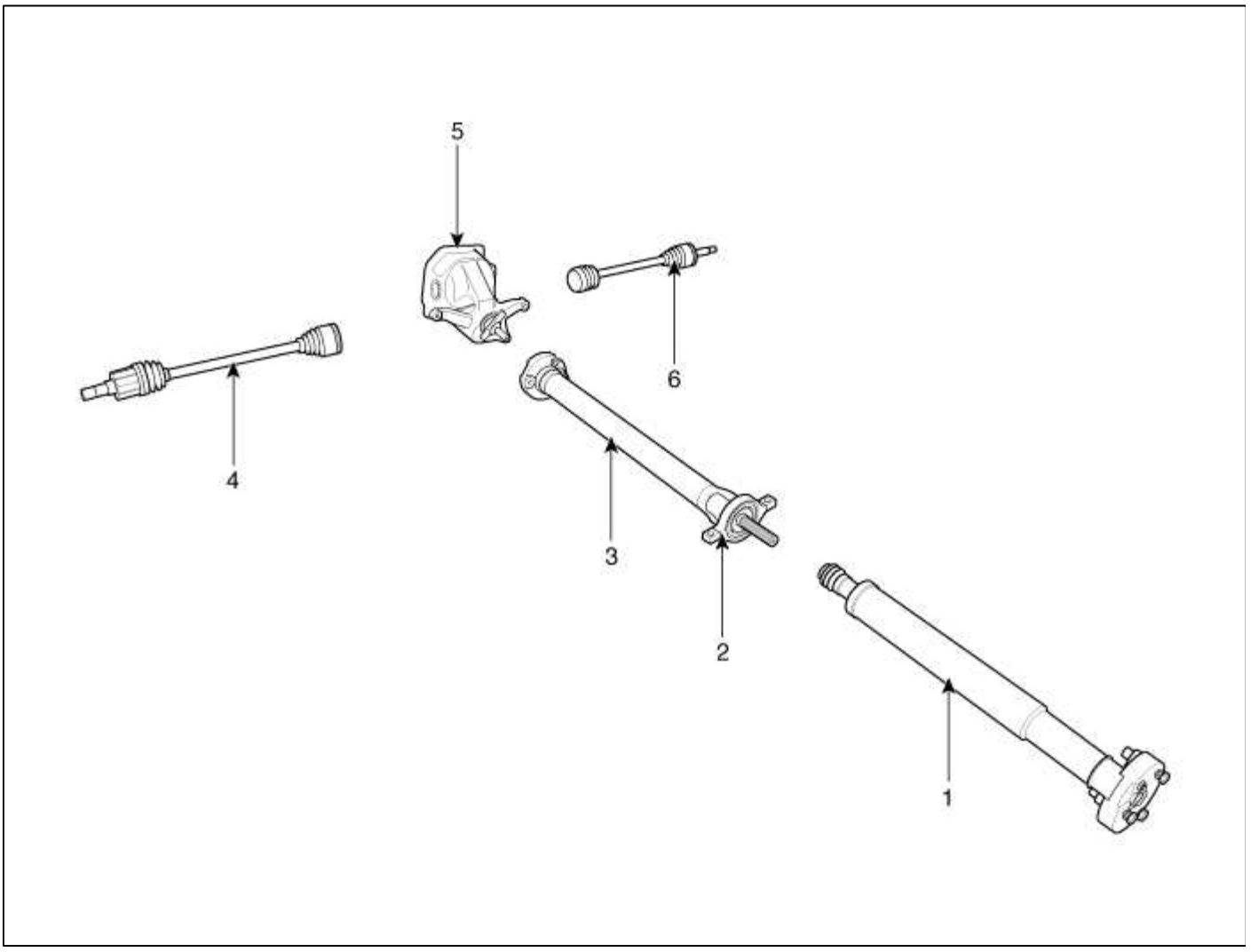
4. Check the dynamic damper for cracks, wear and position.



5. Check the driveshaft for cracks and wears.

Driveshaft and axle > Propeller Shaft Assembly > Propeller Shaft > Components and Components Location

Components



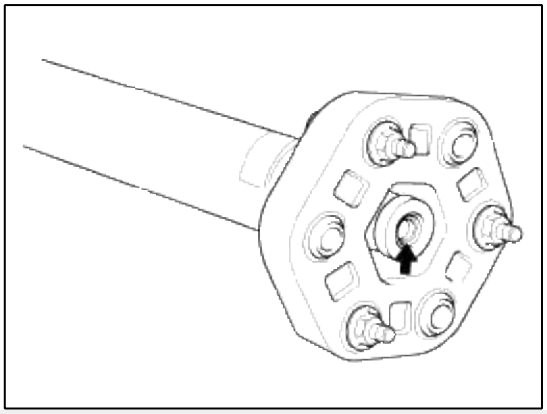
1. Front propeller shaft 2. Center bearing bracket 3. Rear propeller shaft	4. Drive shaft (R) 5. Differential carrier 6. Drive shaft (L)

Driveshaft and axle > Propeller Shaft Assembly > Propeller Shaft > Repair procedures

Inspection

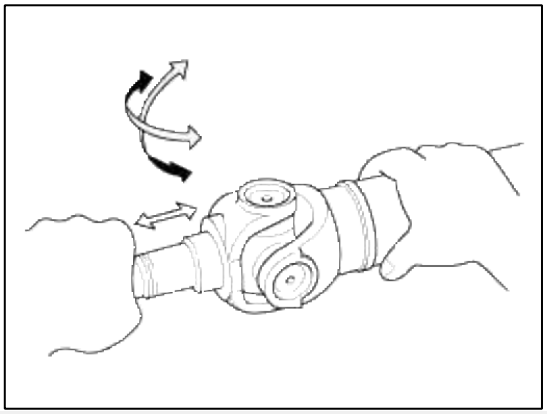
Inspect Flexible Coupling

1. Check the front and rear flexible couplings for cracks or damage.
2. Inspect the flexible coupling centering bushing. If the busing is damaged, replace the propel shaft assembly.



Universal Joint Inspect

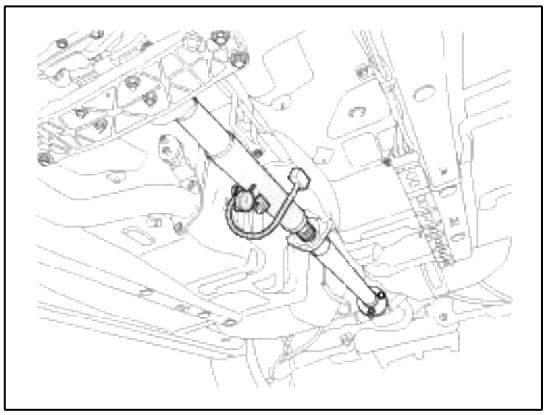
1. Check that the spider berring rotates smoothly.
2. Check that there is no play in the spider bearing if necessary, replace the propeller shaft.



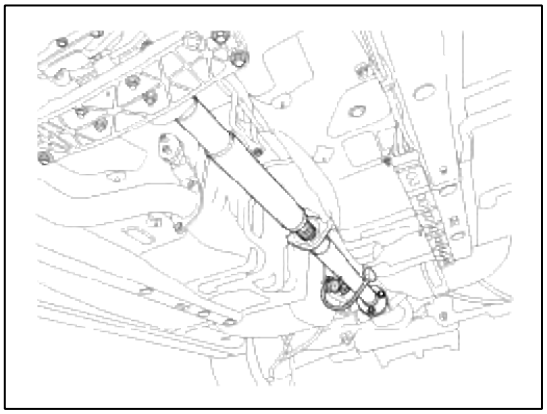
Propeller Shaft Runout

1. Install a dial indicator with its needle on the center of front propeller shaft or rear propeller shaft.
2. Turn the other propeller shaft slowly and check the runout. Repear this procedure for the other propeller shaft.

Front Propeller Shaft Runout : 0.3mm (0.012in.)



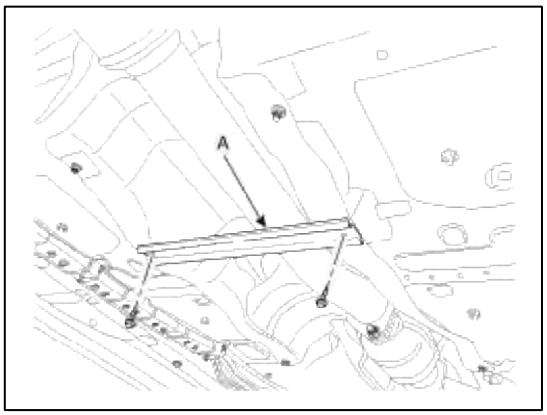
Rear Propeller Shaft Runout : 0.3mm (0.012in.)



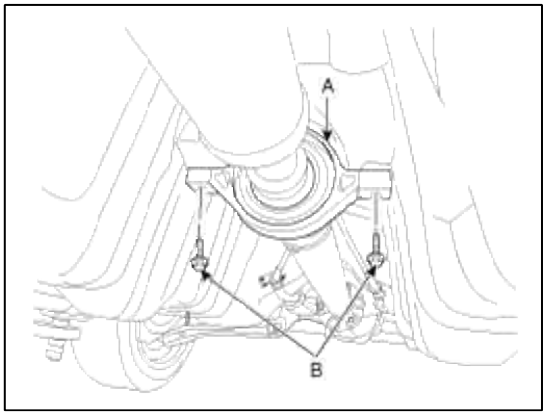
3. If the runout on either propeller shaft exceeds the service limit, replace the propeller shaft assembly.

Replacement

1. Loosen the mount bolt and then remove the bracket(A).

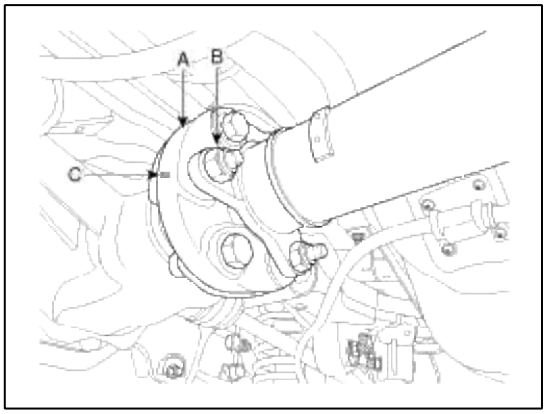


2. Remove the rear muffler(Refer to FL group-Muffler)
3. Loosen the mount bolts and then heating bracket.
4. Remove the center bearing bracket(A) mounting bolts(B).

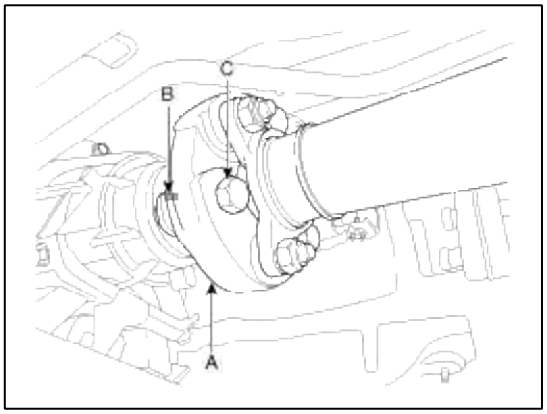


5. After making a match mark(C) on the rubber coupling(A) and rear differential companion(B), remove the propeller shaft mounting bolts(D).

Tightening torque :
90 ~ 110 N.m (9.0 ~ 11.0 kgf.m, 65.0 ~ 79.5 lb-ft)



Tightening torque :
90 ~ 110 N.m (9.0 ~ 11.0 kgf.m, 65.0 ~ 79.5 lb-ft)



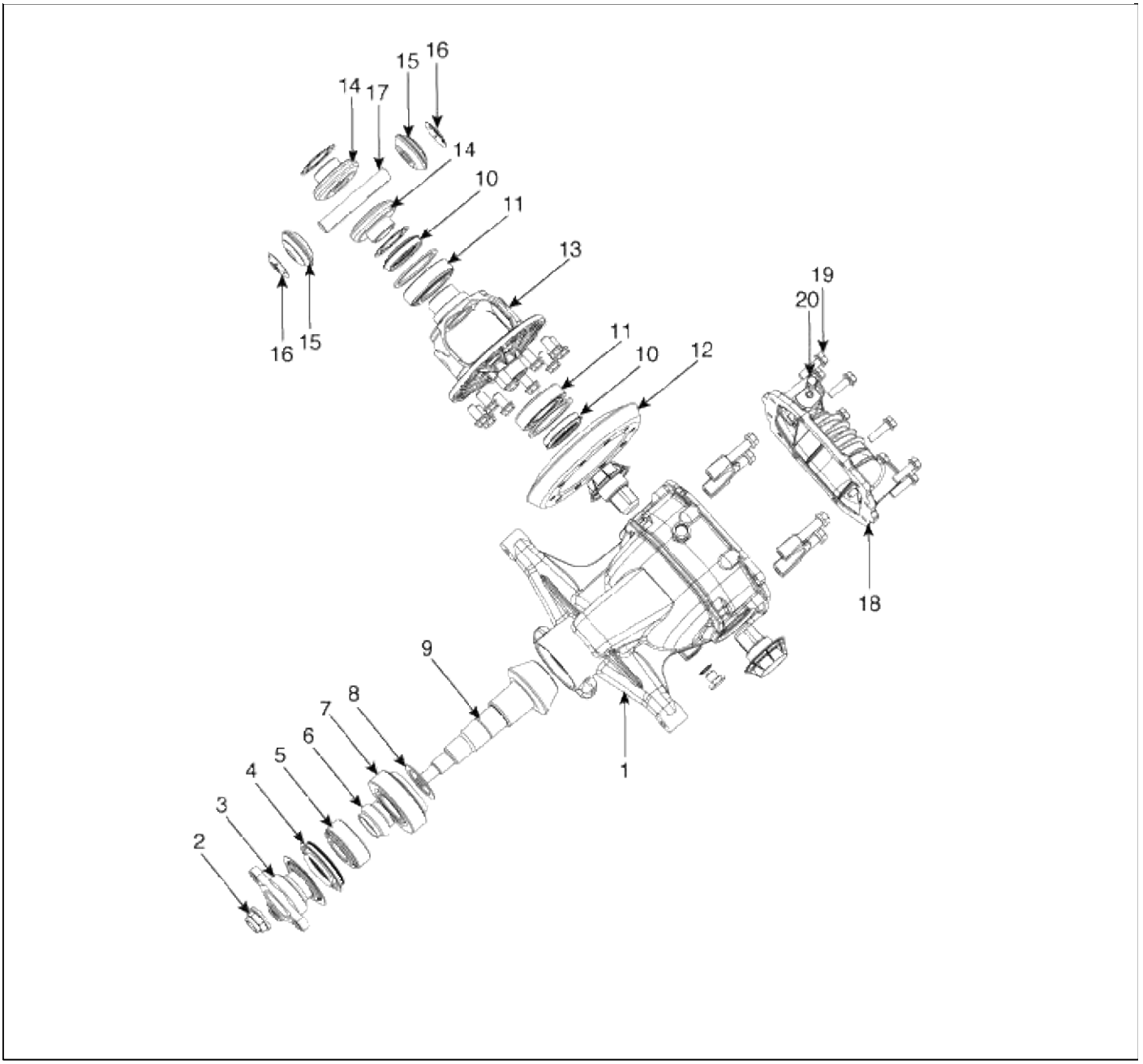
CAUTION

A. Use the hexagonal wrench to prevent damage of bolt head when removing bolts.
B. When retightening the propeller shaft mounting bolts after removing them, each bolt and washer must be placed in its original position and bolt insertion direction must be the same as before, so make marks not to allow the bolts and washers to be mixed up before removing the propeller shaft.
C. If the position and direction of the propeller shaft mounting bolts and washers are reversed, it may cause vibration and noise at high vehicle speeds due to imbalance in the propeller shaft.
D. If abnormal vibration and noise occur at high vehicle speeds after replacing propeller shaft with new one, balance the propeller shaft with a balancing machine.

6. Installation is the reverse order of removal.

Driveshaft and axle > Differential Carrier Assembly > Rear Differential Carrier > Components and Components Location

Components



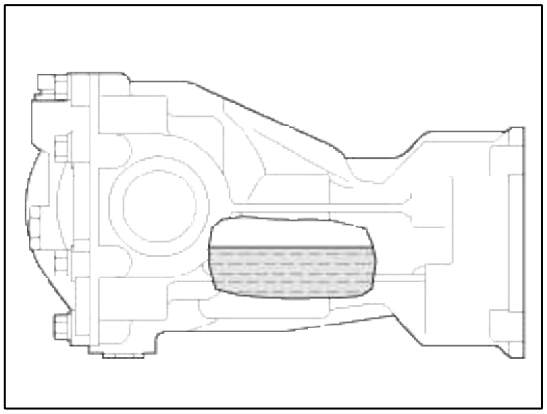
1. Differential	8. Inner bearing adjust shim	15. Pinion gear
2. Pinion locking nut	9. Drive gear	16. Thrust washer
3. Oil Seal guide	10. Oil seal	17. Differential pinion shaft
4. Pinion oil swal	11. Differential side bearing	18. Differential cover
5. Outer pinion bearing	12. Ring gear	19. Differential cover mounting bolts
6. Pinion bearing spacer	13. Differential	20. Air breather
7. Inner pinion bearing	14. Cam side gear	21. Filler piug

Driveshaft and axle > Differential Carrier Assembly > Rear Differential Carrier > Repair procedures

Replacement

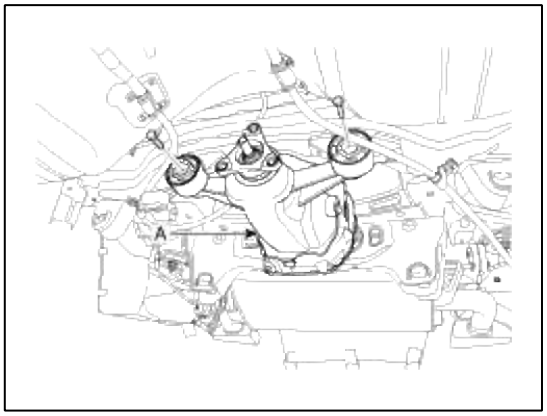
1. Fill the gear oil.

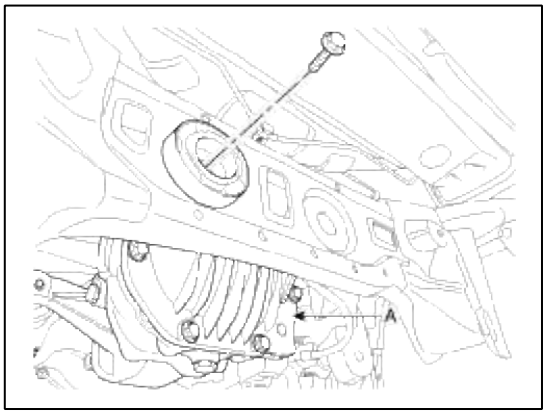
Specified lubricant:
Hypoid ger oil, MS 517-15 (API GL-5, SAE 75W/90)
Oil quantity: Fill the reservoir to the plug hold (About 1.4L ± 0.05L)



2. Remove the rear driveshaft(Refer to DS group-Rear driveshaft)
3. Remove the propellshaft assembly(Refer to DS group-Propellshaft)
4. Loosen the differential carrier assembly mount bolts and than remove the differential assembly(A)

Tightening torque :
80 ~ 100 N.m (8.0 ~ 10.0 kgf.m, 57.8 ~ 72.3 lb-ft)



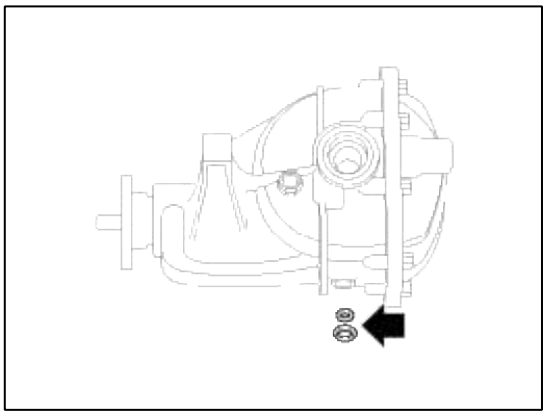


5. Installation is the reverse order of removal.

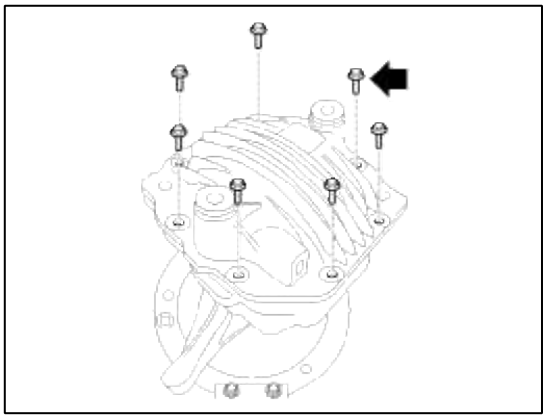
Disassembly

Rear differential carrier

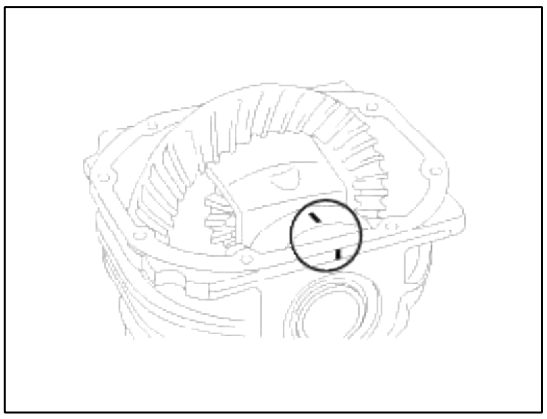
1. Fill the gear oil.



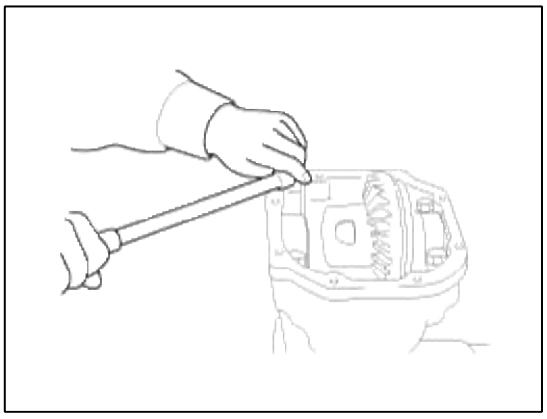
2. Loosen the mount bolts and than remove the cover.



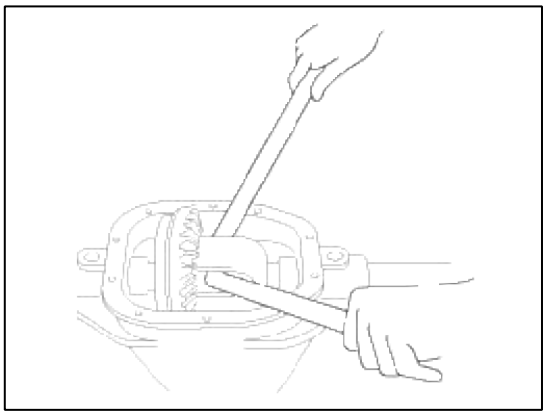
3. Mark as below before removing the differential assembly not to be changed with the left/right side of bearing caap.



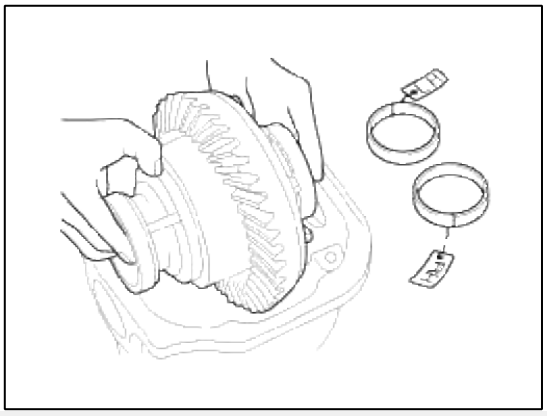
4. Loosen the bearing cap bolts and than bearing cap.



5. Disassembly the differential assembly.

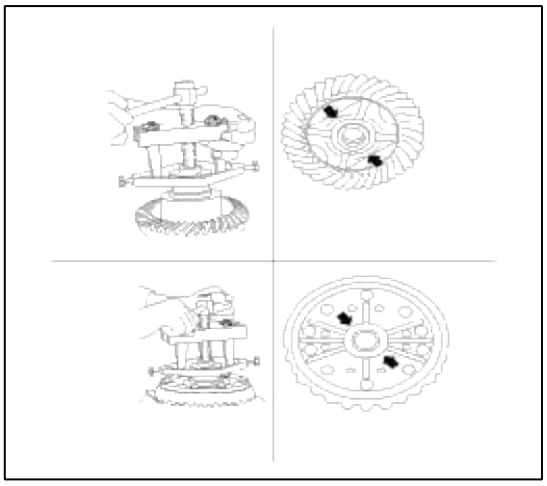


6. Mark as below removing the differential assembly not to be changed with the left/right side of bearing race.

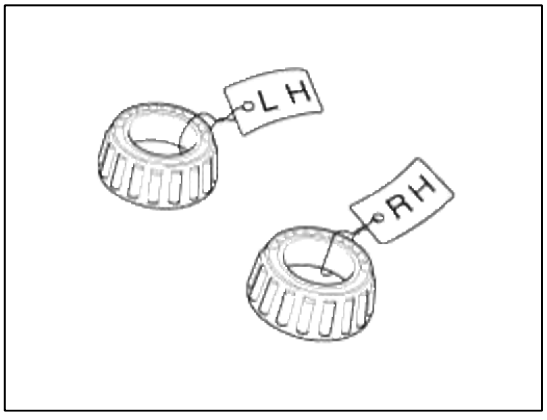


Diff assembly Disassembly

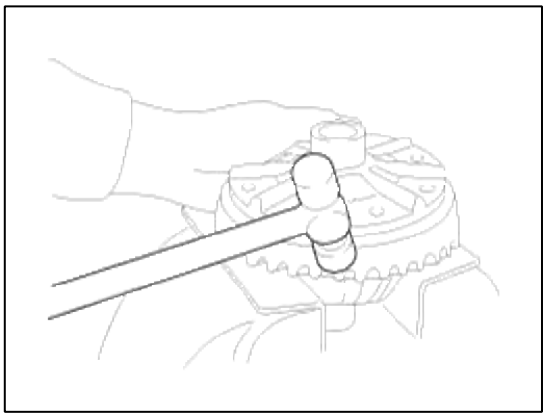
1. Remove the bearing not to be dameged after setting the bearing remover at the discape hole.



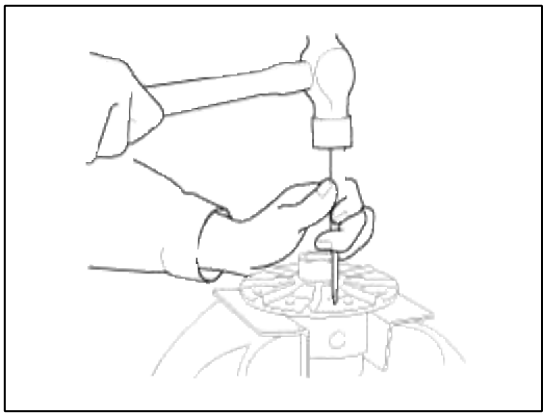
2. Mark as blow removing the bearing no to be changed with the left/right side of bearing.



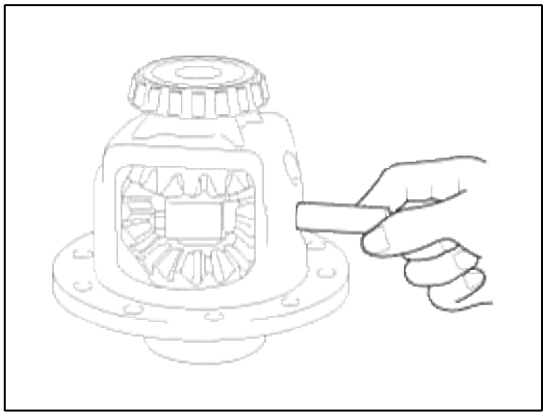
3. Loosen the ring gear bolt and than remove the drive gear.



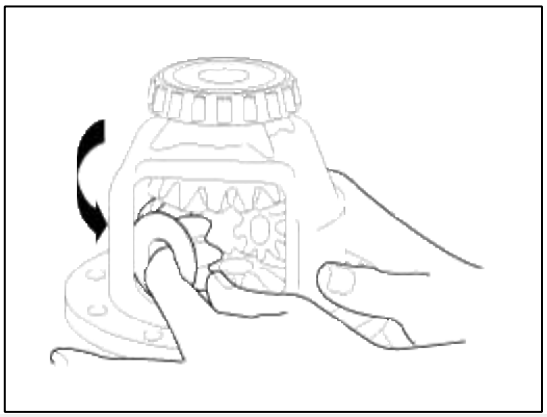
4. Disconnect the lock pin.



5. Disconnect the dif shafe.

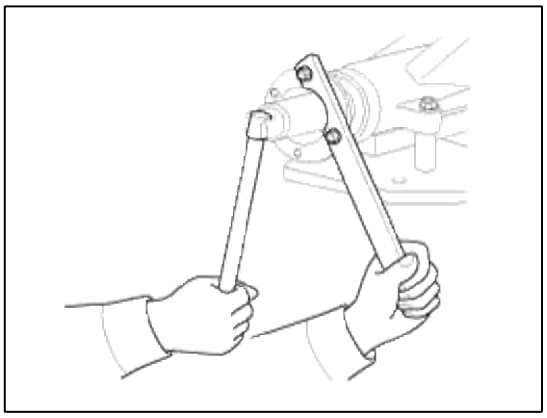


6. Disassembly the diff shat/diff side gear/diffpinion gear/washer as below by putting a finger into the hole of diff shaft.

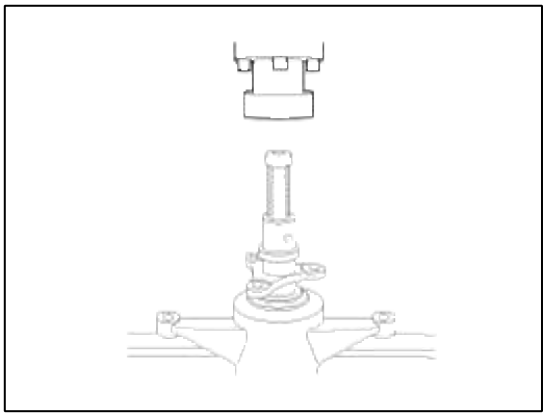


Pinion assembly disassembly

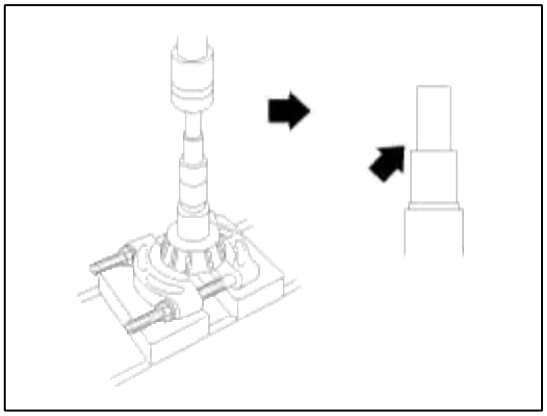
1. Loosen the pinion locking nut.



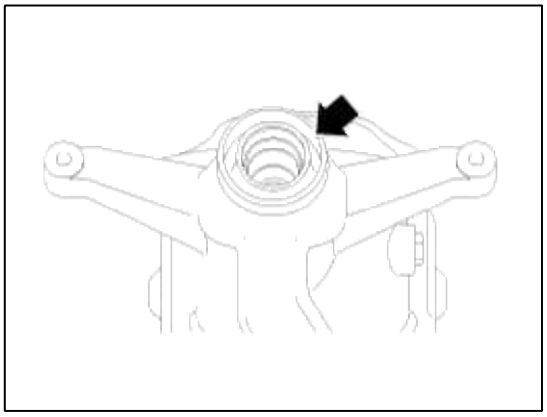
2. Remove the flang/pinion gear/pinion outter bearing by compressing the pinion gear with the pressing machine.



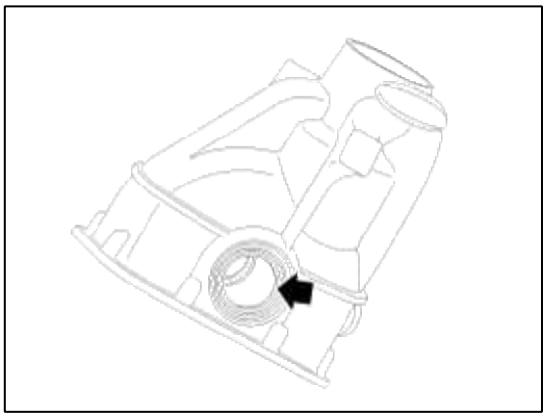
3. Remove the pinion inner bearing using the pinion gear press.



4. Remove the pinion oil seal.

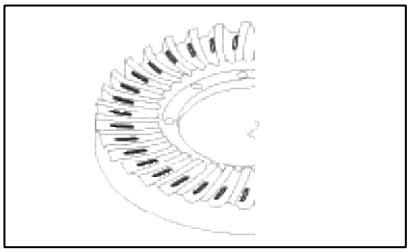
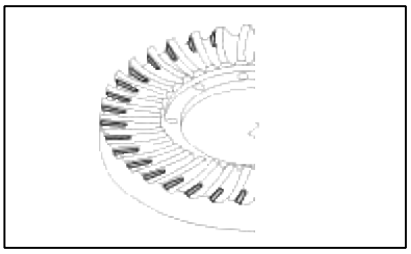
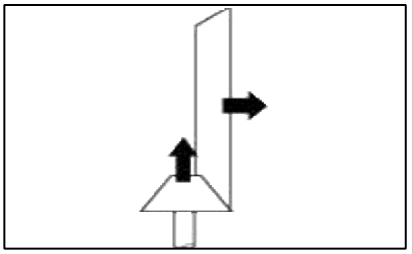
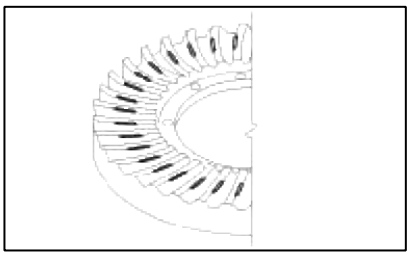
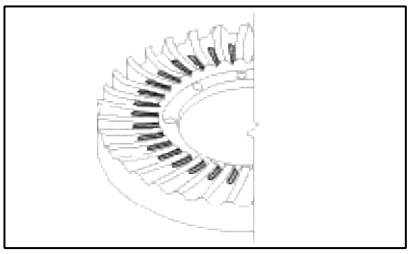
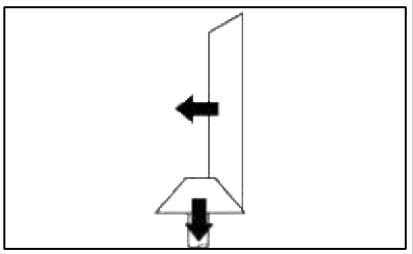
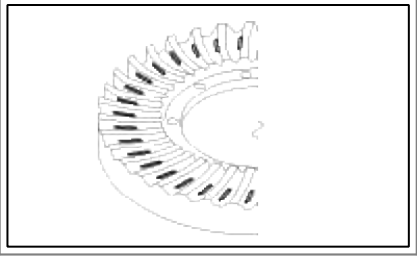


5. Remove the right /left deff oil seal.



Inspection

1. Check the tooth contact pattern.

Tooth contact	Contact state	Solution	
Standard contact			
1. Heal contact		Increase the thickness of the pinion height adjusting shim, and position the drive pinion closer to the center of the drive gear. Also, for backlash adjustment, reposition the drive gear further from the drive pinion.	
2. Face contact			
3. Toe contact		Decrease the thickness of the pinion height adjusting shim, and position the drive pinion further from the center of the drive gear. Also, for backlash adjustment, reposition the drive gear closer to the drive pinion.	
4. Flank contact			

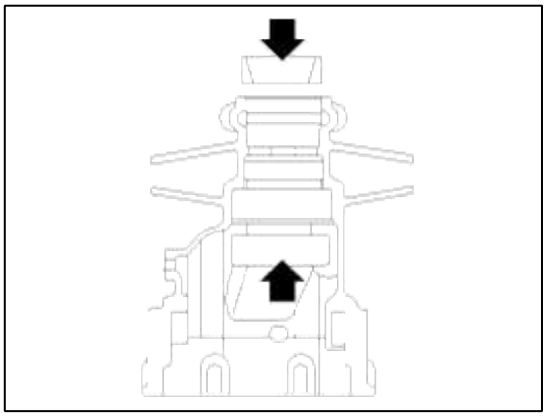
NOTE

1. Tooth contact pattern is a method for judging the result of the adjustmentof drive pinion height and final drive gear backlash. The adjustment of drivepinion height and final drive gear backlash should be repeated until the toothcontact patterns are similar to the standard tooth contact pattern.
2. When you cannot obtain a correct pattern, the drive gear and drive pinionhave exceeded their limits. Both gears should be replaced as a set.

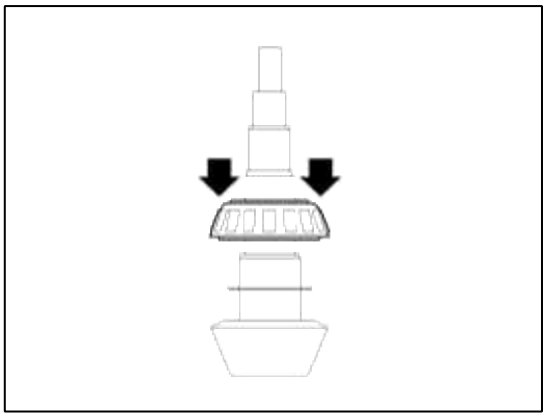
Reassembly

Pinion assembly

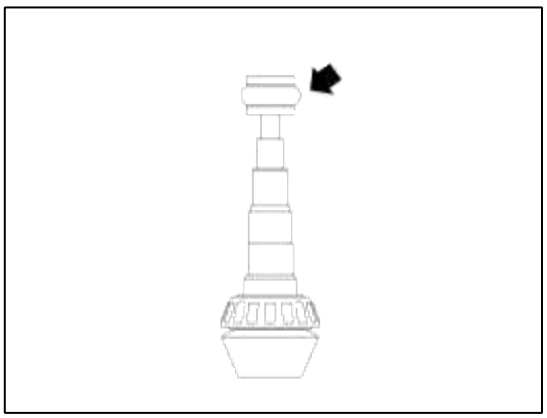
1. Press the inner/outer bearing race.



2. Select the pinion gear adjust shim and install it to the pinio gear. And then press the inner bearing.



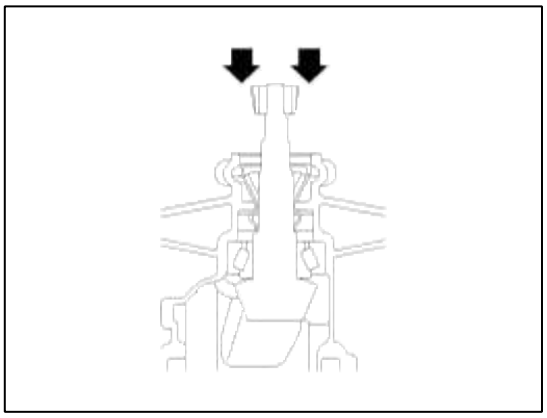
3. Instell the bearing spacer.



CAUTION

Will have to use from new spacer.

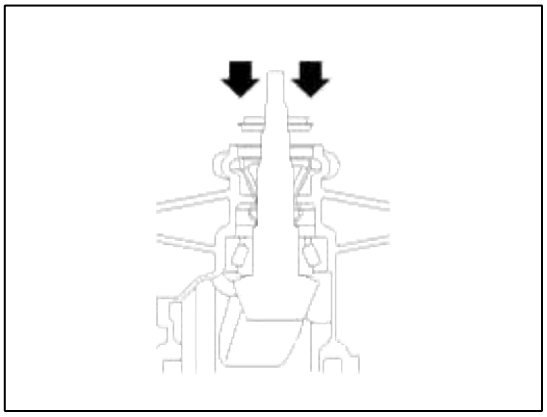
4. Press the installed pinion assembly to carrier with outer bearing in the ilustration.



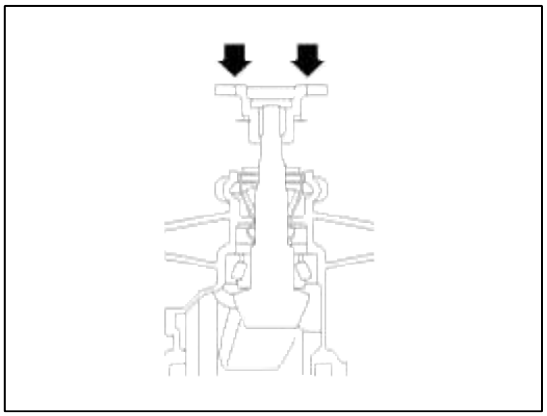
NOTE

Will have to be below pressure 5 ton.

5. Press the pinion oil seal.

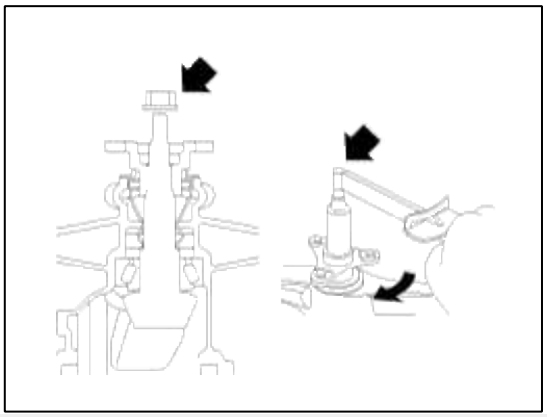


6. Press the companion flange.



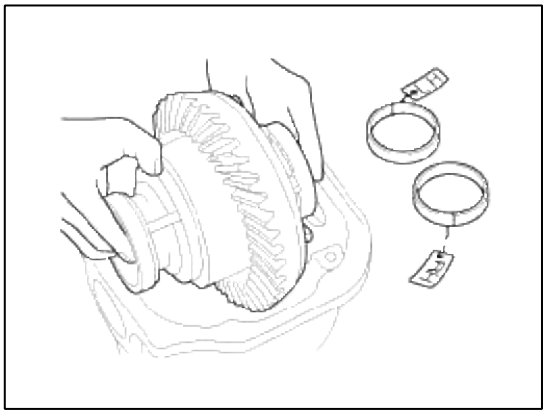
7. Install the pinion locking nut to make that the bearing freeroad is standard.

Tightening torque :
112.7 ~ 161.8 N.m (11.5 ~ 16.5 kgf.m, 83.1 ~ 119.3 lb-ft)

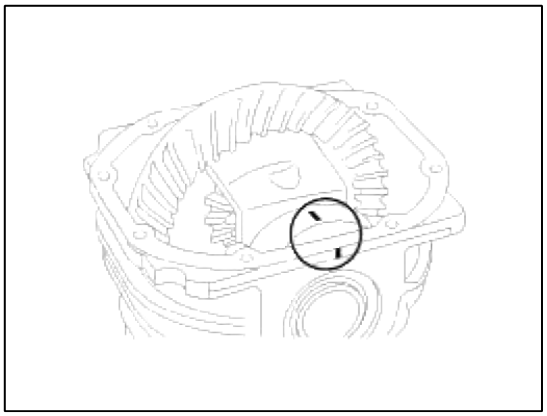


Differential case

1. Fix the diff assembly with both hands and install it to the differential carrier.

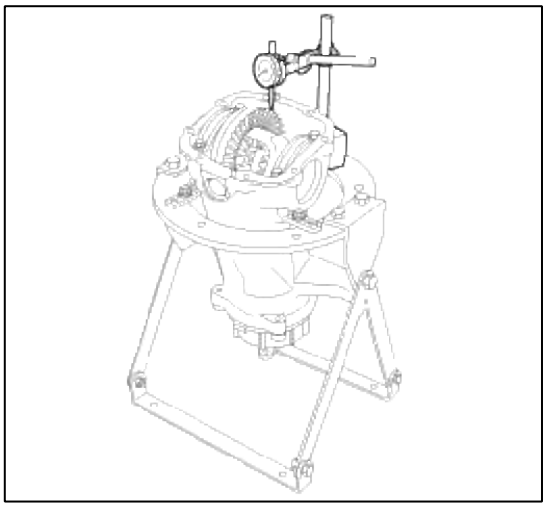


2. Instert the left/right diff shim between the diff side bearing and carrier. And then install the bearing cap with marks.



3. Adjust the diff shim.

Standard :0.10~0.15mm

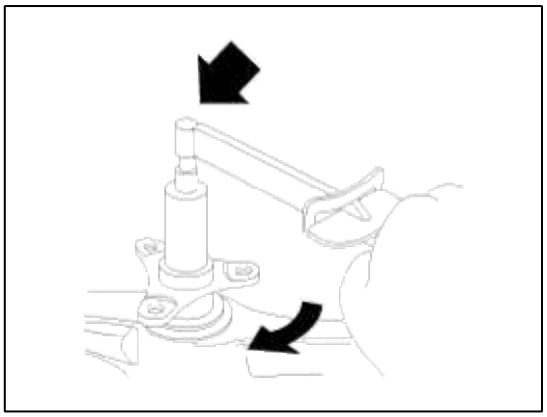


NOTE

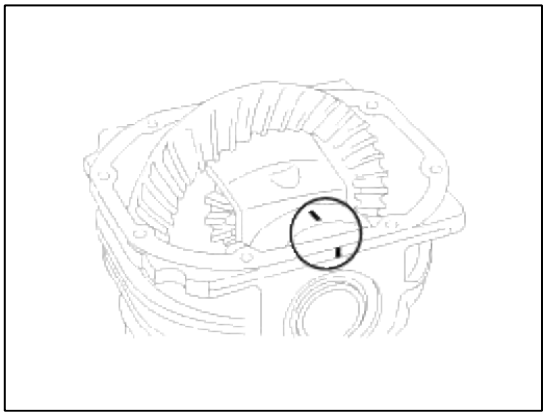
Thickness of the diff shim need to adjusted if backrash is small. Lessen the thickness of the left side diff shim. By contraries enlarge the thickness of the right side diff shim that much.

4. Measures the frea road.

Standard : Pinion freeroad : 1.9~4.9(0.2~0.5, 1.4~3.6)

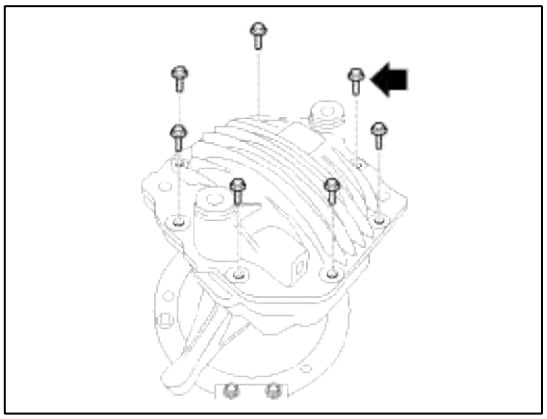


5. Applies a sealant in the carrier.

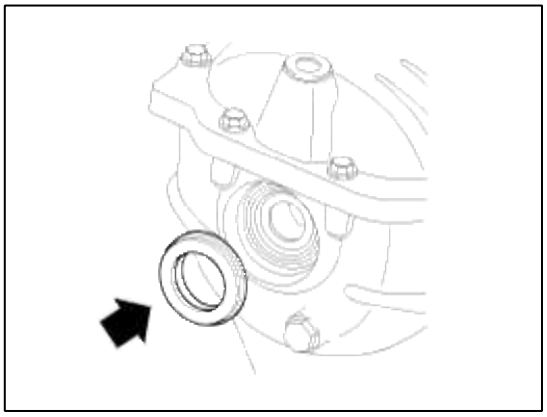


6. Install the differential cover.

Tightening torque Nm (kgf.m, lb-ft) :
39.2 ~ 49.0 N.m (4.0 ~ 5.0 kgf.m, 28.9 ~ 39.1 lb-ft)

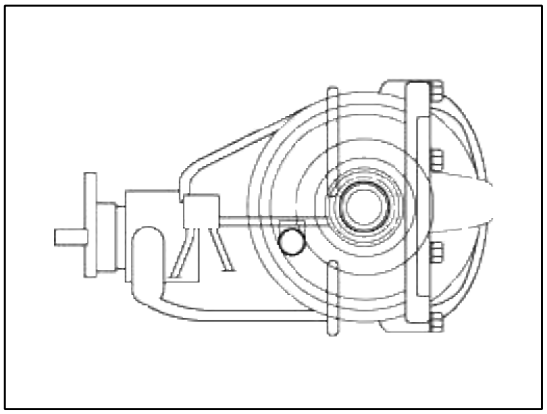


7. Install the diff oil seal.



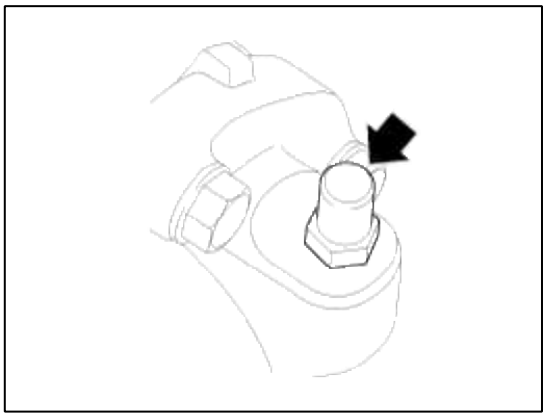
8. Install the drain plug and pinar plug.

Pillar plug : 4 ~ 6 kgf.m
Drain plug : 5 ~ 7 kgf.m



9. Install the air breather.

Tightening torque :
9.8 ~ 19.6 N.m (1.0 ~ 2.0 kgf.m, 7.2 ~ 14.4 lb-ft)



GENESIS COUPE(BK) > 2013 > G 2.0 T-MPI > Emission Control System

Emission Control System > General Information > Description and Operation

Description

Emissions Control System consists of three major systems.

- Crankcase Emission Control System prevents blow-by gas from releasing into the atmosphere. This system recycles gas back into the intake manifold (Closed Crankcase Ventilation Type).
- Evaporative Emission Control System prevents evaporative gas from releasing into the atmosphere. This system burns gas at appropriate engine operating condition after gathering it in the canister.
- Exhaust Emission Control System converts the three pollutants [hydrocarbons (HC), carbon monoxide (CO), and oxides of nitrogen (NOx)] into harmless substances by using the 3-way catalytic converter.

Emission Control System > General Information > Specifications

Specifications

Purge Control Solenoid Valve (PCSV)

Specification

Item	Specification
Coil Resistance (Ω)	19.0 ~ 22.0 [20°C(68°F)]

Fuel Tank Pressure Sensor (FTPS)

Type: Piezo-Resistive Pressure Sensor

Specification

Pressure (kPa)	Output Voltage (V)
-6.67	0.5
0	2.5
+6.67	4.5

Canister Close Valve (CCV)

Specification

Item	Specification
Coil Resistance (Ω)	23.0 ~ 26.0 [20°C(68°F)]

Tightening Torques

Item	kgf.m	N.m	lb-ft
Positive Crankcase Ventilation (PCV) Valve installation	0.8 ~ 1.2	7.8 ~ 11.8	5.8 ~ 8.7
Fuel tank pressure sensor installation bolt	0.4 ~ 0.6	3.9 ~ 5.9	2.9 ~ 4.3
Canister close valve installation bolt	0.4 ~ 0.6	3.9 ~ 5.9	2.9 ~ 4.3
Canister installation bolt	0.4 ~ 0.6	3.9 ~ 5.9	2.9 ~ 4.3
Canister service cover installation bolt	0.8 ~ 1.2	7.8 ~ 11.8	5.8 ~ 8.7
Ventilation hose connector assembly installation bolt	0.4 ~ 0.6	3.9 ~ 5.9	2.9 ~ 4.3
Canister protector installation bolt	2.0 ~ 3.0	19.6 ~ 29.4	14.5 ~ 21.7

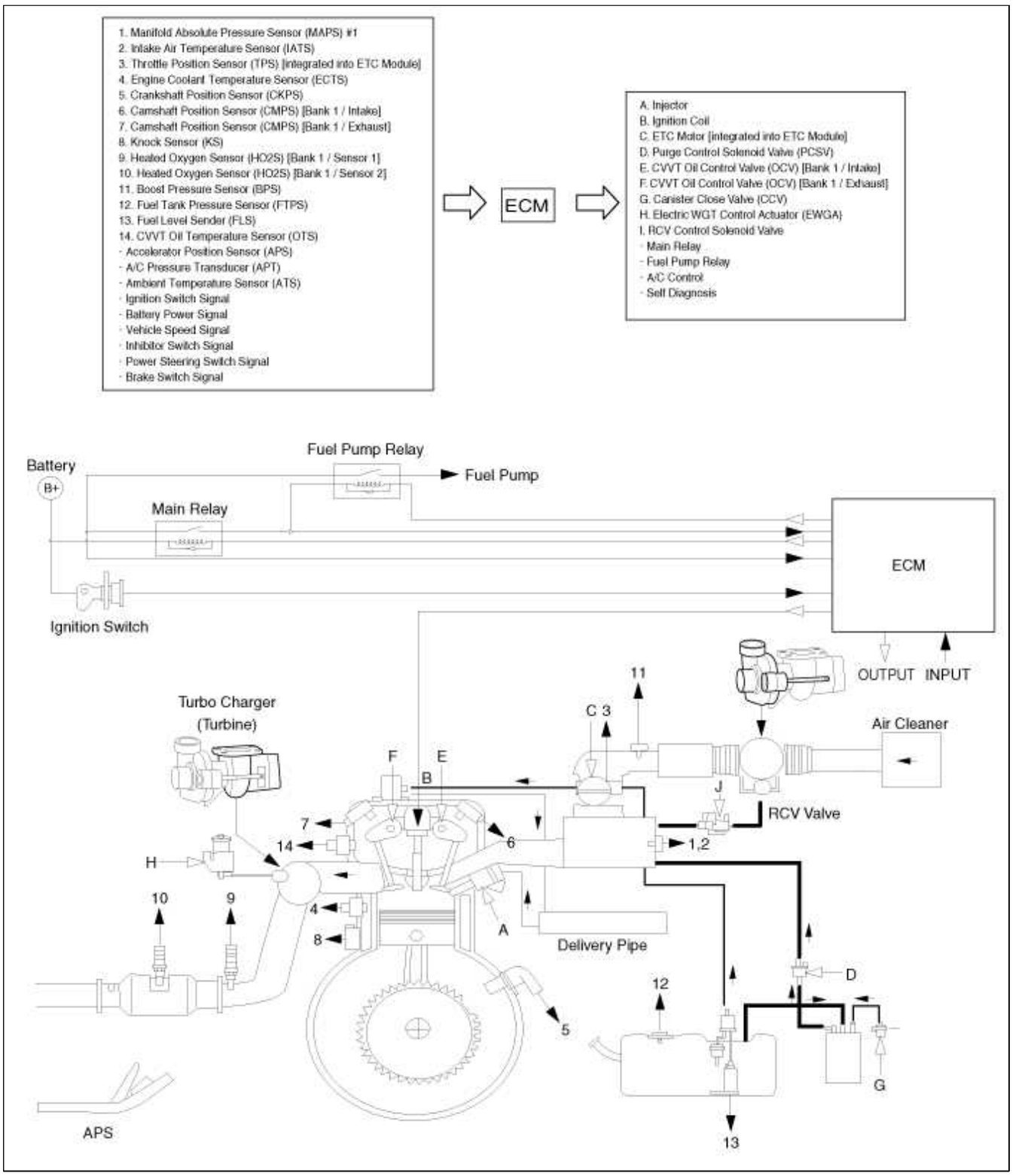
Emission Control System > General Information > Troubleshooting

Troubleshooting

Symptom	Suspect area
Engine will not start or hard to start	Vapor hose damaged or disconnected
Engine hard to start	Malfunction of the Purge Control Solenoid Valve
Rough idle or engine stalls	Vapor hose damaged or disconnected
	Malfunction of the PCV valve
Rough idle	Malfunction of the Evaporative Emission Control System
Excessive oil consumption	Positive crankcase ventilation line clogged

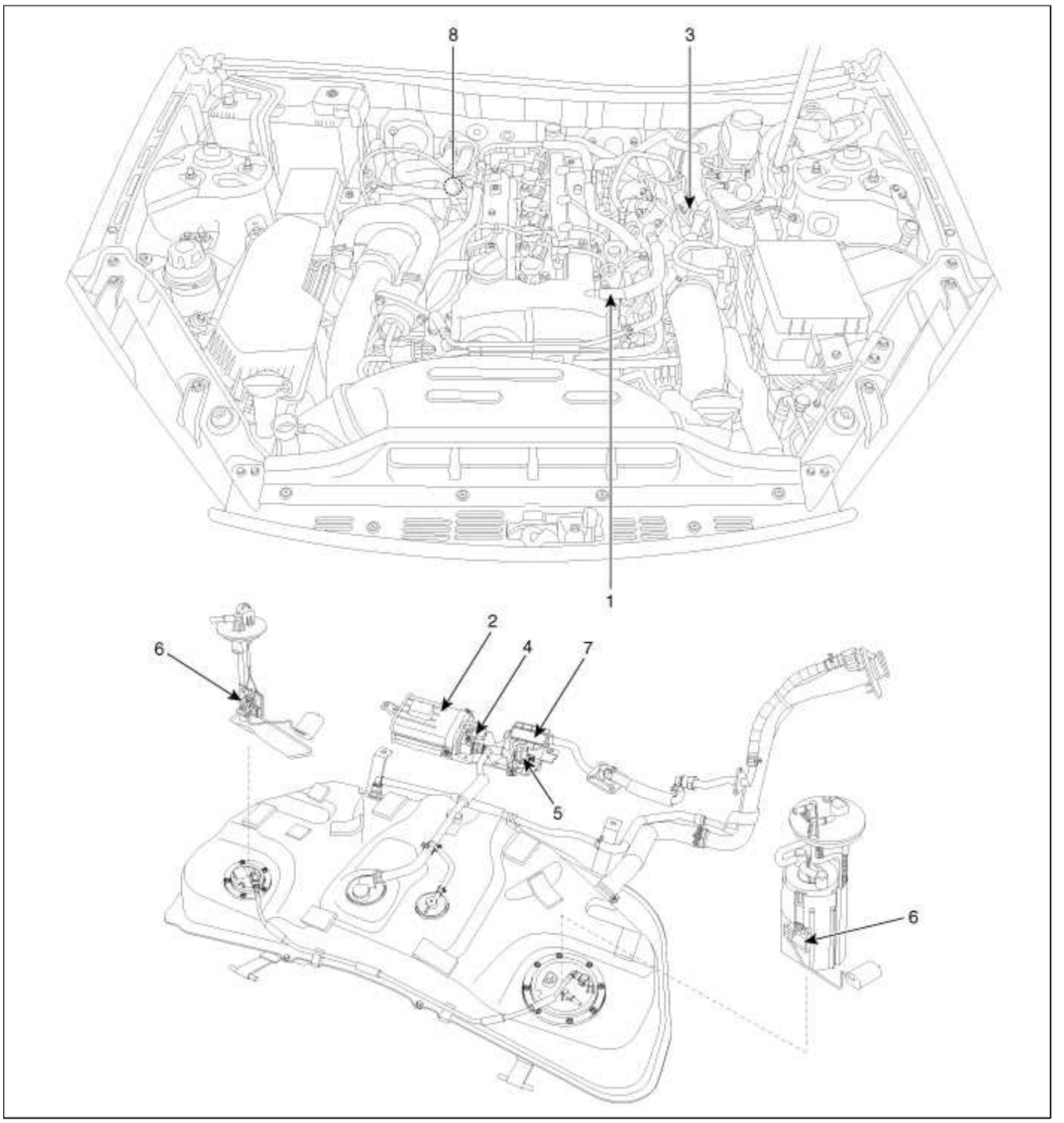
Emission Control System > General Information > Schematic Diagrams

Schematic Diagram

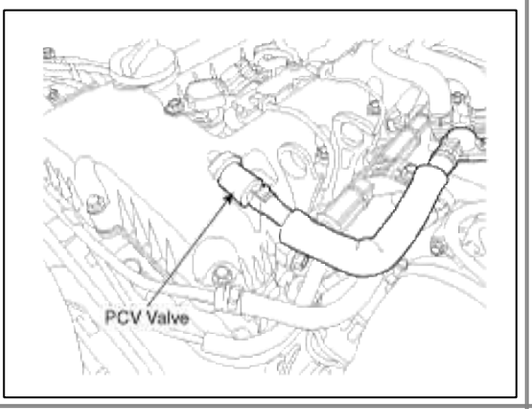
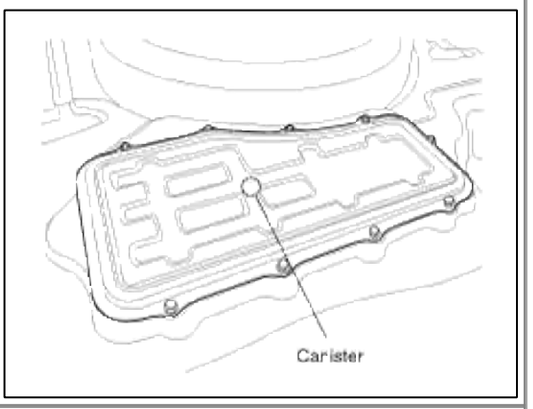
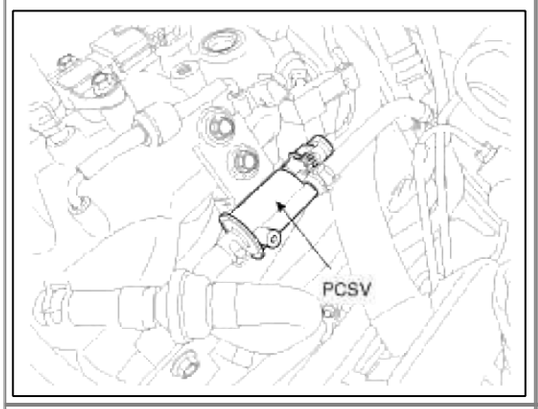
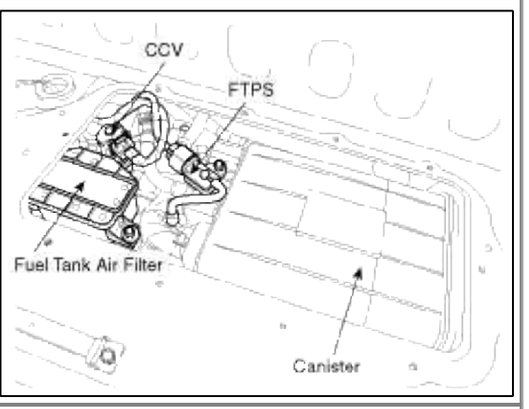
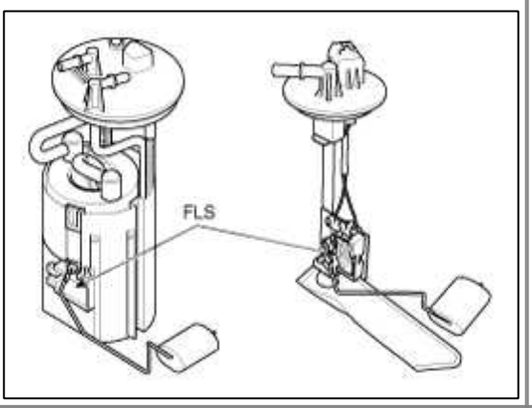
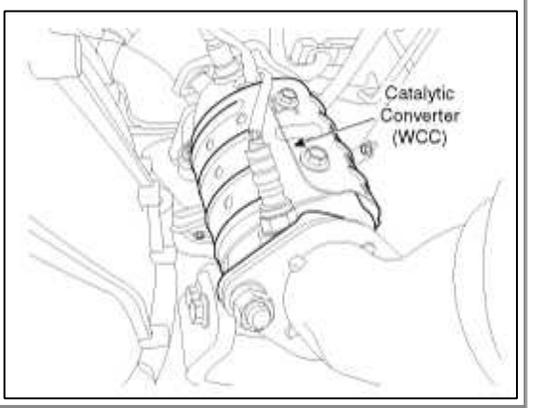
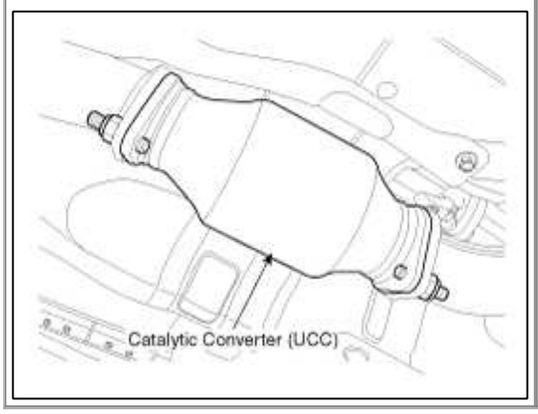


Emission Control System > General Information > Components and Components Location

Components Location

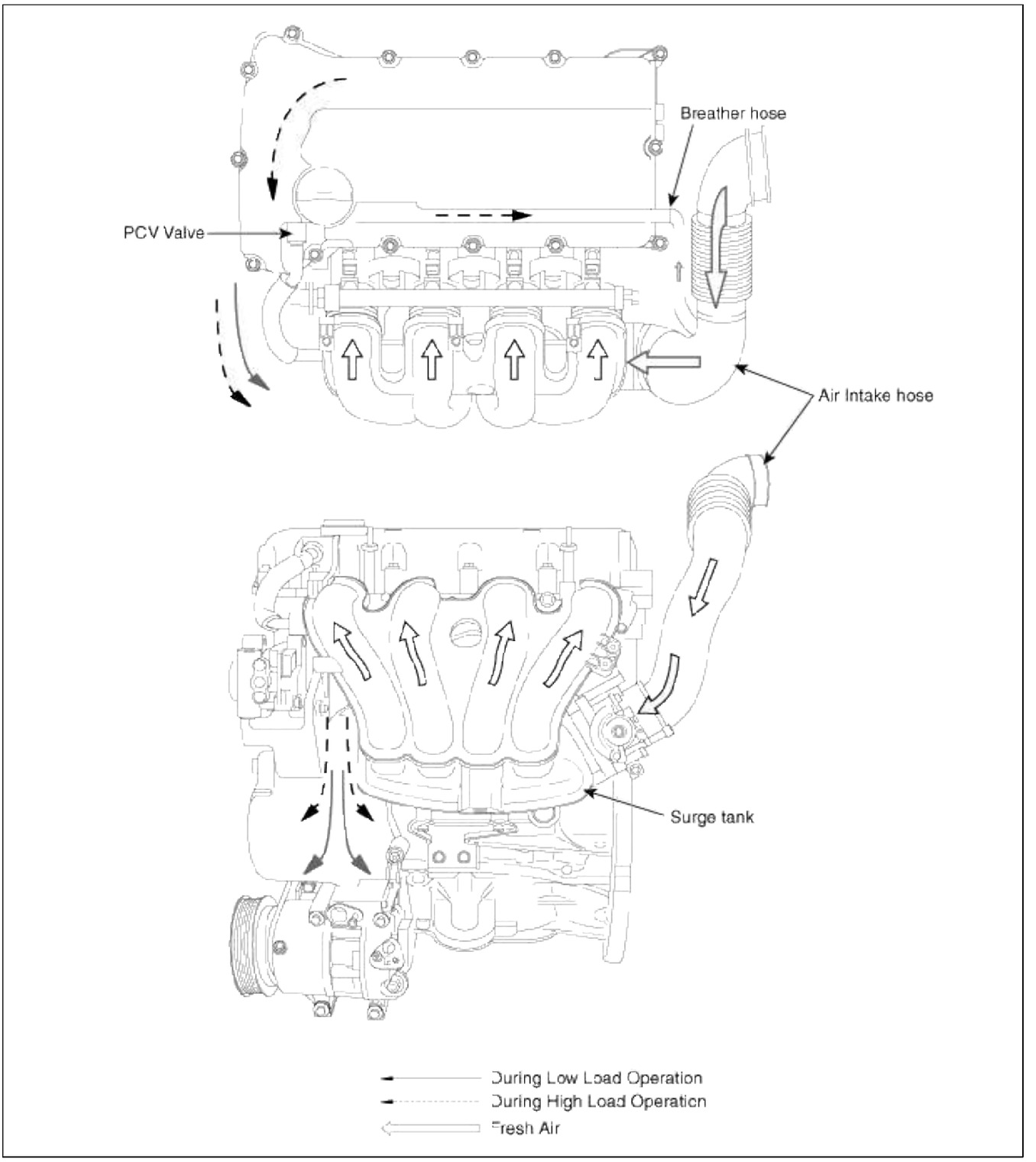


1. PCV Valve 2. Canister 3. Purge Control Solenoid Valve (PCSV) 4. Fuel Tank Pressure Sensor (FTPS)	5. Canister Close Valve (CCV) 6. Fuel Level Sender (FLS) 7. Fuel Tank Air Filter 8. Catalytic Converter (WCC+UCC)

1. PCV Valve	2. Canister
	
3. Purge Control Solenoid Valve (PCSV)	4. Fuel Tank Pressure Sensor (FTPS) 5. Canister Close Valve (CCV) 7. Fuel Tank Air Filter
	
6. Fuel Level Sender (FLS)	8. Catalytic Converter (WCC)
	
8. Catalytic Converter (UCC)	
	

Emission Control System > Crankcase Emission Control System > Schematic Diagrams

Schematic Diagram



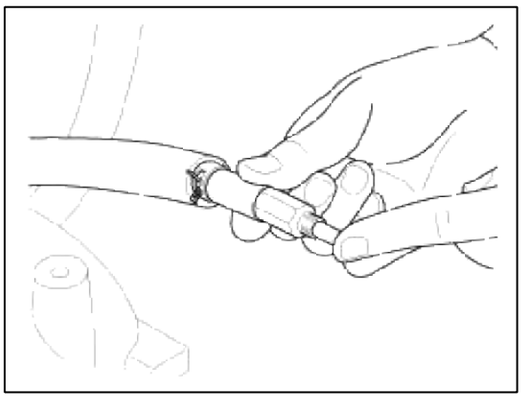
Emission Control System > Crankcase Emission Control System > Repair procedures

Inspection

1. After disconnecting the vapor hose from the PCV valve, remove the PCV valve.
2. Reconnect the PCV valve to the vapor hose.

3. Run the engine at idle, and put a finger on the open end of the PCV valve and make sure that intake manifold vacuum can be felt.

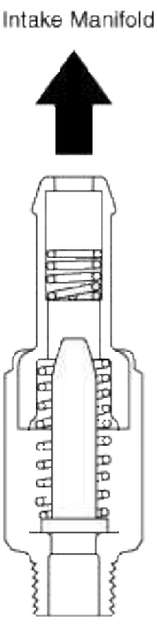
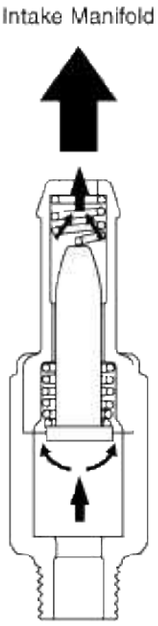
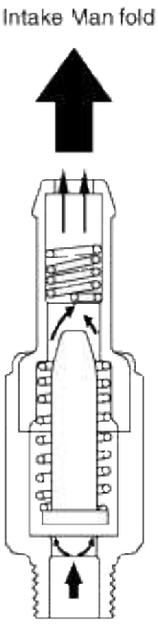
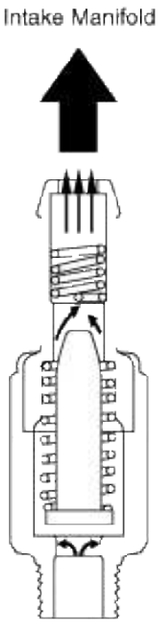
> NOTE
>
> The plunger inside the PCV valve will move back and forth at vacuum.



4. If the vacuum is not felt, clean or replace the vapor hose.

Emission Control System > Crankcase Emission Control System > Positive Crankcase Ventilation (PCV) Valve > Description and Operation

Operation Principle

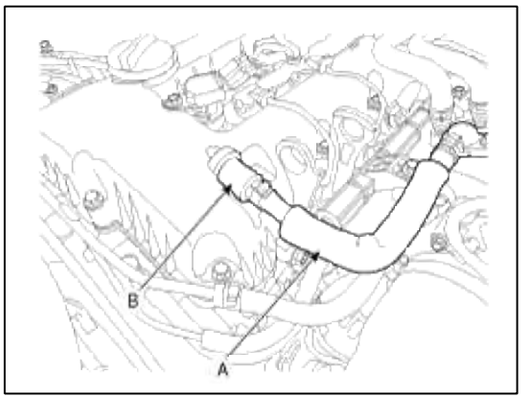
Engine Condition	Not Running	Idling or Decelerating	Normal Operation	Accelerating and High Load
Vacuum in Intake Manifold	0	High	Moderate	Low
PCV Valve	Close	Slightly Open	Properly Open	Fully Open
Blow-by Gas Flow	0	Small	Medium	Large
Schematic Diagram				

Emission Control System > Crankcase Emission Control System > Positive Crankcase Ventilation (PCV) Valve > Repair procedures

Removal

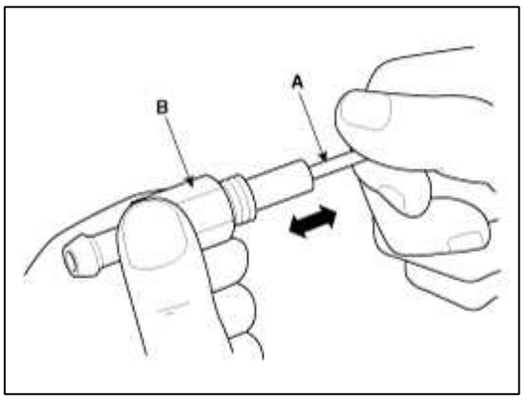
1. Disconnect the vapor hose (A).

2. Remove the PCV valve (B).



Inspection

1. Insert a thin stick (A) into the PCV valve (B) from the threaded side to check that the plunger moves.



NOTE

If the plunger does not move (PCV valve is clogged), clean or replace the valve.

Installation

1. Installation is reverse of removal.

PCV Valve installation:
7.8 ~ 11.8 N.m (0.8 ~ 1.2 kgf.m, 5.8 ~ 8.7 lb-ft)

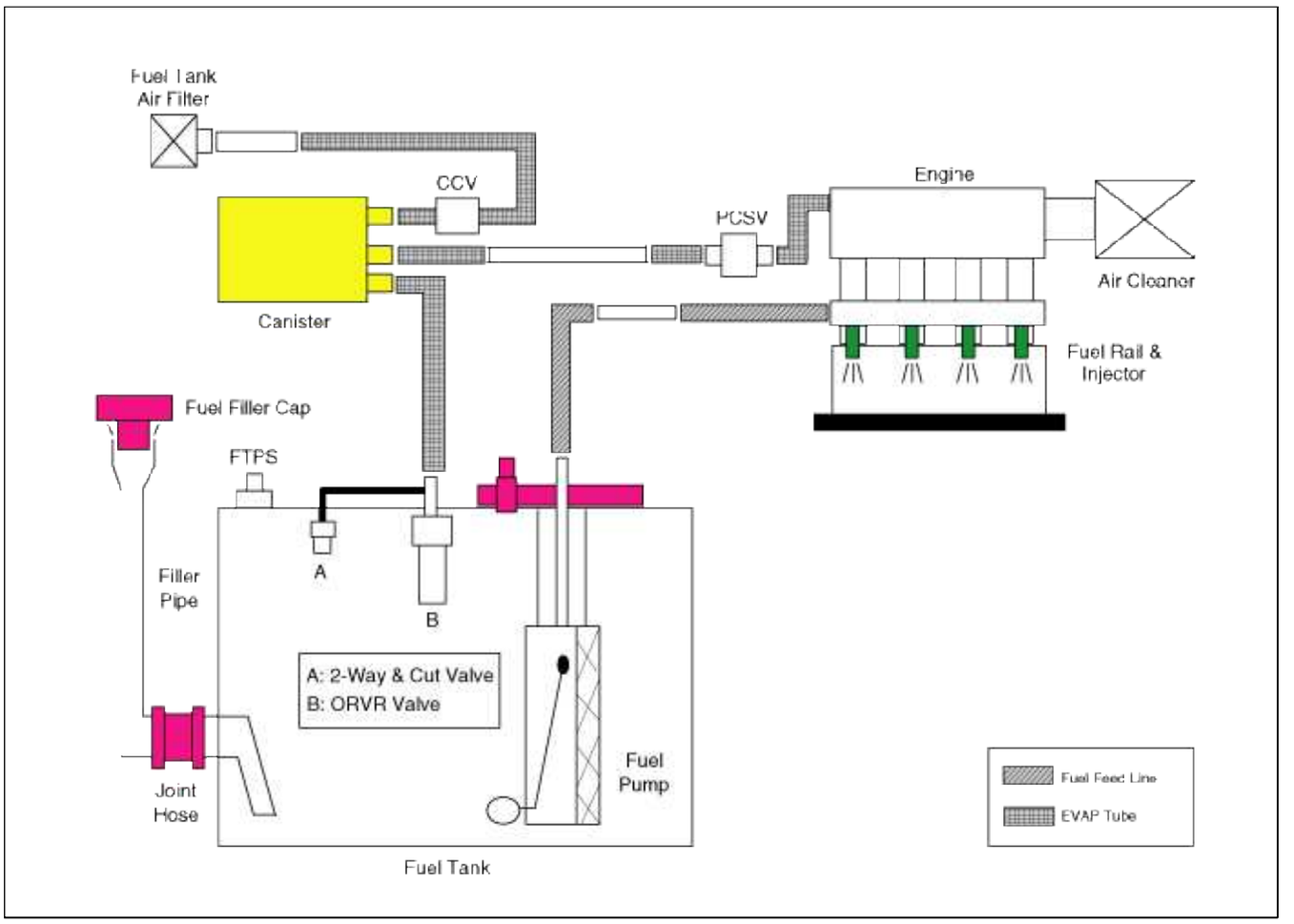
Emission Control System > Evaporative Emission Control System > Description and Operation

Description

Evaporative Emission Control System prevents fuel vapor stored in fuel tank from vaporizing into the atmosphere. When the fuel evaporates in the fuel tank, the vapor passes through vent hoses or tubes to canister filled with charcoal. The canister temporarily holds the vapor in the charcoal. If ECM determines to draw the gathered vapor into the combustion chambers during certain operating conditions, it will vacuum into intake manifold.

Emission Control System > Evaporative Emission Control System > Schematic Diagrams

Schematic Diagram



Canister

Canister is filled with charcoal and absorbs evaporated vapor in fuel tank. The gathered fuel vapor in canister is drawn into the intake manifold by the ECM/PCM when appropriate conditions are set.

Purge Control Solenoid Valve (PCSV)

Purge Control Solenoid Valve (PCSV) is installed in the passage connecting canister and intake manifold. It is a duty type solenoid valve and is operated by ECM/PCM signal.

To draw the absorbed vapor into the intake manifold, the ECM/PCM will open the PCSV, otherwise the passage remains closed.

Fuel Filler Cap

A ratchet tightening device on the threaded fuel filler cap reduces the chances of incorrect installation, seals the fuel filler. After the gasket on the fuel filler cap and the fill neck flange make contact, the ratchet produces a loud clicking noise indicating the seal has been set.

Fuel Tank Pressure Sensor (FTPS)

The Fuel Tank Pressure Sensor (FTPS) is an integral part of the monitoring system. The FTPS checks Purge Control Solenoid Valve (PCSV) operation and leaks in the Evaporative Emission Control System by monitoring pressure and vacuum level in the fuel tank during PCSV operating cycles.

Canister Close Valve (CCV)

The Canister Close Valve (CCV) is located between the canister and the fuel tank air filter. It closes off the air inlet to the canister for the Evaporative Emissions System and also prevents fuel vapors from escaping from the Canister when the vehicle is not operating.

Evaporative System Monitoring

Evaporative Emission Control Monitoring System consists of fuel vapor generation, evacuation, and leakage check step. At first, the OBD-II system checks if vapor generation due to fuel temperature is small enough to start monitoring. Then it evacuates the evaporative system by means of PCSV with ramp in order to maintain a certain vacuum level. The final step is to check if there is vacuum loss by any leakage of the system.

Vapor Generation Checking

During stabilization period, the PCSV and the CCV are closed. The system pressure is measured as starting pressure (DP_A). After a certain defined period (T1), the system pressure (DP_B) is measured again and the difference from the starting pressure is calculated. If this difference (DP_B - DP_A) is bigger than a threshold, there should be excessive vapor and the monitor is aborted for next checking. On the contrary, if the difference is lower than another negative threshold, PCSV is regarded as malfunction such as clogged at open position.

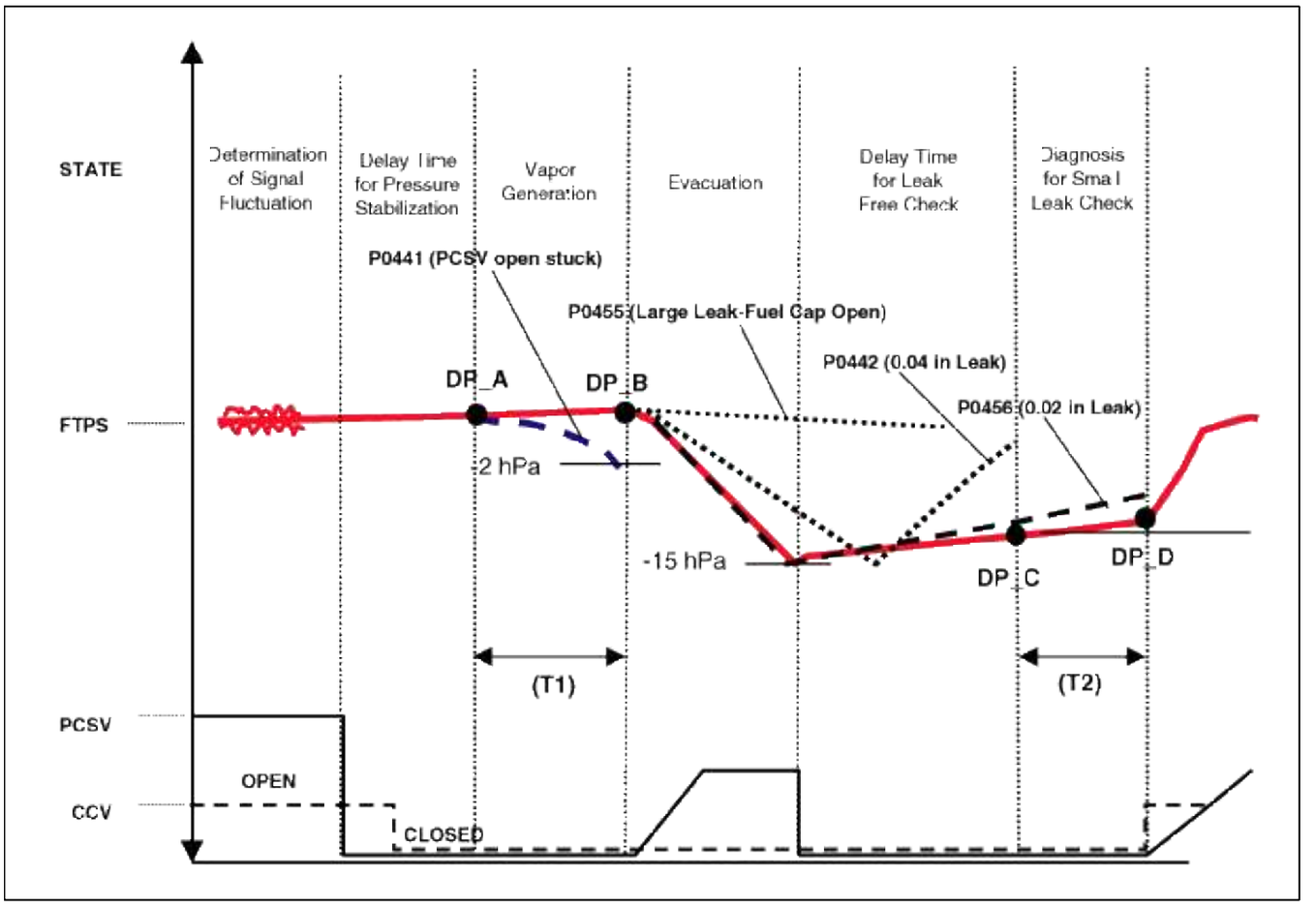
Evacuation

PCSV is opened with a certain ramp for the pressure to reach down to a certain level. If pressure can't be lowered below a threshold, the system is regarded as fuel cap-opened or having a large leakage.

Leaking Checking

PCSV is closed and the system waits for a period to get stabilized pressure. During checking period (T2), the system measures the beginning and the end of the system pressure (DP_C, DP_D). The diagnosis value is the pressure difference corrected by natural vapor generation (DP_B - DP_A) rate from the vapor generation checking step.

Evaporative System Monitoring

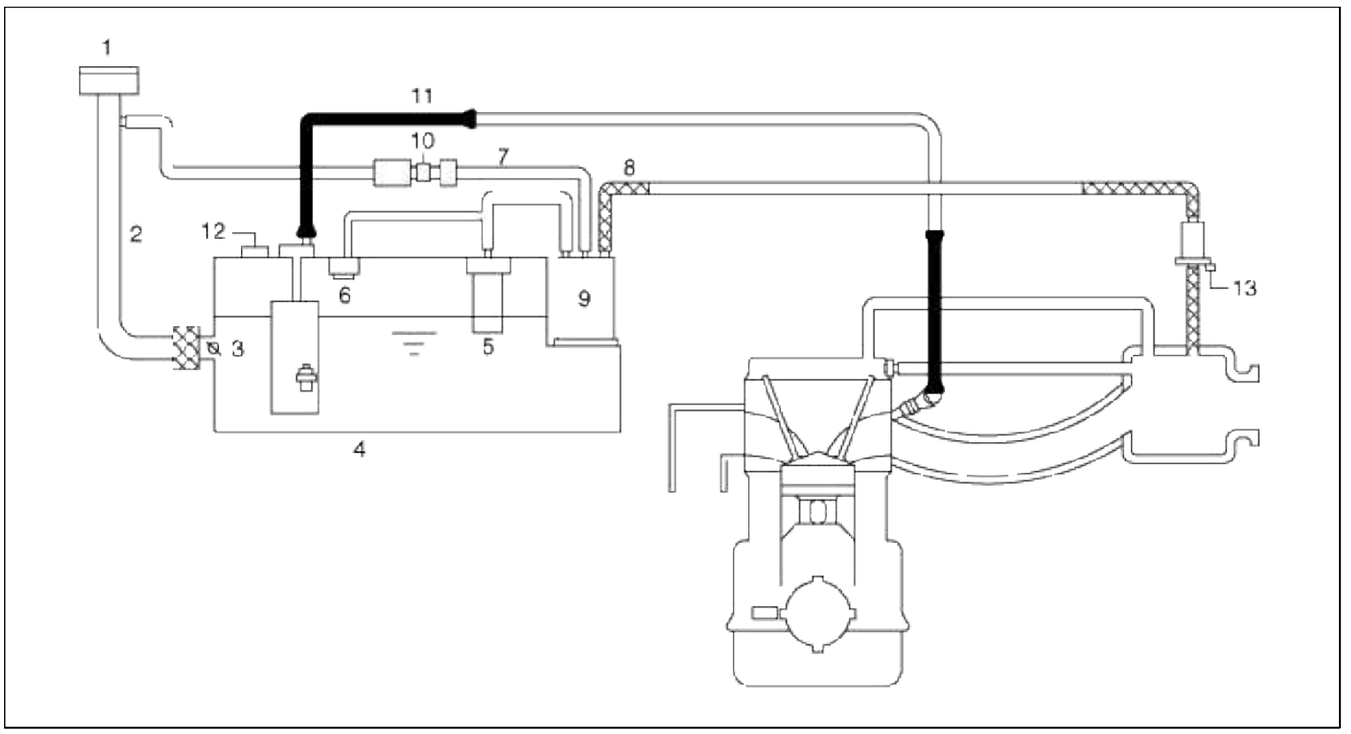


Evaporative And ORVR Emission Control System

This system consists of a fill vent valve, fuel shut-off valve, fuel cut valve (for roll over), two way valve (pressure/vacuum relief), fuel liquid/vapor separator which is installed beside the filler pipe, charcoal canister which is mounted under the rear floor LH side member and protector, tubes and miscellaneous connections.

While refueling, ambient air is drawn into the filler pipe so as not to emit fuel vapors in the air. The fuel vapor in the tank is then forced to flow into the canister via the fill vent valve. The fuel liquid/vapor separator isolates liquid fuel and passes the pure vapor to the charcoal canister.

While the engine is operating, the trapped vapor in the canister is drawn into the intake manifold and then into the engine combustion chamber. According to this purge process, the charcoal canister is purged and recovers its absorbing capability.



1. Fuel Filler Cap 2. Fuel Filler Pipe 3. Fuel Shut-OFF Valve 4. Fuel Tank 5. ORVR Valve 6. 2-Way & Cut Valve 7. Evaporative Hose	8. Evaporative Hose 9. Canister 10. Canister Close Valve (CCV) 11. Fuel Feed Line 12. Fuel Tank Pressure Sensor (FTPS) 13. Purge Control Solenoid Valve (PCSV)

Emission Control System > Evaporative Emission Control System > Repair procedures

Inspection

[System Inspection]

1. Disconnect the vapor hose from the throttle body and connect a vacuum pump to the nipple on the throttle body.
2. Check the following points with applying vacuum using the vacuum pump.

· At Cold Engine [Engine Coolant Temperature < 60°C(140°F)]

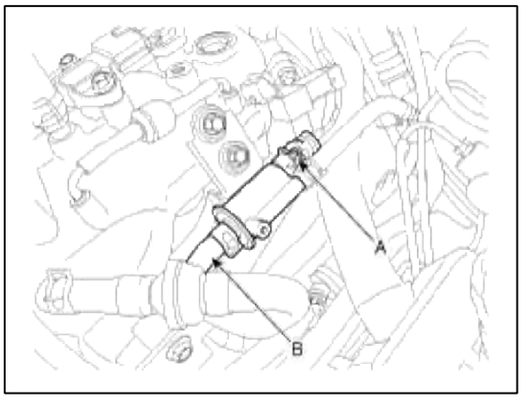
Engine Operating Condition	Applied Vacuum	Result
Idle	0.5kgf/cm² (50kPa,7.3psi)	Vacuum is held
3,000rpm		

· At Warmed Engine [Engine Coolant Temperature > 80°C(176°F)]

Engine Operating Condition	Applied Vacuum	Result
Idle	0.5kgf/cm² (50kPa,7.3psi)	Vacuum is held
Within 3 minutes after engine start at 3,000 rpm	Try to apply vacuum	Vacuum is released
In 3 minutes after engine start at 3,000 rpm	0.5kgf/cm² (50kPa,7.3psi)	Vacuum will be held momentarily, after which, it will be released

[PCSV Inspection]

1. Turn ignition switch OFF and disconnect the negative (-) battery cable.
2. Disconnect the PCSV connector (A).
3. Disconnect the vapor hose (B) which is connected with the intake manifold from the PCSV.



4. After connecting a vacuum pump to the nipple, apply vacuum.
5. With the PCSV control line grounded, check valve operation when applying battery voltage to the PCSV or not.

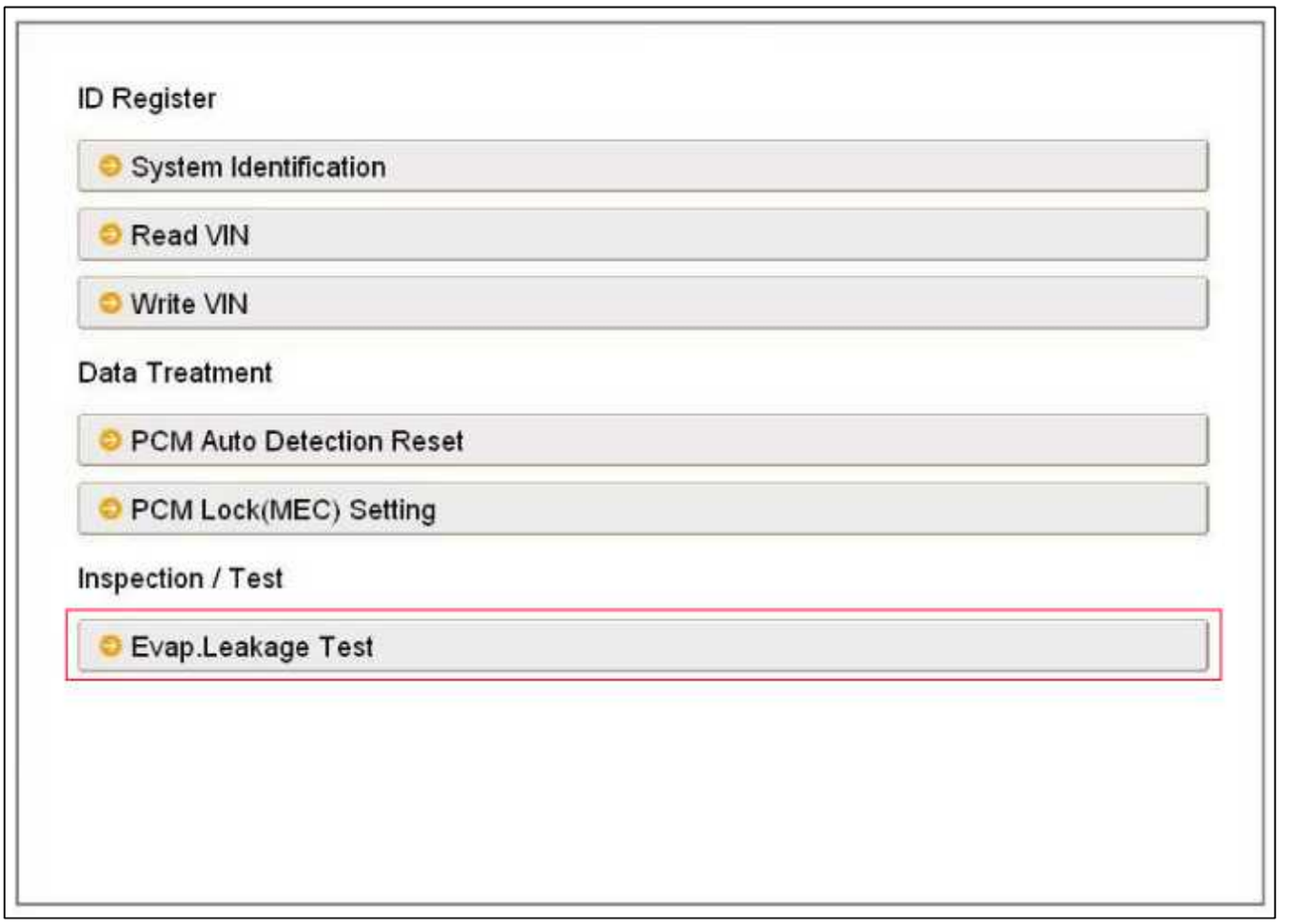
Battery Voltage	Valve	Vacuum
Connected	Open	Released
Disconnected	Close	Maintained

6. Measure the coil resistance of the PCSV.

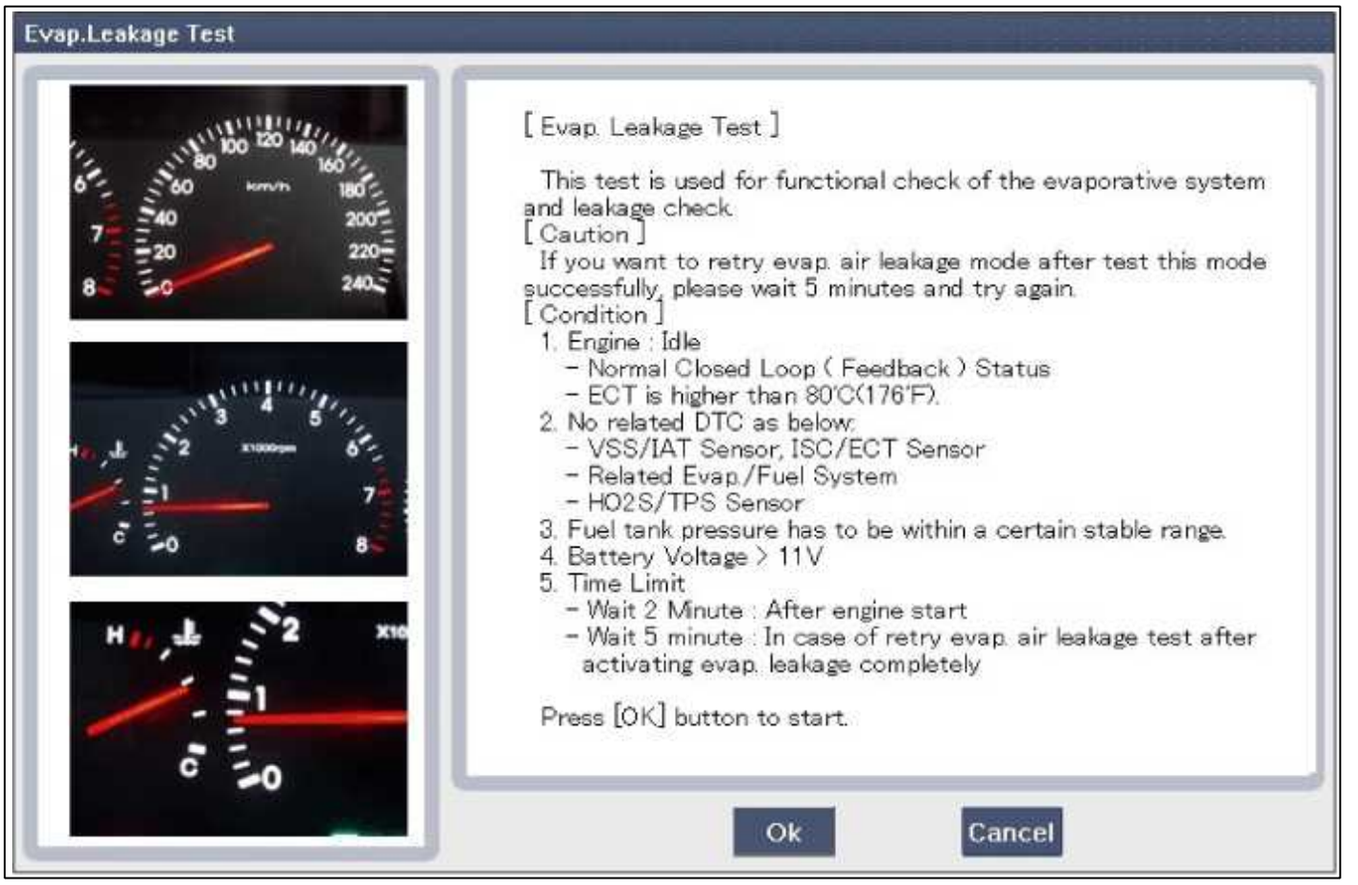
Specification: 19.0 ~ 22.0Ω [20°C(68°F)]

[EVAP. Leakage Test]

1. Select "Evap. Leakage Test".



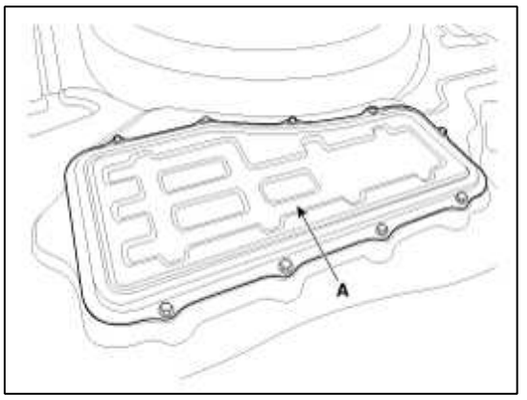
2. Proceed test in a accordance with the screen introduction.



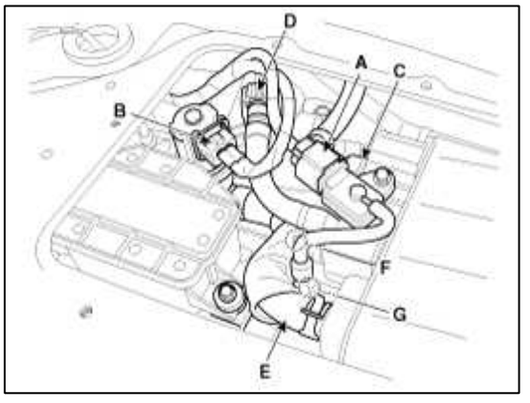
Emission Control System > Evaporative Emission Control System > Canister > Repair procedures

Removal

1. Turn the ignition switch OFF and disconnect the negative (-) battery cable.
2. Remove the canister cover (A).

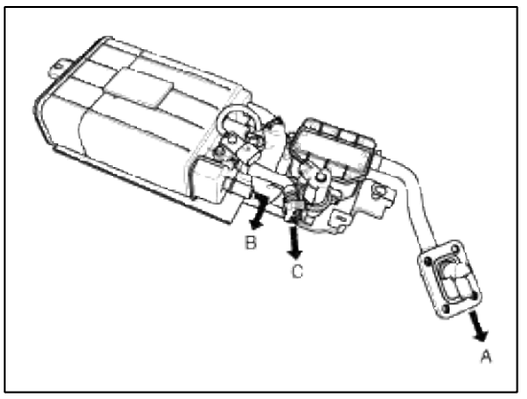


3. Disconnect the fuel tank pressure sensor connector (A) and the canister close valve connector (B).
4. Disconnect the vapor tube quick-connector (C), the vapor hose quick-connector (D), and the vapor hose (E) from the canister.
5. Remove the fuel tank pressure sensor hose clip (F).
6. Remove the canister after removing the installation bolt (G).



Inspection

1. Check for the following items visually.
   A. Cracks or leakage of the canister
   B. Loose connection, distortion, or damage of the vapor hose/tube



A: Canister ↔ Atmosphere (via Fuel Tank Air Filter)
B: Canister ↔ Fuel Tank
C: Canister ↔ Intake Manifold

Installation

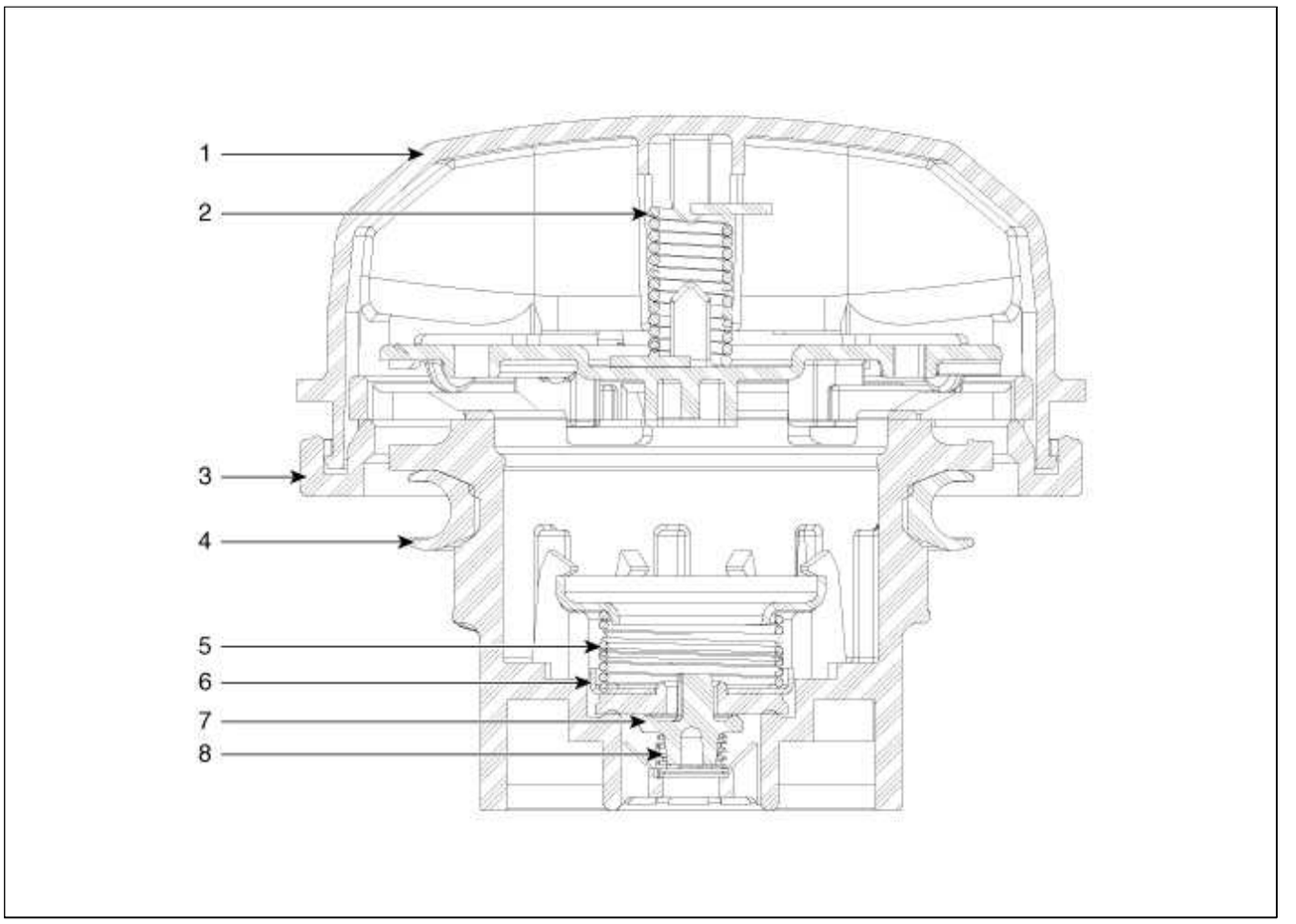
Installation is reverse of removal.

Canister installation bolt :
3.9 ~ 5.9 N.m (0.4 ~ 0.6 kgf.m, 2.9 ~ 4.3 lb-ft)
Canister cover installation bolt :
7.8 ~ 11.8 N.m (0.8 ~ 1.2 kgf.m, 5.8 ~ 8.7 lb-ft)
Canister protector installation bolt :
19.6 ~ 29.4 N.m (2.0 ~ 3.0 kgf.m, 14.5 ~ 21.7 lb-ft)

Emission Control System > Evaporative Emission Control System > Fuel Filler Cap > Description and Operation

Description

A ratchet tightening device on the threaded fuel filler cap reduces the chances of incorrect installation, which would seal the fuel filler. After the gasket on the fuel filler cap and the filler neck flange contact each other, the ratchet produces a loud clicking noise indicating the seal has been set.

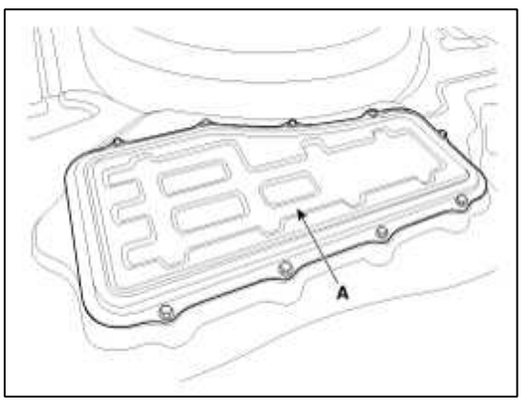


1. Cover	5. Spring
2. Torsion spring	6. Plate seal
3. Retainer	7. Vacuum valve
4. Gasket seal	8. Spring

Emission Control System > Evaporative Emission Control System > Fuel Tank Air Filter > Repair procedures

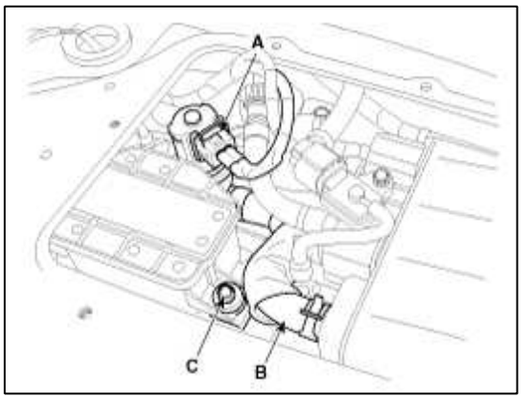
Replacement

1. Turn the ignition switch OFF and disconnect the negative (-) battery cable.
2. Remove the service cover (A).

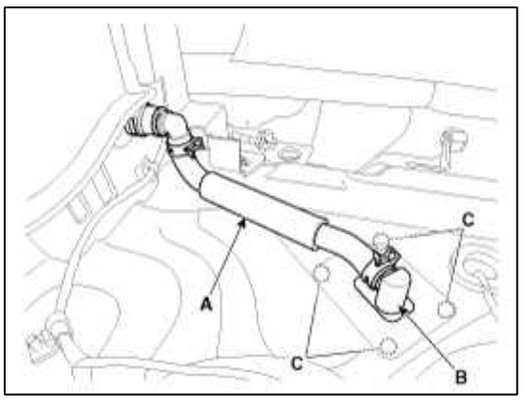


3. Disconnect the canister close valve connector (A).
4. Disconnect the vapor hose (B) from the canister.

5. Remove the insatallation bolt (C).



6. Disconnect the ventilation hose (A) from the connector assembly (B).
7. Remove the fuel tank air filter after removing the connector assembly installation bolts (C).



8. Install a new fuel tank assembly.

Ventilation hose connector assembly installation :
3.9 ~ 5.9 N.m (0.4 ~ 0.6 kgf.m, 2.9 ~4.3 lb-ft)

Emission Control System > Exhaust Emission Control System > Description and Operation

Description

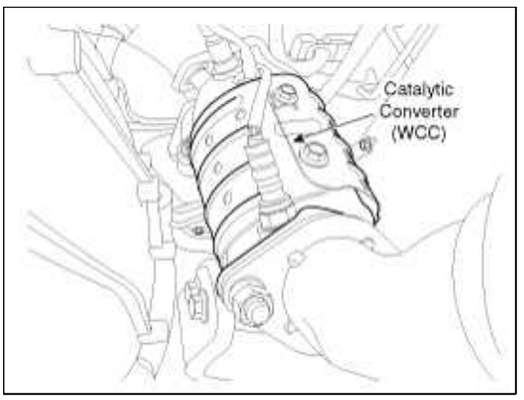
Exhaust emissions (CO, HC, NOx) are controlled by a combination of engine modifications and the addition of special control components.
Modifications to the combustion chamber, intake manifold, camshaft and ignition system form the basic control system. These items have been integrated into a highly effective system which controls exhaust emissions while maintaining good drivability and fuel economy.
Air/Fuel Mixture Control System [Multiport Fuel Injection (MFI) System]
The MFI system uses signals from the heated oxygen sensor to activate and control the injector installed in the manifold for each cylinder, thus precisely regulating the air/fuel mixture ratio and reducing emissions.
This in turn allows the engine to produce exhaust gas of the proper composition to permit the use of a three way catalyst. The three way catalyst is designed to convert the three pollutants [hydrocarbons (HC), carbon monoxide (CO), and oxides of nitrogen (NOx)] into harmless substances. There are two operating modes in the MFI system.

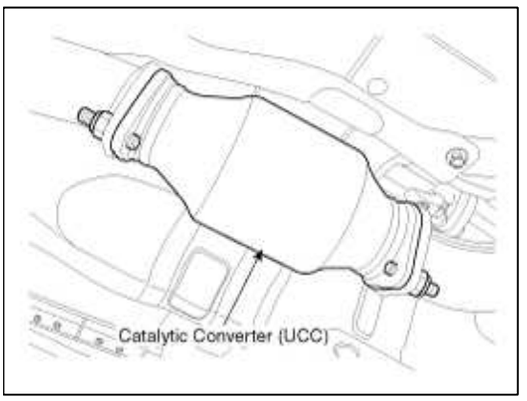
1. Open Loop air/fuel ratio is controlled by information programmed into the ECM.
2. Closed Loop air/fuel ratio is adjusted by the ECM based on information supplied by the oxygen sensor.

Emission Control System > Exhaust Emission Control System > Catalytic Converter > Description and Operation

Description

The catalytic converter of the gasoline engine is a three way catalyst. It oxidizes carbon monoxide and hydrocarbons (HC), and separates oxygen from the oxides of nitrogen (NOx).
There are two types of three-way catalyst; Palette type and Monolith type.





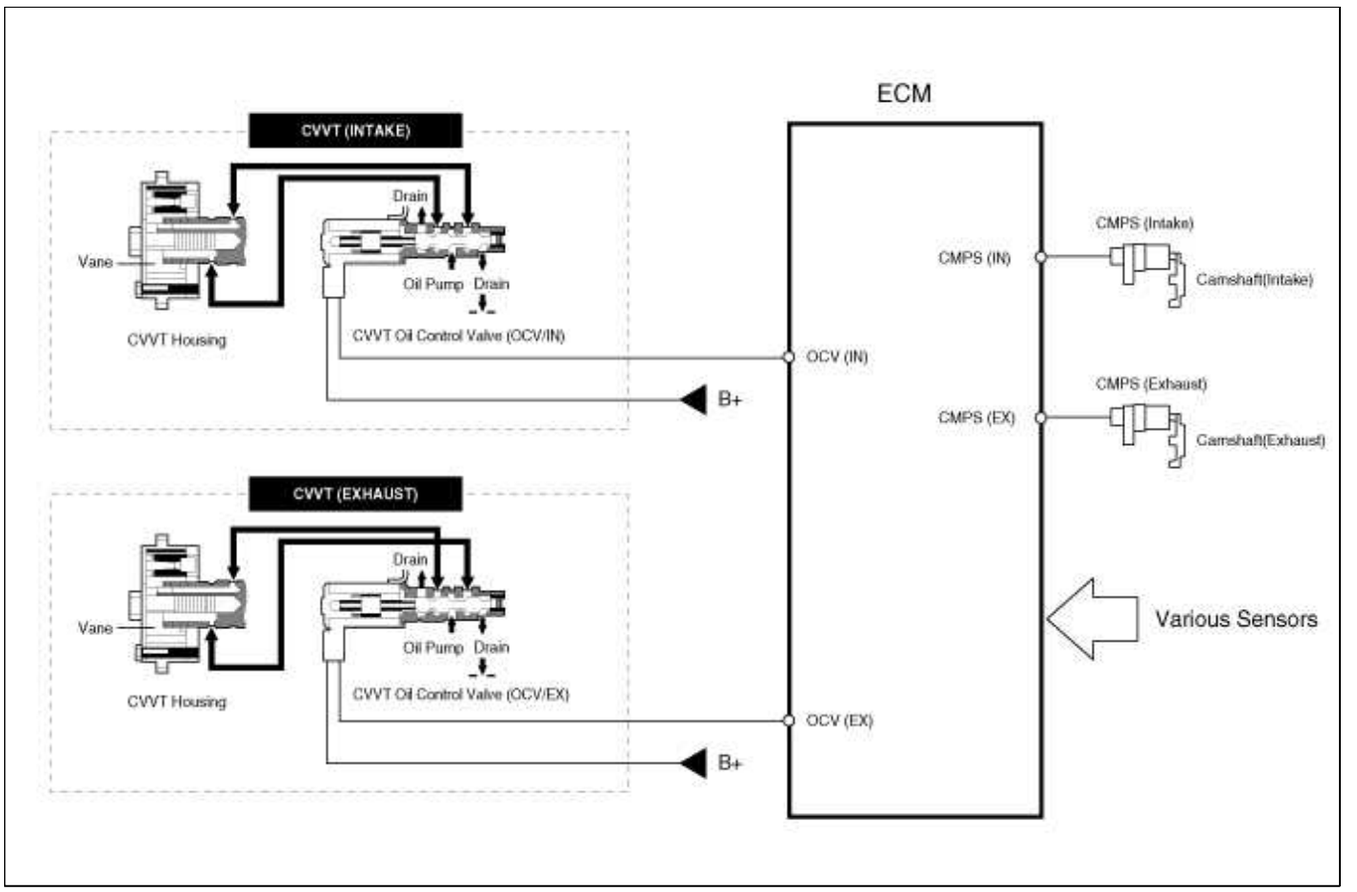
Emission Control System > Exhaust Emission Control System > CVVT (Continuously Variable Valve Timing) System > Description and Operation

Description

Continuous Variable Valve Timing (CVVT) system advances or retards the valve timing of the intake and exhaust valve in accordance with the ECM control signal which is calculated by the engine speed and load.
By controlling CVVT, the valve over-lap or under-lap occurs, which makes better fuel economy and reduces exhaust gases (NOx, HC) and improves engine performance through reduction of pumping loss, internal EGR effect, improvement of combustion stability, improvement of volumetric efficiency, and increase of expansion work.
This system consist of

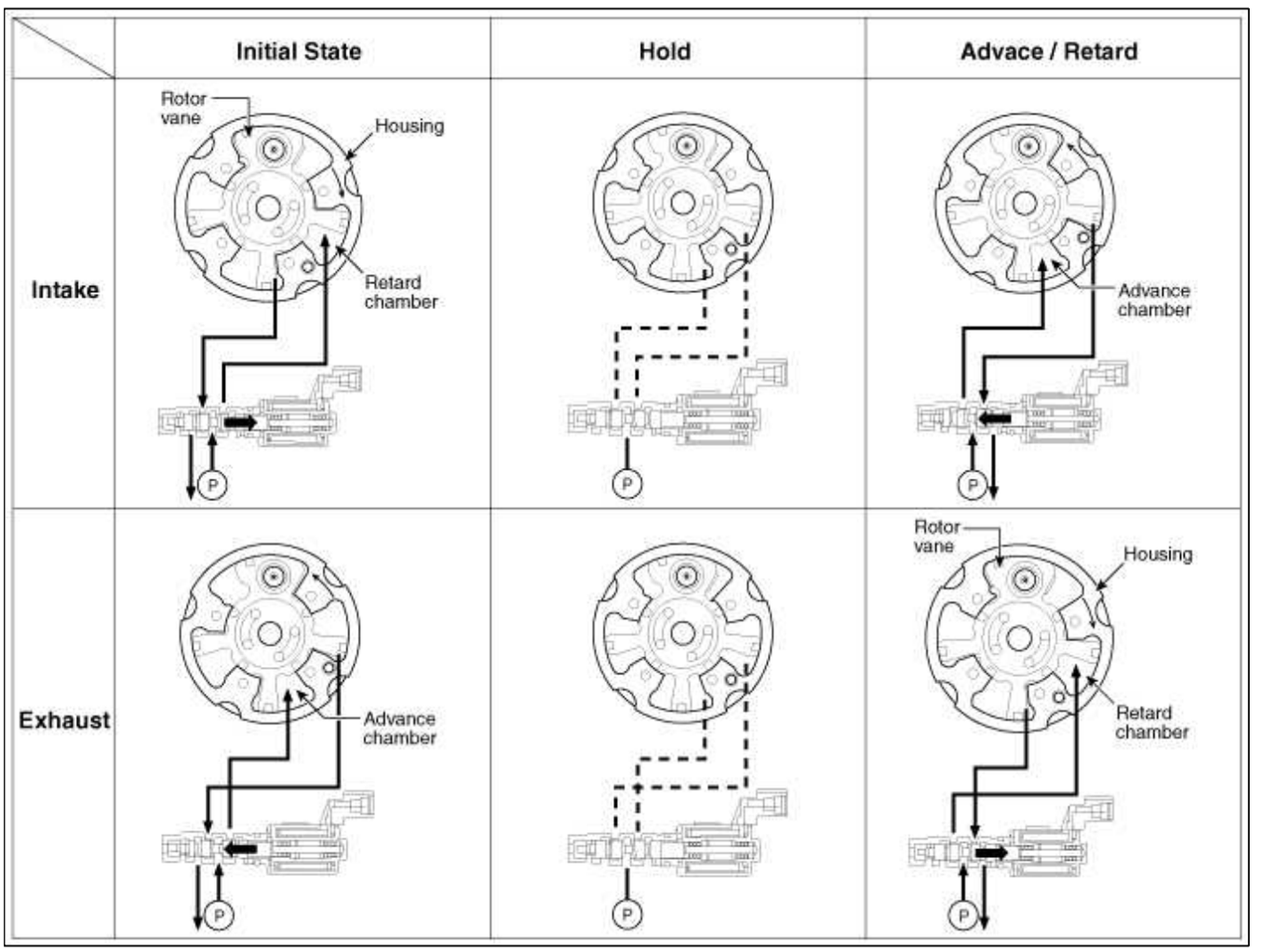
- the CVVT Oil Control Valve (OCV) which supplies the engine oil to the cam phaser or runs out the engine oil from the cam phaser in accordance with the ECM PWM (Pulse With Modulation) control signal,
- the CVVT Oil Temperature Sensor (OTS) which measures the engine oil temperature,
- and the Cam Phaser which varies the cam phase by using the hydraulic force of the engine oil.

The engine oil getting out of the CVVT oil control valve varies the cam phase in the direction (Intake Advance/Exhaust Retard) or opposite direction (Intake Retard/Exhaust Advance) of the engine rotation by rotating the rotor connected with the camshaft inside the cam phaser.

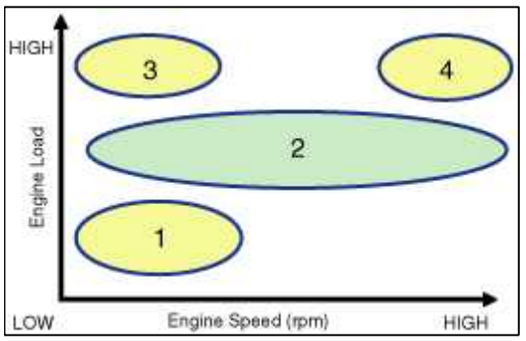


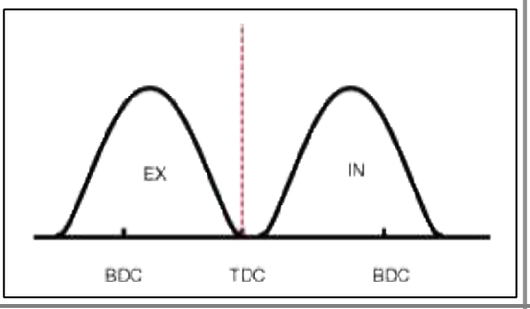
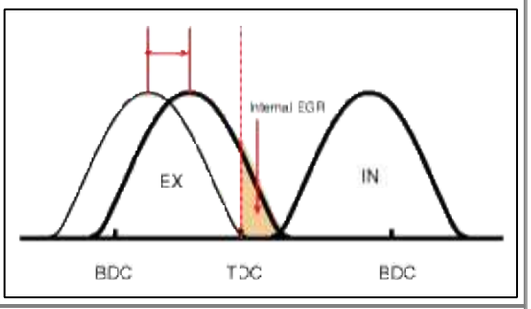
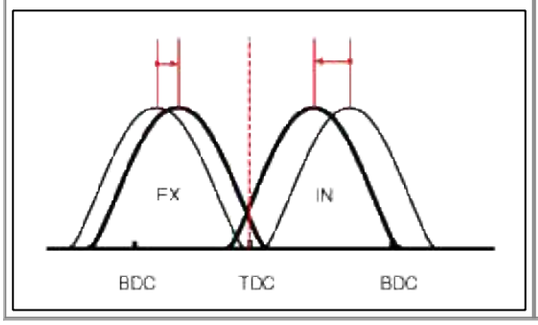
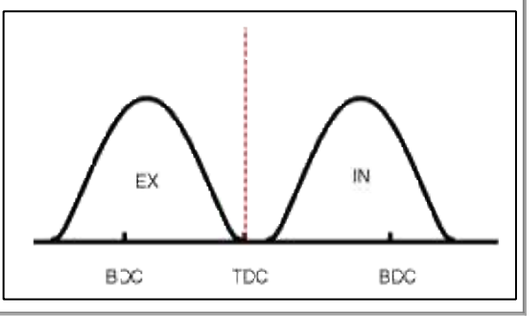
Operation Principle

The CVVT has the mechanism rotating the rotor vane with hydraulic force generated by the engine oil supplied to the advance or retard chamber in accordance with the CVVT oil control valve control.



[CVVT System Mode]



(1) Low Speed / Low Load	(2) Part Load
	
(3) Low Speed / High Load	(4) High Speed / High Load
	

Driving Condition	Exhaust Valve		Intake Valve	
	Valve Timing	Effect	Valve Timing	Effect
(1) Low Speed /Low Load	Completely Advance	* Valve Under-lap * Improvement of combustion stability	Completely Retard	* Valve Under-lap * Improvement of combustion stability
(2) Part Load	Retard	* Increase of expansion work * Reduction of pumping loss * Reduction of HC	Retard	* Reduction of pumping loss
(3) Low Speed /High Load	Retard	* Increase of expansion work	Advance	* Prevention of intake back flow (Improvement of volumetric efficiency)
(4) High Speed /High Load	Advance	* Reduction of pumping loss	Retard	* Improvement of volumetric efficiency

GENESIS COUPE(BK) > 2013 > G 2.0 T-MPI > Engine Electrical System

Engine Electrical System > General Information > Specifications

Specification

Ignition System

Items			Specification
Ignition coil	Primary resistance		0.62 ± 10 % (Ω)
	Secondary resistance		7.0 ± 15 % (kΩ)
Spark plugs	Unleaded	Type	ZK20HQR8
		Gap	1.0 ~ 1.1 mm (0.0394 ~ 0.0433 in.)

Starting System

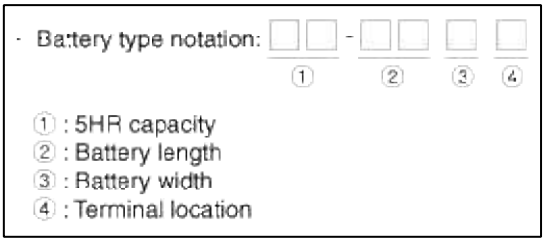
Items			Specification
Starter	Rated voltage		12 V, 1.2 kW
	No. of pinion teeth		8
	No-load characteristics	Voltage	11.5 V
		Ampere	90A, MAX
		Speed	2,600 rpm, MIN

Charging System

Items		Specification
Alternator	Type	Battery voltage sensing
	Rate voltage	13.5 V, 110A
	Speed in use	1,000 ~ 18,000 rpm
	Voltage regulator	IC regulator built-in type
	Regulator setting voltage	14.55 ± 0.2 V
	Temperature compensation	-3.5 ± 1 mV / °C
Battery	Type	64-28FL
	Cold cranking amperage [at -18°C(-0.4°F)]	660 A
	Reserve capacity	145 min
	Specific gravity [at 20°C(68°F)]	1.280 ± 0.01

NOTE

- COLD CRANKING AMPERAGE is the amperage a battery can deliver for 30 seconds and maintain a terminal voltage of 7.2V or greater at a specified temperature.
- RESERVE CAPACITY RATING is amount of time a battery can deliver 25A and maintain a minimum terminal voltage of 10.5V at 26.7°C(80.1°F).



Engine Electrical System > General Information > Troubleshooting

Trouble Shooting

Ignition System

Symptom	Suspect area	Remedy
Engine will not start or is hard to start (Cranks OK)	Ignition lock switch	Inspect ignition lock switch, or replace as required
	Ignition coil	Inspect ignition coil, or replace as required
	Spark plugs	Inspect spark plugs, or replace as required
	Ignition wiring disconnected or broken	Repair wiring, or replace as required
Rough idle or stalls	Ignition wiring	Repair wiring, or replace as required
	Ignition coil	Inspect ignition coil, or replace as required
Engine hesitates/poor acceleration	Spark plugs and spark plug cables	Inspect spark plugs / cable, or replace as required
	Ignition wiring	Repair wiring, or replace as required
Poor mileage	Spark plugs and spark plug cables	Inspect spark plugs / cable, or replace as required

Charging System

Symptom	Suspect area	Remedy
Charging warning indicator does not light with ignition switch "ON" and engine off.	Fuse blown	Check fuses
	Light burned out	Replace light
	Wiring connection loose	Tighten loose connection
	Electronic voltage regulator	Replace voltage regulator
Charging warning indicator does not go out with engine running. (Battery requires frequent recharging)	Drive belt loose or worn	Adjust belt tension or replace belt
	Battery cable loose, corroded or worn	Inspect cable connection, repair or replace cable
	Electronic voltage regulator or alternator	Replace voltage regulator or alternator
	Wiring	Repair or replace wiring
Overcharge	Electronic voltage regulator	Replace voltage regulator
	Voltage sensing wire	Repair or replace wiring
Discharge	Drive belt loose or worn	Adjust belt tension or replace belt
	Wiring connection loose or short circuit	Inspect wiring connection, repair or replace wiring
	Electronic voltage regulator or alternator	Replace voltage regulator or alternator
	Poor grounding	Inspect ground or repair
	Worn battery	Replace battery

Starting System

Symptom	Suspect area	Remedy
Engine will not crank	Battery charge low	Charge or replace battery
	Battery cables loose, corroded or worn out	Repair or replace cables
	Transaxle range switch (Vehicle with automatic transaxle only)	Refer to AT group-automatic transaxle
	Fuse blown	Replace fuse
	Starter faulty	Replace
	Ignition switch faulty	Replace
Engine cranks slowly	Battery charge low	Charge or replace battery
	Battery cables loose, corroded or worn out	Repair or replace cables
	Starter faulty	Replace
Starter keeps running	Starter	Replace
	Ignition switch	Replace
Starter spins but engine will not crank	Short in wiring	Repair wiring
	Pinion gear teeth broken or Starter	Replace

	Ring gear teeth broken	Replace fly wheel or torque converter

Engine Electrical System > General Information > General Information

The Micro 570 Analyzer (Canada only)

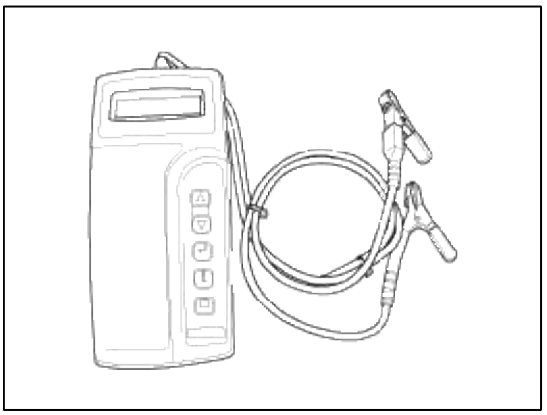
The Micro 570 Analyzer provides the ability to test the charging and starting systems, including the battery, starter and alternator.

CAUTION

Because of the possibility of personal injury, always use extreme caution and appropriate eye protection when working with batteries.

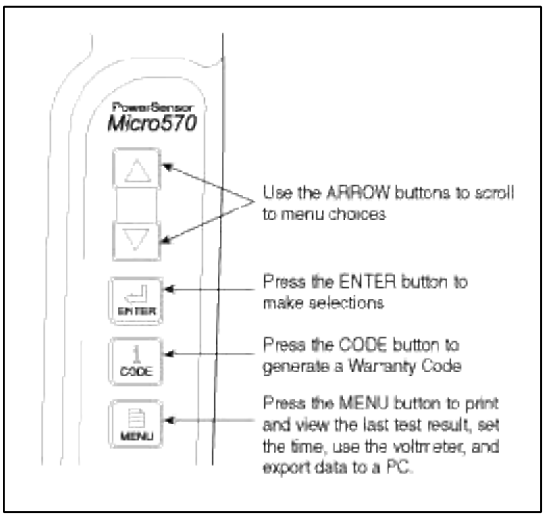
When charging battery by test result, Battery must be fully charged.

To get accurate test result, battery surface voltage must have subsided ahead before test when you test battery after charged. (See following Battery Test Results)



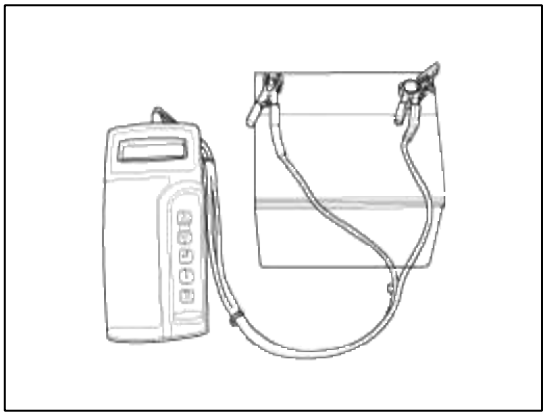
Keypad

The Micro 570 button on the key pad provide the following functions :



Battery Test Procedure

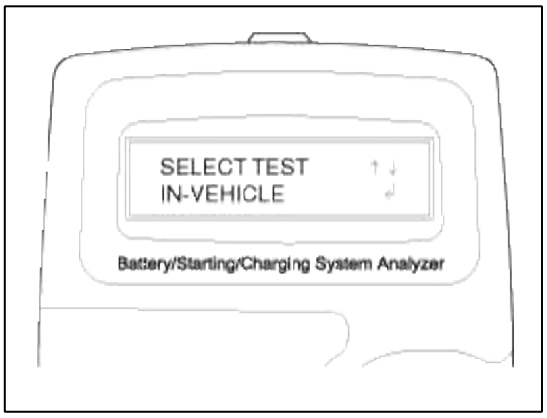
1. Connect the tester to the battery.
   A. Red clamp to battery positive (+) terminal.
   B. Black clamp to battery negative (-) terminal.



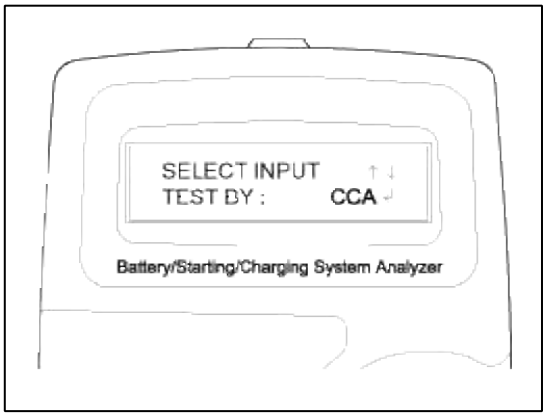
CAUTION

Connect clamps securely. If "CHECK CONNECTION" message is displayed on the screen, reconnect clamps securely.

2. The tester will ask if the battery is connected "IN-VEHICLE" or "OUT-OF-VEHICLE". Make your selection by pressing the arrow buttons; then press ENTER.



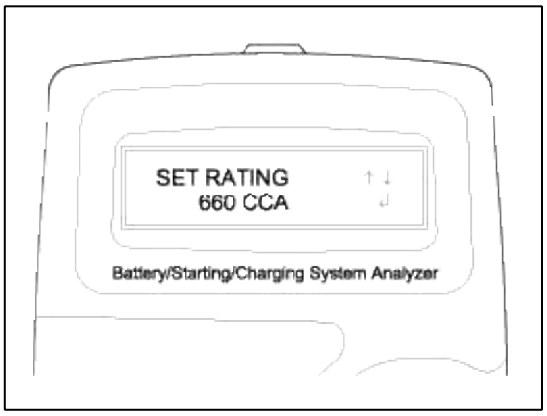
3. Select CCA and press the ENTER button.



NOTE

CCA : Cold cranking amps, is an SAE specification for cranking batteried at -0.4°F (-18°C).

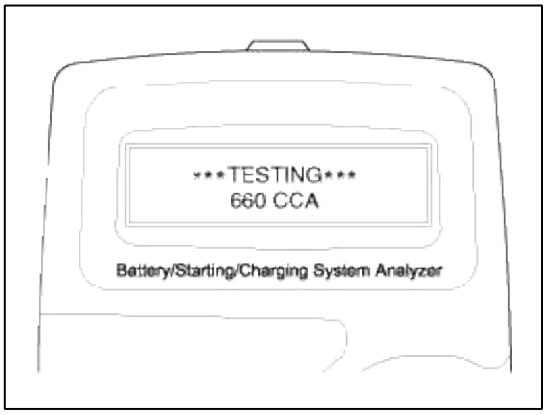
4. Set the CCA value displayed on the screen to the CCA value marked on the battery label by pressing up and down buttons and press ENTER.



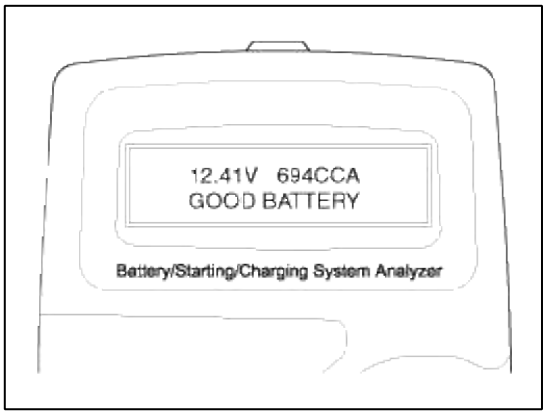
NOTE

The battery ratings(CCA) displayed on the tester must be identical to the ratings marked on battery label.

5. The tester will conduct battery test.



6. The tester displays battery test results including voltage and battery ratings.
Refer to the following table and take the appropriate action as recommended by the Micro 570.



Battery Test Results

Result On Printer	Remedy
GOOD BATTERY	No action is required.
GOOD RECHARGE	Battery is in a good state. Recharge the battery and use. You have to follow instruction below when you charge battery and retest, otherwise test result can be inaccurate. (See 'Charge and Retest method after battery charge' below.)
CHARGE & RETEST	Battery is not charged properly. - Charge and test the battery again. You have to follow instruction below when you charge battery and retest, otherwise test result can be inaccurate. (See 'Charge and Retest method after battery charge' below.)
REPLACE BATTERY	Replace battery and recheck the charging system. - Improper connection between battery and vehicle cables may cause "REPLACE BATTERY". Retest the battery after removing cables and connecting the tester to the battery terminal directly prior to replacing the battery.
BAD CELL-REPLACE	Charge and retest the battery. - If the Micro 570 recommends "REPLACE BATTERY", replace the battery and recheck the charging system.

[Charge and Retest method after battery charge]

Battery charge

Set battery charger to 'Auto Mode' (The Mode that charging current drops as the battery charges.) and charge battery until charging current down close to zero or the charger alerts you with an alarm when charge is complete. (Minimum charging time recommended: More than 3 hours with Auto Mode that explained above)

A. If battery is not fully charged, battery surface voltage will be high while the amount of current charged (CCA) in battery is low. If you measure the battery under this condition, tester may misjudge that battery sulfation occurred because the amount of current in battery is too low in comparison with battery voltage.
   * Surface voltage: When battery is charged electrolyte temperature increases and chemical reaction become active resulting in an excessive increase of battery voltage.
   It is known that it takes approximate one day to subside this increased surface voltage completely.

Battery Test after charge

Do not test battery right after the charge. Test battery after battery surface voltage has subsided as instructed in the following procedure.

(1) When battery charge is complete, install the battery in the vehicle.

(2) Put IG key to ON position and turn on head lamp with low beam, and wait 5 minutes. (Discharge for 5 minutes)

(3) Turn off the head lamp and IG key, and wait 5 minutes. (Waiting for 5 minutes)

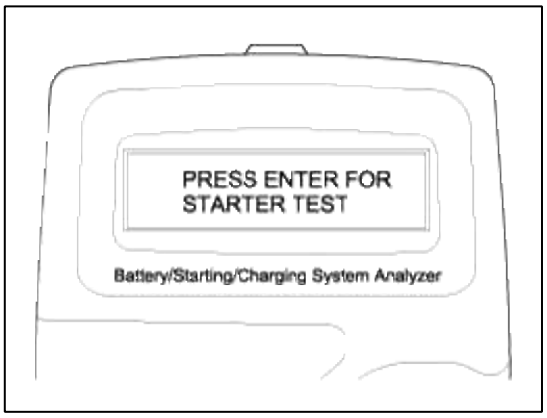
(4) Remove +, - cable from the battery and test battery.

WARNING

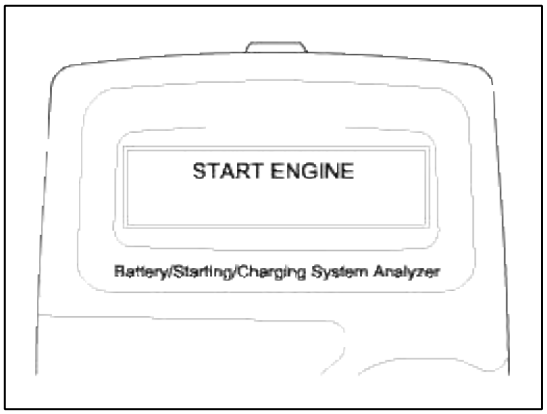
Whenever filing a claim for battery, the print out of the battery test results must be attached.

Starter Test Procedure

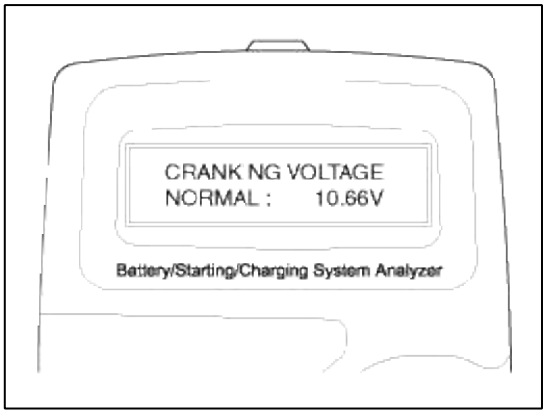
7. After the battery test, press ENTER immediately for the starter test.



8. Start the engine.



9. Cranking voltage and starter test results will be displayed on the screen.
   Refer to the following table and take the appropriate action as recommended by the Micro 570.



Starter Test Results

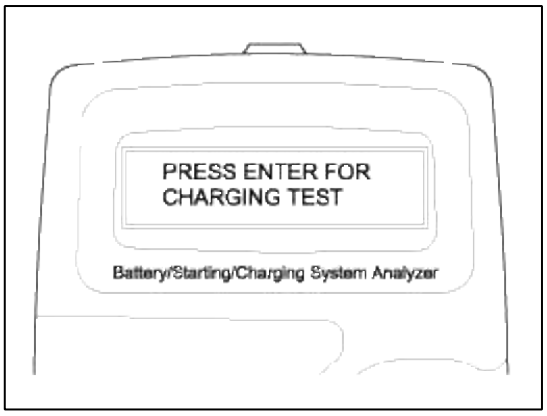
Result On Printer	**Remedy**
CRANKING VOLTAGE NORMAL	System shows a normal starter draw.
CRANKING VOLTAGE LOW	Cranking voltage is lower than normal level. - Check starter.
CHARGE BATTERY	The state of battery charge is too low to test. - Charge the battery and retest.
REPLACE BATTERY	Replace battery. - If the vehicle is not started though the battery condition of "GOOD BATTERY" is displayed, check wiring for open circuit, battery cable connection, starter and repair or replace as necessary. - If the engine does crank, check fuel system.

NOTE

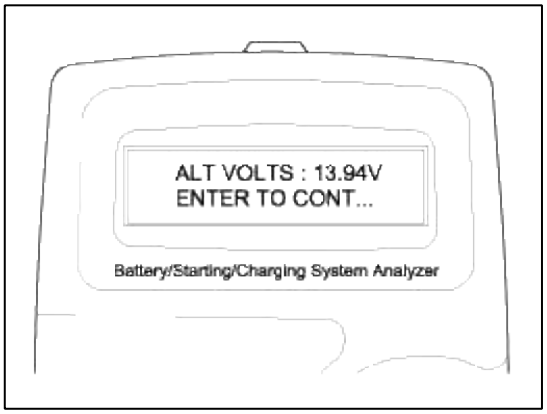
When testing the vehicle with old diesel engines, the test result will not be favorable if the glow plug is not heated. Conduct the test after warming up the engine for 5 minutes.

Charging System Test Procedure

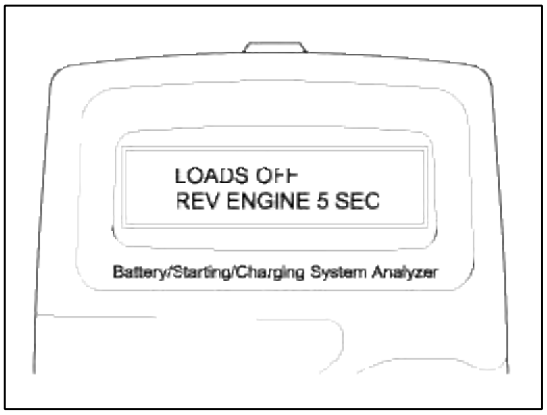
10. Press ENTER to begin charging system test.

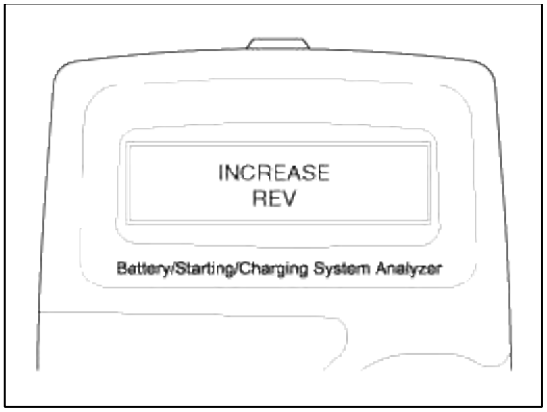


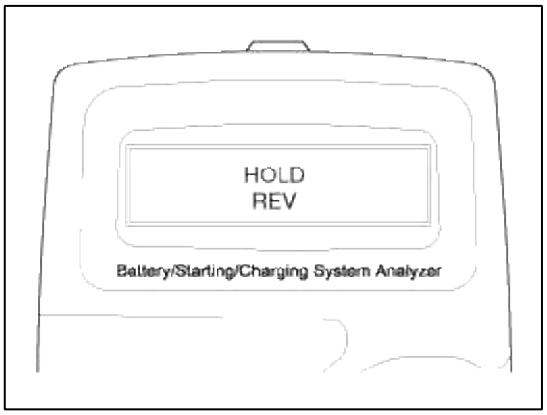
11. The tester displays the actual voltage of alternator.
    Press ENTER to continue.



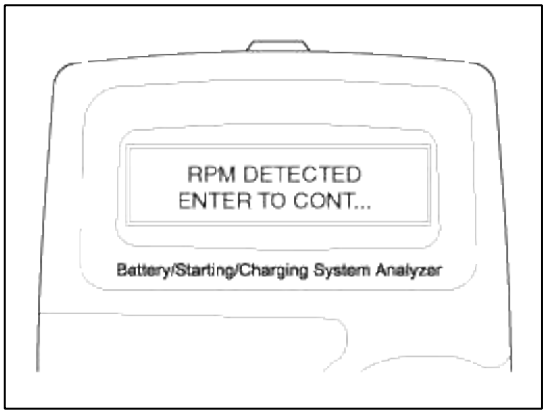
12. Turn off all electrical load and rev engine for 5 seconds with pressing the accelerator pedal. (Follow the instructions on the screen)



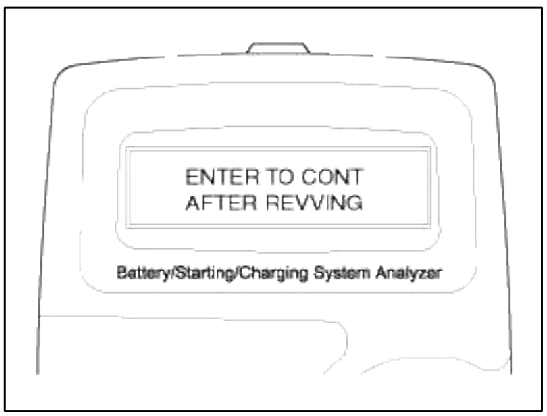




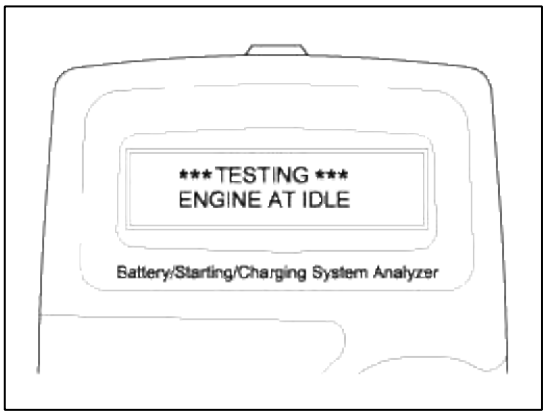
13. The message that engine RPM is detected will be displayed on the screen. Press ENTER to continue.

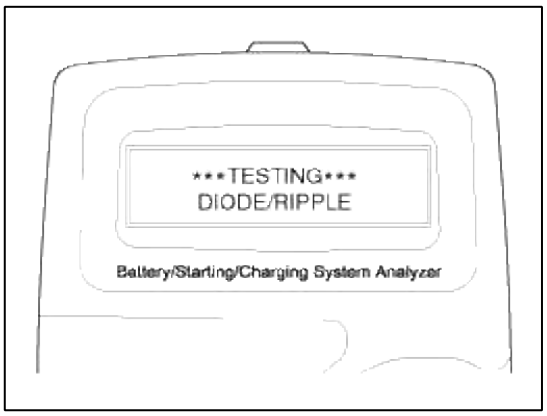


14. If the engine RPM is not detected, press ENTER after revving engine.

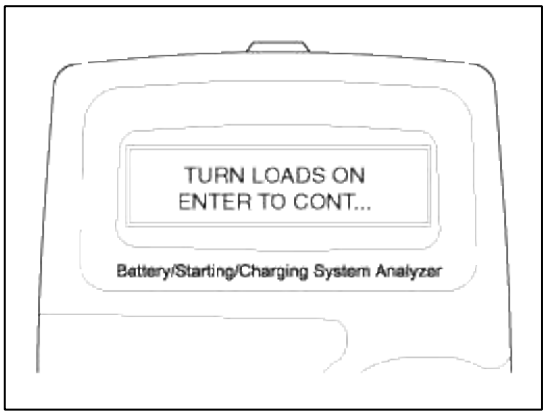


15. The tester will conduct charging system test during loads off.

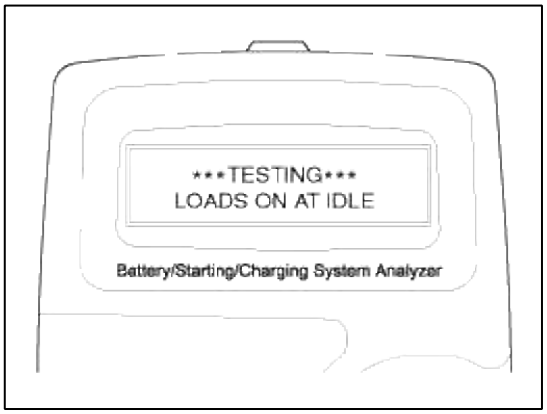




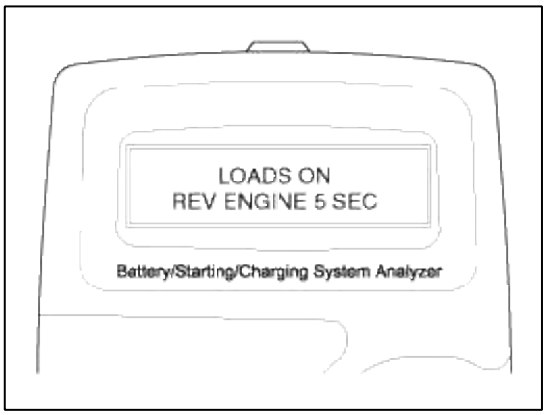
16. Turn on electrical loads (air conditioner, lamps, audio and etc). Press ENTER to continue.

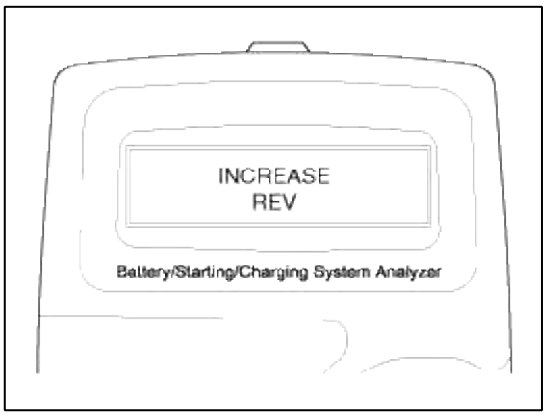


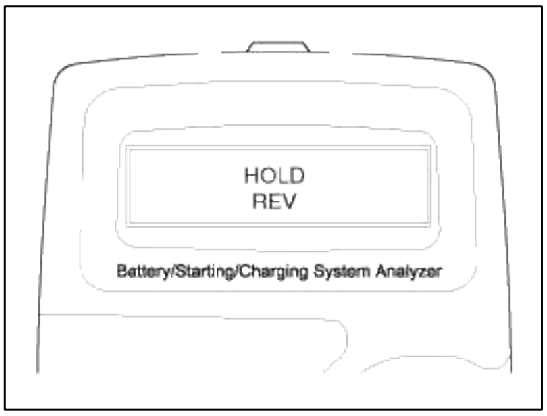
17. The tester will conduct charging system test during loads on.



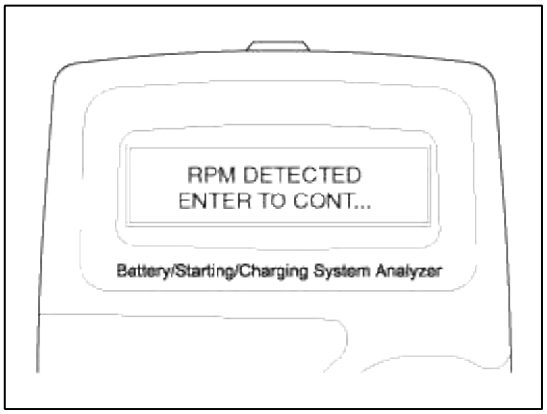
18. Rev engine for 5 seconds with pressing the accelerator pedal. (Follow the instructions on the screen)



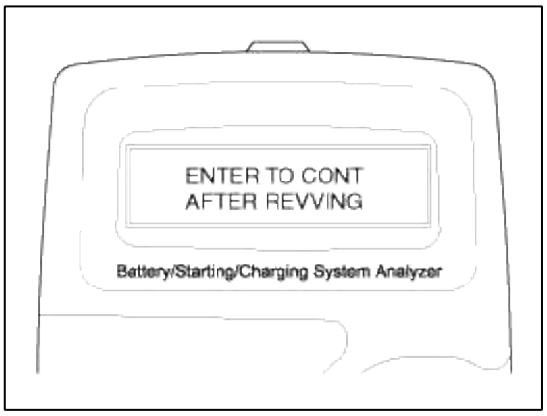




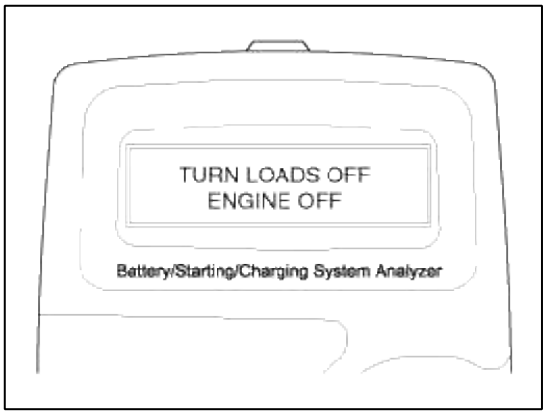
19. The message that engine RPM is detected will be displayed on the screen. Press ENTER to continue.



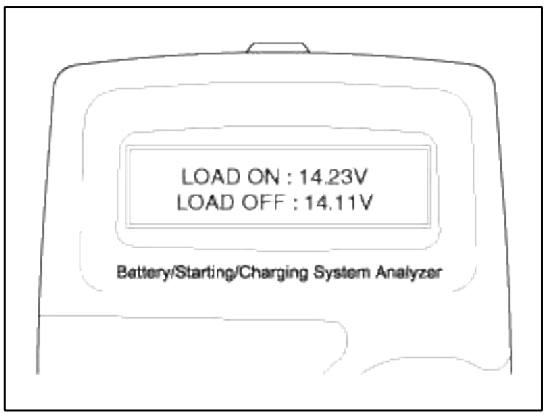
20. If the engine RPM is not detected, press ENTER after revving engine.

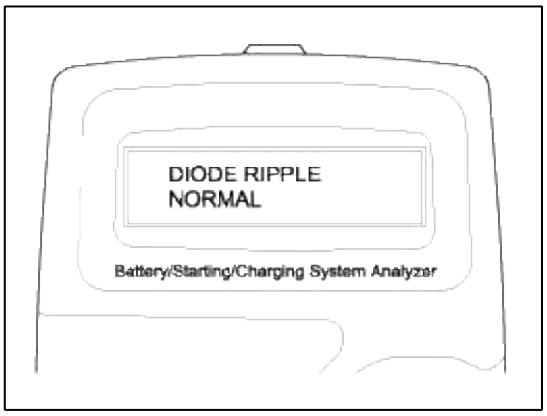


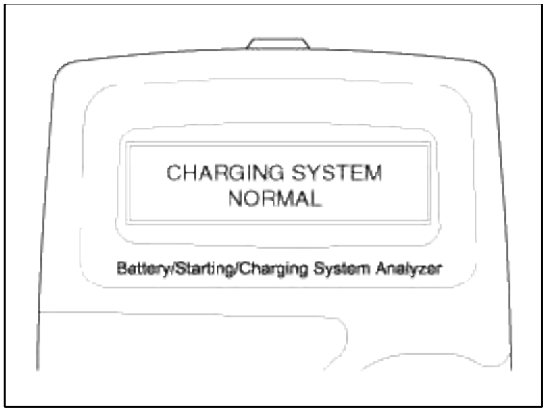
21. Turn off electrical loads (air conditioner, lamps, audio and etc). Turn the engine off.



22. Charging voltage and charging system test results will be displayed on the screen.
    Shut off engine end disconnect the tester clamps from the battery. Refer to the following table and take the appropriate action as recommended by the Micro 570.







Charging System Test Results

Result On Printer	Remedy
CHARGING SYSTEM NORMAL / DIODE RIPPLE NORMAL	Charging system is normal.
NO CHARGING VOLTAGE	Alternator does not supply charging current to battery. - Check belts, connection between alternator and battery and replace belts or cable or alternator as necessary.
LOW CHARGING VOLTAGE	Alternator does not supply charging current to battery and electrical load to system fully. - Check belts and alternator and replace as necessary.
HIGH CHARGING VOLTAGE	The voltage from alternator to battery is higher than normal limit during voltage regulating. - Check connection and ground and replace regulator as necessary. - Check electrolyte level in the battery.
EXCESS RIPPLE DETECTED	One or more diodes in the alternator is not functioning properly. - Check alternator mounting and belts and replace as necessary.

Engine Electrical System > Ignition System > Description and Operation

Description

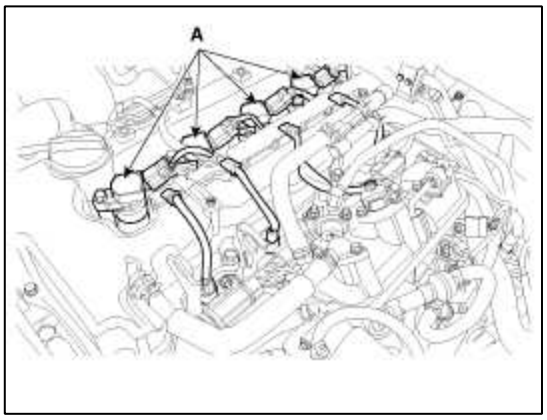
Ignition timing is controlled by the electronic control ignition timing system. The standard reference ignition timing data for the engine operating conditions are preprogrammed in the memory of the ECM (Engine Control Module). The engine operating conditions (speed, load, warm-up condition, etc.) are detected by the various sensors. Based on these sensor signals and the ignition timing data, signals to interrupt the primary current are sent to the ECM. The ignition coil is activated, and timing is controlled.

Engine Electrical System > Ignition System > Repair procedures

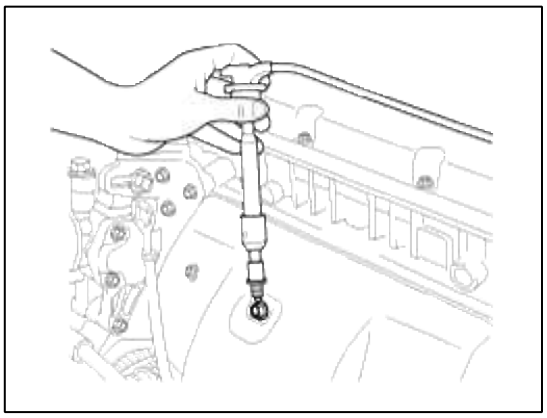
On-vehicle Inspection

Spark Test

1. Remove the ignition coil connector(A) and ignition coil.

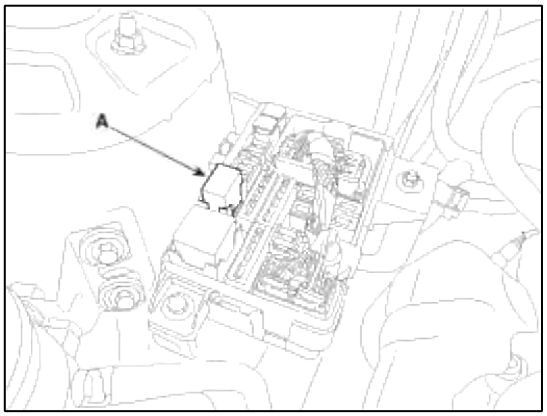


2. Using a spark plug socket, remove the spark plug.
3. Install the spark plug to the ignition coil.
4. Ground the spark plug to the engine.

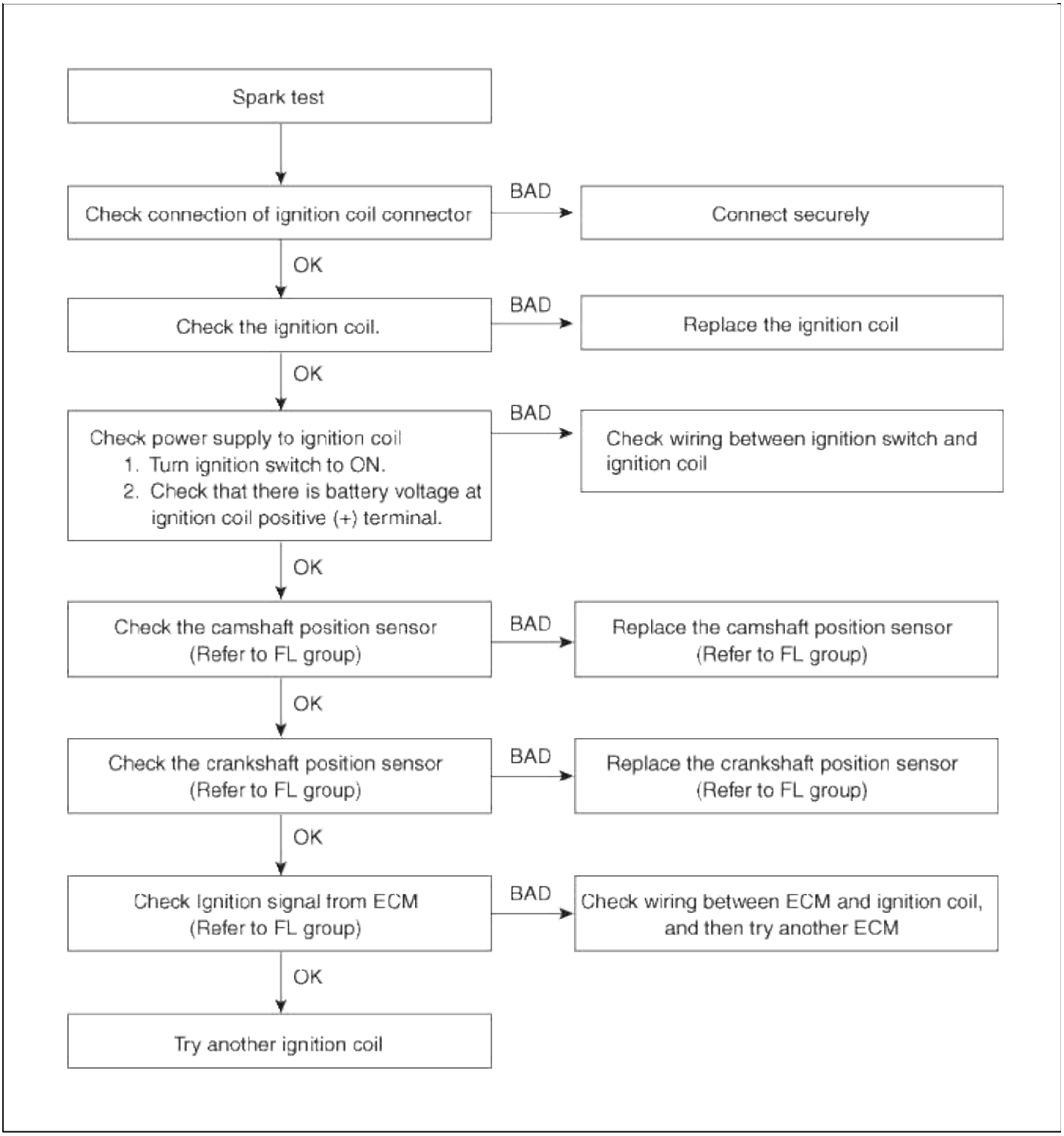


5. Check if spark occurs while engine is being cranked.

> NOTE
>
> To prevent fuel being injected from injectors while the engine is being cranked, remove the fuel pump(A) relay from the fuse box.
> Crank the engine for no more than 5 ~ 10 seconds.

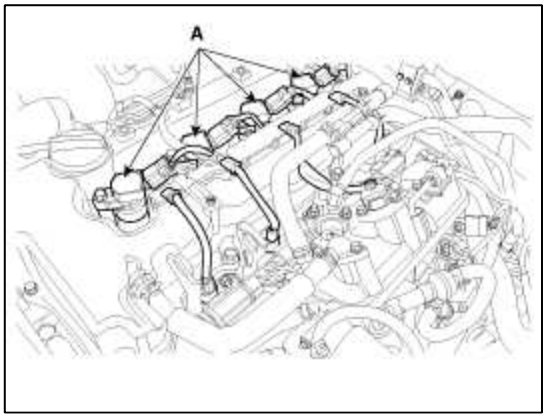


6. Inspect all the spark plugs.
7. Using a spark plug socket, install the spark plug.
8. Install the ignition coil.
9. Reconnect the ignition coil connector.



Inspect Spark Plug

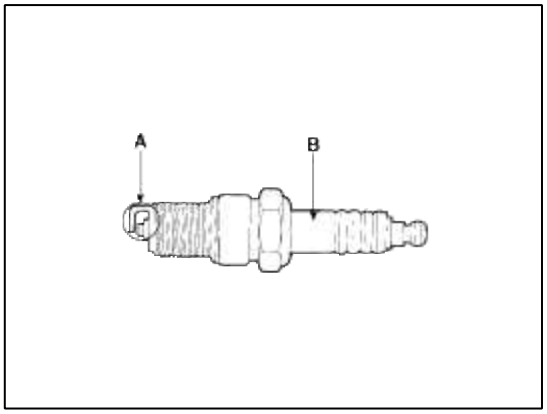
1. Remove the ignition coil connector(A) and ignition coil.



2. Using a spark plug socket, remove the spark plug.

> CAUTION
>
> Be careful that no contaminates enter through the spark plug holes.

3. Inspect the electrodes (A) and ceramic insulator (B).

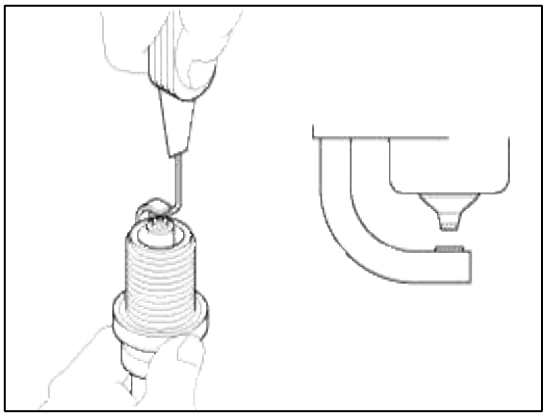


Inspection Of Electrodes

Condition	Dark deposits	White deposits
Description	- Fuel mixture too rich - Low air intake	- Fuel mixture too lean - Advanced ignition timing - Insufficient plug tightening torque

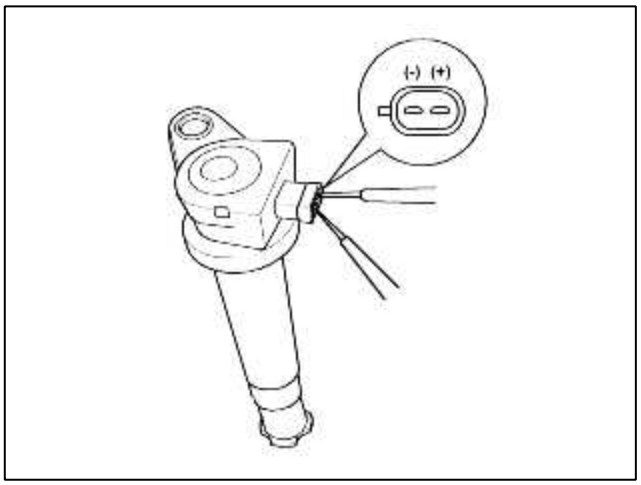
4. Check the electrode gap (A).

Standard
Unleaded : 1.0 ~ 1.1 mm (0.0394 ~ 0.0433 in.)



Inspect Ignition Coil

1. Measure the primary coil resistance between terminals (+) and (-).

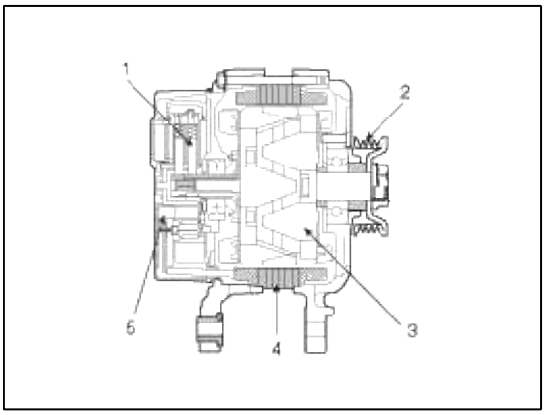


Standard value: 0.62Ω ± 10%

Engine Electrical System > Charging System > Description and Operation

Description

The charging system includes a battery, an alternator with a built-in regulator, and the charging indicator light and wire.
The Alternator has built-in diodes, each rectifying AC current to DC current.
Therefore, DC current appears at alternator "B" terminal.
In addition, the charging voltage of this alternator is regulated by the battery voltage detection system.
The main components of the alternator are the rotor, stator, rectifier, capacitor brushes, bearings and V-ribbed belt pulley. The brush holder contains a built-in electronic voltage regulator.



1. Brush
2. Drive belt pulley
3. Rotor
4. Stator
5. Rectifier

Engine Electrical System > Charging System > Repair procedures

On-vehicle Inspection

CAUTION

- Check that the battery cables are connected to the correct terminals.
- Disconnect the battery cables when the battery is given a quick charge.
- Never disconnect the battery while the engine is running.

Check The Battery Terminals And Fuses

1. Check that the battery terminals are not loose or corroded.
2. Check the fuses for continuity.

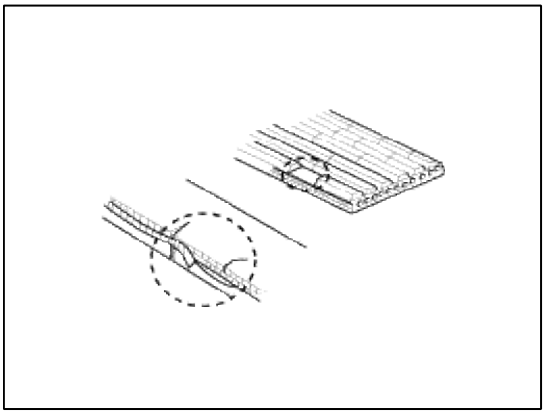
Inspect Drive Belt

Visually check the belt for excessive wear, frayed cords etc.

If any defect has been found, replace the drive belt.

NOTE

Cracks on the rib side of a belt are considered acceptable. If the belt has chunks missing from the ribs, it should be replaced.



Visually Check Alternator Wiring And Listen For Abnormal Noises

1. Check that the wiring is in good condition.
2. Check that there is no abnormal noise from the alternator while the engine is running.

Check Discharge Warning Light Circuit

1. Warm up the engine and then turn it off.
2. Turn off all accessories.
3. Turn the ignition switch "ON". Check that the discharge warning light is lit.
4. Start the engine and Check that the light goes off.
   If the light does not go off as specified, troubleshoot the discharge light circuit.

Inspect Charging System

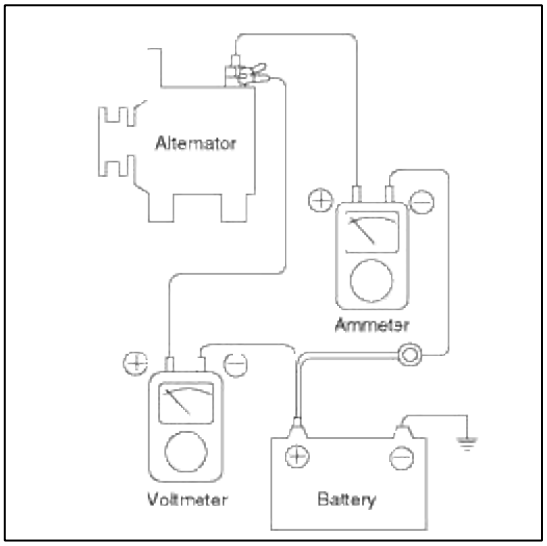
Voltage Drop Test Of Alternator Output Wire

This test determines whether or not the wiring between the alternator "B" terminal and the battery (+) terminal is good by the voltage drop method.

Preparation

1. Turn the ignition switch to "OFF".

2. Disconnect the output wire from the alternator "B" terminal. Connect the (+) lead wire of ammeter to the "B" terminal of alternator and the (-) lead wire of ammeter to the output wire. Connect the (+) lead wire of voltmeter to the "B" terminal of alternator and the (-) lead wire of voltmeter to the (+) terminal of battery.



Test

1. Start the engine.
2. Turn on the headlamps and blower motor, and set the engine speed until the ammeter indicates 20A.
   And then, read the voltmeter at this time.

Result

1. The voltmeter may indicate the standard value.

   Standard value: 0.2V max

2. If the value of the voltmeter is higher than expected (above 0.2V max.), poor wiring is suspected. In this case check the wiring from the alternator "B" terminal to the battery (+) terminal. Check for loose connections, color change due to an over-heated harness, etc. Correct them before testing again.
3. Upon completion of the test, set the engine speed at idle.
   Turn off the headlamps, blower motor and the ignition switch.

Output Current Test

This test determines whether or not the alternator gives an output current that is equivalent to the normal output.

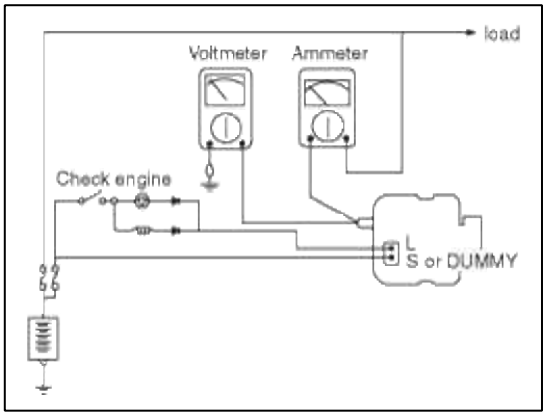
Preparation

1. Prior to the test, check the following items and correct as necessary.
   Check the battery installed in the vehicle to ensure that it is in good condition. The battery checking method is described in the section "Battery".
   The battery that is used to test the output current should be one that has been partially discharged. With a fully charged battery, the test may not be conducted correctly due to an insufficient load.
   Check the tension of the alternator drive belt. The belt tension check method is described in the section "Inspect drive belt".
2. Turn off the ignition switch.
3. Disconnect the battery ground cable.
4. Disconnect the alternator output wire from the alternator "B" terminal.
5. Connect a DC ammeter (0 to 150A) in series between the "B" terminal and the disconnected output wire. Be sure to connect the (-) lead wire of the ammeter to the disconnected output wire.

NOTE

Tighten each connection securely, as a heavy current will flow. Do not rely on clips.

6. Connect a voltmeter (0 to 20V) between the "B" terminal and ground. Connect the (+) lead wire to the alternator "B" terminal and (-) lead wire to a good ground.
7. Attach an engine tachometer and connect the battery ground cable.
8. Leave the engine hood open.



Test

1. Check to see that the voltmeter reads as the same value as the battery voltage. If the voltmeter reads 0V, and the open circuit in the wire between alternator "B" terminal and battery (+) terminal or poor grounding is suspected.
2. Start the engine and turn on the headlamps.
3. Set the headlamps to high beam and the heater blower switch to HIGH, quickly increase the engine speed to 2,500 rpm and read the maximum output current value indicated by the ammeter.

> NOTE
>
> After the engine start up, the charging current quickly drops.
> Therefore, the above operation must be done quickly to read the maximum current value correctly.

Result

1. The ammeter reading must be higher than the limit value. If it is lower but the alternator output wire is in good condition, remove the alternator from the vehicle and test it.

Limit value : 70% of the rate voltage

> NOTE
>
> - The maximum output current value is shown on the nameplate affixed to the alternator body.
> - The output current value changes with the electrical load and the temperature of the alternator itself. Therefore, the maximum output current may not be obtained. If such is the case, keep the headlamps on the cause discharge of the battery, or use the lights of another vehicle to increase the electrical load. The maximum output current may not be obtained if the temperature of the alternator itself or ambient temperature is too high.
>   In such a case, reduce the temperature before testing again.

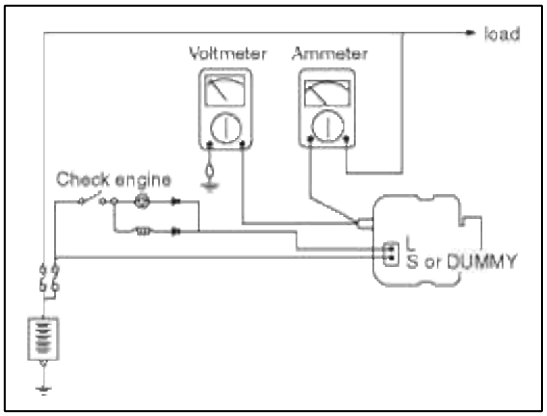
2. Upon completion of the output current test, lower the engine speed to idle and turn off the ignition switch.
3. Disconnect the battery ground cable.
4. Remove the ammeter and voltmeter and the engine tachometer.
5. Connect the alternator output wire to the alternator "B" terminal.
6. Connect the battery ground cable.

Regulated Voltage Test

The purpose of this test is to check that the electronic voltage regulator controls voltage correctly.

Preparation

1. Prior to the test, check the following items and correct if necessary.
   Check that the battery installed on the vehicle is fully charged. The battery checking method is described in the section "Battery".
   Check the alternator drive belt tension. The belt tension check method is described in the section "Inspect drive belt".
2. Turn ignition switch to "OFF".
3. Disconnect the battery ground cable.
4. Connect a digital voltmeter between the "B" terminal of the alternator and ground. Connect the (+) lead of the voltmeter to the "B" terminal of the alternator. Connect the (-) lead to good ground or the battery (-) terminal.
5. Disconnect the alternator output wire from the alternator "B" terminal.
6. Connect a DC ammeter (0 to 150A) in series between the "B" terminal and the disconnected output wire. Connect the (-) lead wire of the ammeter to the disconnected output wire.
7. Attach the engine tachometer and connect the battery ground cable.



Test

1. Turn on the ignition switch and check to see that the voltmeter indicates the following value.

   Voltage: Battery voltage

   If it reads 0V, there is an open circuit in the wire between the alternator "B" terminal and the battery and the battery (-) terminal.
2. Start the engine. Keep all lights and accessories off.
3. Run the engine at a speed of about 2,500 rpm and read the voltmeter when the alternator output current drops to 10A or less

Result

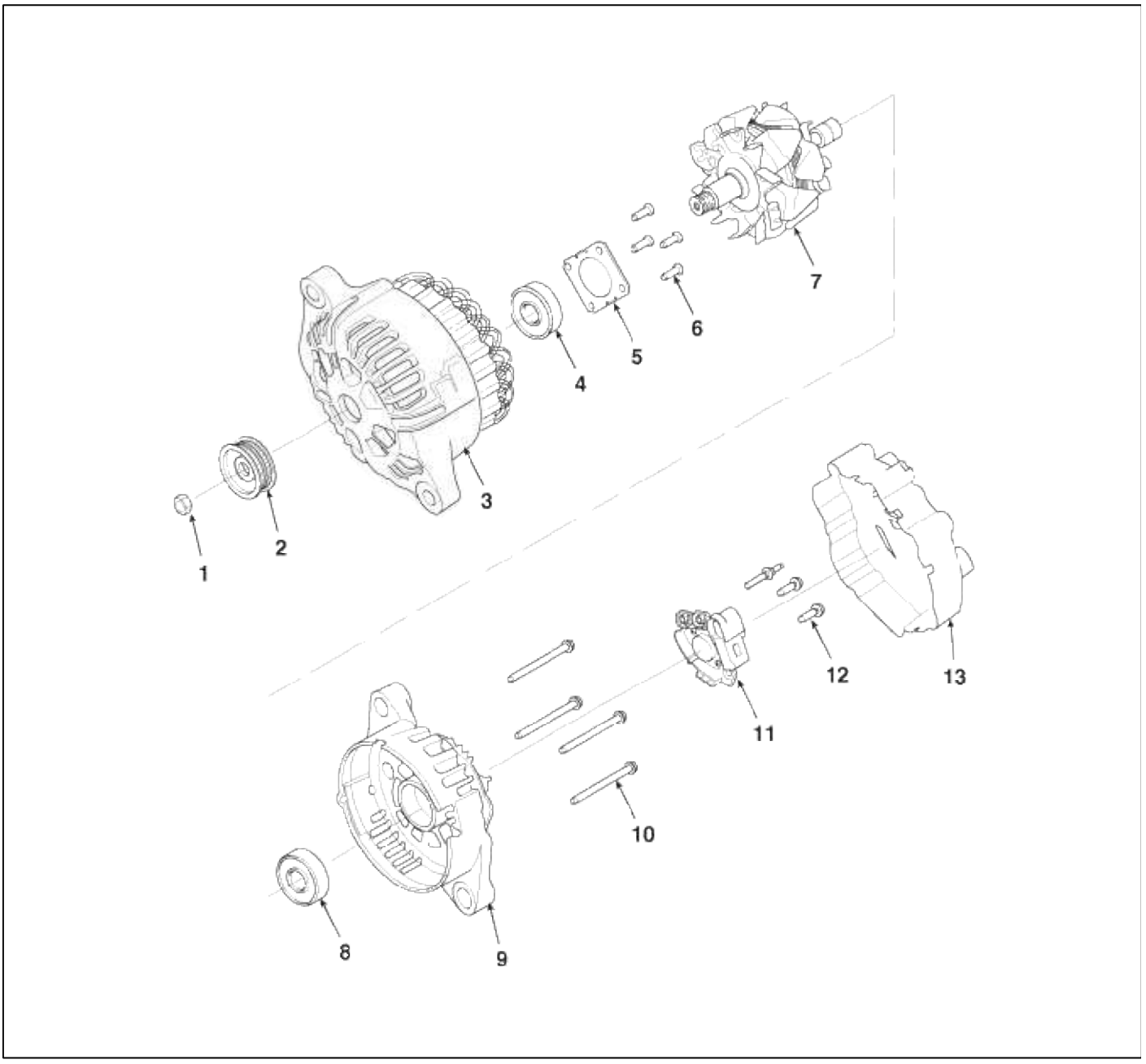
1. If the voltmeter reading agrees with the value listed in the regulating voltage table below, the voltage regulator is functioning correctly. If the reading is other than the standard value, the voltage regulator or the alternator is faulty.
   Regulating Voltage Table

Voltage regulator ambient temperature °C (°F)	Regulating voltage (V)
-30 (-22) 25 (77) 135 (275)	14.2 ~ 15.3 14.2 ~ 14.8 13.3 ~ 14.8

2. Upon completion of the test, reduce the engine speed to idle, and turn off the ignition switch.
3. Disconnect the battery ground cable.
4. Remove the voltmeter and ammeter and the engine tachometer.
5. Connect the alternator output wire to the alternator "B" terminal.
6. Connect the battery ground cable.

Engine Electrical System > Charging System > Alternator > Components and Components Location

Component

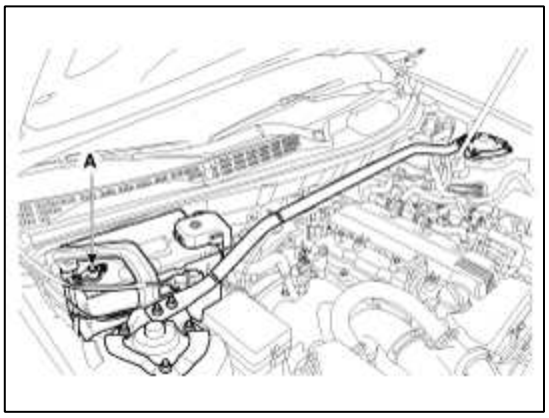


1. Nut	8. Rear bearing
2. Pulley	9. Rear bracket
3. Front bracket	10. Through bolt
4. Front bearing	11. Brush holder assembly
5. Bearing cover	12. Brush holder bolt
6. Bearing cover bolt	13. Rear cover
7. Rotor coil	

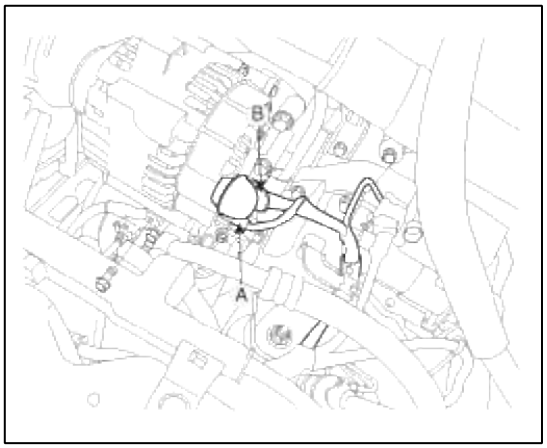
Engine Electrical System > Charging System > Alternator > Repair procedures

Removal and Installation

1. Disconnect the battery negative terminal(A).

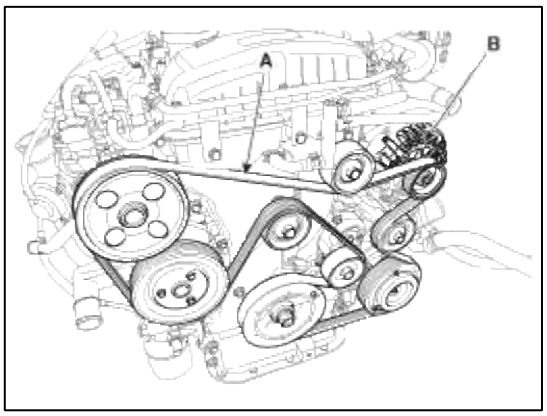


2. Disconnect the alternator connector(B) and cable(A).



3. Remove the drive belt (A) and alternator (B).

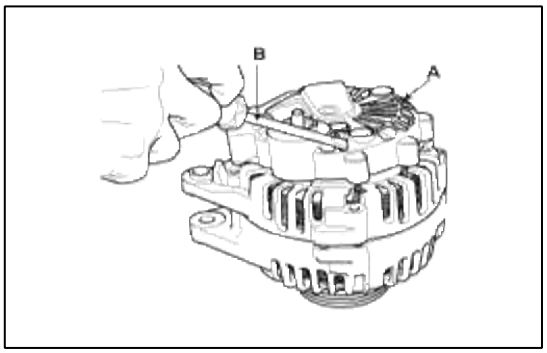
Tightening torque :
44.1 ~ 53.9 N.m (4.5 ~ 5.5 kgf.m, 32.5 ~39.7 lb-ft)



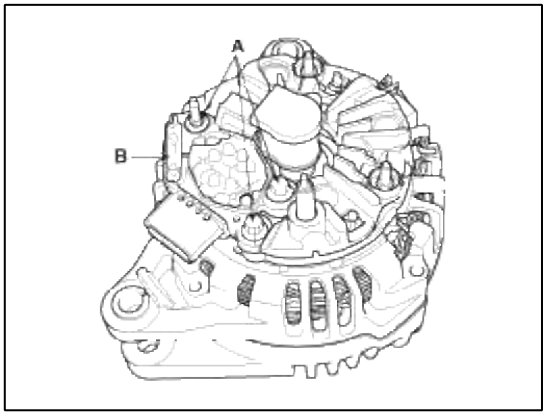
4. Installation is the reverse order of removal.

Disassembly

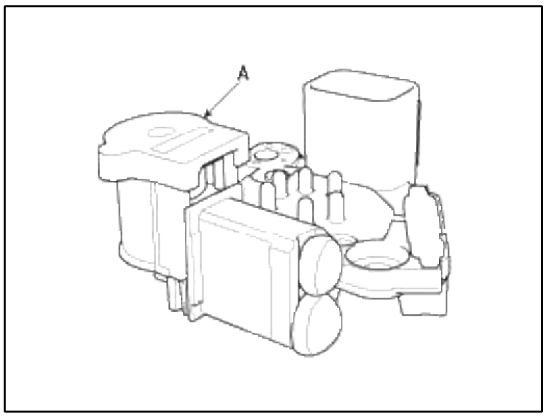
1. Remove the alternator cover(A) using a screw driver(B).



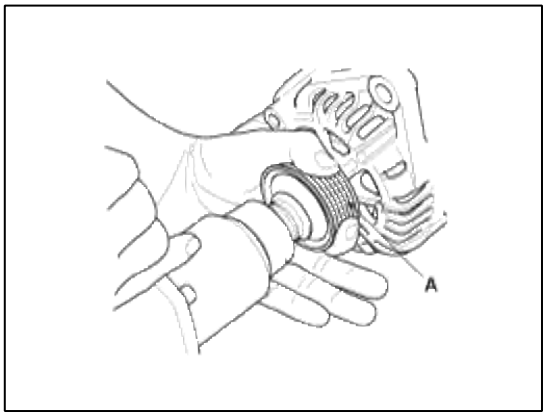
2. Loosen the mounting bolts(A) and disconnect the brush holder assembly(B).



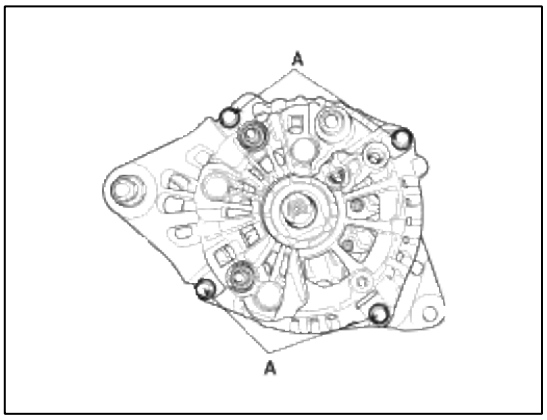
3. Remove the slip ring guide(A).



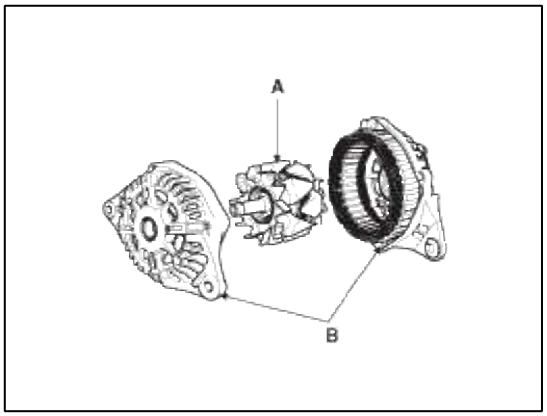
4. Remove the nut, pulley(A) and spacer.



5. Loosen the 4 through bolts(A).



6. Disconnect the rotor(A) and cover(B).

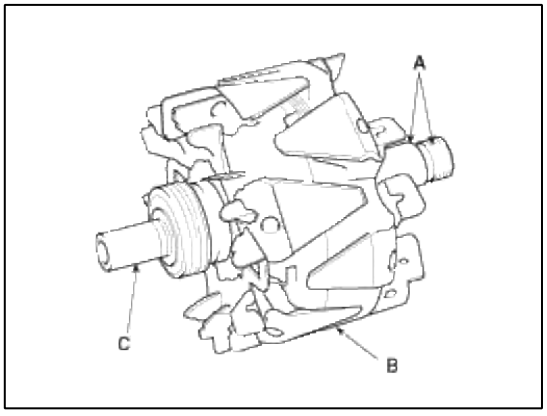


7. Reassembly is the reverse order of disassembly.

Inspection

Inspect Rotor

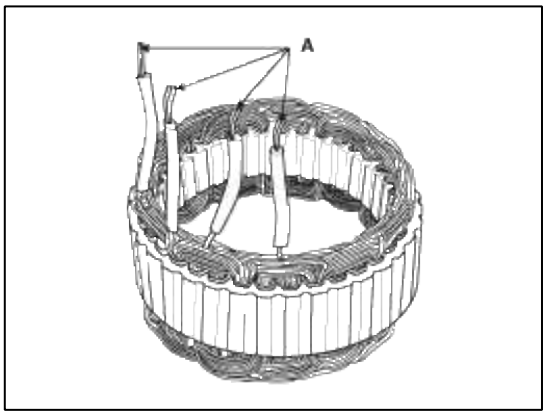
1. Check that there is continuity between the slip rings (A).



2. Check that there is no continuity between the slip rings and the rotor (B) or rotor shaft (C).
3. If the rotor fails either continuity check, replace the alternator.

Inspect Stator

1. Check that there is continuity between each pair of leads (A).

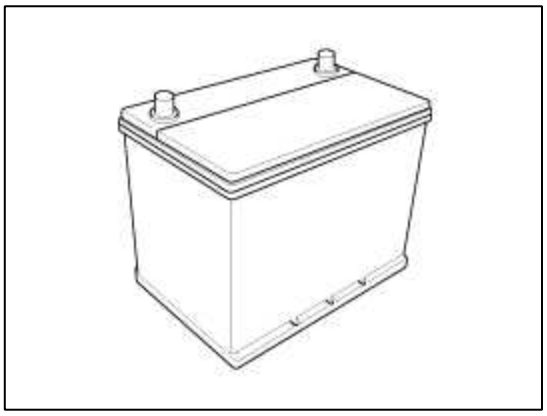


2. Check that there is no continuity between each lead and the coil core.
3. If the coil fails either continuity check, replace the alternator.

Engine Electrical System > Charging System > Battery > Description and Operation

Description

1. The maintenance-free battery is, as the name implies, totally maintenance free and has no removable battery cell caps.
2. Water never needs to be added to the maintenance-free battery.
3. The battery is completely sealed, except for small vent holes in the cover.

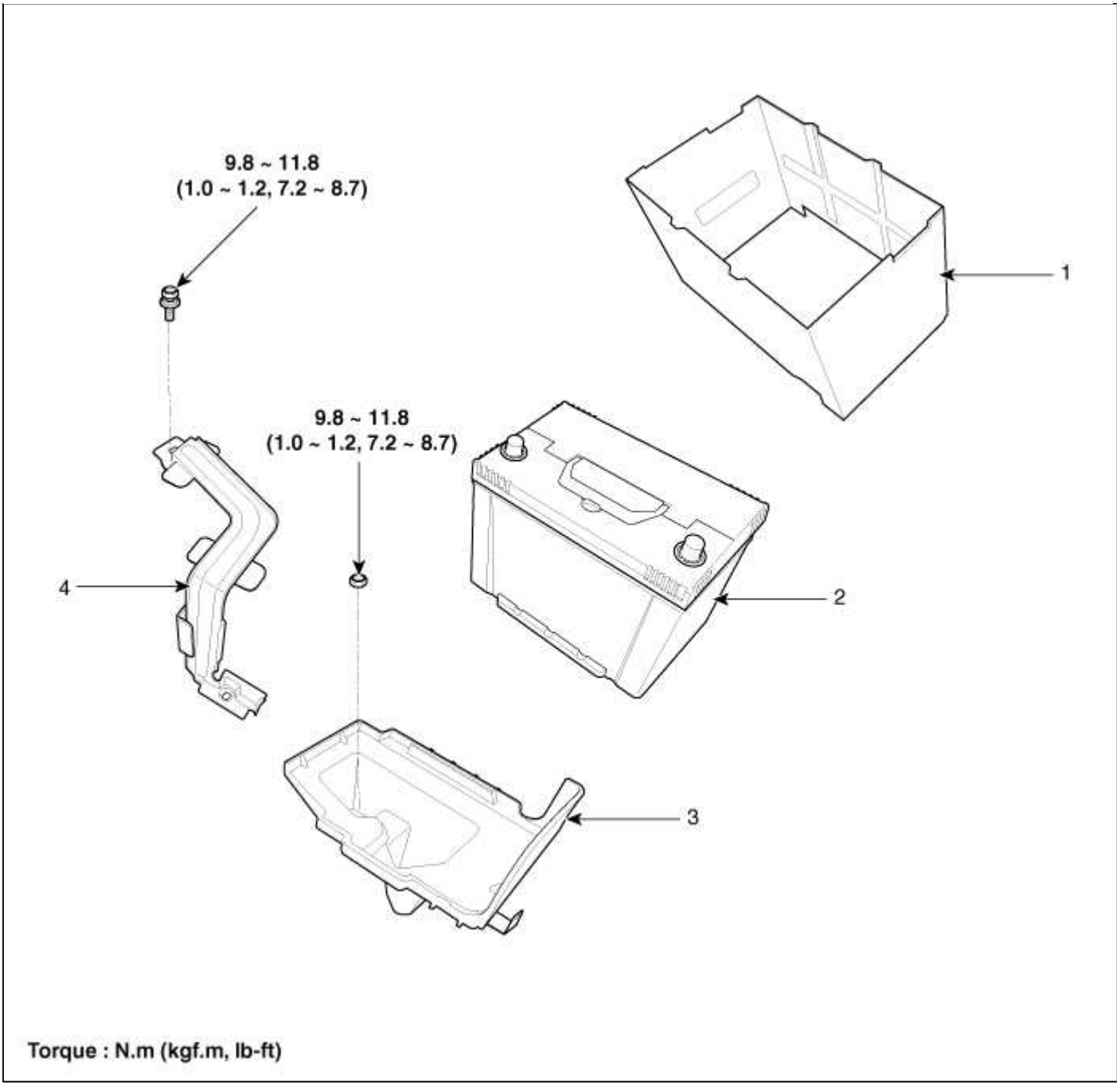


NOTE

When reconnecting the battery cable after disconnecting, be sure to reset systems. (Refer to the BE group - "General Information")

Engine Electrical System > Charging System > Battery > Components and Components Location

Components

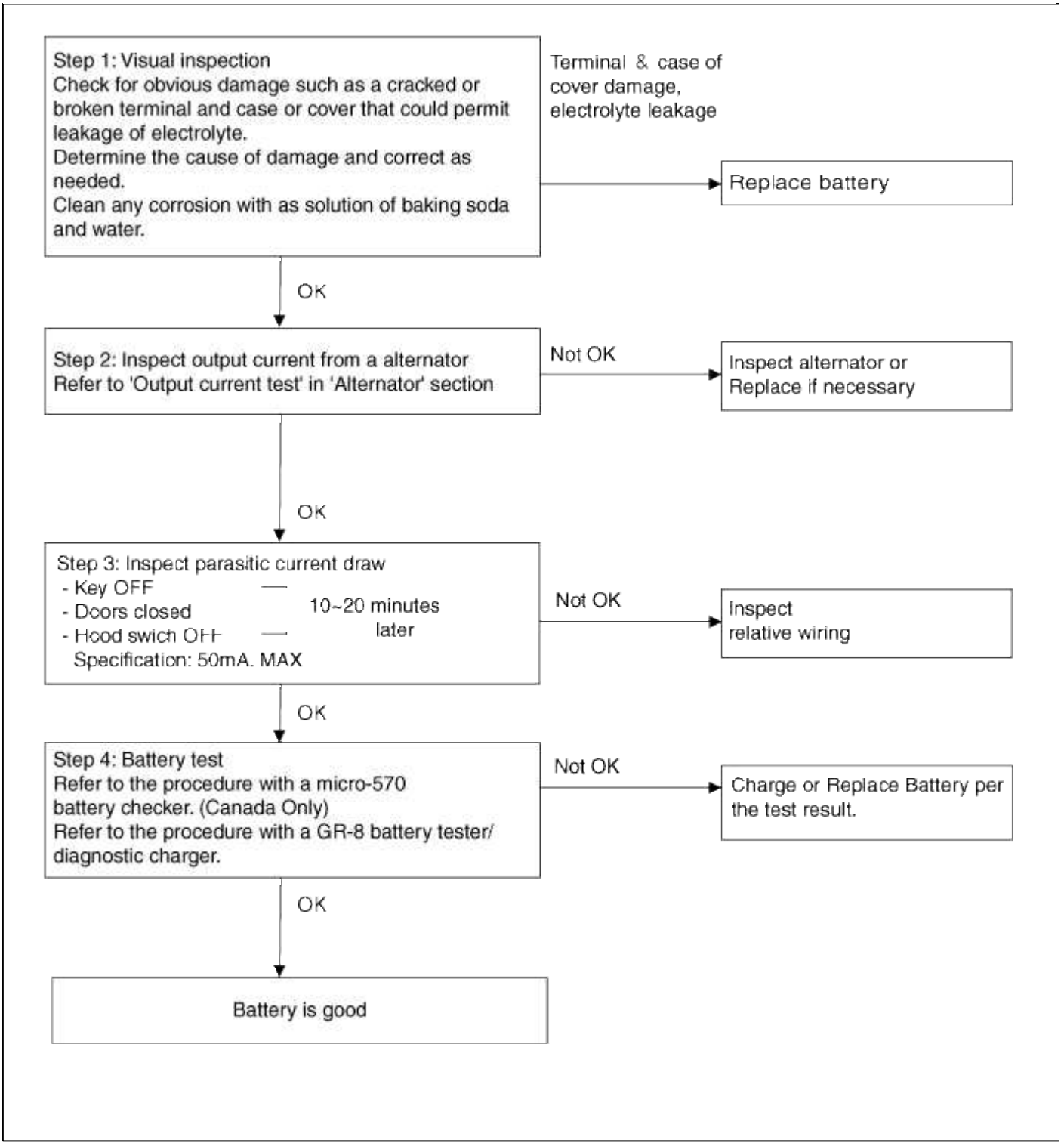


1. Battery insulation pad 2. Battery	3. Battery tray 4. Battery mounting bracket

Engine Electrical System > Charging System > Battery > Repair procedures

Inspection

Battery Diagnostic Flow



Vehicle parasitic current inspection

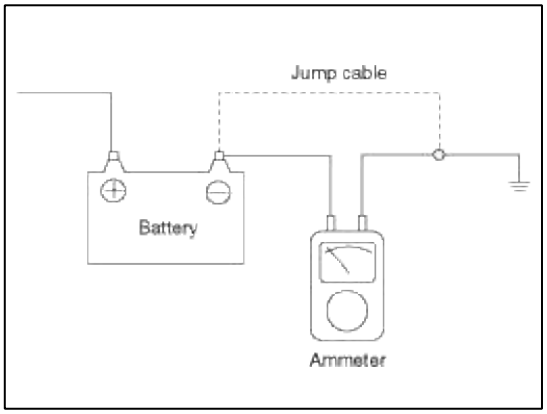
1. Turn the all electric devices OFF, and then turn the ignition switch OFF.
2. Close all doors except the engine hood, and then lock all doors.
   (1) Disconnect the hood switch connector.
   (2) Close the trunk lid.
   (3) Close the doors or remove the door switches.

3. Wait a few minutes until the vehicle's electrical systems go to sleep mode.

> NOTE
>
> For an accurate measurement of a vehicle parasitic current, all electriacl systems should go to sleep mode. (It takes at least one hour or at most one day.) However, an approximate vehicle parasitic current can be measured after 10~20 minutes.

4. Connect an ammeter in series between the battery (-) terminal and the ground cable, and then disconnect the clamp from the battery (-) terminal slowly.

> CAUTION
>
> Be careful that the lead wires of an ammeter do not come off from the battery (-) terminal and the ground cable to prevent the battery from being reset. In case the battery is reset, connect the battery cable again, and then start the engine or turn the ignition switch ON for more than 10 sec. Repeat the procedure from No. 1.
> To prevent the battery from being reset during the inspection,
> 1) Connect a jump cable between the battery (-) terminal and the ground cable.
> 2) Disconnect the ground cable from the battery (-) terminal.
> 3) Connect an ammeter between the battery (-) terminal and the ground cable.
> 4) After disconnecting the jump cable, read the current value of the ammeter.



5. Read the current value of the ammeter.
   A. If the parasitic current is over the limit value, search for abnormal circuit by removing a fuse one by one and checking the parasitic current.
   B. Check the parasitic current again, and search for suspected unit by removing a unit connected with the abnormal circuit one by one.

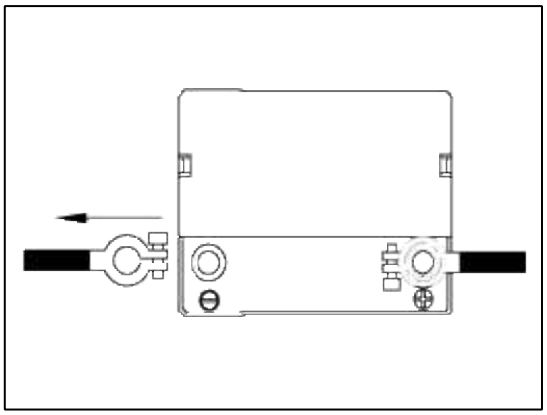
Limit value (after 10~20 min.) : Below 50mA

Cleaning

1. Make sure the ignition switch and all accessories are in the OFF position.
2. Disconnect the battery cables (negative first).

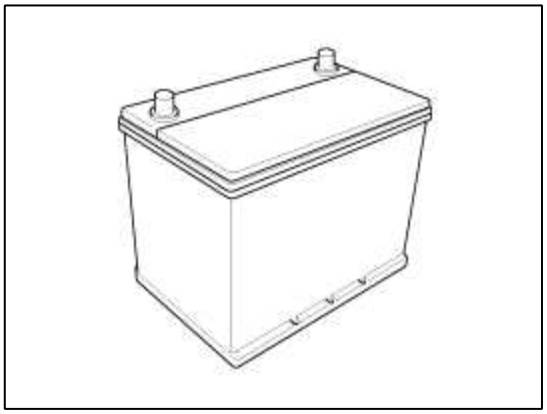
3. Remove the battery from the vehicle.

> CAUTION
>
> Care should be taken in the event the battery case is cracked or leaking, to protect your skin from the electrolyte.
> Heavy rubber gloves (not the household type) should be wore when removing the battery.



4. Inspect the battery tray for damage caused by the loss of electrolyte. If acid damage is present, it will be necessary to clean the area with a solution of clean warm water and baking soda. Scrub the area with a stiff brush and wipe off with a cloth moistened with baking soda and water.
5. Clean the top of the battery with the same solution as described above.
6. Inspect the battery case and cover for cracks. If cracks are present, the battery must be replaced.
7. Clean the battery posts with a suitable battery post tool.
8. Clean the inside surface of the terminal clamps with a suitable battery cleaning tool. Replace damaged or frayed cables and broken terminal clamps.
9. Install the battery in the vehicle.
10. Connect the cable terminals to the battery post, making sure tops of the terminals are flush with the tops of the posts.
11. Tighten the terminal nuts securely.
12. Coat all connections with light mineral grease after tightening.

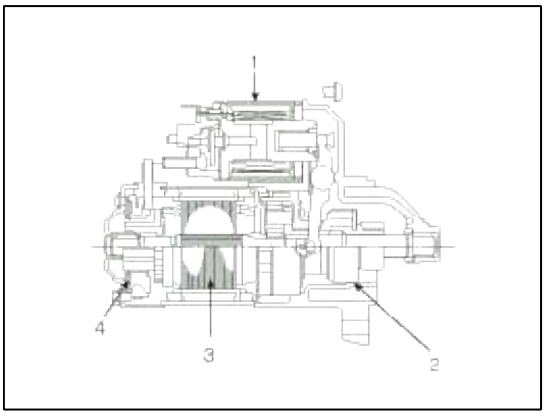
> CAUTION
>
> When batteries are being charged, an explosive gas forms beneath the cover of each cell. Do not smoke near batteries being charged or which have recently been charged. Do not break live circuit at the terminals of batteries being charged.
> A spark will occur when the circuit is broken. Keep open flames away from battery.



Engine Electrical System > Starting System > Description and Operation

Description

The starting system includes the battery, starter, solenoid switch, ignition switch, inhibitor switch (A/T), ignition lock switch, connection wires and the battery cable.
When the ignition key is turned to the start position, current flows and energizes the starter motor's solenoid coil.
The solenoid plunger and clutch shift lever are activated, and the clutch pinion engages the ring gear.
The contacts close and the starter motor cranks. In order to prevent damage caused by excessive rotation of the starter armature when the engine starts, the clutch pinion gear overruns.



1. Solenoid
2. Overrun clutch
3. Armature
4. Brush assembly

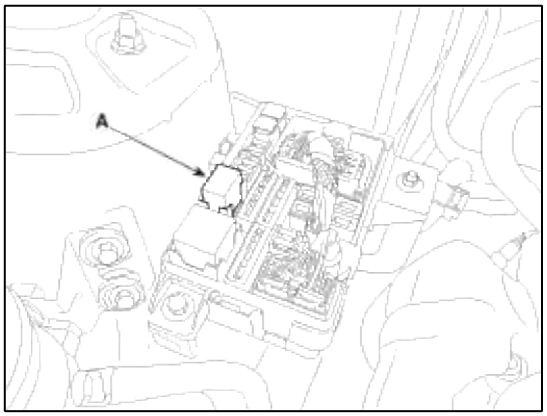
Engine Electrical System > Starting System > Repair procedures

Starter Circuit Troubleshooting

NOTE

The battery must be in good condition and fully charged.

1. Remove the fuel pump relay(A) from the fuse box.

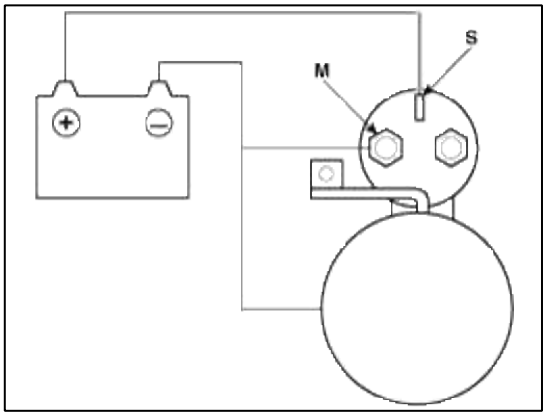


2. With the shift lever in N or P (A/T) or clutch pedal pressed (M/T), turn the ignition switch to "START"
   If the starter normally cranks the engine, starting system is OK. If the starter will not crank the engine at all, go to next step.
   If it won't disengage from the ring gear when you release key, check for the following until you find the cause.
   A. Solenoid plunger and switch malfunction.
   B. Dirty pinion gear or damaged overrunning clutch.

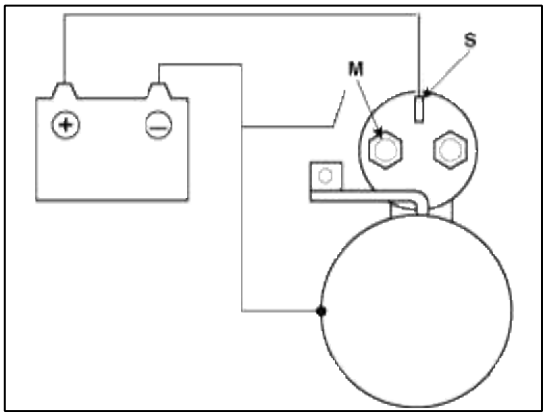
3. Check the battery condition. Check electrical connections at the battery, battery negative cable connected to the body, engine ground cables, and the starter for looseness and corrosion. Then try starting the engine again.
   If the starter cranks normally the engine, repairing the loose connection repaired the problem. The starting system is now OK.
   If the starter still does not crank the engine, go to next step.
4. Disconnect the connector from the S-terminal of solenoid. Connect a jumper wire from the B-terminal of solenoid to the S-terminal of solenoid.
   If the starter cranks the engine, go to next step.
   If the starter still does not crank the engine, remove the starter, and repair or replace as necessary.
5. Check the following items in the order listed until you find the open circuit.
   A. Check the wire and connectors between the driver's under-dash fuse/relay box and the ignition switch, and between the driver's under-dash fuse/relay box and the starter.
   B. Check the ignition switch (Refer to BE group - ignition system)
   C. Check the transaxle range switch connector or ignition lock switch connector.
   D. Inspect the starter relay.

Starter Solenoid Test

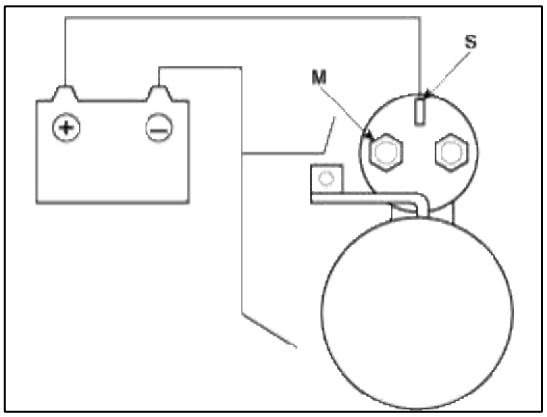
1. Disconnect the field coil wire from the M-terminal of solenoid switch.
2. Connect the battery as shown. If the starter pinion pops out, it is working properly. To avoid damaging the starter, do not leave the battery connected for more than 10 seconds.



3. Disconnect the battery from the M terminal.
   If the pinion does not retract, the hold-in coil is working properly. To avoid damaging the starter, do not leave the battery connected for more than 10 seconds.

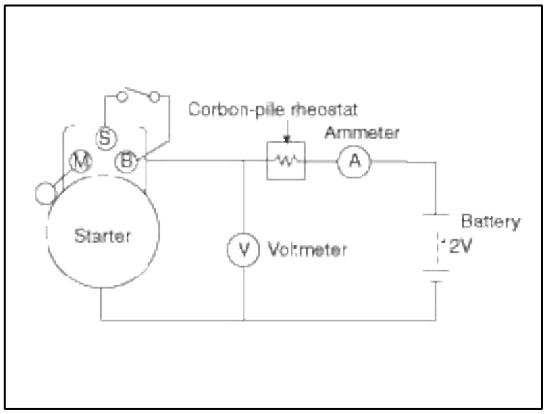


4. Disconnect the battery also from the body. If the pinion retracts immediately, it is working properly. To avoid damaging the starter, do not leave the battery connected for more than 10 seconds.



Free Running Test

1. Place the starter motor in a vise equipped with soft jaws and connect a fully-charged 12-volt battery to starter motor as follows.
2. Connect a test ammeter (100-ampere scale) and carbon pile rheostats as shown in the illustration.
3. Connect a voltmeter (15-volt scale) across starter motor.

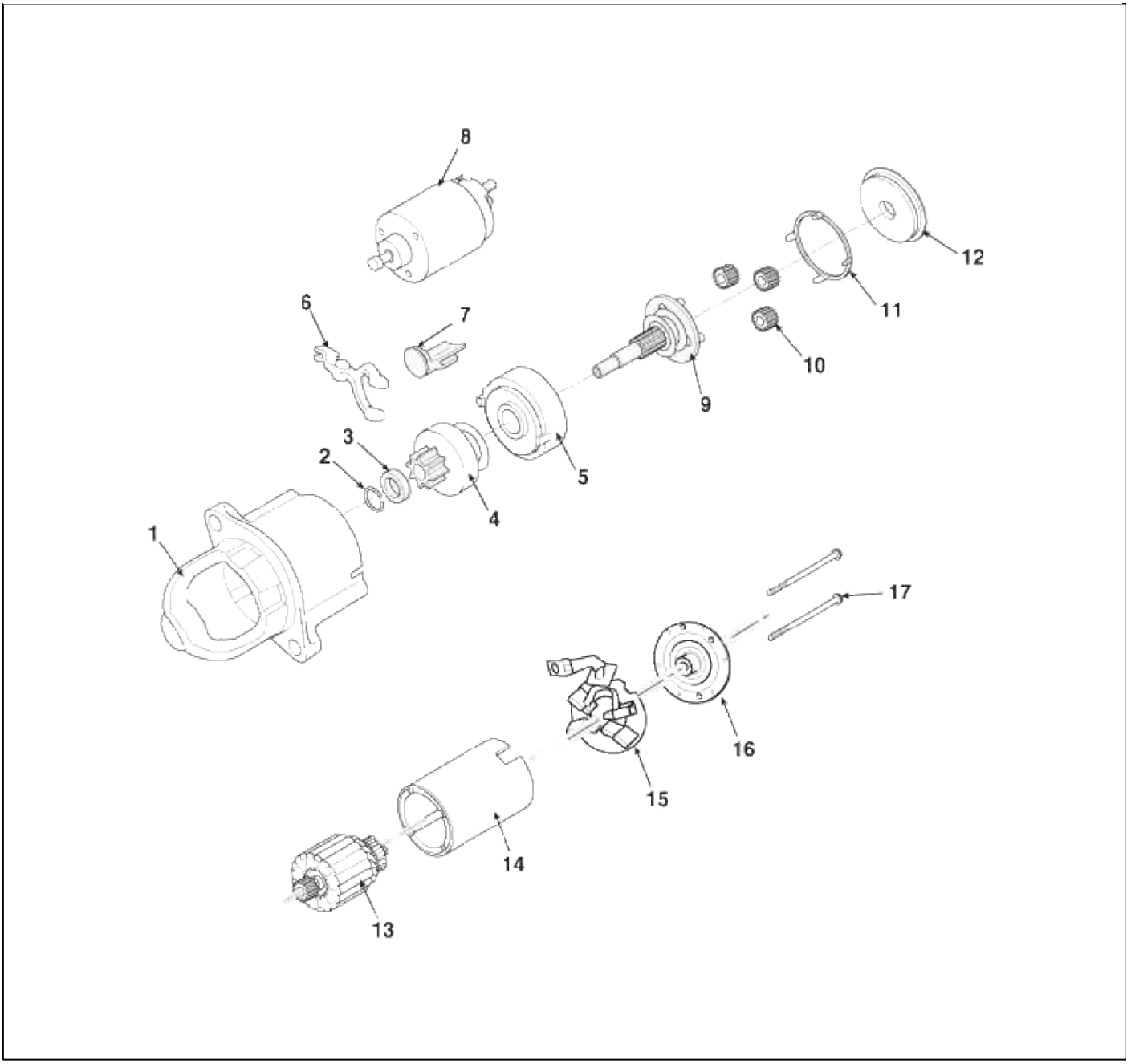


4. Rotate carbon pile to the off position.
5. Connect the battery cable from battery's negative post to the starter motor body.
6. Adjust until battery voltage shown on the voltmeter reads 11volts.
7. Confirm that the maximum amperage is within the specifications and that the starter motor turns smoothly and freely.

Current : 90A max
Speed : 2,600 rpm

Engine Electrical System > Starting System > Starter > Components and Components Location

Component

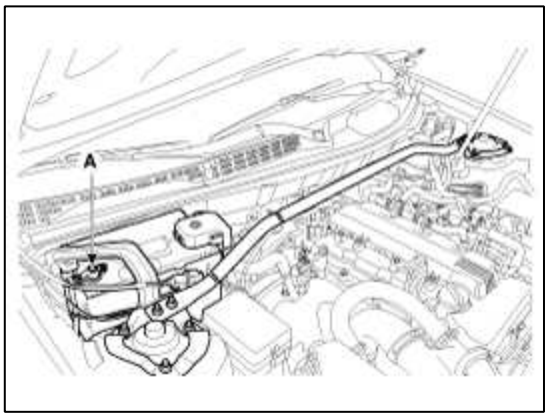


1. Front bracket 2. Stop ring 3. Stopper 4. Overrun clutch assembly 5. Internal gear assembly 6. Lever 7. Lever packing 8. Magnet switch assembly	9. Planet shaft assembly 10. Planetary gear assembly 11. Packing 12. Shield 13. Armature assembly 14. Yoke assembly 15. Brush holder assembly 16. Rear bracket 17. Through bolt

Engine Electrical System > Starting System > Starter > Repair procedures

Removal and Installation

1. Disconnect the battery negative cable(A).

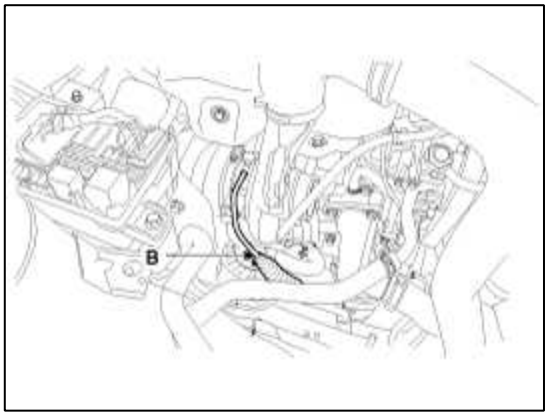


2. Set the jack under the engine oil pan.

> NOTE
>
> Insert the rubber block between engine oil pan and jack to prevent the damage of oil pan.

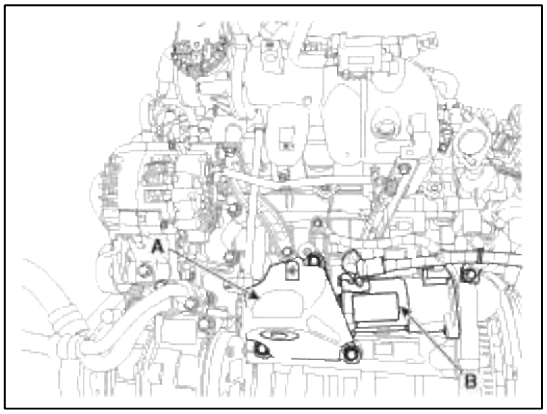
3. Remove the LH engine mounting bracket nut (A).

Tightening torque :
63.7 ~ 83.4 N.m (6.5 ~ 8.5 kgf.m, 47.0 ~ 61.5 lb-ft)



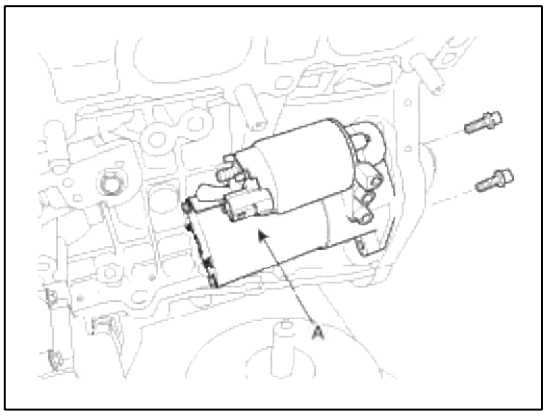
4. Lift up the engine assembly slightly by using a jack to get access to the side of engine.
5. Remove the engine support bracket (A). And then remove cable and connector from starter (B).

Tightening torque :
49.0 ~ 63.7 N.m (5.0 ~ 6.5 kgf.m, 36.2 ~ 47.0 lb-ft)



6. Remove the bolts and starter (A).

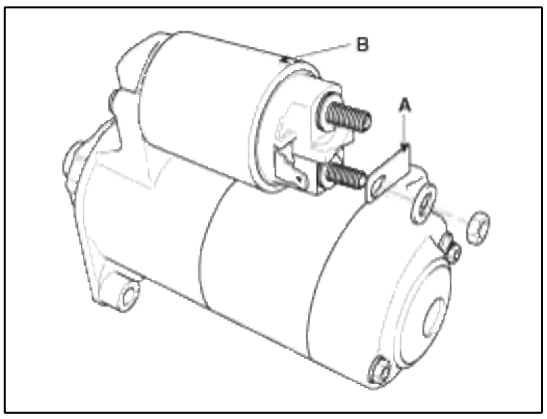
Tightening torque :
42.1 ~ 53.9 N.m (4.3 ~ 5.5 kgf.m, 31.1 ~ 39.7 lb-ft)



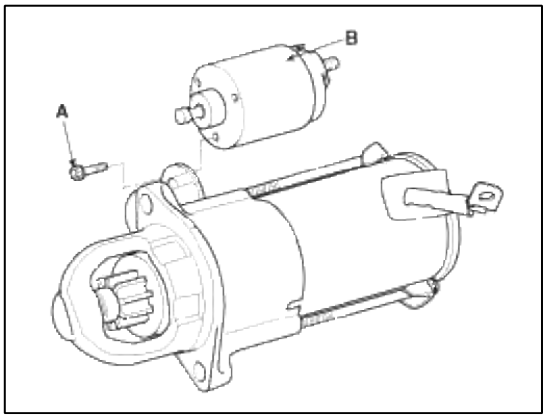
7. Installation is the reverse of removal.

Disassembly

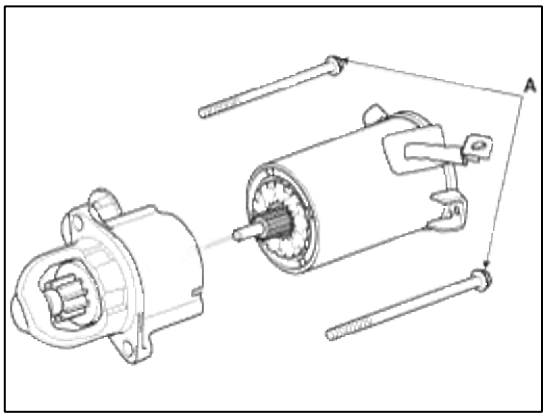
1. Disconnect the M-terminal (A) on the magnet switch assembly (B).



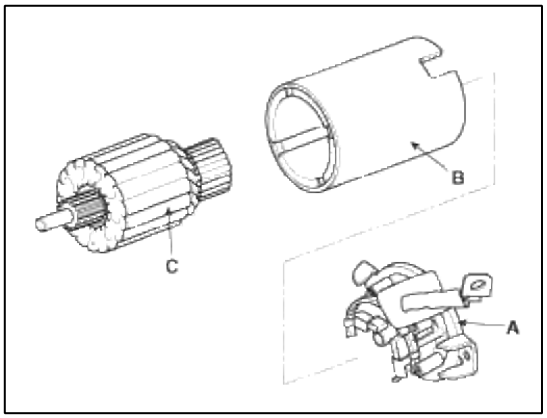
2. After loosening the 3 screws (A), detach the magnet switch assembly (B).



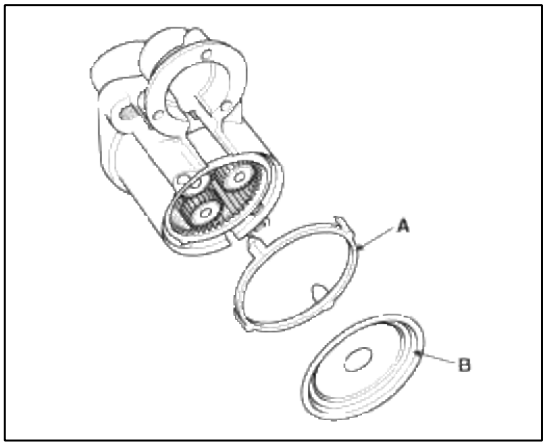
3. Loosen the through bolts (A).



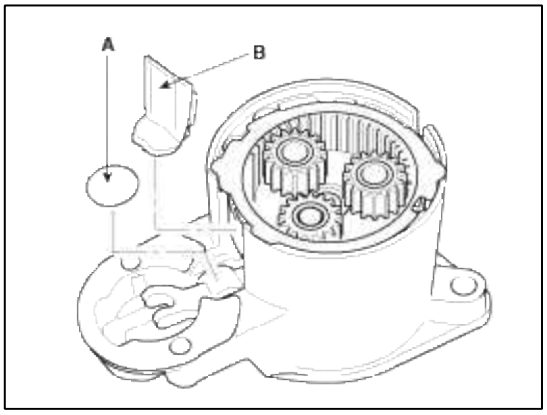
4. Remove the brush holder assembly (A), yoke (b) and armature (C).



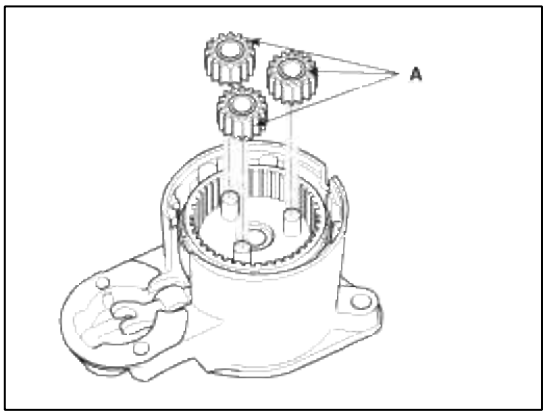
5. Remove the shield (A) and packing (B).



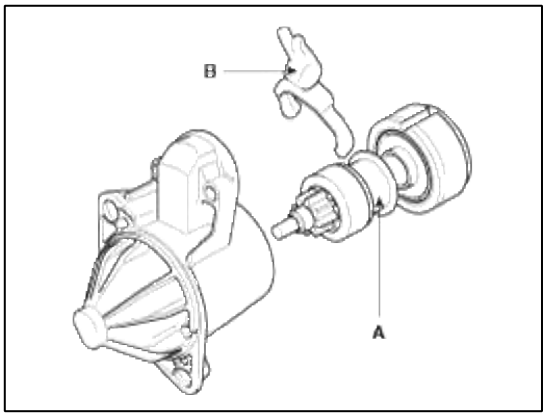
6. Remove the lever plate (A) and lever packing (B).



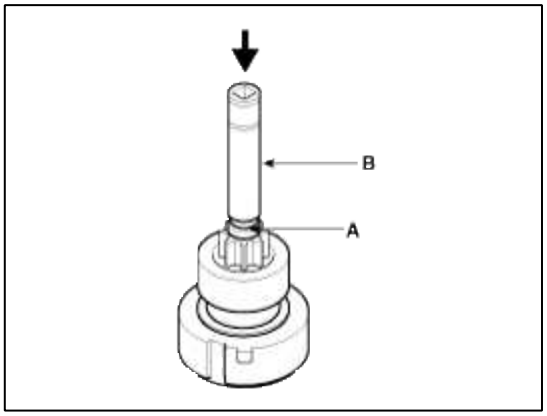
7. Disconnect the planet gear (A).



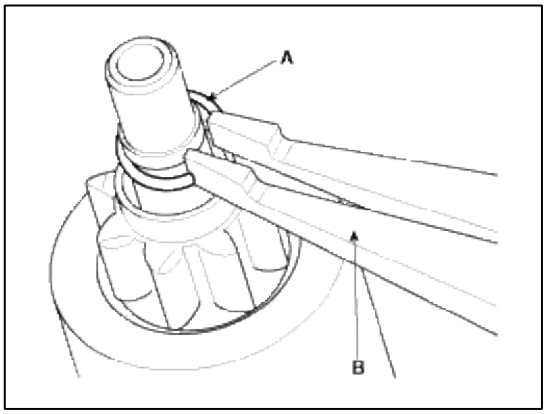
8. Disconnect the planet shaft assembly (A) and lever (B).



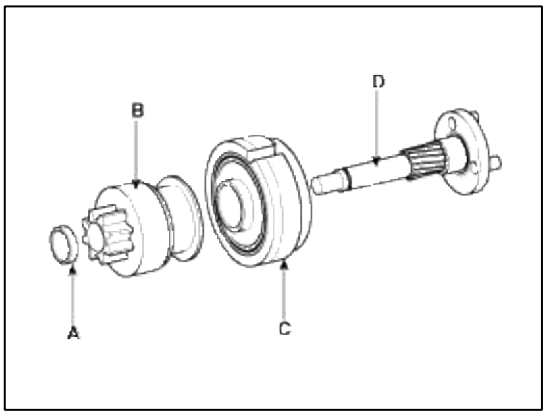
9. Press the stop ring (A) using a socket (B).



10. After removing the stopper (A) using stopper pliers (B).



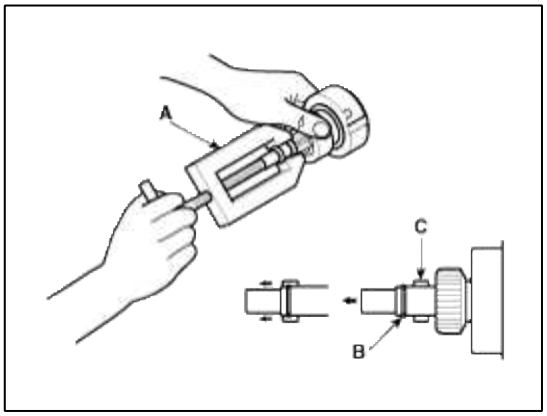
11. Disconnect the stop ring (A), overrunning clutch (B), internal gear (C) and planet shaft (D).



12. Reassembly is the reverse of disassembly.

NOTE

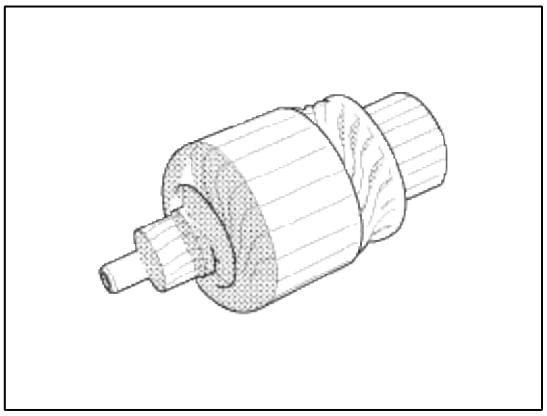
Using a suitable pulling tool (A), pull the overrunning clutch stop ring (B) over the stopper (C).



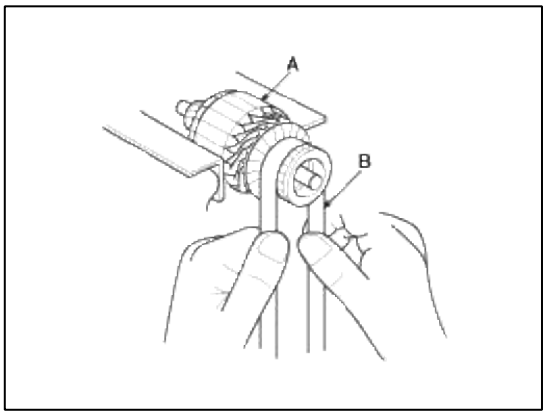
Inspection

Armature Inspection And Test

1. Remove the starter.
2. Disassemble the starter as shown at the beginning of this procedure.
3. Inspect the armature for wear or damage from contact with the permanent magnet. If there is wear or damage, replace the armature.

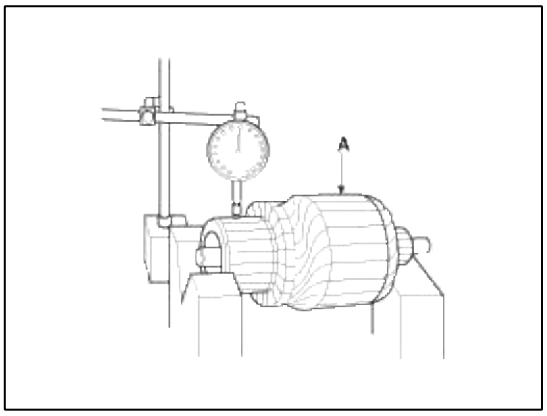


4. Check the commutator (A) surface. If the surface is dirty or burnt, resurface with emery cloth or a lathe within the following specifications, or recondition with #500 or #600 sandpaper (B).



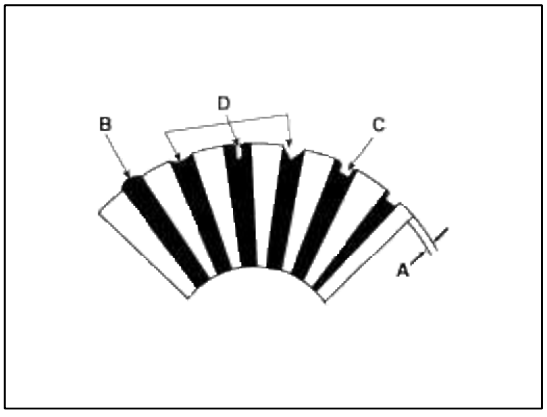
5. Measure the commutator (A) runout.
   A. If the commutator runout is within the service limit, check the commutator for carbon dust or brass chips between the segments.
   B. If the commutator run out is not within the service limit, replace the armature.

Commutator runout
Standard (New): 0.05mm (0.0020in.) max
Service limit: 0.08mm (0.0031in.)

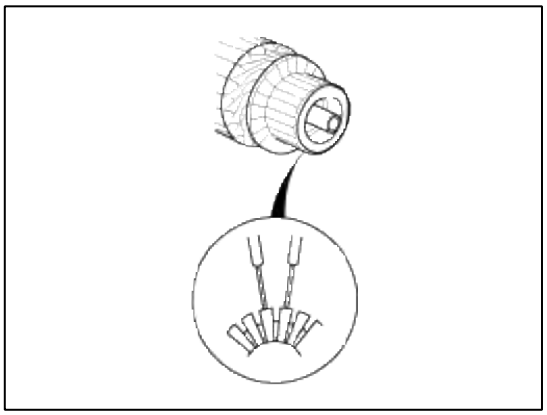


6. Check the mica depth (A). If the mica is too high (B), undercut the mica with a hacksaw blade to the proper depth. Cut away all the mica (C) between the commutator segments. The undercut should not be too shallow, too narrow, or v-shaped (D).

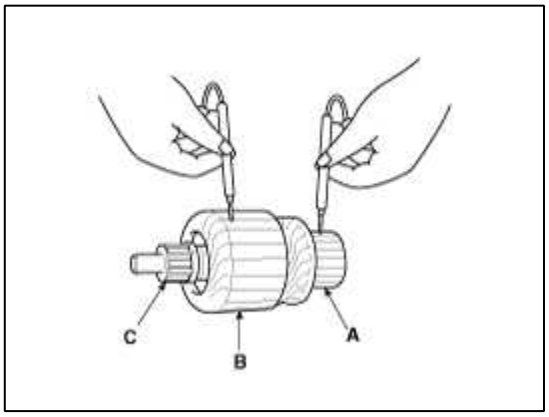
Commutator mica depth
Standard (New) : 0.5 mm (0.0197 in.)
Limit : 0.2mm (0.0079 in.)



7. Check for continuity between the segments of the commutator. If an open circuit exists between any segments, replace the armature.

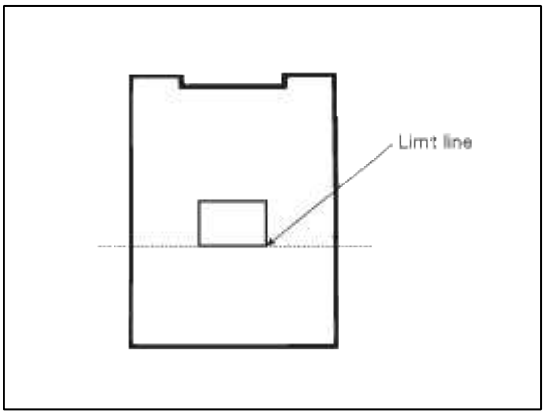


8. Check with an ohmmeter that no continuity exists between the commutator (A) and armature coil core (B), and between the commutator and armature shaft (C). If continuity exists, replace the armature.



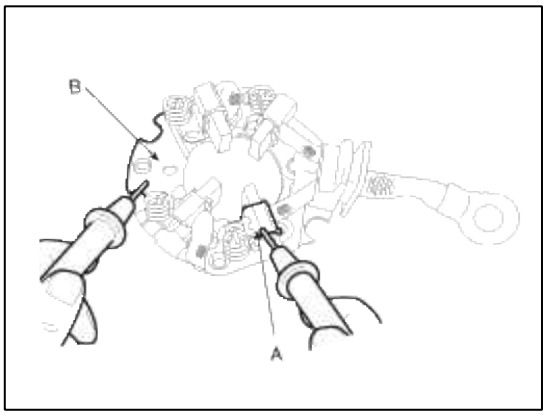
Inspect Starter Brush

Brushes that are worm out, or oil-soaked, should be replaced.

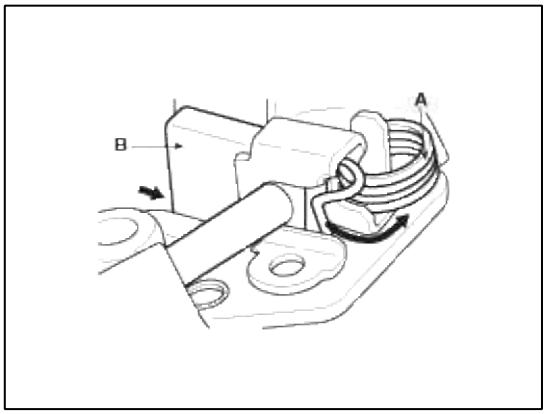


Starter Brush Holder Test

1. Make sure there is no continuity between the (+) brush holder (A) and (-) plate (B). If there is continuity, replace the brush holder assembly.



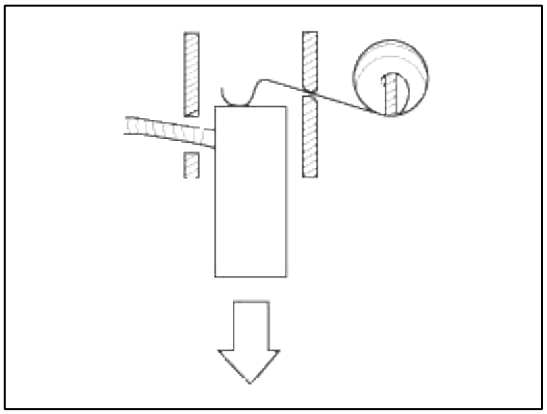
2. Pry back each brush spring (A) with a screwdriver, then position the brush (B) about halfway out of its holder, and release the spring to hold it there.



3. Install the armature in the housing, and install the brush holder. Next, pry back each brush spring again, and push the brush down until it seats against the commutator, then release the spring against the end of the brush.

NOTE

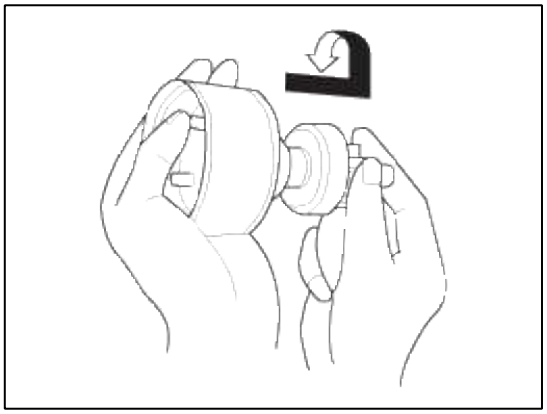
To seat new brushes, slip a strip of #500 or #600 sandpaper, with the grit side up, between the commutator and each brush, and smoothly rotate the armature. The contact surface of the brushes will be sanded to the same contour as the commutator.



Inspect Overrunning Clutch

1. Slide the overrunning clutch along the shaft.
   Replace it if does not slide smoothly.

2. Rotate the overrunning clutch both ways.
   Does it lock in one direction and rotate smoothly in reverse? If it does not lock in either direction or it locks in both directions, replace it.



3. If the starter drive gear is worn or damaged, replace the overrunning clutch assembly. (the gear is not available separately).
   Check the condition of the flywheel or torque converter ring gear if the starter drive gear teeth are damaged.

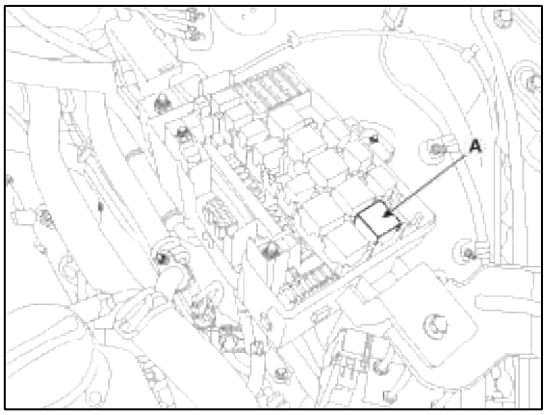
Cleaning

1. Do not immerse parts in cleaning solvent. Immersing the yoke assembly and/or armature will damage the insulation. Wipe these parts with a cloth only.
2. Do not immerse the drive unit in cleaning solvent. The overrun clutch is pre-lubricated at the factory and solvent will wash lubrication from the clutch.
3. The drive unit may be cleaned with a brush moistened with cleaning solvent and wiped dry with a cloth.

Engine Electrical System > Starting System > Starter Relay > Repair procedures

Inspection

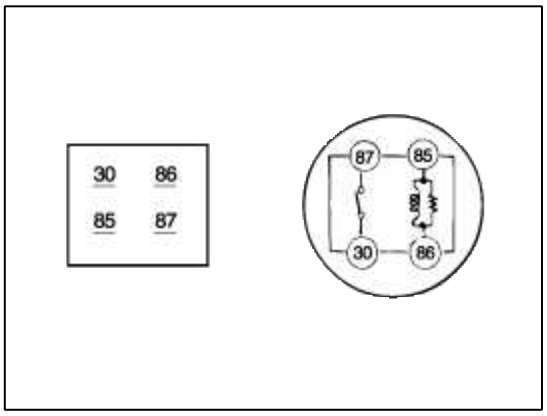
1. Remove the fuse box cover.
2. Remove the starter relay (A).



3. Using an ohmmeter, check that there is continuity between each terminal.

Terminal	Continuity
30 - 87	NO
85 - 86	YES

4. Apply 12V to terminal 85 and ground to terminal 86.
   Check for continuity between terminals 30 and 87.

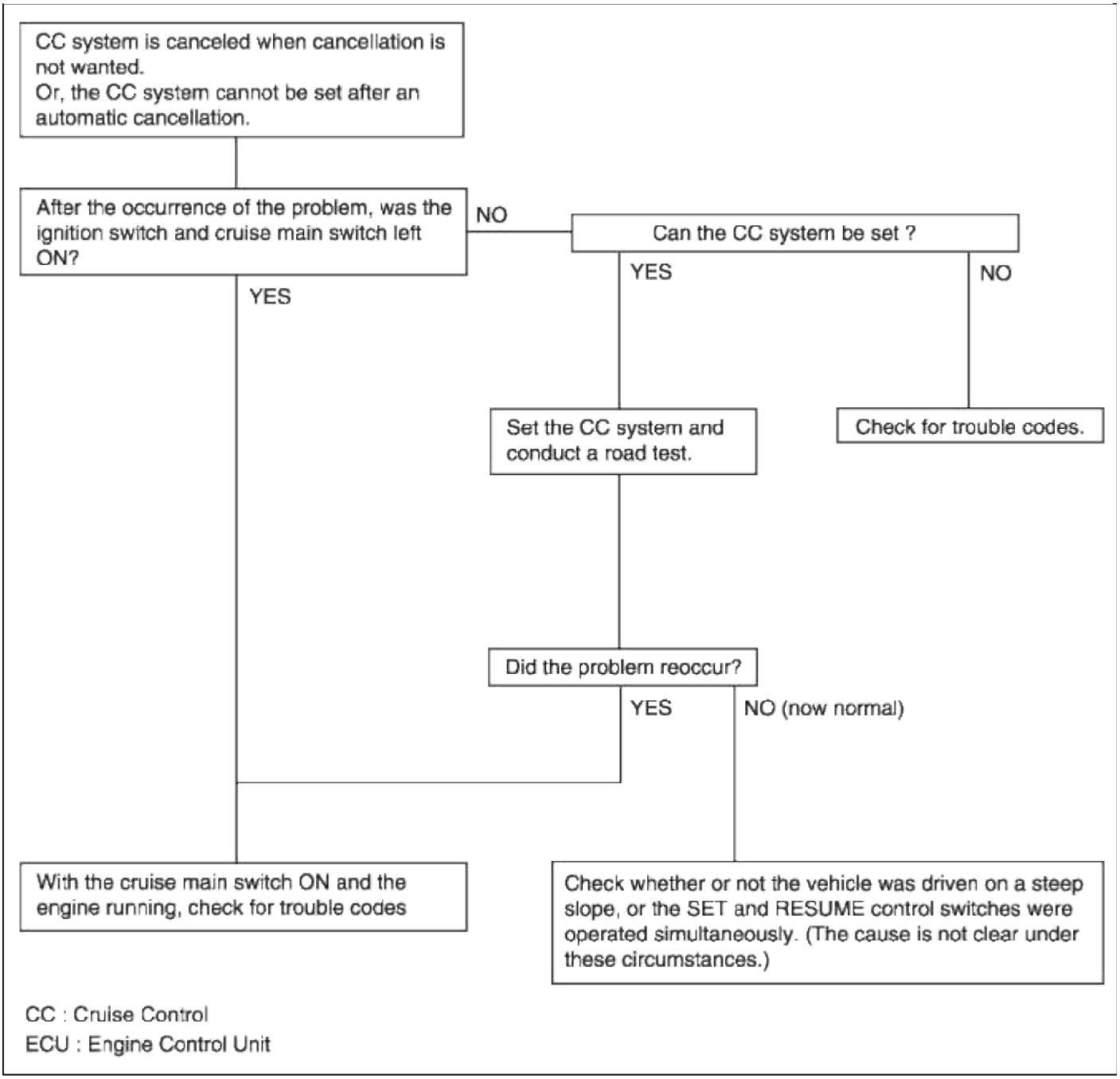


5. If there is no continuity, replace the starter relay.
6. Install the starter relay.
7. Install the fuse box cover.

Engine Electrical System > Cruise Control System > Troubleshooting

Trouble Symptom Charts

Trouble Symptom 1



Trouble Symptom 2

Trouble symptom	Probable cause	Remedy
The set vehicle speed varies greatly upward or downward "Surging" (repeated alternating acceleration and deceleration) occurs after setting	Malfunction of the vehicle speed sensor circuit	Repair the vehicle speed sensor system, or replace the part
	Malfunction of ECM	Replace the ECM

Trouble Symptom 3

Trouble symptom	Probable cause	Remedy
The CC system is not canceled when the brake pedal is depressed	Damaged or disconnected wiring of the brake pedal switch	Repair the harness or replace the brake pedal switch
	Malfunction of the ECM	Replace the ECM

Trouble Symptom 4

Trouble symptom	Probable cause	Remedy
The CC system is not canceled when the shift lever is moved to the "N" position (It is canceled, however, when the brake pedal is depressed	Damaged or disconnected wiring of inhibitor switch input circuit	Repair the harness or repair or replace the inhibitor switch
	Improper adjustment of inhibitor switch	
	Malfunction of the ECM	Replace the ECM

Trouble Symptom 5

Trouble symptom	Probable cause	Remedy
Cannot decelerate (coast) by using the SET switch	Temporary damaged or disconnected wiring of SET switch input circuit	Repair the harness or replace the SET switch
	Malfunction of the ECM	Replace the ECM

Trouble Symptom 6

Trouble symptom	Probable cause	Remedy
Cannot accelerate or resume speed by using the RESUME switch	Damaged or disconnected wiring, or short circuit, or RESUME switch input circuit	Repair the harness or replace the RESUME switch
	Malfunction of the ECM	Replace the ECM

Trouble Symptom 7

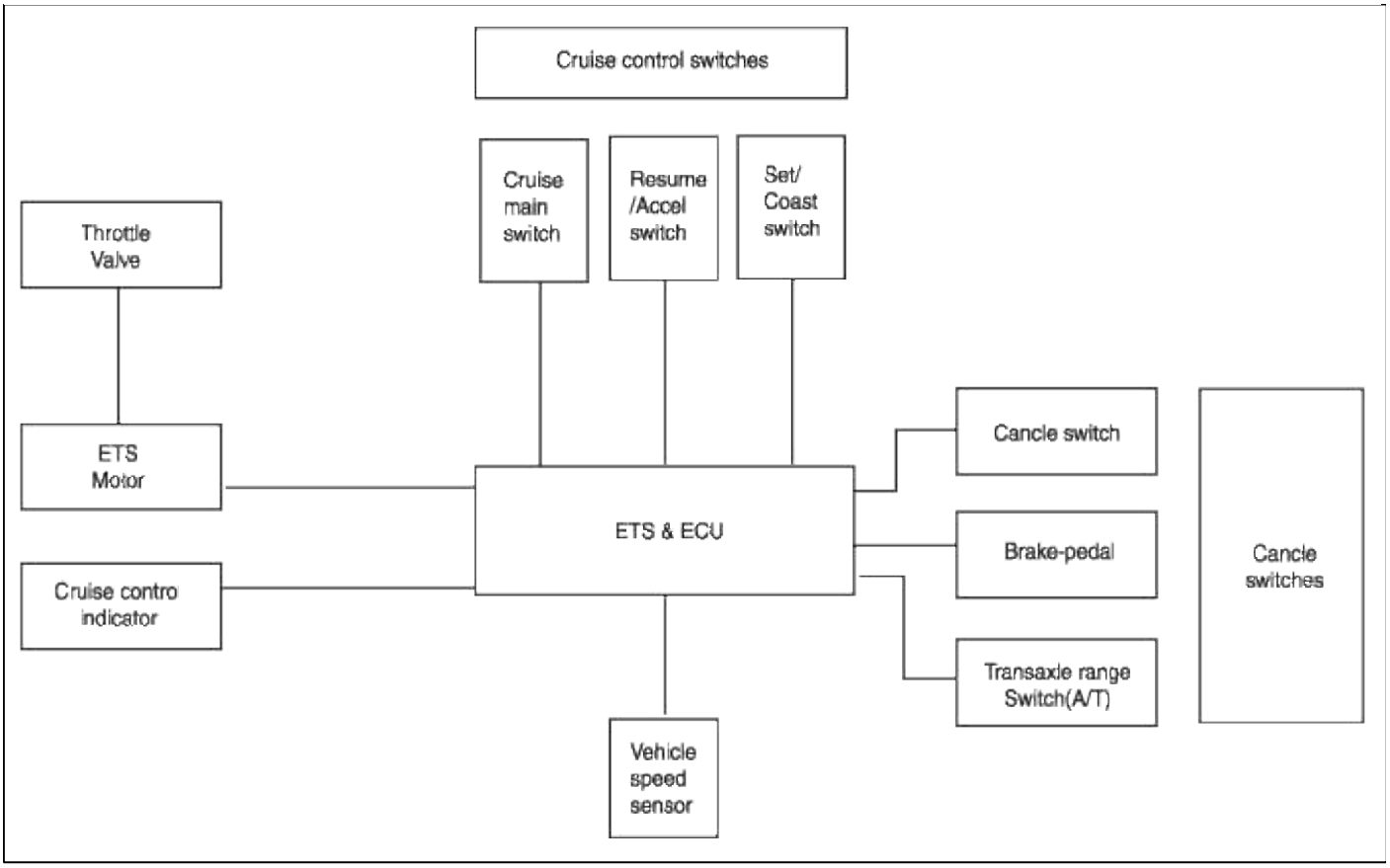
Trouble symptom	Probable cause	Remedy
CC system can be set while driving at a vehicle speed of less than 40km/h (25mph), or there is no automatic cancellation at that speed	Malfunction of the vehicle-speed sensor circuit	Repair the vehicle speed sensor system, or replace the part
	Malfunction of the ECM	Replace the ECM

Trouble Symptom 8

Trouble symptom	Probable cause	Remedy
The cruise main switch indicator lamp does not illuminate (But CC system is normal)	Damaged or disconnected bulb of cruise main switch indicator lamp	Repair the harness or replace the part.
	Harness damaged or disconnected	

Engine Electrical System > Cruise Control System > Description and Operation

System Block Diagram



Component Parts And Function Outline

Component part		Function
Vehicle-speed sensor		Converts vehicle speed to pulse.
Engine control module (ECM)		Receives signals from sensor and control switches;
Cruise control indicator		Illuminate when CRUISE main switch is ON (Built into cluster)
Cruise Control switches	CRUISE main switch	Switch for automatic speed control power supply.
	Resume/Accel switch	Controls automatic speed control functions by Resume/Accel switch (Set/Coast switch)
	Set/Coast switch	
Cancel switch	Cancel switch	Sends cancel signals to ECM
	Brake-pedal switch	
	Transaxle range switch (A/T) Clutch switch (M/T)	
ETS motor		Regulates the throttle valve to the set opening by ECM.

* ETS : Electronic Throttle System

Cruise Control

Cruise control system is engaged by the "ON. OFF" main switch located on right of steering wheel column. The system has the capability to cruise, coast, resume speed, and accelerate, and raise "tap-up" or lower "tap-down" set speed.

It also has a safety interrupt, engaged upon depressing brake or shifting select lever.

The ECM is the control module for this system

The main components of cruise control system are mode control switches, transaxle range switch, brake switch,

vehicle speed sensor, ECM and ETS motor that connect throttle body.
The ECM contains a low speed limit which will prevent system engagement below a minimum speed of 40km/h (25mph).
The operation of the controller is controlled by mode control switches located on steering wheel.
Transaxle range switch and brake switch are provided to disengage the cruise control system. The switches are on brake pedal bracket and transaxle. When the brake pedal is depressed or select lever shifted, the cruise control system is electrically disengaged and the throttle is returned to the idle position.

Cruise main switch

Cruise control system is engaged by pressing the "ON. OFF" push button. Releasing the "ON.OFF" push button release throttle, clears cruise memory speed, and puts vehicle in a non-cruise mode.

Coast/Set switch

COAST.SET switch located on right of steering wheel column has two positions - "Normal" and "Depressed". The set position - With COAST.SET switch depressed and then released the cruise speed will be set at the speed the vehicle was going when COAST.SET switch was released. The coast position - With COAST.SET switch fully depressed, driver can lower cruise speed. To decrease cruise speed, COAST.SET switch is held in, disengaging cruise control system. When vehicle has slowed to required cruise speed, releasing COAST.SET switch will re-engage speed at new selected speed.
The tap down - To lower vehicle speed, cruise must be engaged and operating. Tap down is done by quickly pressing and releasing COAST.SET switch. Do not hold COAST.SET switch in depressed position.
Tap down is a function in which cruise speed car be decreased by 1mph (1.6km/h)

Resume/Accel switch

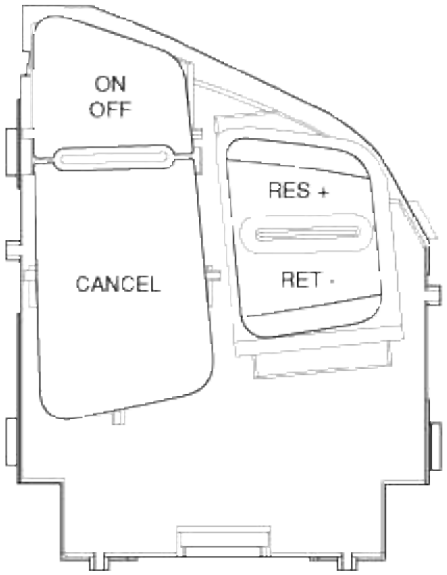
RES.ACCEL switch located on right of steering wheel column has two positions - "Normal" and "Depressed".
The resume position - With RES.ACCEL switch depressed and then release, this switch also returns cruise control operation to last speed (Which is temporarily disengaged by Cancel switch or Brake pedal), setting when momentarily operating RES.ACCEL switch by constant acceleration.
The accel position - With RES.ACCEL switch depressed and held in, disengaging cruise control system, when vehicle has accelerated to required cruise speed, releasing RES.ACCEL switch will re-engage speed at new selected speed.
The tap up - To increase vehicle speed, the cruise must be engaged and operating.
Tap up is done by quickly pressing and releasing RES.ACCEL switch less than 0.5 second. Do not hold RES.ACCEL switch in depressed position. Tap up is a function in which cruise speed can be increased by 1mph (1.6km/h).

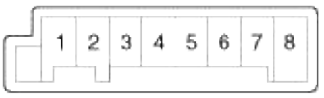
Cancel switch

Cruise control system is temporarily disengaged by pressing "CANCEL" switch.
Cruise speed canceled by this switch will be recovered by RES.ACCEL switch

Engine Electrical System > Cruise Control System > Cruise Control Switch > Schematic Diagrams

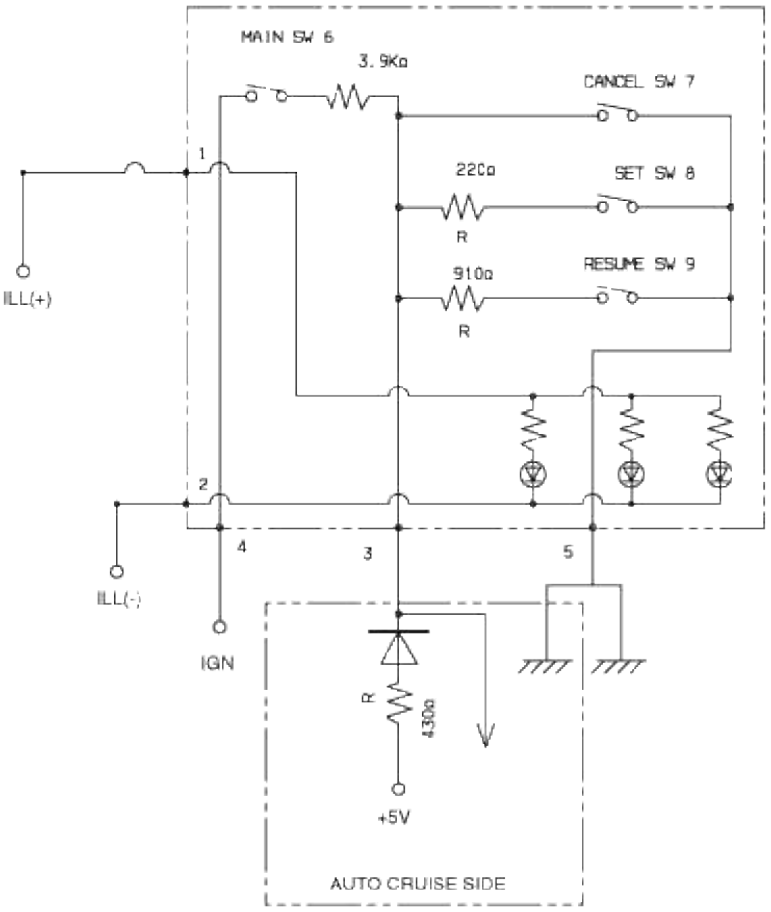
Circuit Diagram





CONNECTOR

NO	CONNECTOR
1	ILL(+)
2	ILL(-)
3	ACC(-)
4	ACC ON/OFF
5	ACC(-)
6	–
7	–
8	–

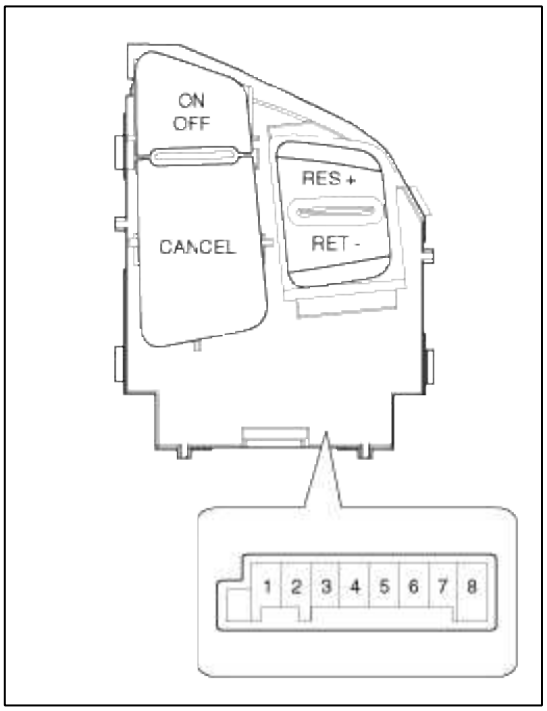


Engine Electrical System > Cruise Control System > Cruise Control Switch > Repair procedures

Inspection

Measuring Resistance

1. Disconnect the cruise control switch connector from the control switch.



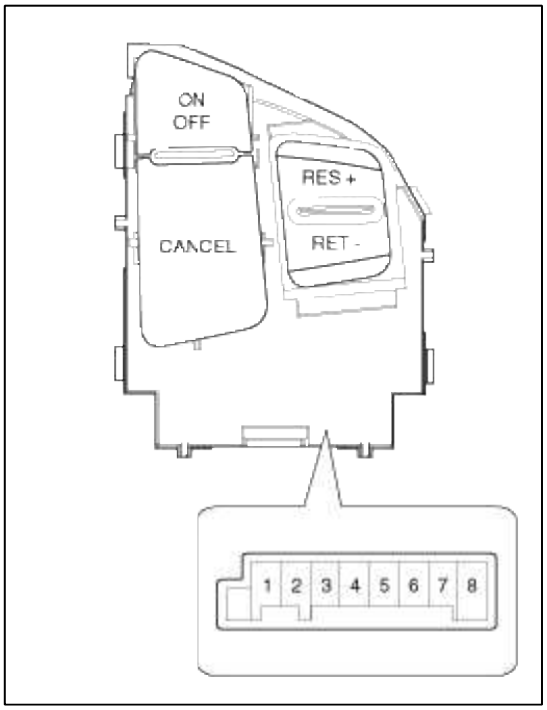
2. Measure resistance between terminals on the control switch when each function switch is ON (switch is depressed).

Function switch	Terminal	Resistance
Cruise Main	RH 3-4	3.9kΩ ± 1%
Cancel	RH 3-5	0Ω ± 1%
Set/Coast	RH 3-5	220Ω ± 1%
Resume/Accel	RH 3-5	910Ω ± 1%

3. If not within specification, replace switch.

Measuring Voltage

1. Connect the cruise control switch connector to the control switch.



2. Measure voltage between terminals on the harness side connector when each function switch is ON (switch is depressed).

Function switch	Terminal	Voltage
Cruise Main	RH 3-4	-
Cancel	RH 3-5	0.0V ± 0.22V
Set/Coast	RH 3-5	1.5V ± 0.22V
Resume/Accel	RH 3-5	3.0V ± 0.22V

3. If not within specification, replace switch.

GENESIS COUPE(BK) > 2013 > G 2.0 T-MPI > Engine Mechanical System

Engine Mechanical System > General Information > Specifications

Specifications

Description	Specifications	Limit
General		
Type	In-line, Double Overhead Camshaft	
Number of cylinder	4	
Bore	86mm (3.385in)	
Stroke	86mm (3.385in)	
Total displacement	1998cc (121.92cu.in.)	
Compression ratio	9.0 : 1	
Firing order	1-3-4-2	
Valve timing		
Intake valve		
Opens (ATDC / BTDC)	ATDC 11° ~ BTDC 34°	
Closes (ABDC)	ABDC 67° ~ ABDC 22°	
Exhaust		
Opens (BBDC)	BBDC 54° ~ BBDC 14°	
Closes (ATDC)	BTDC 10° ~ ATDC 30°	
Valve		
Valve length		
Intake	113.18mm (4.4559in.)	112.93mm (4.4460in)
Exhaust	105.79mm (4.1649in.)	105.54mm (4.1551in)
Stem O.D.		
Intake	5.465 ~ 5.480mm (0.2151 ~ 0.2157in.)	
Exhaust	5.458 ~ 5.470mm (0.2149 ~ 0.2153in.)	
Face angle	45.25° ~ 45.75°	
Margin		
Intake	1.02mm (0.0401in.)	
Exhaust	1.09mm (0.0429in.)	
Valve stem to valve guide clearance		
Intake	0.020 ~ 0.047mm (0.00078 ~ 0.00185in.)	0.07mm (0.00275in.)

Exhaust	0.030 ~ 0.054mm (0.00118 ~ 0.00212in.)	0.09mm (0.00354in.)
MLA		
MLA outer diameter	31.964 ~ 31.980mm (1.2584 ~ 1.2590in.)	
Cylinder head tappet bore inner diameter	32.000 ~ 32.025mm (1.2598 ~ 1.2608in.)	
MLA to tappet bore clearance	0.020 ~ 0.061mm (0.0008 ~ 0.0024in.)	0.07mm (0.0027in.)
Valve seat		
Width of seat contact		
Intake	1.16 ~ 1.46mm (0.0457 ~ 0.0575in.)	
Exhaust	1.35 ~ 1.65mm (0.0531 ~ 0.0649in.)	
Seat angle	44.75° ~ 45.10°	
Valve guide		
Length	43.8 ~ 44.2mm (1.7244 ~ 1.7401in.)	
Inner diameter	5.500 ~ 5.512mm (0.2165 ~ 0.2170in.)	
Valve spring		
Free length	47.44mm (1.8677in.)	
Load	19.0 ± 0.6kg/35.0mm (41.88 ± 1.32lb/1.3779in.)	
Square	39.8 ± 1.2kg/26.0mm (87.74 ± 2.64lb/1.0236in.)	
Out of squareness	1.5° MAX.	
Valve clearance		
Cold (20°C[68°F])		
Intake	0.17 ~ 0.23mm (0.0067 ~ 0.0090in.)	0.10 ~ 0.30mm (0.0039 ~ 0.0118in.)
Exhaust	0.21 ~ 0.38mm (0.0082 ~ 0.0149in,)	0.25 ~ 0.45mm (0.0098 ~ 0.0117in.)
Cylinder head		
Flatness of gasket surface	Max. 0.05mm (0.0019in.)	
Flatness of manifold mounting surface	Max. 0.10mm (0.0039in.)	
Cylinder block		
Cylinder bore	86.00 ~ 86.03mm (3.3853 ~ 3.3871in.)	

Out-of-round and taper of cylinder bore	Less than 0.05mm (0.0019in.)	
Clearance with piston (To set limits to new parts)	0.020 ~ 0.040mm (0.0007 ~ 0.0015in.)	
Piston		
O.D (To set limits to new parts)	87.97 ~ 88.00mm (3.4635 ~ 3.4647in.)	
Ring groove width		
No.1	1.535 ~ 1.550mm (0.0604 ~ 0.0610in.)	1.26mm (0.0496in.)
No.2	1.230 ~ 1.250mm (0.0484 ~ 0.0492in.)	1.26mm (0.0496in.)
Oil ring	2.01 ~ 2.025mm (0.0791 ~ 0.0797in.)	2.05mm (0.0807in.)
Piston ring		
Side clearance		
No.1	0.05 ~ 0.08mm (0.0019 ~ 0.0031in.)	0.1mm (0.004in.)
No.2	0.04 ~ 0.08mm (0.0015 ~ 0.0031in.)	0.1mm (0.004in.)
Oil ring	0.06 ~ 0.14mm (0.0023 ~ 0.0055in.)	0.2mm (0.008in.)
End gap		
No.1	0.15 ~ 0.25mm (0.0059 ~ 0.0098in.)	0.6mm (0.0236in.)
No.2	0.37 ~ 0.42mm (0.0145 ~ 0.0165in.)	0.7mm (0.0275in.)
Oil ring side rail	0.20 ~ 0.70mm (0.0078 ~ 0.0275in.)	0.8mm (0.0315in.)
Piston pin		
Piston pin outer diameter	21.997 ~ 22.000mm (0.8660 ~ 0.8661in.)	
Piston pin hole inner diameter	22.030 ~ 22.070mm (0.8673 ~ 0.8688in.)	
Piston pin hole clearance	0.003 ~ 0.010mm (0.0001 ~ 0.0004in.)	
Connecting rod small end inner diameter	22.005 ~ 22.011mm (0.8663 ~ 0.8666in.)	
Connecting rod		
Bend	0.05mm (0.0020in.) or less	
Twist	0.1mm (0.004in.) or less	

Connecting rod big end to crankshaft side clearance			0.100 ~ 0.250mm (0.0039 ~ 0.010in.)	0.35mm (0.0138in.)
Connecting rod bearing				
Oil clearance (To seat limits to new parts)			0.025 ~ 0.043mm (0.0009 ~ 0.0016in.)	0.05mm (0.0078in.)
Camshaft				
Cam height	Intake		43.80mm (1.7244in.)	
	Exhaust		45.00mm (1.7716in.)	
Journal O.D	Intake	No.1	30mm (1.1811in.)	
		No.2, 3, 4, 5	24mm (0.9449in.)	
	Exhaust	No.1	36mm (1.4173in.)	
		No.2, 3, 4, 5	24mm (0.9449in.)	
Bearing oil clearance	Intake	No.1	0.022 ~ 0.057mm (0.0008 ~ 0.0022in.)	0.09mm (0.0035in.)
		No.2, 3, 4, 5	0.045 ~ 0.082mm (0.0017 ~ 0.0032in.)	0.12mm (0.0047in.)
	Exhaust	No.1	0 ~ 0.032mm (0 ~ 0.0012in.)	
		No.2, 3, 4, 5	0.045 ~ 0.082mm (0.0017 ~ 0.0032in.)	0.12mm (0.0047in.)
End play			0.04 ~ 0.16mm (0.0015 ~ 0.0062in.)	0.20mm (0.0047in.)
Crankshaft				
Pin O.D.			47.954 ~ 47.972mm (1.8879 ~ 1.8886in.)	
Journal O.D.			51.942 ~ 51.960mm (2.0449 ~ 2.0456in.)	
End play			0.07 ~ 0.25mm (0.0027 ~ 0.0098in.)	
Crankshaft bearing				
Oil clearance			0.020 ~ 0.038mm (0.0007 ~ 0.0014in.)	
Cooling method			Water-cooled, pressurized. Forced circulation with water pump	
Engine oil				
Oil quantity	Total		6.0L (6.34US qt, 5.27lmp qt)	When replacing a short engine or a block assembly
	Oil pan		5.0L (5.28US qt, 4.41lmp qt)	

	Drain and refill	5.3L (5.60US qt, 4.66lmp qt)	Including oil filter
Oil grade	Recommendation	5W-30 / ACEA A5	If not abailable, refer to the recommended API or ILSAC or ACEA clasification
	Classification	API SL, SM or above ILSAC GF3, GF4 or above ACEA A3 or A5	Satisfy the requirement of the API or ILSAC classification.
	SAE viscosity grade	Recommended SAE viscosity number	Refer to the "Lubrication System".
Oil pressure (at 1000rpm)		127kPa (1.3kg/cm², 18.49psi) or above	Oil temperature in oil pan : 110±2°C (230±36°F)
Radiator			
Type		Pressurized corrugated fin type	
Radiator cap			
Main valve opening pressure		83 ~ 110kpa (12 ~ 16psi, 0.83 ~ 1.1kg/cm²)	
Vacuum valve opening pressure		-7kpa (-100psi, -0.07kg/cm²) or less	
Thermostat			
Type		Wax pellet type with jiggle valve	
Valve opening temperature		82°C (177°F)	
Full-opening temperature		95°C (201°F)	
Coolant pump		Centrifugal type impeller	
Drive belt			
Type		V-ribbed belt	
Engine coolant temperature sensor			
Type		Heat-sensitive thermistor type	
Resistance		2.31 ~ 2.59KΩ at 20°C (68°F)	
Air cleaner			
Type		Dry type	
Element		Paper type	
Exhaust pipe			
Muffler		Expansion resonance type	
Suspension system		Rubber hangers	

Service Standrds

Standard value	
Antifreeze	Mixture ratio of anti-freeze in coolant
Ethylene glycol base for aluminum	50%

Tightening Torques

Item	N.m	kgf.m	lb-ft
Ladder frame bolt (M8 x 55)	27.4 ~ 31.3	2.8 ~ 3.2	20.2 ~ 23.1
Oil pump bolt (BSM)	9.8 + 19.6 + 29.4	1.0 + 2.0 + 3.0	7.2 + 14.4 + 21.7
Timing chain cover bolt (M8)	18.6 ~ 22.5	1.9 ~ 2.3	13.7 ~ 16.6
Timing chain cover bolt (M6)	7.8 ~ 9.8	0.8 ~ 1.0	5.8 ~ 7.2
Oil pan bolt	9.8 ~ 11.8	1.0 ~ 1.2	7.2 ~ 8.7
Engine support bracket bolt (LH/RH)	49.0 ~ 63.7	5.0 ~ 6.5	36.1 ~ 47.0
Camshaft bearing cap bolt (M6)	10.8 ~ 12.7	1.1 ~ 1.3	7.9 ~ 9.4
Camshaft bearing cap bolt (M8)	27.4 ~ 31.4	2.8 ~ 3.2	20.3 ~ 23.1
Cylinder head bolt	34.3 + 90° + 90°	3.5 + 90° + 90°	25.3 + 90° + 90°
Engine hanger bolt	27.5 ~ 31.4	2.8 ~ 3.2	20.3 ~ 23.1
Cylinder head cover bolt	7.8 ~ 9.8	0.8 ~ 1.0	5.8 ~ 7.2
Crankshaft pulley bolt	166.6 ~ 176.4	17.0 ~ 18.0	122.9 ~ 130.1
Connecting rod bearing cap bolt	19.6 + 90°	2.0 + 90°	14.4 + 90°
Main bearing cap bolt	14.7 + 29.4 + 120°	1.5 + 3.0 + 120°	10.8 + 21.6 + 120°
Flywheel bolt	117.6 ~ 127.4	12.0 ~ 13.0	86.8 ~ 93.9
Drive plate bolt	117.6 ~ 127.4	12.0 ~ 13.0	86.8 ~ 93.9
Timing chain tensioner bolt	9.8 ~ 11.8	1.0 ~ 1.2	7.2 ~ 8.7
Timing chain tensioner arm bolt	9.8 ~ 11.8	1.0 ~ 1.2	7.2 ~ 8.7
Timing chain guide bolt	9.8 ~ 11.8	1.0 ~ 1.2	7.2 ~ 8.7
OCV bolt	9.8 ~ 11.8	1.0 ~ 1.2	7.2 ~ 8.7
CVVT bolt	53.9 ~ 63.7	5.5 ~ 6.5	39.7 ~ 47.0
BSM chain tensioner arm bolt	9.8 ~ 11.8	1.0 ~ 1.2	7.2 ~ 8.7
BSM chain guide bolt	9.8 ~ 11.8	1.0 ~ 1.2	7.2 ~ 8.7
BSM chain tensioner bolt	9.8 ~ 11.8	1.0 ~ 1.2	7.2 ~ 8.7
Water pump bolt	18.6 ~ 23.5	1.9 ~ 2.4	13.7 ~ 17.4
P/S pump bracket bolt	19.6 ~ 23.5	2.0 ~ 2.4	14.5 ~ 17.4
Tensioner ASSY intergrated bracket bolt	39.2 ~ 44.1	4.0 ~ 4.5	28.9 ~ 32.5
Water temp. control nut	18.6 ~ 23.5	1.9 ~ 2.4	13.7 ~ 17.4
Water inlet pipe nut	18.6 ~ 23.5	1.9 ~ 2.4	13.7 ~ 17.4

Water temp. control bolt	14.7 ~ 19.6	1.5 ~ 2.0	10.8 ~ 14.4
Oil level gauge assembly bolt	7.8 ~ 11.8	0.8 ~ 1.2	5.8 ~ 8.7
Ignition coil bolt	3.9 ~ 5.9	0.4 ~ 0.6	2.9 ~ 4.3
Intake manifold bolt	18.6 ~ 27.4	1.9 ~ 2.8	13.7 ~ 20.2
Intake manifold nut	18.6 ~ 27.4	1.9 ~ 2.8	13.7 ~ 20.2
Intake manifold stay bolt	18.6 ~ 23.5	1.9 ~ 2.4	13.7 ~ 17.4
Exhaust manifold heat protector bolt	18.6 ~ 27.4	1.9 ~ 2.8	13.7 ~ 20.2
Exhaust manifold nut	49.0 ~ 53.9	5.0 ~ 5.5	36.1 ~ 39.7
Exhaust manifold stay bolt (M8)	18.6 ~ 27.4	1.9 ~ 2.8	18.6 ~ 20.2
Exhaust manifold stay bolt (M10)	49.0 ~ 53.9	5.0 ~ 5.5	36.1 ~ 39.8
Muffler bolt	39.2 ~ 58.8	4.0 ~ 6.0	28.9 ~ 43.4
Crankshaft position sensor bolt	3.9 ~ 5.9	0.4 ~ 0.6	2.9 ~ 4.3
Oxygen sensor	39.2 ~ 49.0	4.0 ~ 5.0	28.9 ~ 36.1
Knock sensor	16.7 ~ 25.5	1.7 ~ 2.6	12.3 ~ 18.8
Camshaft position sensor	3.9 ~ 5.9	0.4 ~ 0.6	2.9 ~ 4.3
Oil pressure switch	7.8 ~ 11.8	0.8 ~ 1.2	5.8 ~ 8.7
Oil filter	11.8 ~ 15.7	1.2 ~ 1.6	8.7 ~ 11.6

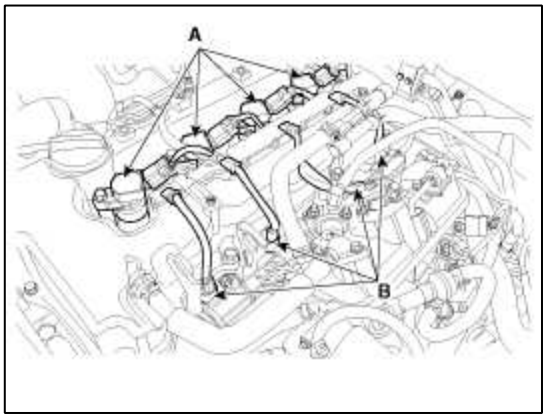
Engine Mechanical System > General Information > Repair procedures

Compression Pressure Inspection

NOTE

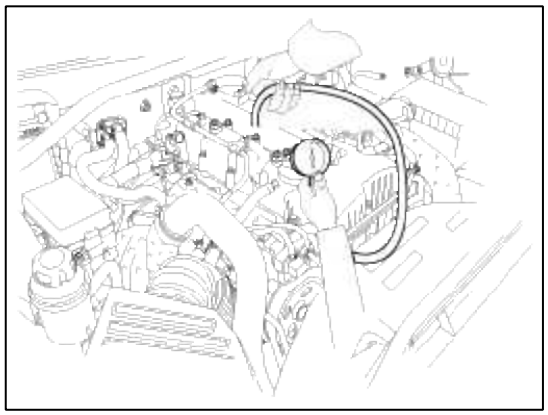
If the there is lack of power, excessive oil consumption or poor fuel economy, measure the compression pressure.

1. Warm up and stop engine.
   Allow the engine to warm up to normal operating temperature.
2. Disconnect the injector connectors (A), ignition coil connectors (B) and ignition coils.



3. Remove spark plugs.
   Using a 16mm plug wrench, remove the 4 spark plugs.

4. Check cylinder compression pressure.
   A. Insert a compression gauge into the spark plug hole.



   B. Fully open the throttle.
   C. While cranking the engine, measure the compression pressure.

> NOTE
>
> Always use a fully charged battery to obtain engine speed of 200 rpm or more.

   D. Repeat steps (a) through (c) for each cylinder.

> NOTE
>
> This measurement must be done in as short a time as possible.

Compression pressure :
1,283kPa (13.0kgf/cm², 185psi)
Minimum pressure :
1,135kPa (11.5kgf/cm², 164psi)
Difference between each cylinder :
100kPa (1.0kgf/cm², 15psi) or less

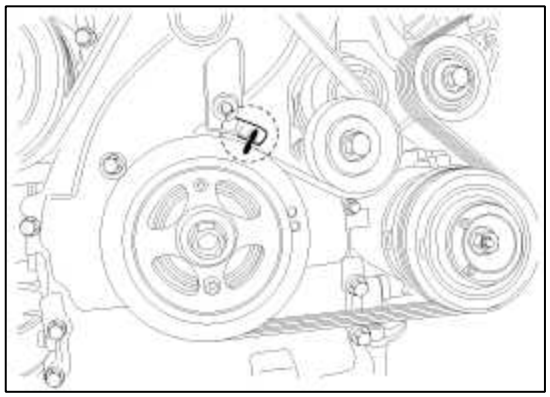
   E. If the cylinder compression in 1 or more cylinders is low, pour a small amount of engine oil into the cylinder through the spark plug hole and repeat steps (a) through (c) for cylinders with low compression.
      • If adding oil helps the compression, it is likely that the piston rings and/or cylinder bore are worn or damaged.
      • If pressure stays low, a valve may be sticking or seating is improper, or there may be leakage past the gasket.
5. Reinstall spark plugs.
6. Connect the injector connectors and ignition coil connectors.

Valve Clearance Inspection And Adjustment

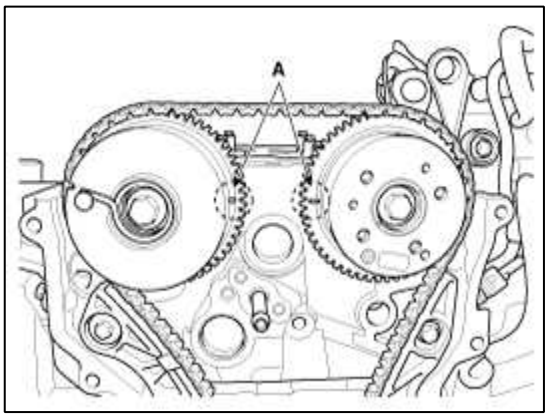
> NOTE
>
> Inspect and adjust the valve clearance when the engine is cold (Engine coolant temperature : 20°C (68°F)) and cylinder head is installed on the cylinder block.

1. Remove the cylinder head cover. (Refer to Timing system)

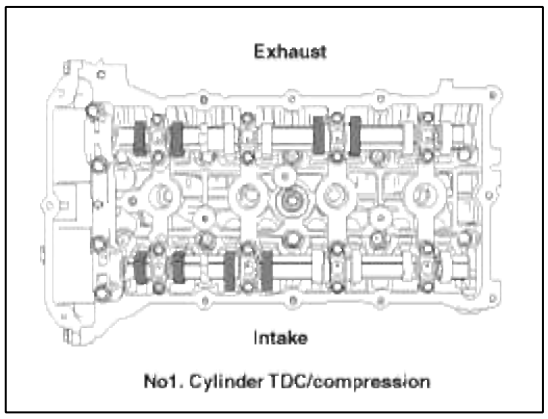
2. Set No.1 cylinder to TDC/compression.
   A. Turn the crankshaft pulley and align its groove with the timing mark "T" of the lower timing chain cover.



   B. Check that the mark (A) of the camshaft timing sprockets are in straight line on the cylinder head surface as shown in the illustration.
   If not, turn the crankshaft one revolution (360°)



3. Inspect the valve clearance.
   A. Check only the valve indicated as shown. [No. 1 cylinder : TDC/Compression] measure the valve clearance.

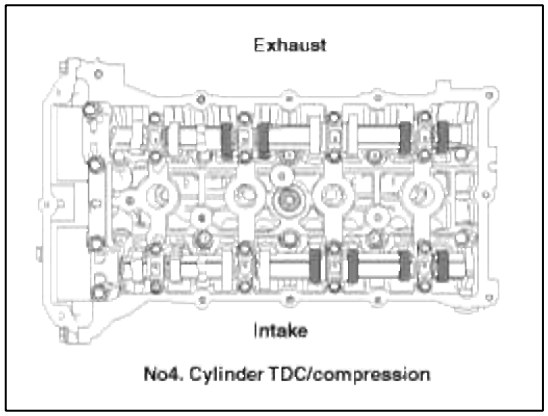


   ·Using a thickness gauge, measure the clearance between the tappet and the base circle of camshaft.
   ·Record the out-of-specification valve clearance measurements. They will be used later to determine the required replacement adjusting tappet.

Valve clearance
Specification
Engine coolant temperature : 20°C [68°F]
Limit
Intake : 0.10 ~ 0.30mm (0.0039 ~ 0.0118in.)
Exhaust : 0.25 ~ 0.45mm (0.0098 ~ 0.0177in.)

B. Turn the crankshaft pulley one revolution (360°) and align the groove with timing mark "T" of the lower timing chain cover.

C. Check only valves indicated as shown. [NO. 4 cylinder : TDC/compression]. Measure the valve clearance.

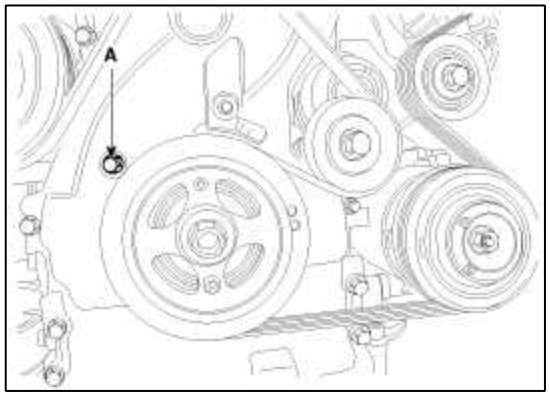


4. Adjust the intake and exhaust valve clearance.

A. Set the No.1 cylinder to the TDC/compression.

B. Marks on the timing chain and camshaft timing sprockets.

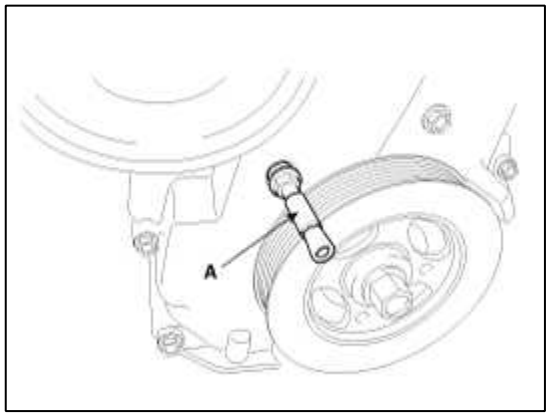
C. Remove the service hole bolt(A) of the timing chain cover.



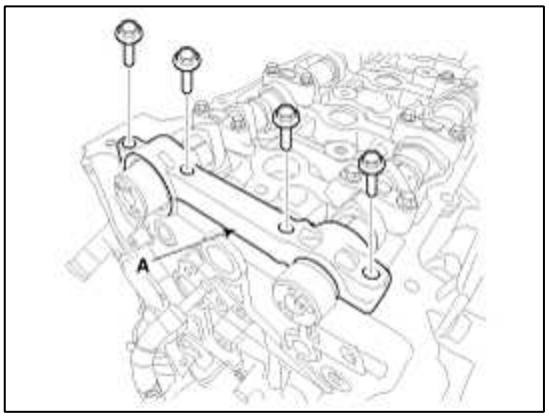
CAUTION

The bolt must not be reused once it has been assembled.

D. Insert the SST(A) (09240-2G000) in the service hole of the timing chain cover and release the ratchet.



E. Remove the front camshaft bearing cap(A).



F. Remove the exhaust camshaft bearing cap and exhaust camshaft.

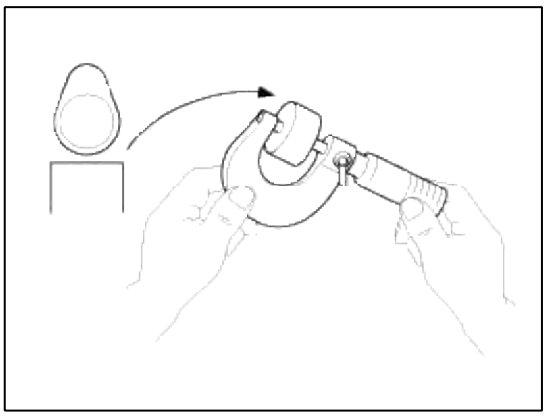
G. Remove the intake camshaft bearing cap and intake camshaft.

> CAUTION
>
> When disconnect the timing chain from the camshaft timing sprocket, hold the timing chain.

H. Tie down timing chain so that it dosen't move.

> CAUTION
>
> Be careful not to drop anything inside timing chain cover.

I. Measure the thickness of the removed tappet using a micrometer.



J. Calculate the thickness of a new tappet so that the valve clearance comes within the specified value.

Valve clearance (Engine coolant temperature : 20°C)
T : Thickness of removed tappet
A : Measured valve clearance
N : Thickness of new tappet
Intake : N = T + [A - 0.20mm(0.0079in.)]
Exhaust : N = T + [A-0.30mm (0.0118in.)]

K. Select a new tappet with a thickness as close as possible to the calculated value.

> NOTE
>
> Shims are available in 47size increments of 0.015mm (0.0006in.) from 3.00mm (0.118in.) to 3.690mm (0.1452in.)

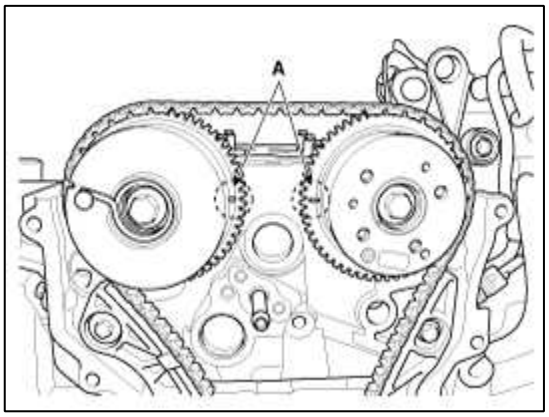
L. Place a new tappet on the cylinder head.

M. Hold the timing chain, and install the intake camshaft and timing sprocket assembly.

N. Align the matchmarks on the timing chain and camshaft timing sprocket.
O. Install the intake and exhaust camshaft.
P. Install the front bearing cap.
Q. Install the sevice hole bolt.

Tightening torque :
11.8 ~ 14.7N.m (1.2 ~ 1.5kgf.m, 8.7 ~ 10.8lb-ft)

R. Turn the crankshaft two turns in the operating direction(clockwise) and realign crankshaft sprocket and camshaft sprocket timing marks(A).



S. Recheck the valve clearance.

Valve clearance (Engine coolant temperature : 20°C)
[Specification]
Intake : 0.17 ~ 0.23mm (0.0067 ~ 0.0090in.)
Exhaust : 0.27 ~ 0.33mm (0.0106 ~ 0.0129in.)

Engine Mechanical System > General Information > Troubleshooting

Troubleshooting

Symption	Suspect area	Remedy
Engine misfire with abnormal internal lower engine noises.	Worn crankshaft bearings Loose or improperly engine filwheel	Replace the crankshaft and bearings as required. Repair or replace the flywheel as required.
	Worn piston rings (Oil consumption may or may not cause the engine to misfire.)	Inspect the cylinder for a loss of compression. Repair or replace as required.
	Worn crankshaft thrust bearings	Replace the crankshaft and bearings as required
Engine misfire with abnormal valve train noise.	Stuck valves. (Carbon buidup on the valve stem)	Repair or replace as required
	Excessive worn or mis-aligned timing chain	Replace the timing chain and sprocket as required.
	Worn camshaft lobes.	Replace the camshaft and valve lifters.

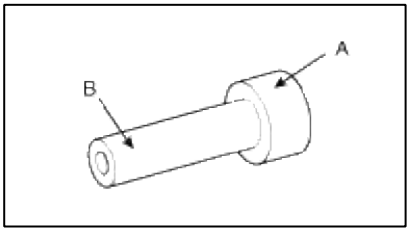
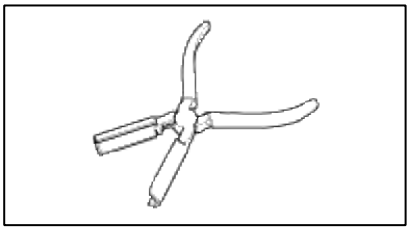
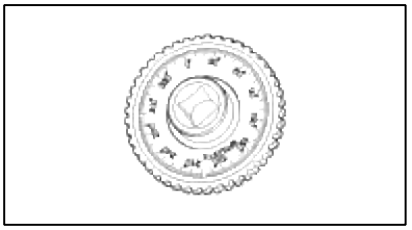
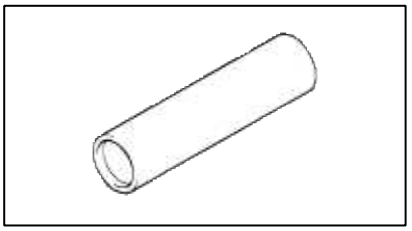
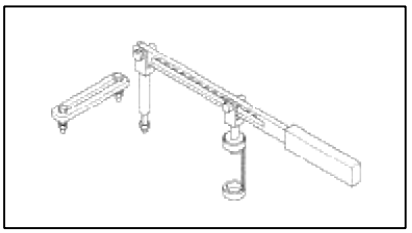
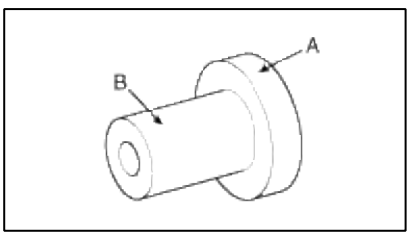
Engine misfire with coolant consumption	• Faulty cylinder head gasket or other damage to the cylinder head and engine block cooling system. • Coolant consumption may or may not cause the engine to overheat.	• Inspect the cylinder head and engine block for damage to the coolant passages and/or a faulty head gasket. • Repair or replace as required.
Engine misfire with excessive oil consumption	Worn valves, guides and/or valve stem oil seals.	Repair or replace as required.
	Worn piston rings. (Oil consumption may or may not cause the engine to misfire)	• Inspect the cylinder for a loss of compression. • Repair or replace as required.
Engine noise on start-up, but only lasting a few seconds.	Incorrect oil viscosity	• Drain the oil. • Install the correct viscosity oil.
	Worn crankshaft thrust bearing.	• Inspect the thrust bearing and crankshaft. • Repair or replace as required.
Upper engine noise, regardless of engine speed.	Low oil pressure	Repair or replace as required.
	Broken valve spring.	Replace the valve spring.
	Worn or dirty valve lifters.	Replace the valve lifters.
	Stetched or broken timing chain and/or damaged sprocket teeth.	Replace the timing chain and sprockets.
	Worn timing chain tensioner, if applicable.	Replace the timing chain tensioner as required.
	Worn camshaft lobes.	• Inspect the camshaft lobes. • Replace the timing camshaft and valve lifters as required.
	Worn valve guides or valve stems.	Inspect the valves and valve guides, then repair or replace as required.
	Stuck valves. (Carbon on the valve stem or valve seat may cause the valve to stay open.	Inspect the valves and valve guides, then repair or replace as required.
	Worn drive belt, idler, tensioner and bearing.	Replace as required
Lower engine noise, regardless of engine speed	Low oil pressure	Repair or required.
	Loose or damaged flywheel.	Repair or replace the flywheel.
	Damaged oil pan, contacting the oil pump screen.	• Inspect the oil pan. • Inspect the oil pump screen. • Repair or replace as required.
	Oil pump screen loose, damaged or restricted.	• Inspect the oil pump screen. • Repair or replace as required.
	Excessive piston-to-cylinder bore clearance.	• Inspect the piston, piston pin and cylinder bore. • Repair or replace as required.

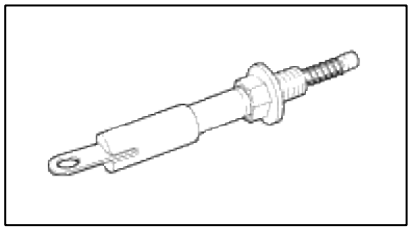
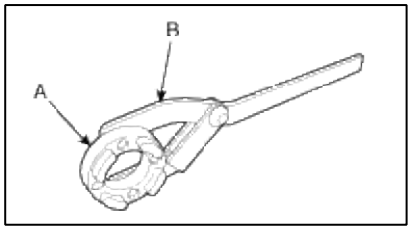
	Excessive piston pin-to-piston clearance	• Inspect the piston, piston pin and the connecting rod. • Repair or replace as required.
	Excessive connecting rod bearing clearance	Inspect the following components and repair or replace as required. • The connecting rod bearings. • The connecting rods. • The crankshaft pin journals.
	Excessive crankshaft bearing clearance	Inspect the following components, and repair or replace as required. • The crankshaft bearings. • The crankshaft main journals. • The cylinder block
	Incorrect piston, piston pin and connecting rod installation	• Verify the piston pins and connecting rods are installed correctly. • Repair as required.
Engine noise under load	Low oil pressure	Repair or replace as required.
	Excessive connecting rod bearing clearance	Inspect the following components and repair or replace as required : • The connecting rod bearings. • The connecting rods. • The crankshaft
	Excessive crankshaft bearing clearance	Inspect the following components, and repair or replace as required. • The crankshaft bearings. • The crankshaft main journals. • The cylinder block.
Engine will not crank-crankshaft will not rotate	Hydraulically locked cylinder • Coolant/antifreeze in cylinder. • Oil in cylinder. • Fuel in cylinder	1. Remove spark plugs and check for fluid. 2. Inspect for broken head gasket. 3. Inspect for cracked engine block or cylinder head. 4. Inspect for a sticking fuel injector and/or leaking fuel regulator.
	Broken timing chain and/or timing chain and/or timing chain gears.	1. Inspect timing chain and gears. 2. Repair as required.
	Material in cylinder • Broken valve • Piston material • Foreign material	1. Inspect cylinder for damaged components and/or foreign materials. 2. Repair or replace as required.
	Seized crankshaft or connecting rod bearings.	1. Inspect crankshaft and connecting rod bearing. 2. Repair as required.

	Bent or broken connecting rod.	1. Inspect connecing rods. 2. Repair as required.
	Broken crankshaft	1. Inspect crankshaft. 2. Repair as required.

Engine Mechanical System > General Information > Special Service Tools

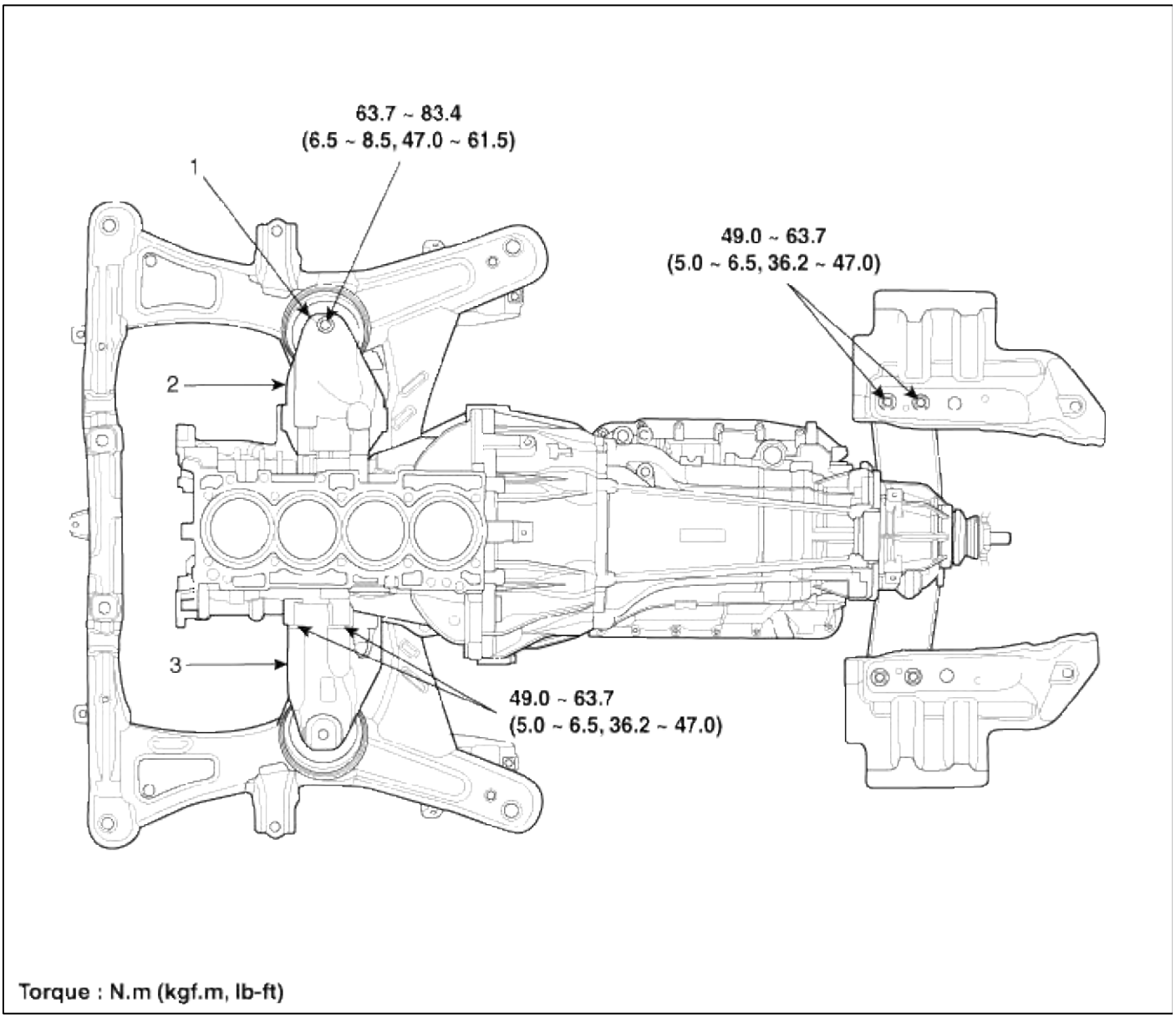
Special Service Tools

Tool (Number and name)	Illustration	Use
Crankshaft front oil seal installer (09214-3K000) (09231-H1100)		Installation of the front oil seal A : 09214-3K000 B : 09231-H1100
Valve stem seal		Removal of the valve stem seal
Torque angle adapter (09221-4A000)		Installtion of bolts & nuts needing an angular method of adjustment.
Valve stem oil seal installer (09222-4A000)		Installation of the valve stem oil seal
Valve spring compressor & holder (09222-3K000) (09222-3K100)		Removal and installation of the intake or exhaust valve 09222-3K100 (holder)
Crankshaft rear oil seal installer (09214-3K100) (09231-H1100)		Installation of the crankshaft rear oil seal A : 09214-3K100 B : 09231-H1100

Timing chain tensioner ratchet holder (09240-2G000)		Timing chain tension release. In vehicle inspection and adjustment of valve clearance.
Crankshaft pulley adapter (09231-2M100) Crankshaft pulley adapter holder (09231-2J210)		Removal and installation of crankshaft pulley from the vehicle A : 09231-2M100 B : 09231-2J210 (Holder)

Engine Mechanical System > Engine And Transaxle Assembly > Engine Mounting > Components and Components Location

Components



1. Engine mounting bracket 2. Engine support bracket RH	3. Engine support bracket LH

Engine Mechanical System > Engine And Transaxle Assembly > Engine And Transaxle Assembly > Repair procedures

Removal

CAUTION

- Use fender covers to avoid damaging painted surfaces.
- To avoid damage, unplug the wiring connectors carefully while holding the connector portion.

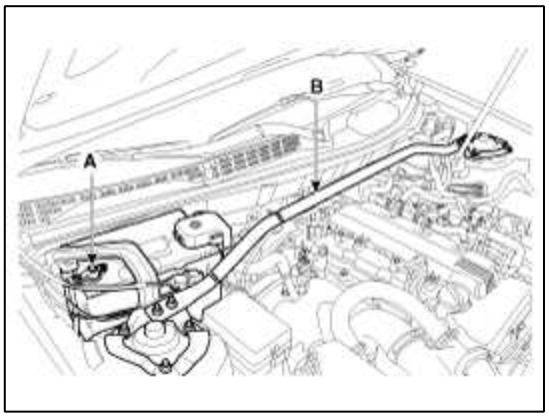
WARNING

For release the fuel pressure, start the engine and wait until fuel in fuel line is exhausted.
After the engine stop turn the ignition switch OFF.

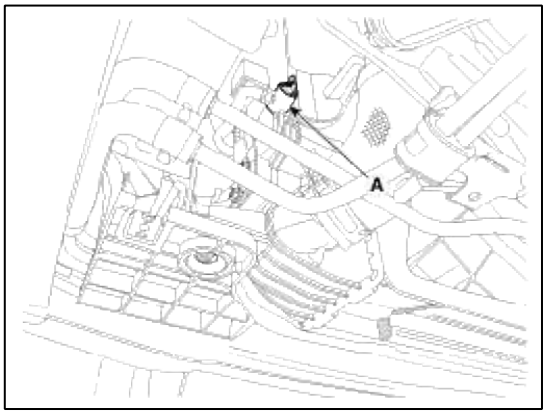
NOTE

Mark all wiring and hoses to avoid misconnection.

1. Disconnect the battery negative cable (A).
2. Remove the transmission system before removing the engine system. (Refer to MT, AT group)
3. Remove the strut bar (B).



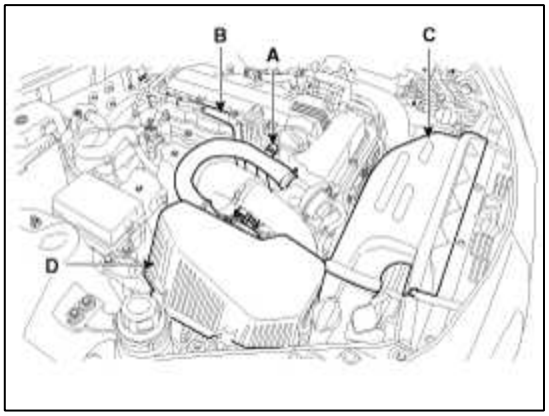
4. Remove the drain plug (A) and drain the engine coolant.



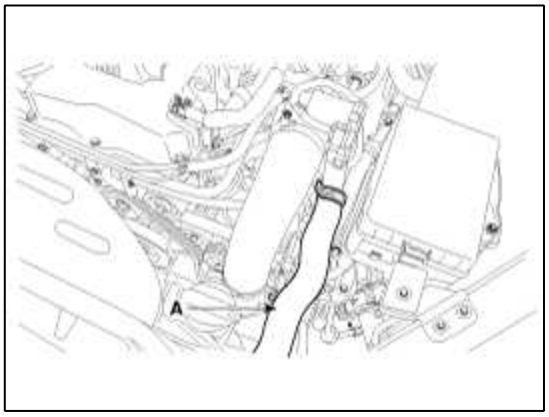
5. After recovering refrigerant, remove the high & low pressure pipe. (Refer to HA group)

6. Disconnect the breather hose (A), vacuum hose (B). And remove the air duct (C) and air cleaner assembly (D).

Tightening torque :
Bolt : 7.8 ~ 9.8N.m (0.8 ~ 1.0kgf.m, 5.8 ~ 7.2lb-ft)
Clamp : 2.9 ~ 4.9N.m (0.3 ~ 0.5kgf.m, 2.2 ~ 3.6lb-ft)

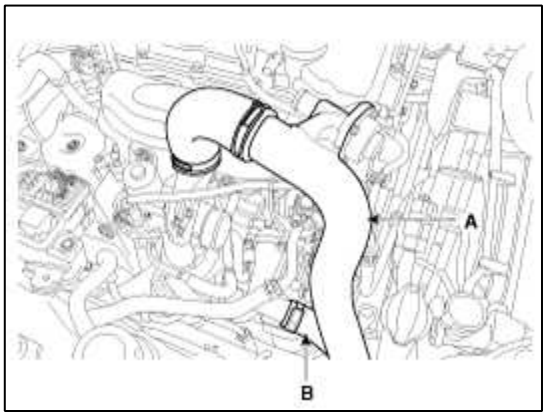


7. Remove the radiator upper hose (A) .

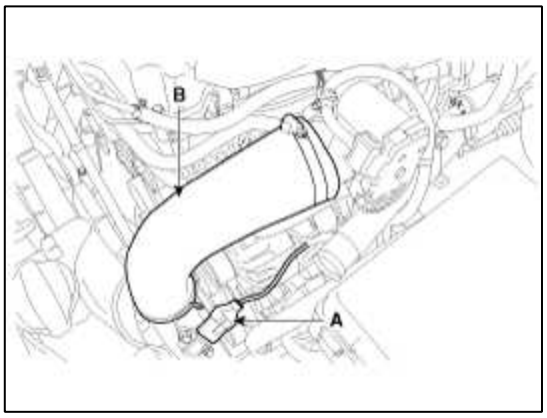


8. Remove the intercooler inlet hose (A) and radiator lower hose (B).

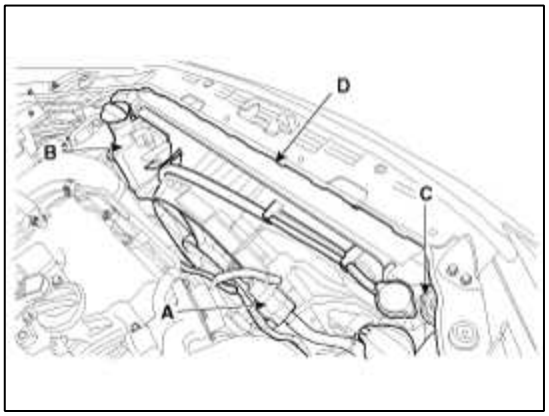
Tightening torque :
Bolt : 14.7 ~ 19.6N.m (1.5 ~ 2.0kgf.m, 10.8 ~ 14.4lb-ft)
Clamp : 4.9 ~ 6.8 N.m (0.5 ~ 0.7kgf.m, 3.6 ~ 5.1lb-ft)



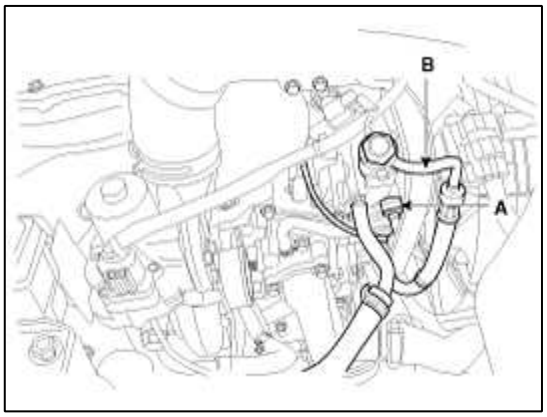
9. Remove the intercooler outlet hose (B) after disconnecting the BPS connector (A).



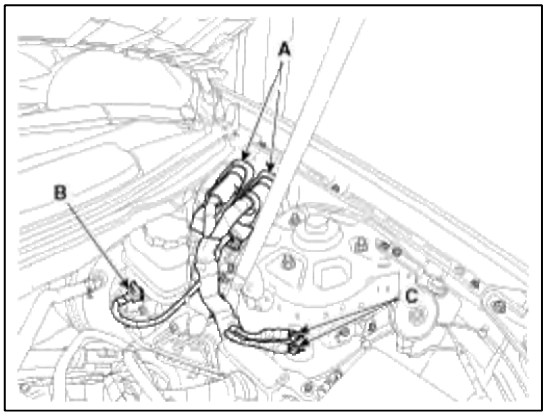
10. Remove the cooling fan (D).
    (1) Remove the cooling fan connector (A).
    (2) Remove the reservoir tank (B).
    (3) Remove the radiator mounting bracket (C).



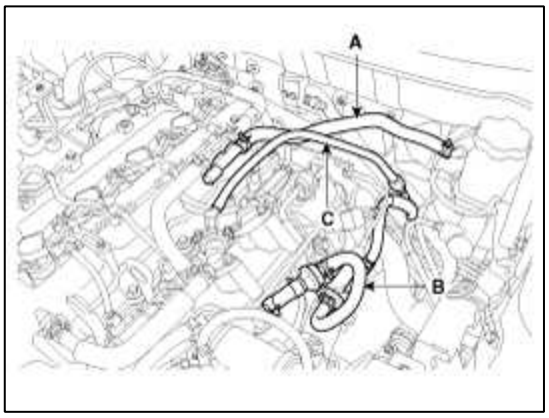
11. Disconnect the oil pressure (OPS) sensor (A) and remove the power steering oil hoses (B).



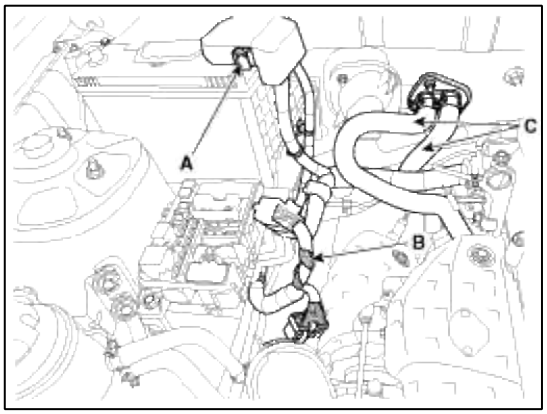
12. Disconnect the ECM connectors (A), brake oil level sensor connector (B) and ground (C).



13. Disconnect the brake booster vacuum hose (A), PCSV hose (B) and fuel hose (C).

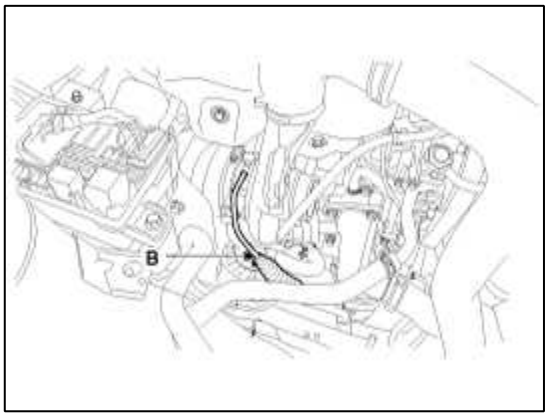


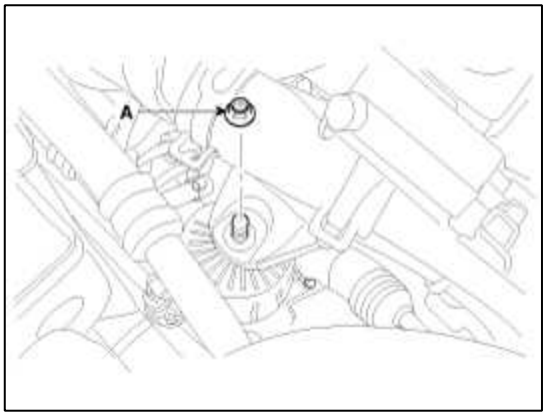
14. Remove the alternator cable. (Refer to EE group)
15. Disconnect the the battery (+) cable (A), wirings (B) and heater hoses (C).



16. Remove the engine mounting bracket nut (A) and bolt (B).

Tightening torque :
66.7 ~ 83.4N.m (6.8 ~ 8.5kgf.m, 49.2 ~ 61.5lb-ft)

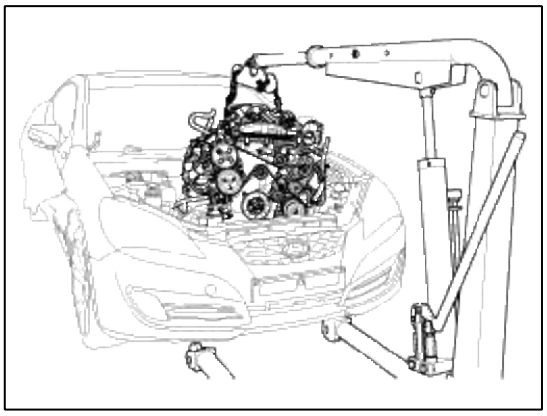




17. Remove the hood. (Refer to BD group)

18. Remove the engine assembly by lifting the engine jack.

> CAUTION
>
> When removing the engine assembly, be careful not to damage any surrounding parts or body components.



Installation

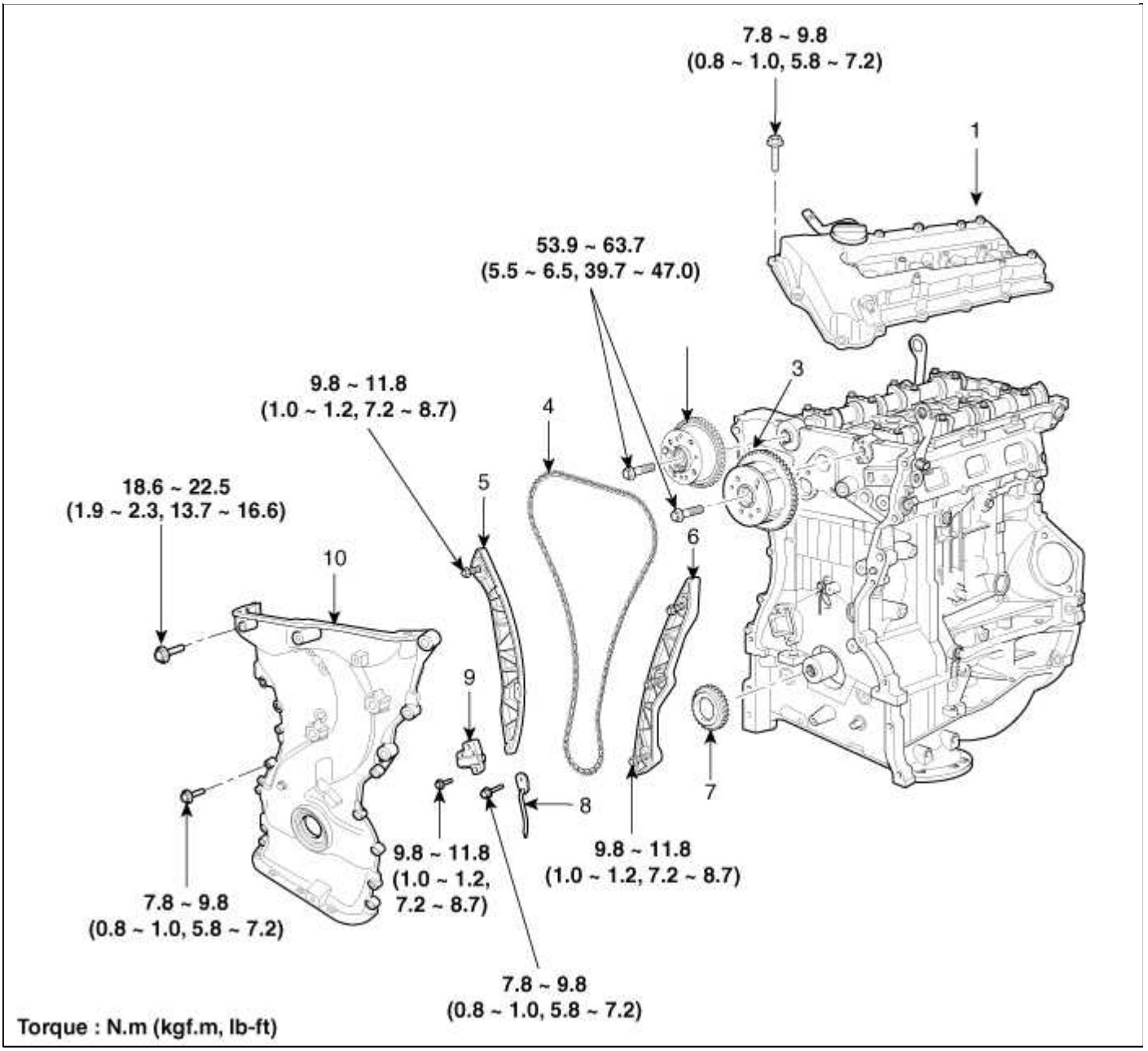
Installation is in the reverse order of removal.

Perform the following :

- Adjust a shift cable.
- Adjust a throttle cable.
- Refill engine with engine oil.
- Refill a transaxle with fluid.
- Refill power steering fluid.
- Refill a radiator and a reservoir tank with engine coolant.
- Place a heater control knob on "HOT" positon.
- Inspect for fuel leakage.
  - After assemble the fuel line, turn on the ignition switch (do not operate the starter) so that the fuel pump runs for approximately two seconds and fuel line pressurizes.
  - Repeat this operation two or three times, then check for fuel leakage at any point in the fuel line.
- Bleed air from the cooling system.
  - Start engine and let it run until it warms up. (until the radiator fan operates 3 or 4 times.)
  - Turn Off the engine. Check the level in the radiator, add coolant if needed. This will allow trapped air to be removed from the cooling system.
  - Put radiator cap on tightly, then run the engine again and check for leaks.
- Clean battery posts and cable terminals and assemble.

Engine Mechanical System > Timing System > Timing Chain > Components and Components Location

Components



1. Cylinder head cover 2. Exhaust CVVT assembly 3. Intake CVVT assembly 4. Timing chain	5. Timing chain tensioner arm 6. Timing chain tensioner guide 7. Crankshaft sprocket	8. Oil jet 9. Timing chain tensioner 10. Timing chain cover

Engine Mechanical System > Timing System > Timing Chain > Repair procedures

Removal

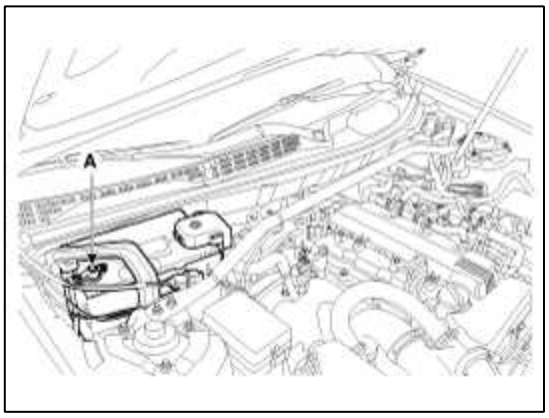
CAUTION

- Use fender covers to avoid damaging painted surfaces.
- To avoid damage, unplug the wiring connectors carefully while holding the connector portion.

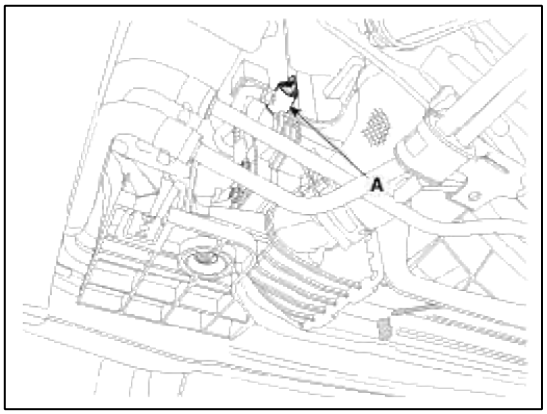
NOTE

Mark all wiring and hoses to avoid misconnection.

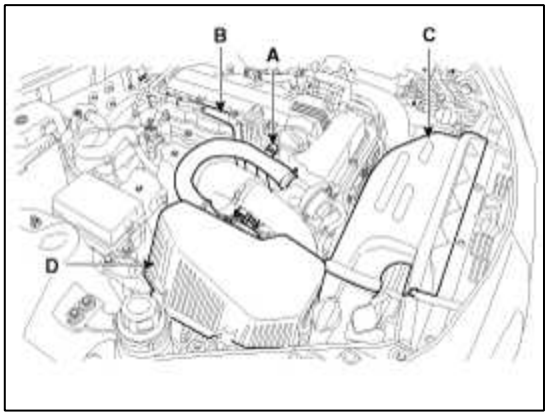
1. Disconnect the battery nagative cable (A).



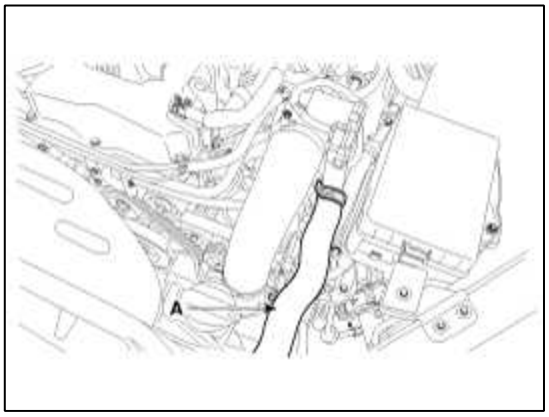
2. Loosen the drain plug (A) and drain the engine coolant.



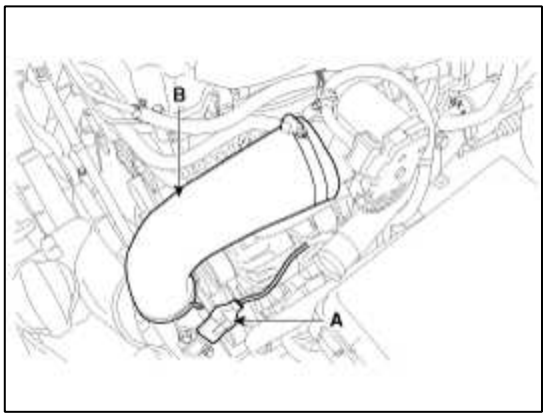
3. Disconnect the breather hose (A), vacuum hose (B). And remove the air duct (C) and air cleaner assembly (D).



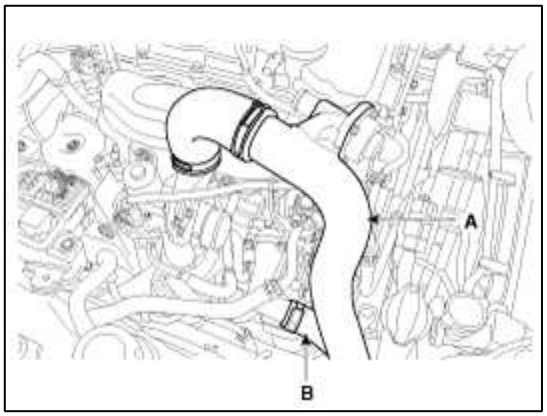
4. Remove the radiator upper hose (A).



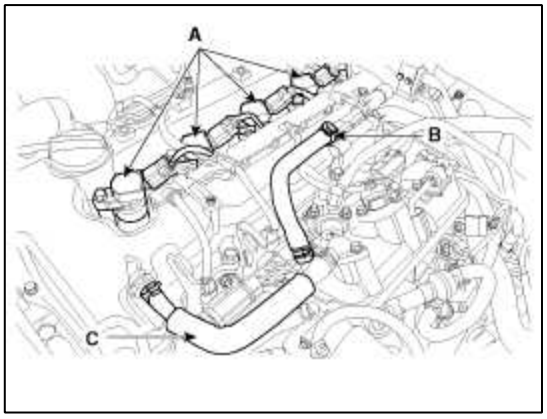
5. Remove the intercooler outlet hose (B) after disconnecting the BPS connector (A).



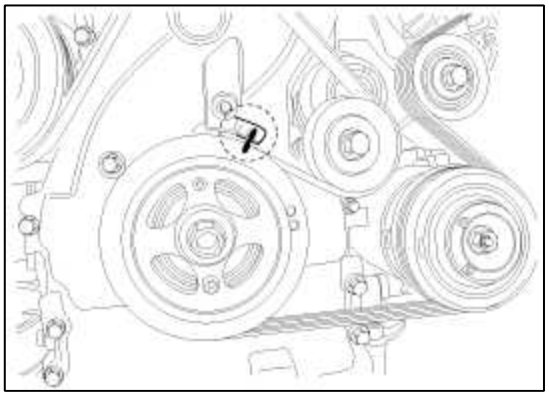
6. Remove the intercooler inlet hose (A).



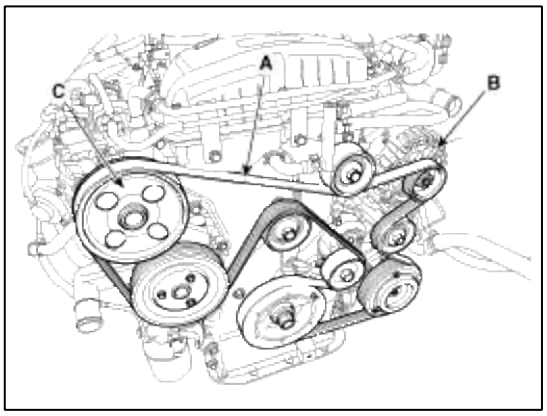
7. Disconnect the ignition coil connectors (A) and remove the ignition coils.
8. Remove the cylinder head cover after removing the vacuum hoses (B) and PCV hose (C).



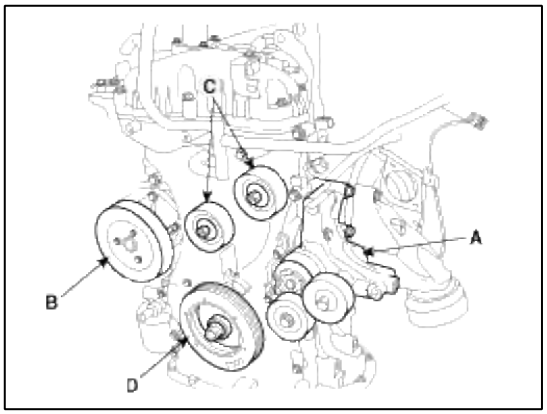
9. Set No.1 cylinder to TDC/compression.



10. Remove the drive belt (A), alternator (B) and power steering pump (C).



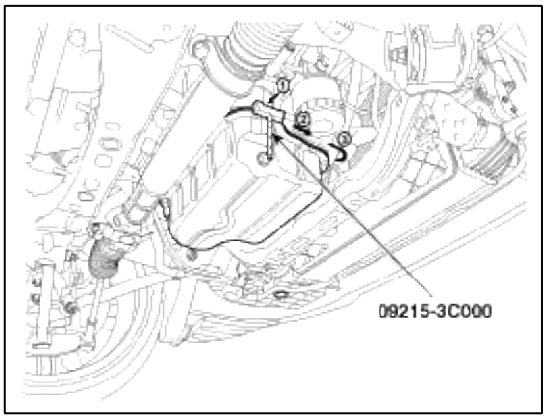
11. Remove the tensioner assembly (A), water pump assembly (B), idler (C) and crankshaft pulley (D).



NOTE

Use the SST (crankshaft pulley adapter and holder, 09231-2M100,09231-2J210,) to remove the crankshaft pulley bolt.

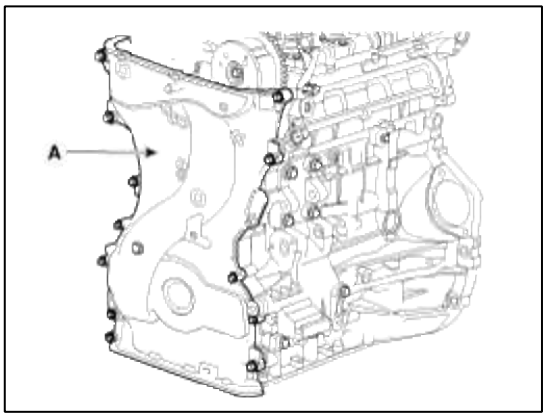
12. Remove the lower oil pan using the SST (09215-3C000).



NOTE

- Insert the SST between the oil pan and the ladder frame by tapping it with a plastic hammer in the direction of arrow #1.
- After tapping the SST with a plastic hammer along the direction of arrow #2 around more than 2/3 edge of the oil pan, remove it from the ladder frame.
- Do not turn over the SST abruptly without tapping. It be result in damage of the SST.
- Be careful not to damage the contact surfaces of Upper oil pan and lower oil pan.

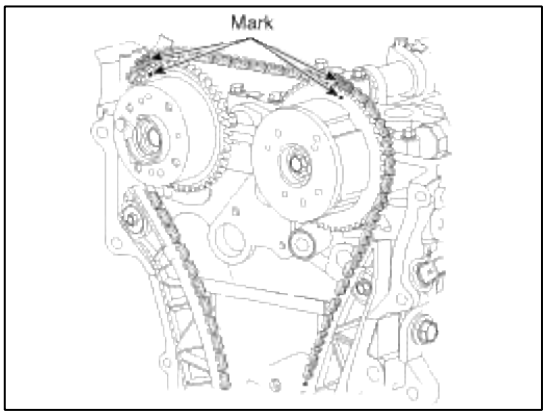
13. Remove the timing chain cover (A).

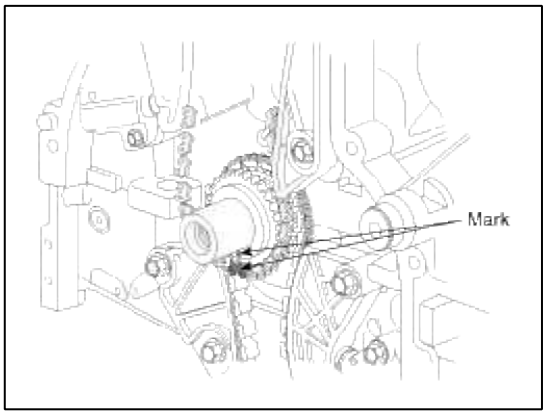


CAUTION

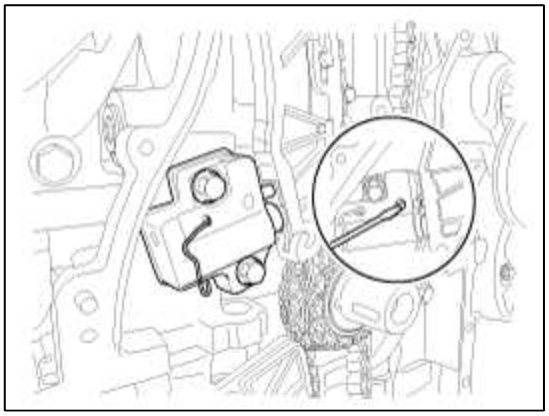
Be careful not to damage the contact surfaces of cylinder block, cylinder head and timing chain cover.

14. The key of crankshaft should be aligned with the mating face of main bearing cap. As a result of this, the piston of No.1 cylinder is placed at the top dead center on compression stroke.

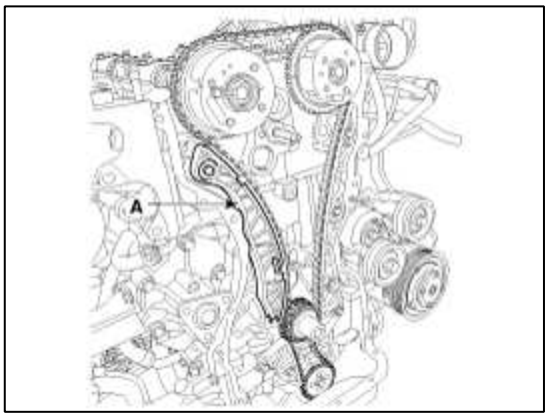




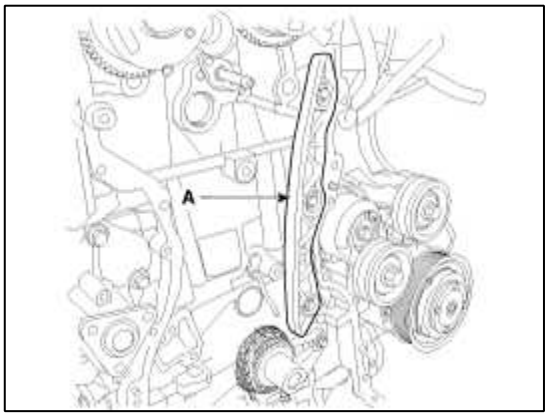
15. Install a set pin after compressing the timing chain tensioner.



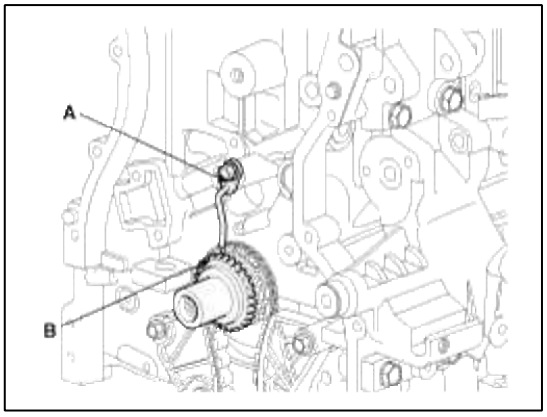
16. Remove the timing chain tensioner and timing chain tensioner arm (A).



17. Remove the timing chain.
18. Remove the timing chain guide (A).



19. Remove the timing chain oil jet (A) and crankshaft sprocket (B).



20. Remove the balance shaft chain.
    (Refer to Lubrication system in this group)

Inspection

Sprockets, Hydraulic Tensioner, Chain Guide, Tensioner Arm

1. Check the CVVT sprocket, crankshaft sprocket teeth for abnormal wear, cracks or damage. Replace if necessary.
2. Check a contact surface of the chain tensioner arm and guide for abnormal wear, cracks or damage. Replace if necessary.
3. Check the hydraulic tensioner for its piston stroke and ratchet operation. Replace if necessary.

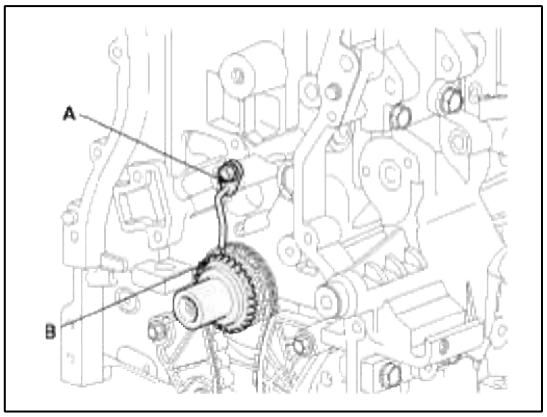
Belt, Idler, Pulley

1. Check the idler for excessive oil leakage, abnormal rotation or vibration. Replace if necessary.
2. Check belt for maintenance and abnormal wear of V-ribbed part. Replace if necessary.
3. Check the pulleys for vibration in rotation, oil or dust deposit of V-ribbed part. Replace if necessary.

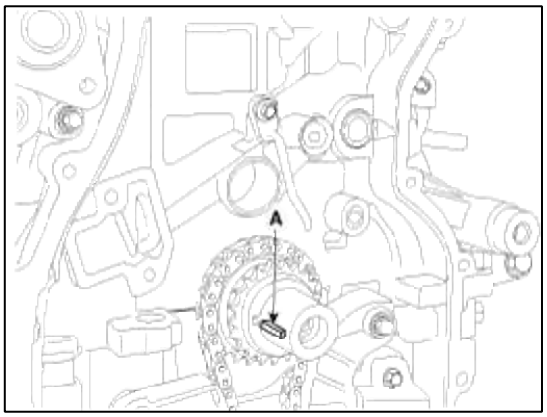
Installation

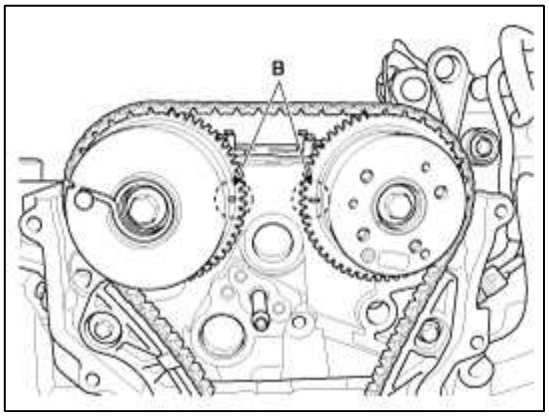
1. Install the timing chain oil jet (A) and crankshaft sprocket (B).

Tightening torque :
7.8 ~ 9.8N.m (0.8 ~ 1.0kgf.m, 5.8 ~ 7.2lb-ft)



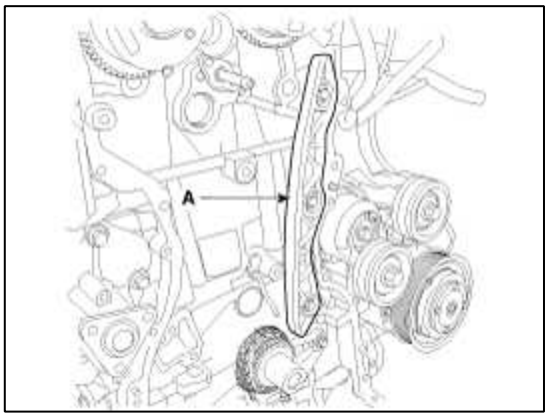
2. Set the crankshaft so that the key (A) of crankshaft will be aligned with the mating surface of main bearing cap. Put the intake and exhaust camshaft assembly so that the TDC marks (B) of the intake and exhaust CVVT sprockets will be aligned with the top surface of cylinder head. As a result of this, the piston of No.1 cylinder is placed at the top dead center on compression stroke.



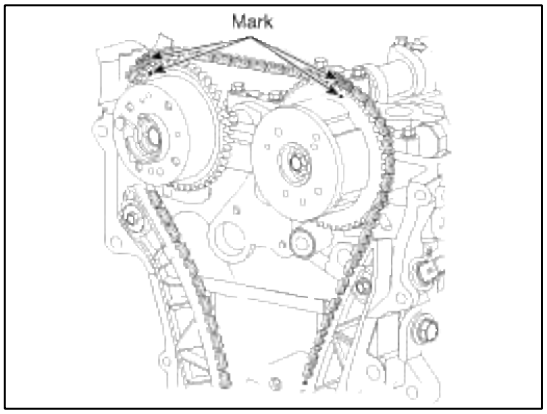


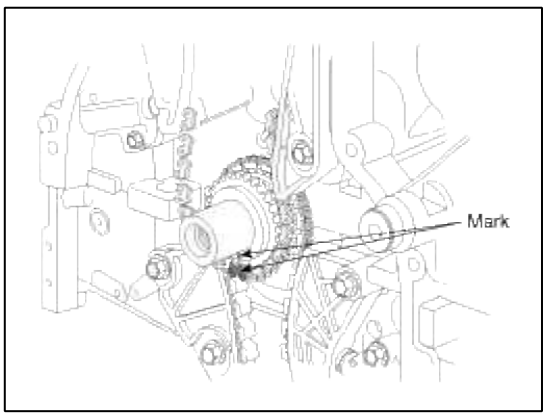
3. Install the timing chain guide (A).

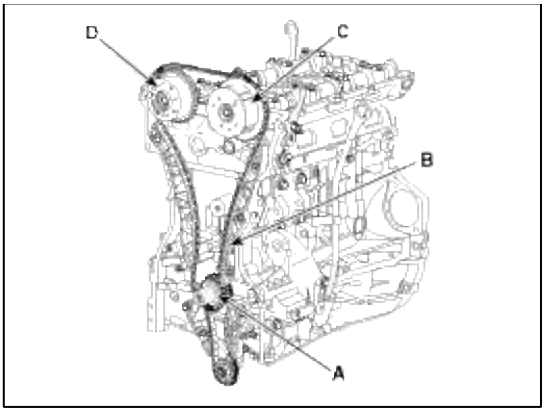
Tightening torque :
9.8 ~ 11.8N.m (1.0 ~ 1.2kgf.m, 7.2 ~ 8.7lb-ft)



4. Install the timing chain.
To install the timing chain with no slack between each shaft (cam, crank), follow the below procedure.Crankshaft sprocket (A) -> Timing chain guide (B) -> Intake CVVT assembly (C) -> Exhaust CVVT assembly (D).
The timing mark of each sprockets should be matched with timing mark (color link) of timing chain at installing timing chain.

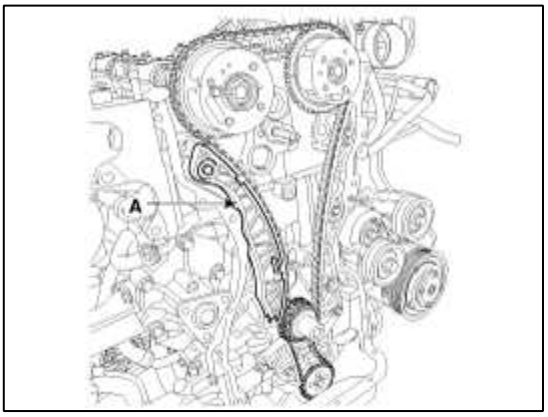






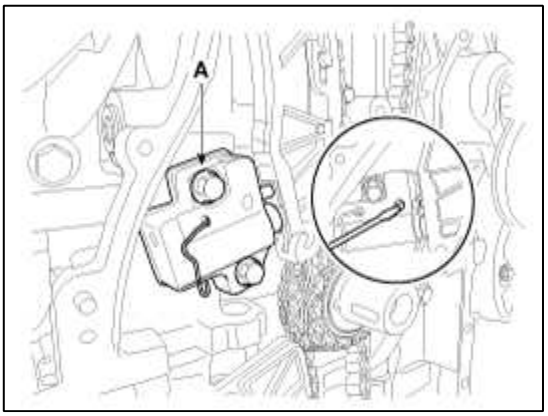
5. Install the timing chain tensioner arm (A).

Tightening torque :
9.8 ~ 11.8N.m (1.0 ~ 1.2kgf.m, 7.2 ~ 8.7lb-ft)

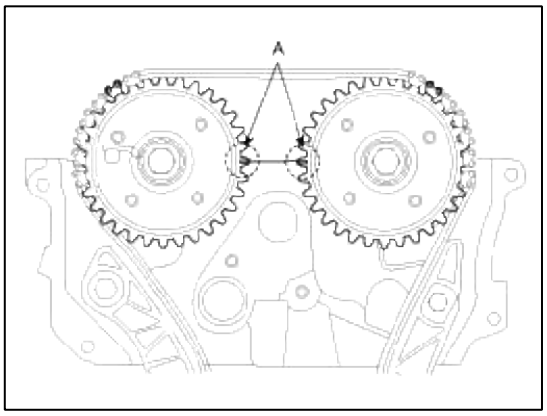


6. Install the timing chain auto tensioner (A) and remove the set pin.

Tightening torque :
9.8 ~ 11.8N.m (1.0 ~ 1.2kgf.m, 7.2 ~ 8.7lb-ft)

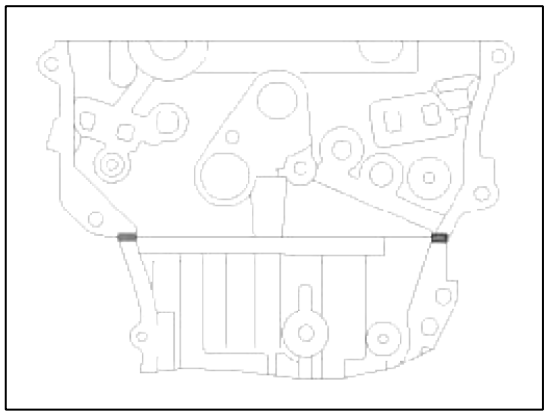


7. After rotating crankshaft 2 revolutions in regular direction (clockwise viewed from front), confirm the timing mark (A).



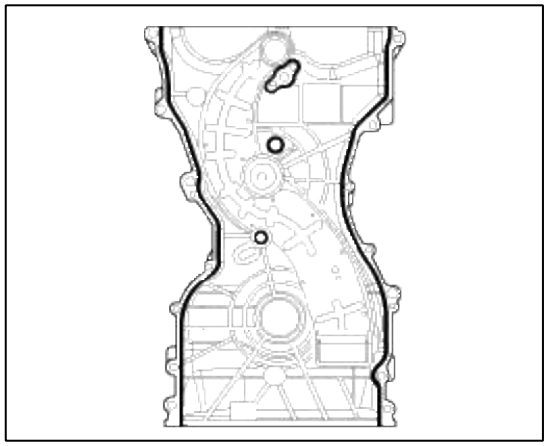
8. Install timing chain cover.
   A. Using a gasket scraper remove all the old packing meterial from the gasket surfaces.
   B. The sealant locations on chain cover and on counter parts (cylinder head, cylinder block, and ladder frame) must be free of engine oil and ETC.
   C. Before assembling the timing chain cover, the liquid sealant Loctite 5900H or THREEBOND 1217H should be applied on the gap between cylinder head and cylinder block.
   The part must be assembled within 5 minutes after sealant was applied.

Bead width : 2.5±0.5mm (0.098±0.019in.)



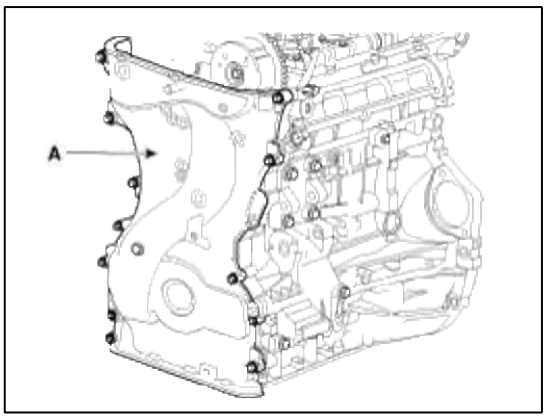
   D. After applying liquid sealant Loctite 5900H on timing chain cover. The part must be assembled within 5 minutes after sealant was applied. Sealant should be applied without discontinuity.

Bead width : 3.0mm(0.12in.)



E. The dowel pins on the cylinder block and holes on the timing chain cover should be used as a reference in order to assemble the timing chain cover to be in exact position.

Tightening torque :
M6 : 7.8 ~ 9.8N.m (0.8 ~ 1.0kgf.m, 5.8 ~ 7.2lb-ft)
M8 : 18.6 ~ 22.5N.m (1.9 ~ 2.3kgf.m, 13.7 ~ 16.6lb-ft)

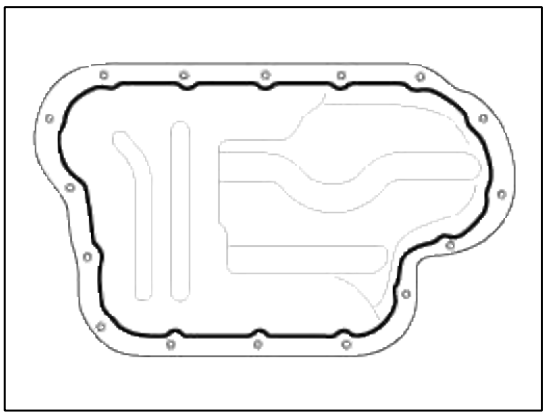


F. The firing and/or blow out test should not be performed within 30 minutes after the timing chain cover was assembled.

9. Install the oil pan.

A. Using a gasket scraper, remove all the old packing material from the gasket surfaces.

B. Before assembling the oil pan, the liquid sealant Loctite 5900H or THREEBOND 1217H should be applied on oil pan. The part must be assembled within 5 minutes after the sealant was applied.



CAUTION

- When applying sealant gasket, sealant must not be protruded into the inside of oil pan.
- To prevent leakage of oil, apply sealant gasket to the inner threads of the bolt holes.

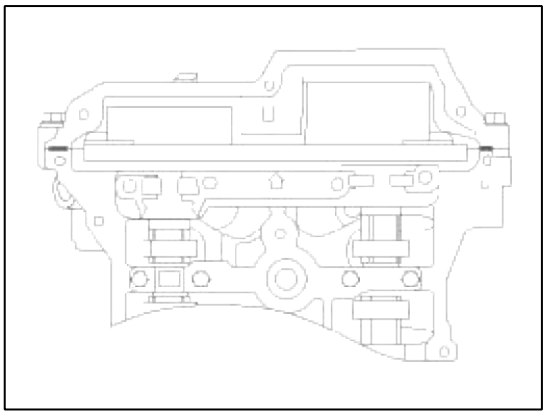
C. Install the oil pan (A).
Uniformly tighten the bolts in several passes.

Tightening torque :
9.8 ~ 11.8N.m (1.0 ~ 1.2kgf.m, 7.2 ~ 8.7lb-ft)

D. After assembly, wait at least 30 minutes before filling the engine with oil.

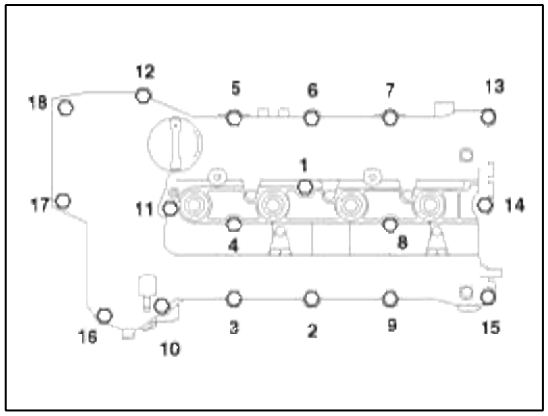
10. Install the cylinder head cover.
    A. The hardened sealant located on the upper area between timing chain cover and cylinder head should be removed before assembling cylinder head cover.
    B. After applying sealant (Loctite 5900H, Three Bond 1217H, it should be assembled within 5 minutes.

Bead width : 2.5±0.5mm (0.098±0.019in.)



    C. The firing and/or blow out test should not be performed within 30 minutes after the cylinder head cover was assembled.
    D. Install the cylinder head cover bolts as following method.

Tightening torque :
Step 1 : 3.9 ~ 5.9N.m (0.4 ~ 0.6kgf.m, 2.9 ~ 4.3lb-ft)
Step 2 : 7.8 ~ 9.8N.m (0.8 ~ 1.0kgf.m, 5.8 ~ 7.2lb-ft)



CAUTION

Do not reuse cylinder head cover gasket.

11. Install the crankshaft pulley (D).

Tightening torque :
166.7 ~ 176.5N.m (17 ~ 18kgf.m, 122.9 ~ 130.2lb-ft)

NOTE

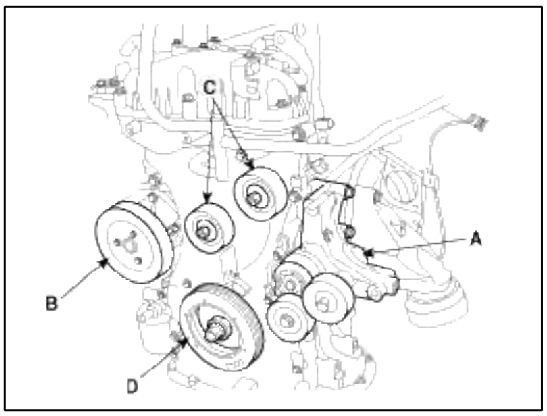
Fix the crankshaft using the SST (09231-2M000, 09231-2J210) when installing the crankshaft pulley bolt.

12. Install the water pump pulley (B) and Idler (C).

Tightening torque :
B: 9.8 ~ 11.8N.m (1.0 ~ 1.2kgf.m, 7.2 ~ 8.7lb-ft)
C: 53.9 ~ 63.7N.m (5.5 ~ 6.5kgf.m, 39.8 ~ 47.0lb-ft)

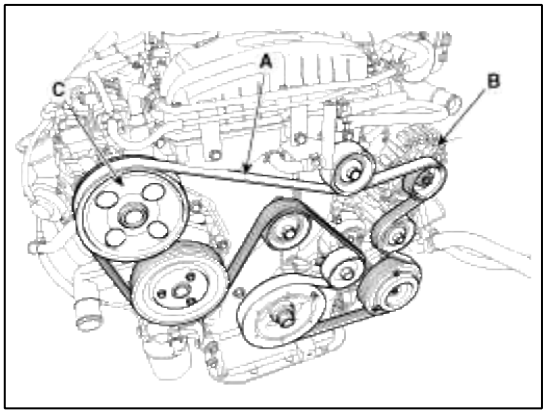
13. Install the tensioner bracket assembly (A).

Tightening torque :
39.2 ~ 44.1N.m (4.0 ~ 4.5kgf.m, 28.9 ~ 32.5lb-ft)



14. Install the alternator (B), power steering pump (C) and drive belt (A).

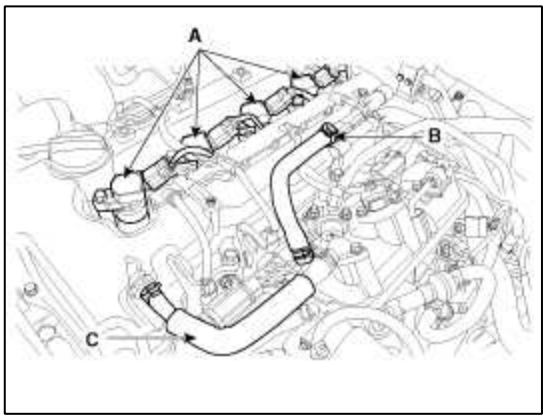
Tightening torque :
B: 49.0 ~ 63.7N.m (5.0 ~ 6.5kgf.m, 36.1 ~ 47.0lb-ft)
C: 16.6 ~ 19.6N.m (1.7 ~ 2.0kgf.m, 12.3 ~ 14.5lb-ft)



15. Install the ignition coil and connect the ignition coil connector (A).

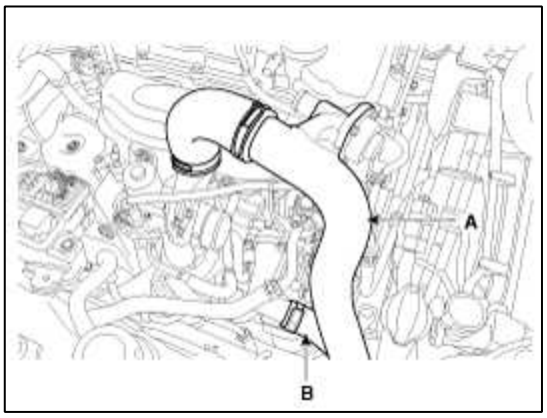
Tightening torque :
9.8 ~ 11.8N.m (1.0 ~ 1.2kgf.m, 7.2 ~ 8.7lb-ft)

16. Install the vacuum hose (B) and PCV hose (C).

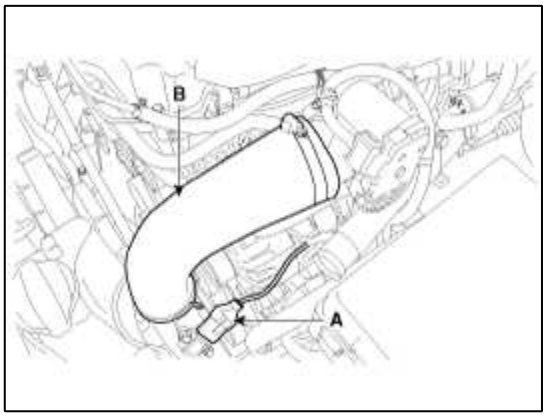


17. Install the intercooler inlet hose (A).

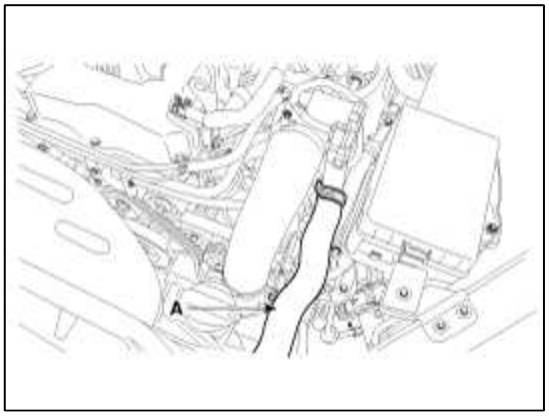
Tightening torque :
Bolt : 14.7 ~ 19.6N.m (1.5 ~ 2.0kgf.m, 10.8 ~ 14.4lb-ft)
Clamp : 4.9 ~ 6.8N.m (0.5 ~ 0.7kgf.m, 3.6 ~ 5.1lb-ft)



18. Install the intercooler outlet hose (B) and connect the BPS connector (A).

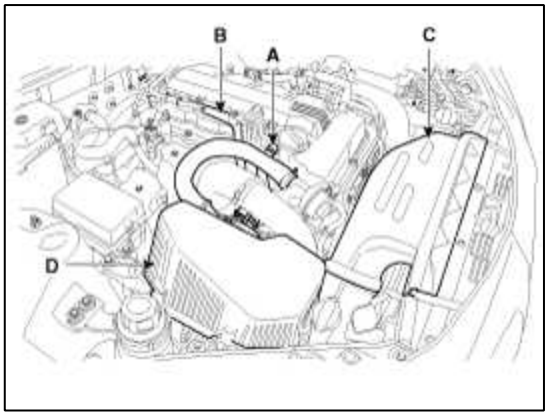


19. Install the radiator upper hose (A).

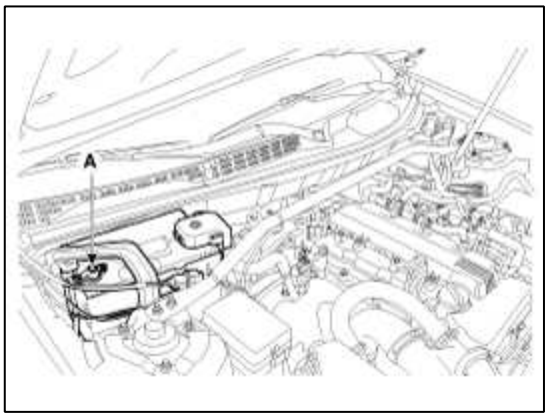


20. Install the air cleaner assembly (D) and air duct (C). And then connect the breather hose (A) and vacuum hose (B).

Tightening torque :
Bolt : 7.8 ~ 9.8N.m (0.8 ~ 1.0kgf.m, 5.8 ~ 7.2lb-ft)
Clamp : 2.9 ~ 4.9N.m (0.3 ~ 0.5kgf.m, 2.1 ~ 3.6lb-ft)

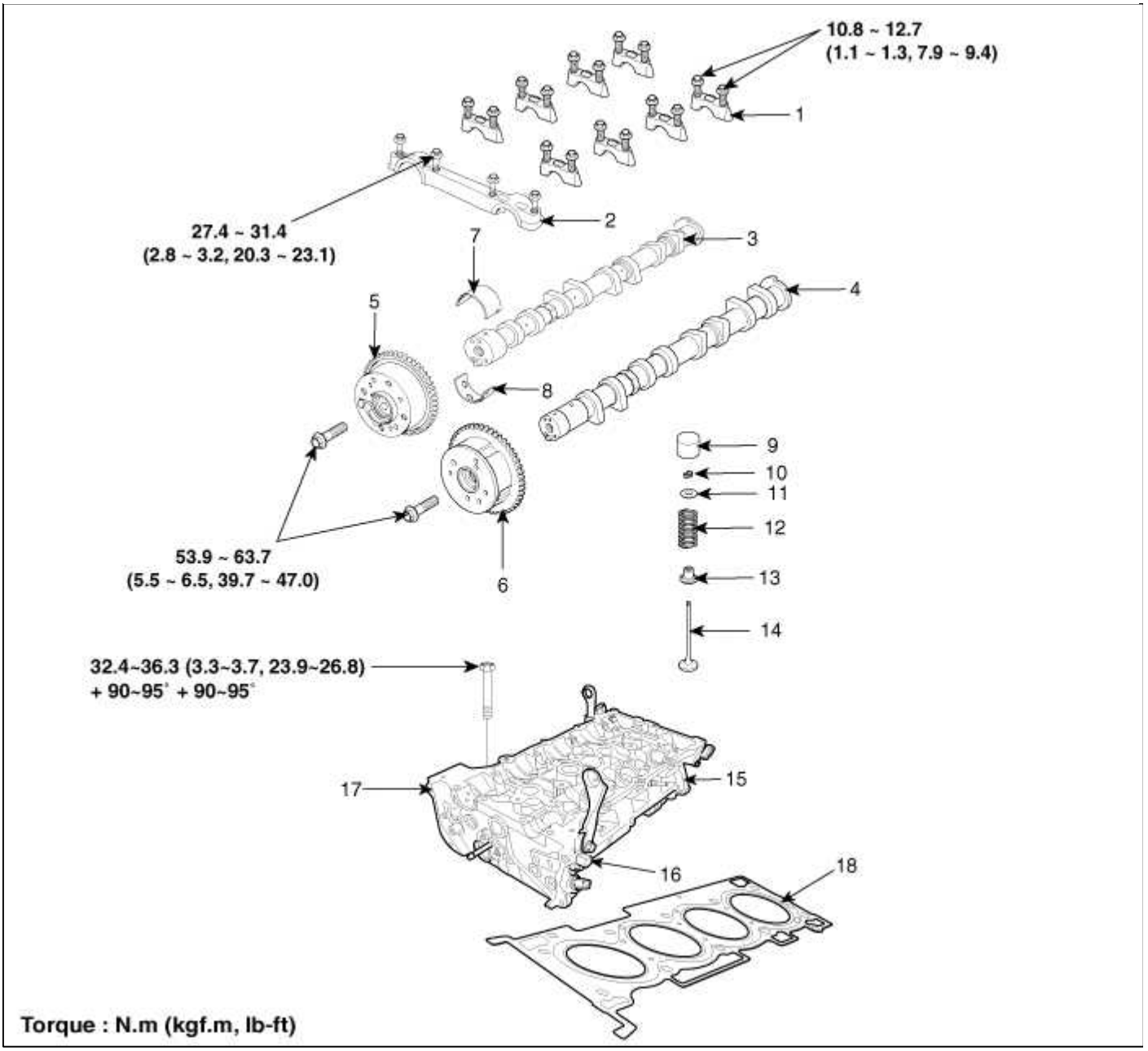


21. Connect the battery negative cable (A).



Engine Mechanical System > Cylinder Head Assembly > Cylinder Head > Components and Components Location

Components



1. Camshaft bearing cap	7. Exhaust camshaft upper bearing	13. Valve stem seal
2. Camshaft front bearing cap	8. Exhaust camshaft lower bearing	14. Valve
3. Exhaust camshaft	9. MLA	15. Cylinder head
4. Intake camshaft	10. Retainer lock	16. Intake OCV
5. Exhaust CVVT assembly	11. Retainer	17. Exhaust OCV
6. Intake CVVT assembly	12. Valve spring	18. Cylinder head gasket

Engine Mechanical System > Cylinder Head Assembly > Cylinder Head > Repair procedures

Removal

Engine removal is not required for this procedure.

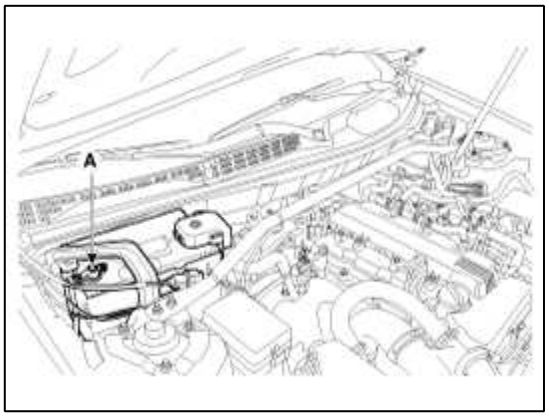
CAUTION

- Use fender covers to avoid damaging painted surfaces.
- To avoid damaging the cylinder head, wait until the engine coolant temperature drops below normal temperature before removing it.
- When handling a metal gasket, take care not to fold the gasket or damage the contact surface of the gasket.
- To avoid damage, unplug the wiring connectors carefully while holding the connector portion.

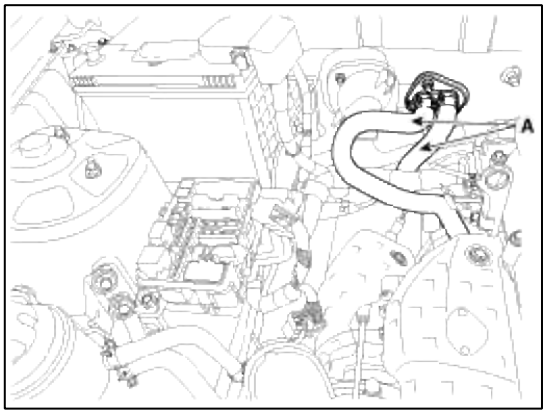
NOTE

Mark all wiring and hoses to avoid misconnection.

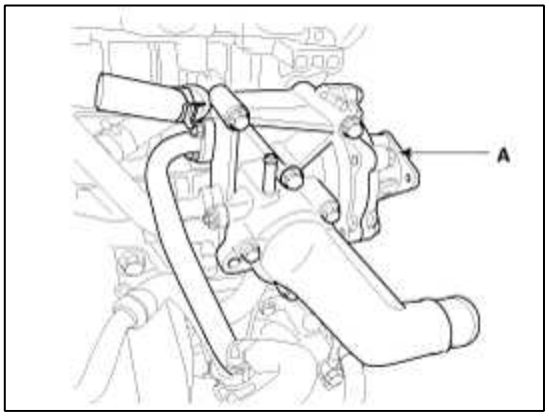
1. Disconnect the negative (-) battery terminal (A).



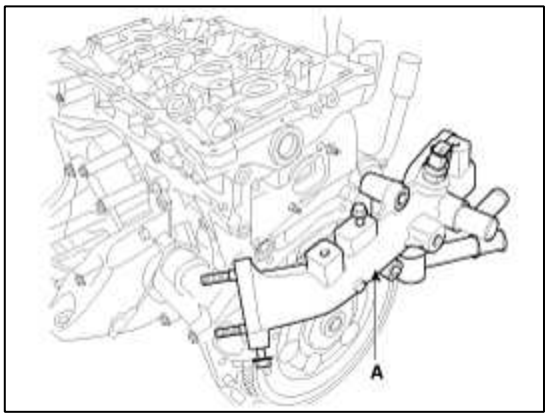
2. Remove the heater hoses (A).



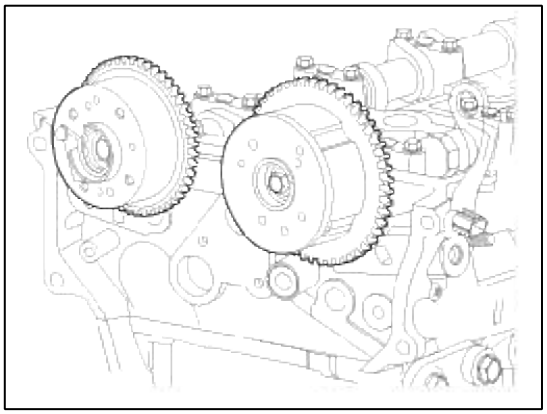
3. Remove the intake & exhaust manifold. (Refer to Intake and exhaust system in this group)
4. Remove the water pump (A) and gasket.



5. Remove the water temperature control assembly (A) and gasket.

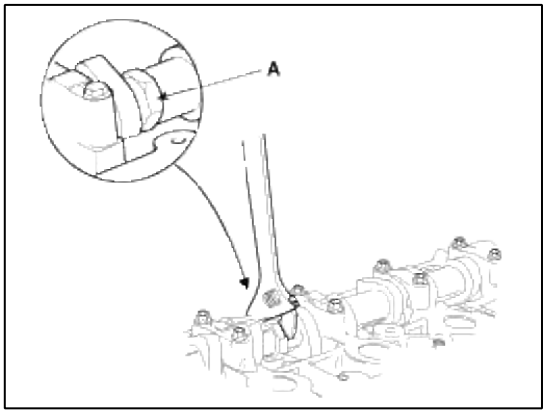


6. Remove the intake & exhaust CVVT assembly. (Refer to Timing system in this group)
7. Remove the intake & exhaust CVVT assembly.

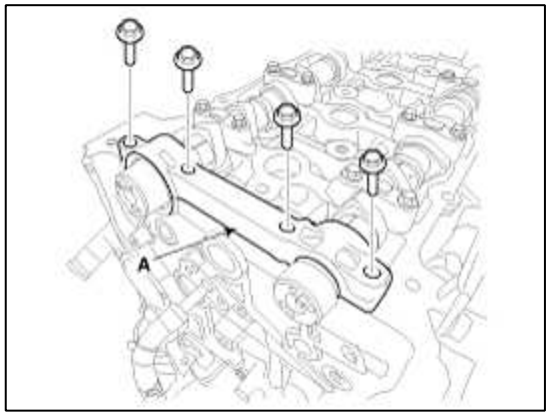


NOTE

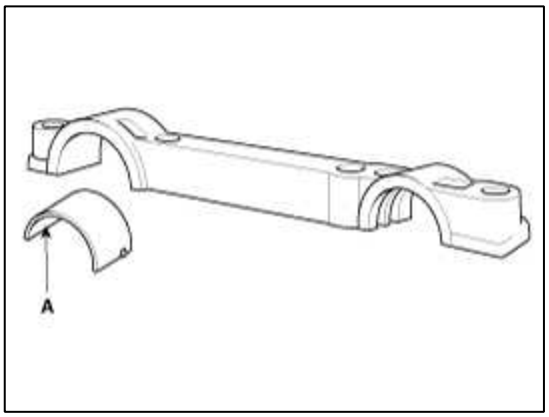
Fix the cam shaft (A) with a wrench when removing the CVVT assembly.



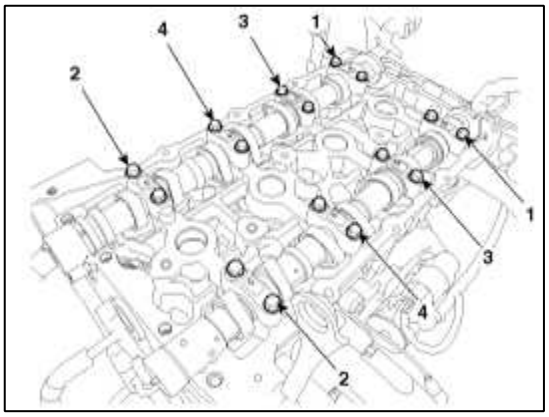
8. Remove the cam shaft.
   A. Remove the front cam shaft bearing cap (A).



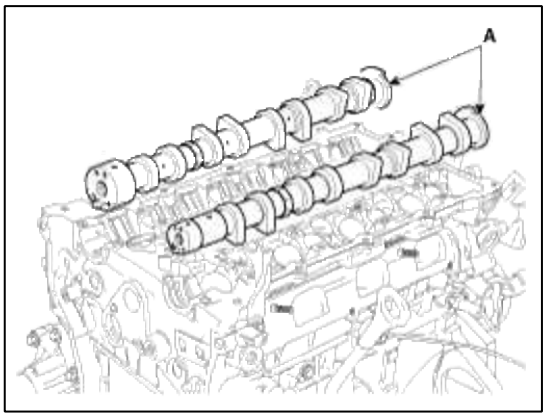
B. Remove the exhaust cam shaft upper bearing (A).



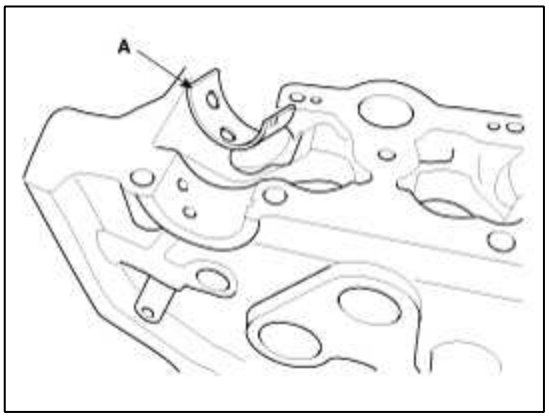
C. Remove camshaft bearing cap, in the sequence shown.



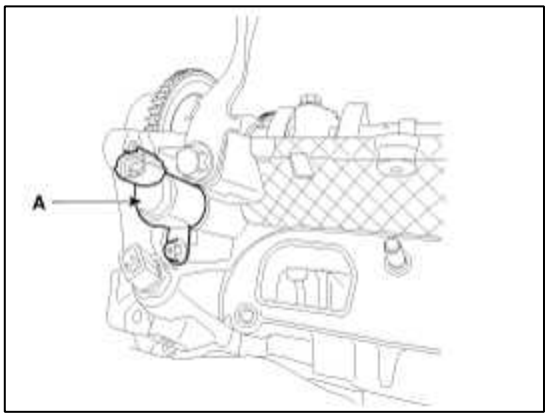
D. Remove the cam shaft (A).



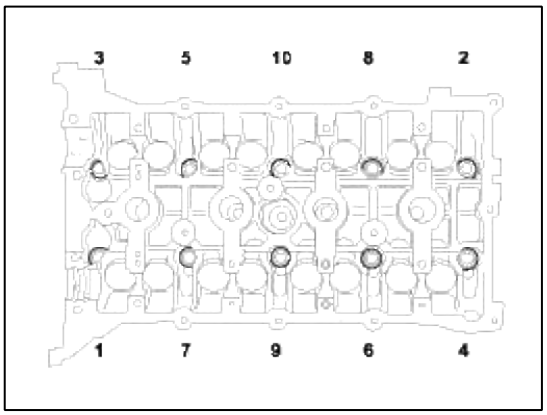
E. Remove the exhaust cam shaft lower bearing (A).



9. Use a torx wrench, remove the intake OCV (A).



10. Remove the exhaust OCV.
11. Remove the cylinder head bolts, then remove the cylinder head.
    A. Using triple square wrench, uniformly loosen and remove the 10 cylinder head bolts, in several passes, in the sequence shown.



> CAUTION
>
> Head warpage or cracking could result from removing bolts in an incorrect order.

    B. Lift the cylinder head from the dowels on the cylinder block and place the cylinder head on wooden blocks on a bench.

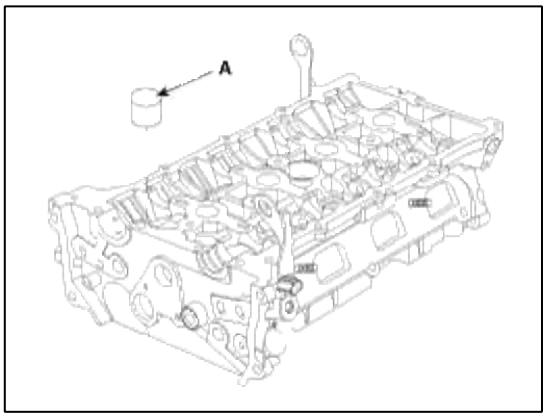
> CAUTION
>
> Be careful not to damage the contact surfaces of the cylinder head and cylinder block.

12. Remove the cylinder head gasket.

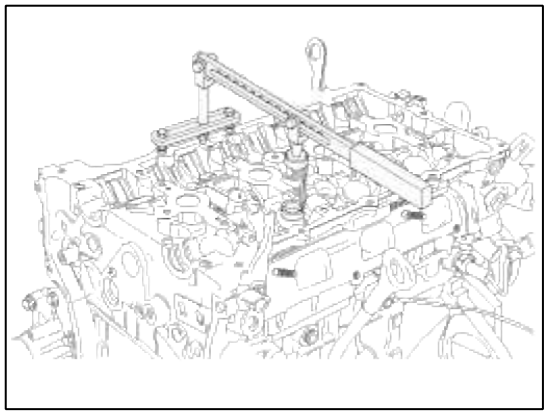
Disassembly

> NOTE
>
> Identify MLA(Mechanical Lash Adjuster), valves, valve springs as they are removed so that each item can be reinstalled in its original position.

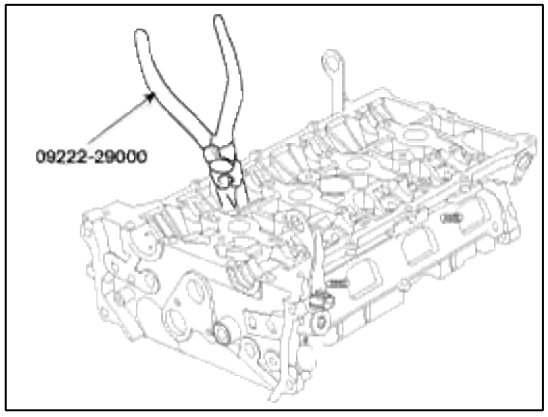
1. Remove MLAs(A).



2. Remove valves.
   (1) Using SST(09222-3K000, 09222-3K100), compress the valve spring and remove retainer lock.



   (2) Remove the spring retainer.
   (3) Remove the valve spring.
   (4) Remove the valve.
   (5) Using valve stem seal remover (09222-29000), remove the valve stem seal.

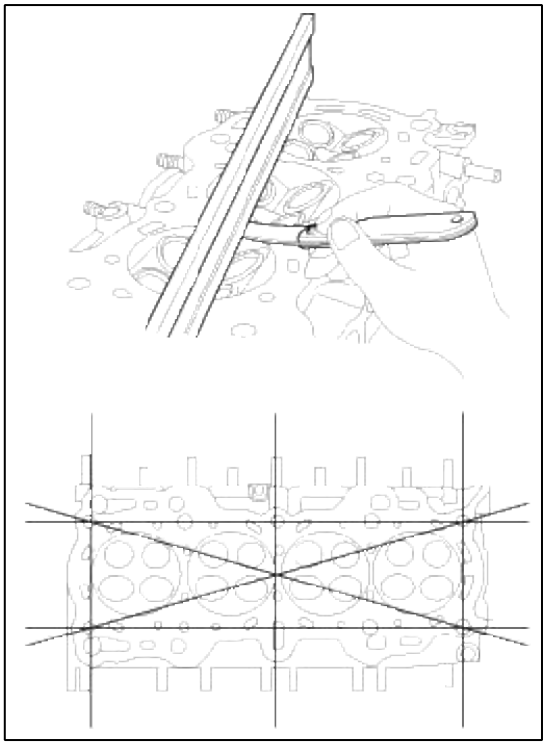


Inspection

Cylinder Head

1. Inspect for flatness.
   Using a precision straight edge and feeler gauge, measure the surface the contacting the cylinder block and the manifolds for warpage.

Flatness of cylinder head gasket surface
Standard : Less than 0.05mm(0.002in.)

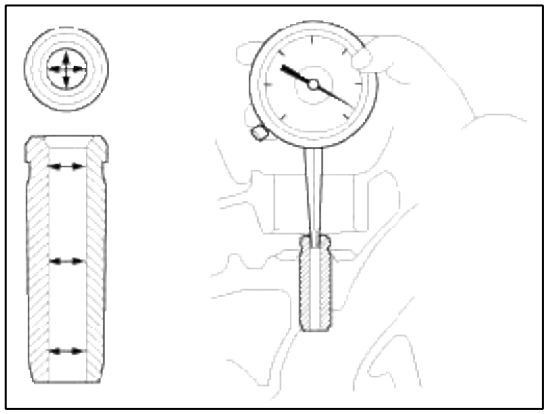


2. Inspect for cracks.
   Check the combustion chamber, intake ports, exhaust ports and cylinder block surface for cracks. If cracked, replace the cylinder head.

Valve And Valve Spring

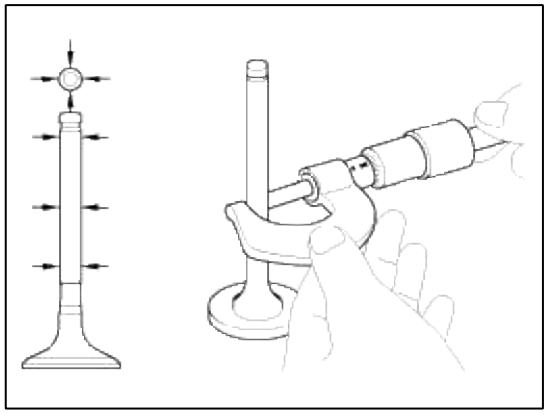
1. Inspect valve stems and valve guides.
   (1) Using a caliper gauge, measure the inside diameter of the valve guide.

Valve guid I.D.
Intake / Exhaust : 5.500 ~ 5.512mm (0.216 ~ 0.217in.)



(2) Using a micrometer, measure the diameter of the valve stem.

Valve stem O.D.
Intake : 5.465 ~ 5.480mm (0.2151 ~ 0.2157in.)
Exhaust : 5.458 ~ 5.470mm (0.2149 ~ 0.2153in.)



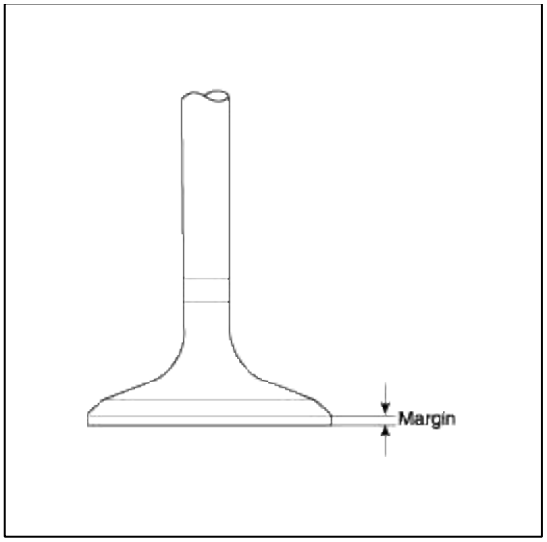
(3) Subtract the valve stem diameter measurement from the valve guide inside diameter measurement.

Valve stem-to-guide clearance
[Standard]
Intake : 0.020 ~ 0.047mm (0.0008 ~ 0.0018in.)
Exhaust : 0.030 ~ 0.054mm (0.0012 ~ 0.0021in.)
[Limit]
Intake : 0.07mm (0.0027in.)
Exhaust : 0.09mm (0.0035in.)

If the clearance is greater than maximum, replace the valve and valve guide.

2. Inspect valves.
(1) Check the valve is ground to the correct valve face angle.
(2) Check that the surface of the valve for wear.
If the valve face is worn, replace the valve.
(3) Check the valve head margin thickness.
If the margin thickness is less than minimum, replace the valve.

Margin
[Standard]
Intake : 1.02mm(0.0401in.)
Exhaust : 1.09mm(0.0429in.)



(4) Check the valve length.

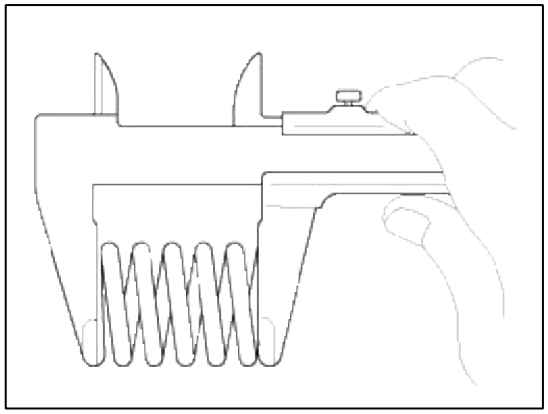
Valve length
[Standard]
Intake : 113.18mm (4.456in.)
Exhaust : 105.79mm (4.1649in.)
[Limit]
Intake : 112.93mm (4.446in.)
Exhaust : 105.54mm (4.1551in)

(5) Check the surface of the valve stem tip for wear.
If the valve stem tip is worn, replace the valve.

3. Inspect valve seats
Check the valve seat for evidence of overheating and improper contact with the valve face.
Replace the seat if necessary.
Before reconditioning the seat, check the valve guide for wear. If the valve guide is worn, replace it, then recondition the seat. Recondition the valve seat with a valve seat grinder or cutter. The valve seat contact width should be within specifications and centered on the valve face.
4. Inspect valve springs.
(1) Using a steel square, measure the out-of-square of the valve spring.

(2) Using a vernier calipers, measure the free length of the valve spring.

Valve spring
[Standard]
Free height : 47.44mm (1.8677in.)
Out-of-square : 1.5°



If the free length is not as specified, replace the valve spring.

MLA

1. Inspect MLA.
   Using a micrometer, measure the MLA outside diameter.

   MLA O.D.
   Intake/Exhaust :
   31.964~31.980mm(1.2584 ~ 1.2590in.)

2. Using a caliper gauge, measure MLA tappet bore inner diameter of cylinder head.

   Tappet bore I.D.
   Intake/Exhaust :
   32.000~32.025mm(1.2598 ~ 1.2608in.)

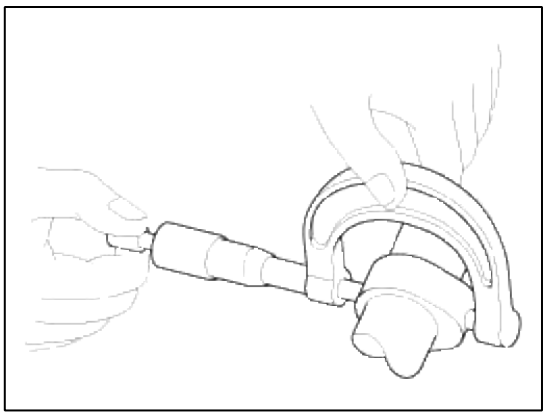
3. Subtract MLA outside diameter measurement from tappet bore inside diameter measurement.

   MLA to tappet bore clearance
   [Standard]
   Intake/Exhaust : 0.020 ~ 0.061mm(0.0008 ~ 0.0024in.)
   [Limit]
   Intake/Exhaust : 0.07mm(0.0027in.)

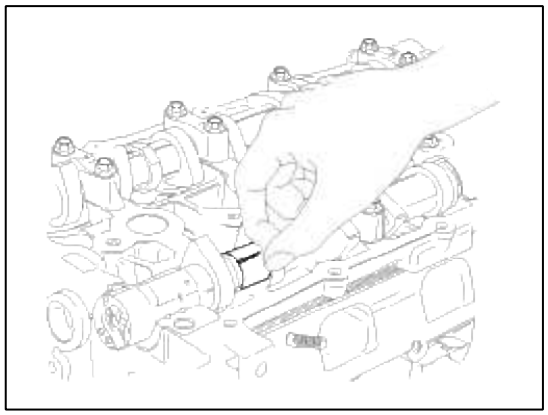
Camshaft

1. Inspect cam lobes.
   Using a micrometer, measure the cam lobe height.

Cam height
[Standard value]
Intake : 43.70 ~ 43.90mm (1.7204 ~ 1.7283in.)
Exhaust : 44.90 ~ 45.10mm (1.7677 ~ 1.7756in.)



   If the cam lobe height is less than standard, replace the camshaft.
2. Inspect camshaft journal clearance.
   (1) Clean the bearing caps and camshaft journals.
   (2) Place the camshafts on the cylinder head.
   (3) Lay a strip of plastigage across each of the camshaft journal.



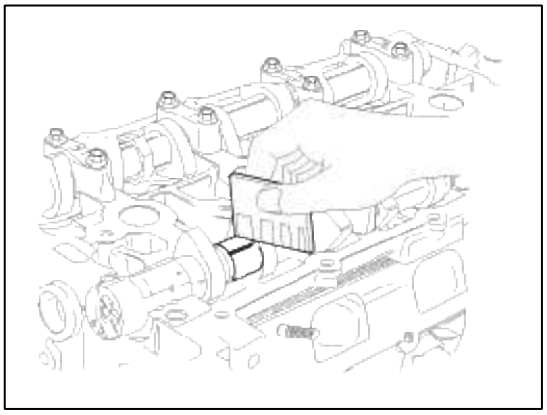
   (4) Install the bearing caps.

> CAUTION
>
> Do not turn the camshaft.

   (5) Remove the bearing caps.

(6) Measure the plastigage at its widest point.

Bearing oil clearance
[Standard value]
Intake
No.1 journal : 0.022 ~ 0.057mm (0.0008 ~ 0.0022in.)
No.2,3,4,5, journal : 0.045 ~ 0.082mm (0.0018 ~ 0.0032in.)
Exhaust
No.1 journal : 0 ~ 0.032mm (0 ~ 0.0012in.)
No.2,3,4,5, journal :
0.045 ~ 0.082mm (0.0017 ~ 0.0032in.)
[Limit] :
Intake
No.1 journal : 0.09mm (0.0035in.)
No.2,3,4,5 journal : 0.12mm (0.0047in.)
Exhaust : 0.12mm (0.0047in.)



If the oil clearance is greater than maximum, replace the camshaft. If necessary, replace cylinder head.

(7) Completely remove the plastigage.

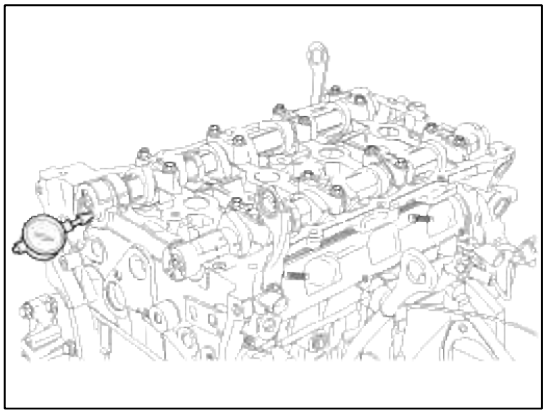
(8) Remove the camshafts.

3. Inspect camshaft end play.

(1) Install the camshafts.

(2) Using a dial indicator, measure the end play while moving the camshaft back and forth.

Camshaft end play
[Standard value] : 0.04 ~ 0.16mm(0.0015 ~ 0.0062in.)
[Limit] : 0.20mm (0.0078in.)



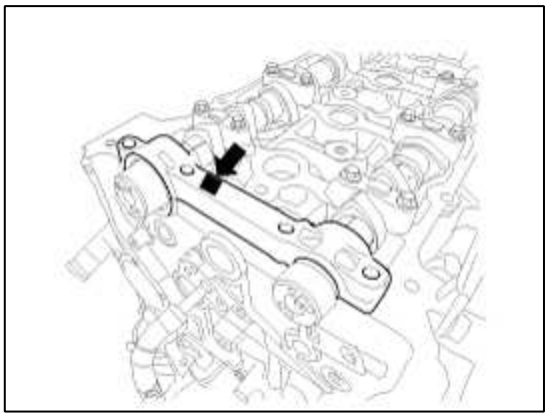
If the end play is greater than maximum, replace the camshaft. If necessary, replace cylinder head.

(3) Remove the camshafts.

Exhaust Cam Shaft Bearing

1. Check the cylinder head bore mark.

Location Of Cylinder Head Bore Mark

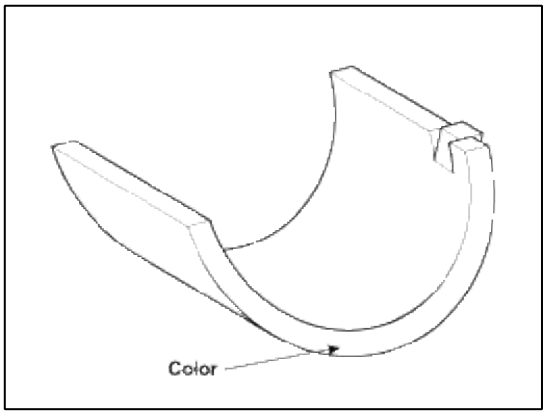


Discrimination Of Cylinder Head

Class	Mark	Exhaust No.1 Inside Diameter Of Cylinder Head Bore
a	A	40.000 ~ 40.008 mm (1.5748 ~ 1.5751 in.)
b	B	40.008 ~ 4.016 mm (1.5751 ~ 1.5754 in.)
c	C	40.016 ~ 40.024 mm (1.5754 ~ 1.5757 in.)

2. Select class of camshaft bearing same as class of cylinder head as shown on the table below.

Place Of Exhaust Cam Shaft Bearing Identification Mark



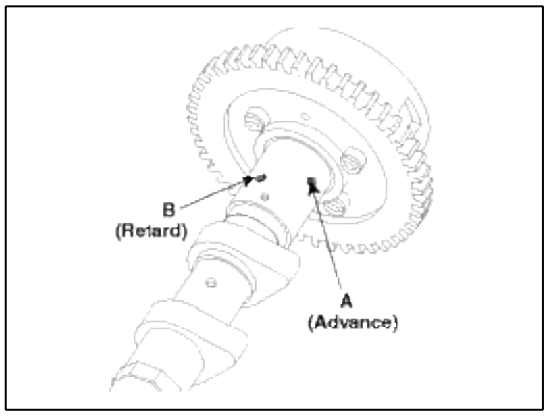
Discrimination Of Exhaust Camshaft Bearing

Cylinder Head Bore Class	Bearing Class For Installing (Color)	Thickness Of Bearing
a (A)	C (Green)	1.996~2.000mm (0.0785~0.0787in.)
b (B)	B (None color)	2.000~2.004mm (0.0787~0.0788in.)
c (C)	A (Black)	2.004~2.008mm (0.0788~0.0790in.)

Oil clearance : 0 ~ 0.032mm (0 ~ 0.0012in.)

CVVT Assembly

1. Inspect CVVT assembly.
   (1) Check that the CVVT assembly will not turn.
   (2) Apply vinyl tape to the retard hole except the one indicated by the arrow in the illustration.
   Verify the hold to tape and the hole to put air in.

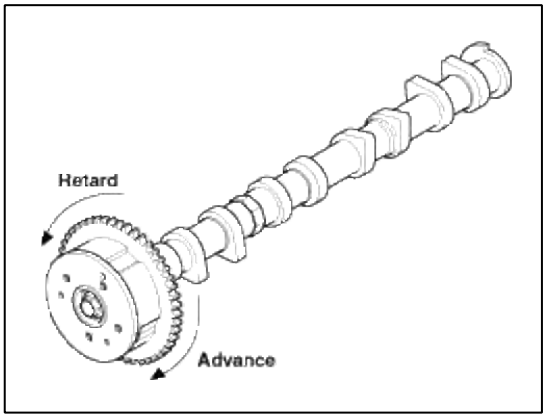


   (3) Wind tape around the tip of the air gun and apply air of approx. 150kpa(1.5kgf/cm², 21psi) to the port of the camshaft.
   (Perform this in order to release the lock pin.)

NOTE

When the oil splashes, wipe it off with a shop rag and the likes.

(4) With air applied, as in step(3), turn the CVVT assembly to the advance angle side (the arrow marked direction in the illustration) with your hand.
Depending on the air pressure, the CVVT assembly will turn to the advance side without applying force by hand. Also, under the condition that the pressure can be hardly applied because of the air leakage from the port, there may be the case that the lock pin could be hardly released.



(5) Turn the CVVT assembly back and forth and check the movable range and that there is no disturbance.

Standard:
Should move smoothly in a range from about
22.5° (Intake) / 20.0° (Exhaust)

(6) Turn the CVVT assembly with your hand and lock it at the maximum delay angle position (counter clockwise).

Reassembly

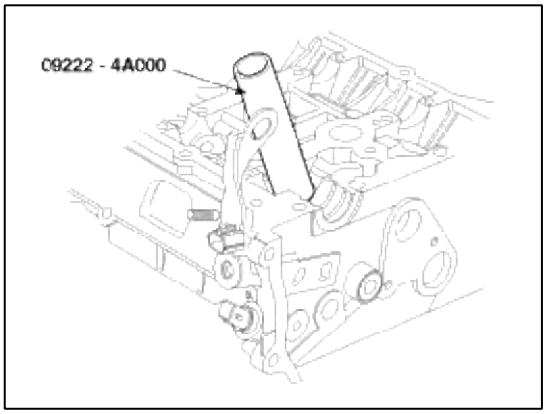
NOTE

Thoroughly clean all parts to be assembled.
Before installing the parts, apply fresh engine oil to all sliding and rotating surfaces.
Replace oil seals with new ones.

1. Install valves.
(1) Using SST(09222-4A000), push in a new oil seal.

NOTE

Do not reuse old valve stem seals.
Incorrect installation of the seal could result in oil leakage past the valve guides.

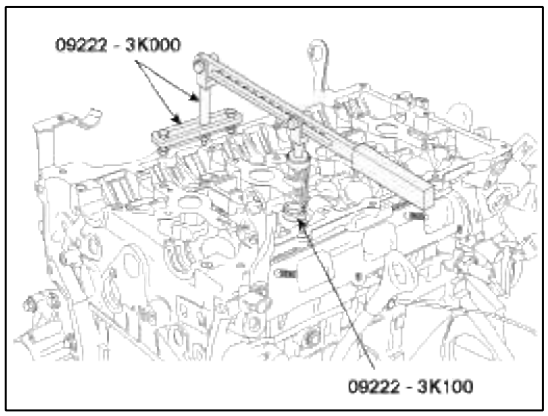


(2) Install the valve, valve spring and spring retainer.

NOTE

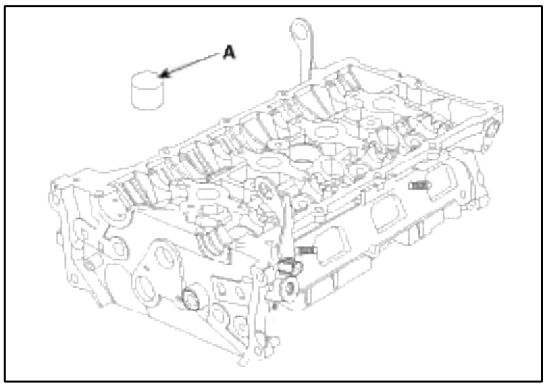
Place valve springs so that the side coated with enamel faces toward the valve spring retainer and then installs the retainer.

(3) Using the SST(09222-3K000, 09222-3K100), compress the spring and install the retainer locks. After installing the valves, ensure that the retainer locks are correctly in place before releasing the valve spring compressor.



(4) Lightly tap the end of each valve stem two or three times with the wooden handle of a hammer to ensure proper seating of the valve and retainer lock.

2. Install MLAs.
Check that the MLA rotates smoothly by hand.



NOTE

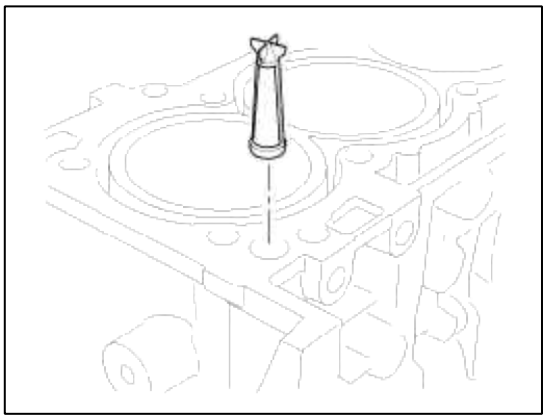
MLA can be reinstalled in its original position.

Installation

NOTE

- Thoroughly clean all parts to be assembled.
- Always use a new head and manifold gasket.
- The cylinder head gasket is a metal gasket. Take care not to bend it.
- Rotate the crankshaft, set the No.1 piston at TDC.

1. Install OCV filter.



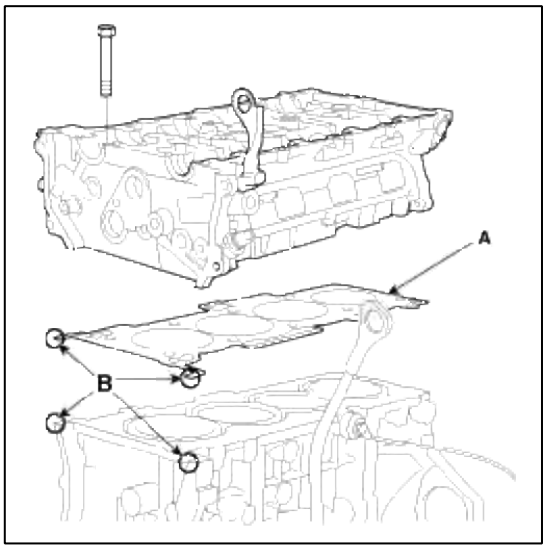
CAUTION

Keep the OCV filter clean.

2. Install the cylinder head gasket(A) on the cylinder block.

NOTE

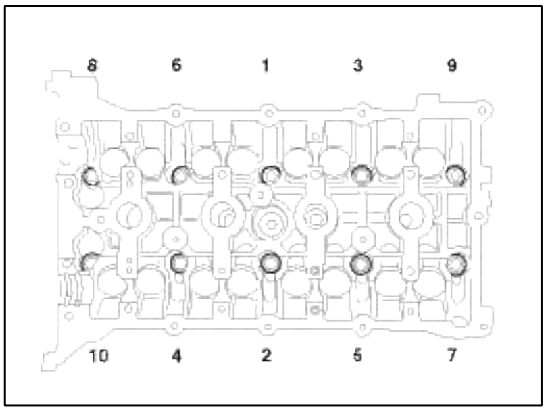
- Be careful of the installation direction.
- Apply liquid gasket (Loctite 5900H) on the edge of cylinder head gasket upside and downside. (At the position 'B')
- After applying sealant, assemble the cylinder head in five minutes.



3. Place the cylinder head carefully in order not to damage the gasket with the bottom part of the end.

4. Install cylinder head bolts.
   A. Apply a light coat if engine oil on the threads and under the heads of the cylinder head bolts.
   B. Using hexagon wrench, install and tighten the 10 cylinder head bolts and plate washers, in several passes, in the sequence shown.

Tightening torque :
32.4~36.3Nm (3.3~3.7kgf.m, 23.9~26.8lb-ft) + 90~95° + 90~95°

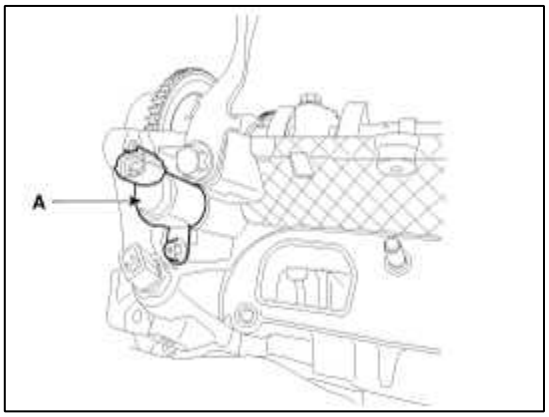


NOTE

Always use new cylinder head bolt.

5. Install the OCV(A).

Tightening torque :
9.8 ~ 11.8N.m (1.0 ~ 1.2kgf.m, 7.2 ~ 8.7lb-ft)



CAUTION

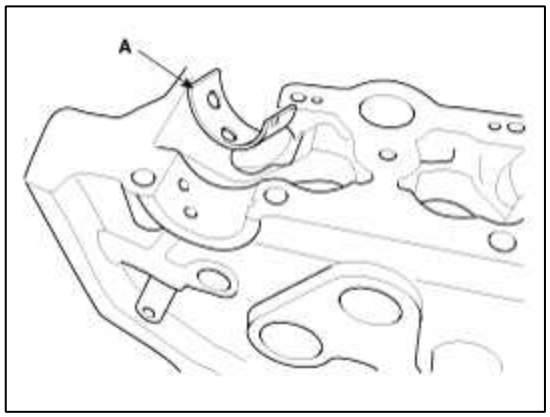
- Do not reuse the OCV when dropped.
- Keep the OCV filter clean.
- Do not hold the OCV sleeve during servicing.
- When the OCV is installed on the engine, do not move the engine with holding the OCV yoke.

6. Install the camshafts.

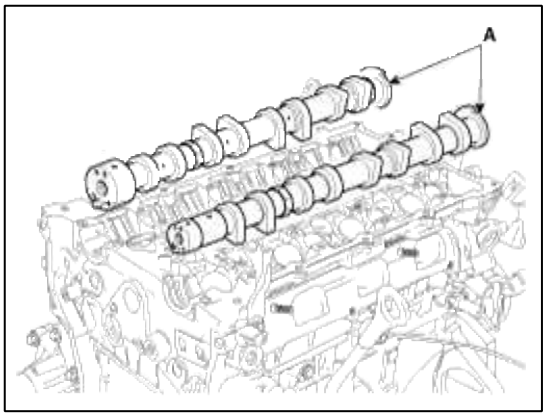
NOTE

Apply a light coat of engine oil on camshaft journals.

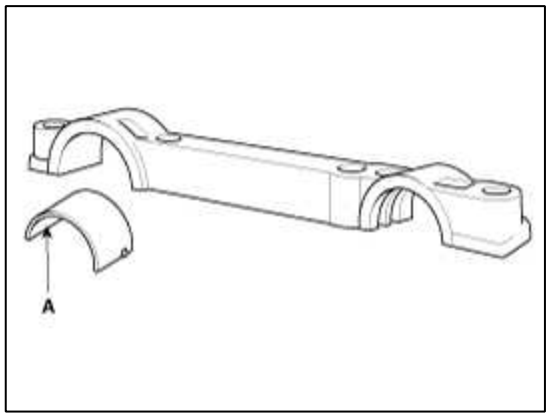
A. Install the exhaust camshaft lower bearing (A).



B. Install the camshafts (A).

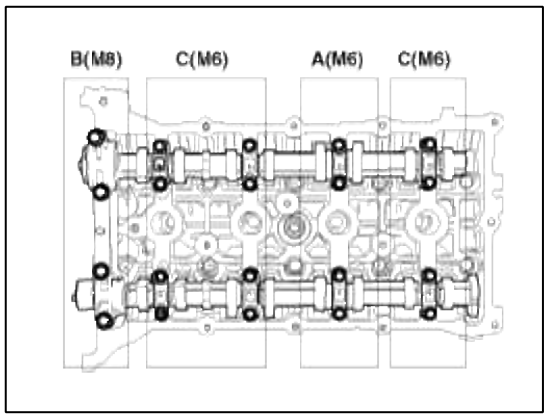


C. Install the exhaust camshaft upper bearing (A).



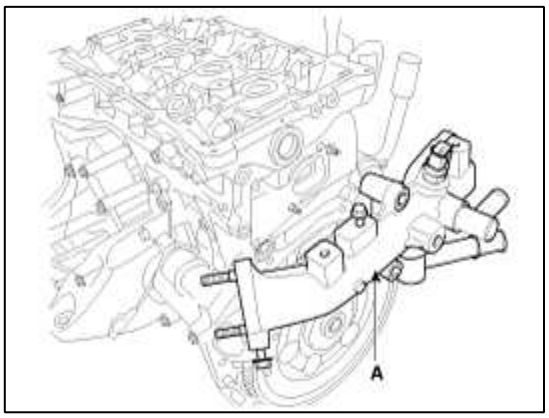
D. Install camshaft bearing caps in their proper locations.
Tightening order.
Group A → Group B → Group C.

Tightening torque
Step 1
M6 : 5.9N.m(0.6kgf.m, 4.3lb-ft)
M8 : 14.7N.m(1.5kgf.m, 10.8lb-ft)
Step 2
M6 : 10.8 ~ 12.7N.m(1.1 ~ 1.3kgf.m, 7.9 ~ 9.4lb-ft)
M8 : 27.5 ~ 31.4N.m(2.8 ~ 3.2kgf.m, 20.3 ~ 23.1lb-ft)



7. Install the water temperature control assembly (A) with a new gasket.

Tightening torque :
Bolts : 14.7 ~ 19.6N.m (1.5 ~ 2.0kgf.m, 10.8 ~ 14.4lb-ft)
Nut : 18.6 ~ 23.5N.m (1.9 ~ 2.4kgf.m, 13.7 ~ 17.4lb-ft)



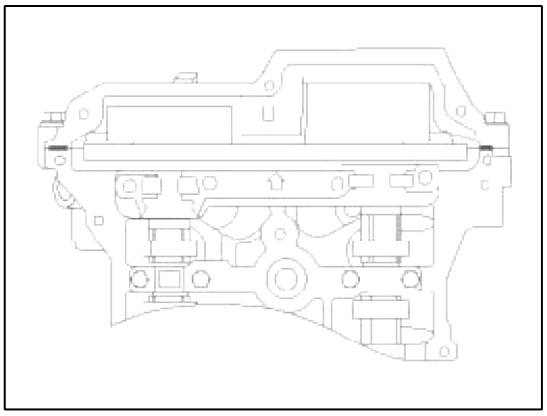
CAUTION

- Assemble water temp control assembly and water inlet pipe to water pump assembly before nuts for assembling of water inlet pipe to be tightened.
- Always use a new O-ring.

8. Install the timing chain.
9. Check and adjust valve clearance.

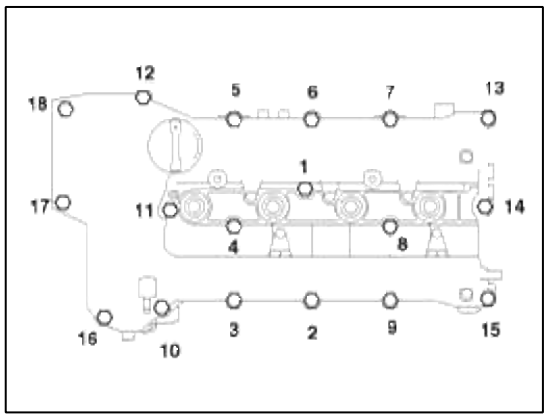
10. Install the cylinder head cover.
    A. The hardening sealant located on the upper area between timing chain cover and cylinder head should be removed before assembling cylinder head cover.
    B. After applying sealant, it should be assembled within 5 minutes.

Bead width : 2.5mm(0.1in.)
Sealant : LOCTITE 5900H, Three Bond 1217H



    C. The firing and/or blow out test should not be performed within 30 minutes after the cylinder head cover was assembled.
    D. Install the cylinder head cover bolts as following method.

Tightening torque :
Step 1 : 3.9 ~ 5.9N.m(0.4 ~ 0.6kgf.m, 2.9 ~ 4.3lb-ft)
Step 2 : 7.8 ~ 9.8N.m(0.8 ~ 1.0kgf.m, 5.8 ~ 7.2lb-ft)

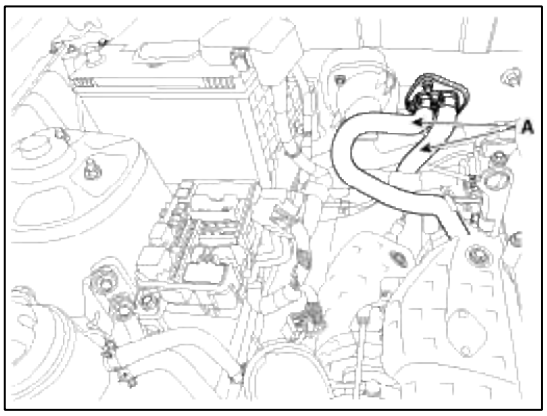


CAUTION

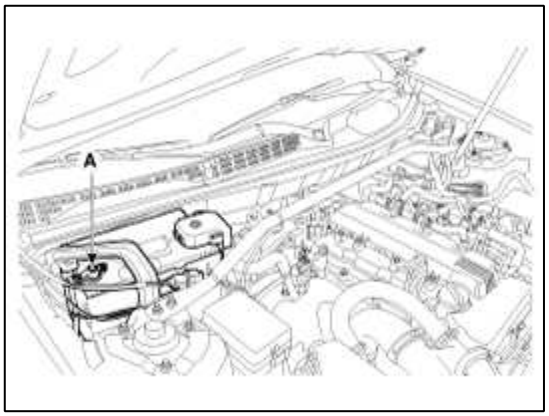
Do not reuse cylinder head cover gasket.

11. Install the intake & exhaust manifold. (Refer to Intake and exhaust system in this group)

12. Install the heater hoses (A).

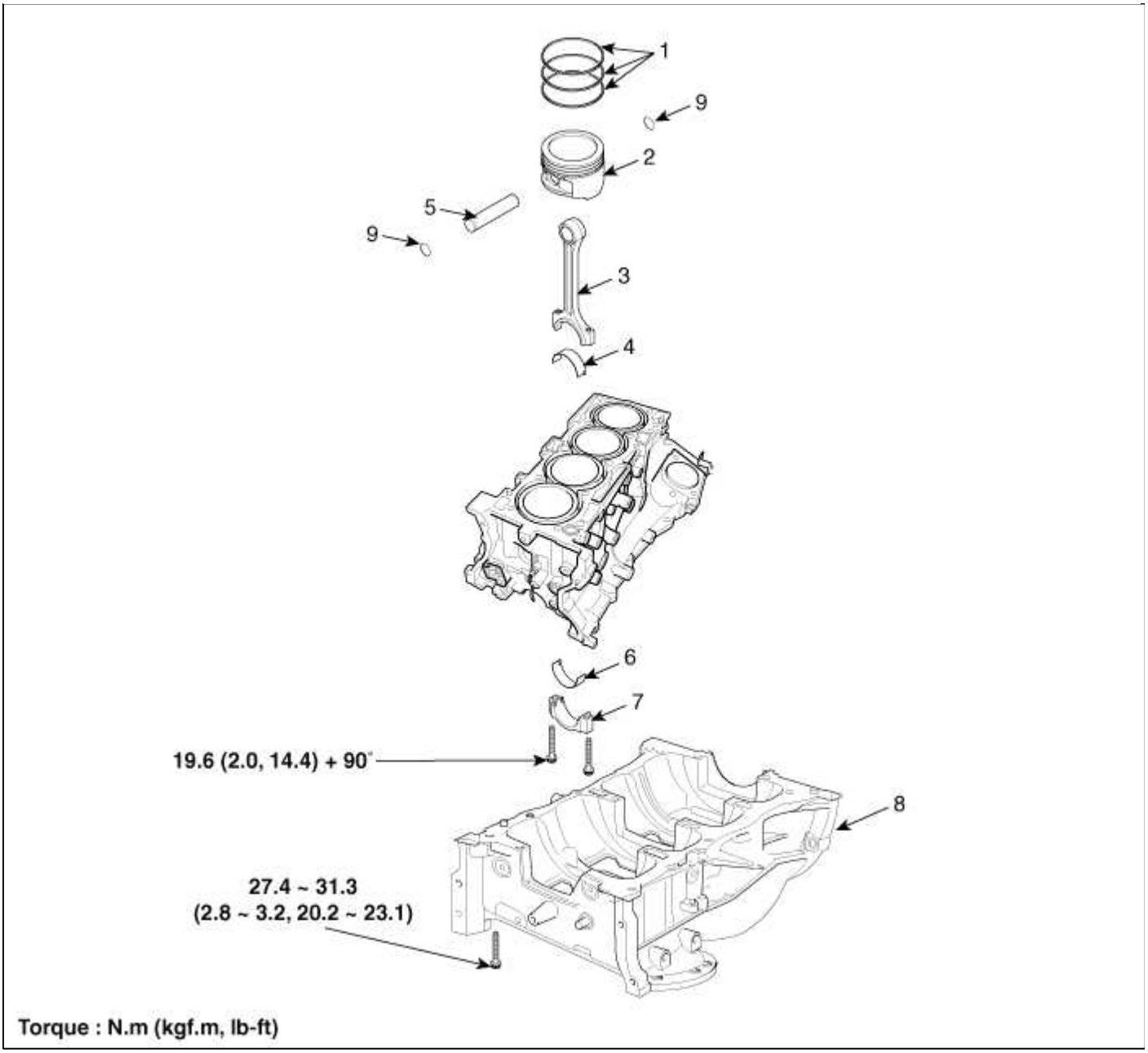


13. Connect the negative (-) battery terminal (A).

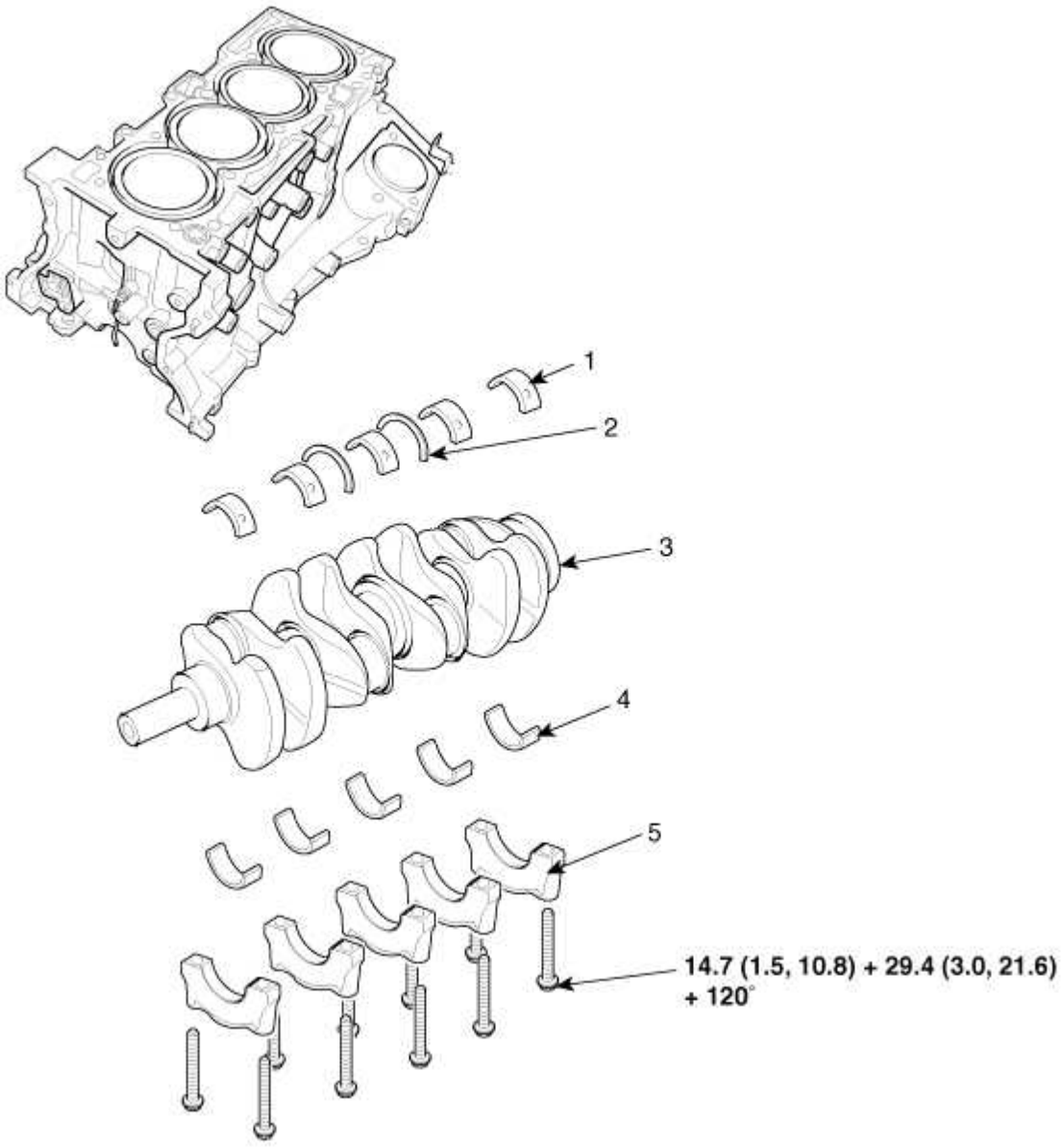


Engine Mechanical System > Cylinder Block > Cylinder Block > Components and Components Location

Components



1. Piston ring	5. Piston pin
2. Piston	6. Connecting rod lower bearing
3. Connecting rod	7. Connecting rod bearing cap
4. Connecting rod upper bearing	8. Ladder frame
	9. Snap ring



Torque : N.m (kgf.m, lb-ft)

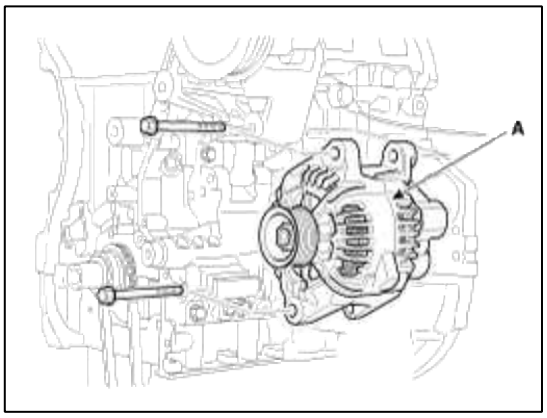
1. Crankshaft upper bearing 2. Thrust bearing 3. Crankshaft	4. Crankshaft lower bearing 5. Main bearing cap

Engine Mechanical System > Cylinder Block > Cylinder Block > Repair procedures

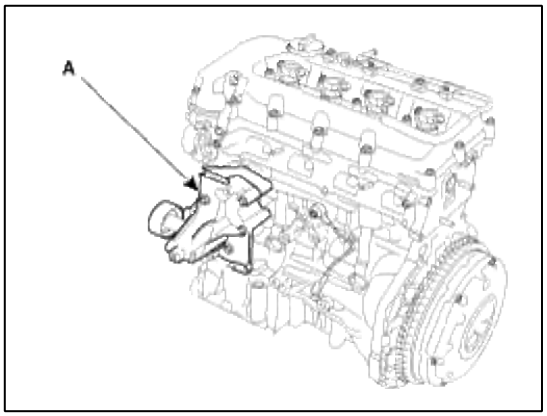
Disassembly

1. M/T : remove the flywheel.
2. A/T : remove the drive plate.
3. Install the engine to the engine stand for disassembly.
4. Remove the timing chain. (Refer to Timing system in this group)
5. Remove the cylinder head. (Refer to Cylinder block in this group)

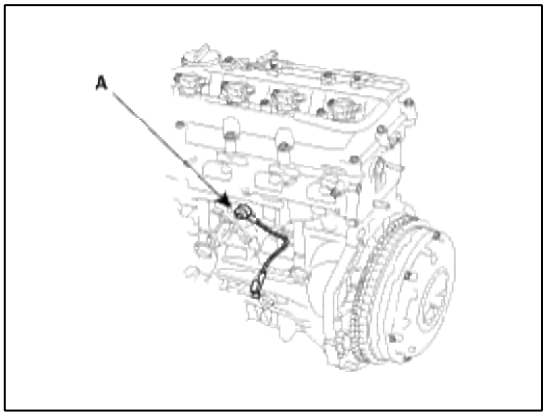
6. Remove the alternator(A) from engine.



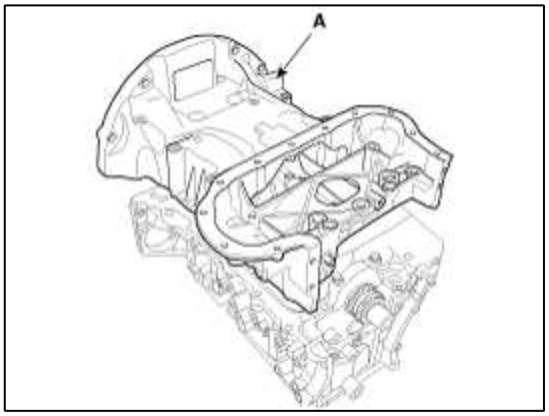
7. Remove the tensioner assembly integrated bracket(A).



8. Remove the knock sensor(A).



9. Remove the water pump.
10. Remove the oil pump.
11. Remove the ladder frame(A).



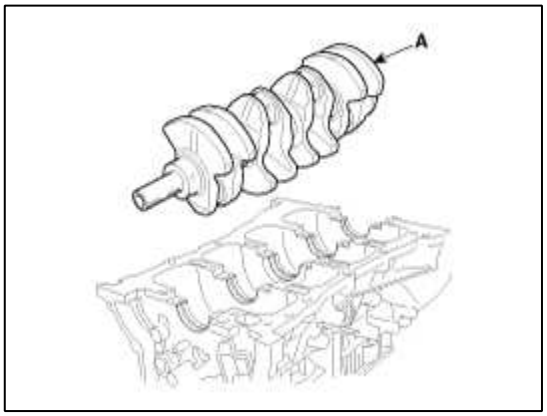
12. Check the connecting rod end play.
13. Remove the connecting rod caps and check oil clearance.

14. Remove the piston and the connecting rod assemblies.
    (1) Using a ridge reamer, remove all the carbon from the top of the cylinder.
    (2) Push the piston, connecting rod assembly and upper bearing through the top of the cylinder block.

> NOTE
>
> • Keep the bearings, connecting rod and cap together.
> • Arrange the piston and connecting rod assemblies in the correct order.

15. Remove the crankshaft bearing cap and check oil clearance.
16. Check the crankshaft end play.
17. Lift the crankshaft(A) out of the engine, being careful not to damage journals.

> NOTE
>
> Arrange the main bearings and thrust bearings in the correct order.



18. Check fit between piston and piston pin.
    Try to move the piston back and forth on the piston pin. If any movement is felt, replace the piston and pin as a set.
19. Remove the piston rings.
    (1) Using a piston ring expender, remove the 2 compression rings.
    (2) Remove 2 side rails and the spacer by hand.

> NOTE
>
> Arrange the piston rings in the correct order only.

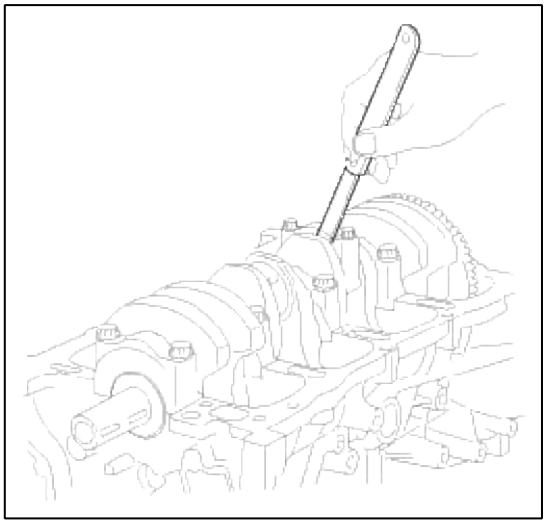
20. Disconnect the connecting rod from piston.

Inspection

Connecting Rod And Crankshaft

1. Check the connecting rod end play.
   Using a feeler gauge, measure the end play while moving the connecting rod back and forth.

Standard end play : 0.1~ 0.25mm(0.004 ~ 0.010in.)
Maximum end play : 0.35mm(0.0138in.)



A. If out-of-tolerance, install a new connecting rod.
B. If still out-of-tolerance, replace the crankshaft.

2. Check the connecting road bearing oil clearance.
   (1) Check the matchmarks on the connecting rod and cap are aligned to ensure correct reassembly.
   (2) Remove 2 connecting rod cap bolts.
   (3) Remove the connecting rod cap and bearing half.
   (4) Clean the crank pin and bearing.
   (5) Place plastigage across the crank pin.
   (6) Reinstall the bearing half and cap, and torque the bolts.

Tightening torque
19.6Nm (2.0kgf.m, 14.4lb-ft) + 90°

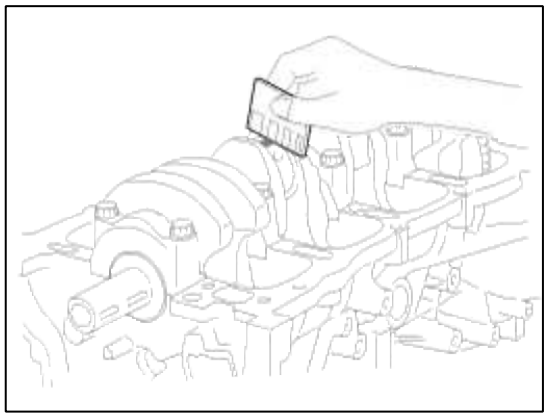
NOTE

Do not turn the crankshaft.

   (7) Remove 2 bolts, connecting rod cap and bearing half.

(8) Measure the plastigage at its widest point.

Standard oil clearance
0.025 ~ 0.043mm(0.0009 ~ 0.0016in.)



(9) If the plastigage measures too wide or too narrow, remove the upper half of the bearing, install a new, complete bearing with the same color mark (select the color as shown in the next column), and recheck the clearance.

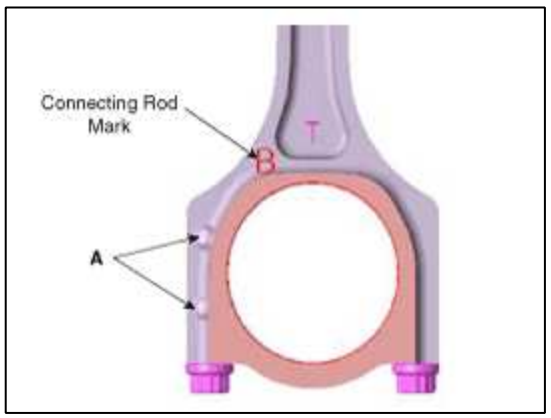
> CAUTION
>
> Do not file, shim, or scrape the bearings or the caps to adjust clearance.

(10) If the plastigage shows the clearance is still incorrect, try the next larger or smaller bearing (the color listed above or below that one), and check clearance again.

> NOTE
>
> If the proper clearance cannot be obtained by using the appropriate larger or smaller bearings, replace the crankshaft and start over.

> CAUTION
>
> If the marks are indecipherable because of an accumulation of dirt and dust, do not scrub them with a wire brush or scraper. Clean them only with solvent or detergent.

Connecting Rod Mark Location

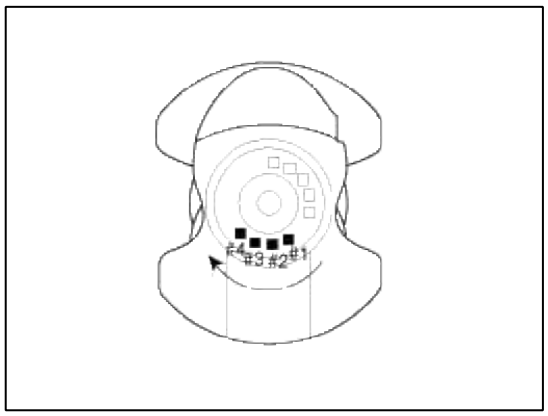


> NOTE
>
> Prevention mark (A) of cap directions should be assembled toward the front of the engine.

Discrimination Of Connecting Rod

Class	Mark	Inside Diameter
A	A	51.000 ~ 51.006mm (2.0079 ~ 2.0081in.)
B	B	51.006 ~ 51.012mm (2.0081 ~ 2.0083in.)
C	C	51.012 ~ 51.018mm (2.0083 ~ 2.0085in.)

Crankshaft Pin Mark Location Discrimination Of Crankshaft



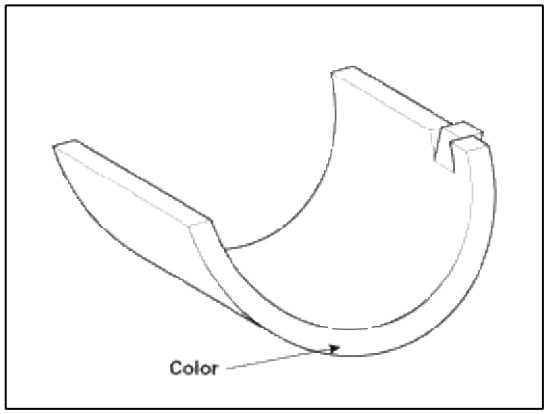
NOTE

Conform to read stamping order as shown arrow direction from #1.

Discrimination Of Crankshaft

Class	Mark	Outside Diameter Of Pin
I	1	47.966 ~ 47.972mm (1.8884 ~ 1.8886in.)
II	2	47.960 ~ 47.966mm (1.8881 ~ 1.8884in.)
III	3	47.954 ~ 47.960mm (1.8879 ~ 1.8881in.)

Place Of Identification Mark (Connecting Rod Bearing) Discrimination Of Connecting Rod Bearing



Discrimination Of Connecting Rod Bearing

Class	Mark	Thickness Of Bearing
AA	Blue	1.517 ~ 1.520mm (0.0597 ~ 0.0598in.)
A	Black	1.514 ~ 1.517mm (0.0596 ~ 0.0597in.)
B	None	1.511 ~ 1.514mm (0.0595 ~ 0.0596in.)
C	Green	1.508 ~ 1.511mm (0.0594 ~ 0.0595in.)
D	Yellow	1.505 ~ 1.508mm (0.0593 ~ 0.0594in.)

(11) Selection

Crankshaft Indentification Mark	Connecting Rod Identification Mark	Assembing Classification Of Bearing
I (1)	a (A)	D (Yellow)
	b (B)	C (Green)
	c (C)	B (None)
II (2)	a (A)	C (Green)
	b (B)	B (None)
	c (C)	A (Black)
III (3)	a (A)	B (None)
	b (B)	A (Black)
	c (C)	AA (Blue)

3. Check the crankshaft bearing oil clearance.

(1) To check main bearing-to-journal oil clearance, remove the main caps and bearing halves.

(2) Clean each main journal and bearing half with a clean shop tower.

(3) Place one strip of plastigage across each main journal.

(4) Reinstall the bearings and caps, then torque the bolts.

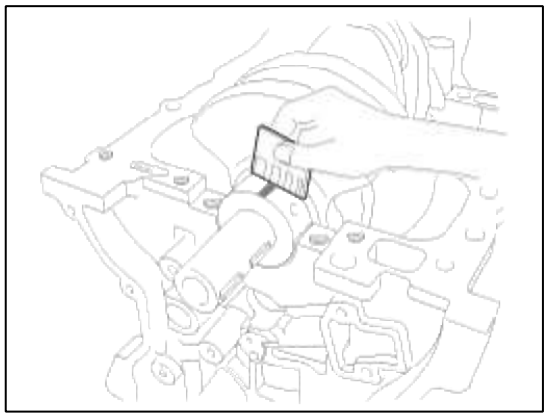
Tightening torque
14.7Nm (1.5kgf.m, 10.8lb-ft) + 29.4Nm (3.0kgf.m, 21.6lb-ft) + 120°

NOTE

Do not turn the crankshaft.

(5) Remove the cap and bearing again, and measure the widest part of the plastigage.

Standard oil clearance
0.020 ~ 0.038mm (0.0008 ~ 0.0015in.)



(6) If the plastigage measures too wide or too narrow, remove the upper half of the bearing, install a new, complete bearing with the same color mark (select the color as shown in the next column), and recheck the clearance.

CAUTION

Do not file, shim, or scrape the bearings or the caps to adjust clearance.

(7) If the plastigage shows the clearance is still incorrect, try the next larger or smaller bearing (the color listed above or below that one), and check clearance again.

NOTE

If the proper clearance cannot be obtained by using the appropriate larger or smaller bearings, replace the crankshaft and start over.

CAUTION

If the marks are indecipherable because of an accumulation of dirt and dust, do not scrub them with a wire brush or scraper. Clean them only with solvent or detergent.

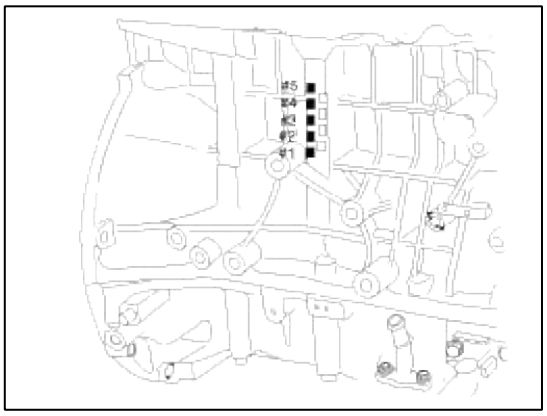
Connecting Rods

1. When reinstalling, make sure that cylinder numbers put on the connecting rod and cap at disassembly match. When a new connecting rod is installed, make sure that the notches for holding the bearing in place are on the same side.
2. Replace the connecting rod if it is damaged on the thrust faces at either end. Also if step wear or a severely rough surface of the inside diameter of the small end is apparent, the rod must be replaced as well.
3. Using a connecting rod aligning tool, check the rod for bend and twist. If the measured value is close to the repair limit, correct the rod by a press. Any connecting rod that has been severely bent or distorted should be replaced.

Allowable bend of connecting rod :
0.05mm / 100mm (0.0020 in./3.94 in.) or less
Allowable twist of connecting rod :
0.1mm / 100mm (0.0039 in./3.94 in.) or less

Crankshaft bore mark location
Letters have been stamped on the block as a mark for the size of each of the 5 main journal bores.

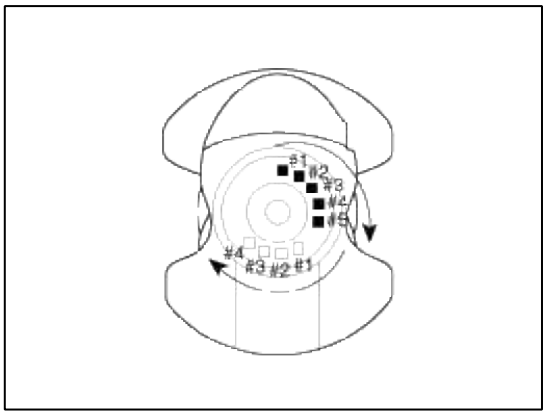
Use them, and the numbers or bar stamped on the crank (marks for main journal size), to choose the correct bearings.



Discrimination Of Cylinder Block

Calss	Mark	Inside Diameter
a	A	56.000 ~ 56.006mm (2.2047 ~ 2.2049in.)
b	B	56.006 ~ 56.012mm (2.2049 ~ 2.2052in.)
c	C	56.012 ~ 56.018mm (2.2052 ~ 2.2054in.)

Crankshaft Journal Mark Location Discrimination Of Crankshaft



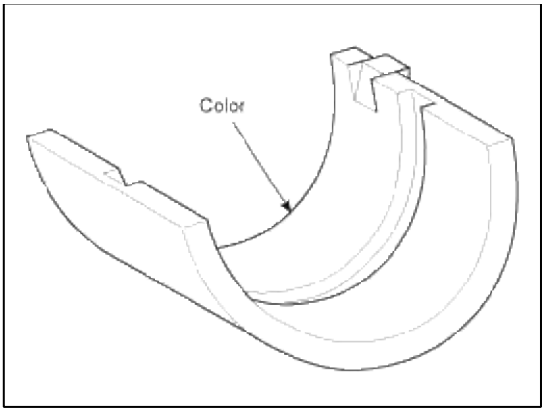
NOTE

Conform to read stamping order as shown arrow direction from #1.

Discrimination Of Crankshaft

Class	Mark	Outside Diameter Of Journal
I	1	51.954 ~ 51.960mm (2.0454 ~ 2.0456in.)
II	2	51.948 ~ 51.954mm (2.0452 ~ 2.0454.)
III	3	51.942 ~ 51.948mm (2.0449 ~ 2.0452in.)

Place Of Identification Mark (Crankshaft Bearing) Discrimination Of Crankshaft Bearing



Discrimination Of Crankshaft Bearing

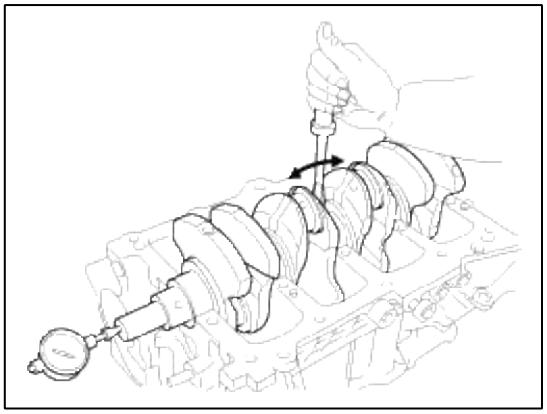
Class	Mark	Thickness Of Bearing
AA	Blue	2.026 ~ 2.029mm (0.0797 ~ 0.0798in.)
A	Black	2.023 ~ 2.026mm (0.0796 ~ 0.0797in.)
B	None	2.020 ~ 2.023mm (0.0795 ~ 0.0796in.)
C	Green	2.017 ~ 2.020mm (0.0794 ~ 0.795in.)
D	Yellow	2.014 ~ 2.017mm (0.0793 ~ 0.0794in.)

Selection

Crankshaft Identification Mark	Crankshaft Bore Identification Mark	Assembling Classification Of Bearing
I (1)	a (A)	D (Yellow)
	b (B)	C (Green)
	c (C)	B (None)
II (2)	a (A)	C (Green)
	b (B)	B (None)
	c (C)	A (Black)
III (3)	a (A)	B (None)
	b (B)	A (Black)
	c (C)	AA (Blue)

4. Check crankshaft end play.
   Using a dial indicator, measure the thrust clearance while prying the crankshaft back and forth with a screwdriver.

Standard end play
0.07 ~ 0.25mm (0.0027 ~ 0.0098in.)
Limit : 0.30mm (0.0118in.)

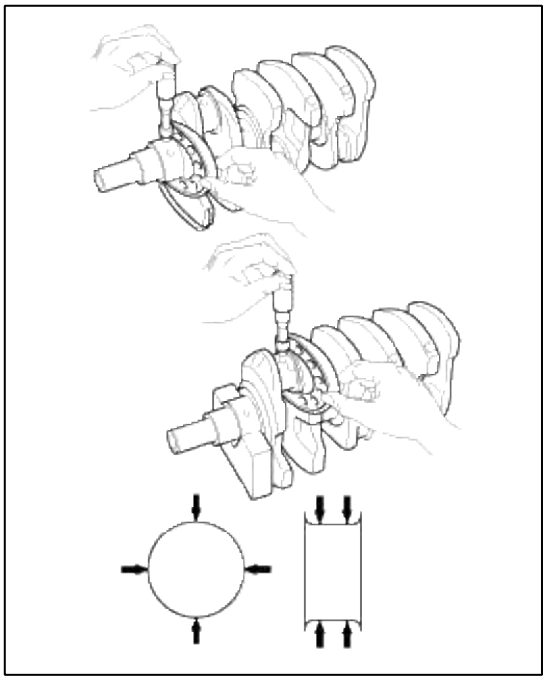


If the end play is greater than maximum, replace the thrust bearings as a set.

Thrust bearing thickness
1.925 ~ 1.965mm(0.0758 ~ 0.07736in.)

5. Inspect main journals and crank pins
   Using a micrometer, measure the diameter of each main journal and crank pin.

Main journal diameter :
51.942 ~ 51.960mm (2.0449 ~ 2.0456in.)
Crank pin diameter :
47.954 ~ 47.972mm (1.8879 ~ 1.8886in.)

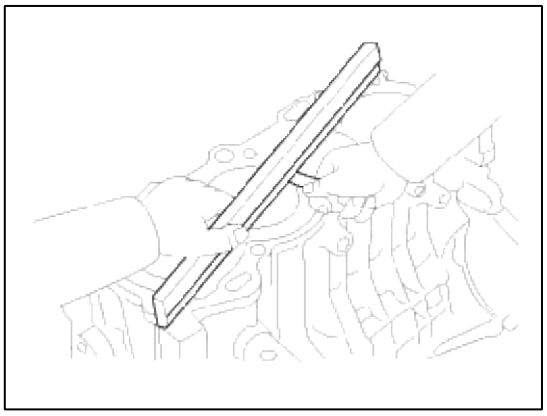


Cylinder Block

1. Remove gasket material.
   Using a gasket scraper, remove all the gasket material from the top surface of the cylinder block.

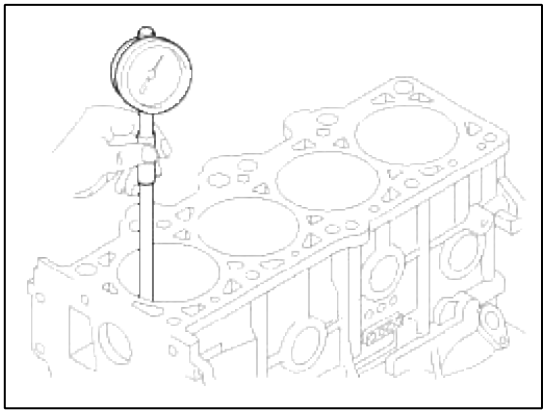
2. Clean cylinder block
   Using a soft brush and solvent, thoroughly clean the cylinder block.
3. Inspect top surface of cylinder block for flatness.
   Using a precision straight edge and feeler gauge, measure the surface contacting the cylinder head gasket for warpage.

Flatness of cylinder block gasket surface
Standard : Less than 0.05mm(0.0020 in.)



4. Inspect cylinder bore diameter
   Visually check the cylinder for vertical scratchs.
   If deep scratches are present, replace the cylinder block.
5. Inspect cylinder bore diameter
   Using a cylinder bore gauge, measure the cylinder bore diameter at position in the thrust and axial directions.

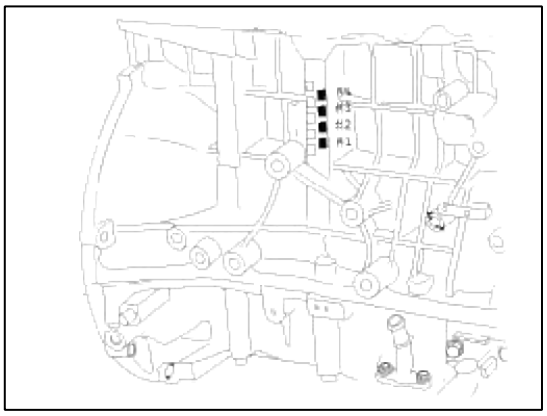
Standard diameter
86.00 ~ 86.03mm (3.3858 ~ 3.3870in.)



NOTE

Measure position(from the bottom of the cylinder block)
: 110.7mm(4.3582in.) / 160mm (6.2992in.) / 210mm (8.2677in.)

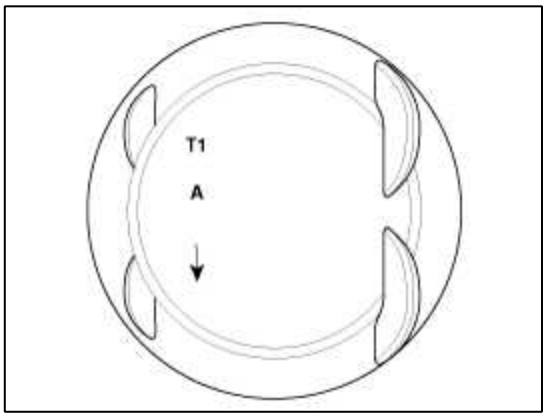
6. Check the cylinder bore size code on the cylinder block.



Cylinder Bore Inner Diameter

Size Code	Inner Diameter
A	86.00 ~ 86.01mm (3.3853 ~ 3.3862in.)
B	86.01 ~ 86.02mm (3.3862 ~ 3.3866in.)
C	86.02 ~ 86.03mm (3.3866 ~ 3.3870in.)

7. Check the piston size code on the piston top face.



NOTE

Stamp the grade mark of basic diameter with rubber stamp.

Piston Outer Diameter

Size Code	Outer Diameter
A	85.975 ~ 85.985mm (3.3848 ~ 3.3852in.)
B	85.985 ~ 85.995mm (3.3852 ~ 3.3856in.)
C	85.995 ~ 86.005mm (3.3856 ~ 3.3860in.)

8. Select the piston related to cylinder bore class.

Clearance : 0.015 ~ 0.035mm (0.00059 ~ 0.00137in.)

Piston And Rings

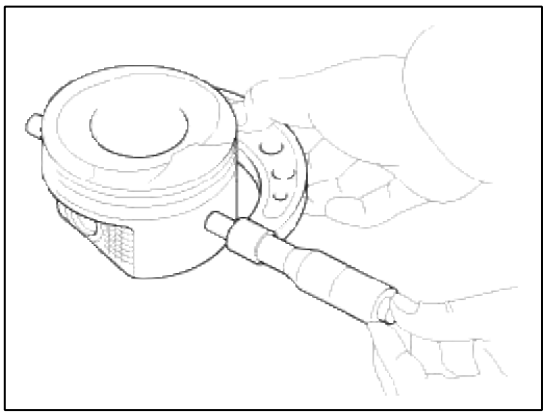
1. Clean piston
   (1) Using a gasket scraper, remove the carbon from the piston top.
   (2) Using a groove cleaning tool or broken ring, clean the piston ring grooves.
   (3) Using solvent and a brush, thoroughly clean the piston.

   NOTE

   Do not use a wire brush.

2. The standard measurement of the piston outside diameter is taken 14 mm (0.55 in.) from the top land of the piston.

   Standard diameter
   85.970 ~ 86.000mm (3.3848 ~ 3.3860in.)

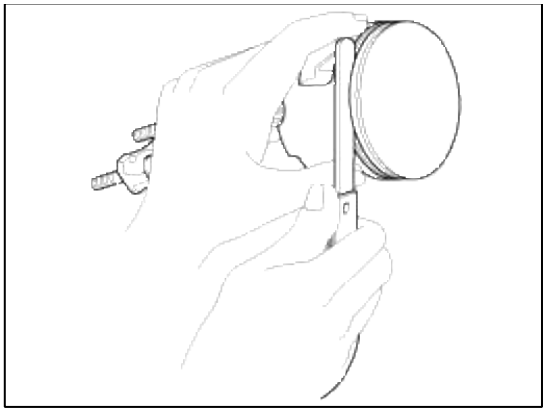


3. Calculate the difference between the cylinder bore diameter and the piston diameter.

   Piston-to-cylinder clearance
   0.020 ~ 0.040mm(0.00078 ~ 0.00157in.)

4. Inspect the piston ring side clearance.
   Using a feeler gauge, measure the clearance between new piston ring and the wall of the ring groove.

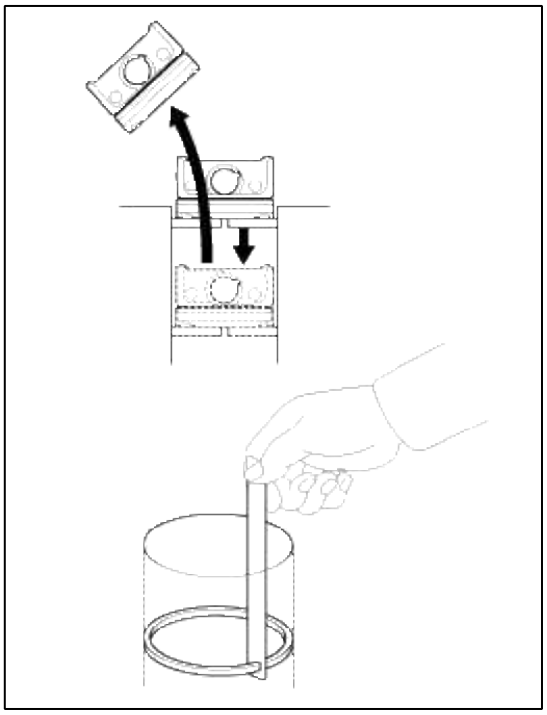
   Piston ring side clearance
   Standard
   No.1 : 0.05 ~ 0.08mm (0.0019 ~ 0.0031in.)
   No.2 : 0.04 ~ 0.08mm (0.0015 ~ 0.0031in.)
   Oil ring : 0.06 ~ 0.14mm (0.0023 ~ 0.0055in.)
   Limit
   No.1 : 0.1mm (0.004in.)
   No.2 : 0.1mm (0.004in.)
   Oil ring : 0.2mm (0.008in.)



If the clearance is greater than maximum, replace the piston.

5. Inspect piston ring end gap.
   To measure the piston ring end gap, insert a piston ring into the cylinder bore. Position the ring at right angles to the cylinder wall by gently pressing it down with a piston. Measure the gap with a feeler gauge. If the gap exceeds the service limit, replace the piston ring. If the gap is too large, recheck the cylinder bore diameter against the wear limits, If the bore is over the service limit, the cylinder block must be rebored.

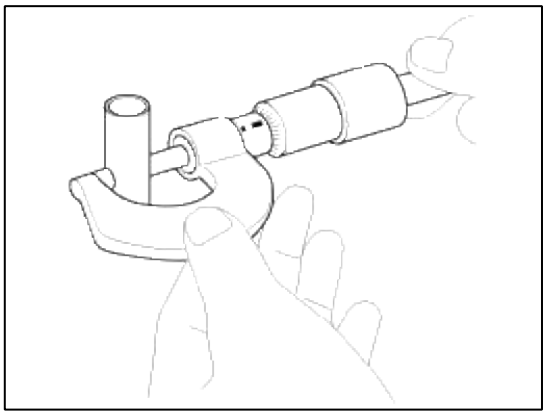
Piston ring end gap
Standard
No.1 : 0.15 ~ 0.25mm (0.0059 ~ 0.0098in.)
No.2 : 0.37 ~ 0.42m (0.0145 ~ 0.0165in.)
Oil ring : 0.20 ~ 0.70mm (0.0079 ~ 0.0275in.)
Limit
No.1 : 0.6mm (0.0236in.)
No.2 : 0.7mm (0.0275in.)
Oil ring : 0.8mm (0.0315in.)



Piston Pins

1. Measure the diameter of the piston pin.

Piston pin diameter
21.997 ~ 22.000mm (0.8660 ~ 0.8661in.)

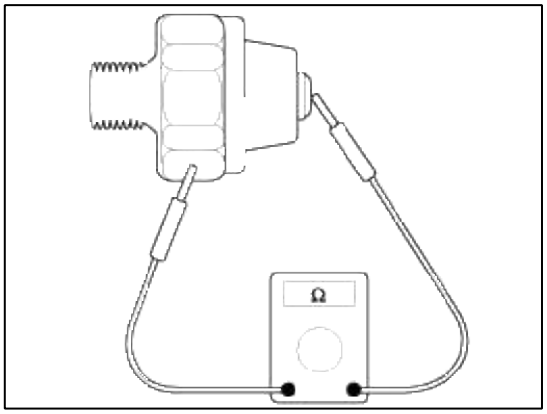


2. Measure the piston pin-to-piston clearance.

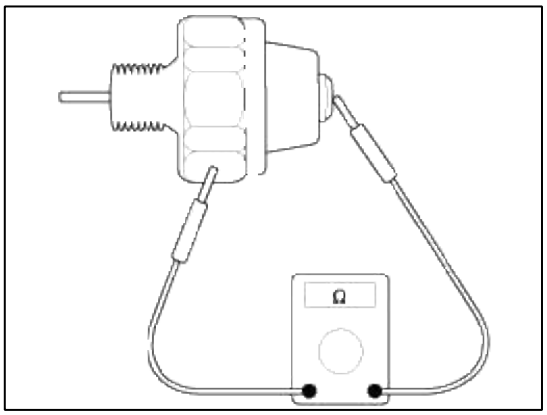
Piston pin-to-piston clearance
0.003 ~ 0.010mm (0.00011 ~ 0.00039in.)

Oil Pressure Switch

1. Check the continuity between the terminal and the body with an ohmmeter.
   If there is no continuity, replace the oil pressure switch.



2. Check the continuity between the terminal and the body when the fine wire is pushed. If there is continuity even when the fine wire is pushed, replace the switch.



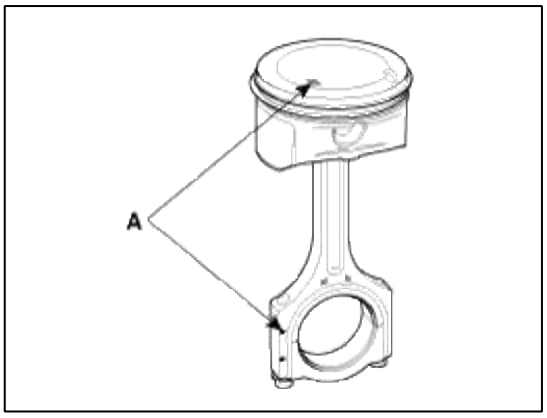
3. If there is no continuity when a 50kpa (7psi) is applied throgh the oil hole, the switch is operaing properly. Check for air leakage. If air leaks, the diaphragm is broken. Replace it.

Reassembly

NOTE

- Thoroughly clean all parts to assembled.
- Before installing the parts, apply fresh engine oil to all sliding and rotating surfaces.
- Replace all gaskets, O-rings and oil seals with new parts.

1. Assemble the piston and connecting rod.
   (1) The piston front mark and the connecting rod front mark must face the timing belt side of the engine.



   (2) Before pressing the piston pin, apply a coat of lubricant oil to the piston pin outer and connecting rod.

CAUTION

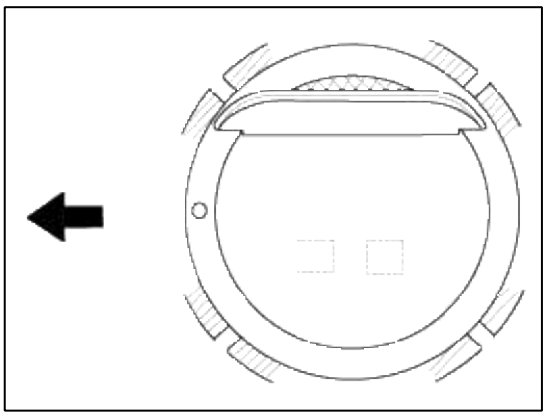
- Apply heat to the piston (70°C) and then install the piston pin.
- Take care that piston pin is not to be damaged during pressing process.
- When replace the piston pin, check the piston pin outer diameter and connecting rod small end inner diameter as below.

Piston pin outer DIA. :
21.997mm ~ 22.000mm (0.8660 ~ 0.8661 in)
Connecting rod S/END inner DIA. :
22.005mm ~ 22.011mm (0.8663 ~ 0.8665 in)

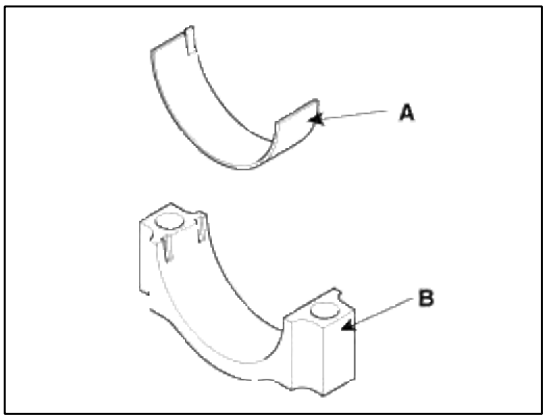
- Take care that piston is not to be damaged during installing process. When replace the piston pin, check the gap as below.

Connecting rod bushing gap :
0.005mm ~ 0.014mm (0.00019 ~ 0.00055 in)
Piston pin BOSS gap :
0.003mm ~ 0.010mm (0.00012 ~ 0.00039 in) - Heat to 70°C

2. Install the piston rings.
   (1) Install the oil ring spacer and 2 side rails by hand.
   (2) Using a piston ring expander, install the 2 compression rings with the code mark facing upward.
   (3) Position the piston rings so that the ring ends are as shown.



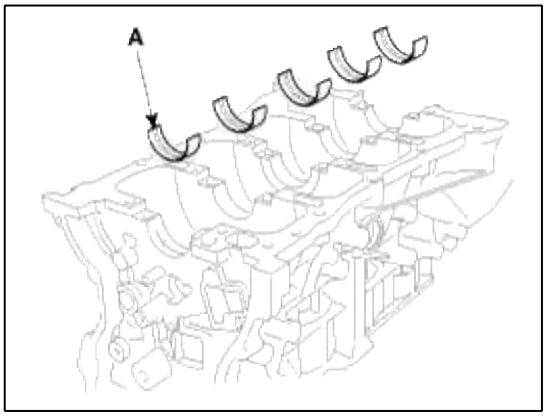
3. Install the connecting rod bearings.
   (1) Align the bearing claw with the groove of the connecting rod or connecting rod cap.
   (2) Install the bearings(A) in the connecting rod and connecting rod cap(B).



4. Install the main bearings.

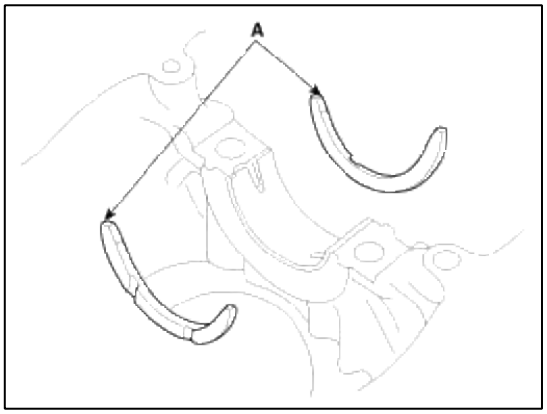
> NOTE
>
> Upper bearings have an oil groove of oil holes; Lower bearings do not.

   (1) Align the bearing claw with the claw groove of the cylinder block, push in the 5 upper bearings(A).

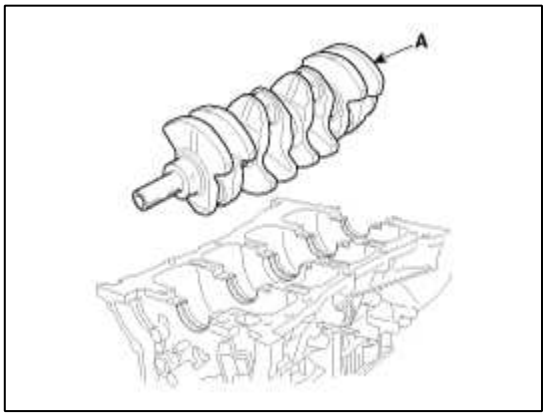


   (2) Align the bearing claw with the claw groove of the main bearing cap, and push in the 5 lower bearings.

5. Install the thrust bearings.
   Install the 2 thrust bearings(A) under the No.3 journal position of the cylinder block with the oil grooves facing outward.



6. Place the crankshaft(A) on the cylinder block.



7. Place the main bearing caps on cylinder block.
8. Install the main bearing cap bolts.

Tightening torque
14.7Nm (1.5kgf.m, 10.8lb-ft) + 29.4Nm (3.0kgf.m, 21.6lb-ft) + 120°

CAUTION

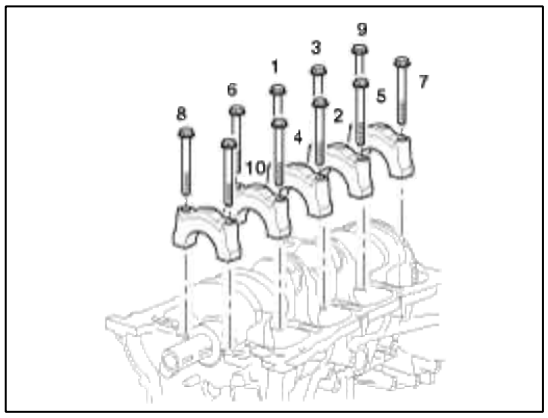
Always use new main bearing cap bolts.

NOTE

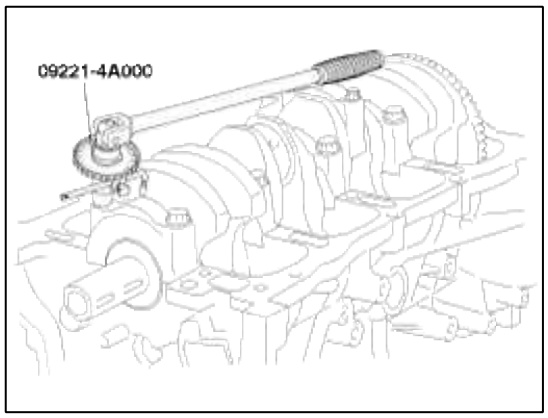
- The main bearing cap bolts are tightened in 2 progressive steps.
- If any of the bearing cap bolts in broken or deformed, replace it.

(1) Apply a light coat of engine oil on the threads and under the bearing cap bolts.

(2) Install and uniformly tighten the 10 bearing cap bolts(A), in several passes, in the sequence shown.



(3) Retighten the bearing cap bolts by 120° in the numerical order shown. (Using the SST (09221-4A000))



(4) Check that the crankshaft turns smoothly.

9. Check crankshaft end play.
10. Install the piston and connecting rod assemblies.

NOTE

Before installing the pistons, apply a coat of engine oil to the ring grooves and cylinder bores.

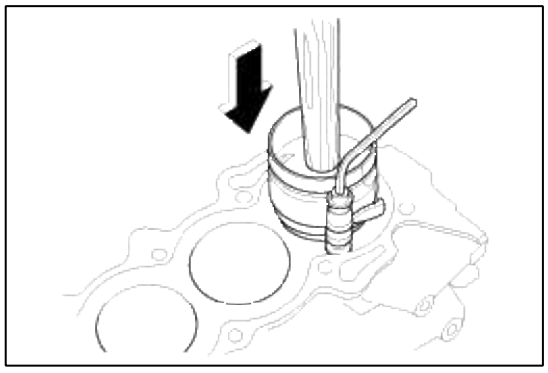
(1) Remove the connecting rod caps, and slip short sections of rubber hose over the threaded ends of the connecting rod bolts.

(2) Install the ring compressor, check that the bearing is securely in place, then position the piston in the cylinder, and tap it in using the wooden handle of a hammer.

(3) Stop after the ring compressor pops free, and check the connecting rod-to-check journal alignment before pushing the piston into place.

NOTE

Maintain downward force on the ring compressor to prevent the rings from expanding before entering the cylinder bore.

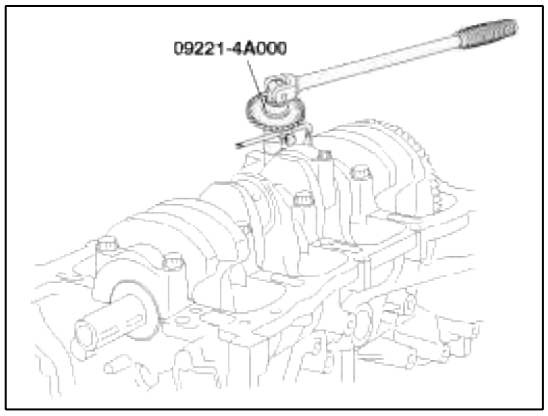


(4) Apply engine oil to the bolt threads. Install the rod caps with bearings, and torque the bolts.

Tightening torque
17.7~21.6Nm (1.8~2.2kgf.m, 13.0~15.9lb-ft) + 88~92°

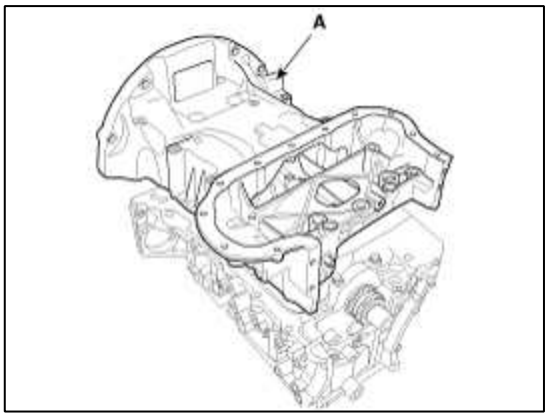
NOTE

Always use new connecting rod cap bolts.



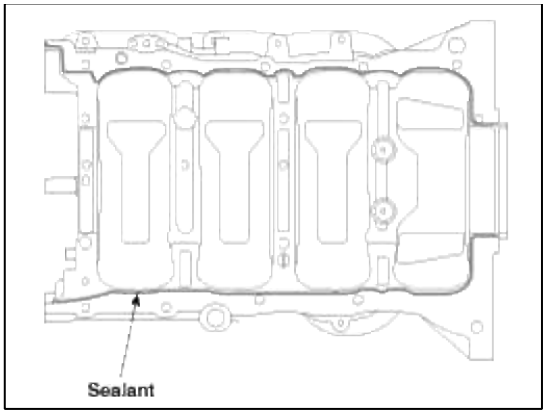
11. Install the ladder frame (A).

Tightening torque :
27.5 ~ 31.4N.m (2.8 ~ 3.2kgf.m, 20.3 ~ 23.1lb-ft)



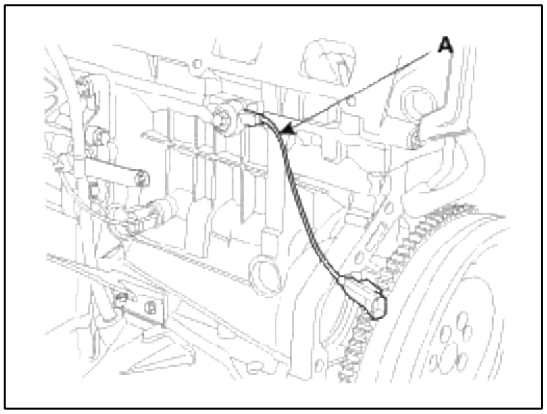
NOTE

- Before assembling ladder frame, the liquid sealant Loctite 5900H or THREEBOND 1217H should be applied ladder frame.
- The part must be assembled within 5 minutes after sealant was applied.
- Apply sealant to the inner threads of the bolt holes.



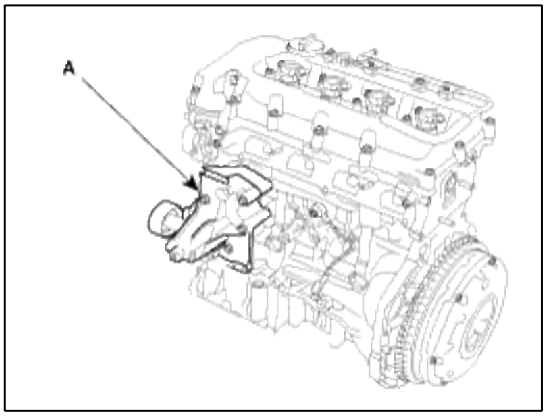
12. Install the rear oil seal.
    (1) Apply engine oil to a new oil seal lip.
    (2) Using SST (09231-H1100, 09214-3K100) and a hammer, tap in the oil seal until its surface is flush with the rear oil seal retainer edge.
13. Install the oil pump.
14. Install the water pump.
15. Install the knock sensor(A).

Tightening torque
16.7 ~ 25.5N.m (1.7 ~ 2.6kgf.m, 12.3 ~ 18.8lb-ft)



16. Install the tensioner assembly integrated bracket(A).

Tightening torque
39.2 ~ 44.1N.m (4.0 ~ 4.5kgf.m, 28.9 ~ 32.5lb-ft)

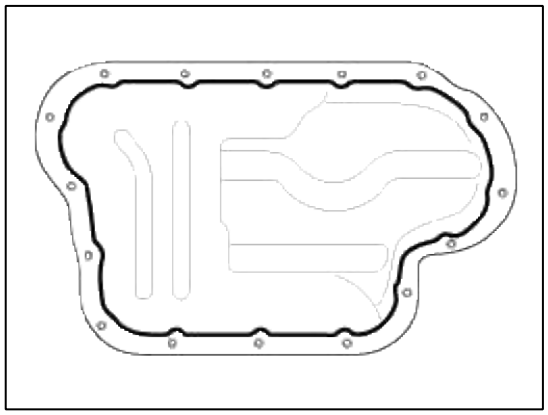


17. Install the power steering pump bracket and power steering pump.
18. Install the alternator.
19. Install the A/C compressor.

20. Install the cylinder head.
21. Install the timing chain.
22. Install the oil pan.
    (1) Using a razor blade and gasket scraper, remove all the old gasket material from the gasket surfaces.

> NOTE
>
> Check that the mating surfaces are clean and dry before applying liquid gasket.

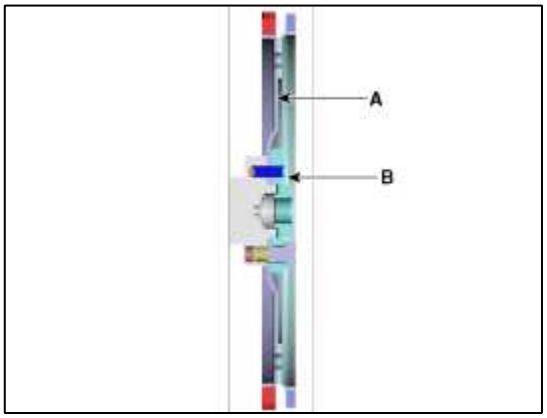
    (2) Apply liquid gasket as an even bead, centered between the edges of the mating surface.
    Use liquid gasket LOCTITE5900H or THREEBOND 1217H equivalent (MS721-40).



> NOTE
>
> • To prevent leakage of oil, apply liquid gasket to the inner threads of the bolt holes.
> • Do not install the parts if five minutes or more have elapsed since applying the liquid gasket. Instead, reapply liquid gasket after removing the residue.
> • After assembly, wait at least 30 minutes before filling the engine with oil.

23. Remove the engine stand.
24. A/T : Install the drive plate (A) with washer (B).

Tightening torque
117.7 ~ 127.5N.m (12 ~ 13kgf.m, 86.8 ~ 94.0lb-ft)



25. M/T : Install the flywheel.

Tightening torque
117.7 ~ 127.5N.m (12 ~ 13kgf.m, 86.8 ~ 94.0lb-ft)

NOTE

- Always use new flywheel(drive plate) bolts.

Engine Mechanical System > Cooling System > Coolant > Repair procedures

Engine Coolant Refilling And Bleeding

WARNING

Never remove the radiator cap when the engine is hot. Serious scalding could be caused by hot fluid under high pressure escaping from the radiator.

CAUTION

When pouring engine coolant, be sure to shut the relay box lid and not to let coolant spill on the electrical parts or the paint. If any coolant spills, rinse it off immediately.

1. Make sure the engine and radiator are cool to the touch.
2. Remove radiator cap.
3. Loosen the drain plug, and drain the coolant
4. Tighten the radiator drain plug securely.
5. After draining engine coolant in the reservoir tank, clean the tank.
6. Fill the radiator with water through the radiator cap and tighten the cap.

NOTE

Pressure can blow water back out the radiator cap-pour water slowly while intermittently squeezing the radiator hoses.

7. After warming up the engine until the cooling fan operates several times, accelerate it at idle.
8. Wait until the engine is cool.
9. Repeat the step 1 to 8 until the drained water is clean.
10. Fill fluid mixture with coolant and water(5 : 5) (Tropical region – 4:6) slowly through the radiator cap. Push the upper/lower hoses of the radiator so as bleed air easily.

NOTE

- Use only genuine antifreeze/coolant.
- For best corrosion protection, the coolant concentration must be maintained year-round at 35% minimum.
  Coolant concentrations less than 35% may not provide sufficient protection against corrosion or freezing.
- Coolant concentrations greater then 60% will impair cooling efficiency and are not recommended.

CAUTION

- Do not mix different brands of antifreeze/coolants.
- Do not use additional rust inhibitors or antirust products; they may not be compatible with the coolant.

11. Start the engine and run coolant circulates.
    When the cooling fan operates and coolant circulates, refill coolant through the radiator cap.
12. Repeat 11 until the cooling fan 3 ~ 5times and bleed air sufficiently out of the cooling system.
13. Install the radiator cap and fill the reservoir tank to the "MAX" line with coolant.
14. Run the vehicle under idle until the cooling fan operates 2 ~ 3 times.
15. Stop the engine and wait coolant to cool.
16. Repeat step.10 to step.15 until the coolant level doesn't fall any more, bleed air out of the cooling system

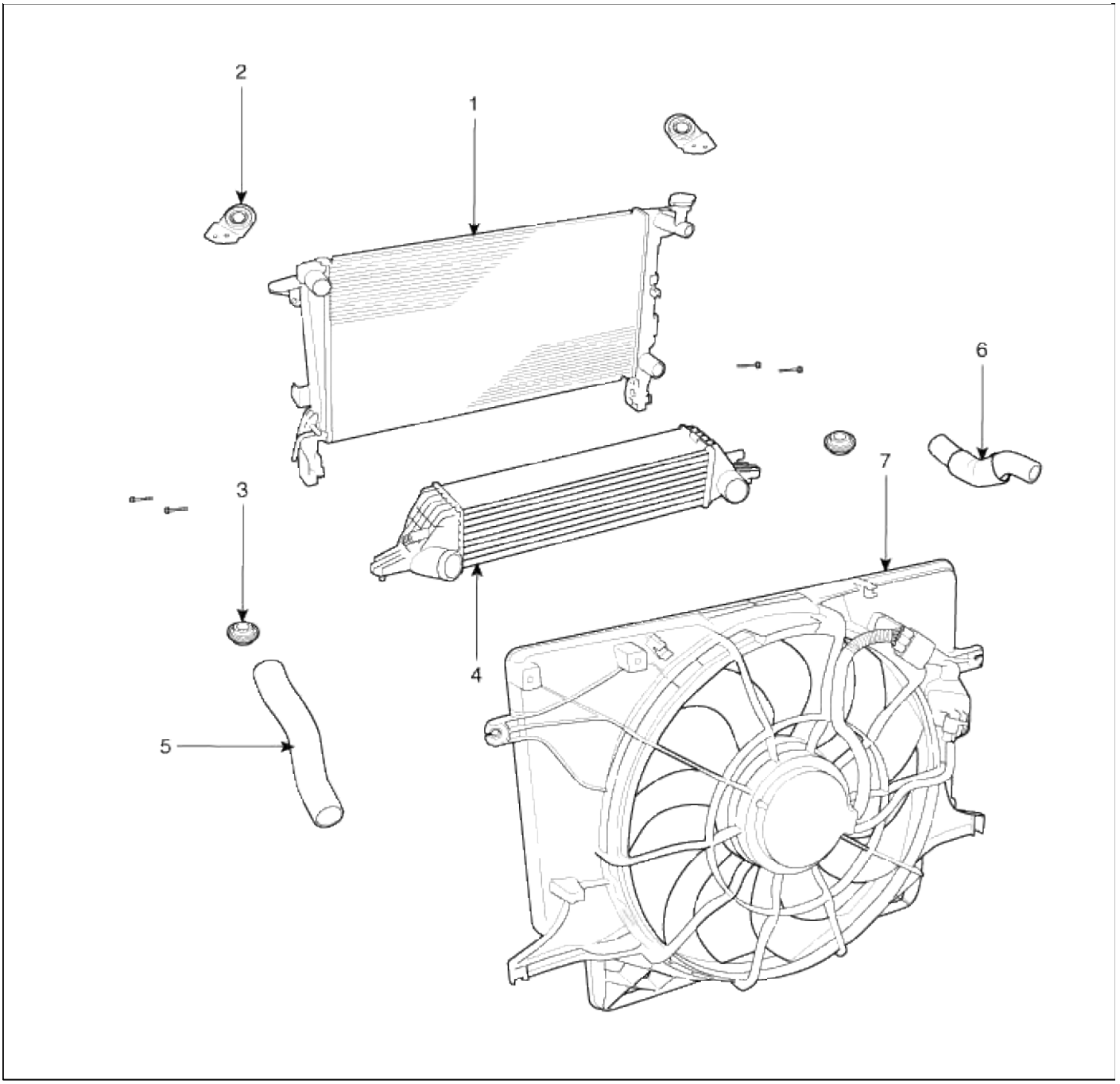
NOTE

As it is to bleed air out to the cooling system and refill coolant when coolant gets cool completely, recheck the coolant level in the reservoir tank for 2 ~ 3 days after replacing coolant.

Coolant capacity :
MT : 5.5L (5.8 US qt, 4.8 lmp.qt)
AT : 6.3L (6.6 US qt, 5.5 lmp.qt)

Engine Mechanical System > Cooling System > Radiator > Components and Components Location

Components



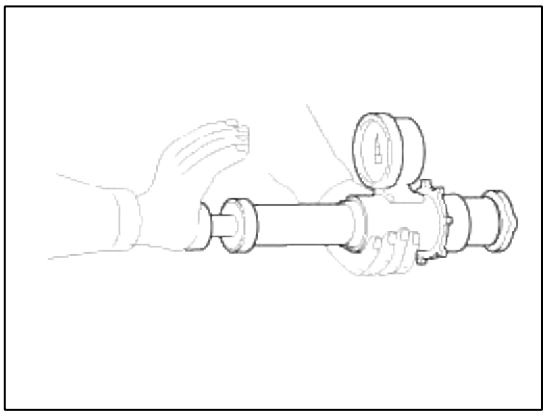
1. Radiator assembly 2. Radiator mounting bracket 3. Mounting insulator 4. Intercooler	5. Radiator upper hose 6. Radiator lower hose 7. Cooling fan assembly

Engine Mechanical System > Cooling System > Radiator > Repair procedures

Inspection

Radiator Cap Test

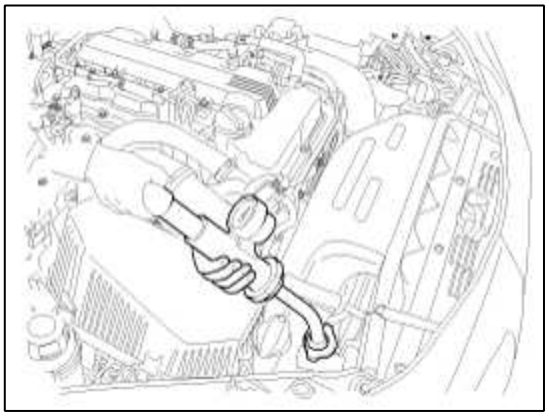
1. Remove the radiator cap, wet its seal with engine coolant, then install it no pressure tester.



2. Apply a pressure of 93 ~ 123kPa (0.95 ~ 1.25kgf/cm², 14 ~ 19psi)
3. Check for a drop in pressure.
4. If the pressure drops, replace the cap.

Radiator Leakage Test

1. Wait until engine is cool, then carefully remove the radiator cap and fill the radiator with engine coolant, then install it on the pressure tester.

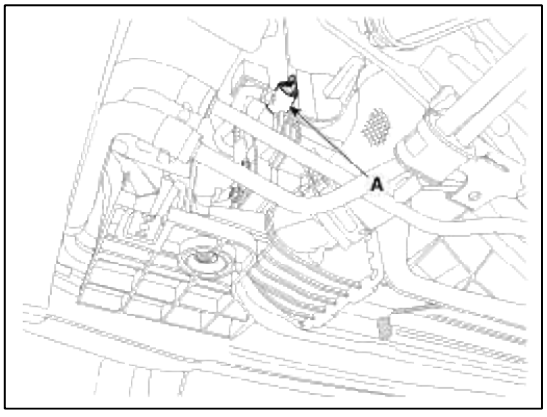


2. Apply a pressure tester to the radiator and apply a pressure of 93 ~ 123kPa (0.95 ~ 1.25kgf/cm² 14 ~18 psi).
3. Inspect for engine coolant leaks and a drop in pressure.
4. Remove the tester and reinstall the radiator cap.

> NOTE
>
> Check for engine oil in the coolant and/or coolant in the engine oil.

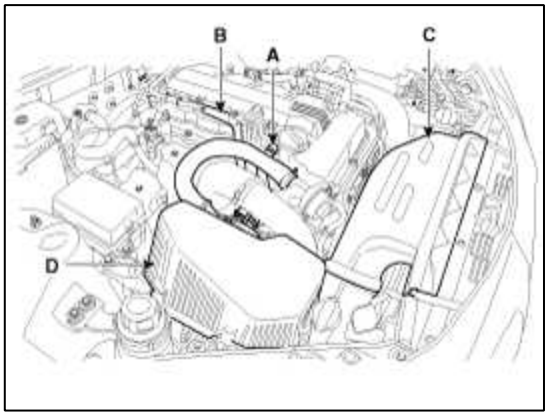
Removal and Installation

1. Remove the drain plug and drain the engine coolant.

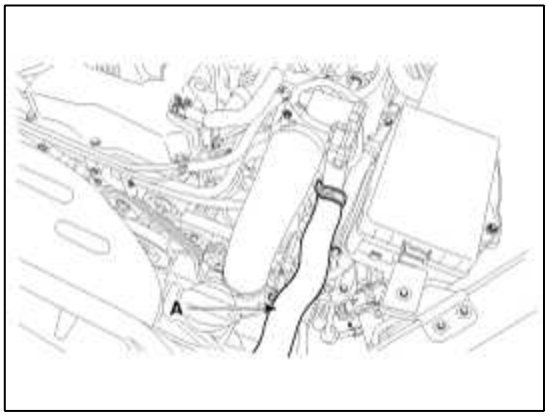


2. Disconnect the breather hose (A), vacuum hose (B) and remove the air duct (C), air cleaner assembly (D).

Tightening torque :
Bolt : 7.8 ~ 9.8N.m (0.9 ~ 1.1kgf.m, 5.8 ~ 7.2lb-ft)
Clamp : 2.9~ 4.9N.m (0.3 ~ 0.5kgf.m, 2.1 ~ 3.6lb-ft)

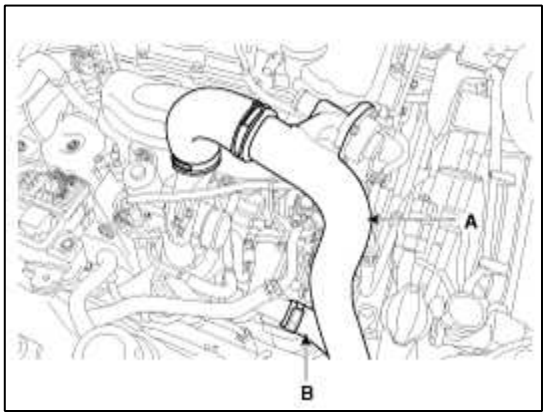


3. Remove the radiator upper hose (A).

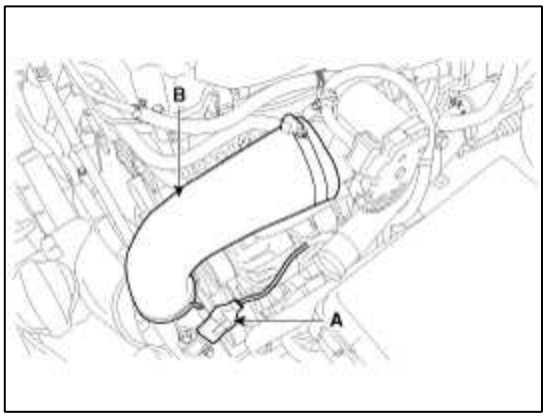


4. Disconnect the intercooler inlet hose (A), radiator lower hose (B).

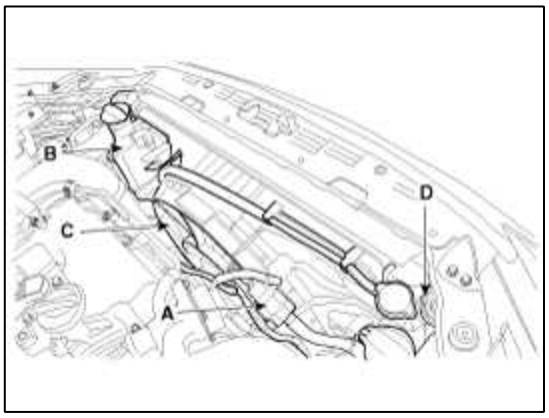
Tightening torque :
Bolt : 14.7 ~ 19.6N.m (1.5 ~ 2.0kgf.m, 10.8 ~ 14.4lb-ft)
Clamp : 4.9~ 6.8N.m (0.5 ~ 0.7kgf.m, 3.6 ~ 5.0lb-ft)



5. Disconnect the BPS connector (A) and intercooler outlet hose (B).



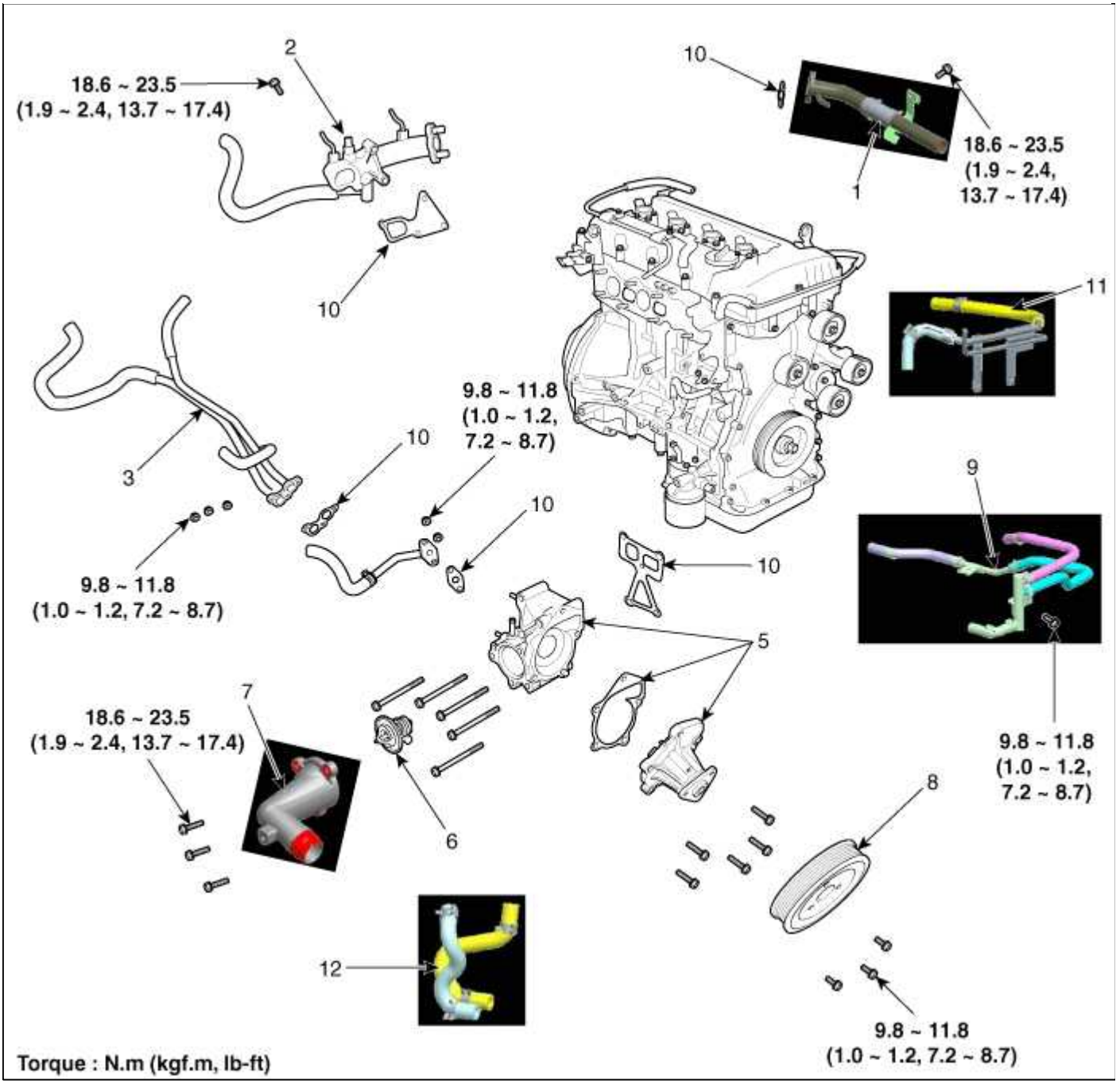
6. Remove the radiator.
   (1) Remove the cooling fan connector(A).
   (2) Remove the reservoir tank(B).
   (3) Remove the fan assembly(C).
   (4) Remove the radiator after removing the radiator upper mounting bracket(D).



7. Installation is the reverse of removal.
8. Fill the engine coolant.
9. Start the engine and check for leaks.
10. Recheck the coolant level.

Engine Mechanical System > Cooling System > Water pump > Components and Components Location

Components

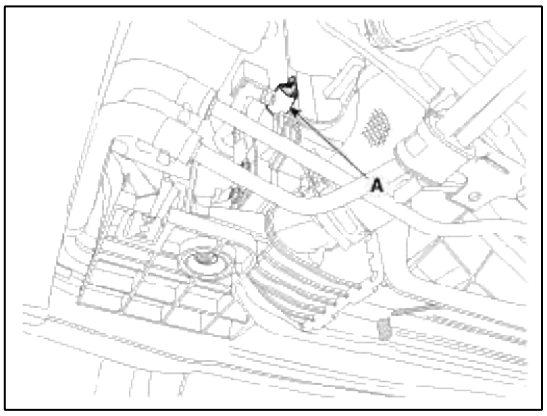


1. Water outlet pipe assembly 2. Water temp. control assembly 3. Heater bypass pipe & hose assembly 4. Turbo charger water pipe 5. Water pump 6. Thermostat	7. Water inlet fitting 8. Water pump pulley 9. Air vent hose & pipe 10. Gasket 11. Vacumm & water hose assembly 12. Oil cooler hose

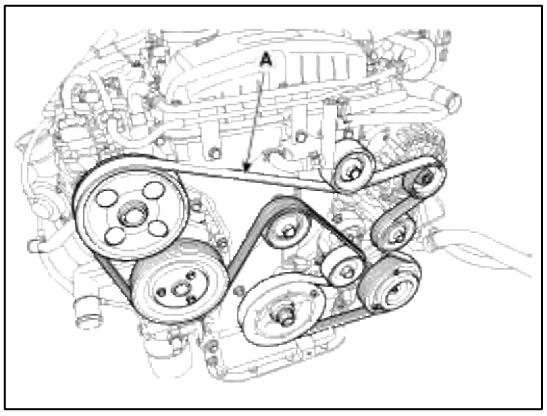
Engine Mechanical System > Cooling System > Water pump > Repair procedures

Removal and Installation

1. Remove the drain plug (A) and drain the engine coolant.

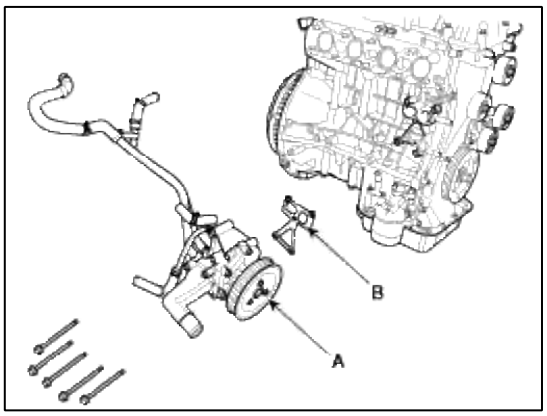


2. Remove the drive belt (A).



3. Remove the water pump (A) and water pump gasket (B).

Tightening torque :
18.6 ~ 23.5Nm (1.9 ~ 2.4kgf.m, 13.7 ~ 17.4lb-ft)



4. Installation is the reverse of removal with a new water pump gasket.
5. Fill the engine coolant.
6. Start the engine and check for leaks.
7. Recheck the coolant level.

Inspection

1. Check each part for cracks, damage or wear, and replace the coolant pump assembly if necessary.
2. Check the bearing for damage, abnormal noise and sluggish rotation, and replace the coolant pump assembly if necessary.

3. Check for coolant leakage. If coolant leaks from hole, the seal is defective. Replace the coolant pump assembly.

NOTE

A small amount of 'weeping' from the bleed hole is normal.

Engine Mechanical System > Cooling System > Water pump > Troubleshooting

Troubleshooting

Symptoms		Possible Causes		Remedy
Coolant leakage	• From the bleed hole of the water pump	Naked eye observation	• Check leaks after about ten-minute warming up.	• If coolant still leaks, replace a water pump.
				• If leakage stops, reuse the water pump (Do not replace the pump with a new one).
	• From gaskets or bolts		• Check the tightening of the water pump mounting bolts.	• Retighten the mounting bolts.
			• Check damage of gaskets or inflow of dust.	• Replace the gasket and clean dust off.
	• From outer surface of water pump		• Check the material or any cracks of the water pump.	• Poor material. If any crack found, replace the water pump.
Noise	• From bearings • From mechanical seals • Impeller interference	Inspection with a stethoscope	• After starting the engine, check noise with a stethoscope.	• If there is no noise, reuse the water pump(do not replace it).
				• If there is any noise from the water pump, remove the drive belt and recheck.
		Inspection after removing a drive belt	• After removing a water pump and a drive belt, check noise again.	• If there is noise, reuse the water pump. Check other drive line parts.
				• If there is no noise, replace the water pump with a new one.
		Inspection after removing a water pump	• After removing a water pump and a drive belt, check noise again.	• If there is any interference between them, replace the water pump with a new one.
Overheating	• Damaged impeller • Loosened	Loosened impeller	• Corrosion of the impeller wing	• Check engine coolant. • Poor coolant quality / Maintenance check

	impeller		• Impeller seperation from the shaft	• Replace the water pump.

Engine Mechanical System > Cooling System > Thermostat > Repair procedures

Removal and Installation

NOTE

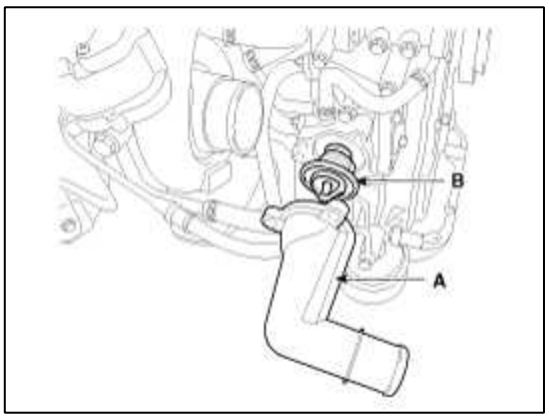
Removal of the thermostat would have an adverse effect, causing a lowering of cooling efficiency. Do not remove the thermostat, even if the engine tends to overheat.

1. Drain the engine coolant so its level is below the thermostat.
2. Remove the water inlet fitting (A) and thermostat (B).

Tightening torque :
18.6 ~ 23.5Nm (1.9 ~ 2.4kgf.m, 13.7 ~ 17.4lb-ft)

NOTE

Install the thermostat with jiggle valve upward.



3. Installation is the reverse of removal.
4. Fill the engine coolant.
5. Start the engine and check for leaks.
6. Recheck the coolant level.

Engine Mechanical System > Cooling System > Thermostat > Troubleshooting

Troubleshooting

Symptoms		Possible Causes		Remedy
Coolant leakage	• From the thermostat gasket	Check the mounting bolts	• Check the torque of the mounting bolts	• Retighten the bolts and check leakage again.
		Check the gasket for damage	• Check gasket or seal for damage	• Replace gaskets and reuse the thermostat.
Cooled excessively	• Low heater performance (cool air blowed-out) • Thermogauge indicates 'LOW'	Visually check observation after removing the radiator cap.	• Insufficient coolant or leakage.	• After refilling coolant, recheck.
		GDS check & Starting engine	• Check DTCs • Check connection of the fan clutch or the fan motor. If the fan clutch is always connected, there will be a noise at idle.	• Check the engine coolant sensor, wiring and connectors. • Replace the componants.
		Remove the thermostat and inspect	• Check if there are dusts or chips in the thermostat valve. • Check adherence of the thermostat.	• Clean the thermostat valve and reuse the thermostat. • Replace the thermostat, if it doesn't work properly.
Heated excessively	• Engine overheated • Thermogauge indicates 'HI'	Naked eyes observation after removing the radiator cap.	• Insufficient coolant or leakage. Be careful when removing a radiator cap of the overheated vehicle. • Check air in cooling system.	• After refilling coolant, recheck. • Check the cylinder head gaskets for damage and the tightening torque of the mounting bolts.
		GDS check & Starting engine	• Check DTCs • Check the fan motor performance as temperature varies. • Check if the fan clutch slips. • Check the water pump adherence or impeller damaged.	• Check the engine coolant sensor, wiring and connectors. • Check the fan motor, the relay and the connector. • Replace the fan clutch, if it doesn't work properly. • Replace the water pump, if it doesn't work properly.
		Immerse the thermostat in boiling water and inspection.	• After removing the thermostat, check it works properly. Check the thermostat opens at the valve opening temperature.	• Replace the thermostat, if it doesn't work properly.

Engine Mechanical System > Lubrication System > Engine Oil > Repair procedures

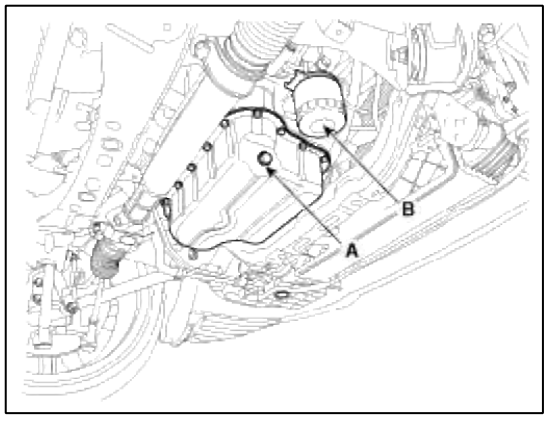
Engine Oil And Filter Replacement

CAUTION

- Prolonged and repeated contact with mineral oil will result in the removal of natural fats from the skin, leading to dryness, irritation and dermatitis. In addition, used engine oil contains potentially harmful contaminants which may cause skin cancer.
- Exercise caution in order to minimize the length and frequency of contact of your skin to used oil. Wear protective clothing and gloves. Wash your skin thoroughly with soap and water, or use water-less hand cleaner, to remove any used engine oil. Do not use gasoline, thinners, or solvents.
- In order to preserve the environment, used oil and used oil filter must be disposed of only at designated disposal sites.

1. Drain the engine oil.
   (1) Remove the oil filler cap.
   (2) Remove the oil drain plug, and drain the oil into a container.
2. Replace the oil filter.
   (1) Remove the oil filter.
   (2) Check and clean the oil filter installation surface.
   (3) Check the part number of the new oil filter is as same as old one.
   (4) Apply clean engine oil to the gasket of a new oil filter.
   (5) Lightly screw the oil filter into place, and tighten it until the gasket contacts the seat.
   (6) Tighten it with the torque below.

Tightening torque :
11.8 ~ 15.7N.m (1.2 ~ 1.6kgf.m, 8.7 ~ 11.6lb-ft)



3. Refill with engine oil.
   (1) Clean and install the oil drain plug with a new gasket.

   Tightening torque :
   34.3 ~ 44.1N.m (3.5 ~ 4.5kgf.m, 25.3 ~ 32.5lb-ft)

   (2) Fill with fresh engine oil.

   Capacity :
   Total : 6.0L (6.34US qt, 5.27lmp qt)
   Oil pan : 5.0L (5.28US qt, 4.41lmp qt)
   Drain and refill including oil filter : 5.3L (5.60US qt, 4.66lmp qt)

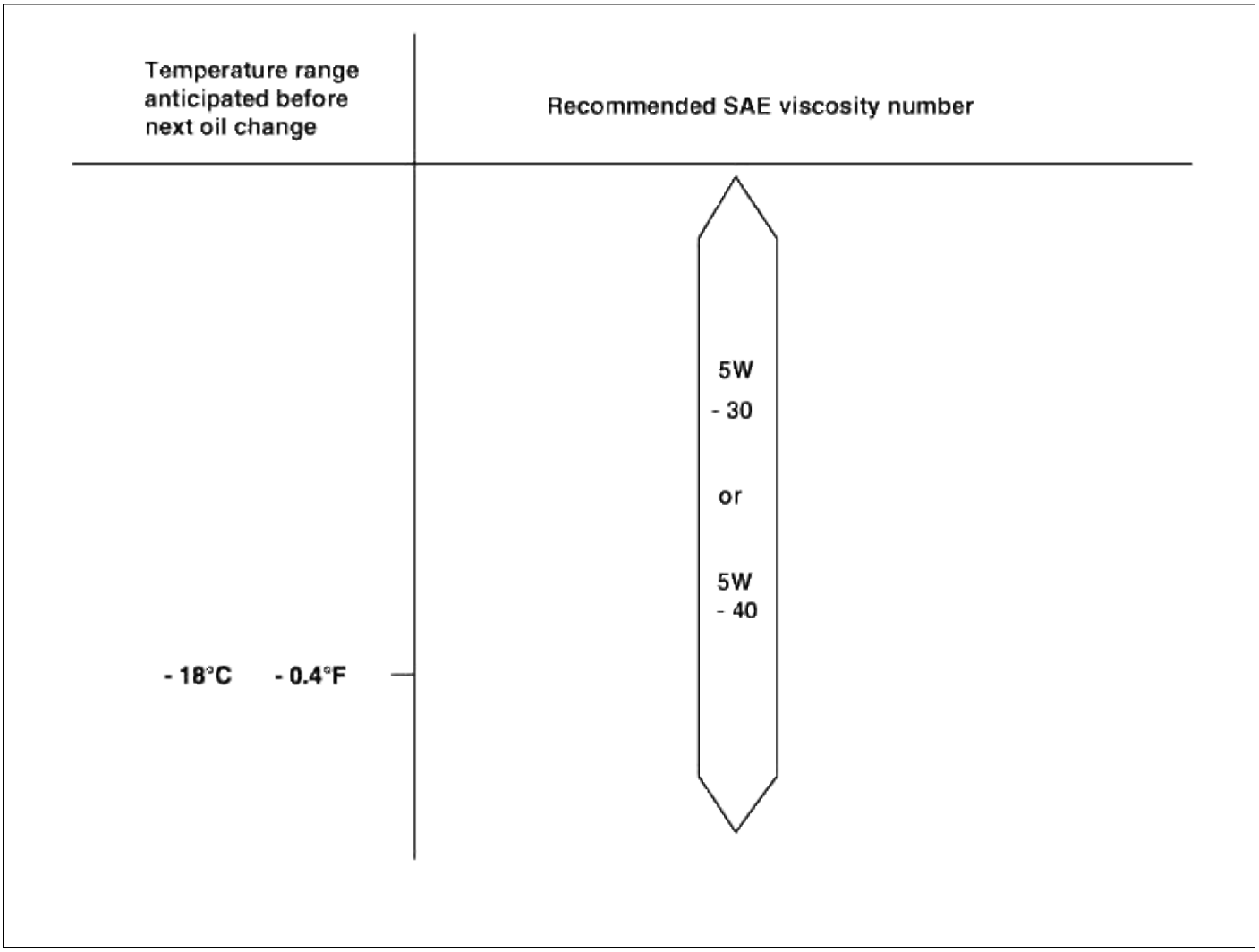
   (3) Install the oil filler cap.
4. Start engine and check for oil leaks and check the oil gauge or light for an indication of oil pressure.
5. Recheck the engine oil level.

Inspection
1. Check the engine oil quality.
   Check the oil deterioration, entry of water, discoloring of thinning. If the quality is visibly poor, replace the oil.
2. Check the engine oil level.
   After engine warm up stop the engine wait 5 minutes then check the oil level. Oil level should be between the "L" and "F" marks on the dipstick. If low check for leakage and add oil up to the "F" mark.

   NOTE

   Do not fill with engine oil above the "F" mark.

Selection Of Engine Oil
Recommendation : 5W-30 ACEA A5 (If not available, refer to the recommended API or ILSAC classification)
API classification: SL or SM above
ILSAC classification : GF3, GF4 or above
ACEA Classification : A3 or A5
SAE viscosity grade : Refer to the recommended SAE viscosity number



NOTE

For best performance and maximum protection of all types of operation, select only those lubricants which :

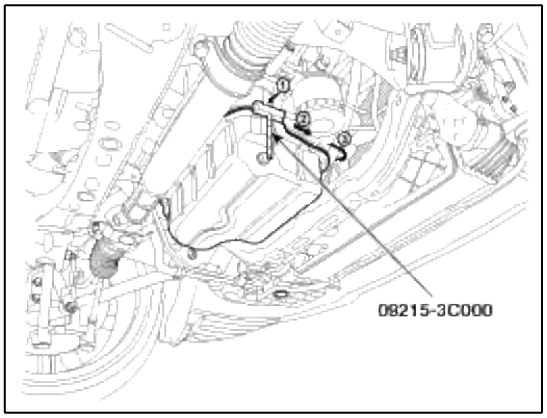
1. Satisfy the requirement of the API or ILSAC classification.
2. Have proper SAE grade number for expected ambient temperature range.
3. Lubricants that do not have both an SAE grade number and API or ILSAC service classification on the container should not be used.

Engine Mechanical System > Lubrication System > Oil Pump > Repair procedures

Removal

1. Drain the engine oil.

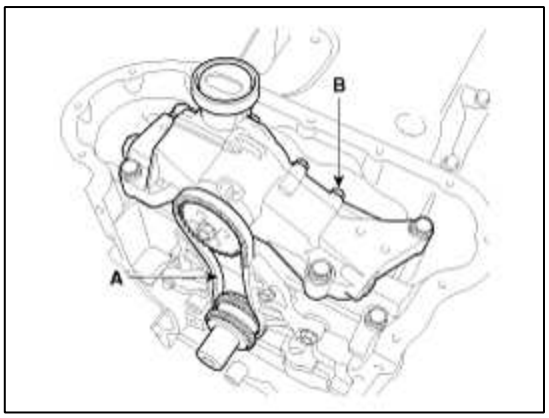
2. Remove the oil pan.
   Insert the blade of SST(09215-3C000) between the ladder frame and the oil pan. Cut off applied sealer and remove the lower oil pan.



NOTE

- Insert the SST between the oil pan and the ladder frame by tapping it with a plastic hammer in the direction of arrow (1).
- After tapping the SST with a plastic hammer along the direction of arrow (2) around more than 2/3 edge of the oil pan, remove it from the ladder frame.
- Do not turn over the SST abruptly without tapping. It be result in damage of the SST.
- Be careful not to damage the contact surfaces of Upper oil pan and lower oil pan.

3. Remove the timing chain.
   (Refer to Timing system in this group)
4. Remove the oil pump (B), oil pump chain (A) and sprocket.

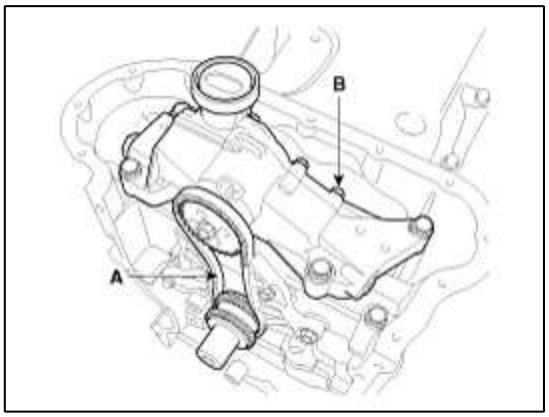


Installation

1. The key of crankshaft should be aligned with the mating face of main bearing cap. As a result of this, the piston of No.1 cylinder is placed at the top dead center on compression stroke.
2. Assemble the crankshaft sprocket on the crankshaft as the front mark on the crankshaft sprocket to be outward.
3. Assemble the oil pump chain on the crankshaft sprocket.

4. Assemble the oil pump assembly (B) as placing oil pump sprocket in to oil pump chain (A).

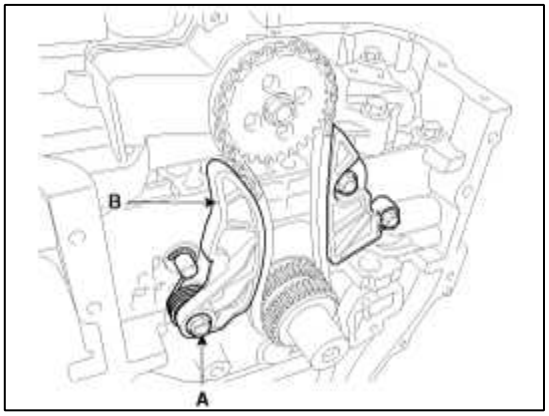
Tightening torque :
9.8 + 19.6 + 29.4 N.m (1.0 + 2.0 + 3.0kgf.m, 7.2+ 14.4 + 21.7 lb-ft)



Bolting order
A. Assemble the bolts with seting torque 29.4 N.m (3.0kgf.m, 21.7 lb-ft)
B. Loosen the bolts as reverse bolting order.
C. Assemble the bolts (4EA) with seting torque 9.8 N.m (1.0kgf.m, 7.2 lb-ft)
D. Assemble the bolts (4EA) with seting torque 19.6 N.m (2.0kgf.m, 14.4 lb-ft)
E. Assemble the bolts with seting torque 29.4 N.m (3.0kgf.m, 21.7 lb-ft) as bolting order.

5. Tighten the oil pump tensioner bolt 'A' after placing the tensioner spring on the dowel pin located in ladder frame and then insert stopper pin to fix the oil pump chain guide 'B'.

Tightening torque :
9.8~ 11.8N.m (1.0 ~ 1.2kgf.m, 7.2 ~ 8.7lb-ft)



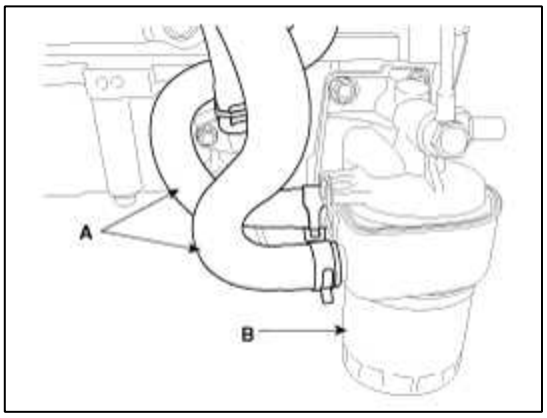
6. Install the timing chain.
(Refer to Timing system in this group)

Engine Mechanical System > Lubrication System > Oil Cooler > Repair procedures

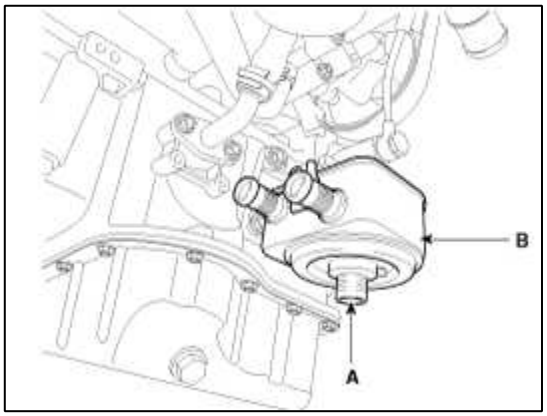
Removal

1. Loosen the drain plug, and drain the coolant. Remove the radiator cap to speed draining.

2. Disconnect the oil cooler coolant hoses (A) and then remove the oil filter (B).



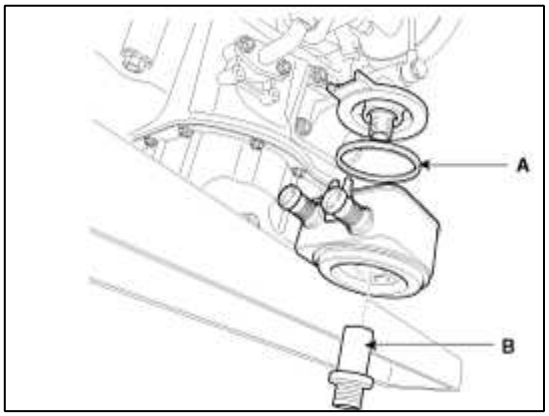
3. Loosen the mounting bolt (A) and remove the oil cooler assembly (B).



Installation

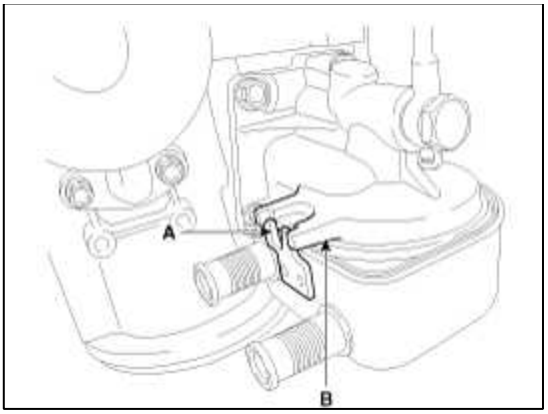
1. Apply a light coat of engine oil to the oil cooler packing surface (A), and then install the oil cooler with fix bolt (B).

Tightening torque :
44.1 ~ 53.9 N.m (4.5 ~ 5.5 kgf.m, 32.5 ~ 39.8 lb-ft)



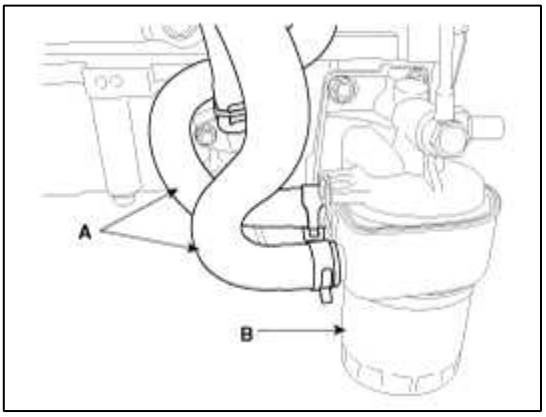
CAUTION

Fix position of oil cooler stopper(A) where oil cooler resists on ladder frame stopper (B).



2. Connect the oil cooler coolant hoses (B) and then installation the oil filter(A).

Tightening torque :
11.8 ~ 15.7 N.m (1.2 ~ 1.6 kgf.m, 8.7 ~ 11.6 lb-ft)



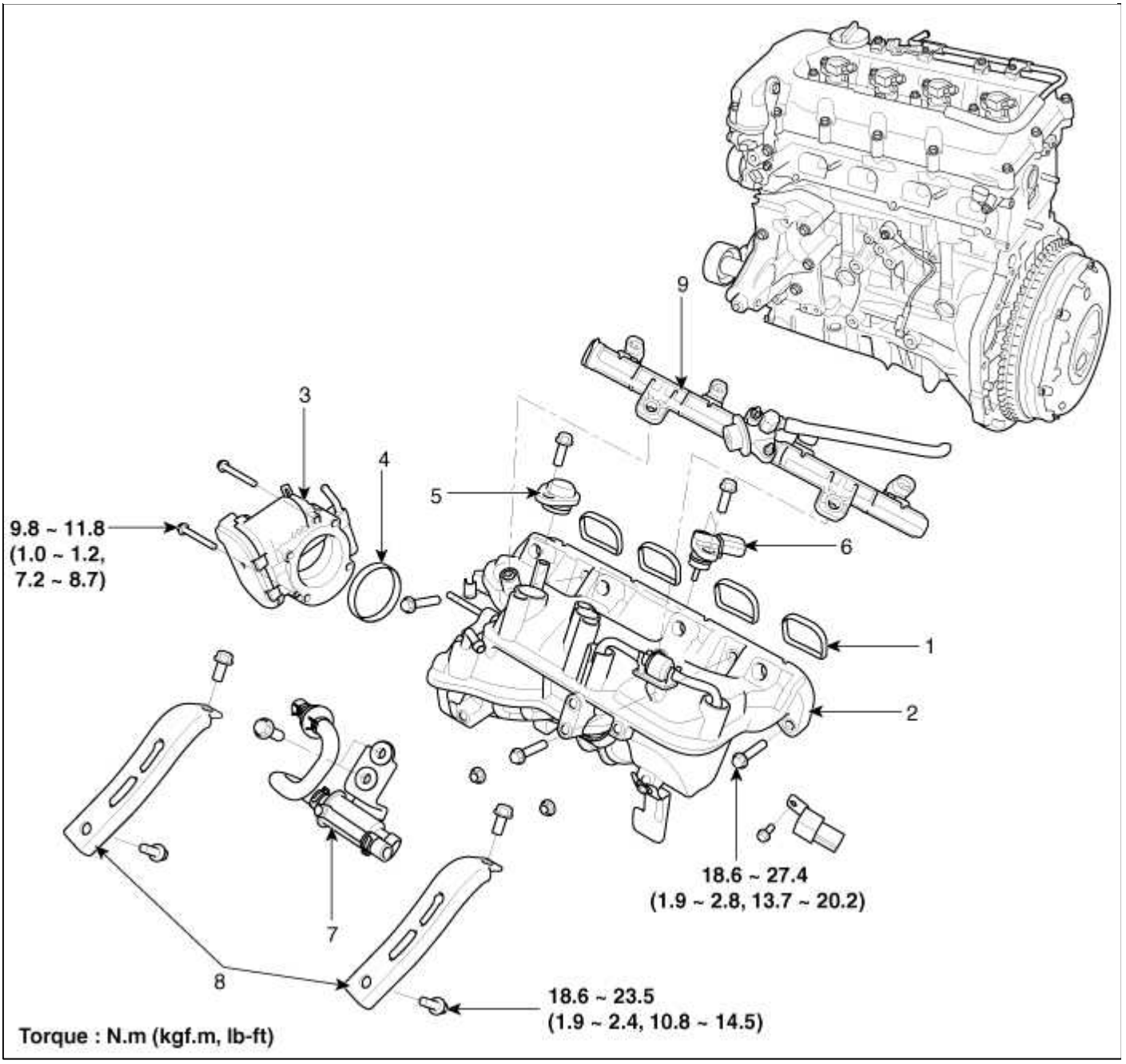
CAUTION

Apply a light coat of engine oil to the oil filter packing surface (A).

3. Fill the radiator with coolant and check for leaks.

Engine Mechanical System > Intake And Exhaust System > Intake Manifold > Components and Components Location

Components

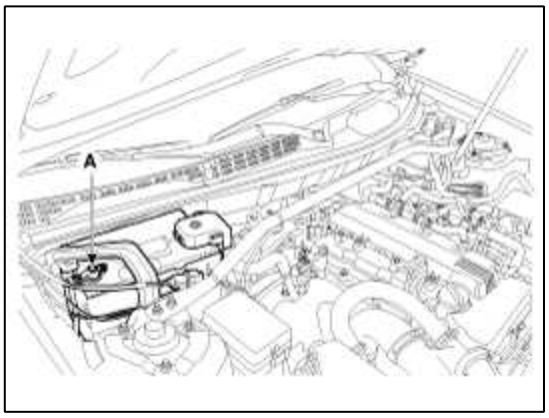


1. Intake manifold gasket	5. PCV hose assembly	8. Intake manifold stay
2. Intake manifold assembly	6. MAP sensor	9. Delivery pipe
3. Electronic throttle body	7. PCSV	10. Vaccum hose
4. Throttle body gasket		

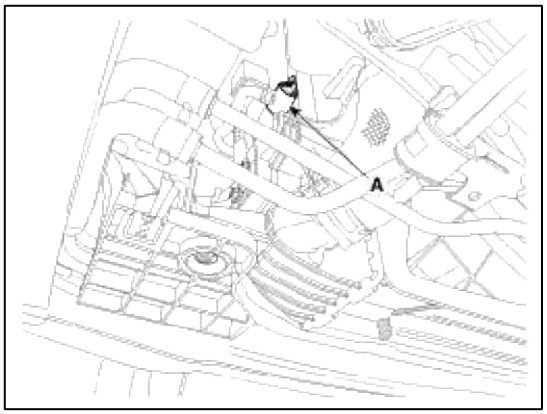
Engine Mechanical System > Intake And Exhaust System > Intake Manifold > Repair procedures

Removal and Installation

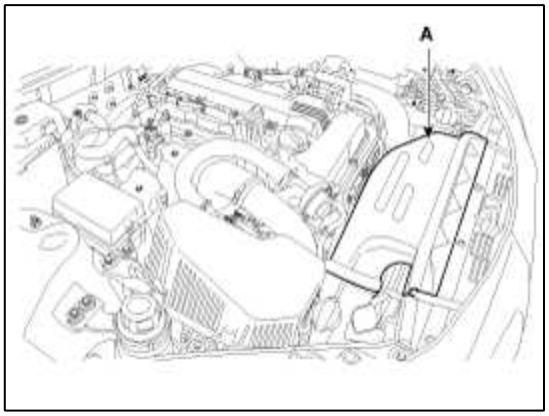
1. Disconnect the negative (-) battery terminal (A).



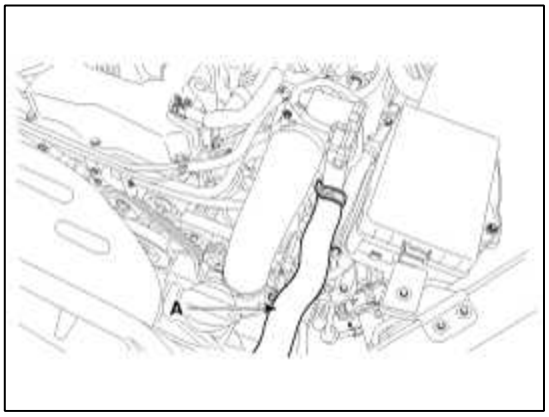
2. Remove the drain plug (A) and drain the engine coolant.



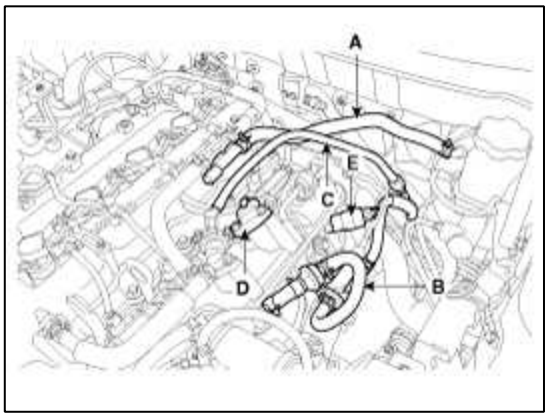
3. Remove the air duct (A).



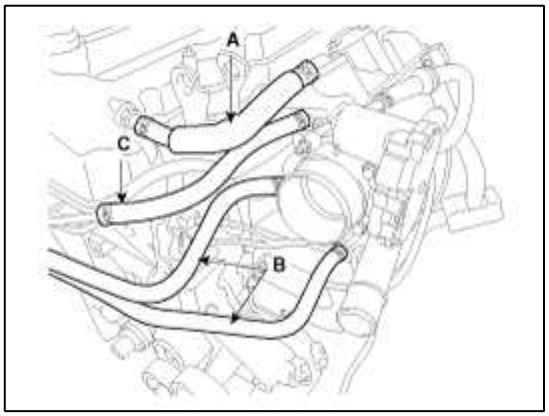
4. Remove the ETC connector (A) and intercooler outlet hose (B).



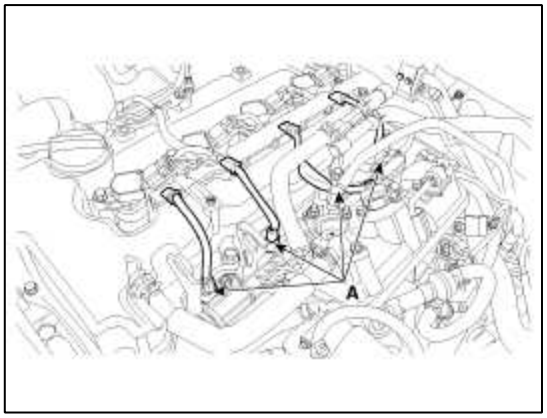
5. Disconnect the vacuum hose (A), PCSV hose (B), fuel hose (C), MAP sensor connector (D), condenser connector (E).



6. Remove the PCV hose (A), coolant hoses (B) and vacuum hoses (C).

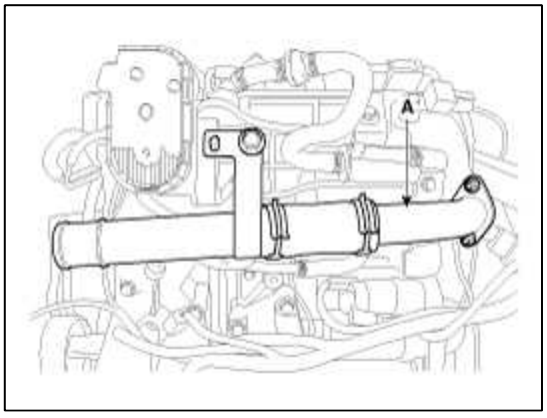


7. Remove the injector connectors (A).



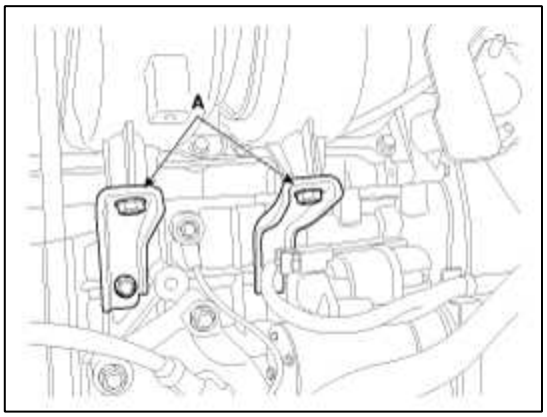
8. Remove the water outlet pipe (A).

Tightening torque :
18.6~ 23.5N.m (1.9 ~ 2.4kgf.m, 13.7 ~ 17.4lb-ft)



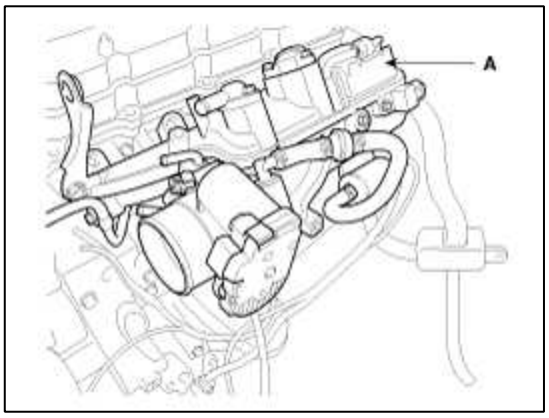
9. Remove the oil level gauge and intake manifold stay (A) bolt.

Tightening torque :
18.6~ 22.5N.m (1.9 ~ 2.3kgf.m, 13.7 ~ 16.6lb-ft)



10. Remove the intake manifold (A) and gasket.

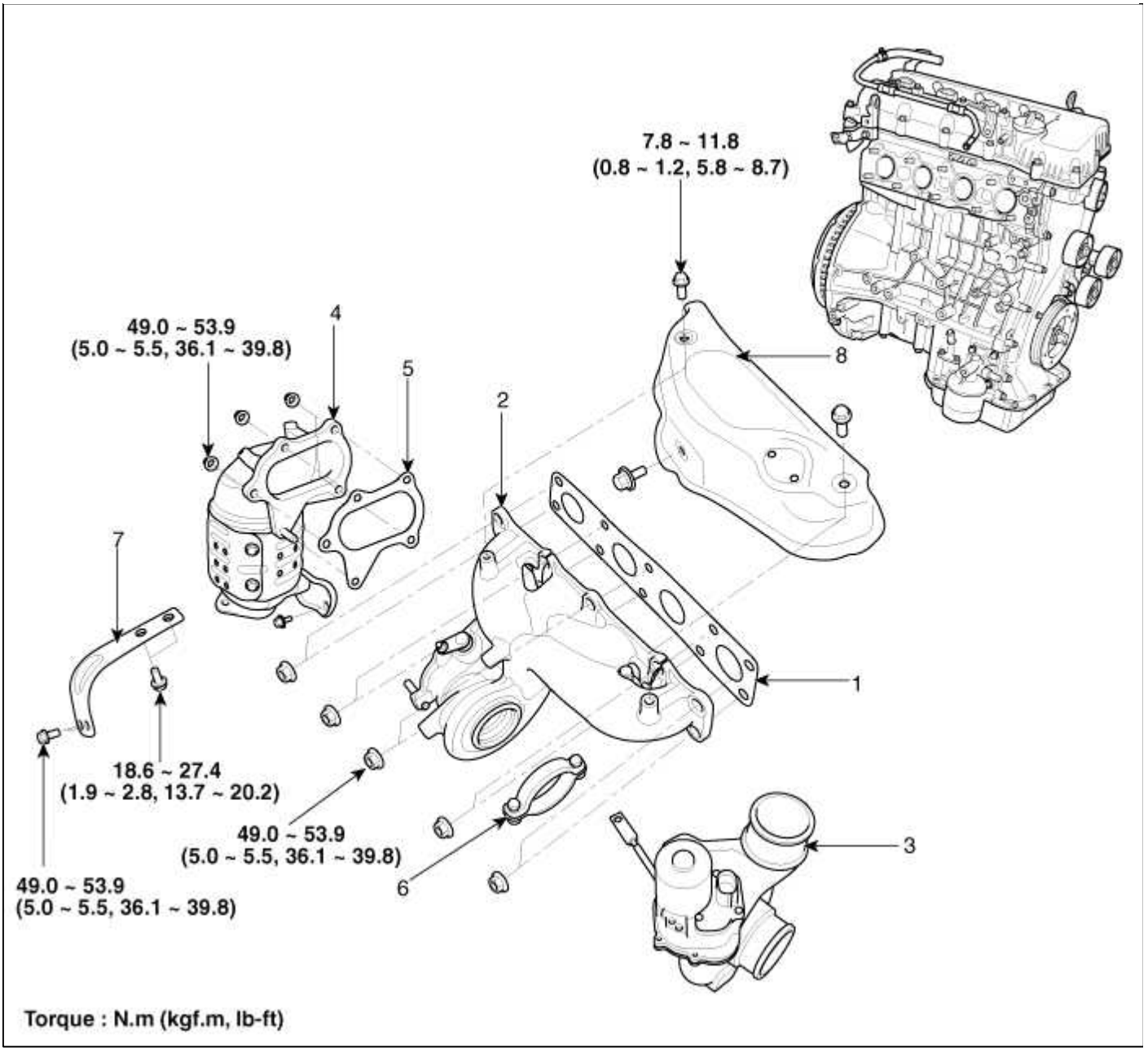
Tightening torque :
18.6~ 27.4N.m (1.9 ~ 2.8kgf.m, 13.7 ~ 20.2lb-ft)



11. Installation is the reverse of removal.

Engine Mechanical System > Intake And Exhaust System > Exhaust Manifold > Components and Components Location

Components



1. Exhaust manifold gasket 2. Exhaust manifold 3. Turobcharger	4. Warm-up catalytic converter (WCC) 5. WCC gasket 6. Turobcharger clamp	7. Turbocharger stay 8. Turobcharger heat protector

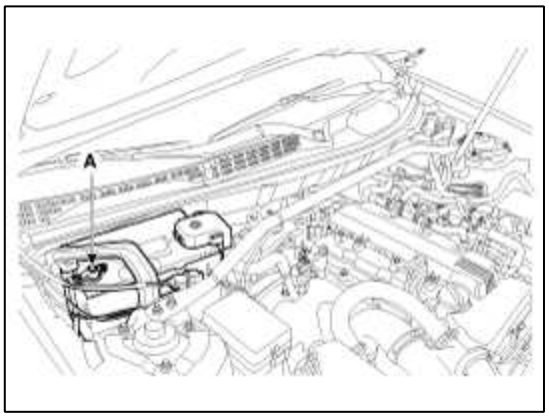
Engine Mechanical System > Intake And Exhaust System > Exhaust Manifold > Repair procedures

Removal and Installation

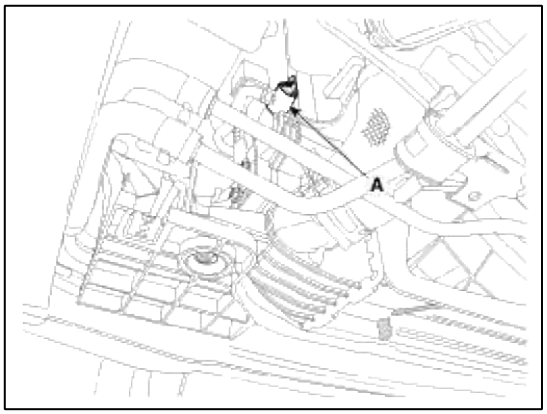
CAUTION

Check that engine is cool enough to work.

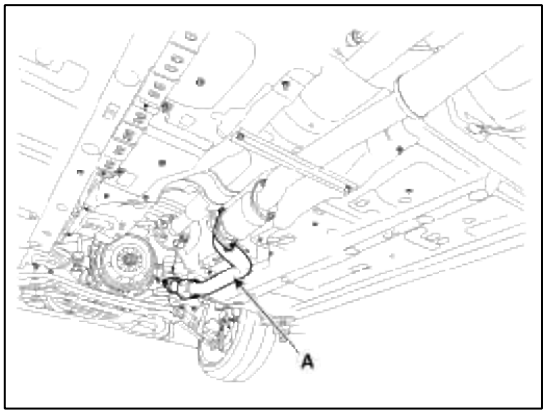
1. Disconnect the negative (-) battery terminal (A).



2. Remove the drain plug (A) and drain the engine coolant.

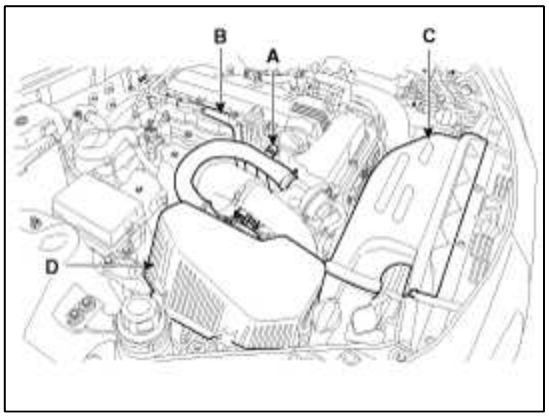


3. Remove the front muffler (A).



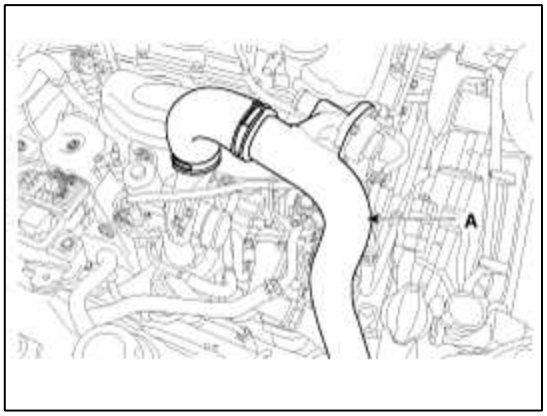
4. Disconnect the breather hose (A), vacuum hose (B). And remove the air duct (C) and air cleaner assembly (D).

Tightening torque :
Bolt : 7.8 ~ 9.8N.m (0.8 ~ 1.0kgf.m, 5.8 ~ 7.2lb-ft)
Clamp : 2.9~ 4.9N.m (0.3 ~ 0.5kgf.m, 2.1 ~ 3.6lb-ft)

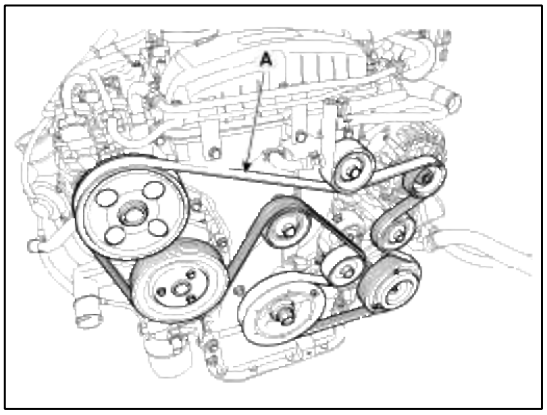


5. Disconnect the intercooler inlet hose (A).

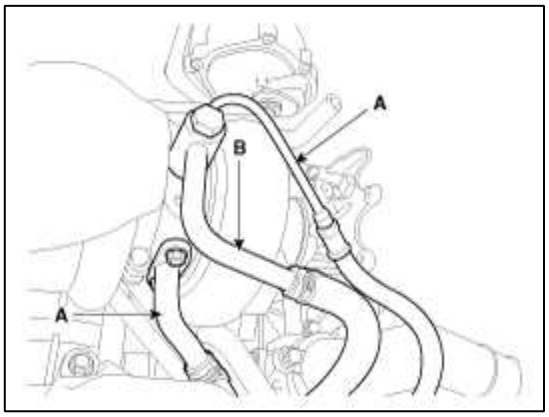
Tightening torque :
Bolt : 14.7 ~ 19.6N.m (1.5 ~ 2.0kgf.m, 10.8 ~ 14.4lb-ft)
Clamp : 4.9~ 6.8N.m (0.5 ~ 0.7kgf.m, 3.6 ~ 5.0lb-ft)

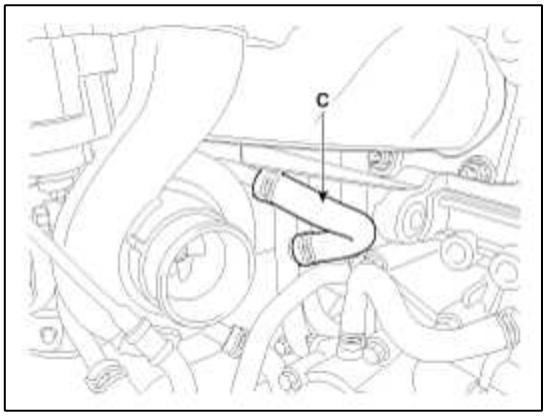


6. Remove the drive belt (A).



7. Remove the turbo oil hose (A), turbo coolant hose (B), turbo oil drain hose (C).

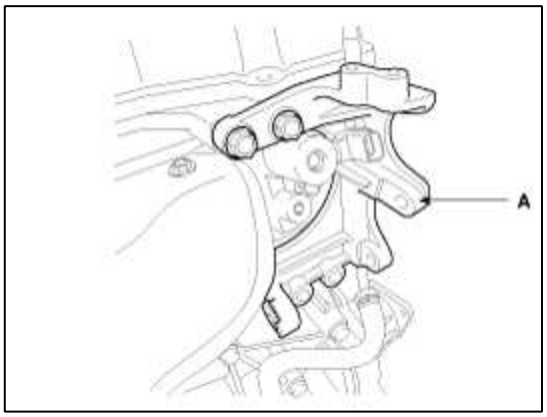




8. Remove the power steering pump. (Refer to steering group)

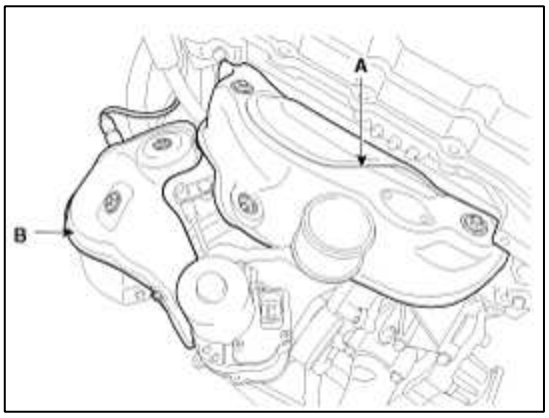
9. Remove the steering pump bracket (A).

Tightening torque :
19.6~ 23.5N.m (2.0 ~ 2.4kgf.m, 13.4 ~ 17.4lb-ft)



10. Remove the exhaust manifold heat protector (A) and turbocharger heat protector (B).

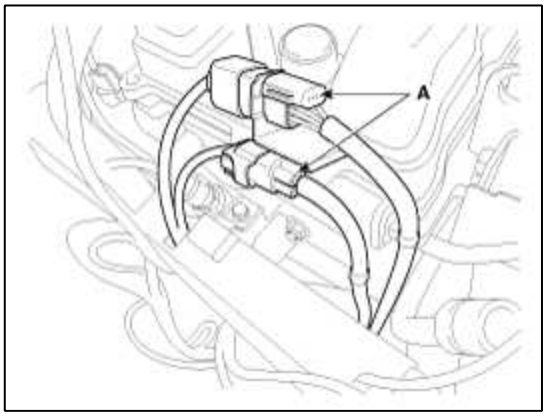
Tightening torque :
7.8~ 11.8N.m (0.8 ~ 1.2kgf.m, 5.8 ~ 8.7lb-ft)



CAUTION

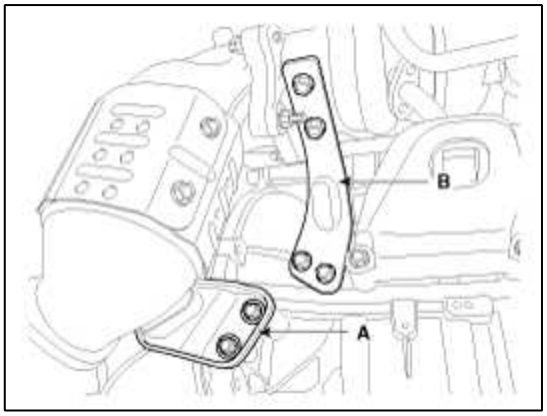
Check that engine is cool enough to work.

11. Remove the oxygen sensor connectors (A).



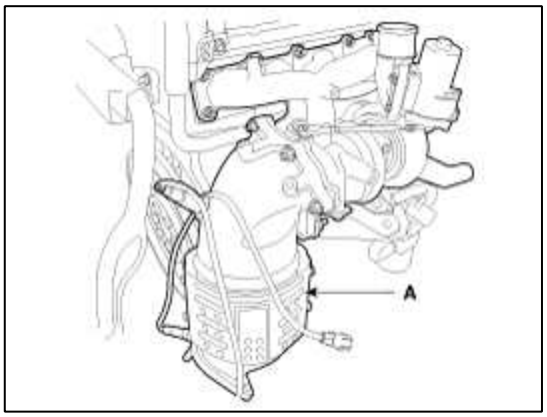
12. Remove the turbocharger stay bolt (A) and WCC stay bolt (B).

Tightening torque :
A: 49.0 ~ 53.9N.m (5.0 ~ 5.5kgf.m, 36.1 ~ 39.8lb-ft)
B: 8.6~ 27.4N.m (1.9 ~ 2.8kgf.m, 13.7 ~ 20.2lb-ft) - Block
49.0 ~ 53.9N.m (5.0 ~ 5.5kgf.m, 36.2 ~ 39.8lb-ft) - Exhaust



13. Remove the exhaust manifold & turbocharger assembly (A) and gasket.

Tightening torque :
49.0 ~ 53.9N.m (5.0 ~ 5.5kgf.m, 36.1 ~ 39.8lb-ft)



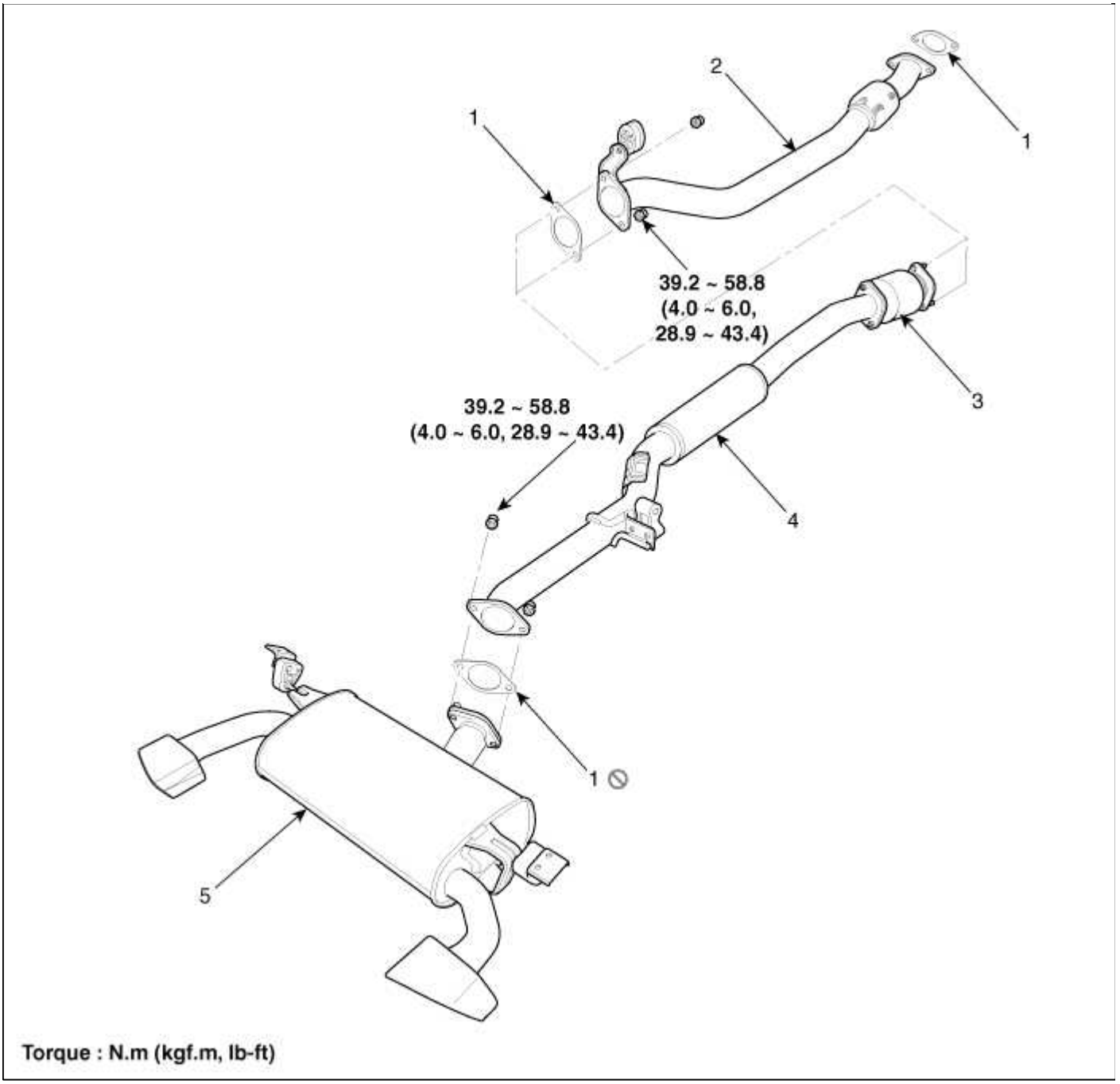
14. Installation is the reverse of removal.

NOTE

- Always use the new turbocharger, exhaust manifold and WCC gaskets when replacing.
- Always use a new turbocharger nuts and, exhaust manifold nuts when it is removed.
- Check that turbo control hose is installed in the right position to avoid interference with another parts (Heat protector, air hose etc.).
- Take care whether the turbocharger coolant hose is interfered with heat protector and exhaust manifold.

Engine Mechanical System > Intake And Exhaust System > Muffler > Components and Components Location

Components



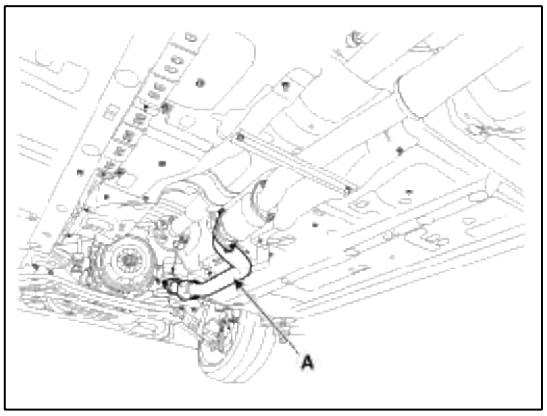
1. Gasket 2. Front muffler 3. Catalytic converter	4. Center muffler 5. Main muffler

Engine Mechanical System > Intake And Exhaust System > Muffler > Repair procedures

Removal

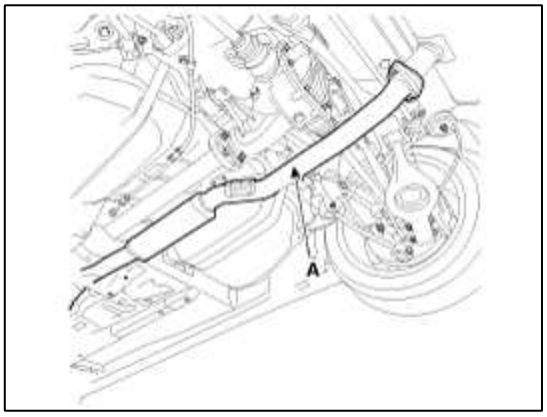
1. Remove the front muffler (A).

Tightening torque :
39.2~ 58.8N.m (4.0 ~ 6.0kgf.m, 28.9 ~ 43.4lb-ft)



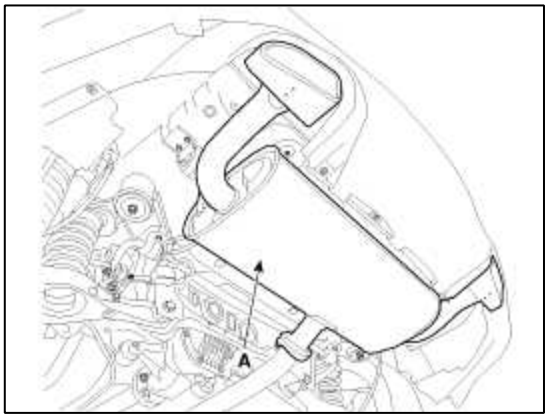
2. Remove the center muffler (A).

Tightening torque :
39.2~ 58.8N.m (4.0 ~ 6.0kgf.m, 28.9 ~ 43.4lb-ft)



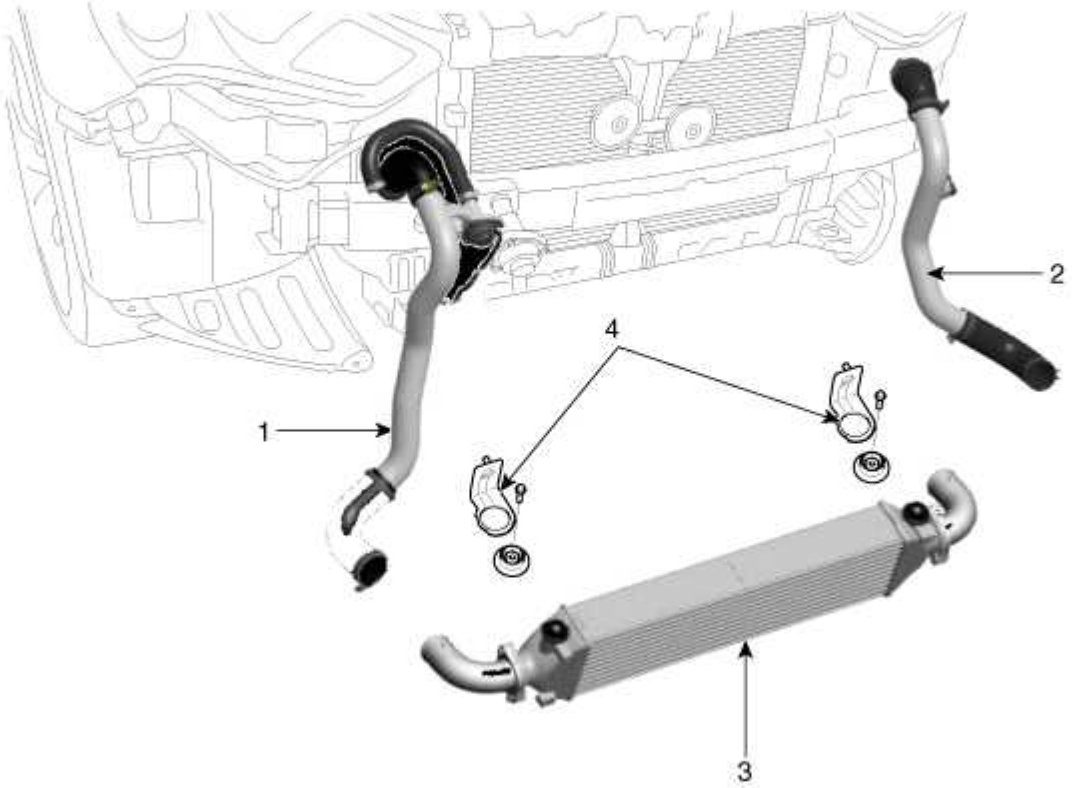
3. Remove the main muffler (A).

Tightening torque :
39.2~ 58.8N.m (4.0 ~ 6.0kgf.m, 28.9 ~ 43.4lb-ft)



Engine Mechanical System > Intake And Exhaust System > Intercooler > Components and Components Location

Components

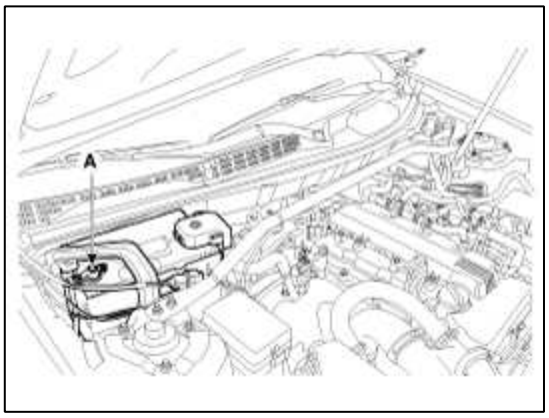


1. Intercooler inlet hose 2. Intercooler outlet hose	3. Intercooler 4. Mounting insulator

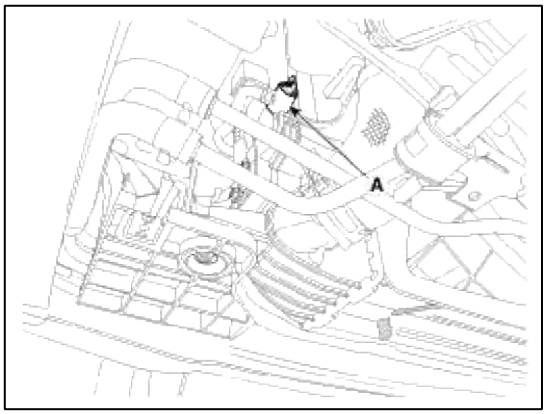
Engine Mechanical System > Intake And Exhaust System > Intercooler > Repair procedures

Removal and Installation

1. Disconnect the negative (-) battery terminal (A).

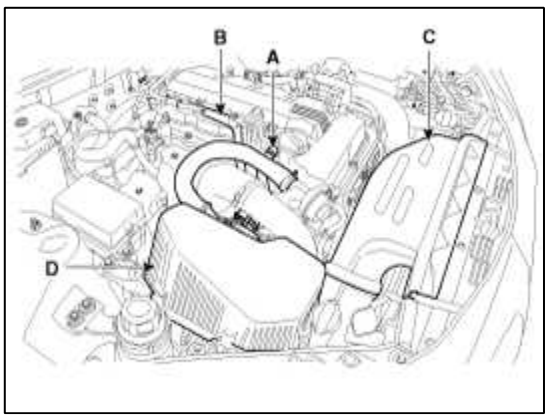


2. Remove the drain plug (A) and drain the engine coolant.

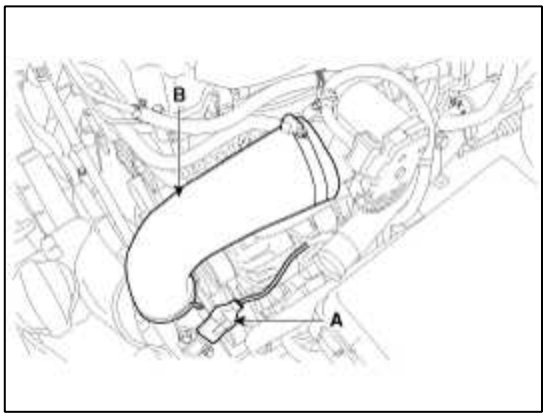


3. Disconnect the breather hose (A) and vacuum hose (B). And remove the air duct (C) and air cleaner assembly (D).

Tightening torque :
Bolt : 7.8 ~ 9.8N.m (0.8 ~ 1.0kgf.m, 5.8 ~ 7.2lb-ft)
Clamp : 2.9~ 4.9N.m (0.3 ~ 0.5kgf.m, 2.1 ~ 3.6lb-ft)

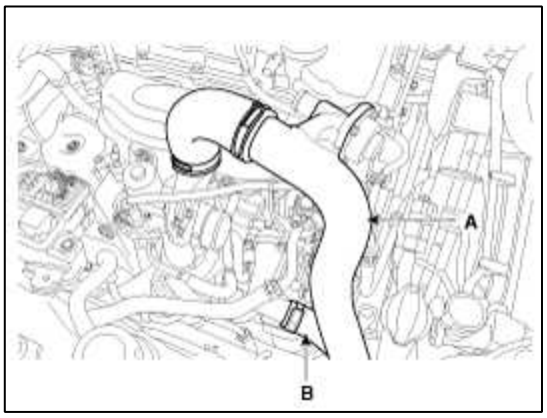


4. Remove the BPS connector (A) and intercooler outlet hose (B).

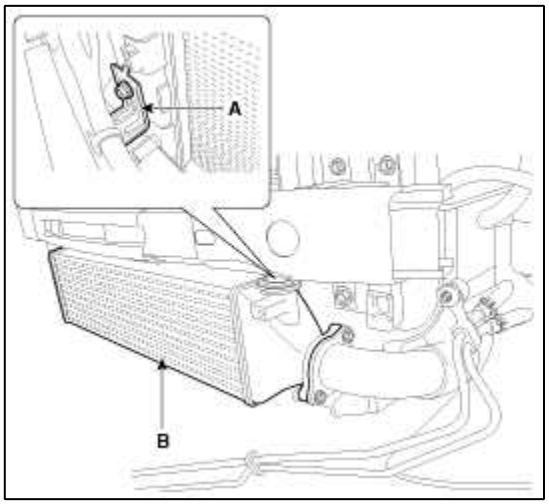


5. Disconnect the intercooler inlet hose (A) and radiator lower hose (B).

Tightening torque :
Bolt : 14.7 ~ 19.6N.m (1.5 ~ 2.0kgf.m, 10.8 ~ 14.4lb-ft)
Clamp : 4.9~ 6.8N.m (0.5 ~ 0.7kgf.m, 3.6 ~ 5.0lb-ft)



6. Remove the intercooler mounting bracket (A) and then remove the intercooler assembly (B).



7. Installation is the reverse of removal.

GENESIS COUPE(BK) > 2013 > G 2.0 T-MPI > Fuel System

Fuel System > General Information > Specifications

Specifications

Fuel Delivery System

Items	Specification	
Fuel Tank	Capacity	65 lit. (17.2 U.S.gal., 68.7 U.S.qt., 57.2 Imp.qt.)
Fuel Filter	Type	Paper type
Fuel Pressure Regulator	Regulated Fuel Pressure	579 kpa (5.9 kgf/cm², 83.9 psi)
Fuel Pump	Type	Electrical, in-tank type
	Driven by	Electric motor

Sensors

Manifold Absolute Pressure Sensor (MAPS)

Type: Piezo-resistive pressure sensor type

Specification

Pressure [kPa (kg/cm², psi)]	Output Voltage (V)
32.5 (0.33, 4.71)	0.5
284 (2.90, 41.20)	4.5

Intake Air Temperature Sensor (IATS)

Type: Thermistor type

Specification

Temperature [°C(°F)]	Resistance (kΩ)
-40(-40)	40.93 ~ 48.35
-20(-4)	13.89 ~ 16.03
0(32)	5.38 ~ 6.09
10(50)	3.48 ~ 3.90
20(68)	2.31 ~ 2.57
40(104)	1.08 ~ 1.21
50(122)	1.56 ~ 1.74
60(140)	0.54 ~ 0.62
80(176)	0.29 ~ 0.34

Boost Pressure Sensor (BPS)

Type: Piezo-resistive pressure sensor type

Specification

Pressure [kPa (kg/cm², psi)]	Output Voltage (V)
32.5 (0.33, 4.71)	0.5
284 (2.90, 41.20)	4.5

Engine Coolant Temperature Sensor (ECTS)

Type: Thermistor type

Specification

Temperature [°C(°F)]	Resistance (kΩ)
-40(-40)	48.14
-20(-4)	14.13 ~ 16.83
0(32)	5.79
20(68)	2.31 ~ 2.59
40(104)	1.15
60(140)	0.59
80(176)	0.32

Throttle Position Sensor (TPS) [integrated into ETC Module]

Type: Variable resistor type

Specification

Throttle Angle(°)	Output Voltage (V)	
	TPS1	TPS2
0	0	5.0
10	0.48	4.52
20	0.95	4.05
30	1.43	3.57
40	1.90	3.10
50	2.38	2.62
60	2.86	2.14
70	3.33	1.67
80	3.81	1.19
90	4.29	0.71
100	4.76	0.24
105	5.0	0
C.T (6~15°)	0.29 ~ 0.71	4.29 ~ 4.71
W.O.T (93~102°)	4.43 ~ 4.86	0.14 ~ 0.57

Item	Resistance (kΩ)
TPS1	0.875 ~ 1.625 [20°C(68°F)]
TPS2	0.875 ~ 1.625 [20°C(68°F)]

Crankshaft Position Sensor (CKPS)
Type: Hall effect type
Camshaft Position Sensor (CMPS)
Type: Hall effect type
Knock Sensor (KS)
Type: Piezo-electricity type
Specification

Item	Specification
Capacitance (pF)	1,480 ~ 2,220

Heated Oxygen Sensor (HO2S) [Bank 1/Sensor 1]
Type: Zirconia (ZrO2) Type
Specification

Item	Specification
Heater Resistance (Ω)	2.5 ~ 4.0 [20°C(68°F)]

Heated Oxygen Sensor (HO2S) [Bank 1/Sensor 2]
Type: Zirconia (ZrO2) Type
Specification

A/F Ratio (λ)	Output Voltage(V)
RICH	0.80 ~ 0.92
LEAN	0.04 ~ 0.1

Item	Specification
Heater Resistance (Ω)	3.3 ~ 4.1 [21°C(69.8°F)]

CVVT Oil Temperature Sensor (OTS)
Type: Thermistor type
Specification

Temperature [°C(°F)]	Resistance (kΩ)
-40(-40)	52.15
-20(-4)	16.52
0(32)	6.0
20(68)	2.45
40(104)	1.11
60(140)	0.54
80(176)	0.29

Accelerator Position Sensor (APS)
Type: Magnetic field sensitive sensor
Specification

Accelerator Position	Output Voltage (V)	
	APS1	APS2
C.T	0.58 ~ 0.93	0.29 ~ 0.46
W.O.T	3.85 ~ 4.35	1.93 ~ 2.18

Fuel Tank Pressure Sensor (FTPS)
Type: Piezo - Resistivity type
Specification

Pressure (kPa)	Output Voltage (V)
-6.67	0.5
0	2.5
6.67	4.5

Actuators

Injector
Specification

Item	Specification
Coil Resistance (Ω)	5.0 ~ 5.8 [20°C(68°F)]

ETC Motor [integrated into ETC Module]
Specification

Item	Specification
Coil Resistance (Ω)	1.2 ~ 1.8 [20°C(68°F)]

Purge Control Solenoid Valve (PCSV)
Specification

Item	Specification
Coil Resistance (Ω)	19.0 ~ 22.0 [20°C(68°F)]

CVVT Oil Control Valve (OCV)

Specification

Item	Specification
Coil Resistance (Ω)	6.9 ~ 7.9 [20°C(68°F)]

EWGA DC Motor [integrated into EWGA]

Specification

Item	Specification
Coil Resistance	1Ω ~ 1kΩ [20°C(68°F)]

RCV Control Solenoid Valve

Specification

Item	Specification
Coil Resistance (Ω)	28.3 ~ 31.1 [20°C(68°F)]

Ignition Coil

Type: Stick type

Specification

Item	Specification
1st Coil Resistance (Ω)	0.62 ± 10 [20°C(68°F)]
2nd Coil Resistance (kΩ)	7.0 ± 15 [20°C(68°F)]

Canister Close Valve (CCV)

Specification

Item	Specification
Coil Resistance (Ω)	23.0 ~ 26.0 [20°C(68°F)]

Service Standard

Item		Specification	
Ignition Timing (°)		BTDC 5 ± 10	
Idle Speed (rpm)	A/C OFF	Neutral, N, P-range	780±100
		D-range	780±100
	A/C ON	Neutral, N, P-range	780±100
		D-range	780±100

Tightening Torques

Engine Control System

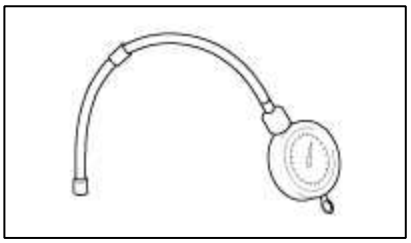
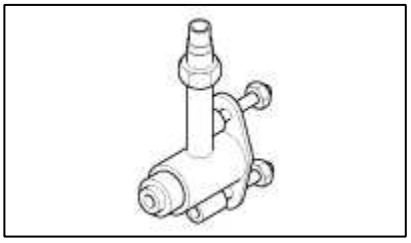
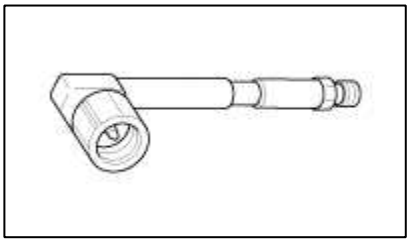
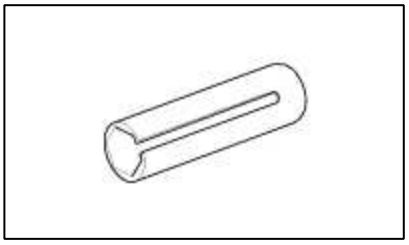
Item	kgf.m	N.m	lb-ft
ECM bracket installation bolt / nut	1.0 ~ 1.2	9.8 ~ 11.8	7.2 ~ 8.7
Manifold absolute pressure sensor installation bolt	1.0 ~ 1.2	9.8 ~ 11.8	7.2 ~ 8.7
Boost pressure sensor installation	0.8 ~ 1.2	7.8 ~ 11.8	5.8 ~ 8.7
Intake air temperature sensor installation bolt	1.0 ~ 1.2	9.8 ~ 11.8	7.2 ~ 8.7
Engine coolant temperature sensor installation	3.0 ~ 4.0	29.4 ~ 39.2	21.7 ~ 28.9
Crankshaft position sensor installation bolt	1.0 ~ 1.2	9.8 ~ 11.8	7.2 ~ 8.7
Camshaft position sensor (Bank 1 / Intake) installation bolt	1.0 ~ 1.2	9.8 ~ 11.8	7.2 ~ 8.7
Camshaft position sensor (Bank 1 / Exhaust) installation bolt	1.0 ~ 1.2	9.8 ~ 11.8	7.2 ~ 8.7
Knock sensor installation bolt	1.9 ~ 2.4	18.6 ~ 23.5	13.7 ~ 17.4
Heated oxygen sensor (Bank 1 / sensor 1) installation	4.0 ~ 5.0	39.2 ~ 49.1	28.9 ~ 36.2
Heated oxygen sensor (Bank 1 / sensor 2) installation	4.0 ~ 5.0	39.2 ~ 49.1	28.9 ~ 36.2
CVVT oil temperature sensor installation	2.0 ~ 4.0	19.6 ~ 39.2	14.5 ~ 28.9
Fuel tank pressure sensor installation bolt	0.4 ~ 0.6	3.9 ~ 5.9	2.9 ~ 4.3
Electronic throttle body installation bolt / nut	1.0 ~ 1.2	9.8 ~ 11.8	7.2 ~ 8.7
Purge control solenoid valve bracket installation bolt	1.0 ~ 1.2	9.8 ~ 11.8	7.2 ~ 8.7
CVVT oil control valve (Bank 1 / Intake) installation bolt	1.0 ~ 1.2	9.8 ~ 11.8	7.2 ~ 8.7
CVVT oil control valve (Bank 1 / Exhaust) installation bolt	1.0 ~ 1.2	9.8 ~ 11.8	7.2 ~ 8.7
RCV control solenoid valve bracket installation bolt	1.0 ~ 1.2	9.8 ~ 11.8	7.2 ~ 8.7
Ignition coil installation bolt	1.0 ~ 1.2	9.8 ~ 11.8	7.2 ~ 8.7
Electric WGT control actuator installation bolt	0.75 ~ 0.85	7.35 ~ 8.34	5.42 ~ 6.08
Canister close valve installaiton bolt	0.4 ~ 0.6	3.9 ~ 5.9	2.9 ~ 4.3

Fuel Delivery System

Item	kgf.m	N.m	lb-ft
Fuel tank band installation nut	4.0 ~ 5.5	39.2 ~ 54.0	28.9 ~ 39.8
Fuel pump installation bolt	0.2 ~ 0.3	2.0 ~ 2.9	1.4 ~ 2.2
Sub fuel sender installation bolt	0.2 ~ 0.3	2.0 ~ 2.9	1.4 ~ 2.2
Filler-neck assembly installation bolt	0.8 ~ 1.2	7.8 ~ 11.8	5.8 ~ 8.7
Filler-neck assembly installation nut	0.4 ~ 0.6	3.9 ~ 5.9	2.9 ~ 4.3
Accelerator pedal module installation bolt	0.9 ~ 1.4	8.8 ~ 13.7	6.5 ~ 10.1
Deliver pipe installation nut (↔ Fuel feed tube)	0.4 ~ 0.6	3.9 ~ 5.9	2.9 ~ 4.3

Fuel System > General Information > Special Service Tools

Special Service Tools

Tool (Number and Name)	Illustration	Application
Fuel Pressure Gauge (09353-24100)		Measuring the fuel line pressure
Fuel Pressure Gauge Adapter (09353-38000)		Connection between the delivery pipe and the fuel feed line
Fuel Pressure Gauge Connector (09353-24000)		Connection between the Fuel Pressure Gauge (09353-24100) and the Fuel Pressure Gauge Adapter (09353-38000)
Heated Oxygen Sensor Socket Wrench (09392-2H100)		Removal and installation of the heated oxygen sensor

Fuel System > General Information > Troubleshooting

Basic Troubleshooting

Basic Troubleshooting Guide

1 Bring Vehicle to Workshop

2 Analyze Customer's Problem

- Ask the customer about the conditions and environment relative to the issue (Use CUSTOMER PROBLEM ANALYSIS SHEET).

3 Verify Symptom, and then Check DTC and Freeze Frame Data

- Connect Hi-Scan (Pro) to Diagnostic Link Connector (DLC).
- Record the DTC and freeze frame data.

NOTE

To erase DTC and freeze frame data, refer to Step 5.

4 Confirm the Inspection Procedure for the System or Part

- Using the SYMPTOM TROUBLESHOOTING GUIDE CHART, choose the correct inspection procedure for the system or part to be checked.

5 Erase the DTC and Freeze Frame Data

WARNING

NEVER erase DTC and freeze frame data before completing Step 2 MIL/DTC in "CUSTOMER PROBLEM ANALYSIS SHEET".

6 Inspect Vehicle Visually

- Go to Step 11, if you recognize the problem.

7 Recreate (Simulate) Symptoms of the DTC

- Try to recreate or simulate the symptoms and conditions of the malfunction as described by customer.
- If DTC(s) is/are displayed, simulate the condition according to troubleshooting procedure for the DTC.

8 Confirm Symptoms of Problem

- If DTC(s) is/are not displayed, go to Step 9.
- If DTC(s) is/are displayed, go to Step 11.

9 Recreate (Simulate) Symptom

- Try to recreate or simulate the condition of the malfunction as described by the customer.

10 Check the DTC

- If DTC(s) does(do) not occur, refer to INTERMITTENT PROBLEM PROCEDURE in BASIC INSPECTION PROCEDURE.
- If DTC(s) occur(s), go to Step 11.

11 Perform troubleshooting procedure for DTC

12 Adjust or repair the vehicle

13 Confirmation test

14 END

Customer Problem Analysis Sheet

1. VEHICLE INFORMAITON

VIN No.		Transmission	☐ M/T ☐ A/T ☐CVT ☐ etc.
Production date		Driving type	☐ 2WD (FF) ☐ 2WD (FR) ☐ 4WD
Odometer Reading	_____km/mile	CPF (Diesel Engine)	☐ With CPF ☐ Without CPF

2. SYMPTOMS

☐ Unable to start	☐ Engine does not turn over ☐ Incomplete combustion ☐ Initial combustion does not occur
☐ Difficult to start	☐ Engine turns over slowly ☐ Other_____
☐ Poor idling	☐ Rough idling ☐ Incorrect idling ☐ Unstable idling (High:_____ rpm, Low: _____rpm) ☐ Other
☐ Engine stall	☐ Soon after starting ☐ After accelerator pedal depressed ☐ After accelerator pedal released ☐ During A/C ON ☐ Shifting from N to D-range ☐ Other_____
☐ Others	☐ Poor driving (Surge) ☐ Knocking ☐ Poor fuel economy ☐ Back fire ☐ After fire ☐ Other_____

3. ENVIRONMENT

Problem frequency	☐ Constant ☐ Sometimes (_____) ☐ Once only ☐ Other_____
Weather	☐ Fine ☐ Cloudy ☐ Rainy ☐ Snowy ☐ Other_____
Outdoor temperature	Approx. _____ °C/°F
Place	☐ Highway ☐ Suburbs ☐ Inner City ☐ Uphill ☐ Downhill ☐ Rough road ☐ Other_____
Engine temperature	☐ Cold ☐ Warming up ☐ After warming up ☐ Any temperature
Engine operation	☐ Starting ☐ Just after starting (____min) ☐ Idling ☐ Racing ☐ Driving ☐ Constant speed ☐ Acceleration ☐ Deceleration ☐ A/C switch ON/OFF ☐ Other_____

4. MIL/DTC

MIL (Malfunction Indicator Lamp)		☐ Remains ON ☐ Sometimes lights up ☐ Does not light
DTC	Normal check (Pre-check)	☐ Normal ☐ DTC (_____) ☐ Freeze Frame Data
	Check mode	☐ Normal ☐ DTC (_____) ☐ Freeze Frame Data

5. ECM/PCM INFORMATION

ECM/PCM Part No.	
ROM ID	

Basic Inspection Procedure

Measuring Condition of Electronic Parts' Resistance

The measured resistance at high temperature after vehicle running may be high or low. So all resistance must be measured at ambient temperature (20°C, 68°F), unless stated otherwise.

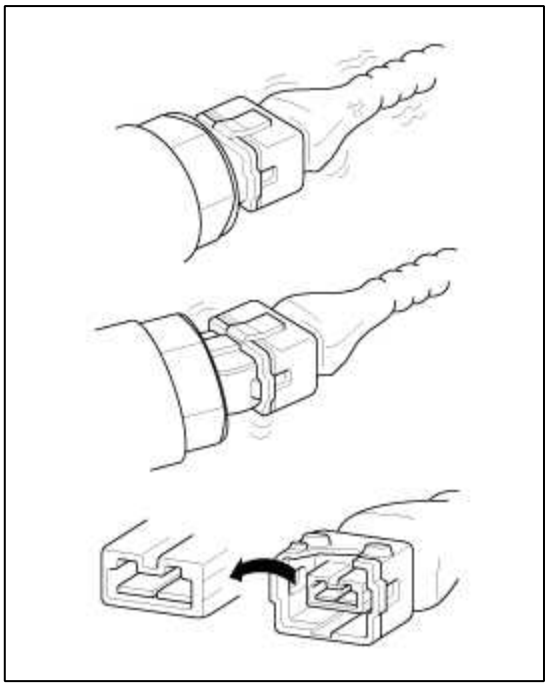
NOTE

The measured resistance in except for ambient temperature (20°C, 68°F) is reference value.

Intermittent Problem Inspection Procedure

Sometimes the most difficult case in troubleshooting is when a problem symptom occurs but does not occur again during testing. An example would be if a problem appears only when the vehicle is cold but has not appeared when warm. In this case, the technician should thoroughly make out a "Customer Problem Analysis Sheet" and recreate (simulate) the environment and condition which occurred when the vehicle was having the issue.

1. Clear Diagnostic Trouble Code (DTC).
2. Inspect connector connection, and check terminal for poor connections, loose wires, bent, broken or corroded pins, and then verify that the connectors are always securely fastened.



3. Slightly shake the connector and wiring harness vertically and horizontally.
4. Repair or replace the component that has a problem.
5. Verify that the problem has disappeared with the road test.

● Simulating Vibration

1) Sensors and Actuators
: Slightly vibrate sensors, actuators or relays with finger.

> WARNING
>
> Strong vibration may break sensors, actuators or relays

2) Connectors and Harness
: Lightly shake the connector and wiring harness vertically and then horizontally.

● Simulating Heat

1) Heat components suspected of causing the malfunction with a hair dryer or other heat source.

> WARNING
>
> • DO NOT heat components to the point where they may be damaged.
> • DO NOT heat the ECM directly.

● Simulating Water Sprinkling

1) Sprinkle water onto vehicle to simulate a rainy day or a high humidity condition.

> WARNING
>
> DO NOT sprinkle water directly into the engine compartment or electronic components.

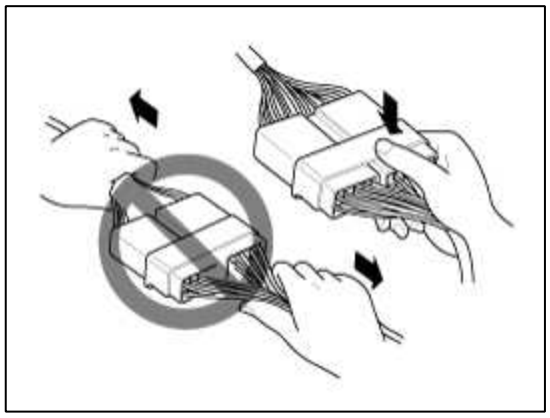
● Simulating Electrical Load

1) Turn on all electrical systems to simulate excessive electrical loads (Radios, fans, lights, rear window defogger, etc.).

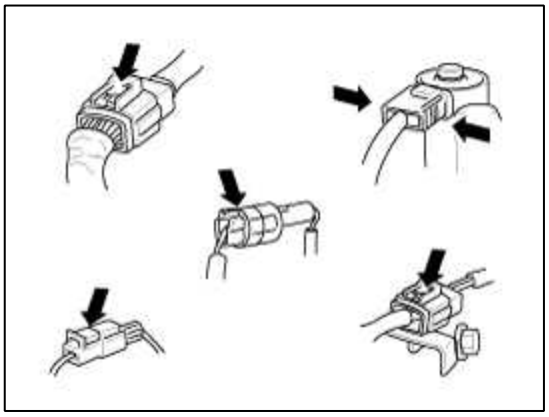
Connector Inspection Procedure

1. Handling of Connector

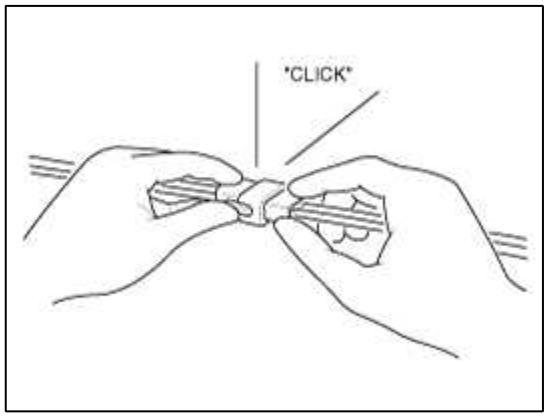
A. Never pull on the wiring harness when disconnecting connectors.



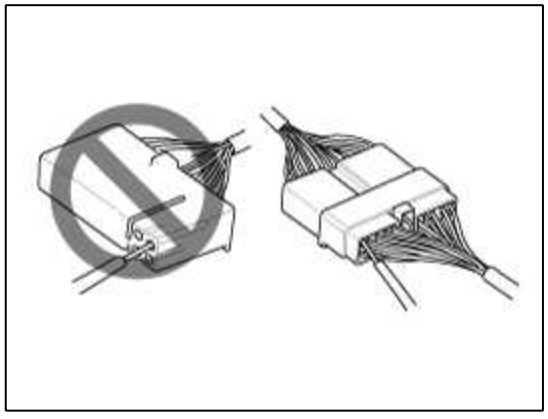
B. When removing the connector with a lock, press or pull locking lever.



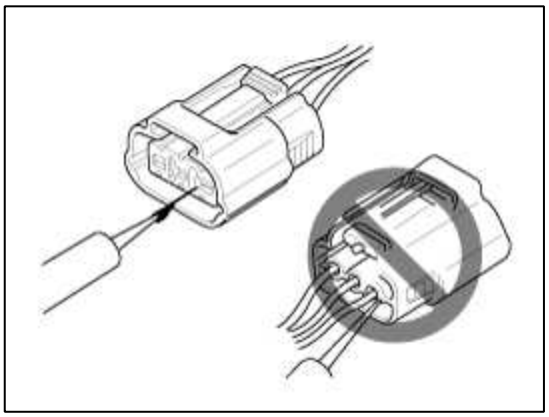
C. Listen for a click when locking connectors. This sound indicates that they are securely locked.



D. When a tester is used to check for continuity, or to measure voltage, always insert tester probe from wire harness side.



E. Check waterproof connector terminals from the connector side. Waterproof connectors cannot be accessed from harness side.



NOTE

- Use a fine wire to prevent damage to the terminal.
- Do not damage the terminal when inserting the tester lead.

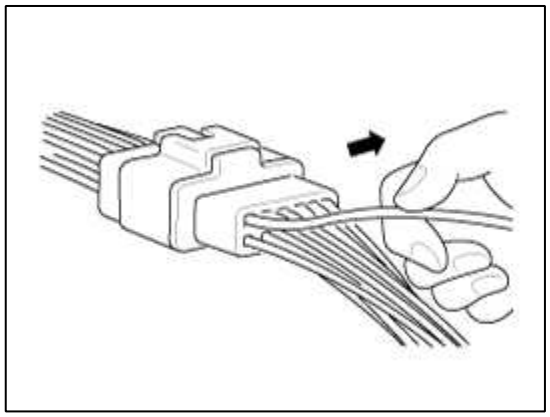
2. Checking Point for Connector

A. While the connector is connected:
Hold the connector, check connecting condition and locking efficiency.

B. When the connector is disconnected:
Check missed terminal, crimped terminal or broken core wire by slightly pulling the wire harness.
Visually check for rust, contamination, deformation and bend.

C. Check terminal tightening condition:
Insert a spare male terminal into a female terminal, and then check terminal tightening conditions.

D. Pull lightly on individual wires to ensure that each wire is secured in the terminal.



3. Repair Method of Connector Terminal

A. Clean the contact points using air gun and/or shop rag.

NOTE

Never use sand paper when polishing the contact points, otherwise the contact point may be damaged.

B. In case of abnormal contact pressure, replace the female terminal.

Wire Harness Inspection Procedure

1. Before removing the wire harness, check the wire harness position and crimping in order to restore it correctly.
2. Check whether the wire harness is twisted, pulled or loosened.
3. Check whether the temperature of the wire harness is abnormally high.
4. Check whether the wire harness is rotating, moving or vibrating against the sharp edge of a part.

5. Check the connection between the wire harness and any installed part.
6. If the covering of wire harness is damaged; secure, repair or replace the harness.

Electrical Circuit Inspection Procedure

● Check Open Circuit

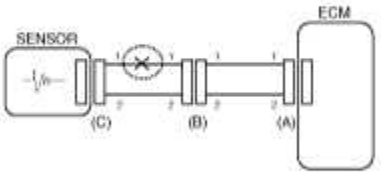
1. Procedures for Open Circuit

A. Continuity Check

B. Voltage Check

If an open circuit occurs (as seen in [FIG. 1]), it can be found by performing Step 2 (Continuity Check Method) or Step 3 (Voltage Check Method) as shown below.

FIG 1



2. Continuity Check Method

NOTE

When measuring for resistance, lightly shake the wire harness above and below or side to side.

Specification (Resistance)

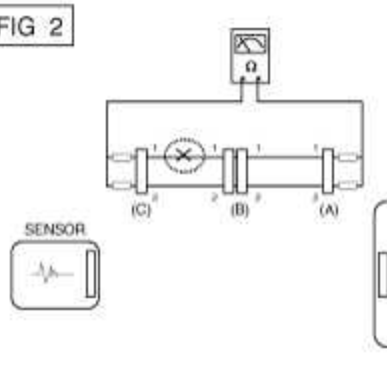
1Ω or less → Normal Circuit

1MΩ or Higher → Open Circuit

A. Disconnect connectors (A), (C) and measure resistance between connector (A) and (C) as shown in [FIG. 2].

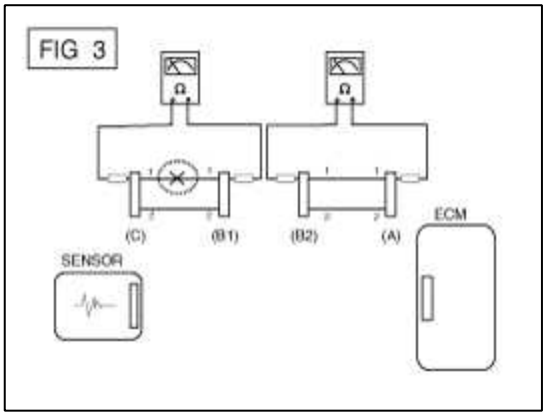
In [FIG.2.] the measured resistance of line 1 and 2 is higher than 1MΩ and below 1 Ω respectively. Specifically the open circuit is line 1 (Line 2 is normal). To find exact break point, check sub line of line 1 as described in next step.

FIG 2



B. Disconnect connector (B), and measure for resistance between connector (C) and (B1) and between (B2) and (A) as shown in [FIG. 3].
In this case the measured resistance between connector (C) and (B1) is higher than 1MΩ and the open circuit is between terminal 1 of connector (C) and terminal 1 of connector (B1).

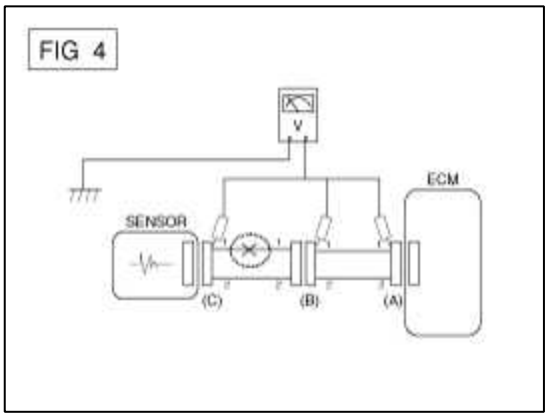
FIG 3



3. Voltage Check Method

A. With each connector still connected, measure the voltage between the chassis ground and terminal 1 of each connectors (A), (B) and (C) as shown in [FIG. 4].
The measured voltage of each connector is 5V, 5V and 0V respectively. So the open circuit is between connector (C) and (B).

FIG 4



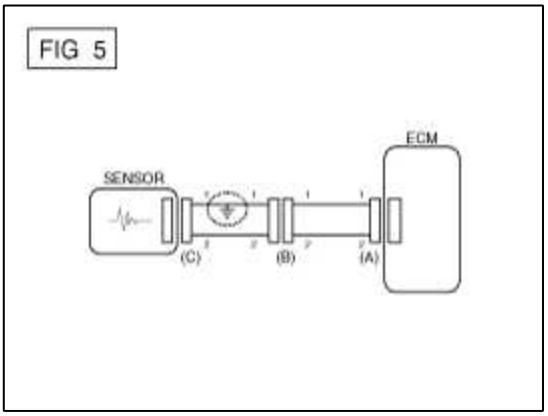
● Check Short Circuit

1. Test Method for Short to Ground Circuit

A. Continuity Check with Chassis Ground

If short to ground circuit occurs as shown in [FIG. 5], the broken point can be found by performing Step 2 (Continuity Check Method with Chassis Ground) as shown below.

FIG 5



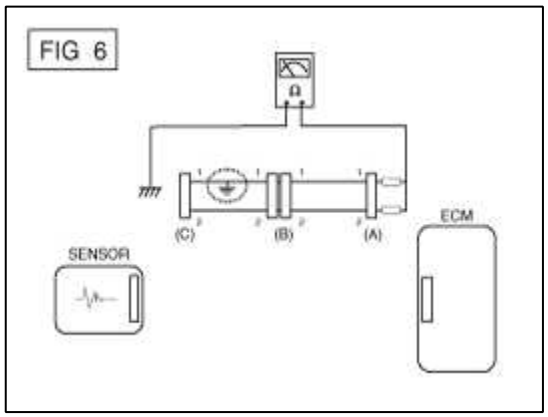
2. Continuity Check Method (with Chassis Ground)

NOTE

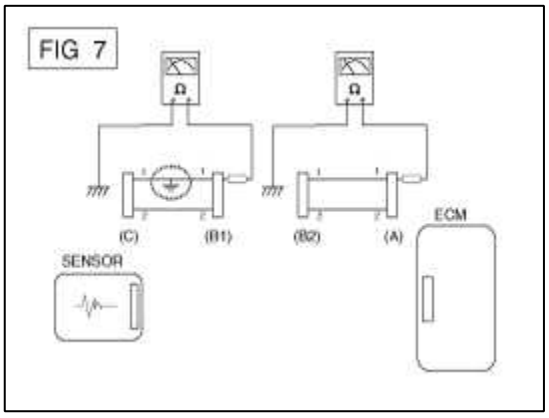
Lightly shake the wire harness above and below, or side to side when measuring the resistance.

Specification (Resistance)
1Ω or less → Short to Ground Circuit
1MΩ or Higher → Normal Circuit

A. Disconnect connectors (A), (C) and measure for resistance between connector (A) and Chassis Ground as shown in [FIG. 6].
The measured resistance of line 1 and 2 in this example is below 1 Ω and higher than 1MΩ respectively. Specifically the short to ground circuit is line 1 (Line 2 is normal). To find exact broken point, check the sub line of line 1 as described in the following step.



B. Disconnect connector (B), and measure the resistance between connector (A) and chassis ground, and between (B1) and chassis ground as shown in [FIG. 7].
The measured resistance between connector (B1) and chassis ground is 1Ω or less. The short to ground circuit is between terminal 1 of connector (C) and terminal 1 of connector (B1).



Symptom Troubleshooting Guide Chart

Main Symptom	Diagnostic Procedure	Also Check For
Unable to start (Engine does not turn over)	1. Test the battery. (Refer to Engine Electrical System - "Battery") 2. Test the starter. (Refer to Engine Electrical System - "Starter") 3. Inhibitor switch (A/T) or clutch start switch (M/T)	

Unable to start (Incomplete combustion)	1. Test the battery. (Refer to Engine Electrical System - "Battery") 2. Check the fuel pressure. (Refer to Fuel Delivery System - "Fuel Pressure Test") 3. Check the ignition circuit. (Refer to Engine Electrical System - "Ignition System") 4. Troubleshooting the immobilizer system. (Refer to Body Electrical System - "Immobilizer System") (In case of immobilizer lamp flashing)	• DTC • Low compression • Intake air leaks • Slipped or broken timing belt • Contaminated fuel
Difficult to start	1. Test the battery. (Refer to Engine Electrical System - "Battery") 2. Check the fuel pressure. (Refer to Fuel Delivery System - "Fuel Pressure Test") 3. Check the ECT sensor and circuit (Check DTC) 4. Check the ignition circuit. (Refer to Engine Electrical System - "Ignition System")	• DTC • Low compression • Intake air leaks • Contaminated fuel • Weak ignition spark
Poor idling (Rough, unstable or incorrect Idle)	1. Check the fuel pressure. (Refer to Fuel Delivery System - "Fuel Pressure Test") 2. Check the Injector. (Refer to Engine Control System - "Injector") 3. Check the long term fuel trim and short term fuel trim (Refer to CUSTOMER DATASTREAM) 4. Check the idle speed control circuit (Check DTC) 5. Inspect and test the Throttle Body 6. Check the ECT sensor and circuit (Check DTC)	• DTC • Low compression • Intake air leaks • Contaminated fuel • Weak ignition spark
Engine stall	1. Test the Battery. (Refer to Engine Electrical System - "Battery") 2. Check the fuel pressure. (Refer to Fuel Delivery System - "Fuel Pressure Test") 3. Check the idle speed control circuit (Check DTC) 4. . Check the ignition circuit. (Refer to Engine Electrical System-"IgnitionSystem") 5. Check the CKPS Circuit (Check DTC)	• DTC • Intake air leaks • Contaminated fuel • Weak ignition spark
Poor driving (Surge)	1. Check the fuel pressure. (Refer to Fuel Delivery System - "Fuel Pressure Test") 2. Inspect and test Throttle Body 3. Check the ignition circuit. (Refer to Engine Electrical System - "Ignition System") 4. Check the ECT Sensor and Circuit (Check DTC) 5. Test the exhaust system for a possible restriction. (Refer to Engine Mechanical System - "Exhaust Manifold") 6. Check the long term fuel trim and short term fuel trim (Refer to CUSTOMER DATASTREAM)	• DTC • Low compression • Intake air leaks • Contaminated fuel • Weak ignition spark

Knocking	1. Check the fuel pressure. (Refer to Fuel Delivery System - "Fuel Pressure Test") 2. Inspect the engine coolant. (Engine Mechanical System - "Radiator") 3. Inspect the radiator and the electric cooling fan. (Engine Mechanical System - "Radiator") 4. Check the spark plugs. (Refer to Engine Electrical System - "Ignition System")	• DTC • Contaminated fuel
Poor fuel economy	1. Check customer's driving habits • Is A/C on full time or the defroster mode on? • Are tires at correct pressure? • Is excessively heavy load being carried? • Is acceleration too much, too often? 2. Check the fuel pressure. (Refer to Fuel Delivery System - "Fuel Pressure Test") 3. Check the injector. (Refer to Engine Control System - "Injector") 4. Test the exhaust system for a possible restriction 5. Check the ECT sensor and circuit	• DTC • Low compression • Intake air leaks • Contaminated fuel • Weak ignition spark
Hard to refuel (Overflow during refueling)	1. Test the canister close valve. (Refer to Fuel Delivery System - "Canister Close Valve) 2. Inspect the fuel filler hose/pipe • Pinched, kinked or blocked? • Filler hose is torn 3. Inspect the fuel tank vapor vent hose between the EVAP. canister and air filter 4. Check the EVAP. canister	• Malfunctioning gas station filling nozzle (If this problem occurs at a specific gas station during refueling)

Fuel System > Engine Control System > Description and Operation

Description

If the Gasoline Engine Control system components (sensors, ECM, injector, etc.) fail, interruption to the fuel supply or failure to supply the proper amount of fuel for various engine operating conditions will result. The following situations may be encountered.

1. Engine is hard to start or does not start at all.
2. Unstable idle.
3. Poor driveability

If any of the above conditions are noted, first perform a routine diagnosis that includes basic engine checks (ignition system malfunction, incorrect engine adjustment, etc.). Then, inspect the Gasoline Engine Control system components with the HI-SCAN (Pro).

NOTE

- Before removing or installing any part, read the diagnostic trouble codes and then disconnect the battery negative (-) terminal.
- Before disconnecting the cable from battery terminal, turn the ignition switch to OFF. Removal or connection of the battery cable during engine operation or while the ignition switch is ON could cause damage to the ECM.
- The control harnesses between the ECM and heated oxygen sensor are shielded with the shielded ground wires to the body in order to prevent the influence of ignition noises and radio interference. When the shielded wire is faulty, the control harness must be replaced.
- When checking the generator for the charging state, do not disconnect the battery '+' terminal to prevent the ECM from damage due to the voltage.
- When charging the battery with the external charger, disconnect the vehicle side battery terminals to prevent damage to the ECM.

Malfunction Indicator Lamp (MIL)

[EOBD]

A malfunction indicator lamp illuminates to notify the driver that there is a problem with the vehicle. However, the MIL will go off automatically after 3 subsequent sequential driving cycles without the same malfunction. Immediately after the ignition switch is turned on (ON position - do not start), the MIL will illuminate continuously to indicate that the MIL operates normally.

Faults with the following items will illuminate the MIL.

- Catalyst
- Fuel system
- Manifold Absolute Pressure Sensor (MAPS)
- Intake Air Temperature Sensor (IATS)
- Engine Coolant Temperature Sensor (ECTS)
- Throttle Position Sensor (TPS)
- Upstream Oxygen Sensor
- Upstream Oxygen Sensor Heater
- Downstream Oxygen Sensor
- Downstream Oxygen Sensor Heater
- Injector
- Misfire
- Crankshaft Position Sensor (CKPS)
- Camshaft Position Sensor (CMPS)
- Evaporative Emission Control System
- Vehicle Speed Sensor (VSS)
- ETC Motor [integrated into ETC module]
- Power Supply
- ECM/ PCM
- MT/AT Encoding
- Acceleration Sensor
- MIL-on Request Signal
- Power Stage

NOTE

Refer to "Inspection Chart For Diagnostic Trouble Codes (DTC)" for more information.

[NON-EOBD]

A malfunction indicator lamp illuminates to notify the driver that there is a problem with the vehicle. However, the

MIL will go off automatically after 3 subsequent sequential driving cycles without the same malfunction. Immediately after the ignition switch is turned on (ON position - do not start), the MIL will illuminate continuously to indicate that the MIL operates normally.

Faults with the following items will illuminate the MIL

- Heated oxygen sensor (HO2S)
- Manifold Absolute Pressure Sensor (MAPS)
- Throttle position sensor (TPS) [integrated into ETC module]
- Engine coolant temperature sensor (ECTS)
- ETC Motor [integrated into ETC module]
- Injectors
- ECM

NOTE

Refer to "Inspection Chart For Diagnostic Trouble Codes (DTC)" for more information.

[INSPECTION]

1. After turning ON the ignition key, ensure that the light illuminates for about 5 seconds and then goes out.
2. If the light does not illuminate, check for an open circuit in the harness, a blown fuse or a blown bulb.

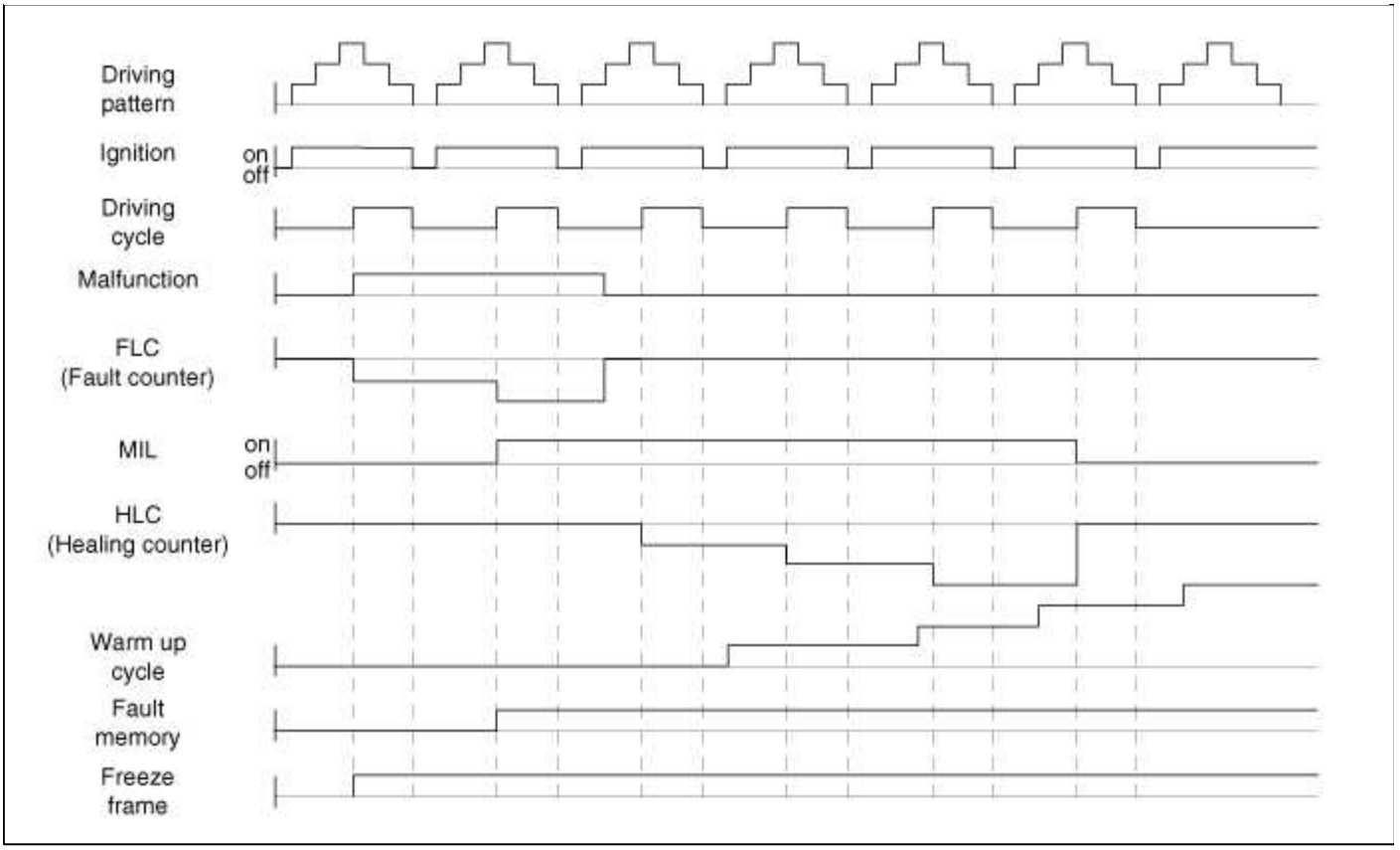
Self-Diagnosis

The ECM monitors the input/output signals (some signals at all times and the others under specified conditions). When the ECM detects an irregularity, it records the diagnostic trouble code, and outputs the signal to the Data Link connector. The diagnosis results can be read with the MIL or HI-SCAN (Pro). Diagnostic Trouble Codes (DTC) will remain in the ECM as long as battery power is maintained. The diagnostic trouble codes will, however, be erased when the battery terminal or ECM connector is disconnected, or by the HI-SCAN (Pro).

NOTE

If a sensor connector is disconnected with the ignition switch turned on, the diagnostic trouble code (DTC) is recorded. In this case, disconnect the battery negative terminal (-) for 15 seconds or more, and the diagnosis memory will be erased.

The Relation Between DTC And Driving Pattern In EOBD System



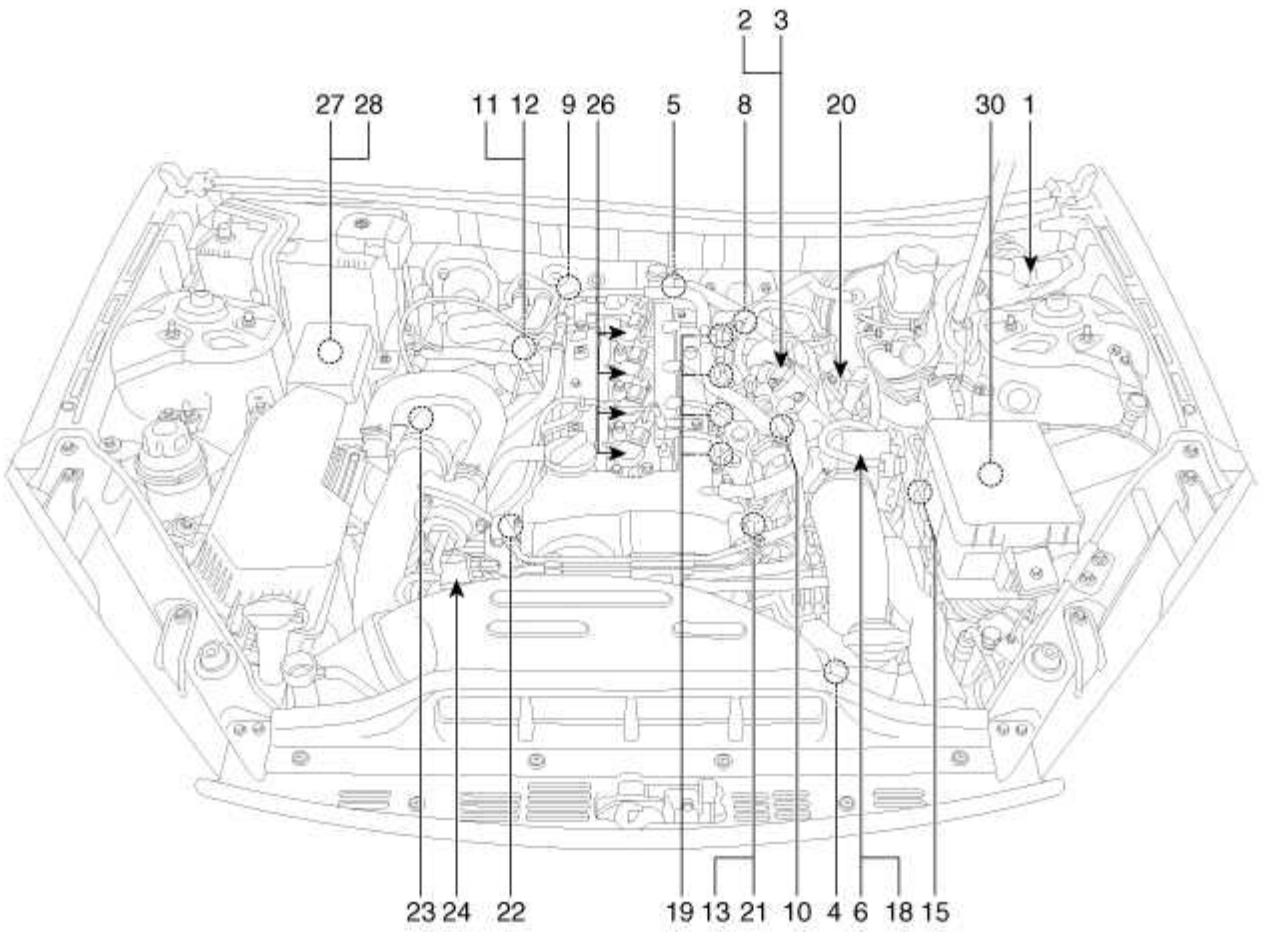
1. When the same malfunction is detected and maintained during two sequential driving cycles, the MIL will automatically illuminate.
2. The MIL will go off automatically if no fault is detected after 3 sequential driving cycles.
3. A Diagnostic Trouble Code(DTC) is recorded in ECM memory when a malfunction is detected after two sequential driving cycles. The MIL will illuminate when the malfunction is detected on the second driving cycle. If a misfire is detected, a DTC will be recorded, and the MIL will illuminate, immediately after a fault is first detected.
4. A Diagnostic Trouble Code(DTC) will automatically erase from ECM memory if the same malfunction is not detected for 40 driving cycles.

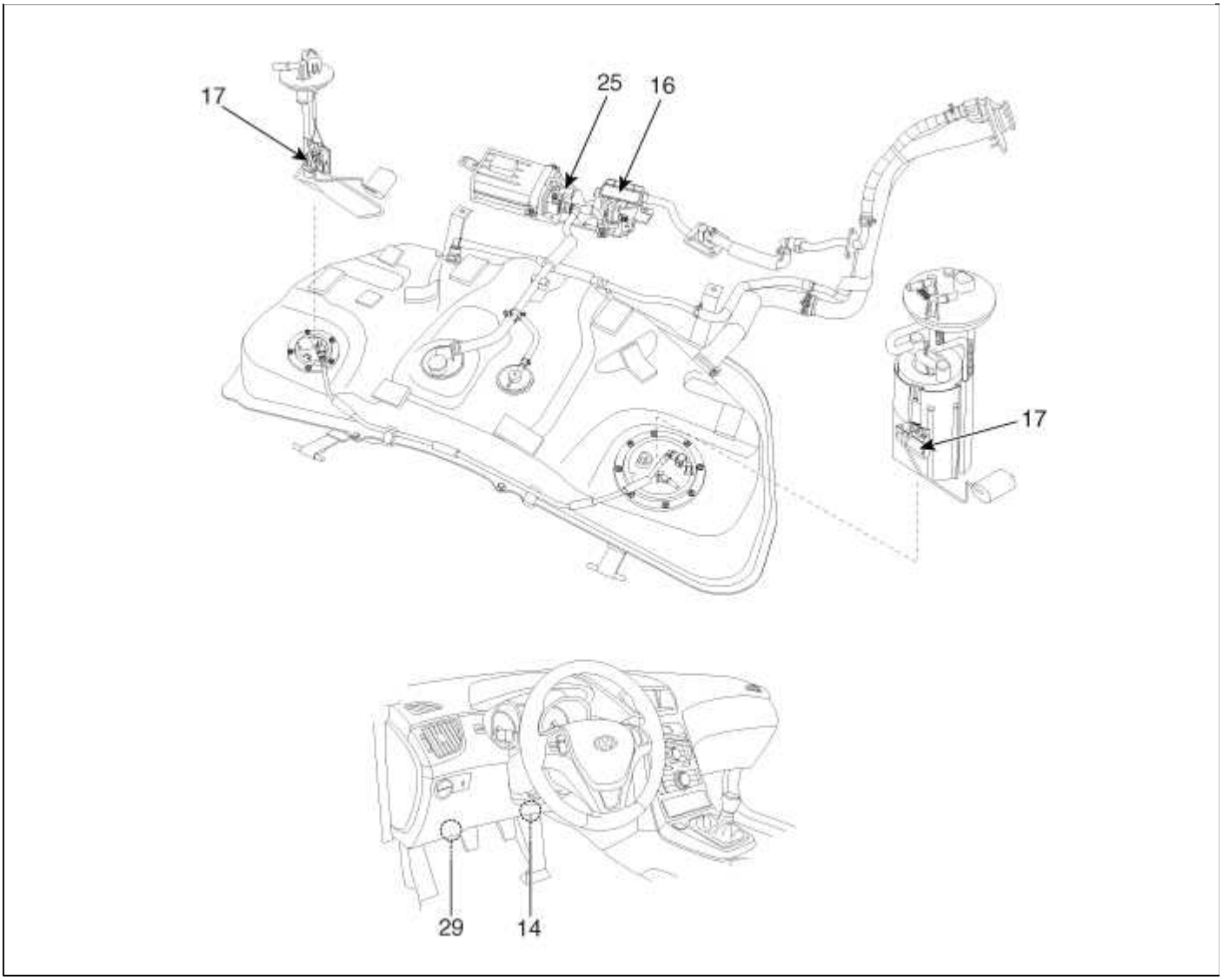
NOTE

- A "warm-up cycle" means sufficient vehicle operation such that the coolant temperature has risen by at least 40 degrees Fahrenheit from engine starting and reaches a minimum temperature of 160 degress Fahrenheit.
- A "driving cycle" consists of engine startup, vehicle operation beyond the beginning of closed loop operation.

Fuel System > Engine Control System > Components and Components Location

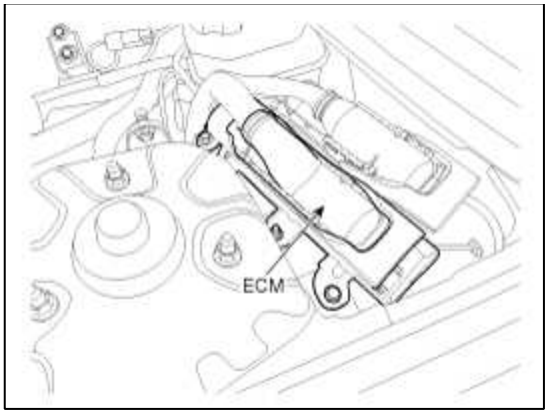
Components Location

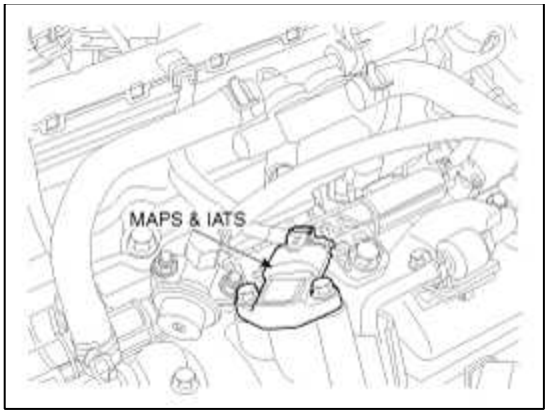

2 3
27 28
11 12
9 26
5
8
20
30 1
23 24
22
19
13 21
10
4
6
18 15



1. Engine Control Module (ECM) 2. Manifold Absolute Pressure Sensor (MAPS) 3. Intake Air Temperature Sensor (IATS) 4. Boost Pressure Sensor (BPS) 5. Engine Coolant Temperature Sensor (ECTS) 6. Throttle Position Sensor (TPS) [integrated into ETC Module] 7. Crankshaft Position Sensor (CKPS) 8. Camshaft Position Sensor (CMPS) [Bank 1 / Intake] 9. Camshaft Position Sensor (CMPS) [Bank 1 / Exhaust] 10. Knock Sensor (KS) 11. Heated Oxygen Sensor (HO2S) [Bank 1 / Sensor 1] 12. Heated Oxygen Sensor (HO2S) [Bank 1 / Sensor 2] 13. CVVT Oil Temperature Sensor (OTS) 14. Accelerator Position Sensor (APS) 15. A/C Pressure Transducer (APT)	16. Fuel Tank Pressrue Sensor (FTPS) 17. Fuel Level Sensor (FLS) 18. ETC Motor [integrated into ETC Module] 19. Injector 20. Purge Control Solenoid Valve (PCSV) 21. CVVT Oil Control Valve (OCV) [Bank 1 / Intake] 22. CVVT Oil Control Valve (OCV) [Bank 1 / Exhaust] 23. Electric Waste Gate Actuator (EWGA) 24. RCV Control Solenoid Valve 25. Canister Close Valve (CCV) 26. Ignition Coil 27. Main Relay 28. Fuel Pump Relay 29. Data Link Connector (DLC) [16 Pin] 30. Multi-Purpose Check Connector [20 Pin]

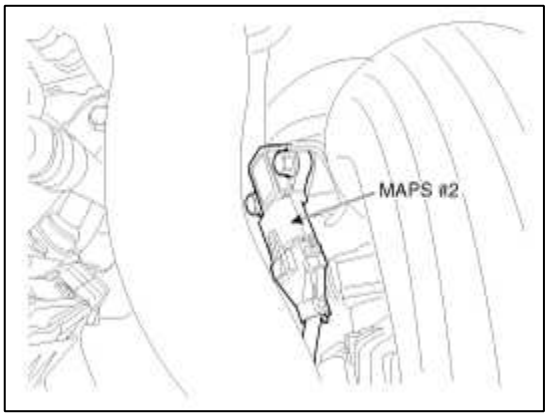
1. Engine Control Module (ECM)	2. Manifold Absolute Pressure Sensor (MAPS) 3. Intake Air Temperature Sensor (IATS)

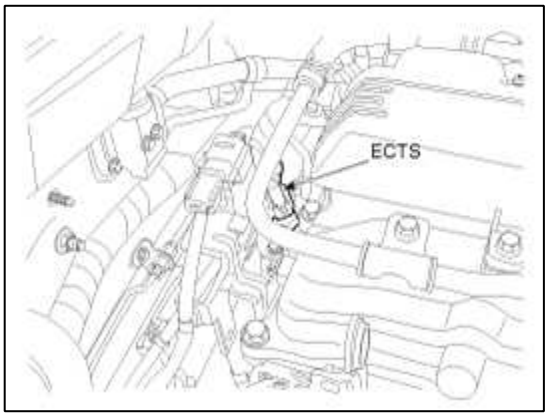




4. Boost Pressure Sensor (BPS)

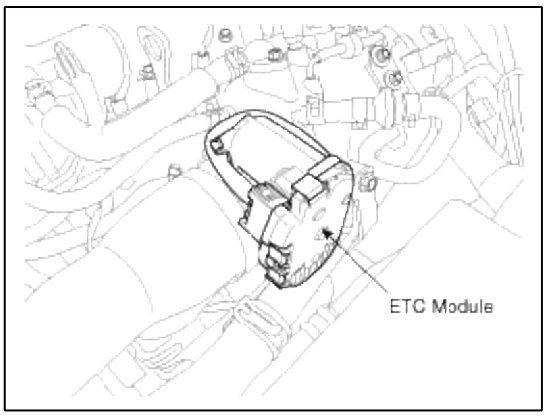
5. Engine Coolant Temperature Sensor (ECTS)

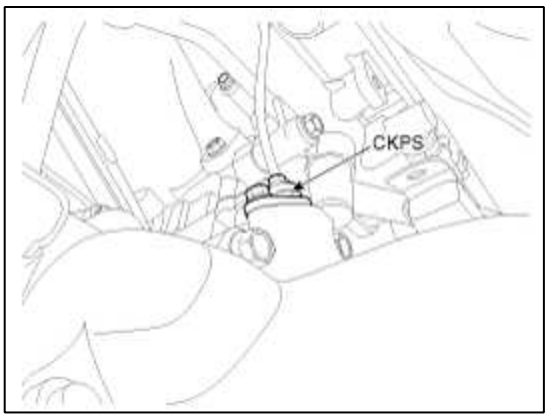




6. Throttle Position Sensor (TPS) [integrated into ETC Module]
18. ETC Motor [integrated into ETC Module]

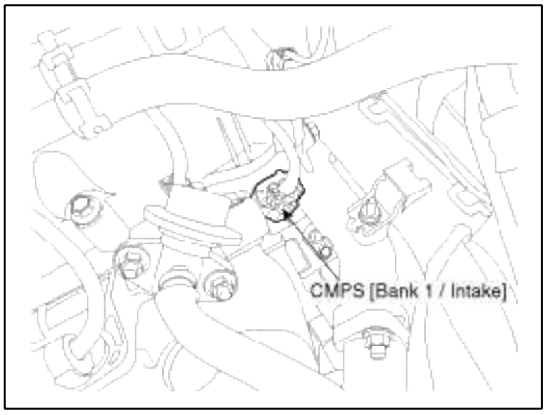
7. Crankshaft Position Sensor (CKPS)

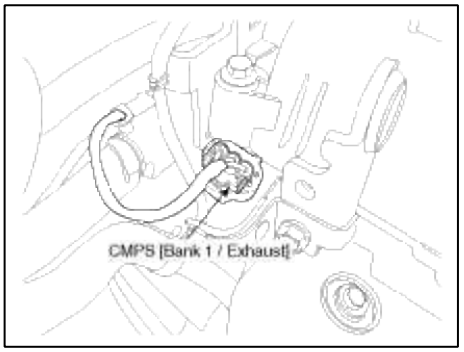


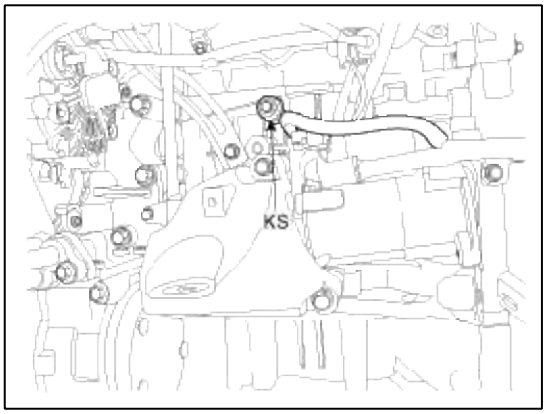
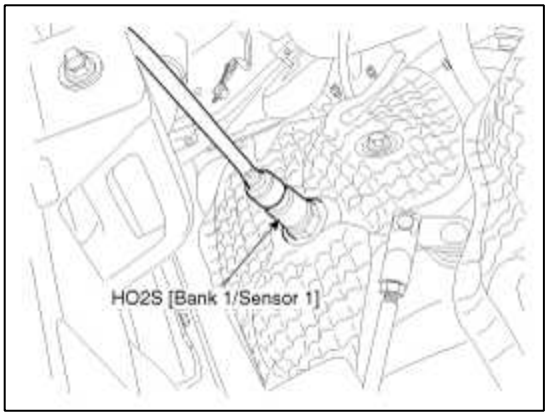
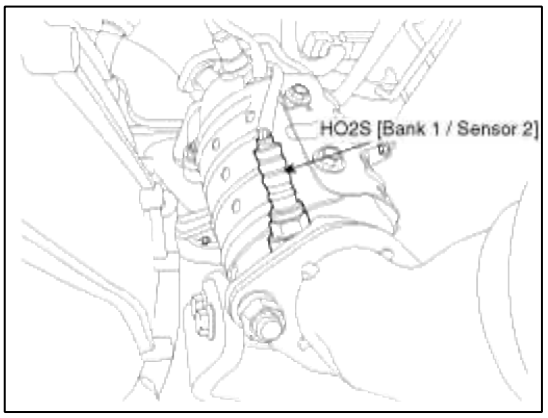
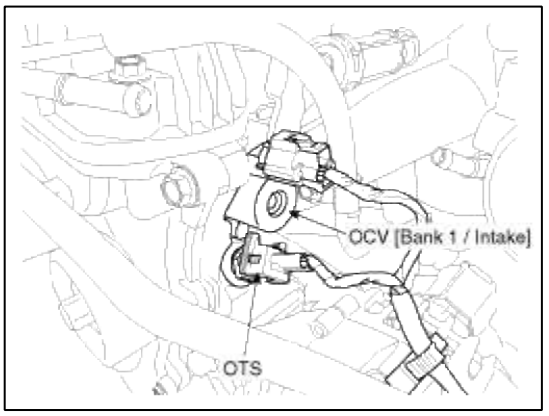
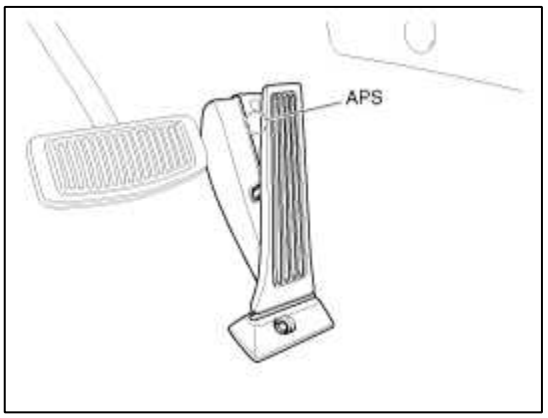
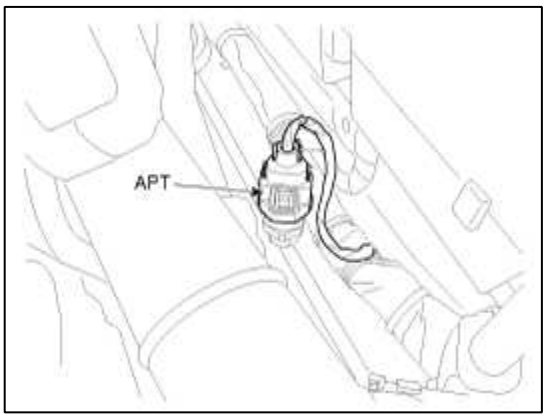


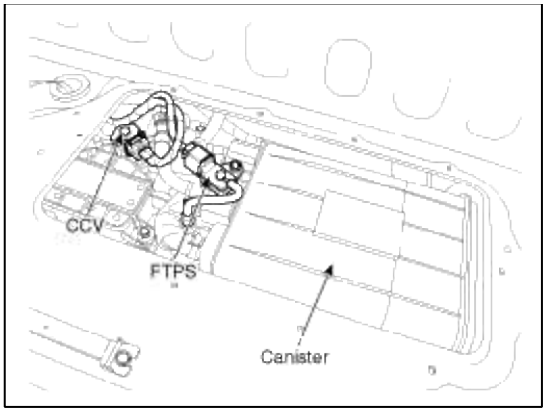
8. Camshaft Position Sensor (CMPS) [Bank 1 / Intake]

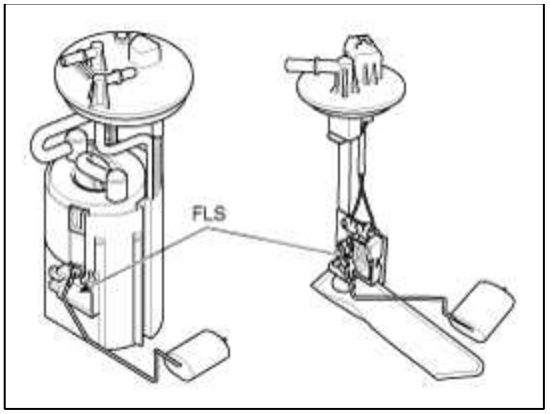
9. Camshaft Position Sensor (CMPS) [Bank 1 / Exhaust]





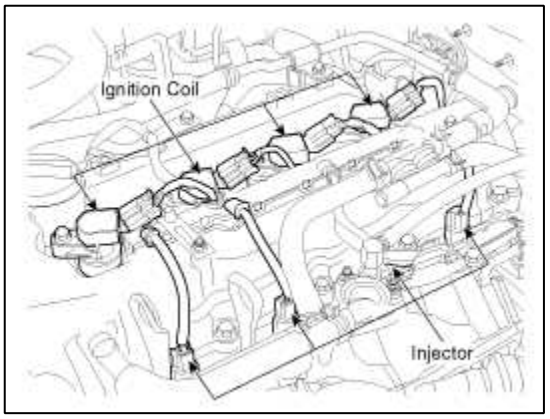
10. Knock Sensor (KS)	11. Heated Oxygen Sensor (HO2S) [Bank 1 / Sensor 1]
	
12. Heated Oxygen Sensor (HO2S) [Bank 1 / Sensor 2]	13. CVVT Oil Temperature Sensor (OTS) 21. CVVT Oil Control Valve (OCV) [Bank 1 / Intake]
	
14. Accelerator Position Sensor (APS)	15. A/C Pressure Transducer (APT)
	
16. Fuel Tank Pressrue Sensor (FTPS) 25. Canister Close Valve (CCV)	17. Fuel Level Sensor (FLS)

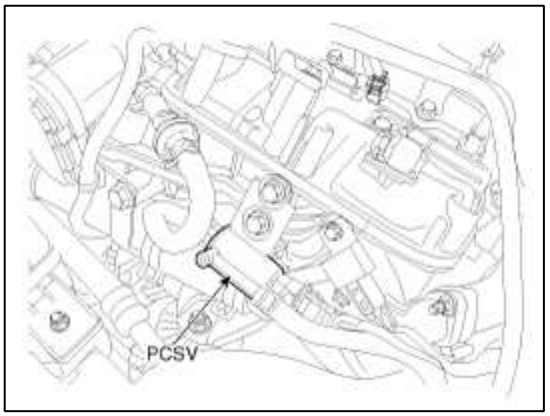




19. Injector
26. Ignition Coil

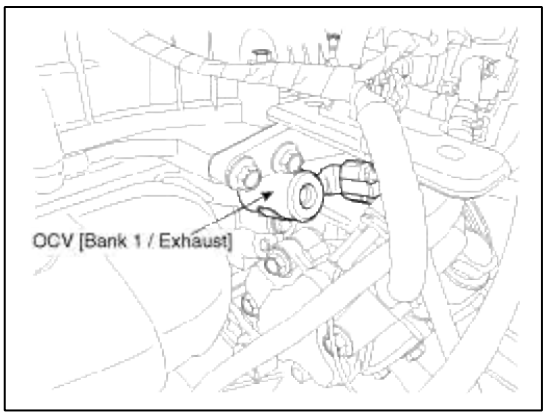
20. Purge Control Solenoid Valve (PCSV)

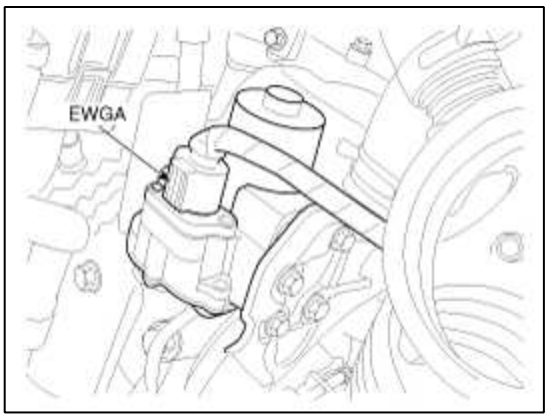




22. CVVT Oil Control Valve (OCV) [Bank 1 / Exhaust]

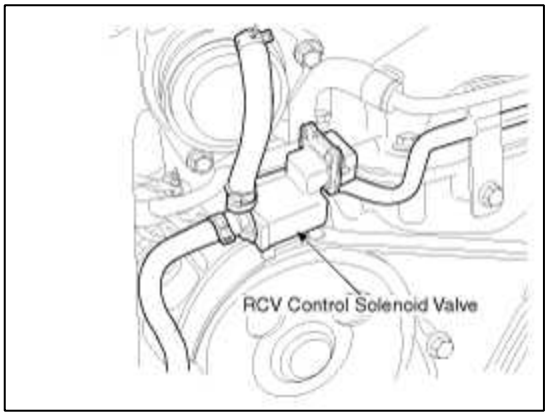
23. Electric Waste Gate Actuator (EWGA)

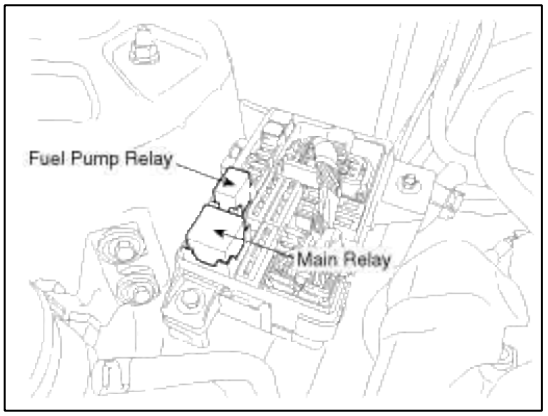


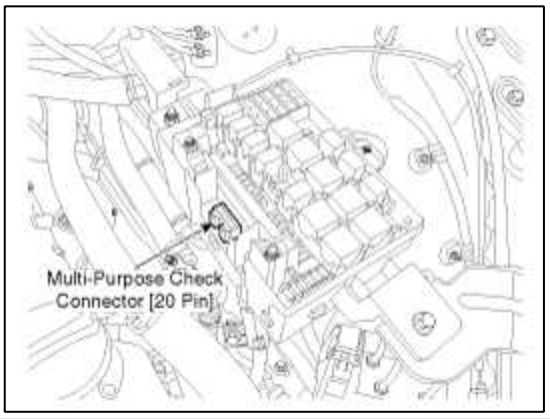


24. RCV Control Solenoid Valve

27. Main Relay
28. Fuel Pump Relay



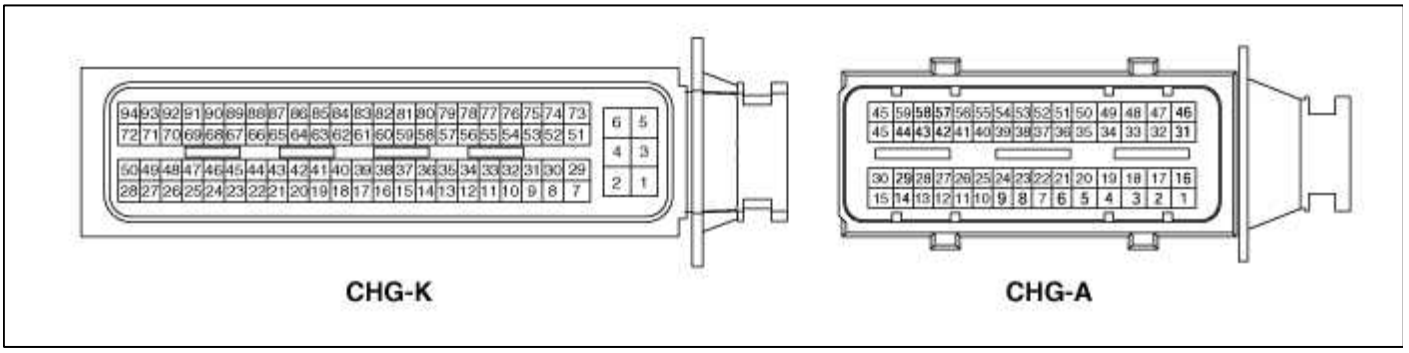


30. Multi-Purpose Check Connector [20 Pin]	
	

Fuel System > Engine Control System > Engine Control Module (ECM) > Schematic Diagrams

ECM Terminal And Input/Output signal

ECM Harness Connector



ECM Terminal Function

Connector [CHG-K]

Pin No.	Description	Connected to
1	Power ground	Chassis Ground
2	Battery power (B+)	Ignition Switch
3	Power ground	Chassis Ground
4	Battery power (B+)	Main Relay
5	Power ground	Chassis Ground
6	Battery power (B+)	Battery
7	-	
8	Fuel Level Sensor (FLS) [MIDDLE] singal input	Fuel Level Sensor (FLS)
9	Fuel Level Sensor (FLS) [TOTAL] singal input	Fuel Level Sensor (FLS)
10	Boost Pressure Sensor (BPS)	Boost Pressure Sensor (BPS)
11	Sensor ground	Boost Pressure Sensor (BPS)
12	Knock Sensor (KS) signal input	Knock Sensor (KS)
13	Sensor ground	Accelerator Position Sensor (APS) 2

14	Sensor ground	Engine Coolant Temperature Sensor (ECTS)
15	Camshaft Position Sensor (CMPS) [Bank 1/Exhaust] signal input	Camshaft Position Sensor (CMPS) [Bank 1/Exhaust]
16	Sensor ground	Electric Waste Gate Actuator (EWGA)
17	Crankshaft Position Sensor (CKPS) signal input	Crankshaft Position Sensor (CKPS)
18	Rc/Rp (Pump Cell Voltage)	Heated Oxygen Sensor [Bank 1/Sensor 1]
19	VS+ (NERNST Cell Voltage)	Heated Oxygen Sensor [Bank 1/Sensor 1]
20	VS-/IP- (Common Ground for VS, IP)	Heated Oxygen Sensor [Bank 1/Sensor 1]
21	-	
22	Electric Waste Gate Actuator (EWGA) Feed beck signal	Electric Waste Gate Actuator (EWGA)
23	-	
24	-	
25	Injector (Cylinder #1) control output	Injector (Cylinder #1)
26	Injector (Cylinder #3) control output	Injector (Cylinder #3)
27	Injector (Cylinder #4) control output	Injector (Cylinder #4)
28	Injector (Cylinder #2) control output	Injector (Cylinder #2)
29	-	
30	Sensor power (+5V)	Manifold Absolute Pressure Sensor (MAPS)
31	Manifold Absolute Pressure Sensor (MAPS) signal input	Manifold Absolute Pressure Sensor (MAPS)
32	Throttle Position Sensor (TPS) 2 signal input	Throttle Position Sensor (TPS) 2
33	Engine Coolant Temperature Sensor (ECTS) signal input	Engine Coolant Temperature Sensor (ECTS)
34	Sensor ground	Knock Sensor (KS)
35	Accelerator Position Sensor (APS) 2 signal input	Accelerator Position Sensor (APS) 2
36	Sensor power (+5V)	Accelerator Position Sensor (APS) 2
37	Sensor ground	Camshaft Position Sensor (CMPS) [Bank 1/Exhaust]
38	-	
39	Sensor ground	Crankshaft Position Sensor (CKPS)
40	Vehicle speed signal input	ABS/VDC Control Unit
41	-	
42	Rc (Compensative Resistance)	Heated Oxygen Sensor [Bank 1/Sensor 1]
43	Sensor power (+5V)	Electric Waste Gate Actuator (EWGA), Boost Pressure Sensor (BPS), A/C Pressure Transducer (APT), Fuel Tank Pressure Sensor (FTPS)

44	-	
45	-	
46	-	
47	-	
48	RCV Control Solenoid Valve control output	RCV Control Solenoid Valve
49	-	
50	-	
51	Battery power (B+)	Main Relay
52	Sensor ground	Fuel Tank Pressure Sensor (FTPS)
53	Intake Temperature Sensor (IATS) signal input	Intake Temperature Sensor (IATS)
54	A/C Pressure Transducer (APT) signal input	A/C Pressure Transducer (APT)
55	-	
56	-	
57	Sensor ground	A/C Pressure Transducer (APT)
58	CVVT Oil Temperature Sensor (OTS) signal input	CVVT Oil Temperature Sensor (OTS)
59	Sensor ground	Throttle Position Sensor (TPS) 1,2
60	Sensor power (+5V)	Accelerator Position Sensor (APS) 1
61	Sensor ground	Accelerator Position Sensor (APS) 1
62	Camshaft Position Sensor (CMPS) [Bank 1/Intake] signal input	Camshaft Position Sensor (CMPS) [Bank 1/Intake]
63	Sensor power (+5V)	Throttle Position Sensor (TPS) 1,2
64	Main Relay control output	Main Relay
65	Cooling Fan Relay [Low] control output	Cooling Fan Relay [Low]
66	CVVT Oil Control (OCV) Valve [Bank 1/Intake] control output	CVVT Oil Control Valve (OCV) [Bank 1/Intake]
67	Purge Control Solenoid Valve (PCSV) control output	Purge Control Solenoid Valve (PCSV)
68	CVVT Oil Control (OCV) Valve [Bank 1/Exhaust] control output	CVVT Oil Control Valve (OCV) [Bank 1/Exhaust]
69	Immobilizer Lamp control output	Immobilizer Lamp
70	Fuel Pump Relay control output	Fuel Pump Relay
71	ETC Motor [+] control output	ETC Motor
72	ETC Motor [-] control output	ETC Motor
73	Fuel Tank Pressure Sensor (FTPS) signal input	Fuel Tank Pressure sensor (FTPS)
74	Sensor ground	Manifold Absolute Pressure Sensor (MAPS)
75	Immobilizer communication line	Smart Key Control Module
76	-	

77	CAN [High]	Other control module, Data Link Connector (DLC), Multi-Purpose Check Connector
78	CAN [Low]	Other control module, Data Link Connector (DLC), Multi-Purpose Check Connector
79	Sensor ground	CVVT Oil Temperature Sensor (OTS)
80	Throttle Position Sensor (TPS) 1 signal input	Throttle Position Sensor (TPS) 1
81	-	
82	Accelerator Position Sensor (APS) 1 signal input	Accelerator Position Sensor (APS) 1
83	Sensor ground	Camshaft Position Sensor (CMPS) [Bank 1/Intake]
84	Heated Oxygen Sensor (HO2S) [Bank 1/Sensor 2] signal input	Heated Oxygen Sensor (HO2S) [Bank 1/Sensor 2]
85	Sensor ground	Heated Oxygen Sensor (HO2S) [Bank 1/Sensor 2]
86	Engine speed signal output	Power Distribution Module (PDM)
87	-	
88	Cooling Fan Relay [High] control output	Cooling Fan Relay [High]
89	-	
90	-	
91	Canister Close Valve (CCV) control output	Canister Close Valve (CCV)
92	-	
93	Heated Oxygen Sensor (HO2S) [Bank 1/Sensor 1] Heater control output	Heated Oxygen Sensor (HO2S) [Bank 1/Sensor 1]
94	Heated Oxygen Sensor (HO2S) [Bank 1/Sensor 2] Heater control output	Heated Oxygen Sensor (HO2S) [Bank 1/Sensor 2]

Connector [CHG-A]

Pin No.	Description	Connected to
1	Ignition Coil (Cylinder #4) control output [With Immobilizer]	Ignition Coil (Cylinder #4) [With Immobilizer]
	Ignition Coil (Cylinder #1) control output [Without Immobilizer]	Ignition Coil (Cylinder #1) [Without Immobilizer]
2	Shield	Ignition Coil (Cylinder #1,2,3,4)
3	-	
4	-	
5	-	
6	-	
7	-	
8	-	
9	-	

10	-	
11	-	
12	-	
13	-	
14	Alternator (FR)	Alternator
15	Ground	Cruise Control Switch
16	Ignition Coil (Cylinder #2) control output [With Immobilizer]	Ignition Coil (Cylinder #2) [With Immobilizer]
	Ignition Coil (Cylinder #3) control output [Without Immobilizer]	Ignition Coil (Cylinder #3) [Without Immobilizer]
17	-	
18	-	
19	-	
20	-	
21	-	
22	-	
23	-	
24	-	
25	-	
26	-	
27	-	
28	-	
29	Brake Switch 1 signal input	Brake Switch
30	Cruise Control Switch signal input	Cruise Control Switch
31	Ignition Coil (Cylinder #1) control output [With Immobilizer]	Ignition Coil (Cylinder #1) [With Immobilizer]
	Ignition Coil (Cylinder #4) control output [Without Immobilizer]	Ignition Coil (Cylinder #4) [Without Immobilizer]
32	-	
33	-	
34	-	
35	-	
36	-	
37	-	
38	-	
39	-	
40	-	

41	-	
42	-	
43	Clutch Switch signal input	Clutch Switch
44	Brake Switch 2 signal input	Brake Switch
45	Electric Waste Gate Actuator (EWGA) DC Motor output (+)	Electric Waste Gate Actuator (EWGA)
46	Ignition Coil (Cylinder #3) control output [With Immobilizer]	Ignition Coil (Cylinder #3) [With Immobilizer]
	Ignition Coil (Cylinder #2) control output [Without Immobilizer]	Ignition Coil (Cylinder #2) [Without Immobilizer]
47	-	
48	-	
49	-	
50	-	
51	-	
52	-	
53	-	
54	-	
55	-	
56	-	
57	-	
58	Power Steering Switch signal input	Power Steering Switch
59	-	
60	Electric Waste Gate Actuator (EWGA) DC Motor output (-)	Electric Waste Gate Actuator (EWGA)

ECM Terminal Input/ Output signal

Connector [CHG-K]

Pin No.	Description	Condition	Type	Level
1	Power ground	Idle	DC	- 0.3 ~ 0.5V
2	Battery power (B+)	IG OFF	DC	Max. 0.5V
		IG ON		Battery Voltage (8 ~ 16V)
3	Power ground	Idle	DC	Max. 50mV
4	Battery power (B+)	IG OFF	DC	Max. 1.0V
		IG ON		Battery Voltage (8 ~ 16V)
5	Power ground	Idle	DC	- 0.3 ~ 0.5V

6	Battery power (B+)	Always (Without Ignition key)	DC	Battery Voltage (8 ~ 16V)
7	-			
8	Fuel Level Sensor (FLS) [MIDDLE] singal input			
9	Fuel Level Sensor (FLS) [TOTAL] singal input			
10	Boost Pressure Sensor (BPS) signal input	Idle	Analog	- 0.3 ~ 5.2V
11	Sensor ground	Idle	DC	- 0.3 ~ 0.5V
12	Knock Sensor (KS) signal input	Knocking	Variable	0.18 ~ 0.3V
		Normal	Frequency	0 V
13	Sensor ground	Idle	DC	- 0.3 ~ 0.5V
14	Sensor ground	Idle	DC	- 0.3 ~ 0.5V
15	Camshaft Position Sensor (CMPS) [Bank 1/Exhaust] signal input	Idle	Pulse (Digital)	HI: 4.5 ~ 5.5V LO: - 0.3 ~ 0.5V FREQ: 7Hz (850 rpm) 25Hz (300 rpm)
16	Sensor ground	Idle	DC	- 0.3 ~ 0.5V
17	Crankshaft Position Sensor (CKPS) signal input	Idle	Pulse (Digital)	HI: 4.5 ~ 5.5V LO: - 0.3 ~ 0.5V FREQ: 7Hz (850 rpm) 25Hz (300 rpm)
18	Rc/Rp (Pump Cell Voltage) signal input	Idle	Analog	- 0.3 ~ 5.2V
19	VS+ (NERNST Cell Voltage) signal input	Idle	Analog	- 0.3 ~ 5.2V
20	VS-/IP- (Common Ground for VS, IP) signal input	Idle	Analog	- 0.3 ~ 5.2V
21	-			
22	Electric Waste Gate Actuator (EWGA) Feed beck signal	Idle	Analog	- 0.3 ~ 5.2V
23	-			
24	Start Relay Control (Signal output)	IG ON	DC	- 0.3V ~ 1.2V
		IG OFF		Battery voltage
		IG ON/ OFF		Voltage peak: 42 ~ 60V
				HI: Battery Voltage
				LO: Max. 1.0V

25	Injector (Cylinder #1) control output [signal output]	Idle	Pulse	Voltage peak: Max. 55V
				Frequency: 2kHz
				Dwell Time: 2.0ms
26	Injector (Cylinder #3) control output [signal output]	Idle	Pulse	HI: Battery Voltage
				LO: Max. 1.0V
				Voltage peak: Max. 55V
				Frequency: 2kHz
				Dwell Time: 2.0ms
27	Injector (Cylinder #4) control output [signal output]	Idle	Pulse	HI: Battery Voltage
				LO: Max. 1.0V
				Voltage peak: Max. 55V
				Frequency: 2kHz
				Dwell Time: 2.0ms
28	Injector (Cylinder #2) control output [signal output]	Idle	Pulse	HI: Battery Voltage
				LO: Max. 1.0V
				Voltage peak: Max. 55V
				Frequency: 2kHz
				Dwell Time: 2.0ms
29	-			
30	Sensor power (+5V) [signal output]	IG OFF	DC	Max. 0.5V
		IG ON		4.75 ~ 5.25V
31	Manifold Absolute Pressure Sensor (MAPS) signal input	Idle	Analog	- 0.3 ~ 5.2V
32	Throttle Position Sensor (TPS) 2 signal input	C.T	Analog	- 0.3 ~ 5.2V
		W.O.T		
33	Engine Coolant Temperature Sensor (ECTS) signal input	Idle	Analog	- 0.3 ~ 5.2V
34	Sensor ground	Idle	DC	- 0.3 ~ 0.5V
35	Accelerator Position Sensor (APS) 2 signal input	C.T	Analog	- 0.3 ~ 5.2V
		W.O.T		
36	Sensor power (+5V) [signal output]	IG OFF	DC	Max. 0.5V
		IG ON		4.75 ~ 5.25V
37	Sensor ground	Idle	DC	- 0.3 ~ 5.2V
38	-			

39	Sensor ground	Idle	DC	- 0.3 ~ 5.2V
40	Vehicle speed signal input	Vehicle Run	Frequency (Digital)	HI: Min. 4.0 ~ 5.2V
				LO: Max. - 0.3 ~ 1.0V
				Frequency (Drive 60km/h) - ABS ECU type: About 499Hz) - Grear box type: About 43Hz)
				Duty(-): 40 ~ 60%
41	-			
42	Rc (Compensative Resistance) signal input	Idle	Analog	- 0.3 ~ 5.2V
43	Sensor power (+5V) [signal input]	IG OFF	DC	Max. 0.5V
		IG ON		4.75 ~ 5.25V
44	-			
45	-			
46	-			
47	-			
48	RCV Control Solenoid Valve control (Signal output)	IG ON	DC	- 0.3 ~ 1.2V
		IG OFF		Battery voltage
		IG ON/ OFF		Voltage peak: 42 ~ 60V
49	-			
50	-			
51	Battery power (B+)	IG OFF	DC	Max. 1.0V
		IG ON		Battery Voltage
52	Sensor ground			
53	Intake Air Temperature Sensor (IATS) signal input	Idle	Analog	0 ~ 5.0V
54	A/C Pressure Transducer (APT) signal input	Idle	Analog	- 0.3 ~ 5.2V
55	-			
56	-			
57	Sensor ground	Idle	DC	- 0.3 ~ 5.2V
58	CVVT Oil Temperature Sensor (OTS) signal input	Idle	Analog	- 0.3 ~ 5.2V
59	Sensor ground	Idle	DC	- 0.3 ~ 0.5V
60	Sensor power (+5V) [signal input]	IG OFF	DC	Max. 0.5V
		IG ON		4.75 ~ 5.25V

61	Sensor ground	Idle	DC	- 0.3 ~ 0.5V
62	Camshaft Position Sensor (CMPS) [Bank 1/Intake] signal input	Idle	Pulse (Digital)	HI: 4.5 ~ 5.0V LO: 0.3 ~ 0.5V Frequency: 7Hz (850 rpm) 25Hz (300 rpm)
63	Sensor power (+5V) [signal input]	IG OFF	DC	Max. 0.5V
		IG ON		4.75 ~ 5.25V
64	Main Relay control output [signal input]	Relay OFF	DC	Battery Voltage
		Relay ON		- 0.3 ~ 1.2V
		Relay ON/OFF		Voltage peak: 4.2 ~ 6.0V
65	Cooling Fan Relay [Low] control output [signal input]	A/C ON	PWM	HI: Battery Voltage LO: 0 ~ 0.5V
66	CVVT Oil control (OCV) Valve [Bank 1/Intake] control output	Idle	PWM	HI: Battery Voltage LO: - 0.3 ~ 1.0V Frequency: 300Hz Duty(+): 0 ~ 100%
67	Purge control Solenoid Valve (PCSV) control output	Inactive Active	PWM	HI: Battery Voltage LO: - Max. 1.0V Voltage peak: 42 ~ 60V Frequency: 20Hz
68	CVVT Oil control (OCV) Valve [Bank 1/Exhaust] control output	Idle	PWM	HI: Battery Voltage LO: - 0.3 ~ 1.0V Duty: 0 ~ 100% Frequency: 300Hz
69	Immobilizer Lamp control output	Lamp OFF	DC	HI: Battery Voltage
		Lamp ON		LO: Max . 2.0V
70	Fuel Pump Relay control output	Relay OFF	DC	Battery Voltage
		Relay ON		- 0.3 ~ 1.2V
		Relay ON/OFF		Voltage peak: 42 ~ 60V
71	ETC Motor [+] control output [signal input]	Idle	PWM	HI: Battery Voltage (OFF) LO: - 0.3 ~ 1.0 (ON) Frequency: 200Hz Duty: 0 ~ 100%

72	ETC Motor [-] control output [signal input]	Idle	PWM	HI: Battery Voltage (OFF) LO: - 0.3 ~ 1.0 (ON) Frequency: 200Hz Duty: 0 ~ 100%
73	Fuel Tank Pressure Sensor (FTPS) signal input			
74	Sensor ground	Idle	DC	- 0.3 ~ 0.5V
75	Immobilizer communication line	During communicating	Pulse	HI: Min. 8.5V LO: Max. 3.5V
76	-			
77	CAN [High]	Recessive Dominant	Pulse	2.0 ~ 3.0V (type: 2.5V) 2.75~4.5V (type: 3.5V)
78	CAN [Low]	Recessive Dominant	Pulse	2.0 ~ 3.0V (type: 2.5V) 2.75~4.5V (type: 3.5V)
79	Sensor ground	Idle	DC	- 0.3 ~ 0.5V
80	Throttle Position Sensor (TPS) 1 signal input	C.T W.O.T	Analog	- 0.3 ~ 5.2V - 0.3 ~ 0.5V
81	-			
82	Accelerator Position Sensor (APS) 1 signal input	C.T W.O.T	Analog	- 0.3 ~ 5.2V
83	Sensor ground	Idle	DC	- 0.3 ~ 5.2V
84	Heated Oxygen Sensor (HO2S) [Bank 1/Sensor 2] signal input	Idle	DC	Rich: 0.6 ~ 1.0V Lean: Max. 0.4V
85	Sensor ground	Idle	DC	Max. 50 mV
86	Engine speed signal output	Idle	Pulse (Frequency)	HI: Battery Voltage LO: - 0.3 ~ 1.0V Frequency: 26Hz (850 rpm) 106Hz (300 rpm) Duty(+)
87	A//C Compressor Relay control output			
88	Cooling Fan Relay [High] control output	Relay OFF Relay ON	DC	HI: Battery Voltage LO: - 0.3 ~ 1.2V
89	-			

90	-			
91	Canister Close Valve (CCV) control output			
92	-			
93	Heated Oxygen Sensor (HO2S) [Bank 1/Sensor 1] Heater control output	Engine Run	PWM	HI: Battery Voltage LO: - 0.3 ~ 1.0V Frequency: 8 ~ 10Hz Duty(+): 0 ~ 100%
94	Heated Oxygen Sensor (HO2S) [Bank 1/Sensor 2] Heater control output	Engine Run	PWM	HI: Battery Voltage LO: - 0.3 ~ 1.0V Frequency: 8 ~ 10Hz Duty(+): 0 ~ 100%

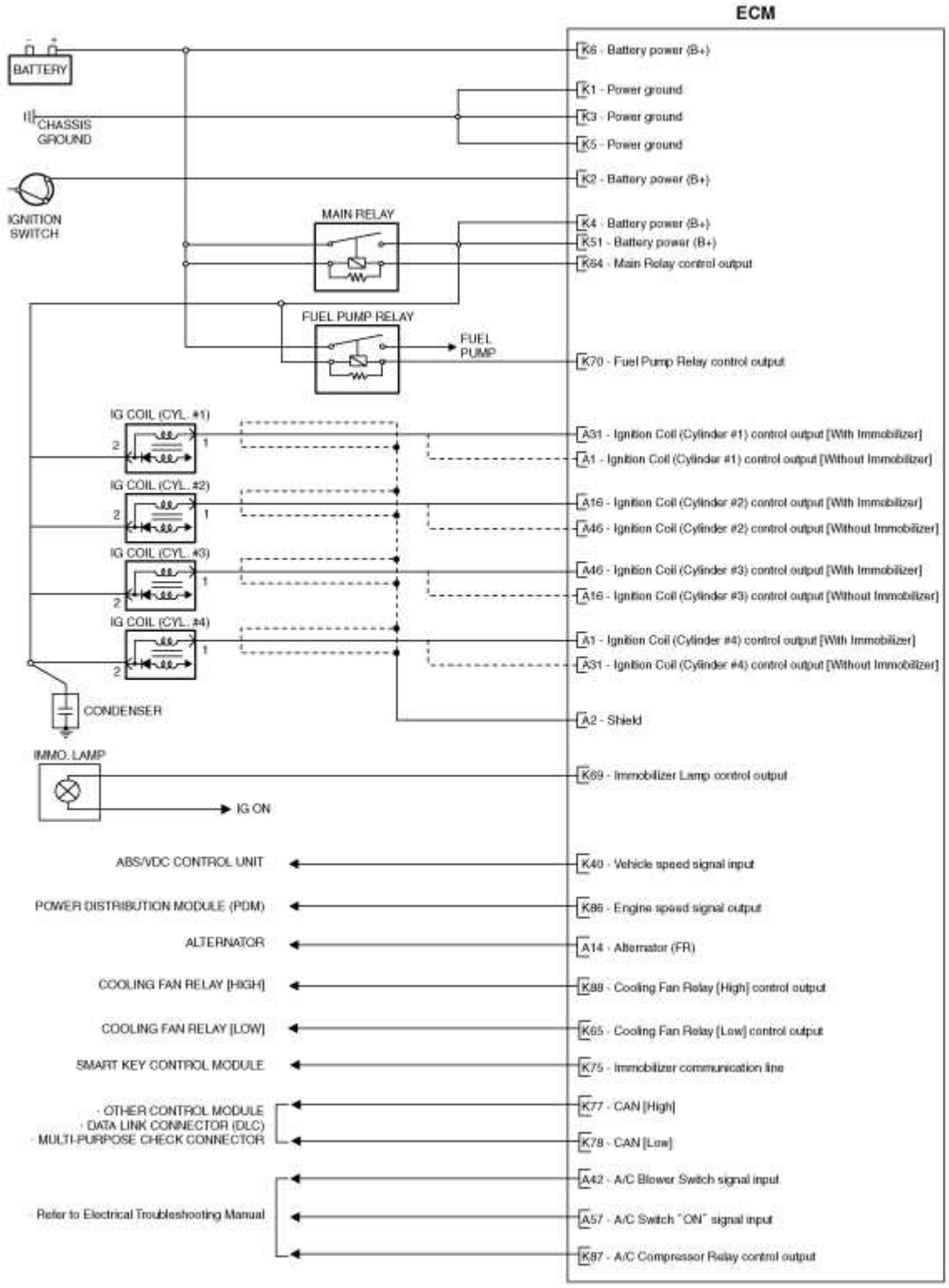
Connector [CHG-A]

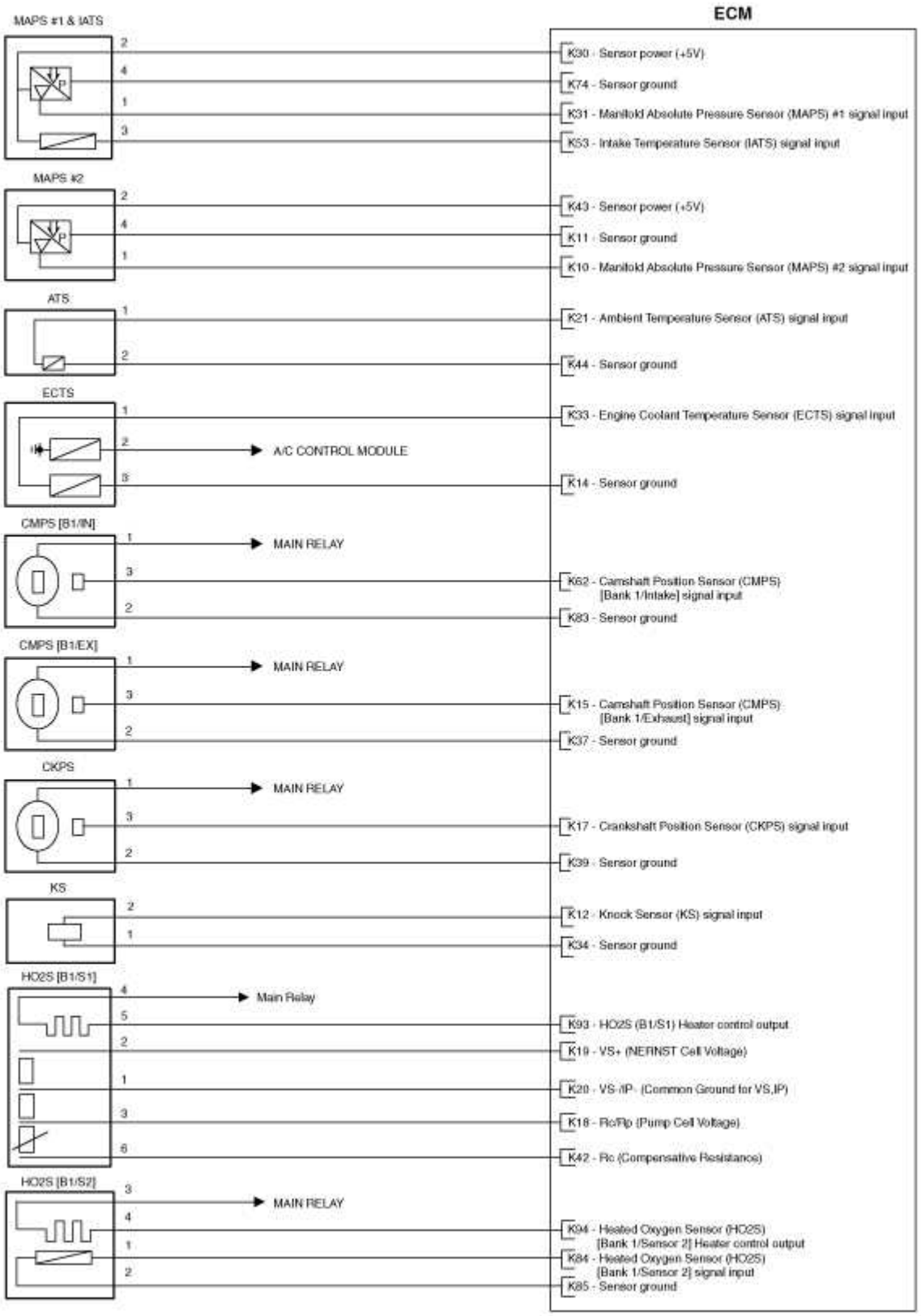
Pin No.	Description	Condition	Type	Level
1	Ignition Coil (Cylinder #4) control output [with Immobilizer] Ignition Coil (Cylinder #1) control output [without Immobilizer]	Idle	Pulse	1st Voltage: 360~440V ON Voltage: Max. 1.6V Dwell Time: 1 ~ 8ms
2	Shield	Idle	DC	- 0.3 ~ 0.5V
3	-			
4	-			
5	-			
6	-			
7	-			
8	-			
9	-			
10	-			
11	-			
12	-			
13	-			
14	Alternator "FR" PWM signal input	Idle	PWM	Frequency: 60Hz or 125Hz or 200Hz Duty: 0% ~ 100% High: 3.3 ~ 3.7V Low: 1.3 ~ 1.7V
15	Ground			
	Ignition Coil (Cylinder #2) control output			1st Voltage: 360~440V

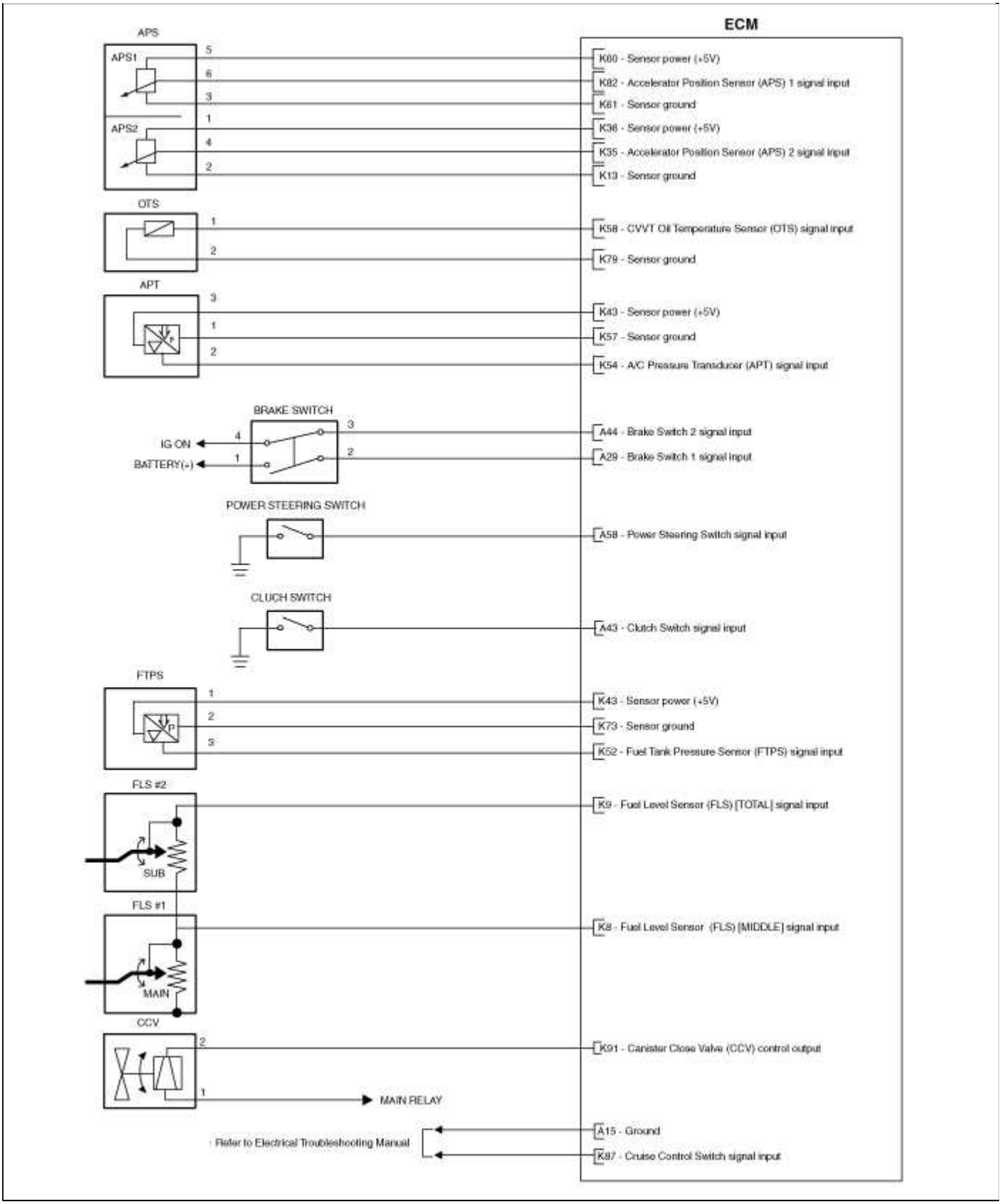
16	[with Immobilizer]	Idle	Pulse	ON Voltage: Max. 1.6V
	Ignition Coil (Cylinder #3) control output [without Immobilizer]			Dwell Time: 1 ~ 1.8ms
17	-			
18	-			
19	-			
20	-			
21	-			
22	-			
23	-			
24	-			
25	-			
26	-			
27	-			
28	-			
29	Brake Switch 1 signal input	Brake Switch ON	DC	Battery Voltage
		Brake Switch OFF		Max. 0.5 V
30	-			
31	Ignition Coil (Cylinder #1) control output [with Immobilizer]	Idle	Pulse	1st Voltage: 360~440V
				ON Voltage: Max. 1.6V
	Ignition Coil (Cylinder #4) control output [without Immobilizer]			Dwell Time: 1 ~ 8ms
32	-			
33	-			
34	-			
35	-			
36	-			
37	-			
38	-			
39	-			
40	-			
41	-			
42	-			
43	Clutch Switch signal input	Clutch Switch ON	Digital	- 0.3 ~ 0.5V
		Clutch Switch OFF		Battery Voltage
44	Brake Switch 2 signal input	Brake Switch ON	Digital	- 0.3 ~ 0.5V
		Brake Switch OFF		Battery Voltage

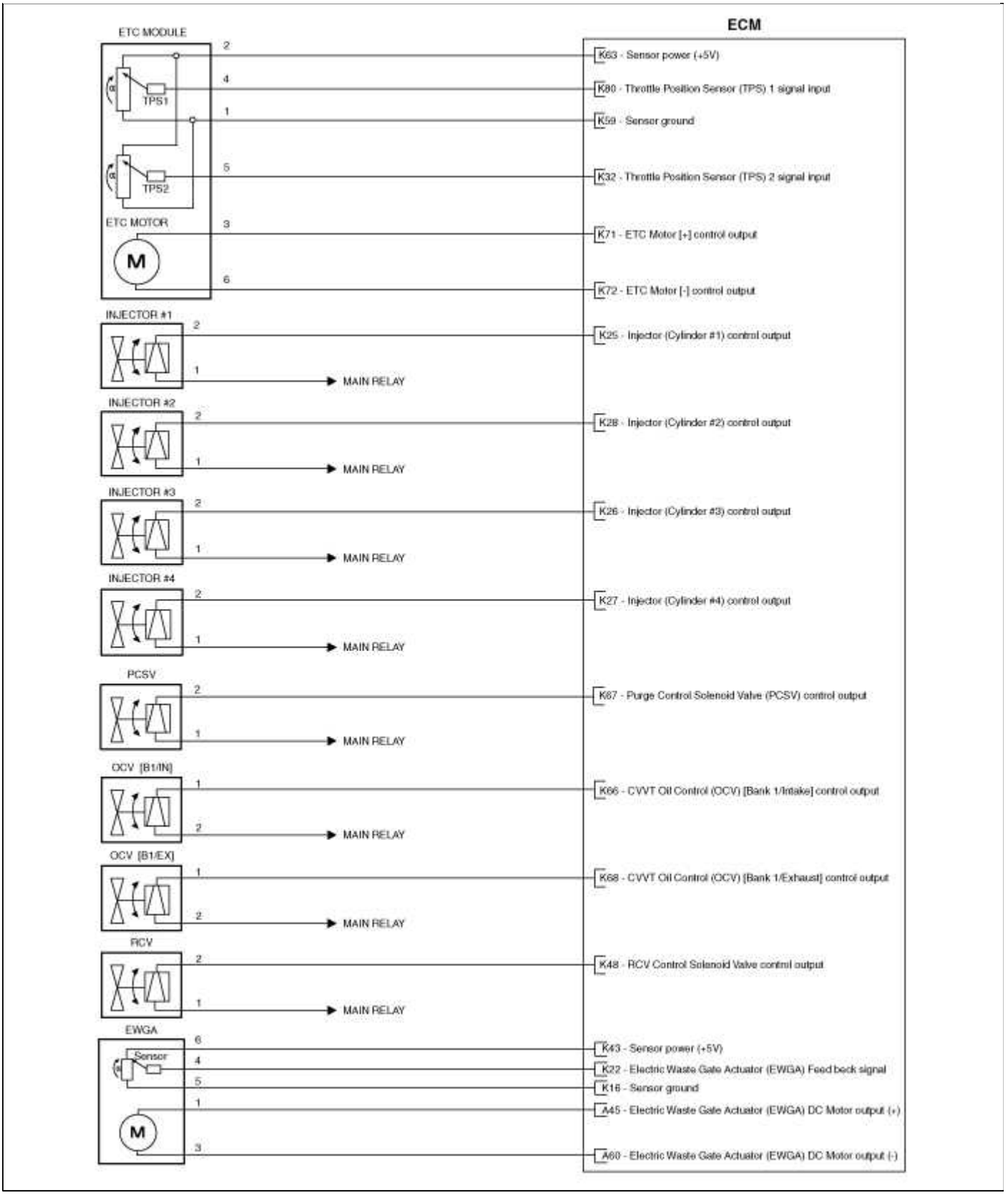
45	EWGA DC Motor Control (+) [signal output]	Idle	PWM	High: Battery voltage [OFF]
				Low: - 0.3 ~ 1.0V [ON]
				Frequency: 1000Hz
46	Ignition Coil (Cylinder #3) control output [with Immobilizer]	Idle	Pulse	1st Voltage: 300~400V
				ON Voltage: Max. 2.0V
	Ignition Coil (Cylinder #2) control output [without Immobilizer]			Frequency
				Dwell Time
47	-			
48	-			
49	-			
50	-			
51	-			
52	-			
53	-			
54	-			
55	-			
56	-			
57	-			
58	Power Steering Switch signal input	Power Steering Swich OFF	Digital	High: Battery voltage
		Power Steering Swich ON		Low: - 0.3 ~ 0.5V
59	-			
60	EWGA DC Motor Control (-) [signal output]	Idle	PWM	High: Battery voltage [OFF]
				Low: - 0.3 ~ 1.0V [ON]
				Frequency: 1000Hz

Circuit Diagram


ECM
BATTERY
CHASSIS GROUND
IGNITION SWITCH
MAIN RELAY
FUEL PUMP RELAY
FUEL PUMP
IG COIL (CYL. #1)
IG COIL (CYL. #2)
IG COIL (CYL. #3)
IG COIL (CYL. #4)
CONDENSER
IMMO. LAMP
IG ON
ABS/VDC CONTROL UNIT
POWER DISTRIBUTION MODULE (PDM)
ALTERNATOR
COOLING FAN RELAY [HIGH]
COOLING FAN RELAY [LOW]
SMART KEY CONTROL MODULE
· OTHER CONTROL MODULE
· DATA LINK CONNECTOR (DLC)
· MULTI-PURPOSE CHECK CONNECTOR
Refer to Electrical Troubleshooting Manual
K6 - Battery power (B+)
K1 - Power ground
K3 - Power ground
K5 - Power ground
K2 - Battery power (B+)
K4 - Battery power (B+)
K51 - Battery power (B+)
K64 - Main Relay control output
K70 - Fuel Pump Relay control output
A31 - Ignition Coil (Cylinder #1) control output [With Immobilizer]
A1 - Ignition Coil (Cylinder #1) control output [Without Immobilizer]
A16 - Ignition Coil (Cylinder #2) control output [With Immobilizer]
A46 - Ignition Coil (Cylinder #2) control output [Without Immobilizer]
A46 - Ignition Coil (Cylinder #3) control output [With Immobilizer]
A16 - Ignition Coil (Cylinder #3) control output [Without Immobilizer]
A1 - Ignition Coil (Cylinder #4) control output [With Immobilizer]
A31 - Ignition Coil (Cylinder #4) control output [Without Immobilizer]
A2 - Shield
K69 - Immobilizer Lamp control output
K40 - Vehicle speed signal input
K86 - Engine speed signal output
A14 - Alternator (FR)
K88 - Cooling Fan Relay [High] control output
K65 - Cooling Fan Relay [Low] control output
K75 - Immobilizer communication line
K77 - CAN [High]
K78 - CAN [Low]
A42 - A/C Blower Switch signal input
A57 - A/C Switch "ON" signal input
K87 - A/C Compressor Relay control output


ECM
MAPS #1 & IATS
2
4
1
3
K30 - Sensor power (+5V)
K74 - Sensor ground
K31 - Manifold Absolute Pressure Sensor (MAPS) #1 signal input
K53 - Intake Temperature Sensor (IATS) signal input
MAPS #2
2
4
1
K43 - Sensor power (+5V)
K11 - Sensor ground
K10 - Manifold Absolute Pressure Sensor (MAPS) #2 signal input
ATS
1
2
K21 - Ambient Temperature Sensor (ATS) signal input
K44 - Sensor ground
ECTS
1
2
3
A/C CONTROL MODULE
K33 - Engine Coolant Temperature Sensor (ECTS) signal input
K14 - Sensor ground
CMPS [B1/IN]
1
3
2
MAIN RELAY
K62 - Camshaft Position Sensor (CMPS) [Bank 1/Intake] signal input
K83 - Sensor ground
CMPS [B1/EX]
1
3
2
MAIN RELAY
K15 - Camshaft Position Sensor (CMPS) [Bank 1/Exhaust] signal input
K37 - Sensor ground
CKPS
1
3
2
MAIN RELAY
K17 - Crankshaft Position Sensor (CKPS) signal input
K39 - Sensor ground
KS
2
1
K12 - Knock Sensor (KS) signal input
K34 - Sensor ground
HO2S [B1/S1]
4
5
2
1
3
6
Main Relay
K93 - HO2S (B1/S1) Heater control output
K19 - VS+ (NERNST Cell Voltage)
K20 - VS-/IP- (Common Ground for VS,IP)
K18 - Rc/Ip (Pump Cell Voltage)
K42 - Rc (Compensative Resistance)
HO2S [B1/S2]
3
4
1
2
MAIN RELAY
K94 - Heated Oxygen Sensor (HO2S) [Bank 1/Sensor 2] Heater control output
K84 - Heated Oxygen Sensor (HO2S) [Bank 1/Sensor 2] signal input
K85 - Sensor ground


ECM
APS
APS1
APS2
OTS
APT
BRAKE SWITCH
IG ON
BATTERY(+)
POWER STEERING SWITCH
CLUCH SWITCH
FTPS
FLS #2
SUB
FLS #1
MAIN
CCV
MAIN RELAY
Refer to Electrical Troubleshooting Manual
K80 - Sensor power (+5V)
K82 - Accelerator Position Sensor (APS) 1 signal input
K81 - Sensor ground
K36 - Sensor power (+5V)
K35 - Accelerator Position Sensor (APS) 2 signal input
K13 - Sensor ground
K58 - CVVT Oil Temperature Sensor (OTS) signal input
K79 - Sensor ground
K43 - Sensor power (+5V)
K57 - Sensor ground
K54 - A/C Pressure Transducer (APT) signal input
A44 - Brake Switch 2 signal input
A29 - Brake Switch 1 signal input
A58 - Power Steering Switch signal input
A43 - Clutch Switch signal input
K43 - Sensor power (+5V)
K73 - Sensor ground
K52 - Fuel Tank Pressure Sensor (FTPS) signal input
K9 - Fuel Level Sensor (FLS) [TOTAL] signal input
K8 - Fuel Level Sensor (FLS) [MIDDLE] signal input
K91 - Canister Close Valve (CCV) control output
A15 - Ground
K87 - Cruise Control Switch signal input



Fuel System > Engine Control System > Engine Control Module (ECM) > Repair procedures

Removal

CAUTION

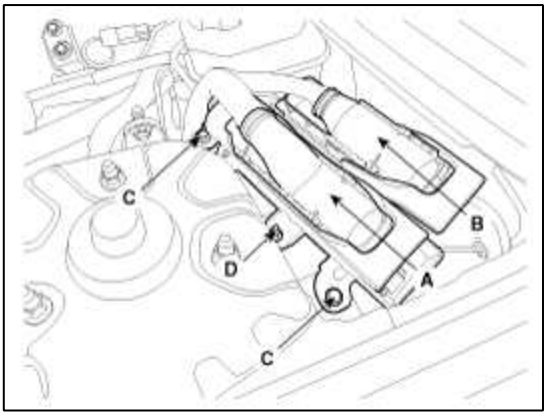
When replacing the ECM, the vehicle equipped with the immobilizer must be performed procedure as below.
[In the case of installing used ECM]
1) Perform "ECM Neutral mode" procedure with GDS. (Refer to Body Electrical System - "Immobilizer")
2) After finishing "ECM Neutral mode", perform "Key teaching" procedure with GDS. (Refer to Body Electrical System - "Immobilizer")
[In the case of installing new ECM]
Perform "Key teaching" procedure with GDS. (Refer to Body Electrical System - "Immobilizer")

CAUTION

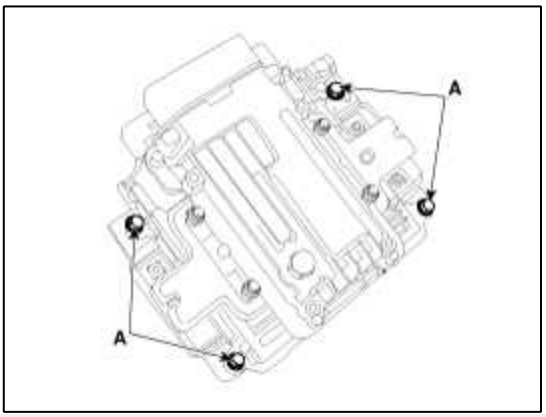
When replacing the ECM, the vehicle equipped with the smart key system (Button start) must be performed procedure as below.
[In the case of installing used ECM]
1) Perform "ECM Neutral mode" procedure with GDS. (Refer to Body Electrical System - "Immobilizer")
2) After finishing "ECM Neutral mode", insert the key (or press the start button) and turn it to the IGN ON and OFF position. Then the ECM learns the smart key information automatically.
[In the case of installing new ECM]
Insert the key (or press the start button) and turn it to the IGN ON and OFF position. Then the ECM learns the smart key information automatically.

[A/T]

1. Turn ignition switch OFF and disconnect the negative (-) battery cable.
2. Disconnect the ECM connector (A).
3. Disconnect the TCM connector (B).
4. Remove the ECM bracket installation bolts (C) and nut (D).



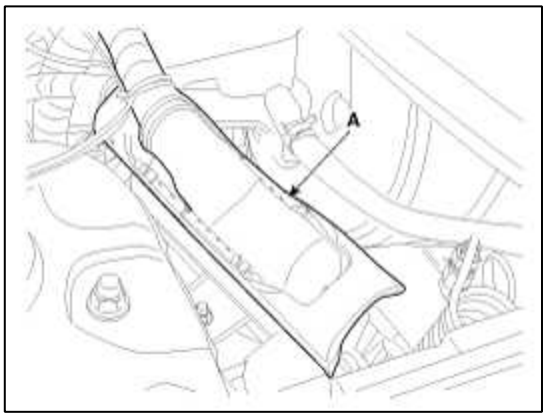
5. Remove the ECM from bracket after remove the installation bolts (A).



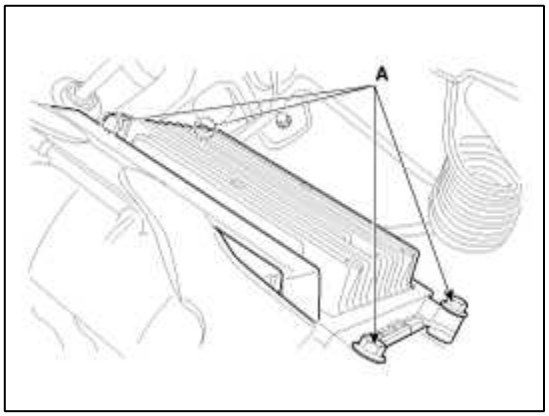
[M/T]

1. Turn ignition switch OFF and disconnect the negative (-) battery cable.
2. Remove the front strut assembly. (Refer to the Suspension System - "Front Strut Bar")

3. Disconnect the ECM connector (A).



4. Remove the ECM after remove the installation bolts (A).



Installation

CAUTION

When replacing the ECM, the vehicle equipped with the immobilizer must be performed procedure as below.
[In the case of installing used ECM]
1) Perform "ECM Neutral mode" procedure with GDS. (Refer to Body Electrical System - "Immobilizer")
2) After finishing "ECM Neutral mode", perform "Key teaching" procedure with GDS. (Refer to Body Electrical System - "Immobilizer")
[In the case of installing new ECM]
Perform "Key teaching" procedure with GDS. (Refer to Body Electrical System - "Immobilizer")

CAUTION

When replacing the ECM, the vehicle equipped with the smart key system (Button start) must be performed procedure as below.
[In the case of installing used ECM]
1) Perform "ECM Neutral mode" procedure with GDS. (Refer to Body Electrical System - "Immobilizer")
2) After finishing "ECM Neutral mode", insert the key (or press the start button) and turn it to the IGN ON and OFF position. Then the ECM learns the smart key information automatically.
[In the case of installing new ECM]
Insert the key (or press the start button) and turn it to the IGN ON and OFF position. Then the ECM learns the smart key information automatically.

1. Installation is reverse of removal.

ECM bracket installation nut/bolt:
9.8 ~ 11.8 N.m (1.0 ~ 1.2 kgf.m, 7.2 ~ 8.7 lb-ft)

ECM Problem Inspection Procedure

1. TEST ECM GROUND CIRCUIT: Measure resistance between ECM and chassis ground using the backside of ECM harness connector as ECM side check point. If the problem is found, repair it.

   Specification: Below 1Ω

2. TEST ECM CONNECTOR: Disconnect the ECM connector and visually check the ground terminals on ECM side and harness side for bent pins or poor contact pressure. If the problem is found, repair it.
3. If problem is not found in Step 1 and 2, the ECM could be faulty. If so, replace the ECM with a new one, and then check the vehicle again. If the vehicle operates normally then the problem was likely with the ECM.
4. RE-TEST THE ORIGINAL ECM: Install the original ECM (may be broken) into a known-good vehicle and check the vehicle. If the problem occurs again, replace the original ECM with a new one. If problem does not occur, this is intermittent problem (Refer to “Intermittent Problem Inspection Procedure” in Basic Inspection Procedure).

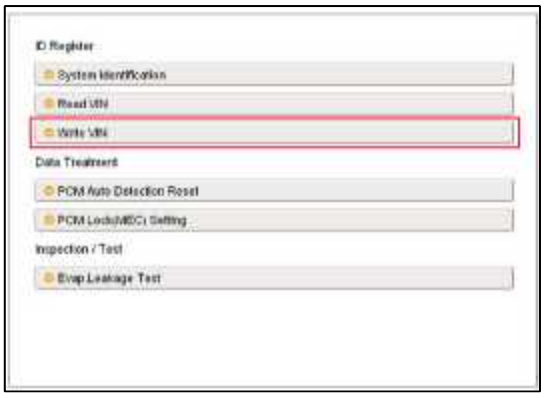
VIN Programming Procedure

VIN (Vehicle Identification Number) is a number that has the vehicle's information (Maker, Vehicle Type, Vehicle Line/Series, Body Type, Engine Type, Transmission Type, Model Year, Plant Location and so forth. For more information, please refer to the group "GI" in this SERVICE MANUAL). When replacing an ECM, the VIN must be programmed in the ECM. If there is no VIN in ECM memory, the fault code (DTC P0630) is set.

CAUTION

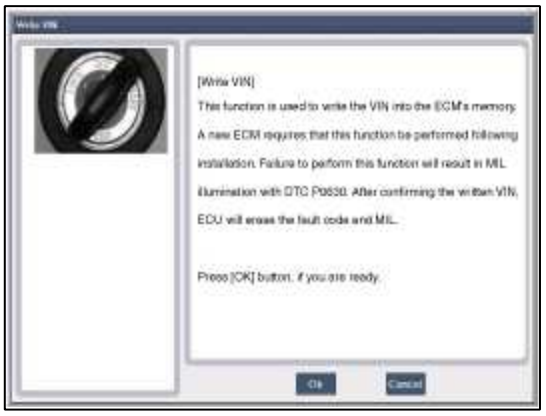
The programmed VIN cannot be changed. When writing the VIN, confirm the VIN carefully

1. Select "VIN Writing" function in "Vehicle S/W Management".
2. Select "Write VIN" in "ID Resister".



3. Input the VIN.

> WARNING
>
> Before inputing the VIN, confirm the VIN again because the programmed VIN cannot be changed.

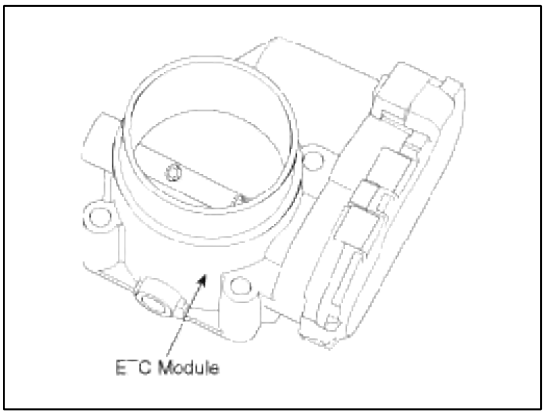


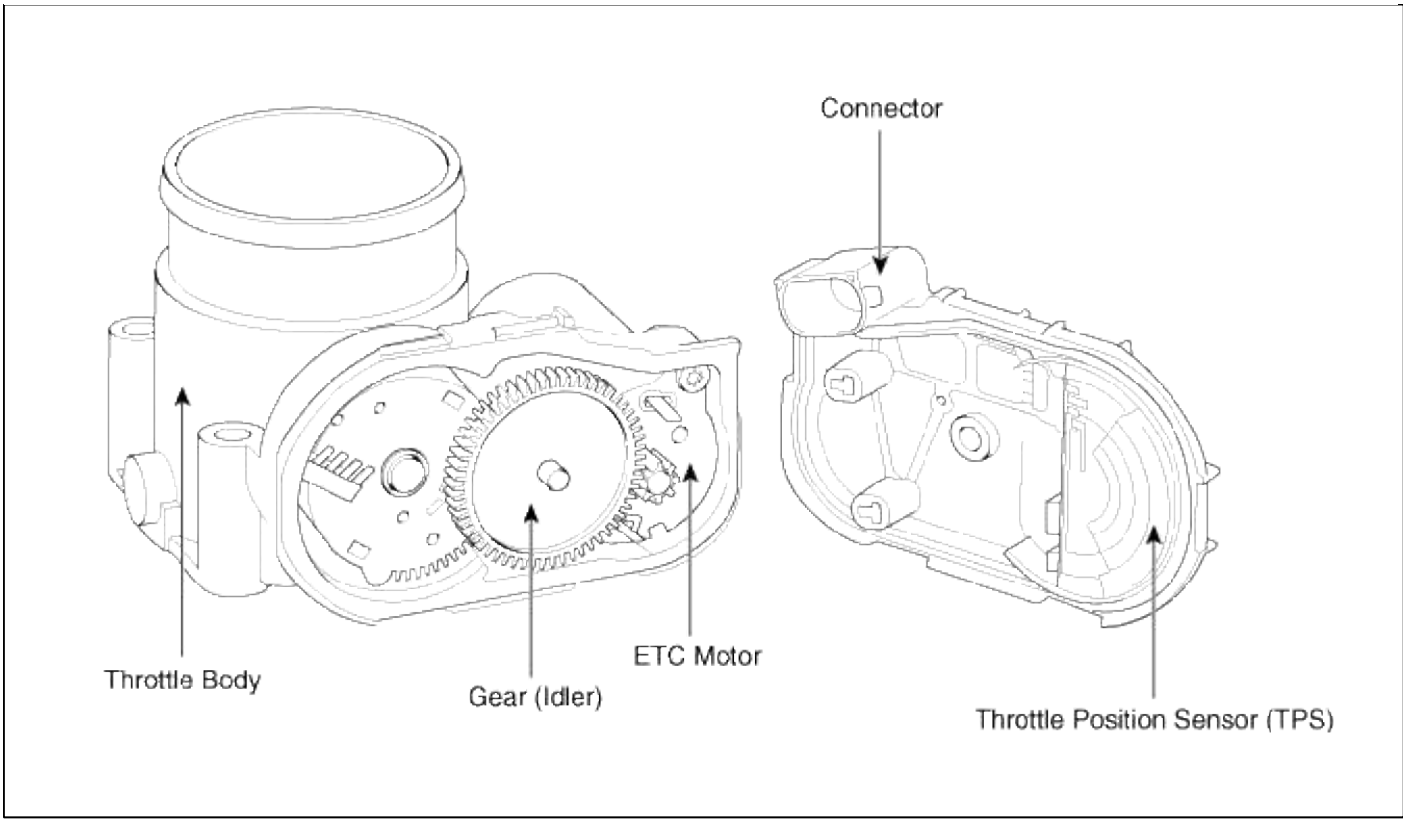
4. Turn the ignition switch OFF, then back ON.

Fuel System > Engine Control System > ETC (Electronic Throttle Control) System > Description and Operation

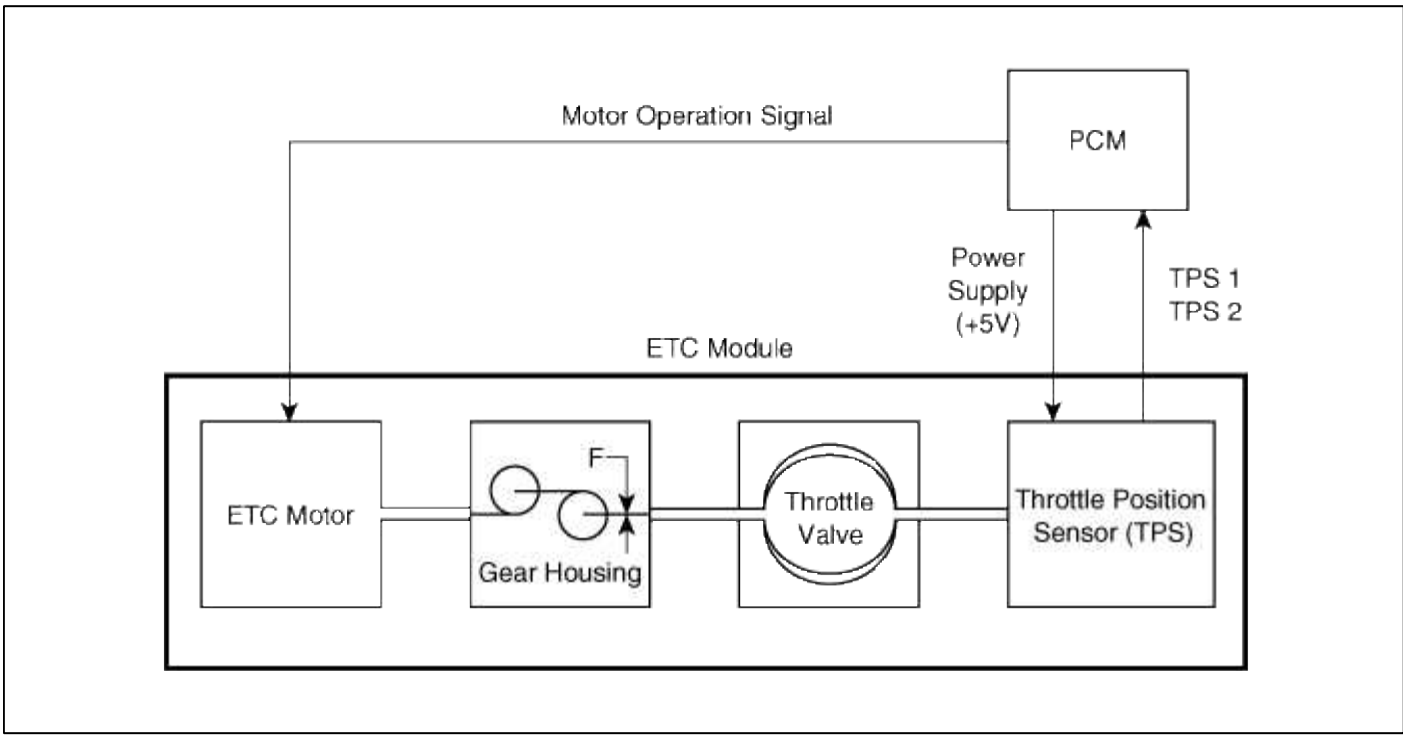
Description

The Electronic Throttle Control (ETC) System consists of a throttle body with an integrated control motor and throttle position sensor (TPS). Instead of the traditional throttle cable, an Accelerator Position Sensor (APS) is used to receive driver input. The ECM uses the APS signal to calculate the target throttle angle; the position of the throttle is then adjusted via ECM control of the ETC motor. The TPS signal is used to provide feedback regarding throttle position to the ECM. Using ETC, precise control over throttle position is possible; the need for external cruise control modules/cables is eliminated.





Schematic Diagram



Fuel System > Engine Control System > ETC (Electronic Throttle Control) System > Troubleshooting

Fail-Safe Mode

Item	Fail-Safe	
ETC Motor	Throttle valve stuck at 5°	
TPS	TPS 1 fault	Replace it with TPS2
	TPS 2 fault	Replace it with TPS1
	TPS 1,2 fault	Throttle valve stuck at 5°
APS	TPS 1 fault	Replace it with TPS2
	TPS 2 fault	Replace it with TPS1
	TPS 1,2 fault	Throttle valve stuck at 5°

NOTE

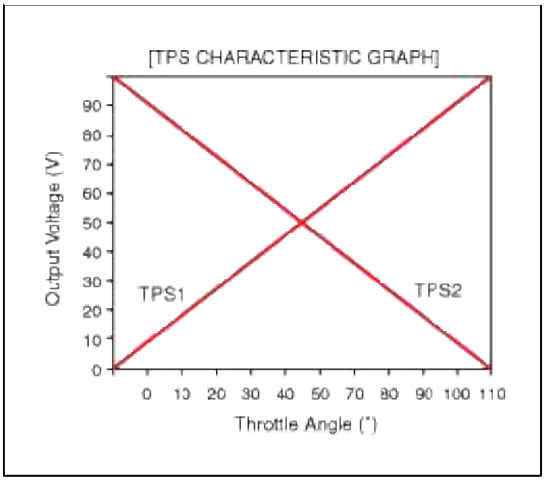
When throttle value is stuck at 5°, engine speed is limited at below 1,500rpm and vehicle speed at maximum 40 ~ 50 km/h (25 ~ 31 mph)

Fuel System > Engine Control System > ETC (Electronic Throttle Control) System > Specifications

Specification

[Throttle Position Sensor (TPS)]

Throttle Angle(°)	Output Voltage(V)	
	TPS1	TPS2
0	0.0	5.0
10	0.48	4.52
20	0.95	4.05
30	1.43	3.57
40	1.90	3.10
50	2.38	2.62
60	2.86	2.14
70	3.33	1.67
80	3.81	1.19
90	4.29	0.71
100	4.76	0.24
105	5.0	0
C.T (6 ~ 15°)	0.29 ~ 0.71	4.29 ~ 4.71
W.O.T (93 ~ 102°)	4.43 ~ 4.86	0.14 ~ 0.57



Item	Sensor Resistance(kΩ)
TPS1	0.875 ~ 1.625 [20°C(68°F)]
TPS2	0.875 ~ 1.625 [20°C(68°F)]

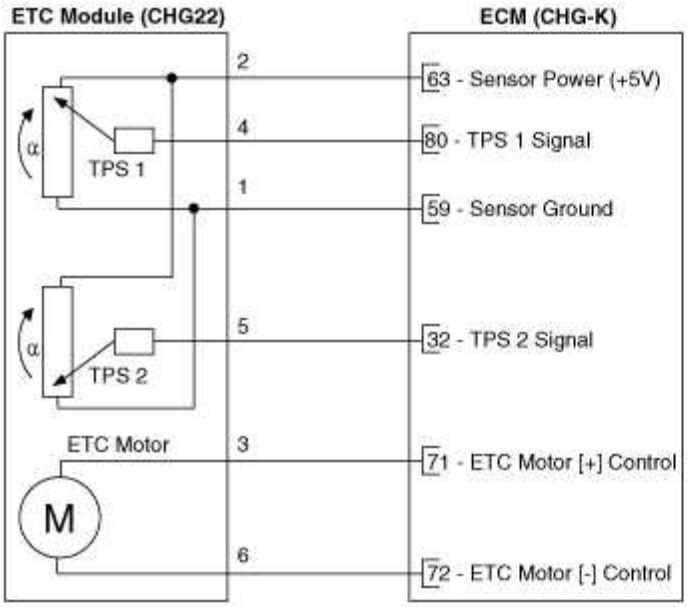
[ETC Motor]

Item	Specification
Coil Resistance (Ω)	1.2 ~ 1.8 [20°C(68°F)]

Fuel System > Engine Control System > ETC (Electronic Throttle Control) System > Schematic Diagrams

Circuit Diagram

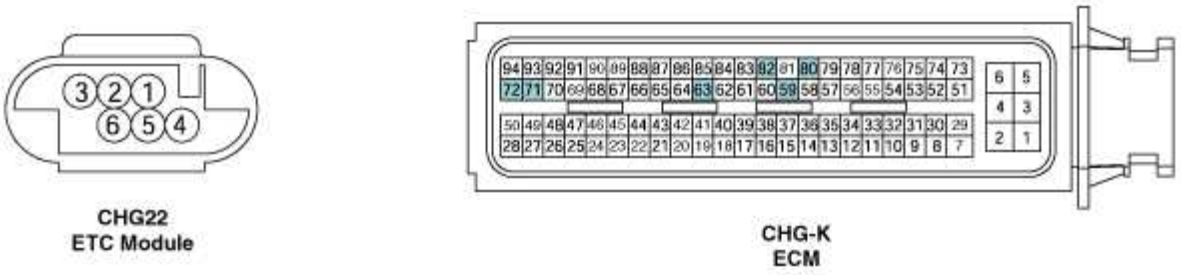
[Circuit Diagram]



[Connection Information]

Terminal	Connected to	Function
1	ECM CHG-K (59)	Sensor Ground
2	ECM CHG-K (63)	Sensor Power (+5V)
3	ECM CHG-K (71)	ETC Motor [+] Control
4	ECM CHG-K (80)	TPS 1 Signal
5	ECM CHG-K (82)	TPS 2 Signal
6	ECM CHG-K (72)	ETC Motor [-] Control

[Harness Connector]



Fuel System > Engine Control System > ETC (Electronic Throttle Control) System > Repair procedures

Inspection

Throttle Position Sensor (TPS)

1. Connect a scantool on the Data Link Connector (DLC).
2. Start the engine and measure the output voltage of TPS 1 and 2 at C.T. and W.O.T.

Throttle Angle	Output Voltage (V)	
	TPS 1	TPS 2
C.T	0.25 ~ 0.9	Min.4.0
W.O.T	Min.4.0	0.25 ~ 0.9

3. Turn the ignition switch OFF and disconnect the scantool from the DLC.
4. Disconnect the ETC module connector and measure the resistance between the ETC module terminals 1 and 2.

Specification: Refer to “Specification”

ETC Motor

1. Turn the ignition switch OFF.
2. Disconnect the ETC module connector.
3. Measure resistance between the ETC module terminals 3 and 6.

4. Check that the resistance is within the specification.

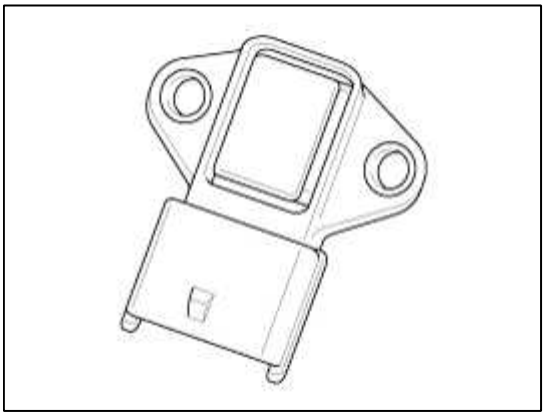
Specification: Refer to “Specification”

Fuel System > Engine Control System > Manifold Absolute Pressure Sensor (MAPS) > Description and Operation

Description

Manifold Absolute Pressure Sensor (MAPS) are installed on the surge tank and sense pressure in front of the throttle body and pressure in intake manifold. It calculates mass air flow indirectly (Speed-density type) and transfers this analog signal proportional to the pressure to the ECM. The ECM calculates the intake air quantity and engine speed based on this signal.

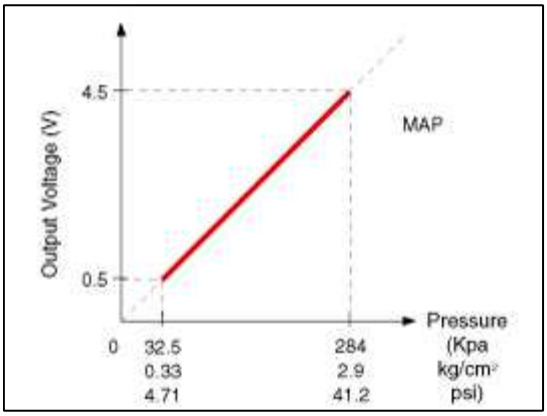
This MAPS consists of a piezo-electric element and a hybrid IC that amplifies the element output signal. The element is silicon diaphragm type and adapts pressure sensitive variable resistor effect of semi-conductor.100% vacuum and the manifold pressure apply to the both sides of it respectively. That is, this sensor outputs the silicon variation proportional to pressure change by voltage.



Fuel System > Engine Control System > Manifold Absolute Pressure Sensor (MAPS) > Specifications

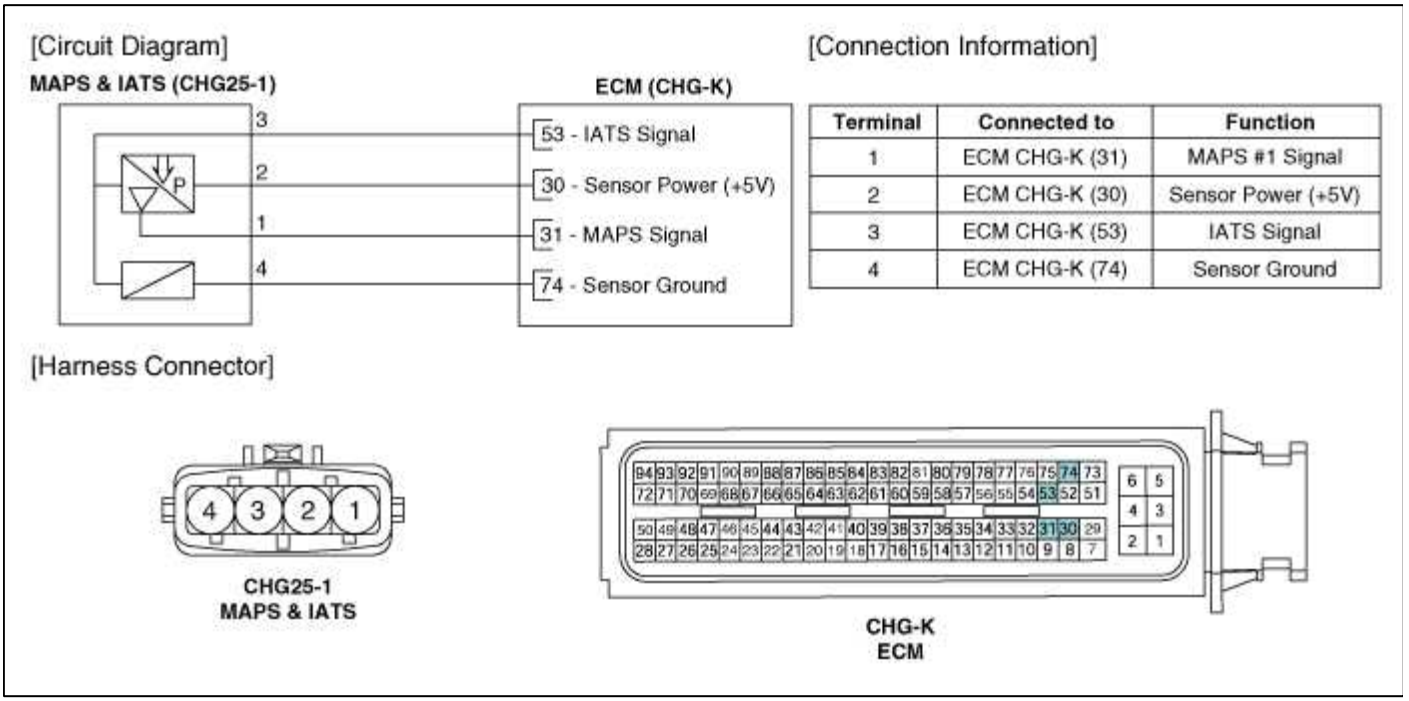
Specification

Pressure [kPa (kg/cm², psi)]	Output Voltage (V)
32.5 (0.33, 4.71)	0.5
284 (2.90, 41.20)	4.5



Fuel System > Engine Control System > Manifold Absolute Pressure Sensor (MAPS) > Schematic Diagrams

Circuit Diagram



Fuel System > Engine Control System > Manifold Absolute Pressure Sensor (MAPS) > Repair procedures

Inspection

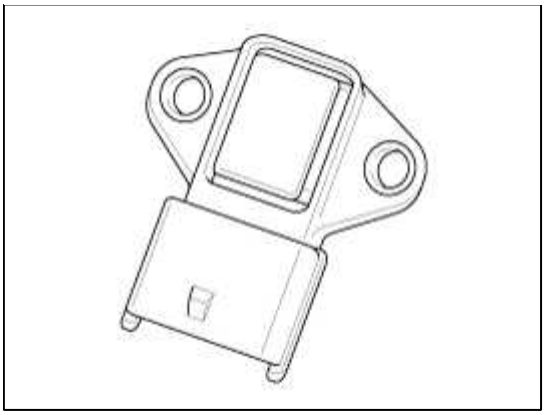
1. Connect a GDS on the Data Link Connector (DLC).
2. Measure the output voltage of the MAPS at idle and IG ON.

Specification: Refer to "Specification"

Fuel System > Engine Control System > Intake Air Temperature Sensor (IATS) > Description and Operation

Description

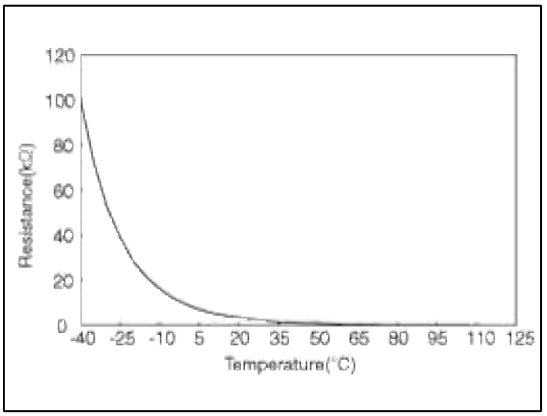
Intake Air Temperature Sensor (IATS) is installed inside the Manifold Absolute Pressure Sensor (MAPS) and detects the intake air temperature. To calculate precise air quantity, correction of the air temperature is needed because air density varies according to the temperature. So the ECM uses not only MAPS signal but also IATS signal. This sensor has a Negative Temperature Coefficient (NTC) and its resistance is in inverse proportion to the temperature.



Fuel System > Engine Control System > Intake Air Temperature Sensor (IATS) > Specifications

Specification

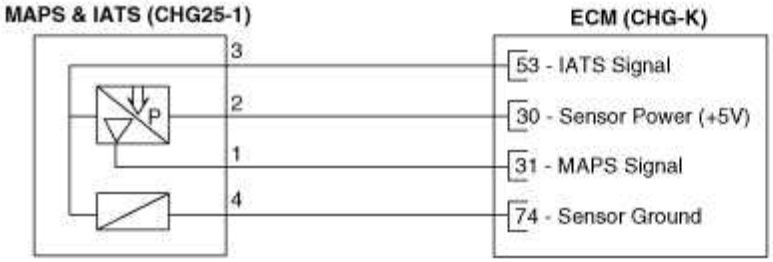
Temperature [°C(°F)]	Resistance (kΩ)
-40(-40)	40.93 ~ 48.35
-20(-4)	13.89 ~ 16.03
0(32)	5.38 ~ 6.09
10(50)	3.48 ~ 3.90
20(68)	2.31 ~ 2.57
40(104)	1.08 ~ 1.21
50(122)	1.56 ~ 1.74
60(140)	0.54 ~ 0.62
80(176)	0.29 ~ 0.34



Fuel System > Engine Control System > Intake Air Temperature Sensor (IATS) > Schematic Diagrams

Circuit Diagram

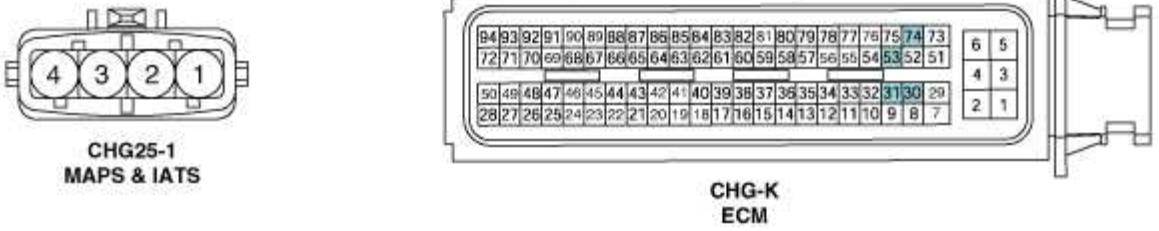
[Circuit Diagram]



[Connection Information]

Terminal	Connected to	Function
1	ECM CHG-K (31)	MAPS #1 Signal
2	ECM CHG-K (30)	Sensor Power (+5V)
3	ECM CHG-K (53)	IATS Signal
4	ECM CHG-K (74)	Sensor Ground

[Harness Connector]



Fuel System > Engine Control System > Intake Air Temperature Sensor (IATS) > Repair procedures

Inspection

1. Turn the ignition switch OFF.
2. Disconnect the IATS connector.
3. Measure resistance between the IATS terminals 3 and 4.
4. Check that the resistance is within the specification.

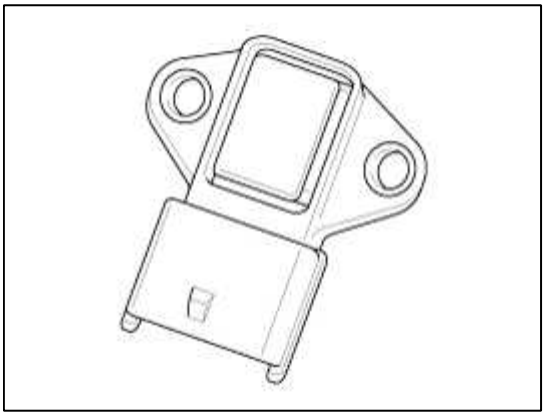
Specification: Refer to “Specification”

Fuel System > Engine Control System > Boost Pressure Sensor (BPS) > Description and Operation

Description

The Boost Pressure Sensor (BPS) is installed on the intercooler assembly and measures the pressure of the compressed air in turbocharger.

The BPS consists of a piezo-electric element and a hybrid IC amplifying the element output signal. The element is silicon diaphragm type and adapts pressure sensitive variable resistor effect of semi-conductor. Because 100% vacuum and the turbocharger pressure apply to both sides of the sensor respectively, this sensor can output analog signal by using the silicon variation proportional to pressure change.



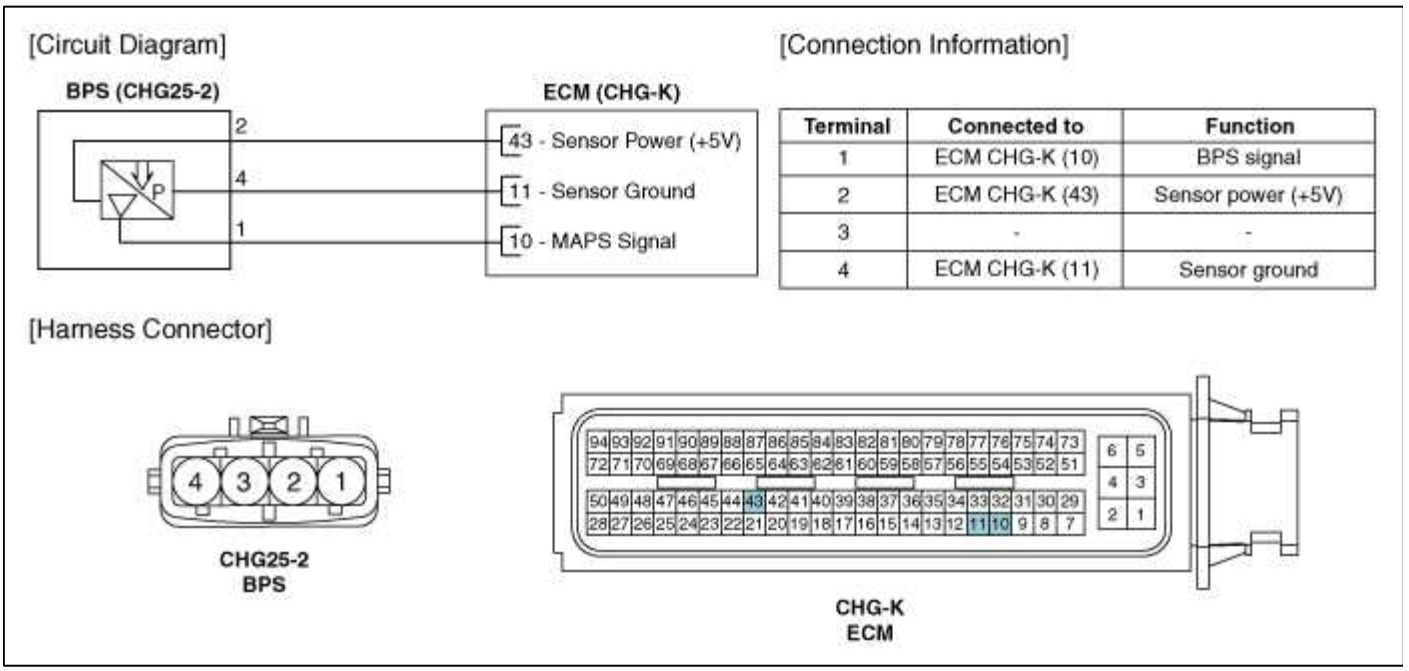
Fuel System > Engine Control System > Boost Pressure Sensor (BPS) > Specifications

Specification

Pressure [kPa (kg/cm², psi)]	Output Voltage (V)
32.5 (0.33, 4.71)	0.5
284 (2.90, 41.20)	4.5

Fuel System > Engine Control System > Boost Pressure Sensor (BPS) > Schematic Diagrams

Circuit Diagram



Fuel System > Engine Control System > Boost Pressure Sensor (BPS) > Repair procedures

Inspection

1. Connect a GDS on the Data Link Connector (DLC).
2. Measure the output voltage of the MAPS at idle and IG ON.

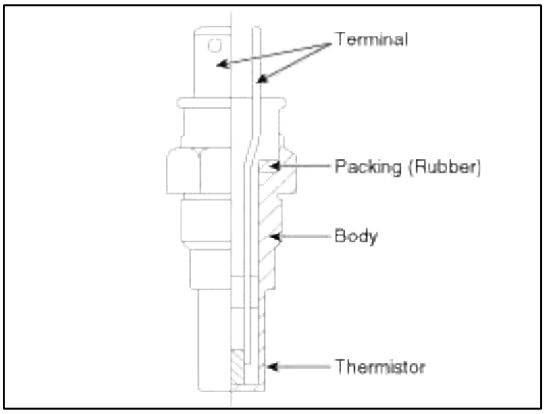
Specification: Refer to "Specification"

Fuel System > Engine Control System > Engine Coolant Temperature Sensor (ECTS) > Description and Operation

Description

Engine Coolant Temperature Sensor (ECTS) is located in the engine coolant passage of the cylinder head for detecting the engine coolant temperature.The ECTS uses a thermistor whose resistance changes with the temperature. The electrical resistance of the ECTS decreases as the temperature increases, and increases as the temperature decreases. The reference 5 V in the ECM is supplied to the ECTS via a resistor in the ECM. That is, the resistor in the ECM and the thermistor in the ECTS are connected in series. When the resistance value of the

thermistor in the ECTS changes according to the engine coolant temperature, the output voltage also changes. During cold engine operation the ECM increases the fuel injection duration and controls the ignition timing using the information of engine coolant temperature to avoid engine stalling and improve drivability.



Fuel System > Engine Control System > Engine Coolant Temperature Sensor (ECTS) > Specifications

Specification

Temperature		Resistance (kΩ)
°C	°F	
-40	-40	48.14
-20	-4	14.13 ~ 16.83
0	32	5.79
20	68	2.31 ~ 2.59
40	104	1.15
60	140	0.59
80	176	0.32

Fuel System > Engine Control System > Engine Coolant Temperature Sensor (ECTS) > Schematic Diagrams

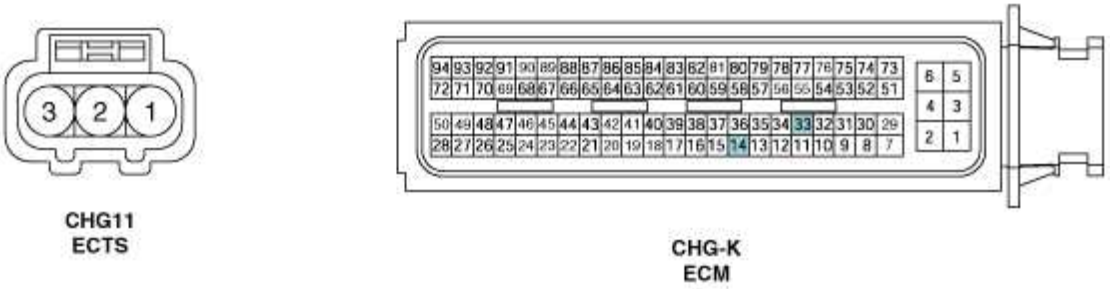
Circuit Diagram

[Circuit Diagram]

[Connection Information]

Terminal	Connected to	Function
1	ECM CHG-K (33)	ECTS Signal
2	-	-
3	ECM CHG-K (14)	Sensor Ground

[Harness Connector]



Fuel System > Engine Control System > Engine Coolant Temperature Sensor (ECTS) > Repair procedures

Inspection

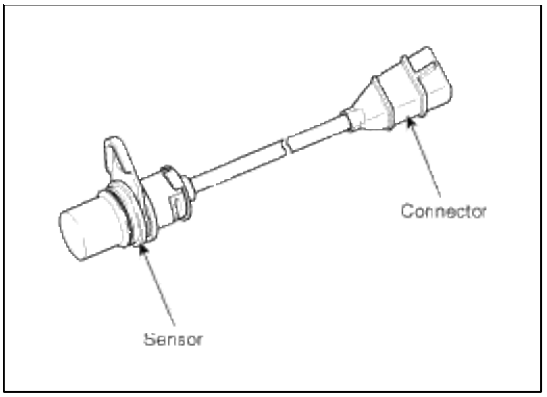
1. Turn the ignition switch OFF.
2. Disconnect the ECTS connector.
3. Remove the ECTS.
4. After immersing the thermistor of the sensor into engine coolant, measure resistance between the ECTS terminals 1 and 3.
5. Check that the resistance is within the specification.

Specification: Refer to “Specification”

Fuel System > Engine Control System > Crankshaft Position Sensor (CKPS) > Description and Operation

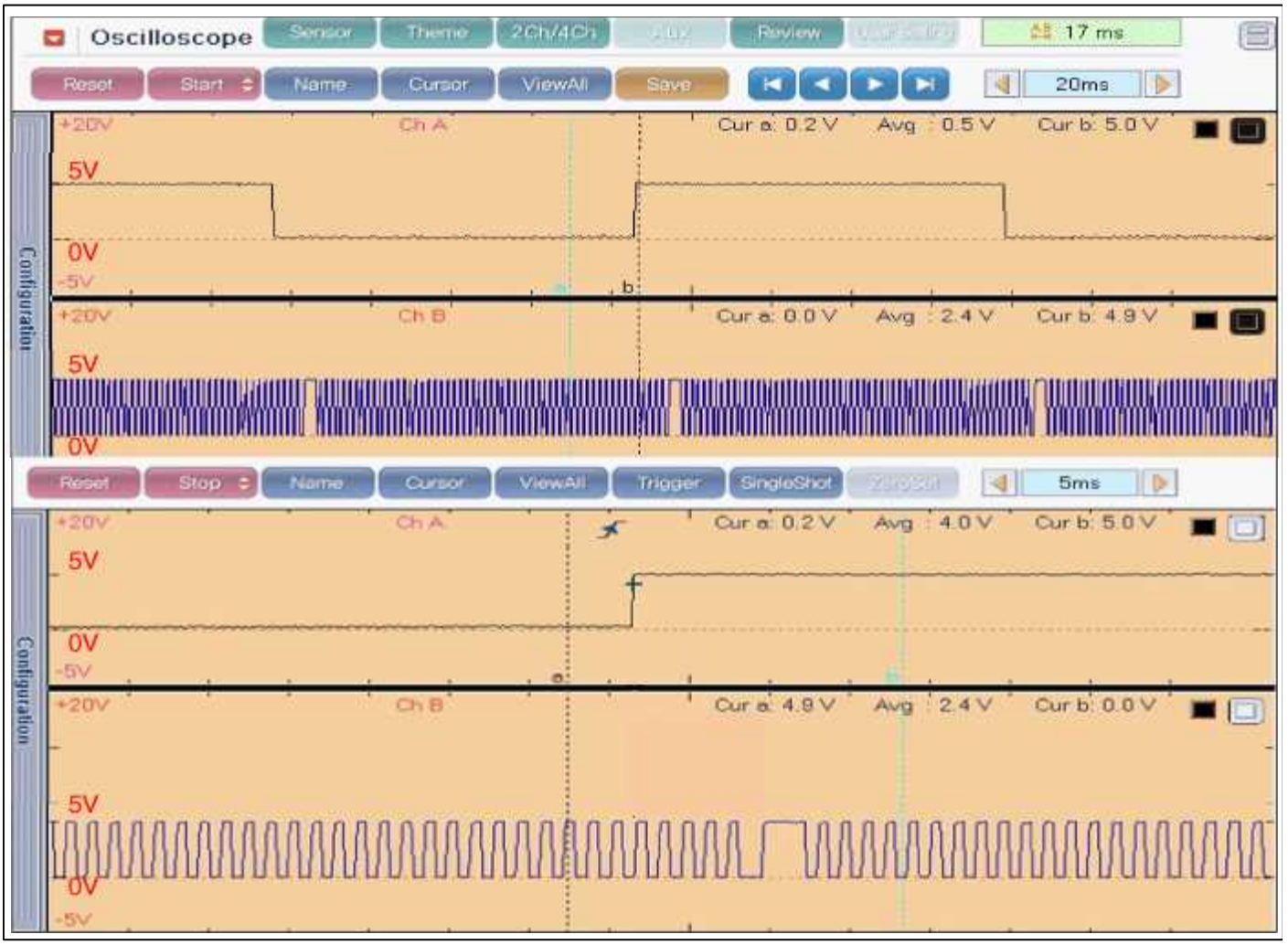
Description

Crankshaft Position Sensor (CKPS) detects the crankshaft position and is one of the most important sensors of the engine control system. If there is no CKPS signal input, the engine may stop because of CKPS signal missing.
This sensor is installed on transaxle housing or the cylinder block and generates alternating current by magnetic flux field which is made by the sensor and the target wheel when the engine rotates. The target wheel consists of 58 slots and 2 missing slots on 360 CA (Crank Angle).



Fuel System > Engine Control System > Crankshaft Position Sensor (CKPS) > Troubleshooting

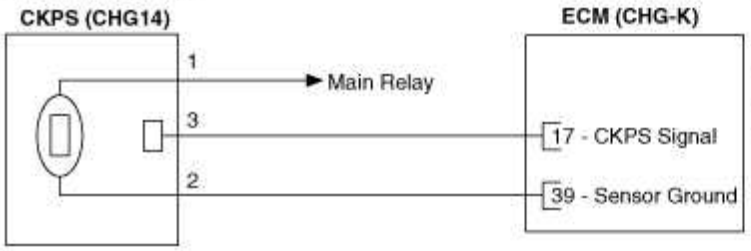
Wave Form



Fuel System > Engine Control System > Crankshaft Position Sensor (CKPS) > Schematic Diagrams

Circuit Diagram

[Circuit Diagram]

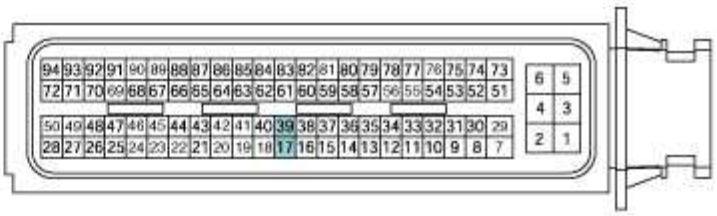


[Connection Information]

Terminal	Connected to	Function
1	Main Relay	Battery Power (B+)
2	ECM CHG-K (39)	CKPS Signal
3	ECM CHG-K (17)	Sensor Ground

[Harness Connector]

CHG14
CKPS



CHG-K
ECM

Fuel System > Engine Control System > Crankshaft Position Sensor (CKPS) > Repair procedures

Inspection

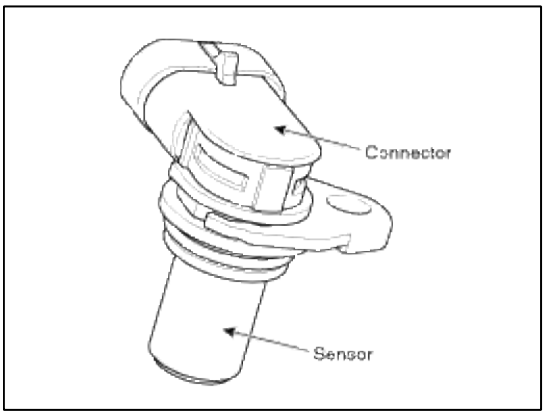
1. Check the signal waveform of the CMPS and CKPS using a scantool.

Specification: Refer to “Wave Form”

Fuel System > Engine Control System > Camshaft Position Sensor (CMPS) > Description and Operation

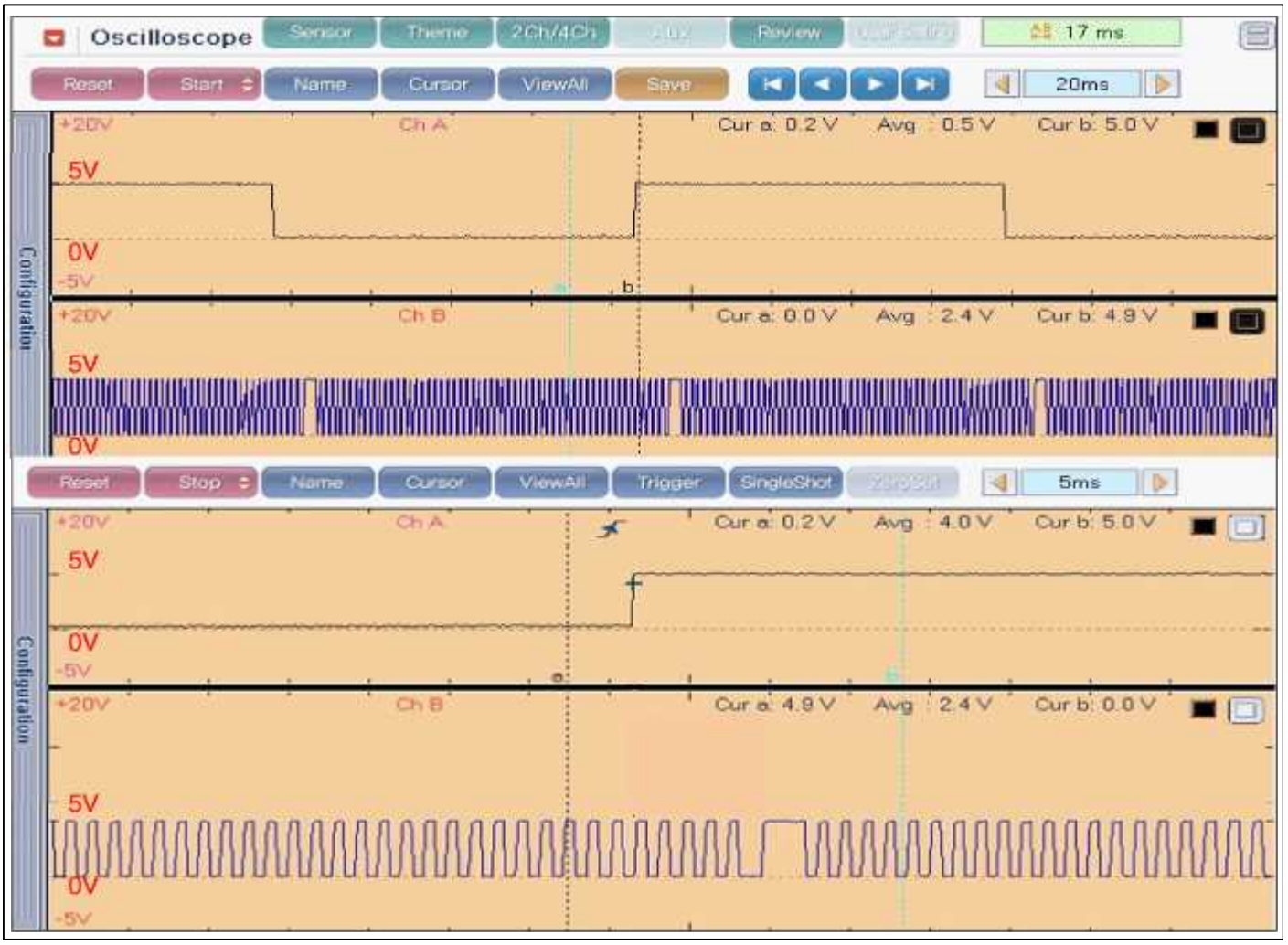
Description

Camshaft Position Sensor (CMPS) is a hall sensor and detects the camshaft position by using a hall element. It is related with Crankshaft Position Sensor (CKPS) and detects the piston position of each cylinder which the CKPS can’t detect. The two CMPS are installed on engine head cover of bank 1 and 2 respectively and use a target wheel installed on the camshaft. This sensor has a hall-effect IC which output voltage changes when magnetic field is made on the IC with current flow. So the sequential injection of the 6 cylinders is impossible without CMPS signal.



Fuel System > Engine Control System > Camshaft Position Sensor (CMPS) > Troubleshooting

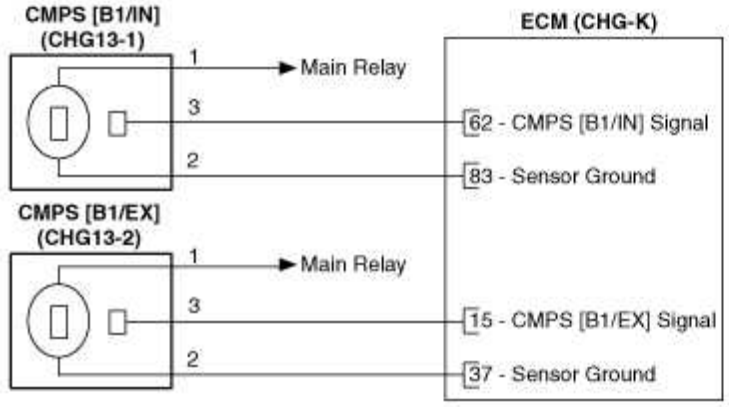
Wave Form



Fuel System > Engine Control System > Camshaft Position Sensor (CMPS) > Schematic Diagrams

Circuit Diagram

[Circuit Diagram]



[Connection Information]

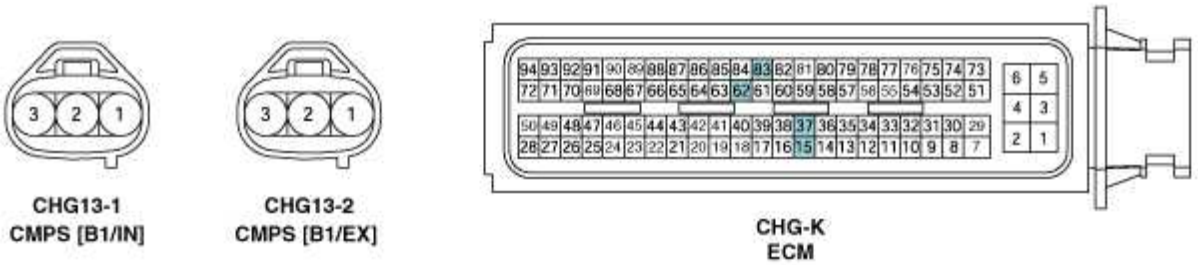
CMPS [B1/IN] (CHG13-1)

Terminal	Connected to	Function
1	Main Relay	Battery Power (B+)
2	ECM CHG-K (83)	Sensor Ground
3	ECM CHG-K (62)	CMPS [B1/IN] Signal

CMPS [B1/EX] (CHG13-2)

Terminal	Connected to	Function
1	Main Relay	Battery Power (B+)
2	ECM CHG-K (37)	Sensor Ground
3	ECM CHG-K (15)	CMPS [B1/EX] Signal

[Harness Connector]



Fuel System > Engine Control System > Camshaft Position Sensor (CMPS) > Repair procedures

Inspection

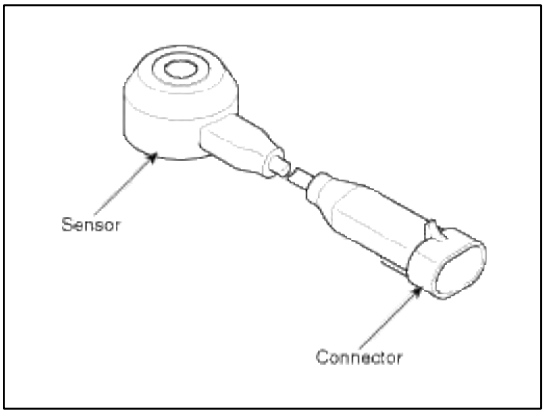
1. Check the signal waveform of the CMPS and CKPS using a scantool.

Specification: Refer to “Wave Form”

Fuel System > Engine Control System > Knock Sensor (KS) > Description and Operation

Description

Knocking is a phenomenon characterized by undesirable vibration and noise and can cause engine damage. Knock Sensor (KS) senses engine knocking and the two sensors are installed inside the V-valley of the cylinder block. When knocking occurs, the vibration from the cylinder block is applied as pressure to the piezoelectric element. At this time, this sensor transfers the voltage signal higher than the specified value to the ECM and the ECM retards the ignition timing. If the knocking disappears after retarding the ignition timing, the ECM will advance the ignition timing. This sequential control can improve engine power, torque and fuel economy.



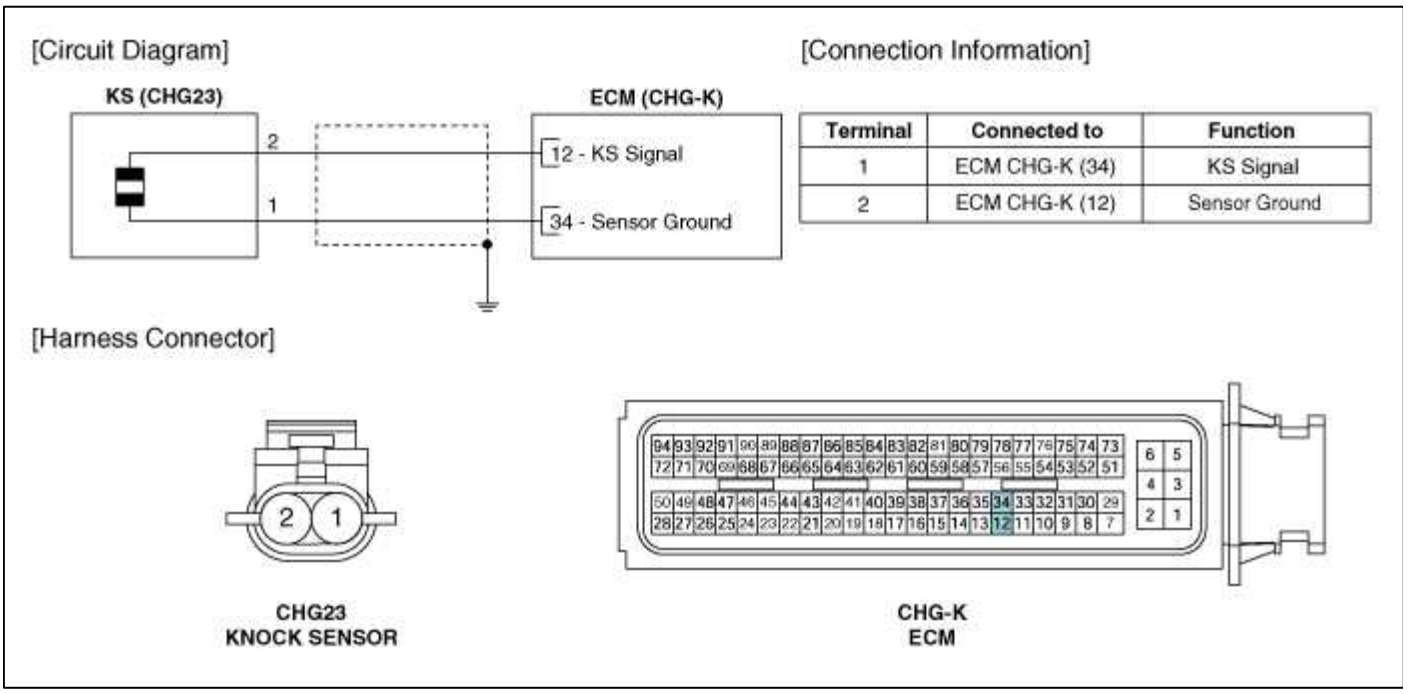
Fuel System > Engine Control System > Knock Sensor (KS) > Specifications

Specification

Item	Specification
Capacitance (pF)	1,480 ~ 2,220

Fuel System > Engine Control System > Knock Sensor (KS) > Schematic Diagrams

Circuit Diagram



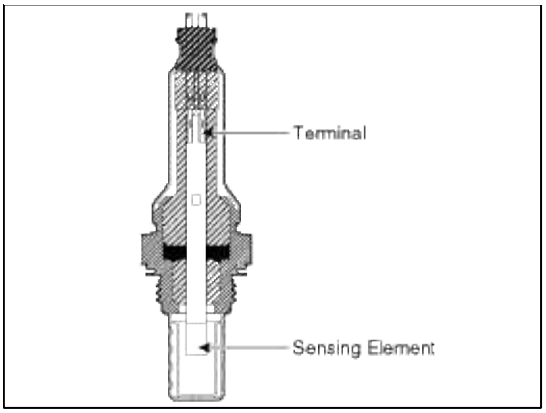
Fuel System > Engine Control System > Heated Oxygen Sensor (HO2S) > Description and Operation

Description

Heated Oxygen Sensor (HO2S) consists of the zirconium and the alumina and is installed on upstream and downstream of the Manifold Catalyst Converter (MCC).

After it compares oxygen consistency of the atmosphere with the exhaust gas, it transfers the oxygen consistency of the exhaust gas to the ECM. When A/F ratio is rich or lean, it generates approximately 1V or 0V respectively. In order that this sensor normally operates, the temperature of the sensor tip is higher than 370°C (698°F). So it has a heater which is controlled by the ECM duty signal.

When the exhaust gas temperature is lower than the specified value, the heater warms the sensor tip.



Fuel System > Engine Control System > Heated Oxygen Sensor (HO2S) > Specifications

Specification

[Bank 1/Sensor 1]

Item	Specification
Heater Resistance (Ω)	2.5 ~ 4.0 [20°C(68°F)]

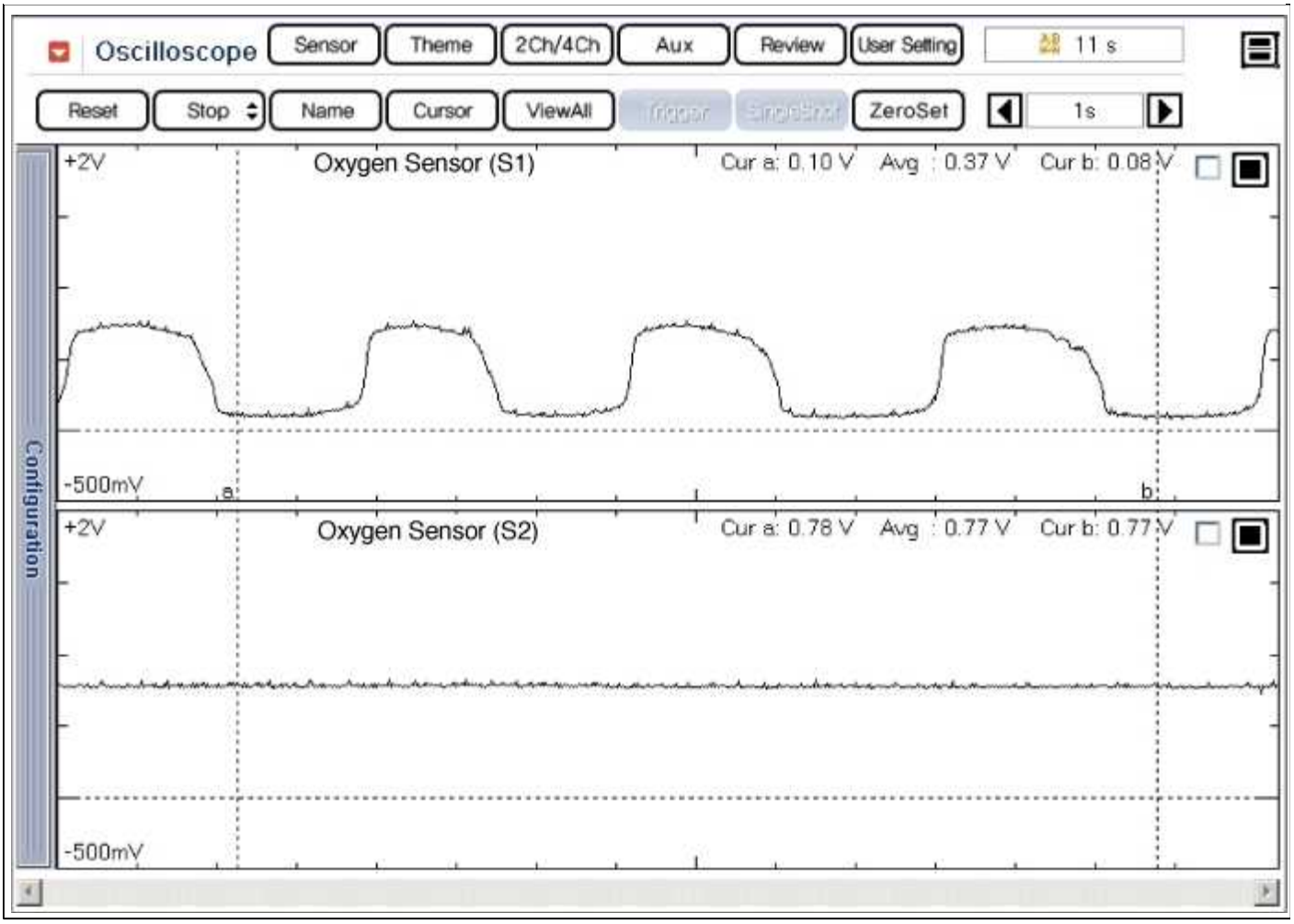
[Bank 1/Sensor 2]

A/F Ratio (λ)	Output Voltage(V)
RICH	0.80 ~ 0.92
LEAN	0.04 ~ 0.1

Item	Specification
Heater Resistance (Ω)	3.3 ~ 4.1 [21°C(69.8°F)]

Fuel System > Engine Control System > Heated Oxygen Sensor (HO2S) > Troubleshooting

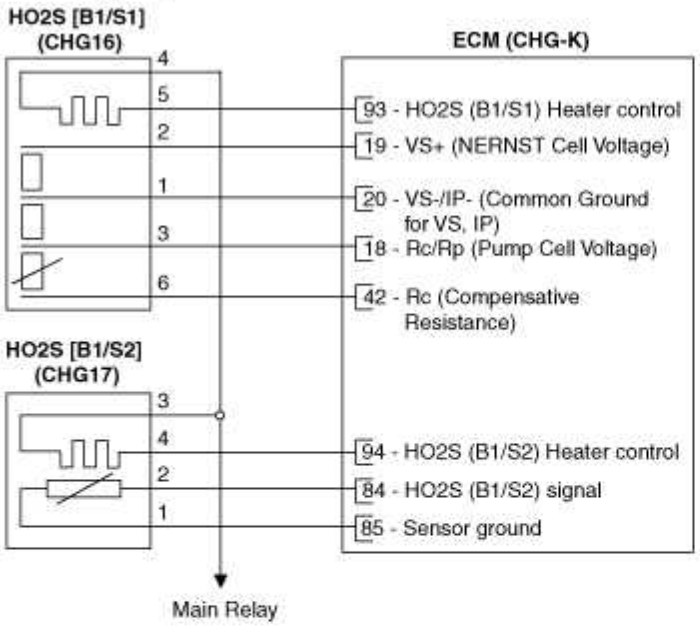
Wave Form



Fuel System > Engine Control System > Heated Oxygen Sensor (HO2S) > Schematic Diagrams

Circuit Diagram

[Circuit Diagram]



[Connection Information]

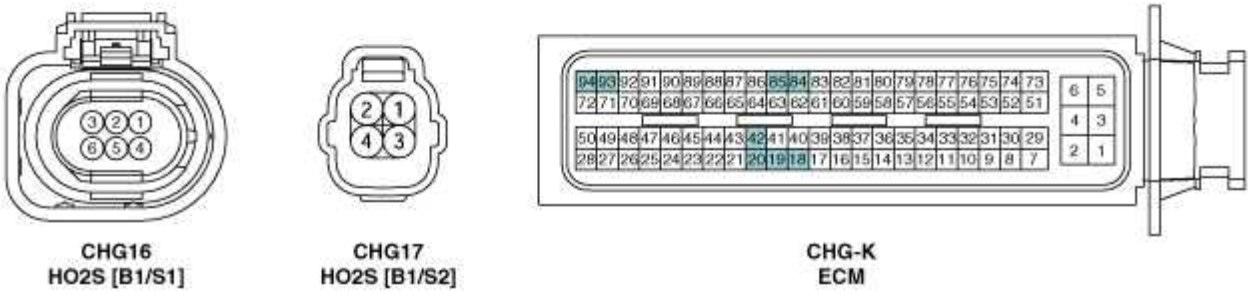
HO2S [B1/S1] (CHG16)

Terminal	Connected to	Function
1	ECM CHG-K (20)	VS-/IP- (Common Ground for VS, IP)
2	ECM CHG-K (19)	VS+ (NERNST Cell Voltage)
3	ECM CHG-K (18)	Rc/Rp (Pump Cell Voltage)
4	Main Relay	Battery Power (B+)
5	ECM CHG-K (93)	HO2S (B1/S1) Heater control
6	ECM CHG-K (42)	Rc (Compensative Resistance)

HO2S [B1/S2] (CHG17)

Terminal	Connected to	Function
1	ECM CHG-K (85)	Sensor ground
2	ECM CHG-K (84)	HO2S (B1/S2) signal
3	Main Relay	Battery Power (B+)
4	ECM CHG-K (94)	HO2S (B1/S2) Heater control

[Harness Connector]



Fuel System > Engine Control System > Heated Oxygen Sensor (HO2S) > Repair procedures

Inspection

1. Turn the ignition switch OFF.
2. Disconnect the HO2S connector.
3. Measure resistance between the HO2S terminals 3 and 4.
4. Check that the resistance is within the specification.

Specification: Refer to “Specification”

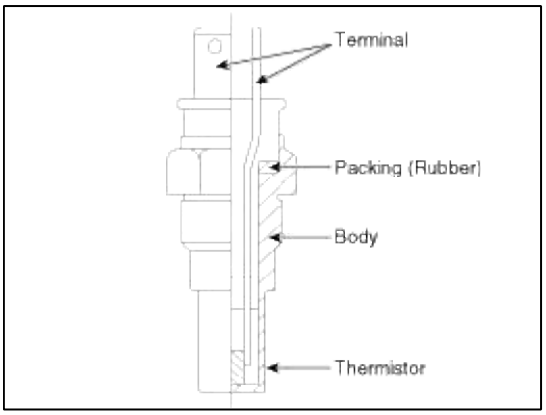
Fuel System > Engine Control System > CVVT Oil Temperature Sensor (OTS) > Description and Operation

Description

Continuous Variable Valve Timing (CVVT) system advances or retards the valve timing of the intake and exhaust valve in accordance with the ECM control signal which is calculated by the engine speed and load.
By controlling CVVT, the valve over-lap or under-lap occurs, which makes better fuel economy and reduces exhaust gases (NOx, HC) and improves engine performance through reduction of pumping loss, internal EGR effect, improvement of combustion stability, improvement of volumetric efficiency, and increase of expansion work.
This system consist of

- the CVVT Oil Control Valve (OCV) which supplies the engine oil to the cam phaser or runs out the engine oil from the cam phaser in accordance with the ECM PWM (Pulse With Modulation) control signal,
- the CVVT Oil Temperature Sensor (OTS) which measures the engine oil temperature,
- and the Cam Phaser which varies the cam phase by using the hydraulic force of the engine oil.

The engine oil getting out of the CVVT oil control valve varies the cam phase in the direction (Intake Advance/Exhaust Retard) or opposite direction (Intake Retard/Exhaust Advance) of the engine rotation by rotating the rotor connected with the camshaft inside the cam phaser.



Fuel System > Engine Control System > CVVT Oil Temperature Sensor (OTS) > Specifications

Specification

Temperature [°C(°F)]	Resistance (kΩ)
-40(-40)	52.15
-20(-4)	16.52
0(32)	6.0
20(68)	2.45
40(104)	1.11
60(140)	0.54
80(176)	0.29

Fuel System > Engine Control System > CVVT Oil Temperature Sensor (OTS) > Schematic Diagrams

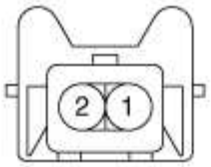
Circuit Diagram

[Circuit Diagram]

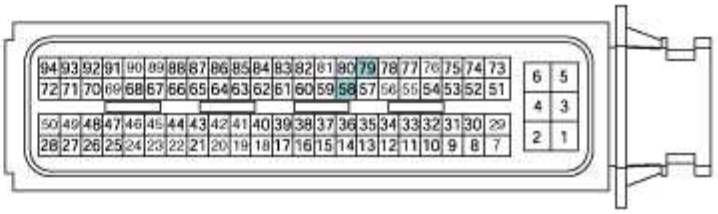
[Connection Information]

Terminal	Connected to	Function
1	ECM CHG-K (58)	OTS Signal
2	ECM CHG-K (79)	Sensor Ground

[Harness Connector]



CHG03
OTS



CHG-K
ECM

Fuel System > Engine Control System > CVVT Oil Temperature Sensor (OTS) > Repair procedures

Inspection

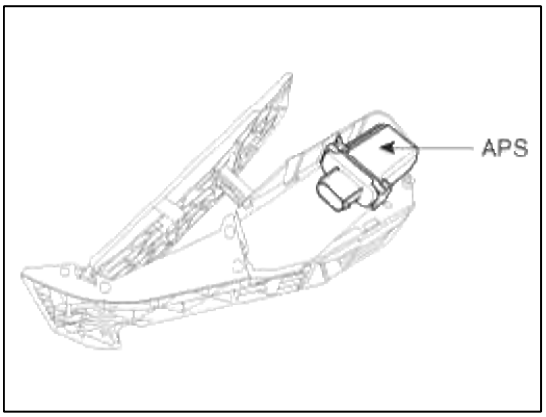
1. Turn the ignition switch OFF.
2. Disconnect the OTS connector.
3. Remove the OTS.
4. After immersing the thermistor of the sensor into engine coolant, measure resistance between the OTS terminals 1 and 2.
5. Check that the resistance is within the specification.

Specification: Refer to “Specification”

Fuel System > Engine Control System > Accelerator Position Sensor (APS) > Description and Operation

Description

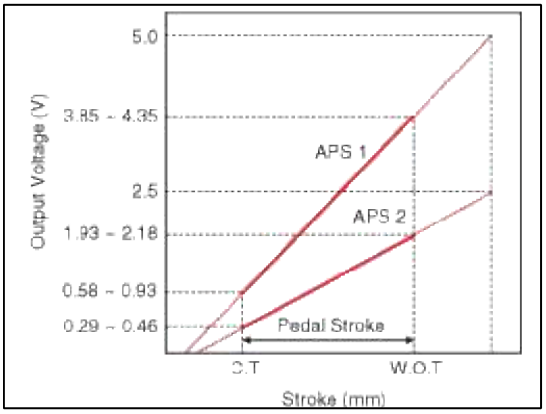
Accelerator Position Sensor (APS) is installed on the accelerator pedal module and detects the rotation angle of the accelerator pedal. The APS is one of the most important sensors in engine control system, so it consists of the two sensors which adapt individual sensor power and ground line. The second sensor monitors the first sensor and its output voltage is half of the first one. If the ratio of the sensor 1 and 2 is out of the range (approximately 1/2), the diagnostic system judges that it is abnormal.



Fuel System > Engine Control System > Accelerator Position Sensor (APS) > Specifications

Specification

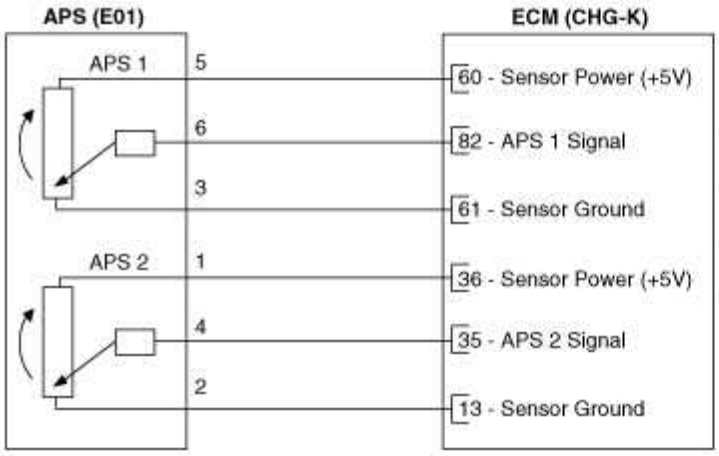
Accelerator Position	Output Voltage (V)	
	APS1	APS2
C.T	0.58 ~ 0.93	0.29 ~ 0.46
W.O.T	3.85 ~ 4.35	1.93 ~ 2.18



Fuel System > Engine Control System > Accelerator Position Sensor (APS) > Schematic Diagrams

Circuit Diagram

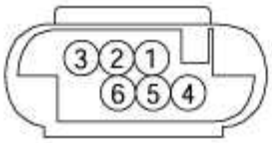
[Circuit Diagram]



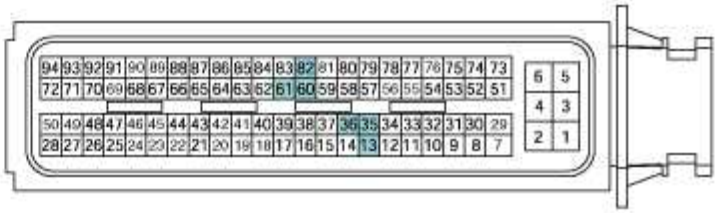
[Connection Information]

Terminal	Connected to	Function
1	ECM CHG-K (36)	APS 2 Sensor Power (+5V)
2	ECM CHG-K (13)	APS 2 Sensor Ground
3	ECM CHG-K (61)	APS 1 Sensor Ground
4	ECM CHG-K (35)	APS 2 Signal
5	ECM CHG-K (60)	APS 1 Sensor Power (+5V)
6	ECM CHG-K (82)	APS 1 Signal

[Harness Connector]



E01
APS



CHG-K
ECM

Fuel System > Engine Control System > Accelerator Position Sensor (APS) > Repair procedures

Inspection

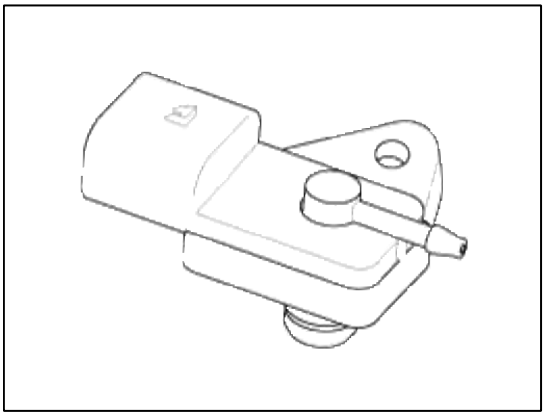
1. Connect a scantool on the Data Link Connector (DLC).
2. Turn the ignition switch ON.
3. Measure the output voltage of the APS 1 and 2 at C.T and W.O.T.

Specification: Refer to “Specification”

Fuel System > Engine Control System > Fuel Tank Pressure Sensor (FTPS) > Description and Operation

Description

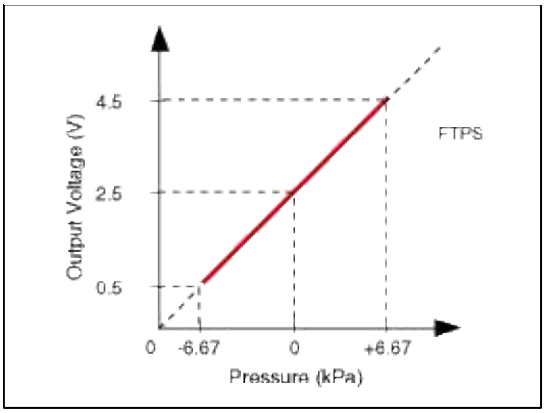
Fuel Tank Pressure Sensor (FTPS) is a component of the evaporative emission control system and is installed on the fuel tank, the fuel pump, or the canister. It checks the purge control solenoid valve operation and detects a leakage of the system.



Fuel System > Engine Control System > Fuel Tank Pressure Sensor (FTPS) > Specifications

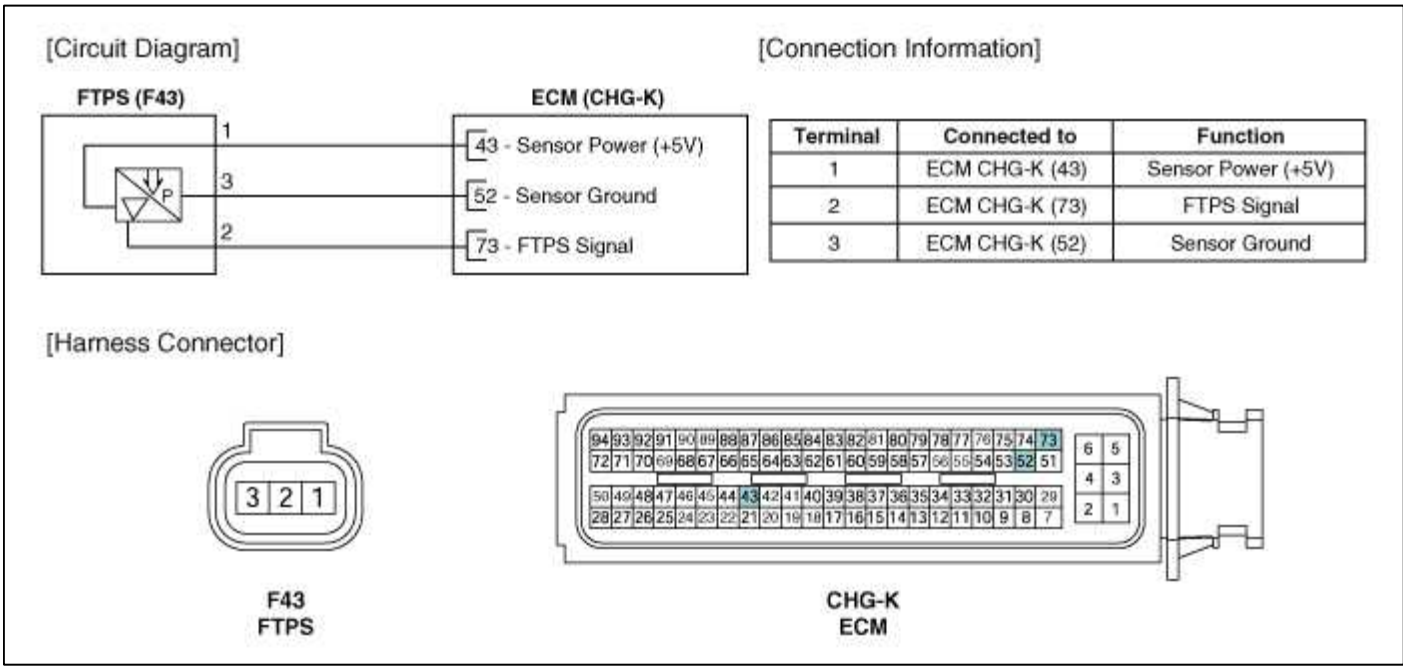
Specification

Pressure (kPa)	Output Voltage (V)
-6.67	0.5
0	2.5
+6.67	4.5



Fuel System > Engine Control System > Fuel Tank Pressure Sensor (FTPS) > Schematic Diagrams

Circuit Diagram



Fuel System > Engine Control System > Fuel Tank Pressure Sensor (FTPS) > Repair procedures

Inspection

1. Connect a scantool on the Data Link Connector (DLC).
2. Measure the output voltage of the FTPS.

Specification: Refer to "Specification"

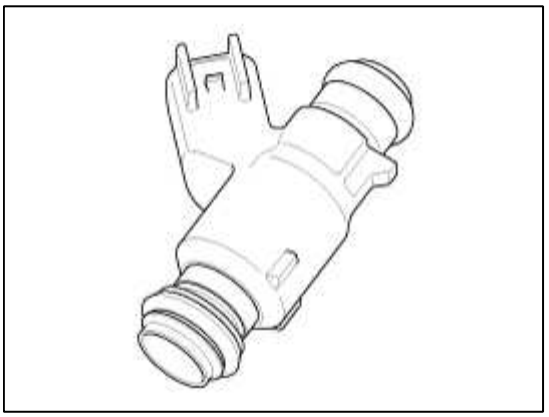
Fuel System > Engine Control System > Injector > Description and Operation

Description

Based on information from various sensors, the ECM determines the fuel injection amount. The fuel injector is a solenoid-operated valve and the fuel injection amount is controlled by length of time that the fuel injector is held open.

The ECM controls each injector by grounding the control circuit. When the ECM energizes the injector by grounding the control circuit, the circuit voltage should be low (theoretically 0V) and the fuel is injected. When the

ECM de-energizes the injector by opening control circuit, the fuel injector is closed and circuit voltage should be peak for a moment.



Fuel System > Engine Control System > Injector > Specifications

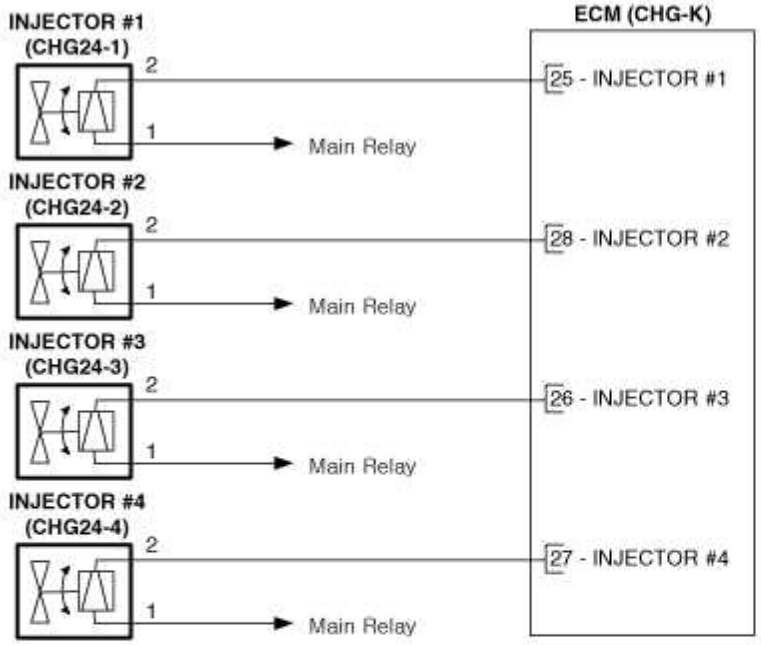
Specification

Item	Specification
Coil Resistance (Ω)	5.0 ~ 5.8 [20°C(68°F)]

Fuel System > Engine Control System > Injector > Schematic Diagrams

Circuit Diagram

[Circuit Diagram]



[Connection Information]

INJECTOR #1 (CHG24-1)

Terminal	Connected to	Function
1	Main Relay	Battery Power (B+)
2	ECM CHG-K (25)	Injector #1 Control

INJECTOR #2 (CHG24-2)

Terminal	Connected to	Function
1	Main Relay	Battery Power (B+)
2	ECM CHG-K (28)	Injector #2 Control

INJECTOR #3 (CHG24-3)

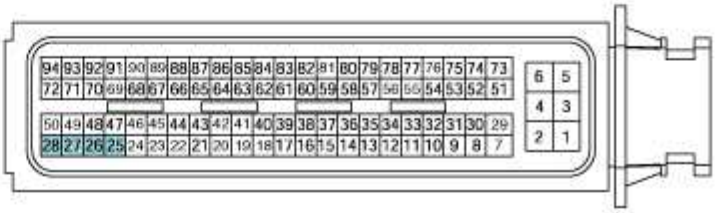
Terminal	Connected to	Function
1	Main Relay	Battery Power (B+)
2	ECM CHG-K (26)	Injector #3 Control

INJECTOR #4 (CHG24-4)

Terminal	Connected to	Function
1	Main Relay	Battery Power (B+)
2	ECM CHG-K (27)	Injector #4 Control

[Harness Connector]

CHG24-1,2,3,4
INJECTOR #1,2,3,4



CHG-K
ECM

Fuel System > Engine Control System > Injector > Repair procedures

Inspection

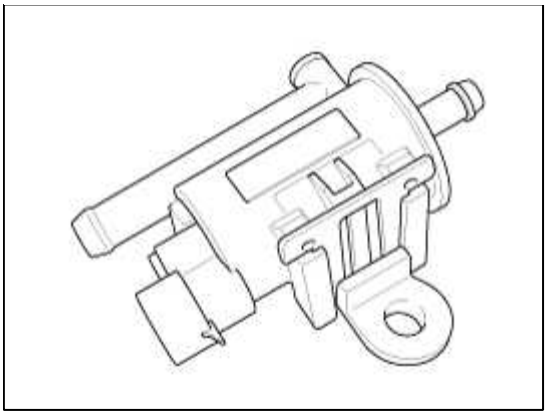
1. Turn the ignition switch OFF.
2. Disconnect the injector connector.
3. Measure resistance between the injector terminals 1 and 2.
4. Check that the resistance is within the specification.

Specification: Refer to “Specification”

Fuel System > Engine Control System > Purge Control Solenoid Valve (PCSV) > Description and Operation

Description

Purge Control Solenoid Valve (PCSV) is installed on the surge tank and controls the passage between the canister and the intake manifold. It is a solenoid valve and is open when the ECM grounds the valve control line. When the passage is open (PCSV ON), fuel vapor stored in the canister is transferred to the intake manifold.



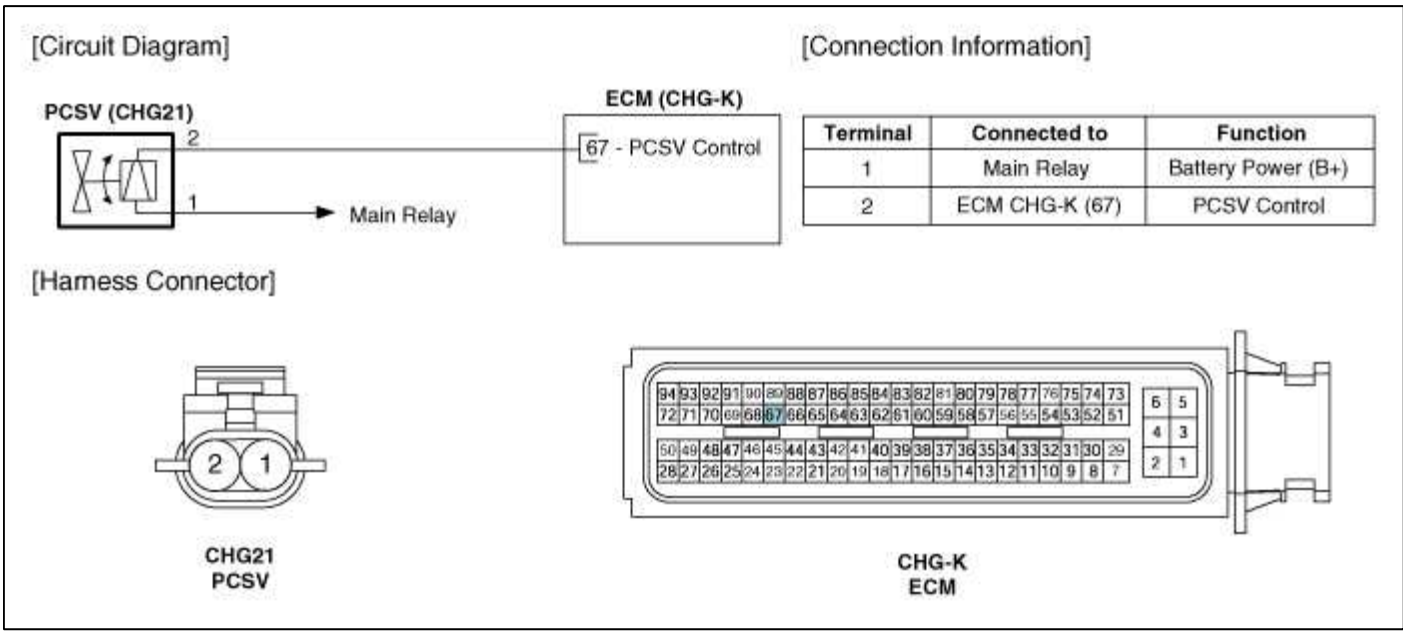
Fuel System > Engine Control System > Purge Control Solenoid Valve (PCSV) > Specifications

Specification

Item	Specification
Coil Resistance (Ω)	19.0 ~ 22.0 [20°C(68°F)]

Fuel System > Engine Control System > Purge Control Solenoid Valve (PCSV) > Schematic Diagrams

Circuit Diagram



Fuel System > Engine Control System > Purge Control Solenoid Valve (PCSV) > Repair procedures

Inspection

1. Turn the ignition switch OFF.
2. Disconnect the PCSV connector.
3. Measure resistance between the PCSV terminals 1 and 2.

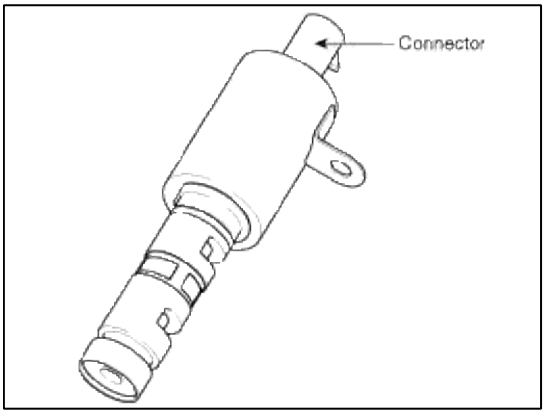
4. Check that the resistance is within the specification.

Specification: Refer to “Specification”

Fuel System > Engine Control System > CVVT Oil Control Valve (OCV) > Description and Operation

Description

Continuous Variable Valve Timing (CVVT) system advances or retards the valve timing of the intake and exhaust valve in accordance with the ECM control signal which is calculated by the engine speed and load.
By controlling CVVT, the valve over-lap or under-lap occurs, which makes better fuel economy and reduces exhaust gases (NOx, HC) and improves engine performance through reduction of pumping loss, internal EGR effect, improvement of combustion stability, improvement of volumetric efficiency, and increase of expansion work.
This system consist of
-the CVVT Oil Control Valve (OCV) which supplies the engine oil to the cam phaser or runs out the engine oil from the cam phaser in accordance with the ECM PWM (Pulse With Modulation) control signal,
- the CVVT Oil Temperature Sensor (OTS) which measures the engine oil temperature,
-and the Cam Phaser which varies the cam phase by using the hydraulic force of the engine oil.
The engine oil getting out of the CVVT oil control valve varies the cam phase in the direction (Intake Advance/Exhaust Retard) or opposite direction (Intake Retard/Exhaust Advance) of the engine rotation by rotating the rotor connected with the camshaft inside the cam phaser.



Fuel System > Engine Control System > CVVT Oil Control Valve (OCV) > Specifications

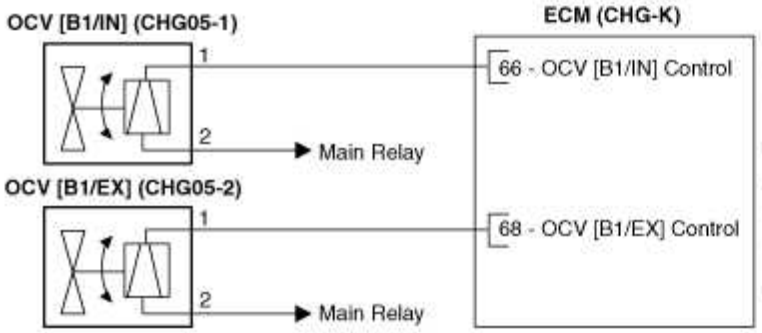
Specification

Item	Specification
Coil Resistance (Ω)	6.9 ~ 7.9 [20°C(68°F)]

Fuel System > Engine Control System > CVVT Oil Control Valve (OCV) > Schematic Diagrams

Circuit Diagram

[Circuit Diagram]



[Connection Information]

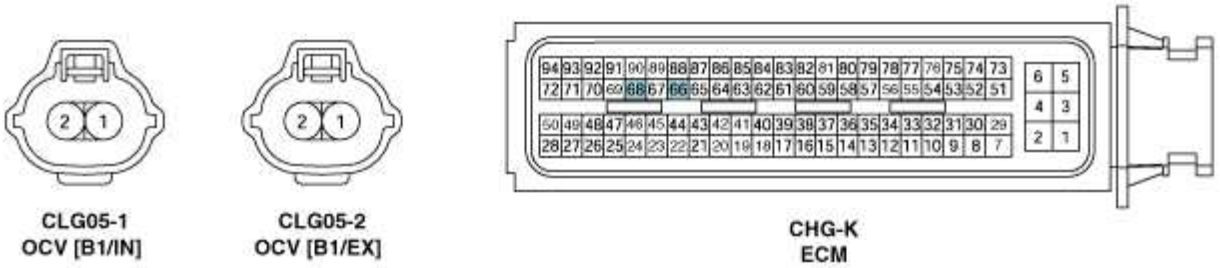
OCV [B1/IN] (CHG05-1)

Terminal	Connected to	Function
1	ECM CHG-K (66)	OCV [B1/IN] Control
2	Main Relay	Battery Power (B+)

OCV [B1/EX] (CHG05-2)

Terminal	Connected to	Function
1	ECM CHG-K (68)	OCV [B1/EX] Control
2	Main Relay	Battery Power (B+)

[Harness Connector]



Fuel System > Engine Control System > CVVT Oil Control Valve (OCV) > Repair procedures

Inspection

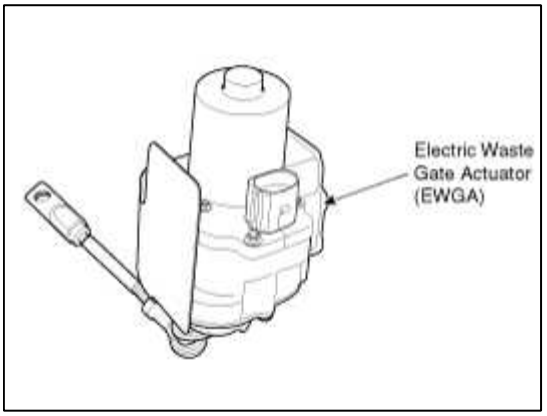
1. Turn the ignition switch OFF.
2. Disconnect the OCV connector.
3. Measure resistance between the OCV terminals 1 and 2.
4. Check that the resistance is within the specification.

Specification: Refer to “Specification”

Fuel System > Engine Control System > Electric WGT Control Actuator > Description and Operation

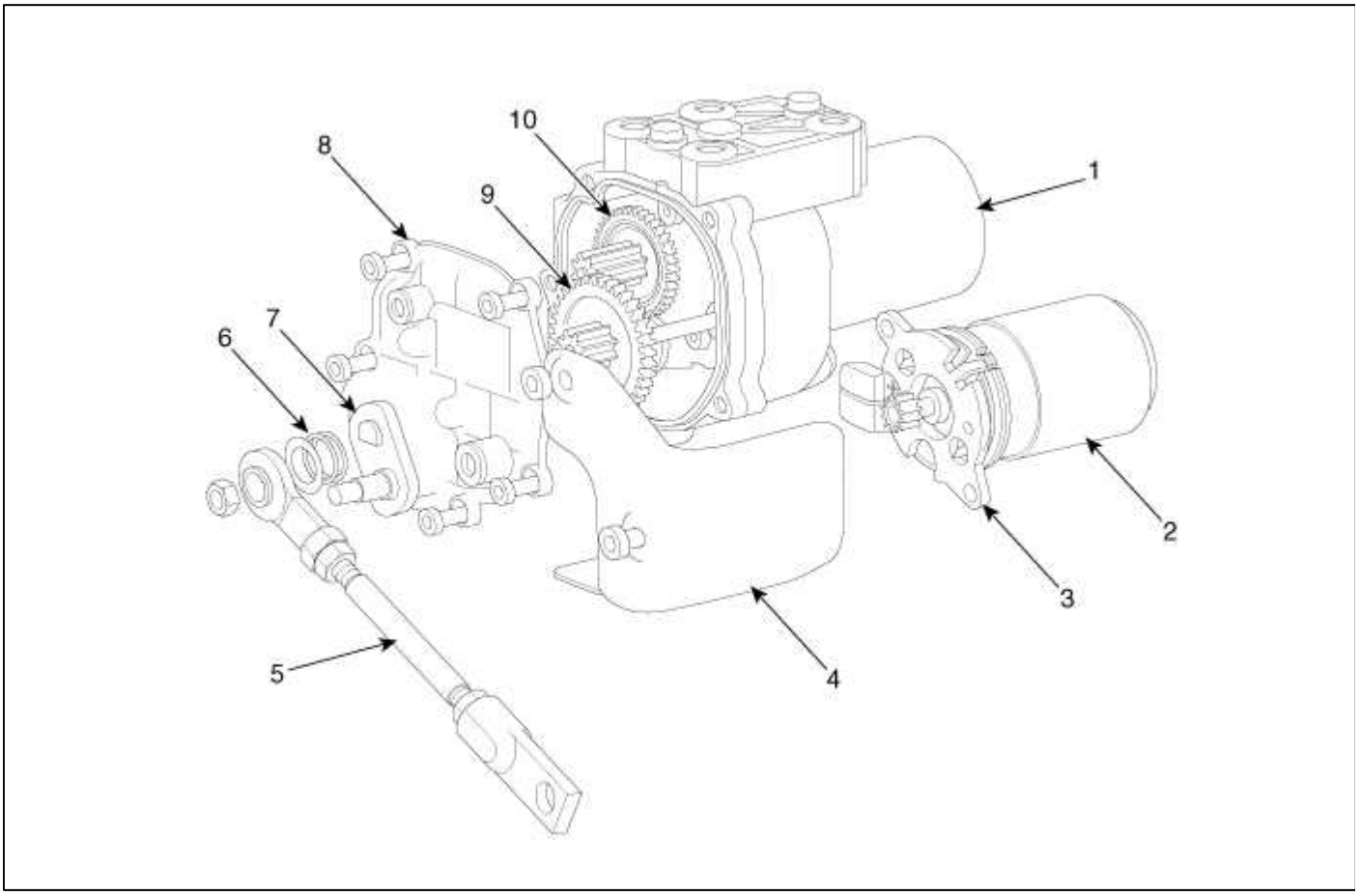
Desrcription

The Electric WGT Control Actuator is installed on the turbocharger.
It operates the vain in the Waste Gate Turbocharger (WGT) and regulates the compressed air amount by the ECM's PWM signal. This actuator consists of a DC motor which actuates the vane, a 2-step gear which increases torque of the DC motor, a position sensor which detects status of the vane, an electric control unit which drives the DC motor.



Fuel System > Engine Control System > Electric WGT Control Actuator > Components and Components Location

Components



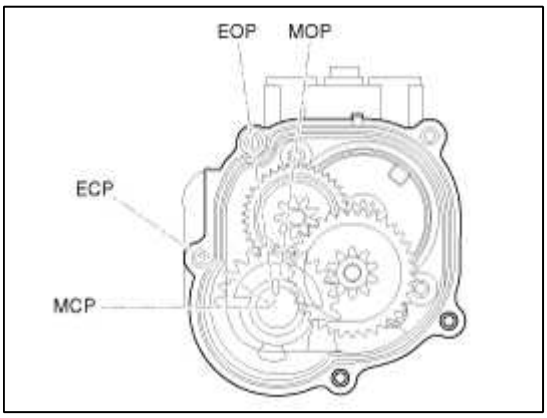
1 . Housing cover 2 . DC motor 3. Motor holder 4 . Heater protector 5. Rod	6 . Rod-end spring 7 . Lever 8 . Housing cover 9. Second gear 10. First gear

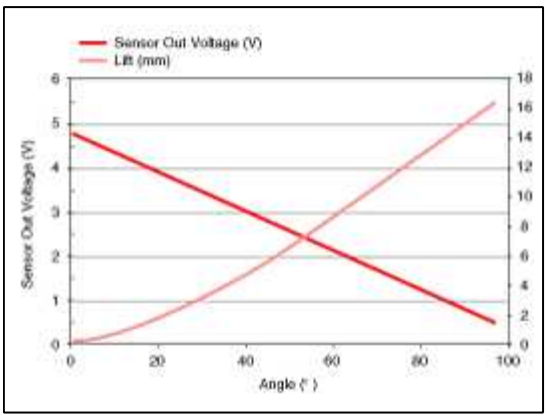
Fuel System > Engine Control System > Electric WGT Control Actuator > Specifications

Specification

[EWGA Position Sensor]

Position	Output Voltage[V]	Operating Angle[°]	Range of Rod [mm], reference
Mechanical Close end stop Position (MCP)	4.8	0	0
Electrical Close end stop Position (ECP)	3.8	22	1.9
Electrical Open end stop Position (EOP)	1.2	81	13
Mechanical Open end stop Position (MOP)	0.5	97	16



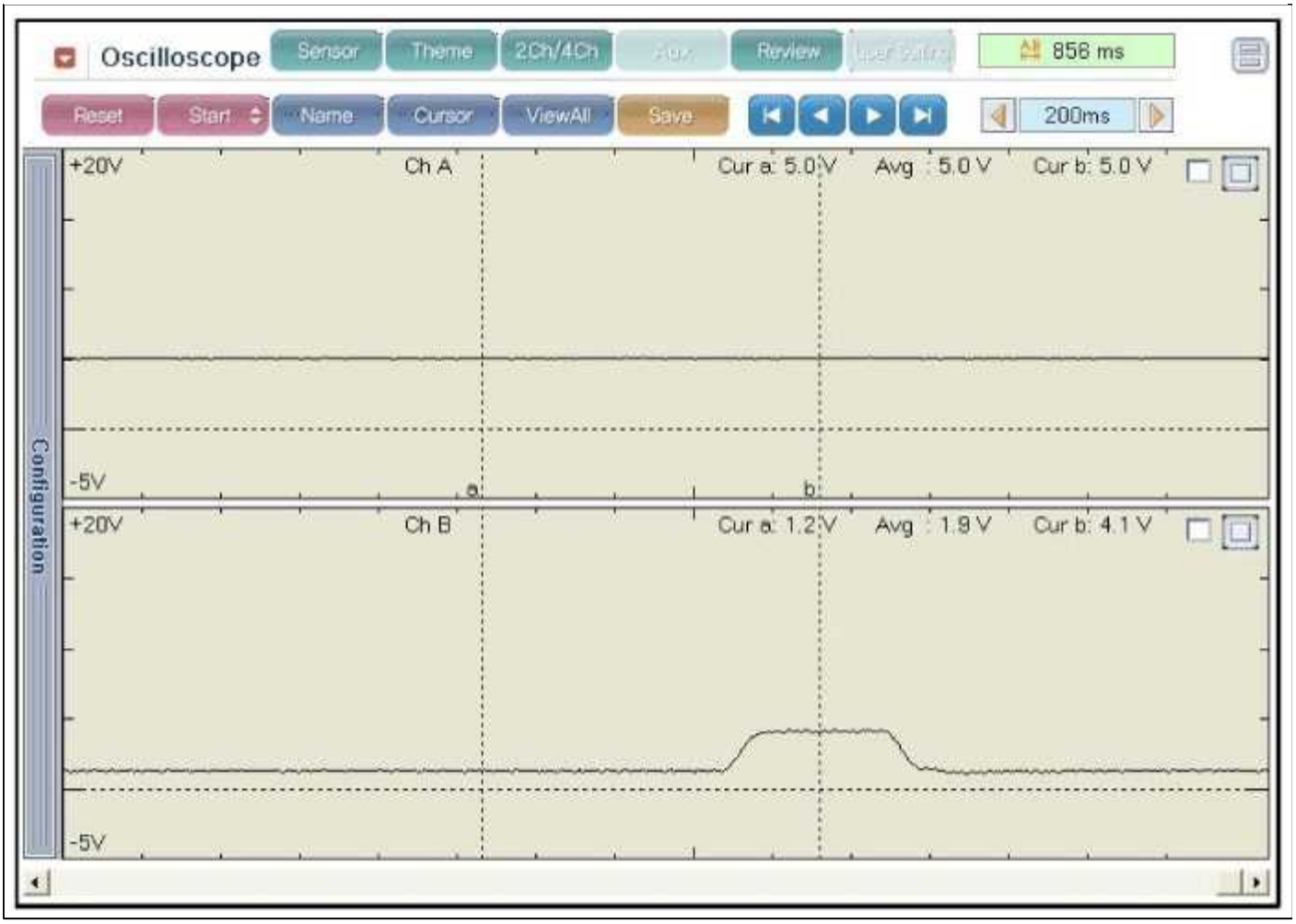


[EWGA DC Motor]

Item	Specification
Coil Resistance (Ω)	1.4 ~ 2.0 [21°C(69.8°F)]

Fuel System > Engine Control System > Electric WGT Control Actuator > Troubleshooting

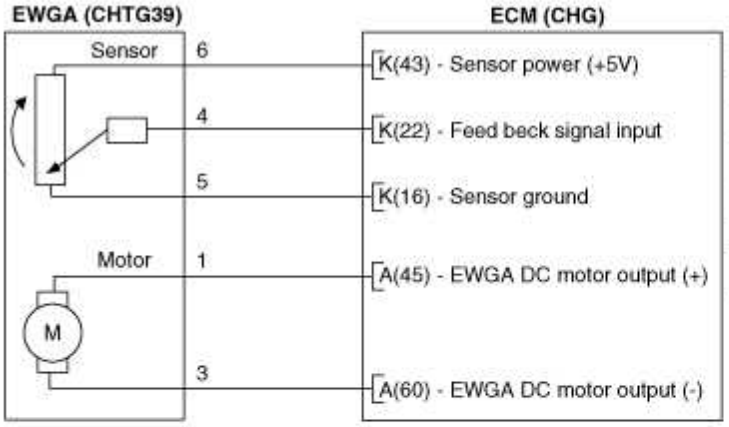
Signal Waveform



Fuel System > Engine Control System > Electric WGT Control Actuator > Schematic Diagrams

Circuit Diagram

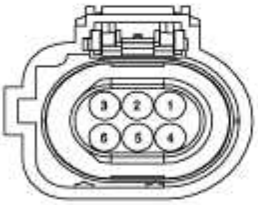
[Circuit Diagram]

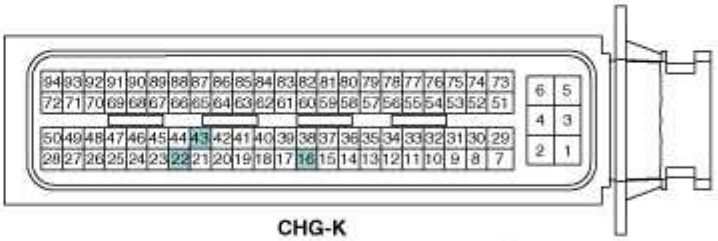


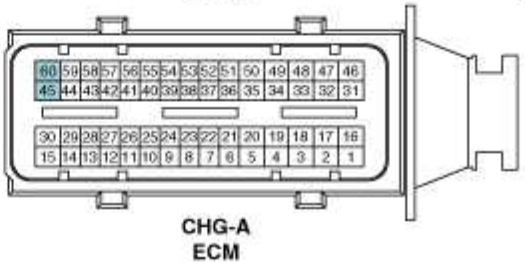
[Connection Information]

Terminal	Connected to	Function
1	ECM CHG-A (45)	EWGA DC Motor output (+)
2	-	-
3	ECM CHG-A (60)	EWGA DC Motor output (-)
4	ECM CHG-K (22)	Feedbeck signal input
5	ECM CHG-K (16)	Sensor ground
6	ECM CHG-K (43)	Sensor power

[Harness Connector]







Fuel System > Engine Control System > Electric WGT Control Actuator > Repair procedures

Inspection

[Motor]

1. Turn ignition switch OFF.
2. Disconnect the EWGA connector.
3. Check that the EWGA is stuck by foreign material.
4. Measure resistance between motor (+) and (-) control terminals of the motor.
5. Check that the resistance is within the specification.

Specification: Refer to “Specification” section.

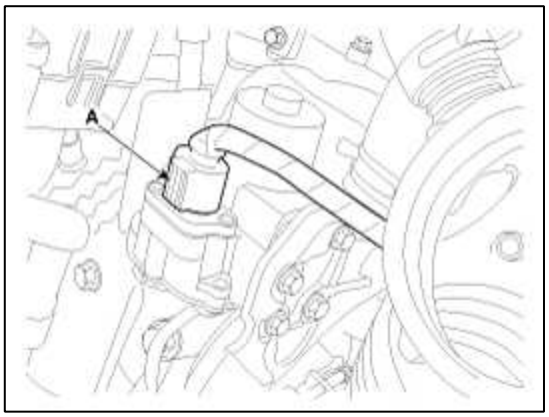
[Position Sensor]

1. Turn ignition switch ON.
2. Connect the GDS to the data link connector(DLC).
3. Check the output voltage at each position of the EWGA position sensor on current data item within the specification.

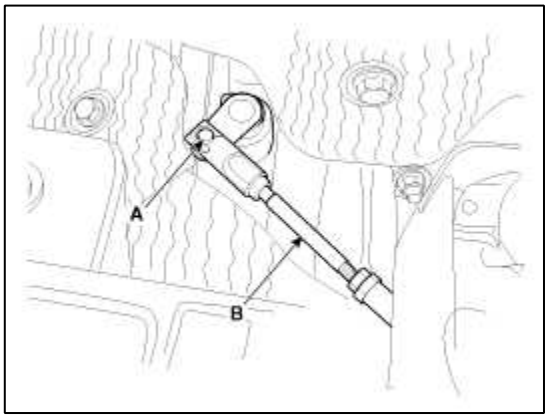
Specification: Refer to “Specification” section.

Removal

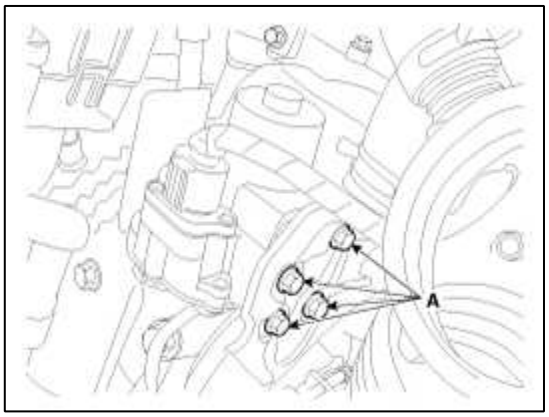
1. Turn the ignition switch OFF and disconnect the battery negative (-) cable.
2. Remove the air cleaner assembly. (Refer to Engine Mechanical System - "Air Cleaner")
3. Disconnect the EWGA connector (A).



4. Remove the shaft link assembly (B) after removing the C-ring (A).



5. Remove the EWGA after removing the bolts (A).



CAUTION

When carrying the turbo charger, do not hold the rod of the turbo charge to prevent bending the rod.

Installation

1. Installation is the reverse order of removal.

Electric WGT control actuator installation bolt: 7.35 ~ 8.34 N.m (0.75 ~ 0.85 kgf.m, 5.42 ~ 6.08 lb-ft)

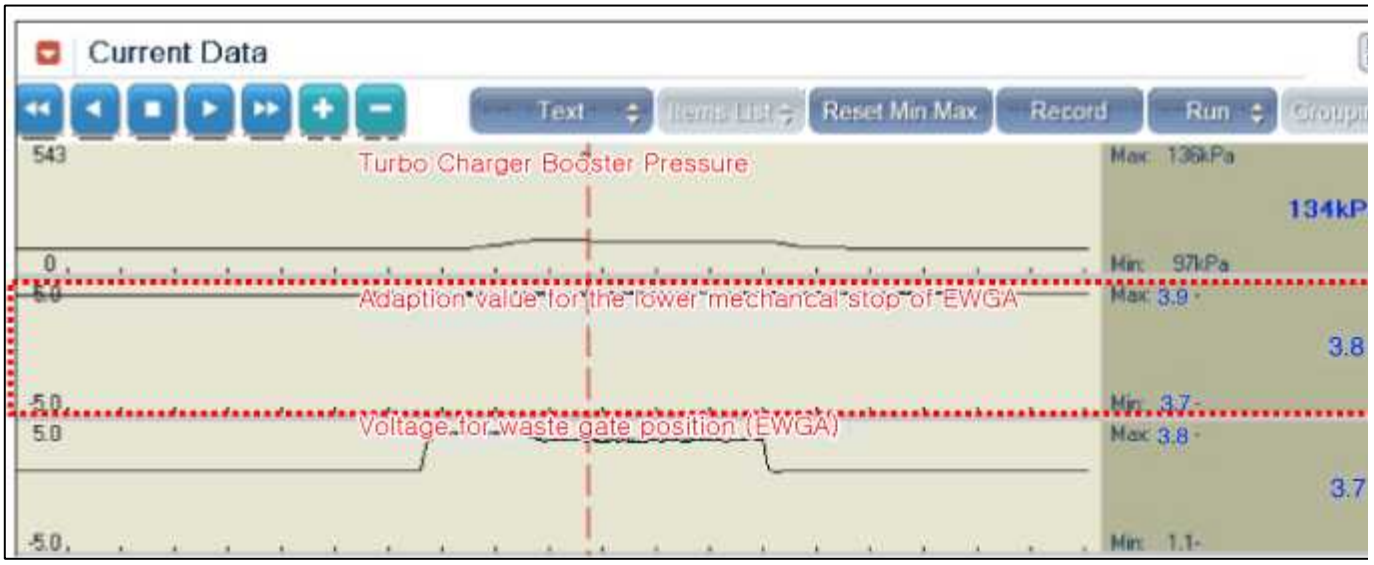
Adjustment

1. Check that the waste gate turbo charger is cool enough to work.
2. Turn the ignition switch to OFF position.
3. Connect the diagnostic tool to DLC connector (16 pin) under the driver side instrument panel.
4. Turn the ignition switch ON position.

> CAUTION
>
> Do not start the engine.

5. Select VIN or Vehicle on the initial screen.
6. Enter "Engine Control" menu after slelecting vehicle information (Vehicle model, Model year, Engine type) or entering the VIN number.
7. Check " Adaption value for the lower mechancal stop of EWGA" after selecting "Current Data" menu.

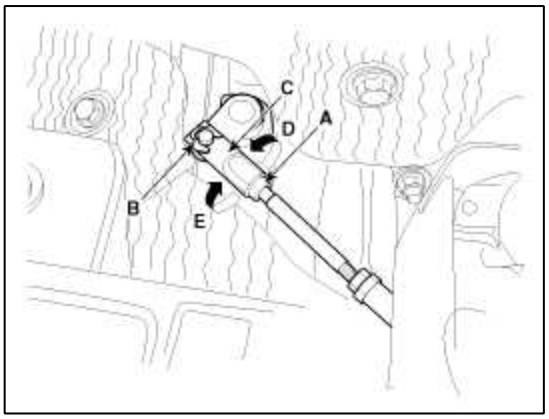
Specified voltage value: 3.7 ~ 3.9 V



8. If the voltage value measured is not within the specified voltage value, adjust the EWGA rod length. But, if no, no further procedure is required.
   (1) Loosen the rod end lock nut (A) and remove the C-ring (B).
   (2) Adjust the rod end part (C) by rotating it clockwise (D) or counterclockwise (E) to satisfy the specification.
      A. If output voltage > 3.9 V
         : Turn it counterclockwise (E)

B. If output voltage < 3.7 V
: Turn it clockwise (D)

Turning angle	Changing level of the adaption value (V)
0.5 turn (180°)	0.15 ~ 0.20
1 turn (360°)	0.30 ~ 0.40



9. Install the rod end part (C) to the turbo charger lever (D) temporarily. Don't tighten the rod end lock nut (A).
10. Turn the ignition switch ON/OFF 5 times. But hold 5 seconds at each IG ON or OFF state.

NOTE

Turn the ignition switch ON/OFF repeatedly until the changing value of " Adaption value for the lower mechancal stop of EWGA" is within 0.05V.

When turning the ignition switch ON or OFF once, maximum changing level of the adaption value : Max. ± 0.05V

11. If the voltage value measured is not within the specified voltage value, repeat 8~10 procedures untill the voltage value is within the specified voltage value.

Specified voltage value : 3.7 ~ 3.9 V

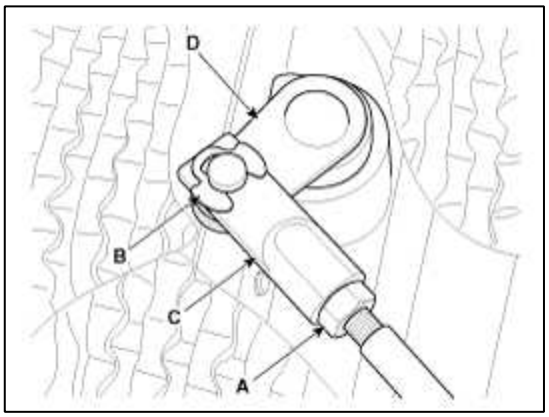
12. Check that " Adaption value for the lower mechancal stop of EWGA" is within the specified voltage value.
13. If it is within the specified voltage value, install the turbo charger lever (D) and the rod end part (C).

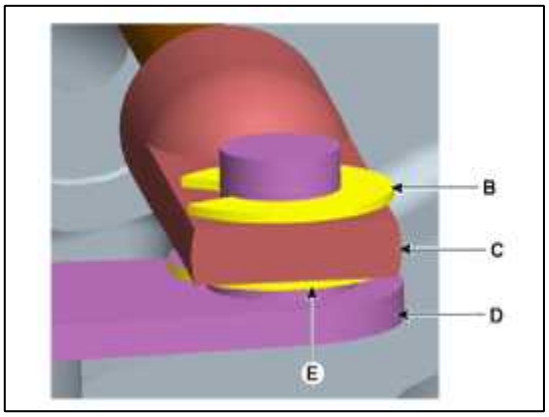
CAUTION

Be careful not to remove the washer (E).

14. Tighten the rod end locking nut (A). The turbo charger lever (D) side and the rod end part (C) side should be parallel at this time.

15. Install the C-ring (B).

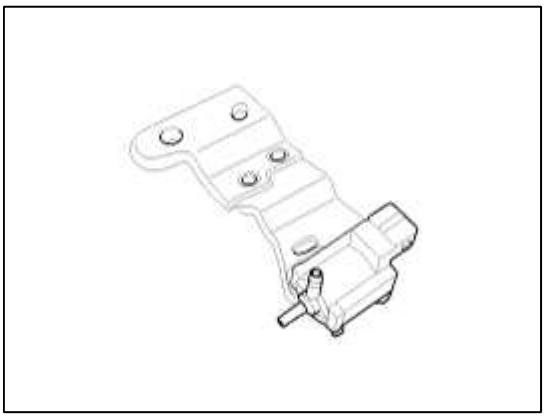




Fuel System > Engine Control System > RCV Control Solenoid Valve > Description and Operation

Description

RCV (Recirculation Valve) Control Solenoid Valve is installed on the cylinder head and operates the RCV actuator which controls the by-pass passage of the turbo-charger compressor.
When the throttle valve is closed during engine running [Tip-out], crash noise of the impeller will occur because of rapid increasing of the boost pressure. So, in this case, in order to prevent this phenomenon, ECM maintains the appropriate boost pressure by opening the by-pass passage.



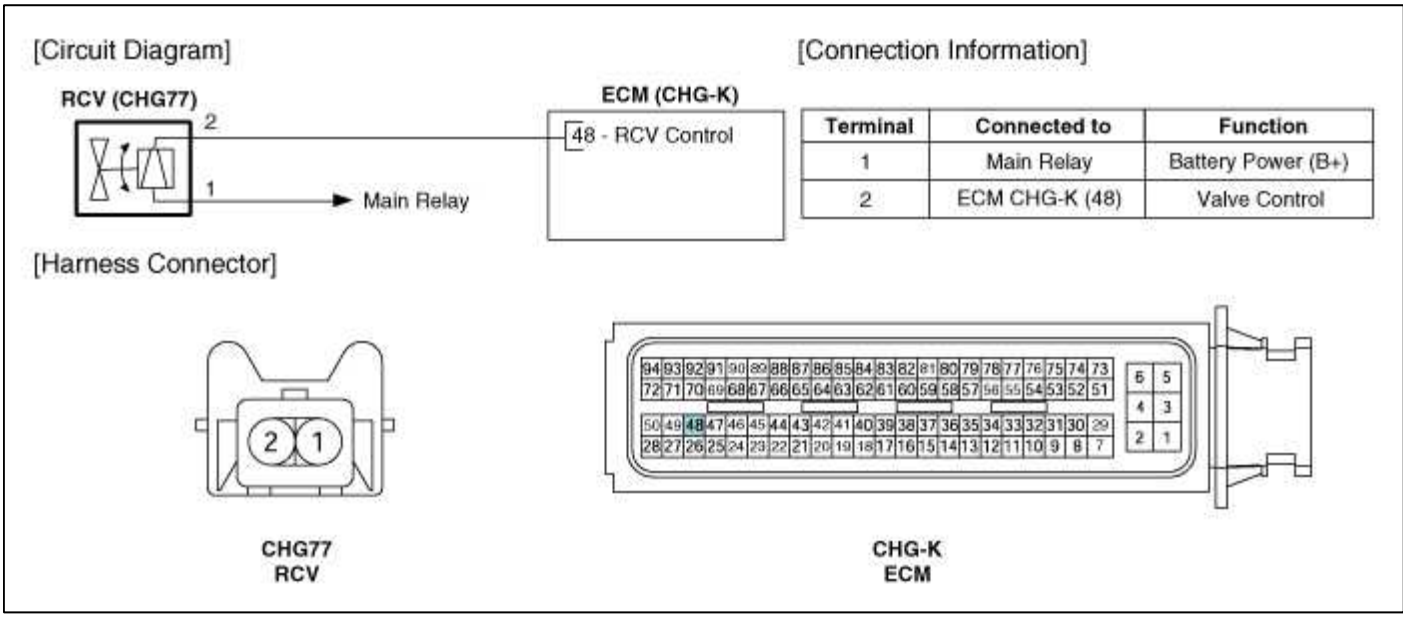
Fuel System > Engine Control System > RCV Control Solenoid Valve > Specifications

Specification

Item	Specification
Coil Resistance (Ω)	28.3 ~ 31.1 [20°C(68°F)]

Fuel System > Engine Control System > RCV Control Solenoid Valve > Schematic Diagrams

Circuit Diagram



Fuel System > Engine Control System > RCV Control Solenoid Valve > Repair procedures

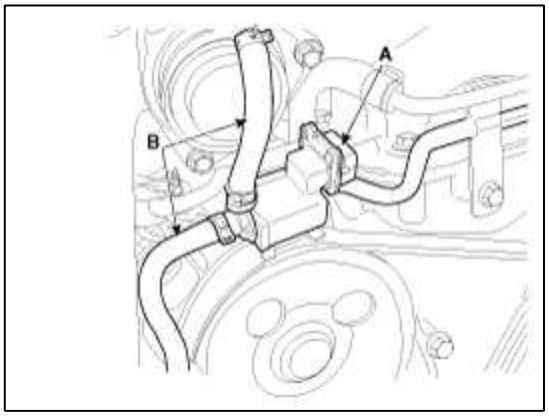
Inspection

1. Turn the ignition switch OFF.
2. Disconnect the RCV control solenoid valve connector.
3. Measure resistance between the valve terminals 1 and 2.
4. Check that the resistance is within the specification.

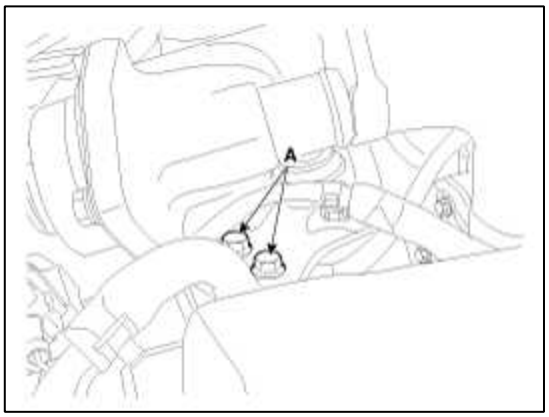
Specification: Refer to “Specification”

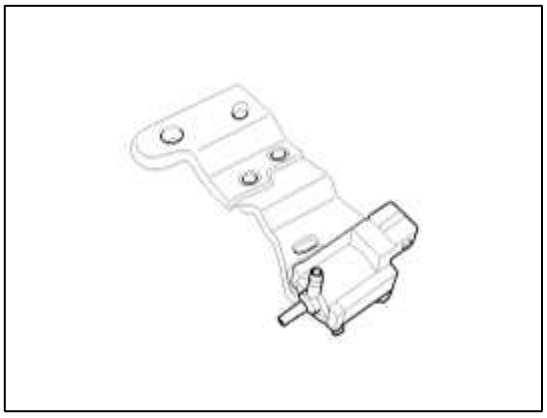
Removal

1. Turn the ignition switch OFF and disconnect the battery negative (-) cable.
2. Disconnect the RCV control solenoid valve connector (A) and hose (B).



3. Remove the RCV control solenoid valve bracket after remove the bracket installation bolts (A).





Installation

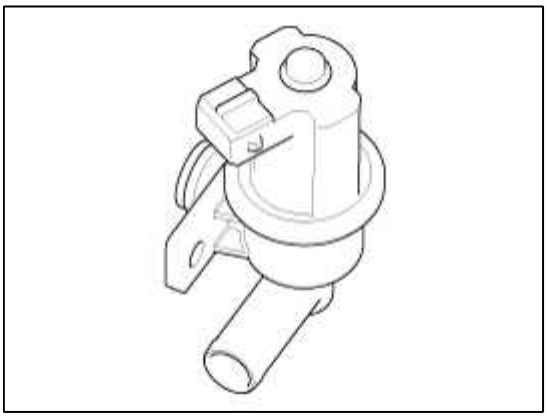
1. Installation is the reverse order of removal.

RCV control solenoid valve bracket installation bolt: 9.8 ~ 11.8 N.m (1.0 ~ 1.2 kgf.m, 7.2 ~ 8.7 lb-ft)

Fuel System > Engine Control System > Canister Close Valve (CCV) > Description and Operation

Description

Canister Close Valve (CCV) is installed on the canister ventilation line. It seals evaporative emission control system by shutting the canister from the atmosphere when leakage detecting system operates.



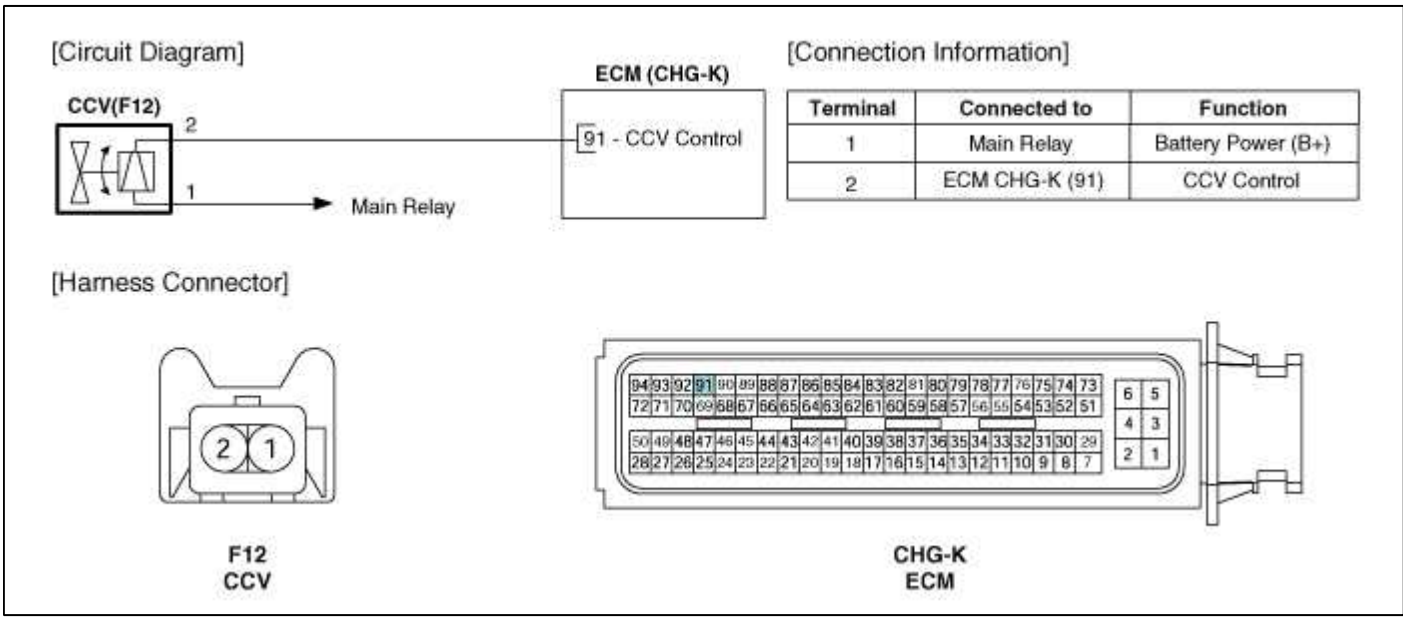
Fuel System > Engine Control System > Canister Close Valve (CCV) > Specifications

Specification

Item	Specification
Coil Resistance (Ω)	23.0 ~ 26.0 [20°C(68°F)

Fuel System > Engine Control System > Canister Close Valve (CCV) > Schematic Diagrams

Circuit Diagram



Fuel System > Engine Control System > Canister Close Valve (CCV) > Repair procedures

Inspection

1. Turn the ignition switch OFF.
2. Disconnect the CCV connector.
3. Measure resistance between the CCV terminal 5 and6.
4. Check that the resistance is within the specification.

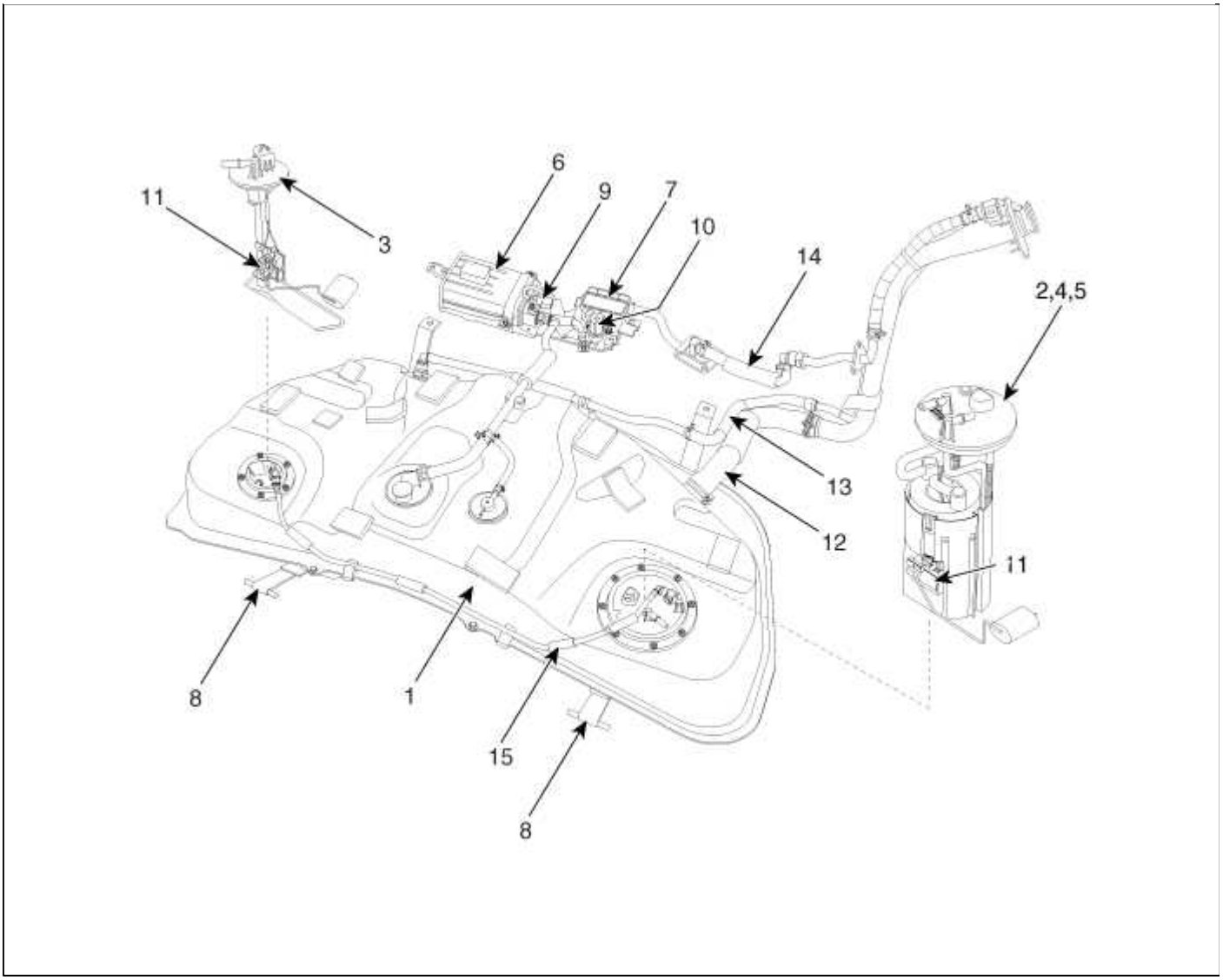
Specification: Refer to "Specification"

5. Disconnect the vapor hose connected with the canister from the CCV.
6. Connect a vacuum pump to the nipple.
7. Ground the CCV control line and apply battery voltage to the CCV power supply line.
8. Apply vacuum and check the valve operation.

Specification: Vacuum maintained

Fuel System > Fuel Delivery System > Components and Components Location

Components Location



1. Fuel Tank 2. Fuel Pump 3. Sub Fuel Sender 4. Fuel Filter 5. Fuel Pressure Regulator 6. Canister 7. Fuel Tank Air Filter 8. Fuel Tank Band	9. Fuel Tank Pressure Sensor (FTPS) 10. Canister Close Valve (CCV) 11. Fuel Level Sender (FLS) 12. Fuel Filler Hose 13. Leveling Hose 14. Ventilation Hose 15. Suction Hose

Fuel System > Fuel Delivery System > Repair procedures

Fuel Pressure Test

1. Release the residual pressure in fuel line (Refer to “Release Residual Pressure in Fuel Line” in this group).

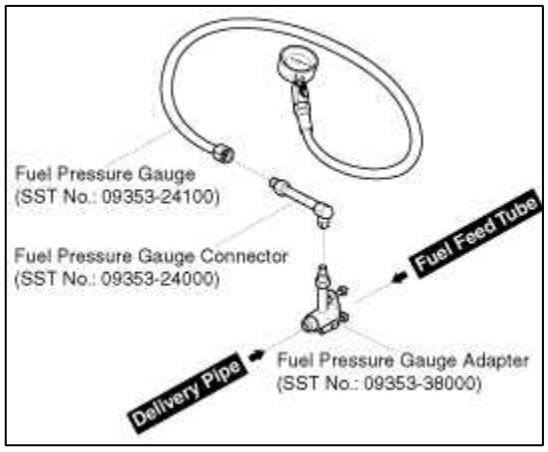
CAUTION

When removing the fuel pump relay, a Diagnostic Trouble Code (DTC) may occur. Delete the code with the GDS after completion of “Release Residual Pressure in Fuel Line” work.

2. Install the Special Service Tool (SST).
   (1) Disconnect the fuel feed tube from the high pressure fuel pump.

> **CAUTION**
>
> There may be some residual pressure even after “Release Residual Pressure in Fuel Line” work, so cover the hose connection with a shop towel to prevent residual fuel from spilling out before disconnecting any fuel connection.

   (2) Install the special service tool for measuring the fuel pressure in between the fuel feed tube and the high pressure fuel pump (Refer to the figure below).



3. Inspect fuel leakage on connections among the fuel feed tube, the high pressure fuel pump, and the SST components with IG ON.
4. Measure Fuel Pressure.
   (1) Start the engine and measure the fuel pressure at idle.

Fuel Pressure:
579 kPa (5.9 kgf/cm², 83.9 psi)

> **NOTE**
>
> If the fuel pressure differs from the standard value, repair or replace the related part (Refer to the table below).

Fuel Pressure	Cause	Related Part
Too Low	Fuel filter clogged	Fuel Filter
	Fuel leakage	Fuel Pressure Regulator
Too High	Fuel pressure regulator stuck	Fuel Pressure Regulator

(2) Stop the engine, and then check for the change in the fuel pressure gauge reading.

Standard Value: The gauge reading should hold for about 5 minutes after the engine stops

NOTE

If the gauge reading should not be held, repair or replace the related part (Refer to the table below).

Fuel Pressure (After Engine Stops)	Cause	Related Part
Fuel Pressure Drops Slowly	Leakage on injector	Injector
Fuel Pressure Drops Immediately	Check valve of fuel pump stuck open	Fuel Pump

(3) Turn the ignition switch OFF.

5. Release the residual pressure in fuel line (Refer to "Release Residual Pressure in Fuel Line").

CAUTION

When removing the fuel pump relay, a Diagnostic Trouble Code (DTC) may occur. Delete the code with the GDS after completion of "Release Residual Pressure in Fuel Line" work.

6. Test End

(1) Remove the Special Service Tool (SST) from the fuel feed tube and the high pressure fuel pump.

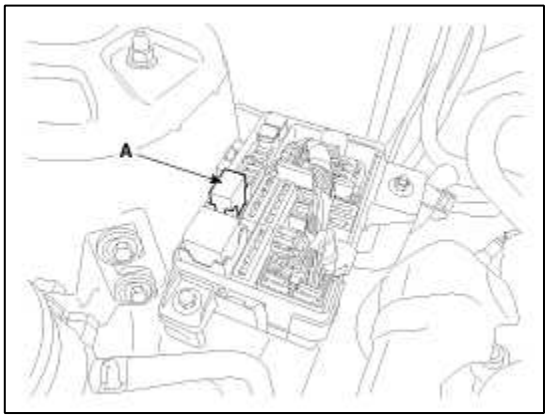
(2) Connect the fuel feed tube and the high pressure fuel pump.

Release Residual Pressure in Fuel Line

CAUTION

There may be some residual pressure even after "Release Residual Pressure in Fuel Line" work, so cover the hose connection with a shop towel to prevent residual fuel from spilling out before disconnecting any fuel connection.

1. Turn the ignition switch OFF and disconnect the battery (-) cable.
2. Remove the fuel pump relay (A).



CAUTION

When removing the fuel pump relay, a Diagnostic Trouble Code (DTC) may occur. Delete the code with the GDS after completion of "Release Residual Pressure in Fuel Line" work.

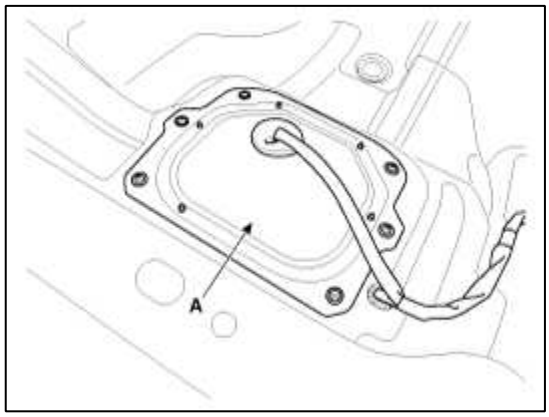
3. Connect the battery (-) cable.
4. Start the engine and let idle, and then turn the ignition switch OFF after the engine has stopped on its own.

5. Disconnect the battery (-) cable, and then install the fuel pump relay (A).
6. Connect the battery (-) cable.
7. Delete the Diagnostic Trouble Code (DTC) related the fuel pump relay with the GDS.

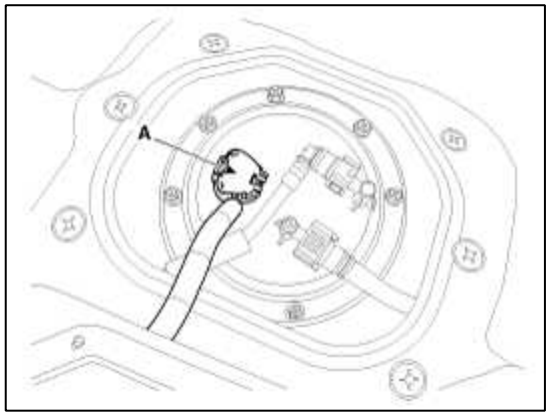
Fuel System > Fuel Delivery System > Fuel Tank > Repair procedures

Removal

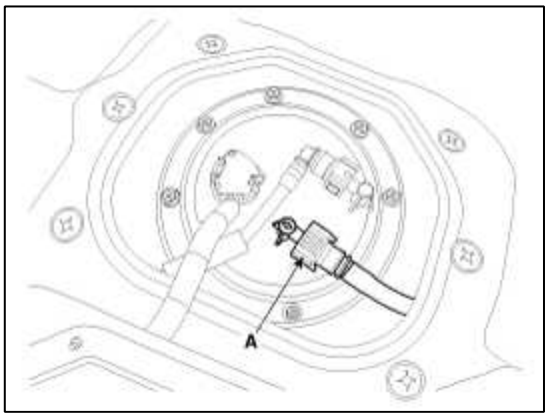
1. Preparation
   (1) Remove the rear seat cushion. (Refer to Body - "Rear Seat")
   (2) Remove the service cover of the fuel pump (A).



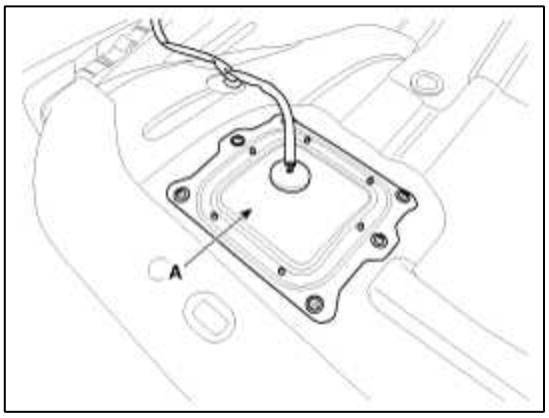
   (3) Disconnect the fuel pump connector (A).



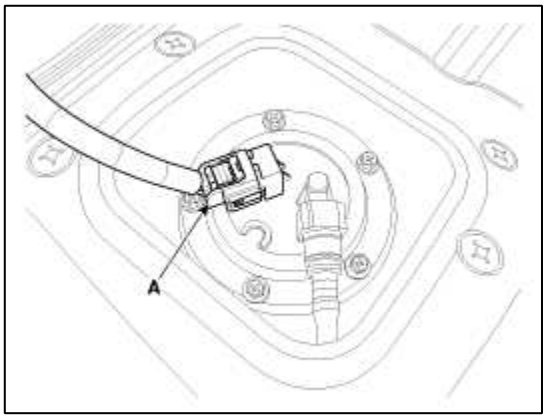
   (4) Idle the engine and wait until fuel in feed line is exhausted.
   (5) After engine stops, turn the ignition switch OFF.
2. Disconnect the fuel feed tube quick-connector (A).



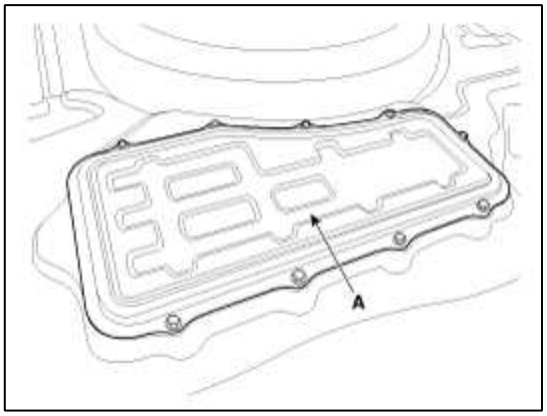
3. Remove the service cover of the sub fuel sender (A).



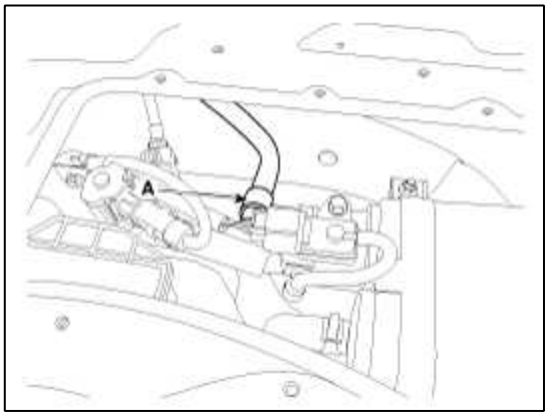
4. Disconnect the sub fuel sender connector (A).



5. Remove the service cover of the canister (A) in trunk room.

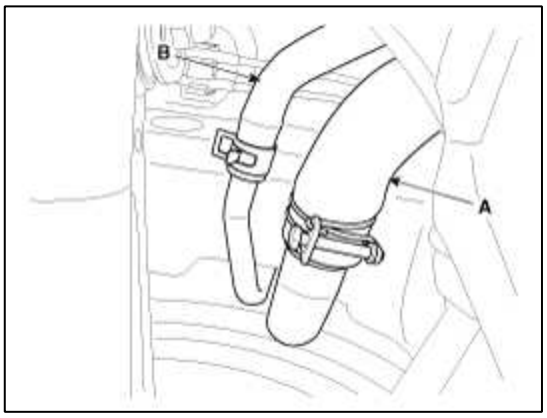


6. Disconnect the vapor tube quick-connector (A).

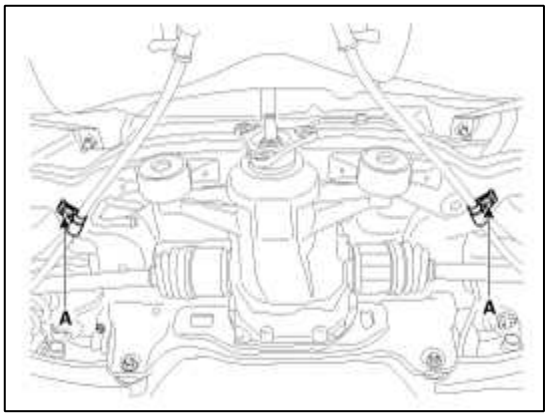


7. Lift the vehicle.
8. Remove the center muffler assembly. (Refer to Engine Mechanical System - "Muffler")
9. Remove the propeller shaft. (Refer to Driveshaft and Axle - "Propeller Sahft")

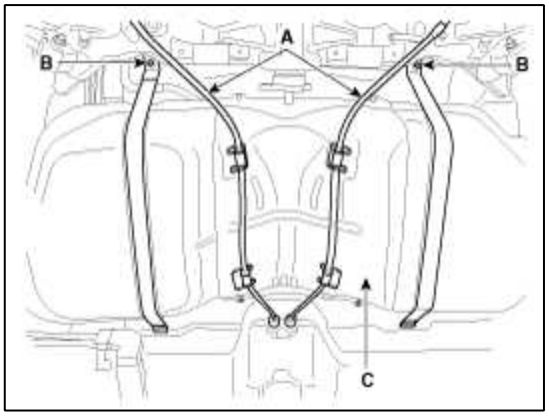
10. Disconnect the fuel filler hose (A) and the leveling hose (B).



11. Remove the brake line bracket installation bolt (A).



12. Detach the parking brake cable (A) from the fuel tank.
13. Remove the fuel tank (C) from the vehicle after removing the mounting nuts (B).



Installation

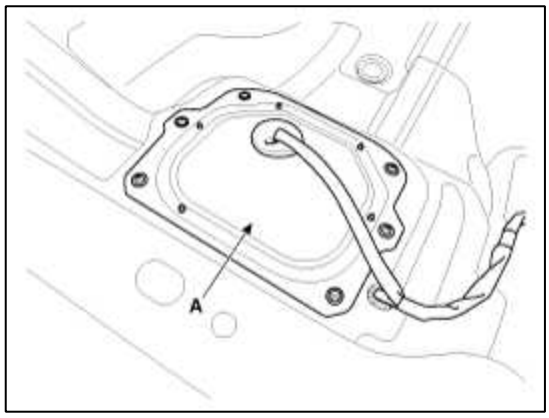
1. Installation is reverse of removal.

Fuel tank band installation nut:
39.2 ~ 54.0 N.m (4.0 ~ 5.5 kgf.m, 28.9 ~ 39.8 lb-ft)

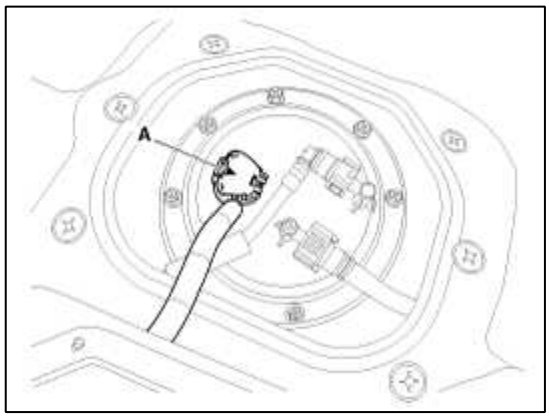
Fuel System > Fuel Delivery System > Fuel Pump > Repair procedures

Removal

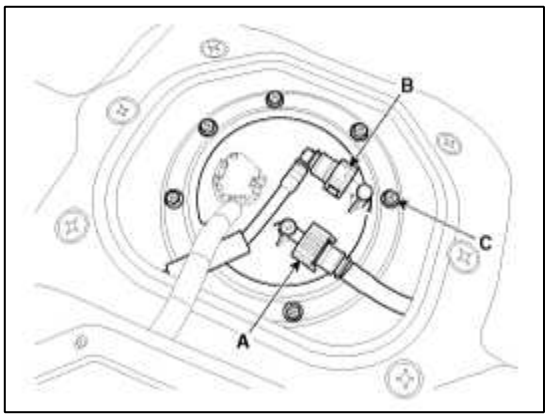
1. Preparation
   (1) Remove the rear seat cushion. (Refer to Body - "Rear Seat")
   (2) Remove the service cover of the fuel pump (A).

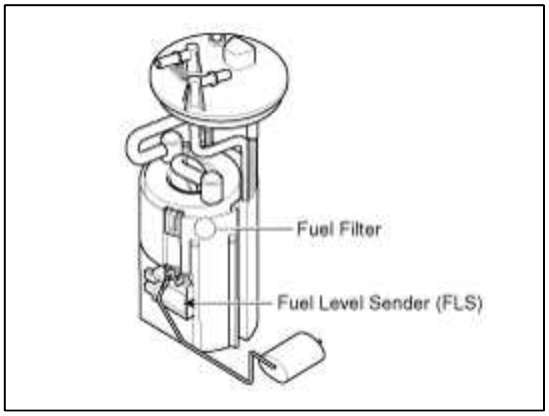


   (3) Disconnect the fuel pump connector (A).



   (4) Idle the engine and wait until fuel in feed line is exhausted.
   (5) After engine stops, turn the ignition switch OFF.
2. Disconnect the fuel feed tube quick-connector (A) and the suction tube quick-connector (B).
3. Remove the fuel pump from the fuel tank after removing the installation bolts (C).





Installation

1. Installation is reverse of removal.

Fuel pump installation bolt :
2.0 ~ 2.9 N.m (0.2 ~ 0.3 kgf.m, 1.4 ~ 2.2 lb-ft)

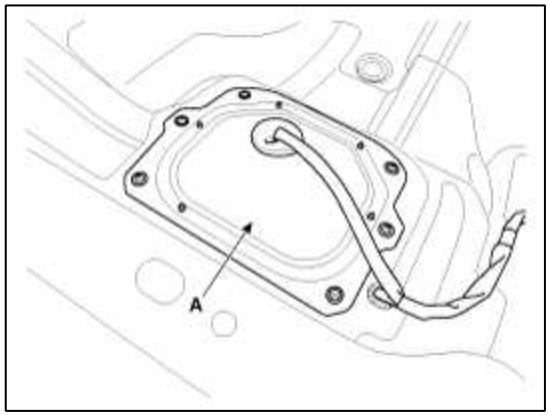
CAUTION

When installing the fuel pump module, be careful not to get the seal-ring entangled.

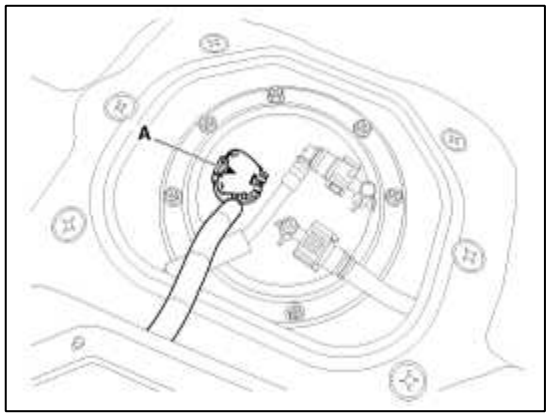
Fuel System > Fuel Delivery System > Sub Fuel Sender > Repair procedures

Removal

1. Preparation
   (1) Remove the rear seat cushion. (Refer to Body - "Rear Seat")
   (2) Remove the service cover of the fuel pump (A).

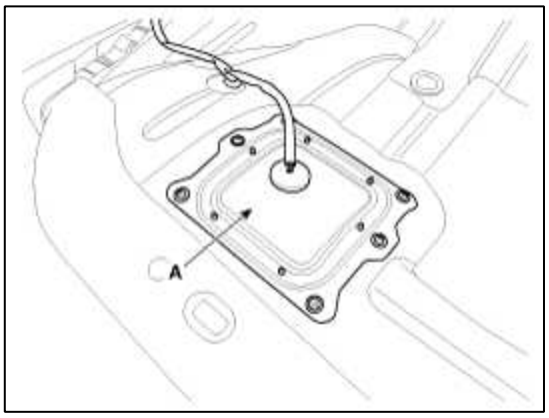


   (3) Disconnect the fuel pump connector (A).

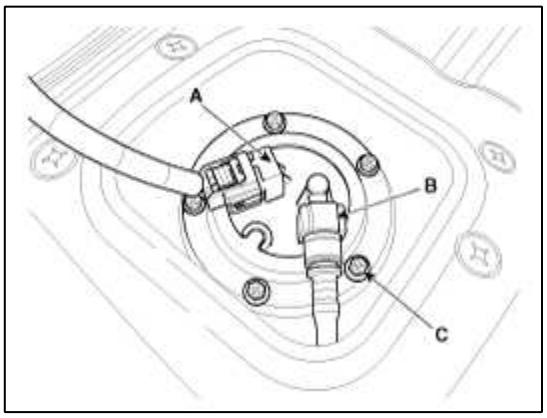


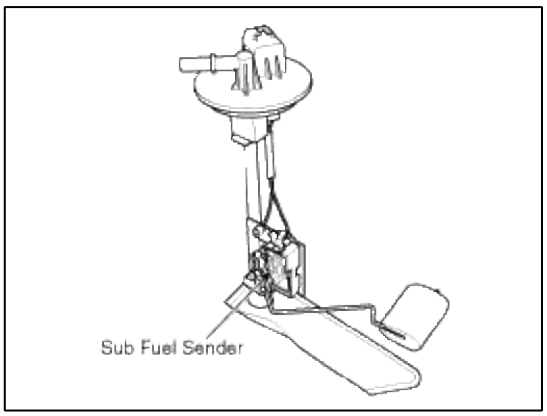
   (4) Idle the engine and wait until fuel in feed line is exhausted.
   (5) After engine stops, turn the ignition switch OFF.

2. Remove the service cover of the sub fuel sender (A).



3. Disconnect the sub fuel sender connector (A).
4. Disconnect the suction tube quick-connector (B).
5. Remove the sub fuel sender from the fuel tank after removing the installation bolts (C).





Installation

1. Installation is reverse of removal.

Sub fuel sender installation bolt :
2.0 ~ 2.9 N.m (0.2 ~ 0.3 kgf.m, 1.4 ~ 2.2 lb-ft)

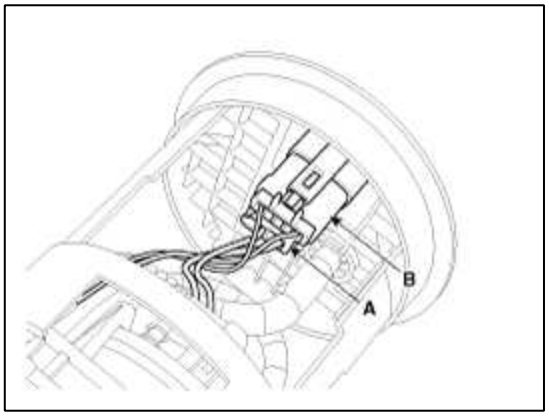
CAUTION

When installing the sub fuel sender, be careful not to get the seal-ring entangled.

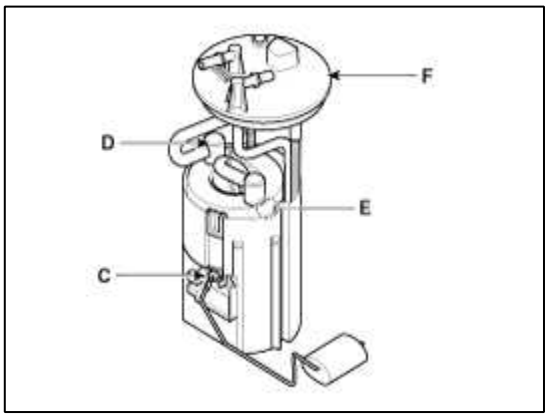
Fuel System > Fuel Delivery System > Fuel Filter > Repair procedures

Replacement

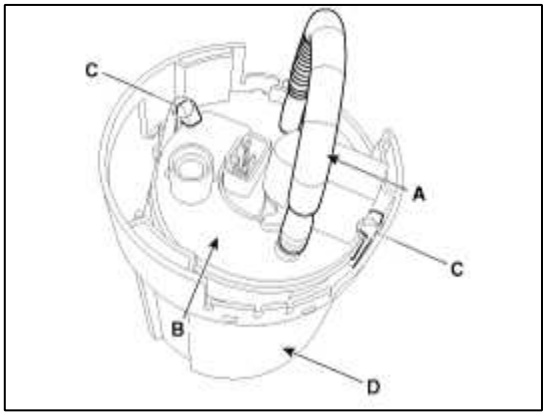
1. Remove the fuel pump. (Refer to Fuel Delivery System - "Fuel Pump")
2. Disconnect the electric pump wiring connector (A) and the fuel sender connector (B).
3. Remove the fuel sender.

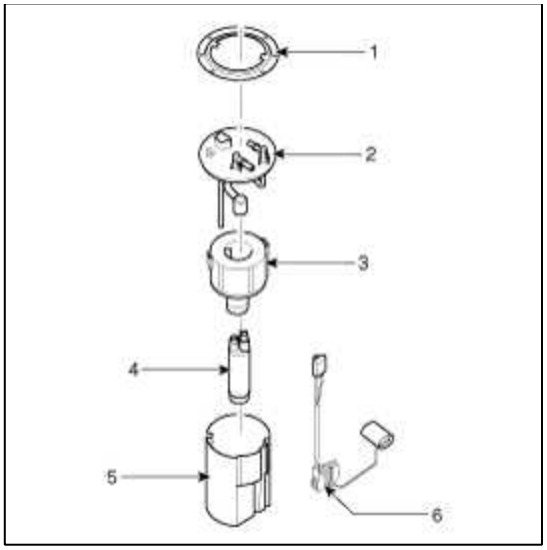


4. Disconnect the fuel feed line (A) from the fuel filter.
5. Separate the head assembly (B) with the hooks (C) released.



6. Disconnect the regulator hose (A) from the fuel filter (B).
7. Separatate the fuel filter (B) from the reservior (D) with the hooks (C) released.



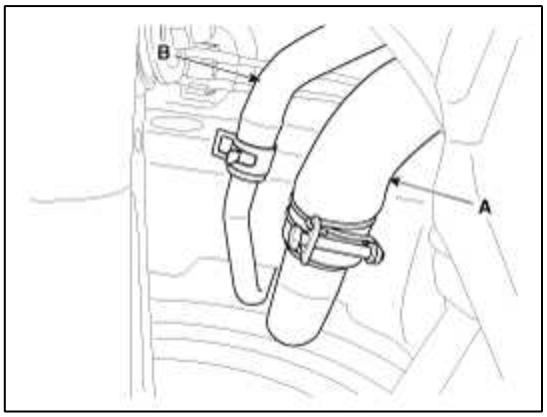


A. Service Cover
B. Head Assembly
C. Fuel Filter
D. Fuel Pump Motor
E. Reservoir
F. Fuel Sender

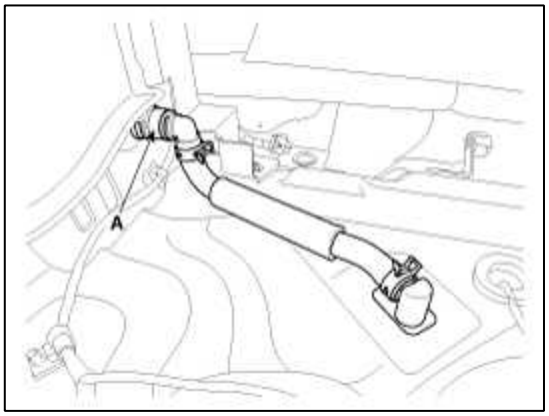
Fuel System > Fuel Delivery System > Filler-Neck Assembly > Repair procedures

Removal

1. Disconnect the fuel filler hose (A) and the leveling hose (B).

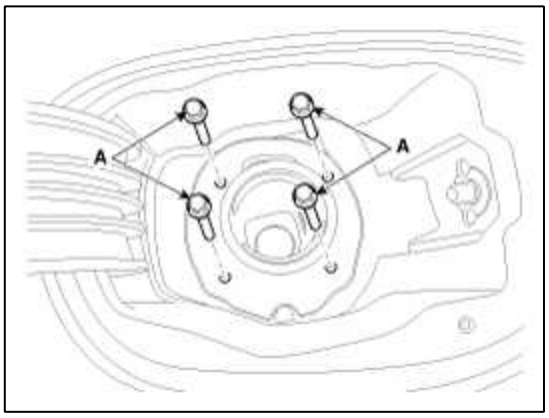


2. Disconnect the vapor hose quick-connector (A) after removing the trunk luggage trim.

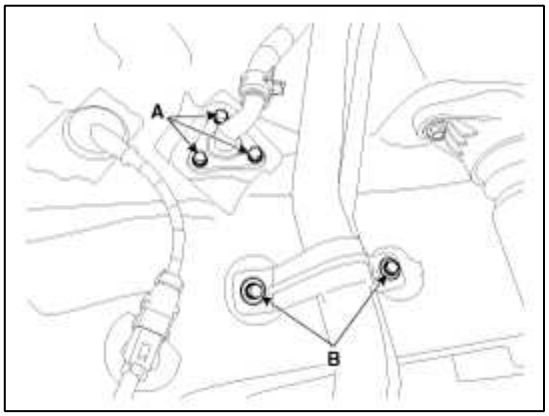


3. Remove the rear-LH wheel, tire, and the inner wheel house.

4. Remove the filler-neck installation bolts (A).



5. Remove the filler-neck assembly from the vehicle after removing the vapor hose mounting bolts (A) and the bracket mounting bolts (B).



Installation

1. Installation is reverse of removal.

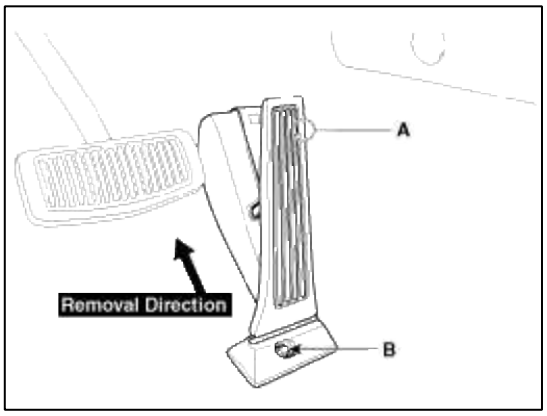
Filler-neck assembly installation bolt :
7.8 ~ 11.8 N.m (0.8 ~ 1.2 kgf.m, 5.8 ~ 8.7 lb-ft)
Filler-neck assembly installation nut :
3.9 ~ 5.9 N.m (0.4 ~ 0.6 kgf.m, 2.9 ~ 4.3 lb-ft)

Fuel System > Fuel Delivery System > Accelerator Pedal > Repair procedures

Removal

1. Turn the ignition switch OFF and disconnect the negative (-) battery cable.
2. Disconnect the accelerator position sensor connector (A).

3. Remove the accelerator pedal in the direction of "Remove Direction" in the figure after removing the mounting bolt (B).



Installation

1. Installation is reverse of removal.

Accelerator pedal module installation bolt :
8.8 ~ 13.7 N.m (0.9 ~ 1.4 kgf.m, 6.5 ~ 10.1 lb-ft)

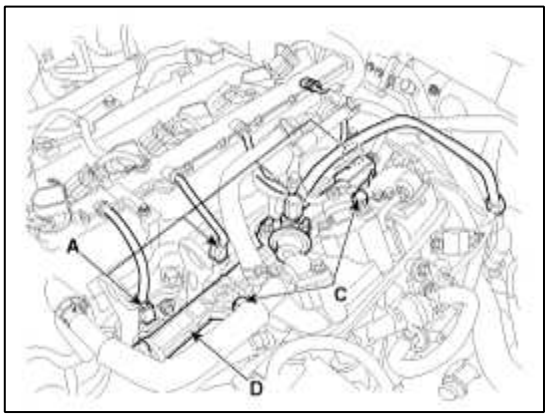
Fuel System > Fuel Delivery System > Delivery Pipe > Repair procedures

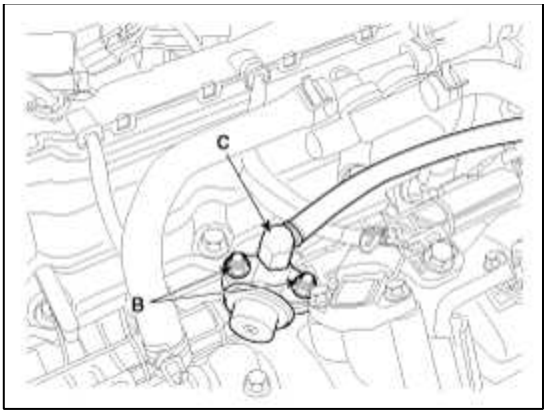
Removal

1. Turn the ignition switch OFF and disconnect the battery negative (-) cable.
2. Release the residual pressure in fuel line (Refer to “Release Residual Pressure in Fuel Line” in this group).

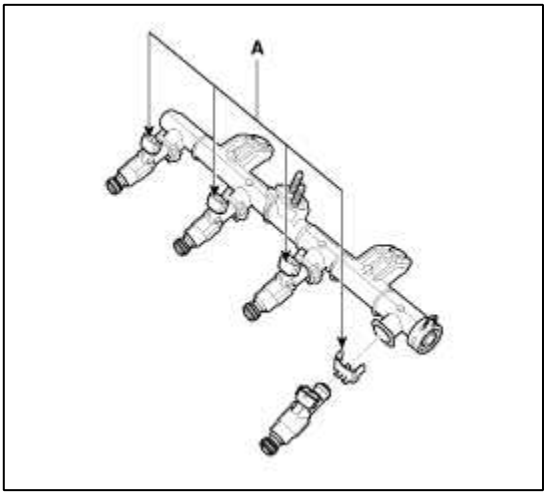
> CAUTION
>
> When removing the fuel pump relay, a Diagnostic Trouble Code (DTC) may occur. Delete the code with the GDS after completion of “Release Residual Pressure in Fuel Line” work.

3. Disconnect the injector connector (A).
4. Remove the installation nut (B), and then disconnect the fuel feed tube (E).
5. Remove the installation bolt (C), and then remove the delivery pipe & injector assembly (D) from the engine.





6. Remove the fixing clip (A), and then separate the injector from the delivery pipe.



Installation

1. Installation is reverse of removal.

Delivery pipe installation bolt:
18.6 ~ 23.5 N.m (1.9 ~ 2.4 kgf.m, 13.7 ~ 17.4 lb-ft)
Delivery pipe installation nut (↔ Fuel feed tube):
3.9 ~ 5.9 N.m (0.4 ~ 0.6 kgf.m, 2.9 ~ 4.3 lb-ft)

GENESIS COUPE(BK) > 2013 > G 2.0 T-MPI > Heating,Ventilation, Air Conditioning

Heating,Ventilation, Air Conditioning > General Information > Specifications

Air conditioner

Item		Specification
Compressor	Type	10A17C
	Oil type & Capacity	FD46XG(PAG) 150 ± 15cc
	Pulley type	6PK-TYPE
	Displacement	180cc/rev
Condenser	Heat rejection	157,000 ± 5% kcal/hr
APT(A/C pressure transducer)	The method to measure the pressure	Voltage = 0.00878835 * Pressure + 0.5
Expansion valve	Type	Block
Refrigerant	Type	R-134a
	Capacity [oz.(g)]	20.1 ± 0.88 (570 ± 25)

Blower unit

Item		Specification
Fresh and recirculation	Operating method	Actuator
Blower	Type	Sirocco
	Speed step	Auto + 8 speed (Automatic) 1~8 (Manual)
	Speed control	Power mosfet
Air filter	Type	Particle filter

Heater and evaporator unit

Item		Specification
Heater	Type	Pin & Tube type
	Heating capacity	4,550 ± 5% kcal/hr
	Mode operating method	Actuator
	Temperature operating method	Actuator
Evaporator	Temperature control type	Evaporator temperature sensor
	A/C ON/OFF [°C(°F)]	ON : 2.1 ± 0.5 (35.7 ± 32.9), OFF: 0.6 ± 0.5 (33.0 ± 32.9)

Heating,Ventilation, Air Conditioning > General Information > Troubleshooting

Problem symptoms table

Before replacing or repairing air conditioning components, first determine if the malfunction is due to the refrigerant charge, air flow or compressor.

Use the table below to help you find the cause of the problem. The numbers indicate the priority of the likely cause of the problem. Check each part in order. If necessary, replace these parts.

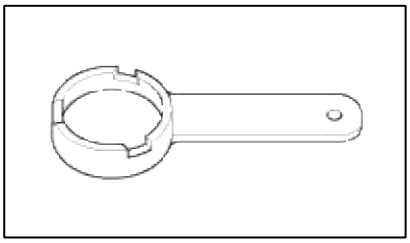
After correcting the malfunction, check the complete system to ensure that performance is satisfactory.

Standard:

Symptom	Suspect Area
No blower operation	1.Blower fuse 2.Blower relay 3.Blower motor 4.Power mosfet 5.Blower speed control switch 6.Wire harness
No air temperature control	1.Engine coolant capacity 2.Heater control assembly
No compressor operation	1.Refrigerant capacity 2.A/C Fuse 3.Magnetic clutch 4.Compressor 5.A/C pressure transducer 6.A/C switch 7.Evaporator temperature sensor 8.Wire harness
No cool air	1.Refrigerant capacity 2.Refrigerant pressure 3.Drive belt 4.Magnetic clutch 5.Compressor 6.A/C pressure transducer 7.Evaporator temperature sensor 8.A/C switch 9.Heater control assemblyWire harness
Insufficient cooling	1.Refrigerant capacity 2.Drive belt 3.Magnetic clutch 4.Compressor 5.Condenser 6.7.8.Expansion valve 9.Evaporator 10.Refrigerant lines 11.A/C pressure transducer 12.Heater control assembly
No engine idle-up when A/C switch ON	1.Engine ECM 2.Wire harness
No air inlet control	1. Heater control assembly

No mode control	1.Heater control assembly 2.Mode actuator
No cooling fan operation	1.Cooling fan fuse 2.Fan motor 3.Engine ECM 4.Wire harness

Heating,Ventilation, Air Conditioning > General Information > Special Service Tools

Tool (Number and name)	Illustration	Use
09977-29000 Disc & hub assembly bolt remover		Removal and installation of disc & hub assembly

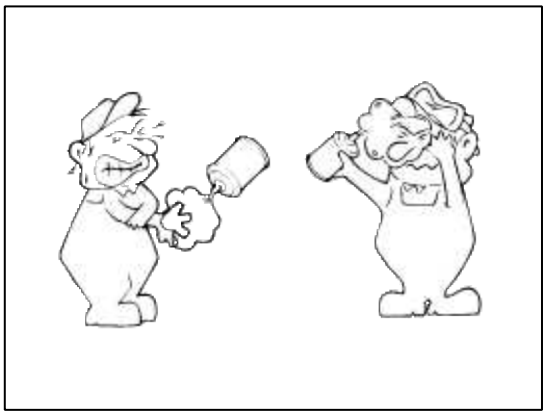
Heating,Ventilation, Air Conditioning > Air conditioning System > General Information

Instructions

When Handling Refrigerant

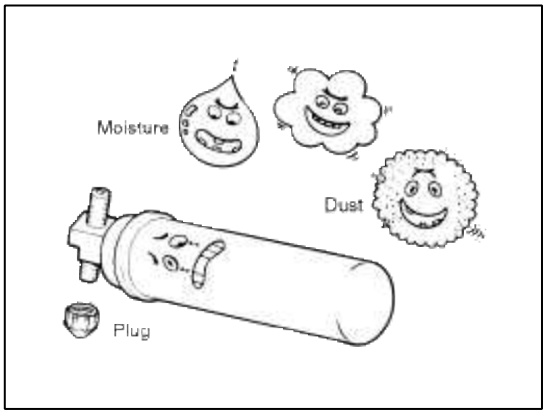
1. R-134a liquid refrigerant is highly volatile. A drop on the skin of your hand could result in localized frostbite. When handling the refrigerant, be sure to wear gloves.
2. It is standard practice to wear goggles or glasses to protect your eyes, and gloves to protect your hands. If the refrigerant splashes into your eyes, wash them with clean water immediately.
3. The R-134a container is highly pressurized. Never leave it in a hot place, and check storage temperature is below 52°C (126°F)
4. An electronic leak detector should be used to check the system for refrigerant leakage. Bear in mind that the R-134a, upon coming into contact with flame, produces phosgene, a highly toxic gas.
5. Use only recommended lubricant for R-134a systems. If lubricants other than the recommended one used, system failure may occur.
6. PAG lubricant absorbs moisture from the atmosphere at a rapid rate, therefore the following precautions must be observed:
   A. When removing refrigerant components from a vehicle, cap the components immediately to prevent entry of moisture.
   B. When installing refrigerant components to a vehicle, do not remove the cap until just before connecting the components.
   C. Complete the connection of all refrigerant tubes and hoses without delay to prevent the A/C system from taking on moisture.
   D. Use the recommended lubricant from a sealed container only.

7. If an accidental discharge in the system occurs, ventilate the work area before resum of service.



When replacing parts ON A/C system

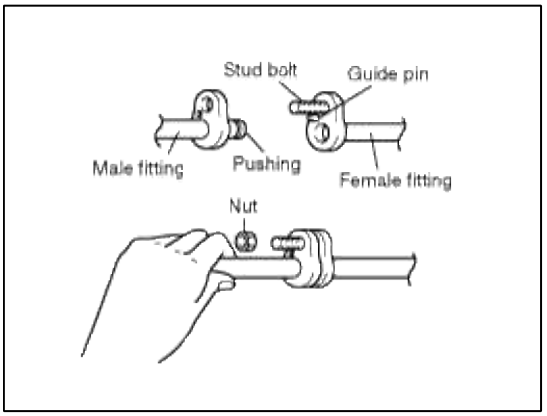
1. Never open or loosen a connection before discharging the system.
2. Seal the open fittings of components with a cap or plug immediately to prevent intrusion of moisture or dust.
3. Do not remove the sealing caps from a Replacement component until it is ready to be installed.
4. Before connecting an open fitting, always install a new sealing ring. Coat the fitting and seal with refrigerant oil before making the connection.



When Installing Connecting Parts

Flange with guide pin

Check the new O-ring for damage (use only the specified) and lubricate by using compressor oil. Tighten the nut to specified torque.



Size	Tightening torque [N.m (kg.m, lbf.ft)]	
	General bolt, nut	
	4T	7T
M6	5 - 6 (0.5 - 0.6, 3.6 - 4.3)	9 - 11 (0.9 - 1.1, 6.5 - 7.9)
M8	12 - 14 (1.2 - 1.4, 8.7 - 10)	20 - 26 (2.0 - 2.6, 14 - 18)
M10	25 - 28 (2.5 - 2.8, 18 - 20)	45 - 55 (4.5 - 5.5, 32 - 39)
Size	Flange bolt, nut	
	4T	7T
M6	5 - 7 (0.5 - 0.7, 3.6 - 5.0)	8 - 12 (0.8 - 1.2, 5.8 - 8.6)
M8	10 - 15 (1.0 - 1.5, 7 - 10)	19 - 28 (1.9 - 2.8, 14 - 20)
M10	21 - 31 (2.1 - 3.1, 15 - 22)	39 - 60 (3.9 - 6.0, 28 - 43)

NOTE

- T means tensile intensity, which is stamped on the head of bolt only numeral.

Handling tubing and fittings

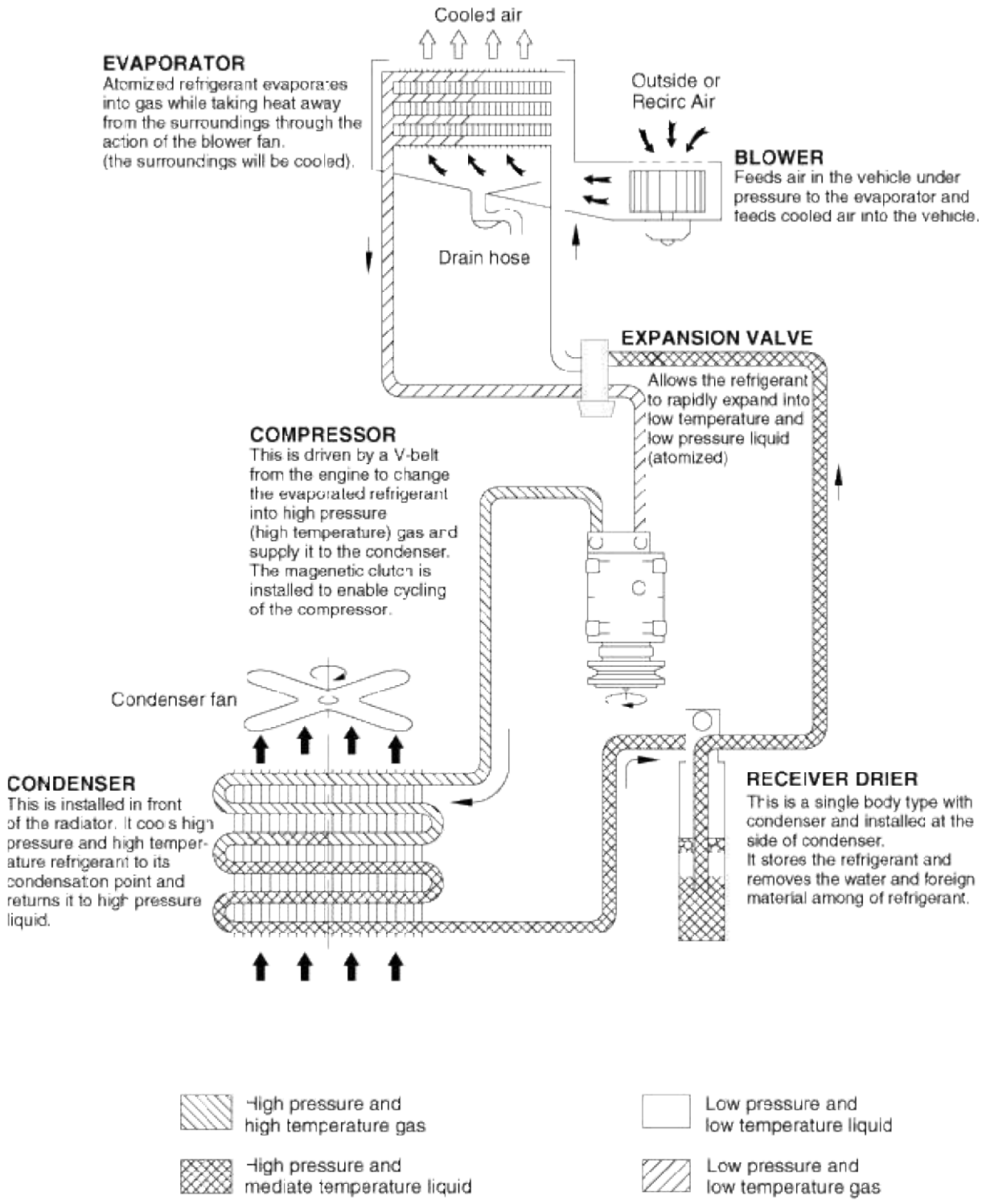
The internal parts of the refrigeration system will remain in a state of chemical stability as long as pure moisture-free refrigerant and refrigerant oil are used. Abnormal amounts of dirt, moisture or air can upset the chemical stability and cause problems or serious damage.

The Following precautions must be observed

1. When it is necessary to open the refrigeration system, have everything you will need to service the system ready so the system will not be left open any longer than necessary.
2. Cap or plug all lines and fittings as soon as they are opened to prevent the entrance of dirt and moisture.
3. All lines and components in parts stock should be capped or sealed until they are ready to be used.
4. Never attempt to rebind formed lines to fit. Use the correct line for the installation you are servicing.
5. All tools, including the refrigerant dispensing manifold, the gauge set manifold and test hoses, should be kept clean and dry.

Heating,Ventilation, Air Conditioning > Air conditioning System > Description and Operation

Refrigeration cycle



Heating,Ventilation, Air Conditioning > Air conditioning System > Repair procedures

Refrigerant system service basics

Refrigerant recovery

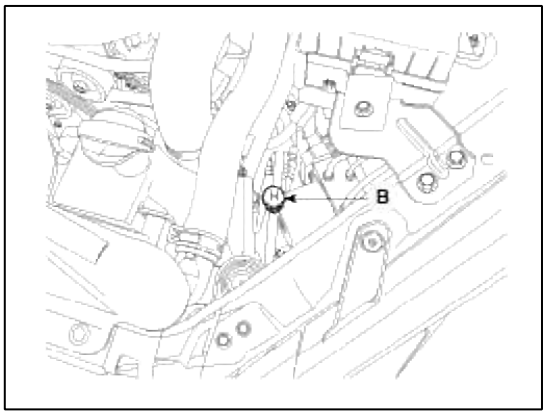
Use only service equipment that is U.L-listed and is certified to meet the requirements of SAE J2210 to remove HFC-134a(R-134a) from the air conditioning system.

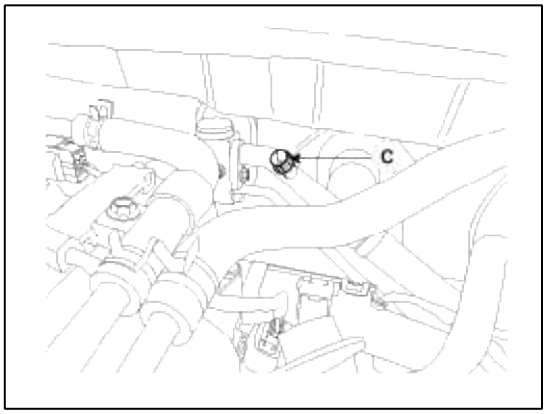
CAUTION

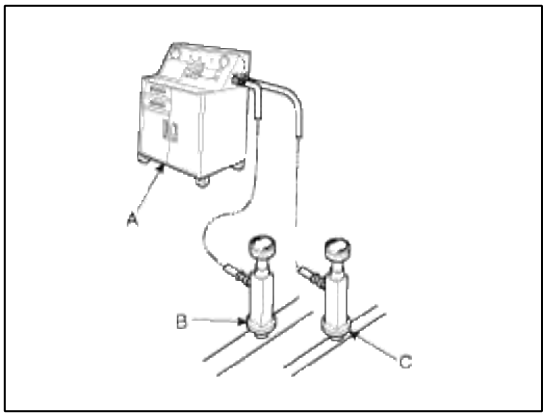
- Air conditioning refrigerant or lubricant vapor can irritate your eyes, nose, or throat.
- Be careful when connecting service equipment.
- Do not breathe refrigerant or vapor.

If accidental system discharge occurs, ventilate work area before resume of service.
Additional health and safety information may be obtained from the refrigerant and lubricant manufacturers.

1. Connect an R-134a refrigerant Recovery/Recycling/Charging System (A) to the high-pressure service port (B) and the low-pressure service port (C) as shown, following the equipment manufacturer's instructions.







2. Measure the amount of refrigerant oil removed from the A/C system after the recovery process is completed. Be sure to install the same amount of new refrigerant oil back into the A/C system before charging.

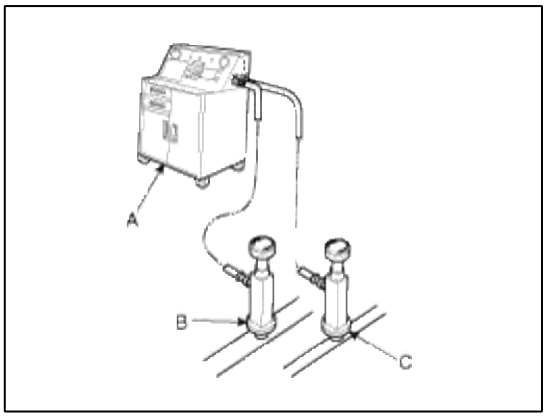
System evacuation
Use only service equipment that is U.L-listed and is certified to meet the requirements of SAE J2210 to remove HFC-134a(R-134a) from the air conditioning system.

CAUTION

- Air conditioning refrigerant or lubricant vapor can irritate your eyes, nose, or throat.
- Be careful when connecting service equipment.
- Do not breathe refrigerant or vapor.

If accidental system discharge occurs, ventilate work area before resume of service.
Additional health and safety information may be obtained from the refrigerant and lubricant manufacturers.

1. When an A/C System has been opened to the atmosphere, such as during installation or repair, it must be evacuated using an R-134a refrigerant Recovery/Recycling/Charging System. (If the system has been open for several days, the receiver/dryer should be replaced, and the system should be evacuated for several hours.)
2. Connect an R-134a refrigerant Recovery/Recycling/Charging System (A) to the high-pressure service port (B) and the low-pressure service port (C) as shown, following the equipment manufacturer's instructions.



3. If the low-pressure does not reach more than 93.3 kPa (700 mmHg, 27.6 in.Hg) in 10 minutes, there is probably a leak in the system. Partially charge the system, and check for leaks (see Leak Test.).
4. Remove the low pressure valve from the low-pressure service port.

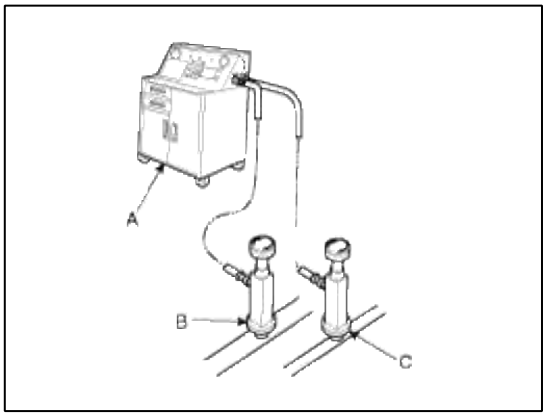
System charging
Use only service equipment that is U.L-listed and is certified to meet the requirements of SAE J2210 to remove HFC-134a(R-134a) from the air conditioning system.

CAUTION

- Air conditioning refrigerant or lubricant vapor can irritate your eyes, nose, or throat.
- Be careful when connecting service equipment.
- Do not breathe refrigerant or vapor.

If accidental system discharge occurs, ventilate work area before resume of service.
Additional health and safety information may be obtained from the refrigerant and lubricant manufacturers.

1. Connect an R-134a refrigerant Recovery/Recycling/Charging System (A) to the high-pressure service port (B) as shown, following the equipment manufacturer's instructions.



2. Add the same amount of new refrigerant oil to system that was removed during recovery. Use only specified refrigerant oil. Charge the system with 20.1 ± 0.88 oz. (570 ± 25g) of R-134a refrigerant. Do not overcharge the system the compressor will be damaged.

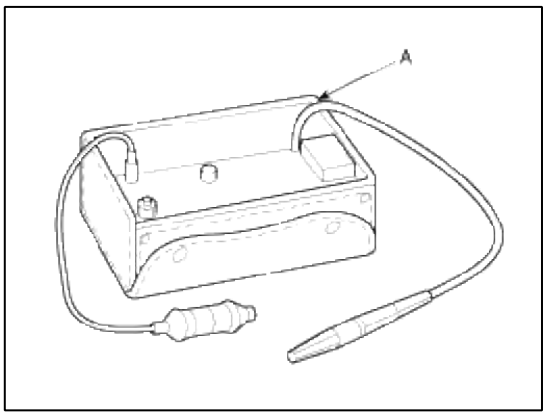
Refrigerant leak test
Always conduct a leak test with an electronic leak detector whenever leakage or refrigerant is suspected and when conducting service operations which are accompanied by disassembly or loosening or connection fittings.

NOTE

In order to use the leak detector properly, read the manual supplied by the manufacturer.

If a gas leak is detected, proceed as follows:

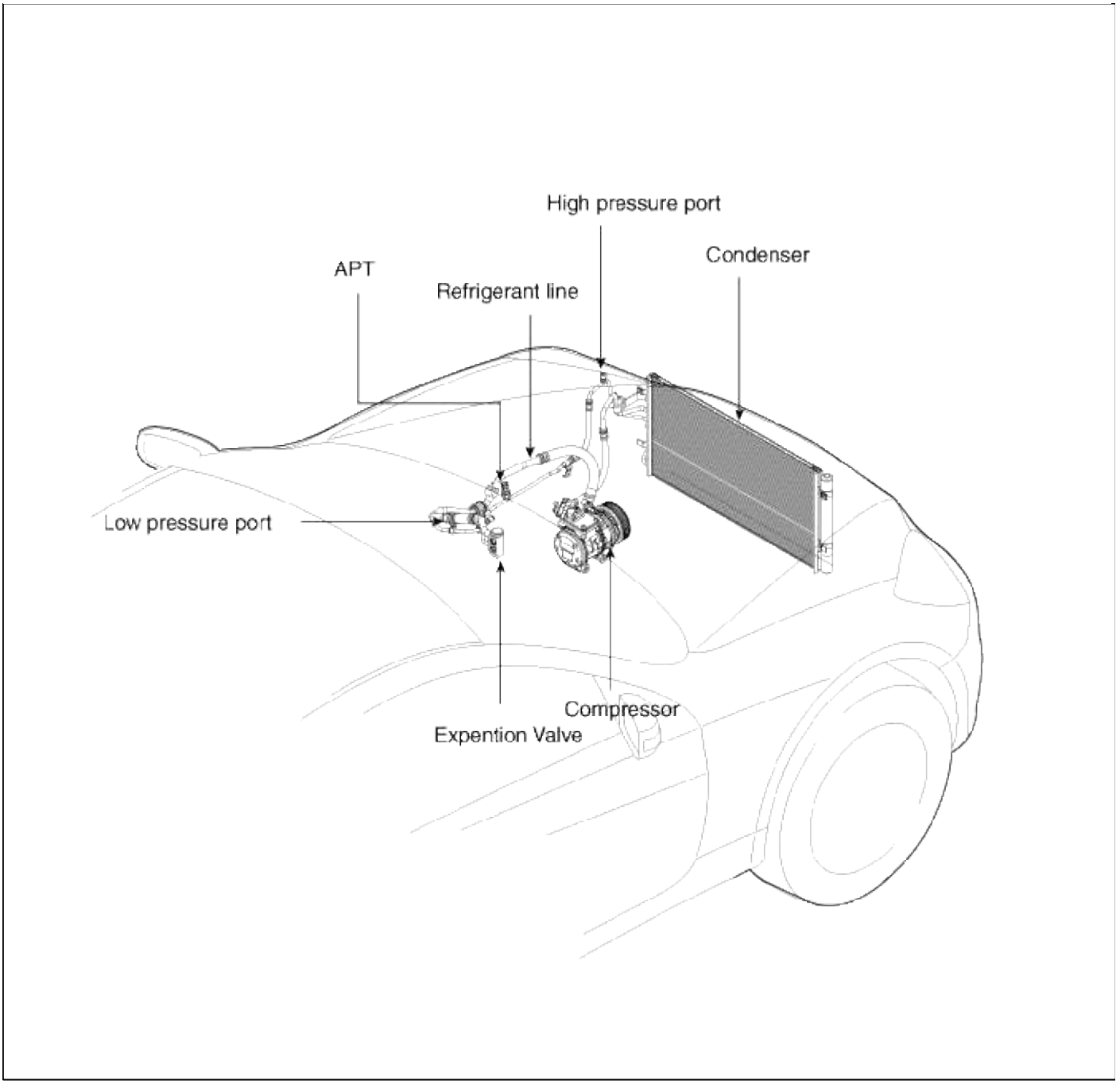
1. Check the torque on the connection fittings and, if too loose, tighten to the proper torque. Check for gas leakage with a leak detector (A).
2. If leakage continues even after the fitting has been tightened, discharge the refrigerant from the system, disconnect the fittings, and check their seating faces for damage. Always replace, even if the damage is slight.
3. Check the compressor oil and add oil if required.
4. Charge the system and recheck for gas leaks. If no leaks are found, evacuate and charge the system again.



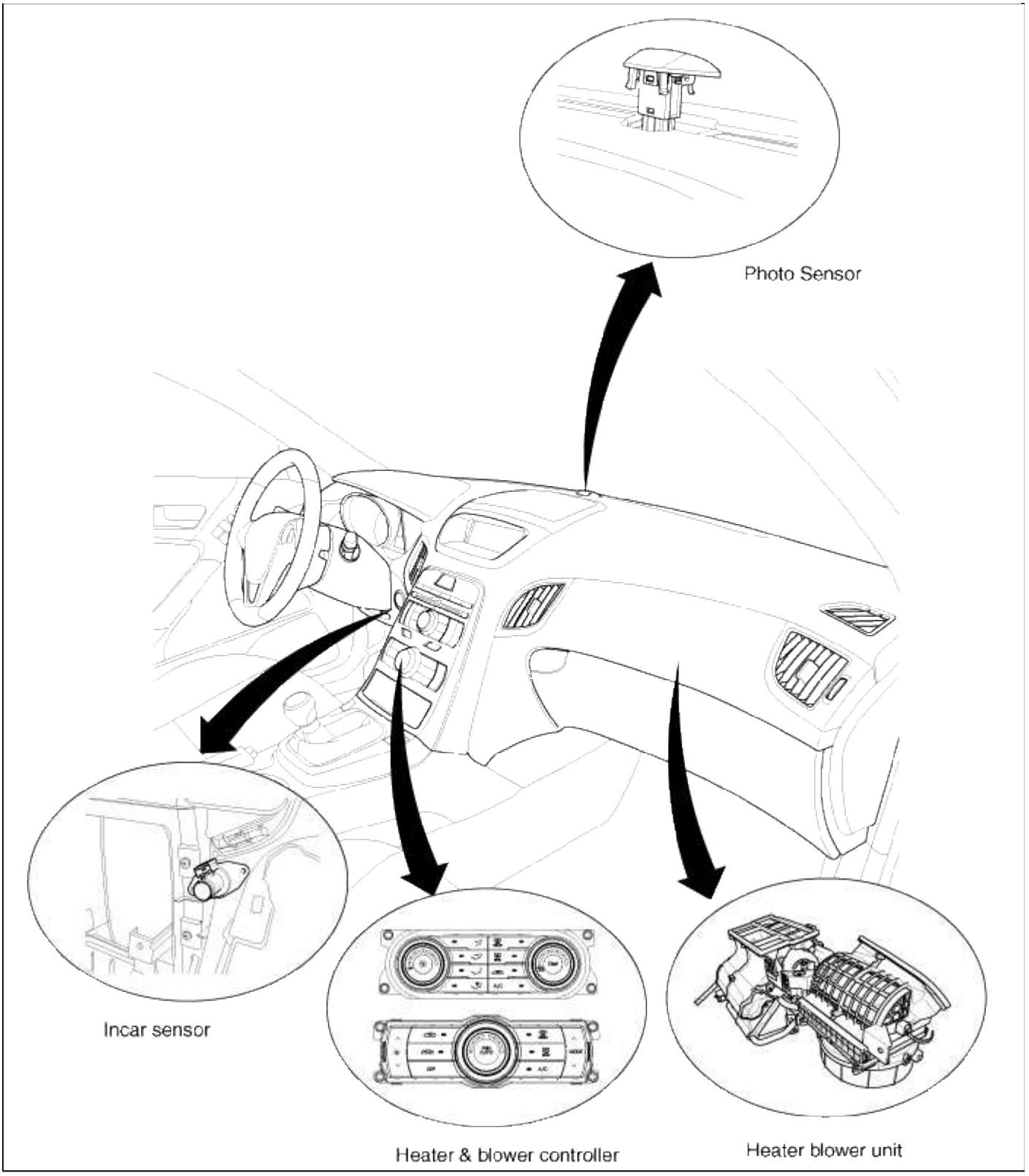
Heating,Ventilation, Air Conditioning > Air conditioning System > Components and Components Location

Component location index

Engine room


High pressure port
Condenser
APT
Refrigerant line
Low pressure port
Compressor
Expention Valve

Interior



Heating,Ventilation, Air Conditioning > Air conditioning System > Compressor oil > Repair procedures

Oil Specification

1. The HFC-134a system requires synthetic (PAG) compressor oil whereas the R-12 system requires mineral compressor oil. The two oils must never be mixed.
2. Compressor (PAG) oil varies according to compressor model. Be sure to use oil specified for the model of compressor.

Handling of Oil

1. The oil should be free from moisture, dust, metal powder, etc.

2. Do not mix with other oil.
3. The water content in the oil increases when exposed to the air. After use, seal oil from air immediately. (HFC-134a Compressor Oil absorbs moisture very easily.)
4. The compressor oil must be stored in steel containers, not in plastic containers.

Compressor oil check

The oil used to lubricate the compressor is circulating with the refrigerant.

Whenever replacing any component of the system or a large amount of gas leakage occurs, add oil to maintain the original amount of oil.

Oil total volume in system : 150±15cc(5.3±0.53 fl.oz)

Oil Return Operation

There is close affinity between the oil and the refrigerant.

During normal operation, part of the oil recirculates with the refrigerant in the system. When checking the amount of oil in the system, or replacing any component of the system, the compressor must be run in advance for oil return operation. The procedure is as follows:

1. Open all the doors and the engine hood.
2. Start the engine and air conditioning switch to "ON" and set the blower motor control knob at its highest position.
3. Run the compressor for more than 20 minutes between 800 and 1,000 rpm in order to operate the system.
4. Stop the engine.

Replacement of Component Parts

When replacing the system component parts, supply the following amount of oil to the component parts to be installed.

Component parts to be installed	Amount of Oil
Evaporator	50 cc (1.70 fl.oz)
Condenser	30 cc (1.02 fl.oz)
Receiver/dryer	30 cc (1.02 fl.oz)
Refrigerant line (One piece)	10 cc (0.34 fl.oz)

For compressor Replacement, subtract the volume of oil drained from the removed compressor from the specified volume, and drain the calculated volume of oil from the new compressor:

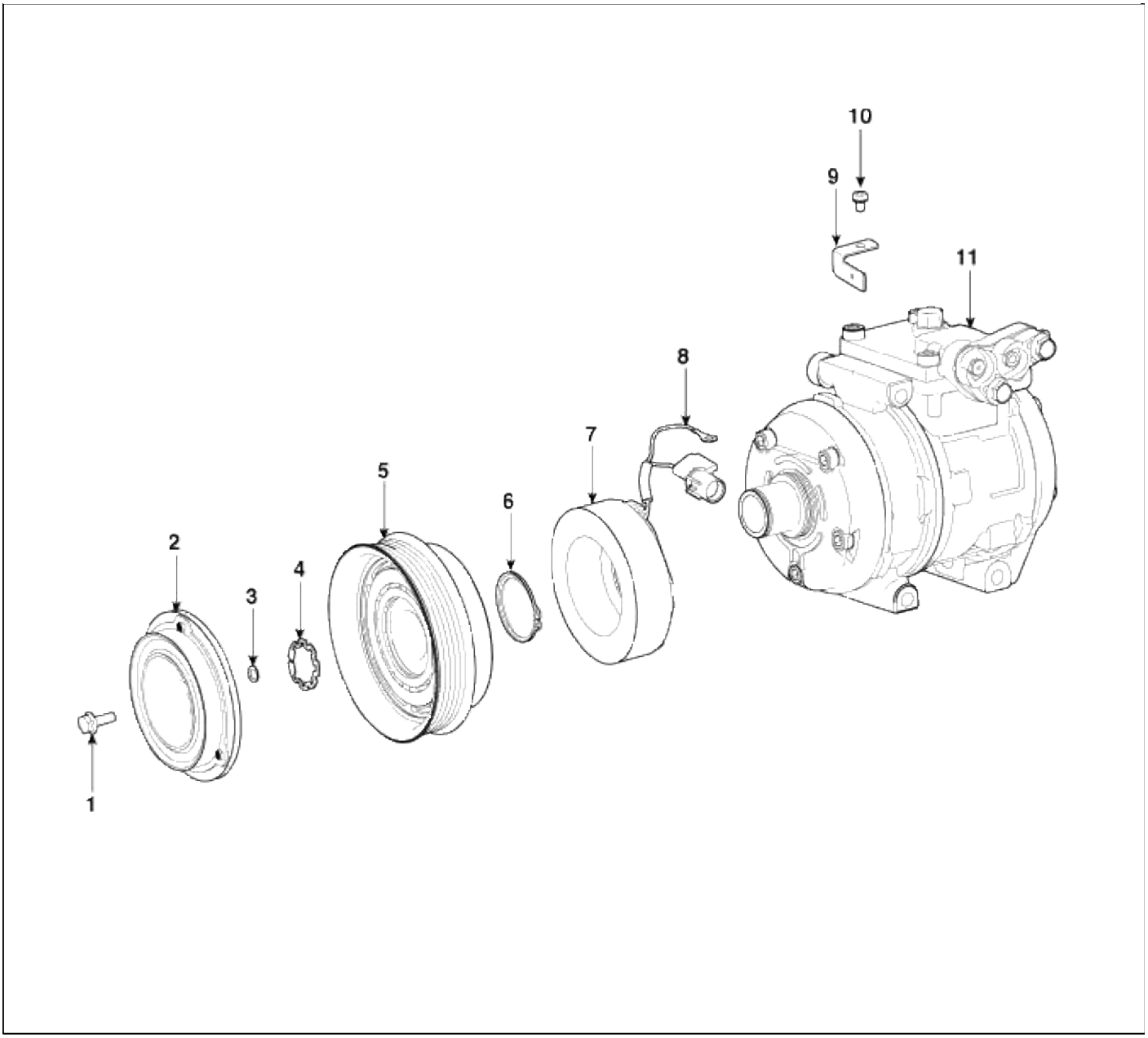
The specified volume - volume of removed compressor = volume to drain from the new compressor.

NOTE

- Even if no oil is drained from the removed compressor, don’t drain more than 50cc from new compressor.

Heating,Ventilation, Air Conditioning > Air conditioning System > Compressor > Components and Components Location

Components



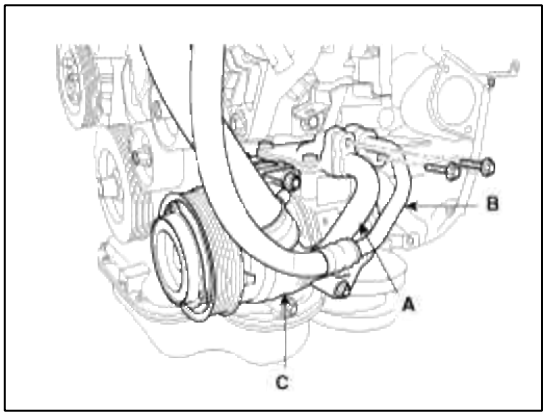
1. Bolt 2. Disc & hub assembly 3. Shim (Gap washer) 4. Retainer ring 5.Pulley	6. Retainer ring 7. Field coil 8. Connector 9. Connector bracket 10. Screw 11. Compressor assembly

Heating,Ventilation, Air Conditioning > Air conditioning System > Compressor > Repair procedures

Removal

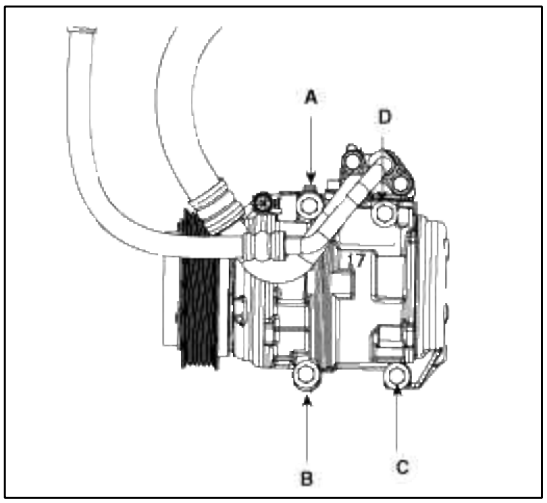
1. If the compressor is marginally operable, run the engine at idle speed, and let the air conditioning work for a few minutes, then shut the engine off.
2. Disconnect the negative cable from the battery.
3. Recover the refrigerant with a recovery/charging station.
4. Loosen the drive belt.

5. Remove the bolts, then disconnect the suction line (A) and discharge line (B) from the compressor. Plug or cap the lines immediately after disconnecting them to avoid moisture and dust contamination.
6. Disconnect the compressor clutch connector, and then remove 4 mounting bolts and the compressor (C).



Installation

1. Make sure of the length of compressor mounting bolts, and then tighten it A→B→C→D order.

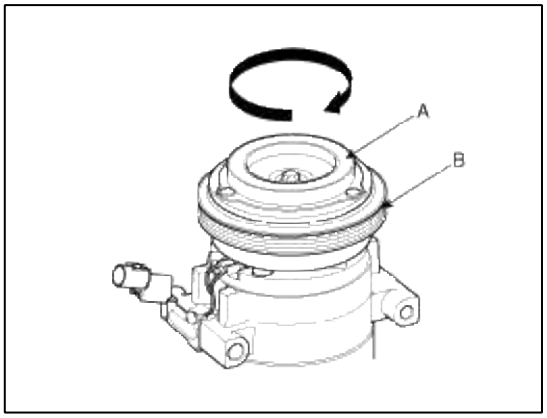


Bolt	Length
A	102mm
B	102mm
C	102mm
D	114mm

2. Install in the reverse order of removal, and note these items.
   A. If you're installing a new compressor, drain all the refrigerant oil from the removed compressor, and measure its volume, Subtract the volume of drained oil from 120cc(4.20 oz.) the result is the amount of oil you should drain from the new compressor (through the suction fitting).
   B. Replace the O-rings with new ones at each fitting, and apply a thin coat of refrigerant oil before installing them. Be sure to use the right O-rings for R-134a to avoid leakage.
   C. To avoid contamination, do not return the oil to the container once dispensed, and never mix it with other refrigerant oils.
   D. Immediately after using the oil, replace the cap on the container and seal it to avoid moisture absorption.
   E. Do not spill the refrigerant oil on the vehicle; it may damage the paint; if the refrigerant oil contacts the paint, wash it off immediately.
   F. Adjust the drive belt.
   G. Charge the system and test its performance.

Inspection

1. Check the plated parts of the disc & hub assembly (A) for color changes, peeling or other damage. If there is damage, replace the clutch set.
2. Check the pulley (B) bearing play and drag by rotating the pulley by hand. Replace the clutch set with a new one if it is noisy or has excessive play/drag.

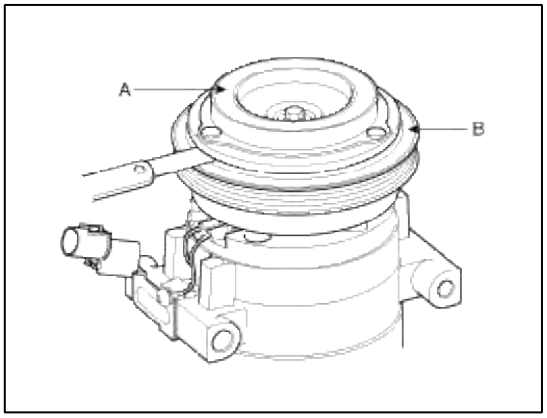


3. Measure the clearance between the pulley (B) and disc & hub assembly (A) all the way around. If the clearance is not within specified limits, remove the disc & hub assembly and add or remove shim (gap washer) as needed to increase or decrease clearance.

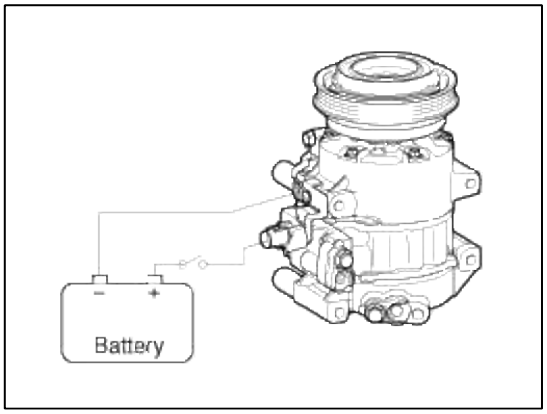
Clearance: 0.45 ± 0.1mm (0.018 ± 0.004 in.)

NOTE

The shims (gap washers) are available in seven thicknesses: 0.7mm, 0.8mm, 0.9mm, 1.0mm, 1.1mm, 1.2mm and 1.3mm.



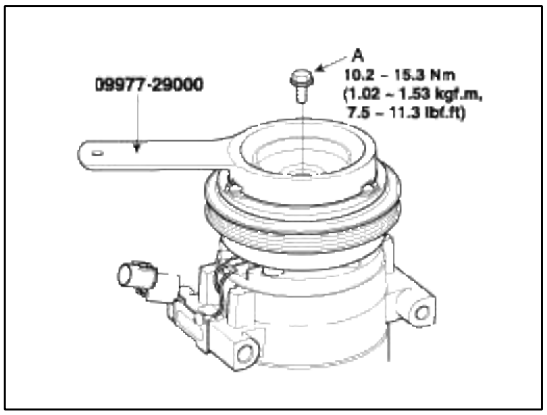
4. Check operation of the magnetic clutch. Connect the compressor side terminals to the battery (+) terminal to the compressor body. Check the magnetic clutch operating noise to dtetrmine the condition.



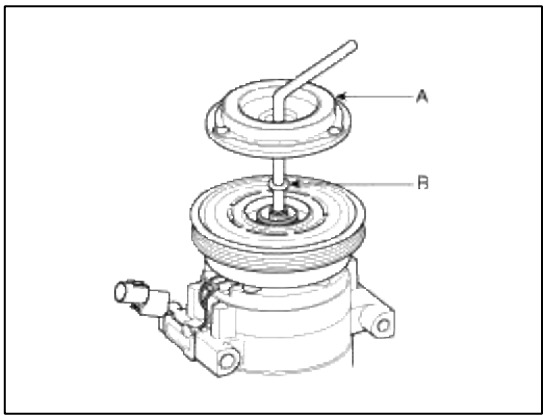
Disassembly

1. Remove the center bolt (A) while holding the disc & hub assembly with a commercially available disc & hub assembly bolt remover; Special tool number 09977-29000.

TORQUE : 10~15N.m (1.02~1.53kgf.m, 7.37~11lbf.ft)



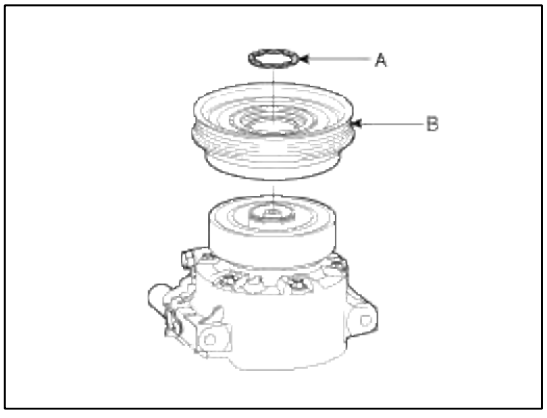
2. Remove the disc & hub assembly (A) and shim (gap washer) (B), taking care not to lose the shims. If the clutch needs adjustment, increase or decrease the number and thickness of shims as necessary, then reinstall the disc & hub assembly, and recheck its clearance.



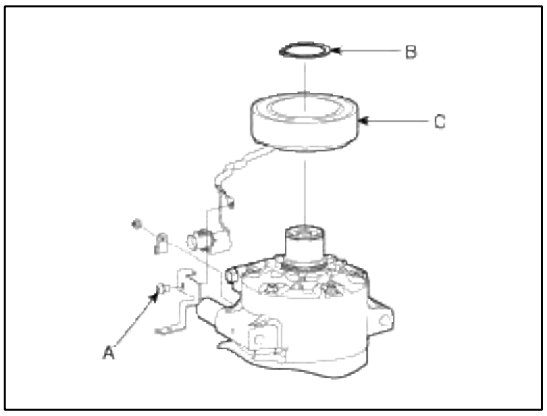
3. If you removal the field coil, remove retainer ring (A) with retainer ring pliers.

NOTE

- Be careful not to damage the pulley (B) and compressor during removal/installation.
- Once retainer ring (A) is removed, replace it with a new one.



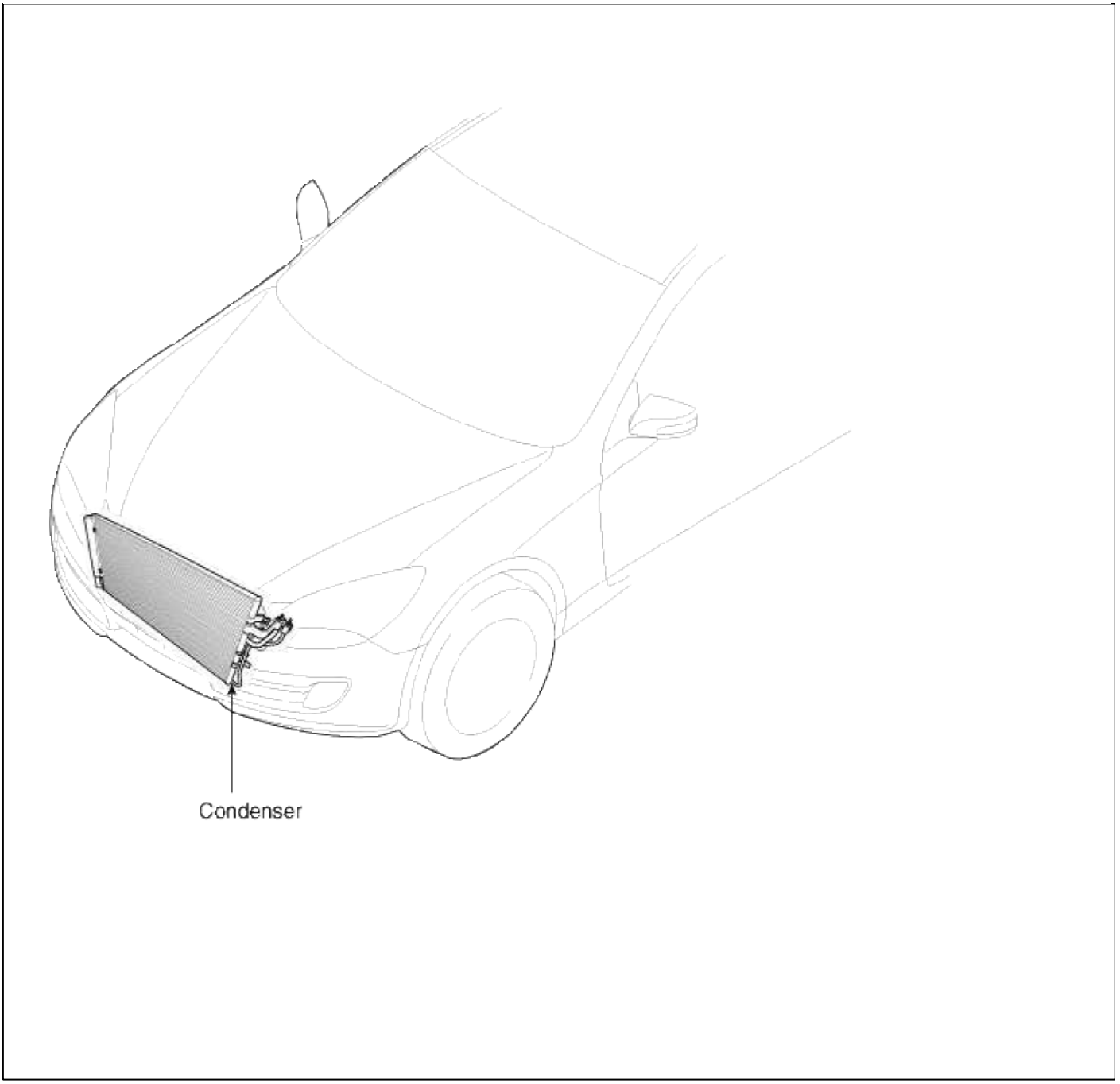
4. Remove the screw (A) from the field coil ground terminal. Remove the retainer ring (B) and then remove the field coil (C) from the shaft with a puller. Be careful not to damage the coil and compressor.



5. Reassemble the compressor clutch in the reverse order of disassembly, and note these items :
   A. Install new retainer rings, and make sure they are fully seated in the groove.
   B. Make sure that the pulley turns smoothly after its reassembled.

Heating,Ventilation, Air Conditioning > Air conditioning System > Condenser > Components and Components Location

Component location



Heating,Ventilation, Air Conditioning > Air conditioning System > Condenser > Repair procedures

Inspection

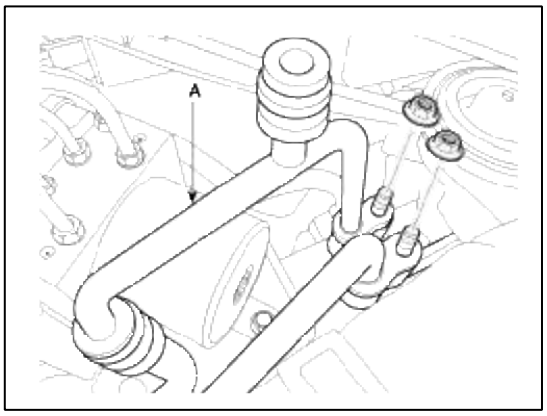
1. Check the condenser fins for clogging and damage. If clogged, clean them with water, and blow them with compressed air. If bent, gently bend them using a screwdriver or pliers.
2. Check the condenser connections for leakage, and repair or replace it, if required.

Replacement

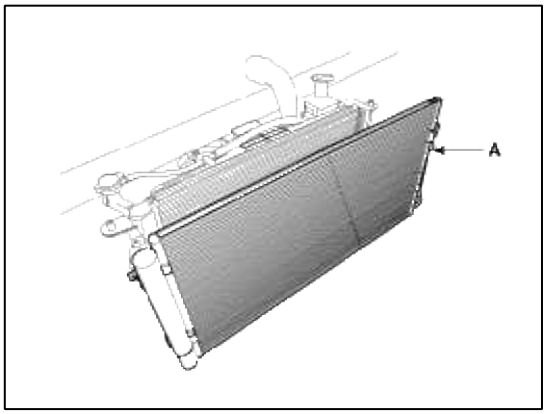
Condenser Assembly

1. Recover the refrigerant with a recovery/ recycling/ charging station .
2. Disconnect the negative (-) battery terminal.

3. Remove 2 nuts, and then disconnect the discharge line and liquid line (A) from the condenser.



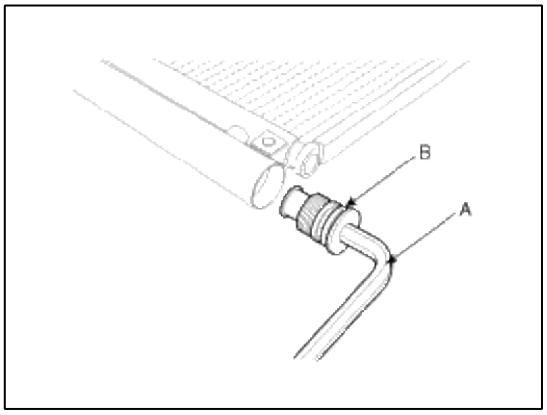
4. Remove the radiator. (Refer to EM group - Radiator)
5. Remove 2 bolts, and then remove the condenser (A) by lifting it up. Be careful not to damage the radiator and condenser fins when removing the condenser.



6. Install in the reverse order of removal, and note these items :
   A. If you're installing a new condenser, add refrigerant oil ND-OIL8.
   B. Replace the O-rings with new ones at each fitting, and apply a thin coat of refrigerant oil before installing them. Be sure to use the right O-rings for R-134a to avoid leakage.
   C. Be careful not to damage the radiator and condenser fins when installing the condenser.
   D. Be sure to install the lower mount cushions of condenser securely into the holes.
   E. Charge the system, and test its performance.

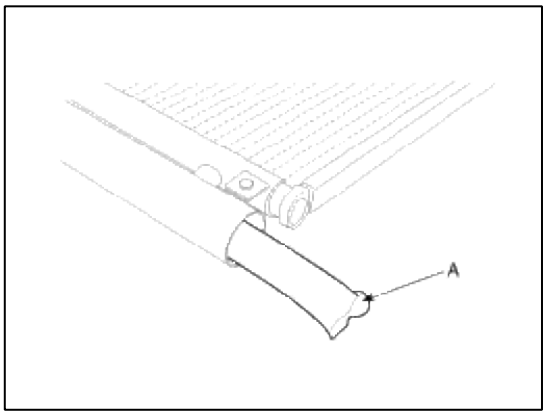
Desiccant
Replacement

1. Remove the condenser, and then remove the bottom cap (B) with L wrench (A) from the condenser.



TORQUE : 20~25N.m (2.0~2.5kgf•m, 14.5~18.2lb-ft)

2. Remove the desiccant (A) from condenser using a long nose plier. Check for crumbled desiccant and clogged bottom cap filter.



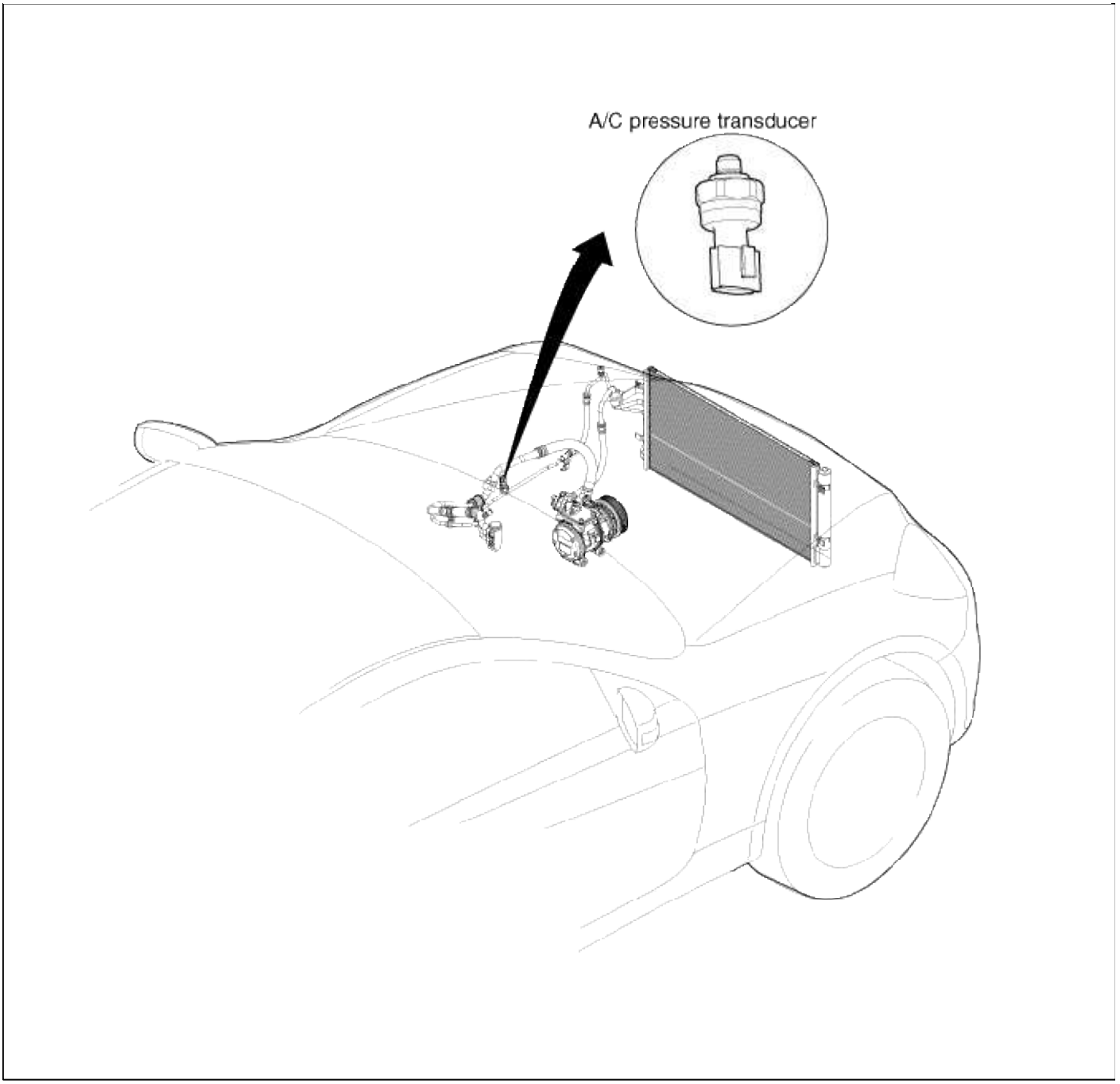
3. Apply air conditioning compressor oil along the O-rings and threads of the new bottom cap.
4. Insert the new desiccant into the receiver drier tank. The desiccant must be sealed in vacuum before it is exposed to air for use.
5. Install the new bottom cap to the condenser.

NOTE

- Always replace the desiccant and bottom cap at the same time.
- Replace the O-rings with new ones at each fitting, and apply a thin coat of refrigerant oil before installing them. Be sure to use the right O-rings for R-134a to avoid leakage.
- Be careful not to damage the radiator and condenser fins when installing the condenser.
- Be sure to install the lower mount cushions of condenser securely into the holes.
- Charge the system, and test its performance.

Heating,Ventilation, Air Conditioning > Air conditioning System > A/C pressure transducer > Components and Components Location

Component Location



Heating,Ventilation, Air Conditioning > Air conditioning System > A/C pressure transducer > Description and Operation

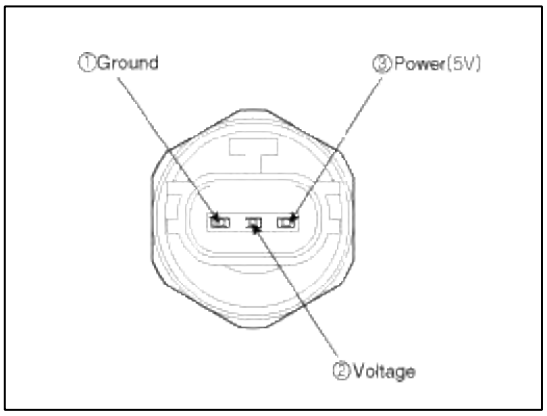
Description

A/C pressure transducer convert the pressure value of high pressure line into voltage value after measure. By converted voltage value, engine ECU controls cooling fan by operating high speed or low speed. Engine ECU stop the operation of compressor when the temperature of refrigerant line is too high or too low irregularly to optimize air conditioning system.

Heating,Ventilation, Air Conditioning > Air conditioning System > A/C pressure transducer > Repair procedures

Inspection

1. Measure the pressure of high pressure line by voltage output between NO.1 and NO.2 terminals



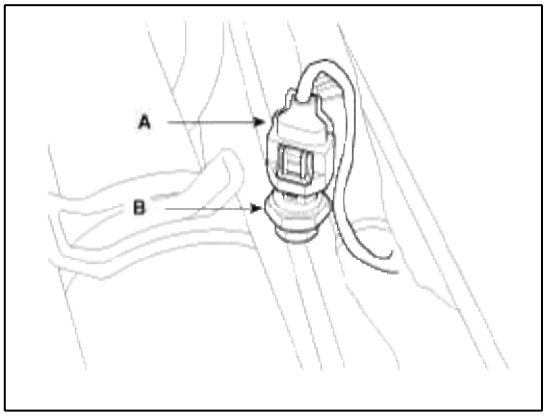
2. Inspect the voltage value whether it is sufficient to be regular value or not.

Voltage = 0.00878835 * Pressure + 0.37081095 [PSIA]

3. If the measured voltage value is not specification, replace the A/C pressure transducer.

Replacement

1. Disconnect the negative (-) battery terminal.
2. Recover the refrigerant with a recovery/charging station.
3. Disconnect A/C pressure transducer connector (3P) (A).
4. Remove the A/C pressure transducer(B).



CAUTION

- Take care that liquid & suction pipe are not bent.

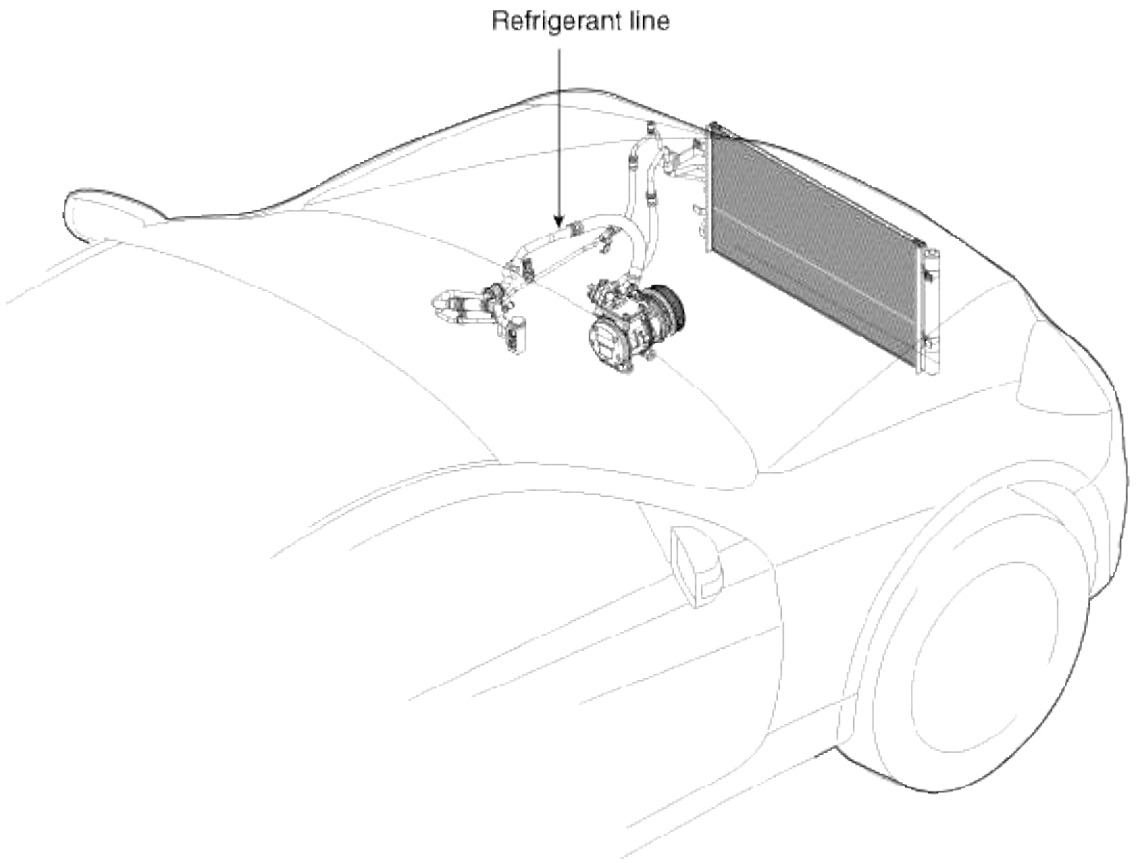
5. Installation is the reverse order of removal.

TORQUE : 10~12N.m (1.0~1.2kgf.m, 7.4~8.8lbf.ft)

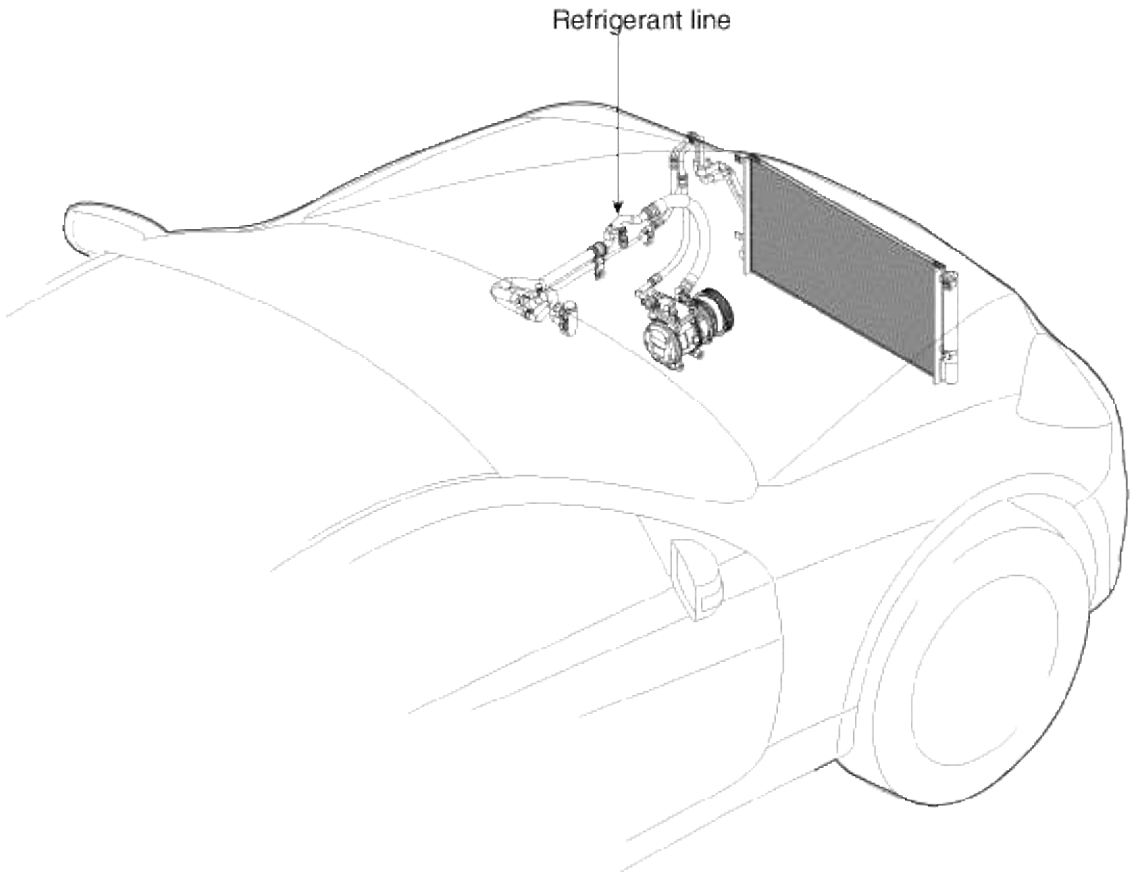
Heating,Ventilation, Air Conditioning > Air conditioning System > Refrigerant line > Components and Components Location

Component location

[Theta engine]



[Lambda engine]



Heating,Ventilation, Air Conditioning > Air conditioning System > Refrigerant line > Repair procedures

Replacement

1. Discharge refrigerant from refrigeration system .
2. Replace faulty tube or hose.

CAUTION

- Cap the open fittings immediately to keep moisture or dirt out of the system.

3. Tighten joint of bolt or nut to specified torque

CAUTION

- Connections should not be torque tighter than the specified torque.

Part tightened	N.m	Kgf.m	lbf.ft
Condenser - Discharge hose	4.9~5.9	0.5~0.6	3.6~4.3
Condenser - Liquid tube			
Compressor - Discharge hose	4.9~5.9	0.5~0.6	3.6~4.3
Compressor - Suction hose			
Expansion valve - Evaporator	11.7~5.9	1.2~1.5	8.7~10.8

4. Evacuate air in refrigeration system and charge system with refrigerant.

Specified amount: 570 ± 25g (20.1 ± 0.88 oz.)

5. Inspect for leakage of refrigerant.
   Using a gas leak detector, check for leakage of refrigerant .
6. Inspect A/C operation.

Heating,Ventilation, Air Conditioning > Air conditioning System > Evaporator temperature sensor > Description and Operation

Description

The evaporator temperature sensor will detect the evaporator core temperature and interrupt compressor relay power in order to prevent evaporator freezing by excessive cooling.

Heating,Ventilation, Air Conditioning > Air conditioning System > Evaporator temperature sensor > Repair procedures

Inspection

1. Ignition "OFF"
2. Disconnect evaporator temperature sensor.

3. Using the multi-tester, Measure resistance between terminal "1" and "2" of evaporator temperature sensor.

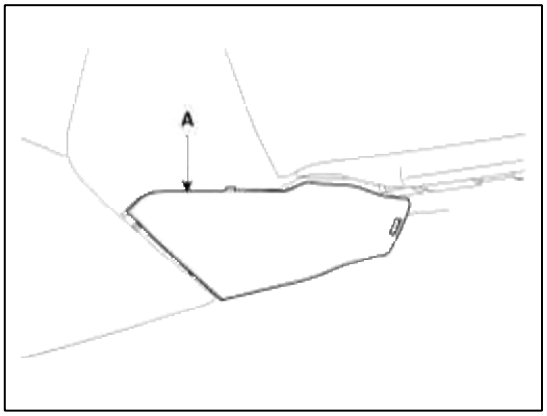
Specification

Evaporator core temperature[°C(°F)]	Resistance[KΩ]	Voltage[V]
-10(14)	29.42	3.736
0(32)	18.9	3.221
10(50)	11.36	2.665
20(68)	7.362	2.125
30(86)	4.892	1.647
40(104)	3.326	1.248
50(122)	2.309	0.941

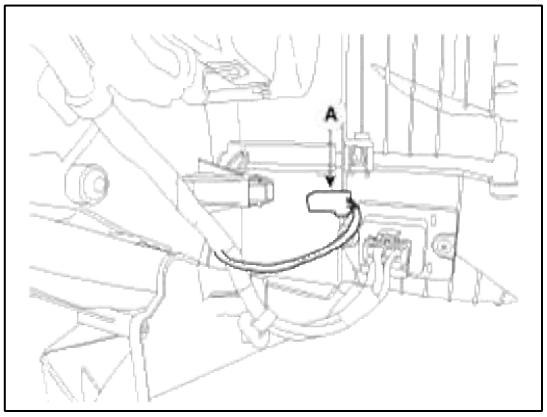
4. If the measured resistance is not specification, substitute with a known-good evaporator temperature sensor and check for proper operation.
5. If the problem is corrected, replace the evaporator temperature sensor.

Replacement

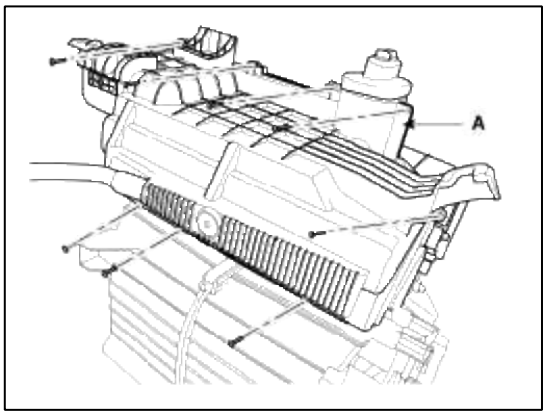
1. Disconnect the negative (-) battery terminal.
2. Remove the crash pad lower cover (A).



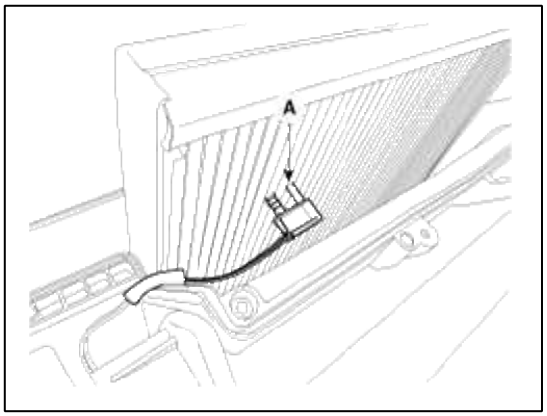
3. Disconnect the evaporator sensor connector (A).



4. Remove the heator unit lower cover (A).



5. Remove the evaporator temperature sensor (A) from evaporator core.



CAUTION

- Take care that evaporator core pins are not bent.

6. Installation is the reverse order of removal.

Heating,Ventilation, Air Conditioning > Air conditioning System > In-car sensor > Description and Operation

Description

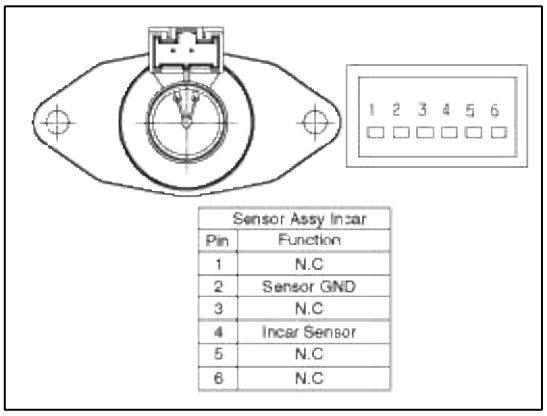
1. In-car air temperature sensor is located at the center facia lower panel.
2. The sensor contains a thermistor which measures the temperature of the inside. The signal decided by the resistance value which changes in accordance with perceived inside temperature, is delivered to heater control unit and according to this signal the control unit regulates incar temperature to intended value.

Heating,Ventilation, Air Conditioning > Air conditioning System > In-car sensor > Repair procedures

Inspection

1. Ignition "ON"

2. Blow air with changing temperature to the in car sensor air inlet. Measure sensor resistance between 2 and 4 terminals.



Sensor Assy Incar

Pin	Function
1	N.C
2	Sensor GND
3	N.C
4	Incar Sensor
5	N.C
6	N.C

Specification

Temperature [°C(°F)]	Resistance between terminals 2and 4 (kΩ)
-30(-22)	509.4 ± 4.1%
-15(5)	216 ± 3.2%
0(32)	97.71 ± 2.4%
15(59)	47.13 ± 1.7%
25(77)	30.00 ± 1.2%
35(95)	19.59 ± 1.6%
50(122)	10.81 ± 2.2%
60(140)	7.463 ± 2.6%

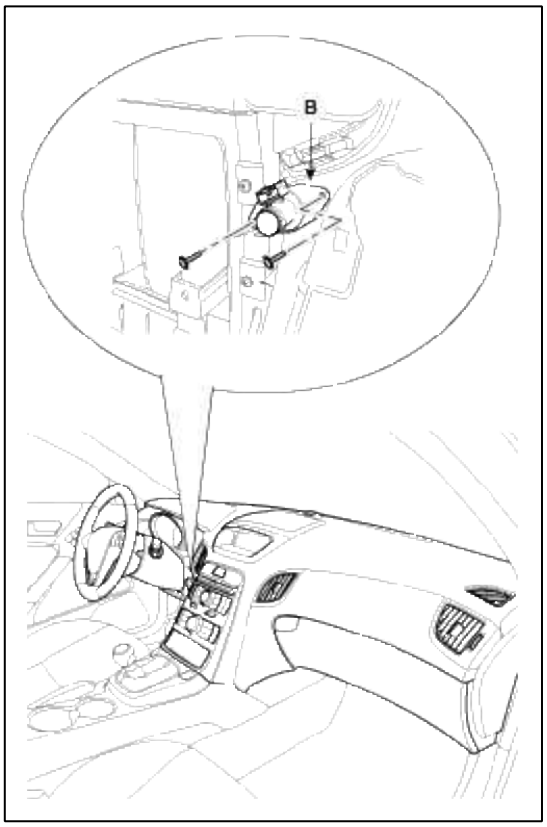
NOTE

In car sensor is negative type thermistor that resistance will rise with lower temperature, and reduce with higher temperature.

Replacement

1. Disconnect the negative (-) battery terminal.
2. Remove the crash pad.

3. Disconnect the connector of in-car sensor. Loosen the mounting 2 screws and then remove the in-car sensor (B).



4. Installation is the reverse order of removal.

Heating,Ventilation, Air Conditioning > Air conditioning System > Photo sensor > Description and Operation

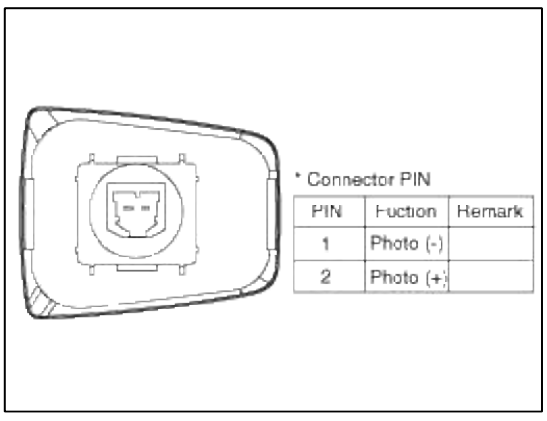
Description

1. The photo sensor is located at the center of defrost nozzle.
2. The photo sensor contains a photovoltaic (sensitive to sunlight) diode. The solar radiation received by its light receiving portion, generates an electromotive force in proportion to the amount of radiation received which is transferred to the automatic temperature control module so that the solar radiation compensation will be performed.

Heating,Ventilation, Air Conditioning > Air conditioning System > Photo sensor > Repair procedures

Inspection

1. Ignition "ON"
2. Using the scan tool.
3. Emit intensive light toward photo sensor using a lamp, and check the output voltage change.
4. The voltage will rise with higher intensive light and reduce with lower intensive light.

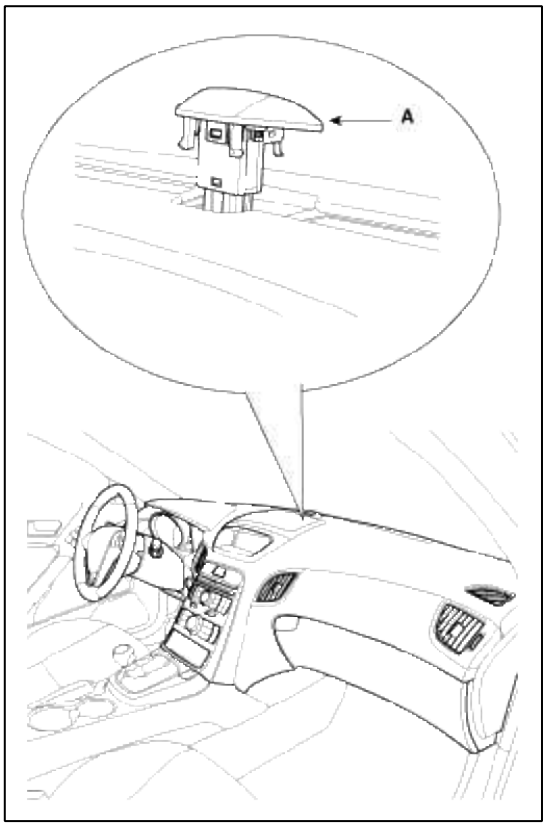


* Connector PIN

PIN	Fuction	Remark
1	Photo (-)	
2	Photo (+)	

Replacement

1. Disconnect the negative (-) battery terminal.
2. With the (-) driver, remove the photo sensor (A) from the center of defrost nozzle.



3. Install in the reverse order of removal.

Heating,Ventilation, Air Conditioning > Air conditioning System > Ambient sensor > Description and Operation

Description

1. The ambient temperature sensor is located at the front of the condenser and detects ambient air temperature. It is a negative type thermistor; resistance will increase with lower temperature, and decrease with higher temperatures.
2. The sensor output will be used for discharge temperature control, temperature regulation door control, blower motor level control, mix mode control and in-car humidity control.

> NOTE
>
> If the ambient temperature is below 2.0°C (35.6°F), the A/C compressor will be stopped.
> The compressor will be operated by manual operating.

Heating,Ventilation, Air Conditioning > Air conditioning System > Ambient sensor > Repair procedures

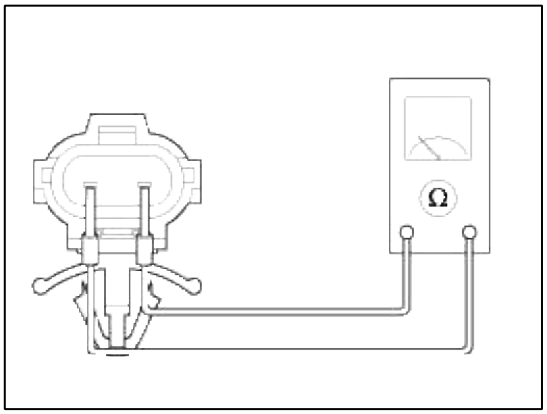
Inspection

1. Ignition "OFF"
2. Disconnect ambient temperature sensor.

3. Check the resistance of ambient temperature sensor between terminals 1 and 2 whether it is changed by changing of the ambient temperature.

   Specification

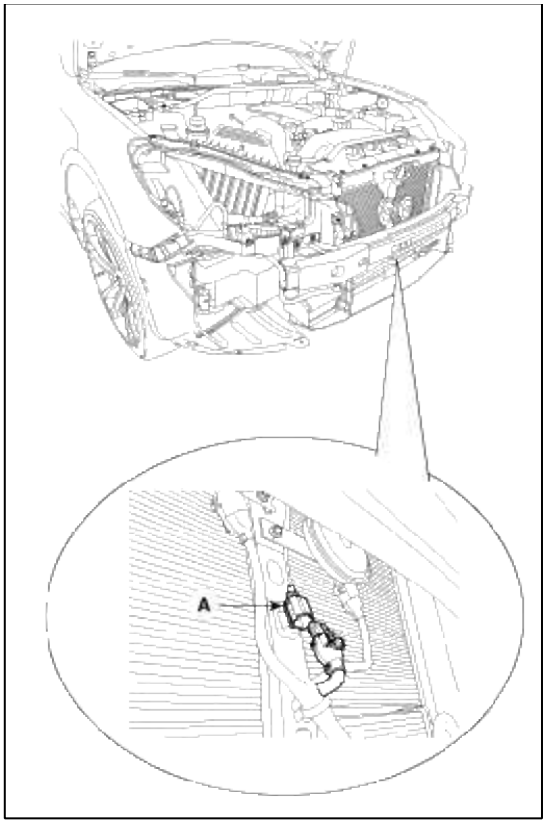
Ambient temperature [°C(°F)]	Resistance between terminals 1and 2 (kΩ)
-10(50)	163.31 ± 3%
0(68)	96.892 ± 3%
10(50)	59.365 ± 3%
20(68)	37.147 ± 3%
25(77)	30 ± 3%
40(104)	16.032 ± 3%



4. If the measured resistance is not specification, substitute with a known-good ambient temperature sensor and check for proper operation.
5. If the problem is corrected, replace the ambient temperature sensor.

Replacement

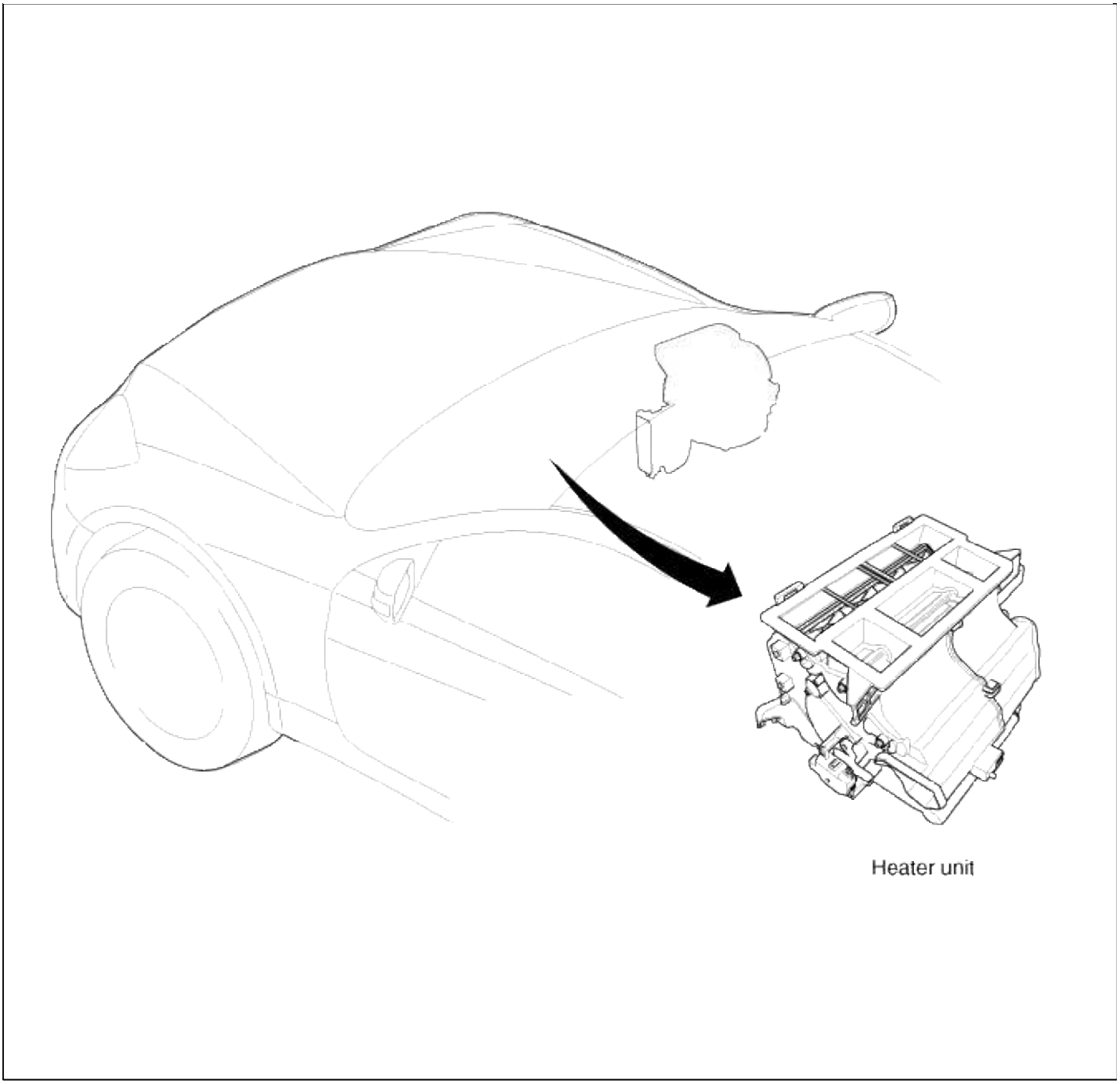
1. Disconnect the negative (-) battery terminal.
2. Remove the front bumper.
   (Refer to BD group-Front bumper)
3. Remove the ambient temperature sensor (A).



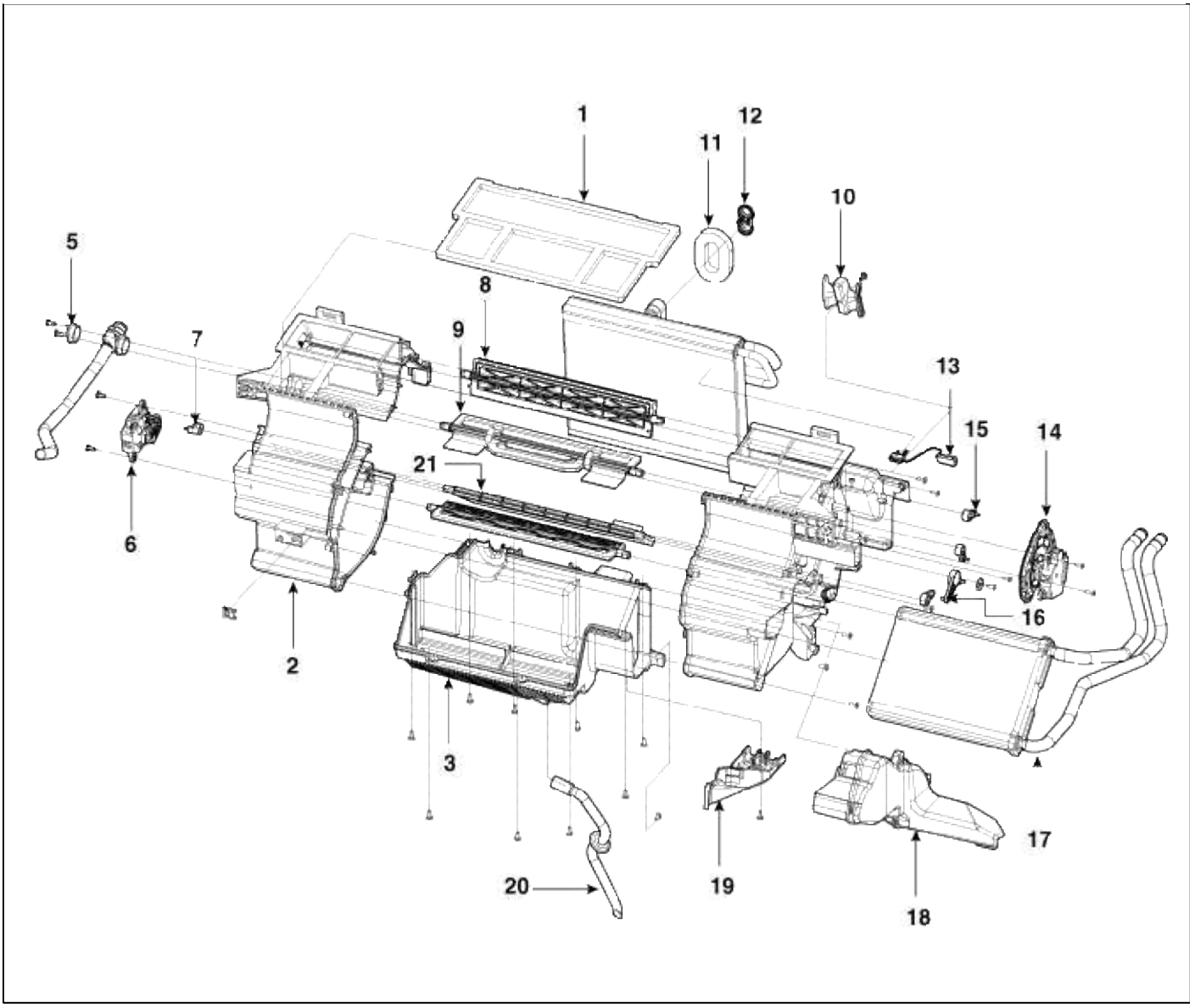
4. Installation is the reverse order of removal.

Heating,Ventilation, Air Conditioning > Heater > Heater Unit > Components and Components Location

Component Location



Compoment



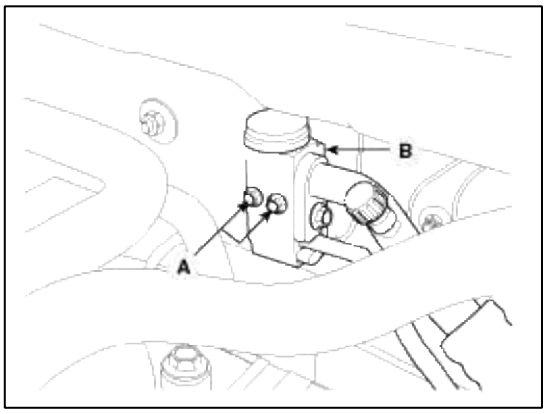
1. Duct	10. Heater pipe cover	18. Shower duct
2. Heater case (L)	11. Flange seal	19. Heater pipe cover
3. Heater lower case	12. Flange cap	20. Drain hose
4. Heater case (R)	13. Evaporator sensor	21. Temp door
5. Aspirator hose	14. Mode actuator	
6. Temp actuator	15. Vent lever	
7. Temp lever	16. Sub foot lever	
8. Foot door	17. Heater core	
9. Vent door		

Heating,Ventilation, Air Conditioning > Heater > Heater Unit > Repair procedures

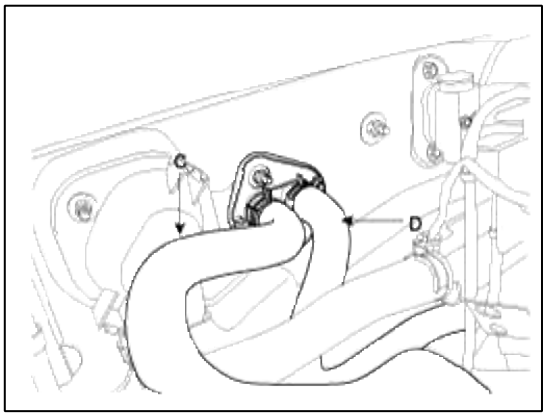
Replacement

1. Disconnect the negative (-) battery terminal.
2. Recover the refrigerant with a recovery/ recycling/ charging station.
3. When the engine is cool, drain the engine coolant from the radiator.

4. Remove the bolts (A) and the expansion valve (B) from the evaporator core.
   Plug or cap the lines immediately after disconnecting them to avoid moisture and dust contamination.



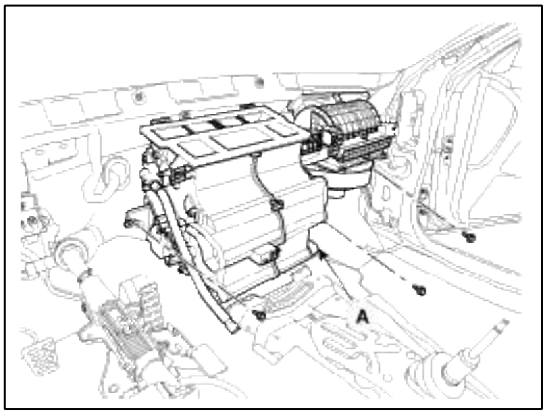
5. Disconnect the inlet (C) and outlet (D) heater hoses from the heater unit.



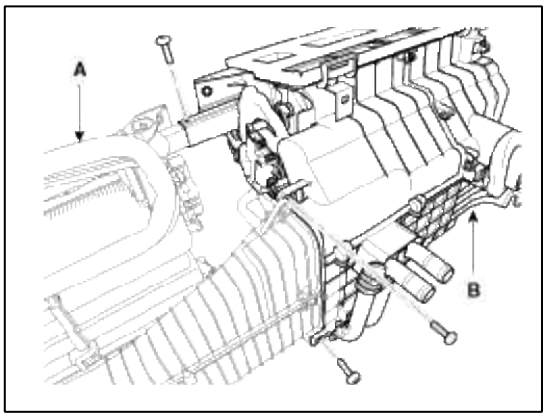
CAUTION

- Engine coolant will spill when the hoses are disconnected; drain it into a clean drip pan. Be sure not to let coolant spill on electrical parts or painted surfaces. If any coolant spills, rinse it off immediately.

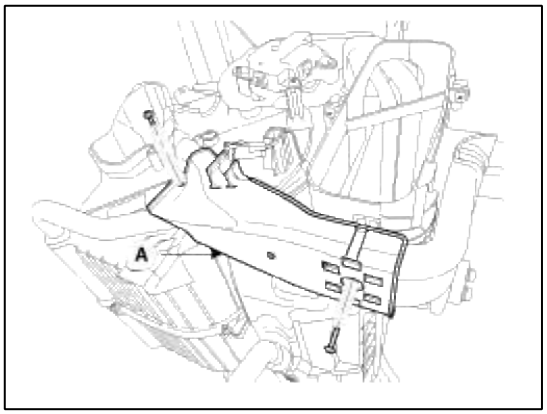
6. Remove the crash pad.
   (Refer to BD group-Crash pad)
7. Remove the cowl cross bar assembly.
   (Refer to BD group-Crash pad)
8. Remove the heater & blower unit after loosening 3 mounting bolts.

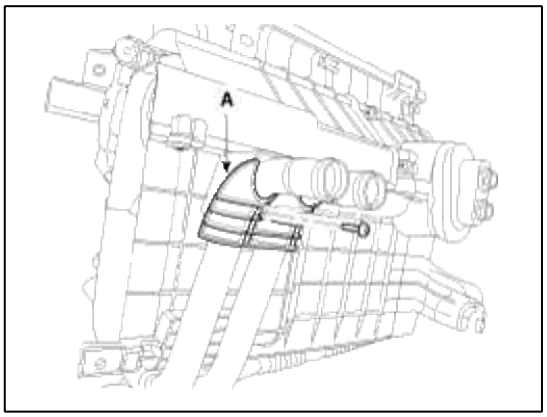


9. Remove the blower unit (A) from heater unit (B) after loosening 2 screws.

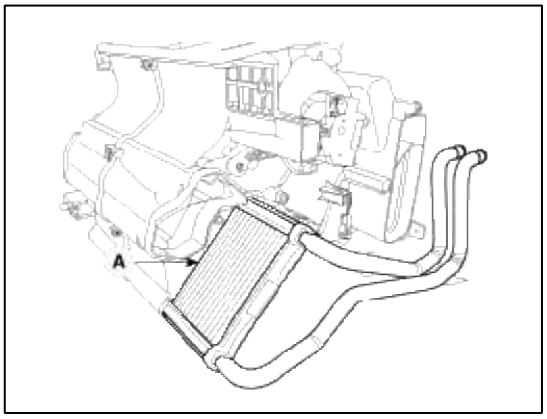


10. Remove the heater core cover after remove the cover (A).

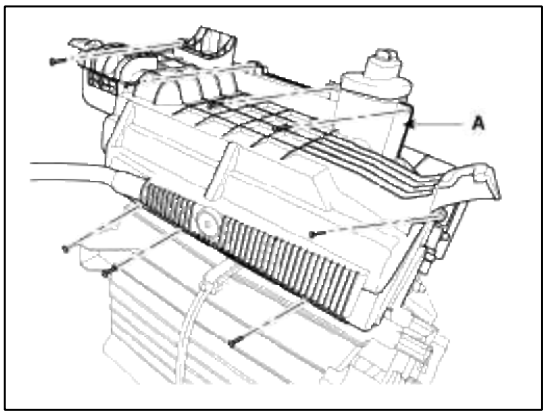




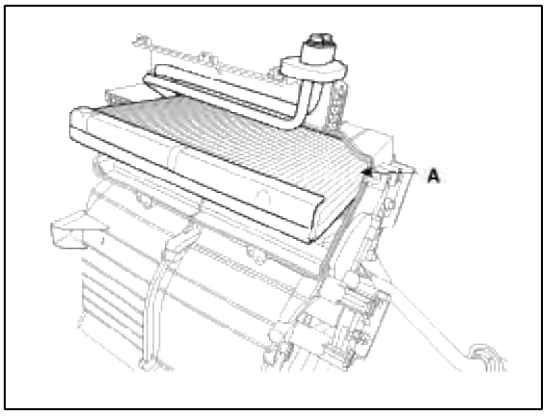
11. Be careful that the inlet and outlet pipe are not bent during heater core removal, and pull out the heater core (A).



12. Remove the heater unit lower case(A).



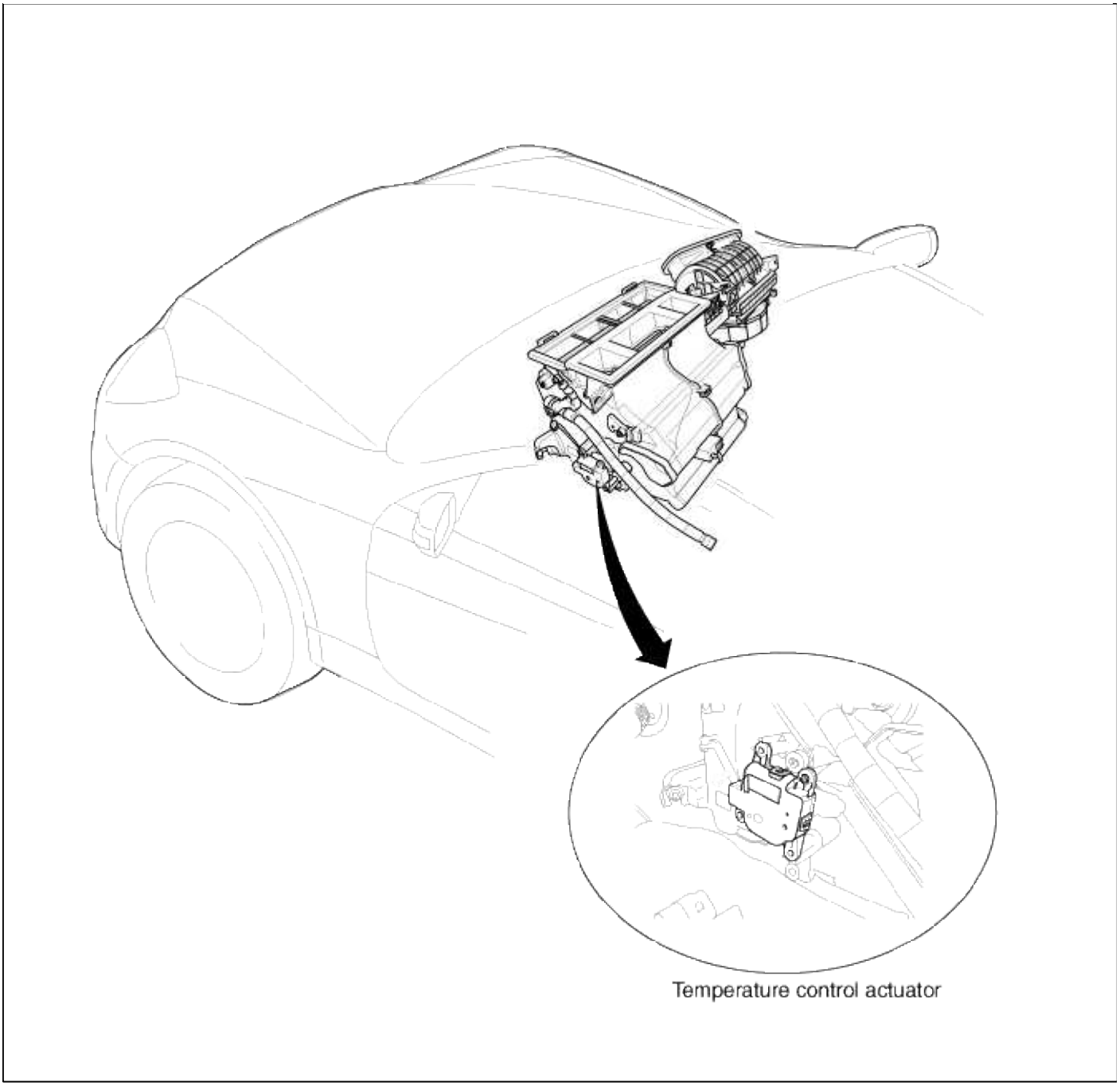
13. Remove the evaporator core(A).



14. Be careful that the inlet and outlet pipe are not bent during heater core removal, and pull out the heater core.
15. Install the heater core in the reverse order of removal.
16. Installation is the reverse order of removal, and note these items :
    A. If you're installing a new evaporator, add refrigerant oil (ND-OIL8).
    B. Replace the O-rings with new ones at each fitting, and apply a thin coat of refrigerant oil before installing. Be sure to use the right O-rings for R-134a to avoid leakage.
    C. Immediately after using the oil, replace the cap on the container, and seal it to avoid moisture absorption.
    D. Do not spill the refrigerant oil on the vehicle ; it may damage paint ; if the refrigerant oil contacts the paint, wash off immediately.
    E. Apply sealant to the grommets.
    F. Make sure that there is no air leakage.
    G. Charge the system and test its performance.
    H. Do not interchange the inlet and outlet heater hoses and install the hose clamps securely.
    I. Refill the cooling system with engine coolant.

Heating,Ventilation, Air Conditioning > Heater > Temperature Control Actuator > Components and Components Location

Component Location



Heating,Ventilation, Air Conditioning > Heater > Temperature Control Actuator > Description and Operation

Description

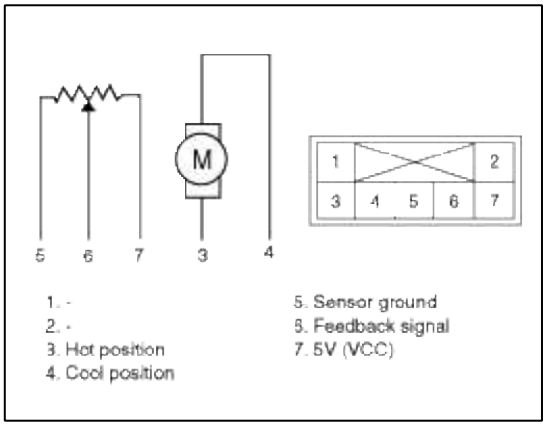
1. Heater unit includes mode control actuator and temperature control actuator.
2. Temperature control actuator is located at the heater unit. It regulates the temperature by the procedure as follows. Signal from control unit adjusts position of temperature door by operating temperature switch and then temperature will be regulated by the hot/cold air ratio decided by position of temperature door

Heating,Ventilation, Air Conditioning > Heater > Temperature Control Actuator > Repair procedures

Inspection

1. Ignition "OFF"
2. Disconnect the connector of temperature control actuator.

3. Verify that the temperature control actuator operates to the hot position when connecting 12V to the terminal 3 and grounding terminal 4.
   Verify that the temperature control actuator operates to the cool position when connecting in the reverse



4. Check the voltage between terminals 5 and 6.

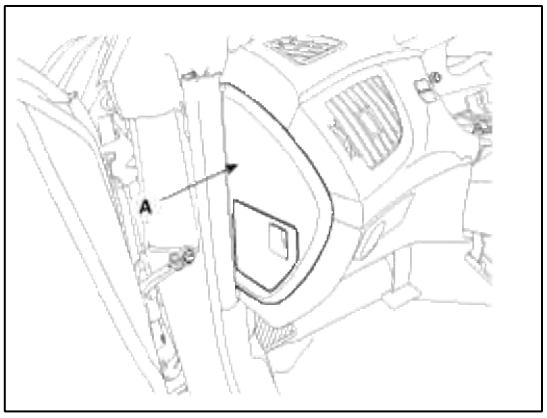
Specification

Door position	Voltage (5-6)	Error detecting
Max. cooling	0.45 ± 0.15V	Low voltage :0.1V or less
Max. heating	4.55 ± 0.15V	High voltage :4.9V or more

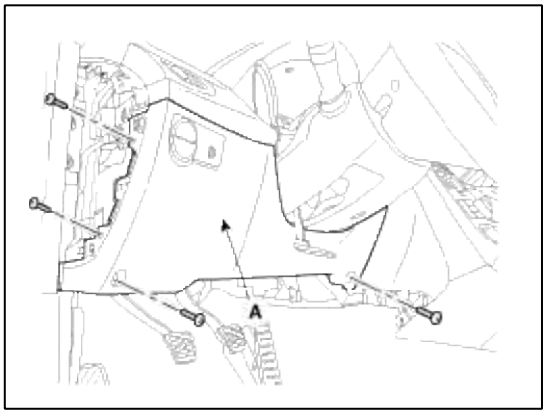
* It will feedback current position of actuator to controls.

Replacement

1. Disconnect the negative (-) battery terminal.
2. Remove the crash pad side cover (A).

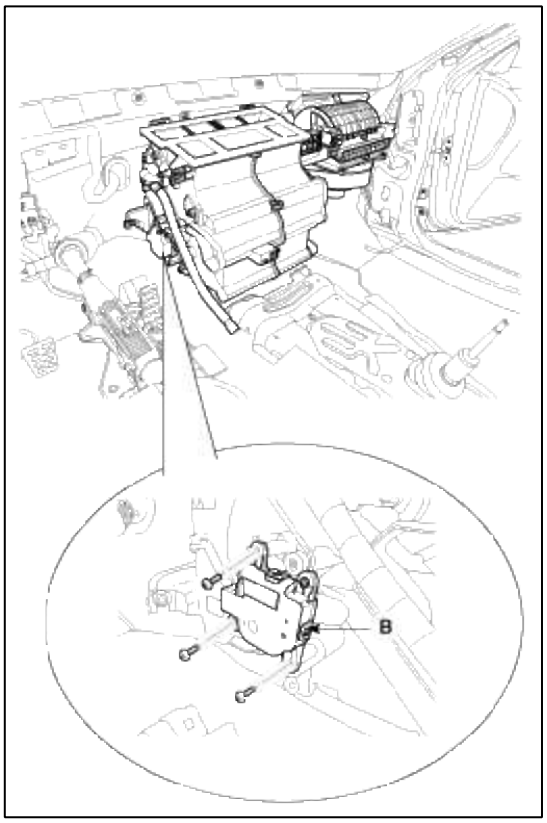


3. After loosening the crash pad lower panel mounting screws, then remove the lower panel (A).



4. Disconnect the temperature control actuator connector after removing the air duct.

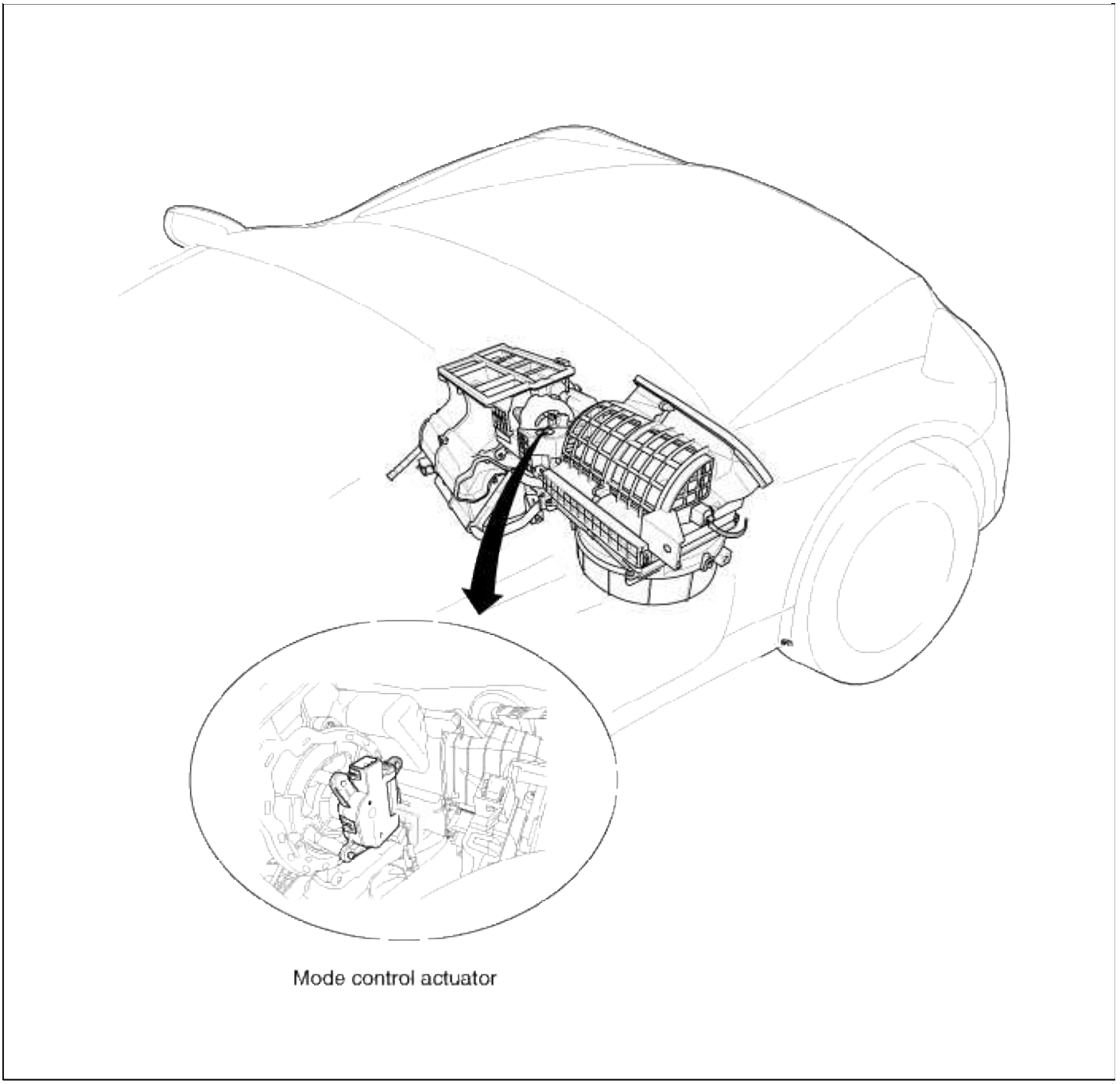
5. Loosen the mounting screw and then remove the temperature control actuator (B).



6. Installation is the reverse order of removal.

Heating,Ventilation, Air Conditioning > Heater > Mode Control Actuator > Components and Components Location

Component Location



Mode control actuator

Heating,Ventilation, Air Conditioning > Heater > Mode Control Actuator > Description and Operation

Description

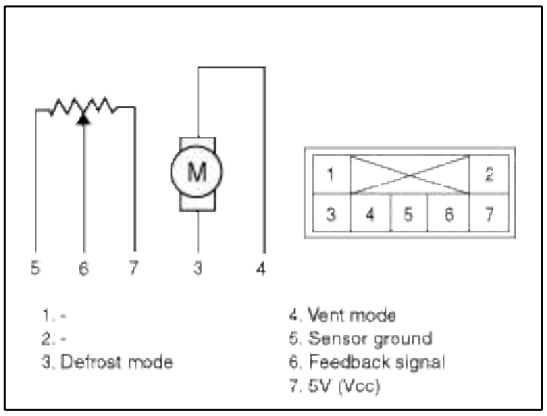
The mode control actuator is located at the heater unit.
It adjusts position of mode door by operating mode control actuator based on signal of A/C control unit. Pressing mode select switch makes the mode control actuator shift in order of vent→ B/L → floor → mix.

Heating,Ventilation, Air Conditioning > Heater > Mode Control Actuator > Repair procedures

Inspection

1. Ignition "OFF"
2. Disconnect the connector of mode control actuator.
3. Verify that the mode control actuator operates to the defrost mode when connecting 12V to the terminal 3 and grounding terminal 4.

4. Verify that the mode control actuator operates to the vent mode when connecting in the reverse.



5. Check the voltage between terminals 5 and 6.

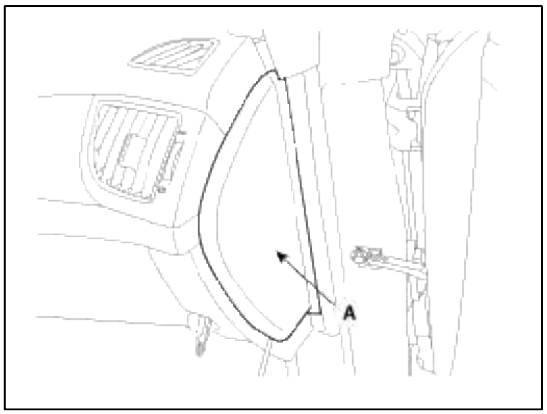
Door position	Voltage (5-6)	Error detecting
Vent	0.45 ± 0.15V	Low voltage :0.1V or less
Defrost	4.55 ± 0.15V	High voltage :4.9V or more

* It will feedback current position of actuator to controls.

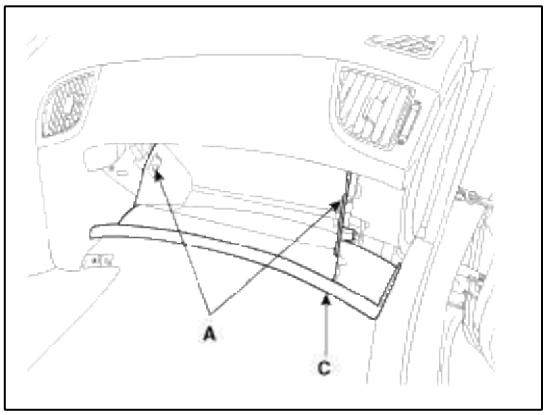
6. If the measured voltage is not specification, substitute with a known-good console temp control actuator and check for proper operation.
7. If the problem is corrected, replace the console temp control actuator.

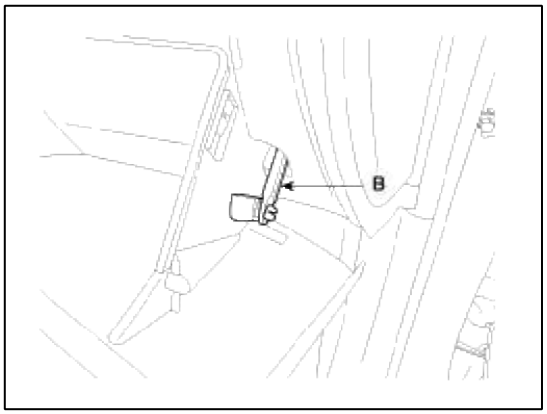
Replacement

1. Disconnect the negative (-) battery terminal.
2. Remove the crash pad side cover (A).

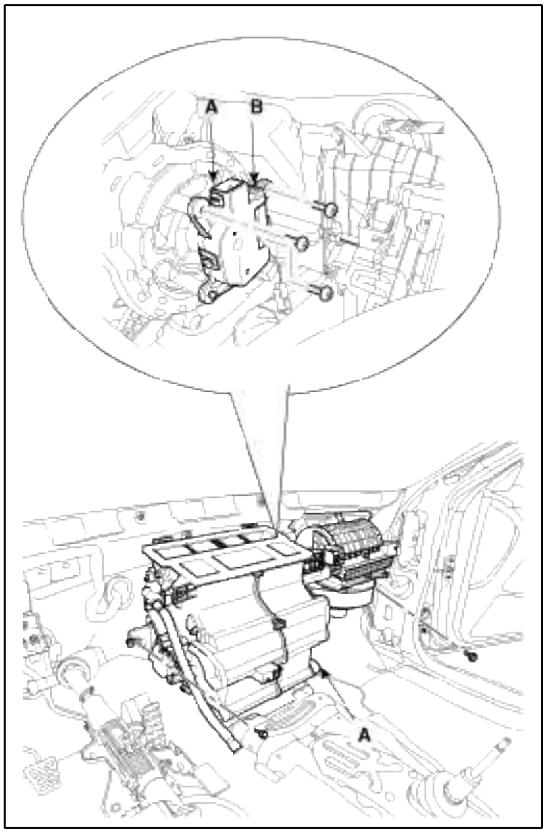


3. Open the glove box. Lower the glove box down completely by removing the glove box damper (A) and lift (B) to the glove box(C).





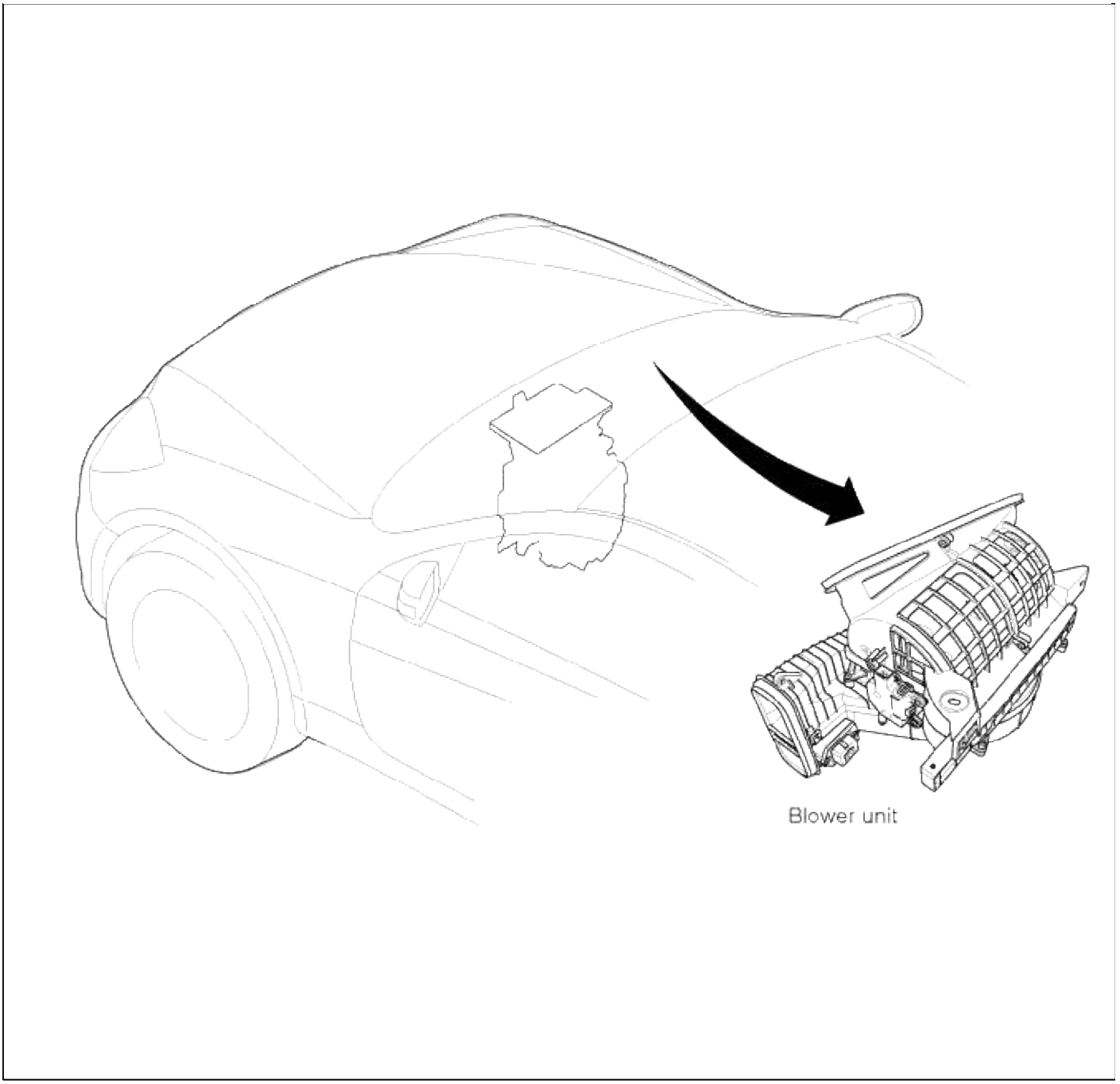
4. Disconnect the mode control actuator connector (A) after removing the air duct.
5. Loosen the mounting screws and then remove the mode control actuator (B).



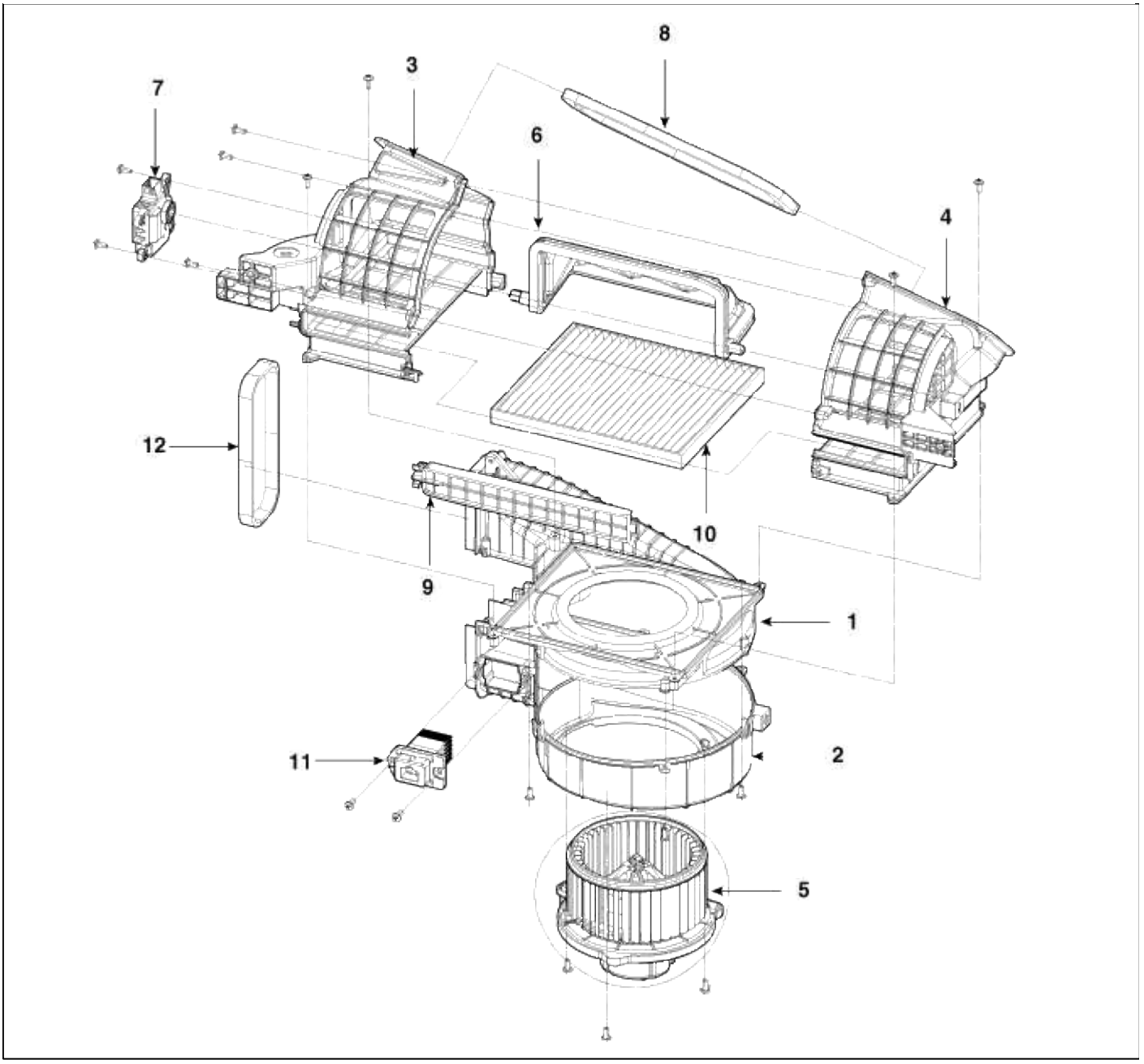
6. Installation is the reverse order of removal.

Heating,Ventilation, Air Conditioning > Blower > Blower Unit > Components and Components Location

Component Location



Components



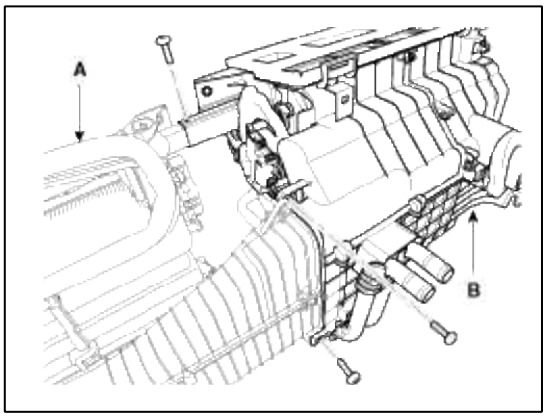
1. Blower upper case	5. Blower motor	9. Climate control air filter cover
2. Blower lower case	6. Intake door	10. Climate control air filter
3. Intake case (L)	7. Intake actuator	11. Power mosfet
4. Intake case (R)	8. Cowl seal	12. Heater matching lining

Heating,Ventilation, Air Conditioning > Blower > Blower Unit > Repair procedures

Replacement

1. Disconnect the negative (-) battery terminal.
2. Remove the crush pad.
   (Refer to BD group-crash pad)
3. Remove the cowl cross bar assembly.
   (Refer to BD group-crash pad)
4. Remove the heater & blower unit.
   (Refer to HA group-heater unit)

5. Remove the blower unit from the heater unit (B) after loosening a mounting bolt and 2 screws.



NOTE

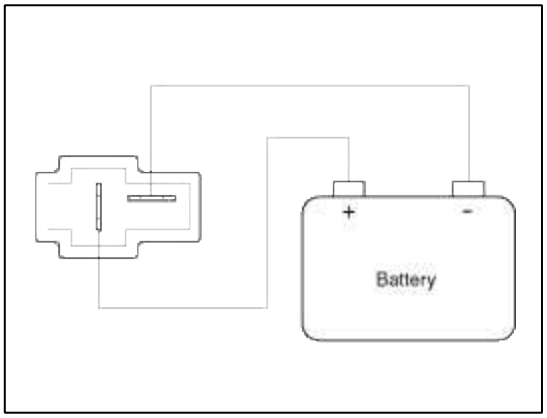
Make sure that there is no air leaking out of the blower and duct joints.

6. Installation is the reverse order of removal.

Heating,Ventilation, Air Conditioning > Blower > Blower Motor > Repair procedures

Inspection

1. Connect the battery voltage and check the blower motor rotation.

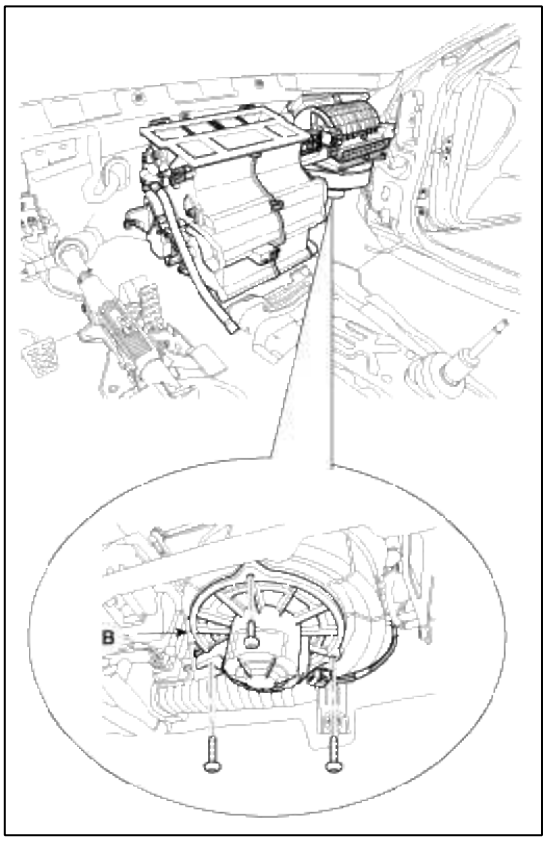


2. If the blower motor voltage is not operated well, substitute with a known-good blower motor and check for proper operation.
3. If the problem is corrected, replace the blower motor.

Replacement

1. Disconnect the negative (-) battery terminal.
2. Remove the crashpad under cover(Refer to BD group-Crash pad).
3. Disconnect the connector of the blower motor.

4. Remove the blower motor (B) after loosening the mounting screws.

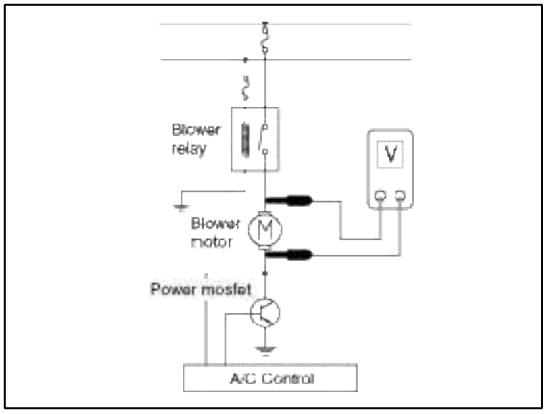


5. Installation is the reverse order of removal.

Heating,Ventilation, Air Conditioning > Blower > Power Mosfet > Repair procedures

Inspection

1. Ignition "ON"
2. Manually operate the control switch and measure the voltage of blower motor between pin 1 and 2.
3. Select the control switch to raise voltage until high speed.



Specification

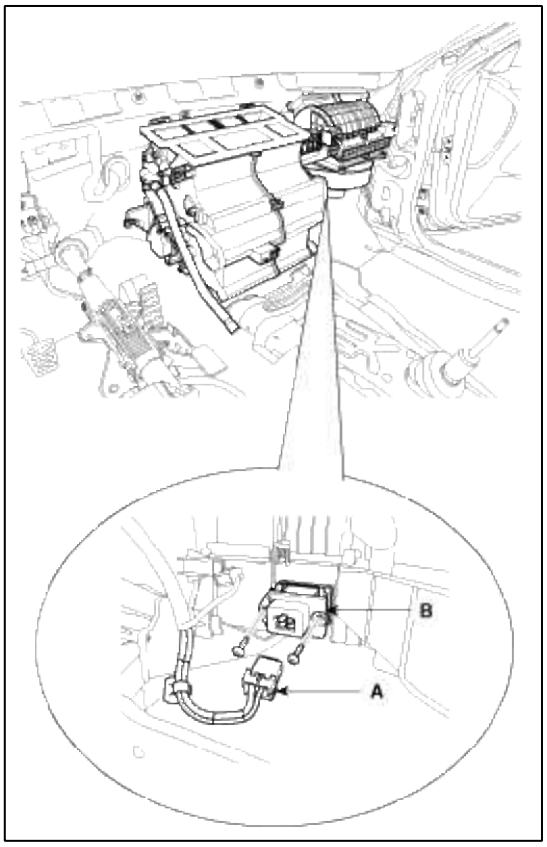
Fan	Motor Voltage
	Manual
First speed	3.8 ±0.5V
Second speed	4.9 ±0.5V
Third speed	6.1 ±0.5V
Fourth speed	7.2 ±0.5V
Fifth speed	8.3 ±0.5V
Sixth speed	9.5 ±0.5V
Seventh speed	10.6 ±0.5V
eighth speed	Battery

*AUTO COOLING: Auto speed (4.5V~B+)
*AUTO HEATING: Auto speed (4.5V~10.5V)

4. If the measured voltage is not specification, substitute with a known-good power mosfet and check for proper operation.
5. If the problem is corrected, replace the power mosfet.

Replacement

1. Disconnect the negative (-) battery terminal.
2. Remove the crashpad under cover.
   (Refer to BD group-Crash pad)
3. Disconnect the power mosfet connector (A) at the connecting part between heater and blower unit.
4. Remove the power mosfet (B) after loosening the mounting screws.



5. Installation is the reverse order of removal.

Heating,Ventilation, Air Conditioning > Blower > Climate control air filtar > Description and Operation

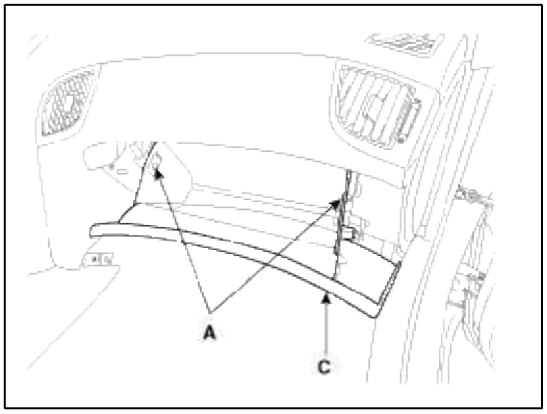
Description

This has particle filter which eliminates foreign materials and odor. The particle filter includes odor filter as well as conventional dust filter to ensure comfortable interior environment.

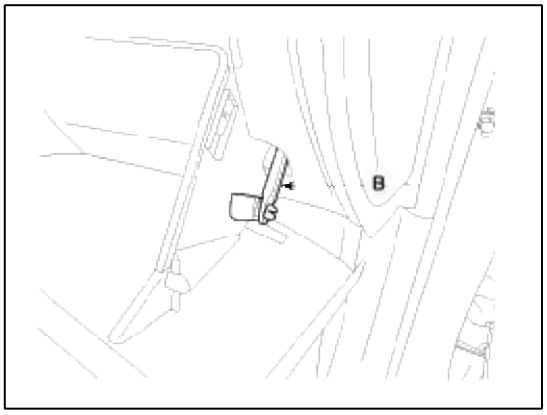
Heating,Ventilation, Air Conditioning > Blower > Climate control air filtar > Repair procedures

Replacement

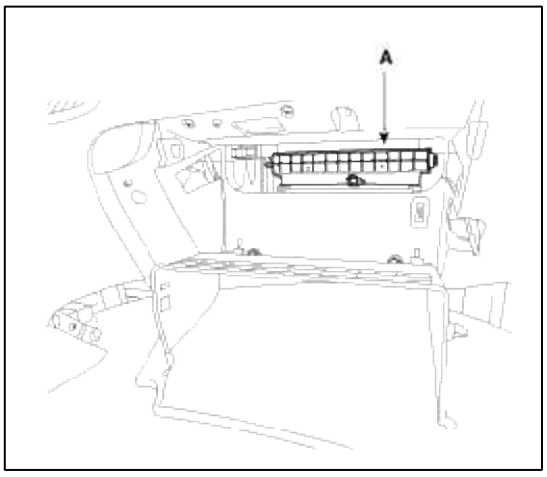
1. Open the glove box (A). Lower the glove box down completely by removing the glove box damper (B) to the glove box.



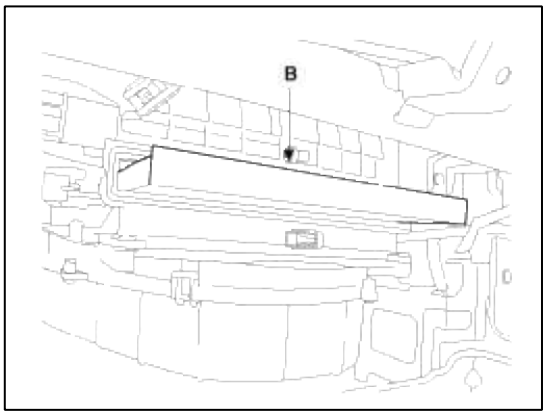
2. Remove the glove box lift(B).



3. Remove the filter cover (A) with pushing the knob.



4. Replace the air filter (B), install it after making sure of the direction of air filter.

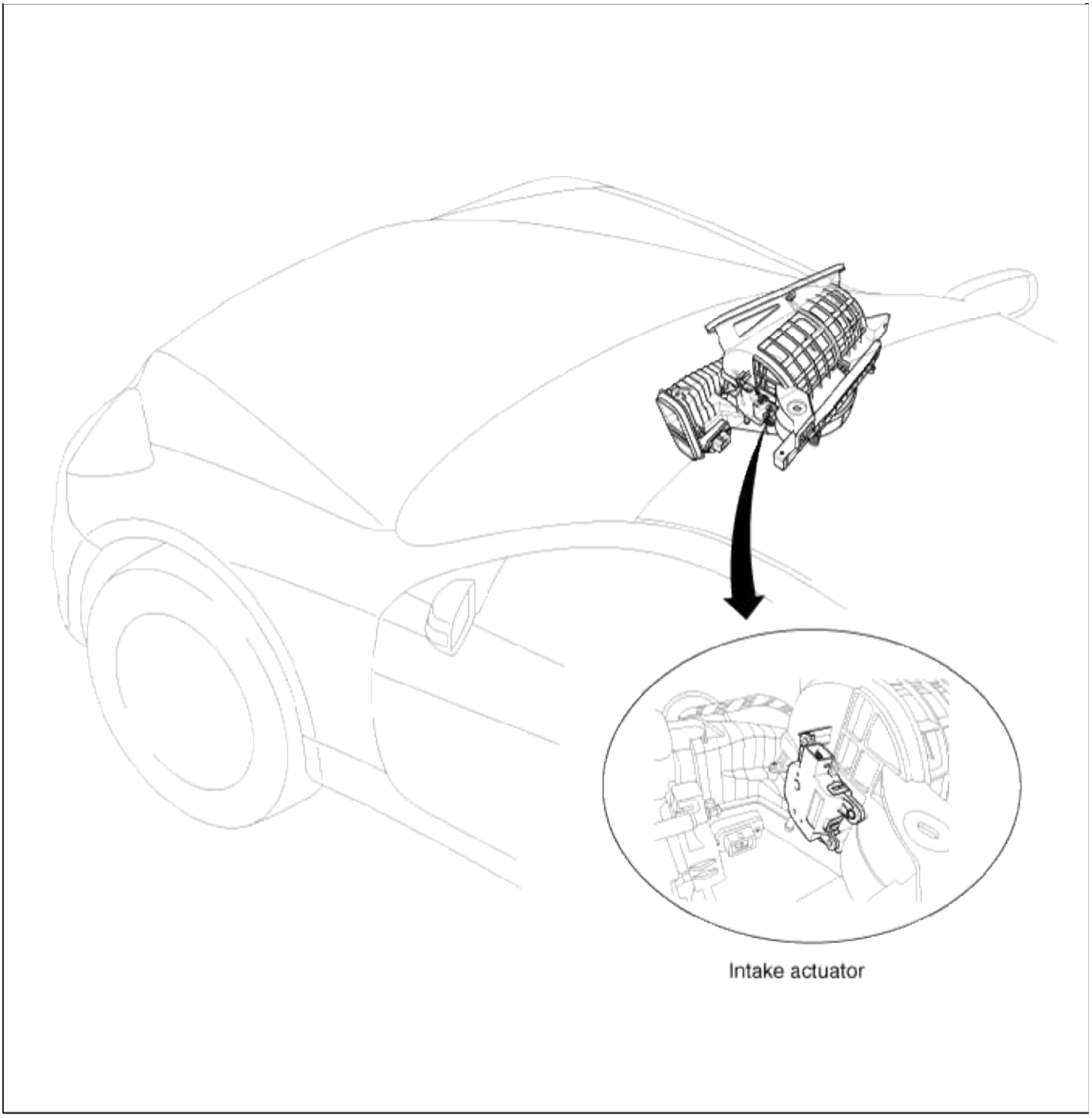


5. Installation is the reverse order of removal.

> NOTE
>
> In case of driving in an air-polluted area or rugged terrain, check and replace the air filter as frequently as possible.

Heating,Ventilation, Air Conditioning > Blower > Intake Actuator > Components and Components Location

Component Location



Heating,Ventilation, Air Conditioning > Blower > Intake Actuator > Description and Operation

Description

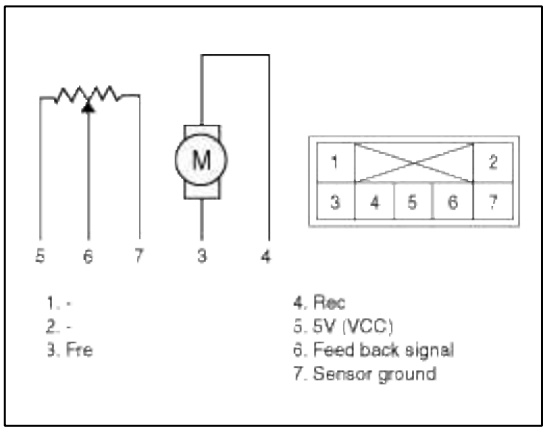
1. The intake actuator is located at the blower unit.
2. It regulates the intake door by signal from control unit.
3. Pressing the intake selection switch will shift between recirculation and fresh air modes.

Heating,Ventilation, Air Conditioning > Blower > Intake Actuator > Repair procedures

Inspection

1. Ignition "OFF”
2. Disconnect the intake actuator connector.
3. Verify that the actuator operates to the recirculation position when connecting 12V to the terminal 3 and grounding terminal 4.

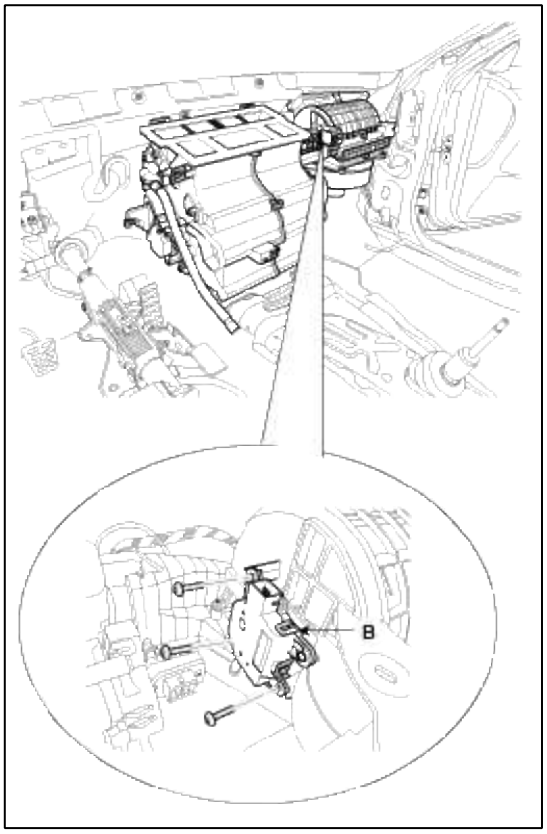
4. Verify that the intake actuator operates to the fresh position when connecting in the reverse.



5. If the intake actuator is not operated well, substitute with a known-good intake actuator and check for proper operation.
6. If the problem is corrected, replace the intake actuator.

Replacement

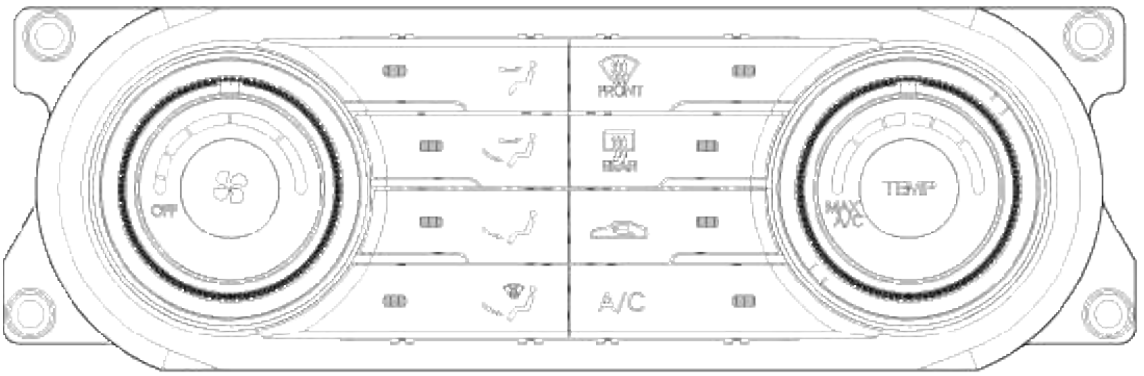
1. Disconnect the negative (-) battery terminal.
2. Remove the crash pad.
   (Refer to BD group-crash pad).
3. Disconnect the intake actuator connector.
4. Loosen the mounting screw and then remove the intake actuator (B) from the blower unit.

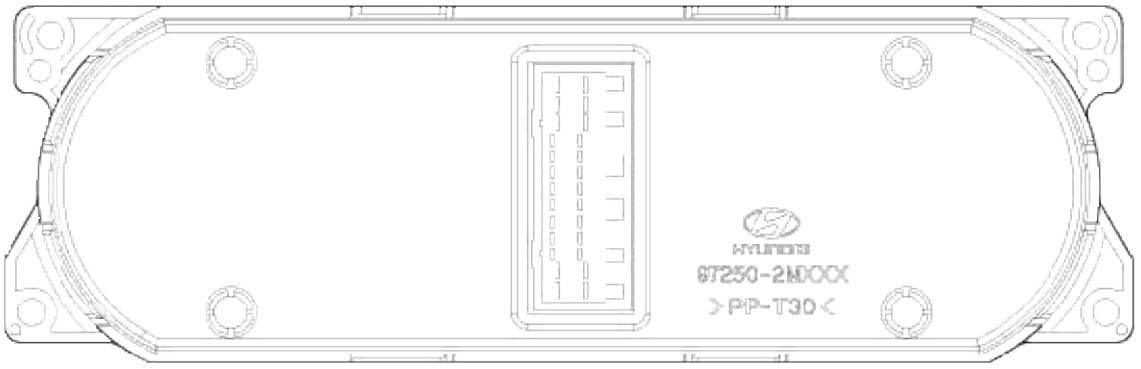


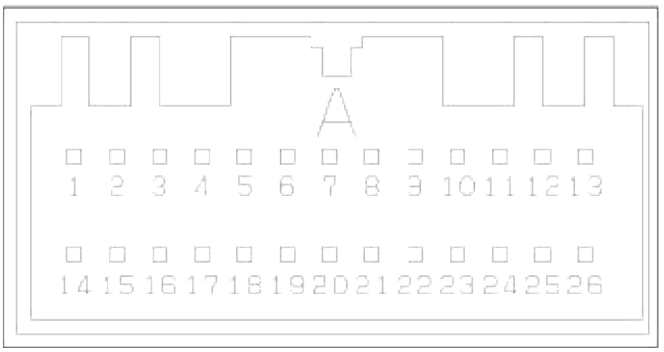
5. Installation is the reverse order of removal.

Heating,Ventilation, Air Conditioning > Controller > Heater & A/C Control Unit(Manual) > Components and Components Location

Component







Connector Pin Function

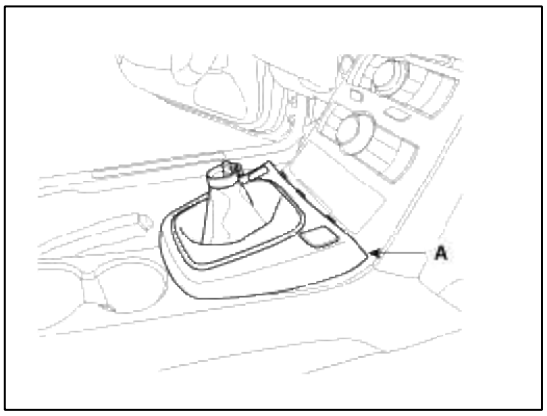
Connector	Pin no.	Function
Connector(A)	1	Battery
	2	Tail lamp (ILL+)
	3	IGN2
	4	Power mosfet (gate)
	5	Mode actuator(Vent)
	6	Mode actuator(Def)
	7	Temp actuator(Cool)
	8	Temp actuator(Warm)
	9	Intake actuator(Fre)
	10	Intake actuator(Rec)
	11	N,C
	12	Rheostat (ILL-)
	13	N,C
	14	Vref(5V)
	15	Blower motor(+)
	16	Power mosfet(Drain)
	17	Mode actuator F/B
	18	Temp actuator F/B
	19	Intake actuator F/B
	20	Evaporator sensor (+)
	21	A/C select(High)
	22	A/C Output(HigH)
	23	RR Def switch
	24	RR Def indicator
	25	GND
	26	Sensor GND

Heating,Ventilation, Air Conditioning > Controller > Heater & A/C Control Unit(Manual) > Repair procedures

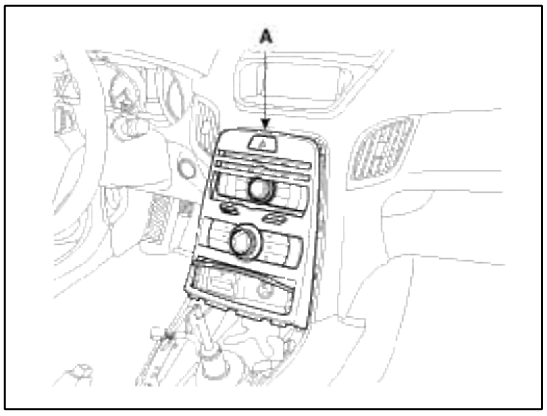
Replacement

1. Disconnect the negative (-) battery terminal.

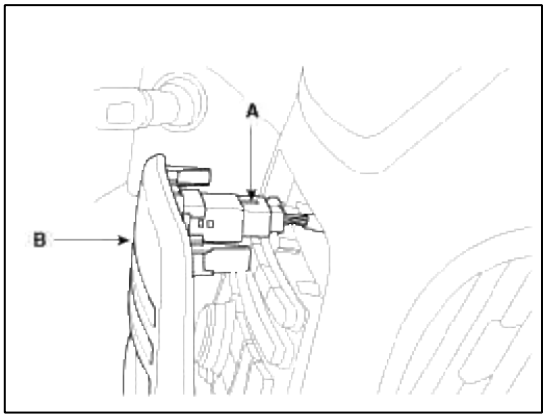
2. Remove the console upper cover (A).

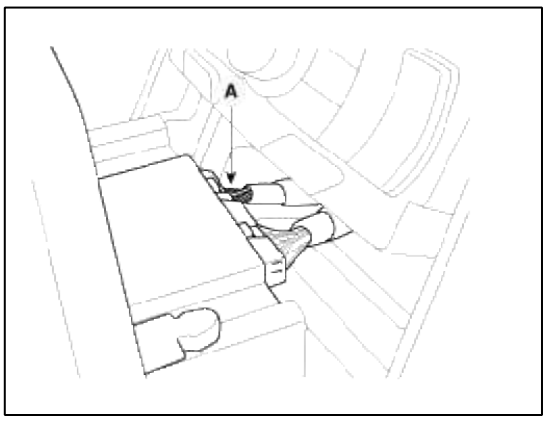


3. Remove the center facia pannel (A).

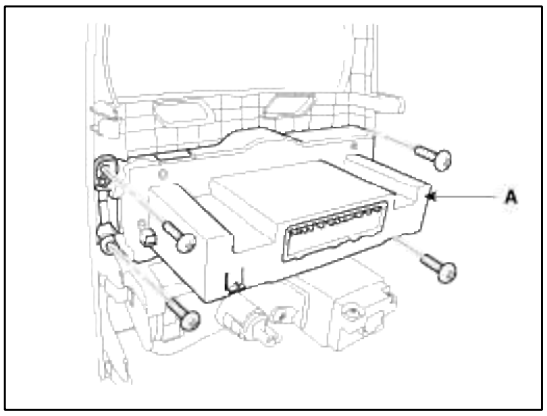


4. Disconnect the connector (A) and then remove the center facia panel (B).





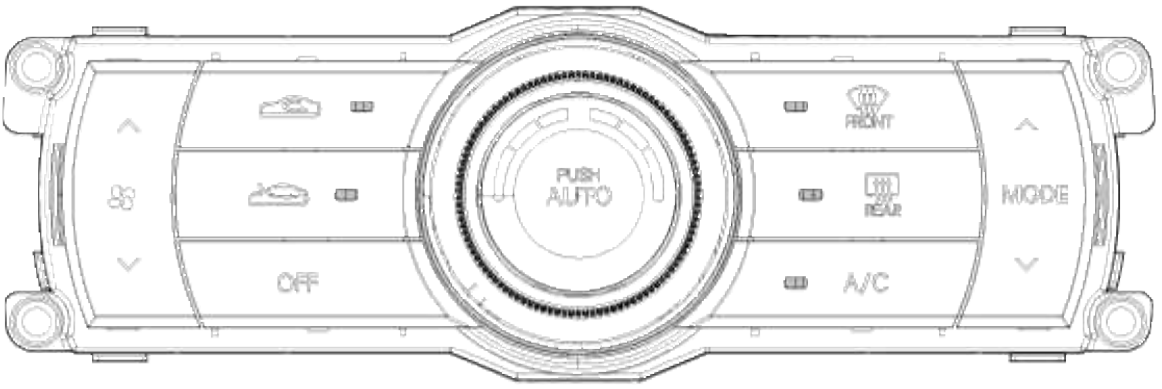
5. Remove the heater & A/C controller (A) from center facia panel.

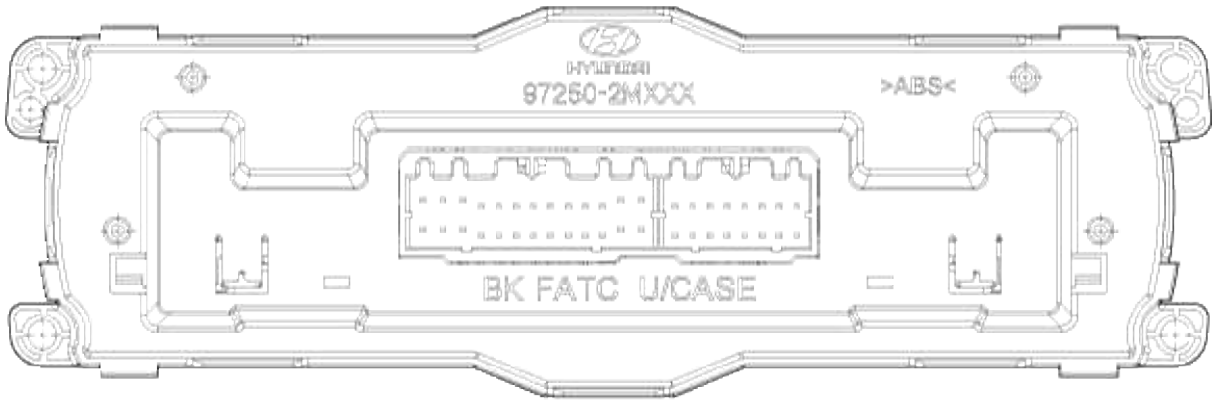


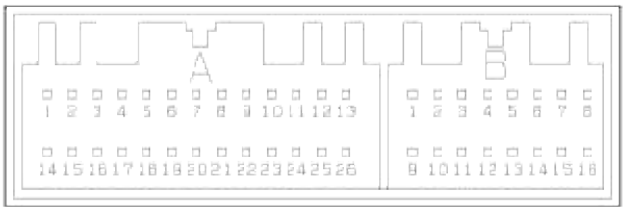
6. Installation is the reverse order of removal.

Heating,Ventilation, Air Conditioning > Controller > Heater & A/C Control Unit(Full Automatic) > Components and Components Location

Component







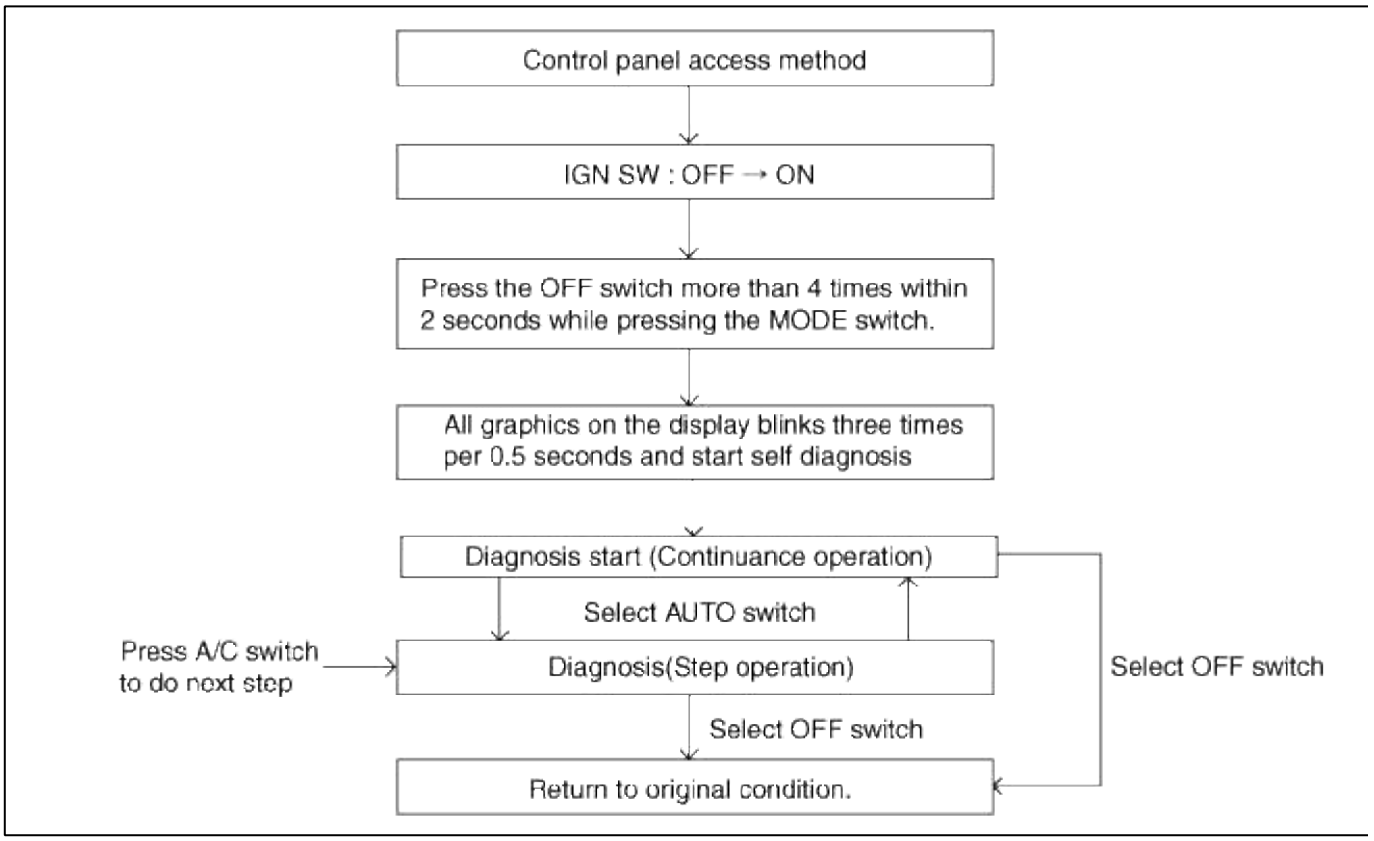
Connector Pin Function

Connector	Pin	Function	Connector	Pin	Function
Connector (A)	1	Battery	Connector (B)	1	N,C
	2	Tail lamp(ILL+)		2	N,C
	3	IGN2		3	Incar sensor
	4	Power mosfet(Gate)		4	Speed sensor
	5	Mode actuator(Vent)		5	Ambient sensor
	6	Mode actuator(Def)		6	HI-Scan
	7	Temp actuator(Cool)		7	N,C
	8	Temp actuator(Warm)		8	N,C
	9	Intake actuator(Fre)		9	Photo sensor(+)
	10	Intake actuator(Rec)		10	Photo sensor(-)
	11	N,C		11	Water sensor(-)
	12	Rheostat(ILL-)		12	N,C
	13	N,C		13	N,C
	14	Vref(5V)		14	Multi media can(L)
	15	Blower motor(+)		15	Multi media can(H)
	16	Power mosfet(Drain)		16	GND
	17	Mode actuator F/B			
	18	Temp actuator F/B			
	19	Intake actuator F/B			
	20	Evaporator sensor			
	21	A/C Select(High)			
	22	A/C Output(High)			
	23	RR Def switch			
	24	RR Def indicator			
	25	GND			
	26	Sensor GND			

Heating,Ventilation, Air Conditioning > Controller > Heater & A/C Control Unit(Full Automatic) > Repair procedures

SELF-DIAGNOSIS

1. Self-diagnosis process



NOTE

DTC data can be retrieved from the control panel directly or from the DLC using the Hi-Scan Pro.

2. How to read self-diagnostic code

After the display panel flickers three times every 0.5 second, the corresponding fault code flickers on the setup temperature display panel every 0.5 second and will show two figures. Codes are displayed in numerical format.

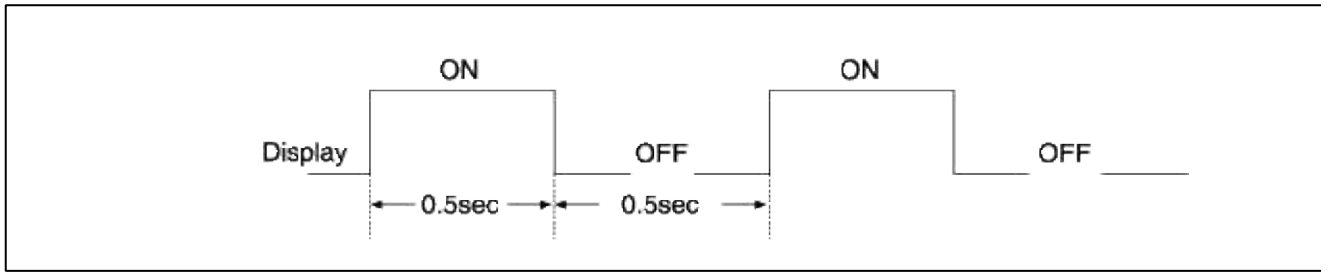
Fault code

NO.	Fail description
00	Normal
11	Incar sensor OPEN
12	Incar sensor SHORT
13	Ambient sensor OPEN
14	Ambient SHORT
15	Water temp sensor OPEN
16	Water temp sensor SHORT
17	Evaporator sensor OPEN
18	Evaporator sensor SHORT
19	Temp potentiometer OPEN/SHORT
20	Temp potentiometer FAULT
21	Mode potentiometer OPEN/SHORT
22	Mode potentiometer FAULT
25	Intake potentiometer OPEN/SHORT

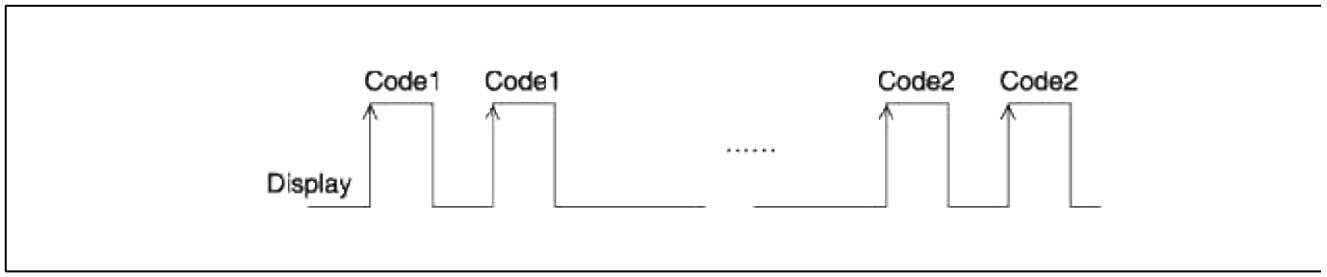
26	Intake potentiometer FAULT

3. Fault code display

(1) Continuance operation : DTC code is one



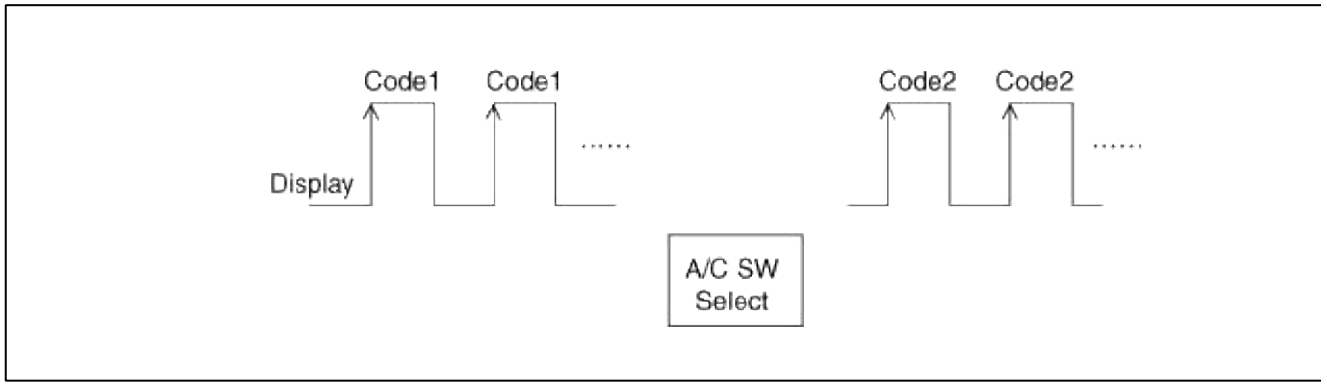
(2) Continuance operation : DTC code is more two



(3) Step operation

A. Nomal or one fault code is same a continuance

B. DTC code is more two



4. If fault codes are displayed during the check, Inspect malfunction causes by referring to fault codes.

5. Fail safe

(1) Incar sensor : Control with the value of 23°C(73°F)

(2) Ambient temperature sensor: Control with the value of 20°C(67°F)

(3) Evaporator temperature sensor: Control with the value of -2°C(28.4°F)

(4) Water temperature sensor : Control with the value of 85°C (185°F)

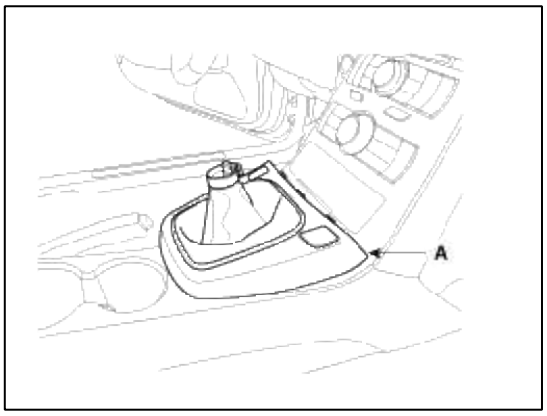
(5) Temperature control actuator (Air mix potentiometer):
If temperature setting 17°C-24.5°C, fix at maximum cooling position.
If temperature setting 25°C-32°C, fix at maximum heating position

(6) Mode control actuator (Direction potentiometer):
Fix vent position, while selecting vent mode.
Fix defrost position, while selecting all except vent mode.

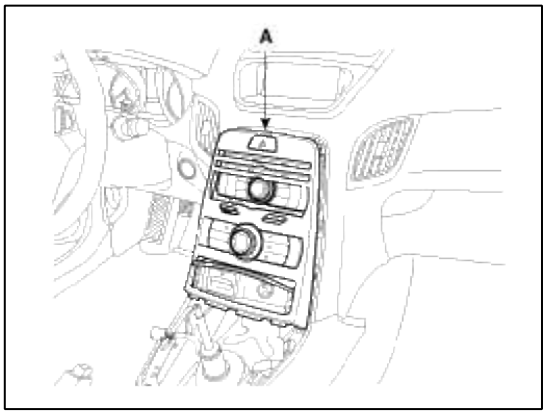
(7) Intake control actuator :
Fix fresh position, while selecting fresh mode.
Fix recirculation position, while selecting recirculation mode.

Replacement

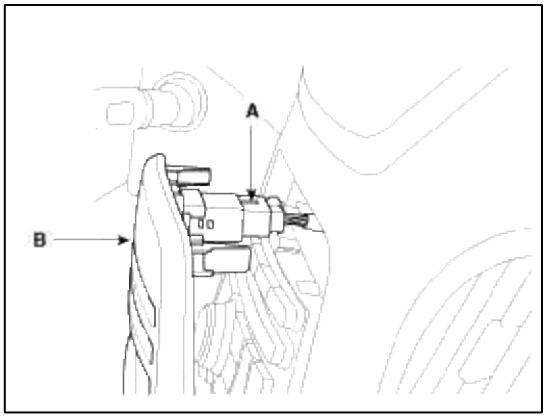
1. Disconnect the negative (-) battery terminal.
2. Remove the console upper cover (A).

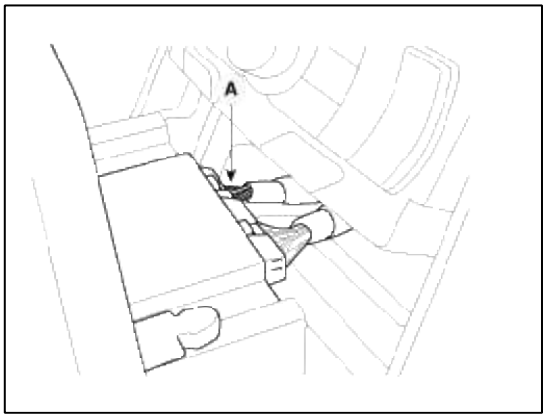


3. Remove the center facia pannel (A).

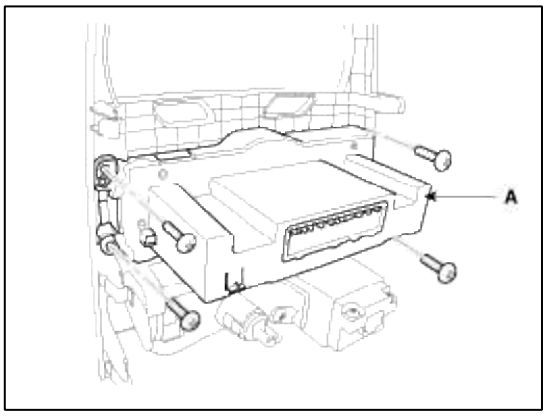


4. Disconnect the connector (A) and then remove the center facia panel (B).





5. Remove the heater & A/C controller (A) from center facia panel.



6. Installation is the reverse order of removal.

GENESIS COUPE(BK) > 2013 > G 2.0 T-MPI > Manual Transaxle System

Manual Transaxle System > General Information > Specifications

Specifications

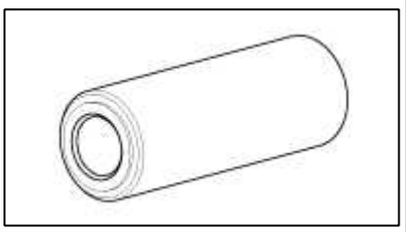
Transmission type		M6VR2
Engine type		Gasoline 2.0 TCI
Gear ratio	1st	3.848
	2nd	2.317
	3rd	1.623
	4th	1.233
	5th	1.000
	6th	0.794
	Reverse	3.985
Final gear ratio		3.538

Lubricants

Items	Recommnend lubricant	Quantity
Transmission gear oil	SAE 75W/85 API GL-4	2.2ℓ (2.3US qt, 1.94lmp qt)
Transmission housing	MS721-40	As requried

Manual Transaxle System > General Information > Special Service Tools

Special Service Tools

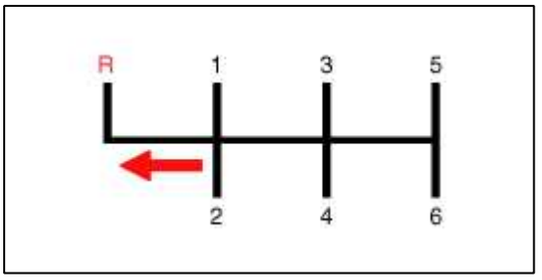
Tool (Number and Name)	Illustration	Use
09452-25200 Oil seal installer		Installation of extension housing oil seal
09432-25400 Oil seal installer		Installation of control shaft oil seal

Manual Transaxle System > Manual Transaxle System > Description and Operation

Main character

- Optimized design with compact and less weight through analyzing partial systems.

- Structure of 5th gear ratio(1:1) to improve power and fuel economy (forward 6th speed, backward 1st speed)
- Multi-cone synchronizer to improve shift feeling and minimize shifting force
- 1,2,3rd : Triple-cone synchronizer
- 4th : Double cone synchronizer
- 'HIGH FORCE TYPE' for shifting to 'R'
- Better shift feeling and sporty
- How to shift 'R' : swiftly pull the lever to the left and shift to 'R'



- Gear teeth optimization and grinding suface of teeth for noise reduction (2nd to 6th gear)
- Applying permanent transmission fluid with low viscosity

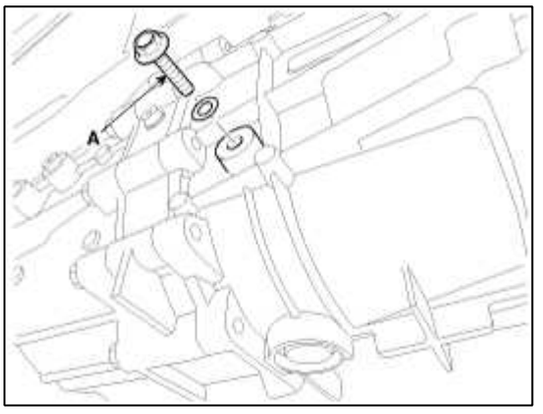
Manual Transaxle System > Manual Transaxle System > Repair procedures

Service Adjustment Procedure

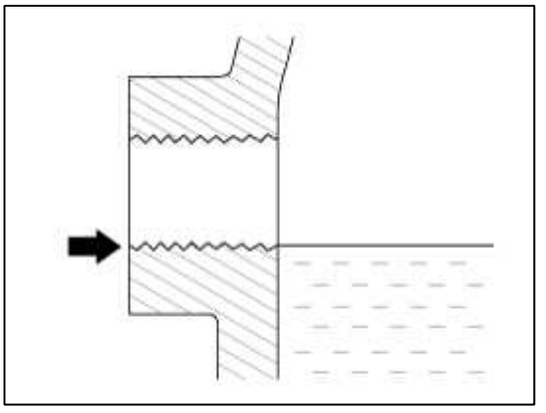
Transmission Gear Oil Level

Inspection

1. Remove oil filler plug (A).



2. Check level with finger.
   Oil level must be up to fill the hole, if not, add oil until it runs over.

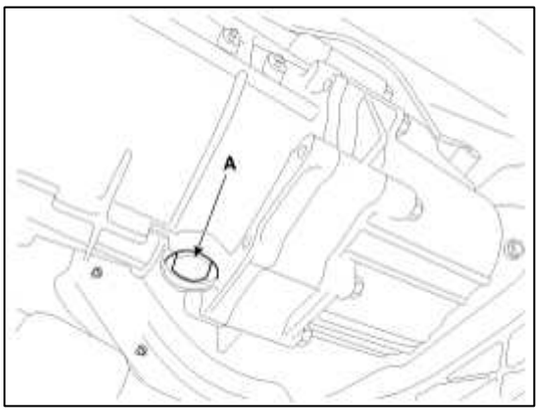


3. Install filler plug with a new gasket.

Tightening torque :
60 ~ 80 N.m (6.0 ~ 8.0 kgf.m, 43.4 ~ 57.8 lb-ft)

Replacement

1. With the vehicle parked on a level surface, remove the drain plug.
2. Drain the transmission oil after loosening the drain plug (A).



3. Install the drain plug with new gasket.

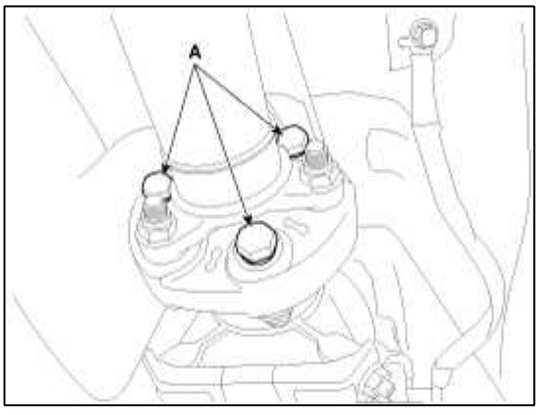
Tightening torque :
60 ~ 80 N.m (6.0 ~ 8.0 kgf.m, 43.4 ~ 57.8 lb-ft)

4. Add new oil through the fille plug hole and, fill it just below the plug opening.

Standard oil : SAE 75W/85, API GL-4
Oil capacity : 2.2ℓ (2.3US qt, 1.94lmp qt)

Extension Housing Oil Seal
Replacement

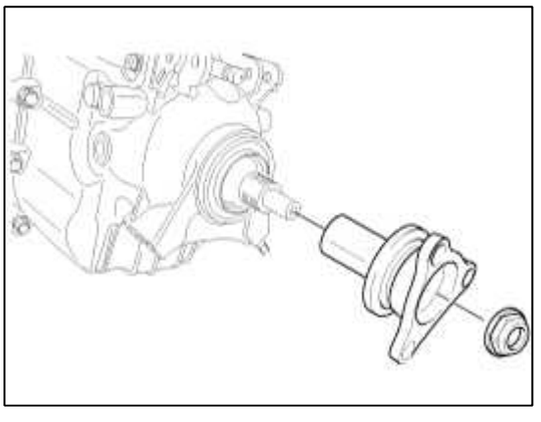
1. Remove the popellar shaft from the transmission by removing the bolts(A-3ea).



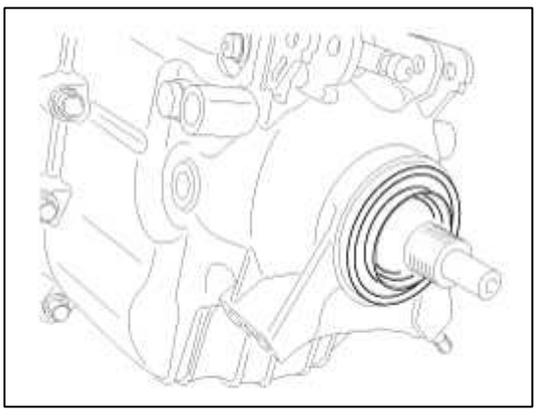
2. After releasing the caulking, remove the flange assembly by removing the locking nut(35mm) and O-ring.

CAUTION

Do not reuse locking nut and O-ring.



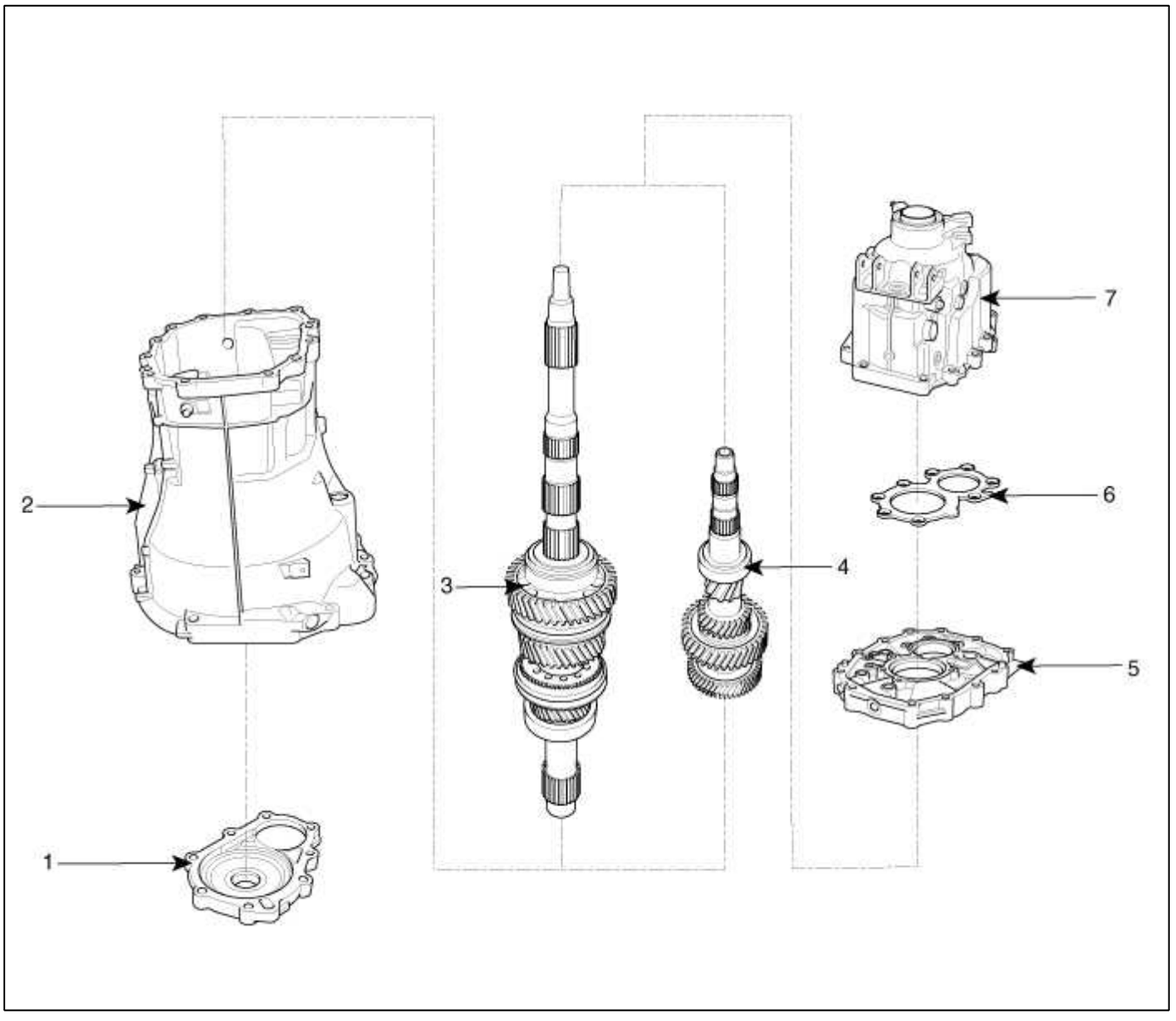
3. Remove the oil seal by using a screw driver.



4. Replace a new one and install the oil seal by using the special service tool(09452-25200).
5. Apply the lithium grease (0.2 ~ 0.5g) to lip of the oil seal.
6. Install the removed parts in reverse order of removal.

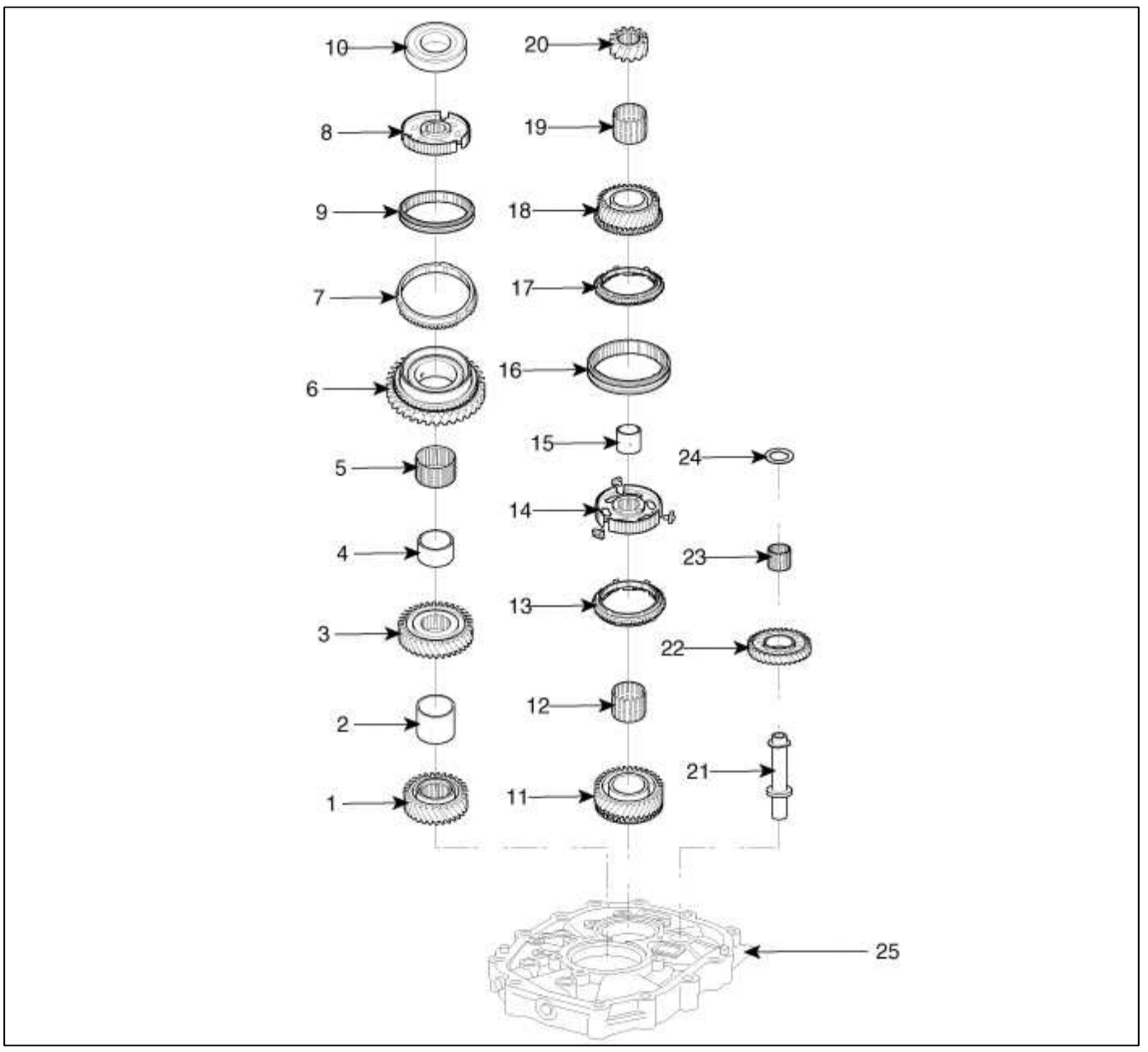
Manual Transaxle System > Manual Transaxle System > Manual Transaxle > Components and Components Location

Components (1)



1. Front bearing retainer assembly 2. Transmission case assembly 3. Main shaft assembly and main drive assembly 4. Counter shaft assembly	5. Intermediate plate 6. Rear bearing retainer 7. Extension housing assembly

Components (2)



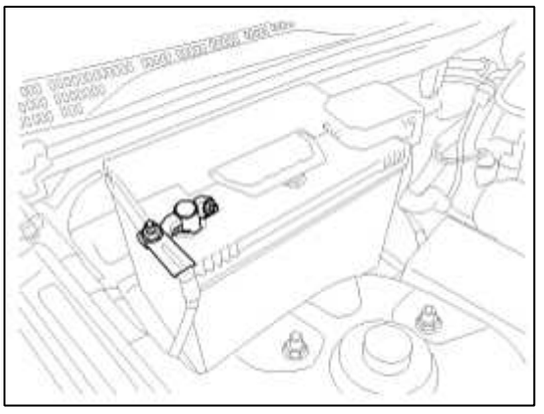
1. 4th gear 2. Spacer 3. 3rd gear 4. Reverse gear sleeve 5. Needle roller bearing 6. Reverse speed gear 7. Synchronizer ring 8. Reverse synchronizer hub 9. Reverse synchronizer sleeve	10. Ball bearing 11. 4th speed gear 12. Needle roller bearing 13. Synchronizer ring assembly 14. 3&4th synchronizer hub 15. 3rd gear sleeve 16. 3&4th synchronizer sleeve 17. Synchronizer ring assembly 18. 3rd speed gear	19. Needle roller bearing 20. Counter reverse gear 21. Reverse idler shaft 22. Reverse idler gear 23. Needle roller bearing 24. Reverse spacer 25. Intermediate plate

Manual Transaxle System > Manual Transaxle System > Manual Transaxle > Repair procedures

Removal

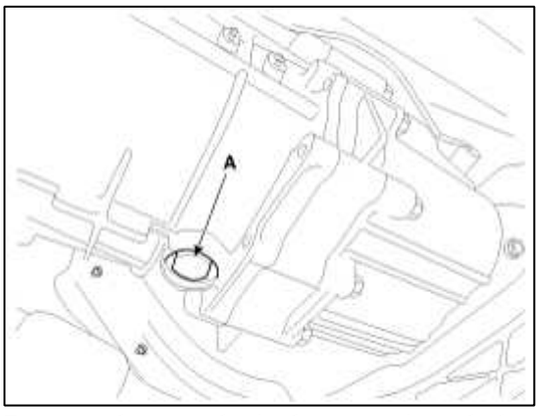
- Use fender covers to avoid damaging painted surfaces.
- To avoid damage, unplug the wiring connectors carefully while holding the connector portion.
- Mark all wiring and hoses to avoid misconnection.

1. Disconnect the (-) terminal from the battery in order to prevent current flow through wire.

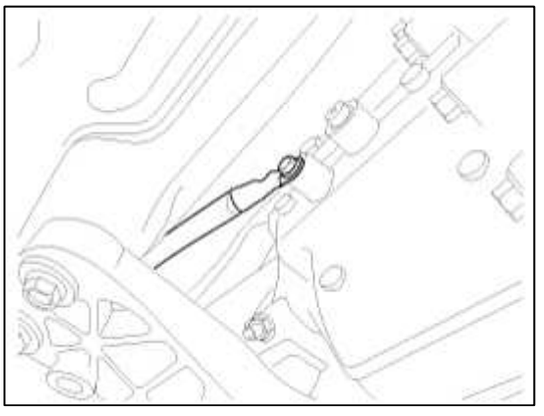


2. Drain the transmission fluid by removing the drain plug (A).

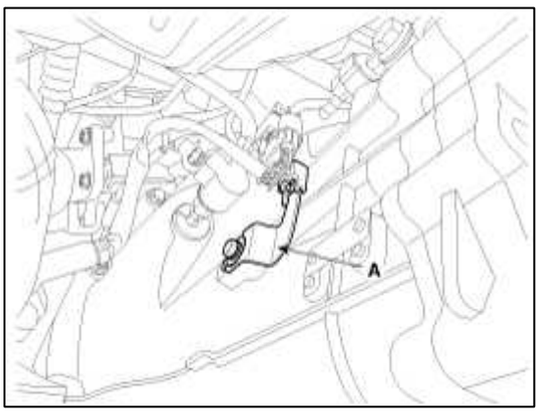
Tightening torque :
60 ~ 80 N.m (6.0 ~ 8.0 kgf.m, 43.4 ~ 57.8 lb-ft)

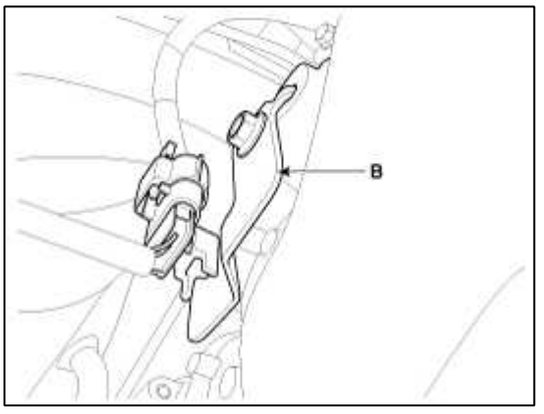


3. Remove the gound wire by removing a bolt.

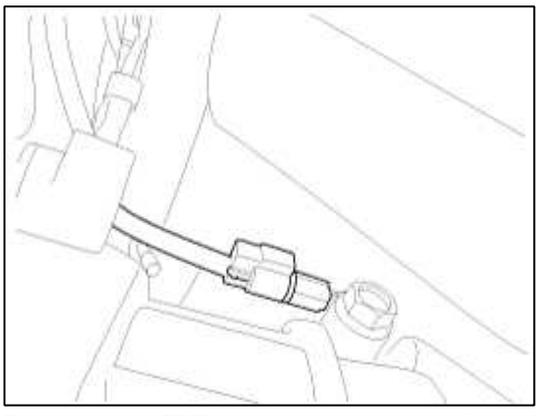


4. Disconnect the oxygen sensor connectors (A,B) from both sides of transmission.

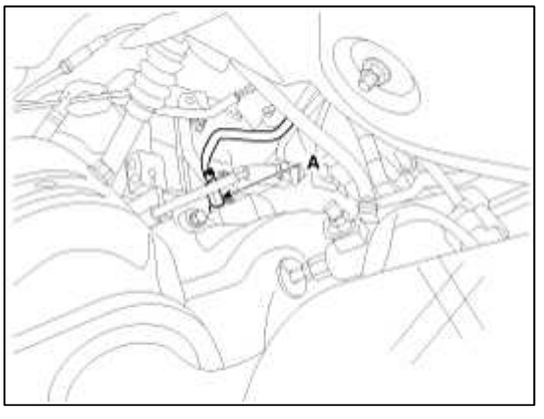




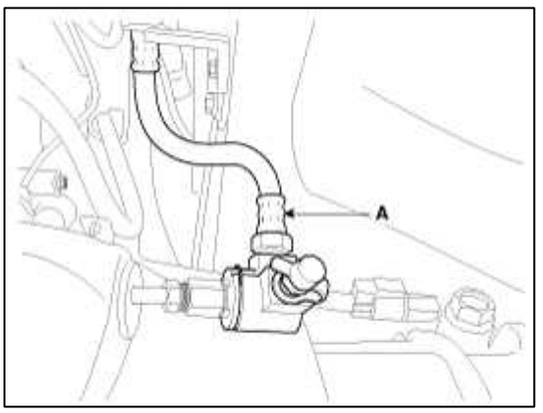
5. Disconnect the back up lamp switch connector.



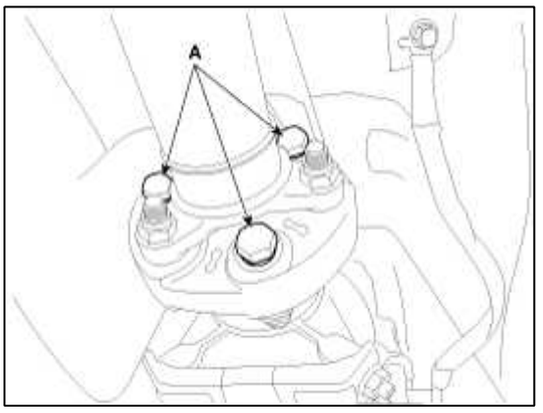
6. Remove the CKP sensor (A) by removing a bolt.



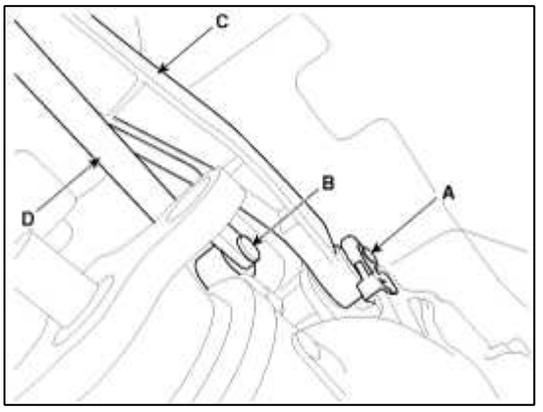
7. Remove the clutch hose from the C.S.C assembly.

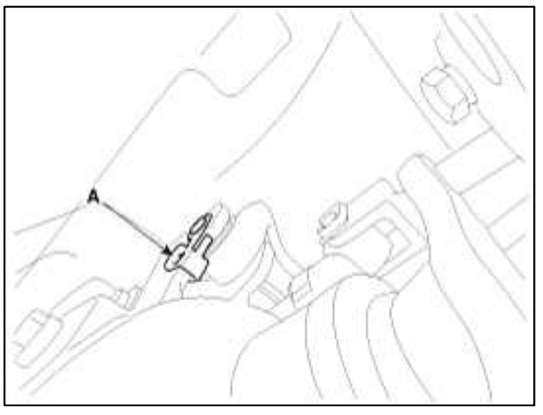


8. Remove the propellar shaft from the transmission by removing the bolts (A-3ea).

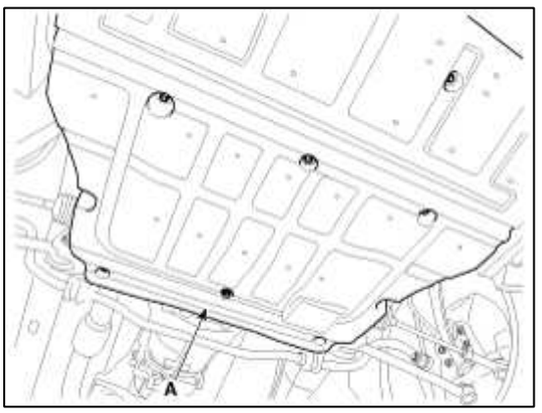


9. Remove the base bracket (C) and select rod (D) from the transmission by removing the clips (A-2ea) and snap pin (B).

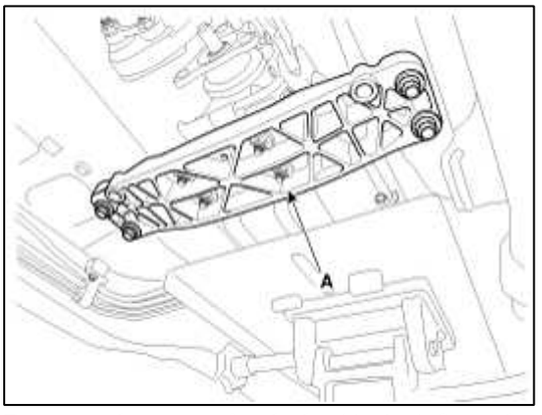




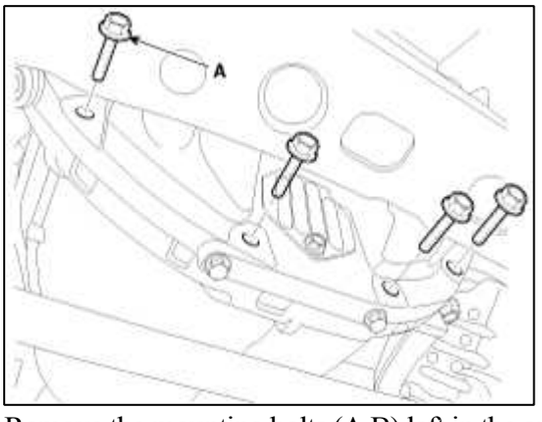
10. Remove the under shield cover (A).



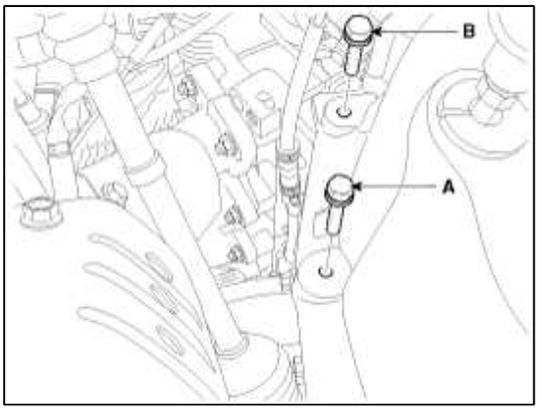
11. After supporting the transmission assembly with a jack, remove the crossmember (A) by removing the bolts(4ea).



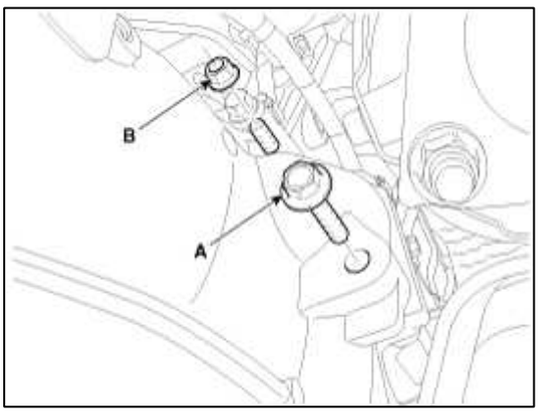
12. Remove the mounting bolts (A-4ea) from the engine side.



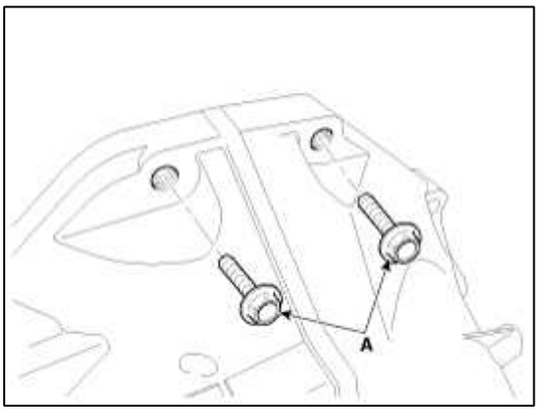
13. Remove the mounting bolts (A,B) left in the engine side.



14. Remove the starter motor mounting bolt (A) and nut (B).



15. Remove the mounting bolts (A-2ea) on the transmission.



16. Lowering the jack slowly, remove the transmission assembly.

> CAUTION
>
> Be careful not to damage to wire, tubes or suspension parts.

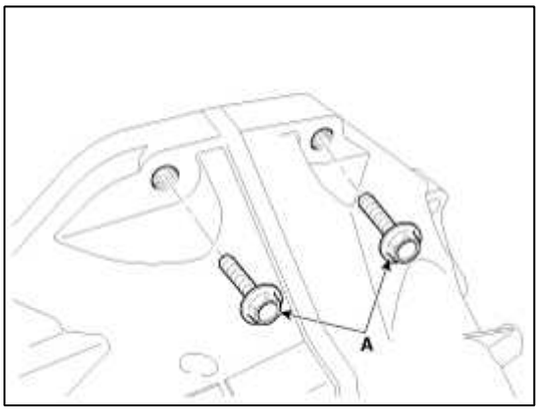
> NOTE
>
> In case remove the transmission mounting bracket assembly from the transmission assembly.

Tightening torque :
50 ~ 65 N.m (5.0 ~ 6.5 kgf.m, 36.2 ~ 47.0 lb-ft)

Installation

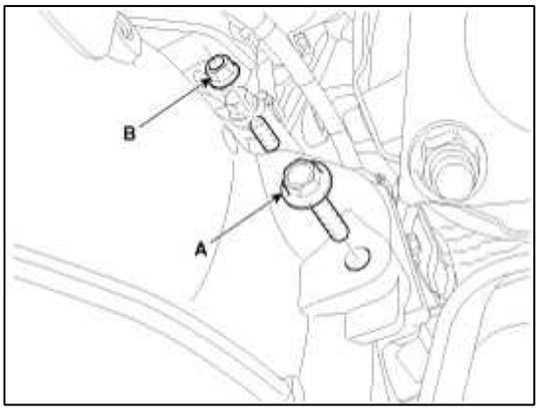
1. Temporarily install the transmission assembly to the engine assembly.
2. Install the mounting bolts (A-2ea) on the transmission.

Tightening torque :
65 ~ 85 N.m (6.5 ~ 8.5 kgf.m, 47.0 ~ 61.5 lb-ft)



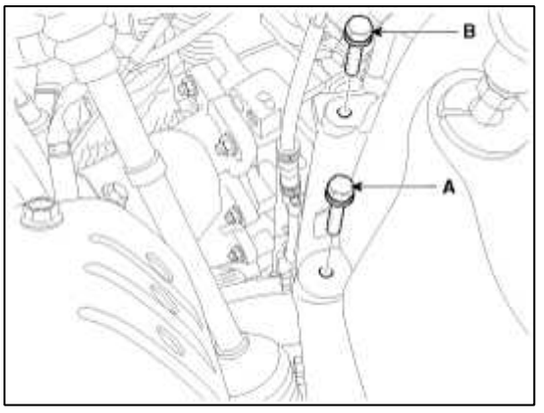
3. Install the starter motor mounting bolt (A) and nut (B).

Tightening torque :
43 ~ 55 N.m (4.3 ~ 5.5 kgf.m, 31.1 ~ 39.8 lb-ft)



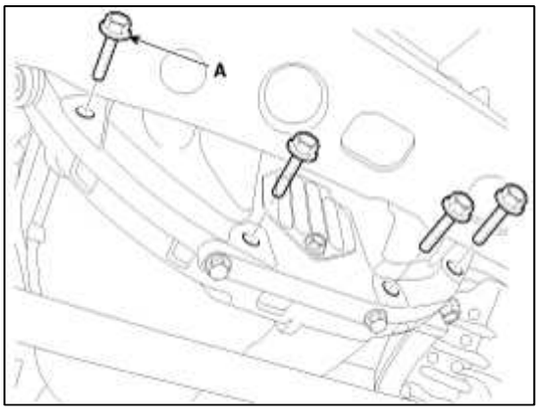
4. Install the mounting bolts (A,B) left in the engine side.

Tightening torque :
[A] 65 ~ 85 N.m (6.5 ~ 8.5 kgf.m, 47.0 ~ 61.5 lb-ft)
[B] 35 ~ 47 N.m (3.5 ~ 4.7 kgf.m, 25.3 ~ 34.0 lb-ft)



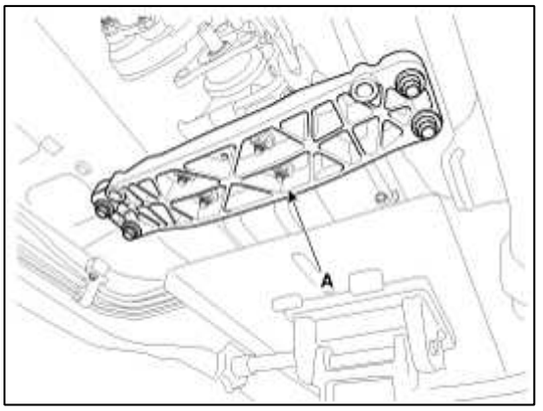
5. Install the mounting bolts (A-4ea) from the engine side.

Tightening torque :
43 ~ 49 N.m (4.3 ~ 4.9 kgf.m, 31.1 ~ 35.4 lb-ft)

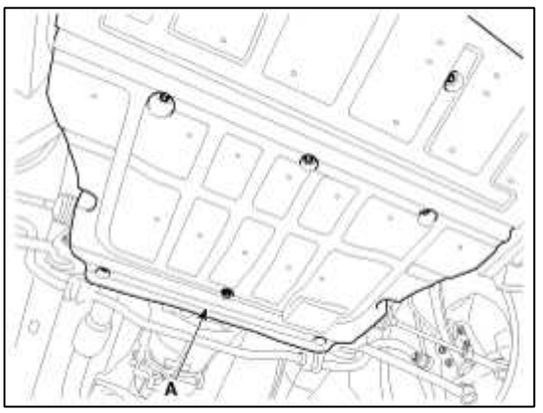


6. Install the crossmember (A) by installing the bolts(4ea) and put aside the supporting jack.

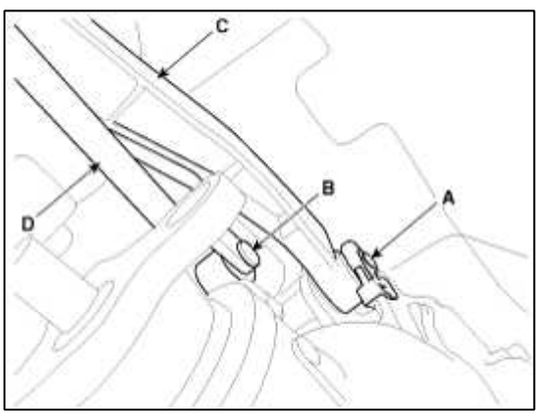
Tightening torque :
50 ~ 65 N.m (5.0 ~ 6.5 kgf.m, 36.2 ~ 47.0 lb-ft)

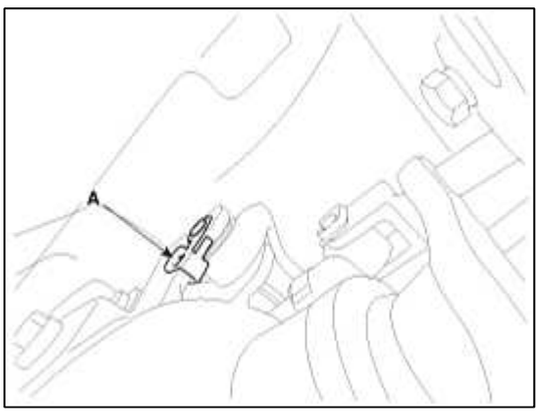


7. Install the under shield cover (A).



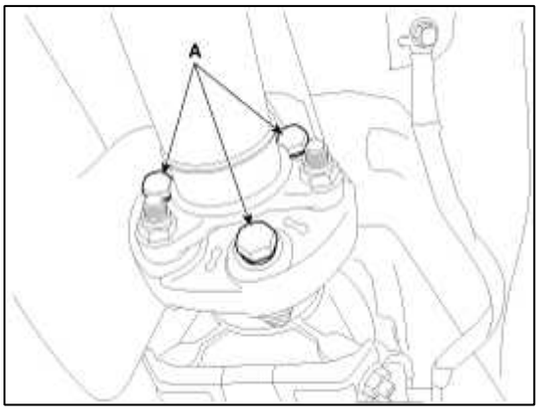
8. Install the base bracket (C) and select rod (D) to the transmission with clips (A-2ea) and snap pin (B).





9. Install the propellar shaft to the transmission by installing the bolts (A-3ea).

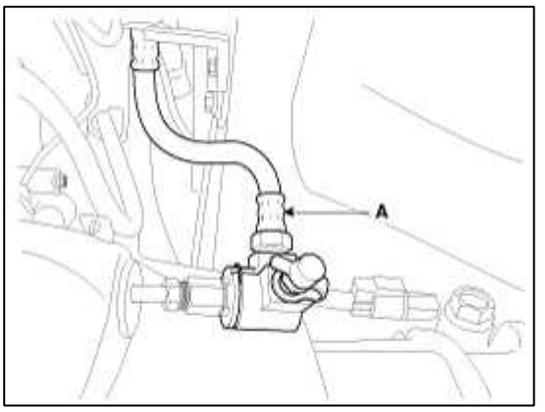
Tightening torque :
90 ~ 110 N.m (9 ~ 11 kgf.m, 65.1 ~ 79.5 lb-ft)



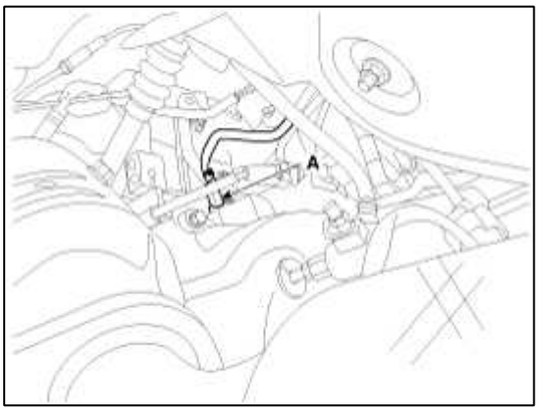
10. Install the clutch hose (A) to the C.S.C assembly.

NOTE

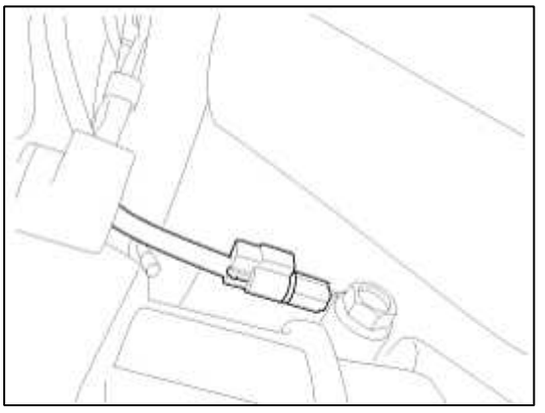
In case of loss of clutch fluid , refill the fluid. (refer to Bleeding in CH group)



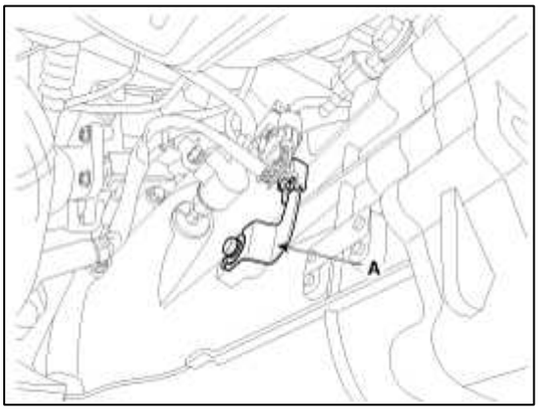
11. Install the CKP sensor (A) by installing a bolt.

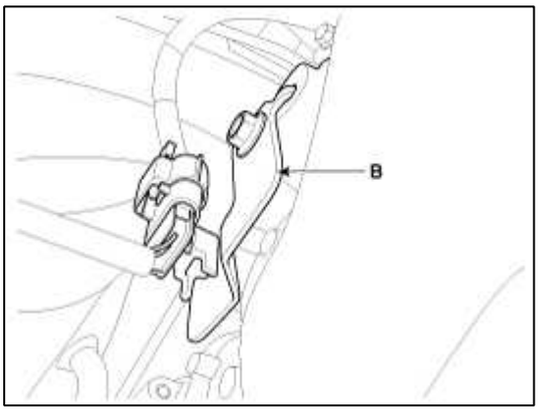


12. Connect the back up lamp switch connector.

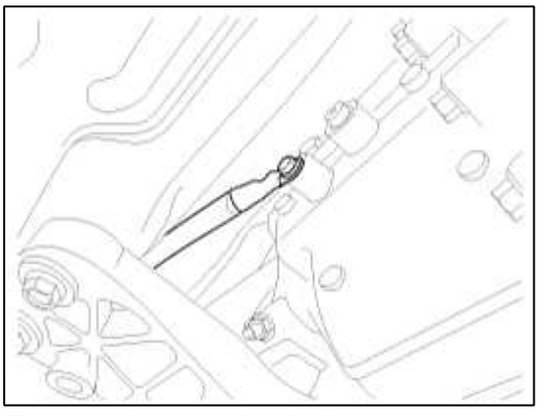


13. Connect the oxygen sensor connectors (A,B) from both sides of transmission.

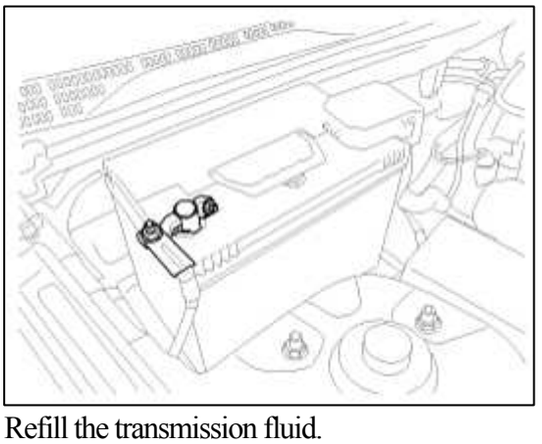




14. Install the ground wire by installing a bolt.



15. Connect (-) terminal to the battery.



16. Refill the transmission fluid.
    (Refer to Service Adjustment Procedure)

GENESIS COUPE(BK) > 2013 > G 2.0 T-MPI > Restraint

Restraint > General Information > General Information

General

The supplemental restraint system (SRS) is designed to supplement the seat belt to help reduce the risk or severity of injury to the driver and passenger by activating and deploying the driver, passenger, side airbag and belt pretensioner in certain frontal or side collisions.

The SRS (Airbag) consists of ; a driver side airbag module located in the center of the steering wheel, which contains the folded cushion and an inflator unit ; a passenger side airbag module located in the passenger side crash pad contains the folded cushion assembled with inflator unit ; side airbag modules located in the front seat contain the folded cushion and an inflator unit ; curtain airbag modules located inside of the headliner which contains folded cushions and inflator units. The impact sensing function of the SRSCM is carried out by electronic accelerometer that continuously measure the vehicle's acceleration and delivers a corresponding signal through amplifying and filtering circuitry to the microprocessor.

SRSCM (SRS Control Module)

SRSCM will detect front impact with front impact sensor, and side impact with side impact sensor, and determine airbag module deployment.

1. DC/DC converter: DC/DC converter in power supply unit includes up/down transformer converter, and provide ignition voltage for 2 front airbag ignition circuits and the internal operation voltage of the SRSCM. If the internal operation voltage is below critical value setting, it will perform resetting.
2. Back up power supply: SRSCM has separate back up power supply, that will supply deployment energy instantly in low voltage condition or upon power failure by front crash.
3. Self diagnosis: SRSCM will constantly monitor current SRS operation status and detect system failure while vehicle power supply is on, system failure may be checked with trouble codes using scan tool. (Hi- Scan)
4. Airbag warning lamp on: Upon detecting error, the module will transmit signal to SRSCM indicator lamp located at cluster. MIL lamp will indicate driver SRS error. Upon ignition key on, SRS lamp will turn on for about six seconds.
5. Trouble code registration: Upon error occurrence in system, SRSCM will store DTC corresponding to the error. DTC can be cleared only by Hi-Scan. However, if an internal fault code is logged or if a crash is recorded the fault clearing should not happen.
6. Self diagnostic connector: Data stored in SRSCM memory will be output to Hi-Scan or other external output devices through connector located below driver side crash pad.
7. Once airbag is deployed, SRSCM should not be used again but replaced.

Restraint > General Information > Specifications

Specification

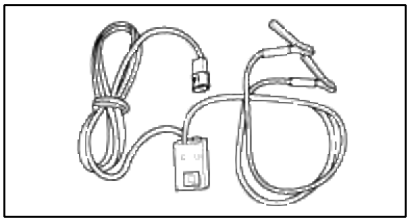
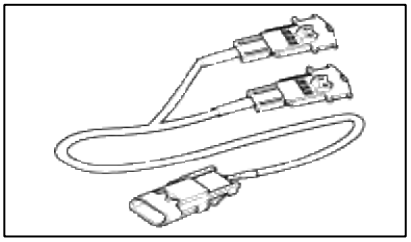
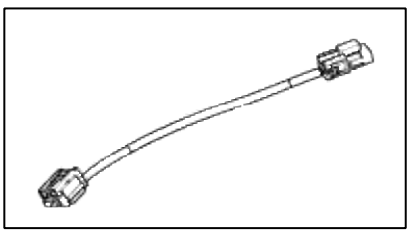
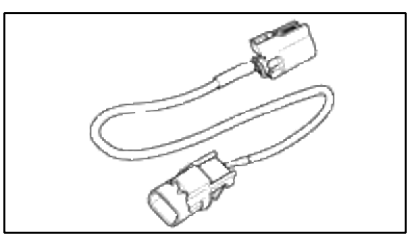
Item	Resistance (Ω)
Driver Airbag (DAB)	1.5 ~ 5.7
Passenger Airbag (PAB)	1.5 ~ 5.7
Side Airbag (SAB)	1.5 ~ 5.7
Curtain Airbag (CAB)	1.5 ~ 5.7
Seat Belt Retractor Pretensioner (BPT)	1.5 ~ 5.7

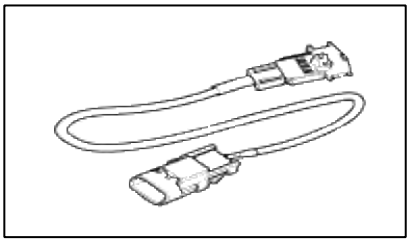
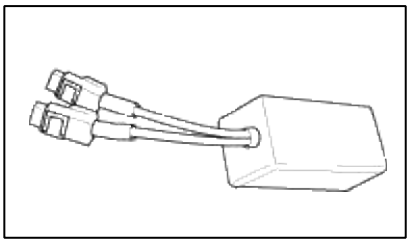
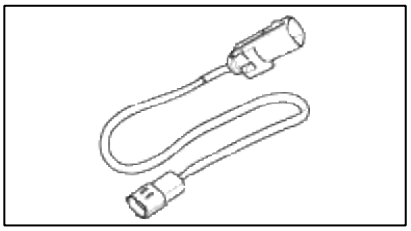
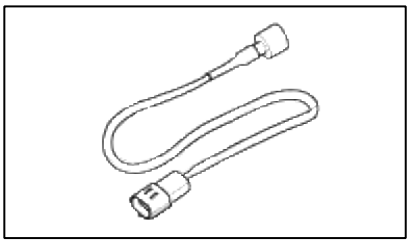
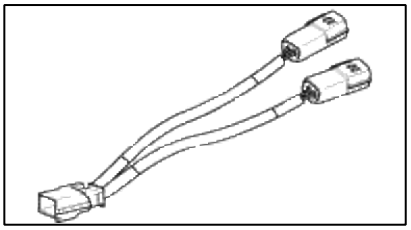
Tightening Torques

Item	N.m	kgf.m	lb-ft
Driver Airbag (DAB)	7.8 ~ 10.8	0.8 ~ 1.1	5.8 ~ 8.0
Passenger Airbag (PAB)	6.9 ~ 10.8 3.9 ~ 6.9	Bolt :0.7 ~ 1.1 Nut : 0.4 ~ 0.7	5.1 ~ 8.0 2.9 ~ 5.0
Curtain Airbag (CAB)	18.6 ~ 26.5	1.9 ~ 2.7	13.7 ~ 19.5
Side Airbag (SAB)	5.9 ~ 7.8	0.6 ~ 0.8	4.3 ~ 5.8
Seat Belt Anchor Bolt (BPT)	39.2 ~53.9	4.0 ~ 5.5	28.9 ~ 39.8
SRSCM	6.9 ~8.8	0.7 ~ 0.9	5.1 ~ 6.5
Front Impact Sensor (FIS) Mounting nut	6.9 ~ 8.8	0.7 ~ 0.9	5.1 ~ 6.5
Side Impact Sensor (SIS) Mounting Bolt	6.9 ~ 8.8	0.7 ~ 0.9	5.1 ~ 6.5

Restraint > General Information > Special Service Tools

Special Service Tools

Tool(Number and Name)	Illustration	Use
Deployment tool 0957A-34100A		Airbag deployment tool
Deployment adapter 0957A-38510		Use with deployment tool. (DAB)
Deployment adapter 0957A-2E110		Use with deployment tool. (PAB)
Deployment adapter 0957A-3F100		Use with deployment tool. (SAB)

Deployment adapter 0957A-38500		Use with deployment tool. (CAB, BPT)
Dummy 0957A-38200		Simulator to check the resistanceof each wiring harness
Dummy adapter 0957A-3F000		Use with dummy (SAB)
Dummy adapter 0957A-2G000		Use with dummy (DAB, CAB, BPT)
Dummy adapter 0957A-2E100		Use with dummy (PAB)

DAB : Driver Airbag
PAB : Passenger Airbag
SAB : Side Airbag
CAB : Curtain Airbag
BPT : Seat Belt Retractor Pretensioner

Restraint > General Information > General Safety Information and Caution

Precautions

General Precautions

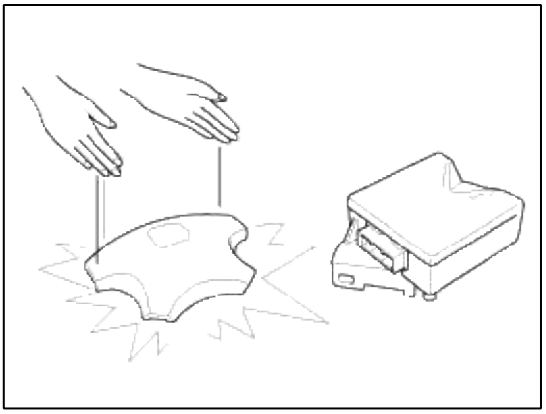
Please read the following precautions carefully before performing the airbag system service.
Observe the instructions described in this manual, or the airbags could accidentally deploy and cause damage or injuries.

- Except when performing electrical inspections, always turn the ignition switch OFF and disconnect the negative cable from the battery, and wait at least three minutes before beginning work.

NOTE

The contents in the memory are not erased even if the ignition switch is turned OFF or the battery cables are disconnected from the battery.

- Use the replacement parts which are manufactured to the same standards as the original parts and quality. Do not install used SRS parts from another vehicle. Use only new parts when making SRS repairs.
- Carefully inspect any SRS part before you install it. Do not install any part that shows signs of being dropped or improperly handled, such as dents, cracks or deformation.



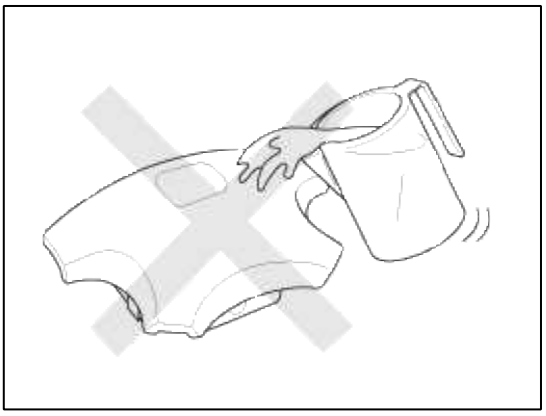
- Before removing any of the SRS parts (including the disconnection of the connectors), always disconnect the SRS connector.

Airbag Handling and Storage

Do not disassemble the airbags; it has no serviceable parts. Once an airbag has been deployed, it cannot be repaired or reused.

For temporary storage of the air bag during service, please observe the following precautions.

- Store the removed airbag with the pad surface up.
- Keep free from any oil, grease, detergent, or water to prevent damage to the airbag assembly.



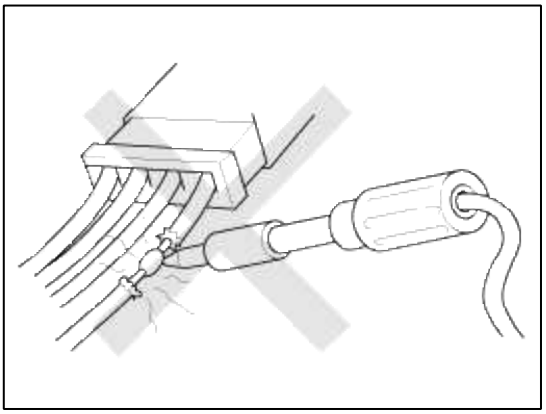
- Store the removed airbag on secure, flat surface away from any high heat source (exceeding 85 C/185 F).
- Never perform electrical inspections to the airbags, such as measuring resistance.
- Do not position yourself in front of the airbag assembly during removal, inspection, or replacement.
- Refer to the scrapping procedures for disposal of the damaged airbag.
- Be careful not to bump or impact the SRS unit or the side impact sensors or front impact sensors whenever the ignition switch is ON, wait at least three minutes after the ignition switch is turned OFF before begin work.
- During installation or replacement, be careful not to bump (by impact wrench, hammer, etc.) the area around the SRS unit and the side impact sensor and the front impact sensors. The airbags could accidentally deploy and cause damage or injury.
- Replace the front airbag module, SRSCM, FIS when deploying the front airbag. Replace the airbag wiring when the airbag wiring get damaged. Replace the side airbag module, the curtain airbag module, SRSCM, SIS when deploying the side airbag. Replace the airbag when the airbag wiring get damaged.

- After a collision in which the airbags or the side air bags did not deploy, inspect for any damage or any deformation on the SRS unit and the side impact sensors. If there is any damage, replace the SRS unit, the front impact sensor and/or the side impact sensors.
- Do not disassemble the SRS unit, the front impact sensor or the side impact sensors.
- Turn the ignition switch OFF, disconnect the battery negative cable and wait at least three minutes before beginning installation or replacement of the SRS unit.
- Be sure the SRS unit, the front impact sensor and side impact sensors are installed securely with the mounting bolts.
- Do not spill water or oil on the SRS unit, or the front impact sensor or the side impact sensors and keep them away from dust.
- Store the SRS unit, the front impact sensor and the side impact sensors in a cool (15 ~ 25 C/ 59 ~ 77 F) and dry (30 ~ 80% relative humidity, no moisture) area.

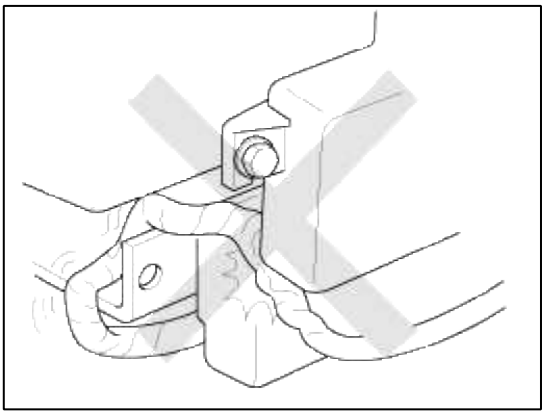
Wiring Precautions

SRS wiring can be identified by special yellow outer covering. Observe the instructions described in this section.

- Never attempt to modify, splice, or repair SRS wiring. If there is an open or damage in SRS wiring, replace the harness.



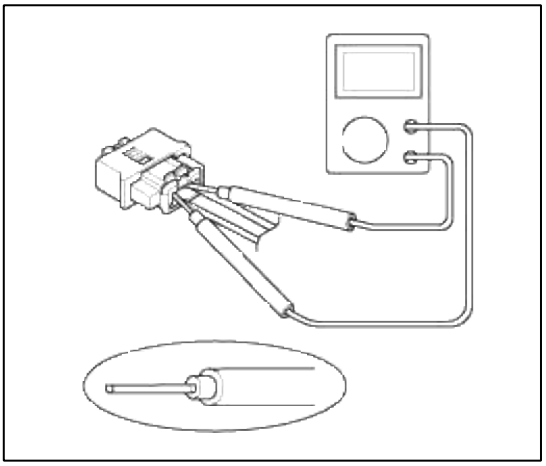
- Be sure to install the harness wires so that they are not pinched, or interfere with other parts.



- Make sure all SRS ground locations are clean, and grounds are securely fastened for optimum metal-to-metal contact. Poor grounding can cause intermittent problems that are difficult to diagnose.

Precautions for Electrical Inspections

- When using electrical test equipment, insert the probe of the tester into the wire side of the connector.
  Do not insert the probe of the tester into the terminal side of the connector, and do not tamper with the connector.



- Use a u-shaped probe. Do not insert the probe forcibly.
- Use specified service connectors for troubleshooting.
  Using improper tools could cause an error in inspection due to poor metal contact.

Spring-laded Lock Connector

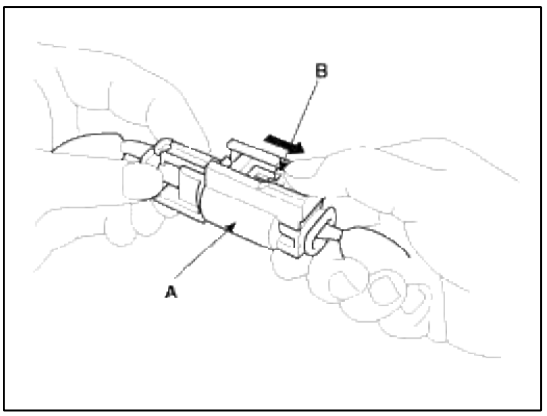
Some SRS system connectors have a spring-loaded lock.

Airbag Connector

Disconnecting

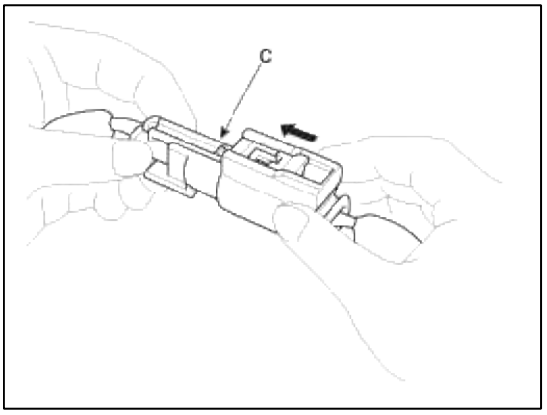
To release the lock, pull the spring-loaded sleeve (A) and he slider (B), while holding the opposite half of the connector.

Pull the connector halves apart. Be sure to pull on the sleeve and not on the connector half.



Connecting

Hold both connector halves and press firmly until the projection(C) of the sleeve-side connector clicks to lock.



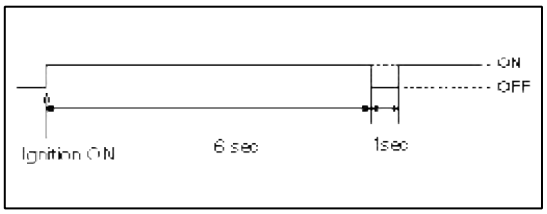
Restraint > General Information > Description and Operation

Warning Lamp Activation

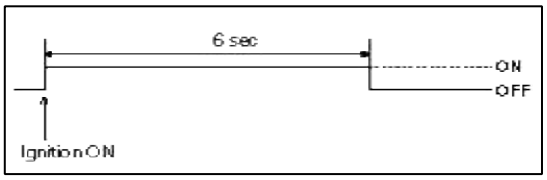
Warning lamp behavior after ignition ON

As soon as the operating voltage is applied to the SRSCM ignition input, the SRSCM activates the warning lamp for a bulb check.
The lamp shall turn on for 6 seconds during the initialization phase and be turned off afterward.
However, in order to indicate the driver, the warning lamp shall turn on for 6 seconds and off for one second then on continuously after the operating voltage is applied if any active fault exists.
If the variant coding is not performed, the airbag warning lamp is turned on for 4 seconds and the is blinking after IG ON.
If the variant coding is normally performed, the airbag warning lamp normally operates.

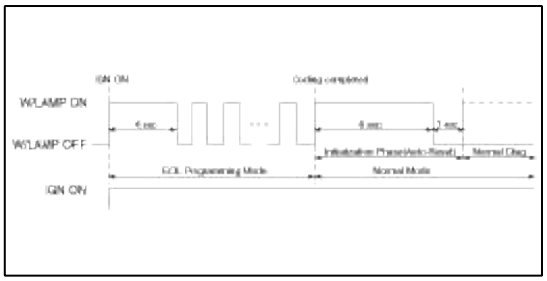
1. Active fault or historical fault counter is greater or equal to 10



2. Normal or historical fault counter is less than 10.



3. SRSCM Variant Coding not performed.



SRSCM Independent warning lamp activation

There are certain fault conditions in which the SRSCM cannot function and thus cannot control the operation of the standard warning lamp. In these cases, the standard warning lamp is directly activated by appropriate circuitry that operates independently of the SRSCM. These cases are:

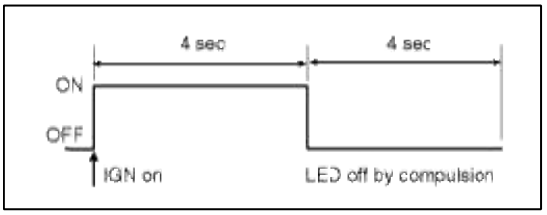
1. Loss of battery supply to the SRSCM : warning lamp turned on continuously.
2. Loss of internal operating voltage : warning lamp turned on continuously.
3. Loss of Microprocessor operation : warning lamp turned on continuously.
4. SRSCM not connected : warning lamp turned on continuously through the shorting bar.

Telltale Lamp Activation

The Telltale Lamp indicates the Passenger Airbag(PAB) enabled and disabled status based on occupant status of passenger seat. If the passenger seat is empty or occupied with child (or child seat), the Passenger Airbag is disabled and the Telltale Lamp is turned ON to inform the driver that the PAB is disabled. As soon as operating voltage is applied to the SRSCM ignition input, the SRSCM activates telltale lamp prove out. OCS will send an defect status to the SRSCM as a default setting for passenger airbag deployment during the prove out period. Occupant status information and telltale status are as below table.

Occupant Status	Telltale Lamp	PAB
Empty	ON	Disabled
Child (Small Occupant)	ON	Disabled
Adult (Large Occupant)	OFF	Enabled
Defect	OFF	Enabled

After ignition on, telltale lamp will turn on for 4 seconds and turn off for 4 seconds during the initialization phase and be turned off afterward until receipt of first valid suppression message from OCS system.
It is possible to turn off the telltale lamp when the larger child than 6 years old sits on the passenger side seat.



Restraint > General Information > Repair procedures

Component Replacement after Deployment

NOTE

Before doing any SRS repairs, use the Hi-Scan Pro to check for DTCs. Refer to the Diagnostic Trouble Code list for repairing of the related DTCs.

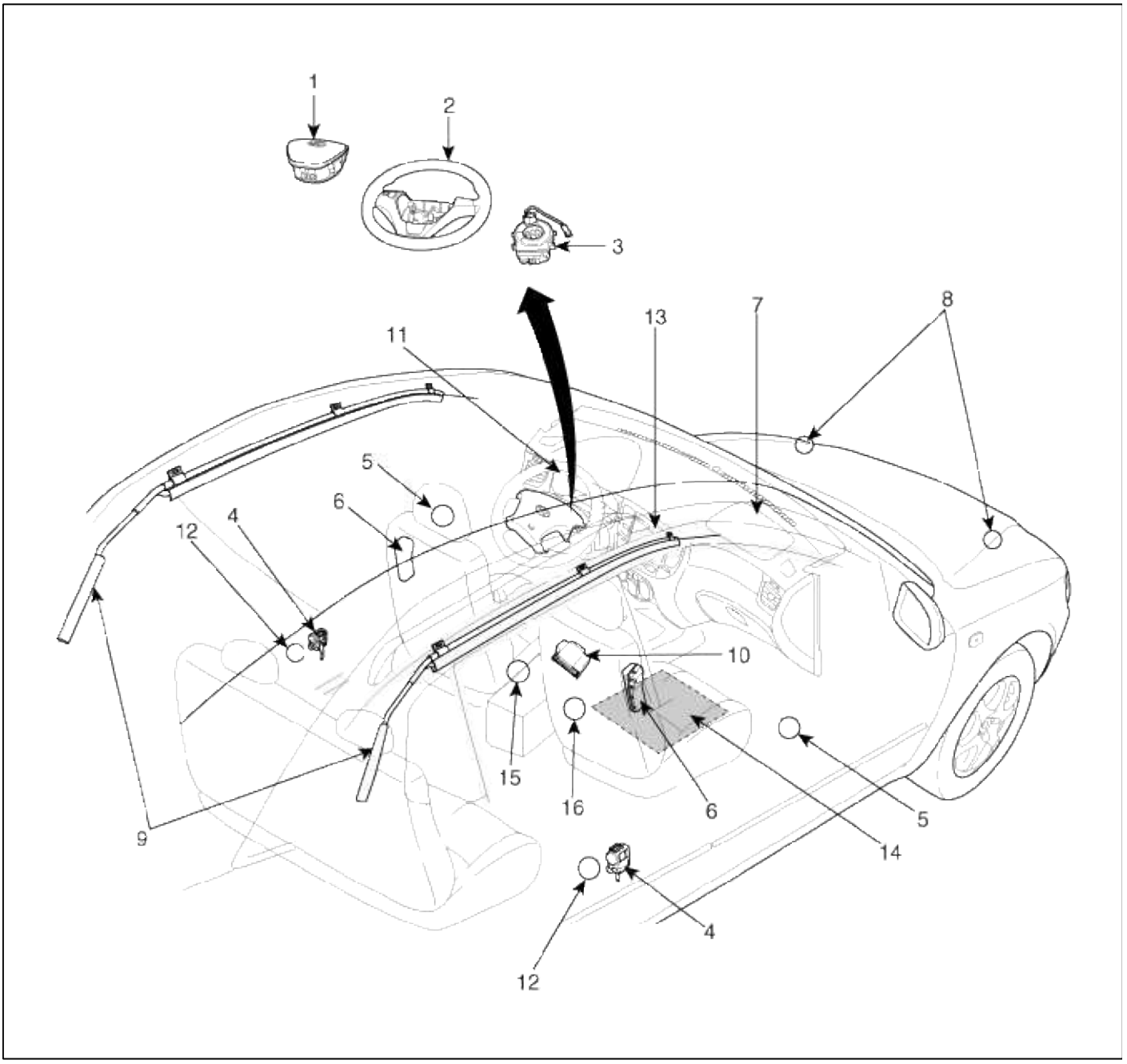
When the front airbag(s) deployed after a collision, replace the following items.
- SRSCM
- Deployed airbag(s)
- Seat belt pretensioner(s)
- Front impact sensors
- SRS wiring harnesses
- Inspect the clock spring for heat damage.
  If any damage found, replace the clock spring.
  If any damage found, or problem to occupant detection, replace the Passenger seat with PODS system.

When the side/curtain airbag(s) deployed after a collision, replace the following items.
- SRSCM
- Deployed airbag(s)
- Side impact sensor(s) for the deployed side(s)
- SRS wiring harnesses

After the vehicle is completely repaired, confirm the SRS airbag system is OK.
- Turn the ignition switch ON, the SRS indicator should come on for about 6 seconds and then go off.

Restraint > General Information > Components and Components Location

Components

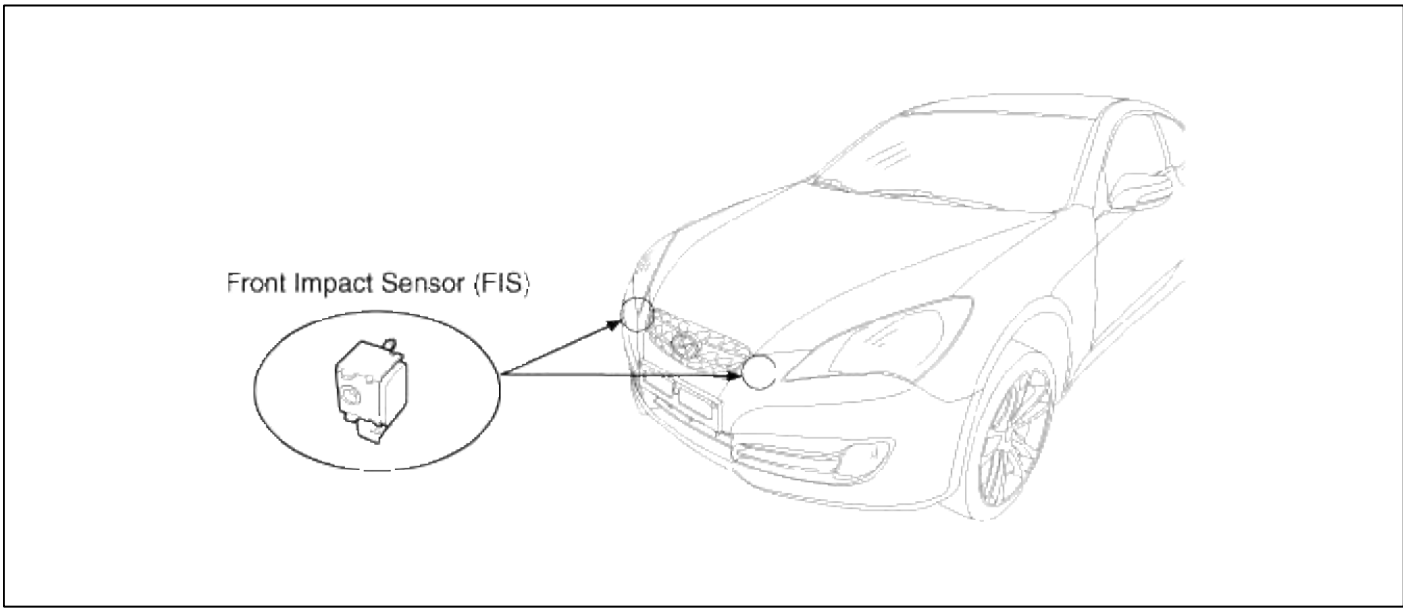


1. Driver Airbag (DAB)	9. Curtain Airbag (CAB)
2. Steering Wheel	10. Supplemental Restraint System Control Module(SRSCM)
3. Clock Spring	11. Airbag Warning Lamp
4. Seat Belt Pretensioner (BPT)	12. Side Impact Sensor (SIS)
5. Side Pressure Sensor (P-SIS)	13. Telltale Lamp
6. Side Airbag (SAB)	14. Passenger Occupant Detecting System(PODS)
7. Passenger Airbag (PAB)	15. Seat Belt Buckle Switch
8. Front Impact Sensor (FIS)	16. Seat Belt Buckle switch & Belt tension sensor

Components Location

Supplemental Restraint System Control Module (SRSCM)

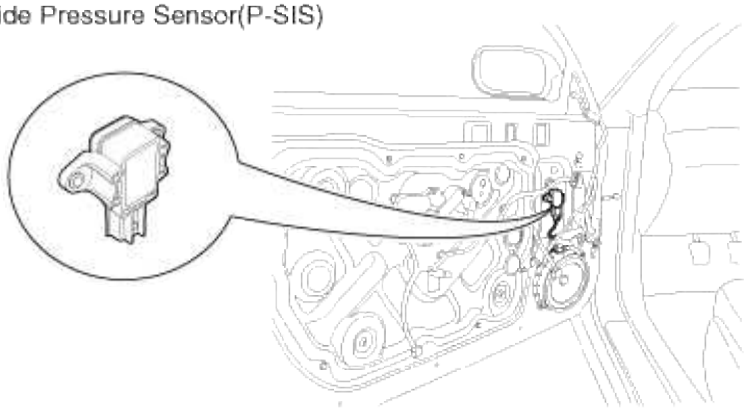
Front Impact Sensor (FIS)



Side Impact Sensor (SIS)

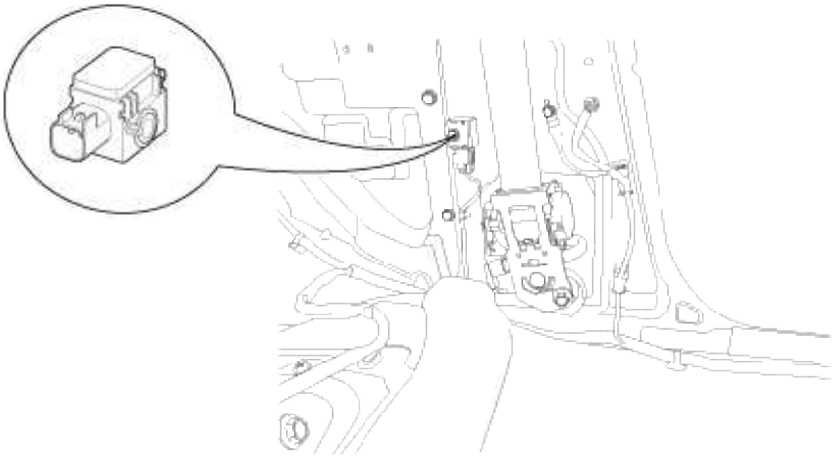
[Front]

Side Pressure Sensor(P-SIS)

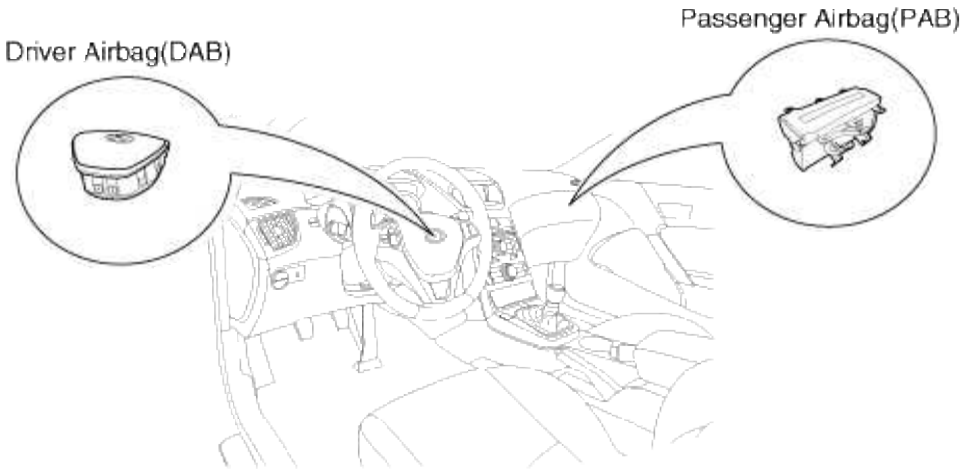


[Rear]

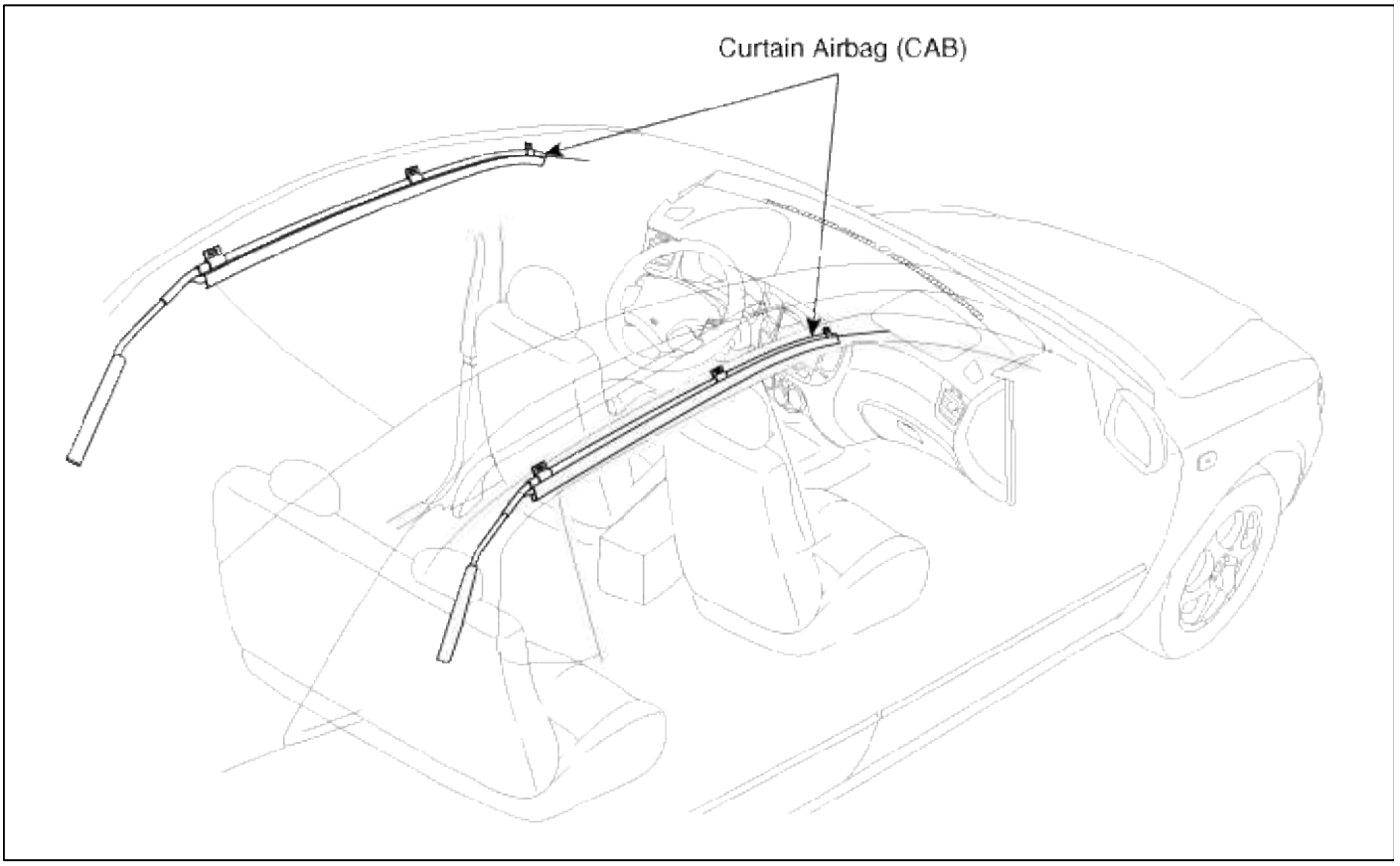
Side Impact Sensor (SIS)



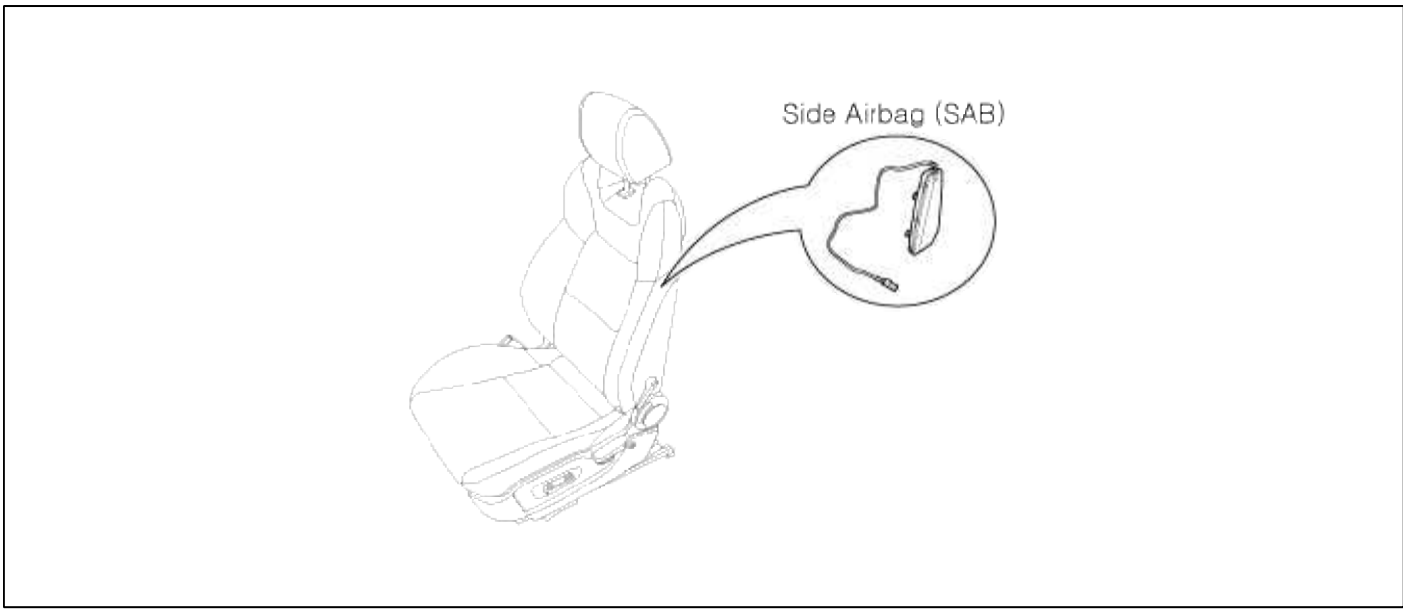
Driver Airbag (DAB) / Passenger Airbag (PAB)



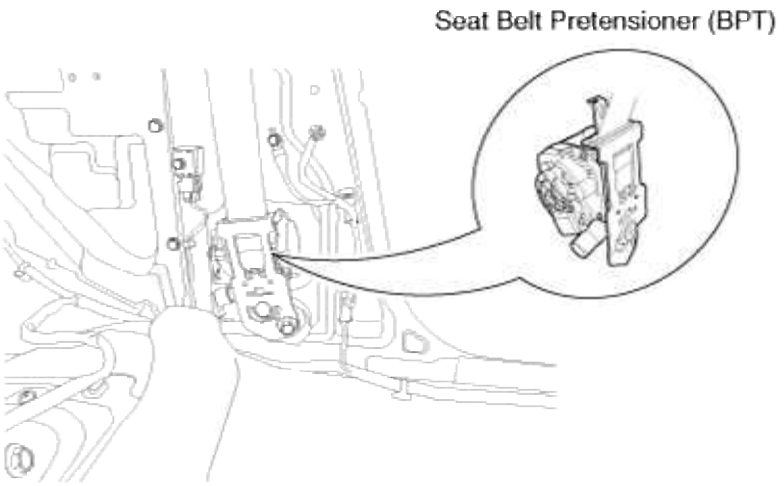
Curtain Airbag (CAB)



Side Airbag (SAB)



Seat Belt Pretensioner (BPT)



Restraint > SRSCM > SRS Control Module (SRSCM) > Description and Operation

Description

The primary purpose of the SRSCM (Supplemental Restraints System Control Module) is to discriminate between an event that warrants restraint system deployment and an event that does not. The SRSCM must decide whether to deploy the restraint system or not. After determining that pretensioners and/or airbag deployment is required, the SRSCM must supply sufficient power to the pretensioners and airbag igniters to initiate deployment.

The SRSCM determines that an impact may require deployment of the pretensioners and airbags from data obtained from impact sensors and other components in conjunction with a safing function.

The SRSCM will not be ready to detect a crash or to activate the restraint system devices until the signals in the SRSCM circuitry stabilize.

It is possible that the SRSCM could activate the safety restraint devices in approximately 2 seconds but is guaranteed to fully function after prove-out is completed.

The SRSCM must perform a diagnostic routine and light a system readiness indicator at key-on. The system must perform a continuous diagnostic routine and provide fault annunciation through a warning lamp indicator in the event of fault detection. A serial diagnostic communication interface will be used to facilitate servicing of the restraint control system.

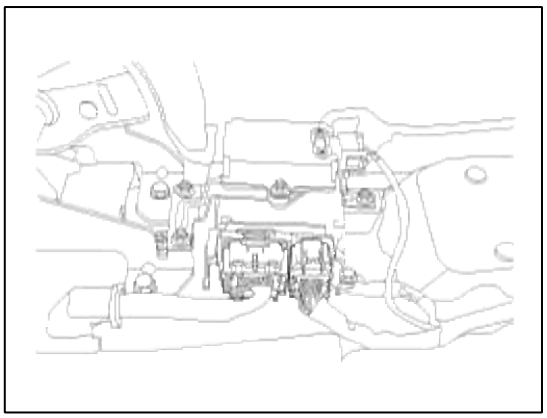
Restraint > SRSCM > SRS Control Module (SRSCM) > Components and Components Location

Components

Restraint > SRSCM > SRS Control Module (SRSCM) > Repair procedures

Removal

1. Remove the ignition key from the vehicle.
2. Disconnect the battery negative cable and wait for at least three minutes before beginning work.
3. Disconnect the DAB, PAB, SAB, CAB and BPT connectors.
4. Remove the floor console.
   (Refer to Body group - "Console")
5. Disconnect the SRSCM harness connector from the SRSCM.



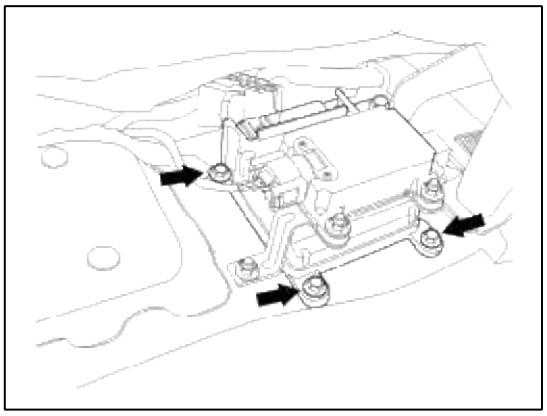
6. Remove the SRSCM mounting bolts(3EA) from the SRSCM, then remove the SRSCM.

Installation

1. Remove the ignition key from the vehicle.
2. Disconnect the battery negative cable and wait for at least three minutes before beginning work.

3. Install the SRSCM with the SRSCM mounting bolts.

Tightening torque (SRSCM Mounting Bolt)
: 6.9 ~ 8.8 N.m (0.7 ~ 0.9 kgf.m, 5.1 ~ 6.5 lb.ft)



NOTE

Use new mounting bolts when replacing the SRSCM after a collision.

4. Connect the SRSCM harness connector.
5. Install the floor console.
   (Refer to the Body group - "Console")
6. Connect the DAB, PAB, SAB, CAB and BPT connectors.
7. Reconnect the battery negative cable.
8. After installing the SRSCM, confirm proper system operation:
   A. Turn the ignition switch ON; the SRS indicator light should be turned on for about six seconds and then go off.

Variant coding

After replacing the SRSCM with a new one, MUST perform the “Variant Coding” procedure.

NOTE

1. On SRSCM variant coding mode, the airbag warning lamp is periodically blinking (ON: 0.5sec., OFF: 0.5sec.) until the coding is normally completed.
2. If the variant coding is failed, DTC B1762 (ACU Coding Error) will be displayed and the warning lamp will be turned on.
   In this case, perform the variant coding procedure again after confirming the cause in “DTC Fault State Information”.
   Variant Coding can be performed up to 255 times, but if the number of coding work exceeds 255 times, DTC B1683 (Exceed Maximum coding Number) will be displayed and SRSCM must be replaced.
3. If the battery voltage is low (less than 9V), DTC B1102 will be displayed. In this case, charge the battery before anything else, and then perform the variant coding procedure.
   Because, although Variant Coding is normally performed, DTC B1762 (ACU Coding Error) and B1102 (Battery Voltage Low) are displayed simultaneously.

Variant coding Procedure

■ On-Line type on GDS

1. Ignition "OFF", connect scantool.
2. Ignition "ON" & Engine "OFF" select vehicle name and airbag system.
3. Select Variant coding mode.

4. Follow steps on the screen as below.

1) Initial ACU Variant Coding screen

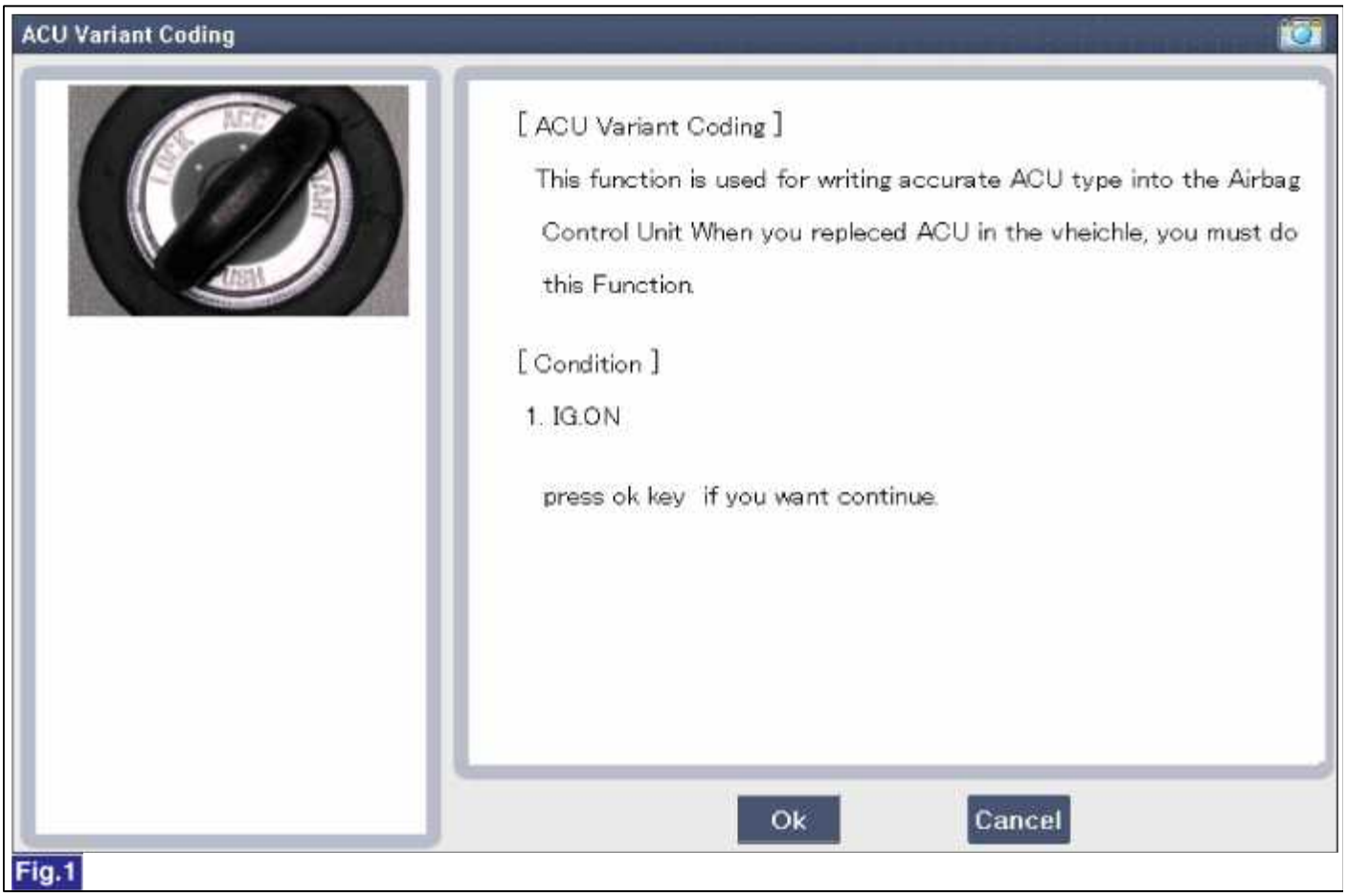


Fig.1

2) VIN Code entering screen

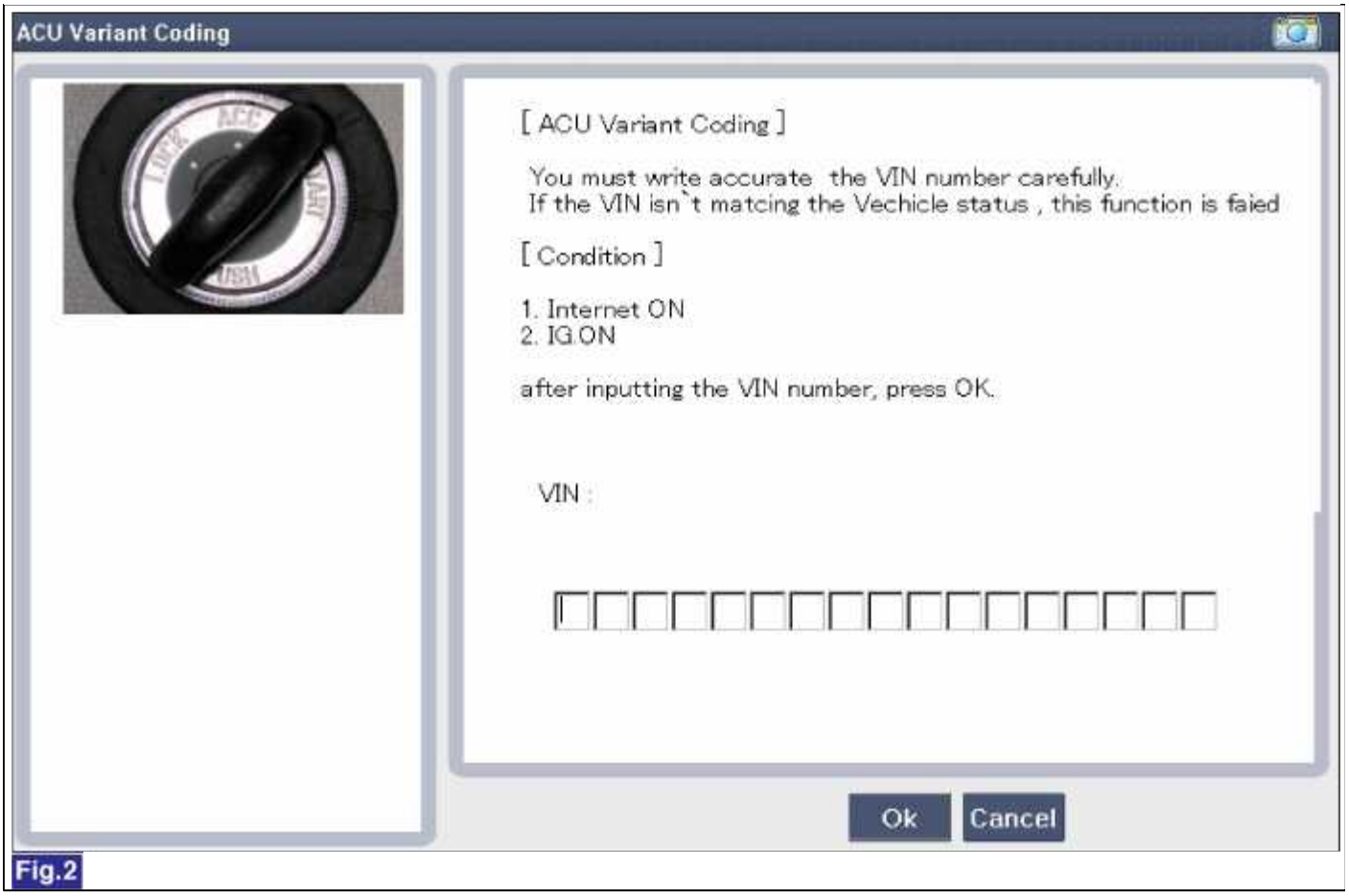


Fig.2

3) Variant coding's proceeding screen-1

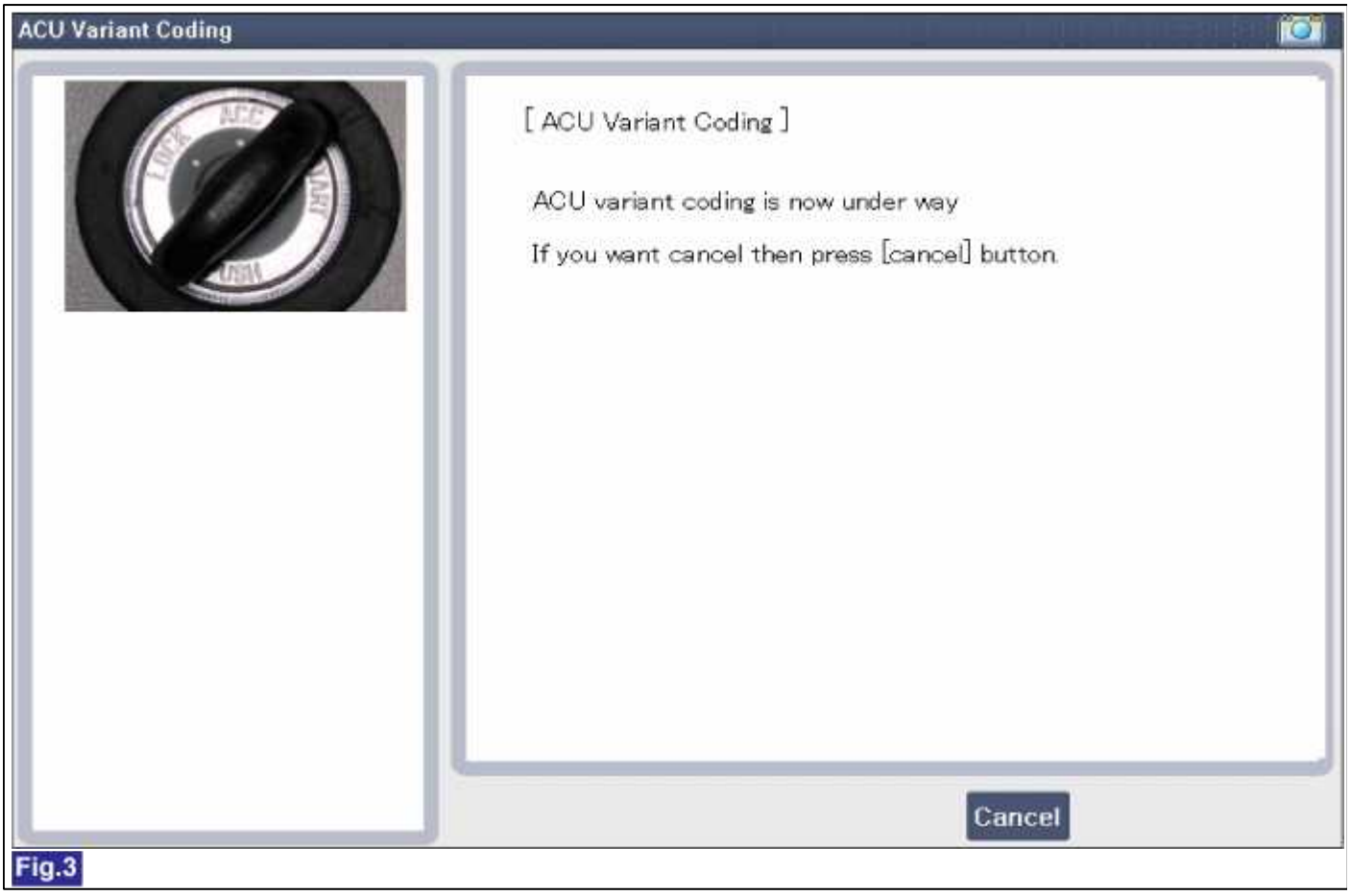


Fig.3

4) Variant coding's proceeding screen-2

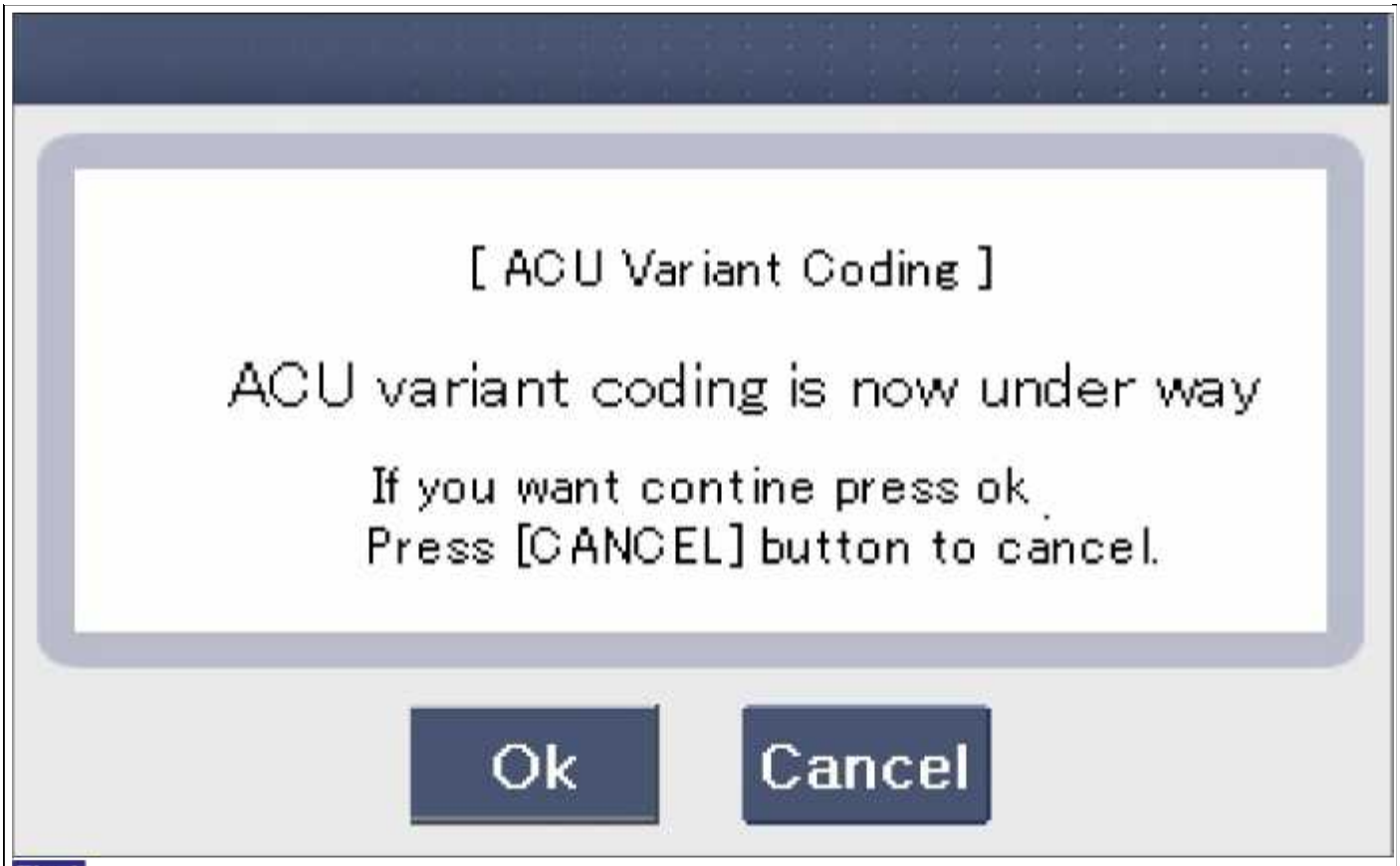


Fig.4

5) Variant coding is completed

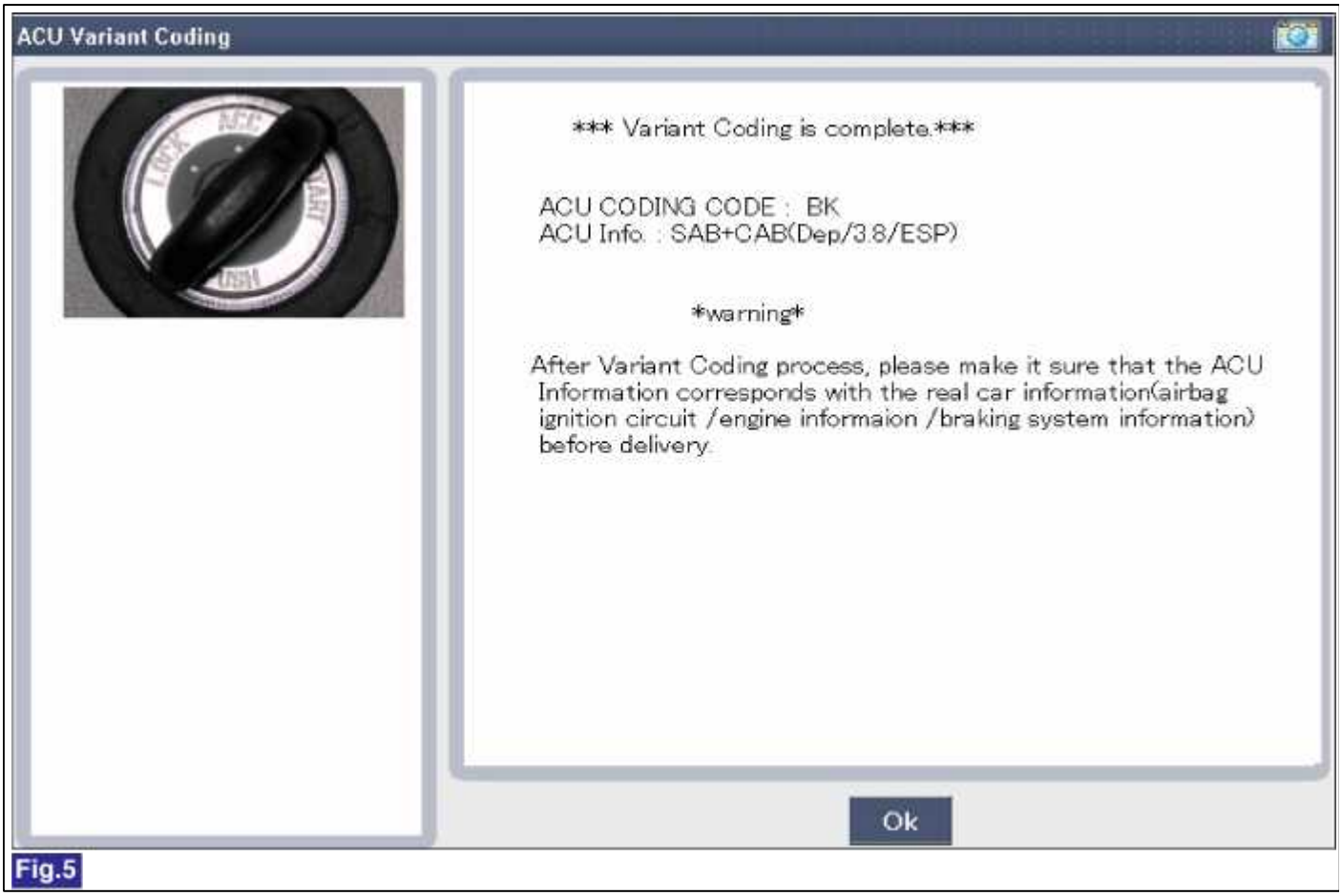


Fig.5

NOTE

1) Screen of Retrying the Variant coding after finishing variant coding

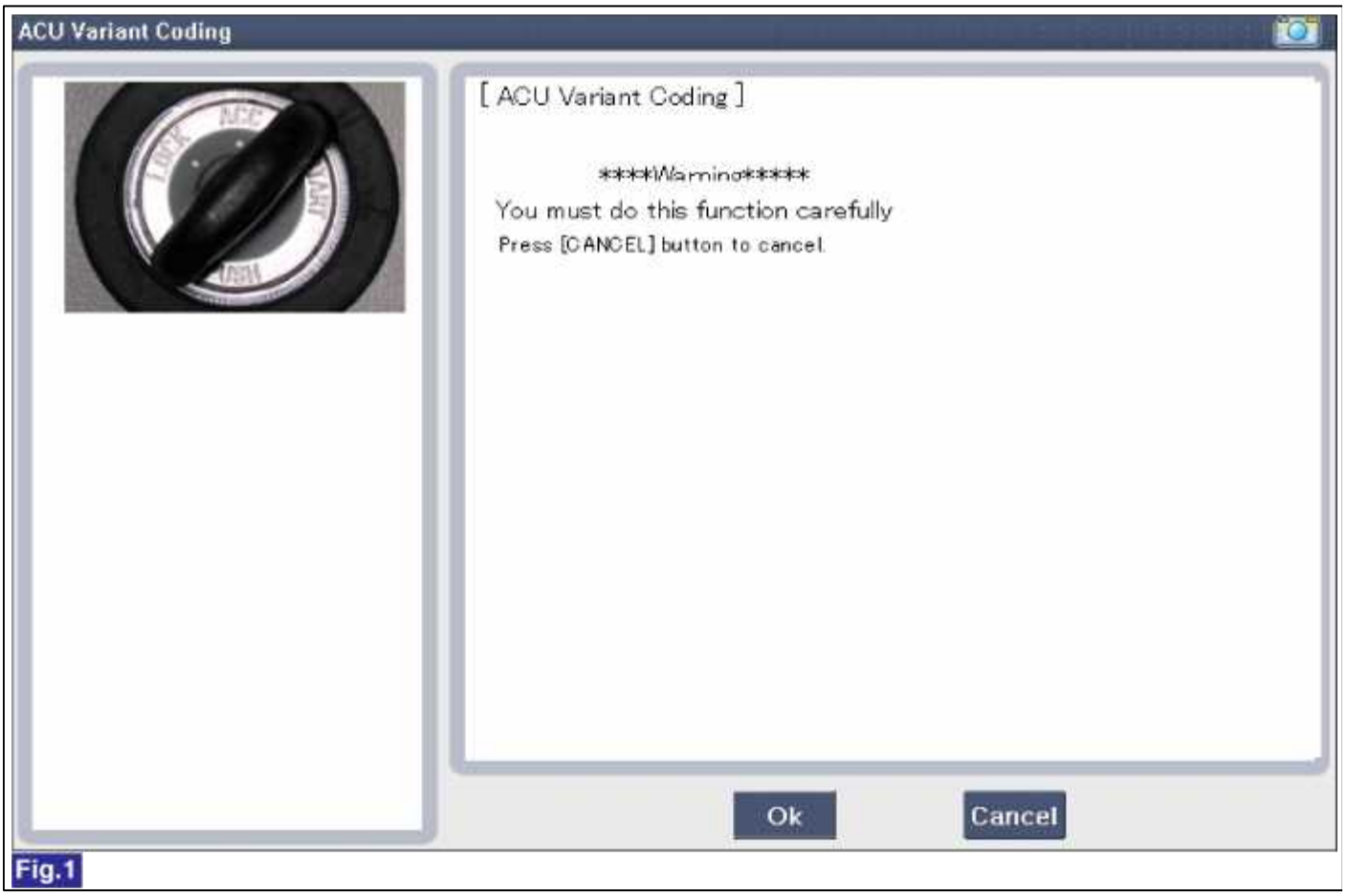
Fig.6

2) Screen of communication failure

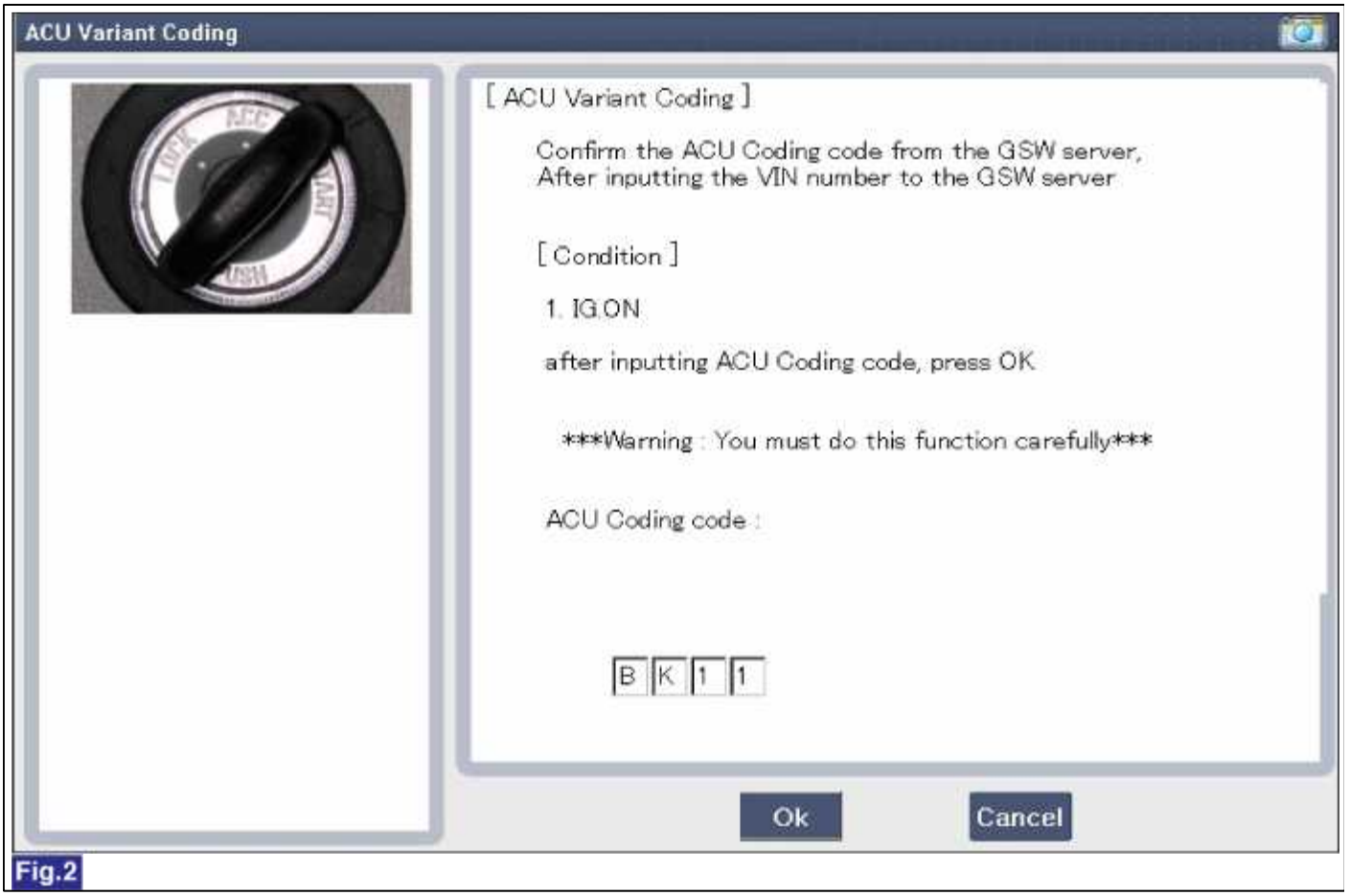
Fig.7

■ Off-line type on GDS (This can be used when not connecting to internet)

1) Initial ACU Variant Coding screen



2) ACU CODING Code entering screen



3) Screen of rechecking ACU CODING code's entering

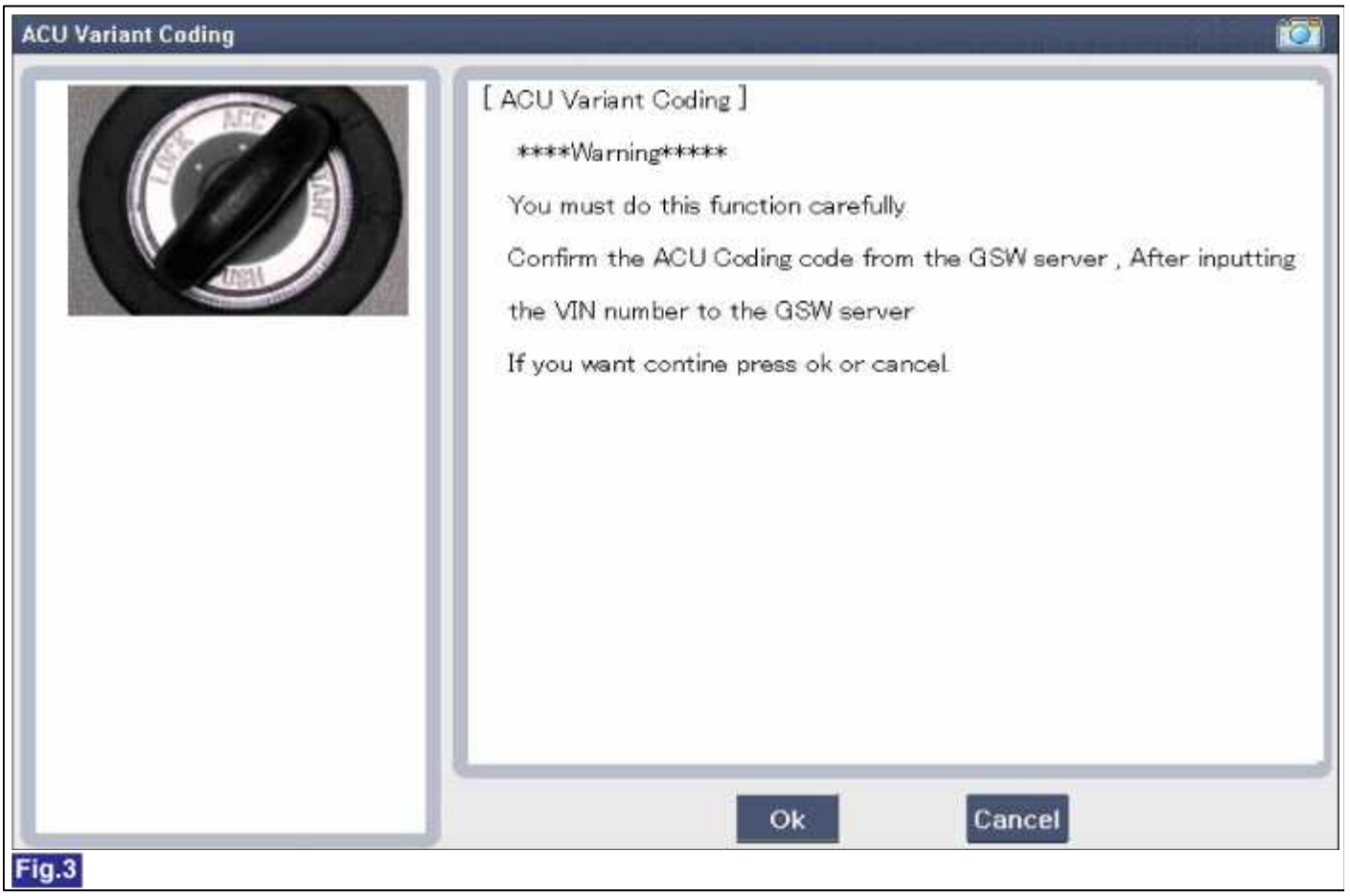


Fig.3

4) Variant coding's proceeding screen-1

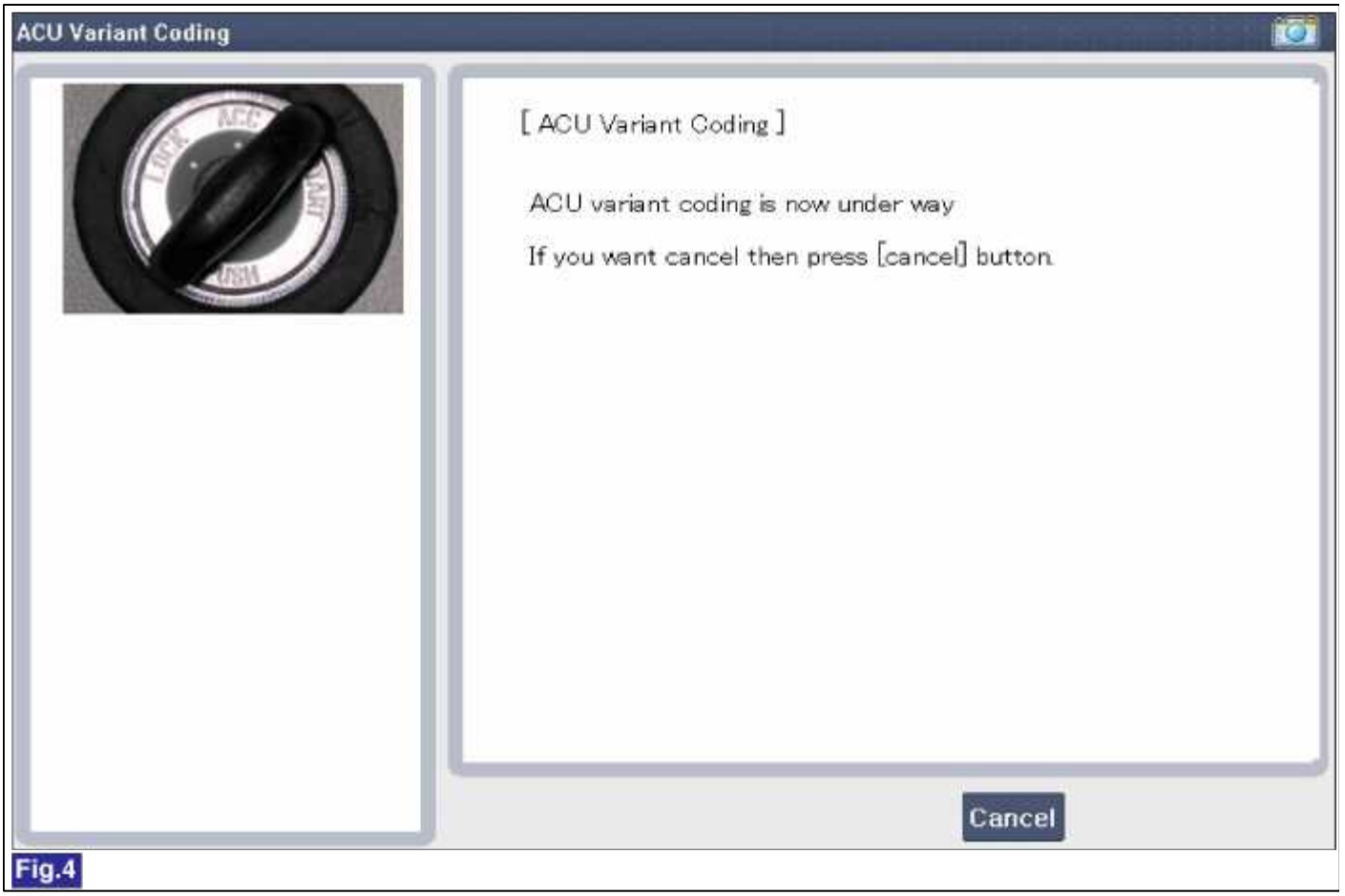


Fig.4

5) Variant coding's proceeding screen-2

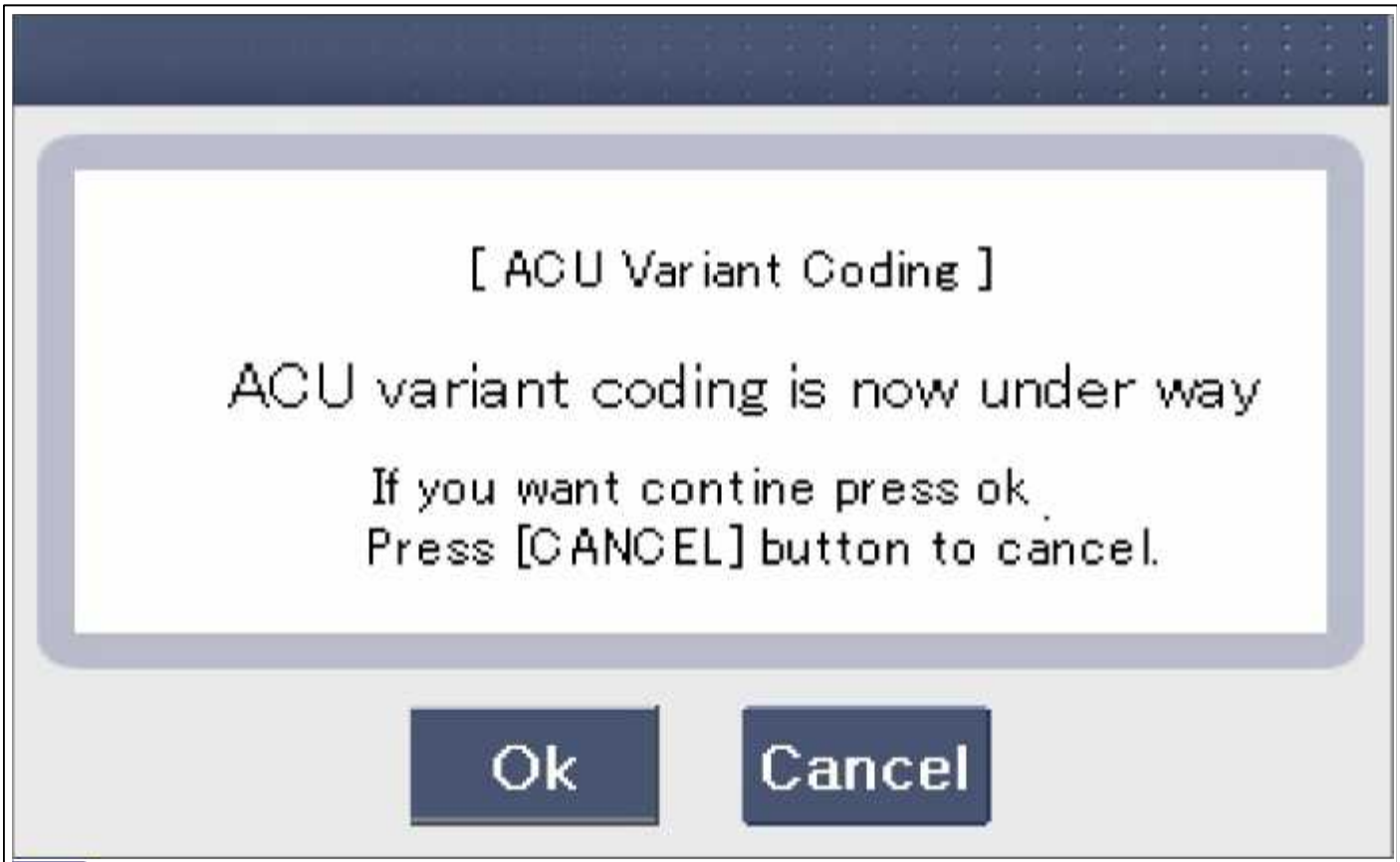


Fig.5

6) Variant coding is completed

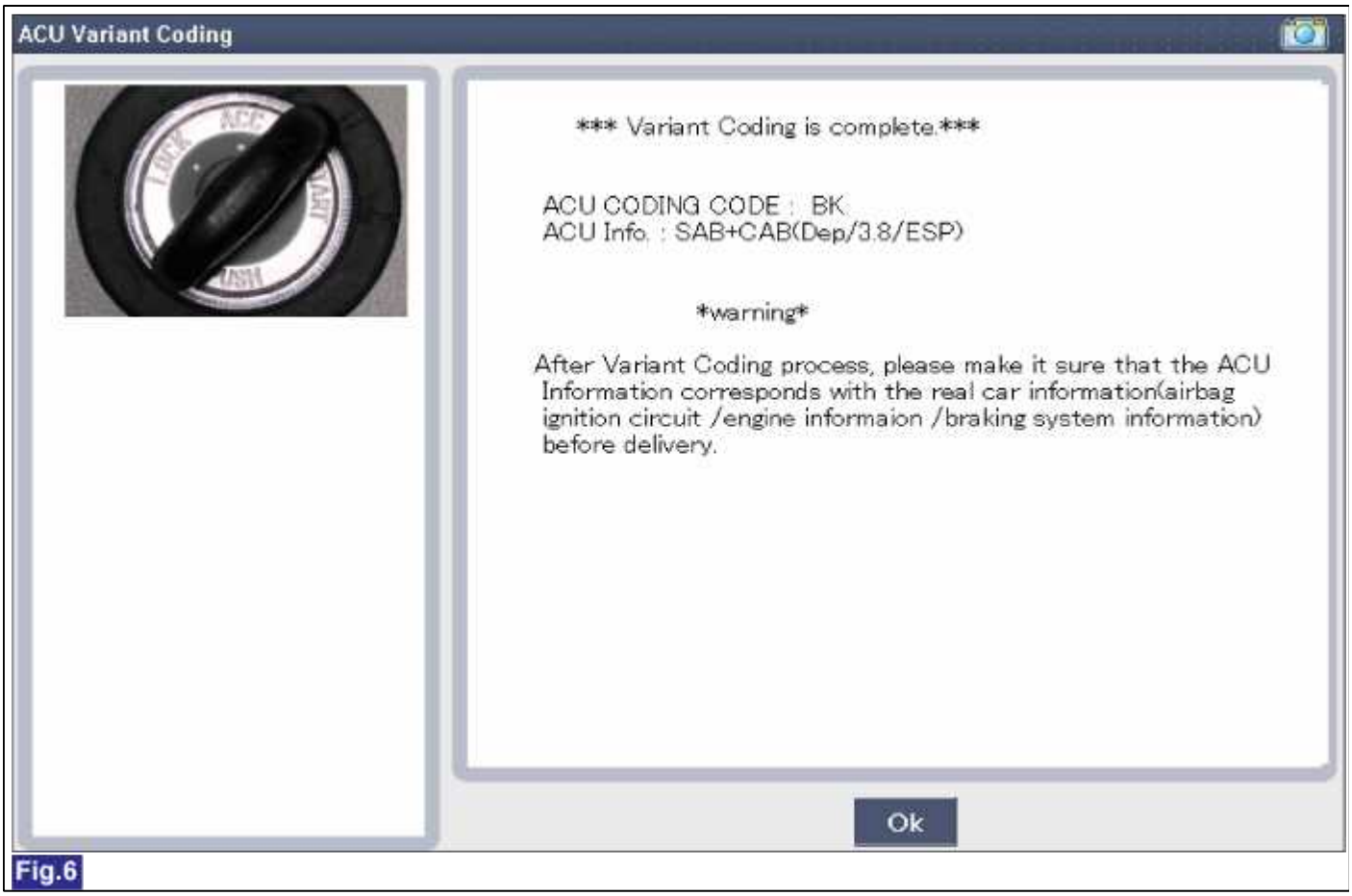


Fig.6

NOTE

1) Screen of Retrying the Variant coding after finishing variant coding

Fig.7

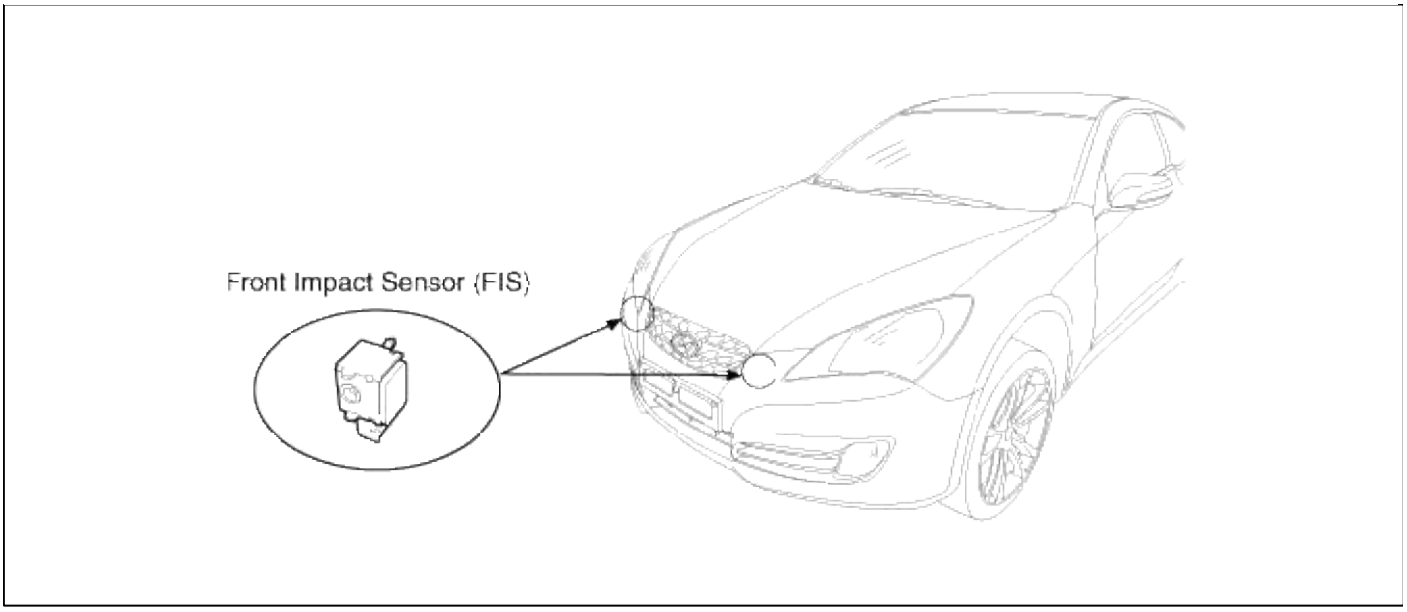
Restraint > SRSCM > Front Impact Sensor (FIS) > Description and Operation

Description

The front impact sensor (FIS) is installed in the Front End Module (FEM). They are remote sensors that detect acceleration due to a collision at its mounting location. The primary purpose of the Front Impact Sensor (FIS) is to provide an indication of a collision. The Front Impact Sensor (FIS) sends acceleration data to the SRSCM.

Restraint > SRSCM > Front Impact Sensor (FIS) > Components and Components Location

Components



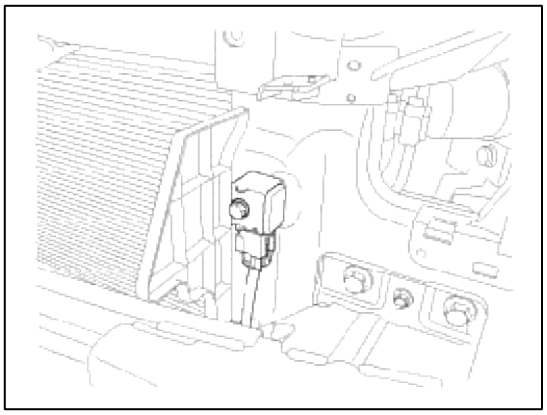
Restraint > SRSCM > Front Impact Sensor (FIS) > Repair procedures

Removal

CAUTION

- Removal of the airbag must be performed according to the precautions/ procedures described previously.
- Before disconnecting the front impact sensor connector, disconnect the front airbag connector(s).
- Do not turn the ignition switch ON and do not connect the battery cable while replacing the front impact sensor.

1. Disconnect the battery negative cable, and wait for at least three minutes before beginning work.
2. Remove the front bumper.
   (Refer to Body group - "Bumper")
3. Disconnect the Front Impact Sensor connector.
4. Remove the Front Impact Sensor mounting nut.



5. Remove the Front Impact Sensor.

Installation

CAUTION

- Do not turn the ignition switch ON and do not contact the battery cable while replacing the front impact sensor.

1. Install the new Front Impact Sensor.

2. Tighten the Front Impact Sensor mounting nut.

Tightening torque
: 6.8 ~ 8.8 N.m (0.7 ~ 0.9 kgf.m, 5.1 ~ 6.5 lb.ft)

3. Connect the Front Impact Sensor connector and install the front bumper.
   (Refer to Body group - "Bumper")
4. Reconnect the battery negative cable.
5. After installing the Front Impact Sensor, confirm proper system operation:
   A. Turn the ignition switch ON the SRS indicator light should be turned on for about six seconds and then go off.

Restraint > SRSCM > Side Impact Sensor (SIS) > Description and Operation

Description

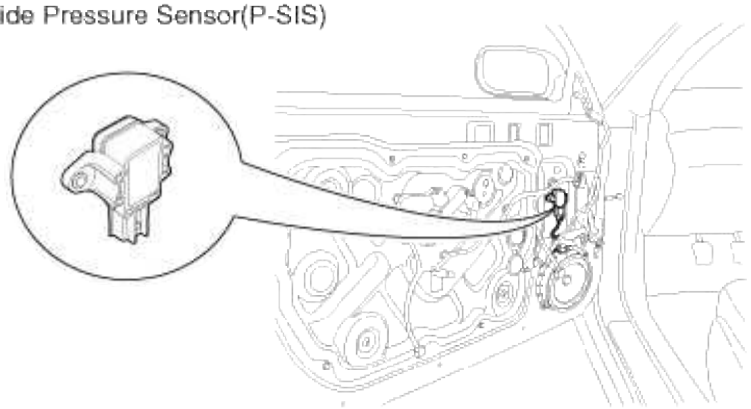
Side Impact Sensor (SIS) system consists of two Front-SIS which are installed at each center of the front door module (LH and RH) and two Rear-SIS which are installed at each rear pillar nearby (LH and RH).
Front-Side Impact Sensor (F-SIS) is also called P-SIS because that detects pressure due to collision at its mounting location.
Rear-Side Impact Sensor (R-SIS) is also called A-SIS because that detects acceleration.
SRSCM decides deployment or not of the airbag and the time of deployment through the collision signal of SIS when the collision occurred.

Restraint > SRSCM > Side Impact Sensor (SIS) > Components and Components Location

Components

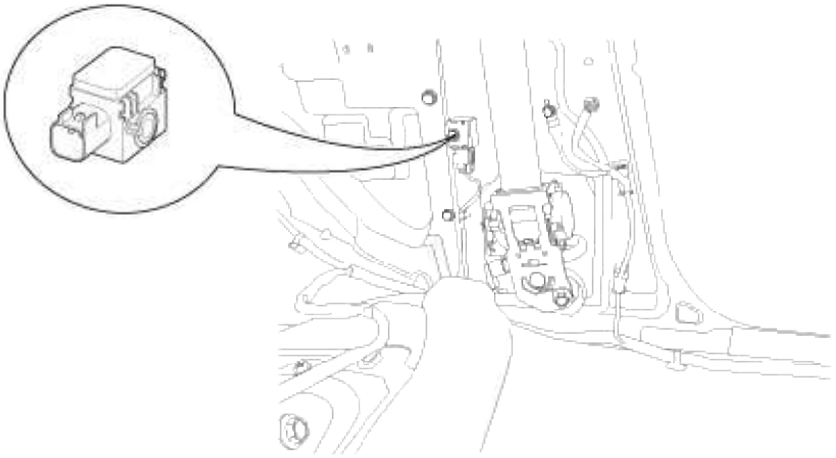
[Front]

Side Pressure Sensor(P-SIS)



[Rear]

Side Impact Sensor (SIS)



Restraint > SRSCM > Side Impact Sensor (SIS) > Repair procedures

Removal

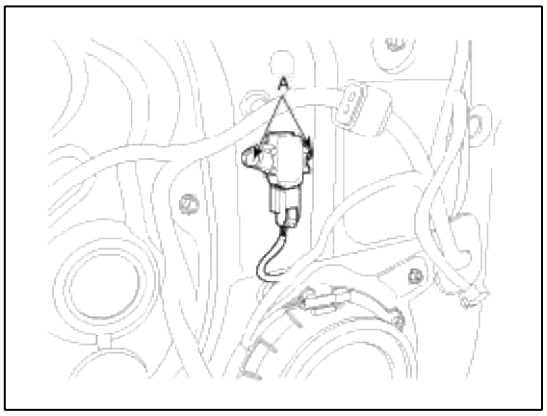
Side Pressure Sensor

CAUTION

- Removal of the airbag must be performed according to the precautions/procedures described previously.
- Before disconnecting the side impact sensor connector(s), disconnect the side airbag connector (s).
- Do not turn the ignition switch ON and do not connect the battery cable while replacing the side impact sensor.

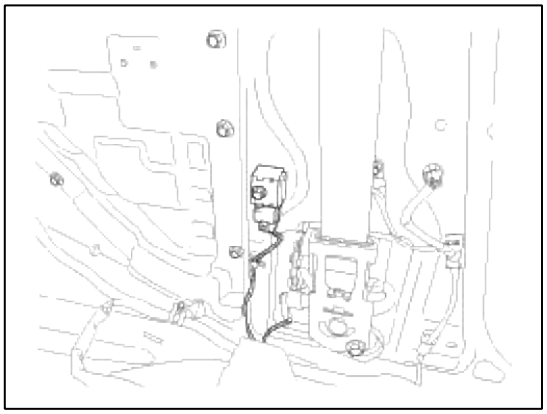
1. Disconnect the battery negative cable, and wait for at least three minutes before beginning work.
2. Remove the front door trim.
   (Refer to Body group - "Front door")

3. Disconnect the side pressure sensor connector and remove the side pressure sensor after removing 2 rivets (A).



Side Impact Sensor

1. Disconnect the battery negative cable and wait for at least three minutes before beginning work.
2. Remove the rear seat.
   (Refer to Body group - "Seat")
3. Remove the luggage side trim.
   (Refer to Body group - "Interior trim")
4. Disconnect the side impact sensor connector.
5. Loosen the side impact sensor mounting bolt and remove the side impact sensor.



Installation

Side Pressure Sensor

CAUTION

- Do not turn the ignition switch ON and do not connect the battery cable while replacing the side impact sensor.

1. Install the new side pressure sensor with 2 rivets then connect the side pressure sensor connector.
2. Install the front door trim.
   (Refer to Body group - "Front door")
3. Reconnect the battery negative cable.
4. After installing the side pressure sensor, confirm proper system operation:
   A. Turn the ignition switch ON, the SRS indicator light should be turned on for about six seconds and then go off.

Side Impact Sensor

CAUTION

- Do not turn the ignition switch ON and do not connect the battery cable while replacing the side impact sensor.

1. Install the new side impact sensor with the bolt then connect the SRS harness connector to the side impact sensor.

Tightening torque
: 6.8 ~ 8.8 N.m (0.7 ~ 0.9 kgf.m, 5.1 ~ 6.5 lb.ft)

2. Install the luggage side trim.
   (Refer to Body group - "Interior trim")
3. Install the rear seat.
   (Refer to Body group - "Seat")
4. Reconnect the battery negative cable.
5. After installing the side impact sensor, confirm proper system operation:
   A. Turn the ignition switch ON, the SRS indicator light should be turned on for about six seconds and then go off.

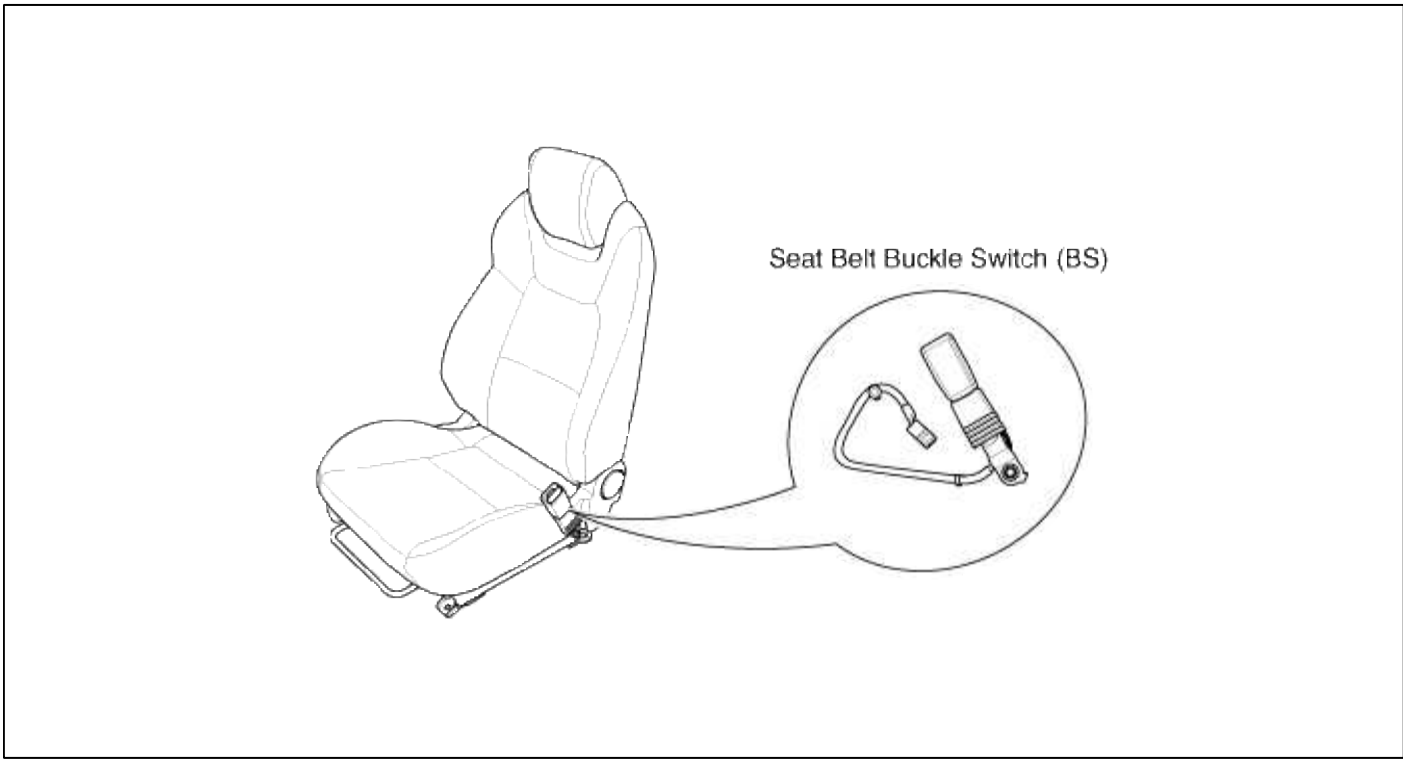
Restraint > SRSCM > Seat Belt Buckle Switch (BS) > Description and Operation

Description

The SRSCM shall monitor the status of the driver and front passenger seat belt buckle. The SRSCM provides one pin each for the driver and front passenger seat belt buckle status input. The seat belt buckle circuit operates from internal boost voltage supplied by the SRSCM, and uses chassis ground for the signal return. The buckle status shall modify the SRSCM deployment. If the buckle status is unbuckled, the corresponding pretensioner will be deactivated.

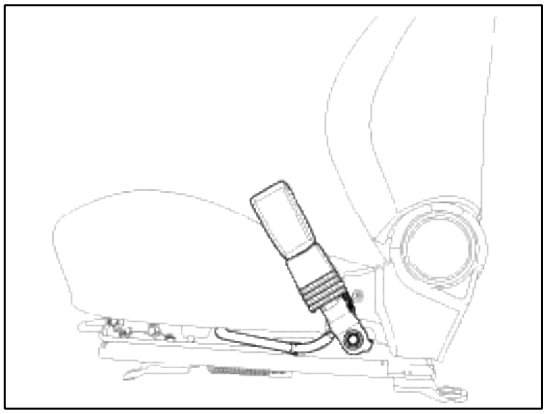
Restraint > SRSCM > Seat Belt Buckle Switch (BS) > Components and Components Location

Components



Restraint > SRSCM > Seat Belt Buckle Switch (BS) > Repair procedures

Removal

1. Disconnect the battery negative cable, and wait for at least three minutes before beginning work.
2. Remove the front seat assembly.
   (Refer to Body group - "Seat")
3. Loosen the seat belt buckle mounting bolt and remove the seat belt buckle switch.
4. 

Installation

CAUTION

Be sure to install the harness wires not to be pinched or interfered with other parts.

1. Disconnect the battery negative cable, and wait for at least three minutes before beginning work.
2. Remove the ignition key from the vehicle.
3. Install the seat belt buckle switch.

Tightening Torque
: 39.2 ~ 53.9 N.m (4.0 ~ 5.5 kgf.m, 28.9 ~ 39.8 lb.ft)

4. Install the front seat assembly.
   (Refer to Body group - "Seat")
5. Reconnect the battery negative cable.
6. After installing the Seat Belt Buckle Switch, confirm proper system operation:
   A. Turn the ignition switch ON; the SRS indicator should be turned on for about six seconds and then go off.

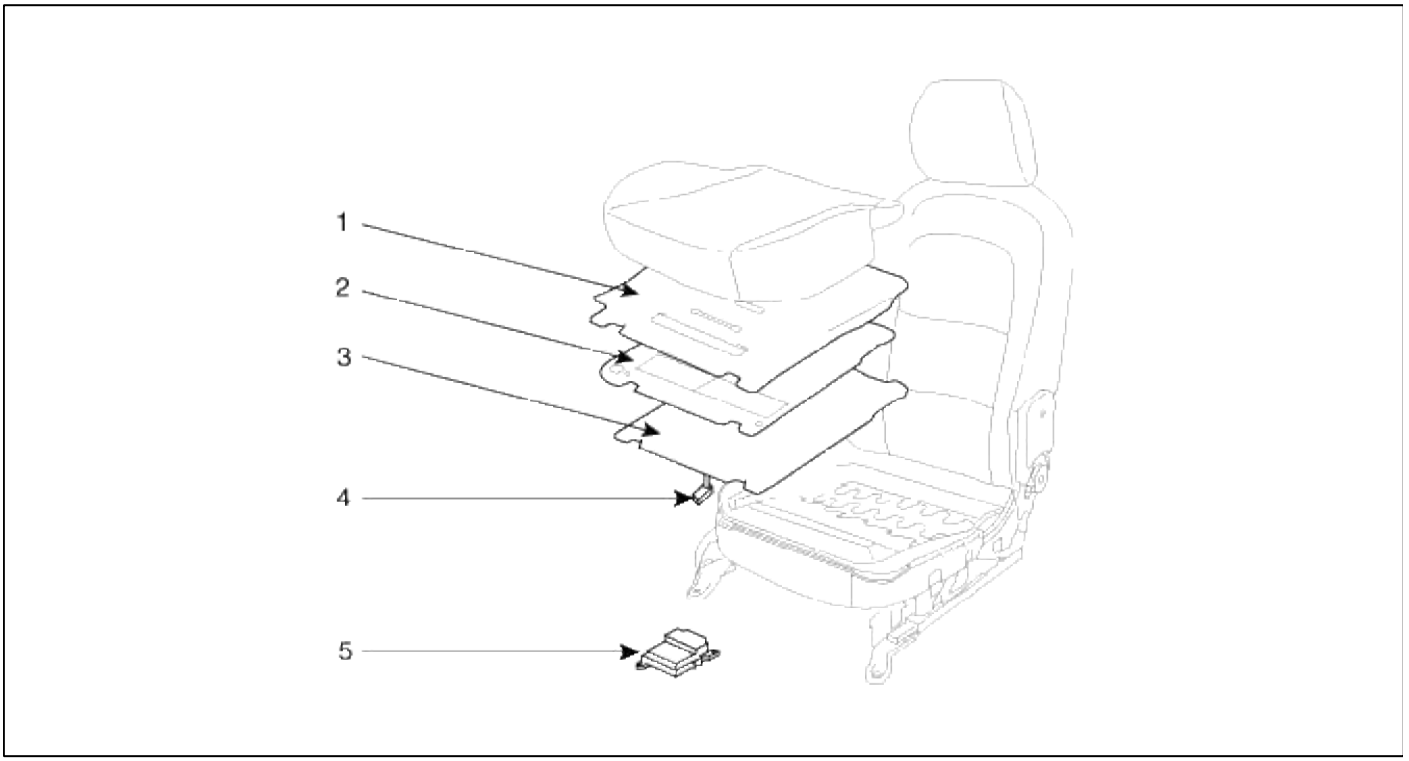
Restraint > SRSCM > Passenger Occupant Detecting Sensor (PODS) > Description and Operation

Description

The system is intended to classify the occupancy status of the front passenger seat in a motor vehicle based upon the measured force on the bottom seat cushion.
The system also communicates to the SRSCM whether to allow or inhibit the deployment of the passenger airbags and/or pretensioner based upon this status.
The System also measured dynamic responses of the occupant. This information is used to identify when a child seat is cinched down tightly with the seat belt, and to also determine if the seat is unoccupied.
However, the dynamic measurements are not intended, nor capable of monitoring the seating position of the occupant, nor can they determine the proximity of the occupant to the inflator modules.
The system should not be confused with an occupant position recognition system, or any other occupant proximity sensor.
The Passive Occupant Detecting System (PODS) utilizes bladder placed between the passenger seat cushion and suspension to measure the occupant's loading force on the vehicle seat. The bladder is connected to pressure sensor and ultimately to an electronic control unit (ECU), both of which are mounted under the seat pan. The quantitative force determined by the system is compared to a given threshold for determination of passenger airbag suppression.

Restraint > SRSCM > Passenger Occupant Detecting Sensor (PODS) > Components and Components Location

Components



1. Bladder : Sense occupant weight and provide fluid pressure input to Pressure Sensor.
2. Backer Board : Provide stable and smooth reaction surface for Bladder, together with Felt Pad.
3. Felt Pad : Provide stable reaction surface for Bladder, together with Backer Board, and protect BladderAssembly from the seat frame environment.
4. Pressure Sensor : Sense pressure input from Bladder and convert the pressure input to a voltage signalfor ECU.
5. ECU : Utilizing data from the Pressure Sensor, BTS (Belt Tension sensor), and Compensation Tables,determine if PAB (Passenger Airbag) will be suppressed.

Restraint > SRSCM > Passenger Occupant Detecting Sensor (PODS) > Repair procedures

Removal

1. Disconnect the battery negative cable, and wait for at least three minutes before beginning work.
2. Remove the front passenger seat assembly.
   (Refer to Body group - "Seat")
3. Remove the seat cushion as an assembly.
   (Refer to Body group - "Seat")

Installation

1. Install the PODS equipped seat front assembly. (Refer to Body group- Seat)
2. Reconnect the battery negative cable.

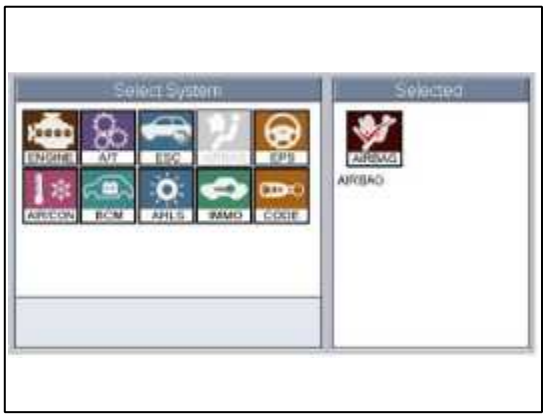
3. After installing the PODS, confirm proper system operation :
   A. Turn the ignition switch ON; the SRS indicator should be turned on for about six seconds and then go off. Telltale lamp will turn on for 4 seconds and be turned off for 4 seconds. After the 8 seconds, it shall remain off if the PODS does not require suppression and the passenger airbag is enabled.

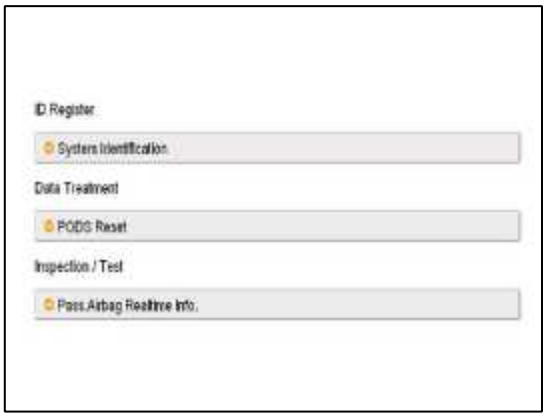
> NOTE
>
> Be sure to perform PODS reset with scantool after replcacing PODS equipped seat cushion.

PODS Re-zero procedure

You should perform PODS Re-zero procedure after service or replacement about all part of the passenger seat.

1. Ignition “OFF”, connect scantool.
2. Ignition “ON” & Engine “OFF”, select Airbag system and “PODS Reset” mode.





3. The scantool will show the two PODS RESET function steps.
   (1) Erase PODS ECU diagnostic codes.
   (2) PODS ECU initialization.

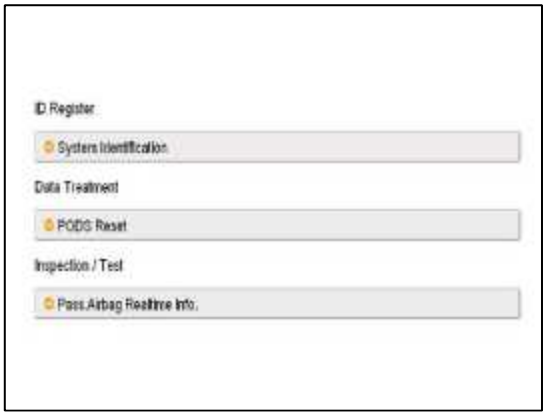
4. Press the OK button to erase the PODS related diagnostic codes.

5. Press OK button to initialize the PODS.

> CAUTION
>
> This step must be done PODS re-zero, when the front passenger seat is empty.

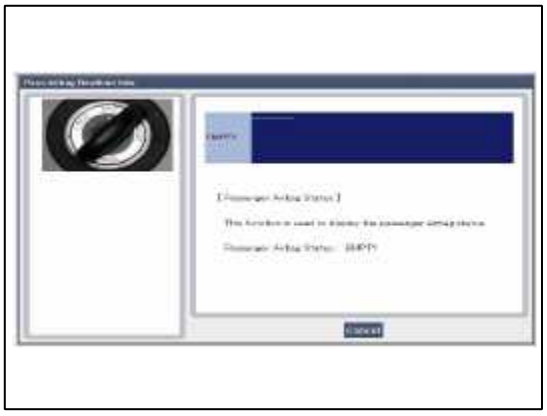
6. The PODS initialization procedure will be performed.

7. Check PODS situation with selecting " Pass. Airbag Realtime Info" after performing PODS Reset procedure.



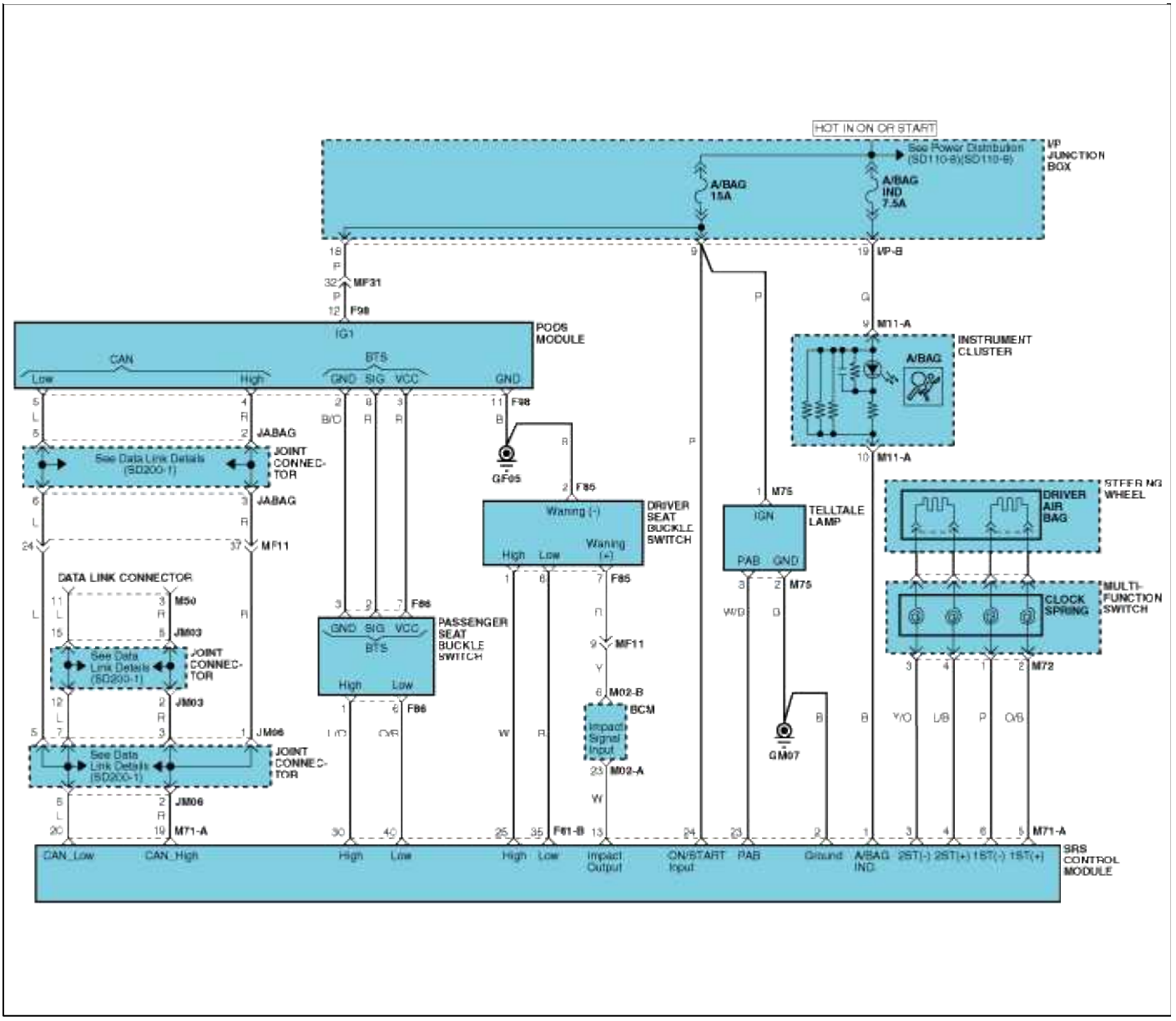
8. Perform inspection with pressing OK button.

9. Finish the procedure with pressing cancel button if there is no problem after inspecting each status as below.

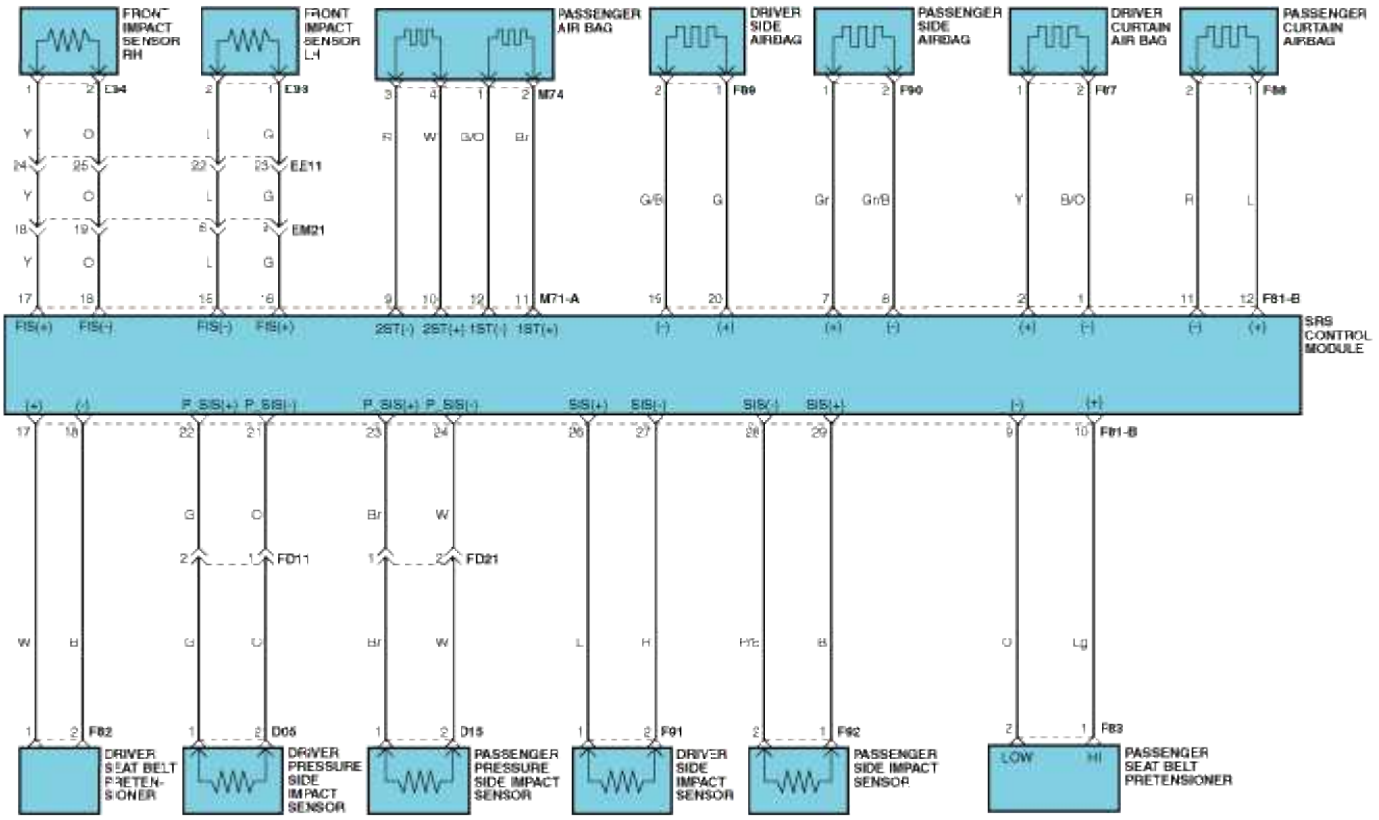


Restraint > SRSCM > Schematic Diagrams

Circuit Diagram (1)



Circuit Diagram (2)



SRSCM Connector Terminal

Harness Connector

6	5	4	3	2	1
12	11	10	9	8	7
18	17	16	15	14	13
24	23	22	21	20	19

CONNECTOR A

10	9	8	7	6	5	4	3	2	1
20	19	18	17	16	15	14	13	12	11
30	29	28	27	26	25	24	23	22	21
40	39	38	37	36	35	34	33	32	31

CONNECTOR B

Shorting bar (▭) : located on the upper side of pin 1 and 2 of SRSCM connector A
Note : For short circuit check, shorting bar must be opened. Use a plastic clip as a shorting bar opener for disconnecting shorting bar.

Pin	Function (Connector A)	Pin	Function (Connector B)
1	Airbag Warning Lamp (Shorting bar opener)	1	Curtain Airbag [Driver] Low
2	Power Ground (Shorting bar opener)	2	Curtain Airbag [Driver] High
3	(2nd stage) Driver Airbag Low	3	-

4	(2nd stage) Driver Airbag High	4	-
5	(1st stage) Driver Airbag High	5	-
6	(1st stage) Driver Airbag Low	6	-
7	-	7	Side Airbag [Passenger] High
8	-	8	Side Airbag [Passenger] Low
9	(2nd stage) Passenger Airbag Low	9	Seat Belt Pretensioner [Passenger] Low
10	(2nd stage) Passenger Airbag High	10	Seat Belt Pretensioner [Passenger] High
11	(1st stage) Passenger Airbag High	11	Curtain Airbag [Passenger] Low
12	(1st stage) Passenger Airbag Low	12	Curtain Airbag [Passenger] High
13	Crash Output	13	-
14	-	14	-
15	Front Impact Sensor [Driver] Low	15	-
16	Front Impact Sensor [Driver] High	16	-
17	Front Impact Sensor [Passenger] High	17	Seat Belt Pretensioner [Driver] High
18	Front Impact Sensor [Passenger] Low	18	Seat Belt Pretensioner [Driver] Low
19	CAN High (PODS and OBD)	19	Side Airbag [Driver] Low
20	CAN High (PODS and OBD)	20	Side Airbag [Driver] High
21	-	21	Side Impact Sensor [Driver] Low
22	-	22	Side Impact Sensor [Driver] High
23	Telltale Warning Lamp	23	Side Impact Sensor [Passenger] High
24	Power supply (Ignition)	24	Side Impact Sensor [Passenger] Low
		25	Seat Belt Buckle Switch [Driver] High
		26	Side Impact Sensor [Driver] High
		27	Side Impact Sensor [Driver] Low
		28	Side Impact Sensor [Passenger] Low
		29	Side Impact Sensor [Passenger] High
		30	Seat Belt Buckle Switch [Passenger] High
		31	-
		32	-
		33	-
		34	-
		35	Seat Belt Buckle Switch [Driver] Low
		36	-

		37	-
		38	-
		39	-
		40	Seat Belt Buckle Switch [Passenger] Low

Restraint > Airbag Module > Driver Airbag (DAB) Module and Clock Spring > Description and Operation

Description

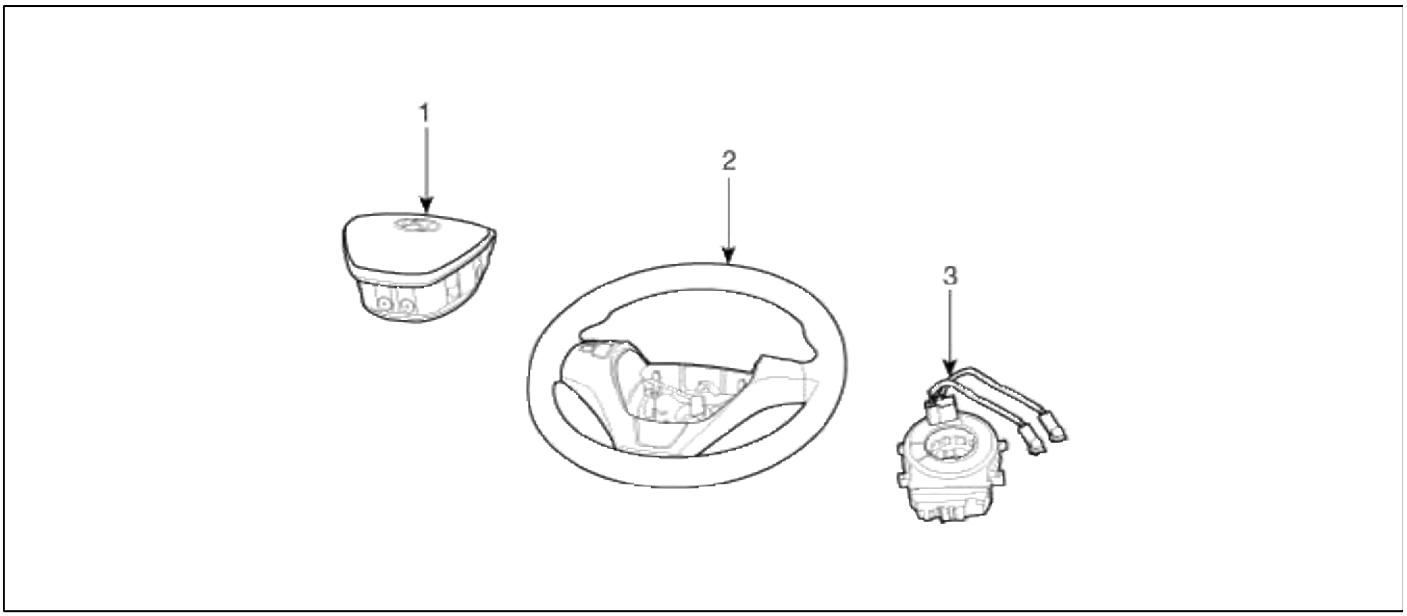
Driver Airbag (DAB) is installed in steering wheel and electrically connected to SRSCM via clock spring. It protects the driver from danger by deploying a bag when frontal crash occurs. The SRSCM determines deployment of Driver Airbag (DAB).

CAUTION

Never attempt to measure the circuit resistance of the airbag module (squib) even if you are using the specified tester. If the circuit resistance is measured with a tester, accidental airbag deployment will result in serious personal injury.

Restraint > Airbag Module > Driver Airbag (DAB) Module and Clock Spring > Components and Components Location

Components

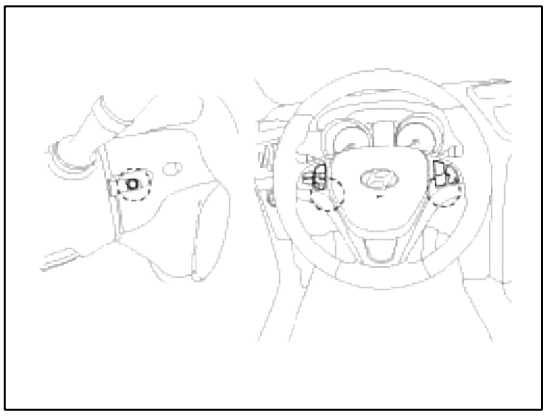


1. Driver Airbag (DAB)
2. Steering Wheel
3. Clock Spring

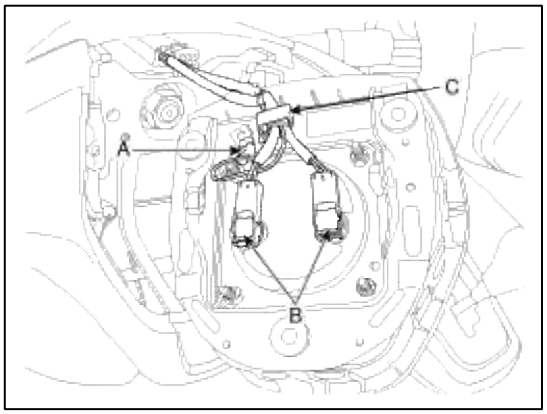
Restraint > Airbag Module > Driver Airbag (DAB) Module and Clock Spring > Repair procedures

Removal

1. Disconnect the battery negative cable and wait for at least three minutes before beginning work.
2. Remove the airbag module mounting bolts (2EA).



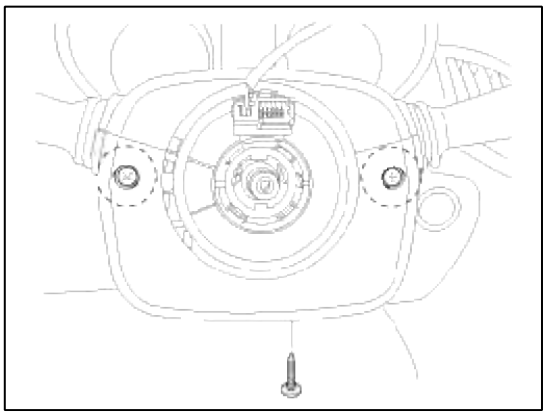
3. Disconnect the horn connector (A).



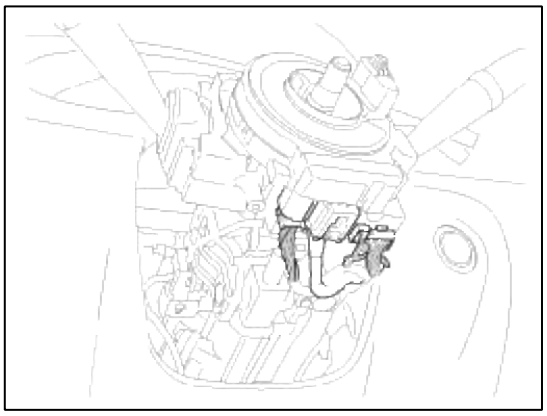
4. Remove the wiring fixing clip (C) and disconnect airbag module connector (B).
5. Separate the airbag module from the steering wheel.

> CAUTION
>
> The removed airbag module should be stored in aclean, dry place with the pad cover face up.

6. Remove the steering wheel and steering wheel column cover.
   (Refer to Steering System group - "Steering Column and Shaft")



7. Disconnect the clock spring and horn connector, then remove the clock spring.



Inspection

Driver Airbag (DAB)

If any improper parts are found during the following inspection, replace the airbag module with a new one.

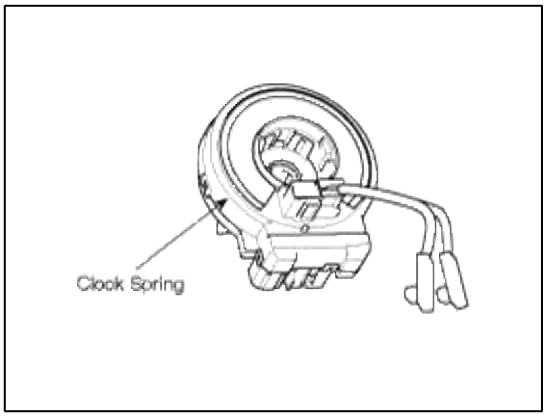
CAUTION

Never attempt to measure the circuit resistance of the airbag module (squib) even if you are using the specified tester. If the circuit resistance is measured with a tester, accidental airbag deployment will result in serious personal injury.

1. Check pad cover for dents, cracks or deformities.
2. Check the airbag module for denting, cracking or deformation.
3. Check hooks and connectors for damage, terminals for deformities, and harness for binds.
4. Check airbag inflator case for dents, cracks or deformities.
5. Install the airbag module to the steering wheel to check for fit or alignment with the wheel.

Clock Spring

1. If, as a result of the following checks, even one abnormal point is discovered, replace the clock spring with a new one.
2. Check connectors and protective tube for damage, and terminals for deformities.

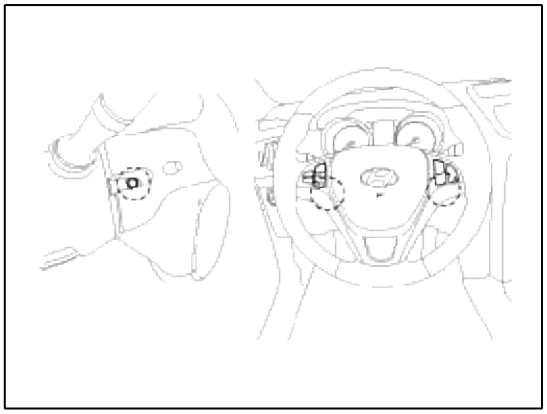


Installation

1. Remove the ignition key from the vehicle.
2. Disconnect the battery negative cable from battery and wait for at least three minutes before beginning work.
3. Connect the clock spring harness connector and horn harness connector to the clock spring.
4. Set the center position by getting marks between the clock spring and the cover into line. Make an array the mark ( ) by turning the clock spring clockwise to the stop and then 3 revolutions counterclockwise.
5. Install the steering wheel column cover and the steering wheel. (Refer to Steering System group- Steering Column and Shaft)

6. Connect the Driver Airbag (DAB) module connector and horn connector, and then install the Driver Airbag (DAB) module on the steering wheel.
7. Secure the Driver Airbag (DAB) with the new mounting bolts.

Tightening torque
: 7.8 ~ 10.8 N.m (0.8 ~ 1.1 kgf.m, 5.8 ~ 8.0 lb.ft)



8. Connect the battery negative cable.
9. After installing the airbag, confirm proper system operation:
   A. Turn the ignition switch ON; the SRS indicator light should be turned on for about six seconds and then go off.
   B. Make sure horn button works.

Restraint > Airbag Module > Passenger Airbag (PAB) Module > Description and Operation

Description

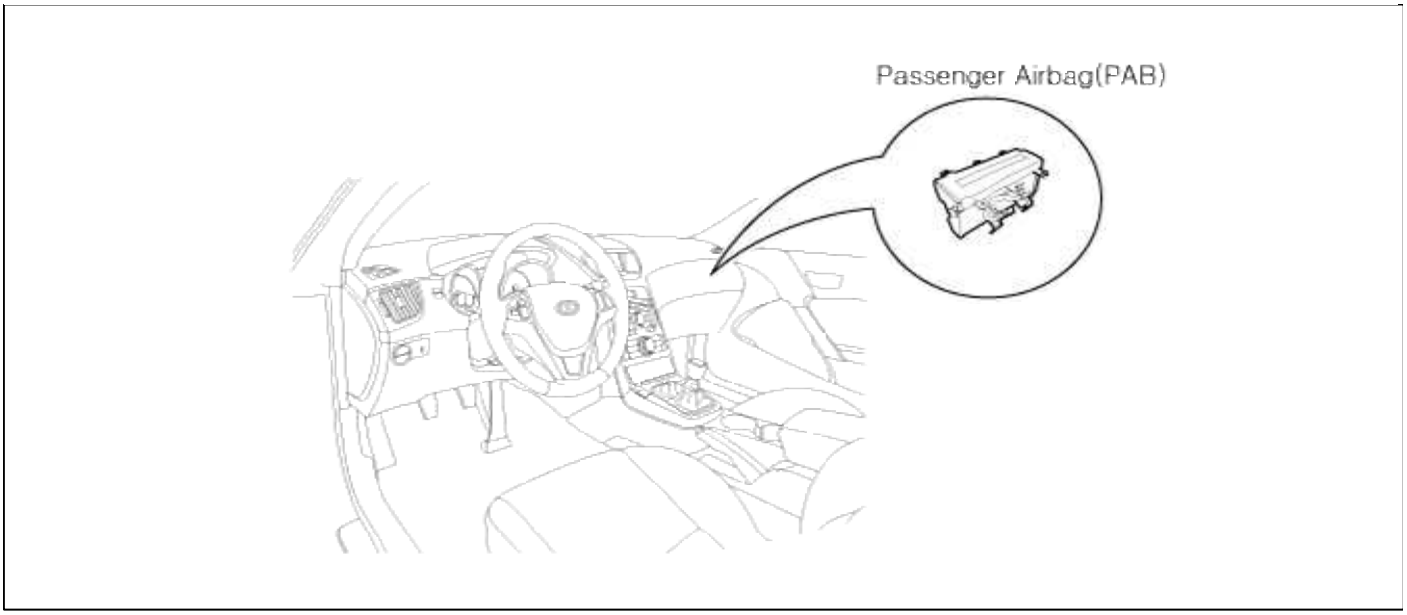
The passenger Airbag (PAB) is installed inside the crash pad and protects the front passenger in the event of a frontal crash. The SRSCM determines if and when to deploy the PAB.

CAUTION

Never attempt to measure the circuit resistance of the airbag module (squib) even if you are using the specified tester. If the circuit resistance is measured with a tester, accidental airbag deployment will result in serious personal injury.

Restraint > Airbag Module > Passenger Airbag (PAB) Module > Components and Components Location

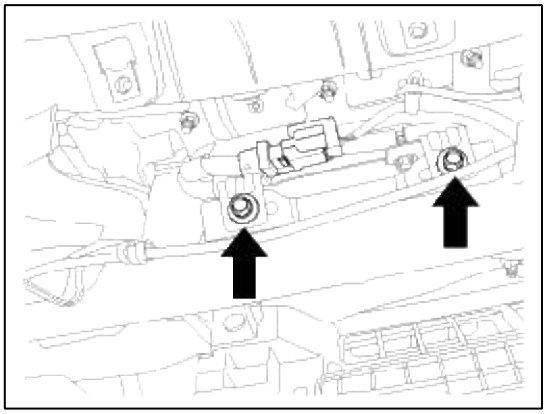
Components



Restraint > Airbag Module > Passenger Airbag (PAB) Module > Repair procedures

Removal

1. Disconnect the battery negative cable and wait for at least three minutes before beginning work.
2. Remove the glove box assembly.
   (Refer to Body group - "Crash pad")
3. Disconnect the PAB connector and remove the PAB mounting bolt.



4. Remove the crash pad.
   (Refer to Body group - "Crash pad")

> NOTE
>
> Replace the crash pad which is damaged while PAB is deployed.

5. Remove the heater duct from the crash pad.
6. Remove the mounting nuts(6EA) from the crash pad. Then remove the passenger airbag.

> CAUTION
>
> The removed airbag module should be stored in a clean, dry place with the airbag cushion up.

Installation

1. Remove the ignition key from the vehicle.

2. Disconnect the battery negative cable from battery and wait for at least three minutes before beginning work.
3. Place a Passenger Airbag (PAB) on the crash pad and tighten the Passenger Airbag (PAB) mounting nuts.

Tightening torque
: 3.9 ~ 6.9 N.m (0.4 ~ 0.7 kgf.m, 2.9 ~ 5.0 lb.ft)

4. Install the heater duct to the crash pad.
5. Install the crash pad.
   (Refer to Body group - "Crash pad")
6. Tighten the PAB mounting bolt.

Tightening torque
: 6.9 ~ 10.8 N.m (0.7 ~ 1.1 kgf.m, 5.1 ~ 8.0 lb.ft)

7. Connect the Passenger Airbag (PAB) harness connector to the SRS main harness connector.
8. Reinstall the glove box assembly.
   (Refer to Body group - "Crash pad")
9. Reconnect the battery negative cable.
10. After installing the Passenger Airbag (PAB), confirm proper system operation:
    A. Turn the ignition switch ON; the SRS indicator light should be turned on for about six seconds and then go off.

Restraint > Airbag Module > Side Airbag (SAB) Module > Description and Operation

Description

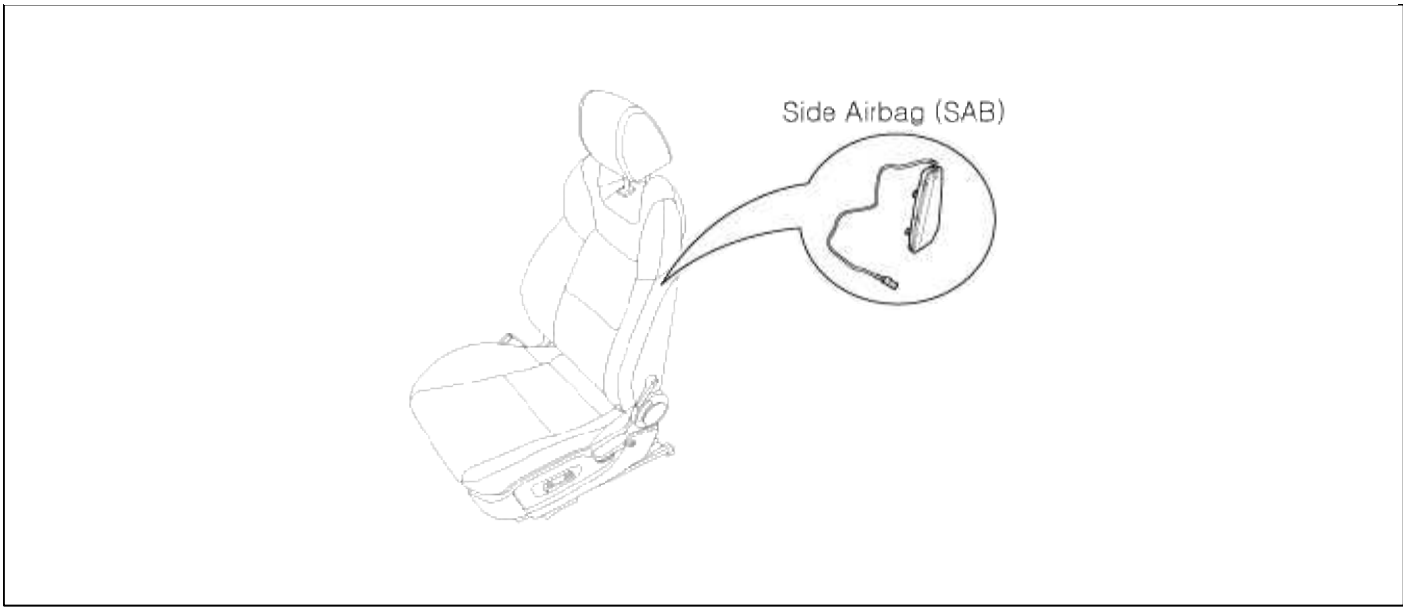
The Side Airbags (SAB) are installed inside the front seat and protect the driver and front passenger from danger when side crash occurs. The SRSCM determines deployment of side airbag by using Side Impact Sensor (SIS) signal.

CAUTION

Never attempt to measure the circuit resistance of the airbag module (squib) even if you are using the specified tester. If the circuit resistance is measured with a tester, accidental airbag deployment will result in serious personal injury.

Restraint > Airbag Module > Side Airbag (SAB) Module > Components and Components Location

Components



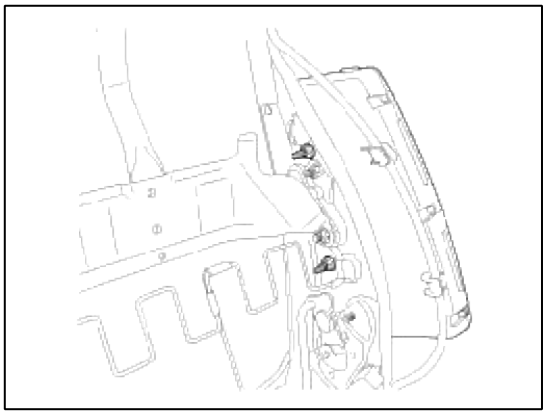
Restraint > Airbag Module > Side Airbag (SAB) Module > Repair procedures

Removal

1. Disconnect the battery negative cable and wait for at least 3 minutes before beginning work.
2. Remove the front seat assembly.
   (Refer to Body group - "Seat")
3. Remove the seat back cover.
   (Refer to Body group - "Seat")

> NOTE
>
> When the front side airbag deployed after a collision, replace the seat back as an assembly.

4. Loosen the SAB mounting nuts and remove the SAB module.



> WARNING
>
> The removed airbag module should be stored in a clean and dry place with the cushion side up.

Installation

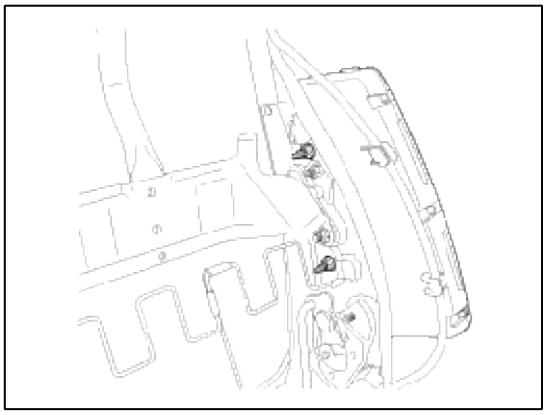
> CAUTION
>
> Be sure to install the harness wires not to be pinched or interfered with other parts.

NOTE

- Do not open the lid of the side airbag cover.
- Use a new mounting nuts when you replace a side airbag.
- Make sure that the airbag assembly cover is installed properly. Improper installation may prevent the proper deployment.

1. Remove the ignition key from the vehicle.
2. Disconnect the battery negative cable and wait for at least three minutes.
3. Place a Side Airbag (SAB) on the side airbag frame and tighten the side airbag mounting nuts (2EA).

Tightening torque
: 5.9 ~ 7.8 N.m (0.6 ~ 0.8 kgf.m , 4.3 ~ 5.8 lb.ft)



4. Install the new seat back cover.
   (Refer to Body group - "Seat")
5. Install the front seat assembly, and then connect the Side Airbag (SAB) harness connector.
6. Recline and slide the front seat forward fully, make sure the harness wires are not pinched of interfering with other parts.
7. Reconnect the battery negative cable.
8. After installing the Side Airbag (SAB), confirm proper system operation:
   A. Turn the ignition switch ON; the SRS indicator light should be turned on for about six seconds and then go off.

Restraint > Airbag Module > Curtain Airbag (CAB) Module > Description and Operation

Description

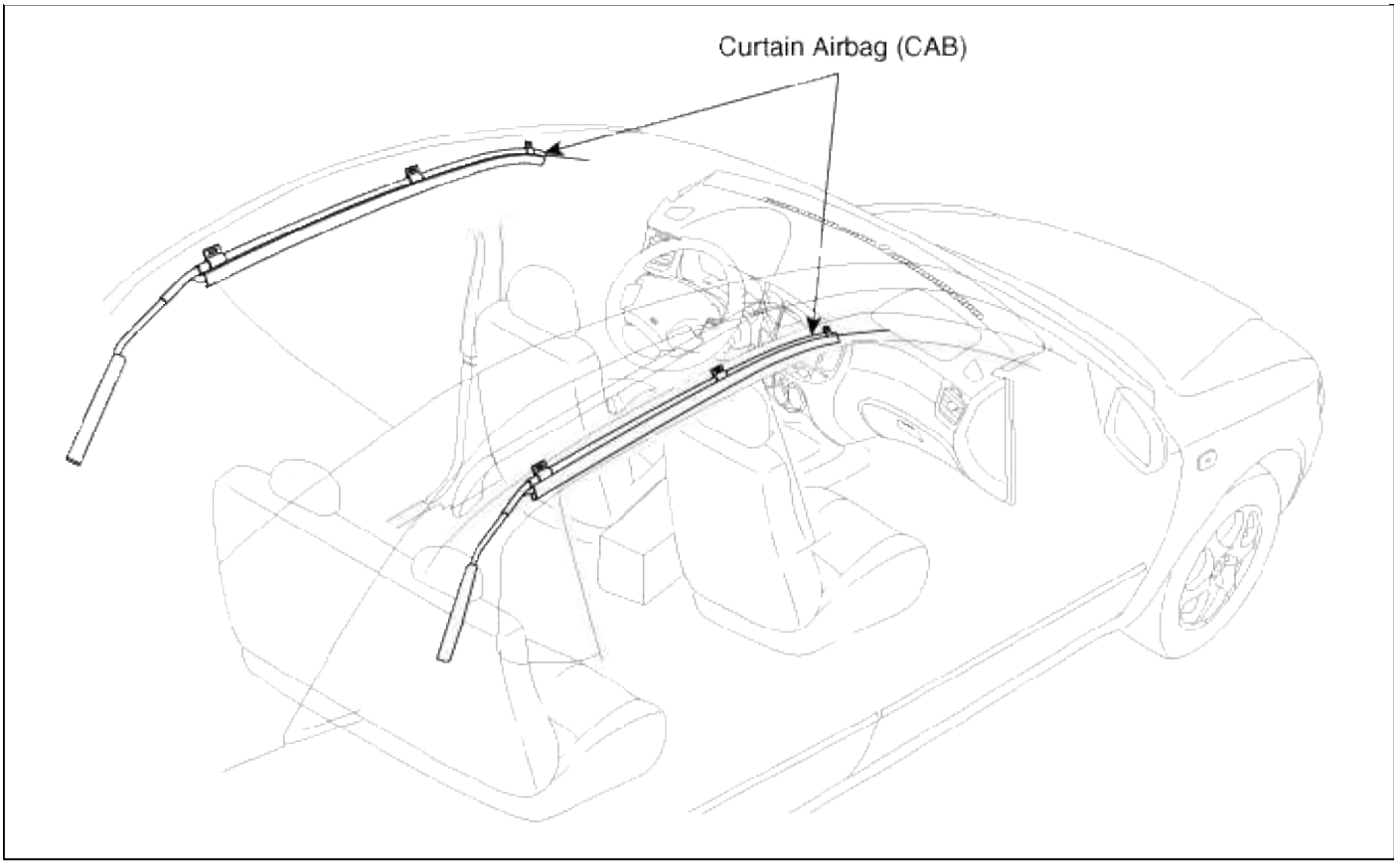
Curtain airbags are installed inside the headliner (LH and RH) and protect the driver and passenger from danger when side crash occurs. The SRSCM determines deployment of curtain airbag by using side impact sensor (SIS) signal.

CAUTION

Never attempt to measure the circuit resistance of the airbag module even if you are using the specified tester. If the circuit resistance is measured with a tester, accidental airbag deployment will result in serious personal injury.

Restraint > Airbag Module > Curtain Airbag (CAB) Module > Components and Components Location

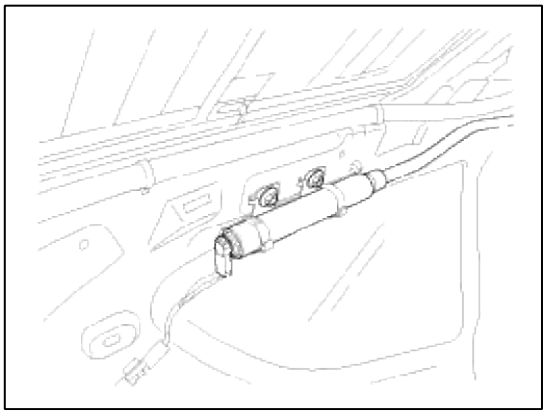
Components



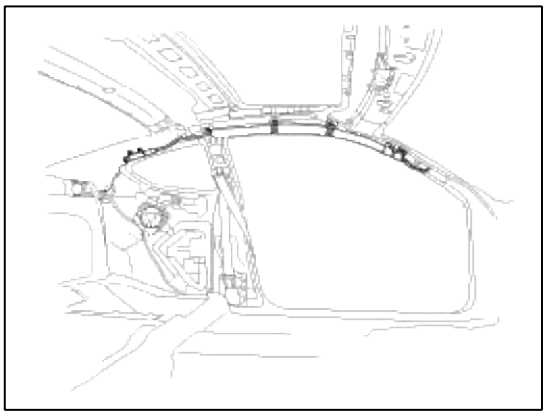
Restraint > Airbag Module > Curtain Airbag (CAB) Module > Repair procedures

Removal

1. Disconnect the battery negative cable and wait for at least 3 minutes before beginning work.
2. Remove the following parts.
   (Refer to Body group - "Interior trim")
   A. Front pillar trim, Rear seat assembly, Door scuff trim
   B. Rear pillar trim, Headliner, luggage side trim
3. Disconnect the Curtain Airbag harness connector.



4. After loosening the mounting bolts and nuts remove the curtain airbag.



Installation

1. Remove the ignition key from the vehicle.
2. Disconnect the battery negative cable and wait for at least three minutes.
3. Tighten the Curtain Airbag (CAB) mounting bolts.

Tightening torque
: 18.6 ~ 26.5 N.m (1.9 ~ 2.7 kgf.m, 13.7 ~ 19.5 lb.ft)

CAUTION

- Never twist the airbag module when installing it. If the module is twisted, airbag module may operate abnormally.

4. Connect the CAB connector.
5. Install the following parts.
   (Refer to Body group - "Interior trim")
   A. Headliner, Front pillar trim, Rear seat assembly
   B. Door scuff trim, luggage side trim, Rear pillar trim
6. Reconnect the battery negative cable.
7. After installing the Curtain Airbag (CAB), confirm proper system operation:
   A. Turn the ignition switch ON; the SRS indicator light should be turned on for about six seconds and then go off.

Restraint > Airbag Module > Airbag Module Disposal > Description and Operation

Airbag Disposal

Special tool required

Deployment tool 0957A-34100A
Before scrapping any airbags or side airbags (including those in a whole vehicle to be scrapped), the airbags or side airbags must be deployed. If the vehicle is still within the warranty period, before deploying the airbags or side airbags, the Technical Manager must give approval and/or special instruction. Only after the airbags or side airbags have been deployed (as the result of vehicle collision, for example), can they be scrapped. If the airbags or side airbags appear intact (not deployed), treat them with extreme caution. Follow this procedure.
Deploying airbags in the vehicle
If an SRS equipped vehicle is to be entirely scrapped, its airbags or side airbags should be deployed while still in the vehicle. The airbags or side airbags should not be considered as salvageable parts and should never be installed in another vehicle.
1. Turn the ignition switch OFF, and disconnect the battery negative cable and wait at least three minutes.

2. Confirm that each airbag or side airbag is securely mounted.
3. Confirm that the special tool is functioning properly by following the check procedure.
   (1) Driver's Airbag :
      A. Remove the driver's airbag and install the SST (0957A-38500).
      B. Install the driver's airbag on the steering wheel.
   (2) Front Passenger's Airbag :
      A. Remove the glove box, and then disconnect the 2P connector between the front passenger's airbag and SRS main harness.
      B. Install the SST(0957A-3F100).
   (3) Side Airbag :
      A. Disconnect the 2P connector between the side airbag and side wire harness.
      B. Install the SST (0957A-3F100).
   (4) Curtain Airbag :
      A. Disconnect the 2P connector between the curtain airbag and wire harness.
      B. Install the SST (0957A-38500).
   (5) Seat Belt Pretensioner :
      A. Disconnect the 2P connector from the seat belt pretensioner.
      B. Install the SST (0957A-38500).
4. Place the deployment tool at least thirty feet (10meters) away from the airbag.
5. Connect a 12 volt battery to the tool.
6. Push the tool's deployment switch. The airbag should deploy (deployment is both highly audible and visible: a loud noise and rapid inflation of the bag, followed by slow deflection)
7. Dispose of the complete airbag. No part of it can be reused. Place it in a sturdy plastic bag and seal it securely.

Deploying the airbag out of the vehicle

If an intact airbag has been removed from a scrapped vehicle, or has been found defective or damage during transit, storage or service, it should be deployed as follows:

1. Confirm that the special is functioning properly by following the check procedure on this page.
2. Position the airbag face up, outdoors on flat ground at least thirty feet (10meters) from any obstacles or people.

Disposal Of Damaged Airbag

1. If installed in a vehicle, follow the removal procedure of driver's airbag front passenger's and side airbag.
2. In all cases, make a short circuit by twisting together the two airbag inflator wires.
3. Package the airbag in exactly the same packing that the new replacement part come in.

Restraint > Seat Belt Pretensioner > Seat Belt Pretensioner (BPT) > Description and Operation

Description

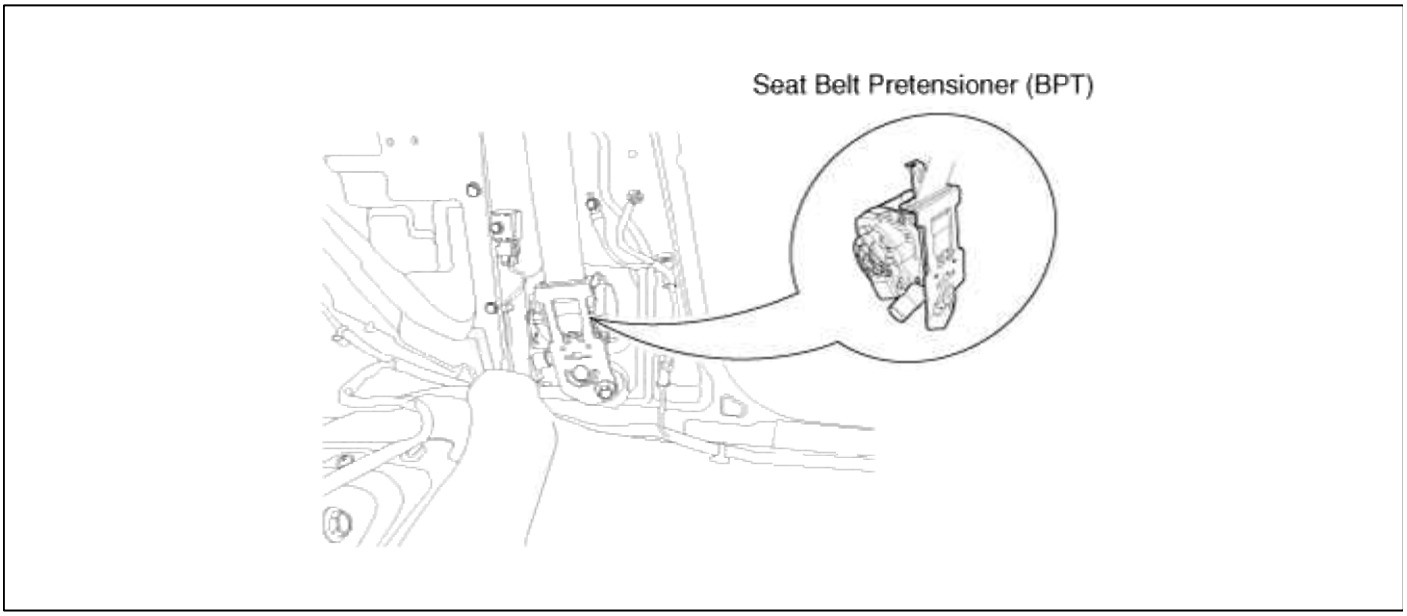
The Seat Belt Pretensioners (BPT) are installed inside Center Pillar (LH & RH). When a vehicle crashes with a certain degree of frontal impact, the pretensioner seat belt helps to reduce the severity of injury to the front seat occupants by retracting the seat belt webbing. This prevents the front occupants from thrusting forward and hitting the steering wheel or the instrument panel when the vehicle crashes.

CAUTION

Never attempt to measure the circuit resistance of the Seat Belt Pretensioner (BPT) even if you are using the specified tester. If the circuit resistance is measured with a tester, the pretensioner will be ignited accidentally. This will result in serious personal injury.

Restraint > Seat Belt Pretensioner > Seat Belt Pretensioner (BPT) > Components and Components Location

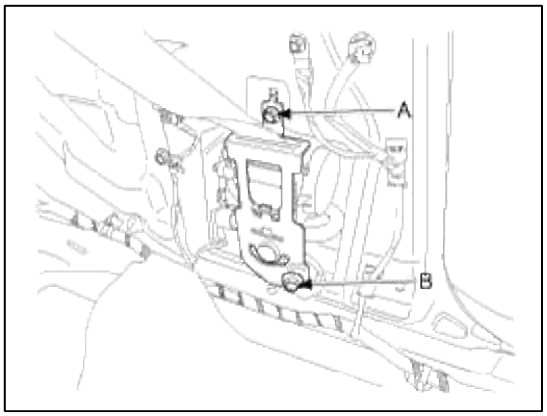
Components



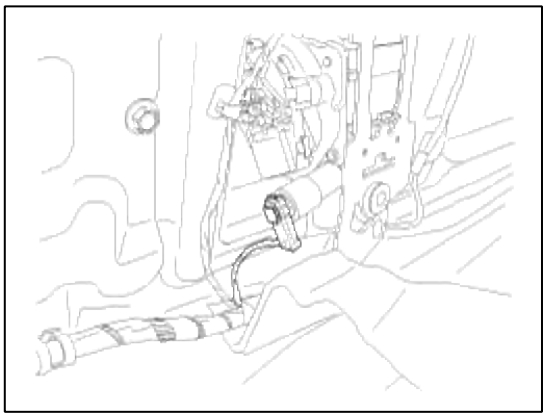
Restraint > Seat Belt Pretensioner > Seat Belt Pretensioner (BPT) > Repair procedures

Removal

1. Disconnect the battery negative cable, and wait for at least three minutes before beginning work.
2. Remove the lower anchor bolt.
3. Remove the following parts.
   (Refer to Body group - "Interior trim")
   A. Rear seat assembly, Door scuff trim
   B. Iuggage side trim, Center upper trim
4. Remove the upper anchor bolt.
5. Loosen the Seat Belt Pretensioner mounting bolt and remove the Seat Belt Pretensioner.



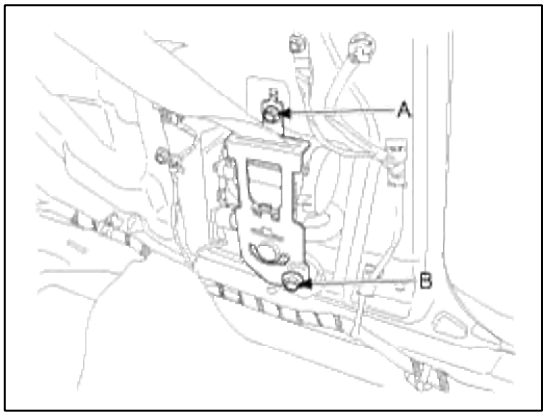
6. Disconnect the Seat Belt Pretensioner connector.



Installation

1. Remove the ignition key from the vehicle.
2. Disconnect the battery negative cable and wait for at least three minutes.
3. Connect the Seat Belt Pretensioner (BPT) connector.
4. Install the Seat Belt Pretensioner (BPT) with a bolt.

Tightening torque
Bolt B : 39.2 ~ 53.9 N.m (4.0 ~ 5.5 kgf.m, 28.9 ~ 39.8 lb.ft)



5. Install the upper anchor bolts.

Tightening torque
: 39.2 ~ 53.9 N.m (4.0 ~ 5.5 kgf.m, 28.9 ~39.8 lb.ft)

6. Install the following parts.
   (Refer to Body group - "Interior trim")
   A. Center upper trim, luggage side trim
   B. Door scuff trim, Rear seat assembly
7. Install the lower anchor bolts.

Tightening torque
: 39.2 ~ 53.9 N.m (4.0 ~ 5.5 kgf.m, 28.9 ~39.8 lb.ft)

8. Reconnect the battery negative cable.
9. After installing the Seat Belt Pretensioner (BPT), confirm proper system operation:
   A. Turn the ignition switch ON; the SRS indicator light should be turned on for about six seconds and then go off.28

GENESIS COUPE(BK) > 2013 > G 2.0 T-MPI > Steering System

Steering System > General Information > Specifications

Specifications

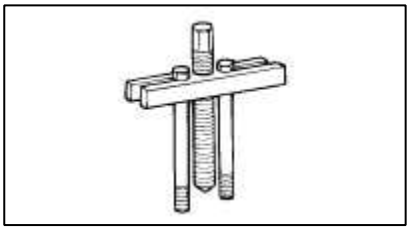
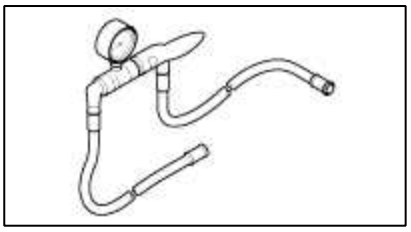
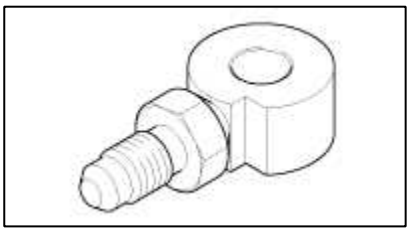
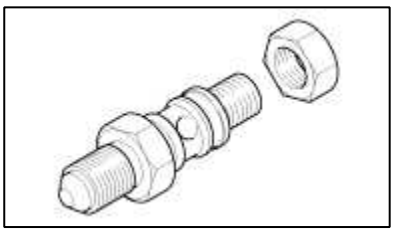
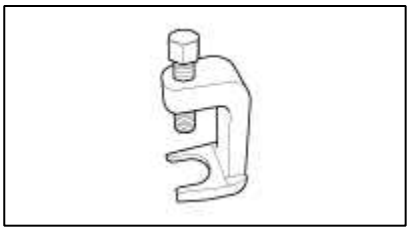
Item		Specification
Steering gear	Type	Rack & Pinion
	Rack stroke	129mm (5.0787 in)
Oil pump	Type	Vane
	Relief pressure	100 ~ 105kgf/cm²
Steering angle	Inner	38.01°±1°30’
	Outer	31.6°
Power steering oil		PENTOSIN CHF202

Tightening Torques

Item	Tightening torque		
	N.m	kgf.m	lb-ft
Wheel nuts	88.3 ~ 107.9	9.0 ~ 11.0	65.1 ~ 79.6
Steering column assembly and universal joint	29.4 ~ 34.3	3.0 ~ 3.5	21.7 ~ 25.3
Steering column assembly mounting bolt & nuts	12.7 ~ 17.7	1.3 ~ 1.8	9.4 ~ 13.0
Tie rod end & front axle	58.8 ~ 78.5	6.0 ~ 8.0	43.4 ~ 57.9
Steering gear box & sub frame	78.5 ~ 98.1	8.0 ~ 10.0	57.9 ~ 72.3
Steering gear box & bracket	19.6 ~ 29.4	2.0 ~ 3.0	14.5 ~ 21.7
Pressure tube wrench bolt & power steering pump	53.9 ~ 63.7	5.5 ~ 6.5	39.8 ~ 47.0
Steering gear box & universal joint	17.7 ~ 24.5	1.8 ~ 2.5	13.0 ~ 18.1
Dust cover & dash	12.7 ~ 17.7	1.3 ~ 1.8	9.4 ~ 13.0
Dust cover clamp	6.9 ~ 11.8	0.7 ~ 1.2	5.1 ~ 8.7

Steering System > General Information > Special Service Tools

Special Service Tools

Tool (Number and Name)	Illustration	Use
09561-11001 Steering wheel puller		Removal of steering wheel
09572-21000 Oil pressure gauge		Measurement of oil pressure (Use with 09572-22100, 09572-21200)
09572-22100 Oil pressure gauge adaptor		Measurement of oil pressure (Use with 09572-21000, 09572-21200)
09572-21200 Oil pressure gauge adaptor		Measurement of oil pressure (Use with 09572-22100, 09572-22100)
09568-2J100 Ball joint puller		Separation of tie-rod end ball joint

Steering System > General Information > Troubleshooting

Troubleshooting

Symptom	Probable cause	Remedy
Excessive play in steering	Loose yoke plug	Retighten
	Loose steering gear mounting bolts	Retighten
	Loose or worn tie rod end	Retighten or replace as necessary
Steering wheel operation is not smooth (Insufficient power assist)	V-belt slippage	Readjust
	Damaged V-belt	Replace
	Low fluid level	Replenish
	Air in the fluid	Bleed air
	Twisted or damaged hoses	Correct the routing or replace

	Insufficient oil pump pressure	Repair or replace the oil pump
	Sticky flow control valve	Replace
	Excessive internal oil pump leakage	Replace the damaged parts
	Excessive oil leaks from rack and pinion in gear box	Replace the damaged parts
	Distorted or damaged gear box or valve body seals	Replace
Steering wheel does not return properly	Excessive turning resistance of tierod end	Replace
	Yoke plug excessively tight	Adjust
	Tie rod and/or ball joint cannot turn smoothly	Replace
	Loose mounting of gear box mounting bracket Worn steering shaft joint and/or	Retighten
	Worn steering shaft joint and/or body grommet	Correct or replace
	Distorted rack	Replace
	Damaged pinion bearing	Replace
	Twisted or damaged hoses	Reposition or replace
	Damaged oil pressure control valve	Replace
	Damaged oil pump input shaft bearing	Replace
Noise	Hissing Noise in Steering Gear There is some noise with all power steering systems. One of the most common is a hissing sound when the steering wheel is turned and the car is not moving. This noise will be most evident when turning the wheel while the brakes are being applied. There is no relationship between this noise and steering performance. Do not replace the valve unless the "hissing" noise becomes extreme. A replaced valve will also make a slight noise, and is not always a solution for the condition.	
Rattling or chucking noise in the rack and pinion	Interference with hoses from vehicle body	Reposition
	Loose gear box bracket	Retighten
	Loose tie rod end and/or ball joint	Retighten
	Worn tie rod and/or ball joint	Replace
Noise in the oil pump	Low fluid level	Replenish
	Air in the fluid	Bleed air
	Loose pump mounting bolts	Retighten

Steering System > General Information > Repair procedures

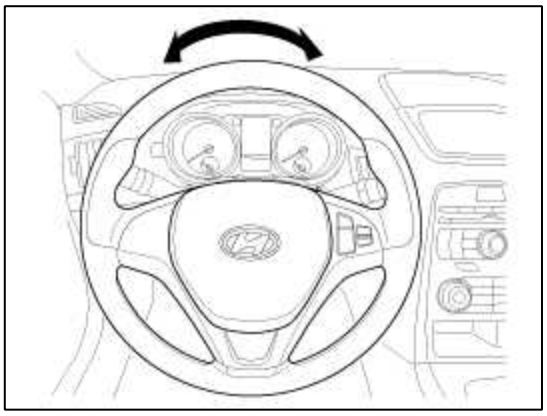
Adjustment

Steering Wheel Play Inspection

1. Turn the steering wheel so that the front wheels can face straight ahead.

2. Measure the distance the steering wheel can be turned without moving the front wheels.

Standard value: 30mm (1.1811in.) or less

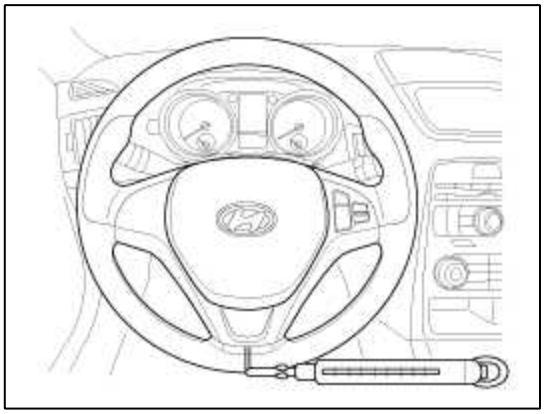


3. If the play exceeds standard value, inspect the steering column, shaft, and linkages.

Checking stationary steering effort

1. Position the vehicle on a level surface and place the steering wheel in the straight ahead position.
2. Start the engine and turn the steering wheel from lock to lock several times to warm up the power steering fluid.
3. Attach a spring scale to the steering wheel. With the engine speed 900 ~ 1100rpm, pull the scale and read it as soon as the tires begin to turn.

Standard value: 3.5kgf or less



4. If the measured value exceeds standard value, inspect the power steering gear box and pump.

Power steering fluid replacement

CAUTION

Always use genuine power steering fluid. Using other type of power steering fluid or ATF can cause increased wear and poor steering in cold weather.

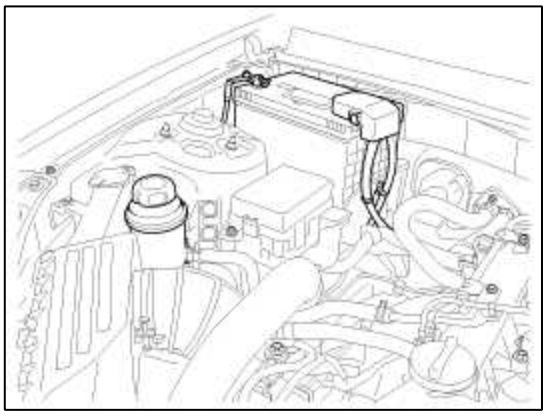
1. Raise the reservoir and then disconnect the return hose to drain the reservoir. Take care not to spill the fluid on the body and parts. Wipe off any spilled fluid at once.
2. Connect a tube of suitable diameter to the disconnected return hose, and put the hose end in a suitable container.
3. Jack up the front wheels and turn the steering wheel from the lock to lock until fluid stops running out of the tube.
4. Reconnect the return hose to reservoir
5. Fill the reservoir with the power steering fluid and then bleed the power steering system.

Air bleeding

CAUTION

Always use genuine power steering fluid. Using other type of power steering fluid or ATF can cause increased wear and poor steering in cold weather.

1. Fill the reservoir with the power steering fluid up to the level of 'COLD MAX' marked on the reservoir.



> NOTE
>
> While conducting the following operations, keep replenishing the reservoir so that the fluid level can be always between the 'COLD MAX' and the 'COLD MIN' marked on the reservoir.

2. Jack up the front wheels.
3. Crank the engine 1 ~ 2times by turning the ignition key very quickly from the 'On' position to the 'Start' position, but do not start the engine.

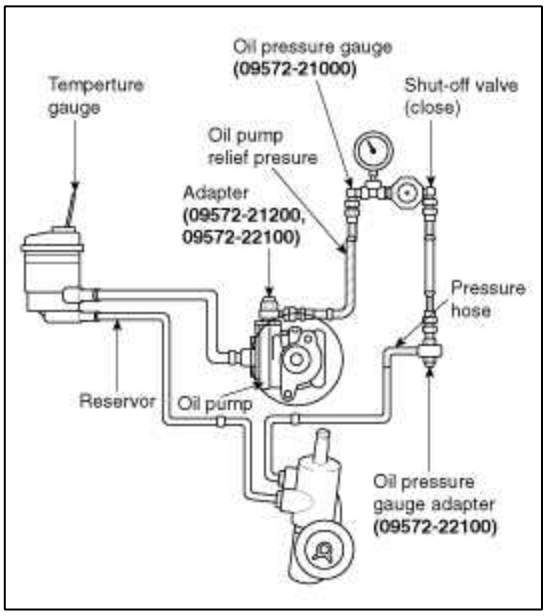
> CAUTION
>
> Be careful not to start the engine. If starting the engine before performing the steps 3 through 4, it may cause an abnormal noise during power steering pump operation.

4. Turn the steering wheel from lock to lock 5 ~ 6 times for 15 ~ 20 seconds.
5. Start the engine and keep turning the steering wheel from lock to lock until air bubbles stop appearing in the reservoir with the engine idle.
6. Check the color and level of the power steering fluid in the reservoir and then replenish the reservoir up to the 'COLD MAX' level as required.

> NOTE
>
> If the fluid level moves up and down when turning the steering wheel, the fluid overflows out of the reservoir when the turning off the engine or the fluid has white color, it indicates that air bubbles have not been removed sufficiently from the power steering system. Therefore, repeat the steps 5 through 6 as required.

Oil pump relief pressure test

1. Disconnect the pressure tube from the power steering pump and then install the special tools between the pump and the pressure tube as illustration below.



2. Start the engine and turn the steering wheel several times so that the fluid temperature can rise to approx. 50 ~ 60 C (122 F).
3. Set the engine speed to approx. 1000rpm.
4. Close the shut-off valve of the special tools and measure the fluid pressure.

Relief pressure:
100 ~ 105kgf/cm² (1422 ~ 1493psi, 9.7 ~ 10.2Mpa)

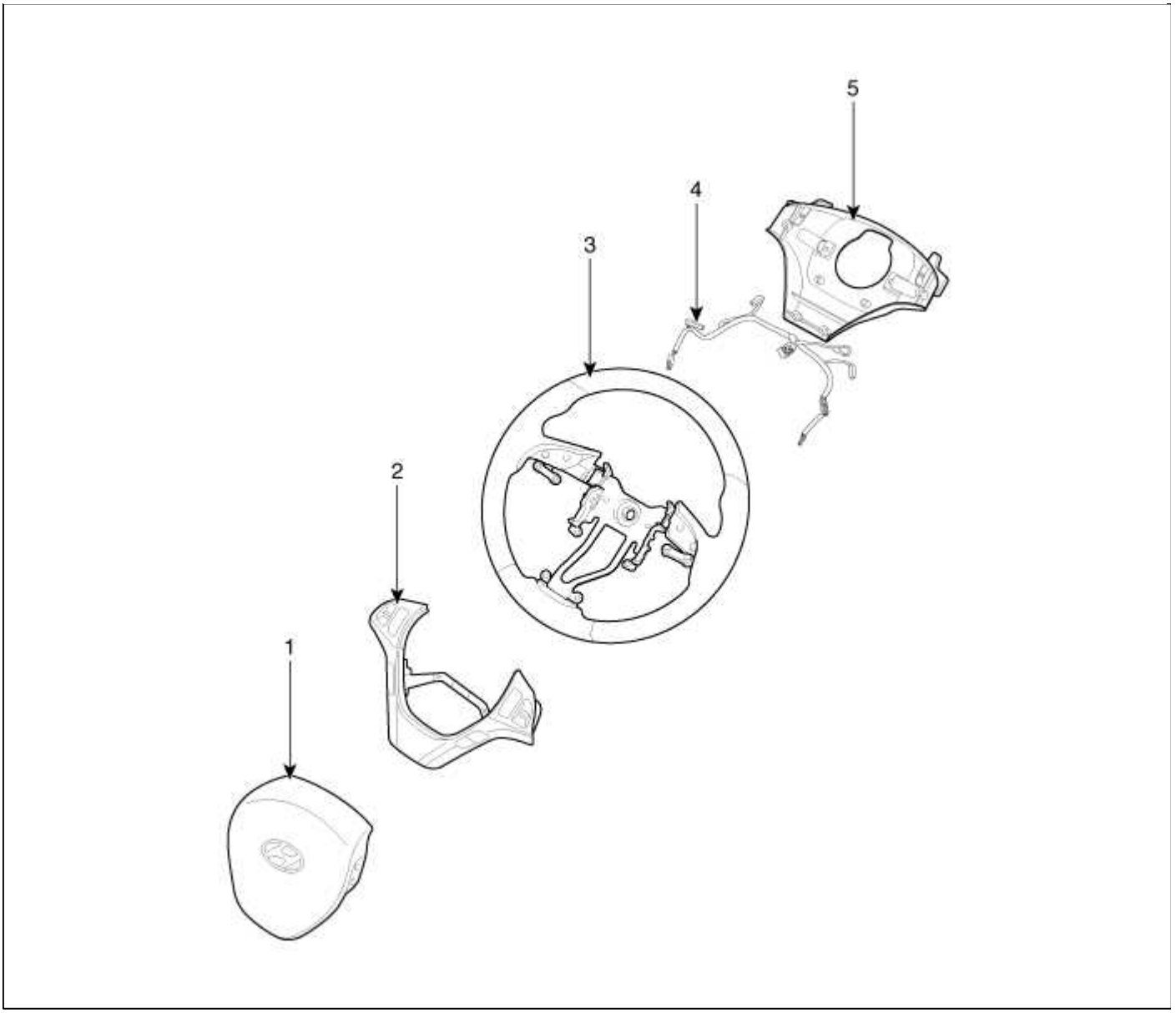
CAUTION

Do not keep the shut-off valve on the pressure gauge closed for longer than 10 seconds.

5. Remove the special tools, and than connect the pressure tube to the pump by tightening the eye bolt.
6. Bleed the power steering system.

Steering System > Steering wheel > Components and Components Location

Components



1. Driver airbah module (DAB) 2. Remote control assembly 3. Steering wheel	4. Wiring 5. Lower cover

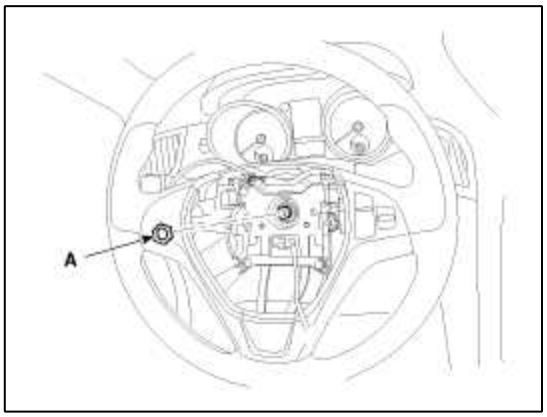
Steering System > Steering wheel > Repair procedures

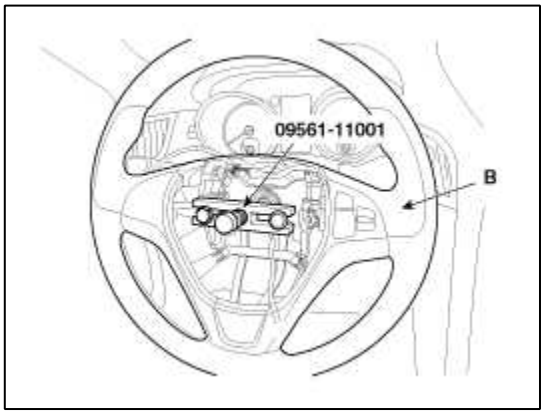
Removal

1. Disconnect the battery negative cable from the battery and then wait for at least 30 seconds.
2. Turn the steering wheel so that the front wheels can face straight ahead.
3. Remove the airbag module.
   (Refer to Restraint - "Airbag Module")

4. Disconnect the lock nut (A) remove the steering wheel (B) by using special service tools. (09561-11001)

Tightening torque :
39.2 ~ 44.1N.m (4.0 ~ 4.5kgf.m, 28.9 ~ 32.5lb-ft)





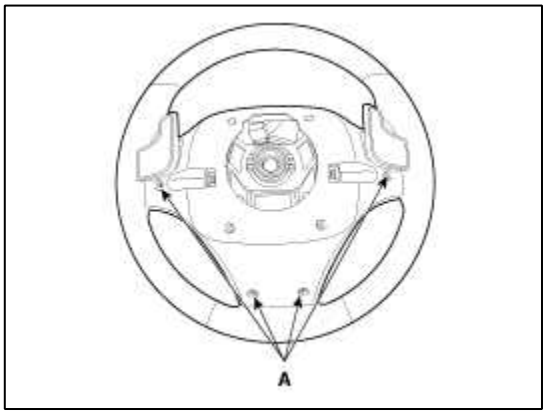
CAUTION

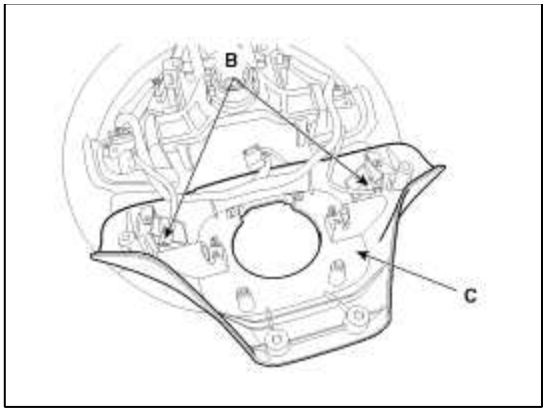
- Do not hammer on the steering wheel to remove it; it may damage the steering column.

5. Installation is the reverse of the removal.

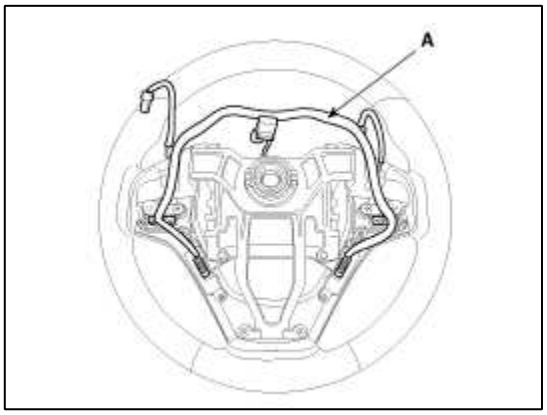
Disaseembly

1. Disconnect the screw (A-4ea) & paddle shift connector (B) and then remove the lower cover (C).

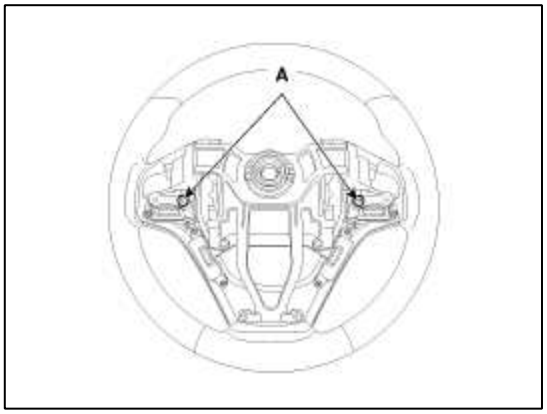


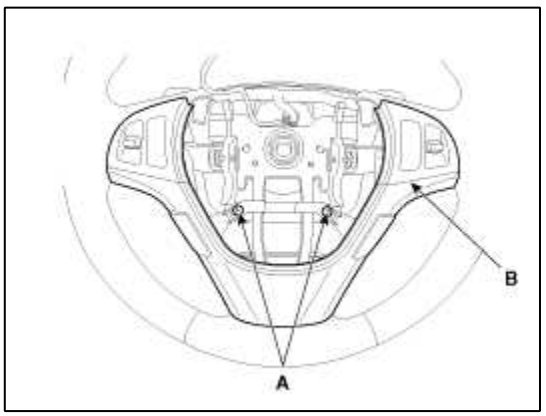


2. Disconnect the wiring (A)



3. Disconnect the screw (A-4ea) remove the remote control assembly (B).

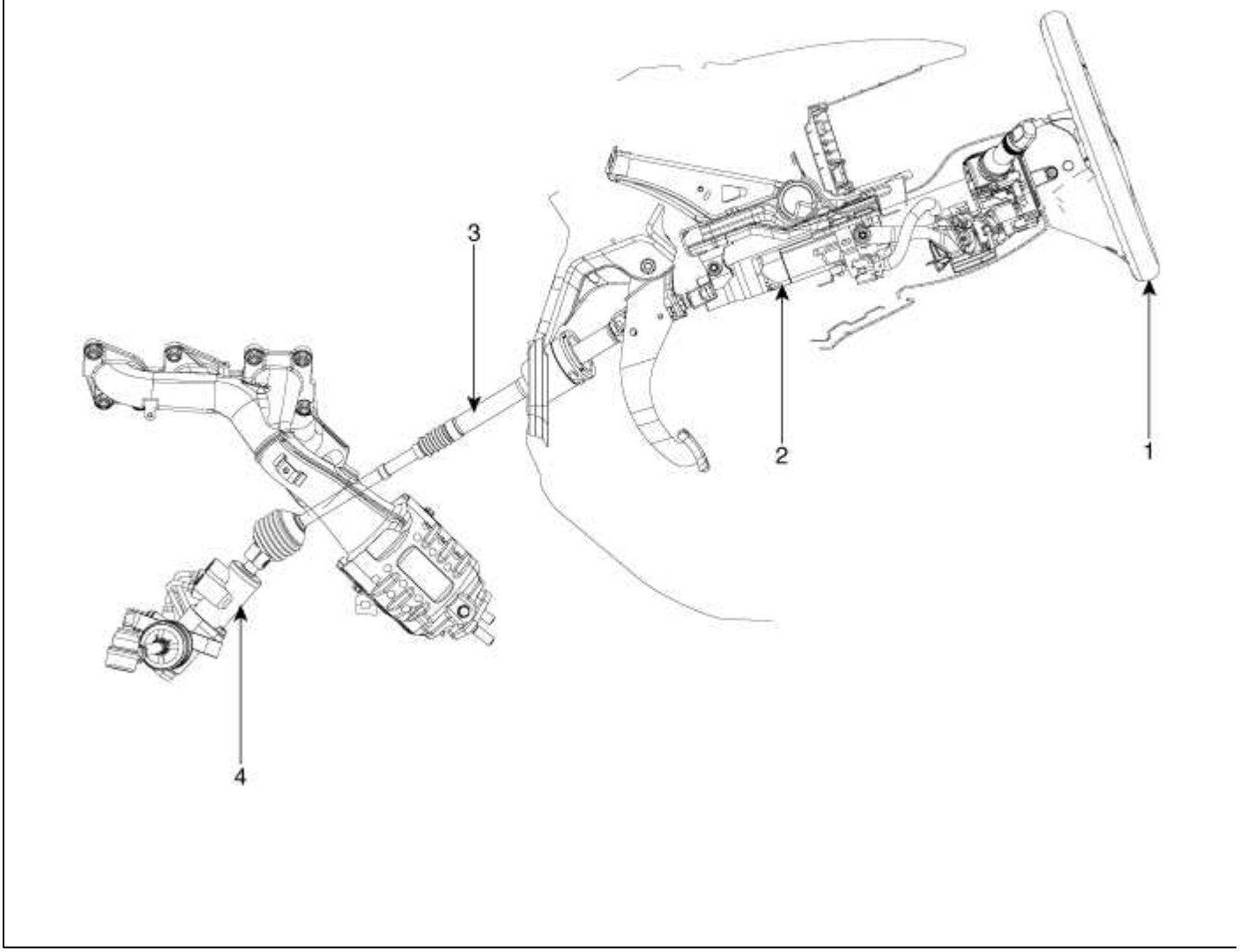




4. Reassembly is the reverse of the disaseembly.

Steering System > Steering Column & Shaft > Steering Column-Shaft > Components and Components Location

Components



1. Steering wheel 2. Steering column	3. Wheel joint assembly 4. Steering gear box

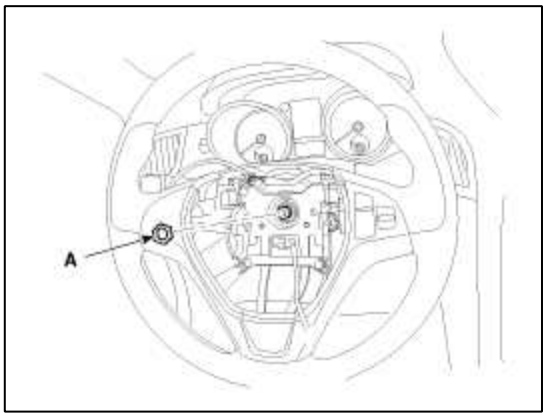
Steering System > Steering Column & Shaft > Steering Column-Shaft > Repair procedures

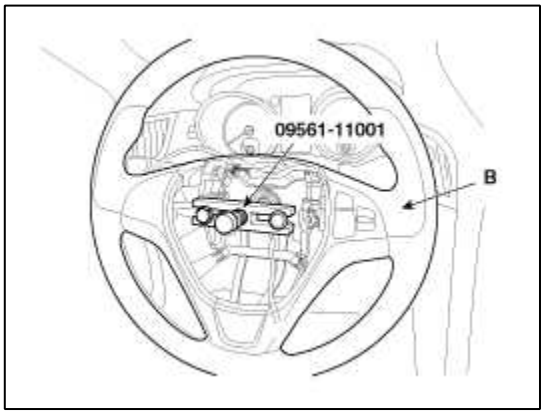
Replacement

1. Disconnect the battery negative cable from the battery and then wait for at least 30 seconds.
2. Turn the steering wheel so that the front wheels can face straight ahead.
3. Remove the airbag module.
   (Refer to Restraint - "Airbag Module")

4. Disconnect the lock nut (A) remove the steering wheel (B) by using special service tools. (09561-11001)

Tightening torque :
39.2 ~ 44.1N.m (4.0 ~ 4.5kgf.m, 28.9 ~ 32.5lb-ft)

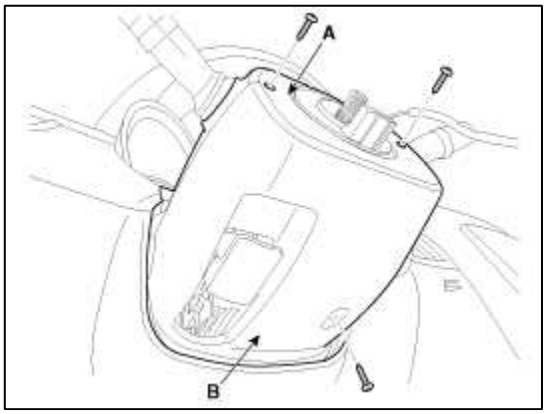




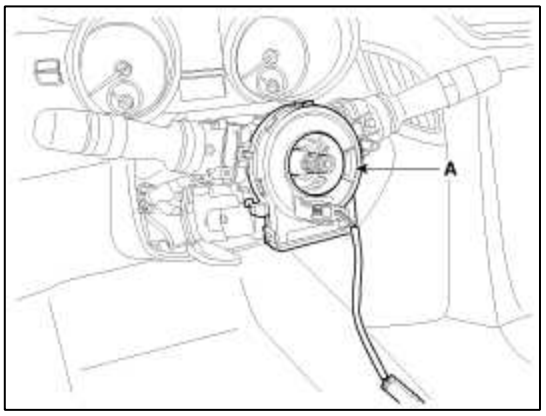
CAUTION

- Do not hammer on the steering wheel to remove it; it may damage the steering column.

5. Remove the steering column upper (A) and lower shroud (B).



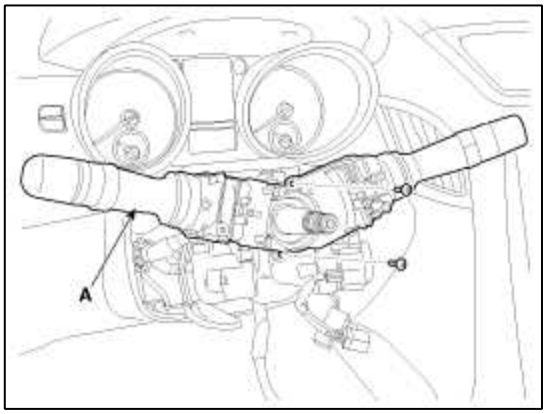
6. Remove the clock spring (A).



CAUTION

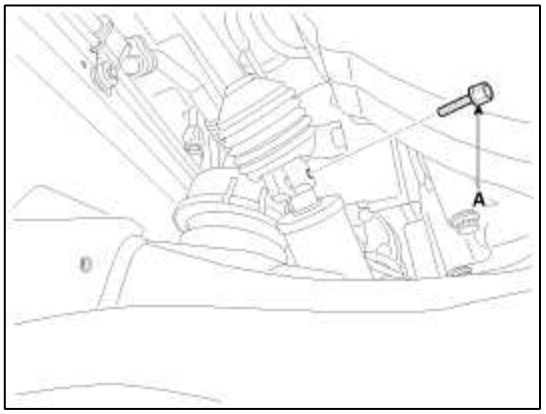
- When assembling set the center position by setting the marks between the clock spring and the cover into line. Make an array the mark ( ) by turning the clock spring clockwise to the stop and then 2.0 revolutions counterclockwise.

7. Remove the multifunction switches (A).



8. Remove the lower crash pad.
(Refer to Body - "Crash Pad")
9. Loosen the bolt and then disconnect the universal joint (A) assembly from the pinion of the steering gear box.

Tightening torque :
17.7 ~ 24.5N.m (1.8 ~ 2.5kgf.m, 13.0 ~ 18.1lb-ft)

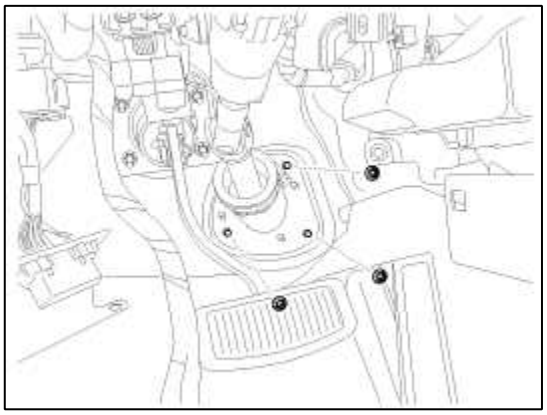


CAUTION

- Lock the steering wheel in the straight ahead position to prevent the damage of the clock spring inner cable when you handle the steering wheel.
- Change to the new bolt when assembling.

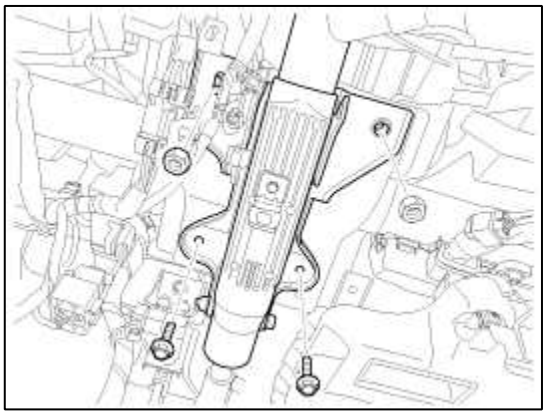
10. Remove the steering column dust cover bolts.

Tightening torque :
12.7 ~ 17.7N.m (1.3 ~ 1.8kgf.m, 9.4 ~ 13.0lb-ft)



11. Disconnect all connectors connected to the steering column assembly.
12. Remove the steering column assembly by loosening the mounting bolts and nuts.

Tightening torque :
12.7 ~ 17.7N.m (1.3 ~ 1.8kgf.m, 9.4 ~ 13.0lb-ft)



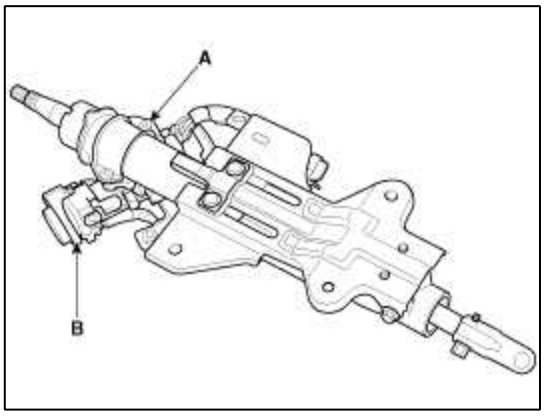
13. Installation is the reverse of the removal.

Disassembly

1. Make a groove on head of the special bolt (A) by using a punch.

2. Use a screwdriver to remove the key lock assembly (B).

Tightening torque :
6.9 ~ 12.7N.m (0.7 ~ 1.3kgf.m, 5.1 ~ 9.4lb-ft)

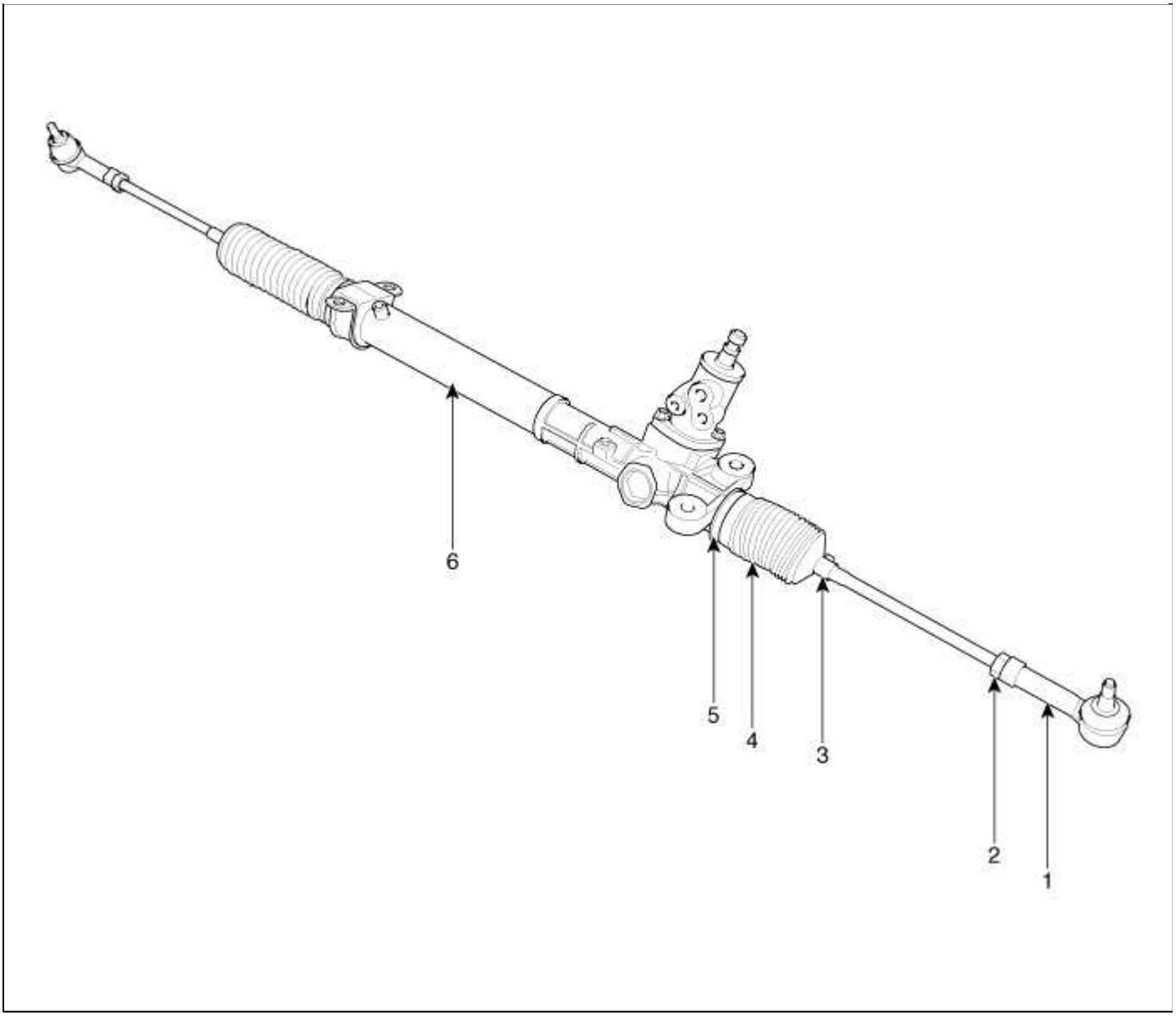


Inspection

1. Check the steering column for damage and deformation.
2. Check the join bearing for damage and wear.
3. Check the tilt bracket for damage and cracks.
4. Check the key lock assembly for proper operation and replace it if necessary.

Steering System > Hydraulic Power Steering System > Power Steering Gear Box > Components and Components Location

Components



1. Tie rod end assembly 2. Lock nut 3. Bellows clip	4. Bellows 5. Bellows band 6. Rack housing assembly

Steering System > Hydraulic Power Steering System > Power Steering Gear Box > Repair procedures

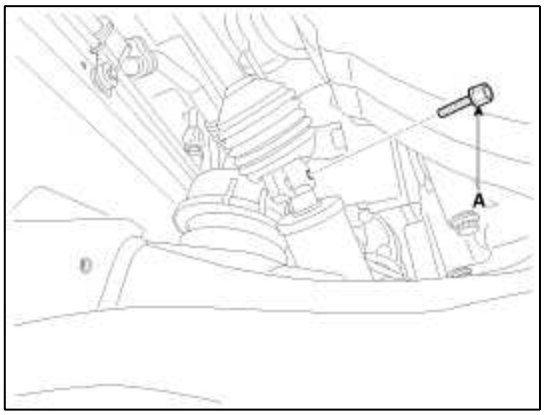
Replacement

1. Drain the power steering fluid.
2. Remove the front wheel & tire.

Tightening torque :
88.3 ~ 107.9N.m (9.0 ~ 11.0kgf.m, 65.1 ~ 79.6lb-ft)

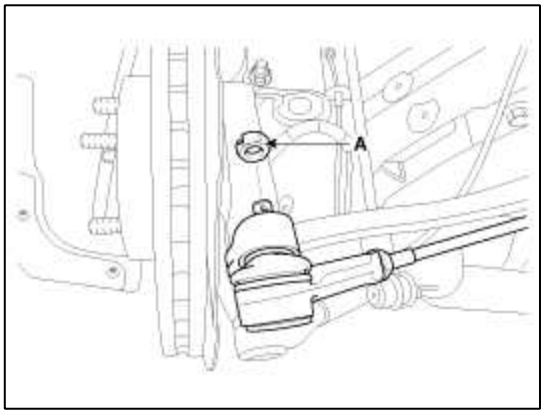
3. Loosen the bolt and then disconnect the universal joint (A) assembly from the pinion of the steering gear box.

Tightening torque :
17.7 ~ 24.5N.m (1.8 ~ 2.5kgf.m, 13.0 ~ 18.1lb-ft)

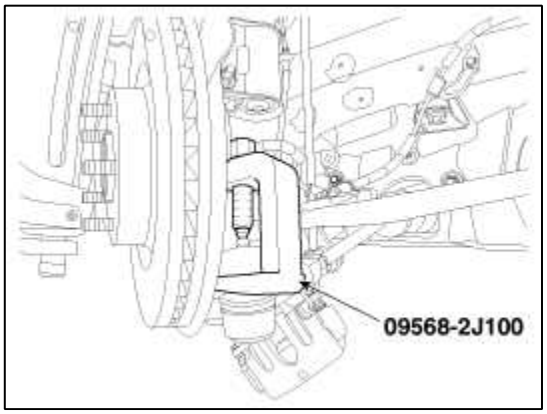


4. Loosen the castle nut (A).

Tightening torque :
58.8 ~ 78.5N.m (6.0 ~ 8.0kgf.m, 43.4 ~ 57.9lb-ft)

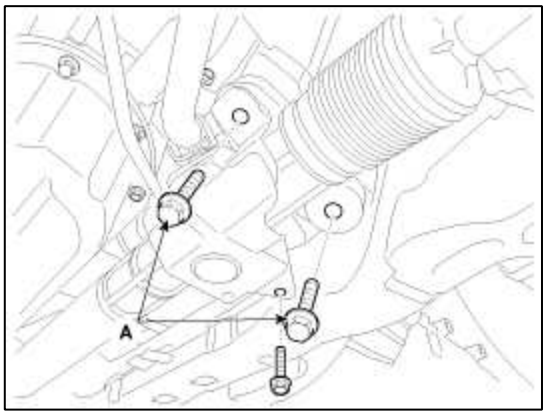


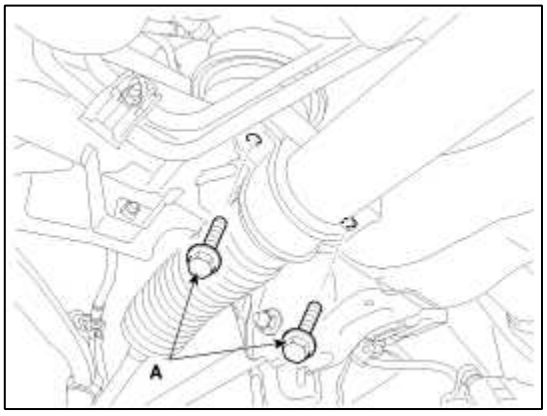
5. Remove the Tie rod end from the front axle by using a SST (09568-2J100).



6. Remove steering gearbox from the cross member by loosening the bracket mounting bolts (A).

Tightening torque :
58.8 ~ 78.5N.m (6.0 ~ 8.0kgf.m, 43.4 ~ 57.9lb-ft)

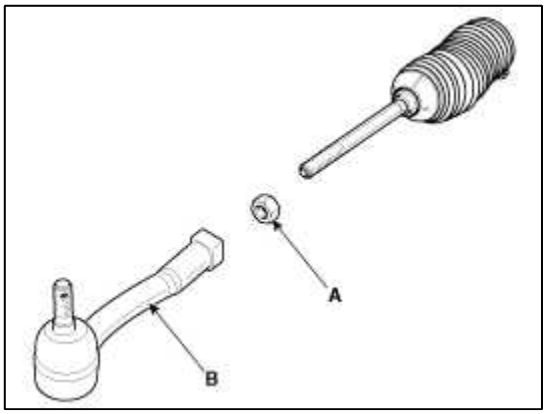




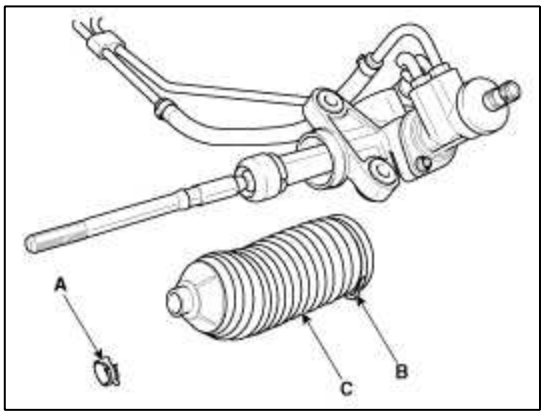
7. Installation is the reverse of the removal.

Disassembly

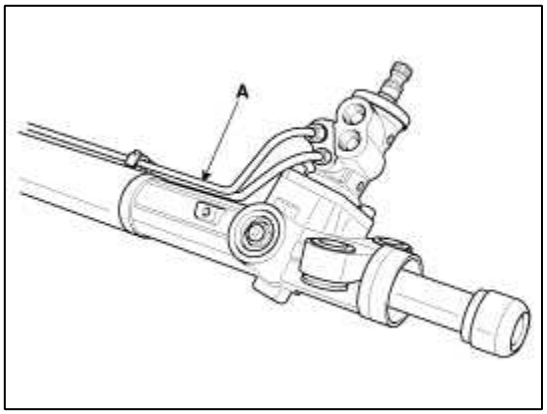
1. Loosen the lock nut (A) and then unscrew the toe-rod end (B) and lock nut from the tie-rod.



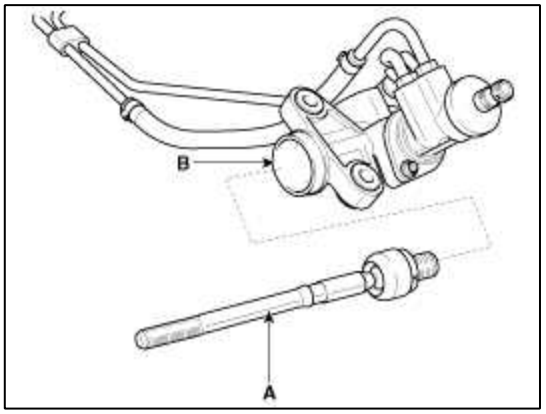
2. Remove the bellows clip (A) and band (B) and then pull the bellows (C) away from the end of the tie-rod.



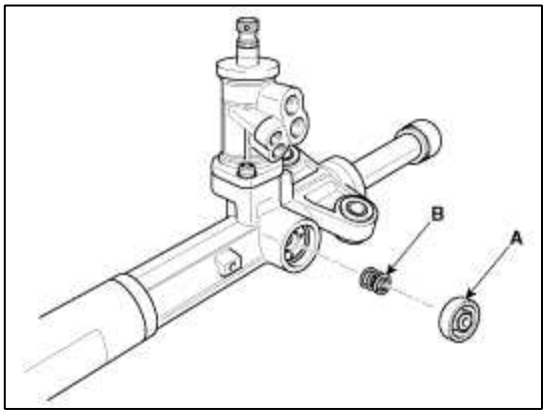
3. Remove the feed tubes (A) from the steering gear box.



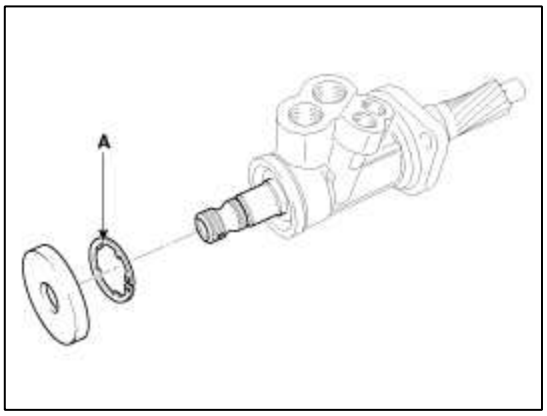
4. Unscrew the tie-rod (A) from the rack bar (B).



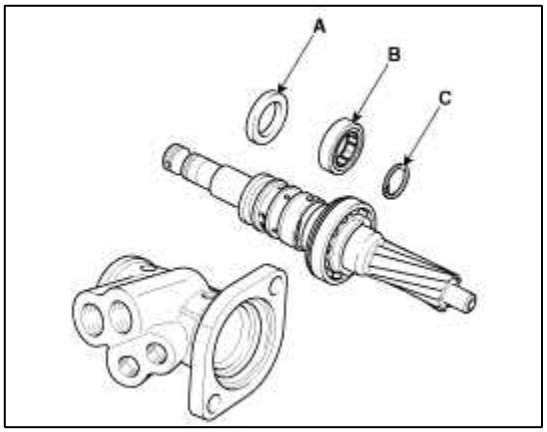
5. Remove the lock nut and yoke plug and then pull out the yoke spring and support yoke.



6. Remove the snap ring (A).



7. Remove the oil seal (A), bearing (B) and snap ring (C).



CAUTION

Do not allow dust, dirt, or foreign materials to contact the disassembled parts or inside of the valve assembly housing.

8. Unscrew the rack bush and pull the rack bar out of the rack housing.
9. Reassembly is the reverse of the disassembly.

Inspection

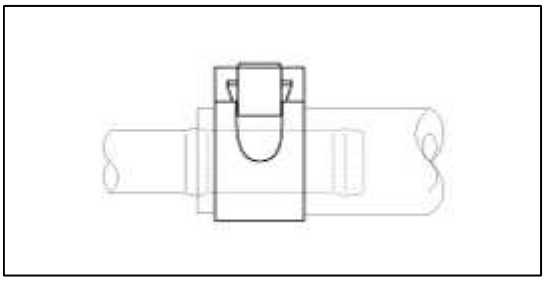
1. Rack
   A. Check for rack tooth face damage or wear.
   B. Check for oil seal contact surface damage.
   C. Check for rack bending or twisting.
   D. Check for oil seal ring damage or wear.
   E. Check for oil seal damage or wear.
2. Pinion valve
   A. Check for pinion gear tooth face damage or wear.
   B. Check for oil seal contact surface damage.
   C. Check for seal ring damage or wear.
   D. Check for oil seal damage or wear.
3. Bearing
   A. Check for seizure or abnormal noise during abearing rotation.
   B. Check for excessive play.
   C. Check for missing needle bearing rollers.

4. Others
   A. Check for damage of the rack housing cylinder bore.
   B. Check for boot damage, cracking or aging.

Steering System > Hydraulic Power Steering System > Power Steering Hoses > Repair procedures

Replacement

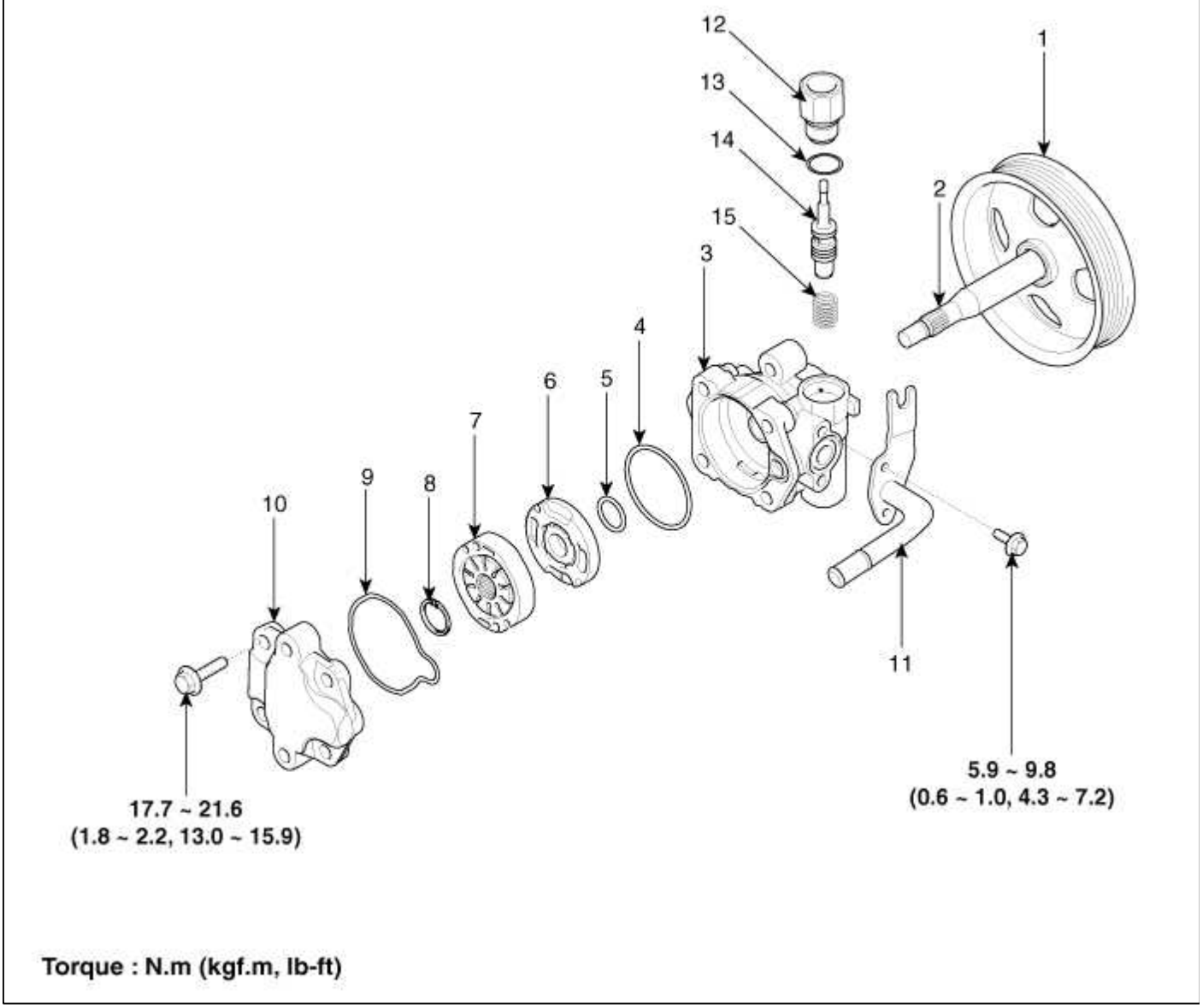
- Refer to the components illustration during removal or installation.
- When installing, be sure to connect between hose to tube using a clamp as shown in the illustration.



- Check all clamps for deterioration or deformation; replace with the clamps new one if necessary.
- Add the recommended power steering fluid and bleed the power steering system.

Steering System > Hydraulic Power Steering System > Power Steering Oil Pump > Components and Components Location

Components



1. Pump pulley	6. Side plate	11. Suction pipe
2. Pump shaft	7. Rotor & vane	12. Connector assembly
3. Pump body	8. O - ring	13. O-ring
4. O - ring	9. O - ring	14. Flow control valve
5. O - ring	10. Pump cover	15. Spring

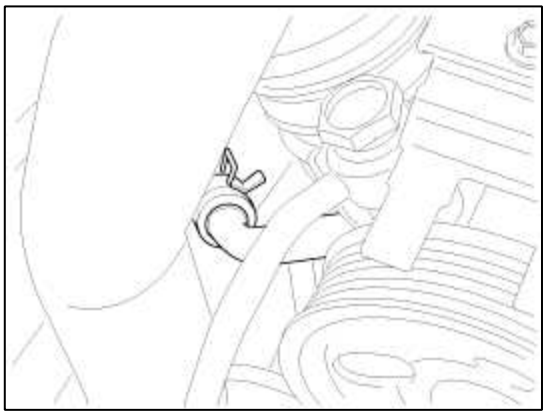
Steering System > Hydraulic Power Steering System > Power Steering Oil Pump > Repair procedures

Replacement

[2.0 Theta]

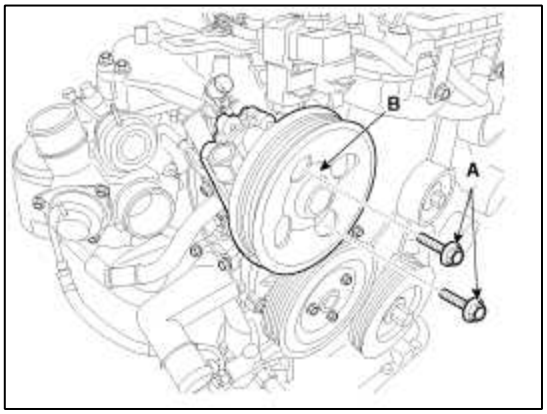
1. Drain the power steering fluid.
2. Remove the drive belt.

3. Disconnect the pressure tube and return hose from the power steering pump.



4. Loosen the mounting bolts (A) and then remove the power steering pump (B).

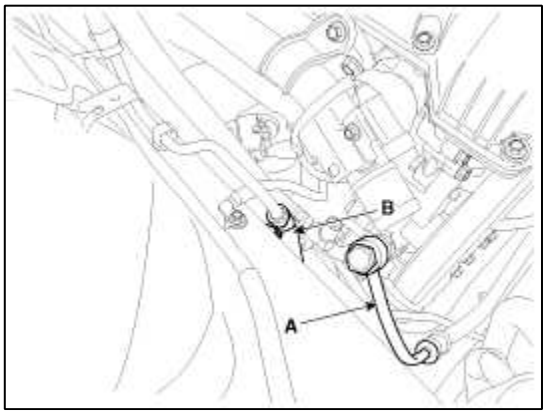
Tightening torque :
19.6 ~ 29.4N.m (2.0 ~ 3.0kgf.m, 14.5 ~ 21.7lb-ft)



5. Installation is the reverse of the removal.

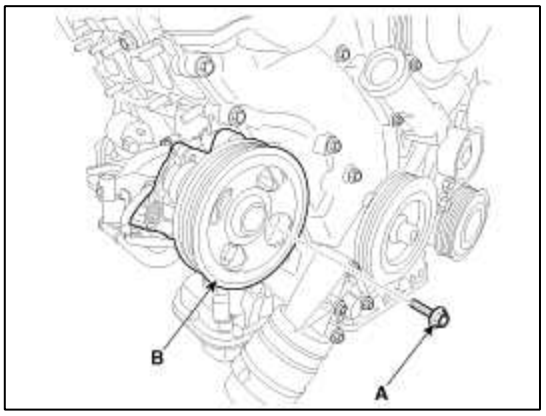
[3.8 DOHC]

1. Drain the power steering fluid.
2. Remove the drive belt.
3. Disconnect the pressure tube (A) and return hose (B) from the power steering pump.



4. Loosen the mounting bolts (A) and then remove the power steering pump (B).

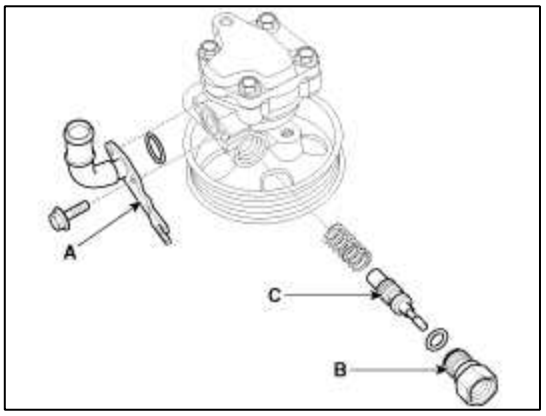
Tightening torque :
19.6 ~ 29.4N.m (2.0 ~ 3.0kgf.m, 14.5 ~ 21.7lb-ft)



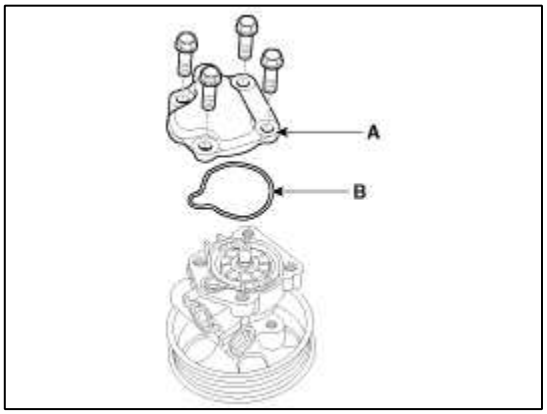
5. Installation is the reverse of the removal.

Disassembly

1. Remove the suction tube (A) and O-ring.
2. Unscrew the connector assembly (B) and then pull the flow control valve (C) and spring out of the pump body.

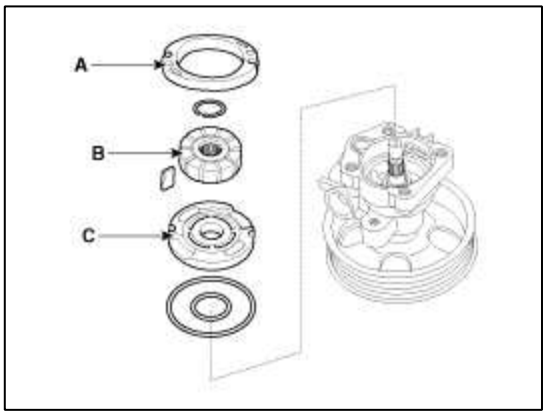


3. Remove the pump cover (A) and O-ring (B).

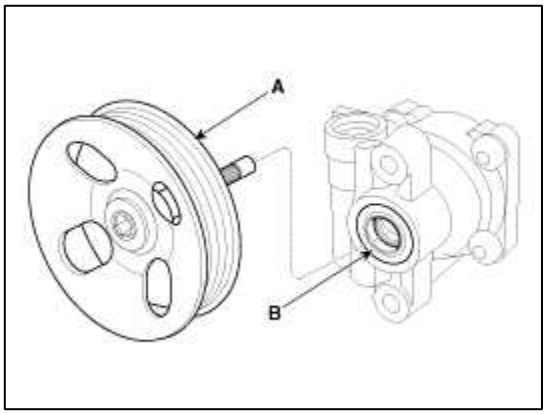


4. Remove the cam ring (A) and rotor& vanes (B).

5. Remove the side plate (C) and O-rings.



6. Remove the pump pulley & shaft (A) and O – ring (B).



Inspection

1. Check that the flow control valve is not bent.
2. Check the shaft for wear and damage.
3. Check the V belt for wear and deterioration.
4. Check the grooves of the rotor and vanes for stratified abrasion.
5. Check the contact surface of the cam ring and vanes for stratified abrasion.
6. Check vanes for damage.
7. Check that there is no striped wear in the side plate or contacting part between the shaft and the pump cover surface.

GENESIS COUPE(BK) > 2013 > G 2.0 T-MPI > Suspension System

Suspension System > General Information > Specifications

Specifications

Front Suspension

Item		Specification
Suspension type		Multi link
Shock absorber	Type	Gas
		Strut tower bar
Coil spring	Free Height [I.D. color]	319.0mm (12.5590 in) Green
Ride height		383±10mm (15.0787±0.3937 in)

Rear Suspension

Item		Specification
Suspension type		Multi link
Shock absorber	Type	Gas
Coil spring	Free Height [I.D. color]	302.4mm (11.9055 in) Cyan
Ride height		383±10mm (15.0787±0.3937 in)

Wheel & Tire

Item			Specification
Wheel			7.5J x 18 : 8.0J x 18
			8.0J x 19 : 8.5J x 19
Temporary Spare Wheel	Aluminum		4.0T x 18
	Steel		4.0T x 17
Tire			225/45 R18 : 245/45 R18
			225/40 R19 : 245/40 R19
Temporary Spare Tire	Aluminum		T135/80 R18
	Steel		T135/90 D17
Tire pressure	Front	P225/45R18	2.5+0.07kg/cm² (35+1.0psi)
		P225/40R19	2.5+0.07kg/cm² (35+1.0psi)
		T135/90D17	4.2+0.07kg/cm² (60+1.0psi)
	Rear	P245/45R18	2.5+0.07kg/cm² (35+1.0psi)
		P245/40R19	2.5+0.07kg/cm² (35+1.0psi)
		T135/80R18	4.2+0.07kg/cm² (60+1.0psi)

Wheel Alignment

Item		Specification	
		Front	Rear
Toe-in	Total	0.28°±0.2°	0.16°±0.2°
	Individual	0.14°±0.1°	0.08°±0.1°
Camber angle		-0.7°±0.5°	-1.5°±0.5°
Caster angle		7.45°±0.5°	-
King-pin angle		13.7°	-

Tightening Torques

Front Suspension

Item	Tightening torque		
	N.m	kgf.m	lb-ft
Wheel nuts	88.3 ~ 107.9	9.0 ~ 11.0	65.1 ~ 79.6
Tension arm to sub frame	137.3 ~ 156.9	14.0 ~ 16.0	101.3 ~ 115.7
Tension arm to front axle	78.5 ~ 88.3	8.0 ~ 9.0	57.9 ~ 65.1
Tension arm to flexible hose	6.9 ~ 10.8	0.7 ~ 1.1	5.1 ~ 8.0
Lateral arm to sub frame	137.3 ~ 156.9	14.0 ~ 16.0	101.3 ~ 115.7
Lateral arm to front axle	78.5 ~ 88.3	8.0 ~ 9.0	57.9 ~ 65.1
Front stabilizer bar to sub frame	49.0 ~ 63.7	5.0 ~ 6.5	36.2 ~ 47.0
Front stabilizer bar to stabilizer link	98.1 ~ 117.7	10.0 ~ 12.0	72.3 ~ 86.8
Steering gear box to front axle	23.5 ~ 33.3	2.4 ~ 3.4	17.4 ~ 24.6

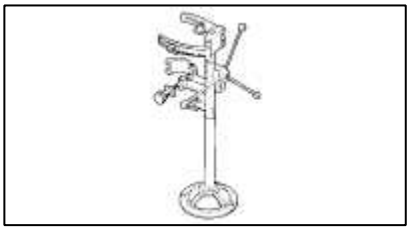
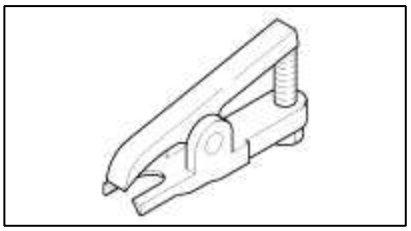
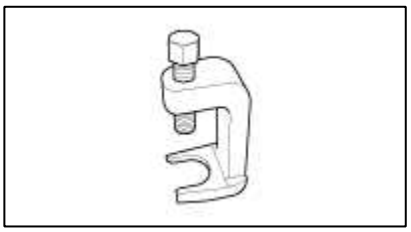
Rear Suspension

Item	Tightening torque		
	N.m	kgf.m	lb-ft
Wheel nuts	88.3 ~ 107.9	9.0 ~ 11.0	65.1 ~ 79.6
Rear shock absorber to frame	44.1 ~ 58.8	4.5 ~ 6.0	32.5 ~ 43.4
Rear shock absorber to lower arm	137.3 ~ 156.9	14.0 ~ 16.0	101.3 ~ 115.7
Front upper arm to sub frame	98.1 ~ 117.7	10.0 ~ 12.0	72.3 ~ 86.8
Front upper arm to rear axle	98.1 ~ 117.7	10.0 ~ 12.0	72.3 ~ 86.8
Rear upper arm to sub frame	98.1 ~ 117.7	10.0 ~ 12.0	72.3 ~ 86.8
Rear upper arm to rear axle	137.3 ~ 156.9	14.0 ~ 16.0	101.3 ~ 115.7
Rear stabilizer bar to sub frame	49.0 ~ 63.7	5.0 ~ 6.5	36.2 ~ 47.0
Rear stabilizer link to lower arm	98.1 ~ 117.7	10.0 ~ 12.0	72.3 ~ 86.8

Rear stabilizer bar to stabilizer link	98.1 ~ 117.7	10.0 ~ 12.0	72.3 ~ 86.8
Rear lower arm to sub frame	137.3 ~ 156.9	14.0 ~ 16.0	101.3 ~ 115.7
Rear lower arm to rear axle	137.3 ~ 156.9	14.0 ~ 16.0	101.3 ~ 115.7
Assist arm to sub frame	137.3 ~ 156.9	14.0 ~ 16.0	101.3 ~ 115.7
Assist arm to rear axle	98.1 ~ 117.7	10.0 ~ 12.0	72.3 ~ 86.8
Trailing arm to sub frame	98.1 ~ 117.7	10.0 ~ 12.0	72.3 ~ 86.8
Trailing arm to rear axle	98.1 ~ 117.7	10.0 ~ 12.0	72.3 ~ 86.8

Suspension System > General Information > Special Service Tools

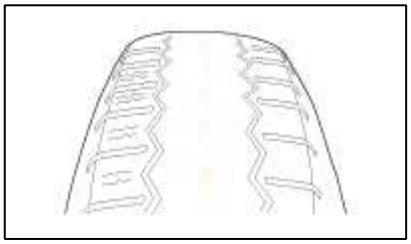
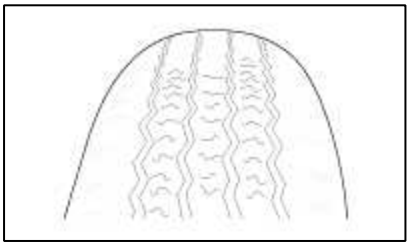
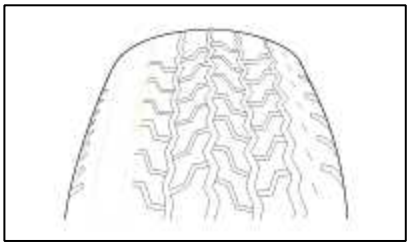
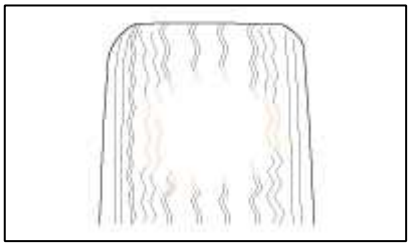
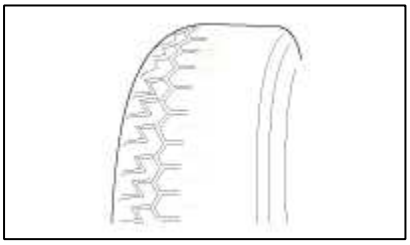
Special Service Tools

Tool (Number and Name)	Illustration	Use
09546-26000 Strut spring compressor		Compression of coil spring
09568-34000 Ball joint remover		Removal of Ball joint
09568-2J100 Ball joint remover		Removal of Ball joint

Suspension System > General Information > Troubleshooting

Troubleshooting

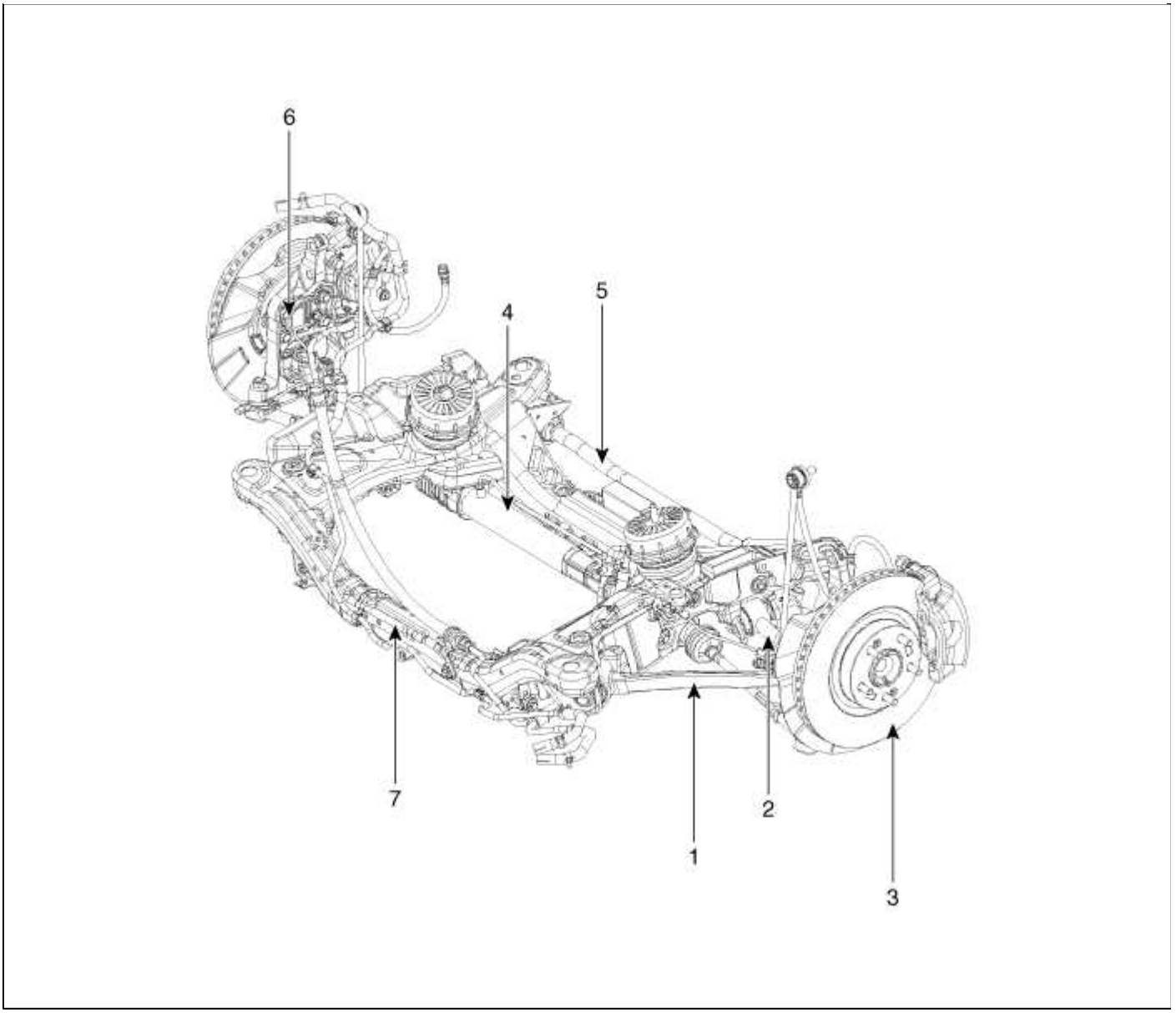
Trouble symptom	Probable cause	Remedy
Hard steering	Improper front wheel alignment	Repair
	Excessive turning resistance of lower arm ball joint	Replace
	Flat tire	Adjust
	No power assist	Repair or Replace
Poor return of steering wheel to center	Improper front wheel alignment	Repair
Poor ride quality	Improper front wheel alignment	Repair
	Damaged shock absorber	Repair or Replace
	Varied or damaged stabilizer	Replace
	Varied or damaged coil spring	Replace
	Worn lower arm bushing	Replace
Abnormal tire wear	Improper front wheel alignment	Repair
	Improper tire inflation pressure	Adjust
	Worn of shock absorber	Replace
Wandering	Improper front wheel alignment	Repair
	Poor turning resistance of lower arm ball joint	Repair
	Loose or worn lower arm bushing	Re-tighten or Replace
Vehicle pulls to one side	Improper front wheel alignment	Repair
	Excessive turning resistance of lower arm ball joint	Replace
	Varied or damaged coil spring	Replace
	Bent lower arm	Replace
	Tire pressure	Adjust
	Tire lateral pull	Adjust
	Front camber/caster	Adjust
	Perform correct road test on flat, no-crown road	Adjust
Steering wheel shimmy	Improper front wheel alignment	Repair
	Excessive turning resistance of lower arm ball joint	Replace
	Varied or damaged stabilizer	Replace
	Worn lower arm bushing	Replace
	Worn of shock absorber	Replace
	Varied or damaged coil spring	Replace
Bottoming	Broken or worn spring	Replace
	Malfunction of shock absorber	Replace

Wheel And Tire Diagnosis		
Rapid wear at the center	Rapid wear at both shoulders	Wear at one shoulder
		
• Center-tread down to fabric due to excessive over inflated tires • Lack of rotation • Excessive toe on drive wheels • Heavy acceleration on drive	• Under-inflated tires • Worn suspension components • Excessive cornering speeds • Lack of rotation	• Toe adjustment out of specification • Camber out of specification • Damaged strut • Damaged lower arm • Under-inflated tires
Partial wear	Feathered edge	Wear pattern
		
• Caused by irregular burrs on brake drums. • Under-inflated tires • Lack of rotation	• Toe adjustment out of specification • Damaged or worn tie rods • Damaged knuckle	• Excessive toe on non-drive wheels • Lack of rotation

Suspension System > Front Suspension System > Components and Components Location

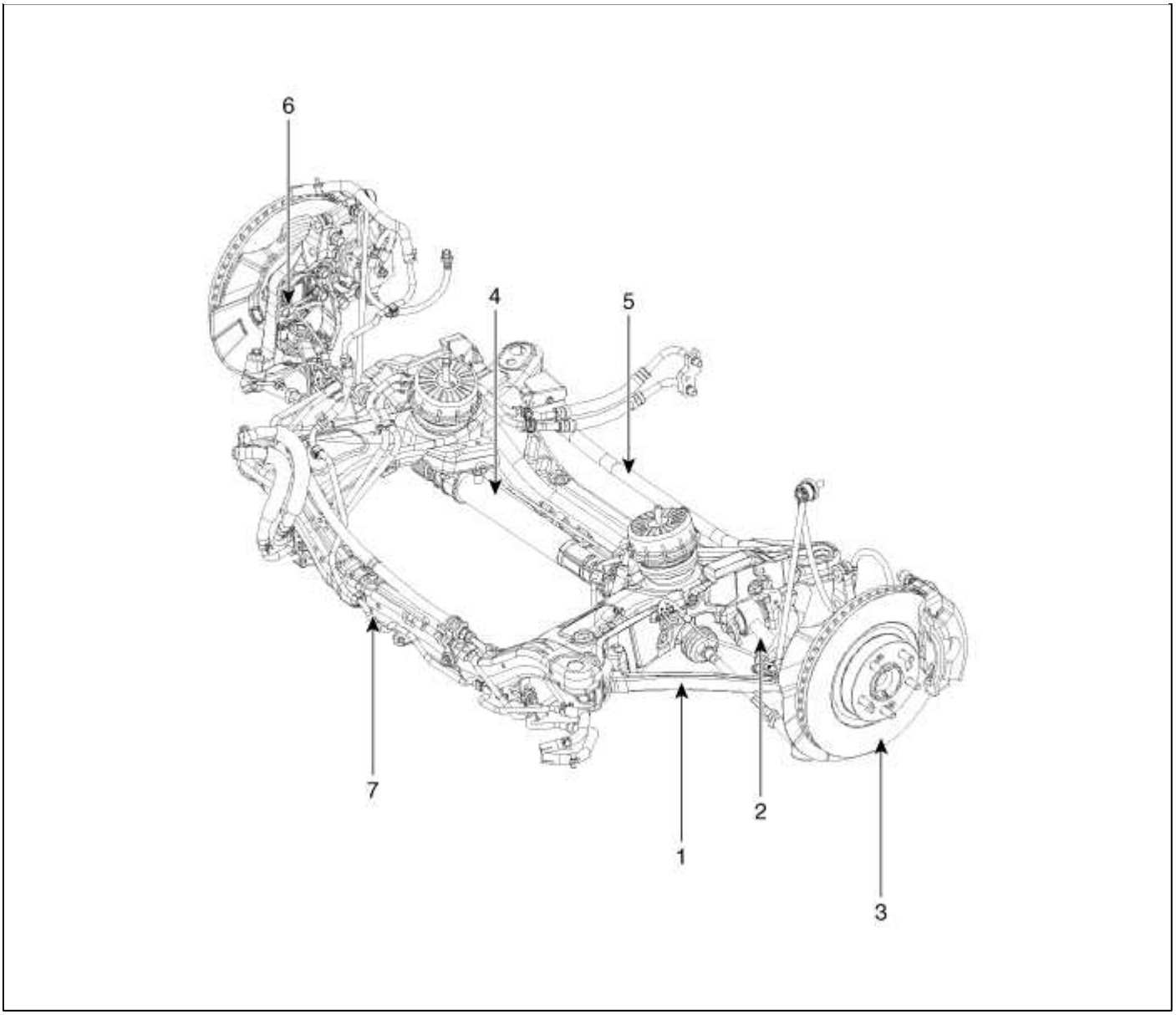
Components

[Theta]



1. Tension arm 2. Lateral arm 3. Front disk 4. Steering gearbox	5. Stabilizer bar 6. Front axle 7. Sub frame

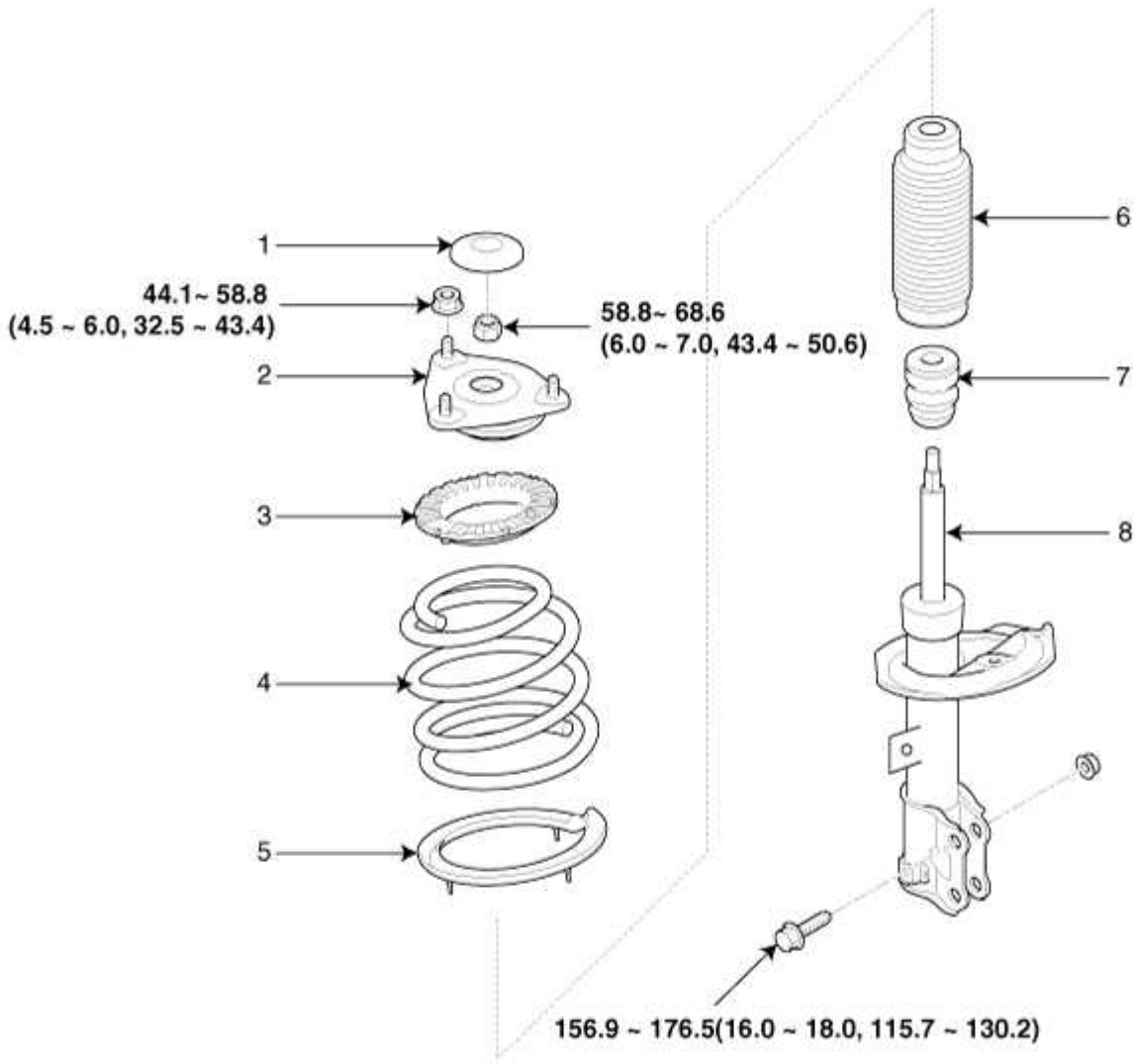
[Lamda]



1. Tension arm 2. Lateral arm 3. Front disk 4. Steering gearbox	5. Stabilizer bar 6. Front axle 7. Sub frame

Suspension System > Front Suspension System > Front Strut Assembly > Components and Components Location

Components



Torque : N.m (kgf.m, lb-ft)

1. Insulator cap 2. Insulator assembly 3. Spring upper pad 4. Coil spring	5. Spring lower pad 6. Dust cover 7. Bumper rubber 8. Shock absorber

Suspension System > Front Suspension System > Front Strut Assembly > Repair procedures

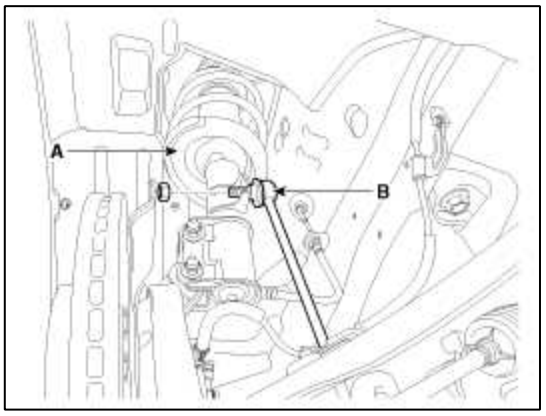
Replacement

1. Remove the front wheel & tire.

Tightening torque :
88.3 ~ 107.9 N.m(9.0 ~ 11.0 kgf.m, 65.1 ~ 79.6 lb-ft)

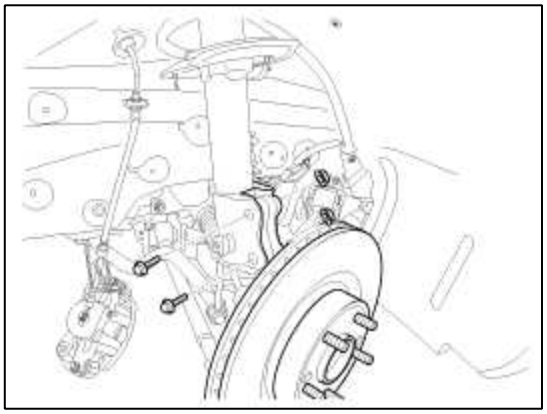
2. Disconnect the stabilizer link (B) with the front strut assembly (A) after loosening the nut.

Tightening torque :
98.1 ~ 117.7 N.m(10.0 ~ 12.0 kgf.m, 72.3 ~ 86.8 lb-ft)



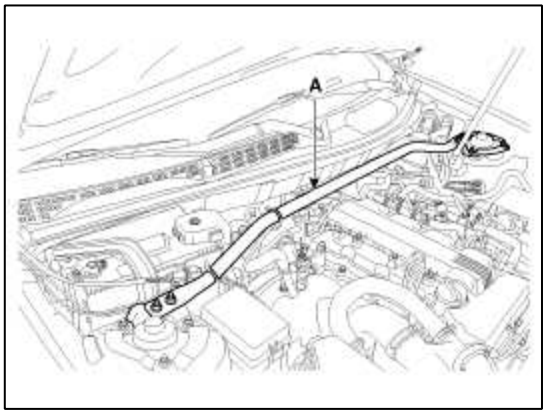
3. Disconnect the front strut assembly with the knuckle by loosening the bolt & nut.

Tightening torque :
137.3 ~ 156.9 N.m(16.0~18.0 kgf.m, 101.3 ~ 115.7 lb-ft)



4. Remove the front stabilizer bar (A)removing the nut.

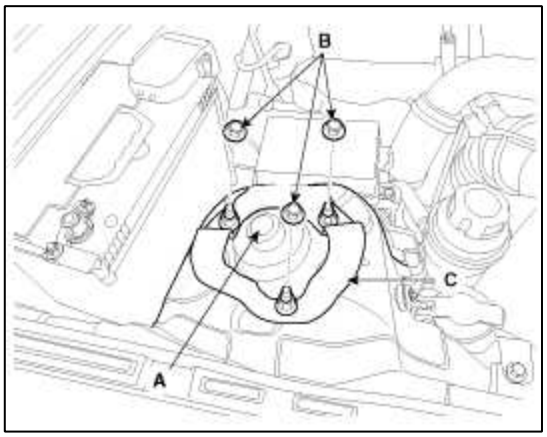
Tightening torque :
26.5 ~ 40.2 N.m(2.7 ~ 4.1 kgf.m, 19.5 ~ 29.7 lb-ft)



5. Remove the strut cap (A).

6. Remove the bracket (C)removing the nut (B).

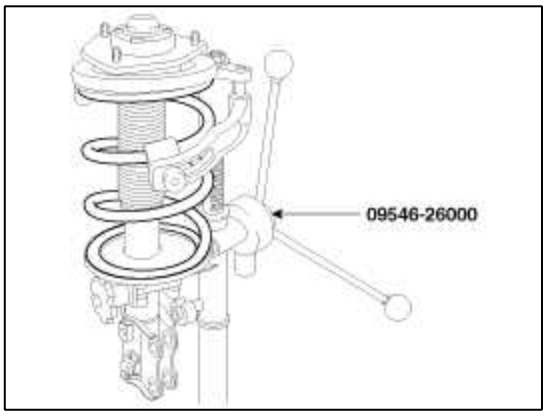
Tightening torque :
53.9 ~ 73.5 N.m(5.5 ~ 7.5 kgf.m, 39.8 ~ 54.2 lb-ft)



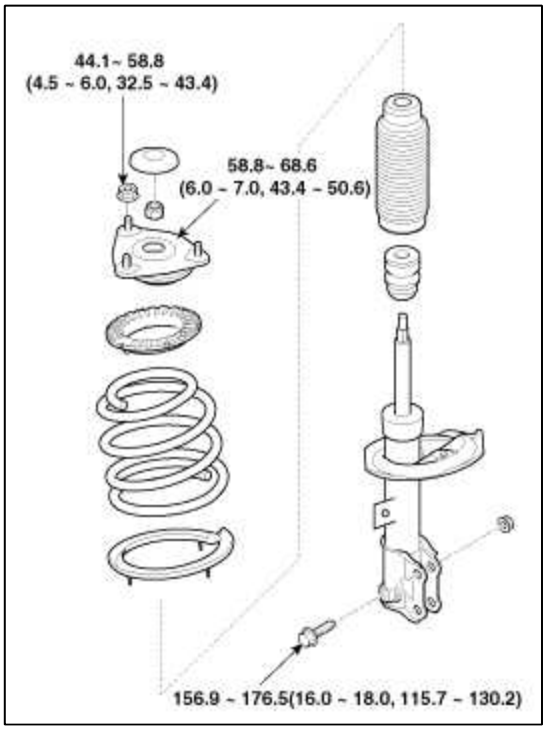
7. Installation is the reverse of removal.

Disassembly

1. Using the special tool (09546-26000), compress the coil spring.

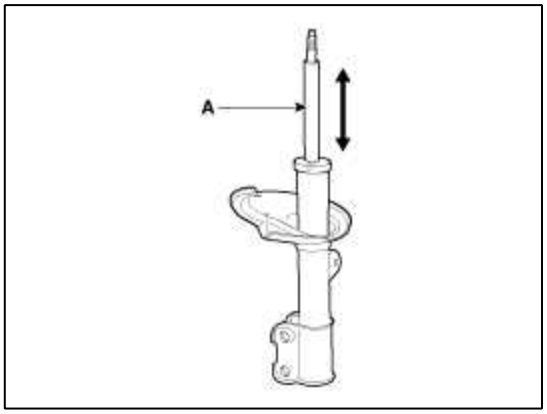


2. Remove the self-locking nut.
3. Remove the insulator, spring seat, coil spring and dust cover from the strut assembly.



Inspection

1. Check the strut insulator for wear or damage.
2. Check rubber parts for damage or deterioration.
3. Compress and extend the piston rod (A) and check that there is no abnormal resistance or unusual sound during operation.

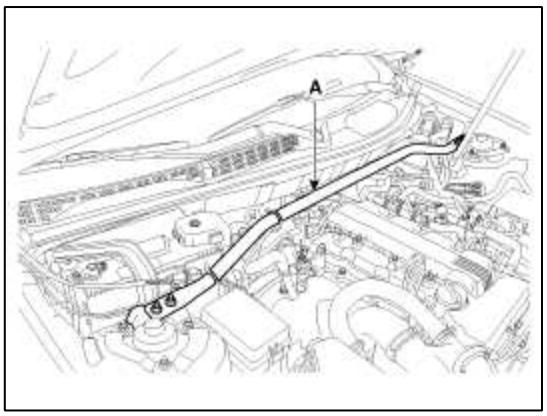


Suspension System > Front Suspension System > Front Strut Bar > Repair procedures

Replacement

1. Loosen the strut bar nuts.

Tightening torque :
26.5 ~ 40.2 N.m(2.7 ~ 4.1 kgf.m, 19.5 ~ 29.7 lb-ft)



2. Installation is the reverse of removal.

Suspension System > Front Suspension System > Front Lower Arm > Repair procedures

Replacement

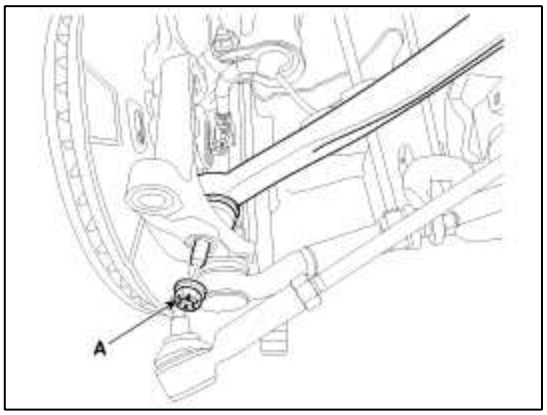
Tension arm

1. Remove the front wheel & tire.

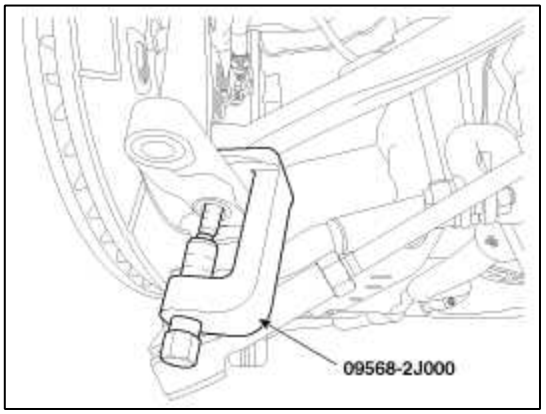
Tightening torque :
88.3 ~ 107.9 N.m(9.0 ~ 11.0 kgf.m, 65.1 ~ 79.6 lb-ft)

2. Remove the split pin and the castle nut (A).

Tightening torque :
78.5 ~ 88.3 N.m(8.0 ~ 9.0 kgf.m, 57.9 ~ 65.1 lb-ft)

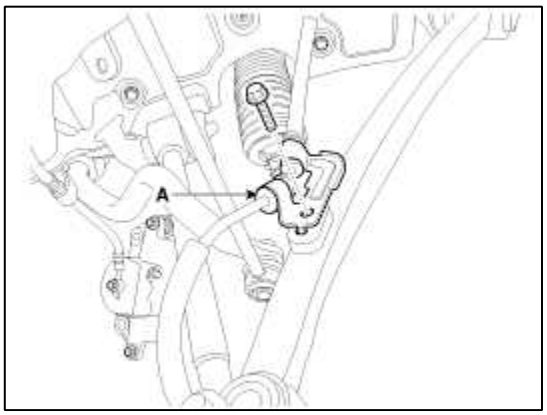


3. Separate the tension arm from the front axle ball joint by using SST (09568-2J000).



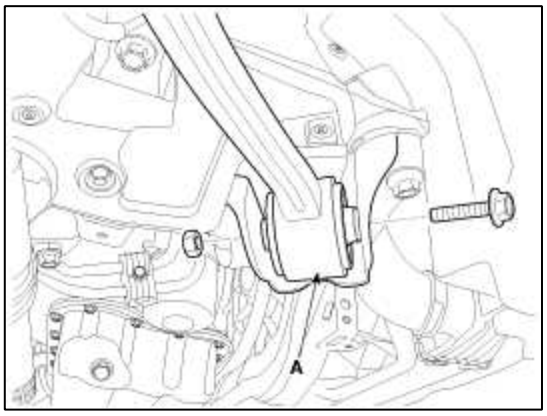
4. Remove the flexible hose (A).

Tightening torque :
6.9 ~ 10.8 N.m(0.7 ~ 1.1 kgf.m, 5.1 ~ 8.0 lb-ft)



5. Loosen the bolts and nuts and then remove the tension arm (A) from the sub frame.

Tightening torque :
137.3 ~ 156.9 N.m(14.0~16.0 kgf.m, 101.3 ~ 115.7 lb-ft)



6. Installation is the reverse of removal.

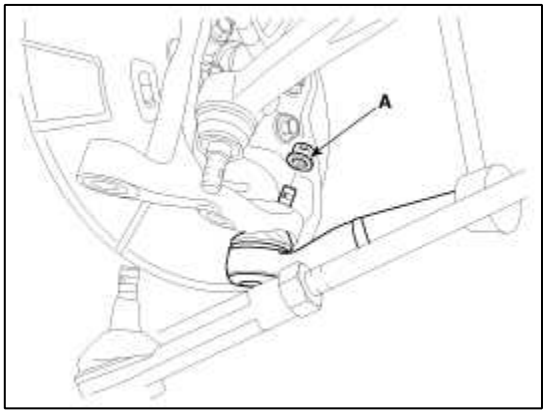
Lateral arm

1. Remove the front wheel & tire.

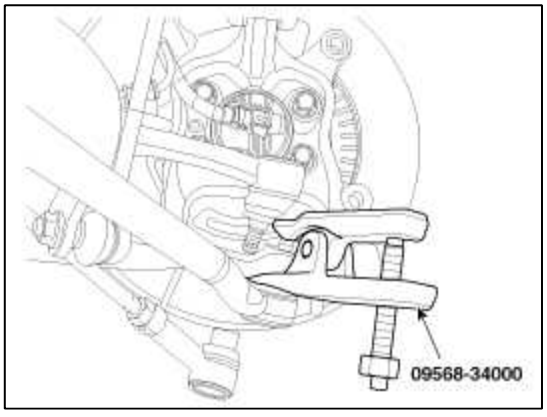
Tightening torque :
88.3 ~ 107.9 N.m(9.0 ~ 11.0 kgf.m, 65.1 ~ 79.6 lb-ft)

2. Remove the split pin and the castle nut (A).

Tightening torque :
78.5 ~ 88.3 N.m(9.0 ~ 11.0 kgf.m, 57.9 ~ 65.1 lb-ft)

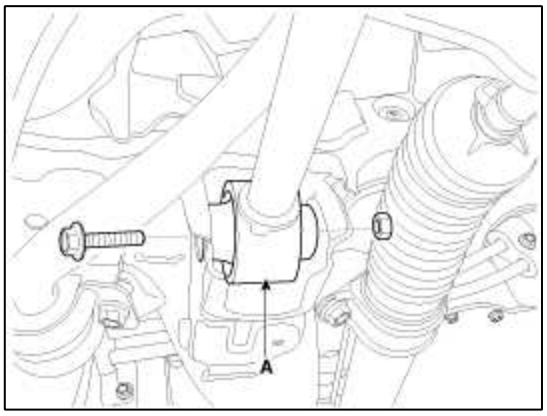


3. Separate the lateral arm from the front axle ball joint by using SST (09568-34000).



4. Loosen the bolts and nuts and then remove the lateral arm (A) from the sub frame.

Tightening torque :
137.3 ~ 156.9 N.m(16.0~18.0 kgf.m, 101.3 ~ 115.7 lb-ft)



5. Installation is the reverse of removal.

Suspension System > Front Suspension System > Front Stabilizer Bar > Repair procedures

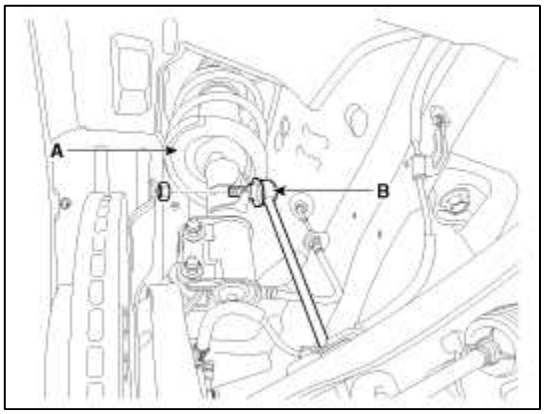
Replacement

1. Remove the front wheel & tire.

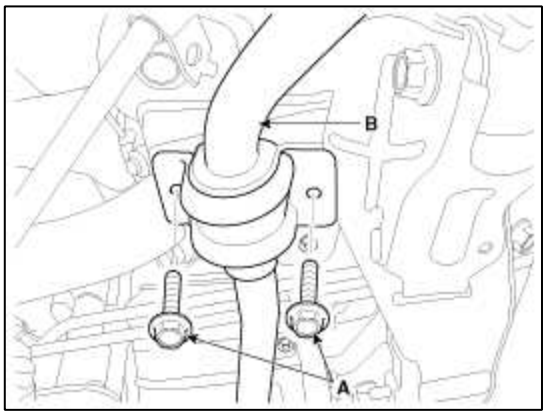
Tightening torque :
88.3 ~ 107.9 N.m(9.0 ~ 11.0 kgf.m, 65.1 ~ 79.6 lb-ft)

2. Disconnect the stabilizer link (B) with the front strut assembly (A) after loosening the nut.

Tightening torque :
98.1 ~ 117.7 N.m(10.0 ~ 12.0 kgf.m, 72.3 ~ 86.8 lb-ft)



3. Remove stabilizer (B) from the cross member by loosening the clamp mounting bolts (A).



4. Installation is the reverse of removal.

Inspection

1. Check the bushing for wear and deterioration.
2. Check the front stabilizer bar for deformation.
3. Check the front stabilizer link ball joint for damage.

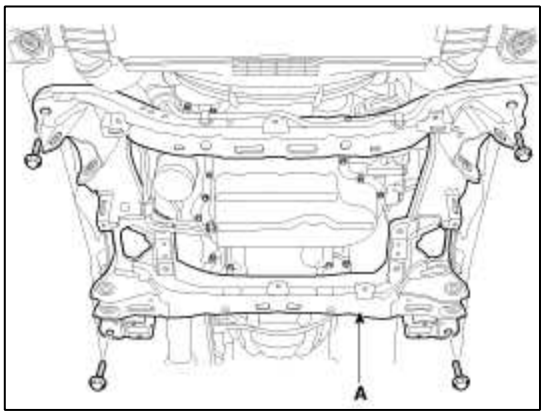
Suspension System > Front Suspension System > Sub Frame > Repair procedures

Replacement

1. Remove the front wheel & tire.

Tightening torque :
88.3 ~ 107.9 N.m(9.0 ~ 11.0 kgf.m, 65.1 ~ 79.6 lb-ft)

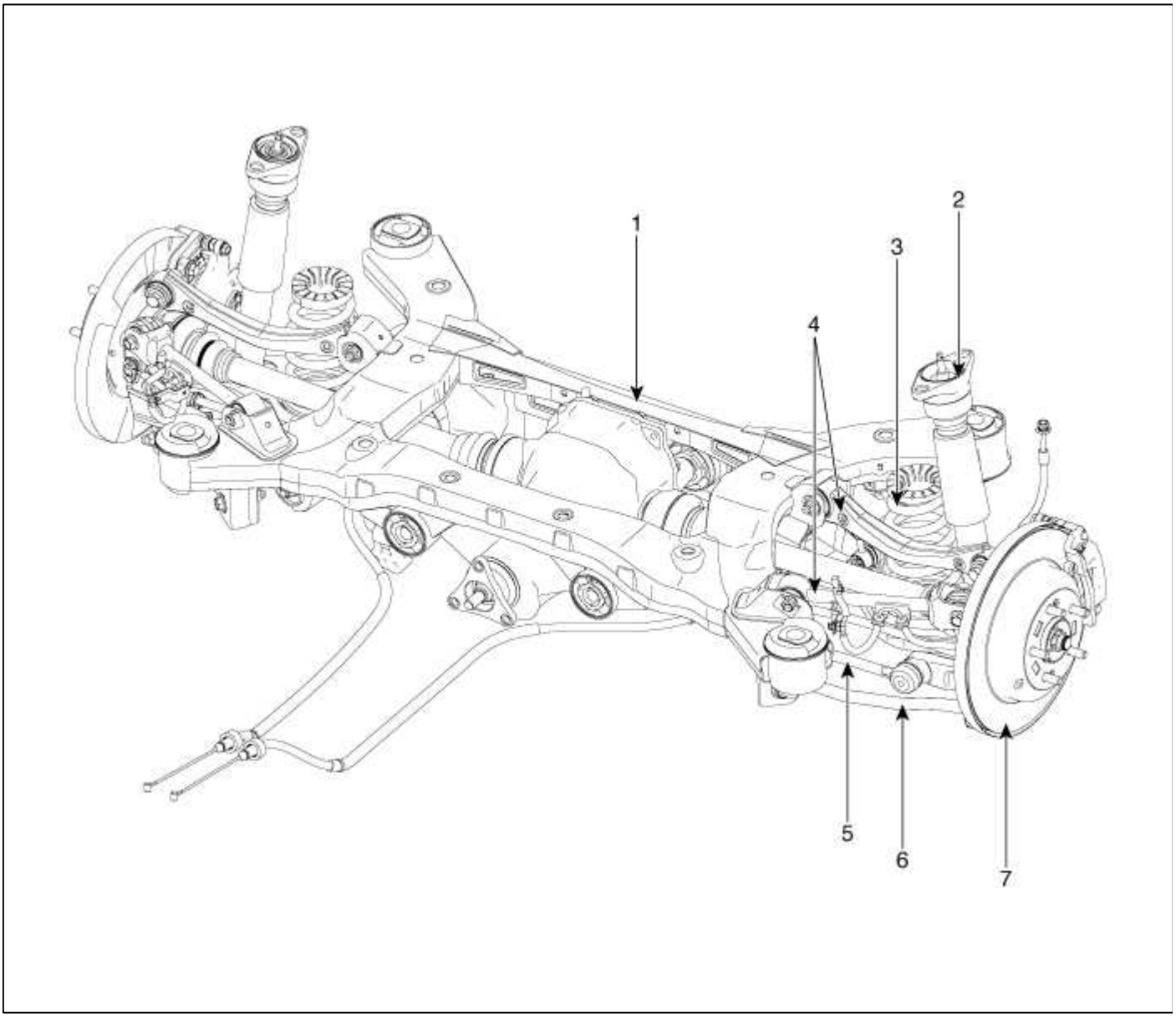
2. Remove the lower arm.
   (Refer to SS group - "Front Lower Arm")
3. Remove the front strut assembly.
   (Refer to SS group - "Front Strut Assembly")
4. Remove the front stabilizer bar.
   (Refer to SS group - "Front Stabilizer Bar")
5. Remove the steering gear box.
   (Refer to ST group - "Steering Gear Box")
6. Remove the cross member (A) from the body by loosening the mounting bolts and nuts.



7. Installation is the reverse of removal.

Suspension System > Rear Suspension System > Components and Components Location

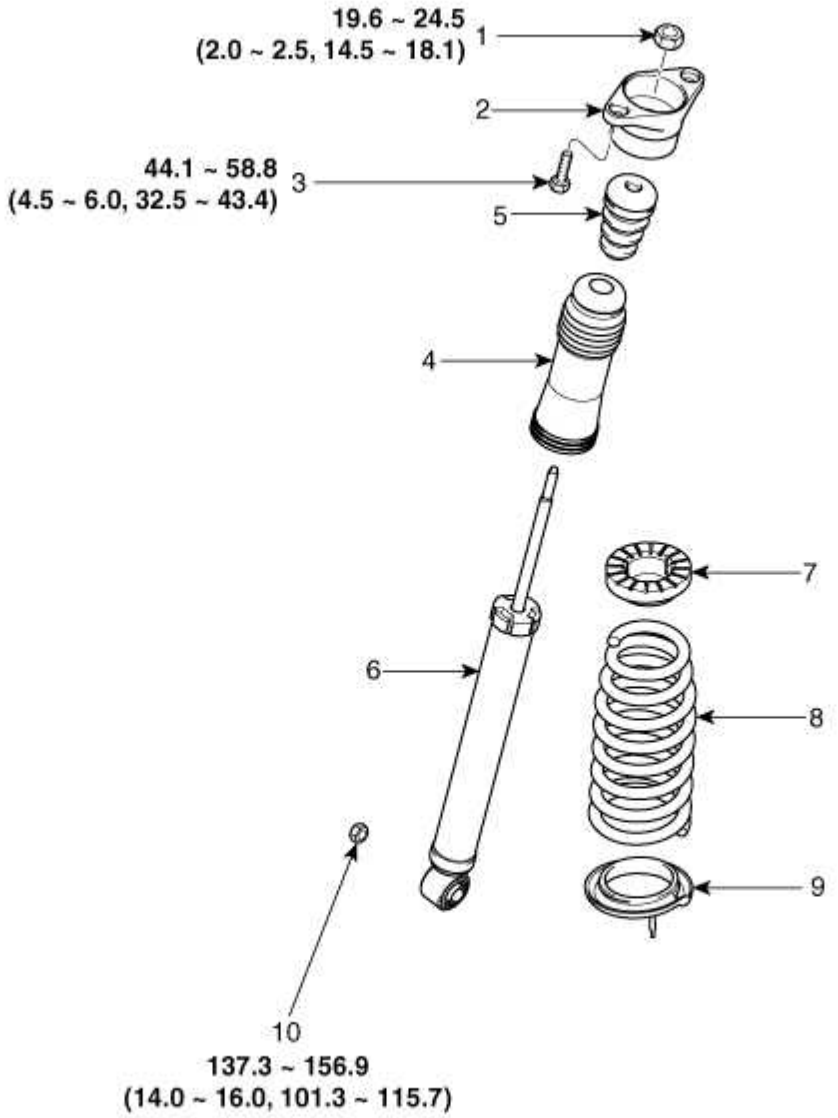
Components



1. Sub frame 2. Rear shock absorber 3. Spring 4. Rear upper arm	5. Assist arm 6. Trailing arm 7. Rear disc

Suspension System > Rear Suspension System > Rear Shock Absorber > Components and Components Location

Components



Torque : N.m (kgf.m, lb-ft)

1. Lock nut	5. Urethan bumper	8. Spring
2. Bracket	6. Shock absorber	9. Lower pad
3. Bolt	7. Upper pad	10. Nut
4. Dust cover		

Suspension System > Rear Suspension System > Rear Shock Absorber > Repair procedures

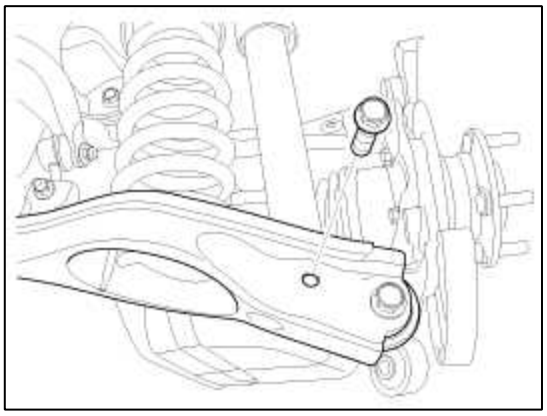
Replacement

1. Remove the rear wheel & tire.

Tightening torque :
88.3 ~ 107.9 N.m(9.0 ~ 11.0 kgf.m, 65.1 ~ 79.6 lb-ft)

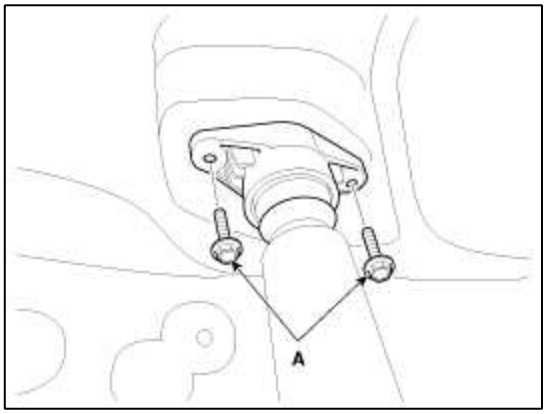
2. Loosen the bolts and nuts and then remove the rear shock absorber from the lower arm.

Tightening torque :
137.3 ~ 156.9 N.m(14.0~16.0 kgf.m, 101.3 ~ 115.7 lb-ft)



3. Loosen the mounting bolts (A).

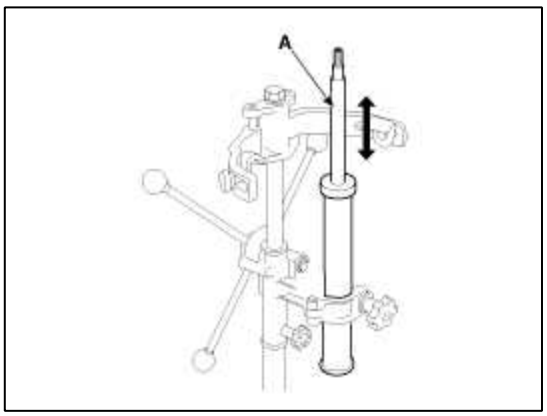
Tightening torque :
44.1 ~ 58.8 N.m(4.5 ~ 6.0 kgf.m, 32.5 ~ 43.4 lb-ft)



4. Installation is the reverse of removal.

Inspection

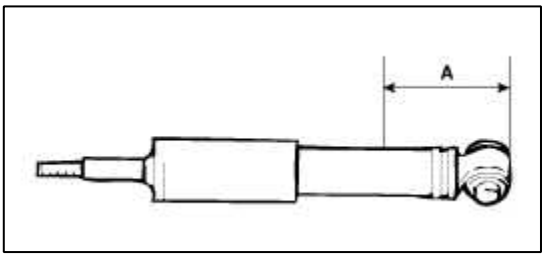
1. Check the components for damage or deformation.
2. Compress and extend the piston rod (A) and check that there is no abnormal resistance or unusual sound during operation.



Disposal

1. Fully extend the piston rod.

2. Drill a hole on the (A) section to discharge gas from the cylinder.



CAUTION

The gas coming out is harmless, but be careful of chips that may fly when drilling. Be sure to wear safety goggles or eye protection when performing this task.

Suspension System > Rear Suspension System > Rear Upper Arm > Repair procedures

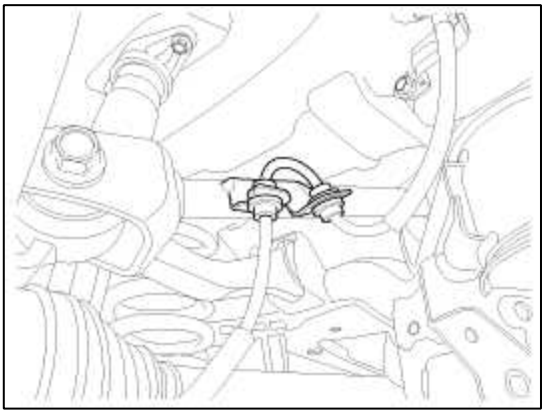
Replacement

Front Upper Arm

1. Remove the rear wheel & tire.

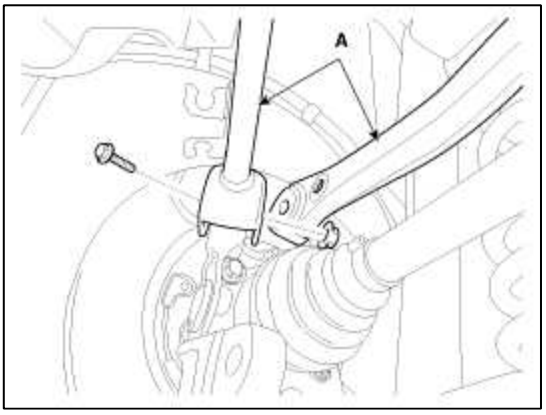
Tightening torque :
88.3 ~ 107.9 N.m(9.0 ~ 11.0 kgf.m, 65.1 ~ 79.6 lb-ft)

2. Remove the brake hose bracket.



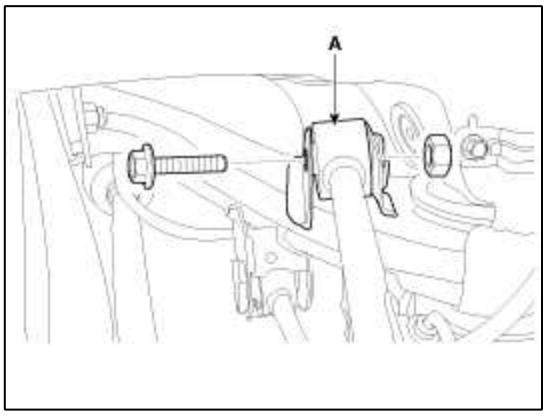
3. Loosen the bolts and nuts and then remove the front upper arm (A) from rear axle.

Tightening torque :
98.1 ~ 117.7 N.m(10.0 ~ 12.0 kgf.m, 72.3 ~ 86.8 lb-ft)



4. Loosen the bolts and nuts and then remove the front upper arm (A) from sub frame.

Tightening torque :
98.1 ~ 117.7 N.m(10.0 ~ 12.0 kgf.m, 72.3 ~ 86.8 lb-ft)



5. Installation is the reverse of removal.

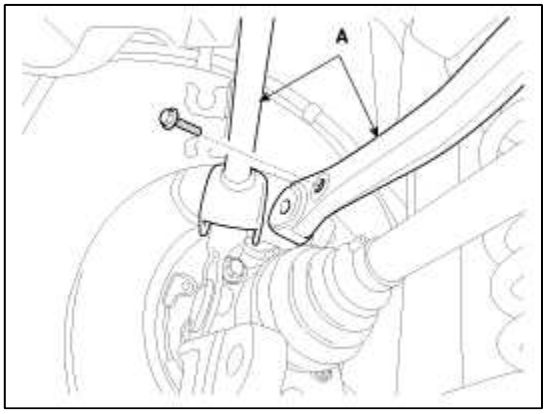
Rear Upper Arm

1. Remove the rear wheel & tire.

Tightening torque :
88.3 ~ 107.9 N.m(9.0 ~ 11.0 kgf.m, 65.1 ~ 79.6 lb-ft)

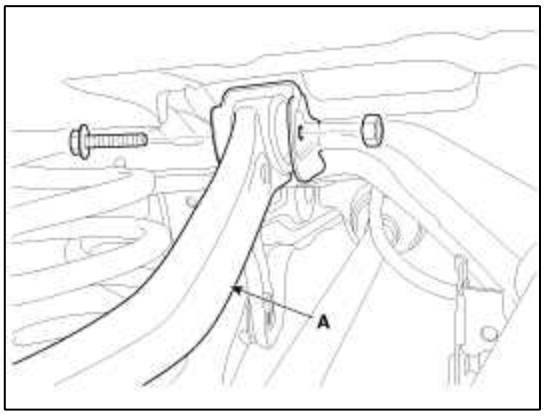
2. Loosen the bolts and nuts and then remove the rear upper arm (A) from rear axle.

Tightening torque :
137.3 ~ 156.9 N.m(14.0~16.0 kgf.m, 101.3 ~ 115.7 lb-ft)



3. Loosen the bolts and nuts and then remove the rear upper arm (A) from sub frame.

Tightening torque :
98.1 ~ 117.7 N.m(10.0 ~ 12.0 kgf.m, 72.3 ~ 86.8 lb-ft)



4. Installation is the reverse of removal.

Suspension System > Rear Suspension System > Rear Lower Arm > Repair procedures

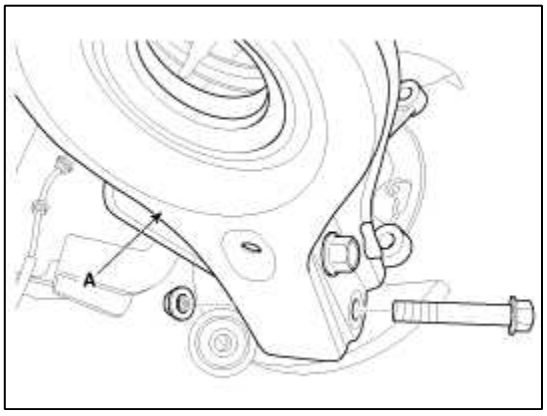
Replacement

1. Remove the rear wheel & tire.

Tightening torque :
88.3 ~ 107.9 N.m(9.0 ~ 11.0 kgf.m, 65.1 ~ 79.6 lb-ft)

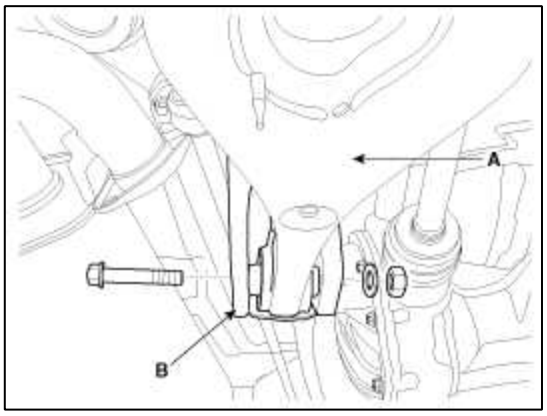
2. Remove the rear shock absorber.
3. Loosen the bolts and nuts and then remove the lower arm (A) from rear axle.

Tightening torque :
137.3 ~ 156.9 N.m(14.0~16.0 kgf.m, 101.3 ~ 115.7 lb-ft)



4. Loosen the bolts and nuts and then remove the lower arm (A) from sub frame (B).

Tightening torque :
137.3 ~ 156.9 N.m(14.0~16.0 kgf.m, 101.3 ~ 115.7 lb-ft)



5. Installation is the reverse of removal.

Inspection

1. Check the bushing for wear and deterioration.
2. Check the rear lower arm deformation.
3. Check the all bolts.
4. Check the coil spring pad for deterioration and deformation.

Suspension System > Rear Suspension System > Rear Stabilizer Bar > Repair procedures

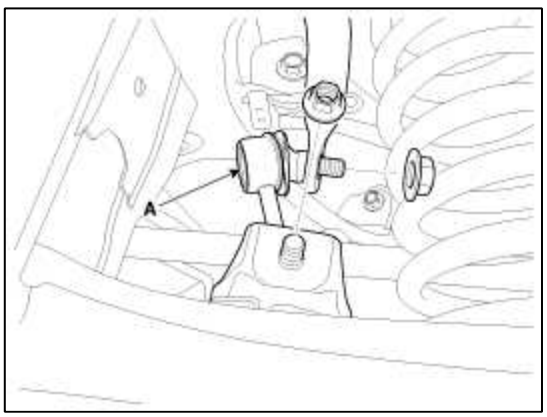
Replacement

1. Remove the rear wheel & tire.

Tightening torque :
88.3 ~ 107.9 N.m(9.0 ~ 11.0 kgf.m, 65.1 ~ 79.6 lb-ft)

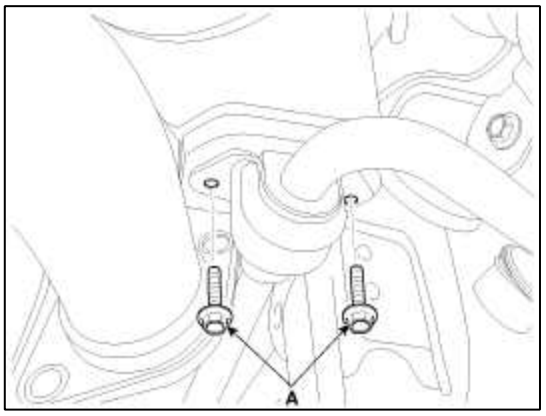
2. Loosen the nuts and then remove the stabilizer link (A) from stabilizer bar and lower arm.

Tightening torque :
98.1 ~ 117.7 N.m(10.0 ~ 12.0 kgf.m, 72.3 ~ 86.8 lb-ft)



3. Loosen the mounting bolts (A).

Tightening torque :
49.0 ~ 63.7 N.m(4.5 ~ 6.0 kgf.m, 36.2 ~ 47.0 lb-ft)



4. Installation is the reverse of removal.

Inspection

1. Check the bushing for wear deterioration.
2. Check the all bolts.
3. Check the stabilizer bar for deformation.
4. Check the stabilizer link ball joint for damage.

Suspension System > Rear Suspension System > Rear Assist Arm > Repair procedures

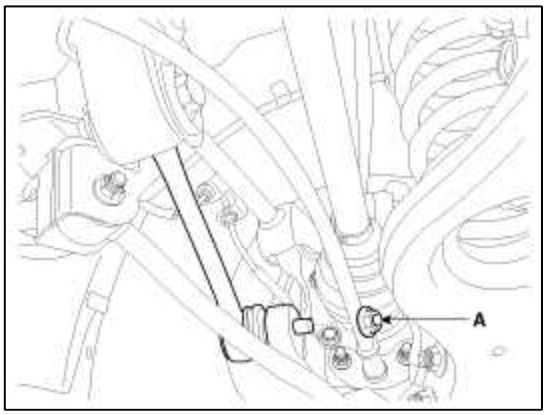
Replacement

1. Remove the rear wheel & tire.

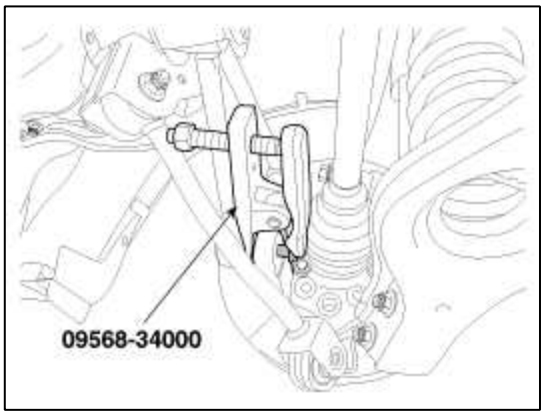
Tightening torque :
88.3 ~ 107.9 N.m(9.0 ~ 11.0 kgf.m, 65.1 ~ 79.6 lb-ft)

2. Loosen the nuts (A).

Tightening torque :
98.1 ~ 117.7 N.m(10.0 ~ 12.0 kgf.m, 72.3 ~ 86.8 lb-ft)

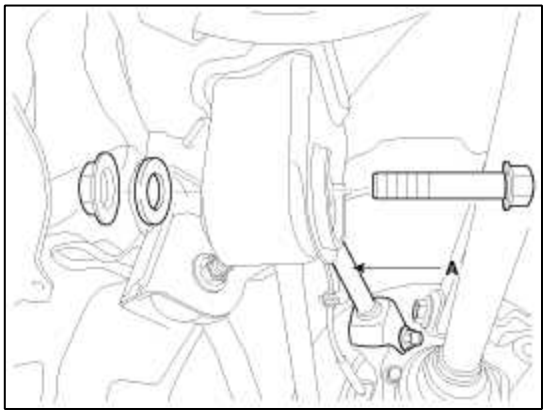


3. Separate the assist arm from the rear axle ball joint by using SST (09568-34000).



4. Loosen the bolts and nuts and then remove the assist arm (A) from sub frame.

Tightening torque :
137.3 ~ 156.9 N.m(14.0~16.0 kgf.m, 101.3 ~ 115.7 lb-ft)



5. Installation is the reverse of removal.

Suspension System > Rear Suspension System > Trailing Arm > Repair procedures

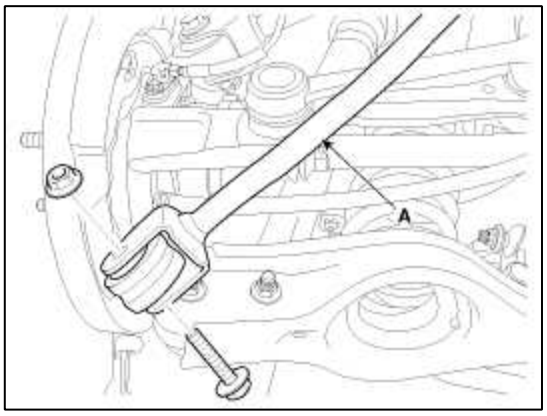
Replacement

1. Remove the rear wheel & tire.

Tightening torque :
88.3 ~ 107.9 N.m(9.0 ~ 11.0 kgf.m, 65.1 ~ 79.6 lb-ft)

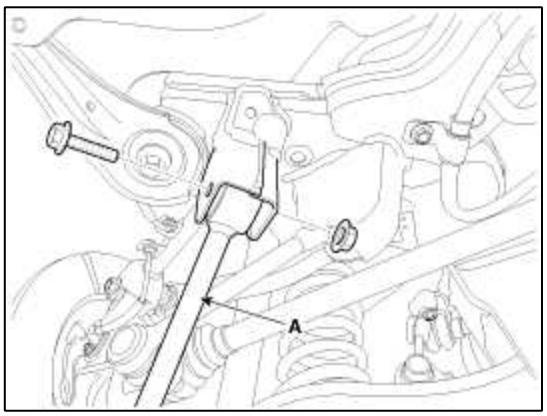
2. Loosen the bolts and nuts and then remove the trailing arm (A) from rear axle.

Tightening torque :
98.1 ~ 117.7 N.m(10.0 ~ 12.0 kgf.m, 72.3 ~ 86.8 lb-ft)



3. Loosen the bolts and nuts and then remove the assist arm (A) from sub frame.

Tightening torque :
98.1 ~ 117.7 N.m(10.0 ~ 12.0 kgf.m, 72.3 ~ 86.8 lb-ft)



4. Installation is the reverse of removal.

Suspension System > Rear Suspension System > Rear Sub Frame > Repair procedures

Replacement

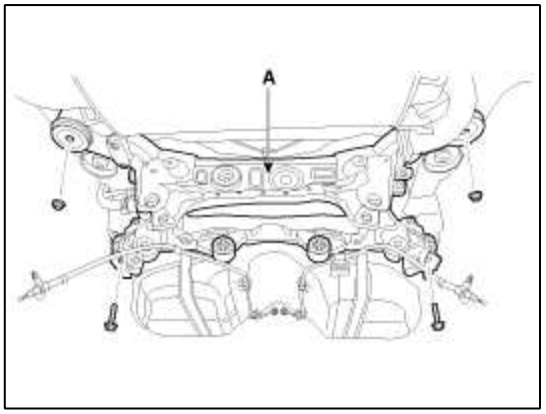
1. Remove the rear wheel & tire.

Tightening torque :
88.3 ~ 107.9 N.m(9.0 ~ 11.0 kgf.m, 65.1 ~ 79.6 lb-ft)

2. Remove the rear lower arm.
   (Refer to SS group - "Rear Lower Arm")
3. Remove the rear shock absorber.
   (Refer to SS group - "Rear Shock Absorber")
4. Remove the rear upper arm.
   (Refer to SS group - "Rear Upper Arm")
5. Remove the trailing arm.
   (Refer to SS group - "Trailing Arm")
6. Remove the assist arm.
   (Refer to SS group - "Rear Assist Arm")

7. Remove the differential carrier.
   (Refer to DS group - "Differential Carrier Assembly")
8. Loosen the bolts and nuts and then remove the sub frame (A).

Tightening torque :
156.9 ~ 176.5 N.m(16.0~18.0 kgf.m, 115.7 ~ 130.2 lb-ft)



9. Installation is the reverse of removal.

Suspension System > Tires/Wheels > Tire > Repair procedures

Tire Wear

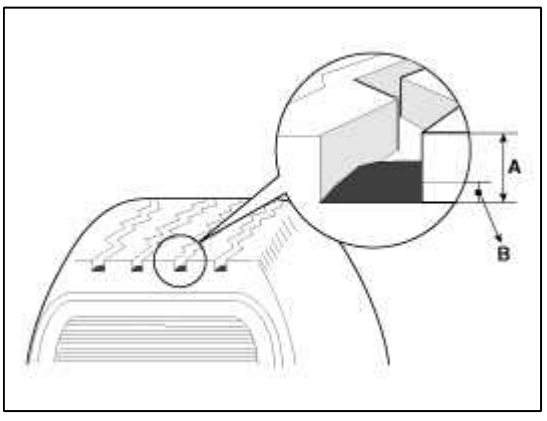
1. Measure the tread depth of the tires.

Tread depth [limit] : 1.6 mm (0.0630 in)

2. If the remaining tread (A) depth is less than the limit, replace the tire.

NOTE

When the tread depth of the tires is less than 1.6 mm (0.0630 in), the wear indicators (B) will appear.

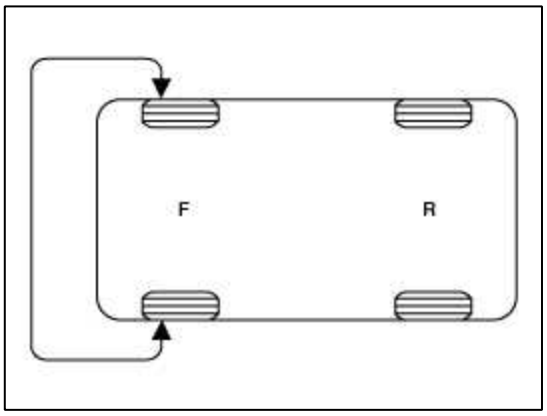


Tire Rotation

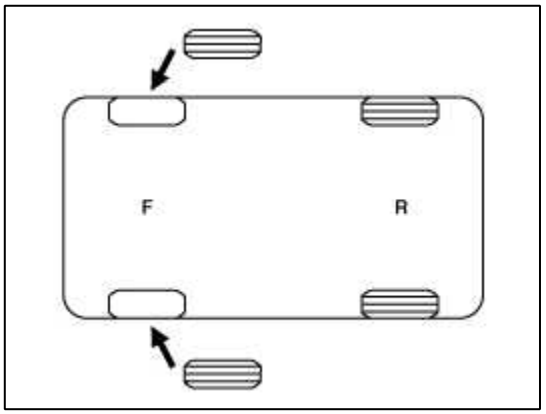
Checking For Pull And Wander

If the steering pulls to one side, rotate the tires according to the following wheel rotation procedure.

1. Rotate the front right and front left tires, and perform a road test in order to confirm vehicle stability.



2. If the steering continues to pull to the opposite side, replace the front wheels with new ones.



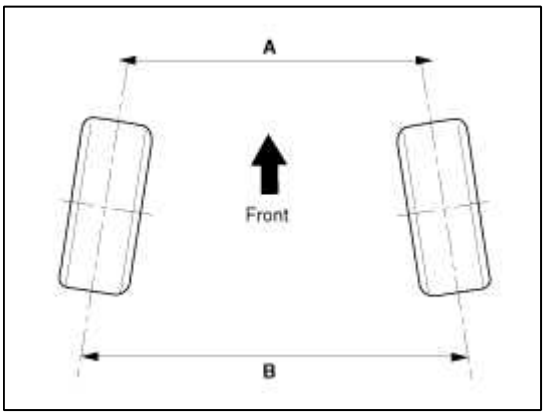
Suspension System > Tires/Wheels > Wheel > Repair procedures

Wheel Alignment

When using commercially available computerized four wheel alignment equipment (caster, camber, toe) to inspect the front wheel alignment, always position the car on a level surface with the front wheels facing straight ahead. Prior to inspection, make sure that the front suspension and steering system are in normal operating condition and that the wheels and tires face straight ahead and the tires are inflated to the specified pressure.

Toe

Toe is a measurement of how much the front of the wheels are turned in or out from the straight-ahead position.



Item	Description
A - B < 0	Positive (+) toe (toe in)
A - B > 0	Negative (-) toe (toe out)

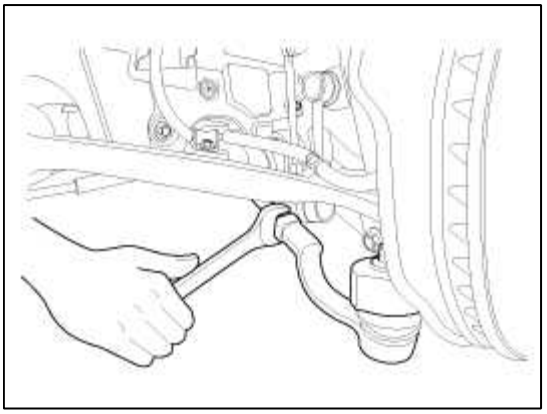
When the wheels are turned in toward the front of the vehicle, toe is positive (+) (toe in). When the wheels are turned out toward the front of the vehicle, toe is negative(-) (toe out). Toe is measured in degrees, from side to side, and totaled.
[Front]
Toe-in(B-A or angle a+b) is adjusted by turning the tie rod turnbuckles. Toe-in on the left front wheel can be reduced by turning the tie rod toward the rear of the car. Toe- in change is adjusted by turning the tie rods for the right and left heels simultaneously at the same amount as follows.

Standard value :
Toe-in
Total : 0.28°±0.2°
Individual : 0.14°±0.1°

NOTE

- Toe-in adjustment should be made by turning the right and left tie rods at the same amount.
- When adjusting toe-in, loosen the outer bellows clip to prevent twisting the bellows.
- After the adjustment, tighten the tie rod end lock nuts firmly and reinstall the bellows clip.
- Adjust each toe-in to be the range of ±0.1°.

Tie rod (A) Specified torque :
49.0 ~ 53.9 N.m (5.0 ~ 5.5 kgf.m, 36.2 ~ 39.8 lb-ft)



[Rear]

Standard value :
Toe-in
Total : 0.16°±0.2°
Individual : 0.08°±0.1°

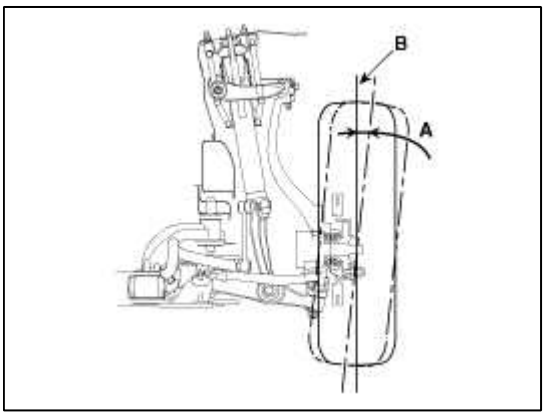
Adjust the toe-in by turning the cambolt of the assist arm.

Left cambolt : Clockwise → toe-out
Right cambolt : Clockwise → toe-in
The variation of toe by a rotation of the cambolt :
About 0.4°

CAUTION

- Each toe should be within 0.1° ± 0.1°.
  If the difference between right and left is not within +0.2°, repeat adjustment.
- After adjusting the cambolt, tighten the nut to the specified torque.

Camber
[Front]
Camber is the inward or outward tilting of the wheels at the top.



Item	Description
A	Positive camber angle
B	True vertical

When the wheel tilts out at the top, then the camber is positive (+).
When the wheel tilts in at the top, then the camber is negative(-).

Standard value : -0.7° ± 0.5°

NOTE

Camber is pre-set at the factory and doesn't need to be adjusted. If the camber is not within the standard value, replace the bent or damaged parts.

[Rear]

Standard value : -1.5° ± 0.5°
Difference between right and left angle is within 0.5°

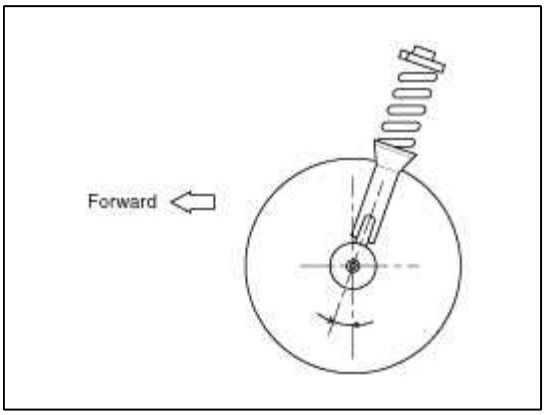
Adjust the camber by turning the cambolt of the rear lower arm.

Left cambolt : Clockwise → camber(-)
Right cambolt : Clockwise →camber(+)
The variation of camber by a rotation of the cambolt :
About 0.09°

Caster
Caster is the tilting of the strut axis either forward or backward from vertical. A backward tilt is positive (+) and a forward tilt is negative (-).

Caster is pre-set at the factory and doesn't need to be adjusted. If the caster is not within the standard value, replace the bent or damaged parts.

Caster : 7.45° ± 0.5°



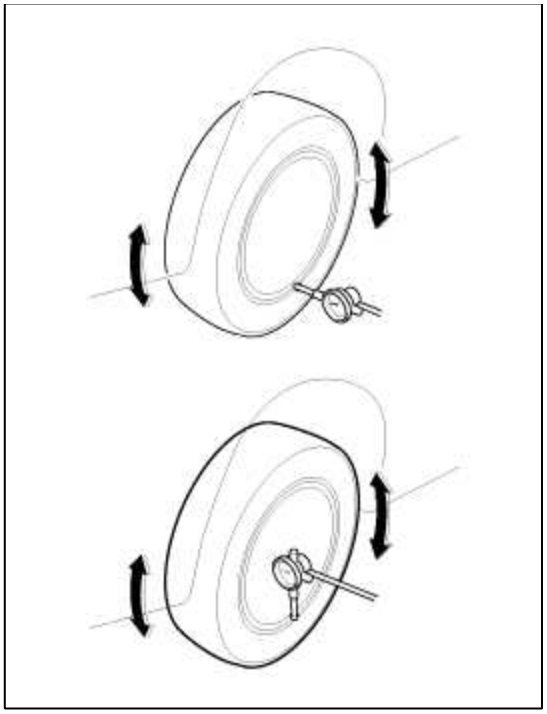
NOTE

- The worn loose or damaged parts of the front suspension assembly must be replaced prior to measuring front wheel alignment.
- Caster are pre-set to the specified value at the factory and don't need to be adjusted.
- If the caster are not within specifications, replace bent or damaged parts.
- The difference of left and right wheels about the the caster must be within the range of 0° ± 0.5°.

Wheel Runout

1. Jack up the vehicle and support it with jack stands.
2. Measure the wheel runout with a dial indicator as illustrated.
3. Replace the wheel if the wheel runout exceeds the limit.

Limit		Radial	Axial
Runout mm	Aluminium	0.3mm (0.0118 in.)	0.3mm (0.0118 in.)



Wheel Nut Tightening

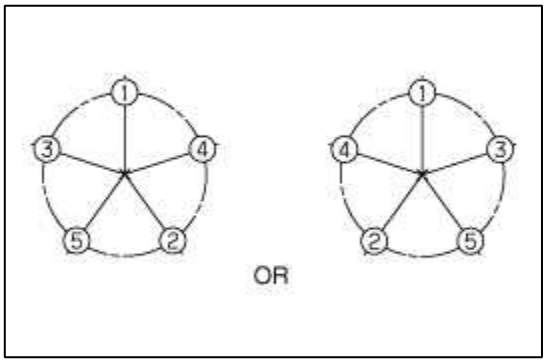
1. Tightening torque.

Tightening torque :
88.3 ~ 107.9 N.m(9.0 ~ 11.0 kgf.m, 65.1 ~ 79.6 lb-ft)

CAUTION

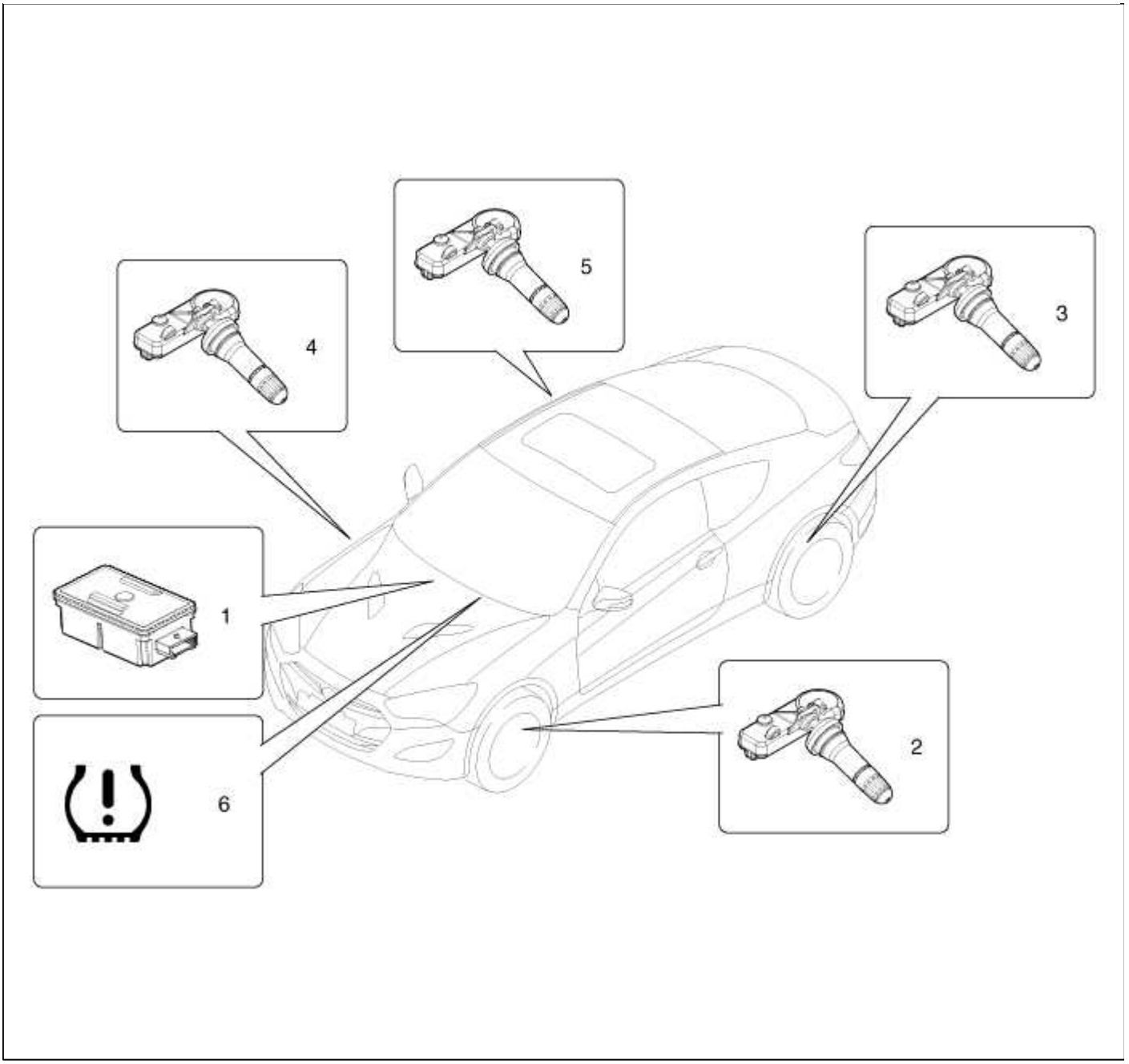
When using an impact gun, final tightening torque should be checked using a torque wrench.

2. Tightening order.
Check the torque again after tightening the wheel nuts diagonally.



Suspension System > Tire Pressure Monitoring System > Components and Components Location

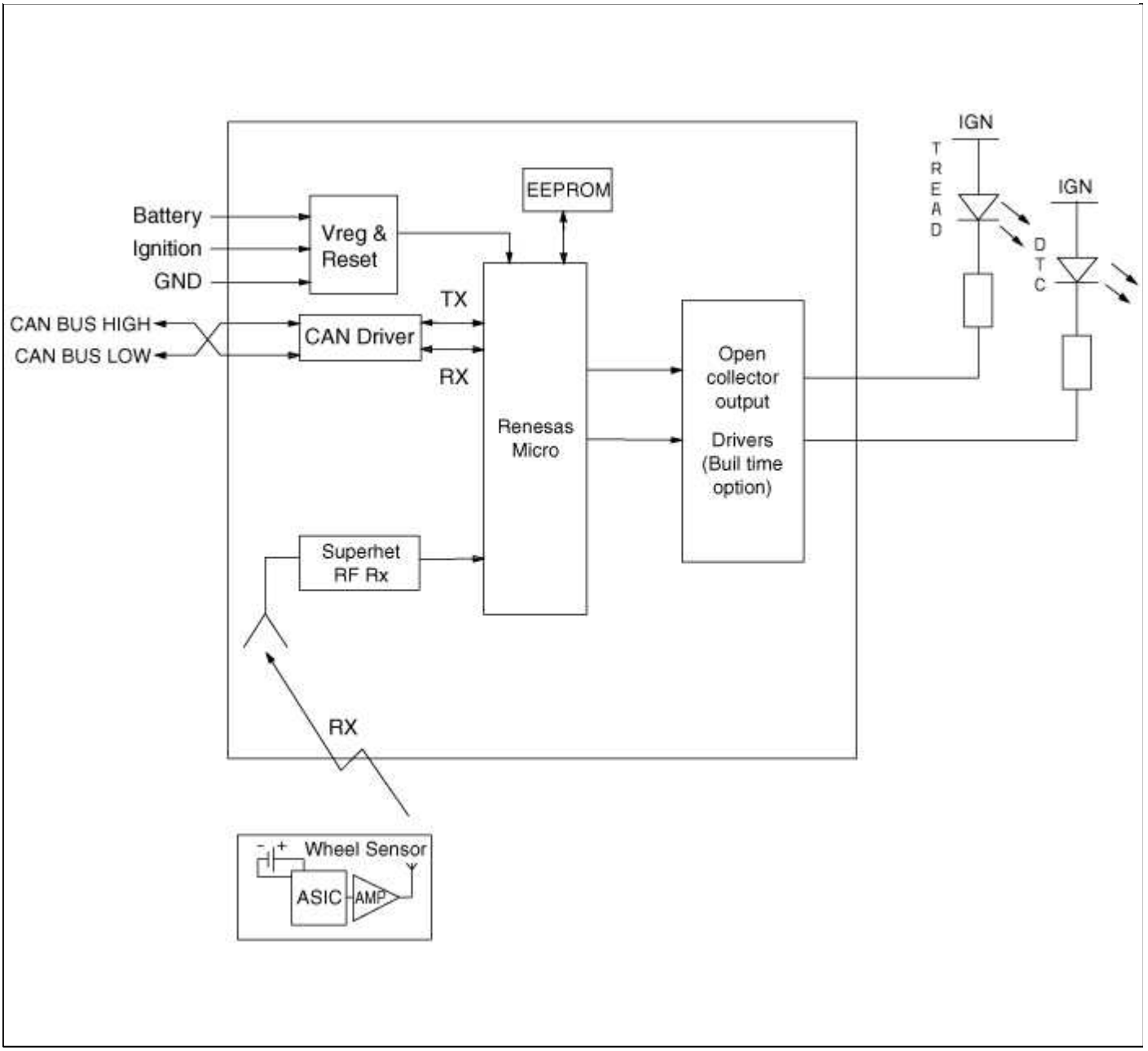
Components



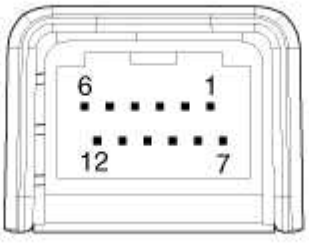
1. Receiver	4. TPMS Sensor (S2)
2. TPMS Sensor (S1)	5. TPMS Sensor (S3)
3. TPMS Sensor (S4)	6. Tread Lamp

Suspension System > Tire Pressure Monitoring System > Schematic Diagrams

Circuit Diagram



Hamess Connector



Pin No.	Discription	Remark
1	-	
2	-	
3	-	
4	Vehicle Ground	
5	CAN_HIGH	
6	Battery	
7	-	
8	-	
9	-	
10	-	
11	CAN_LOW	
12	Ignition	

Suspension System > Tire Pressure Monitoring System > Description and Operation

Description

TREAD Lamp

- Tire Under Inflation / Leak Warning.

1. Turn on condition
   A. When tire pressure is below allowed threshold
   B. When rapid leak is detected by the sensor.
   C. Indicates that tire needs to be re-inflated to placard pressure / repaired.
2. Turn off condition
   A. Under-inflation ; When tire pressure is above (warning threshold + hysteresis).
   B. Rapid Leak ; When tire pressure is above (leak warning threshold).

DTC Warning

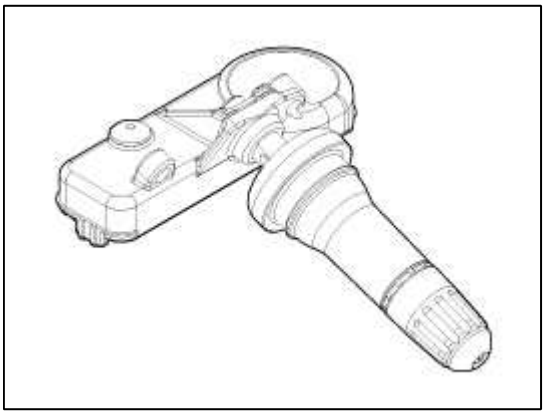
1. Turn on condition
   A. When the system detects a fault that is external to the receiver/ sensor.
   B. When the system detects a receiver fault.
   C. When the system detects a sensor fault.
2. Turn off condition
   A. If the fault is considered as 'critical', then the lamp is held on throughout the current Ignition cycle (even if the DTC has been demoted). This is because it is important to bring the problem to the drivers attention. On the following Ignition cycle, the demotion conditions will be re-checked. If the demotion conditions occur, the lamp will be turned off. It will be held on until DTC demotion checking is completed.
   B. 'Non critical' faults are those that can occur temporarily e.g. vehicle battery under voltage. The lamp is therefore turned off when the DTC demotion condition occurs.

System Fault

1. General Function
   A. The system monitors a number of inputs across time in order to determine that a fault exists.
   B. Faults are prioritized according to which has the most likely cause.
   C. Maximum fault store is equal to 15.
   D. Certain faults are not covered through DTC. The main ones are:
      1) Sensor thermal shutdown (over 257°F/125°C).
      2) Ignition Line stuck ; requires observation of lamps at Ignition ON to diagnose.

Suspension System > Tire Pressure Monitoring System > TPMS Sensor > Description and Operation

Description



1. Mode
   (1) Configuration State
      A. All sensors should be in the Low Line (Base) state.
      B. In Low Line (Base) configuration, sensor transmissions occur every 3 minutes 20 seconds (nominal) and pressure is measured every 20 seconds.
   (2) Normal Fixed Base State
      A. Sensor transmissions continue at the Low Line (Base) configuration defined rates until the state is either changed by LF command or by the sensor detecting a condition that requires a temporary change to another state.
      B. The LF command to this state must contain the sensors ID.
   (3) Storage Auto State:
      A. This state is a Low current consumption state.
      B. Sensors are in this state when they first arrive at the dealership (either on the vehicle or as replacement spares).
      C. In this state, the sensor does not measure pressure / temperature / battery level.
      D. The sensor will not transmit in this state unless requested to do so by the initiate command.

(4) Alert State:

A. The sensor automatically enters this state if the measured temperature exceeds 230 °F(110 °C) and over temperature shutdown is likely.

B. In this state, pressure is measured every 4 seconds and RF data transmitted every 4 seconds.

C. The state lasts for 1 minute if it is pressure triggered.

D. This state is alse entered when a 3 psi change in pressure from the last RF transmission occurs.

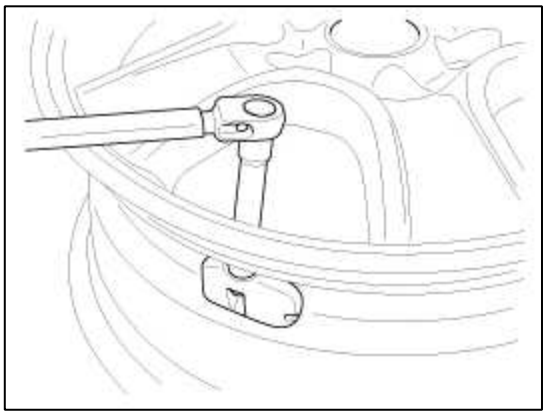
> NOTE
>
> Sensor mode is used to configure sensor between high line and low line system. TPMS sensor for UB should be set to low line.

Suspension System > Tire Pressure Monitoring System > TPMS Sensor > Repair procedures

Removal

> CAUTION
>
> Handle the sensor with care.

1. Remove the tire. (Refer to "Tire Removal")
2. Remove the valve nut.



> CAUTION
>
> The valve nut should not be re-used.

3. Discard the valve assembly.

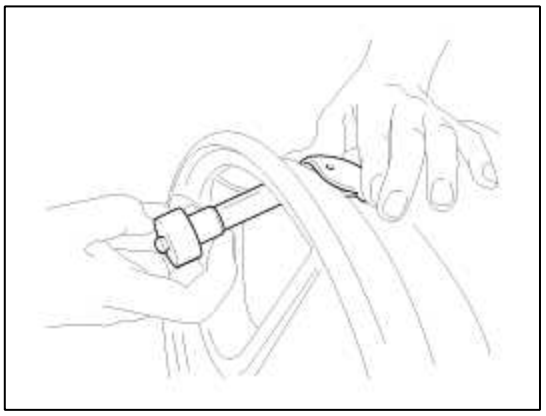
Installation

Sensor Fit

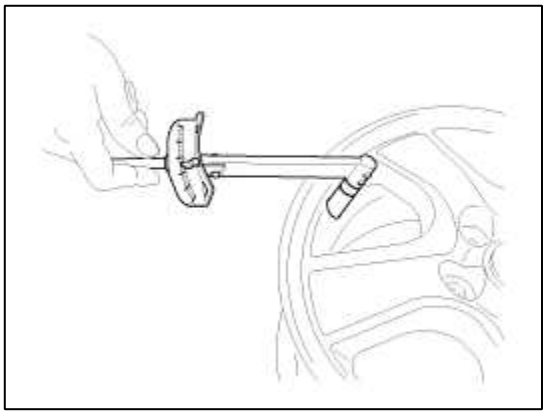
> CAUTION
>
> - Handle the sensor with care.
> - Avoid lubricant contact.
> - Ensure that the wheel to be fitted is designed for sensor mount. There should normally be a mark to indicate this.
> - Ensure that the valve hole and mating face of the wheel are clean.

1. Slide the sensor-valve unit through the valve hole of the rim. Hold the sensor against the rim and the rubber grommet against the sealing surface.

2. Insert the nut over the valve stem and then tighten the nut.



3. Continue to tightening the nut until contact with the rim and then tighten to 3.5 ~ 4.5Nm.



CAUTION

- Tighten slowly with quarter turn steps until the final torque is reached.
- Do not exceed allowed torque.
- Do not use electric or pneumatic tools.

4. Check that the sensor is firmly attached to the rim.

CAUTION

Risk of damage during the tire installation/ removal if the sensor is not firmly attached to the rim.

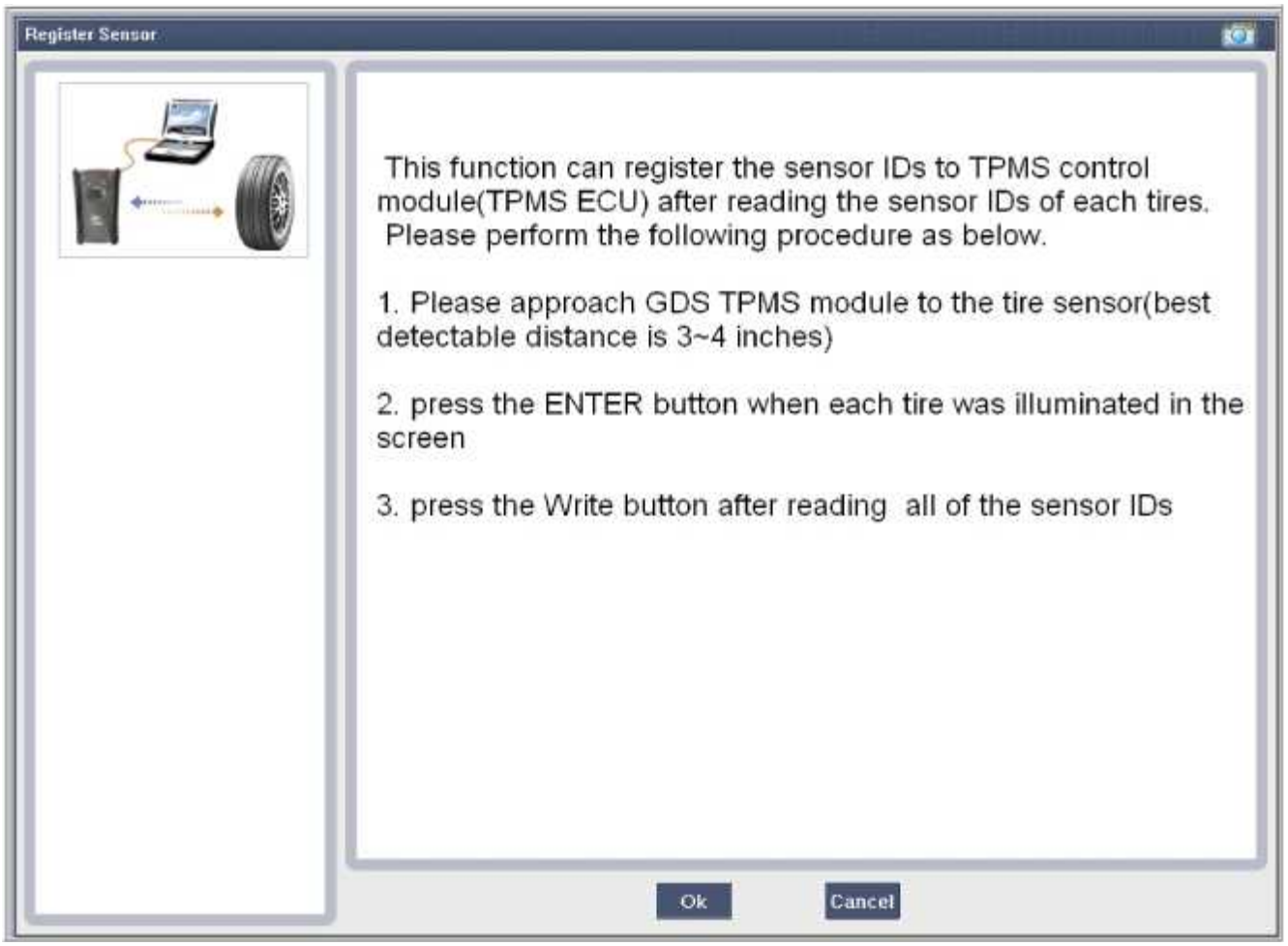
5. Carry out inflation / pressure correction and then fit valve cap.

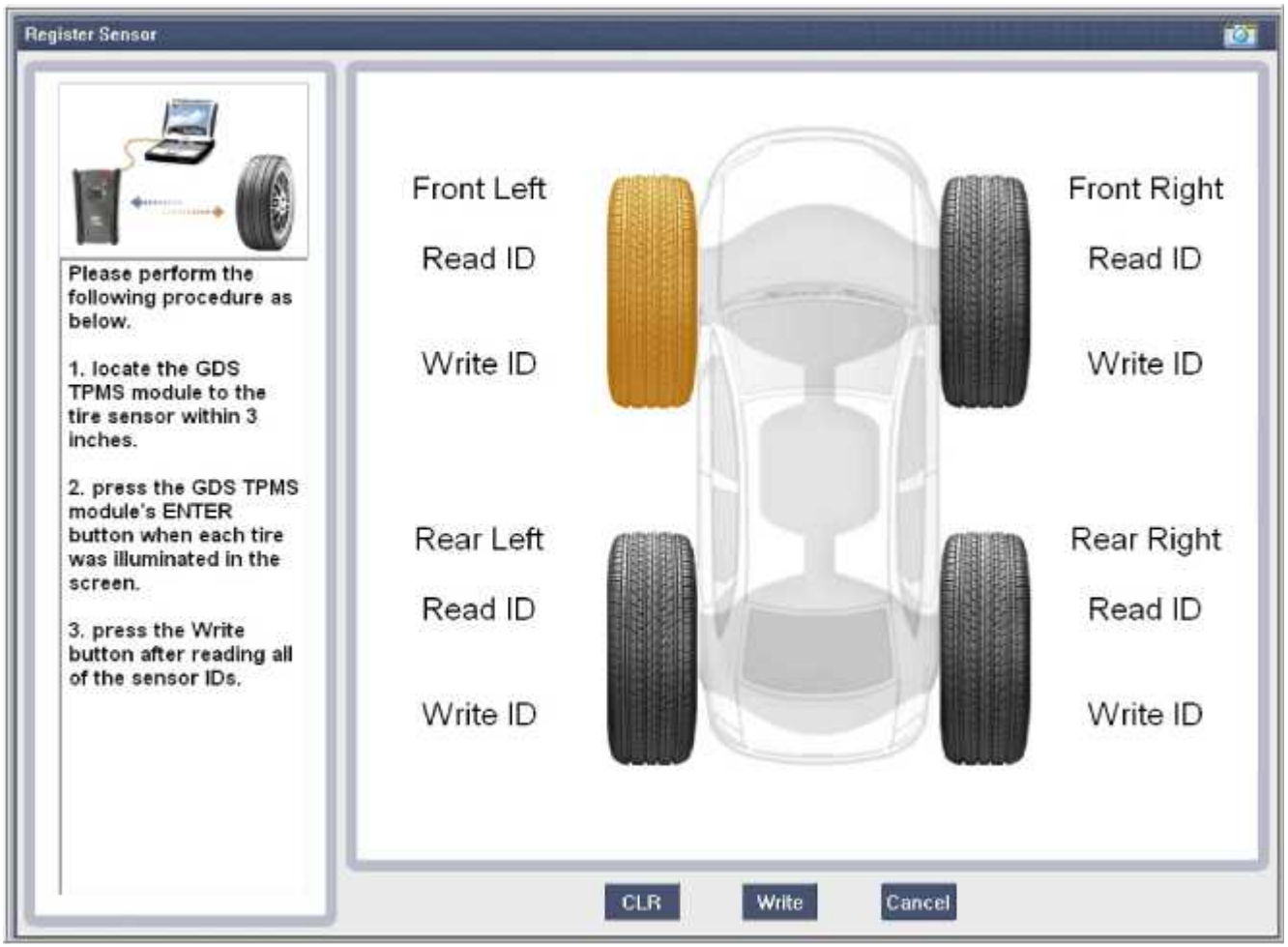
CAUTION

Change the newly installed sensor mode to Normal Fixed Base(Low Line) with the 'GDS'. Mode (Status / option) of the sensor installed to the vehicle should be Normal Fixed Base (Low).

6. Install the tire. (Refer to "Tire Installation")

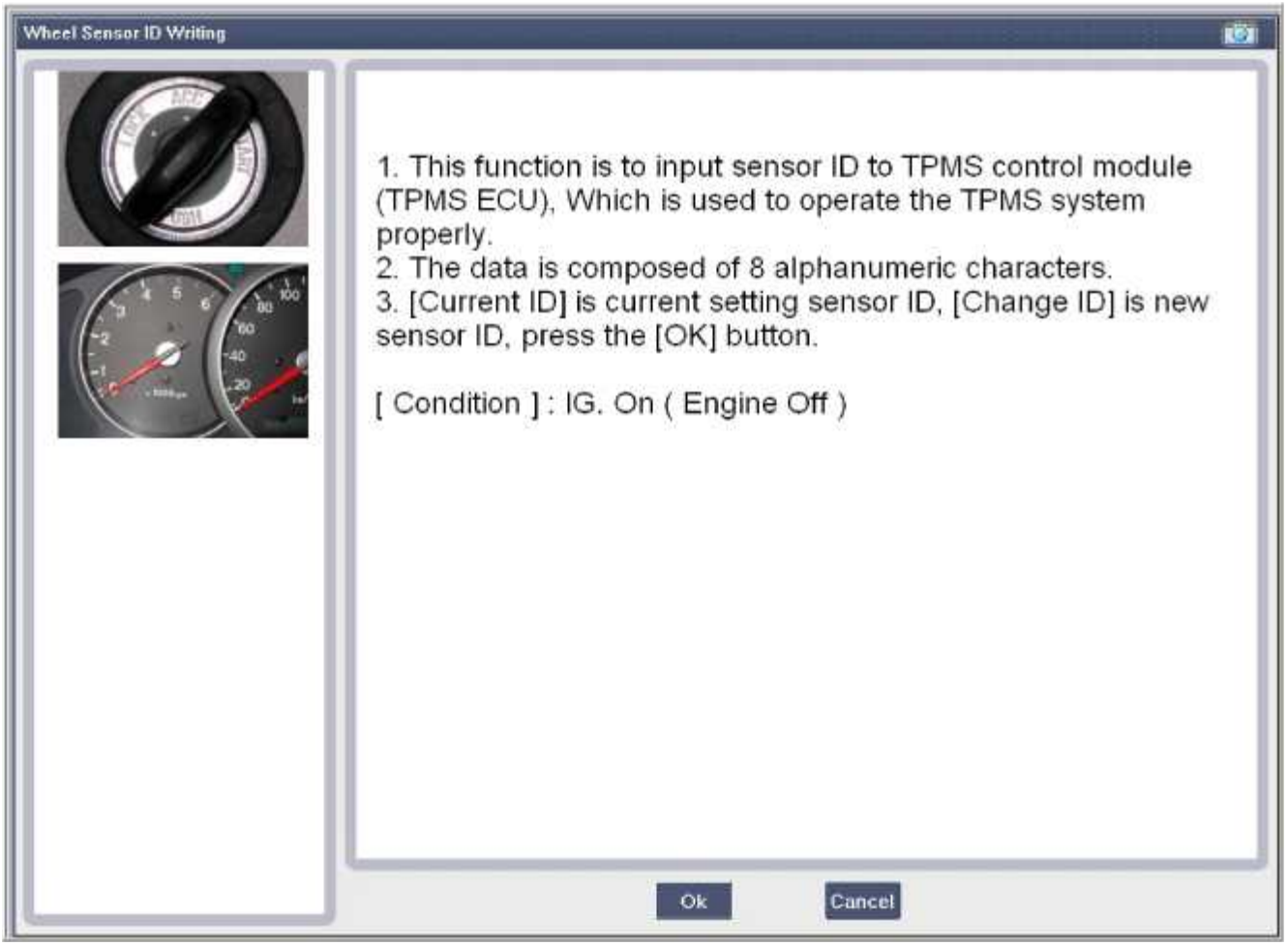
Sensor ID Writing (Wireless)

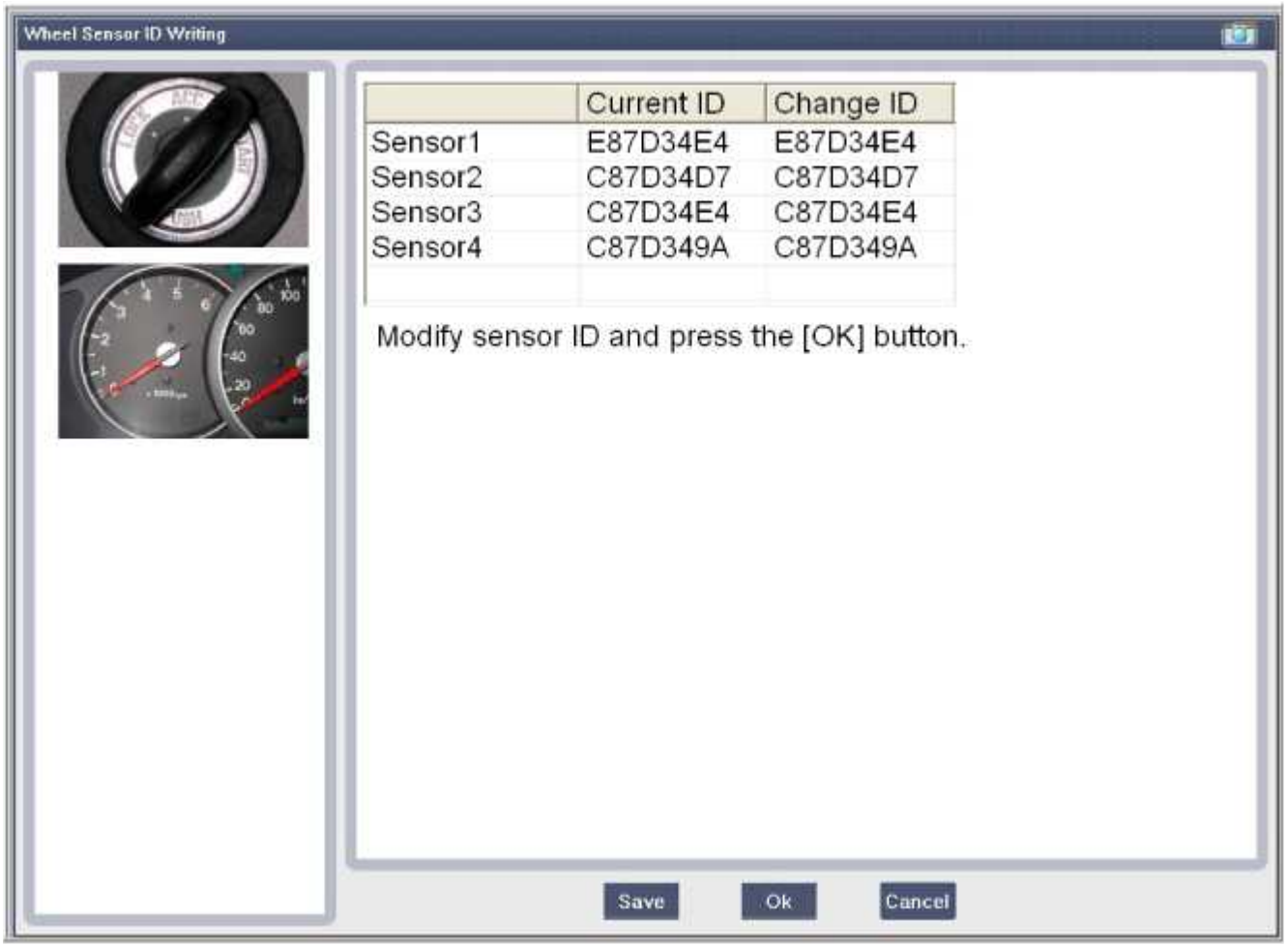

Register Sensor
This function can register the sensor IDs to TPMS control module(TPMS ECU) after reading the sensor IDs of each tires. Please perform the following procedure as below.
1. Please approach GDS TPMS module to the tire sensor(best detectable distance is 3~4 inches)
2. press the ENTER button when each tire was illuminated in the screen
3. press the Write button after reading all of the sensor IDs
Ok
Cancel

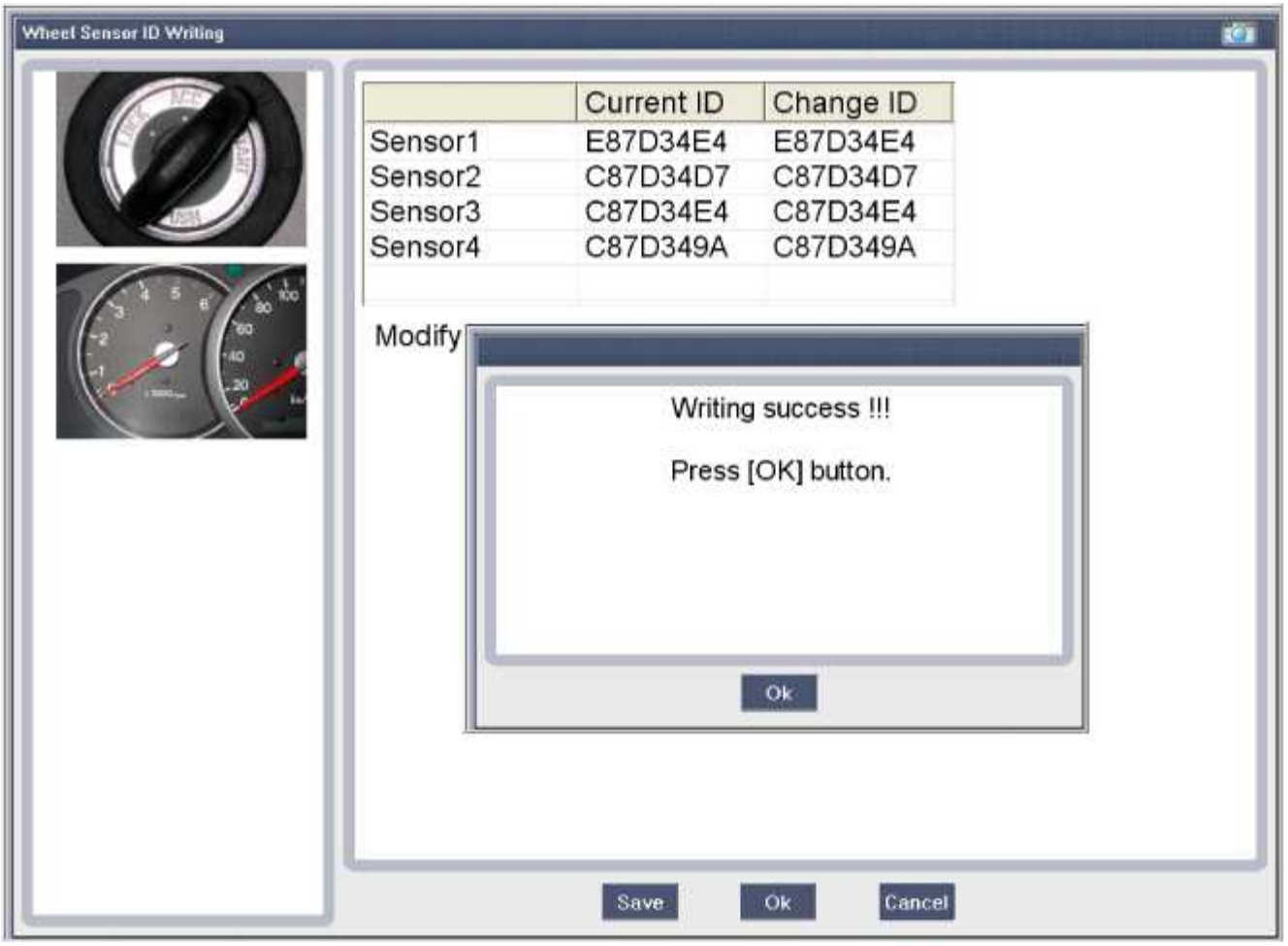

Register Sensor
Please perform the following procedure as below.
1. locate the GDS TPMS module to the tire sensor within 3 inches.
2. press the GDS TPMS module's ENTER button when each tire was illuminated in the screen.
3. press the Write button after reading all of the sensor IDs.
Front Left
Read ID
Write ID
Front Right
Read ID
Write ID
Rear Left
Read ID
Write ID
Rear Right
Read ID
Write ID
CLR
Write
Cancel


Register Sensor
Please perform the following procedure as below.
1. locate the GDS TPMS module to the tire sensor within 3 inches.
2. press the GDS TPMS module's ENTER button when each tire was illuminated in the screen.
3. press the Write button after reading all of the sensor IDs.
Front Left
Read ID
Write ID
Front Right
Read ID
Write ID
GDS TPMS
It takes Max. 30 Sec. Please, wait.....
Cancel
Rear Right
Read ID
Write ID
Write ID
Write ID
CLR
Write
Cancel

Sensor ID Writing

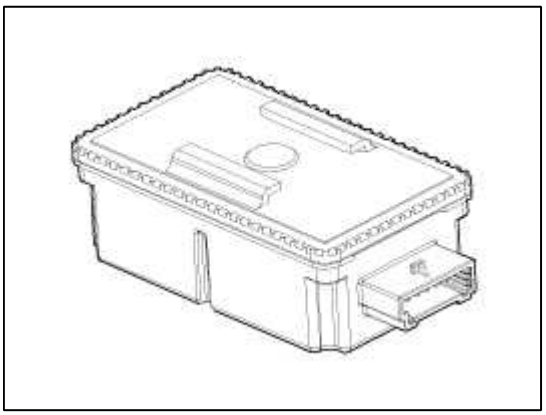

Wheel Sensor ID Writing
1. This function is to input sensor ID to TPMS control module (TPMS ECU), Which is used to operate the TPMS system properly.
2. The data is composed of 8 alphanumeric characters.
3. [Current ID] is current setting sensor ID, [Change ID] is new sensor ID, press the [OK] button.
[Condition] : IG. On (Engine Off)
Ok
Cancel


Wheel Sensor ID Writing
Current ID
Change ID
Sensor1 E87D34E4 E87D34E4
Sensor2 C87D34D7 C87D34D7
Sensor3 C87D34E4 C87D34E4
Sensor4 C87D349A C87D349A
Modify sensor ID and press the [OK] button.
Save
Ok
Cancel



Suspension System > Tire Pressure Monitoring System > TPMS Receiver > Description and Operation

Description



1. **Mode**
   (1) Virgin State
      A. The receiver as a sole part is shipped in this state. Replacement parts should therefore arrive in this state.
      B. In this state, there is no sensor monitoring and no DTC monitoring.
      C. The state indicates that platform specific parameters must be written to the receiver and that sensors are un-learned.
   (2) Normal State
      A. In order for tire inflation state and DTC monitoring to occur, the receiver must be in this state.
      B. In this state, automatic sensor learning is enabled.
   (3) Test State
      A. This state is only used in manufacturing plant to check RF transmission between sensor and receiver.
2. **Overview**
   A. Receives RF data from sensor.
   B. Uses sensor data to decide whether to turn on TREAD Lamp.
   C. Learn TPM sensor for under inflation monitoring automatically.
   D. Uses sensor information, distance travelled, background noise levels, Auto-learn status, short / open circuit output status, vehicle battery level, internal receiver states to determine if there is a system or a vehicle fault.

Operation
1. General Function
   A. Auto-learn takes place only once per Ignition cycle.
   B. On successful completion, 4 road wheel sensor ID's are latched into memory for monitoring.
   C. Until Auto-learn completes, previously learned sensors are monitored for under inflation / leak warnings.
2. General Conditions to Learn New Sensors:
   A. Receiver must determine that it is confident that sensor is not temporary:
      1) Uses vehicle speed.
      2) Uses confidence reduction of previously learned sensors.
   B. Typical time at driving continuously over 12.4 mph(20 kph) to learn a new sensor is up to 20 minutes.
3. General Conditions to Un-Learn a sensor that is removed:
   A. It takes less than 20 minutes at 12.4 ~ 18.6 mph(20 ~ 30kph).
   B. Confidence reduction is dependent on time which vehicle is driven at speed greater than or equal to 12.4 mph(20 kph).

Suspension System > Tire Pressure Monitoring System > TPMS Receiver > Repair procedures

Replacement

NOTE

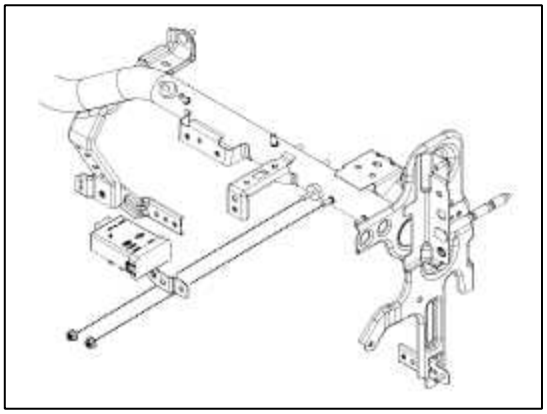
When the receiver first arrives for replacement:
1) It will be in Virgin State.
2) It will not be configured for any specific platform.
3) It will not have any sensor ID's memorized.

CAUTION

It is important to make sure that the correct receiver is used to replace the faulty part i.e. it must be Low Line and not High Line in order to have the correct inflation warning thresholds set.

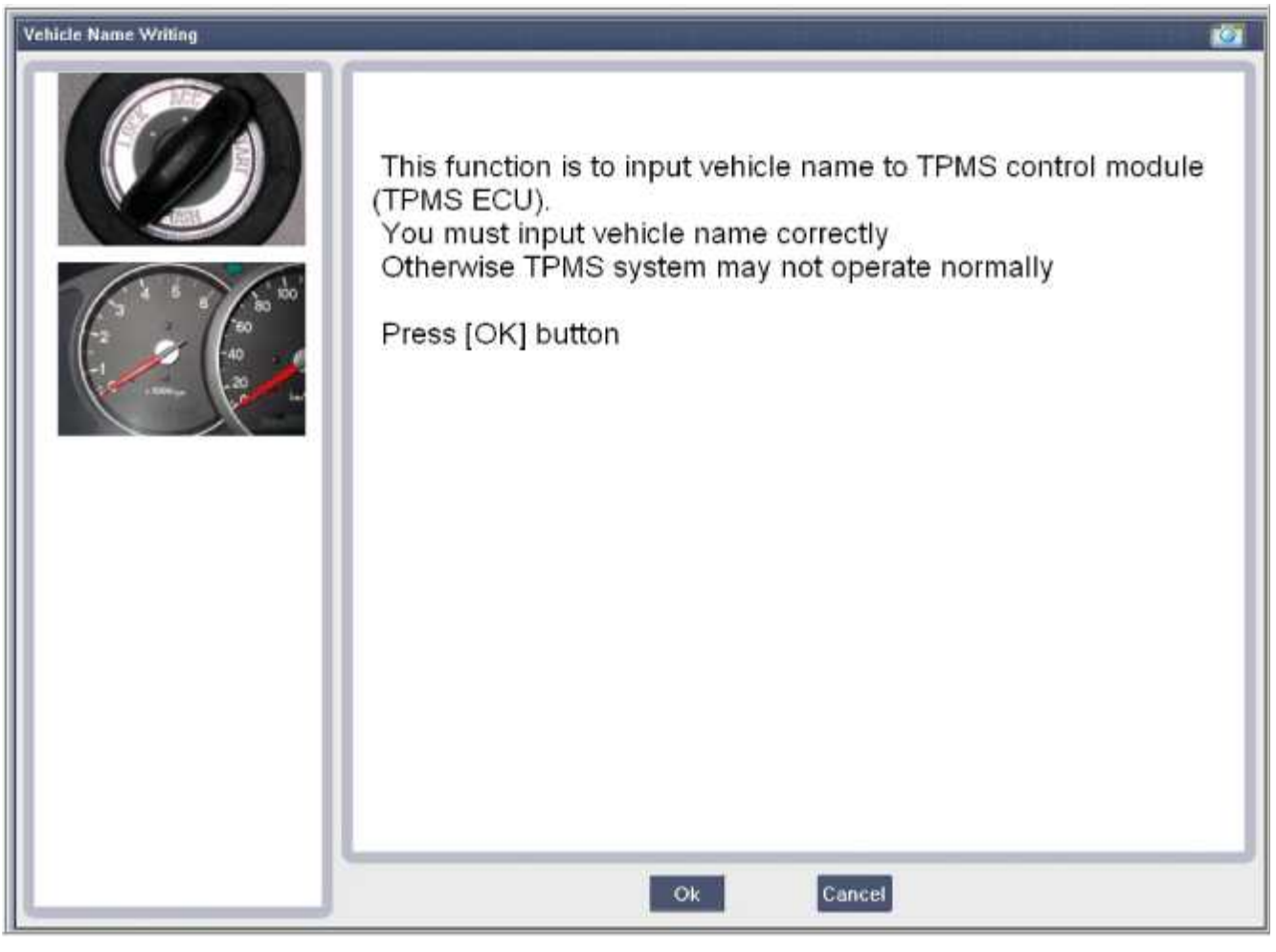
1. Disconnect vehicle battery.

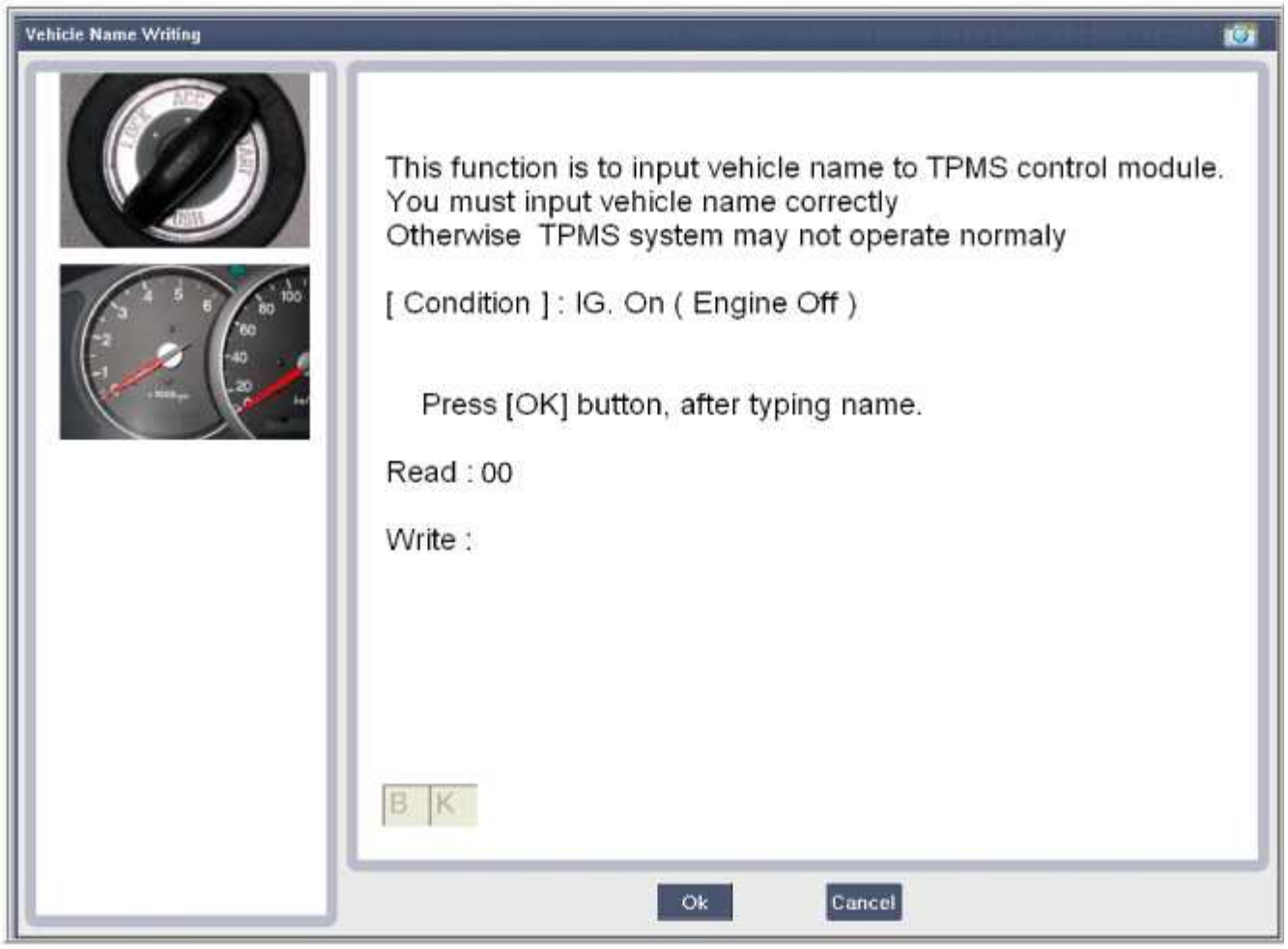
2. Remove the glove box.
   (Refer to BD group - "Crash Pad")
3. Remove the receiver (A) and fit bracket assembly to new part.

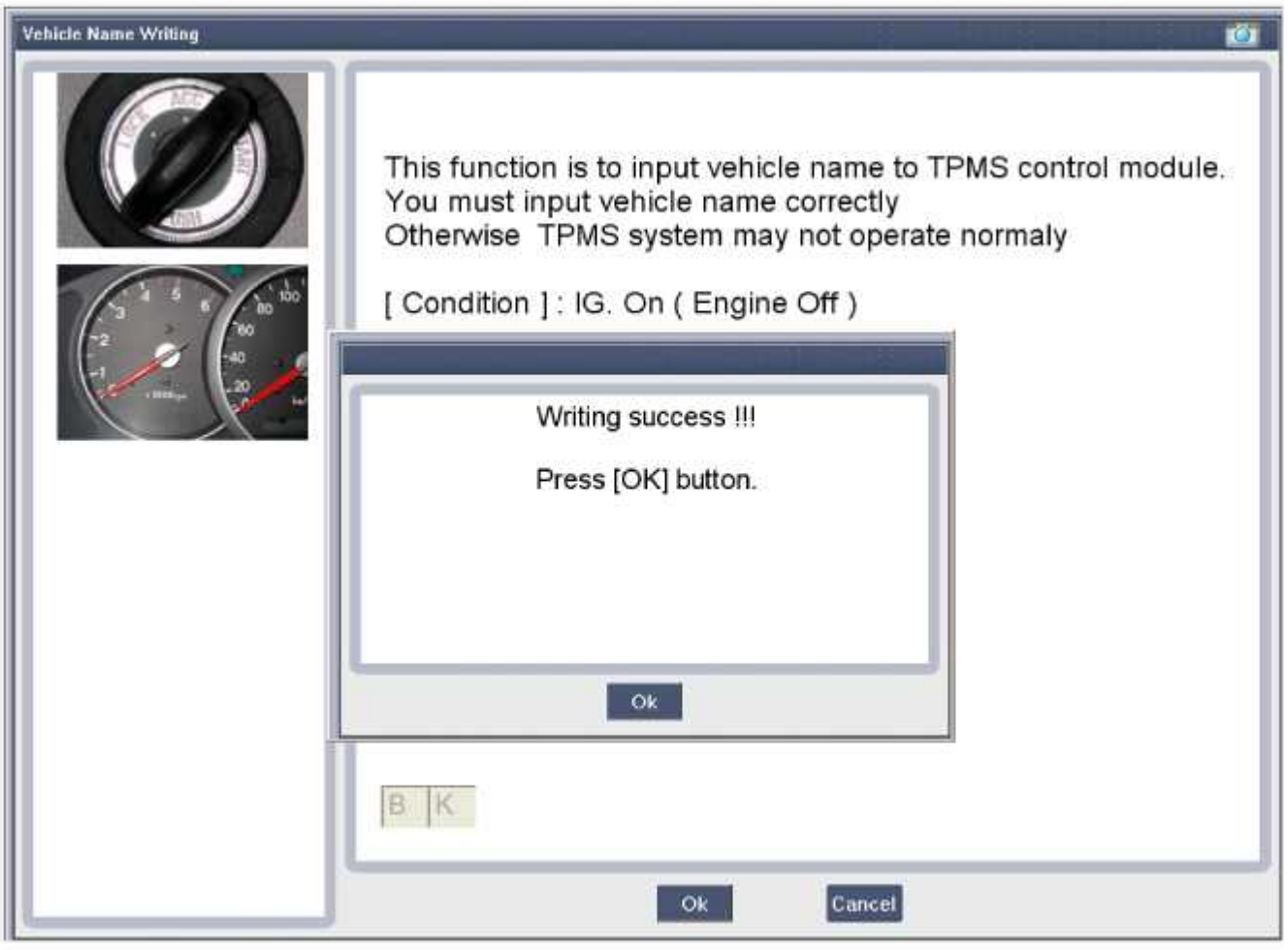


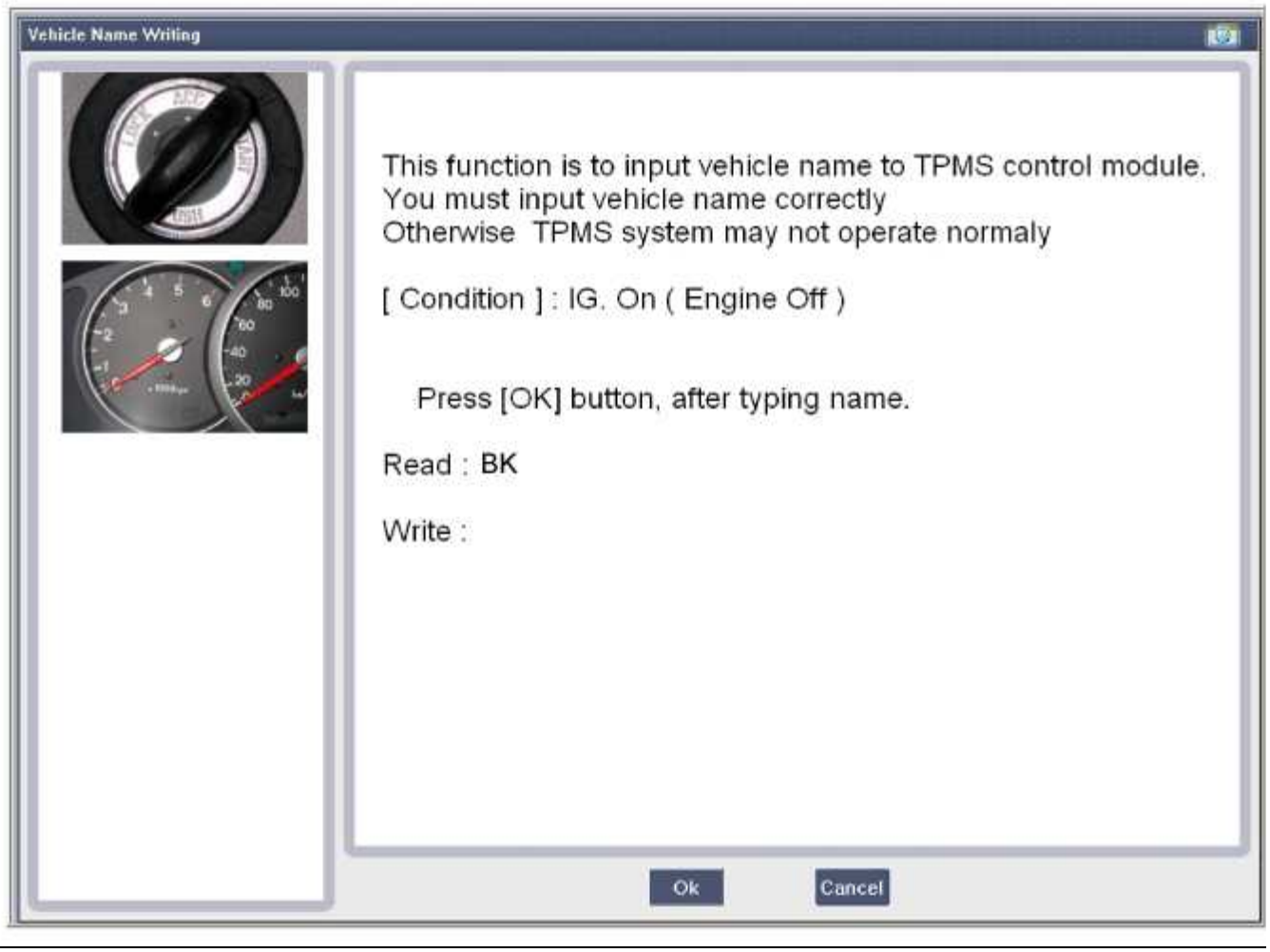
4. Secure new part to vehicle and fit connector.
5. Re-connect battery and turn Ignition on.
6. Check that TREAD Lamp flash rate matches Virgin State indication.

Vechicle Name Writing

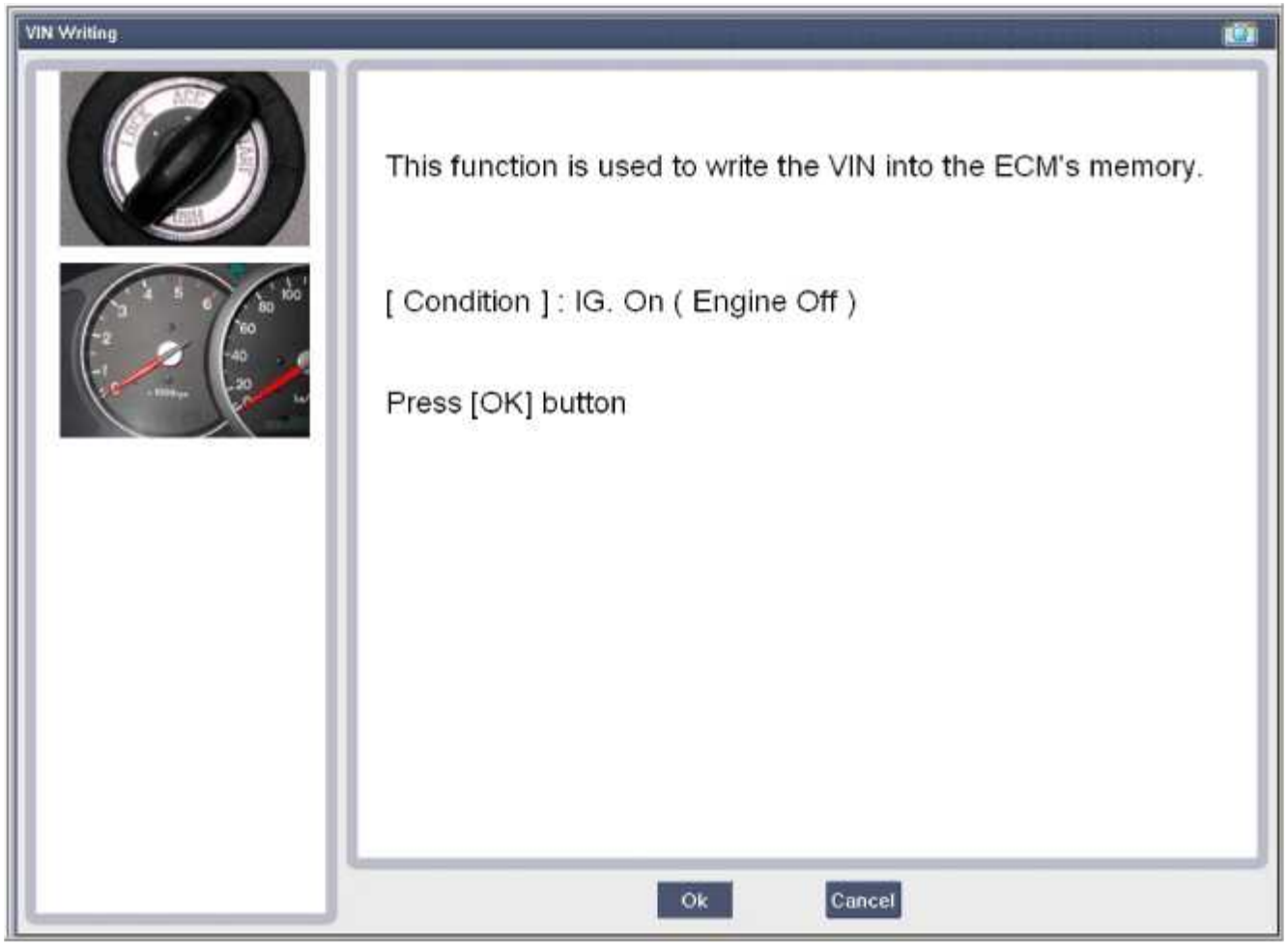


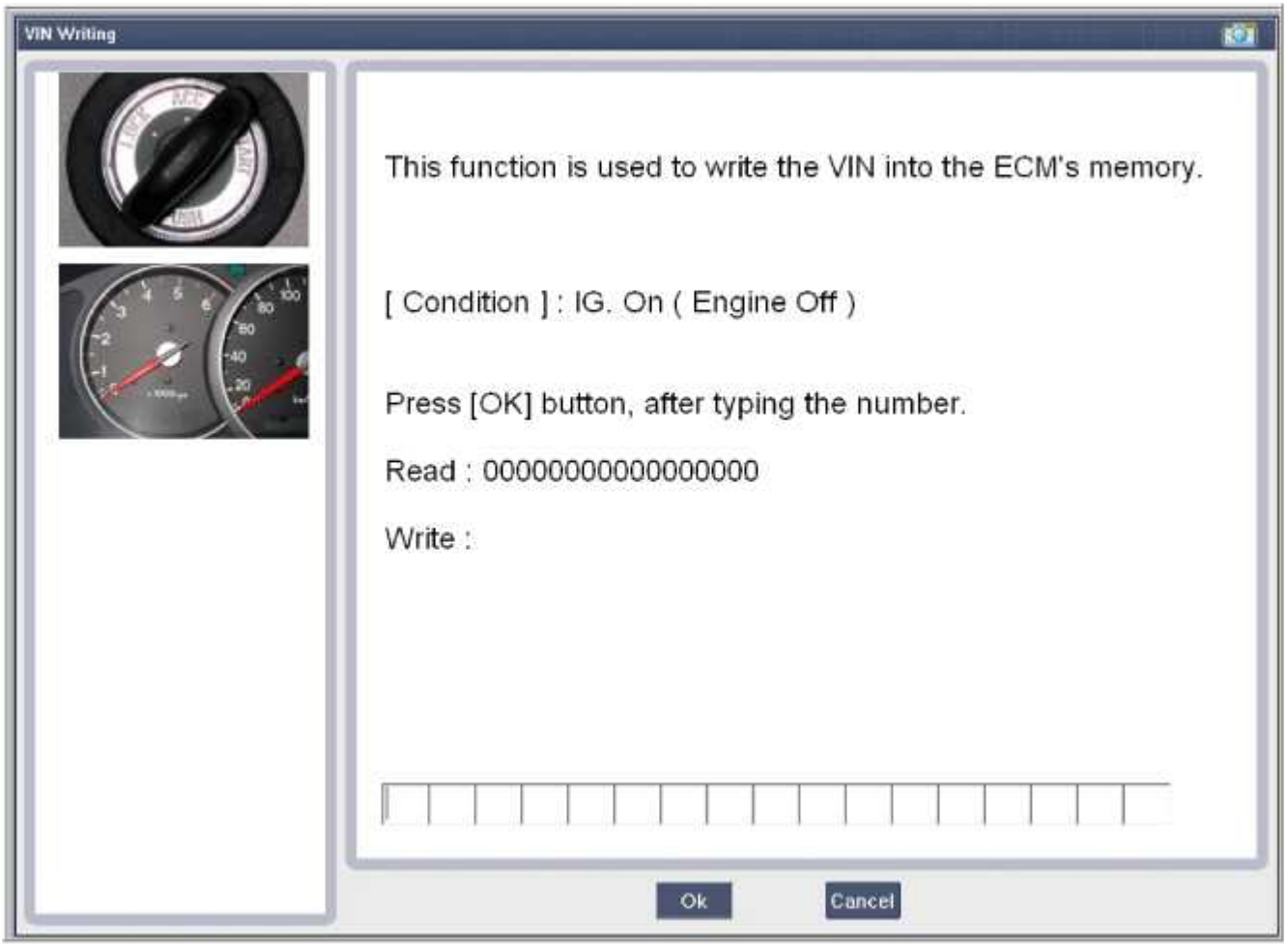

Vehicle Name Writing
This function is to input vehicle name to TPMS control module.
You must input vehicle name correctly
Otherwise TPMS system may not operate normaly
[Condition] : IG. On (Engine Off)
Press [OK] button, after typing name.
Read : 00
Write :
B K
Ok
Cancel

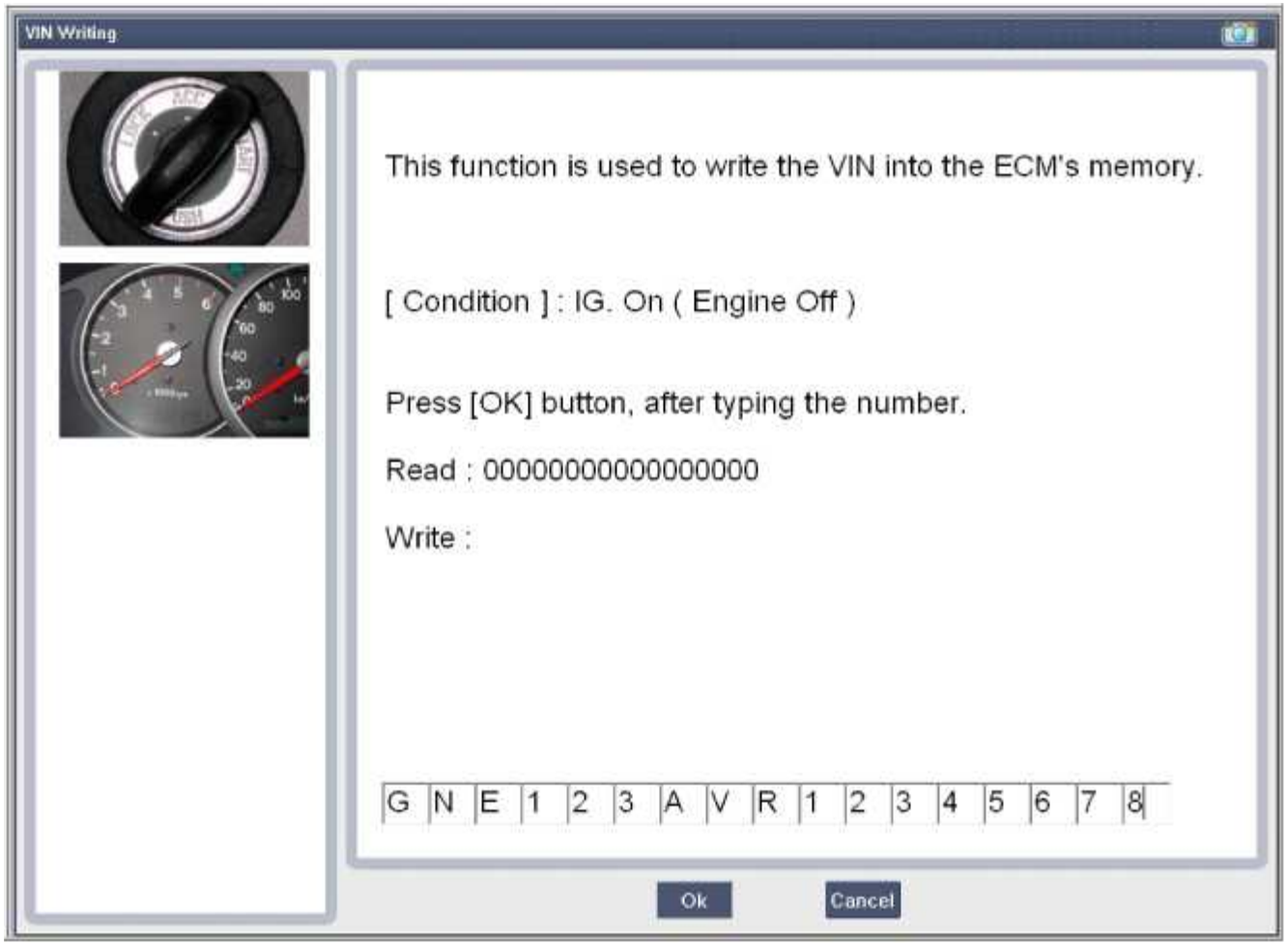

Vehicle Name Writing
This function is to input vehicle name to TPMS control module.
You must input vehicle name correctly
Otherwise TPMS system may not operate normaly
[Condition] : IG. On (Engine Off)
Writing success !!!
Press [OK] button.
Ok
B K
Ok
Cancel

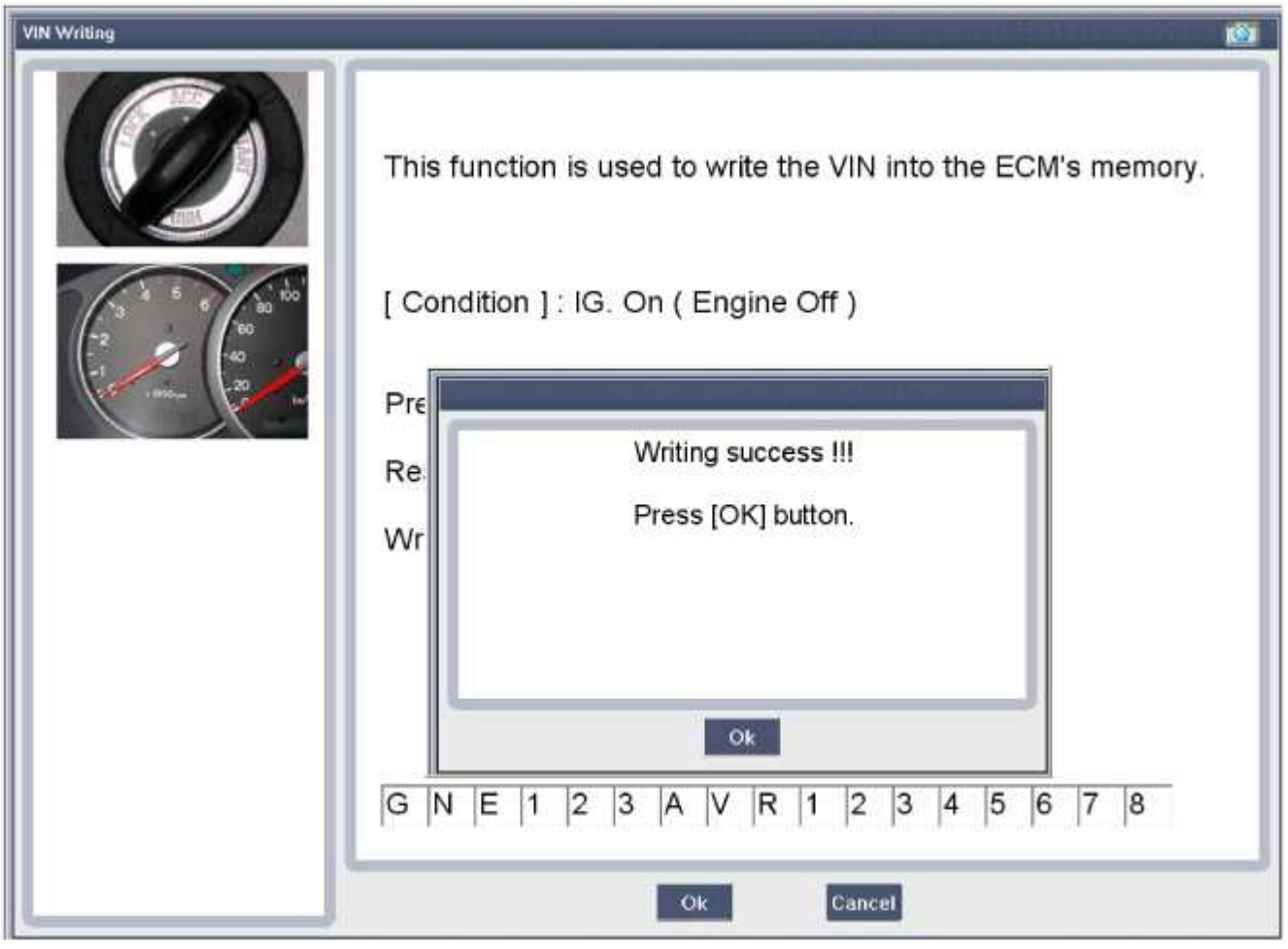

Vehicle Name Writing
This function is to input vehicle name to TPMS control module.
You must input vehicle name correctly
Otherwise TPMS system may not operate normaly
[Condition] : IG. On (Engine Off)
Press [OK] button, after typing name.
Read : BK
Write :
Ok
Cancel

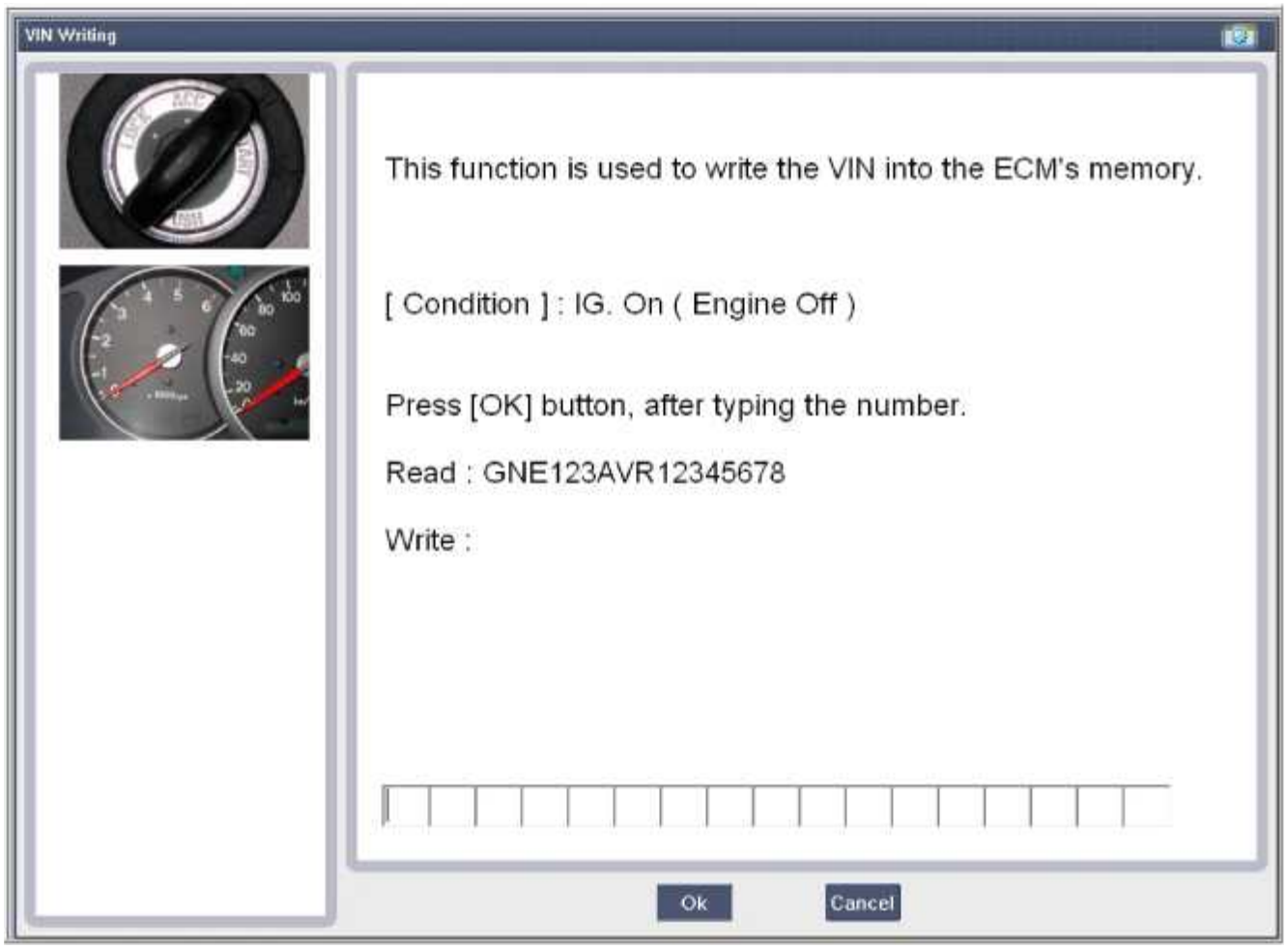
VIN Writing


VIN Writing
This function is used to write the VIN into the ECM's memory.
[Condition] : IG. On (Engine Off)
Press [OK] button
Ok
Cancel


VIN Writing
This function is used to write the VIN into the ECM's memory.
[Condition] : IG. On (Engine Off)
Press [OK] button, after typing the number.
Read : 00000000000000000
Write :
Ok
Cancel


VIN Writing
This function is used to write the VIN into the ECM's memory.
[Condition] : IG. On (Engine Off)
Press [OK] button, after typing the number.
Read : 00000000000000000
Write :
G N E 1 2 3 A V R 1 2 3 4 5 6 7 8
Ok
Cancel


VIN Writing
This function is used to write the VIN into the ECM's memory.
[Condition] : IG. On (Engine Off)
Writing success !!!
Press [OK] button.
Ok
G N E 1 2 3 A V R 1 2 3 4 5 6 7 8
Ok
Cancel


VIN Writing
This function is used to write the VIN into the ECM's memory.
[Condition] : IG. On (Engine Off)
Press [OK] button, after typing the number.
Read : GNE123AVR12345678
Write :
Ok
Cancel