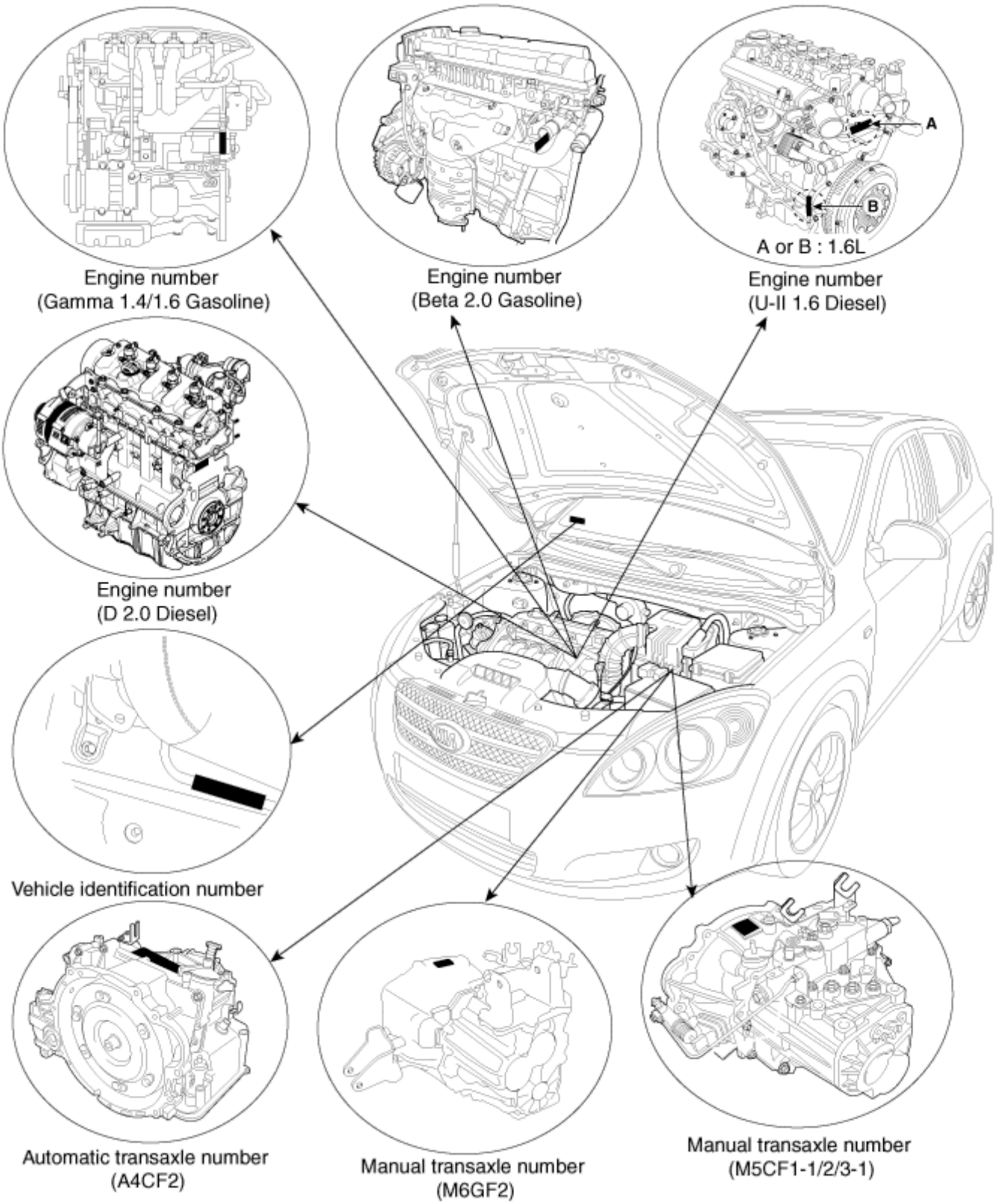
IDENTIFICATION NUMBER LOCATIONS



Identification Number Description

Vehicle Identification Number

English ▼



1. World Manufacturer Identifier (WMI)
   - U5Y : Passenger vehicle

2. Vehicle line
   - H : Cee'd

3. Model & Series
   - A : Low grade (L)
   - B : Middle-Low grade (GL)
   - C : Middle grade (GLS, JSL, TAX)
   - D : Middle-High grade (HGS)
   - E : High grade (TOP)

4. Body/Cabin type, Gross Vehicle Weight Rating
   U5Y
   - 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

5. Restraint system, Brake system
   U5Y
   - 0 : Both side - None
   - 1 : Both side - Active belt
   - 2 : Both side - Passive belt

6. Engine type
   - 1 : Gasoline engine 1.4
   - 2 : Gasoline engine 1.6
   - 3 : Gasoline engine 2.0
   - 5 : Diesel engine 2.0
   - 6 : Diesel engine 1.6

7. Check digit or Driver’s side & Transmission
   - 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

8. Production year
   - A : 2010, B : 2011, C : 2012, D : 2013 …

9. Plant of production
   - L: Zilina (Slovakia)

10. Vehicle production sequence number
    - 000001 ~ 999999

Paint Code

Code	Color
WD	Cassa White
9S	Machine Silver
5K	Piston Gray
1K	Black Pearl
8Q	Pewter Beige
A6	Dakar Yellow
B6	Oil Blue
AA1	Infra Red
AA2	Solid Clyde Blue
5B	Byte Blue
AA3	Sirius Silver
AA4	Phoenix Silver

Engine Number



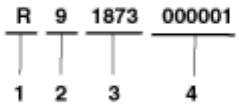
1. Engine fuel
   – G : Gasoline
   – D : Diesel
2. Engine range
   – 4 : 4 cycle 4 cylinder
   – 6 : 4 cycle 6 cylinder
3 - 4. Engine development order and capacity
   – FA : γ engine, 1396cc (Gasoline)
   – FB : U engine, 1582cc (Diesel)
   – FC : γ engine, 1592cc (Gasoline)
   – GC : β engine, 1975cc (Gasoline)
   – EA : D engine, 1991cc (Diesel)
5. Production year
   – 9 : 2009, A : 2010, B : 2011, C : 2012, D : 2013 …
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

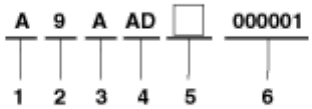
Transaxle Number

Manual



1. Model
   - R : M5CF1
   - P : M5CF2
   - S : M5CF3, M6GF2
2. Production year
   - 9 : 2009, A : 2010, B : 2011, C : 2012, D : 2013 …
3. Gear ratio
   - 1873 = 4.056
   - 1767 = 3.941
   - C = 4.063
   - L = 4.533
4. Transaxle production sequence number
   - 000001 ~ 999999

Automatic



1. Model
   - A : A4CF1
   - B : A4CF2

2. Production year
   - 9 : 2009, : 2010, B : 2011, C : 2012, D : 2013 …

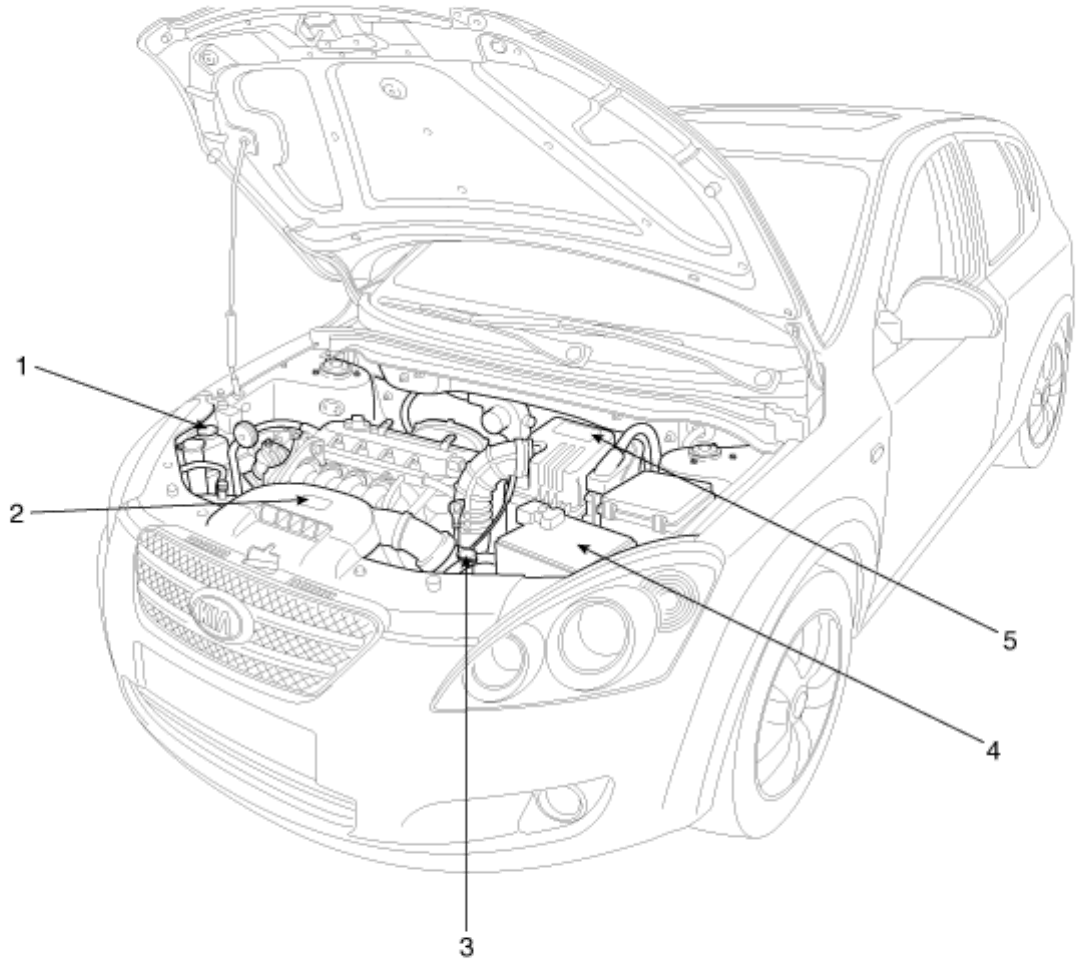
3. Gear ratio
   - A = 4.375
   - B = 3.532

4. Detailed chassification
   - AD : γ - 1.6
   - CD : β - 2.0
   - JD : U - 1.6

5. Spare

6. Transaxle production sequence number
   - 000001 ~ 999999

Warning / caution label locations



1. Coolant level caution 2. Fan caution 3. Radiator cap caution	4. Battery caution 5. Air cleaner 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.

NOTICE

After reconnecting or recharging a discharged battery, the ESP 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 ESP OFF indicator may turn OFF.
If the ESP OFF indicator does not turn OFF, have the system checked refering to DTC. (Refer to the BR group.)

Lift And Support Points

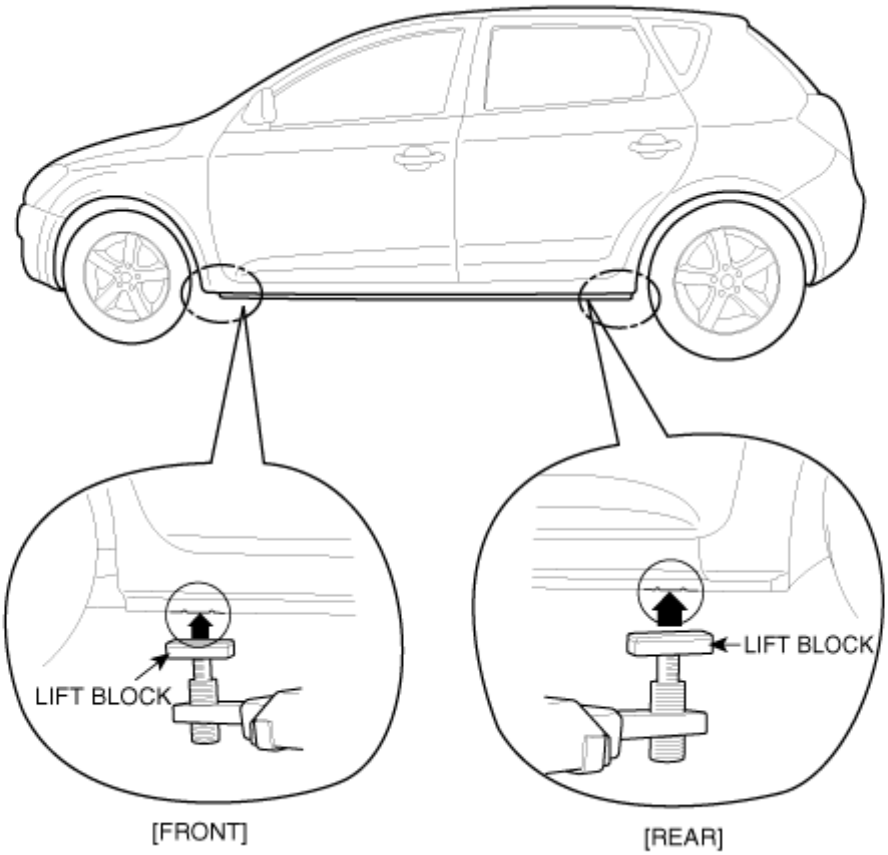
WARNING

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 can cause the vehicle to tip forward on the hoist.

NOTICE

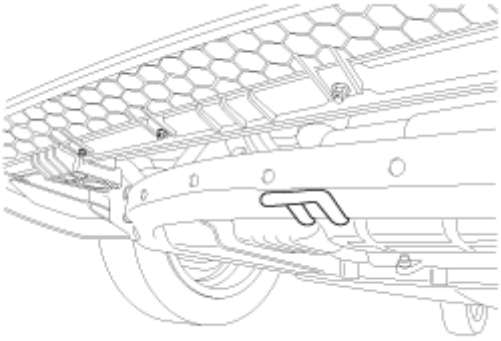
- Since each tire/wheel assembly weights approximately 30lbs (14kg), placing the front wheels in the luggage area can assist with the weight distribution.
- Use the same support points to support the vehicle on safety stands.

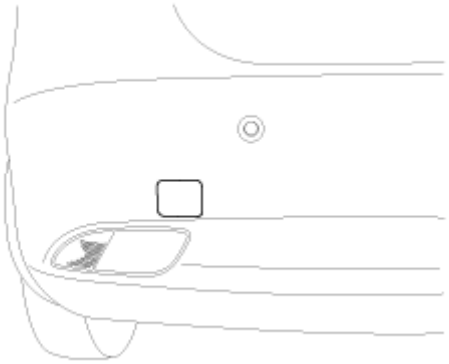
1. Place the lift blocks under the support points as shown in the illustration.
2. Raise the hoist a few inches (centimeters) and rock the vehicle to be sure it is firmly supported.
3. Raise the hoist to full height to inspect the lift points for secure support.



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.

General Service Information

Protection Of The Vehicle

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

⚠ CAUTION

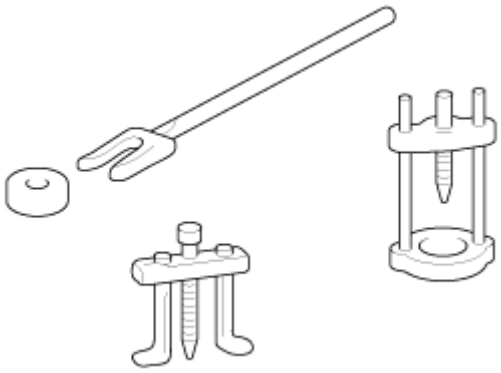
The support rod must be inserted into the hole near the edge of the hood whenever you inspect the engine compartment to prevent the hood from falling and causing possible injury.
Make sure that the support rod has been released prior to closing the hood. Always check to be sure the hood is firmly latched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

Preparation Of Tools And Mesuring Equipment

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

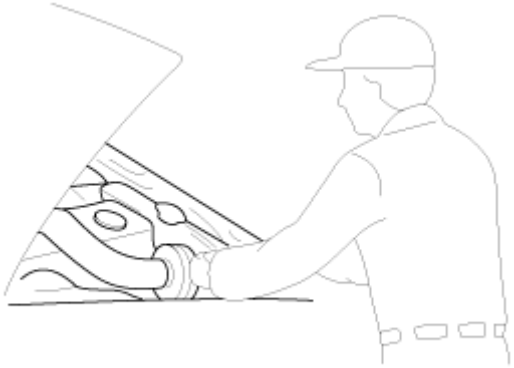
Special Tools

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.



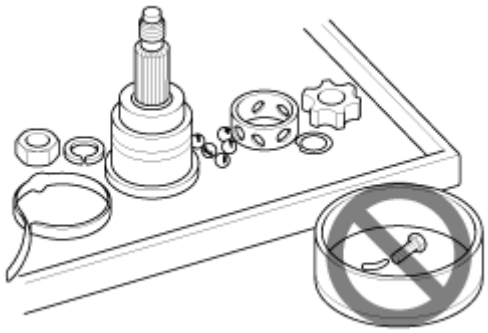
Disassembly

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 KIA genuine parts.

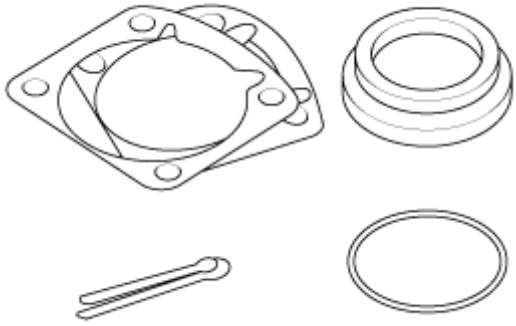


Replacement

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.

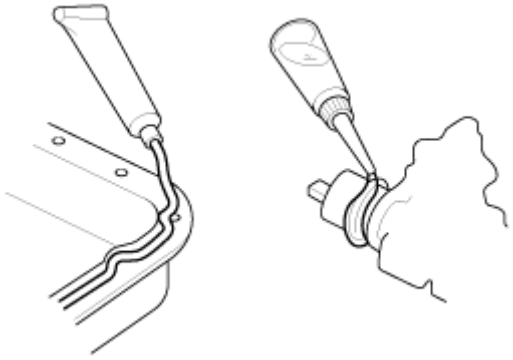
1) Oil seals
2) Gaskets
3) O-rings

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.

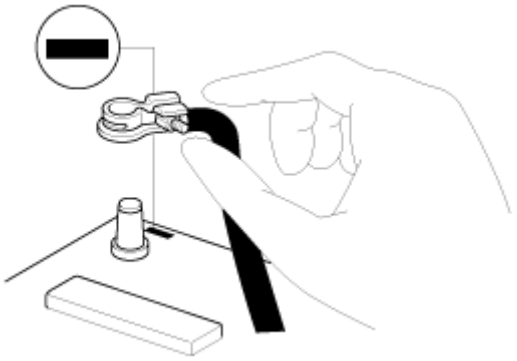


Adjustment

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.

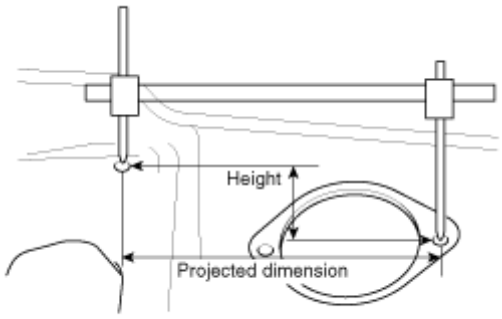


Measuring Body Dimensiongs

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

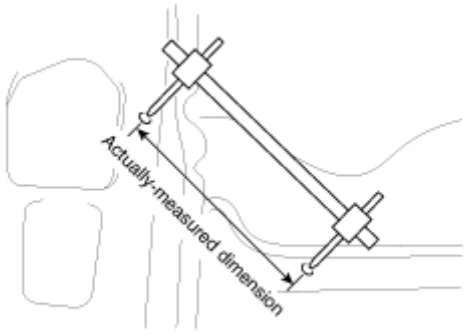
1. These are the dimensions measured when the measurement points are projected from the vehicle's surface, and are the reference dimensions used for used for body alterations.
2. If the length of the tracking gauge probes is adjustable, measure it by lengthening one of two probes as long as the different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



Measuring Actual Dimensions

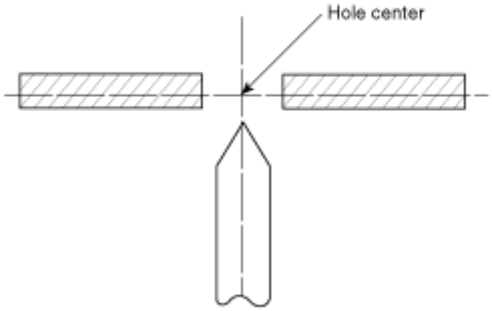
1. These dimensions indicate the actual linear distance between measurement points, and are used as the reference dimensions when a tracking gauge is used for measurement.
2. First adjust both probes to the same length (A=A') before measurement.

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



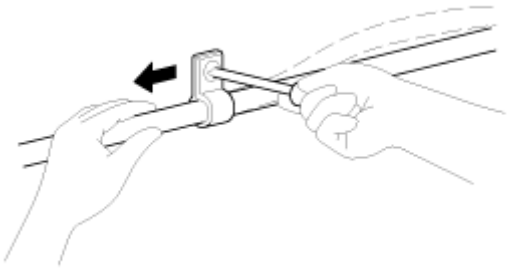
Measurement Point

Measurements should be taken at the center of the hole.



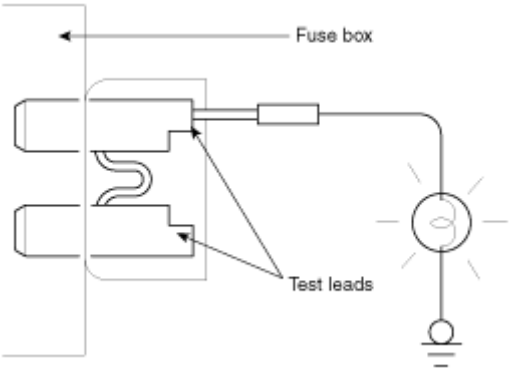
Checking Cables And Wires

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)



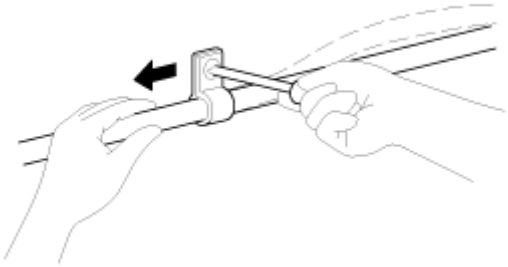
Serivicing The Electrical System

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

> **NOTICE**
>
> 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, record the diagnostic data before removing the battery cable.



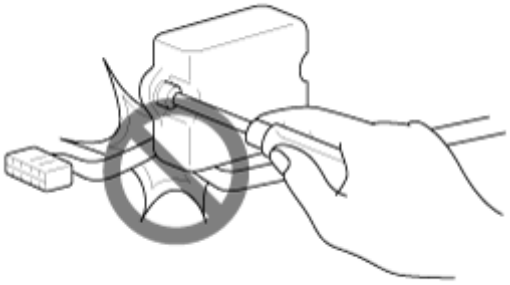
2. Attach the wiring harnesses with clamps so that there is no slack. However, for any harness which passes the engine or other vibrating parts of the vehicle, allow some slack within a range that does not allow the engine vibrations to cause the harness to come into contact with any of the surrounding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



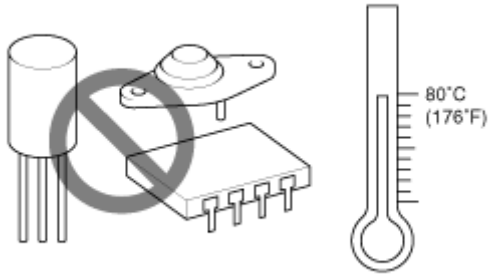
4. When installing any parts, be careful not to pinch or damage any of the wiring harness.



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



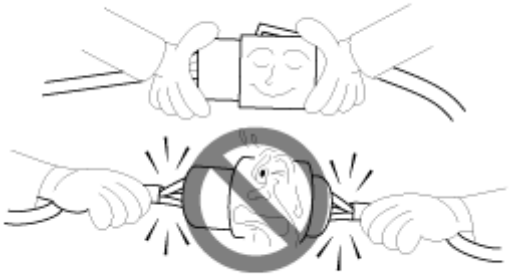
6. The electronic parts used in the computer, relays, etc. are readily damaged by heat. If there is a need for service operations that may cause the temperature to exceed 80°C (176°F), remove the electronic parts before hand.



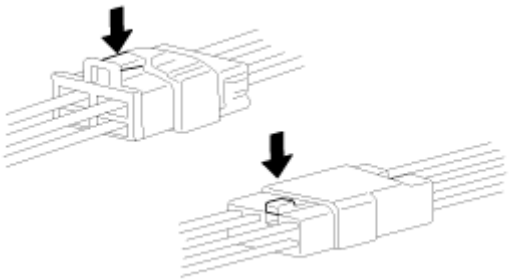
7. Loose connectors cause problems. Make sure that the connectors are always securely fastened.



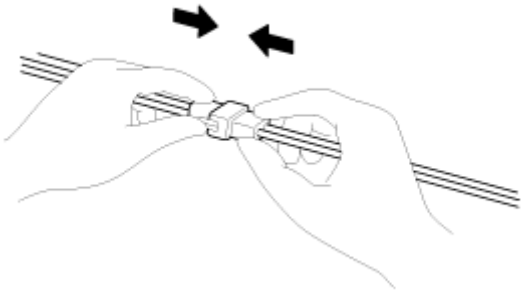
8. When disconnecting a connector, be sure to grip only the connector, not the wires.



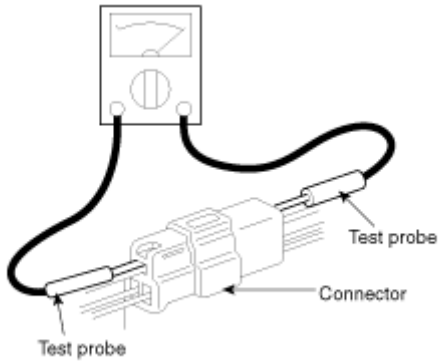
9. Disconnect connector which have catches by pressing in the direction of the arrows shown the illustration.



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 gasoline flows 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. Do not measure engine compression for an extended time. Engine compression tests must be made as rapidly as possible. Remove the fuel pump relay before performing a compression test.
4. Do not dispose of used catalytic converter together with parts contaminated with gasoline or oil.

SPECIFICATIONS

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
REAR DOOR	Construction	Front hinged, full door construction
	Regulator system	Wire drum type
	Locking system	Pin-fork system
TAIL GATE	Type	Inner hinged, Gas lifter
SEAT BELTS	Front	3 point type with Emergency Locking Retractor (E.L.R)
	Rear	3 point type with Emergency Locking Retractor (E.L.R)

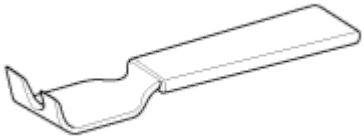
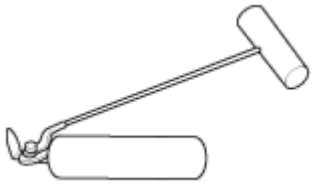
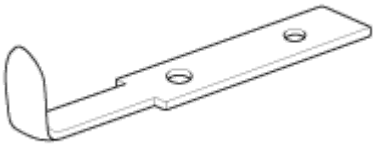
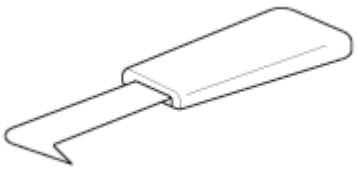
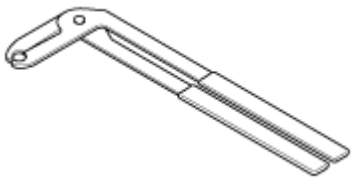
TIGHTENING TORQUE

Items		N·m	kgf·m	Lbf·ft
Foont and rear doors	Door hinge to body	21.6~26.5	2.2~2.7	15.9~19.5
	Door hinge to door	21.6~26.5	2.2~2.7	15.9~19.5
	Door Striker	16.7~21.6	1.7~2.2	12.3~15.9
	Checker to body	16.7~21.6	1.7~2.2	12.3~15.9
	Checker to door	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
	Hoodl hinge to hood	21.6~26.5	2.2~2.7	15.9~19.5
	Hood latch to body	6.9~10.8	0.7~1.1	5.1~8.0
Seat	Front seat mounting bolts	34.3 ~ 53.9	3.5~5.5	25.3~39.8
	Rear seat mounting bolts	16.7~25.5	1.7~2.6	12.3~18.8
Seat belt	Front seat belt height adjuster	39.2~53.9	4.0 ~ 5.5	28.9 ~ 39.8
	Front seat belt buckle mounting bolt	39.2~53.9	4.0 ~ 5.5	28.9 ~ 39.8
	Front seat belt anchor mounting bolt	39.2~53.9	4.0 ~ 5.5	28.9 ~ 39.8
	Front seat belt lower anchor	39.2~53.9	4.0 ~ 5.5	28.9 ~ 39.8
	Front seat belt upper anchor	39.2~53.9	4.0 ~ 5.5	28.9 ~ 39.8
	Rear seat belt anchor attaching 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

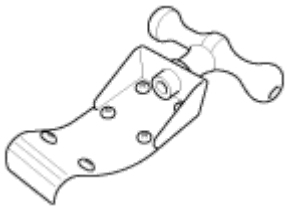
TROUBLESHOOTING

Symptom	Suspect Area	Remedy (Refer to page)
Water leaks from sunroof	Dirt accumulated in drain tube	Clear dirt inside of 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
Sunroof lid makes a noise when move	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 resistance or interference of sunroof with drive cables, weatherstrip, etc. due to maladjustment 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 orregulator	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

SPECIAL TOOLS

Tool (Number and name)	Illustration	Use
09793-21000 Door hinge adjusting wrench		Adjustment, removal and installationOf the door hinge
09800-21000 Ornament remover		Trim removal
09853-31000 Headliner clip remover		Removal of the headliner clips
09861-31100 Sealant cut-out tool		Cutting the sealant of the windshield (Use with 09861-31200)
09861-31200 Sealant cutting blade		Cutting the sealant of the windshield (Use with 09861-31100)
09861-31000 Windshield molding remover		Removal of the windshield molding
09880-4F000 Hog ring clip installer		Installation of the hog ring clip

English ▼

09840-1E100 Center fascia remover		Center fascia removal

REPLACEMENT

Hood Assembly Replacement

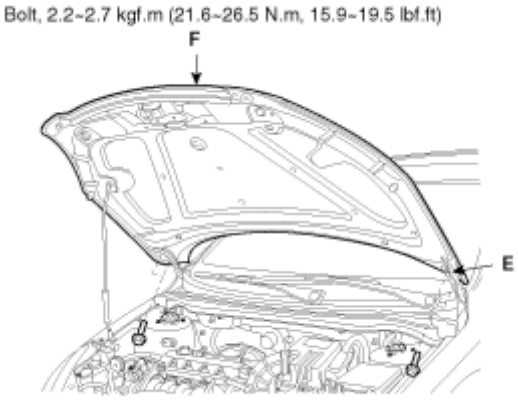
NOTICE

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

1. After loosening the hood hinge (E) mounting bolts,remove the hood (F).
2. Installation is the reverse of removal.

NOTICE

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

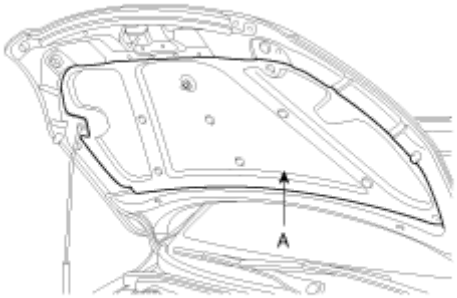


Hood Insulator Pad Replacement

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

NOTICE

Take care not to scratch the hood panel.



English ▼

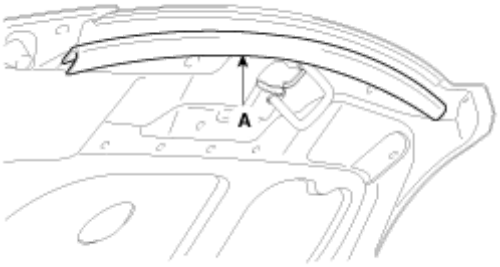
2. Installation is the reverse of removal.

NOTICE

Replace any damaged clips.

Hood Seal Weatherstrip Replacement

1. Detach the clips, then remove the hood weatherstrip (A). Take care not to scratch the hood.



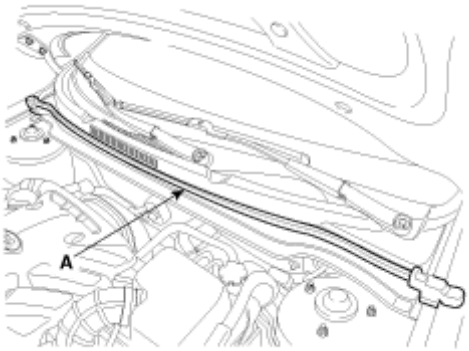
2. Installation is the reverse of removal.

NOTICE

- Replace any damaged clips.

Hood Weatherstrip Replacement

1. Remove the hood weatherstrip (A).



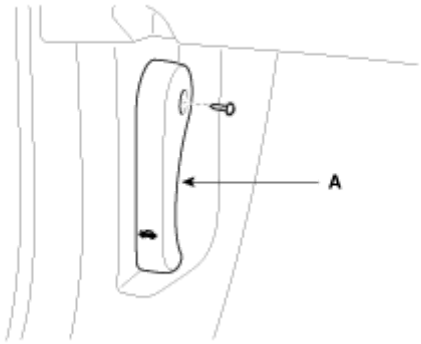
2. Installation is the reverse of removal.

NOTICE

Replace any damaged clips.

Hood Release Handle Replacement

1. After loosening the mounting screw, then remove the hood release handle (A).



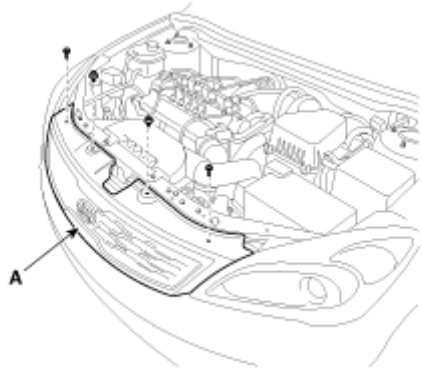
2. Installation is the reverse of removal.

NOTICE

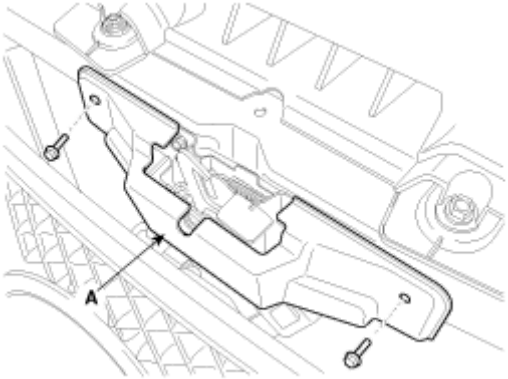
- Make sure the hood latch cable is connected properly.
- Make sure the hood locks securely.

Hood Latch Replacement

1. Remove the radiator grille upper cover (A).

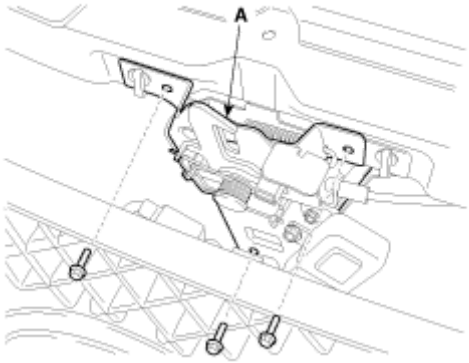


2. Loosen the bolts, then remove the hood latch cover(A).

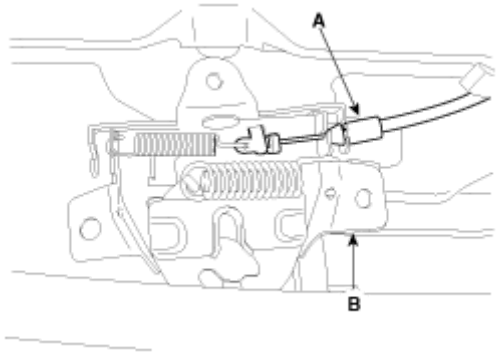


3. Remove the hood latch (A) mounting bolts.

Bolt, 0.7~1.1 kgf.m (6.9~10.8 N.m, 5.1~8.0 lbf.ft)



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



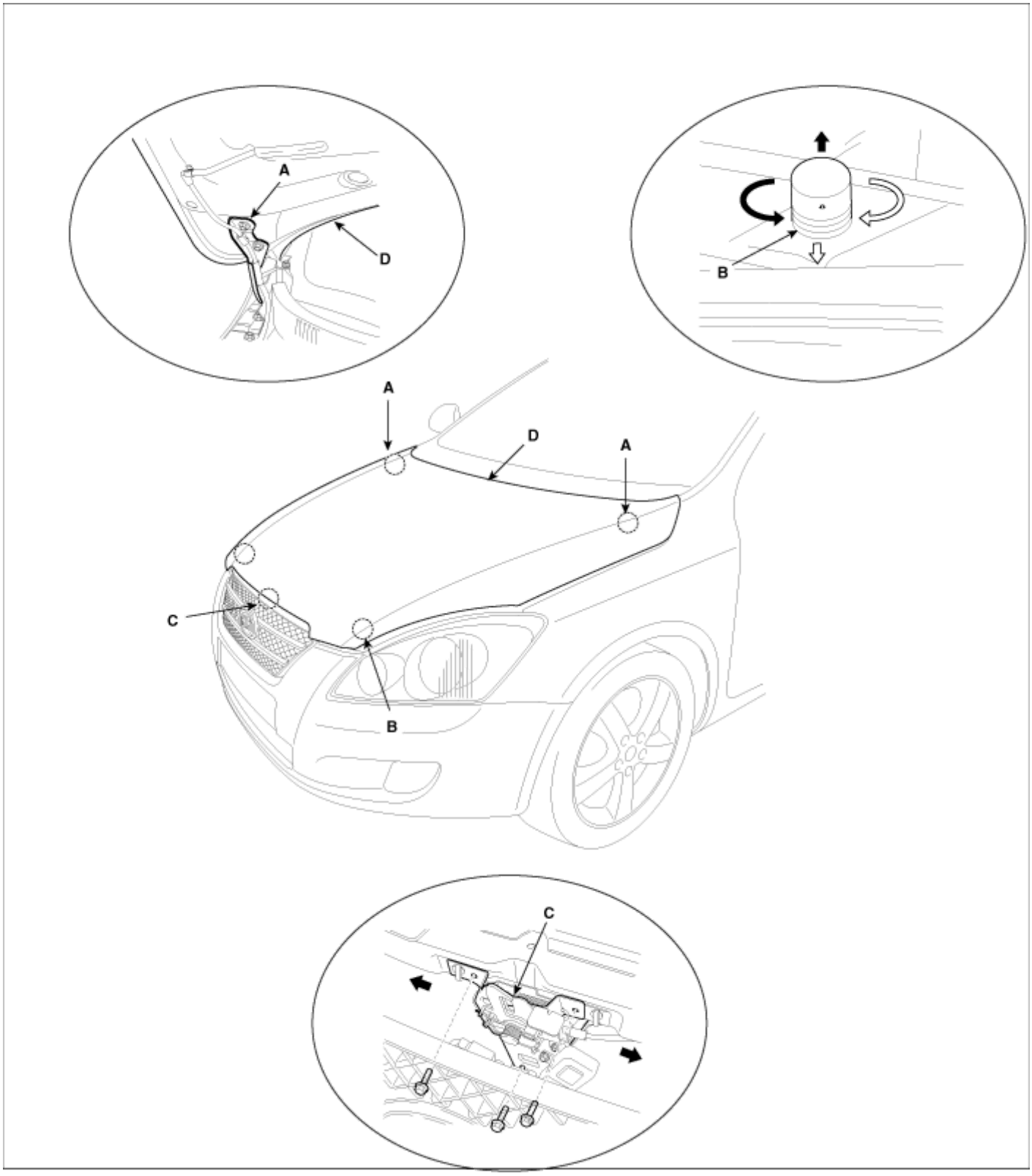
5. Installation is the reverse of removal.

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

ADJUSTMENT

Adjust Hood

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


A
D
B
A
D
A
C
B
C

REPLACEMENT

Tailgate Trim Replacement (5Door)

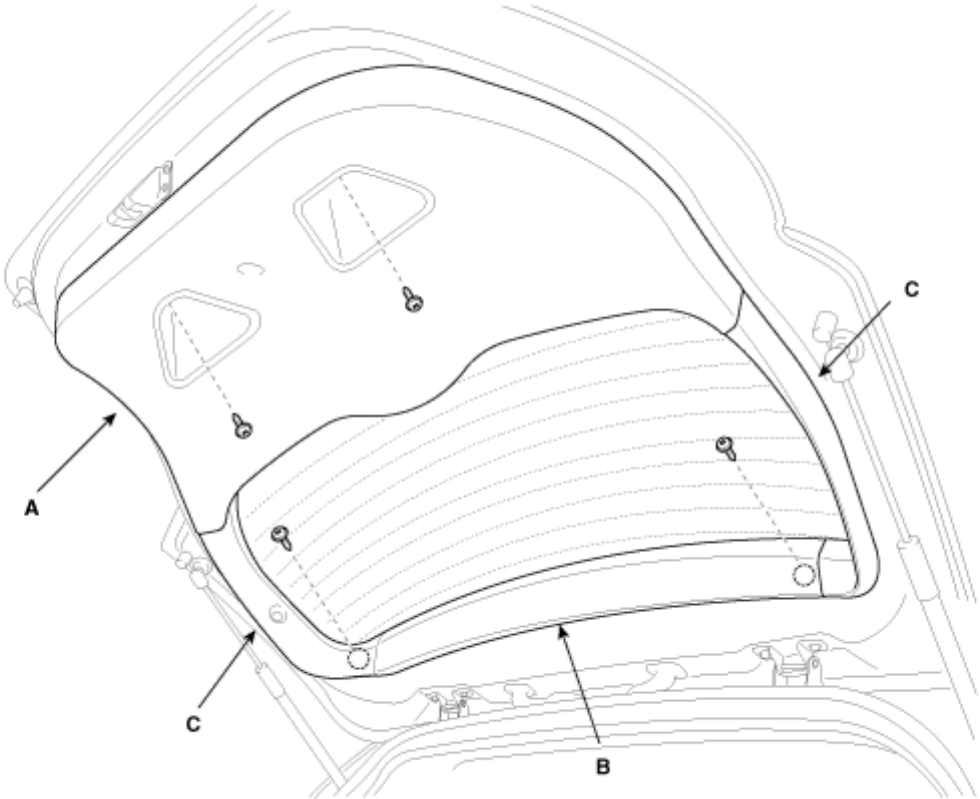
NOTICE

- When prying with a flat-tipped 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. After loosening the screws the remove the tailgate trim (A).
2. Remove the upper trim (B) and side trim (C).
3. Installation is the reverse of removal.

NOTICE

- Replace and damaged clips.



Tailgate Trim Replacement (3Door)

NOTICE

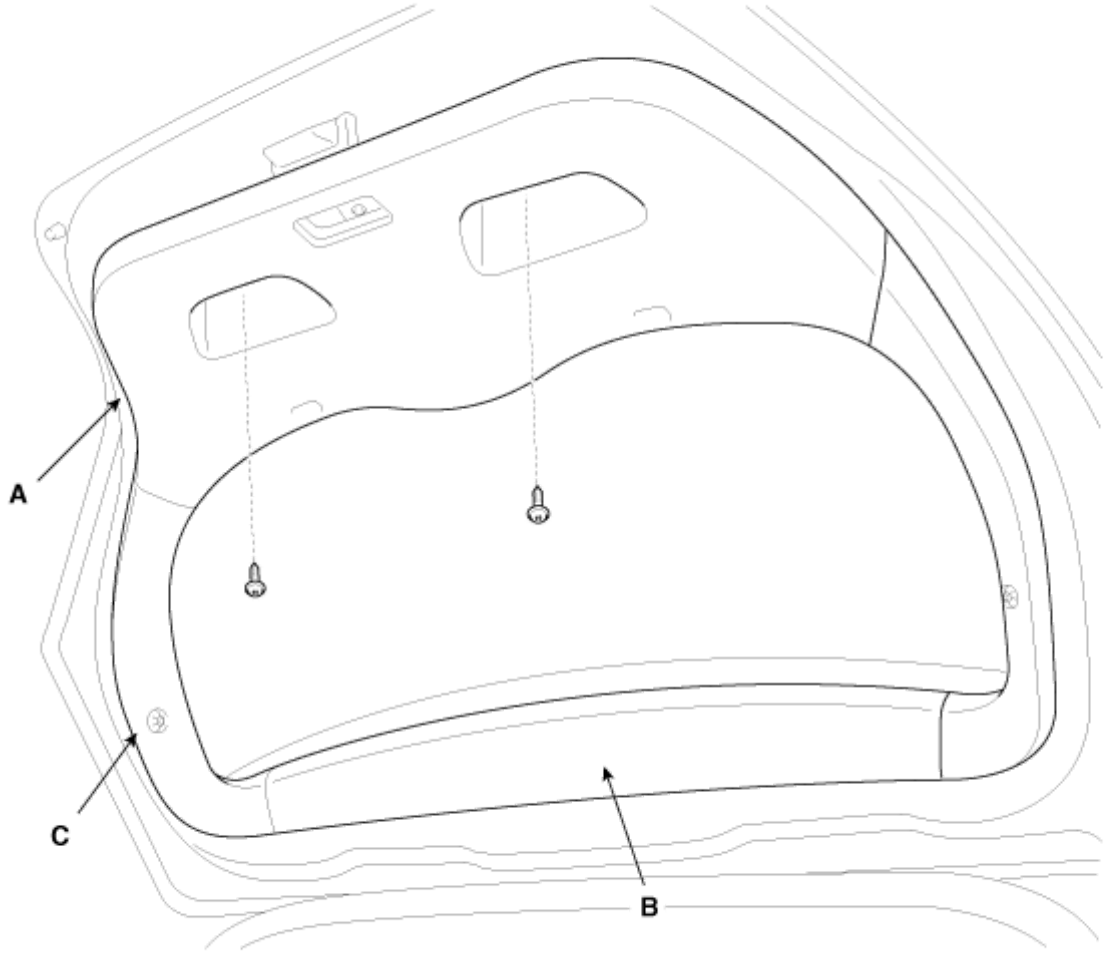
- When prying with a flat-tipped screwdriver, wrap it with protective tape, and apply protective tape around th... parts, to prevent damage.
- Put on gloves to protect your hands.

English ▼

1. After loosening the screws the remove the tailgate trim (A).
2. Remove the upper trim (B) and side trim (C).
3. Installation is the reverse of removal.

NOTICE

- Replace and damaged clips.



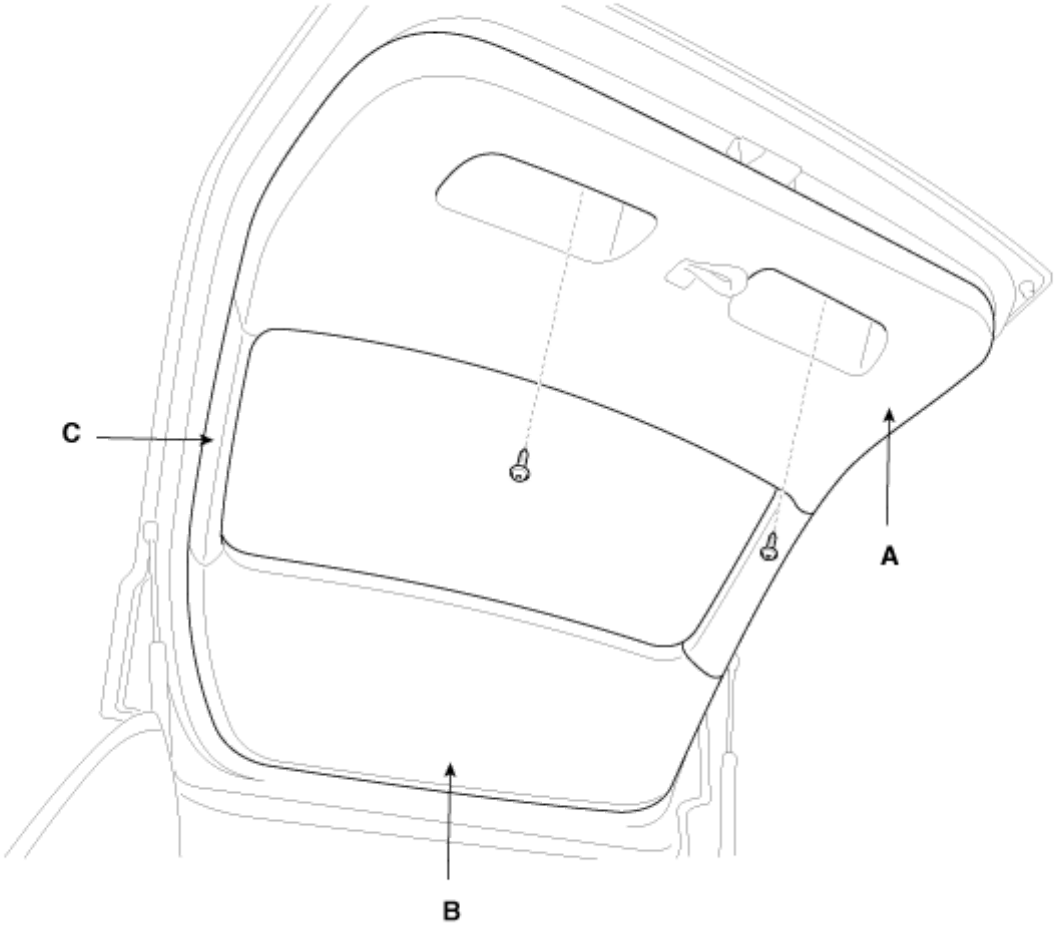
Tailgate Trim Replacement (Wagon)

NOTICE

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

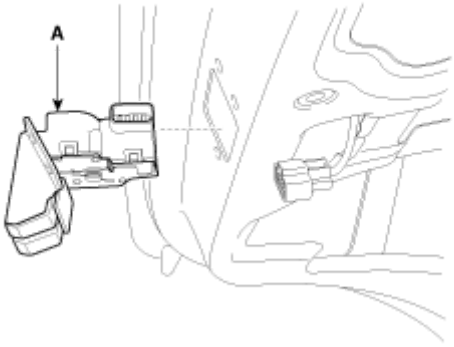
1. After loosening the screws the remove the tailgate trim (A).
2. Remove the upper trim (B) and side trim (C).
3. Installation is the reverse of removal.

> **NOTICE**
>
> - Replace and damaged clips.



Latch Assembly Replacement

1. Remove the tailgate trim.
2. After loosening the mounting nuts, then remove the latch assembly (A).
3. Disconnect the connector.



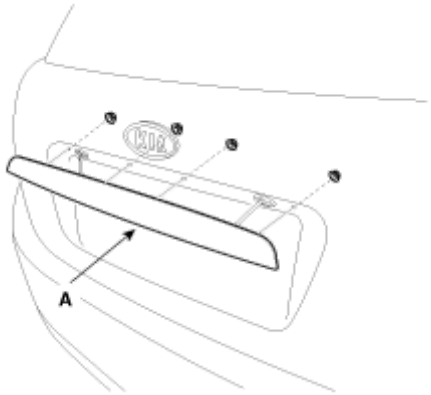
4. Installation is the reverse of removal.

NOTICE

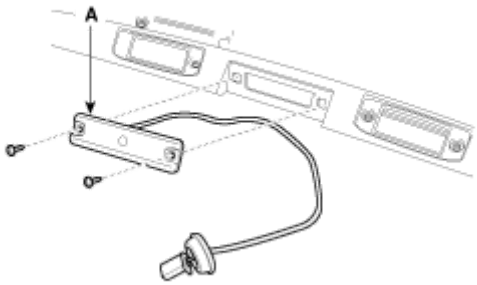
- Make sure the connector is connected properly and the connecting rod is connected properly.
- Make sure the tailgate opens properly and locks securely.

Outside Handle Replacement

1. Remove the tailgate trim.
2. After loosening the tail gate garnish mounting nuts, then tailgate garnish (A).



3. Remove the outside handle (A).



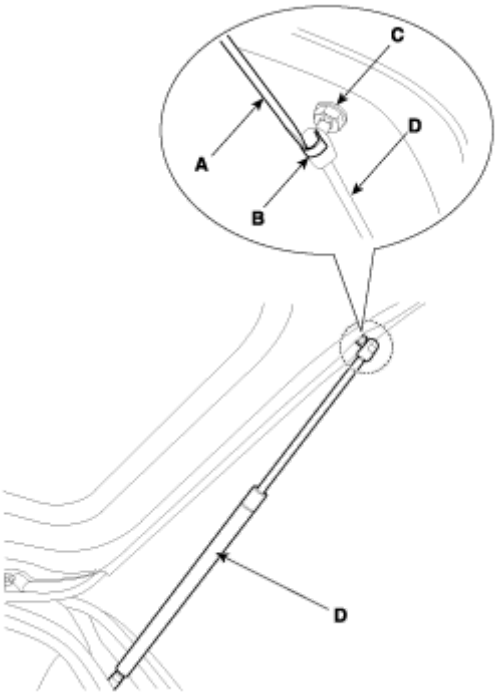
4. Installation is the reverse of removal.

NOTICE

- Make sure the tailgate opens properly and locks securely.

Lifter Replacement

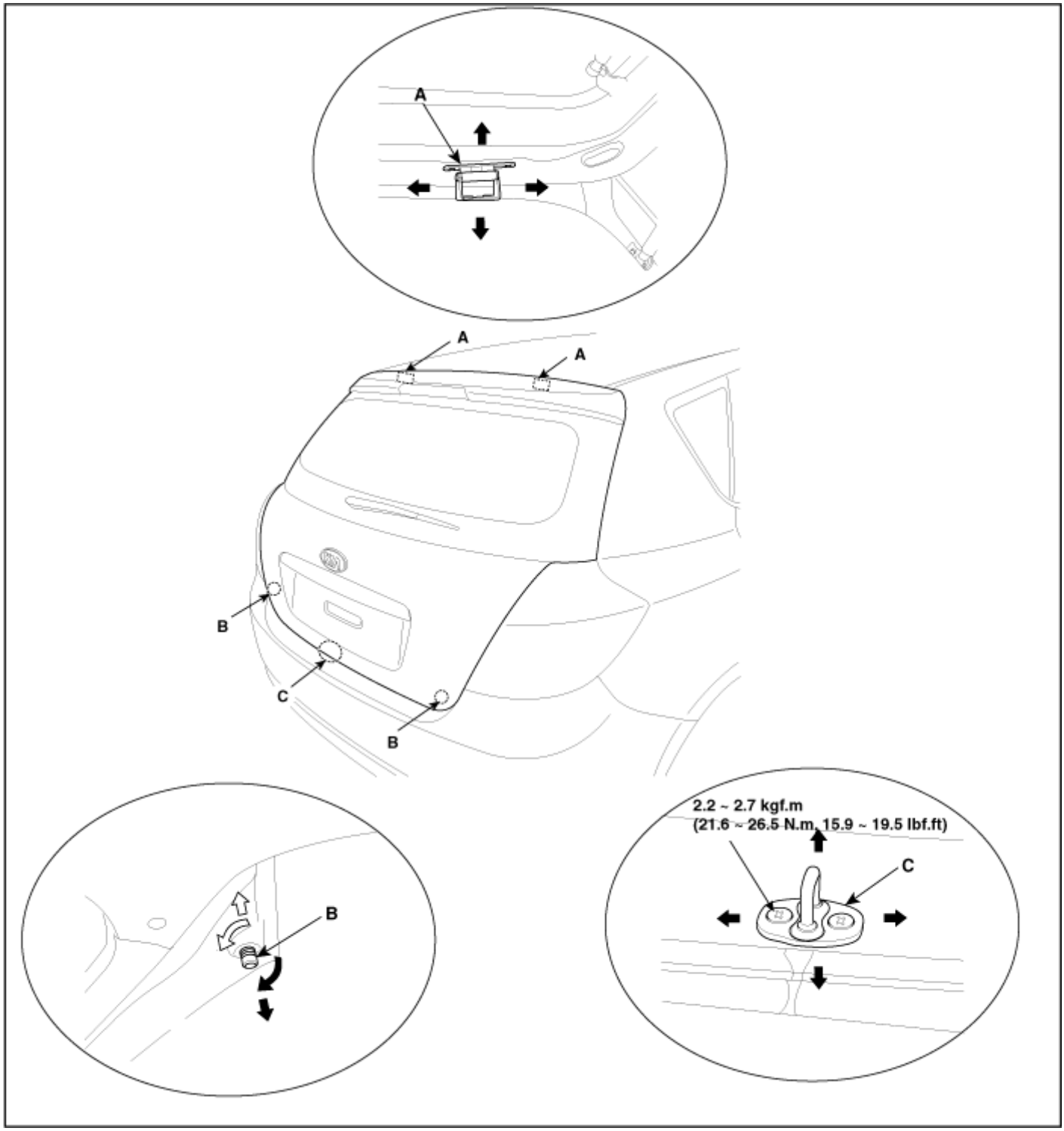
1. Using a screwdriver (A), lift up slightly the socket clips (B) of both ends on the lifer (D), and then remove the lifter from the bracket (C).



2. Push the socket of the lifter into the bracket for installation.

ADJUSTMENT

1. After loosening the tailgate hinge (A) mounting bolt,adjust the tailgate by moving it up or down, or right or left.
2. Adjust the tailgate fit by turning the tailgate over slam bumper and side bumper (B).
3. Adjust the striker (C) by moving it up or down, or right or left.


A
A
A
B
C
B
B
2.2 ~ 2.7 kgf.m
(21.6 ~ 26.5 N.m, 15.9 ~ 19.5 lbf.ft)
C

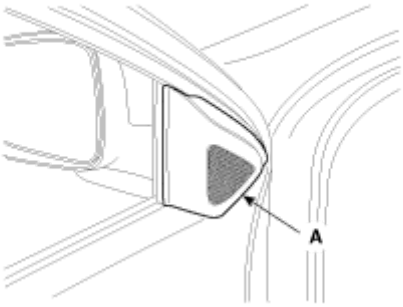
REPLACEMENTS

Door Trim Replacement

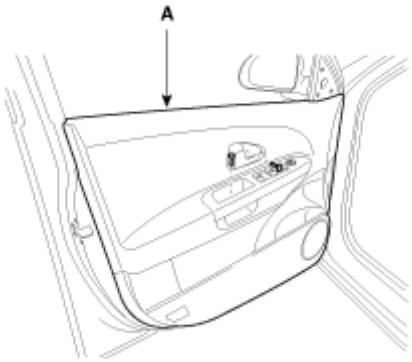
NOTICE

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

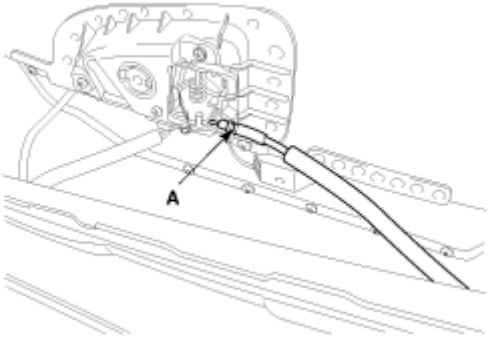
1. Remove the quadrant inner cover (A).



2. Loosen the door trim (A) mounting screws. Release the clips that hold the door trim, then remove the door trim by pulling it upward. Disconnect the power window switch connector, power mirror connector, and door courtesy lamp connector, trunk lid connector.



3. Disconnect the cable (A).



4. Installation is the reverse of removal.

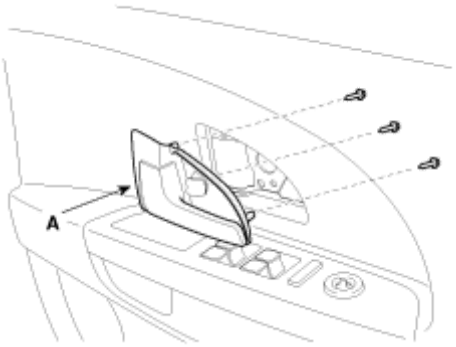
English ▼

NOTICE

- Make sure of connectors is plugged in properly and each rod is connected securely.
- Make sure the door lock and opens properly.

Inside Handle Replaement

1. Remove the door trim.
2. Loosen the door inside handle mounting screws, remove the door inside handle (A).



3. Installation is the reverse of removal.

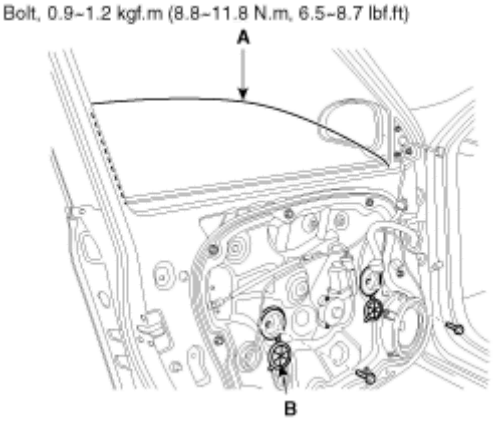
Glass Replacement

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

NOTICE

- Using the door switch to align the mounting hole with the hole on the door glass.
- If it is impossible, align the hole with hands after removing the motor.
- Take care not to drop to glass and scratch the glass surface.

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



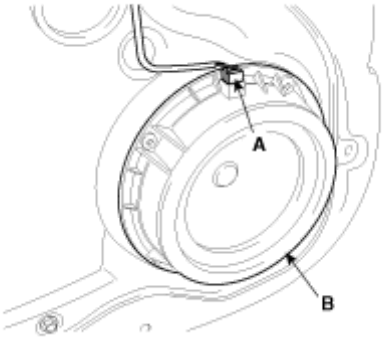
4. Installation is the reverse of removal.

NOTICE

- Roll the glass up down to see if it move freely without binding.
- Adjust the position of the glass as necessary.

Speaker Replacement

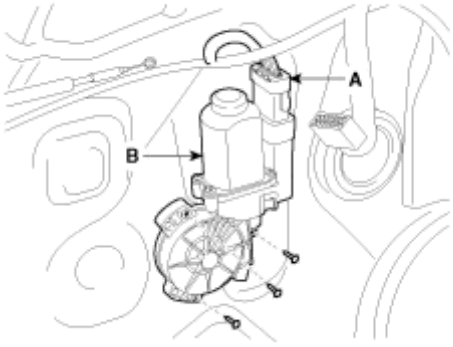
1. Remove the door trim.
2. Drill out the rivets to remove the speaker (B) from the door module.
3. Disconnect the speaker connector (A).



4. Installation is the reverse of removal.
   Use sheet metal screws to secure the speaker.

Power Window Motor Replacement

1. Remove the door trim .
2. After disconnecting the connector (A), remove the power window motor (B).



3. Installation is the reverse of removal.

NOTICE

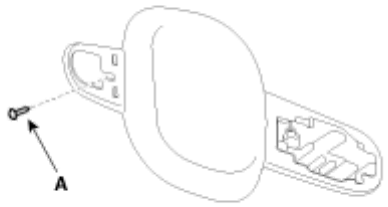
- The area of rotational parts and springs should be applied with sufficient grease.
- Roll the glass up down to see if it move freely without binding.

Door Module Assembly Replacement

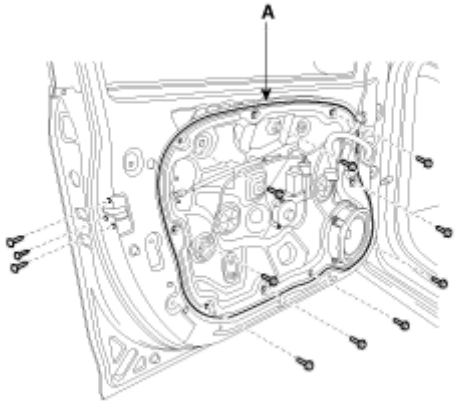
1. Remove the following parts.

- Door trim.
- Glass.
- Outside handle.

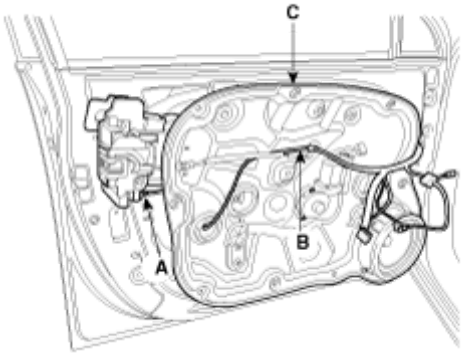
1. Loosen the mounting screw (A).



2. Loosen the door module mounting bolts, then remove the door module (A).



3. Disconnect the connector (A).
4. Disconnect the door module wiring harness (B), then remove the module assembly (C).



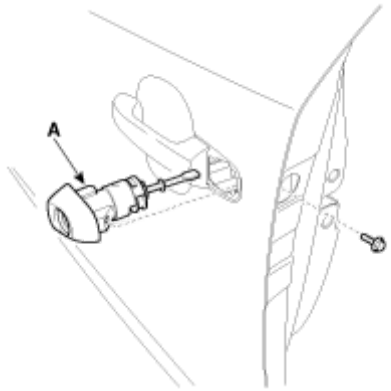
5. Installation is the reverse of removal.

NOTICE

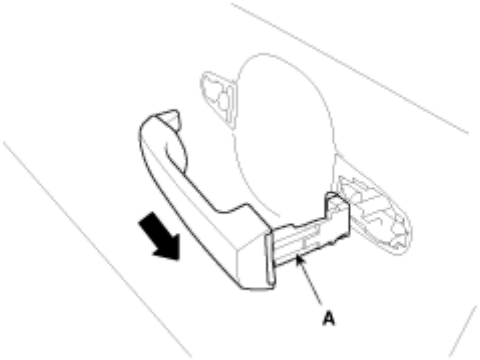
- The area of whole parts should be applied with sufficient grease.
- Make sure the connector is plugged in properly and each rod is connected securely.
- Make sure the door lock and open properly.

Out Side Handle Replacement

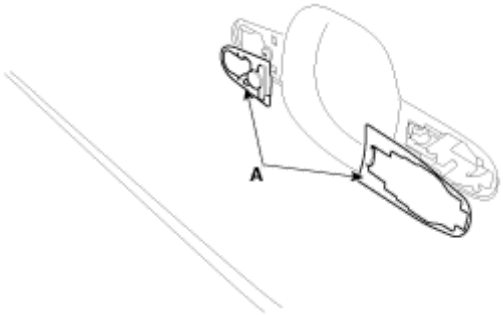
1. After loosening the mounting bolt, then remove the key holder (A).



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



3. Remove the outside handle pad (A).

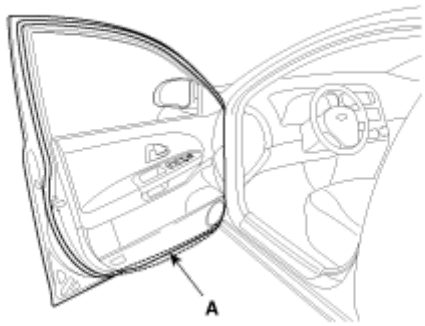


4. Installation is the reverse of removal.

> **NOTICE**
>
> - Make sure the door lock and open properly

Door Weatherstrip Replacement

1. Loosen the checker mounting bolts.
2. Detach the clips, then remove the weatherstrip(A).



3. Installation is the reverse of removal.

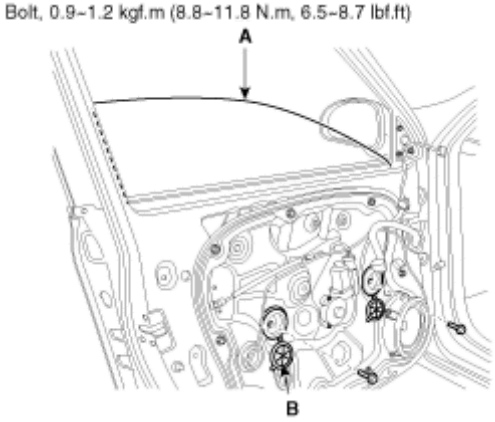
ADJUSTMENT

Glass Adjustment

NOTICE

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

1. Remove the following parts.
   - Quadrant inner cover.
   - Door trim.
2. Carefully move the glass (A) until you can see theglass mounting bolts (B), then loosen them.



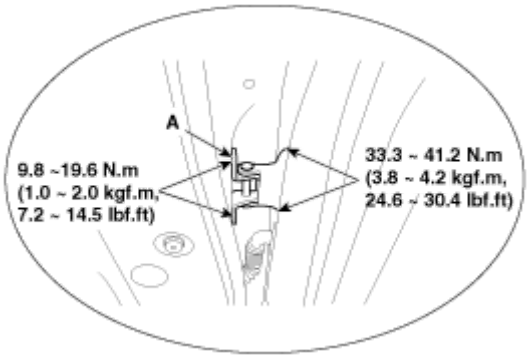
3. Check that the glass moves smoothly.
4. Raise the glass fully, and check for gaps.
   Check that the glass contacts the glass run channel evenly.
5. Check for water leaks. Run water over the roof andon the sealing area as shown, and note these items:
   - Use a 12mm (1/2Iin.) diameter hose.
   - Adjust the rate of water flow as shown.
   - Do not use a nozzle.
   - Hold the hose about 300mm(12in.) away from the door.

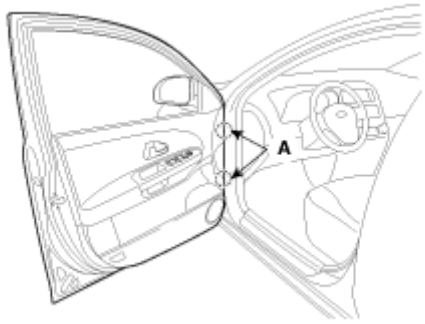
Door Position Adjustment

NOTICE

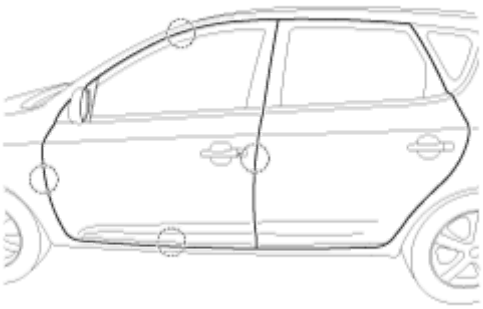
- After installing the door, check for a flush fit with the body, then check for equal gaps between the front,Rear, and bottom, door edges and the body. Check that the door and body edges are parallel. Before adjusting, replace the mounting bolts.

1. Place the vehicle on a firm, level surface when adjusting the doors.
2. Adjust at the hinges (A):
   – Loosen the door mounting bolts slightly, and move the door IN or OUT until it aligns flush withthe body.
   – Loosen the hinge mounting bolts slightly, and move the door BACKWARD or FORWARD, UP or DOWN as necessary to equalize the gaps.
   – Place a shop towel on the jack to prevent damage to the door when adjusting the door.





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



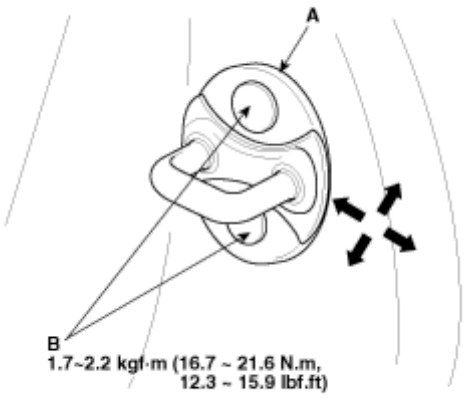
4. Grease the pivot portions of the hinges indicated by the arrows.
5. Check for water leaks.

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 fine adjusted up or down, and in or out.

1. Loosen the screws (B), then insert a shop towel between the body and striker.



2. Lightly tighten the screws.
3. Wrap the striker with a shop towel, then adjust the striker by tapping it with a plastic hammer.
   Do not tap the striker too hard.
4. Loosen the screws and remove the shop towel.
5. Lightly tighten the screws.
6. 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.

REPLACEMENT

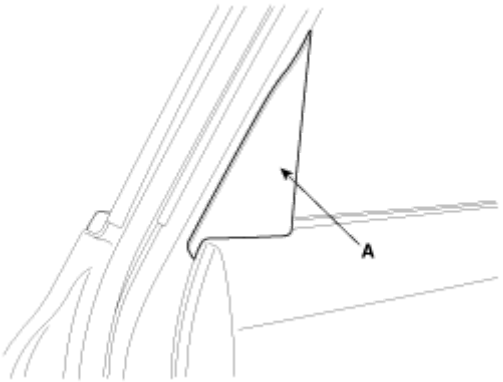
5Door, Wagon

Door Trim Replacement

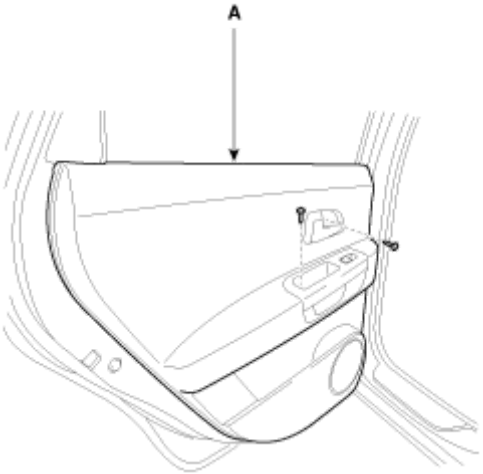
NOTICE

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

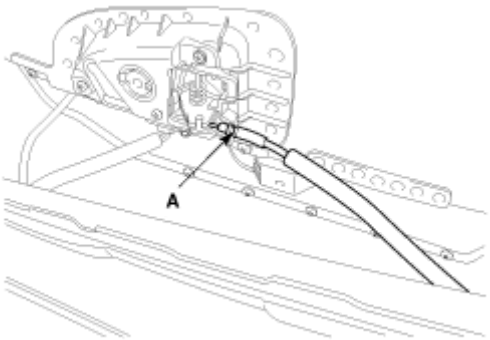
1. Remove the delta inner cover (A).



2. Loosen the door trim (A) mounting screws. release the clips that hold the door trim, then remove the door trim by pulling it upward. disconnect the power window switch connector.



3. Disconnect the lock cable and (A) inside connect cable (B).



4. Installation is the reverse of removal.

> **NOTICE**
>
> - Make sure of connectors is plugged in properly and each rod is connected securely.
> - Make sure the door lock and opens properly.

Inside Handel Replacement

1. Remove the door trim.
2. Loosen the door inside handle mounting screws, remove the door inside handle (A).



3. Installation is the reverse of removal.

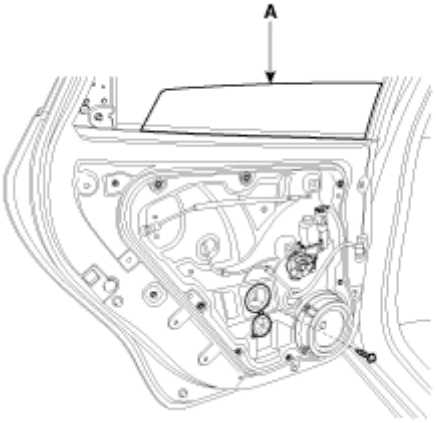
Glass Replacement

> **NOTICE**
>
> - Put on gloves to protect your hands.

1. Remove the door trim.
2. Remove the door belt weatherstrip.
3. Release the rear channel mounting bolt and nut.

> **⚠ CAUTION**
>
> - Take care not to drop to glass and scratch the glasssurface.

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

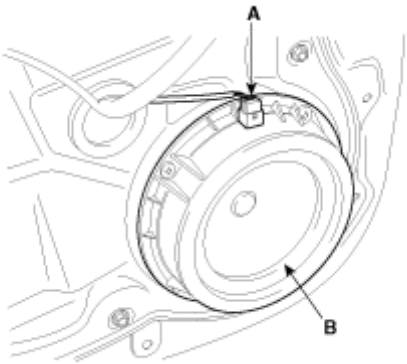


5. Installation is the reverse of removal.

> **NOTICE**
>
> - Roll the glass up down to see if it move freely without binding.
> - Adjust the position of the glass as necessary.

Speaker Replacement

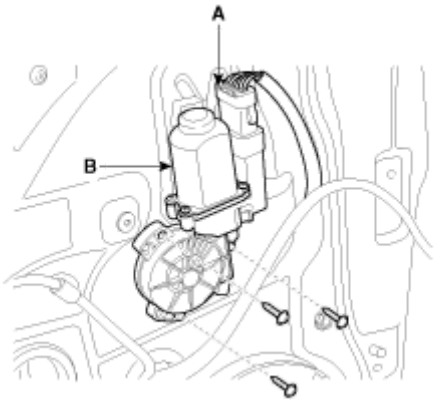
1. Remove the door trim.
2. Drill out the rivets to remove the speaker (B) from the door module.
3. Disconnect the speaker connector (A).



4. Installation is the reverse of removal.
   Use sheet metal screws to secure the speaker.

Power Window Motor Replacement

1. Remove the door trim.
2. After disconnecting the connector (A), remove the power window motor (B).

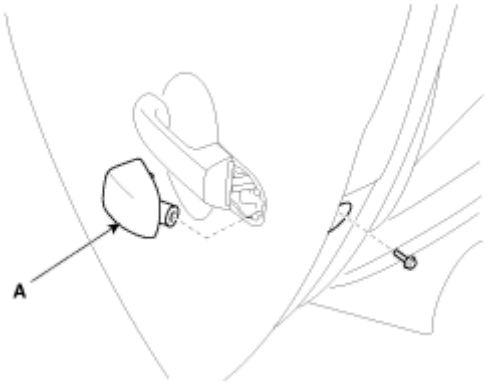


3. Installation is the reverse of removal.

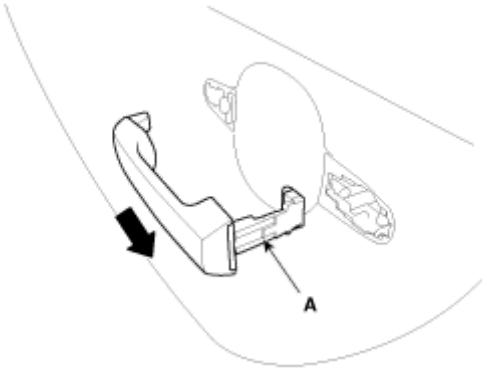
> **NOTICE**
>
> - The area of rotational parts and springs should be applied with sufficient grease.
> - Roll the glass up down to see if it move freely without binding.

Out Side Handle Replacement

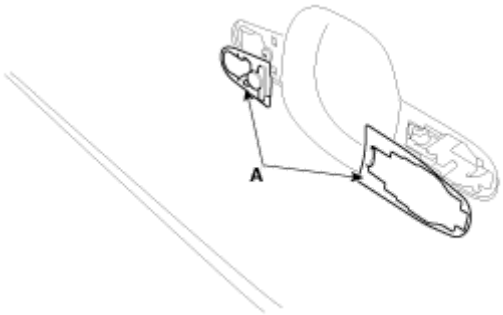
1. After loosening the mounting bolt, then remove the handle cover (A).



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



3. Remove the outside handle pad (A).

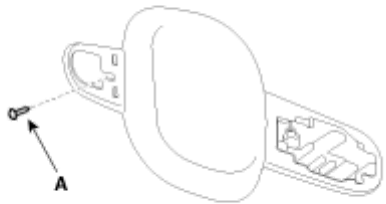


4. Installation is the reverse of removal.

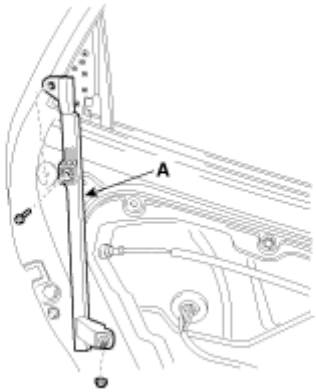
> **NOTICE**
>
> - Make sure the door lock and open properly.

Module Assembly Replacement

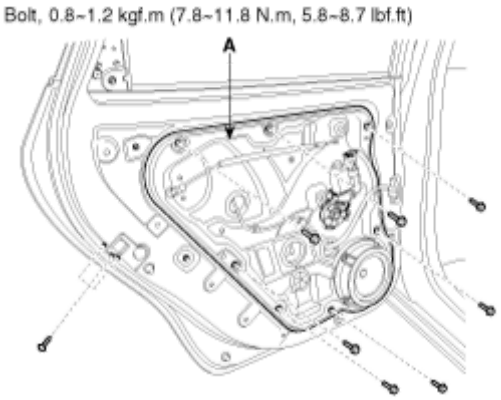
1. Remove the following parts.
   - Door trim.
   - Window glass.
   - Outside handle.
2. Loosen the mounting screw (A).



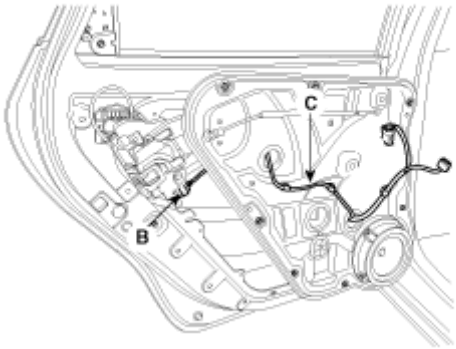
3. Remove the rear channel (A).



4. After loosening the door module mounting bolts, remove the door module (A).



5. Disconnect the connector (B).
6. Detach the clips, then remove the wiring harness(C).



7. Installation is the reverse of removal.

> **NOTICE**
>
> - 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 lock and open properly.

Door Weatherstrip Replacement

1. Loosen the checker mounting bolts.
2. Detach the clips, then remove the weatherstrip(A).



3. Installation is the reverse the removal.

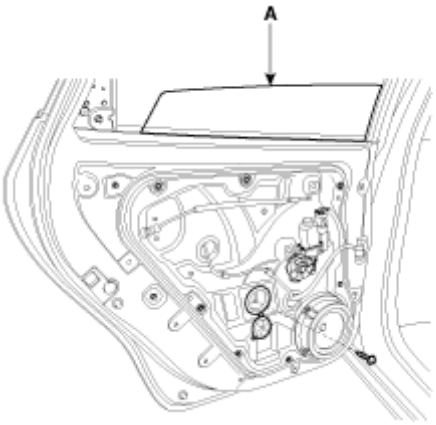
ADJUSTMENT

Glass Adjustment

NOTICE

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

1. Remove the following parts.
   - Door trim.
2. Carefully move the glass (A) until you can see theglass mounting bolts, then loosen them.



3. Push the glass against the channel, then tighten the glass mounting bolts.
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 andon the sealing area as shown, and note these items:
   – Use a 12mm (1/2Iin.) diameter hose.
   – Adjust the rate of water flow as shown.
   – Do not use a nozzle.
   – Hold the hose about 300mm(12in.) away from the door.

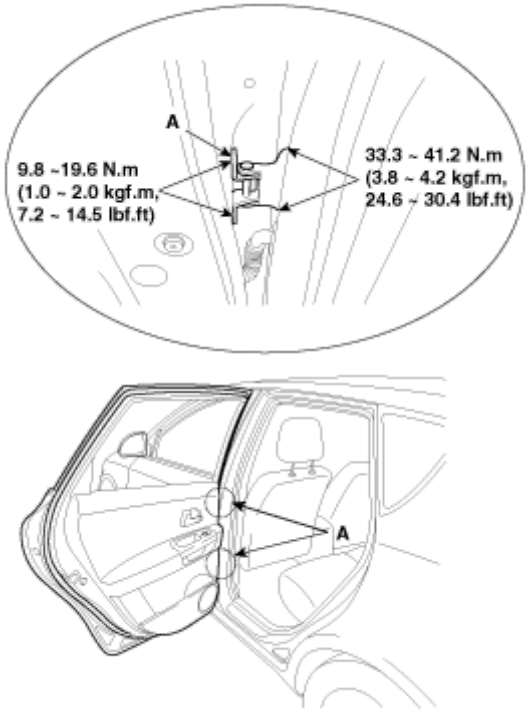
Door Position Adjustment

NOTICE

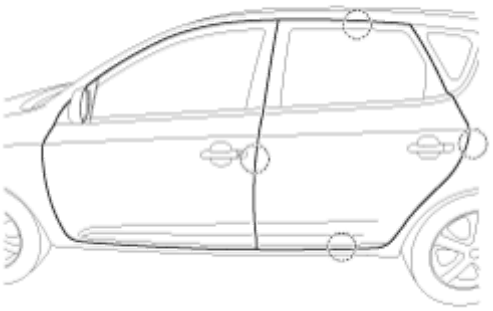
- After installing the door, check for a flush fit with the body, then check for equal gaps between the front,Rear, and bottom, door edges and the body. Check that the door and body edges are parallel. Before adjusting, replace the mounting bolts.

1. Place the vehicle on a firm, level surface when adjusting the doors.
2. Adjust at the hinges (A):
   – Loosen the door mounting bolts slightly, and move the door IN or OUT until it aligns flush withthe body.
   – Loosen the hinge mounting bolts slightly, and move the door BACKWARD or FORWARD, UP or DOWN as necessary to equalize the gaps.

– Place a shop towel on the jack to prevent damage to the door when adjusting the door.



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

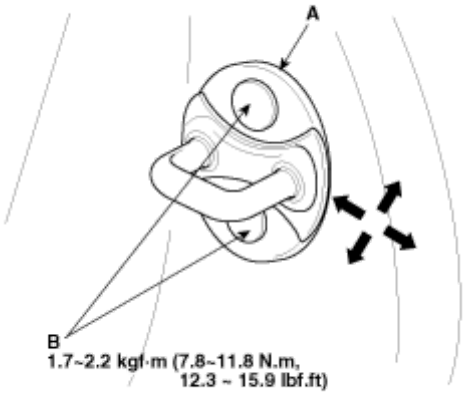


4. Grease the pivot portions of the hinges indicated by the arrows.
5. Check for water leaks.

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 fine adjusted up or down, and in or out.

1. Loosen the screws (B), then insert a shop towel between the body and striker.



2. Lightly tighten the screws.
3. Wrap the striker with a shop towel, then adjust the striker by tapping it with a plastic hammer.
   Do not tap the striker too hard.
4. Loosen the screws and remove the shop towel.
5. Lightly tighten the screws.
6. 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.

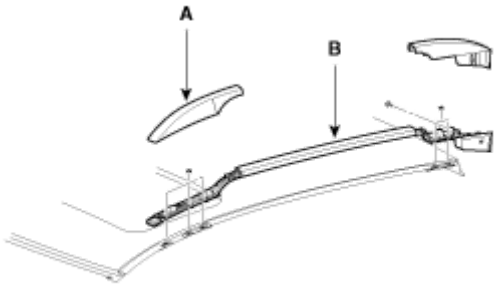
REPLACEMENT

Roof Rack Replacement (Wagon)

NOTICE

- 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.
- Take care not to scratch the body surface.

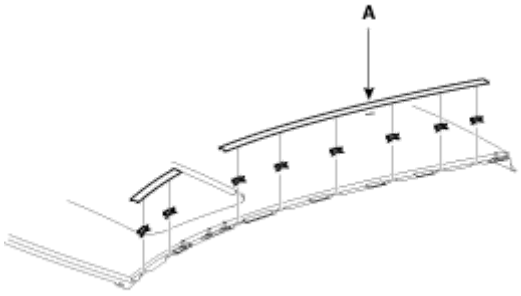
1. Remove the roof rack cover (A).
2. Remove the roof rack (B).



3. Installation is the reverse of removal.

Roof molding Replacement (Wagon)

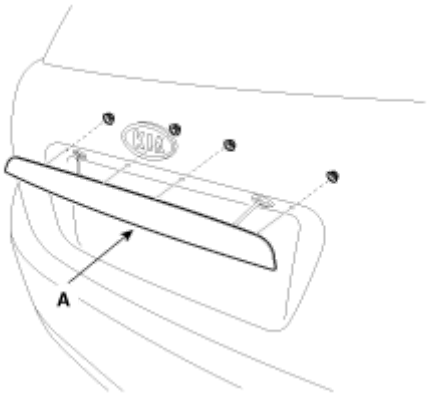
1. Remove the roof molding (A).



2. Installation is the reverse of removal.

Tailgate Garnish Replacement (5Door/Wagon)

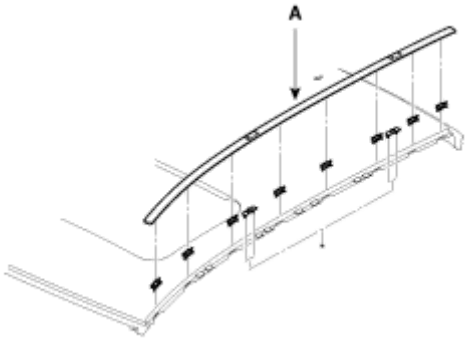
1. Remove the tailgate trim.
2. Remove the tailgate garnish (A).



3. Installation is the reverse of removal.

Roof molding Replacement (3Door)

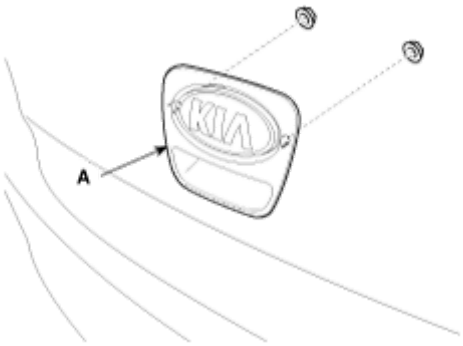
1. Remove the roof molding (A).



2. Installation is the reverse of removal.

Tailgate Garnish Replacement (3Door)

1. Remove the tailgate trim.
2. Remove the tailgate garnish (A).



3. Installation is the reverse of removal.

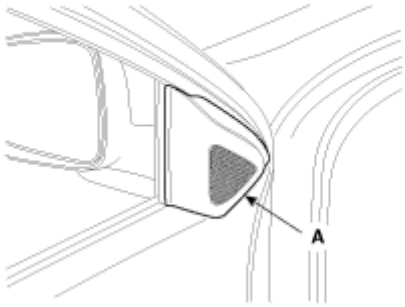
REPLACEMENT

Outside Rear View Mirror Relplacement

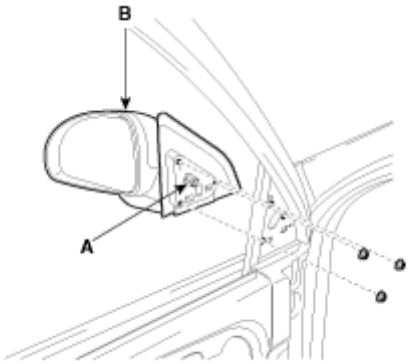
NOTICE

- 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. Remove the quadrant inner cover (A).



2. After disconnecting the connector (A), remove the outside rear view mirror (B).

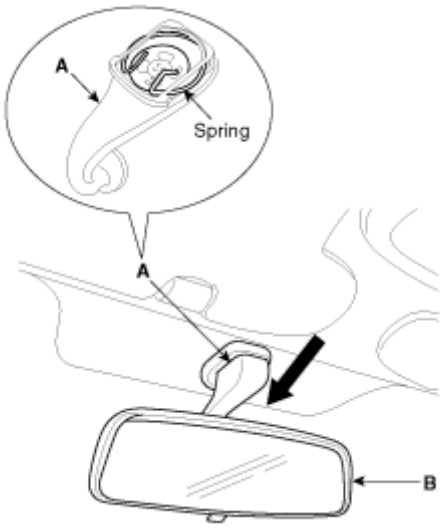


3. Installation is the reverse of removal.

Inside Rear View Mirror Replacement

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

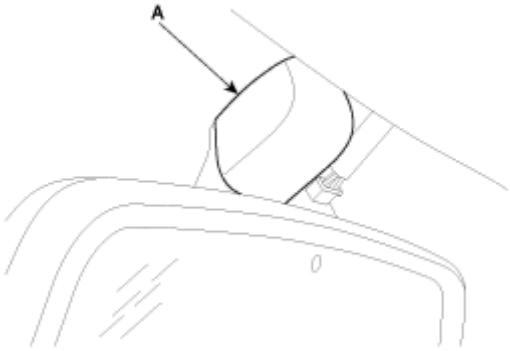
English ▼



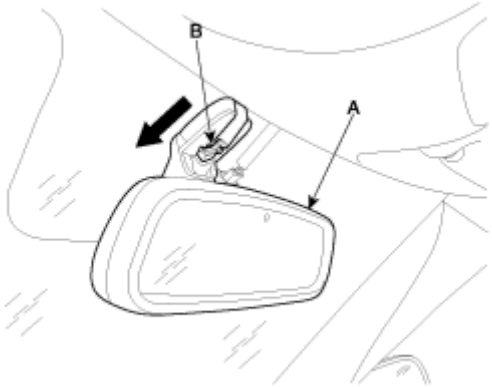
2. Installation is the reverse of removal.

ECM Mirror Replacement

1. Gently detach the hook, then remove the ECM mirror cover (A).



2. Disconnect the connector (B).
3. Push the ECM mirror base down to remove the ECMmirror assembly (A).

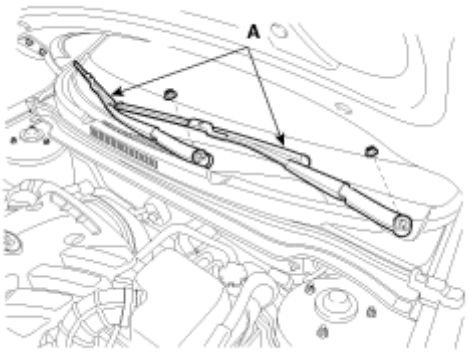


4. Installation is the reverse of removal.

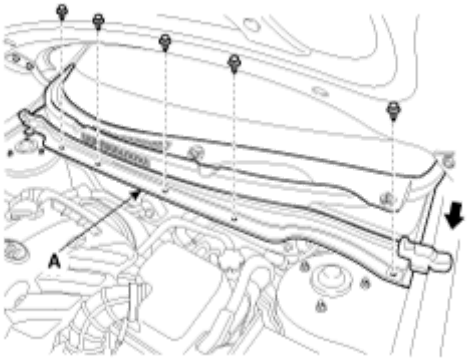
REPLACEMENT

Cowl Top Cover Replacement

1. Remove the wiper (A).



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



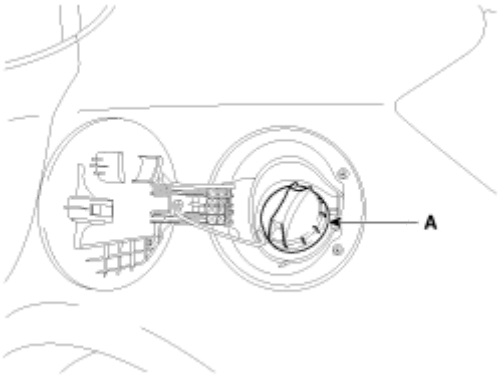
3. Installation is the reverse of removal.

REPLACEMENT

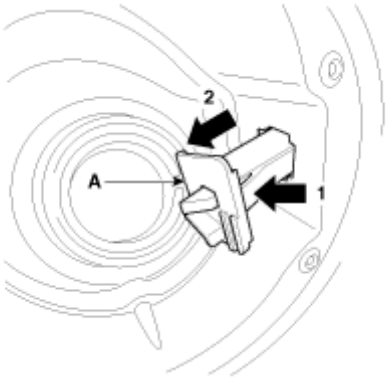
⚠ CAUTION

- 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.

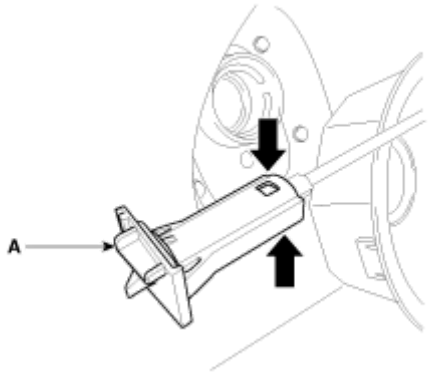
1. Open the fuel filler door.
2. Remove the fuel filler door cap (A).



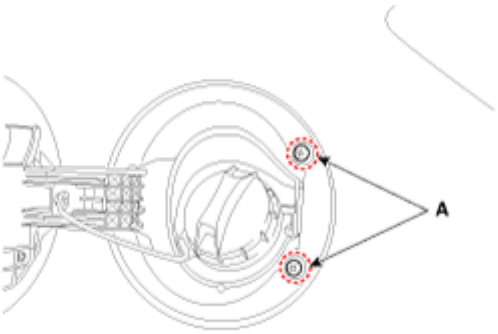
3. Pull out the fuel filler door cable (A) by pushing the lock pin.



4. Remove the fuel filler door open switch (A) by pushing the both lock pins.



5. Remove the clips (A).



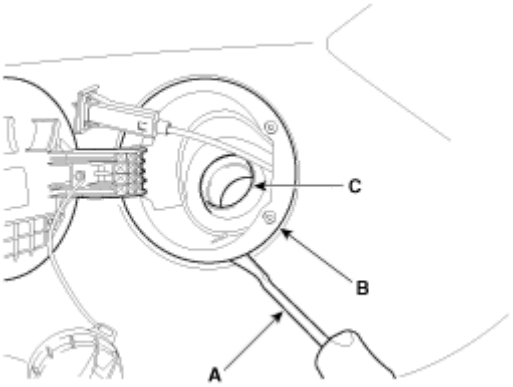
6. Remove the fuel filler door housing (B) by inserting the screwdriver (A) into the gap between the housing and body panel.

Information

- Slightly pull out the packing part (C) inside of the housing before removing the fuel filler door housing.

CAUTION

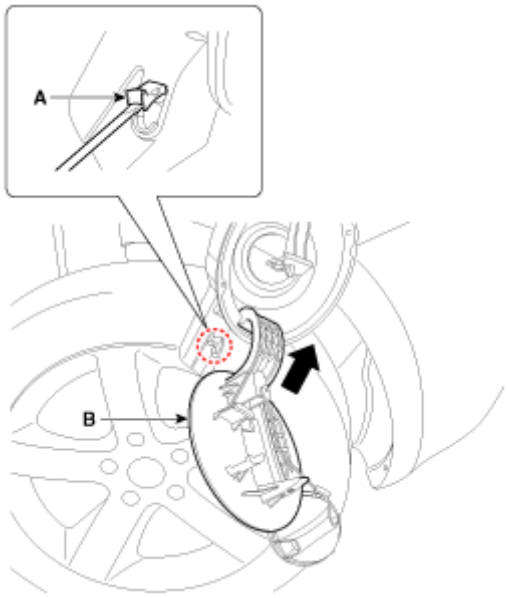
- Be careful not to tear the housing.



7. Slightly pry up the lock pin (A) using a flat head screwdriver and remove the fuel filler door (B) by pulling it in the direction of the arrow.

CAUTION

- Be careful not to damage the lock pin.

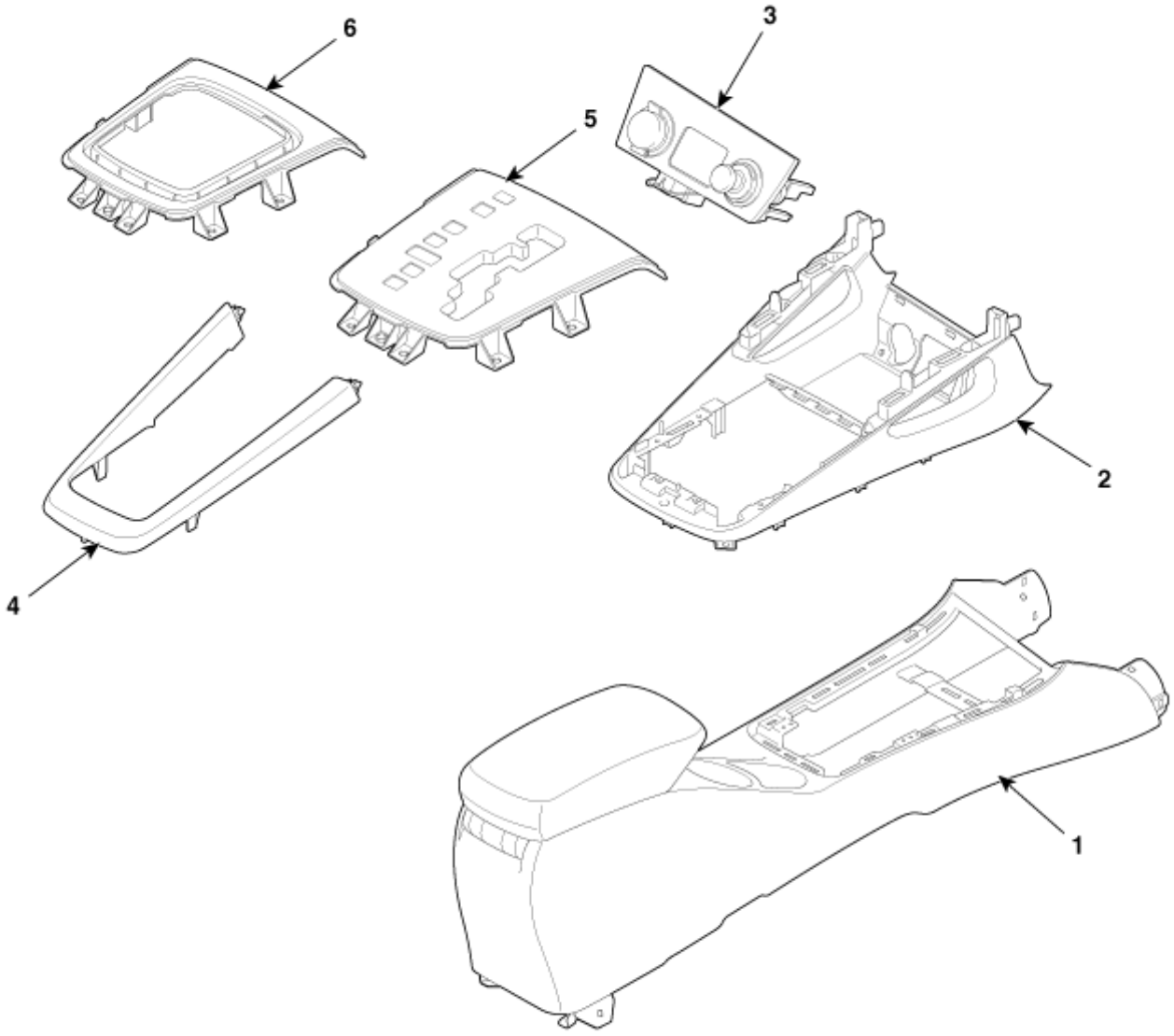


8. Reinstall all removed parts in the reverse order of removal.

Information

- Make sure the fuel filler door locks/unlocks and opens/closes properly.

COMPONENTS



1. Console assembly	4. Console upper cover
2. Floor console upper cover	5. Console upper bezel (AT)
3. Console switch assembly	6. Console upper bezel (MT)

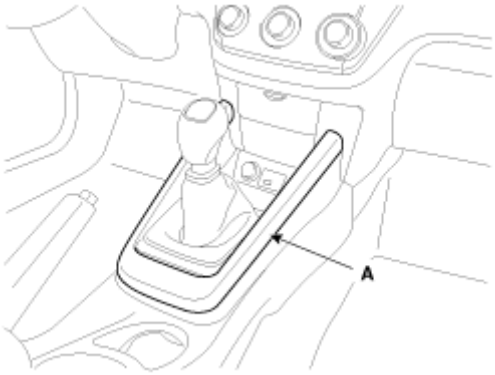
REPLACEMENT

Floor Console Replacement

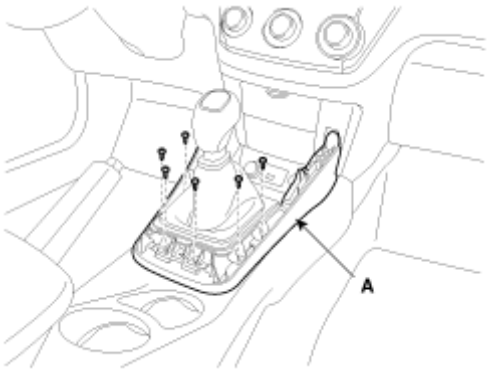
NOTICE

- 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.

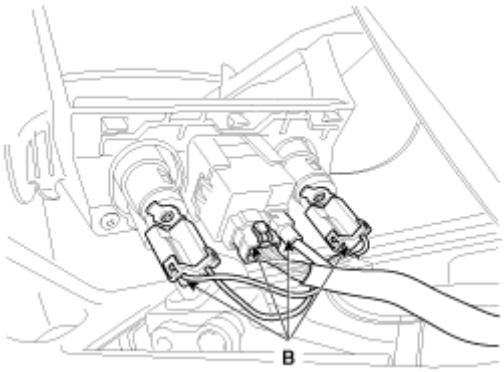
1. Remove the console upper cover (A).



2. After loosening mounting screws, then remove the floor console upper cover (A).



3. Disconnect the connector (B).

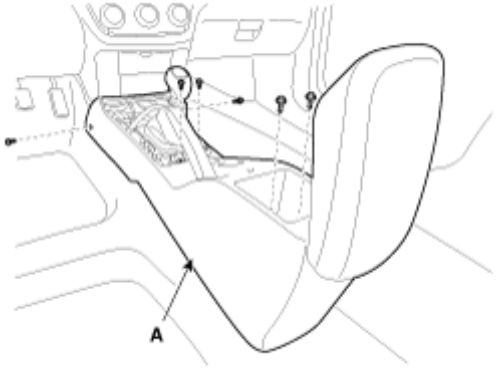


4. Gently detach the hook, remove the parking brake cover (A).

English ▼



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



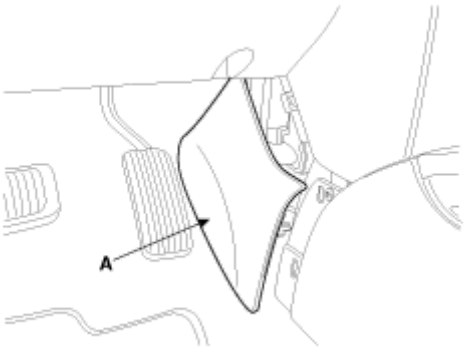
6. Installation is the reverse of removal.

> **NOTICE**
>
> - Make sure the connector is plugged in properly.
> - Replace any damage clips.

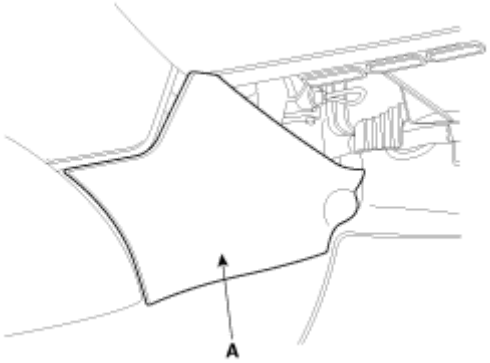
Console Extenser Cover

1. Remove the console extenser cover (A).

Driver's

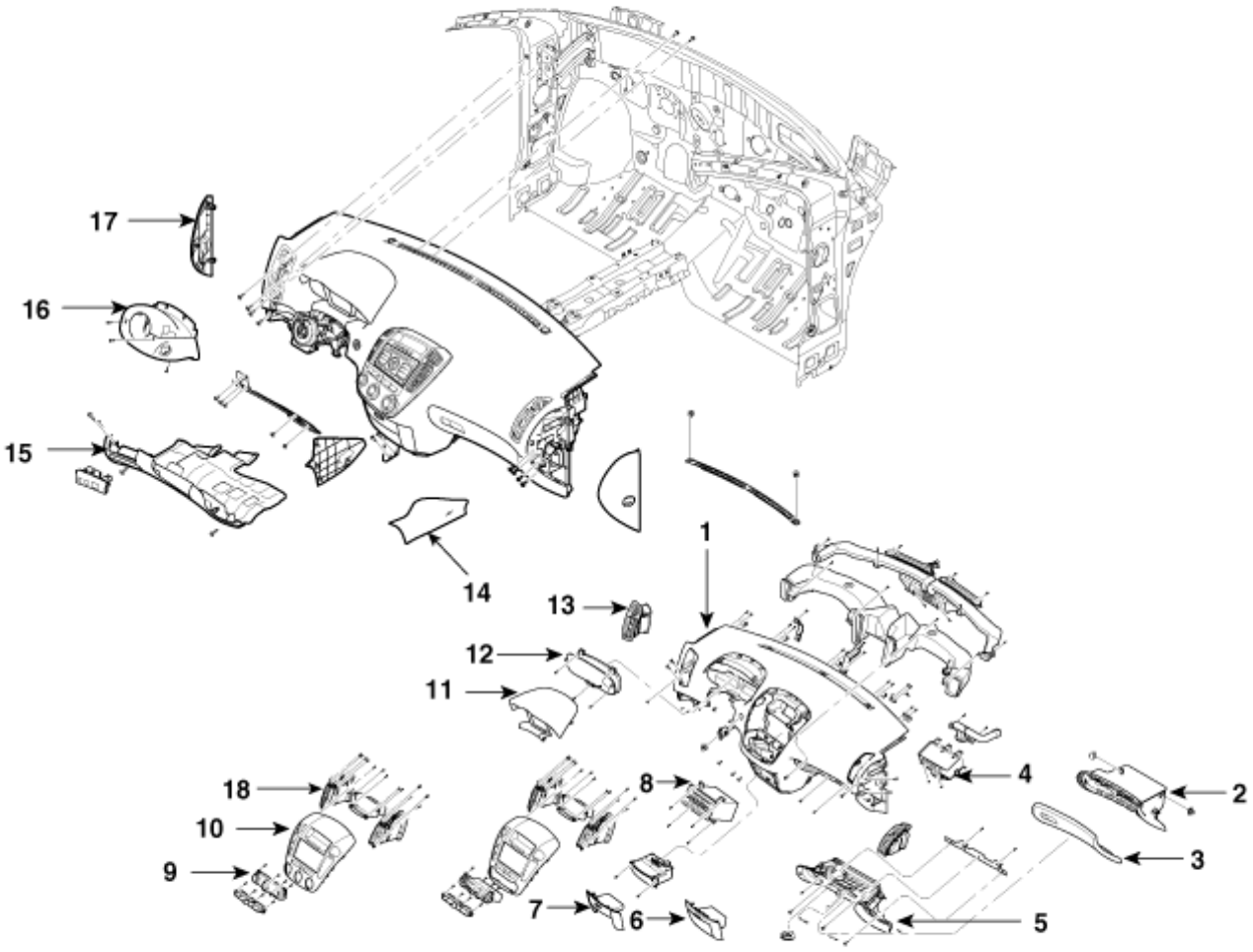


Passenger's



2. Installation is the reverse of removal.

COMPONENTS



1. Crash pad main panel	7. Crash pad centr tray	13. Air vent
2. Glove box housing	8. Audio assembly	14. Crash pad centr side cover
3. Glove box cover	9. Heater control unit	15. Crash pad lower panel
4. Airback module	10. Center facia panel	16. Shroud
5. Crash pad lower panel	11. Cluster panel	17. Crash pad side cover
6. Storage box	12. Cluster	18. Air vent

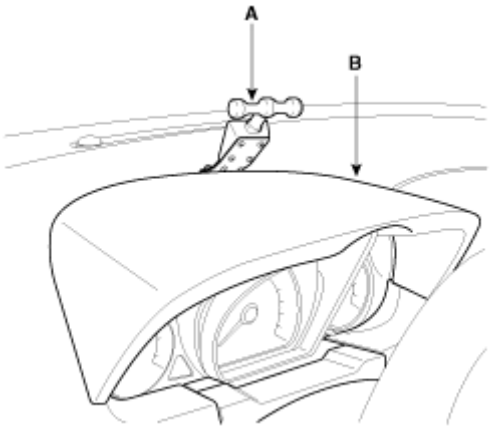
REPLACEMENT

Cluster Facia Replacement

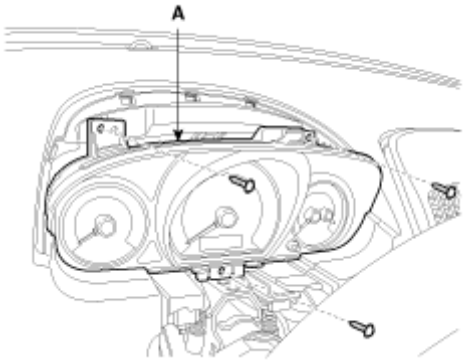
NOTICE

- 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. Tilt the steering column down.
2. Separate the cluster facia panel (B) from the crash pad pulling the SST (09840-1E100) (A).

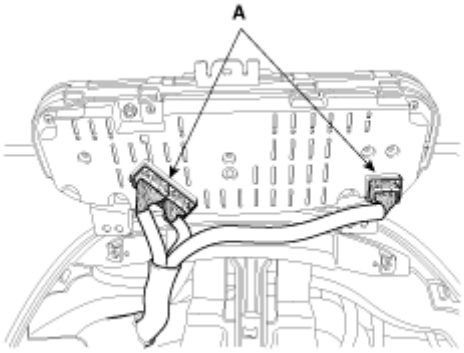


3. After loosening the mounting screws, then remove the cluster fascia (A).



4. Disconnect the connector (A).

English ▼



5. Installation is the reverse the removal.

> **NOTICE**
>
> - Make sure the connector is plugged in properly.

Center Facia Panel Replacement

> **NOTICE**
>
> - 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. Put the SST (09840-1E100) (A) into the space between the center fascia and crash pad.

> **NOTICE**
>
> - Be care not to damage the center facia and crash pad.



2. Separate the center facia panel from the crash pad pulling the SST (09840-1E100) (A) as shown on the photo.

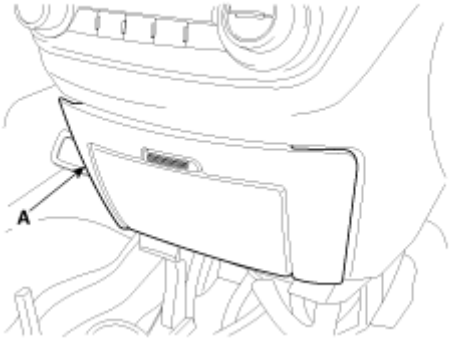
> **⚠ CAUTION**
>
> - Pull the SST (09840-1E100) (A) slowly not to damage the center fascia panel.



3. Pull the other side of center facia panel with the SST (09840-1E100) in the way of "step 2)".

Center Facia Lower Tray Replacement

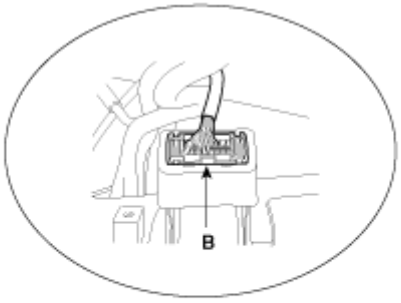
1. After loosening the mounting clips, then remove the center facia lower tray (A).



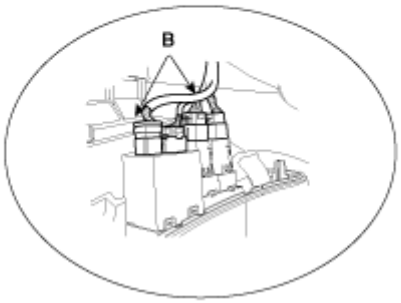
2. Installation is the reverse of removal.

Lower Panel Replacement

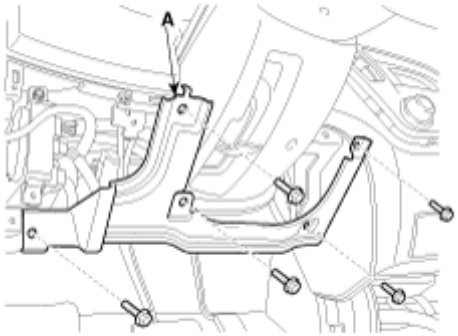
1. Remove the crash pad side cover.
2. Disconnecting the connector (B).
3. After loosening the crash pad lower panel mounting screws, then remove the lower panel (A).







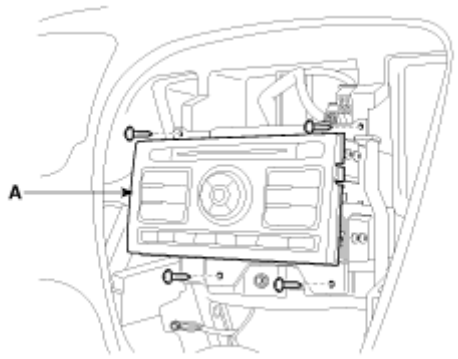
4. After loosening the mounting bolts, then remove the reinforcing panel (A).



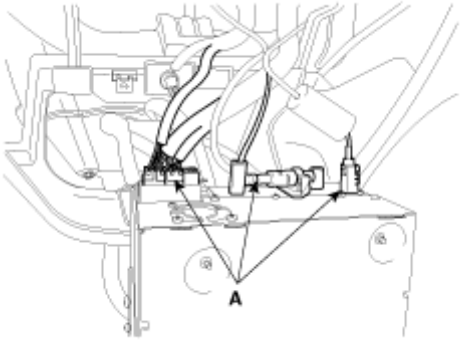
5. Installation is the reverse of removal.

Audio Assembly Replacement

1. Remove the center facia panel .
2. After loosening the mounting screws, then remove the audio assembly (A).



3. Disconnect the connector (A).



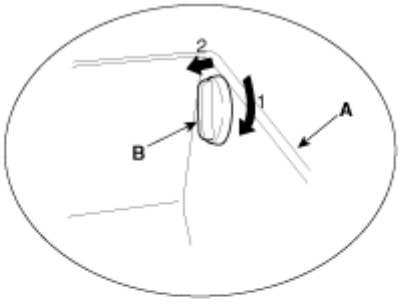
4. Installation is the reverse of removal.

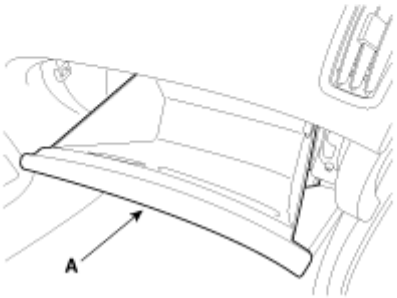
NOTICE

- Make sure the connector is plugged in properly.

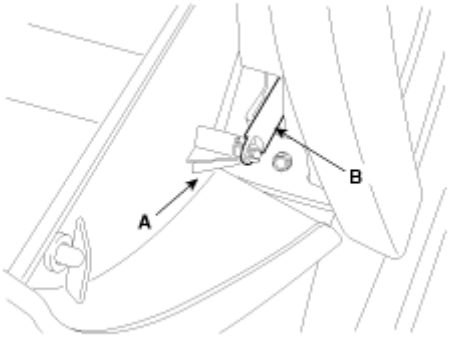
Glove Box Replacement

1. Disconnect the damper (B) from the glove box (A).

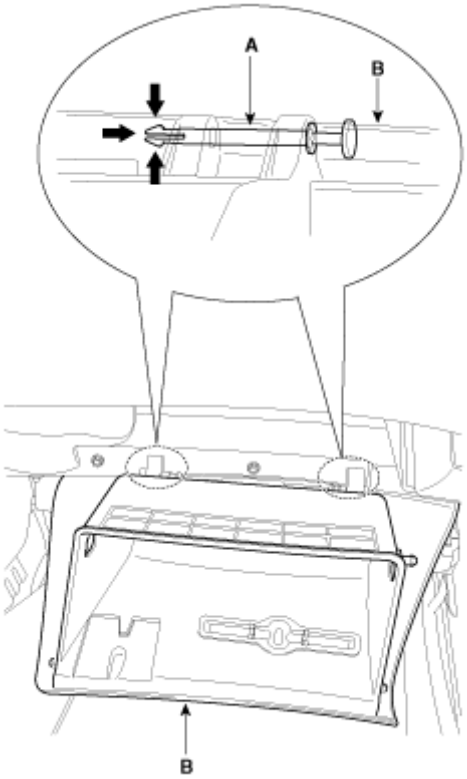




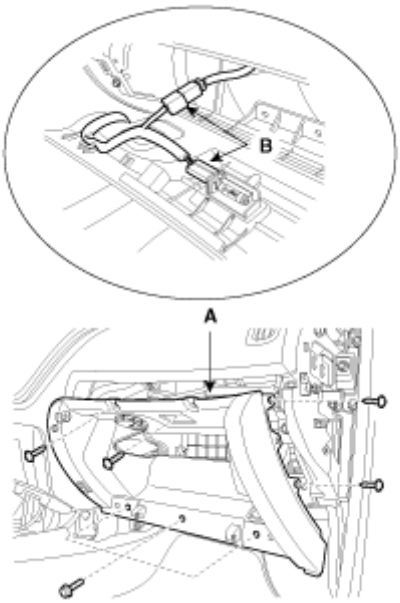
2. Remove the glove box (A) from the lift (B).



3. Disconnect the pine (A), then remove the glove box (B).



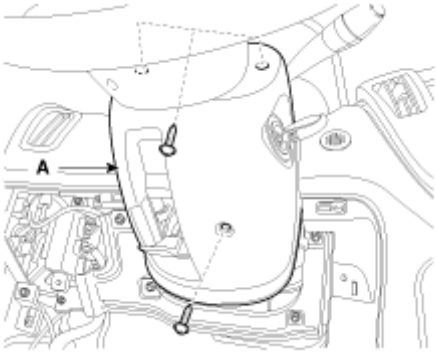
4. After loosening the mounting screws, then remove the glove box housing (A).
5. Disconnect teh connector (B).



6. Installation is the reverse of removal.

Shroud Replacement

1. Loosen the screws.
2. Remove the shroud assembly (A).



3. Installation is the reverse of removal.

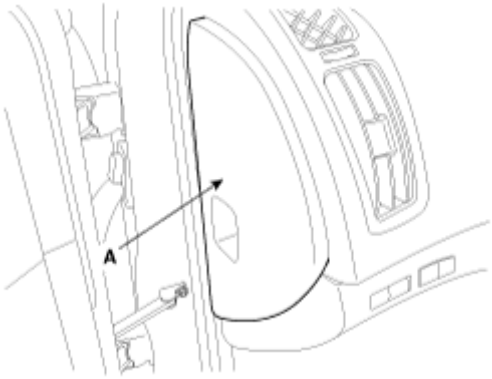
Cover Replacement

NOTICE

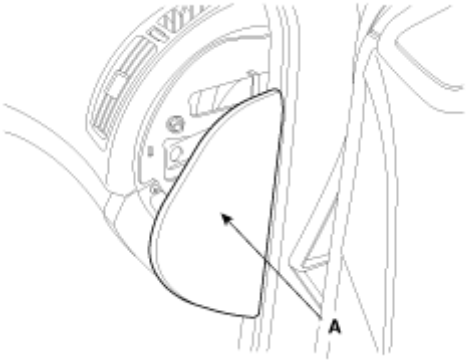
- When prying with a flat-up screwdriver, wrap it with protective tape, and apply protective tape around the related parts, to prevent damage.
- Put on gloves to protect your hands.

1. Remove the crash pad side cover (A).

Driver's



Passenger's



2. Installation is the reverse of removal.

Crash Pad Replacement

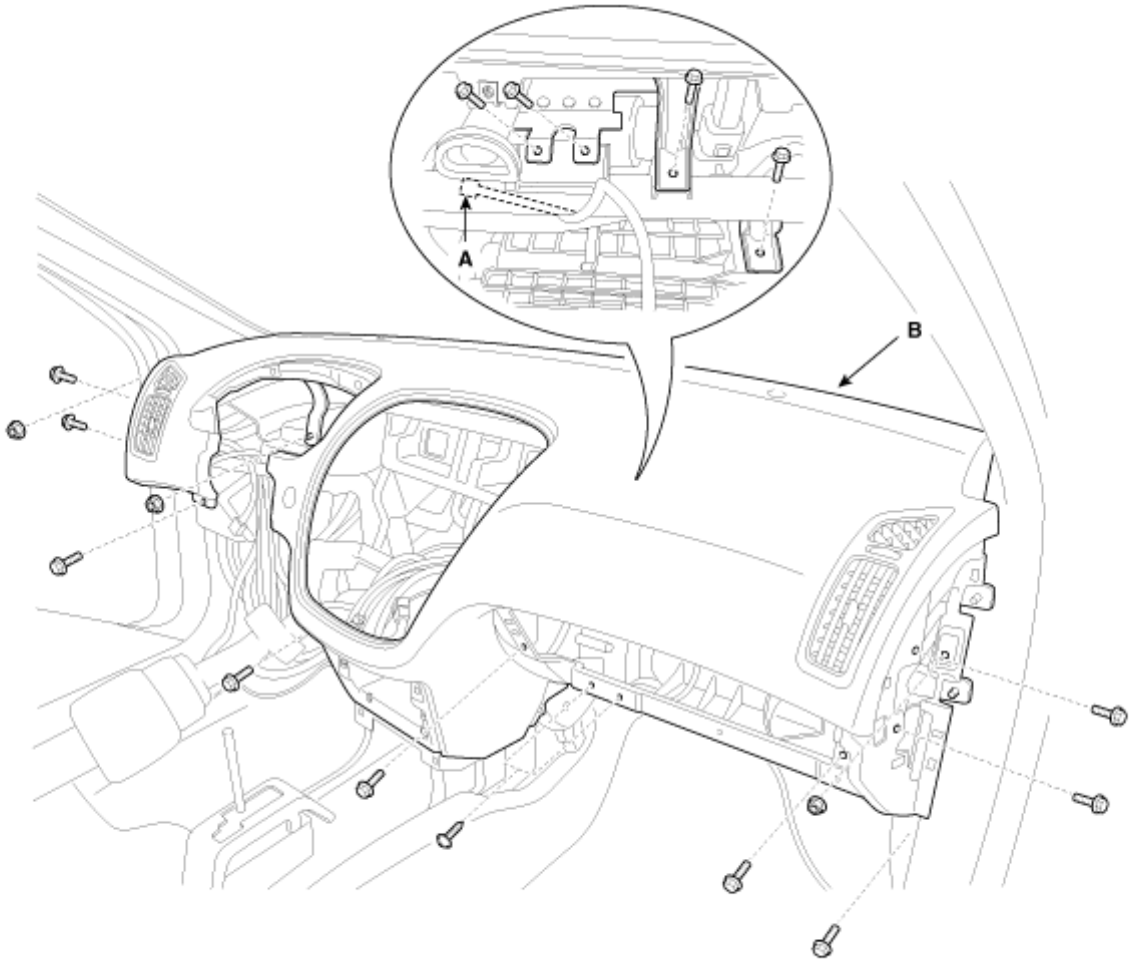
NOTICE

- 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. Remove the following items.
   - Front seat.
   - Cluster fascia panel, cluster.
   - Audio assembly.
   - Glove box.
   - Crash pad side cover.
   - Front pillar trim.
2. Remove the photo sensor.
3. Disconnect the passenger`s air bag connector (A).
   Loosen the bolts and nuts, then remove the crash pad (B).
4. Installation is the reverse of removal.

NOTICE

- 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.



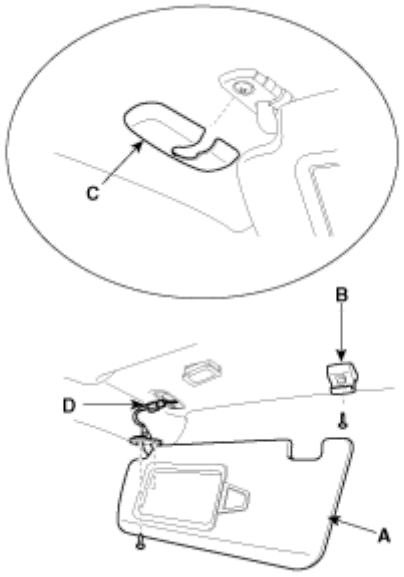
REPLACEMENT

Sunvisor Replacement

NOTICE

- When prying with a flat-tip screwdriver, wrap it with protective tape to prevent damage.
- Put on gloves to protect your hands.

1. Remove the cover (C).
2. Remove the sunvisor (A) and holder (B) from each side.
3. Disconnect the connector (D).



4. Installation is the reverse of removal.

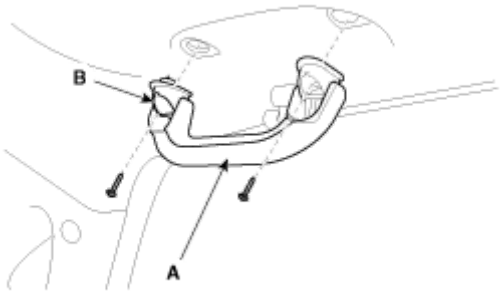
Assist Handle Replacement

NOTICE

- When prying with a flat-tip screwdriver, wrap it with protective tape to prevent damage.
- Put on gloves to protect your hands.

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

English ▼



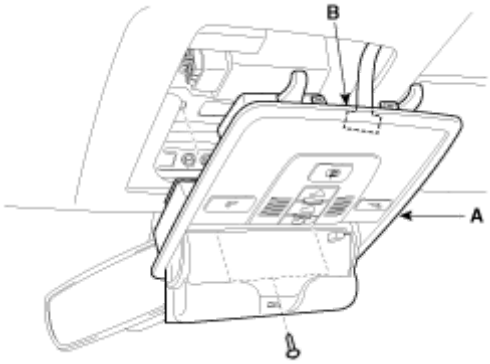
2. Installation is the reverse of removal.

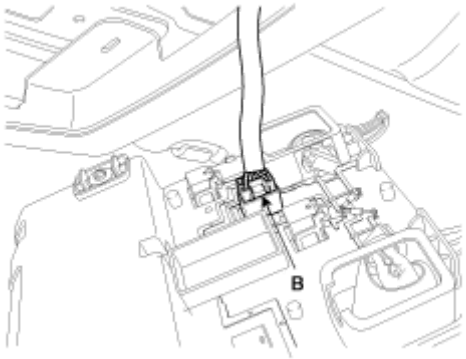
Overhead Console Lamp Replacement

NOTICE

- When prying with a flat-tip screwdriver, wrap it with protective tape to prevent damage.
- Put on gloves to protect your hands.

1. Remove the overhead console
   - Remove the screw.
   - Pull out the roof console (A).
   - Disconnect the connector (B).





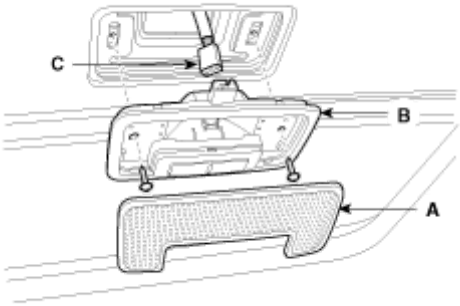
2. Installation is the reverse of removal.

Room Lamp Replacement

NOTICE

- When prying with a flat-tip screwdriver, wrap it with protective tape to prevent damage.
- Put on gloves to protect your hands.

1. Remove the room lamp.
   - Remove the lens (A).
   - Remove the screws.
   - Pull out the room lamp (B).
   - Disconnect the connector (C).



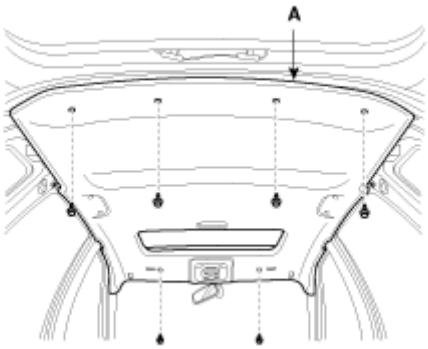
2. Installation is the reverse of removal.

Headliner Replacement

NOTICE

- 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. Remove the following items.
   - Front seat, rear seat assembly.
   - Door scuff trim.
   - Front pillar trim.
   - Center pillar trim.
   - Rear pillar trim.
   - Overhead console.
   - Room lamp.
   - Sunvisor.
   - Assist handle
2. Remove the roof trim (A).



3. Installation is the reverse of removal.

NOTICE

- Replace any damage clips.

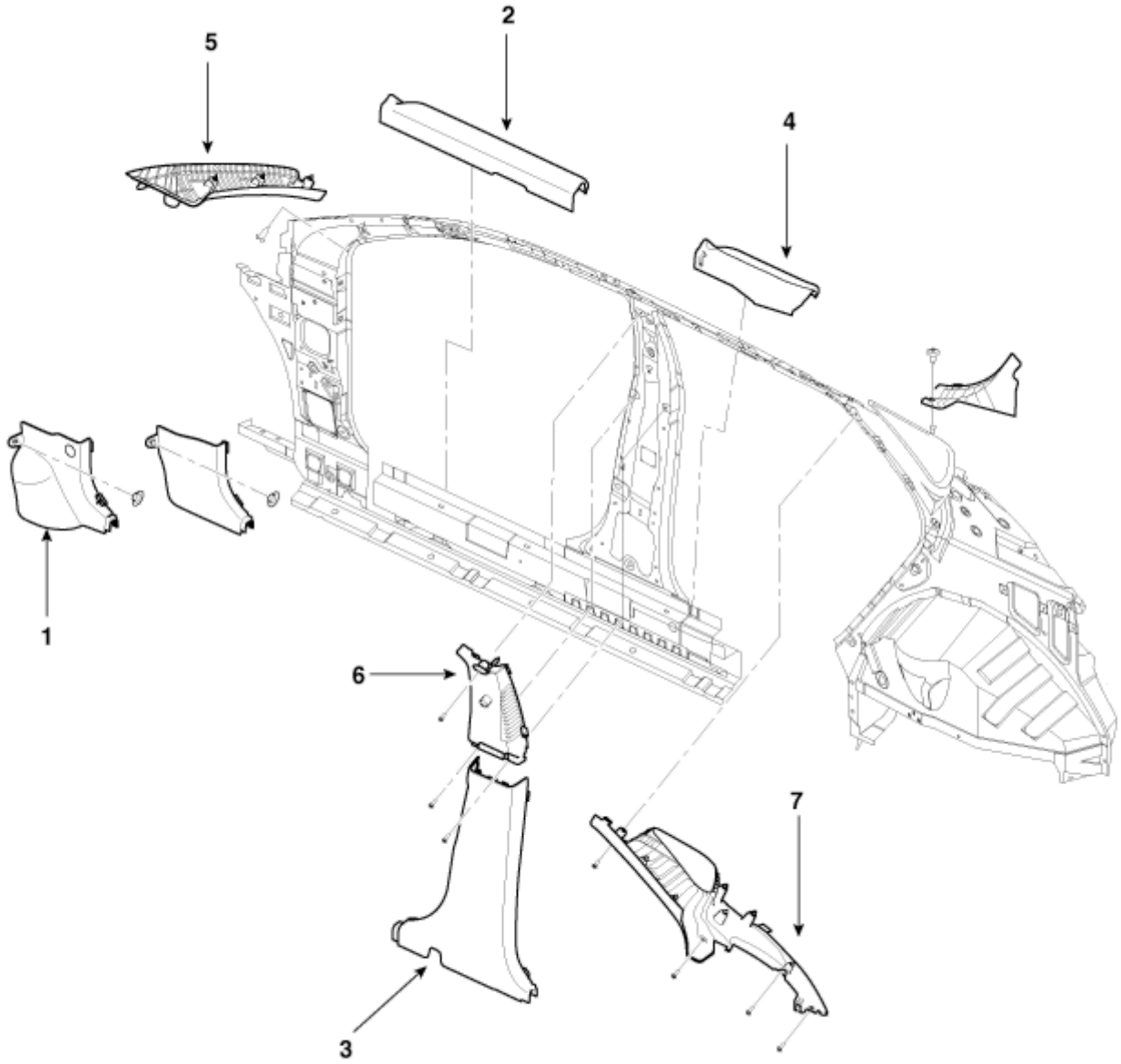
REPLACEMENT

5Door

NOTICE

- 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. Remove the interior trim.



1. Cowl side trim	5. Front pillar upper trim
2. Front door scuff trim	6. Center pillar upper trim

3. Center pillar lower trim 4. Rear door scuff trim	7. Rear pillar trim

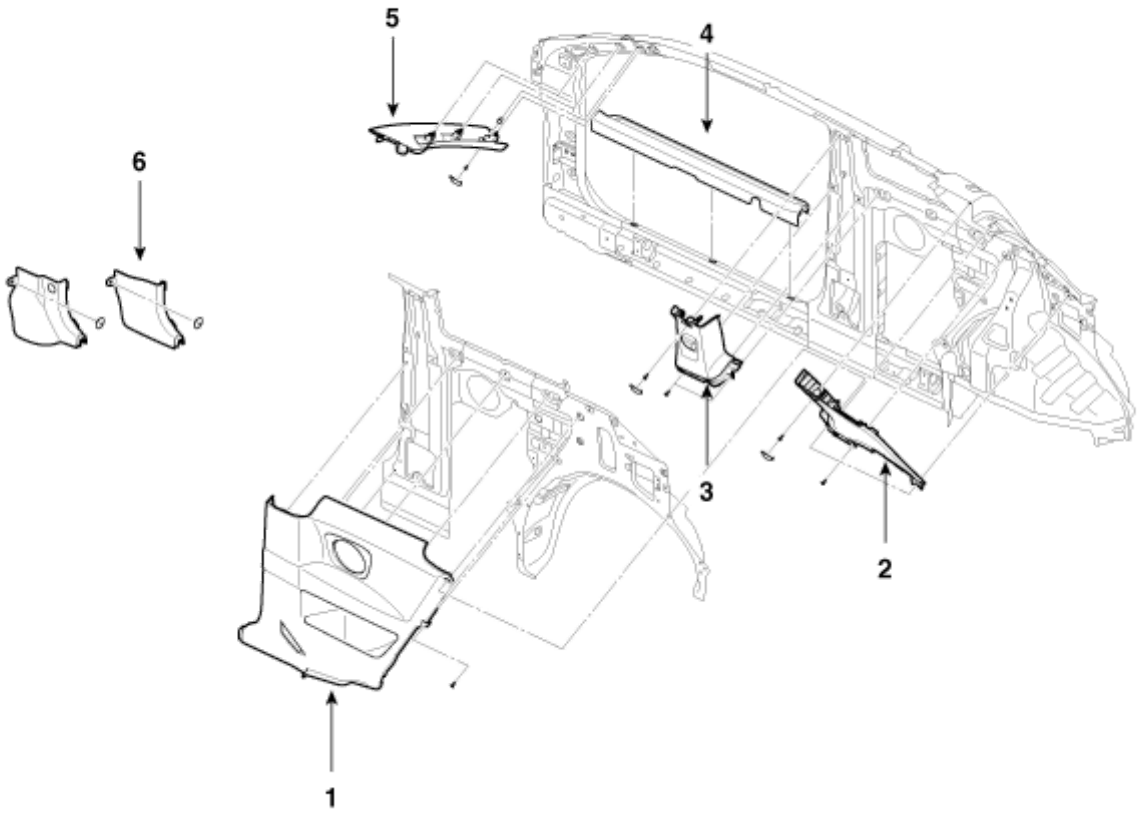
English ▼

3Door

NOTICE

- 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. Remove the interior trim.



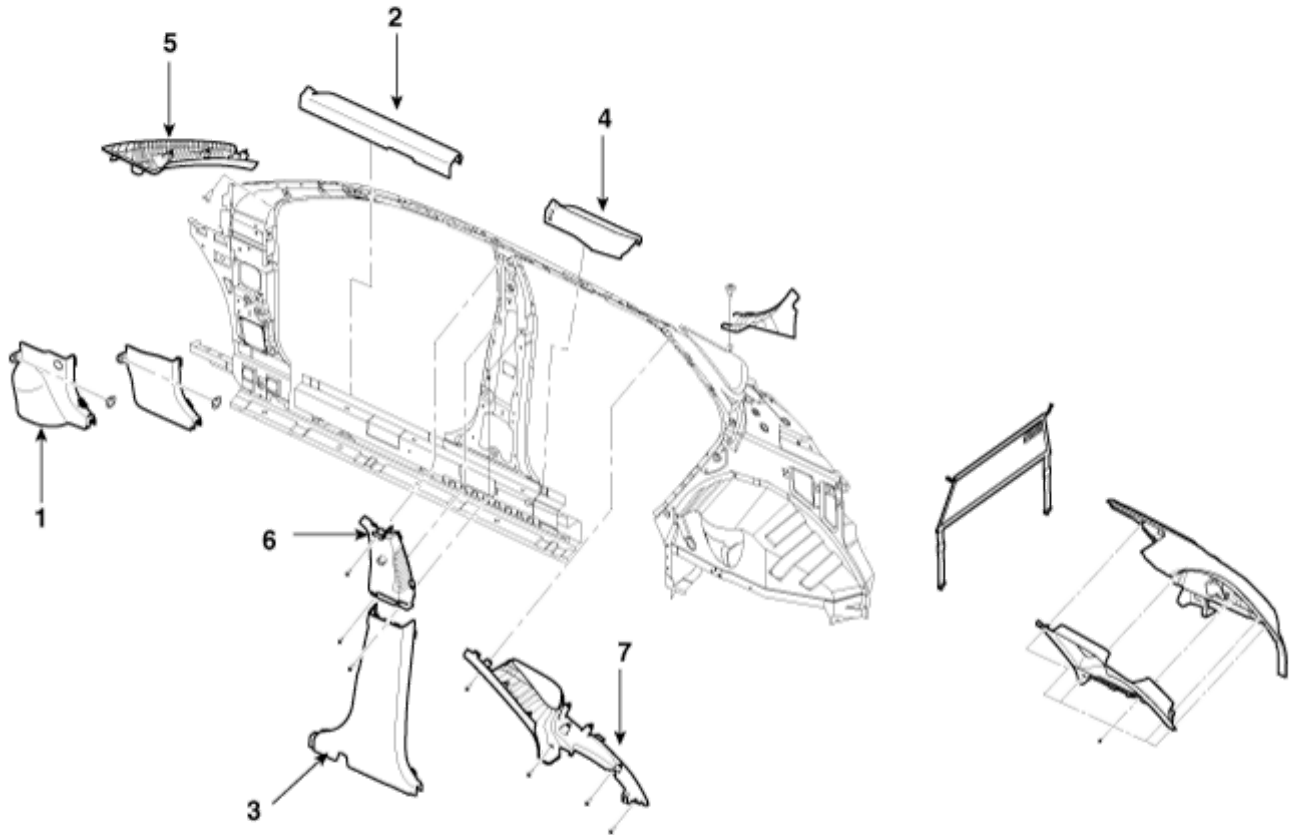
1. Rear guarter trim 2. Rear pillar trim 3. B pillar trim	4. Door scuff trim 5. Front pillar trim 6. Cowl side trim

Wagon

NOTICE

- 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. Cowl side trim 2. Front door scuff trim 3. Center pillar trim 4. Rear door scuff	5. Front pillar trim 6. Center pillar trim 7. Rear pillar trim

Luggage Side Trim Replacement

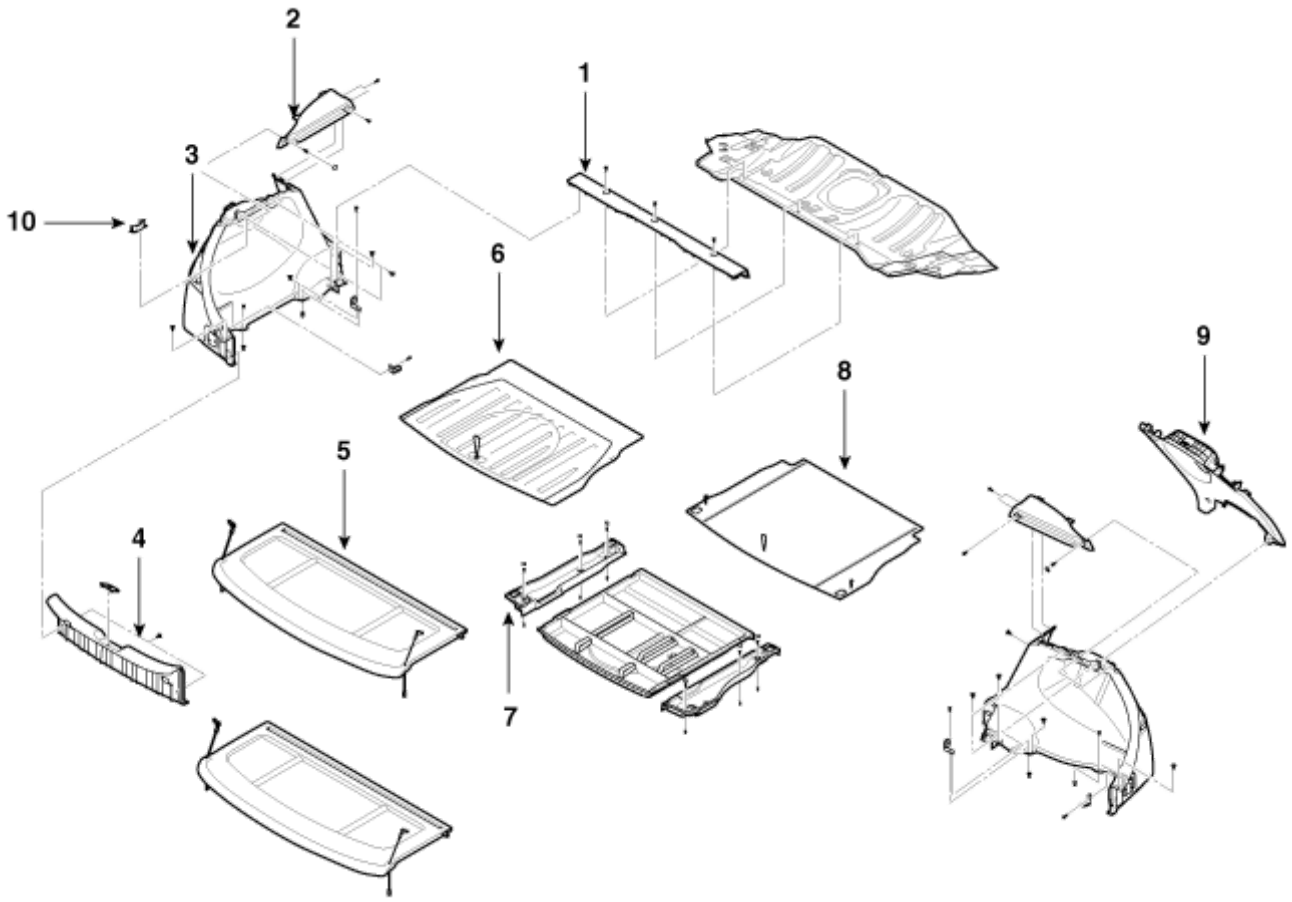
5Door

NOTICE

- Put on gloves to protect your hands.
- When prying with a flat-tipped screwdriver, wrap it with protective tape to prevent damaged.

- Take care not to bend or scratch the trim and panels.

1. Remove the rear seat.
2. Remove the rear seat belt lower anchor.
3. After loosening the mounting screws, then remove the luggage side trim.
4. Installation is the reverse of removal.



1. Front lord floor trim	6. Luggage covering m at
2. Luggage side shelf	7. Center luggage box
3. Luggage side trim	8. Luggage covering mat
4. Rear transverse trim	9. Rear pillar trim
5. Luggage center shelf	10. Luggage room lamp

Luggage Side Trim Replacement

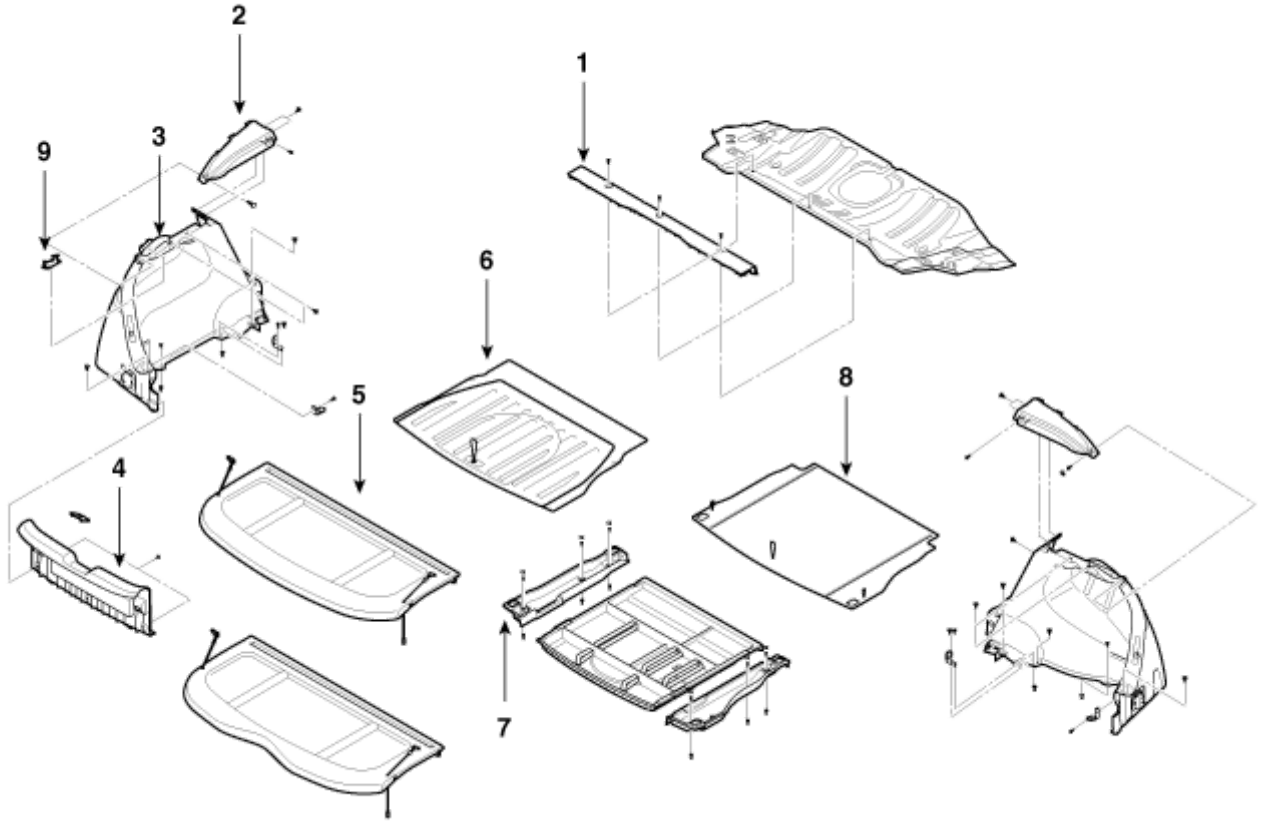
3Door

NOTICE

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

1. Remove the rear seat.

2. Remove the rear seat belt lower anchor.
3. After loosening the mounting screws, then remove the luggage side trim.
4. Installation is the reverse of removal.



1. Front lord floor trim	6. Luggage covering mat
2. Luggage side shelf	7. Center luggage box
3. Luggage side trim	8. Luggage covering mat
4. Rear transverse trim	9. Luggage room lamp
5. Luggage center shelf	

Luggage Side Trim Replacement

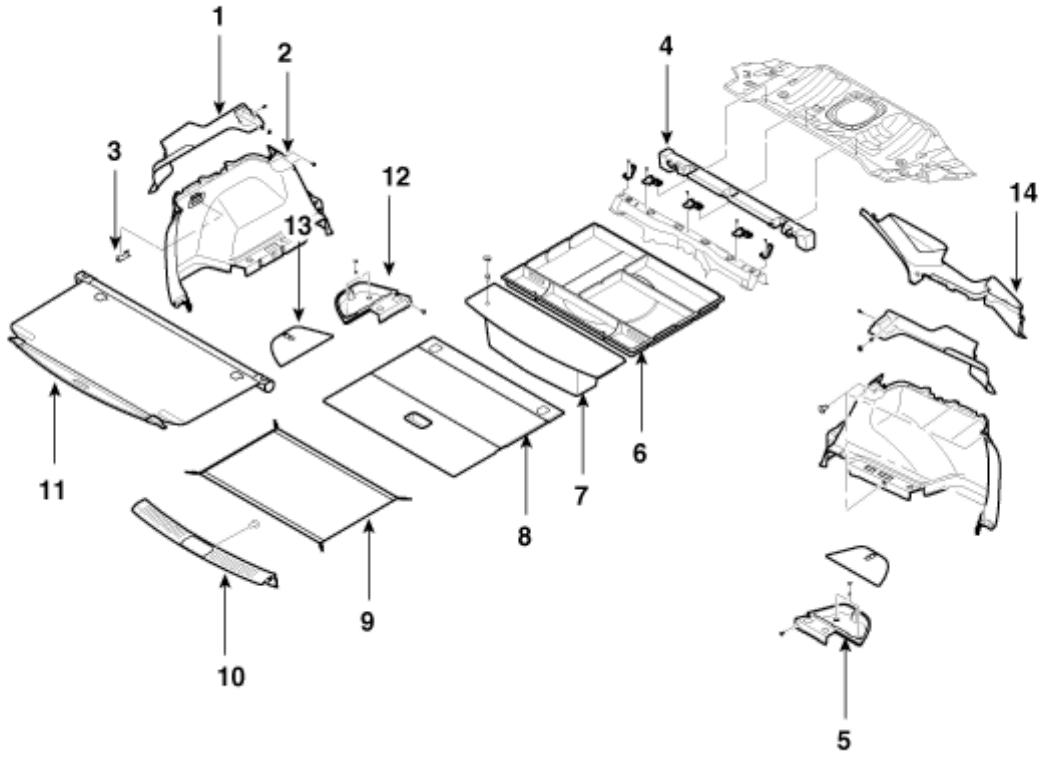
Wagon

NOTICE

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

1. Remove the rear seat.
2. Remove the rear seat belt lower anchor.
3. After loosening the mounting screws, then remove the luggage side trim.

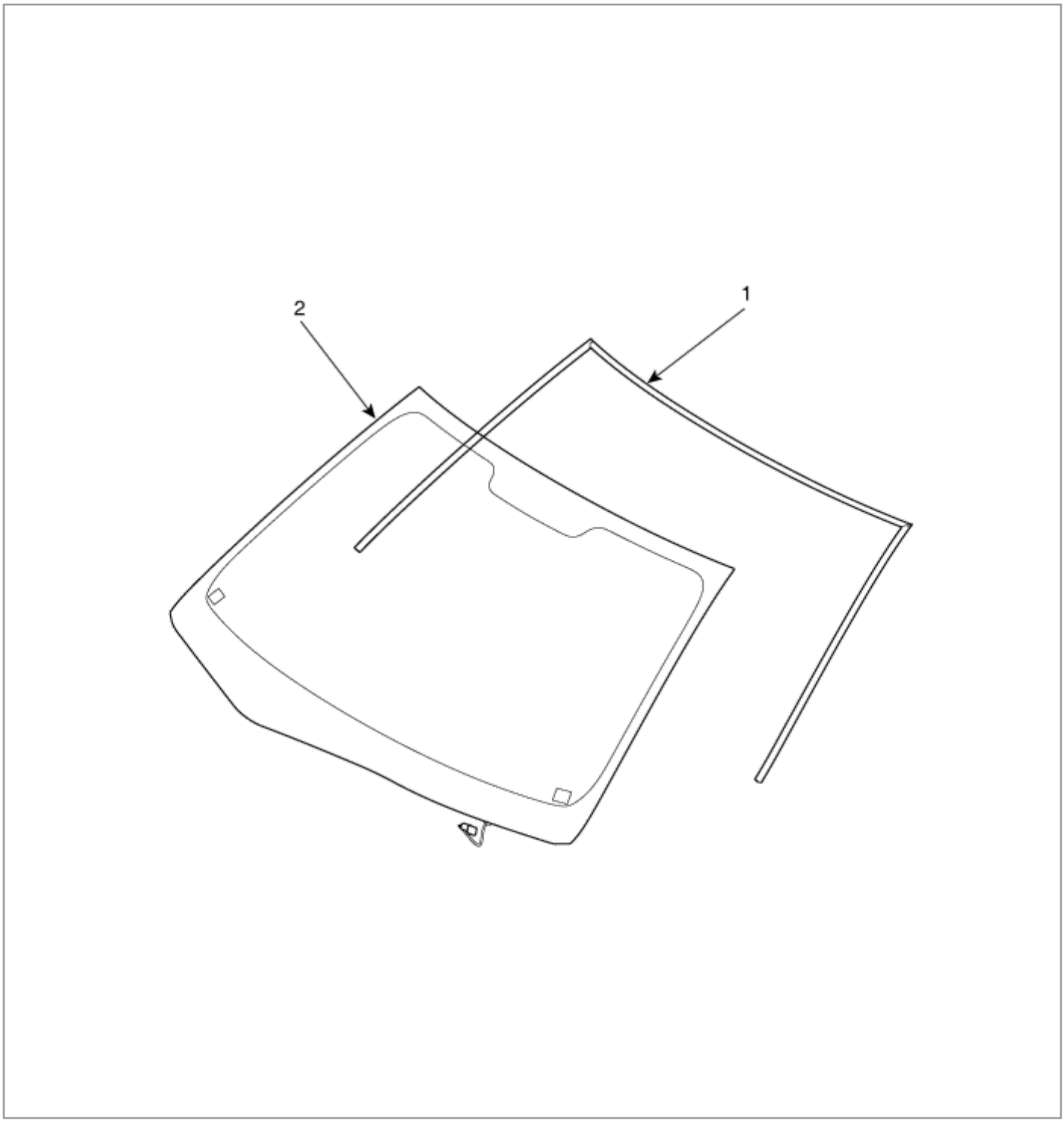
4. Installation is the reverse of removal.



1. Side C/shelf trim	6. Front luggage box	11. Cargo screen
2. Luggage side trim	7. Rear luggage box	12. Luggage side box
3. Luggage room lamp	8. Front luggage covering	13. Luggage side box cover
4. Floor load trim	9. Luggage net	14. Rear pillar trim
5. Luggage side box	10. Rear transverse trim	

English ▼

COMPONENTS



1. Windshield molding
2. Windshield glass

English ▼

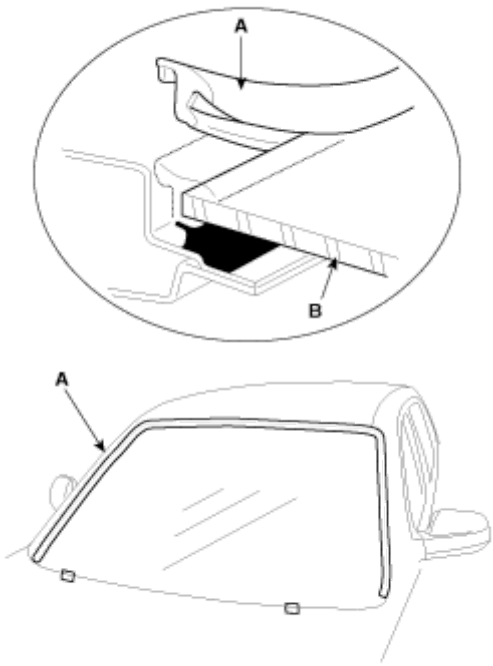
REPLACEMENT

Removal

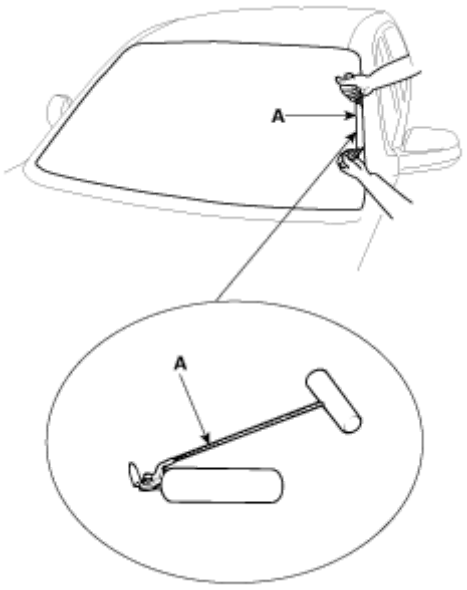
NOTICE

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

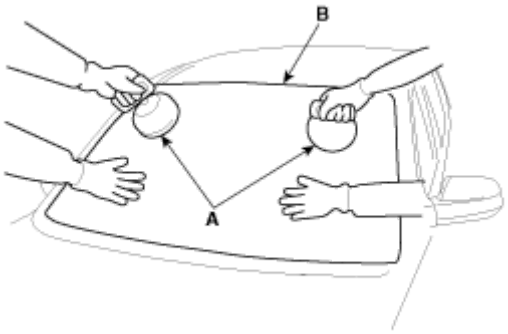
1. Remove the following items:
   - Inside rear view mirror.
   - Sunvisors and holders, both sides, overhead console, Grab handles, both sides.
   - Front pillar trim, both sides.
   - Windshield wiper arms and cowl cover. (See page BE- "Windshield wiper")
2. Remove the molding (A) from the edge of the windshield (B). If necessary, cut the molding with a utility knife.



3. Pull down the front portion of the headliner. Take care not to bend the headliner excessively, or you may crease or break it.
4. Cut out the sealant using the sealant cutting tool [A(09861-31100)].

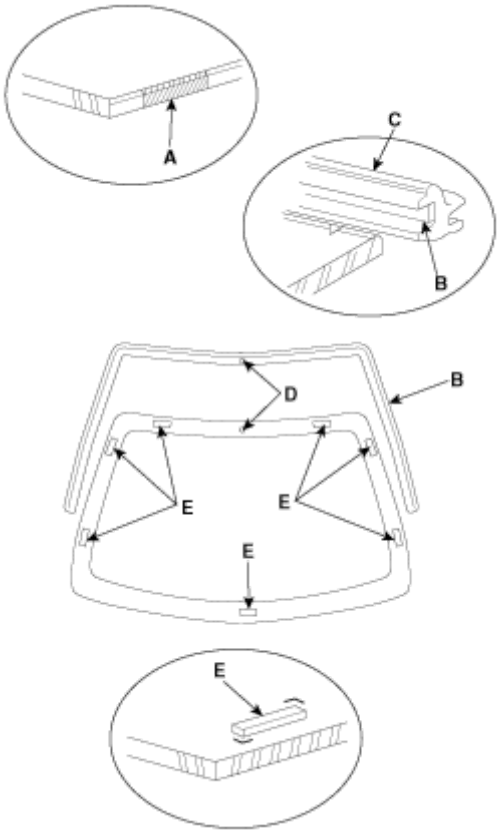


5. Remove the winshield (B) carefully using the glass holder [A].

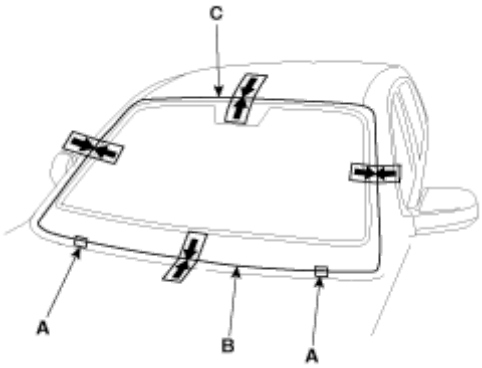


Installtion

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:
   - Do not scrape down to the painted surface of the body; damaged paint will interfere with proper bonding.
   - Remove the rubber dam and fasteners from the body.
   - Mask off surrounding surfaces before painting.
2. Clean the body bonding surface with a sponge dampened in alcohol. After cleaning, keep oil, grease and water from getting on the clean surface.
3. Apply the glass primer (A) to the side of the windshield glass edge and stick the both-sided adhesive tape (B) on the inside of molding (C).
4. When attaching the molding, make it in line (D) with the windshield glass and attach the windshield glass pad (E)to the designated place.



5. Install the spacer (A) install the windshield glass (B) temperarily with making sure to position them on the center, and then place the alignment mark (C).
6. Remove the windshield.

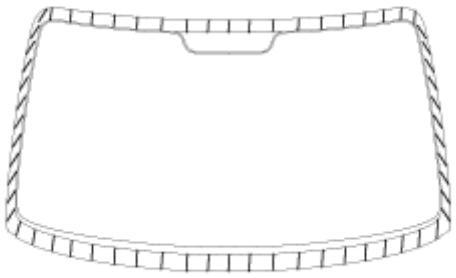


7. Apply a light coat of glass primer to the outside of the fasteners.

NOTICE

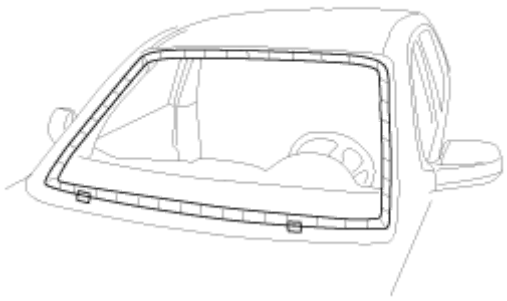
- Never touch the primed surface with your hand. If you do, the adhesive may not bond to the glass properly, causing a leak after the windshield glass is installed.
- Do not apply body primer to the glass.
- Keep water, dust, and abrasive materials away from the primer.

////////// : Apply glass primer here.

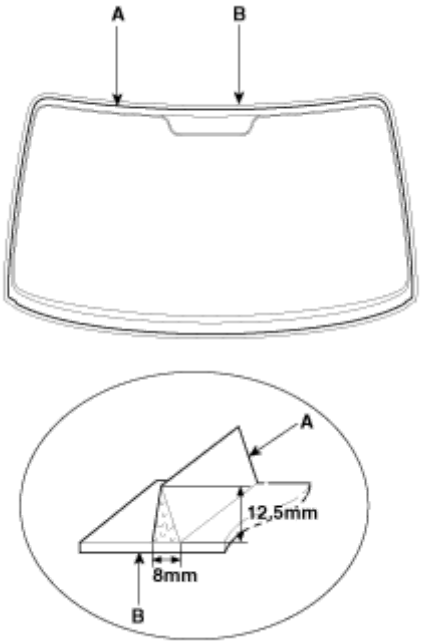


8. With a sponge, apply a light coat of body primer to the original adhesive remaining around the windshield opening flange. Let the body primer dry for at least 10 minutes:
   - Do not apply glass primer to the body, and be careful not to mixup glass and body primer sponges.
   - Never touch the primed surfaces with your hands.
   - Mask off the dashboard before painting the flange.

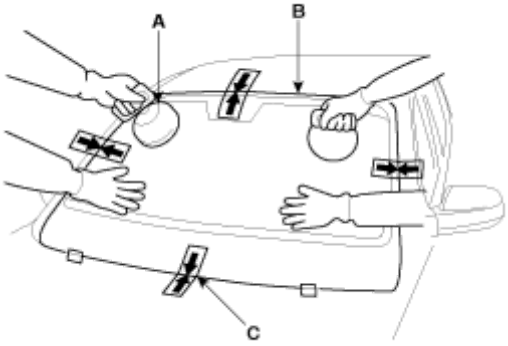
////////// : primer



9. Pack adhesive into the cartridge without air pockets to ensure continuous delivery. Put the cartridge in a caulking gun, and run a bead of sealant (A) around the edge of the windshield (B) 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.



10. Use glass holder (A) to hold the windshield over the opening, align it with the alignment marks (B) 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.

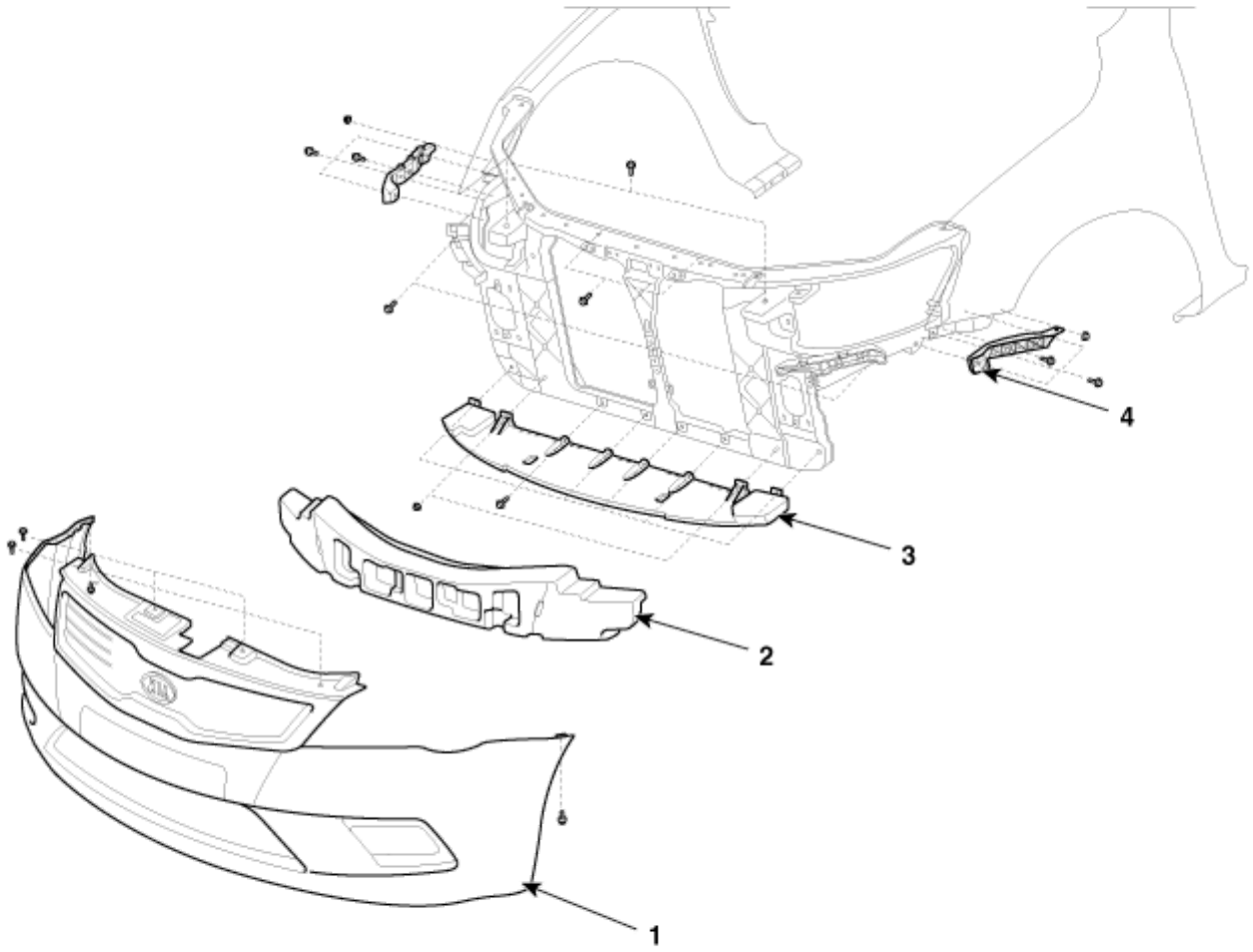


11. Scrape or wipe the excess adhesive off with a putty knife or towel. To remove adhesive from a painted surface or the windshield, wipe with a soft shop towel dampened with alcohol.
12. Let the adhesive dry for at least one hour, then spray water over the windshield and check for leaks. Make leaking areas, and let the windshield dry, then seal with sealant:
    - Let the vehicle stand for at least four hours after windshield installation. If the vehicle has to be used within the first four, it must be driven slowly.
    - Keep the windshield dry for the first hour after installation.
13. Reinstall all remaining removed parts. Install the rearview mirror after the adhesive has dried thoroughly. Advise the customer not to do the following things for two the three days:
    - Slam the door with all the windows rolled up.
    - Twist the body excessively (such as when going in and out of driveways at an angle or driving over rough, uneven roads).

English ▼

COMPONENTS

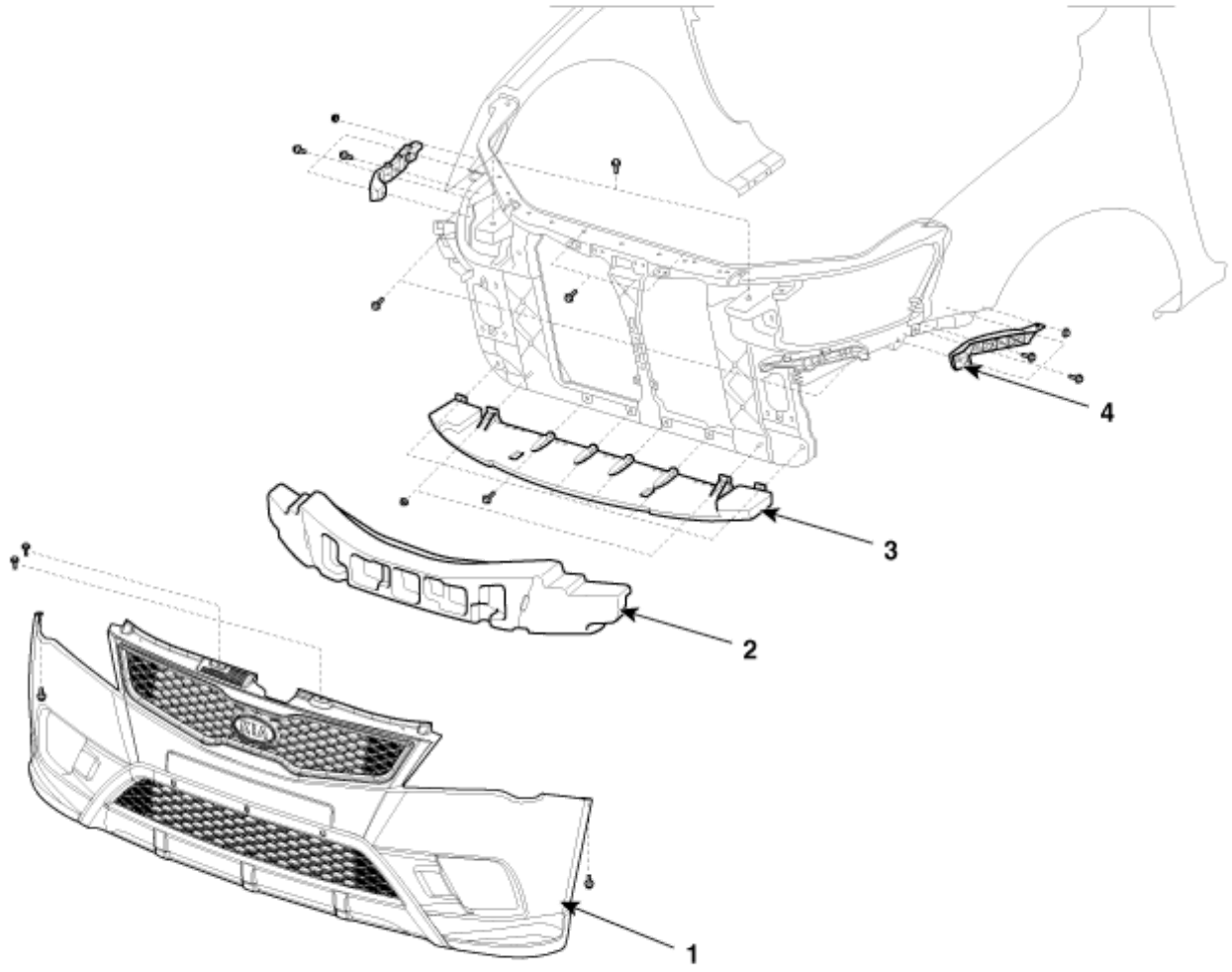
< 3 Door, 5 Door >



1. Front bumper cover 2. Front bumper energy absorber	3. Front bumper lower stiffener 4. Front bumper side bracket

< Sports Pack >

English ▼



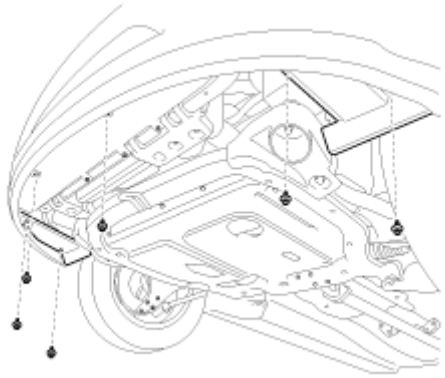
1. Front bumper cover 2. Front bumper energy absorber	3. Front bumper lower stiffener 4. Front bumper side bracket

REPLACEMENT

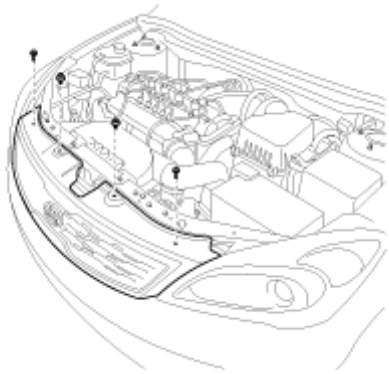
NOTICE

- 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 bend or scratch the cover and other parts.

1. Remove the mounting clips.



2. Loosen the radiator upper cover mounting screws and bolts.

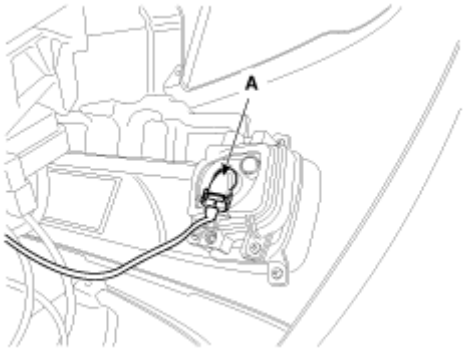


3. After loosening the front bumper side's mounting screw, then disconnect the side's.



4. Disconnect the fog lamp connector (A).

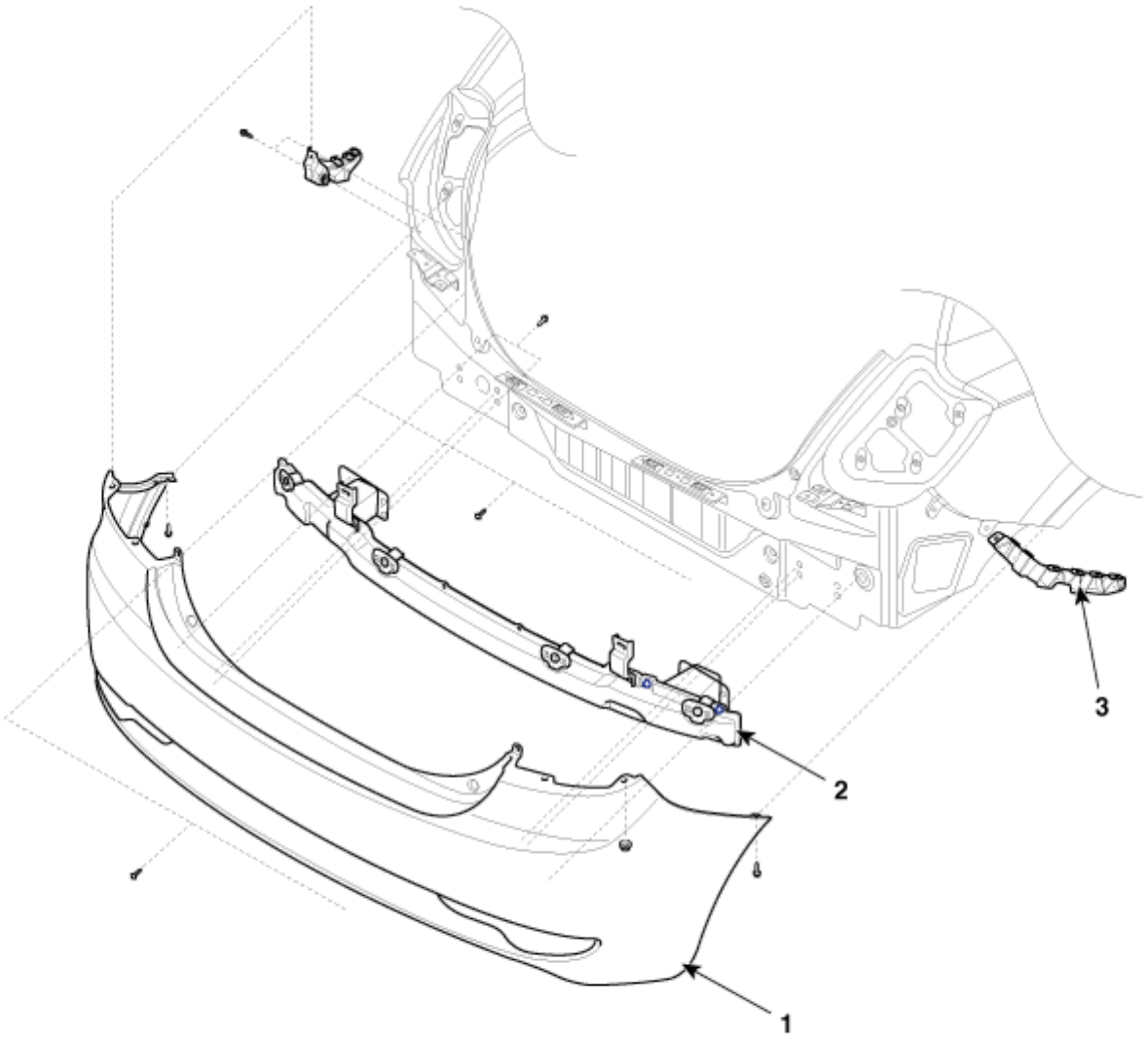
English ▼



5. Remove the front bumper cover.
6. Installation is the reverse of removal.

COMPONENTS

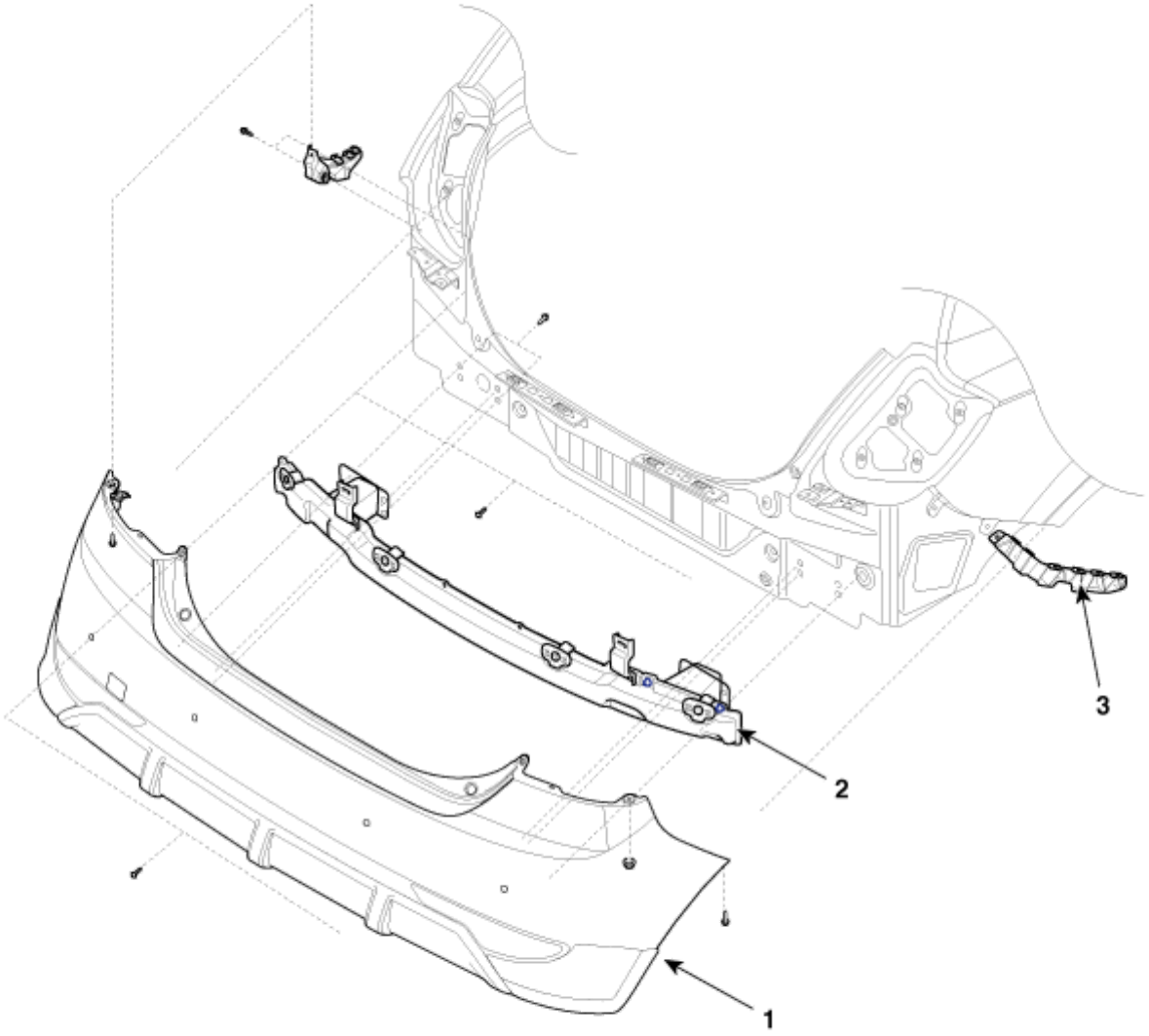
< 3 Door, 5 Door >



1. Rear bumper cover 2. Rear bumper energy absorber	3. Rear bumper side bracket

< Sports Pack >

English ▼



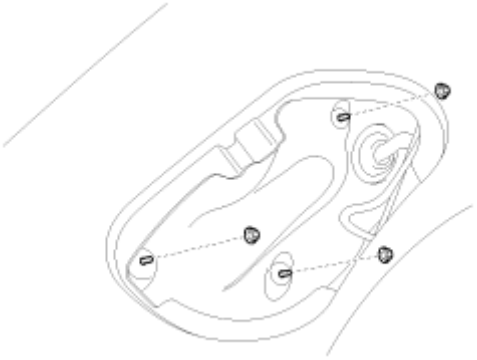
1. Rear bumper cover 2. Rear bumper energy absorber	3. Rear bumper side bracket

REPLACEMENT

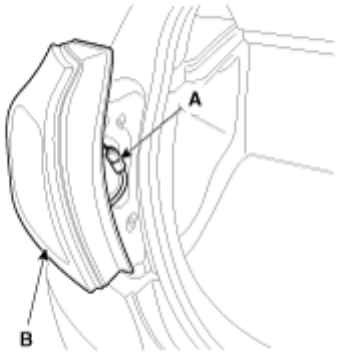
NOTICE

- 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 bend or scratch the cover and other parts.

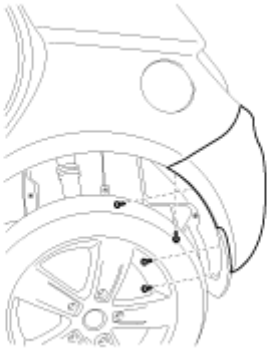
1. Remove the mounting nuts.



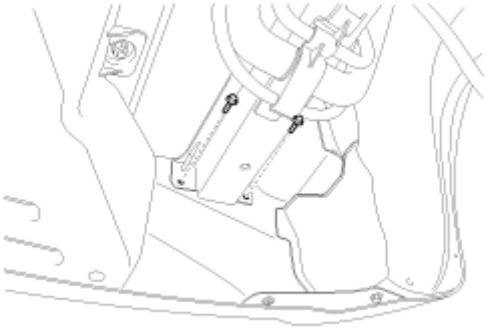
2. Disconnect the connector (A), then remove the rear combination lamp (B).



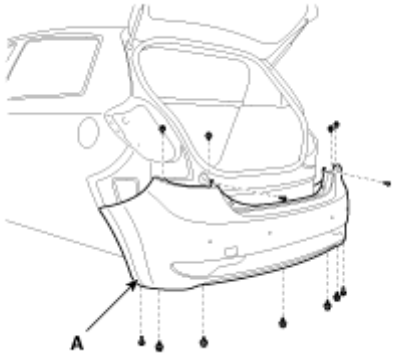
3. Remove the rear bumper side's screws.



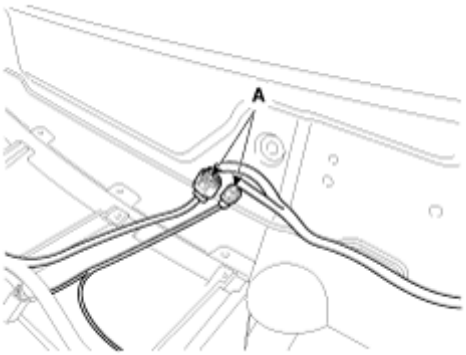
4. Loosen the inside mounting bolts.



5. After loosening the mounting screws and clips, then remove the rear bumper cover (A).



6. Disconnect the connector (A).

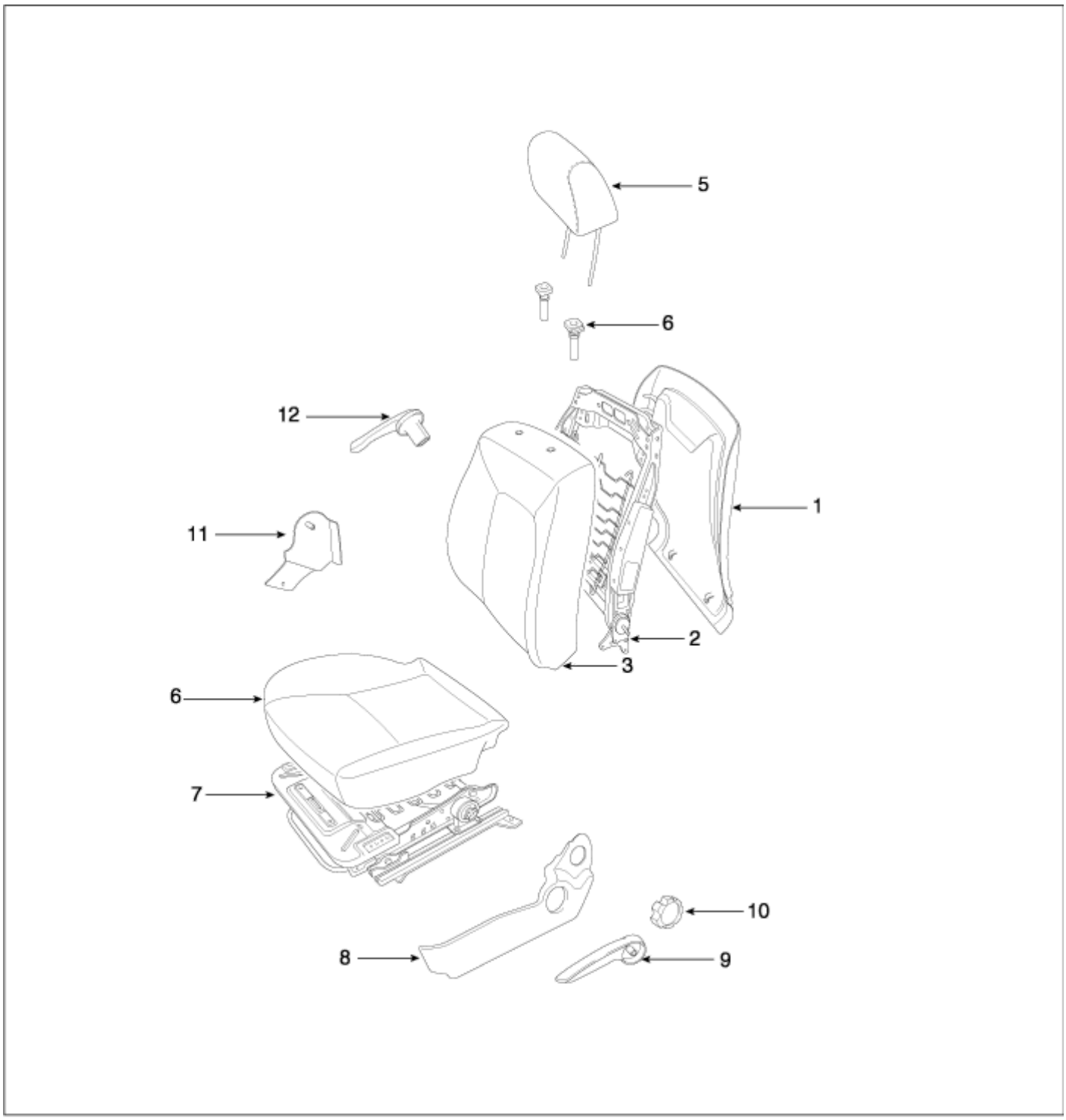


7. Installation is the reverse of removal.

NOTICE

- Replace any damage clips.

COMPONENTS



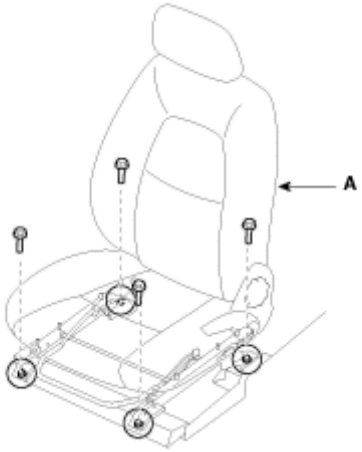
1. Back panel
2. Back frame
3. Seat back pad
4. Headrest
5. Headrest guid
6. Seat cushion
7. Seat cushion frame
8. Recliner cover
9. Hight lever
10. Recliner lever
11. Recliner cover
12. lumber sport lever

REPLACEMENT

Seat Assembly Replacement

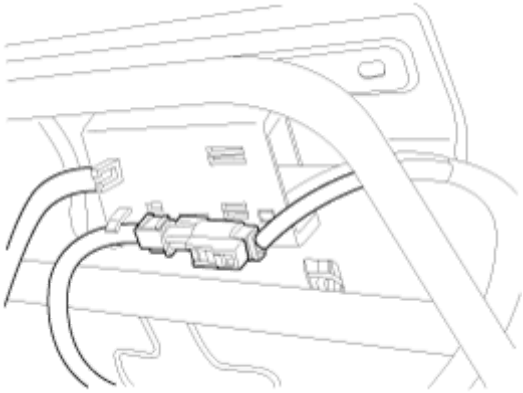
1. Remove the seat assembly mounting cover.
2. After loosening the seat assembly mounting bolts, remove the seat assembly (A).

   Bolt, 3.5~5.5 kgf.m (34.3~53.9 N.m, 25.3~39.8 lbf.ft)

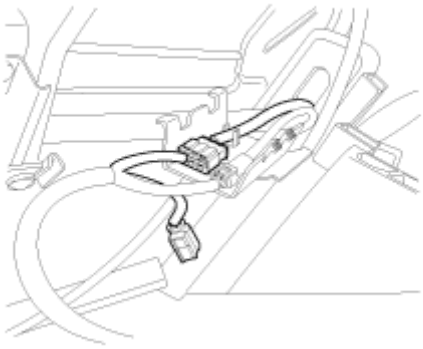


3. Disconnect the connectors, and remove the seat assembly.

Driver`s



Passenger`s



4. Installation is the reverse of removal.

English ▼

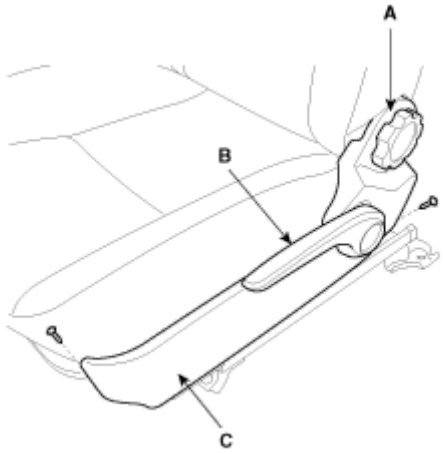
⚠ CAUTION

SEAT MOUNTING BOLT INSTALLATION PROCE-DURE (manual seat only)

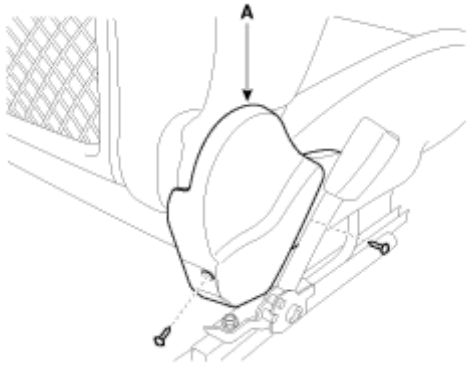
- Set the into the most rearward position.Check then each slide is locked, and then Tighten the front mounting bolt temporarily.
- Set the seat into most forward position.Check that each slide is locked, and thenTighten the rear mounting bolt completely.
- Set the seat into the most rearward position.Check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

Recliner Cover Replacement

1. After loosening the recliner mounting screw, then remove the recliner lever (A) and height lever (B).
2. After loosening the mounting screws, then remove the recliner cover (C).



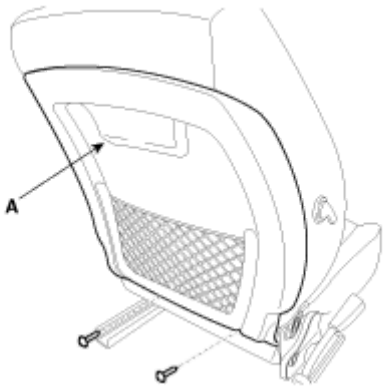
3. Gently detach the hook, remove the recliner cover (A).



4. Installation is the reverse of removal.

Seat Back Cover Replacement

1. Remove front seat assembly.
2. Remove the recliner cover .
3. After disconnecting the scuff band, remove the seat back panel.



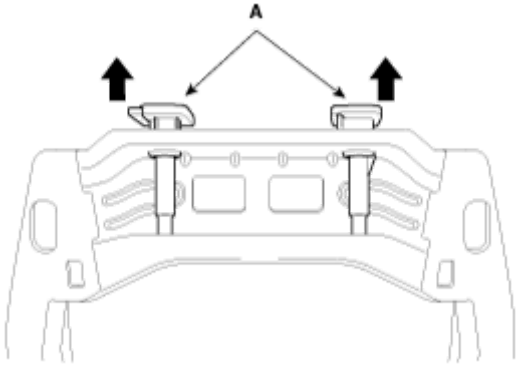
4. Disconnect the protector (A) from the back frame.



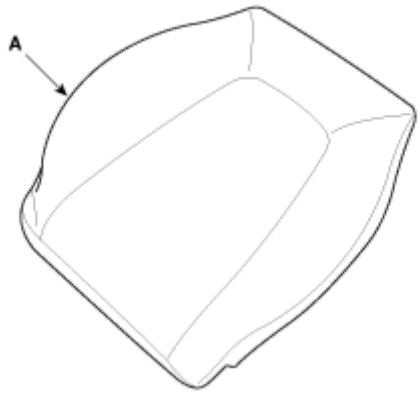
5. Remove the lumber sport lever.



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



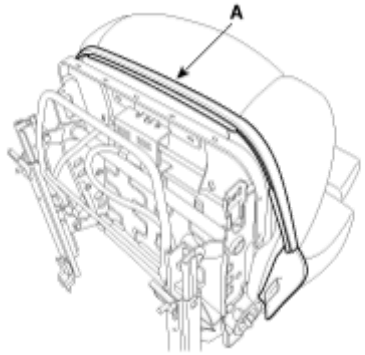
7. After removing the tape on the front of seat back remove the seat back cover (A).



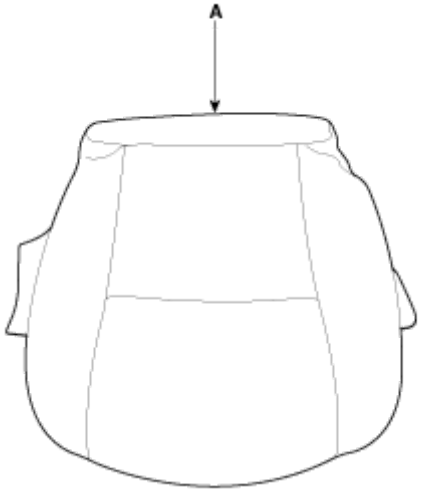
8. Installation is the reverse of removal.

Seat Cushion Cover Replacement

1. Remove front seat assembly.
2. Remove the recliner cover.
3. After disconnect the protector (A), then remove the seat cushion (B).



4. After removing the hogring clip on the front of seat cushion and remove the seat cushion cover (A).



5. Installation is the reverse of removal.

Seat Frame Replacement

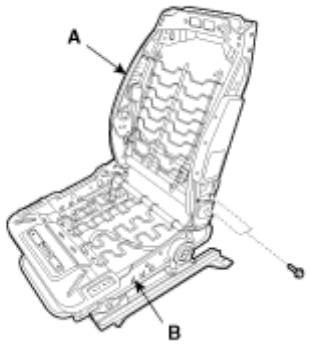
1. Remove the following items.
    - Recliner cover

- Seat back panel
- Headrest guide
- Seat back cover

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

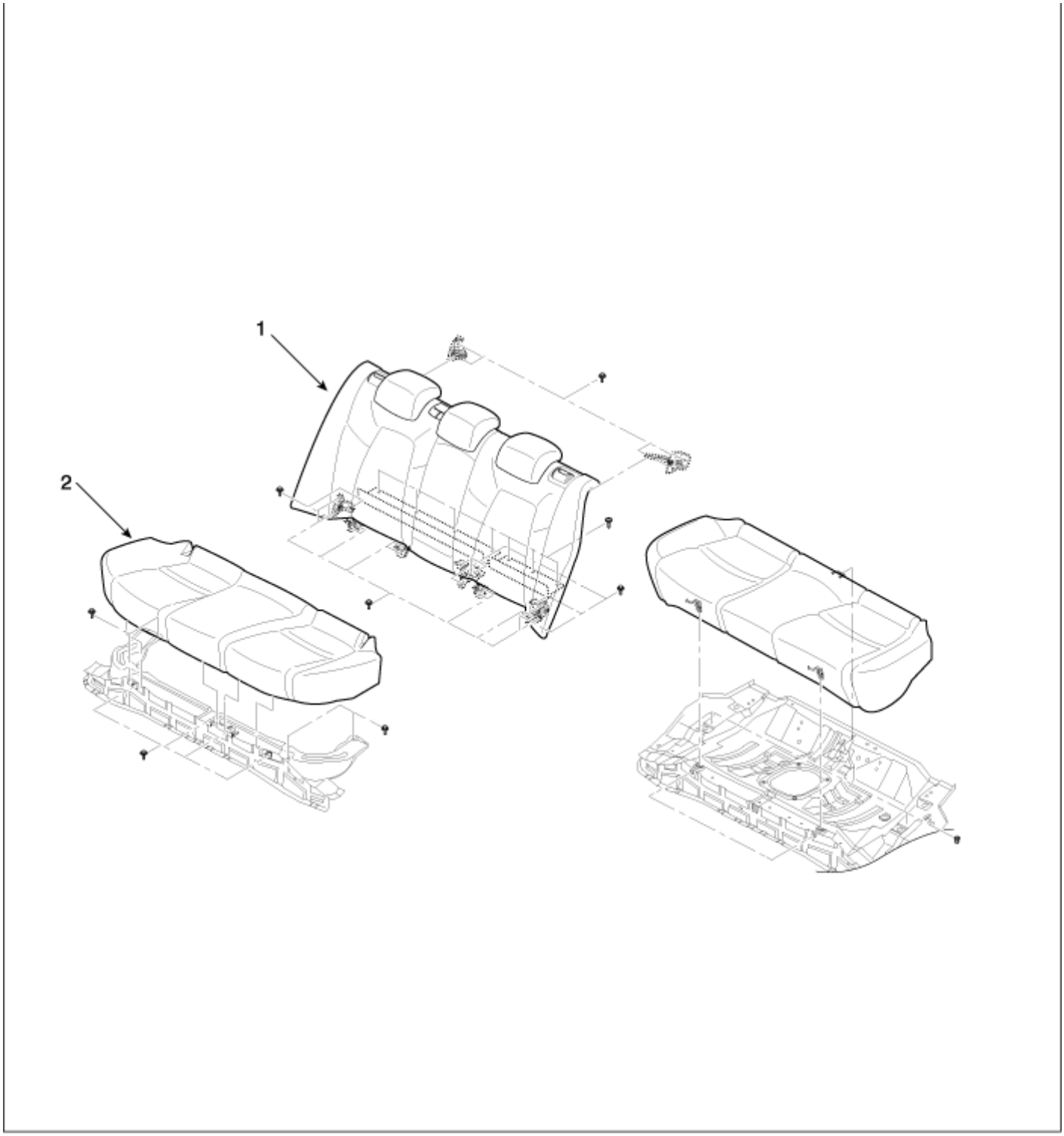
NOTICE

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



3. Installation is the reverse of removal.

COMPONENTS

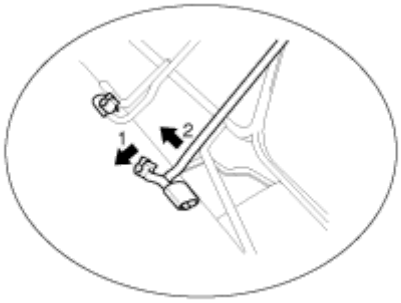


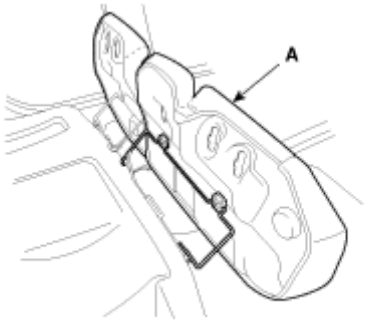
1. Rear seat back
2. Rear seat cushion

REPLACEMENT

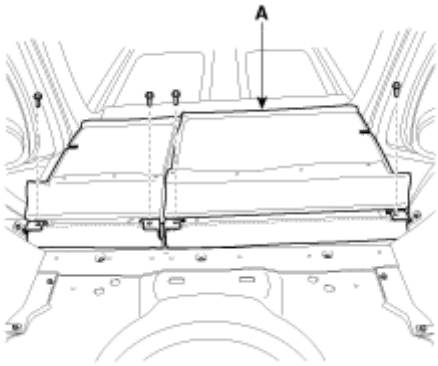
Seat Assembly Replacement

1. Remove the seat cushion (A).





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



3. Installation is the reverse of removal.

REPLACEMENT

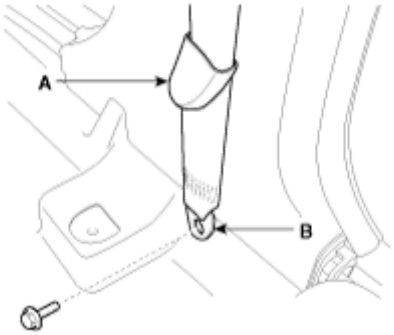
5Door/Wagon

Front Seat Belt Replacement

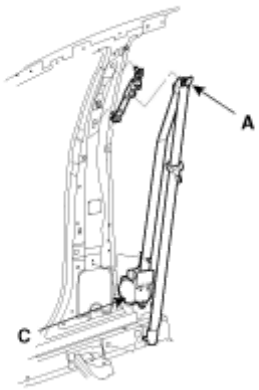
CAUTION

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

1. Disconnect the battery negative cable, and wait for at least three minutes before beginning work.
2. After raise the lower anchor cover (A), loosen the lower anchor mounting bolt (B).



3. Remove the center pillar lower trim.
4. Remove the center pillar upper trim.
5. After disconnecting the pretensioner connector lock pin, remove the SIS connector (B), Loosen the mounting bolt, then remove the pretensioner (C).

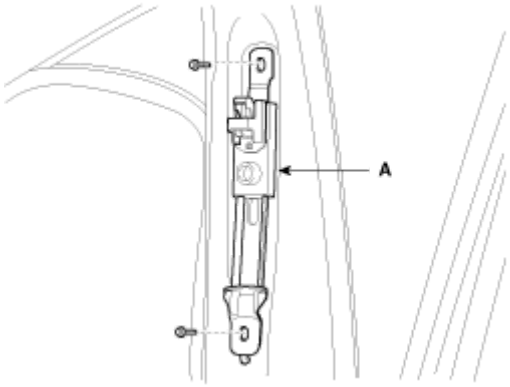


Hight Adjuster Replacement

1. Remove the following items first.
   - Front seat assembly.
   - Door scuff trim.
   - Front seat belt.
   - Center pillar trim.

2. After loosening the mounting bolt, then remove the height adjuster (A).

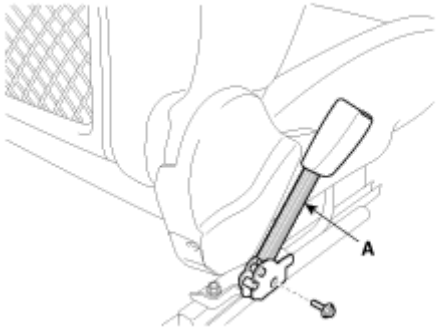
English ▼



3. Installation is the reverse of removal.

Front Seat Belt Buckle Replacement

1. Remove the following items first.
   - Front seat assembly.
2. Remove the wire harness of buckle from seat.
3. Remove the seat belt buckle (A).



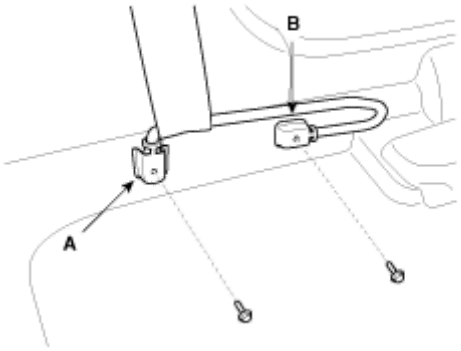
4. Installation is the reverse of removal.

3Door

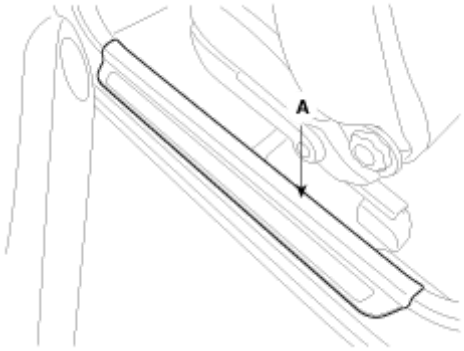
Front Seat Belt Replacement

> **⚠ CAUTION**
>
> - When installing the belt, make sure not to damage the pretensioner.

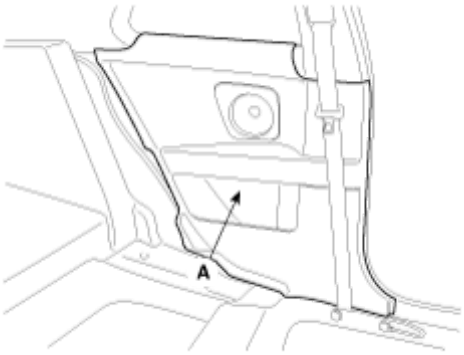
1. Disconnect the battery negative cable, and wait for at least three minutes before beginning work.
2. After raise the lower anchor cover (A), loosen the lower anchor mounting bolt (B).
   Tightening torque :
   4.0~5.5kgf.m (39.2~53.9N.m, 28.9~39.8lb-ft)



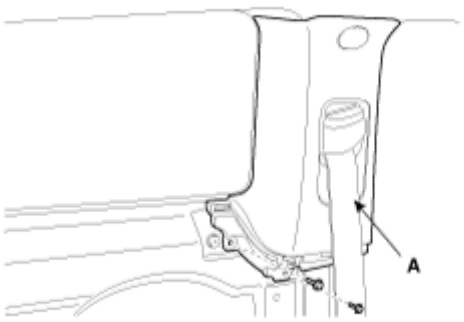
3. Remove the door scuff trim (A).



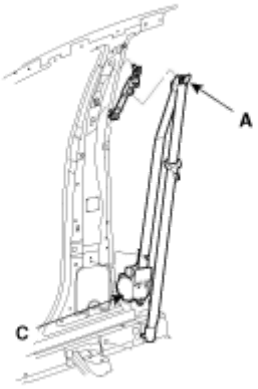
4. Remove the rear guarter trim (A).



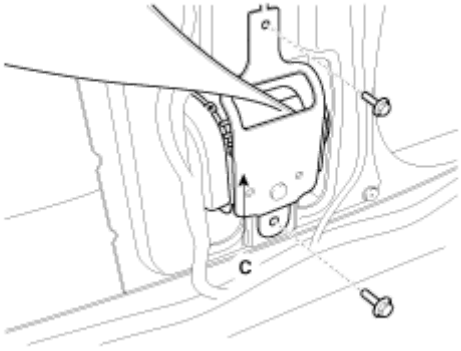
5. Remove the B pillar upper trim (A).



6. Remove the upper anchor (A).



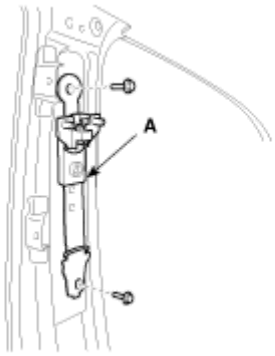
7. After disconnecting the pretensioner connector lock pin, remove the SIS connector, Loosen the mounting bolt, then remove the pretensioner (C).



Hight Adjuster Replacement

1. Remove the following items first.
   - Front seat assembly.
   - Door scuff trim.
   - Front seat belt.
   - Center pillar trim.

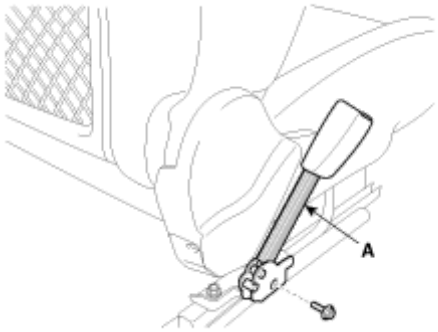
2. After loosening the mounting bolt, then remove the height adjuster (A).
   Tightening torque :
   4.0~5.5kgf.m (39.2~53.9N.m, 28.9~39.8lb-ft)



3. Installation is the reverse of removal.

Front Seat Belt Buckle Replacement

1. Remove the following items first.
    - Front seat assembly.
2. Remove the wire harness of buckle from seat.
3. Remove the seat belt buckle (A).



4. Installation is the reverse of removal.

REPLACEMENT

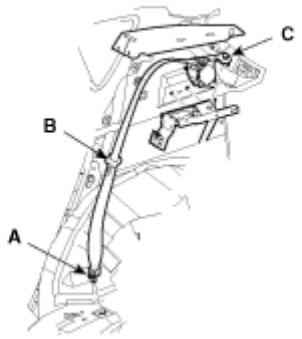
5Door

Rear Seat Belt Replacement

CAUTION

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

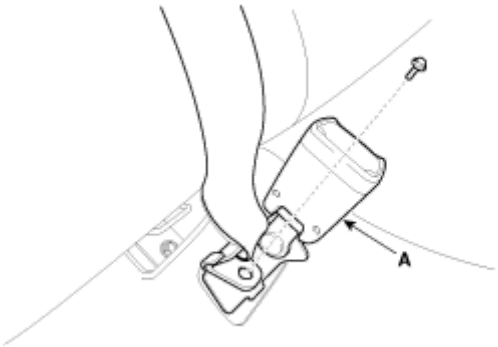
1. Remove the lower anchor (A).
2. After loosening retractor (C) mounting bolt, remove the rear seat belt (B).



3. Installation is the reverse of removal.

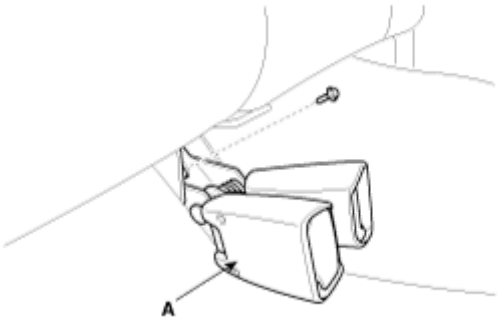
Rear Seat Belt Buckle Replacement

1. Remove the rear seat cushion.
2. Remove the seat belt buckle and center seat belt (A).



3. Remove the seat belt buckle (A).

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



4. Installation is the reverse of removal.

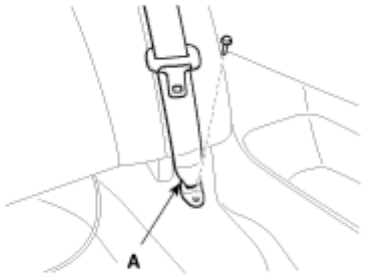
3Door

Rear Seat Belt Relacement

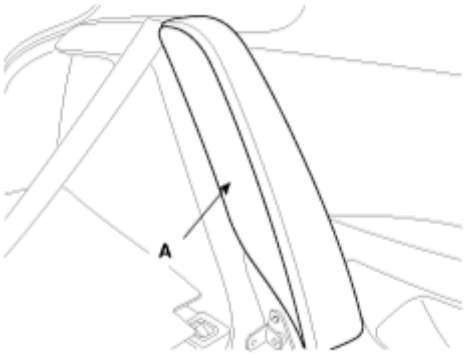
⚠ CAUTION

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

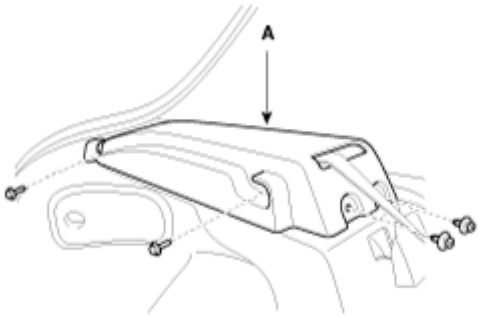
1. Remove the following items first.
   - Rear seat assembly.
   - Rear door scuff trim.
2. Remove the lower anchor (A).



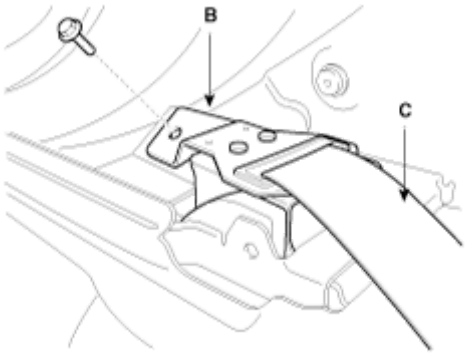
3. Remove the side seat (A).



4. Remove the luggage side shelf (A).



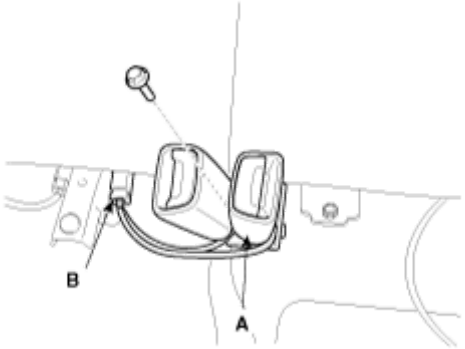
5. After loosening the retractor (B) mounting bolt, remove the rear seat belt (C).
   Tightening torque :
   4.0~5.5kgf.m (39.2~53.9N.m, 28.9~39.8lb-ft)



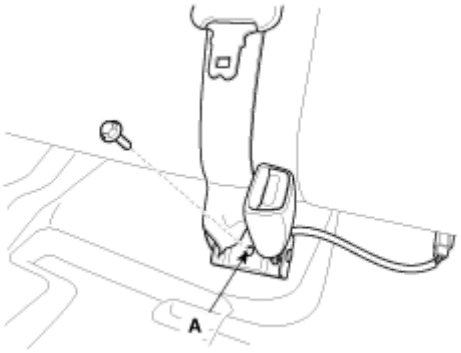
6. Installation is the reverse of removal.

Rear Seat Belt Buckle Replacement

1. Remove the sear seat cushion.
2. Remove the seat belt buckle (A).
3. Disconnect the connector (B).
   Tightening torque :
   4.0~5.5kgf.m (39.2~53.9N.m, 28.9~39.8lb-ft)



4. Remove the center seat belt and buckle (A).
   Tightening torque :
   4.0~5.5kgf.m (39.2~53.9N.m, 28.9~39.8lb-ft)



5. Installation is the reverse of removal.

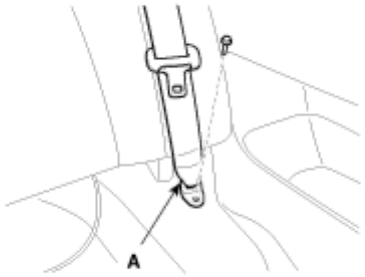
Wagon

Rear Seat Belt Relacement

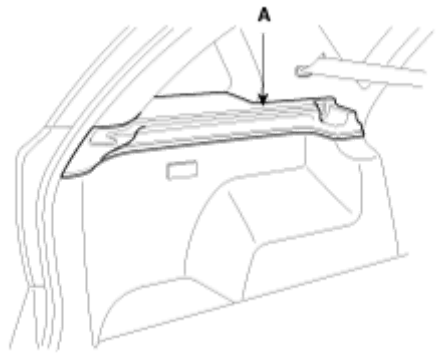
⚠ CAUTION

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

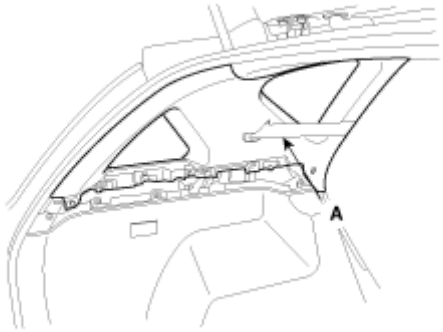
1. Remove the following items first.
   - Rear seat assembly.
   - Rear door scuff trim.
2. Remove the lower anchor (A).
   Tightening torque :
   4.0~5.5kgf.m (39.2~53.9N.m, 28.9~39.8lb-ft)



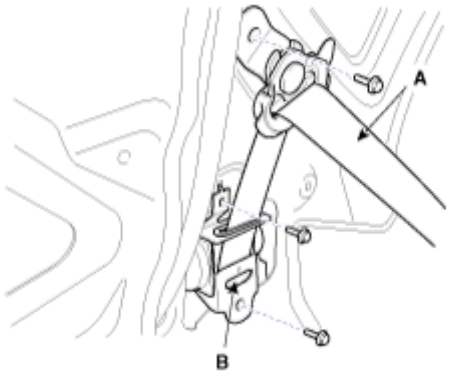
3. Remove the side shelf trim (A).



4. Remove the rear pillar trim (A).



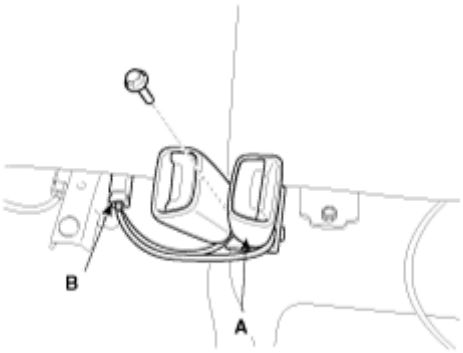
5. Remove the luggage side trim.
6. After loosening the retractor (B) mounting bolt, remove the rear seat belt (C).
   Tightening torque :
   4.0~5.5kgf.m (39.2~53.9N.m, 28.9~39.8lb-ft)



7. Installation is the reverse of removal.

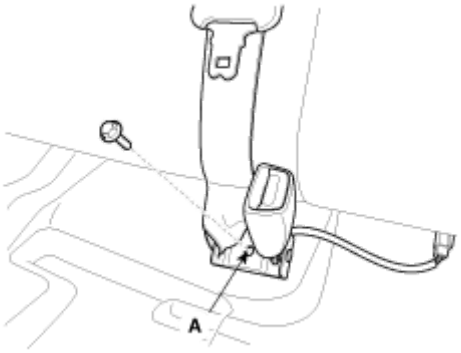
Rear Seat Belt Buckle Replacement

1. Remove the sear seat cushion.
2. Remove the seat belt buckle (A).
3. Disconnect the connector (B).
   Tightening torque :
   4.0~5.5kgf.m (39.2~53.9N.m, 28.9~39.8lb-ft)



4. Remove the center seat belt and buckle (A).
   Tightening torque :

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



5. Installation is the reverse of removal.

GENERAL TROUBLESHOOTING INFORMATION

Before Troubleshooting

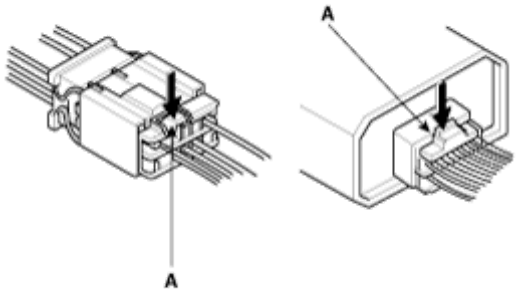
1. Check applicable fuses in the appropriate fuse/relay box.
2. Using the battery checker (MCR-570 KIT), check the battery for damage, state of charge, and clean and tight connections. (Refer to the Engine Electrical System - Battery)

> **NOTICE**
>
> - 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.

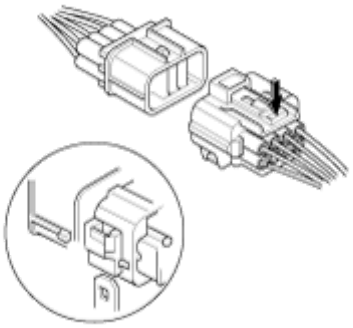
Handling Connectors

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).

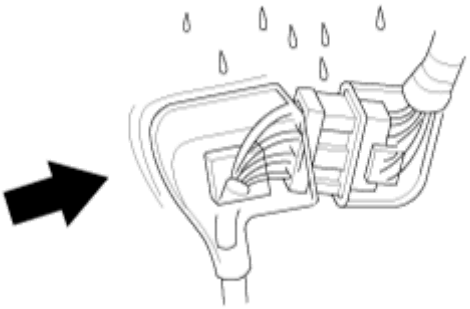


4. Some connectors have a clip on their side used to attach them to a mount bracket on the body or on another component. This clip has a pull type lock.
5. Some mounted connectors cannot be disconnected unless you first release the lock and remove the connector from its mount bracket (A).

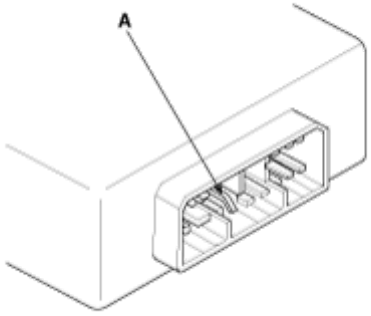
English ▼



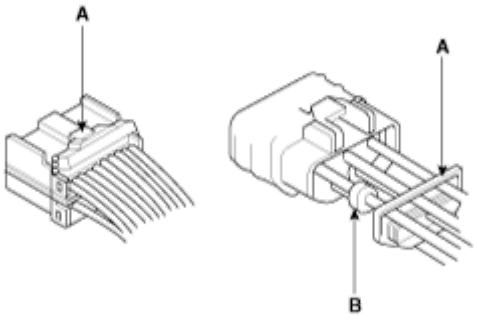
6. Never try to disconnect connectors by pulling on their wires; pull on the connector halves instead.
7. Always reinstall plastic covers.



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

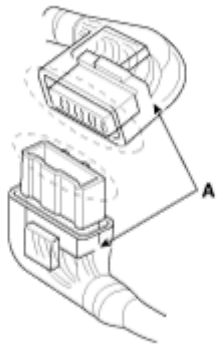


9. Check for loose retainer (A) and rubber seals (B).

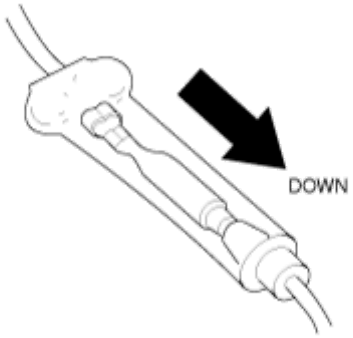


10. The backs of some connectors are packed with grease. Add grease if necessary. If the grease (A) is contaminated,

replace it.

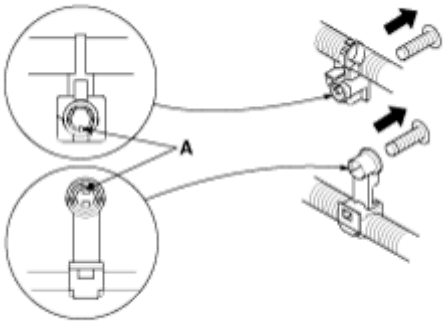


11. Insert the connector all the way and make sure it is securely locked.
12. Position wires so that the open end of the cover faces down.

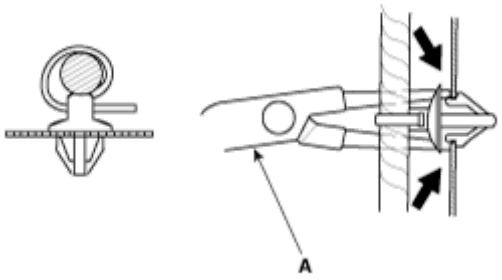


Handling Wires And Harnesses

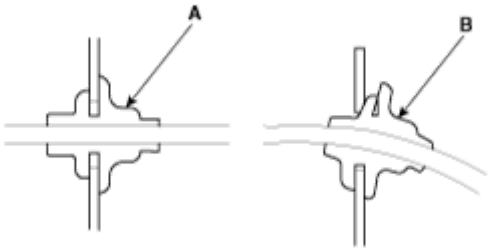
1. Secure wires and wire harnesses to the frame with their respective wire ties at the designated locations.
2. Remove clips carefully; don't damage their locks (A).



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.

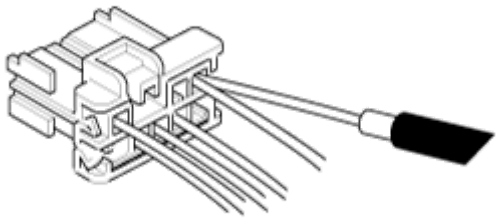


4. After installing harness clips, make sure the harness doesn't interfere with any moving parts.
5. Keep wire harnesses away from exhaust pipes and other hot parts, from sharp edges of brackets and holes, and from exposed screws and bolts.
6. Seat grommets in their grooves properly (A). Do not leave 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 probe with a tapered tip.
   Refer to the user's guide in the wiring repair kit (Pub No. : TRK 015.)



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.

SPECIFICATION

Audio

Item		Specification
Model		RADIO/CD/MP3/RDS
Power supply		DC 14.4V
Load Impedance		4 Ohm x 4
Dark Current		2mA Max (Head unit only)
Antenna		50 Ohm
Tuning type		COURGAR TUNER
Frequency range / Channel space	FM	87.5 ~ 108.0 MHz/100 KHz
	AM	531 ~ 1602 KHz/9 KHz

* RDS : Radio Data System.

Speaker

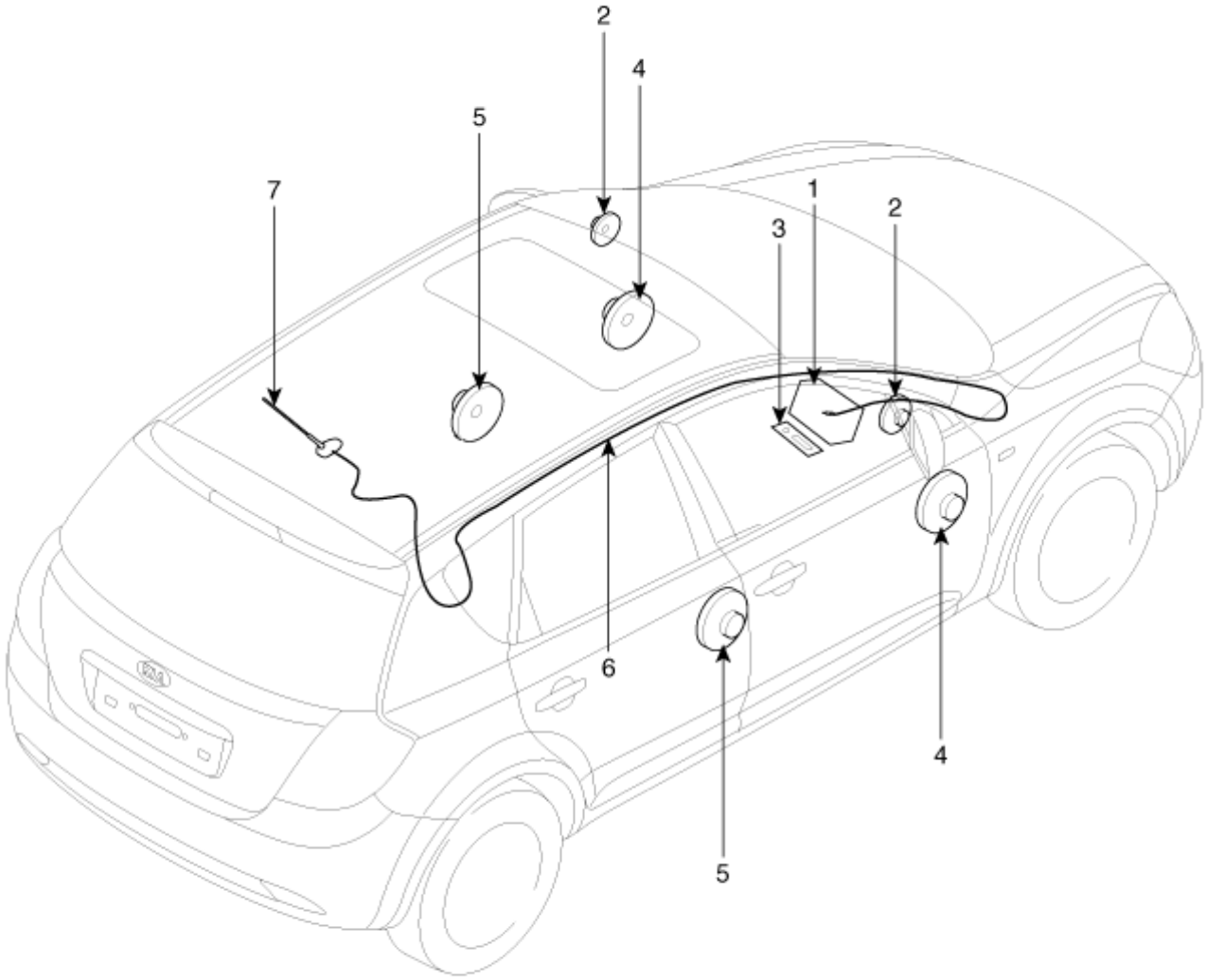
Item		Specification
Input Power (W)	Front	Max 40
	Rear	Max 40
	Tweeter	Max 40
Speaker Impedance (Ω)	Front	4.0 ± 0.6
	Rear	4.0 ± 0.6
	Tweeter	4.0 ± 0.6
Speaker Number		6

Antenna

Item	Specification
Installation Position	Roof
Input Voltage	DC 10.5V~16.0V
Rated Voltage	DC 12V (AM/FM) / DC 4.5V (GPS)
Output Impedance (Radio+GPS)	75Ω (AM/FM), 50Ω (GPS)
Output Impedance (Radio)	50Ω (AM/FM)

COMPONENT LOCATION

This illustration shows the LHD type.
RHD type is symmetrical.

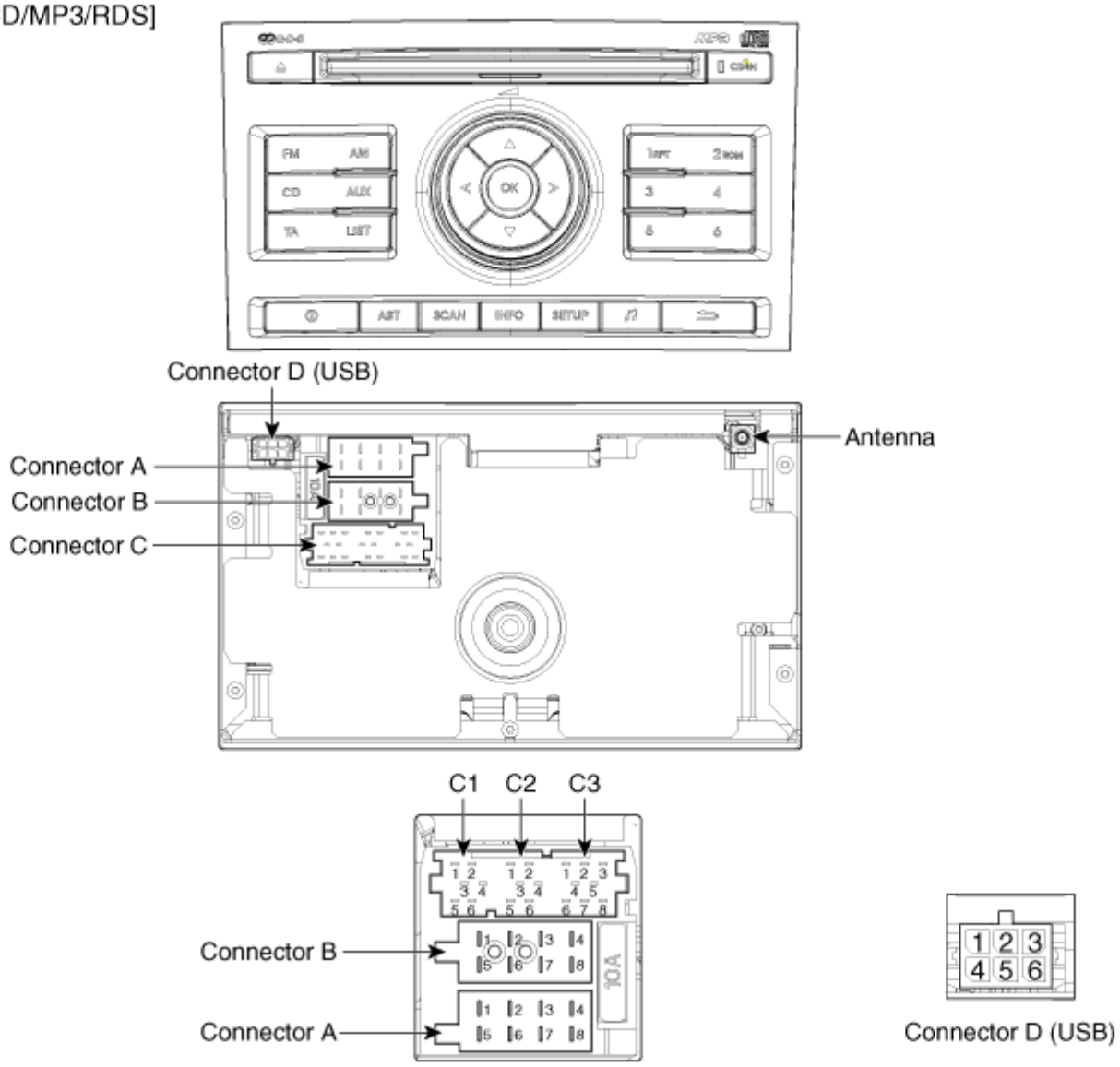


1. Audio unit 2. Tweeter speaker 3. AUX Jack / USB Port / iPod 4. Front door speaker	5. Rear door speaker 6. Antenna feeder cable 7. Roof antenna (Radio)

English

COMPONENTS

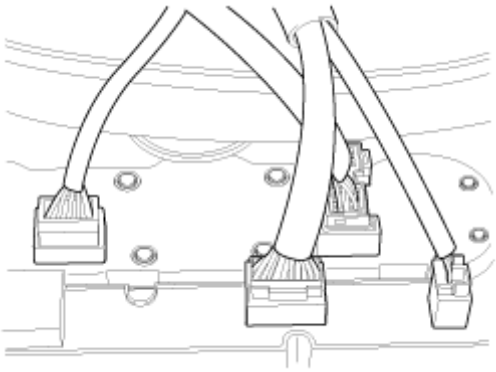
[RADIO/CD/MP3/RDS]



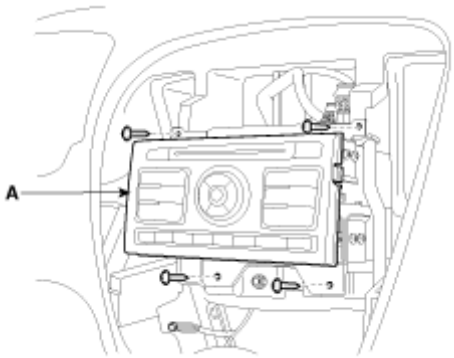
NO	Connector A	Connector B	Connector C1	Connector C2	Connector C3	Connector D
1	Speed signal	SPEAKER RR+	MIC + (Bluetooth)	AUX R- IN	-	D (-)
2	Tail switch (illumination +)	SPEAKER FR+	MIC - (Bluetooth)	AUX L- IN	-	D (+)
3	Remote anntena	SPEAKER FL+	-	AUX REF - IN	HS CAN L	V Bus
4	Supply (+12V)	SPEAKER RL+	-	AUX Detect -IN	-	Ground
5	-	SPEAKER RR-	-	SWRC	-	-
6	Accessory (+12V)	SPEAKER FR-	-	SWRC Ground	-	-
7	PWM illumination (-)	SPEAKER FL-			-	
8	Ground	SPEAKER RL-			HS CAN H	

REMOVAL

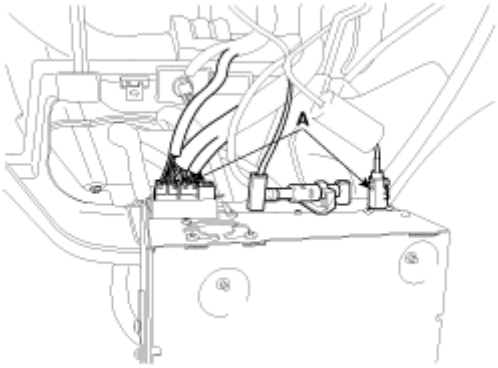
1. Disconnect the negative (-) battery terminal.
2. Remove the crash pad center facia panel (A).
   (Refer to the BD group - "Crash pad")
3. Disconnect the connectors from the crash pad center facia panel.



4. Remove the mounting bolts then remove the audio unit (A).



5. Disconnect the audio connectors and cable (A).



INSTALLATION

1. Connect the audio unit connectors and cable.

2. Install the audio unit.
3. Install the crash pad center facia panel.
4. Check the audio system.

English ▼

REMOVAL

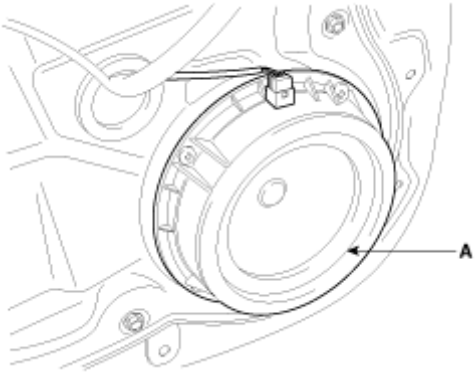
Front Speaker

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



Rear Speaker

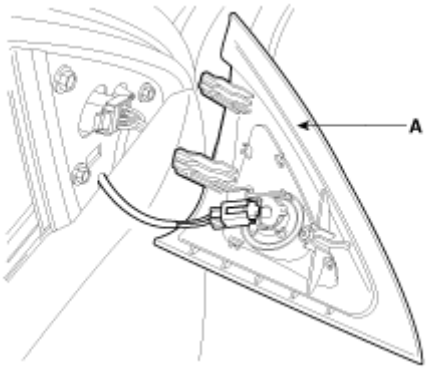
1. Remove the rear door trim.
   (Refer to the BD group - "Rear door")
2. Remove the rear speaker (A) after removing 4 rivets.



Tweeter Speaker

1. Remove the front door delta cover (A).
   (Refer to the BD group - "Front door")
2. Remove the tweeter speaker (A) after disconnecting the connector.

English ▼



INSTALLATION

Front Speaker

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

Rear Speaker

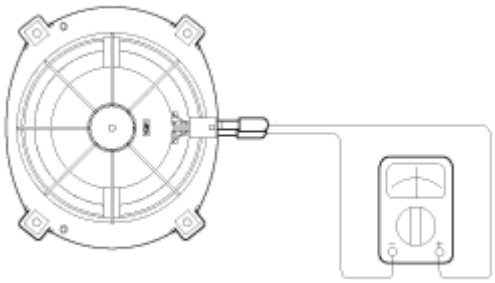
1. Install the rear speaker.
2. Install the rear door trim.

Tweeter Speaker

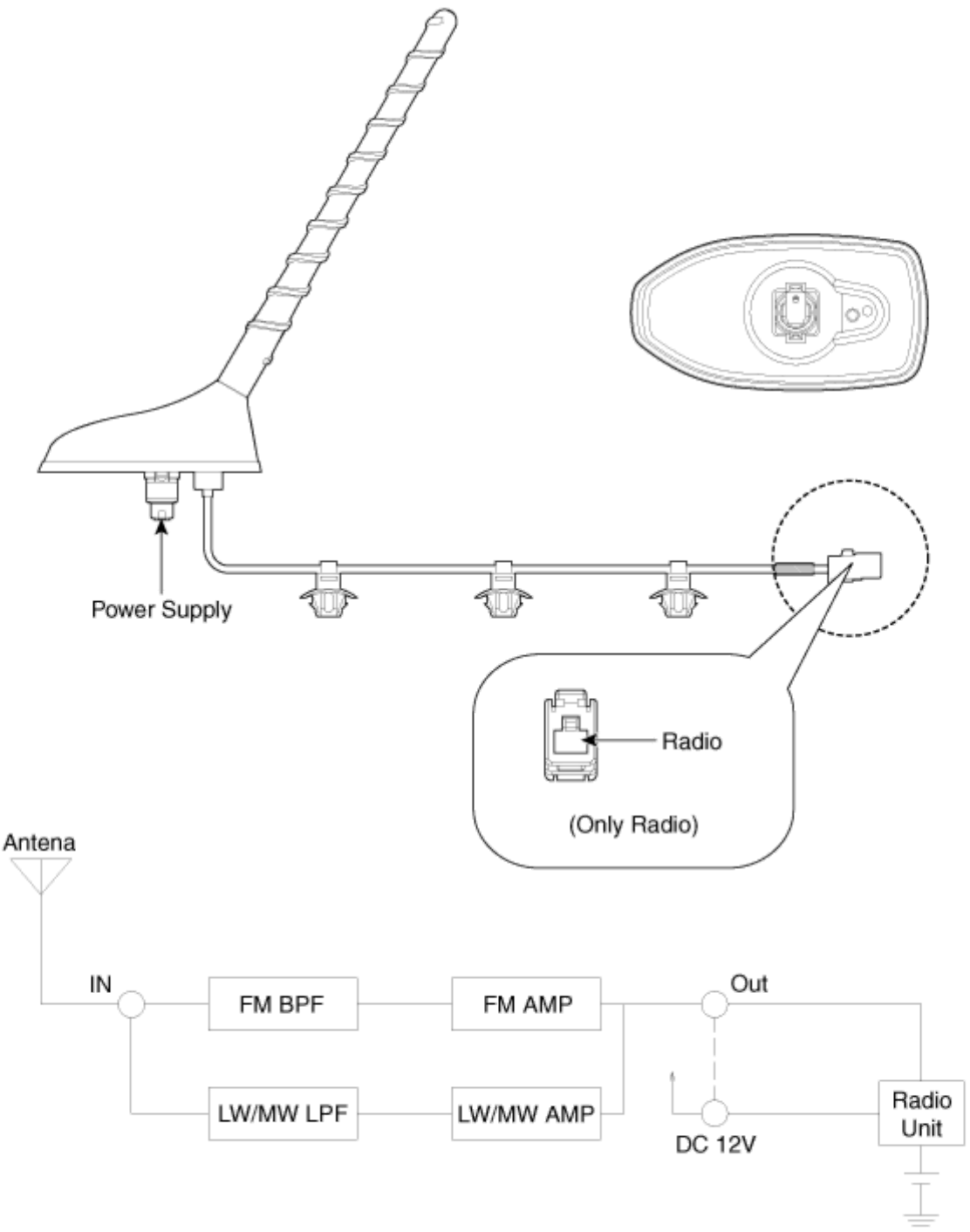
1. Install the tweeter speaker after connecting the tweeter speaker connector.
2. Install the front door delta cover.

INSPECTION

1. Check the speaker with an ohmmeter. If an ohmmeter indicates the correct impedance of the speaker when checking between the speaker (+) and speaker (-) of the same channel, the speaker is ok.
   Specified impedance : 3.4 ~ 4.6Ω



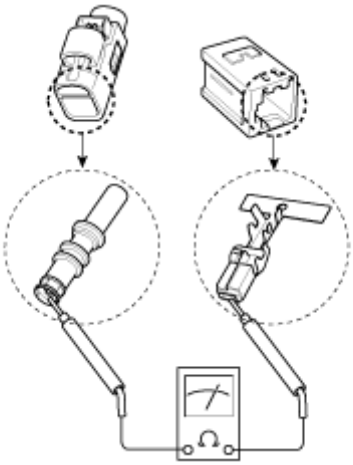
COMPONENTS


Power Supply
Radio
(Only Radio)
Antena
IN
FM BPF
FM AMP
Out
LW/MW LPF
LW/MW AMP
DC 12V
Radio Unit

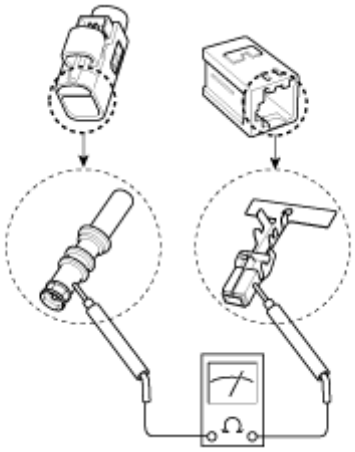
INSPECTION

Antenna Cable

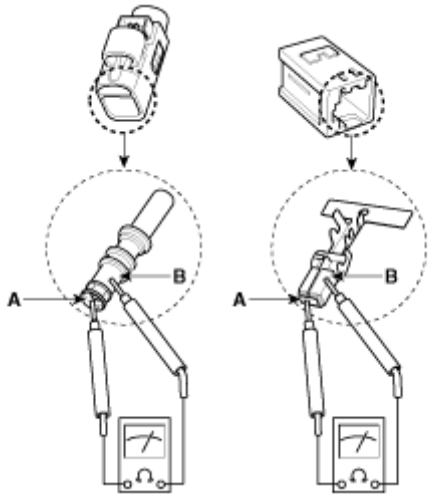
1. Remove the antenna jack from the audio unit and antenna.
2. Check for continuity between the center poles of antenna cable.



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



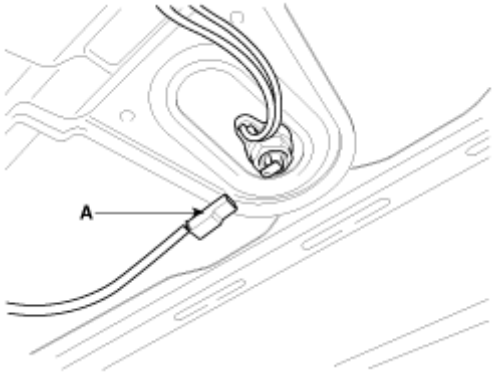
4. If there is no continuity, replace the antenna cable.
5. Check for continuity between the center pole (A) and outer pole (B) of antenna cable. There should be no continuity.



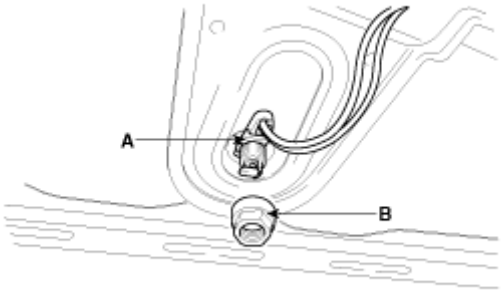
6. If there is continuity, replace the antenna cable.

REPLACEMENT

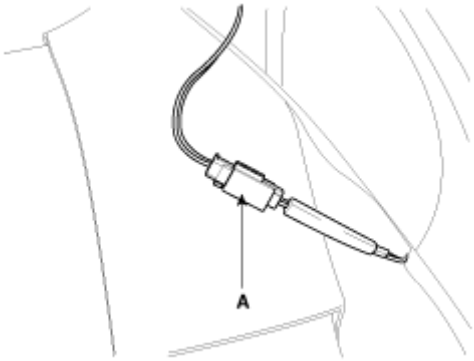
1. Remove the rear roof trim.
   (Refer to the BD group - "Roof trim")
2. Disconnect the 1P power connector (A) from the roof antenna.



3. Remove the roof antenna(A) after removing a nut(B).



4. Disconnect the roof antenna feeder cable connector (A) on the quater inner panel.

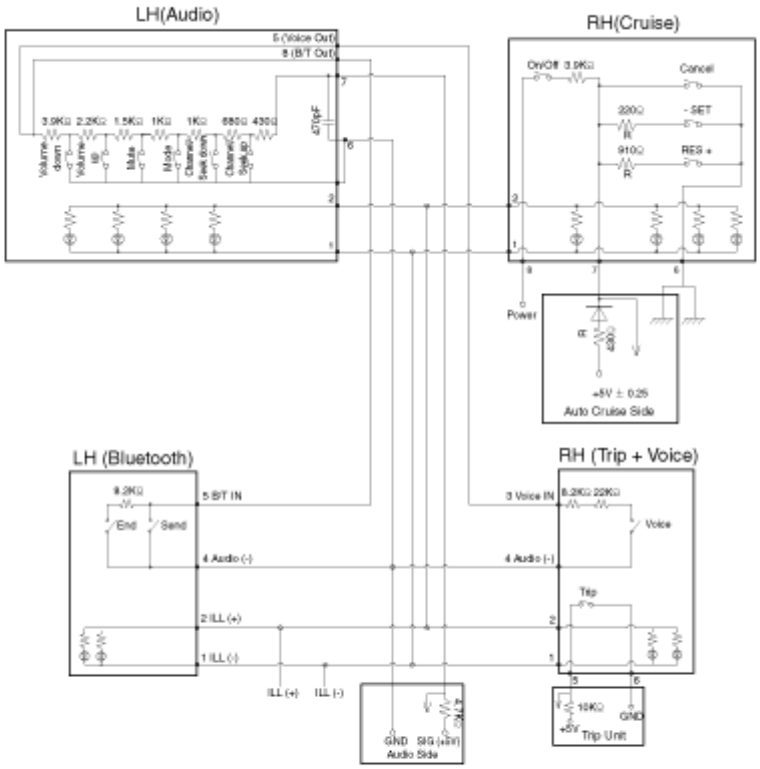


5. Installation is the reverse of removal.

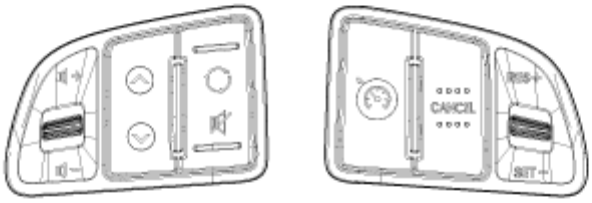
English

CIRCUIT DIAGRAM

[Audio system + Auto cruise (Bluetooth switch + Trip/Voice switch)]



Audio system + Auto cruise



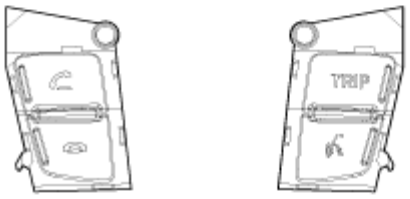
LH

NO	Connector
1	Illumination (-)
2	Illumination (+)
3	-
4	-
5	Voice out
6	Audio (-)
7	Audio (+)
8	Bluetooth out

RH

NO	Connector
1	Illumination (-)
2	Illumination (+)
3	-
4	-
5	-
6	ACC ground
7	ACC signal
8	ACC power

Bluetooth switch + Trip/Voice switch



LH

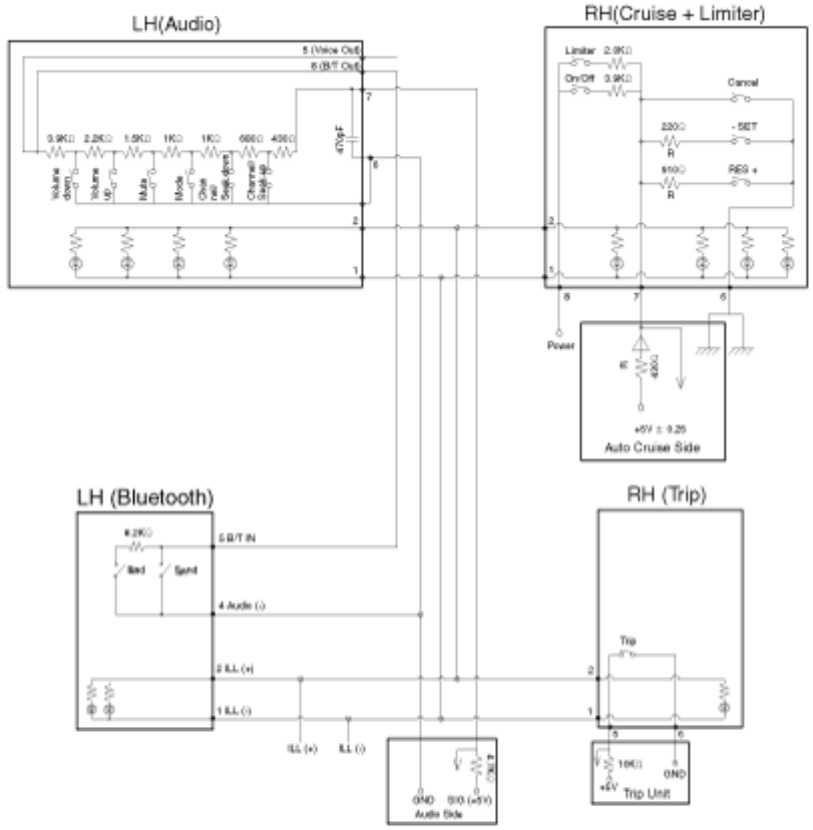
NO	Connector
1	ILL (-)
2	ILL (+)
3	-
4	Audio (-)
5	Bluetooth in
6	-

RH

NO	Connector
1	ILL (-)
2	ILL (+)
3	Voice in
4	Audio (-)
5	Trip in
6	Trip ground

[Audio system + Auto cruise/Limiter (Bluetooth switch + Trip switch)]

English ▼

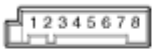


Audio system + Auto cruise/Limiter



LH RH

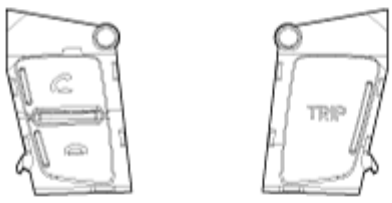




NO	Connector
1	Illumination (-)
2	Illumination (+)
3	-
4	-
5	Voice out
6	Audio (-)
7	Audio (+)
8	Bluetooth out

NO	Connector
1	Illumination (-)
2	Illumination (+)
3	-
4	-
5	-
6	ACC/Limiter ground
7	ACC/Limiter signal
8	ACC/Limiter power

Bluetooth switch + Trip switch



LH RH

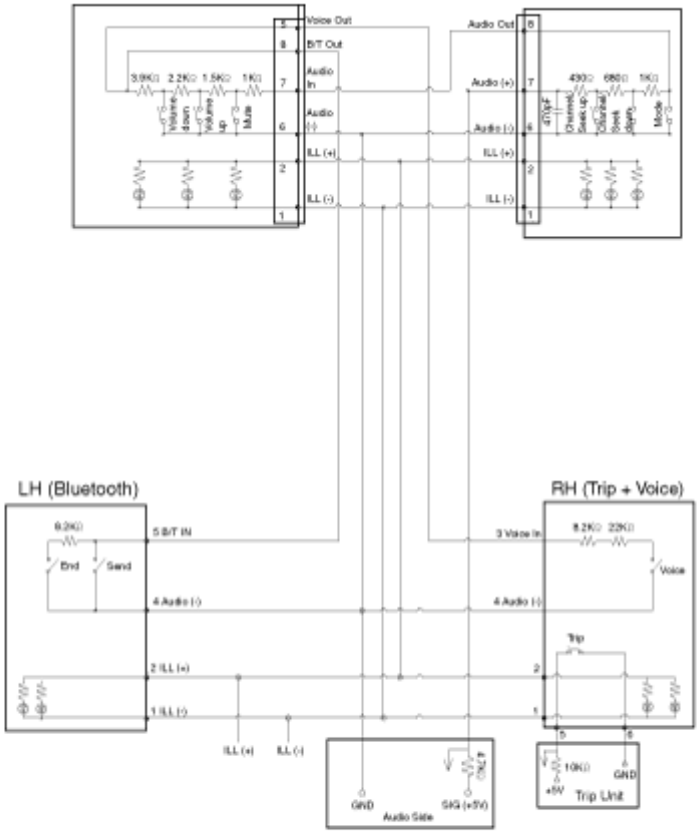




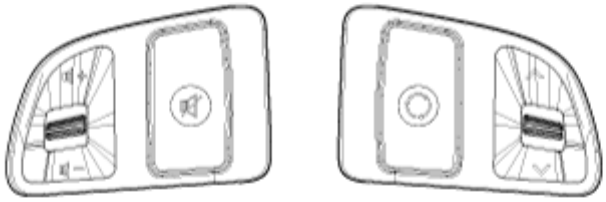
NO	Connector
1	Illumination (-)
2	Illumination (+)
3	-
4	Audio (-)
5	Bluetooth in
6	-

NO	Connector
1	Illumination (-)
2	Illumination (+)
3	-
4	-
5	Trip in
6	Trip ground

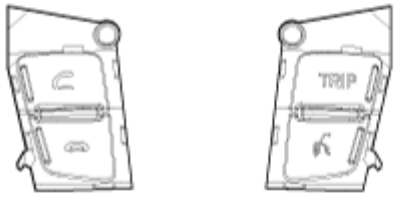
[Audio system (Bluetooth switch + Trip/Voice switch)]



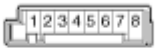
Audio system



Bluetooth switch + Trip/Voice switch



LH



NO	Connector
1	Illumination (-)
2	Illumination (+)
3	-
4	-
5	Voice out
6	Audio (-)
7	Audio in
8	Blutooth out

RH



NO	Connector
1	Illumination (-)
2	Illumination (+)
3	-
4	-
5	-
6	Audio (-)
7	Audio (+)
8	Audio out

LH



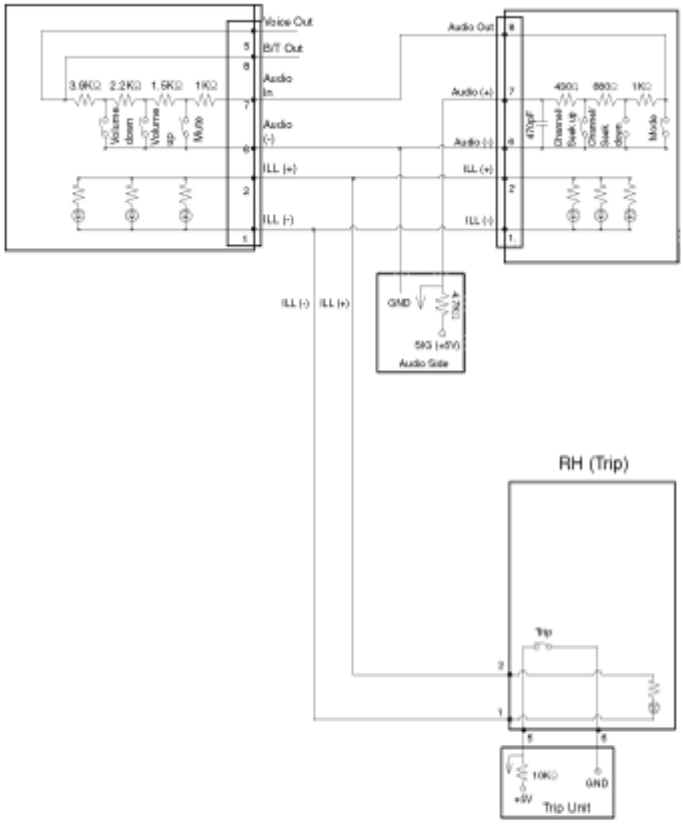
NO	Connector
1	Illumination (-)
2	Illumination (+)
3	-
4	Audio (-)
5	Bluetooth in
6	-

RH

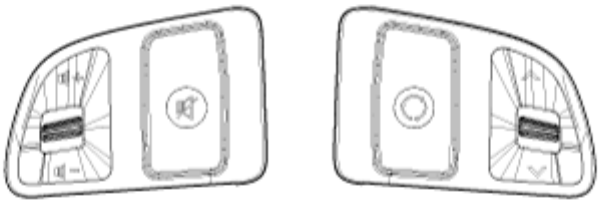


NO	Connector
1	Illumination (-)
2	Illumination (+)
3	Voice in
4	Audio (-)
5	Trip in
6	Trip ground

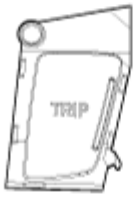
[Audio system (Trip switch)]



Audio system



Trip switch



LH



NO	Connector
1	Illumination (-)
2	Illumination (+)
3	-
4	-
5	Voice out
6	Audio (-)
7	Audio in
8	Bluetooth out

RH



NO	Connector
1	Illumination (-)
2	Illumination (+)
3	-
4	-
5	-
6	Audio (-)
7	Audio (+)
8	Audio out

RH

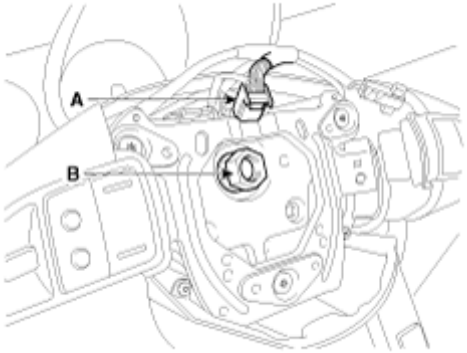


NO	Connector
1	Illumination (-)
2	Illumination (+)
3	-
4	-
5	Trip in
6	Trip ground

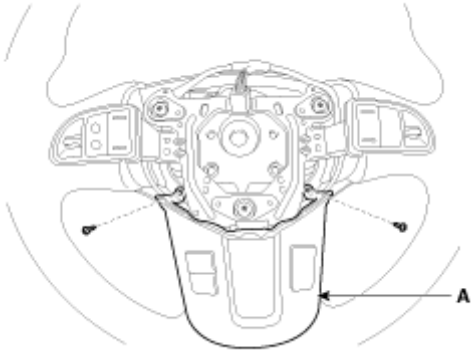
English ▼

REMOVAL

1. Disconnect the negative (-) battery terminal.
2. Remove the driver airbag module.
   (Refer to the RT group - "Airbag module and clock spring")
3. Remove the steering wheel after loosening the nut (B) and disconnecting the connector (A).
   (Refer to the ST group - "Steering column and shaft")



4. Remove the steering wheel lower cover (A) after loosening the 2 screws.

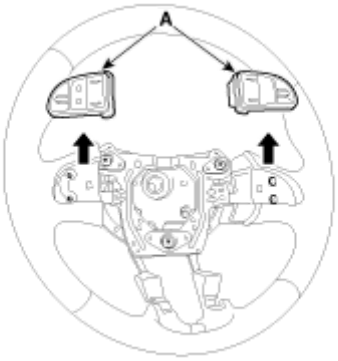


5. Loosen the screws (4EA) on the opposite side of the steering wheel.



6. Remove the audio remote control switch (A).

English ▼

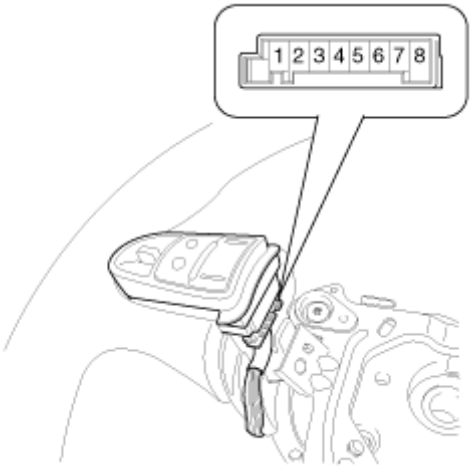


INSTALLATION

1. Install the audio remote control switch on the steering wheel.
2. Install the steering wheel.
3. Connect the audio remote control switch connector.
4. Install the driver airbag module.

INSPECTION

1. Check for resistance between No.6 and No.7 terminals in each switch position.



[Audio system + Auto cruise (Blue tooth switch + Trip/Voice switch)]

Switch	Connector terminal	Resistance (±5%)
Channel/Seek up	6-7 (Left)	430 Ω
Channel/Seek down	6-7 (Left)	1.1 kΩ
Mode	6-7 (Left)	2.11 Ω
Mute	6-7 (Left)	3.11 kΩ
Volume up	6-7 (Left)	4.61 kΩ
Volume down	6-7 (Left)	6.81 kΩ

[Audio system + Auto cruise/Limiter (Blue tooth switch + Trip switch)]

Switch	Connector terminal	Resistance (±5%)
Channel/Seek up	6-7 (Left)	430 Ω
Channel/Seek down	6-7 (Left)	1.1 kΩ
Mode	6-7 (Left)	2.11 Ω
Mute	6-7 (Left)	3.11 kΩ
Volume up	6-7 (Left)	4.61 kΩ
Volume down	6-7 (Left)	6.81 kΩ

[Audio system (Blue tooth switch + Trip/Voice switch)]

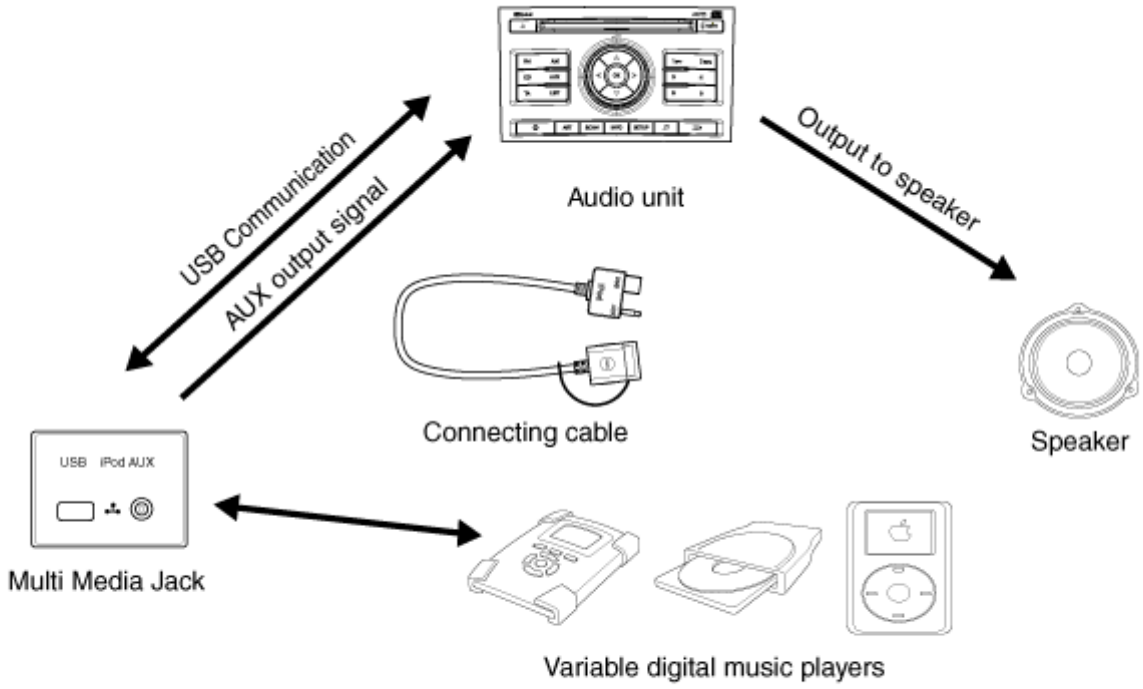
Switch	Connector terminal	Resistance (±5%)
Channel/Seek up	6-7 (Right)	430 Ω
Channel/Seek down	6-7 (Right)	1.1 kΩ
Mode	6-7 (Right)	2.11 Ω
Mute	6-7 (Left)	3.11 kΩ
Volume up	6-7 (Left)	4.61 kΩ
Volume down	6-7 (Left)	6.81 kΩ

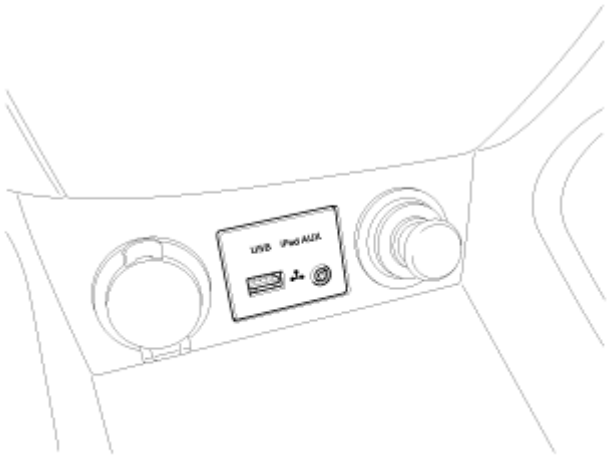
[Audio system (Trip switch)]

Switch	Connector terminal	Resistance (±5%)
Channel/Seek up	6-7 (Right)	430 Ω
Channel/Seek down	6-7 (Right)	1.1 kΩ
Mode	6-7 (Right)	2.11 Ω
Mute	6-7 (Left)	3.11 kΩ
Volume up	6-7 (Left)	4.61 kΩ
Volume down	6-7 (Left)	6.81 kΩ

DESCRIPTION

The AUX, iPod and USB JACK on the center console is for customers who like to listen to external portable music players like the MP3, iPod, earphone, USB memory stick, CD player 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.

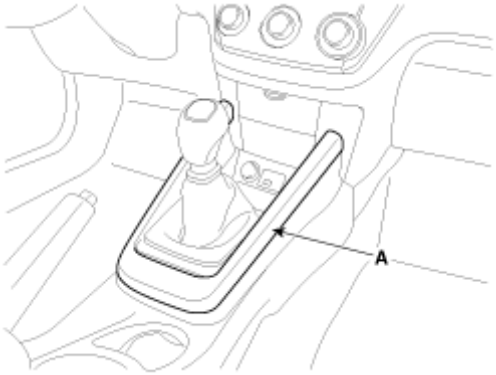




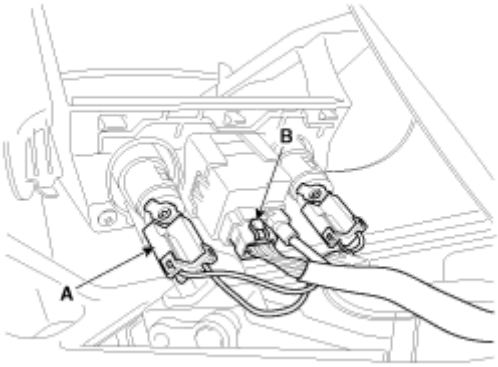
REMOVAL

Multi Media Jack

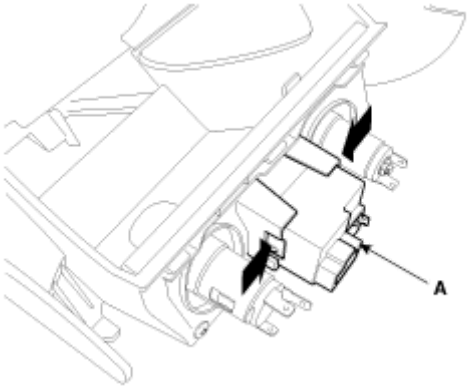
1. Remove the upper cover (A) on the floor console.
   (Refer to the BD group - "Console")

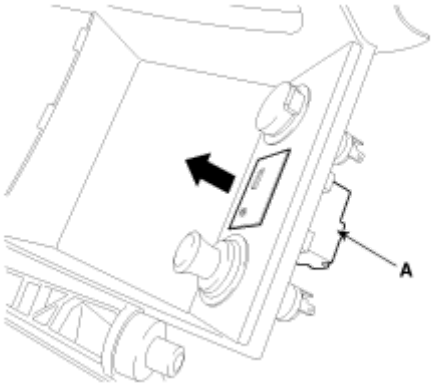


2. Disconnect the power outlet connector (A) and multi media jack connector (B) from under cover.



3. Remove the multi media jack (A) after disconnecting the multi media jack connector.





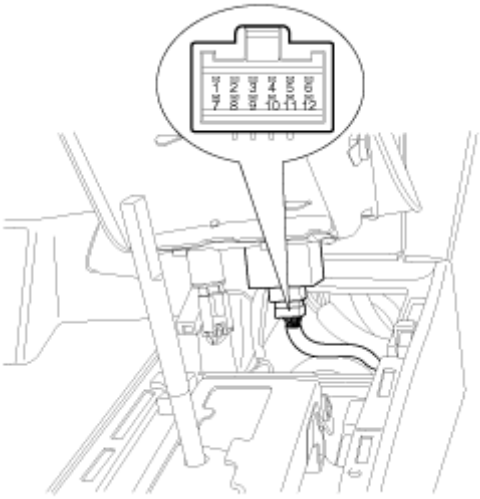
INSTALLATION

Multi Media Jack

1. Install the multi media jack.
2. Connect the multi media jack connector.
3. Install the under cover to the floor console.

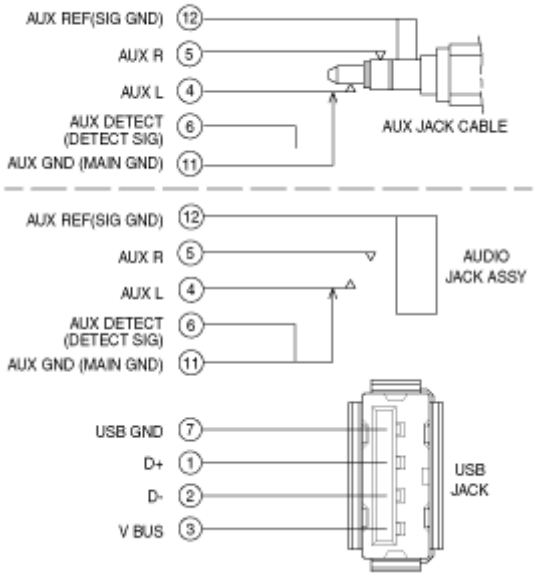
INSPECTION

1. Disconnect the negative(-) battery terminal.
2. Disconnect the multi media jack connector after removing the under cover.



3. To inspect USB / iPod port, check the voltage between NO.3 and 7 terminal of.
   Standard value : 5V
4. To inspect AUX jack, check the voltage between NO. 6and 12 terminal of AUX jack / Audio jack input.
   Standard value : 5V
5. Using an ohmmeter, check for continuity between the terminals of multi media jack connector.

< AUX JACK INSERT >



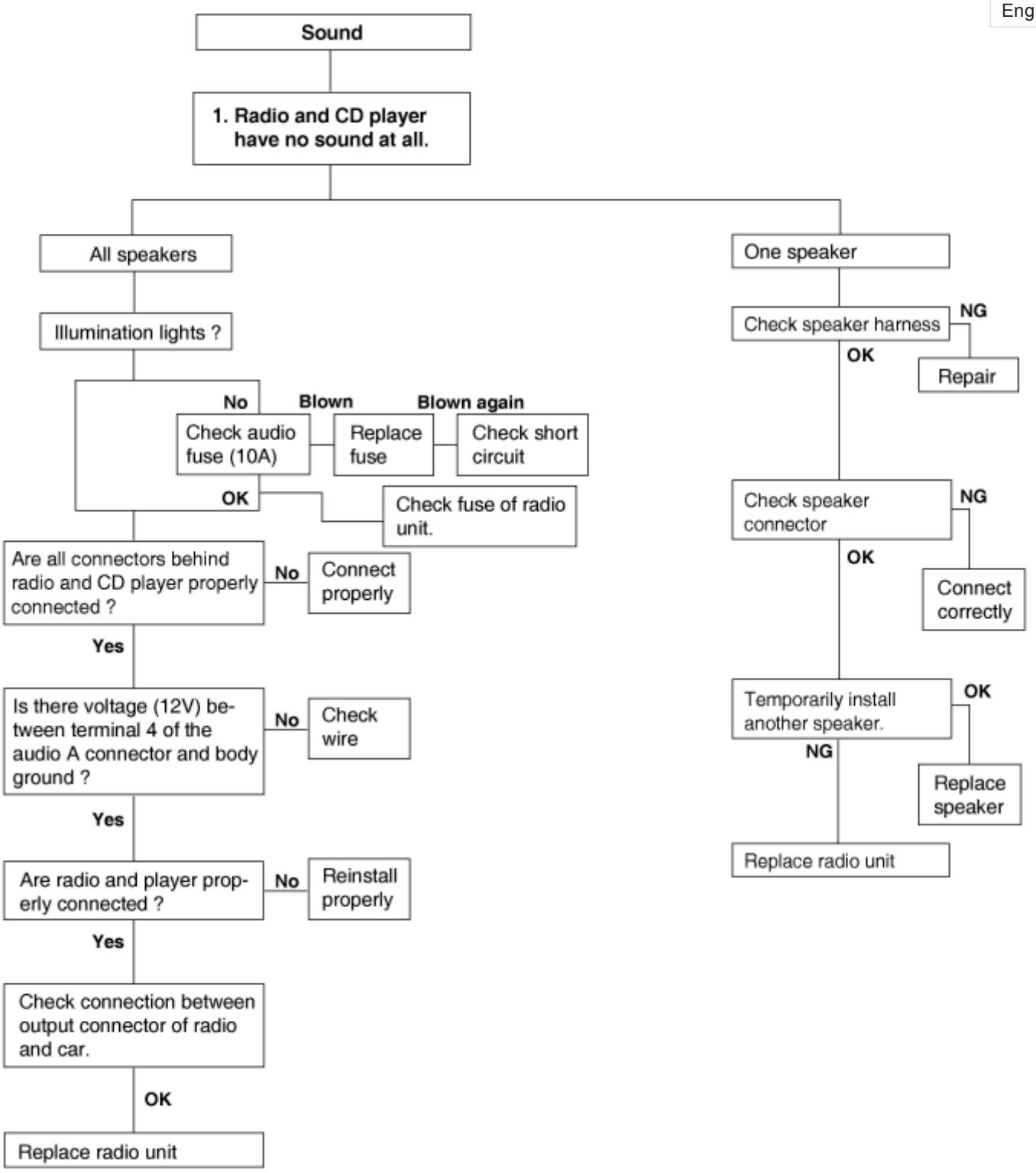
TROUBLESHOOTING

CUSTOMER COMPLAINT ANALYSIS CHECK SHEET

Item	Status	How to check
System	Audio is not functioning and no function of display	▶ Check the fuse audio unit and vehicle ▶ Check power connections
Radio	No radio reception	▶ Check if the antenna is completely and correctly connected.
	Poor radio reception	▶ Antenna (disc antenna) obscured, antenna rod bent or antenna defective. ▶ Please arrange for an authorized dealer to check the antenna.
	The frequency instead of the station name is displayed.	▶ The unit is tuned to a station that does not transmit RDS signals or the transmitter is too weak.
	The required station cannot be tuned to using automatic search	▶ Set desired station manually (manual tuning) ▶ Check whether the antenna is completely and correctly connected
	No traffic announcements are switched through (during CD playback)	▶ Activate the traffic announcement by pressing the TA button ※TA : Traffic Announcement
CD	CD will not be accepted	▶ Clean CD with damp cloth ▶ The CD does not comply with the CD player specification ▶ See notes on Audio and MP3 CDs
	Distorted sound/skips during CD play	▶ With the set on, wait for 5 minutes until the condensation evaporates
	No sound during CD playback	▶ Some CDs contain multimedia data which is not recognized by the unit ▶ Advance the tracks until music is heard
USB	USB mode is not functioned	▶ Plug in USB drive again

1. System Check Procedure

English ▼



2. Radio Check Procedure

Chart 1

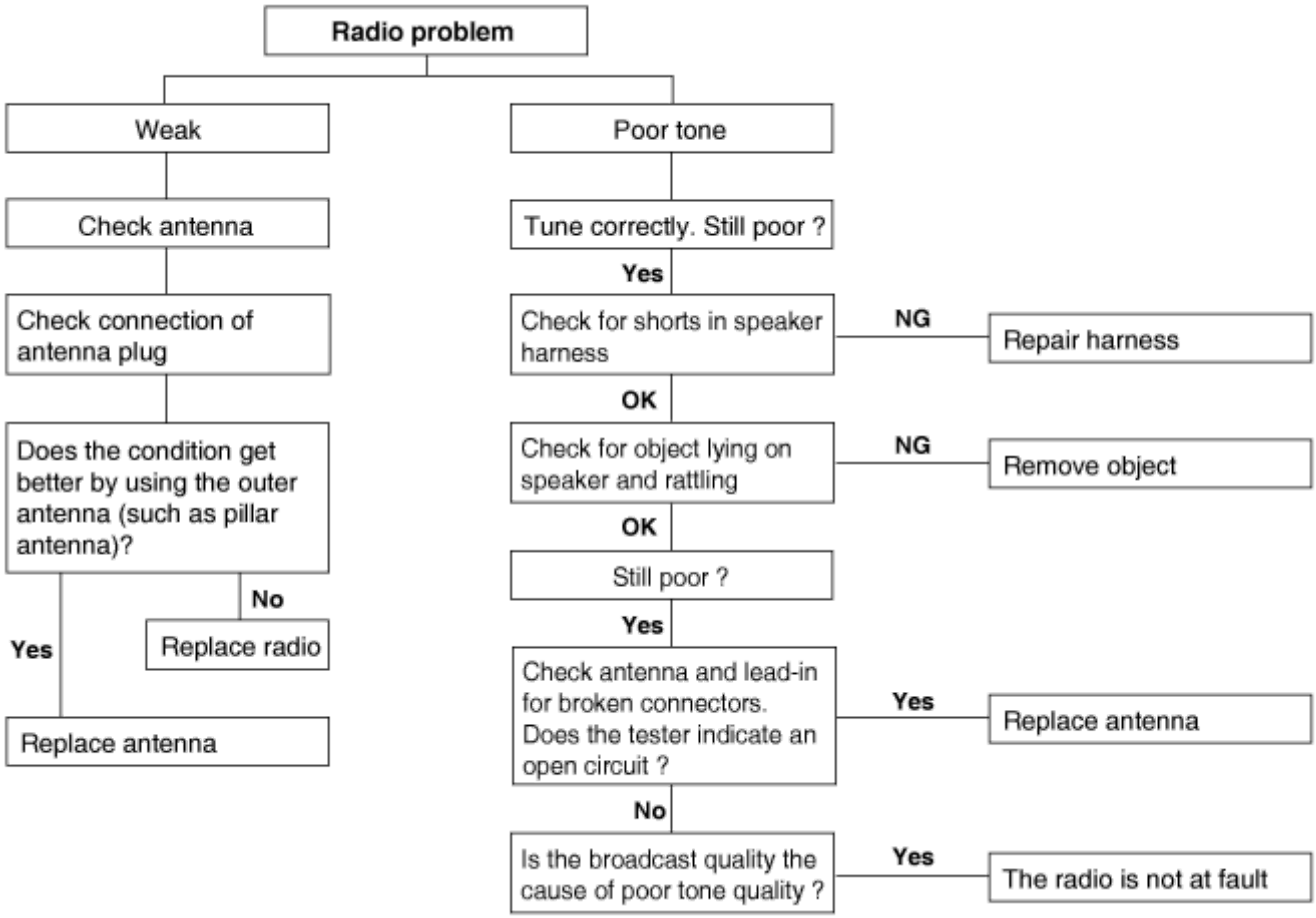


Chart 2

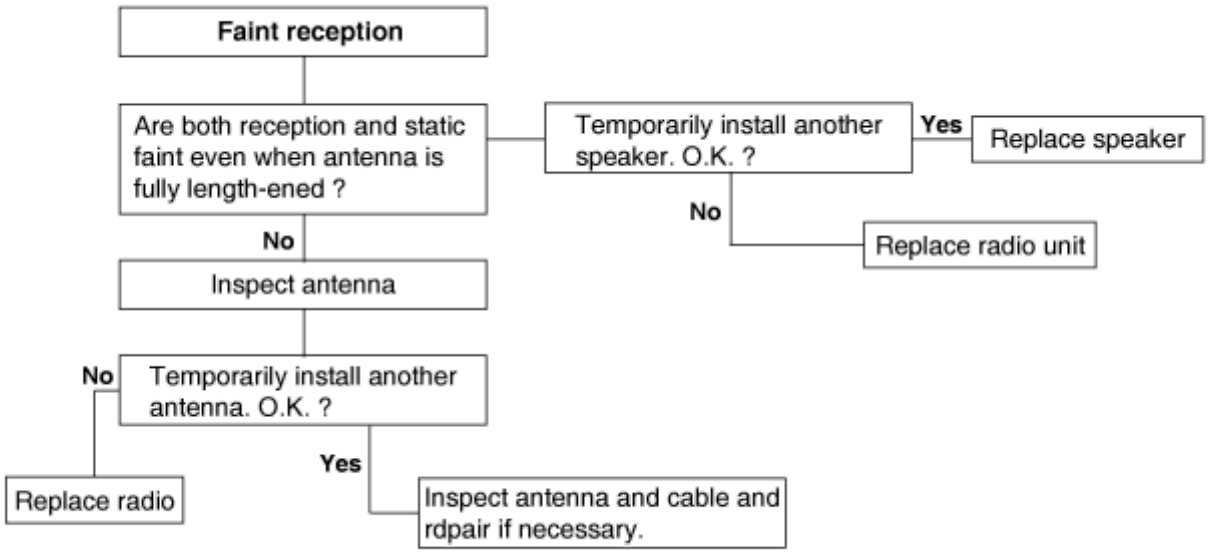


Chart 3

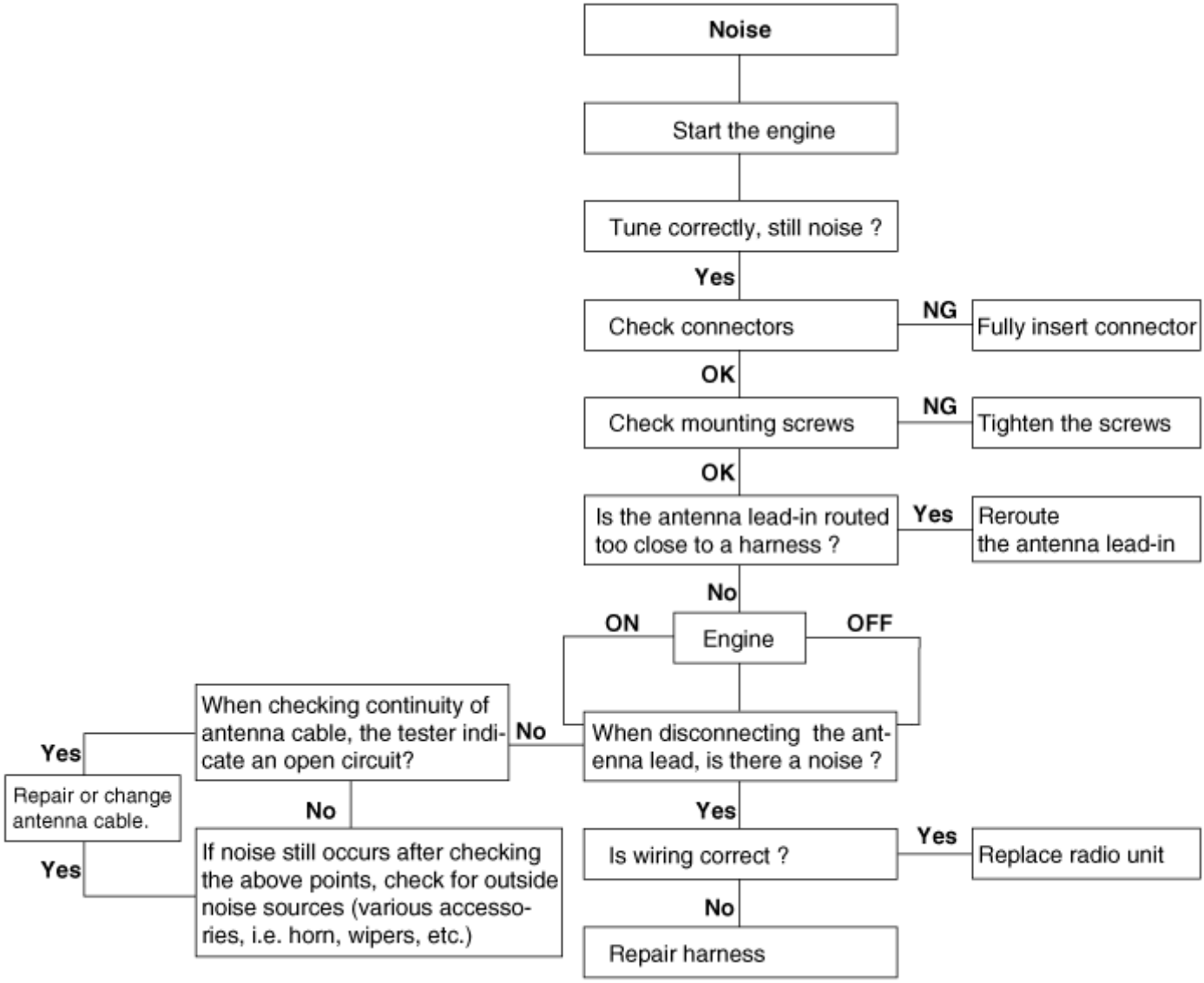

Noise
Start the engine
Tune correctly, still noise ?
Yes
Check connectors
NG
Fully insert connector
OK
Check mounting screws
NG
Tighten the screws
OK
Is the antenna lead-in routed too close to a harness ?
Yes
Reroute the antenna lead-in
No
ON
Engine
OFF
When checking continuity of antenna cable, the tester indicate an open circuit?
No
When disconnecting the antenna lead, is there a noise ?
Yes
Repair or change antenna cable.
No
Yes
Is wiring correct ?
Yes
Replace radio unit
Yes
If noise still occurs after checking the above points, check for outside noise sources (various accessories, i.e. horn, wipers, etc.)
No
Repair harness

Chart 4

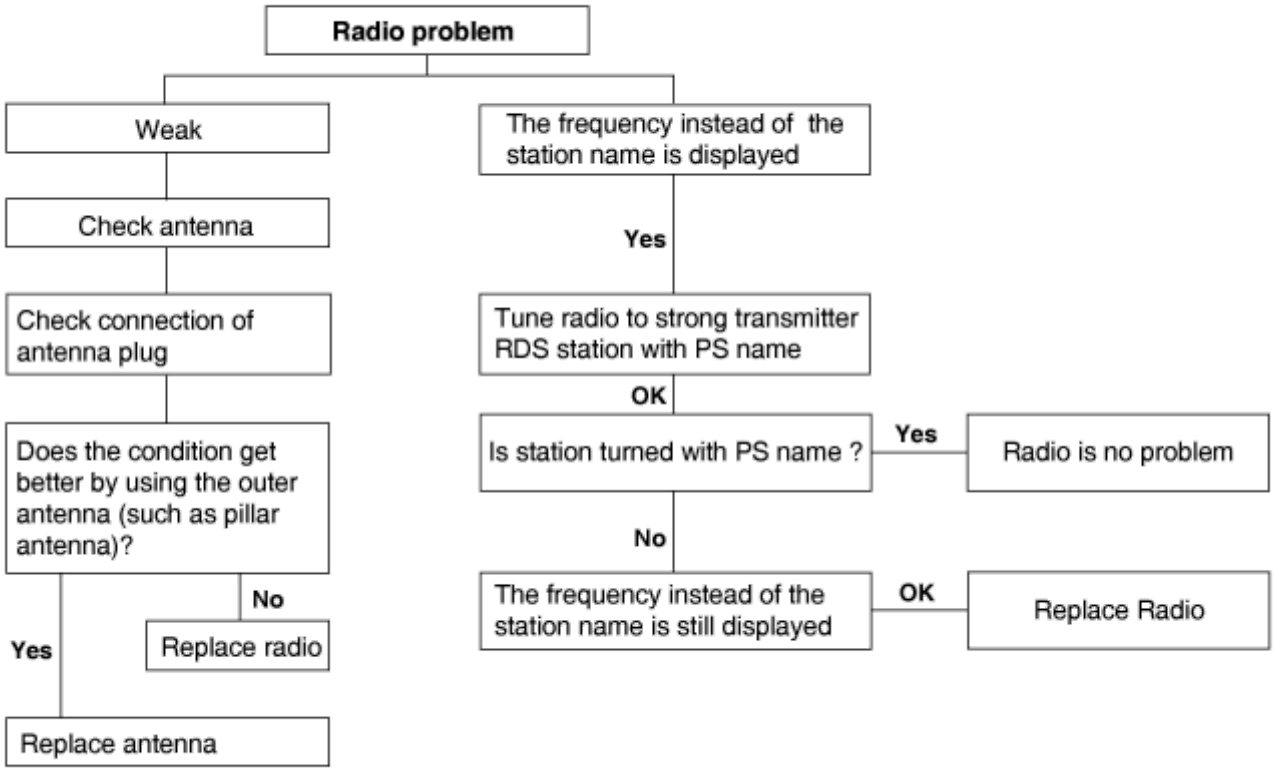

Radio problem
Weak
Check antenna
Check connection of antenna plug
Does the condition get better by using the outer antenna (such as pillar antenna)?
No
Yes
Replace radio
Replace antenna
The frequency instead of the station name is displayed
Yes
Tune radio to strong transmitter RDS station with PS name
OK
Is station turned with PS name ?
Yes
Radio is no problem
No
The frequency instead of the station name is still displayed
OK
Replace Radio

Chart 5

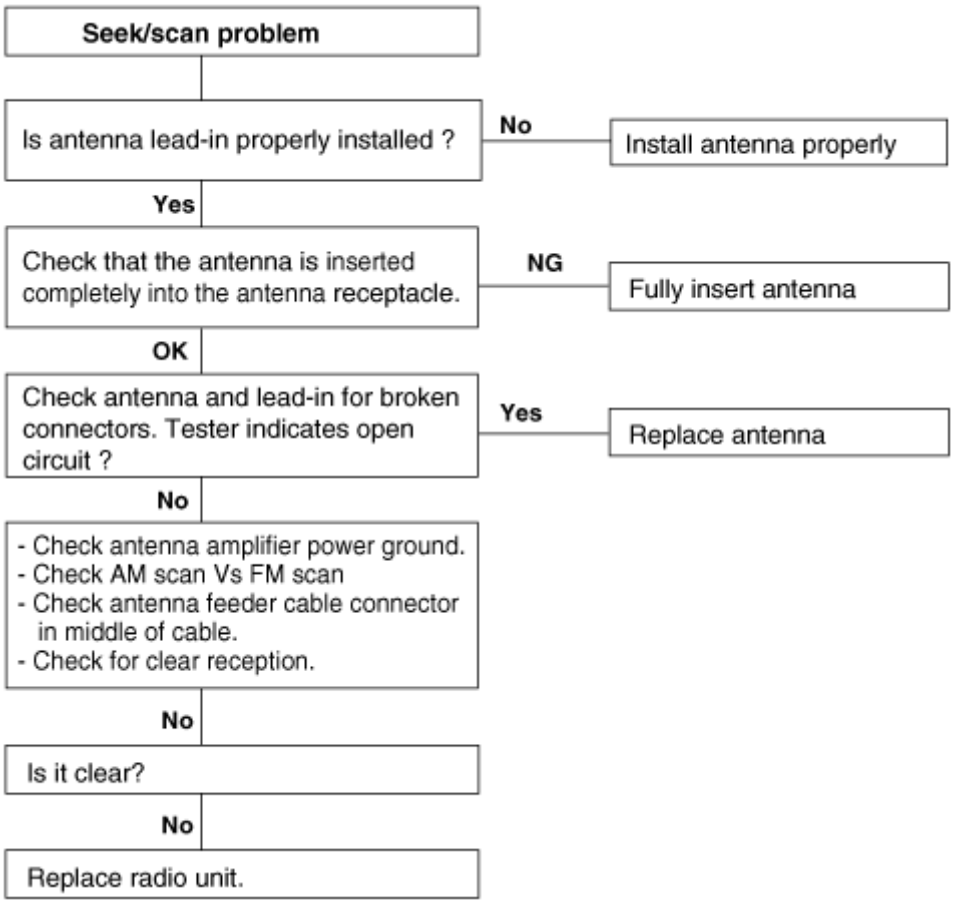
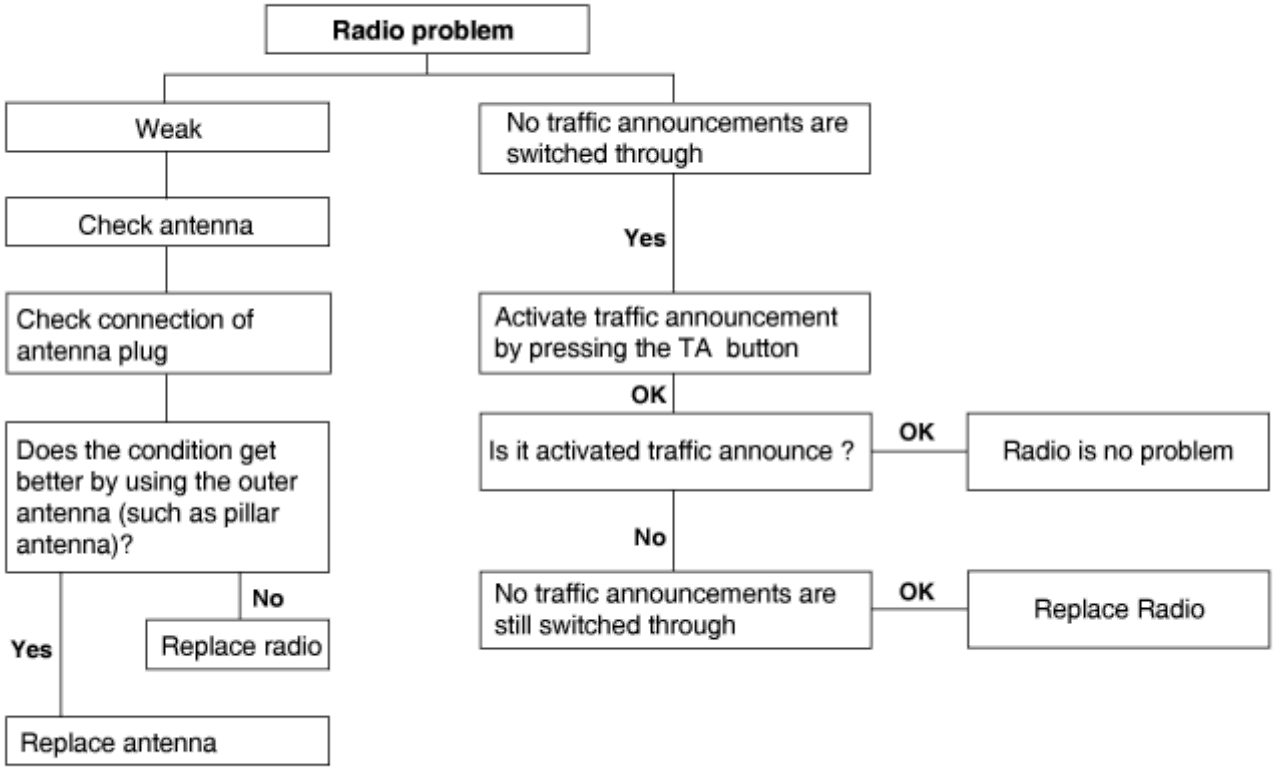

Seek/scan problem
Is antenna lead-in properly installed ?
No
Install antenna properly
Yes
Check that the antenna is inserted completely into the antenna receptacle.
NG
Fully insert antenna
OK
Check antenna and lead-in for broken connectors. Tester indicates open circuit ?
Yes
Replace antenna
No
- Check antenna amplifier power ground.
- Check AM scan Vs FM scan
- Check antenna feeder cable connector in middle of cable.
- Check for clear reception.
No
Is it clear?
No
Replace radio unit.

Chart 6



3. CD Check Procedure

Chart 1. CD Will Not Be Accepted

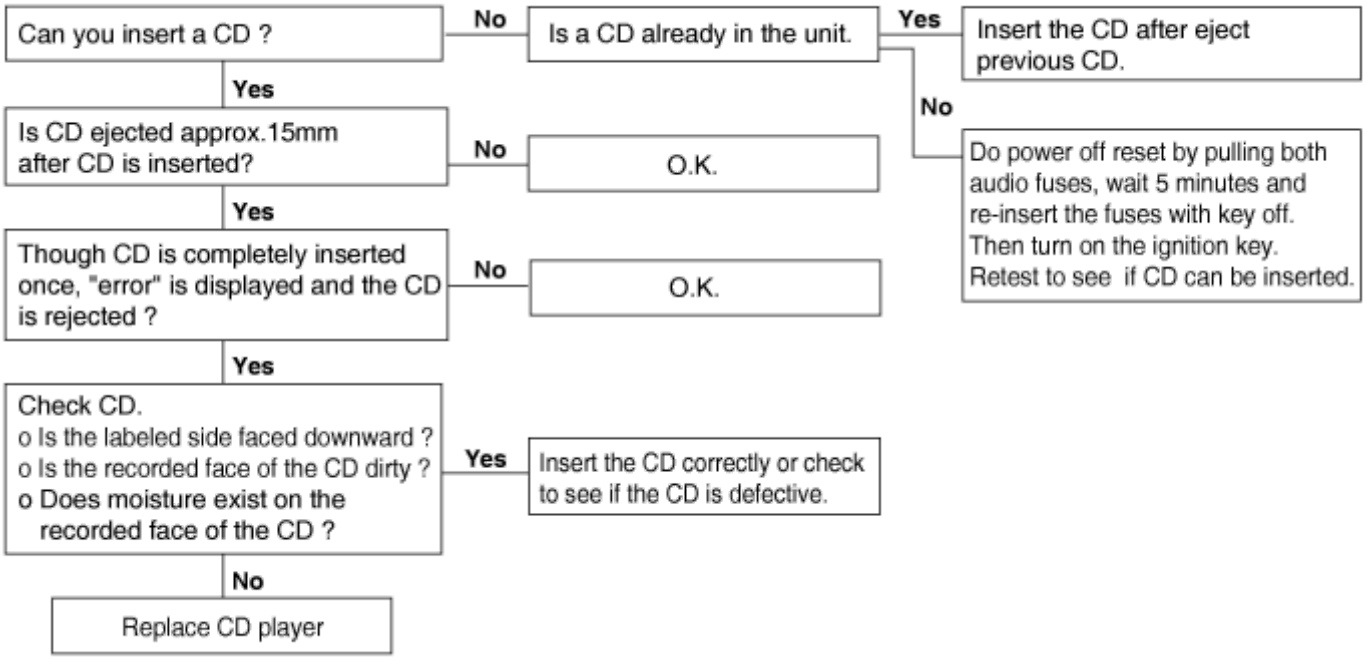
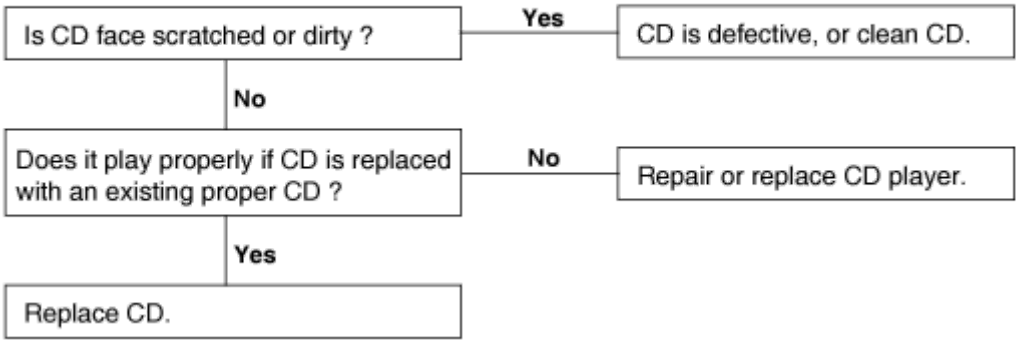


Chart 2. CD Sound Skips

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.)

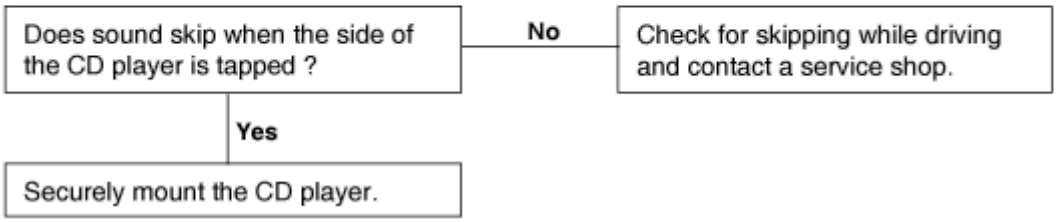
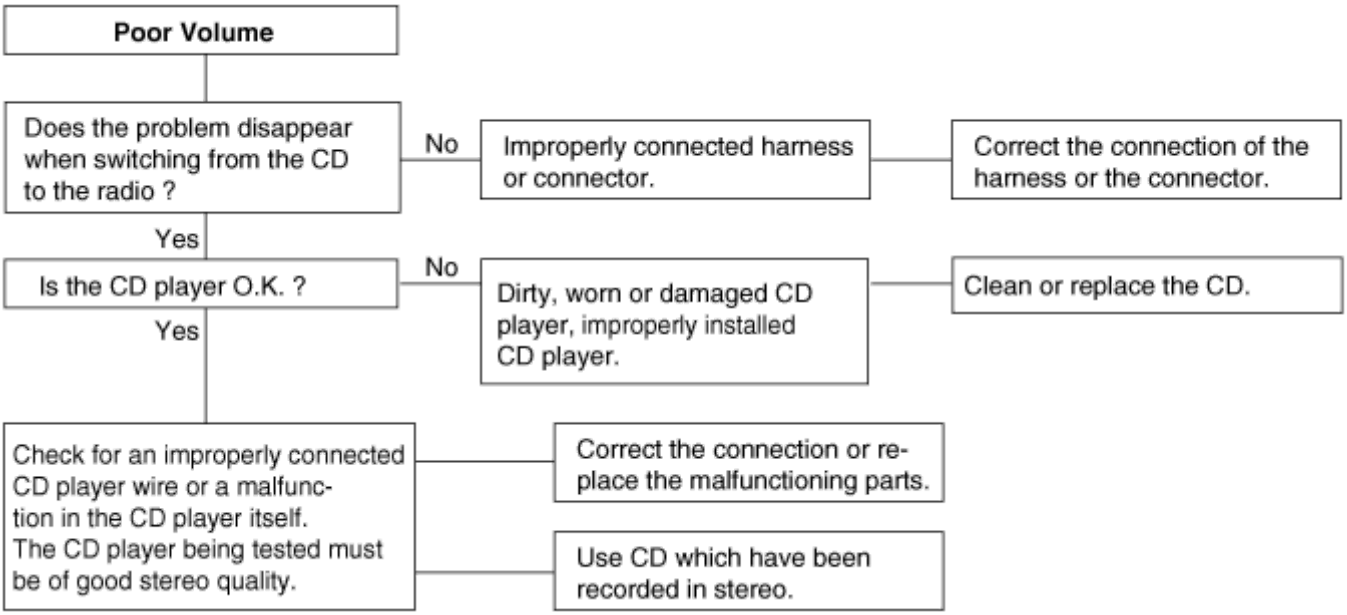
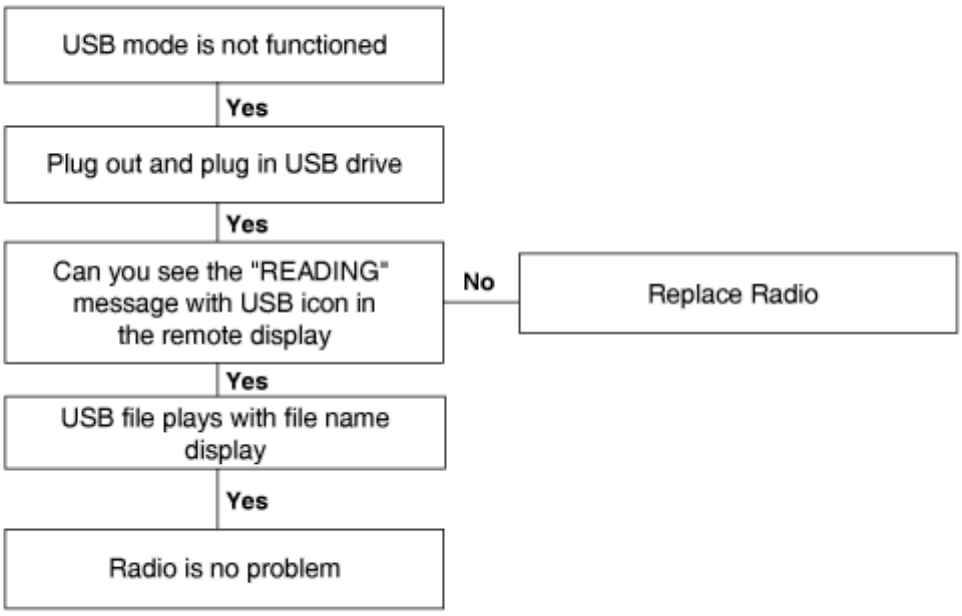


Chart 3



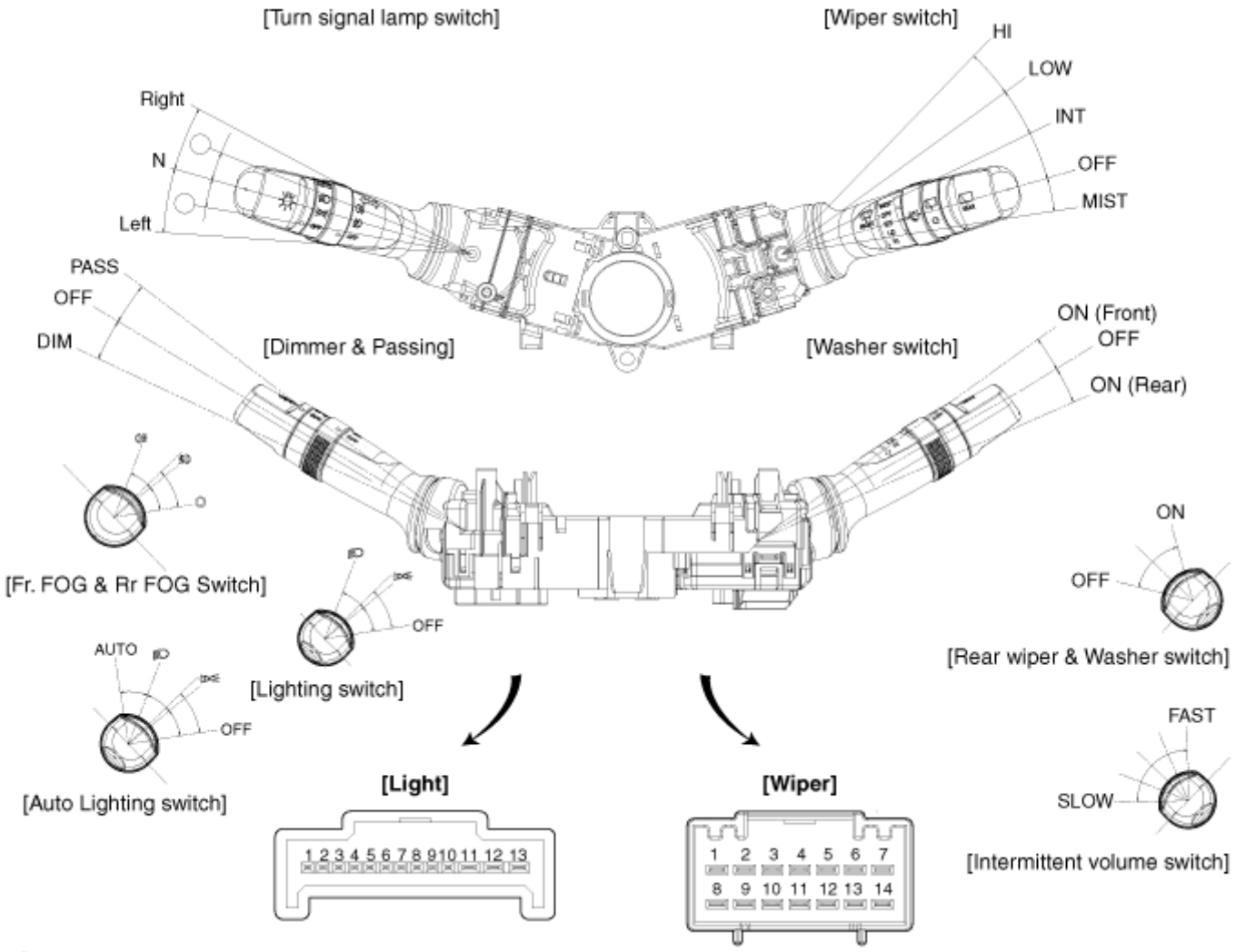
4. USB Check Procedure


USB mode is not functioned
Yes
Plug out and plug in USB drive
Yes
Can you see the "READING" message with USB icon in the remote display
No
Replace Radio
Yes
USB file plays with file name display
Yes
Radio is no problem

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 switch	6.6 ± 0.5A (Lamp load)
	Wiper & mist switch	High : 4.5A (Motor load) Low : 4.5 A (Motor load) Intermittent : 0.22±0.05A(Relay Load) Lock : Max. 28A (Motor load) Mist : 4A (Motor load)
	Front & Rear fog lamp switch	0.2A (Relay load)
	Rear wiper & Washer	Wiper : 1A (Relay load) Washer : 4A (Motor load)

COMPONENT



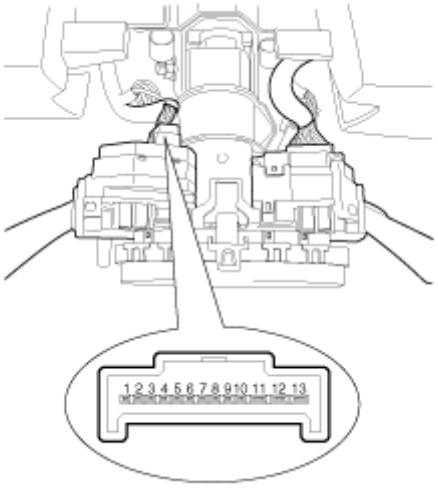
Circuit connection

Connector Name	Terminal No.	Description	Connector Name	Terminal No.	Description
Light	1	Tail lamp switch	Wiper	1	-
	2	Lighting switch ground		2	Rear wiper switch
	3	Auto light switch		3	Intermittent time base
	4	Head lamp switch		4	Intermittent volume base
	5	Fog switch base		5	Wiper Low speed
	6	Front fog lamp switch		6	Wiper parking
	7	Rear fog lamp switch		7	Mist switch
	8	Head lamp low beam		8	-
	9	Head lamp high beam		9	Rear washer
	10	Dimmer switch base		10	Rear wiper & washer IGN
	11	Turn signal lamp (LH) switch		11	Front washer switch
	12	Turn signal base		12	Front washer & wiper IGN
	13	Turn signal lamp (RH) switch		13	Wiper High speed
				14	Intermittent wiper switch

INSPECTION

Lighting Switch Inspection

1. 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)

Terminal / Position	1	4	3	2
OFF				
I	○			○
II	○	○		○
AUTO			○	○

Lighting Switch

Terminal / Position	1	4	2
OFF			
I	○		○
II	○	○	○

Dimmer And Passing Switch

Terminal / Position	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

English ▼

Hazard switch / Turn signal switch / Terminal	13	11	12
OFF – L		○——	——○
OFF – N			
OFF – R	○——	——	——○

Front Fog Lamp

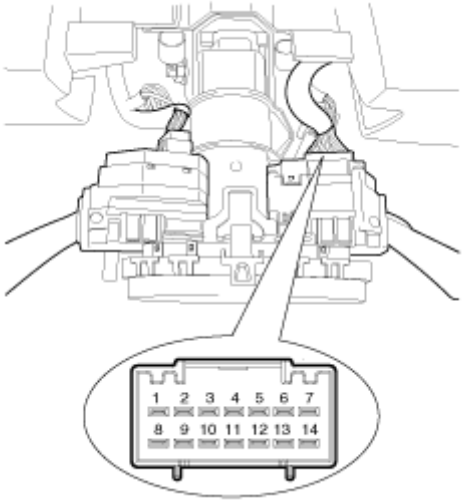
Position / Terminal	5	6
OFF		
ON	○——	——○

Rear Fog Lamp

Position / Terminal	5	7
OFF		
ON	○——	——○

Wiper And Washer Switch Inspection

1. 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	5	13	6	14	12	7	4	3
MIST	○——		——○		○——	——○		
OFF	○——		——○					
INT	○——		——○	○——	——○		○~~○	
LOW	○——				——○			
HI		○——			——○			

Washer Switch

Terminal / Position	11	12
OFF		
ON	○	○

Rear Wiper & Washer Switch

Terminal / Position	10	2	9
WIPER(ON)	○	○	
OFF			
WASHER(ON)	○		○

REMOVAL

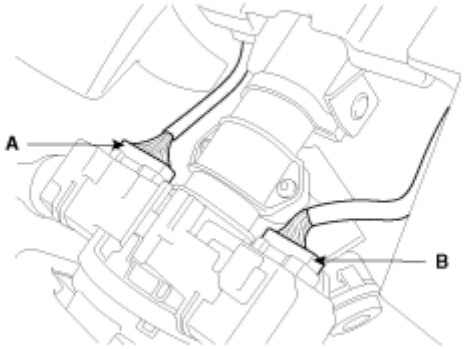
1. Disconnect the negative (-) battery terminal.
2. Remove the steering column upper and lower shrouds after removing 3 screws.



NOTICE

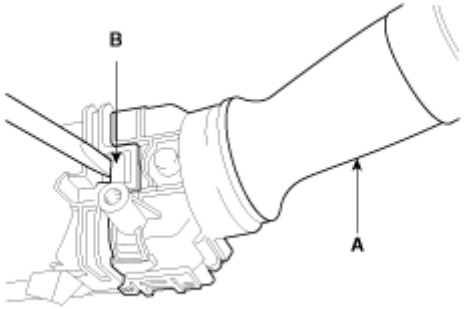
Remove the 2 screws (A,B) after turning the steering left and right.

3. Disconnect the light switch connector (A) and the wiper switch connector (B).

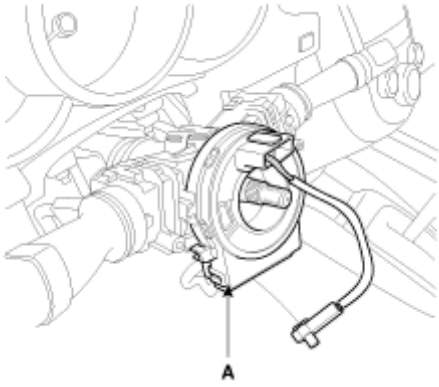


4. Remove the wiper switch (A) by releasing the lock (B).

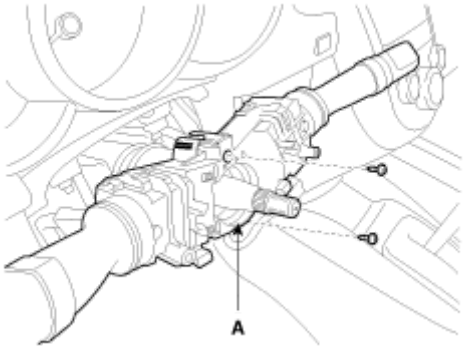
> **NOTICE**
>
> when removing the wiper & washer switch only, release the lock of wiper switch without removing the steering wheel.



5. Remove the clock spring(A).



6. Loosen the screws from the multifunction switch assembly (A).

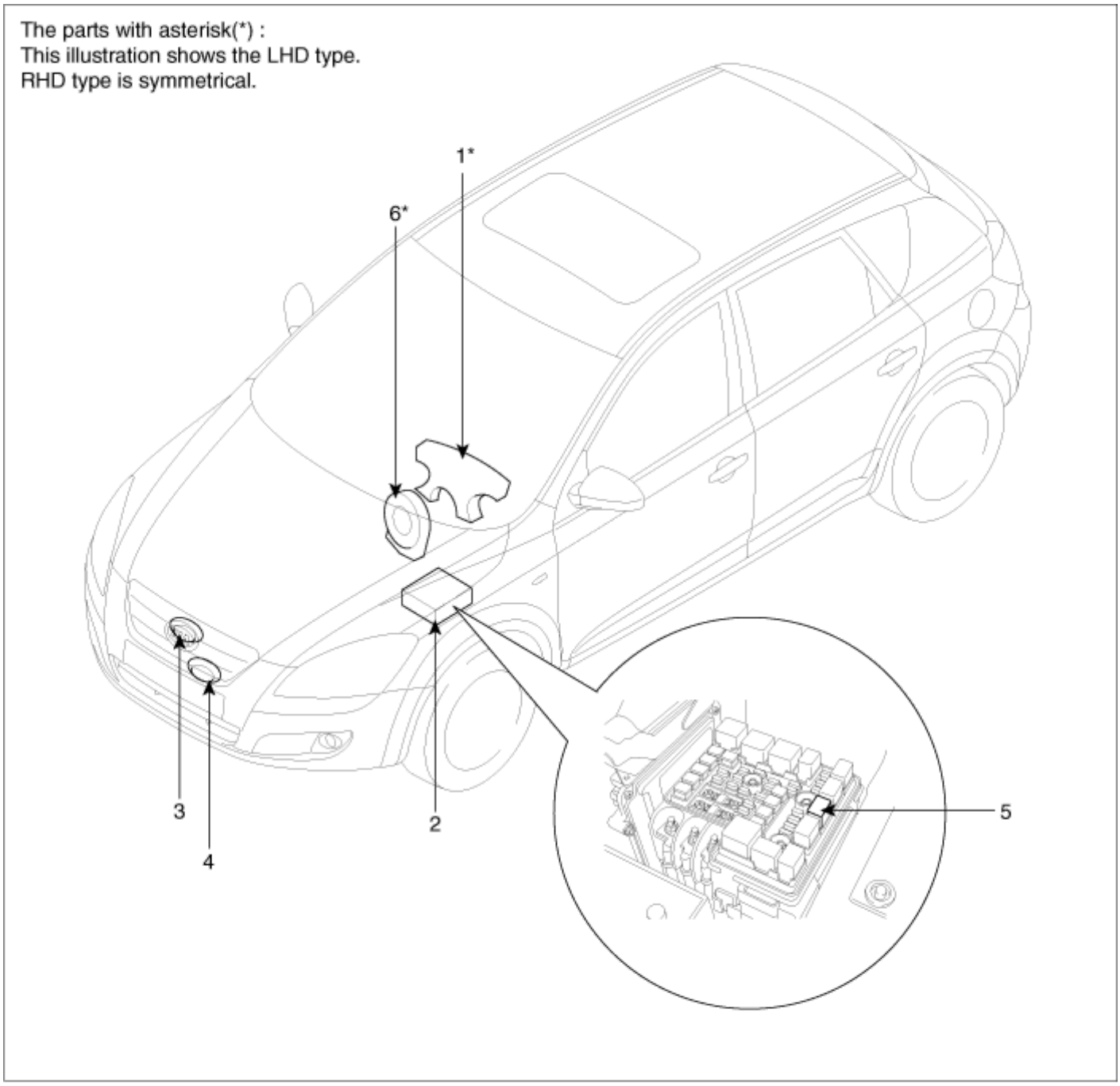


7. Remove the multifunction switch assembly after loosening the connectors.

INSTALLATION

1. Install the wiper switch then connect the lighting switch connector.
2. Install the lighting switch then connect the wiper switch connector.
3. Install the steering column upper and lower shrouds.

COMPONENT LOCATION

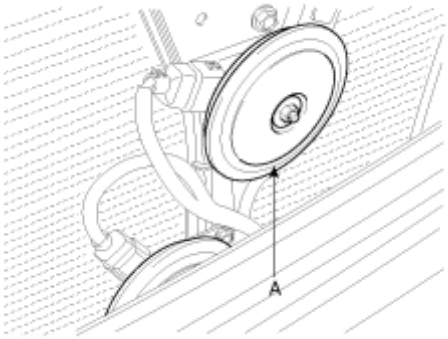


1. Horn switch
2. Relay box (Engine room compartment)
3. Horn (Low pitch - Single)
4. Horn (High pitch)
5. Horn relay
6. Clock spring

English ▼

REMOVAL

1. Remove the front bumper. (Refer to the BD group - front bumper).
2. Remove the bolt and disconnect the horn connector, then remove the horn (A).



INSTALLATION

1. Install the horn after connecting the horn connector.
2. Install the front bumper.
   (Refer to the BD group - Front bumper).

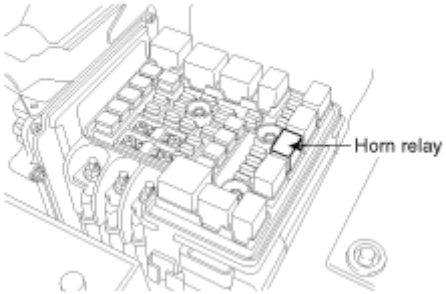
INSPECTION

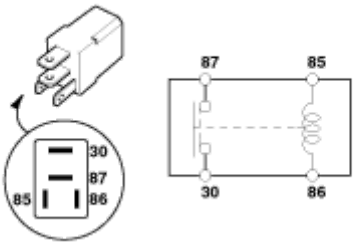
Test the horn by connecting battery voltage to the 1 terminal and ground the 2 terminal.
The horn should make a sound. If the horn fails to make a sound, replace it.

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.

English ▼



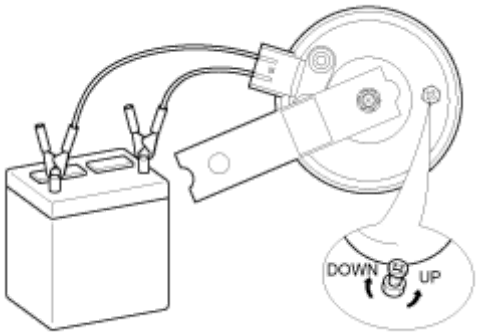


Terminal / Power	30	87	85	86
Disconnected			○	○
Connected	○	○	⊖	⊕

ADJUSTMENT

1. Operate the horn, and adjust the tone to a suitable level by turning the adjusting screw.

> **NOTICE**
>
> After adjustment, apply a small amount of paint around the screw head to keep it from loosening.



SPECIFICATIONS

Item		Specification
Power supply		DC 14.4V (-) Negative ground
Load impedance		4 Ohm
Frequency range / Channel space		FM : 87.5~108.0MHz, AM : 522~1620KHz
Tuning type		PLL SYNTHESIZED TUNING
Antenna		FM/AM : 75 Ohm / GPS : 50 Ohm
Dark current		Max 2mA (Head unit)
S/N		FM : MIN 50 dB / AM : MIN 40 dB
Temperature range	CD	Operating : -4°F~ +158°F (-20°C~ +70°C) Storage : -22°F~ +185°F (-30°C~ +85°C)
	Radio	Operating : -4°F~ +149°F (-20°C~ +65°C) Storage : -22°F~ +176°F (-30°C~ +80°C)
	SET	Esouthecon & button : -40°F~ +176°F (-40°C~ +80°C) Storage : -40°F~ +176°F (-40°C~ +80°C)

CD Deck

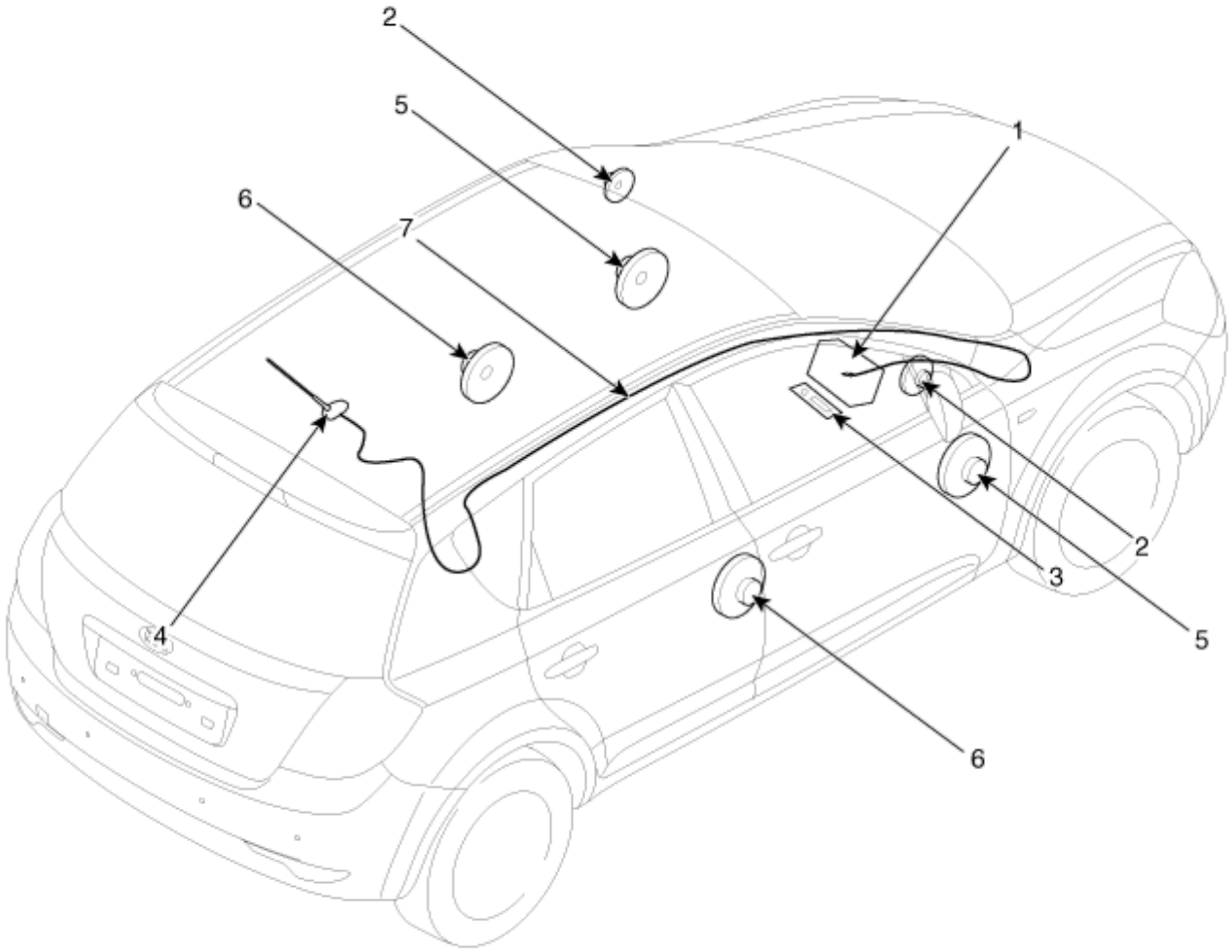
Item	Specification
Power supply	8V (1800mA)
Distorion	Max 0.3%

Speaker

Item		Specification
Input Power (W)	Front	40
	Rear	40
	Tweeter	40
Speaker Impedance (Ω)	Front	4.0 ± 0.6
	Rear	4.0 ± 0.6
	Tweeter	4.0 ± 0.6
Speaker Number		6

COMPONENT LOCATION

This illustration shows the LHD type.
RHD type is symmetrical.

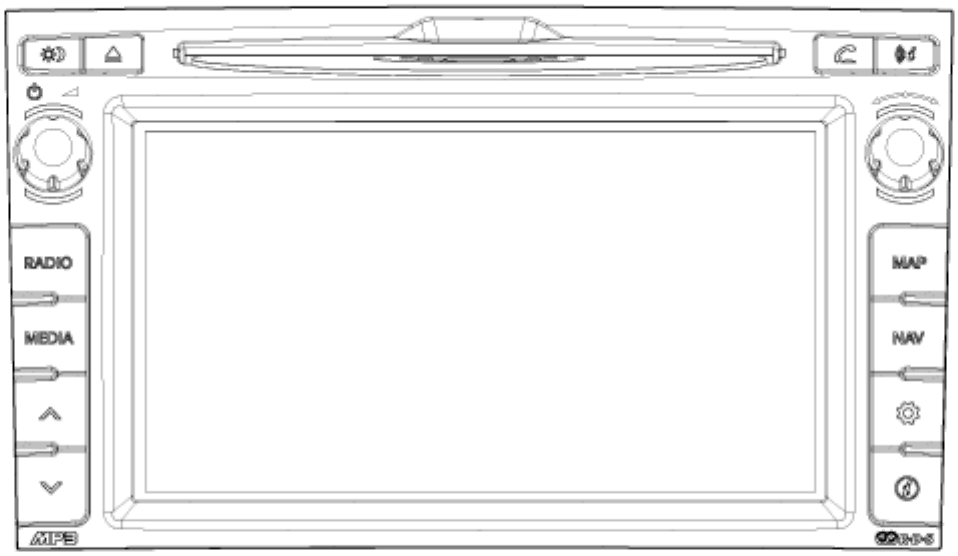


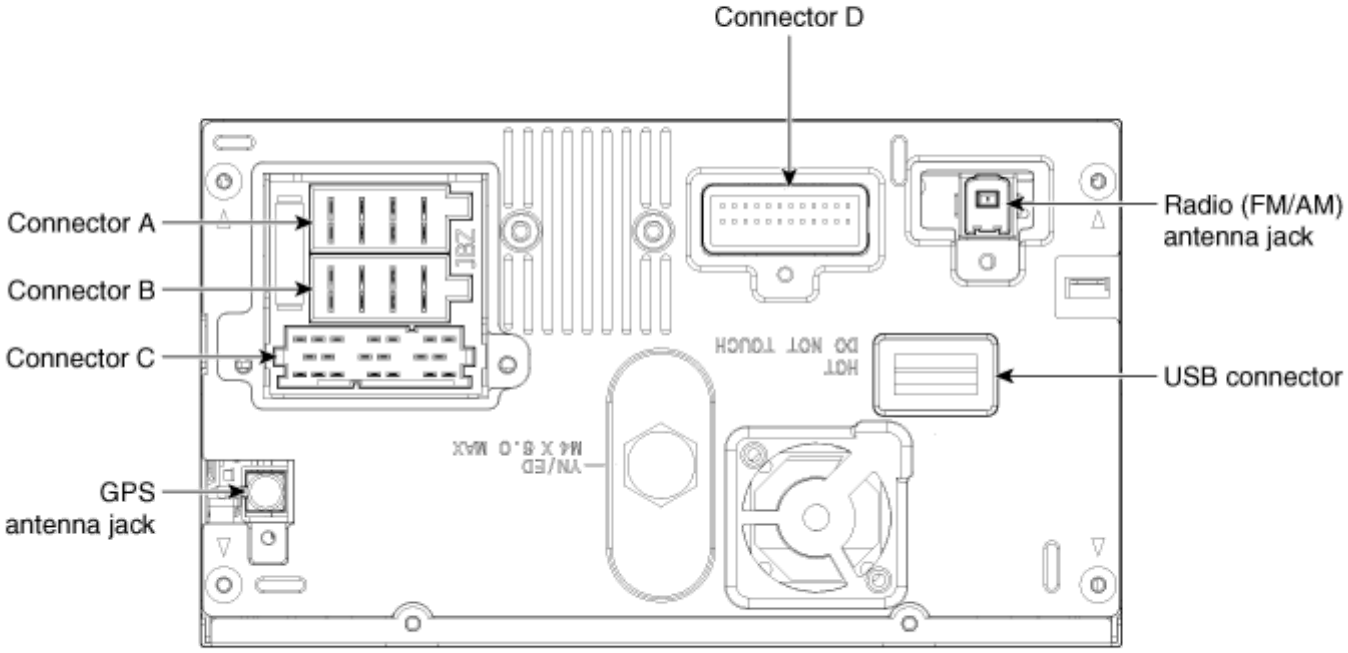
1. AVN (A/V & Navigation) head unit	5. Front door speaker
2. Tweeter speaker	6. Rear door speaker
3. AUX Jack / USB Port	7. Antenna feeder cable
4. Roof antenna (Radio/GPS)	

COMPONENTS

AVN (A/V & Navigation) Head Unit

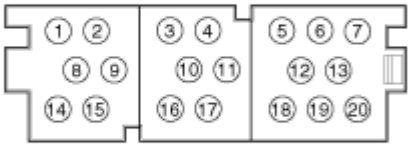
English ▼

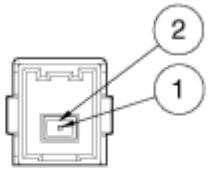

RADIO
MEDIA
MAP
NAV

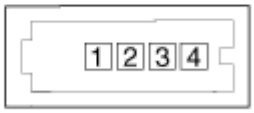

Connector D
Connector A
Connector B
Connector C
GPS
antenna jack
Radio (FM/AM)
antenna jack
USB connector
DO NOT TOUCH

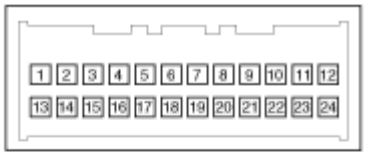
Connector A	NO	Description	NO	Description
	1	Speed	5	R Inhibit
	2	Illummination (+)	6	ACC
	3	Remote antenna	7	Illummination (-)
	4	Battery (=)	8	Power GND

Connector B	NO	Description	NO	Description
	1	Speaker RR (+)	5	Speaker RR (-)
	2	Speaker FR (+)	6	Speaker FR (-)
	3	Speaker FL (+)	7	Speaker FL (-)
	4	Speaker RL (+)	8	Speaker RL (-)

Connector C	NO	Description	NO	Description
	1	Mic +	11	Aux Input DET
	2	Mic -	12	-
	3	Aux input right	13	LIN
	4	Aux input left	14	Parking
	5	Aux V GND	15	Door unlock
	6	-	16	Remote control
	7	HS CAN low	17	Remote control GND
	8	-	18	Aux video input
	9	Auto light input	19	-
	10	Aux GND	20	HS CAN high

Radio antenna	No.	Description	No.	Description
	1	Signal (FM/AM)	2	Ground

USB connector	No.	Description	No.	Description
	1	USB D (+) / iPod ground	3	USB D (-) / iPod TX (Navigation iPod)
	2	USB D (+) / iPod RX (Navigation iPod)	4	USB D (+) / iPod 5V

Connector D	No.	Description	No.	Description
	1	SPDIF output (+)	13	Camera B (+)
	2	SPDIF output (-)	14	Camera P ground
	3	SPDIF ground	15	Camera video
	4	Camera ON	16	Camera V ground
	5	Hands free voice (+)	17	Hands free voice (-)
	6	Navigation voice (+)	18	Navigation voice (-)
	7	-	19	-
	8	-	20	-
	9	Ambent (-)	21	-
	10	Audio (+)	22	Audio (-)
	11	Camera front / rear	23	CAN ground
	12	CAN High	24	CAN Low

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 external devices are placed on or near the GPS antenna or when travelling 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 occurrence, driving for a short period of time will allow vehicle to go through map matching or GPS information (several minutes may be necessary in certain cases).
   - When driving on a Y-shaped road with a narrow angle, the current position may be displayed in the opposite direction.
   - If the vehicle is loaded onto a car transport vehicle, the current position mark may be stalled on the last position prior to loading.
   - When driving on a spiral-shaped road.
   - When driving in mountain regions with sharp turns or sudden brakes.
   - When entering a road after having been in an underground parking structure, building parking structure, or turnable with many rotations.
   - When the tires have recently been replaced (Especially upon use of spare or studless tires)
   - If the battery terminal is removed.
   - When driving in city streets, the current position may be displayed on the opposite side or on an off-road position.
   - 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.
   - When driving in heavy traffic with frequent stop and go in traffic or intersections.
   - When driving under slippery conditions, such as heavy sand, snow, etc.
   - When driving with the tire chain in place.
   - When using a tire with an incorrect size specification.
   - When the tire pressure for the 4 tires are different.
   - When the replacement tire is a worn or used tire (Especially studless tires having passed a 2nd seasons, etc.)
   - When driving near high-rise buildings
   - If a roof carrier has been installed
   - When driving under high speeds or having calculated a long-distance route.

Route Guidance

Suitable route guidance may not occur caused by 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.

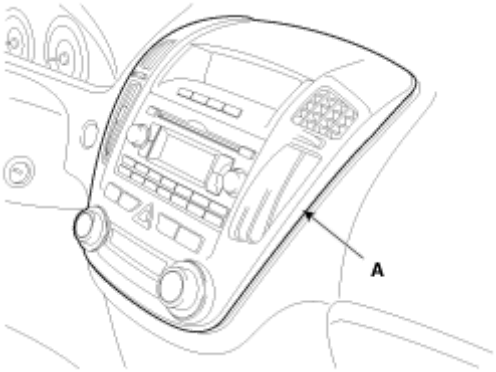
Route Re-calculation

The following phenomena may occur after conducting route recalculation.

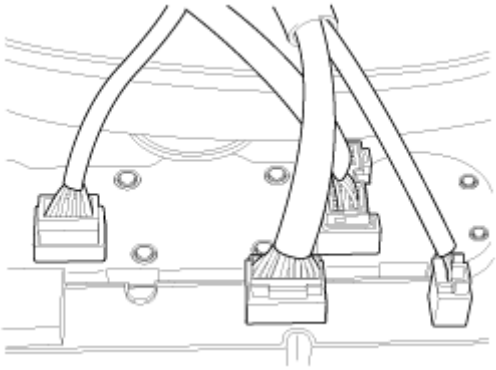
- Guidance may be given to a position differing from the current position when turning at an intersection.
- Route recalculation may take a longer period of time when driving under high speeds.
- A route guidance signaling for a U-Turn in a No U-Turn location may occur.
- A route guidance signaling entrance 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)

REMOVAL

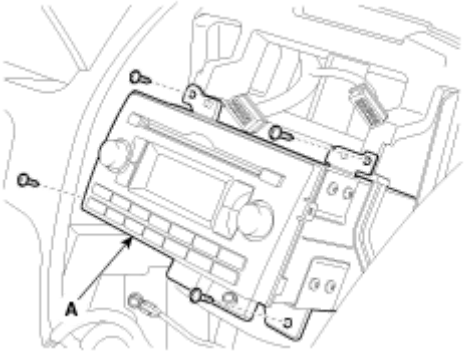
1. Disconnect the negative (-) battery terminal.
2. Remove the crash pad center facia panel (A).
   (Refer to the BD group - "Crash pad")



3. Disconnect the connectors from the crash pad center facia panel.

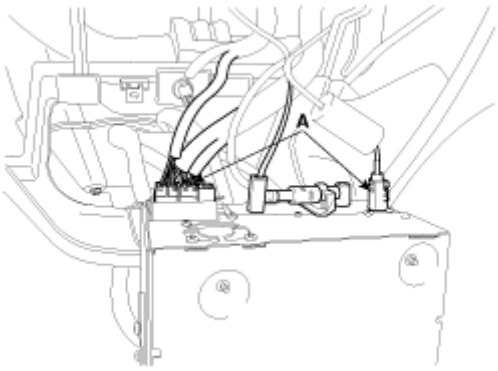


4. Remove the mounting bolts then remove the AVN head unit (A).



5. Disconnect the AVN head unit connectors and cable (A).

English ▼



NOTICE

When the compact disc is not ejected, do not remove it forcibly.

INSTALLATION

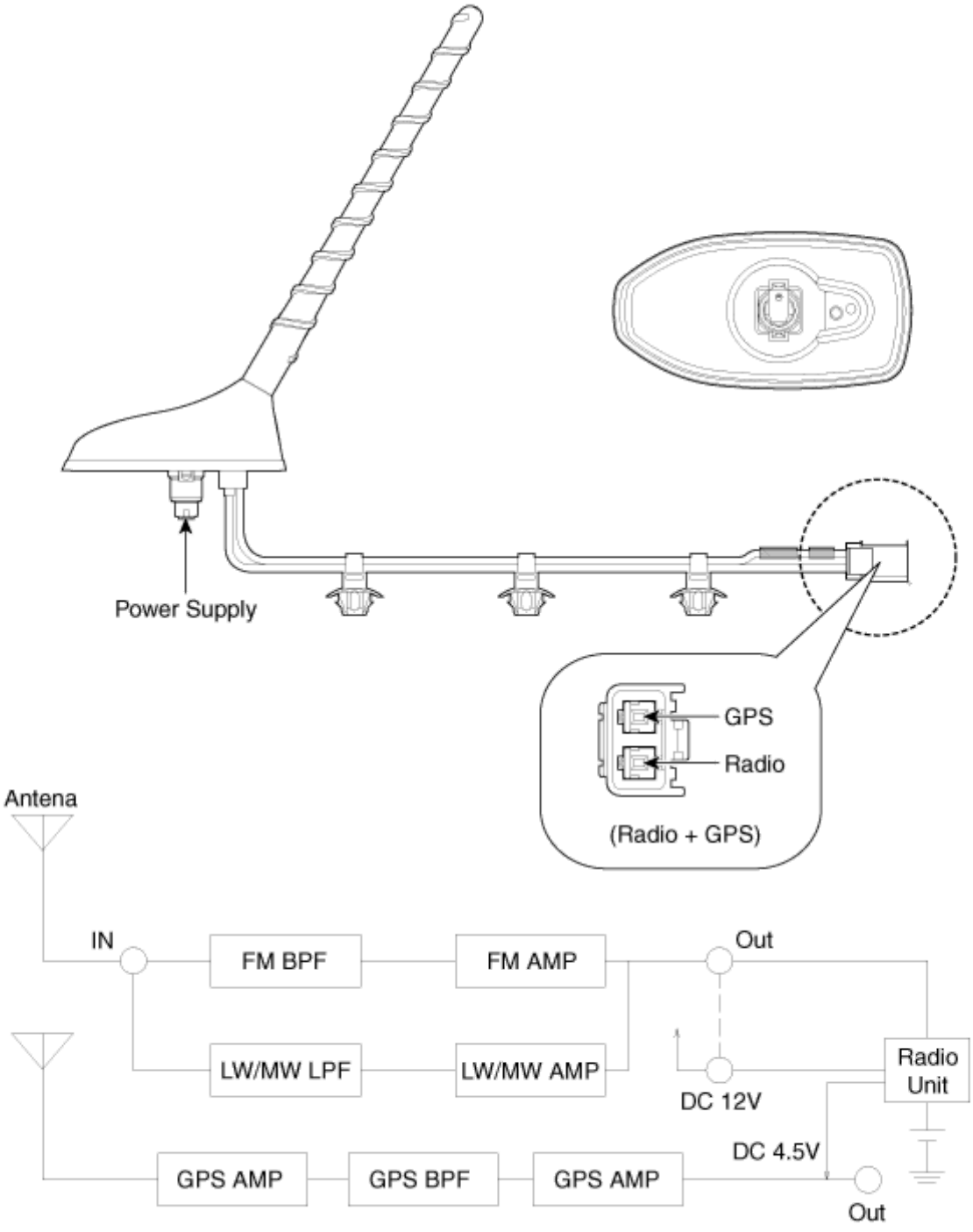
1. Connect the AVN head unit connectors and cable.
2. Install the AVN head unit.
3. Install the crash pad center facia panel.
4. Connect the negative (-) battery terminal.

NOTICE

1) Make sure the connector are connected in properly.
2) Check the AVN system.

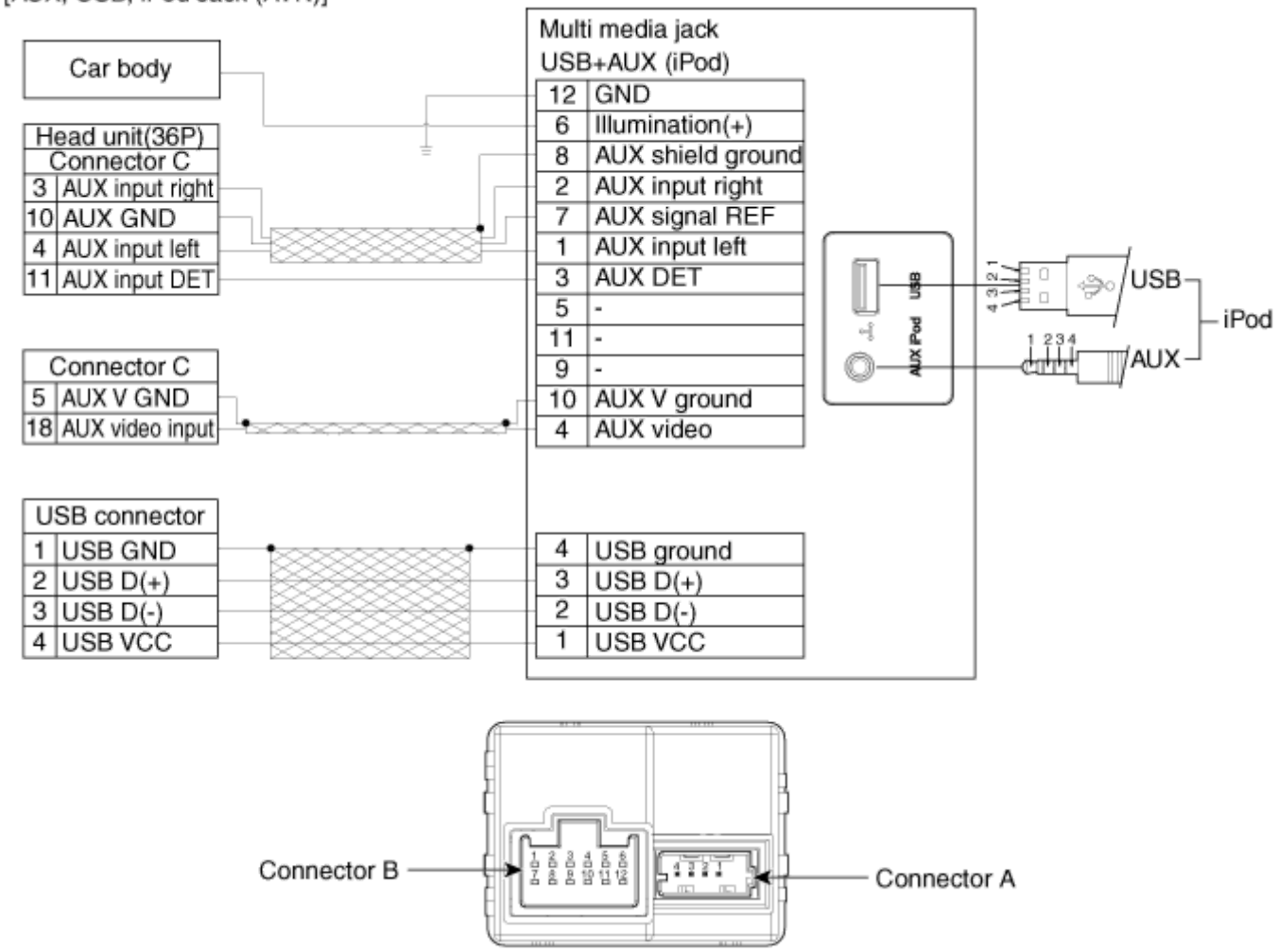
English

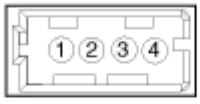
COMPONENTS

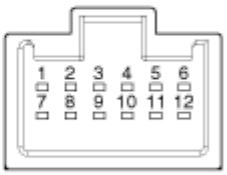


CIRCUIT DIAGRAM

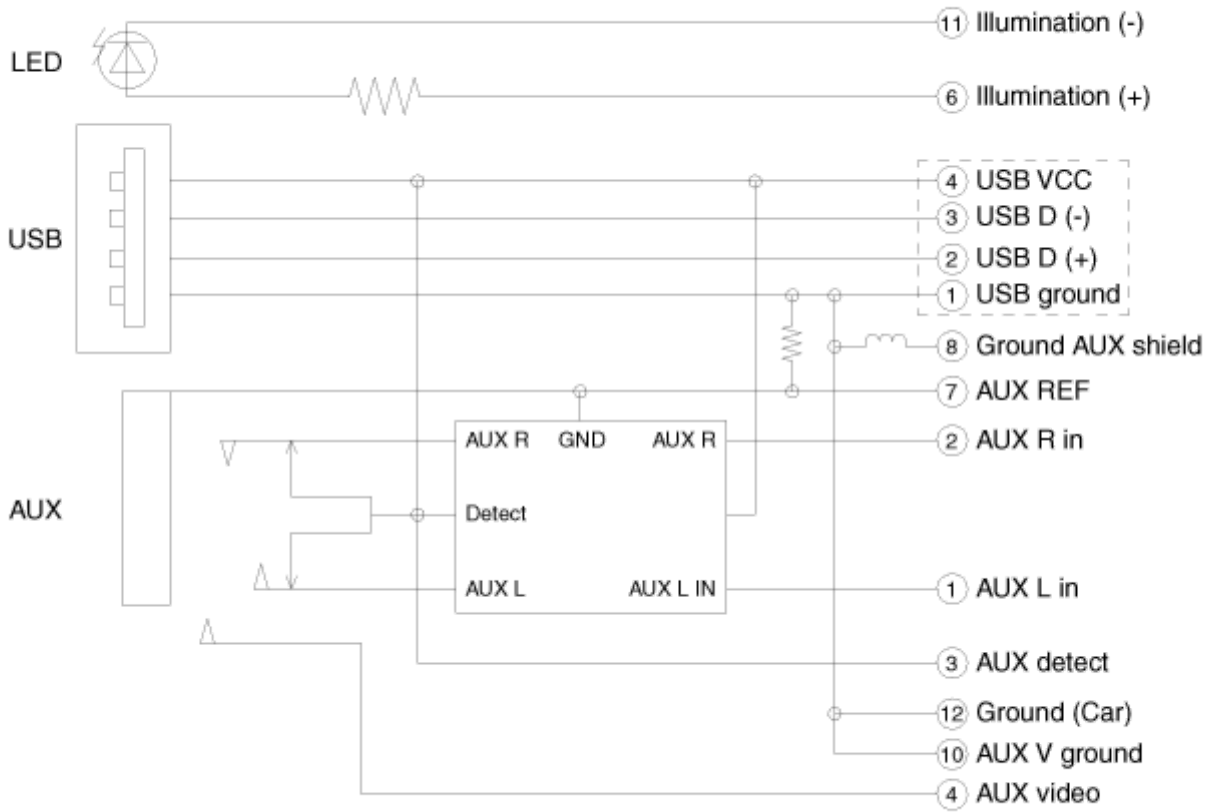
[AUX, USB, iPod Jack (AVN)]



Connector A	No.	USB Connector
	1	USB ground
	2	USB D (+)
	3	USB D (-)
	4	USB VCC

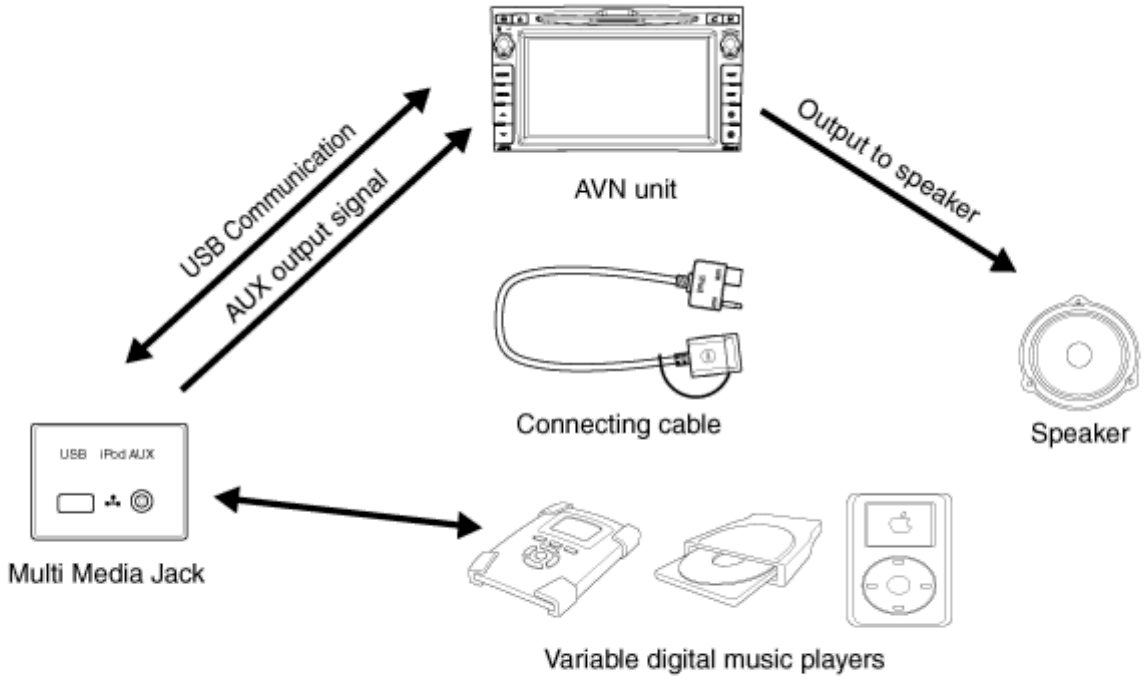
Connector B	No.	AUX(iPod) Connector
	1	AUX input left
	2	AUX input right
	3	AUX detect
	4	AUX video
	5	-
	6	Illumination(+)
	7	AUX signal REF
	8	AUX shield ground
	9	-
	10	AUX V ground
	11	Illumination(-)
	12	ground

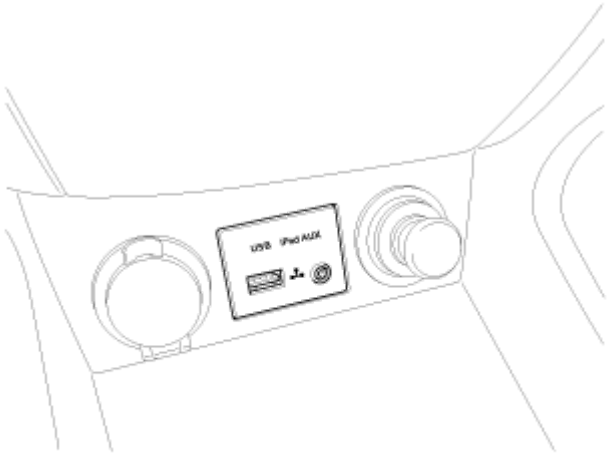
English ▼


LED
USB
AUX
AUX R
GND
AUX R
Detect
AUX L
AUX L IN
11 Illumination (-)
6 Illumination (+)
4 USB VCC
3 USB D (-)
2 USB D (+)
1 USB ground
8 Ground AUX shield
7 AUX REF
2 AUX R in
1 AUX L in
3 AUX detect
12 Ground (Car)
10 AUX V ground
4 AUX video

DESCRIPTION

The AUX, iPod and USB JACK on the center console is for customers who like to listen to external portable music players like the MP3, iPod, earphone, USB memory stick, CD player 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.

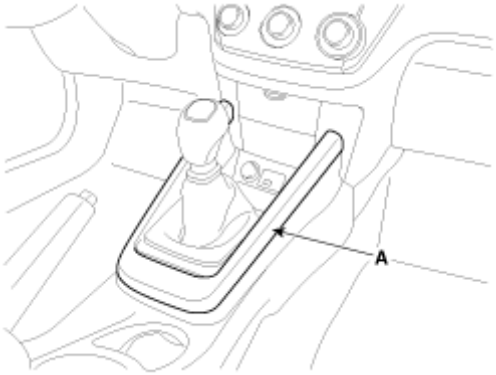




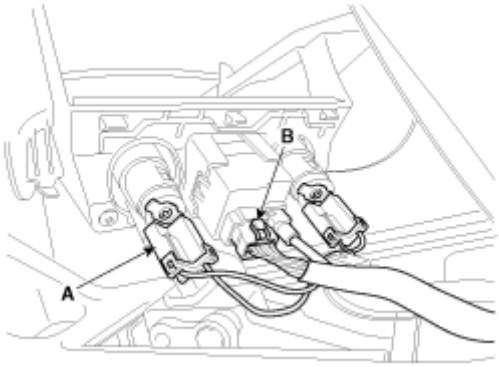
REMOVAL

Multi Media Jack

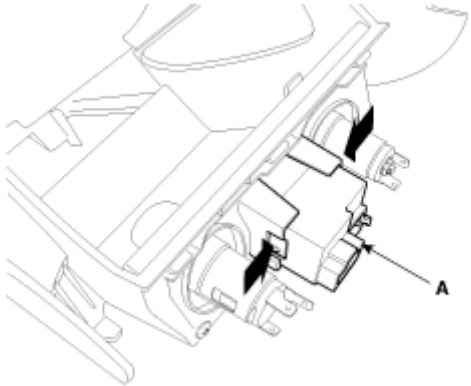
1. Remove the upper cover (A) on the floor console.
   (Refer to the BD group - "Console")

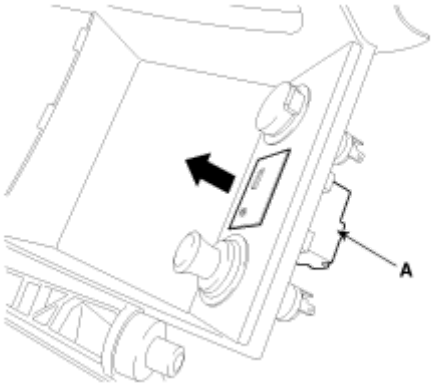


2. Disconnect the power outlet connector (A) and multi media jack connector (B) from under cover.



3. Remove the multi media jack (A) after disconnecting the multi media jack connector.





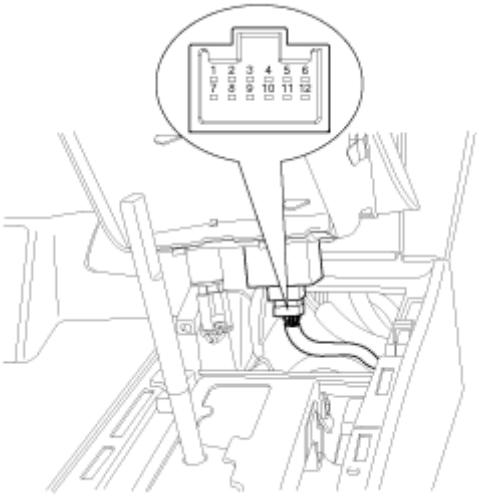
INSTALLATION

Multi Media Jack

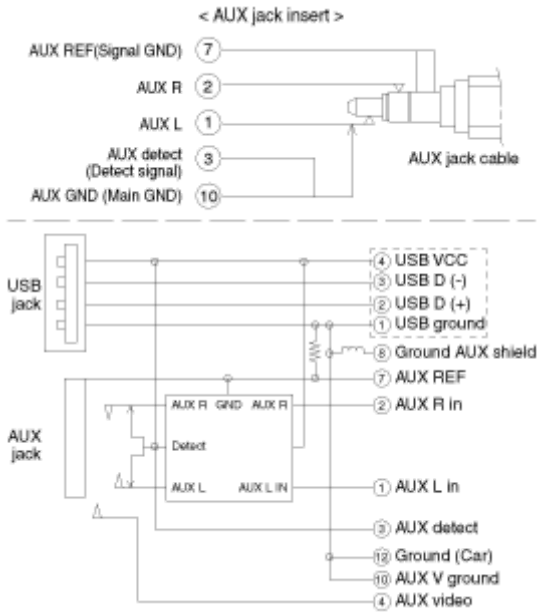
1. Install the multi media jack.
2. Connect the multi media jack connector.
3. Install the under cover to the floor console.

INSPECTION

1. Disconnect the negative(-) battery terminal.
2. Disconnect the multi media jack connector after removing the under cover.



3. To inspect USB / iPod port, check the voltage between NO.1 and 4 terminal of.
   Standard value : 5V
4. To inspect AUX jack, check the voltage between NO. 3 and 7 terminal of AUX jack / Audio jack input.
   Standard value : 5V
5. Using an ohmmeter, check for continuity between the terminals of multi media jack connector.


< AUX jack insert >
AUX REF(Signal GND) 7
AUX R 2
AUX L 1
AUX detect (Detect signal) 3
AUX GND (Main GND) 10
AUX jack cable
USB jack
4 USB VCC
3 USB D (-)
2 USB D (+)
1 USB ground
8 Ground AUX shield
7 AUX REF
AUX jack
AUX R GND AUX R
Detect
AUX L AUX L IN
2 AUX R in
1 AUX L in
3 AUX detect
12 Ground (Car)
10 AUX V ground
4 AUX video

TROUBLESHOOTING

Check Procedure

Status	Cause	How to check
• Audio/ MP3 rejected by the unit.	1) CD may be dirty	1) Clean CD with damp cloth. 2) The CD does not comply with the CD player specification. 3) See notes on Audio and MP3 CDs
• The operating panel generates some heat.	1) No error	1) Normal. The unit feels warm.
• The volume decreases automatically.	1) An integrated safety circuit prevents the temperature in the unit from exceeding a certain value.	1) Allow the unit to cool down (set low volume)
• Navigation radio not functioning, no function of display	No power supply	Check the fuse (unit and vehicle) and the connections
• No radio reception		1) Check if the antenna is completely and correctly connected.
• Poor radio reception		1) Antenna (disc antenna) obscured, antenna rod bent or antenna defective. 2) Please arrange for an authorized dealer to check the antenna.
• The frequency instead of the station name is displayed.		1) The unit is tuned to a station that does not transmit RDS signals or the transmitter is too weak.
• The required station cannot be tuned to using automatic search.	1) The desired station is too weak.	1) Set desired station manually (manu. tuning) 2) Check whether the antenna is completely and correctly connected.
• No traffic announcements are switched through (during CD playback)		1) Activate the traffic announcment by pressing the TA button
• Distorted sound/skips during CD play.		1) Player cannot read CD. CD is damaged or soiled.
• CD player does not work	1) In cold weather conditions, condensation may occur on the laser.	1) With the set on, wait for 5 minutes until the condensation evaporates.
• No sound during CD playback		1) Some CDs contain multimedia data which is not recognized by the unit.

		2) Advance the tracks until music is hea 3) See notes on Audio and MP3 CDs.
• Problems with new copyprotected audio CDs.	1) See notes on Audio and MP3 CDs.	1) Some copy protection procedures are incompatible with acceptable standards for audio CDs. This is not a fault on the unit.

English ▼

Navigation Check Procedure

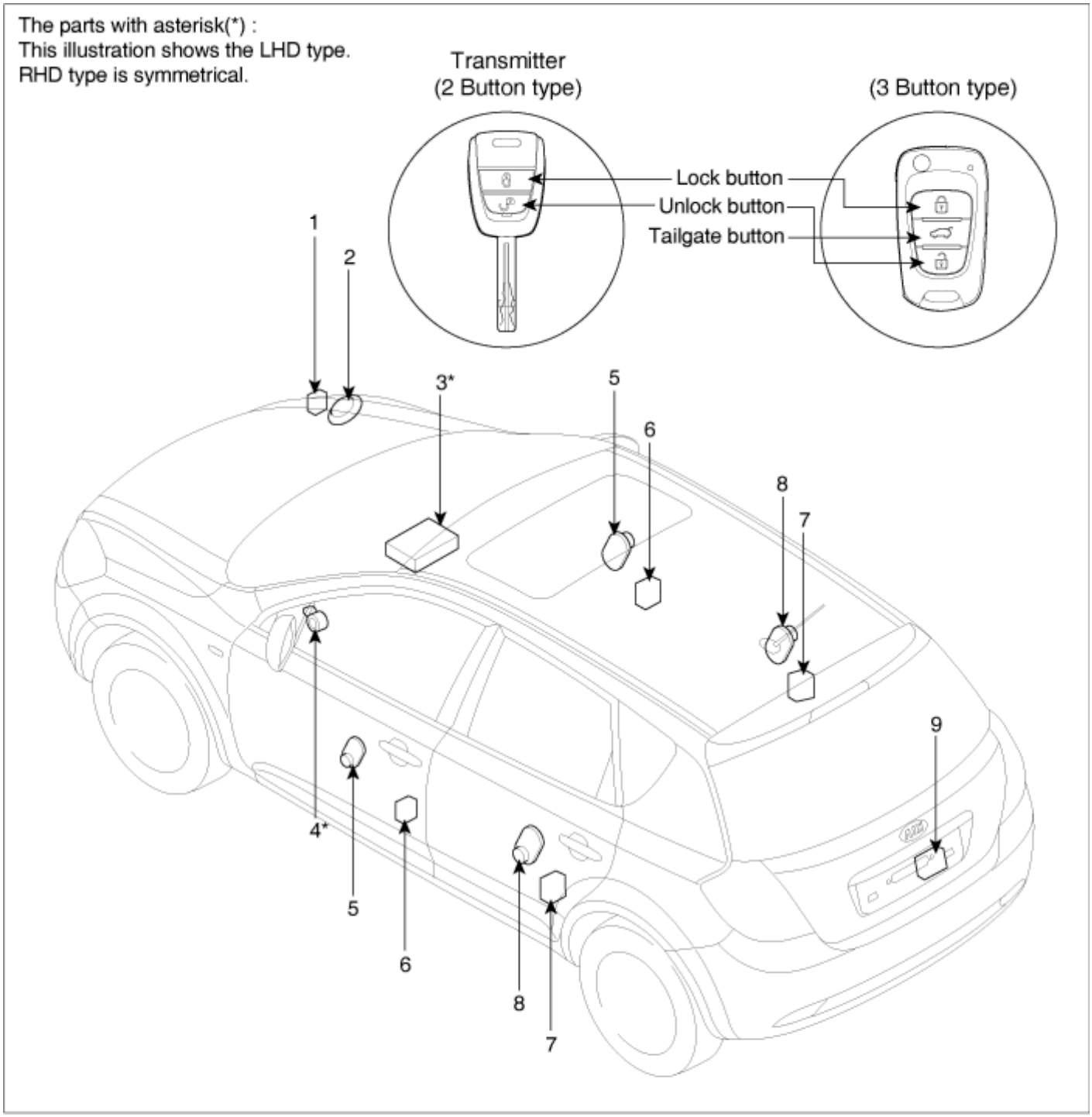
Status	Cause	How to check
• Display shows "Please insert map CD"	The map CD is required for some functions in naviation mode.	Insert the C-IQ map CD into the radio CDdrive with the label facing upwards.
• The direction advices cannot be heard or are very quiet.	Navi volume to low	Set the navigation volume in the setup menu under "Navigation → Navi volume"
• Guidance is not accurate	An inaccuracy of appr. 30 m is within the tolerance limits.	1) If greater inaccuracies ocur repeatedly, please contact your dealer. 2) The displayed distance to the turning point is calculated to the centre of the junction (especially for extended junctions and mainroad exits).
• Display position does not correspond to the actual traffic conditions.	It is possible that the car's position as calculated by the navigation system is not currently correct.	The routing may have been changed and does not correspond with the information stored on the map CD.
• Displayed time is incorrect.		Adjust the time zone using the "Clock/Date → Time Zone" option in the setup menu
Estimated time of arrival displayed on the guidance screen is incorrect.		Check the time zone using the "Clock/Date → Time Zone" option in the setup menu

SPECIFICATIONS

ITEM	
Rated voltage	DC 3V
Service voltage range	DC 2.7V ~ 3.5V
Temperature range	-4°F ~ 140°F (-20°C ~ +60°C)
Storage temperature range	-22°F ~ 176°F (-30°C ~ +80°C)
DARK CURRENT	MAX 0.1㎃
Modulation method	FM(Frequency Modulation)
FREQUENCY	433.92MHz
CODE	Rolling Code
Lifetime of a dry cell	20 years (20 times/day)

English ▼

COMPONENT LOCATION



1. Hood switch
2. Burglar horn
3. Body control module
4. Key warning switch
5. Front door switch
6. Front door lock actuator & switch
7. Rear door lock actuator & switch
8. Rear door switch
9. Tailgate actuator & switch

DESCRIPTION

Burglar Alarm System

The burglar alarm system is armed automatically after the doors, hood, and tailgate are closed and locked.
The system is set off when any of these things occur :

- A door is forced open.
- The tailgate is opened.
- The hood is opened.

When the system is set off, the alarm sounds and the hazard lamp flash for about 30 seconds or until the system is disarmed by unlocking the transmitter or door key.
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 tailgate are closed and locked. When everything is closed and locked, none of the control unit inputs are grounded. The door switches, hood switch and tailgate switch are all close and lock the doors with the remote transmitter and then the system arms immediately.
If anything is opened 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.

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 again, 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.

FUNCTION

Keyless Entry Function

DOOR LOCK / UNLOCK and Tailgate (Folding key only) operation are performed with remocon

1. Keyless entry function is performed in a state that key in SW is eliminated from key cylinder
2. LOCK / UNLOCK and tailgate signals are received from the transmitter and DOOR LOCK / UNLOCK and Tailgate signals are output.

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	A
2	A	B	B (A is deleted)

English ▼

3	B	C, D	C, D (B is dele
4	C, D	E, F, G	E, F, G (C, D is deleted)
5	E, F, G	H, I, J, K	H, I, J, K (E, F, G are deleted)
6	A, B	C, F, E, F, G	C, F, E, F
7	A, B	C, C, D, E, F	C, D, E, F
8	A, B, C, D	A	A
9	A, B, C, D	E	E

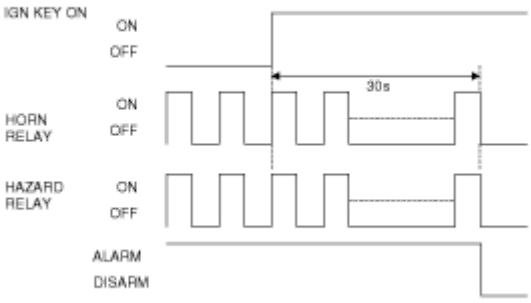
(3) For the registration procedures by using Hi-scan tool, refer to "TRANSMITTER CODE REGISTRATION".

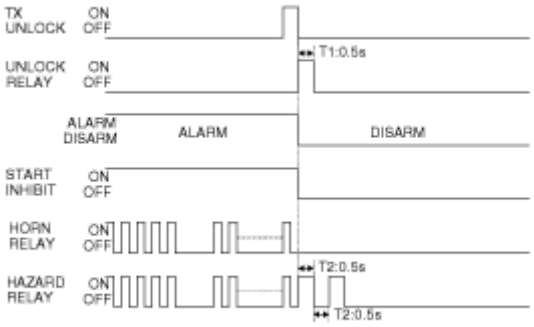
3. Transmitter signal & Receiver Spec
   (1) Transmission signal
   - Transmit relevant transmission DATA (Transmission frame) twice by pushing TX SW.
   - Only LOCK signal is output when pushing TX LOCK SW and UNLOCK SW at the same time.

DISARM

Condition 1

State	Description
Initial Condition	ALARM state
Event	• IGN KEY ON during 30sec or ALT"L" = ON • TX(Transmitter) Unlock & Any Door open(4Door SW ON) • TX(Transmitter) Lock & Lock confirm failed • Driver door key unlock switch ON. • Driver door key lock SW ON & Lock confirm failed • TX tailgate ON (Folding key type only : 3 button).
Action	• The state goes to DISARM state • Hazard relay off, Horn relay off and start inhibit relay off. • TX Unlock – Unlock relay on for 0.5 sec. – Hazard relay on (TWICE)





Condition 2

State	Description
Initial Condition	DISARM state & (IGN KEY OUT) & Any Door open
Event	• TX Unlock
Action	• No state change • TX UNLOCK – Unlock relay on for 0.5 sec – Hazard relay on (Twice)

Condition 3

State	Description
Initial Condition	ARMWAIT state
Event	• At least one entrance opened • Any door is unlocked • Key in SW ON • Driver door key unlock SW ON
Action	The state goes to DISARM state

Condition 4

State	Description
Initial Condition	AUTOLOCKTIMER1 state
Event	• At least one entrance opened • Key in SW ON • Lock by AUTOLOCK, but Lock confirmation failure • Tx Lock, but Lock confirmation failure • Driver door key unlock SW ON, but Lock confirmation failure
Action	• The state goes to DISARM state

Condition 5

State	Description
Initial Condition	AUTOLOCKTIMER2 state
Event	• Any Door open • Key in SW ON • Lock by AUTOLOCK, but Lock confirmation failure • Tx Lock, but Lock confirmation failure • Driver door key lock SW ON, but Lock confirmation failure
Action	• The state goes to DISARM state

Condition 6

State	Description
Initial Condition	ARM state
Event	• IGN KEY ON • Driver door key unlock SW ON
Action	• The state goes to DISARM state

Condition 7

State	Description
Initial Condition	REARM state
Event	• IGN KEY ON during 30sec or ALT"L" = ON • Tx Lock, but Lock confirmation failure • Driver door key unlock SW ON • Driver door key lock SW ON & Lock confirmation failure • TX tailgate ON (Folding key type only : 3 button).
Action	• The state goes to DISARM state • Start Inhibit relay OFF

Condition 8

State	Description
Initial Condition	PREARM state
Event	• Key in SW ON • All entrance closed & Any Door is unlocked • Any Door open & Tx Unlock
Action	• The state goes to DISARM state • TX UNLOCK – Unlock relay on for 0.5sec

	– Hazard relay on (Twice)

Condition 9

State	Description
Initial Condition	AutoLockTimer3 state
Event	• Key in SW ON • Hood open • Any Door open • Lock confirm failed
Action	• The state goes to DISARM state

ARM

– LED is Blinking

Condition 1

State	Description
Initial Condition	ARM state
Event	• Tx Lock
Action	• No state change • Hazard relay 1Time on(1sec)

Condition 2

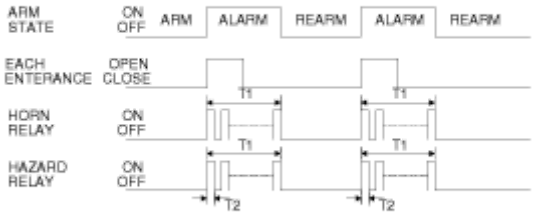
State	Description
Initial Condition	ARMWAIT state
Event	• ARMWAITTIMER is expired
Action	• The state goes to ARM state

ALARM

– LED is Blinking

Condition 1

State	Description
Initial Condition	ARM state
Event	• Any entrance open (DOORS, TAILGATE, or HOOD)
Action	• The state goes to ALARM state • The horn is ON one time for 27sec(±2sec) • The hazard is driven also (During Horn driving) • Engine Start Inhibit is ON



T1 : 27s ± 2sec, T2 : 0.5s ± 0.1sec.

> **NOTICE**
>
> Horn Output : Period : 1sec(Can be calibrated Horn Period), 50% Duty

Condition 2

State	Description
Initial Condition	REARM state
Event	• Any door open or Hood open or tailgate open
Action	• The state goes to ALARM state • The horn is ON one time for 27sec (±2sec.) • The hazard is driven also (During horn driven)

ARM WAIT MODE

– LED is turn on

Condition 1

State	Description
Initial Condition	ARMWAIT state
Event	• Tx Lock
Action	• The state goes to State • TX LOCK – Hazard relay 1 Time on(1sec)

Condition 2

State	Description
Initial Condition	DISARM state & IGN KEY OUT & All entrances closed (DOORS, HOOD and TAILGATE)
Event	• Tx Lock & locked confirmed • Driver door key lock SW ON & Locked confirmed

Action	• The state goes to ARMWAIT State • Start ARMWAITTIMER • TX LOCK & locked confirmed. – Hazard relay 1 Time on (1 sec.)

Condition 3

State	Description
Initial Condition	ALARM state & All entrances closed(DOORS, HOOD and TAILGATE)
Event	• Tx Lock & locked confirmed • Driver door key lock SW ON & Locked confirmed
Action	• The state goes to ARMWAIT state • Start ARMWAITTIMER • Horn relay off • Start inhibit relay off • Hazard relay 1Time on(1sec)

Condition 4

State	Description
Initial Condition	AUTOLOCKTIMER1 state
Event	• AUTO LOCK confirmed • Tx Lock & locked confirmed • Driver door key lock SW ON & Locked confirmed
Action	• The state goes to ARMWAIT state • Start ARMWAITTIMER • Hazard relay 1Time on(1sec)

Condition 5

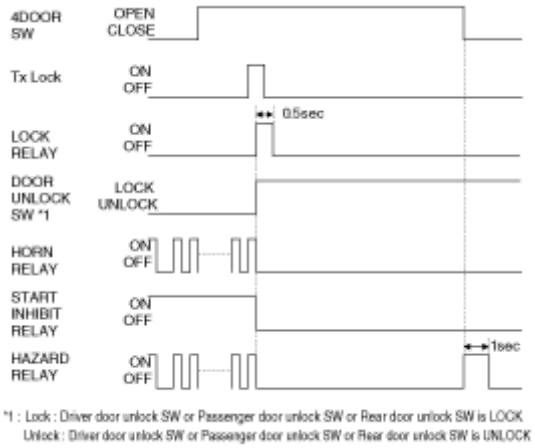
State	Description
Initial Condition	PREARM state
Event	• Hood and 4door are closed & All doors locked & Tailgate closed.
Action	• The state goes to ARMWAIT state • Start ARMWAITTIMER • Hazard relay 1Time on(1sec) • Dead lock • Tailgate mark = set

Condition 6

State	Description
Initial Condition	REARM state
Event	• Tx Lock & locked confirmed • Drive door key lock SW ON & locked confirmed
Action	• The state goes to ARMWAIT state • Start ARMWAITTIMER • Start inhibit relay off • Hazard relay 1Time on(1sec)

Condition 7

State	Description
Initial Condition	Auto Lock Timer3 state
Event	• Tx Lock & locked confirmed • Drive door key lock SW ON & locked confirmed
Action	• The state goes to ARMWAIT state • Start ARMWAITTIMER • Start inhibit relay off • Hazard relay 1Time on(1sec)



*1 : Lock : Driver door unlock SW or Passenger door unlock SW or Rear door unlock SW is LOCK
Unlock : Driver door unlock SW or Passenger door unlock SW or Rear door unlock SW is UNLOCK

REARM MODE

– LED is Blinking

Condition 1

State	Description
Initial Condition	ALARM state
Event	• All entrance is closed & Alarm Patten finished
Action	• The state goes to REARM state

AUTOLOCKTIMER1 MODE

– LED is Blinking

Condition 1

State	Description
Initial Condition	ARM state
Event	• Tx Unlock
Action	• The state goes to AUTOLOCKTIMER1 state • Start AUTOLOCKTIMER1 • Hazard relay Twice on(0.5s ON/0.5s OFF)

Condition 2

State	Description
Initial Condition	AUTOLOCKTIMER1 state
Event	• Timer is expired • Tx Unlock
Action	• The state goes to State • Tx Unlock – Hazard relay Twice on(0.5s ON/0.5s OFF) – Restart AUTOLOCKTIMER1 • Expire AUTOLOCKTIMER1 – AUTOLOCK

Condition 3

State	Description
Initial Condition	ARMWAIT state
Event	• Tx Unlock
Action	• The state goes to AUTOLOCKTIMER1 state • Start AUTOLOCKTIMER1 • Hazard relay Twice on(0.5s ON/0.5s OFF)

Condition 4

State	Description
Initial Condition	DISARM state & All entrances closed (DOORS, HOOD & TAILGATE) & IGN KEY OUT
Event	• Tx Unlock
Action	• The state goes to AUTOLOCKTIMER1 state • Start AUTOLOCKTIMER1

	• Hazard relay Twice on(0.5s ON/0.5s OFF)

Condition 5

State	Description
Initial Condition	ALARM state & All entrances are closed (DOORS, HOOD & TAILGATE)
Event	• Tx Unlock
Action	• The state goes to AUTOLOCKTIMER1 state • Start AUTOLOCKTIMER1 • 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	• Tx Unlock
Action	• The state goes to AUTOLOCKTIMER1 state • Start AUTOLOCKTIMER1 • Hazard relay Twice on(0.5s ON/0.5s OFF) • Start inhibit relay off

Condition 7

State	Description
Initial Condition	Auto Lock Timer3 state
Event	• Tx Unlock
Action	• The state goes to AUTOLOCKTIMER1 state • Start AUTOLOCKTIMER1 • Hazard relay Twice on(0.5s ON/0.5s OFF)

AUTOLOCKTIMER2 MODE

– LED is blinking

Condition 1

State	Description
Initial Condition	AUTOLOCKTIMER2 state
Event	• Timer is expired • Tx Unlock

Action	• No State change • Tx Unlock – Hazard relay Twice on(0.5s ON/0.5s OFF) – The timer restart • Expire AUTOLOCKTIMER2 – AUTOLOCK

Condition 2

State	Description
Initial Condition	DISARM state & All Doors are closed & (HOOD is opened) & IGN KEY OUT
Event	• Tx Unlock
Action	• The state goes to AUTOLOCKTIMER2 state • Start AUTOLOCKTIMER2 • Hazard relay Twice on(0.5s ON/0.5s OFF)

Condition 3

State	Description
Initial Condition	ALARM state & All Door are closed & (HOOD is opened)
Event	• Tx Unlock
Action	• The state goes to AUTOLOCKTIMER2 state • Start AUTOLOCKTIMER2 • Hazard relay Twice on(0.5s ON/0.5s OFF) • Start inhibit relay off • Horn relay off

Condition 4

State	Description
Initial Condition	PREARM state All Doors are closed & (HOOD is opened)
Event	• Tx Unlock
Action	• The state goes to AUTOLOCKTIMER2 state • Start AUTOLOCKTIMER2 • Memorize Hood and Tailgate state • Hazard relay Twice on(0.5s ON/0.5s OFF)

AUTO LOCK TIMER3 MODE

- LED is blinking

Condition 1

State	Description
Initial Condition	ARM state
Event	• Tx TAILGATE Unlock
Action	• The state goes to AUTO LOCK RELAY TIMER3 state • Start AUTO LOCK RELAY TIMER3 • Hazard relay Twice on(0.5s ON/0.5s OFF) • TAILGATE Mark=set • Dead unlock

Condition 2

State	Description
Initial Condition	AutoLockTimer3 state
Event	• Tx TAILGATE Unlock
Action	• Restart AUTO LOCK TIMER3 state

Condition 3

State	Description
Initial Condition	ARMWAIT state
Event	• Tx TAILGATE Unlock
Action	• The state goes to AUTO LOCK RELAY TIMER3 state • Start AUTO LOCK RELAY TIMER3 • Dead Unlock • Hazard relay Twice on(0.5s ON/0.5s OFF) • TAILGATE Mark=set

PREARM MODE

– LED is blinking

Condition 1

State	Description
Initial Condition	AUTOLOCKTIMER2 state
Event	• AUTOLOCK confirmed • Tx Lock & locked confirmed • Driver door key lock SW ON & Locked confirmed
Action	• The state goes to PREARM state

Condition 2

State	Description
Initial Condition	DISARM state & IGN KEY OUT
Event	• ((4Door Not Closed = ON & Tailgate SW = OFF or (Hood SW = ON)) & Tx Lock & Locked confirmed • ((4Door Not Closed = ON & Tailgate SW = OFF or (Hood SW = ON)) & driver door key lock SW ON on & Locked confirmed
Action	• The state goes to PREARM state

Condition 3

State	Description
Initial Condition	ALARM state & Hood SW = ON
Event	• Tx Lock & Locked confirmed • Driver door key lock SW ON & Locked confirmed
Action	• The state goes to PREARM state • Start inhibit relay off • Horn relay off • Hazard relay 1Time on (1sec.)

Condition 4

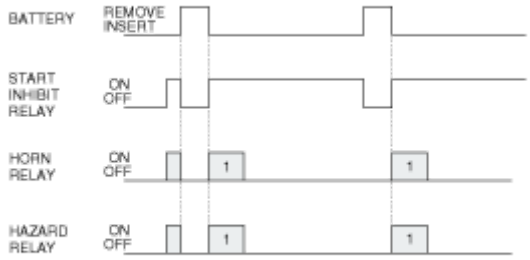
State	Description
Initial Condition	AUTOLOCKTIMER3 state
Event	• Expire Auto Lock Timer3 • Tailgate open
Action	• The state goes to PREARM state.

RESET

1. In case of taking the battery out during the ALARM state

Condition 1

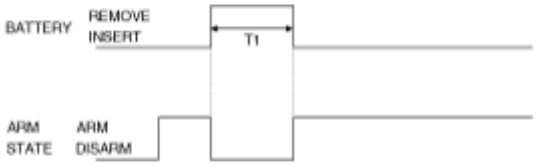
State	Description
Initial Condition	During ALARM, REARM
Event	• TAKING THE BATTERY OUT (Cold or Warm RESET)
Action	• The state goes to ALARM mode • Horn relay 1 Times on (No remained time of warning signal) • Hazard lamp is flashing during making horn



2. In case of taking the battery out during arm

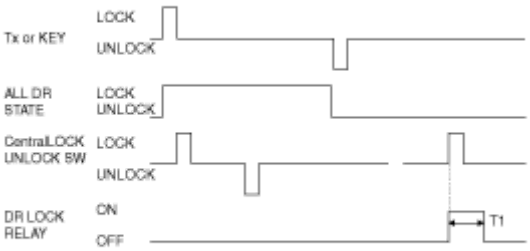
Condition 2

State	Description
Initial Condition	ARM state
Event	• TAKING THE BATTERY OUT (Cold or Warm RESET)
Action	• The state goes to ARM mode • Maintained ARM state



The Restricted Function Of Unlock By Centrol Door Lock Sw

1. In IGN Key OUT, UNLOCK is restricted by Central Door Lock SW if All DR LOCK & CLOSED when TX LOCK.
2. In IGN Key OUT, UNLOCK is restricted by Central Door Lock SW if All DR LOCK & CLOSED when DR LOCK by DRV DR Key.
3. The restricted function of UNLOCK is canceled when TX UNLOCK signal output during the restricted function of Central Door Lock SW.
4. The restricted function of UNLOCK is canceled when DR UNLOCK signal output during the restricted function of Central Door Lock SW.



T1 : 0.5s ± 0.1s

Tailgate Release Function

Permissive Mode State

State	Description
Initial Condition	PROHIBITIONAL MODE STATE
Event	Any Door Unlocked
Operating	MOVE TO PERMISSIVE MODE STATE

State	Description
Initial Condition	30s PERMISSIVE MODE STATE
Event	Any Door Unlocked
Operating	MOVE TO PERMISSIVE MODE STATE

State	Description
Initial Condition	PERMISSIVE MODE STATE
Event	TAILGATE RELEASE SW = ON
Operating	• TAILGATE RELEASE RELAY 0.5SEC ON • MOVE TO PERMISSIVE MODE STATE

30s Permissive Mode State

State	Description
Initial Condition	PROHIBITIONAL MODE STATE
Event	TAILGATE UNLOCK
Operating	• START TAILGATE TIMER • HAZARD 2 FLASHING • MOVE TO 30s PERMISSIVE MODE STATE

State	Description
Initial Condition	30s PERMISSIVE MODE STATE
Event	TAILGATE UNLOCK

Operating	• RESTART TGATE TIMER • HAZARD 2 times FLASHING • MOVE TO 30s PERMISSIVE MODE STATE

State	Description
Initial Condition	30s PERMISSIVE MODE STATE
Event	TAILGATE RELEASE SW = ON
Operating	• TAILGATE RELEASE RELAY OUTPUT FOR 0.5s • MOVE TO 30s PERMISSIVE MODE STATE

Prohibitional Mode State

State	Description
Initial Condition	30s PERMISSIVE MODE STATE
Event	• TAILGATE OPEN→CLOSE • 4Door Lock Confirm
Operating	MOVE TO PROHIBITIONAL MODE STATE

State	Description
Initial Condition	30s PERMISSIVE MODE STATE
Event	TAILGATE TIMER IS EXPIRED
Operating	MOVE TO PROHIBITIONAL MODE STATE

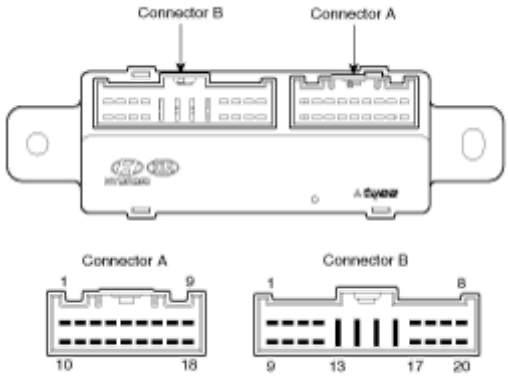
State	Description
Initial Condition	PERMISSIVE MODE STATE
Event	4Door Lock Confirm
Operating	MOVE TO PROHIBITIONAL MODE STATE

INSPECTION

Burglar Alarm Horn Relay

Check for continuity between the terminals.

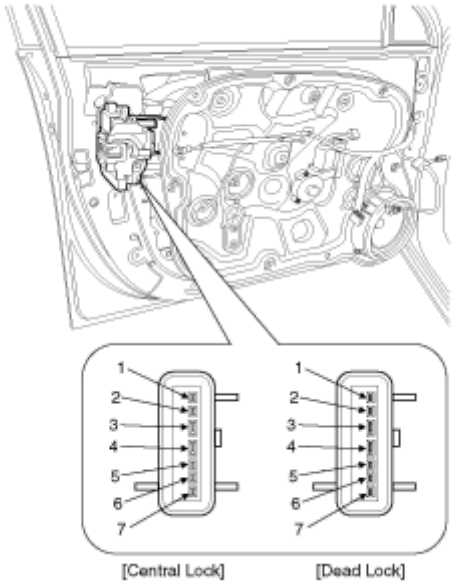
1. There should be continuity between the No.3 and No.11 terminals when power and ground are connected to the No.11 and No.12 in the ICM-A.
2. There should be no continuity between the No.3 and No.11 terminals when power is disconnected.



Front Door Lock Actuator

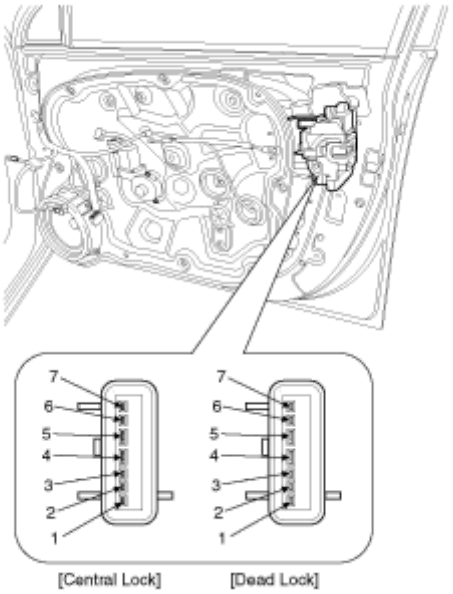
1. Remove the front door trim.
   (Refer to the BD group - Front door)
2. Remove the front door module.
   (Refer to the BD group - Front door).
3. Disconnect the connectors from the actuator.

[LHD]



[RHD]

English ▼



4. Check actuator operation by connecting power and ground according to the table. To prevent damage to the actuator, apply battery voltage only momentarily.

[Central Lock] ( ) : RHD

Position \ Terminal		5(3)	6(2)
Front left	Lock	⊕	⊖
	Unlock	⊖	⊕
Position \ Terminal		2(6)	3(5)
Front right	Lock	⊖	⊕
	Unlock	⊕	⊖

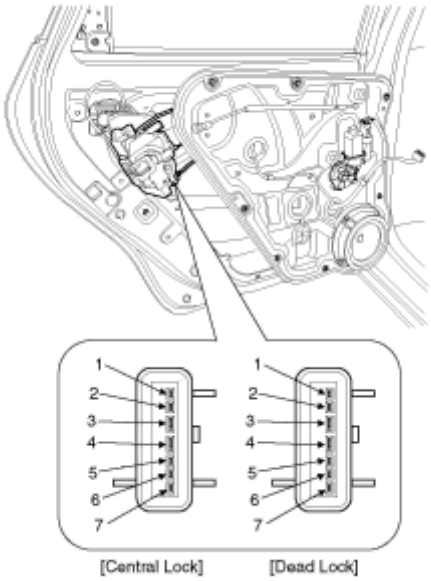
[Dead Lock] RHD only

Position \ Terminal		1	2
Front left	Lock	⊕	⊖
	Unlock	⊖	⊕
Position \ Terminal		7	6
Front right	Lock	⊕	⊖
	Unlock	⊖	⊕

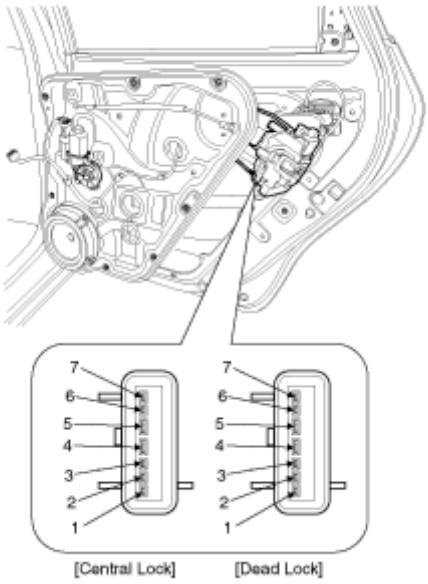
Rear Door Lock Actuator

1. Remove the rear door trim.
   (Refer to the BD group - Rear door)
2. Remove the rear door module.
   (Refer to the BD group - Rear door)
3. Disconnect the connectors from the actuator.

   [LHD]



[RHD]



4. Check actuator operation by connecting power and ground according to the table. To prevent damage to the actuator, apply battery voltage only momentarily.

[Central Lock] ( ) : RHD

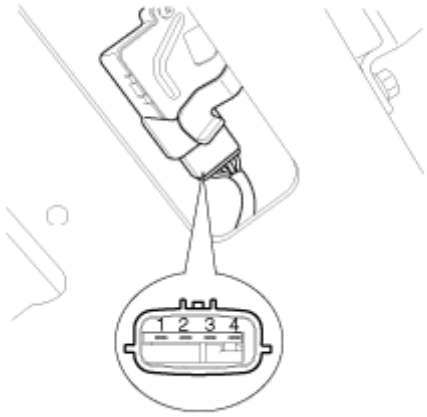
Position \ Terminal		5(3)	6(2)
Rear left	Lock	⊕	⊖
	Unlock	⊖	⊕
Position \ Terminal		2(6)	3(5)
Rear right	Lock	⊖	⊕
	Unlock	⊕	⊖

[Dead Lock] RHD only

Position \ Terminal		1	2
Rear left	Lock	⊕	⊖
	Unlock	⊖	⊕
Position \ Terminal		7	6
Rear right	Lock	⊕	⊖
	Unlock	⊖	⊕

Tailgate Lock Actuator Inspection

1. Remove the tailgate trim. (Refer to the BD group - tailgate)
2. Disconnect the 4P connector from the actuator.



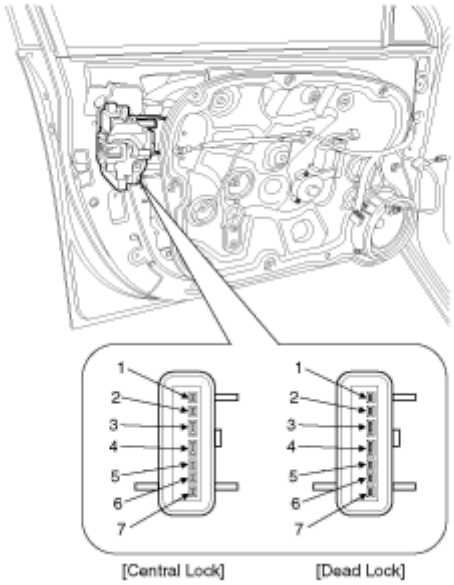
3. Check actuator operation by connecting power and ground according to the table. To prevent damage to the actuator, apply battery voltage only momentarily.

Position \ Terminal	3	4
Unlock	⊕	⊖

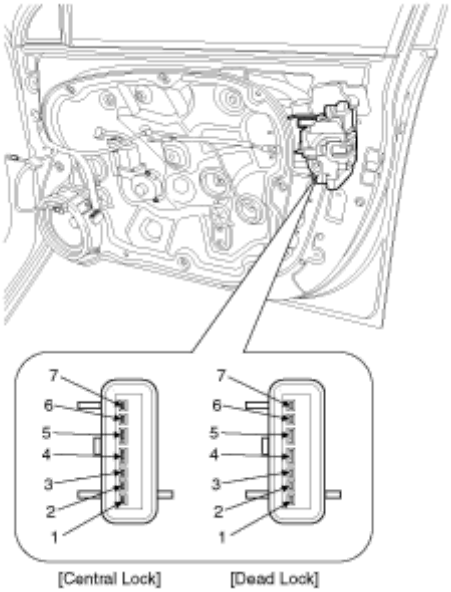
Front Door Lock Switch

1. Remove the front door trim.
   (Refer to the BD group - Front door)
2. Remove the front door module.
   (Refer to the BD group - Front door).
3. Disconnect the connectors from the actuator.

[LHD]



[RHD]



4. Check for continuity between the terminals in each switch position when inserting the key into the door according to the table.

[CENTRAL LOCK] ( ) : RHD

Position \ Terminal			2(6)	3(5)	4(4)
Central door lock	Front left	Clockwise	○	○	
		Counter-clockwise		○	○
Position \ Terminal			4(4)	5(3)	6(2)
Central door lock	Front right	Clockwise	○	○	
		Counter-clockwise		○	○

[DEAD LOCK] ( ) : RHD

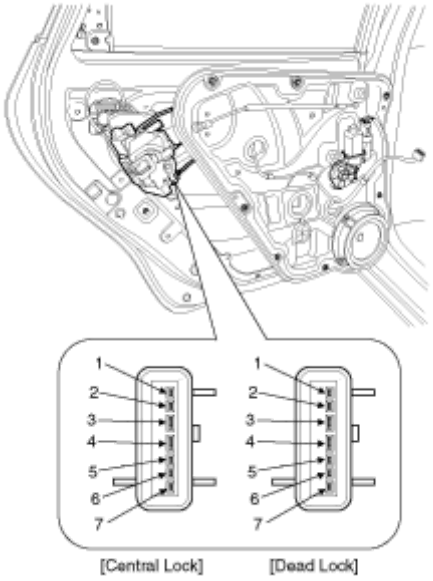
Position \ Terminal			2(6)	3(5)	4(4)
Central door lock	Front left	Clockwise	○	○	
		Counter-clockwise		○	○

Position \ Terminal			4(4)	5(3)	6(2)
Central door lock	Front right	Clockwise	○	○	
		Counter-clockwise		○	○

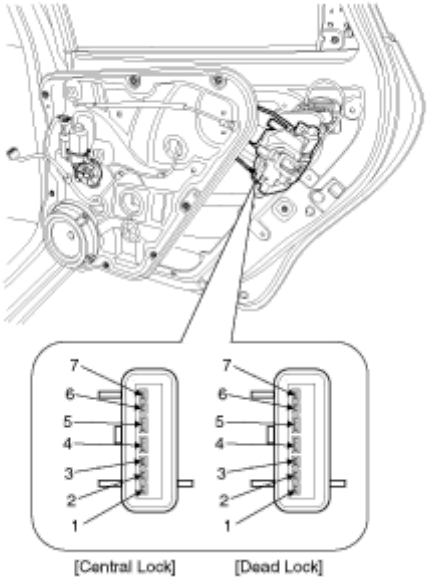
Rear Door Lock Switch

1. Remove the rear door trim.
   (Refer to the BD group - Rear door)
2. Remove the rear door module.
   (Refer to the BD group - Rear door)
3. Disconnect the connectors from the actuator.

[LHD]



[RHD]



4. Check for continuity between the terminals in each switch position according to the table.

[CENTRAL LOCK] ( ) : RHD

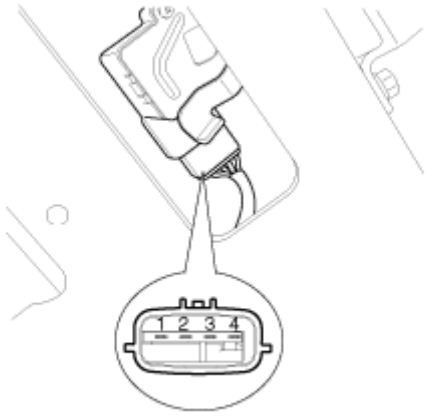
Position \ Terminal			1(7)	3(5)
Central door lock	Front left	lock		
		Unlock	○———	———○

[DEAD LOCK] ( ) : RHD

Position \ Terminal			1(7)	3(5)
Central door lock	Front left	lock		
		Unlock	○———	———○

Tailgate Switch

1. Remove the tailgate trim. (Refer to the BD group - Tailgate)
2. Disconnect the 4P connector from the actuator.

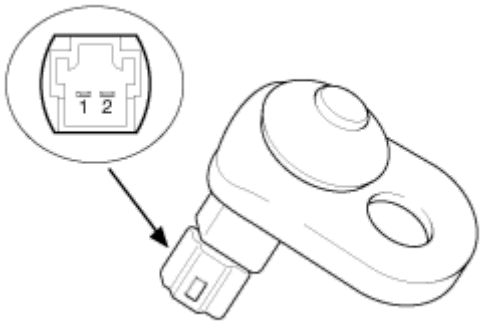


3. Check for continuity between the terminals in each switch position according to the table.

Position \ Terminal	1	2
Lock		
Unlock	○———	———○

Door Switch

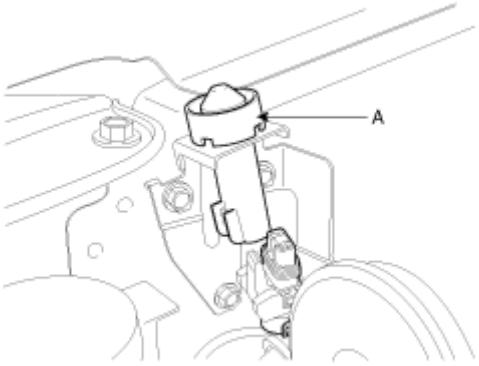
Remove the door switch and check for continuity between the terminals.



Position \ Terminal	1	2	Body (Ground)
Free(Door open)	○	○	○
Push(Door close)			

Hood Switch

1. Disconnect the connector from the hood switch (A).

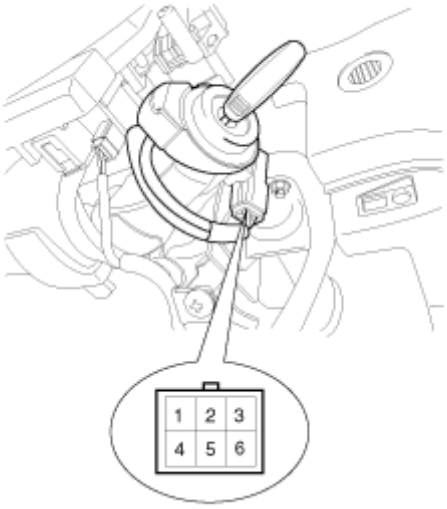


2. Check for continuity between the terminals and ground according to the table.

Position \ Terminal	1	2
Hood open (Free)	○	○
Hood close (Push)		

Key Warning Switch

1. Remove the crash pad lower panel. (Refer to Body group-Crash pad)
2. Disconnect the 6P connector from the key warning switch.

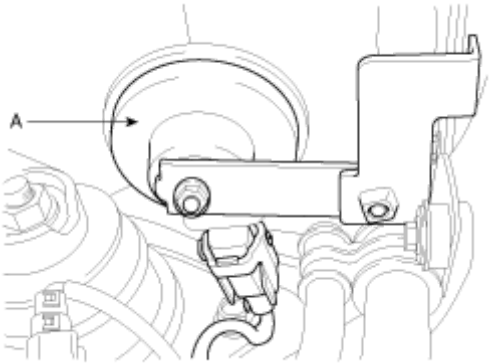


3. Check for continuity between the terminals in each position according to the table.

Terminal / Key position	2	4
Insert	○	○
Removal		

Burglar Horn

1. Remove the burglar horn(A) after removing 1 bolt and disconnect the 2P connector from the burglar horn.



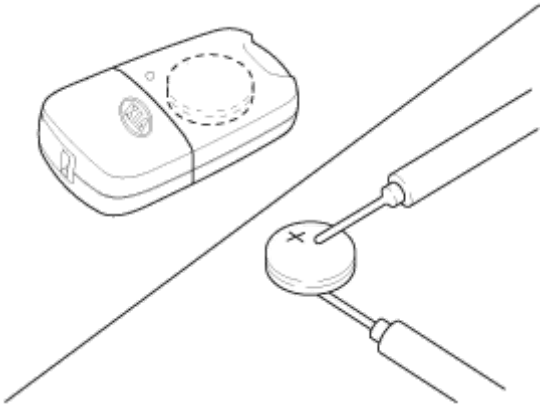
2. Test the burglar horn by connecting battery power to the terminal 1 and ground the terminal 2.
3. The burglar horn should make a sound. If the burglar horn fails to make a sound replace it.

SPECIFICATION

Items		Specifications
Keyless entry transmitter Power source		Lithium 3V battery (1EA)
Transmissible distance		30m or more
Life of battery		2 years or more (at 20 times per day)
Button	2 Button Type	2 (Door lock, Door unlock)
	3 Button Type (Folding key)	3 (Door lock, Door unlock, Tailgat)
Transmission frequency		433.92 MHz

INSPECTION

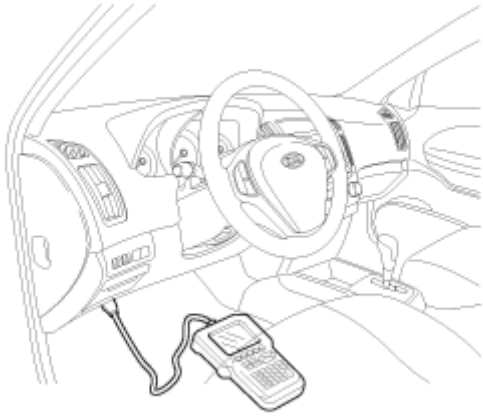
1. Check that the red light flickers when the door lock or unlock button is pressed on the transmitter.
2. Remove the battery and check voltage if the red light doesn't flicker.
   Standard voltage : 3V



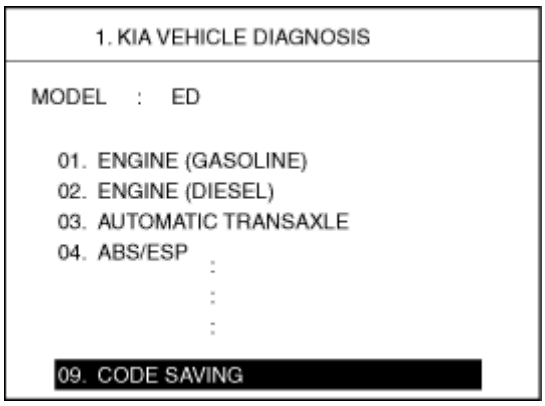
3. Replace the transmitter battery with a new one, if voltage is below 3V then try to lock and unlock the doors with the transmitter by pressing the lock or unlock button five or six times.
4. If the doors lock and unlock, the transmitter is O.K, but if the doors don't lock and unlock, register the transmitter code, then try to lock and unlock the doors.
5. If the transmitter is fails, replace only the transmitter (A).

TRANSMITTER CODE REGISTRATION

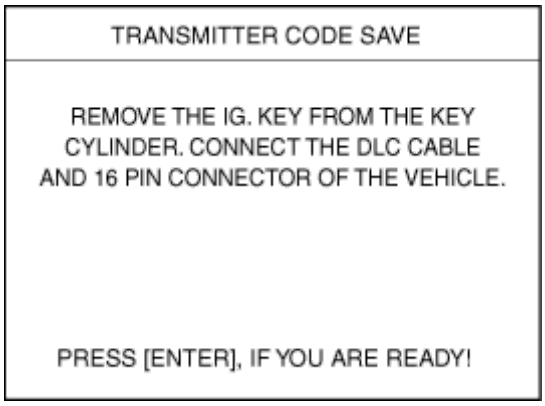
1. Connect the DLC cable of scan tool to the data link connector (16 pins) in driver side crash pad lower panel, turn the power on scan tool.



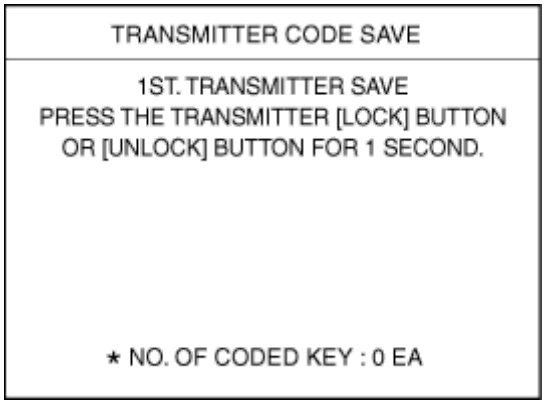
2. Select the vehicle model and then do "CODE SAVING".

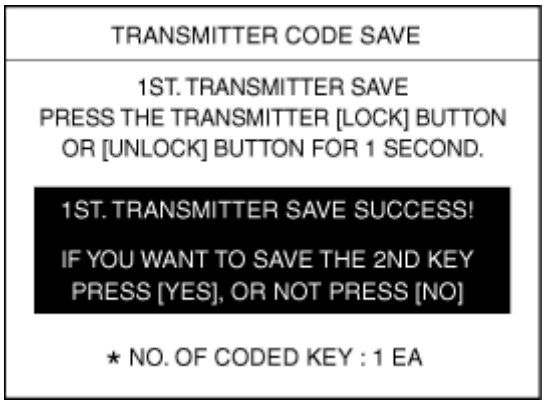


3. After selecting "CODE SAVING" menu, push "ENTER" key, then the screen will be shown as below.



4. After removing the ignition key from key cylinder, push "ENTER" key to proceed to the next mode for code saving. Follow steps 1 to 4 and then code saving is completed.





TRANSMITTER CODE SAVE

2ND. TRANSMITTER SAVE
PRESS THE TRANSMITTER [LOCK] BUTTON
OR [UNLOCK] BUTTON FOR 1 SECOND.

★ NO. OF CODED KEY : 1 EA

TRANSMITTER CODE SAVE

2ND. TRANSMITTER SAVE
PRESS THE TRANSMITTER [LOCK] BUTTON
OR [UNLOCK] BUTTON FOR 1 SECOND.

2ND. TRANSMITTER SAVE SUCCESS!

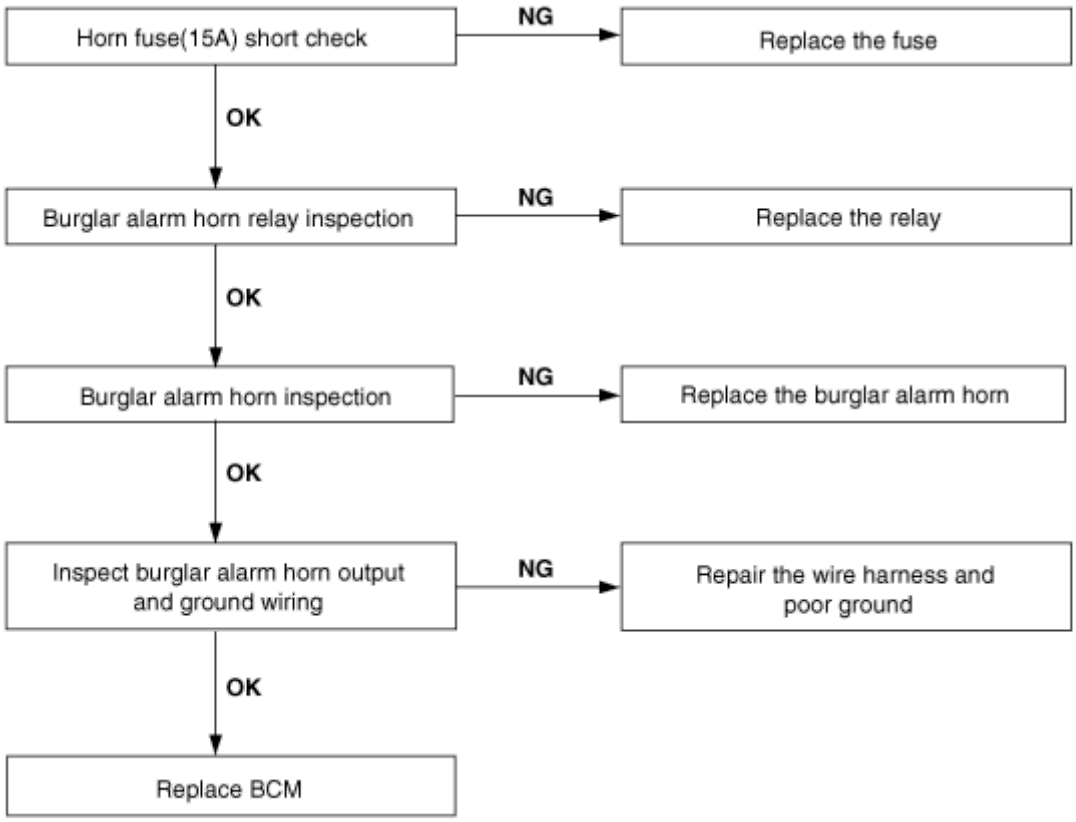
CODE SAVING IS COMPLETED!
IF YOU STOP, PRESS [ESC] KEY!!!

★ NO. OF CODED KEY : 2 EA

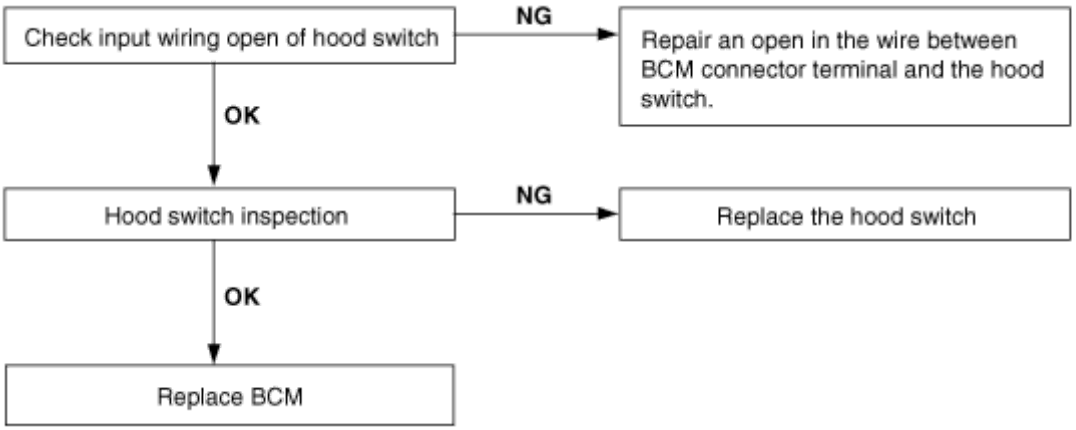
English ▼

TROUBLESHOOTING

1. Alarm does not work. (Hazard lamps work)

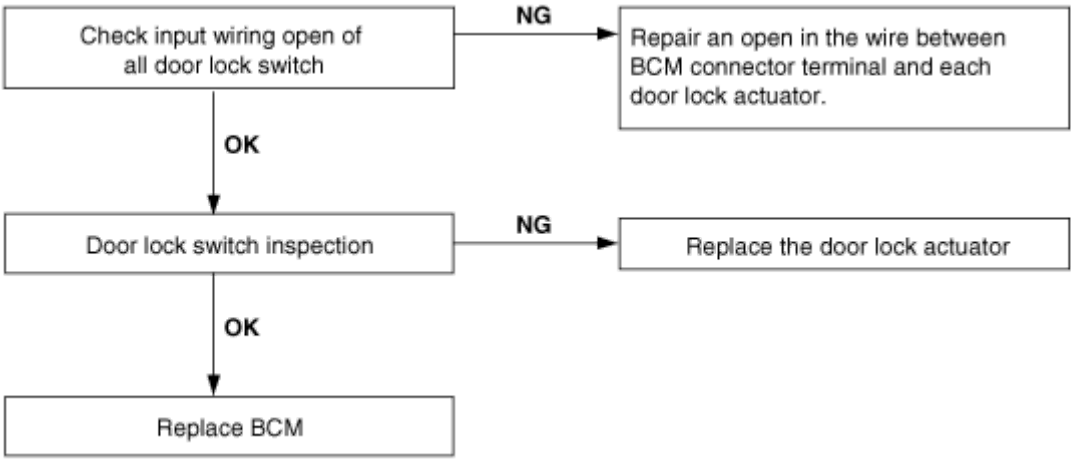


2. When hood is opened in ARM mode, burglar horn does not work.

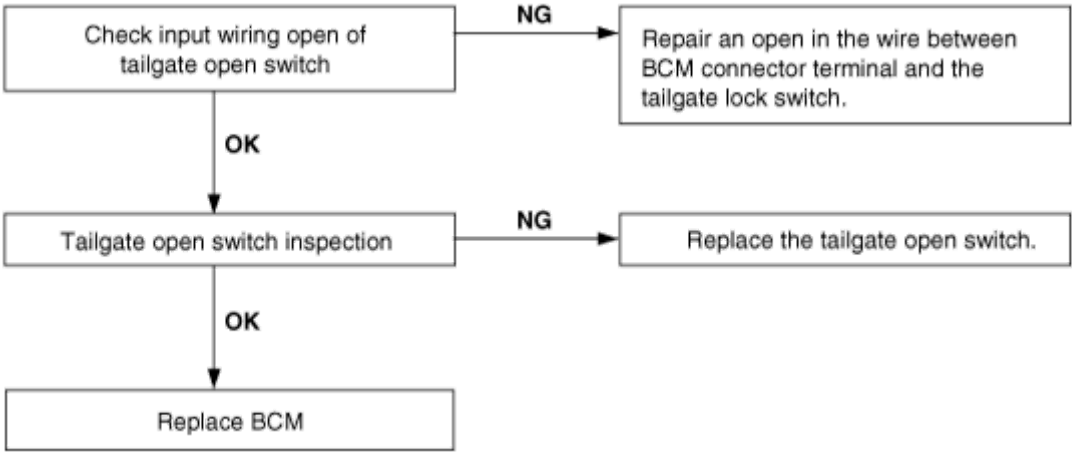


3. When door is opened, burglar horn does not work. (If tailgate and hood is opened, alarm works)

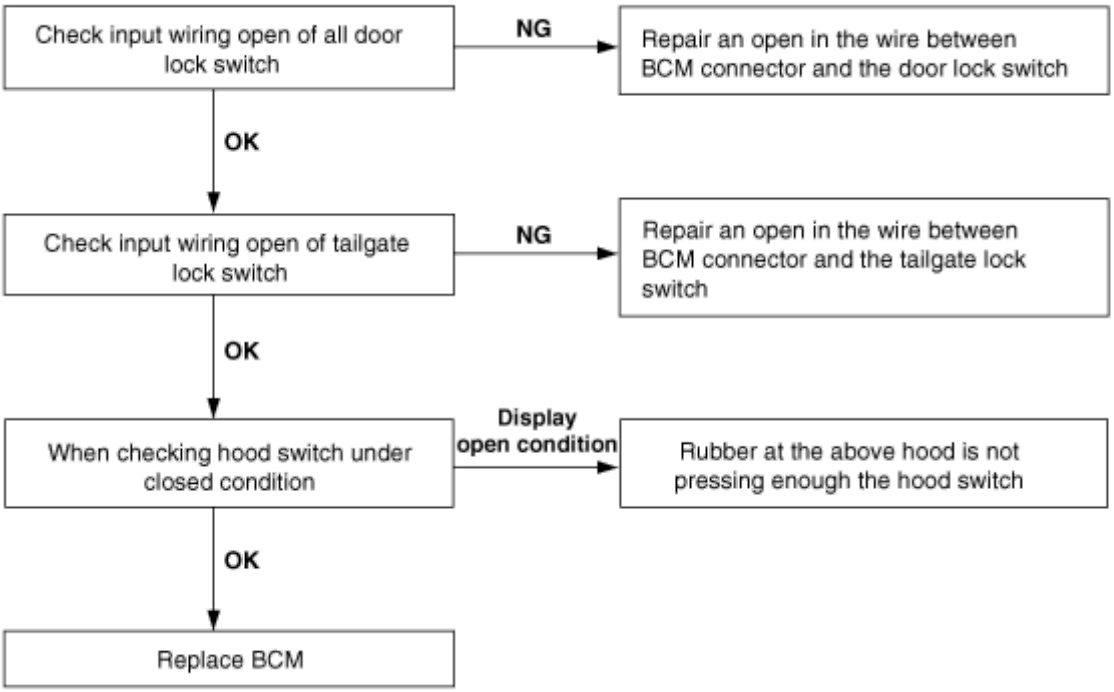
English ▼



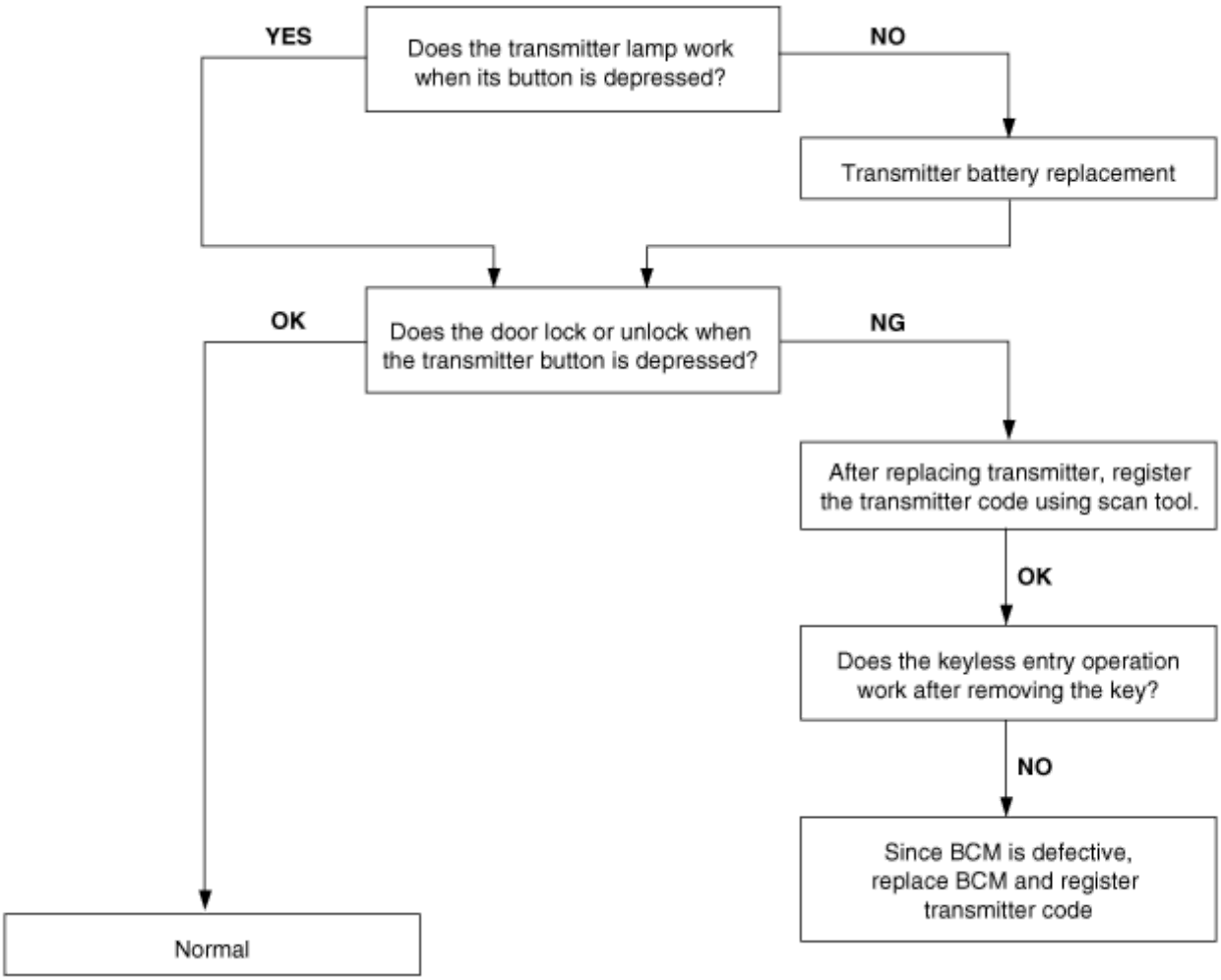
4. When tailgate is opened in ARM mode, burglar horn does not work.



5. When the vehicle is locked by the transmitter, central door lock function works but hazard lamp doesn't blink.



6. Central door lock function works, but keyless entry system does not work.


Does the transmitter lamp work when its button is depressed?
YES
NO
Transmitter battery replacement
Does the door lock or unlock when the transmitter button is depressed?
OK
NG
After replacing transmitter, register the transmitter code using scan tool.
OK
Does the keyless entry operation work after removing the key?
NO
Since BCM is defective, replace BCM and register transmitter code
Normal

SPECIFICATIONS

Item	Requirement	Remark
Rated voltage	DC 12V	Shall activate normally in these range.
Operating voltage range	DC 9 ~ 16V	
Operating temperature range	-30°C ~ +80°C	
storage temperature range	-40°C ~ +85°C	
Max humidity in use	95%	
High voltage resistance	24V	
Insulation resistance	100Mohm or more (measured with 500V MEGGER)	Specify as well as parts that insulation like PCB, moisture-proof COATING is required
Dark Current	Max 5.5mA (KEYLESS) (Included security IND Mean value) Max 3mA (NON-KEYLESS)	Measure when the state, all output loads excepted security IND are OFF and there are no Input SW(including TX operation) changes, continues 2sec.
Voltage drop	1.2V or less	Output terminals for TAIL LAMP RELAY, POWER WINDOW RELAY, SAFETY POWER WINDOW, BURGLAR ALARM RELAY shall be 2.0V or less, DRL, Wiper, Relay

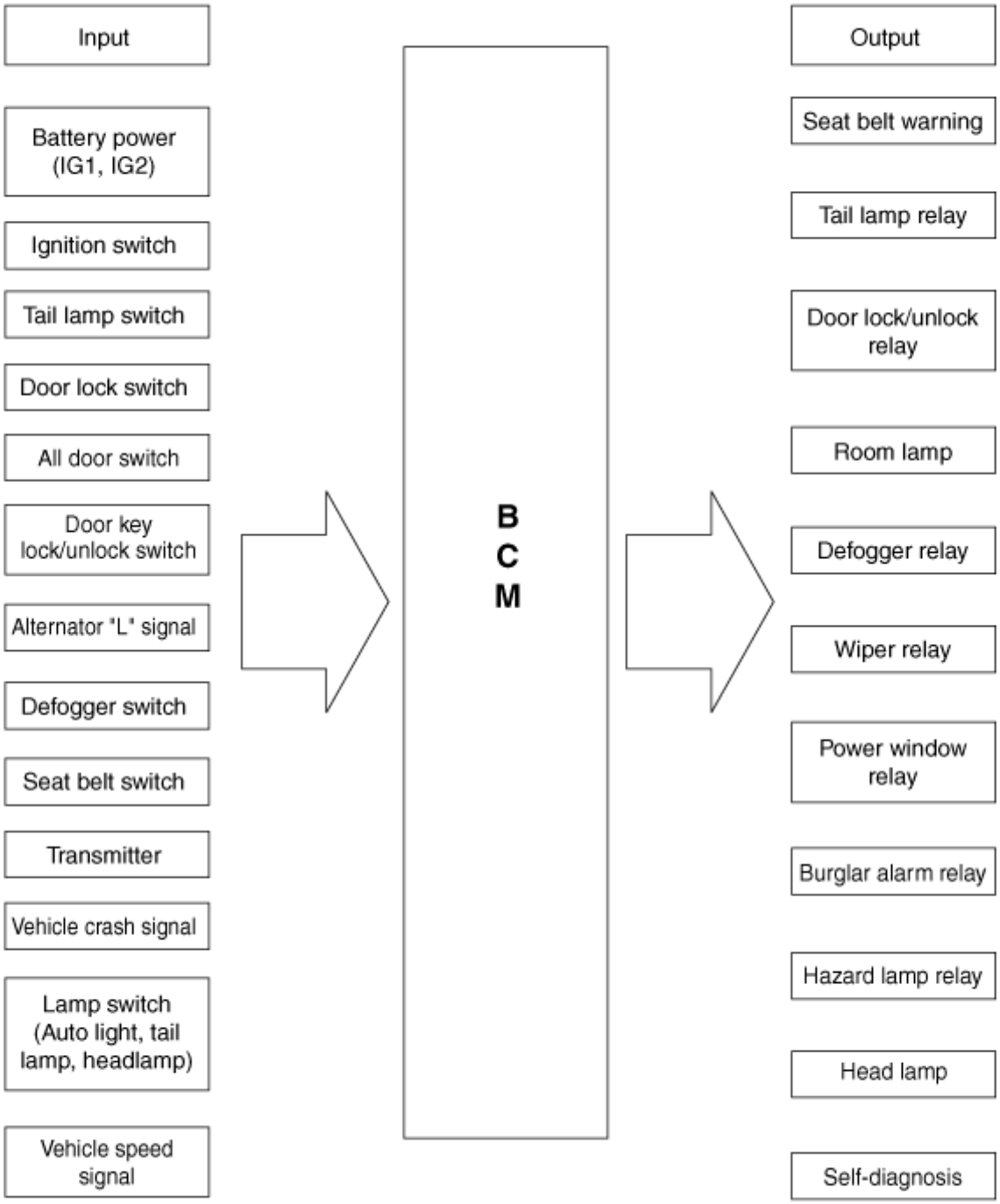
Rated Load

Item	Rated load
Room lamp	DC 12V 28W (LAMP load)
Key hole illumination	DC 12V 2W (LAMP load)
Seat belt indicator	DC 12V 1.2W (LED load)
Door lock relay	DC 12V 200mA (Inductive load)
Door unlock relay	DC 12V 200mA (Inductive load)
Dead lock relay	DC 12V 200mA (Inductive load)
Hazard relay	DC 12V 200mA (Inductive load)
Rear wiper relay	DC 12V 200mA (Inductive load)
Power window relay	DC 12V 200mA (Inductive load)
Wiper relay	DC 12V 200mA (Inductive load)
Defogger relay	DC 12V 200mA (Inductive load)
Tailgate relay	DC 12V 200mA (Inductive load)
Tail lamp relay	DC 12V 200mA (Inductive load)
Head lamp relay	DC 12V 200mA (Inductive load)
Front deicer relay	DC 12V 200mA (Inductive load)
Front fog relay	DC 12V 200mA (Inductive load)
Rear fog relay	DC 12V 200mA (Inductive load)

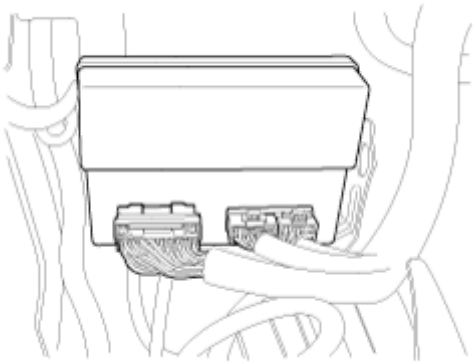
Horn relay	DC 12V 200mA (Inductive load)
Security indicatior	DC 12V 1W (LED load)
Central door lock indicator	DC 12V 1W (LED load)
Door open indicator	DC 12V 1W (LED load)

English ▼

CIRCUIT DIAGRAM



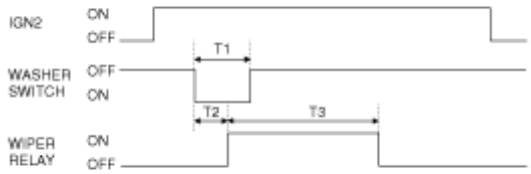
DESCRIPTION

Body control module (A) receives various input switch signals controlling time and alarm functions for tail lamp, rear fog lamp, wiper control, buzzer warning, front deicer timer, tail lamp auto cut, central door lock, seat belt warning, key operated warning, over speed warning, ignition key hole illumination, room lamp control, power window timer, keyless entry control, burgular alarm control, crash door unlock, key reminder.	

FUNCTION

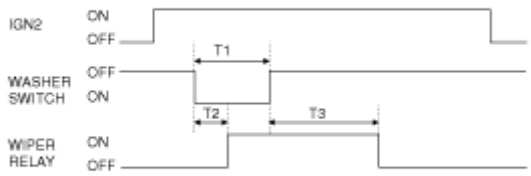
Wiper control

1. WIPER Control coupled with Washer
   (1) Under IGN2 SW ON, WIPER RELAY is turned ON after T2 from WASHER SW ON if WASHER SW is ON for T1 and WIPER RELAY is turned OFF after T3.



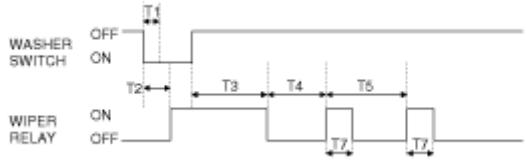
T1 : 0.06s ~ 0.2s, T2 : 0.3s ± 0.1s,
T3 : 0.7s ± 0.1s

   (2) Under IGN2 SW ON, WIPER RELAY is turned ON after T2 from WASHER SW ON if WASHER SW is ON for T1 or more, and WIPER RELAY is turned OFF after T3 from the moment that WASHER SW is turned OFF.



T1 : 0.2s(MIN), T2 : 0.3s ± 0.1s,
T3 : 2.5s ~ 3.8s (2 ~ 3TURN)

(3) Operation in Item (2) is performed if WASHER SW is ON for at least T1 during WIPER operation with INT SW. Operation in Item (1) is performed if WASHER SW is ON for T6.



T1 : 0.2s(MIN), T2 : 0.3s ± 0.1s,
T3 : 2.5s ~ 3.8s (2 ~ 3 times rotation),
T4 : T5 - 0.7s, T5 : INT TIME,
T6 : 0.2s ~ 0.59s, T7 : 0.7s ± 0.1s

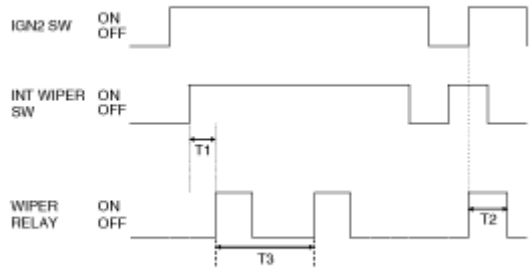
(4) Operation is cancelled in case IGN is OFF during T3.

(5) Give priority to WASHER interlocking WIPER than Speed sensing INT WIPER function.

(6) WASHER SW signal input shall be ignored at start-up (IGN1 ON & IGN2 OFF states).

2. VARIABLE INT WIPER

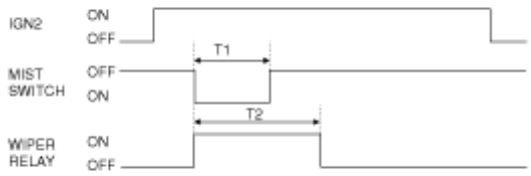
(1) Under IGN2 SW = ON & INT SW = ON states, and INT VOLUME value are acquired and intermittent time is calculated. Then, WIPER intermittent time is automatically converted.



T1 : 0.3 sec Max.
T2 : 0.7 ± 0.1 sec.
T3 : INT TIME 2.2 ± 0.2sec (VR=0kΩ)Min ~ 10±1sec (VR 50kΩ)Max.

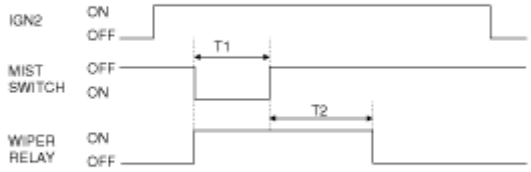
M-F SW	0~1 Kohm	13 Kohm ± 10%	24 Kohm ± 10%	38 Kohm ± 10%	50 Kohm ± 10%
INT TIME (T3)	2.2 sec (± 0.2)	3.9 sec (± 0.4)	6.1 sec (± 0.6)	8.3 sec (± 0.8)	10.0 sec (± 1.0)

3. MIST Control coupled with WIPER
   (1) Under IGN2 SW ON, WIPER RELAY is turned ON directly from MIST SW ON if MIST SW is ON for T1 and WIPER RELAY is turned OFF after T2.



T1 : 0.7s (Max.), T2 : 0.7s ± 0.1s

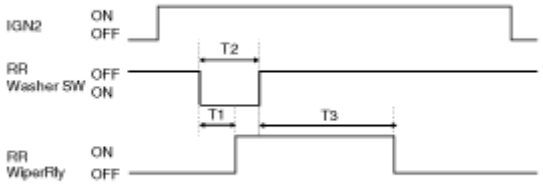
   (2) Under IGN2 SW ON, WIPER RELAY is turned ON directly from MIST SW ON if MIST SW is ON for at least T1, and WIPER RELAY is turned OFF after T3 from the moment that MIST SW is turned OFF.



T1 : 0.7s(Min), T2 : 0.7s ± 0.1s

Rear Wiper & Washer Control (Non Variable)

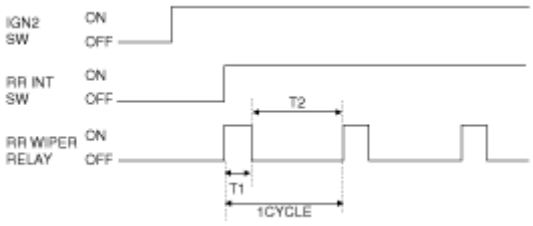
1. Rear WIPER Control coupled with Rear Washer
   (1) when Rr Washer SW Input is T2 or more at) IGN2 ON Condition, Rr Wiper Rly is truned ON directly after T1 at the time that Rr Washer SW ON and is turned OFF after operating 2.5s~3.8s(2~3 Times) from Rr Washer SW is turned OFF.



T1：0.3s±0.1s, T2：0.2s(MIN)
T3：2.5s~3.8s (2~3 rotation)

   (2) Rear WIPER Control coupled with Rear Washer is prior to at RR INT WIPER Function .

2. REAR INT WIPER
   (1) REAR WIPER RELAY is turned ON by 1 CYCLE (0.7s ON / 7.5s OFF) when rear INT wiper SW ON.

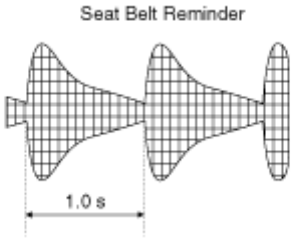


T1 :0.7 ± 0.1sec,
T2 : 7.5 ± 1sec.

Buzzer Control

1. Buzzer Sound

	Frequency	Frequency(Duty)	Cycle	Sound Pressure	Remark
Seat Beltreminder	800Hz	50%	1.0s	70±10dB	Diminished sound
Speed Limit	800Hz	50%	1.0s	70±10dB	Diminished sound



2. Output continues up to OFF cycle when output is OFF.
3. Sound pressure measurement distance: 1.0 m

Seat Belt Reminder Function

1. Driveriver & Passenger seat
   (1) Waring lamp is turned ON when First is IGN1 ON seat belt is not fastened.

   (2) In the above (1), Waring lamp is turned OFF when seat belt is fastened.
   (But Warning lamp continues to light for 6sec if SEAT BELT is fastened within 6sec)
   Warning lamp is turned ON continually If seat belt is not fastened Warning lamp output to pattern stop to light for 6sec when Patten approach condition completion among Warning lamp continues to light for 6sec.

   (3) In the above (2), Waring lamp is turned ON when above 9KPH and seat belt is not fastened.
   (Warning lamp continues to flash for 6sec if SEAT BELT is refastened within 6sec)

   (4) In the above (3), Waring lamp is turned ON when above 6KPH and seat belt is not fastened.

   (5) In the above (3), The warning lamp continues to flash and BUZZER output follows the PATTERN once and seat belt is not fastened.
   (but, Warning lamp continues to light for 6sec if SEAT BELT is refastened within 6sec)
   The warning lamp continues to flash and BUZZER is turned OFF after output completion.
   PATTERN do not output when above 20KPH after PATTERN output once completion(Never entering Pattern)

   (6) In the above (3),(4),(5), the warning lamp and BUZZER OFF are turned OFF when seat belt is fastened.

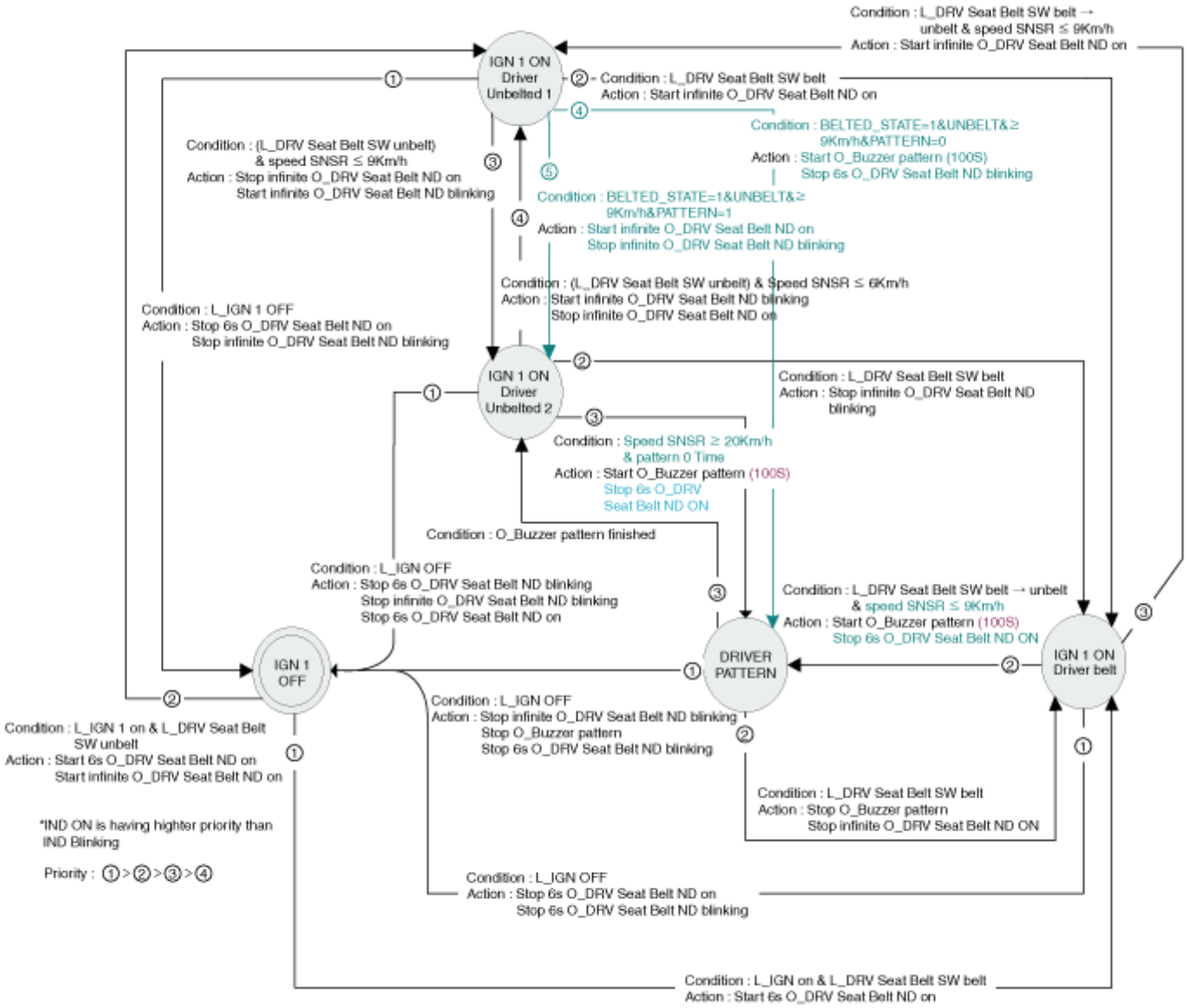
   (7) 6) clause After Selt belt=belted,Driver Selt belt Switch Belt→Unbelted & above 9KPH case of spped, It outputs one PATTERN. Between Pattern outputs Selt belt at the time of fastened A Pattern output stop is carried out.
   Under a Driver Pattern output If the conditions of an Assist Pattern output are realized, it will be at the driver's seat point. After a Pattern output end passenger seat remainder A Pattern output is performed.

(8) In the above (6), Selt/belt is fastened→unfastened and when vehicle speed becomes under 9KPH, warning lamp is turn on.

(9) In the above (3),(4),(5), warning alarm is operated, warning lamp is turned off when IGN OFF.

- Chime Buzzer:1SEC Cycle, Seat belt Indicator : 1SEC Cycle
- Buzzer Operating Cycle & Seat Belt indicator Operating Cycle are synchronized.
- Speed recognition error
  6KMPH : 5.6KMPH ±1.4Km/h
  9KMPH : 8.5KMPH ±1.4Km/h
  20KMPH: 19.6KMPH ±1.4Km/h

2. Seat Belt Reminder Logic

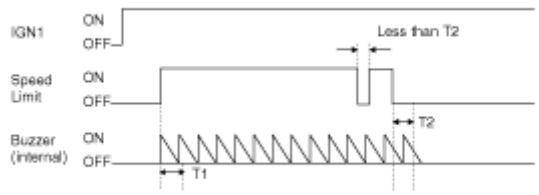


Speed Limited Warning

Speed Limit is On from, IGN1 On when conditions Buzzer On.
When the next condition is satisfied From IGN1 On condition, it executes Speed Limit Warning.

(1) When speed limit turn on, alarm start immediately.

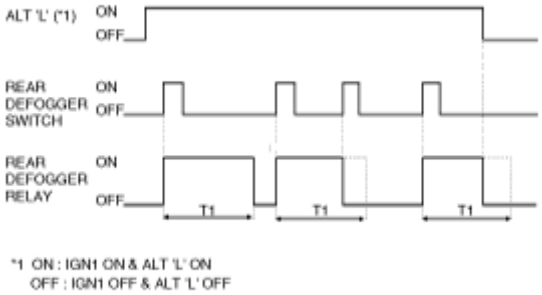
(2) When speed limit turn off, remainder outputs alarm executes and ends after 1 second filtering time.



T1, T2：1s ± 0.1sec

Rear Defogger Timer

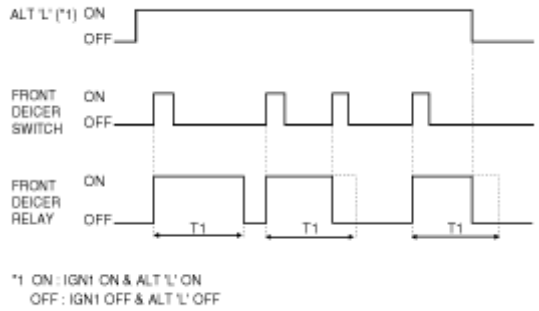
1. Defogger relay is turned for T1 if defogger SW is turned ON under ALT "L" ON.
2. Defogger relay is turned OFF if defogger SW is turned ON again under output ON or ALT"L" OFF.



T1 : 20MIN ± 1MIN

Front Deicer Timer

1. DEICER RELAY is turned for T1 if DEICER SW is turned ON under ALT "L" ON.
   DEICER RELAY is turned OFF if DEICER SW is turned ON again under output ON or ALT"L" OFF.



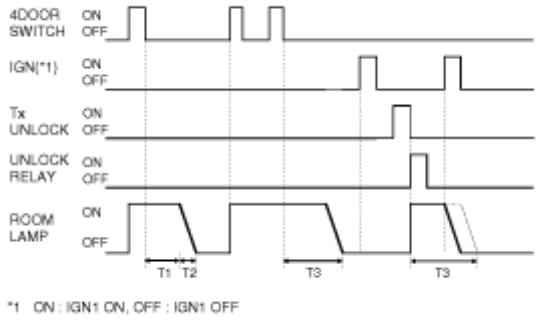
T1 : 20MIN ± 1MIN

Delayed Room Lamp

1. ROOM LAMP lights 100% at DOOR OPEN.
   (But, the lamp phases out lighting up to 0% in 2sec after lighting 100% for 20minute.)
2. Resolution is 32 STEP or more.
3. The lamp is immediately turned OFF at ALL DOOR LOCK or IGN SW is ON during T1(phasing out lighting for 2sec).
4. Should be no phasing out lighting if 4DOOR SW ON time is 0.08sec or less.
5. Should be no flashing.

6. Should be no flashing under 4DOOR OPEN and ROOM LAMP ON at IGN1 ON.

7. ROOM LAMP is turned ON for T3 when Tx UNLOCK signal is received under DOOR CLOSE.
   ROOM LAMP signal output is extended for T3 if Tx UNLOCK signal is received under ON state.
   The lamp lights continuously at DOOR OPEN under ON state. Operation in (1) is performed at DOOR CLOSE. ROOM LAMP signal is turned OFF at ALL DOOR LOCK during ROOM LAMP ON.(phasing out for 2sec).



*1 ON : IGN1 ON, OFF : IGN1 OFF

T1 : 30s ± 3s, T2 : 2 ± 0.2s,
T3 : 32 ± 3.2s

Tail Lamp Auto Cut

1. TAIL RELAY is turned ON when changing TAIL SW from OFF to ON.

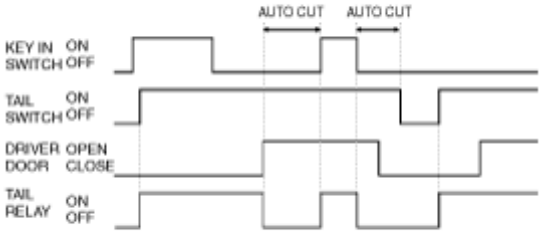
2. TAIL RELAY is turned OFF when TAIL SW is OFF.

3. TAIL RELAY is turned OFF if the state is changed from KEY IN SW ON and TAIL SW ON to KEY IN SW OFF, TAIL SW ON and Dr DOOR OPEN.(automatic light out)

4. TAIL RELAY is turned ON when KEY IN SW is turned ON after the operation in (3).

5. TAIL RELAY is not turned ON if Dr DOOR is closed after the operation in (3).

6. The previous MODE is held at BATTERY ON/OFF after the operation in (3).



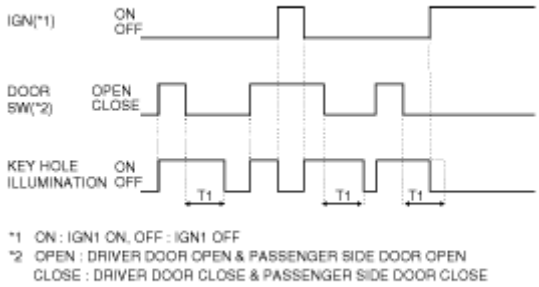
IGN Key Hole Illumination

1. KEY ILLUMI LAMP is turned ON at IGN SW OFF and DOOR OPEN

2. KEY ILLUMI LAMP is turned ON for T1 at DOOR CLOSE after the operation in (1).

3. KEY ILLUMI LAMP is immediately turned OFF at IGN SW ON during output

4. KEY ILLUMI LAMP is immediately turned OFF at transition to warning MODE during output

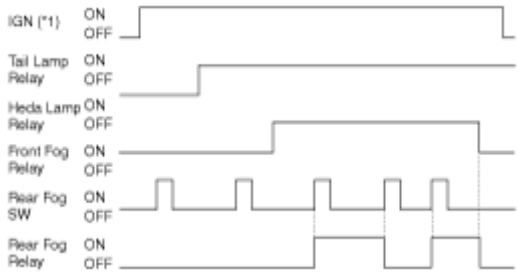


*1 ON : IGN1 ON, OFF : IGN1 OFF
*2 OPEN : DRIVER DOOR OPEN & PASSENGER SIDE DOOR OPEN
CLOSE : DRIVER DOOR CLOSE & PASSENGER SIDE DOOR CLOSE

T1 : 30s ± 3s

Rear Fog Lamp

1. Rear fog relay is turned ON if pushing rear fog Switch under head lamp Output ON and front fog SW ON after IGN ON and Tail lamp Output ON.
2. Output is turned OFF if pushing rear Front fog lamp switch again under REAR FOG RELAY ON
3. REAR FOG RELAY is turned OFF unless the condition "IGN ON, TAIL Lamp Output ON & Head lamp Output ON (and front fog SW ON)" is met.
4. Head Lamp Relay after Front fog lamp switch off Front Fog Lamp Relay=ON and Rear Fog Lamp Relay=ON it does from on conditons and Rear Fog Lamp Relay off.
5. Rear FOG LAMP Switch is Self-Return Type.



*1 ON : IGN1 = ON
OFF : IGN1 = OFF

Central Door Lock/unlock

1. All door lock relay signal is output for T1(0.5s) if Drver/Assist DOOR UNLOCK SW is locked within 3s, central door lock indicator signal is output when All DOOR LOCKED.
2. All door unlock relay signal is output for T1(0.5s) if DR DOOR UNLOCK SW is unlocked within 3s, central door lock indicator signal is not output when All DOOR UNLOCKED.
3. All door lock relay signal is output for T1(0.5s) when AS DR Key Lock SW is turned ON and if AS DOOR UNLOCK SW is unlocked within 3s, Center DR Lock IND signal is not output when All DOOR LOCKED.
4. Change of UNLOCK(LOCK) → LOCK(UNLOCK) is ignored during LOCK(UNLOCK) signal ouput by other functions.
5. All door lock relay signal is output for T1 when TX LOCK signal is received, central door lock indicator siganal is output when All DOOR LOCKED.
6. All Door Unlock Relay signal is output for T1 if TX UNLOCK signal is received, central door lock indicator siganal is not output when any DOOR UNLOCKED or ALL DOOR UNLOCKED.
7. ALL DOOR UNLocked, All door lock relay signal is output for T1 if central door Lock/UNLOCK SW is turned ON, Central door lock indicator signal is output when All DOOR LOCKED.

8. ALL DOOR Locked, All door unlock relay signal is output for T1 if central door Lock/UNLOCK SW is turned ON, Central door lock indicator signal is not output when All DOOR UNLOCKED.

9. Any DOOR LOCKED, All door lock relay signal is output for T1 if central door Lock/UNLOCK SW is turned ON, Central door lock indicator signal is output when All DOOR LOCKED.

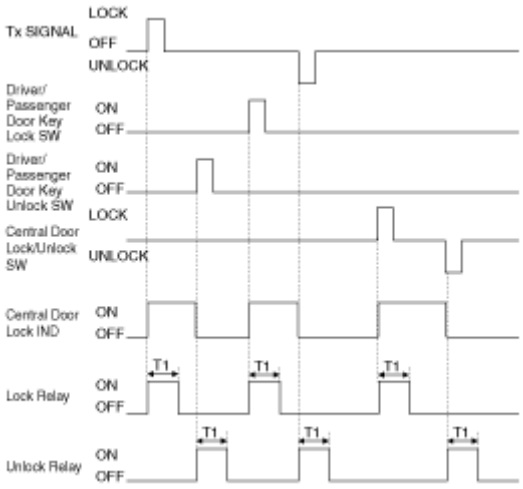
10. At The condition Key In SW OFF(OUT) & central door Lock IND signal ouput is turned ON, central door Lock IND signal is output for 1 minute then OFF.

11. Shall be no malfunction at BATTERY connection.(shall be no malfunction even at KEY IN position)

12. Inputs which are 40msec or less shall not be received.
(Door Key Lock/Unlock SW)

13. LOCK signal is not output by DOOR KEY LOCK SW when IGN turn ON.

14. Lock output is forbidden During IGN KEY REMINDER signal ouput by C/DOOR LOCK/UNLOCK SW or DOOR KEY.



T1 : 0.5 ± 0.1sec.
* The changes of NOBE by LOCK/UNLOCK output signal do not displayed.

Central Door Lock Indicator

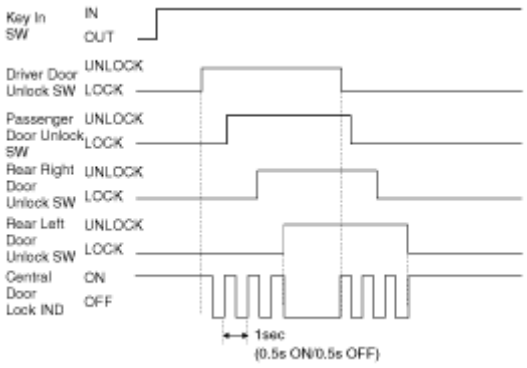
1. KEY OUT, when All DOOR LOCK & TAILGATE CLOSED, LOCK & TAIL GATE CLOSE is turned OFF after lighting 100% for 1 minute.

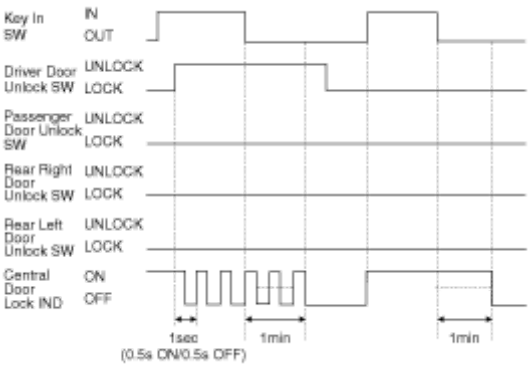
2. KEY IN, when All DOOR LOCK & TAILGATE CLOSED, CENTRAL DOOR LOCK INDICATOR lighting 100% continuously. Under operation, Continuation blink is carried out by 1cycle.in ANY DOOR UNLOCK or ALL DOOR LOCK&TAIL GATE OPEN. When ALL DOOR UNLOCK A output is turned off immediately.

3. Above 2), if KEY OUTED, CENTRAL DOOR LOCK INDICATOR is turned OFF after lighting for 1 minute. Under operation, Continuation blink is carried out by 1cycle.in ANY DOOR UNLOCK or ALL DOOR LOCK&TAIL GATE OPEN. When ALL DOOR UNLOCK A output is turned off immediately.

4. After above 3), when DR UNLOCK is changed and All DOOR LOCK & TAILGATE CLOSED, follow above 3).

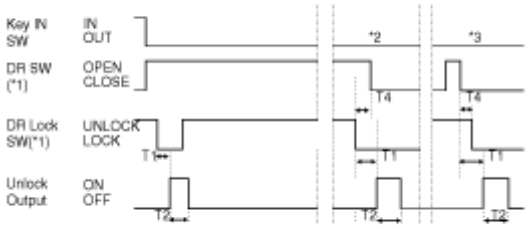
5. When The changes of DOOR LOCK/UNLOCK state by AUTO DOOR LOCK function occure, follow above 2)~4).





The Reminder Unlock Function By Central Door Lock Sw Or Keyless Or Door Key

1. When Door UNLock SW LOCK by Key In SW OUT & Door SW OPEN & Central door LOCK/UNLOCK SW or KEYLESS or DOOR KEY, Unlock relay output for 1sec after 0.5sec.

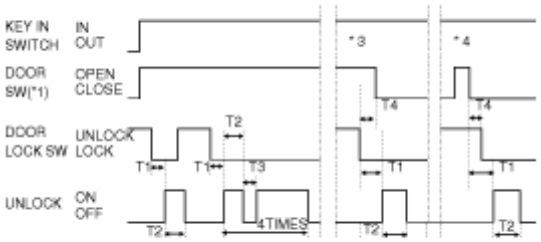


T1, T3 : 0.5±0.1sec, T2 : 1±0.1sec,
T4 : 0.5sec MAX.
*1 OPEN : Driver Door OPEN or Passenger side Door OPEN or Rear Right Door OPEN or Rear Left Door OPEN or Tailgate OPEN
CLOSE : Driver Door Close and Passenger side Door Close and Rear Right Door Close and Rear Left Door Close TAILGATE CLOSE
*2 Key In SW OUT, if door is closed within 0.5sec from the change that Door Unlock SW UNLOCK → LOCK by Central door Lock/UNLOCK SW or KEYLESSor DOOR KEY, Unlock relay ouput for 1sec.(once)
*3 Key In SW OUT, if Door UNLOCK SW is LOCKED within 0.5sec from the change that DOOR OPEN → CLOSE by Central door Lock/UNLOCK SW or KEYLESS or DOOR KEY, Unlock relay output for 1sec.(once)
* RETRY output is or is not which is decided RETRY output start point.(after 1.5sec from Unlock relay output at first time)
* Unlock relay output even if the condition is not maintained for 0.5sec after condition is valid.
* Above Time Chart, output by Door LOCK/UNLOCK Function is not displayed.
* The case LOCK & REMINDER UNLOCK by KEYLESS, HARZARD is not by ARM entry.
* This function is valid when enter LOCK mode by Central DR LOCK SW or KEYLESS or DOOR KEY.(When DOOR OPEN & UNLOCK, REMINDER UNLOCK is not output by OVERRIDE.)
* REMINDER UNLOCK output once only, Monitoring of DOOR LOCK/UNLOCK state is not exercised additionally.

(NEED OF DIVISION WITH KEY REMINDER UNLOCK When DRV Or ASS Or RL Or RR DR OPEN & DR LOCK, if LOCK state is maintained after ouput one time by above function, output three times additionally.)

IGN Key Reminder

1. This function is not performed when vehicle speed is 3km/h or more. Only, after AUTO DOOR LOCK operating the vehicle speed from 3Km/h under hour KEY REMINDER conditions.
2. ALL DOOR UNLOCK signals are output for 1s after 0.5s from when the state becomes KEY IN SW IN & Driver DOOR OPEN & Driver DOOR LOCK SW LOCK
3. ALL UNLOCK signal is output for 1s after 0.5s from when the state becomes KEY IN SW IN, Passenger side DOOR OPEN and Passenger side DOOR LOCK SW LOCK
4. ALL UNLOCK signal is output for 1s after 0.5s from when the state becomes KEY IN SW IN, Rear right DOOR OPEN and Rear right DOOR LOCK SW LOCK
5. ALL UNLOCK signal is output for 1s after 0.5s from when the state becomes KEY IN SW IN, Rear left DOOR OPEN and Rear left DOOR LOCK SW LOCK
6. Even though UNLOCK output for 1sec by above (2)~(5), if the LOCK state is maintained Unlock relay ouput maximum three times(except output for 1sec) ; (1sec cycle : 0.5sec ON/OFF)
7. If Key In SW IN, Tailgate SW OPEN and ALL DOOR Lock SW LOCK, Unlock relay ouput for 1sec after 0.5sec.
   (Unlock relay is not output when ANY DOOR Lock SW UNLOCK)
   *Even though UNLOCK output for 1sec by above (7), if the LOCK state is maintained Unlock relay ouput maximum three times(except output for 1sec)
8. IGN KEY REMINDER outputting C/DOOR LOCK in compliance with LOCK/UNLOCK SW or DOOR KEY The output forbids.

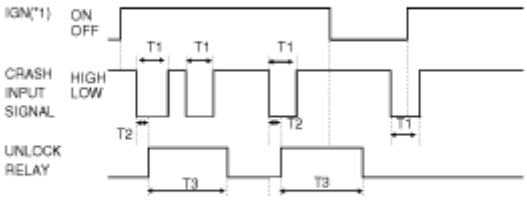


T1, T3 : 0.5±0.1sec, T2 : 1±0.1sec,
T4 : 0.5sec MAX.
*1. OPEN : Dr DOOR OPEN or PASSENGER SIDE DOOR OPEN or RR DOOR OPEN or RL D00R OPEN
CLOSE : Dr DOOR CLOSE or PASSENGER SIDE DOOR CLOSE or RR DOOR CLOSE or RLDOOR CLOSE
*2. UNLOCK : Dr DOOR or PASSENGER SIDE DOOR or RR DOOR or RL DOOR Lock SW UNLOCK
LOCK : Dr DOOR or PASSENGER SIDE DOOR or RR DOOR or RL DOOR Lock SW LOCK
*3. UNLOCK signal is output (only once) within 1s if DOOR is closed within 0.5s from DOOR LOCK SW(DR or PASSENGER or RR or RL) UNLOCK → LOCK under KEY IN SW IN.
*4. UNLOCK signal is output (only once) within 1s if DOOR LOCK SW is locked within 0.5s from DOOR (DR or PASSENGER or RR or RL) OPEN → CLOSE under KEY IN SW IN. But, Performance followed above *9 when C/DOOR LOCK,UNLOCK SW is turned ON within 0.5s.
*5. ALL DOOR UNLOCK signal is output at CTL DOOR LOCK after Dr DOOR & AsDOOR & RR DOOR & RL DOOR under KEY IN.
*6. Judgment of the possibility of RETRY signal output is performed at RETRY signal output start.
(after 1.5s from the first UNLOCK signal output)
*7. After the condition if UNLOCK is met, UNLOCK signal is output if the condition is not held for 0.5s.
But, UNLOCK signal is not output if KEY IN SW is OUT at the moment that 0.5s passes after the condition is met by DOOR LOCK SW change from UNLOCK to LOCK.
*8. Output by DOOR LOCK/UNLOCK functions is not displayed in the above TimeChart

*9. Signal is Output by Central door LOCK,UNLOCK or Driver DOOR KEY LOCK/UNLOCK Switch or Assist DOOR KEY UNLOCK Switch input signal and IGN KEY REMINDER UNLOCK signal is not output(IGN KEY REMINDER function is reseted) when Central DOOR LOCK,UNLOCK Switch or Driver DOOR KEY LOCK/UNLOCK Switch or Assist DOOR KEY UNLOCK Switch is turned ON within 0.5s after IGN KEY REMINDER condition is valided.
*10. Central DOOR LOCK,UNLOCK Switch or Driver DOOR KEY LOCK/UNLOCK Switch or As DOOR KEY UNLOCK Switch input signal is ignored during IGN KEY REMINDER UNLOCK output

Impact Sensing Door Unlock

1. UNLOCK signal is always output when Crash Input signal is input under IGN SW ON.
2. UNLOCK signal is output for the remaining time even when IGN SW ON is turned to OFF during UNLOCK output.
3. UNLOCK signal is not output when IGN SW OFF is turned to ON after Crash Input signal is input in advance.
4. UNLOCK signal is output for T3 when Driveriver or passenger or rear right or rear left DOOR LOCK SW is locked from UNLOCK after UNLOCK signal is output.
5. AUTO DOOR LOCK function is not performed when CRASH UNLOCK condition is met.
6. CENTRAL DOOR LOCK function is not performed during or after CRASH UNLOCK signal output.
   But, CENTRAL DOOR LOCK function is performed normally if CRASH UNLOCK function is reset after IGN OFF.



* T1 is the time when AIR BAG signal is output

T1: 0.2s
T2: 40ms
T3: 5s ± 0.5s

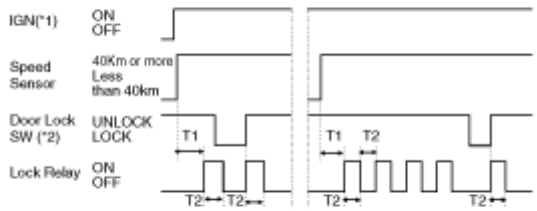
NOTICE

a. Output at that time is immediately stopped and 100ms is extended when there is reverse direction output request during output, then the reverse direction output is performed.
   But, output is performed for the last received output request when there is output request during extending 100ms.
   (200mS in DEAD LOCK Spec)
b. LOCK signal output is performed and UNLOCK signal output request is ignored when LOCK signal output and UNLOCK signal output are performed at the same time.
c. CRASH DOOR UNLOCK function is given priority than LOCK/UNLOCK control by other functions.
d. LOCK/UNLOCK signal request by other functions is ignored during and after CRASH DOOR UNLOCK signal output.
   But, LOCK/UNLOCK signal control by other functions are performed in case of IGN1 SW OFF & IGN2 SW OFF.
e. LOCK (UNLOCK) signal request is not output again when All LOCK(UNLOCK) SW is LOCK (UNLOCK) state.
   But, Driver DOOR UNLOCK signal request is not output again when Dr DOOR LOCK SW is UNLOCK state.
f. Dr DOOR UNLOCK signal is output as well as ALL DOOR UNLOCK signal when there is ALL DOOR UNLOCK signal output request during Dr DOOR UNLOCK output.
g. TAILGATE LOCK/UNLOCK CONTROL CONDITION

TAILGATE LOCK COGNITIVE CONDITION : ALL DOOR LOCK & TAILGATE CLOSE
TAILGATE UNLOCK COGNITIVE CONDITION :
1) When one DOOR of All DOOR is UNLOCK
2) When TAILGATE OPEN

Speed Sensing Auto Door Lock (Unlock When Key Out)

1. This does not activate when vehicle speed is less than 15km/h.
2. LOCK signal is output if vehicle speed is 15km/h or more for at least 1s under ALT"L" ON, IGN SW = ON. But, LOCK signal is not output if all DOORs are lockedor all DOORs are FAIL in advance.
3. LOCK signal is output 3 times as Max ((2) is ignored) if either one door is unlocked after LOCK signal output in (2).(1s cycle) But, DOOR, which is locked from UNLOCK state during 3-time output, is ignored.
4. Relevant DOOR is FAIL if the state is UNLOCK after 3-time output.
5. After Lock relay output above (2), Lock relay output one time if LOCKED DR is changed Unlock. But After Lock relay output, relevant Door Lock relay output three times if UNLOCK state is maintained.
6. FAIL DOOR is cleared at IGN SW = OFF or DOOR UNLOCK SW changed(UNLOCK→LOCK)
7. AUTO DOOR LOCK function is not performed when CRASH UNLOCK condition is met.
8. All DOOR UNLOCK signal is output when KEY OUT After IGN1 ON→OFF in LOCK condition.
   But, when KEY OUT, UNLOCK function is relevant when AUTO DOOR LOCK function is performed.



T1 : 1 ± 0.1sec, T2 : 0.5 ± 0.1sec.
*1 ON : IGN1 ON, OFF : IGN1 OFF
*2 LOCK : Driver & Passenger & Rear Door Lock SW = LOCK
UNLOCK : Driver or Passenger or Rear Door LockSW = UNLOCK

Dead Lock / Unlock

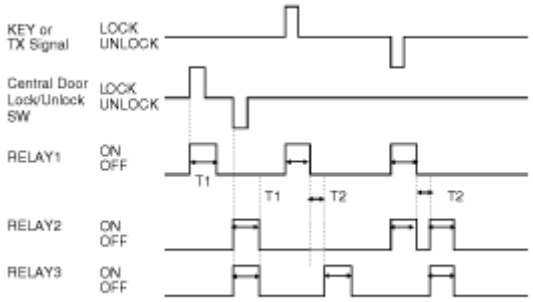
1. Central Door LOCK signal is output for 0.5s if Central Door LOCK is performed with Driver/Passenger KEY or TX. Then, DEAD LOCK signal is output for 0.5s after checking the state (after 200msec).
2. Not DEAD LOCK but only Central Door LOCK is perormed after Central Door LOCK output for 0.5s when Central Door is LOCKED by Central Door LockSW.
3. Central Door UNLOCK ouput for 0.5s after DEAD UNLOCK output for 05.s and after 200ms when Central Door UNLOCK SW is turned ON by Door KEY or TX after DEAD UNLOCK output for 05.s.
4. Not DEAD UNLOCK but only Central Door UNLOCK is perormed when Central Door UNLOCK is turned ON by Central Door Lock SW.
   (In DR, the relevant DOOR is performed Door UNLOCK & DEAD UNLOCK mechanically when UNLOCK by KEY)
5. DEAD LOCK/UNLOCK is performed when only DOOR CLOSED.
   (But, except the state of DEAD LOCK by TX or Door Key. All DOOR Unlock signal is output when Door OPEN by

REMINDER function by TX or Dr Key.)

6. LOCK function is performed first when both LOCK/UNLOCK functions are performed at the same Time.
7. Priority is decided in order of TX>KEY>Door LOCK SW in case of simultaneous input with KEY/TX/Door LOCK SW. If (7),(8) is happened simultaneously, priority is given to (8).
8. DEAD LOCK is canceled (DEAD UNLOCK signal output for 0.5SEC) at KEY IN & IGN ON after DEAD LOCK.
9. In the condition of IGN ON, DEAD LOCK is not output when DOOR KEY LOCK.
10. Door LOCK/UNLOCK signal output is ignored by TX, Central Door Lock/Unlock SW during DEAD LOCK/UNLOCK signal output.

Functional Relay Output Condition

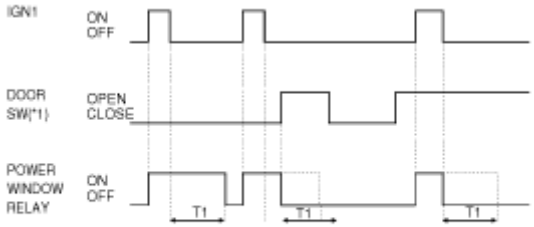
	Relay 1	Relay 2	Relay 3
Central/Lock	ON	OFF	OFF
Dead/Lock	OFF	OFF	ON
Dead/Unlock	ON	ON	OFF
Central/Unlock	OFF	ON	ON



T1 : 0.5s±0.1s. T2 : 0.2s±0.05s.

Power Window Timer

1. POWER WINDOW RELAY it turned ON at IGN SW ON
2. POWER WINDOW RELAY is turned ON for T1 at IGN SW OFF
3. POWER WINDOW RELAY is immediately turned OFF if DOOR is opened under P/WINDOW RELAY ON for T1.
4. POWER WINDOW RELAY is immediately turned OFF at IGN SW ON→OFF under DOOR OPEN.

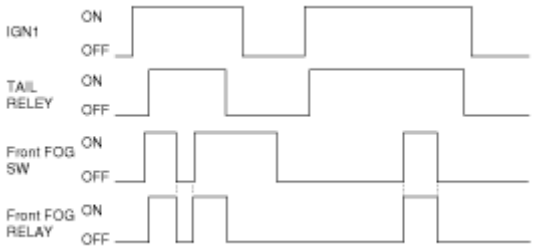


*1 OPEN : DRIVER & PASSENGER SIDE DOOR OPEN
CLOSE : DRIVER AND PASSENGER SIDE DOOR CLOSE

T1 : 30 ± 3sec.

Front Fog Lamp Control

1. IGN1 ON & TAIL Relay ON, if Front FOG SW is turned ON then Front FOG Relay is ON.
2. Above (1), Front FOG SW is turned ON then Front FOG Relay is OFF.
3. IGN1=ON & TAIL Relay ON & Front FOG SW ON when conditions are not formed, Front FOG Relay off.



Auto Light Control

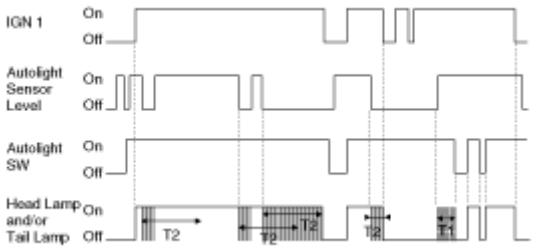
1. AUTO LIGHT SENSOR value is always read at IGN1 ON.
2. LIGHT is turned ON after 2sec±0.2sec when AUTO LIGHT SENSOR value is same as LIGHT ON input value.
3. LIGHT is turned OFF after 2sec±0.2sec when AUTO LIGHT SENSOR value is same as LIGHT OFF input value.
4. LIGHT ON value of SENSOR is based on the below table.
5. Head Lamp signal is output when Head Lamp OUTPUT is ON.
6. After Head Lamp is turned OFF, Head Lamp signal output is kept if Head Lamp and Tail Lamp ON.
   luminance condition is met at Auto Light SW ON.
7. After Head Lamp is turned OFF, Head Lamp signal output is immediately stopped if HEAD LAMP and Tail Lamp OFF
   luminance condition is met at Auto Light SW ON.
8. After Head Lamp is turned OFF, Head Lamp signal output is immediately stopped at TAIL SW signal input.
9. After Head Lamp is turned OFF, Head Lamp signal output is stopped if there is no input of Auto Light SW or TAIL SW.
   (shall be no flashing of Head Lamp)
10. Head Lamp signal output is stopped when SW position is changed from AUTO to Head Lamp SW during Head Lamp ON
    with Auto Light. (shall be no flashing of Head Lamp)

Light Sensor Reading

	Head lamp & Tail lamp
ON	1.10 V
OFF	2.80 V



T1 : ON Filtering Time
T2 : OFF Filtering Time



T1 : ON Filtering Time
T2 : OFF Filtering Time

Head Lamp Escort

1. If Head Lamp is lighting by Head Lamp SW or AUTOLIGHT, Head Lamp lighting is maintained when IGN1 is changed ON to OFF.

2. Following stste, Head Lamp lighting is truned off.
   But, TAIL LAMP keep up lighting when KEY IN in the condition of lighting off after IGN ON→OFF and lighting.
   (the condition of TAIL LAMP lighting off follows TAIL LAMP AUTOCUT function.)
   - When Driver DOOR SW OPEN→CLOSE and after 30sec.
   - When Head Lamp SW ON or not the case of AUTO LIGHT SW ON.
     (ALC ; When Head Lamp ON, Head Lamp SW ON within Multi-function SW during ESCORT → Lighting keeping up when SW is moned to AUTO LIGHT SW ON or reverse.)
   - When Driver DOOR OPEN state is maintained after 5minute.
   - When IGN1 ON→IGN OFF and sfter 5minute.
   - When received TX LOCK signal two times during output.

NOTICE

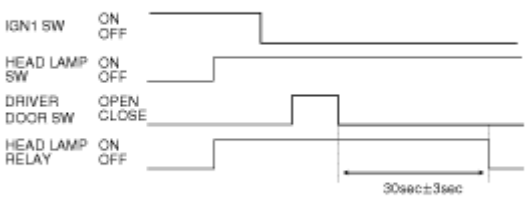
– Head Lamp RELAY output of TIMING CHART contains the condition of TAIL LAMP ON.

– Head Lamp RELAY output by - Head Lamp SW and HEAD LAMP RELAY output by AUTO LIGHT is regarded identical condition.
That is, the explaining of HEAD LAMP RELAY ouput contains two cases.

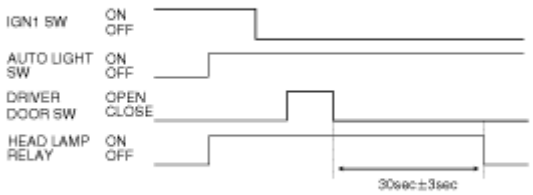
– AUTO LIGHT SW ON : HEAD LAMP and TAIL LAMP signal by AUTO LIGHT is output.

– AUTO LIGHT SW OFF: HEAD LAMP and TAIL LAMP signal by AUTO LIGHT is not output.

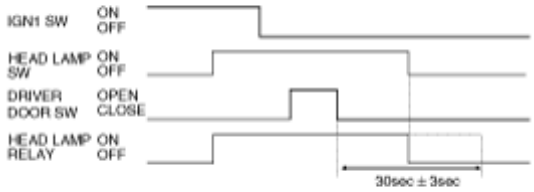
<CASE 1>



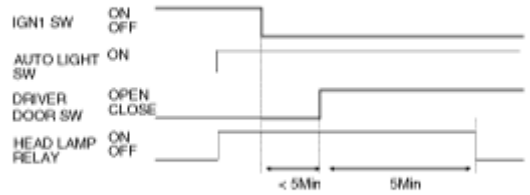
<CASE 2>



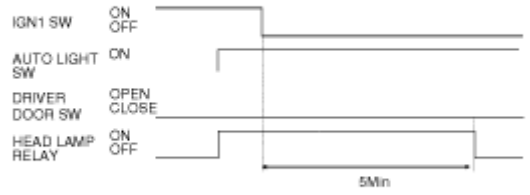
<CASE 3>



<CASE 4>



<CASE 5>

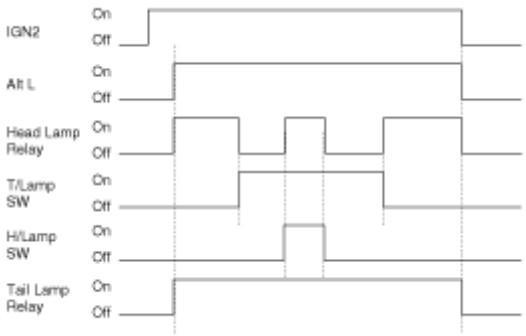


Daytime Running Light

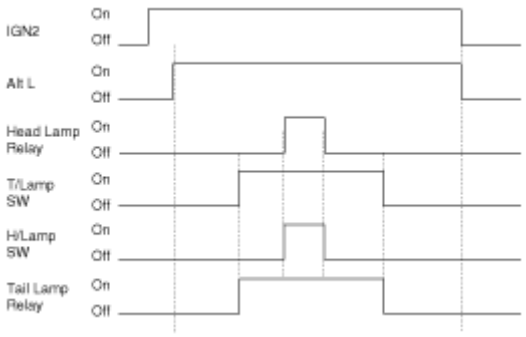
1. If IGN2 & ALT "L" ON & HEAD LAMP SW = OFF & TAIL LAMP SW=OFF, TAIL LAMP RELAY and HEAD LAMP RELAY is output.
2. After above 1), HEAD LAMP RELAY output is OFF when TAIL LAMP SW=ON.
3. After above 2), HEAD LAMP RELAY output is ON when HEAD LAMP SW=ON again.

4. If TAIL LAMP Switch= ON and IGN2 & ALT "L" OFF→ON, only TAIL LAMP RELAY is ON.
5. HEAD LAMP ESCORT is performed when LAMP is turn on by HEAD LAMP Switch after IGN1 OFF, but HEAD LAMP ESCORT is not performed when LAMP is turn on by DRL function after IGN1 OFF.
   (HEAD LAMP SW=OFF)
6. DRL is not performed when DRL Deactivation INPUT=ON(GND).
7. During DRL operating, DRL function id stopped when DRL_Deactivation INPUT=ON(GND).

■ When DRL _ Deactivation INPUT = OFF (OPEN)

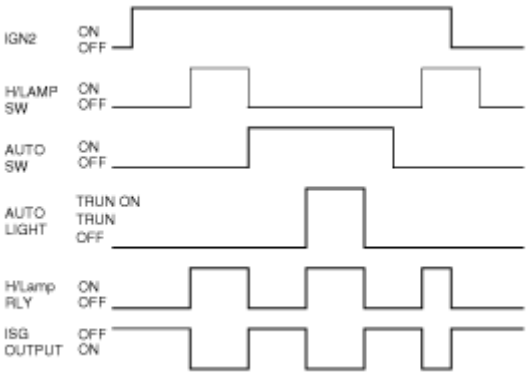


■ When DRL _ Deactivation INPUT = ON (GND)



Alternator Management System Control

1. HeadLamp in compliance with Switch ON/OFF or Auto light functions Head Lamp Relay at the time of ON/OFF percentage AMS identically, ON/OFF it controls.
2. DRL in compliance with a functions Head Lamp Relay at the time of ON , It does not AMS ON.

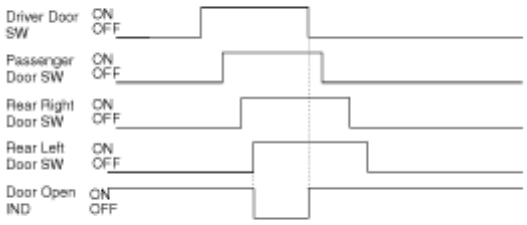


Door Open Indicator

1. One more DOOR Open
   Door Open IND is turned on when ("Driver Door SW OFF"or "Passenger side Door SW OFF" or "Rear Right Door SW OFF"

or "Rear left Door SW OFF")

2. Door Open IND is turned off when All DOOR CLOSE ("Driver Door SW ON" & "Passenger side Door SW ON" & "Rear Right Door SW=ON" & "Rear Left DoorSW=ON")
   - DOOR SW“ON” = DOOR CLOSE
   - DOOR SW“OFF”= DOOR OPEN



CENTER FACIA PANEL SWITCH



Turn Signal And Hazard Control

1. Flashing function
   (1) On the state of Tail Switch ON, Hazard symbol light ON.

   (2) On the state of Tail Switch OFF, Hazard symbol light OFF.

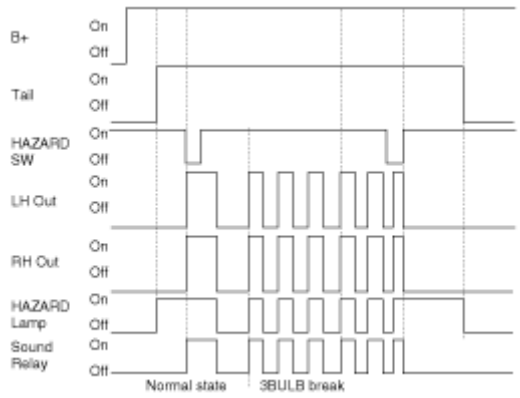
   (3) On the state of Hazard Switch ON, Micom sense the bulbs status that is normal, removed more than 3 bulbs , over load or short to GND. At each state output signal is as follow.
      - Normal : 85±10 C/M, DUTY RATIO 50%
      - More than 3 Bulbs are removed : more than 120C/M, DUTY RATIO 50%
      - Over Load or Short to GND: DO NOT OPERATE

   (4) Hazard symbol light(LED;RED COLOR) is same as (3).

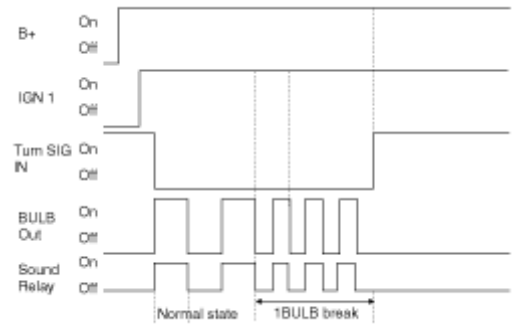
   (5) SOUND R/Y output signal is same as (3).

   (6) The state of GND Short is terminated by the input OFF signal signal for all Turn_Lamp

   (7) RKE signal is prior to Hazard signal.



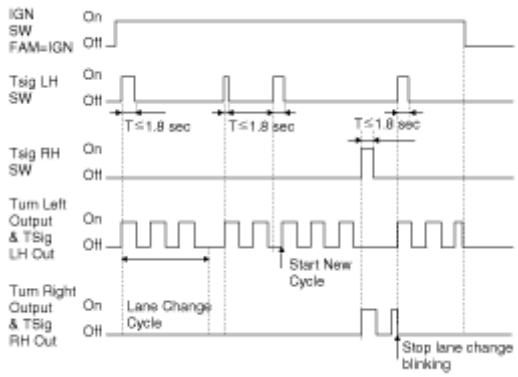
2. Turn Left/Right signal flashing function
   (1) On the state of IGN1, TURN_SIGNAL switch is LOW ACTIVE .
   (2) On the state of Turn_Signal Switch ON, Micom sense the bulbs state that is normal, removed more than 1 bulbs, over load or short to GND. At each state output signal is as follow.
      - Normal : 85±10 C/M,DUTY RATIO 50%
      - More than 1 BULBs are removed : more than 120C/M, DUTY RATIO 50%
      - Over Load or Short to GND: DO NOT OPERATE
   (3) SOUND R/Y output signal is same as (3).
   (4) The state of GND Short is terminated by the input OFF signal signal for all Turn_Lamp
   (5) Hazard signal is prior to Turn_signal.
   (6) RKE signal is prior to Turn_signal.



3. Lane change
   (1) If Both IGN1 and Turn_signal SW are ON and then Turn_signal SW is under 1.8S,SW's Turn_signal print out 3 time .
   (2) Lane Change is stopped in case of as follows.
      – The Opposite side T/Sig SW ON
      – Hazard SW ON
   (3) During Lane change is running through LH Turn signal SW, when RH Turn signal SW's input is under 1.8s, cut output of LH Turn signal and do output of RH Turn signal.
   (4) During Lane change is running, when Lamp failure detection as follows.
      – Before output the case lamp failure : Do normal output 1 time and Do output of Double blinking 3 time.
      – During output the case lamp failure : After output completing Do output of Double blinking 3 time.
      – During output and Turn signal lamp OFF the case lamp failure : Do normal output 1 time and Do output of Double

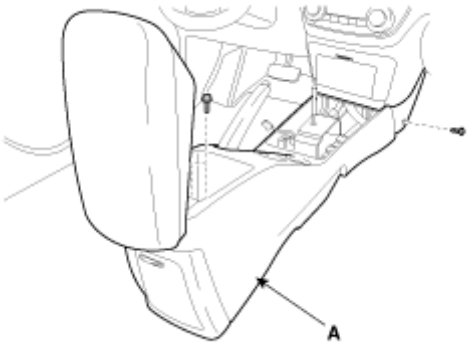
blinking 3 time.

(5) During Lane change is running, when short is happened, stop output at once.

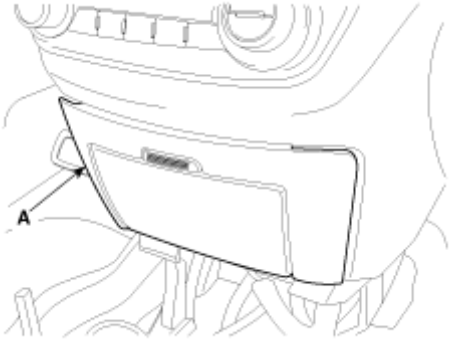


REMOVAL

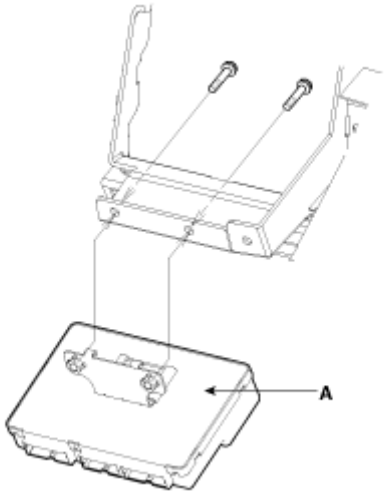
1. Disconnect the negative (-) battery terminal.
2. Remove the floor console assembly (A) after loosening the console mounting screws.
   (Refer to the BD group - "Console")



3. Remove the center facia lower try (A) after loosening the mounting screws.



4. Remove the body control module (A) after loosening 2 bolts and disconnecting connector.



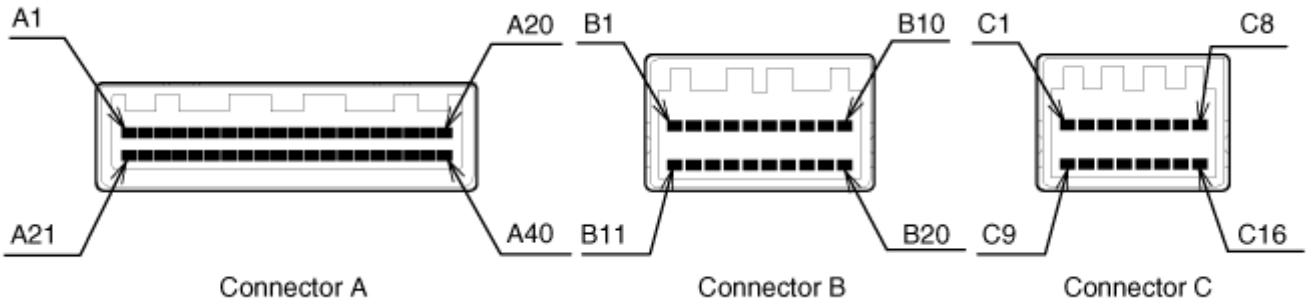
INSTALLATION

English ▼

1. Install the body control module.
2. Install the center facia lower try.
3. Install the floor console assembly.

INSPECTION

BCM Connectors



Pin NO.	Connector A	Connector B	Connector C
1	Battery Voltage	Auto Light Signal	Room Lamp
2	IGN1	Auto Light (Ground)	-
3	Alternator 'L'	Rear Right Door Unlock Switch	Defogger Relay
4	Key In Switch	Rear Defogger Switch	Tail Lamp Relay
5	Speed Limit	Rear Fog Lamp Switch	Wiper Relay
6	Rear Left Door Lock Switch	Front Fog Lamp Switch	DRL Lock Relay 1
7	Carsh Input	Auto Light (Power)	Dead Lock Relay 1
8	Driver Door Unlock Switch	-	Horn Relay
9	Passenger Side Door Unlock Switch	-	Hazard Relay
10	Rear Wiper Switch	EMS	Key Illumination Lamp
11	-	Safety Power Window ECU	Driver Seat Belt Indicator
12	Ground	Power Window Relay	Ground(power)
13	IGN2	Front Deicer Relay	Rear Fog Relay
14	Washer Switch	Head Lamp Relay	Diagnosis
15	INT Wiper Switch	Door Lock Relay 2	Central Door Lock Indicator
16	Code Save	Security Indicator	Door Open Indicator
17	Rear Right Washer Switch	Front Fog Lamp Relay	
18	Tailgate Relay	Rear Wiper Relay	
19	Tailgate Handle Switch	Head Lamp Escort	
20	Driver Door Switch	Passenger Seat Belt Indicator	
21	Assist Door Switch		
22	Rear Left Door Switch		
23	Tailgate Door Switch		

24	Hood Switch		
25	Driver Door Key Lock Switch		
26	Driver Door Key Unlock Switch		
27	-		
28	Tail Lamp Switch		
29	INT Wiper Volume Switch		
30	Speed Sensor		
31	Auto Light Switch		
32	Driver Seat Belt Switch		
33	Head Lamp Switch		
34	Assist Door Key Unlock Switch		
35	Central Door Lock/unlock Switch		
36	Assist Seat Belt Signal		
37	Front Deicer Switch		
38	MIST Switch		
39	Rear Door Switch		
40	-		

Terminal Voltage

No	Input signal name	Logic state	ON/OFF voltage recognition LEVEL(V)	Remarks
1	B+	ON = BAT	9V~16V	
2	IGN1	ON = BAT (IGN KEY is ON or START position)	7V or more/4V or less	BAT= BATTERY
3	IGN2	ON = BAT (IGN KEY is ON position)	7V or more/4V or less	
4	Alt L	ON = BAT(starting state)	7V or more/4V or less	
5	Key In Switch	IN = BAT (KEY insertion state)	7V or more/4V or less	
6	Rear Left Door Switch	OPEN = GND	1V or less/OPEN (Reference value: 4V or more)	
7	Driver door switch	OPEN = GND	1V or less/OPEN (Reference value: 4V or more)	
8	Passenger side door Switch	OPEN = GND	1V or less/OPEN (Reference value: 4V or more)	
9	Driver door unlock switch	LOCK = OPEN, UNLOCK = GND	1V or less/OPEN (Reference value: 4V or more)	
10	Passenger side door Unlock Switch	LOCK = OPEN, UNLOCK = GND	1V or less/OPEN (Reference value: 4V or more)	
11	Center door lock/unlock switch	ON=GND	1V or less/OPEN (Reference value: 4V or more)	
12	Rear door switch	OPEN = GND	1V or less/OPEN (Reference value: 4V or more)	
			1V or less/OPEN (Reference value: 4V or	

13	Tail gate switch	OPEN = GND	more)	
14	Hood Switch	OPEN = GND	1V or less/OPEN (Reference value: 4V or more)	
15	Driver door key lock switch	ON = GND	1V or less/OPEN (Reference value: 4V or more)	
16	Driver door key unlock switch	ON = GND	1V or less/OPEN (Reference value: 4V or more)	
17	Passenger door key unlock switch	ON = GND	1V or less/OPEN (Reference value: 4V or more)	
18	Front deicer switch	ON = GND	1V or less/OPEN (Reference value: 4V or more)	
19	Washer switch	ON = BAT	7V or more/4V or less	
20	Wiper INT switch	ON = BAT	7V or more/4V or less	
21	Wiper INT volume switch	0V ~ 2.5V	-	0Ω~ 50KΩ
22	Rear washer switch	ON = BAT	7V or more/4V or less	
23	Rear wiper Int switch	ON = BAT	7V or more/4V or less	
24	Rear defogger switch	ON = GND	1V or less/OPEN (Reference value: 4V or more)	
25	Tail switch	ON = GND	1V or less/OPEN (Reference value: 4V or more)	
26	L_Driver seat belt switch	Fasten = OPEN, Unfasten = GND	1V or less/OPEN (Reference value: 4V or more)	
27	Crash Input (Impact sensor)	ON = GND(at crash detection)	1V or less/OPEN (Reference value: 4V or more)	
28	Speed sensor	Speed input = PULSE(0~5V)	1V or less/4V or more	OPEN COLLECTOR
29	Head lamp switch	ON = GND	1V or less/OPEN (Reference value: 4V or more)	
30	Front fog switch	ON = GND	1V or less/OPEN (Reference value: 4V or more)	
31	Rear fog switch	ON = GND	1V or less/OPEN (Reference value: 4V or more)	
32	Tail gate handle switch	ON = GND	1V or less/OPEN (Reference value: 4V or more)	
33	Code save unit	ON = GND	1V or less/4V or more	
34	Rear right door Unlock switch	LOCK = OPEN, UNLOCK = GND	1V or less/OPEN (Reference value: 4V or more)	
35	Rear left door Unlock switch	LOCK = OPEN, UNLOCK = GND	1V or less/OPEN (Reference value: 4V or more)	
36	Mist switch	ON = BAT	7V or more/4V or less	
37	Auto light sensor Signal	-	-	

BCM Actuator Operation

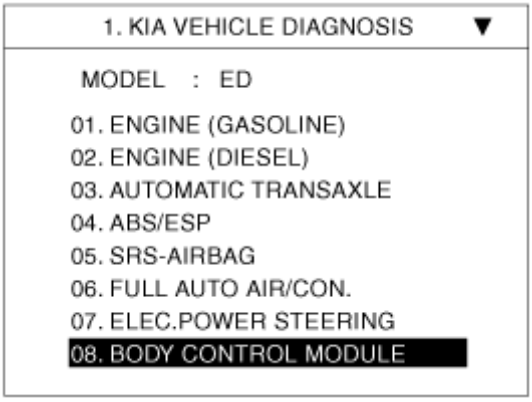
SCAN tool can operates all actuators controlled by BCM by force.

NO.	BCM DISPLAY

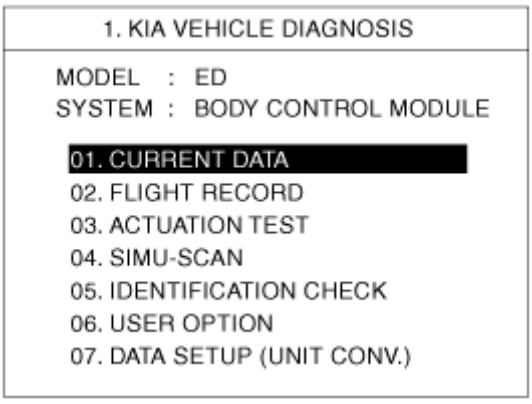
1	DOOR LOCK RELAY
2	DOOR UNLOCK RELAY
3	TAILGATE RELEASE RELAY
4	POWER WINDOW RELAY
5	WIPER RELAY
6	HAZARD RELAY (+RK)
7	BURGLAR HORN RELAY (+RK)
8	STARTER INHIBIT RELAY (+RK)
9	TAIL LAMP RELAY/DRL UNIT
10	HEAD LAMP RELAY
11	REAR FOG RELAY
12	FRONT DEICER RELAY
13	REAR DEFOGGER RELAY
14	DRIVER SEAT BELT INDICATOR
15	IGN KEY HOLE ILLUMINATION
16	ROOM LAMP

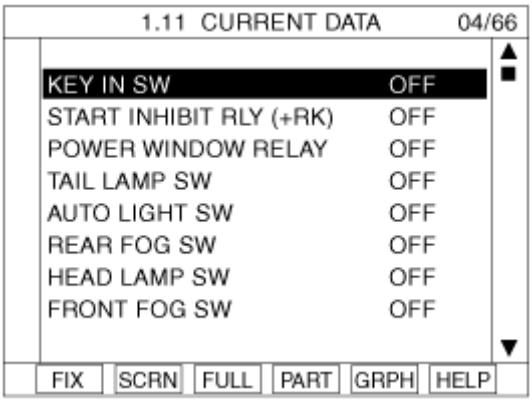
BCM Diagnosis With Scan Tool

1. It will be able to diagnose defects of BCM with scan tool quickly. Scan tool can operates actuator forcefully, input/output value monitoring and self diagnosis.
2. Select model and menu.

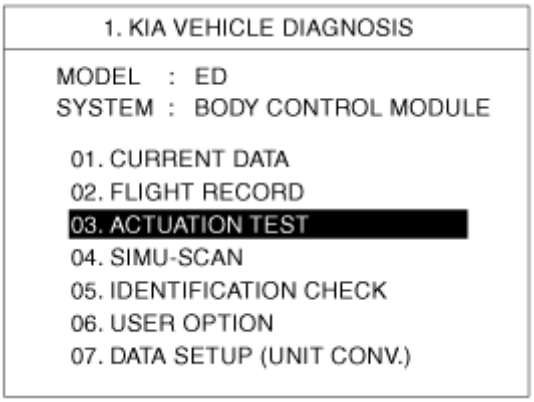


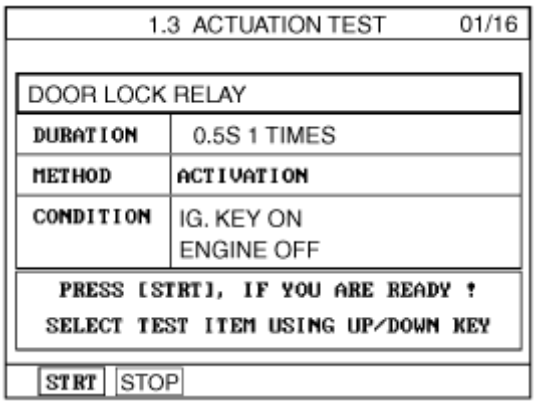
3. Select "Current data", if you will check current data of BCM. It provides power supply status, multi function status, lamp status, door status, lock system status, wiper, auto light status and so on.





4. If you will check BCM data operation forcefully, select "Actuation test".





5. You can turn ON/OFF as below option function with the user option program.
   (1) LOCK / UNLOCK comfirming alarm: Alarm sound ON/OFF control when you LOCK/UNLOCK doors with transmitter.
   (2) Mechanical LOCKING system: Arm/Disarm ON/OFF when you lock the door with the mechanical key.
   (3) AUTO DOOR LOCK/UNLOCK system ON/OFF.
      – Vehicle speed gearing AUTO DOOR LOCK (more than 20km/h)
      – AUTO DOOR LOCK non application
      – Shift lever gearing AUTO DOOR LOCK
      – Driver seat AUTO DOOR LOCK
      – AUTO DOOR UNLOCK non application
      – All doors UNLOCK in the case of driver door UNLOCK
      – All doors UNLOCK in the case of IGN key seperation.
   (4) Riding & Getting off gearing
      – Seat installation state ON/OFF

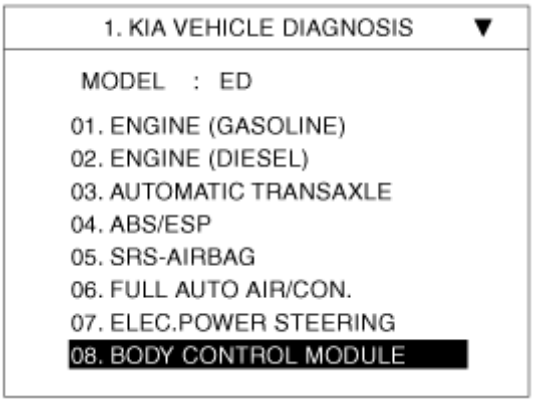
– Seat riding & getting off gearing ON/OFF
– Column installation state ON/OFF
– Column riding & getting off gearing ON/OFF

User Option Mode

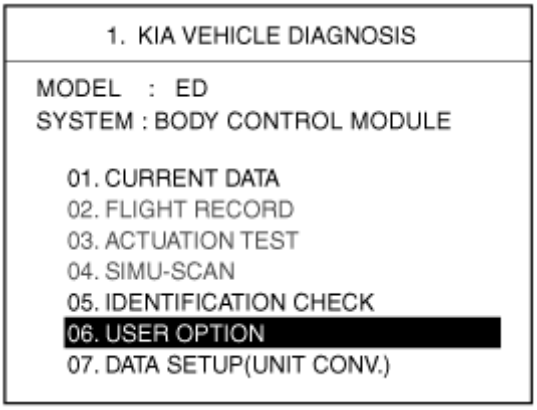
The BCM offers 1 items user option mode for a user convenience (AUTO DOOR LOCK)

– It is able to set up the enable or disable of AUTO DOOR LOCK function or AUTO DOOR LOCK operation vehicle speed when using it.

1. Select option "ED" and press ENTER.
2. Select option "BODY CONTROL MODULE" and press ENTER.

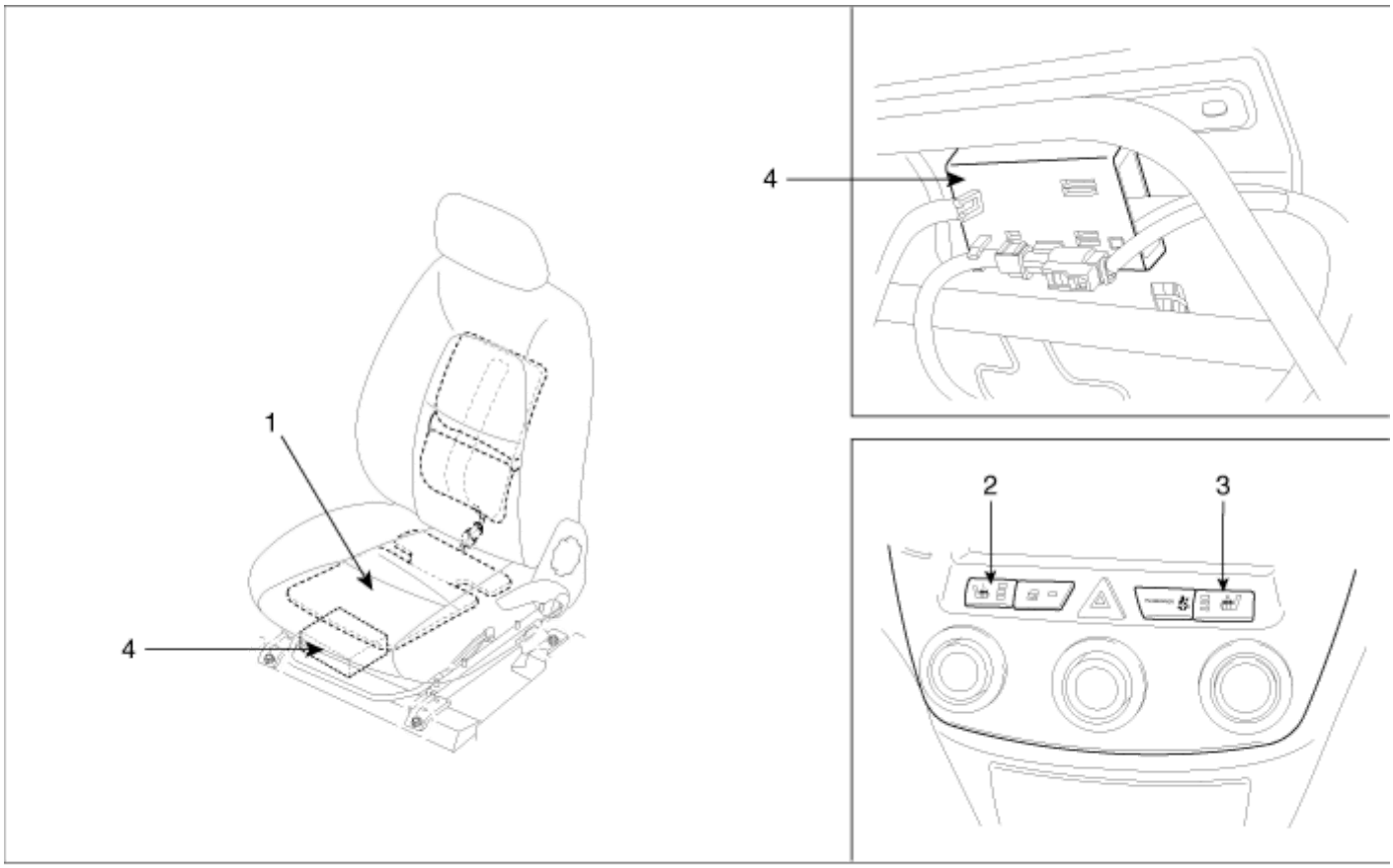


3. Select option "USER OPTION" and press ENTER.



4. Select option "AUTO DOOR LOCK STATUS by using the direction button(▲ / ▼).
5. Select the parameter by using the direction button(◄ / ►) and press ENTER to save it.
(Disable / FIXING)

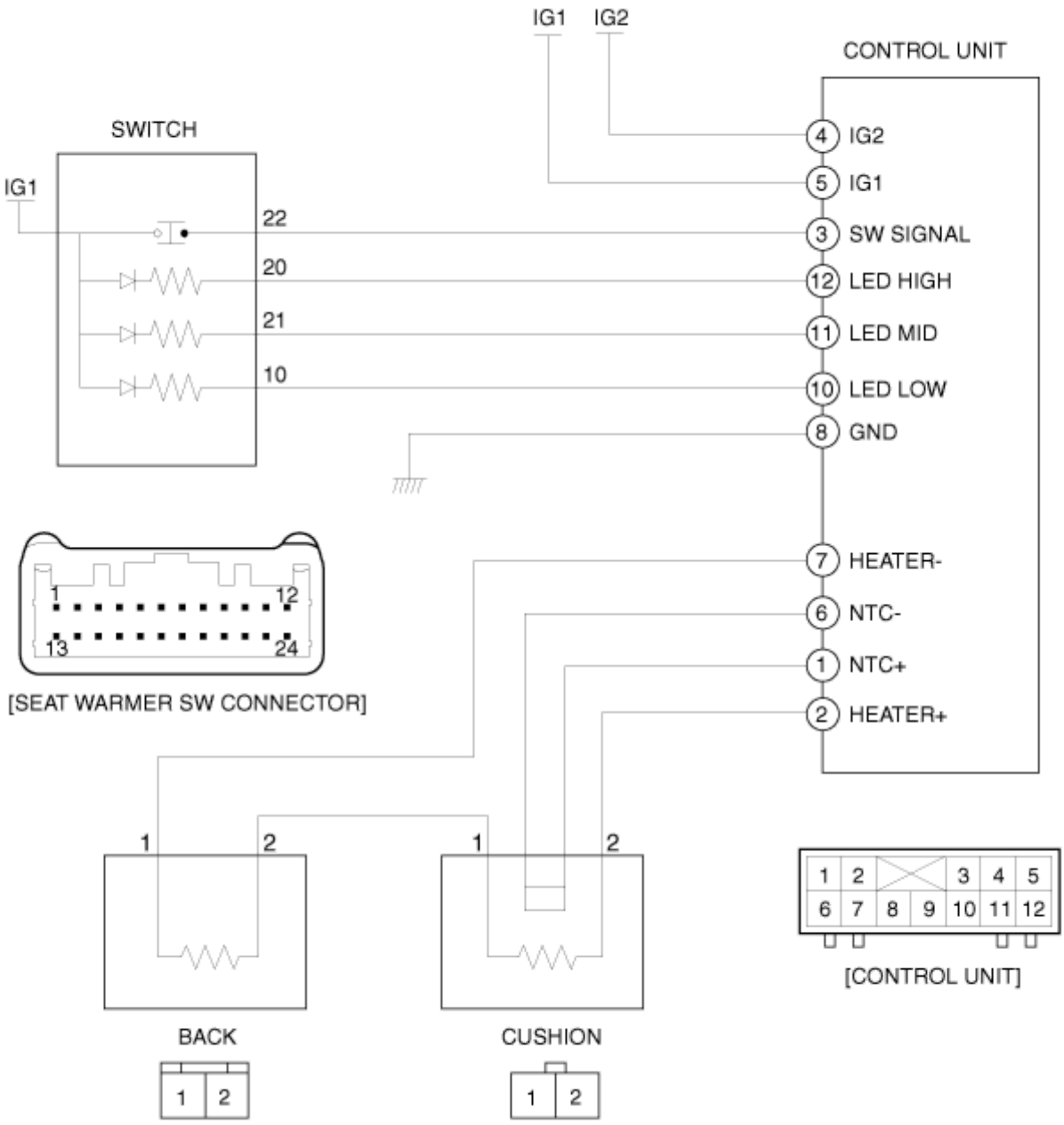
COMPONENT LOCATION



1. Seat warmer
2. Seat warmer switch (LH)
3. Seat warmer switch (RH)
4. Control unit

English

CIRCUIT DIAGRAM



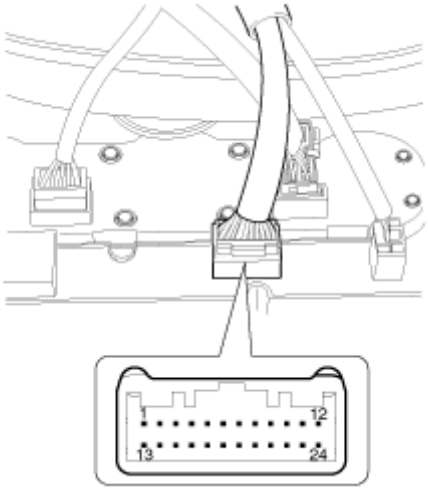
INSPECTION

Front Seat Warmer Switch

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



3. Disconnect the seat warmer switch connector.

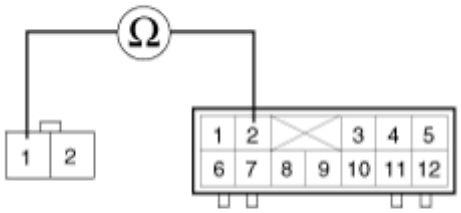


4. Check that continuity exists between the terminals.

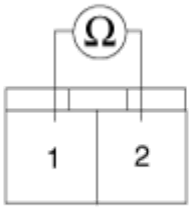
Direction \ Terminal		2	22	GND
Front Left	ON		○——○	
	OFF			
Front Right	ON	○———	———○	
	OFF			

INSPECTION

1. For cushion side of seat warmer, check for continuity and measure the resistance between No.2 terminal of control unit harness connector and No.1 terminal of cushion connector.



2. For back side of seat warmer, check for continuity and measure the resistance between No.1 and No.2 terminal of back connector.



Standard value
Cushion : 1.43Ω ± 10%, Back : 1.01Ω ± 10%

3. Operate the seat warmer after connecting the connectors, and then check the NTC(Negative Temperature Coefficient) thermostat by measuring the temperature of seat surface.

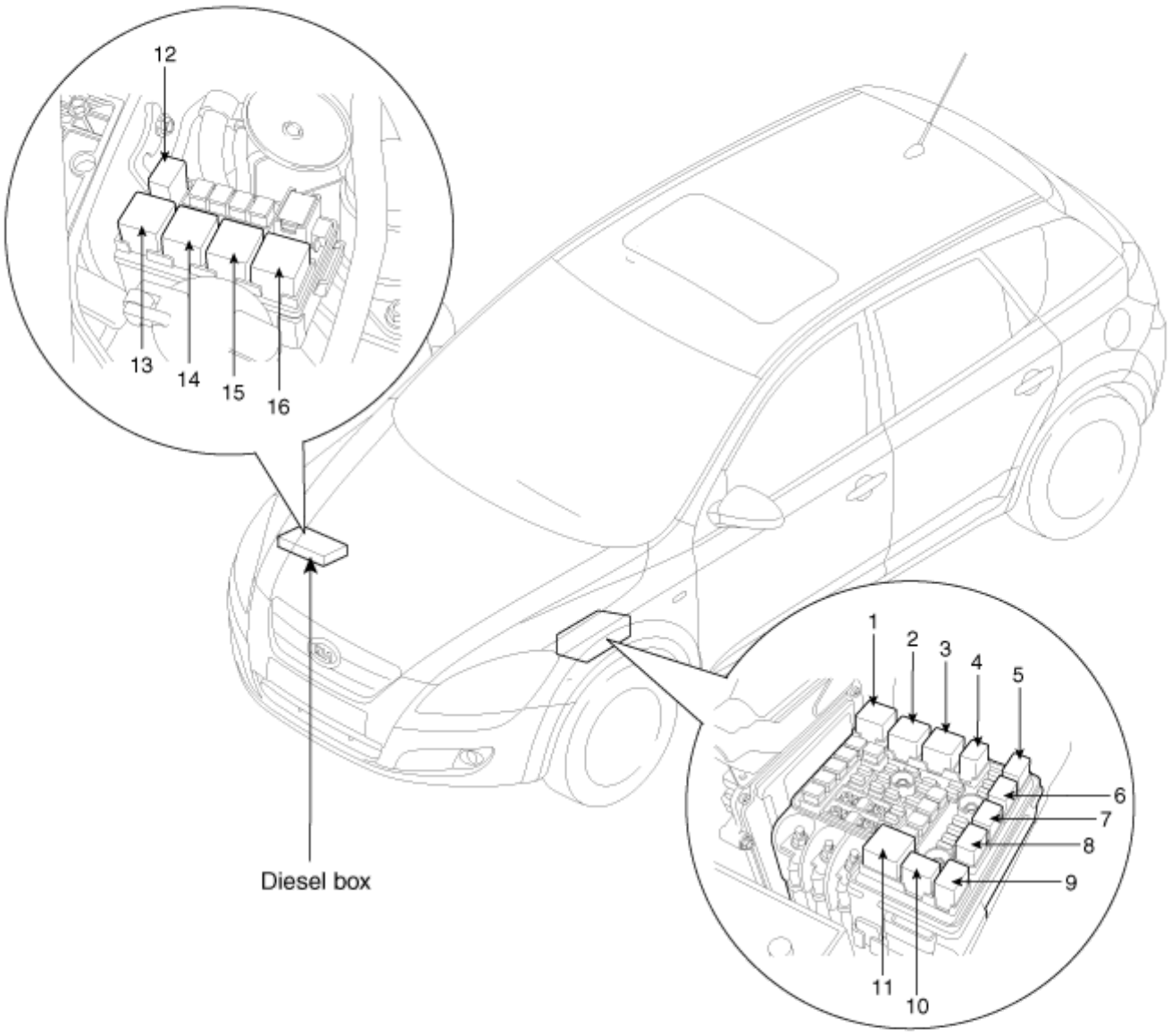
Standard value

Item	Cushion	Back	Remark
LOW	97°F (36°C)	104°F (40°C)	±36°F (±2°C)
MID	100°F (38°C)	109°F (43°C)	±36°F (±2°C)
HIGH	104°F (40°C)	115°F (46°C)	±36°F (±2°C)

English ▼

COMPONENT LOCATION

[Engine room relay box]

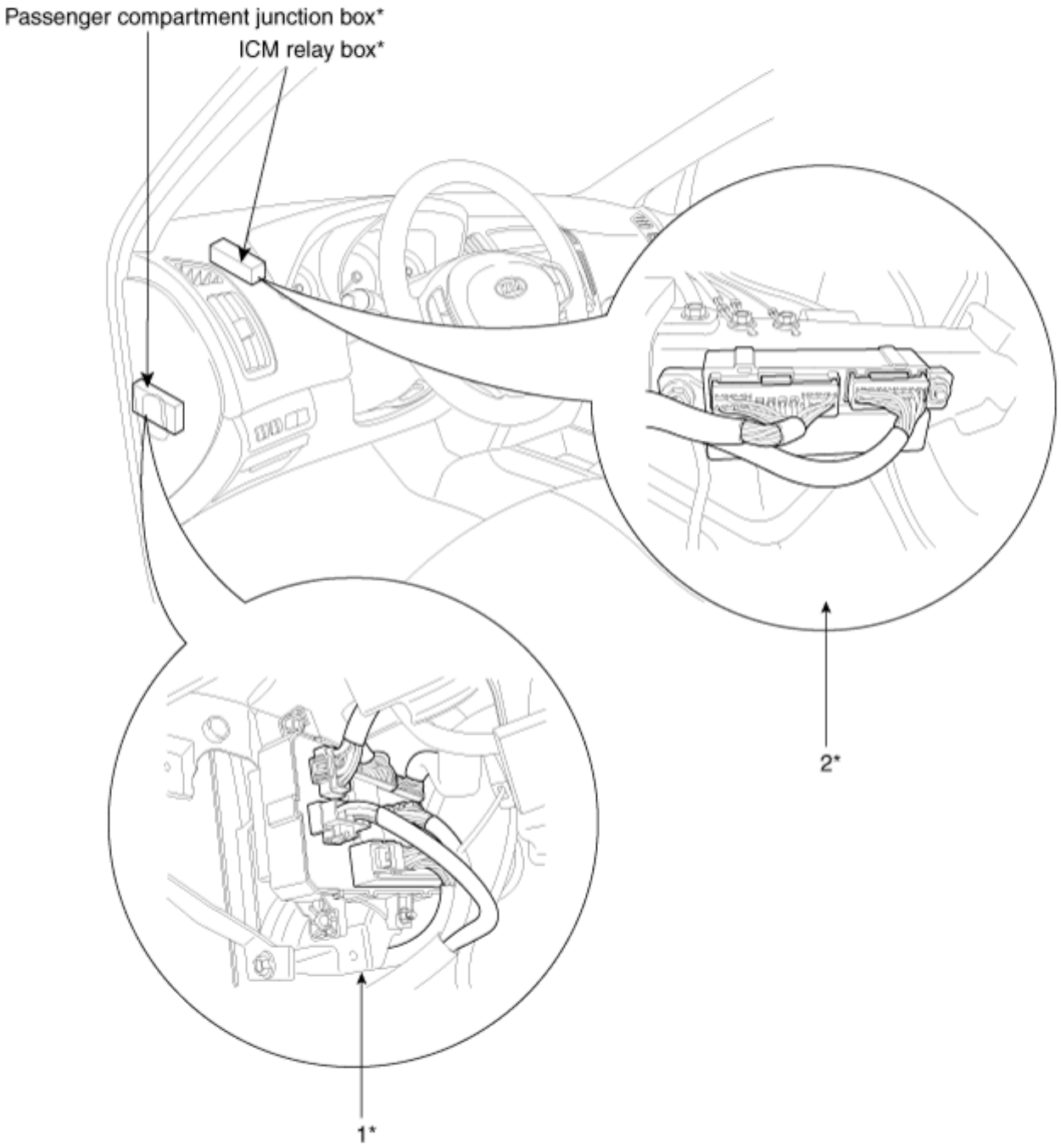


1. Condenser pan 2 relay
2. Condenser pan 1 relay
3. Start relay
4. Fuel pump relay
5. A/C relay
6. Head lamp relay (Low-left side)
7. Horn relay
8. Head lamp relay (High)
9. Front fog lamp relay
10. Wiper relay
11. Main relay
12. Fuel filter heater relay
13. PTC heater relay #3
14. PTC heater relay #2
15. PTC heater relay #1
16. Glow relay

English ▼

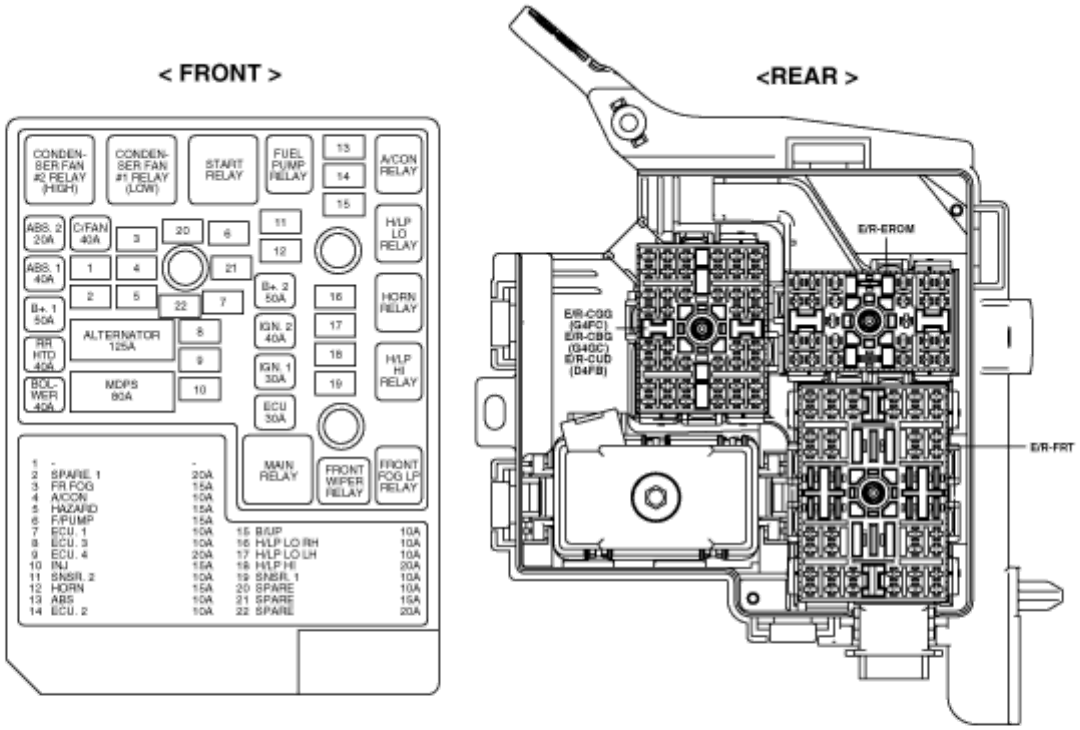
[Passenger compartment relay]

The parts with asterisk(*) :
This illustration shows the LHD type.
RHD type is symmetrical.



1. Tail lamp relay, Power window relay, Rear heater relay, Tailgate relay (Built-in-Junction box)
2. Door unlock relay, Door lock relay, Front decier relay, Rear fog relay, Buglar alarm horn relay, Rain sensor relay, Dead lock relay (Built-in-ICM relay Box)

COMPONENT LOCATION

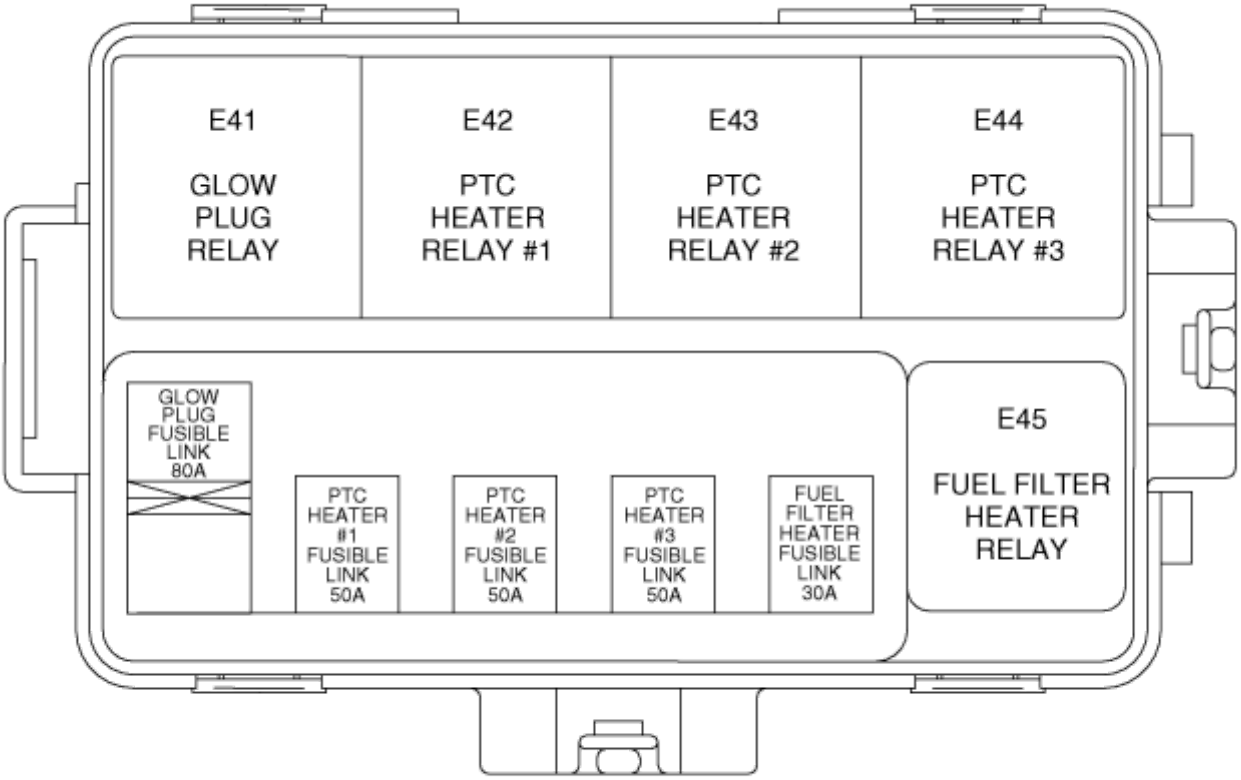


CIRCUIT

	Description	(A)	Circuit Protected
FUSIBLE LINK	ALTERNATOR	125A	Generator, Fusible Link Box (D4FB)
	IGN. 1	30A	Ignition Switch
	IGN. 2	40A	Ignition Switch, Start Relay
	B+. 2	50A	I/P Junction Box
	ECU	30A	Main Relay, PCM (G4GC)
	C/FAN	40A	Condenser Fan #1 Relay (Low), Condenser Fan #2 Relay (High)
	RR HTD	40A	I/P Junction Box
	B+. 1	50A	I/P Junction Box
	BLOWER	40A	Blower Relay
	ABS. 1	40A	ESP Control Module, ABS Control Module, Multipurpose Check Connector
	ABS. 2	20A	ESP Control Module, ABS Control Module, Multipurpose Check Connector
	MDPS	80A	MDPS Control Module
FUSE	SNSR. 1	10A	Immobilizer Module (G4FC/G4GC), Oxygen Sensor (G4FC/G4GC), PCM (G4FC), Camshaft Position Sensor (G4FC/G4GC), Purge Control Solenoid Valve (G4FC), Crankshaft Position Sensor (G4GC), Stop Lamp Switch (D4FB), Lambda Sensor (D4FB)
	INJ	15A	A/Con Relay, Fuel Pump Relay, Injector #1, 2, 3, 4 (G4FC/G4GC), PCM (G4FC/G4GC), Oil Control Valve (G4FC/G4GC), Idle Speed Actuator (G4FC/G4GC), ECM (G4FC), Purge Control Solenoid Valve (G4GC), Camshaft Position Sensor (D4FB), Throttle Flap Actuator (D4FB), EGR Actuator (D4FB), VGT Actuator (D4FB), Immobilizer Module (D4FB), Fusible Link Box (D4FB)
	HAZARD	15A	Hazard Switch, ICM Relay Box (Hazard Relay)
	F/PUMP	15A	Fuel Pump Relay
	HORN	15A	Horn Relay, ICM Relay Box (Burglar Alarm Horn Relay)
	SNSR. 2	10A	Pulse Generator 'A', Pulse Generator 'B', TCM (D4FB), Air Flow Sensor (D4FB), Stop Lamp Switch (G4FC/G4GC), Fuel Filter Warning Switch (D4FB), PCM (G4FC/G4GC), ECM (G4FC/D4FB), Vehicle Speed Sensor
	H/LP HI	20A	H/LP Hi Relay
	H/LP LO LH	10A	Head Lamp LH, Head Lamp Leveling Actuator LH, Head Lamp Leveling Switch
	H/LP LO RH	10A	Head Lamp RH, Head Lamp Leveling Actuator RH
	ECU. 1	10A	ECM (G4FC), PCM (G4FC), TCM (D4FB)
	ECU. 3	10A	ECM (D4FB)
	ECU. 4	20A	ECM (D4FB)
	FR FOG	15A	Front Fog Lp Relay
	A/CON	10A	A/Con Relay
	ABS	10A	ESP Control Module, ABS Control Module, Yaw Rate Sensor, Multipurpose Check Connector
	B/UP	10A	Back-up Lamp Switch, Transaxle Range Switch, Multifunction Switch, Cruise Control Module
	ECU. 2	10A	Condenser (G4FC), Ignition Coil #1, 2, 3, 4 (G4FC), PCM (G4GC)
	SPARE. 1	20A	-
	SPARE	10A	-
	SPARE	15A	-
	SPARE	20A	-

※USE THE DESIGNATED FUSE ONLY

English ▼



※ **USE THE DESIGNATED FUSE ONLY**

INSPECTION

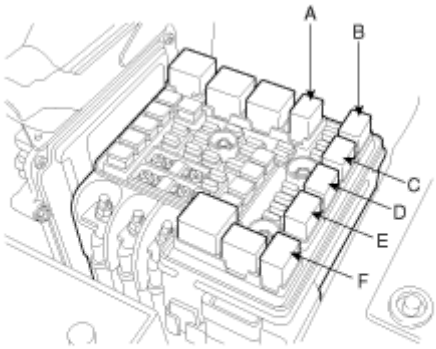
1. Disconnect the negative (-) battery terminal.
2. Pull out the relay from the engine compartment relay box.

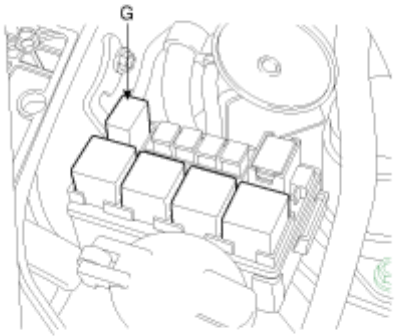
Power Relay (Type A)

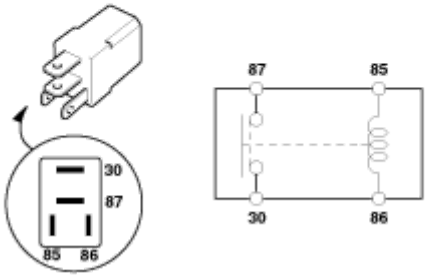
Check for continuity between the terminals.

A : Fuel pump relay
B : A/C relay
C : Head lamp relay (Low)
D : Horn relay
E : Head lamp relay (High)
F : Front fog lamp relay
G : Fuel filter heater relay

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.







Terminal / Power	30	87	85	86
Disconnected			○	○
Connected	○	○	⊖	⊕

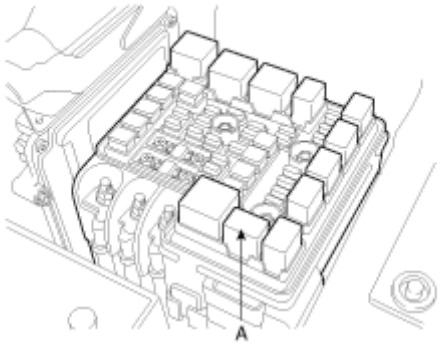
English ▼

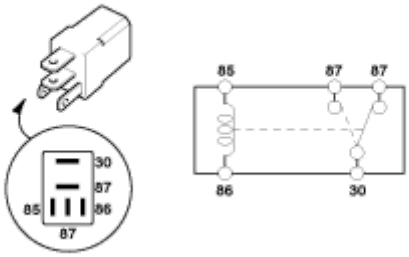
Power Relay (Type B)

Check for continuity between the terminals.

A : Wiper relay

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.





Terminal / Power	85	86	30	87	87
Disconnected			○		○
Connected	⊖	⊕	○	○	

Power Relay (Type C)

Check for continuity between the terminals.

A : Condenser pan2 relay

B : Condenser pan 1 relay

C : Start relay

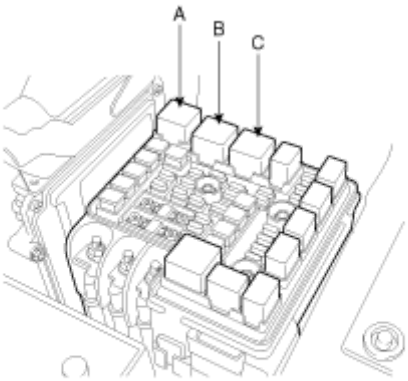
D : Glow relay

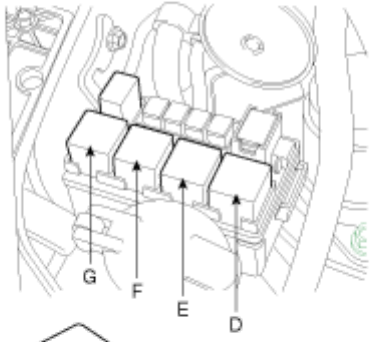
E : PTC heater relay #1

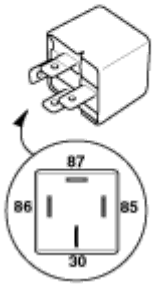
F : PTC heater relay #2

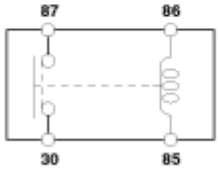
G : PTC heater relay #3

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.









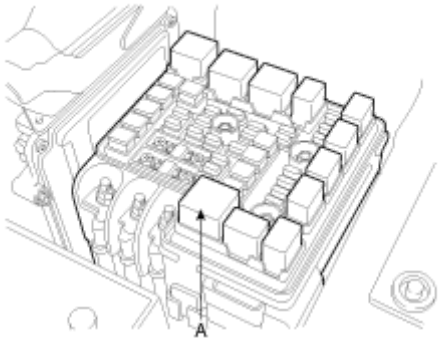
Terminal / Power	86	85	87	30
Disconnected	○	○		
Connected	⊖	⊕	○	○

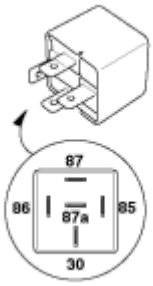
Power Relay (Type D)

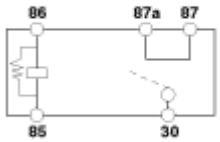
Check for continuity between the terminals.

A : Main relay

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.







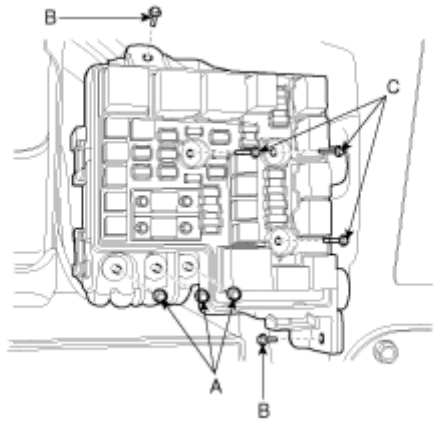
Terminal / Power	86	85	87	87a	30
Disconnected	○	○			
Connected	⊖	⊕	○	○	○

Fuse

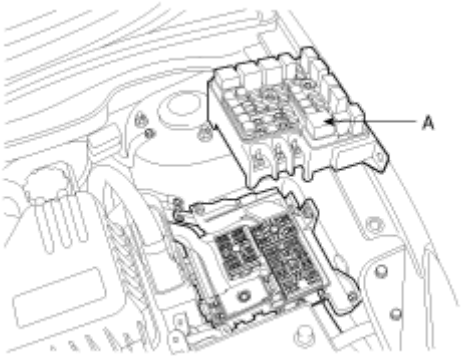
1. Be sure there is no play in the fuse holders, and that the fuses are held securely.
2. Are the fuse capacities for each circuit correct?
3. Are there any blown fuses?
   If a fuse is to be replaced, be sure to use a new fuse of the same capacity. Always determine why the fuse blew first and completely eliminate the problem before installing a new fuse.

REMOVAL

1. Disconnect the negative(-) battery terminal.
2. Remove the engine room junction box upper cover.
3. Loosen the ring terminal mounting 3 nuts(A) then remove the ring terminal cables.
4. Loosen the body and lower cover 2 bolts(B).
5. Loosen the connector 3 bolts(C).



6. Remove the fuse and relay box(A) from the lower cover.



7. Remove the lower cover and mating connectors after loosening the box mounting 2 bolts.



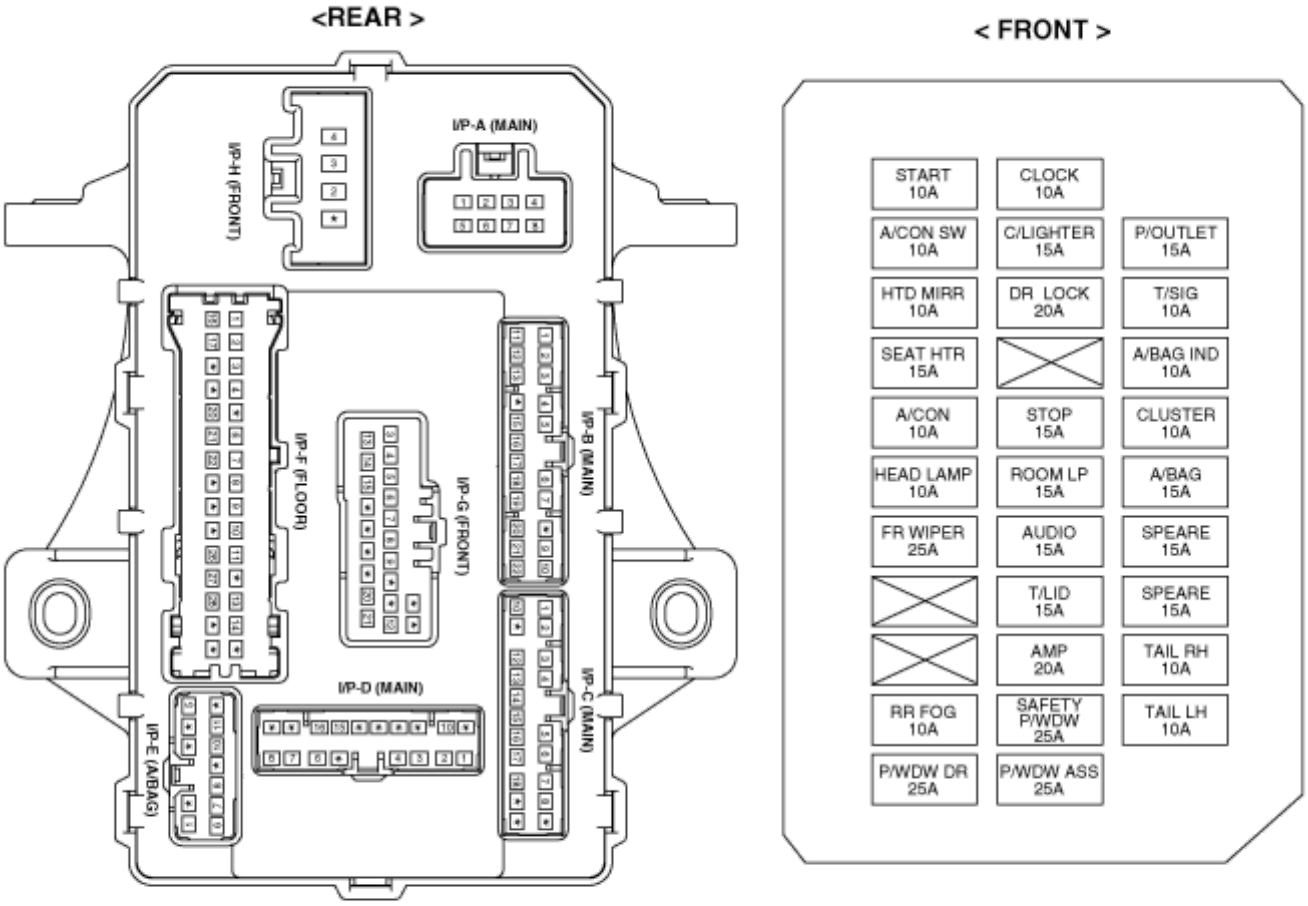
INSTALLATION

1. Install the lower cover.
   TORQUE : 10 ~ 12Nm (1.0 ~ 1.2 kgf.m, 7.2 ~ 8.7 lbf.ft)

2. Install the fuse and relay box to the lower cover.
   TORQUE :
   Connector bolt : 10 ~ 12Nm (1.0 ~ 1.2 kgf.m, 7.2 ~ 8.7 lbf.ft)
   Ring terminal mounting nut : 10 ~ 12Nm (1.0 ~ 1.2 kgf.m, 7.2 ~ 8.7 lbf.ft)
   Body and lower cover bolt : 10 ~ 12Nm (1.0 ~ 1.2 kgf.m, 7.2 ~ 8.7 lbf.ft)

3. Install the junction box upper cover.

COMPONENT LOCATION



※USE THE DESIGNATED FUSE ONLY

English ▼

CIRCUIT

FUSE		(A)	Circuit Protected
CLOCK		10A	Audio, ATM Key Lock Control Module, Digital Clock, Power Outside Mirror Switch
C/LIGHTER		15A	Power Outlet
P/OUTLET		15A	Power OUtlet
A/BAG		15A	SRS Control Module
A/BAG IND		10A	Instrument Cluster
T/SIG		10A	Hazard Switch
CLUSTER		10A	Instrument Cluster, MDPS Control Module, ESP Switch, BCM, Steering Angle Sensor, ATM Key Lock Control Module
A/CON SW		10A	A/C Control Module
A/CON		10A	A/C Control Module, Blower Relay, BCM, Incar & Humidity Sensor (Auto), Fusible Link Box (D4FB), AQS & AMB Sensor (Auto), Sunroof Control Module, Electro Chromic Mirror
FR WIPER		25A	Multifunction Switch, Front Wiper Relay
HEAD LAMP		10A	H/LP Lo Relay, H/LP Hi Relay
HTD MIRR		10A	A/C Control Module, ECM (G4FC), PCM (G4FC), Power Outside Mirror Motor
POWER CONNECTOR	AUDIO	15A	Audio
	ROOM LP	15A	Room Lamp, Data Link Connector, Instrument Cluster, Room Lamp, Map Lamp, Vanity Lamp Switch, A/C Control Module, Digital Clock, BCM, Ignition Key ILL. & Door Warning Switch
DR LOCK		20A	Sunroof Control Module, ICM Relay Box (Door Unlock/Lock Relay)
STOP		15A	Key Solenoid, ATM Lever Switch, Stop Lamp Switch
TAILGATE		15A	Tailgate Relay
RR FOG		10A	ICM Relay Box (Rear Fog Lamp Relay)
AMP		20A	AMP
SAFETY P/WDW		25A	Safety Power Window Module
START		10A	Ignition Lock Switch, Start Relay, Transaxle Range Switch, ICM Relay Box (Burglar Alarm Relay)
P/WDW DR		25A	Power Window Main Switch, Rear Power Window Switch LH
P/WDW ASS		25A	Power Window Main Switch, Rear Power Window Switch RH, Passenger Power Window Switch
TAIL LH		10A	Head Lamp LH, Power Window Main, Switch Power Window Switch, License Lamp Rear, Combination Lamp LH (OUT)
TAIL RH		10A	License Lamp, Rear Combination Lamp RH (OUT), Glove Box Lamp, Head Lamp RH, Shunt Connector, Front Fog Lp Relay
SEAT HTR		15A	Front Seat Warmer Switch

※ USE THE DESIGNATED FUSE ONLY

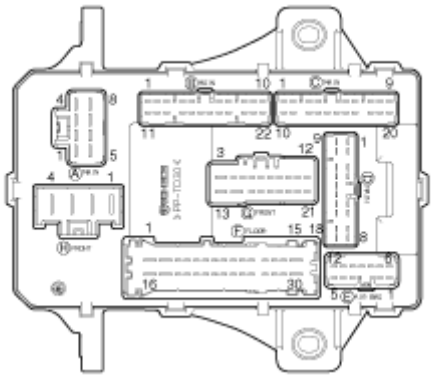
INSPECTION

Fuse

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.

Passenger Compartment Relay

1. Disconnect the negative(-) battery terminal.
2. Remove the crash pad lower panel.
   (Refer to the BD group - "Crash pad")
3. Remove the junction box.



Power Window

Check for continuity between the terminals.

1. There should be continuity between the No.2 terminal in the I/P-H and the No.16 or 17 terminal in the I/P-F when power and ground are connected to the No.2 terminal in the I/P-H and the No.17 terminal in the I/P-B.
2. There should be no continuity between the No.2 terminal in the I/P-H and the No.16 or 17 terminal in the I/P-F when power and ground are connected to the No.2 terminal in the I/P-H and the No.17 terminal in the I/P-B.

Tail Lamp

Check for continuity between the terminals.

1. There should be continuity between the No.2 terminal in the I/P-H and the No.15(LH) or 4(RH) terminal in the I/P-G when power and ground are connected to the No.2 terminal in the I/P-H and the No.6 terminal in the I/P-D.
2. There should be no continuity between the No.2 terminal in the I/P-H and the No.15(LH) or 4(RH) terminal in the I/P-G when power and ground are connected to the No.2 terminal in the I/P-H and the No.6 terminal in the I/P-D.

Tailgate Lid Open

Check for continuity between the terminals.

1. There should be continuity between the No.3 terminal in the I/P-H and the No.2 terminal in the I/P-D when power and ground are connected to the No.3 terminal in the I/P-H and the No.28 terminal in the I/P-F.

2. There should be no continuity between the No.3 terminal in the I/P-H and the No.2 terminal in the I/P-D when p… ground are connected to the No.3 terminal in the I/P-H and the No.28 terminal in the I/P-F.

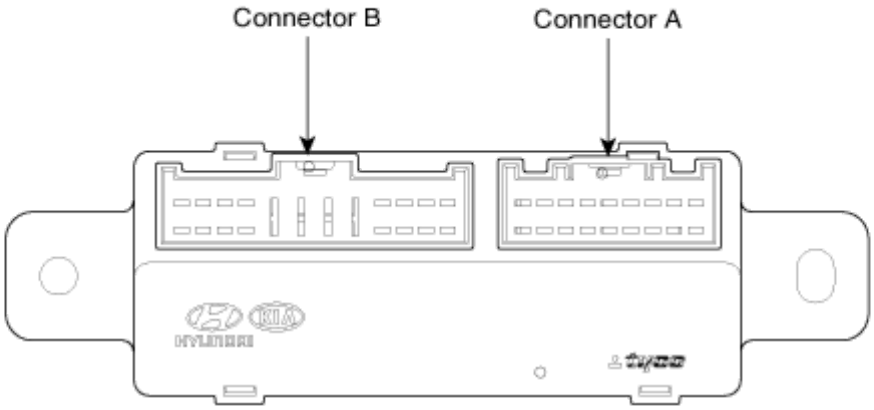
English ▼

Rear Heater

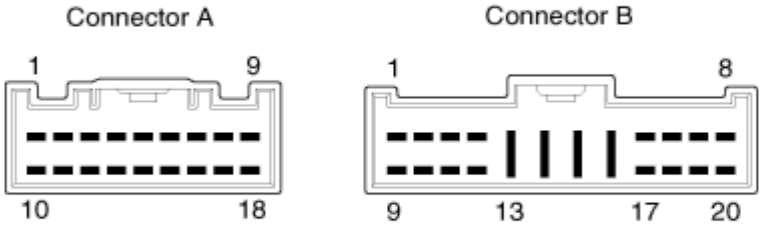
Check for continuity between the terminals.

1. There should be continuity between the No.3 terminal in the I/P-G and the No.2 or 4 terminal in the I/P-F when power and ground are connected to the No.3 terminal in the I/P-G and the No.16 terminal in the I/P-B.
2. There should be no continuity between the No.3 terminal in the I/P-G and the No.2 or 4 terminal in the I/P-F when power and ground are connected to the No.3 terminal in the I/P-G and the No.16 terminal in the I/P-B.

COMPONENT

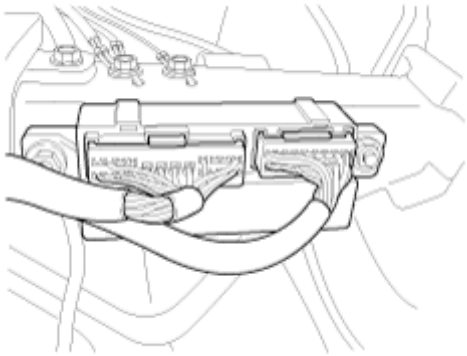

Connector B
Connector A




Connector A
1
9
10
18
Connector B
1
8
9
13
17
20

DESCRIPTION

The ICM is united with many kinds of relays and installed over the instrument panel box.



INSPECTION

1. Disconnect the negative(-) battery terminal.
2. Remove the ICM relay box.

Door Lock

Check for continuity between the terminals.

1. There should be continuity between the No.15 and No.6(or 16) terminals when power and ground are connected to the No.15 and No.17 in the ICM-B.
2. There should be no continuity between the No.15 and No.6(or 16) terminals when power is disconnected.

Door Unlock

Check for continuity between the terminals.

1. There should be no continuity between the No.15 and No.4(or 14) terminals when power and ground are connected to the No.12 and No.15 in the ICM-B.
2. There should be continuity between the No.15 and No.4(or 14) terminals when power is disconnected.

Burglar Alarm Horn

Check for continuity between the terminals.

1. There should be continuity between the No.11 and No.12 terminals when power and ground are connected to the No.3 and No.11 in the ICM-A.
2. There should be no continuity between the No.11 and No.12 terminals when power is disconnected.

Front Deicer

Check for continuity between the terminals.

1. There should be continuity between the No.1 and No.10 terminals when power and ground are connected to the No.2 and No.10 terminals in the ICM-A.
2. There should be no continuity between the No.1 and No.10 terminals when power is disconnected.

Rear Fog Lamp

Check for continuity between the terminals.

1. There should be continuity between the No.2(or 10) and No.11 terminals when power and ground are connected to the No.9(or 10) and No.11 terminals in the ICM-B.
2. There should be no continuity between the No.2(or 10) and No.11 terminals when power is disconnected.

Rain Sensor

Check for continuity between the terminals.

1. There should be continuity between the No.9 and No.16 terminals when power and ground are connected to the No.8 and No.18 terminals in the ICM-A.
2. There should be no continuity between the No.9 and No.16 terminals when power is disconnected.

Dead Lock

Check for continuity between the terminals.

1. There should be continuity between the No.5 and No.14 terminals when power and ground are connected to the No.7 and

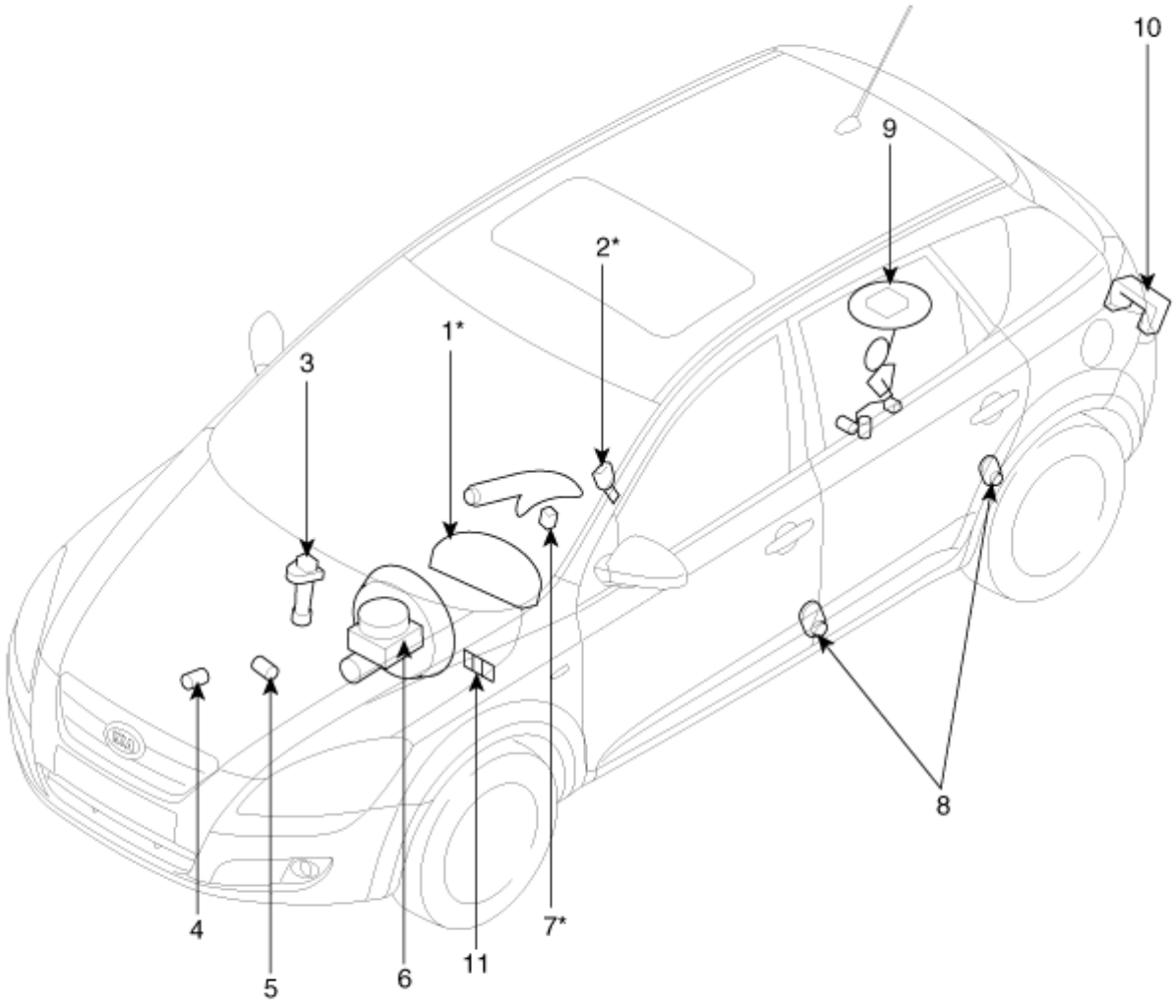
No.14 terminals in the ICM-A.

English ▼

2. There should be no continuity between the No.5 and No.14 terminals when power is disconnected.

COMPONENT LOCATION

The parts with asterisk(*) :
This illustration shows the LHD type.
RHD type is symmetrical.

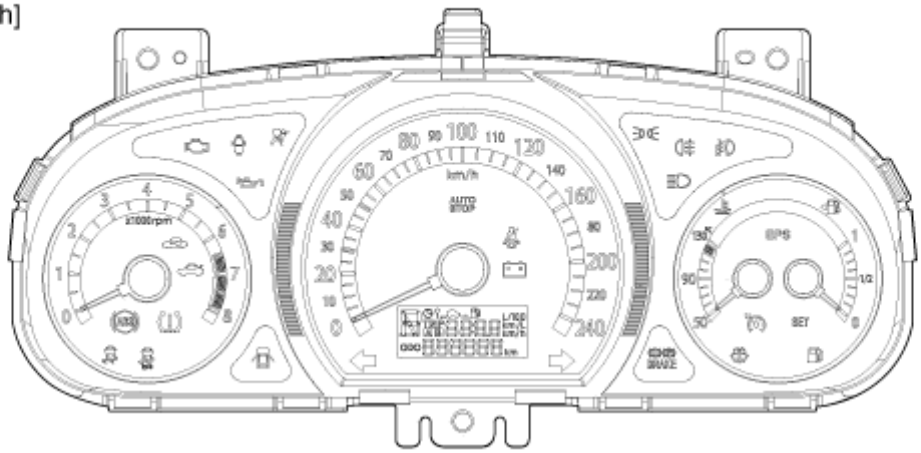


1. Cluster assembly	7. Parking brake switch
2. Seat belt switch	8. Door switch
3. Vehicle speed sensor	9. Fuel gauge sender
4. Engine coolant temperature sender	10.Tailgate switch
5. Oil pressure switch	11. ISG OFF switch / ESP OFF switch
6. Brake fluid level warning switch	

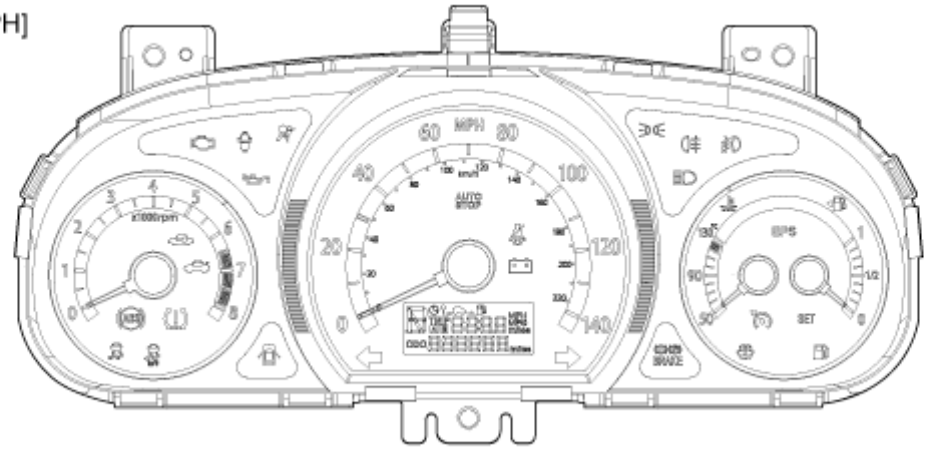
COMPONENTS

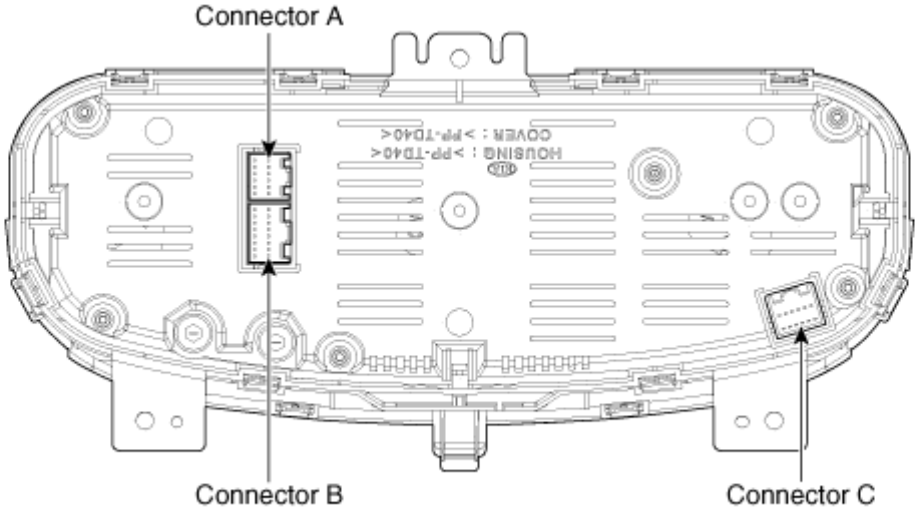
[General (Gasoline)]

[km/h]

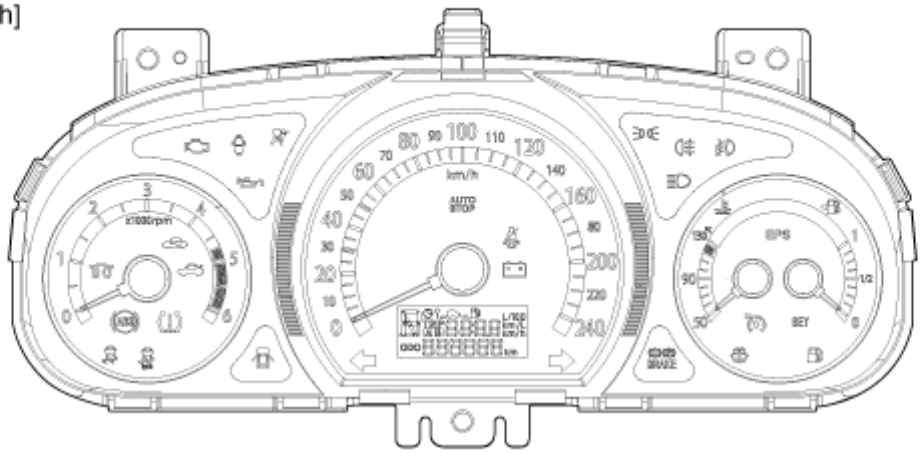


[MPH]

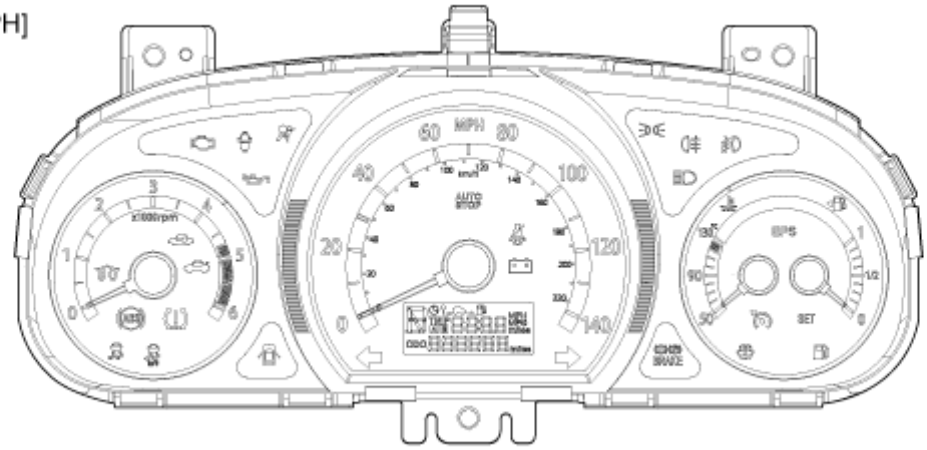


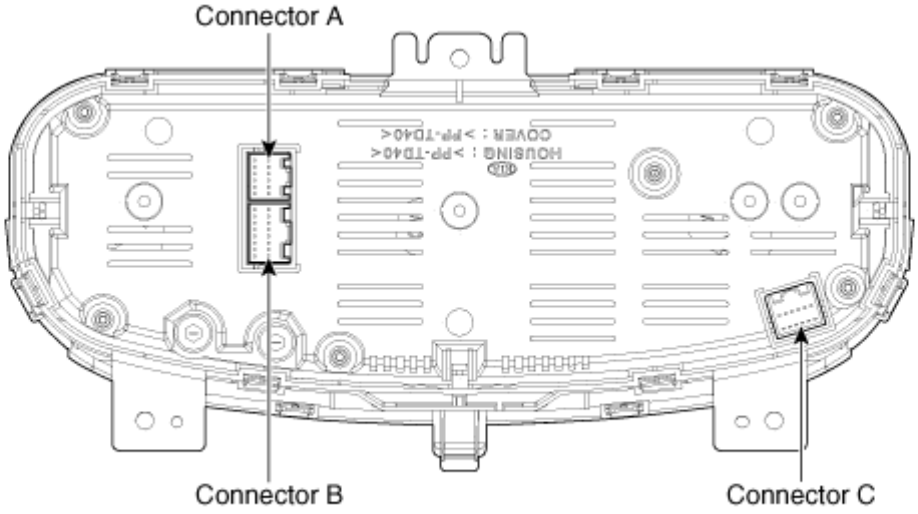


[km/h]

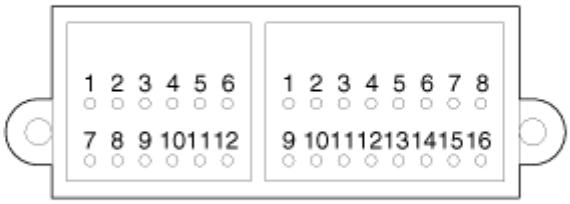


[MPH]



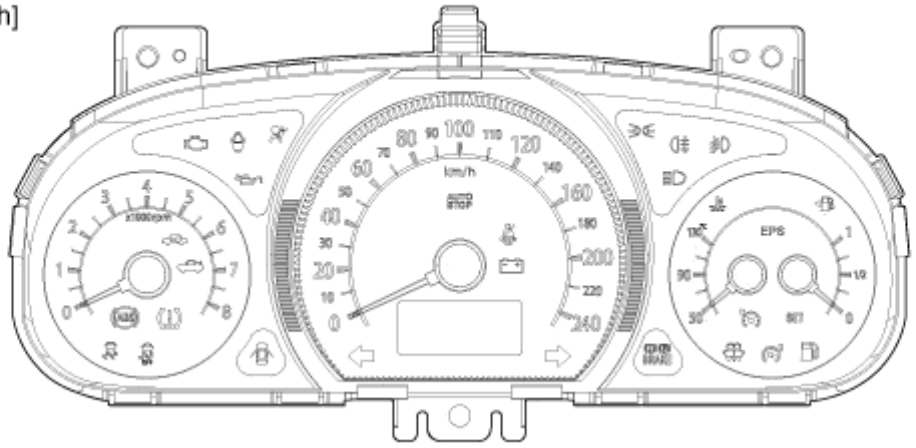


[General (Gasoline/Diesel)]

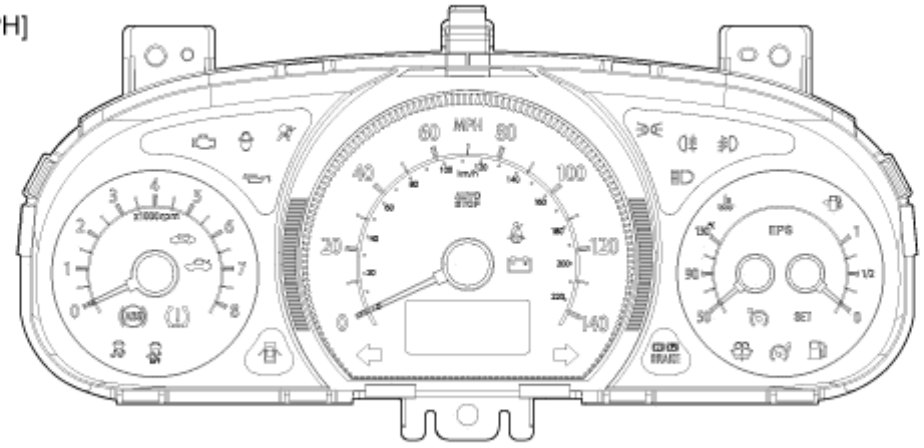
			
Pin	Connector A	Connector B	Connector C
1	Illumination (+)	Speed	Pground
2	Illumination (-)	Hood open (ISG)	CAN (-)
3	Diagnosis	Driver door (ISG)	CAN (+)
4	Alternator	Sground	Alternator L out (ISG)
5	Oil pressure	Fground	Washer low
6	Seat belt	Fuel input	Cruse (BETA-Engine)
7	Mode switch	IGN	Front fog
8	Parking breake	B+	Rear fog
9	Turn right	-	Tail lamp on
10	Turn left	Glow (Diesel)	High beam input (+)
11	Door open	Trunk open	MT R
12	DC Illumination (ISG)	Immoblizer	Cruse set (BETA-Engine)
13		Airbag (-)	
14		Airbag (+)	
15		Water separator	
16		Check engine	

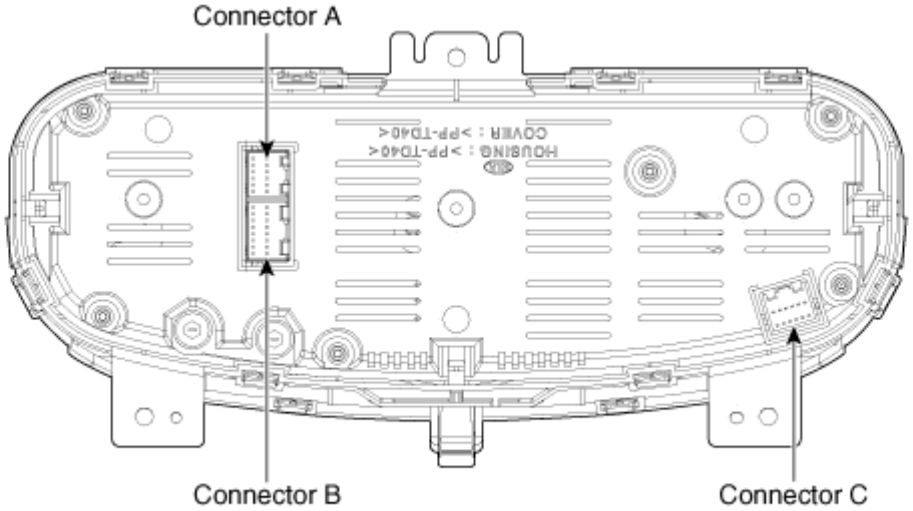
[Super Vision (Gasoline)]

[km/h]



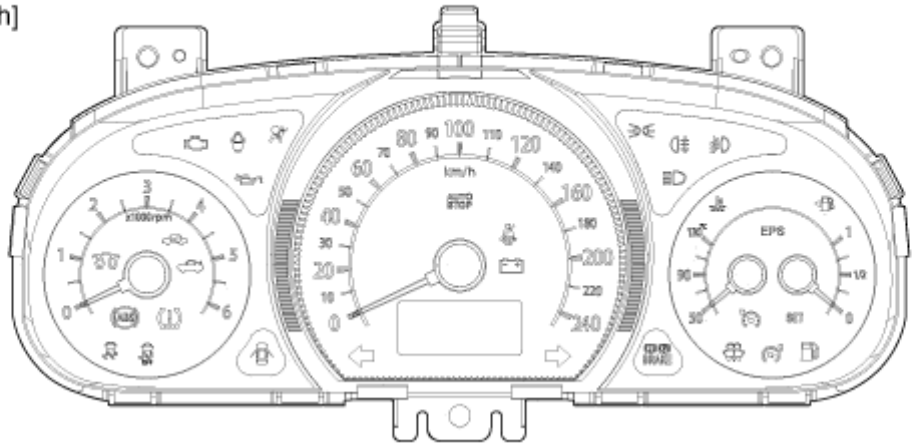
[MPH]



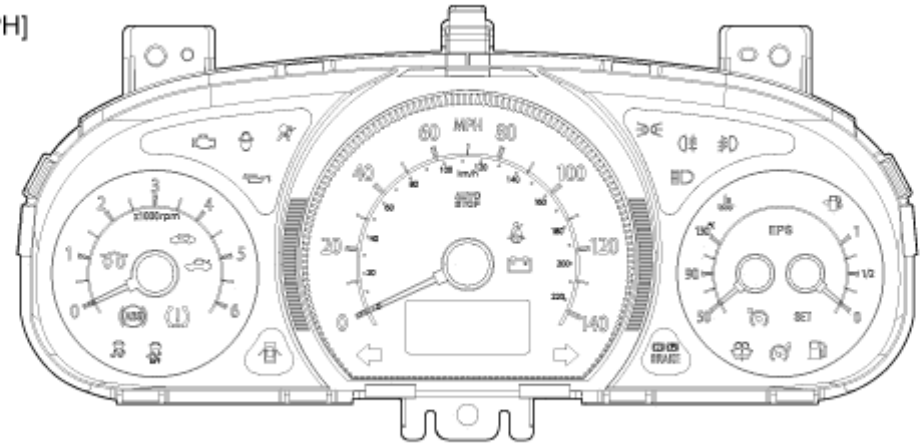


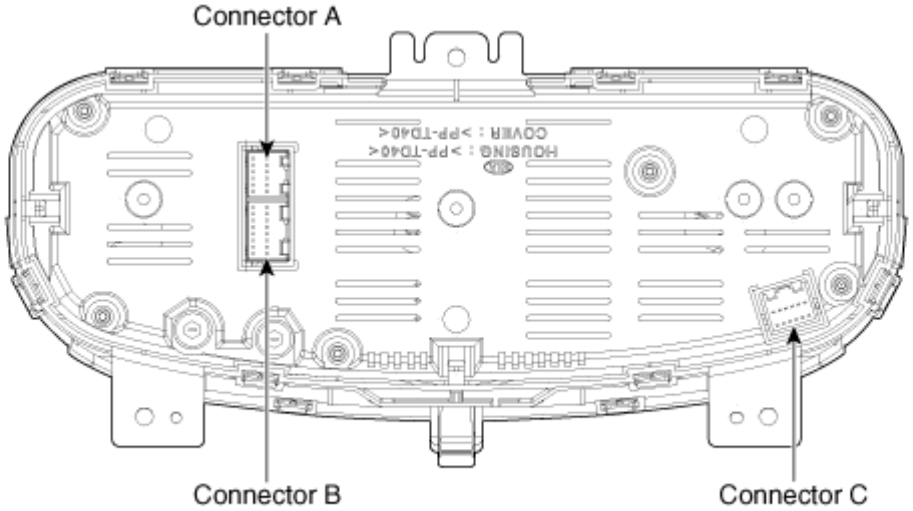
[Super Vision (Diesel)]

[km/h]

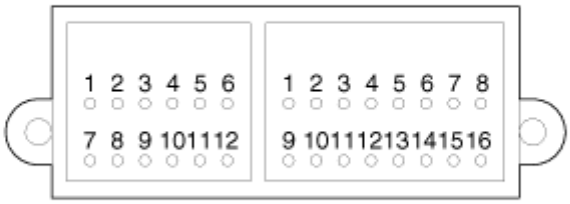


[MPH]





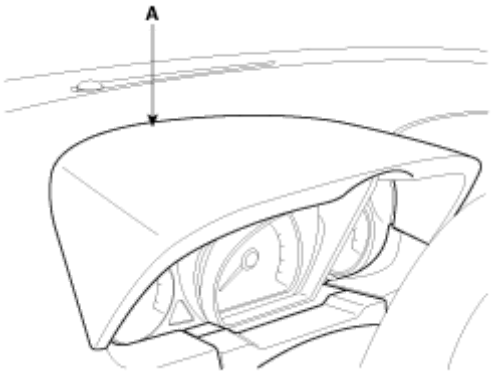
[Super Vision (Gasoline/Diesel)]

			
Pin	Connector A	Connector B	Connector C
1	Illumination (+)	Speed	Pground
2	Illumination (-)	Hood open (ISG)	CAN (-)
3	Diagnosis	Driver door (ISG)	CAN (+)
4	Alternator	Sground	Alternator L out (ISG)
5	Oil pressure	Fground	Washer low
6	Seat belt	Fuel input	Cruse (BETA-Engine)
7	Mode switch	IGN	Front fog
8	Parking breake	B+	Rear fog
9	Turn right	Over speed out	Tail lamp on
10	Turn left	Glow (Diesel)	High beam input (+)
11	Door open	Trunk open	MT R
12	DC Illumination (ISG)	Immoblizer	Cruse set (BETA-Engine)
13		Airbag (-)	
14		Airbag (+)	
15		Water separator	
16		Check engine	

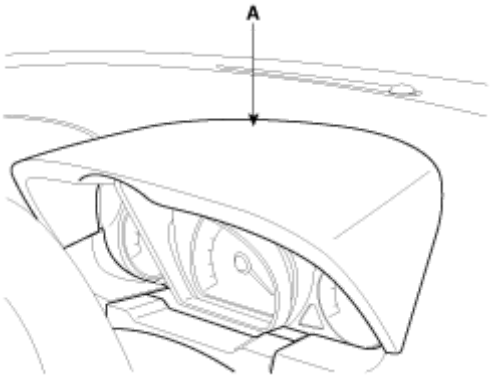
REMOVAL

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

   [LHD]

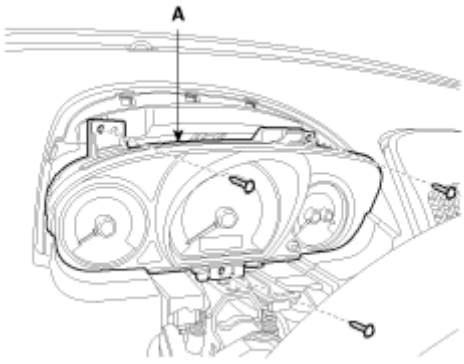


   [RHD]



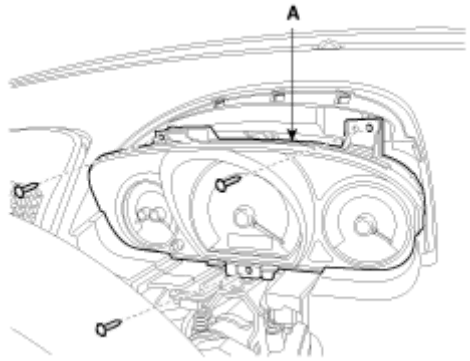
3. Remove the cluster fascia (A) from the housing after removing 4 screws.

   [LHD]

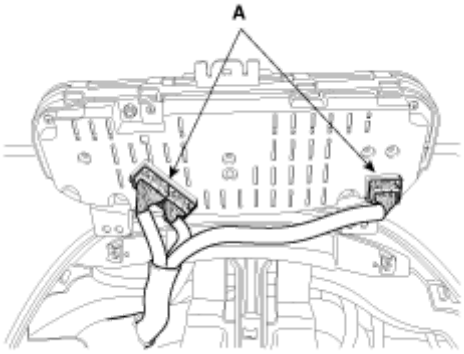


   [RHD]

English ▼



4. Disconnect the cluster fascia connecters (A) and then remove the cluster.



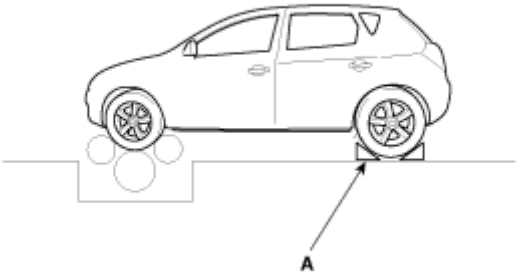
INSTALLATION

1. Connect the cluster connector.
2. Install the cluster assembly.
3. Connect the trip switch connector.
4. Install the center facia panel.

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.

> **NOTICE**
>
> Tire wear and tire over or under inflation will increase the indication error.

[km/h]

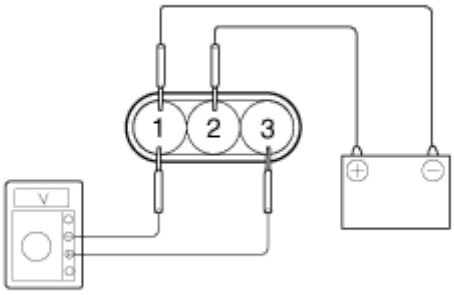
Velocity (km/h)	20	40	60	80	100
Tolerance (km/h)	+3.6 +0.6	+5.9 +2.4	+7.0 +3.5	+8.2 +4.5	+8.9 +5.9
Velocity (km/h)	120	160	200	220	240
Tolerance (km/h)	+10.5 +6.5	+12.7 +8.3	+15.0 +10.0	+16.1 +11.1	-

[MPH]

Velocity (MPH)	10	20	40	60
Tolerance (MPH)	+3.2 +1.2	+3.5 +1.6	+4.5 +2.4	+5.3 +3.3
Velocity (MPH)	80	100	120	140
Tolerance (MPH)	+6.1 +4.1	+7.3 +4.5	+8.6 +5.1	-

Vehicle Speed Sensor

1. Connect the positive (+) lead from battery to terminal 2 and negative (-) lead to terminal 1.
2. Connect the positive (+) lead from tester to terminal 3 and the negative (-) lead to terminal 1.
3. Rotate the shaft.
4. Check that there is voltage change from approx. 0V to 11V or more between terminals 3 and 1.
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

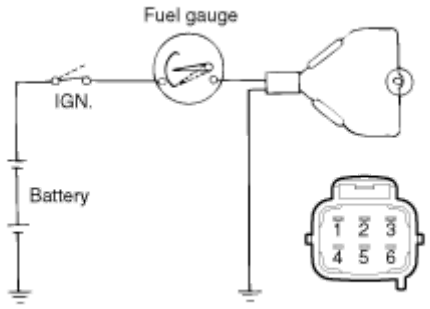
1. Connect the scan tool to the diagnostic link connector or install a tachometer.
2. With the engine started, compare the readings of the tester with that of the tachometer. Replace the tachometer if the tolerance is exceeded.

> **⚠ CAUTION**
>
> a. Reversing the connections of the tachometer will damage the transistor and diodes inside.
>
> b. 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	Remark
Tolerance (rpm)	±100	±100	±100	±100	Gasoline
Tolerance (rpm)	±100	±100	±100	±100	Diesel
Revolution (rpm)	5,000	6,000	7,000	8,000	Remark
Tolerance (rpm)	±100	±100	±100	±100	Gasoline
Tolerance (rpm)	±100	±100	-	-	Diesel

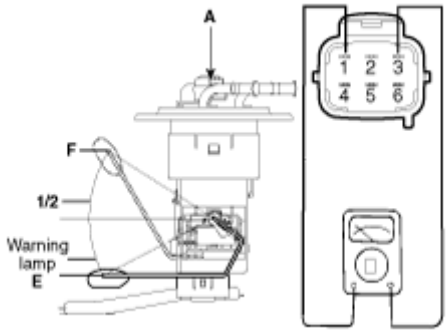
Fuel Gauge

1. Disconnect the fuel sender connector from the fuel sender.
2. Connect a 3.4 wattages, 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.



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".

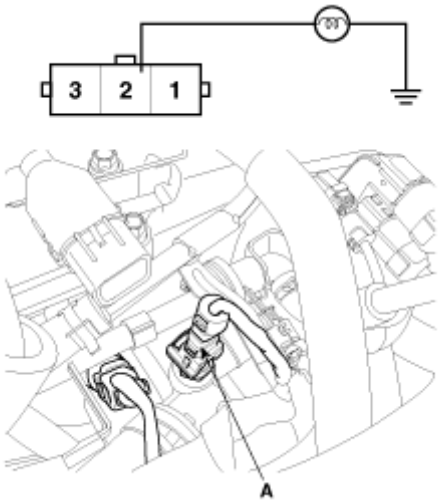
Position	Resistance(Ω)
E	184 ± 2.5Ω
Warning lamp	170 ± 2.5Ω
1/2	66 ± 2.4Ω
Sender (F)	15 ± 2.5Ω

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.

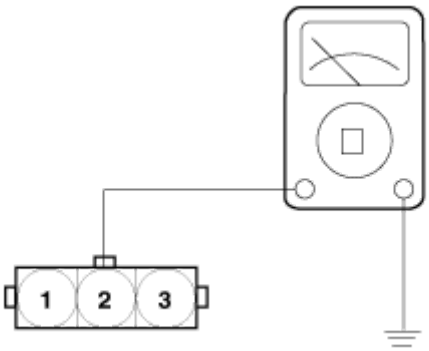
Engine Coolant Temperature Gauge

1. Disconnect the wiring connector (A) from the engine coolant temperature sender in the engine compartment.
2. Connect a 12V, 3.4 wattages test bulb between the harness side connector 2 terminal and ground.
3. Turn the ignition switch ON.
4. Verify that the test bulb flashes and that the indicator moves to HOT position.
   If operation is not as specified, replace the cluster (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.

[Super Vision]

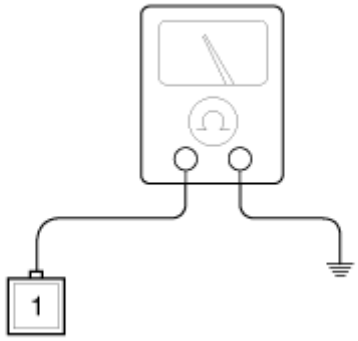
Temperature [°F(°C)]	131 (55)	159.8 (71)	230 (110)	257 (125)	E/G
Deflection(°)	0°±3°	35°±3°	35°±3°	75°±3°	Gasoline
	0°±3°	35°±3°	35°±3°	75°±3°	Diesel

[General]

Temperature [°F(°C)]	122 (50)	185 (85)	230 (110)	257 (125)	E/G
Deflection(°)	0°±3°	35°±3°	35°±3°	75°±3°	Gasoline
	0°±3°	35°±3°	35°±3°	75°±3°	Diesel

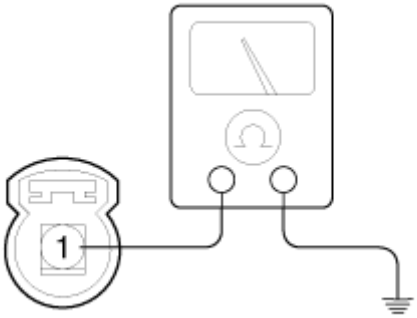
Oil Pressure Switch

1. Check that there is continuity between the oil pressure switch terminal 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 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

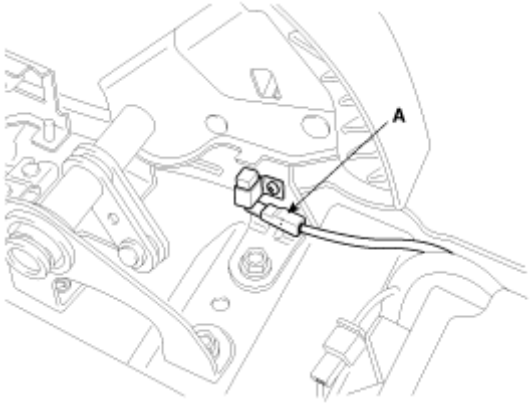
1. Ignition "ON".
2. Release the parking brake.
3. Remove the connector from the brake fluid level warning switch.
4. Ground the connector at the harness side.

5. Verify that the warning lamp lights.

Parking Brake Switch

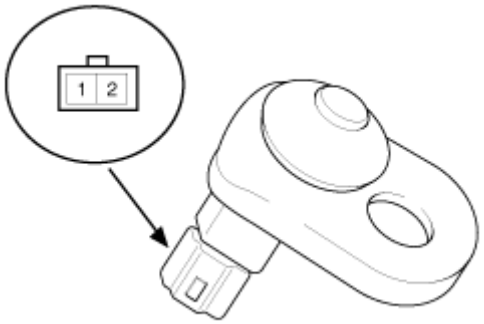
The parking brake switch is a pull type. It is located at the side of the parking brake lever.

1. Check that there is continuity between the terminal and switch body with the switch (A) ON.
2. Check that there is no continuity between the terminal and switch body with the switch OFF.
   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.

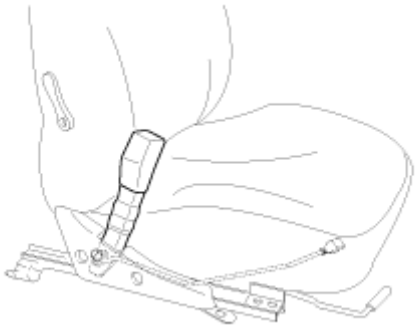


Terminal / Position	1	2	Body (Ground)
Free(Door open)	○	○	○
Push(Door close)			

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)



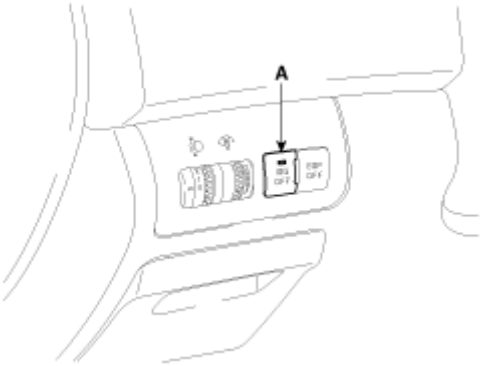
Seat Belt Warning Lamp

With the ignition switch turned ON, verify that the lamp glows.

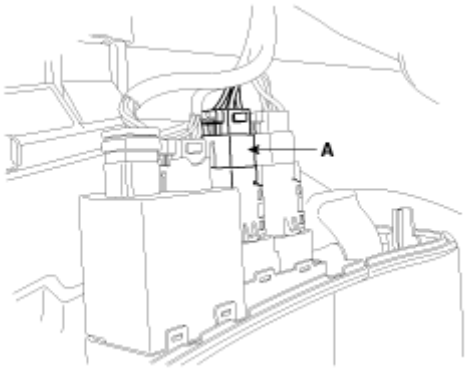
Seat belt condition	Warning lamp
Fastened	OFF
Not fastened	ON

ISG OFF Switch

1. Remove the lower side crash pad switch assembly(A).



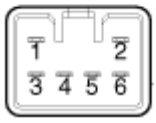
2. Disconnect the ISG off switch connector(A).



3. Check the continuity between switch terminals.

Position / Terminal	ON	OFF	REMARKS
1			
3			IND+
4		1KΩ	
5			IND-
6			ILL+
2			ILL-





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
	Bulb burned out	Replace bulb
	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
	Bulb burned out	Replace bulb
	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 tailgate warning lamp do not light up	Memory fuse (15A) blown	Check for short and replace fuse
	Bulb burned out	Replace bulb
	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
	Bulb burned out	Replace bulb
	Seat belt switch faulty	Check switch

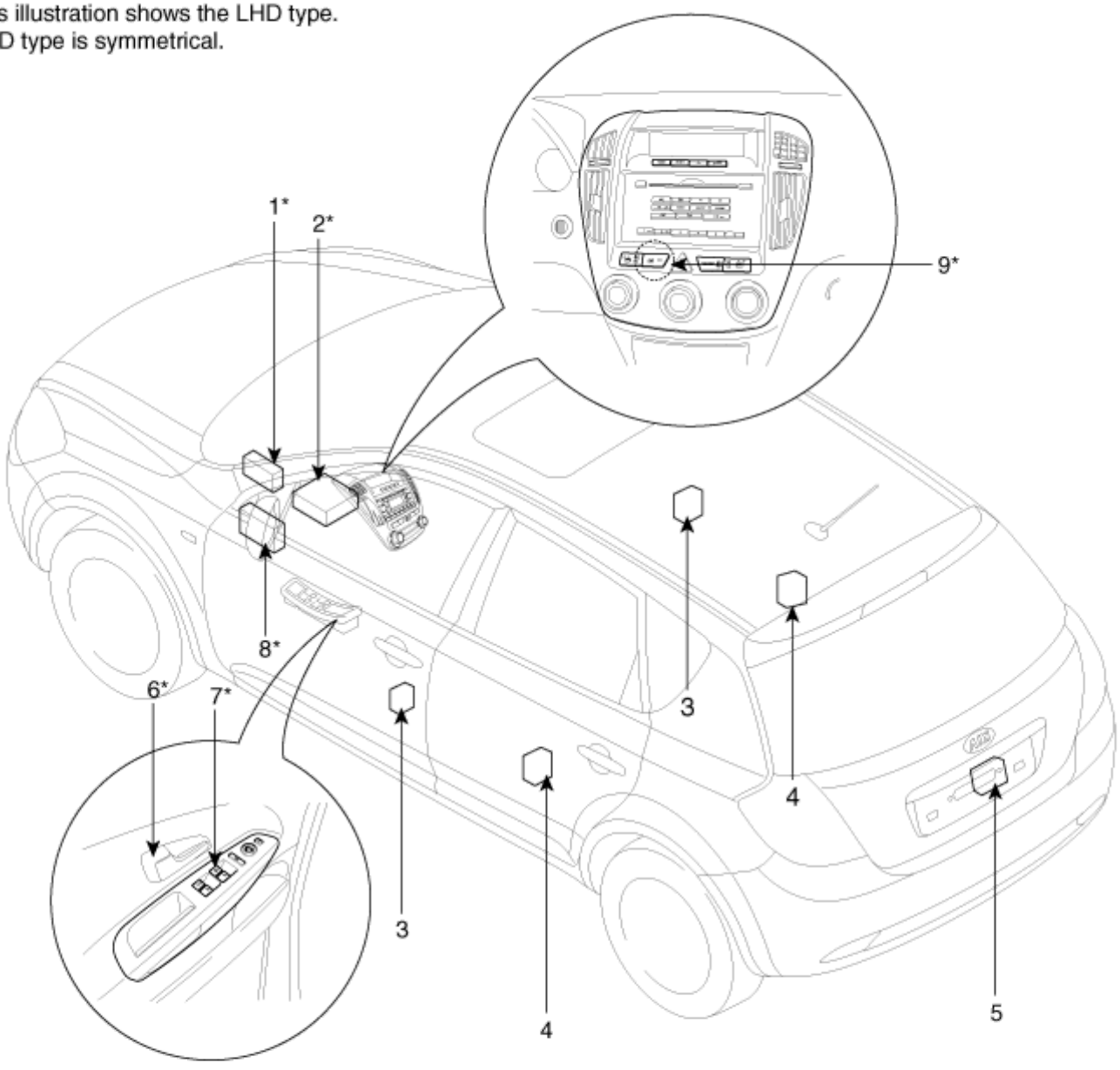
	Wiring or ground faulty	Repair if necessary

English ▼

English ▼

COMPONENT LOCATION

The parts with asterisk(*) :
This illustration shows the LHD type.
RHD type is symmetrical.



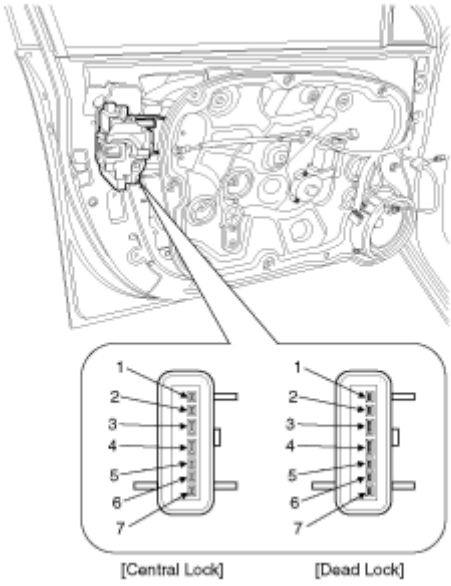
1. ICM relay box (Door lock/unlock relay)
2. Body control module (BCM)
3. Front door lock actuator & switch
4. Rear door lock actuator & switch
5. Tailgate actuator & switch
6. Door lock knob
7. Door lock switch
8. Passinger compartment junction box (Tailgate relay)
9. Door unlock switch

INSPECTION

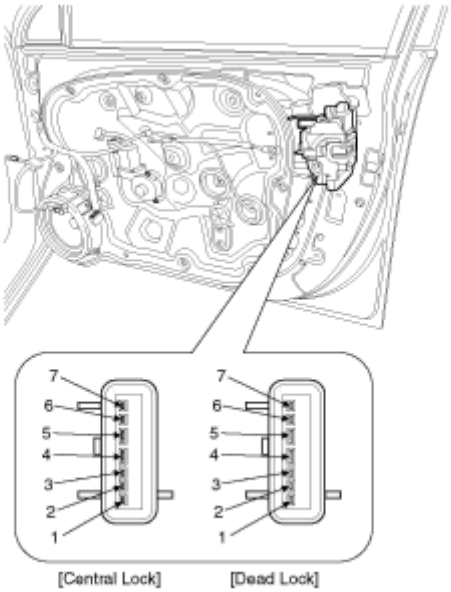
Front Door Lock Actuator

1. Remove the front door trim.
   (Refer to the BD group - Front door)
2. Remove the front door module.
   (Refer to the BD group - Front door).
3. Disconnect the connectors from the actuator.

[LHD]



[RHD]



4. Check actuator operation by connecting power and ground according to the table. To prevent damage to the actuator, apply battery voltage only momentarily.

English ▼

[Central Lock] ( ) : RHD

Position \ Terminal		5(3)	6(2)
Front left	Lock	⊕	⊖
	Unlock	⊖	⊕
Position \ Terminal		2(6)	3(5)
Front right	Lock	⊖	⊕
	Unlock	⊕	⊖

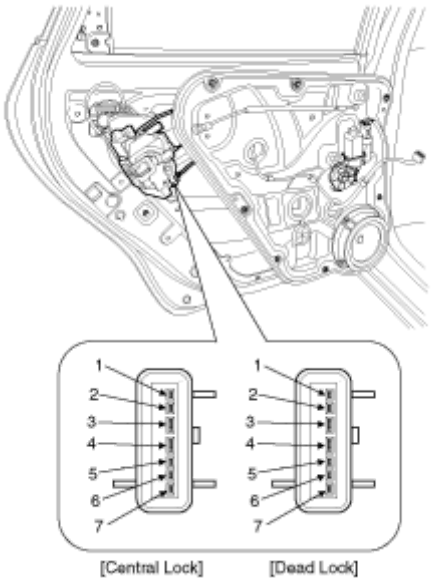
[Dead Lock] RHD only

Position \ Terminal		1	2
Front left	Lock	⊕	⊖
	Unlock	⊖	⊕
Position \ Terminal		7	6
Front right	Lock	⊕	⊖
	Unlock	⊖	⊕

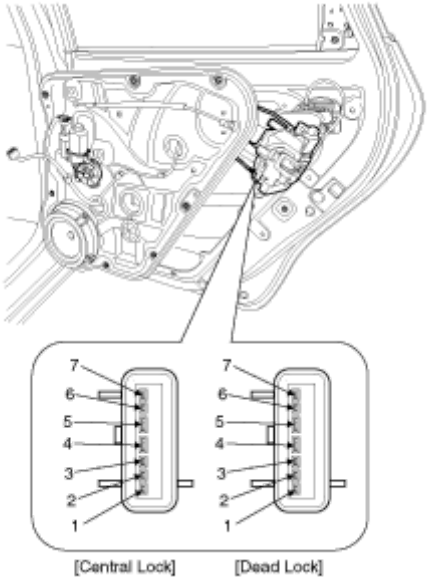
Rear Door Lock Actuator

1. Remove the rear door trim.
   (Refer to the BD group - Rear door)
2. Remove the rear door module.
   (Refer to the BD group - Rear door)
3. Disconnect the connectors from the actuator.

[LHD]



[RHD]



4. Check actuator operation by connecting power and ground according to the table. To prevent damage to the actuator, apply battery voltage only momentarily.

[Central Lock] ( ) : RHD

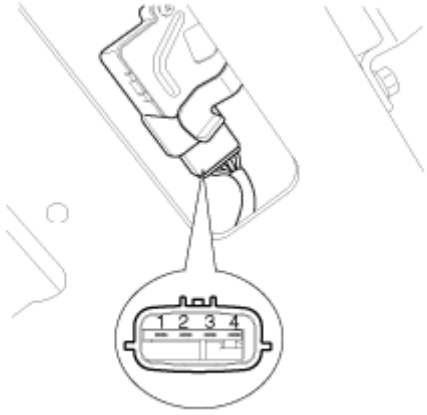
Position \ Terminal		5(3)	6(2)
Rear left	Lock	⊕	⊖
	Unlock	⊖	⊕
Position \ Terminal		2(6)	3(5)
Rear right	Lock	⊖	⊕
	Unlock	⊕	⊖

[Dead Lock] RHD only

Position \ Terminal		1	2
Rear left	Lock	⊕	⊖
	Unlock	⊖	⊕
Position \ Terminal		7	6
Rear right	Lock	⊕	⊖
	Unlock	⊖	⊕

Tailgate Lock Actuator Inspection

1. Remove the tailgate trim. (Refer to the BD group - tailgate)
2. Disconnect the 4P connector from the actuator.



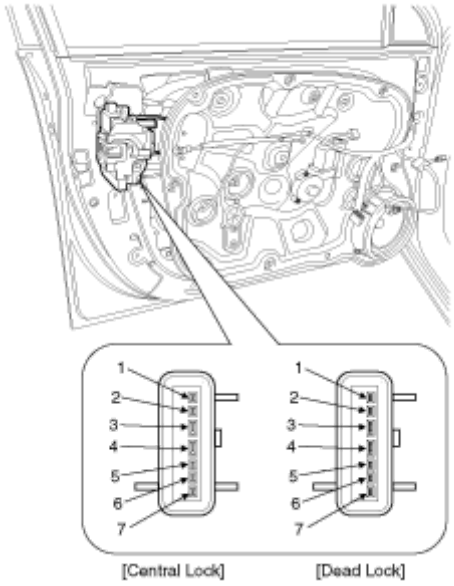
3. Check actuator operation by connecting power and ground according to the table. To prevent damage to the actuator, apply battery voltage only momentarily.

Terminal / Position	3	4
Unlock	⊕	⊖

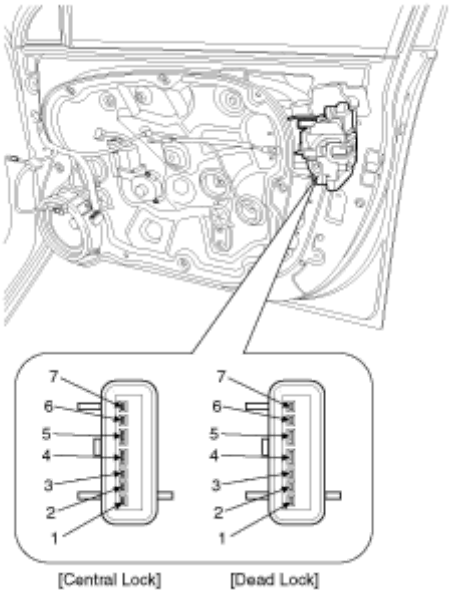
Front Door Lock Switch

1. Remove the front door trim.
   (Refer to the BD group - Front door)
2. Remove the front door module.
   (Refer to the BD group - Front door).
3. Disconnect the connectors from the actuator.

[LHD]



[RHD]



4. Check for continuity between the terminals in each switch position when inserting the key into the door according to the table.

[CENTRAL LOCK] ( ) : RHD

Position		Terminal	2(6)	3(5)	4(4)
Central door lock	Front left	Clockwise	○	○	
		Counter-clockwise		○	○
Position		Terminal	4(4)	5(3)	6(2)
Central door lock	Front right	Clockwise	○	○	
		Counter-clockwise		○	○

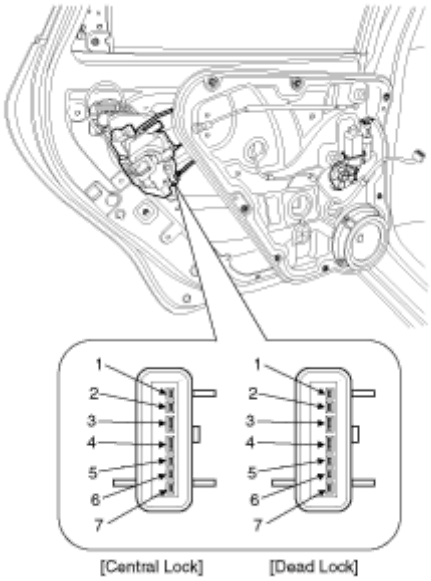
[DEAD LOCK] ( ) : RHD

Position		Terminal	2(6)	3(5)	4(4)
Central door lock	Front left	Clockwise	○	○	
		Counter-clockwise		○	○
Position		Terminal	4(4)	5(3)	6(2)
Central door lock	Front right	Clockwise	○	○	
		Counter-clockwise		○	○

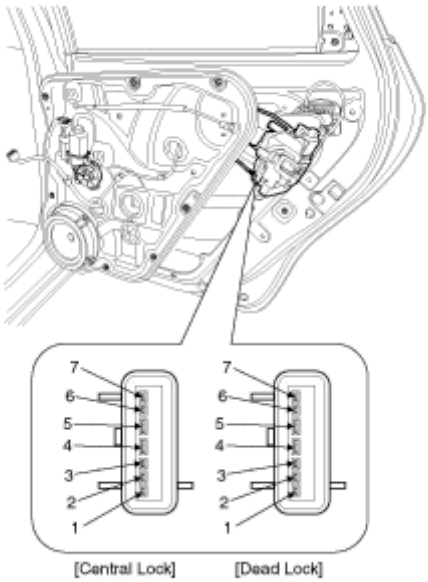
Rear Door Lock Switch

1. Remove the rear door trim.
   (Refer to the BD group - Rear door)
2. Remove the rear door module.
   (Refer to the BD group - Rear door)
3. Disconnect the connectors from the actuator.

   [LHD]



[RHD]



4. Check for continuity between the terminals in each switch position according to the table.

[CENTRAL LOCK] ( ) : RHD

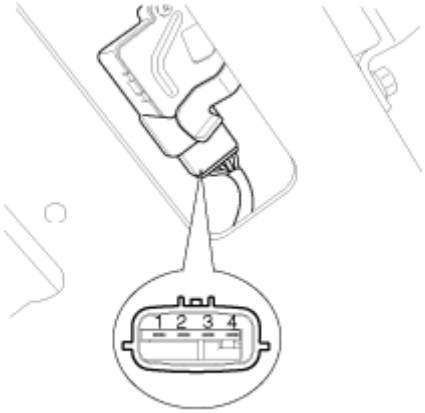
Position \ Terminal			1(7)	3(5)
Central door lock	Front left	lock		
		Unlock	○———	———○

[DEAD LOCK] ( ) : RHD

Position \ Terminal			1(7)	3(5)
Central door lock	Front left	lock		
		Unlock	○———	———○

Tailgate Switch

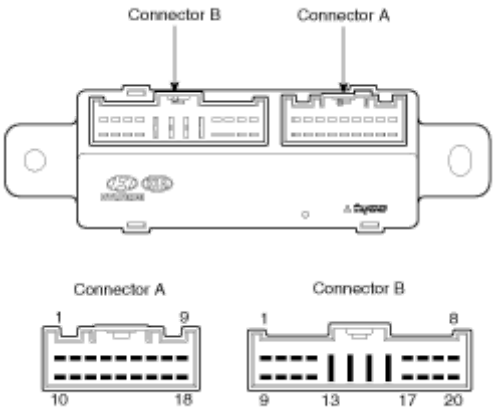
1. Remove the tailgate trim. (Refer to the BD group - Tailgate)
2. Disconnect the 4P connector from the actuator.



3. Check for continuity between the terminals in each switch position according to the table.

Position \ Terminal	1	2
Lock		
Unlock	○	○

INSPECTION



Door Lock

1. Disconnect the negative (-) battery terminal.
2. Remove the ICM relay box.
3. Check for continuity between the terminals.
4. There should be continuity between the No.15 terminal and No.6(or 16) terminals in the ICM-B when power and ground are connected to the No.15 terminal and No.17 terminal in the ICM-B.
5. There should be no continuity between the No.15 terminal and No.6(or 16) terminal in the I/P-D when power is disconnected.

Terminal / Power	ICM-B (15)	ICM-B (17)	ICM-B (6or16)	ICM-B (15)
Disconnected			○ ——— ○	
Connected	○ ——— ○		⊖ ——— ⊕	

Door Unlock

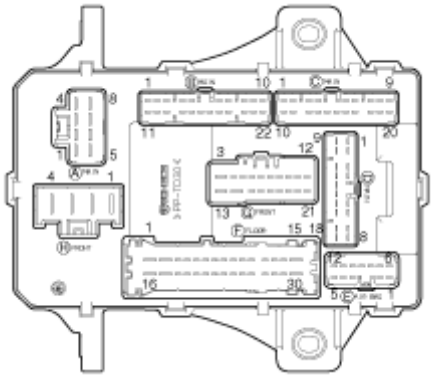
1. Disconnect the negative (-) battery terminal.
2. Remove the ICM relay box.
3. Check for continuity between the terminals.
4. There should be continuity between the No.15 terminal and No.4(or 14) terminal in the ICM-B when power and ground are connected to the No.12 terminal and No.15 terminal in the ICM-B.
5. There should be no continuity between the No.15 terminal and No.4(or 14) terminal in the ICM-B when power is disconnected.

Terminal / Power	ICM-B (4or14)	ICM-B (15)	ICM-B (12)	ICM-B (15)
Disconnected			○ ——— ○	
Connected	○ ——— ○		⊖ ——— ⊕	

Tailgate Open

English ▼

1. Disconnect the negative (-) battery terminal.
2. Remove the passenger compartment junction box.
3. Check for continuity between the terminals.
4. There should be continuity between the No.3 terminal in the I/P-H and the No.2 terminal in the I/P-D when power and ground are connected to the No.3 terminal in the I/P-H and the No.28 terminal in the I/P-F.
5. There should be no continuity between the No.3 terminal in the I/P-H and the No.2 terminal in the I/P-D when power and ground are connected to the No.3 terminal in the I/P-H and the No.28 terminal in the I/P-F.



Terminal / Power	H-3	F-28	H-3	D-2
Disconnected			○	○
Connected	○	○	⊕	⊖

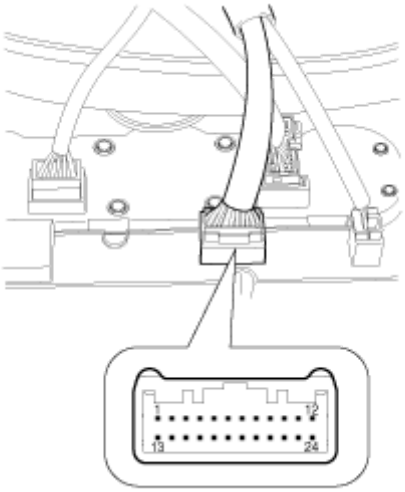
INSPECTION

Driver Door Lock Switch

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



3. Disconnect the connector from the center fascia panel.



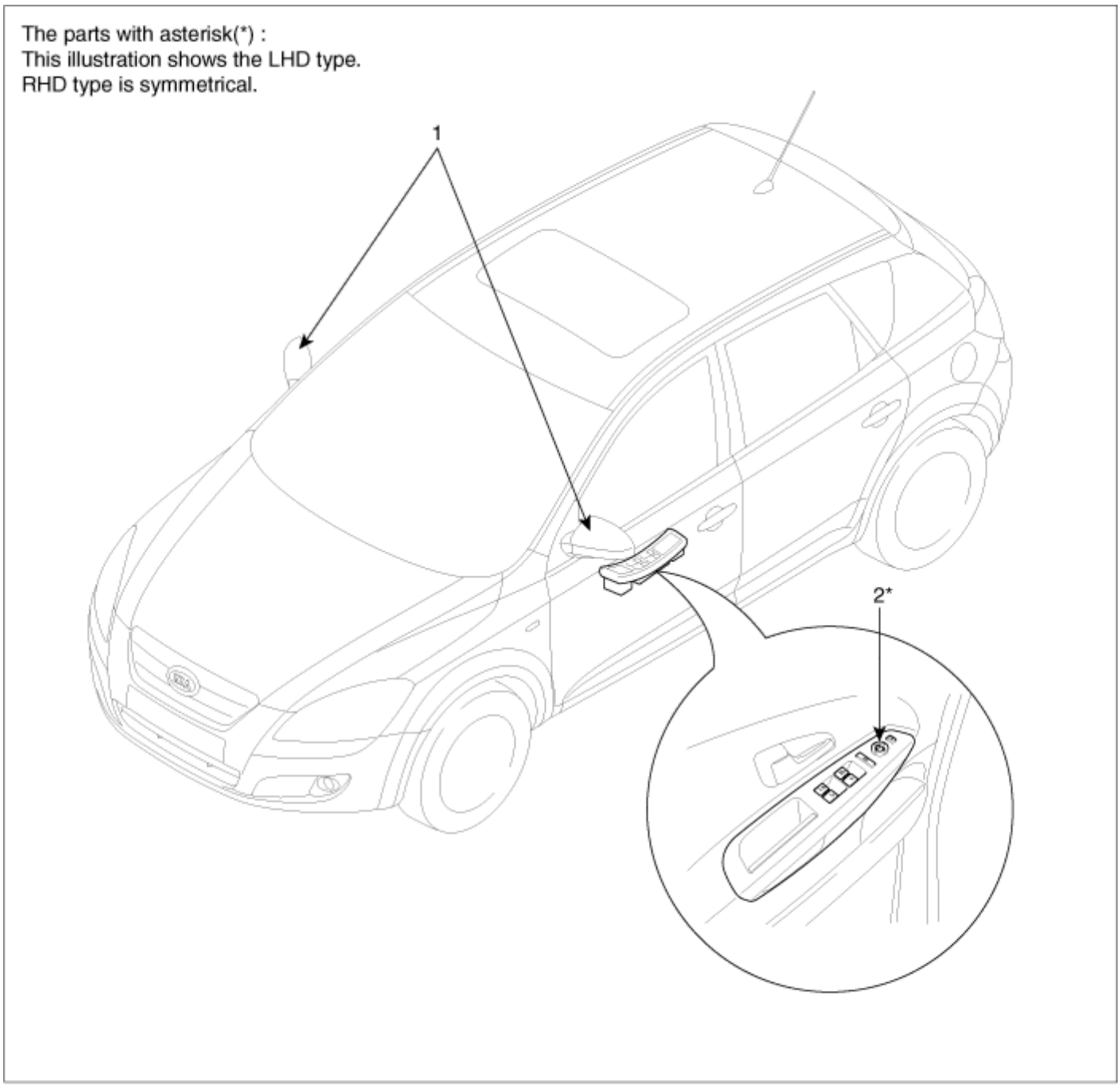
4. Check for continuity between the terminals in each switch position according to the table.

Terminal / Position	9	GND
ON	○———	———○
OFF		

English ▼

COMPONENT LOCATION

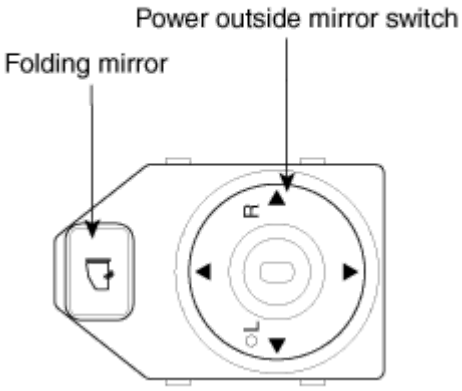
The parts with asterisk(*) :
This illustration shows the LHD type.
RHD type is symmetrical.

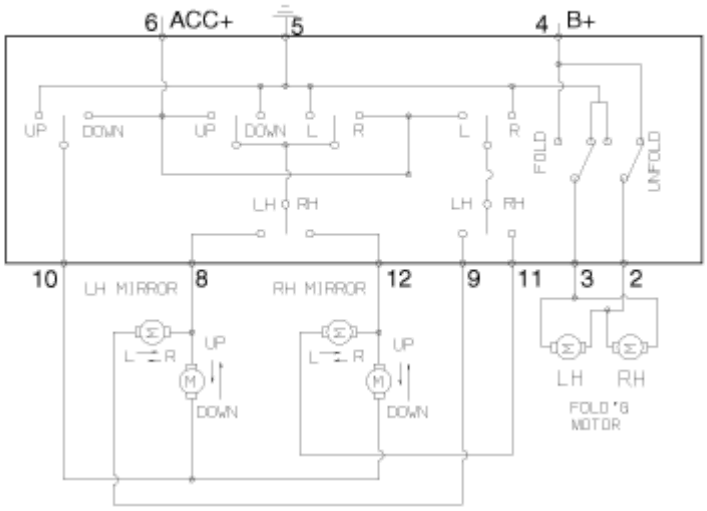


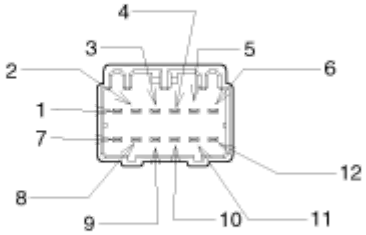
1. Power door mirror
2. Power door mirror switch

English

COMPONENTS



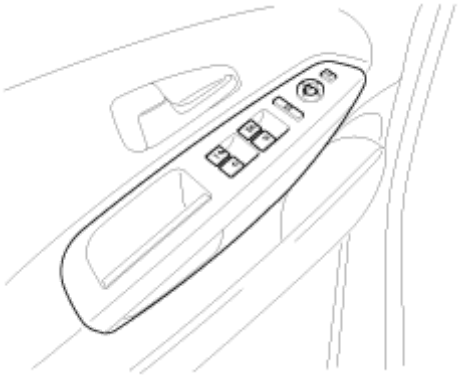




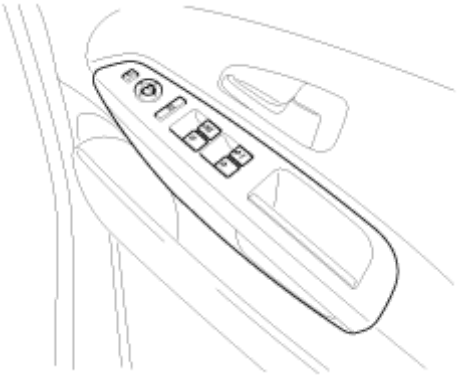
INSPECTION

1. Disconnect the negative (-) battery terminal.
2. Remove the front door trim and power window switch module. (Refer to the BD group-front door)

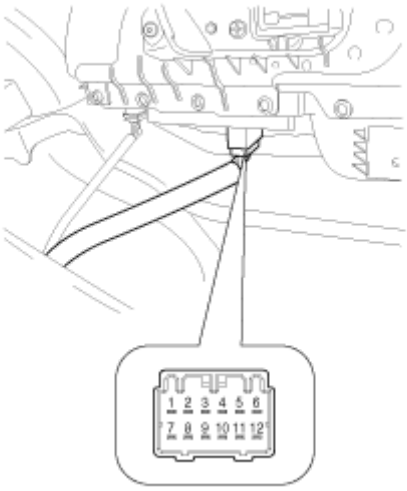
[LHD]



[RHD]



3. Check for the continuity between terminals of power door mirror switch according to the table.



4. Check for continuity between the terminals in each switch position according to the table.

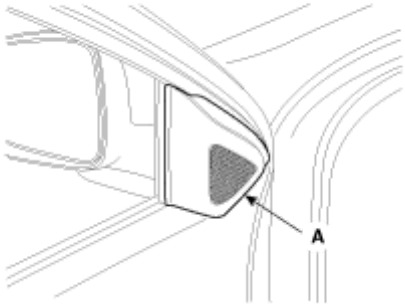
English ▼

Item	Terminal / Direction	6	5	8	9	10	11	12
Left	UP		○			○		
		○		○	○			
	DOWN		○	○	○			
		○				○		
	OFF		○	○	○	○		
	LEFT		○	○		○		
		○			○			
	RIGHT		○		○			
		○		○		○		
Right	UP		○			○	○	○
		○						
	DOWN		○				○	○
		○				○		
	OFF		○			○	○	○
	LEFT	○					○	
			○			○		○
	RIGHT	○				○		○
			○				○	

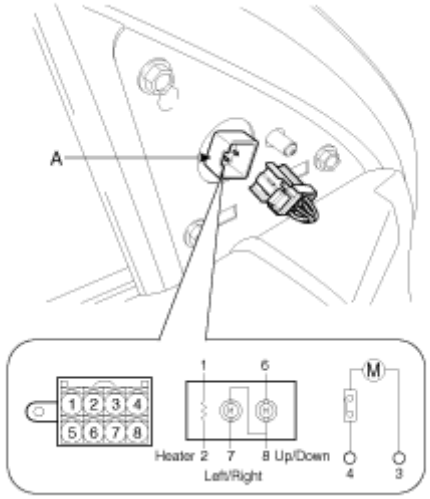
Direction \ Terminal	2	3	4	5
Folding		○	○	
	○			○
Unfolding	○		○	
		○		○

INSPECTION

1. Remove the front door quadrant inner cover (A). Take care not to damage fixing clips. (Refer to the BD 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.



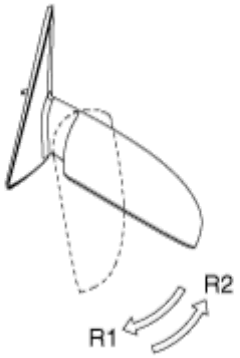
Position \ Terminal	8	7	6	1	2
UP	○	○		○	
			○		○
DOWN			○	○	
	○	○			○
OFF	○	○		○	
RIGHT	○		○	○	
		○			○
LEFT		○		○	
	○		○		○

Mirror Heater

Position \ Terminal	1	2
Heater	○	○

Folding Mirror

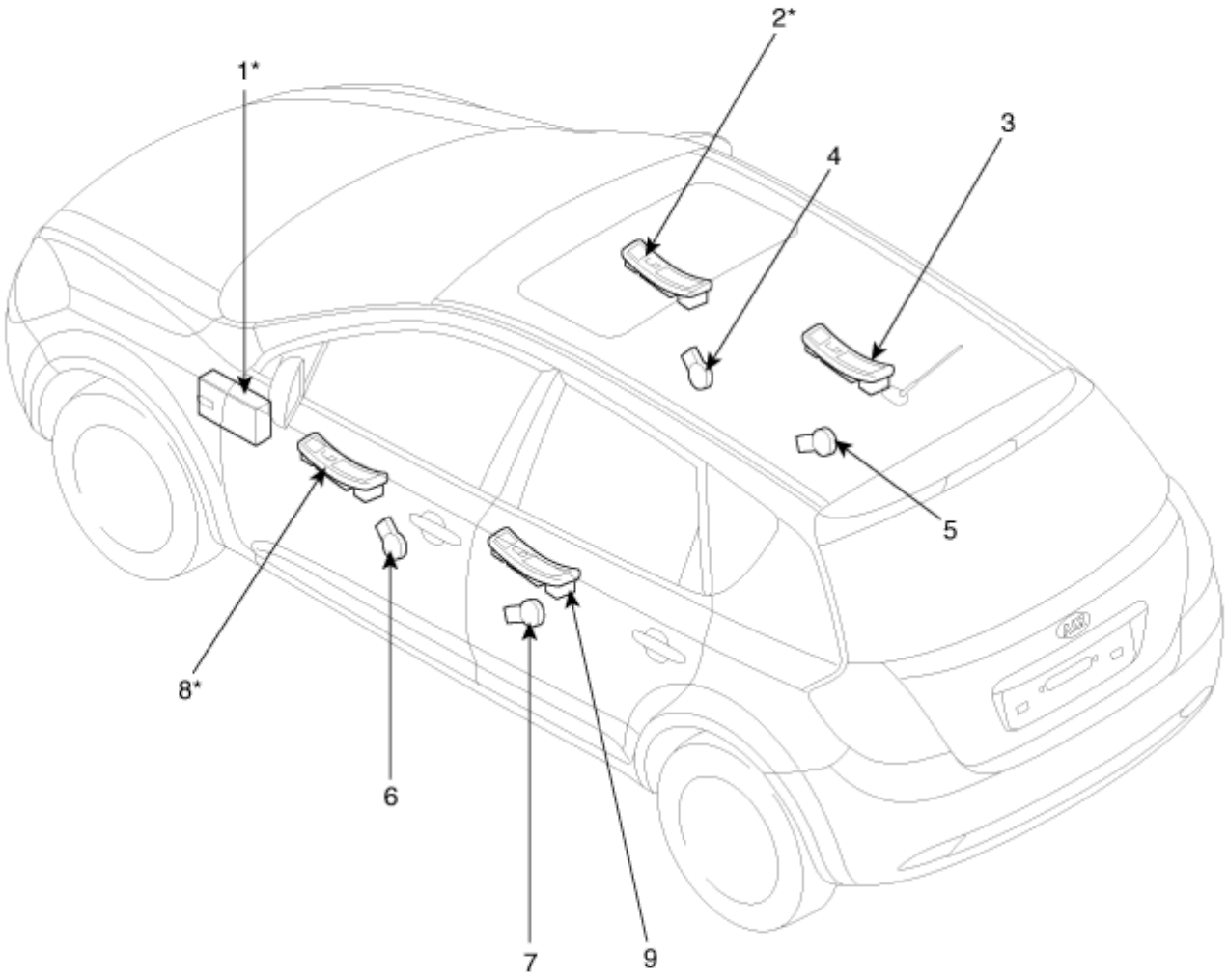
English ▼



Terminal / Direction	1	2	3	4
Folding R1		○	○	
	○			○
Folding R2	○		○	
		○		○

COMPONENT LOCATION

The parts with asterisk(*) :
This illustration shows the LHD type.
RHD type is symmetrical.



1. Instrument panel junction box (Power window relay)
2. Passenger window switch
3. Rear window switch
4. Front window motor & Safety power window unit
5. Rear window motor & Safety power window unit
6. Front window motor & Safety power window unit
7. Rear window motor & Safety power window unit
8. Driver power window main switch
9. Rear window switch

OPERATION

Function Of Safety Power Window

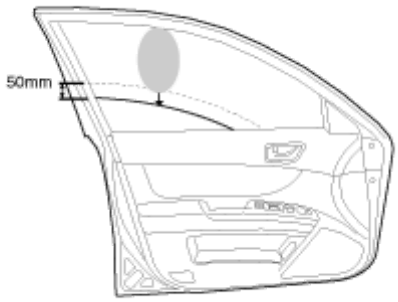
When all door (Front, Rear) power window auto-up switch is operated, safety function is activated.

1. Safety function condition
   When detect the force of 100N during the window rising, window is reversed.

2. Length of window reversing (except holding the auto-up switch)
   - When detect the jamming during the 4mm ~ 250mm from top of the door.
     → Window is reversed until 300mm from top of the door.

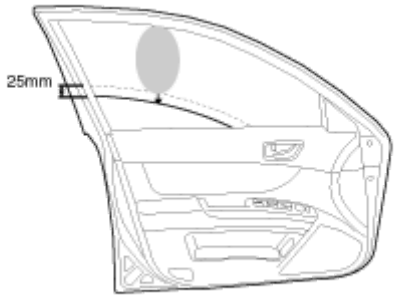


   - When detect the jamming over the 250mm from top of the door.
     → Window is reversed until 50mm from jamming position.
     → Window is reversed 50mm or bottom position in case of 50mm reversing distance.



   - When detect the jamming over 300mm from top of the door.
     → Window stops at reverse point.

3. Length of window reversing (holding the auto-up switch)
   - When detect the jamming during holding the auto-up switch.
     → Window is reversed until 25mm from jamming position.
   - 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.)
   - When detect the jamming during holding the auto-up switch again.
     → Window is reversed until 25mm from jamming position.
   - When holding the auto-up switch after 5 seconds from above condition.
     → Window is reverse until 25mm from jamming position.



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. Position counter and position initialization
   (1) Position counter
   Window position counting is implemented by use of one Hall Effect sensor (HEF) connected to timer capture unit of the ?Controller with a resolution of 180° electrical.
   Even the battery was separated from the car, it must keep the window position information.

   (2) Position initialization
   For position initialization, position counter detect the upper mechanical stop and lower mechanical Position. Motor control unit (MCU) allow only Manual mode activity (without ASD Anti-Squeeze Detection algorithm) feature) before to be initialized.
   Initialization means the condition to move the window system with full anti-pinch function and related functions by detecting the window travel distance (Upper/Lower mechanical limits).
   Conditions for initialization are
   - de-initialized position counter
   - Power window switch Up activated
   - block condition detected
     (no motor movement of more than 1 count during 1sec/ SW dependent)

   Switch action with De-initialized condition :
   - Up direction : Manual & Auto P/WDW sw input → manual mode;
   - Down direction : Manual P/WDW sw input → manual mode, + Auto s/w input → auto mode

   (3) Re-initialization
   During re-initialization, position counter is set to "zero" at upper block position to compensate counting errors by software, mechanical tolerances or physics. Conditions for re-initialisation are
   - initialized position counter.
   - window at upper block position (capture range EEPROM programmable)
   - block condition detected
     (no motor movement of more than 1 count during 1 sec/ SW dependent)

   (4) De-initialization
   The system initialization/calibration will be lost in the following cases:
   - After parameter modification via diagnostic
   - Wrong EEPROM checksum at ECU wake-up or power-on
   - Movement outside predefined window stroke (above learned top position, below predefined bottom position)
   - De-initialisation after a defined number (EEPROM) of reversals without re-initialisation in the upper seal

(activation /de-activation controlled by EEPROM value). A window down movement or switching off the window lifter permission resets the reversal counter value(activation by EEPROM bit).

- De-initialisation after a defined number of movements (EEPROM) without re-initialisation in the upper seal (activation /de-activation controlled by EEPROM value)
- Special de-initialization procedure :
  The special window lifter de-initialization procedure works as follows:
  - System is initialized
  - Move window below soft-stop position (position EEPROM adjustable)
  - Press MANU-down switch and keep it pressed
  - Apply permission signal (serial-link = PIN 6) ON → OFF → ON within 2 seconds (time EEPROM adjustable)

(5) Soft stop function
In order to reduce noise and mechanical stress, the window movement is stopped under control of the ECU before the bottom position is reached.
The clearance is 0 / +10 mm (at 11.5 V to 14.5 V).
To activate the soft bottom stop function, the top reference position and bottom reference position have to be initialized. Therefore, the window is lifted into the top position until the block condition is detected. This position is taken as top reference position.
Afterwards, the window is moved to the bottom position until the block condition is detected (mechanical stop). This position is taken as bottom reference position.
The bottom reference position is re-initialized :

- When window is operated down starting from soft stop position
- Every "9" stops at soft stop position.

(6) Thermal protection
Thermal protection by software module is implemented to prevent from destruction of motor during overload condition. Motor temperature is estimated by integrating squared motor current as an estimate for heating power integral. When estimated motor temperature exceeds EEPROM programmable upper limit, motor is deactivated for fixed delay time (default value = 30 sec.)
Thermal shutdown during a window operation will not interrupt the operation due to safety reasons.

(7) Operation time limiter
Maximal operation time of power window motor is limited to 15 sec (EEPROM programmable).

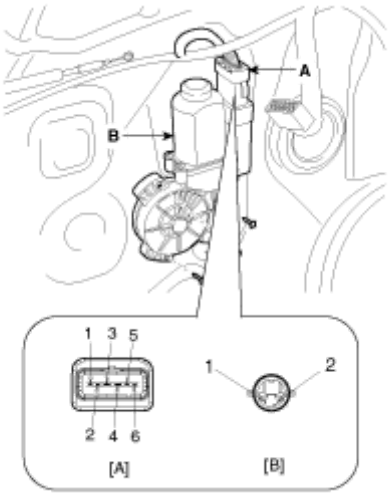
(8) Continuous reverse
Current Number of Continuous reverse of window is 5. With the below condition, this counter Will be initialized.

- IG OFF
- DOWN signal ON
- WINDOW CLOSE

INSPECTION

Front Power Window Motor

1. Remove (-) negative battery terminal.
2. Remove the front door trim. (Refer to the BD group-front door)
3. Disconnect the connector from the motor.
   (A : Safety, B : Standard)



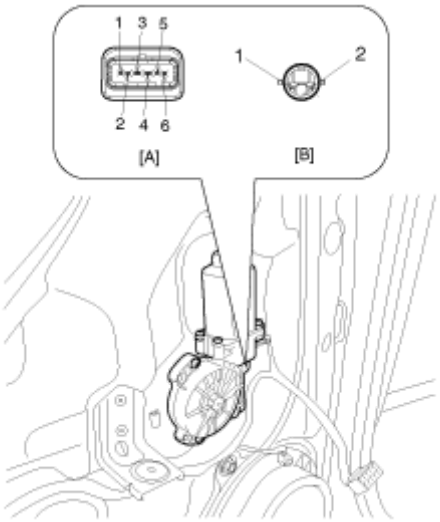
4. Connect the motor terminals directly to battery voltage (12V) and check that the motor operates smoothly. Next, reverse the polarity and check that the motor operates smoothly in the reverse direction. If the operation is abnormal, replace the motor.

Position		Terminal	1	2
Left	UP	Clockwise	⊕	⊖
	DOWN	Counter-clockwise	⊖	⊕
Right	DOWN	Clockwise	⊖	⊕
	UP	Counter-clockwise	⊕	⊖

Rear Power Window Motor

1. Remove (-) negative battery terminal.
2. Remove the rear door trim. (Refer to the BD group-rear door)
3. Disconnect the connector from the motor.
   (A : Safety, B : Standard)

English ▼



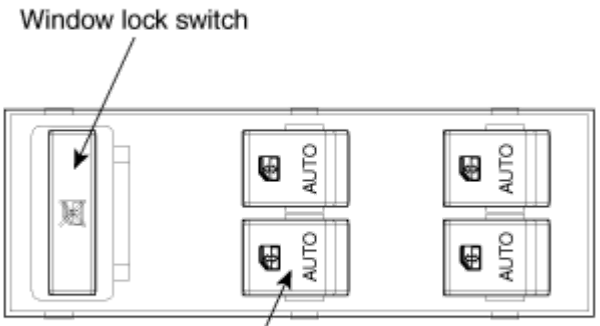
4. Connect the motor terminals directly to battery voltage (12V) and check that the motor operates smoothly. Next, reverse the polarity and check that the motor operates smoothly in the reverse direction. If the operation is abnormal, replace the motor.

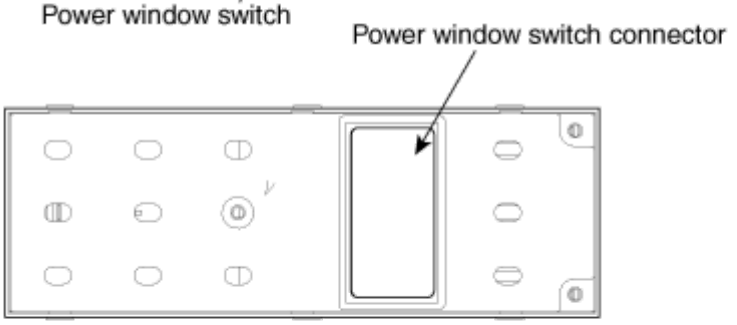
Position \ Terminal			1	2
Left	UP	Clockwise	⊕	⊖
	DOWN	Counter-clockwise	⊖	⊕
Right	DOWN	Clockwise	⊖	⊕
	UP	Counter-clockwise	⊕	⊖

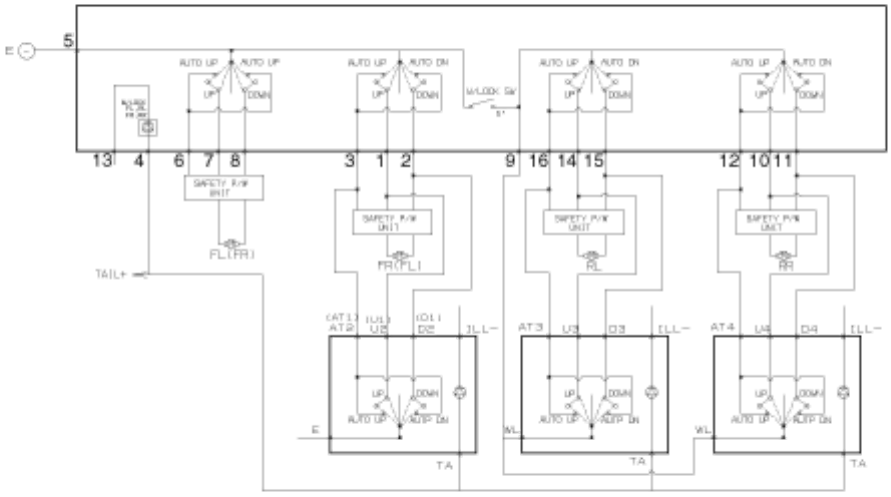
COMPONENTS

POWER WINDOW MAIN SWITCH

English ▼

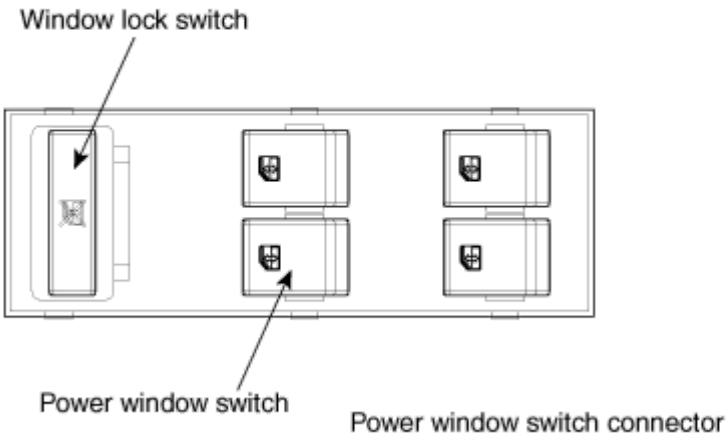


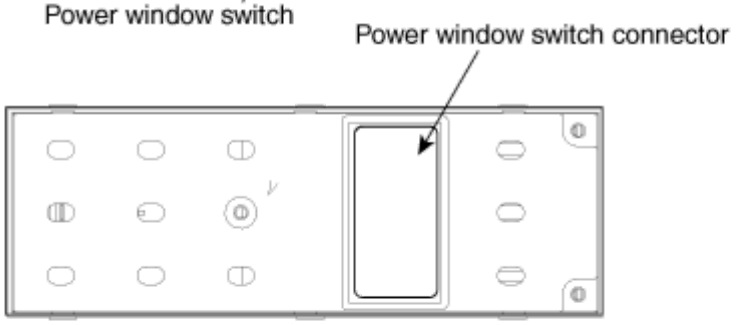


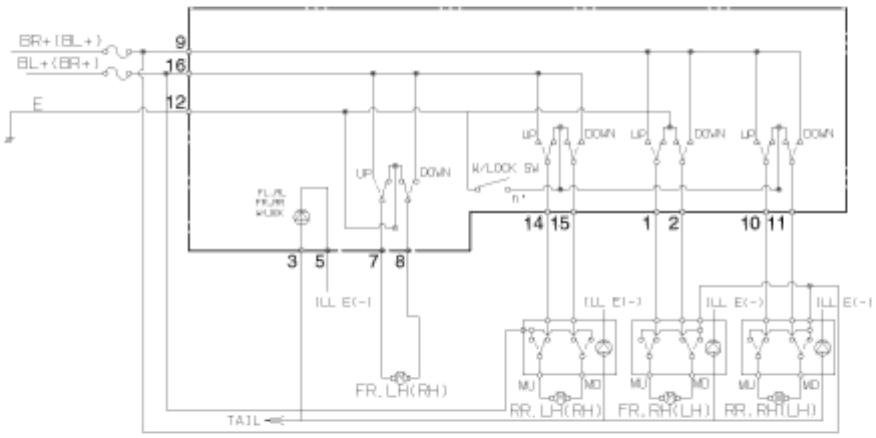


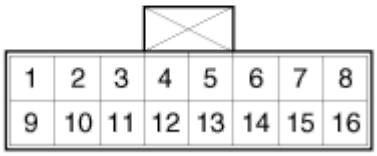
1	2	3	4	5	6	7	8
9	10	11	12	13	14	15	16

[MANUAL POWER WINDOW]





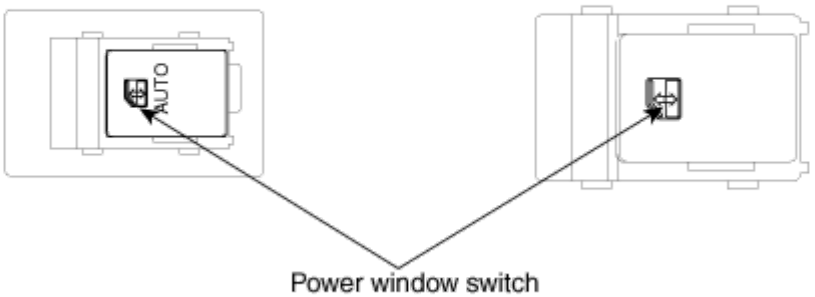




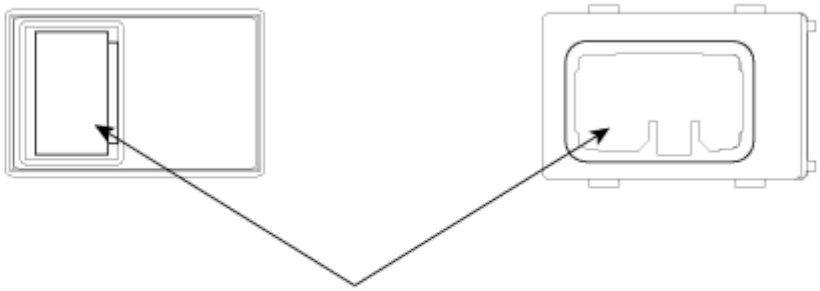
1	2	3	4	5	6	7	8
9	10	11	12	13	14	15	16

PASSENGER/REAR POWER WINDOW SWITCH

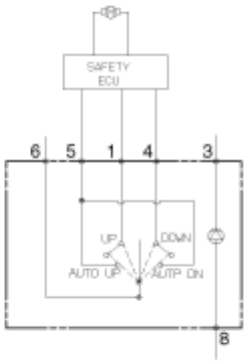
[SAFETY P/W] [MANUAL P/W]

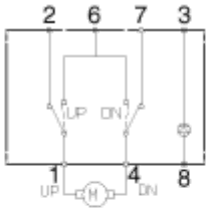


Power window switch



Passenger power window switch connector





1			2	3
4	5	6	7	8

1			2	3
4	5	6	7	8

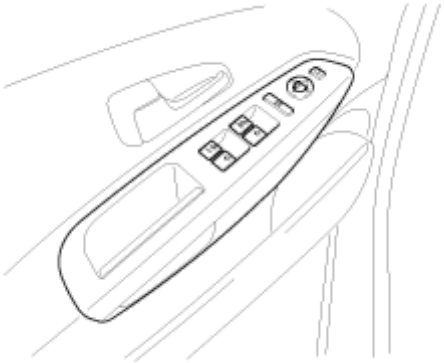
English ▼

INSPECTION

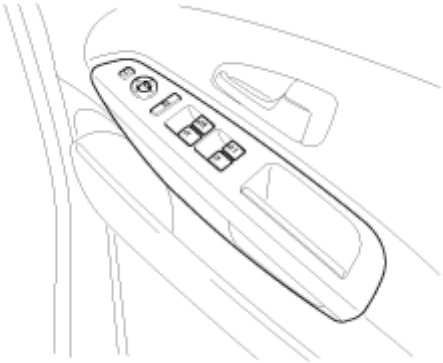
Power Window Main Switch Inspection

1. Disconnect the negative (-) battery terminal.
2. Remove the front door trim. (Refer to the BD group - front door)
3. Disconnect the 16P connector from the switch.

[LHD]

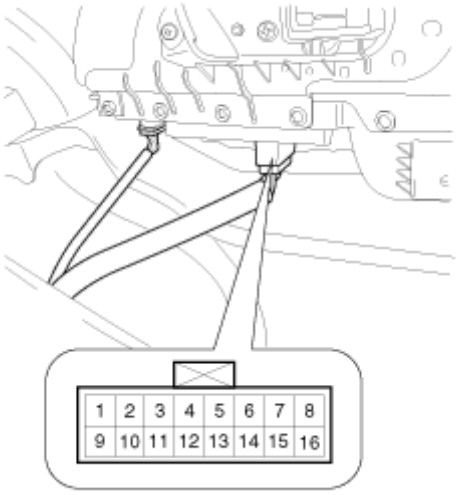


[RHD]



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.

English ▼



[SAFETY WINDOW]

Terminal / Position	5	9
Lock		
Unlock	○———	———○

[MANUAL POWER WINDOW]

Terminal / Position	12	14
Lock		
Unlock	○———	———○

[SAFETY WINDOW]

Terminal / Position	Front left				Front right			
	6	7	8	5	1	2	3	5
AUTO UP	○—○——○				○——○——○			
UP		○——○			○———○			
OFF								
DOWN			○—○			○———○		
AUTO DOWN	○———○——○					○——○——○		

Terminal / Position	Rear left				Rear right			
	5	14	15	16	5	10	11	12
AUTO UP	○—○——○				○—○——○			
UP	○—○				○—○			
OFF								
DOWN	○———○				○———○			
AUTO DOWN	○———○——○				○———○——○			

[MANUAL POWER WINDOW]

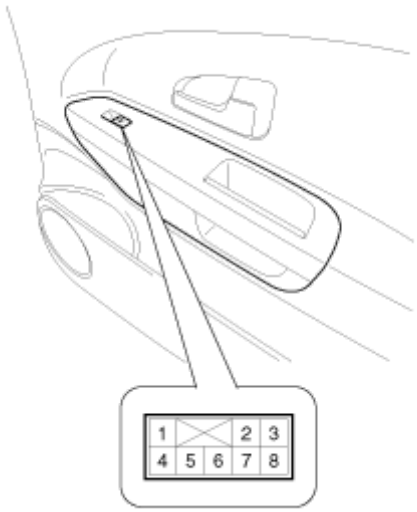
Terminal / Position	Front left				Front right			
	7	8	12	16	1	2	9	12
UP	○———○	○—○			○———○	○———○		
OFF	○—○—○				○—○———○			
DOWN	○	○———○			○	○—○		

Terminal / Position	Rear left				Rear right			
	12	14	15	16	9	10	11	12
UP	○	○———○			○—○		○—○	
OFF	○—○—○					○———○		
DOWN	○—○		○—○		○	○		

Passenger Power Window Switch Inspection

1. Disconnect the negative (-) battery terminal.

2. Remove the front door trim. (Refer to the BD group - front door)
3. Disconnect the 8P 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.

[Safety Window]

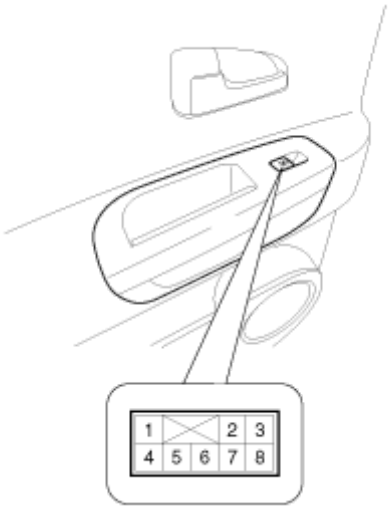
Terminal / Position	6	4	1	5
AUTO UP	○	—	○	○
UP	○	—	○	
OFF				
DOWN	○	○		
AUTO DOWN	○	○	—	○

[Manual Power Window]

Terminal / Position	6	1	2	7	4
UP	○	○		○	○
OFF		○	○	○	○
DOWN	○	—	○		○

Rear Power Window Switch Inspection

1. Disconnect the negative (-) battery terminal.
2. Remove the rear door trim. (Refer to the BD group - rear door)
3. Disconnect the 8P 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.

[Safety Window]

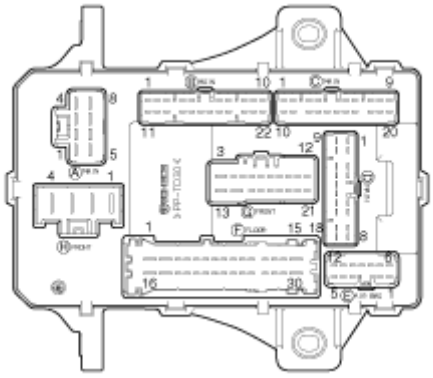
Terminal / Position	6	4	1	5
AUTO UP	○	—	○	○
UP	○	—	○	
OFF				
DOWN	○	○		
AUTO DOWN	○	○	—	○

[Manual Power Window]

Terminal / Position	6	1	2	7	4
UP	○	○		○	○
OFF		○	○	○	○
DOWN	○	—	○	—	○

INSPECTION

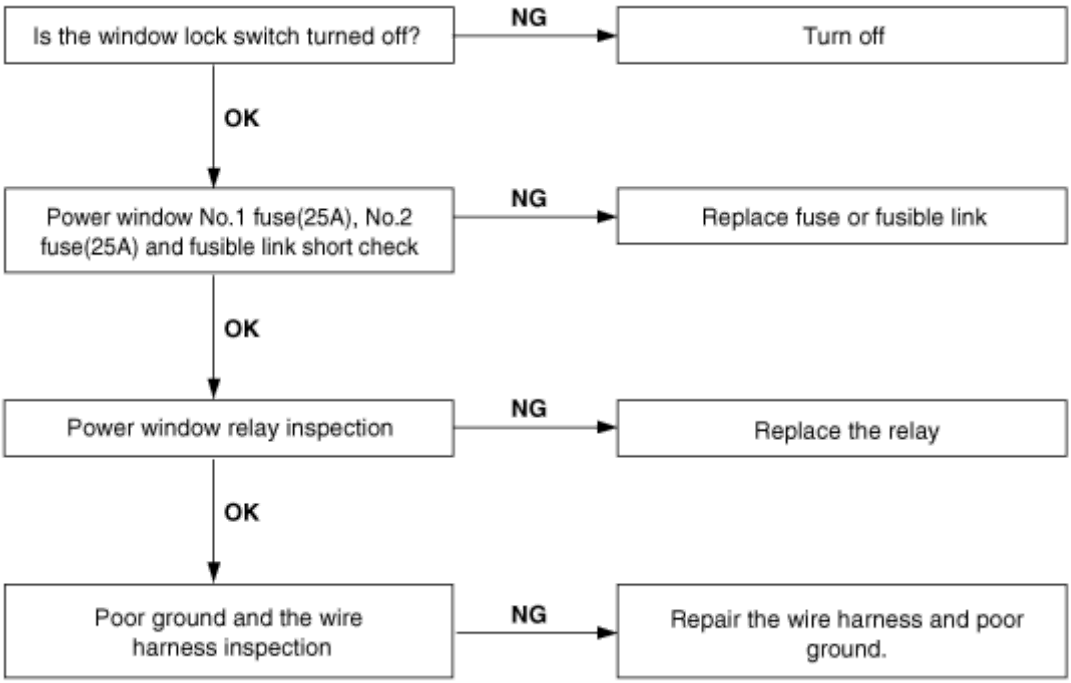
1. Disconnect the negative (-) battery terminal.
2. Remove the crash pad lower panel.
   (Refer to Body group - "Crash pad")
3. Remove the junction box.
4. Check for continuity between the terminals.
5. There should be continuity between the No.2 in the I/P-F and No.17 terminal in the I/P-B when power and ground are connected to the No.2 terminal in the I/P-H and No.17 terminal in the I/P-B.
6. There should be no continuity between the No.2 terminal in the I/P-F and No.17 terminal in the I/P-B when power is disconnected.



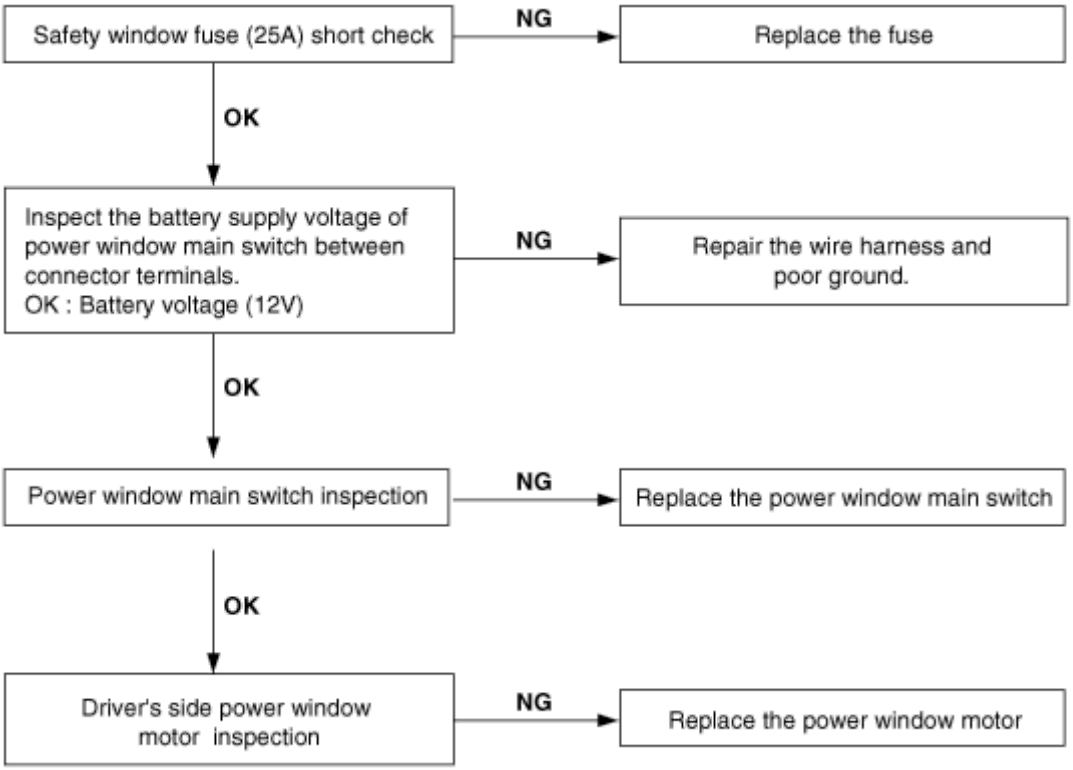
Terminal / Power	I/P-H (2)	I/P-F (17)	I/P-H (2)	I/P-B (17)
Disconnected			○	○
Connected	○	○	⊕	⊖

TROUBLESHOOTING

1. No windows operate from the main switch on the driver's door.

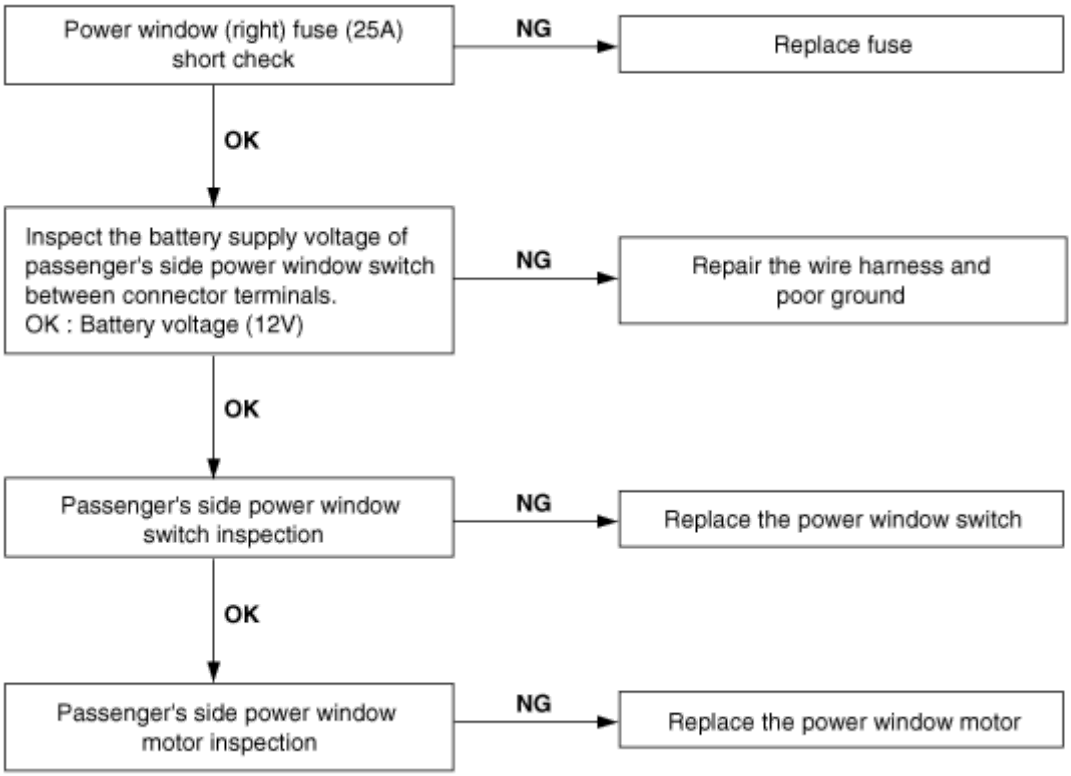


2. Driver's side window does not operate.



3. Passenger's side window does not operate.

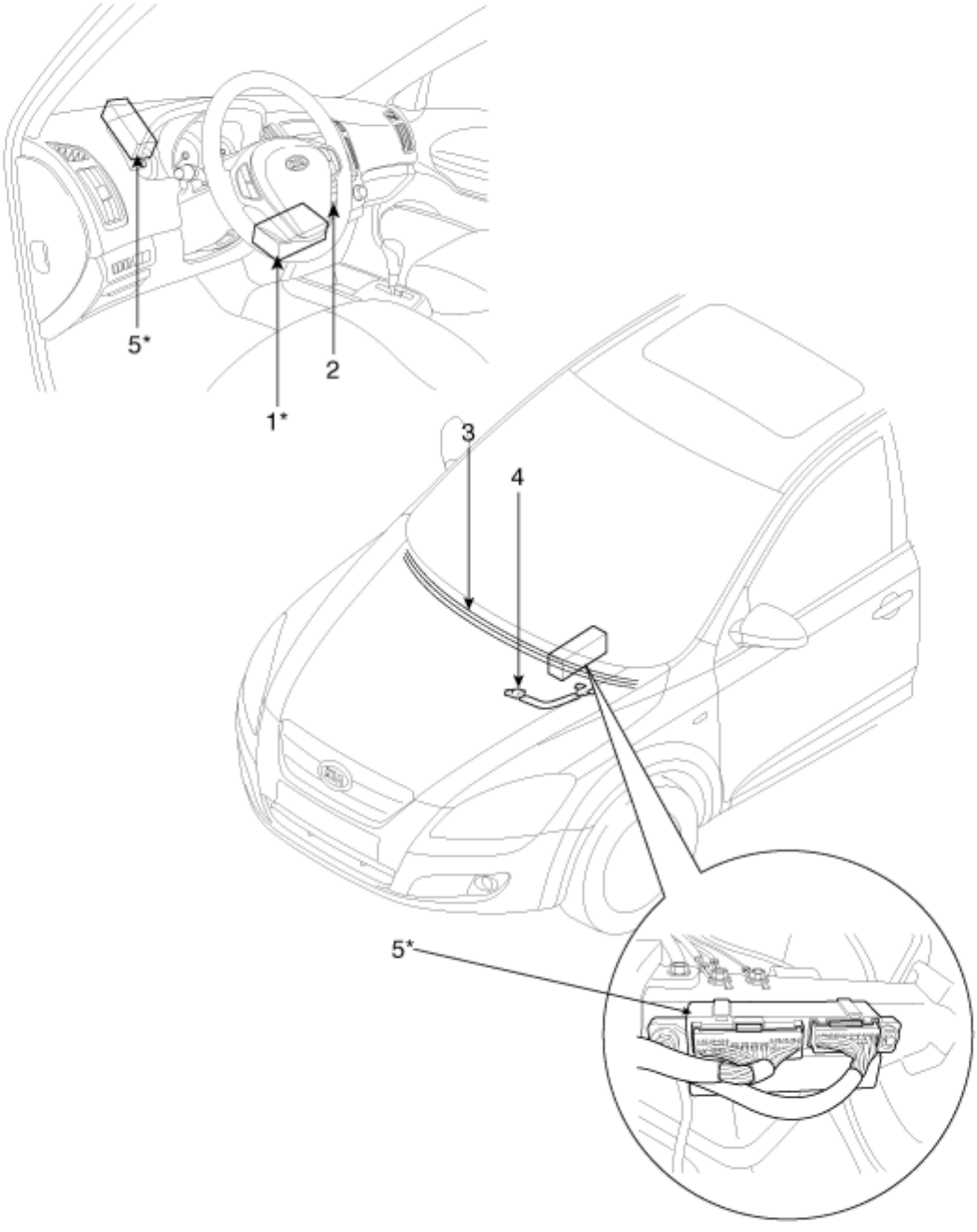
English ▼


Power window (right) fuse (25A) short check
NG
Replace fuse
OK
Inspect the battery supply voltage of passenger's side power window switch between connector terminals.
OK : Battery voltage (12V)
NG
Repair the wire harness and poor ground
OK
Passenger's side power window switch inspection
NG
Replace the power window switch
OK
Passenger's side power window motor inspection
NG
Replace the power window motor

English ▼

COMPONENT LOCATION

The parts with asterisk(*) :
This illustration shows the LHD type.
RHD type is symmetrical.



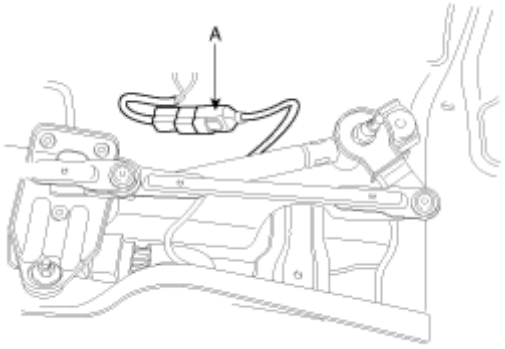
1. Body control module
2. Windshield deicer switch
3. Windshield deicer
4. Deicer connector
5. Windshield deicer relay (in ICM relay box)

DESCRIPTION

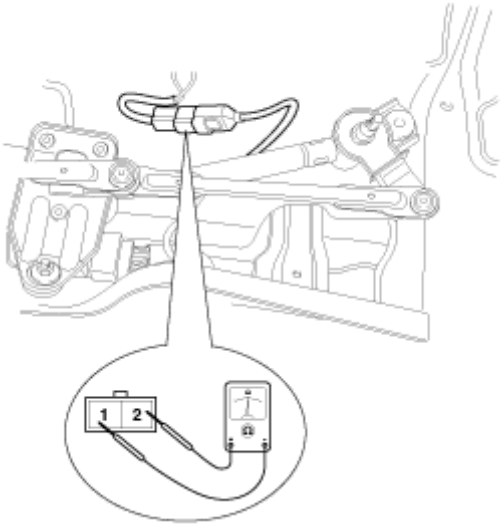
Windshield deicer system prevent windshield wiper from freezing in the winter season. It consists of deicer in the lower part of windshield, switch and relay. Body control module receives an input signal from the deicer switch, then controls relay.
Since the generator "L" is switched ON, if the deicer switch is ON, then deicer output is ON for 20 minutes.

INSPECTION

1. Remove the cowl top cover.(Refer to the wiper)
2. Disconnect the windshield deicer connector (A) from the wiper motor linkage.



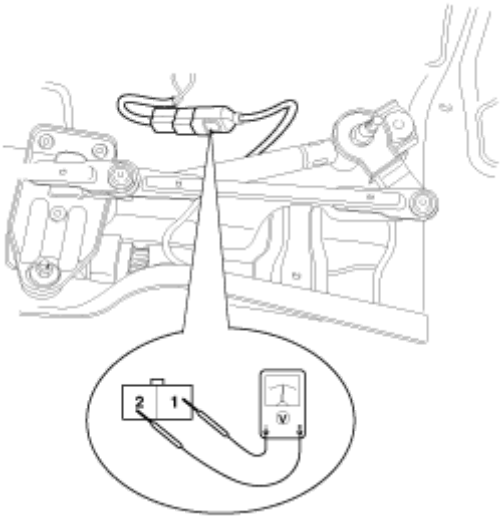
3. Check for continuity between the terminals of deicer lines.



4. Turn the ignition switch ON and the windshield deicer switch ON, then measure the voltage between the terminals of harness side deicer connector.

   O K : approx. Battery voltage (12V)

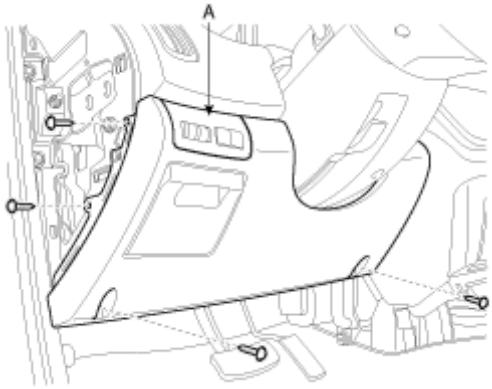
English ▼



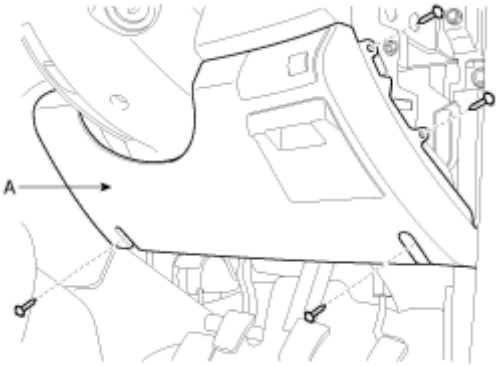
INSPECTION

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

[LHD]

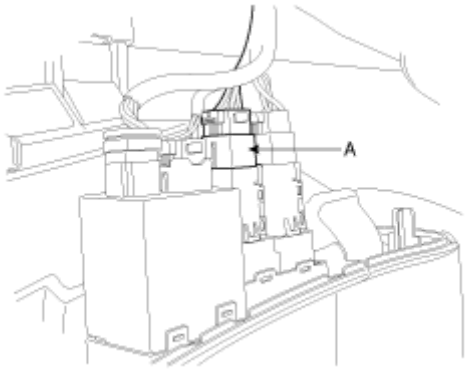


[RHD]



3. Disconnect deicer switch connectors.

[LHD]



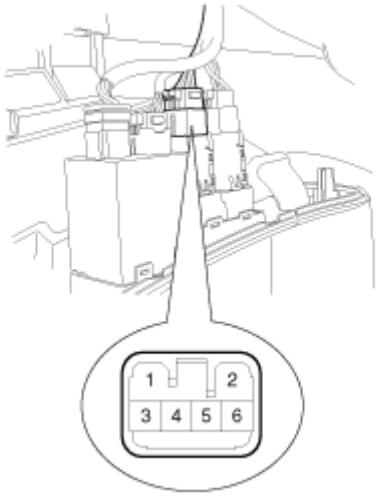
[RHD]

English ▼

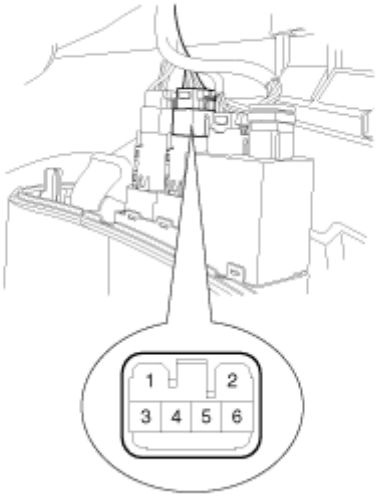


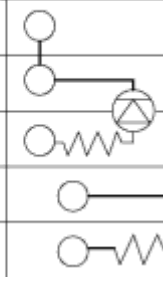
4. Using an ohmmeter, inspect the continuity between the terminals.

[LHD]



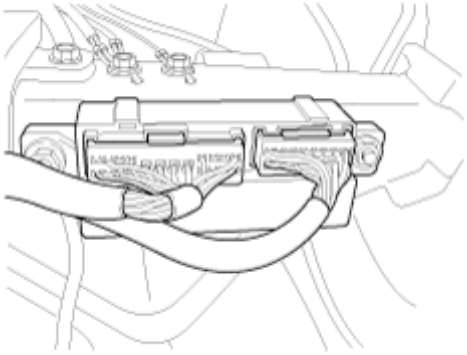
[RHD]



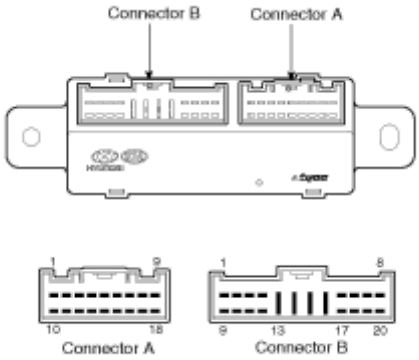
Position / Terminal	ON(PUSH)	OFF(FREE)	Remark
1			
4			
3			IND+
2			ILL-
6			ILL+

INSPECTION

1. Disconnect the negative (-) battery terminal.
2. Remove the ICM relay box to check the windshield deicer relay.

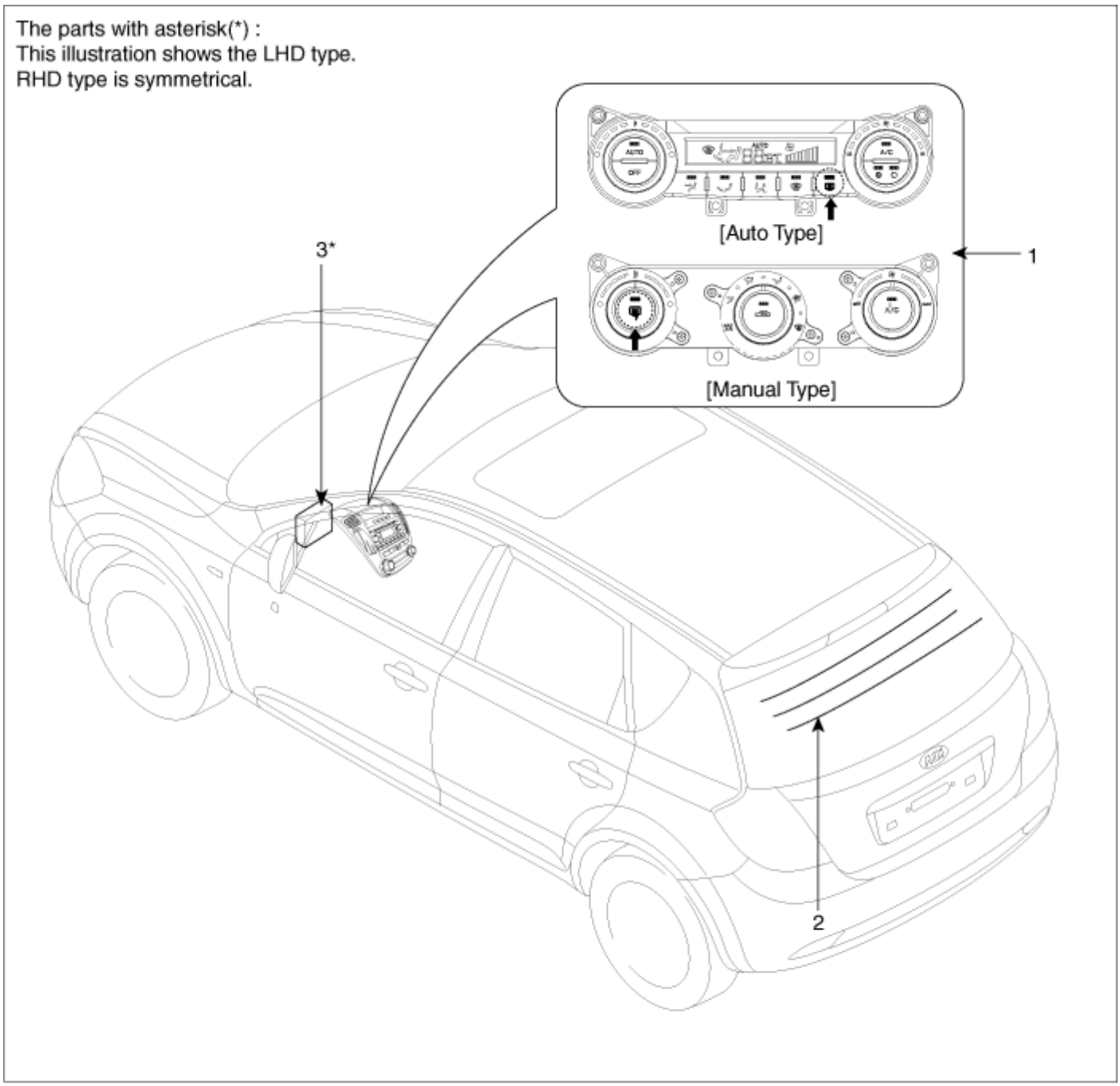


3. There should be continuity between the No.1 and No.10 terminals when power and ground are connected to the No.2 and No.10 terminals in the ICM-A.
4. There should be no continuity between the No.1 and No.10 terminals when power is disconnected.



English

COMPONENT LOCATION

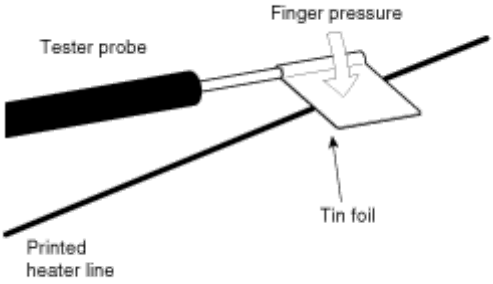


1. Rear window defogger switch
2. Rear window defogger
3. Body control module

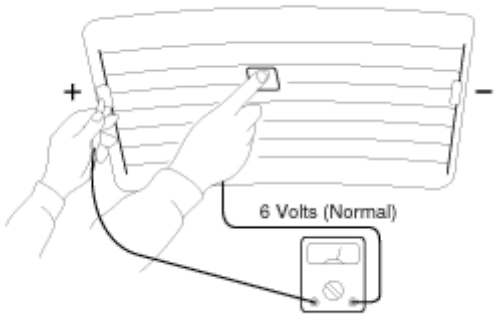
INSPECTION

⚠ CAUTION

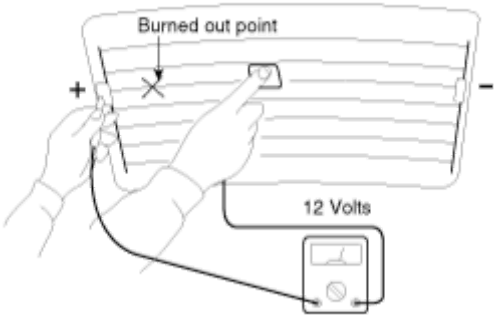
Wrap tin foil around the end of the voltmeter test lead to prevent damaging the heater line. Apply finger pressure on the tin foil, moving the tin foil along the grid line to check for open circuits.



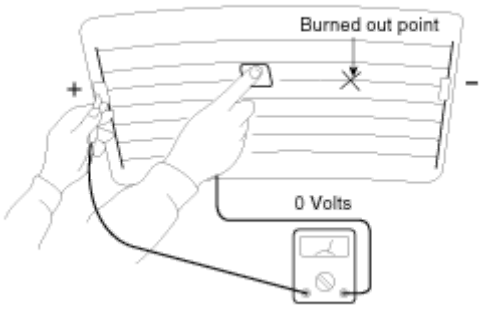
1. Turn on the defogger switch and use a voltmeter to measure the voltage of each heater line at the glass center point. If a voltage of approximately 6V is indicated by the voltmeter, the heater line of the rear window is considered satisfactory.



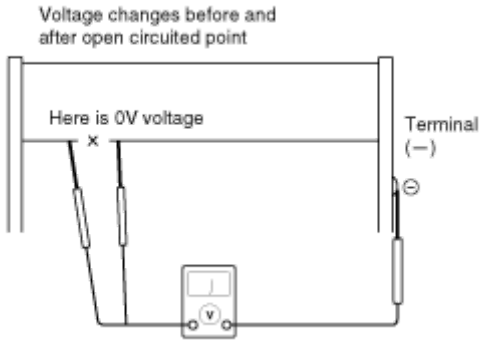
2. If a heater line is burned out between the center point and (+) terminal, the voltmeter will indicate 12V.



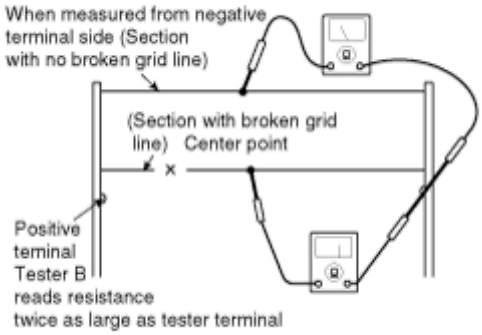
3. If a heater line is burned out between the center point and (-) terminal, the voltmeter will indicate 0V.



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.

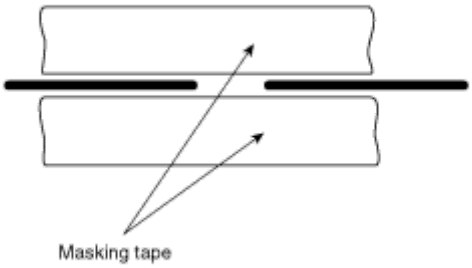


Repair Of Broken Heater Line

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.

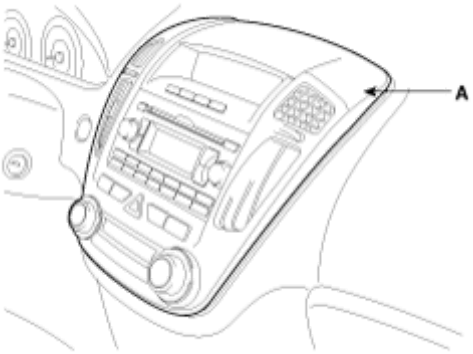
Remove the tape and allow sufficient time for drying before applying power. For a better finish, scrape away excess deposits with a knife after the paint has completely dried. (Allow 24 hours).



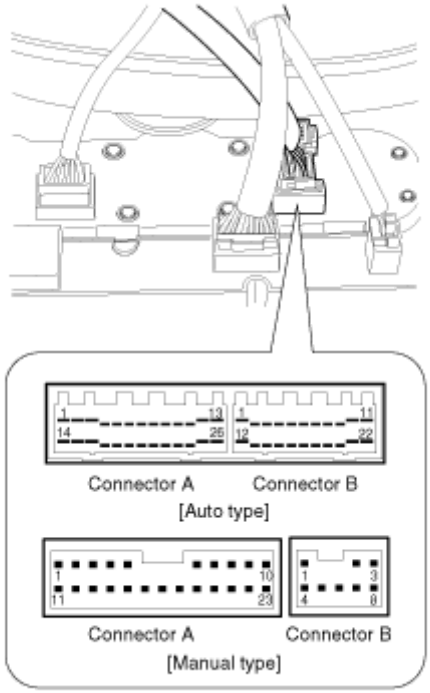
English

INSPECTION

1. Disconnect the negative (-) battery terminal.
2. Remove the center facia panel(A). Take care not to damage fixing clips.
   (Refer to the BD group - Crash pad)



3. Disconnect connectors.
4. Using an ohmmeter, inspect the continuity between the terminals after removing controller.



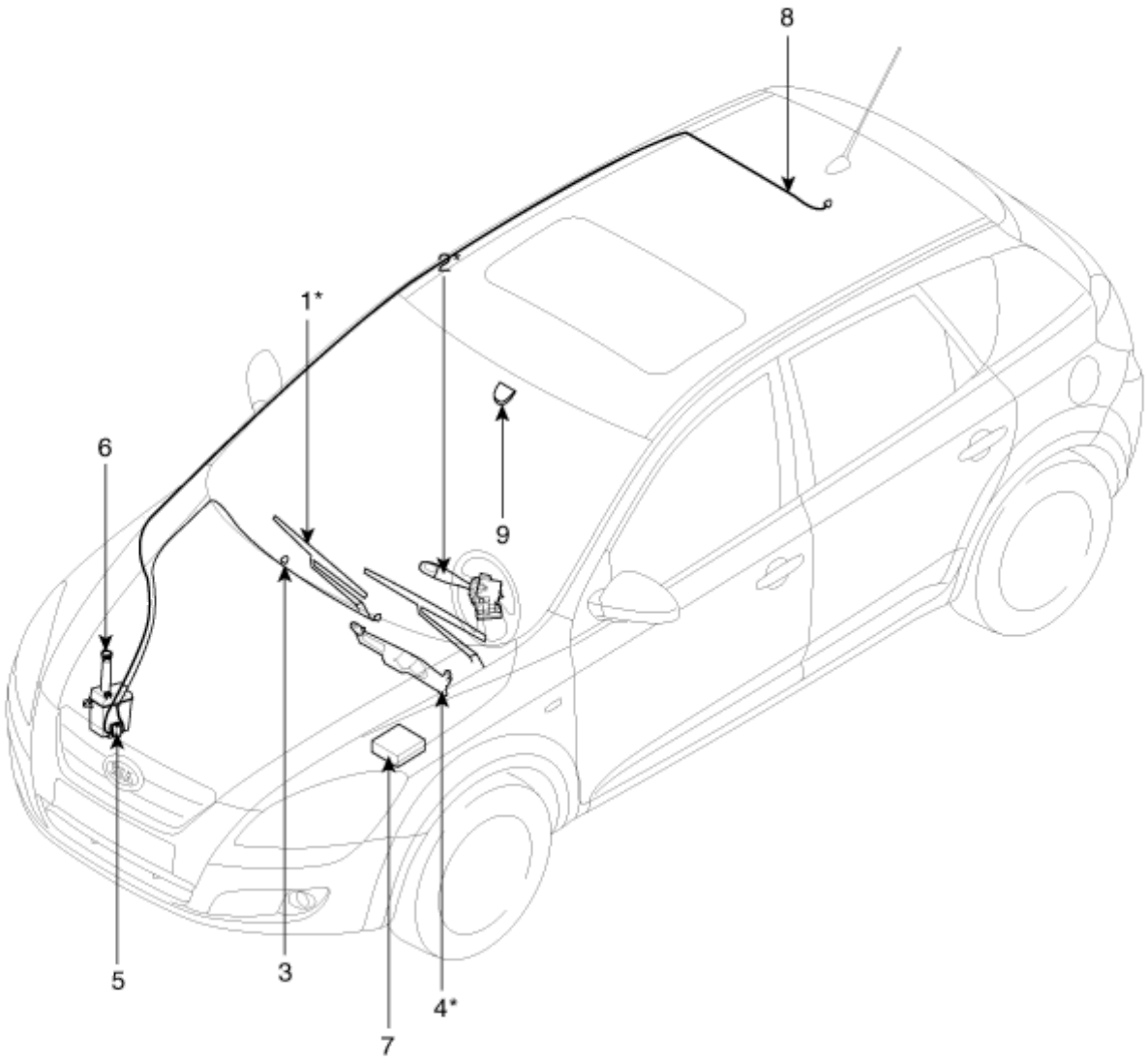
English ▼

Position \ Terminal		A10	Ground
Auto Heater	ON	○——○	
	OFF		

Position \ Terminal		A20	Ground
Manual Heater	ON	○——○	
	OFF		

COMPONENT LOCATION

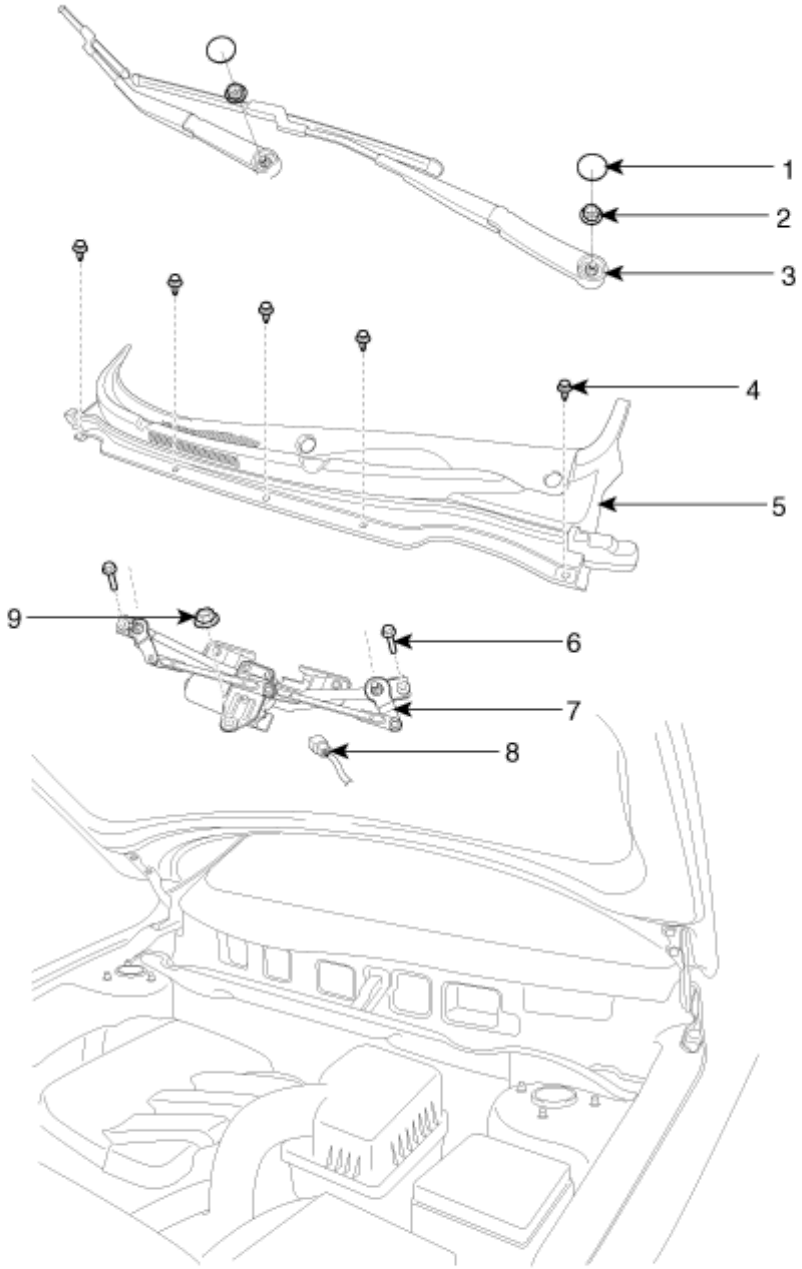
The parts with asterisk(*) :
This illustration shows the LHD type.
RHD type is symmetrical.



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)
8. Rear washer hose
9. Rain sensor

English

COMPONENT LOCATION

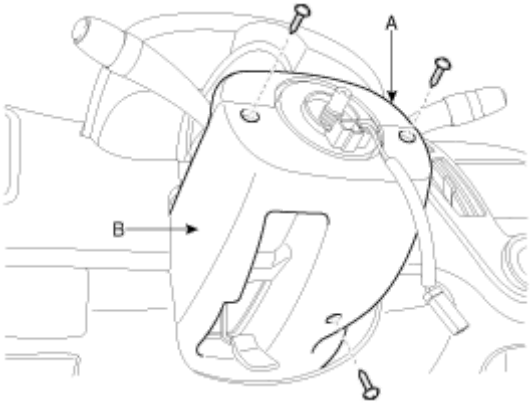


1. Cap
2. Nut
3. Wiper arm & blade
4. Retainer
5. Cowl top cover
6. Bolt
7. Wiper motor & linkage assembly
8. Wiper motor connector
9. Nut

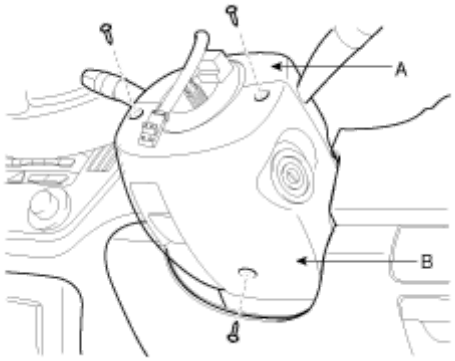
REMOVAL

1. Disconnect the negative (-) battery terminal.
2. Remove the steering column upper(A) and lower (B) shrouds after loosening 3 screws.

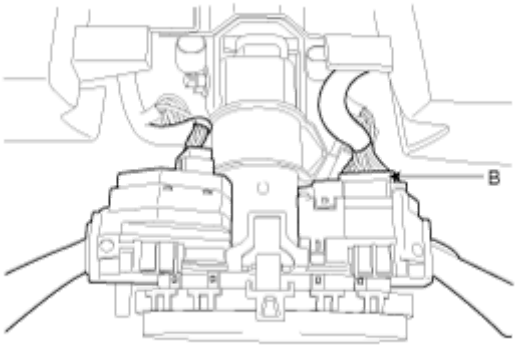
[LHD]



[RHD]

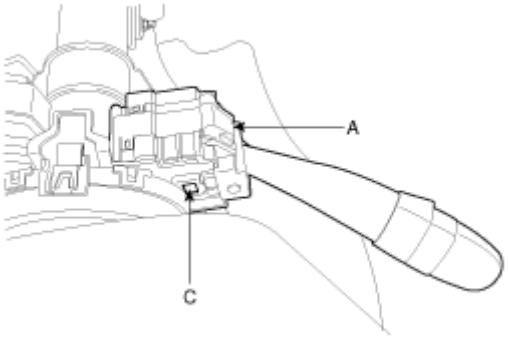


3. Remove the wiper switch (A) after disconnecting the connector(B) with pushing the lock pin (C) and loosening 2 screws.

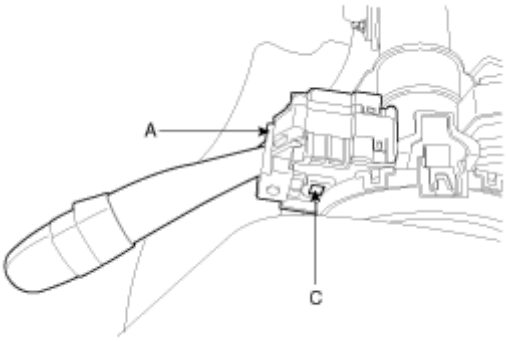


[LHD]

English ▼



[RHD]

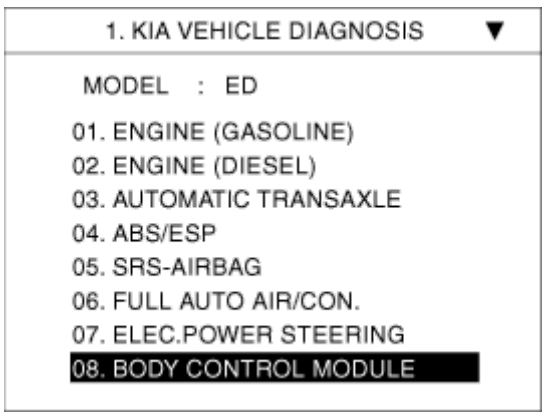


INSTALLATION

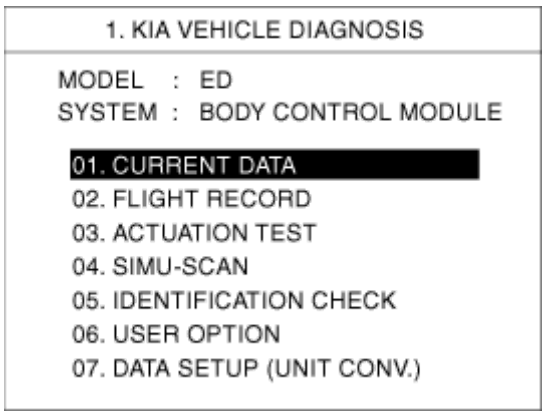
1. Install the windshield wiper switch.
2. Connect the wiper switch connector.
3. Install the steering column upper and lower shrouds.

INSPECTION

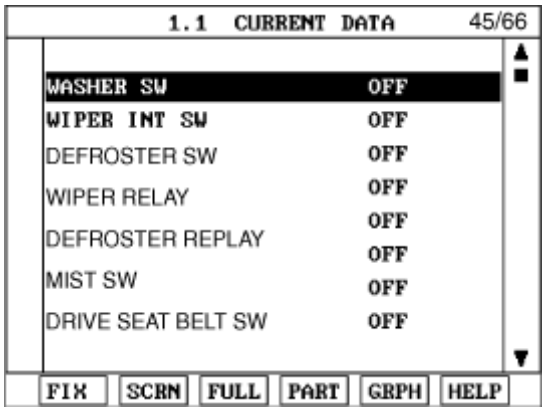
1. Multifunction switch operates head lamps and wiper by communicating with BCM through LIN communication.
2. Check BCM input/output value of each position of multifunction switch when you inspect the module whether faulty or not.
3. Select model and BCM menu.



4. Select "Current data" and wiper.

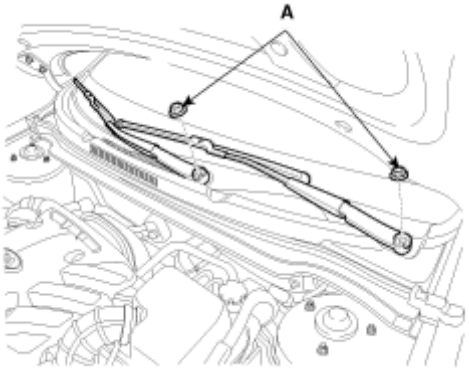


5. Check input/output value of washer & wiper switch.

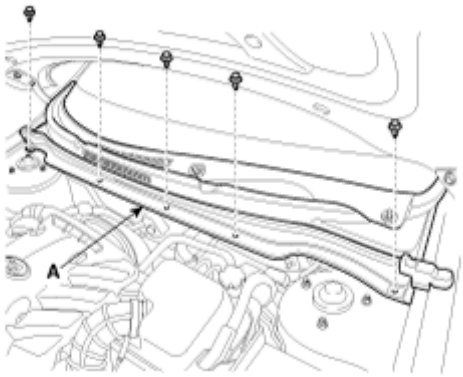


REMOVAL

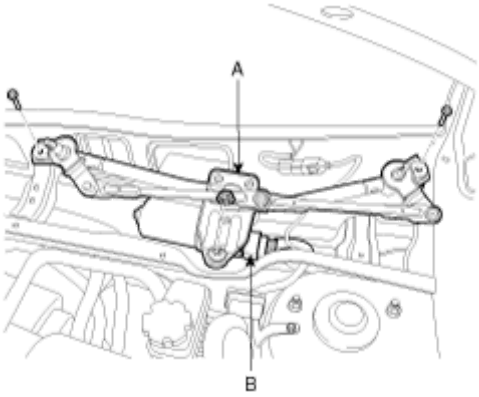
1. Remove the windshield wiper arm and blade after removing a nut (A).



2. Remove the weather strip and the cowl top cover (A) after removing 5 retainers.



3. Remove the windshield wiper motor and linkage assembly(A) after removing 2 bolts and 1 nut. Disconnect the wiper motor connector (B) from the wiper motor & linkage assembly.



INSTALLATION

1. Install the wiper motor and linkage assembly and then connect the wiper motor connector.
   TORQUE : 7-11Nm (0.7-1.1, kgf.m, 5.0-7.9 lbf.ft)

2. Install the cowl top cover.

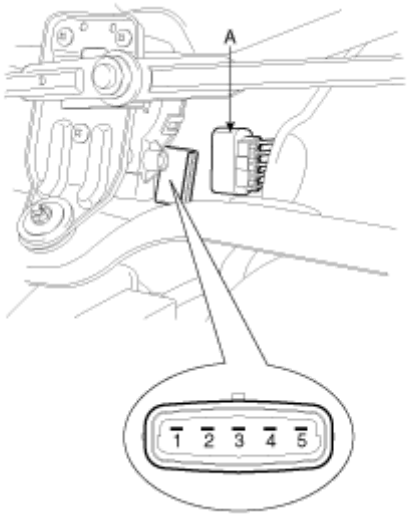
English ▼

3. Install the windshield wiper arm and blade.
   TORQUE : 28~33 Nm (2.8~3.3 kgf.m, 20~23.1 lbf.ft)

INSPECTION

Speed Operation Check

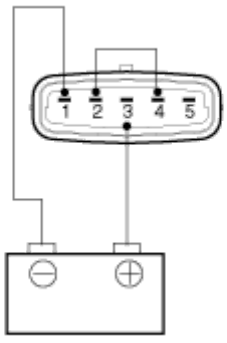
1. Remove the connector(A) from the wiper motor.



2. Attach the positive (+) lead from the battery to terminal 4 and the negative (-) lead to terminal 2.
3. Check that the motor operates at low speed.
4. Connect the positive (+) lead from the battery to terminal 5 and the negative (-) lead to terminal 2.
5. Check that the motor operates at high speed.

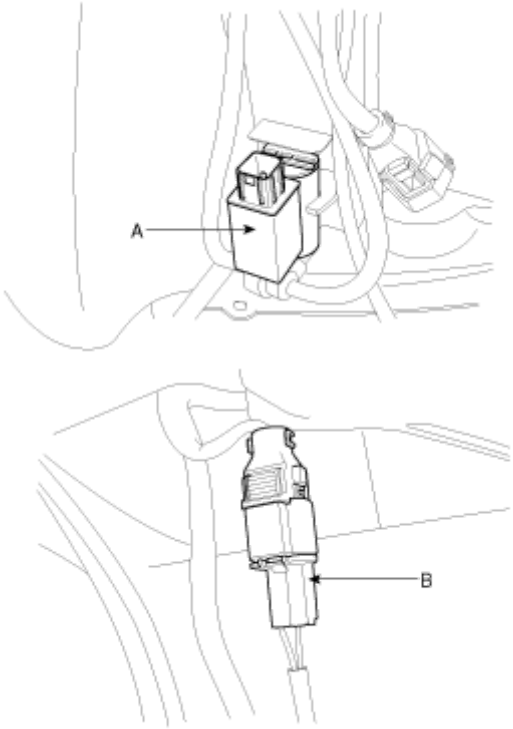
Automatic Stop Operation Check

1. Operate the motor at low speed using the stalk control.
2. Stop the motor operation anywhere except at the off position by disconnecting terminal 4.
3. Connect terminals 4 and 2.
4. Connect the positive (+) lead from the battery to terminal 3 and the negative (-) lead to terminal 1.
5. Check that the motor stops running at the off position.

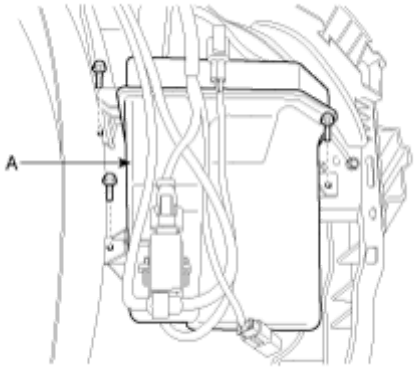


REMOVAL

1. Disconnect the negative (-) battery terminal.
2. Remove the front bumper cover. (Refer to Body group - Front bumper)
3. Remove the washer hose and the washer motor connector (A) and level sensor connector(B).



4. Remove the washer reservoir (A) after removing 3 bolts.



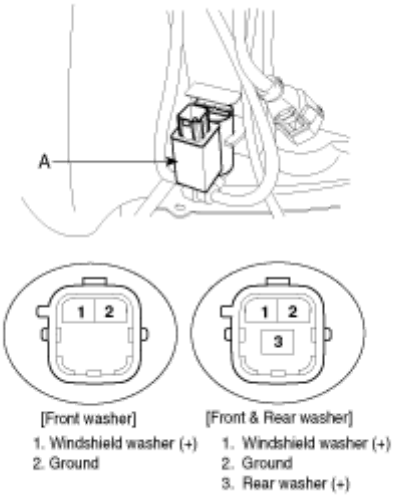
INSTALLATION

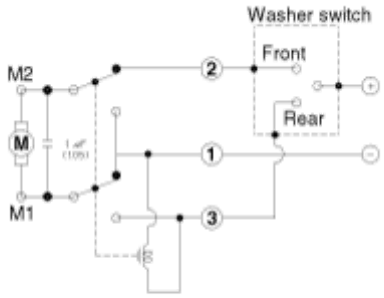
1. Install the washer reservoir.
2. Install the washer motor and connect the washer hose, the motor and level sensor connector.
3. Install the front bumper cover.

INSPECTION

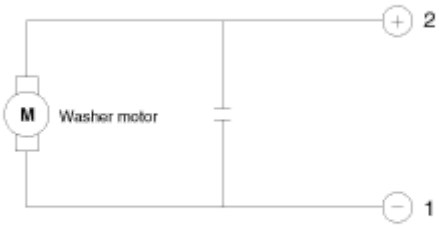
English

1. With the washer motor connected to the reservoir tank, fill the reservoir tank with water.
2. Connect positive (+) battery cables to terminal 2 and negative (-) battery cables to terminal 1 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 (A).





<Windshield & Rear washer motor>



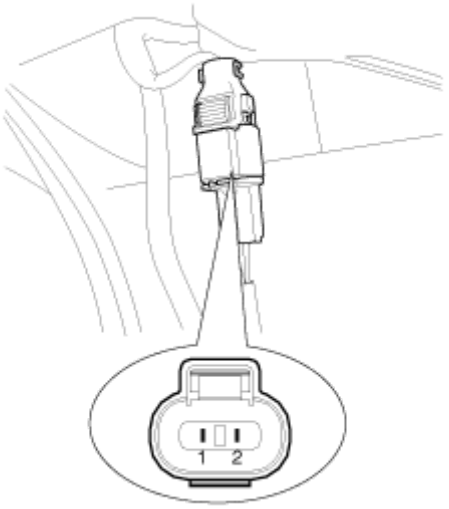
[Windshield washer motor]

Washer Fluid Level Sensor Switch

1. Disconnect the negative(-) battery terminal.
2. Drain the washer fluid less than 700 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 continity when the folat is up.

4. If the continuity is not as specified, replace the washer fluid level switch

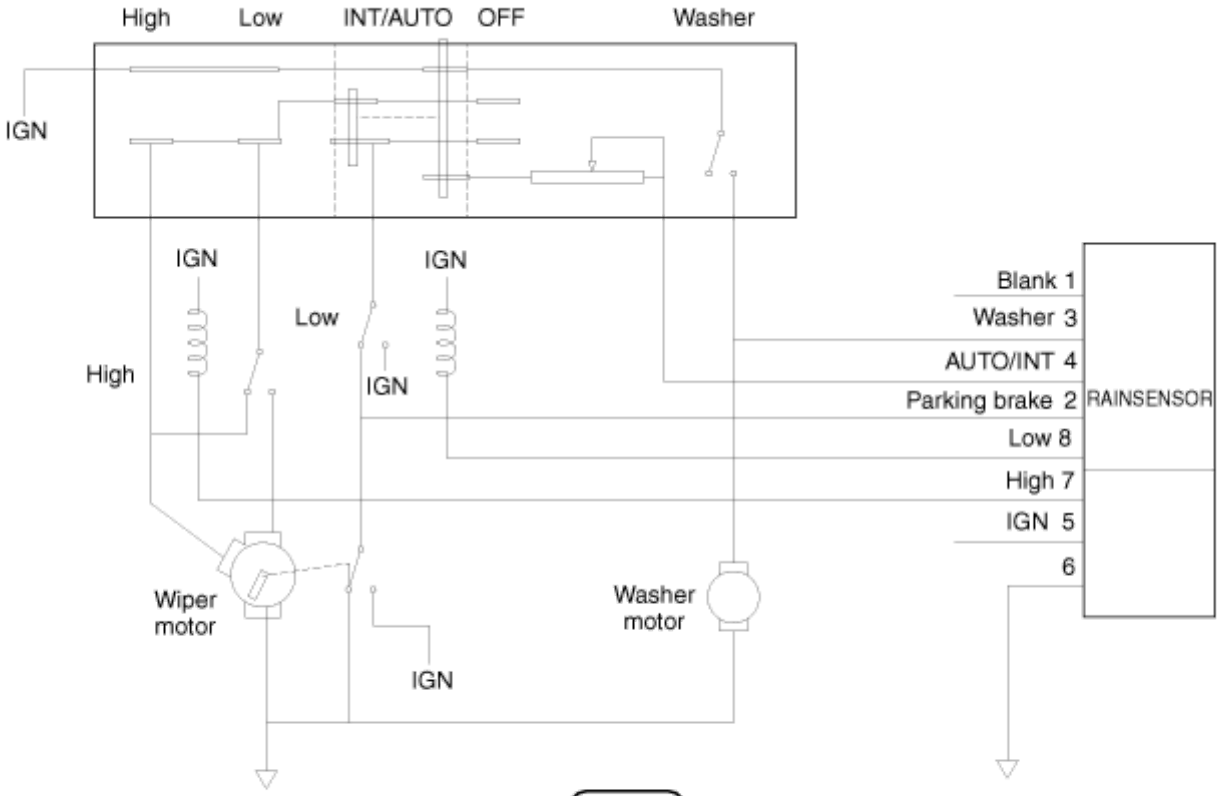


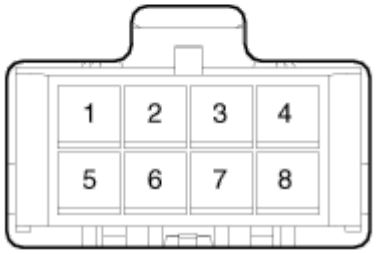
Terminal / Position	1	2
Over 700cc		
Under 700cc	○	○

(Tolerance : -50cc ~ +100cc)

English

CIRCUIT DIAGRAM

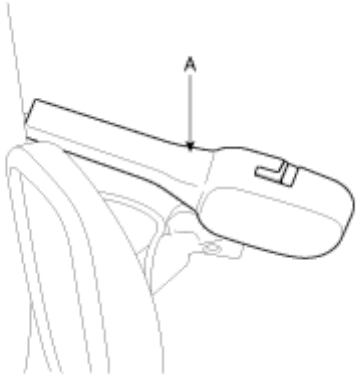




Terminal / Position	2	8	7	4	3	6
Washer					○	○
Low		○				○
High			○			○
OFF	○	○				
AUTO/INT	○	○		○		○

DESCRIPTION

The Rain sensing windshield wiper system is a wiper system that, in addition to providing normal wiper functions off, mist, manual low speed, manual high speed, and wash, provides automatic control of automatic intermittent, automatic low, and automatic high speeds. When the ignition key is in the ON position, the rain sensor (A) will be activated.



OPERATING MODES - RAINSENSING WINDSHIELD WIPER SYSTEM

MULTIFunction SWITCH POSITION	RAINSENSOR OPERATING MODE	SENSOR ACTION
MIST	MIST	Mist is controlled by the column switch. The sensor has no affect on this function
OFF	OFF	If not already parked, wiper motor runs in low speed until blades are in the depressed park position.
AUTOMATIC Automatic mode has 5 SENSITIVITY settings.	AUTOMATIC	AUTOMATIC Automatic INT/speed control. The sensitvity to raindrop accumulation on the windshield is set by the MULTIFunction SWITCH sensitivity adjustment.
LOW SPEED	MANUAL	Wiper motor runs continuously in low speed, for example 45 wipes/minute. The sensor has no affect on this function
HI SPEED	MANUAL	Wiper motor runs continuously in high speed, for example 60 wipes/minute. The sensor has no affect on this function
WASH - DEMAND WASHER SW ≥ 0.6 SEC	WASH	If washer sw on after 0.6 sec then wipes during 2.5 to 3.8 sec. The rain sensor enables the wipers and controls the after wipes.
WASH - DEMAND WASHER SW < 0.6 SEC	WASH	If washer sw on less than 0.2 to 0.6 sec then once wipes

Off Mode

With the wipe switch in the OFF position and the ignition switch in the ON positions, the Rainsensor is considered to be in "OFF" mode. In this mode, the sensor commands the wiper to be off.

The Rainsensor monitors the state of the windshield during OFF mode so that knowledge of the state of the windshield is present when the MULTIFunction SWITCH is moved to any SENSITIVITY setting. This optimizes the performance of the sensor when moving from the

OFF condition to an AUTOMATIC mode. The algorithm assumes the nominal sensitivity setting when in the OFF mode.

English ▼

Automatic Mode

When the MULTIFunction SWITCH is moved to AUTO position and the ignition switch is in the RUN or ACCESSORY positions, the Rainsensor is considered to be in "AUTOMATIC" mode. Once a single "Instant wipe" has occurred, the wipers remain at "Innerwiper/park" untill the Rainsensor determines that the dwell time at that position is appropriate for the amount of precipitation on the windshield, considering the driver input from the switch SENSITIVITY setting. After the dwell time the Rainsensor provides input to the wiper motor to activate the wipers to clear the preciptation from the windshield.

Automatic Int

For all AUTOMATIC INT operations the Rainsensor commands the wipers to operate in LOW SPEED for one wipe, followed by a variable dwell period in the inner wipe position.

Automatic Low

AUTOMATIC LOW SPEED operation is utilized when the amount of precipitation imping on the windshield exceeds the AUTOMATIC INT TO AUTOMATIC LOW threshold. This threshold includes sufficient hysterisis to prevent cycling between AUTOMATIC INT and AUTOMATIC LOW SPEED operation with a steady amount of precipitation accumulation on the windshield.

Automatic High

AUTOMATIC HIGH SPEED operation is utilized when the amount of precipitation imping on the windshield exceeds the AUTOMATIC LOW to AUTOMATIC HIGH threshold. This threshold includes sufficient hysterisis to prevent cycling between AUTOMATIC LOW to AUTOMATIC HIGH operation with a steady amount of precipitation accumulation on the windshield.

Wash Mode

The Rainsensor monitors the MULTIFunction SWITCH to determine if the wash Function is selected. Rainsensor enables the wiper motor to run in low speed during the wash mode and performs follow up wipes during 2.5 to 3.8 sec.

Manual Mode

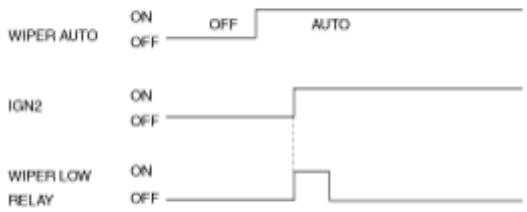
The Rainsensor determines when a manual mode such as manual low, Mist, Off or manual high is selected. The column switch performs these modes and the rain sensor has no affect.

English ▼

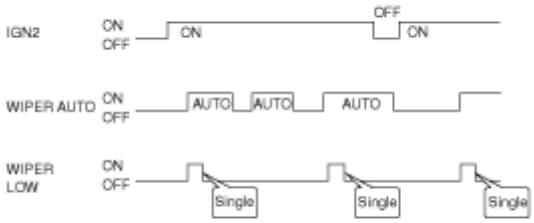
INSPECTION

Rain Sensing Wiper

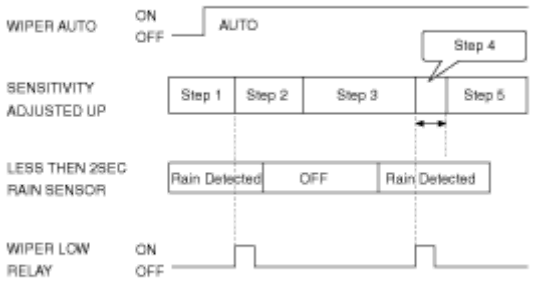
1. In IGN2 ON state, if auto switch input (LIN communication) is ON then both wiper low relay and wiper high relay outputs are controlled by the rain sensor input signal.
2. If the wiper switch has been left in automatic mode with the vehicle ignition OFF, and then the vehicle ignition switch is turned on, a single wipe will be performed.



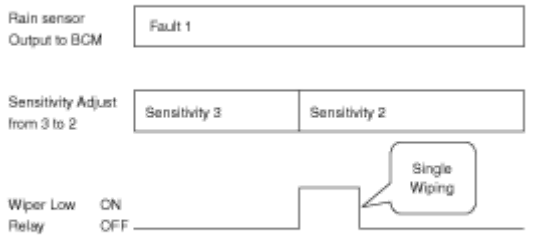
3. A single wipe will be performed whenever rain has been detected (Rain Detected signal from Rain sensor) and the wiper switch is moved to the AUTO position. But a single wipe will not be performed when the wiper switch is moved to the AUTO position and OFF signal is being received from Rain sensor. But if the wiper switch is moved to AUTO position for the first time since vehicle ignition switch is turned on then a single wipe will be performed regardless of Rain Detected or OFF signal.



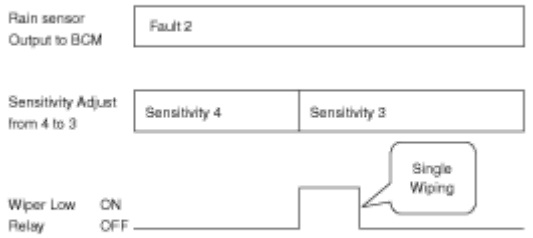
4. The drive may adjust the rain sensor performance by adjusting the sensitivity input. When in automatic mode, the BCM will perform a single wipe each time the sensitivity is adjusted upward to a more sensitive setting (downward more then one step). This single wipe will only be performed if Rain Detected signal is being received from the Rain sensor. If the sensitivity adjustment is adjusted upward more than one sensitivity, the BCM will only perform a single wipe unless the time between Increases is more than 2 seconds.



5. Fault strategy for the rain sensor
   Rain Sensor Fault 1 - Internal Fault Detected
   This failure is detected when the wiper is in automatic mode and the input faulty rain sensor from the rain sensor has a duty cycle corresponding to Fault 1. The confirmation delay for the failure is of 1 sec.
   When this failure is detected, the wiper outputs are OFF and the wiper will also do a wipe in slow speed on the transition from sensitivity 3 to sensitivity 2 (Step 2 to 3) in order to signal the presence of this fault. If another sensitivity is set, the wiper won't make any additional wipe.



   Rain Sensor Fault 2 - Glass Attachment Fault Detected
   This failure is detected when the wiper is in automatic mode and the input faulty rain sensor from the rain sensor has a duty cycle corresponding to Fault 2. The confirmation delay for the failure is of 1 s.
   When this failure is detected, the wiper outputs are OFF and the wiper will also do a wipe on the transition from sensitivity 4 to sensitivity 3 (Step 1 to 2) in order to signal the presence of this fault. If another sensitivity is set, the wiper won't make any additional wipe.



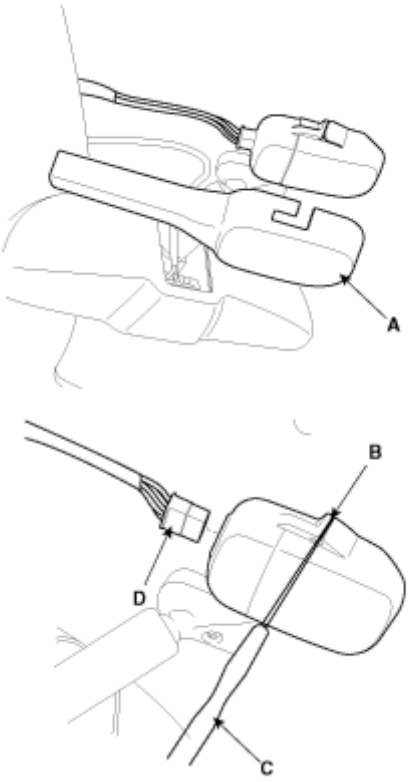
   Rain Sensor Fault 3 - No Input Signal Present
   This failure is detected when the wiper is in automatic mode and the input faulty rain sensor from the rain sensor has a duty cycle corresponding to Fault 3 or in case the duty cycle of the input faulty rain sensor is 0% or 100%. The confirmation delay for the failure is of 1 s.
   When this failure is detected, the wiper outputs are OFF.

REMOVAL

⚠ CAUTION

The dust or foreign substance on the rain sensor have a bad effect upon the rain sensor capability,so protect the sensor surface with protection cover until installing the rain sensor to bracket for accurate funtion.
The coupling pad on the rain sensor surface has adherive strength, so the coupling pad could stick to the windshield by environment condition during the using time.
If separate it by force, it could be damaged. So make sure to separate the rain sensor from the windshield carefully.

1. Remove the rain sensor cover(A) first. Be careful not to damage the cover latch by applying excessive force. To remove the latch, pull aside the latch using the cover hole (B) with the little (-) screwdriver (C).



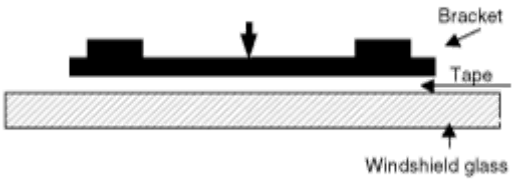
2. Remove the wiring harness connector (D) from sensor.
3. Rain sensor module is attached to the front windshield by glue replacing the front windshield, remove the rain sensor module from the existing front windshield and install on the new front windshield.

INSTALLATION

NOTICE

- In case of the windshield with reflection layer which reflects the infrared rays in sensing field, should install the rain sensor into the field removed the reflection layer.
- Install the rain sensor after some time and be care not to be settled the dust after installation.

1. Install the rainsensor bracket to the windshield glass using the tape.



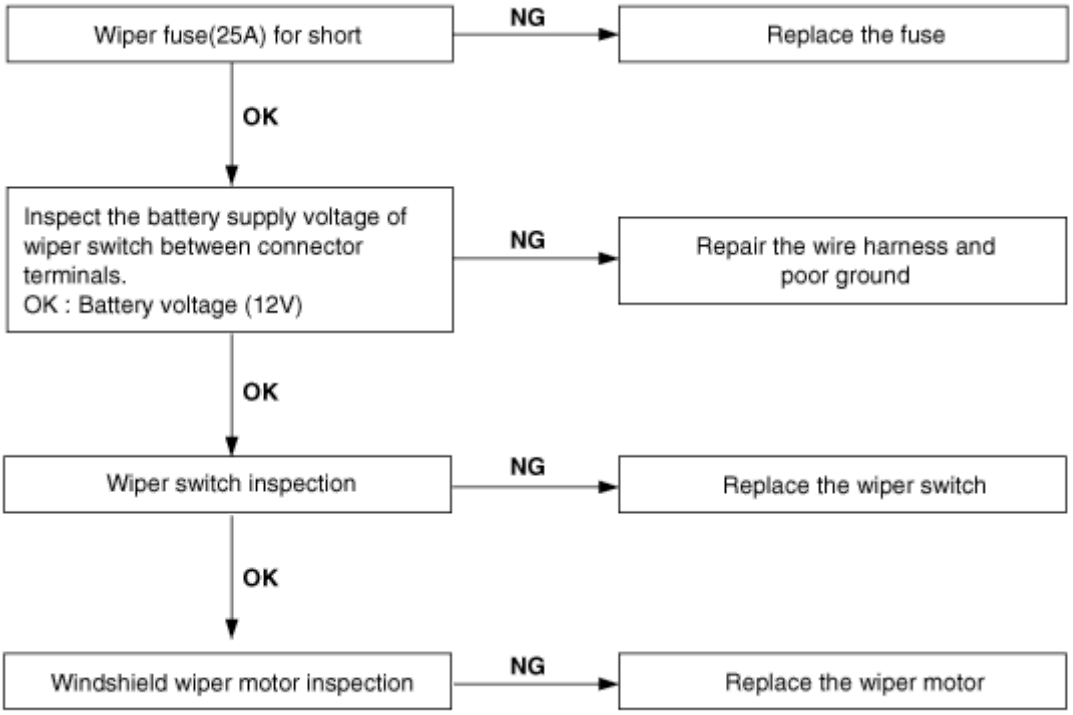
⚠ CAUTION

It is very important that the coupling pad pushes the windshield completely to stick to each other without bubbles.

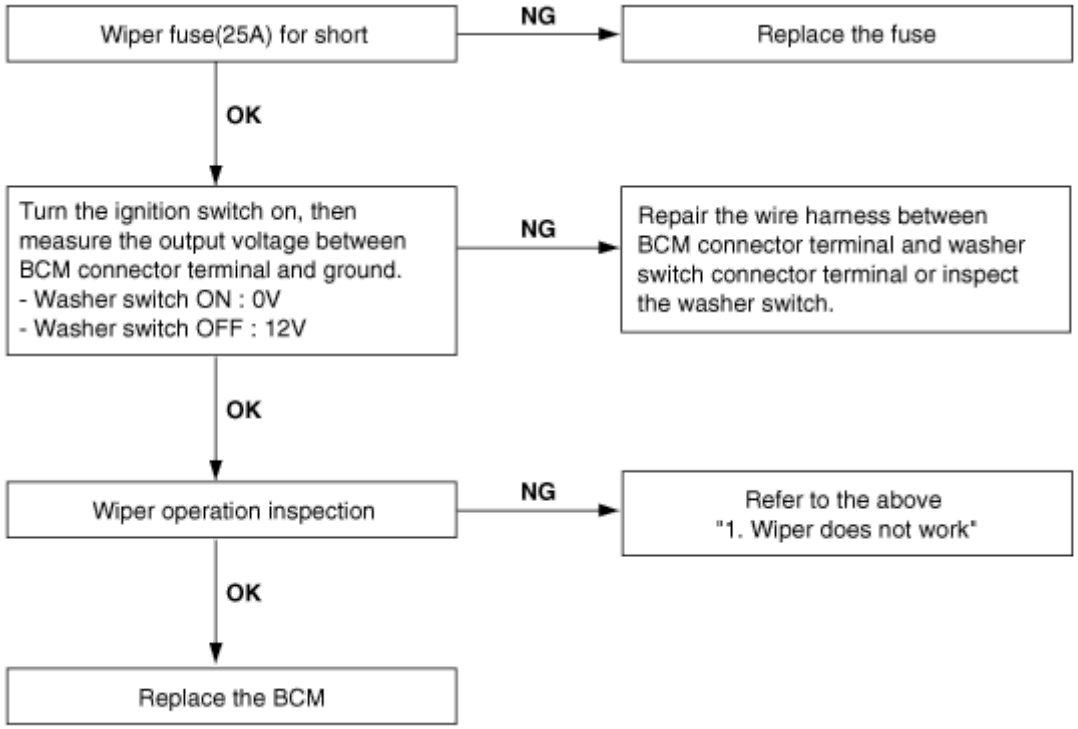
2. Connect the rainsensor connector, and then install the sensor cover.

TROUBLESHOOTING

1. Wiper low and wiper high do not work.

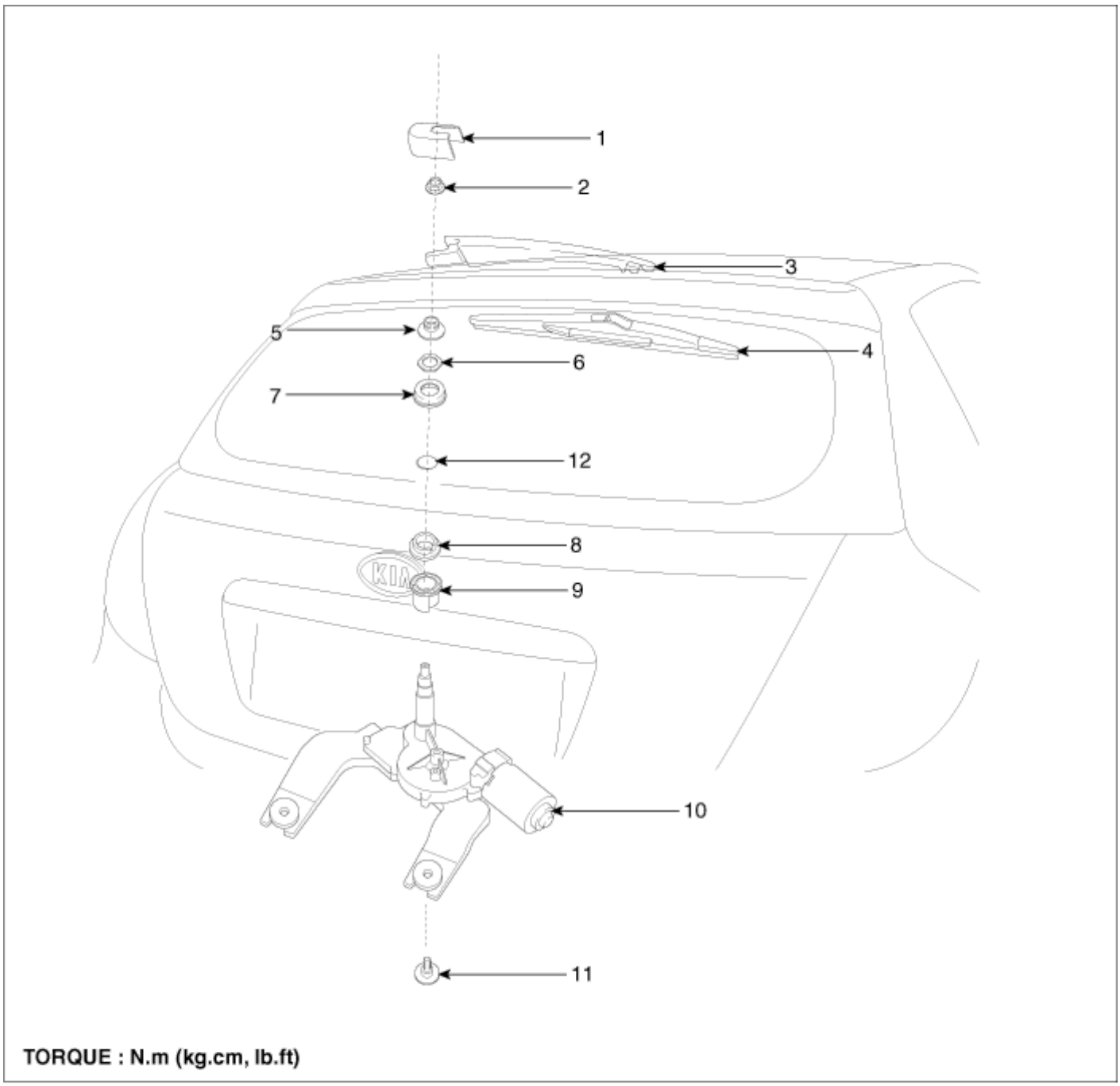


2. When washer switch is on, wiper does not work.



English ▼

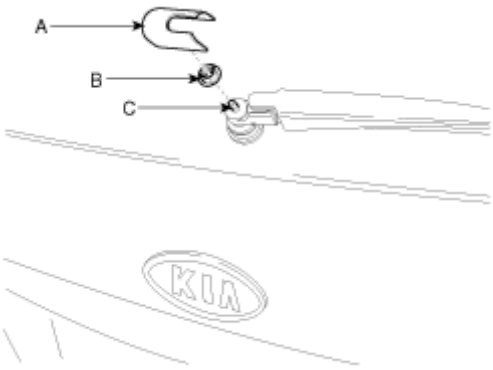
COMPONENT LOCATION



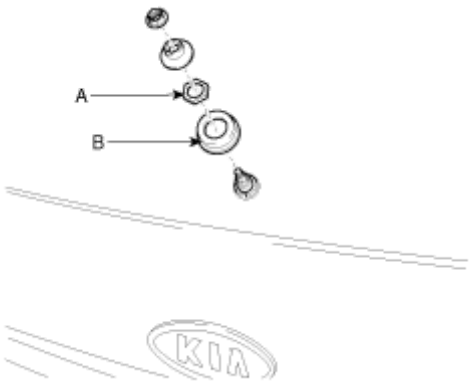
1. Head cap
2. Nut
3. Rear wiper arm
4. Rear wiper blade
5. Cover
6. Nut
7. Rear wiper cap & Pad
8. Pad
9. Support
10. Rear wiper motor assembly
11. Bolt
12. Glass hole

REPLACEMENT

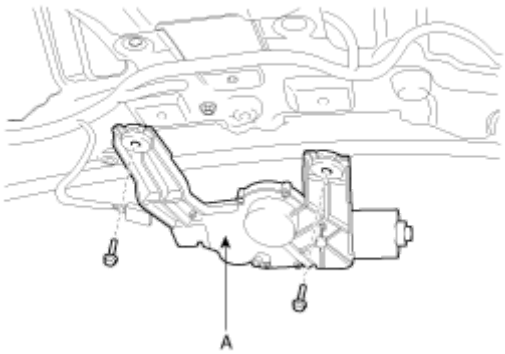
1. Detach the wiper cap (A), then remove the rear wiper arm (C) after removing a nut (B).
   Tightening torque Nut(B) :
   10~14 Nm (1.0~1.4 kgf.m, 7~10 lbf.ft)



2. Remove the rear wiper cap & pad (B) after removing a nut (A).
   Tightening torque Nut (A) :
   10~14 Nm (1.0~1.4 kgf.m, 7~10 lbf.ft)



3. Open the tailgate then remove the tailgate trim.
4. Disconnect the rear wiper motor connector then remove the rear wiper motor (A) after removing 2 bolts.
   Tightening torque Nut :
   10~14 Nm (1.0~1.4 kgf.m, 7~10 lbf.ft)

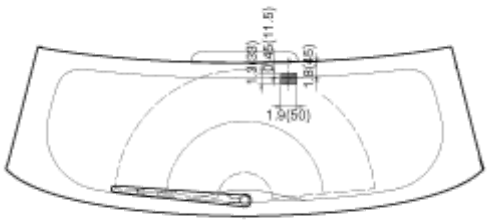


5. Installation is the reverse of removal.

INSPECTION

Rear Wiper And Nozzel Setting

1. Set the rear washer nozzle on the specified spray position.

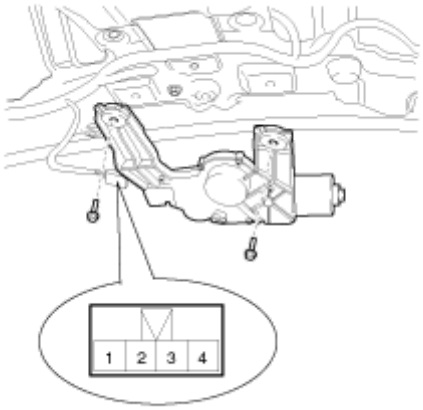


Unit : in(mm)

2. Set the rear wiper blade and to the lowest defogger heat line and tailgate glass.

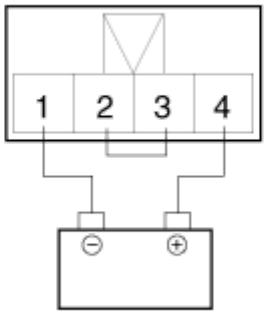
Rear Wiper Motor

1. Remove the 4P connector from the rear wiper motor.
2. Connect battery positive (+) and negative (-) cables to terminals 4 and 1 respectively.
3. Check that the motor operates normally. Replace the motor if it operates abnormally.
   (1. GND, 2. Switch, 3. Parking, 4. B+)



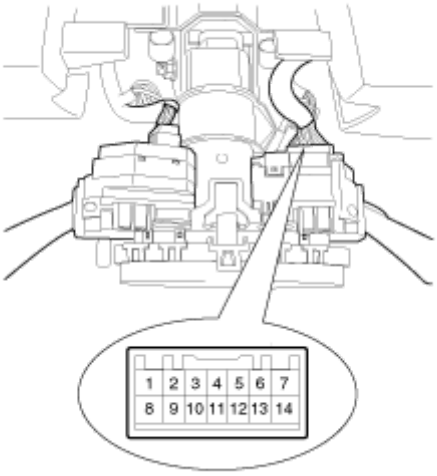
Automatic Stop Operation Check

1. Operate the motor at low speed using the stalk control.
2. Stop the motor operation anywhere except at the off position by disconnecting terminal 2.
3. Connect terminals 2 and 3.
4. Connect the positive (+) lead from the battery to terminal 4 and the negative (-) lead to terminal 1.
5. Check that the motor stops running at the off position.


1
2
3
4

INSPECTION

1. With the rear wiper & washer switch in each position, make sure that continuity exists between the terminals below. If continuity is not as specified, replace the multifunction switch.



Rear Wiper & Washer Switch

( ) : RHD

Terminal / Position	4(5)	3(4)	2(3)	1(2)
WIPER	○			○
OFF				
INT	○	○		
ON	○		○	
WASHER	○			○

English ▼

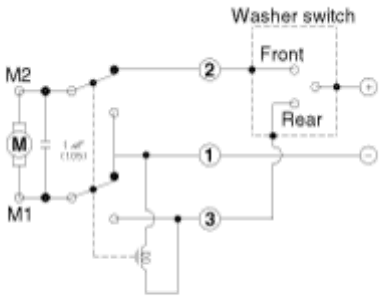
INSPECTION

1. With the washer motor connected to the reservoir tank, fill the reservoir tank with water.
2. Remove the front bumper cover. (Refer to the BD group- Front bumper)
3. Connect positive (+) and negative (-) battery cables to terminals 3 and 1 respectively to see that the washer motor runs and water is pumped.
4. Check that the motor operates normally.
   Replace the motor if it operates abnormally.



[Front & Rear washer]

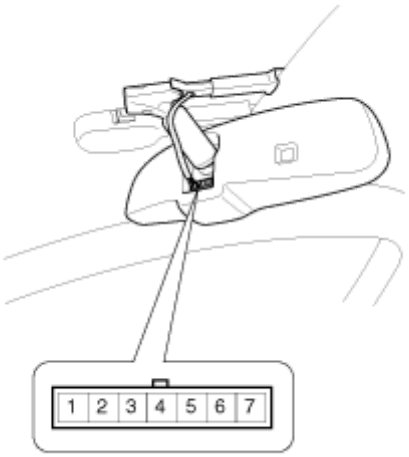
1. Windshield washer (+)
2. Ground
3. Rear washer (+)



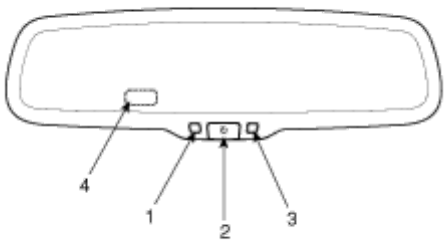
<Windshield & Rear washer motor>

DESCRIPTION

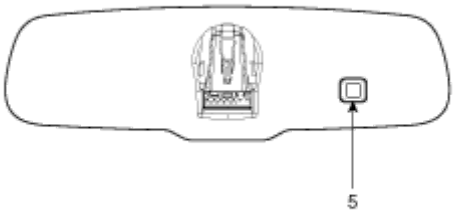
The ECM (Electro Chromic inside rear view Mirror) is for dimming the reflecting light from a vehicle behind at night, in order the user not to be dazzled by the light. The front looking sensor detects brightness of the surroundings, while the rearward looking sensor the strength of the reflecting light so that adjusts the reflexibility of the mirror in the range of 10~70%. But, when the reverse gear is engaged, it stops functioning.
(1. IGN(12V), 2. Reverse gear signal, 3. GND)



1. The front looking 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. Status indicator LED, 2. Buttom, 3. Rear indicator, 4. Front light sensor, 5. Front light sensor)



English ▼



AUTOMATIC-DIMMING FUNCTION

To protect your vision during nighttime driving, your mirror will automatically dim upon detecting glare from the vehicles traveling behind you. The auto-dimming function can be controlled by the Dimming ON/OFF Button :

1. Pressing and holding the Feature Control button for more than 3 but less than 6 seconds turns the auto-dimming function OFF which is indicated by the green Status Indicator LED turning off.
2. Pressing and holding the Feature Control button again for more than 3 but less than 6 seconds turns the auto-dimming function ON which is indicated by the green Status Indicator LED turning on.

> **NOTICE**
>
> The mirror defaults to the "ON" position each time the vehicle is started.

INSPECTION

Check it by the procedure below to see if the function of the ECM is normal.

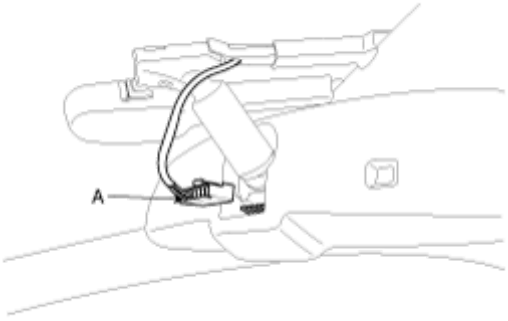
1. Turn the ignition key to the "ON" position.
2. Cover the foreward looking sensor to stop functioning.
3. Head a light to the rearward looking sensor.
4. The ECM should be darkened as soon as the rearward looking sensor detects the light.

> **NOTICE**
>
> If this test is performed in daytime, the ECM may be darkened as soon as the foreward looking sensor is covered.

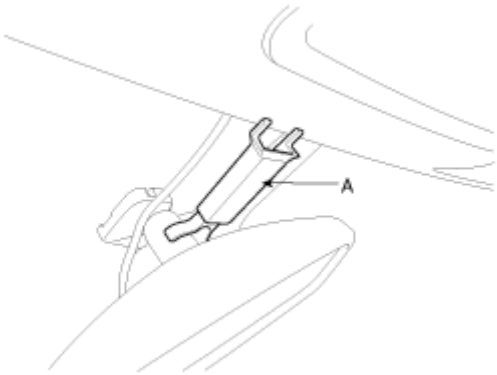
5. When the reverse gear is engaged, the ECM should not be darkened.
   When heading lights to both the foreward looking and rearward looking sensors, the ECM should not be darkened.

REMOVAL

1. Disconnect the inside rear view mirror connector(A).

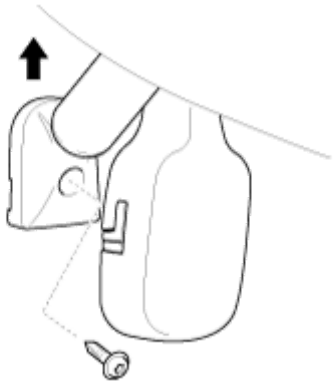


2. Remove the mirror wire cover(A.



3. Remove the inside rear view mirror pulling it upside carefully after loosening the mirror base mounting screw.

English ▼

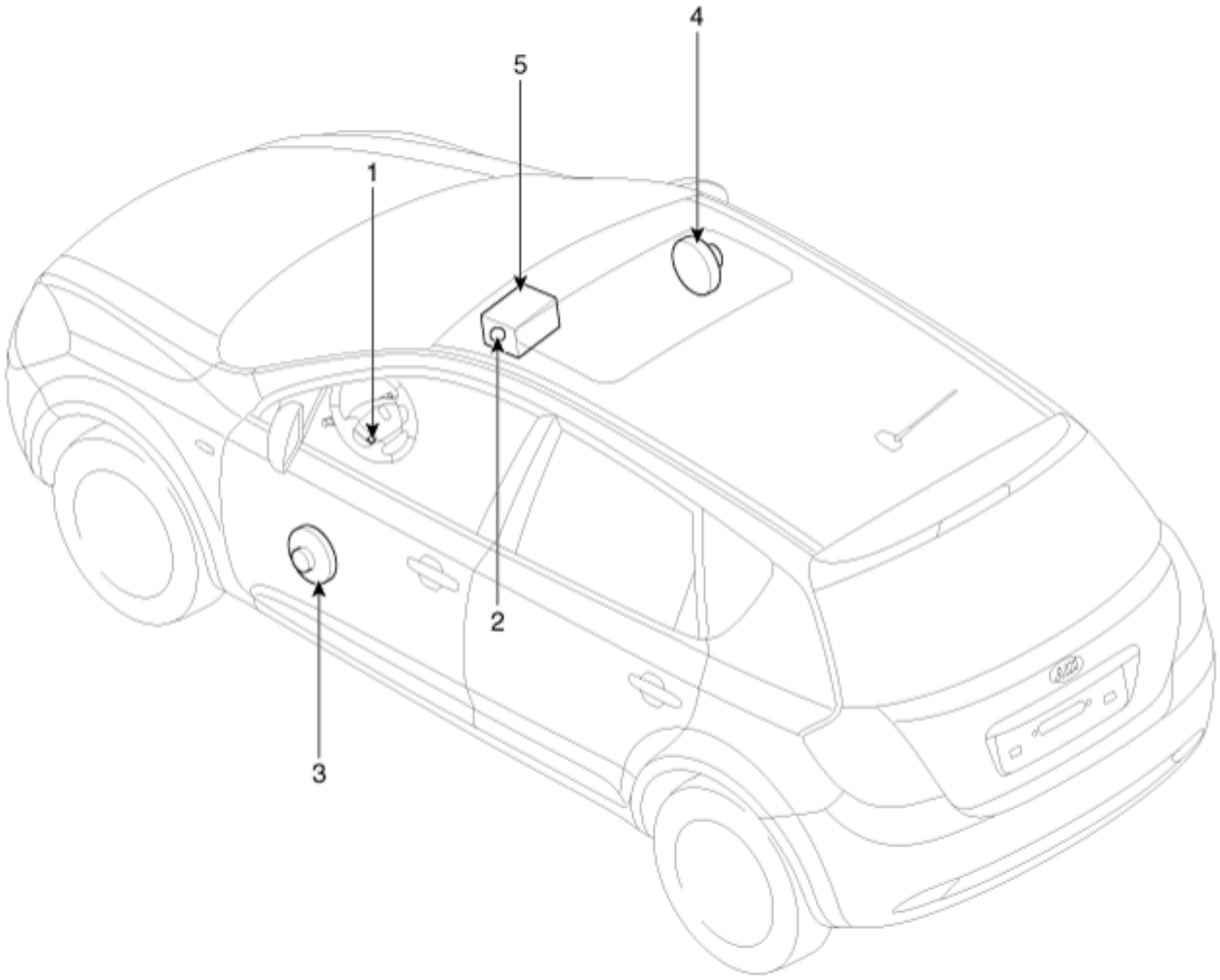


INSTALLATION

1. Install the inside rear view mirror.
2. Install the mirror wire cover.
3. Connect the inside rear view mirror connector.

English ▼

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).

FUNCTION

Bluetooth

You can use a Bluetooth device in your car to make a hands-free phone call or to stream music onto your in-car speakers (via this Head Unit). This Head Unit supports HFP, A2DP and AVRCP connection.

Advanced Audio Distribution Profile (A2DP)

This profile defines how high quality audio(stereo or mono) can be streamed from onedevice to another over a Bluetooth connection.For example: music streamed from amobile phone to a wireless headset or caraudio.

Audio/Video Remote Control Profile (AVRCP)

This profile is designed to provide a standardinterface to control TVs, Hi-fi equipment,etc. to allow a single remote control (or otherdevice) to control all of the A/V equipment towhich a user has access. It may be used inconcert with A2DP or VDP.

Hands-Free Profile (HFP)

This is commonly used to allow car handsfreekits to communicate with mobile phonesin the car.

Notes for mobile phones

Some functions (e.g. starting of speech recognition) are not supported by all mobile phones. We cannot guarantee that all functions described will be supported by all mobile phones with Bluetooth.

New device

This function allows you to add a new phone to the Head Units Bluetooth Device List. Maximum of 5 devices can be added to the list. If the list is full, the oldest device will be replaced by the newly added Bluetooth device, based on last pairing date.

Pairing

To pair your Bluetooth-enabled device to this Head Unit, make sure that no device is currently streaming to this Head Unit first.

- Short press the **SETUP** button to enter the Setup menu.
- Short press the ▼ or ▲ button to access the Bluetooth sub-menu.
- Now select “New Device”.
- Press the ▼ or ▲ button to select the number of the first digit.
- Press the **<** or **>** button to select the next digit.
- Repeat the above steps for the other three digits.
- Press the **OK** button to confirm the 4-digit PIN for authentication and activate the “Discoverable Mode“.
- In “Discoverable Mode” the Head Unit broadcasts a Bluetooth ID.
- Look for the “KIA-BLUETOOTH“ on your Bluetooth device.
- Enter identically the same PIN in your Bluetooth device and authenticate pairing on your Bluetooth device.
- When pairing is established, the ID of the Bluetooth device and the service list info will be stored in the Head Unit Bluetooth Device List.

Device List

With this function you can browse through and select bluetooth devices that are stored in the Head Unit Bluetooth Device List.

- Short press the **SETUP** button to enter the Setup menu.
- Short press the ▼ or ▲ button to access the Bluetooth sub-menu.
- Press the **>** button to browse the Device List to select the required device.
- Press the **OK** button to start pairing between the selected device and the Head Unit.

NOTICE

Whenever there is at least one connecteddevice active, in the display the Bluetooth icon is visible.

Delete Device

This function allows you to delete a Bluetooth device ID from the Head Unit Bluetooth Device List.

– Short press the **SETUP** button to enter the Setup menu.

– Short press the ▼ or ▲ button to access the Bluetooth sub-menu.

– Press the **>** button to select Delete Device.

– Press the **OK** button to delete the selected device from the Head Unit Bluetooth Device List.

Phone Volume

– Short press the **SETUP** button to enter the Setup menu.

– Short press the ▼ or ▲ button to access the Bluetooth sub-menu.

– Select the option “Phone Volume”.

– Press the **<** or **>** button to decrease or increase the phone volume setting.
Default setting: 12
Setting range: 3 … 25

– During an ongoing call, user is allowed toadjust the BT Phone volume. The adjustedvolume is memorized into Phone Volumesetting.

Answering a Call

– Press the **Call** button on the Steering Wheel Remote Control to accept an incoming call.

Terminate / Reject Call

– Press the **End Call** button on the Steering Wheel Remote Control to terminate or reject a call.

Last Call Re-dial

– Short press the **Call** button on the Steering Wheel Remote Control to re-dial last dialled number (one attempt).

– Long press the **Call** button on the Steering Wheel Remote Control to re-dial last dialled number (two attempts).

Private Call

This function allows you to have a private call even if the phone is connected to the Head Unit.

– Press the **Call** button on your phone to start a private call.

OR

– Press the End Call button on your phone to end a private call.

Transferring a Call

This function allows you to transfer a call during an ongoing call.

– From the tuner to the phone

– From the phone to the tuner

– Long press the **Call** button on the Steering Wheel Remote Control to transfer the ongoing call back to the phone or back to the tuner again.

Audio Streaming

Start Audio Streaming

This function allows the Head Unit to start streaming music from phone.

– The Bluetooth device must be connected with the Head Unit.

– Press the **AUX** button and select BT AUDIO.

– The Head Unit starts streaming the audio from the phone and will start playing the audio files.

– The Head Unit has no control on the sequence of track playback in phone.

Next/Previous Track

This function allows you to select the next/ previous track of phone‘s music player by using the next/previous track buttons on the Head Unit or Steering Wheel Remote Control.

– Short press the **<** or **>** button on the Head Unit or the Steering Wheel Remote Control.

Suspend Audio Streaming

This function allows you to suspend streaming music from the phone to the Head Unit.

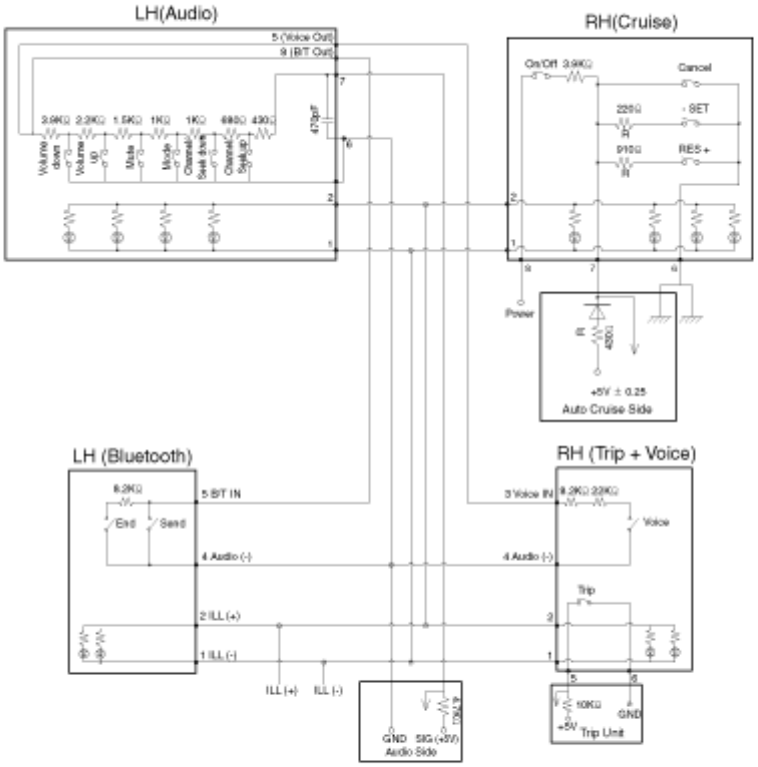
– Short press the **Mute** button on the Steering Wheel Remote Control.

– Press the **AUX button and de-select BT AUDIO.**

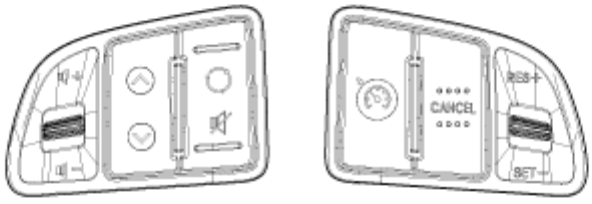
English

CIRCUIT DIAGRAM

[Audio + Auto cruise + Bluetooth hand free + Voice + Trip]



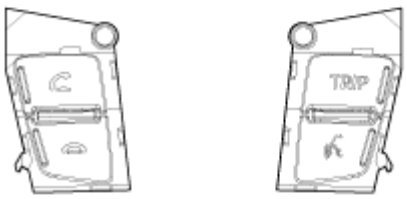
Audio system + Auto cruise



LH RH

1 2 3 4 5 6 7 8		1 2 3 4 5 6 7 8	
NO	Connector	NO	Connector
1	Illumination (-)	1	Illumination (-)
2	Illumination (+)	2	Illumination (+)
3	-	3	-
4	-	4	-
5	Voice out	5	-
6	Audio (-)	6	ACC ground
7	Audio (+)	7	ACC signal
8	Bluetooth out	8	ACC power

Bluetooth switch + Trip/Voice switch

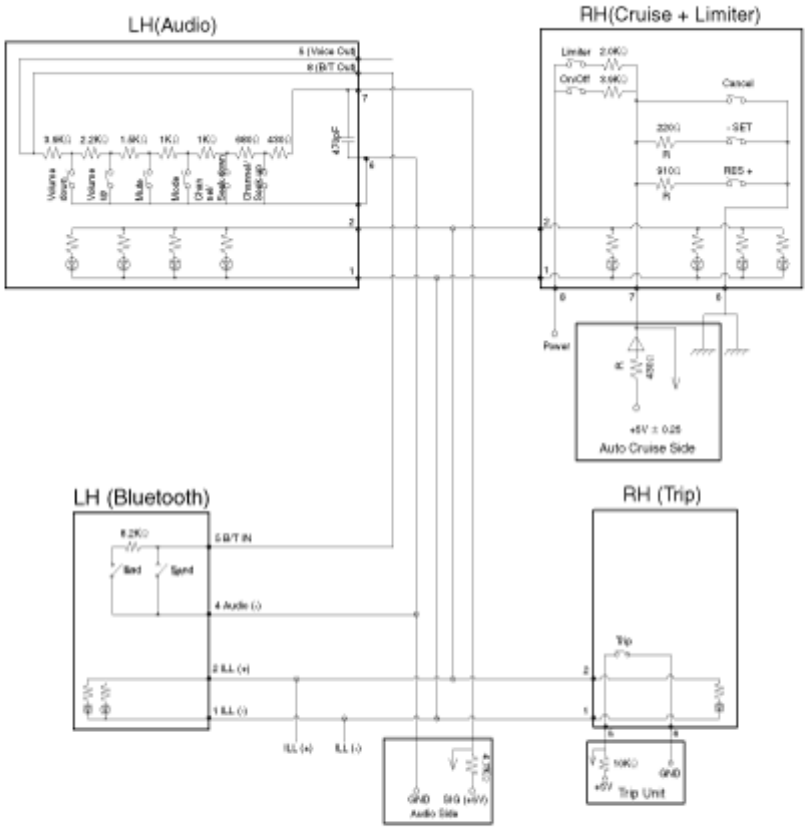


LH RH

654321		654321	
NO	Connector	NO	Connector
1	ILL (-)	1	ILL (-)
2	ILL (+)	2	ILL (+)
3	-	3	Voice in
4	Audio (-)	4	Audio (-)
5	Bluetooth in	5	Trip in
6	-	6	Trip ground

[Audio + Auto cruise/Limiter + Bluetooth hand free + Trip]

English ▼



Audio system + Auto cruise/Limiter



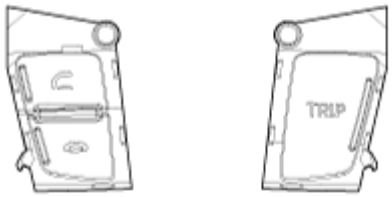
LH RH





NO	Connector	NO	Connector
1	Illumination (-)	1	Illumination (-)
2	Illumination (+)	2	Illumination (+)
3	-	3	-
4	-	4	-
5	Voice out	5	-
6	Audio (-)	6	ACC/Limiter ground
7	Audio (+)	7	ACC/Limiter signal
8	Bluetooth out	8	ACC/Limiter power

Bluetooth switch + Trip switch



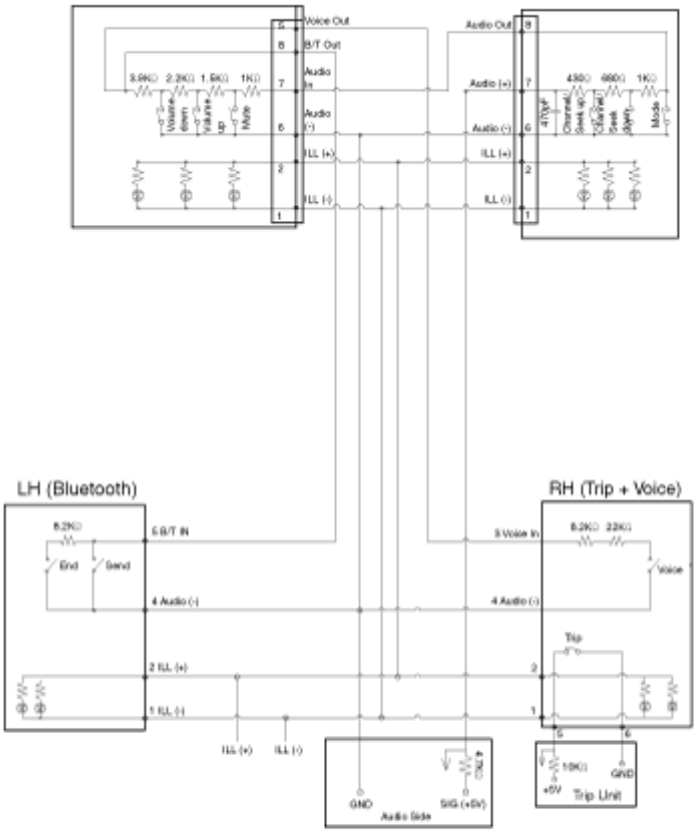
LH RH



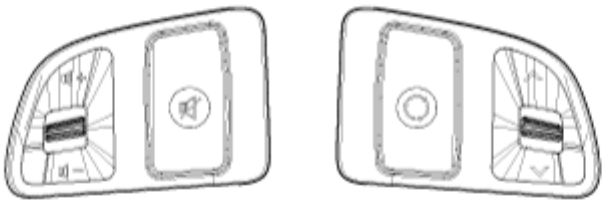


NO	Connector	NO	Connector
1	Illumination (-)	1	Illumination (-)
2	Illumination (+)	2	Illumination (+)
3	-	3	-
4	Audio (-)	4	-
5	Bluetooth in	5	Trip in
6	-	6	Trip ground

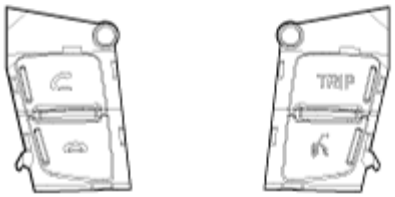
[Audio + Bluetooth hand free + Voice + Trip]



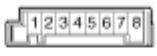
Audio system



Bluetooth switch + Trip/Voice switch



LH



NO	Connector
1	Illumination (-)
2	Illumination (+)
3	-
4	-
5	Voice out
6	Audio (-)
7	Audio in
8	Blutooth out

RH



NO	Connector
1	Illumination (-)
2	Illumination (+)
3	-
4	-
5	-
6	Audio (-)
7	Audio (+)
8	Audio out

LH



NO	Connector
1	Illumination (-)
2	Illumination (+)
3	-
4	Audio (-)
5	Bluetooth in
6	-

RH



NO	Connector
1	Illumination (-)
2	Illumination (+)
3	Voice in
4	Audio (-)
5	Trip in
6	Trip ground

English

INSPECTION

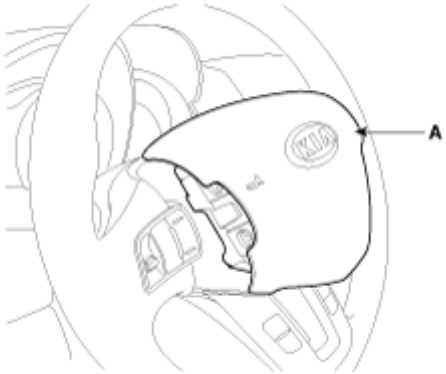
1. Check the hands free remote control switch for resistance between No.3 and No.4 terminals in each switch position.



Switch	Connector terminal	Resistance (±5%)
SEND	4 - 5 (LH)	10.71 kΩ
END	4 - 5 (LH)	18.91 kΩ

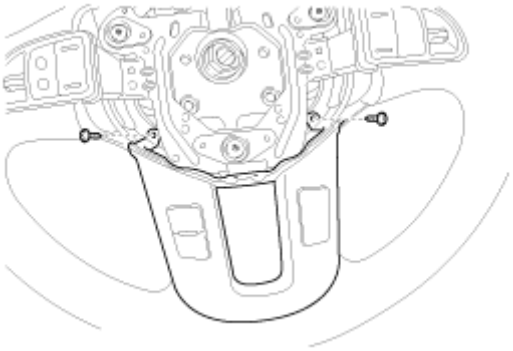
REMOVAL

1. Disconnect the negative (-) battery terminal.
2. Remove the driver airbag module (A).
   (Refer to the RT group)



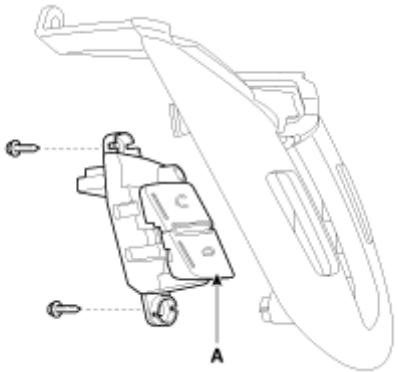
3. Remove the steering wheel lower cover after loosening the 2 screws.

English ▼



4. Remove the hands free remote control switch (A) after removing the steering wheel remote control switch connector (B) and 2 screws.





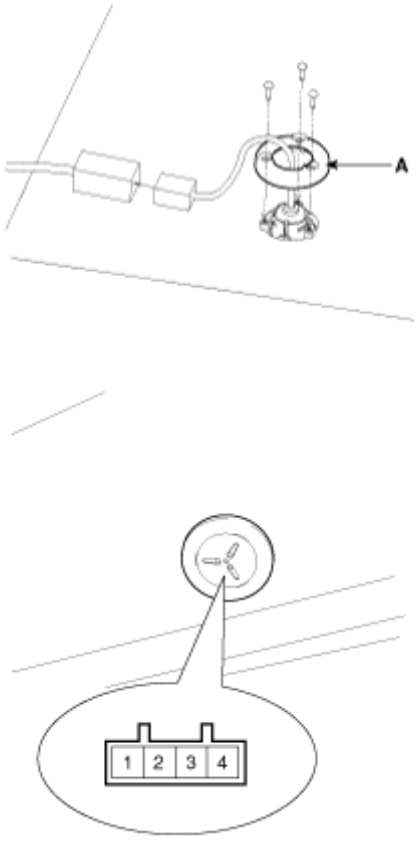
INSTALLATION

1. Reassemble the steering wheel remote control switch after connecting the connector.
2. Reassemble the steering wheel.
3. Reassemble the driver airbag module.

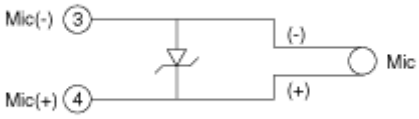
> **NOTICE**
>
> Make sure the hands free remote control switch and the airbag module connectors are plugged in properly.

INSPECTION

1. Disconnect the negative(-) battery terminal.
2. Remove the roof trim (A).
   (Refer to the BD group - "Roof trim")
3. Remove the hands free mic (A) after loosening the connector and screw (3EA) from loof top.

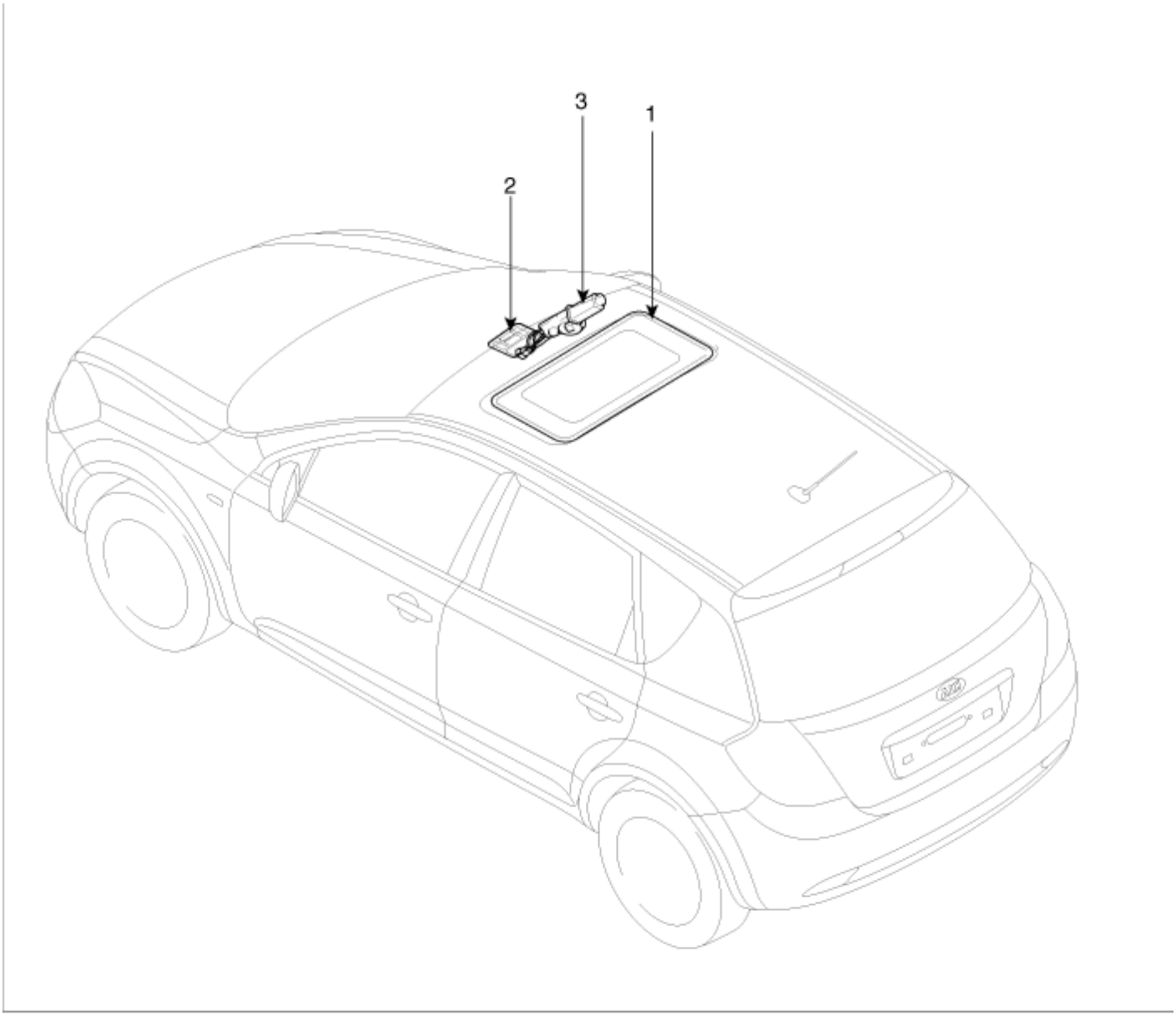


4. Check the continuity of Mic between terminals.



English ▼

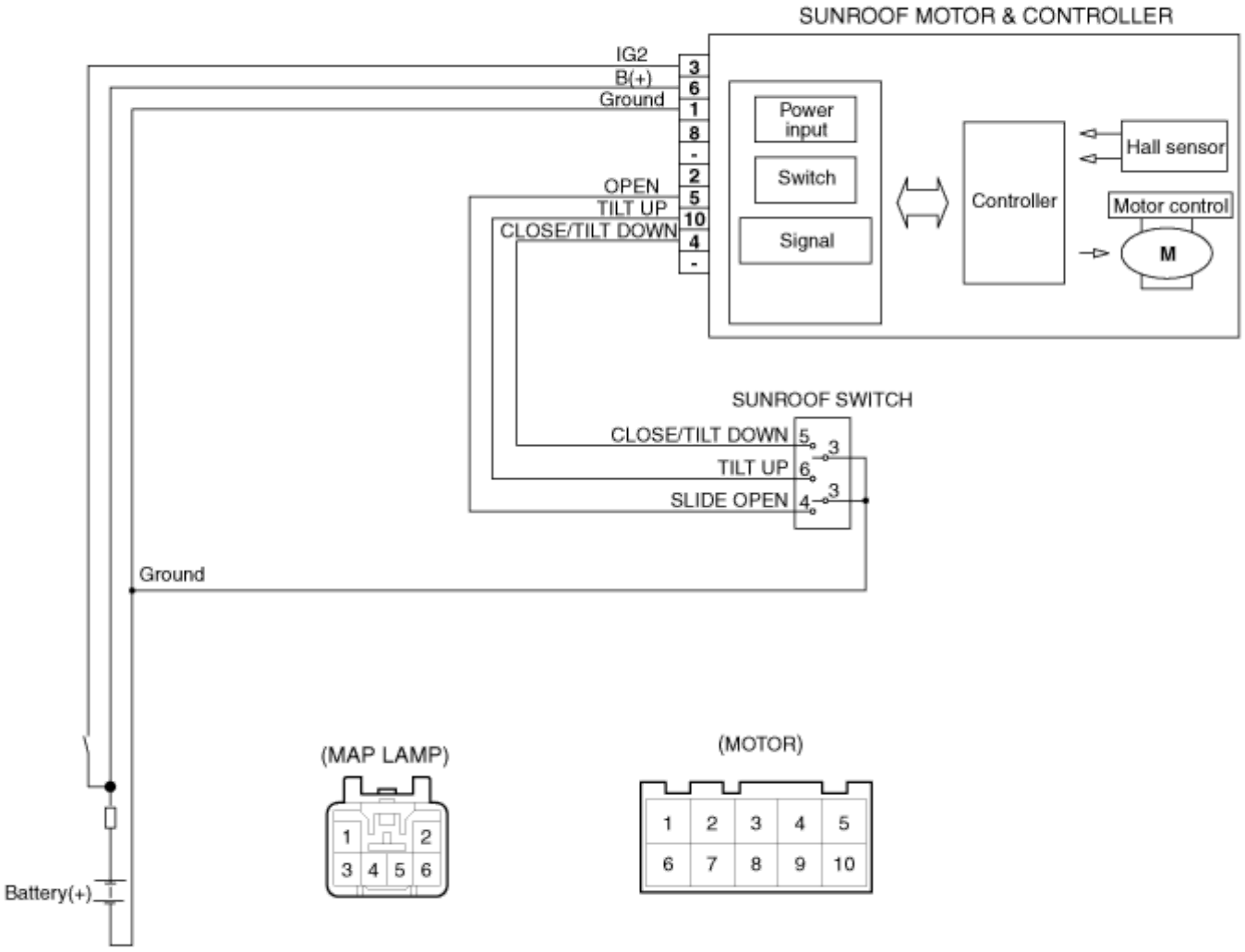
COMPONENT LOCATION



1. Sunroof
2. Sunroof switch
3. Sunroof motor & controller

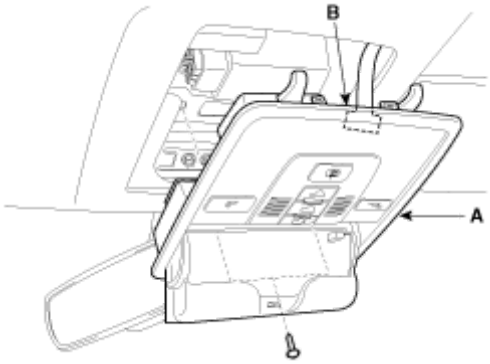
English ▼

CIRCUIT DIAGRAM

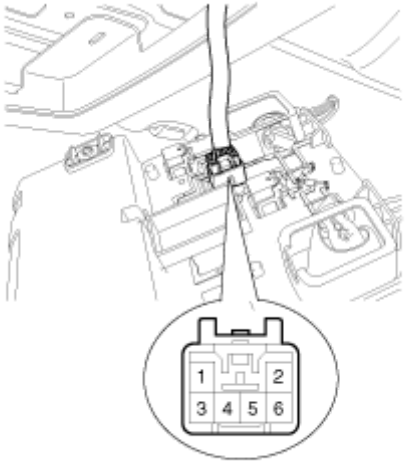


INSPECTION

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 switch connector(B) and then remove the overhead console lamp (A).



3. Check for continuity between the terminals. If the continuity is not as specified, replace the sunroof switch.

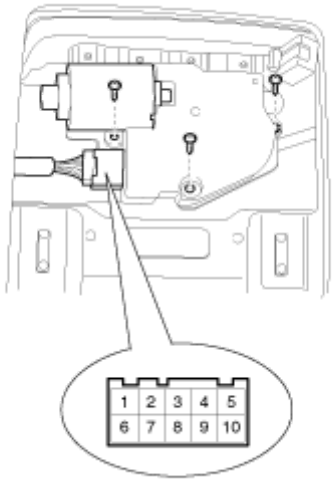


[Switch side connector]

Position \ Terminal	3	4	5	6
TILT UP	○			○
CLOSE/ TILT DOWN	○		○	
SLIDE OPEN	○	○		

REPLACEMENT

1. Disconnect the negative (-) battery terminal.
2. Remove the overhead console then remove the sun roof motor mounting screws (3EA). And then remove the sunroof motor after disconnecting the connector (10 Pin).



3. Ground the terminals as below table, and check that the sunroof unit operates as below table.

Position \ Terminal	3	4	5	10
TILT UP	⊕			⊖
SLIDE CLOSE/DOWN	⊕	⊖		
SLIDE OPEN	⊕		⊖	

4. 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.

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.
2. According to the position of the sunroof, do as follows.
   (1) In case that the sunroof has closed completely or been tilted :
   Press the TILT button until the sunroof has tilted upward completely.

English ▼

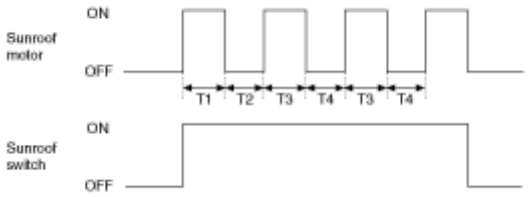
(2) In case that the sunroof has slide-opened :
Press and hold the CLOSE button for more than 5 seconds until the sunroof has closed completely.
Press and hold the CLOSE button for more than 5 seconds after the sunroof has closed completely. Press the TILT button until the sunroof has tilted upward completely.

3. Release the TILT button.
4. Press and hold the TILT button once again until the sunroof has returned to the original position of TILT after it is raised a little higher than the maximum TILT position.
When this is complete, the sunroof system is reset.

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.
   - In case that motor is not operated continuously, the run-time is increased.
   - The Run-Time of motor is initialized to "0" if the battery or fuse is reconnected after being disconnected, discharged or blown.



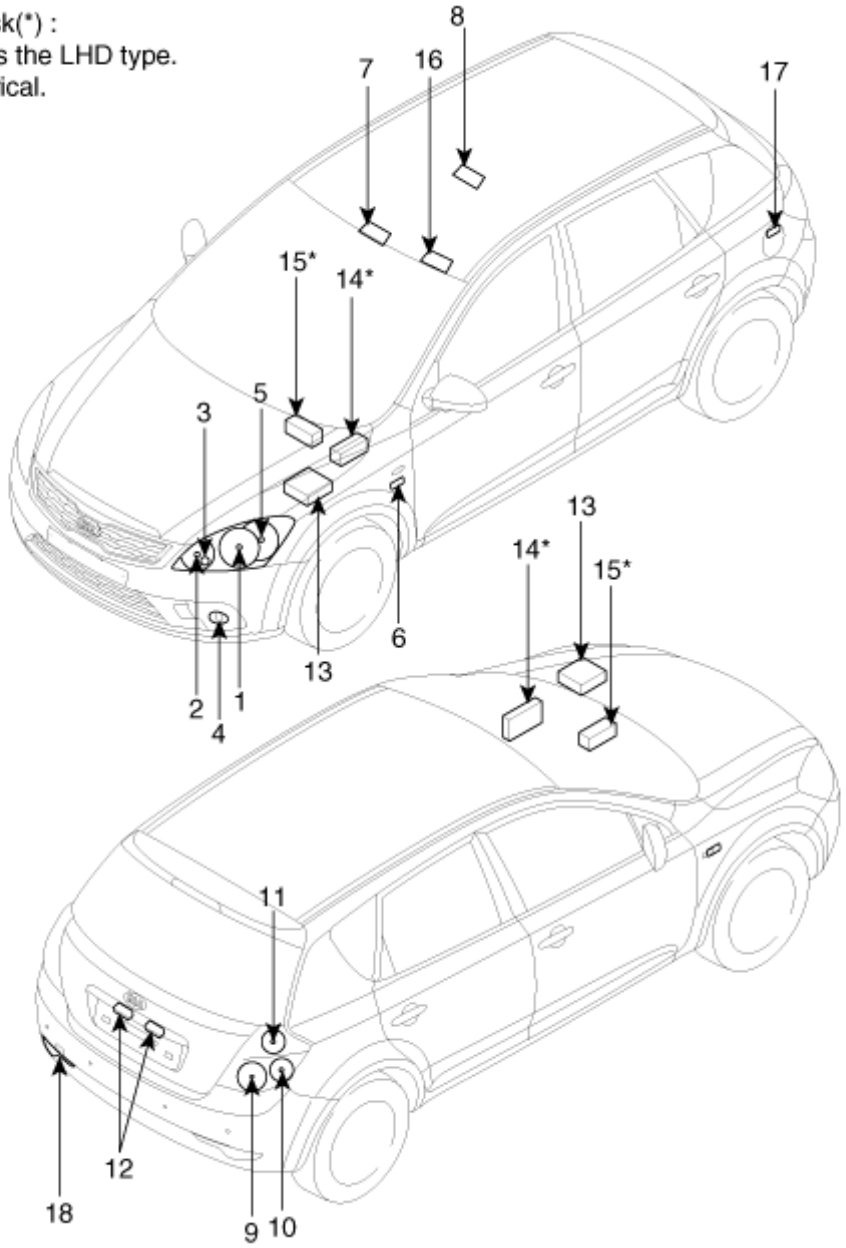
T1 : 120 ± 10 sec., T2 : 18 ± 2 sec.,
T3 : 10 ± 2 sec., T4 : 18 ± 2 sec.

SPECIFICATION

Items	Bulb Wattage (W)
Head lamp (High)	55
Head lamp (Low)	55
Front turn signal lamp	21
Front fog lamp	27
Rear stop/tail lamp (Outside)	21/5
Back up lamp	16
Rear turn signal lamp	21
Rear fog lamp - Europe	21
License plate lamp	5
Side repeater	5
Room lamp	8
Overhead console lamp	10
High mounted stop lamp	1.6
Glove box lamp	5
Map lamp	10

COMPONENT LOCATION

The parts with asterisk(*) :
This illustration shows the LHD type.
RHD type is symmetrical.



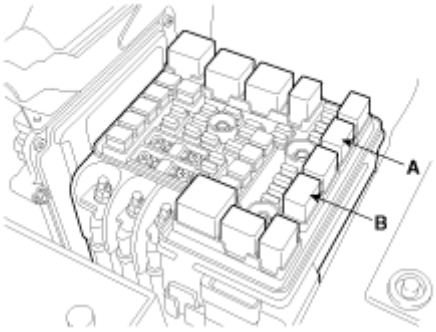
1. Head lamp (Low)	10. Rear turn signal lamp
2. Head lamp (High)	11. Back up lamp
3. Position lamp	12. License plate lamp
4. Front fog lamp	13. Engine room junction box
5. Front turn signal lamp	(Head lamp Low/High, Fog lamp relay)
6. Side repeater	14. Passinger compartment junction box (Tail lamp relay)
7. Over head lamp	15. ICM relay box (Hazard relay)
8. Room lamp(Center)	16. Vanity lamp
9. Tail/Stop lamp	17. Lugguage room lamp
	18. Rear fog lamp & Rear reflector

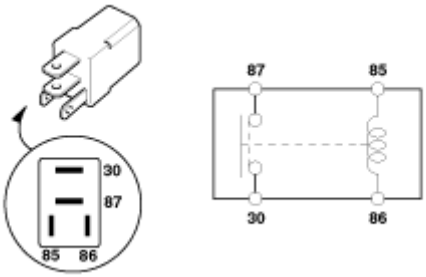
English

INSPECTION

Head Lamp Relay / Front Lamp Relay

1. Disconnect the negative(-) battery terminal.
2. Pull out the relay from the engine compartment relay box.
   A : Head lamp(Low) relay
   B : Head lamp (High) relay





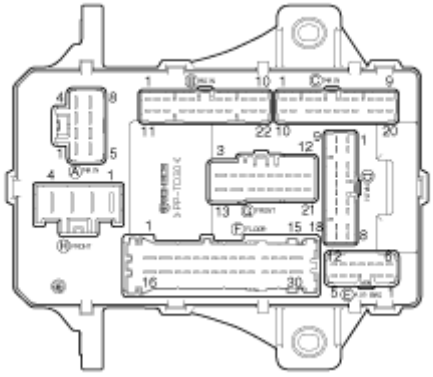
3. Check for continuity between terminals. There should be continuity between the No.87 and No.30 terminals when power and ground are connected to the No.86 and No.85 terminals.
4. There should be no continuity between the No.87 and No.30 terminals when power is disconnected.

Terminal / Power	30	87	85	86
Disconnected			○	○
Connected	○	○	⊖	⊕

Tail Lamp

1. Disconnect the negative(-) battery terminal.
2. Remove the crash pad lower panel.
   (Refer to the BD group - "Crash pad")
3. Remove the junction box.

English ▼



4. Check for continuity between the terminals.
   (1) There should be continuity between the No.2 terminal in the I/P-H and the No.15(LH) or 4(RH) terminal in the I/P-G when power and ground are connected to the No.2 terminal in the I/P-H and the No.6 terminal in the I/P-D.

   (2) There should be no continuity between the No.2 terminal in the I/P-H and the No.15(LH) or 4(RH) terminal in the I/P-G when power and ground are connected to the No.2 terminal in the I/P-H and the No.6 terminal in the I/P-D.

Head Lamp Escort

1. If Head Lamp is lighting by Head Lamp SW or AUTOLIGHT, Head Lamp lighting is maintained when IGN1 is changed ON to OFF.

2. Following stste, Head Lamp lighting is truned off.
   But, TAIL LAMP keep up lighting when KEY IN in the condition of lighting off after IGN ON→OFF and lighting.
   (the condition of TAIL LAMP lighting off follows TAIL LAMP AUTOCUT function.)
   - When Driver DOOR SW OPEN→CLOSE and after 30sec.
   - When Head Lamp SW ON or not the case of AUTO LIGHT SW ON.
     (ALC ; When Head Lamp ON, Head Lamp SW ON within Multi-function SW during ESCORT → Lighting keeping up when SW is moned to AUTO LIGHT SW ON or reverse.)
   - When Driver DOOR OPEN state is maintained after 5minute.
   - When IGN1 ON→IGN OFF and sfter 5minute.
   - When received TX LOCK signal two times during output.

NOTICE

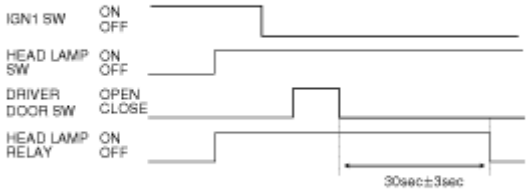
– Head Lamp RELAY output of TIMING CHART contains the condition of TAIL LAMP ON.

– Head Lamp RELAY output by - Head Lamp SW and HEAD LAMP RELAY output by AUTO LIGHT is regarded identical condition.
That is, the explaining of HEAD LAMP RELAY ouput contains two cases.

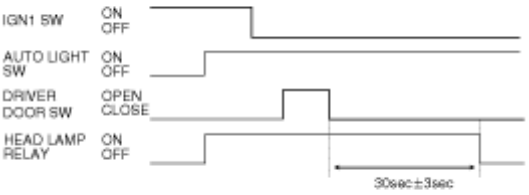
– AUTO LIGHT SW ON : HEAD LAMP&TAIL LAMP signal by AUTO LIGHT is output.

– AUTO LIGHT SW OFF: HEAD LAMP&TAIL LAMP signal by AUTO LIGHT is not output.

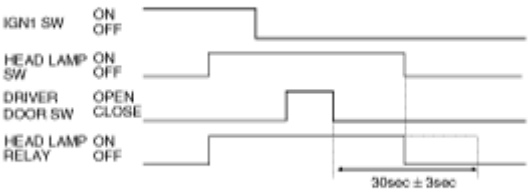
<CASE 1>



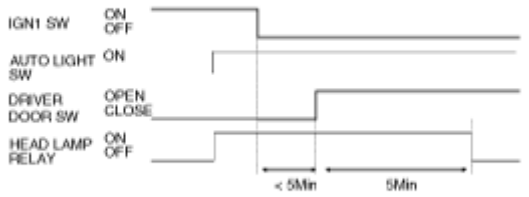
<CASE 2>



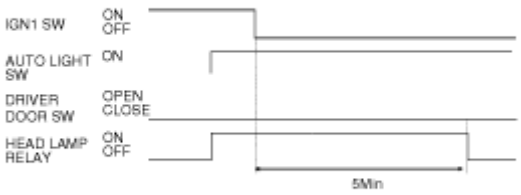
<CASE 3>



<CASE 4>



<CASE 5>



ADJUSTMENT

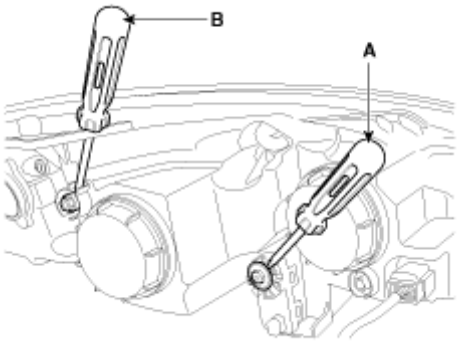
Head Lamp Aiming Instructions

The head lamps should be aimed with the proper beam-setting equipment, and in accordance with the equipment manufacturer's instructions.

> **NOTICE**
>
> 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 :

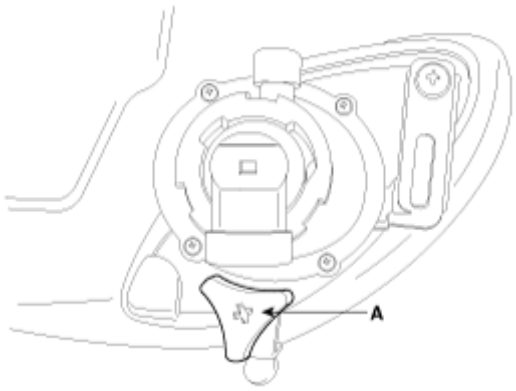
1. Inflate the tires to the specified pressure and remove any loads from the vehicle except the driver, spare tire, and tools.
2. The vehicle should be placed on a flat floor.
3. Draw vertical lines (Vertical lines passing through respective head lamp centers) and a horizontal line (Horizontal line passing 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) and horizontal (B) adjustments to the lower beam using the adjusting wheel.



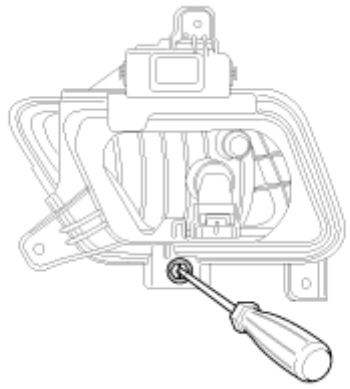
Front Fog Lamp Aiming

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 gear (A).

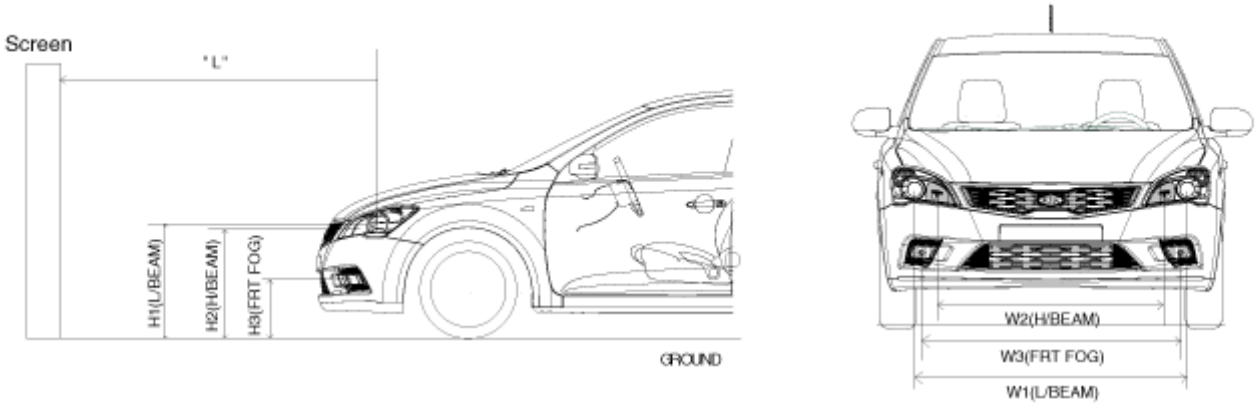
[3Door]



[5Door/Wagon]



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

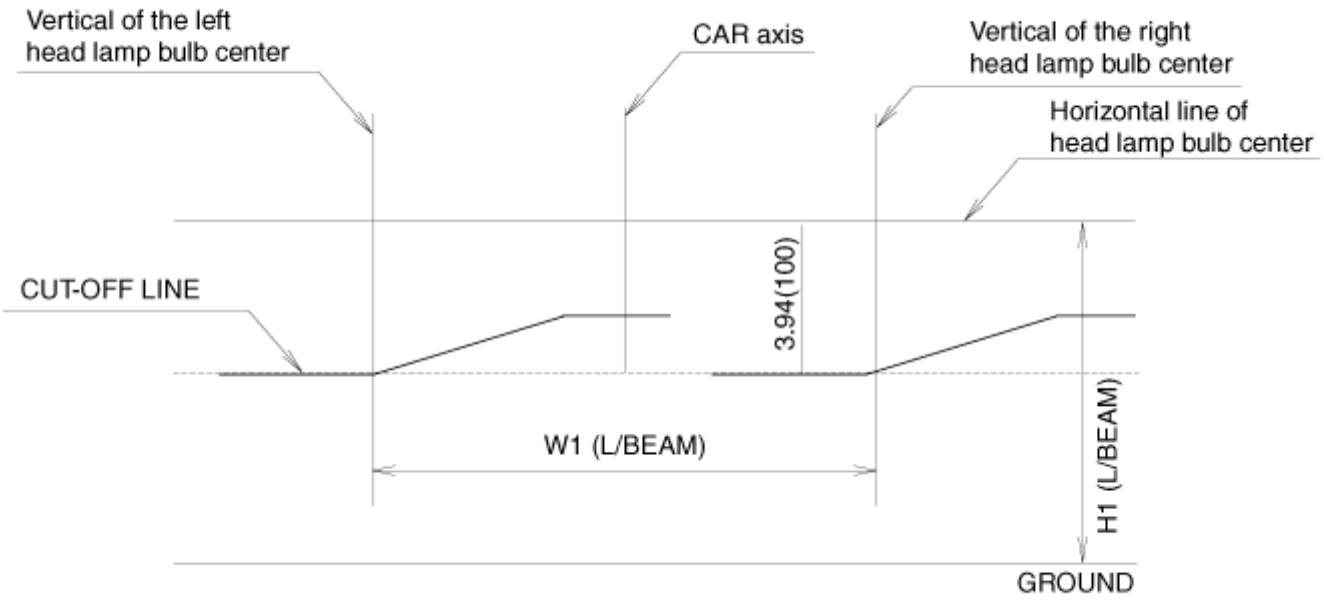
Unit : in (mm)

Vehicle condition	H1	H2	H3	W1	W2	W3	L
Without driver	26.8(681)	26.2(666)	14.2(361)	54.2(1,376)	45.3(1,150)	51.6(1,310)	393.7(10,000)
With driver	26.5(673)	25.9(658)	14.0(358)				

1. Turn the low beam on with driver.

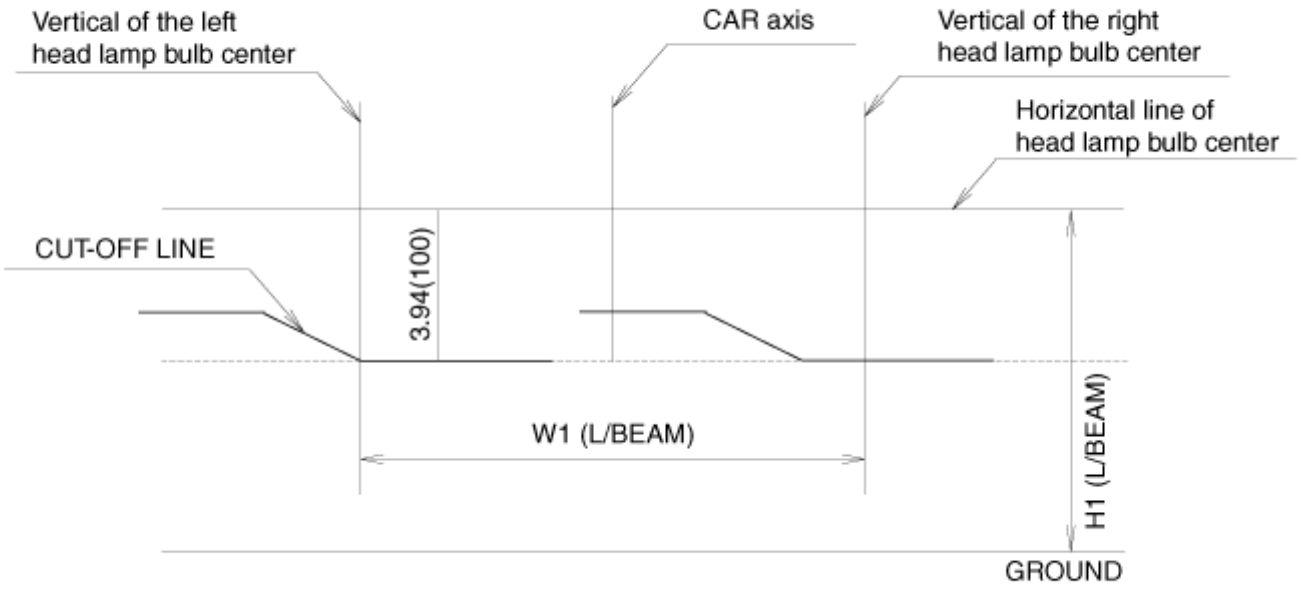
The cut-off line should be projected in the allowable range.
In case of equipping with the manual leveling device, set the leveling device switch on the "O" position.
In case of equipping with the auto leveling device, set the initialization by using the diagnostic tool before aiming.

[LHD]



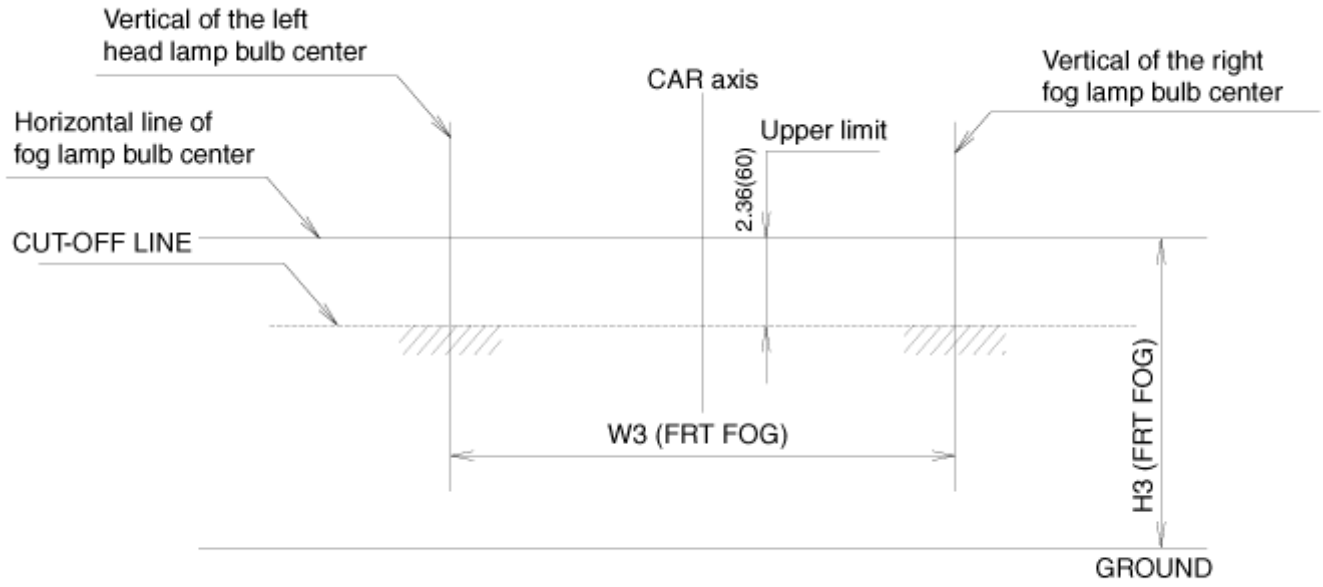
Unit : in.(mm)

[RHD]



Unit : in.(mm)

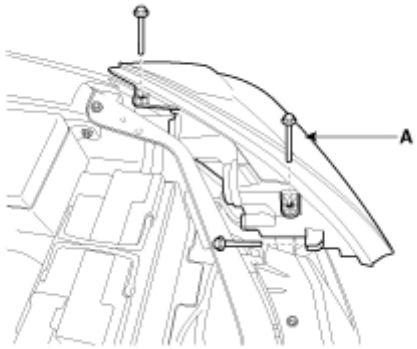
2. Turn the front fog lamp on with driver.
   The cut-off line should be projected in the allowable range



Unit : in.(mm)

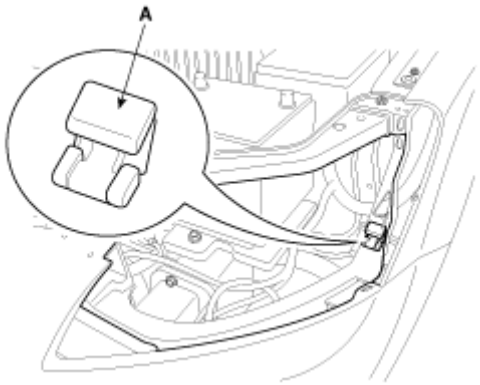
REMOVAL

1. Disconnect the negative (-) battery terminal.
2. Loosen the mounting bolts (3EA) of head lamp. Remove the head lamp assembly (A) after disconnecting the lamp connectors.

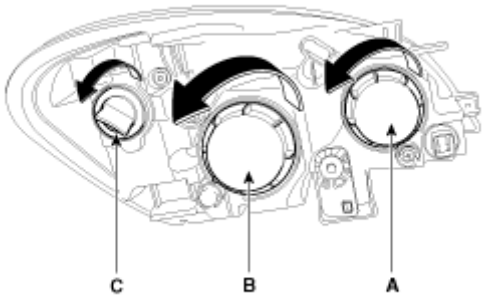


NOTICE

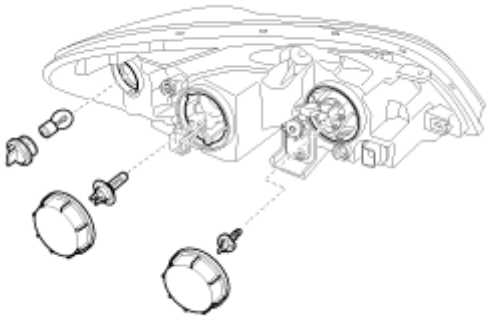
Take care that retaining clip (A) is not to be damaged.



3. Remove the bulb caps from the head lamp assembly.
   A : Head lamp high bulb & position bulb cab
   B : Head lamp low bulb cab
   C : Turn signal bulb cab



4. Remove the head lamp bulbs.

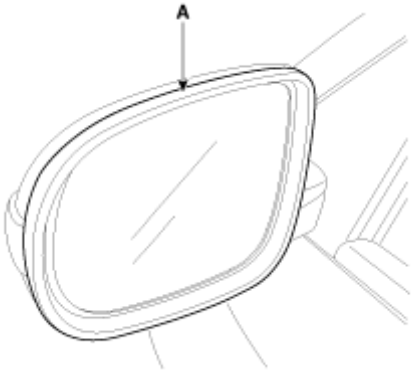


INSTALLATION

1. Install the head lamp bulbs.
2. Install the head lamp bulb caps.
3. Install the head lamp assembly after connecting the lamp connector.

REMOVAL

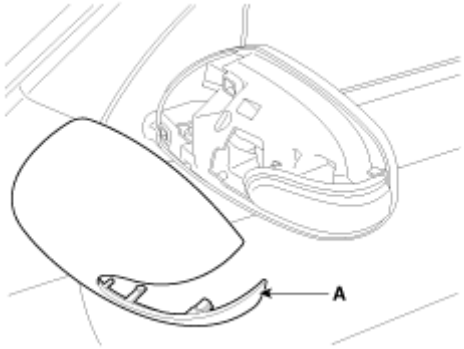
1. Disconnect the negative (-) battery terminal.
2. Remove the mirror (A) from mirror holder.



3. Remove the turn signal lamp fixing screw (A).

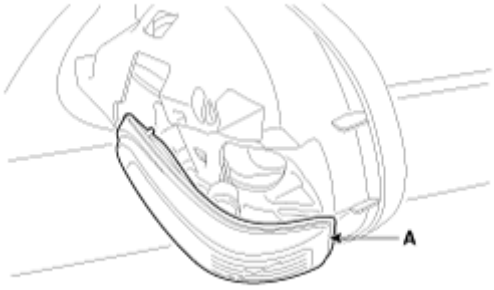


4. Remove the door mirror cover (A).

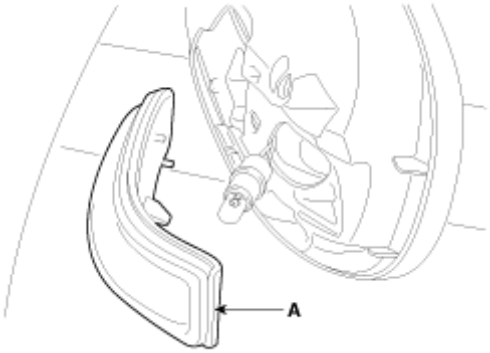


5. Remove the bulb and lens (A) from door mirror.

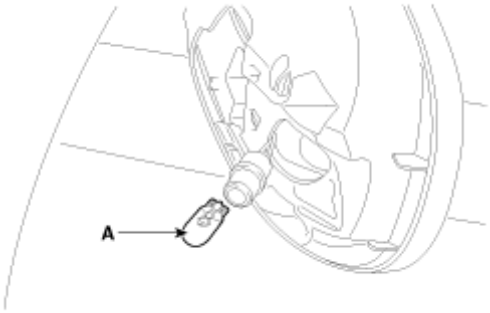
English ▼



6. Remove the lens (A).



7. Replace the bulb (A).



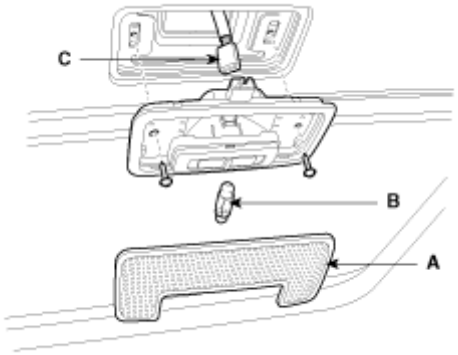
INSTALLATION

1. Install the bulb and lens.
2. Install the door mirror cover.
3. Install the door mirror.
4. Connect the negative (-) battery terminal.

English

REMOVAL

1. Disconnect the negative (-) battery terminal.
2. Detach the lamp lens (A) from the room lamp with a flat-tip screwdriver then remove the bulb (B).



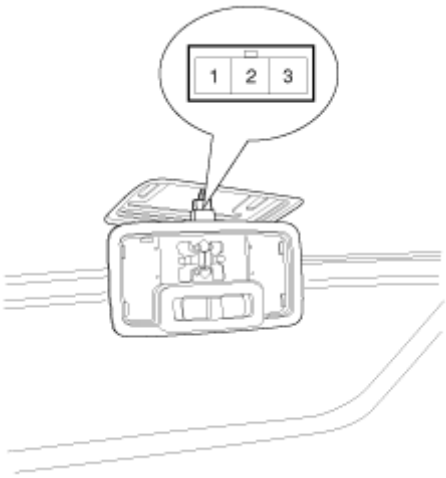
3. Loosen the fixing screw (2EA) and disconnect the 3P connector (C). And then remove the room lamp assembly.

INSTALLATION

1. Install the room lamp assembly after connecting the lamp connector.
2. Install the lamp lens after assembling the bulb.

INSPECTION

1. Remove the room lamp assembly then check for continuity between terminals.

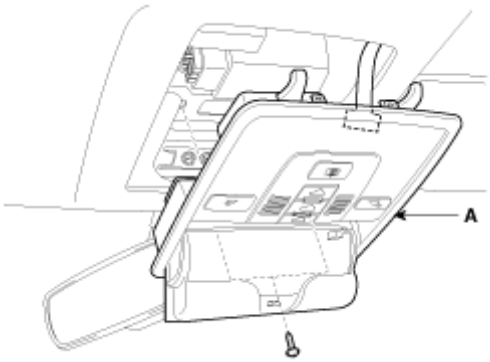


Terminal / Position	1	2	3
ON		●	●
DOOR	●	●	
OFF			

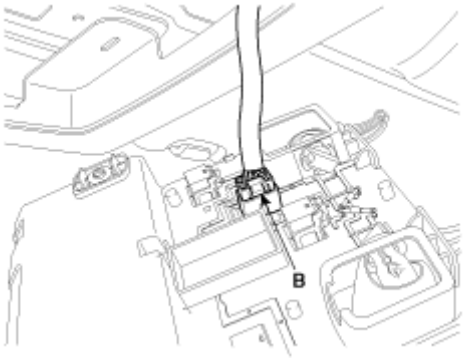
English ▼

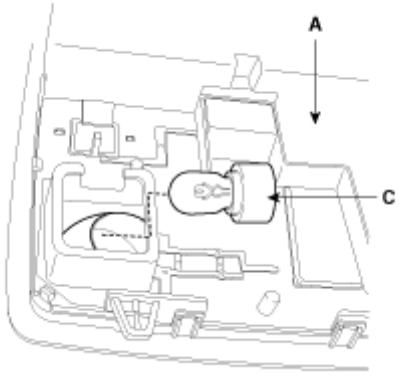
REMOVAL

1. Disconnect the negative (-) battery terminal.
2. Remove the overhead console lamp (A) after loosening the overhead console lamp screw (2EA).



3. Disconnect the sunroof switch and lamp connector (B) and then remove the overhead console (A) lamp (C).





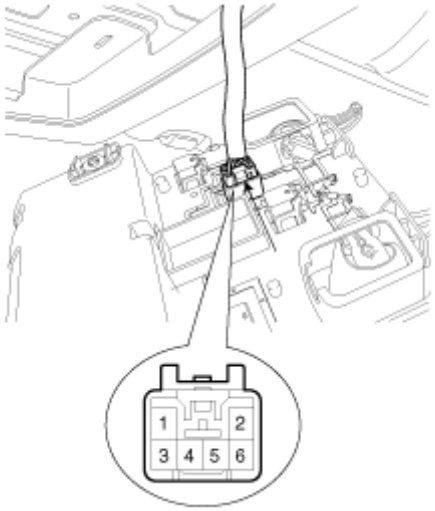
INSTALLATION

1. Install the overhead console lamp after connecting the sunroof switch and lamp connector.
2. Install the lens after tightening 2 screws.

INSPECTION

English ▼

Remove the overhead console lamp assembly then check for continuity between terminals. If the continuity is not as specified, replace the map lamp switch.



Sort / Position / Terminal	Map lamp switch			
	LH		RH	
	ON	OFF	ON	OFF
3	⊕		⊕	
4	⊕		⊕	

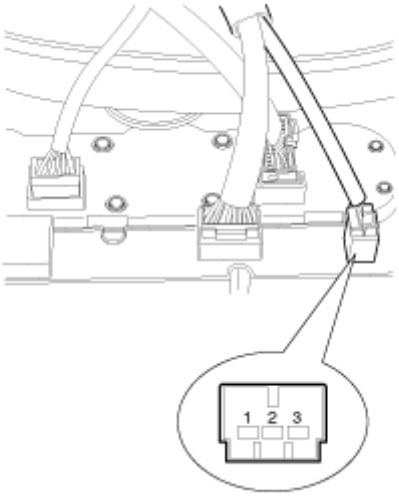
INSPECTION

Hazard Lamp Switch

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



3. Disconnect the hazard lamp switch conector.
4. Operate the switch and check for continuity between terminals with an ohmmeter.

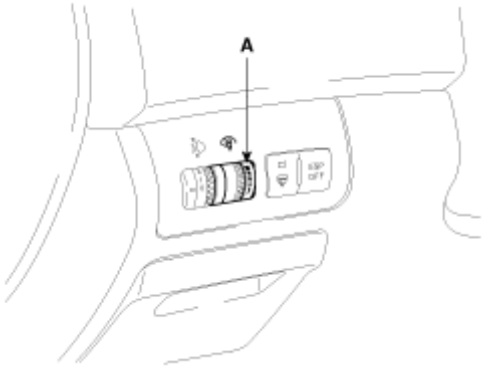


Terminal / Position	1	2	GND
ON	○	○	○
			○
OFF			

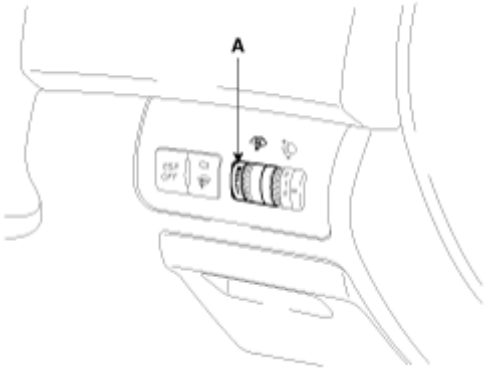
INSPECTION

1. Disconnect the negative (-) battery terminal.
2. Remove the lower side crash pad switch assembly (A) by using the trim remover tool.

[LHD]

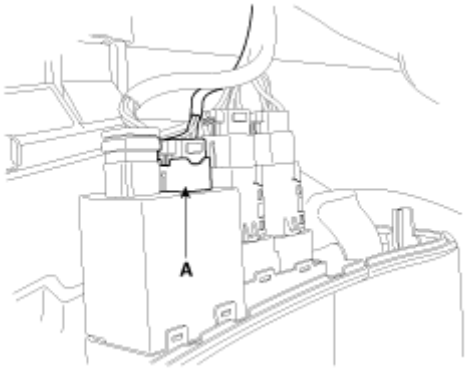


[RHD]



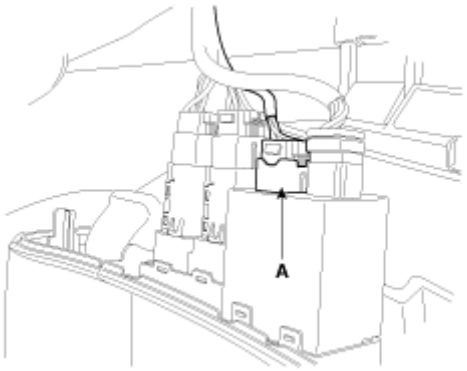
3. Disconnect the rheostat switch connector (A).

[LHD]

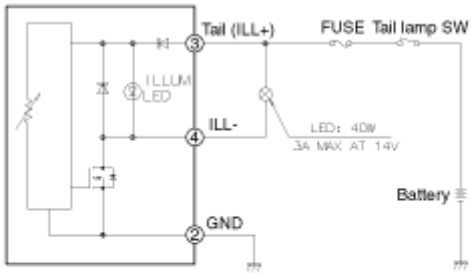


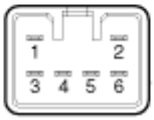
[RHD]

English ▼



4. Check for intensity of new rheostat switch. 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.

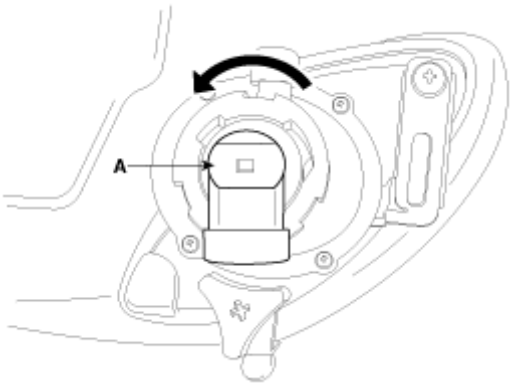




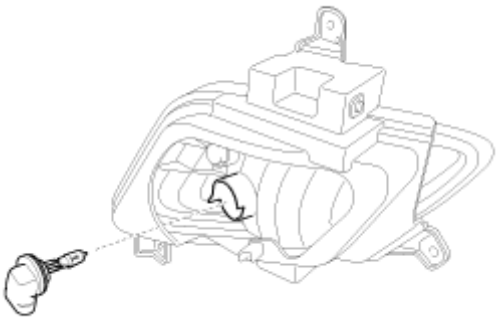
REMOVAL

1. Disconnect the negative (-) battery terminal.
2. Remove the front side cover screw.
3. Remove the front fog lamp assembly connector.
4. Remove the front fog lamp bulb (A).

[3Door]



[5Door/Wagon]



INSTALLATION

1. Install the front fog lamp bulb.
2. Connect the front fog lamp connector.
3. Install the front side cover.

INSPECTION

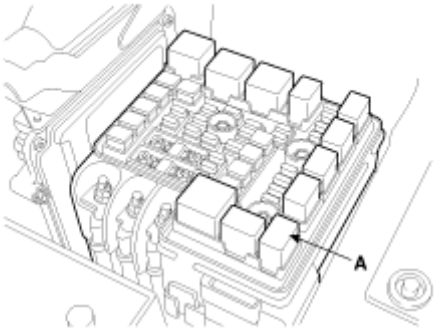
Front Fog Lamp Relay

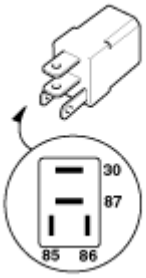
1. Disconnect the negative(-) battery terminal.
2. Pull out the front fog lamp relay (A) from the engine compartment relay box.

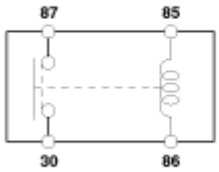
3. Check for continuity between terminals. There should be continuity between the No.87 and No.30 terminals wh ground are connected to the No.85 and No.86 terminals.

English ▼

4. There should be no continuity between the No.87 and No.30 terminals when power is disconnected.



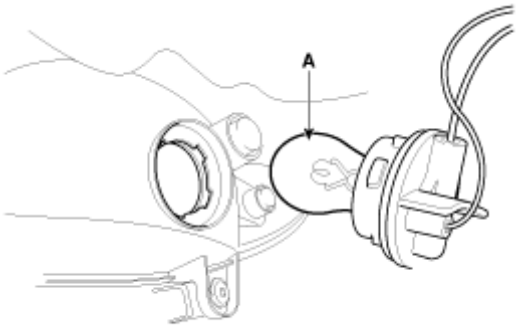




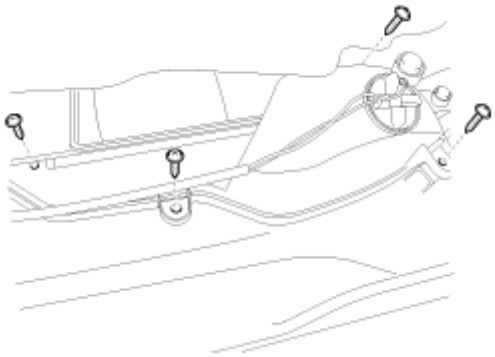
Terminal / Power	30	87	85	86
Disconnected			○	○
Connected	○	○	⊖	⊕

REMOVAL

1. Disconnect the negative(-) battery terminal.
2. Remove the rear bumper.
   (Refer to the BD group - "Rear Bumper")
3. Remove the rear lamp (A) after loosening the cap.



4. Remove the rear lamp assembly after loosening the screws (4EA).



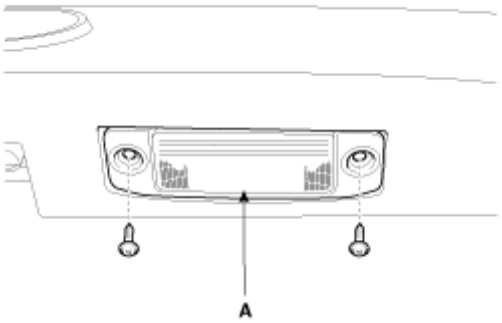
INSTALLATION

1. Install the rear lamp assembly.
2. Install the rear lamp
3. Install the rear bumper.

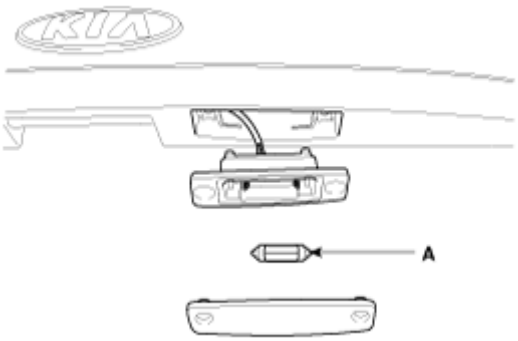
REMOVAL

Licence Lamp

1. Disconnect the negative (-) battery terminal.
2. Remove the license lamp lens (A) from the panel after loosening a screw (2EA).

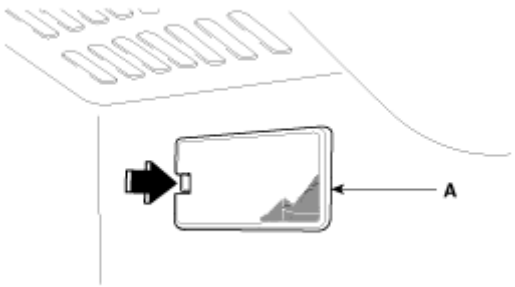


3. Replace the bulb (A).



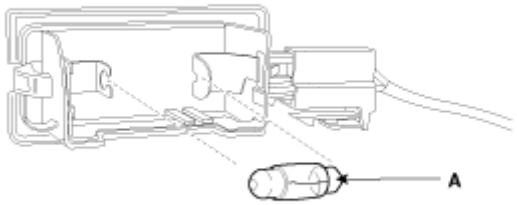
Tailgate Room Lamp

1. Disconnect the negative(-) battery terminal.
2. Remove the tailgate room lamp len(A) from the luggage side trim.



3. Remove the bulb (A).

English ▼



INSTALLATION

Licence Lamp

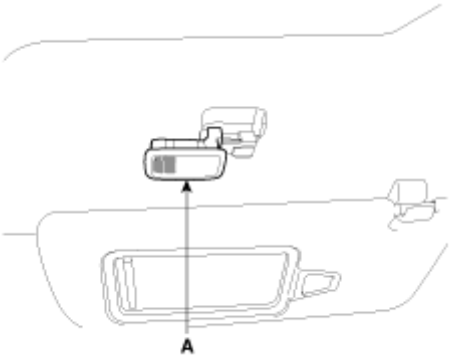
1. Install the bulb.
2. Install the license lamp lens.

Tailgate Room Lamp

1. Install the bulb.
2. Install the tailgate room lamp len.

REMOVAL

1. Disconnect the negative(-) battery terminal.
2. Remove the vanity lamp lens (A) and then remove the bulb.

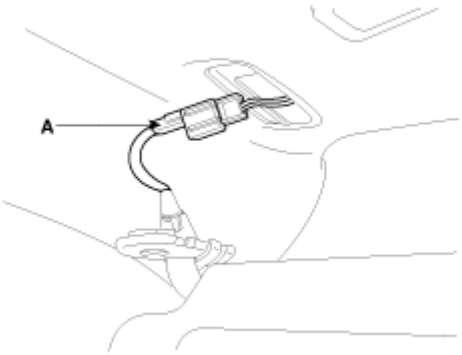


3. Remove the sunvisor (A) after loosening the screws (2EA).





4. Disconnect the sunvisor connector (A).



INSTALLATION

English ▼

1. Install the vanity bulb.
2. Istall the vanity lamp lens.
3. Install the sunvisor assembly.

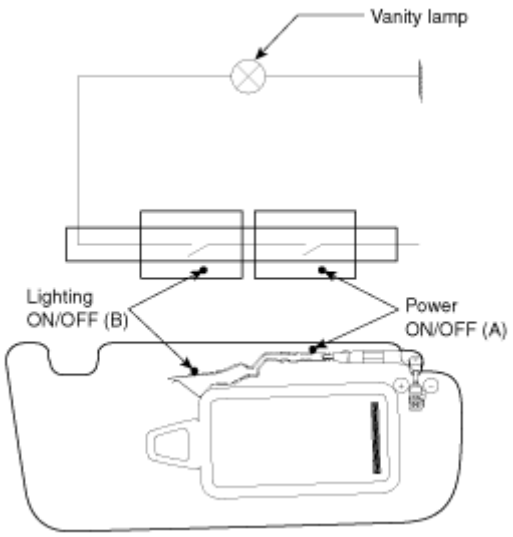
INSPECTION

Bulb

1. Disconnect the vanity lamp connector and check for continuity between terminals.

Sunvisor

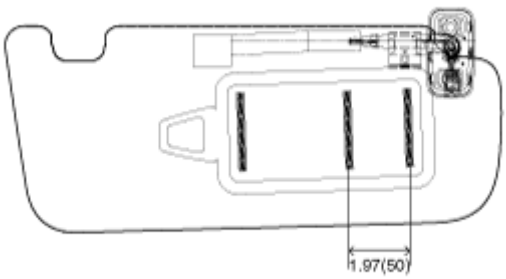
1. Remove the sunvisor assembly and check for continuity between terminals. If the continuity is not as specified, replace the vanity lamp or sunvisor.



Condition / Terminal	OFF	A or B	A and B
1			○
2			○

(1) Condition A

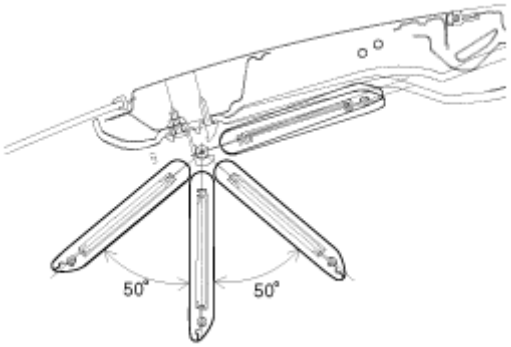
– Power ON : When mirror frame in the sunvisor is opened over 1.97in(50mm)



Unit : in(mm)

(2) Condition B

– Lighting ON : When sunvisor is positioned within the vertical angle ±50° range.

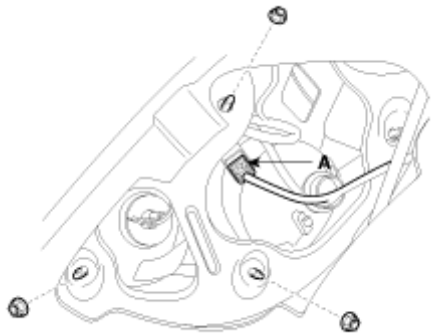


English ▼

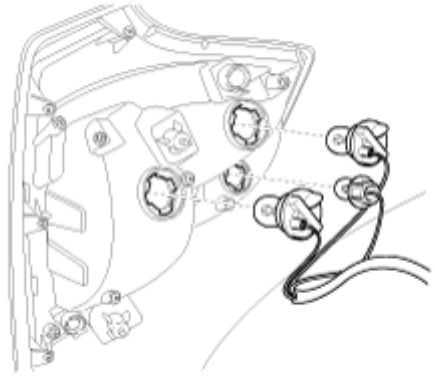
REMOVAL

[5Door]

1. Disconnect the negative (-) battery terminal.
2. Loose the nut (3EA) holding the rear combination lamp then disconnect the 4P connector (A) then remove the outside rear combination lamp.

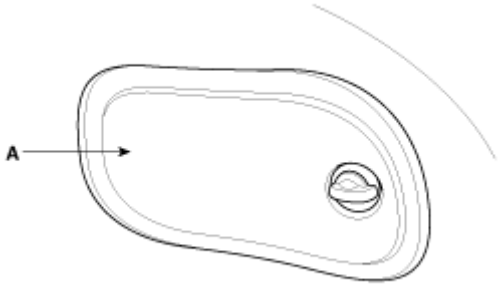


3. Replace the bulbs (3EA) turning in the counter clockwise direction after disconnecting the rear combination lamp assembly.

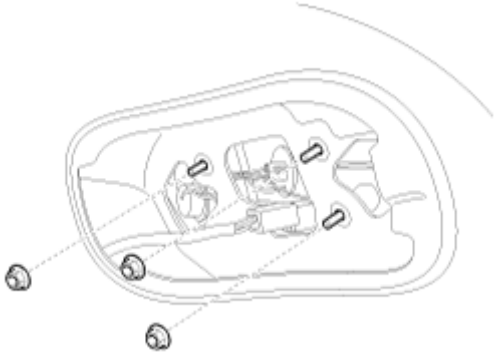


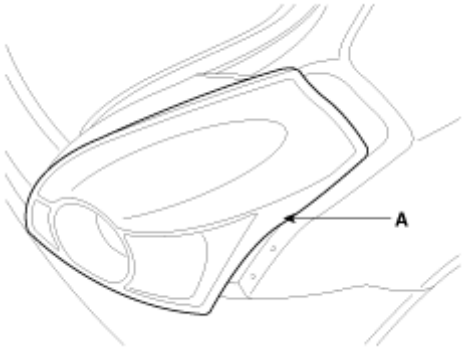
[3 Door]

1. Disconnect the negative (-) battery terminal.
2. Remove the trim cover (A).

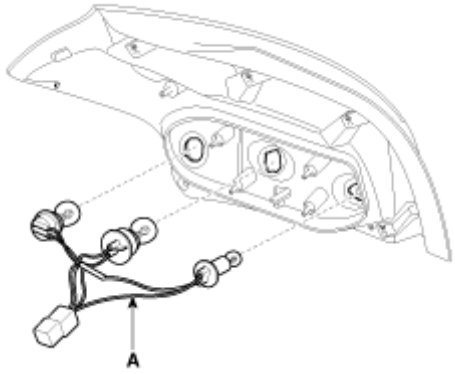


3. Loose the nuts (3EA) holding the rear combination lamp then remove the rear combination lamp (A).



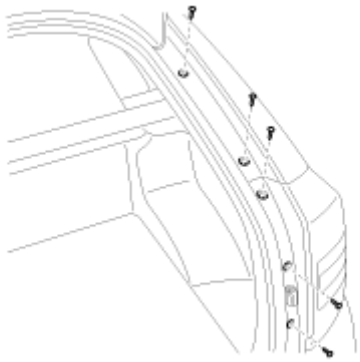


4. Replace the bulbs (3EA) (A) turning in the counter clockwise direction after disconnecting the rear combination lamp assembly.

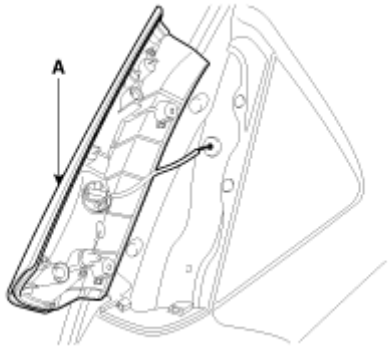


[Wagon]

1. Disconnect the negative (-) battery terminal.
2. Remove the screws (5EA).

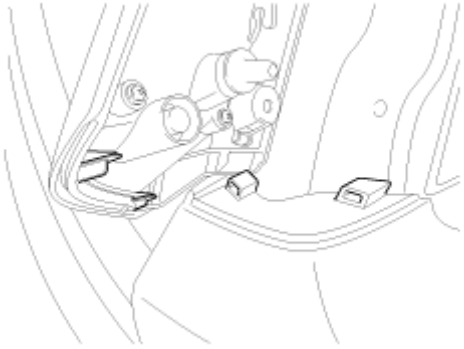


3. Remove the rear combination upper lamp (A).

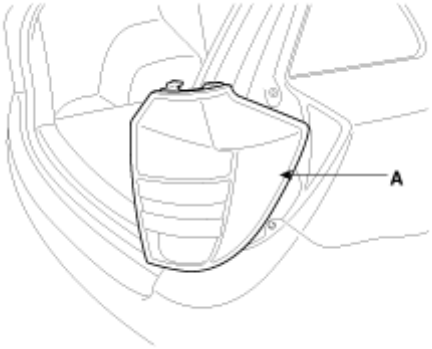


CAUTION

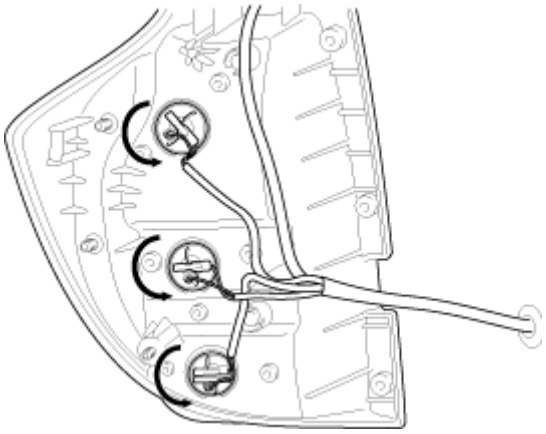
Be careful not to damage the fixing hook.



4. Remove the rear combination lower lamp (A).



5. Replace the bulbs (3EA) turning in the counter clockwise direction after disconnecting the rear combination lamp assembly.



INSTALLATION

1. Install the rear combination lamp assembly after assembling the bulb and connector.

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
	Head lamp fuse (LOW:10A, HIGH:20A) blown	Check for short and replace fuse
	Head lamp fuse (10A) 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 (10A) 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
Flasher rate too slow or too fast	Lamps' wattages are smaller or larger than specified	Replace lamps

English ▼

	Flasher unit faulty	Check flasher unit
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
Room lamp does not light	Bulb burned out	Replace bulb
	Room lamp fuse (15A) blown	Check for short and replace fuse
	Room lamp switch 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
Rear fog lamps do not light	Bulb burned out	Replace bulb
	Rear fog lamp fuse (10A) blown	Check for short and replace fuse
	Rear fog lamp fuse (10A) blown	Check for short and replace fuse
	Rear fog lamp switch faulty	Check switch
	Rear fog lamp relay faulty	Check relay
	Wiring or ground faulty	Repair if necessary
Room 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
Tailgate room lamp does not light	Bulb burned out	Replace bulb
	Room lamp fuse (10A) blown	Check for short and replace fuse
	Tailgate room lamp switch faulty	Check switch
	Wiring or ground faulty	Repair if necessary

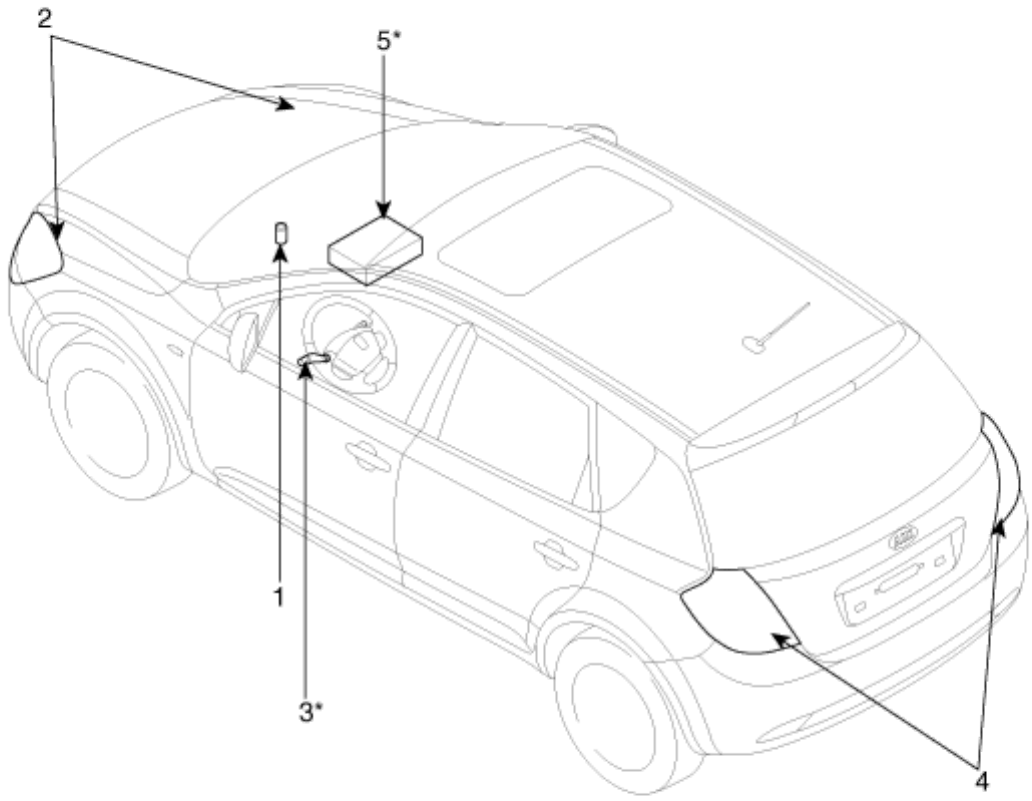
SPECIFICATIONS

Item			Specifications
Rated voltage			5V
Operating current	Auto light		Max. 2.62mA ± 10%
	Solar		Max. 0.88mA ± 10%
Signal output	Head lamp & Tail lamp	ON	4.33V
		OFF	3.23V

English ▼

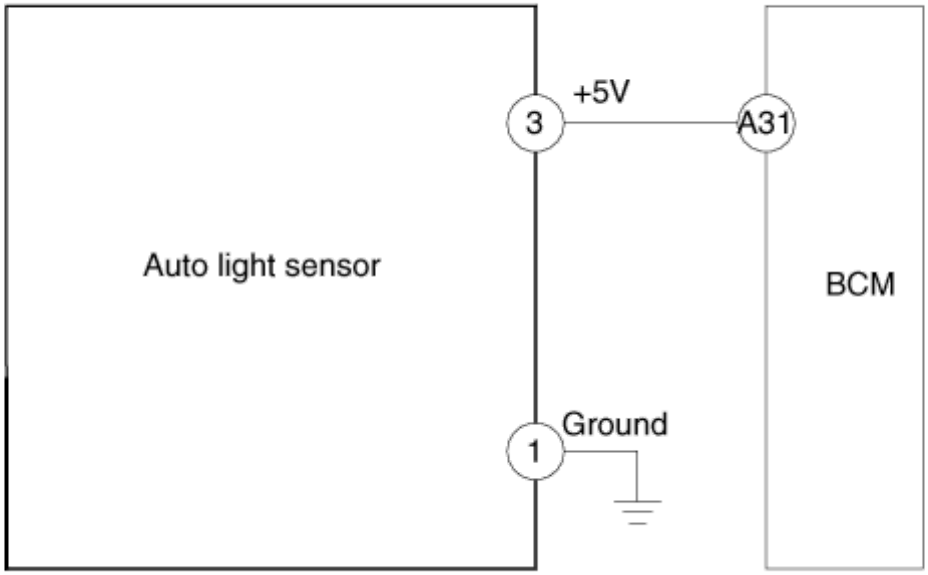
COMPONENT LOCATION

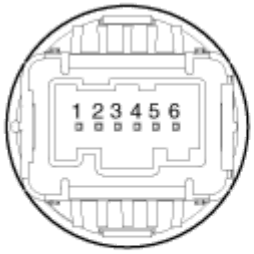
The parts with asterisk(*) :
This illustration shows the LHD type.
RHD type is symmetrical.



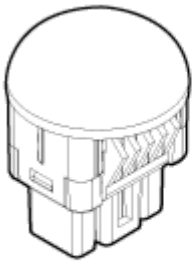
1. Auto light sensor unit
2. Head lamps
3. Lighting switch (Auto)
4. Tail lamps
5. Body control module

CIRCUIT DIAGRAM





[Autolight unit connector]



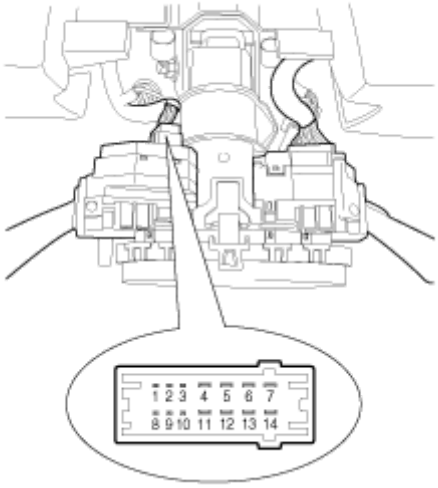
DESCRIPTION

The auto light control system operates by using the auto light switch.
If you set the multi-function switch to "AUTO" position, the tail lamp and head lamp will be turned automatically on or off according to external illumination.

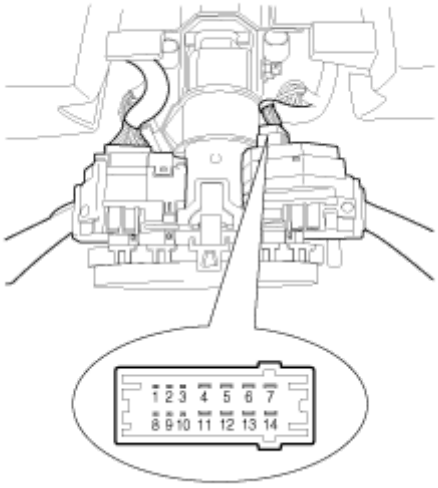
INSPECTION

1. 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

[LHD]



[RHD]



Lighting Switch (Auto Light)

( ) : RHD

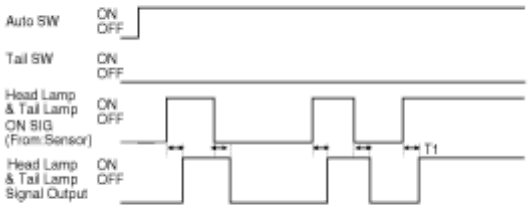
Terminal / Position	8(9)	9(10)	10(14)	1(8)
OFF				
I	○			○
II	○	○		○
AUTO			○	○

INSPECTION

1. AUTO LIGHT SENSOR value is always read at IGN1 ON.
2. LIGHT is turned ON after 2sec±0.2sec when AUTO LIGHT SENSOR value is same as LIGHT ON input value.
3. LIGHT is turned OFF after 2sec±0.2sec when AUTO LIGHT SENSOR value is same as LIGHT OFF input value.
4. LIGHT ON value of SENSOR is based on the below table.
5. Head Lamp signal is output when Head Lamp OUTPUT is ON.
6. After Head Lamp is turned OFF, Head Lamp signal output is kept if Head Lamp&Tail Lamp ON.
   luminance condition is met at Auto Light SW ON.
7. After Head Lamp is turned OFF, Head Lamp signal output is immediately stopped if HEAD LAMP&Tail Lamp OFF
   luminance condition is met at Auto Light SW ON.
8. After Head Lamp is turned OFF, Head Lamp signal output is immediately stopped at TAIL SW signal input.
9. After Head Lamp is turned OFF, Head Lamp signal output is stopped if there is no input of Auto Light SW or TAIL SW.
   (shall be no flashing of Head Lamp)
10. Head Lamp signal output is stopped when SW position is changed from AUTO to Head Lamp SW during Head Lamp ON with Auto Light. (shall be no flashing of Head Lamp)

Light Sensor Reading

	Head lamp & Tail lamp
ON	4.33V
OFF	3.23V



T1 : 2.5 ± 0.25sec.

REPLACEMENT

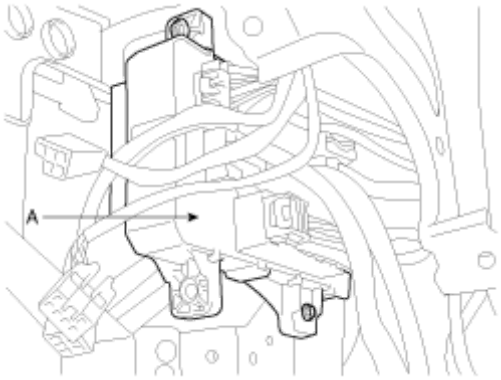
1. Disconnect the negative (-) battery terminal.
2. Remove the Photo & auto light sensor (A) using screw (-) driver.



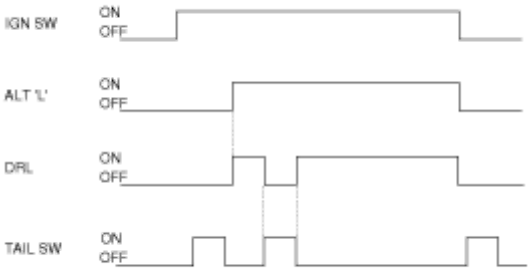
3. Remove the auto light connector.
4. Installation is the reverse of removal.

INSPECTION

1. The daytime running unit (A) is integrated in the I/P Junction box.



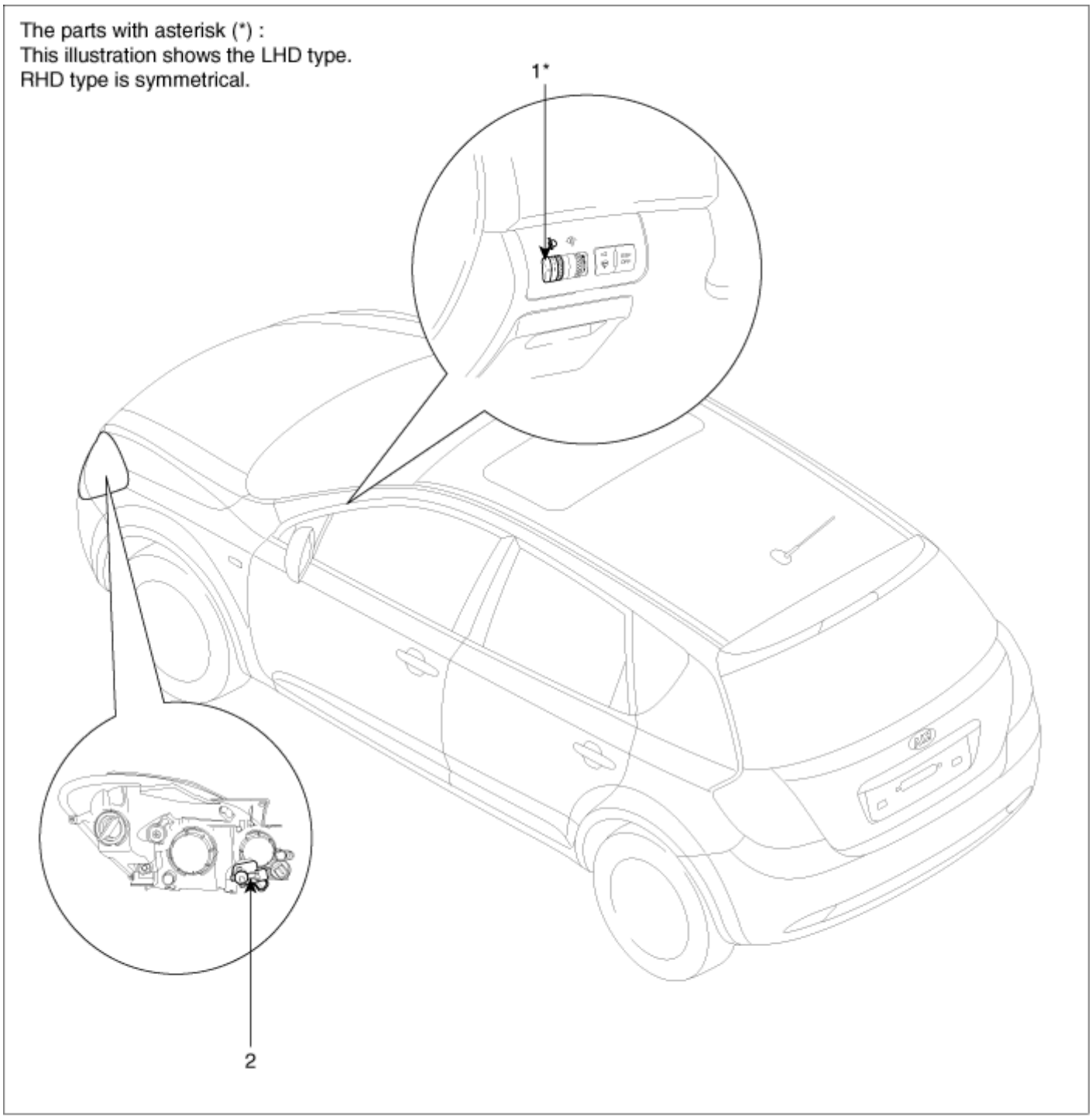
2. Check that the light operate according to the following timing chart.
   (1) Operation condition
      a. DRL ON
         – ALT L signal and IGN2 signal input
      b. DRL operation
         – The head lamp low beam and tail lamp ON.
      c. DRL OFF
         – Tail lamp SW ON.



3. If the daytime running light is not operated 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 4.

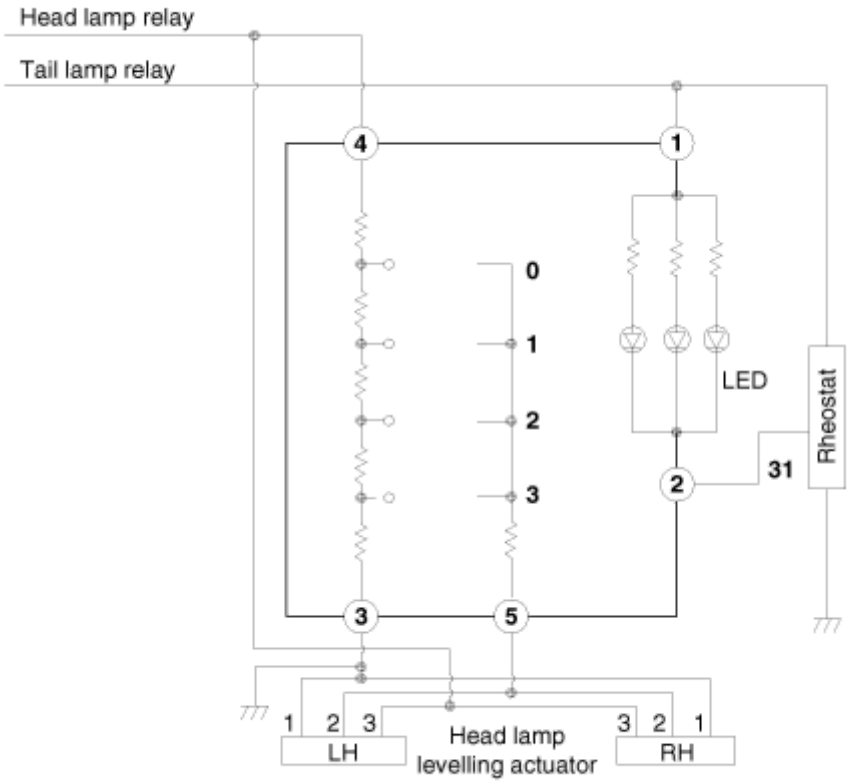
4. Make these input tests at the connector by using ETM.
   If any test indicates a problem, find and correct the cause, then recheck the system.
   If all the input tests prove OK, the I/P (Instrument panel) junction box must be faulty; replace it.

COMPONENT LOCATION



1. Headlamp leveling switch
2. Headlamp leveling actuator

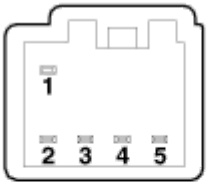
CIRCUIT DIAGRAM



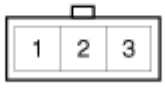
PIN CONNECTION

PIN NO	Description
1	Illumination(+)
2	Rheostat
3	Ground
4	IGN
5	Actuator (+)

Head lamp leveling SW connector

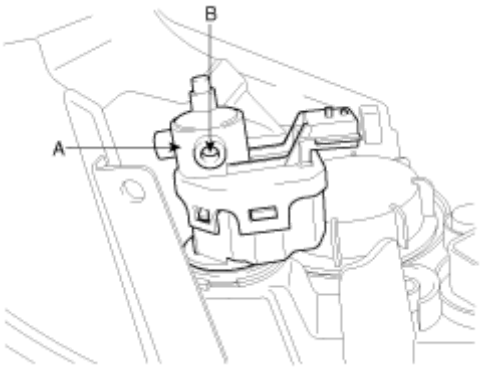


Head lamp leveling actuator connector



REMOVAL

1. Disconnect the negative (-) battery terminal.
2. Remove the head lamp assembly (Refer to the head lamp).
3. Remove the head lamp leveling actuator (A) by turning the adjusting gear in the hole(B) using the adjusting wheel or screw driver.



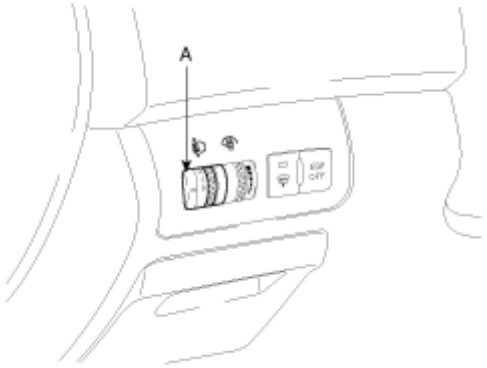
INSTALLATION

1. Install the head lamp leveling actuator by turning the adjusting gear.
2. Install the head lamp assembly.
3. Adjust the head lamp in accordance with the head lamp aiming instructions.

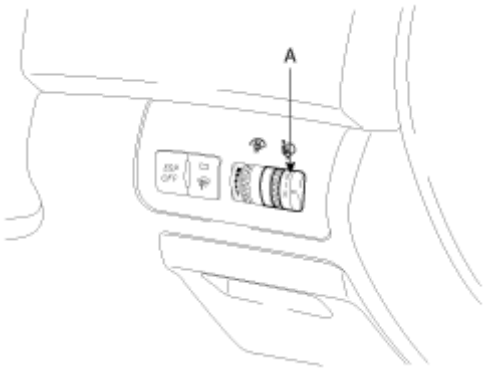
INSPECTION

1. Disconnect the negative (-) battery terminal.
2. Remove the side crash pad cover.
   (Refer to the BD group - "Crash pad")
3. Remove the lower side crash pad switch (A) from the side crash pad cover by using the trim removal tool.

   [LHD]



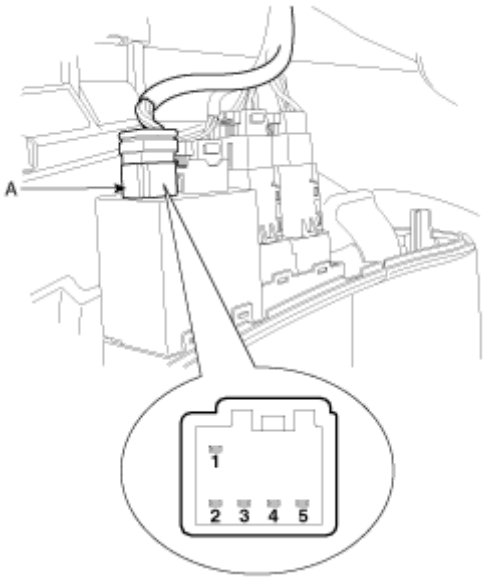
   [RHD]



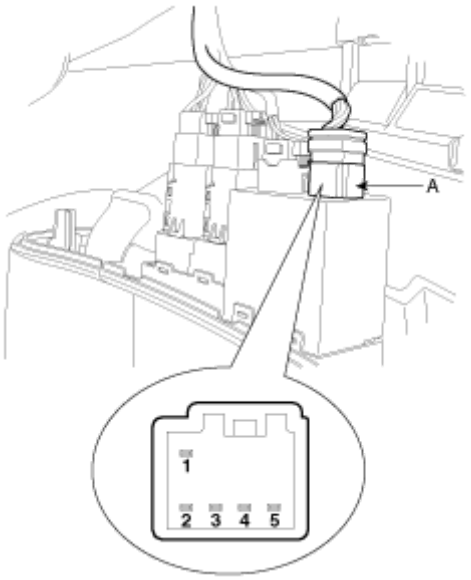
4. Remove the head lamp leveling switch connector from the lower crash pad switch.

   [LHD]

English ▼



[RHD]



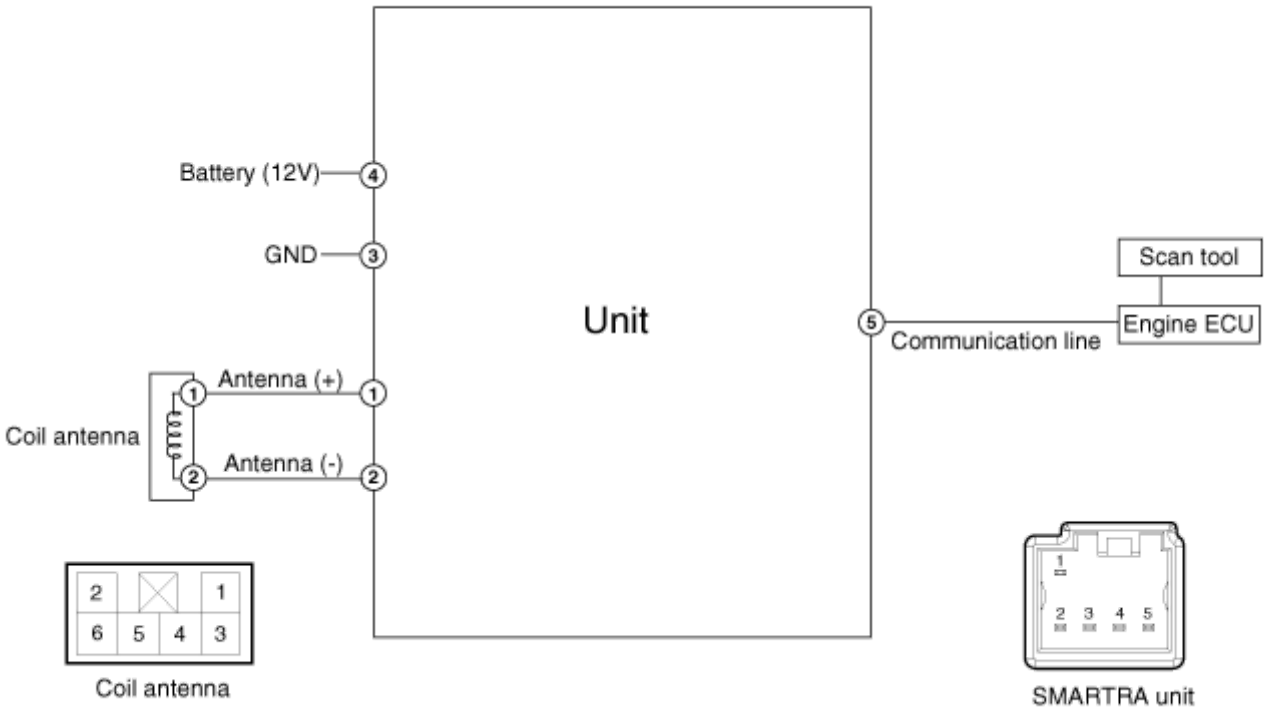
5. Connect the battery voltage between terminals 3 and 4.
6. Measure the voltage between terminals 4 and 5 at each position.

Position No.	Rotation	Voltage (V) (±5%)
0	0°	11.55
1	20°	9.21
2	40°	7.52
3	60°	6.63

7. If the voltage is not as specified, replace the head lamp leveling switch.

English ▼

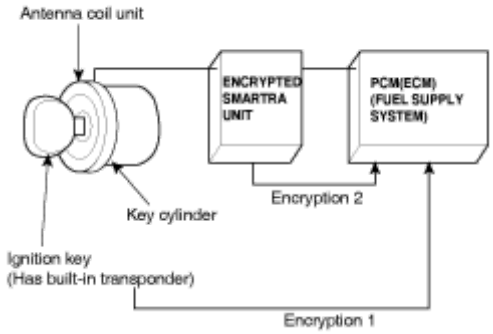
CIRCUIT DIAGRAM



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.

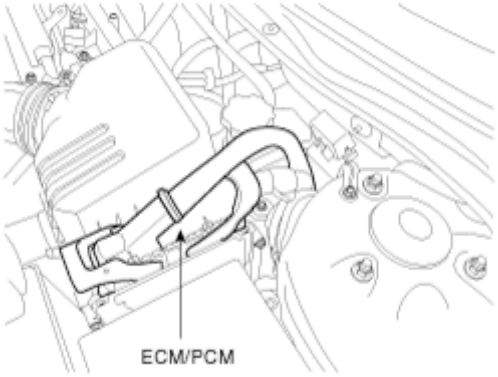
1. Encrypted SMARTRA type immobilizer
   - The SMARTRA system consists of a passivie challenge - response (mutual authentication)transponder located in the ignition key, an antenna coil, a encoded SMARTRA unit, an indicator light and the PCM(ECM).
   - The SMARTRA communicates to the PCM(ECM) (Engine 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.
   - 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).
   - 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.
   - 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.
   - 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.
   - The immobilizer system can store up to eight key codes.
   - If the customer has lost his key, and cannot start the engine, contact Hyundai motor service station.



COMPONENTS OPERATIONS

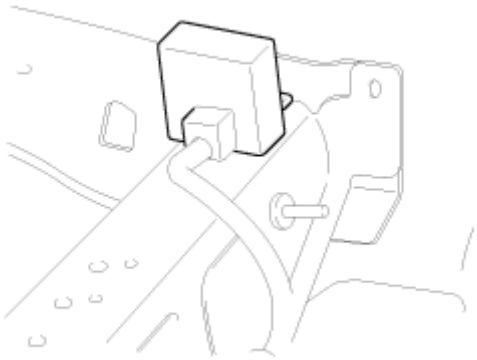
PCM (Power Train Control Module)

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.



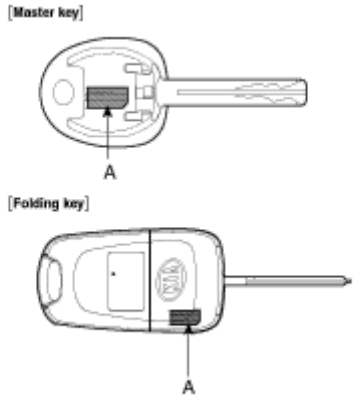
Encrypted SMARTRA unit (A)

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.

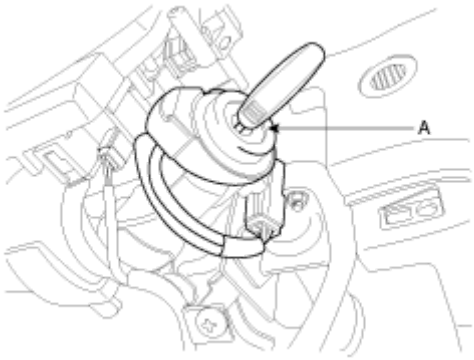


Antenna coil

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.

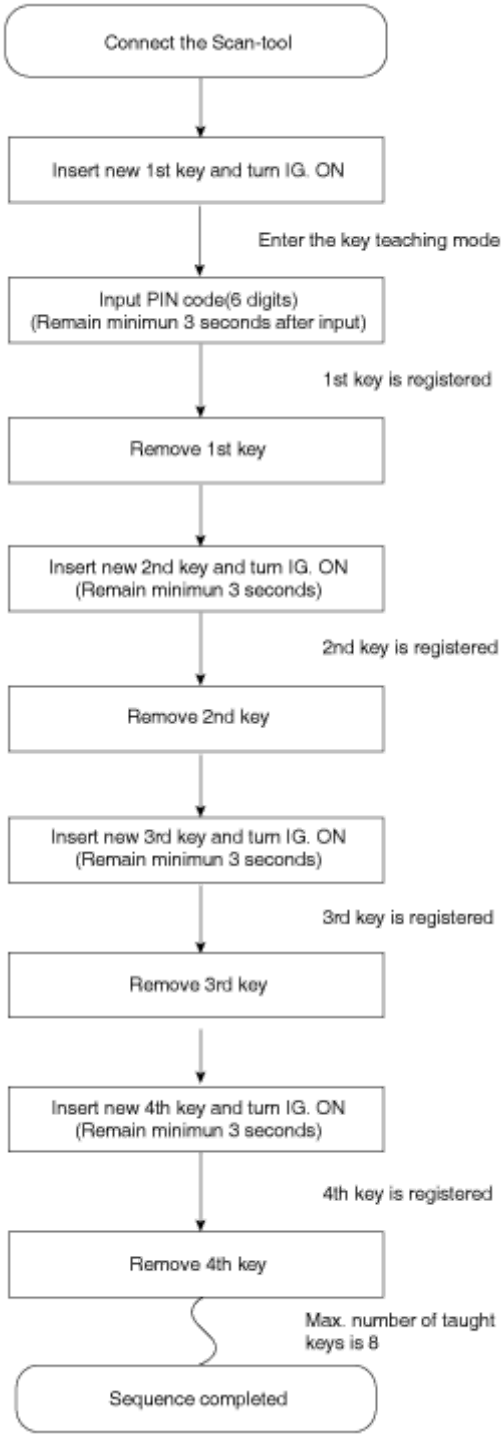


TEACHING PROCEDURES

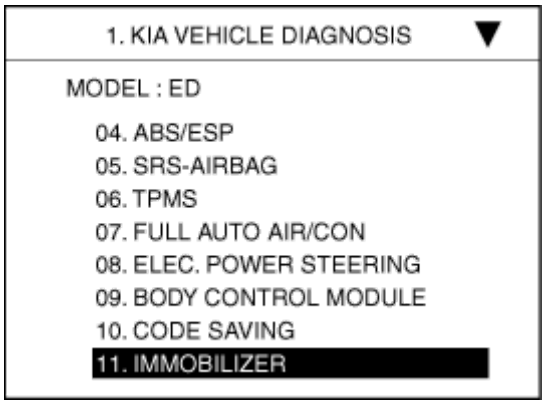
1. Key Teaching Procedure
   Key teaching must be done after replacing a defective PCM(ECM) or when providing additional keys to the vehicle owner. The procedure starts with an PCM(ECM) request for vehicle specific data (PIN code: 6digits) from the tester. The "virgin" PCM(ECM) stores the vehicle specific 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 proceed.
   If incorrect vehicle specific data have been sent to the PCM(ECM) three times, the PCM(ECM) will reject the request of key teaching for one hour. This time cannot be reduced by disconnecting the battery or any other manipulation. After 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 the 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 recognized by 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 can be 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 invalid.
   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 fault code is stored.
   If the PCM(ECM) status and the key status do not match for teaching of keys, the tester procedure will be stopped and a specific fault code will be stored at PCM(ECM).

> **NOTICE**
>
> When teaching the 1st key, Smartra regists at the same time.

English ▼



(1) PCM(ECM) learnt status.



1. KIA VEHICLE DIAGNOSIS

MODEL : ED
SYSTEM : IMMOBILIZER

01. CURRENT DATA
02. PASSWORD TEACHING/CHANGING
03. TEACHING
04. NEUTRAL MODE
05. LIMP HOME MODE
06. SMARTRA NEUTRAL

1.3 TEACHING

MODEL : ED
SYSTEM : IMMOBILIZER
STATUS : LEARNT

INPUT PIN OF SIX
FIGURE AND PRESS [ENTER] KEY

CODE : 234567

1.3 TEACHING

MODEL : ED
SYSTEM : IMMOBILIZER
STATUS : LEARNT

1st KEY TEACHING
ARE YOU SURE ? [Y/N]

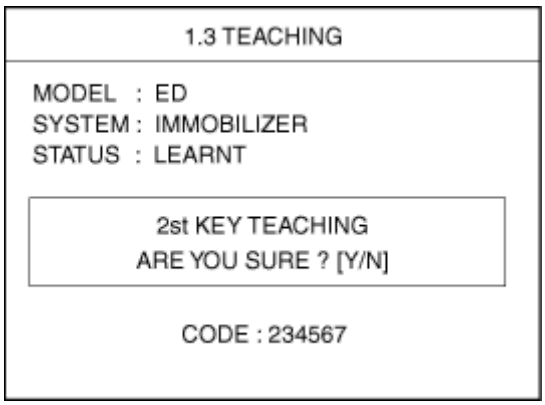
CODE : 234567

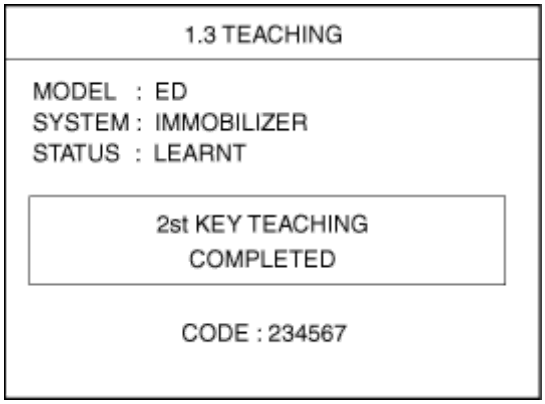
1.3 TEACHING

MODEL : ED
SYSTEM : IMMOBILIZER
STATUS : LEARNT

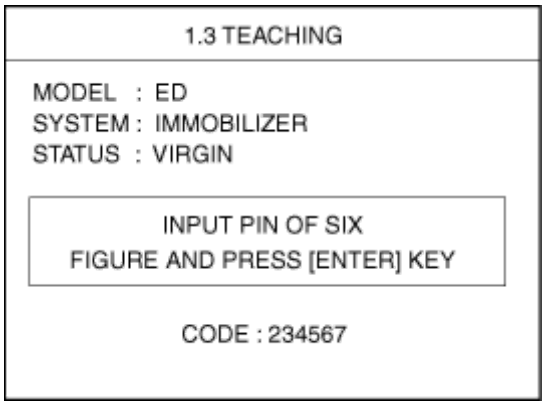
1st KEY TEACHING
COMPLETED

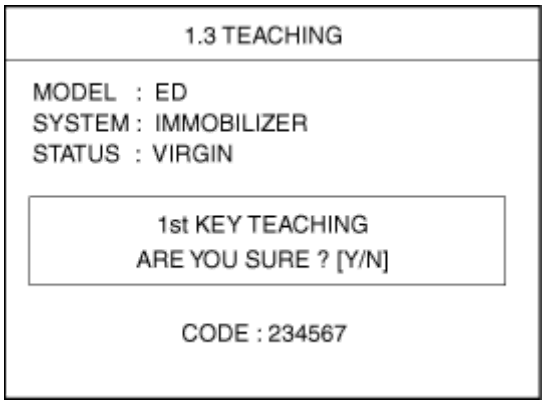
CODE : 234567

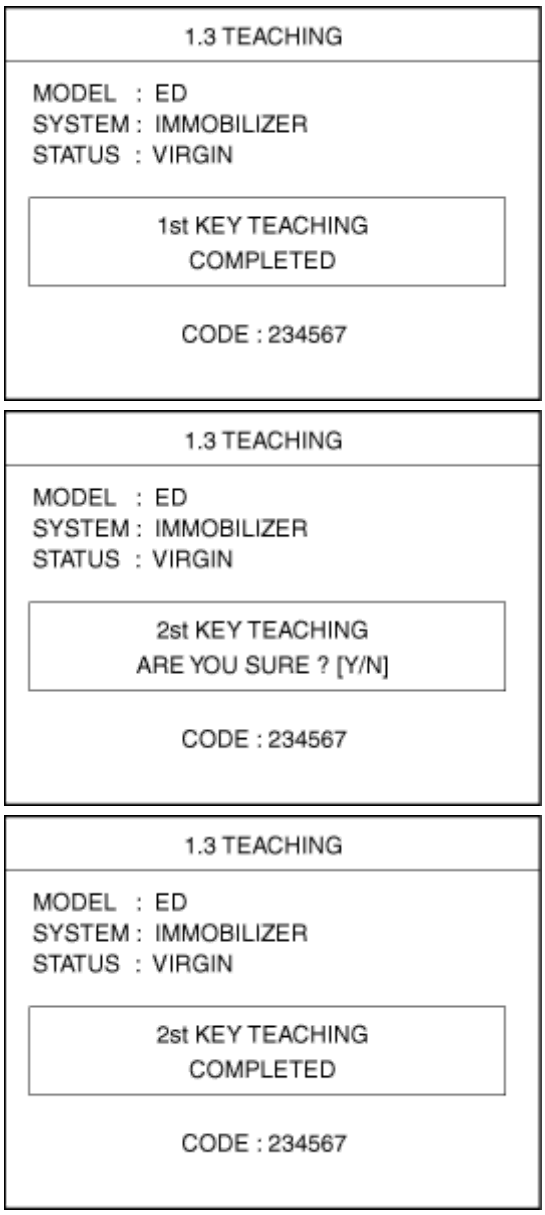




(2) PCM(ECM) virgin status.
After replacing new "PCM(ECM)" scantool displays that PCM(ECM) is virgin status in Key Teaching mode.
"VIRGIN" status means that PCM(ECM) has not matched any PIN code before.







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 with four digits.
   User password teaching is only accepted by a "learnt" PCM(ECM). Before first teaching of user password to an 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 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 tester sends authorization of access, either the old user password or the vehicle specific data. After correct authorization, the PCM(ECM) requests the new user password. The status remains "learnt" and the new user password will be valid for the next limp home mode.
   If incorrect user passwords or wrong vehicle specific data have been sent to the PCM(ECM) three times, the PCM(ECM) will reject the request to change the password for one hour. This time cannot be reduced by disconnecting the battery or any other actions. After reconnecting the battery, the timer starts again for one hour.
   (1) User password teaching

1. KIA VEHICLE DIAGNOSIS

MODEL : ED
SYSTEM : IMMOBILIZER

01. CURRENT DATA
02. PASSWORD TEACHING/CHANGING
03. TEACHING
04. NEUTRAL MODE
05. LIMP HOME MODE
06. SMARTRA NEUTRAL

1.2 PASSWORD TEACHING/CHANGING

MODEL : ED
SYSTEM : IMMOBILIZER
STATUS : VIRGIN

INPUT NEW PASSWORD OF FOUR FIGURES AND PRESS [ENTER] KEY

NEW PASSWORD :

1.2 PASSWORD TEACHING/CHANGING

MODEL : ED
SYSTEM : IMMOBILIZER
STATUS : VIRGIN

INPUT NEW PASSWORD OF FOUR FIGURES AND PRESS [ENTER] KEY

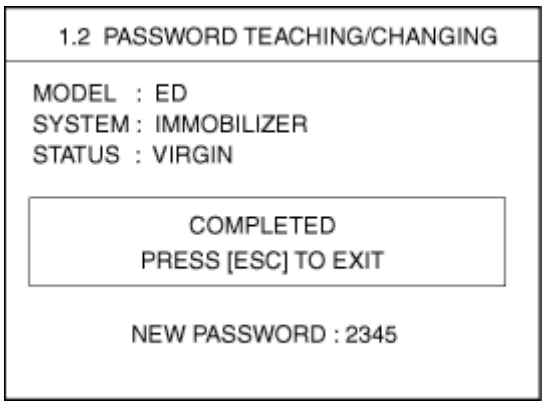
NEW PASSWORD : 2345

1.2 PASSWORD TEACHING/CHANGING

MODEL : ED
SYSTEM : IMMOBILIZER
STATUS : VIRGIN

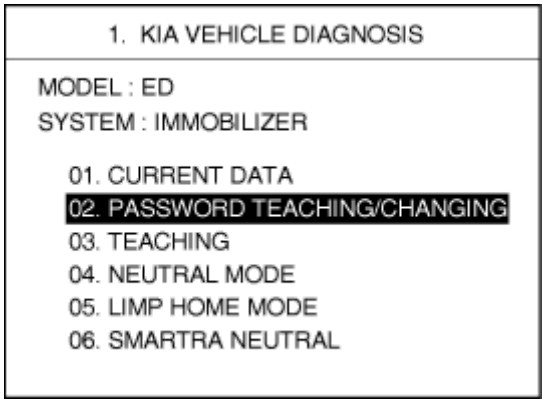
ARE YOU SURE ? [Y/N]

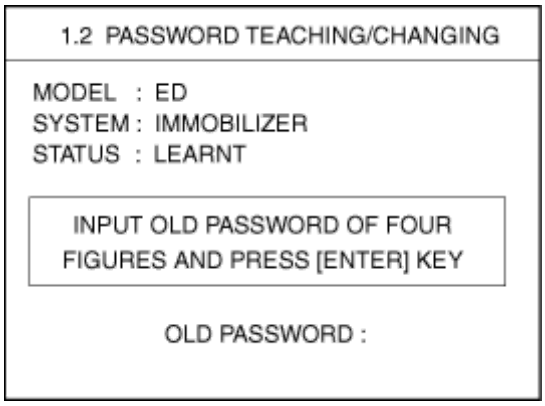
NEW PASSWORD : 2345

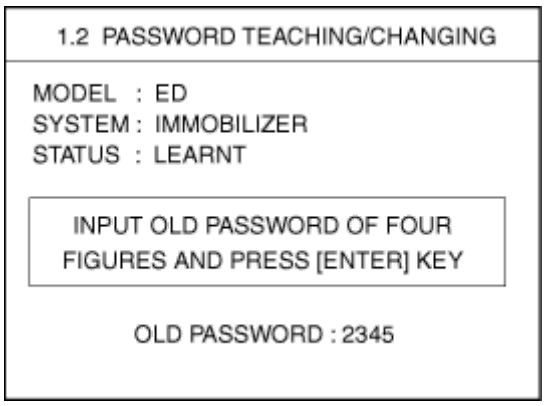


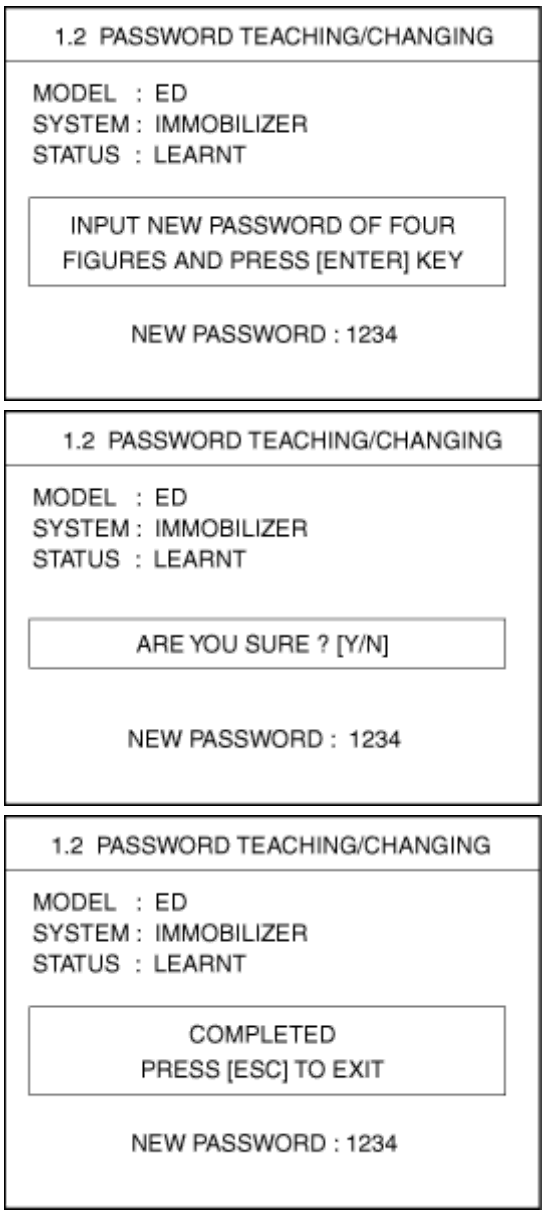
※ In case of putting wrong password, retry from first step after 10 seconds.

(2) User password changing



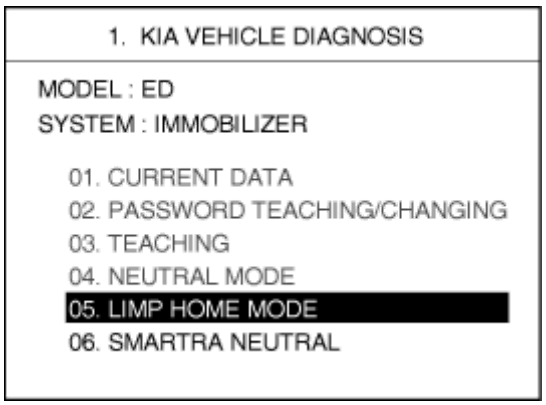


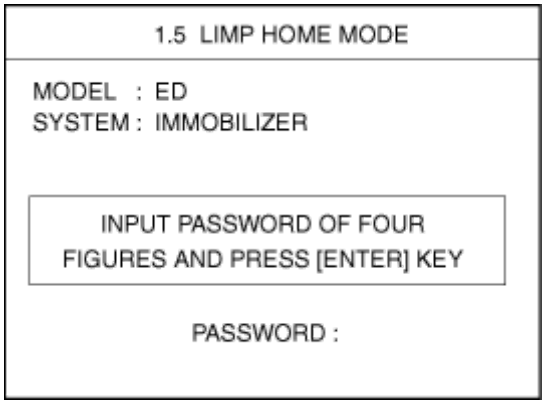


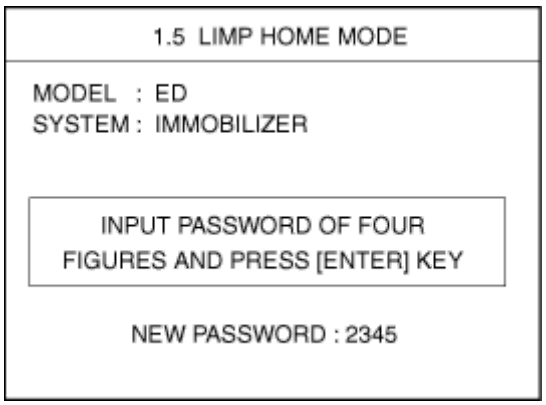


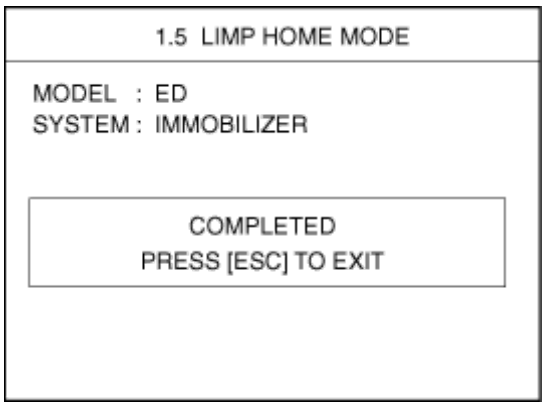
LIMP HOME FUNCTION

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 station.
   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 correct, 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. Disconnecting 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.

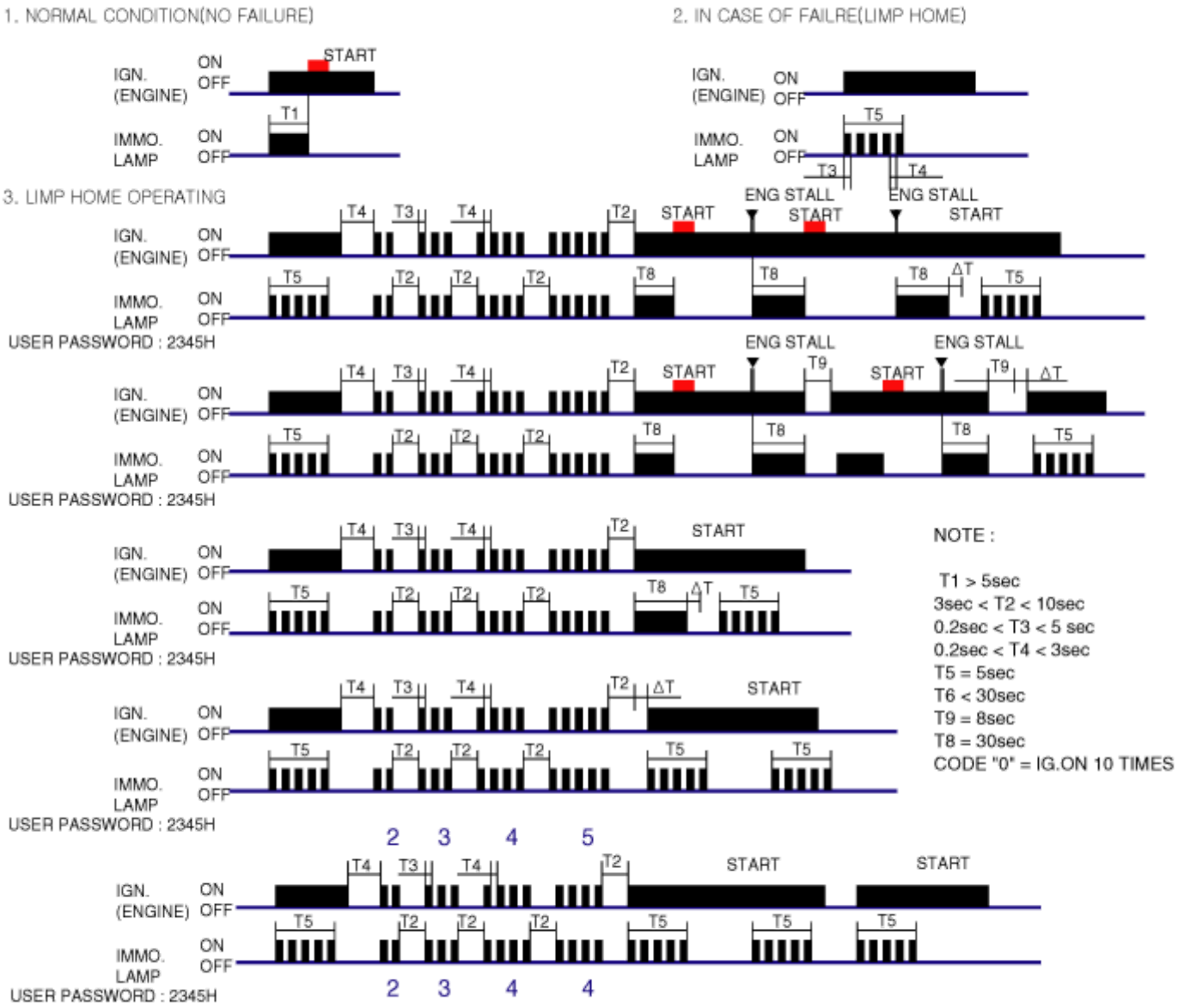








2. LIMP HOME BY IGNITION KEY
   The limp home can be activated also by the ignition key. The user password can be input to the PCM(ECM) by a special sequence of ignition on/off.
   Only if the PCM(ECM) is in status "learnt" and the user password status is "learnt" and the user password is correct, the 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.



REPLACEMENT

Problems And Replacement Parts:

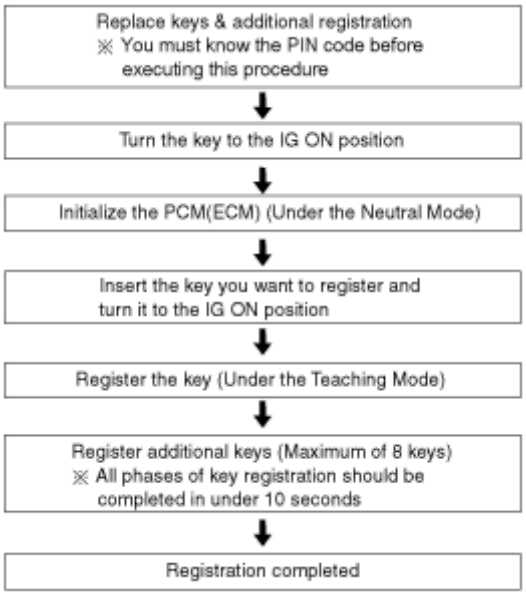
Problem	Part set	Scan tool required?
All keys have been lost	Blank key (4)	YES
Antenna coil unit does not work	Antenna coil unit	NO
ECM does not work	PCM(ECM)	YES
Ignition switch does not work	Ignition switch with Antenna coil unit	YES
Unidentified vehicle specific data occurs	Key, PCM(ECM)	YES
SMARTRA unit does not work	SMARTRA unit	YES

Replacement Of Ecm And Smartra

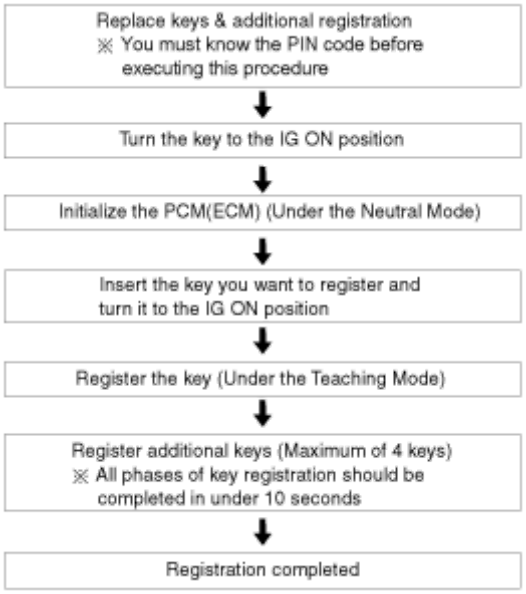
In case of a defective ECM, the unit has to be replaced with a "virgin" or "neutral" ECM. All keys have to be taught to the new ECM. Keys,

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. There are no transponder-related data stored in this device.

1. Things to remember before a replacement (PCM(ECM))



2. Things to remember before a replacement (Keys & Additional registration)



NOTICE

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.

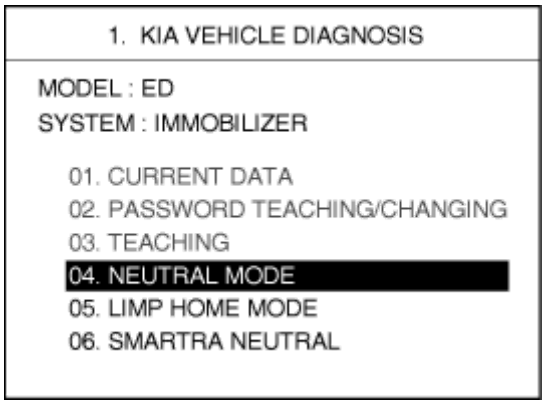
Neutralising Of ECM

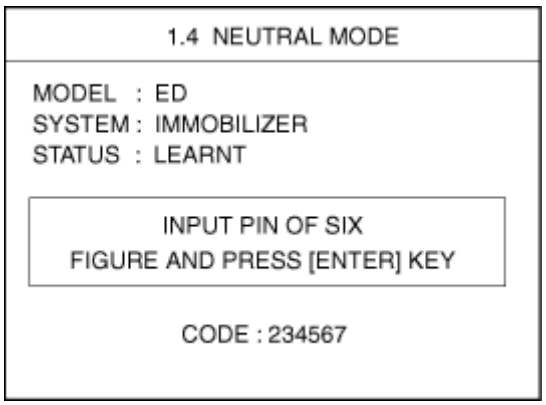
The PCM(ECM) can be set to the "neutral" status by a tester.
A valid ignition key is inserted and after ignition on is recorded, the PCM(ECM) requests the vehicle specific data from the tester. The communication messages are described at "Neutral Mode" After successfully receiving the data, the PCM(ECM) 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.

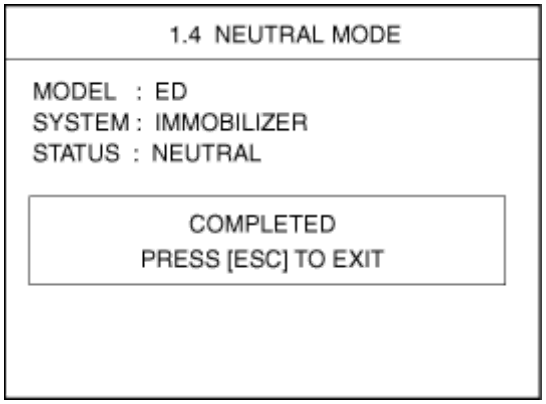
NOTICE

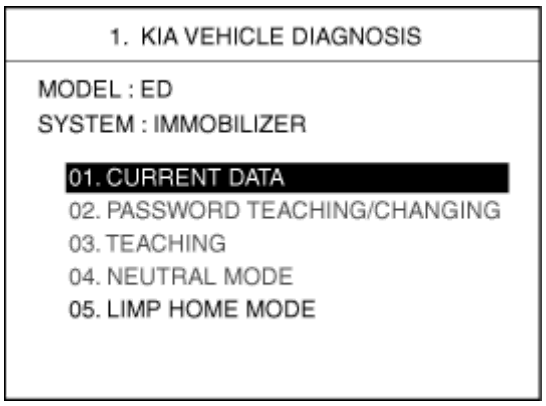
- Neutralizing setting condition
  - In case of PCM(ECM) status "Learnt" regardless of user password "Virgin or Learnt"
  - Input correct PIN code by scanner.
  - Neutralizing meaning .
    : PIN code (6) & user password (4) deletion.
    : Locking of ECM (except key teaching permission)
- Neutralizing meaning:
  - PIN Code(6) & User P/Word(4) deletion
  - Locking of EMS(except Key Learning permission)

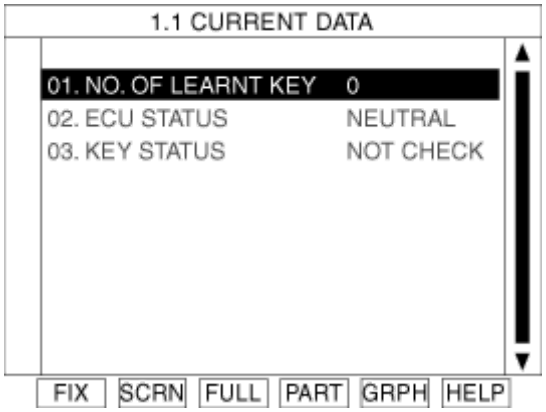
Function / EMS	Engine Running			Learning	
	Learnt Key	Limp home	Twice Ignition	Key	User Password
Neutral	No	No	No	Yes	No











Neutralising Of SMARTRA

The EMS can be set to the status "neutral" by tester

Ignition key (regardlss 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.

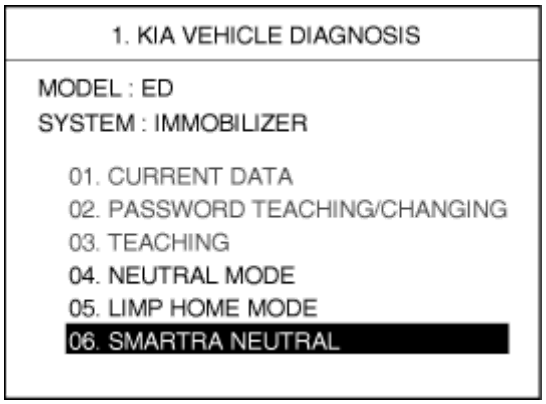
If wrong vehicle specific data have been sent to SMATRA three times continuously or intermittently, the SMATRA will reject the request to

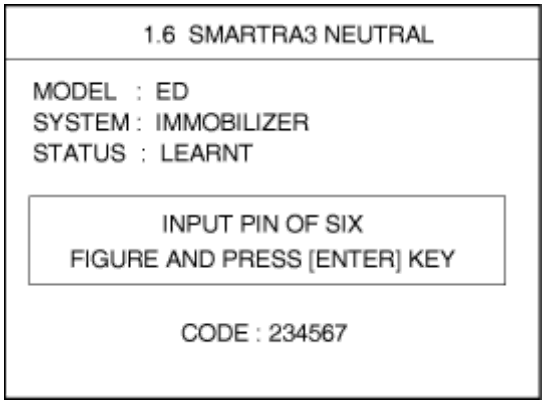
enter neutral mode for one hour. Disconnecting the battery or other manipulation cannot reduce this time. After connecting the battery the timer starts again for one hour.

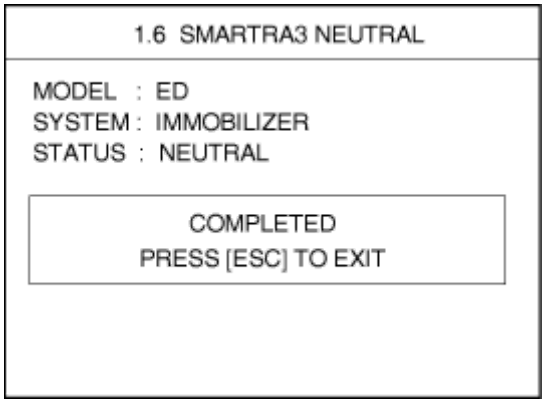
NOTICE

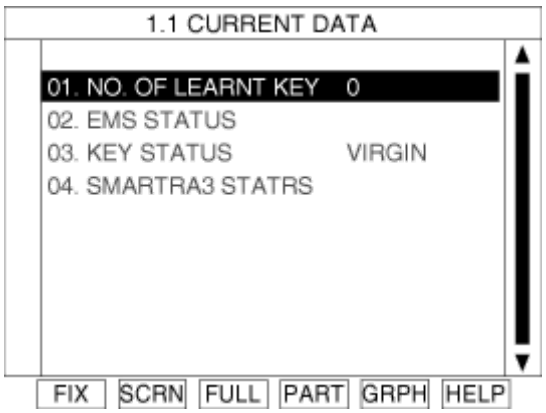
- Neutralizing Setting condition :
  - In case of "SMARTRA status", "Learnt"
  - Input correct Pin code by tester
- Neutralizing meaning :
  - Vehicle password(DPN Code) & SEK Code deletion.
  - Permission of New DPN Learning.

Function / SMARTRA	Engine Running			Learning	
	Learnt Key	Limp home	Twice Ignition	Key	User Password
Neutral	No	Yes (EMS learnt)	No	Yes	No



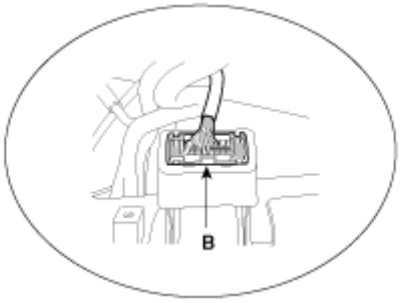




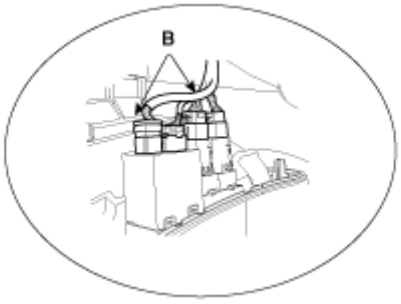

1.1 CURRENT DATA
01. NO. OF LEARNT KEY 0
02. EMS STATUS
03. KEY STATUS VIRGIN
04. SMARTRA3 STATRS
FIX
SCRN
FULL
PART
GRPH
HELP

REMOVAL

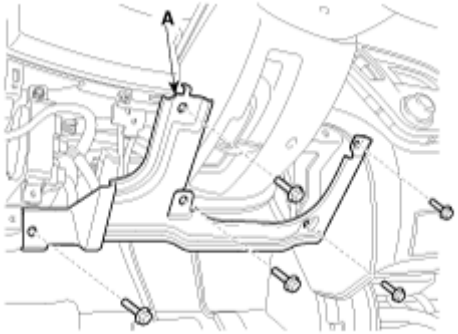
1. Disconnect the negative (-) battery terminal.
2. Remove the crash pad lower panel (A) and disconnect the connectors (B). (Refer to the BD group - "Crash pad").





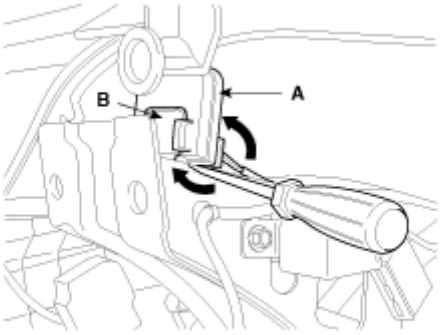


3. Remove the reinforcing panel (A).

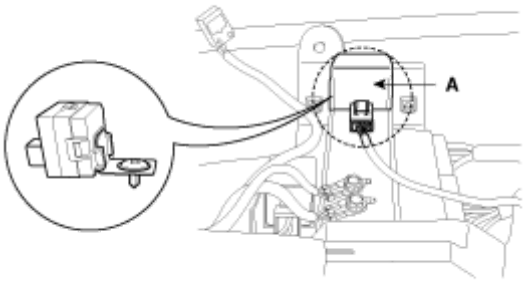


4. Insert a flat-up screwdriver between immobilizer unit and mounting bracket located on the inside of crash pad.
5. Move a flat-up screwdriver up and down slowly to loose the immobilizer unit (A) from bracket (B).

English ▼



6. Remove the immobilizer unit (A) after disconnecting the connector.



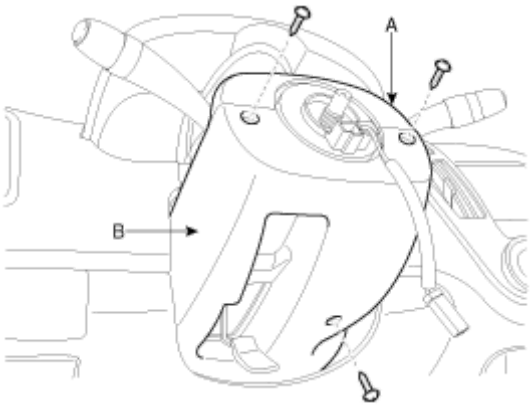
INSTALLATION

1. Install the immobilizer control unit after connecting the unit connector.
2. Install the reinforcing panel.
3. Install the crash pad lower panel.

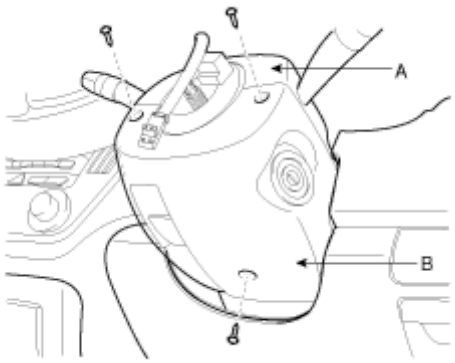
REMOVAL

1. Disconnect the negative (-) battery terminal.
2. Remove the steering clumn upper(A) and lower(B) shrouds. (Refer to the ST group - "Steering column and shaft").

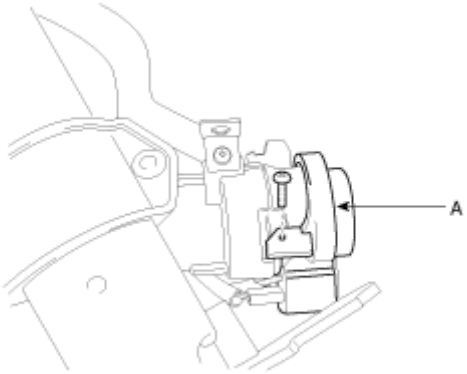
[LHD]



[RHD]



3. Disconnect the 6P connector of the coil antenna and then remove the coil antenna (A) after loosening the screw.



INSTALLATION

1. Install the coil antenna and connect the 6P connector.

2. Install the steering column upper and lower shrouds.

English ▼

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:

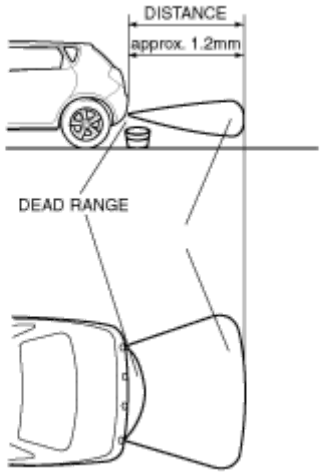
Immobilizer Related Faults	Fault types	Diagnostic codes
PCM(ECM) fault	1) Non-Immobilizer-EMS connected to an Immobilizer	P1610
Transponder key fault	1) Transponder not in password mode 2) Transponder transport data has been changed.	P1674 (Transponder status error)
Transponder key fault	1) Transponder 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) Incorect 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)
	1) Virgin transponder at PCM(ECM) status "Learnt"Learnt	P1696

Invalid key fault	(Invalid) Transponder at PCM(ECM) status "Learnt" (Authentication fail)	(Authentica[illegible]
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)

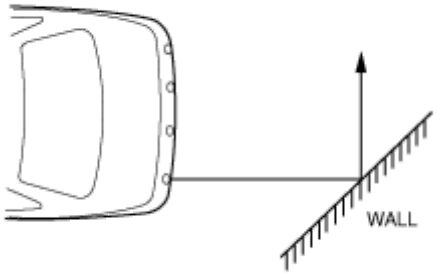
English ▼

WARNING

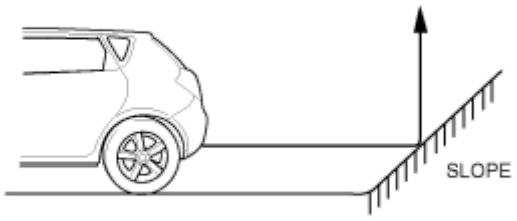
1. Range detected by back sensors is limited.
   Watch back before reversing.
2. There is a blind spot below the bumper. Low objects (for example boundary barrier) may be detected from minimum 1.5m away unable to detect at nearer.
3. Besides there are some materials unable to be detected even in detection range as follows.
   (1) Needles, ropes, rods, or other thin objects.
   (2) Cotton, snow and other material absorbing ultrasonic wave(for example, fire extinguisher device covered with snow)



4. Reversing toward the sloped walls.



5. Reversing toward the sloped terrain.



6. False alarm may operate in the following condition: irregular road surface, gravel road, sloped road and grass. Upon alarm generation by grass the alarm may be generated by rock behind grass. Be sure to check for the safety.
   Ultrasonic sensor cannot discriminate among glass, stake, and rock.

7. Sensors may not operate correctly in the below conditions.
   Ensure sensors clean from mud or dirt.
   (1) When spraying the bumper, the sensor opening is covered with something in order not to be contaminated. If sensor opening is contaminated with mud, snow, or dirt, detection range will be reduced and alarm may not be generated under the crash condition. Dirt accumulated on the sensor opening shall be removed with water.
   Do not wipe or scrape sensor with a rod or a hard object.

   (2) If the sensor is frozen, alarm may not operate until sensor thaws.

   (3) If a vehicle stays under extremely hot or cold environment, the detection range may be reduced. It will be restored at the normal temperature.

   (4) When heavy cargo is loaded in tailgate, it changes the vehicle balance, which reduces the detection range.

   (5) When other vehicle's horn, motor cycle engine noise, or other ultra-sonic wave sources are near.

   (6) Under heavy rain.

   (7) When reversing towards a vertical wall and the gap between the vehicle and the wall is 15cm. (Alarm may sound despite of no barrier)

   (8) If radio antenna is installed at the rear.

   (9) If the vehicle rear wiring is re-routed or electrical component is added at the rear part.

   (10) Vehicle balance is changed due to the replacement of the rear spring.

   (11) The unit will operate normally when the vehicle speed is 5km/h or less. Above the speed, the unit may not operate normally.

8. Check the rear bumper for installation condition and deformation. If installed improperly or the sensor orientation is deviated, it may cause malfunction.

9. Be careful not to apply shock during sensor installation on the transmission or reception unit.

10. When adding electrical devices or modifying harness at the rear body of the vehicle, ensure not the change the transmission and reception unit wiring. Tagging the transmission side and reception side, it may cause malfunction.

11. High power radio transmitter (above 10W) may cause malfunction. Do not install it on the vehicle.

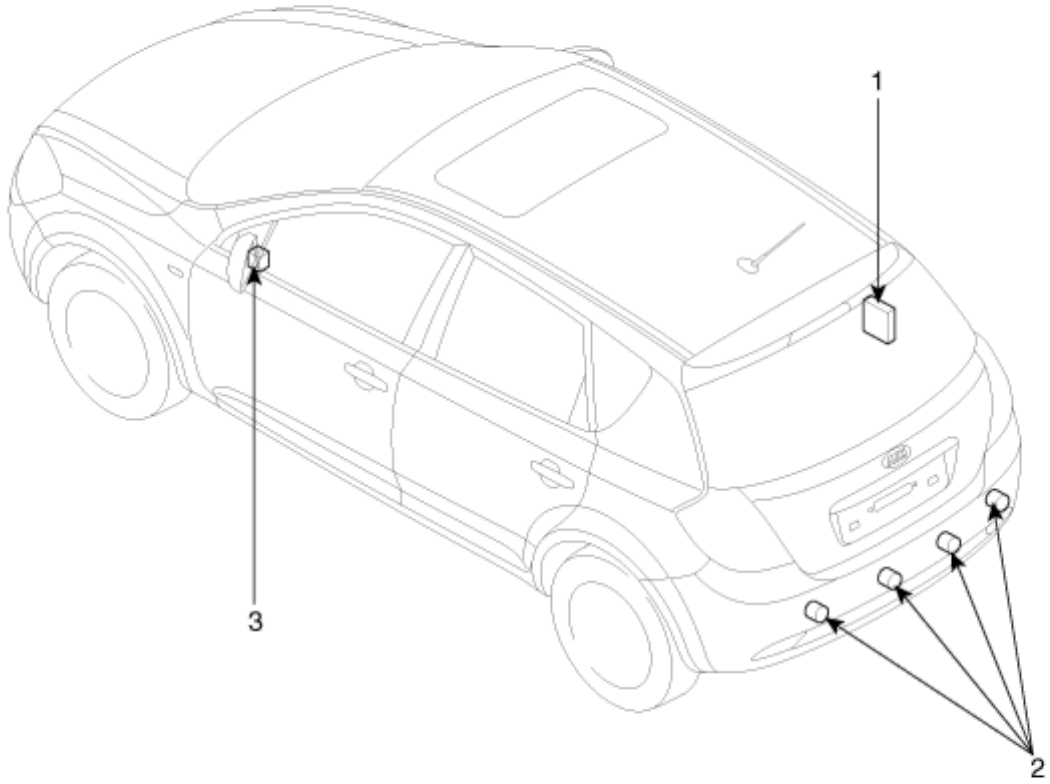
12. Be careful that heating or sharp objects shall not touch ultrasonic sensor surface.
    Besides do not cover the sensor opening or press the sensor.

SPECIFICATION

Item		Specification
Rear parking assist system control unit	Voltage rating	DC 12V
	Operation voltage	DC 9 ~ 16 V
	Operation temperature	-30°C ~ + 80°C
	Operation current	MAX 600 mA
	Operation frequency	40 ± 5 KHz
	Detective method	Direct and indirect detection
Ultrasonic sensor	Voltage rating	DC 8 V
	Detecting range	25 cm ~ 120 cm
	Operation voltage	DC 7 ~ 9 V
	Operation current	MAX 20 mA
	Operation temperature	-30°C ~ + 80°C
	Beam width	Horizontal : 40±5°, Vertical : 60±5°
	Number of sensors	4 (Right, Right center, Left center, Left)
Piezo buzzer	Voltage rating	DC 12 V
	Operation voltage	DC 9 ~ 16 V
	Operation temperature	-30°C ~ + 80°C
	Operation current	MAX 60 mA
	Sound, tone	Oscillation frequency : 2.2±0.5 KHz
		Sound level : MIN 70 dB (DC 13V /m)

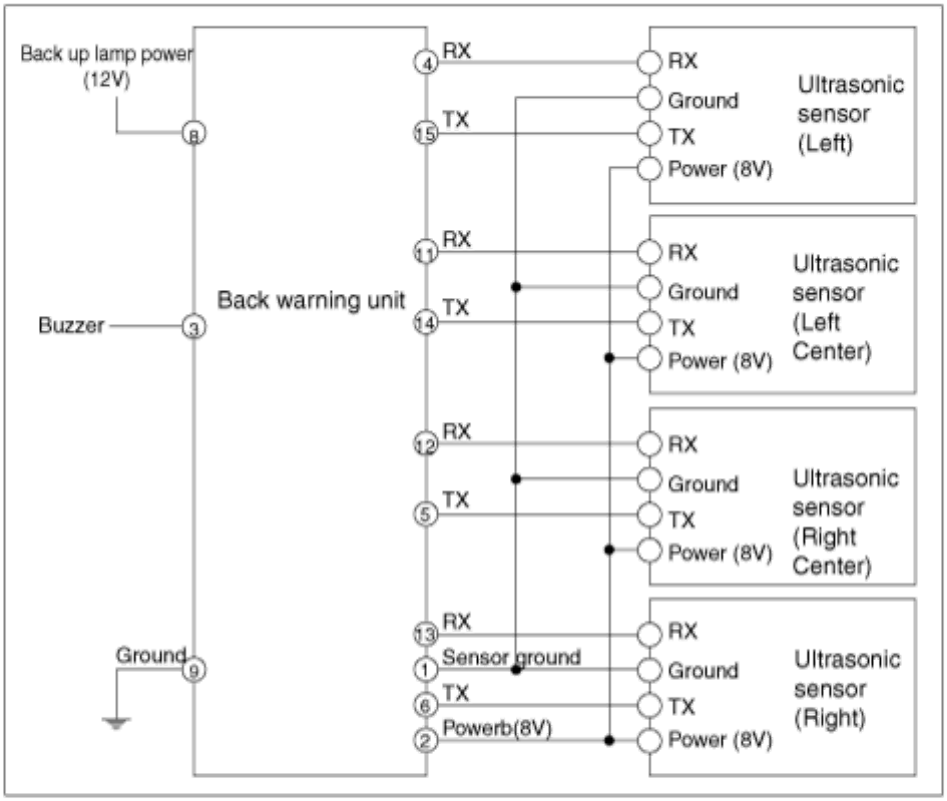
English ▼

COMPONENT LOCATION



1. Rear parking assist system control unit
2. Ultrasonic sensor
3. Buzzer

CIRCUIT DIAGRAM

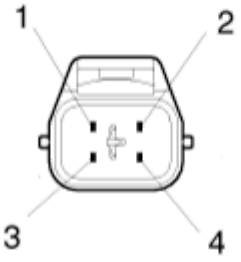




(Rear parking assist system control unit connector)

Pin configuration

Pin No.	Signal	Test : Desired result
1	Sensor ground	0V
2	Sensor power	8V (While operating)
3	Buzzer	0V (While operating)
4	RX - Sensor(Left)	0~1V voltage change (Inspect waveform)
5	TX - Sensor(Right center)	0~3V voltage change (Inspect waveform)
6	TX - Sensor(Right)	0~3V voltage change (Inspect waveform)
8	Back up lamp power	12V (While shifting to "R")
9	Ground	0V
11	RX - Sensor(Left center)	0~1V voltage change (Inspect waveform)
12	RX - Sensor(Right Center)	0~1V voltage change (Inspect waveform)
13	RX - Sensor(Right)	0~1V voltage change (Inspect waveform)
14	TX - Sensor(Left center)	0~3V voltage change (Inspect waveform)
15	TX - Sensor(Left)	0~3V voltage change (Inspect waveform)



(Ultrasonic sensor connector)

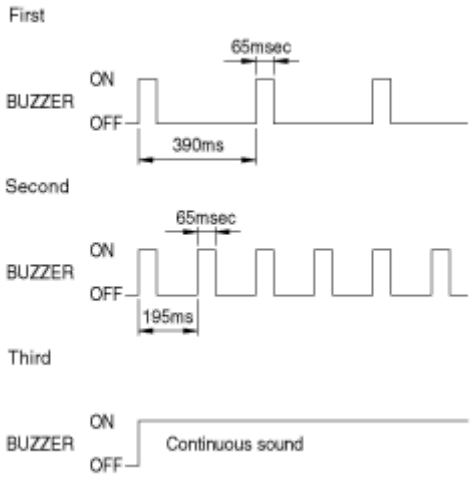
PIN NO	SIGNAL
1	8V
2	GND
3	TX
4	RX

DESCRIPTION

When reversing, the driver is not easy to find objects in the blind spots and to determine the distance from the object. In order to provide the driver safety and convenience, rear parking assist system will operate upon shifting to "R" Ultrasonic sensor will emit ultrasonic wave rearward and detect the reflected wave. Control unit will calculate distance to the object using the sensor signal input and output buzzer alarm in three steps (first, second and third alarm).

ALARM RANGE

Upon detecting an object at each range out of 3 ranges as stated below within the operation range, it will generate alarm.
First alarm : Object comes near to the sensor located at the rear of vehicle, within 81-120cm ± 15cm
Second alarm : Object comes near to the sensor located at the rear of vehicle, within 41-80cm ± 10cm
Third alarm : Object comes near to the sensor located at the rear of vehicle, within 40cm ± 10cm

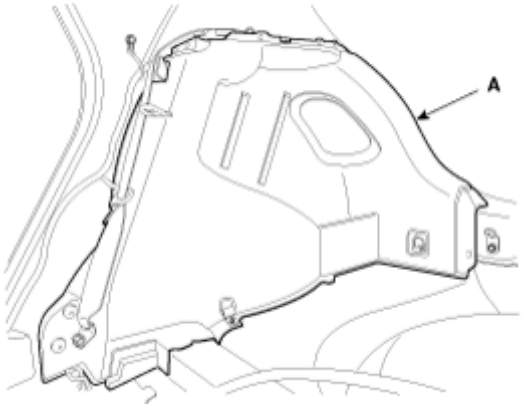


NOTICE

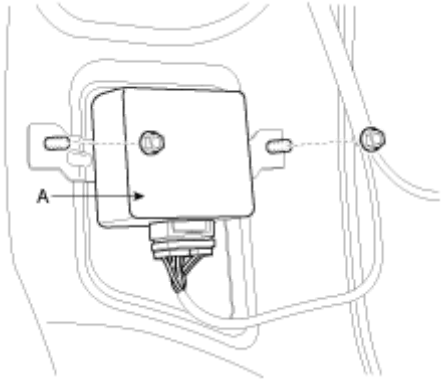
1) Time tolerance of the above waveform : Time ± 10%
2) At nearer distance than 40cm, detection may not occur.
3) Alarm will be generated with vehicle reversing speed 10km/h or less.
   For moving target, maximum operation speed shall be target approach speed of 10km/h.
4) When the vehicle or the target is moving, sequential alarm generation or effective alarm may be failed.
5) Misalarm may occur in the following conditions.
   - Irregular road surface, gravel road, reversing toward grass.
   - Horn, motor cycle engine noise, large vehicle air brake, or other object generating ultrasonic wave is near.
   - When a wireless transmitter is used near to the sensor.
   - Dirt on the sensor.
   - Sequential alarm may not occur due to the reversing speed or the target shape.

REPLACEMENT

1. Disconnect the negative (-) battery terminal.
2. Remove the right side trim(A) of the trunk room.
   (Refer to the BD group - "Interior trim")



3. Loosen the mounting nuts and disconnect the connector.
4. Remove the rear parking assist system control unit (A).



5. Installation is the reverse of removal procedure.

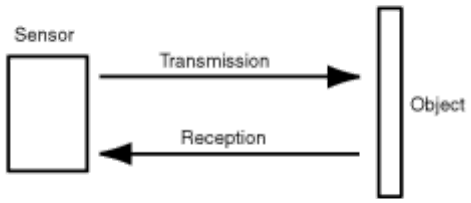
OPERATION PRINCIPLE

The sensor emits ultrasonic wave to the objects, and it measures the time until reflected wave returns, and calculates the distance to the object.

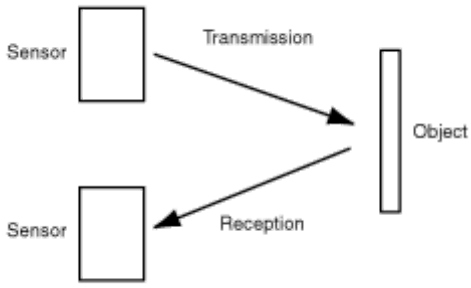
Distance Detection Type

Direct detection type and indirect detection type are used together for improving effectiveness of the detection.

1. Direct detection type: One sensor transmits and receives signals to measure the distance.



2. Indirect detection type: One sensor transmits signals and the other sensor receives the signals to measure the distance.



Measurement Principle

Rear parking assist system is a complementary device for reversing. Rear parking assist system detects objects behind vehicle and provides the driver with buzzer alarm finding objects in a certain area, using ultrasonic wave propagation speed and time.

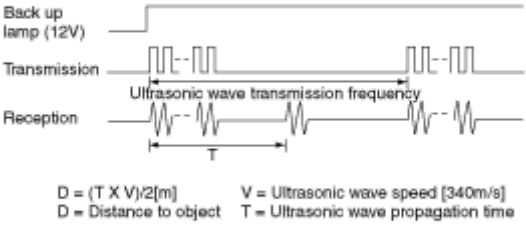
The propagation speed formula of ultrasonic wave in air is following :

v=331.5 + 0.6t (m/s)

v=ultrasonic wave propagation speed

t=ambient temperature

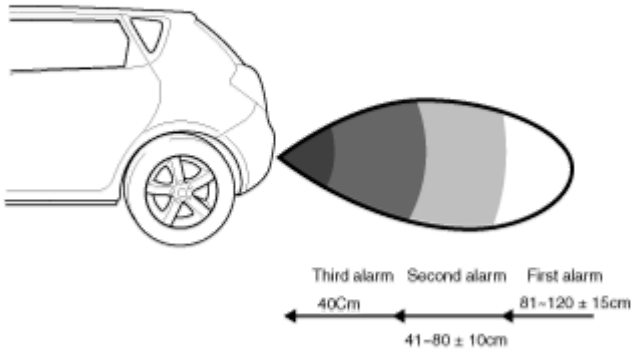
The basic principle of distance measurement using ultrasonic wave is :



D = (T X V)/2[m] V = Ultrasonic wave speed [340m/s]
D = Distance to object T = Ultrasonic wave propagation time

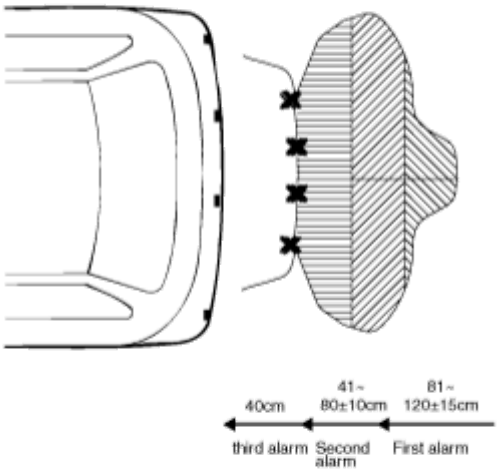
Sensor detection range

[Vertical range]



1. Distance tolerance(Messured at the front of sensor)
   81~120cm : ±15cm
   41~80cm : ±10cm
   40cm : ±10Cm
2. Detection tolerance
   At 40cm :45° ± 15°
   At 80cm : 30° ± 15°
   At 120cm : 20° ± 15°
3. At nearer distance than 40cm detection may occur.
4. Measurement condition : Room temperature (20℃), 90mm diameter, 3m length rod.

[Horizontal range]



1. Distance tolerance(Messured at the front of sensor)
   81~120cm : ±15cm
   41~80cm : ±10cm
   40cm : ±10cm
2. Detection tolerance
   At 80cm : 90° ± 20°
   At 120cm : 10° ± 20°
3. At nearer distance than 40Cm detection may occur.
4. Measurement condition : Room temperature (20℃), 90mm diameter, 3m length rod.

NOTICE

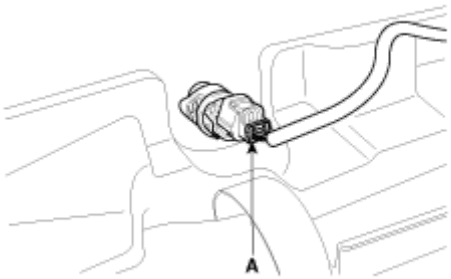
1) 14cm (dia.) plastic rod is used for the test target.
2) The test result may differ by a different target object.
3) Detection range may be reduced by dirt accumulated on sensor, and extremely hot or cold weather.
4) The following object may not be detected.

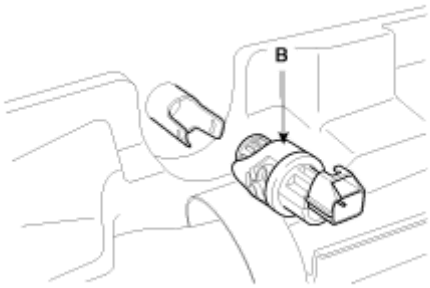
- Sharp object or thin object like rope.
- Cotton sponge, snow or other materials absorbing sonic wave.
- Smaller objects than 14cm (dia.), 1m length.

English

REPLACEMENT

1. Disconnect the negative (-) battery terminal.
2. Remove the rear bumper (Refer to the Body group - "Rear bumper")
3. Disconnect the sensor connector (A) at the inside of the rear bumper, and then remove the sensor (B) from the housing.





4. Installation is the reverse of removal procedure.

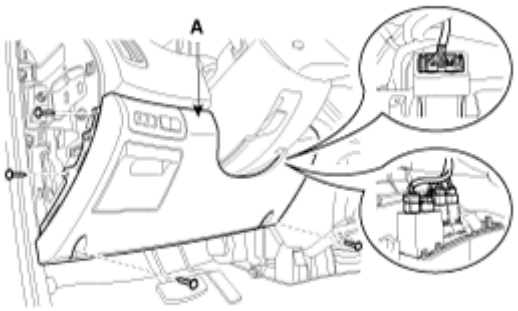
INSPECTION

Test the buzzer by connecting battery voltage to the 1 terminal and ground the 2 terminal.
The buzzer should make a sound. If the buzzer fails to make a sound, replace it.

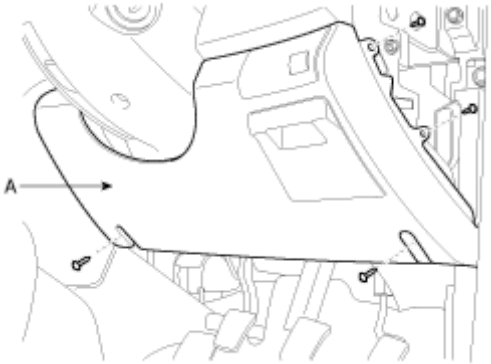
REPLACEMENT

1. Disconnect the negative (-) battery terminal.
2. Remove the crash pad side lower panel (A).
   (Refer to the BD group - "Crash pad")

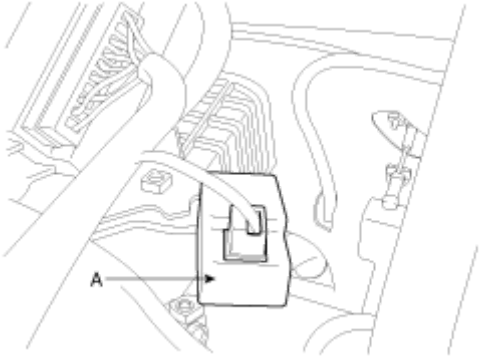
   [LHD]



   [RHD]



3. Remove the buzzer (A) after loosening the nut and disconnecting the 2P connector.

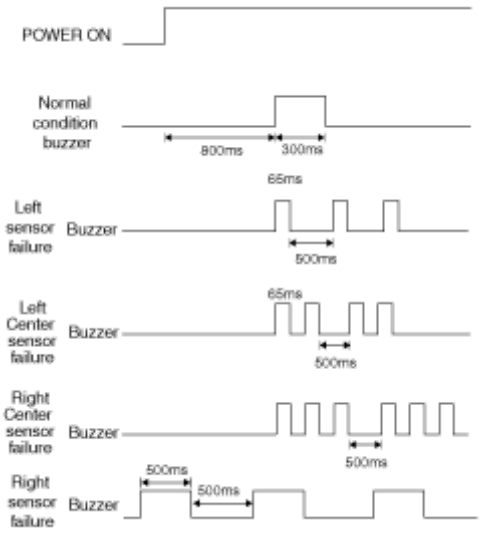


4. Installation is the reverse of removal procedure.

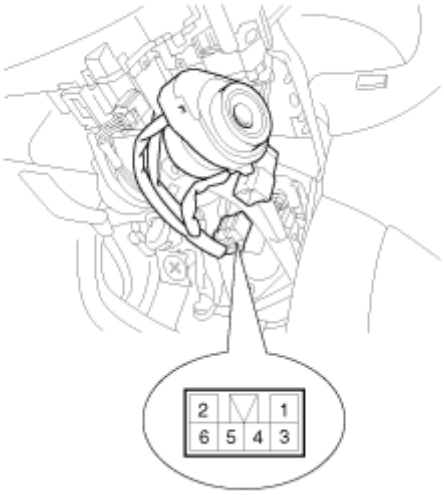
English ▼

DIAGNOSIS

1. Operate with ignition switch on and shift the lever to position "R"
2. Then it checks the system condition.
   If no trouble, it generates buzzer alarm sound for 0.3 seconds after 0.8 seconds from power approval. In case of system failure, then it indicates the failed point as follows.
   - Left sensor failure : beep-beep-beep
   - Left center sensor failure : beep beep-beep beep-beep beep
   - Right center sensor failure: beep beep beep-beep beep beep-beep beep beep
   - Right sensor failure : beep - beep - beep
3. Alarm is generated 3 times sequentially.
4. Effective operation range is 10km/h or less for the vehicle speed.



INSPECTION

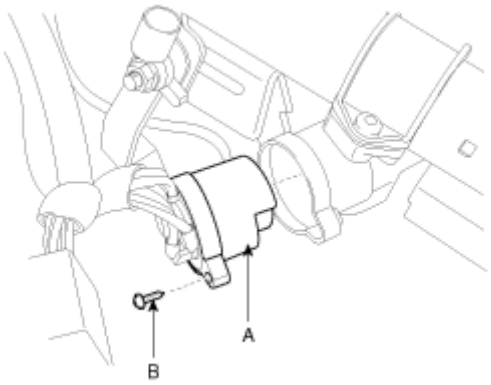


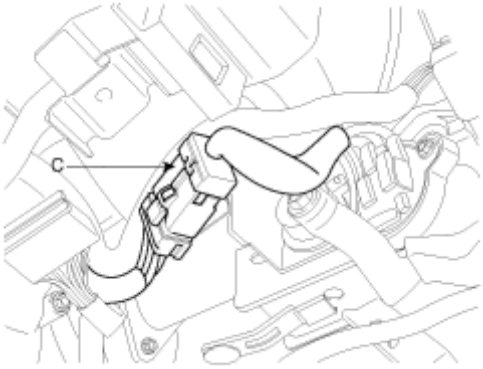
1. Disconnect the ignition switch connector and key warning switch connector from under the steering column.
2. Check for continuity between the terminals.
3. If continuity is not specified, replace the switch.

TERMINAL / POSITION / KEY		IGNITION SWITCH						STEERING		KEY WARNING SWITCH		KEY HOLE ILLUMINATION	
		2	4	6	5	3	1	TRAVEL	TRAVEL	5	6	3	4
LOCK	REMOVAL							LOCK					
	INSERT							LOCK	UNLOCK				
ACC		○	○					UNLOCK					
ON		○	○	○	○	○				○	○	○	○
START		○		○	○	○	○						

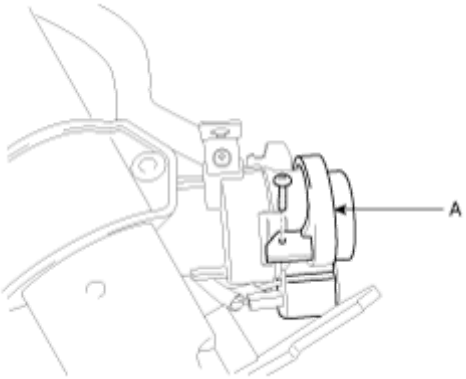
REMOVAL

1. Disconnect the negative (-) battery terminal.
2. Remove the crash pad lower panel (Refer to the BD group - "Crash pad").
3. Remove the ignition switch (A) after loosening the screw (B) with IG ON and disconnecting the 6P connector (C).

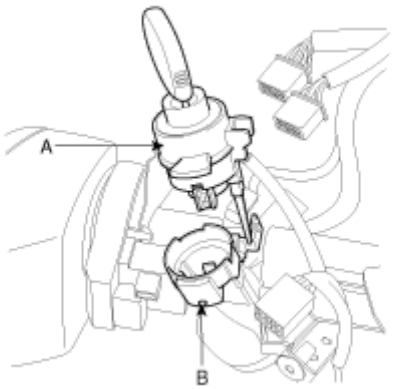




4. Remove the steering column cover (Refer to the ST group - steering column and shaft).
5. Remove the door warning switch and key illumination lamp (A) after loosening the screw and disconnecting the 6P connector.



6. If it is necessary to remove the key lock cylinder (A), Remove the key lock cylinder after pushing lock pin (B) with key ACC.



INSTALLATION

1. Install the key lock cylinder.
2. Install the door warning switch and key illumination lamp.
3. Install the steering column cover.
4. Install the ignition switch.
5. Install the crash pad lower panel.

SPECIFICATIONS

Item	Specification
Master cylinder Type I.D. Piston stroke Fluid level warning sensor	 Tandem type 22.22 mm (0.875 in) 45 mm (1.77 in) Provided
Brake booster Type Boosting ratio	 Vacuum 9 : 1
Front brake(Disc) Type Disc O.D. Disc I.D. Disc thickness Pad thickness Cylinder type Cylinder I.D.	 Floating type with ventilated disc 280 mm(11.02 in) 172 mm(6.77 in) 26 mm(1.02 in) 11 mm(0.43 in) Single piston Ø57.15 mm(2.25 in)
Rear brake(Disc) Type Disc O.D. Disc I.D. Disc thickness Pad thickness Cylinder type Cylinder I.D.	 Floating type with solid disc 262 mm (10.31 in) 185 mm (7.28 in) 10 mm (0.39 in) 10 mm (0.39 in) Single piston Ø34.0 mm (1.34 in)
Parking brake Actuation Type Drum I.D.	 DIH (Drum in hat) Lever 168 mm(6.61 in)

NOTICE

ABS : Anti-lock Brake System
CBS : Conventional Brake System

Specification (ABS)

Part	Item	Standard value	Remark
HECU (Hydraulic and Electronic Control Unit)	System	4 channel 4 sensor (Solenoid)	·ABS system: ABS & EBD control
	Type	Motor, valve relay intergrated type	
	Operating voltage	10 V ~ 16 V(DC)	
	Operating temperature	-40 ~ 110 °C (-40 ~ 230 °F)	
	Operating voltage	12 V	·ABS W/L: ABS failure ·Brake W/L: Parking,

English ▼

Warning lamp				brake oil, E
	Current consumption		80 mA	
Acitve wheel speed sensor	Supply voltage		DC 4.5 ~ 20 V	
	Operating temperature		-40 ~ 150 °C (-40 ~ 302 °F)	
	Output current low		5.9 ~ 8.4 mA	Typ.7 mA
	Output current High		11.8 ~ 16.8 mA	Typ.14 mA
	Frequency range		1 ~ 2500 HZ	
	Air gap	Front	0.4 ~ 1.0 mm (0.02 ~ 0.04 in)	Typ.0.7 mm(0.03 in)
		Rear	0.2 ~ 0.8 mm (0.01 ~ 0.03 in)	Typ.0.7 mm(0.03 in)
	Tone wheel		46 teeth	
	Output duty		30~70 %	

Specification (ESP)

Part	Item		Standard Value	Remark
HECU(Hydraulic and Electronic Control Unit)	System		4 channel 4 sensor (Solenoid)	·Total control (ABS, EBD, TCS, ESP)
	Type		Motor, valve relay intergrated type	
	Operating voltage		10 V ~ 16 V(DC)	
	Operating temperature		-40 ~ 110 °C (-40 ~ 230 °F)	
Warning lamp	Operating voltage		12 V	·ESP Operating Lamp ·ESP Warning Lamp
	Current consumption		80 mA	
Active wheel speed sensor	Supply voltage		DC 4.5 ~ 20V	
	Operating temperature		-40 ~ 150 °C (-40 ~ 302 °F)	
	Output current low		5.9 ~ 8.4 mA	
	Output current high		11.8 ~ 16.8 mA	
	Tone wheel		46 teeth	
	Frequency range		1 ~ 2500 HZ	
	Airgap	Front	0.2 ~ 0.8 mm (0.01 ~ 0.03 in)	Typ.0.7 mm(0.03 in)
		Rear	0.4 ~ 1.0 mm (0.02 ~ 0.04 in)	Typ.0.7 mm(0.03 in)
Steering Wheel Angle Sensor	Operating Voltage		8V ~ 16 V	
	Current Consumption		Max 150 mA	
	Operating Angular velocity		Max ± 780 °/sec	
Yaw-rate & Lateral G sensor	Operating Voltage		8 V ~ 16 V	
	Current Consumption		Max. 120 mA	
	Output Voltage high		4.35 V~ 4.65 V	Typ. 4.5 V
	Output Voltage low		0.35 ~ 0.65 V	Typ. 0.5 V

	Yaw Sensor Operating Range	±100 ° /s	
	G Sensor Operating Range	±1.8 G	
	Reference voltage output	2.464 ~ 2.536 V	Typ. 2.5 V

Service Standard

Item	Standard value
Standard value	
Brake pedal height	174.3 mm (6.86 in) [LHD] 167.5 mm (6.59 in) [RHD]
Brake pedal stroke	135 mm (5.31 in)
Stop lamp switch outer case to pedal stopper clearance	1.0 ~ 2.0 mm (0.04 ~ 0.08 in)
Brake pedal free play	3 ~ 8 mm (0.11 ~ 0.31 in)
Booster push rod to master cylinder piston clearance	0.6 ~ 1.4mm (at 500 mmHg vacuum)
Parking brake lever stroke when lever assembly is pulled with 196N (20Kg, 44lb force)	7 clicks
Front disc brake pad thickness	11 mm (0.43 in.)
Front disc thickness	26 mm (1.02 in)
Rear disc brake pad thickness	10 mm (0.4 in)
Rear disc brake disc thickness	10 mm (0.4 in)
Rear brake lining thickness	3.3 mm (0.13 in)

Tightening Torque

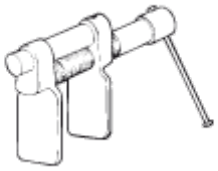
Item	Nm	kgf.m	lb-ft
Master cylinder to booster mounting nut	9.8 ~ 15.7	1.0 ~ 1.6	7.2 ~ 11.6
Brake booster mounting nut	12.7 ~ 15.7	1.3 ~ 1.6	9.4 ~ 11.6
Bleeder screw	6.9 ~ 12.7	0.7 ~ 1.3	5.1 ~ 9.4
Brake tube to HECU(M10 nut)-ABS	12.7 ~ 16.7	1.3 ~ 1.7	9.4 ~ 12.3
Brake tube to HECU(M12 nut)-ESP	18.6 ~ 22.6	1.9 ~ 2.3	13.7 ~ 16.6
Caliper guide rod bolt	21.6 ~ 31.4	2.2 ~ 3.2	15.9 ~ 23.1
Caliper mounting bolt (Front)	78.5 ~ 98.1	8.0 ~ 10.0	57.9 ~ 72.3
Caliper mounting bolt (Rear)	49.0 ~ 58.8	5.0 ~ 6.0	36.2 ~ 43.4
Brake hose to caliper	24.5 ~ 29.4	2.5 ~ 3.0	18.1 ~ 21.7
Brake pedal member assembly bracket mounting nut (cowl side upper mounting)	16.7 ~ 25.5	1.7 ~ 2.6	12.3 ~ 18.8
Brake pedal member bracket to booster mounting nut	12.7 ~ 15.7	1.3 ~ 1.6	9.4 ~ 11.6
Stop lamp switch mounting nut	7.9 ~ 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 mounting bracket bolt	16.7 ~ 25.5	1.7 ~ 2.6	12.3 ~ 18.8
HECU bracket mounting nut	5.9 ~ 9.8	0.6 ~ 1.0	4.3 ~ 7.2
Yaw rate & Lateral G sensor mounting bolt	4.9 ~ 7.8	0.5 ~ 0.8	3.6 ~ 5.8

LUBRICANT

Item	Recommended lubricant	Quantity

Brake fluid	DOT 3 or DOT 4	As required
Brake pedal bushing and brake pedal bolt	Chassis grease	As required
Parking brake shoe and backing plate contact surfaces	Bearing grease	As required
Front caliper guide rod bolt and boot	AI-11P or KL-64Y	0.8 ~ 2.0g
Rear caliper guide rod and boot	AI-11P or KL-64Y	0.8 ~ 2.0g

SPECIAL SERVICE TOOLS

Tool (Number and Name)	Illustration	Use
09581 - 11000 Piston expander		Pushing back of the front disc and rear disc brake piston

TROUBLESHOOTING

PROBLEM SYMPTOMS TABLE

Use the table below to help you find the cause of the problem. The numbers indicate the priority of the like cause of the problem. Check each part in order. If necessary, replace these parts.

Symptom	Suspect Area	Remedy
Lower pedal or spongy pedal	1) Brake system (Fluid leaks) 2) Brake system (Air in) 3) Piston seals (Worn or damaged) 4) Master cylinder (Faulty)	Repair Air bleeding Replace Replace
Brake drag	1) Brake pedal free play (Minimum) 2) Parking brake lever travel (Out of adjustment) 3) Parking brake wire (Sticking) 4) Pad or lining (Cracked or distorted) 5) Piston (Stuck) 6) Piston (Frozen) 7) Return spring (Faulty) 8) Booster system (Vacuum leaks) 9) Master cylinder (Faulty)	Adjust Adjust Repair Replace Replace Replace Replace Replace 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) Pad or lining (Oily) 6) Pad or lining (Glazed) 7) Disc (Scored) 8) Booster system (Vacuum leaks)	Repair Air bleeding Replace Replace Replace Replace Replace Replace
Noise from brake	1) Pad or lining (Cracked or distorted) 2) Installation bolt (Loosen) 3) Disc (Scored) 4) Sliding pin (Worn)	Replace Retighten Replace Replace

English ▼

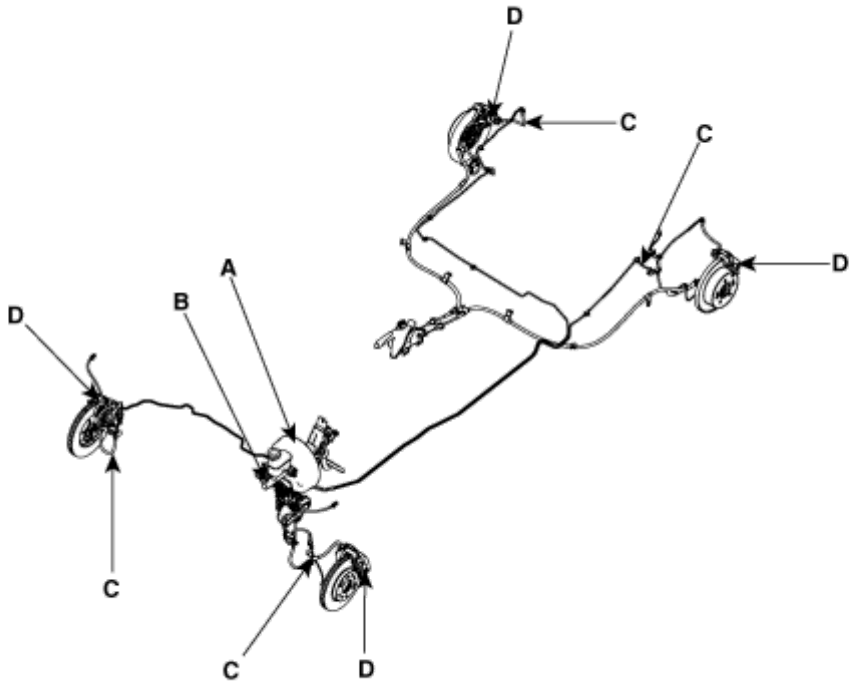
	5) Pad or lining (Dirty) 6) Pad or lining (Glazed) 7) Return spring (Faulty) 8) Brake pad shim (Damage) 9) Shoe hold-down spring (Damage)	C Re Replace Replace Replace
Brake fades	1) Master cylinder	Replace
Brake vibration, pulsation	1) Disc (Excessive thickness variation) 2) Disc (Faulty run-out) 3) Disc (Uneven worn or crack) 4) Pad or lining (Uneven worn and contact) 5) Caliper (Faulty pad sliding)	Replace 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.	

English ▼

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.

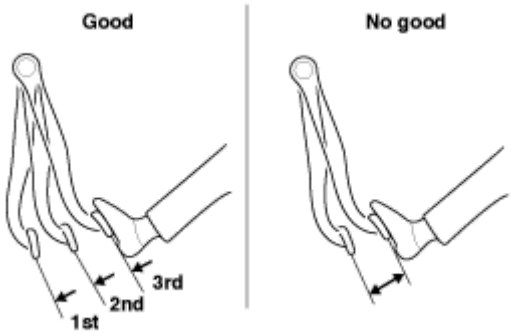


BRAKE BOOSTER OPERATING TEST

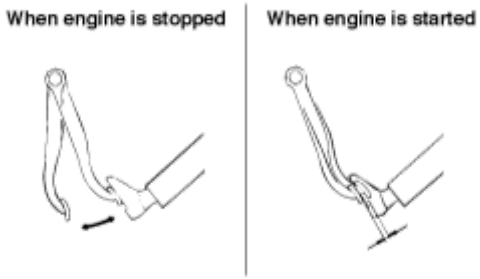
For simple checking of the brake booster operation, carry out the following tests :

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 defective.

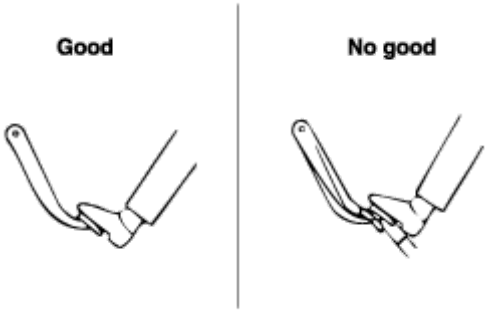
English ▼



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 defective.



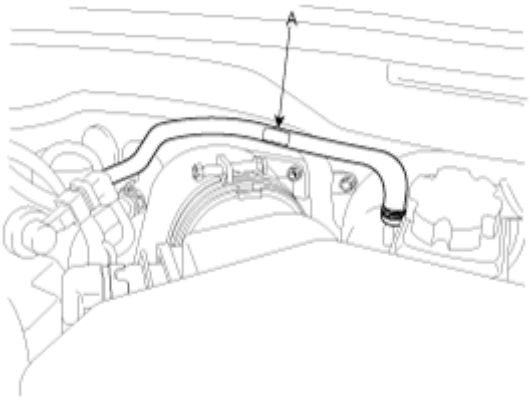
3. With the engine running, step on the brake pedal and then stop the engine. Hold the pedal depressed for 30 seconds. If the pedal height does not change, the booster is in good condition, if the pedal rises, the booster is defective. If the above three tests are okay, the booster performance can be determined as good. Even if one of the above three tests is not okay, check the check valve, vacuum hose and booster for defect.



VACUUM HOSE (CHECK VALVE)

INSPECTION

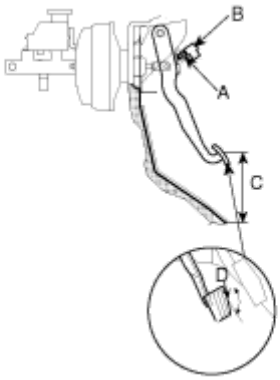
1. Disconnect the brake booster vacuum hose (check valve built in) (A) at the booster .
2. Start the engine and let it idle. There should be vacuum available. If no vacuum is available, the check valve is not working properly. Replace the brake booster vacuum hose and check valve and retest.



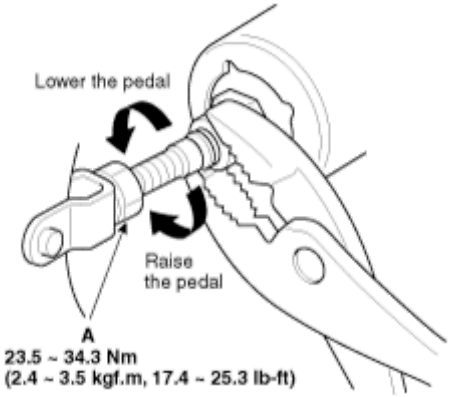
BRAKE PEDAL & BRAKE SWITCH ADJUSTMENT

PEDAL HEIGHT

1. Disconnect the brake switch connector, loosen the brake switch locknut (A), and brake off the brake switch (B) until it is no longer touching the brake pedal.
2. Measure the pedal height (C) from the middle of the left-side center of the pedal pad (D).
   Standard pedal height (on the carpet) :
   174.3 mm (6.86 in) [LHD]
   167.5 mm (6.59 in) [RHD]

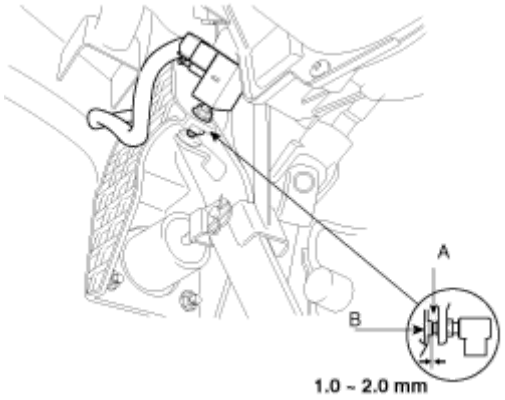


3. Loosen the pushrod locknut (A), and screw the pushrod in or out with pliers until the standard pedal height from the floor is reached. After adjustment, tighten the locknut firmly. Do not adjust the pedal height with the pushrod depressed.



BRAKE SWITCH CLEARANCE

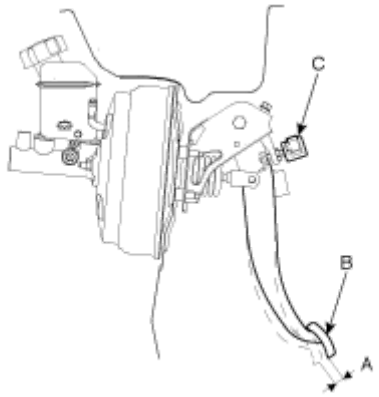
Screw in the stop lamp switch until its switch rod is fully depressed (threded end (A) touching the pad (B) on the pedal arm) then brake off the switch 3/4 turn to make 1.0~2.0 mm(0.04~0.08 in.) of clearance between the stop lamp switch pad. Make sure that the brake lights go off when the pedal is released.



PEDAL FREE PLAY

1. With the engine stopped, depress the brake pedal two or three times. After eliminating the vacuum in the power brake booster, press the pedal(B) down by hand, and confirm that the amount of movement(A) before resistance is met (the free play) is within the standard value.

   Standard value : 3 ~ 8 mm (0.117 - 0.312 in.)



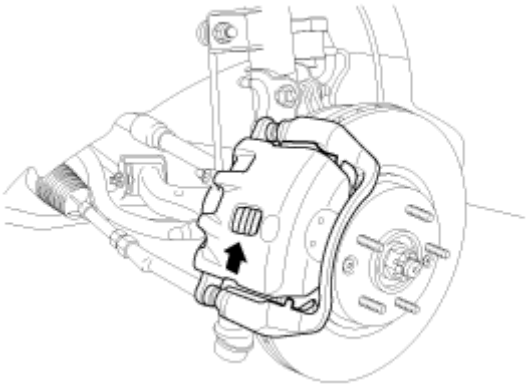
2. If free play does not reach the standard value, check that clearance between the outer case of stop lamp switch(C) and brake pedal is within the standard value. If free play exceeds the standard value, it is probably due to excessive clearance between the clevis pin and brake pedal arm. Check for excessive clearance and replace faulty parts as required.

3. Start the engine, depress the brake pedal with approximately 120kg(1176.8N, 264.5 lb) of force, and check for oil leakage in the master cylinder, brake line and each connecting part. Repair the faulty parts as required.

INSPECTION OF FRONT DISC BRAKE PAD

1. Check the brake pad thickness through the caliper body inspection hole.

   Pad thickness
   Standard value : 11.0 mm (0.43 in.)
   Service limit : 2.0 mm (0.0787 in.)



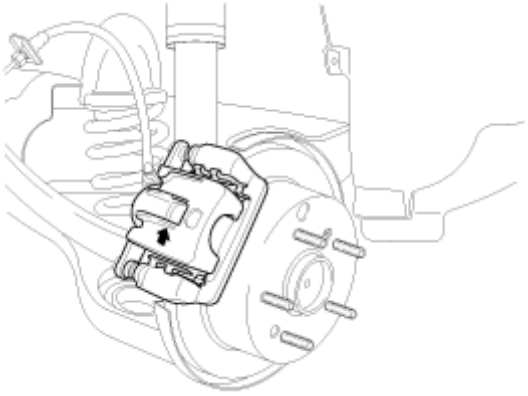
CAUTION

- If the pad lining thickness is out of specification, left and right pads must be replaced as a complete set.
- When the thickness difference between the left pad and right pad is large, check the sliding condition of the piston and the guide rod.

INSPECTION OF REAR DISC BRAKE PAD

1. Check the brake pad thickness through the caliper body inspection hole.

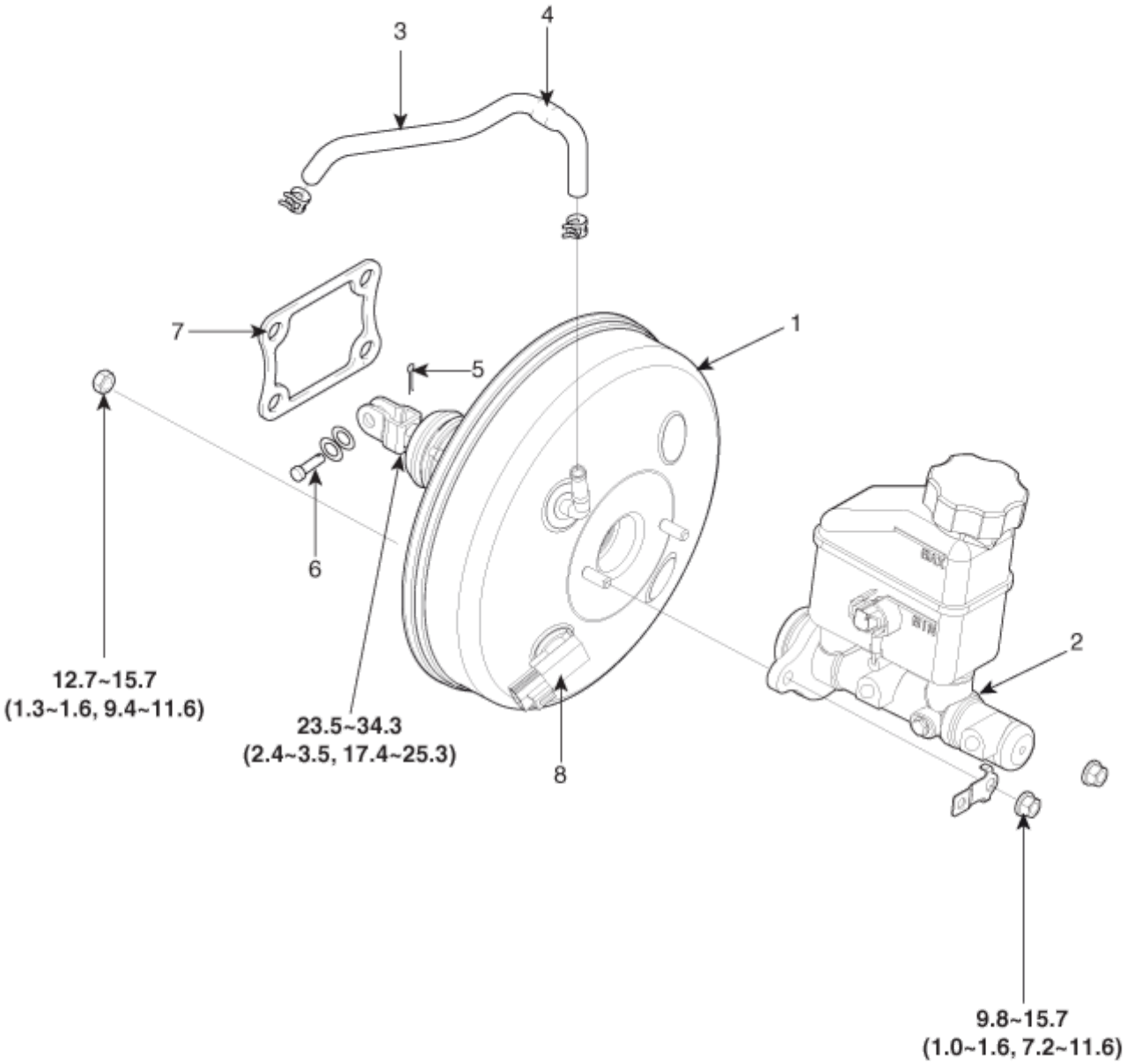
   Pad thickness
   Standard value : 10.0 mm (0.39 in.)
   Service limit : 2.0 mm (0.0787 in.)



CAUTION

- If the pad thickness is out of specification, left and right pads must be replaced as a complete set.
- When the thickness difference between the left pad and right pad is large, check the sliding condition of the piston and the guide rod.

COMPONENTS

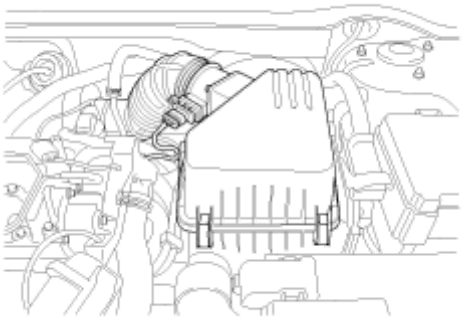


Torque : N.m (kgf.m, lb-ft)

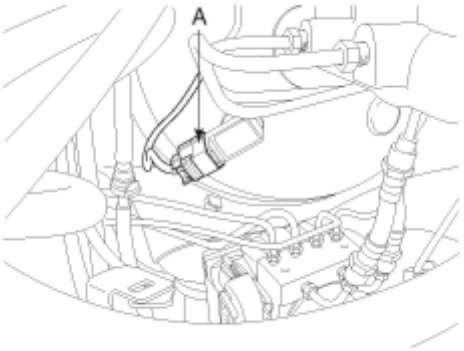
1. Brake booster	5. Snap pin
2. Master cylinder	6. Clevis pin
3. Vaccum hose	7. Seal
4. Check valve	8. Brake booster vacuum pressure sensor

REMOVAL

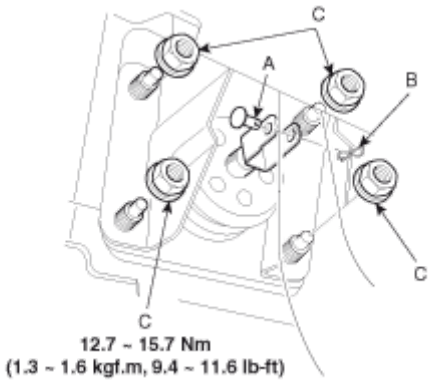
1. Remove air cleaner assembly.



2. Disconnect the vacuum hose from the brake booster.
3. Remove the master cylinder.
   (Refer to "Master cylinder - Removal")
4. Remove the brake booster vacuum pressure sensor connector.

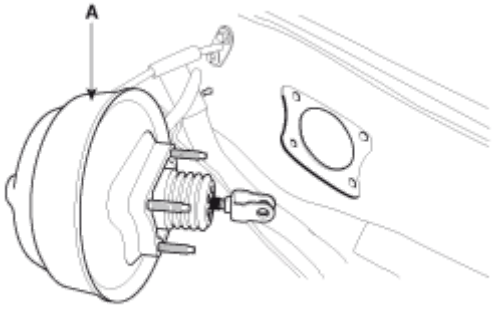


5. Remove the clevis pin (A) and snap pin (B).



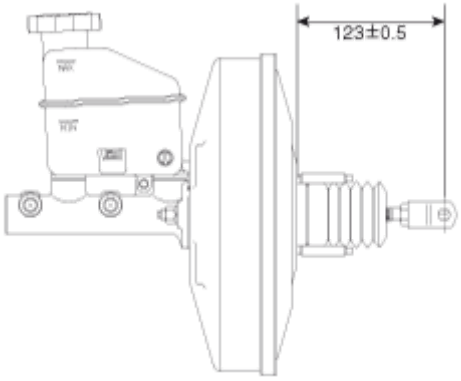
6. Remove the four booster mounting nuts (C).
7. Remove the brake booster (A) from the engine compartment.

English ▼

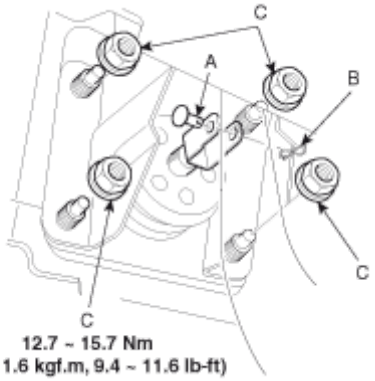


INSTALLATION

1. Adjust push rod length of the booster, and then install the seal on the booster assembly.
   Standard length(A) : 123 ± 0.5 mm (4.84 ± 0.02 in)



2. Insert the booster and tighten the nuts (C).



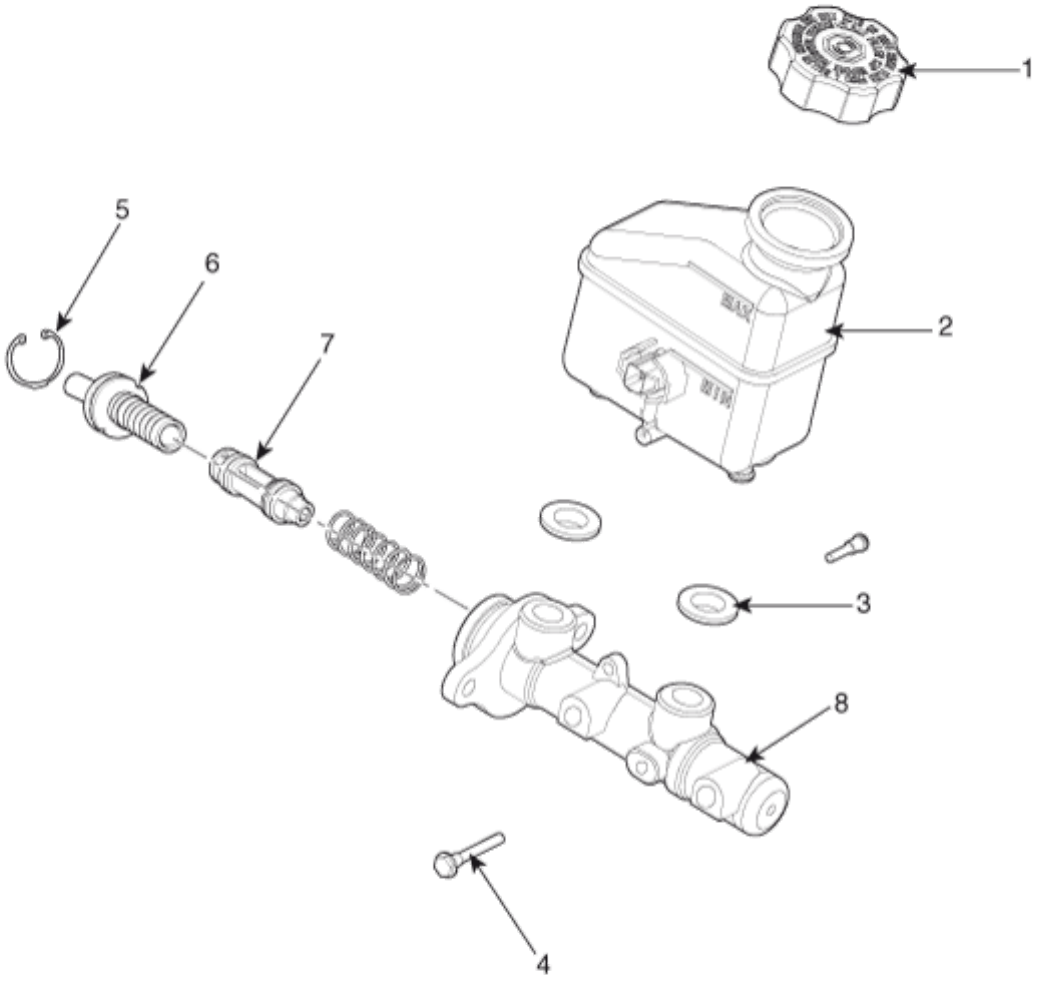
3. Connect the booster push rod and brake pedal with a clevis pin (A) and install a snap pin (B) to the clevis pin (A).

> **⚠ CAUTION**
>
> Grease the pin before installing the snap pin.
> Always use a new snap pin.

4. Install the master cylinder, then install the brake tubes to the master cylinder.
5. Install the brake booster vacuum pressure sensor connector.
6. Connect the vacuum hose to the brake booster.

7. After filling the brake reservoir with brake fluid, bleed the system.
8. Check for fluid leakage.
9. Check and adjust the brake pedal for proper operation.

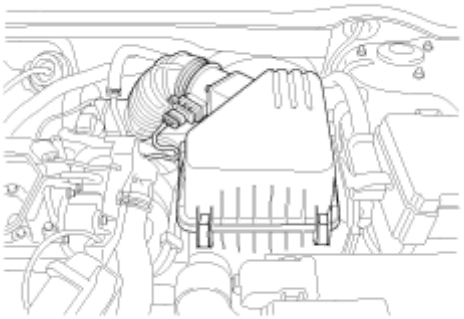
COMPONENTS



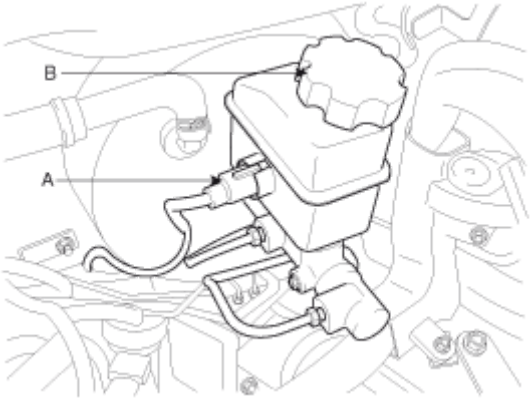
1. Reservoir cap	5. Retainer
2. Reservoir	6. Primary piston assembly
3. Grommet	7. Secondary piston assembly
4. Cylinder pin	8. Master cylinder body

REMOVAL

1. Remove air cleaner assembly.



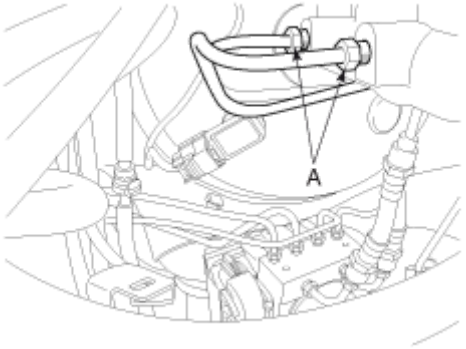
2. Disconnect the brake fluid level switch connector (A), and remove the reservoir cap (B).



3. Remove the brake fluid from the master cylinder reservoir with a syringe.

> **NOTICE**
>
> 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.

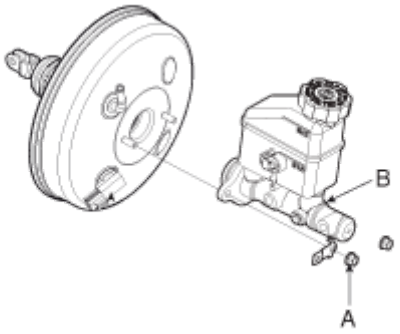
4. Disconnect the brake lines (A) from the master cylinder. To prevent spills, cover the hose joints with rags or shop towels.



5. Remove the master cylinder mounting nuts (A) and washers.
6. Remove the master cylinder (B) from the brake booster. Be careful not to bend or damage the brake lines when removing

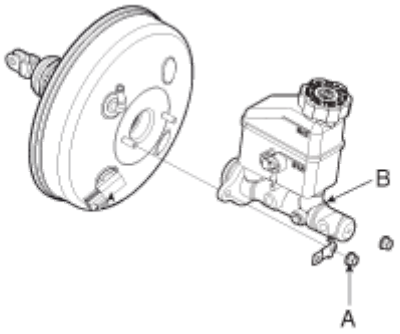
the master cylinder.

English ▼

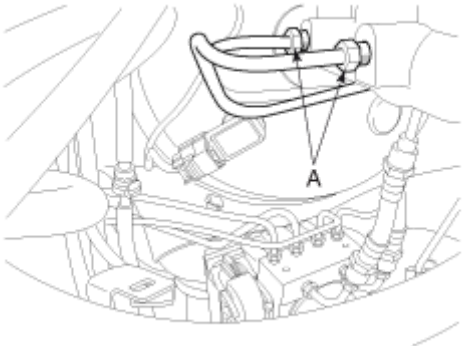


INSTALLATION

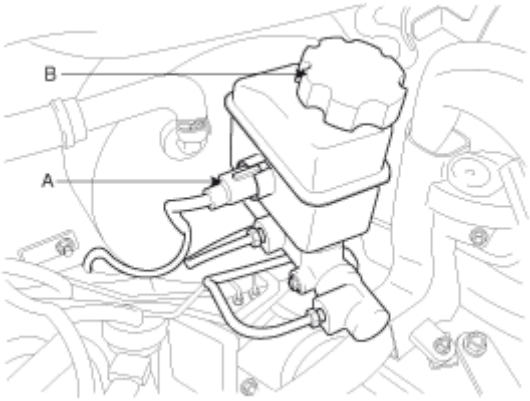
1. Install the master cylinder (B) to the brake booster.
2. Install the master cylinder mounting nuts (A) and washers.
   Tightening torque :
   9.8~15.7 N.m(1.0~1.6kgf.m, 7.2~11.6 lb-ft)



3. Connect the brake lines (A) to the master cylinder.
   Tightening torque :
   12.7~16.7 N.m (1.3~1.7kgf.m, 9.4~12.3lb-ft) M10
   18.6~22.6 N.m (1.9~2.3kgf.m, 13.7~18.6lb-ft) M12



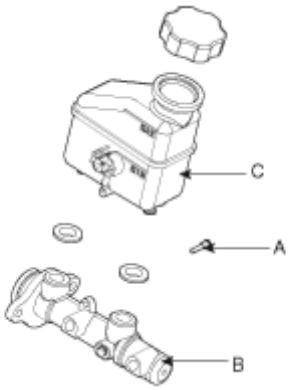
4. Connect the brake fluid level switch connector (A).



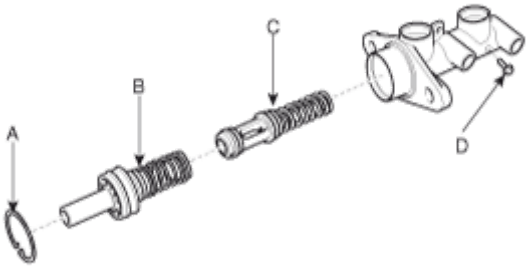
5. Install the air cleaner assembly.
6. Refill the master cylinder reservoir to the MAX line.
7. Bleed the brake system. (Refer to "Bleeding of brake system")

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 the 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).



NOTICE

Do not disassemble the primary and secondary piston assembly.

INSPECTION

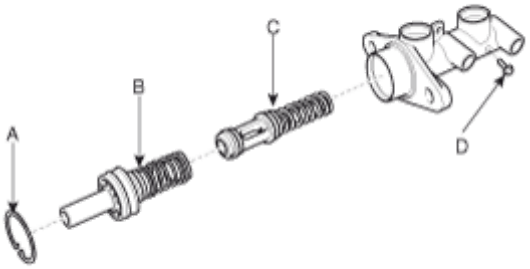
1. Check the master cylinder bore for rust or scratch.
2. Check the master cylinder for wear or damage. If necessary, clean or replace the cylinder.

⚠ CAUTION

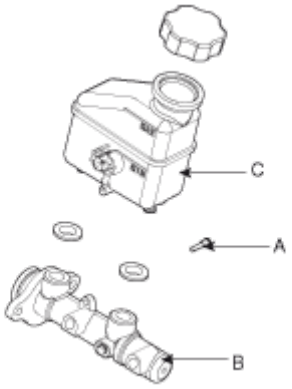
1) If the cylinder bore is damaged, replace the master cylinder assembly.
2) Wash the contaminated parts in alcohol.

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).

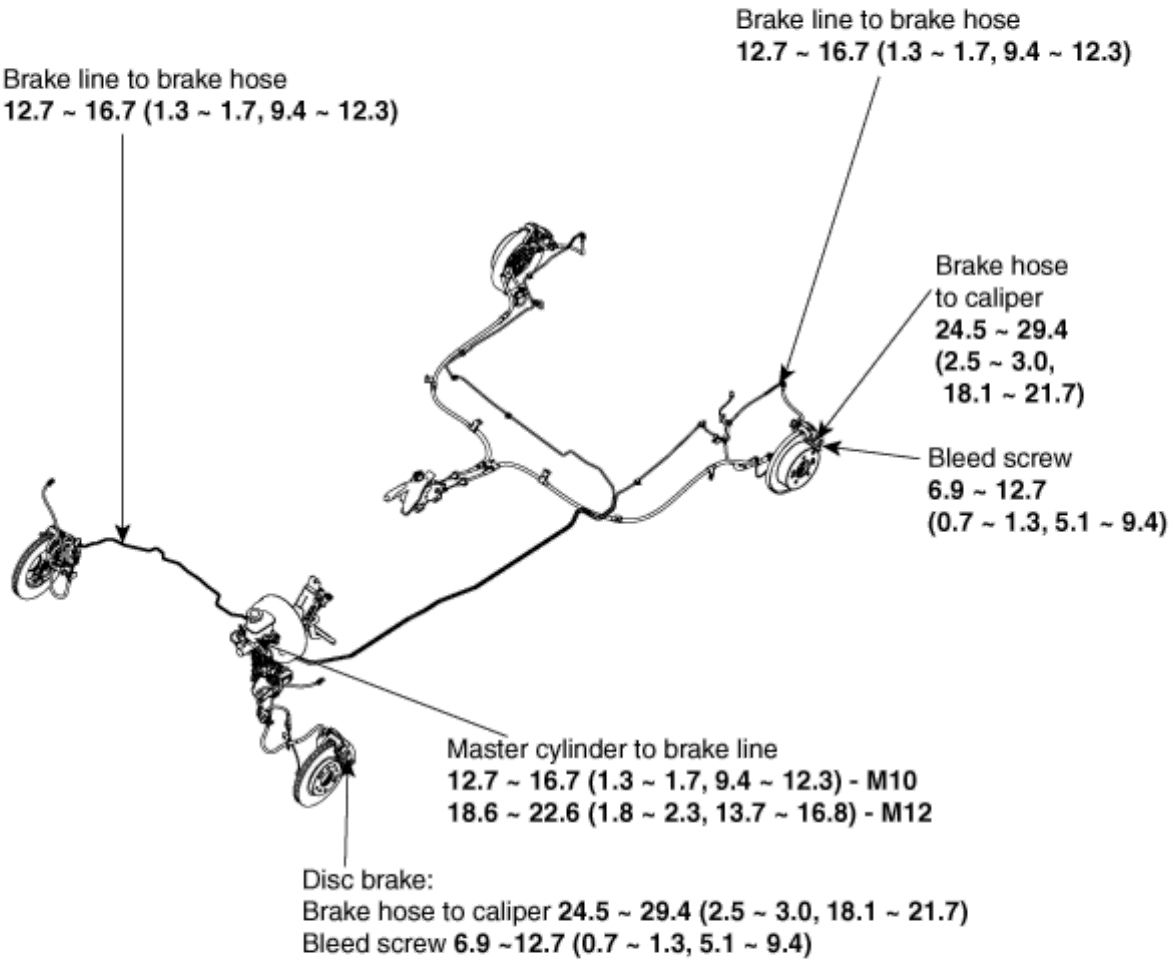


4. Install the primary piston assembly (B) and the retainer ring (A).
5. Mount two grommets (D).
6. Install the reservoir (C) to the master cylinder (B) and tighten the screw (A).



English ▼

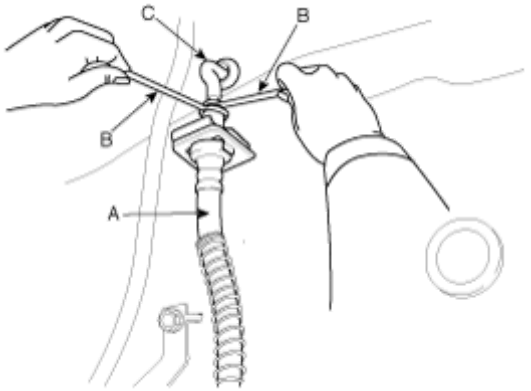
COMPONENTS



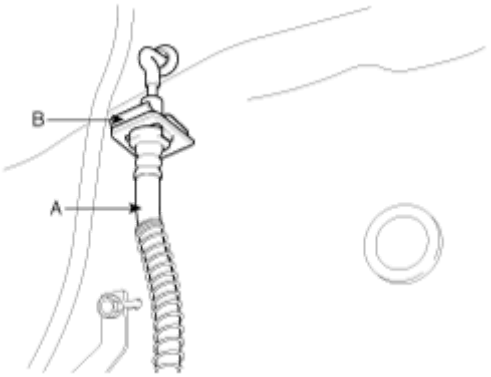
TORQUE : Nm (kgf.m, lb-ft)

REMOVAL

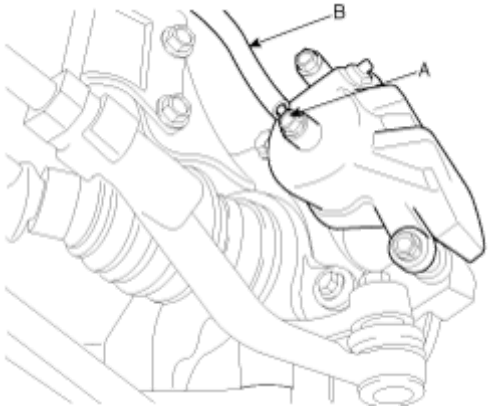
1. Disconnect the brake hose (C) from the brake line (A) using a flare-nut wrench (B).



2. Remove the brake hose clip (B), and then remove the brake hose (A).

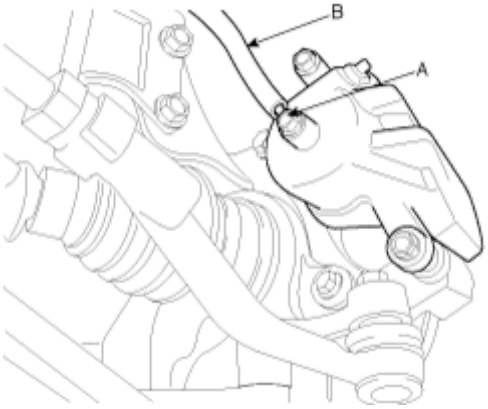


3. Remove the connector bolt (A) from the caliper, and disconnect the brake hose (B) from the caliper.

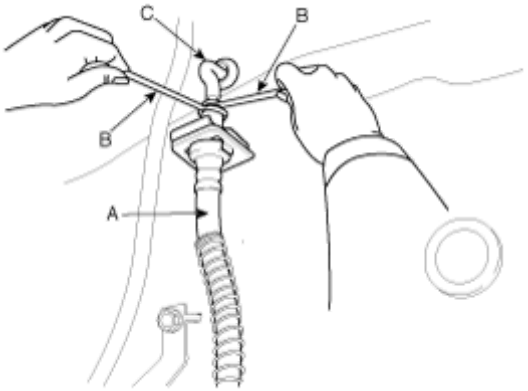


INSTALLATION

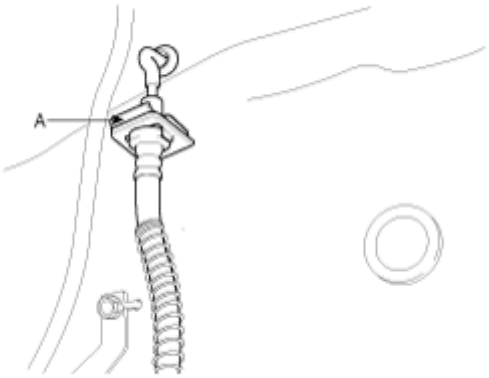
1. Install a brake hose (B) on the caliper with tightening brake hose bolt (A) and washer.
   Tightening torque : N.m (kgf.m, lb-ft)
   24.5 ~ 29.4 (2.5 ~ 3.0, 18.1 ~ 21.7)



2. Connect the brake hose (A) to the brake line (C) using a flare-nut wrench (B).



3. Install the brake hose clip (A) to the brake hose bracket.



4. After installing the brake hose, bleed the brake system.

⚠ CAUTION

- Check the brake hoses for interference and twisting.
- Check the brake hose and line joint for leaks, and tighten if necessary.

INSPECTION

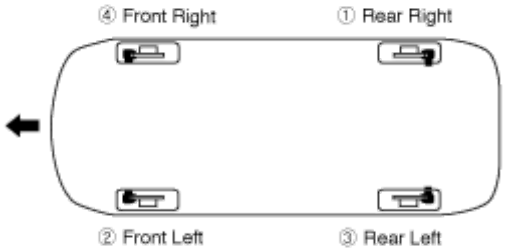
1. Check the brake tubes for cracks, crimps and corrosion.
2. Check the brake hoses for cracks, damaged and oil leakage.
3. Check the brake tube flare nuts for damage and oil leakage.

BRAKE SYSTEM BLEEDING

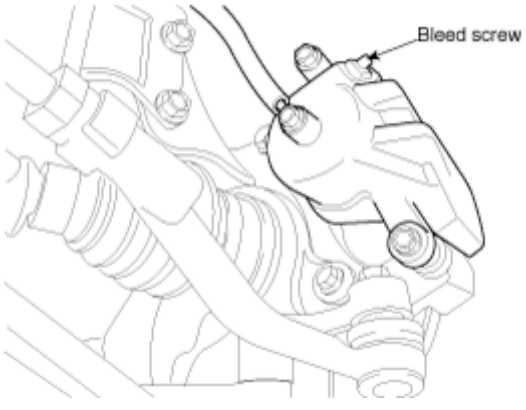
NOTICE

- Do not reuse the drained fluid.
- Always use Genuine DOT3/DOT4 or Brake Fluid. Using a non-Genuine DOT3/DOT4 or brake fluid can cause corrosion and decrease the life of the system.
- Make sure no dirt of 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.

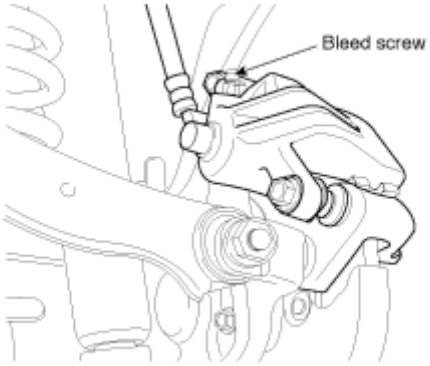
1. Make sure the brake fluid level in the reservoir is at the MAX (upper) level line.
2. Have someone slowly pump the brake pedal several times, and then apply steady pressure.
3. Loosen the right-rear brake bleed screw to allow air to escape from the system. Then tighten the bleed screw securely.
4. Repeat the procedure for each wheel in the sequence shown below until air bubbles no longer appear in the fluid.
5. Refill the master cylinder reservoir to the MAX (upper) level line.



FRONT DISC BRAKE :

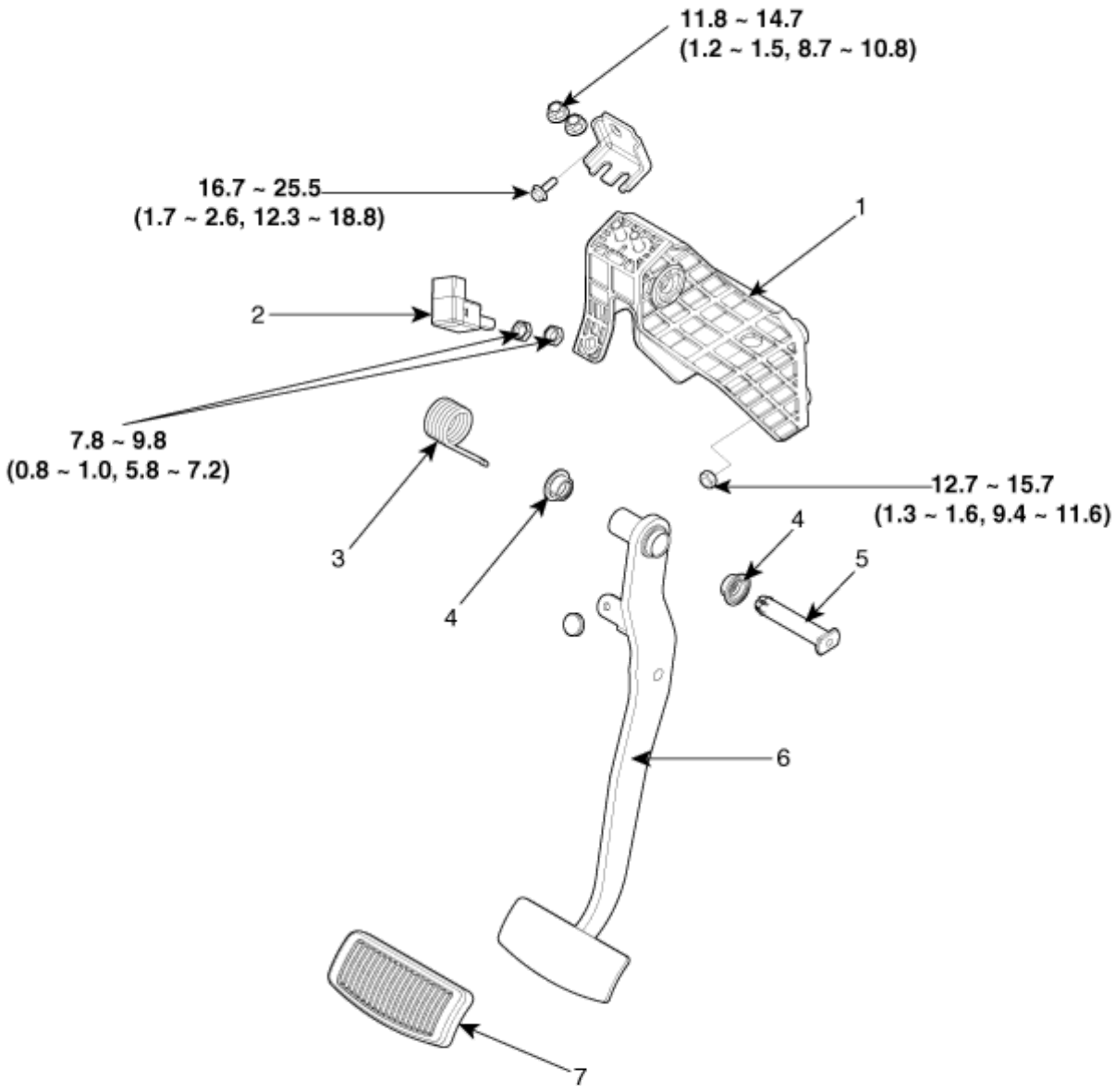


REAR DISC BRAKE



COMPONENTS(1)

[LHD] - COMMON PEDAL



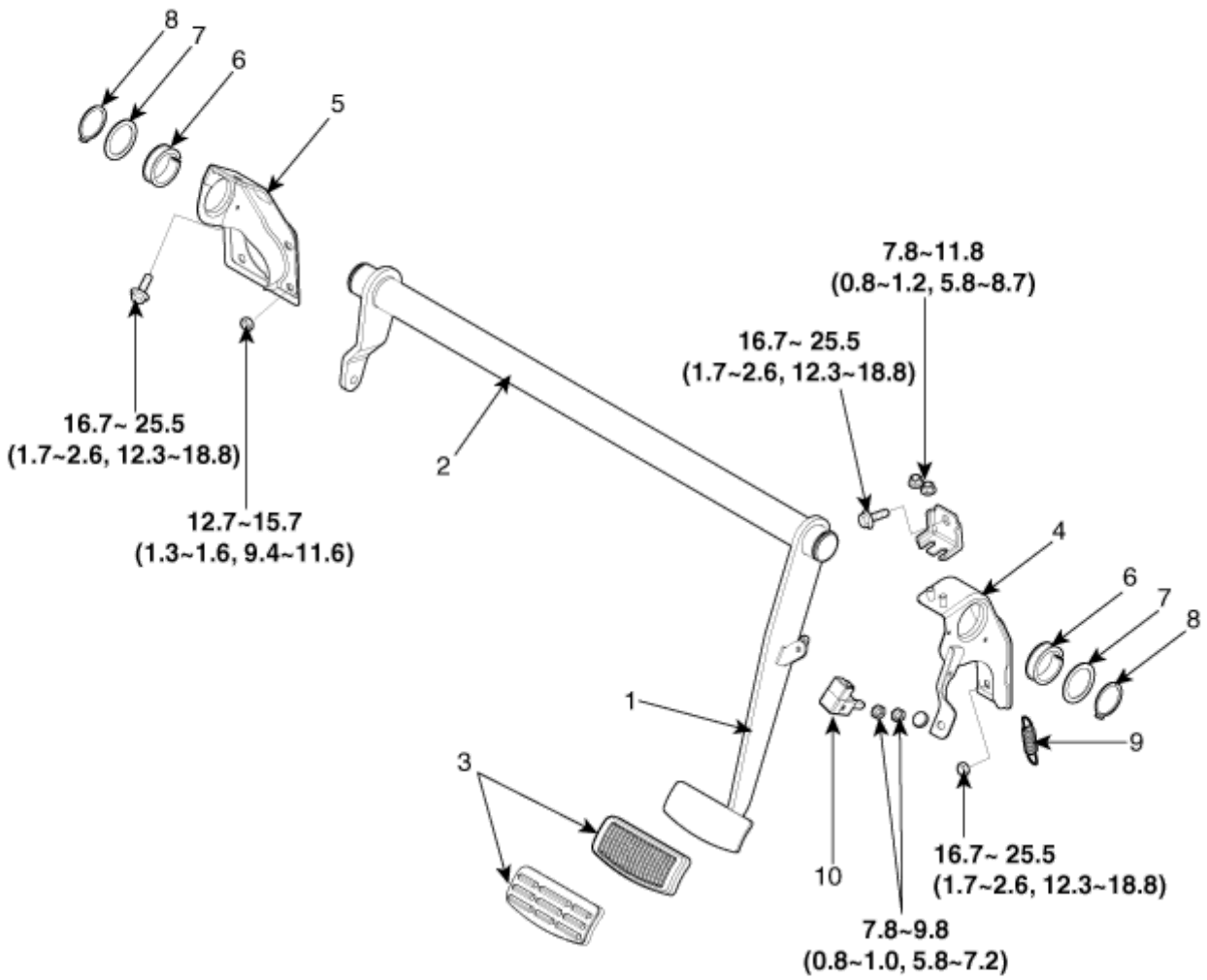
TORQUE : Nm (kgf.m, lb-ft)

1. Member assembly bracket
2. Stop lamp switch
3. Return spring
4. Bushing
5. Brake pedal

COMPONENTS(2)

English ▼

[RHD]

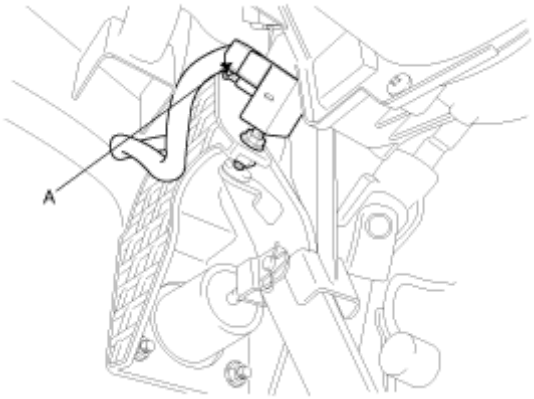


TORQUE : kgf.m (Nm, lb-ft)

1. Brake pedal arm
2. Pipe
3. Pedal pad
4. Pedal support bracket
5. Support bracket
6. Bushing
7. Washer
8. Snap ring
9. Spring
10. Stop lamp switch

REMOVAL

1. Remove the lower crash pad.(Refer to BD "crash pad")
2. Pull down steering column shaft after removing 4 bolts.
3. Remove the stop lamp switch connector (A).



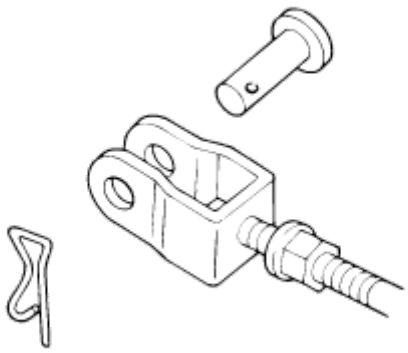
4. Remove the clevis pin and snap pin.
5. Remove the brake pedal member assembly mounting nuts and then remove the brake pedal assembly.

INSTALLATION

1. Installation is the reverse of removal.
   Grease : LiG-2

> **CAUTION**
>
> Coat the inner surface of the bushings with the specified grease.

2. Before inserting the pin, apply the specified grease to the joint pin.



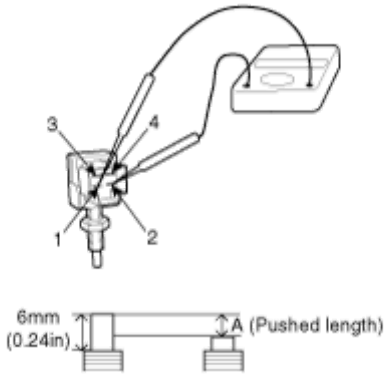
3. Adjust the brake pedal height and free play.(Refer to "Brake pedal & stop lamp switch adjustment")
4. Install the stop lamp switch.

INSPECTION

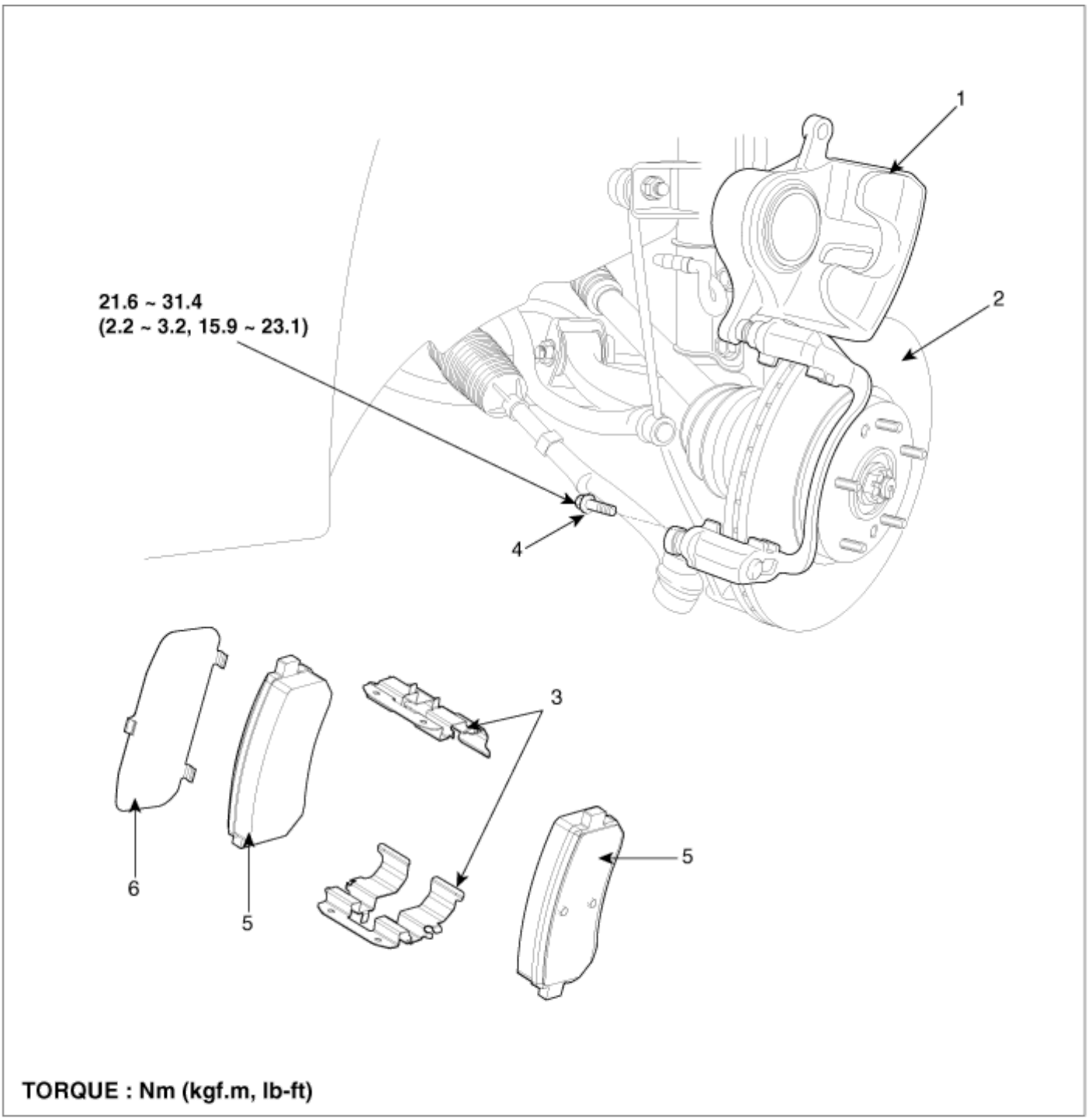
English ▼

1. Check the bushing for wear.
2. Check the brake pedal for bending or twisting
3. Check all parts for crack and wear.
4. Check the stop lamp switch.
   (1) Connect a circuit tester to the connector (1-2 terminals) of stop lamp switch, and check whether or not there is continuity when the switch rod 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 the switch rod is pushed.

Item	Terminal	Pushed length(A)	Continuity
Stop lamp switch	1-2	2.3±0.25mm (0.09±0.01in)	ON→OFF
Cruise control switch	3-4	1.8±0.25mm (0.07±0.01in)	OFF→ON



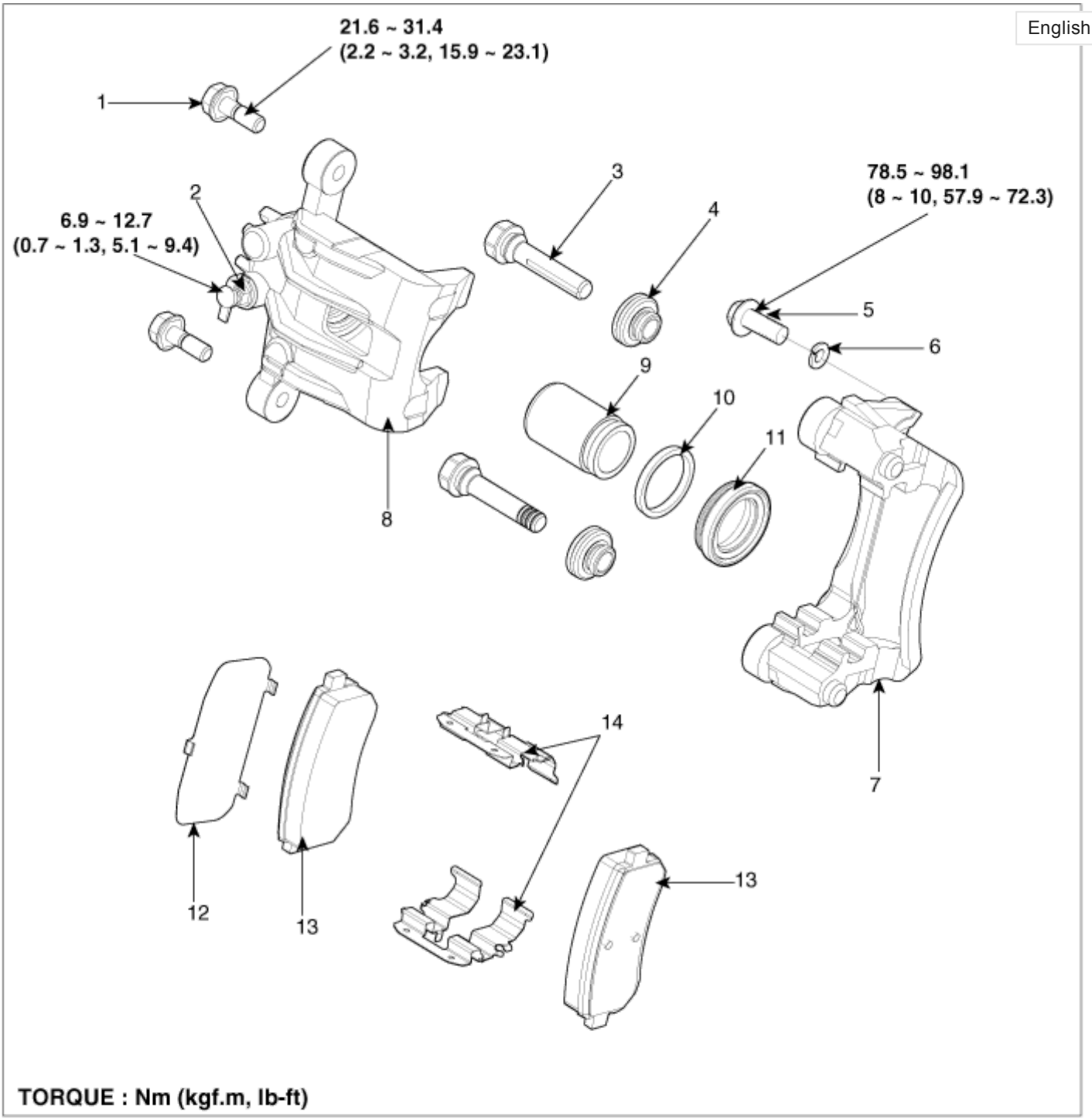
COMPONENTS(1)



1. Brake caliper
2. Brake disc
3. Pad spring
4. Guide rod bolt
5. Brake pad
6. Brake pad shim

COMPONENTS(2)

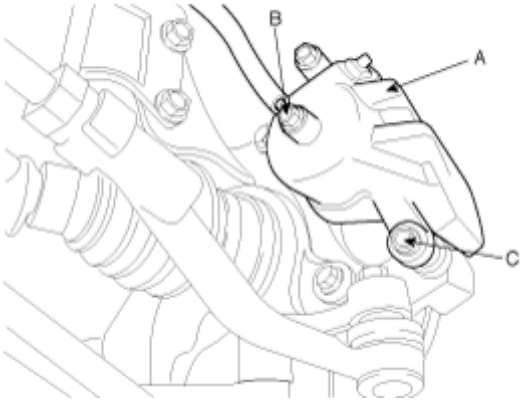
English ▼



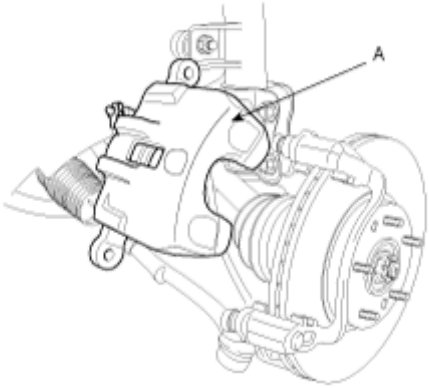
1. Guide rod bolt
2. Bleeder screw
3. Guide rod
4. Boot
5. Caliper mounting bolt
6. Washer
7. Caliper carrier
8. Caliper housing
9. Piston
10. Piston seal
11. Piston boot
12. Shim
13. Brake pad
14. Pad spring

REMOVAL

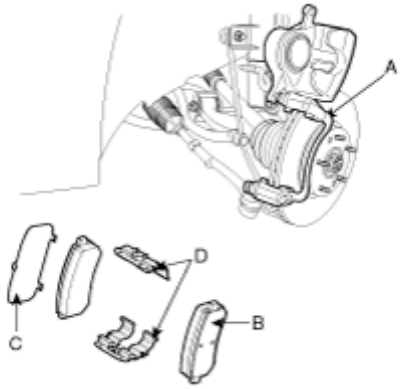
1. Remove the brake hose bolt (B) and the guide rod bolts (C) from the caliper assembly (A).



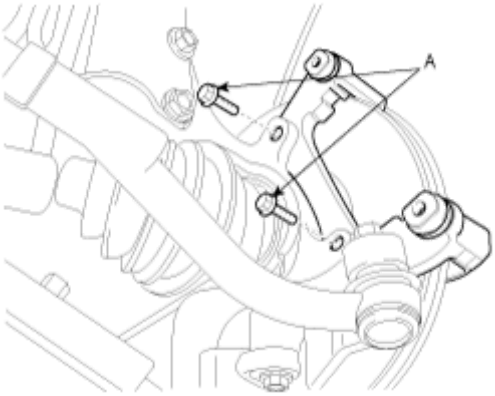
2. Remove the caliper assembly (A).

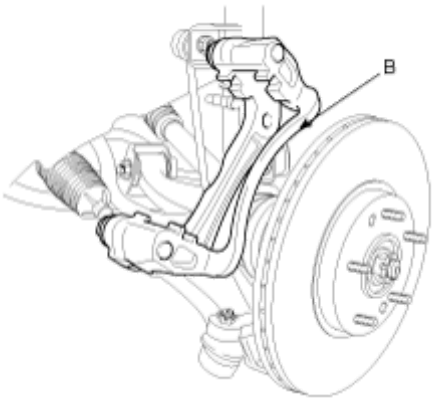


3. Remove the pads (B), the pad shims (C) and the pad springs (D) from the caliper carrier (A).

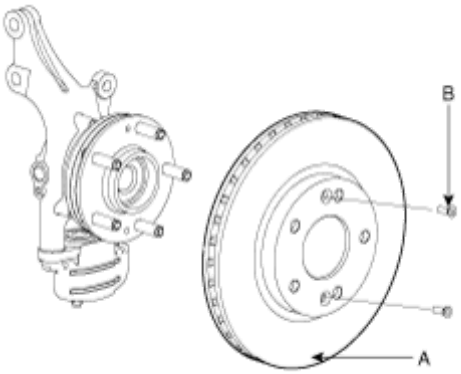


4. Remove the caliper carrier (B) and the caliper mounting bolts (A).



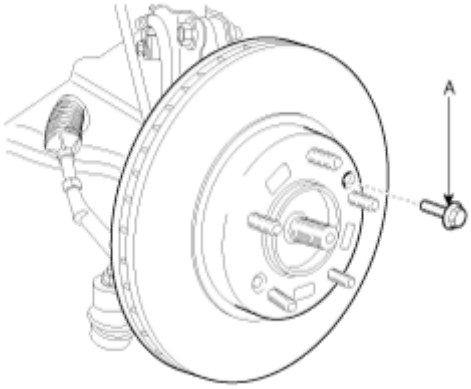


5. Remove the brake disc (A) and the screw (B).



NOTICE

Remove the brake disc from hub using M8 bolt (A) if the brake disc has been seized with the hub due to corrosion or overheat.
Be careful not to use the hammer. The disc can be damaged if you remove the disc from the hub by hammer.



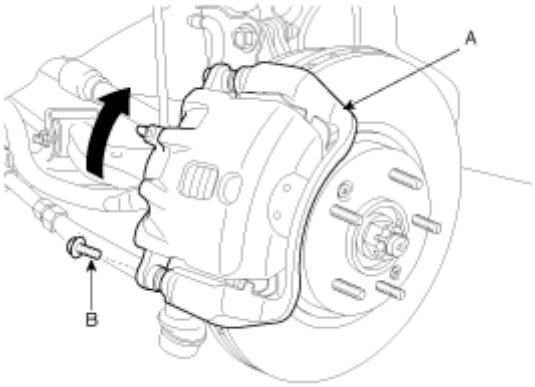
REPLACEMENT

CAUTION

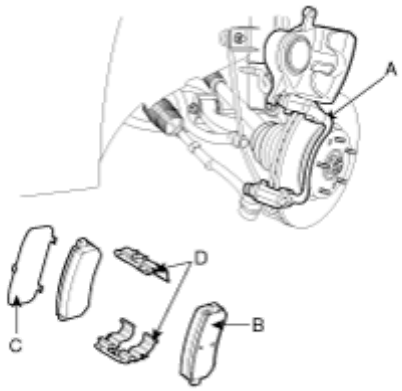
Frequent inhalation of brake pad dust, regardless of material composition, could be hazardous to your health.

- Avoid breathing dust particles.
- Never use on air hose or brush to clean brake assemblies.

1. Remove guide rod bolt (B) and raise the caliper assembly (A).

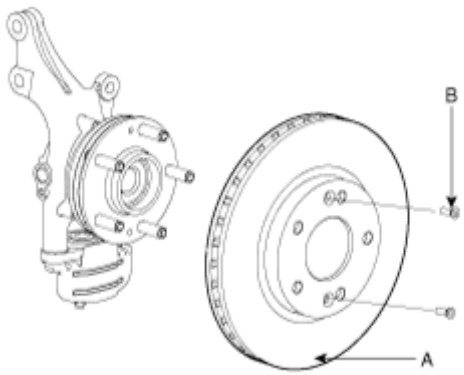


2. Remove the pads (B), the pad shims (C) and the pad springs (D) from the caliper carrier (A).



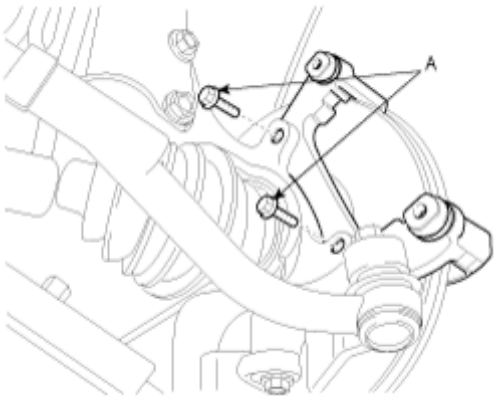
INSTALLATION

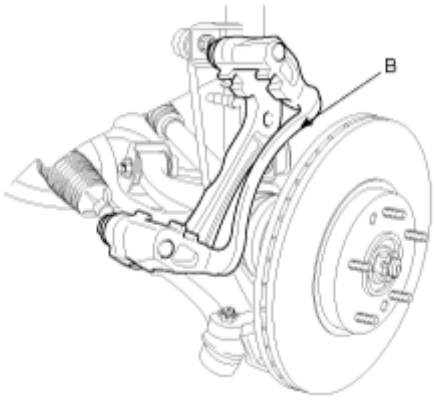
1. Install the brake disc (A) and tighten the screw (B).
   Tightening torque : N.m (kgf.m, lb-ft)
   4.9~5.9 (0.5~0.6, 3.6~4.3)



2. Install the caliper carrier (B) and tighten the caliper mounting bolts (A).

   Tightening torque : N.m (kgf.m, lb-ft)
   78.5~98.1 (8.0~10.0, 57.9~72.3)

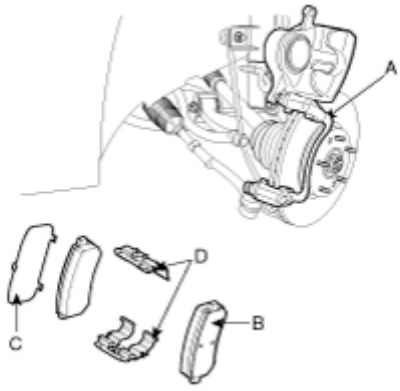




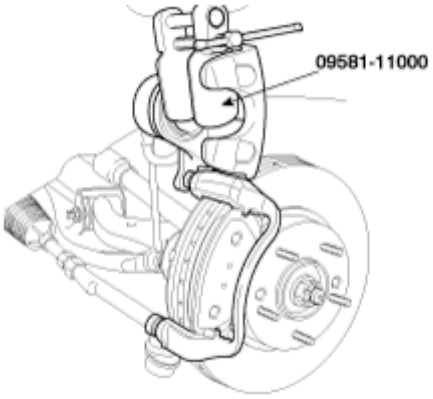
3. Install the pad springs (D) to the caliper carrier (A).

4. Install the brake pads (B) and pad shims (C) on the pad springs correctly. Install the pad with the wear indicator on the inside. If you are reusing the pads, always reinstall the brake pads in their original positions to prevent a momentary loss of braking efficiency.

> **NOTICE**
>
> Check the foreign material at the pad shims (A) and the back of the pads (B).
> Contaminated brake discs or pads reduce stopping ability. Keep grease off the discs and pads.

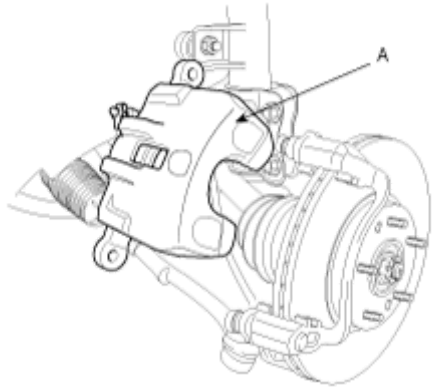


5. Push in the piston using the SST(09581-11000) so that the caliper will fit over the pads. Make sure that the piston boot is in position to prevent damaging it when installing the caliper.

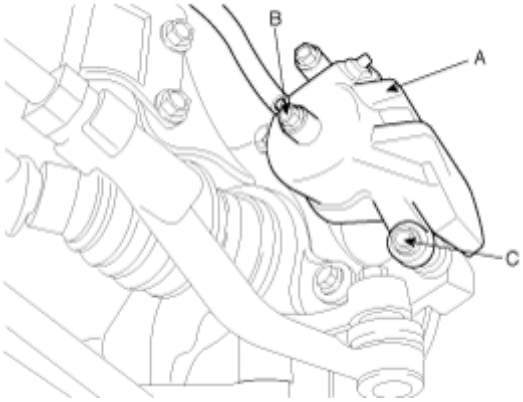


6. Install the caliper assembly(A).

> **NOTICE**
>
> Be careful not to damage the piston pin boot.



7. Install the brake hose bolt (B) and the guide rod bolts (C) to the caliper assembly (A).
   Tightening torque : N.m (kgf.m, lb-ft)
   Bolt (B) : 24.5~29.4 (2.5~3.0, 18.1~21.7)
   Bolt (C) : 21.6~31.4 (2.2~3.2, 15.9~23.1)



8. Refill the master cylinder reservoir to the MAX line.
9. Bleed the brake system. (Refer to "Bleeding of brake system")
10. Depress the brake pedal several times to make sure the brakes work, then test-drive.

> **NOTICE**
>
> Engagement of the brake may require a greater pedal stroke immediately after the brake pads have been replaced as a set. Several applications of the brake will restore the normal pedal stroke.

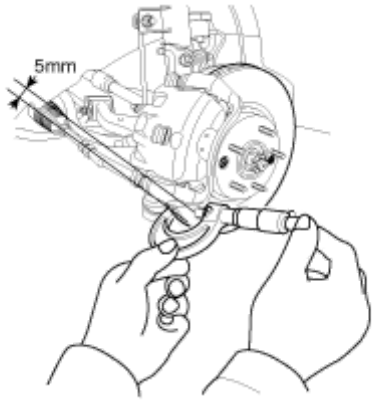
11. After installation, check for leaks at hose and line joints or connections, and retighten if necessary.

INSPECTION

FRONT BRAKE DISC THICKNESS CHECK

1. Remove all rust and contamination from the disc surface, and then measure the disc thickness at 8 positions at least.

   Front brake disc thickness
   Standard value : 26.0 mm (1.02 in)
   Limit : 24.0 mm (0.94 in)



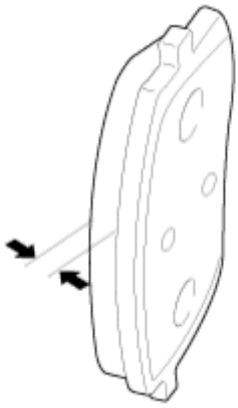
2. Thickness variation should not exceed 0.005 mm (0.0002in) (circumference) and 0.01 mm(0.0004 in) (radius) at any directions.

3. If wear exceeds the limit, replace the discs and pad assemblies for left and right of the vehicle.

FRONT BRAKE PAD CHECK

1. Check the pad wear. Measure the pad thickness. replace it if it is less than the specified value.

   Pad thickness
   Standard value : 11.0 mm (0.43 in)
   Service limit : 2.0 mm (0.0787 in)

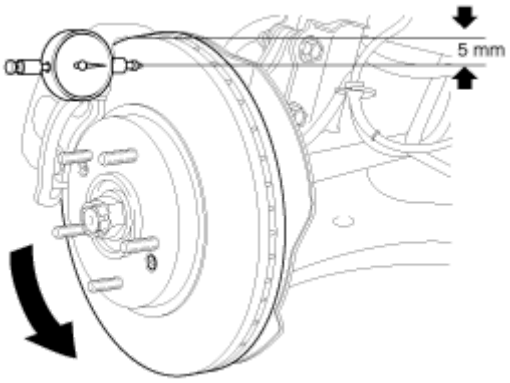


2. Check that grease is applied, to sliding contact points and the pad and backing metal for damage.

FRONT BRAKE DISC RUN OUT CHECK

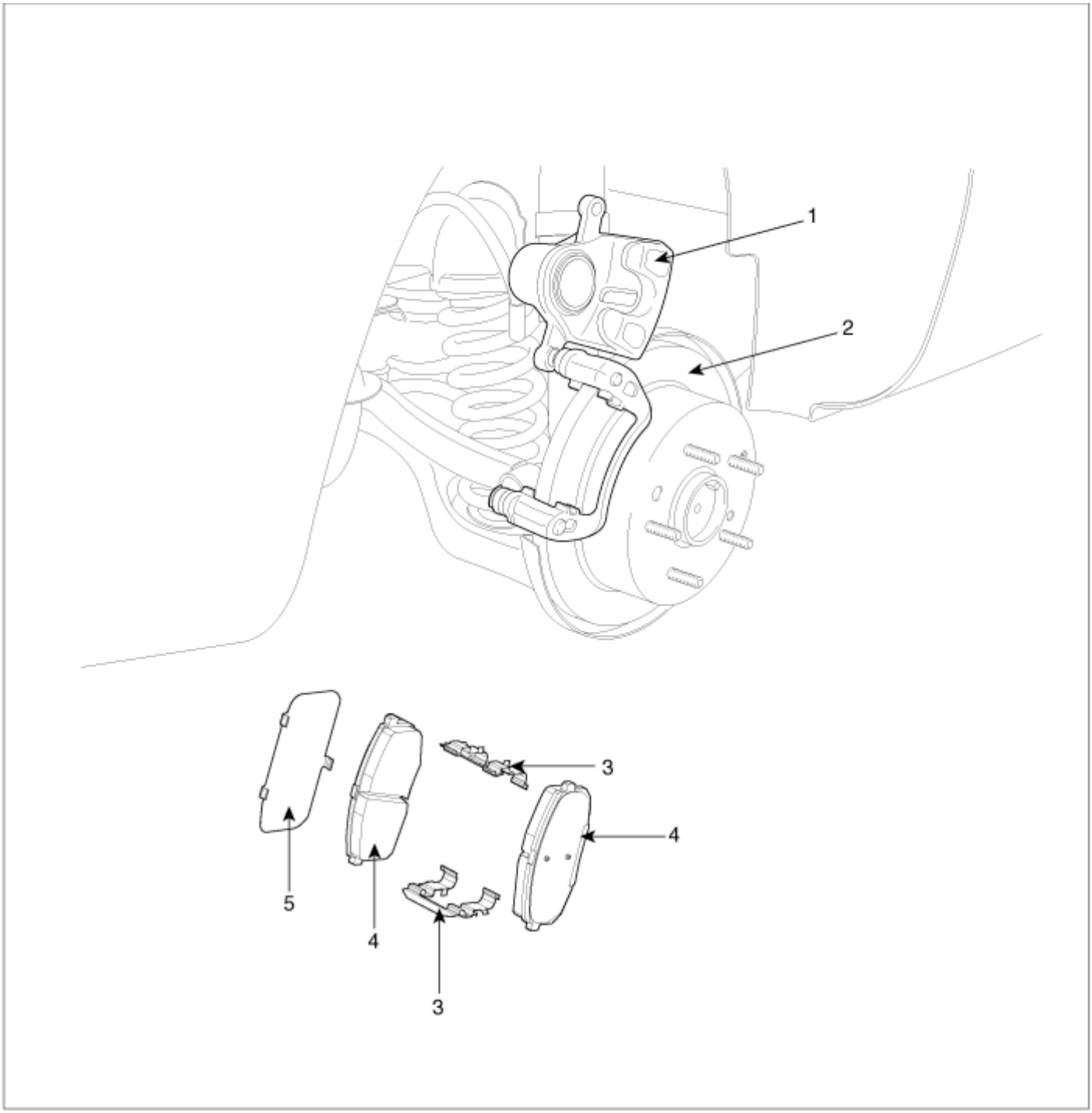
1. Place a dial gauge about 5mm (0.2 in) from the outer circumference of the brake disc, and measure the run out of the disc.

   Brake disc run out
   Limit : 0.04 mm (0.0016 in.) or less



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.

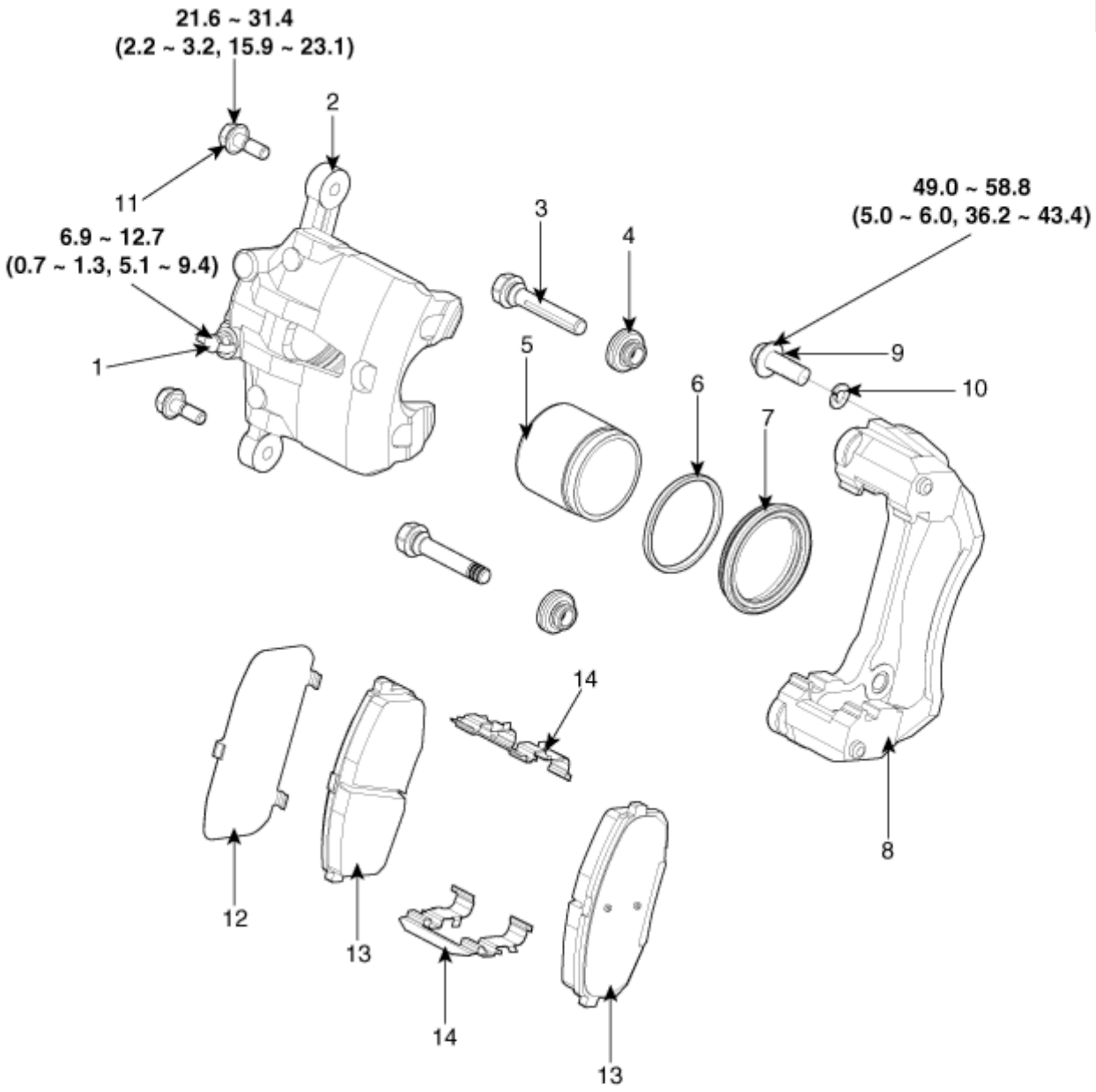
COMPONENT LOCATION



1. Brake caliper
2. Brake disc
3. Pad spring
4. Brake pad
5. Brake pad shim

COMPONENTS

English ▼

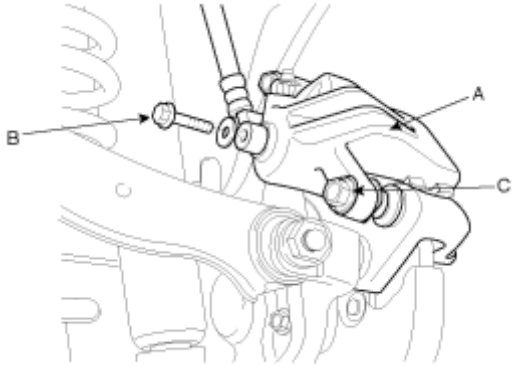


TORQUE : Nm (kgf.m, lb-ft)

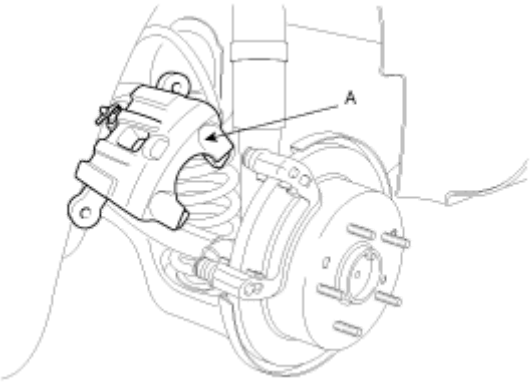
1. Bleeder screw
2. Caliper housing
3. Guide rod
4. Boot
5. Piston
6. Piston seal
7. Piston boot
8. Caliper carrier
9. Caliper mounting bolt
10. Washer
11. Guide rod bolt
12. Inner shim
13. Brake Pad
14. Pad spring

REMOVAL

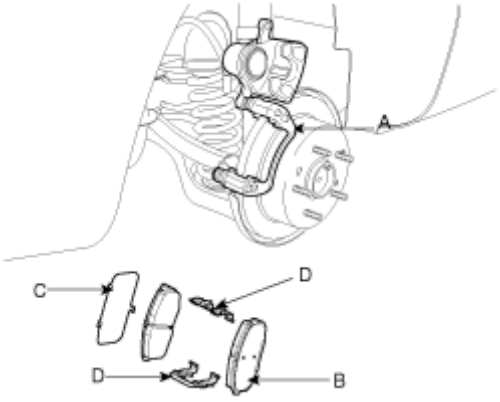
1. Remove the brake hose bolt (B) and the guide rod bolts (C) from the caliper assembly (A).



2. Remove the caliper assembly (A).

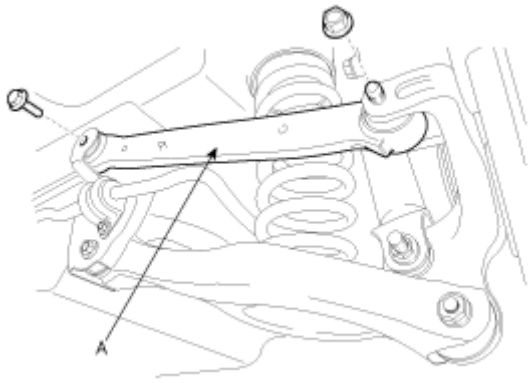


3. Remove the pads (B), the pad shims (C) and the pad springs (D) from the caliper carrier (A).

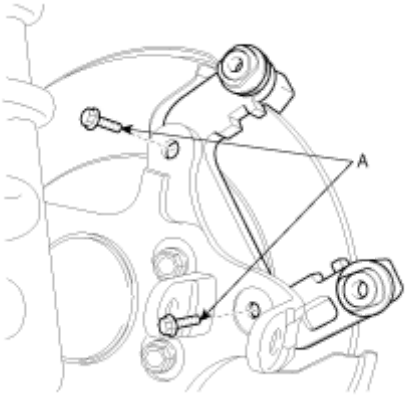


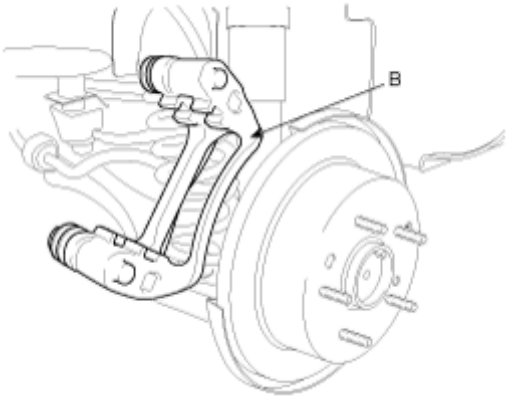
4. Remove the rear upper arm (A).

English ▼

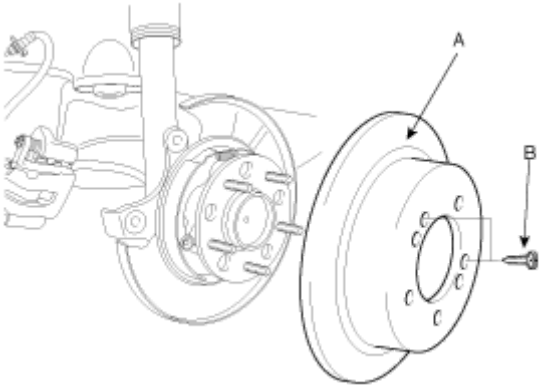


5. Remove the caliper carrier (B) and the caliper mounting bolts (A).



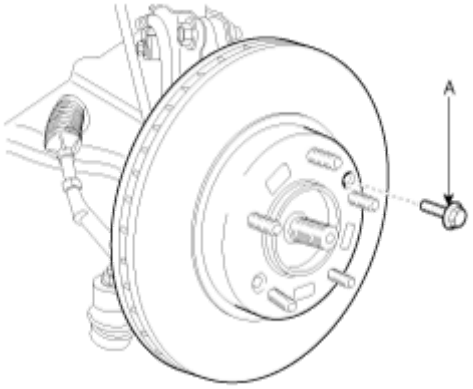


6. Remove the brake disc (A) and the screw (B).



NOTICE

Remove the brake disc from hub using M8 bolt (A) if the brake disc has been seized with the hub due to corrosion or overheat.
Be careful not to use the hammer. The disc can be damaged if you remove the disc from the hub by hammer.



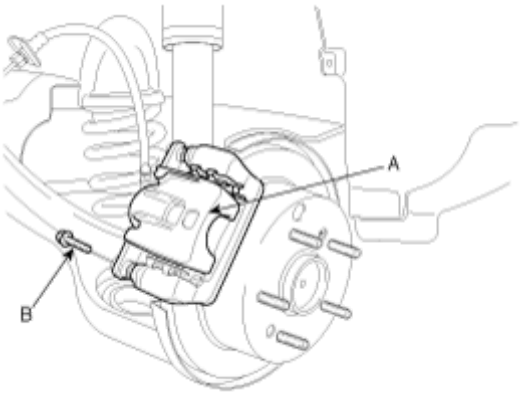
REPLACEMENT

CAUTION

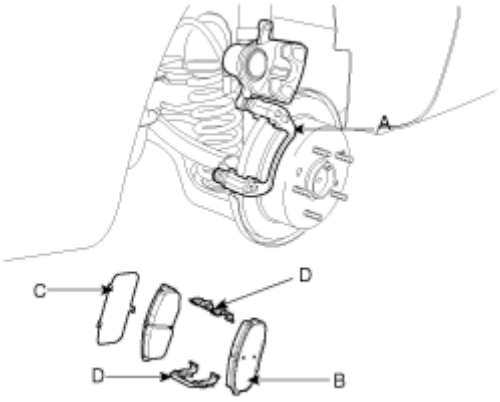
Frequent inhalation of brake pad dust, regardless of material composition, could be hazardous to your health.

- Avoid breathing dust particles.
- Never use on air hose or brush to clean brake assemblies.

1. Remove guide rod bolt (B) and raise the caliper assembly (A).



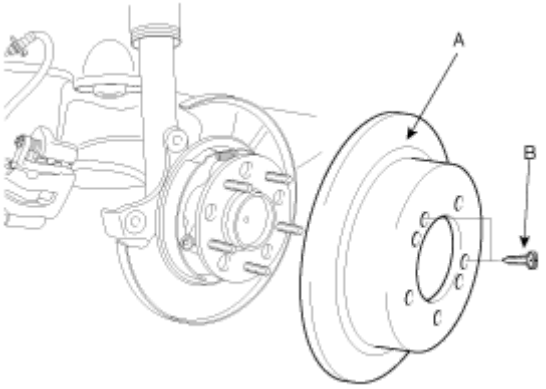
2. Remove the pads (B), the pad shims (C) and the pad springs (D) from the caliper carrier (A).



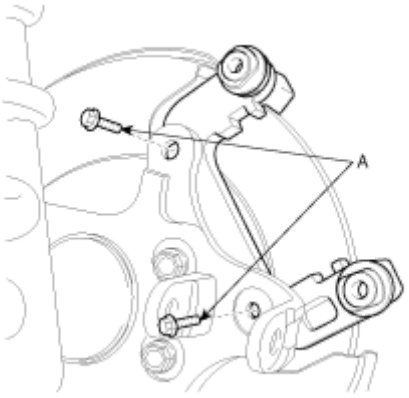
INSTALLATION

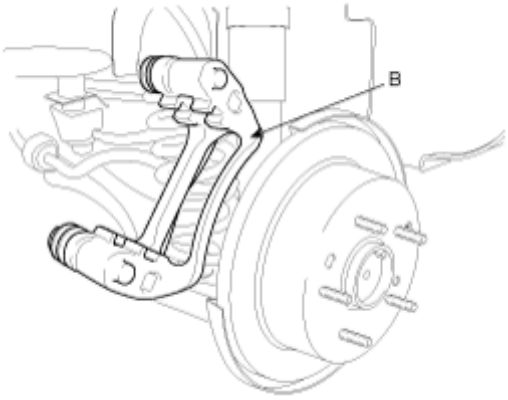
1. Install the brake disc (A) and tighten the screw (B).
   Tightening torque : N.m (kgf.m, lb-ft)

4.9~5.9 (0.5~0.6, 3.6~4.3)

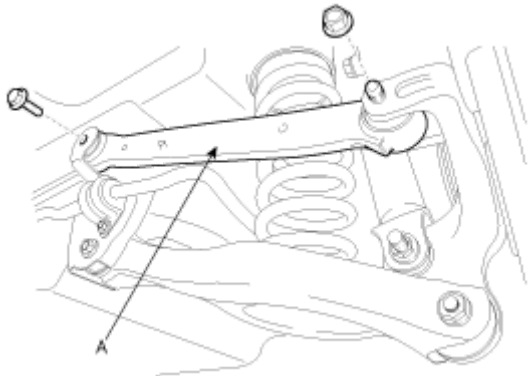


2. Install the caliper carrier (B) and tighten the caliper mounting bolts (A).
   Tightening torque : N.m (kgf.m, lb-ft)
   49.0~58.8 (5.0~6.0, 36.2~43.4)





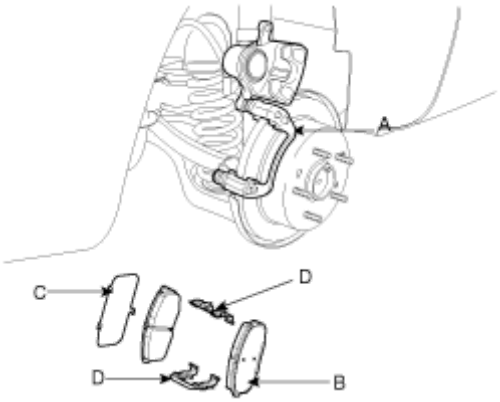
3. Install the rear upper arm (A).



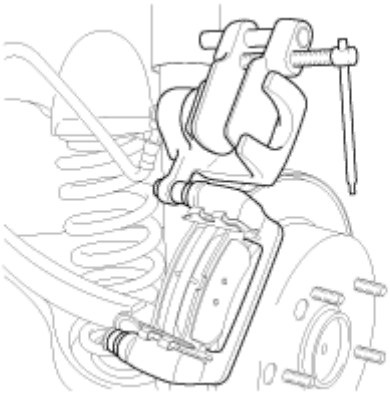
4. Install the pad springs (D) to the caliper carrier (A).

5. Install the brake pads (B) and pad shims (C) on the pad springs correctly. Install the pad with the wear indicator on the inside. If you are reusing the pads, always reinstall the brake pads in their original positions to prevent a momentary loss of braking efficiency.

> **NOTICE**
>
> Check the foreign material at the pad shims (A) and the back of the pads (B).
> Contaminated brake discs or pads reduce stopping ability. Keep grease off the discs and pads.

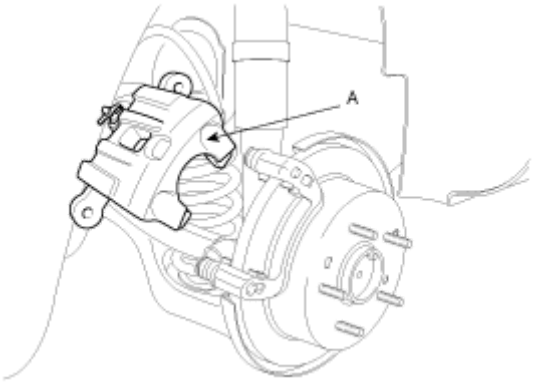


6. Push in the piston using the SST(09581-11000) so that the caliper will fit over the pads. Make sure that the piston boot is in position to prevent damaging it when installing the caliper.



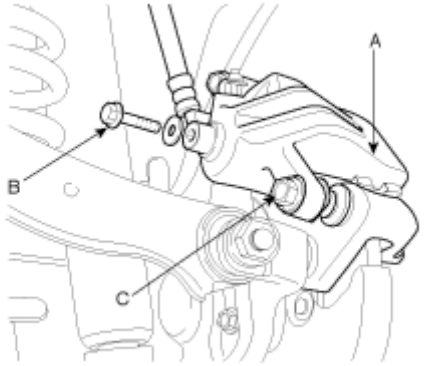
7. Install the caliper assembly (A).

> **NOTICE**
>
> Be careful not to damage the piston pin boot.



8. Install the brake hose bolt (B) and the guide rod bolts (C) to the caliper assembly (A).
   Tightening torque : N.m (kgf.m, lb-ft)
   Bolt (B) : 24.5~29.4 (2.5~3.0, 18.1~21.7)

Bolt (C) : 21.6~31.4 (2.2~3.2, 15.9~23.1)



9. Refill the master cylinder reservoir to the MAX line.
10. Bleed the brake system. (Refer to "Bleeding of brake system")
11. Depress the brake pedal several times to make sure the brakes work, then test-drive.

> **NOTICE**
>
> Engagement of the brake may require a greater pedal stroke immediately after the brake pads have been replaced as a set. Several applications of the brake will restore the normal pedal stroke.

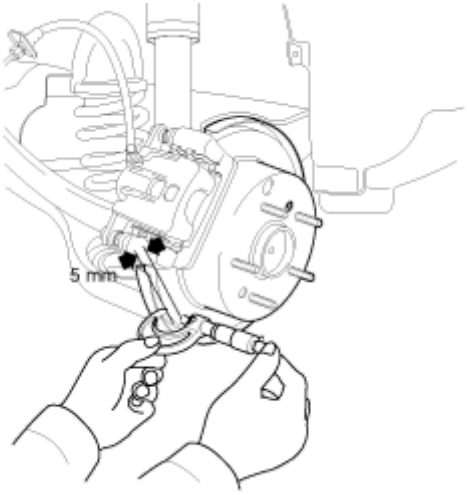
12. After installation, check for leaks at hose and line joints or connections, and retighten if necessary.

INSPECTION

REAR BRAKE DISC THICKNESS CHECK

1. Remove all rust and contamination from the disc surface, and then measure the disc thickness at 8 positions at least.

   Rear brake disc thickness
   Standard value : 10.0 mm (0.39 in)
   Limit : 8.4 mm (0.33 in)

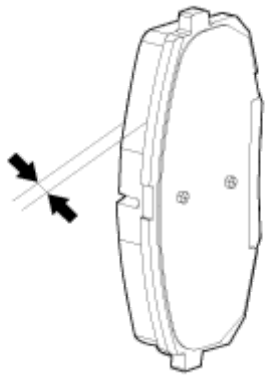


2. Thickness variation should not exceed 0.01 mm (0.0004in) (circumference) and 0.01 mm(0.0004 in) (radius) at any directions.
3. If wear exceeds the limit, replace the discs and pad assemblies for left and right of the vehicle.

REAR BRAKE PAD CHECK

1. Check the pad wear. Measure the pad thickness. replace it if it is less than the specified value.

   Pad thickness
   Standard value : 10.0 mm (0.39 in)
   Service limit : 2.0 mm (0.0787 in)

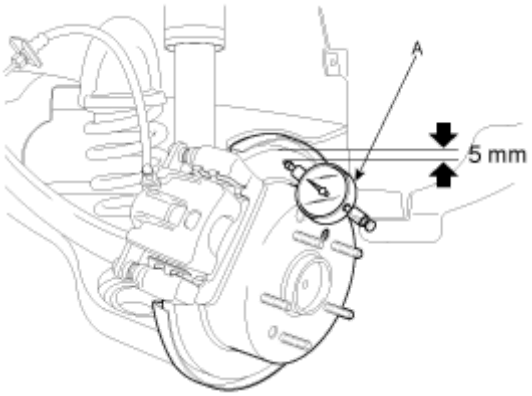


2. Check that grease is applied, to sliding contact points and the pad and backing metal for damage.

REAR BRAKE DISC RUN OUT CHECK

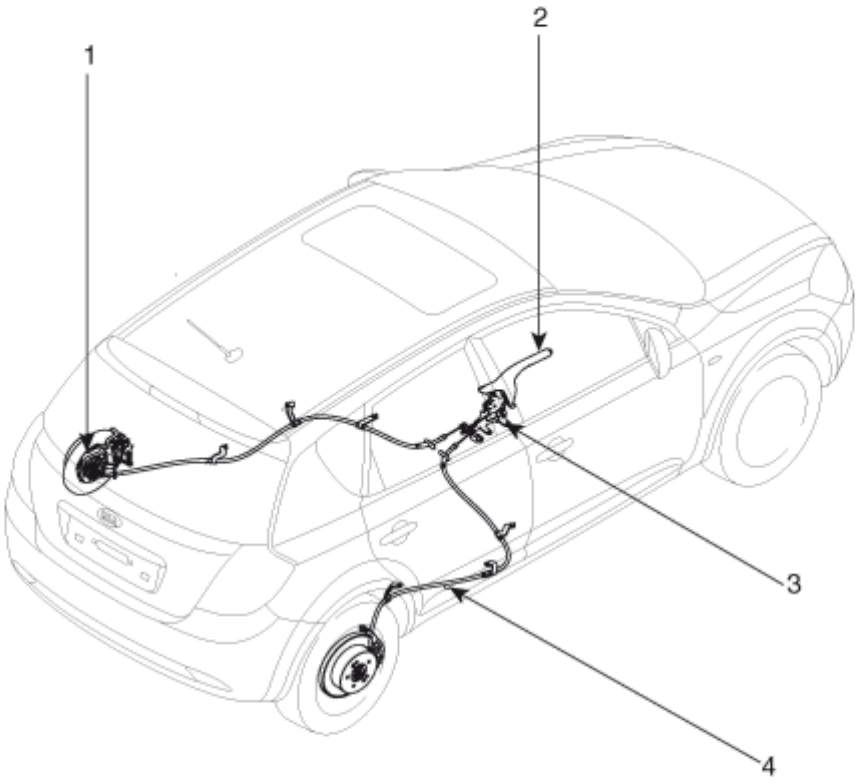
1. Place a dial gauge about 5mm (0.2 in) from the outer circumference of the brake disc, and measure the run out of the disc.

   Brake disc run out
   Limit : 0.05 mm (0.0020 in) or less



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.

COMPONENT LOCATION

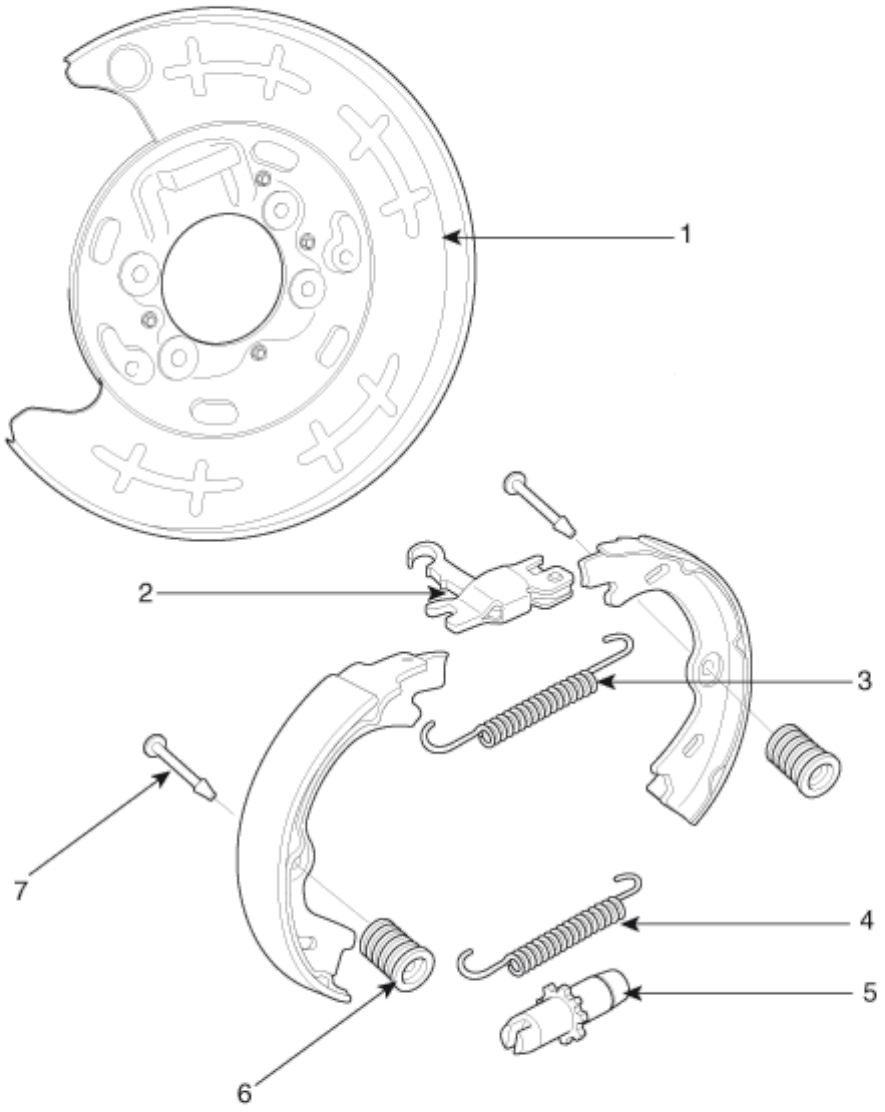


1. Rear parking brake 2. Parking brake lever	3. Parking brake switch 4. Parking brake cable

COMPONENT

Disc Brake Type

English ▼



1. Backing plate 2. Operating lever 3. Upper spring 4. Lower spring	5. Adjuster 6. Shoe hold down spring 7. Shoe hold down pin

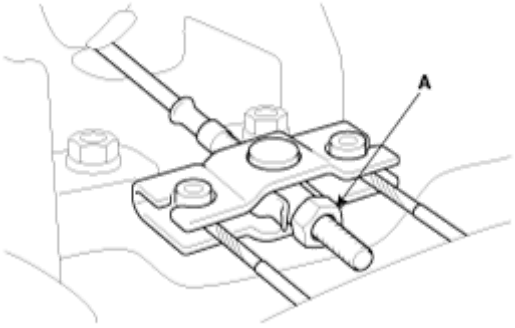
REMOVAL

PARKING BRAKE LEVER

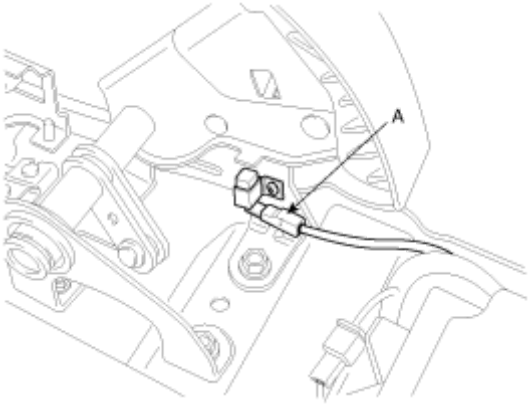
NOTICE

The parking brake cables must not be bent or distorted. This will lead to stiff operation and premature failure.

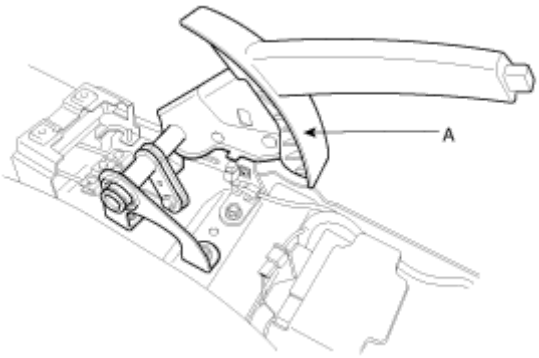
1. Remove the floor console. (Refer to BD Gr. -"Floor console")
2. Loosen the adjusting nut (A) and the parking brake cables.



3. Disconnect the connector (A) of parking brake switch.



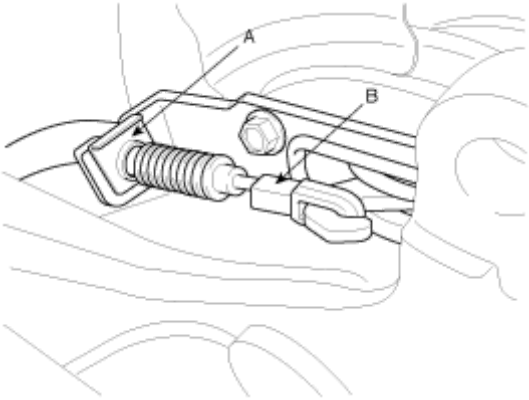
4. Remove the parking brake lever assembly (A) with loosening the bolts.



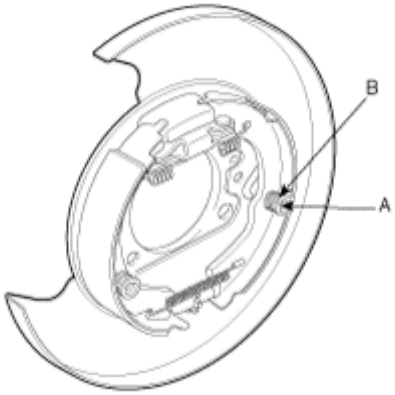
PARKING BRAKE SHOE (DISC BRAKE TYPE)

English ▼

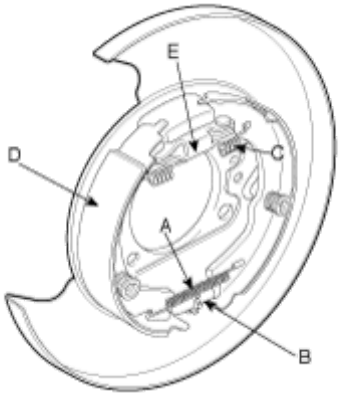
1. Raise the vehicle, and make sure it is securely supported.
2. Remove the rear tire and wheel, then remove the brake caliper. (Refer to "Rear disc brake removal")
3. Remove the parking brake cable (B), after remove the clip (A).



4. Remove the shoe hold down pin (A) and spring (B) by pressing and rotating the spring.



5. Remove the adjuster assembly (B) and the lower return spring (A).

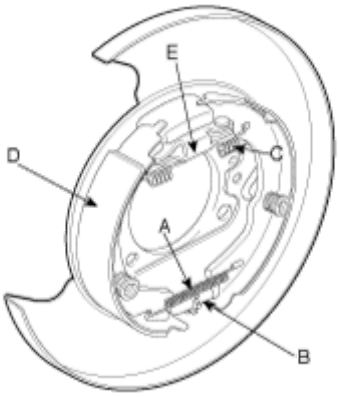


6. Remove the upper return spring (C) and the brake shoes (D).
7. Remove the operating lever assembly (E).

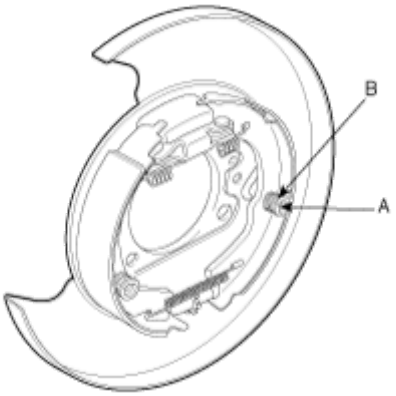
INSTALLATION

PARKING BRAKE SHOE (DISC BRAKE TYPE)

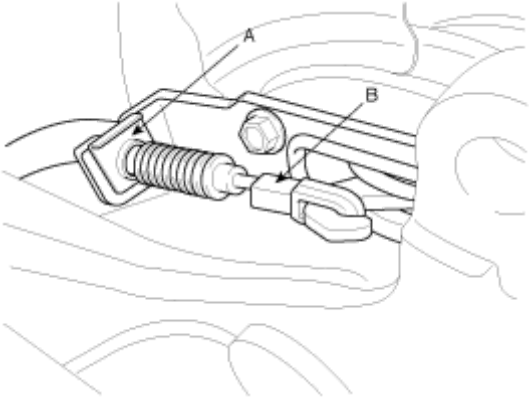
1. Install the operating lever assembly (E).



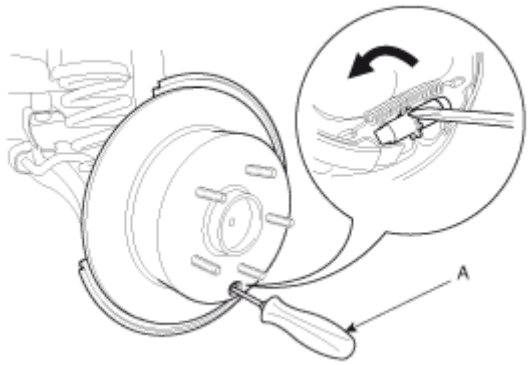
2. Install the upper return spring (C) and the brake shoes (D).
3. Install the adjuster assembly (B) and the lower return spring (A).
4. Install the shoe hold down pin (A) and spring (B) by pressing and rotating the spring.



5. Install the parking brake cable (B), then install the clip (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.

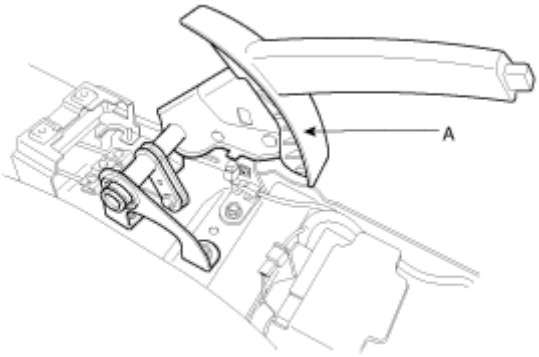


7. Install the brake caliper. (Refer to "Rear brake installation")
8. Install the tire and wheel.
9. Adjust the parking brake lever.
10. If the parking brake shoe or the brake disc are replaced a newly one, perform the brake shoe bed-in procedure.
    (1) While operating the parking brake lever for 69 N(7 kgf, 15 lb) effort, drive the vehicle 500 meters (0.31 miles) at the speed of 60 kph (37.3 mph).
    (2) Repeat the above procedure more than two times.
    (3) Must be held on at 30% grade.

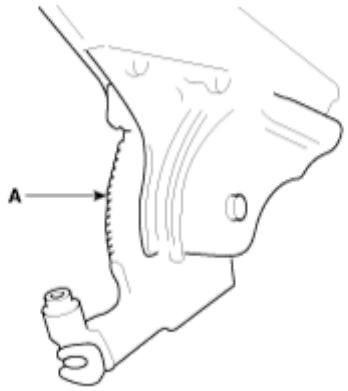
> **⚠ CAUTION**
>
> After adjusting parking brake, verify the following;
> 1) Must be free from malfunction when the parking pedal is operated at 686N(70 kgf, 154 lb).
> 2) Check that all parts move smoothly.
> 3) The parking brake indicator lamp must be on after the parking lever is applied and must be off after the lever is released.

PARKING BRAKE LEVER

1. Install the parking brake lever assembly, then tighten the mounting bolts.
   Tightening torque : N.m (kgf.m, lb-ft)
   8.8 ~ 13.7(0.9 ~ 1.4, 6.5 ~ 10.1)

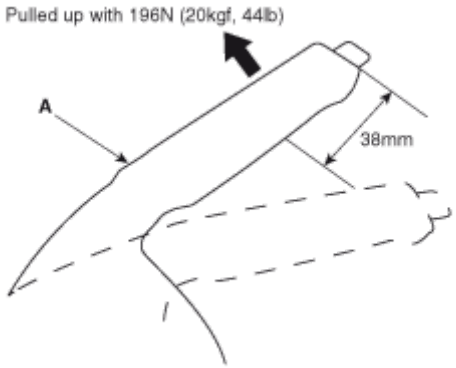


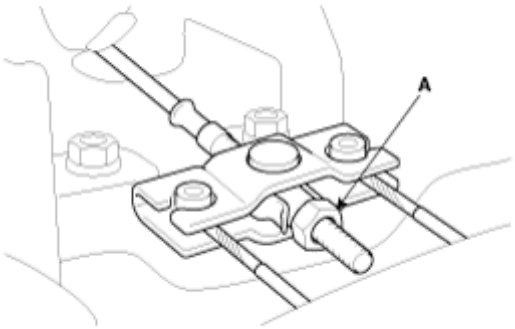
2. Apply a coating of the specified grease to each sliding parts (A) of the ratchet plate or the ratchet pawl.
   Specified grease :
   Multi purpose grease RheoGel 429 (MS511-54, LT2)



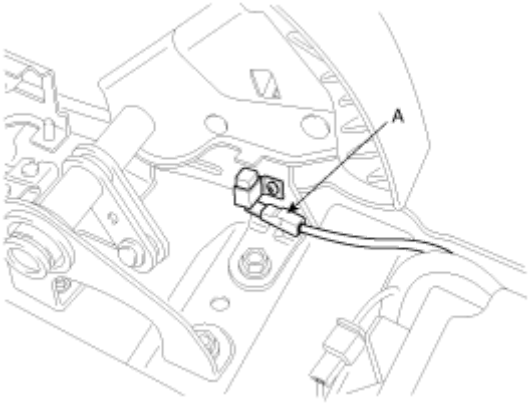
3. Install the parking brake cable adjuster, then adjust the parking brake lever stroke by turning adjusting nut (A).
   Parking brake lever stroke :
   7 cliks (Pull the lever with 20kg)

> **NOTICE**
>
> 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.



NOTICE

Inspect the continuity of parking brake switch.

When the brake lever is pulled : continuity
When the brake lever is released : no continuity

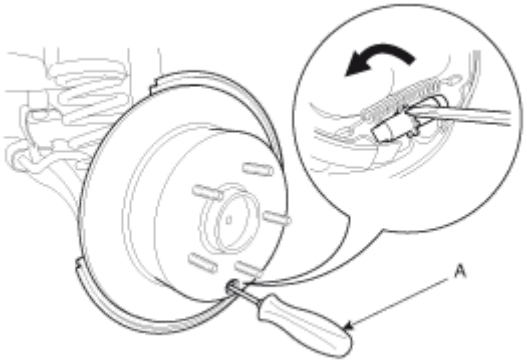
7. Install the floor console.
   (Refer to BD Gr. - "Floor console")

ADJUSTMENT

Parking Brake Shoe Clearance Adjustment

Disc Brake Type

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.

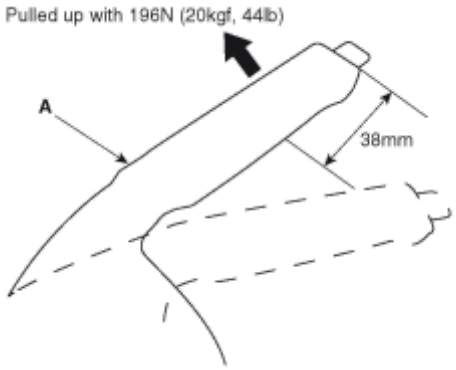


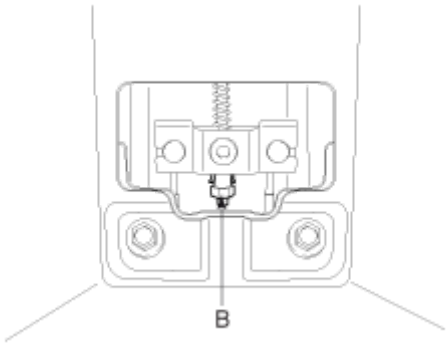
Parking Brake Lever Stroke Adjustment

1. Raise the vehicle, and make sure it is securely supported.
2. Remove the floor console cover. (Refer to Body Group - "Console")
3. Adjust the parking brake lever (A) stroke by turning adjusting nut (B).
   Parking brake lever stroke :
   7 cliks (Pull the lever with 20kgf)

NOTICE

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")

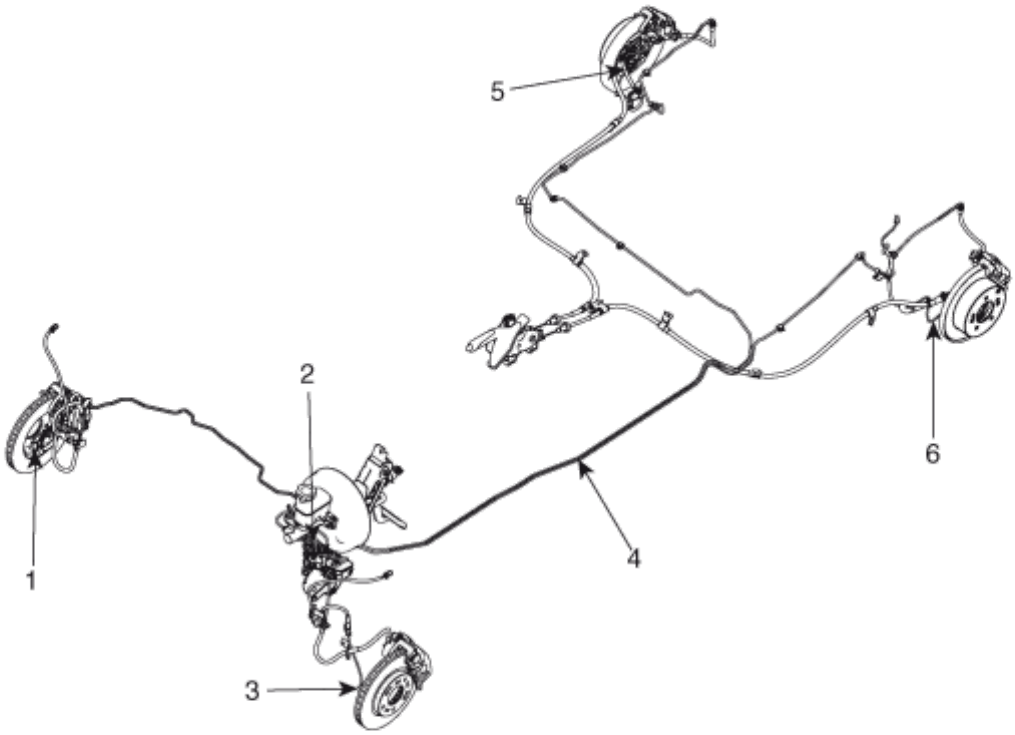




4. Release the parking brake lever fully, and check that parking brakes do not drag when the rear wheels are turned. Readjust if necessary.
5. Make sure that the parking brakes are fully applied when the parking brake lever is pulled up fully.
6. Install the floor console cover. (Refer to Body Group - "Console")

English ▼

COMPONENTS



1. Front left wheel speed sensor	4. Hydrauric line
2. ABS control module(HECU)	5. Rear right wheel speed sensor
3. Front right wheel speed sensor	6. Rear left wheel speed sensor

This specification applies to HCU(Hydraulic Control Unit) and ECU(Electronic Control Unit) of the HECU.(Hydraulic and Electronic Control Unit)
This specification is for the wiring design and installation of ABS ECU.
This unit has the functions as follows.

- Input of signal from the wheel speed sensors attached to each wheel.
- Control of braking force.
- Failsafe function.
- Self diagnosis function.
- Interface with the external diagnosis tester.

Installation Position : Engine Compartment

- Brake tube length from Master cylinder port to HECU inlet port should be max. 1m
- The position should not be close to the engine block and not lower than the wheel.

Operation

The ECU shall be put into operation by switching on the operating voltage (IGN).
On completion of the initialization phase, the ECU shall be ready for operation.
In the operating condition, the ECU shall be ready, within the specified limits (voltage and temperature), to process the signals offered by the various sensors and switches in accordance with the control algorithm defined by the software and to control the hydraulic and electrical actuators.

Wheel Sensor Signal Processing

The ECU shall receive wheel speed signal from the four active wheel sensors.
The wheel signals are converted to voltage signal by the signal conditioning circuit after receiving current signal from active wheel sensors and given as input to the MCU.

Solenoid Valve Control

When one side of the valve coil is connected to the positive voltage that is provided through the valve relay and the other side is connected to the ground by the semiconductor circuit, the solenoid valve goes into operation.
The electrical function of the coils are always monitored by the valve test pulse under normal operation conditions.

Voltage Limits

- Overvoltage
  When overvoltage is detected(above 16.8 V), the ECU switches off the valve relay and shuts down the system.
  When voltage is returned to operating range, the system goes back to the normal condition after the initialization phase.
- Undervoltage
  In the event of undervoltage(below 9.3 V), ABS control shall be inhibited and the warning lamp shall be turned on.
  When voltage is returned to operating range, the warning lamp is switched off and ECU returns to normal operating mode.

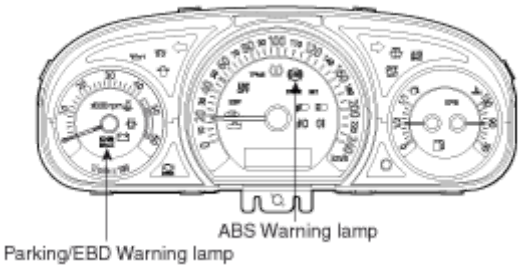
Pump Motor Checking

The ECU performs a pump motor test at a speed of 30km/h once after IGN is switched on.

Diagnostic Interface

Failures detected by the ECU are encoded on the ECU, stored in a EEPROM and read out by diagnostic equipment when the ignition switch is turned on.
The diagnosis interface can also be used for testing the ECU during production of the ECU and for actuating the HCU (Air-bleeding line or Roll and Brake Test line).

Warning Lamp Module



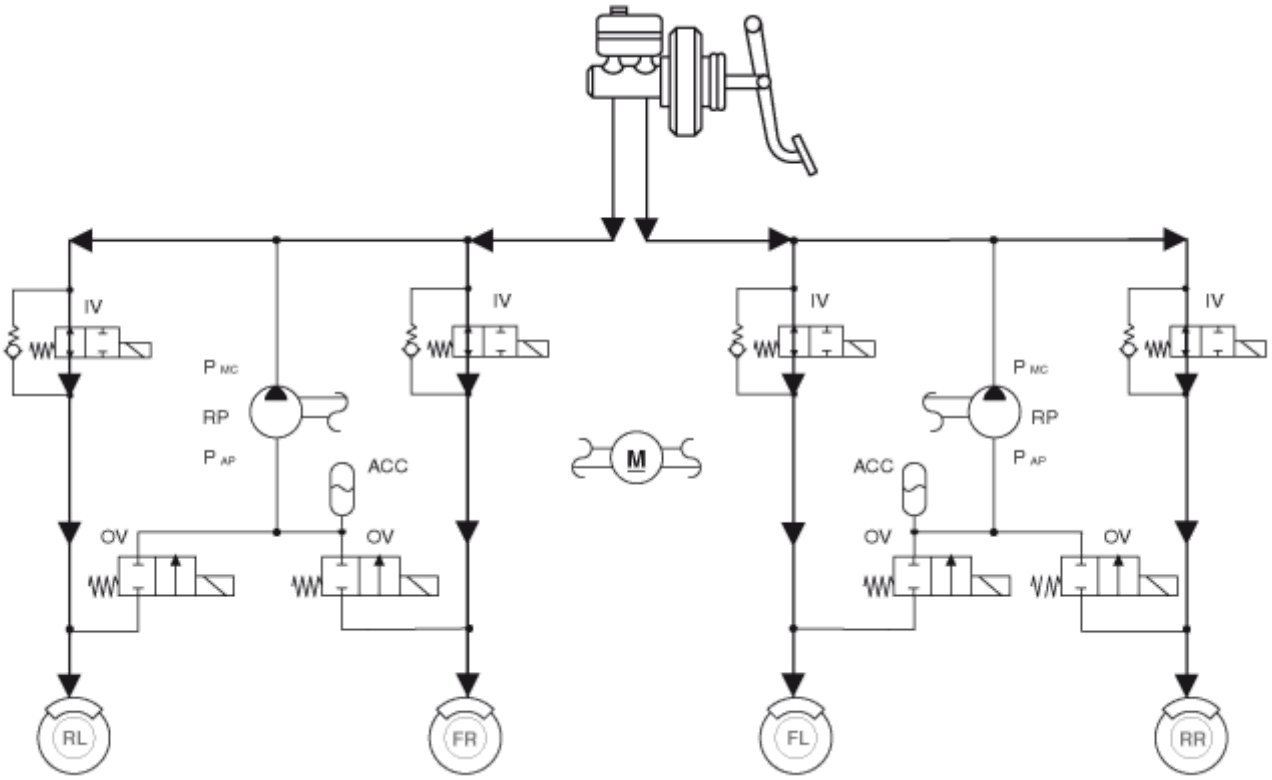
1. ABS Warning Lamp
   The active ABS warning lamp indicates the selftest and failure status of the ABS.The ABS warning lamp shall be on:
   - During the initialization phase after IGN ON. (continuously 3 seconds).
   - In the event of inhibition of ABS functions by failure.
   - During diagnostic mode.
   - When the ECU Connector is separated from ECU.

2. Parking/EBD Warning Lamp
   The active EBD warning lamp indicates the selftest 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 shall be 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 separated from ECU.

ABS CONTROL

1. Normal Braking without ABS

	Inlet valve(IV)	Outlet valve(OV)	Return pump
Operation	Open	Close	OFF

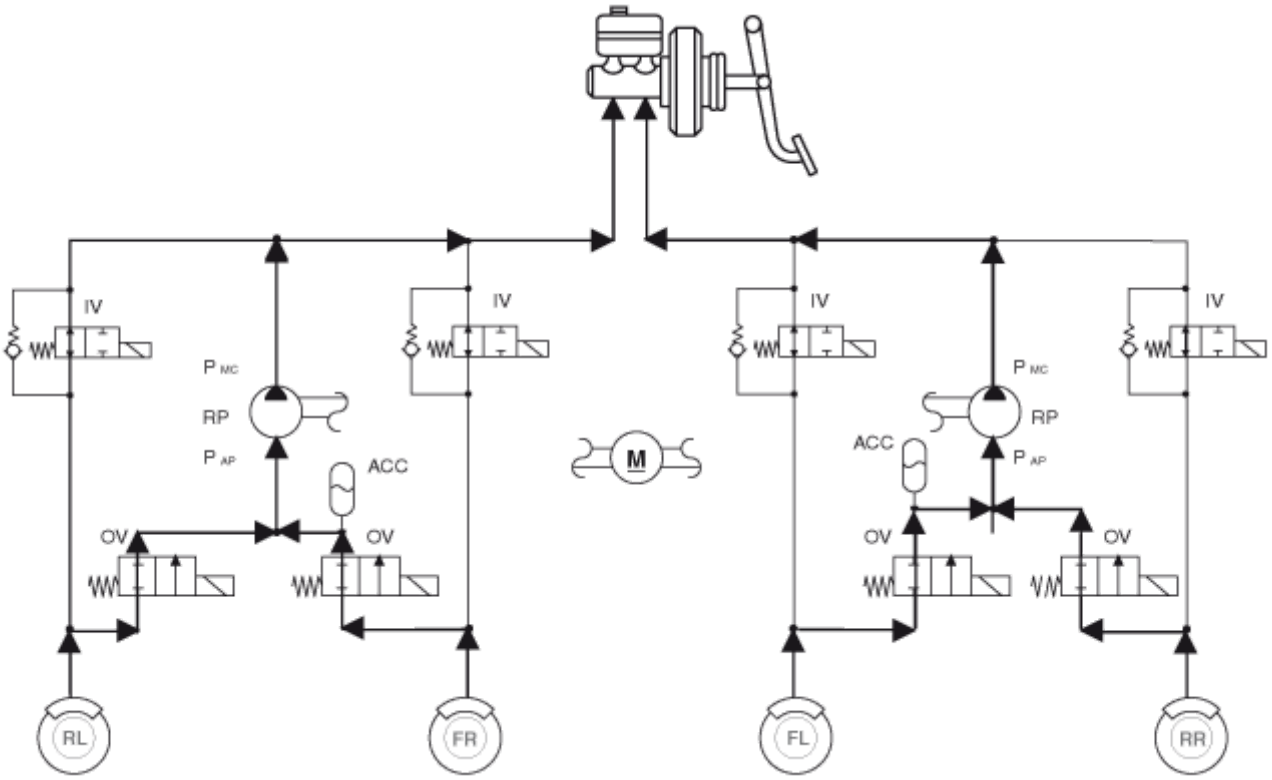


NOTICE

IV : Inlet Valve
OV : Outlet Valve
RL : Rear left wheel
FR : Front right wheel
FL : Front left wheel
RR : Rear right wheel
RP : Return pump

2. Decrease Mode

	Inlet valve(IV)	Outlet valve(OV)	Return pump
Operation	Close	Open	ON(Motor speed control)

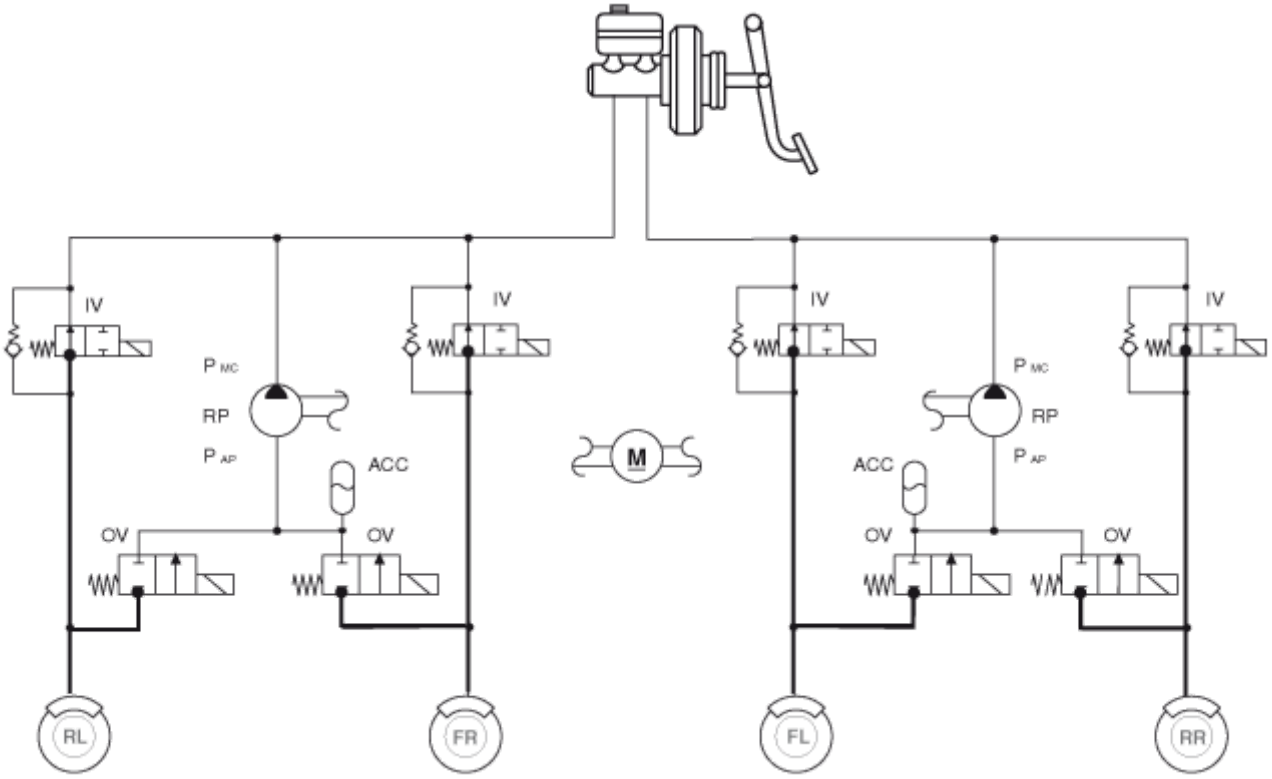


NOTICE

IV : Inlet Valve
OV : Outlet Valve
RL : Rear left wheel
FR : Front right wheel
FL : Front left wheel
RR : Rear right wheel
RP : Return pump

3. Hold Mode

	Inlet valve(IV)	Outlet valve(OV)	Return pump
Operation	Close	Close	ON(Motor speed control)

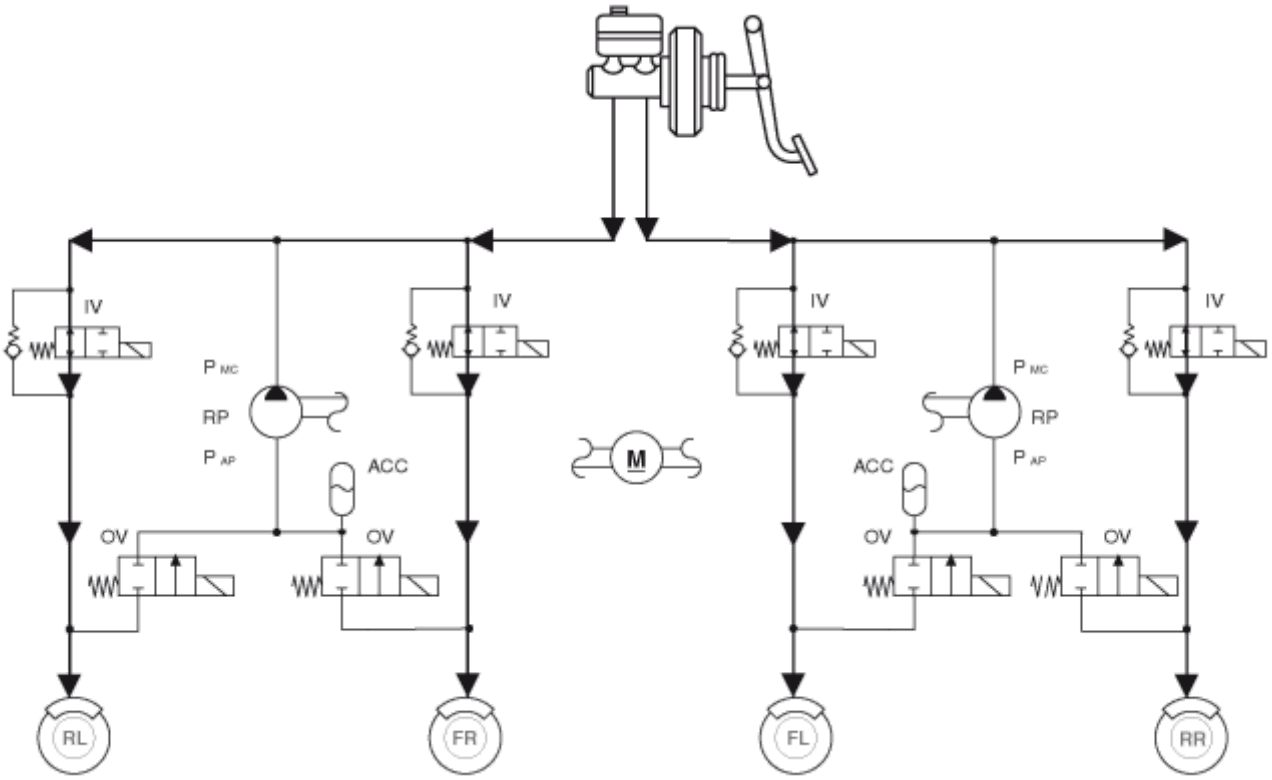


NOTICE

IV : Inlet Valve
OV : Outlet Valve
RL : Rear left wheel
FR : Front right wheel
FL : Front left wheel
RR : Rear right wheel
RP : Return pump

4. Increase Mode

	Inlet valve(IV)	Outlet valve(OV)	Return pump
Operation	Open	Close	ON(Motor speed control)

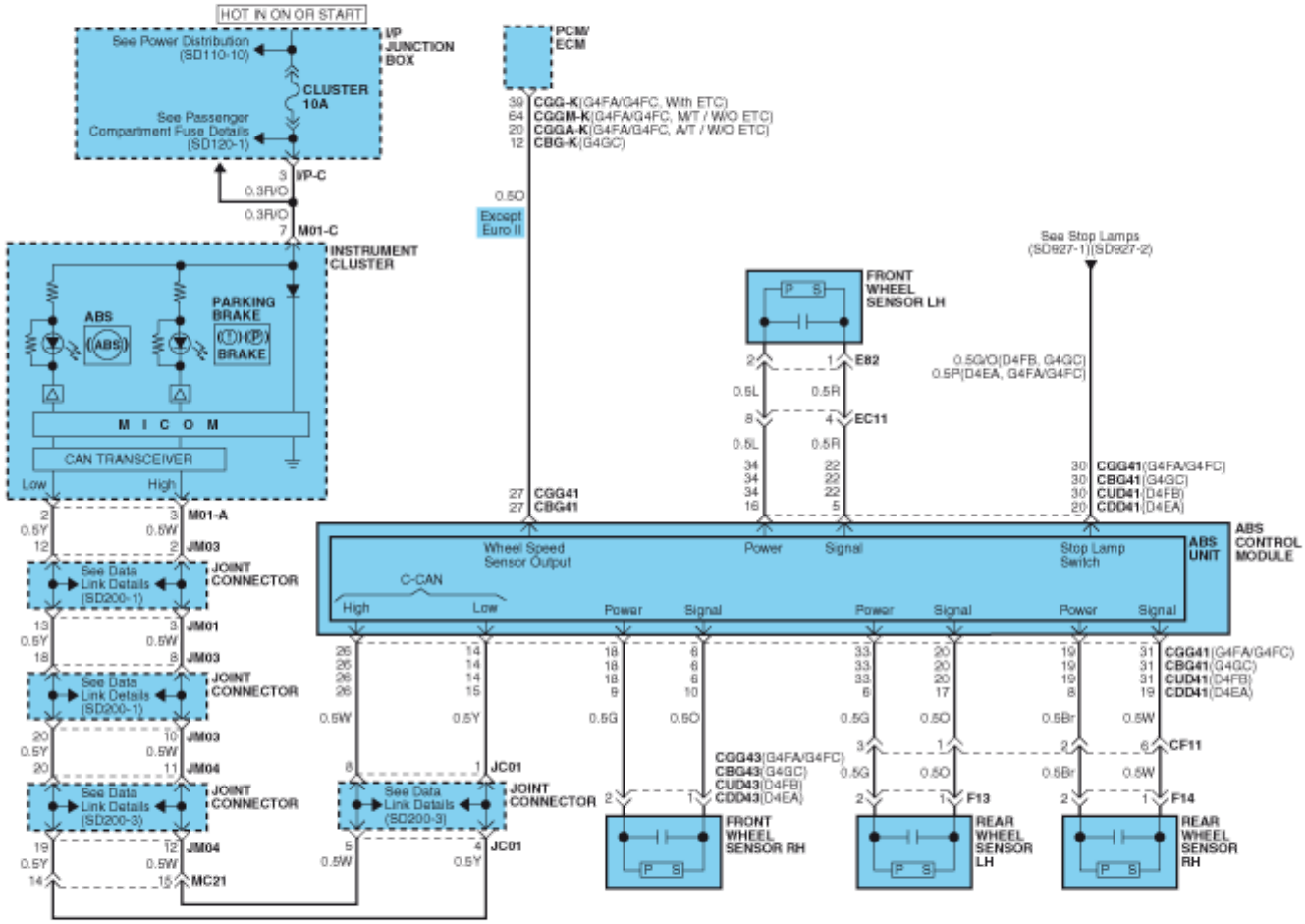


NOTICE

IV : Inlet Valve
OV : Outlet Valve
RL : Rear left wheel
FR : Front right wheel
FL : Front left wheel
RR : Rear right wheel
RP : Return pump

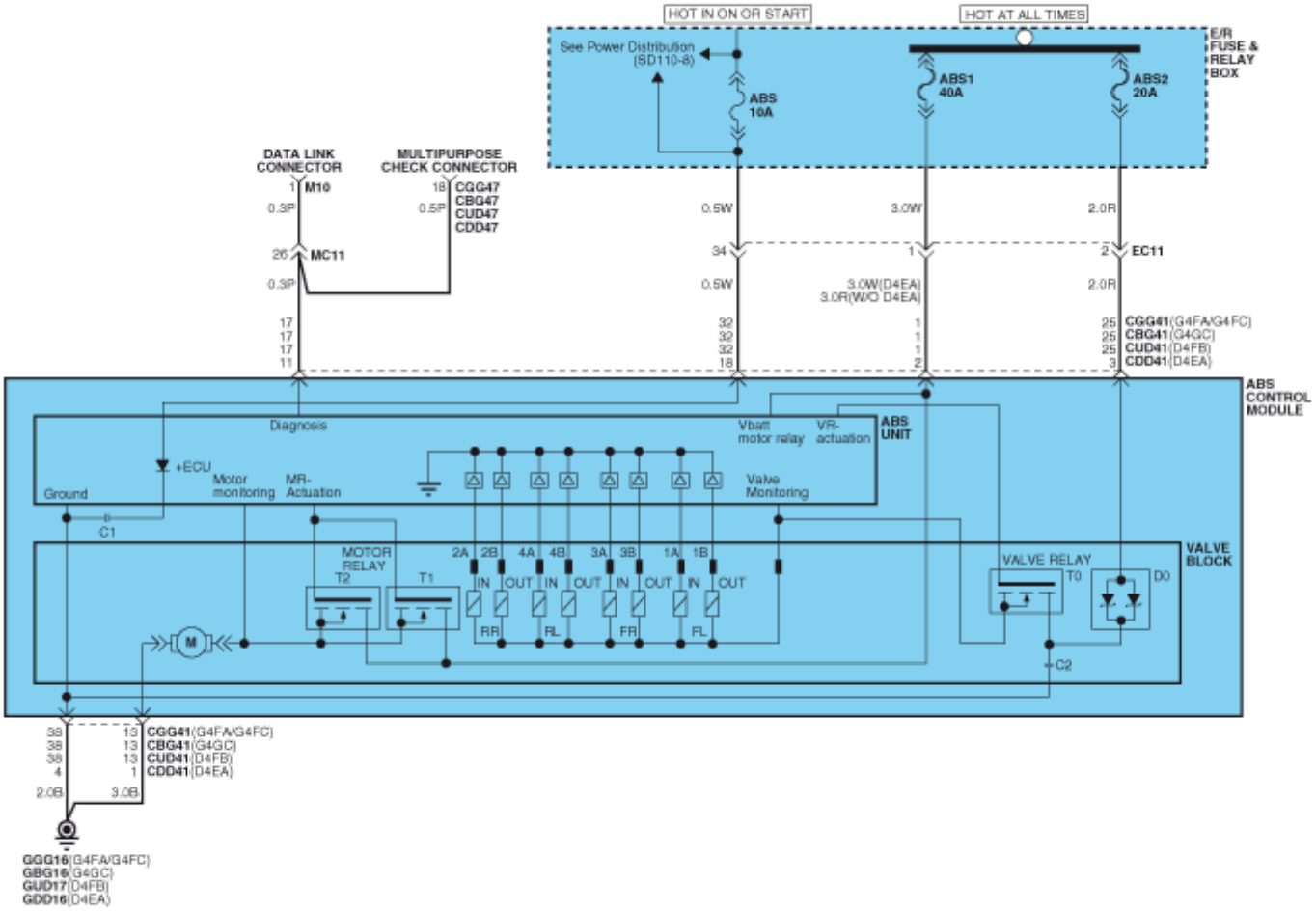
English

ABS CIRCUIT DIAGRAM(1)

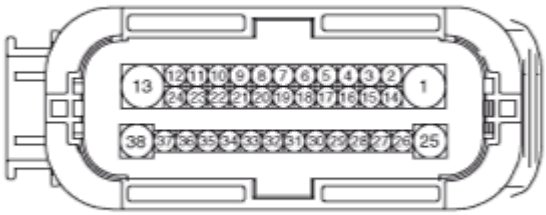


ABS CIRCUIT DIAGRAM(2)

English ▼



ECU CONNECTOR INPUT/OUTPUT(ABS)



Wire No.	Designation	Current		max.permissible wire resistance R_L (mΩ)	min.leakage current A
		max	min		
13	Ground for recirculation pump	39 A	10 A	10	100μA FET lexage
38	Ground for solenoid valves and	15 A	2 A	10	"

	ECU				
1	Voltage supply for pump motor	39 A	10 A	10	"
25	Voltage supply for solenoid valves	15 A	2 A	10	"
32	Voltage for hybrid ECU	1 A	500 mA	60	0
22,6,20,31	signal wheel speed sensor FL, FR, RL,RR	16.8 mA	5.9 mA	250	0
34,18,33,19	Voltage supply for the active wheel speed sensor FL,FR, RL, RR	16.8 mA	5.9 mA	250	0
30	brake light switch	10 mA	5 mA	250	0
14	CAN Low	30 mA	20 mA	250	250μA
26	CAN High	30 mA	20 mA	250	"
27	Wheel speed sensor output	20 mA	10 mA	250	-
17	Diagnostic K	6 mA	3 mA	250	-

ABS Hecu Connector

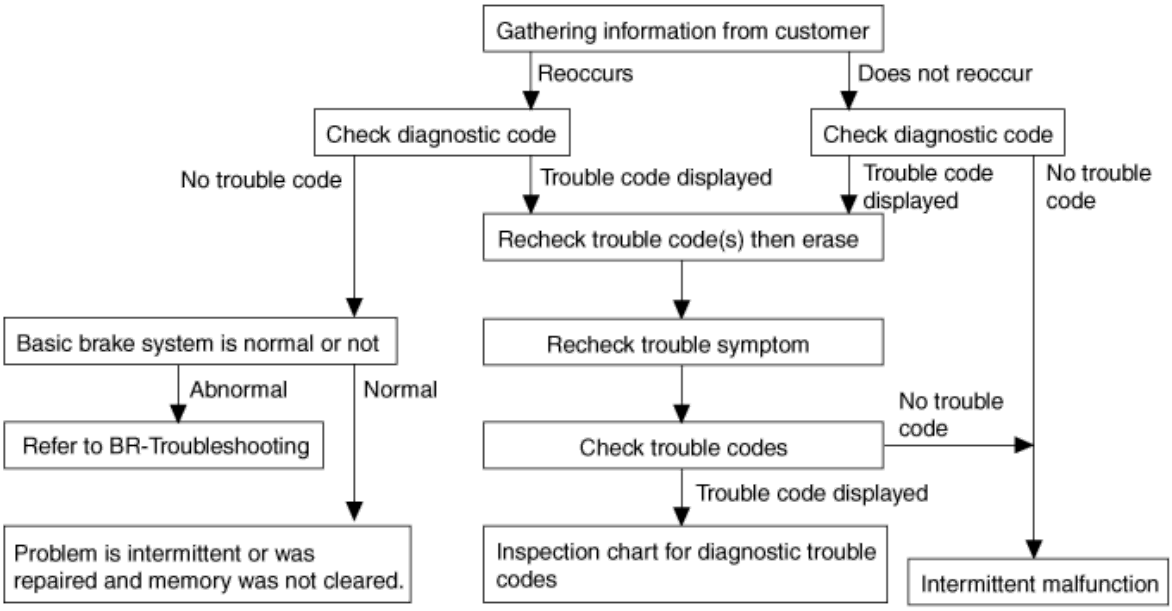
Connector terminal		Specification	Condition
Number	Description		
13	Ground for recirculation pump	Current range: Min.10A Max.39A	Always
38	Ground for solenoid valves and ECU	Current range: Min.2A Max.15A	Always
1	Voltage supply for pump motor	Battery voltage	Always
25	Voltage supply for solenoid valves		
34	Voltage supply for the active wheel speed sensor FL,FR, RL, RR	Battery voltage	IG On
18			
33			
19			
22	signal wheel speed sensor FL, FR, RL,RR	Voltage(High) : 0.89~1.26 V Voltage (Low) : 0.44~0.63 V	On driving
16			
20			
31			
32	Voltage for hybrid ECU	Battery voltage	KEY ON/OFF
30	Brake light switch	Voltage (High) : ≥ 4.5 * IG ON Voltage (Low) : ≤ 2.0 * IG ON	Brake On/Off
27	Wheel speed sensor output		
17	Diagnostic K	Voltage (High) : ≥ 0.8 * IG ON Voltage (Low) : ≤ 0.2 * IG ON	

Sensor Output On GDS(ABS)

	Description	Abbreviation	Unit	Remarks
1	Vehicle speed sensor	VEH. SPD	Km/h	
2	Battery voltage	BATT. VOL	V	

3	FL Wheel speed sensor	FL WHEEL	Km/h	
4	FR Wheel speed sensor	FR WHEEL	Km/h	
5	RL Wheel speed sensor	RL WHEEL	Km/h	
6	RR Wheel speed sensor	RR WHEEL	Km/h	
7	ABS Warning lamp	ABS LAMP	-	
8	EBD Warning lamp	EBD LAMP	-	
9	Brake Lamp	B/LAMP	-	
10	Pump relay state	PUMP RLY	-	
11	Valve relay state	VALVE RLY	-	
12	Motor	MOTOR	-	
13	Front Left valve(IN)	FL INLET	-	
14	Front Right valve (IN)	FR INLET	-	
15	Rear Left valve (IN)	RL INLET	-	
16	Rear Right valve (IN)	RR INLET	-	
17	Front Left valve (OUT)	FL OUTLET	-	
18	Front Right valve (OUT)	FR OUTLET	-	
19	Rear Left valve(OUT)	RL OUTLET	-	
20	Rear Right valve (OUT)	RR OUTLET	-	

Standard Flow Of Diagnostic Troubleshooting



*** Using the customer problem analysis check sheet for reference, ask the customer as much detail as possible about the problem.**

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

English ▼

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 system is operating to specifications. 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) Diagnosis line
Communication with GDS is not possible.	1) Power source circuit

(Communication with ABS only is not possible)	2) Diagnosis 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 ABS control module.	– Inoperative power source circuit – Inoperative wheel speed sensor circuit – Inoperative hydraulic circuit for leakage – Inoperative HECU

Inspection procedures

DTC Inspection

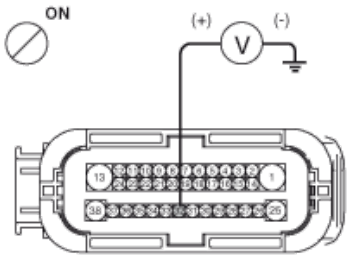
1. Connect the GDS with the data link connector and turn the ignition switch ON.
2. Verify that the system is operating to specifications.
3. Is the system operating to specifications?

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 ABS control module.
2. Turn the ignition switch ON, measure the voltage between terminal 32 of the ABS control module harness side connector and body ground.
   Specification: approximately B+
3. Is the voltage within specification?

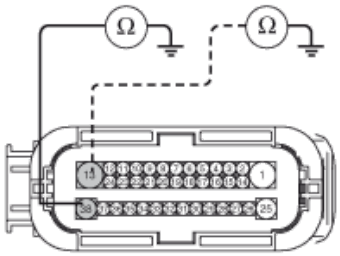
YES	► Check the ground circuit.
NO	► Check the harness or connector between the fuse (10A) in the engine compartment junction block and the ABS control module. Repair if necessary.



Check the ground circuit

1. Disconnect the connector from the ABS control module.
2. Check for continuity between terminals 13, 38 of the ABS 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 the system operating to specifications?

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 the system operating to specifications?

YES	► The problem is still occurring, replace the ABS control module.
NO	► Replace the leaking hydraulic lines.

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 ABS control module.	– Inoperative power source circuit – Inoperative wheel speed sensor circuit – Inoperative hydraulic circuit for leakage – Inoperative HECU

Inspection procedures

DTC Inspection

1. Connect the GDS with the data link connector and turn the ignition switch ON.
2. Verify that the system is operating to specifications.
3. Is the system operating to specifications?

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 the system operating to specifications?

YES	► Check the hydraulic circuit for leakge.
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 the system operating to specifications?

YES	► The problem is still occurring, replace the ABS control module.
NO	► Replace the leaking hydraulic lines.

Communication with GDS is not possible. (Communication with any system is not possible)

Detecting Condition

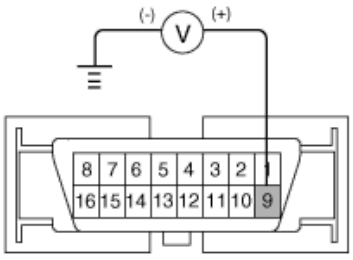
Trouble Symptoms	Possible Cause
Possible malfunction in the power supply system (including ground) for the diagnosis line.	– An open in the wire – Poor ground – Inoperative power source circuit

Inspection procedures

Check the power supply circuit for the diagnosis

1. Measure the voltage between terminal 9 of the data link connector and body ground.
   Specification: approximately B+
2. Is voltage within specification?

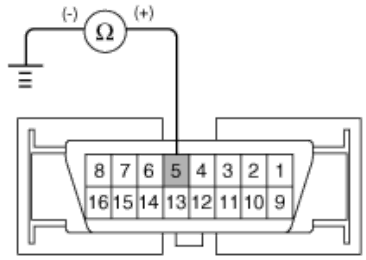
YES	► Check the ground circuit for the diagnosis.
NO	► Repair an open in the wire. Check and replace fuse (15A) from the engine compartment junction block.



Check the ground circuit for the diagnosis

1. Check for continuity between terminal 5 of the data link connector and body ground.
2. Is there continuity?

NO	► Repair an open in the wire between terminal 5 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 – Inoperative HECU – Inoperative power source circuit

Inspection procedures

Check for continuity in the K-Line

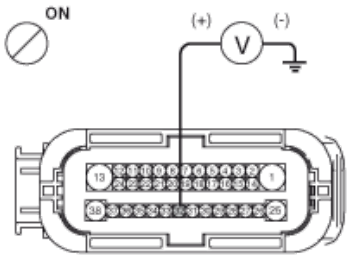
1. Disconnect the connector from the ABS control module.
2. Check for continuity between terminals 17 of the ABS control module connector and 1 of the data link connector.
3. Is there continuity?

YES	► Check the power source of ABS control module.
NO	► Repair an open in the wire.

Check the power source of ABS control module

1. Disconnect the connector from the ABS control module.
2. Turn the ignition switch ON, measure the voltage between terminal 32 of the ABS control module harness side connector and body ground.
   Specification: approximately B+
3. Is voltage within specification?

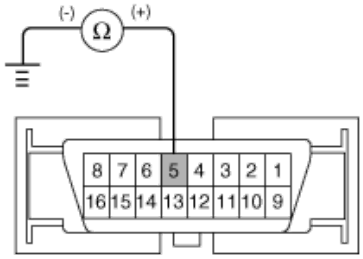
YES	► Check for poor ground.
NO	► Check the harness or connector between the fuse (10A) in the engine compartment junction block and the ABS control module.Repair if necessary.



Check for poor ground

Check for continuity between terminal 5 of the data link connector and ground point.

YES	► Replace the ABS 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

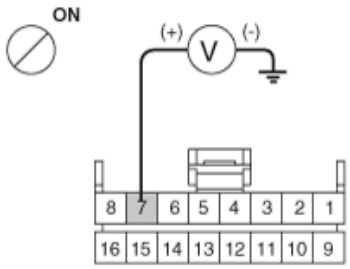
Problem Verification

1. Disconnect the connector from the ABS control module and turn the ignition switch ON.
2. Does the ABS warning lamp light up?

YES	► Inspect again after replacing the ABS 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 (M01-C) and turn the ignition switch ON.
2. Measure the voltage between terminal (M01-C) 7 of the cluster harness side connector and body ground.
   Specification : approximately B+

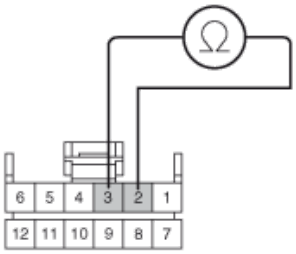


3. Is voltage within specification?

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 (M01-A) and turn the ignition switch OFF.
2. Measure the resistance between terminal (M01-A) 2 and 3 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 (M01-A) and ABS HECU connector, and then turn the ignition switch OFF.
2. Check for continuity between terminal (M01-A) 3 of the cluster harness side connector and terminal 26 of ABS HECU harness side.
   Check for continuity between terminal (M01-A) 2 of the cluster harness side connector and terminal 14 of ABS HECU harness side.
   Specification : Below 1Ω
3. Is resistance within specification?

YES	► Repair short of wiring between terminal 26, 14 of ABS HECU harness connector and ABS warning lamp module.
NO	► Repair open of wiring between terminal 26, 14 of ABS 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

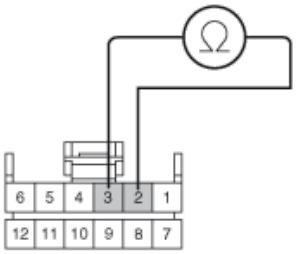
Check DTC output

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 (M01-A) and turn the ignition switch OFF.
2. Measure the resistance between terminal (M01-A) 2 and 3 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 (M01-A) and ABS HECU connector, and then turn the ignition switch OFF.
2. Check for continuity between terminal (M01-A) 3 of the cluster harness side connector and terminal 26 of ABS HECU harness side.
   Check for continuity between terminal (M01-A) 2 of the cluster harness side connector and terminal 14 of ABS HECU harness side.
   Specification : Below 1Ω
3. Is there continuity?

YES	► Repair short of wiring between terminal 26, 14 of ABS HECU harness connector and ABS warning lamp module. If no trouble in wiring, inspect again after replacing the ABS HECU.
NO	► Repair short of wiring between terminal 26, 14 of ABS HECU harness connector and ABS warning lamp module. If no trouble in wiring, inspect again after replacing the ABS HECU.

Bleeding of Brake System

This procedure should be followed to ensure adequate bleeding of air and filling of the ABS 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.

> ***NOTICE***
>
> When pressure bleeding, do not depress the brake pedal.
> Recommended fluid..... DOT3 or DOT4

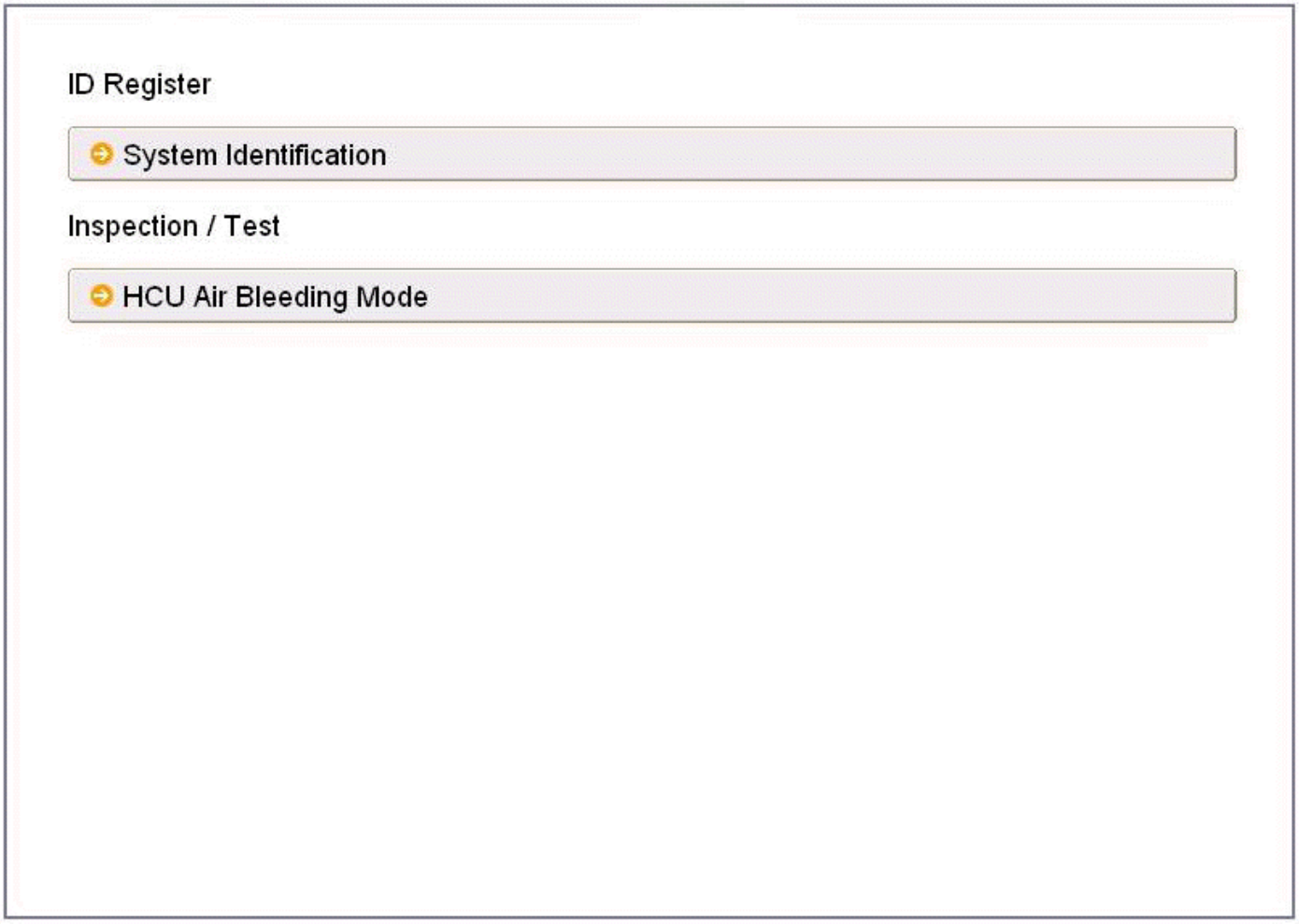
2. Connect a clear plastic tube to the wheel cylinder bleeder plug and insert the other end of the tube into a half filled clear plastic bottle.
3. Connect the GDS to the data link connector located underneath the dash panel.
4. Select and operate according to the instructions on the scan tool screen.

> **⚠ CAUTION**
>
> You must obey the maximum operating time of the ABS motor with the hi-scan (Pro) to prevent the motor pump from burning.

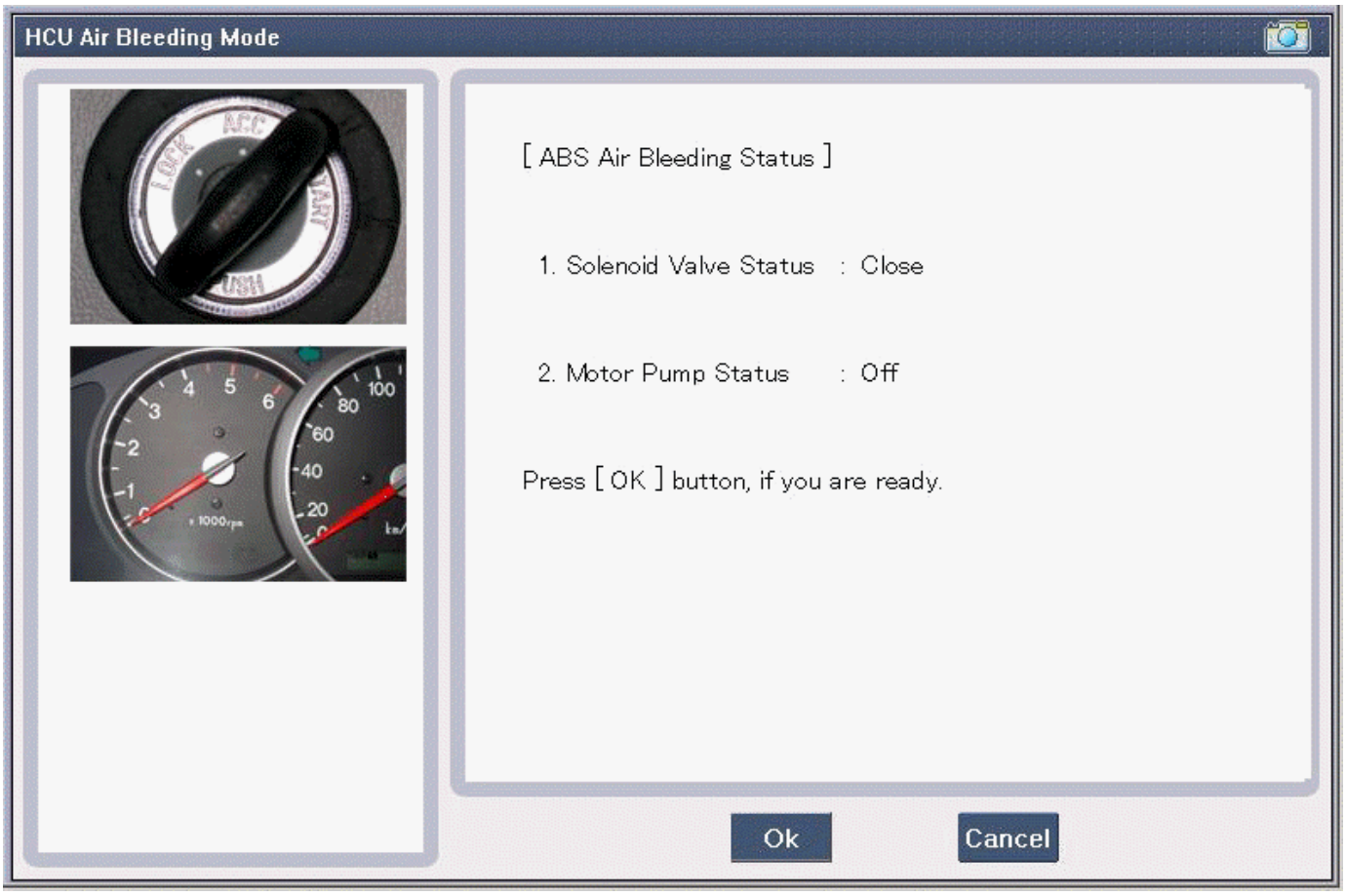
(1) Select vehicle name.

(2) Select Anti-Lock Brake system.

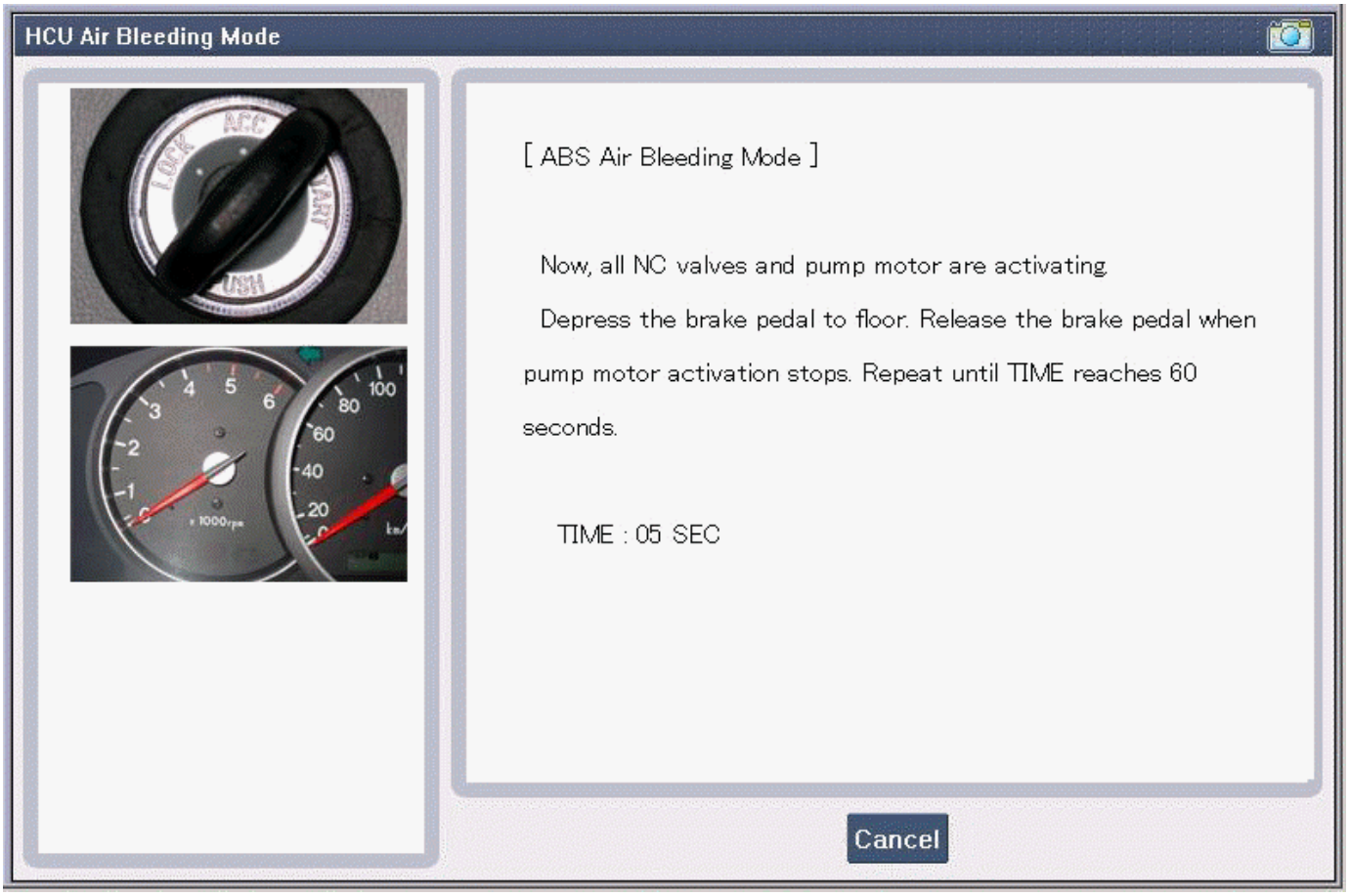
(3) Select air bleeding mode.



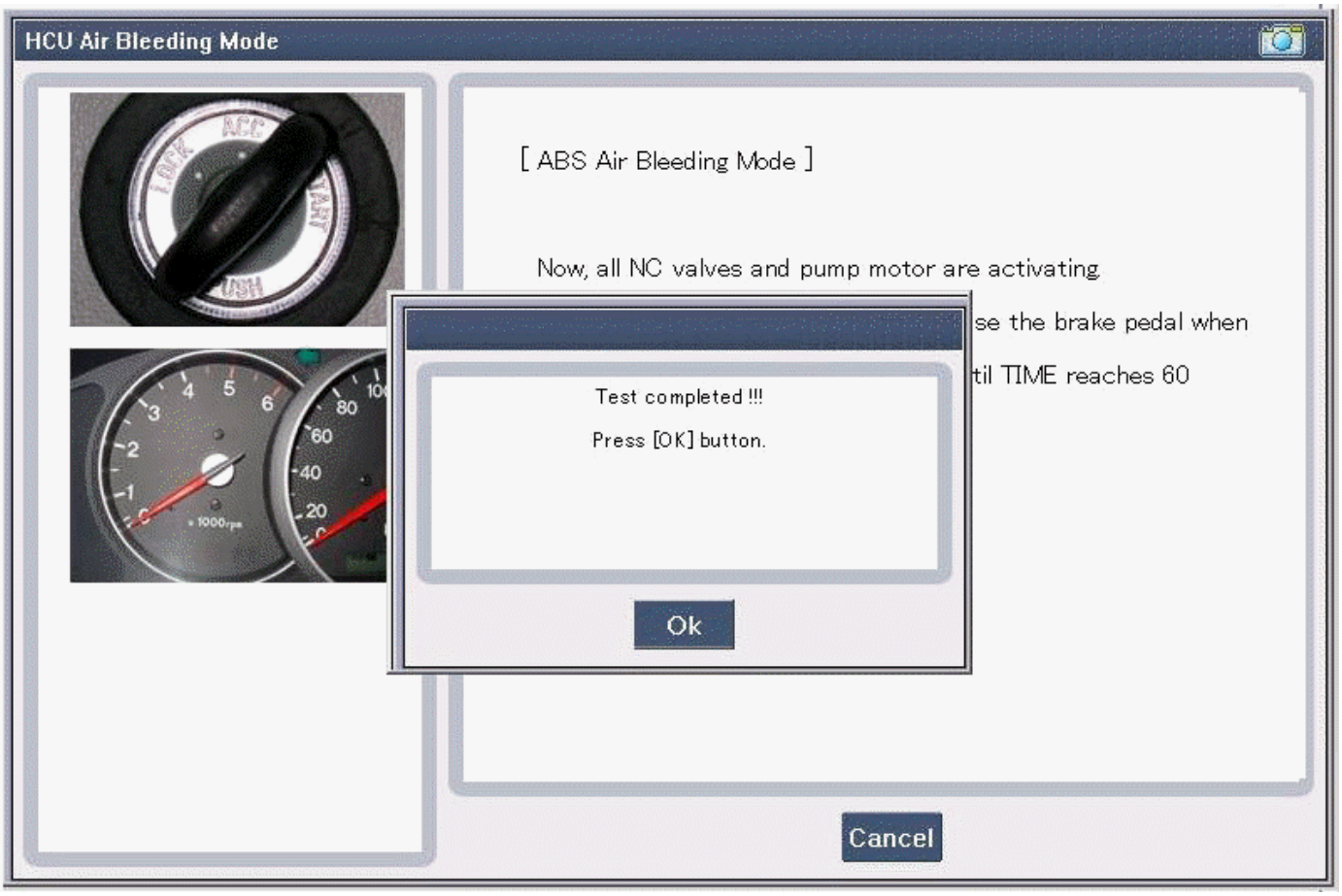
(4) Press "OK" to operate motor pump and solenoid valve.



(5) Wait 60 sec. before operating the air bleeding. (If not, you may damage the motor.)

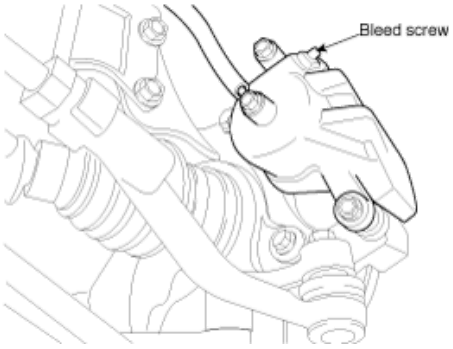


(6) Perform the air bleeding.

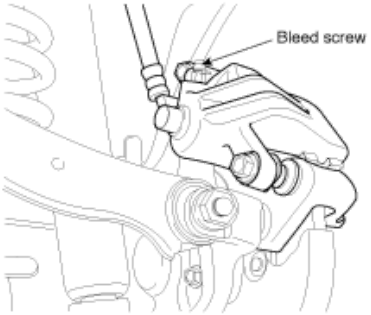


5. Pump the brake pedal several times, and then loosen the bleeder screw until fluid starts to run out without bubbles. Then close the bleeder screw(A).

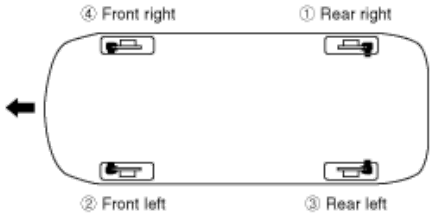
Front



Rear



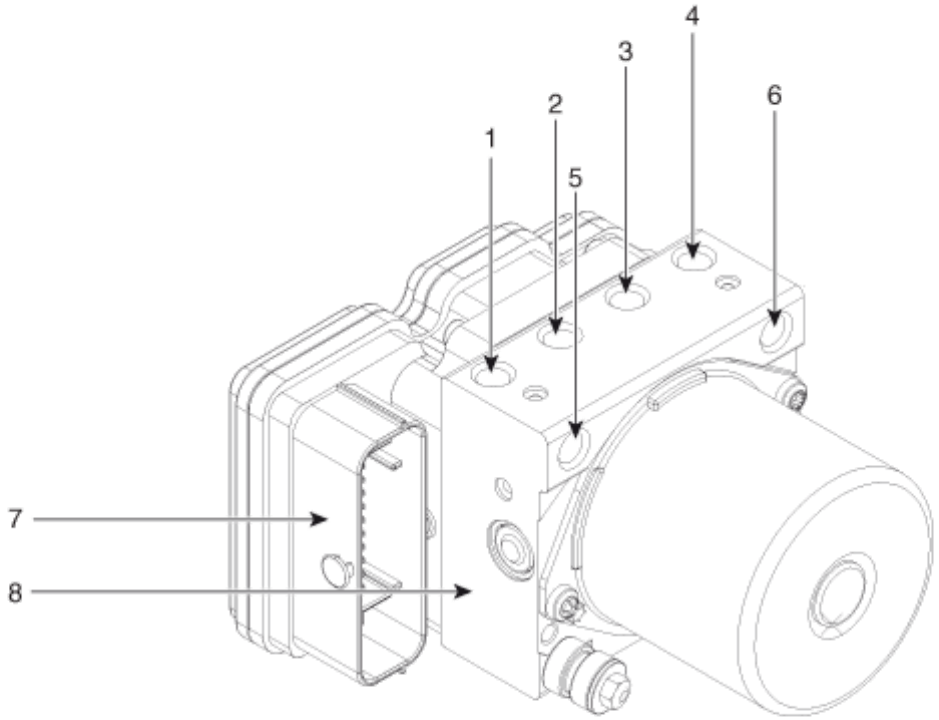
6. Repeat step 5 until there are no more bubbles in the fluid for each wheel.



7. Tighten the bleeder screw.

   Bleed screw tightening torque:
   6.9 ~ 12.7N.m (0.7 ~ 1.3kgf.m, 5.1 ~ 9.4lb-ft)

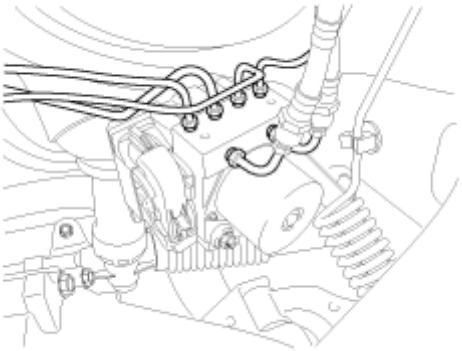
COMPONENTS



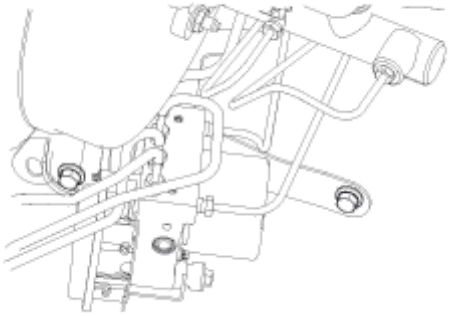
1. Front - right tube	5. Master cylinder tube2
2. Rear - left tube	6. Master cylinder tube1
3. Rear - right tube	7. ABS control module connector
4. Front - left tube	8. ABS control module (HECU)

REMOVAL

1. Disconnect the battery(-) terminal.
2. Disconnect the brake tubes from the HECU.
   Tightening torque :
   5.9 ~ 9.8 N.m(0.6 ~ 1.0 kgf.m, 4.3 ~ 7.2lb-ft)



3. Disconnect the HECU connector.
4. Remove the HECU by loosening the bracket mounting bolts.
   Tightening torque :
   16.7 ~ 25.5 N.m(1.7 ~ 2.6 kgf.m, 12.3 ~ 18.8lb-ft)



⚠ CAUTION

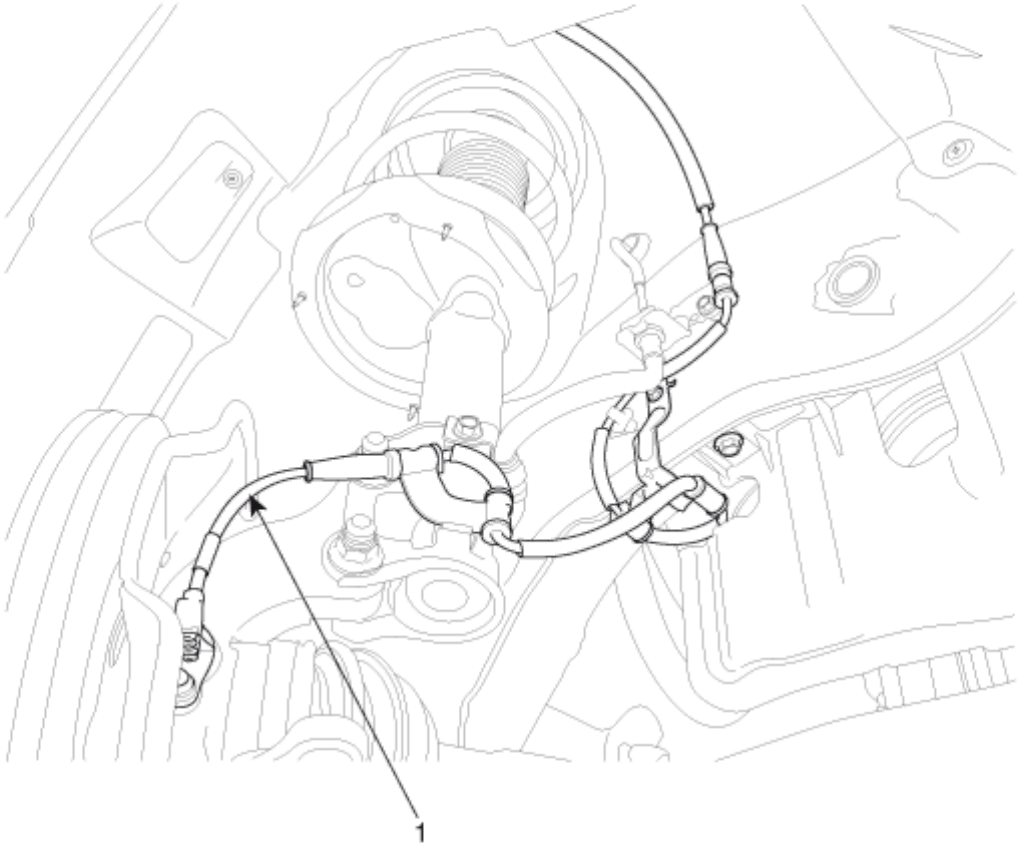
- Never attempt to disassemble the HECU.
- The HECU must be protected during storage and transport, and must not be subjected to excessive shock.

INSTALLATION

1. Installation is the reverse of removal.
2. After installation, bleed the brake system. (Refer to ABS bleeding)

English

COMPONENTS

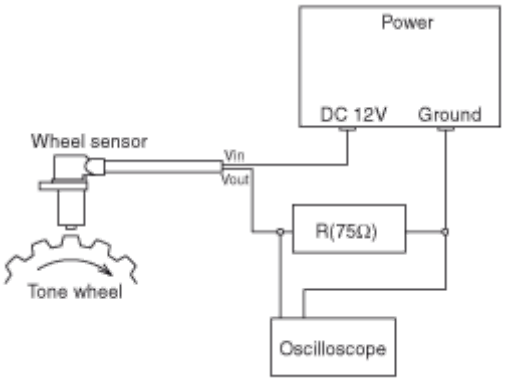


1. Front wheel speed sensor	

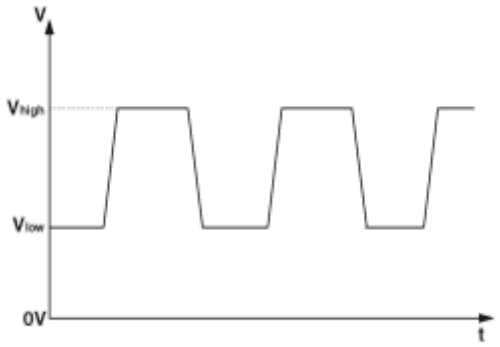
INSPECTION

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 75Ω resistor must be used as shown.



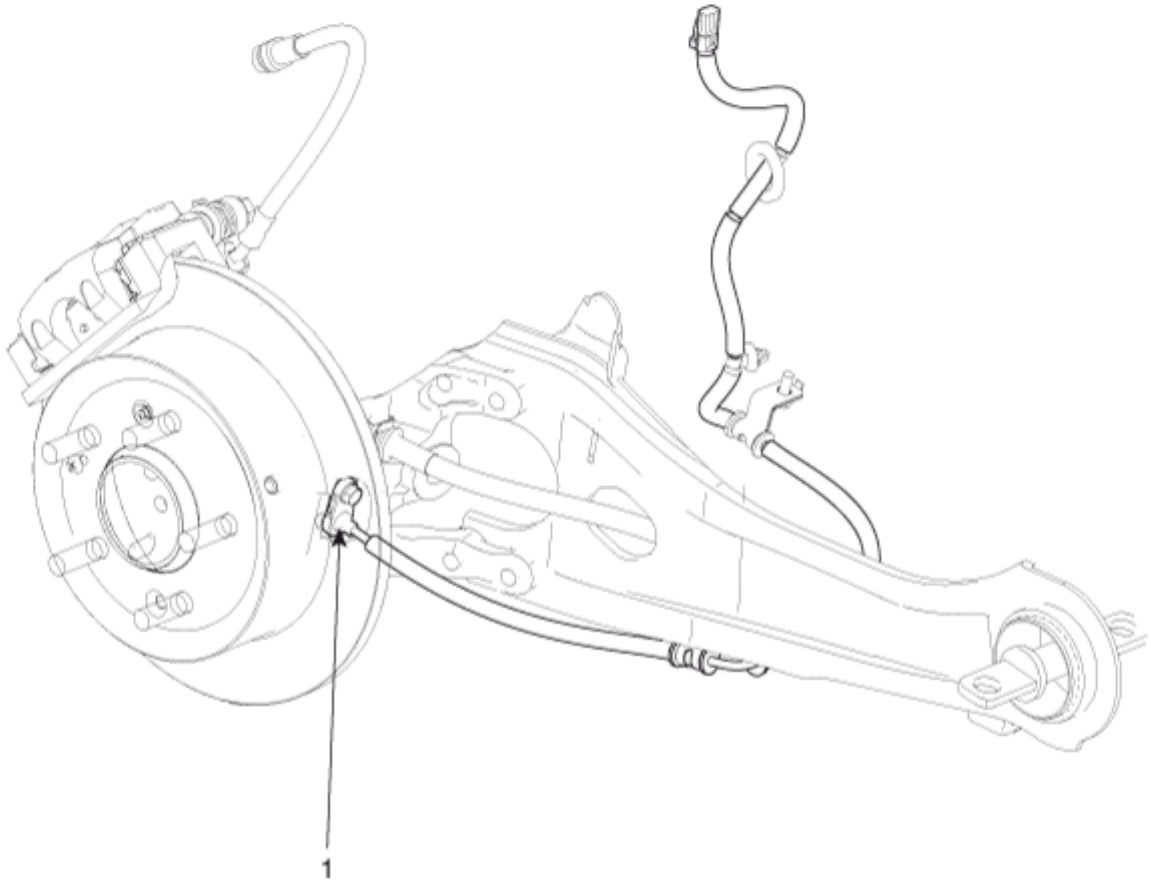
2. Compare the change of the output voltage of the wheel speed sensor to the normal change of the output voltage as shown below.



- V_low : 0.44 V ~ 0.63 V
- V_high : 0.885 V ~ 1.26 V
- Frequency range : 1~2,500 Hz

English

COMPONENTS

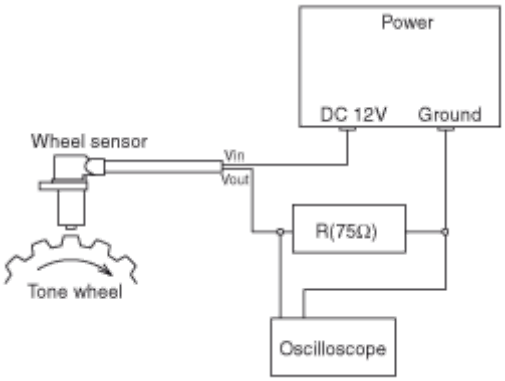


1. Rear wheel speed sensor	

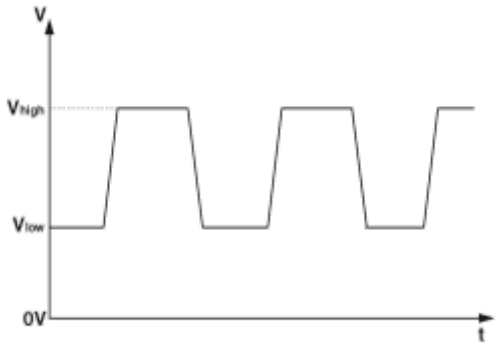
INSPECTION

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 75Ω resistor 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 : 0.44 V ~ 0.63 V
- V_high : 0.885 V ~ 1.26 V
- Frequency range : 1~2,500 Hz

English ▼

DESCRIPTION

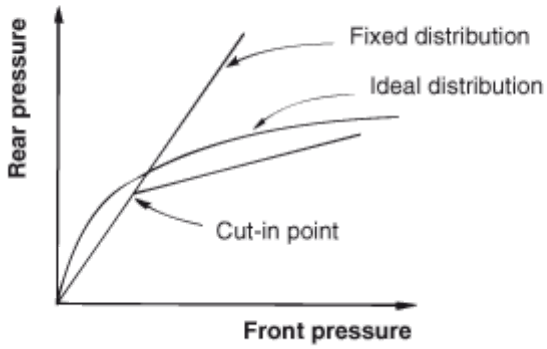
The EBD system (Electronic Brake force Distribution) as a sub-system of the ABS system is to control the effective adhesion utilization by the rear wheels.
It further utilizes the efficiency of highly developed ABS equipment by controlling the slip of the rear wheels in the partial braking range.
The 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

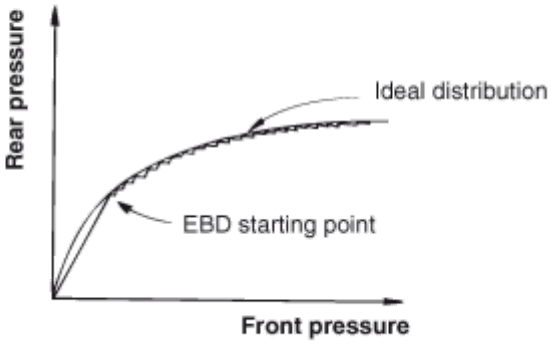
- Function improvement of the base-brake system.
- Compensation for the different friction coefficients.
- Elimination of the proportioning valve.
- Failure recognition by the warning lamp.

Comparison between Proportioning valve and EBD

[With P-Valve]

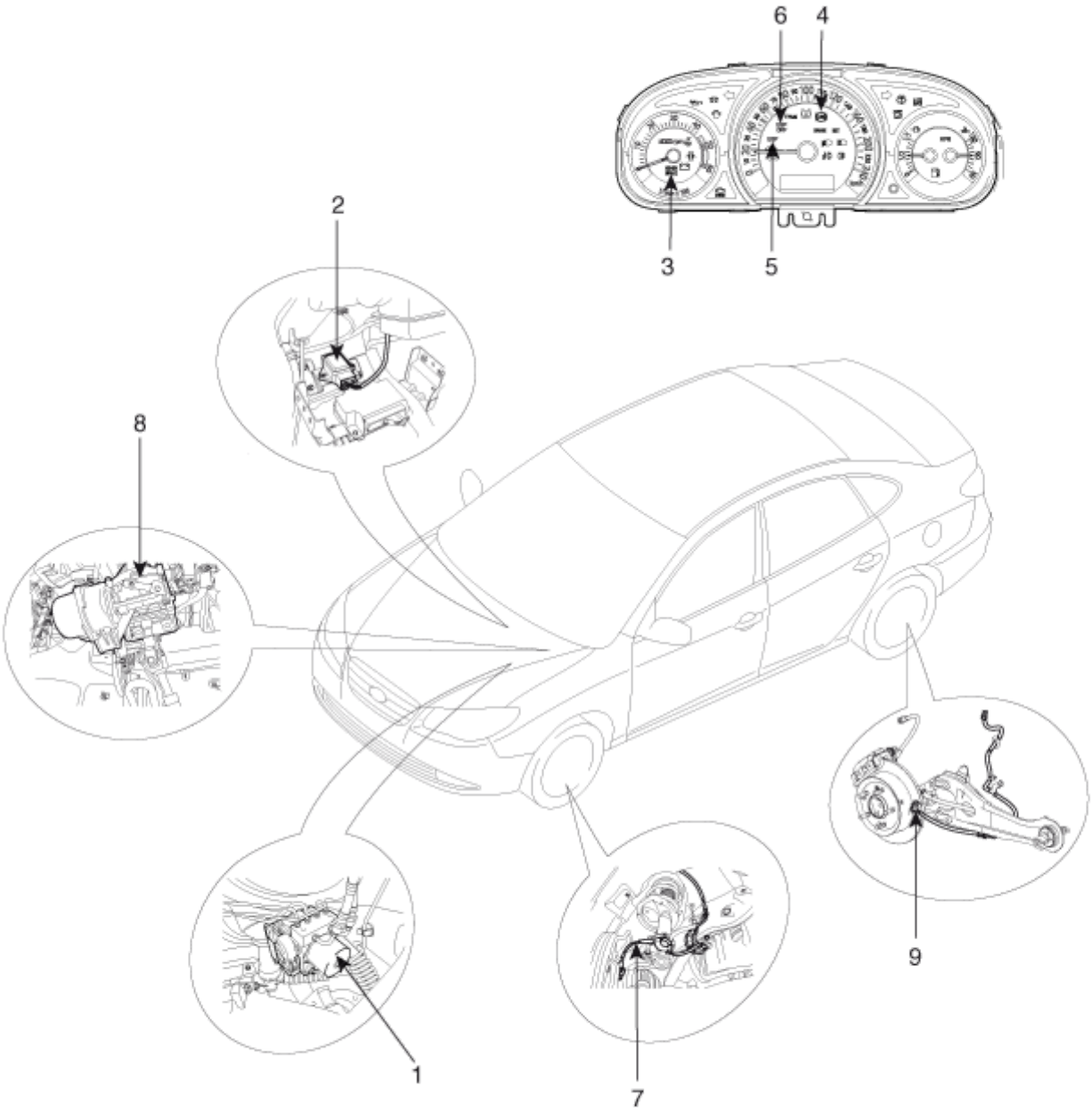


[With EBD]



English ▼

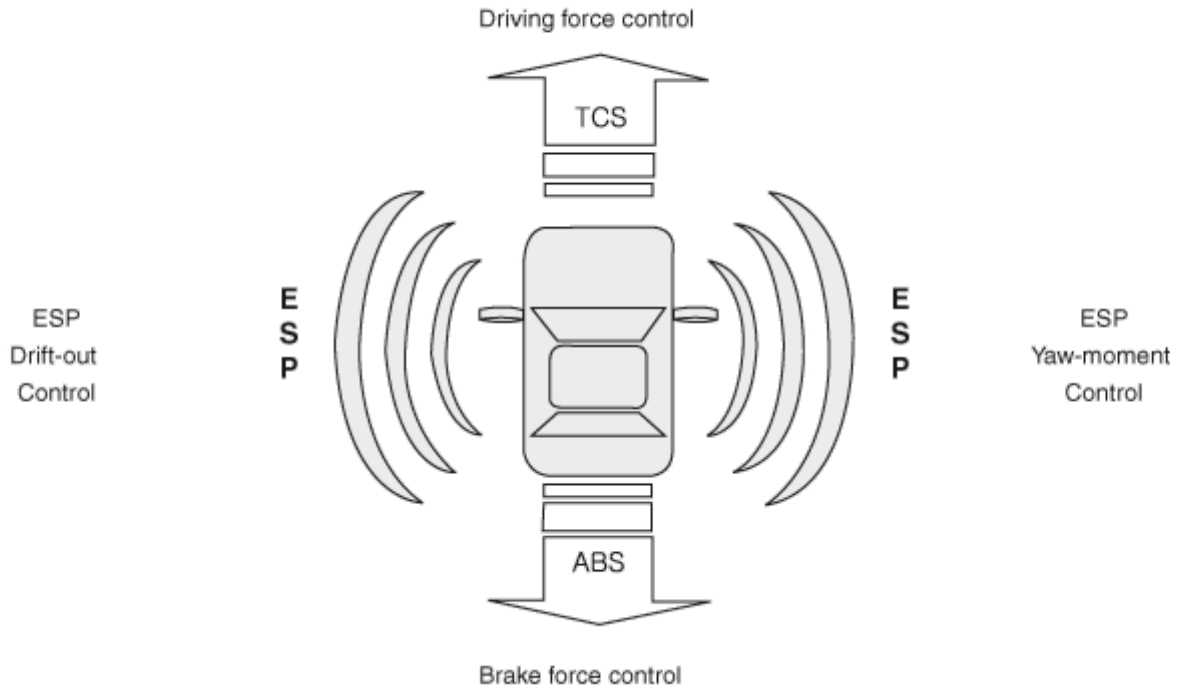
COMPONENTS



1. HECU module	6. ESP OFF lamp
2. Yaw rate & Lateral G sensor	7. Front wheel speed sensor
3. Parking brake/EBD warning lamp	8. Steering angle sensor
4. ABS Warning lamp	9. Rear wheel speed sensor
5. ESP lamp	

DESCRIPTION OF ESP

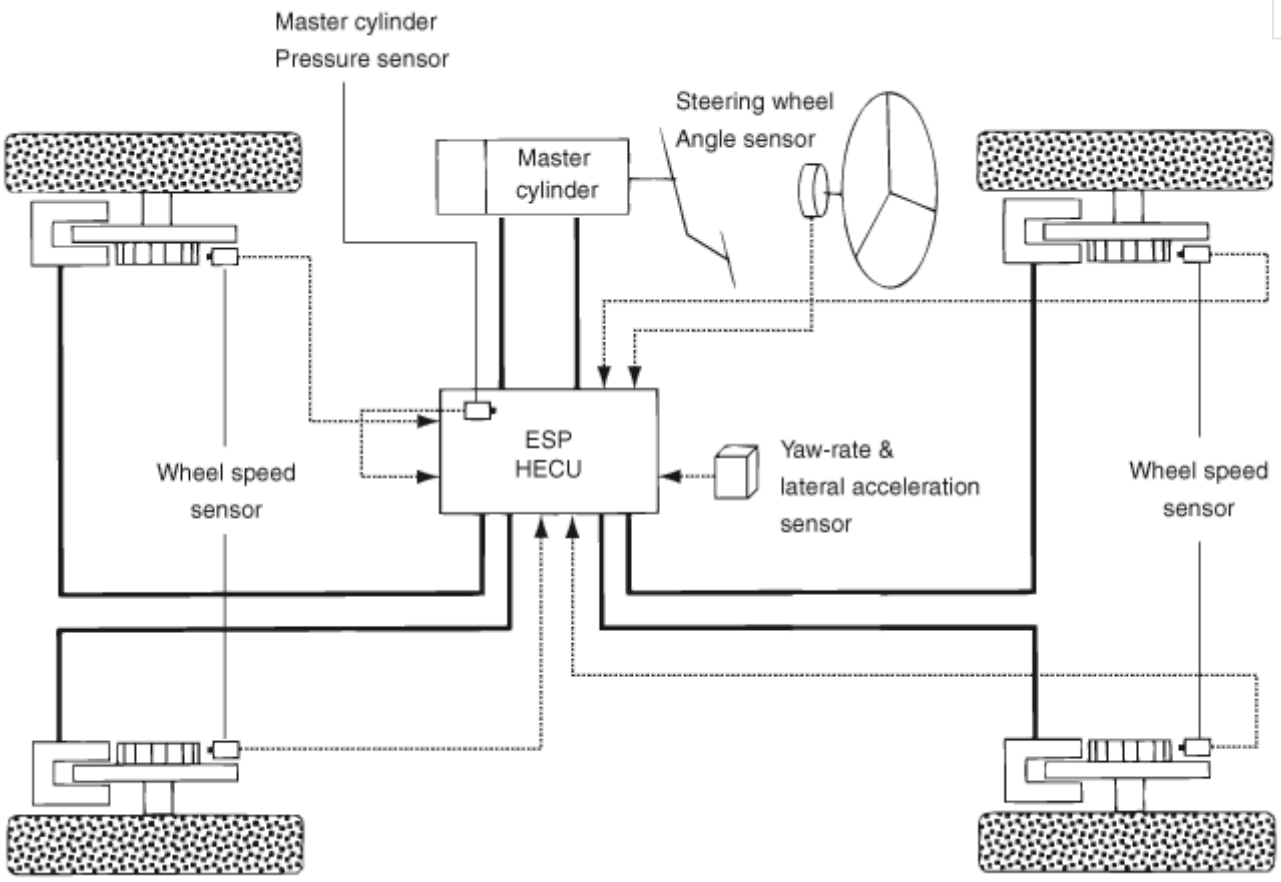
Optimum driving safety now has a name : ESP, the Electronic Stability Program.
ESP recognizes critical driving conditions, such as panic reactions in dangerous situations, and stabilizes the vehicle by wheel-individual braking and engine control intervention with no needfor actuating the brake or the gas pedal.
ESP adds a further function known as Active Yaw Control (VDC) to the ABS, TCS, EBD and ESP 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.
Of course, 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 ESP 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 ESP Control

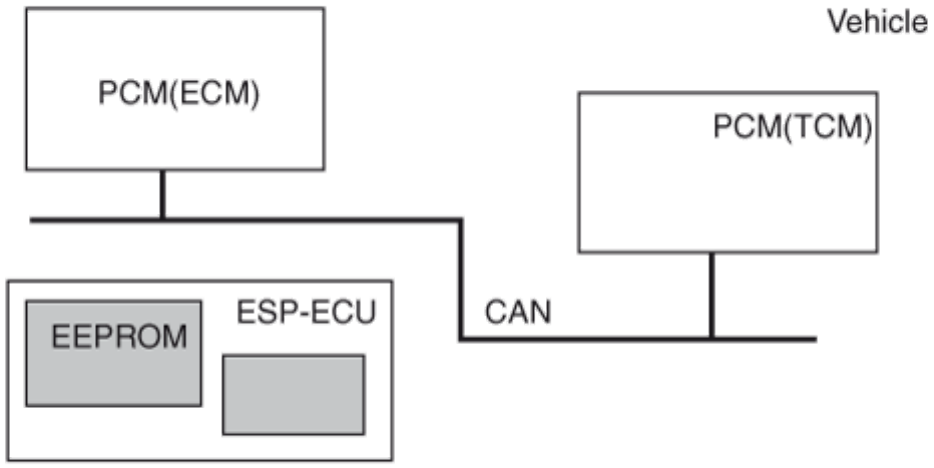
ESP system includes ABS/EBD, TCS and VDC (Vehicle Dynamic Control) function.
ABS/EBD function : The ECU changes the active sensor signal (current shift) coming from the four wheel sensors to the square waveform.By using the input of above signals, the ECU calculates the vehicle speed and the acceleration & 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.
VDC function prevents unstable maneuver of the vehicle. To determine the vehicle maneuver, VDC 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), VDC 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/ESP warning lamp. (fail-safe warning)

English ▼



Variant Coding

The HECU is programmed with a variant code based on the vehicle powertrain configuration. This variant code is used to determine the appropriate ESP calculations. Variant code programming should be performed whenever an HECU is replaced.



Procedure of Variant Coding

1. Install a PCM(ECM & TCM)/ESP normally.
2. Connect the GDS to the data link connector located underneath the crash pad.

3. Select vehicle name.
4. Select ANTI-LOCK BRAKE SYSTEM.
5. Select the variant coding.
6. Ignition "ON" & Engine "OFF".
7. Perform variant coding.

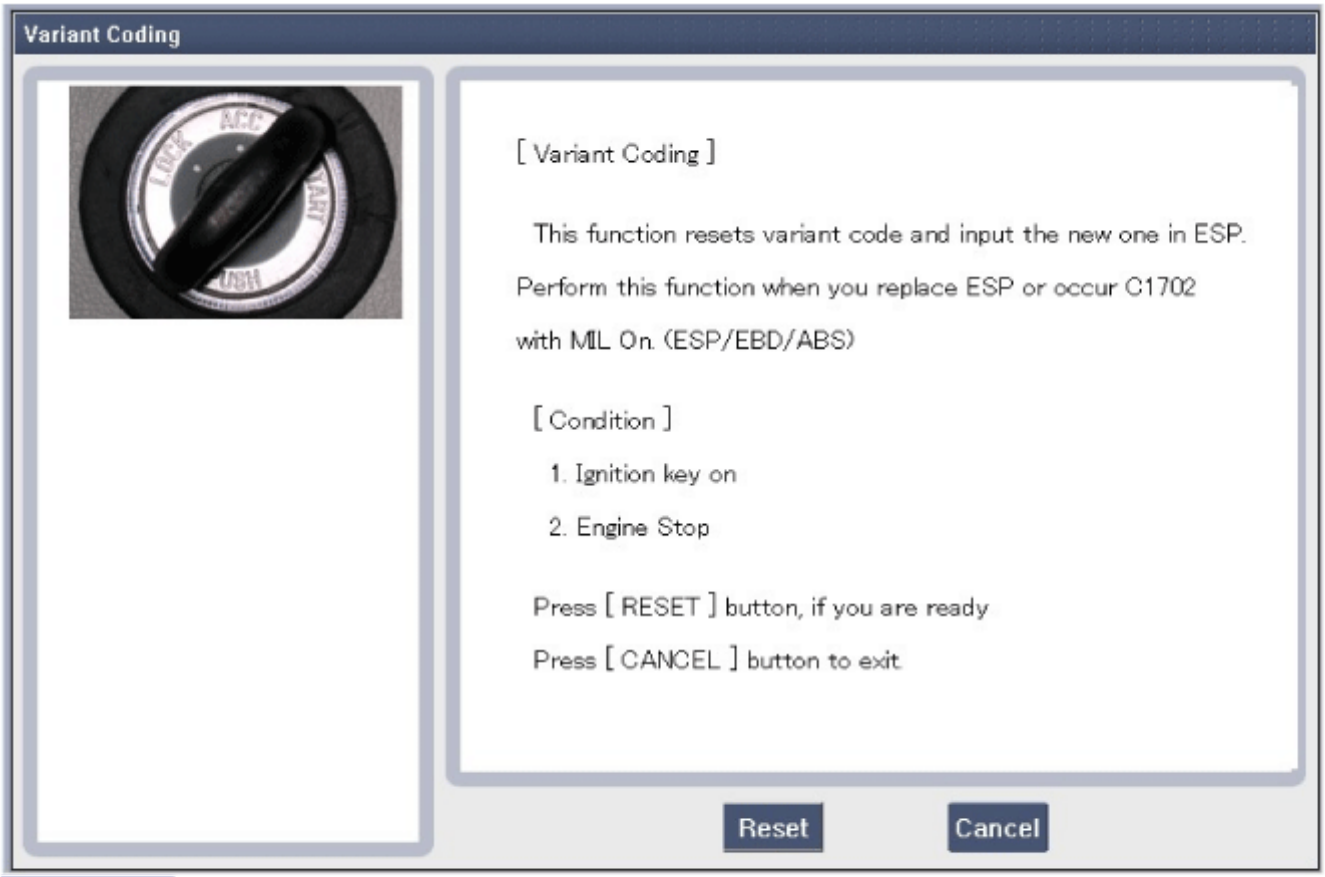


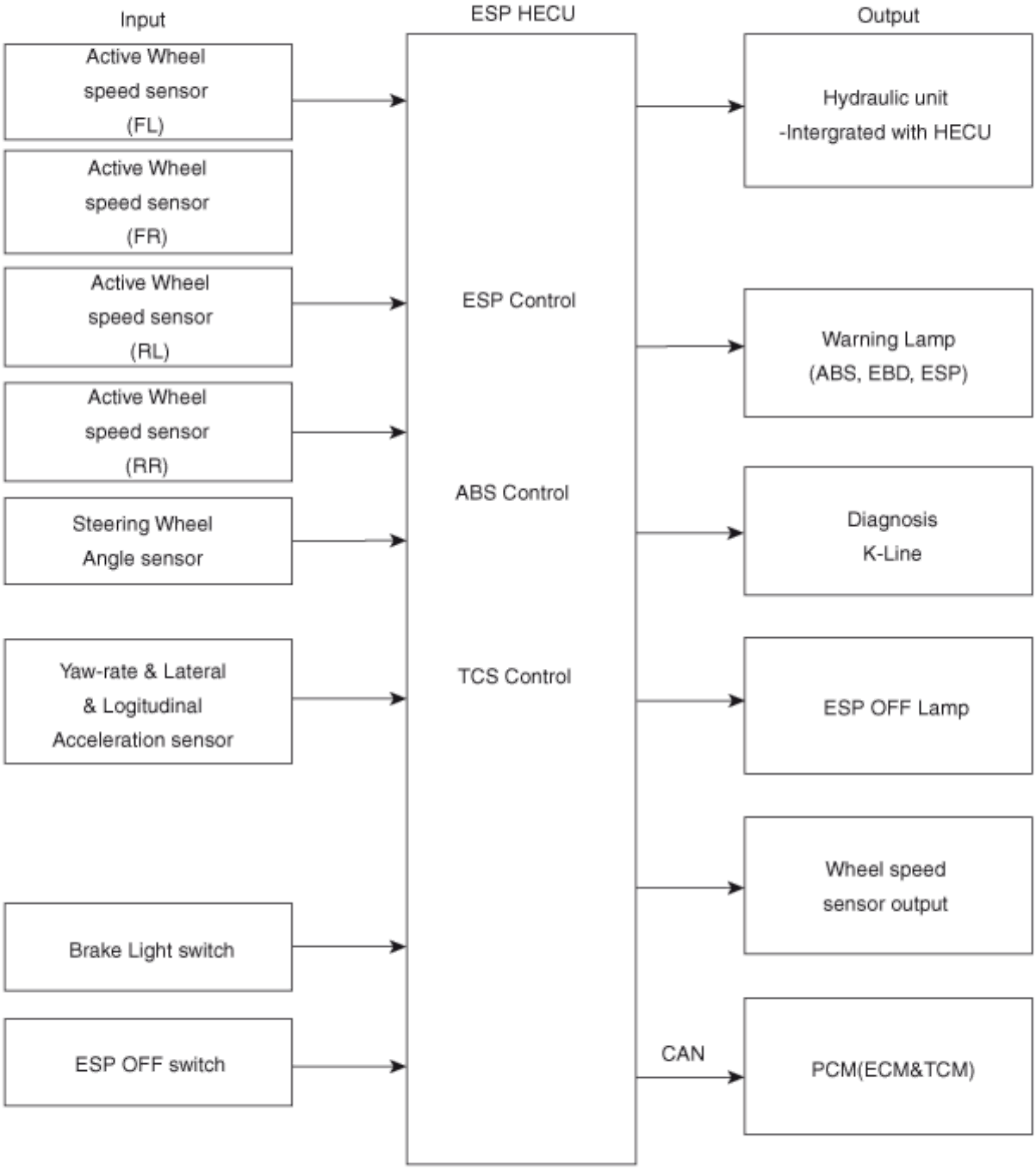
Fig.2

8. Ignition "OFF" and then ignition "ON".
9. The variant coding is completed.

⚠ CAUTION

- If the warning lamp(ESP, EBD, ABS) is illuminated, follow the "Variant coding" again.

Input and Output Diagram



ESP OPERATION MODE

1. STEP 1
   The ESP analyzes the intention of the driver.

Position of steering wheel
+ Vehicle speed
+ Acceleration pedal

→ ECU decides the intention of the driver.

2. STEP 2
   It analyzes the movement of the ESP vehicle.

Vehicle rotation speed
+ Operated power to the side

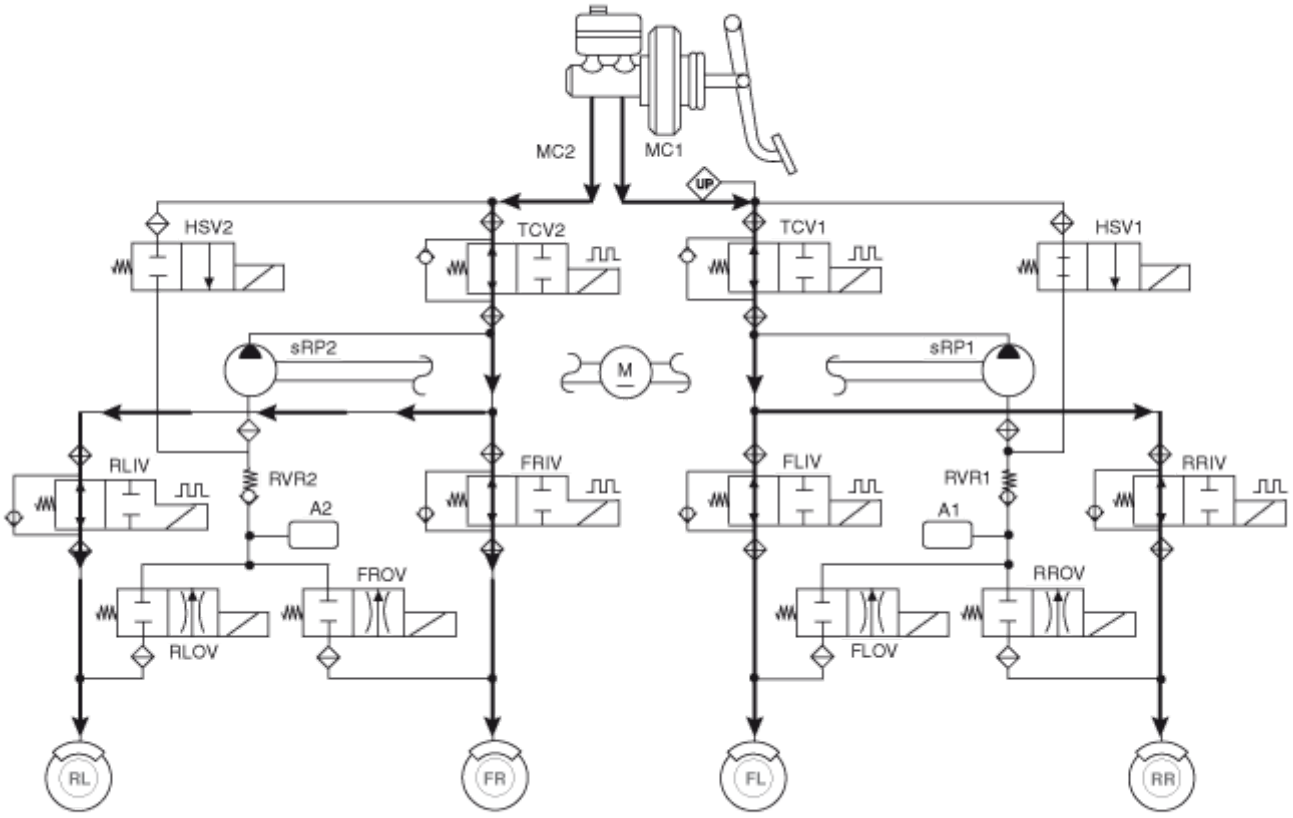
→ ECU decides movement of the ESP vehicle.

3. STEP 3
   he HECU calculates the required strategy, then actuates the appropriate valves and sents torque control requests via CAN to maintain vehicle stability.

ESP Operation Mode

1. ESP Non-operation-Normal braking.

	Inlet valve(IV)	Outlet valve(OV)	Traction Control Valve(TCV)	High pressure switch valve(HSV)	Return pump
Normal braking	Open	Close	Open	Close	OFF

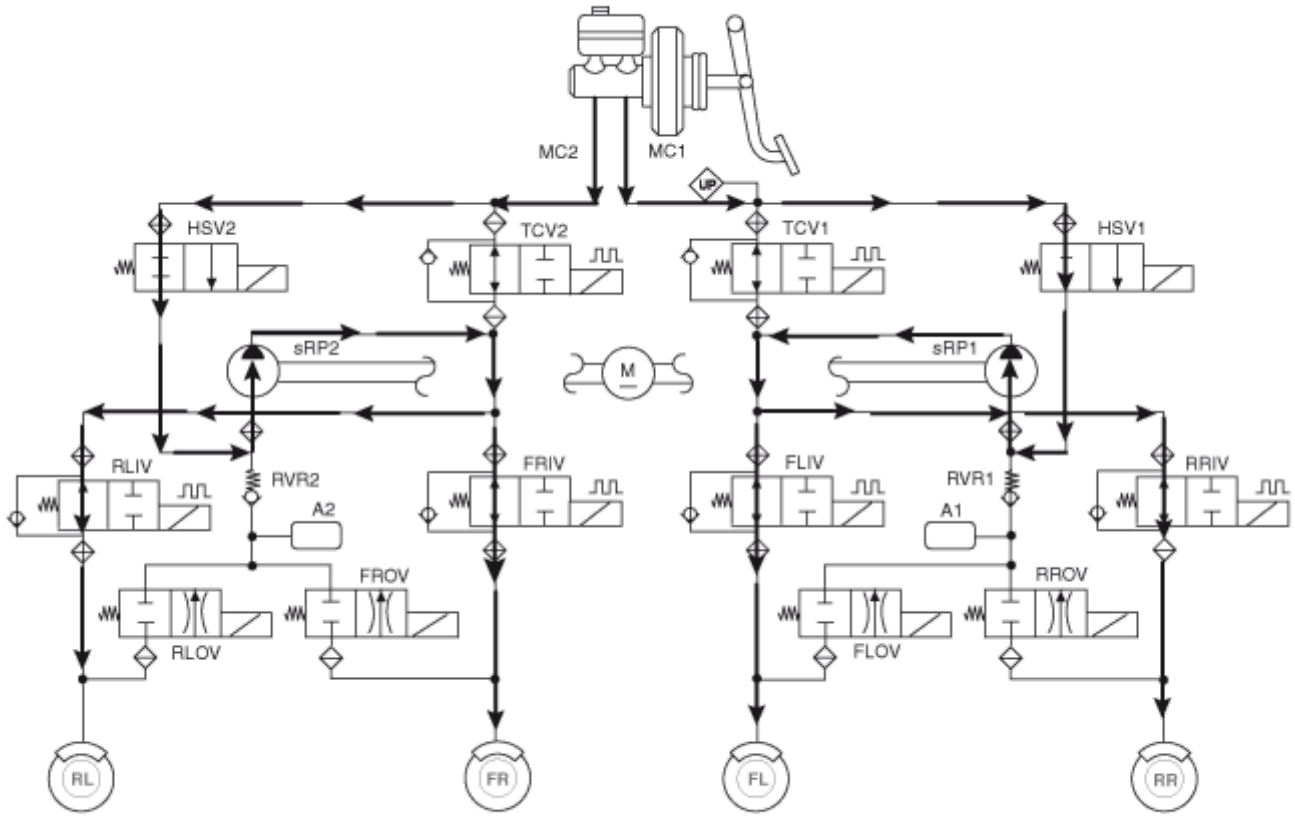


NOTICE

IV : Inlet Valve
OV : Outlet Valve
RL : Rear left wheel
FR : Front right wheel
FL : Front left wheel
RR : Rear right wheel
RP : Return pump
TCV : Traction Control Valve
HSV : High pressure Switch Valve

2. ESP Increase Mode

	Inlet valve(IV)	Outlet valve(OV)	Traction Control Valve(TCV)	High pressure switch valve(HSV)	Return pump
Normal braking	Open	Close	Close(Partial)	Open	ON(Motor speed control)



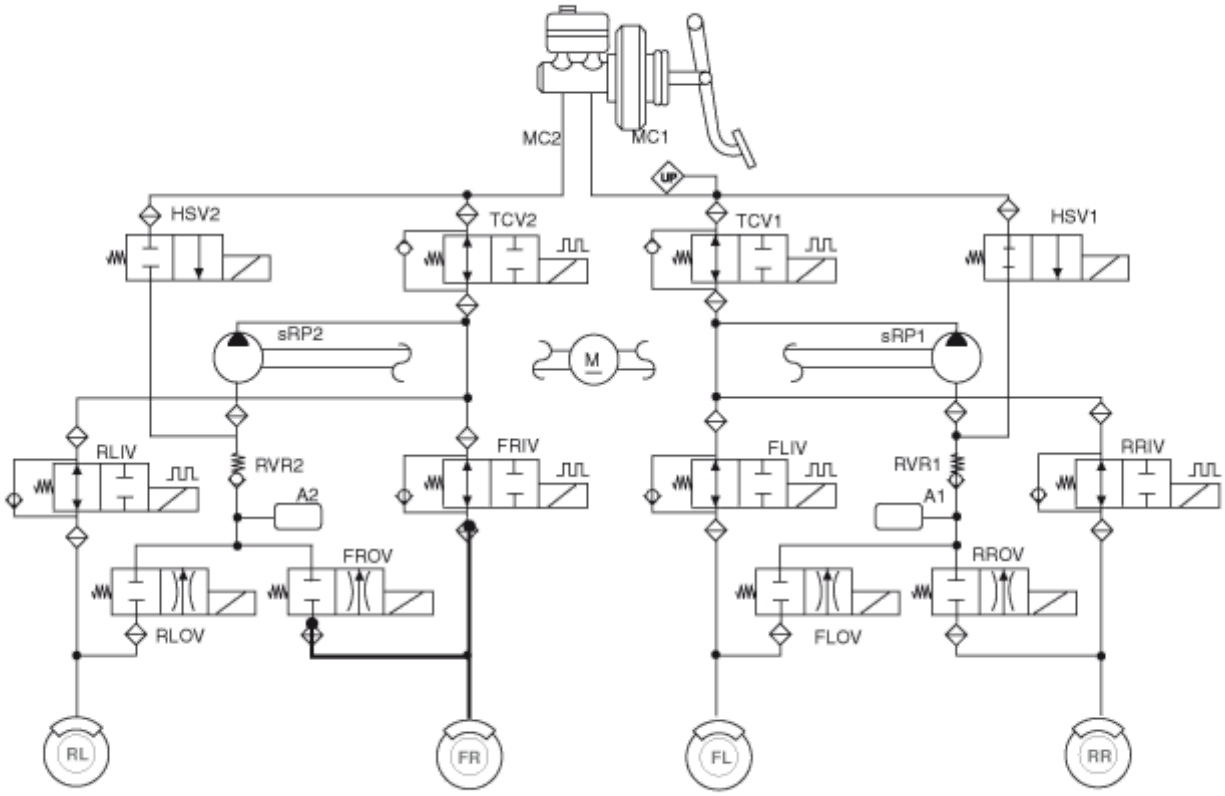
NOTICE

IV : Inlet Valve
OV : Outlet Valve
RL : Rear left wheel
FR : Front right wheel
FL : Front left wheel
RR : Rear right wheel
RP : Return pump

TCV : Traction Control Valve
HSV : High pressure Switch Valve

3. ESP Hold Mode (FR is only controlled.)

	Inlet valve(IV)	Outlet valve(OV)	Traction Control Valve(TCV)	High pressure switch valve(HSV)	Return pump
Normal braking	Close	Close	Close(Partial)	Open	OFF

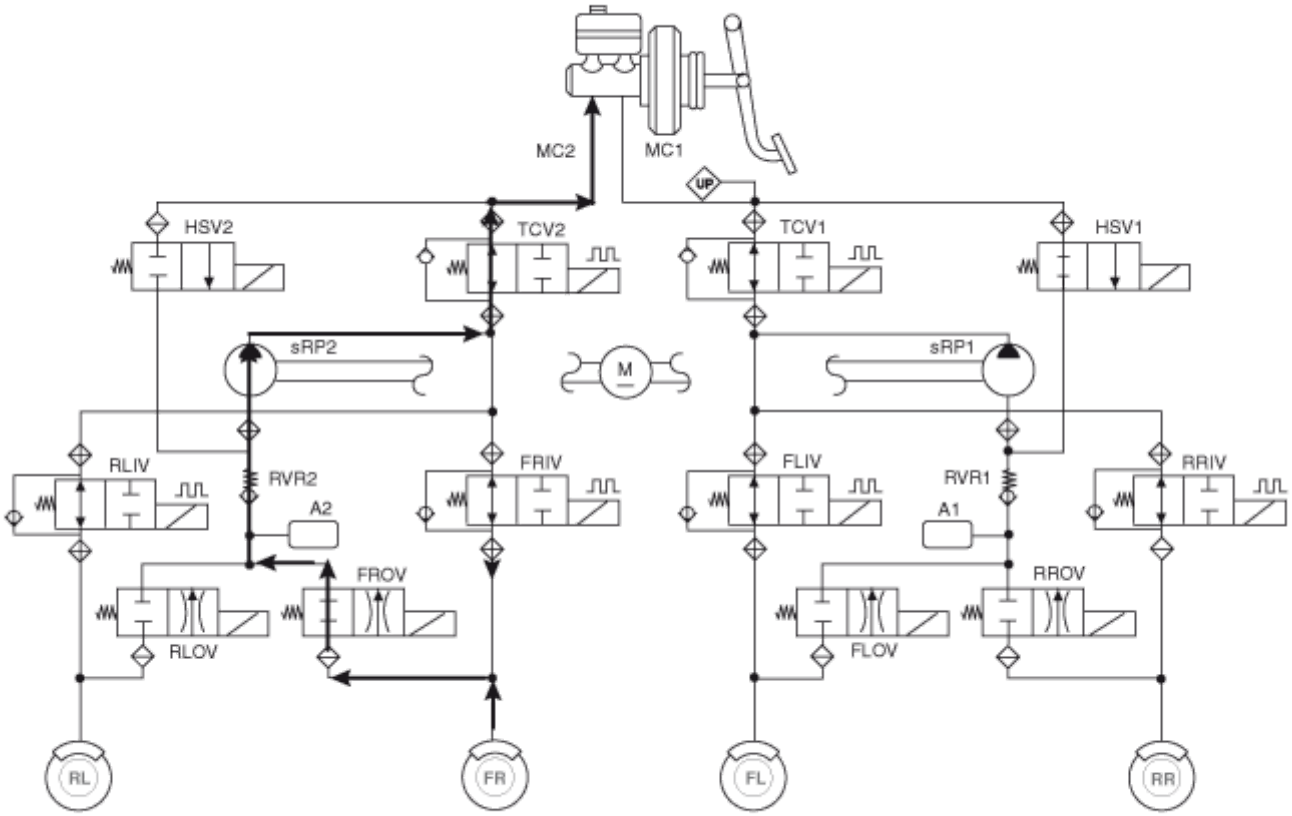


NOTICE

IV : Inlet Valve
OV : Outlet Valve
RL : Rear left wheel
FR : Front right wheel
FL : Front left wheel
RR : Rear right wheel
RP : Return pump
TCV : Traction Control Valve
HSV : High pressure Switch Valve

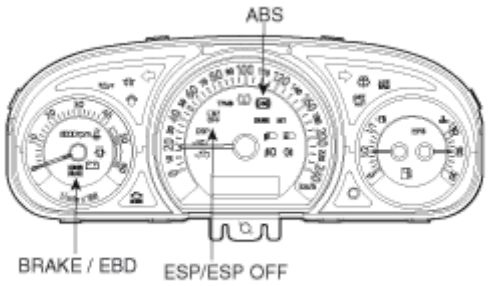
4. ESP Decrease Mode (FR is only controlled)

	Inlet valve(IV)	Outlet valve(OV)	Traction Control Valve(TCV)	High pressure switch valve(HSV)	Return pump
Normal braking	Close	Open	Close(Partial)	Open	ON(Motor speed low control)



NOTICE

IV : Inlet Valve
OV : Outlet Valve
RL : Rear left wheel
FR : Front right wheel
FL : Front left wheel
RR : Rear right wheel
RP : Return pump
TCV : Traction Control Valve
HSV : High pressure Switch Valve



ABS Warning lamp

The active ABS warning lamp 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 separated from ECU.

EBD/parking brake warning lamp

The active EBD warning lamp 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 shall be 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 separated from ECU.

ESP OFF Lamp (ESP system)

The ESP OFF lamp indicates the self-test and ON/OFF status of the ESP.
The ESP OFF lamp operates under the following conditions :

- During the initialization phase after IGN ON. (continuously 3 seconds).
- When driver turn off the ESP function by on/off switch.

ESP Lamp (ESP system)

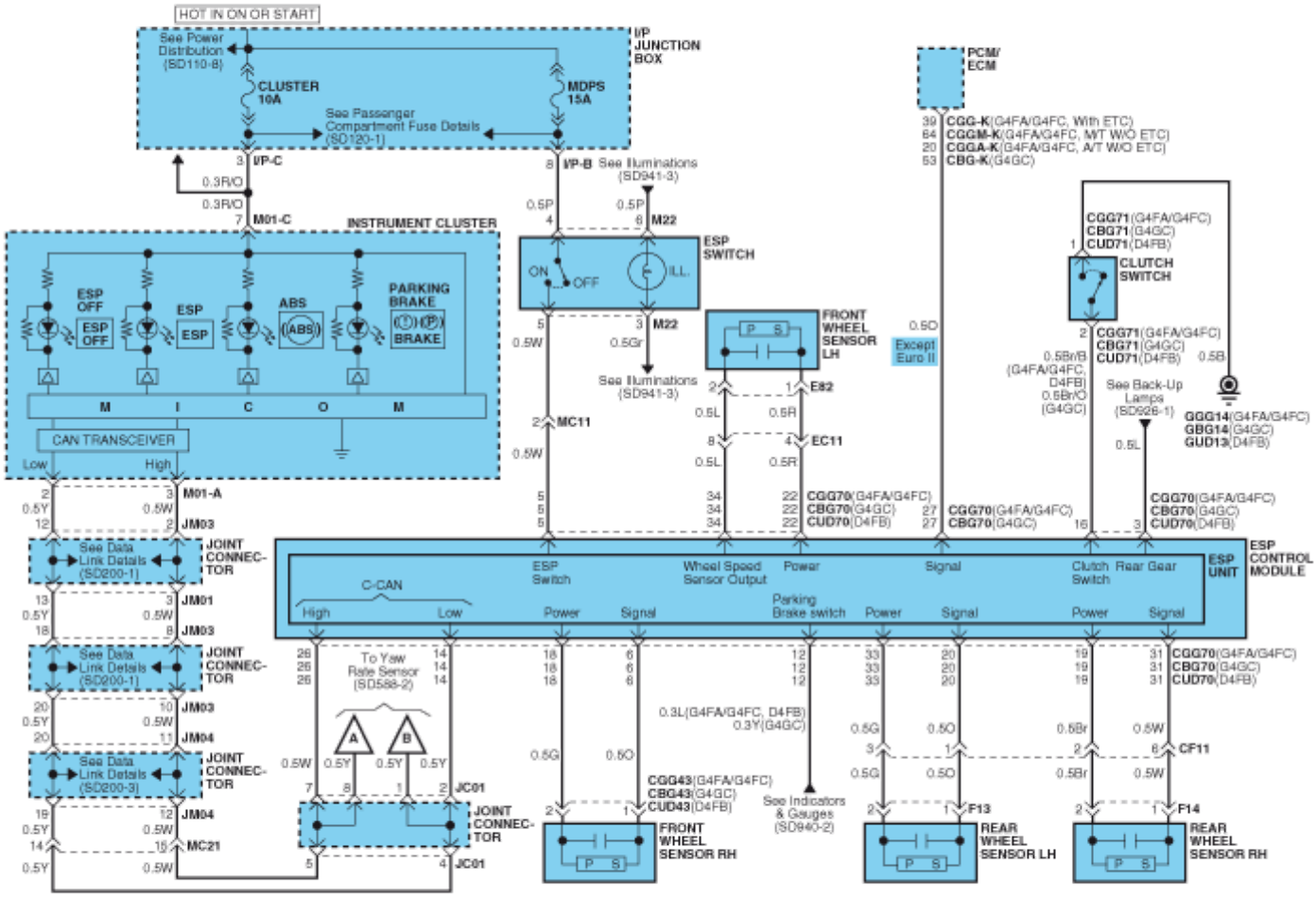
The ESP lamp indicates the self-test and failure status of the ESP and operating status of the ESP.
The ESP lamp is turned on under the following conditions :

- During the initialization phase after IGN ON. (continuously 3 seconds).
- In the event of inhibition of ESP functions by failure.
- During diagnostic mode.
- When the ESP control is operating. (Blinking - 2Hz)
- When the ECU connector is seperated from ECU.

ESP On/Off Switch (ESP system)

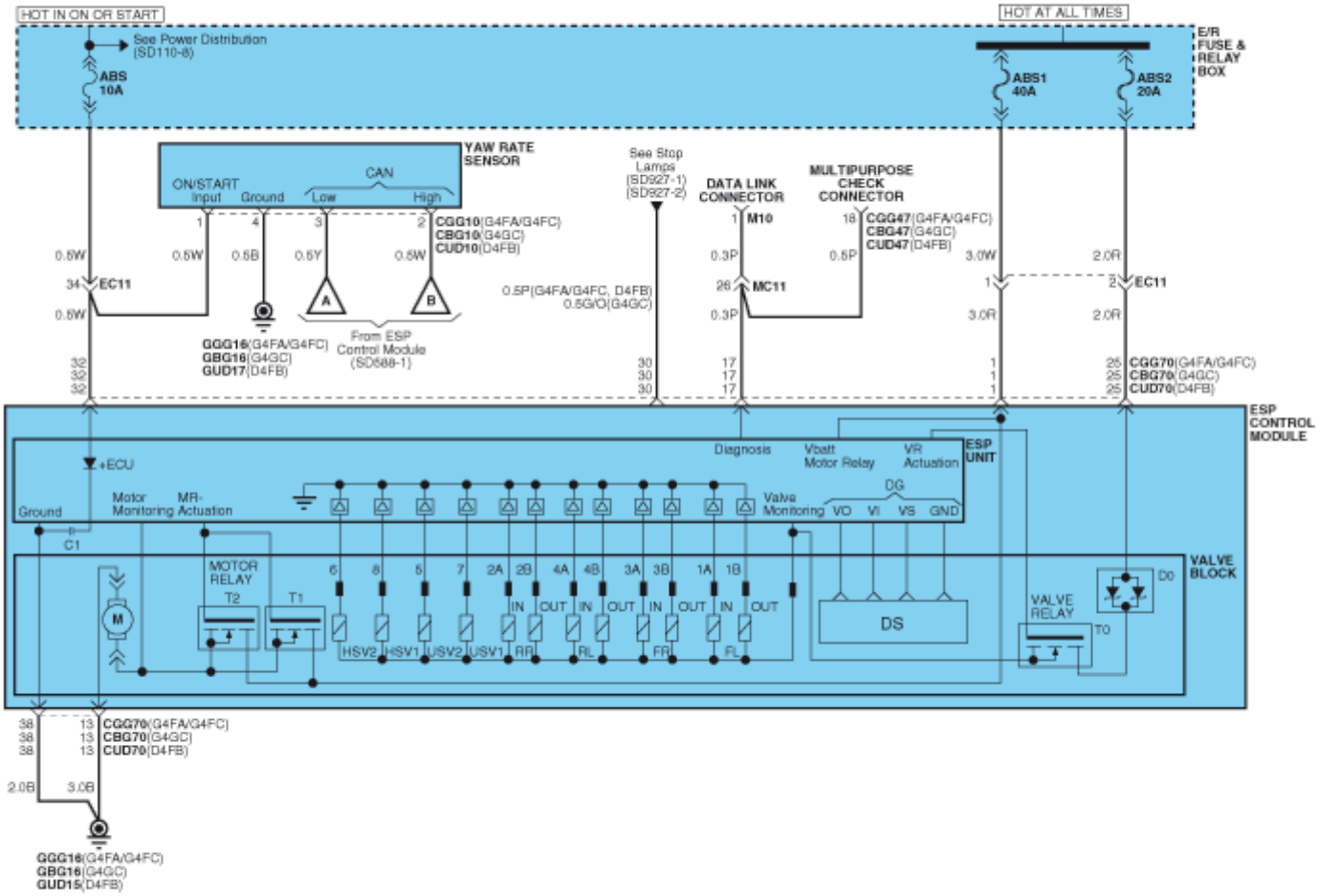
The ESP On/Off Switch shall be used to toggle the ESP function between On/Off states based upon driver input.
The On/Off switch shall be a normally open, momentary contact switch.
Initial status of the ESP function is on and the switch is used to request an ESC status change.

CIRCUIT DIAGRAM - ESP(1)

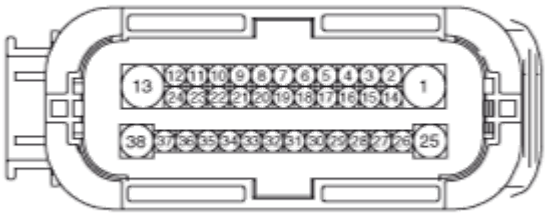


CIRCUIT DIAGRAM - ESP(2)

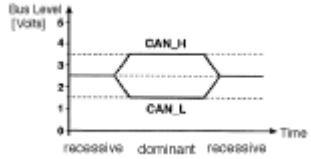
English ▼



ESP HECU CONNECTOR INPUT/OUTPUT



Connector Terminal		Specifications	Conditions
No	Description		
13	Ground(Pump)	Current range : Min-10 A Max 39 A	Always
38	Ground(Valve,ECU)	Current range : Min-2 A Max 15 A	Always

1	Supply voltage(Pump)	Battery voltage	Always
25	Supply voltage(Valve)		
34	Wheel sensor voltage(FL)	Battery voltage	IG ON
18	Wheel sensor voltage(FR)		
33	Wheel sensor voltage(RL)		
19	Wheel sensor voltage(RR)		
22	Wheel sensor signal(FL)	Voltage(High) : 1.34 ~ 2.02 V Voltage(Low) : 0.67 ~ 1.0 V	RUNNING
6	Wheel sensor signal(FR)		
20	Wheel sensor signal(RL)		
31	Wheel sensor signal(RR)		
32	Ignition	Battery voltage	KEY ON/OFF
5	ESP Passive switch	Voltage(High) : 0.6 * IG ON more Voltage(Low) : 0.4 * IG ON lower	Switch ON/OFF
26	CAN High	not communicating:2.5 ± 0.5 V communication : 	IG ON
14	CAN Low		
30	Brake Light Switch	voltage(High) : ≥ 4.5 V voltage(Low) : ≤ 2.0 V	BRAKE ON/OFF
12	Parking Brake Switch (Signal)	voltage(High) : ≥ 0.7 V * IG ON voltage(Low) : ≤ 0.35 V * IG ON	
17	Diagnostic K	voltage(High) : ≥ 0.8 V * IG ON voltage(Low) : ≤ 0.2 V * IG ON	
16	Clutch switch (M/T Only)	voltage(High) : ≥ 0.6 V * IG ON voltage(Low) : ≤ 0.4 V * IG ON	
3	Reverse gear	voltage(High) : ≥ 4.5 V * IG ON voltage(Low) : ≤ 0.2 V * IG ON	

FAILURE DIAGNOSIS

1. In principle, ESP and TCS controls are prohibited in case of ABS failure.
2. When ESP or TCS fails, only the failed system control is prohibited.
3. However, when the solenoid valve relay should be turned off in case of ESP failure, refer to the ABS fail-safe.
4. Information on ABS fail-safe is identical to the fail-safe in systems where ESP 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

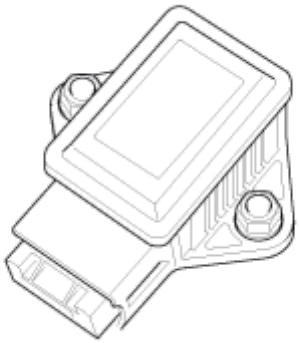
1. Turn the system down and perform the following actions and wait for HECU power OFF.
2. Turn the valve relay off.
3. Stop the control during the operation and do not execute any until the normal condition recovers.

Warning Lamp ON

1. ESP lamp turn on in case of
   - ESP failure detect
   - For 3sec after IGN ON
   - During diagnostic mode
   - When the ECU connector is separated from ECU
2. ESP lamp blinks when ESP Act.
3. ESP OFF lamp turn on in case of
   - ESP OFF switch on
   - For 3sec after IGN ON

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 ESP 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.



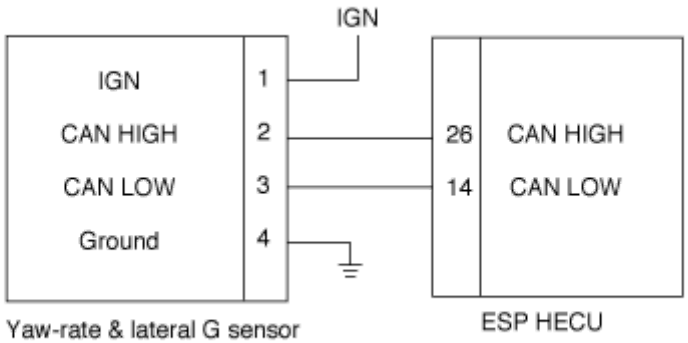
Specifications

Description		Specification	Remarks
Operating voltage		10 ~ 16V	
Output signal		CAN Interface	
Operating temperature		-40 ~ 85°C(-40 ~ 185°F)	
Yaw-rate sensor	Measurement range	-100 ~ 100 deg/s	
Lateral G sensor	Measurement range	-1.8 ~ 1.8g	

External Diagram



[Yaw-rate & lateral G sensor connector]

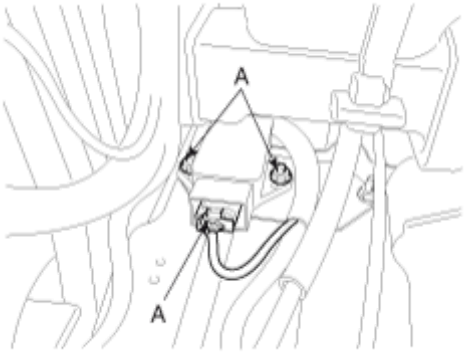


Yaw-rate & lateral G sensor

ESP HECU

REMOVAL

1. Turn ignition switch OFF and disconnect the negative (-) battery cable.
2. Remove the console assembly. (Refer to the Body group - Console)
3. Disconnect the yaw rate & lateral G sensor connector (B).



4. Remove the mounting bolts (A).
   Tightening torque:
   4.9 ~ 7.8 N.m (0.5 ~ 0.8 kgf.m, 3.6 ~ 5.8 lb-ft)
5. Installation is the reverse of removal.

Longitudinal G sensor Calibration

Register zero value of Longitudinal G sensor within the Yaw-rate for calibration to ESP to perform HAC (Hill Assist Control) function.
Calibration must be performed as following cases.

- Calibration failure.
- Yaw-rate and Lateral & Longitudinal G sensor replacement.
- HECU replacement.
- DTC codes (C1285 Longitudinal G sensor not calibrated) detection.

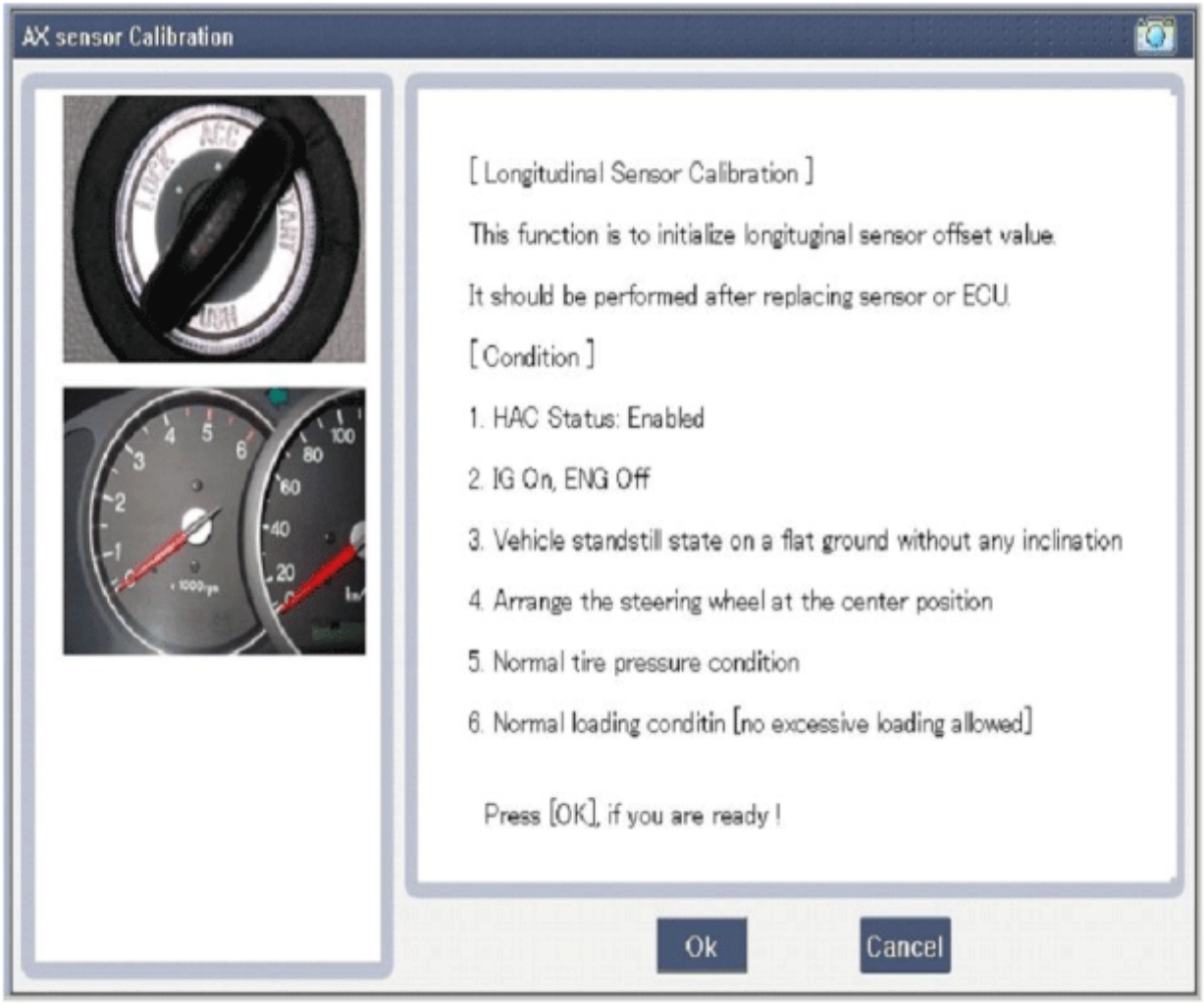
Calibration procedure

1. IG ON, ENG OFF.
2. Stand the vehicle on a flat ground without any inclination.
   - Max. allowed inclination angle(A): ± 0,57° (1%)



3. Set the steering wheel at the center position.

4. Keep the vehicle under normal tire pressure condition and normal loading condition.
5. Connect GDS to data link connector (DLC).
6. Perform Longitudinal Sensor Calibration.



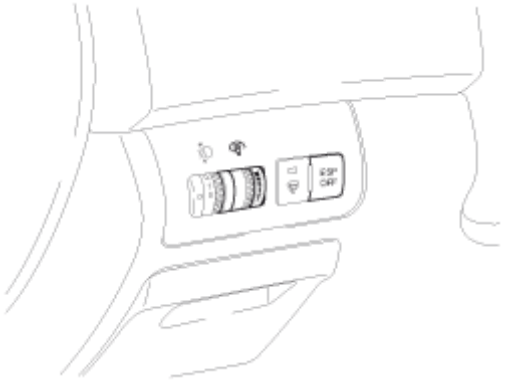
English ▼

DESCRIPTION

1. The ESP OFF switch is for the user to turn off the ESP system.
2. The ESP OFF lamp is on when ESP OFF switch is engaged.

INSPECTION

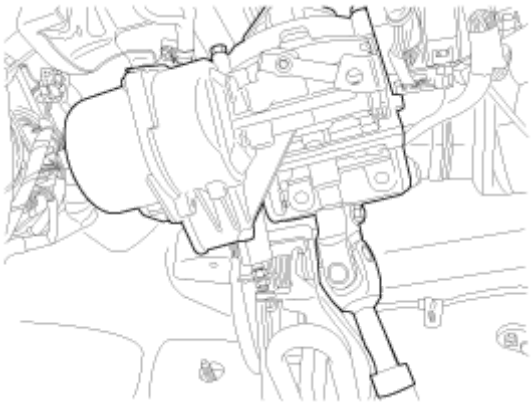
1. Turn ignition switch OFF and disconnect the negative (-) battery cable.
2. Remove the lower crash pad switch assembly by using the scraper and then disconnect the connectors.



3. Check the continuity between the switch terminals as the ESP OFF switch is engaged.

Position \ Terminal	4	5	3	6
ON	○	○	○	○
OFF				

COMPONENT LOCATION



DESCRIPTION

General data

The Steering Angle Sensor (SAS) is installed in EPS (Electric Power Steering) and it sends messages to HECU through CAN communication line.
The SAS is used to determine turning direction and speed of the steering wheel.
The HECU uses the signals from the SAS when performing ESP-related calculations.
Components (Steering Angle Sensor, Torque Sensor, Failsafe relay, etc.) of the EPS system are located inside the steering column & EPS unit assembly and the steering column & EPS unit assembly must not be disassemble to inspect or replace them. (Refer to “ST (Steering system) Gr.”)

SPECIFICATIONS

Item	Specification	
Clutch operation method	Hydraulic type	
Clutch cover assembly	Type	Diaphragm spring strap
Clutch disc	Type	Single dry with diaphragm
	Facing diameter (outside x inside) mm(in)	Gasoline 1.4 / 1.6 : Ø210 × Ø145
		Gasoline 2.0 : Ø225 × Ø150
		Diesel 1.6 : Ø235 × Ø155
		Diesel 2.0 : Ø240 × Ø155
Clutch release cylinder	Inside diameter	20.64 mm (0.81in)
Clutch master cylinder	Inside diameter	15.87mm (0.62in)

Service Standard

Item	Specification
Clutch disc thickness [When free]	Gasoline 1.4 : 8.3 ± 0.3 mm
	Gasoline 1.6 : 8.3 ± 0.3 mm
	Gasoline 2.0 : 8.5 ± 0.3 mm
	Diesel 1.6 : 8.3 ± 0.3 mm
	Diesel 2.0 : 8.5 ± 0.3 mm
Clutch pedal height [Without carpet]	182.8 mm (7.19 in)
Clutch pedal free play	6 ~ 13 mm (0.24 ~ 0.51 in)
Clutch pedal stroke	Gasoline : 140 ± 3mm(5.5 ± 0.12)
	Diesel : 150 ± 3mm(5.9 ± 0.12)
Clutch disc rivet depth	Gasoline 1.4 : Min 1.1 mm
	Gasoline 1.6 : Min 1.1 mm
	Gasoline 2.0 : Min 1.2 mm
	Diesel 1.6 : Min 1.1 mm
	Diesel 2.0 : 1.0 mm
Diaphragm spring end height difference	Gasoline 1.4 : Max 0.5 mm
	Gasoline 1.6 : Max 0.5 mm
	Gasoline 2.0 : Max 0.5 mm
	Diesel 1.6 : Max 0.5 mm
	Diesel 2.0 : Max 0.8 mm
Clutch master cylinder clearance to piston	0.15 mm (0.006 in)

Tightening Torques

Item	N.m	kgf.m	lb-ft

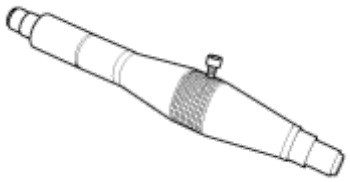
English ▼

Clutch pedal installation bolt (to the pedal support member)		17 ~ 26	1.7 ~ 2.6	12
Clutch pedal installation nut (to the master cylinder)		6 ~ 8	0.6 ~ 0.8	4.3 ~ 5.8
Clutch tube flare nut		13 ~ 17	1.3 ~ 1.7	9.4 ~ 12.3
Clutch tube bracket installation bolt		8~ 10	0.8 ~ 1.0	5.8 ~ 7.2
Clutch release cylinder installation bolt		15 ~ 22	1.5 ~ 2.2	10.8 ~ 15.9
Clutch release cylinder union bolt		25 ~ 35	2.5 ~ 3.5	18.1 ~ 25.3
Clutch cover assembly installation bolt	Gasoline (6ea)	15 ~ 22	1.5 ~ 2.2	10.9 ~ 16.0
	Diesel 1.6 (6ea)	12 ~ 15	1.2 ~ 1.5	8.7 ~ 10.9
	Diesel 2.0 (6ea)	25 ~ 36	2.5 ~ 3.6	18.1 ~ 26.0
Ignition lock switch nut		8 ~ 10	0.8 ~ 1.0	5.8 ~ 7.2

LUBRICANTS

Items	Specified lubricants	Quantity
Contact surface of release bearing and fulcrum of clutch release fork	CASMOLY L9508	As required
Inner surface of clutch release bearing	CASMOLY L9508	As required
Inner surface of clutch release cylinder and outer circumference of piston and cup	Brake fluid DOT 3 or DOT 4	As required
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
Contact portion of release fork to release cylinder push rod	CASMOLY L9508	As required
Input shaft spline	CASMOLY L9508	As required

SPECIAL SERVICE TOOLS

Tool (Number and name)	Illustration	Use
09411-1P000 Clutch disc guide		Installation of the clutch disc.

TROUBLESHOOTING

Trouble symptom		Suspect area	Remedy (See page)
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 after the clutch is disengaged	Unusual wear and/ or damage of the release bearing	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 or bearing	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
		Insufficient lubrication of the clutch release lever shaft	Repair
Hard to shift or will not shift		Excessive clutch pedal free play	Adjust the pedal free play
		Faulty of the clutch release cylinder	Repair the release cylinder
		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

	Binding of the release fork	Inspect the release fork
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
	Worn or dirty release bearing	Replace the replease bearing
	Sticking release fork or linkage	Repair as necessary

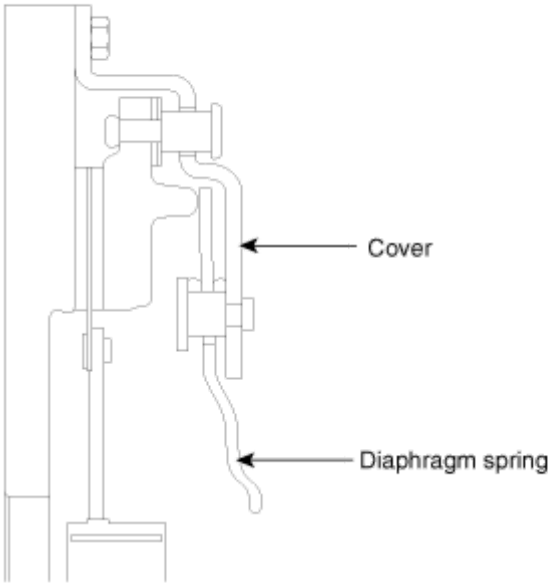
English ▾

DESCRIPTION

Self Adjusting Clutch(S.A.C.) Cover

- As a clutch disc facing is worn away according to its durability, a cover weight is increasing and a clutch pedal pressure can be more needed.
- To make up for this defect, the self adjusting clutch system makes the requsted pedal pressure minimized so that makes the maintenance cycle longer.

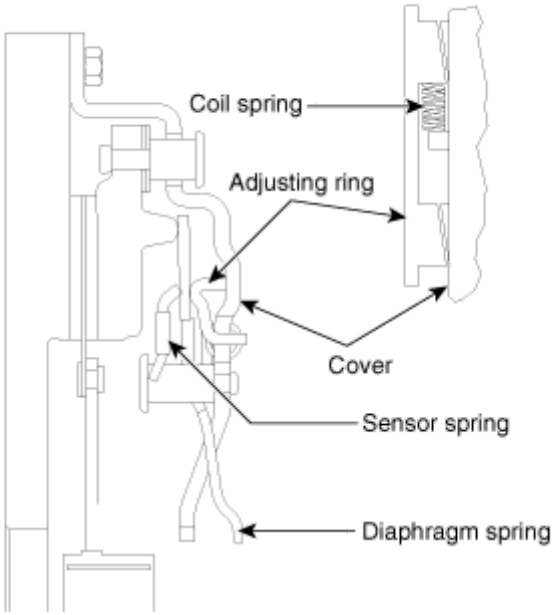
General Clutch Cover



· In a general clutch cover, the diaphragm spring increases the weight to the disc in proportion to abrasion.

[M5CF*,M6CF*]

Self Adjusting Clutch Cover



· In a self adjusting clutch, the adjusting ring prevents the diaphragm spring from being raised to the transmission side in spite of abrasion.

[M6GF2]

Concentric Slave Cylinder-C.S.C.

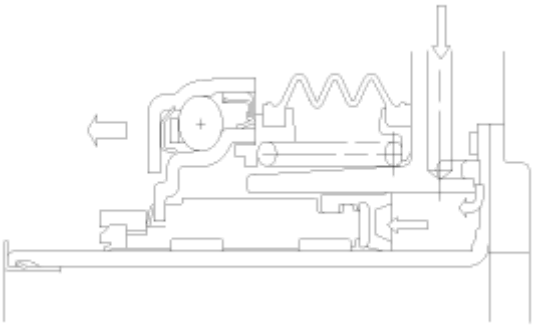
It improves working efficiency and lowers the number and the weight of part by unifing clutch release control parts(clutch release bearing ~ clutch release cylinder) in a manual transaxle.

OPERATION

CONCENTRIC SLAVE CYLINDER-C.S.C

When the clutch pedal is pressed, oil pressure is transmitted along the arrow directions shown below and that moves the clutch slave cylinder and the diaphragm spring of the clutch cover.

English ▼



SERVICE ADJUSTMENT PROCEDURE

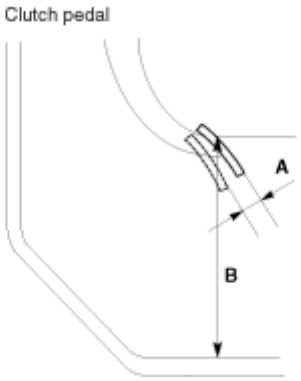
Clutch Pedal Inspection And Adjustment

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 ~ 13 mm (0.24~0.51 in)

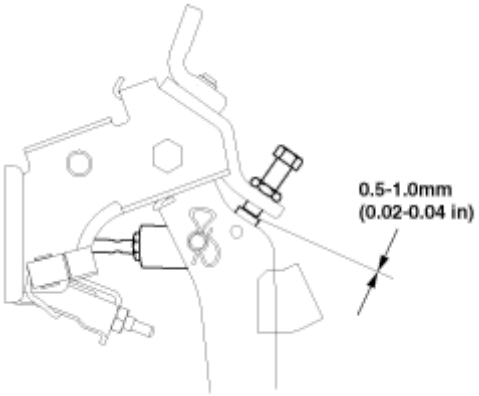
   (B) : 182.8 mm (7.19 in)



2. If the clutch pedal freeplay and height is not within the standard value range, adjust as follows:

   (1) Turn and adjust the bolt within the standard value, then secure by tightening the lock nut.

> **NOTICE**
>
> If the clutch pedal height is lower than the standard value, loosen the bolt and adjust the push rod.
> After adjustment, tighten the bolt so that the clearance with pedal stopper becomes 0.5mm(0.02 in) to 1.0mm (0.04 in) and secure with lock nut.



   (2) Turn the push rod to agree with the standard value and then secure the push rod with the lock nut.

> **⚠ CAUTION**
>
> When adjusting the clutch pedal height or the clutch pedal play, be careful not to push the push rod toward the master cylinder.

3. If the clutch pedal free play and the distance between the clutch pedal and the floor board when the clutch is disengaged, do not meet with the standard values, it may be the result of either air in the hydraulic system or a faulty clutch master

cylinder. Bleed the air or disassemble and inspect the master cylinder or clutch.

English ▼

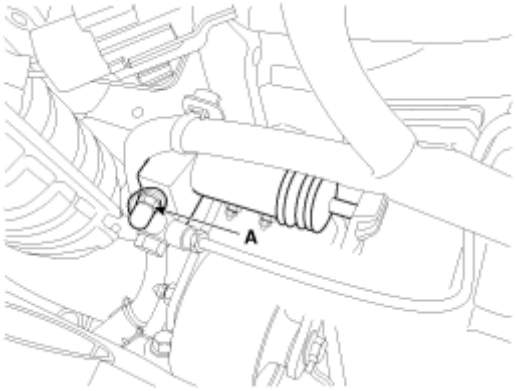
Bleeding

> **⚠ CAUTION**
>
> Use the specified fluid. Avoid mixing different brands of fluid.

Specified fluid: SAE J1703 (DOT 3 or DOT 4)

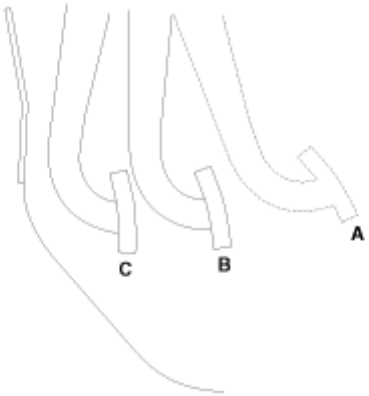
[M5CF*,M6CF*]

1. Loosen the bleeder screw(A) at the clutch release cylinder.



2. Depress the clutch pedal slowly until all air is expelled.
3. Hold the clutch pedal down until the bleeder is retightened.
4. Refill the clutch master cylinder with the specified fluid.

> **⚠ CAUTION**
>
> The rapidly-repeated operation of the clutch pedal in B-C range may disrupt the release cylinder's position. During the bleeding operation, press the clutch pedal to the floor after it returns to the "A" point.



[M6GF2]

Concentric Slave Cylinder Air Bleeding Procedure

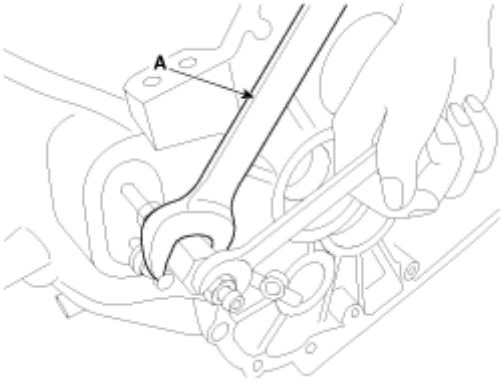
1. After disconnecting a cap from the concentric slave cylinder air bleeder, insert a vinyl hose in the plug.
2. Loosening the plug screw, press and release the clutch pedal about 10 times.

> ***NOTICE***
>
> Hold the air bleeder body not to rotate with a spanner(A). 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 :
   25~29N.m (2.5~2.9Kgf.m, 18~21lb-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)



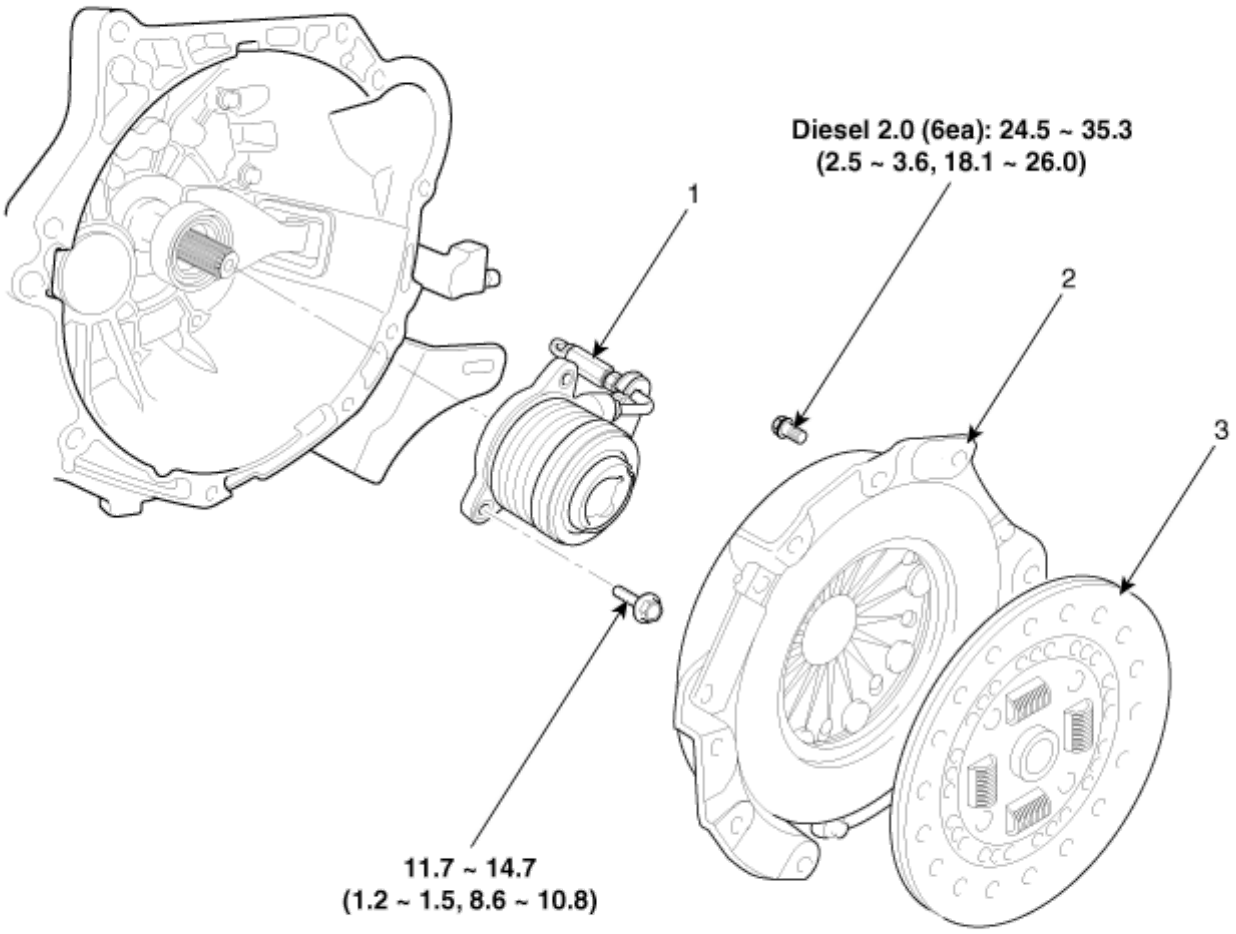
⚠ CAUTION

1) Do not clamp the pipe of a concentric slave cylinder.
2) Be careful not to damage O-rings.

English ▼

COMPONENTS

[M6GF2]

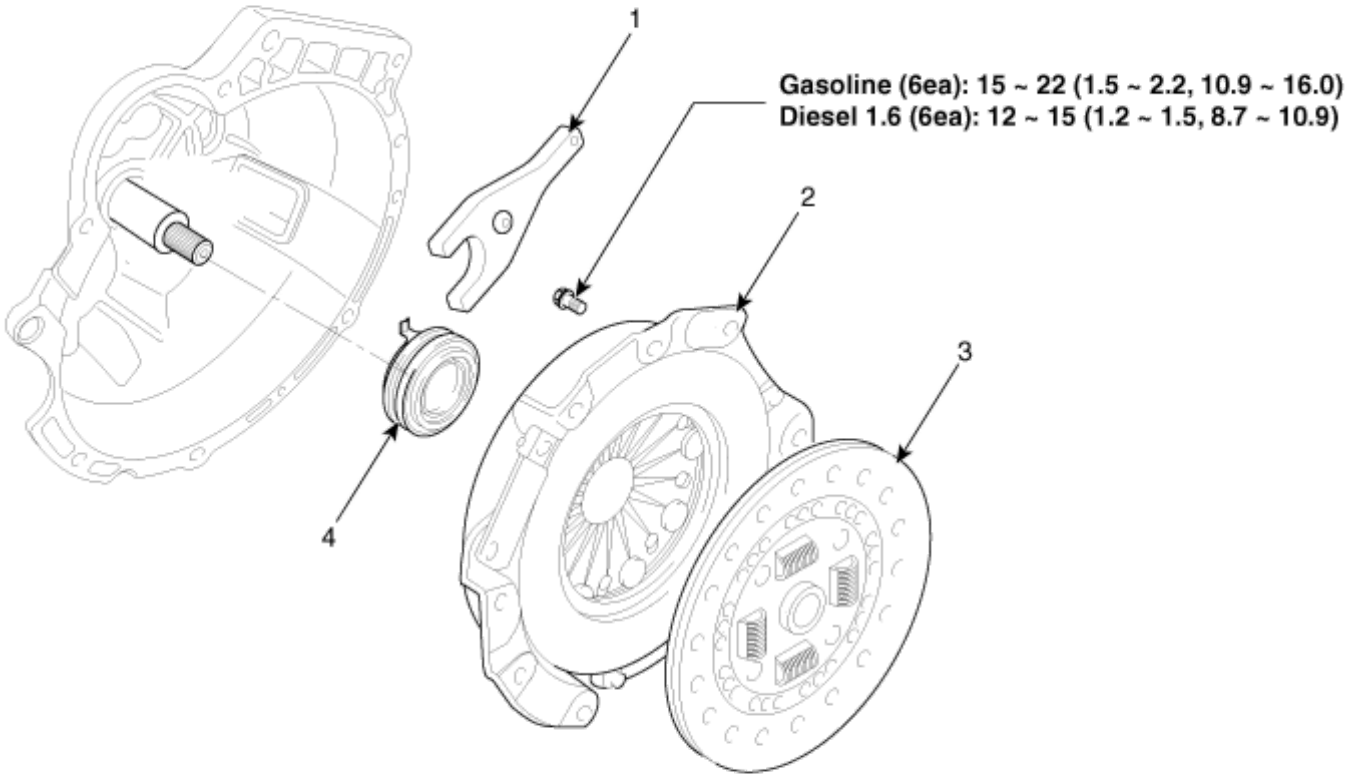


Torque: N.m (kgf.m, lb-ft)

1. Concentric slave cylinder (Diesiel 2.0) 2. Clutch disc cover	3. Clutch disc

[M6CF*, M5CF*]

English ▼



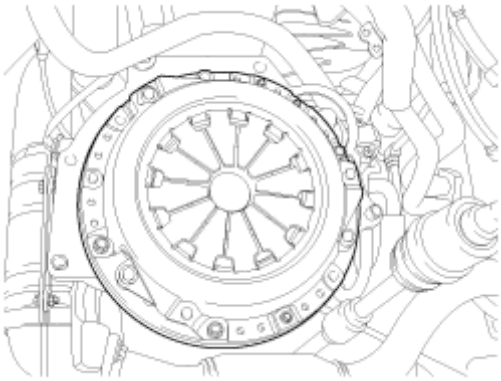
Torque: N.m (kgf.m, lb-ft)

1. Clutch release fork 2. Clutch disc cover	3. Clutch disc 4. Clutch release bearing (Gasoline & Diesel U1.6)

REMOVAL

1. Remove the transaxle assembly. (Refer to Manual transaxle's removal in MT group)
2. Loosen the bolts 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.

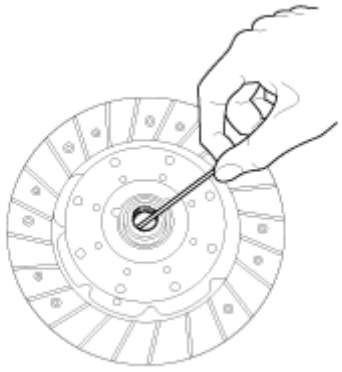
> **NOTICE**
>
> Do not clean the clutch disc or the release bearing with cleaning solvent.



INSTALLATION

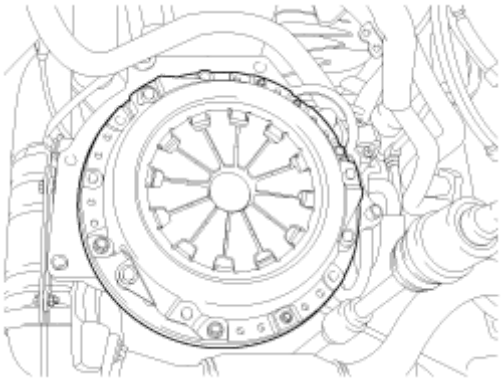
1. Apply multipurpose grease to the spline of the disc.
   Grease: CASMOLY L 9508

> **⚠ 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 (shudder).



2. Temporarily install the clutch disc assembly to the flywheel using the special tool.
3. Tighten the bolts one or two steps at a time in a star pattern.
   Tightening torque:
   [Gasoline]
   15 ~ 22 N.m (1.5 ~ 2.2 kgf.m, 10.9 ~ 16.0 lb-ft)

[Diesel 1.6]
12 ~ 15 N.m (1.2 ~ 1.5 kgf.m, 8.7 ~ 10.9 lb-ft)
[Diesel 2.0]
25 ~ 36 N.m (2.5 ~ 3.6 kgf.m, 18.1 ~ 26.0 lb-ft)



4. Remove the clutch disc guide.
5. Install the transaxle assembly to the engine. (Refer to Manual transaxle's installation in MT group)

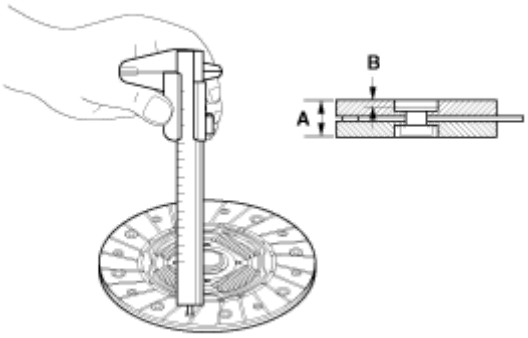
INSPECTION

Clutch 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]
   Clutch disc rivet depth(B)
   : refer to 'SERVICE STANDARD' in GENERAL section.



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

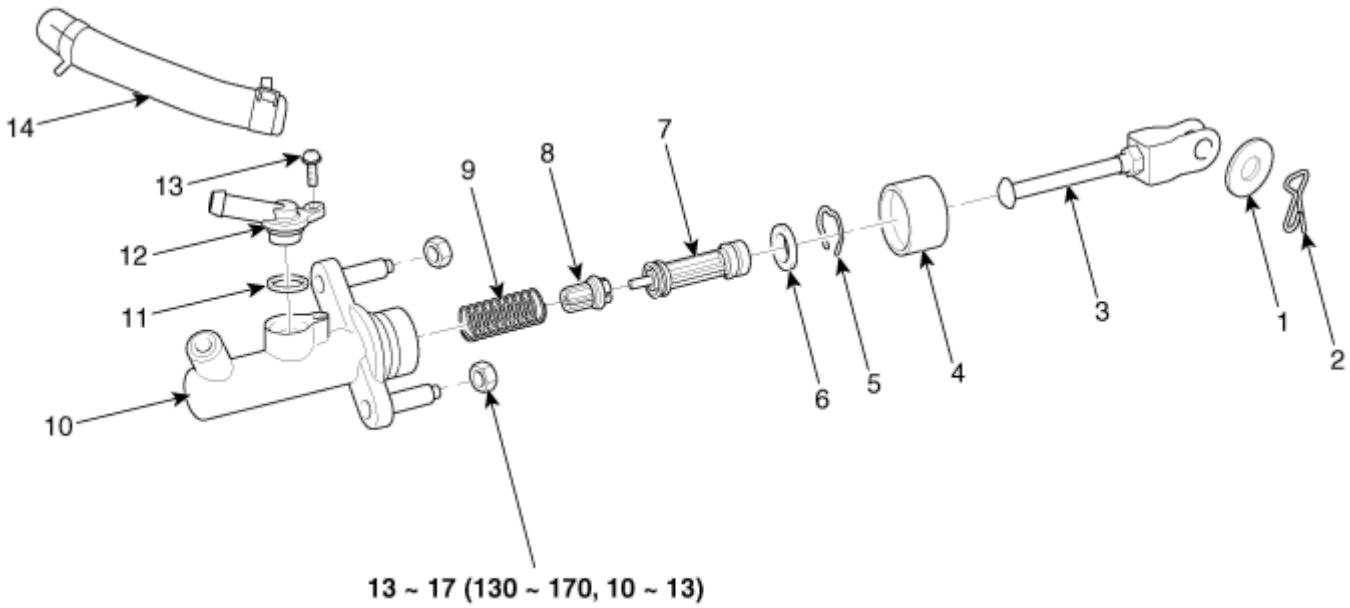
1. Check the bearing for seizure, damage or abnormal noise. Also check the diaphragm spring contacting points for wear.
2. Replace the bearing if the release fork contacting points are worn abnormally.

Clutch release fork

If there is abnormal wear at the point of contact with the bearing, replace the release fork assembly.

English ▼

COMPONENTS



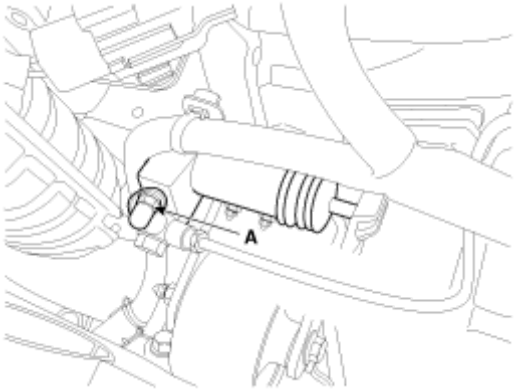
Torque: N.m (kgf.cm, lb-ft)

1. Washer	8. Spring seat
2. Snap pin	9. Spring
3. Rod assembly	10. Body assembly
4. Boot	11. O-ring
5. Key	12. Nipple
6. Plate	13. Bolt
7. Piston assembly	14. Flexible hose

English ▼

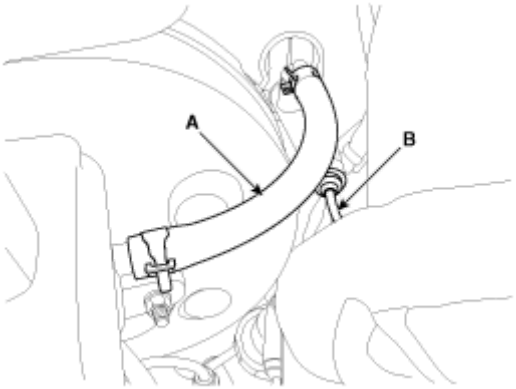
REMOVAL

1. Drain the brake fluid through the bleeding plug (A).

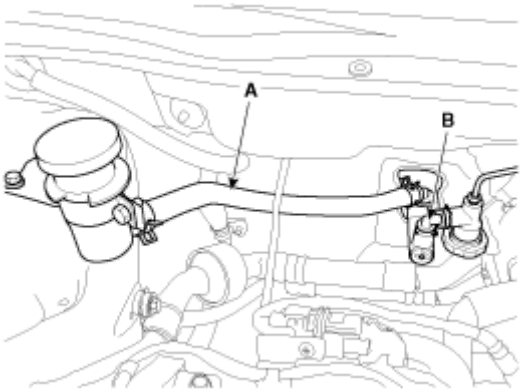


2. Remove the flexible hose (A) connected to brake reserve tank from the master cylinder.

[LHD]

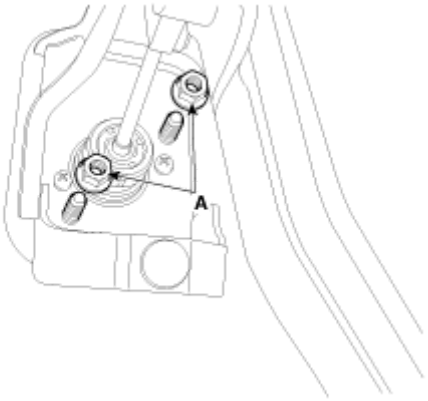


[RHD]

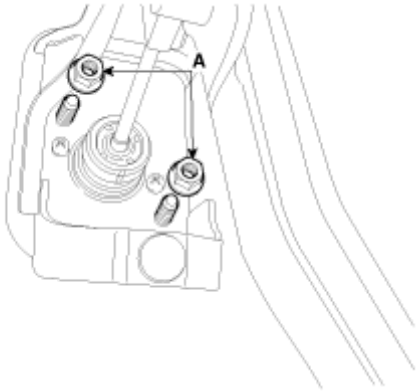


3. Disconnect the clutch tube (B) from the master cylinder.
4. Disconnect the two ignition lock switch connectors.
5. Remove the clutch pedal mounting nuts(A-2ea) and the bracket mounting nut.

[LHD]

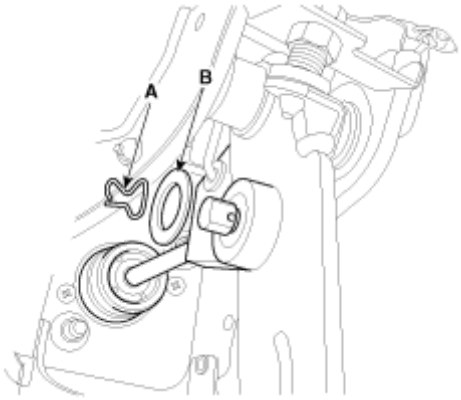


[RHD]

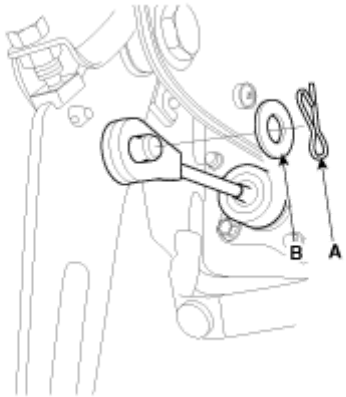


6. Disconnect the push rod from the master cylinder by removing the snap pin (A) and washer (B).

[LHD]



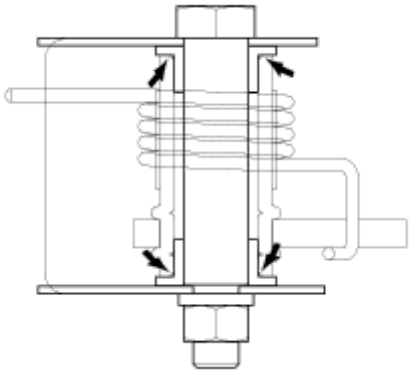
[RHD]



7. Remove the screws mounting the master cylinder to the clutch pedal assembly.

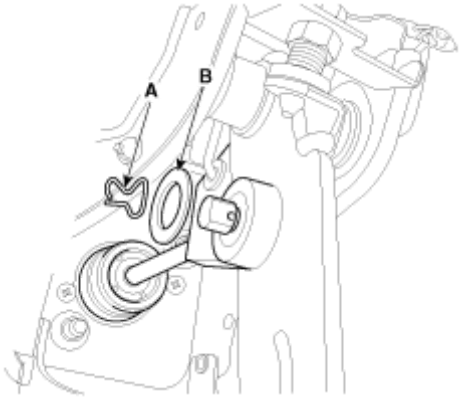
INSTALLATION

1. Apply the specified grease to the clutch pedal and bushings.
   Chassis grease: SAE J310a, NLGI No.1

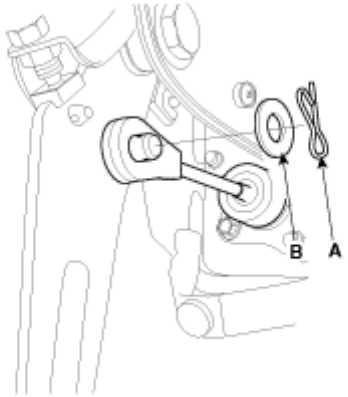


2. Install the screws or nut mounting the master cylinder to the clutch pedal assembly.
3. Apply the specified grease to the snap pin(A) and washer.
   Wheel bearing grease: SAE J310, NLGI No.2
4. Connect the push rod to the clutch pedal by installing the snap pin (A) and washer (B).

[LHD]

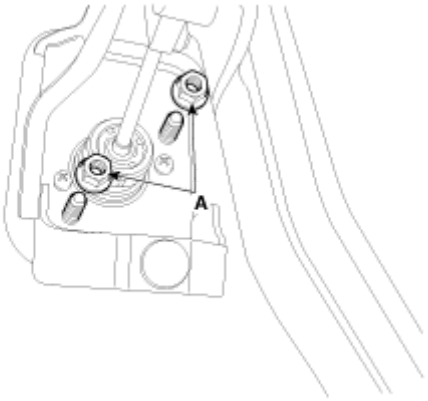


[RHD]

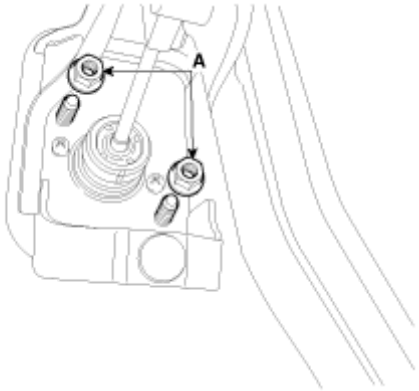


5. Install the clutch pedal mounting nuts (A-2ea).
   Tightening torque :
   17 ~ 26Nm (1.7 ~ 2.6kgf.m, 12.3 ~ 18.8lb-ft)

[LHD]

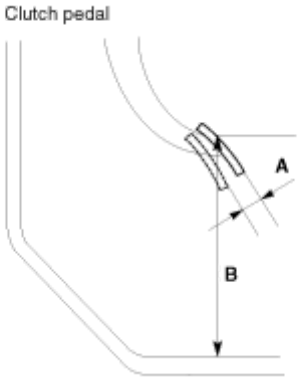


[RHD]



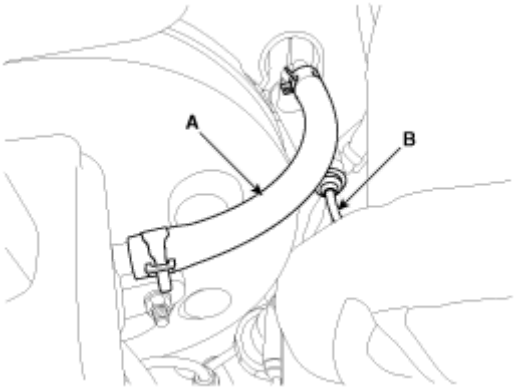
6. Adjust the clutch pedal within the standard value, then secure by tightening the lock nut.

   Standard value
   Free play (A)
   6~13mm (0.24~0.51 in)
   Height (B)
   182.8mm (7.19 in)

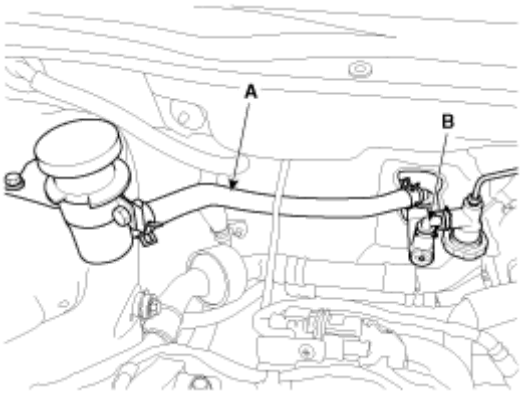


7. Connect the flexible hose of the brake reserve tank to the master cylinder.

[LHD]



[RHD]



8. Connect the clutch tube(B) to the master cylinder.
9. Refill the brake fluid.
10. Bleed the air in the clutch system.(refer to Bleeding in Serive Adjustment Procedure)

DISASSEMBLY

1. Remove the piston stop ring.
2. Pull out the push rod and piston assembly.
3. Remove the reserve tank band, reserve tank cap, and reserve tank.

> **NOTICE**
>
> 1) Use care not to damage the master cylinder body and piston assembly.
> 2) Do not disassemble the piston assembly.

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.

> **NOTICE**
>
> 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)

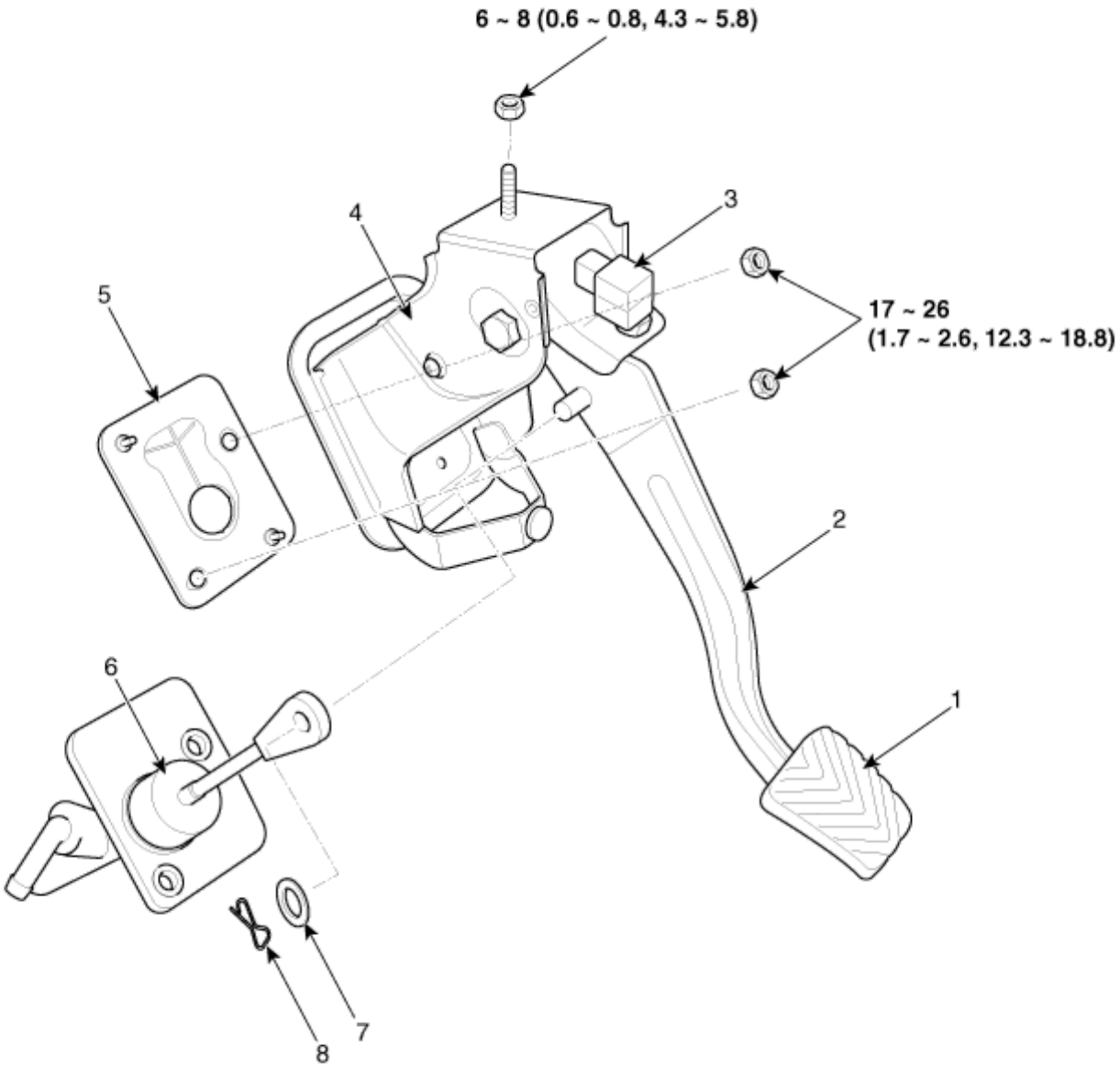
REASSEMBLY

1. Apply the specified fluid to the inner surface of the master cylinder body (A) and to the entire periphery of the piston assembly (B).
   Specified fluid: Brake fluid DOT 3 or DOT 4
2. Install the piston assembly.
3. Install the piston snap ring.
4. Install the push rod assembly.

English ▼

COMPONENTS

[LHD]

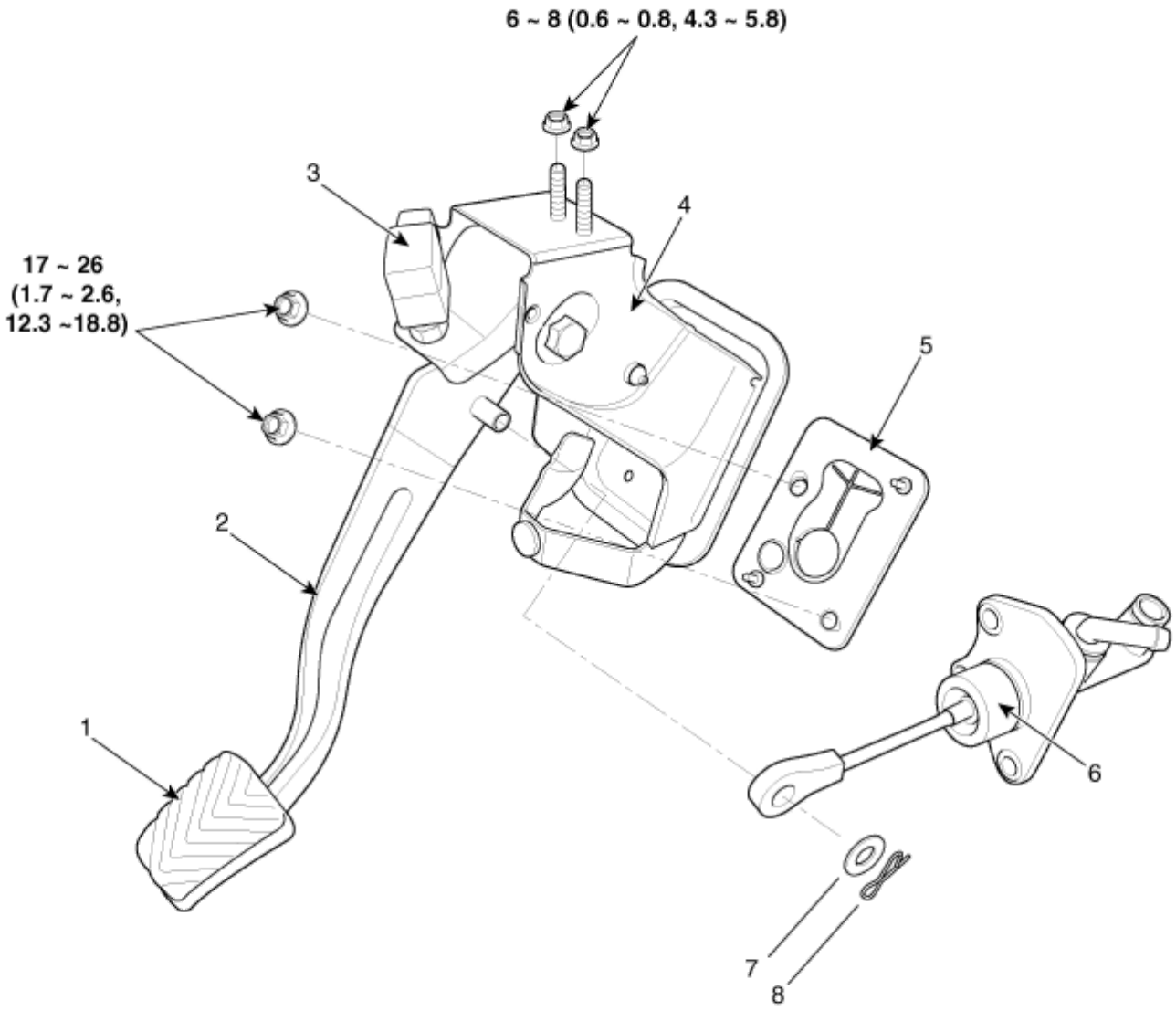


Torque: N.m (kgf.m, lb-ft)

1. Pedal pad	5. Dust cover
2. Clutch arm assembly	6. Master cylinder assembly
3. Ignition lock switch	7. Washer
4. Clutch member assembly	8. Snap pin

[RHD]

English ▼

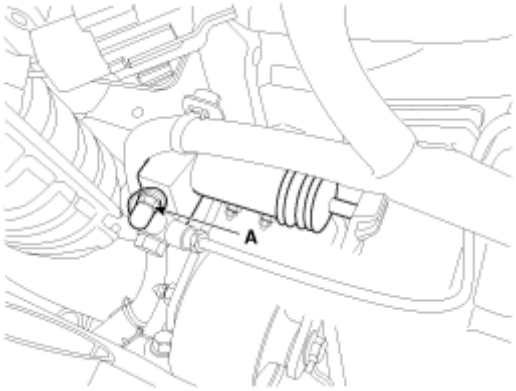


Torque: N.m (kgf.m, lb-ft)

1. Pedal pad	5. Dust cover
2. Clutch arm assembly	6. Master cylinder assembly
3. Ignition lock switch	7. Washer
4. Clutch member assembly	8. Snap pin

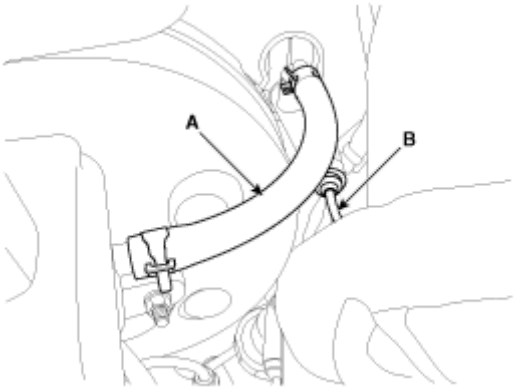
REMOVAL

1. Drain the brake fluid through the bleeding plug (A).

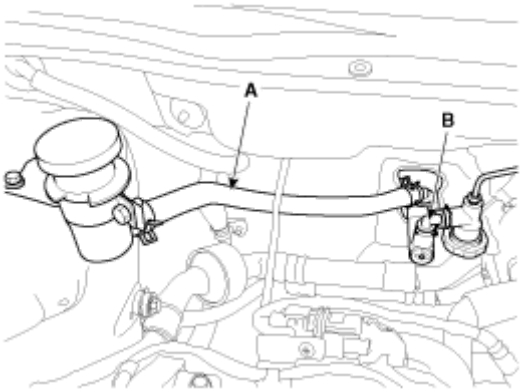


2. Remove the flexible hose (A) connected to brake reserve tank from the master cylinder.

[LHD]

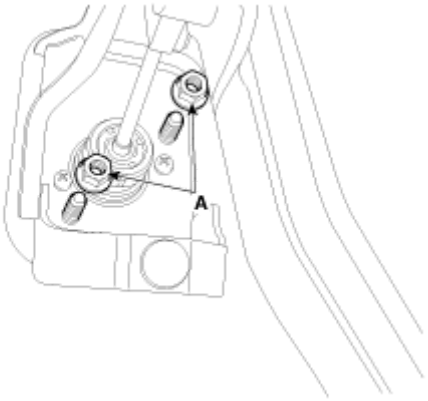


[RHD]

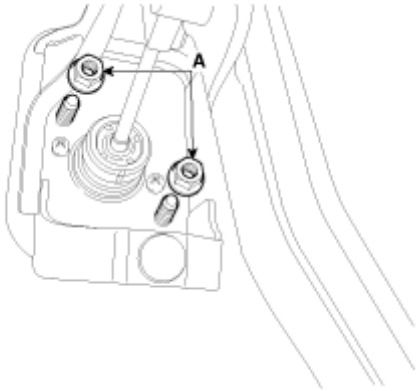


3. Disconnect the clutch tube (B) from the master cylinder.
4. Disconnect the two ignition lock switch connectors.
5. Remove the clutch pedal mounting nuts(A-2ea) and the bracket mounting nut.

[LHD]

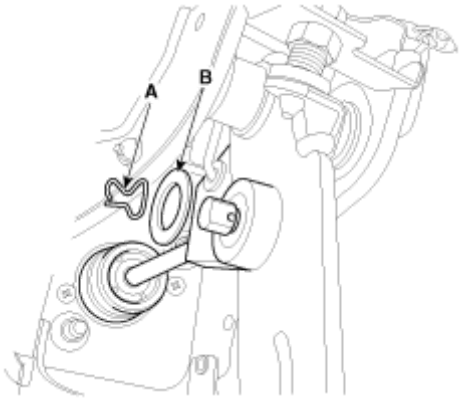


[RHD]

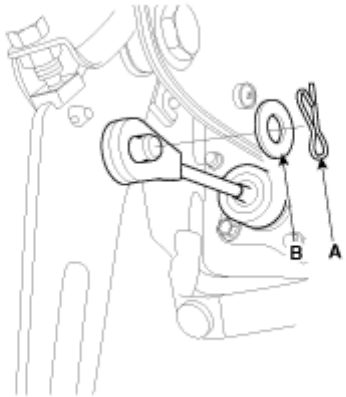


6. Disconnect the push rod from the master cylinder by removing the snap pin (A) and washer (B).

[LHD]



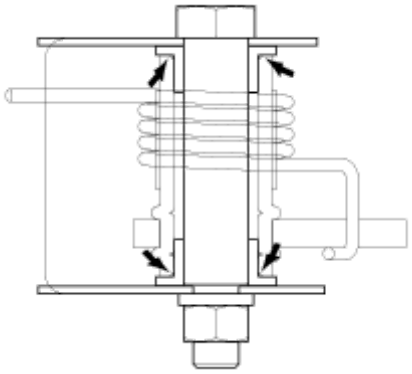
[RHD]



7. Remove the screws or nut mounting the master cylinder to the clutch pedal assembly.

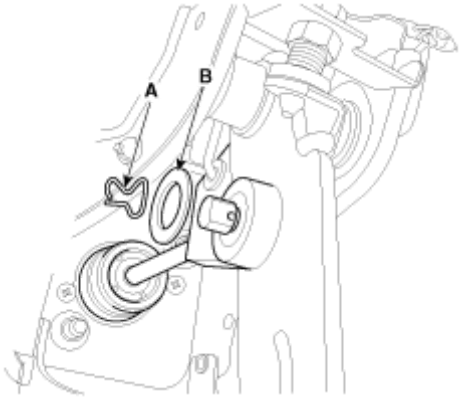
INSTALLATION

1. Apply the specified grease to the clutch pedal and bushings.
   Chassis grease: SAE J310a, NLGI No.1

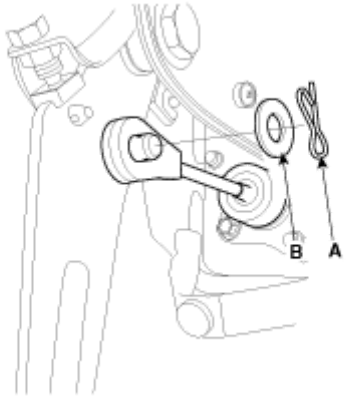


2. Install the screws or nut mounting the master cylinder to the clutch pedal assembly.
3. Apply the specified grease to the snap pin(A) and washer.
   Wheel bearing grease: SAE J310, NLGI No.2
4. Connect the push rod to the clutch pedal by installing the snap pin (A) and washer (B).

[LHD]

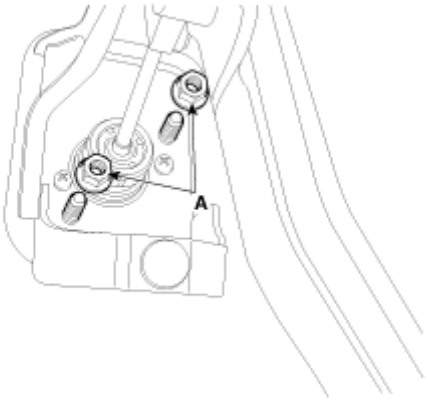


[RHD]

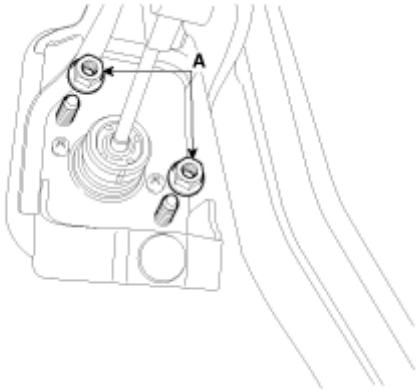


5. Install the clutch pedal mounting nuts (A-2ea).
   Tightening torque :
   17 ~ 26Nm (1.7 ~ 2.6kgf.m, 12.3 ~ 18.8lb-ft)

[LHD]

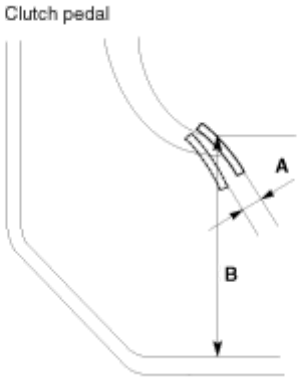


[RHD]



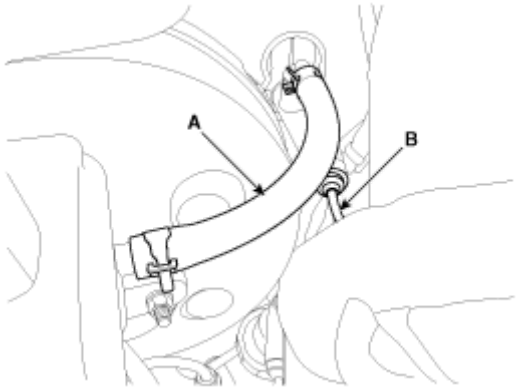
6. Adjust the clutch pedal within the standard value, then secure by tightening the lock nut.

   Standard value
   Free play (A)
   6~13mm (0.24~0.51 in)
   Height (B)
   182.8mm (7.19 in)

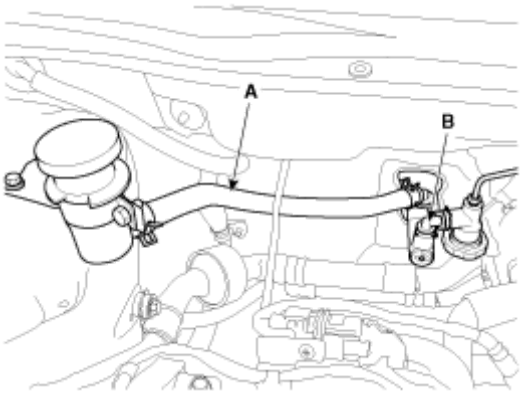


7. Connect the flexible hose of the brake reserve tank to the master cylinder.

[LHD]



[RHD]



8. Connect the clutch tube(B) to the master cylinder.
9. Refill the brake fluid.
10. Bleed the air in the clutch system.(refer to Bleeding in Serive Adjustment Procedure)

INSPECTION

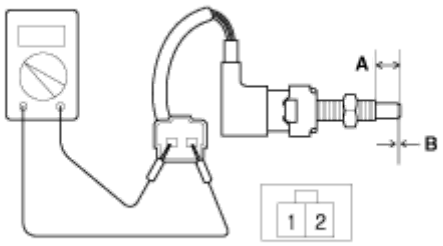
1. Check the pedal shaft and bushing for wear.
2. Check the clutch pedal for bending or torsion.
3. Check the return spring for damage or deterioration.
4. Check the pedal pad for damage or wear.

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)		

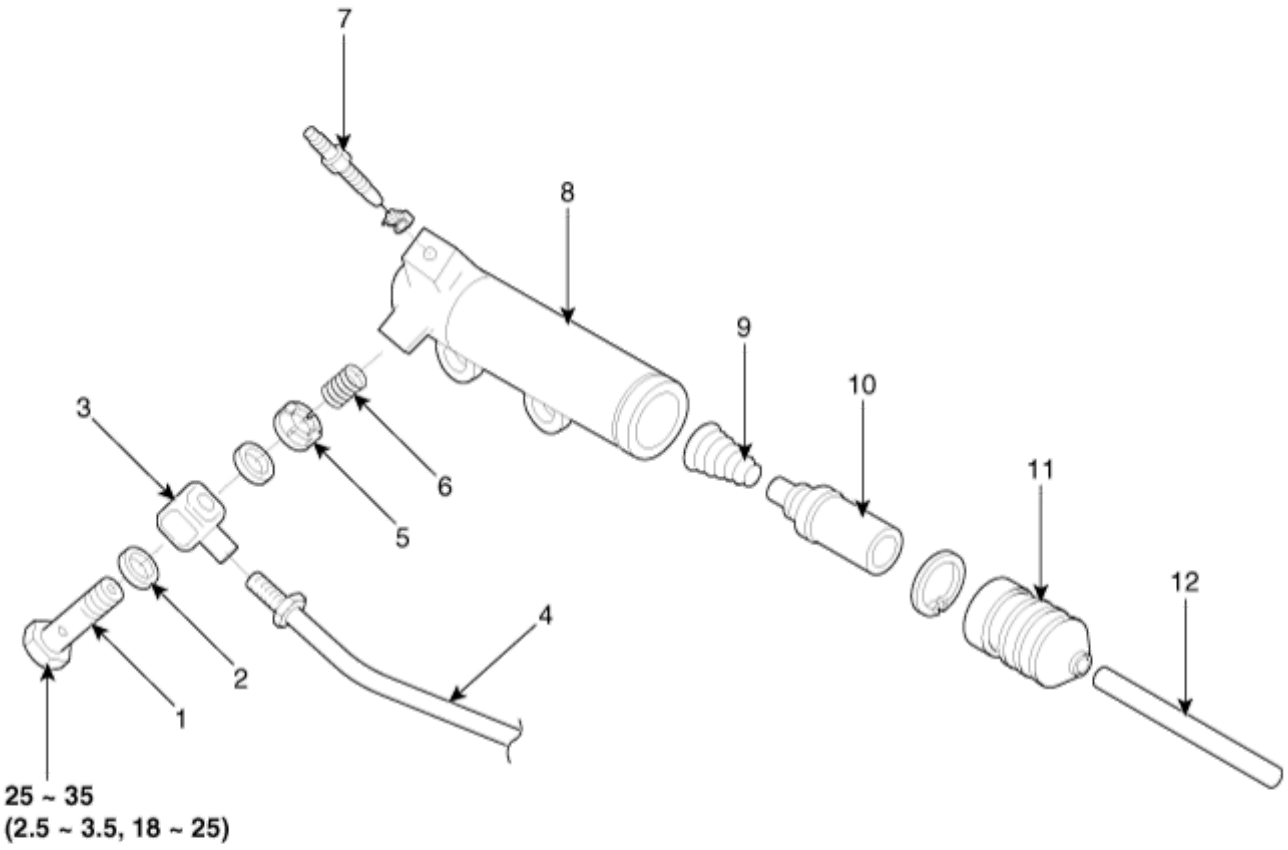
Standard value
Full stroke(A) : 12.0 ± 0.3mm (0.472 ± 0.012 in.)
ON-OFF point (B) : 2.0 ± 0.3mm (0.078 ± 0.012 in)


A
B
1
2

English

COMPONENTS

[M5CF*, M6CF*]

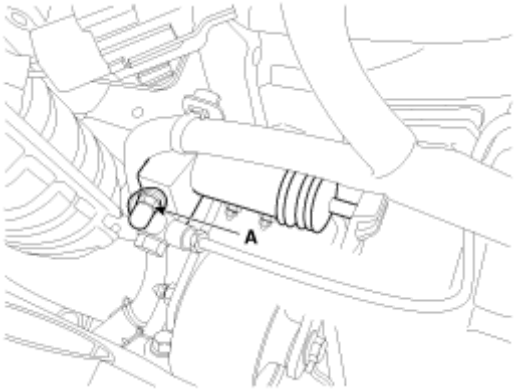


Torque: N.m (kgf.m, lb-ft)

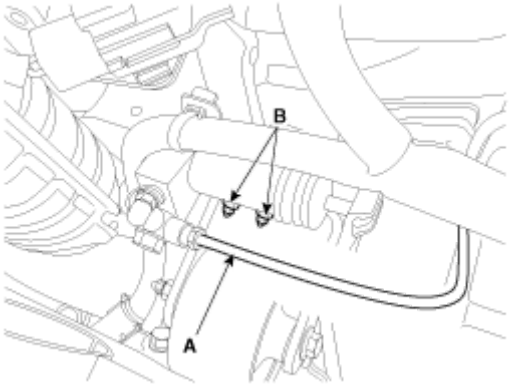
1. Union bolt	7. Bleeder screw
2. Gasket	8. Release cylinder
3. Tube joint	9. Return spring
4. Clutch tube	10. Piston
5. Valve plate	11. Boot
6. Valve spring	12. Push rod

REMOVAL

1. Drain the brake fluid through the bleed plug(A).



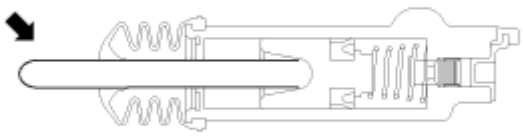
2. Disconnect the clutch tube(A).



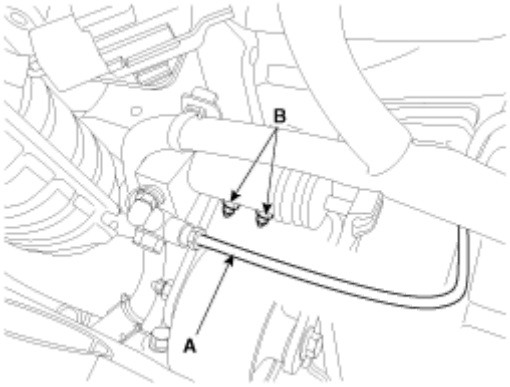
3. Remove the two clutch release cylinder mounting nuts(B-2ea).

INSTALLATION

1. Coat the clutch clevis push rod specified grease.
   Specified grease: CASMOLY L9508



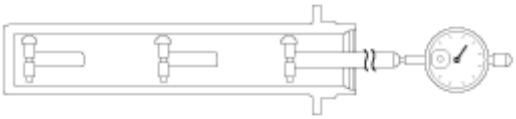
2. Install the release cylinder mounting nuts(B-2ea).
   Tightening torque :
   15 ~ 22Nm (150 ~220 kgf.cm, 11 ~ 16 lb-ft)



3. Install the clutch tube(A).
4. Refill the brake fluid.
5. Bleed the air in the clutch system.
   (refer to Bleeding in Service Adjustment Procedure)

INSPECTION

1. Check the release cylinder bore for rust and damage.
2. Measure the release cylinder bore at three locations (bottom, middle, and top) with a cylinder gauge and replace the release cylinder assembly if the bore-to-piston clearance exceeds the limit.
   Limit clearance to piston: 0.25mm (0.0098 in)



3. Check the clutch release cylinder for fluid leakage.
4. Check the clutch release cylinder boots for damage.

DISASSEMBLY

1. Remove the clutch hose, valve plate, spring, push rod, and boot.
2. Remove any dirt from the piston bore opening of the release cylinder.
3. Remove the piston from the release cylinder using compressed air.

⚠ CAUTION

- Use rags to prevent the piston from popping out and causing injury.

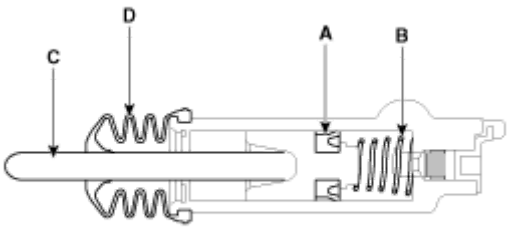
- Apply compressed air slowly. Keep the fluid from splashing in your eyes or on your skin.



REASSEMBLY

1. Apply specified brake fluid to the release cylinder bore and the outer surface of the piston and piston cup, and push the piston cup assembly into the cylinder.
   Specified fluid: Brake fluid DOT 3 or DOT 4

2. Install the valve plate(A), Spring(B), push rod(C) and boot(D).



SPECIFICATION

DRIVESHAFT

Engine	T/M	Joint type		Max. permissible angle	
		Outer	Inner	Outer	Inner
Diesel 1.6 / 2.0	M/T	AC3300i	AAR3300i	45°	21°
Gasoline 2.0	M/T	AC2300i	AAR2300i	45°	21°
	A/T			45°	21°
Gasoline 1.4 / 1.6	M/T	AC2000i	AAR2000i	45°	21°
	A/T			45°	21°
Front wheel bearing					
Bearing type		Double row angular contact ball bearing			
Starting torque		1.8 Nm (18 kgf.cm, 1.31 lb-ft) or below			
Rear hub & bearing assembly					
Bearing type		Double row angular contact ball bearing			
Starting torque		1.0 Nm (10 kgf.cm, 0.7 lb-ft) or below			

ACi : Angular Contact Improved Joint
AARi : Angular Adjusted Roller Improved joint
Inner : On transaxle side
Outer : On tire side

TIGHTENING TORQUE

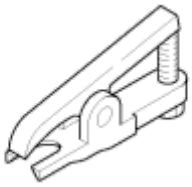
Items	Nm	Kgf-m	lb-ft
Wheel nut	88.3~107.9	9.0~11.0	65.1~79.6
Driveshaft nut (Castle nut)	240.3 ~ 269.7	24.5 ~ 27.5	177.2 ~ 198.9
Lower arm ball joint assembly to knuckle bolts	98.1~117.7	10.0~12.0	72.3~86.8
Wheel speed sensor bolt	6.9~9.8	0.7~1.1	5.1~7.2
Front caliper assembly to knuckle bolts	78.5~98.1	8.0~10.0	57.9~72.3
Tie rod end castle nut	23.5~33.3	2.4~3.4	17.4~24.6
Front strut assembly to knuckle bolts	137.3~156.9	14.0~16.0	101.3~115.7
Rear lower arm to carrier assembly bolts	137.3~156.9	14.0~16.0	101.3~115.7
Rear lower arm to cross member bolts	137.3~156.9	14.0~16.0	101.3~115.7
Rear upper arm to carrier assembly bolts	98.1~117.7	10.0~12.0	72.3~86.8
Rear caliper assembly to carrier assembly bolts	49.0~58.8	5.0~6.0	36.2~43.4
Rear shock absorber assembly to carrier assembly bolts	137.3~156.9	14.0~16.0	101.3~115.7
Assist arm to carrier assembly bolts	44.1~53.9	4.5~5.5	32.5~39.8
Trailing arm to carrier assembly bolts	34.3~53.9	3.5~5.5	25.3~39.8
Carrier assembly to rear hub assembly bolts	58.8~68.6	6.0~7.0	43.4~50.6

English ▼

⚠ CAUTION

Replace self-locking nuts with new ones after removal.

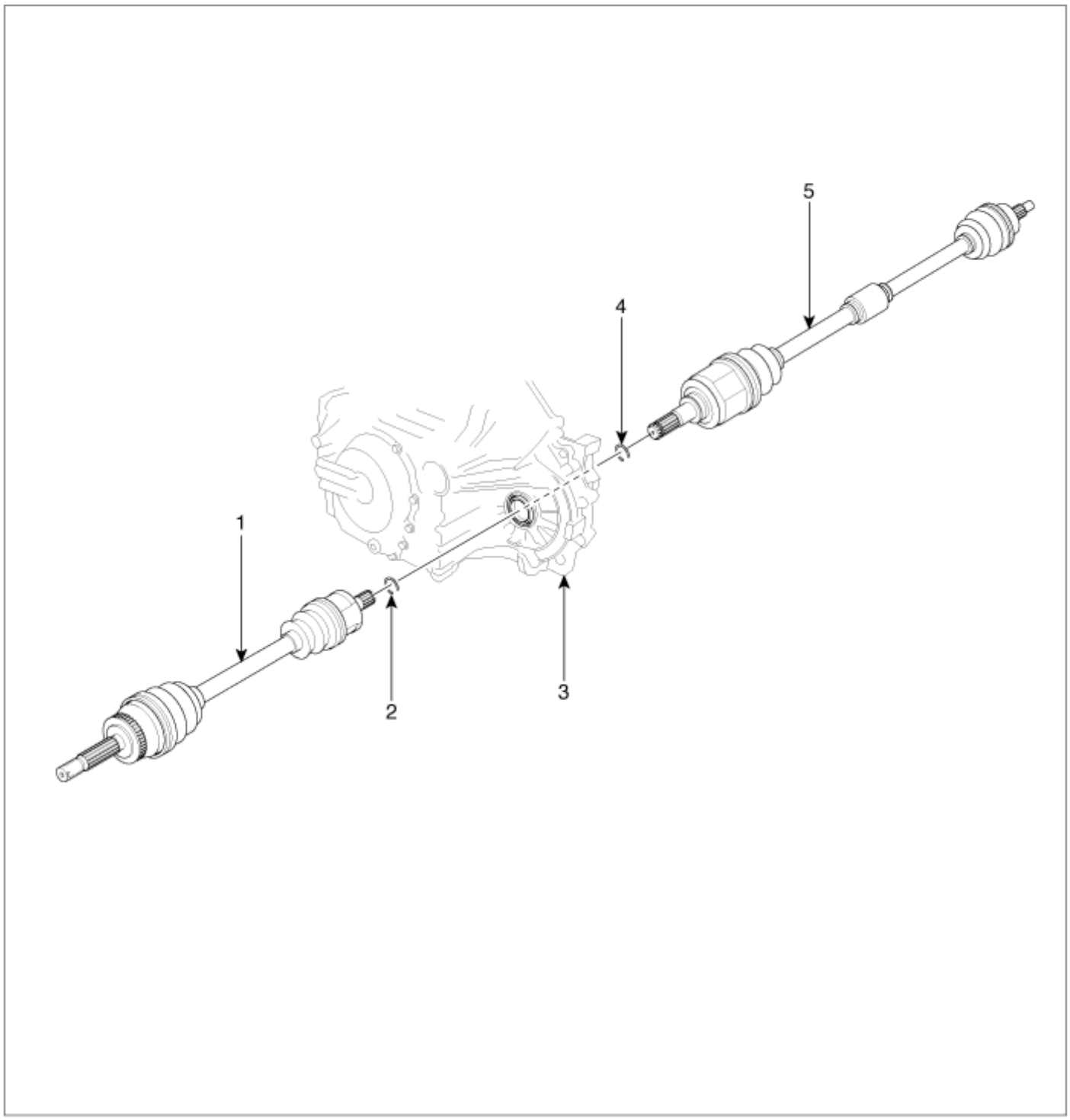
SPECIAL TOOLS

Tool(Number and Name)	Illustration	Use
09568-34000 Ball joint puller		Remover of ball joint
09495-3K000 Band installer		Installation of ear type boot band

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
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

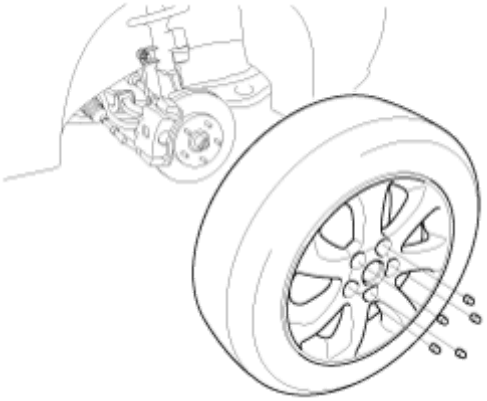
COMPONENT



1. Driveshaft (LH)
2. Circlip
3. Transaxle
4. Circlip
5. Driveshaft (RH)

REMOVAL

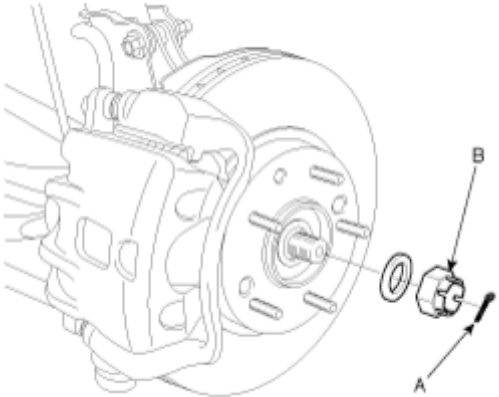
1. Loosen the wheel nuts slightly.
   Raise the vehicle, and make sure it is securely supported.
2. Remove the front wheel and tire from front hub.



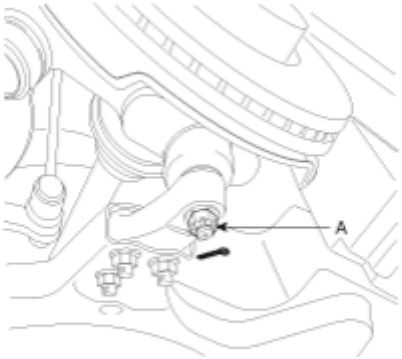
CAUTION

Be careful not to damage to the hub bolts when removing the front wheel and tire.

3. Remove the split pin (A), then remove castle nut (B) and washer from the front hub under applying the break.



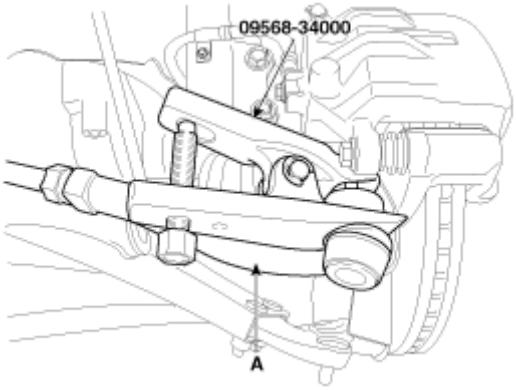
4. Remove the ball joint assembly mounting nut (A) from the knuckle.



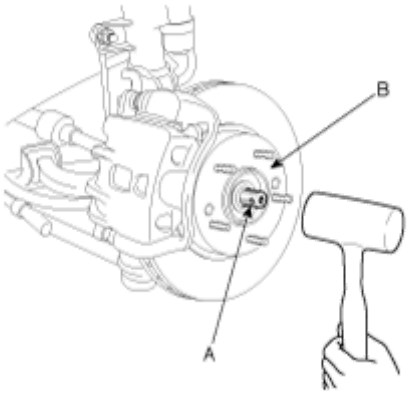
5. Remove the split pin and castle nut and then disconnect the tie rod end (A) from the front knuckle by using a SST (09568-

English ▼

34000).

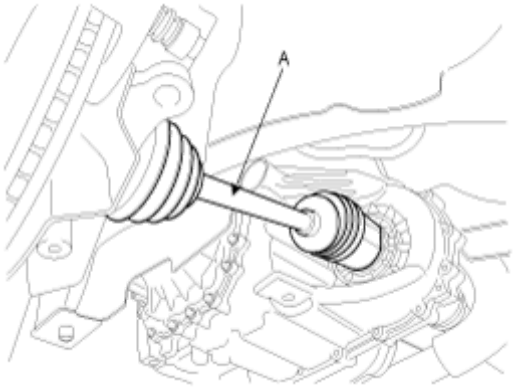


6. Using a plastic hammer, disconnect driveshaft (A) from the axle hub (B).

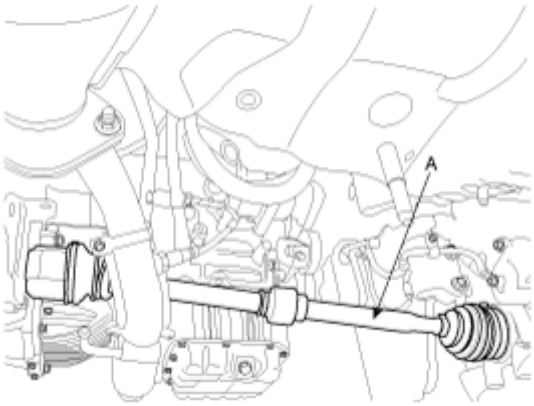


7. Insert a pry bar between the transaxle case and joint case, and separate the driveshaft (A) from the transaxle case.

[LH]



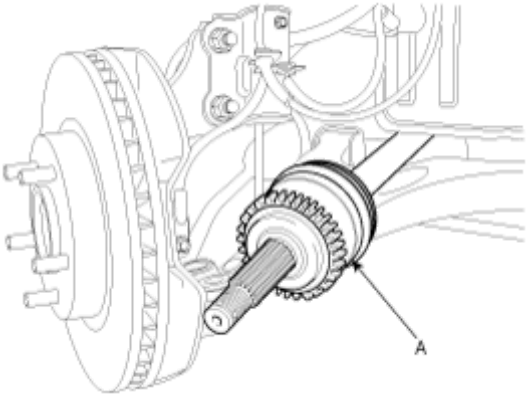
[RH]



⚠ CAUTION

- Use a pry bar being careful not to damage the transaxle and joint.
- Do not insert the pry bar 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.

8. Pull out the driveshaft (A) from the transaxle case.



⚠ CAUTION

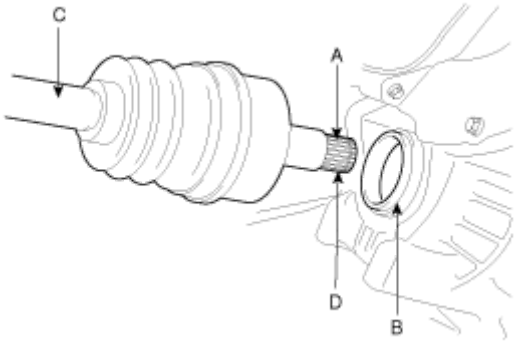
- Plug the hole of the transaxle case with the oil seal cap to prevent contamination.
- Support the driveshaft properly.
- Replace the retainer ring whenever the driveshaft is removed from the transaxle case.
- If the driveshaft is damaged, replace the driveshaft assembly.

INSTALLATION

1. Apply gear oil on the oil seal contacting surface (B) of transaxle case and the driveshaft splines (A).

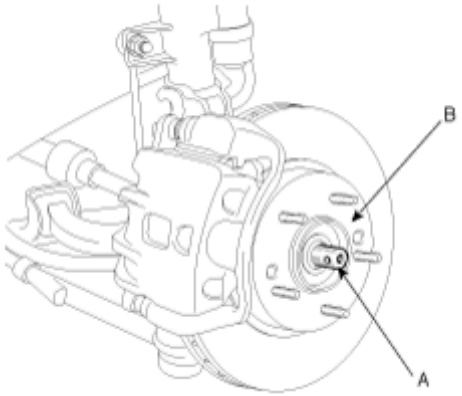
⚠ CAUTION

- Replace circlip with new one.
- Be careful not to install a different kind, when replacing the circlip.



2. Before installing the driveshaft (C), set the opening side of the circlip (D) facing downward.

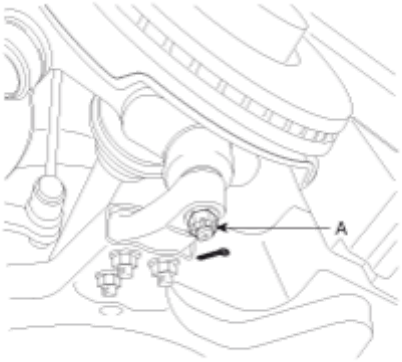
3. After installation, check that the driveshaft (C) cannot be removed by hand.
4. Install the driveshaft (A) to the axle hub (B).



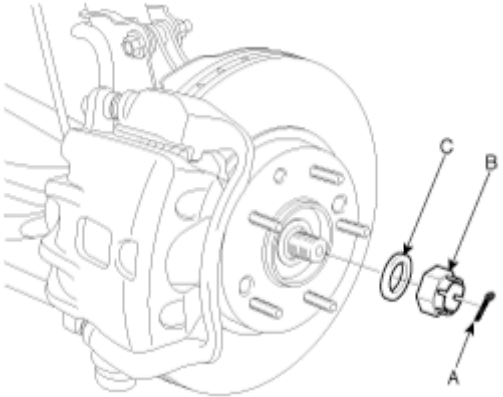
CAUTION

- Be careful not to damage and dent the both boots.
- Keep clean without contamination on contacting point between the hub-bearingand BJ.

5. Install the ball joint assembly mounting nut (A) to the knuckle.
   Tightening torque Nm (kgf.m, lb-ft) :
   98.1~117.7 (10~12, 72.3~86.8)

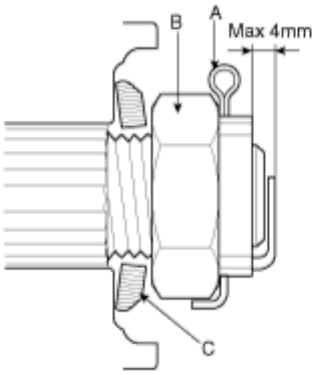


6. Install the washer (C), castle nut (B) and split pin (A) to the front hub assembly.
   Tightening torque Nm (kgf.m, lb-ft) :
   196.1~274.6 (20~28, 144.7~202.5)

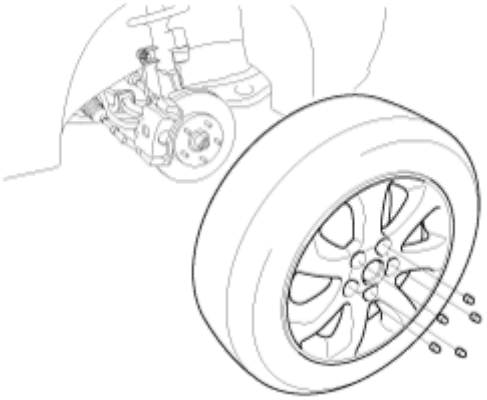


CAUTION

The washer (C) should be assembled with convex surface outward when installing the castle nut (B) and split pin (A).



7. Install the wheel and the tire to the front hub.
   Tightening torque Nm (kgf.m, lb-ft) :
   88.3~107.9 (9~11, 65.1~79.6)

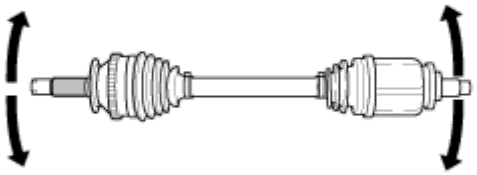


⚠ CAUTION

Be careful not to damage the hub bolts when installing the front wheel and tire.

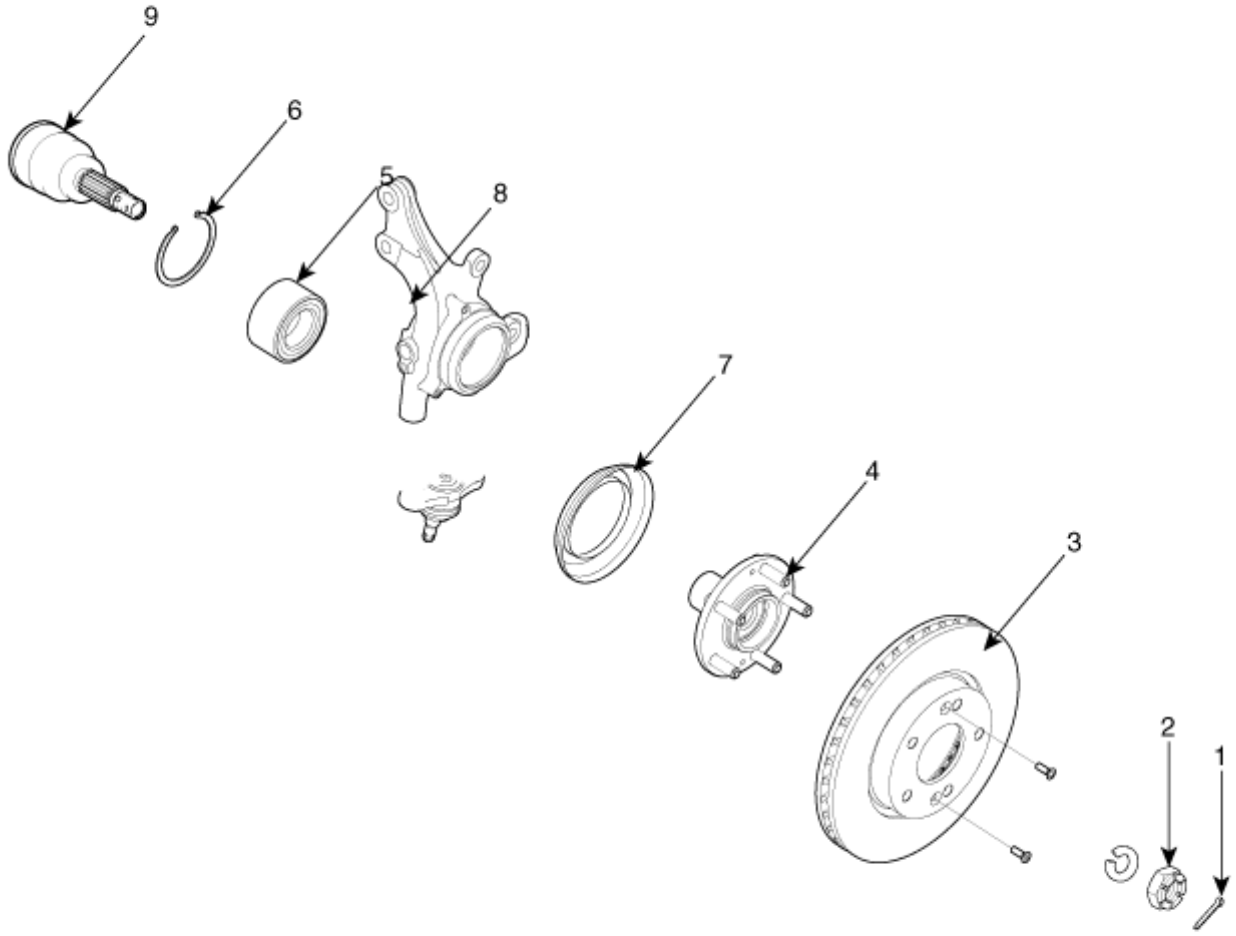
INSPECTION

1. Check the driveshaft boots for damage and deterioration.
2. Check the boots for grease leak.
3. Check the ball joint for wear and damage.
4. Check the splines for wear and damage.
5. Check the dynamic damper for cracks, wear and position.



6. Check the driveshaft for cracks and wears.
7. If the driveshaft is damaged, replace the driveshaft assembly.

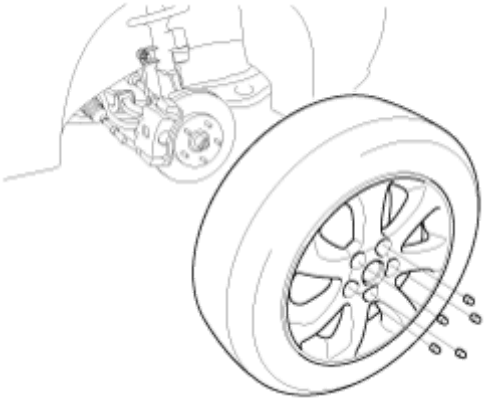
COMPONENTS



1. Split pin	6. Snap ring
2. Driveshaft nut (castle nut)	7. Dust cover
3. Brake disc	8. Knuckle
4. Hub	9. Driveshaft
5. Wheel bearing	

REMOVAL

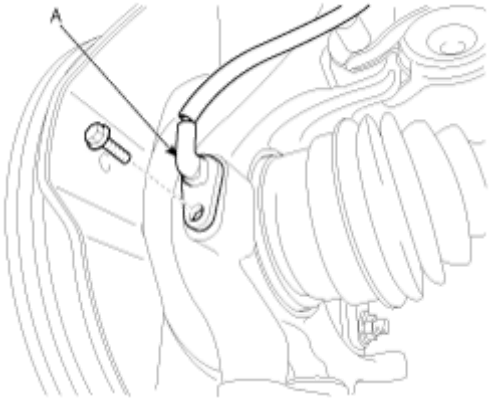
1. Loosen the wheel nuts slightly.
   Raise the vehicle, and make sure it is securely supported.
2. Remove the front wheel and tire from front hub.



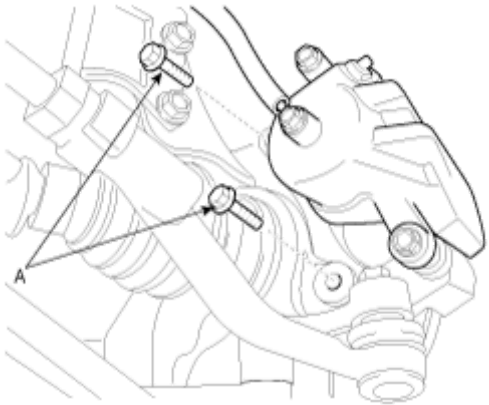
CAUTION

Be careful not to damage to the hub bolts when removing the front wheel and tire.

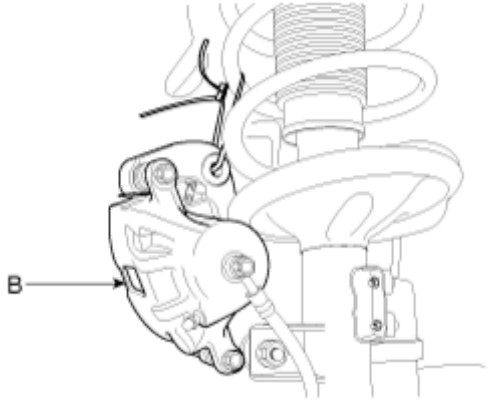
3. Remove the wheel speed sensor (A) from the knuckle.



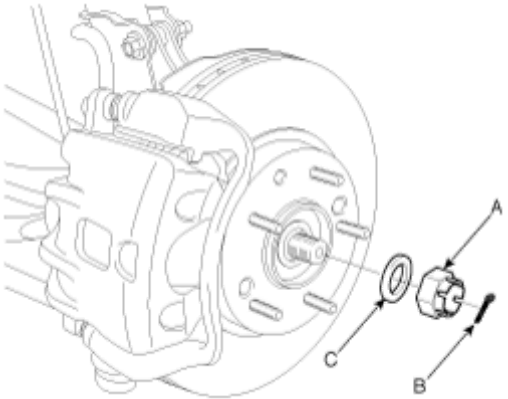
4. Remove the brake caliper mounting bolts (A), and then place the brake caliper assembly (B) with wire.



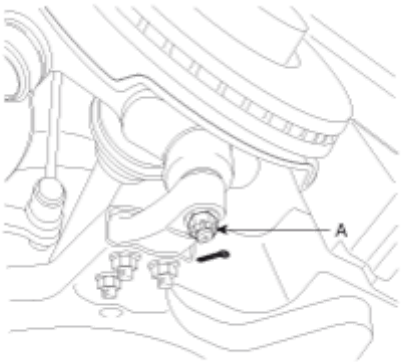
English ▼



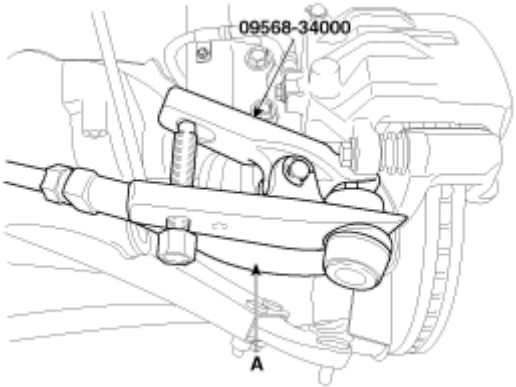
5. Remove the split pin (B), then remove castle nut (A) and washer (C) from the front hub under applying the break.



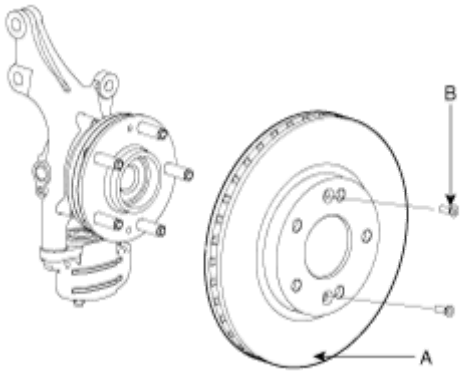
6. Remove the ball joint assembly mounting nut (A) from the knuckle.



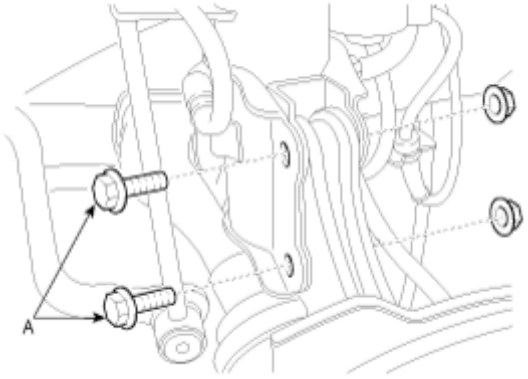
7. Remove the split pin and castle nut and then disconnect the tie rod end (A) from the front knuckle by using a SST (09568-34000).



8. Remove the brake disc (A) from the front hub assembly after remove the screws (B).



9. Remove the strut assembly mounting bolts (A) and nuts.



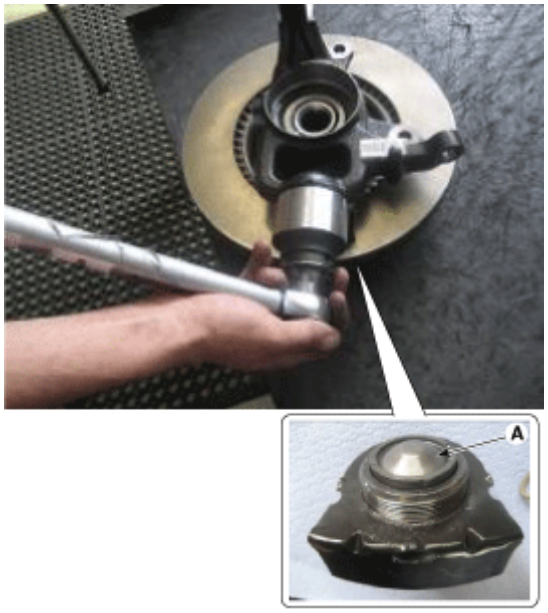
10. Remove the hub and knuckle assembly.

> **CAUTION**
>
> Be careful not to damage the boot and rotor teeth.

REPLACEMENT

Ball joint Rework instruction

1. Remove ball joint (A) with torque wrench.



2. Install ball joint (A) as tightening torque.
   Tightening torque: 137.3 ~ 156.9 N.m (14.0 ~ 16.0 kgf.m, 101.3 ~ 115.7 lb-ft)



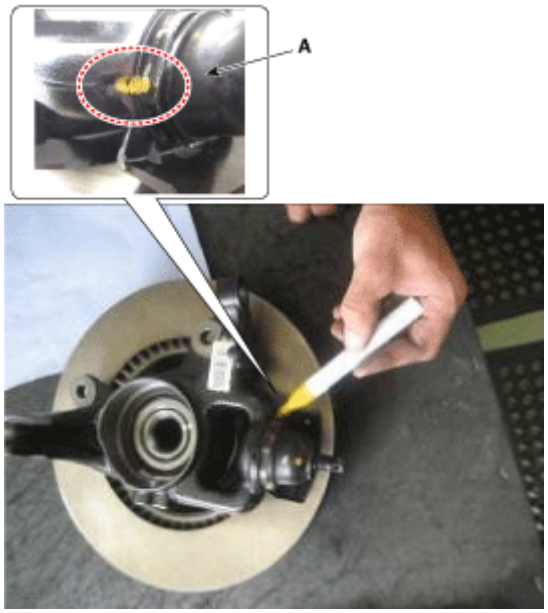
⚠ CAUTION

- Install as careing the direction of color above.

3. Make a calking with chisel.

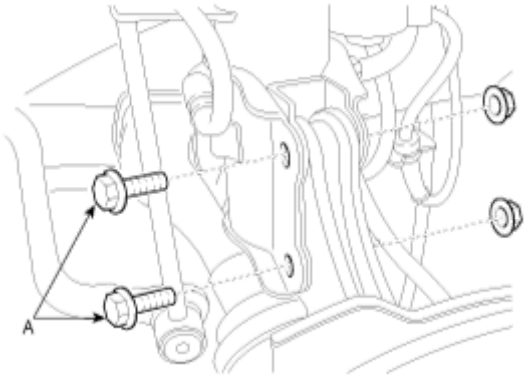


4. Mark the position of ball joint (A) after repacement.

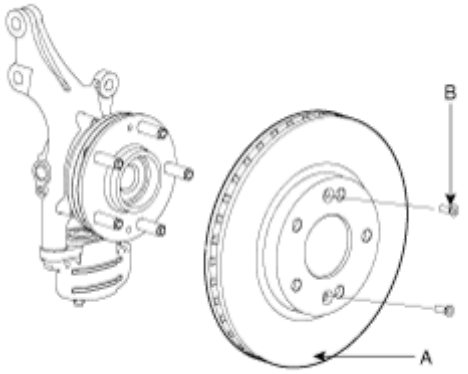


INSTALLATION

1. Install the hub and knuckle assembly to the drive shaft.
2. Install the knuckle to the strut assembly and tighten mounting bolts (A) and nuts.
   Tightening torque Nm (kgf.m, lb-ft) :
   Bolts(A): 137.3~156.9 (14.0~16.0, 101.3~115.7)



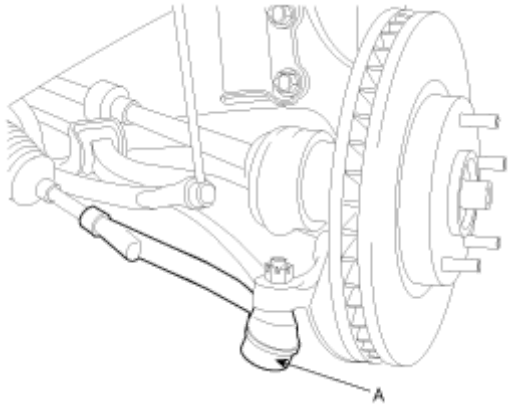
3. Install the brake disc (A) to the front hub assembly, and tighten the screws (B).



4. Install the tie rod end ball joint (A) to the knuckle.

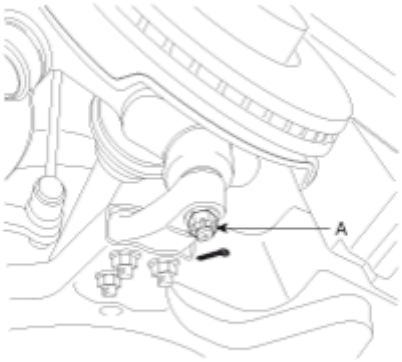
5. Install the nut and split pin.

   Tightening torque Nm (kgf.m, lb-ft) :
   23.5~33.3 (2.4~3.4, 17.4~24.6)



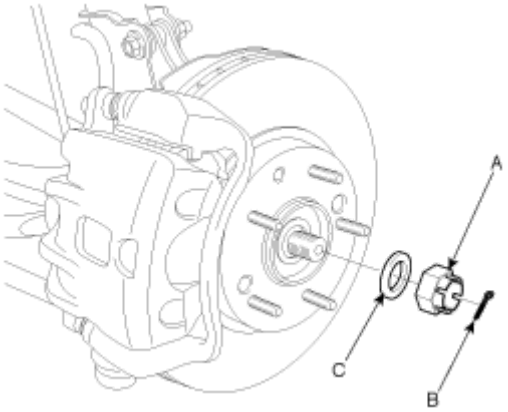
6. Install the ball joint assembly mounting nut (A) to the knuckle.

   Tightening torque Nm (kgf.m, lb-ft) :
   Bolt(A) : 98.1~117.7 (10~12, 72.3~86.8)



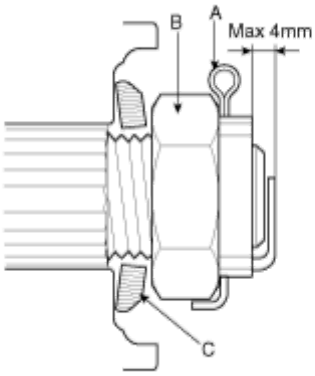
7. Install the washer (C), castle nut (A) and split pin (B) to the front hub assembly.

Tightening torque Nm (kgf.m, lb-ft) :
274.4 ~ 294.3 N.m, (28.0 ~ 30.0 kgf.m, 202.4 ~ 217.0 lb-ft)



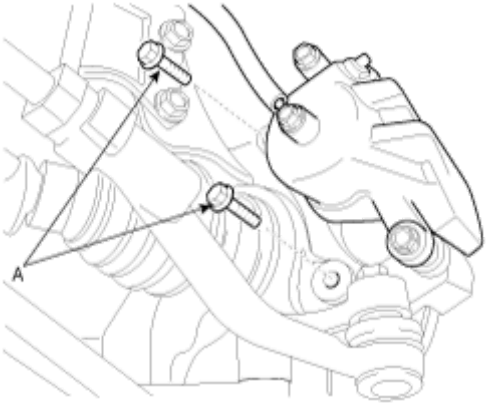
⚠ CAUTION

The washer (C) should be assembled with convex surface outward when installing the castle (B) nut and split pin (A).

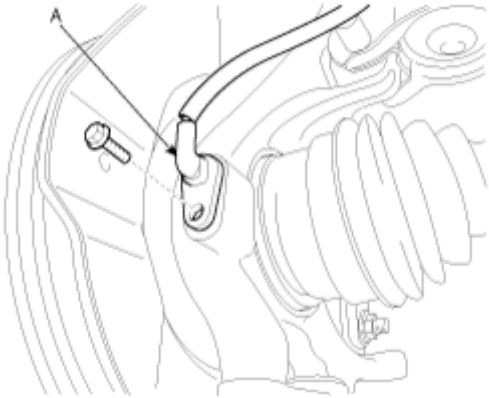


8. Install the brake caliper and then tighten the mounting bolts(A).

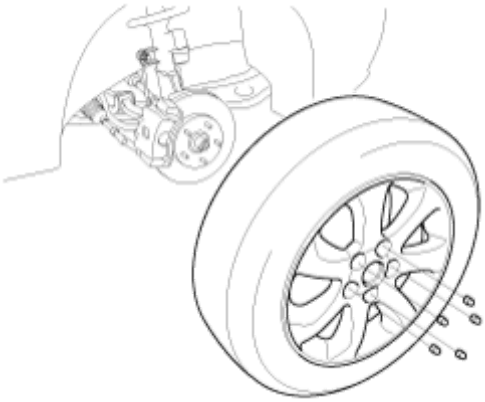
Tightening torque Nm (kgf.m, lb-ft) :
78.5~98.1 (8~10, 57.9~72.3)



9. Install the wheel speed sensor (A) to the knuckle.
   Tightening torque Nm (kgf.m, lb-ft) :
   6.9~9.8 (0.7~1.1, 5.1~7.2)



10. Install the wheel and the tire to the front hub.
    Tightening torque Nm (kgf.m, lb-ft) :
    88.3~107.9 (9~11, 65.1~79.6)



⚠ CAUTION

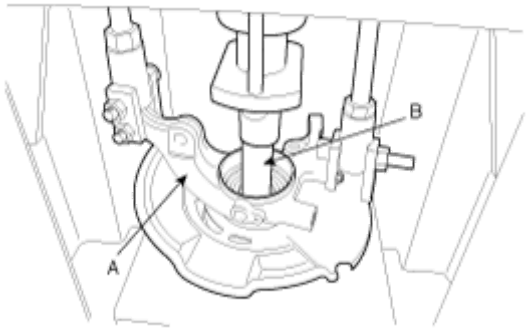
Be careful not to damage the hub bolts when installing the front wheel and tire.

DISASSEMBLY

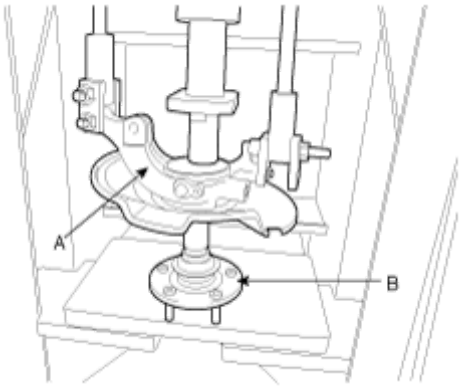
1. Remove the snap ring (A).



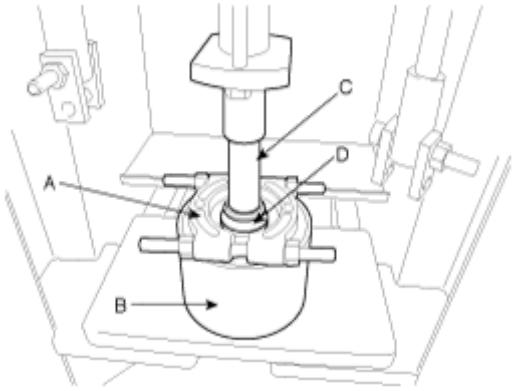
2. Remove the hub assembly from the knuckle assembly.
   (1) Install the front knuckle assembly (A) on press.
   (2) Lay a suitable adapter (B) upon the hub assembly shaft.



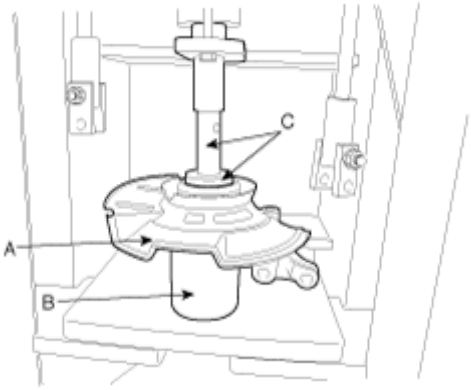
   (3) Remove the hub assembly (B) from the knuckle assembly (A) by using press.



3. Remove the hub bearing inner race from the hub assembly.
   (1) Install a suitable tool (A) for removing the hub bearing inner race on the hub assembly.
   (2) Lay the hub assembly and tool (A) upon a suitable adapter (B).
   (3) Lay a suitable adapter (C) upon the hub assembly shaft.
   (4) Remove the hub bearing inner race (D) from the hub assembly by using press.



4. Remove the hub bearing outer race from the knuckle assembly.
   (1) Lay the hub assembly (A) upon a suitable adapter (B).
   (2) Lay a suitable adapter (C) upon the hub bearing outer race.
   (3) Remove the hub bearing outer race from the knuckle assembly by using press.



5. Replace hub bearing with a new one.

INSPECTION

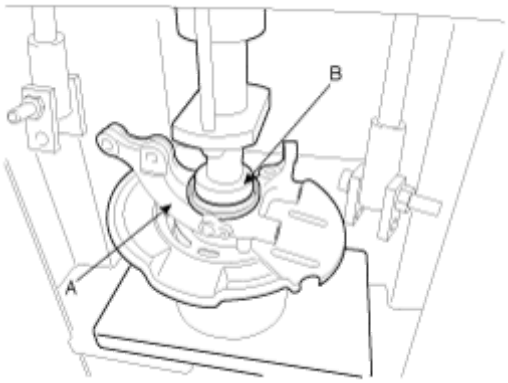
1. Check the hub for cracks and the splines for wear.
2. Check the brake disc for scoring and damage.
3. Check the knuckle for cracks.
4. Check the bearing for cracks or damage.

REASSEMBLY

1. Install the hub bearing to the knuckle assembly.
   (1) Lay the knuckle assembly (A) on press.
   (2) Lay a new hub bearing upon the knuckle assembly (A).
   (3) Lay a suitable adapter (B) upon the hub bearing.
   (4) Install the hub bearing to the knuckle assembly by using press.

⚠ CAUTION

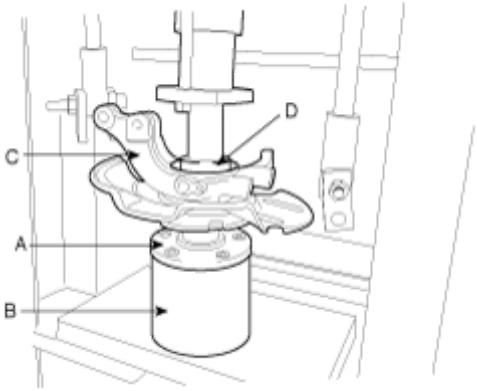
- Do not press against the inner race of the hub bearing because that can cause damage to the bearing assembly.
- Always use a new wheel bearing assembly.



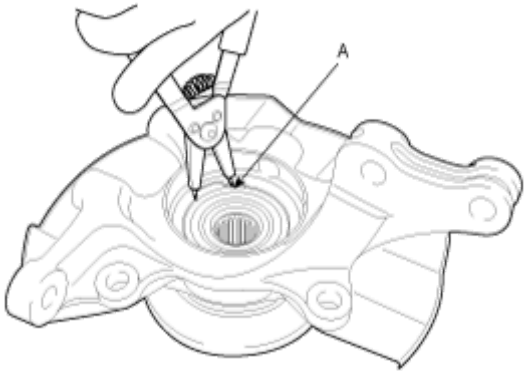
2. Install the hub assembly to the knuckle assembly.
   (1) Lay the hub assembly (A) upon a suitable adapter (B).
   (2) Lay the knuckle assembly (C) upon the hub assembly (A).
   (3) Lay a suitable adapter (D) upon the hub bearing.
   (4) Install the hub assembly (A) to the knuckle assembly (C) by using press.

⚠ CAUTION

- Do not press against the inner race of the hub bearing because that can cause damage to the bearing assembly.

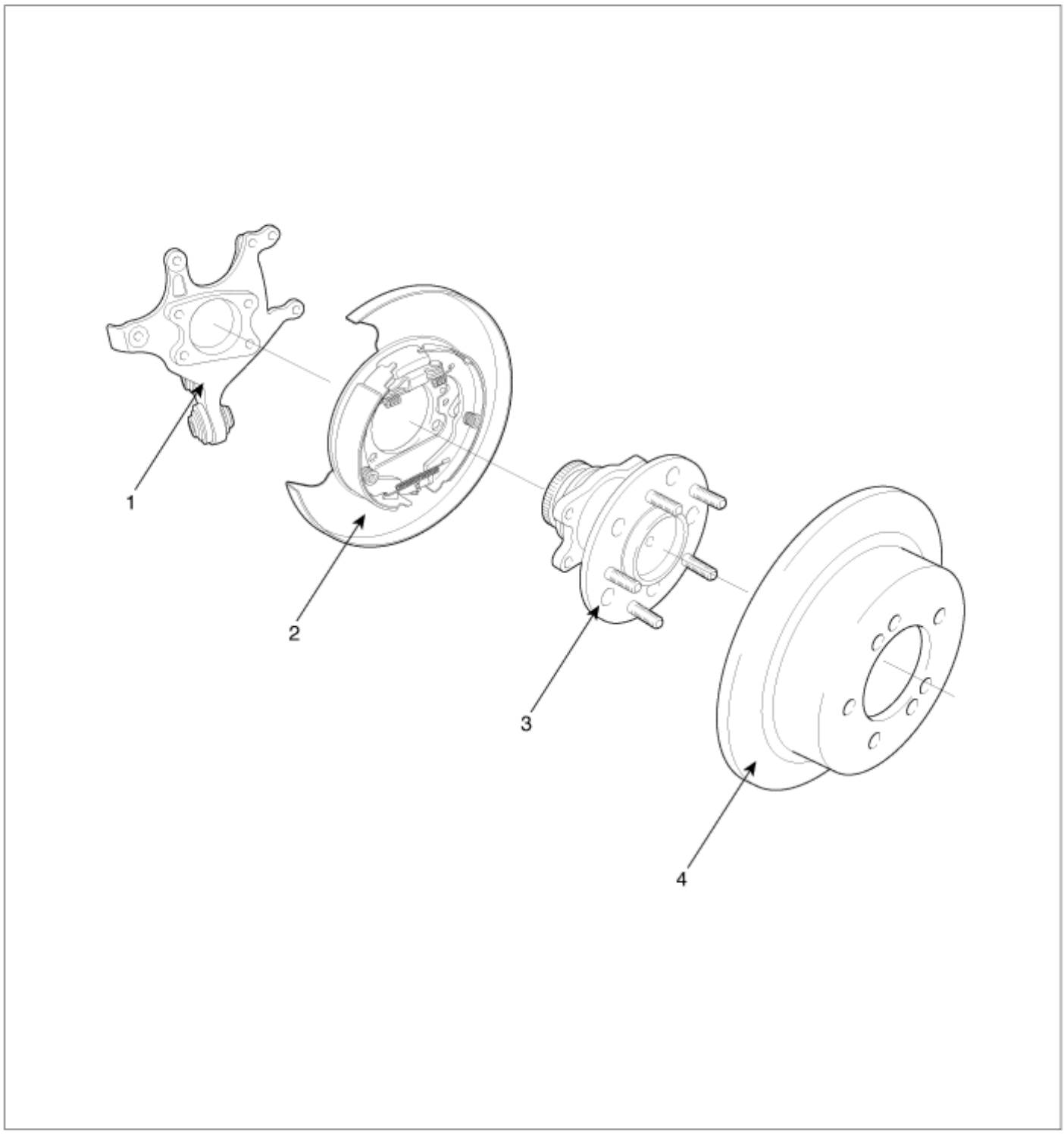


3. Install the snap ring (A).



COMPONENT

DISC BRAKE TYPE

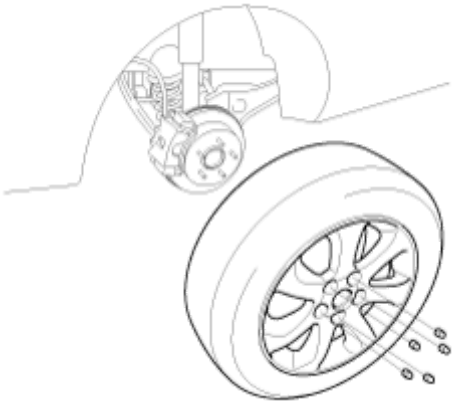


1. Carrier assembly
2. Rear brake assembly
3. Hub & bearing assembly
4. Rear brake disc

REMOVAL

DISC BRAKE TYPE

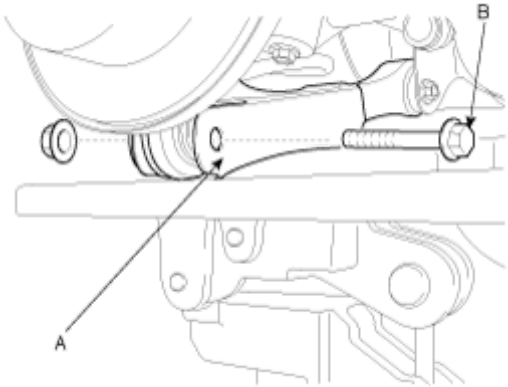
1. Release the parking brake.
2. Loosen the wheel nuts slightly.
   Raise the vehicle, and make sure it is securely supported.
3. Remove the rear wheel and tire from rear hub.



CAUTION

Be careful not to damage to the hub bolts when removing the rear wheel and tire.

4. Remove the mounting bolt (B) of the rear lower arm (A) and the rear carrier, while supporting the lower arm (A) with a jack as shown in the illustration.

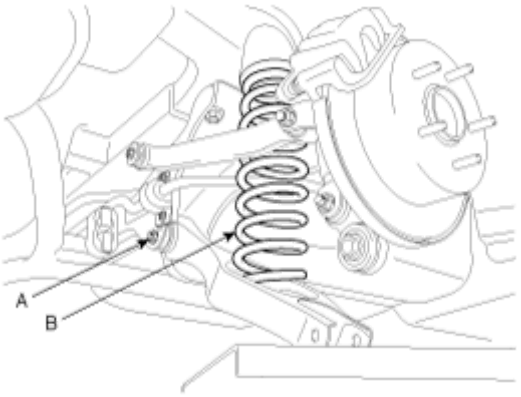


CAUTION

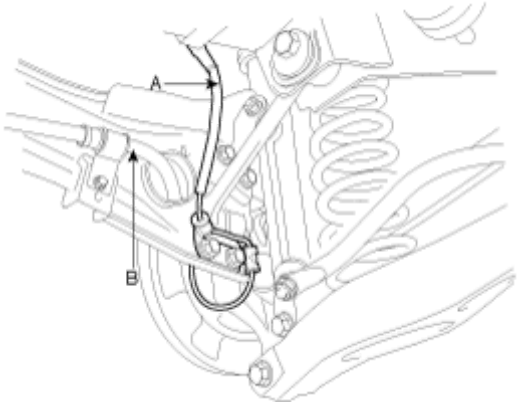
Be careful not to damage the deadener coating

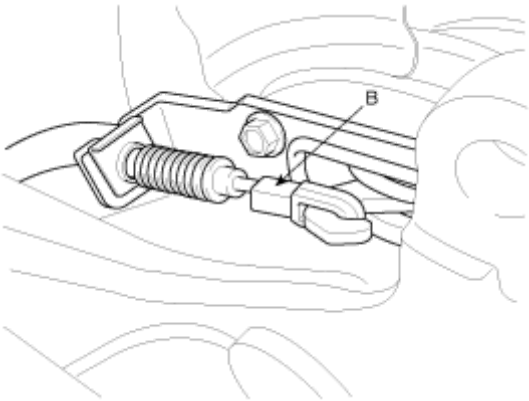
5. Loosen the mounting nut (A) of the cross member and the rear lower arm, then remove the coil spring (B) by taking down the jack.

English ▼

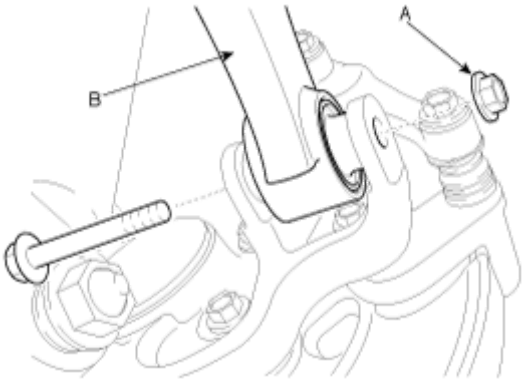


6. Remove the wheel speed sensor (A) and parking brake cable (B).

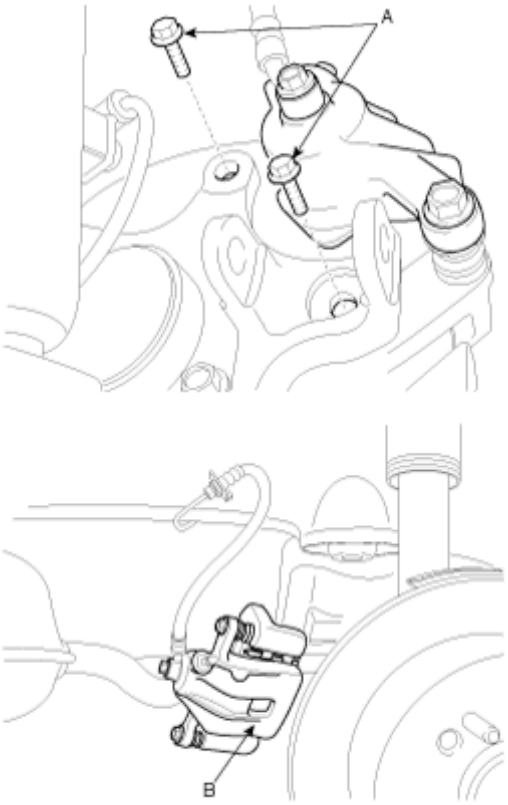




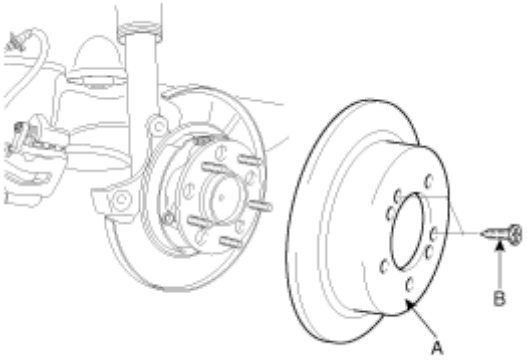
7. Disconnect the upper arm (B) from the carrier assembly after loosen the nut (A).



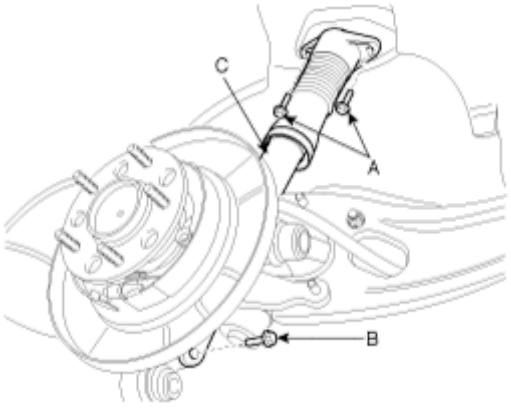
8. Remove the brake caliper mounting bolts (A), and then place the brake caliper assembly (B) with wire as shown in the illustration.



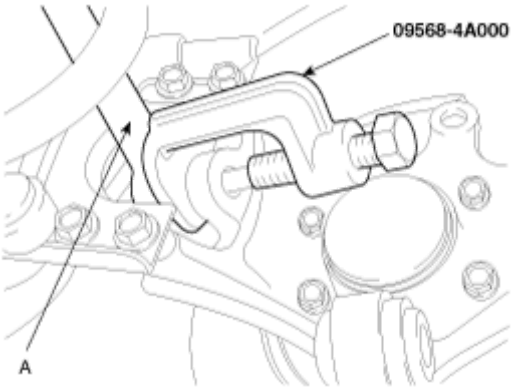
9. Remove the rear brake disc assembly (A) after loosen the screw (B).



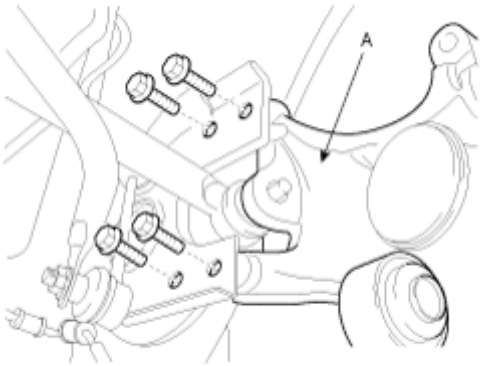
10. Remove the rear shock absorber assembly (C) after loosen the bolt (A, B).



11. Remove the split pin and castle nut from the assist arm.
12. Using the SST (09568-4A000), disconnect the assist arm (A) from the carrier assembly.

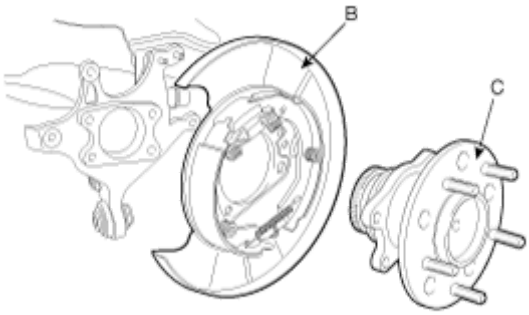


13. Remove the carrier assembly (A) from the trailing arm after remove the mounting bolts.



14. Remove the rear hub assembly (C) and rear brake assembly (B) after remove mounting bolts (A).





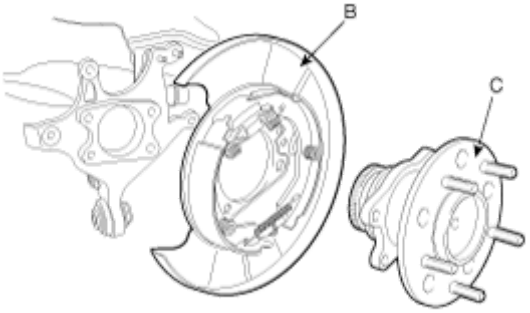
INSTALLATION

DISC BRAKE TYPE

1. Install the rear hub assembly (C) and rear brake assembly (B) to the rear carrier, then tighten mounting bolts (A).

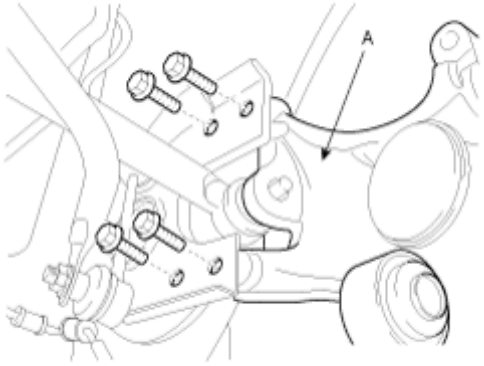
   Tightening torque Nm (kgf.m, lb-ft) :
   58.8~68.6 (6.0~7.0, 43.4~50.6)





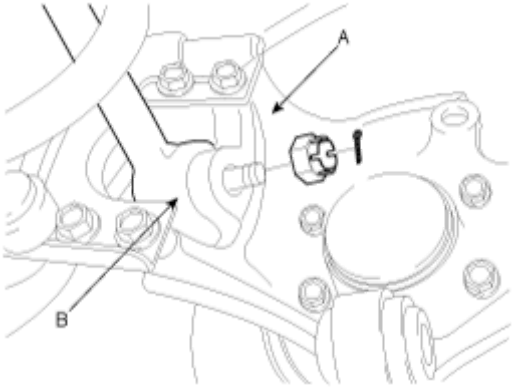
2. Install the carrier assembly (A) to the trailing arm, then tighten the mounting bolts.

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

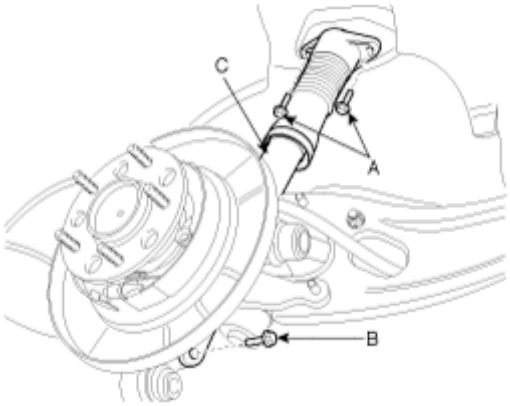


3. Install the assist arm(B) to the carrier assembly (A) , then install the castle nut and split pin.

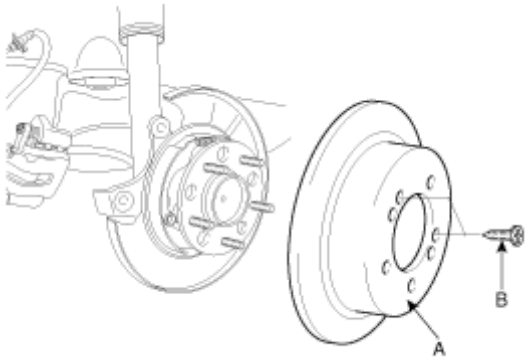
   Tightening torque Nm (kgf.m, lb-ft) :
   44.1~53.9 (4.5~5.5, 32.5~39.8)



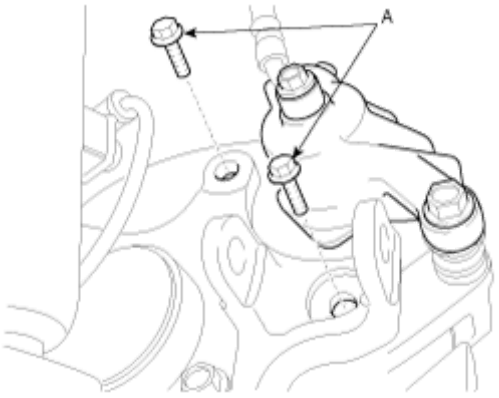
4. Install the rear strut assembly (C), then tighten the bolt (A, B).
   Tightening torque Nm (kgf.m, lb-ft) :
   Bolt(A) : 49.0~63.7 (5.0~6.5, 36.2~47.0)
   Bolt(B) : 137.3~156.9 (14.0~16.0, 101.3~115.7)



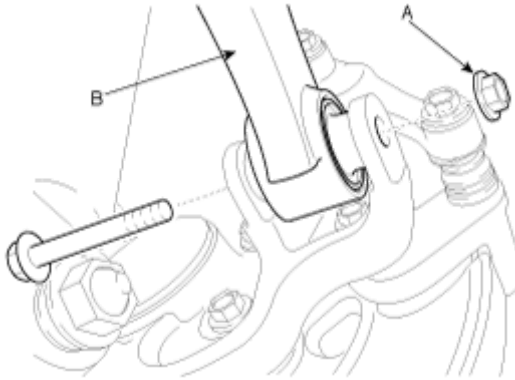
5. Install the rear brake disc assembly (A) and tighten screw (B).



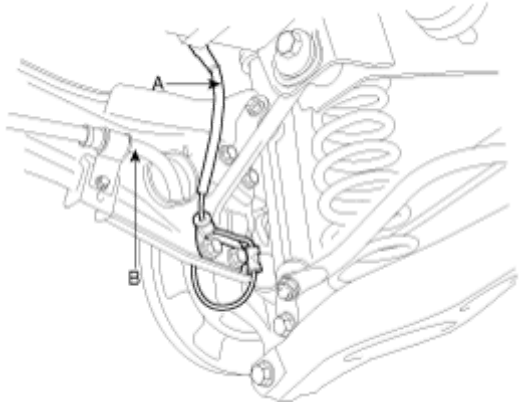
6. Install the brake caliper, then tighten the brake caliper mounting bolts (A).
   Tightening torque Nm (kgf.m, lb-ft) :
   49.0~58.8 (5.0~6.0, 36.2~43.4)

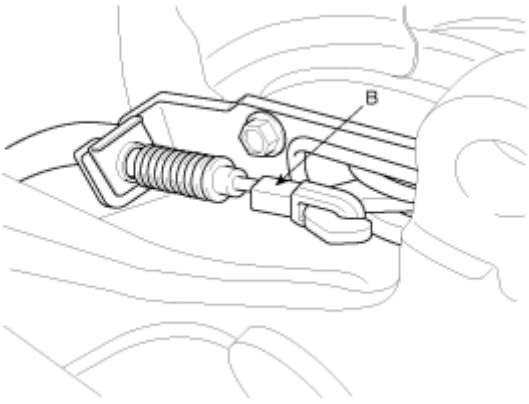


7. Install the upper arm (B) from the carrier assembly , then tighten the nut (A).
   Tightening torque Nm (kgf.m, lb-ft) :
   Nut(A) : 98.1~117.7 (10~12, 72.3~86.8)

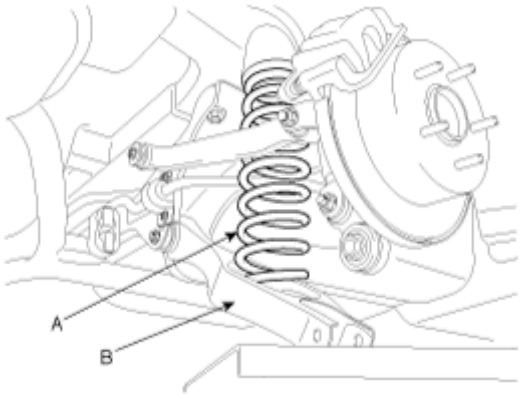


8. Install the wheel speed sensor (A) and parking brake cable (B).



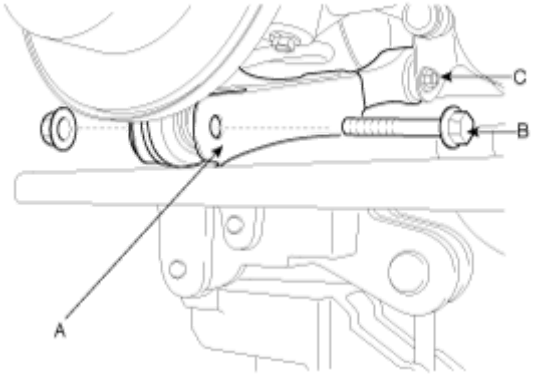


9. Install the coil spring (A) on the rear lower arm (B), then slowly jack-up the rear lower arm (B) by using jack.



10. Install the mounting bolt (B) of the rear lower arm (A) and the rear carrier with a specified torque, while supporting the lower arm (A) with a jack as shown in the illustration. Tighten the mounting bolt (C) of the cross member and the rear lower arm with a specified torque.

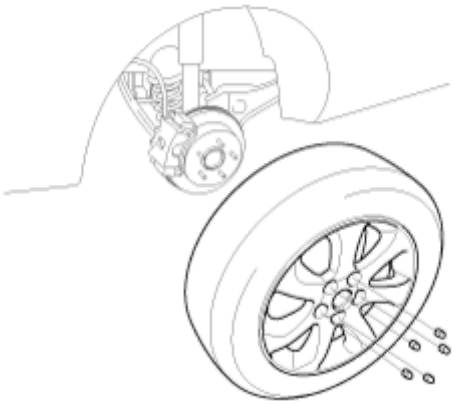
    Tightening torque Nm (kgf.m, lb-ft) :
    Bolt (B, C) :137.3~156.9 (14.0~16.0, 101.3~115.7)



> **⚠ CAUTION**

11. Install the wheel and the tire to the rear hub.

    Tightening torque Nm (kgf.m, lb-ft) :
    88.3~107.9 (9~11, 65.1~79.6)



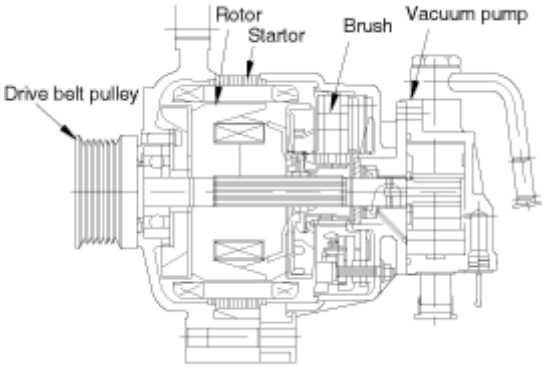
> **⚠ CAUTION**
>
> Be careful not to damage the hub bolts when installing the rear wheel and tire.

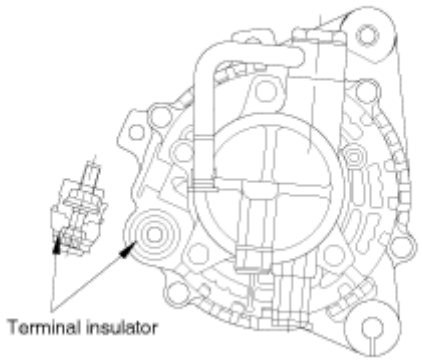
INSPECTION

1. Check the hub for cracks and the splines for wear.
2. Check the bearing for cracks or damage.
3. Check the brake disc for scoring and damage.
4. Check the rear axle carrier for cracks.
5. Check the rear tone wheel for chipped the teeth.

DESCRIPTION

The conventional internal voltage detection type alternator controls the charging voltage regardless of the battery condition and according to the external load change so that it sometimes causes battery under or over charging or causes flickering of meters and lamps due to ripples of generated voltage resulting from load fluctuation. The figure below show the internal circuits of the alternator and voltage regulator.





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.
- Do not perform tests with a high voltage insulation resistance tester.
- Never disconnect the battery while the engine is running.

CHECK BATTERY TERMINALS, FUSIBLE LINK AND FUSES

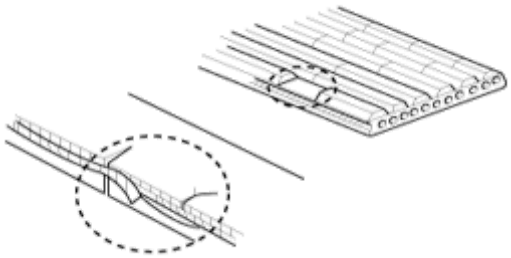
1. Check that the battery terminals are not loose or corroded.
2. Check the fusible link and fuses for continuity.

INSPECT DRIVE BELT

1. Visually check the belt for excessive wear, frayed cords etc.
   If any defect has been found, replace the drive belt.

NOTICE

Cracks on the rib side of a belt are considered acceptable. If the belt has chunks missing from the ribs, it should be replaced.



2. Using a belt tension gauge, measure the drive belt tension.

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 it.
4. Start the engine. Check that the light goes off.

INSPECT CHARGING SYSTEM

English ▼

VOLTAGE DROP TEST OF ALTERNATOR OUTPUT WIRE

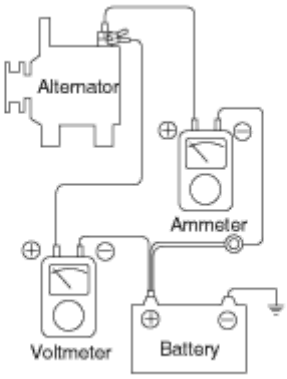
This test determines whether or not the wiring between the alternator "B" terminal and the battery (+) terminal is good by the voltage drop method.

PREPARATION

1. Turn the ignition switch to "OFF".

> **NOTICE**
>
> To find abnormal conditions of the connection, actions should not be taken on the two terminals and each connection during the test.

2. Connect a digital voltmeter between the alternator "B" terminal and battery (+) lead wire to the battery (+) terminal. Connect the (+) lead wire of the voltmeter to the "B" terminal and the (-) lead wire to the battery (+) terminal.



CONDITIONS FOR THE TEST

1. Start the engine.
2. Switch on the headlamps, blower motor and so on. And then, read the voltmeter under this condition.

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 fusible link to the battery (+) terminal. Check for loose connections, color change due to an overheated harness, etc. Correct them before testing again.
3. Upon completion of the test, set the engine speed at idle. Turn off the head lamps, 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 nominal output.

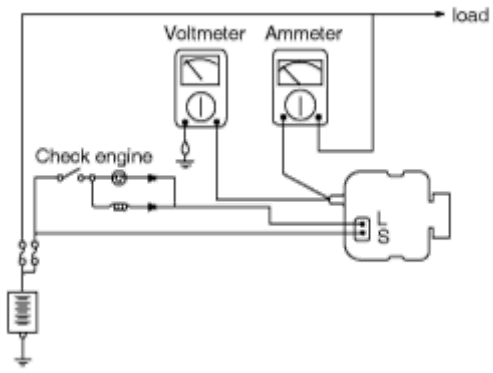
PREPARATION

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 "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.
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.

> **NOTICE**
>
> 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 the alternator "B" terminal and battery (+) terminal, a blown fusible link or poor grounding is suspected.
2. Start the engine and turn on the headlights.
3. Set the headlights 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.

> **NOTICE**
>
> After the engine starts 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 (120Aalternator):50% of the rate voltage

> **NOTICE**
>
> - The nominal 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 nominal output current may not be obtained. If such is the case, keep the headlights on the cause discharge of the battery, or use the lights of another vehicle to increase the electrical load.The nominal 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.

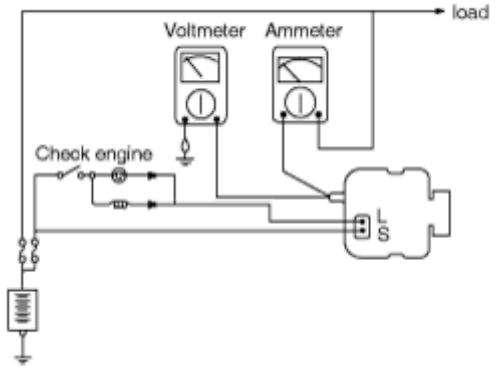
2. Disconnect the battery ground cable.
3. Remove the ammeter and voltmeter and the engine tachometer.
4. Connect the alternator output wire to the alternator "B" terminal.
5. Connect the battery ground cable.

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. For battery checking method, see "BATTERY".
   Check the alternator drive belt tension.
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 (-), or the fusible link is blown.
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.

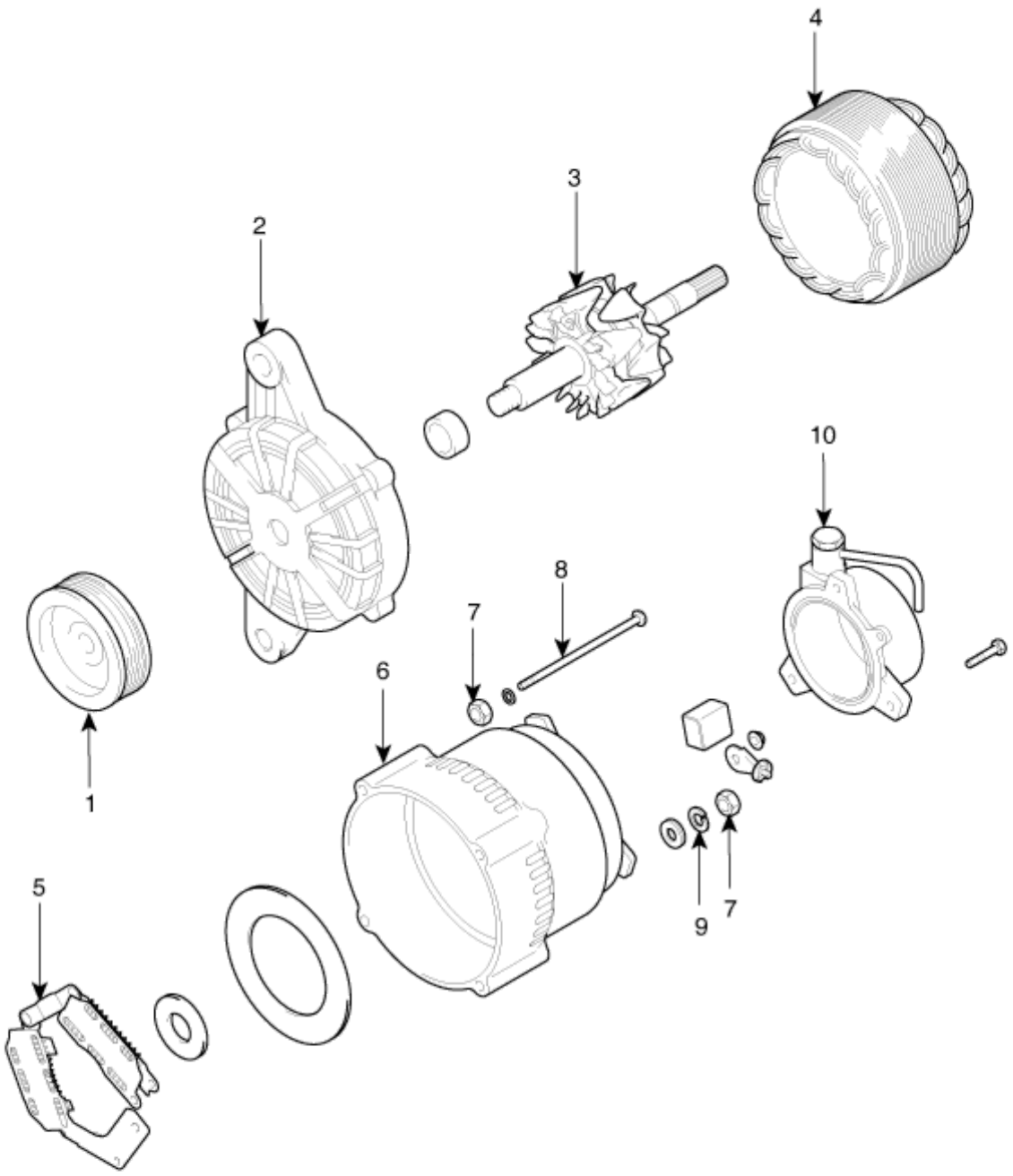
REGULATING VOLTAGE TABLE

Voltage regulator ambient temperature °C (°F)	Regulating voltage (V)
-30 (-22) 20 (68) 120 (248)	14.1 ~ 15.2 14.1 ~ 14.7 13.3 ~ 14.7

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.

English ▼

COMPONENTS

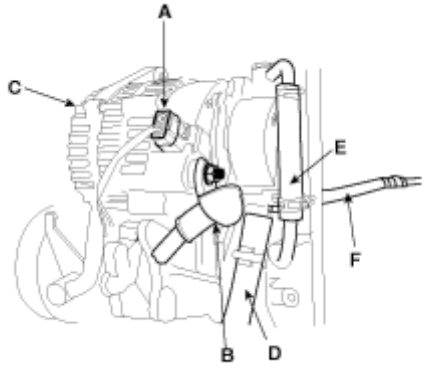


1. Pulley
2. Front frame assembly
3. Rortor
4. Startor
5. Brush & Regulator assembly
6. Rear frame assembly
7. Nuts
8. Throught bolts
9. Washer
10. Pump assembly

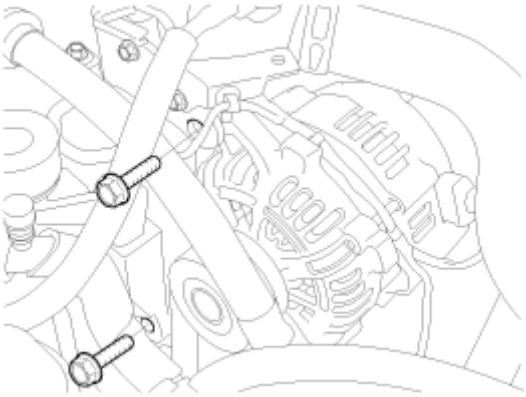
English ▼

REMOVAL

1) Disconnect the battery negative terminal frist, then the positive terminal.
2) Disconnect the alternator connector(A) and "B" terminal cable(B) from the alternator(C).
3) Disconnect the vacuum pump oil drain hose(D), vacuum pump oil feed hose(E) and vacuum hose(F).



4) Remove the mounting bolt and remove the alternator.

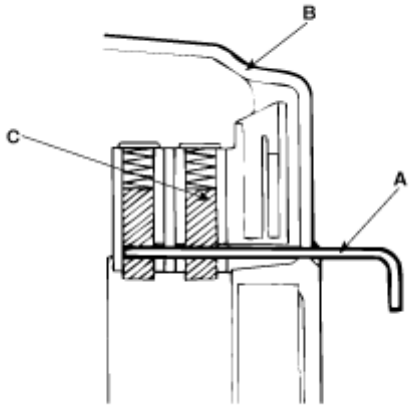


5) Installation is the reverse of removal.

INSTALLATION

Installation is the reverse of removal.

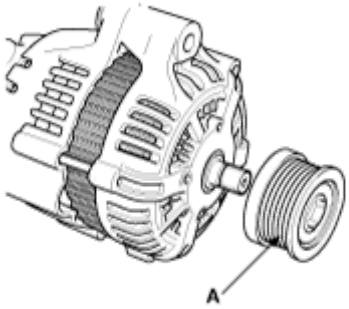
1. Befor install the rotor to the rear bracket, fix the brush(C) by inseting the wire(A) to the rear bracket(B) hole.
2. Remove the wire(A) after assembly the rotor.



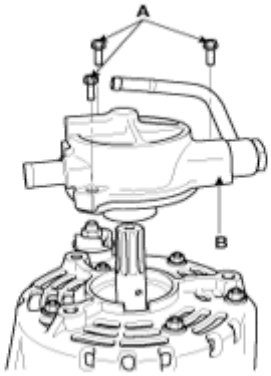
DISASSEMBLY

DISASSEMBIY

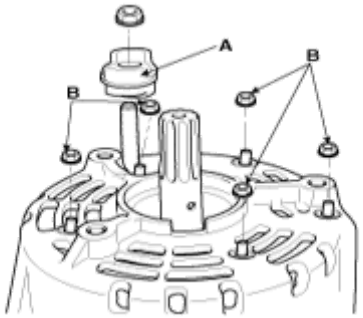
1) Remove the pulley(A).



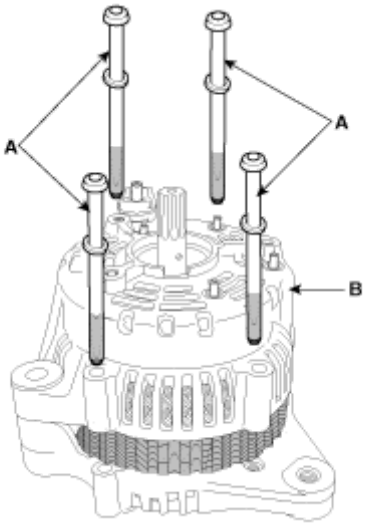
2) After loosening the three bolts(A). Remove the vacuum pump(B).



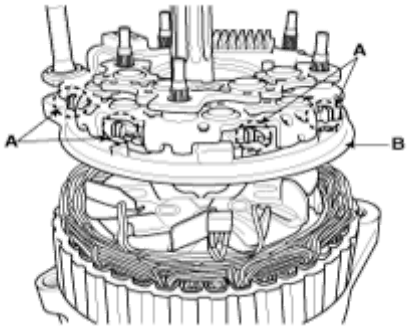
3) Remove the B terminal insulator(A) and loosen the five rear cover mounting nuts(B).



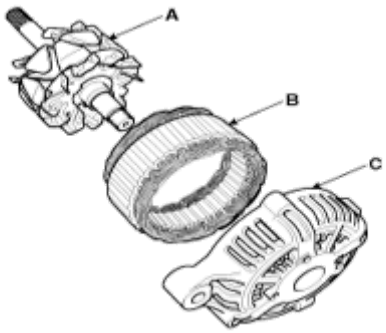
4) After loosening the four through bolts(A), remove the rear cover(B).



5) After removing the weld between the stator lead and diode lead(A), remove the regulator assembly(B).



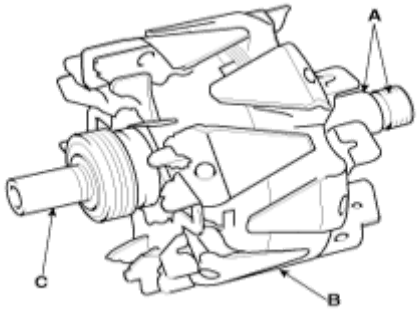
6) Separate the rotor(A), stator(B), and front cover(C).



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).



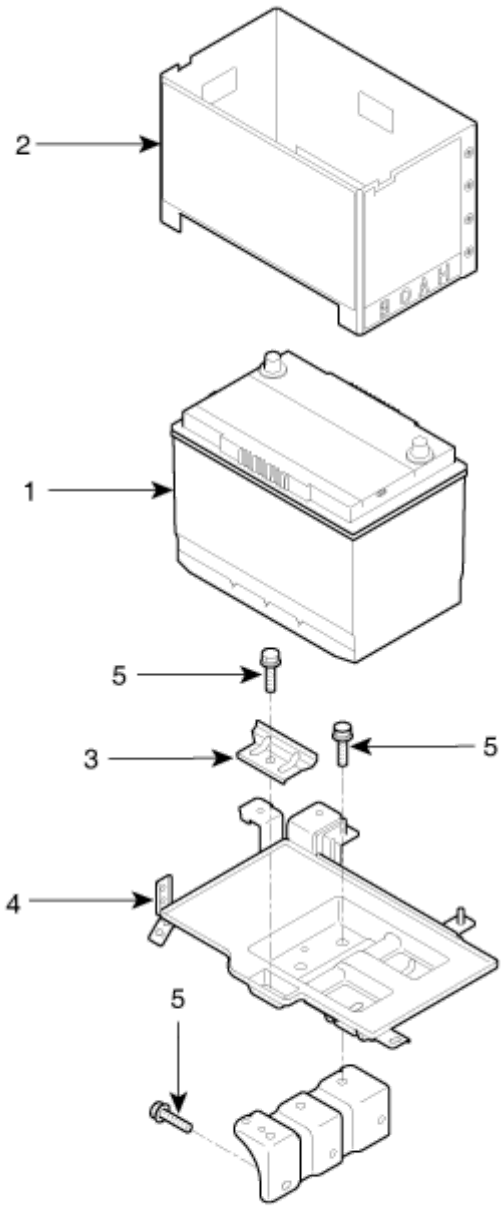
2. Check that there is no continuity between each lead and the coil core.
3. If the coil fails either continuity check, replace the generator.

DESCRIPTION

1. The Closed Maintenance Free(CMF) battery is, as the name implies, totally mainfenance free and has no removable battery cell cap.
2. The Closde Maintenance Free(CMF) battery is, water never needs to be added to the maintenance free battery.
3. The battery is completely sealde, except for small vent holes in the cover.

English ▼

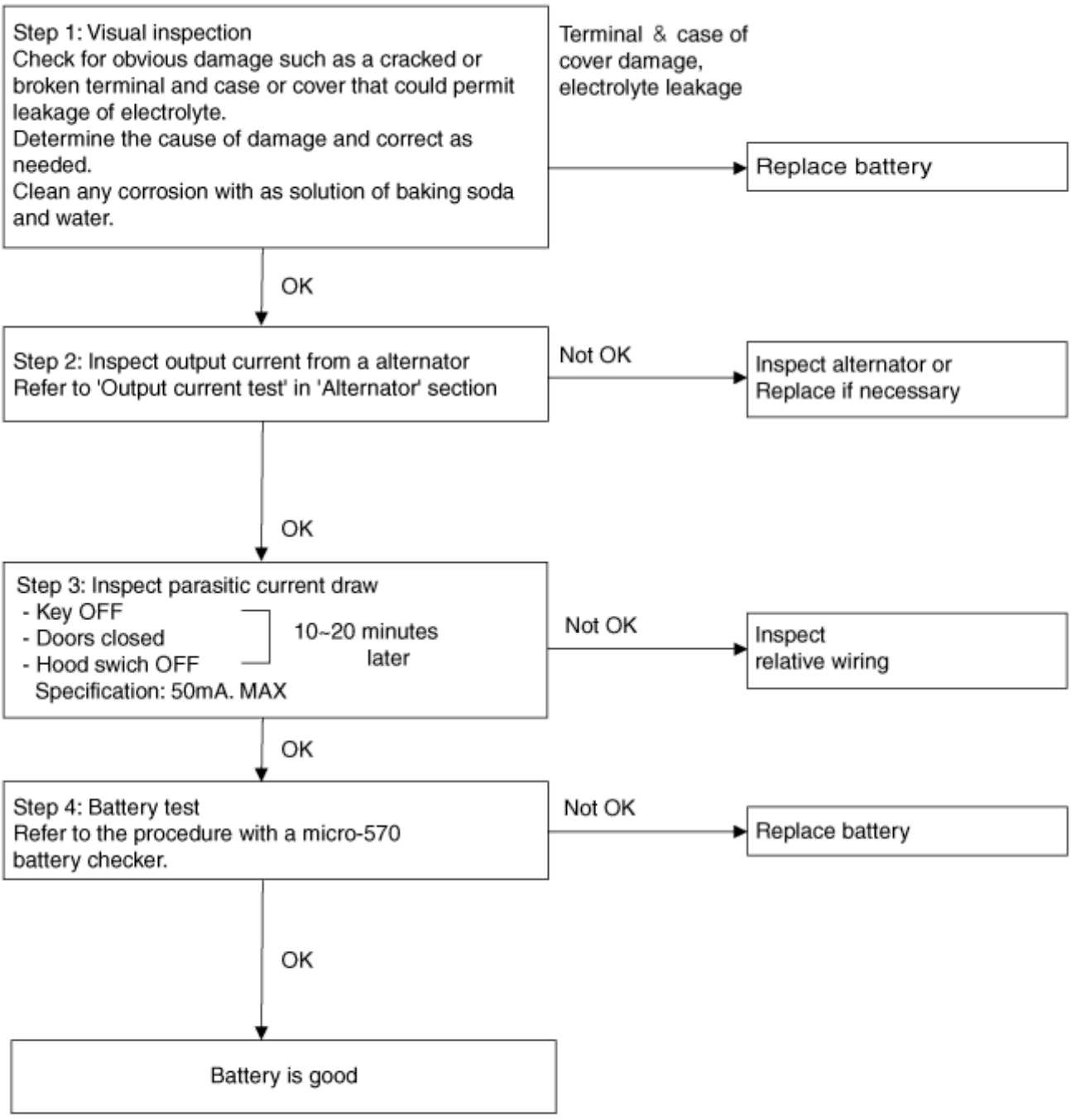
COMPONENTS



1. Battery assembly
2. Battery insulation pad
3. Battery mounting bracket
4. Battery tray assembly
5. Bolts

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.

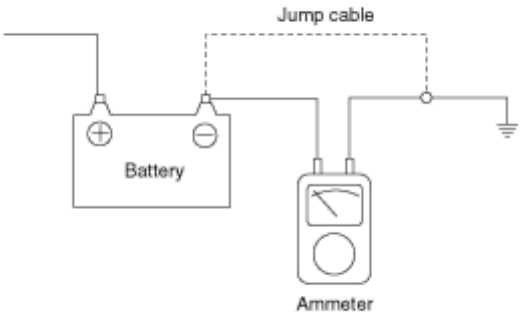
(3) Close the doors or remove the door switches.

3. Wait a few minutes until the vehicle's electrical systems go to sleep mode.

> **NOTICE**
>
> 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,
>
> a. Connect a jump cable between the battery (-) terminal and the ground cable.
>
> b. Disconnect the ground cable from the battery (-) terminal.
>
> c. Connect an ammeter between the battery (-) terminal and the ground cable.
>
> d. After disconnecting the jump cable, read the current value of the ammeter.



5. Read the current value of the ammeter.
   - 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.
   - Check the parasitic current again, and search for suspected unit by removing a unit connected with the abnormal circuit one by one.

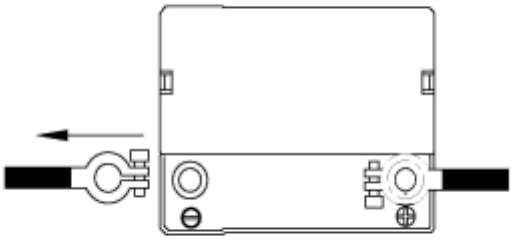
   Limit value (after 10~20 min.) : Below 50mA

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

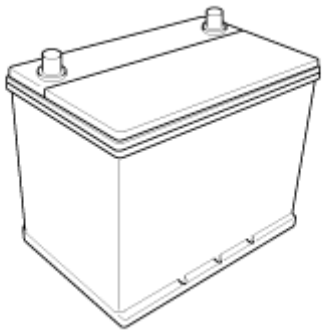
Care should be taken in the event the battery case is cracked or leaking, to protect your skin from the electrolyte. Heavy rubber gloves (not the household type) should be wore when removing the battery.



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 form battery.



TROUBLESHOOTING

Before starting troubleshooting, inspect each of the following sections, and if there is an abnormality, carry out a repair.

1. Check that the actuator and pulley assembly are all normal.
2. Check if the pulley assembly and the movement of cables are working smoothly.
3. Check if there is no excessive play or tension in each cable.

TROUBLESHOOTING PROCEDURES

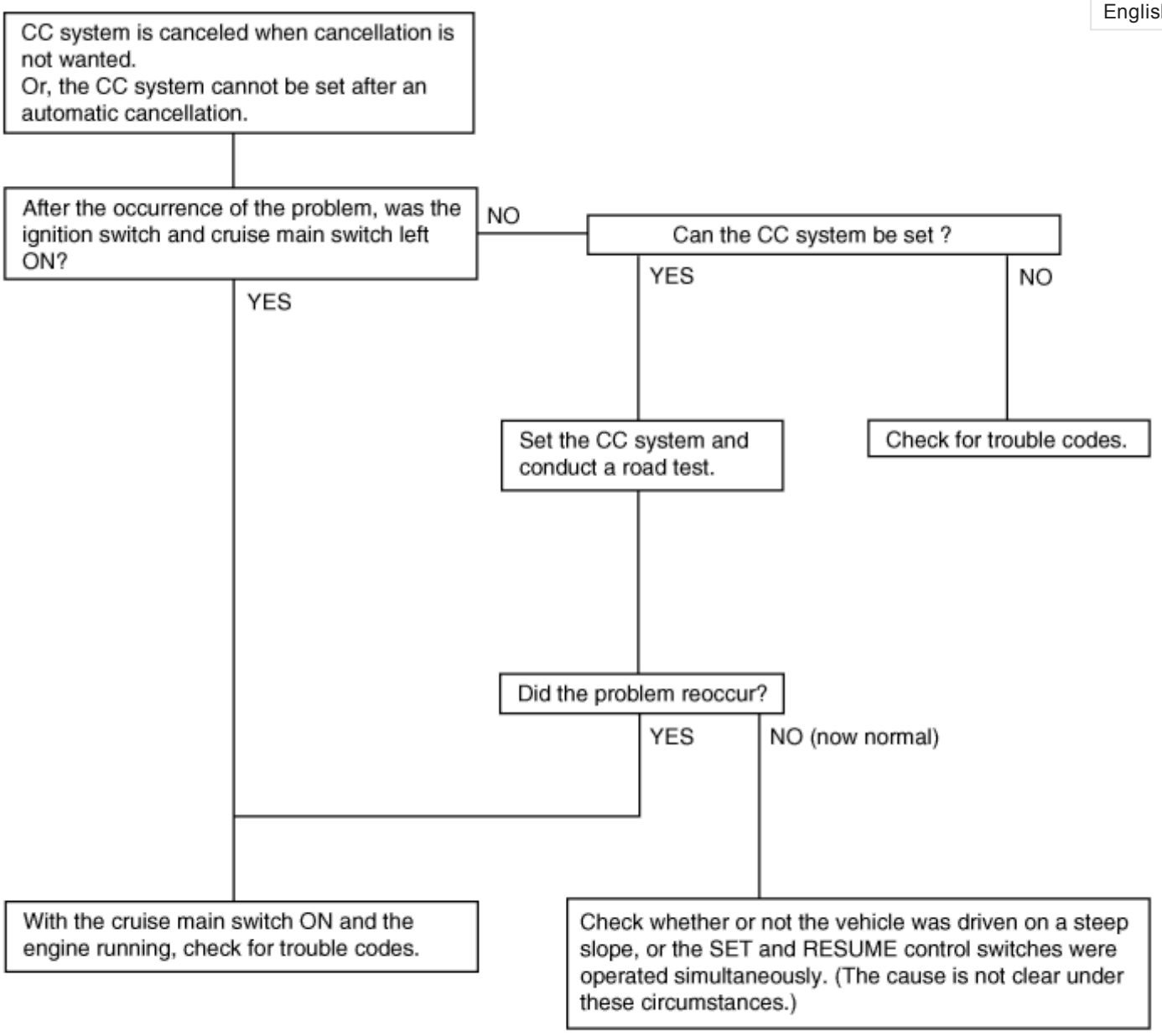
First, select the applicable malfunction symptom from the "TROUBLE SYMPTOM CHARTS" shown on nest pages.
Determine the condition of all function circuits.

1. Make the following preliminary inspections.
   - Check that the installation of the actuator, accelerator cable are correct, and that the cables and links are securely connected.
   - Check that the accelerator pedal moves smootyly.
   - Adjust the cable so there is not excessive tension or excessive play on the accelerator cable.
   - Check that the actuator and unit assembly, cruise main, control switch and the connector of each cancel switch are connected securely.
2. Check in the sequence indicated in the "TROUBLE SYMPTOM CHARTS".
3. If a normal condition is indicated, replace the cruise control module.

TROUBLE SYMPTOM CHARTS

TROUBLE SYMPTOM 1

English ▼



CC : Cruise Control

TROUBLE SYMPTOM 2

Trouble symptom	Probable cause	Remedy
The set vehicle speed varies greatly upward or downwqrd "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 the speedometer cable or speedometer drive gear	
	Malfunction of the actuator and unit	Replace the actuator and unit

TROUBLE SYMPTOM 3

Trouble symptom	Probable cause	Remedy
The CC system is not canceled when the brake pedal is deprssed	Damaged or disconnected wiring of the stop lamp switch	Repair the harness or replace the stop lamp switch

	Malfunction of the actuator and unit	Replace the actuator and unit

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 ingibitor switch
	Improper adjustment of inhibitor switch	
	Malfunction of the actuator and unit	Replace the actuator and unit

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
	Actuator circuit poor contact	Repair the harness or replace the actuator
	Malfunction of the actuator	
	Malfunction of the actuator and unit	Replace the actuator and unit

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 RESUME switch
	Actuator circuit poor contact	Repair the harness or replace the actuator
	Malfunction of the actuator	
	Malfunction of the actuator and unit	Replace the actuator and unit

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 speedometer cable or the speedometer drive gear	
	Malfunction of the actuator and unit	Replace the actuator and unit

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	

TROUBLE SYMPTOM 9

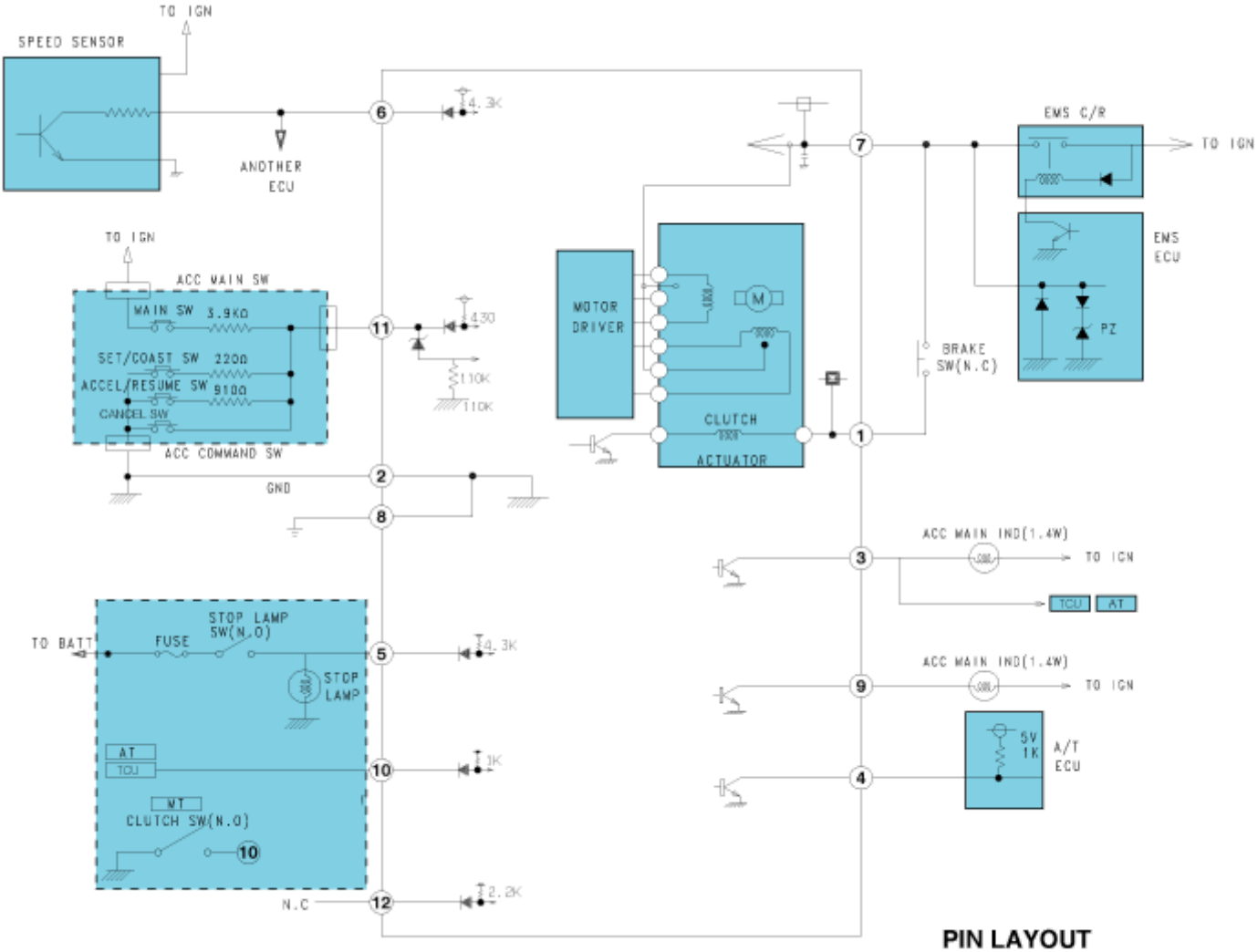
Trouble symptom	Probable cause	Remedy
Malfunction of control function by ON/OFF switching of idle switch	Malfunction of circuit related to idle switch function	Repair the narness or replace the part
	Malfunction of the actuator and unit	

TROUBLE SYMPTOM 10

Trouble symptom	Probable cause	Remedy
Overdrive is not canceled during fixed speed driving	Malfunction of circuit related to overdrive cancellation, or malfunction of actuator and unit	Repair the harness or replace the part
No shift to overdrive during manual driving		

English

CIRCUIT DIAGRAM

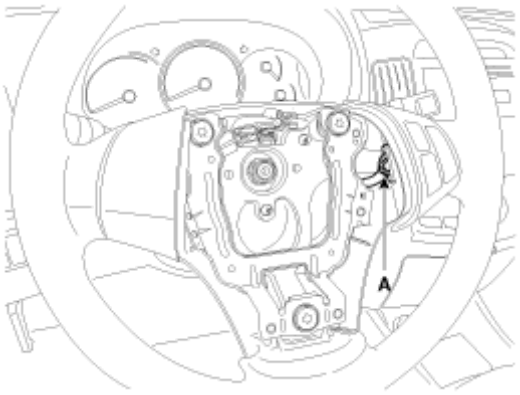


PIN LAYOUT

No	Name	Note
1	BRK	AUTUATOR CLUTCH
2	GND	GND
3	SET	SET INDICATOR
4	AT	OD CONTROL
5	STOP	STOP LAMP SW
6	SPD	SPEED SENSOR
7	IGN1	POWER SOURCE
8	GND	GND
9	MAIN	MAIN INDICATOR
10	CLU	INH./CLUTCH SW
11	COM	MAIN/COMMAND SW
12	NC	NO CONNECTION

REMOVAL

1. Remove the air bag module assembly. (Refer to 'RT','ST' group)
2. Disconnect the auto cruise control main switch connector.



3. Remove the auto cruise control main switch assembly.
4. To install, reverse the removal procedure.

INSPECTION

1. Operate the switchs and check for continuity between the terminals.
2. If continuity is not as specified, replace the switch.

Switches	State	Terminals							
		1	2	3	4	5	6	7	8
Main	ON							○—○	
Set/ Coast							○—○		
Accel/ Resume							○—○		
Cancel							○—○		

THE MICRO 570 ANALYZER

The Micro 570 Analyzer provides the ability to test the charging and starting systems, including the battery, starter and alternator.

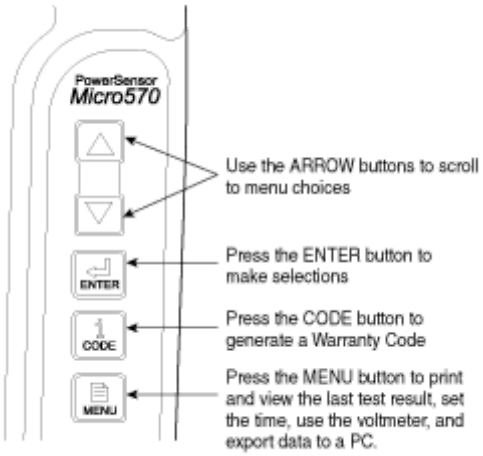
⚠ CAUTION

※ 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)



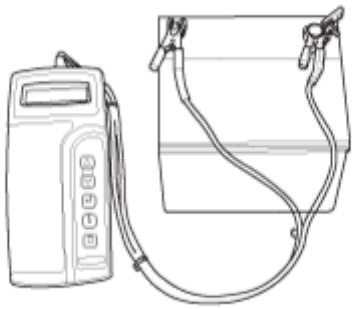
Keypad

The Micro 570 button on the key pad provide the following functions :



Battery Test Procedure

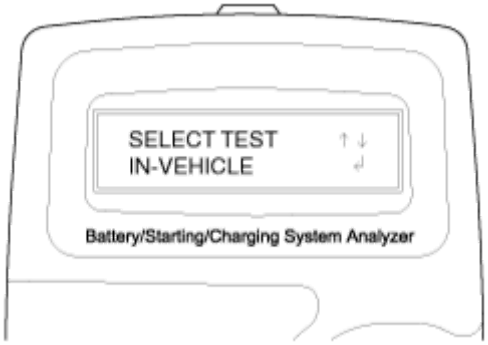
1. Connect the tester to the battery.
   - Red clamp to battery positive (+) terminal.
   - Black clamp to battery negative (-) terminal.



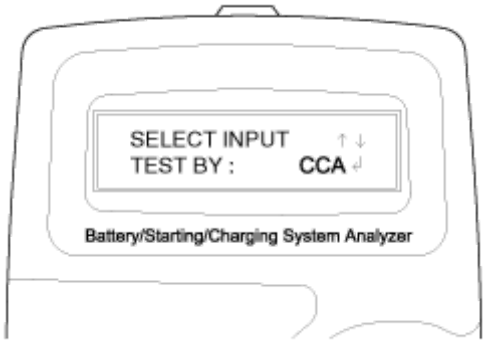
⚠ CAUTION

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.



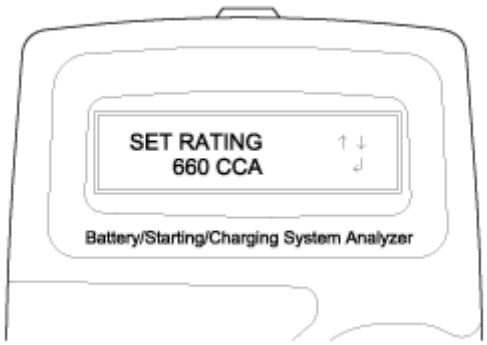
3. Select CCA and press the ENTER button.



NOTICE

CCA : Cold cranking amps, is an SAE specification for cranking batteried at -0.4°F (-18°C).

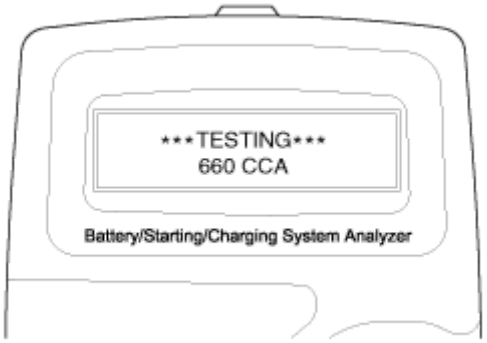
4. Set the CCA value displayed on the screen to the CCA value marked on the battery label by pressing up and down buttons and press ENTER.



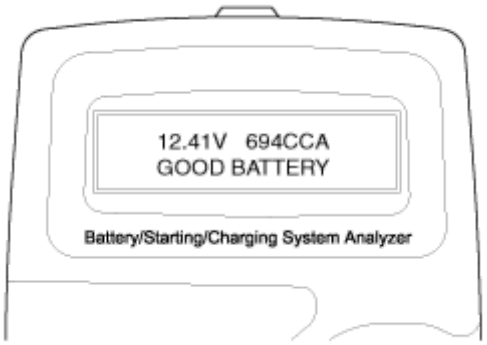
NOTICE

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)

- 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.

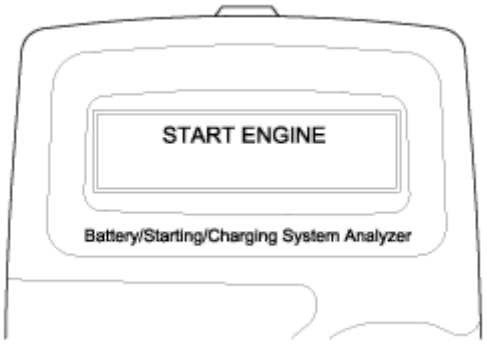
> **⚠ WARNING**
>
> Whenever filing a claim for battery, the print out of the battery test results must be attached.

Starter Test Procedure

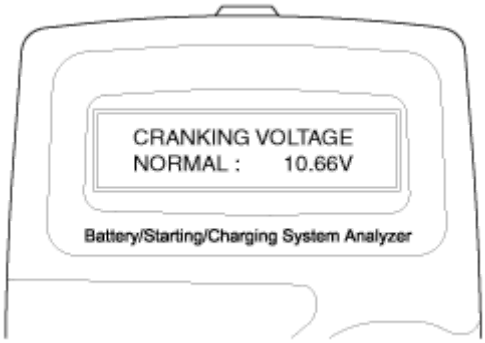
7. After the battery test, press ENTER immediately for the starter test.



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.

NOTICE

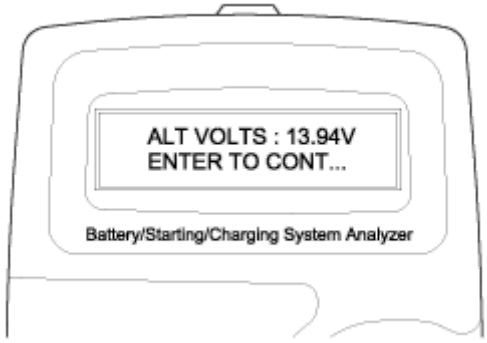
When testing the vehicle with old diesel engines, the test result will not be favorable if the glow plug is not heated. Conduct the test after warming up the engine for 5 minutes.

Charging System Test Procedure

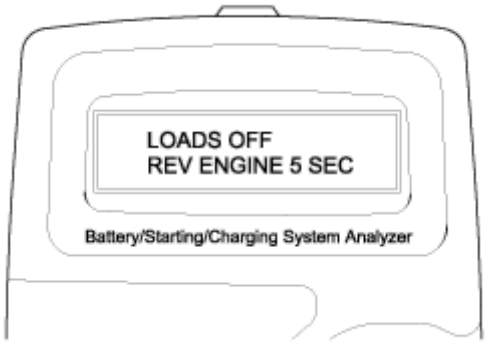
10. Press ENTER to begin charging system test.

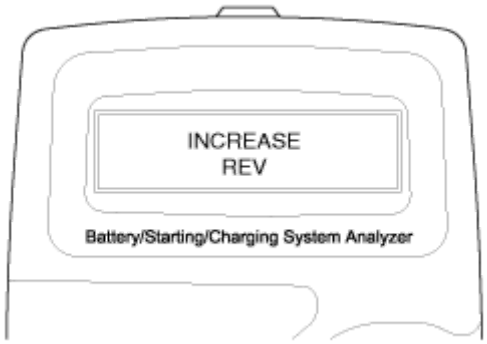


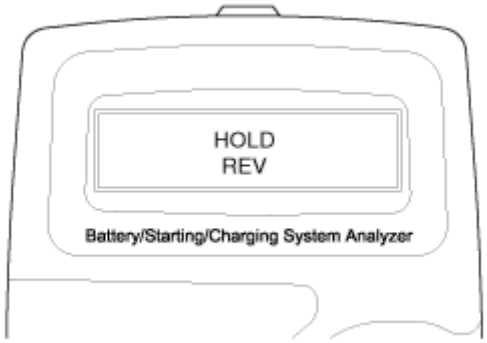
11. The tester displays the actual voltage of alternator.
    Press ENTER to continue.



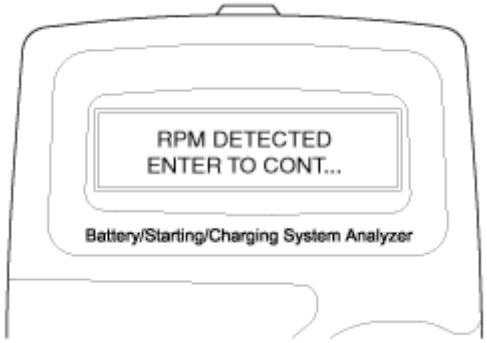
12. Turn off all electrical load and rev engine for 5 seconds with pressing the accelerator pedal. (Follow the instructions on the screen)



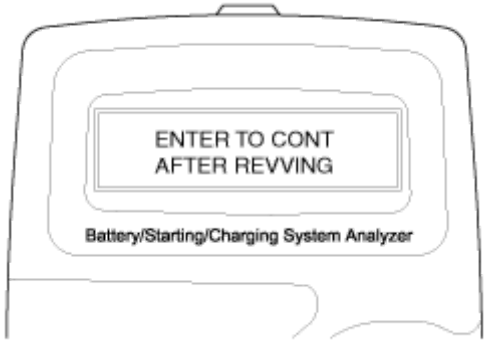




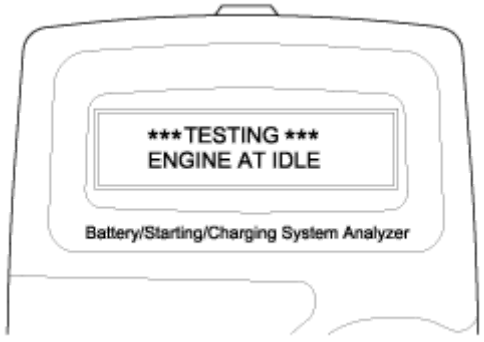
13. The message that engine RPM is detected will be displayed on the screen. Press ENTER to continue.

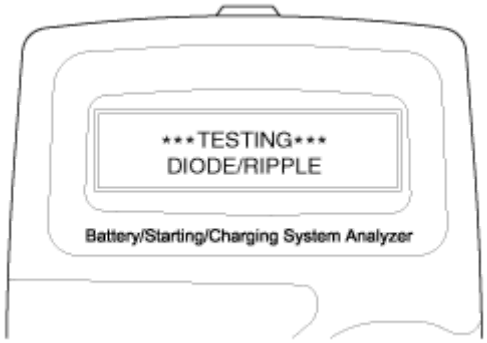


14. If the engine RPM is not detected, press ENTER after revving engine.

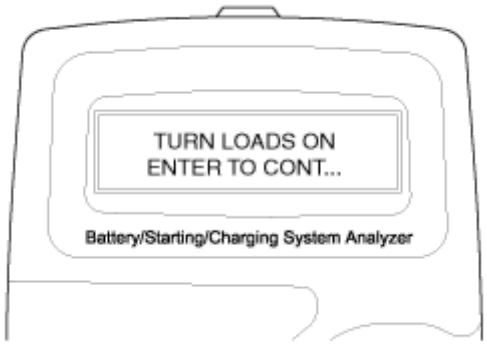


15. The tester will conduct charging system test during loads off.

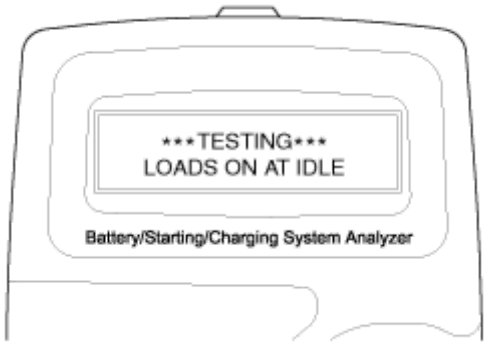




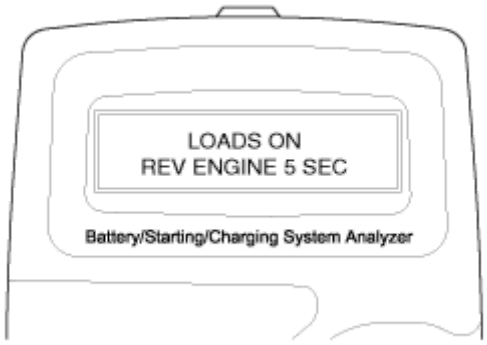
16. Turn on electrical loads (air conditioner, lamps, audio and etc). Press ENTER to continue.

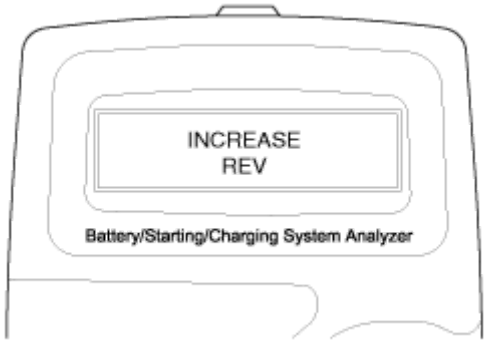


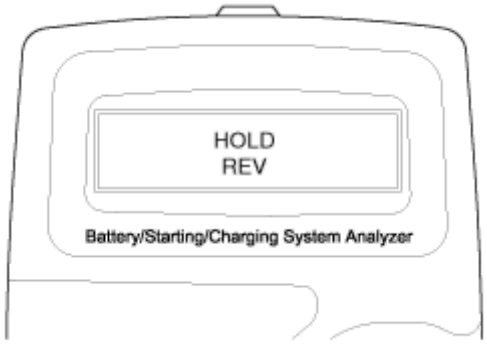
17. The tester will conduct charging system test during loads on.



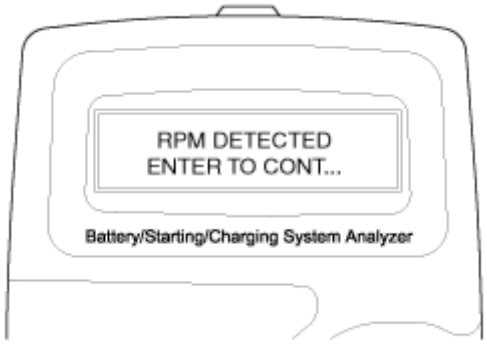
18. Rev engine for 5 seconds with pressing the accelerator pedal. (Follow the instructions on the screen)



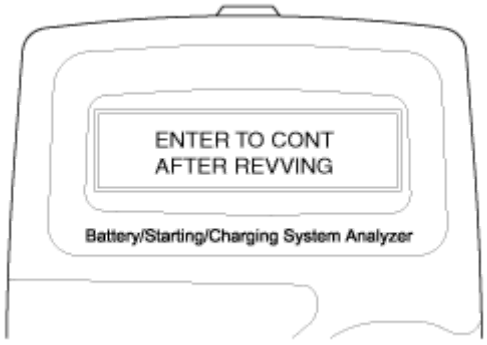




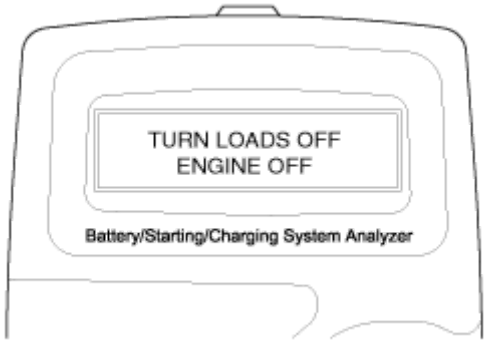
19. The message that engine RPM is detected will be displayed on the screen. Press ENTER to continue.



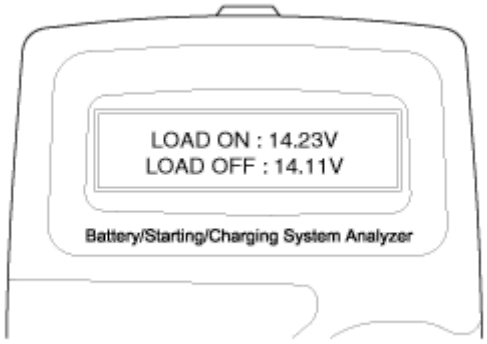
20. If the engine RPM is not detected, press ENTER after revving engine.

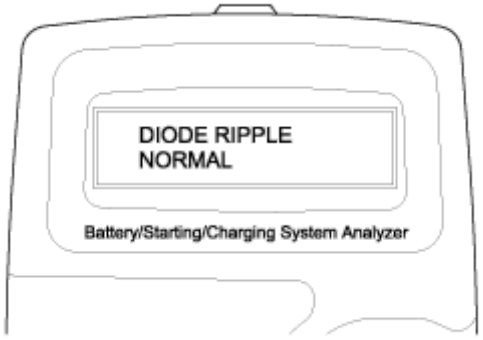


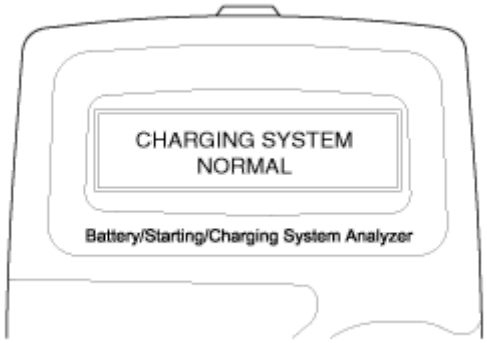
21. Turn off electrical loads (air conditioner, lamps, audio and etc). Turn the engine off.



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	Charging system is normal.

NORMAL / DIODE RIPPLE 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.

SPECIFICATION

STARTING SYSTEM

Item			Specifications
Starter	Type		PRE.engaged drive
	Rated voltage		12V, 2.0KW
	No. of pinion teeth		12
	No-load charasteristics	Voltage	11V
		Amperage	130A, MAX
		Speed	3,600rpm, MIN
	Commutator diameter	Standard	35 mm (1.378 in)
		Limit	
	Undercut depth	Standard	0.7 mm (0.028 in)
		Limit	

CHARGING SYSTEM

Item		Specifications
Alternator	Rated voltage	12V, 120A
	Speed	1,000 ~ 12,000 rpm
	Voltage regulator	I.C regulator built-in type
	Regulator setting voltage	14.4 ± 0.3V(AT 20°C full chgreged battery)
	Temperrature compensation	-10 ± 3mV/°C
Battery	Type	CMF 80AH
	Cold cranking amperage at-18°C (0°F)	720A
	Reserve capacity	160min
	Specific gravity at 20°C (77°F)	1.280 ± 0.01

NOTICE

- 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.
- REVERSE CAPACITY RATING is amount of time a battery can deliver 25A and maintain a minimum terminal voltage of 10.5V at 25.7°C(77°F)

PREHEATING SYSTEM

Item		Specifications
Glow plug	Rated voltage	DC 11V
	Current	16A ± 1.5A after 4 seconds loading at rated voltage

English ▼

Glow plug relay	Rated voltage	DC 12V
	Operating voltage range	DC 9V ~ DC 16V
	Operating temperature range	-40°C ~ 120°C
	Rated load current	DC 12V, 70A

TIGHTENING TORQUE

Items	Nm	kgf.m	lb·ft
Generator terminal (B+)	10.8 ~ 14.7	1.1 ~ 1.5	8.0 ~ 10.8
Generator mounting bolts	38.2 ~ 58.8	3.9 ~ 6.0	28.2 ~ 43.4
Starter motor terminal (B+)	9.8 ~ 11.8	1.0 ~ 1.2	7.2 ~ 8.7
Stater moter mounting bolts	58.8 ~ 53.9	4.3 ~ 5.5	31.1 ~ 39.8
Battery terminal	0.4 ~ 5.9	0.4 ~ 0.6	2.9 ~ 4.3
Glow plug	9.8 ~ 13.7	1.0 ~ 1.4	7.2 ~ 10.1
Glow plug plate attaching nut	0.8 ~ 0.15	0.08 ~ 0.15	0.6 ~ 1.1

TROUBLESHOOTING

CHARGING SYSTEM

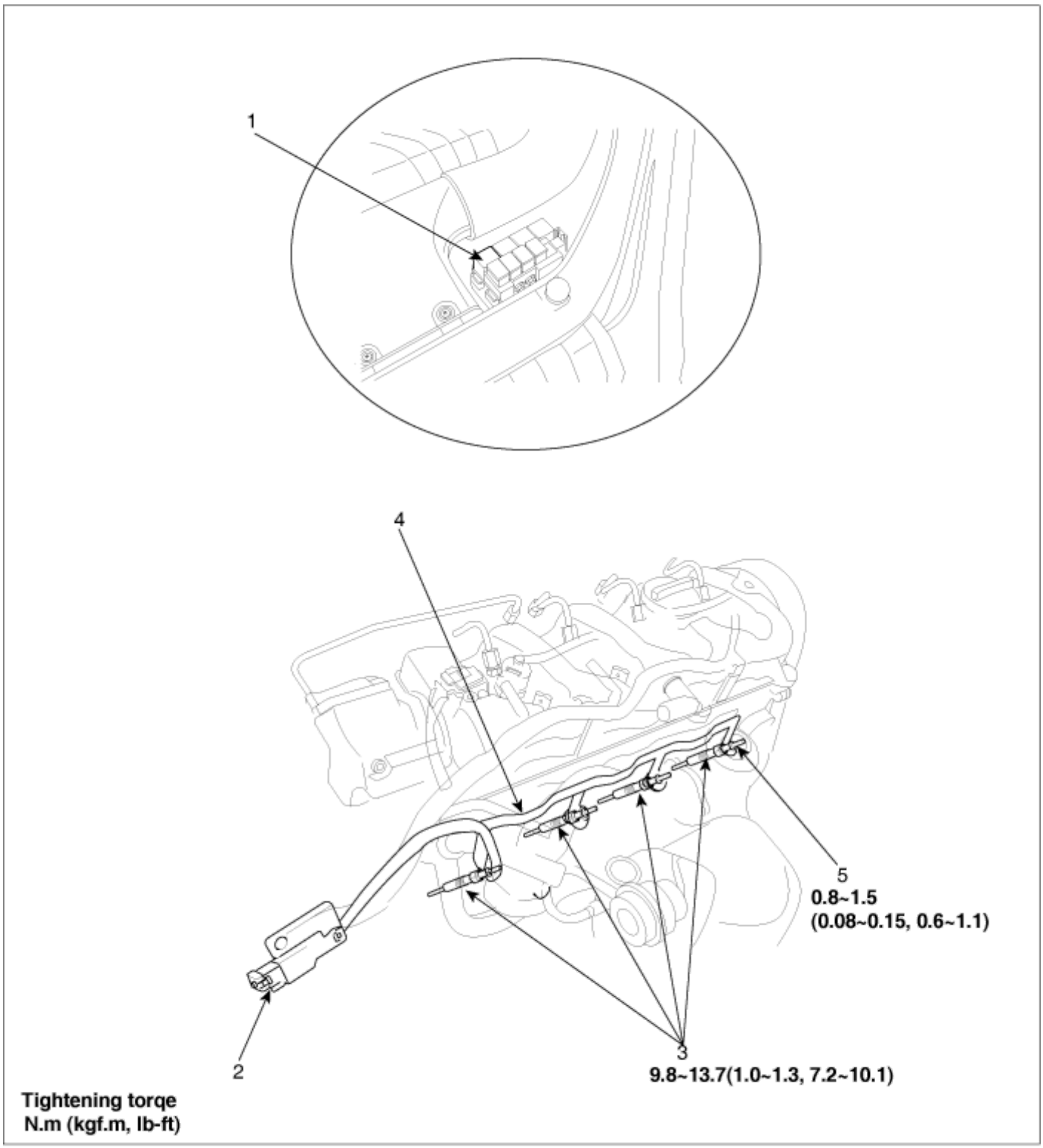
Symptom	Suspect Area	Remedy
Charging warning indicator does not light with ignition switch "ON" and engine off	Fuse blown Light burned out Wiring connection loose Electronic voltage regulator	Check fuses Replace light Tighten loose connections Replace voltage regulator
Charging warning indicator does not go out with engine running (Battery requires frequent recharging)	Drive belt loose or worn Battery cables loose, corroded or worn Fuse blown Fusible link blown Electronic voltage regulator or generator Wiring	Adjust tension or replace drive belt Repair or replace cavles Check fuses Replace fusible link Test generator Repair wiring
Engine hesitates/poor acceleration Overcharge	Drive belt loose or worn Wiring connection loose or open circuit Fusible link blown Poor grounding Electronic voltage regulator or generator Worn battery Electronic voltage regulator Voltage sensing wire	Adjust tension or replace drive belt Tighten loose connection or repair wiring Replace fusible link Repair Test generator, if faulty, repair or replace Replace battery Replace voltage regulator Repair wire

STARTING SYSTEM

Symptom	Suspect Area	Remedy
Engine will not crank	Battery charge low Battery cables loose, corroded or worn out Transaxle range switch (Vehicle with automatic transaxle only) Fusible link blown Starter motor faulty Ignition switch faulty	Charge or replace battery Repair or replace cables Adjust or replace switch Replace fusible link Repair starter motor Inspect
Engine cranks slowly	Battery charge low Battery cables loose, corroded or worn out Starter motor	Charge or replace battery Repair or replace cables Repair starter motor
Starter keeps running	Starter motor Ignition switch	Repair starter motor Inspect
Starter spins but engine will not crank	Short in wiring Pinion gear teeth broken or starter motor Ring gear teeth broken	Repair wiring Repair starter motor Replace flywheel ring gear or torque converter

English

COMPONENT LOCATION



1. Glow relay
2. Glow plug connector
3. Glow plug
4. Plate
5. Washer nuts

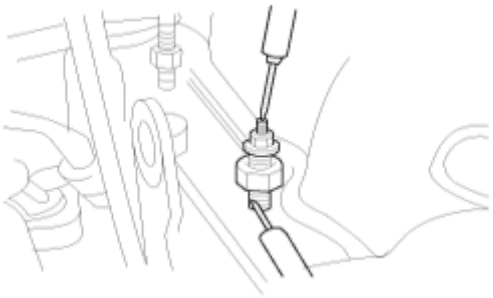
INSPECT PREHEATING SYSTEM

Conditions before inspection :
Battery voltage : 12V

1. Connect voltmeter between glow plug plate and plug body (ground).
2. Check indicated value on voltmeter with ignition switch ON.
3. Check that preheat indication lamp lights for about 6 seconds and indicates battery voltage (about 9V or over) for about 36 seconds immediately afterignitionswitch is turned on. [At cooling water temperature 20°C (68°F)]

> **NOTICE**
>
> Continuity time varies depending upon cooling water temperature.

4. After checking 3, set ignition switch at START position.
5. The system is normal if battery voltage (about 9V or over) is generatedforabout 6 seconds during engine cranking and after start operation. [at coolingwater temperature 20°C (68°F)]
6. When the voltage or continuity time is not normal, check the terminal voltage in glow control unit, and single parts.



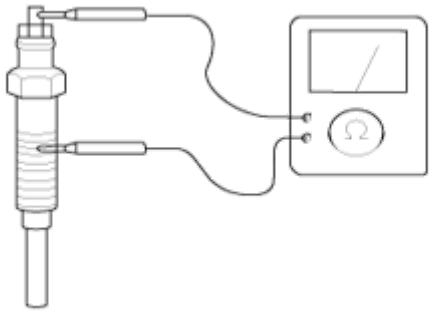
INSPECT GLOW PLUS

1. Check the continuity between the terminal and body as illustrated. Replaceif discontinuity or with large resistance.
   Standard value : 0.25Ω

> **⚠ CAUTION**
>
> Remove oil from plug before measuring as glow plug resistance is verysmall.

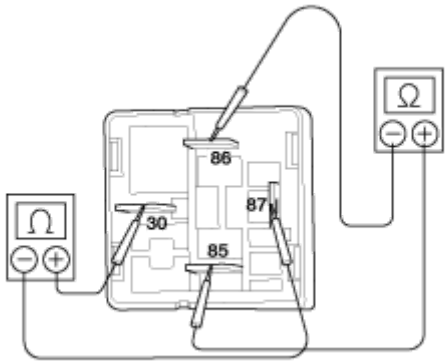
2. Check for rust on glow plug plate.
3. Check glow plug for damage.

English ▼

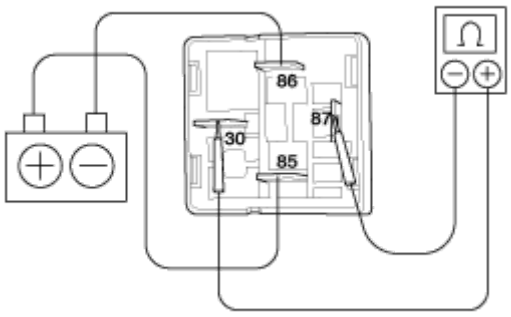


INSPECT GLOW PLUG RELAY

1. Remove the glow plug relay.
2. Inspect the relay continuity.
   - Using an ohmmeter, check that there is continuity between terminals 85 and 86.
     If there is no continuity, replace the relay.
   - Check that there is no continuity between terminals 30 and 87.
     If there is continuity, replace the relay.



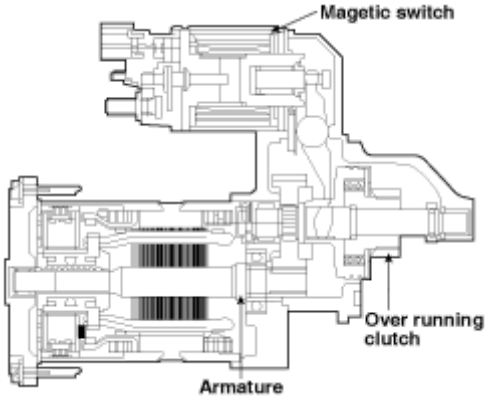
3. Inspect the relay operation.
   - Apply battery positive voltage across terminals 85 and 86.
   - Using an ohmmeter, check that there is continuity between terminals 87 and 30.
     If there is no continuity, replace the relay.



4. Install the glow plug relay.

DESCRIPTION

The starting system includes the battery, starter motor, 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.

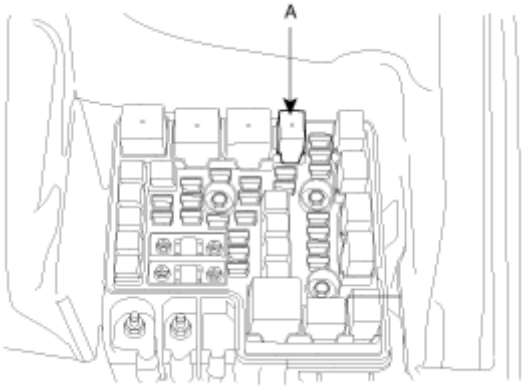


INSPECTION

STARTER CIRCUIT

The battery must be in good condition and fully charged.

1. Remove the fuel pump relay(A) from the fuse box.

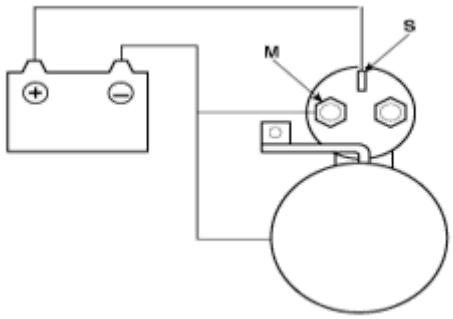


2. With the shift lever in N or P (A/T) or clutch pedal pressed (M/T), turn the ignition switch to "START"
   If the starter normally cranks the engine, starting system is OK.
   If the starter will not crank the engine at all, go to next step.
   If it won't disengage from the ring gear when you release key, check for the following until you find the cause.
   - Solenoid plunger and switch malfunction.
   - 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.
   - 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.
   - Check the ignition switch (Refer to BE group - ignition system)
   - Check the transaxle range switch connector or ignition lock switch connector.
   - Inspect the starter relay.

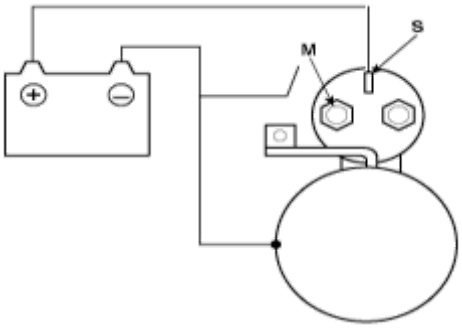
STARTER SOLENOID TEST

1. Disconnect the wires from the Sterminal and the M terminal.
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.

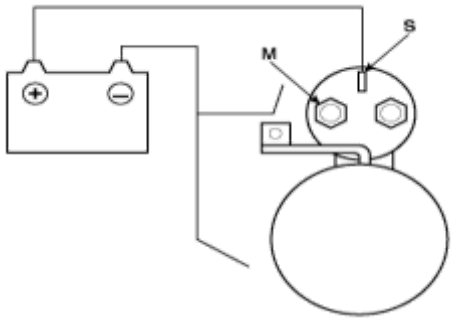
English ▼



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.

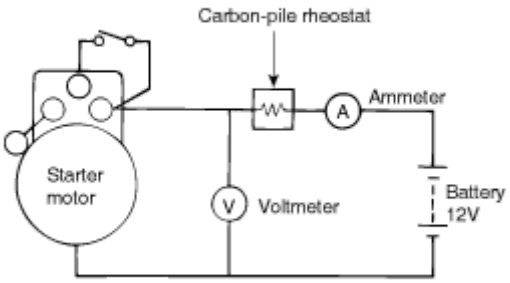


4. Disconnect the battery also from the body. If the pinion retracts immediately, it is working properly.
   To avoid damaging the starter, do not leave the battery connected for more than 10 seconds.



FREE RUNNING TEST

1. Place the starter motor in a vise equipped with soft jaws and connecta fully-charged 12-volt battery to starter motor as follows :
2. Connect a test ammeter (100-ampere scale) and carbon pile rheostatas shown is 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 11 volts.
7. Confirm that the maximum amperage is within the specifications and that the starter motor turns smoothly and freely :
   : Max. 130 Amps
   : Min. 3,600 rpm

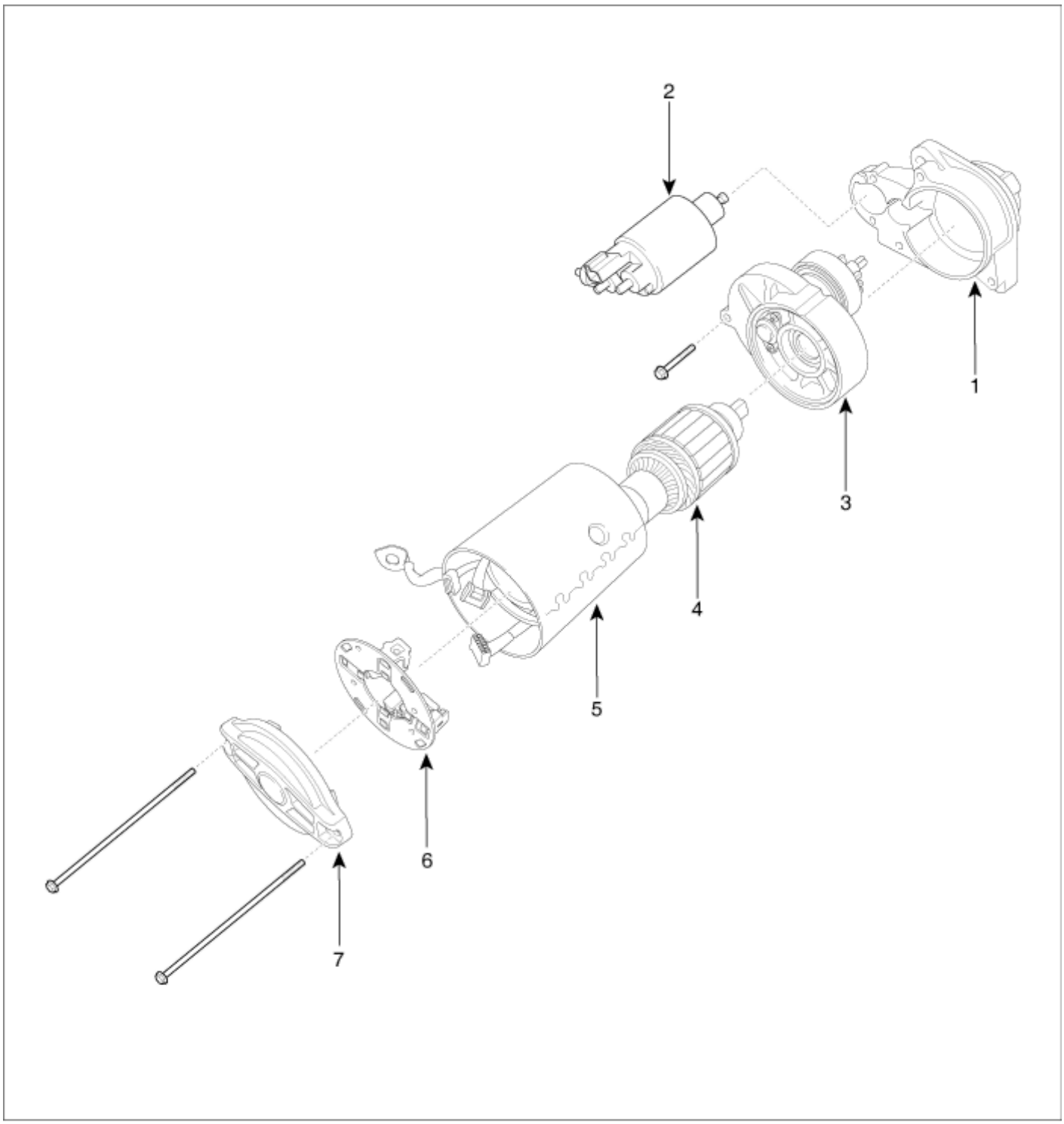


CLEANING

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.

English ▼

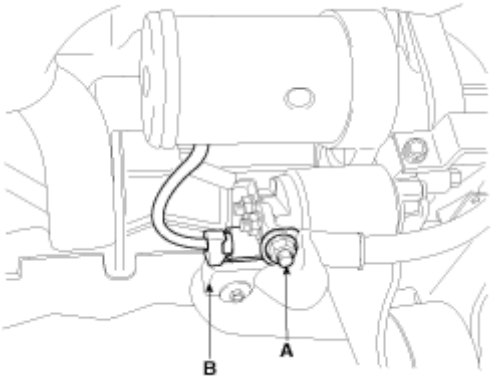
COMPONENTS



1. Front bracket
2. Magnetic switch
3. Housing
4. Armature
5. Yoke assembly
6. Brush holder
7. Rear cover

REMOVAL

1. Disconnect the battery negative cable.
2. Disconnect the starter cable(A) from the B terminal on the solenoid, then disconnect the connector(B) from the S terminal.

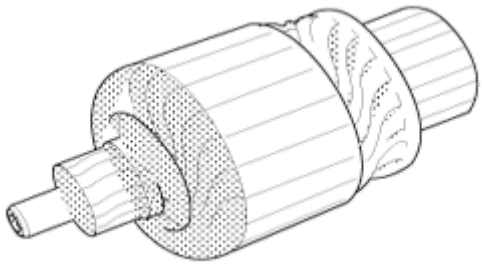


3. Remove the 2 bolts holding the starter, then remove the starter.
   Tightening torpue
   42.2~53.9 N.m (4.3~5.5 kgf.m, 31.1~39.8 Ib-ft)
4. Installation is the reverse of removal.
5. Connect the battery positive cable and negative cable to the battery.

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.

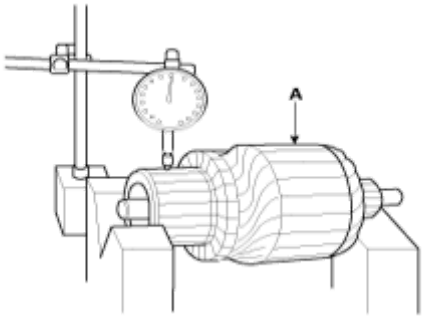


4. Measure the commutator (A) runout.
   - If the commutator runout is within the service limit, check the commutator for carbon dust or brass chips between the segments.
   - If the commutator runout is not within the service limit, replace the armature.

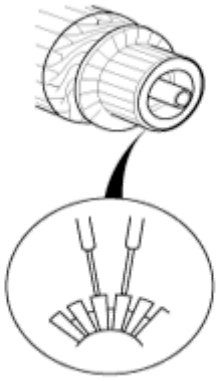
   Commutator Runout
   Standard (New) : 0.02mm (0.001 in.) max.

Service limit : 0.05mm (0.002 in.)

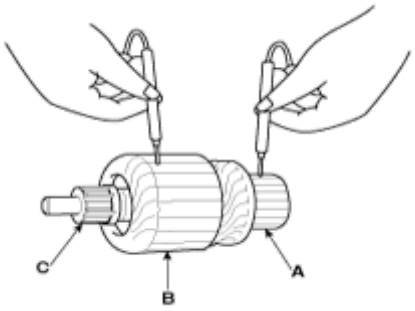
English ▼



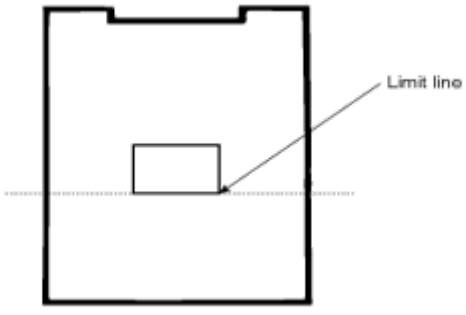
5. Check for continuity between the segments of the commutator. If an open circuit exists between any segments, replace the armature.



6. 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

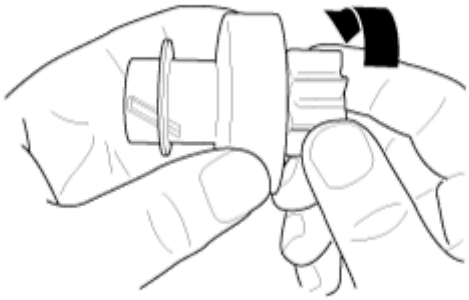


STARTER BRUSH HOLDER TEST



INSPECT OVERRUNNING CLUTCH

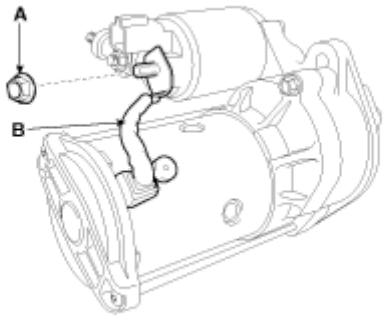
1. Slide the overrunning clutch along the shaft.
   Replace it if does not slide smoothly.
2. Rotate the overrunning clutch (A) both ways.
   Does it lock in one direction and rotate smoothly in reverse? If it does not lock in either direction or it locks in both directions, replace it.



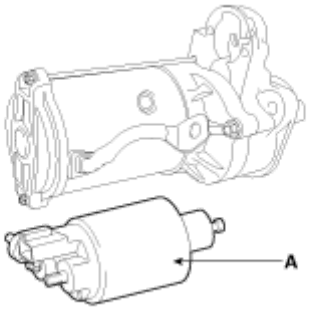
3. If the starter driver gear (B) is worn or damaged, replace the overrunning clutch assembly: the gear is not available separately.
   Check the condition of the flywheel or torque converter ring gear if the starter drive gear teeth are damaged.

DISASSEMBLY

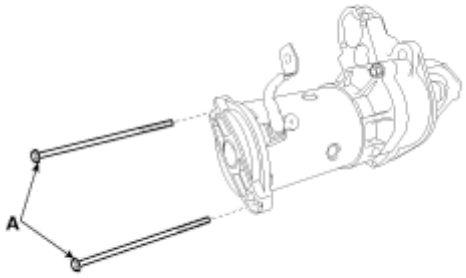
1) Remove the nut(A) and disconnect the lead wire(B) from the magnetic switch terminal(C).



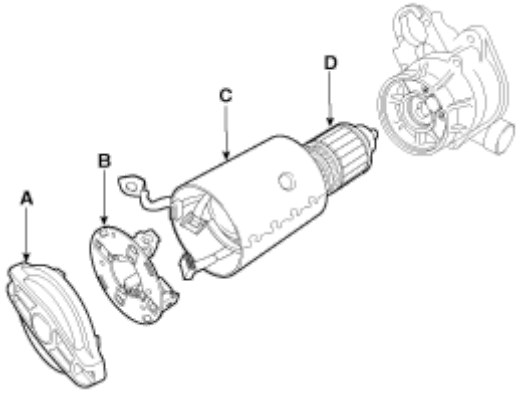
2) Remove the 2 bolts(A) and pull out the yoke assembly(B) with the armature(C) from the front bracket(D).



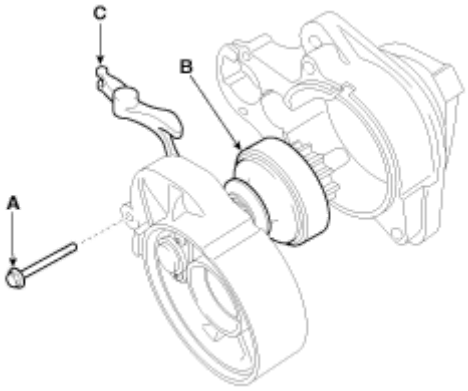
3) Remove the through bolts (A).



4) Remove the rear bracket (A) and brush holder assembly (B).
5) Remove the yoke (C) and armature (D).



6) Remove the mounting bolt (A) and the overrunning clutch (B), lever (C).



7) Reassembly is the reverse of disassembly.

SPECIFICATIONS

Description	Specification 2.0(D4EA)	Limit
General		
Type	In-line, Single Overhead Camshaft	
Number of cylinders	4	
Bore	83mm (3.27in.)	
Stroke	92mm (3.62in.)	
Total displacement	1991cc (121.5cu.in.)	
Compression ratio	17.3 : 1	
Firing order	1 - 3 - 4 - 2	
Valve timing		
Intake valve		
Opens (BTDC)	7°	
Closes (ABDC)	35°	
Exhaust valve		
Opens (BBDC)	52°	
Closes (ATDC)	6°	
Cylinder head		
Faltness of gasket surface	0.03mm (0.0012in.) for width	
	0.09mm (0.0035in.) for length	
	0.012mm. (0.00047in.) / 51×51mm	
Camshaft		
Cam height		
Intake	34.697mm (1.366in.)	34.197mm (1.346in.)
Exhaust	34.570mm (1.361in.)	34.070mm (1.341in.)
Journal O.D	28mm (1.10in.)	
Bearing oil clearance	0.040 ~ 0.074mm (0.0020 ~ 0.0029in.)	
End play	0.05 ~ 0.15mm (0.002 ~ 0.006in.)	
Valve		
Valve length		
Intake	95.7mm (3.77in.)	
Exhaust	95.4mm (3.76in.)	
Stem O.D.		
Intake	5.953mm (0.234in.)	
Exhaust	5.925mm (0.233in.)	
Face angle	45.5°	
Thickness of valve head (margin)		

English ▼

Intake	1.6mm (0.063in.)	
Exhaust	1.3mm (0.0512in.)	
Valve stem to valve guide clearance		
Intake	0.022 ~ 0.067mm (0.00086 ~ 0.00263in.)	0.1mm (0.0039in.)
Exhaust	0.050 ~ 0.095mm (0.0020 ~ 0.0037in.)	0.15mm (0.0059in.)
Valve guide		
Length		
Intake	36.5mm (1.437in.)	
Exhaust	36.5mm (1.437in.)	
Valve seat		
Width of seat contact	1.21 ~ 1.61mm (0.0477 ~ 0.6634in.) (IN/EX)	
Seat angle	44° ~ 44.5°	
Valve spring		
Free length	38.8mm (1.527in.)	
Load	21.25kg/32mm (47.2lb/1.26in.) at installed height	
Cylinder block		
Cylinder bore	83 + 0.03mm (3.27 + 0.0012in.)	
Flatness of head gasket surface	0.042mm (0.00165in.) for width 0.096mm (0.00378in.) for length 0.012mm (0.00047in.) / 50×50mm	
Piston		
O.D	82.92 ~ 82.95mm (3.26 ~ 3.27in.)	
Piston-to-cylinder clearance	0.07 ~ 0.09mm (0.0027 ~ 0.0036in.)	
Ring groove width		
No.1	1.915 ~ 1.945mm (0.075 ~ 0.076in.)	
No.2	2.06 ~ 2.08mm (0.08 ~ 0.082in.)	
Oil	3.02 ~ 3.04mm (0.119 ~ 0.1196in.)	
Service size	0.25mm (0.010in.), 0.5mm (0.020in.) oversize	
Piston ring		
Side clearance		
No.1	0.064 ~ 0.114mm (0.00252 ~ 0.00449in.)	
No.2	0.065 ~ 0.11mm (0.00256 ~ 0.00433in.)	
Oil ring	0.03 ~ 0.07mm (0.00118 ~ 0.00275in.)	
End gap		
No.1	0.2 ~ 0.35mm (0.008 ~ 0.014in.)	
No.2	0.40 ~ 0.50mm (0.016 ~ 0.024in.)	
Oil ring side rail	0.2 ~ 0.45mm (0.0079 ~ 0.0177in.)	
Connecting rod		
Connecting rod pin O.D	28.022 ~ 28.034mm (1.103 ~ 1.104in.)	

Connecting rod bearing oil clearance		0.024 ~ 0.042mm (0.0009 ~ 0.0016in.)	
Crankshaft main bearing oil clearance		0.024 ~ 0.042mm (0.0009 ~ 0.0016in.)	
Crankshaft			
Journal O.D.		60.002 ~ 60.020mm (2.362 ~ 2.363in.)	
Pin O.D.		50.008 ~ 50.026mm (1.9688 ~ 1.9695in.)	
Out-of-round of journal and pin		Less than 0.0035mm (0.0001in.)	
Taper of journal and pin		Less than 0.006mm (0.0002in.)	
End play		0.09 ~ 0.32mm (0.0035 ~ 0.0126in.)	
Flywheel			
Runout		0.45mm/Ø200	0.45mm (0.0170in.)
Engine oil			
Oil quantity	Total	7.4 L (7.81 US qt, 6.51 Imp qt)	When replacing a short engine or a block assembly
	Oil pan	6.2 L (6.55 US qt, 5.45 Imp qt)	
	Drain and refill	6.7 L (7.07 US qt, 5.89 Imp qt)	Including oil filter
Oil grade	Classification	ACEA C3 (with CPF) ACEA B4 (without CPF)	
	SAE viscosity grade	Recommended SAE viscosity number	Refer to the "Lubrication System"
Oil pressure (at idle)		78.45kPa (0.8kg/cm², 11.38psi) or above	Oil temperature in oil pan : 80°C (176°F)
Oil pump			
Oil pump performance [Oil temperature is 95 ~ 105°C (203 ~ 221°F, SAE 10W -30)]&Eng rpm 1500		More than 25ℓ/min (0.01471ft³/s) 4.0kgf/cm²(8192lbf/ft²)	
Tip clearance		0.28 ~ 0.36mm (0.01102 ~ 0.01417in.)	
Radial clearance		0.13 ~ 0.23mm (0.0051 ~ 0.009in.)	
Side clearance		0.02 ~ 0.07mm (0.00078 ~ 0.0027in.)	
Relief spring			
Freen length		47.5mm (1.835in.)	
Opening pressure		570 ± 50kPa (82.67 ± 7.25psi)	
Silent shaft			
Front journal diameter		27.99 ~ 28.01mm (1.102 ~ 1.1027in.)	
Rear journal diameter		41.99 ~ 42.01mm (1.6531 ~ 1.6539in.)	
Oil clearacne			
Front		0.050 ~ 0.09mm (0.0020 ~ 0.0036in.)	
Rear		0.050 ~ 0.091mm (0.0020 ~ 0.0036in.)	
Cooling method			
Cooling system quantity (Radiator)		Forced circulation with electrical fan 7.3L (7.7U.S.qts, 6.42 Imp.qts)	
Thermostat			
Type		Wax pellet type with jiggle valve	
Normal opening temperature		85°C (185°F)	

Opening temperature range	83.5 ~ 86.5°C (182 ~ 188°F)	
Full opening temperature	100°C (212°F)	
Radiator cap	107.9 ± 14.7kPa (1.1±0.15kg/cm², 15.64±2.13psi)	
Main valve openg pressure		
Main valve closing pressure	83.4kPa (0.85kg/cm², 12.1psi)	
Vacuum valve openting pressure	-6.86kPa (-0.07kg/cm², -1.00psi)	
Air cleaner		
Type	Dry type	
Element	Unwoven cloth type	
Exhaust		
Muffler	Expansion resonance type	
Suspension system	Rubber hangers	
Coolant tempreature sensor		
Type	Thermister type	
Resistance		
20°C (68°F)	2.45 ± 0.14kΩ	
80°C (176°F)	0.3222kΩ	

SERVICE STANDARDS

Standard value	
Coolant concentration	
Tropical area	40%
Other area	50%

LUBRICANT

Engine oil	ACEA : C3(CPF EQUIPPED VEHICLE ACEA : B4 or API CH-4 ABOVE(NON CPF VEHICLE)	SAE 15W-40 (ABOVE -15°C)
		SAE 10W-30 (-20°C ~ 40°C)
		SAE 5W-30 (-25°C ~ 40°C)
		SAE 0W-30 (BELOW 10°C)*1 *2

*1. Restricted to driving condition and area

*2. Not recommeded for sustained high speed

SEALANT

Engine coolant temperature sensor	3M No.1324 or equivalant
Oil pressure switch	3M ATD No. 8660 or Three bond TB 2403
Bed plate	OMNI FIT FD20, DREIBOND 5105 or HYLOMAR 3000

NOTICE

O.D. = Outer Diameter
I.D. = Inner Diameter

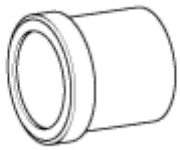
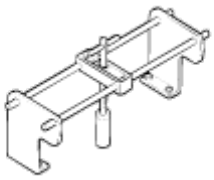
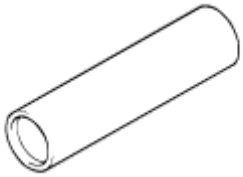
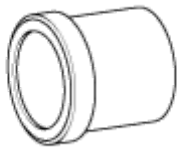
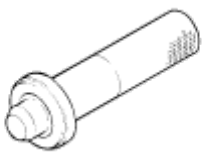
O.S. = Oversize Diameter
U.S. = Undersize Diameter

TIGHTENING TORQUE

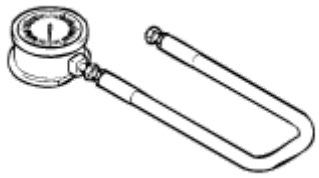
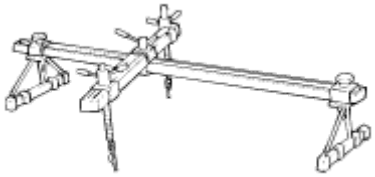
Items	N.m	kgf.m	lbf.ft
Engine system			
High fuel pipe(reil↔pump) mounting nut	24.5 ~ 28.4	2.5 ~ 2.9	18.1 ~ 21.0
Drive plate	68.6 ~ 78.5	7.0 ~ 8.0	50.6 ~ 57.9
Damper pulley mounting bolt	29.4 ~ 33.3	3.0 ~ 3.4	21.7 ~ 24.6
Real roll stopper bracket sub frame bolt	49.0 ~ 63.7	5.0 ~ 6.5	36.2 ~ 47.0
Real roll mounting insulator bolts	49.0 ~ 63.7	5.0 ~ 6.5	36.2 ~ 47.0
Relief plug	41.2 ~ 51.0	4.2 ~ 5.2	30.4 ~ 37.6
Balance shaft assembly mounting bolt	52.0 ~ 55.9	5.3 ~ 5.7	38.3 ~ 41.2
Engine support bracket bolt	42.2 ~ 53.9	4.3 ~ 5.5	31.1 ~ 39.8
Starter motor mounting bolt	47.1 ~ 51.0	4.8 ~ 5.2	34.7 ~ 37.6
Cylinder head bolt	49.0 + 120° + 90°	5.0 + 120° + 90°	36.2 + 120° + 90°
Cylinder head cover mounting bolt(10mm)	7.8 ~ 9.8	0.8 ~ 1.0	5.8 ~ 7.2
Cylinder head cover mounting bolt(12mm)	21.6 ~ 25.5	2.2 ~ 2.6	15.9 ~ 18.8
Air cleaner mounting bolt	7.8 ~ 9.8	0.8 ~ 1.0	5.8 ~ 7.2
Air cleaner intake hose clamp	2.9 ~ 4.9	0.3 ~ 0.5	2.2 ~ 3.6
Engine mounting bracket bolt & nut	63.7 ~ 83.4	6.5 ~ 8.5	47.0 ~ 61.5
Injector holder bolt	7.8 ~ 10.8	0.8 ~ 1.1	5.8 ~ 8.0
A/T mounting bracket bolt	49.0 ~ 63.7	5.0 ~ 6.5	36.2 ~ 47.0
A/T insulator bolt	49.0 ~ 63.7	5.0 ~ 6.5	36.2 ~ 47.0
Camshaft bearing cap bolt	26.5 ~ 29.4	2.7 ~ 3.0	19.5 ~ 21.7
Camshaft sprocket mounting bolt	122.6 ~ 140.2	12.5 ~ 14.3	90.4 ~ 103.4
Connecting rod cap bolt	24.5 + 90°	2.5 + 90°	18.1 + 90°
Crankshaft bed plate bolt(15mm)	(27.5~31.4) + 120°	(2.8~3.2) + 120°	(20.3~23.1) + 120°
Crankshaft bed plate bolt(12mm)	33.3 ~ 37.3	3.4 ~ 3.8	24.6 ~ 27.5
Crankshaft pulley bolt	196.1 ~ 205.9	20.0 ~ 21.0	144.7 ~ 151.9
Crankshaft position mounting bolt	3.9 ~ 5.9	0.4 ~ 0.6	2.9 ~ 4.3
Front roll stopper bracket sub frame mounting bolt	49.0 ~ 63.7	5.0 ~ 6.5	36.2 ~ 47.0
Front roll stopper insulator bolt	49.0 ~ 63.7	5.0 ~ 6.5	36.2 ~ 47.0
Fly wheel	68.6 ~ 78.5	7.0 ~ 8.0	50.6 ~ 57.5
Timing system			
Timing auto tensioner bolt	49.0 ~ 53.9	5.0 ~ 5.5	36.2 ~ 39.8
Upper cover mounting bolt	7.8 ~ 11.8	0.8 ~ 1.2	5.8 ~ 8.7
Rear cover mounting bolt	7.8 ~ 11.8	0.8 ~ 1.2	5.8 ~ 8.7
Idler mounting bolt	44.1 ~ 48.1	4.5 ~ 4.9	32.5 ~ 35.4
Auto tensiner adjustable bolt	9.8 ~ 11.8	1.0 ~ 1.2	7.2 ~ 8.7
Lower cover mounting bolt	7.8 ~ 11.8	0.8 ~ 1.2	5.8 ~ 8.7

Lubrication system			
Oil lever gage mounting bolt	9.8 ~ 11.8	1.0 ~ 1.2	7.2 ~ 8.7
Oil screen mounting bolt	9.8 ~ 11.8	1.0 ~ 1.2	7.2 ~ 8.7
Oil jet mounting bolt	8.8 ~ 12.7	0.9 ~ 1.3	6.5 ~ 9.4
Oil pan drain plug	34.3 ~ 44.1	3.5 ~ 4.5	25.3 ~ 32.5
Oil pan bolt	9.8 ~ 7.8	1.0 ~ 1.2	7.2 ~ 8.7
Oil pump mounting bolt	19.6 ~ 26.5	2.0 ~ 2.7	14.5 ~ 19.5
Oil pump cover bolt	7.8 ~ 9.8	0.8 ~ 1.0	5.8 ~ 7.2
Oil pressure switch	14.7 ~ 21.6	1.5 ~ 2.2	10.8 ~ 15.9
Oil filter	22.6 ~ 24.5	2.3 ~ 2.5	16.6 ~ 18.1
Heater & oil cooler return pipe bracket mounting bolt(10mm)	7.8 ~ 9.8	0.8 ~ 1.0	5.8 ~ 7.2
Heater & oil cooler return pipe bracket mounting bolt(12mm)	19.6 ~ 24.5	2.0 ~ 2.5	14.5 ~ 18.1
Cooling system			
Water pump mounting bolt(10mm)	9.8 ~ 11.8	1.0 ~ 1.2	7.2 ~ 8.7
Water pump mounting bolt(14mm)	47.1 ~ 51.0	4.8 ~ 5.2	34.7 ~ 37.6
Radiator drain plug	7.8 ~ 15.7	0.8 ~ 1.6	5.8 ~ 11.6
Radiator shroud mounting bolt	8.8 ~ 10.8	0.9 ~ 1.1	6.5 ~ 8.0
Radiator upper bracket mounting bolt	8.8 ~ 10.8	0.9 ~ 1.1	6.5 ~ 8.0
Engine water coolant temperature sensor	19.6 ~ 23.5	2.0 ~ 2.4	14.5 ~ 17.4
Thermostat inlet mounting bolt, nut	19.6 ~ 24.5	2.0 ~ 2.5	14.5 ~ 18.1
Intake & exhaust system			
Main muffler and center exhaust pipe nuts	39.2 ~ 58.8	4.0 ~ 6.0	28.9 ~ 43.4
Cylinder head and exhaust manifold nuts	24.5 ~ 37.3	2.5 ~ 3.8	18.1 ~ 27.5
Catalytic convert and center exhaust pipe nuts	29.4 ~ 39.2	3.0 ~ 4.0	21.7 ~ 28.9
Turbo charger support bolt	34.3 ~ 44.1	3.5 ~ 4.5	25.3 ~ 32.5
Intake manifold mounting nuts & bolt	14.7 ~ 21.6	1.5 ~ 2.2	10.8 ~ 15.9

SPEICAL TOOLS

Tool (Number and name)	Illustration	Use
Camshaft oil seal installer (09212-27100)		Installation of the camshaft oil seal
Valve spring compressor (09222-27300)		Removal and installation of intake and exhaust valves
Valve stem oil seal installer (09222-27200)		Installation of valve stem oil seals
Crankshaft rear oil seal installer (09231-27000)		Installation of the crankshaft real oil seal
Front case oil seal installer (09231-27100)		Installation of the front case oil seal
Injector oil seal installer (09351-27401)		Installation of the injector oil seal
Compression gauge & adapter (09351-27000) (09351-27500)		Checking engine compression pressure

English ▼

		
Oil filter wrench (09263-27000)		Removal and installation of oil filter For the rest area except Europe LHD
Oil filter wrench (09263-2E000)		Removal and installation of oil filter For Europe LHD
Engine support fixture and adapter (09200-38001, 09200-1C00)		Engine fixing

TROUBLESHOOTING

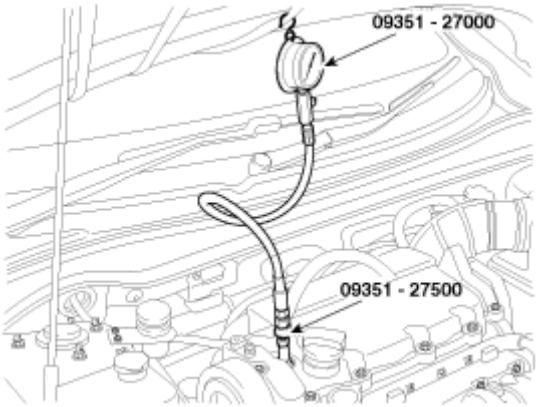
Symptom	Suspect	Remedy
Engine misfire with abnormal internal lower engine noises.	Loose or improperly installed engine flywheel.	Repair or replace the flywheel as required.
	Worn piston rings (Oil consumption may or may not cause the engine to misfire.)	Inspect the cylinder for a loss of compression. 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 buildup on the valve stem can cause the valve not to close properly.)	Repair or replace as required
	Excessive worn or mis-aligned timing belt	Replace the timing belt and sprocket as required.
	Worn camshaft lobes.	Replace the camshaft and valve lifters.
Engine misfire with coolant consumption.	• Faulty cylinder head gasket and/or cranking or other damage to the cylinder head and engine block cooling system. • Coolant consumption 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, valve 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.
	Stretched or broken timing belt and/or damaged sprocket teeth.	Replace the timing belt 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 as required.
	Stuck valves. (Carbon on the valve stem or valve seat may cause the valve to stay open.)	Inspect the vlaves and valve guides, then repair as required.

Lower engine noise, regardless of engine speed.	Low oil pressure.	Repair or replace damaged compone 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, damage or restired.	• Inspect the oil pump screen. • Repair or replace as required.
	Excessive piston-to-cylinder bore clearance.	• Inspect the piston and cylinder bore. • Repair as required.
	Excessive piston pin-to bore 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 as required. • The connecting rod bearings. • The connecting rods. • The crankshaft. • The crankshaft journal.
	Excessive crankshaft bearing clearance	Inspect the following components and repair as required. • The crankshaft bearings. • The crankshaft journals.
	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 as required. • The connecting rod bearings. • The connecting rods. • The crankshaft
	Excessive crankshaft bearing clearnace	Inspect the following components, and repair as required. • The crankshaft bearings. • The crankshaft journals. • The cylinswe block crankshaft bearing bore.
Engine will not crank-crakshaft will not rotate	Hydraulically cylinder • Coolant/antifreeze in cylinder. • Oil in cylinder.	1) Remove injectors and check for fluid. 2) Inspect for broken head gasket. 3) Inspect for cranked engine black or cylinder

	• Fuel in cylinder	head. 4) Inspect for a sticking fuel injector and/or leaking fuel regulator.
	Broken timing chain and/or timing chain gears.	1) Inspect timing chain and gears. 2) Repair as required.
	Material cylinder • Broken valve • Piston material • Foreign meterial	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 connectong rods. 2) Repair as required.
	Broken crankshaft	1) Inspect crankshaft. 2) Repair as required.

COMPRESSION PRESSURE INSPECTION

1. Check the engine oil, stater motor and the battery normal condition.
2. Warm up the engine until the normal operating temperature becoming 80~95°C(176~203°F).
3. Engine stop, remove the air cleaner assembly.
4. Remove the Electronic Control Module(ECM).
5. Remove the injector.(Refer to Injector in FLC Group).
6. While cranking the engine, remove impurity from the cylinder.
7. Install the pressure gauge(09351-27000 , 09351-27500) to the injector hall.



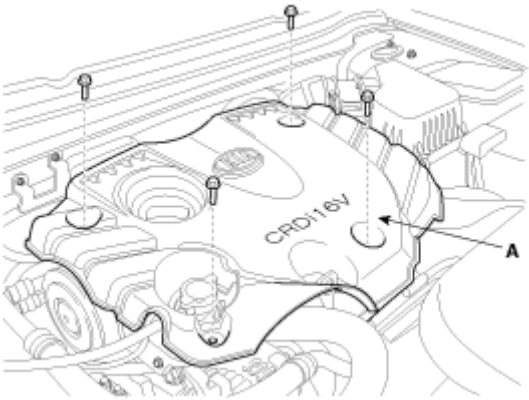
8. While cranking the engine, measure the compression pressure.
   Compression pressure
   Standard pressure :
   2,549kPa (26.0kgf/cm², 369psi) - 270rpm
   Minimum pressure :
   2,255kPa (23.0kgf/cm², 327psi)
9. Check the power balance between all cylinder are within limIt by repeating steps 7) through 8) for each cylinder.
   Limit : each cylinder pressure 294kPa (3.0kgf/cm², 42psi)
10. If the cylinder compression in 1 or more cylinders is low, pour a small amount of engine oil into the cylinderthrough the spark plug hole and repeat steps through for cylinders with low compression. Repeat steps 7) through 9) for each cylinder.
    (1) If adding oil helps the compression, it is likely that the piston rings and/or cylinder bore are worn or damaged.
    (2) If pressure stays low, a valve may be sticking or seating is improper, or there may be leakage past the gasket.
11. In case of remove the injection nozzle when measure cylinder compressed pressure replace gasket and holder with new one and tighten them Tightening torque.

REMOVAL

CAUTION

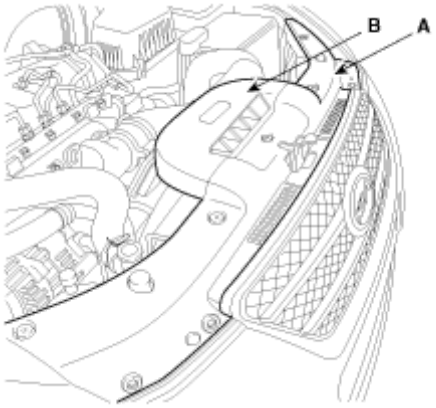
- Make sure jacks and safety stands are placed properly.
- Make sure the vehicle will not roll off stands and fall while you are working under it.
- Use fender covers to avoid damaging painted surface.
- Unplug the wiring connectors carefully while holding the connector portion to avoid damage.
- Mark all wiring and hoses to avoid misconnection.
  Also, be sure that they do not contact other wiring or hoses or interfere with other parts.

1. Remove the engine cover(A).

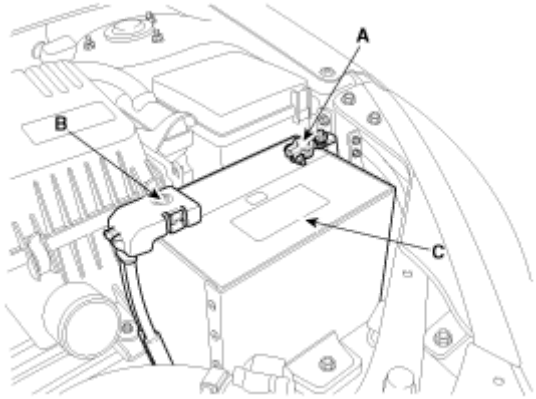


2. Remove the front bumper upper cover (A) and the air duct (B).

   Tightening torque :
   7.8 ~ 10.8N.m (0.8 ~ 1.1kgf.m, 5.8 ~ 8.0lb.ft)



3. Disconnect the battery negative terminal(A) first, then the positive terminal(B) and remove the battery(C).

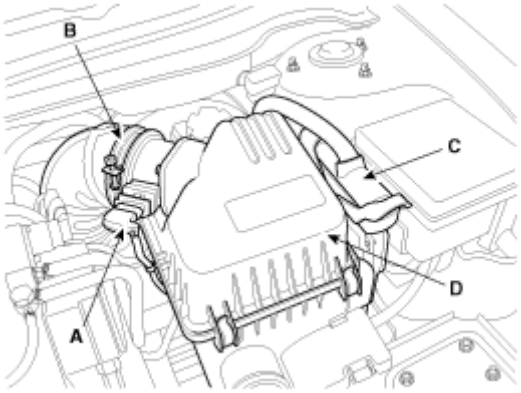


4. Remove the radiator cap to speed draining.
5. Loosen the radiator drain plug (A) and drain engine coolant.

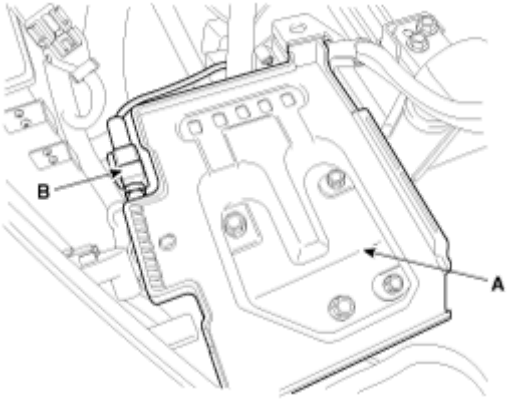


6. Remove the air cleaner.
   (1) Disconnect the air flow sensor (AFS) connect(A).
   (2) Remove the air intake hose (B).
   (3) Disconnect the electric control unit (ECU) connector (C).
   (4) Remove the air clear assembly(D).

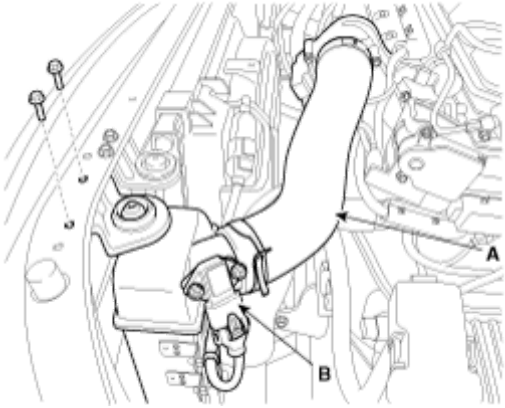
   Tightening torque :
   Hose clamp (B) : 2.9 ~ 4.9N.m (0.3~0.5kgf.m, 2.2 ~ 2.6lb.ft)
   Mounting bolt : : 7.8 ~ 10.8N.m (0.8~1.1kgf.m, 5.8 ~ 8.0lb.ft)



7. Remove the battery tray (A) and disconnect the front connector (B).



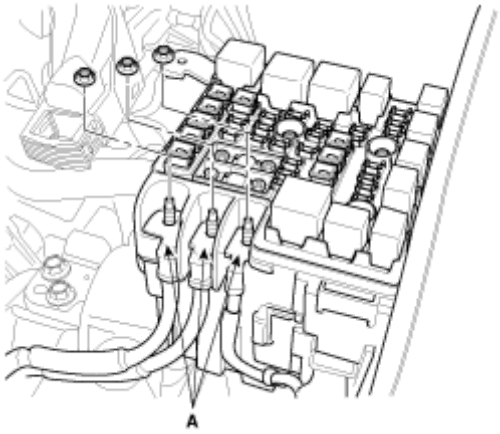
8. Remove the intercooler hose (A) and disconnect the booster pressure sensor (BPS) connector (B).



9. Remove the fuse box cover.

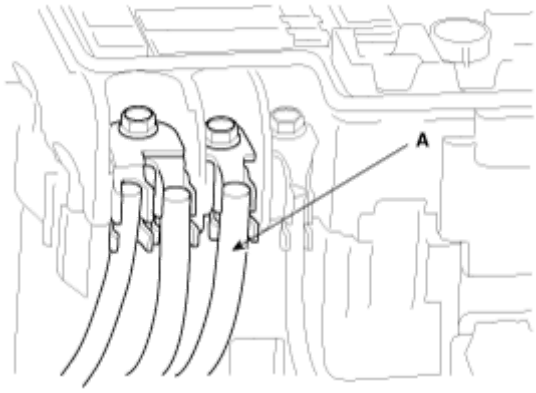
10. Disconnect the terminals(A) from the fuse box.

Tightening torque :
9.8 ~ 11.8N.m (1.0 ~ 1.2kgf.m, 7.2 ~ 8.7lb-ft)



NOTICE

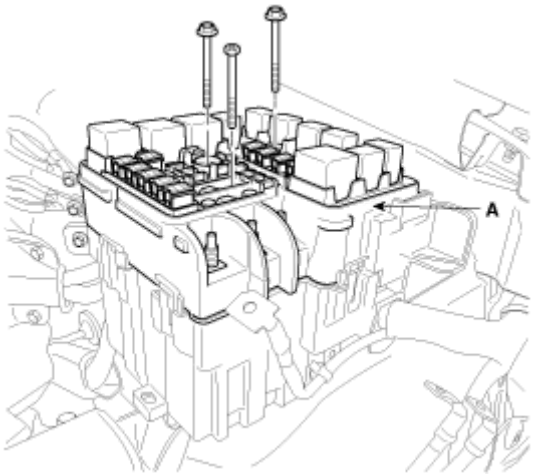
When connecting the alternator B+ cable, refer to the illustration below.



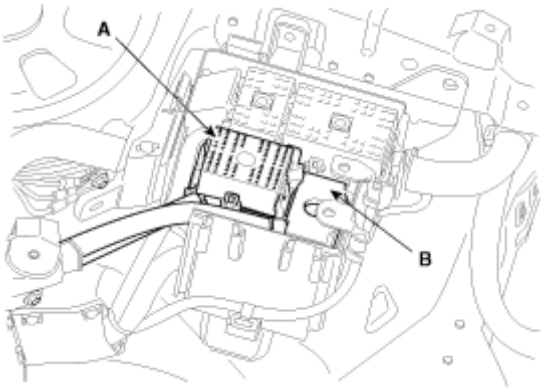
11. After removing the mounting bolts, remove the relay and fuse assembly(A).

    Tightening torque :

    9.8 ~ 11.8N.m (1.0 ~ 1.2kgf.m, 7.2 ~ 8.7lb-ft)



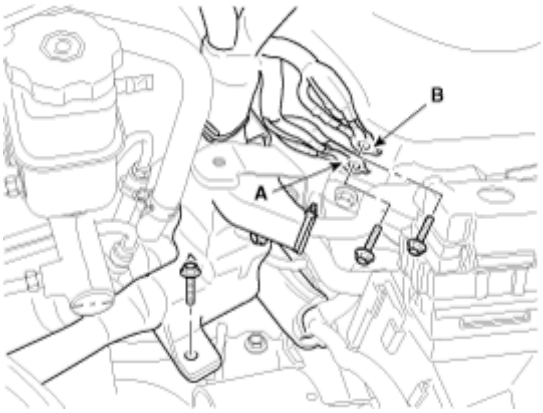
12. Remove the connector wiring(A) and the engine wiring(B).



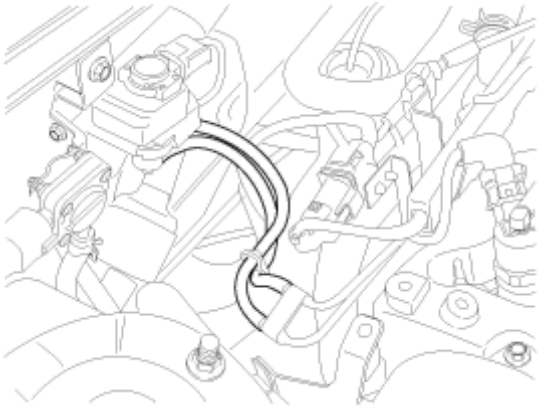
13. Remove the engine control side ground(A) and, the transaxle control side one(B).

    Tightening torque :

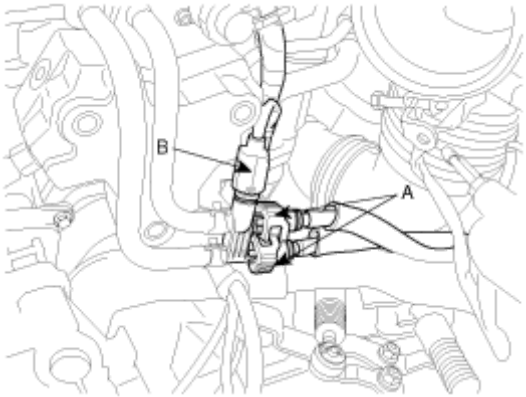
    9.8 ~ 11.8N.m (1.0 ~ 1.2kgf.m, 7.2 ~ 8.7lb-ft)



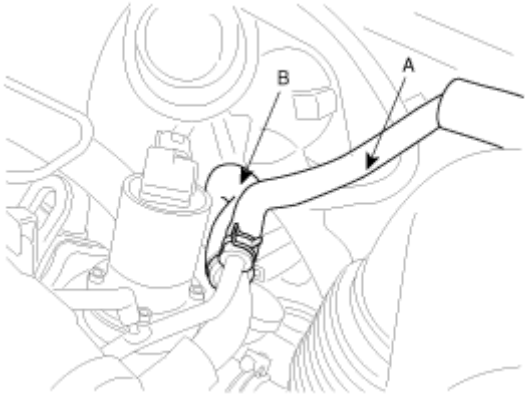
14. Remove the solenoid valve vacuum hose(A).



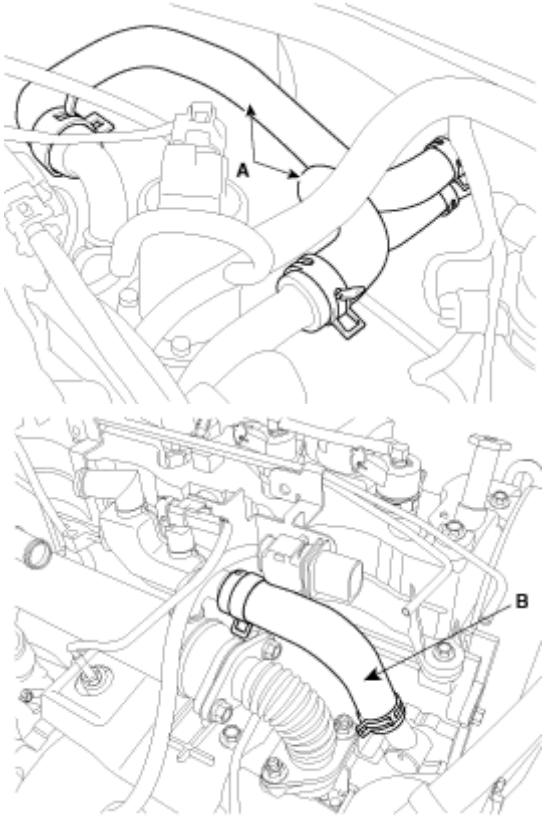
15. Disconnect the fuel hoses(A) and fuel temperature sensor connector(B).



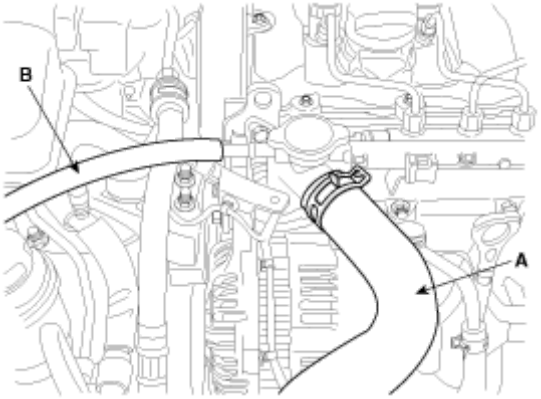
16. Disconnect the brake booster vacuum hose(A) and heater hose(B).



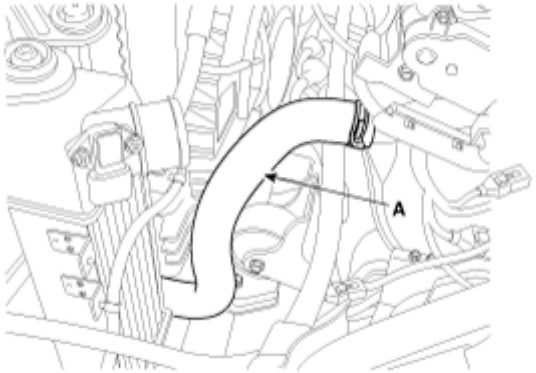
17. Remove the heater hose(A) and EGR cooler hose(B).



18. Remove the radiator upper hoses(A) and the coolant bleed hose(B).



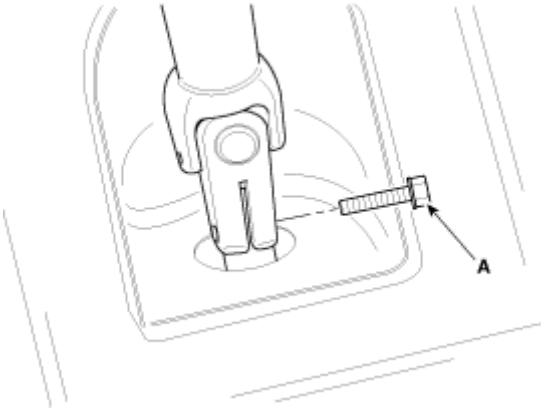
19. Remove the radiator lower hose(A).



20. Disconnect the transaxle wire harness and the control cable.
    (Refer to Transaxle control system in MTC Group).

21. Remove the high & low pressure pipe. (Refer to Air conditioner compressor in HA Group).

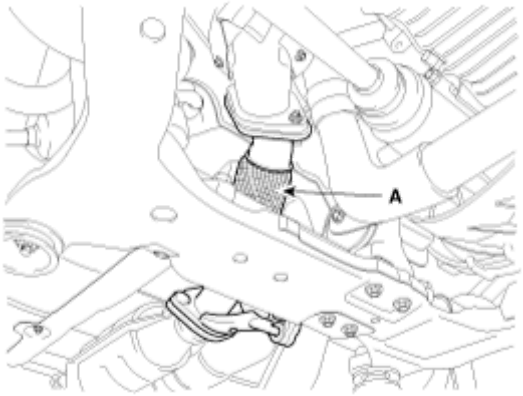
22. Remove the steering column mounting bolt(A), (Refer to Steering column in ST Group).



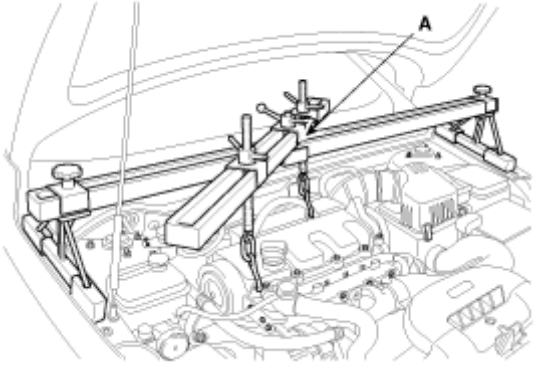
23. Remove the front wheels and tires.

24. Disconnect the stabilizer bar link and remove the mounting bolts from the lower arm and the front axles. (Refer to front suspension system in SS Group)

25. Remove the front muffle (A).

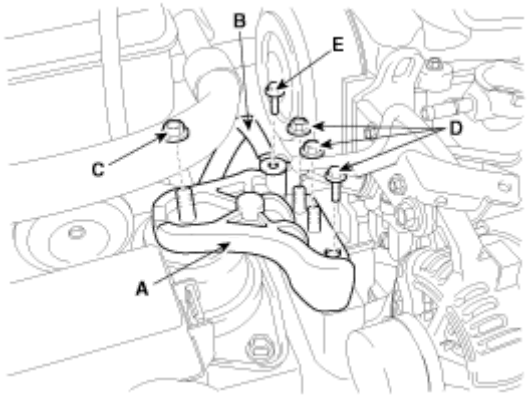


26. Install the SST (09200-38001, 09200-1C000), the engine support fixture and the adapter, on the engine and transaxle assembly.

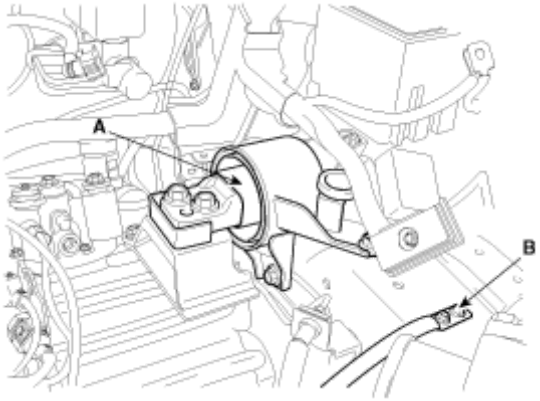


27. Remove the engine mounting bracket (A) and the ground line (B).

Tightening torque :
63.7 ~ 83.4N.m (6.5 ~ 8.5kgf.m, 47.0 ~ 61.5lb.ft)
7.8 ~ 11.8N.m (0.8 ~ 1.2kgf.m, 5.8 ~ 8.7lb.ft)

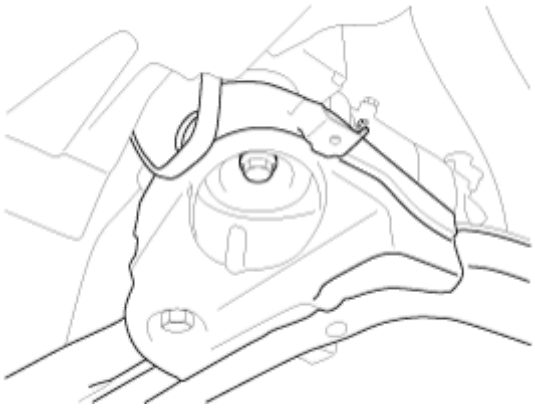


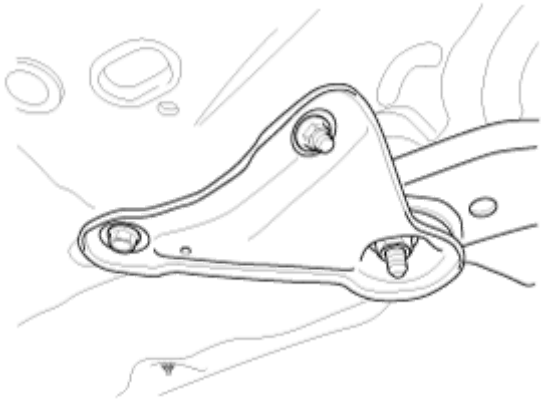
28. Remove the transaxle mounting bracket (A) and the ground line (B).



29. Remove the sub frame mounting bolts and nut.

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





30. Remove the engine and transaxle assembly by lifting vehicle.

NOTICE

When remove the engine and transaxle assembly, be careful not to damage any surrounding parts or body components.

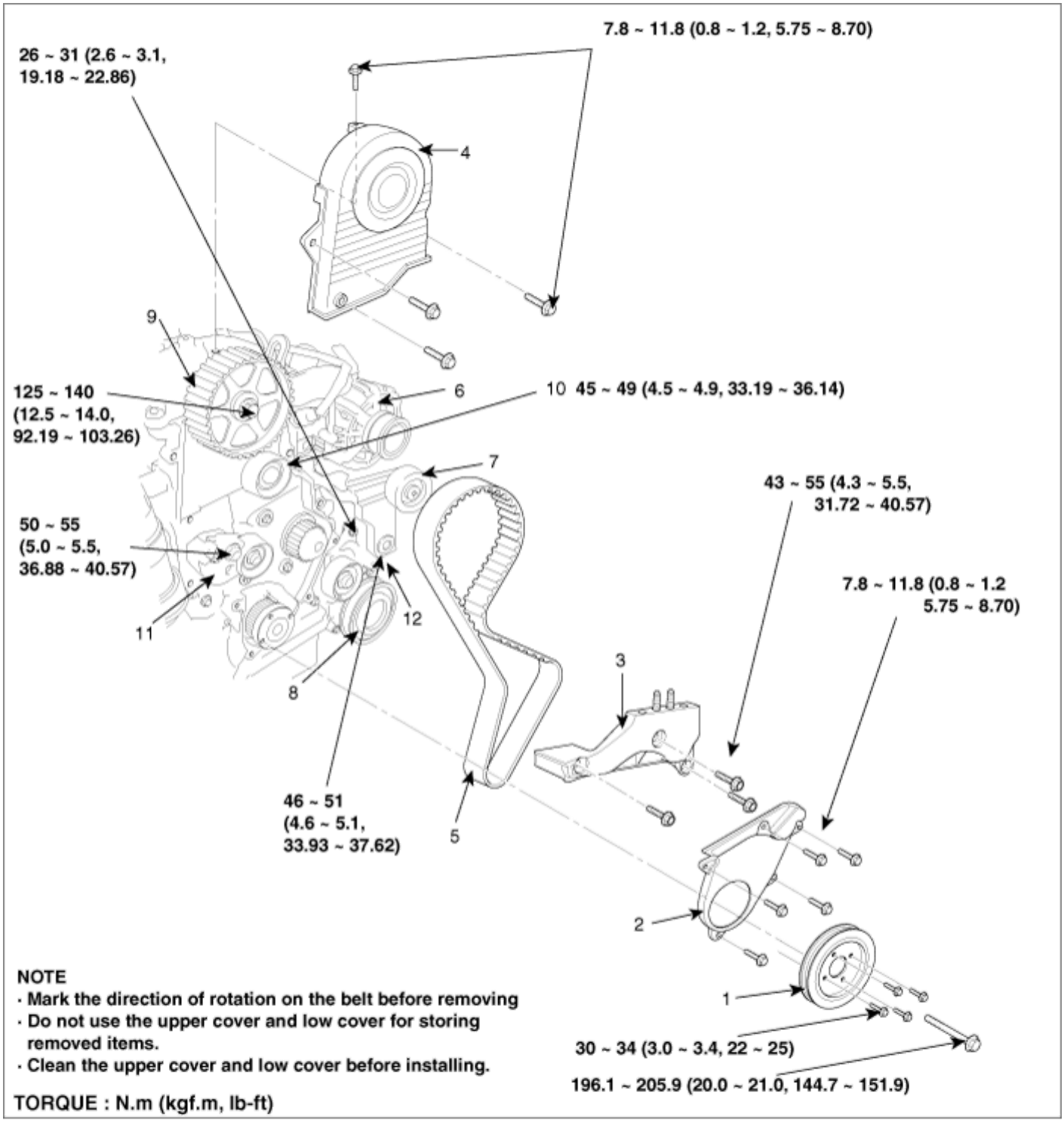
INSTALLATION

Install the engine in the reverse order of removal.
Reinstall the mount bolts/nuts in the following sequence.
Failure to follow these procedures may cause excessive noise and vibration, and reduce bushing life.

1. Install the sub frame installation bolt.
2. Tighten the engine and transmission mounting bolts.
3. Connect the power steering oil hoses.
4. Install the front muffler.
5. Install the front tires/wheels and splash shield.
6. Connect the air condition hoses.
7. Install the transmission links.
8. Connect the fuel hoses.
9. Connect the engine wire harness connectors.
10. Connect the radiator upper and lower hoses.
11. Connect the heater hoses.
12. Connect the hose to the reservoir tank.
13. Connect the intercooler hoses.
14. Install the air cleaner and the battery.
15. Perform the following :
    - Clean the areas where the driveshaft contact the transmission thoroughly with solvent or carburetor cleaner, and dry with compressed air.
    - Check that the snap rings on the ends of the driveshaft click into place.

English

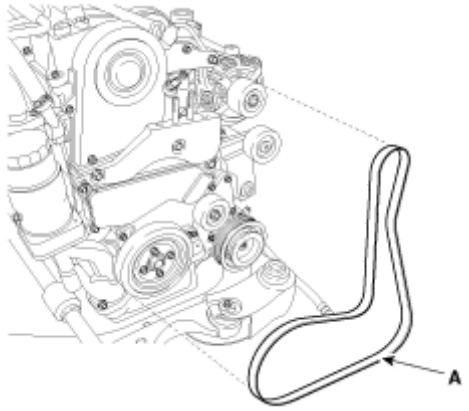
COMPONENTS



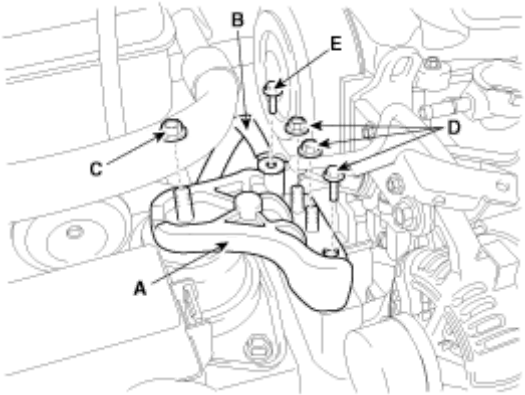
1. Damper pulley
2. Timing belt lower cover
3. Engine support bracket
4. Timing belt upper cover
5. Timing belt
6. Alternator and vacuum pump assembly
7. Power steering pump
8. Air conditioning compressor
9. Camshaft sprocket
10. Timing belt idler
11. Timing belt tensioner
12. Idler

REMOVAL

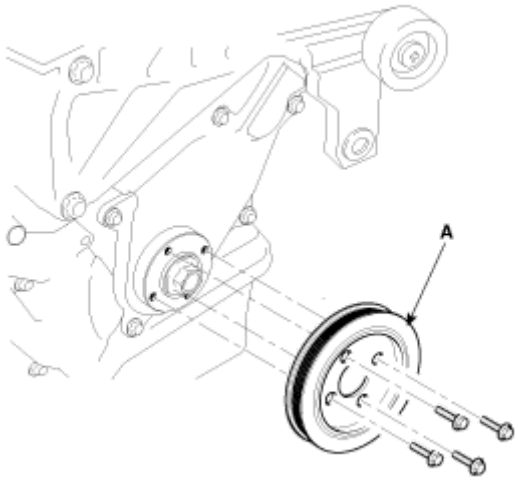
1. Remove the front tires.(RH)
2. Remove the side cover.
3. The tensioner should be lifted up to remove the drive belt(A).



4. Remove the engine mounting bracket(A) and the groud cable(B).

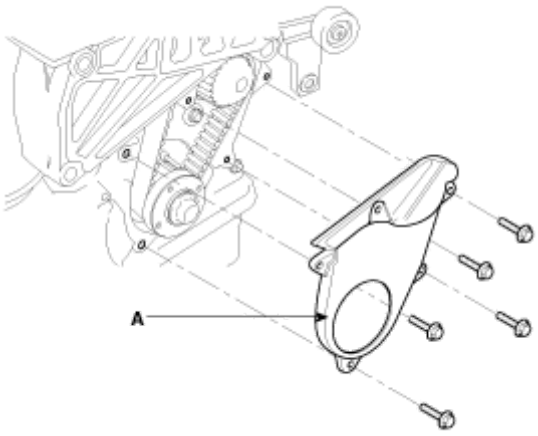


5. Remove the crankshaft pulley(A).

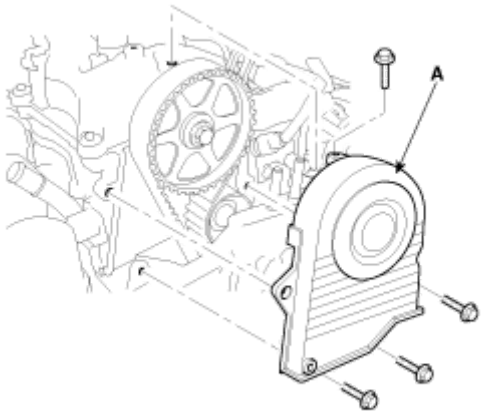


6. Remove the timing belt lower cover(A).

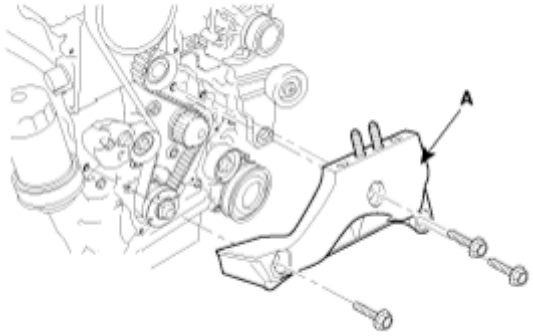
English ▼



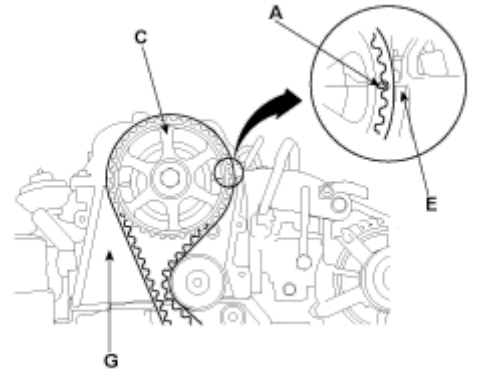
7. Remove the timing belt upper cover(A).

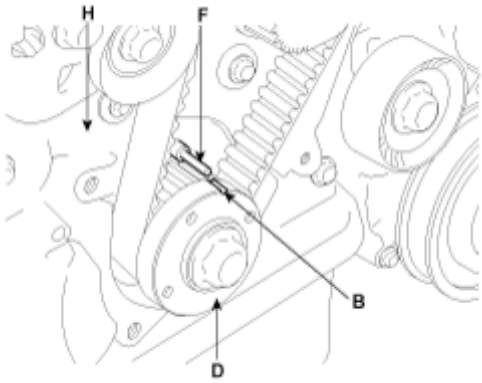


8. Remove the engine support bracket(A).

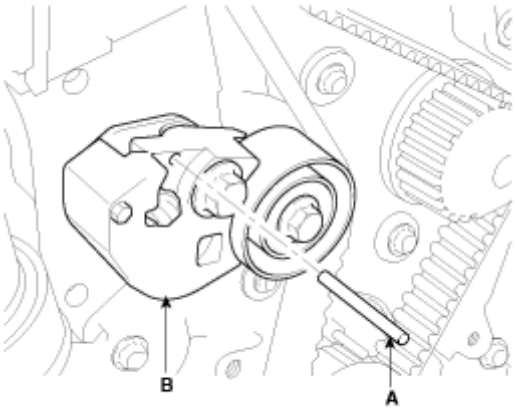


9. Align the timing marks(A, B) on the camshaft sprocket(C) and the crankshaft sprocket(D) with the marks(E, F) on the cylinder head(G) and the oil pump hausing(H) with rotating the engine.

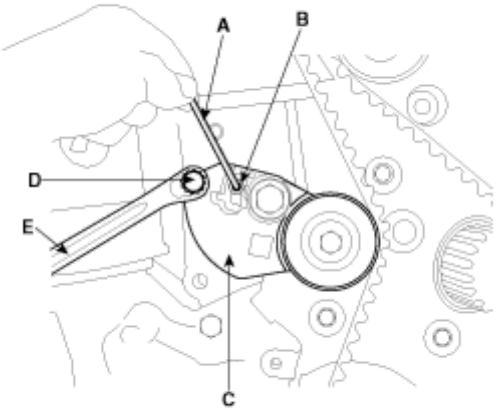




10. Insert a pin(A) into the aligned holes in the auto-tensioner(B).



11. Using a hexagonal wrench (5mm)(A), loosen the stop bolt(B). And then, turning the auto-tensioner(C) clockwise fully with the boss bolt(D) and 12mm spanner(E), retighten the stop bolt(B).



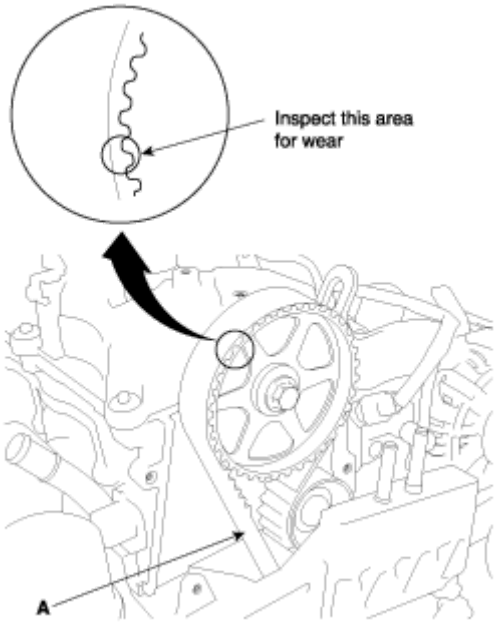
12. Remove the timing belt.

> **NOTICE**
>
> To be prepared in case the removed belt is used, mark an arrow on the timing belt in the direction of rotation before removing it.

INSPECTION

1. Remove the upper cover.
2. Inspect the timing belt(A) for cracks and oil or coolant soaking.

> **NOTICE**
>
> - Replace the belt if oil or coolant soaked.
> - Remove any oil or solvent that gets on the belt.

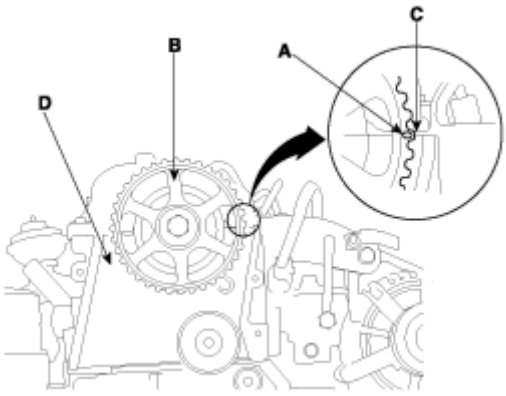


SPROCKETS, TENSIONER, IDLER

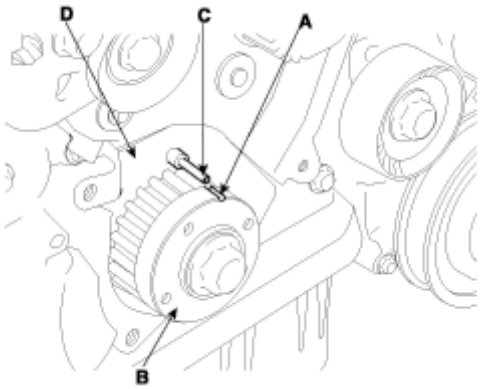
1. Check the camshaft sprocket.
   Camshaft sprocket, crankshaft, tensioner pulley and idler pulley for abnormal wear, cracks or damage. Replace as ecessary.
2. Inspect the tensioner pulley and the idler pulley for easy and smooth rotation and check for play or noise. Replace as necessary.
3. Replace the pulley if there is a grease leak from its bearing.

INSTALLATION

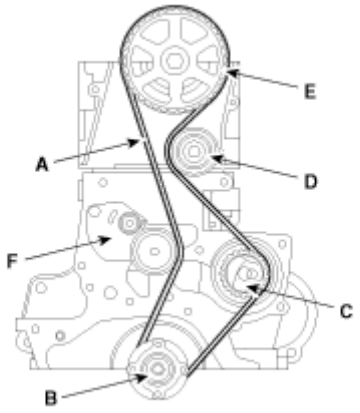
1. Align the timing mark(A) on the camshaft sprocket(B) with the mark(C) on the cylinder head(D).



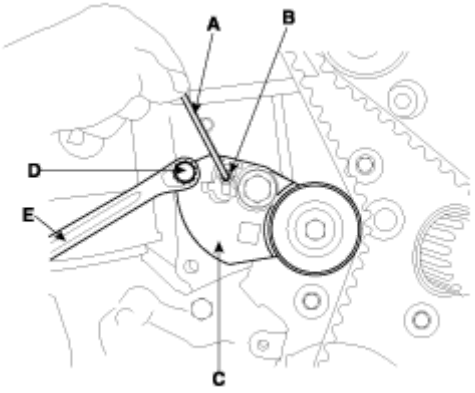
2. Align the timing mark(A) on the crankshaft sprocket(B) with the pin(C) press fitted in the oil pump housing(D).



3. Install the timing belt.
   (1) Install the timing belt(A) tightly in the sequence shown.
   ① Timing belt drive pulley(B) (crankshaft) → ② Water pump pulley(C) ③ Timing belt idler(D) →① ④ Camshaft sprocket(E) → ⑤ Timing belt tensioner(F).



(2) Turn the auto-tensioner(C) counterclockwise fully to install the timing belt using the boss bolt(D) and spanner(E).

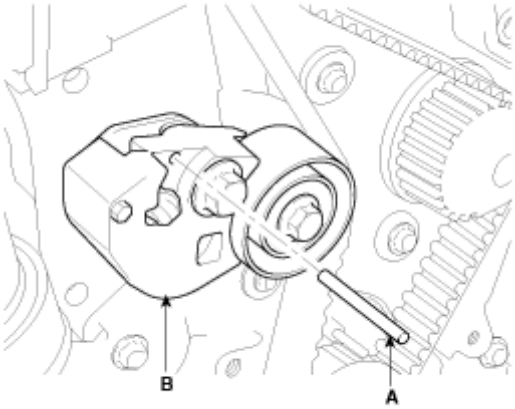


(3) Rotate the crankshaft by hand 2 complete revolutions (clockwise) to take up any slack and set to TDC(Top Dead Center).

(4) Using a hexagonal wrench, install the stop bolt.

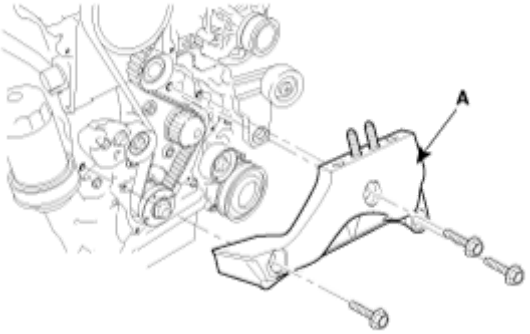
Tightening torque :
10 ~ 12N.m (1.0 ~ 1.2 kgf.m, 7 ~ 9lb-ft)

(5) Remove the fixing pin(A)



4. Install the engine support backet(A).

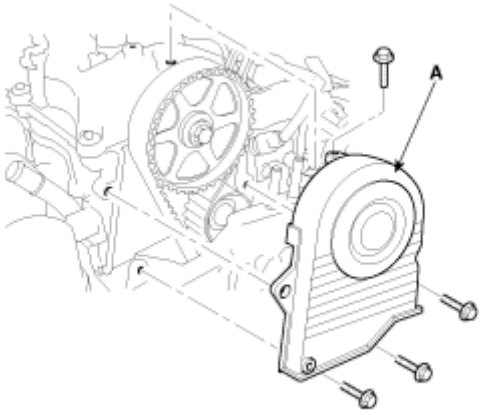
Tightening torque :
43 ~ 55N.m (4.3 ~ 5.5kgf.m, 31.72 ~ 40.57lb-ft)

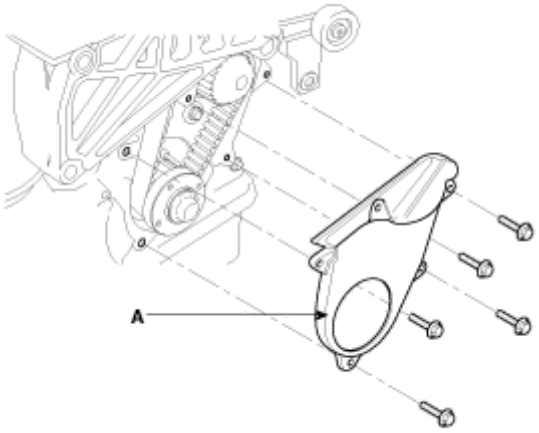


5. Install the timing belt upper cover(A) and lower cover(B).

   Tightening torque :

   7.8 ~ 11.8N.m (0.8 ~ 1.2kgf.m, 5.75 ~ 8.70lb-ft)

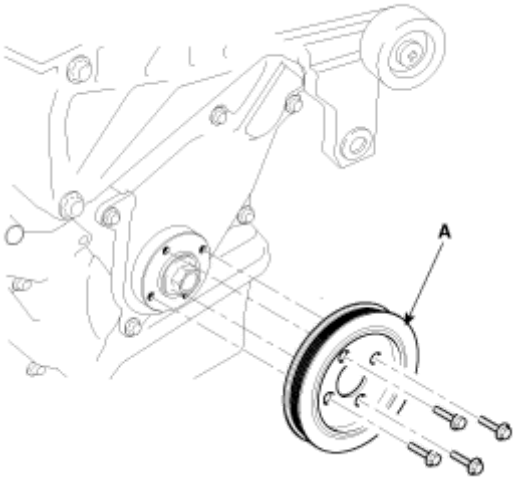




6. Install the crankshaft pulley(A).

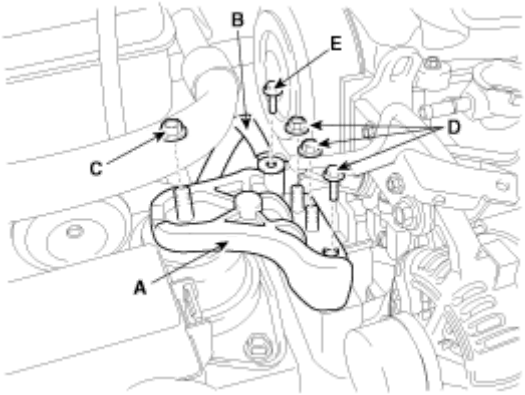
   Tightening torque :

   30 ~ 34N.m (3.0 ~ 3.4kgf.m, 22 ~ 25lb-ft)

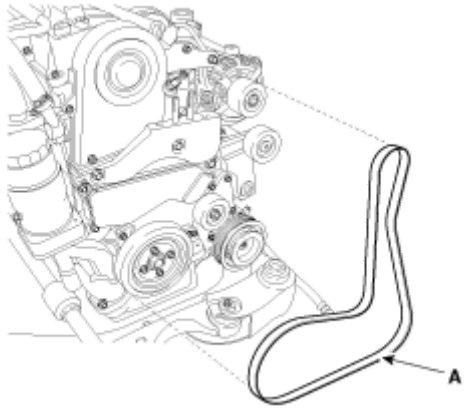


7. Install the engine mounting bracket(A) and the groud cable(B).

   Tightening torque :
   Nut(C) : 63.7 ~ 83.4N.m(6.5 ~ 8.5kgf.m, 47.0 ~ 61.5lb-ft)
   Bolt, nuts(D) : 49.0 ~ 63.7N.m (5.0 ~ 6.5kgf.m, 36.2 ~ 47.0lb-ft)
   Bolt(E) : 7.8 ~ 9.8N.m (0.8 ~ 1.0kgf.m, 5.8 ~ 7.2lb-ft)



8. Install the drive belt(A), following the sequence below.
   1.Alternator → 2.Idler → 3.Air compressor → 4.Crankshaft pulley → 5.Tensioner.
   The tensioner should be lifted up to install the drive belt(A).

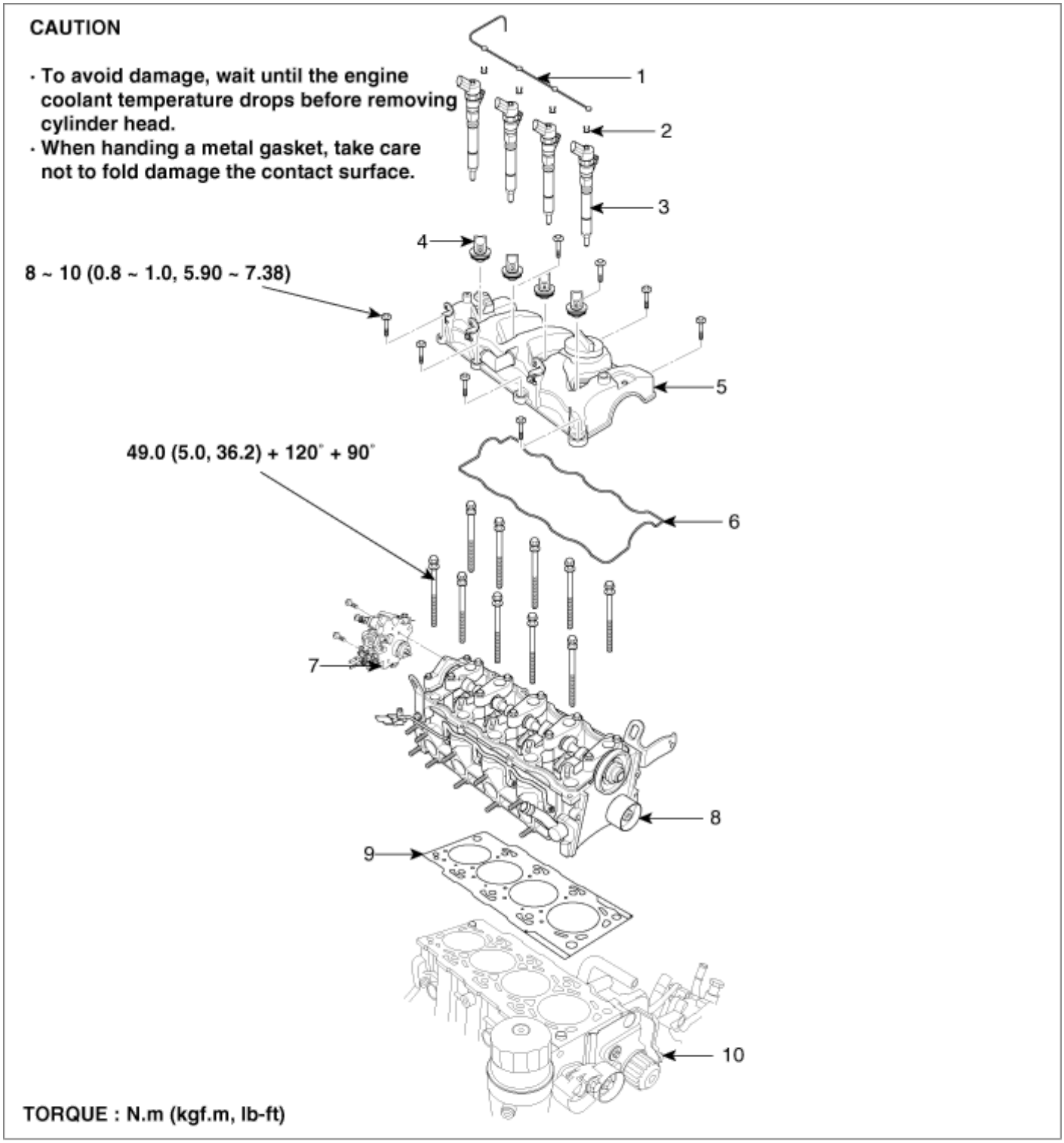


9. Install the side cover.

10. Install the front tires.(RH)

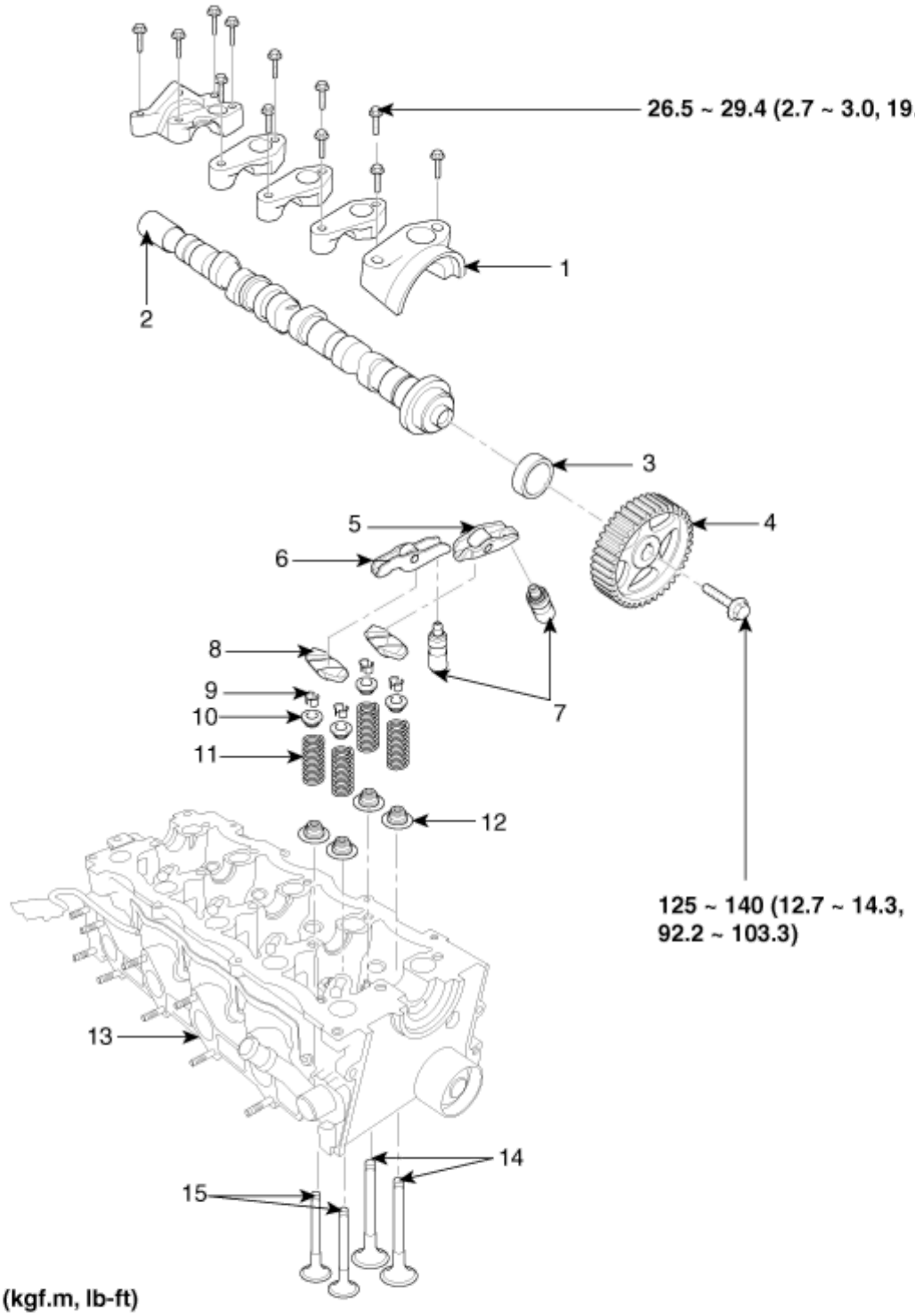
English ▼

COMPONENTS



1. Fuel return hose
2. Cilp
3. Injector
4. Injection installation plug
5. Cylinder head cover
6. Cylinder head cover gasket
7. Fuel pump
8. Cylinder head
9. Cylinder head gasket
10. Cylinder block assembly

English ▼

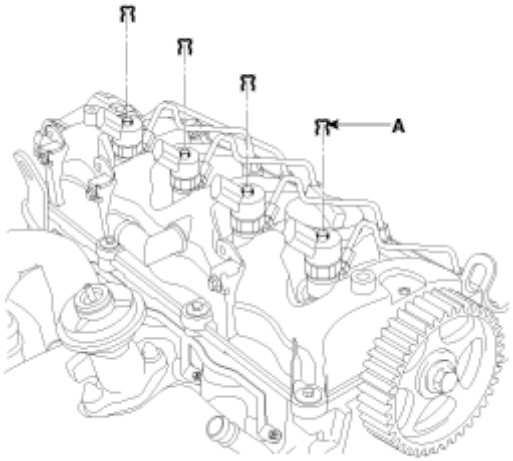


TORQUE : N.m (kgf.m, lb-ft)

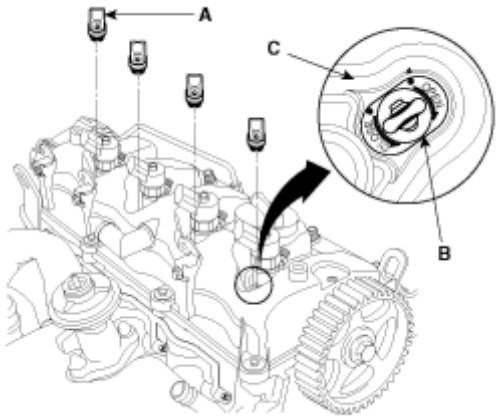
1. Camshaft bearing cap
2. Camshaft
3. Oil seal
4. Camshaft sprocket
5. Intake cam follower
6. Exhaust cam follower
7. Lash adjuster
8. Valve cap
9. Valve spring retainer lock
10. Valve spring retainer
11. Valve spring
12. Valve stem seal
13. Cylinder head
14. Intake valves
15. Exhaust valves

REMOVAL

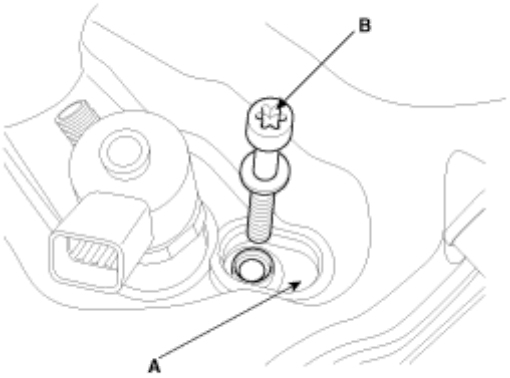
1. Before removing the cylinder head, the timing belt should be removed first. Refer to the timing belt 'removal' step.
2. Remove injector connector.
3. Disconnect the fuel return hose after removing the clips(A).



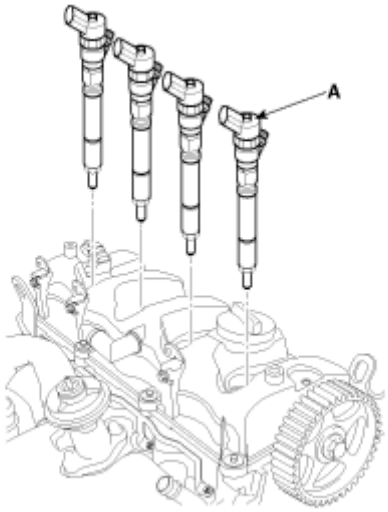
4. Remove the fuel tube. (Refer to Fuel pump in FLC group)
5. Remove the plugs(A).
   a. Pull the plug up slightly. (more than 1mm)
   b. Rotate the plug 90° clockwise.
   c. Remove the plug with inserting a (-)driver between the plug assy(B) and the cylinder head cover(C).



6. Remove the injector hoder bolt using the torx wrench.

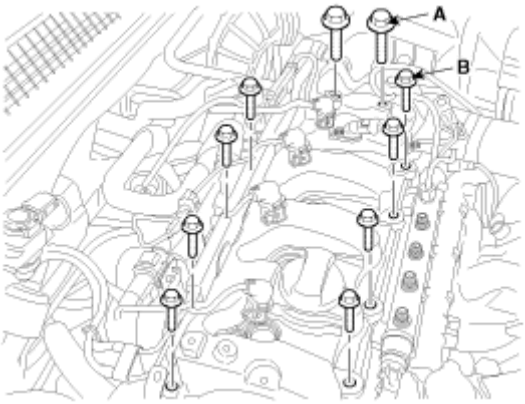


7. Pull the injector holders with the bolts.
8. Remove the injectors(A).



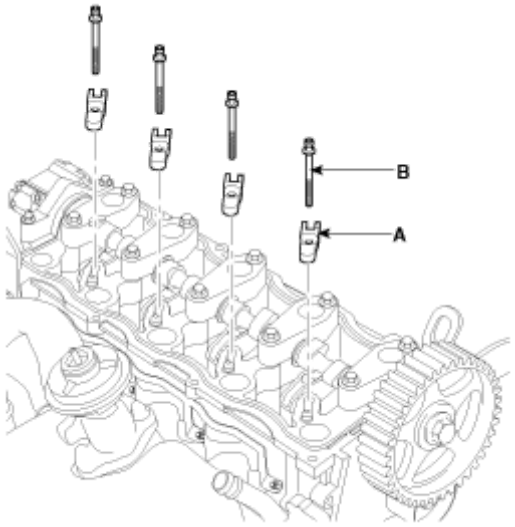
   a. Disconnector the position sensor.
   b. Remover the wiring bracket.
   c. Remove the pipe between the oil pan.
   d. Remove the fuelline hose bolt.

9. Remove the cylinder head cover mounting bolts(A,B).

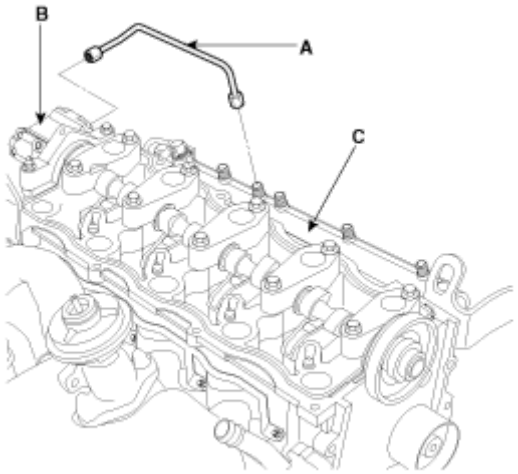


10. Remove the cylinder head cover.

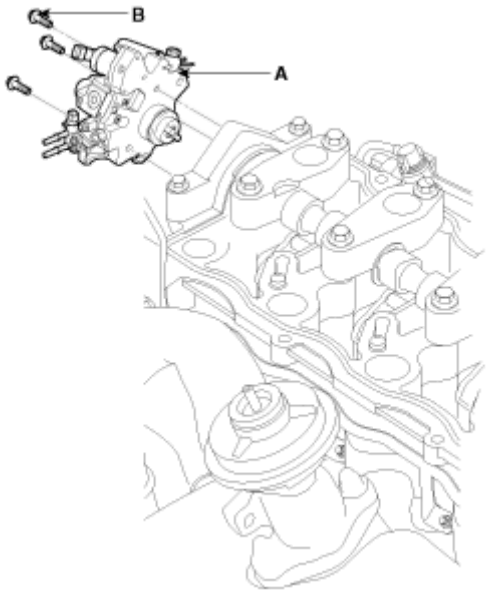
11. Remove the injector holders(A) with the bolts(B).



12. Remove the metal tube(A) between the fuel pump(B) and the common rail(C).

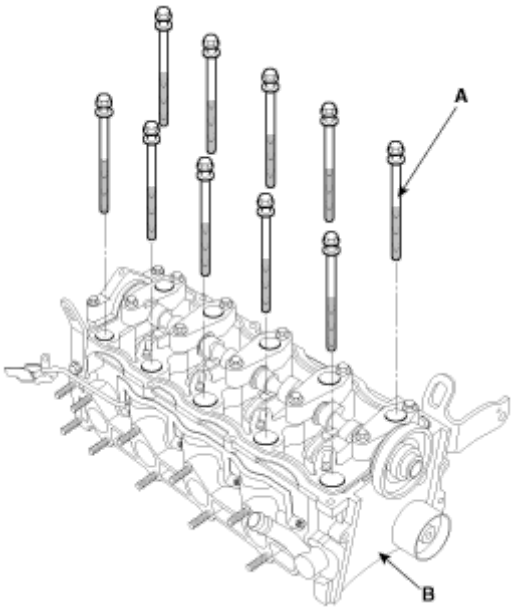


13. Remove the fuel pump(A) after removing the three bolts(B).



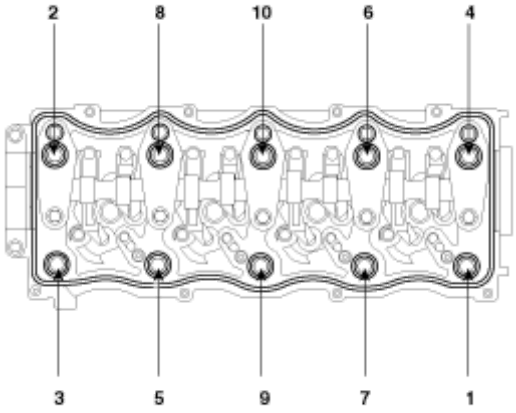
14. Remove the exhaust manifold.

15. Remove the intake manifold.
16. Remove the cylinder head bolts(A), then remove the cylinder head(B).



⚠ CAUTION

To prevent warpage, unscrew the bolts in sqience 1/3 turn at a time:repeat the sequence until all bolts are loosened.

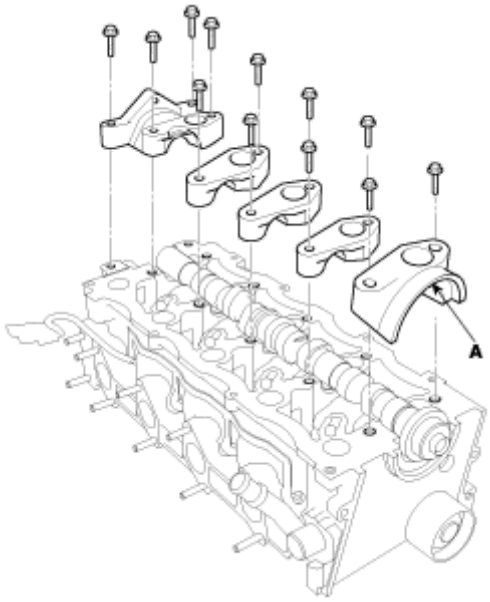


DISASSEMBLY

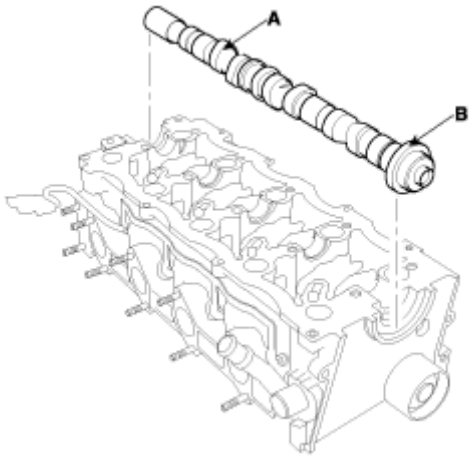
NOTICE

- Identify parts as they are removed to ensure reinstallation in original locations.
- Inspect camshafts.

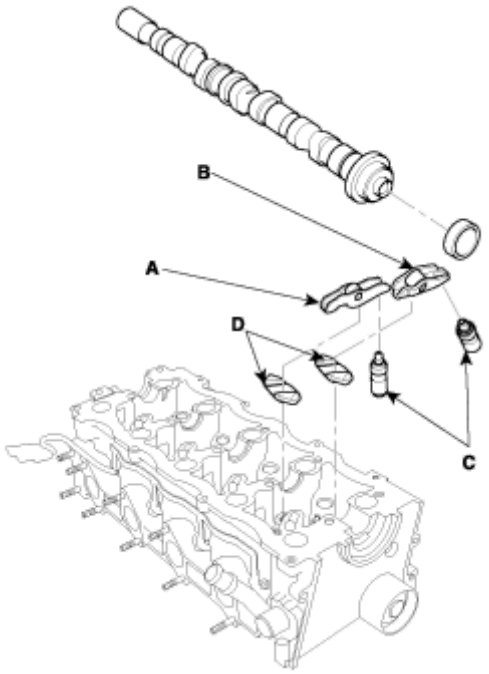
1. Remove the engine hangers, the knock bushes and the studs.
2. Remove the camshaft bearing caps(A).



3. Remove the camshaft(A) with the oil seal(B).



4. Remove the Intake/Exhaust cam followers(A, B).

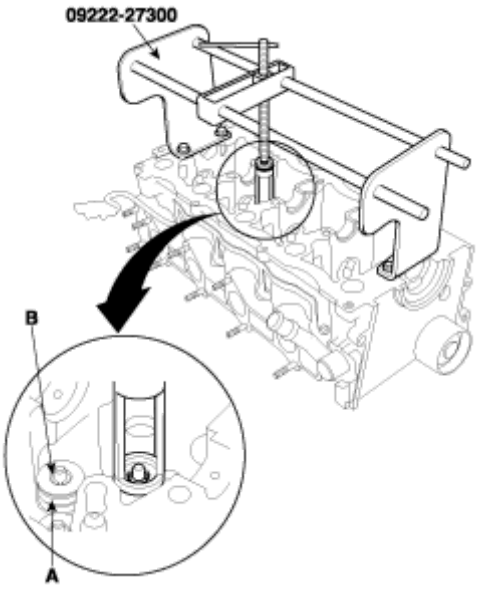


5. Remove the lash adjusters(C).

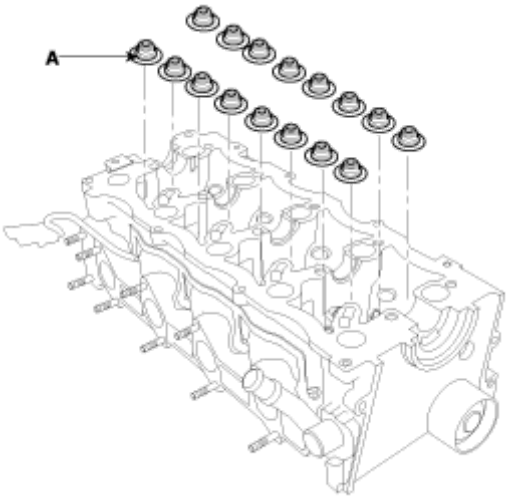
6. Remove the valve caps(D).
7. Using an appropriate-sized socket and plastic mallet, lightly tap the valve retainer to loosen the valve retainer locks before installing the valve spring compressor.

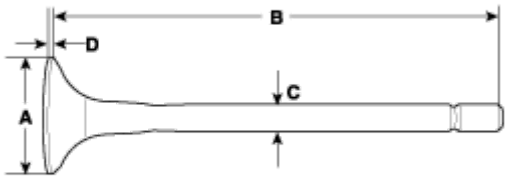
> **NOTICE**
>
> Identify valves and valve springs as they are removed so that each item can be reinstalled in its original position.

8. Using the SST(09222-27300), compress the valve spring(A) in order to remove the valve spring retainer locks(B).



9. Remove the valve stem seals(A).





Intake Valve Dimensions
A Standard (New) :
28.5 ~ 28.7mm (1.1220 ~ 1.1299in.)
B Standard (New) :
94.0 ~ 94.2mm (3.7008 ~ 3.7087in.)
C Standard (New) :
5.933~5.953mm (0.2336~0.0669in.)
D Standard (New) :
1.5 ~ 1.7mm (0.0591 ~ 0.0669in.
Exhaust Valve Dimensions
A Standard (New) :
24.3 ~ 24.5mm (0.9567 ~ 0.9646in.)
B Standard (New) :
94.0 ~ 94.2mm (3.7008 ~ 3.7087in.)
C Standard (New) :
5.905~5.925mm (0.2325~0.2333in.)
D Standard (New) :
1.2 ~ 1.4mm (0.0472 ~ 0.0551in.)

INSPECTION

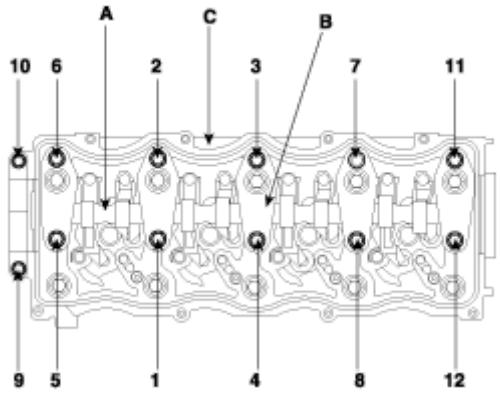
CAMSHAFT

NOTICE

Do not rotate the camshaft during inspection.

1. Put the camshaft(A) and the camshaft bearing caps(B) on the cylinder head(C), then tighten the bolts to the specified torque with the following sequence below.

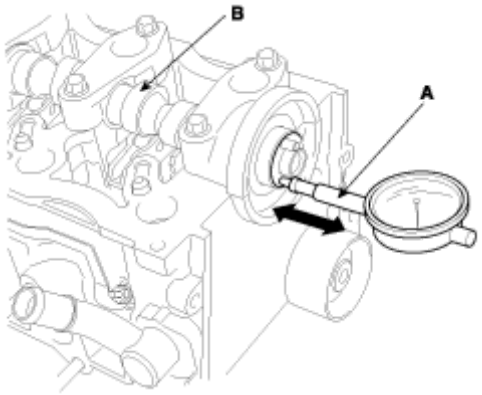
   Specified torque
   26.5 ~ 29.4N.m (2.7 ~ 3.0kgf.m, 19.5 ~ 21.7lb-ft)



2. Seat the camshaft by pushing it toward the rear of the cylinder head.

3. Zero the dial indicator(A) against the end of the camshaft(B).
   Push the camshaft(B) back and forth, and read the end play.

   Camshaft End Play
   Standard (New) : 0.05 ~ 0.15mm (0.002 ~ 0.006in.)

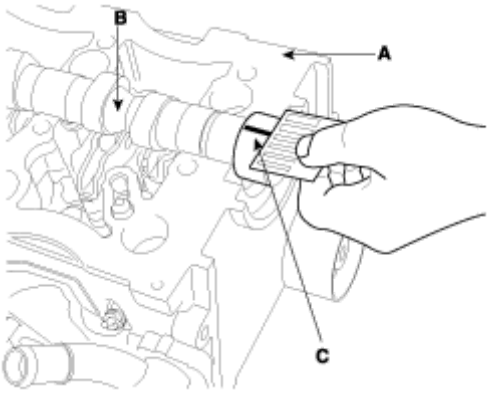


4. Remove the bolts, then remove the camshaft bearing caps from the cylinder head(A).
   - Lift the camshaft(B) out of the cylinder head(A), wipe it clean. Replace the camshaft if any lobes are pitted, scored, or excessively worn.
   - Clean the camshaft bearing surfaces in the cylinder head, then set the camshaft back in place.
   - Place a plastigauge strip(C) across each journal.

5. Install the camshaft bearing caps and tighten the bolts to the specified torque.

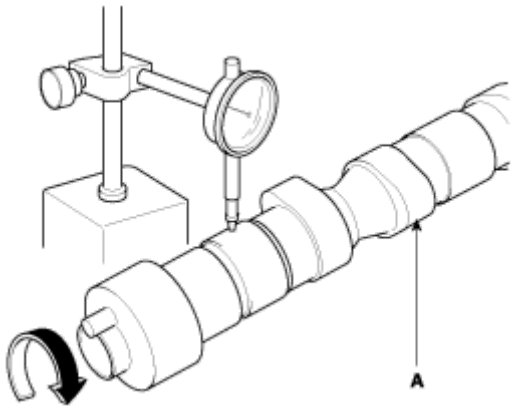
6. Remove the camshaft bearing caps, then measure the widest portion of the plastigage(C) on each journal.

   Camshaft-to-Camshaft bearing cap oil clearance
   Standard (New)
   0.040 ~ 0.074mm (0.0020 ~ 0.0029in.)



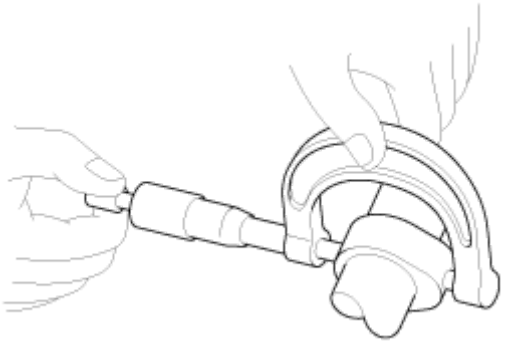
7. If the camshaft-to-camshaft bearing cap oil clearance is out of tolerance :
   - And the camshaft(A) has already been replaced, you must replace the cylinder head.
   - If the camshaft has not been replaced, first check the total runout with the camshaft supported on V-blocks.

     Camshaft Total Runout
     Standard (New)
     0.035mm (0.0014in.) for No.2 and4
     0.050mm (0.0019in.) for No.3



- If the total runout of the camshaft is within tolerance, replace the cylinder head.
- If the total runout is out of tolerance, replace the camshaft and recheck the camshaft-to-camshaft bearing cap oil clearance. If the oil clearance is still out of tolerance, replace the cylinder head.

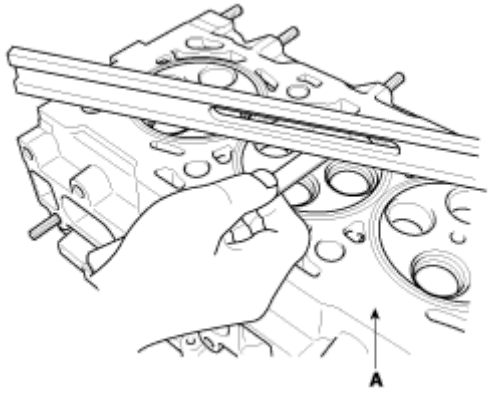
8. Check the cam height wear.
   [Standard]
   Intake : 34.697mm (1.366in.)
   Exhaust : 34.570mm (1.361in.)
   [Limit]
   Intake : 34.197mm (1.346in.)
   Exhaust : 34.070mm (1.341in.)



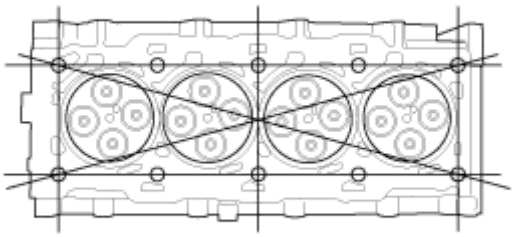
CYLINDER HEAD

Check the cylinder head(A) for warpage.

- If warpage is less than 0.03mm (0.0012in.) for width, 0.09mm (0.0035in.) for length and 0.012mm (0.0035in) for 51mm ×51mm, cylinder head is in good condition.
- If warpage is over the standard value, replace the cylinder head.



Measure along edges, and three ways across center.

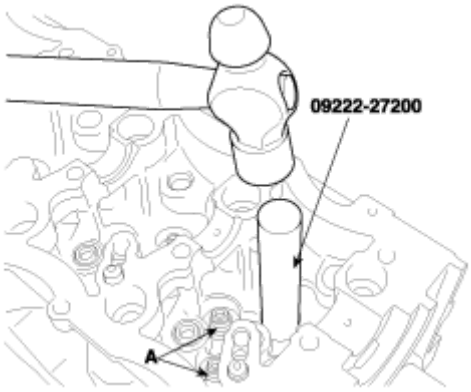


REASSEMBLY

NOTICE

Prior to reassembling, cylinder head assembly shall be cleaned sufficiently to remove scrap and clust. (Clean holes with special care.)

1. Using the SST(09222-27200) insert the valve stem seals(A).

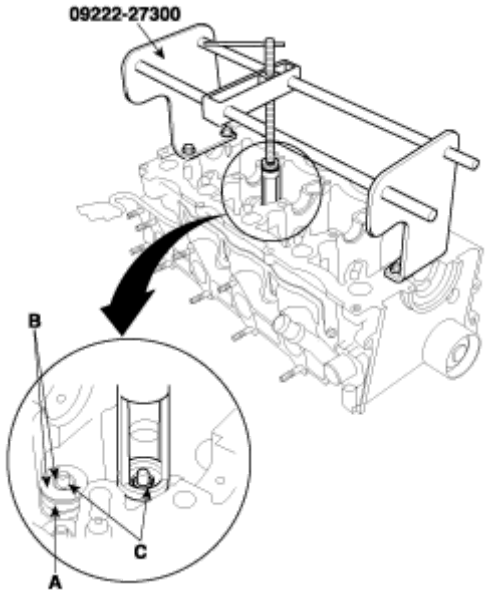


2. Insert the valves through the valve stem seals.

NOTICE

Make sure the valves move up and down smoothly.

3. Install the valve spring(A) and valve spring retainer(B), then install the SST (09222-27300, the valve spring compressor). Compress the spring(A) and install the valve spring retainer lock(C).



4. Lightly tap the end of each valve stem two or three times with a plastic mallet to ensure proper seating of the valve and valve spring retainer locks.

> **NOTICE**
>
> Tap the valve stem only along its axis so you do not bend the stem.

5. Assembly of lash adjuster.
   (1) Until installing, lash adjuster shall be held upright so that gas oil in lash adjuster should not spill and assured that dust does not adhere to adjuster.

   (2) Lash adjust shall be inserted tenderly to the cylinder head not to spill gas oil from lash adjuster. In case of spilling air bent shall be done in accordance with the air bent procedure below.

> **NOTICE**
>
> Air bent procedure
>
> 1) In case of lash adjuster alone.
> Stroke lash adjuster in gas oil 4~5 times by pushing its cap while pushing the ball down slightly by hard steel wire.
> Take care not to severely push hard steel wire down since ball is several grams.
>
> 2) After installed on engine
> Lash adjuster might give out unusual noise if air is mingled. Apply slow racing from idle to 3,000rpm (Approximately one minute per one racing) and the air shall be removed from adjuster.
> Therefore noise can be extinguished.

6. Install the valve-caps.

7. Put the cam followers on the lash adjusters and valve caps.

8. After wiping down the camshaft and camshaft seal in the cylinder head, lubricate both surfaces and install the camshaft with engine oil.

9. Confirm that cam followers are located on lash adjusters and their rollers are in touch with camshaft.

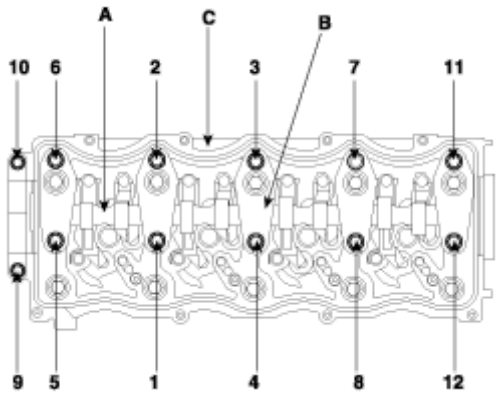
10. In assembly camshaft bearing cap, to the cylinder head with the cylinder block, all pistons should be in the middle position between TDC(Top Dead Center) and BDC(Bottom ead Center) because valves come out of the bottom surface of the cylinder head.

11. Install the bolts loosely.

12. Tighten each bolt two turns at a time in the sequence shown below to ensure that the cam followers do not bind on the valves.

    Tightening torque

    26.5 ~ 29.4N.m (2.7 ~ 3.0kgf.m, 19.5 ~ 21.7lb-ft)



INSTALLATION

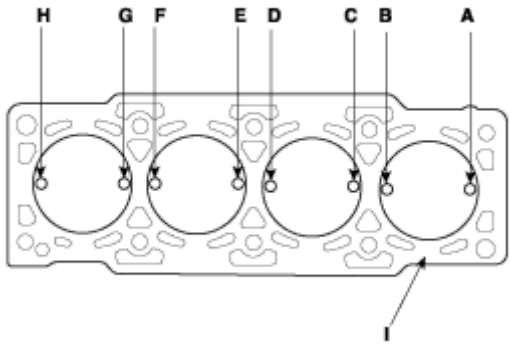
Install the cylinder head in the reverse order of removal :

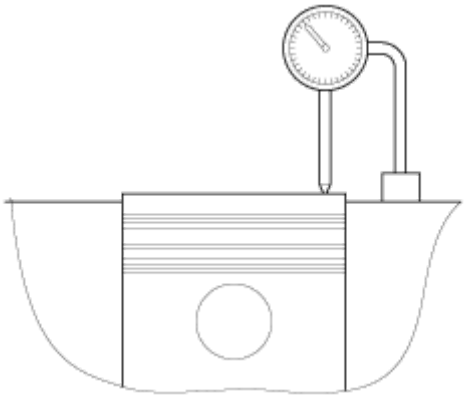
> **NOTICE**
>
> - Always use a new head gasket.
> - Cylinder head and cylinder block surface must be clean.
> - Turn the crankshaft so the No.1 piston is at TDC(Top Dead Center).

1. Cylinder head dowel pins must be aligned.

2. Select the cylinder head gasket.

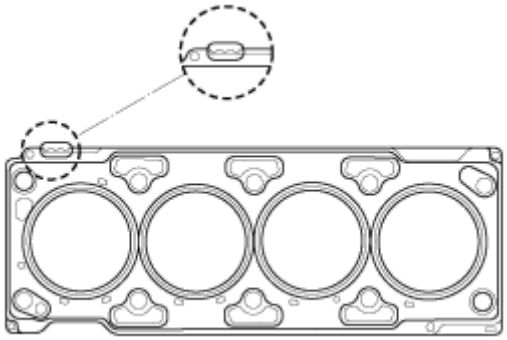
   (1) Measure the piston protrusion from the upper cylinder block face (I) on 8 places (A ~ H) at T.D.C. Measure on the crankshaft center line considering the piston migration.





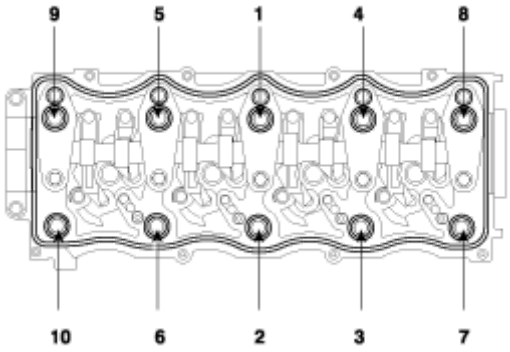
(2) Install the gasket so that the identification mark faces toward the flywheel side.

(3) Select the gasket in the table below using the average value of piston protrusions.
Although even the only 1 point is over than the each rank limit, use 1 rank upper gasket than specified in the table below.



Displacement	2.0 L		
Average of pisston protrusion	0.194 ~ 0.337mm (0.0079 ~ 0.013in.)	0.337 ~ 0.440mm (0.013 ~ 0.017in.)	0.440 ~ 0.542mm (0.017 ~ 0.021in.)
Gasket thickness	1.13 ± 0.05mm (0.0445 ± 0.0019in.)	1.23 ± 0.05mm (0.0484 ± 0.0019in.)	1.33 ± 0.05mm (0.0523 ± 0.0019in.)
Limit of each rank extant	0.43mm (0.0169in.)	0.53mm (0.0208in.)	-
Identification code			

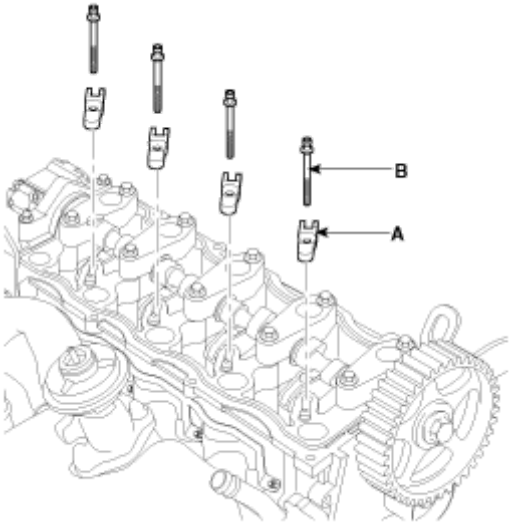
3. Position the cylinder head assembly over the gasket.
4. Tighten the cylinder head bolts slightly.
5. Install the camshaft sprocket, aligning the timing mark.
   Tightening torque
   124.5 ~ 144.2N.m (12.7 ~ 14.7kgf.m, 91.9 ~ 106.3lb-ft)
6. Tighten the bolts to the specified torque
   Tightening torque
   49.0Nm (5.0kgf.m, 36.2lb-ft) + 120° + 90°



NOTICE

- Tightening sequence of cylinder head bolt should be confirmed to the upper drawing.
- Cylinder head bolt must be replaced.

7. Install the fuel pump assembly.
8. Install the intake/exhaust manifold assemblies.
9. Install the hose between the vacuum pump and the cylinder head.
10. If it is necessary to replace the oil seals on the cylinder head cover for injectors, use the SST(09351-27401).
11. Install the camshaft oil seal with use the SST(09212 - 27100)
12. Install the injector holder(A).



13. Install the head cover gasket in the groove of the cylinder head cover.

NOTICE

- Cylinder head cover gasket must be replaced.
- Before installing the head cover gasket, throughly clean the seal and the groove.

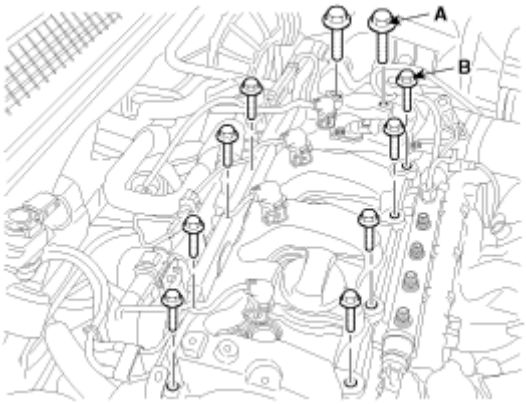
14. Apply liquid gasket to the head cover gasket at the four corners of the recesses.

NOTICE

- Use liquid gasket LOCTITE 5699 or TH1212D.
- Check that the mating surface are clean and dry before applying liquid gasket.
- Do not install the parts if five minutes or more have elapsed since applying liquid gasket. Instead, reapply liquid gasket after removing old residue.
- After assembly, wait at least 30 minutes before filling the engine with oil.

15. Install the sylinder head cover bolts(A, B).

Tighten torque
(A) : 21 ~ 25N.m (2.2 ~ 2.6kgf.m, 15.9 ~ 18.8lb-ft)
(B) : 8 ~ 10N.m (0.8 ~ 1.0kgf.m, 5.9 ~ 7.38lb-ft)

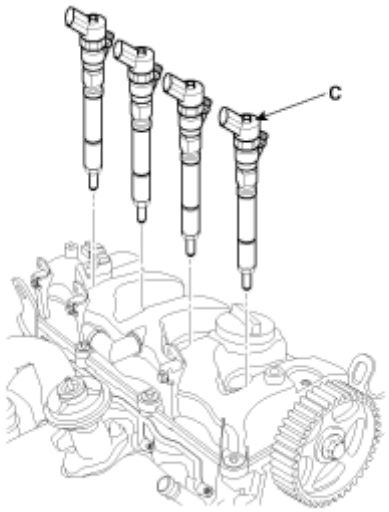


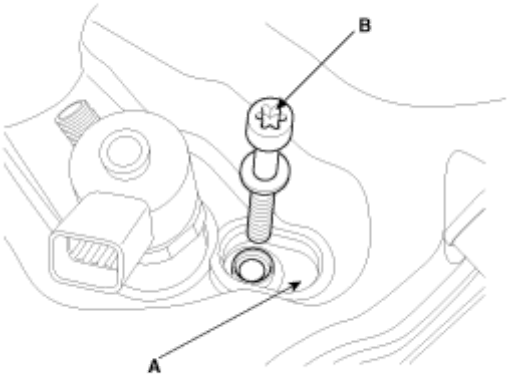
NOTICE

After assembly, wait at least 30 minutes before filling the engine with oil.

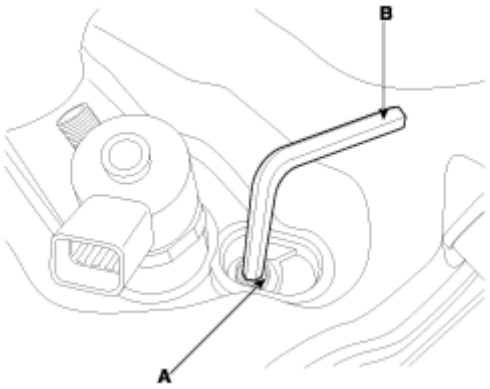
16. Insert the injectors(C), moving back the injector holders(A) with the bolts(B).

Tighten torque :
24.5 ~ 28.4N.m (2.5 ~ 2.9kgf.m, 18.1 ~ 21.0lb-ft)

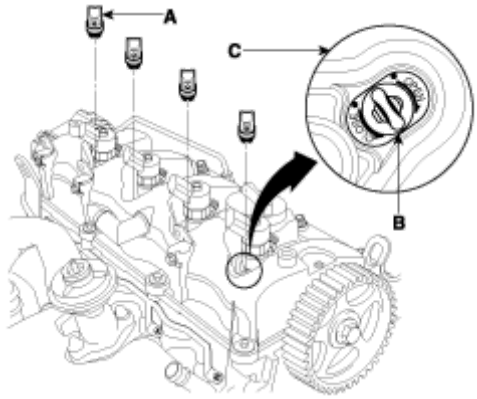




17. Install the injector holder bolts(A) useing the torx wrench(B).



18. Install the injector plug(A).



a. Make sure that the stopper of the plug faces 'OPEN' side. Otherwise pull and rotate the plug clockwise so the stopper should face 'OPEN' side.

b. Apply the engine oil on the head cover mating surface or the gasket of the plug.

c. Insert the plugs in the head cover.

d. Rotate the plug inserted counterclockwise 90°.

e. After installation, rotate the plug clockwise. If it is rotated, repeat the step a ~ d.

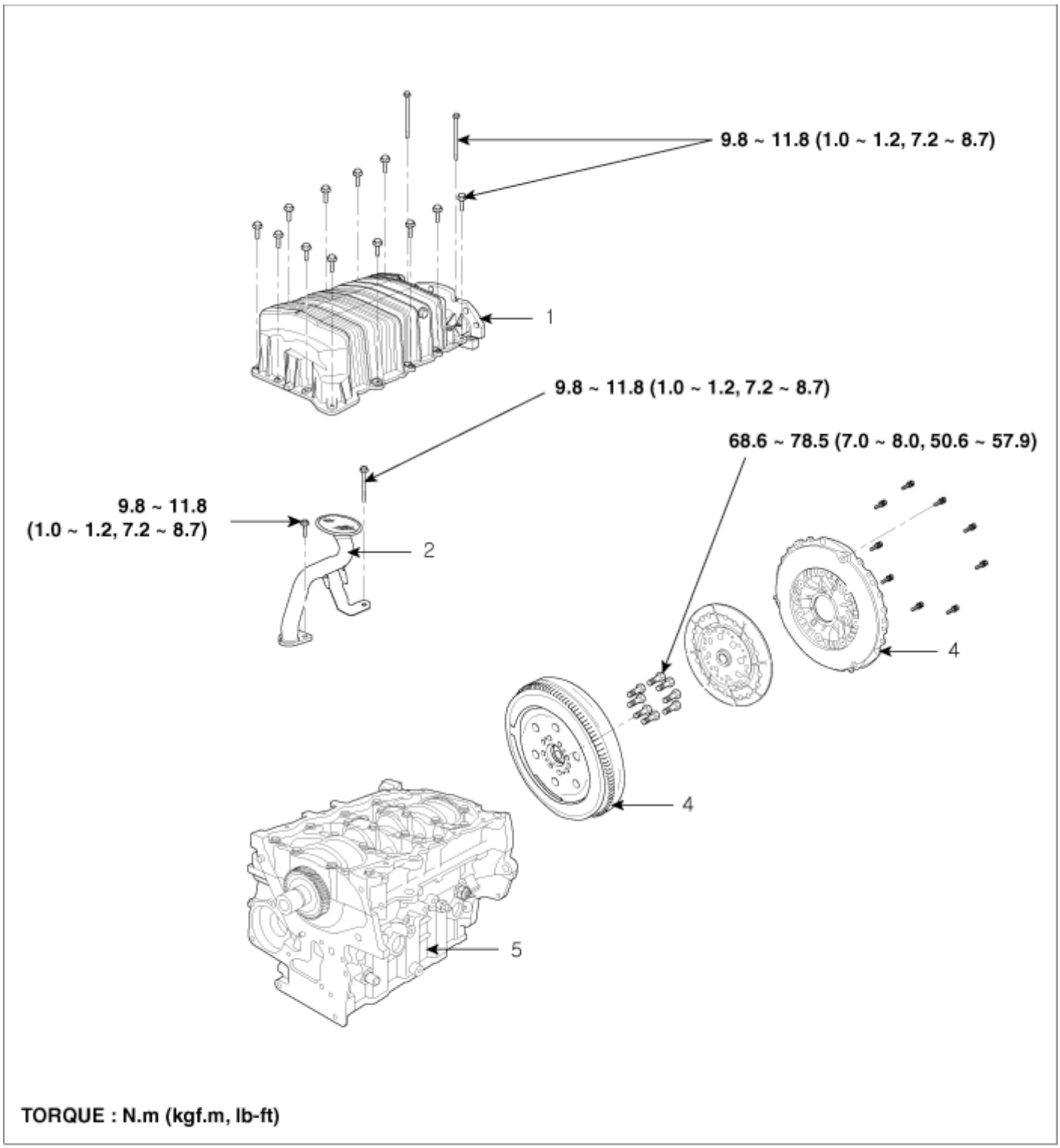
NOTICE

Plug gasket must be replaced.

19. Install the fuel tube.(Refer to Injector in FLC group)
20. Install the timing belt.

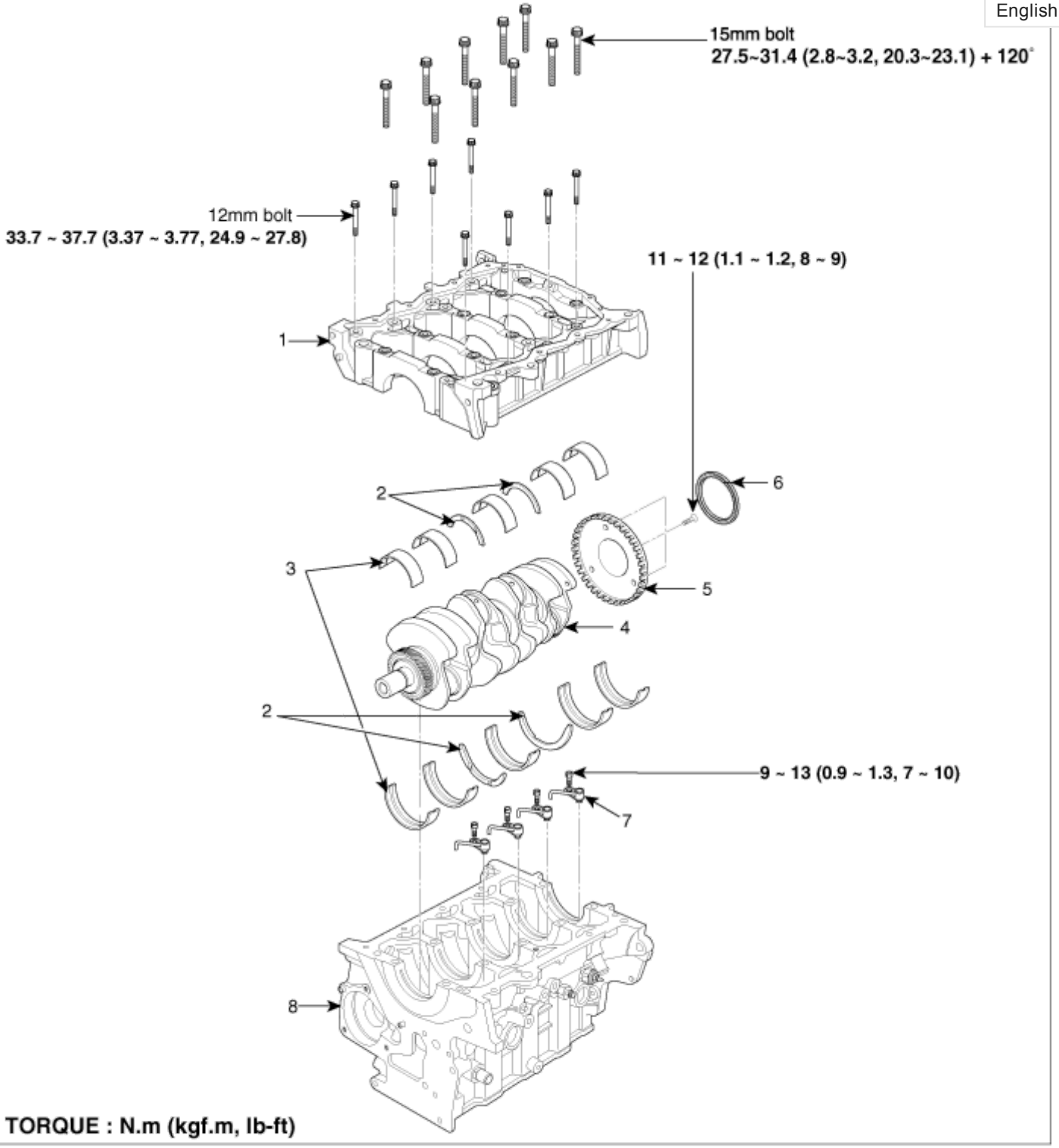
English ▼

COMPONENTS



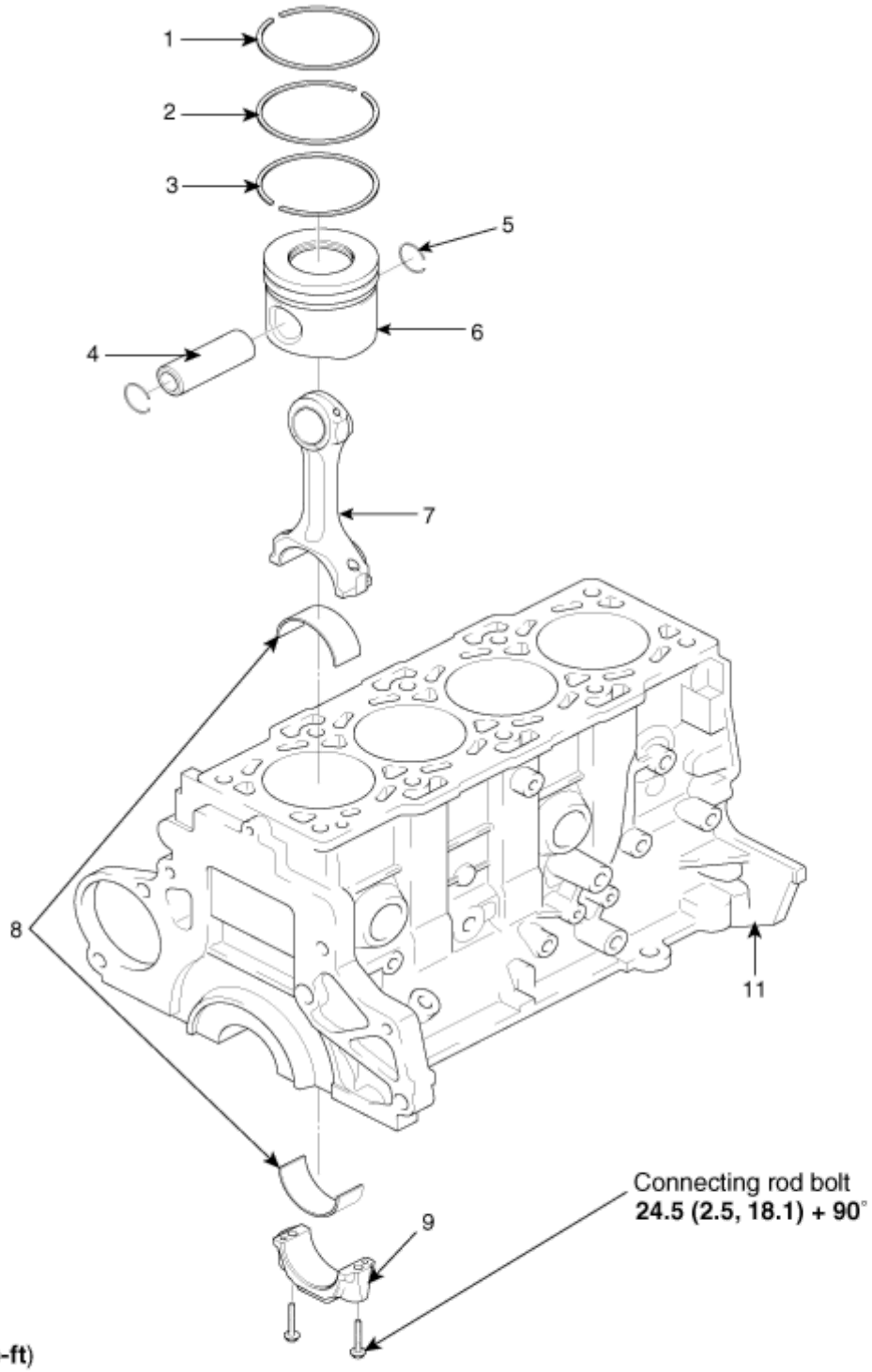
1. Oil pan
2. Oil screen
3. Duel mass flywheel
4. Cylinder block assembly

English ▼



TORQUE : N.m (kgf.m, lb-ft)

1. Badplate assembly
2. Center bearings
3. Main bearings
4. Crankshaft
5. Crankshaft position sensor wheel
6. Crankshaft rear oil seal
7. Piston cooling jet (Oil jet)
8. Cylinder block assembly



TORQUE : N.m (kgf.m, lb-ft)

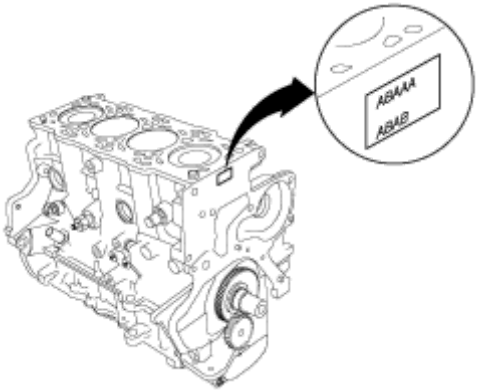
1. Piston ring No. 1
2. Piston ring No. 2
3. Oil ring
4. Piston pin
5. Snap ring
6. Piston
7. Connecting rod
8. Connecting rod bearings
9. Connecting rod bearing cap
10. Cylinder block assembly

REPLACEMENT

MAIN BEARING SELECTION

Crankshaft Bore Code Location

1. Letters have been stamped on the end of the block as a code for the size of each of the 5 main journal bores. Write down the crank bore codes.
   If you can't read the codes because of accumulated dirt and dust, do not scrub them with a wire brush or scraper. Clean them only with solvent or detergent.

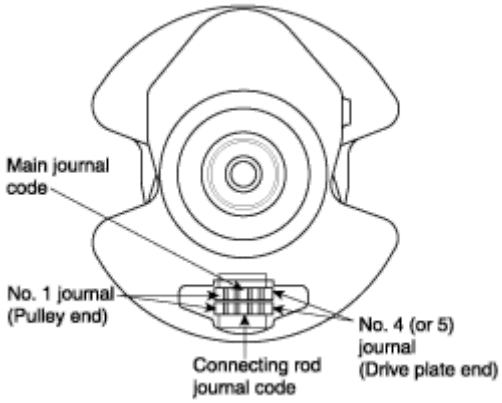


Discrimination of cylinder block

Discrimination		SIZE (Inside diameter of crank bore)
Class	Mark	
A	A	Ø64mm(2.5197in) (0 ~ +0.006in)(0 ~ +0.0002in)
B	B	Ø64mm(2.5197in) (+0.006 ~ +0.012in)(+0.0002~0.0005in)
C	C	Ø64mm(2.5197in) (+0.012 ~ +0.018in)(+0.0005~0.0007in)

Main Journal Code Locations

1. The main Journal Codes are stamped on the No.1 web.



Discrimination of crank shaft

Discrimination		SIZE (Outside diameter of main journal)
Class	Mark	
I	A	Ø60mm(2.3622in)

English ▼

		(+0.014 ~ +0.020in)(+0.0006~+0.0008
II	B	Ø60mm(2.3622in) (+0.008 ~ +0.014in)(+0.0003~0.0006in)
III	C	Ø60mm(2.3622in) (+0.002 ~ +0.008in)(+0.0001~+0.0003in)

2. Use the crank bore codes and crank journal codes to select the appropriate replacement bearings from the following table.

NOTICE

- Color code is on the edge of the bearing. Refer to the table in the step 6 of the main bearing clearance inspection.
- When using bearing halves of different colors, it dose not matter which color is used in the top or bottom.

Installing procedure of bearing

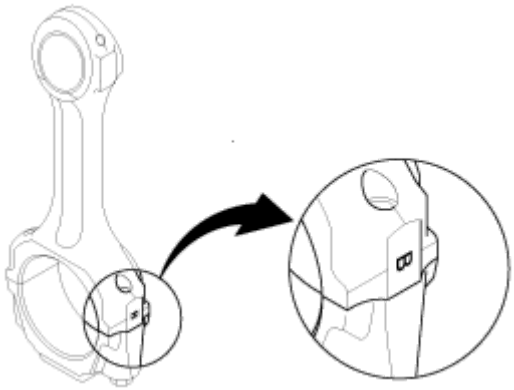
Shaft bore combination		Bearing mark	Oil clearance
Shaft mark	Bore mark		
I (A)	A (A)	A (BLUE)	0.024 ~ 0.042mm (0.0009 ~ 0.0017in)
	B (B)	B (BLACK)	
	C (C)	C (-)	
II (B)	A (A)	B (BLACK)	
	B (B)	C (-)	
	C (C)	D (GREEN)	
III (C)	A (A)	C (-)	
	B (B)	D (GREEN)	
	C (C)	E (YELLOW)	

Rod Bearing Selection

1. Inspect each connecting rod for cracks and heat damage.

Connecting Rod Big End Bore Code Locations

1. Each rod has tolernance range from 0 to 0.018mm (0.0007in.), in 0.006mm (0.0002in.) increments, depending on the size of its big end bore. It's then stamped with a letter (A, B or C) indicating the range. You may find any combination of letters in any engine.



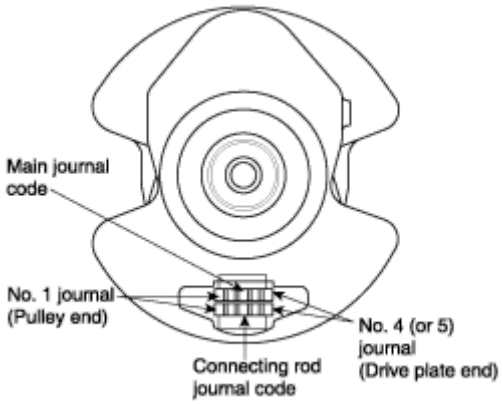
NOTICE

Discrimination connecting rod

Discrimination		SIZE (Inside diameter of connecting rod big end bore)
Class	Mark	
A	A	Ø 53mm(2.0866in) (0 ~ +0.006in)(0~+0.0002in)
B	B	Ø 53mm(2.0866in) (+0.006 ~ +0.012in)(+0.0002~0.0005in)
C	C	Ø 53mm(2.0866in) (+0.012 ~ +0.018in)(0.0005~0.0007in)

Connecting Rod Journal Code Locations

1. The connecting Rod Journal Codes are stamped on the No. 1 web.
)



NOTICE

Discrimination of crank shaft pin

Discrimination		SIZE (Outside diameter of pin)
Class	Mark	
I	A	Ø50mm(1.9685in) (+0.020 ~ +0.026in)(+0.0008~0.0010in)
II	B	Ø50mm(1.9685in) (+0.014 ~ +0.020in)(+0.0006~0.0008in)
III	C	Ø50mm(1.9685in) (+0.008 ~ +0.014in)(+0.0003~0.0006in)

2. Use the big end bore codes and rod journal codes to select appropriate replacement bearings from the following table.

NOTICE

Color code is on the edge of the bearing.
Refer to the table in the step 5 of rod bearing clearance inspection.

Shaft bore combination		Bearing mark	Oil clearance
Sahft mark	Bore mark		

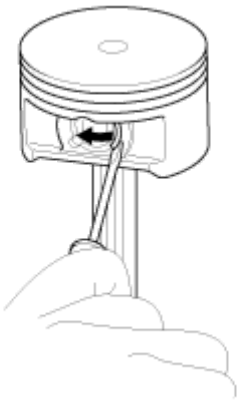
I	A (A)	A (BLUE)	0.024 ~ 0.042mm (0.0009~0.0017in)
	B (B)	B (BLACK)	
	C (C)	C (WHITE)	
II	A (A)	B (BLACK)	
	B (B)	C (WHITE)	
	C (C)	D (GREEN)	
III	A (A)	C (WHITE)	
	B (B)	D (GREEN)	
	C (C)	E (YELLOW)	

Piston, Pin and Connecting Rod

1. Apply engine oil to the piston pin snap rings and turn them in the ring grooves.

> **NOTICE**
>
> Take care not to damage the ring grooves.

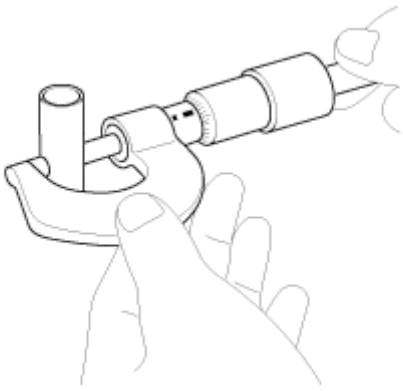
2. Remove both snap rings(A) carefully so they do not go flying or get lost. Wear eye protection.



3. Remove the piston pin and the conecting rod assembly.

4. Measure the diameter of the piston pin.

Piston Pin Diameter
Standard (New)
27.995 ~ 28.000mm (1.1022 ~ 1.1024in.)



> **NOTICE**

Inspect the piston, piston pin and connecting rod when they are at room temperature.

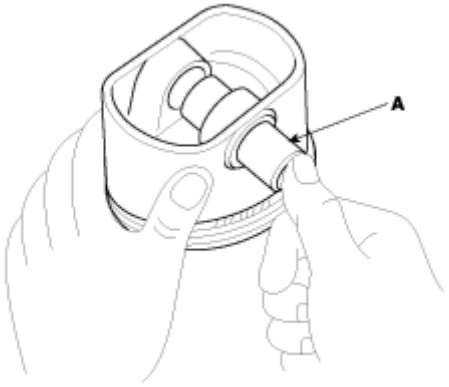
5. Zero the dial indicator to the piston pin diameter.
6. Check the difference between the piston pin diameter and piston pin hole diameter in the piston.

   Piston Pin-to-Piston Clearanace
   Standard (New)
   0.015 ~ 0.030mm (0.00059 ~ 0.00118in.)

7. Measure the piston pin-to-connecting rod clearance.

   Piston Pin-to-Connecting Rod Clearance
   Standard (New)
   0.022 ~ 0.039mm (0.00087 ~ 0.00154in.)

8. Set a snap ring in one side of piston pin hole.
9. Before inserting the piston pin, apply a sufficient amount of the lubricant oil to the outer surface of the piston, the inner surface of the piston pin hole and the small end bore of the connecting rod.
10. Insert the piston pin(A). Assembly the piston and connecting rod with the embossed front marks on the same side.



NOTICE

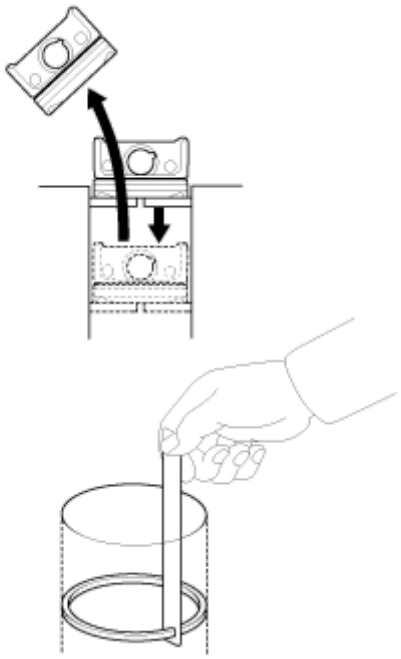
The front mark of the piston is embossed on the piston whereas some letters are located on a side surface of the connecting rod as the front mark.

⚠ CAUTION

- Be sure to keep the small end bore, piston pin hole and piston pin undamaged and unscratched when inserting the piston pin.
- Set the snap rings to be sure for contacting with the groove of the piston pin hole.

Piston Ring

1. Using a piston, push a new ring into the cylinder bore.



2. Measure the piston ring end-gap(B) with a feeler gauge :
   - If the gap is too small, check to see if you have the proper rings for your engine.
   - 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
     Top ring
     Standard (New) : 0.20 ~ 0.35mm (0.008 ~ 0.014in.)
     Second Ring
     Standard (New) : 0.40 ~ 0.50mm (0.016 ~ 0.024in.)
     Oil Ring
     Standard (New) : 0.20 ~ 0.40mm (0.008 ~ 0.016in.)

3. Using a ring expander, remove the old piston rings.

4. Clearance all ring grooves thoroughly with a squared-off broken ring or ring groove cleaner with a blade to fit the piston grooves.

   Top ring groove
   1.915 ~ 1.945mm (0.07539 ~ 0.07657in.)
   2nd ring groove
   2.060 ~ 2.080mm (0.08110 ~ 0.08189in.)
   Oil ring groove
   3.020 ~ 3.040mm (0.11889 ~ 0.00968in.)

   File down a blade if necessary.
   Do not use a wire brush to clean the ring grooves, or cut the ring grooves deeper with cleaning tools.

   > **NOTICE**
   >
   > If the piston is to be separated from the connecting rod, do not install new rings yet.

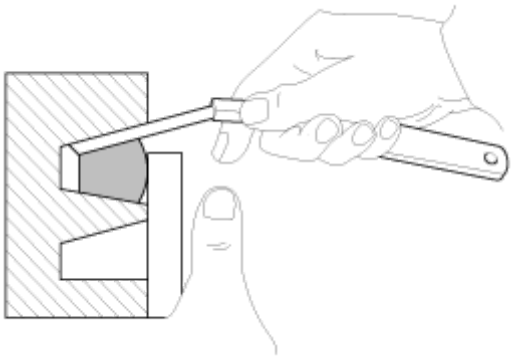
5. Install the piston rings.

   Piston Ring Dimensions
   Top Ring (Standard)
   Width : 2.95 ~ 3.25mm (0.116 ~ 0.128in.)
   Thickness : 2mm (0.079in.)
   Second Ring (Standard)

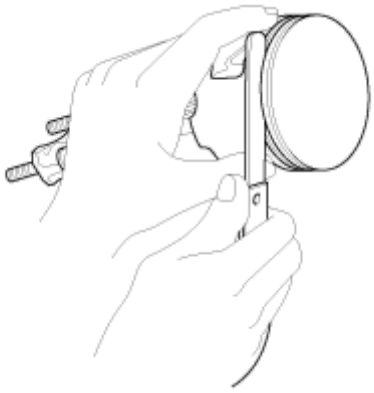
Width : 3.60 ~ 3.90mm (0.142 ~ 0.154in.)
Thickness : 1.970 ~ 1.995mm (0.078 ~ 0.079in.)

6. After installing a new set of rings, measure the ring-to-groove clearances :

Top Ring Clearance
Standard (New)
0.083 ~ 0.137mm (0.00327 ~ 0.00529in.)

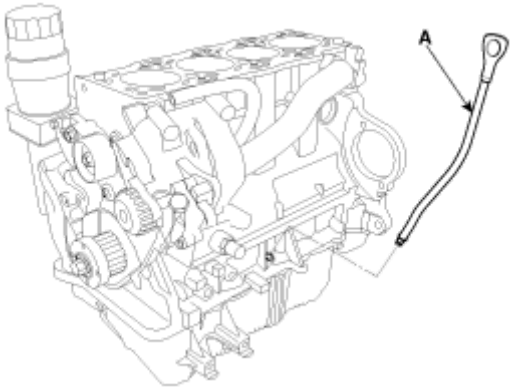


Second Ring Clearance
Standard (New)
0.065 ~ 0.110mm (0.00256 ~ 0.00433in.)
Oil Ring Clearance
Standard (New)
0.03 ~ 0.07mm (0.00118 ~ 0.00275in.)

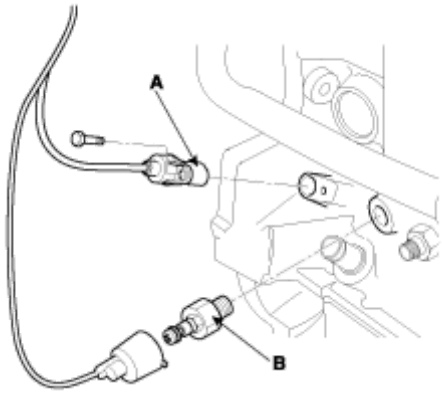


REMOVAL

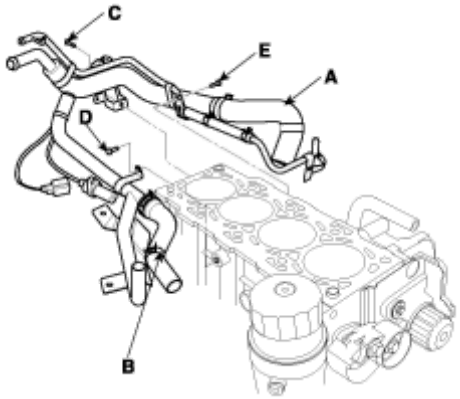
1. Remove the engine and transaxle assembly from the vehicle.(Refer to Engine and transaxle assembly in this Group)
2. Remove the timing belt assembly.(Refer to Timing system in this Group)
3. Remove the intake and the exhaust manifold.(Refer to Cylinder head assembly in this Group)
4. Remove the cylinder head assembly.
5. Remove the alternator. (Refer to Alternator in EEC Group)
6. Remove the engine oil level gauge(A).



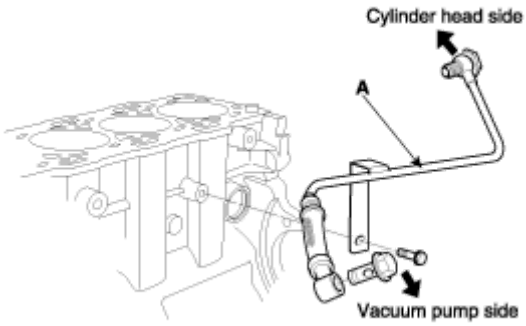
7. Remove the Crankshaft Position Sensor(CKP)(A) and the oil pressure switch(B).



8. Remove the heater and oil cooler return pipe assembly(A) after loosening the hose clamps(B) and the bolts(C, D, E).

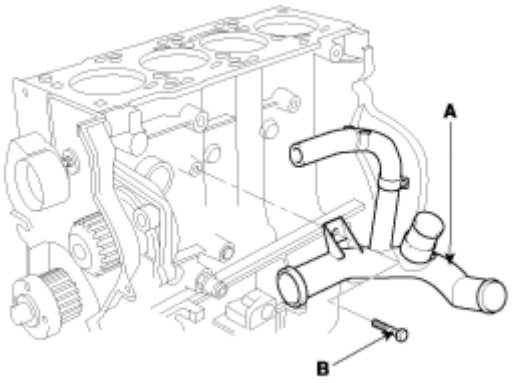


9. Remove the tube(A) between the vacuum pump and the cylinder head.

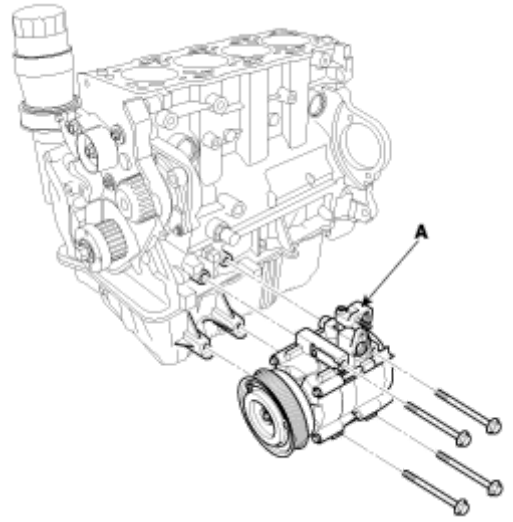


10. Remove alternator lower bracket.

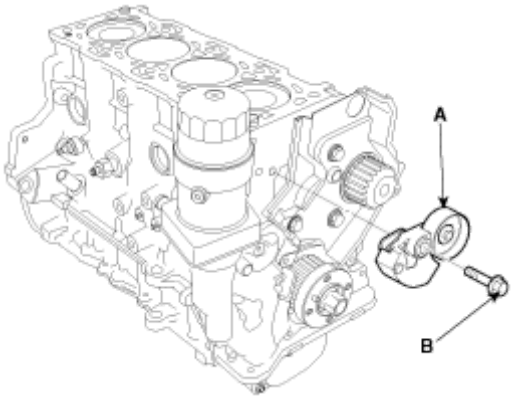
11. Remove the water inlet pipe assembly(A) by loosening a bolt(B) and clamps.



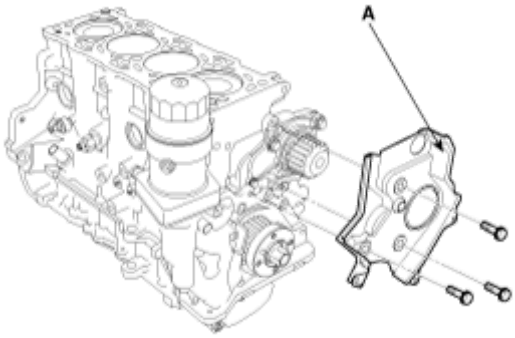
12. Remove the air compressor(A). (See HA group - compressor)



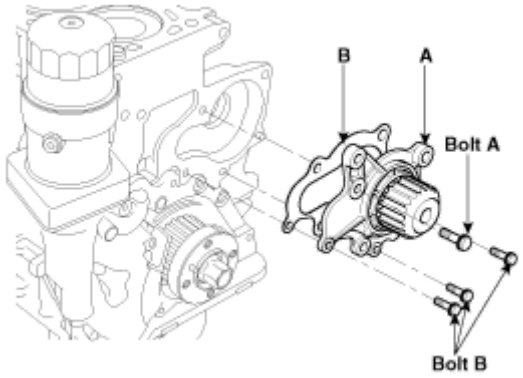
13. Remove the auto-tensioner(A) by loosening the bolt(B).



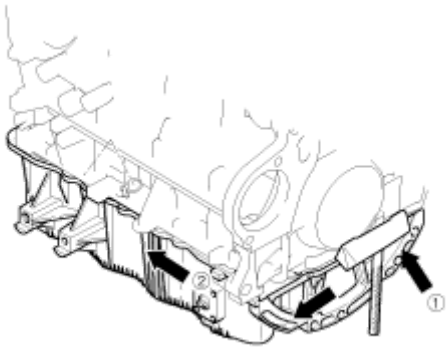
14. Remove the timing belt rear cover(A).



15. Remove the water pump assembly(A) with the gasket(B).



16. Remove the oil pan(A).

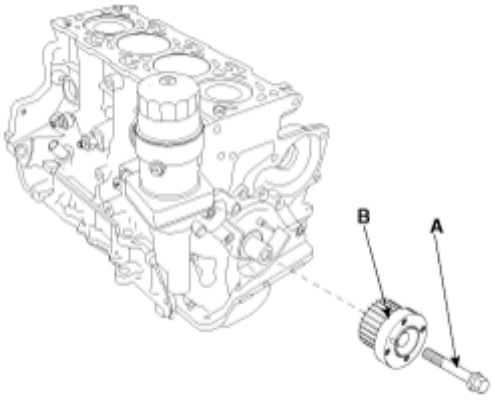


⚠ CAUTION

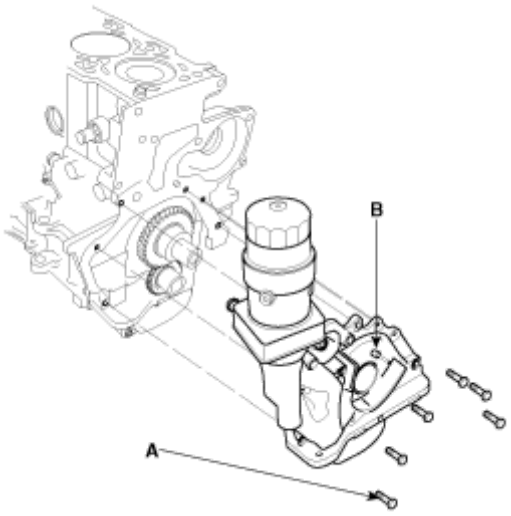
- Insert the SST between the oil pan and the ladder frame by tapping it with a plastic hammer in the direction of ① arrow.
- After tapping the SST with a plastic hammer along the direction of ② arrow around more than 2/3 edge of the oil pan, remove it from the ladder frame.
- Do not turn over the SST abruptly without tapping. It is result in damage of the SST.

17. Remove oil screen for removal of oil pump assembly(B).

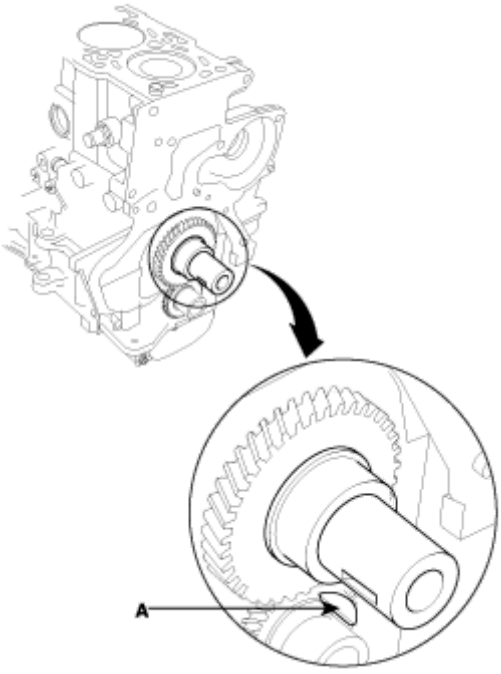
18. Remove the crankshaft bolt(A), then seperate the crankshaft sprocket(B).



19. Remove the oil-pump assembly(B) by loosening the bolts(A).

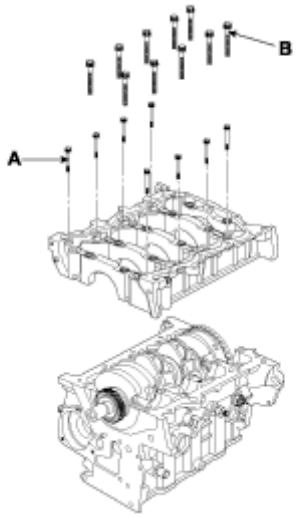


20. Remove the crankshaft key(A).

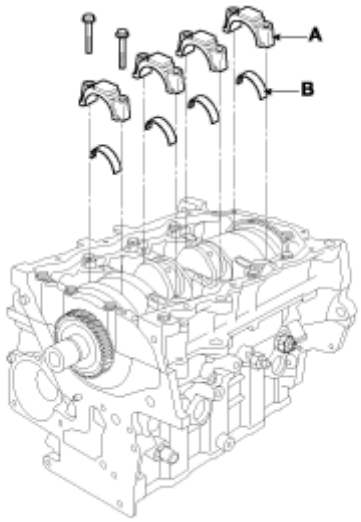


DISASSEMBLY

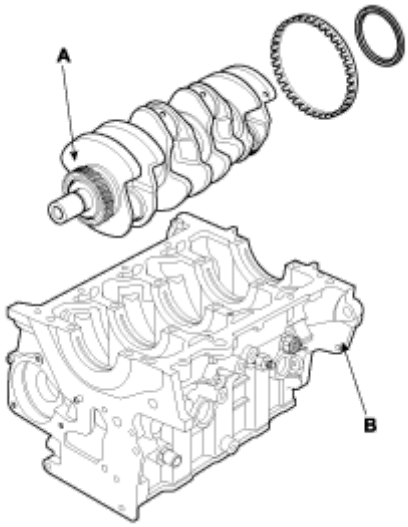
1. Remove the bed plate assembly.
   - Remove the bolts(A).
     To prevent warpage, unscrew the bolts in sequence 1/3 turn at a time : repeat the sequence until all bolts are loosened.
   - Remove the bolts(B).



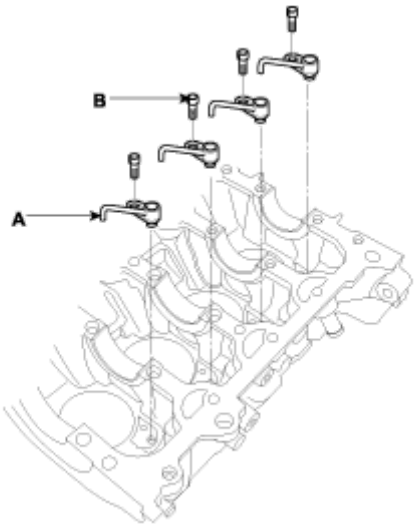
2. Remove the connecting rod bearing caps(A) and bearings(B).
   - After removing No. 1 and 4 connecting rod bearing caps and turn the crankshaft No. 2 and 3 crankpins are at the top.
   - Remove the rest bearing caps and bearings.
   - Keep all caps/bearings in order.



3. If you can feel a ridge of metal or hard cabon around the top of each cylinder, remove it with a ridge reamer. Follow the reamer manufacturer's instructions. If the ridge is not removed, it may damage the pistons as they are pushed out.
4. Drive out the piston assembly from the engine block.
   a. Reinstall the connecting rod bearings and caps after removing each piston/connecting rod assembly.
   b. To avoid mixup on reassembly, mark each piston/connecting rod assembly with its cylinder number.
5. Lift the crankshaft(A) out of the cylinder block(B), being careful not to damage the journals.



6. Remove the piston oil jet(A) by loosening the hexagonal bolt(B) with a hexagonal wrench.



INSPECTION

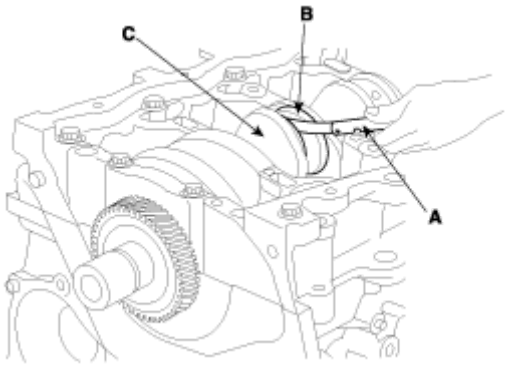
FLYWHEEL

1. Inspect ring gear teeth for wear or damage.
2. Flywheel bolts should be free from detrimental flaws.

Connecting Rod and Crankshaft End Play

1. Measure the connecting rod end play with a feeler gauge(A) between the connecting rod(B) and crankshaft(C).

   Connecting Rod End play
   Standard (New) : 0.10 ~ 0.35mm (0.004 ~ 0.014in.)
   Service Limit : 0.40mm (0.016in.)



2. If the connecting rod end play is out-of-tolerance, install a new connecting rod, and recheck. If it is still out-of-tolerance, replace the crankshaft.
3. If the end play is excessive. Replace parts as necessary.

Main Bearing Clearance

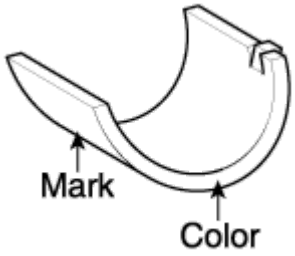
1. To check main bearing-to-journal oil clearance, remove the bed plate, the crankshaft and the bearing halves.
2. Clean each main journal and bearing half with a clean shop towel.
3. Cut plastigauge to the same length as the width of the bearing.
4. Place one strip of plastigauge across each main journal on the cylinder block and the bed plate, avoiding the oil holes.
5. Reinstall the bearings, crankshaft and bed plate then torque the bolts to the specified valve.

> **NOTICE**
>
> Do not rotate the crankshaft during inspection.

6. Remove the bed plate and bearings again and measure the widest part of the plastigauges with a calibrated scale on which an arrow of marks has beeen printed.

Main bearing-to-journal Oil Clearance
Standard (valve)
0.024 ~ 0.042mm (0.0009 ~ 0.0017in.)

> **NOTICE**
>
> **Discrimination of crankshaft main bearing**

Discrimination		SIZE (Thickness of bearing)	Place of identification mark
Class	Mark		
E	YELLOW	1.987~1.990mm (0.0782~0.0783in)	
D	GREEN	1.984~1.987mm (0.0781~0.0782in)	
C	-	1.981~1.984mm (0.0780~0.0781in)	
B	BLACK	1.978~1.981mm (0.0779~0.0780in)	
A	BLUE	1.975~1.978mm (0.0778~0.0779in)	

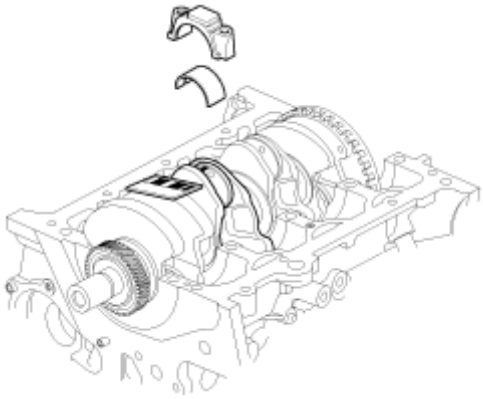
7. If the plastigauge mesaure too wide or too narrow, remove the crankshaft, and remove the upper half of the bearing. Install a new, complete bearing with the same color code(s), and recheck the clearance. Do not file, shim, or scrape the bearings to adjust clearance.
8. If the plastigauge shows the clearance is still incorrect, try the next larger or smaller bearing (the color listed above or below that one), and check again. If the proper clearance cannot be obtained by using the appropriate larger or smaller bearings, replace the crankshaft and start over.

Rod bearing Clearance

1. Remove the connecting rod cap and bearing half.
2. Clean the crankshaft rod journal bearing half with a clean shop towel.
3. Place pastigauge across the rod journal.
4. Reinstall the bearing half and cap, and torque the bolt.

> **NOTICE**
>
> Do not rotate the crankshaft during inspecition.

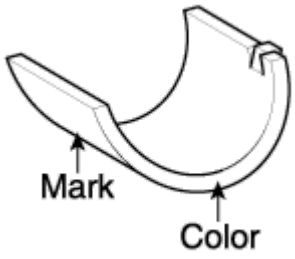
5. Remove the rod cap and bearing half and measure the widest part of the plastigauge.
   Connectinng Rod Bearing-to-Journal Oil
   Clearance : 0.024 ~ 0.042mm (0.0009 ~ 0.0017in.)



6. If the plastigauge measure too wide or too narrow, remove the upper half of the bearing, install a new, complete bearing with the same color code(s), and recheck the clearance. Do not file, shim, or scrape the bearings or the caps to adjust clearance.

> **NOTICE**
>
> **Discrimination of connecting rod bearing**

Discrimination		Size (Thickness of bearing)	Place of Identification
Class	Mark		
E	YELLOW	1.484 ~ 1.487mm (0.0584~0.0585in)	
D	GREEN	1.481 ~ 1.484mm (0.0583~0.0584in)	
		1.478 ~ 1.481mm	

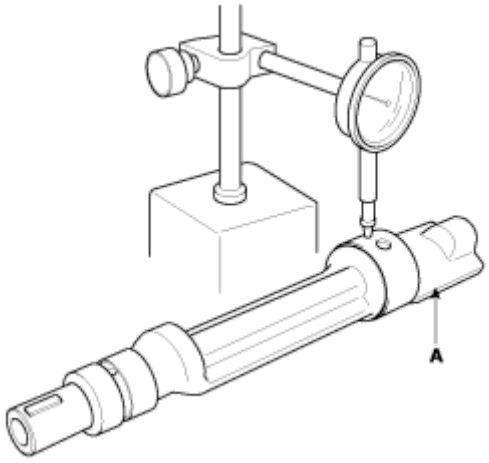
C	WHITE	(0.0582~0.0583in)	
B	BLACK	1.475 ~ 1.478mm (0.0581~0.0582in)	
A	BLUE	1.472 ~ 1.475mm (0.0580~0.0581in)	

7. If the plastigauge shows the clearance is still incorrect, try the next larger or smaller bearins (the color listed above or below that one), and check clearance again. If the proper clearance cannot be obtained by using the appropriate larger or smaller bearing, replace the crankshaft and start over.

Balancer Shafts

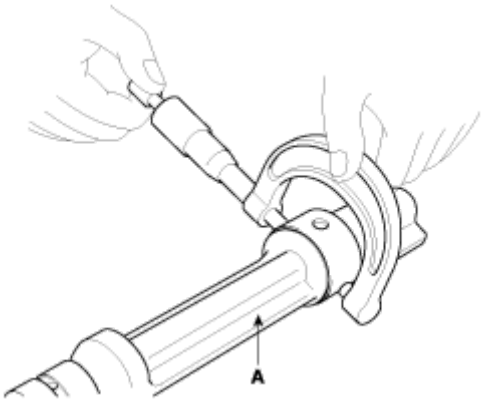
1. Measure runout on the journals of each balance shaft(A) to make sure the balancer shafts are not bent.

   Balancer Shaft Total Indicated Runout
   Standard (New) : 0.025mm (0.00098in.)



2. Measure the diameters of the journals on the balance shafts(A).

   Journal Diameter
   Standard (New)
   No. 1 journal :
   19.980 ~ 19.993mm (0.7866 ~ 0.7871in.)
   No. 2 journal :
   27.99 ~ 28.01mm (1.1020 ~ 1.1028in.)
   No. 3 journal :
   41.99 ~ 42.01mm (1.6531 ~ 1.6539in.)



3. Measure the inner diameters of the bearings for the balance shafts.

   Bearing Inner Diameter
   Standard (New)
   No. 1 journal :
   20.00 ~ 20.02mm (0.7874 ~ 0.7882in.)
   No. 2 journal :
   28.06 ~ 28.08mm (1.1047 ~ 1.1055in.)
   No. 3 journal :
   42.06 ~ 42.08 (1.6559 ~ 1.6567in.)

4. Claculate the shaft-to-bearings oil clearances.
   BEARING I.D - JOURNAL O.D = OIL CLEARANCE

   Shaft-to-Bearings Oil clearance
   Standard (New)
   No. 1 journal :
   0.007 ~ 0.041mm (0.00028 ~ 0.00161in.)
   No. 2 journal :
   0.050 ~ 0.090mm (0.00197 ~ 0.00354in.)
   No. 3 journal :
   0.050 ~ 0.090mm (0.00197 ~ 0.00354in.)

CRANKSHAFT

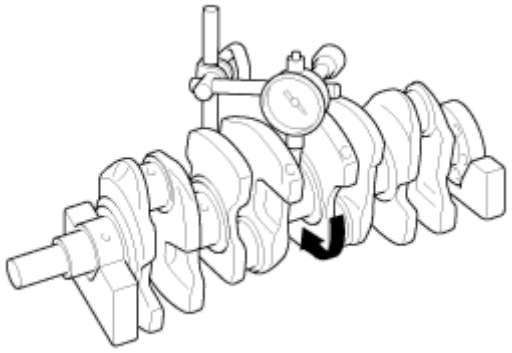
Straightness

NOTICE

- Clean the crankshaft oil passages with pipe cleaners or a suitable brush.
- Check the keyway and threads.

1. Support the crankshaft with V-blocks.
2. Measure runout on all main journals to make sure the crank is not bent. Rotate the cranklshaft two complate revolutions. The difference between measurements on each journal must not be more than the stardard value.

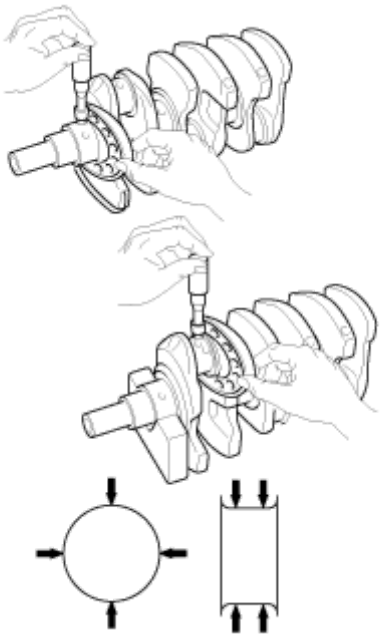
   Crankshaft Total Indicator Runout
   Standard (New) : 0.06mm (0.002in.) max.



Out-of-Round and Taper

1) Measure out-of-round at the middle of each rod and main journal in two places. The difference between measurements on each journal must not be more than the serivce limit.

   Journal Out-of-Round
   Standard (New) : 0.0035mm (0.0001in.) max.

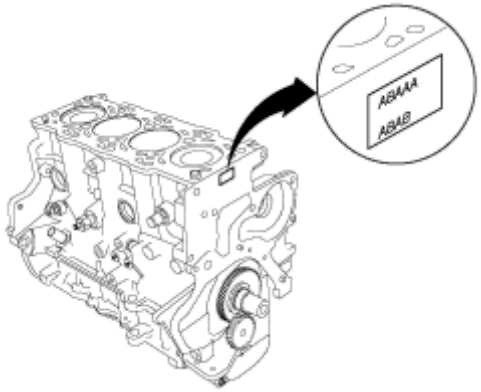


2) Measure taper at the edge of each rod and main journal. The difference between measurements on each journal must not be more than the serive limit.

Journal Taper
Standard (New) : 0.006mm (0.0002in.) max.

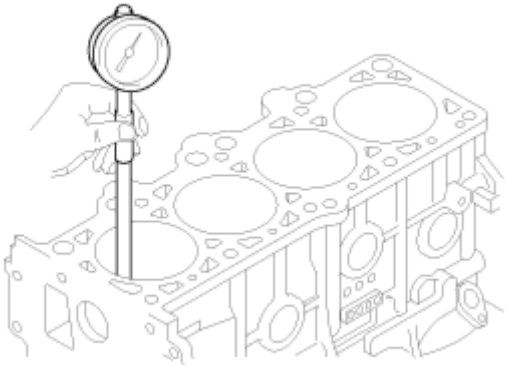
Block and Piston

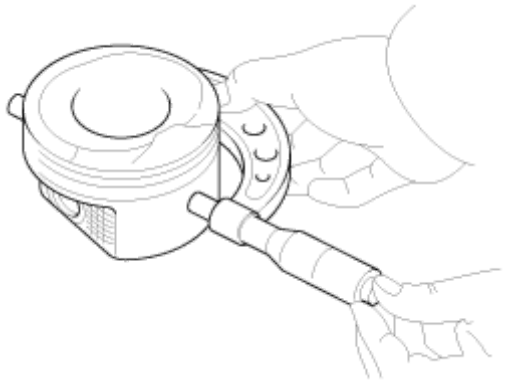
1. Check the piston for distortion or cracks.
2. Measure the piston diameter at a point 10mm (0.4in) from the bottom of the skirt. There are three standard-size pistons (A. B and C). The letter is stamped on the top of the piston. Letters are also stamped on the block as cylinder bore sizes.



Piston Diameter and Cylinder Bore
Standard value :

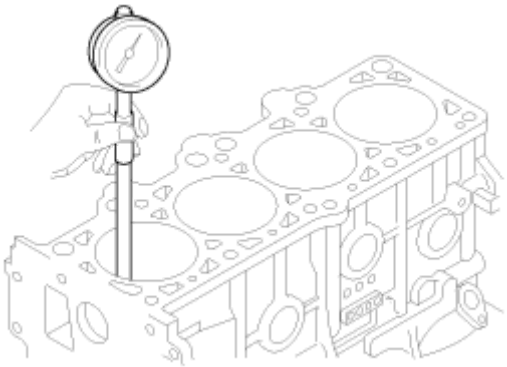
Grade	A	B	C
Piston Outer Diameter	82.92 ~ 82.93mm (3.2646~3.2650in)	82.93 ~ 82.94mm (3.2650~3.2653in)	82.94 ~ 82.95mm (3.2650~3.2657in)
Cylinder Bore	83.00 ~ 83.01mm (3.2677~3.2681in)	83.01 ~ 83.02mm (3.2681~3.2685in)	83.02 ~ 83.03mm (3.2685~3.2686in)
Clearance	0.070 ~ 0.090mm(0.0028~0.0035in)		





3. Measure wear and taper in direction X and Y at three levels in each cylinder as shown. If measurements in any cylinder are beyond the cylinder bore standard value (Refer to the previous page), replace the block. If the block is to be rebored, refer to step 6 after reboring.

   Oversize
   0.25 : 83.250 ~ 83.280mm (3.2776 ~ 3.2787in.)
   0.50 : 83.500 ~ 83.530mm (3.2874 ~ 3.2886in.)
   Bore Taper
   Limit : (Difference betweem first amd thired measurement)
   0.01mm (0.0004in.) MAX.
   Level 1 : No. 1 piston ring position at TDC(Top Dead Center).
   Level 2 : Center of cylinder.
   Level 3: Bottom of cylinder.



4. Scored or scratched cylinder bores must be honed.

5. Check the top of the block for warpage. Measure along the edges and across the center.

   Engine Block Warpage
   Standard (New)
   0.042mm (0.00165in.) for width
   0.096mm (0.00378in.) for legth

0.012mm (0.00047in.)/50×50mm
Service Limit : 0.10mm (0.004in.)

6. Calculate the difference between the cylinder bore diameter and the piston diameter. If the clearance is near or exceeds the standard value, inspect the piston and cyllinder block for excessive wear.

   Piston-to-Cylinder Clearance
   Standard (New) :
   0.070 ~ 0.090mm (0.0028 ~ 0.0035in.)
   Oversize Piston Diameter :
   0.25 : 83.170 ~ 83.200mm (3.2744 ~ 3.2756in.)
   0.50 : 83.420 ~ 83.450mm (3.2882 ~ 3.2881in.)

Cylinder Honing

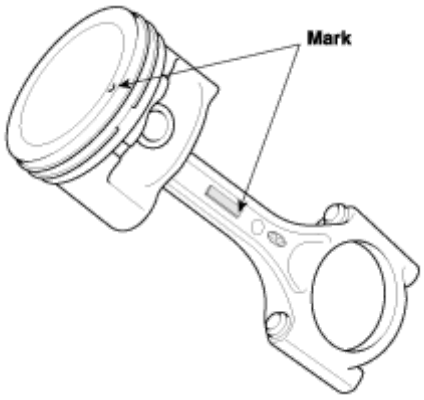
Only a scored or scratched cylinder bore must be honed.

1. Measure the cylinder bores.
   If the block is to be reused, hone the cylinders and remeasure the bores.
2. Hone the cylinder bores with honing oil and a fine stone. Do not use stones that are worn or broken.
3. When honing is complate, thoroughly clean the engine block of all metal particles. Wash the cylinder bores with hot soapy water, then dry and oil them immediately to prevent rusting. Never use solvent, it will redistribute the grit on the cylinder walls.
4. If scoring or scratches are still present in the cylinder bores after honing to the service limit, rebore the cylinder block. Some light vertical scoring and scratching is acceptable if it is not deep enough to catch your fingernail and does not run the full length of the bore.

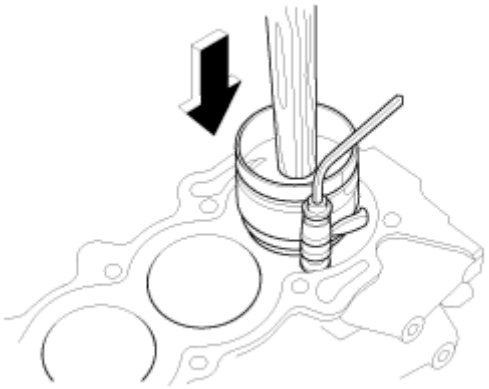
REASSEMBLY

PISTON

1. Remove the connecting rod caps then install the ring compressor and check that the bearing is securely in place.
2. Position the marks facing the timing belt side of the engine.



3. Position the piston in the cylinder and tap it in using the wooden handle of hammer.
   Maintain downward force on the ring compressor to prevent the rings from expanding before entering the cylinder bore.



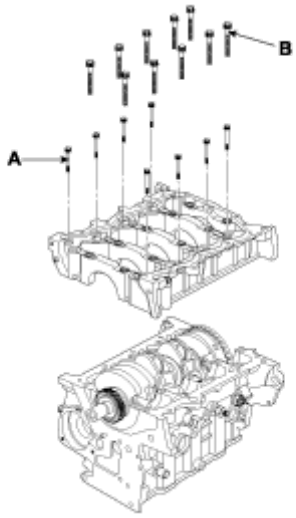
4. Stop after the ring compressor pops free, and check the connecting rod-to-crank journal alignment before pushing the piston into place.
5. Check the connecting rod bearing clearance with plastigauge.
6. Apply engine oil to the bolt threads, then install the rod caps with bearings.

CRANKSHAFT AND BALANCER

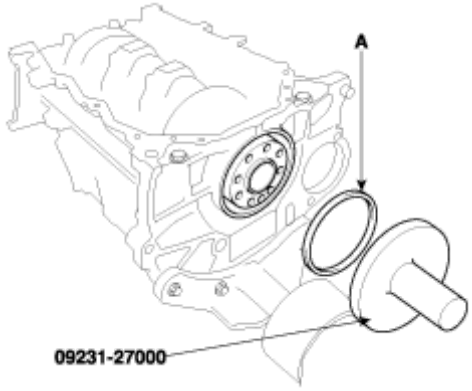
1. Install the oil jets, tightening the hexagon socket head bolts with the torque 9 ~ 13Nm (0.9 ~ 1.3kgf.m, 6.5 ~ 9.4lb-ft)
2. Apply a coat of engine oil to the main bearings.
3. Install the bearing halves in the engine block.
4. Hold the crankshaft so rod journal No. 2 and rod journal No. 3 are straight up.
5. Lower the crankshaft into the block.
6. Install the bearing halves in the bed plate after applying a coat of engine oil.
7. Install the bed plate(C) to the cylinder block after applying the sealant (omniFIT FD2.0, DREIBOND 5105 or HYLOMAR 3000).

   Tightening torque
   15mm(B)
   27.5 ~ 31.4N.m + (2.8 ~ 3.2kgf.m, 20.3 ~23.1lb-ft) + 120°
   12mm(A)
   33.3 ~ 37.3N.m (3.4 ~ 3.8kgf.m, 24.6 ~27.5lb-ft)

> **⚠ CAUTION**
>
> Always use new cylinder head bolts.



8. Rotate the crankshaft clockwise to be seated properly.
9. Check the main bearing clearance with plastigauge.
10. Install the piston and connecting rod assemblies.
    a. Apply coat of engine oil to the connecting rod bearings.
    b. Install the bearing halves in the connecting rods.
    c. Insert the assemblies into the cylinder bores.
    d. Install the connecting rod caps and bolts finger tight
    e. Rotate the crankshaft clockwise, seat the journals into connecting rod No.2 and connecting rod No.3. Install the connecting rod caps and bolts finger tight. Install caps so the bearing recess is on the same side as the recess in the rod.
    f. Check the connecting rod bearing clearance with plastigage.
    g. Apply engine oil to the bolt threads, then install the rod caps within bearings and torque the bolts to 24.5N.m + 90° (2.5kgf.m + 90°, 18.1lb-ft + 90°).
11. Using the SST(09231-27000), install the crankshaft oil seal(A) squarely.

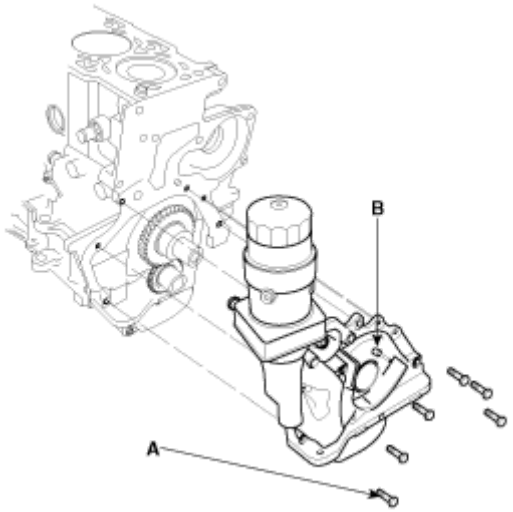


12. Clean and dry the mating surfaces.
    Apply a light coat of oil to the crankshaft and to the lip of the seal.

INSTALLATION

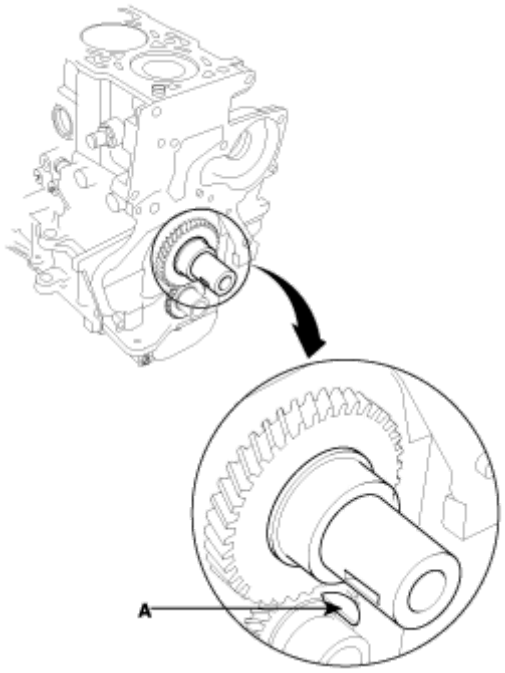
1. Clean and dry the oil pump mating surface.

2. Install the oil pump
   a. Install a new crankshaft oil seal in the oil pump.
   b. Apply liquid gasket evenly to the block mating surface of the oil pump.
      Standard liquid gaskets (or sealants)
      LOCTITE5900 or TB1217H
      - Apply liquid gasket in a wide bead : 2.5 ± 0.5m
      - Apply the liquid gasket without stoping.
      - Assemble the oil pump within 5 minutes after applying.
   c. Grease the lips of the oil seals.
   d. Align the oil pump gear with the crankshaft drive gear and install the oil pump(B).
      Tightening torque(A)
      19.6 ~ 26.5N.m (2.0 ~ 2.7kgf.m, 14.5 ~ 19.51lb-ft)



   e. Clean the excess grease off the crankshaft and check the seals for distortion.

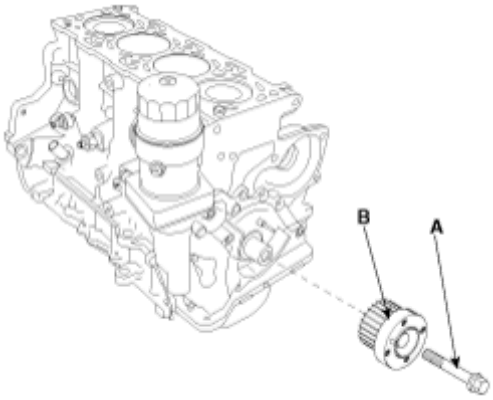
3. Install the crankshaft key(A) on the crankshaft assembly.



4. Insert the crankshaft sprocket(B) then tighten the crankshaft bolt(A).

Tightening torque
196.1 ~ 205.9N.m (20.0 ~ 21.0kgf.m, 144.7 ~ 151.9lb-ft)

> **NOTICE**
>
> Align the timing mark on the sproket.



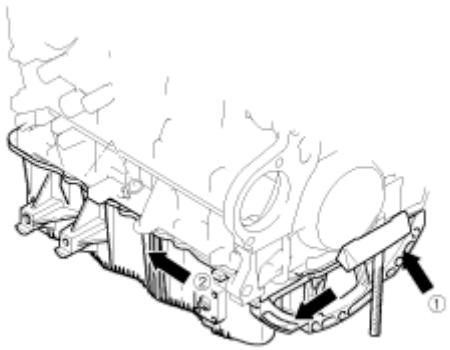
5. Install oil screen.

> **NOTICE**
>
> The bolt B should be tightened after the installation of the bolt A.

6. Clean and dry the bed plate and the oil pan mating surfaces.
7. Apply liquid gasket evenly to the bed plate mating surface of the oil pan. Install the oil pan.

> **NOTICE**
>
> - Standard liquid gasket : LOCTITE 5900 or TB1217H
> - Assemble the oil pan in 5 mimutes after applying the liquid gasket.
> - Apply liquid gasket in a 3mm wide bead without stopping.
> - The clearance between the liquid gasket end and the flange inner end at T-joint should be 2~3mm(2places)

8. Tighten the bolt in two or three steps. In the final step, tighten all bolts.
Tightening torque
9.8 ~ 11.8N.m (1.0 ~ 1.2kgf.m, 7.2 ~ 8.7lb-ft)

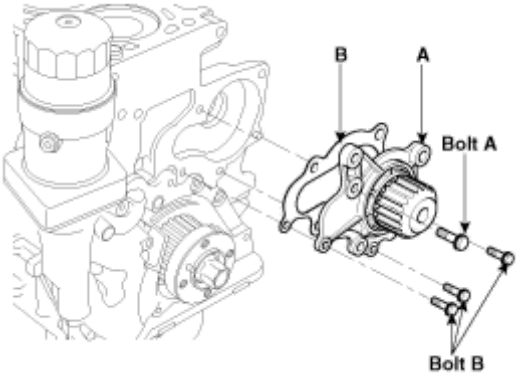


> **NOTICE**

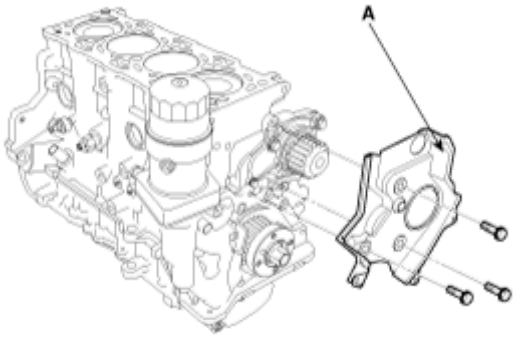
After installing the oil pump assembly and the oil pan, remove the oil cooler and fill the 50cc engine oil.

9. Install water pump(A) with new gasket(B).

Tighten torque
Bolt A
47.1 ~ 51.0N.m (4.8 ~ 5.2kgf.m, 34.7 ~ 37.6lb-ft)
Bolt B
9.8 ~ 11.8N.m (1.0 ~ 1.2kgf.m, 7.2 ~ 8.7lb-ft)

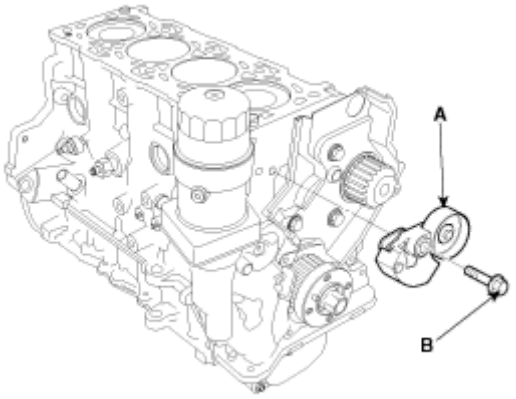


10. Install the timing belt rear cover(A).

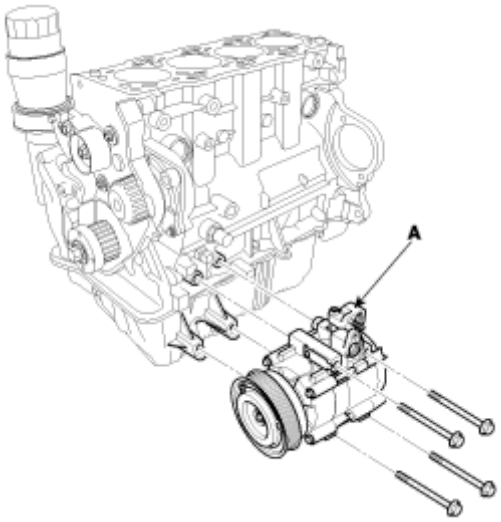


11. Install the auto-tensioner(A).

Tightening torque
Pivot bolt(B)
49.0 ~ 53.9N.m (5.0 ~ 5.5kgf.m, 36.2 ~ 39.8lb-ft)
Stop bolt
9.8 ~ 11.8N.m (1.0 ~ 1.2kgf.m, 7.2 ~ 8.7lb-ft)



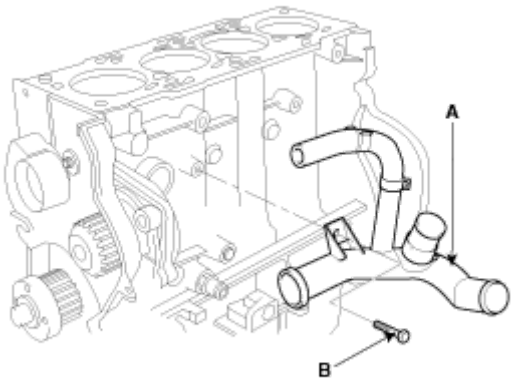
12. Install the air compressor(A). (Refer to Compressor in HA Group)



13. Install the water inlet pipe assembly(A), tightening the bolt(B).

Tightening torque

19.6 ~ 26.5N.m (2.0 ~ 2.5kgf.m, 14.5 ~ 19.5lb-ft)



14. Install the heater and oil cooler return pipe(A) assembly.

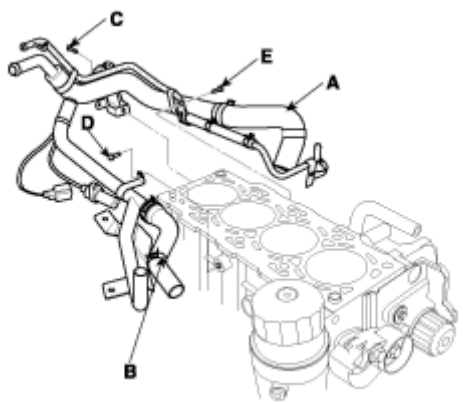
Tightening torque

Rear side bolt and left side bolt(C, D)

19.6 ~ 26.5N.m (2.0 ~ 2.5kgf.m, 14.5 ~ 19.5lb-ft)

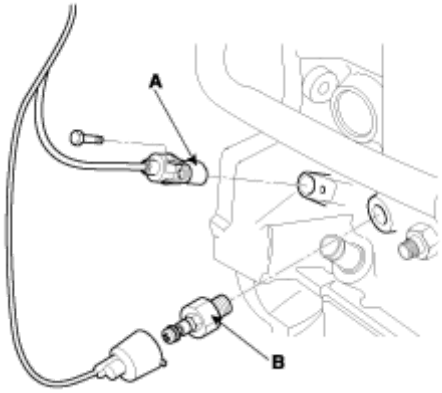
Right side bolt(E)

7.8 ~ 9.8N.m (0.8 ~ 1.0kgf.m, 5.8 ~ 7.2lb-ft)



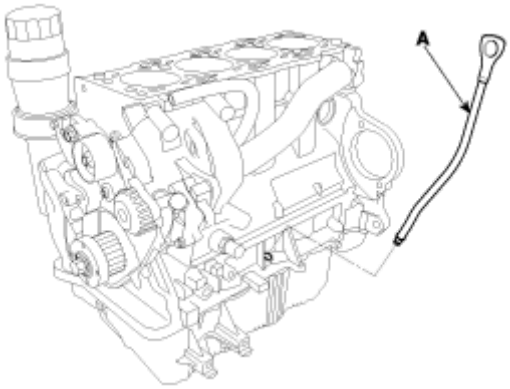
15. Install the Crankshaft Position Sensor(CKP)(A) and the oil pressure switch(B).

Tightening torque
(A) : 3.9 ~ 5.9N.m (0.4 ~ 0.6kgf.m, 2.9 ~ 4.3lb-ft)
(B) : 14.7 ~ 21.6N.m (1.5 ~ 2.2kgf.m, 10.8 ~ 15.9lb-ft)



16. Install the cylinder head assembly.
17. Install the intake/exhaust manifold assemblies.
18. Install the oil level gauge(A).

Tightening torque
9.8 ~ 11.8N.m (1.0 ~ 1.2kgf.m, 7.2 ~ 8.7lb-ft)



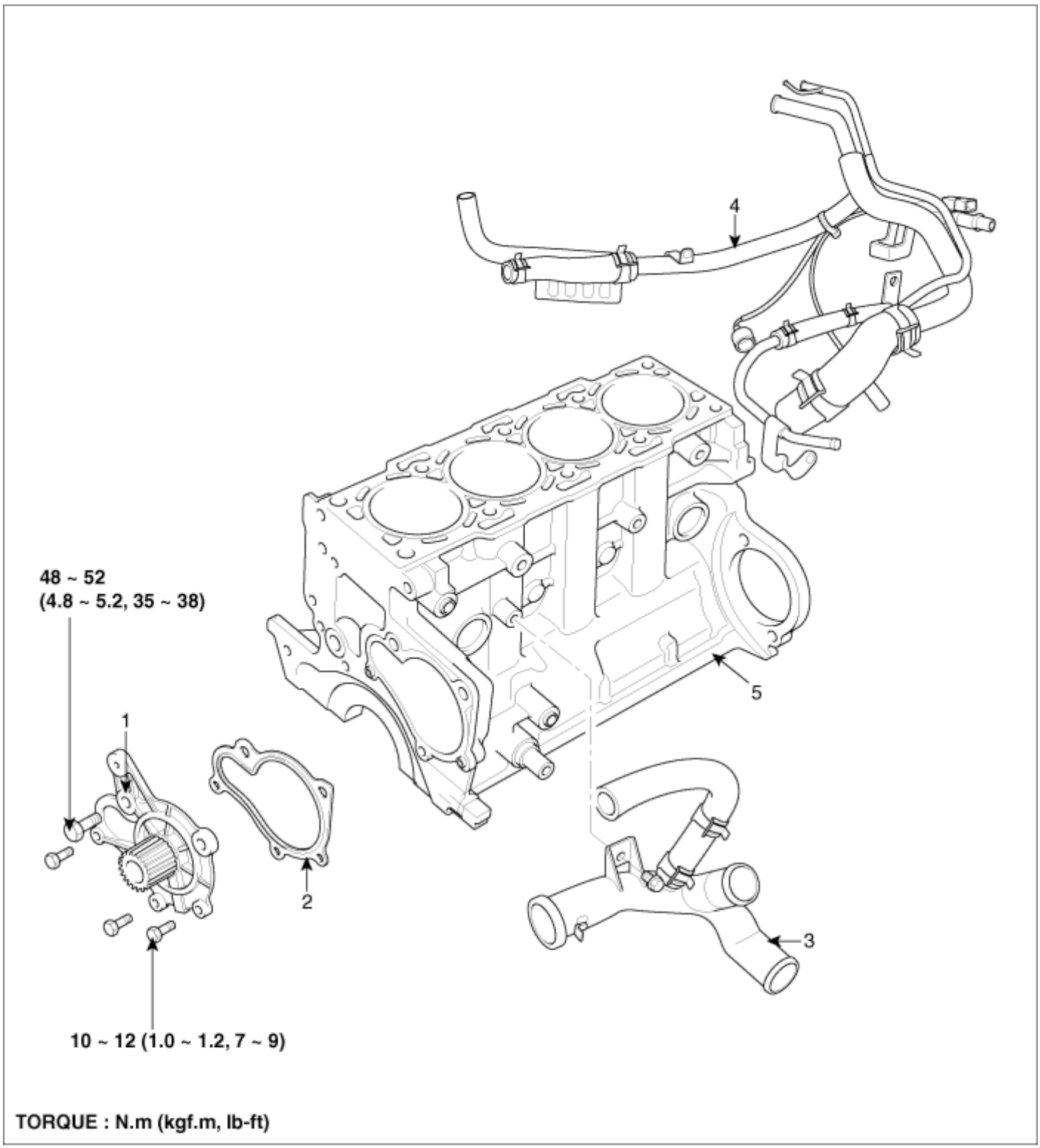
NOTICE

Apply engine oil to O-ring before assembly.

19. Install the timing belt assembly.

English

COMPONENTS



1. Coolant pump
2. Gasket
3. Coolant inlet pipe
4. Coolant hose & pipe
5. Cylinder block

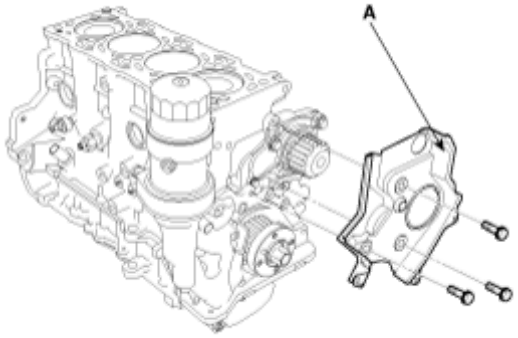
REMOVAL

Water Pump

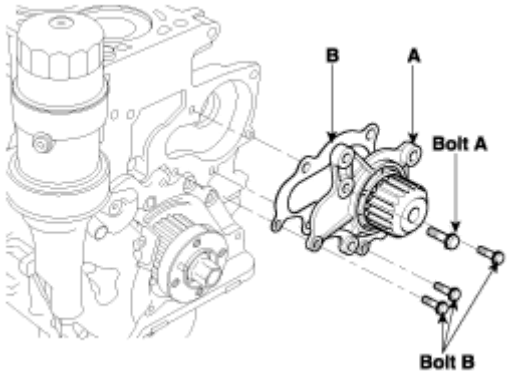
1. Remove radiator cap to speed drain.
2. Drain the engine coolant after removing drain plug(A).



3. Remove the timing belt.
4. Remove the timing belt rear cover(A).



5. Remove the water pump(A) with the gasket(B) by removing four bolts. (One bolt A and three bolt B)



6. Inspect, repair and clean the mating surface on the engine block.
7. Install the water pump, with a new gasket in the reverse order of removal.

   Tightening torque

   For timing belt rear cover

English ▼

7.8 ~ 11.8N.m (0.8 ~ 1.2kgf.m, 5.8 ~ 8.7lb-ft)
For water pump
Bolt A :
47.1 ~ 51.0N.m (4.8 ~ 5.2kgf.m, 34.7 ~ 37.6lb-ft)
Bolt B :
9.8 ~ 11.8N.m (1.0 ~ 1.2kgf.m, 7.2 ~ 8.7lb-ft)

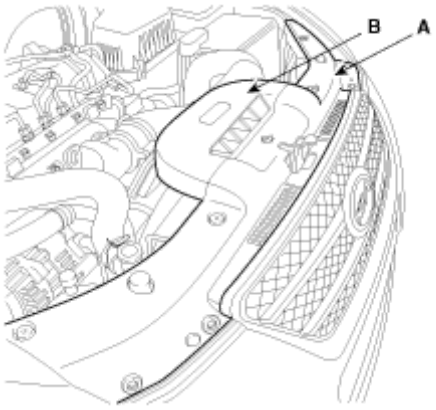
8. Clean the spilled engine coolant.

RADIATOR

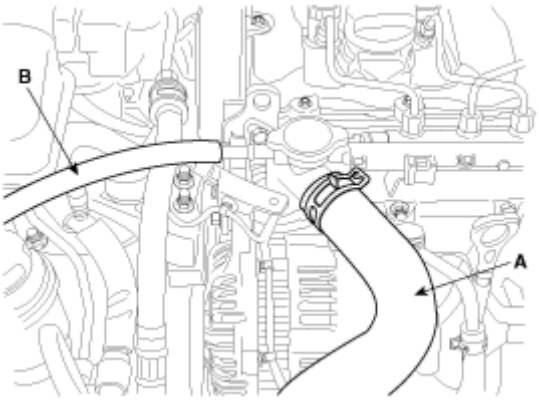
1. Remove the radiator cap to speed draining.
2. Loosen the radiator drain plug (A) and drain engine coolant.
   Tightening torque
   7.8 ~ 15.7N.m (0.8 ~ 1.6kgf.m, 5.8 ~ 11.6lb-ft)



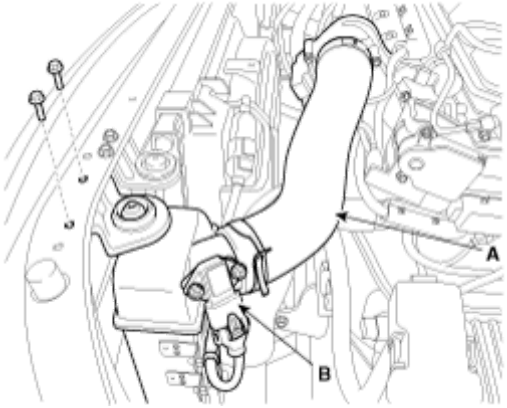
3. Remove the front bumper upper cover (A) and the air duct (B).
   Tightening torque
   7.8 ~ 9.8N.m (0.8 ~ 1.0kgf.m, 5.8 ~ 7.2lb-ft)



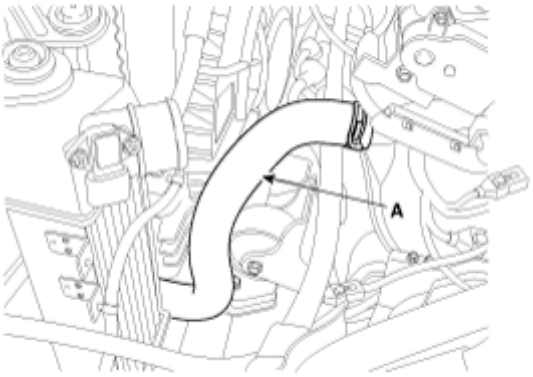
4. Remove the radiator upper hoses(A) and the coolant bleed hose(B).



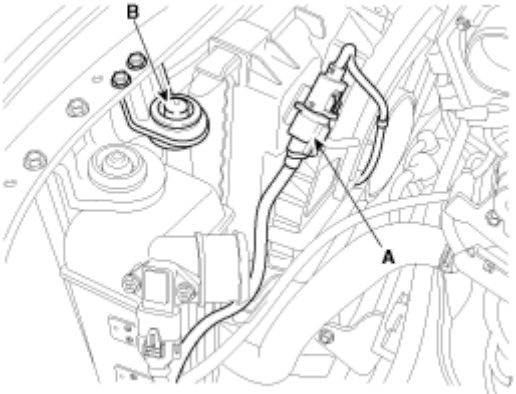
5. Remove the intercooler hose (A).



6. Remove the radiator lower hose(A).



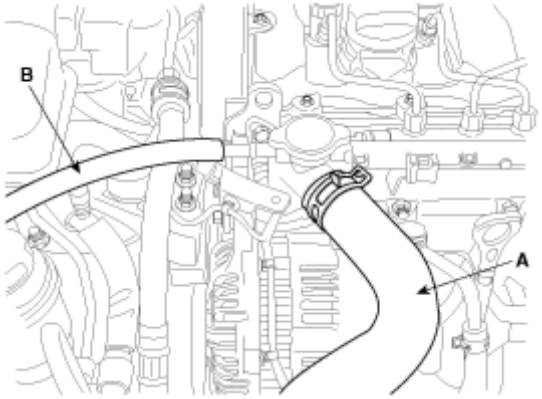
7. Disconnect the fan motor connector (A) and remove the radiator mounting bracket (B).



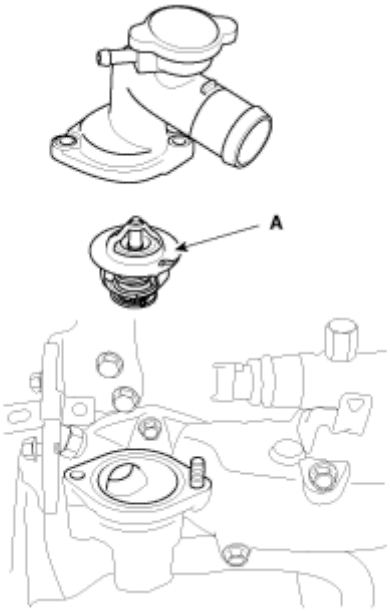
8. Pull radiator upper from engine room.
9. Install is in the reverse order of removal.

THERMOSTAT

1. Drain the engine coolant.
2. Remove the radiator upper hose(A) and coolant bleeder hose(B).



3. Remove the coolant inlet fitting.
4. Remove the thermostat(A).



5. To install, reverse the removal order with a new gasket.

INSPECTION

Thermostat

Replace the thermostat if it is open at room temperature.

1. Immerse thermostat in water heated to over 95°C (203°F), then heat for at least 3 minutes to check valve lift.



NOTICE

- Do not use water below 95°C (203°F).
- Do not directly heat unit as this will damage thermostat.

2. Heat the water and check the temperature with the thermomster. Check the temperature at which the thermostat first opens, and at which it is fully open.

3. Measure the lift height of the thermostat when it is fully open.

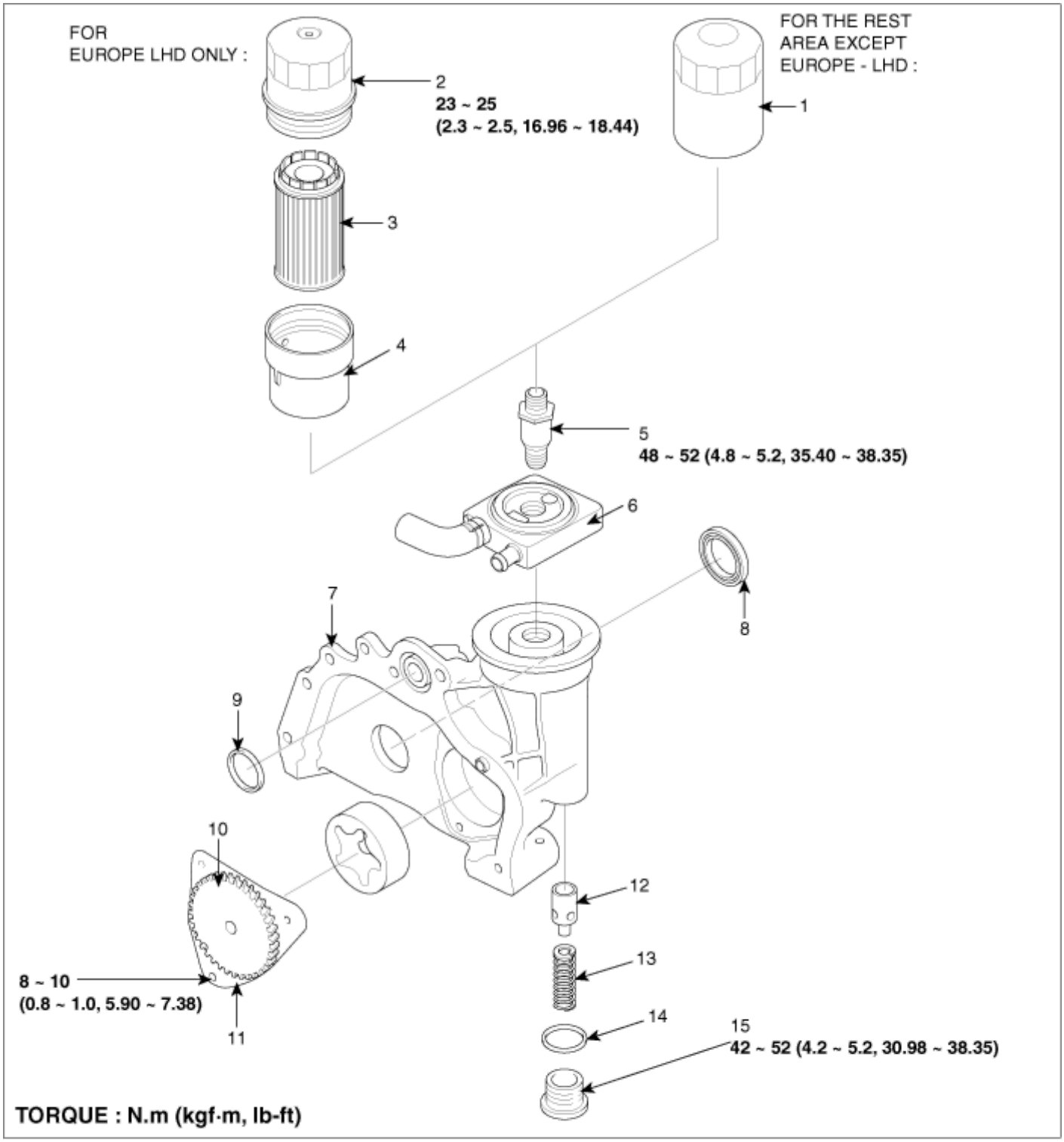
   STANDARD THERMOSTAT
   Lift height : above 8.0mm (0.31in.)
   Starts opening: 85 ± 1.5°C (185 ± 34.7°F)
   Fully open : 100°C (212°F)

ENGINE OVERHEAT TROUBLESHOOTING

Inspection		Remedy
Visual inspection	Inspect for shortage of coolant in reservoir tank .	Reinspect after replenishing coolant.
	Inspect for coolant pollution after removing radiator cap. **CAUTION** Be careful when removing radiator cap from overheated vehicle.	Reinspect after replacing coolant.
	Inspect for leakage and loose coolant hoses (radiator hose, heater hose, oil cooler hose, etc.).	Reinspect for leakage after reinstalling hoses and clamps.
	Inspect for leakage on water inlet fitting mounting part.	Reinspect for leakage after replacing O-ring. Reinspect for leakage after tightening to the specified torque.
	Inspect drive belt (for normal operation of water pump).	Adjust drive belt tension or replace.
	Inspect for leakage on water pump gasket mounting part.	Reinspect for leakage after replacing gasket. Reinspect for leakage after tightening to the specified torque.
	Inspect for loose coolant temperature sensor, cooling fan connector and pin.	Reinstall loose connector. Replace relevant part if connector pin is damaged.
	Inspect operation status of cooling fan. - Check operation status by switching ON/OFF the heater control A/C. **Information** Will not operate in cold ambient temperature.	Check mounting status of ground cable.
Diagnostic device	Inspect self-diagnostic code using KDS/GDS.	Check coolant temperature sensor, wiring, connector, etc.
Unit inspection	Inspect water pump impeller.	Replace water pump.
	Inspect for foreign materials and status of thermostat valve.	Inspect unit after removing foreign materials.
	Inspect for stuck thermostat valve. - Immerse thermostat in water heated to over 95°C (203°F), then heat for at least 3 minutes to check valve lift. **NOTICE**	Check valve lift. - Replace thermostat if valve lift is below specification or valve is stuck.

	• Do not use water below 95°C (203°F). • Do not directly heat unit as this will damage thermostat.	English ▼

COMPONENTS



1. Oil filter assembly
2. Oil filter upper cap
3. Oil filter
4. Oil filter lower case
5. Oil filter fitting
6. Oil cooler
7. Oil pump housing
8. Oil seal
9. O-ring
10. Oil pump drive gear
11. Oil pump cover
12. Relief plunger
13. Relief spring
14. Relief cap washer
15. Relief cap

REPLACEMENT

Engine Oil Filter

NOTICE

There are two kinds of oil filters. One is for Europe LHD and the orther is for the rest area except Europe LHD (Left Hand Drive).

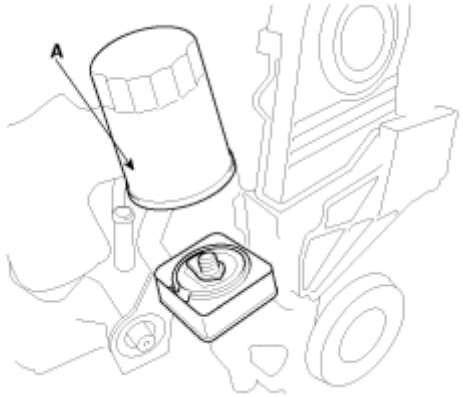
For Europe LHD :

1. Remove the oil filter upper cap from lower case with SST(09263-2E000 the oil filter wrench.).
2. Inspect the threads and rubber packing. Wipe off the seat on the oil filter assembly, then apply a light coat of oil to the oil filter assembly upper cap packing.
3. Install the new oil filter by hand to the upper cap.
4. After the rubber seal seats, tighten the oil filter clockwise with the special tool.

   Capacity
   Total : 7.4 L (7.82 US qt, 6.51 Imp qt)
   Oil pan : 6.2 L (6.55 US qt, 5.45 Imp qt)
   Drain and refil including oil filter : 6.7 L (7.08 US qt, 5.89Imp qt)

For the rest area except Eurpe LHD :

1) Remove the oil filter(A) with the SST(09263-27000, the oil filter wrench).



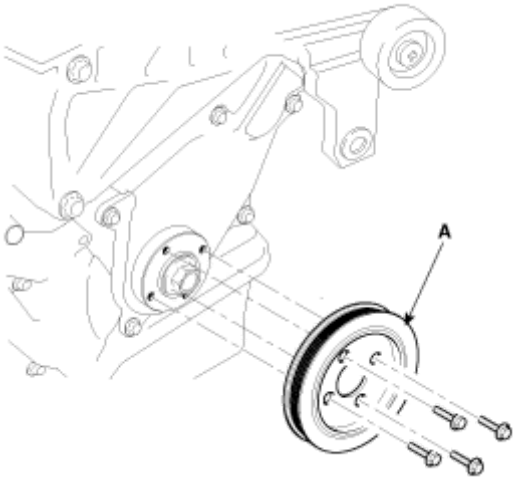
2) Inspect the threads and the packing on the apply a light coat of new oil filter. Wipe off the seat.
3) Install the new oil filter by hand.
4) After the packing seats, tighten the oil filter clockwise with the SST(09263-27000).

REMOVAL

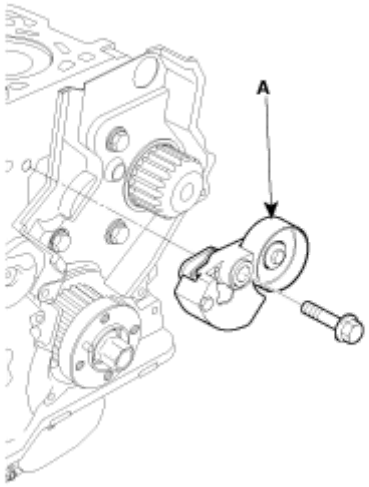
OIL PUMP

1. Drain the engine oil.
2. Remove the crankshaft pulley(A).

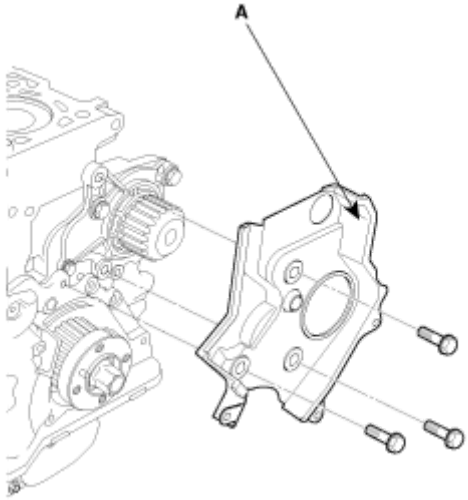
English ▼



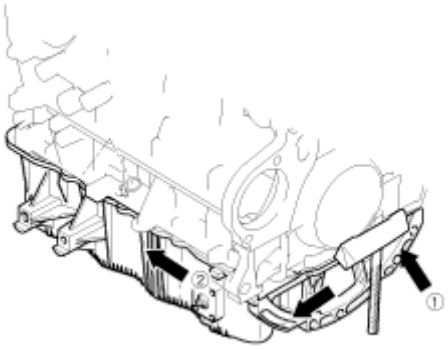
3. Remove the timing belt assembly.
4. Remove the timing belt tensioner(A).



5. Remove the timing rear cover(A).



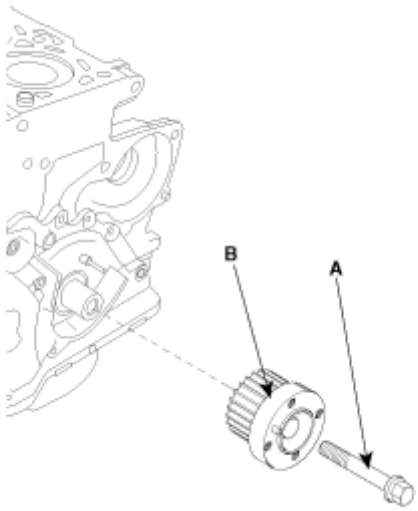
6. Separate oil pan(A).



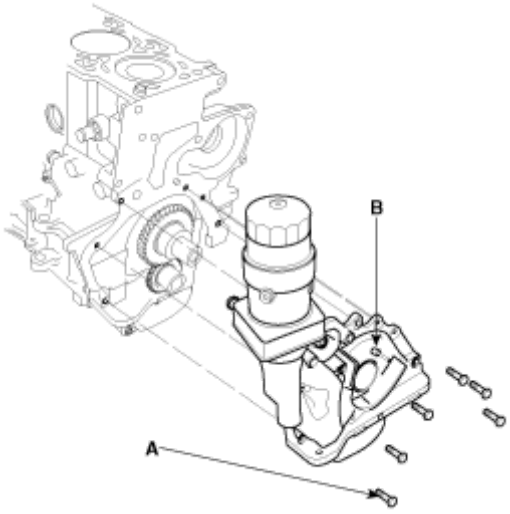
⚠ CAUTION

- Insert the SST between the oil pan and the ladder frame by tapping it with a plastic hammer in the direction of ① arrow.
- After tapping the SST with a plastic hammer along the direction of ② arrow 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 is result in damage of the SST.

7. Remove the oil screen.
8. Remove the crankshaft sproket(B) with bolt(A).



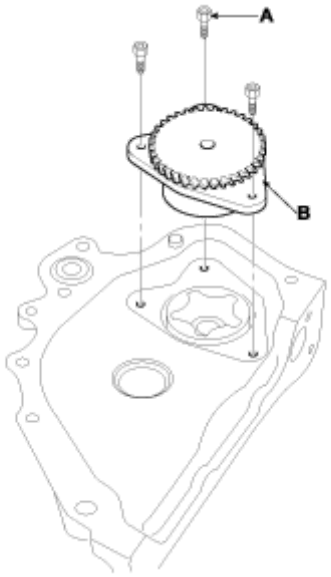
9. Remove the mounting bolts(A) and the oil pump assembly(B).



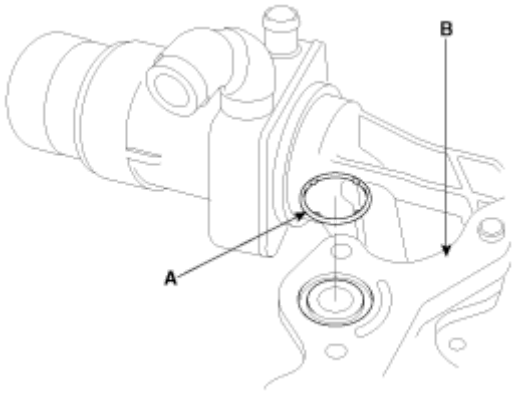
DISASSEMBLY

OIL PUMP

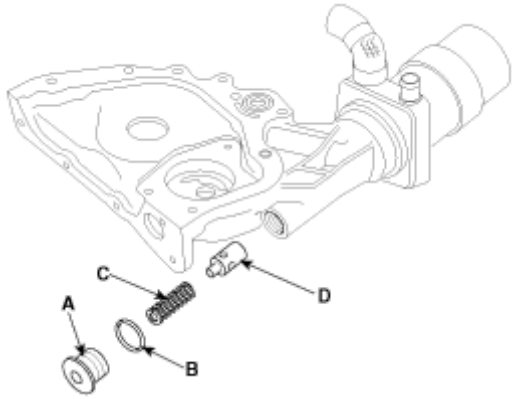
1. Remove the three hexagon socket head bolts(A) from the oil pump cover(B).



2. Remove the out rotor from the oil pump housing.
3. Remove the old oil seals from the oil pump housing.
4. Remove the O ring(A) from the oil pump housing.



5. Remove the relief cap(A), relief cap washer(B), relief spring(C) and relief plunger(D).



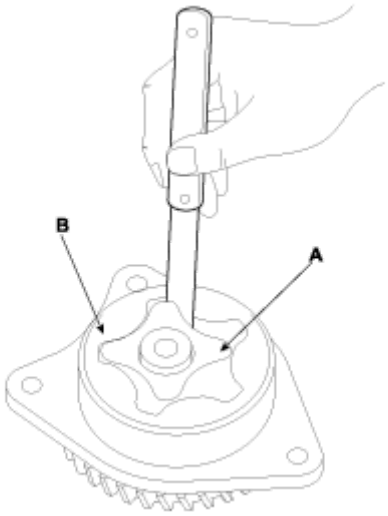
6. Remove the oil filter. Refer to the engine oil filter replacement.
7. Remove the oil cooler and hose assembly after seperating the oil filter fitting.

INSPECTION

OIL PUMP

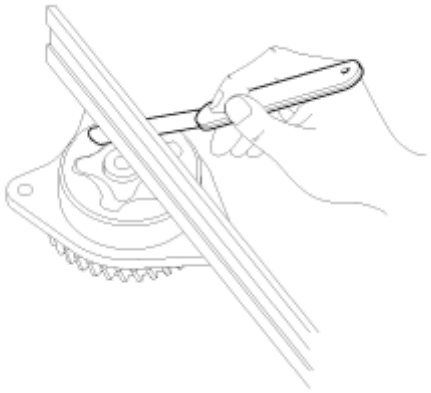
1. Check the inner-to-outer rotor tip clearance between the inner rotor(A) and outer rotor(B). If the inner-to-outer rotor clearance exceeds the service limit, replace the inner and outer rotors.

   Inner Rotor-to-Outer Rotor tip Clearance
   Standard (New)
   0.08mm (0.00315in.)



2. Check the housing-to-rotor axial clearance between the rotor and oil pump cover housing. If the housing-to-rotor axial clearance exceeds the service limit, replace the set of inner and outer rotors and/or the pump housing.

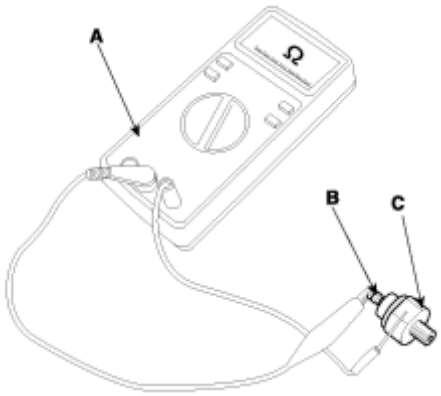
   Housing-to-Rotor Axial Clearance
   Standard (New)
   0.020 ~ 0.070mm (0.00079 ~ 0.00276in.)



3. Inspect both rotors and the oil pump cover housing for scoring or other damage. Replace parts if necessary.

OIL PRESSURE SWITCH

1. Remove the oil pressure switch from the engine block.
2. Connect a tester (ohm range) between the terminal and the body of the switch to check for continuity. The switch is normal if there is continuity. If they is no continuity, replace the switch.

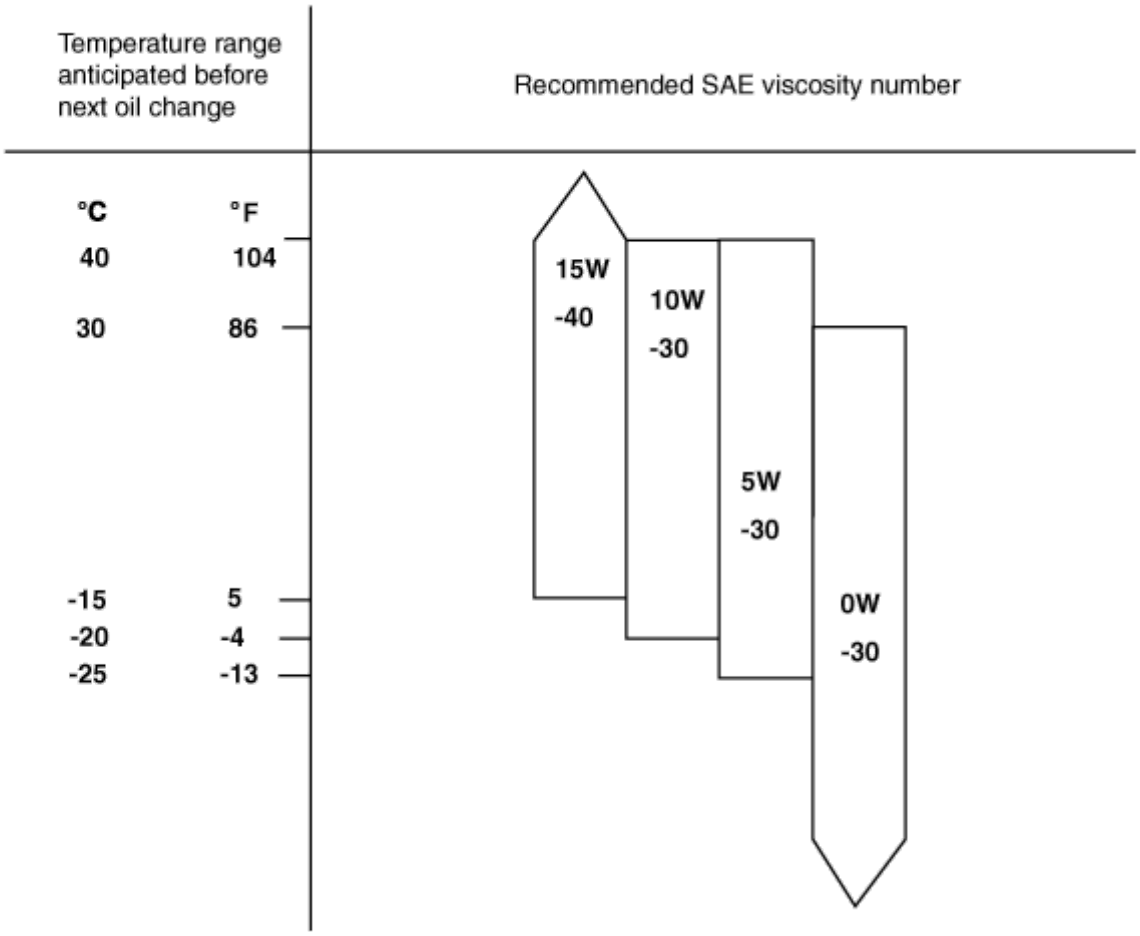


3. Insert a thin rod in the oil hole of the switch and push it in lightly. The switch is normal of no continuity as detected (infinite resistance on the tester). If there is continuity, replace the switch.



SELECTION OF ENGINE OIL

ACEA classificaton : C3 (with CPF), B4 (without CPF)
SAE viscosity grades : Refer to the recommended SAE viscosity number



NOTICE

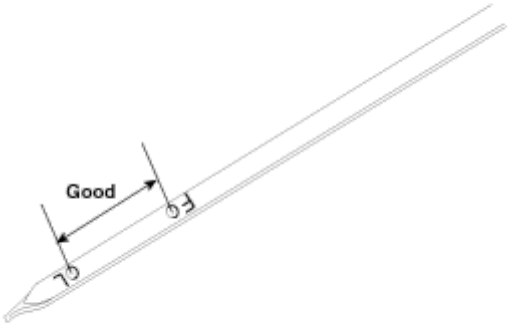
For best performance and maximum protection of all types of operation, select only those lubricants which :
1. Satisfy the requirement of the ACEA classification.
2. Have proper SAE grade number for expected ambient temperature range.
   - Lubricants that do not have both an SAE grade number and ACEA service classification on the container should not be used.
   - The ACEA certified engine oil is required as a service engine oil. Only in case that ACEA certified engine oil is not available, the API certified engine oil (API CH-4 or above) is allowed restrictively.
   - For the vehicle equipped with CPF, the service engine oil quality should meet the ACEA C3 grade. However, oil refill with small amount of ACEA B4 grade between oil change intervals is possible.

ENGINE OIL

1. Park the vehicle on the flat ground.
2. Turn the engine off.
3. The oil level should be between the 'L' and 'F' marks on the dipstick, then.
   If low, check for leakage and add oil up to the "F" mark.

NOTICE

When refill the engine oil, use the same type engine oil with current engine oil.



4. Check the oil for deterioration, entry of coolant or fuel, and engine oil viscosity.

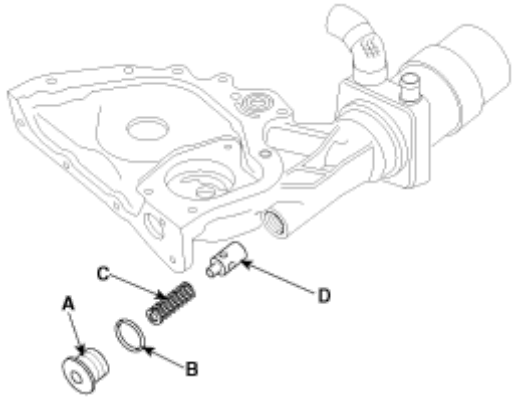
REASSEMBLY

OIL PUMP

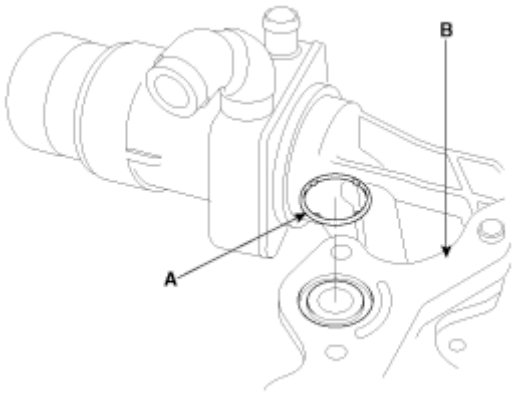
1. Insert the relief plunger(D), the relief spring(C) and the relief cap washer(B). Then torque the relief cap(A).

   Tightening torque

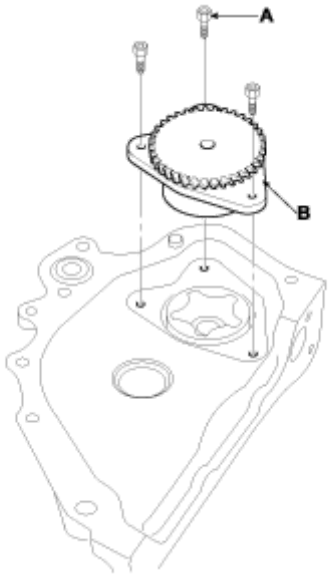
   41.2 ~ 51.0N.m (4.2 ~ 5.2kgf.m, 30.4 ~ 37.6lb-ft)



2. Install the new O ring(A) to the oil pump housing(B) after applying engine oil.



3. Assemble the inner/outer rotors with engine oil the drive gear and the oil pump cover.
4. Install the oil pump cover(B)assembly to the oil pump housing with the three hexagon socket head bolts(A).



5. The oil seal which was disassembled in 'Disassembly' step is recommended to be installed after the installation of the crankshaft.

INSTALLATION

1. Install the oil pump assembly and the oil pan on the cylinder block.
   Tightening torque
   19.6 ~ 26.5N.m (2.0 ~ 2.7kgf.m, 14.5 ~ 19.5lb-ft)

   > **NOTICE**
   >
   > Standard liquid gasket : LOCTITE 5900 or TB1217H

2. Install the oil screen.

3. Install the oil pan.
   Tightening torque
   9.8 ~ 11.8N.m (1.0~ 1.2kgf.m, 7.2 ~ 8.7lb-ft)

   > **NOTICE**
   >
   > Standard liquid gasket : LOCTITE 5900 or TB1217H
   > Assemble the oil pan in 5 minutes after applying the liquid gasket.
   > Apply liquid gasket in a 3mm wide bead without stopping.
   > Te clearance between the liquid gasket end and the flange inner end at T-joint should be 2 ~ 3mm.(2places)

4. Fill the engine oil in the room below the oil cooler (50cc).

5. Tightening the oil filter fitting, install the oil cooler and hose assembly.

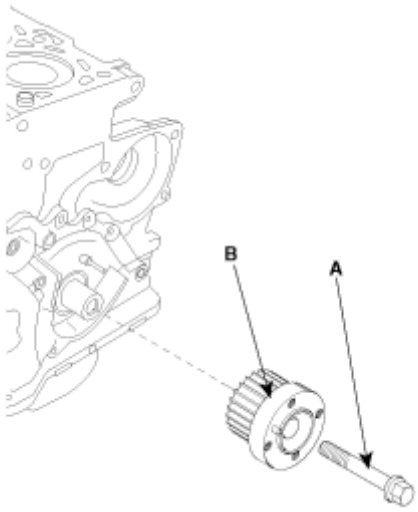
   > **NOTICE**
   >
   > Before assembling the oil cooler apply engine oil on the O-ring.

   Tightening torque
   47.1 ~ 51.0N.m (4.8 ~ 5.2kgf.m, 34.7 ~ 37.6lb.ft)

6. Install the oil filter after applying engine oil on the O-ring.

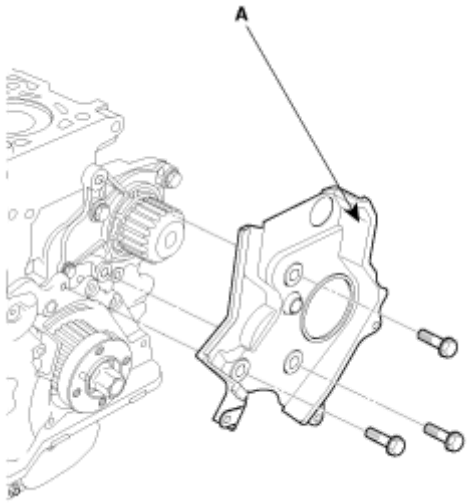
7. Install the crankshaft sprocket(B) with bolt(A).

   Tightening torque
   196.1 ~ 205.9N.m (20.0 ~ 21.0kgf.m, 144.7 ~ 151.9lb-ft)



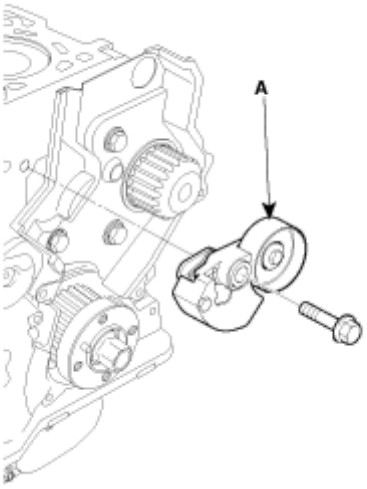
8. Install the timing belt rear cover(A).

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



9. Install the auto tensioner(A).

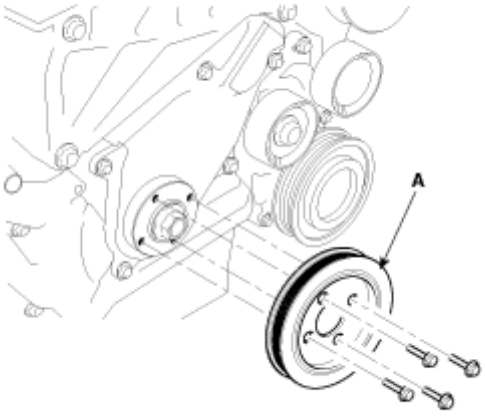
   Tightening torque
   49.0 ~ 53.9N.m (5.0 ~ 5.5kgf.m, 36.2 ~ 39.8lb-ft)



10. Install timing belt.

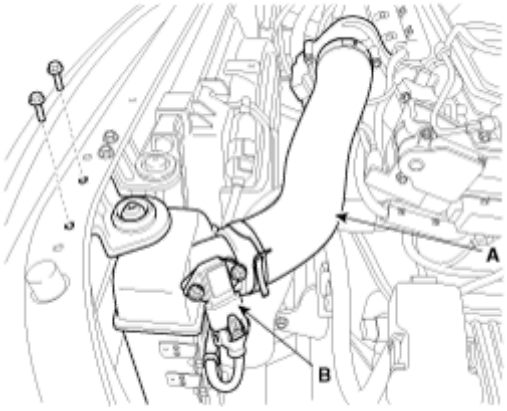
11. Install the crankshaft pulley(A).

    Tightening torque
    29.4 ~ 33.3N.m (3.0 ~ 3.4kgf.m, 21.7 ~ 24.6lb-ft)



REPLACEMENT

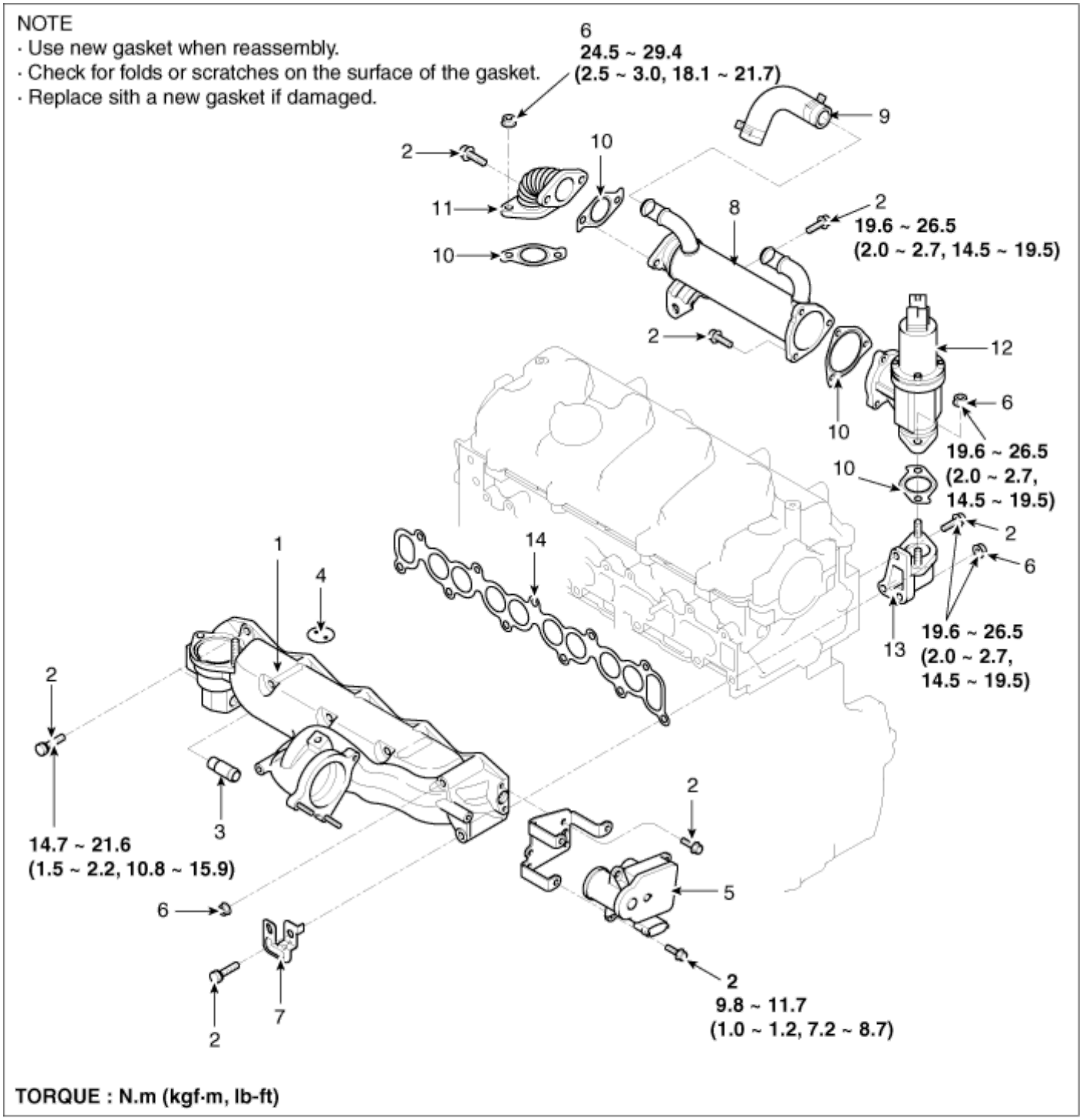
1. Remove the intercooler hose(A).
2. Disconnect the booster pressure sensor(B).
3. Remove intercooler lower hose and intercooler mounting bracket(C).



4. Installation is in the reverse order of removal.

English

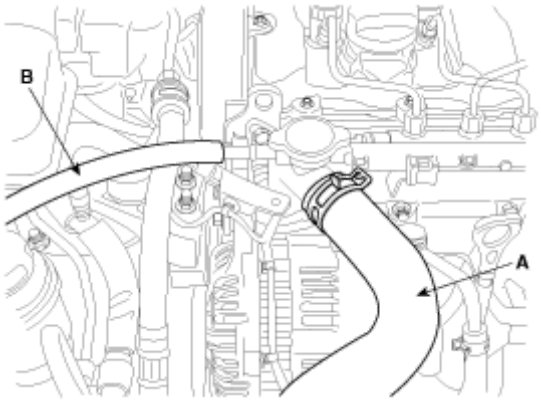
COMPONENTS



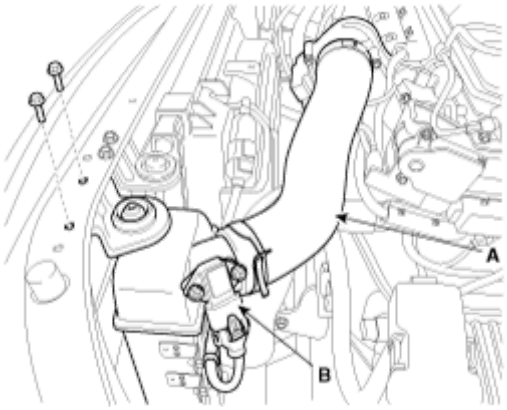
1. Intake manifold assembly
2. Bolts
3. Water bypass connector
4. Swirl control valve
5. Swirl control actuator
6. Nuts
7. Wiring mounting bracket
8. EGR cooler
9. EGR cooler hose
10. Gasket
11. EGR pipe assembly
12. EGR valve assembly
13. EGR elbow

REMOVAL

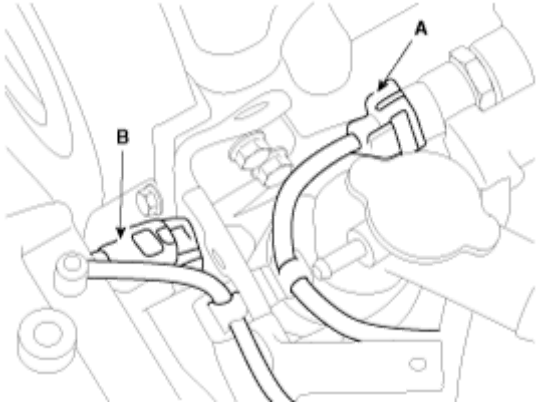
1. Remove the radiator upper hose(A) and the coolant bleed hose(B).



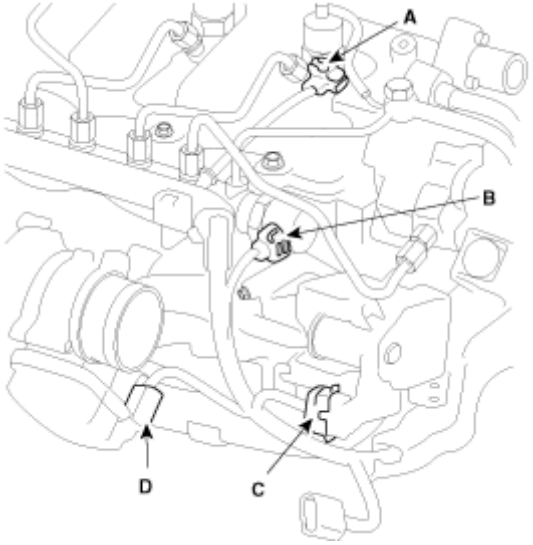
2. Remove the alternator. (Refer to Alternator in EEC Group).
3. Remove the intercooler hose(A) and the disconnect booster pressure sensor(BPS) connector(B).



4. Disconnector the engine wire harness connectors from intake manifold side.
   a. Disconnect the rail pressure sensor connector(A) and the water temperature sensor connector(B).



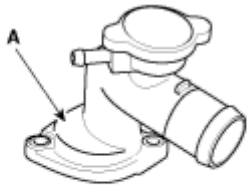
5. Disconnector the camshaft position sensor(A), pressure control valve(B), valve control actuator (c) and throttle body actuator(D) connector.



6. Remove oil level gauge.

7. Remove the thermostat housing(A).

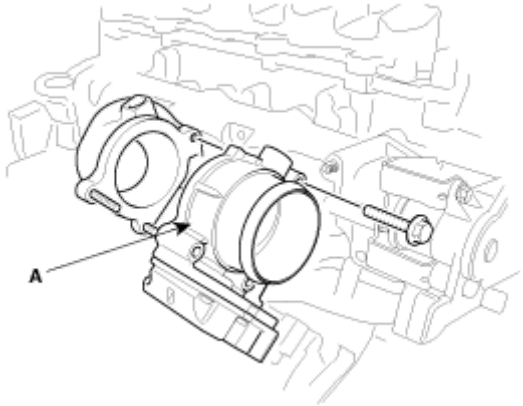
   Tightening torque :
   20 ~ 25N.m (2.0 ~ 2.5kgf.m, 15 ~ 18lb-ft)



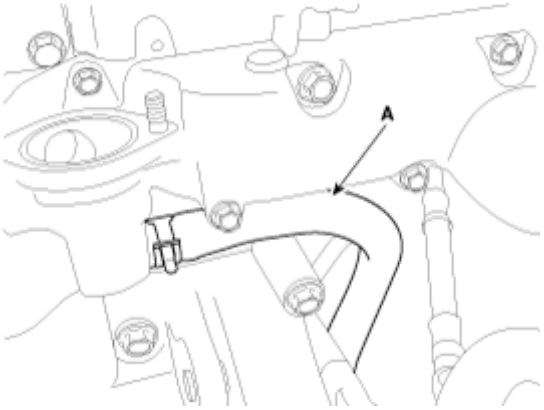


8. Remove the EGR throttle body(A).

   Tightening torque :
   10 ~ 12N.m (1.0 ~ 1.2kgf.m, 7 ~ 9lb-ft)

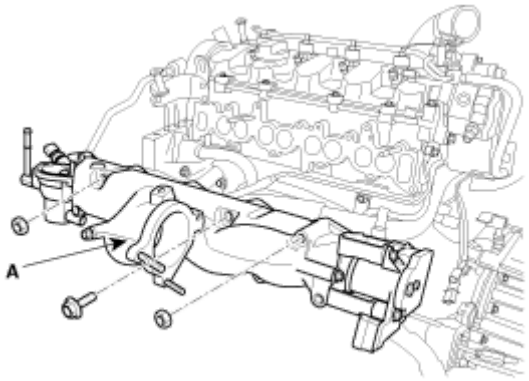


9. Remove the thermostat hose(A).



10. Remove the intake manifold(A).

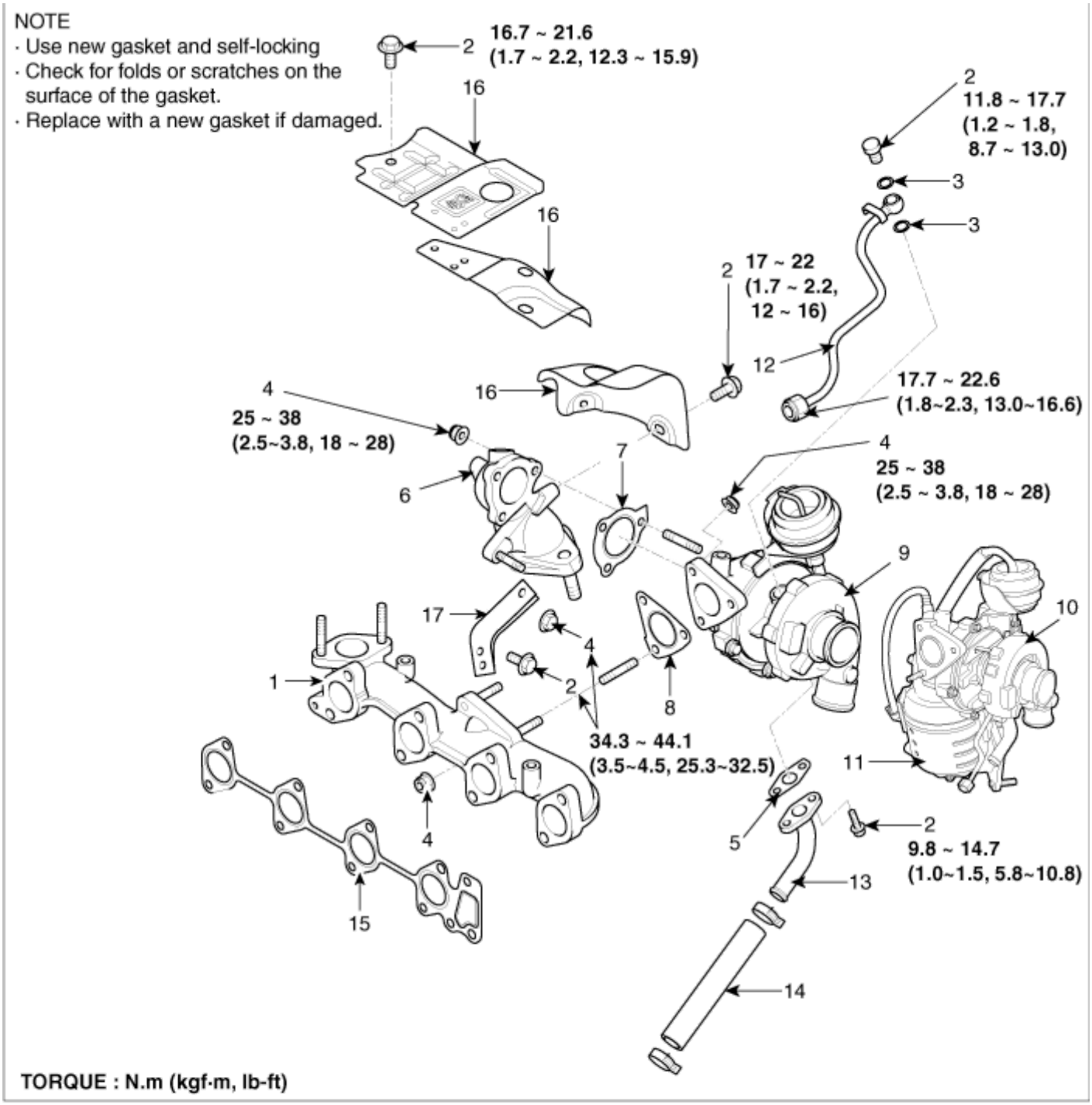
Tightening torque :
14.7 ~ 21.6N.m (1.5 ~ 2.2kgf.m, 10.8 ~ 15.9lb-ft)



11. Installation is in the reverse order of removal.

English

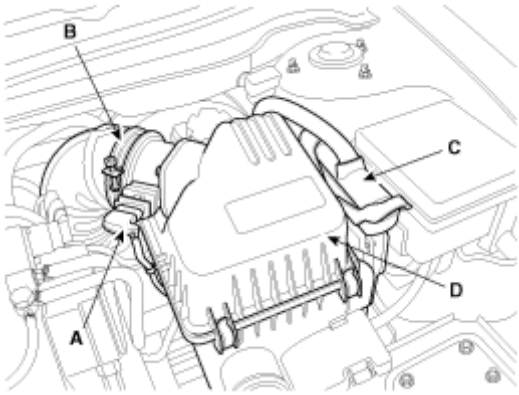
COMPONENTS



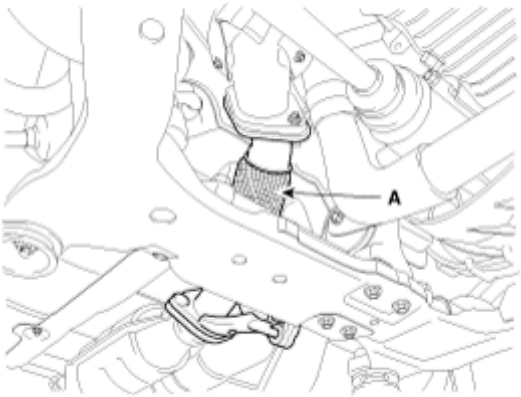
1. Exhaust manifold
2. Bolts
3. Gasket
4. Nuts
5. Turbo charger oil drain gasket
6. Turbo charger discharger pipe
7. Turbo charger exhaust gasket
8. Turbo charger intake gasket
9. Turbo charger[C.P.F vehicle]
10. Turbo charger[Non C.P.F vehicle]
11. Warm up catarytic converter[W.C.C]
12. Oil feed pipe
13. Oil drain pipe
14. Oil drain hose
15. Exhaust manifold gasket
16. Oil hose
17. Turbo charger support braket

REMOVAL

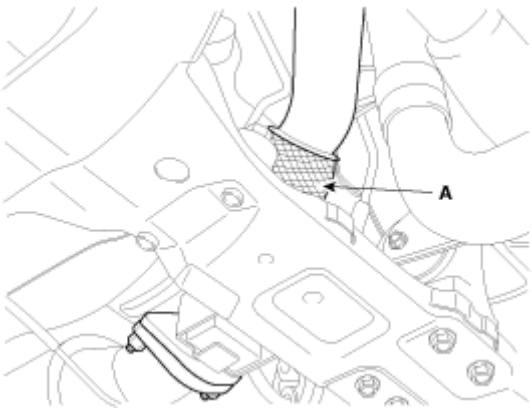
1. Remove the air cleaner.
   (1) Disconnect the Air Flow Sensor (AFS) connect(A).
   (2) Remove the air intake hose clamp first, then remove the air cleaner assembly(B).
   (3) Disconnect the electric control unit(E,C,U) connector(C).
   (4) Remove the air cleaner assembly(D).



2. Remove the front muffler(A).



[C.P.F]

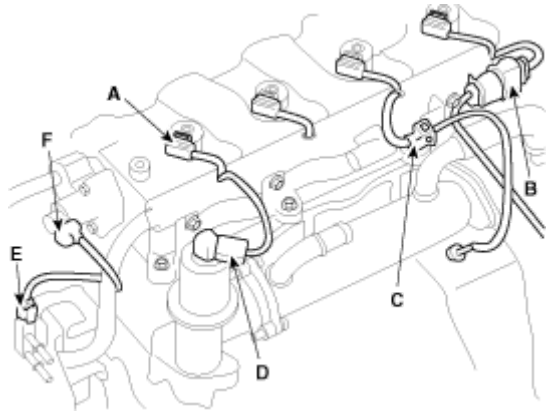


3. Remove the intercooler hose(A).

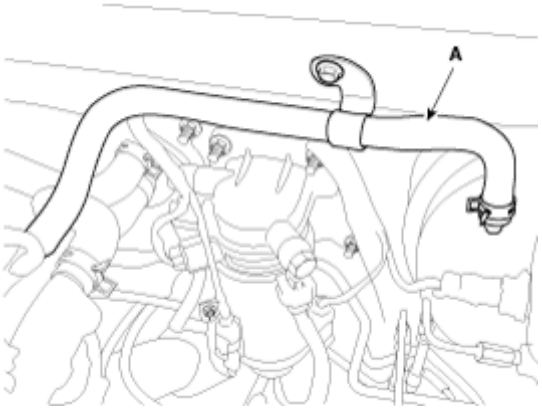
English ▼



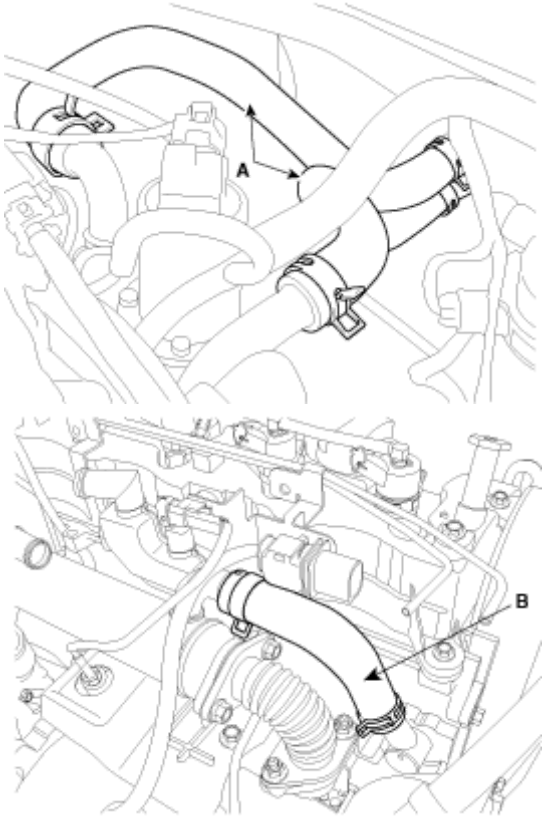
4. Disconnect the engine wire harness connectors from exhaust manifold.
   (1) Disconnect the injector connector(A).
   (2) Lambda sensor connector(B).
   (3) VGT exhaust gas temperature sensor connector(C).[Only C.P.F]
   (4) Disconnector the EGR actuator(D),fuel temperature sensor(E) and the fuel pressure regulator connector(E).



5. Remove the brake booster vacuum hose(A).



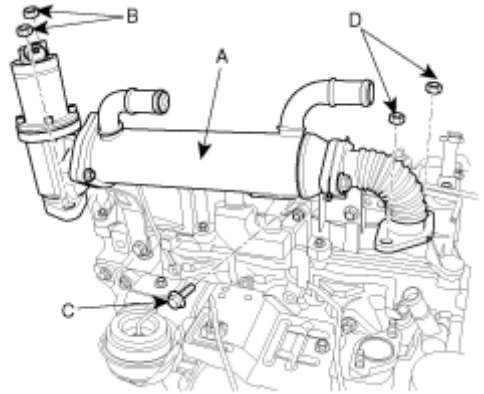
6. Remove the heater hose(A) and EGR cooler hose(B).



7. Remove VGT actuator vacuum hose.

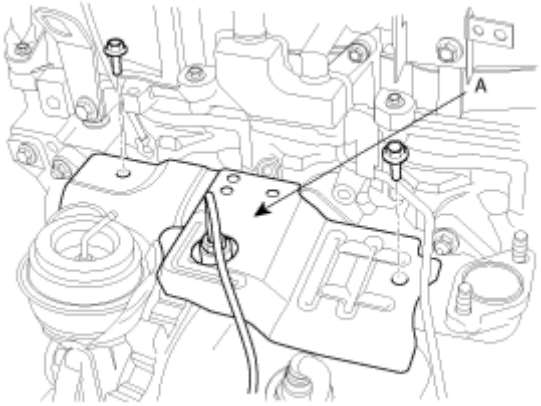
8. Remove the EGR valve and cooler assembly(A).

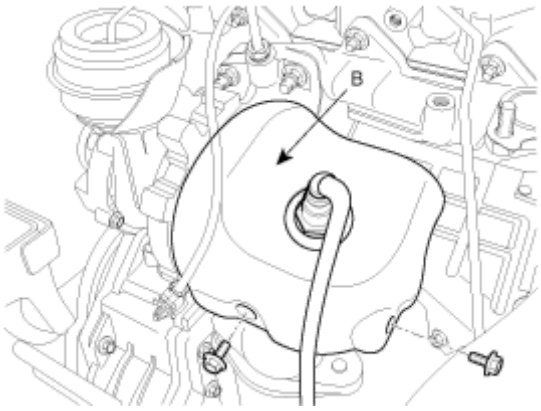
   Tightening torque :
   Nuts(B), Bolt(C)
   19.6 ~ 26.5N.m (2.0 ~ 2.7kgf.m, 14.5 ~ 19.5lb-ft)
   Nuts(D) : 24.5 ~ 29.4N.m (2.5 ~ 3.0kgf.m, 18.1 ~ 21.7lb-ft)



9. Remove the turbo charger heat protector(A, B).

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

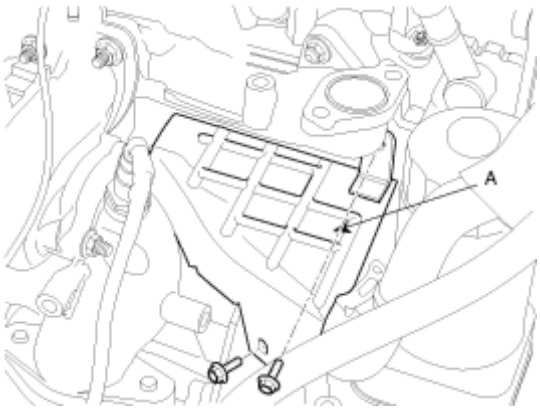




10. Remove the heater pipe heat protector(A).

    Tightening torque :

    7.8 ~ 9.8N.m (0.8 ~ 1.0kgf.m, 5.8 ~ 7.2lb-ft)

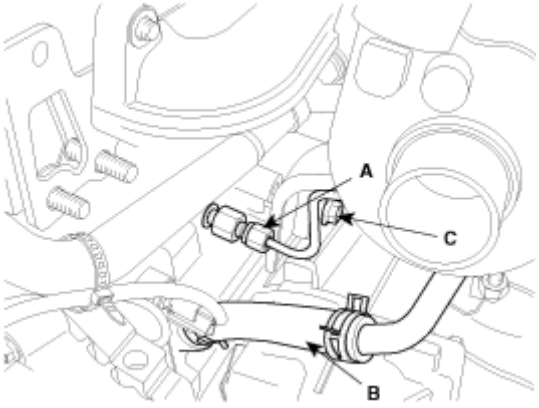


11. Disconnect the turbo charger oil feed pipe(A) and oil return hose(B).

12. Remove turbocharger support bracket mounting bolts(C).

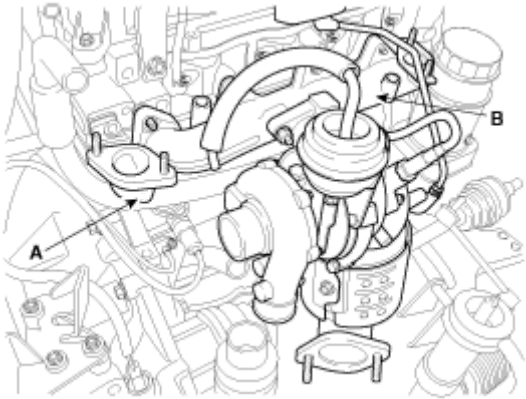
    Tightening torque :

    34.3 ~ 44.1N.m (3.5 ~ 4.5kgf.m, 25.3 ~ 32.5lb-ft)

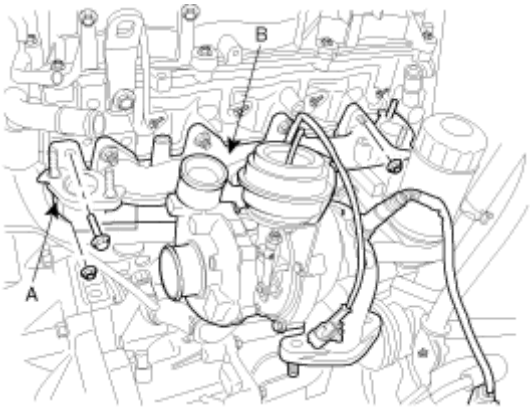


13. Remove the EGR elbow(A) and turbocharger & exhaust manifold assembly(B).

Tightening torque :
EGR elbow bolt and nuts
19.6 ~ 26.5N.m (2.0 ~ 2.7kgf.m, 14.5 ~ 19.5lb-ft)
Exhaust manifold nuts
29.4 ~ 37.3N.m (3.0 ~ 3.8kgf.m, 21.7 ~ 27.5lb-ft)



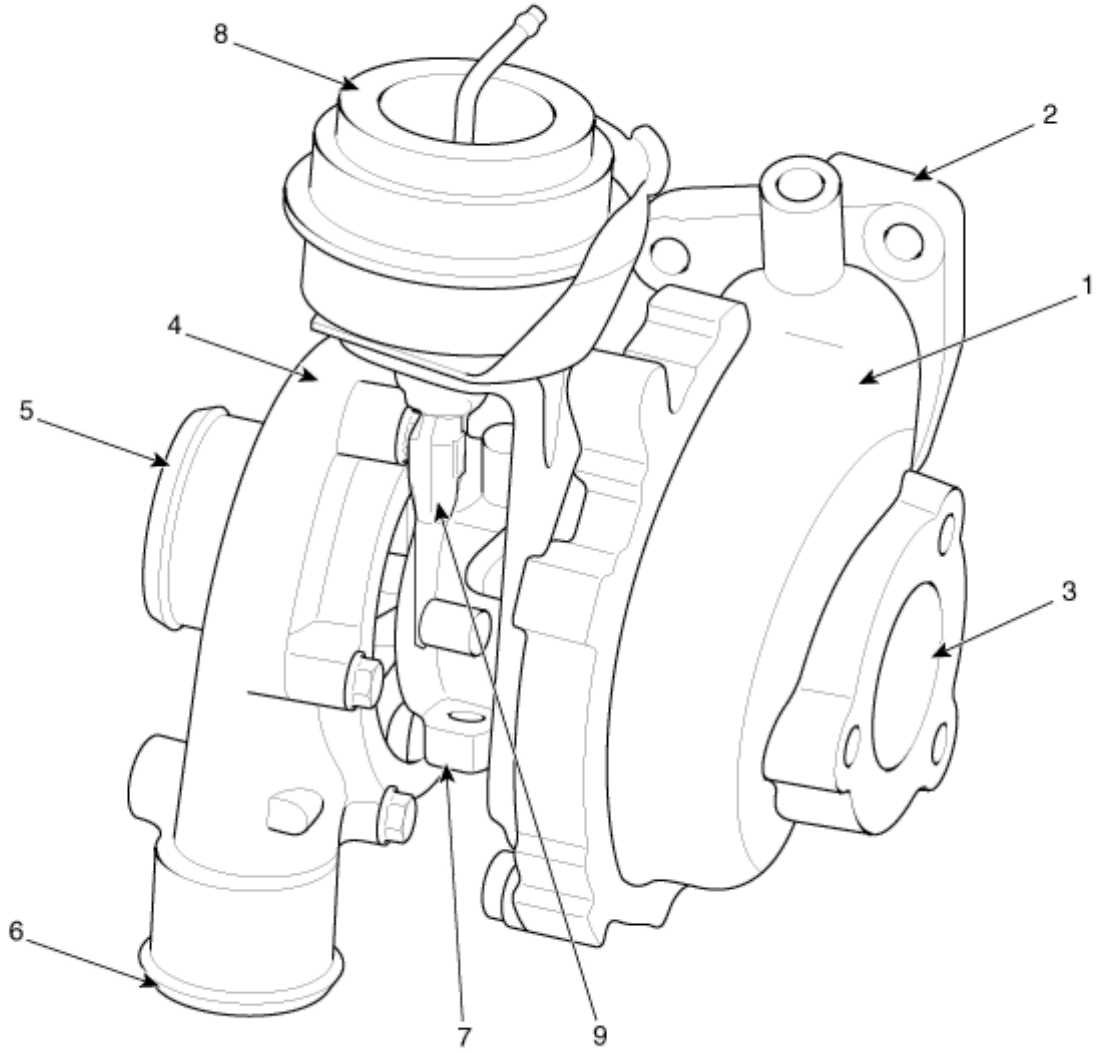
[C.P.F]



14. Installation is in the reverse order of removal.

English ▼

COMPONENTS



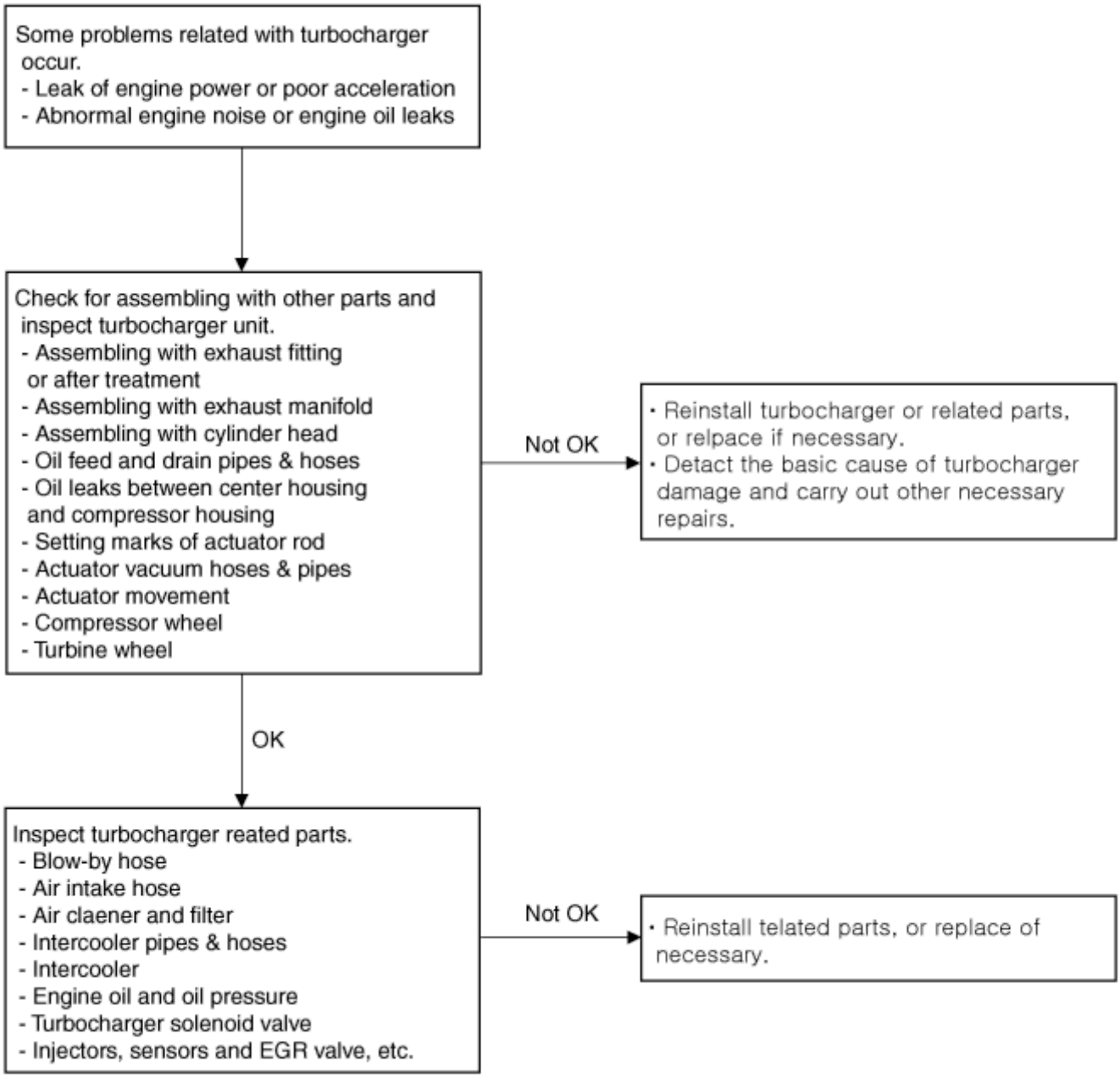
1. Turbine housing	6. Compressor outlet
2. Turbine inlet	7. Center housing
3. Turbine outlet	8. Actuator
4. Compressor housing	9. Actuator rod
5. Compressor inlet	

REMOVAL AND INSTALLATION

1. Remove the turbocharger.
   (Refer to Intake And Exhaust System - "Exhaust Manifold")

ON-VEHICLE INSPECTION

Turbocharger Diagnostic Flow



If any problem related with turbocharger, such as lack of engine power, poor acceleration, abnormal engine noise or oil leaks, may

occur, check the turbocharger according to the procedure as follows.

English ▼

1. Check for assembling of the turbocharger and the exhaust fitting (or the after treatment).
   – Check if a gasket is installed.
   – Check if mounting bolts (or nuts) are tightened properly.
   – Check if there is a gas leak.
   – Check if there is any damage, such as crack, on the parts.

   If a gas leak occur as a gasket was not installed or mounting bolts (or nuts) were tightened inadequately, it may cause abnormal engine noise.
   If the cause of the problem is detected, retighten the mounting bolts (or nuts) as the specified torque or replace the gasket or damaged parts with new ones if necessary.

2. Check for assembling of the turbocharger and the exhaust manifold.
   – Check if a gasket is installed.
   – Check if the mounting bolts (or nuts) are tightened properly.
   – Check if there is a gas leak.
   – Check if there is any damage, such as crack, on the parts.

   If a gas leak occur as a gasket was not installed or mounting bolts (or nuts) were tightened inadequately, it may cause abnormal engine noise.
   If the cause of the problem is detected, retighten the mounting bolts (or nuts) as the specified torque or replace the gasket or damaged parts with new ones if necessary.

3. Check for assembling of the exhaust manifold and the cylinder head.
   – Check if a gasket is installed.
   – Check if the mounting bolts (or nuts) are tightened properly.
   – Check if there is a gas leak.

   If a gas leak occur as a gasket was not installed or mounting bolts (or nuts) were tightened inadequately, it may cause abnormal engine noise.
   If the cause of the problem is detected, retighten the mounting bolts (or nuts) as the specified torque or install a new gasket if necessary.

4. Check the turbocharger oil feed pipe & hose and oil drain pipe & hose.
   – Check if a gasket is installed.
   – Check if the mounting bolts are tightened properly.
   – Check if the clamps are positioned in place.
   – Check if the oil pipes & hoses are damaged (bent, crushed, torn or cracked).

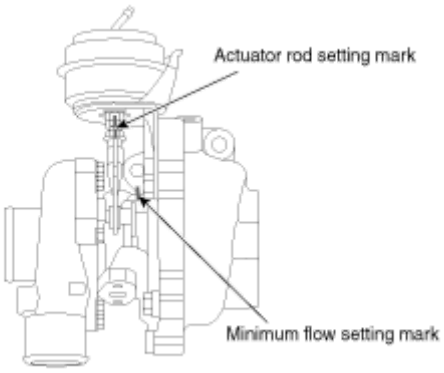
   If a gas leak occur as a gasket was not installed or mounting bolts were tightened inadequately, it may cause oil leaks.
   If the oil feed pipe & hose is damaged, engine oil is not supplied sufficiently to the turbocharger then it may damage the turbocharger. If the oil drain pipe & hose is damaged and clogged, engine oil is not drained smoothly then it may cause oil leaks from the turbocharger.
   If the cause of the problem is detected, retighten the mounting bolts (or nuts) as the specified torque or replace the gasket or damaged parts with new ones if necessary.

5. Check for oil leaks between center housing and compressor housing.
   – Check if the mounting bolts are tightened properly.
   – Check if there is an oil leak.

   If the O-ring (gasket) between the center housing and the compressor housing is damaged, it may cause oil leaks.
   If an oil leak is detected, replace the turbocharger with a new one.

6. Check the setting marks of the turbocharger actuator rod.
   – Check if the actuator rod setting mark is aligned in line.

– Check if the minimum flow setting mark is aligned in line.

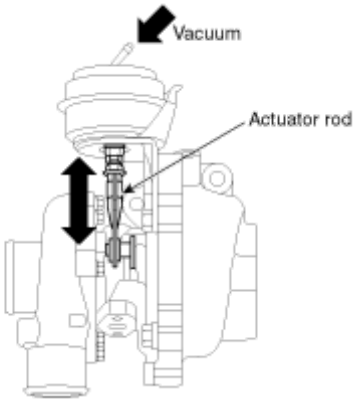


If the setting marks are not aligned in line, the engine performance is changed by an arbitrary tune-up of the turbocharger after delivery.
If the setting marks are not aligned in line, replace the turbocharger with a new one.

7. Check the turbocharger actuator vacuum hoses & pipes.
   – Check if the vacuum hose is connected to the actuator properly.
   – Check if the vacuum hoses & pipes are damaged (bent, detached or torn).
   – Check if there is any damage, such as crack, on the vacuum pipes.
   – Check if the vacuum hoses are connected to inlet or outlet of the solenoid valve correctly.

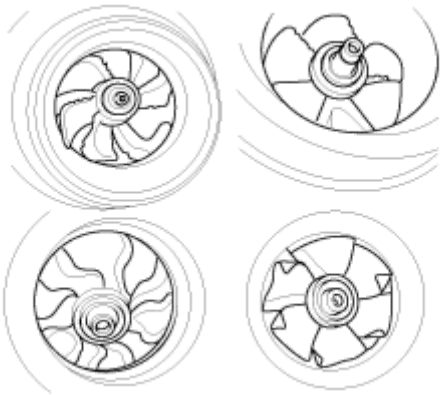
   If the vacuum pipes & hoses are damaged or disconnected, the actuator does not work properly then it may cause lack of engine power and poor acceleration.
   If the vacuum hoses & pipes are damaged, replace them with new ones.

8. Check the turbocharger actuator.
   – Vacuum type actuator: Check for movement of the actuator rod when a vacuum of 60kPa (450mmHg, 8.7psi) is applied to the actuator or a forced actuator operating mode is performed by GDS. (Refer to DTC guide)



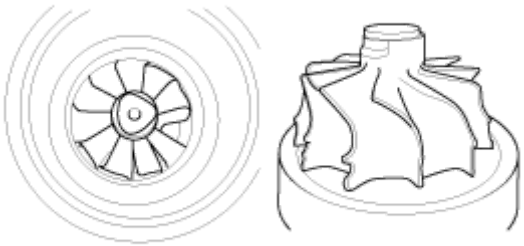
   If the turbocharger actuator is damaged, it may cause lack of engine power and poor acceleration.
   If the actuator rod does not move, replace the turbocharger with a new one.

9. Check the turbocharger compressor wheel.
   – Check if the compressor wheel is damaged (bent or deformed).
   – Check if the compressor wheel rotates smoothly.
     EX)



If the compressor wheel are damaged, it may cause abnormal noise from the turbocharger and poor acceleration.
If the compressor wheel are damaged or deformed, replace the turbocharger with new ones.

10. Check the turbocharger turbine wheel.
    - Check if the turbine wheel is damaged.
    - Check if the turbine wheel rotates smoothly.
      EX)



If the turbine wheel are damaged, it may cause abnormal noise from the turbocharger and poor acceleration.
If the turbine wheel are damaged or deformed, replace the turbocharger with new ones.

If any problem is not detected in the turbocharger, check the turbocharger-related parts according to the procedure as follows .

1. Check the blow-by hose. (Refer to FL group)
   - Check if the breather hose is damaged (bent, clogged).
   - Check if the positive crankcase ventilation (PCV) valve is clogged.

   If the breather hose is bent or clogged, the internal pressure in the engine increases then engine oil is not supplied smoothly to the turbocharger. So it may cause damage of the turbocharger and oil leaks.
   If the cause of the problem is detected, replace the breather hose or the related parts with new ones.

2. Check the air intake hose connected to the turbocharger.
   - Check if the air intake hose is damaged (bent, crushed, detached or torn).

   If a cross-section of the hose diminishes as the air intake hose is bent or crushed, intake air to the turbocharger reduces and the pressure in front of turbocharger drops. So it may cause damage of the turbocharger and oil leaks. If the air intake hose is detached or torn, a foreign substance goes into the turbocharger and causes damage of it.
   If the air intake hose is damaged, replace it with a new one.

3. Check the air cleaner.
   - Check the air cleaner filter for pollution state.
   - Check the air cleaner filter for water influx.
   - Check the air cleaner cover for dirtiness.
   - Check if the air cleaner filter is a genuine part..

If the air cleaner filter is moistened or polluted excessively or a non-genuine part is used, intake air to the turbocharger reduces and the pressure in front of turbocharger drops. So it may cause damage of the turbocharger and oil leaks. .
If the air cleaner filter is moistened or polluted excessively, replace it with a new one.

> **NOTICE**
>
> Replace the air cleaner filter according to the maintenance schedule.

4. Check the intercooler hoses & pipes.
   - Check if the intercooler hoses & pipes are connected properly.
   - Check if the intercooler hoses & pipes are damaged (bent, detached or torn).
   - Check if there is any damage, such as crack, on the intercooler pipes.
   - Check if the clamps are positioned in place.

   If the intercooler hoses & pipes are damaged or disconnected, oil leaks may occur from the hoses & pipes and the turbocharger may exceed the permissible speed then it may cause damage of the turbocharger.
   If the intercooler hoses & pipes are damaged, replace them with new ones.

   > **NOTICE**
   >
   > Use new clamps when replacing the hoses & pipes.

5. Check the intercooler.
   - Check if the intercooler tubes and tanks are damaged (oil leak or crack).

   If the intercooler is damaged, the turbocharger may exceed the permissible speed then it may cause damage of the turbocharger.
   If the intercooler is damaged, replace them with a new one.

   > **NOTICE**
   >
   > Use new clamps when replacing the intercooler.

6. Check the engine oil.
   - Check the engine oil level.
   - Check the engine oil for discoloration, water influx and viscosity degradation.
   - Check the engine oil grade.

   If the engine oil level is low, amount of engine oil fed to turbocharger reduces then the bearings in the turbocharger may adhere due to insufficient lubrication and cooling.
   If the cause of the problem is detected, add or change engine oil.

   > **NOTICE**
   >
   > Change the engine oil according to the maintenance schedule.

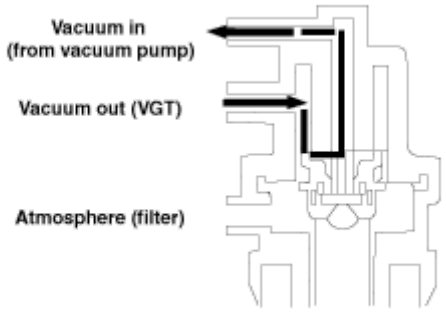
7. Check the engine oil pressure.
   - Engine oil pressure: Check the oil pressure using an oil pressure gauge after removing the oil pressure switch on the cylinder block.
   - Check the engine oil screen in the oil pan if the engine oil level is low. Then check the injectors for gas leaks if foreign substances are accumulated on the oil screen.

   If the engine oil level is low, amount of engine oil fed to turbocharger reduces then the bearings in the turbocharger may adhere due to insufficient lubrication and cooling.
   If the cause of the problem is detected, add or change engine oil. If foreign substances are accumulated on the oil screen,

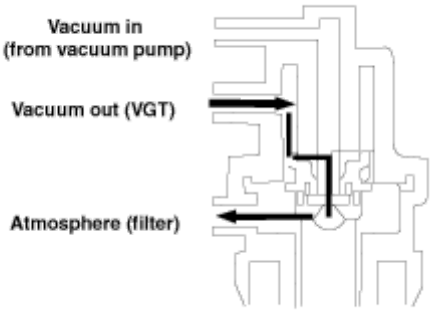
wash the oil screen and replace the injector's washer with a new one after checking the injectors for gas leaks. Check the engine oil-related parts, such as oil pump, if necessary.

> **NOTICE**
>
> As the turbocharger rotates at high speed of 100,000 rpm or above, deterioration of engine oil can cause damage of the turbocharger bearings. Check engine oil for discoloration, water influx, viscosity degradation and oil pressure lowering.

8. Check the solenoid valve of turbocharger. (Refer to DTC guide)
   - Damage of the solenoid valve: Check if vacuum is generated at the disconnected vacuum hose from the actuator when a forced actuator operating mode is performed by GDS..
   - Clog of the solenoid valve filter: Check if vacuum is released when a forced actuator operating mode is performed from max. duty (95%) to min. duty (5%) by GDS. (If the solenoid valve filter is clogged, the vacuum won't be released or it will take a long time to be released.)



<Valve On>



<Valve Off>

If the solenoid valve is damaged, the actuator does not work properly then it may cause lack of engine power and poor acceleration. If the solenoid valve filter is clogged, vacuum is not released then it may cause damage of the turbocharger by overrunning.
If the solenoid valve is damaged, replace it with a new one.

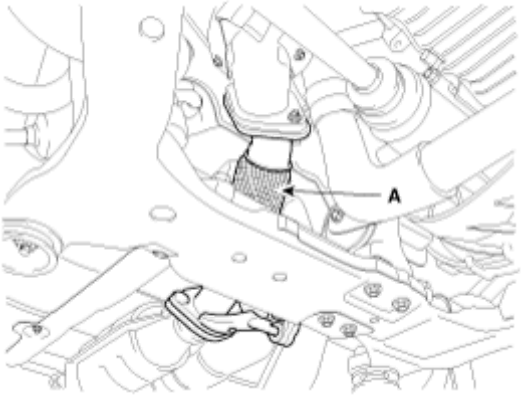
9. Check the injectors, sensors, EGR valve, etc. (Refer to FL group)
   - Check if the injectors operate properly.
   - Check if the sensors, such as the mass air flow sensor (MAFS), intake air temperature sensor (IATS), boost pressure sensor (BPS), operate properly.
   - Check if the exhaust gas recirculation (EGR) valve operates properly.

If the injectors, sensors, EGR valve and etc. don't work properly, it may cause lack of engine power.
If the cause of the problem is detected, replace the related parts with new ones.

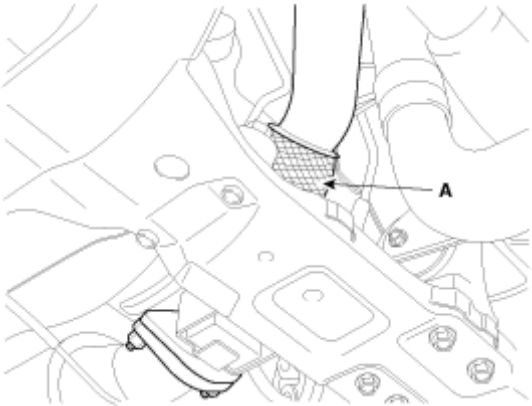
REMOVAL

1. Remove the front muffler(A).

   Tightening torque :
   40 ~ 60N.m (4.0 ~ 6.0kgf.m, 30 ~ 43lb-ft)

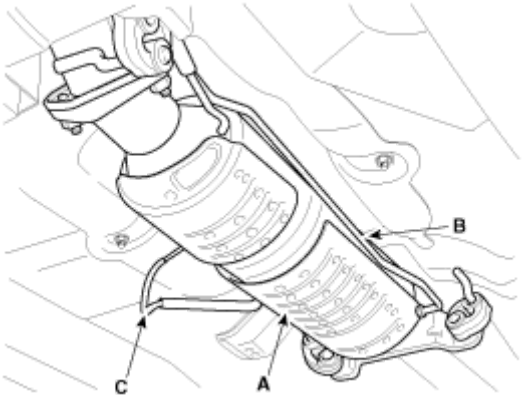


[C.P.F]



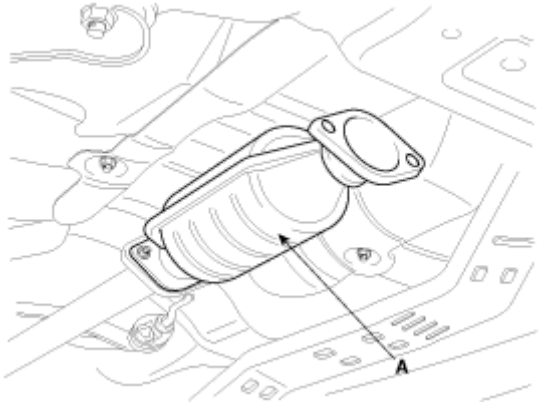
(1) Remove the Catalyzed Particulate Filter(CPF)(A) after disconnecting the differential pressure hoses(B) and exhaust gas temperature sensor(C).(Only C.P.F)

Tightening torque :
40 ~ 60N.m (4.0 ~ 6.0kgf.m, 30 ~ 43lb-ft)



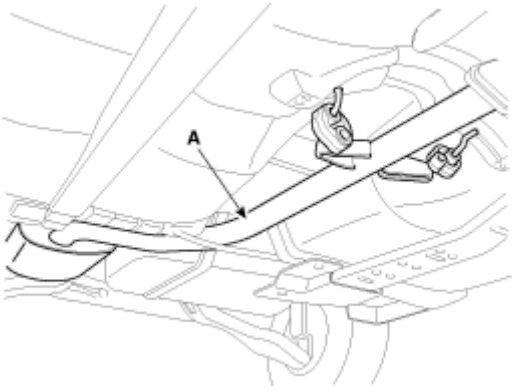
2. Remove the catalytic converter(A).

   Tightening torque :
   40 ~ 60N.m (4.0 ~ 6.0kgf.m, 30 ~ 43lb-ft)



3. Remove the main muffler(A).

   Tightening torque :
   40 ~ 60N.m (4.0 ~ 6.0kgf.m, 30 ~ 43lb-ft)



4. Installation is in the reverse order of removal.

SPECIFICATIONS

FUEL DELIVERY SYSTEM

Items	Specification	
Fuel Tank	Capacity	55 lit. (12.1 Imp.gal., 14.5 U.S.gal.)
Fuel Return System	Type	Return Type
Fuel Filter	Type	High pressure type (Built in engine room)
High Pressure Fuel Pump	Type	Mechanical, Plunger Pumping Type
	Driven by	Camshaft
Fuel Pressure (Maximum)	Pressure	1,600 bar (160 MPa, 23,206 psi)

INPUT SENSORS

MASS AIR FLOW SENSOR (MAFS)

▷ Type: Hot-Film Type

▷ Specification

* At intake air temperature = 20°C(68°F)

Air Flow (kg/h)	Frequency (kHz)
8	1.94 ~ 1.96
10	1.98 ~ 1.99
15	2.06 ~ 2.07
75	2.72 ~ 2.75
160	3.36 ~ 3.41
310	4.44 ~ 4.53
640	7.66 ~ 8.01
800	10.13 ~ 11.17

* At intake air temperature = -15°C(5°F) or 80°C(176°F)

Air Flow (kg/h)	Frequency (kHz)
10	1.97 ~ 1.99
75	2.71 ~ 2.76
160	3.34 ~ 3.43
310	4.39 ~ 4.58

INTAKE AIR TEMPERATURE SENSOR (IATS) #1 [BUILT IN MAFS]

▷ Type: Thermistor type

▷ Specification

Temperature [°C(°F)]	Resistance(kΩ)
-40(-40)	35.14 ~ 43.76
-20(-4)	12.66 ~ 15.12
0(32)	5.12 ~ 5.89

English ▼

20(68)	2.29 ~ 2.55
40(104)	1.10 ~ 1.24
60(140)	0.57 ~ 0.65
80(176)	0.31 ~ 0.37

BOOST PRESSURE SENSOR (BPS)

▷ Type: Piezo-resistive pressure sensor type

▷ Specification

Pressure (kPa)	Output Voltage (V)
32.5	0.5
70	1.02 ~ 1.17
140	2.13 ~ 2.28
210	3.25 ~ 3.40
270	4.20 ~ 4.35
284	4.5

INTAKE AIR TEMPERATURE SENSOR (IATS) #2 [BUILT IN BPS]

▷ 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
20(68)	2.31 ~ 2.57
40(104)	1.08 ~ 1.21
60(140)	0.54 ~ 0.62
80(176)	0.29 ~ 0.34

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

CAMSHAFT POSITION SENSOR (CMPS)

▷ Type: Hall effect type

▷ Specification

Level	Output Pulse (V)

High	5V
Low	0V

Items	Specification
Air Gap	1.0 ± 0.5 mm

CRANKSHAFT POSITION SENSOR (CKPS)

▷ Type: Variable reluctance type

▷ Output Voltage (V): 0 ~ 5V

Items	Specification
Coil Resistance (Ω))	774 ~ 946Ω [20°C(68°F)]

ACCELERATOR POSITION SENSOR (APS)

▷ Type: Potentiometer type

▷ Specification

Test Condition	Output Voltage(V)	
	APS 1	APS 2
Idle	0.7 ~ 0.8	0.275 ~ 0.475
Fully depressed	3.8 ~ 4.4	1.75 ~ 2.35

Items	Specification	
	APS 1	APS 2
Potentiometer Resistance (kΩ)	0.7 ~ 1.3	1.4 ~ 2.6

FUEL TEMPERATURE SENSOR (FTS)

▷ Type: Thermistor type

▷ Specification

Temperature [°C(°F)]	Resistance(kΩ)
-30(-22)	27.00
-20(-4)	15.00
-10(14)	9.45
0(32)	5.89
20(68)	2.27 ~ 2.73
40(104)	1.17
50(122)	0.83
60(140)	0.60
70(158)	0.43
80(176)	0.30 ~ 0.32

RAIL PRESSURE SENSOR (RPS)

▷ Type: Piezo-electricity type

▷ Specification

Test Condition	Rail pressure (bar)	Output Voltage(V)

Idle	220 ~ 320	Below 1.7
Fully depressed	1800	Approx. 4.5

LAMBDA SENSOR

▷ Type: Zirconia (ZrO2) Type

▷ Specification

λ Value (A/F Ratio)	**Pumping Current(A)**
0.65	-2.22
0.70	-1.82
0.80	-1.11
0.90	-0.50
1.01	0.00
1.18	0.33
1.43	0.67
1.70	0.94
2.42	1.38
Air (Atmosphere)	2.54

Temperature [°C(°F)]	**Heater Resistance(Ω)**
20(68)	9.2
100(212)	10.7
200(392)	13.1
300(572)	14.6
400(752)	17.7
500(932)	19.2
600(1,112)	20.7
700(1,292)	22.5

EXHAUST GAS TEMPERATURE SENSOR (EGTS) #1 FOR VGT

▷ Type: Thermistor type

▷ Specification

Temperature [°C(°F)]	**Resistance(kΩ)**
100(212)	289.0 ~ 481.0
300(572)	5.30 ~ 6.61
600(1,112)	0.35 ~ 0.38
900(1,652)	0.08 ~ 0.09

DIFFERENTIAL PRESSURE SENSOR (DPS)

▷ Type: Piezo-electricity type

▷ Specification: Vout = (4.5 - 1.0) / 100 * ΔP + 1.0 (V)

Differential Pressure [ΔP] (kPa)	**Output Voltage (V)**
0	1.00
10	1.35

20	1.70
30	2.05
40	2.40
50	2.75
60	3.10
70	3.45
80	3.80
90	4.15
100	4.50

EXHAUST GAS TEMPERATURE SENSOR (EGTS) #2 FOR CPF

▷ Type: Thermistor type

▷ Specification

Temperature [°C(°F)]	Resistance(kΩ)
100(212)	289.0 ~ 481.0
300(572)	5.30 ~ 6.61
600(1,112)	0.35 ~ 0.38
900(1,652)	0.08 ~ 0.09

VEHICLE SPEED SENSOR (VSS)

▷ Type: Inductive type

OUTPUT ACTUATORS

INJECTOR

▷ Number: 4

▷ Specification

Items	Specification
Coil Resistance (Ω)	0.33Ω [20°C(68°F)]

FUEL PRESSURE REGULATOR VALVE

▷ Specification

It ems	Specification
Coil Resistance (Ω)	2.9 ~ 3.15Ω [20°C(68°F)]

RAIL PRESSURE REGULATOR VALVE

▷ Specification

Items	Specification
Coil Resistance (Ω)	3.42 ~ 3.78Ω [20°C(68°F)]

THROTTLE CONTROL ACTUATOR

▷ Type : Duty control motor type

▷ Specification

Duty (%)	Throttle Valve Position
5	Open
5 ~ 94	Normal operation (Partially open in proportion to duty value)

94	Closed
94 ~ 95	Maintaining the last valid position
95 ~ 97	Fully closed

ELECTRIC EGR CONTROL VALVE

▷ Type: Linear solenoid type

▷ Specification

Items	Specification
Coil Resistance (Ω)	7.3 ~ 8.3Ω [20°C(68°F)]

VGT CONTROL SOLENOID VALVE

▷ Specification

Items	Specification
Coil Resistance (Ω)	14.7 ~ 16.1Ω [20°C(68°F)]

VARIABLE SWIRL CONTROL ACTUATOR

▷ Type: Motor Driven (including Position Sensor)

▷ Specification

Motor

Items	Specification
Coil Resistance (Ω)	3.4 ~ 4.4Ω [20°C(68°F)]

Position Sensor

Items	Specification
Coil Resistance (kΩ)	3.44 ~ 5.16kΩ [20°C(68°F)]

SERVICE STANDARD

Basic Idle rpm(After warm up)	A/C OFF	Neutral,N,P-range	850 ± 100 rpm
		D-range	850 ± 100 rpm
	A/C ON	Neutral,N,P-range	850 ± 100 rpm
		D-range	850 ± 100 rpm

TIGHTENING TORQUES

ENGINE CONTROL SYSTEM

Item	N·m	Kgf·m	lbf·ft
ECM installation bolts	7.8 ~ 11.8	0.8 ~ 1.2	5.8 ~ 8.7
Mass air flow sensor clamp installation bolts	2.9 ~ 4.9	0.3 ~ 0.5	2.2 ~ 3.6
Boost pressure sensor installation bolts	9.8 ~ 11.8	1.0 ~ 1.2	7.2 ~ 8.7
Engine coolant temperature sensor installation	19.6 ~ 39.2	2.0 ~ 4.0	14.5 ~ 28.9
Crankshaft position sensor installation bolt	3.9 ~ 5.9	0.4 ~ 0.6	2.9 ~ 4.3

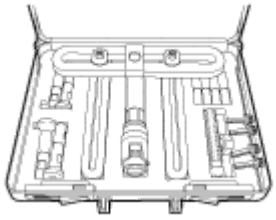
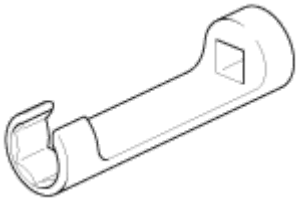
Camshaft position sensor installation bolt	3.9 ~ 5.9	0.4 ~ 0.6	2.9 ~ 4.3
Lambda sensor installation	40.2 ~ 59.8	4.1 ~ 6.1	29.7 ~ 44.1
Electric EGR control valve installation bolts	19.6 ~ 26.5	2.0 ~ 2.7	14.5 ~ 19.5
Variable swirl control actuator installation bolts	9.8 ~ 11.8	1.0 ~ 1.2	7.2 ~ 8.7
Exhaust gas temperature sensor (For CPF) installation	39.2 ~ 49.1	4.0 ~ 5.0	28.9 ~ 36.2
Exhaust gas temperature sensor (For VGT) installation	39.2 ~ 49.1	4.0 ~ 5.0	28.9 ~ 36.2
DPS & VGT control solenoid valve bracket installation bolts	9.8 ~ 11.8	1.0 ~ 1.2	7.2 ~ 8.7
Throttle body installation bolts	9.8 ~ 11.8	1.0 ~ 1.2	7.2 ~ 8.7
Oil pressure switch installation	14.7 ~ 21.6	1.5 ~ 2.2	10.9 ~ 15.9
Glow plug installation	9.8 ~ 13.7	1.0 ~ 1.4	7.2 ~ 10.1
Pipe (DPS ↔ CPF) installation (CPF side)	9.8 ~ 11.8	1.0 ~ 1.2	7.2 ~ 8.7

FUEL DELIVERY SYSTEM

Item	N·m	Kgf·m	lbf·ft
Injector clamp installation bolt	24.5 ~ 28.4	2.5 ~ 2.9	18.1 ~ 21.0
Common rail installation bolts	19.6 ~ 26.5	2.0 ~ 2.7	14.5 ~ 19.5
High pressure fuel pump installation bolts	24.5 ~ 34.3	2.5 ~ 3.5	18.1 ~ 25.3
High pressure pipe (Injector ↔ Common Rail) installation nuts	24.5 ~ 28.4	2.5 ~ 2.9	18.1 ~ 21.0
High pressure pipe (Common Rail ↔ High Pressure Fuel Pump) installation nuts	24.5 ~ 28.4	2.5 ~ 2.9	18.1 ~ 21.0
Fuel tank band installation bolts	39.2 ~ 54.0	4.0 ~ 5.5	28.9 ~ 39.8
Fuel pump (Low Pressure) installation bolts	3.9 ~ 5.8	0.4 ~ 0.6	2.8 ~ 4.4
Fuel filter installation nuts	9.8 ~ 14.7	1.0 ~ 1.5	7.2 ~ 10.9
Accelerator pedal module installation bolts	12.8 ~ 15.7	1.3 ~ 1.6	9.4 ~ 11.6

English ▼

SPECIAL SERVICE TOOLS

Tool (Number and name)	Illustration	Application
09351-4A300 Injector Remover		Removing the injector
09314-27110(14mm) 09314-27120(17mm) Torque Wrench Socket		Installing the high pressure pipe

Tool Number	Tool Name
CTR-1000	Common Rail Tester (Standard kit)
CRT-1010	Tool Case
CRT-1020	Regulator Valve
CRT-1021	Plug (for Delphi) M14mm
CRT-1022	Plug (for Bosch) M12mm
CRT-1023	Adapter (for Bosch)
CRT-1030	Flask & Holder
CRT-1031	Visible Tube
CRT-1032	Injector Return Hose Adapter
CRT-1033	Injector Return Hose Plug
CRT-1034	Flushing Tube
CRT-1035	Dust Cap
CRT-1040	High Pressure Meter
CRT-1041	Adapter Connector (for Delphi Old)
CRT-1042	Adapter Connector (for Delphi New)
CRT-1043	Adapter Connector (for Bosch)
CRT-1044	IMV Control Valve
CRT-1050	Vacuum Gauge
CRT-1051	Pressure Gauge
CRT-1052	Gauge Connection Tube
CRT-1053	Connection Adapter
CRT-1054	Connection Adapter with Hose
CRT-1055	Hose Clamp

CRT-1060	User's Guide

English ▼

* To use this Common Rail Tester, refer to the user's guide included in this kit.



BASIC TROUBLESHOOTING

BASIC TROUBLESHOOTING GUIDE

English ▼

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		

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

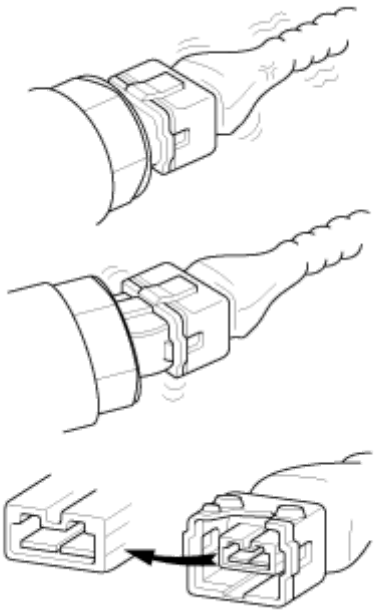
The measured resistance at high temperature after vehicle running may be high or low. So all resistance must be measured at ambient temperature (20°C, 68°F), unless stated otherwise.

NOTICE

The measured resistance in except for ambient temperature (20°C, 68°F) is reference value.

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

a. Sensors and Actuators
: Slightly vibrate sensors, actuators or relays with finger.

> **⚠ WARNING**
>
> Strong vibration may break sensors, actuators or relays

b. Connectors and Harness
: Lightly shake the connector and wiring harness vertically and then horizontally.

● SIMULATING HEAT

a. 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

a. Sprinkle water onto vehicle to simulate a rainy day or a high humidity condition.

WARNING

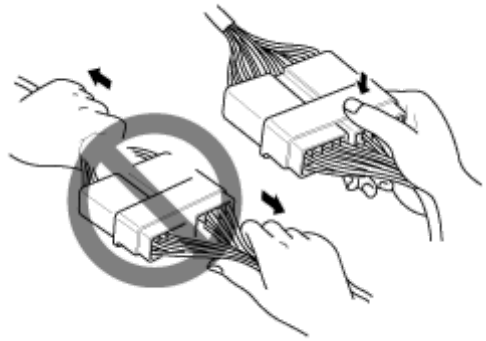
DO NOT sprinkle water directly into the engine compartment or electronic components.

● SIMULATING ELECTRICAL LOAD

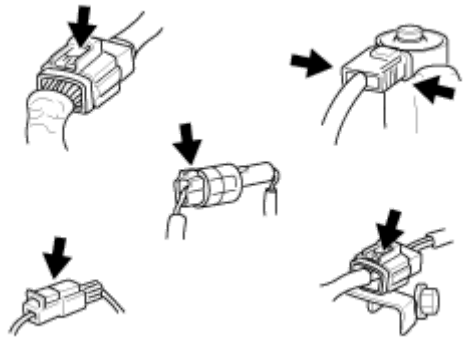
a. Turn on all electrical systems to simulate excessive electrical loads (Radios, fans, lights, rear window defogger, etc.).

CONNECTOR INSPECTION PROCEDURE

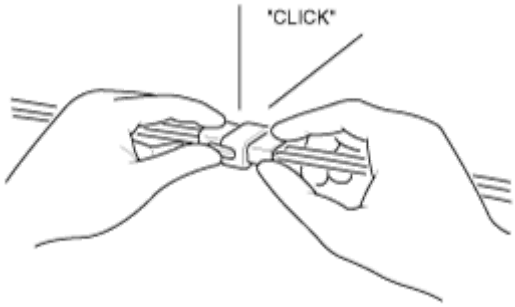
1. Handling of Connector
   a. Never pull on the wiring harness when disconnecting connectors.



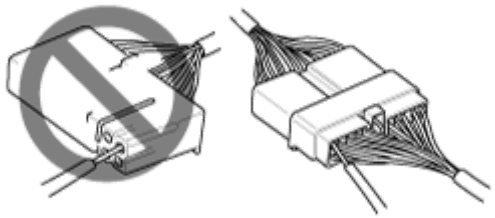
   b. When removing the connector with a lock, press or pull locking lever.



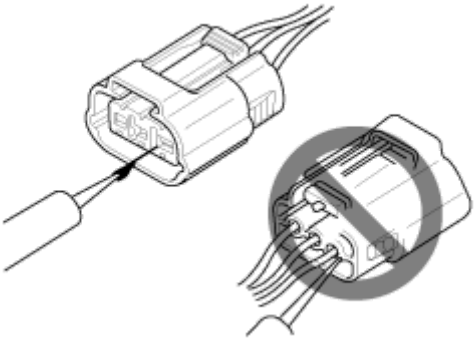
   c. Listen for a click when locking connectors. This sound indicates that they are securely locked.



   d. When a tester is used to check for continuity, or to measure voltage, always insert tester probe from wire harness side.



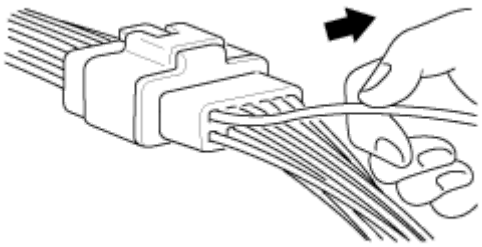
e. Check waterproof connector terminals from the connector side. Waterproof connectors cannot be accessed from harness side.



NOTICE

- 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.

> **NOTICE**
>
> 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

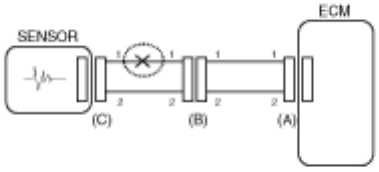
1. Before removing the wire harness, check the wire harness position and crimping in order to restore it correctly.
2. Check whether the wire harness is twisted, pulled or loosened.
3. Check whether the temperature of the wire harness is abnormally high.
4. Check whether the wire harness is rotating, 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

1. Procedures for Open Circuit
   - Continuity Check
   - 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



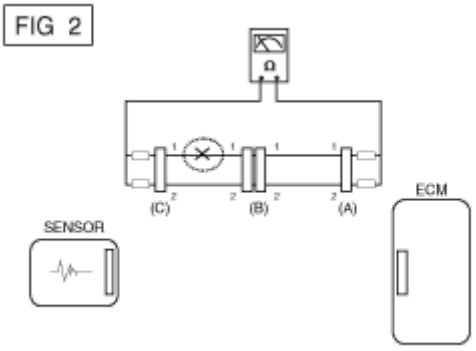
2. Continuity Check Method

> **NOTICE**
>
> When measuring for resistance, lightly shake the wire harness above and below or from side to side.

Specification (Resistance)
1Ω or less → Normal Circuit
1MΩ or Higher → Open Circuit

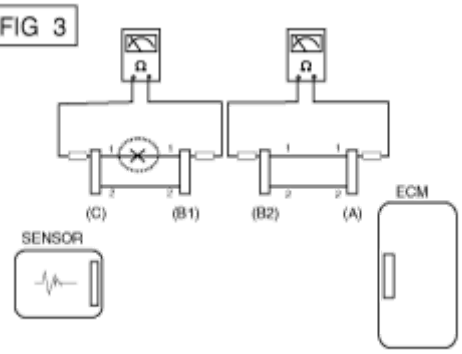
   a. Disconnect connectors (A), (C) and measure resistance between connector (A) and (C) as shown in [FIG. 2].
   In [FIG.2.] the measured resistance of line 1 and 2 is higher than 1MΩ and below 1 Ω respectively. Specifically the open circuit is line 1 (Line 2 is normal). To find exact break point, check sub line of line 1 as described in next step.

FIG 2



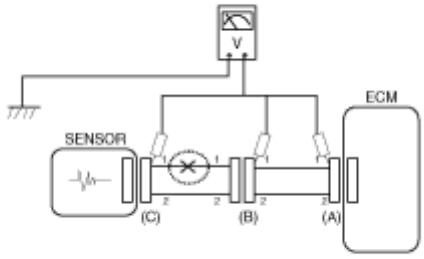
b. Disconnect connector (B), and measure for resistance between connector (C) and (B1) and between (B2) and (A) as shown in [FIG. 3].
In this case the measured resistance between connector (C) and (B1) is higher than 1MΩ and the open circuit is between terminal 1 of connector (C) and terminal 1 of connector (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

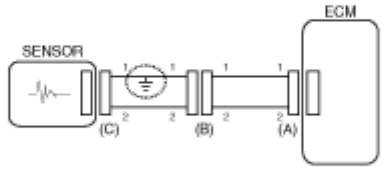


● CHECK SHORT CIRCUIT

1. Test Method for Short to Ground Circuit
   - 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



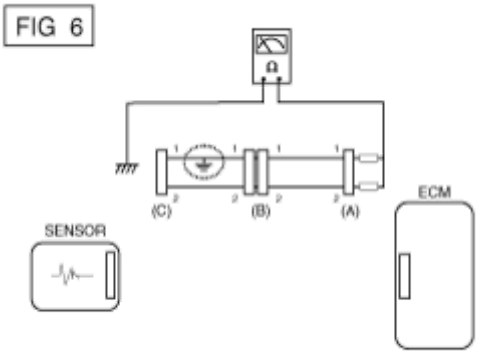
2. Continuity Check Method (with Chassis Ground)

> **NOTICE**
>
> Lightly shake the wire harness above and below, or from side to side when measuring the resistance.

Specification (Resistance)
1Ω or less → Short to Ground Circuit
1MΩ or Higher → Normal Circuit

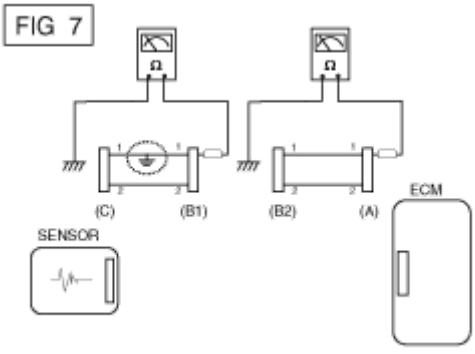
a. Disconnect connectors (A), (C) and measure for resistance between connector (A) and Chassis Ground as shown in [FIG. 6].
The measured resistance of line 1 and 2 in this example is below 1 Ω and higher than 1MΩ respectively. Specifically the short to ground circuit is line 1 (Line 2 is normal). To find exact broken point, check the sub line of line 1 as described in the following step.

FIG 6



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).

FIG 7



SYMPTOM TROUBLESHOOTING GUIDE TABLE

(SYMPTOM 1) ENGINE DOES NOT START

Possible Cause	
• Run out of fuel • Starter faulty • Fuel pump hose supply cut • High pressure leakage • Fuse out of order • Drift of the rail pressure sensor not detected • Cam and Crank signals missing simultaneously • Battery voltage too low • Faulty immobilizer • Electric EGR control valve blocked open • Fuel pressure regulator valve contaminated, stuck, jammed • Rail pressure regulator valve contaminated, stuck, jammed • Fuel quality / presence of water	• Inversion of low pressure fuel connections • Fuel filter not adapted • Low pressure fuel circuit sealed • Sealed fuel filter • Intermittent fault connection • Air ingress in the low pressure fuel circuit • Fuel return circuit of the pump sealed • Engine compression too low • Leakage at the injector • Low pressure fuel pump faulty • High pressure fuel pump faulty • Injector jammed open • Bug software or hardware fault not detected • Glow system faulty

(SYMPTOM 2) ENGIEN STARTS WITH DIFFICULTY OR STARTS AND STALLS

Possible Cause	
• Run out of fuel • Fuel return hose of injector cut • High pressure leakage • Fuse faulty • Air filter sealed • Alternator or voltage regulator faulty • The compensation of individual injector not adapted • Drift of the engine coolant temperature sensor not detected • Drift of the rail pressure sensor not detected • Battery voltage too low • Electric EGR control valve blocked open • Fuel pressure regulator valve contaminated, stuck, jammed • Rail pressure regulator valve contaminated, stuck, jammed • Fuel quality / presence of water	• Inversion of low pressure fuel connections • Low pressure fuel circuit sealed • Sealed fuel filter • Oil level too high/too low • Catalytic converter sealed or damaged • Intermittent fault connection • Air ingress in the low pressure fuel circuit • Fuel return circuit of the pump sealed • Glow system faulty • Engine compression too low • Fuel return hose of injector sealed • Carbon deposit on the injector (sealed holes) • Needle stuck (injection possible over a certain pressure) • Gasoline in fuel • Bug software or hardware fault not detected

(SYMPTOM 3) POOR STARTING WHEN HOT

Possible Cause	
• The compensation of individual injector not adapted • Drift of the rail pressure sensor not detected • Electric EGR control valve blocked open • Fuel pressure regulator valve contaminated, stuck, jammed • Rail pressure regulator valve contaminated, stuck, jammed • Air filter sealed • Air ingress in the low pressure fuel circuit • Fuel quality / presence of water	• Fuel return circuit of the pump sealed • Sealed fuel filter • Engine compression too low • Intermittent fault connection • Carbon deposit on the injector (sealed holes) • Needle stuck (injection possible over a certain pressure) • Gasoline in fuel • Bug software or hardware fault not detected

(SYMPTOM 4) UNSTABLE IDLING

Possible Cause	
• Fuel return hose of injector cut • The compensation of individual injector not adapted • Drift of the rail pressure sensor not detected • Harness resistance increased • Air ingress in the low pressure fuel circuit • Fuel quality / presence of water • Sealed fuel filter • Air filter sealed • Fuel return hose of injector sealed • High pressure leakage	• Glow system faulty • Engine compression too low • Bad flanging of the injector • High pressure pump out of order • Injector not adapted • Carbon deposit on the injector (sealed holes) • Needle stuck (injection possible over a certain pressure) • Injector jammed open • Electric EGR control valve blocked open

(SYMPTOM 5) IDLE SPEED TOO HIGH OR TOO LOW

Possible Cause	
• Drift of the engine coolant temperature sensor not detected • Incorrect state of the electrical pack devices • Alternator or voltage regulator faulty	• Clutch not well set • Bug software or hardware fault not detected • Electric EGR control valve blocked open • Throttle control actuator faulty

(SYMPTOM 6) BLUE, WHITE, OR BLACK SMOKES

Possible Cause	

• The compensation of individual injector not adapted • Drift of the engine coolant temperature sensor not detected • Drift of the rail pressure sensor not detected • Electric EGR control valve blocked open • Fuel pressure regulator valve contaminated, stuck, jammed • Rail pressure regulator valve contaminated, stuck, jammed • Oil level too high/too low • Fuel quality / presence of water	• Catalytic converter sealed or damaged • Air filter sealed • Oil suction (engine racing) • Glow system faulty • Engine compression too low • Bad flanging of the injector • Injector washer not adapted, forgotten, doubled • Injector not adapted • Carbon deposit on the injector (sealed holes) • Injector jammed open • Gasoline in fuel

(SYMPTOM 7) ENGINE RATTLING, NOISY ENGINE

Possible Cause	
• The compensation of individual injector not adapted • Electric EGR control valve blocked closed (noisy engine) • Electric EGR control valve blocked open • Drift of the engine coolant temperature sensor not detected • Glow system faulty • Engine compression too low • Fuel return hose of injector sealed	• Drift of the rail pressure sensor not detected • Injector washer not adapted, forgotten, doubled • Injector not adapted • Carbon deposit on the injector (sealed holes) • Needle stuck (injection possible over a certain pressure) • Injector jammed open • Drift of engine coolant temperature sensor not detected

(SYMPTOM 8) BURST NOISE

Possible Cause	
• The compensation of individual injector not adapted • Intermittent fault connection • Exhaust system sealed • Drift of the rail pressure sensor not detected	• Fuel pressure regulator valve contaminated, stuck, jammed • Rail pressure regulator valve contaminated, stuck, jammed • Bug software or hardware fault not detected

(SYMPTOM 9) UNTIMELY ACCELERATION/DECELERATION AND ENGINE RACING

Possible Cause	
• Accelerator position sensor blocked • Electric EGR valve blocked open • Intermittent fault connection	• Oil suction (engine racing) • Drift of the rail pressure sensor not detected • Bug software or hardware fault not detected

(SYMPTOM 10) GAP WHEN ACCELERATING AND AT RE-COUPLING (RESPONSE TIME)

Possible Cause	
• Air inlet circuit open • Incorrect state of the electrical pack devices • Accelerator position sensor blocked • Electric EGR valve blocked open • Turbo charger damaged, vacuum hose line leakage • Sealed fuel filter	• Engine compression too low • High pressure leakage • Fuel pressure regulator valve contaminated, stuck, jammed • Rail pressure regulator valve contaminated, stuck, jammed • Needle stuck (injection possible over a certain pressure) • Bug software or hardware fault not detected

(SYMPTOM 11) ENGINE STOP OR STALLING

Possible Cause	
• Run out of fuel • Fuel pump hose supply cut • High pressure leakage • Fuse faulty • Fuel quality / presence of water • Low pressure fuel circuit sealed • Sealed fuel filter • Crank signals missing simultaneously • Electric EGR valve blocked open • Fuel pressure regulator valve contaminated, stuck, jammed	• Rail pressure regulator valve contaminated, stuck, jammed • Alternator or voltage regulator faulty • Intermittent fault connection • Catalytic converter sealed or damaged • Oil suction (engine racing) • Low pressure fuel pump faulty • High pressure pump faulty • Faulty ignition key • Gasoline in fuel • Bug software or hardware fault not detected

(SYMPTOM 12) ENGINE JUDDER

Possible Cause	
• Run out of fuel • Fuel return hose of injector cut • Incorrect state of the electrical pack devices • The compensation of individual injector not adapted • Electric EGR valve blocked open • Fuel filter not adapted • Air ingress in the low pressure fuel circuit • Fuel quality / presence of water • Sealed fuel filter	• Glow system faulty • Engine compression too low • Fuel return hose of injector sealed • Valve clearance • Low pressure fuel pump faulty • Injector washer not adapted, forgotten, doubled • Carbon deposit on the injector (sealed holes) • Needle stuck (injection possible over a certain pressure) • Injector jammed open

• Intermittent fault connection • Harness resistance increased	• Gasoline in fuel • Bug software or hardware fault not detected

(SYMPTOM 13) LACK OF POWER

Possible Cause	
• The compensation of individual injector not adapted • Accelerator position sensor blocked • Incorrect state of the electrical pack devices • Electric EGR valve blocked open • Air inlet circuit open • Air filter sealed • Oil level too high/too low • Catalytic converter sealed or damaged • Turbo charger damaged, vacuum hose line leakage	• Sealed fuel filter • Leakage at the injector • Fuel return circuit of the pump sealed • Fuel return hose of injector sealed • Engine compression too low • Injector not adapted • Carbon deposit on the injector (sealed holes) • Valve clearance

(SYMPTOM 14) TOO MUCH POWER

Possible Cause	
• The compensation of individual injector not adapted • Oil suction (engine racing)	• Bug software or hardware fault not detected

(SYMPTOM 15) EXCESSIVE FUEL CONSUMPTION

Possible Cause	
• Fuel return hose of injector cut • Leakage at the Fuel pressure regulator valve • Leakage at fuel temperature sensor • Leakage at the spacers • High pressure leakage • Air inlet circuit open • Air filter sealed • The compensation of individual injector not adapted • Electric EGR valve blocked open	• Incorrect state of the electrical pack devices • Oil level too high/too low • Fuel quality / presence of water • Catalytic converter sealed or damaged • Turbo charger damaged • Engine compression too low • Injector not adapted • Bug software or hardware fault not detected

(SYMPTOM 16) OVER SPEED ENGINE WHEN CHANGING THE GEAR BOX RATIO

Possible Cause	

• Accelerator position sensor blocked • The compensation of individual injector not adapted • Intermittent fault connection • Clutch not well set	• Oil suction (engine racing) • Turbo charger damaged • Injector not adapted • Bug software or hardware fault not detected

(SYMPTOM 17) EXHAUST SMELLS

Possible Cause	
• Electric EGR control valve leakage • Oil suction (engine racing) • Turbo charger damaged • Oil level too high/too low • The compensation of individual injector not adapted • Catalytic converter sealed or damaged • Bad flanging of the injector	• Injector washer not adapted, forgotten, doubled • Injector not adapted • Carbon deposit on the injector (sealed holes) • Needle stuck (injection possible over a certain pressure) • Injector jammed open • Bug software or hardware fault not detected

(SYMPTOM 18) SMOKES (BLACK, WHITE, BLUE) WHEN ACCELERATING

Possible Cause	
• The compensation of individual injector not adapted • Electric EGR valve blocked open • Air filter sealed • Fuel quality / presence of water • Oil level too high/too low • Turbo charger damaged • Catalytic converter sealed or damaged • Oil suction (engine racing) • Air heaters out of order • Engine compression too low • High pressure leakage	• Intermittent fault connection • Bad flanging of the injector • Injector washer not adapted, forgotten, doubled • Injector not adapted • Carbon deposit on the injector (sealed holes) • Needle stuck (injection possible over a certain pressure) • Injector jammed open • Gasoline in fuel • Bug software or hardware fault not detected • Catalyzed Particulate Filter (CPF) fail

(SYMPTOM 19) FUEL SMELLS

Possible Cause	
• Fuel pump hose supply cut • Fuel return hose of injector cut • Leakage at the Fuel pressure regulator valve	• Leakage at fuel temperature sensor • Leakage at the spacers • High pressure leakage

(SYMPTOM 20) THE ENGINE COLLAPSES AT TAKE OFF

Possible Cause	
• Accelerator position sensor blocked • Incorrect state of the electrical pack devices • Air filter sealed • Inversion of low pressure fuel connections • Fuel filter not adapted • Fuel quality/presence of water • Air ingress in the low pressure fuel circuit • Sealed fuel filter	• Catalytic converter sealed or damaged • Clutch not well set • Intermittent fault connection • Drift of the rail pressure sensor not detected • Fuel pressure regulator valve contaminated, stuck, jammed • Rail pressure regulator valve contaminated, stuck, jammed • Gasoline in fuel • Bug software or hardware fault not detected

(SYMPTOM 21) THE ENGINE DOES NOT STOP

Possible Cause
• Faulty ignition key • Oil suction (engine racing) • Bug software or hardware fault not detected

(SYMPTOM 22) DIFFERENT MECHANICAL NOISES

Possible Cause	
• Buzzer noise (discharge by the injectors) • Clip broken (vibrations, resonance, noises) • Incorrect state of the electrical pack devices • Catalytic converter sealed or damaged • Air inlet circuit open	• Bad flanging of the injector • Clutch not well set • Turbo charger damagedValve clearance • Valve clearance

DESCRIPTION

1) Engine is hard to start or does not start at all.
2) Nstable idle.
3) Poor driveability.

NOTICE

- Before removing or installing any part, read the diagnostic trouble codesand 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 operationor while the ignition switch is ON could cause damage to the ECM.
- Wchecking the generator for the charging state, do not disconnect the battery '+' terminal to prevent the ECM from damage due to the voltage.
- Wcharging the battery with the external charger, disconnect the vehicleside battery terminals to prevent damage to the ECM.

SELF-DIAGNOSIS

NOTICE

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.

CHECKING PROCEDURE (SELF-DIAGNOSIS)

NOTICE

- When attery 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 ECM connector is disconnected. Do not disconnect the battery before the diagnostic trouble codes are completely read and recorded.

INSPECTION PROCEDURE (USING GENERIC SCAN TOOL)

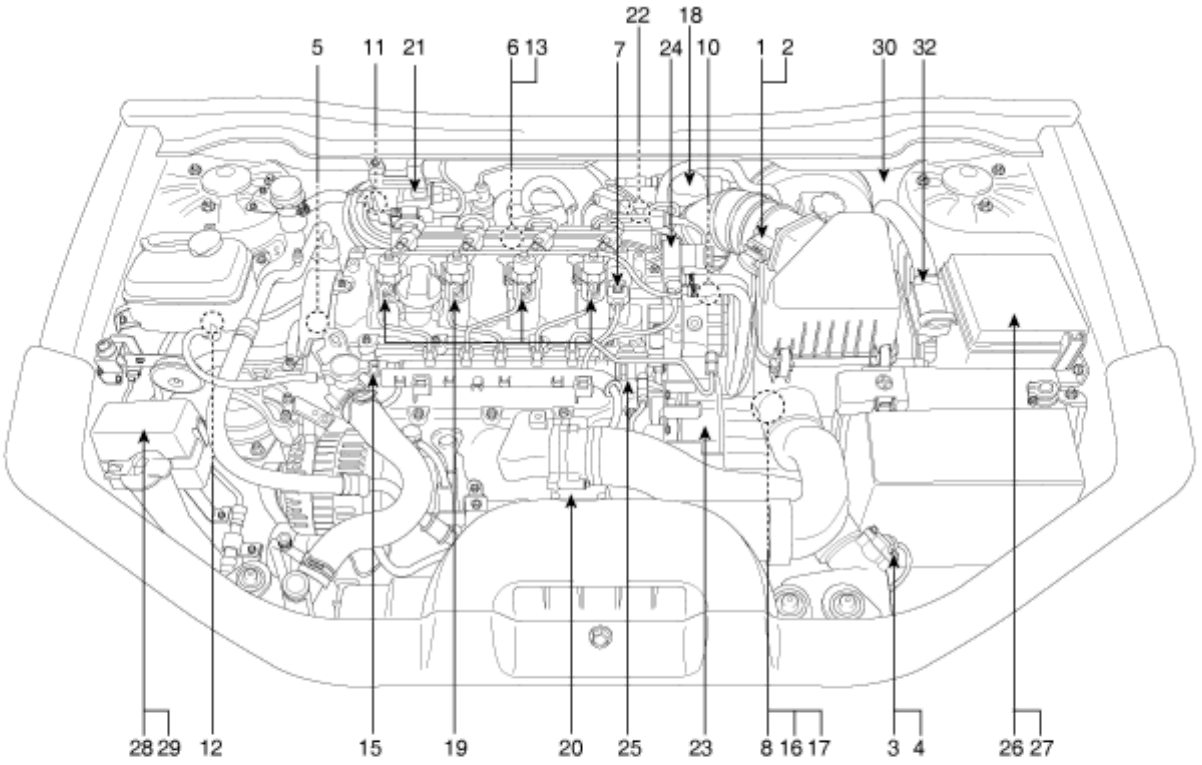
1. Turn OFF the ignition switch.
2. Connect the scan tool to the data link connector on the lower crash pad.
3. Turn ON the ignition switch.
4. Use the scan tool to check the diagnostic trouble code.
5. Repair the faulty part from the diagnosis chart.
6. Erase the diagnostic trouble code.
7. Disconnect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

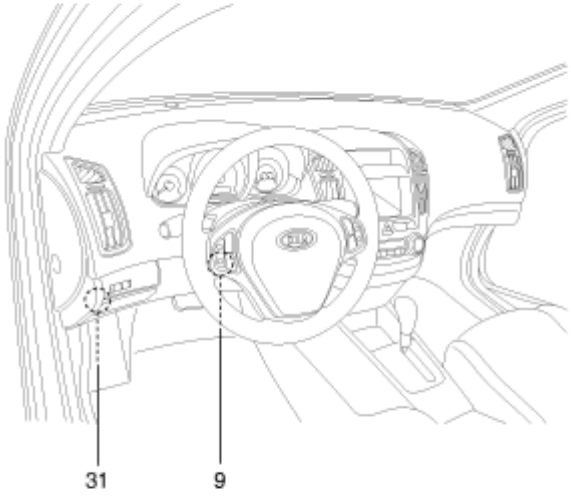
NOTICE

When deleting diagnostic trouble code, use scan tool as possible. When deleting diagnostic trouble code by disconnecting battery terminal(-), data for ECM control may delete simultaneously.

English ▼

COMPONENT LOCATION

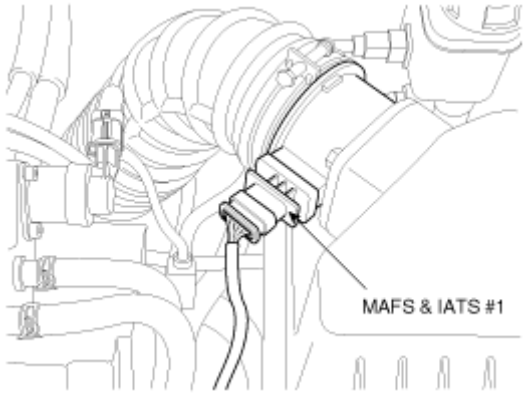
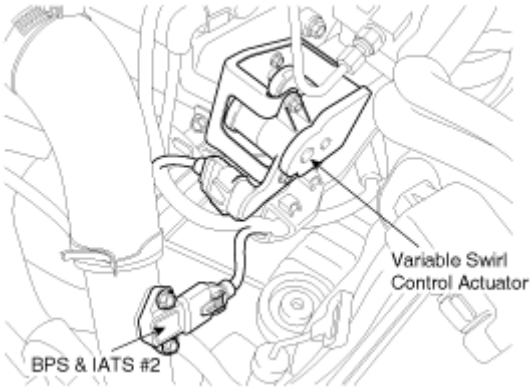
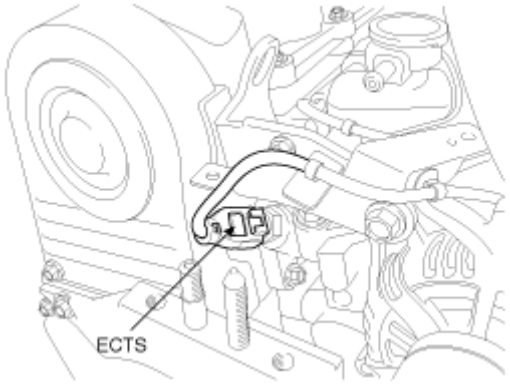
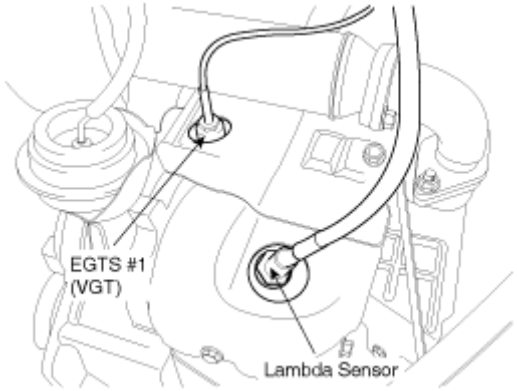
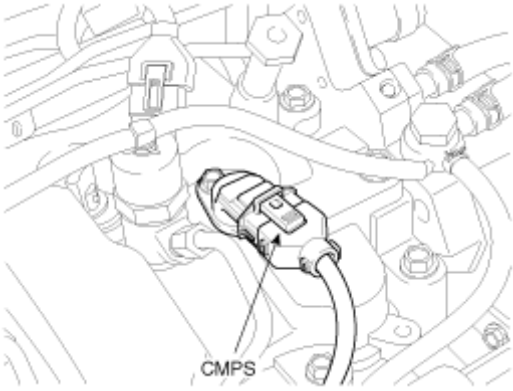
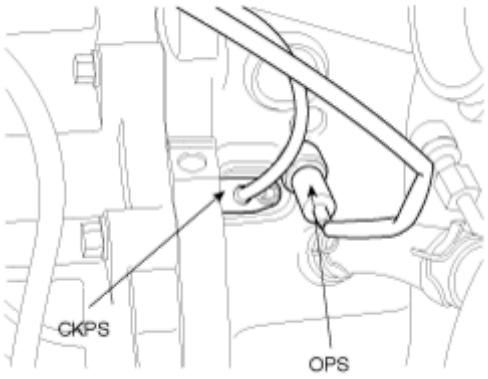


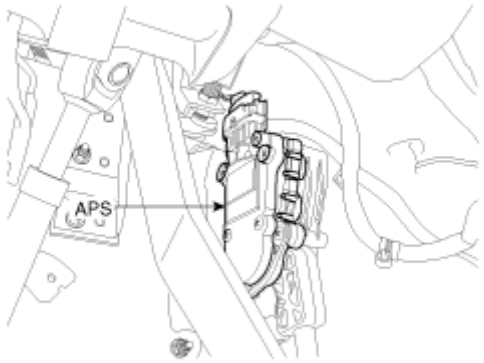
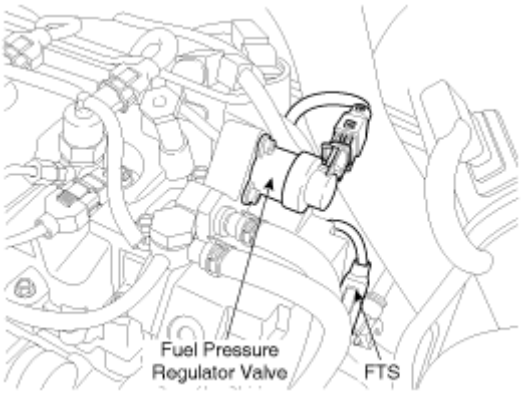
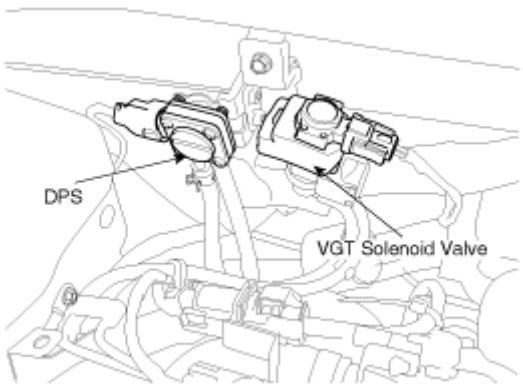
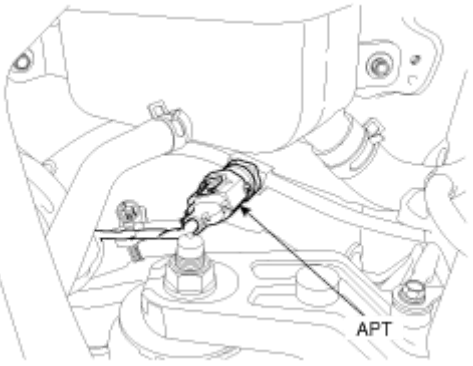
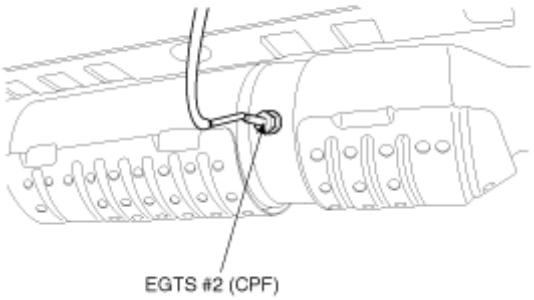
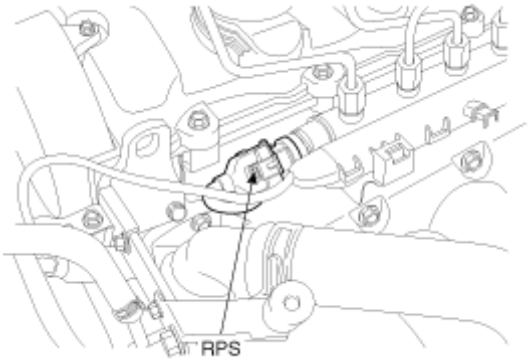
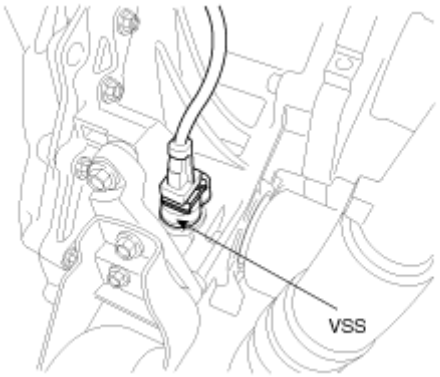
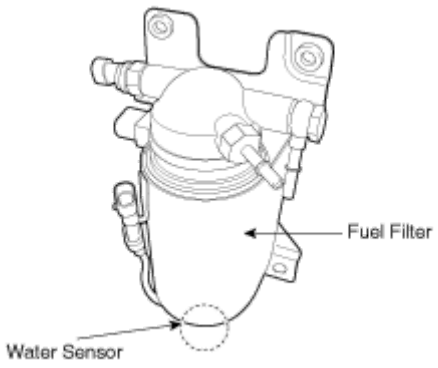


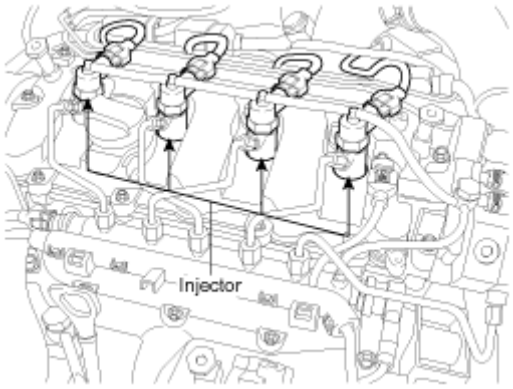
1. Mass Air Sensor (MAFS)
2. Intake Air Temperature Sensor (IATS) #1 built in MAFS
3. Boost Pressure Sensor (BPS)
4. Intake Air Temperature Sensor (IATS) #2 built in BPS
5. Engine Coolant Temperature Sensor (ECTS)
6. Lambda Sensor
7. Camshaft Position Sensor (CMPS)
8. Crankshaft Position Sensor (CKPS)
9. Accelerator Position Sensor (APS)
10. Fuel Temperature Sensor (FTS)
11. Differential Pressure Sensor (DPS)
12. A/C Pressure Transducer (APT)
13. Exhaust Gas Temperature Sensor (EGTS) #1 for VGT
14. Exhaust Gas Temperature Sensor (EGTS) #2 for CPF
15. Rail Pressure Sensor (RPS)
16. Vehicle Speed Sensor (VSS)
17. Oil Pressure Switch (OPS)
18. Water Sensor (included in Fuel Filter)
19. Injector
20. Throttle Control Actuator
21. VGT Control Solenoid Valve
22. Electric EGR Control Valve
23. Variable Swirl Control Actuator
24. Fuel Pressure Regulator Valve
25. Rail Pressure Regulator Valve
26. Main Relay
27. Fuel Pump Relay
28. Glow Relay
29. Auxiliary Heater Relay
30. Multi-Purpose Check Connector
31. Data Link Connector (DLC)
32. ECM (Engine Control Module)

1. Mass Air Flow Sensor (MAFS)	3. Boost Pressure Sensor (BPS) 4. Intake Air Temperature Sensor (IATS) #2 built in BPS

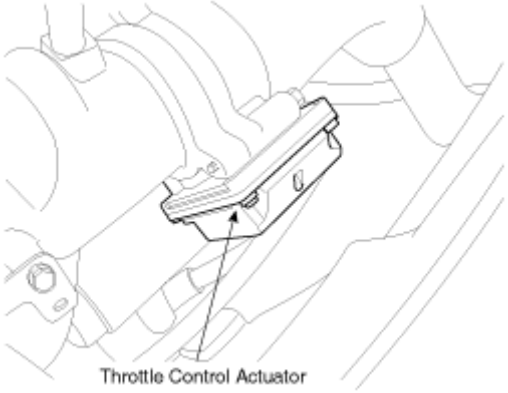
English ▼

2. Intake Air Temperature Sensor (IATS) #1 built in MAFS	23. Variable Swirl Control Actuator
	
5. Engine Coolant Temperature Sensor (ECTS)	6. Lambda Sensor 13. Exhaust Gas Temperature Sensor (EGTS) #1 for VGT
	
7. Camshaft Position Sensor (CMPS)	8. Crankshaft Position Sensor (CKPS) 17. Oil Pressure Switch (OPS)
	
9. Accelerator Pedal Position Sensor (APS)	10. Fuel Temperature Sensor (FTS) 24. Fuel Pressure Regulator Valve

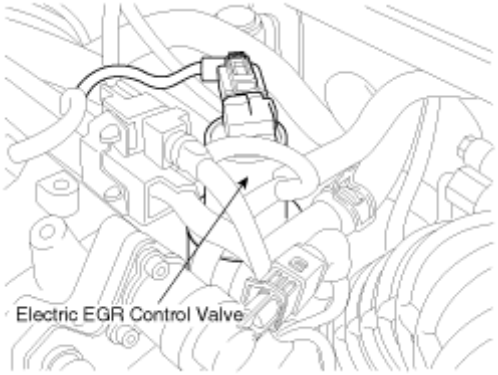
	
11. Differential Pressure Sensor (DPS) 21. VGT Control Solenoid Valve	12. A/C Pressure Transducer (APT)
	
14. Exhaust Gas Temperature Sensor (EGTS) #2 for CPF	15. Rail Pressure Sensor (RPS)
	
16. Vehicle Speed Sensor (VSS)	18. Water Sensor (included in Fuel Filter)
	
19. Injector	20. Throttle Control Actuator



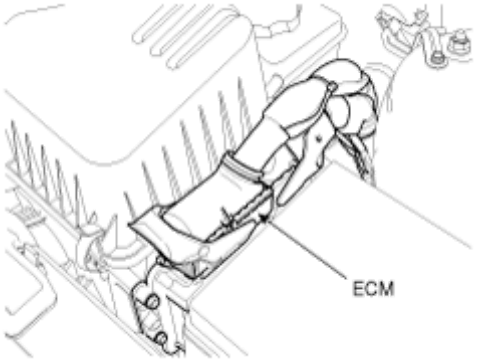
22. Electric EGR Control Valve



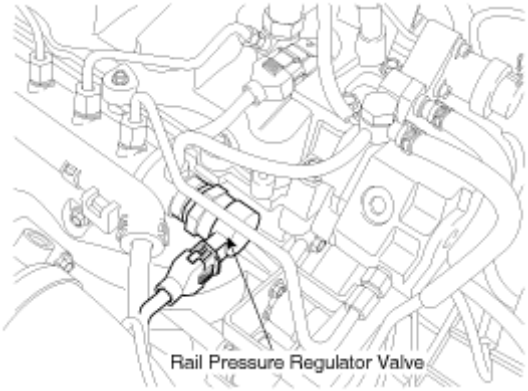
24. ECM (Engine Control Module)



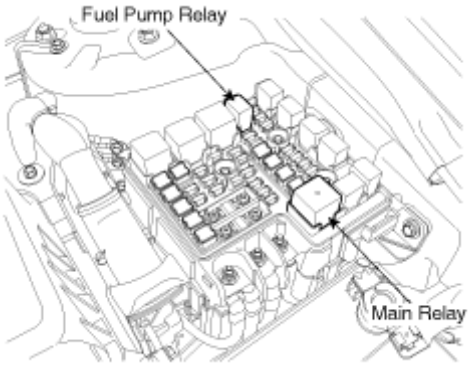
25. Rail Pressure Regulator Valve



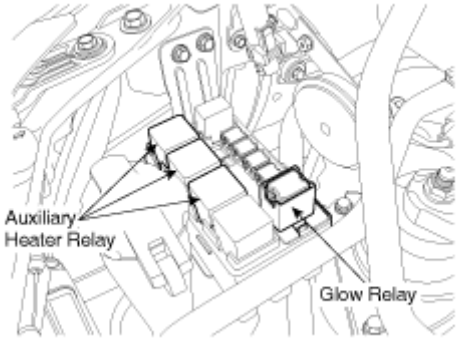
26. Main Relay
27. Fuel Pump Relay

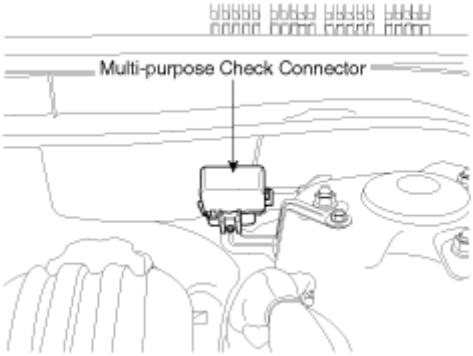


28. Glow Relay
29. Auxiliary Heater Relay (Option)



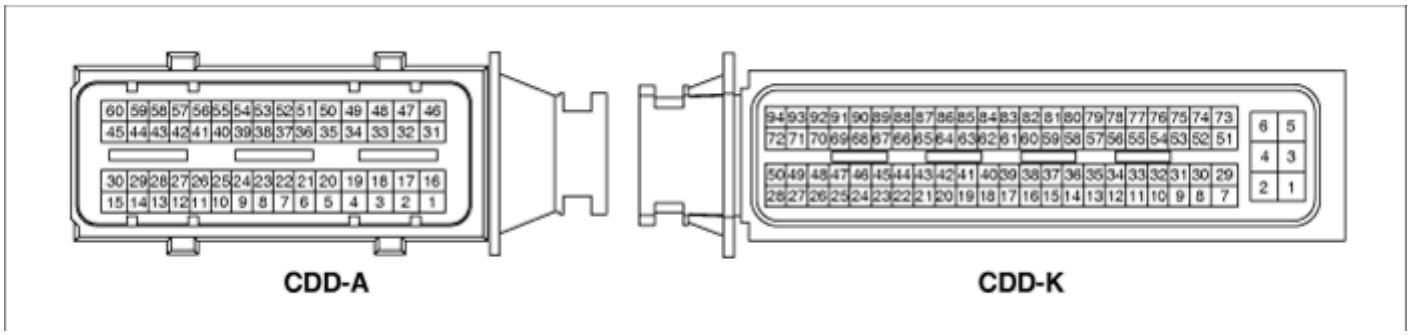
30. Multi-Purpose Check Connector





ECM (ENGINE CONTROL MODULE)

1. ECM HARNESS CONNECTOR



2. ECM TERMINAL FUNCTION

CONNECTOR [CDD-A]

Pin	Description	Connected to
1	Injector (Cylinder #3) [HIGH] control output	Injector (Cylinder #3)
2	Injector (Cylinder #2) [HIGH] control output	Injector (Cylinder #2)
3	-	
4	Battery power	Rail Pressure Regulator Valve
5	-	
6	Sensor ground	Position Sensor in Variable Swirl Control Actuator
7	Sensor shield	Crankshaft Position Sensor (CKPS)
8	Sensor ground	Rail Pressure Sensor (RPS)
9	-	
10	-	
11	-	
12	Crankshaft Position Sensor (CKPS) [-] signal input	Crankshaft Position Sensor (CKPS)
13	Reference voltage (+5V)	Boost Pressure Sensor (BPS)
14	-	
15	-	
16	Injector (Cylinder #1) [HIGH] control output	Injector (Cylinder #1)
17	Injector (Cylinder #4) [HIGH] control output	Injector (Cylinder #4)
18	-	
19	Battery power	Fuel Pressure Regulator Valve
20	Sensor ground	Camshaft Position Sensor (CMPS)
21	-	
22	-	
23	Sensor ground	Boost Pressure Sensor (BPS)
24	-	

English ▼

25	-	
26	Reference voltage (+5V)	Position Sensor in Variable Swirl Control Actuator
27	Crankshaft Position Sensor (CKPS) [+] signal input	Crankshaft Position Sensor (CKPS)
28	Reference voltage (+5V)	Rail Pressure Sensor (RPS)
29	-	
30	Motor [-] control output	Variable Swirl Control Actuator
31	Injector (Cylinder #2) [LOW] control output	Injector (Cylinder #2)
32	-	
33	Injector (Cylinder #4) [LOW] control output	Injector (Cylinder #4)
34	Rail Pressure Regulator Valve control output	Rail Pressure Regulator Valve
35	-	
36	-	
37	Reference frequency	Mass Air Flow Sensor (MAFS)
38	-	
39	-	
40	Boost Pressure Sensor (BPS) signal input	Boost Pressure Sensor (BPS)
41	Sensor ground	Engine Coolant Temperature Sensor (ECTS)
42	Mass Air Flow Sensor (MAFS) signal input	Mass Air Flow Sensor (MAFS)
43	Rail Pressure Sensor (RPS) signal input	Rail Pressure Sensor (RPS)
44	Sensor ground	MAFS & IATS #1
45	Fuel Pump Relay output	Fuel Pump Relay
46	Injector (Cylinder #3) [LOW] control output	Injector (Cylinder #3)
47	Injector (Cylinder #1) [LOW] control output	Injector (Cylinder #1)
48	-	
49	Fuel Pressure Regulator Valve control output	Fuel Pressure Regulator Valve
50	Camshaft Position Sensor (CMPS) signal input	Camshaft Position Sensor (CMPS)
51	-	
52	-	
53	Intake Air Temperature Sensor (IATS) #2 signal input	Intake Air Temperature Sensor (IATS) #2 built in BPS
54	-	
55	-	
56	Position Sensor signal input	Position Sensor in Variable Swirl Control Actuator
57	-	
58	Engine Coolant Temperature Sensor (ECTS) signal input	Engine Coolant Temperature Sensor (ECTS)
59	Electric EGR Control Valve control output	Electric EGR Control Valve
60	Motor [+] control output	Variable Swirl Control Actuator

CONNECTOR [CDD-K]

Pin	Description	Connected to
1	Batter voltage supply after main relay	Main Relay
2	Power ground	Chassis Ground
3	Batter voltage supply after main relay	Main Relay
4	Power ground	Chassis Ground
5	Batter voltage supply after main relay	Main Relay
6	Power ground	Chassis Ground
7	Cooling Fan Relay [HIGH] control output	Cooling Fan Relay [HIGH]
8	Sensor ground	Accelerator Position Sensor (APS) #2
9	Accelerator Position Sensor (APS) #1 signal input	Accelerator Position Sensor (APS) #1
10	Sensor ground	Fuel Temperature Sensor (FTS)
11	Fuel Temperature Sensor (FTS) signal input	Fuel Temperature Sensor (FTS)
12	Ground	A/C Pressure Transducer
13	A/C Pressure Transducer signal input	A/C Pressure Transducer
14	Ground	Cruise Control Switch
15	Cruise Control "ACTIVATOR" signal input	Cruise Control Switch
16	Ground	Immobilizer Control Module
17	-	
18	-	
19	-	
20	-	
21	-	
22	Reference voltage (+5V)	A/C Pressure Transducer
23	-	
24	Reference voltage (+5V)	Cruise Control Switch
25	Diagnosis Data Line (K-Line)	Data Link Connector (DLC)
26	-	
27	Fuel consumption signal output	Trip computer
28	Ignition switch signal input	Ignition Switch
29	VGT Control Solenoid Valve control output	VGT Control Solenoid Valve
30	Sensor ground	Accelerator Position Sensor (APS) #1
31	Accelerator Position Sensor (APS) #2 signal input	Accelerator Position Sensor (APS) #2
32	Exhaust Gas Temperature Sensor (EGTS) #2 signal input	Exhaust Gas Temperature Sensor (EGTS) #2 for CPF
33	Sensor ground	Exhaust Gas Temperature Sensor (EGTS) #2 for CPF
34	Exhaust Gas Temperature Sensor (EGTS) #1 signal input	Exhaust Gas Temperature Sensor (EGTS) #1 [VGT]
35	Sensor ground	Exhaust Gas Temperature Sensor (EGTS) #1 [VGT]
36	Differential Pressure Sensor (DPS) signal input	Differential Pressure Sensor (DPS)
37	Sensor ground	Differential Pressure Sensor (DPS)

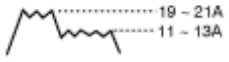
38	Brake Switch "Lamp" signal input	Brake Switch
39	-	
40	Water Sensor siganl input	Water Sensor in Fuel Filter
41	-	
42	Blower Switch Signal input	Blower Switch
43	-	
44	Reference voltage (+5V)	Differential Pressure Sensor (DPS)
45	Reference voltage (+5V)	Accelerator Position Sensor (APS) #1
46	Reference voltage (+5V)	Accelerator Position Sensor (APS) #2
47	Immobilizer Communication Line	Immobilizer Control Module
48	Engine speed signal output	Tachometer (Cluster)
49	Cruise Control "SET" Lamp control output	Cruise Control "SET" Lamp (Cluster)
50	-	
51	Lambda Sensor Heater control output	Lambed Sesnor
52	-	-
53	-	
54	A/C Switch "ON" signal input	A/C Switch
55	-	
56	Thermo Switch signal input	A/C Switch
57	Gear Neutral Switch signal input (MT Only)	Gear Neutral Switch
58	-	
59	-	
60	-	
61	-	
62	-	
63	-	
64	Lambda Sensor Voltage "NERNST"	Lambda Sensor
65	Lambda Sensor Current Pump	Lambda Sensor
66	-	
67	-	
68	Malfunction Indicator Lamp (MIL) control output	Malfunction Indicator Lamp (MIL)
69	Glow Time Indicator Lamp contorl output	Glow Time Indicator Lamp (Cluster)
70	A/C Compressor Relay control output	A/C Compressor Relay
71	Cooling Fan Relay [LOW] control output	Cooling Fan Relay
72	Main Relay control output	Main Relay
73	-	
74	-	
75	Vehicle speed signal input	Vehicle Speed Sensor (VSS)
76	-	
77	Feedback signal input	Throttle Control Actuator

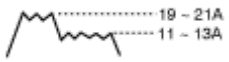
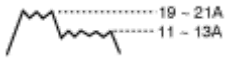
78	-	
79	Clutch Switch signal input	Clutch Switch
80	Brake Switch "Redundant" signal input	Brake Switch
81	MT/AT auto reconition signal input	M/T: Open, A/T: Ground
82	-	
83	CAN [LOW]	Other Control Modules
84	CAN [HIGH]	Other Control Modules
85	-	
86	Lambda Sensor Virtual Ground	Lambda Sensor
87	Lambda Sensor Current Adjust	Lambda Sensor
88	-	
89	Intake Air Temperature Sensor (IATS) #1 signal input	Intake Air Temperature Sensor (IATS) #1 in MAFS
90	Throttle Control Actuator control output	Throttle Control Actuator
91	Cruise Control "MAIN" Lamp control output	Cruise Control "MAIN" Lamp (Cluster)
92	Immobilizer Lamp control output	Immobilizer Lamp (Cluster)
93	Glow Relay control output	Glow Relay
94	PTC Heater Relay control output	PTC Heater Relay

3. ECM TERMINAL INPUT/OUTPUT SIGNAL

CONNECTOR [CDD-A]

Pin	Description	Condition	Type	Level
1	Injector (Cylinder #3) [HIGH] control output	Idle	Pulse	B+ ~ 80V
2	Injector (Cylinder #2) [HIGH] control output	Idle	Pulse	B+ ~ 80V
3	-	-	-	-
4	Battery power	Idle	DC	Vbatt
5	-	-	-	-
6	Sensor ground	Idle	DC	Max. 50mV
7	Sensor shield	Idle	DC	Max. 50mV
8	Sensor ground	Idle	DC	Max. 50mV
9	-	-	-	-
10	-	-	-	-
11	-	-	-	-
12	Crankshaft Position Sensor (CKPS) [-] signal input	Idle	Sine Wave	Vp_p : Min.1.0V
13	Reference voltage (+5V)	IG OFF	DC	Max. 0.5V
		IG ON		4.9 ~ 5.1V
14	-	-	-	-
15	-	-	-	-
16	Injector (Cylinder #1) [HIGH] control output	Idle	Pulse	Vbatt ~ 80V
17	Injector (Cylinder #4) [HIGH] control output	Idle	Pulse	Vbatt ~ 80V

18	-	-	-	-
19	Battery power	IG OFF	DC	Max. 0.5 V
		IG ON		Vbatt
20	Sensor ground	Idle	DC	Max. 50 mV
21	-	-	-	-
22	-	-	-	-
23	Sensor ground	Idle	DC	Max. 50 mV
24	-	-	-	-
25	-	-	-	-
26	Reference voltage (+5V)	IG OFF	DC	Max. 0.5V
		IG ON		4.9 ~ 5.1V
27	Crankshaft Position Sensor (CKPS) [+] signal input	Idle	Sine Wave	Vp_p : Min.1.0V
28	Reference voltage (+5V)	IG OFF	DC	Max. 0.5V
		IG ON		4.9 ~ 5.1V
29	-	-	-	-
30	Motor [-] control output	Active	DC	Max.0.5V
31	Injector (Cylinder #2) [LOW] control output	Idle	Pulse	Peak Current : 19 ~ 21 A Hold Current : 11~ 13 A 
32	-	-	-	-
33	Injector (Cylinder #4) [LOW] control output	Idle	Pulse	Peak Current : 19 ~ 21 A Hold Current : 11~ 13 A 
34	Rail Pressure Regulator Valve control output	Idle	Pulse	Hi: Vbatt Lo: Max. 1.0V Frequency = 1kHz ± 2%
35	-	-	-	-
36	-	-	-	-
37	Reference frequency	Idle	Pulse	Hi: Vcc or Vbatt Lo: Max. 1.0V
38	-	-	-	-
39	-	-	-	-
40	Boost Pressure Sensor (BPS) signal input	IG ON	Analog	0.5 ~ 4.5V
41	Sensor ground	Idle	DC	Max. 50 mV
42	Mass Air Flow Sensor (MAFS) signal input	Idle	Pulse	Hi: Vcc or Vbatt Lo: Max. 1.0V
		IG ON		Max. 1.0V

43	Rail Pressure Sensor (RPS) signal input	Idle	Analog	1.0 ~ 1.5 V
		3000 RPM		1.5 ~ 3.0 V
44	Sensor ground	Idle	DC	Max. 50 mV
45	Fuel Pump Relay output	Relay OFF	DC	Vbatt
		Relay ON		Max. 1.0V
46	Injector (Cylinder #3) [LOW] control output	Idle	Pulse	Peak Current : 19 ~ 21 A Hold Current : 11~ 13 A 
47	Injector (Cylinder #1) [LOW] control output	Idle	Pulse	Peak Current : 19 ~ 21 A Hold Current : 11~ 13 A 
48	-	-	-	-
49	Fuel Pressure Regulator Valve control output	Idle	Pulse	Hi: Vbatt Lo: Max. 1.0V
50	Camshaft Position Sensor (CMPS) signal input	Idle	Pulse	Hi: Vcc or Vbatt Lo: Max. 1.0V
51	-	-	-	-
52	-	-	-	-
53	Intake Air Temperature Sensor (IATS) #2 signal input	Idle	Analog	0.5 ~ 4.5V
54	-	-	-	-
55	-	-	-	-
56	Position Sensor signal input	Idle	DC	0.5 ~ 4.5V
57	-	-	-	-
58	Engine Coolant Temperature Sensor (ECTS) signal input	Idle	Analog	0.5 ~ 4.5V
59	Electric EGR Control Valve control output	Idle	Pulse	Hi: Vbatt Lo: Max. 1.0V
60	Motor [+] control output	Active	Pulse	Hi: Vbatt Lo: Max. 1.0V

CONNECTOR [CDD-K]

Pin	Description	Condition	Type	Level
1	Batter voltage supply after main relay	IG OFF	DC	Max. 1.0 V
		IG ON		Vbatt
2	Power ground	Idle	DC	Max. 50 mV
3	Batter voltage supply after main relay	IG OFF	DC	Max. 1.0 V
		IG ON		Vbatt
4	Power ground	Idle	DC	Max. 50 mV

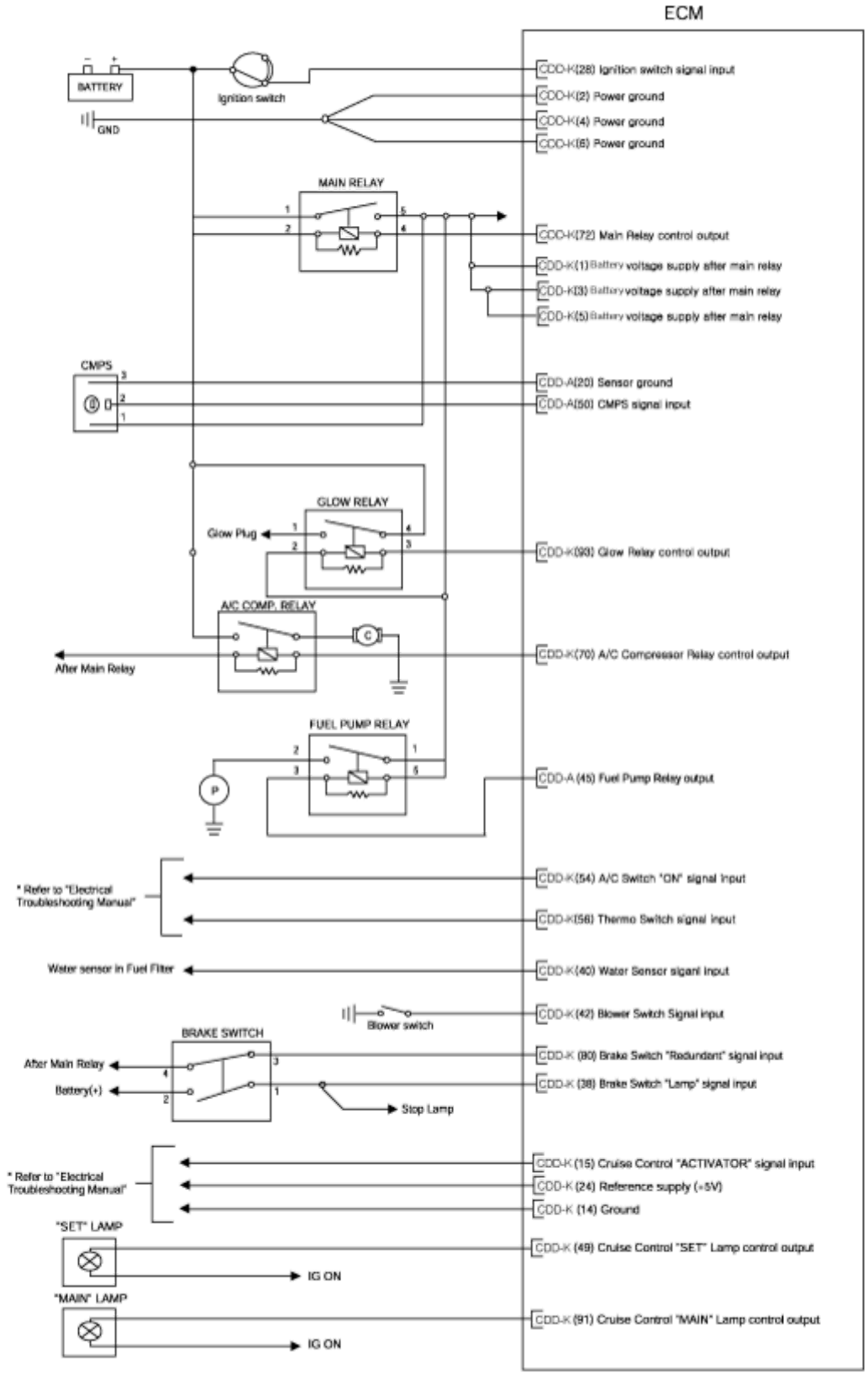
5	Batter voltage supply after main relay	IG OFF	DC	Max. 1.0 V
		IG ON		Vbatt
6	Power ground	Idle	DC	Max. 50 mV
7	Cooling Fan Relay [HIGH] control output	Relay OFF	DC	Vbatt
		Relay ON		Max. 1.0V
8	Sensor ground	Idle	DC	Max. 50 mV
9	Accelerator Position Sensor (APS) #1 signal input	C.T	Analog	0.3 ~ 0.9V
		W.O.T		4.0 ~ 4.8V
10	Sensor ground	Idle	DC	Max. 50 mV
11	Fuel Temperature Sensor (FTS) signal input	IG ON	Analog	0.5 ~ 4.5V
12	Ground	Idle	DC	Max. 50 mV
13	A/C Pressure Transducer signal input	A/C On	Analog	Max. 4.8V
14	Ground	Idle	DC	Max. 50mV
15	Cruise Control "ACTIVATOR" signal input	-	-	-
16	Ground	Idle	DC	Max. 50 mV
17	-	-	-	-
18	-	-	-	-
19	-	-	-	-
20	-	-	-	-
21	-	-	-	-
22	Reference voltage (+5V)	IG OFF	DC	Max. 0.5V
		IG ON		4.9 ~ 5.1V
23	-	-	-	-
24	Reference voltage (+5V)	IG OFF	DC	Max. 0.5V
		IG ON		4.9 ~ 5.1V
25	Diagnosis K-Line	When transmitting	Pulse	Hi: Min. Vbatt×80% Lo: Max. Vbatt×20%
		When receiving		Hi: Min. Vbatt×70% Lo: Max. Vbatt×30%
26	-	-	-	-
27	Fuel consumption signal output	Idle	Pulse	Hi: Vbatt or Vcc Lo: Max. 0.5V
28	Ignition switch signal input	IG OFF	DC	Max. 1.0V
		IG ON		Vbatt
29	VGT Control Solenoid Valve control output	Idle	Pulse	Hi: Vbatt Lo: Max. 0.5V
30	Sensor ground	Idle	DC	Max. 50 mV
31	Accelerator Position Sensor (APS) #2 signal input	C.T	Analog	0.3 ~ 0.9V
		W.O.T		1.5 ~ 3.0V
32	Exhaust Gas Temperature Sensor (EGTS) #2 signal input	Idle	Analog	0.5 ~ 4.5V
33	Sensor ground	Idle	DC	Max. 50 mV

34	Exhaust Gas Temperature Sensor (EGTS) #1 signal input	Idle	Analog	0.5 ~ 4.5V
35	Sensor ground	Idle	DC	Max. 50 mV
36	Differential Pressure Sensor (DPS) signal input	Idle	Analog	0.5 ~ 4.5V
37	Sensor ground	Idle	DC	Max. 50 mV
38	Brake Switch "Lamp" signal input	Release	DC	Max. 0.5V
		Push		Vbatt
39	-	-	-	-
40	Water Sensor siganl input	Full of Water	Analog	Vbatt
		No Water		Max. 1V
41	-	-	-	-
42	Blower Switch Signal input	Blower Off	DC	Vbatt
		Blower On		Max. 2V
43	-	-	-	-
44	Reference voltage (+5V)	IG OFF	DC	Max. 0.5V
		IG ON		4.9 ~ 5.1V
45	Reference voltage (+5V)	IG OFF	DC	Max. 0.5V
		IG ON		4.9 ~ 5.1V
46	Reference voltage (+5V)	IG OFF	DC	Max. 0.5V
		IG ON		4.9 ~ 5.1V
47	Immobilizer Communication Line	After IG ON when communicating	Pulse	Hi: Min. 8.5V
				Lo: Max. 3.5V
48	Engine speed signal output	Idle	Pulse	Hi: Vbatt Lo: Max. 5V Frequency : 50~60Hz
49	Cruise Control "SET" Lamp control output	-	-	-
50	-	-	-	-
51	Lambda Sensor Heater control output	Vehicle Run	Pulse	Hi: Vbatt Lo: Max. 1.0V
52	-	-	-	-
53	-	-	-	-
54	A/C Switch "ON" signal input	A/C SW OFF	DC	Max. 1.0V
		A/C SW ON		Vbatt
55	-	-	-	-
56	Thermo Switch signal input	A/C OFF	DC	Max. 0.5V
		A/C ON		Vbatt
57	Gear Neutral Switch signal input (MT Only)	SW OFF (Neutral)	DC	Vbatt
		SW ON (1st)		Max. 0.5V
58	-	-	-	-
59	-	-	-	-

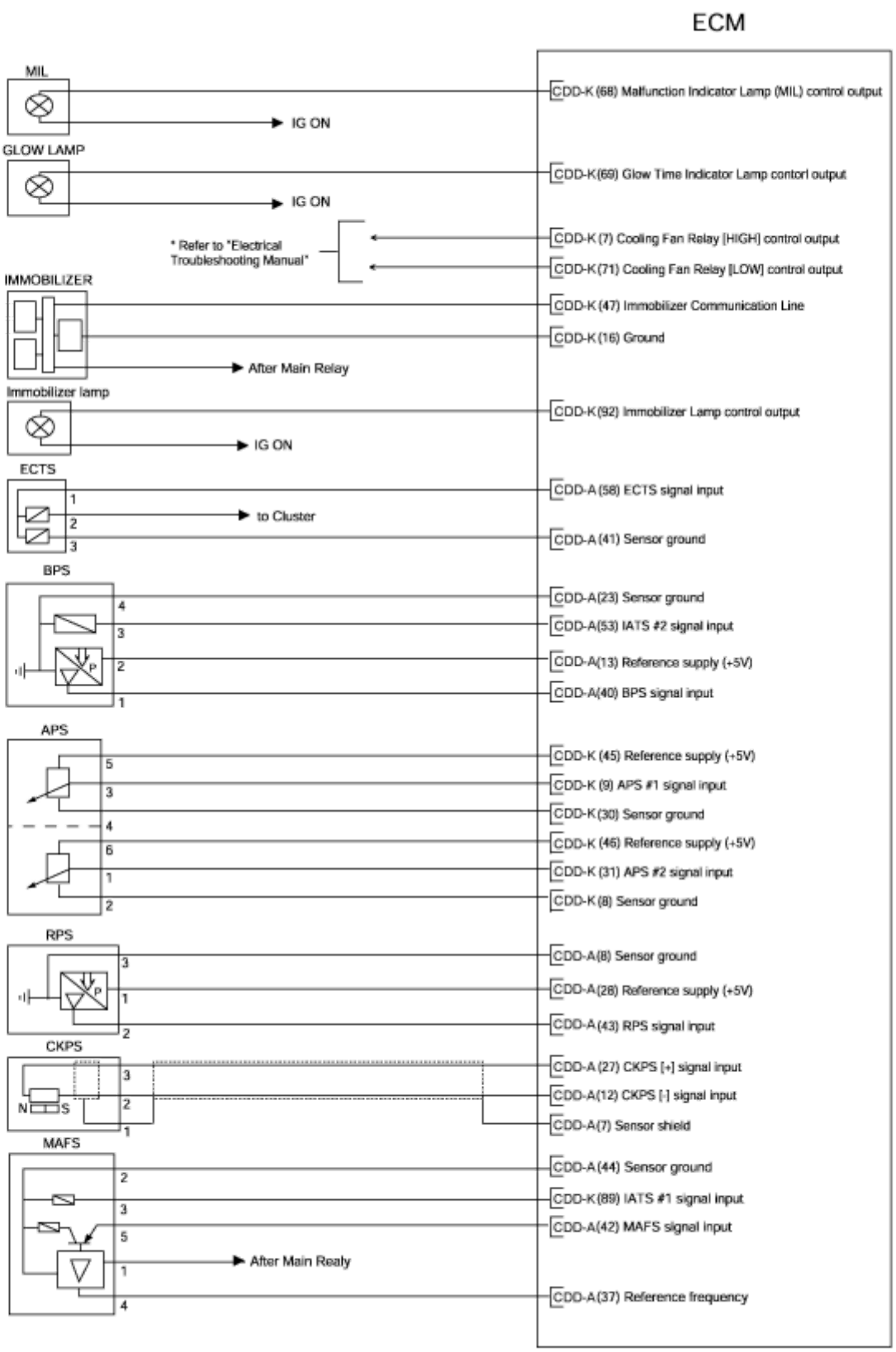
60	-	-	-	-
61	-	-	-	-
62	-	-	-	-
63	-	-	-	-
64	Lambda Sensor Voltage "NERNST"	Engine Run	Analog	Normal : 450 ± 50 mV Rich : Max. Normal + 150mV Lean : Min. Normal - 150mV
65	Lambda Sensor Current Pump	Engine Run	Analog	Normal : 0 ± 500 mV Rich : Min. Normal - 1.5V Lean : Max. Normal + 1.5V
66	-	-	-	-
67	-	-	-	-
68	Malfunction Indicator Lamp (MIL) control output	Lamp OFF	DC	Vbatt
		Lamp ON		Max. 1.0V
69	Glow Time Indicator Lamp control output	Glow OFF	DC	Vbatt
		Glow ON		Max. 1.0V
70	A/C Compressor Relay control output	A/Con OFF	DC	Vbatt
		A/Con ON		Max. 1.0V
71	Cooling Fan Relay [LOW] control output	Relay OFF	DC	Vbatt
		Relay ON		Max. 1.0V
72	Main Relay control output	Relay OFF	DC	Vbatt
		Relay ON		Max. 1.0V
73	-			
74	-	-	-	-
75	Vehicle speed signal input	Vehicle Run	Pulse	Hi: Min. 5.0V Lo: Max. 1.0V
76	-	-	-	-
77	Feedback signal input	Normal	DC	Vbatt
		Abnormal		Max. 0.5V
78	-	-	-	-
79	Clutch Switch signal input	Release	DC	Max. 0.5V
		Push		Vbatt
80	Brake Switch "Redundant" signal input	Release	DC	Vbatt
		Push		Max. 0.5V
81	MT/AT auto reconition signal input	MT	DC	Vbatt
		AT		Max. 0.5V
82	-	-	-	-
83	CAN [LOW]	Recessive	Pulse	2.0 ~ 3.0 V
		Dominant		0.5 ~ 2.25 V

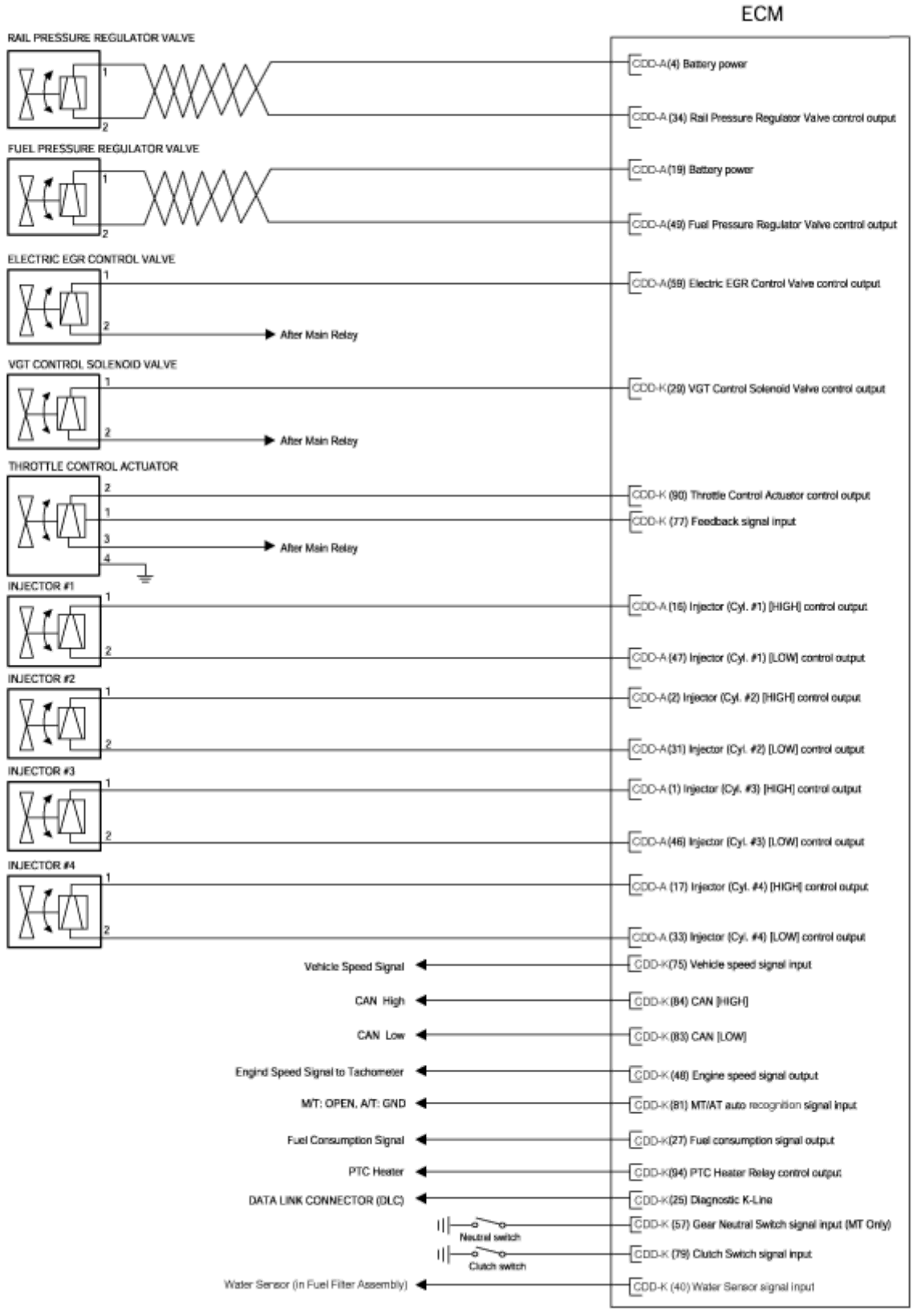
84	CAN [HIGH]	Recessive	Pulse	2.0 ~ 3.0 V
		Dominant		2.75 ~ 4.5 V
85	-	-	-	-
86	Lambda Sensor Virtual Ground	Engine Run	Analog	2.4 ~ 2.6V
87	Lambda Sensor Current Adjust	Engine Run	Analog	|Current Pump - Current Adjust |< 0.2V
88	-	-	-	-
89	Intake Air Temperature Sensor (IATS) #1 signal input	Idle	Analog	0.5V ~ 4.5V
90	Throttle Control Actuator control output	Key On/Key Off	Pulse	Hi: Vbatt Lo: Max. 1V
91	Cruise Control "MAIN" Lamp control output	-	-	-
92	Immobilizer Lamp control output	Lamp OFF	DC	Vbatt
		Lamp ON		Max. 1.0V
93	Glow Relay control output	Relay OFF	DC	Vbatt
		Relay ON		Max. 1.0V
94	PTC Heater Relay control output	Relay OFF	DC	Vbatt
		Relay ON		Max. 1.0V

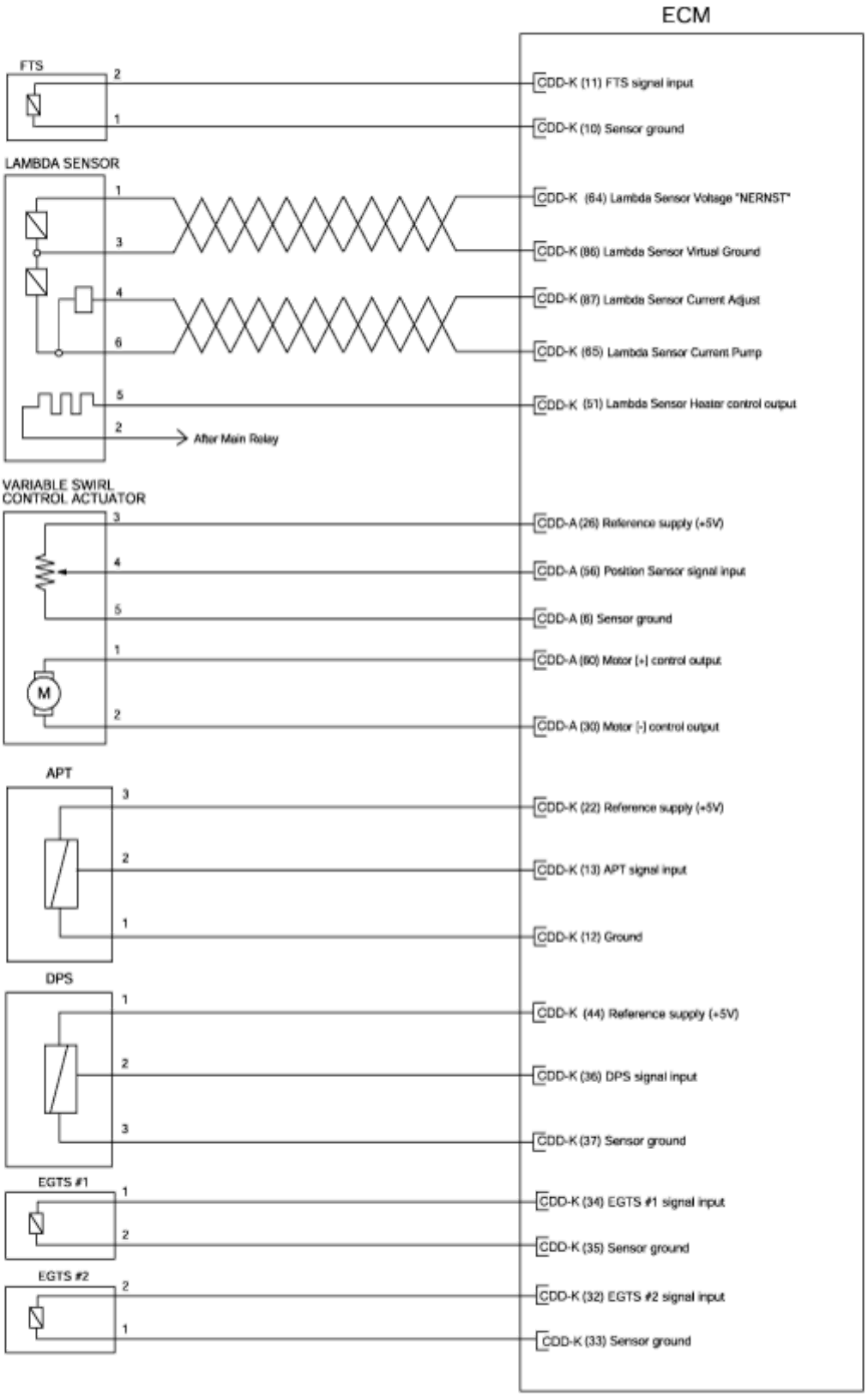
CIRCUIT DIAGRAM



English ▼


ECM
MIL
IG ON
CDD-K (68) Malfunction Indicator Lamp (MIL) control output
GLOW LAMP
IG ON
CDD-K(69) Glow Time Indicator Lamp contorl output
* Refer to "Electrical Troubleshooting Manual"
CDD-K (7) Cooling Fan Relay [HIGH] control output
CDD-K(71) Cooling Fan Relay [LOW] control output
IMMOBILIZER
CDD-K (47) Immobilizer Communication Line
CDD-K (16) Ground
After Main Relay
Immobilizer lamp
CDD-K(92) Immobilizer Lamp control output
IG ON
ECTS
1
2
3
CDD-A (58) ECTS signal input
to Cluster
CDD-A (41) Sensor ground
BPS
4
3
2
1
P
CDD-A(23) Sensor ground
CDD-A(53) IATS #2 signal input
CDD-A(13) Reference supply (+5V)
CDD-A(40) BPS signal input
APS
5
3
4
6
1
2
CDD-K (45) Reference supply (+5V)
CDD-K (9) APS #1 signal input
CDD-K (30) Sensor ground
CDD-K (46) Reference supply (+5V)
CDD-K (31) APS #2 signal input
CDD-K (8) Sensor ground
RPS
3
1
2
P
CDD-A(8) Sensor ground
CDD-A(28) Reference supply (+5V)
CDD-A(43) RPS signal input
CKPS
3
2
1
N
S
CDD-A (27) CKPS [+] signal input
CDD-A(12) CKPS [-] signal input
CDD-A(7) Sensor shield
MAFS
2
3
5
1
4
CDD-A(44) Sensor ground
CDD-K(89) IATS #1 signal input
CDD-A(42) MAFS signal input
After Main Realy
CDD-A(37) Reference frequency


ECM
RAIL PRESSURE REGULATOR VALVE
1
2
CDD-A(4) Battery power
CDD-A (34) Rail Pressure Regulator Valve control output
FUEL PRESSURE REGULATOR VALVE
1
2
CDD-A(19) Battery power
CDD-A(49) Fuel Pressure Regulator Valve control output
ELECTRIC EGR CONTROL VALVE
1
2
After Main Relay
CDD-A(59) Electric EGR Control Valve control output
VGT CONTROL SOLENOID VALVE
1
2
After Main Relay
CDD-K(29) VGT Control Solenoid Valve control output
THROTTLE CONTROL ACTUATOR
2
1
3
4
After Main Relay
CDD-K (90) Throttle Control Actuator control output
CDD-K (77) Feedback signal input
INJECTOR #1
1
2
CDD-A (16) Injector (Cyl. #1) [HIGH] control output
CDD-A (47) Injector (Cyl. #1) [LOW] control output
INJECTOR #2
1
2
CDD-A (2) Injector (Cyl. #2) [HIGH] control output
CDD-A (31) Injector (Cyl. #2) [LOW] control output
INJECTOR #3
1
2
CDD-A (1) Injector (Cyl. #3) [HIGH] control output
CDD-A (46) Injector (Cyl. #3) [LOW] control output
INJECTOR #4
1
2
CDD-A (17) Injector (Cyl. #4) [HIGH] control output
CDD-A (33) Injector (Cyl. #4) [LOW] control output
Vehicle Speed Signal
CDD-K(75) Vehicle speed signal input
CAN High
CDD-K(84) CAN [HIGH]
CAN Low
CDD-K(83) CAN [LOW]
Engind Speed Signal to Tachometer
CDD-K (48) Engine speed signal output
M/T: OPEN, A/T: GND
CDD-K(81) MT/AT auto recognition signal input
Fuel Consumption Signal
CDD-K(27) Fuel consumption signal output
PTC Heater
CDD-K(94) PTC Heater Relay control output
DATA LINK CONNECTOR (DLC)
CDD-K(25) Diagnostic K-Line
Neutral switch
CDD-K (57) Gear Neutral Switch signal input (MT Only)
Clutch switch
CDD-K (79) Clutch Switch signal input
Water Sensor (in Fuel Filter Assembly)
CDD-K (40) Water Sensor signal input


ECM
FTS
2
1
CDD-K (11) FTS signal input
CDD-K (10) Sensor ground
LAMBDA SENSOR
1
3
4
6
5
2
After Main Relay
CDD-K (64) Lambda Sensor Voltage "NERNST"
CDD-K (86) Lambda Sensor Virtual Ground
CDD-K (87) Lambda Sensor Current Adjust
CDD-K (85) Lambda Sensor Current Pump
CDD-K (51) Lambda Sensor Heater control output
VARIABLE SWIRL
CONTROL ACTUATOR
3
4
5
1
2
M
CDD-A (26) Reference supply (+5V)
CDD-A (56) Position Sensor signal input
CDD-A (6) Sensor ground
CDD-A (60) Motor [+] control output
CDD-A (30) Motor [-] control output
APT
3
2
1
CDD-K (22) Reference supply (+5V)
CDD-K (13) APT signal input
CDD-K (12) Ground
DPS
1
2
3
CDD-K (44) Reference supply (+5V)
CDD-K (36) DPS signal input
CDD-K (37) Sensor ground
EGTS #1
1
2
CDD-K (34) EGTS #1 signal input
CDD-K (35) Sensor ground
EGTS #2
2
1
CDD-K (32) EGTS #2 signal input
CDD-K (33) Sensor ground

English ▼

ECM PROBLEM INSPECTION PROCEDURE

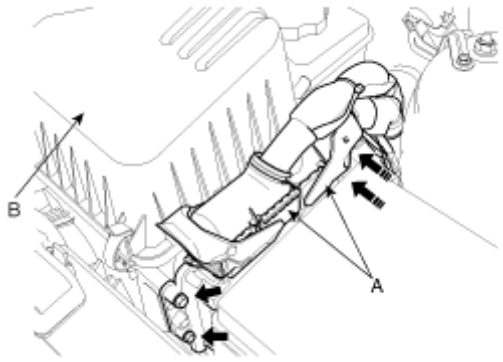
1. TEST ECM GROUND CIRCUIT: Measure resistance between ECM and chassis ground using the backside of ECM harness connector as ECM side check point. If the problem is found, repair it.
2. TEST ECM CONNECTOR: Disconnect the ECM connector and visually check the ground terminals on ECM side and harness side for bent pins or poor contact 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 PROCEDURE in BASIC INSPECTION PROCEDURE)

REPLACEMENT

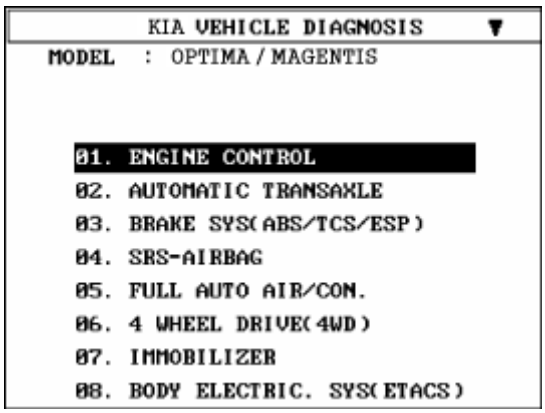
⚠ CAUTION

After replacing an ECM, MUST input the vehicle mileage and the injector data (7 digit) of each cylinder into a new ECM.

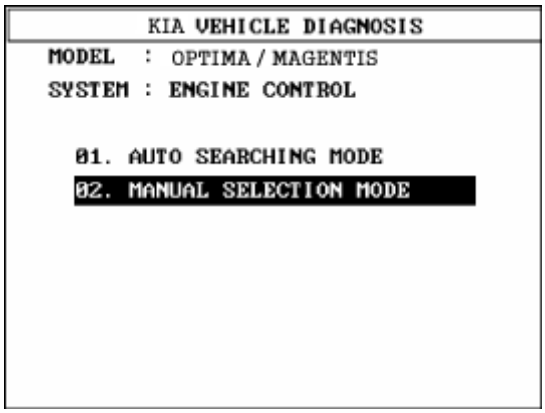
1. Turn ignition switch OFF.
2. Remove the battery negative (-) cable from the battery.
3. Remove the battery and disconnect the ECM connector (A) in the engine room.



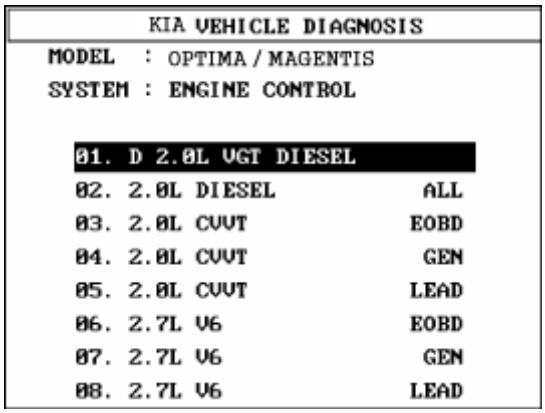
4. Remove the ECM (B) after unscrewing the four mounting bolts.
5. Install a new ECM in to the reverse order of step 1~4.
   ECM mounting bolts : 7.8 ~ 11.8 N·m (0.8 ~ 1.2 kgf·m, 5.8 ~ 8.7lbf·ft)
6. Connect a scan tool to Data Link Connector (DLC) and turn ignition switch on.
7. Proceed "ECM CHANGE" procedure.
   (1) Select "ENGINE CONTROL". (For example, OPTIMA)



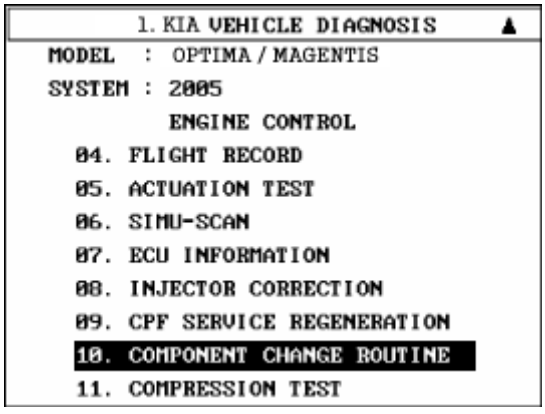
(2) Select "MANUAL SELECTION MODE".



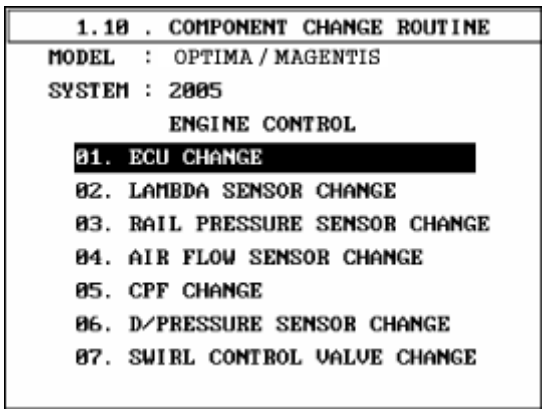
(3) Select "D 2.0L VGT DIESEL".



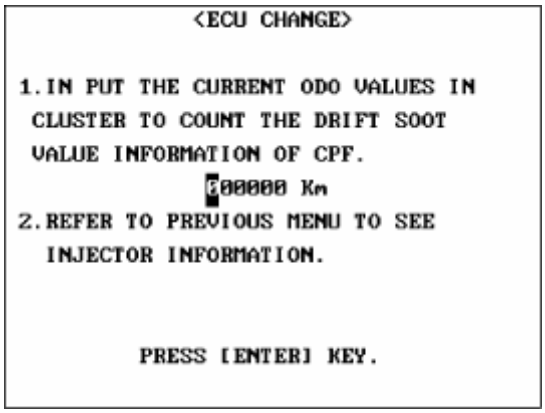
(4) Select "COMPONET CHANGE ROUTINE"



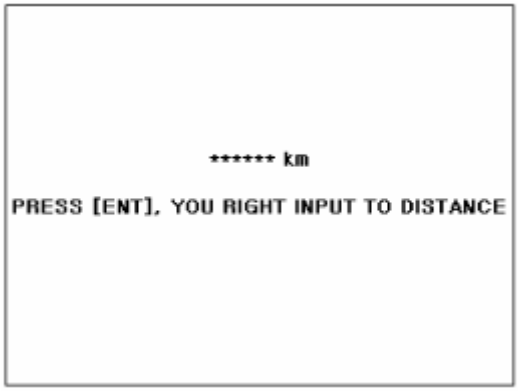
(5) Select "ECU CHANGE".

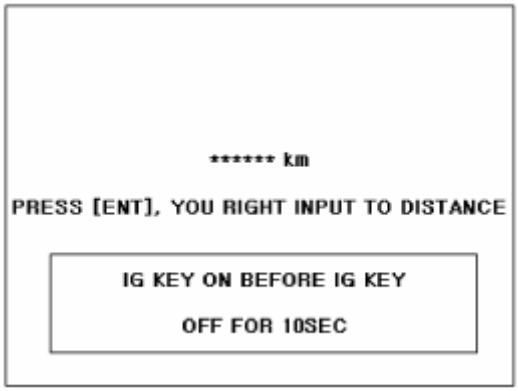


(6) Press "ENTER" key.



(7) Input the vehicle mileage and press "ENTER" key.



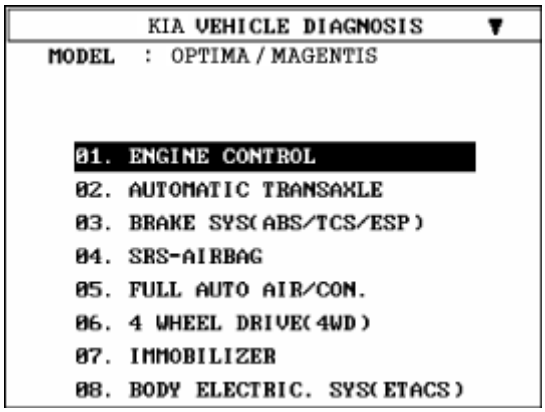


(8) Wait 10 seconds with IG ON.

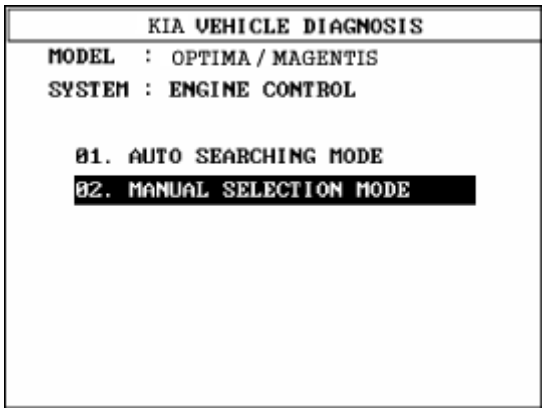
(9) Turn ignition switch off.

8. Turn ignition switch on.

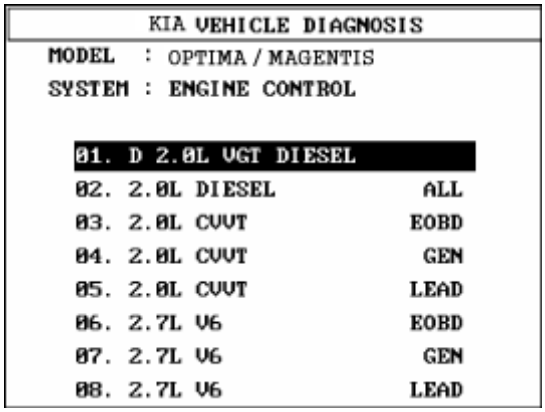
9. Proceed "INJECTOR CORRECTION" procedure.
   (1) Select "ENGINE CONTROL".



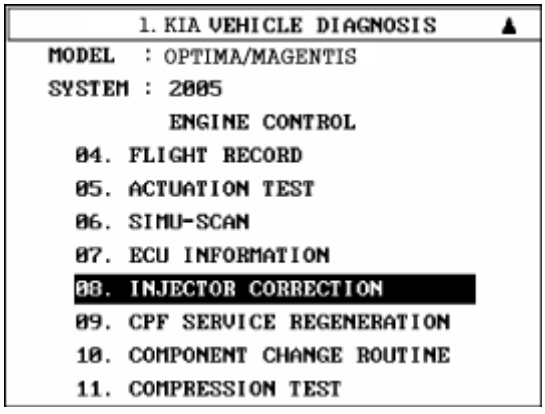
   (2) Select "MANUAL SELECTION MODE".



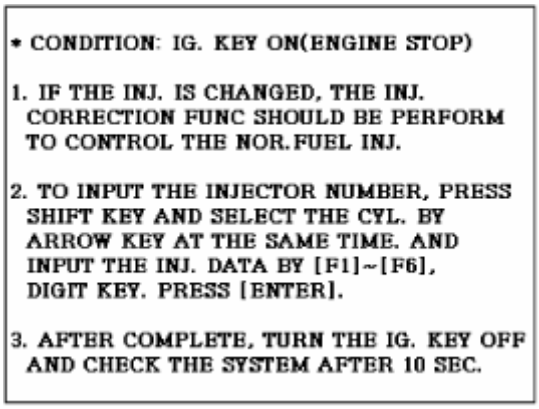
   (3) Select "D 2.0L VGT DIESEL".



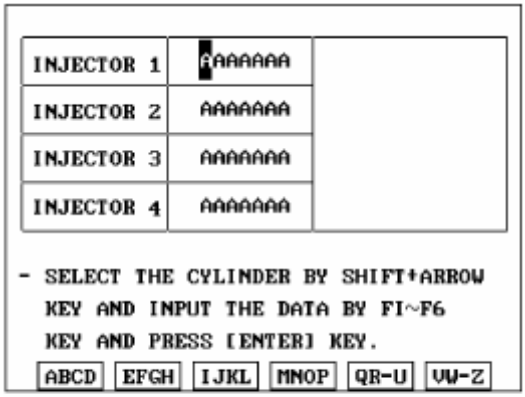
   (4) Select "INJECTOR CORRECTION".

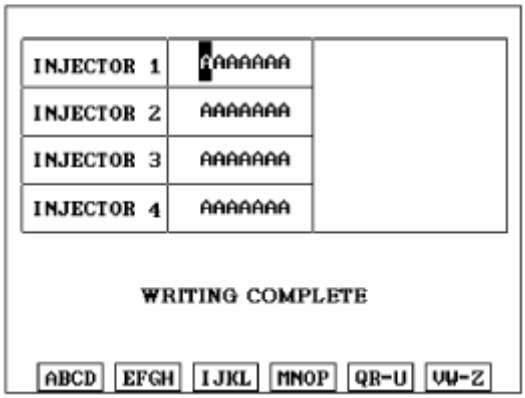


   (5) Press "ENTER" key.



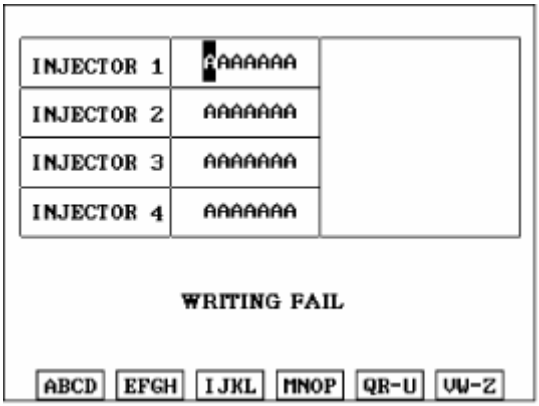
(6) Input the injector data (7 digit) written on the top of each injector with function keys ([F1] ~ [F6]) and number keys.





NOTICE

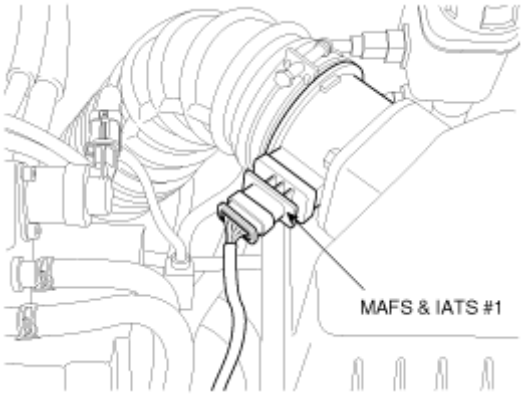
When "WRITING FAIL" is displayed on the scan tool, input injector data (7 digits) of each cylinder into a new ECM again as prior procedure.



English ▼

INSPECTION

MAFS uses a hot-film type sensing element to measure the mass of intake air entering the engine, and send the signal to ECM.
A large amount of intake air represents acceleration or high load conditions while a small amount of intake air represents deceleration or idle.
The ECM uses this information to control the EGR solenoid valve and correct the fuel amount.



SPECIFICATION

*At intake air temperature = 20℃(68˚F)

Air Flow (kg/h)	Frequency (kHz)
8	1.94 ~ 1.96
10	1.98 ~ 1.99
15	2.06 ~ 2.07
75	2.72 ~ 2.75
160	3.36 ~ 3.41
310	4.44 ~ 4.53
640	7.66 ~ 8.01
800	10.13 ~ 11.17

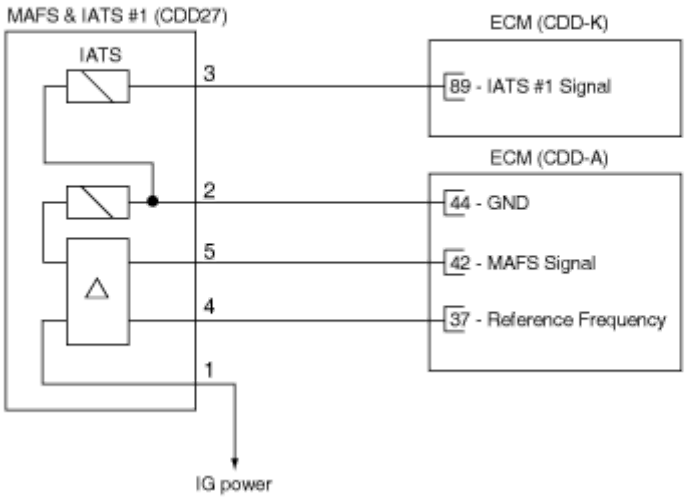
*At intake air temperature = -15℃(5˚F) or 80℃(176˚F)

Air Flow (kg/h)	Frequency (kHz)
10	1.97 ~ 1.99
75	2.71 ~ 2.76
160	3.34 ~ 3.43
310	4.39 ~ 4.58

CIRCUIT DIAGRAM

English ▼

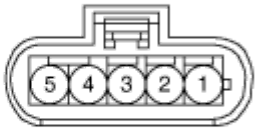
[CIRCUIT DIAGRAM]



[CONNECTION INFORMATION]

Terminal	Connected to	Function
1	E/R-CDD (43)	IG power
2	ECM CDD-A (44)	Sensor Ground
3	ECM CDD-K (89)	IATS #1 Signal
4	ECM CDD-A (37)	Reference Frequency
5	ECM CDD-A (42)	MAFS Signal

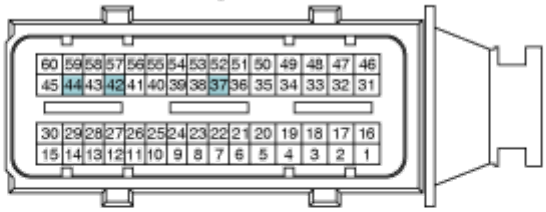
[HARNESS CONNECTORS]



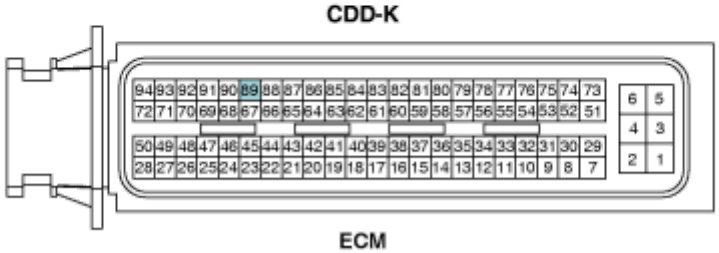
CDD27

MAFS & IATS #1

CDD-A



CDD-K



ECM

SIGNAL WAVEFORM

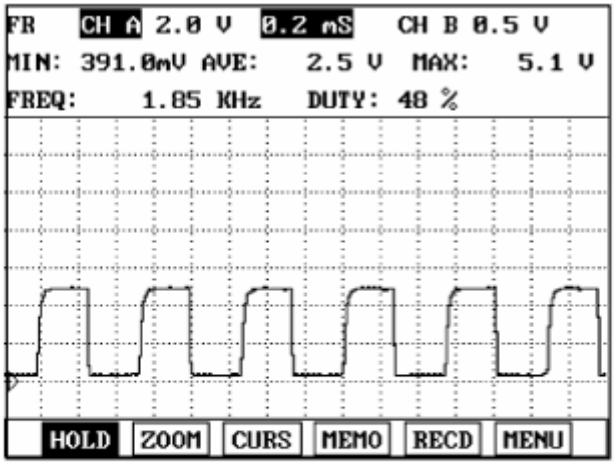


Fig.1

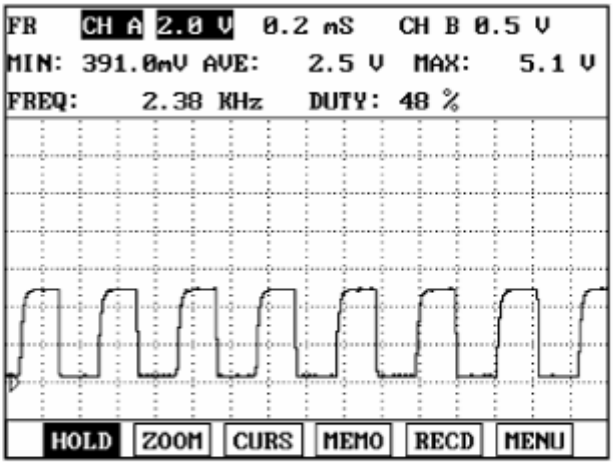


Fig.2

Fig.1) AFS signal waveform at IG KEY "ON". It shows digital signal of 50% duty, 1.8KHz.
Fig.2) AFS signal waveform at idle(790RPM, EGR actuator duty 5%, air flow for each cylinder 410mg/st).
It shows digital signal of 50% duty, 2.2~2.7KHz.

COMPONENT INSPECTION

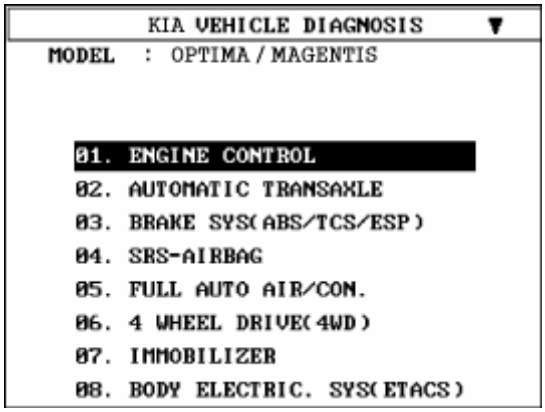
1. Check the MAFS visually.
   - Mounting direction correct.
   - Any contamination, corrosion or damage on connector.
   - Air cleaner's clogging or wet.
   - MAFS cylinder's deforming or blocking by any foreign material.
2. Check any leakage on intake system and intercooler system.

REPLACEMENT

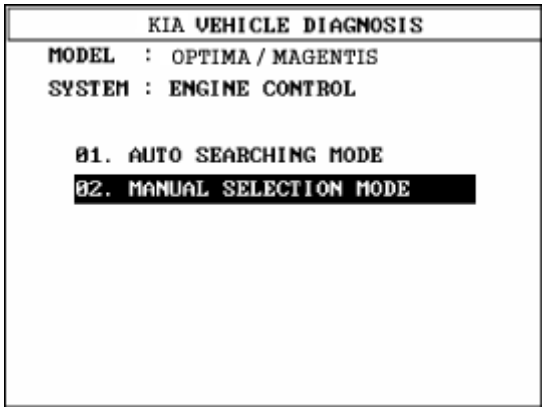
NOTICE

After replacing a Mass Air Flow Sensor (MAFS) or Intake Air Temperature Sensor (IATS)#1, MUST proceed below procedure.

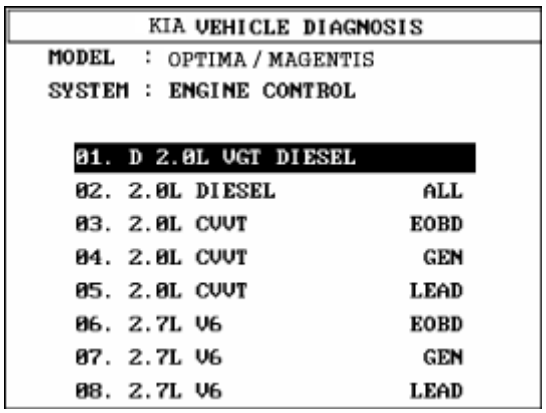
1. Turn ignition switch OFF.
2. Connect a scan tool to Data Link Connector (DLC).
3. Turn ignition switch ON.
4. Select "ENGINE CONTROL". (For example, OPTIMA)



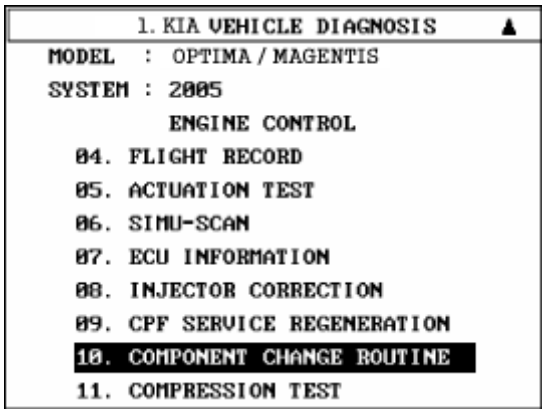
5. Select "MANUAL SELECTION MODE".



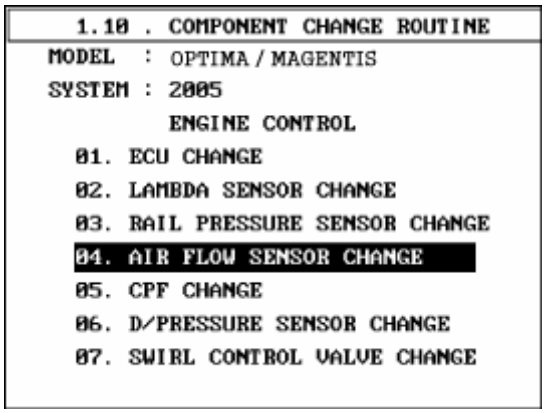
6. Select "D 2.0L VGT DIESEL".



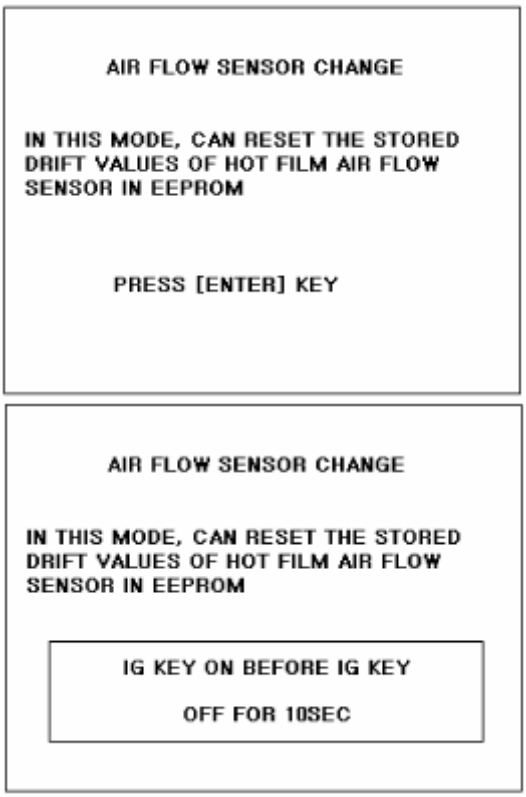
7. Select "COMPONET CHANGE ROUTINE"



8. Select "AIR FLOW SENSOR CHANGE".



9. Press "ENTER" key.



10. Wait 10 seconds with IG ON.
11. Turn ignition switch off.

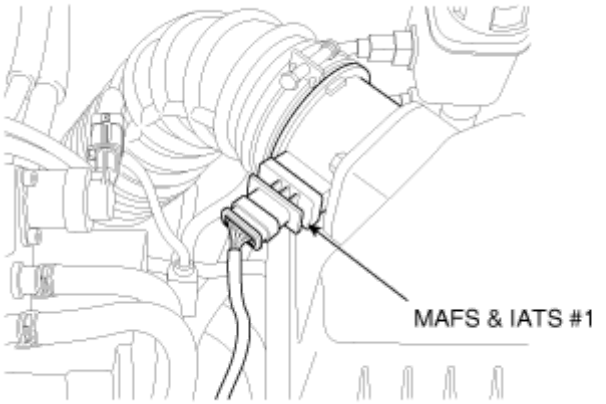
English ▼

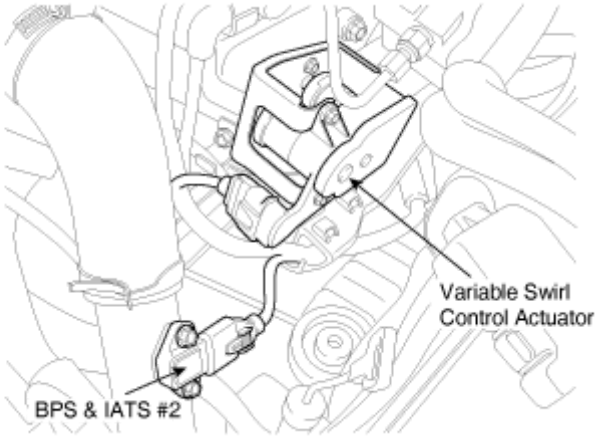
INSPECTION

Intake Air Temperature Sensor (IATS) uses a Negative Temperature Characteristics (NTC) thermistor and senses intake air temperature. Two intake air temperature sensors are installed in this engine.

IATS #1 in Mass Air Flow Sensor (MAFS) and IATS #2 in Boost Pressure Sensor (BPS) are located in front of and behind turbo-charger respectively. IATS #1 senses air temperature entering turbo-charger and the other (IATS #2) does air temperature coming out from the turbo-charger.

Comparing these air temperature values from both sensors, more accurate sensing of intake air temperature is possible. ECM uses these air temperature signals to perform EGR control correction and fuel injection quantity correction.





SPECIFICATION

IATS #1 in MAFS

Temperature [℃(˚F)]	Resistance (kΩ)
-40(-40)	35.14 ~ 43.76
-20(-4)	12.66 ~ 15.12
0(32)	5.12 ~ 5.89
20(68)	2.29 ~ 2.55
40(104)	1.10 ~ 1.24
60(140)	0.57 ~ 0.65
80(176)	0.31 ~ 0.37

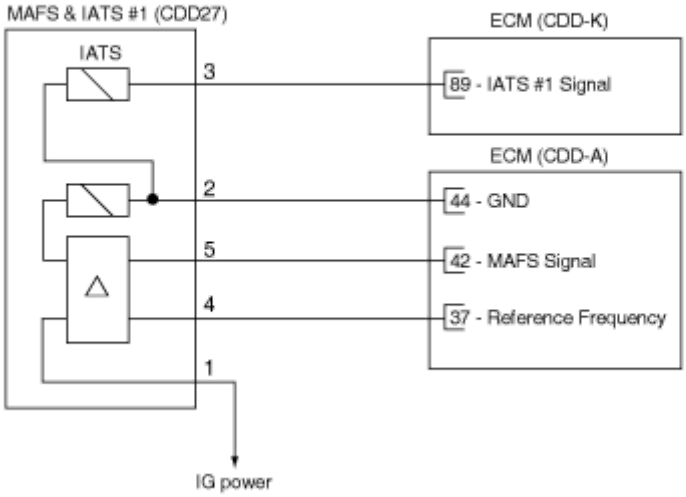
IATS #2 in BPS

Temperature [℃(˚F)]	Resistance (kΩ)
-40(-40)	40.93 ~ 48.35
-20(-4)	13.89 ~ 16.03
0(32)	5.38 ~ 6.09
20(68)	2.31 ~ 2.57
40(104)	1.08 ~ 1.21
60(140)	0.54 ~ 0.62
80(176)	0.29 ~ 0.34

CIRCUIT DIAGRAM

English ▼

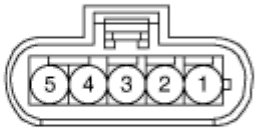
[CIRCUIT DIAGRAM]



[CONNECTION INFORMATION]

Terminal	Connected to	Function
1	E/R-CDD (43)	IG power
2	ECM CDD-A (44)	Sensor Ground
3	ECM CDD-K (89)	IATS #1 Signal
4	ECM CDD-A (37)	Reference Frequency
5	ECM CDD-A (42)	MAFS Signal

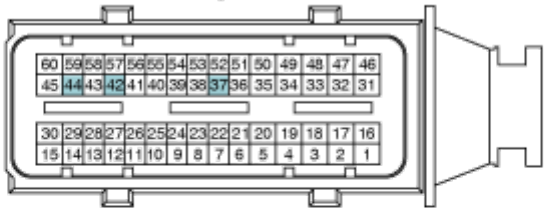
[HARNESS CONNECTORS]



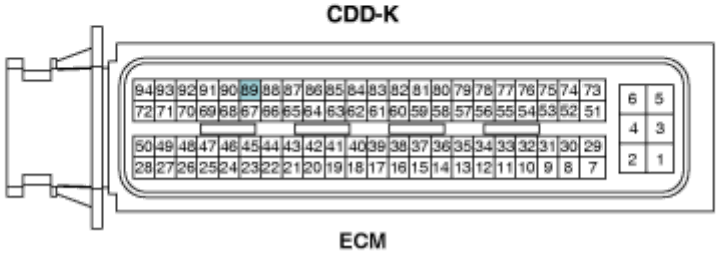
CDD27

MAFS & IATS #1

CDD-A

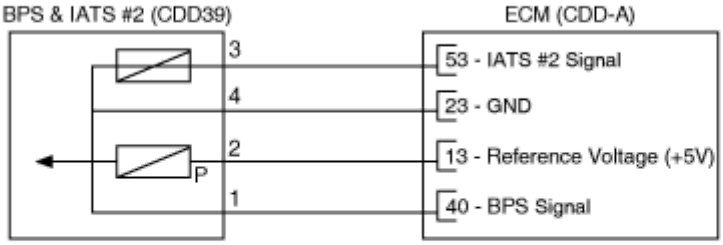


CDD-K



ECM

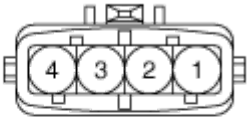
[CIRCUIT DIAGRAM]



[CONNECTION INFORMATION]

Terminal	Connected to	Function
1	ECM CDD-A (40)	BPS Signal
2	ECM CDD-A (13)	Reference Voltage (+5V)
3	ECM CDD-A (53)	IATS #2 Signal
4	ECM CDD-A (23)	Sensor ground

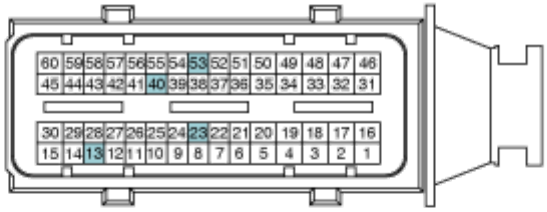
[HARNESS CONNECTORS]



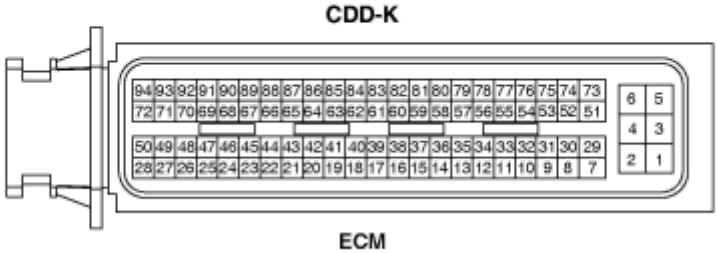
CDD39

BPS & IATS #2

CDD-A

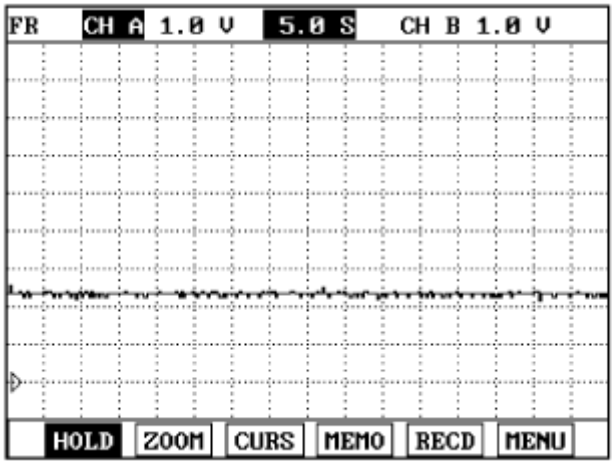


CDD-K



ECM

SIGNAL WAVEFORM



IATS signal should be smooth and continuous without any sudden changes.
After warmed-up, the IATS signal should not change significantly while ECTS signal drops.

COMPONENT INSPECTION

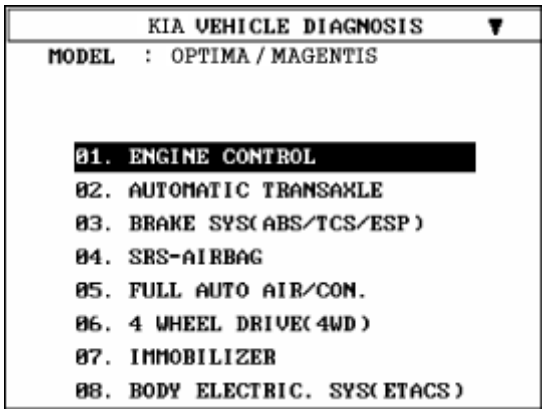
1. Turn ignition switch OFF.
2. Disconnect the MAFS (for IATS #1) or BPS (for IATS #2) connector.
3. Measure resistance between IATS signal terminal and sensor ground terminal.
4. Check that the resistance is within the specification.
   Specification: Refer to "SPECIFICATION".

REPLACEMENT

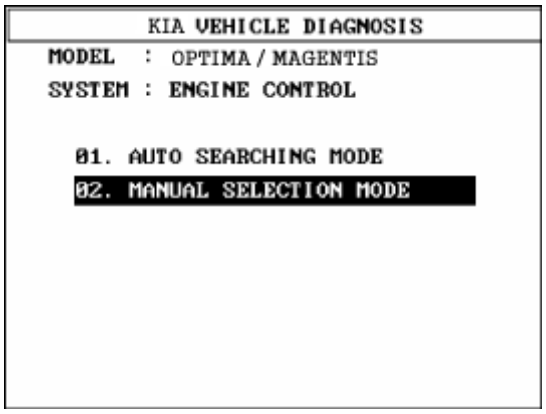
NOTICE

After replacing a Mass Air Flow Sensor (MAFS) or Intake Air Temperature Sensor (IATS)#1, MUST proceed below procedure.

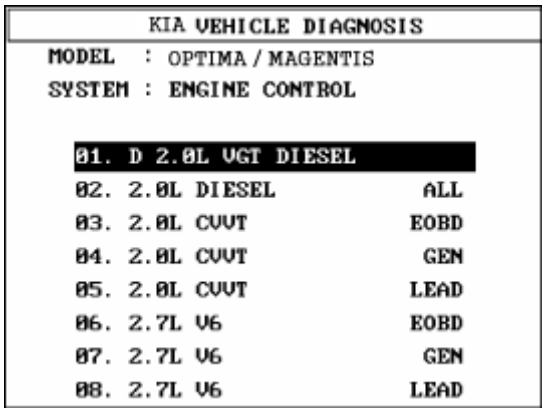
1. Turn ignition switch OFF.
2. Connect a scan tool to Data Link Connector (DLC).
3. Turn ignition switch ON.
4. Select "ENGINE CONTROL". (For example, OPTIMA)



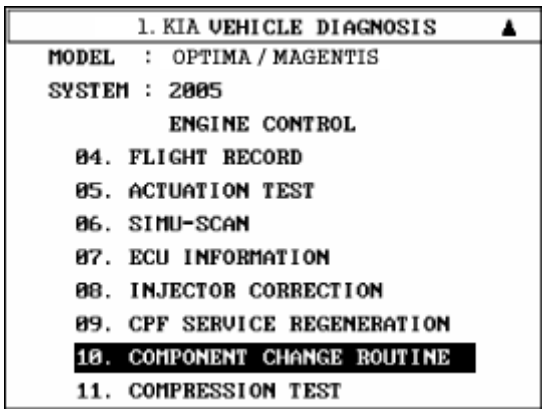
5. Select "MANUAL SELECTION MODE".



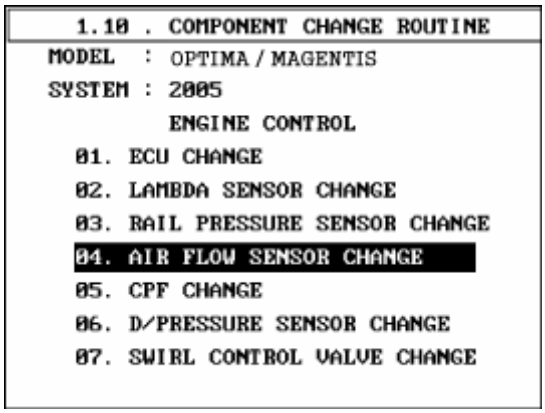
6. Select "D 2.0L VGT DIESEL".



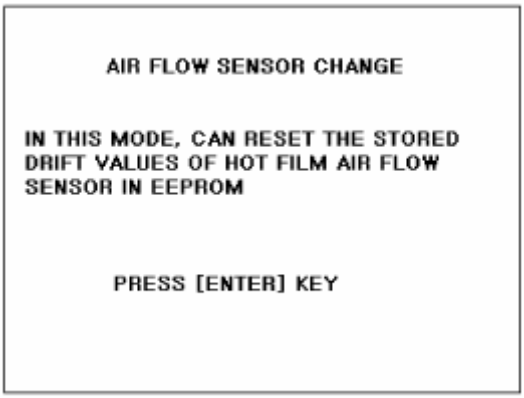
7. Select "COMPONET CHANGE ROUTINE"

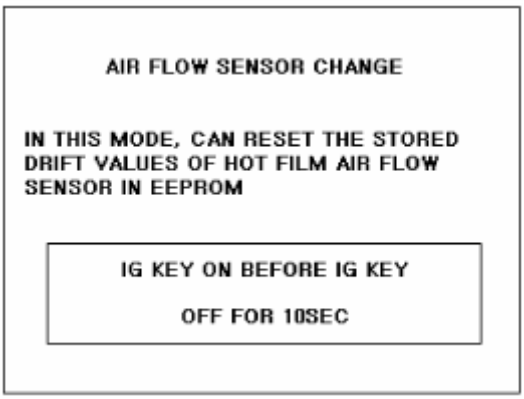


8. Select "AIR FLOW SENSOR CHANGE".



9. Press "ENTER" key.



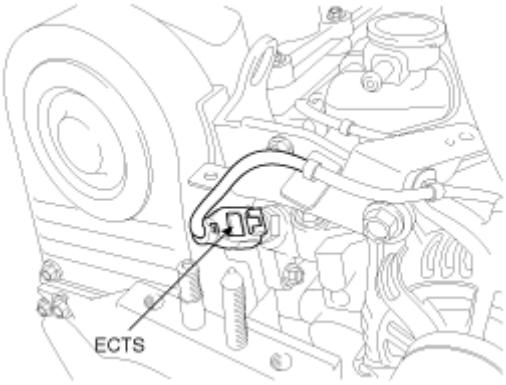


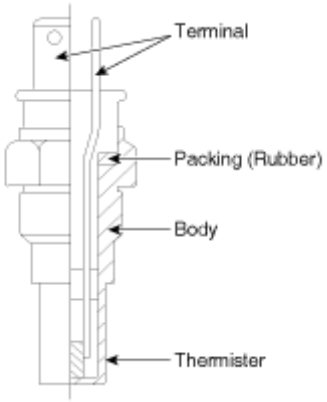
10. Wait 10 seconds with IG ON.
11. Turn ignition switch off.

INSPECTION

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 5V 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.





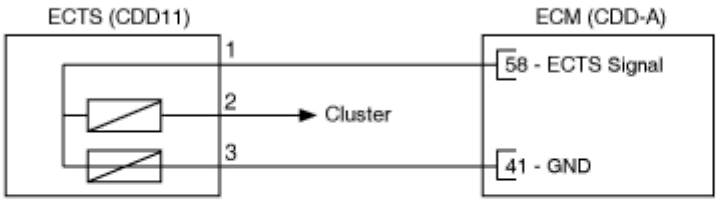
SPECIFICATION

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

CIRCUIT DIAGRAM

English ▼

[CIRCUIT DIAGRAM]



[CONNECTION INFORMATION]

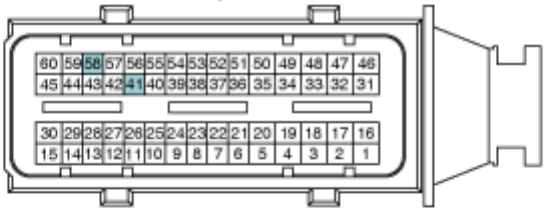
Terminal	Connected to	Function
1	ECM CDD-A (58)	ECTS Signal
2	Cluster	-
3	ECM CDD-A (41)	Sensor ground

[HARNESS CONNECTORS]

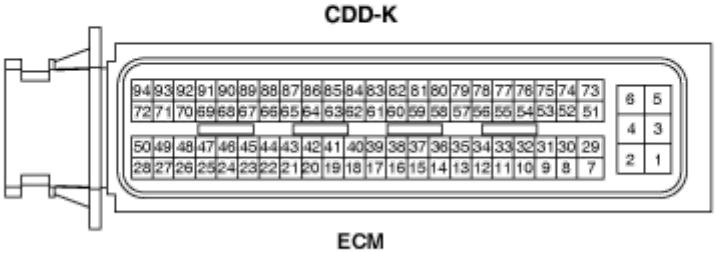


CDD11
ECTS

CDD-A



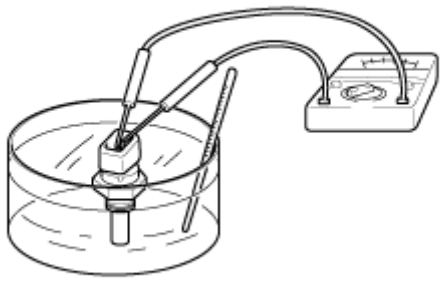
CDD-K



ECM

COMPONENT INSPECTION

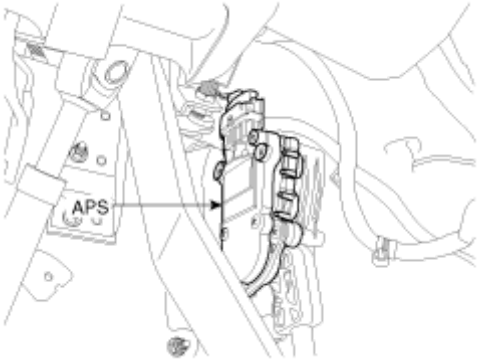
1. Turn ignition switch OFF.
2. Disconnect the engine coolant temperature sensor connector.
3. Remove the sensor.
4. After immersing the thermistor of the sensor into engine coolant, measure resistance between ECTS signal terminal and ground terminal.



5. Check that the resistance is within the specification.
   Specification: Refer to "SPECIFICATION".

INSPECTION

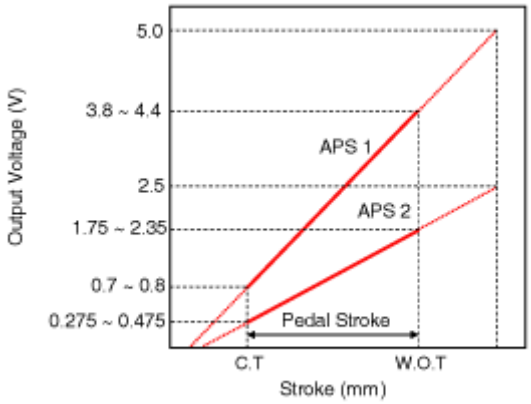
On electronic injection systems, there is no longer a load lever that mechanically controls the fuelling. The flow is caculated by the ECM depending on a number of parameters, including pedal position, which is measured using a potentiometer. The pedal sensor has two potentio-meters whoses slides are mechanically solid. The two potentiometers are supplied from distinct and different power sources so there is built in redundancy of information giving reliable driver's request information. A voltage is generated across the potentiometer in the acceleration position sensor as a function of the accelerator-pedal setting. Using a peogrammed characteristic curve, the pedal's position is then calculated from this voltage.



SPECIFICATION

Test Condition	Output Voltage(V)	
	APS 1	APS 2
Idle	0.7 ~ 0.8	0.275 ~ 0.475
Fully depressed	3.8 ~ 4.4	1.75 ~ 2.35

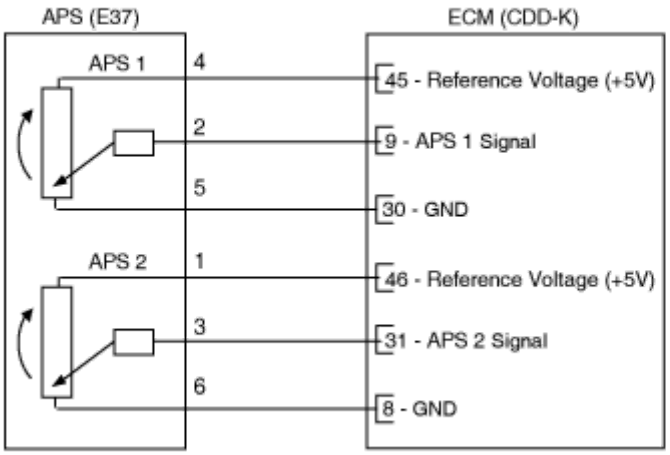
Items	Specification	
	APS 1	APS 2
Potentiometer Resistance (kΩ)	0.7 ~ 1.3	1.4 ~ 2.6



CIRCUIT DIAGRAM

English ▼

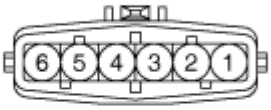
[CIRCUIT DIAGRAM]



[CONNECTION INFORMATION]

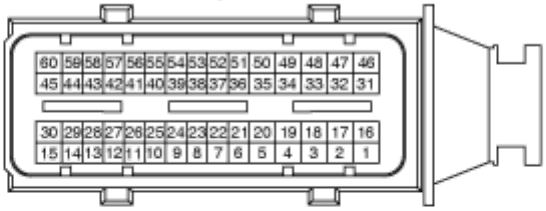
Terminal	Connected to	Function
1	ECM CDD-K (31)	APS 2 Signal
2	ECM CDD-K (8)	APS 2 Ground
3	ECM CDD-K (9)	APS 1 Signal
4	ECM CDD-K (30)	APS 1 Ground
5	ECM CDD-K (45)	APS 1 Reference Voltage (+5V)
6	ECM CDD-K (46)	APS 2 Reference Voltage (+5V)

[HARNESS CONNECTORS]

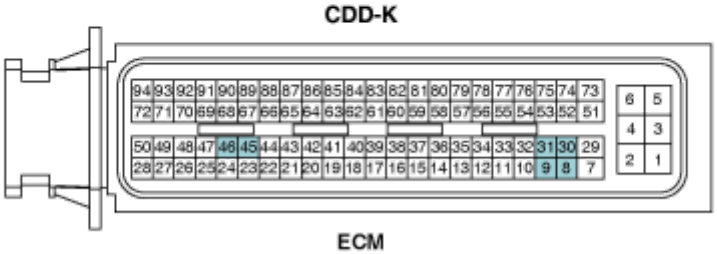


E37
APS

CDD-A



CDD-K



ECM

SIGNAL WAVEFORM

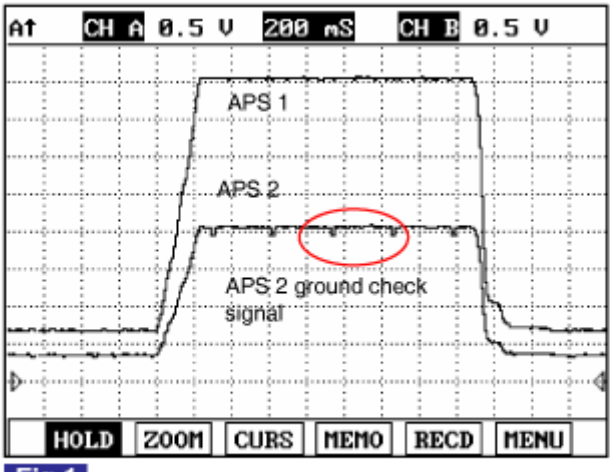


Fig.1

Fig.1) APS 1 and APS 2 signals are measured simultaneously, Check if output value is rising and APS 2 is 1/2 of APS 1 signal.

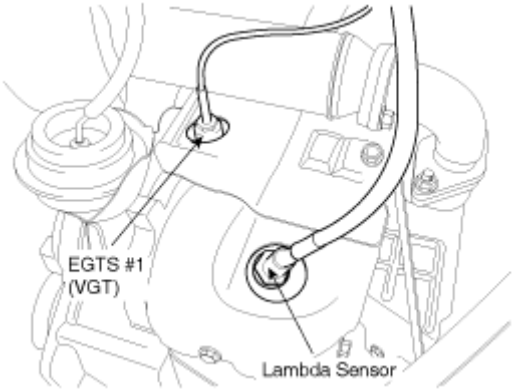
COMPONENT INSPECTION

1. Turn ignition switch OFF.
2. Disconnect the accelerator position sensor connector.

3. Measure resistance between voltage supply terminal and ground terminal of APS1.
4. Measure resistance between voltage supply terminal and ground terminal of APS2.
   Specification: Refer to "SPECIFICATION".

INSPECTION

Lambda Sensor is installed on exhaust manifold and is a linear oxygen sensor. It senses oxygen density of exhaust gas in order to control EGR acculately through fuel correction and also limits smoke which is generated by reach air-fuel mixture at high engine load condition. ECM controls pumping current in order to fit λ-value from linear lambda sensor to 1.0.
Lean air-fuel mixture(1.0 < λ < 1.1): ECM supplies pumping current to lambda sensor (+pumping current) and activates it for lambda sensor to have the characteristic at λ =1.0 (0.0 pumping current). With the value of pumping current supplied to lambda sensor, ECM detects lambda density of exhaust gas.
Rich air-fuel mixture(0.9 < λ < 1.0): ECM takes away pumping current from lambda sensor (-pumping current) and deactivates it for lambda sensor to have the characteristic at λ =1.0 (0.0 pumping current). With the value of pumping current taken away from lambda sensor, ECM detects lambda density of exhaust gas.
This performance is the most active and fast at normal operating temperature (450°C ~ 600°C) thus, in order to reach normal operating temp. and last at that temperature, a heater (heating coil) is integrated with lambda sensor. The heater coil is controlled by ECM as Pulse With Modulator (PWM). The resistance of heater coil is low when coil is cold thus, current through it increases while resistance is high when coil is hot thus, current decreases. With this principle, temperature of lambda sensor is measured and lambda sensor heater operation varies based on the data.



SPECIFICATION

Sensor

λ Value (A/F Ratio)	Pumping Current (A)
0.65	-2.22
0.70	-1.82
0.80	-1.11
0.90	-0.50
1.01	0.00
1.18	0.33
1.43	0.67
1.70	0.94
2.42	1.38
Air (Atmosphere)	2.54

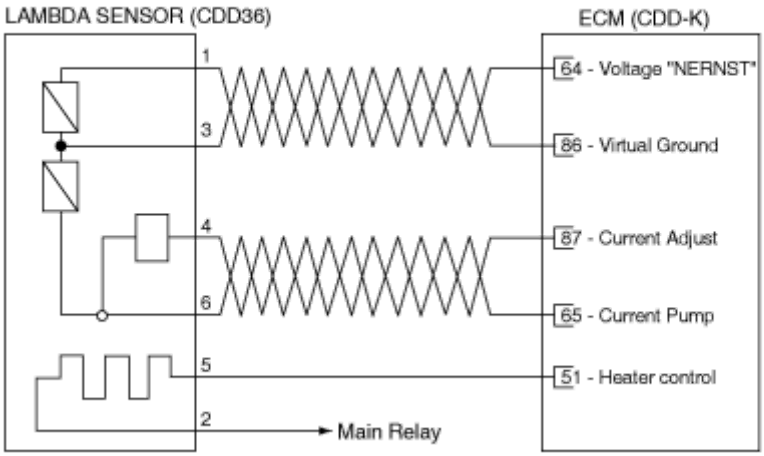
Heater

Temperature [℃(°F)]	Heater Resistance(Ω)
20 (68)	9.2
100 (212)	10.7
200 (392)	13.1
300 (572)	14.6
400 (752)	17.7
500 (932)	19.2
600 (1,112)	20.7
700 (1,292)	22.5

CIRCUIT DIAGRAM

English ▼

[CIRCUIT DIAGRAM]



[CONNECTION INFORMATION]

Terminal	Connected to	Function
1	ECM CDD-K(64)	Voltage "NERNST"
2	Main Relay	Battery Voltage (B+)
3	ECM CDD-K (86)	Virtual Ground
4	ECM CDD-K (87)	Current Adjust
5	ECM CDD-K (51)	Heater control
6	ECM CDD-K (65)	Current Pump

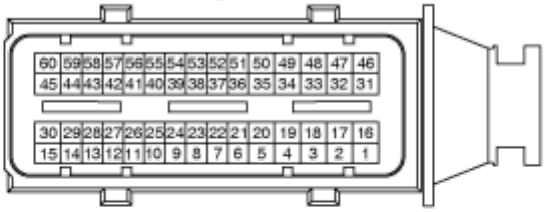
[HARNESS CONNECTORS]



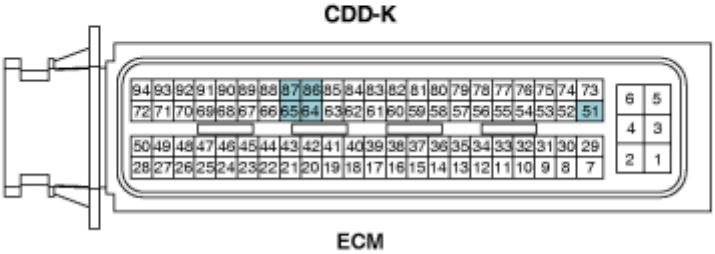
CDD36

LAMBDA SENSOR

CDD-A



CDD-K



ECM

SIGNAL WAVEFORM

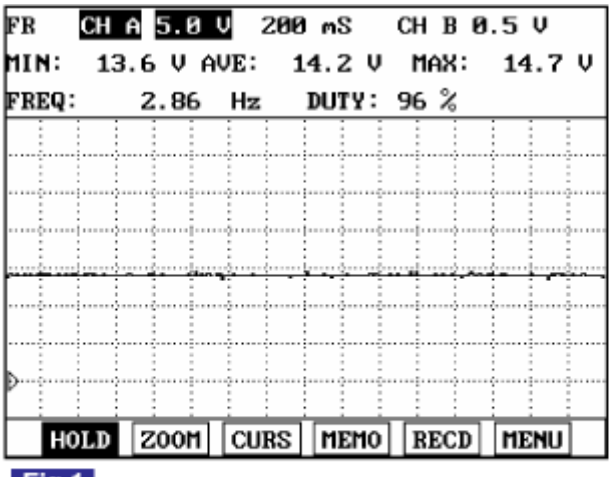


Fig.1

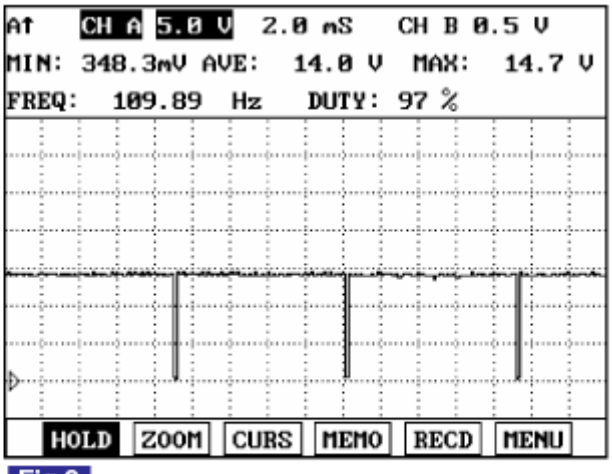


Fig.2

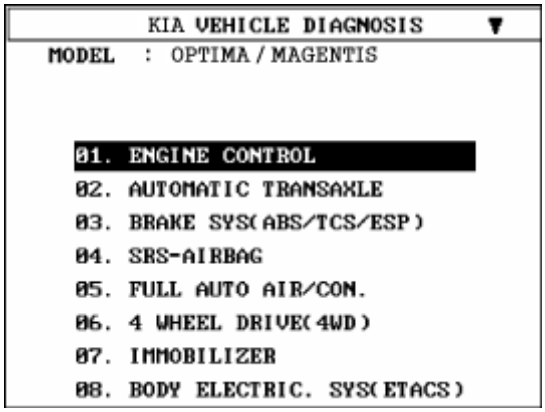
Fig.1) Waveform of Lambda sensor heater power. It is battery voltage.
Fig.2) Waveform of Lambda sensor heater control at cold idle.(duty increases to approx. 40% at heater operation.)

REPLACEMENT

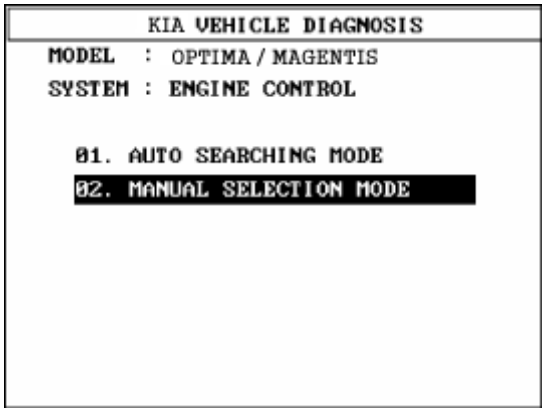
NOTICE

After replacing a Lambda Sensor, MUST proceed below procedure.

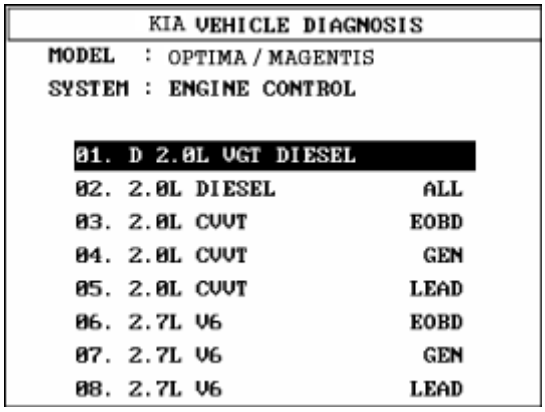
1. Turn ignition switch OFF.
2. Connect a scan tool to Data Link Connector (DLC).
3. Turn ignition switch ON.
4. Select "ENGINE CONTROL". (For example, OPTIMA)



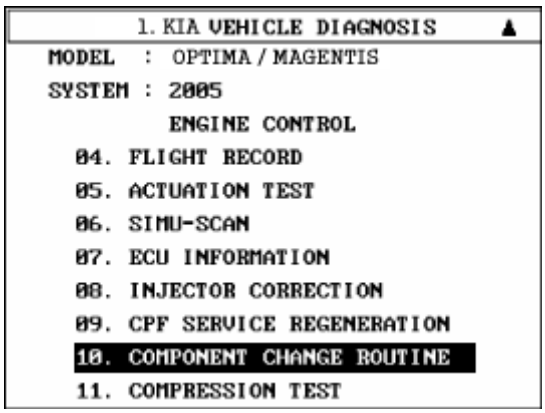
5. Select "MANUAL SELECTION MODE".



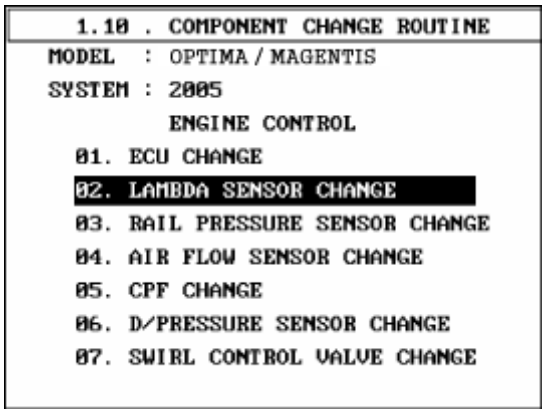
6. Select "D 2.0L VGT DIESEL".



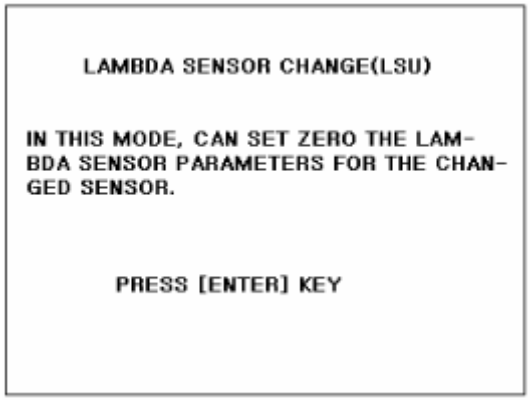
7. Select "COMPONET CHANGE ROUTINE"

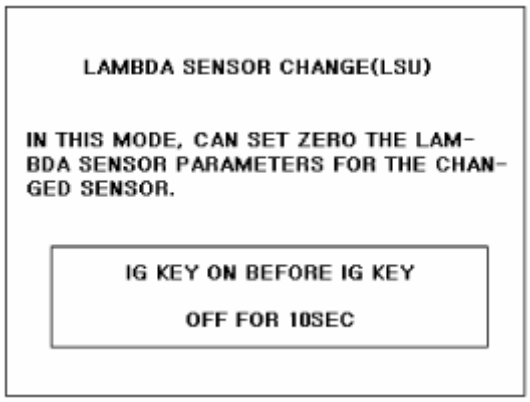


8. Select "LAMBDA SENSOR CHANGE".



9. Press "ENTER" key.

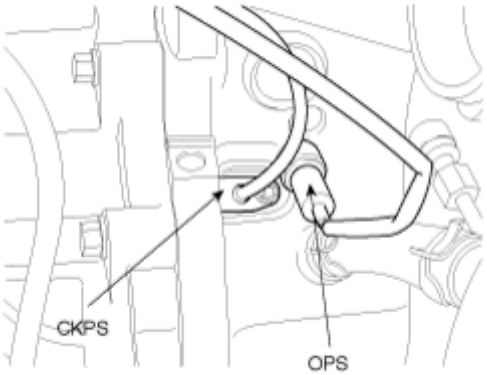




10. Wait 10 seconds with IG ON.
11. Turn ignition switch off.

INSPECTION

Piston position on combustion chamber is the substantial to define the starting of injection timing. All engine pistons are connected to crankshaft by connecting rod. Sensor on crankshaft can supply the informations concerning all piston positions, revolution speed is defined by revolution perminute of crankshaft. Prior input variable is determined at ECM by using signal induced from crankshaft position sensor.



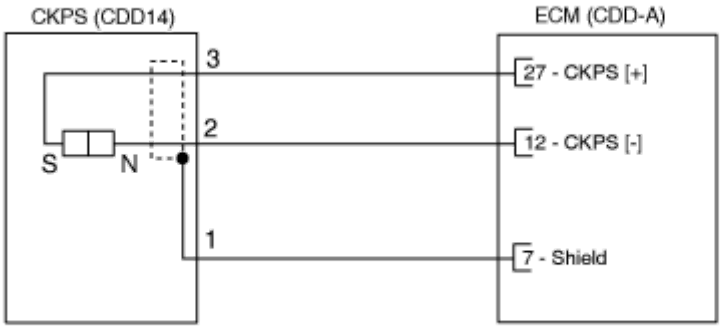
SPECIFICATION

Items	Specification
Coil Resistance (Ω)	774 ~ 946Ω [20°C(68°F)]

CIRCUIT DIAGRAM

English ▼

[CIRCUIT DIAGRAM]



[CONNECTION INFORMATION]

Terminal	Connected to	Function
1	ECM CDD-A (7)	Sensor Shield
2	ECM CDD-A (12)	CKPS [-] Signal
3	ECM CDD-A (27)	CKPS [+] Signal

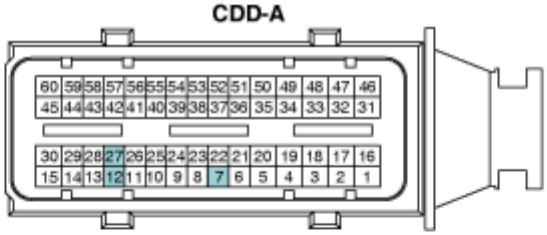
[HARNESS CONNECTORS]



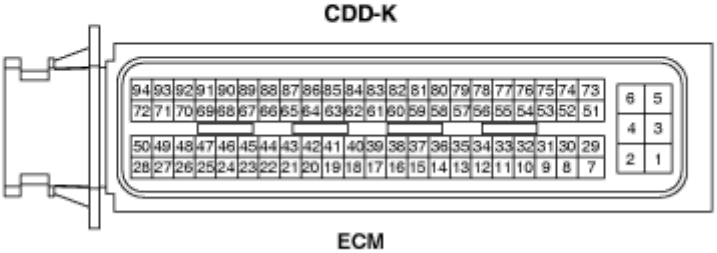
CDD14

CKPS

CDD-A



CDD-K



ECM

SIGNAL WAVEFORM

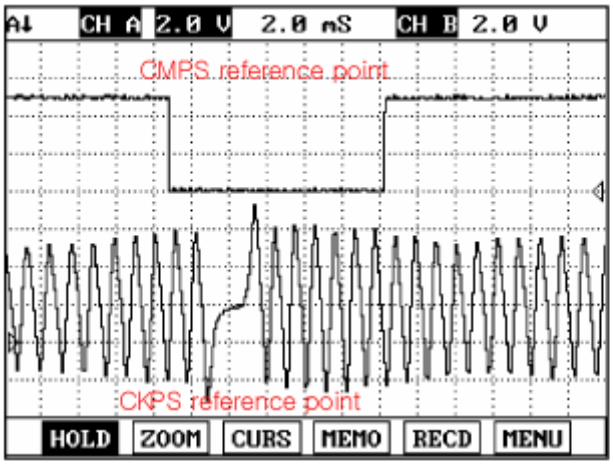


Fig.1

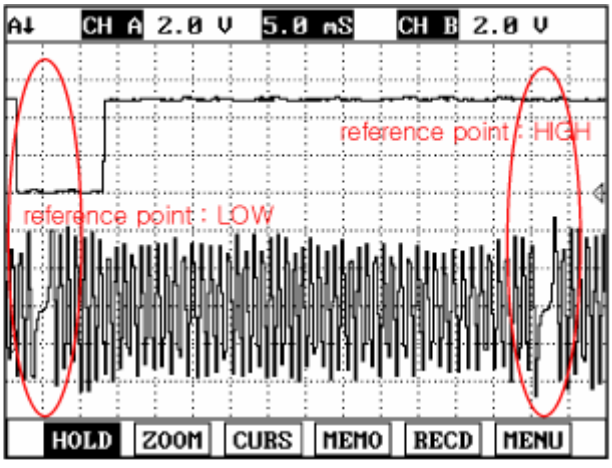


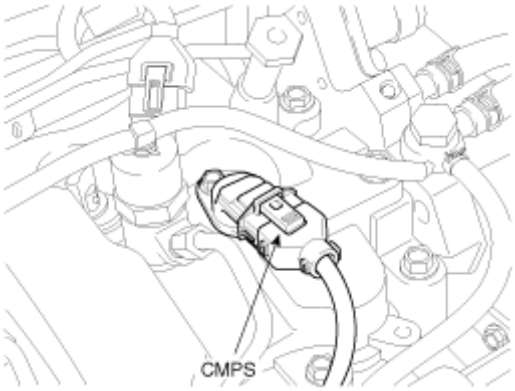
Fig.2

Fig.1) This shows waveform of Crank Shaft Position Sensor and Cam Shaft Position Sensor simulatneously. The middle area indicates reference points of Crank Shaft Position Sensor and Cam Shaft Position Sensor.

Fig.2) Crank Shaft Position Sensor and Cam Shaft Position Sensor signal are measured simultaneously.
Cam Shaft Position Sensor
signal is outputted once when Crank Shaft Position sensor signal is outputted twice. LOW and HIGH output of Cam Shaft Position sensor reference point is detected at Crank Shaft Position sensor reference point.
(Injection sequence is determined based on LOW and HIGH signal of Cam Shaft Position Sensor reference point as detecting cylinder position.)

INSPECTION

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 the each cylinder which the CKPS can't detect. The two CMPS are installed on engine head cover and uses 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 4 cylinders is impossible without CMPS signal.



SPECIFICATION

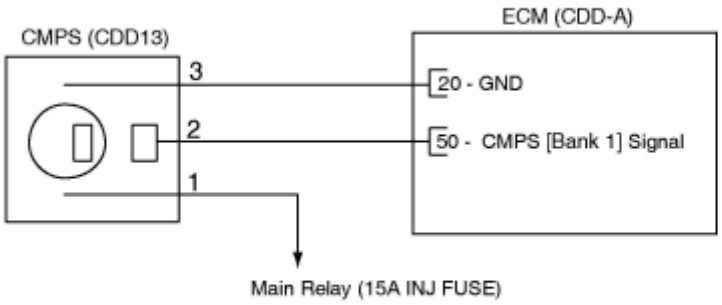
Level	Output Pulse (V)
High	12V
Low	0V

Items	Specification
Air Gap	1.5 ± 0.1 mm

CIRCUIT DIAGRAM

English ▼

[CIRCUIT DIAGRAM]



[CONNECTION INFORMATION]

Terminal	Connected to	Function
1	E/R CDD (32)	Battery Voltage
2	ECM CDD-A (50)	CMPS Signal
3	ECM CDD-A (20)	GND

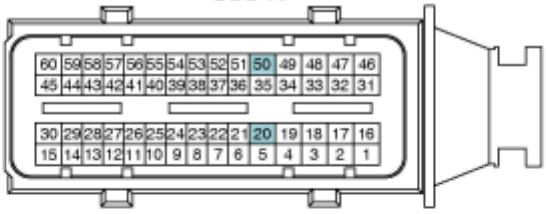
[HARNESS CONNECTORS]



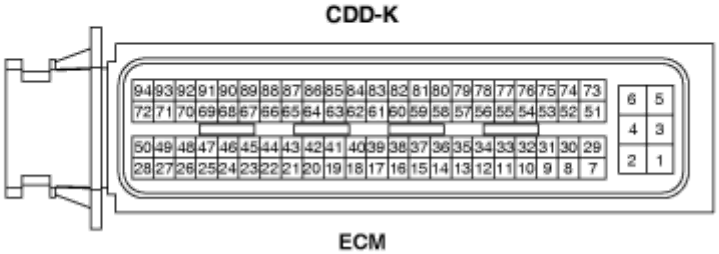
CDD13

CMPS

CDD-A



CDD-K



ECM

SIGNAL WAVEFORM

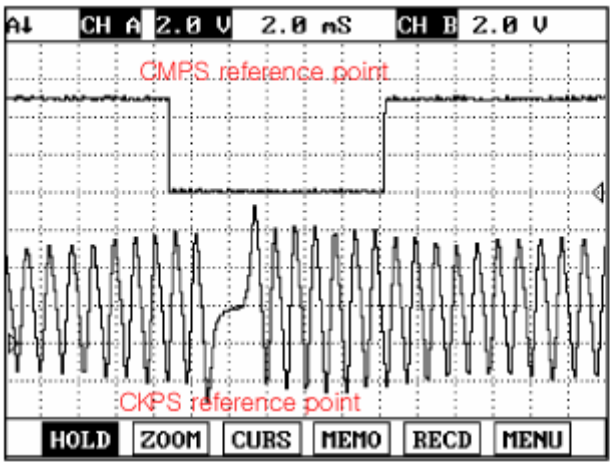


Fig.1

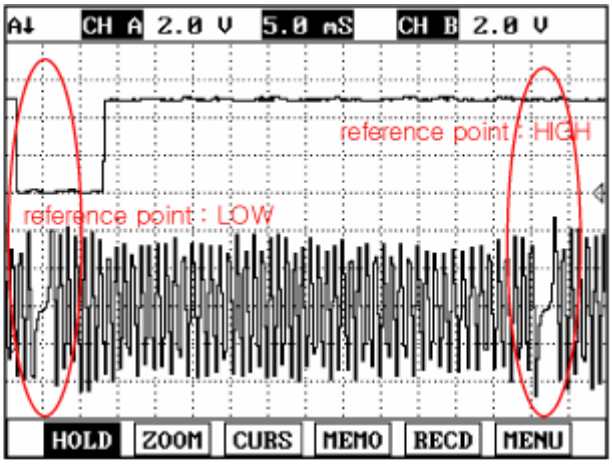


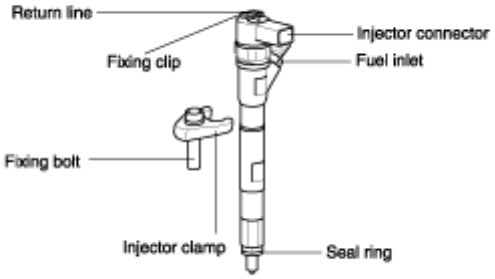
Fig.2

Fig.1) This shows waveform of Crank Shaft Position Sensor and Cam Shaft Position Sensor simulatneously. The middle area indicates reference points of Crank Shaft Position Sensor and Cam Shaft Position Sensor.

Fig.2) Crank Shaft Position Sensor and Cam Shaft Position Sensor signal are measured simultaneously.
Cam Shaft Position Sensor
signal is outputted once when Crank Shaft Position sensor signal is outputted twice. LOW and HIGH output of Cam Shaft Position sensor reference point is detected at Crank Shaft Position sensor reference point.
(Injection sequence is determined based on LOW and HIGH signal of Cam Shaft Position Sensor reference point as detecting cylinder position.)

English ▼

DESCRIPTION

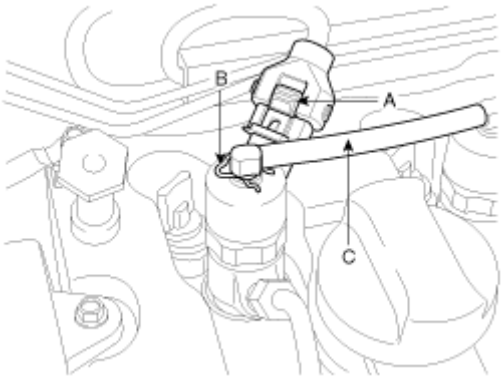


REMOVAL

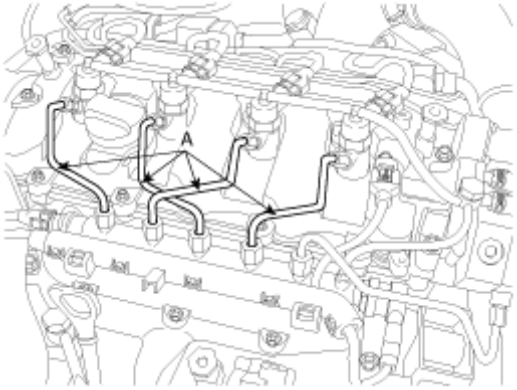
WARNING

- Common Rail Fuel Injection System is subject to extremely high pressure (Approximately 1,600 bar)
- Never perform any work on injection system with engine running or within 30 seconds after the engine stops.
- Always pay attention to safety precaution.
- Ensure the absolute cleanliness.
- It is not recommended to remove the injectors without any notice.

1. Disconnect the injector connector (A).

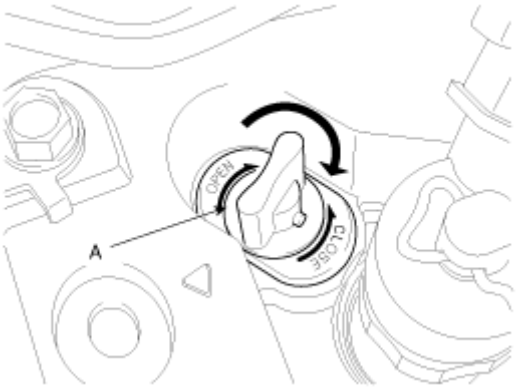


2. After removing the clip (B), disconnect the retun hose (C) from the injectors
3. Disconnect the high pressure pipe (A) connecting the injectors with the common rail.

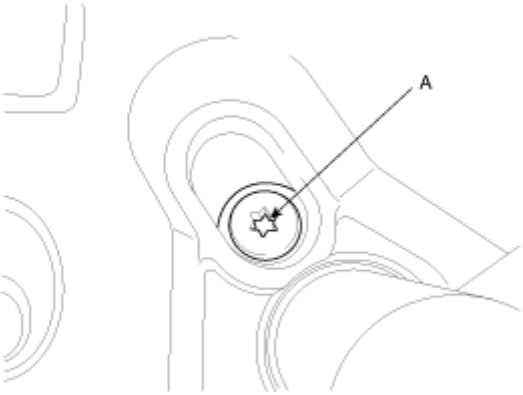


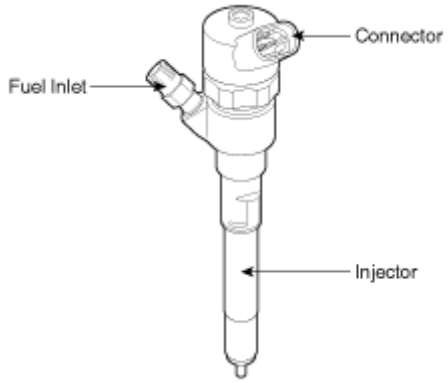
4. Rotate the lever (A) clockwise and pull it upward.

English ▼



5. Unscrew the clamp tightening bolt (A) and pull the injector upward with the "Injector Remover" and the "Injector Remover Adapter" (Refer to "SPECIAL SERVICE TOOL" section).

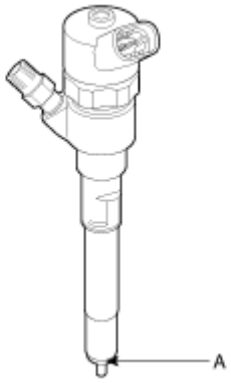




INSTALLATION

1. Install the injector according to the reverse order of "REMOVAL" procedure.

> **NOTICE**
>
> When installing the injector, MUST REPLACE the O-ring (A) and apply a grease to that.



NOTICE

When installing the high pressure pipe, apply the specified tightening torques to the flange nuts of the injectors and the common rail side with SST (Refer to below table).

Item	Dimension	SST No.
Flange Nut (Injector Side)	14 mm (0.551 in)	09314-27110
Flange Nut (Common Rail Side)	17 mm (0.669 in)	09314-27120

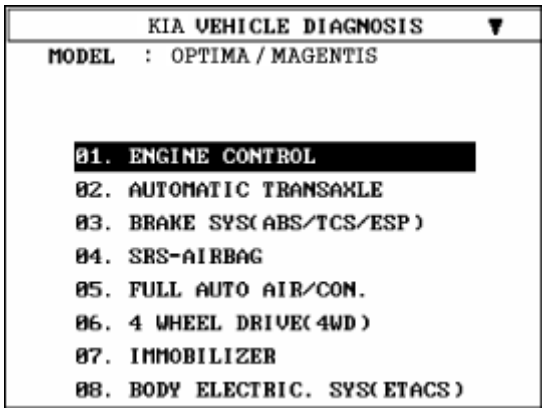
· Injector clamp mounting bolts: 24.5 ~ 28.4 N·m (2.5 ~ 2.9 kgf·m, 18.1 ~ 20.1 lbf·ft)
· High pressure pipe flange nuts (Injectors ↔ Common Rail): 24.5 ~ 28.4 N·m (2.5 ~ 2.9 kgf·m, 18.1 ~ 20.1 lbf·ft)

REPLACEMENT

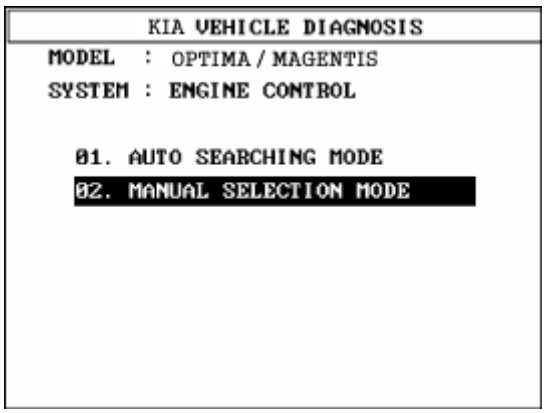
⚠ CAUTION

After replacing (an) injector(s), MUST input the injector data (7 digit) into the ECM.

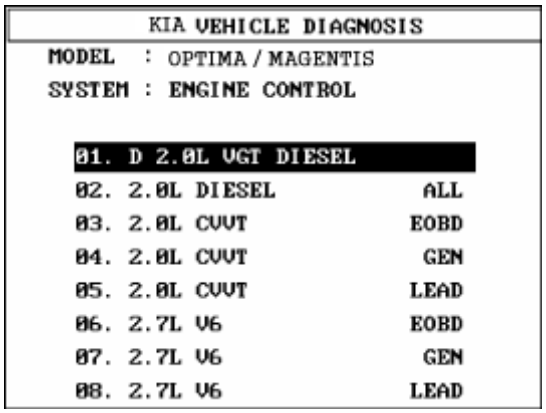
1. Turn ignition switch OFF.
2. Replace the injector with a new one according to the "REMOVAL" and "INSTALLATION" procedures.
3. Connect a scan tool to Data Link Connector (DLC) and turn ignition switch on.
4. Select "ENGINE CONTROL". (For example, OPTIMA)



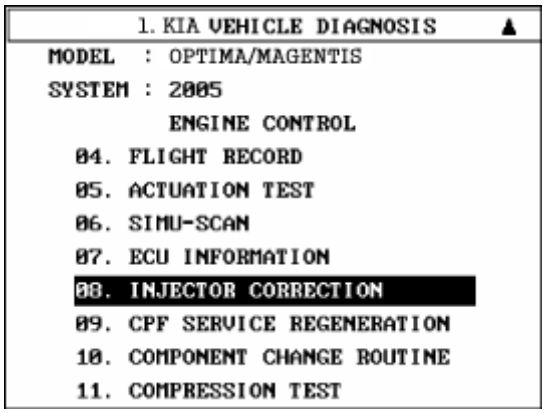
5. Select "MANUAL SELECTION MODE".



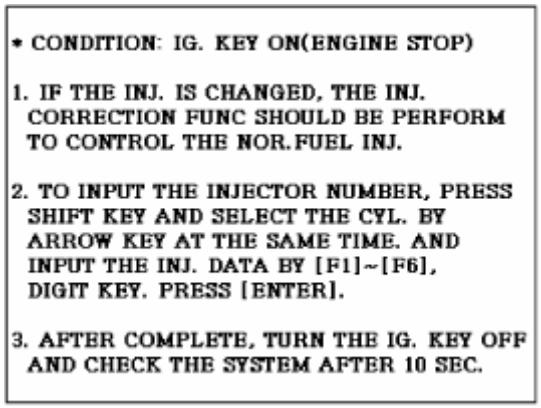
6. Select "D 2.0L VGT DIESEL".



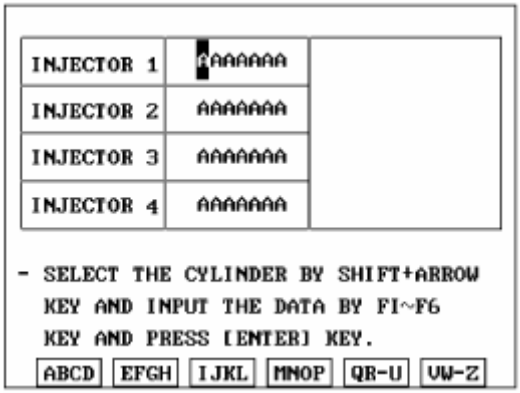
7. Select "INJECTOR CORRECTION".

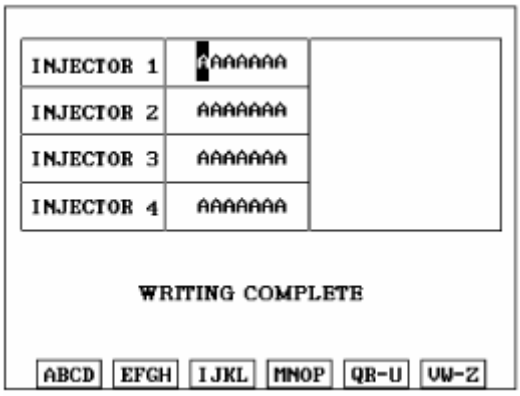


8. Press "ENTER" key.



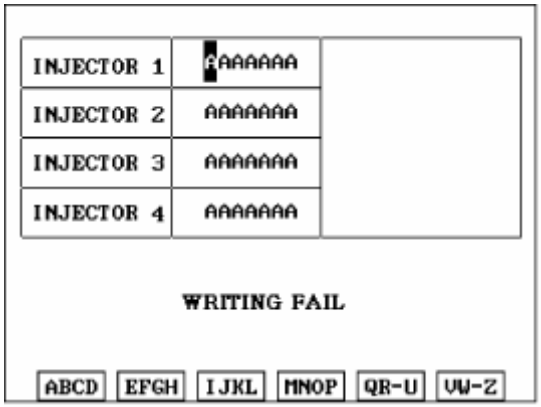
9. Input the injector data (7 digit) written on the top of each injector with function keys ([F1] ~ [F6]) and number keys.





NOTICE

When "WRITING FAIL" is displayed on the scan tool, input injector data (7 digits) of each cylinder into a new ECM again as prior procedure.



INSPECTION

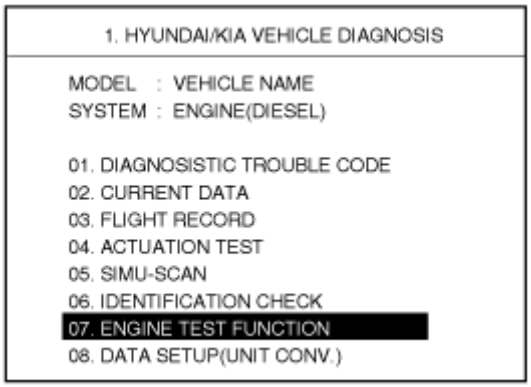
USING HI-SCAN(PRO)

Test mode

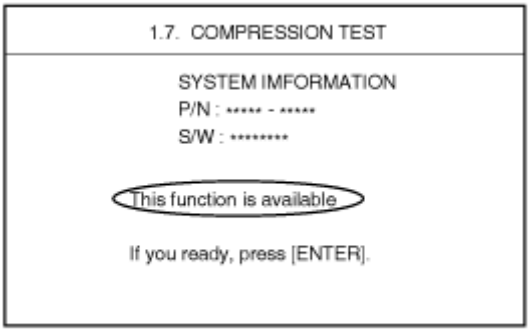
- COMPRESSION TEST
- IDLE SPEED COMPARISON
- INJECT QUANTITY COMPARISON

TEST PROCEDURE

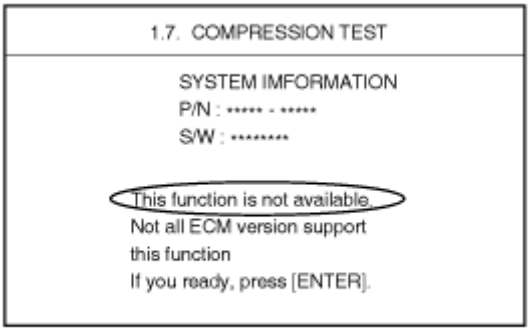
1. Connect Scan tool to the DLC and select "Vehicle" and "Engine Test Function".



2. Information for ECM version is displayed as below.

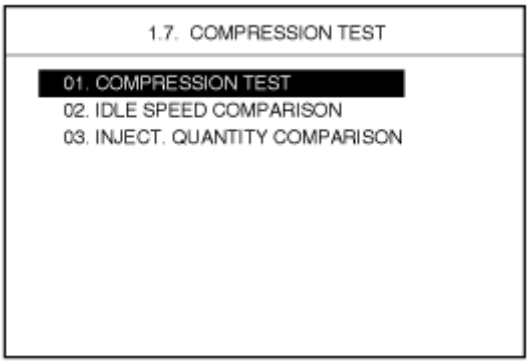


<Available system>

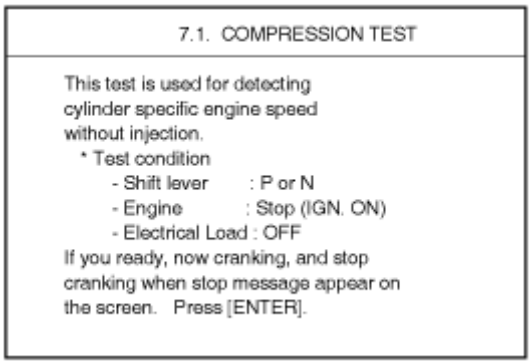


<Not available system>

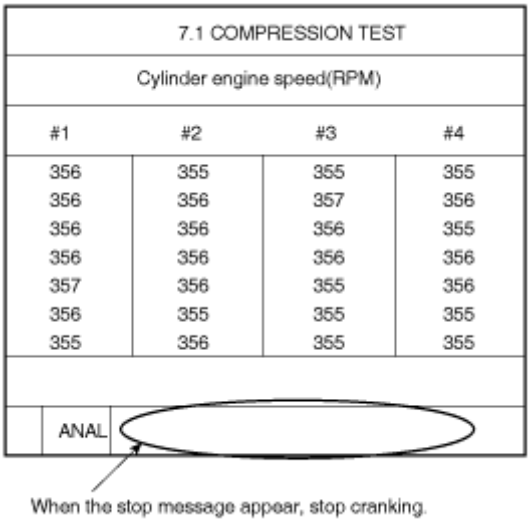
3. After pressing "[ENTER]" select "COMPRESSION TEST" mode and press "[ENTER]".



4. Set the test condition described as below screen and then, crank engine. When engine stop message being appeared, stop cranking.

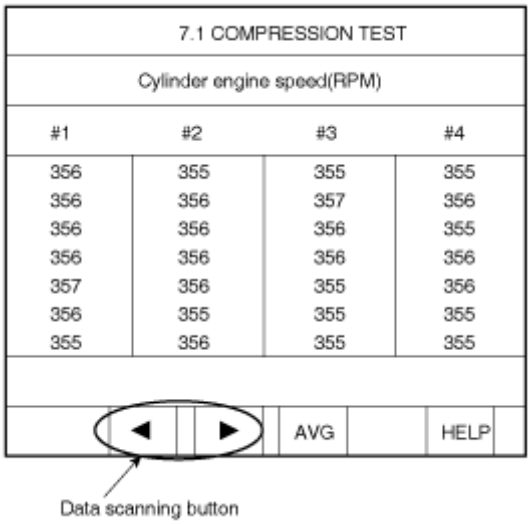


5. Press "ANAL" and the test result is appeared.

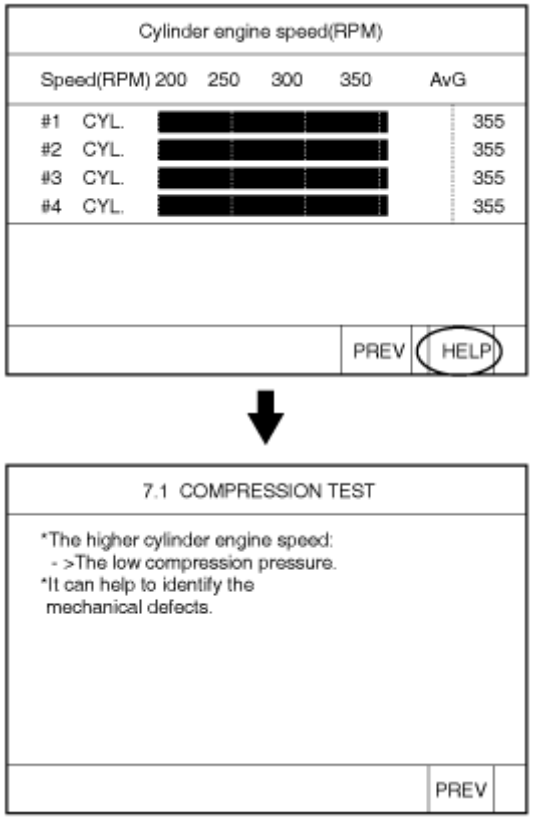


NOTICE

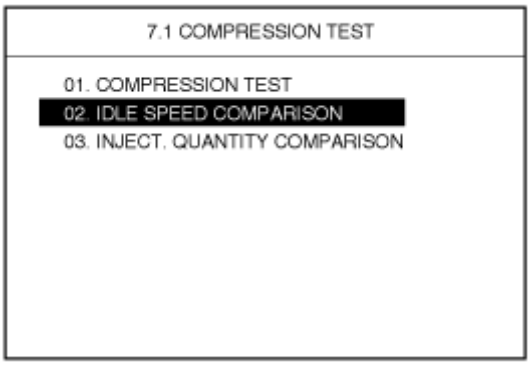
During cranking engine does not start.



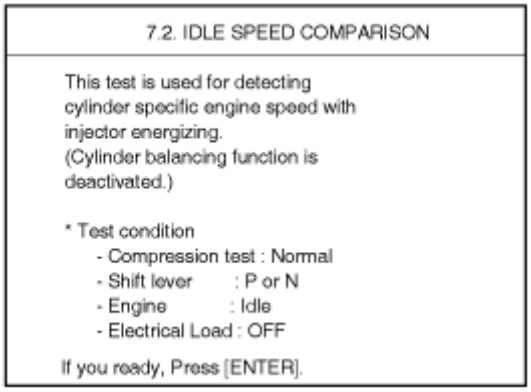
6. Press "AVG" and the data average of each cylinder is appeared.
   Press "HELP" and description of the data is appeared.



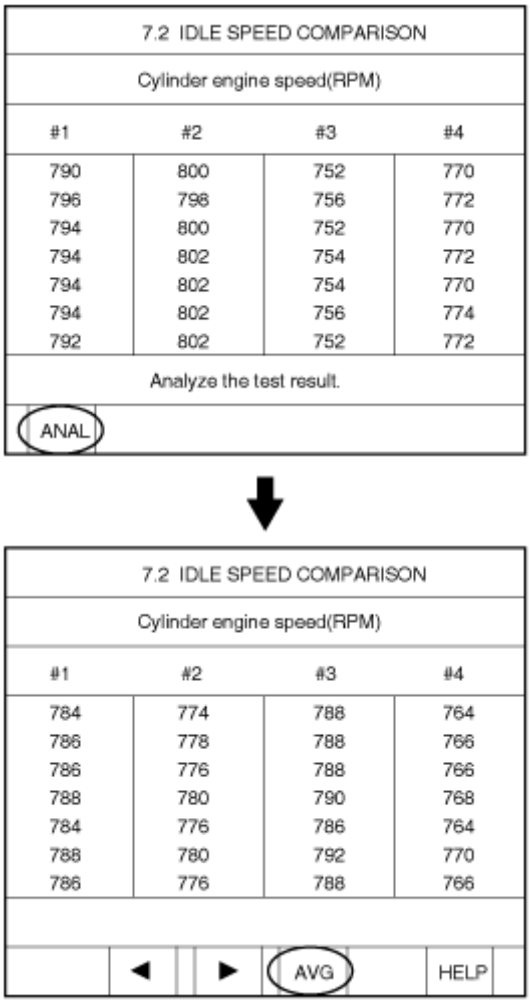
7. After pressing "ESC", select "IDLE SPEED COMPARISON" and press "[ENTER]".



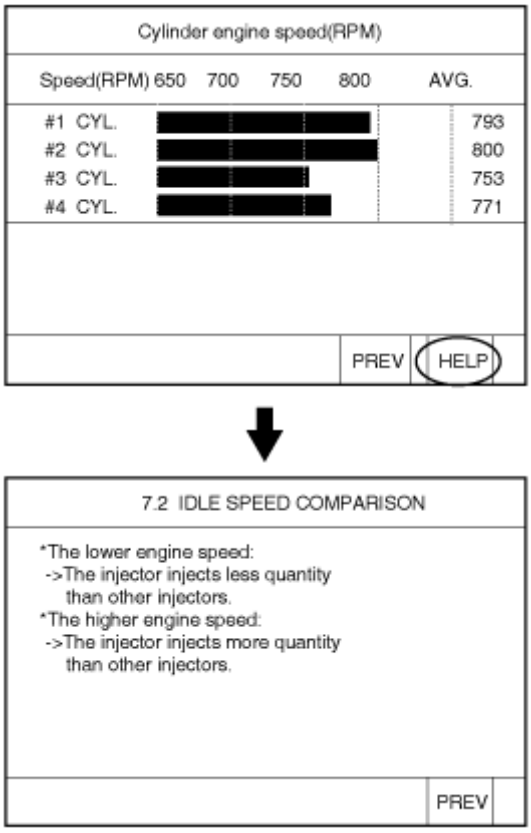
8. Set the test condition described as below screen and press "[ENTER]".



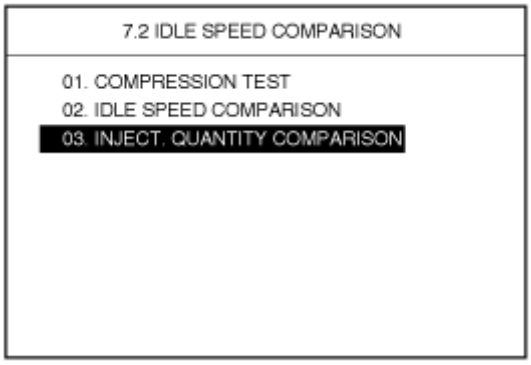
9. The rpm data of each cylinder is appeared.



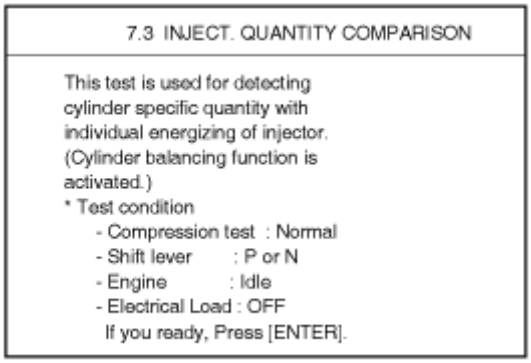
10. Press "AVG" and teh data average of each cylinder is appeared.
    Press "HELP" and description of the data is appeared.



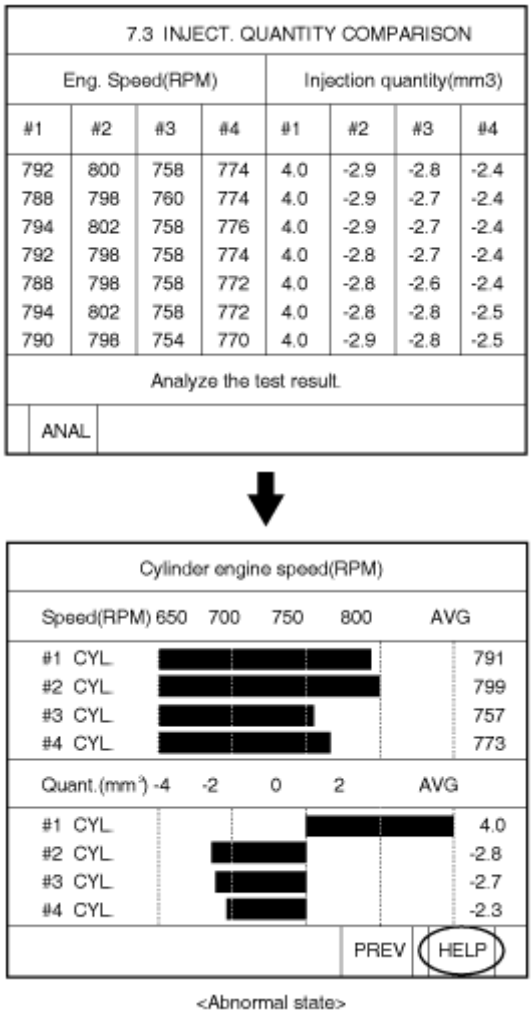
11. After pressing "ESC", select "INJECT QUANTITY COMPARISON" and press "[ENTER]".



12. Set the test condition described as below screen and press "[ENTER]".

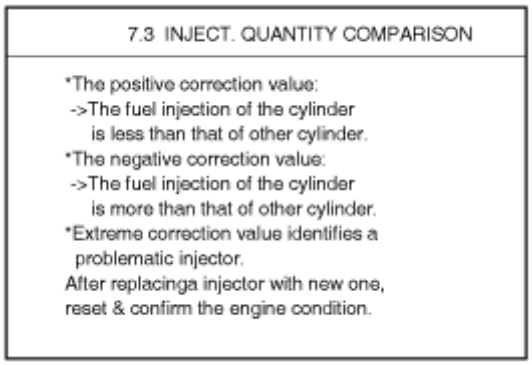


13. The data of each cylinder about RPM and compensating injection quantity is appeared.



<Abnormal state>

14. Press "HELP" and description of the data is displayed as below.



15. Replace the default injector, and then repeat previous test modes to check if the injector is normal.

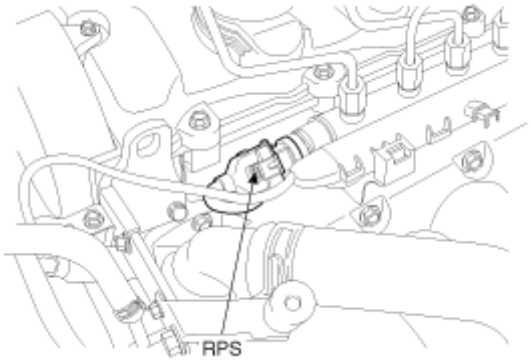
COMPONENT INSPECTION

1. Turn ignition switch OFF.
2. Disconnect the injector connector.
3. Measure resistance between terminal 1 and 2.
   Specification : 0.33Ω at 20°C(68°F)

English

INSPECTION

Rail Pressure Sensor (RPS) is installed at the end of the common rail and measures the instantaneous fuel pressure in the common rail by using its diaphragm. Its sensing element (semiconductor device) mounted on the diaphragm converts the fuel pressure to an electric signal.



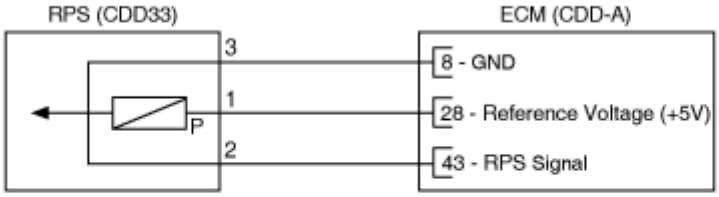
SPECIFICATION

Test Condition	Rail pressure (bar)	Output Voltage (V)
Idle	220 ~ 320	Below 1.7
Fully depressed	1,800	Approx. 4.5

CIRCUIT DIAGRAM

English ▼

[CIRCUIT DIAGRAM]



[CONNECTION INFORMATION]

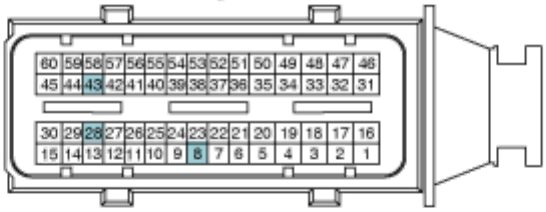
Terminal	Connected to	Function
1	ECM CDD-A (28)	Reference Voltage (+5V)
2	ECM CDD-A (43)	RPS Signal
3	ECM CDD-A (8)	Sensor Signal

[HARNESS CONNECTORS]

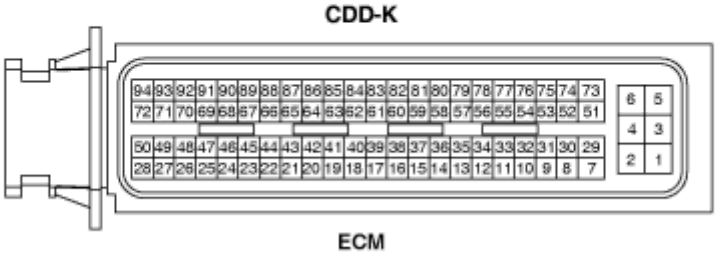


CDD33

RPS



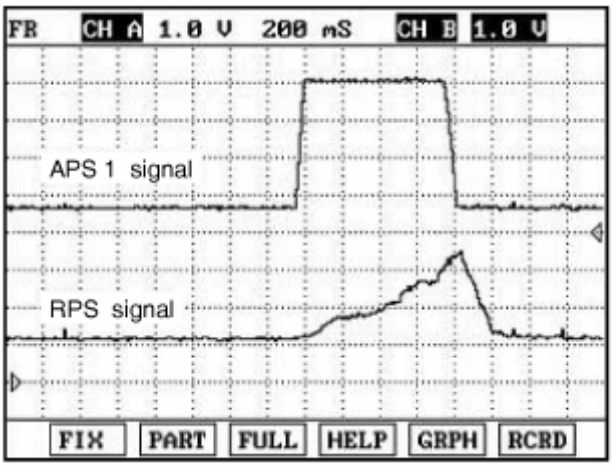
CDD-A



CDD-K

ECM

SIGNAL WAVEFORM



Rail Pressure Sensor (RPS) is to provide to the ECM the voltage signal corresponding to rail pressure.
The change in resistance is preportional to the rail pressure acting upon the diaphragm and rail pressure increases as load increases.

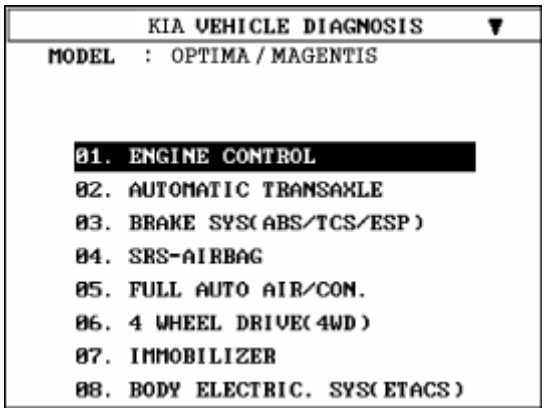
REPLACEMENT

NOTICE

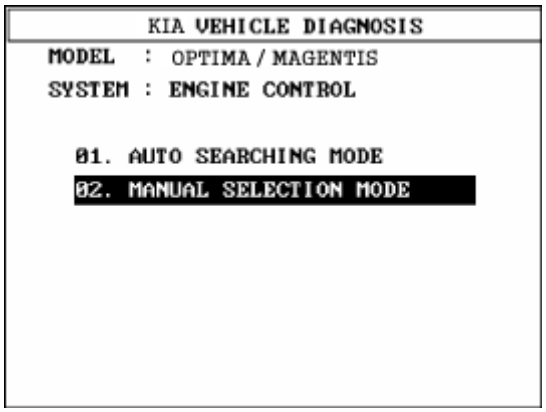
After replacing a Rail Pressure Sensor (RPS), MUST proceed below procedure.

1. Turn ignition switch OFF.
2. Connect a scan tool to Data Link Connector (DLC).
3. Turn ignition switch ON.

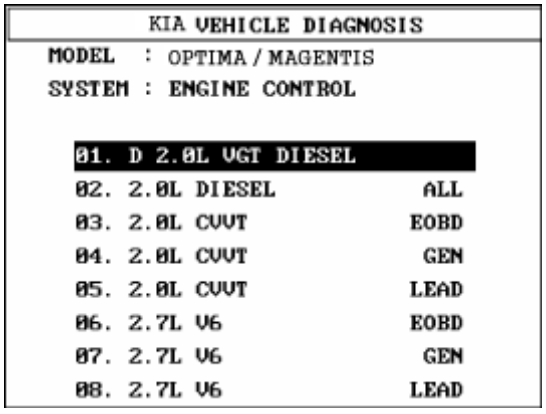
4. Select "ENGINE CONTROL". (For example, OPTIMA)



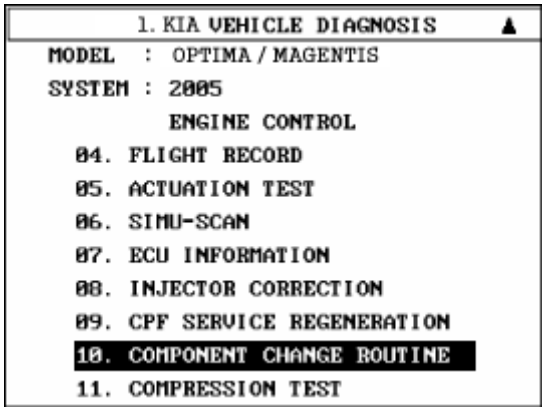
5. Select "MANUAL SELECTION MODE".



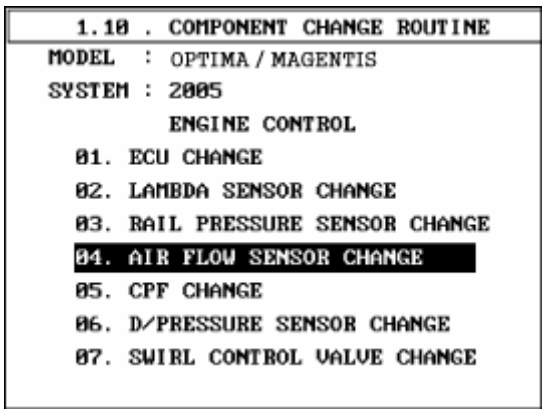
6. Select "D 2.0L VGT DIESEL".



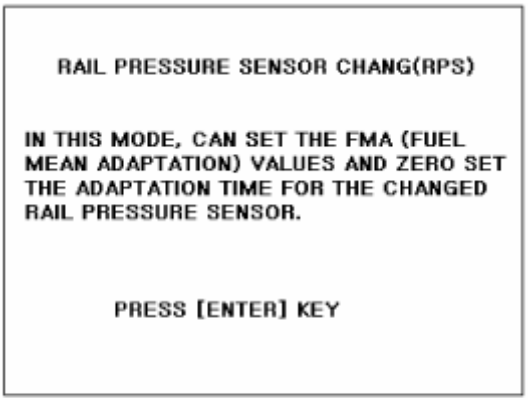
7. Select "COMPONET CHANGE ROUTINE"

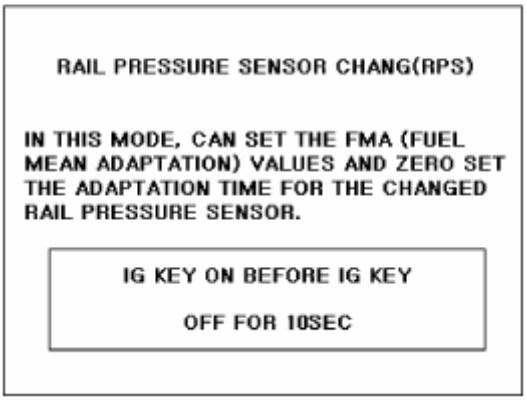


8. Select "RAIL PRESSURE SENSOR CHANGE".



9. Press "ENTER" key.



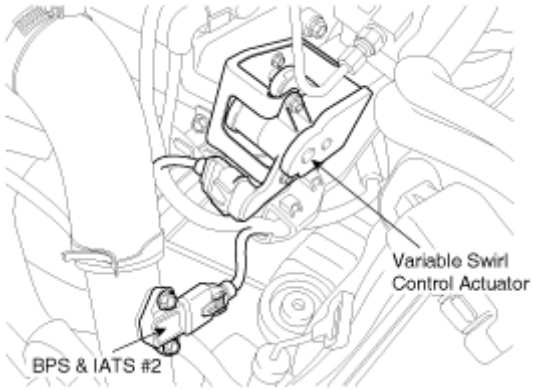


10. Wait 10 seconds with IG ON.
11. Turn ignition switch off.

English ▼

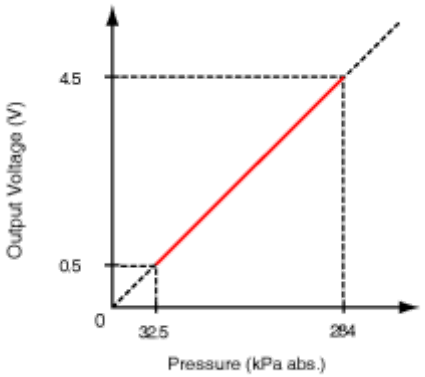
INSPECTION

Boost pressure sensor (BPS) is installed on surge tank to measure the absolute intake manifold pressure. BPS input voltage is changed in proportion with absolute pressure in manifold. This information is used to control Variable Geometery Turbocharger (VGT) by ECM.



SPECIFICATION

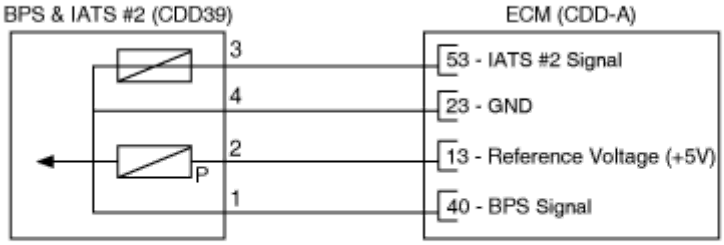
Pressure (kPa)	Output Voltage (V)
70	1.02 ~ 1.17
140	2.13 ~ 2.28
210	3.25 ~ 3.40
270	4.20 ~ 4.35



CIRCUIT DIAGRAM

English ▼

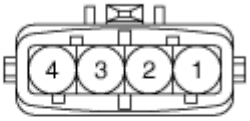
[CIRCUIT DIAGRAM]



[CONNECTION INFORMATION]

Terminal	Connected to	Function
1	ECM CDD-A (40)	BPS Signal
2	ECM CDD-A (13)	Reference Voltage (+5V)
3	ECM CDD-A (53)	IATS #2 Signal
4	ECM CDD-A (23)	Sensor ground

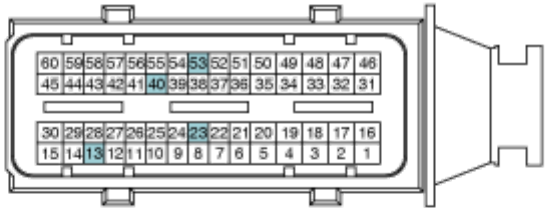
[HARNESS CONNECTORS]



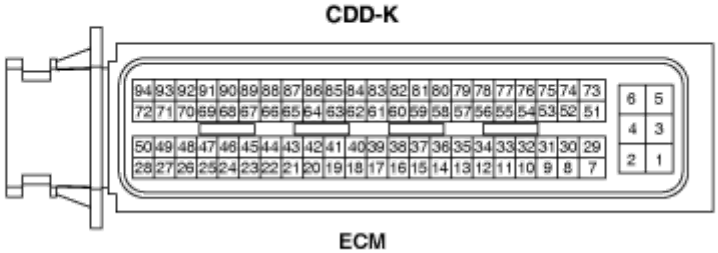
CDD39

BPS & IATS #2

CDD-A

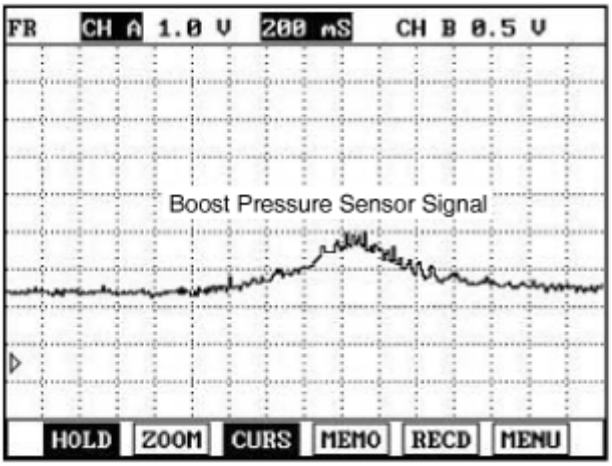


CDD-K



ECM

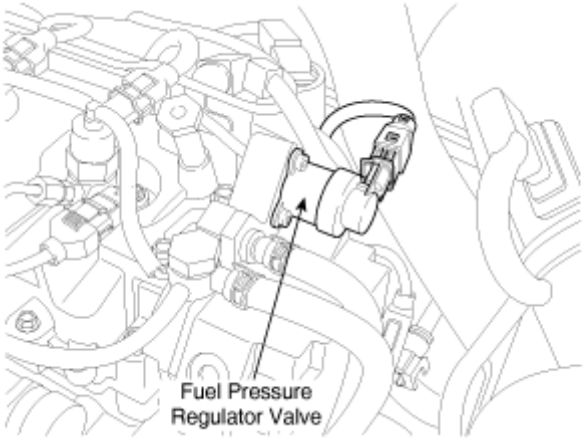
SIGNAL WAVEFORAM

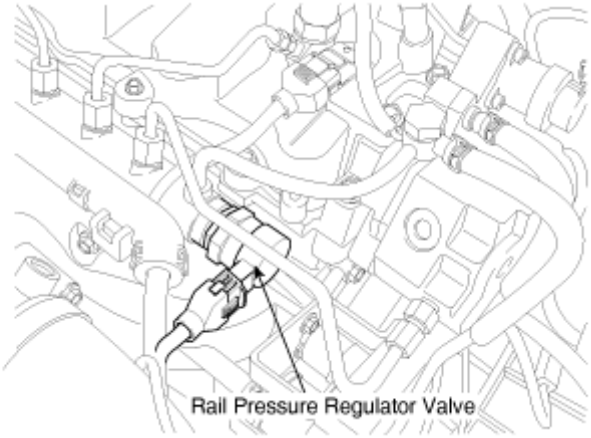


This illustration represents waveform of BPS when accelerating and decelerating.

INSPECTION

The Fuel Pressure Regulator Valve and the Rail Pressure Regulator Valve are installed on high pressure pump and common rail respectively. These valves control fuel inlet (feed) from fuel tank via fuel filter and outlet (return) to fuel tank of high pressure fuel circuit. This system is called "Dual Fuel Pressure Control System" and can precisely and quickly control the fuel pressure in accordance with various engine conditions by controlling the fuel inlet and outlet simultaneously.





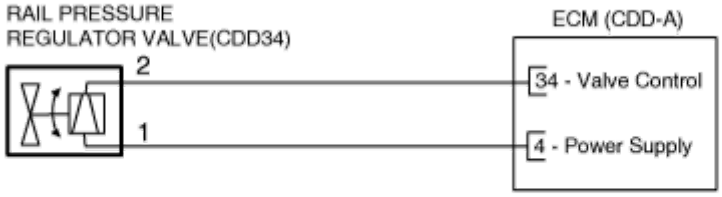
SPECIFICATION

Items	Specification
Coil Resistance (Ω)	3.42 ~ 3.78Ω [20°C(68°F)]

CIRCUIT DIAGRAM

English

[CIRCUIT DIAGRAM]



[CONNECTION INFORMATION]

Terminal	Connected to	Function
1	ECM CDD-A (4)	Battery Voltage (B+)
2	ECM CDD-A (34)	Valve Control

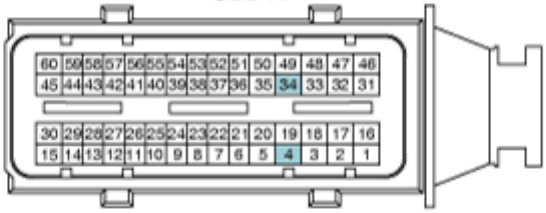
[HARNESS CONNECTORS]



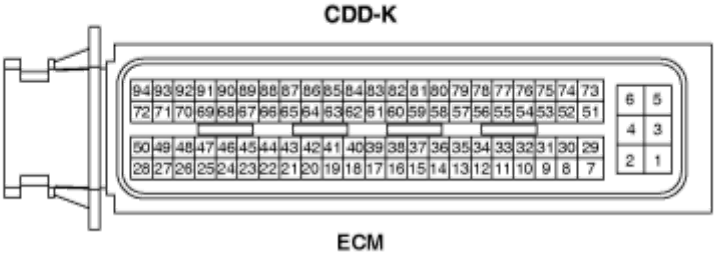
CDD34

RAIL PRESSURE REGULATOR VALVE

CDD-A



CDD-K



ECM

SIGNAL WAVEFORM

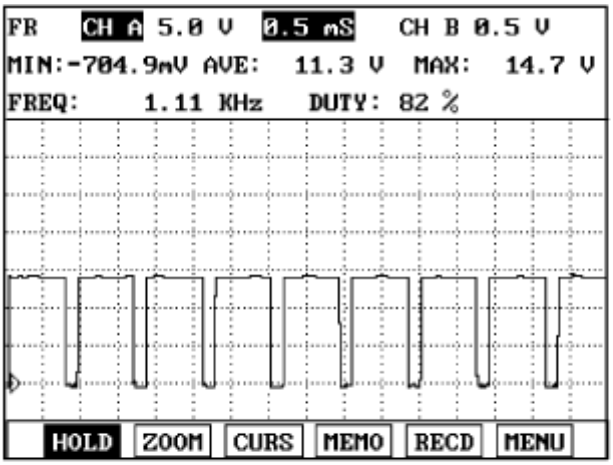


Fig.1

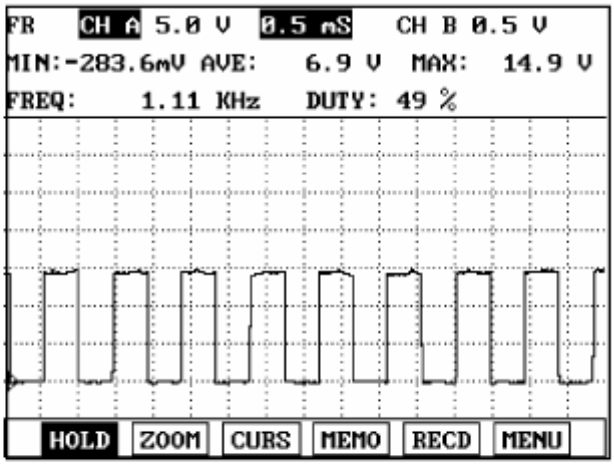


Fig.2

Fig.1) Waveform of rail pressure regulator valve at idle. It shows approx. 17% duty((-) duty.
Fig.2) Waveform of rail pressure regulator valve as accelerating. Approx. 50% duty is outputted as engine load increases.
(When rail pressure increases as accelerating, rail pressure regulator valve duty(current) rises.)

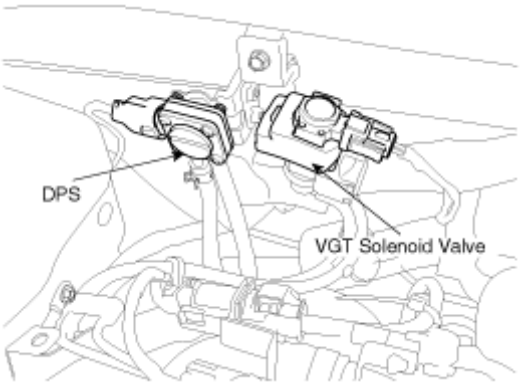
COMPONENT INSPECTION

1. Turn ignition switch OFF.
2. Disconnect the rail pressure regulator valve connector.
3. Measure resistance between terminal 1 and 2 of the valve.
   Specification: Refer to "SPECIFICATION".

English ▼

INSPECTION

Variable Geometry Turbo-charger (VGT) is used to charge additional air into combustion chamber for improvement of combustion efficiency.
ECM controls the VGT with controlling duty of the VGT control solenoid valve according to engine load.

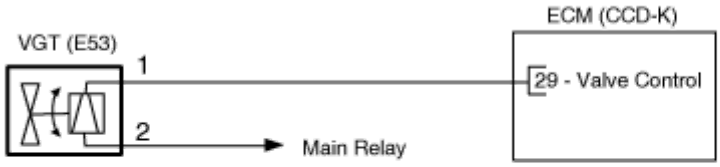


SPECIFICATION

Items	Specification
Coil Resistance (Ω)	14.7 ~ 16.1Ω [20°C(68°F)]

CIRCUIT DIAGRAM

[CIRCUIT DIAGRAM]



[CONNECTION INFORMATION]

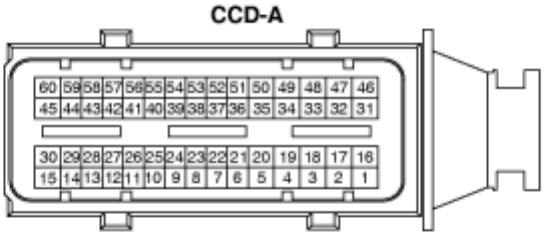
Terminal	Connected to	Function
1	ECM CCD-K (29)	Valve Control
2	Main Relay	Battery Voltage (B+)

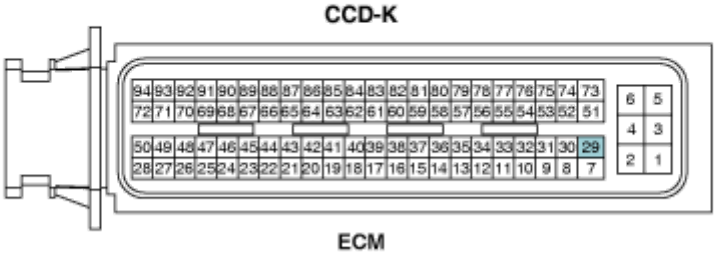
[HARNESS CONNECTORS]



E53

VGT CONTROL SOLENOID VALVE





SIGNAL WAVEFORM

English ▼

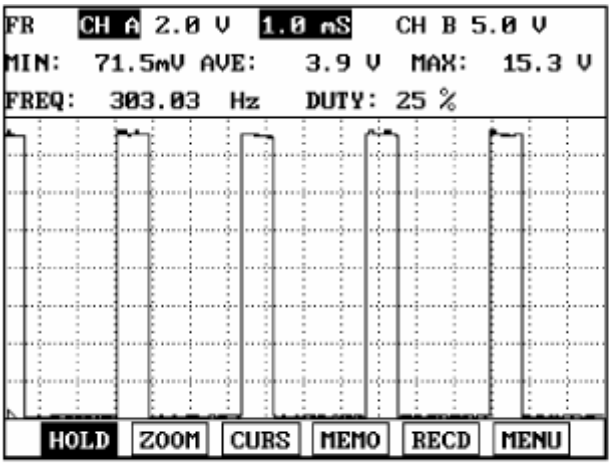


Fig.1

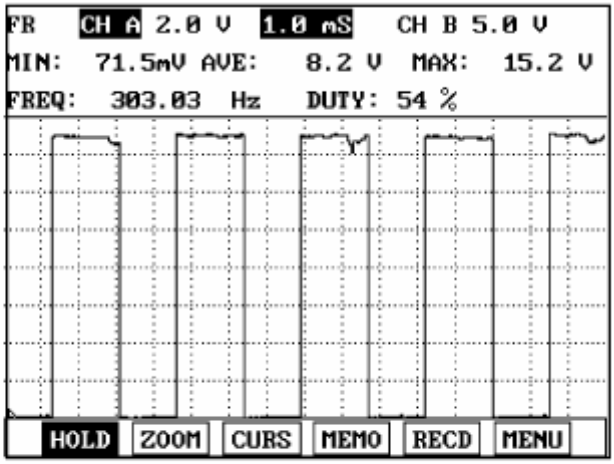


Fig.2

Fig.1) VGT actuator output waveform at 76% duty((-)duty. Duty decreases as boost pressure increases.
Fig.2) VGT actuator duty((-)duty) decreases as accelerating.

COMPONENT INSPECTION

1. Turn ignition switch OFF.
2. Disconnect the VGT control solenoid valve connector.
3. Measure resistance between terminal 1 and 2 of the valve.
   Specification: Refer to "SPECIFICATION".

English

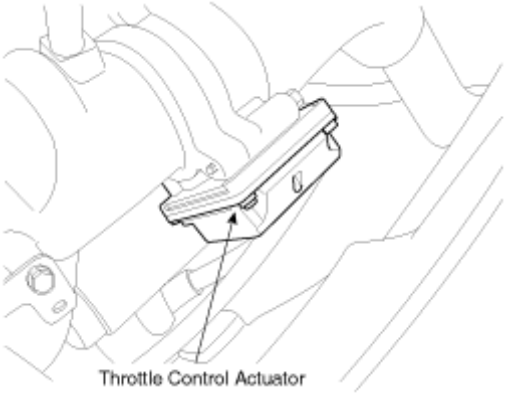
INSPECTION

The Throttle Control Actuator is mounted on throttle body of diesel engine and controls throttle valve according to PWM (Pulse With Modulation) signal from ECM.
It consists of;

- a DC motor which actuates the throttle valve,
- a 2-step gear (transmission ratio = 1:40) which is located in between the DC motor and the throttle valve and increases torque of the DC motor,
- a position sensor which is a hall-effect sensor and detects status of the throttle valve,
- an electric control unit which is a micro-controller and drives the DC motor by the PWM (Pulse With Modulation) signal from the ECM,
- and a reset spring which resets the de-energized throttle valve to its open position.

Its function is described below:

1) Anti-judder function: When engine is shut off, the ECM can prevent intake air from entering to intake manifold by fully closing the throttle valve for 1.5 seconds (95% < Duty < 97%) to reduce engine vibration.
2) Intake air control for EGR: When exhaust gas pressure is equal to or lower than intake air pressure (for example, when low engine speed), the exhaust gas would not enter to the intake manifold. At this time, the ECM partially closes the throttle valve (5% < Duty < 94%) to reduce the intake air quantity. The intake air pressure thus is lower than the exhaust gas pressure.
3) Exhaust gas temperature control for CPF regeneration: When the Catalyzed Particulate Filter (CPF) is need to regenerate, the ECM partially closes the throttle valve (5% < Duty < 94%) to reduce the intake air quantity. At this time, the air-fuel ratio would become rich and the exhaust gas temperature would be high enough to burn the soot inside the CPF.


Throttle Control Actuator

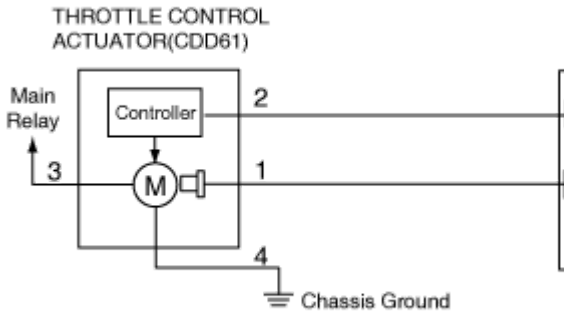
SPECIFICATION

Duty (%)	Throttle Valve Position
5	Open
5 ~ 94	Normal operation (Partially open in proportion to duty value)
94	Closed
94 ~ 95	Maintaining the last valid position
95 ~ 97	Fully closed

CIRCUIT DIAGRAM

English ▼

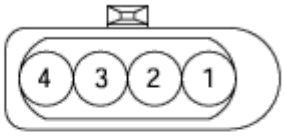
[CIRCUIT DIAGRAM]



[CONNECTION INFORMATION]

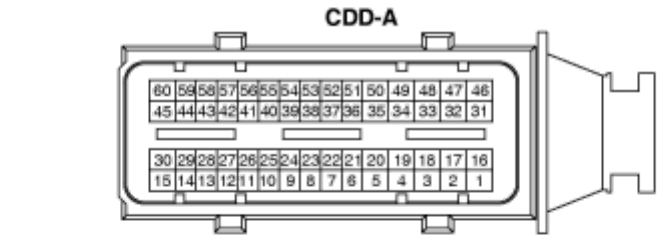
Terminal	Connected to	Function
1	ECM CDD-K (77)	Feedback Signal
2	ECM CDD-K (90)	Actuator Control
3	Main Relay	Battery Voltage
4	Chassis Ground	Ground

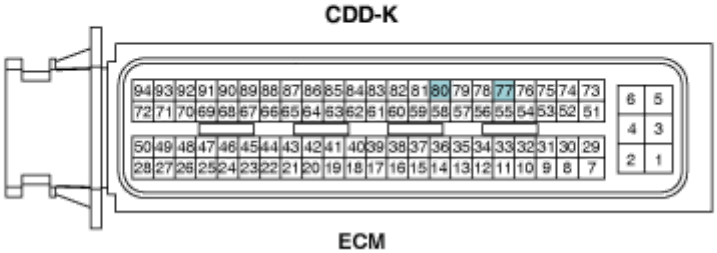
[HARNESS CONNECTORS]



CDD61

THROTTLE CONTROL ACTUATOR





ECM

SIGNAL WAVEFORM

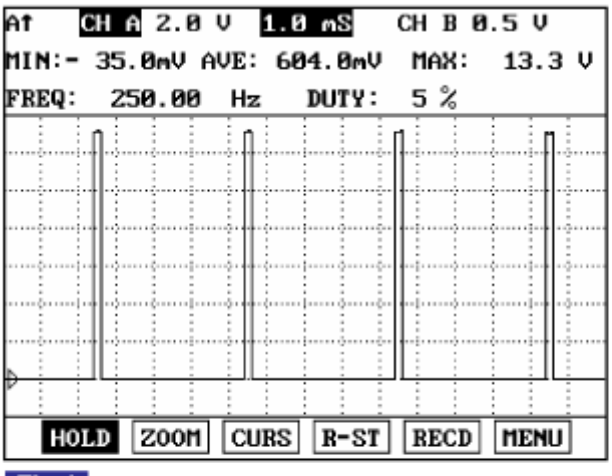


Fig.1

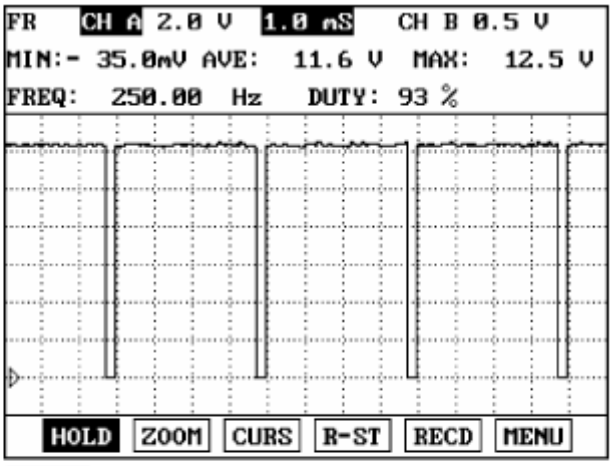


Fig.2

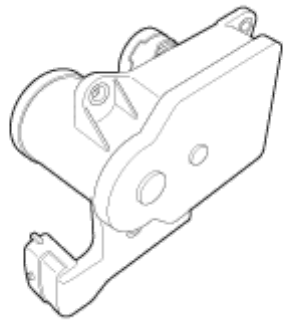
Fig.1) Waveform of Throttle control actuator at wide open(at idle) : At IG KEY "ON", ENGINE "ON", 5% duty is outputted continuously.
Fig.2) Waveform of Throttle control actuator at closed position : At IG KEY "OFF", 93% duty is outputted for about 1 sec.

COMPONENT INSPECTION

1. Turn ignition switch OFF.
2. Disconnect the electric throttle control actuator connector.
3. Measure resistance between terminal 1 and 2 of the valve.
   Specification: Refer to "SPECIFICATION".

DESCRIPTION

Variable Swirl Control Actuator consists of DC motor and position sensor which detects the position of the swirl valve.
At idle or below 3000rpm, the swirl valve is closed. This swirl effect increases air flow rate.



	Low and Middle Load	High Load
Engine speed	Below 3000rpm	Above 3000rpm
Valve operation	CLOSE	OPEN
Description illustration		
Fail-safe	Fully opened	

NOTICE

To prevent the swirl valve and the shaft from being stuck by foreign material and to learn max opening and closing position of the valve, the ECM fully opens and closes the valve twice when engine is being stopped.

SPECIFICATION

Motor

Items	Specification
Coil Resistance (Ω)	3.4 ~ 4.4Ω [20℃(68°F)]

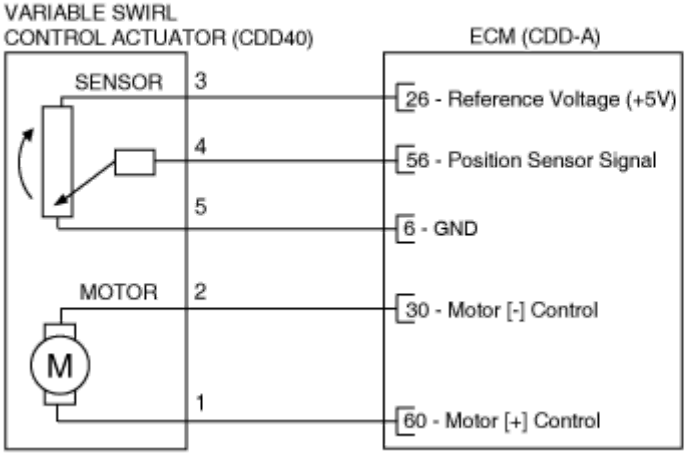
Position Sensor

Items	Specification
Coil Resistance (Ω)	3.44 ~ 5.16Ω [20℃(68°F)]

CIRCUIT DIAGRAM

English ▼

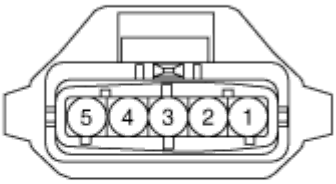
[CIRCUIT DIAGRAM]



[CONNECTION INFORMATION]

Terminal	Connected to	Function
1	ECM CDD-A (60)	Motor [+] Control
2	ECM CDD-A (30)	Motor [-] Control
3	ECM CDD-A (26)	Reference Voltage (+5V)
4	ECM CDD-A (56)	Position Signal
5	ECM CDD-A (6)	Sensor Ground

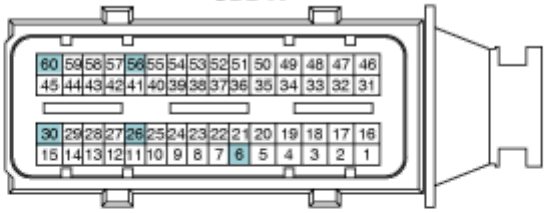
[HARNESS CONNECTORS]



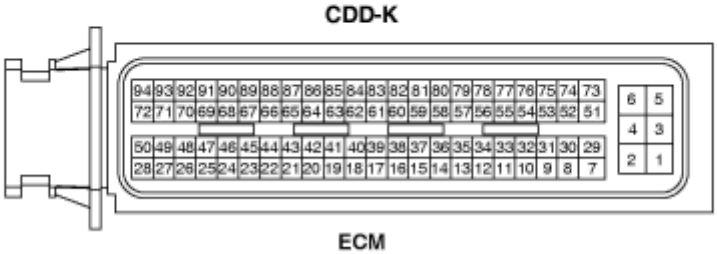
CDD40

VARIABLE SWIRL CONTROL ACTUATOR

CDD-A



CDD-K



ECM

SIGNAL WAVEFORM

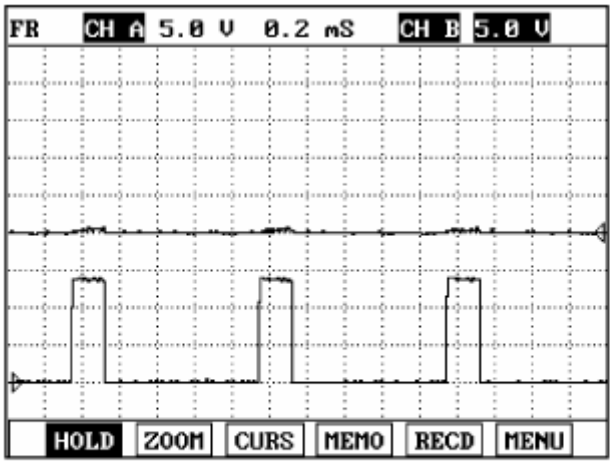


Fig.1

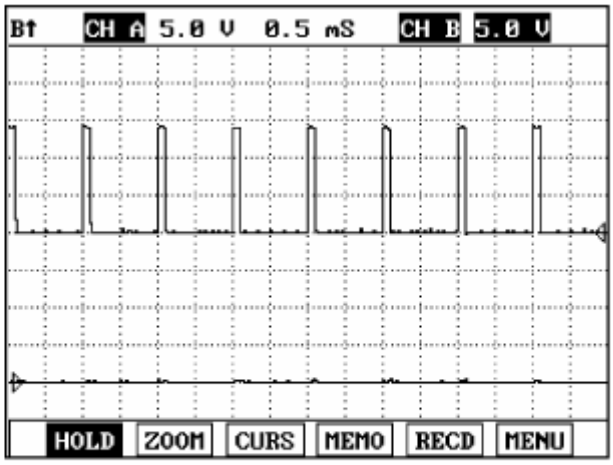


Fig.2

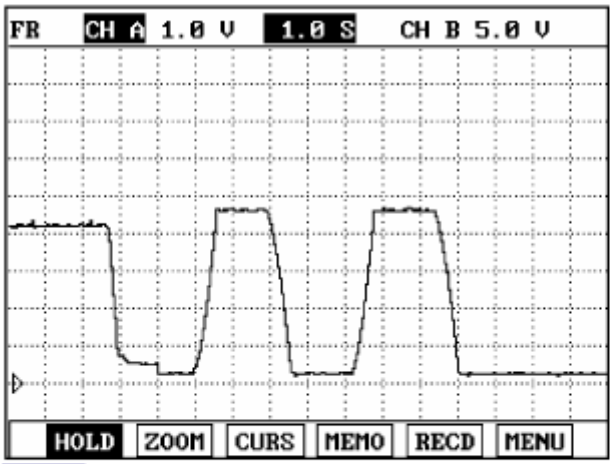


Fig.3

Fig.1) Waveform when variable swirl valve closed at idle. Terminal 1 is (+) and 2 is (-).
Fig. 2) Waveform when variable swirl valve opened at above 3000RPM. Terminal 1 is (-) and 2 is (+).
Fig. 3) Waveform of variable swirl control actuator motor position sensor at the point of turning engine OFF.
4.3V at swirl valve closed and 0.3V at swirl valve opened. Swirl valve is opened and closed twice at engine "OFF".

COMPONENT INSPECTION

1. Turn ignition switch OFF.
2. Disconnect the electric EGR control valve connector.
3. Check that swirl valve is stuck by foreign material.
4. Measure resistance between motor (+) and (-) control terminals.
   Specification: Refer to "SPECIFICATION".
5. Measure resistance between voltage supply terminal and ground terminal of position sensor.
   Specification: Refer to "SPECIFICATION".

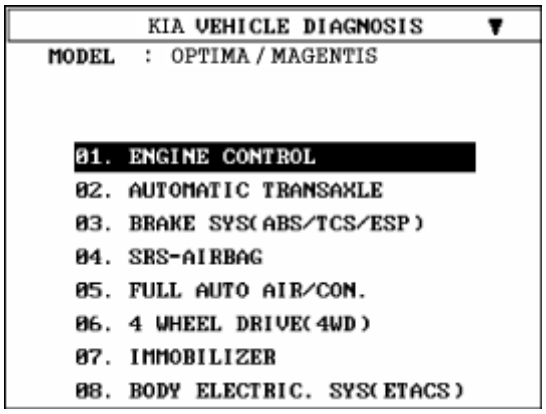
REPLACEMENT

NOTICE

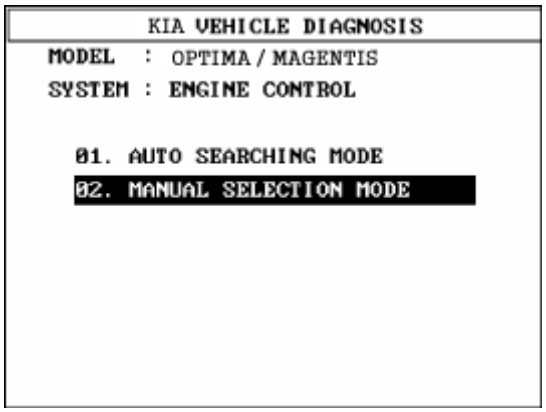
After replacing a Variable Swirl Actuator, MUST proceed below procedure.

1. Turn ignition switch OFF.

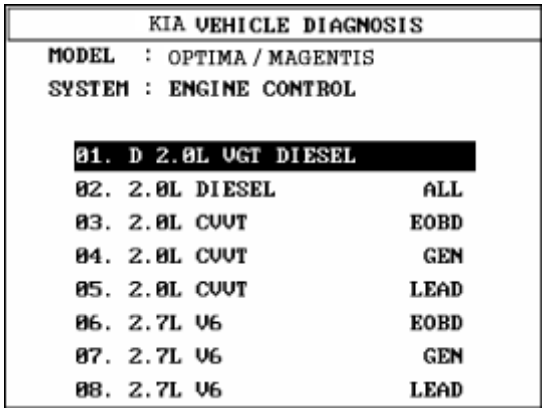
2. Connect a scan tool to Data Link Connector (DLC).
3. Turn ignition switch ON.
4. Select "ENGINE CONTROL". (For example, OPTIMA)



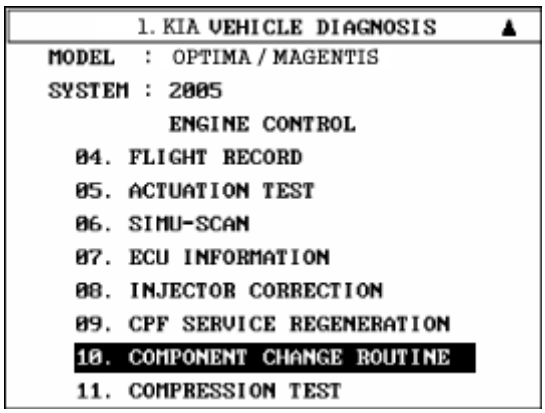
5. Select "MANUAL SELECTION MODE".



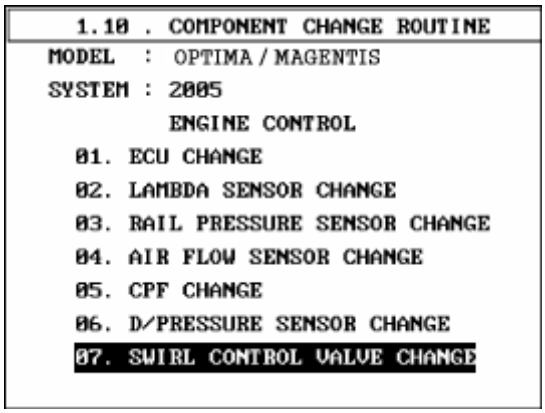
6. Select "D 2.0L VGT DIESEL".



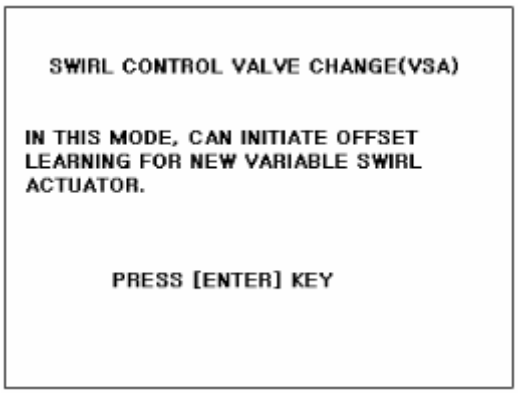
7. Select "COMPONET CHANGE ROUTINE"

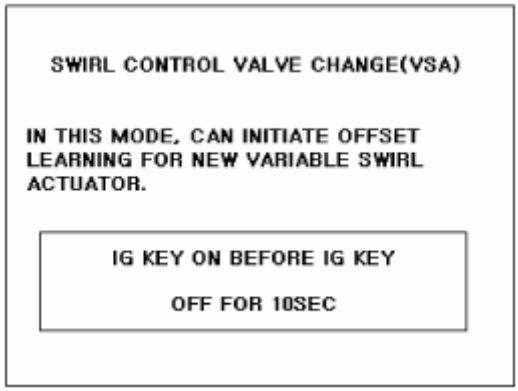


8. Select "SWIRL CONTROL VALVE CHANGE".



9. Press "ENTER" key.

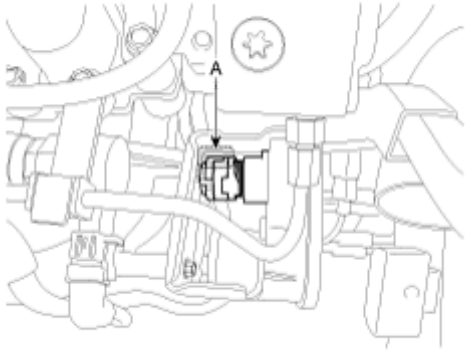




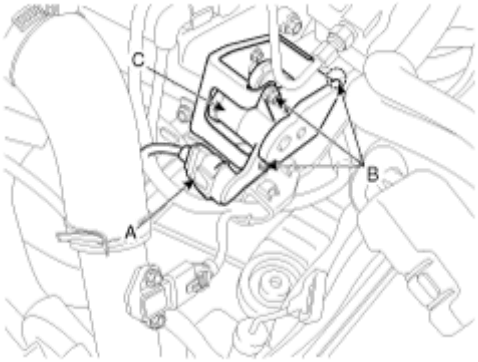
10. Wait 10 seconds with IG ON.
11. Turn ignition switch off.

REMOVAL

1. Disconnect the battery (-) terminal.
2. Mark painting on the top (A) of the variable swirl actuator coupling of the intake manifold side.



3. Disconnect the variable swirl actuator connector (A).
4. Remove the variable swirl actuator (C) after removing the installation bolt (B).



INSTALLATION

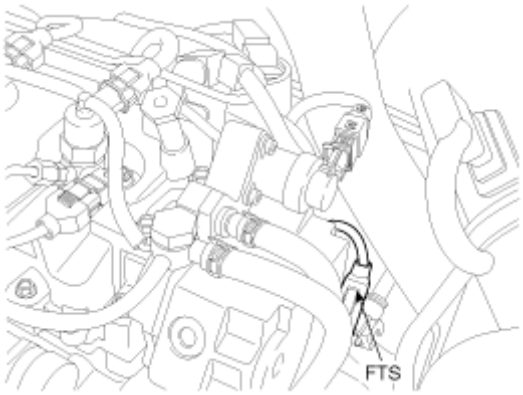
1. Installation is the reverse order of removal.
   Variable swirl actuator installation bolt:
   9.8 ~ 11.8 N.m (1.0 ~ 1.2 kgf.m, 7.2 ~ 8.7 lb-ft)

> **⚠ CAUTION**
>
> If the coupling of the intake manifold side is rotated a 180-degree turn, a real gap between the port and the flap in the intake manifold may be different from measuring it.
> Install the actuator after confirming the mark on the top of the coupling.

2. Confirm normal operation of the actuator more than 3 times when the ignition switch OFF after full warm up (Engine Coolant Temperature > 70 °C).

INSPECTION

Fuel Temperature Sensor(FTS) is installed in fuel supplying line and senses the termperature of fuel supplied to high pressure pump. Fuel temperature is limmited to protect fuel such as high pressure pump and injectors from damages due to rapid deterioration by vapor-lock which can occur at high temperature or destruction of oil membrance.



SPECIFICATION

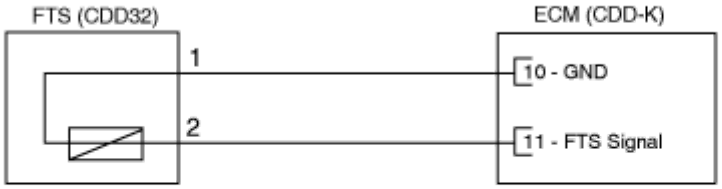
Temperature [℃(°F)]	Resistance (kΩ)
-30 (-22)	27.00
-20 (-4)	15.67
-10 (14)	9.45
0 (32)	5.89
20 (68)	2.27 ~ 2.73

Temperature [℃(°F)]	Resistance (kΩ)
40 (104)	1.17
50 (122)	0.83
60 (140)	0.60
70 (158)	0.43
80 (176)	0.30 ~ 0.32

CIRCUIT DIAGRAM

English

[CIRCUIT DIAGRAM]



[CONNECTION INFORMATION]

Terminal	Connected to	Function
1	ECM CDD-K (10)	Sensor ground
2	ECM CDD-K (11)	FTS Signal

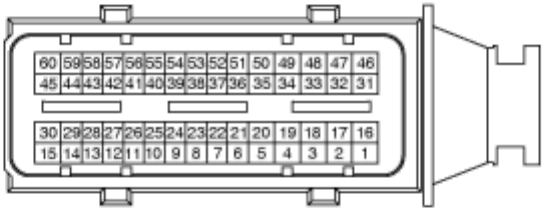
[HARNESS CONNECTORS]



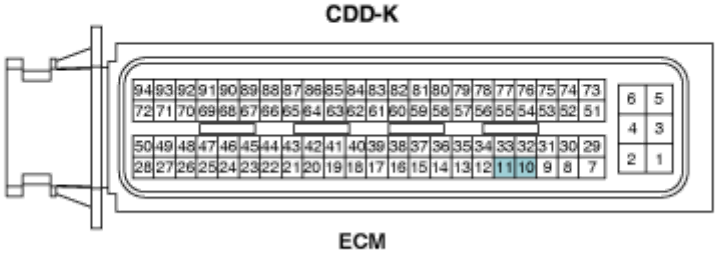
CDD32

FTS

CDD-A

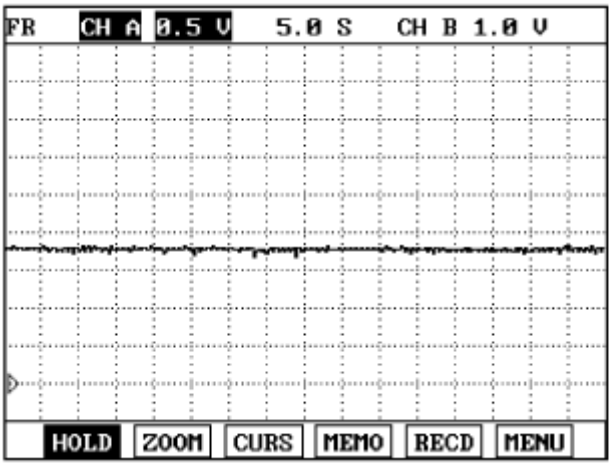


CDD-K



ECM

SIGNAL WAVEFORM



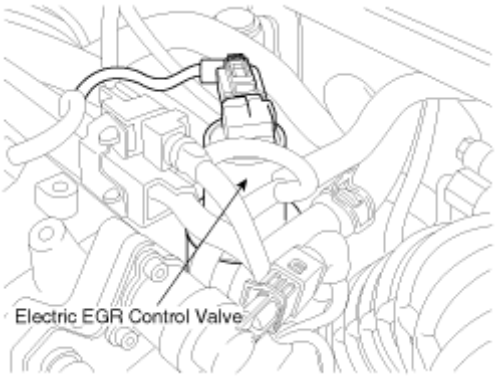
This illustration shows the waveform of fuel temperature sensor at 50℃.
The higher fuel temperature rises, the lower signal voltage becomes.

COMPONENT INSPECTION

1. Turn ignition switch OFF.
2. Disconnect the fuel temperature sensor connector.
3. Measure resistance between sensor signal terminal and ground terminal.
   Specification: Refer to "SPECIFICATION".

INSPECTION

The Exhaust Gas Recirculation (EGR) system is used to add the exhaust gas to intake air in order to reduce an excess of air and the temperature in the combustion chamber. The Electric EGR valve is controlled by ECM's duty control signal depending on engine load and the need of intake air and is operated by solenoid valve not vacuum valve.



SPECIFICATION

Items	Specification
Coil Resistance (Ω)	7.3 ~ 8.3Ω [20°C(68°F)]

CIRCUIT DIAGRAM

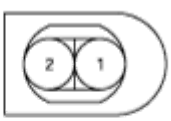
[CIRCUIT DIAGRAM]



[CONNECTION INFORMATION]

Terminal	Connected to	Function
1	ECM CDD-A (59)	EEGR Control
2	Main Relay	Battery Voltage (B+)

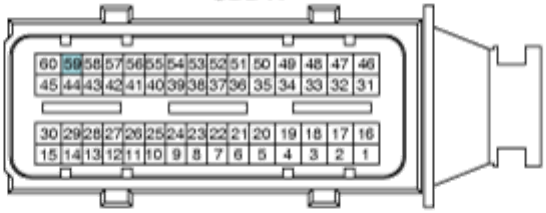
[HARNESS CONNECTORS]



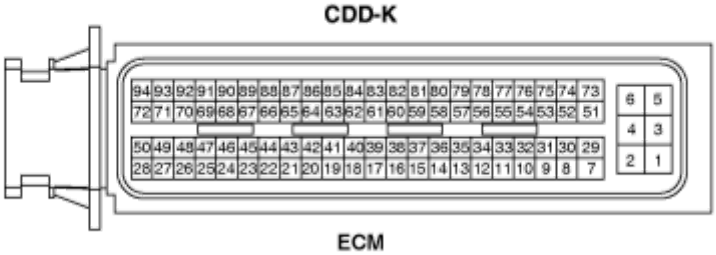
CDD31

EEGR

CDD-A



CDD-K



ECM

SIGNAL WAVEFORM

English

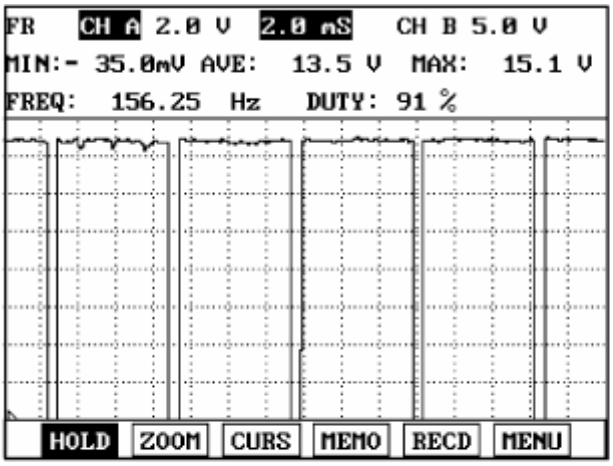


Fig.1

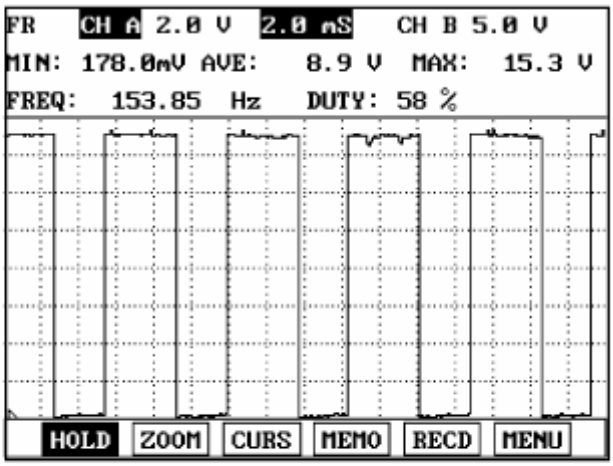


Fig.2

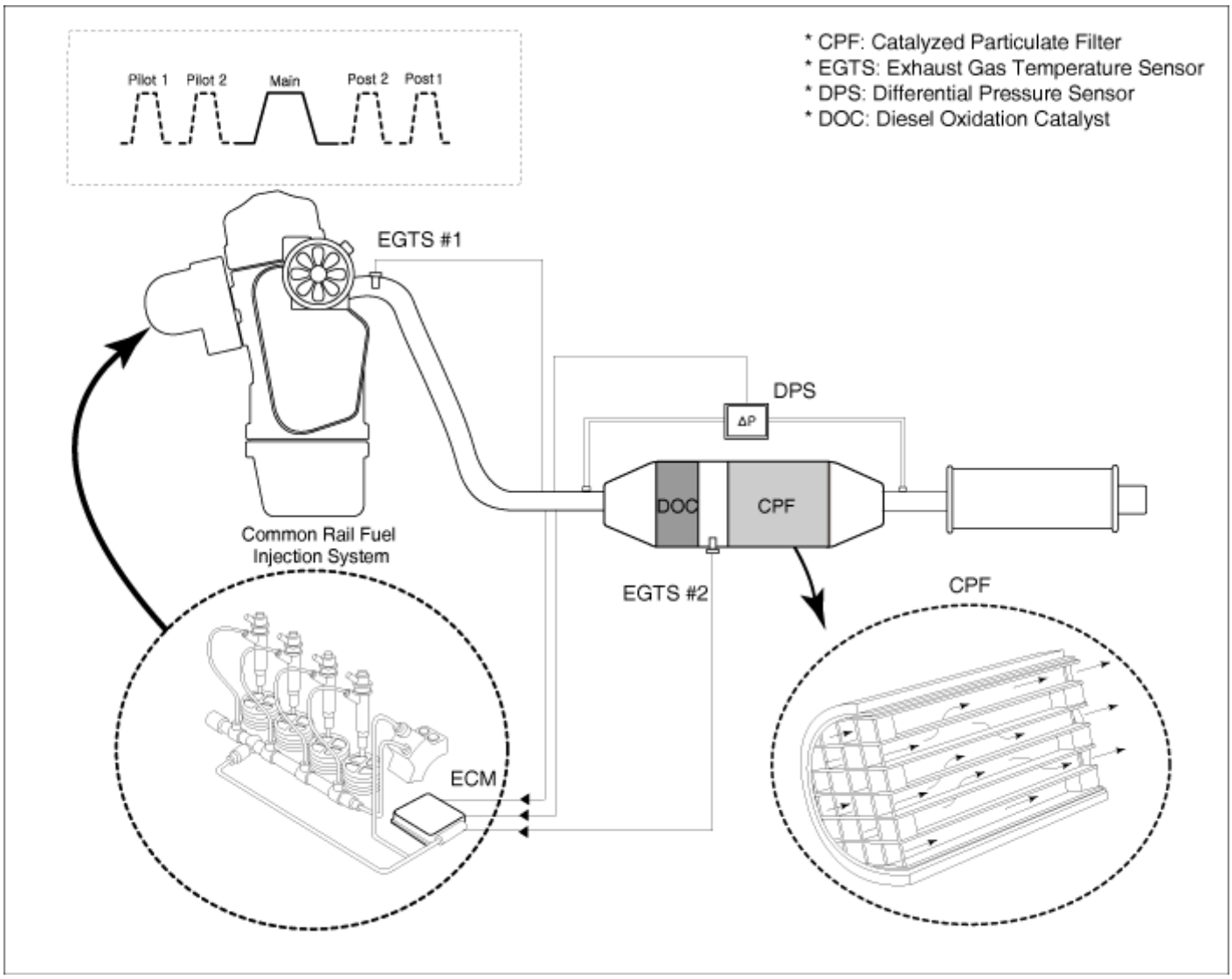
Fig.1) Approx. 10% duty((-)duty) signal waveform of EEGR actuator (with EEGR valve closed)
Fig.2) Approx. 40% duty((-)duty) signal waveform of EEGR actuator(with EEGR valve opened)

COMPONENT INSPECTION

1. Turn ignition switch OFF.
2. Disconnect the electric EGR control valve connector.
3. Measure resistance between terminal 1 and 2 of the valve.
   Specification: Refer to "SPECIFICATION".

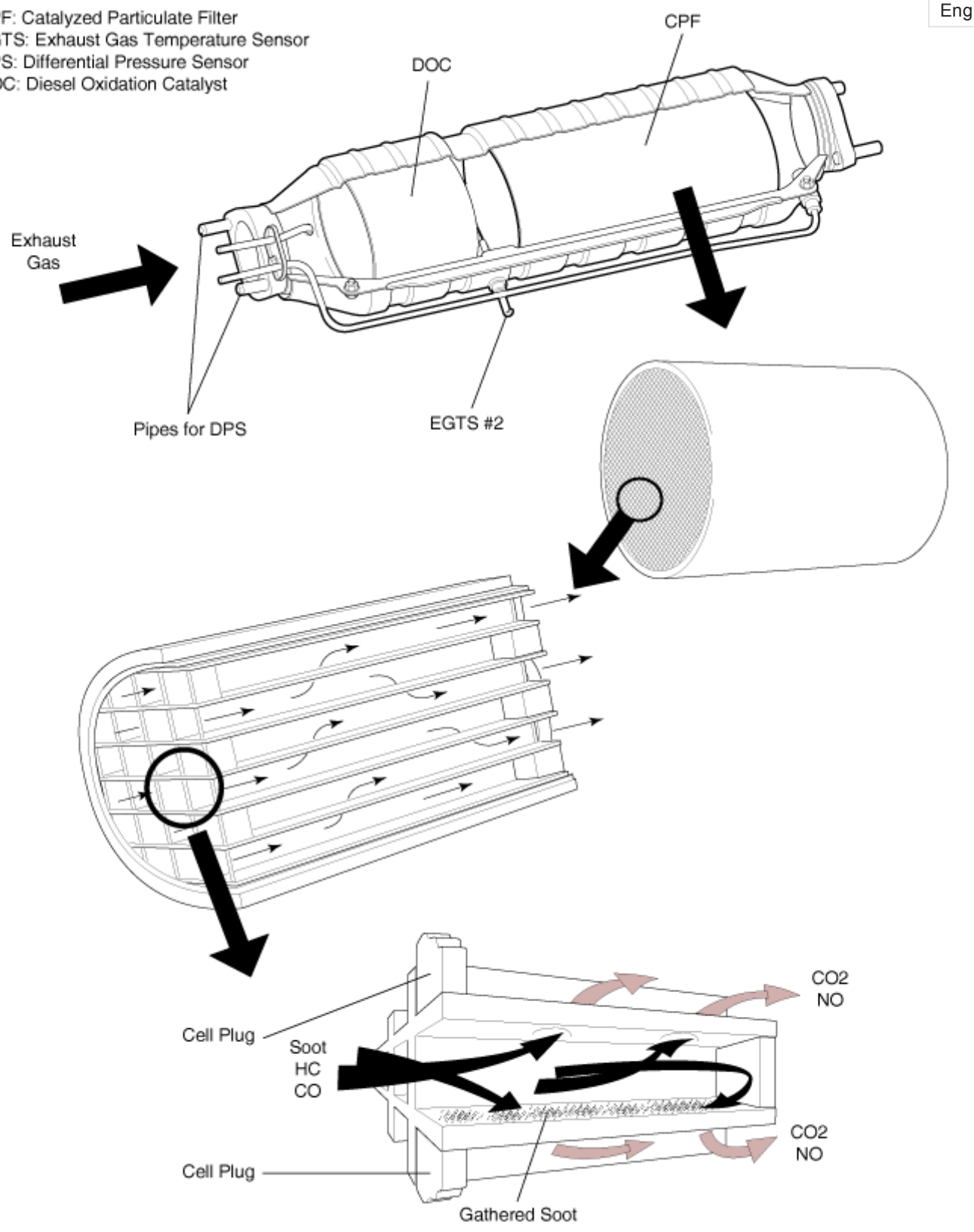
English

SCHEMATIC DIAGRAM



English ▼

* CPF: Catalyzed Particulate Filter
* EGTS: Exhaust Gas Temperature Sensor
* DPS: Differential Pressure Sensor
* DOC: Diesel Oxidation Catalyst



DESCRIPTION

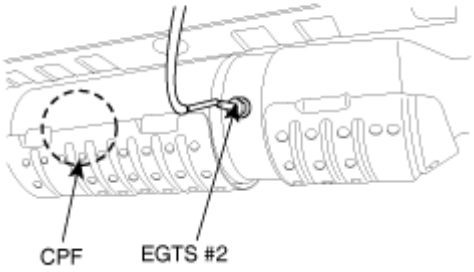
The Catalyzed Particulate Filter (CPF) system prevents Particulate Matter (PM) from being discharged to the atmosphere and consists of a filter assembly, two Exhaust Gas Temperature Sensor (EGTS) and a Differential Pressure Sensor (DPS).The filter is integrated in the catalytic converter assembly and has honeycomb cell structure which can filter the PM in the exhaust gas. While the exhaust gas passes the CPF, the PM is gathered in the CPF and the others (CO2, NO, etc.) are discharged to the atmosphere via muffler. This gathered PM in CPF is called "soot".

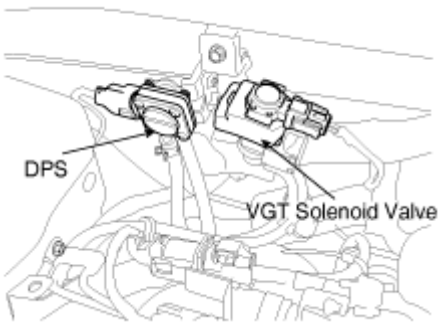
[CPF Regeneration]

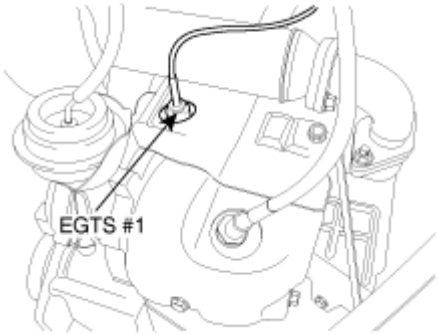
If there are much soot in the CPF, the CPF must be regenerated. ECM can calculate amount of the soot by using the DPS signal, vehicle mileage or simulation data. If the ECM determines the CPF is need to regenerate, it will perform "Regeneration Procedure" when the vehicle condition is corresponded with the predetermined one (Regeneration Mode).
To burn the soot, the ECM injects additional fuel in the cylinders during exhaust stroke (two Post Injection) and increases the exhaust gas temperature to burning temperature of the soot (above 600°C). At this time, the soot are burn and its ash remains in the CPF as a result of the combustion.

[Regeneration Mode]

1. Mileage > 1,000km
2. Engine Speed: 1,000 ~ 4,000rpm
3. Engine Load = About 0.7bar [8mg/st]
4. Vehicle Speed > 5km/h
5. Engine Coolant Temperature > 40°C







CPF REGENERATION

This procedures is to forcibly regenerate the CPF with scan tool when the CPF doesn't have been regenerated during driving. For example, if the vehicle has repeated "Low speed driving" or "Short distance driving", the CPF regeneration procedure cannot be proceeded because "Regeneration Mode" doesn't made.

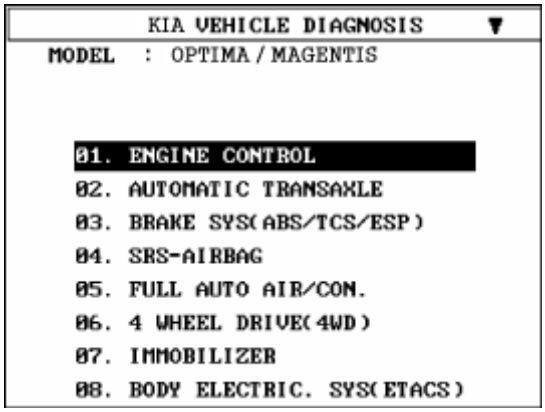
WARNING

If performing the CPF service regeneration mode indoors, fire or burn injuries may occur by high-temperature exhaust gas.
Therefore the CPF service regeneration mode must be performed in a outdoor safe zone.

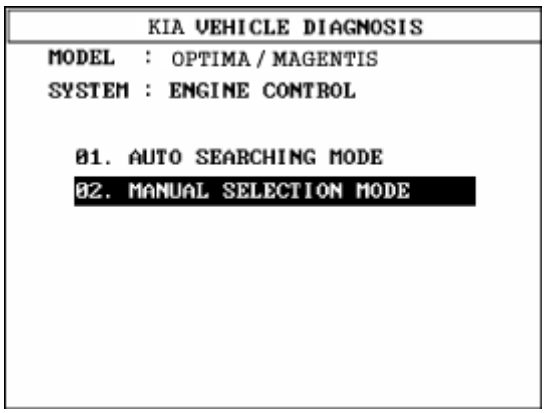
FORCIBLY REGENERATION CONDITION

- Engine coolant temperature: about 70°C
- Engine at idle
- P-range (A/T) or Neutral (M/T)
- Normal battery voltage
- Electrical fully load (A/C ON if equipped, Blower ON with maximum speed, Head Lamp ON, Wiper ON, Other Lamps ON, etc.)

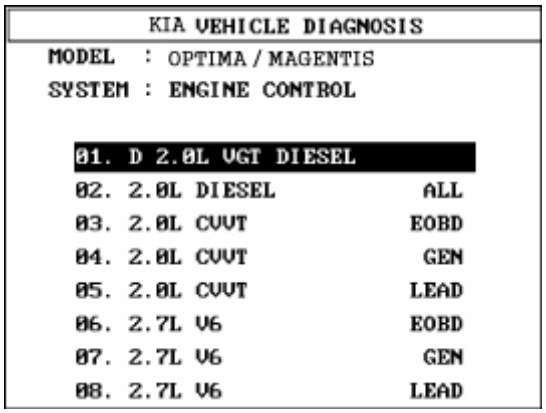
1. Turn ignition switch OFF.
2. Connect a scan tool to Data Link Connector (DLC).
3. Start engine at idle and P-range (A/T) or neutral (M/T).
4. Apply electrical fully load to the vehicle (A/C ON, Blower ON with maximum speed, Head Lamp ON, Wiper ON, and Other Lamps ON, etc.)
5. Select "ENGINE CONTROL". (For example, OPTIMA)



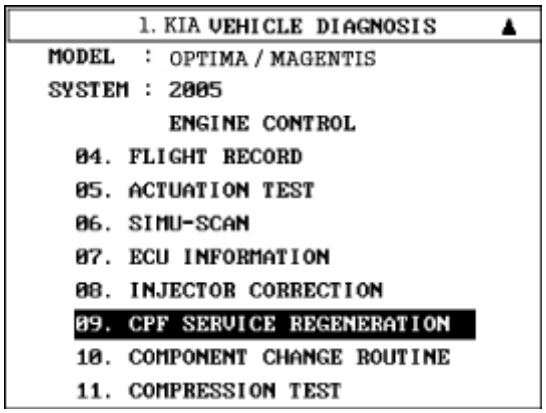
6. Select "MANUAL SELECTION MODE".



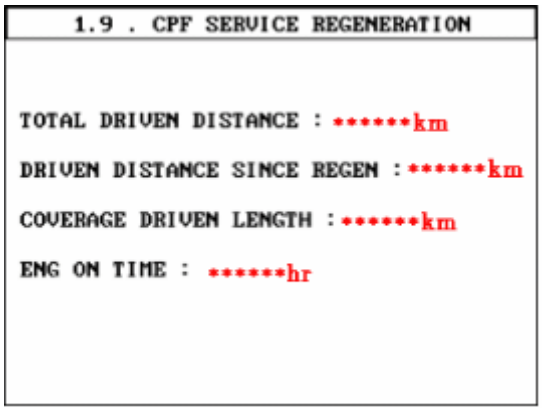
7. Select "D 2.0L VGT DIESEL".



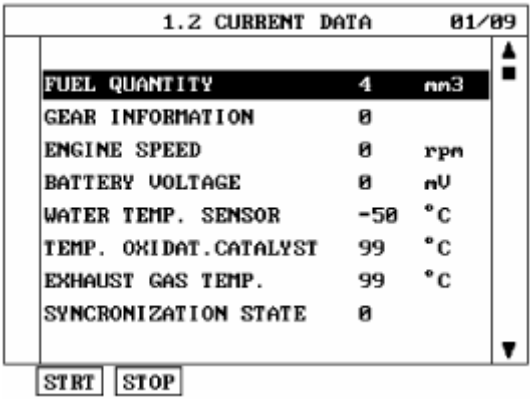
8. Select "CPF SERVICE REGENERATION".



9. Press "ENTER" key after looking around data memorized in ECM.

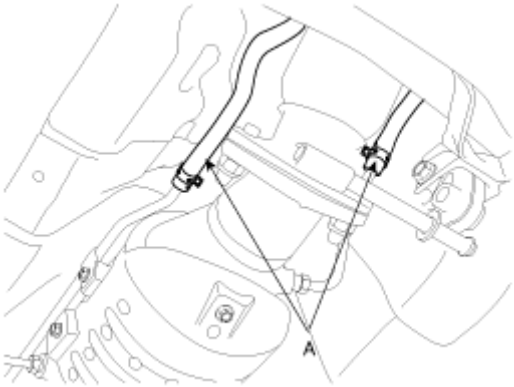


10. Press "STRT" key.

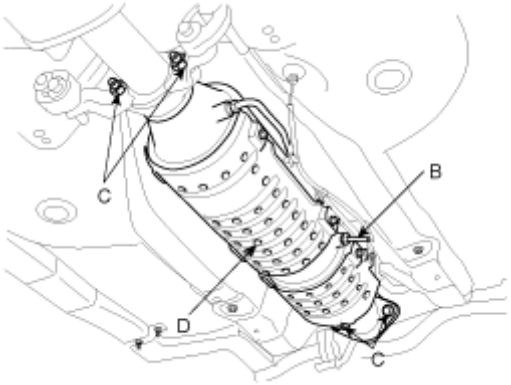


REMOVAL

1. Turn ignition switch off.
2. Lift the vehicle and support CPF assembly with a jack.
3. Disconnect the hoses (A) connected with Differential Pressure Sensor (DPS) from the CPF assembly.



4. Disconnect the Exhaust Gas Temperature Sensor (EGTS) #2 connector (B).



5. Linscrew the mounting nuts (C) and remove the CPF (D) from the vehicle.

INSTALLATION

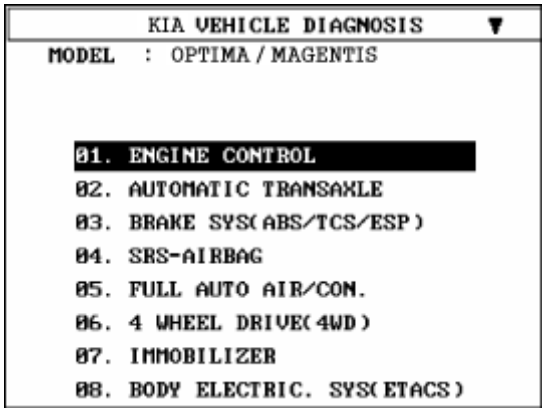
1. Install the CPF in the reverse order of "REMOVAL" procedure.
   CPF Mounting Nuts: 39.2 ~ 58.9N·m (4.0 ~ 6.0 kgf·m, 28.9 ~ 43.4lbf·ft)

REPLACEMENT

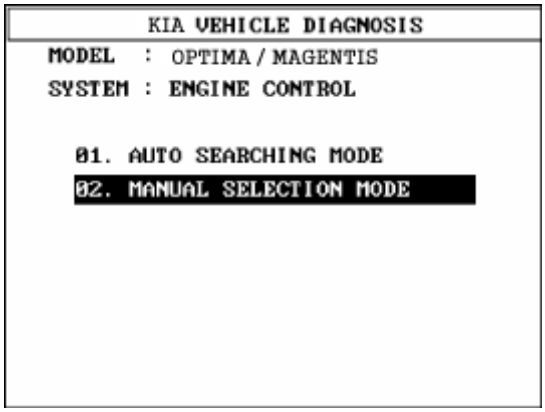
NOTICE

After replacing a CPF, MUST proceed below procedure.

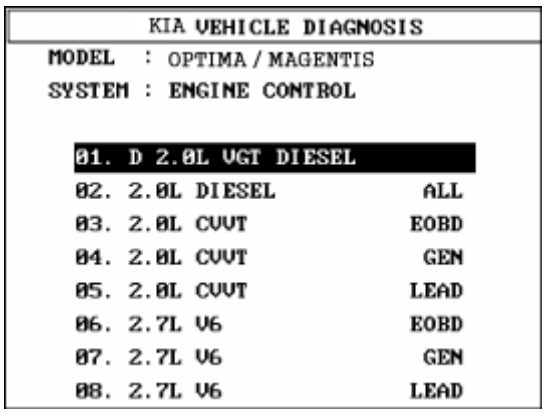
1. Turn ignition switch OFF.
2. Connect a scan tool to Data Link Connector (DLC).
3. Turn ignition switch ON.
4. Select "ENGINE CONTROL". (For example, OPTIMA)



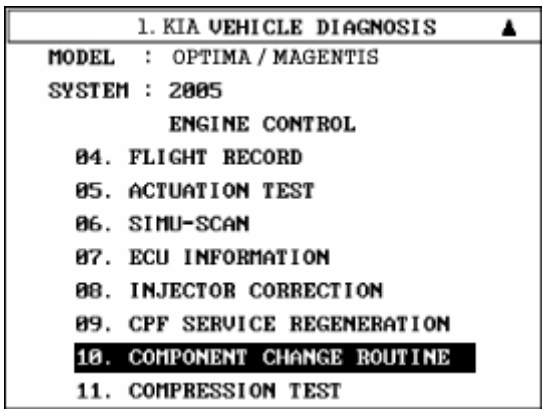
5. Select "MANUAL SELECTION MODE".



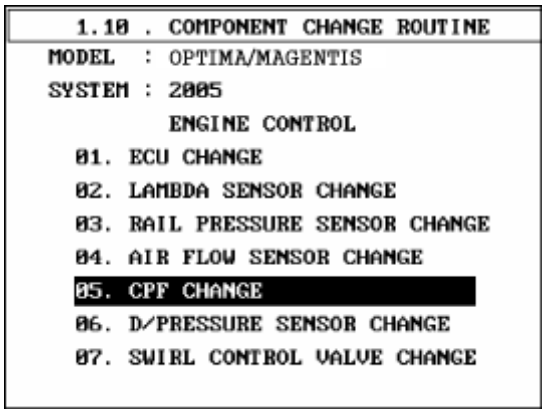
6. Select "D 2.0L VGT DIESEL".



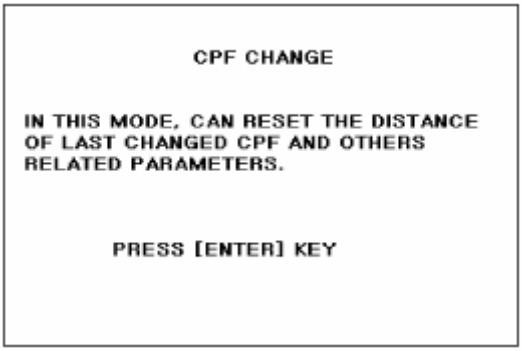
7. Select "COMPONET CHANGE ROUTINE"

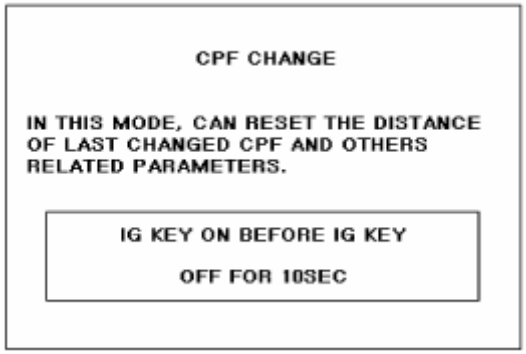


8. Select "CPF CHANGE".



9. Press "ENTER" key.

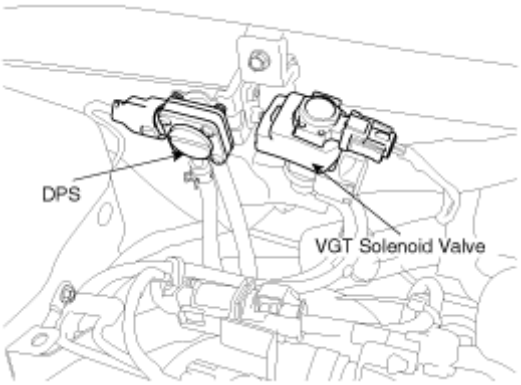




10. Wait 10 seconds with IG ON.
11. Turn ignition switch off.

INSPECTION

Differential Pressure Sensor (DPS) measures difference pressure between upstream and downstream exhaust gas of CPF. The ECM can calculate quantity of soot deposited in CPF with value from this sensor.



SPECIFICATION

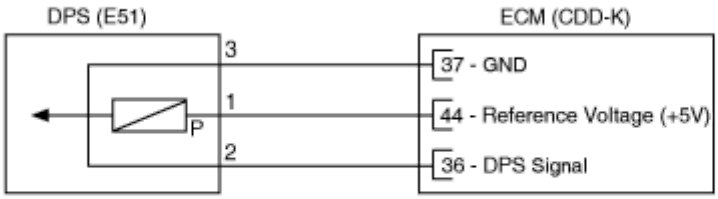
Differential Pressure[△P] (kPa)	Output Voltage (V)
0	1.00
10	1.35
20	1.70
30	2.05
40	2.40
50	2.75

Differential Pressure[△P] (kPa)	Output Voltage (V)
60	3.10
70	3.45
80	3.80
90	4.15
100	4.50

CIRCUIT DIAGRAM

English ▼

[CIRCUIT DIAGRAM]



[CONNECTION INFORMATION]

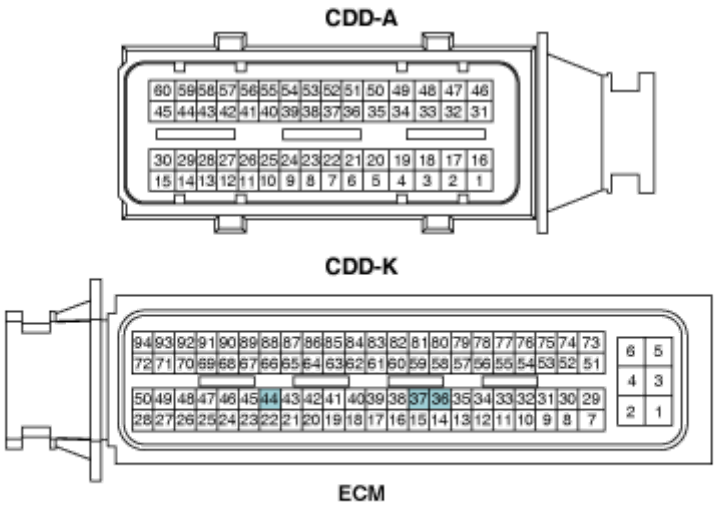
Terminal	Connected to	Function
1	ECM CDD-K (44)	Reference Voltage (+5V)
2	ECM CDD-K (36)	DPS Signal
3	ECM CDD-K (37)	Sensor ground

[HARNESS CONNECTORS]



E51

DPS



SIGNAL WAVEFORM

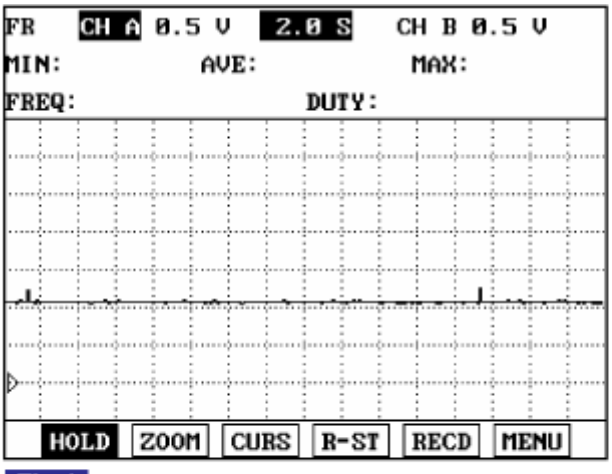


Fig.1

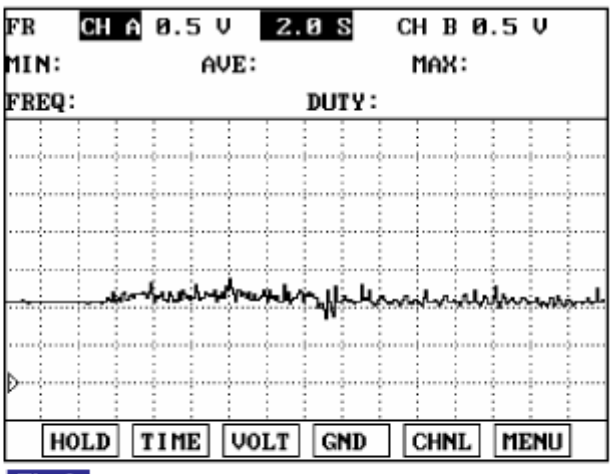


Fig.2

Fig1). This is the signal waveform of DPS at idle state. When CPF is new, 1.0~1.2V is outputted normally.
Fig2). This is the waveform of DPS as accelerating.

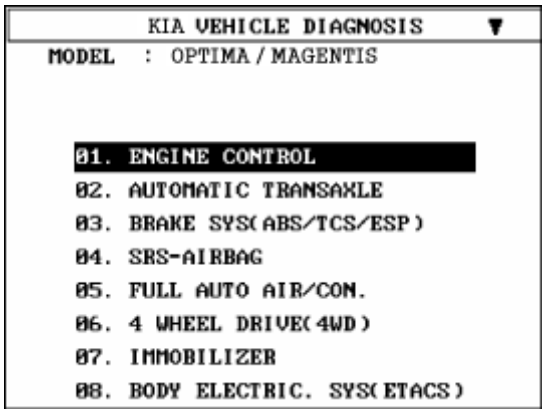
REPLACEMENT

NOTICE

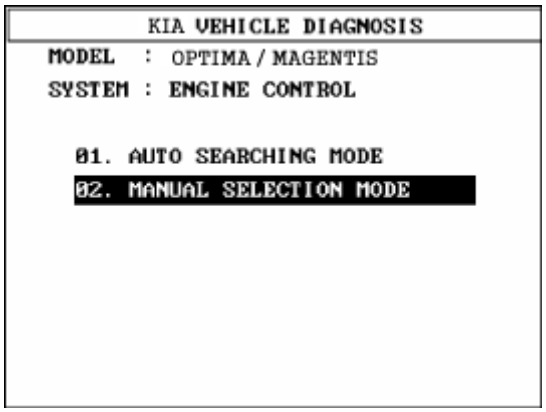
After replacing a Differential Pressure Sensor (DPS), MUST proceed below procedure.

1. Turn ignition switch OFF.

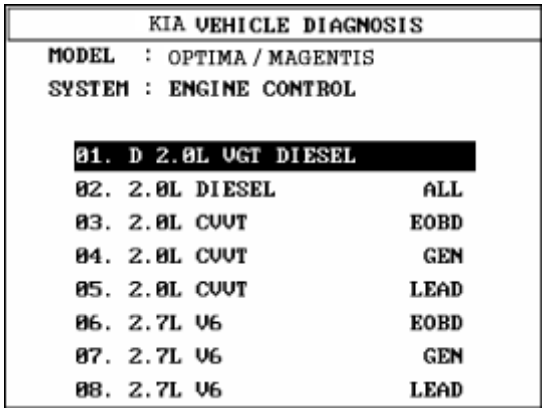
2. Connect a scan tool to Data Link Connector (DLC).
3. Turn ignition switch ON.
4. Select "ENGINE CONTROL". (For example, OPTIMA)



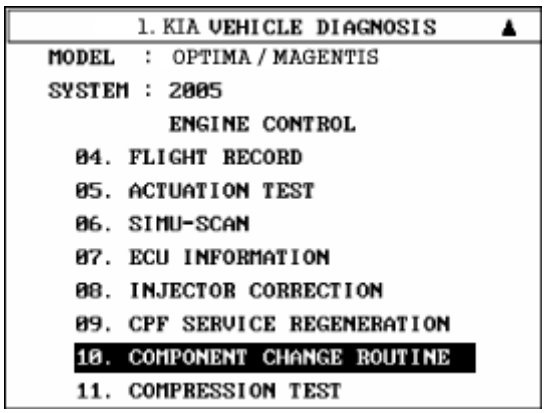
5. Select "MANUAL SELECTION MODE".



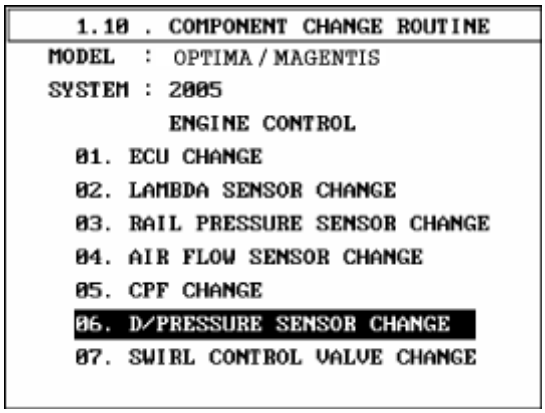
6. Select "D 2.0L VGT DIESEL".



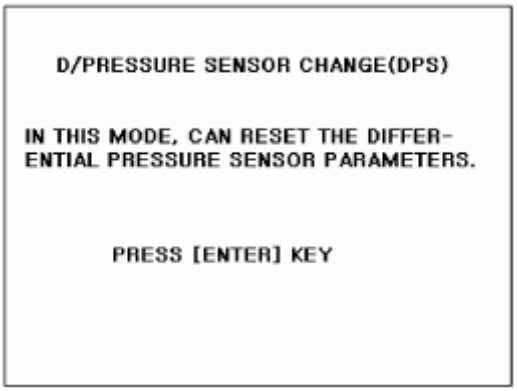
7. Select "COMPONET CHANGE ROUTINE"

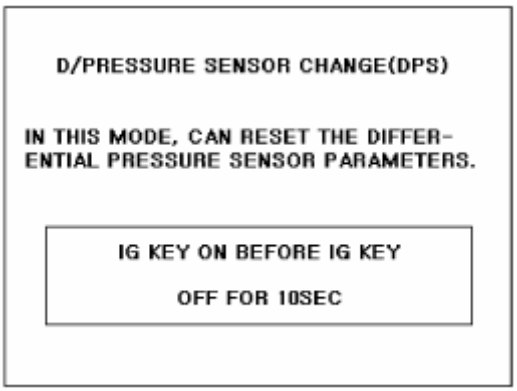


8. Select "D/PRESSURE SENSOR CHANGE".



9. Press "ENTER" key.





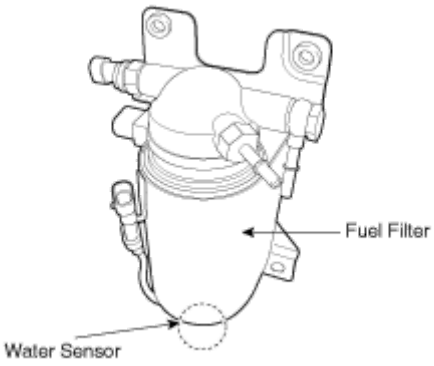
10. Wait 10 seconds with IG ON.
11. Turn ignition switch off.

INSPECTION

Water Sensor is installed on bottom end of fuel filter and detects presence of water in fuel. When the water level reaches the lower level of the upper electrode, the "WATER" lamp in cluster should flash. If the water level decreases below the lower electrode, the lamp should turn off.

NOTICE

Without presence of water, the lamp should flash for 2 seconds and turn off afterward in order that this system has normal condition.



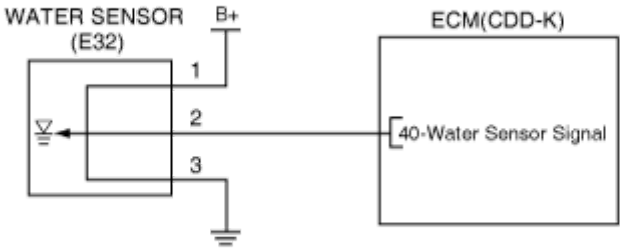
SPECIFICATION

Items	Specification
Warning Level of Water Presence (cc)	40 ~ 60

CIRCUIT DIAGRAM

English ▼

[CIRCUIT DIAGRAM]



[CONNECTION INFORMATION]

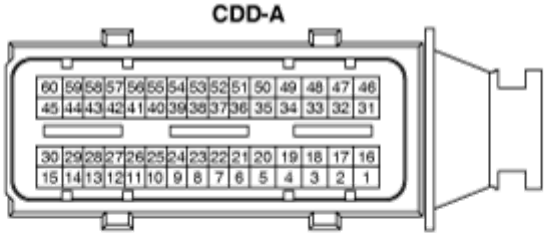
Terminal	Connected to	Function
1	Main Relay	Battery voltage(B+)
2	ECM CDD-K (40)	Sensor Signal
3	Chassis ground	Sensor ground

[HARNESS CONNECTOR]

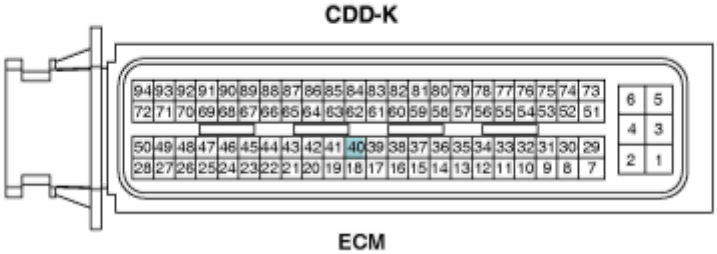


E32
WATER SENSOR

CDD-A



CDD-K

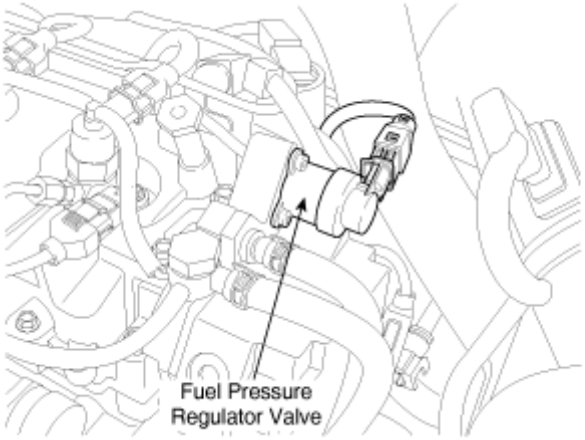


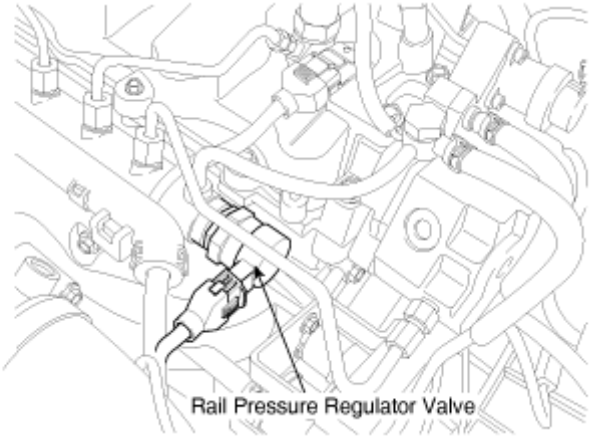
ECM

English ▼

INSPECTION

The Fuel Pressure Regulator Valve and the Rail Pressure Regulator Valve are installed on high pressure pump and common rail respectively. These valves control fuel inlet (feed) from fuel tank via fuel filter and outlet (return) to fuel tank of high pressure fuel circuit. This system is called "Dual Fuel Pressure Control System" and can precisely and quickly control the fuel pressure in accordance with various engine conditions by controlling the fuel inlet and outlet simultaneously.





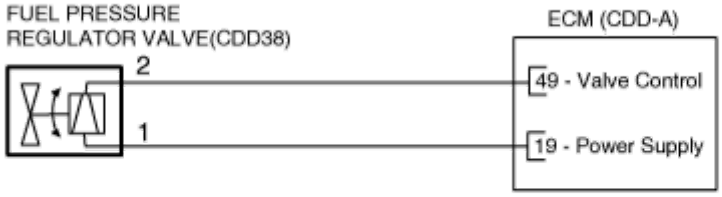
SPECIFICATION

Items	Specification
Coil Resistance (Ω)	2.9 ~ 3.15Ω [20°C(68°F)]

CIRCUIT DIAGRAM

English

[CIRCUIT DIAGRAM]



[CONNECTION INFORMATION]

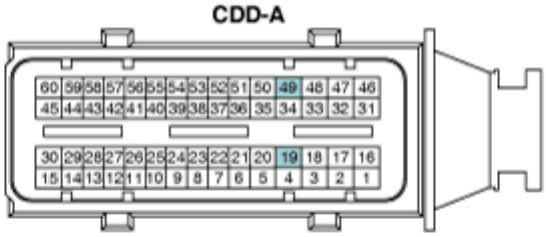
Terminal	Connected to	Function
1	ECM CDD-A (19)	Battery Voltage (B+)
2	ECM CDD-A (49)	Valve Control

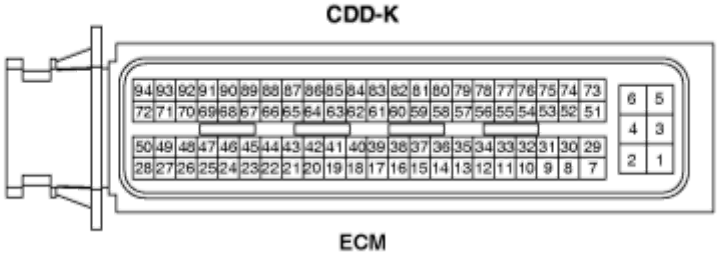
[HARNESS CONNECTORS]



CDD38

FUEL PRESSURE REGULATOR VALVE





SIGNAL WAVEFORM

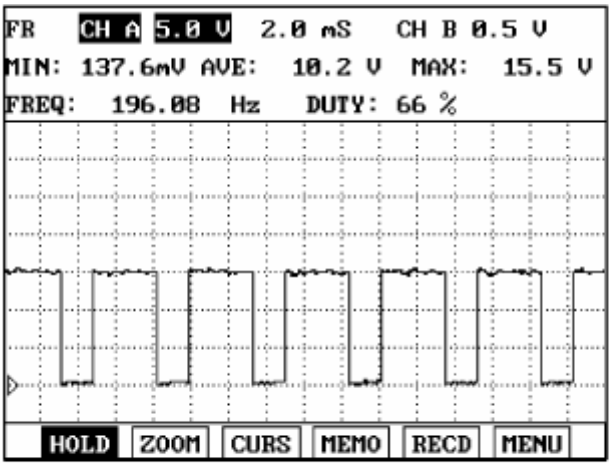


Fig.1

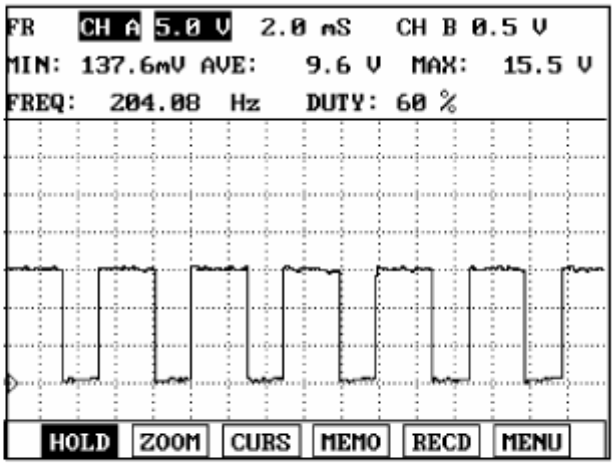


Fig.2

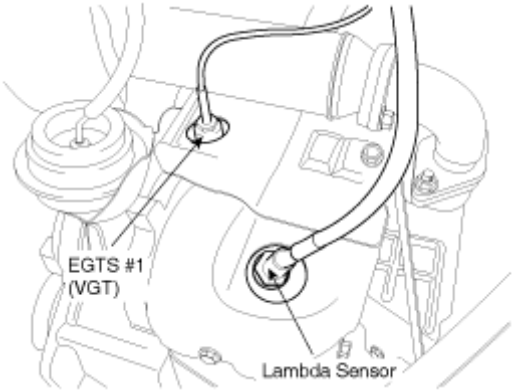
Fig.1) Waveform of fuel pressure regulator valve at idle. It shows approx. 34% duty((-)duty).
Fig.2) Waveform of fuel pressure regulator valve as accelerating. approx. 38% duty((-)duty) is outputted as engine load increases.

COMPONENT INSPECTION

1. Turn ignition switch OFF.
2. Disconnect the fuel pressure regulator valve connector.
3. Measure resistance between terminal 1 and 2 of the valve.
   Specification: Refer to "SPECIFICATION".

INSPECTION

Exhaust Gas Temperature Sensor (EGTS) #1 for VGT is installed on exhaust manifold and senses the termperature of exhaust gas flowing into the VGT.



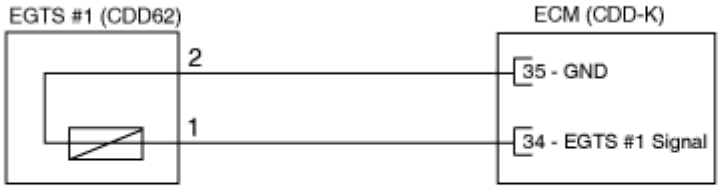
SPECIFICATION

Temperature [°C(°F)]	Resistance(kΩ)
100(212)	289.0 ~ 481.0
300(572)	5.30 ~ 6.61
600(1,112)	0.35 ~ 0.38
900(1,652)	0.08 ~ 0.09

CIRCUIT DIAGRAM

English ▼

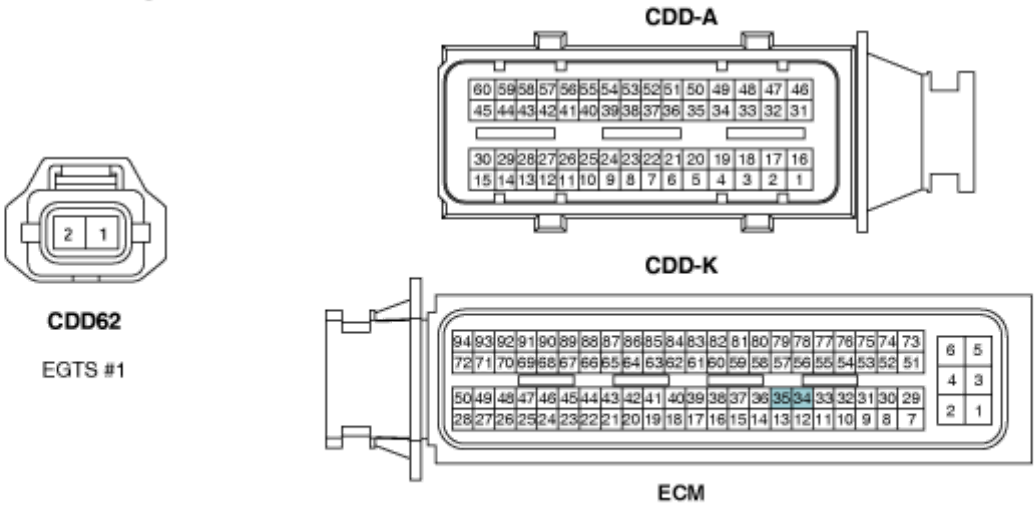
[CIRCUIT DIAGRAM]



[CONNECTION INFORMATION]

Terminal	Connected to	Function
1	ECM CDD-K (34)	EGTS #1 Signal
2	ECM CDD-K (35)	Sensor ground

[HARNESS CONNECTORS]



SIGNAL WAVEFORM

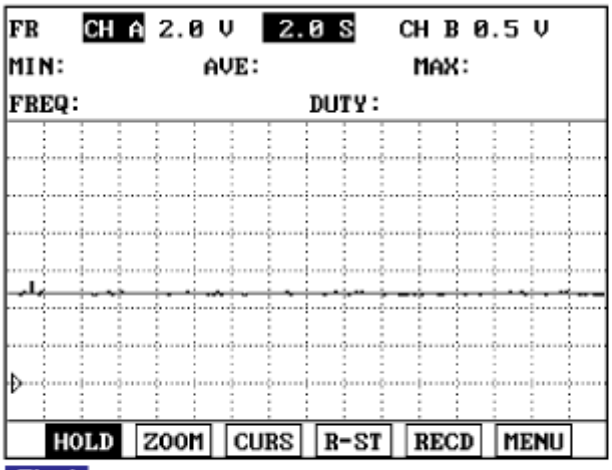


Fig.1

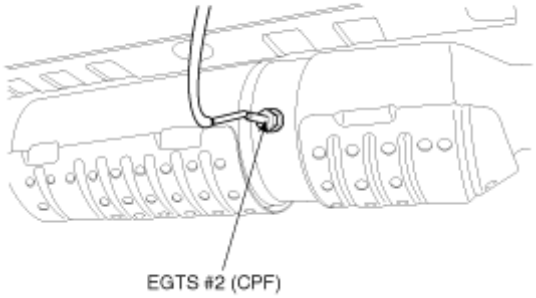
Fig.1) 4.8V is outputted at EGTS output signal circuit, when exhaust gas temp. is approx.150℃.
when exhaust gas temp. is 550~600℃ at CPF regeneration, output voltage drops to 0.3~0.4V.

COMPONENT INSPECTION

1. Turn ignition switch OFF.
2. Disconnect the exhaust gas temperature sensor #1 connector.
3. Measure resistance between sensor signal terminal and ground terminal.
   Specification: Refer to "SPECIFICATION".

INSPECTION

Exhaust Gas Temperature Sensor (EGTS) #2 for CPF is installed on Catalyzed Particulate Filter (CPF) assembly and senses the temperature of exhaust gas flowing into the CPF.
When pre-determined engine condition is set, ECM burns soot gathered in CPF with exhaust gas. At this time, the exhaust gas temperature is an important factor of engine condition.

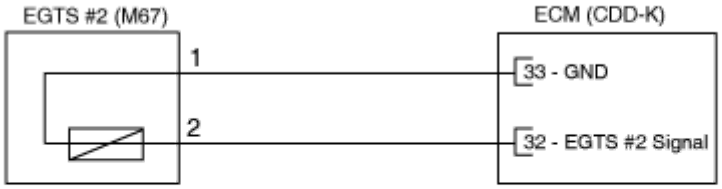


SPECIFICATION

Temperature [°C(°F)]	Resistance(kΩ)
100(212)	289.0 ~ 481.0
300(572)	5.30 ~ 6.61
600(1,112)	0.35 ~ 0.38
900(1,652)	0.08 ~ 0.09

CIRCUIT DIAGRAM

[CIRCUIT DIAGRAM]



[CONNECTION INFORMATION]

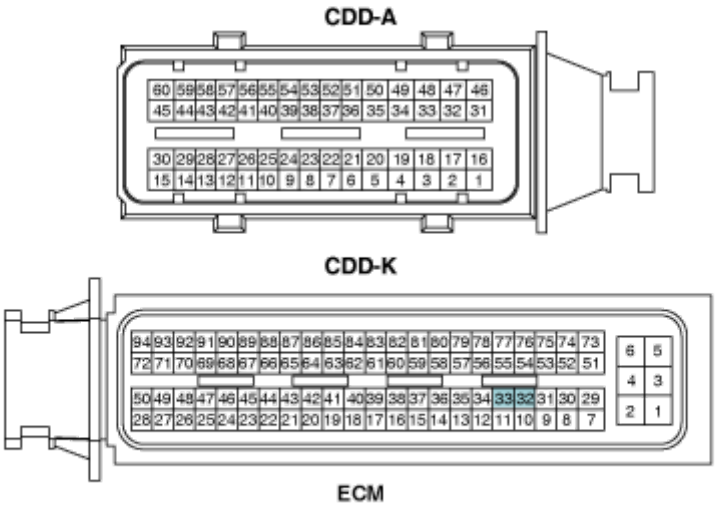
Terminal	Connected to	Function
1	ECM CDD-K (33)	Sensor ground
2	ECM CDD-K (32)	EGTS #2 Signal

[HARNESS CONNECTORS]



M67

EGTS #2



SIGNAL WAVEFORM

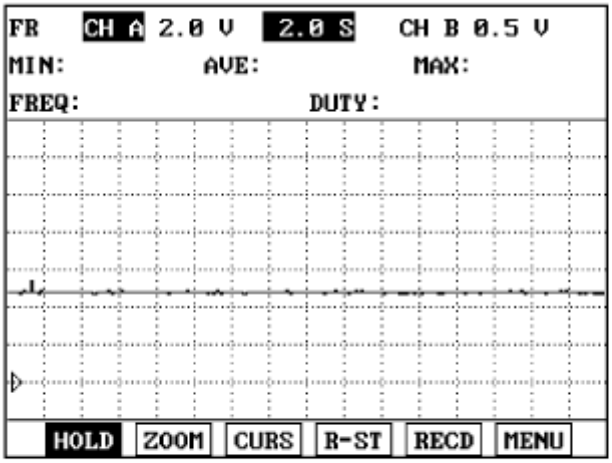


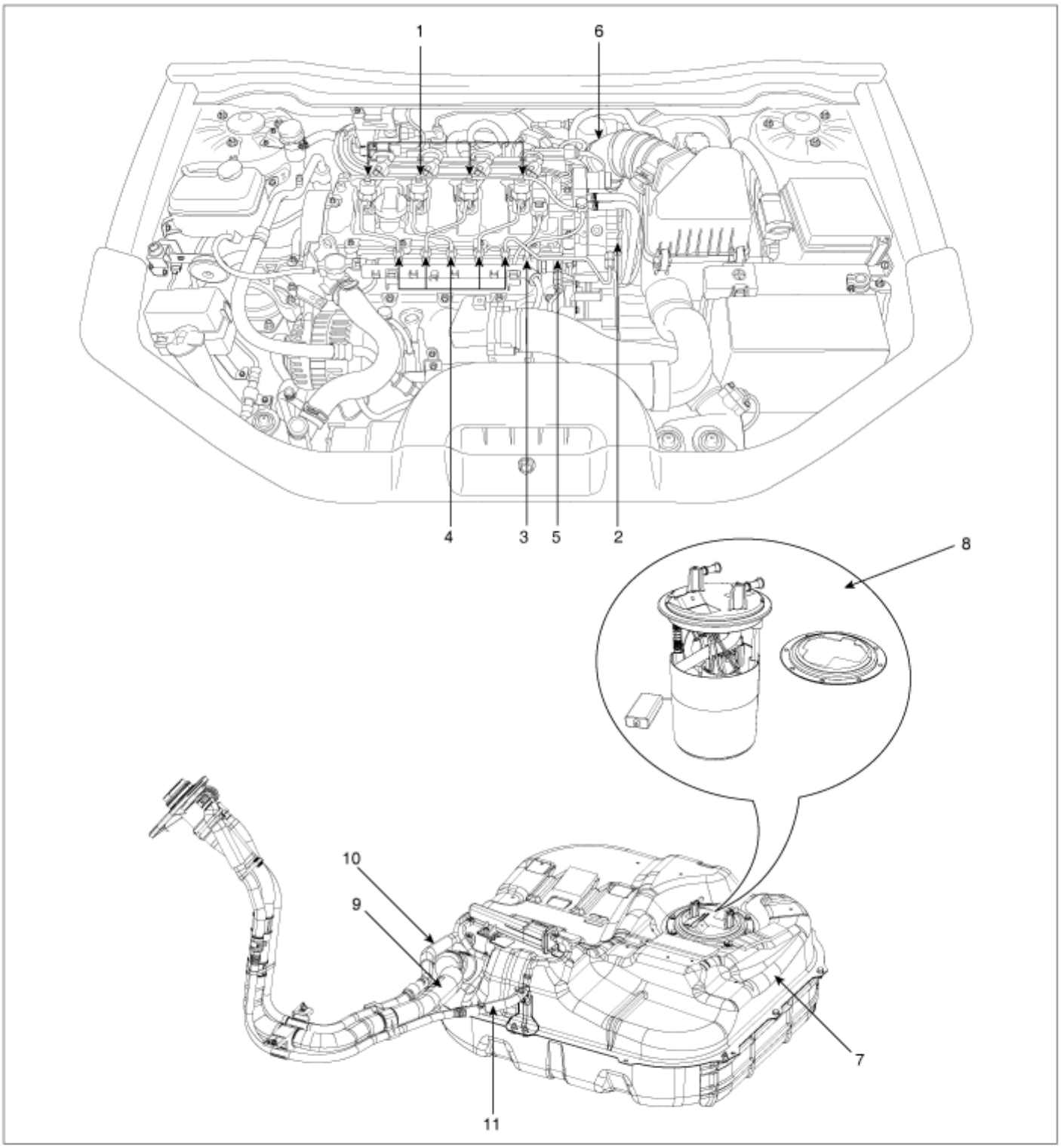
Fig.1

Fig.1) 4.8V is outputted at EGTS output signal circuit, when exhaust gas temp. is approx.150℃.
when exhaust gas temp. is 550~600℃ at CPF regeneration, output voltage drops to 0.3~0.4V.

COMPONENT INSPECTION

1. Turn ignition switch OFF.
2. Disconnect the exhaust gas temperature sensor #2 connector.
3. Measure resistance between sensor signal terminal and ground terminal.
   Specification: Refer to "SPECIFICATION".

COMPONENT LOCATION



1. Injector
2. High Pressure Fuel Pump
3. Common Rail
4. High Pressure Pipe (Injector → Common Rail)
5. High Pressure Pipe (Common Rail → High Pressure Fuel Pump)
6. Fuel Filter
7. Fuel Tank
8. Fuel Pump (Low Pressure)
9. Fuel Filler Hose
10. Leveling Hose
11. Vapor Hose

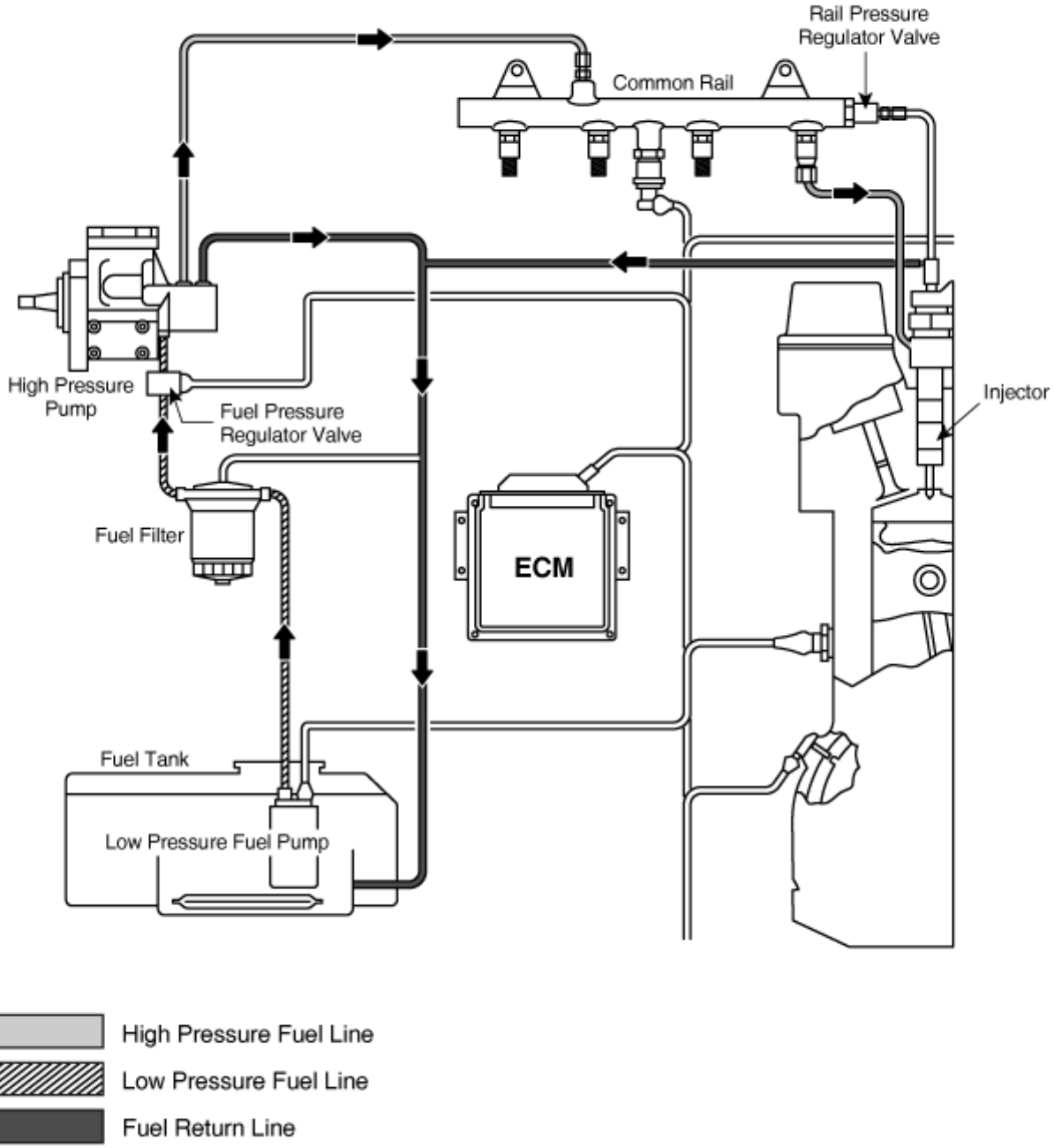
⚠ CAUTION

English ▼

- Common Rail Fuel Injection System is subject to extremely high pressure (Approximately 1,600 bar)
- Never perform any work on injection system with engine running or within 30 seconds after the engine stops.
- Always pay attention to safety precaution.
- Ensure the absolute cleanliness.
- It is not recommended to remove the injectors without any notice.

English ▼

SCHEMATIC DIAGRAM



COMPONENTS

FUEL PUMP

The fuel pump is either an electric fuel pump with pre-filter, or a gear-type fuel pump. The pump draws the fuel from the fuel tank and continually delivers the required quantity of fuel in the direction of the high-pressure pump.

FUEL FILTER

Inadequate filtering can lead to damage at the pump components, delivery valves, and injector nozzles. The fuel filter cleans the fuel before it reaches the high-pressure pump, and thereby prevents premature wear at the pump's sensitive components.

English ▼

● HIGH PRESSURE FUEL SYSTEM COMPONENTS

HIGH PRESSURE FUEL PUMP

The high-pressure pump pressurizes the fuel to a system pressure of up to 1,600bar. This pressurized fuel then passes through a high-pressure line and into the tubular common rail.

COMMON RAIL (HIGH PRESSURE ACCUMULATOR)

Even after an injector has taken fuel from the rail in order to inject it, the fuel pressure inside the rail remains practically constant. This is due to the accumulator effect arising from the fuel's inherent elasticity. Fuel pressure is measured by the rail pressure sensor and maintained at the desired level by the pressure-control valve.

INJECTORS

The nozzles of these injectors open when the solenoid valve is triggered and permit the flow of fuel. They inject the fuel directly into the engine's combustion chamber. The excess fuel which was needed for opening the injector nozzles flows back to the tank through a collector line. The return fuel from the fuel pressure control valve and from the low-pressure stage is also led into this collector line together with the fuel used to lubricate the high-pressure pump.

HIGH PRESSURE PIPE

These High Pressure Pipes carry the high-pressure fuel. They must therefore be able to permanently withstand the maximum system pressure and, during the pauses in injection, the sometimes high-frequency pressure fluctuations which occur. They are therefore manufactured from steel tubing.

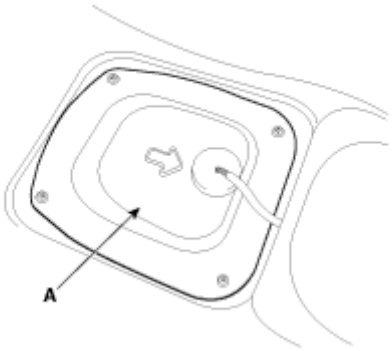
Normally, they have an outside diameter of about 6.35mm and an internal diameter of about 3.0mm. The injection lines between the common rail and the injectors must all be of the same length. The differences in length between the common rail and the individual injectors are compensated for by using slight or pronounced bends in the individual lengths of tubing. Nevertheless, the injection lines should be kept as short as possible.

REMOVAL

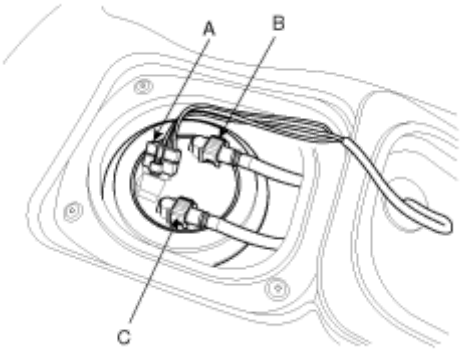
WARNING

When lifting up or downing the vehicle, be sure to place blocks between the vehicle and lifter to prevent fuel tank from being damaged.

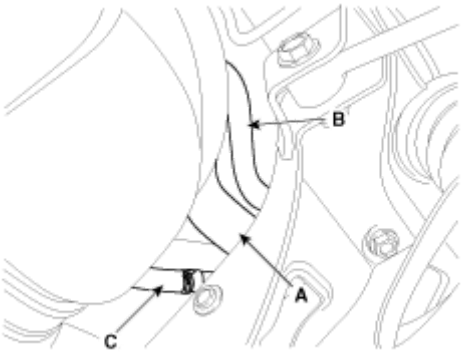
1. Remove the mufflers and the Catalyzed Particulate Filter (CPF) assembly passing under the fuel tank (Refer to group "EM" in this Shop Manual).
2. Remove the rear seat. (Refer to BD group)
3. Open the service covers (A).



4. Disconnet the fuel pump connector (A), the fuel feed tube quick-connector (B) and the return tube guick-connector (C).

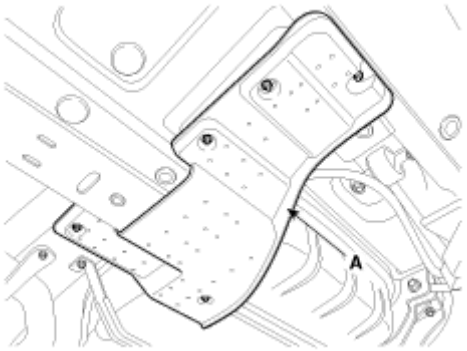


5. Lift the vehicle and disconnect the fuel filler hose (A), the fuel leveling hose (B) and the vapor hose (C).

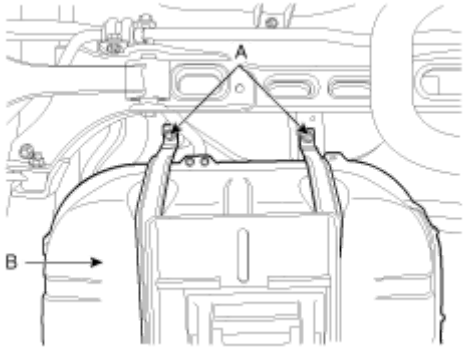


English ▼

6. Remove the under-cover(A).



7. Support the fuel tank with a jack, and then remove the two fuel tank band (A).



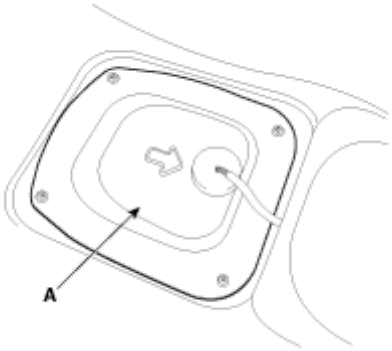
8. Remove the fuel tank (B) from the vehicle with setting down the jack.

INSTALLATION

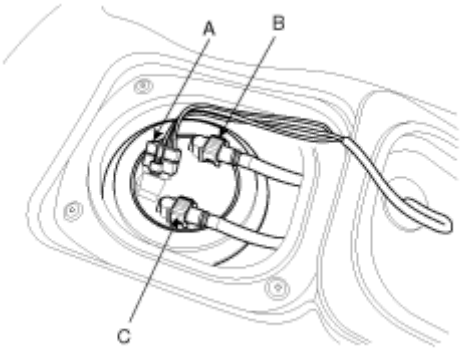
1. Install the fuel tank in the reverse order of "REMOVAL" procedure.
   Fuel tank band mounting bolts: 39.2 ~ 53.9 N·m (4.0 ~ 5.5 kgf·m, 28.9 ~ 39.8 lbf·ft)

REMOVAL

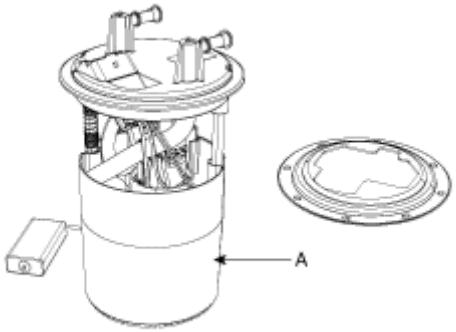
1. Remove the rear seat. (Refer to BD group)
2. Open the service cover(A).



3. Disconnet the fuel pump connector (A), the fuel feed tube quick-connector (B), the return tube guick-connector (C).



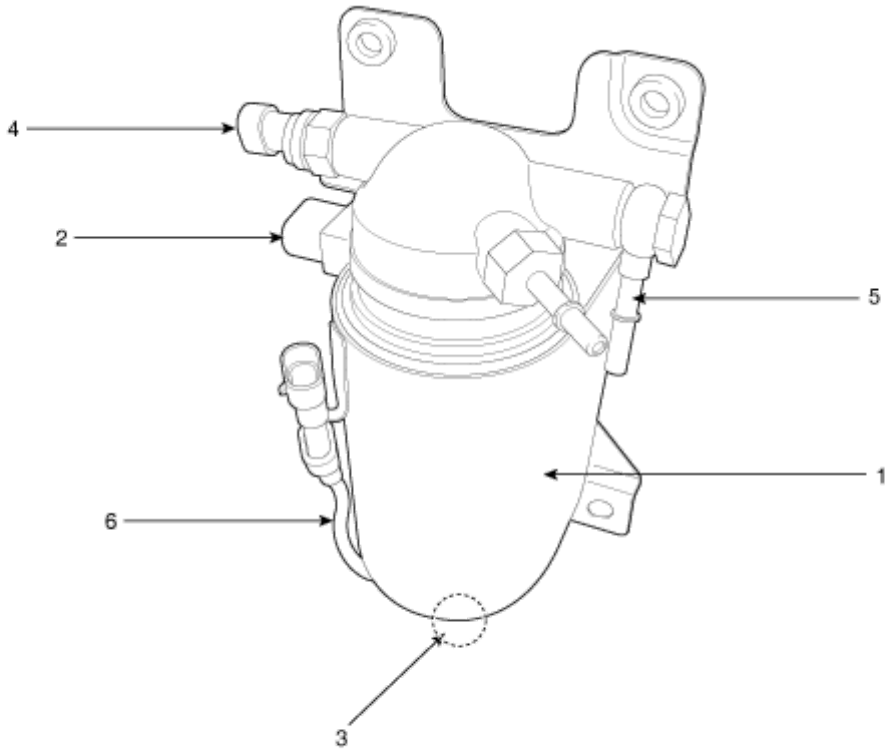
4. Remove the fuel pump assembly (A) after unscrwing the fuel pump installation bolts.



INSTALLATION

1. Install the fuel pump in the reverse order of "REMOVAL" procedure.
   Fuel pump installation bolts : 3.9 ~ 5.8 N·m (0.4 ~ 0.6 kgf·m, 2.8 ~ 4.4 lbf·ft)

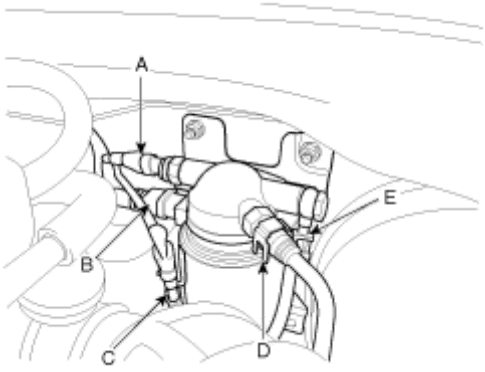
COMPONENTS



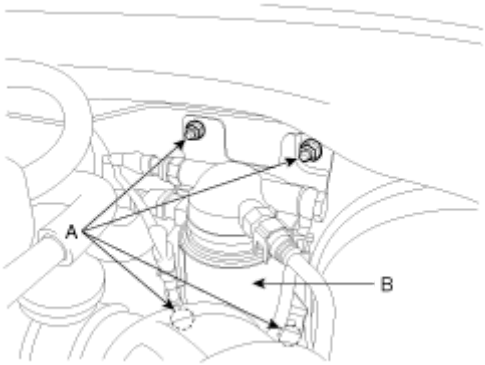
1. Fuel Filter
2. Heater
3. Water Sensor
4. Thermostat
5. Nipple (From Fuel Tank)
6. Nipple (To High Pressure Pump)

REMOVAL

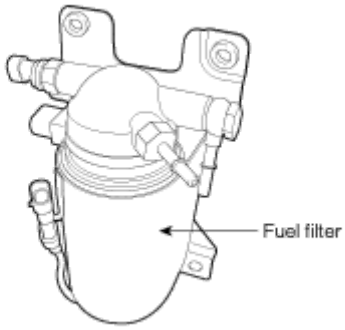
1. Disconnect the thermostat connector (A), the heater connector (B) and water sensor connector (C).



2. Disconnet the fuel input quick-connector (D) and the fuel output quick-connector (E).
3. Unscrew the mounting bolts (A).



4. Remove the fuel filter assembly (B).



INSTALLATION

1. Install the fuel filter in the reverse order of "REMOVAL" procedure.

DESCRIPTION

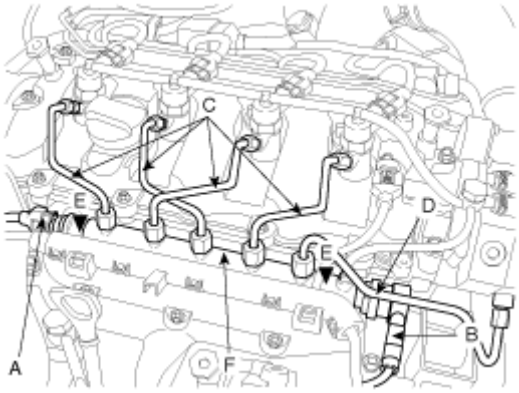
In order to comply with the wide variety of engine installation conditions, the common rail with its flow limiters and the provistions for attaching rail pressure sensor, fuel pressure control valve, and pressure limiter valve is available in a number of different designs. The available common rail volume is permanently filled with pressurized fuel. The compressibility of the fuel resulting from the high pressure is utilized to achieve the accumulator effect. When fuel leaves the rail for injection, the pressure variations resulting from the pulsating fuel supply from the high-pressure pump are compensated for.

REMOVAL

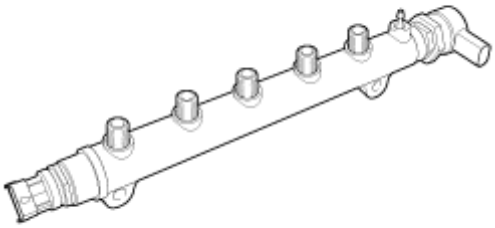
WARNING

- Common Rail Fuel Injection System is subject to extremely high pressure (Approximately 1,600 bar)
- Never perform any work on injection system with engine running or within 30 seconds after the engine stops.
- Always pay attention to safety precaution.
- Ensure the absolute cleanliness.
- It is not recommended to remove the injectors without any notice.

1. Disconnect the rail pressure sensor connector (A) and rail pressure regulator valve connector (B).



2. Disconnect the high pressure pipe (C) connecting the injectors with the common rail.
3. Disconnect the high pressure pipe (D) connecting the common rail with the high pressure fuel pump.
4. Unscrew the two mounting bolts (E) and remove the common rail (F).



INSTALLATION

1. Install the common rail according to the reverse order of "REMOVAL" procedure.

NOTICE

When installing the high pressure pipe, apply the specified tightening torques to the flange nuts of the injectors, the high pressure pipe, and the common rail side with SST (Refer to below table).

English ▼

Item	Dimension	SST No.
Flange Nut (Injector Side)	14 mm (0.551 in)	09314-27110
Flange Nut (HP Pump Side)		
Flange Nut (Common Rail Side)	17 mm (0.669 in)	09314-27120

· Common rail mounting bolts: 19.6 ~ 26.5 N·m (2.0 ~ 2.7 kgf·m, 14.5 ~ 19.5 lbf·ft)
· High pressure pipe flange nuts (Injectors ↔ Common Rail): 24.5 ~ 28.4 N·m (2.5 ~ 2.9 kgf·m, 18.1 ~ 20.1 lbf·ft)
· High pressure pipe flange nuts (Common Rail ↔ HP Pump): 24.5 ~ 28.4 N·m (2.5 ~ 2.9 kgf·m, 18.1 ~ 20.1 lbf·ft)

English ▼

DESCRIPTION

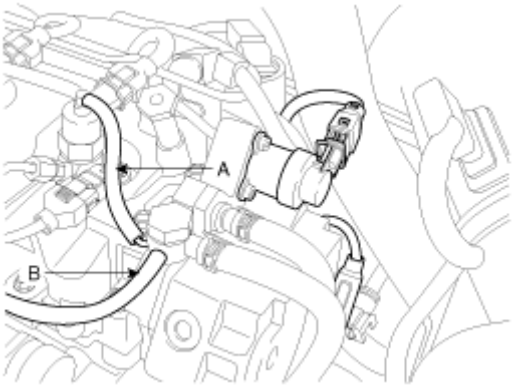
The high-pressure pump is the interface between the low pressure and the high-pressure stages. Under all operating conditions, it is responsible for providing adequate high-pressure fuel through out the vehicle's complete service life. This also includes the provision of extra as needed for rapid starting and for rapid build-up of pressure in the rail. The high pressure pump continually generates the system pressure as needed in the high-pressure accumulator (common rail). This means therefore, that in contrast to conventional systems, the fuel does not have to be specially compressed for each individual injection process.

REMOVAL

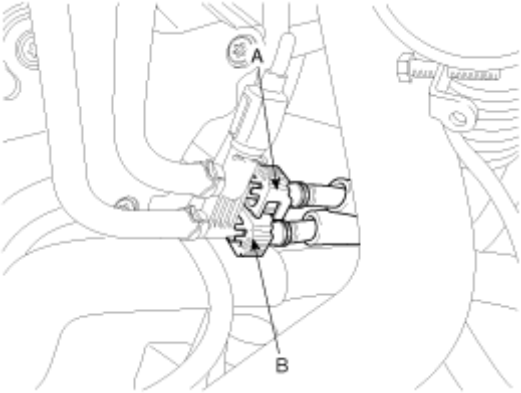
WARNING

- Common Rail Fuel Injection System is subject to extremely high pressure (Approximately 1,600 bar)
- Never perform any work on injection system with engine running or within 30 seconds after the engine stops.
- Always pay attention to safety precaution.
- Ensure the absolute cleanliness.
- It is not recommended to remove the injectors without any notice.

1. Remove the air cleaner assembly (Refer to group "EM" in this Shop Manual).
2. Disconnect the return hoses (A,B) connected with the injectors and the common rail.

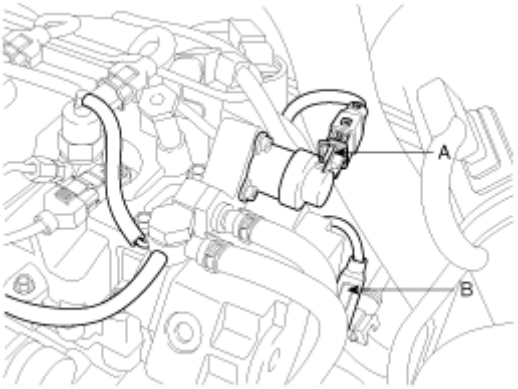


3. Disconnet the fuel feed hose quick-connector (A) and the return hose quick-connector (B).

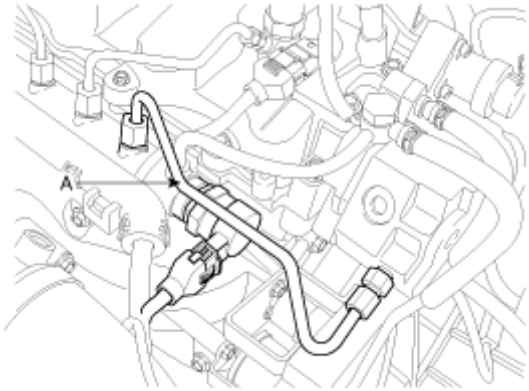


4. Disconnect the fuel pressure regulator valve connector (A) and the fuel temperature sensor connector (B).

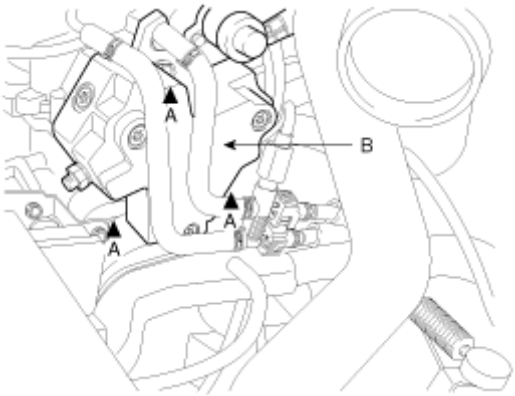
English ▼

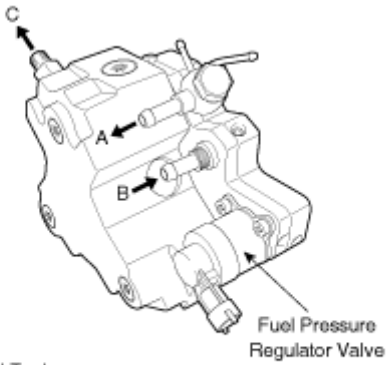


5. Disconenct the high pressure pipe (A) connecting the common rail with the high pressure pump.



6. Unscrew the mounting bolts (A) and remove the high pressure fuel pump (B) from the engine.





A : To Fuel Tank
(Return Line)
B : From Fuel Tank
C : To High Pressure Fuel Pump

INSTALLATION

1. Install the high pressure fuel pump according to the reverse order of "REMOVAL" procedure.

> **NOTICE**
>
> When installing the high pressure pipe, apply the specified tightening torques to the flange nuts of the high pressure pipe side and the common rail side with SST (Refer to below table).

Item	Dimension	SST No.
Flange Nut (HP Pump Side)	14 mm (0.551 in)	09314-27110
Flange Nut (Common Rail Side)	17 mm (0.669 in)	09314-27120

High pressure fuel pump mounting bolts: 19.6 ~ 26.5 N·m (2.0 ~ 2.7 kgf·m, 14.5 ~ 19.5 lbf·ft)
High pressure pipe flange nuts (Common Rail ↔ HP Pump): 24.5 ~ 28.4 N·m (2.5 ~ 2.9 kgf·m, 18.1 ~ 20.1 lbf·ft)

AIR CONDITIONER

Item		Specification			
		1.6,2.0 Engine (Gasoline)		1.6, 2.0 Engine (Diesel)	
Compressor	Type	VS16M(Varible Dispacement Swashplate)			
	Oil type & Capacity	FD46XG (PAG), 150 ± 10cc			
	Pulley type	1.6	2.0	1.6	2.0
		6PK type	4PK type	5PK type	6PK type
	Displacement	160cc/rev			
Condenser	Heat rejection	13,400 - 5% kcal/hr		12,300 -5% kcal/hr	
	Dessicant specification & weight	XH-9 , 50g			
APT(A/C pressure transducer)	The method to measure the pressure	Voltage = 0.00878835 * Pressure + 0.37081095 [PSIA]			
Expansion valve	Type	Block			
Refrigerant	Type	HFC-134a(R-134a)			
	Capacity [oz.(g)]	17.6 ± 0.88 (500 ± 25)			

BLOWER UNIT

Item		Specification
Fresh and recirculation	Operating method	Actuator
Blower	Type	Sirocco
	Speed step	Auto + 8 speed (Automatic), 1-16 speed (Manual)
	Speed control	Power mosfet
Air filter	Type	Particle filter

HEATER AND EVAPORATOR UNIT

Item		Specification
Heater	Type	AL BRAZING TYPE
	Heating capacity	4300 ± 5% kcal/hr
	PTC heater capacity	1000W + 5%/-10%
	Mode operating method	Actuator
	Temperature operating method	Actuator
Evaporator	Temperature control type	Evaporator temperature sensor
	A/C ON/OFF [°C(°F)]	ON : 2.8 (37) OFF: 1.3 (34.3)

English ▼

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.

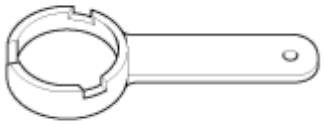
Standard:

Symptom	Suspect Area	See page
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 comes out	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 assembly	
	10. Wire harness	
	1. Refrigerant capacity	
	2. Drive belt	
	3. Magnetic clutch	

English ▼

Insufficient cooling	4. Compressor	
	5. Condenser	
	6. Expansion valve	
	7. Evaporator	
	8. Refrigerant lines	
	9. A/C pressure transducer	
	10. 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	

SPECIAL TOOLS

Tool (Number and name)	Illustration	Use
09977-29000 Disc & hub assembly bolt remover		Removal and installation of the disc & hub assembly bolt

INSTRUCTIONS

When Handling Refrigerant

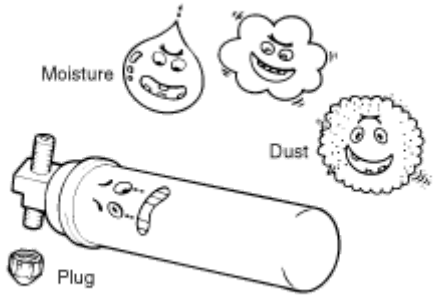
1. R-134a liquid refrigerant is highly volatile. A drop on the skin of your hand could result in localized frostbite. When handling the refrigerant, be sure to wear gloves.
2. It is standard practice to wear goggles or glasses to protect your eyes, and gloves to protect your hands. If the refrigerant 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 that the 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 the 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:
   - When removing refrigerant components from a vehicle, cap immediately the components to prevent from the entry of moisture.
   - When installing refrigerant components to a vehicle, do not remove the cap until just before connecting the components.
   - Complete the connection of all refrigerant tubes and hoses without delay to prevent the A/C system from taking on moisture.
   - Use the recommended lubricant from a sealed container only.
7. If an accidental discharge in the system occurs, ventilate the work area before resuming 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.

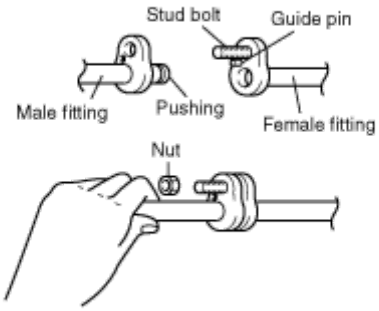
English ▼



WHEN INSTALLING CONNECTING PARTS

FLANGE WITH GUIDE PIN

Check the new O-ring for damage (use only the specified) and lubricate it 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)

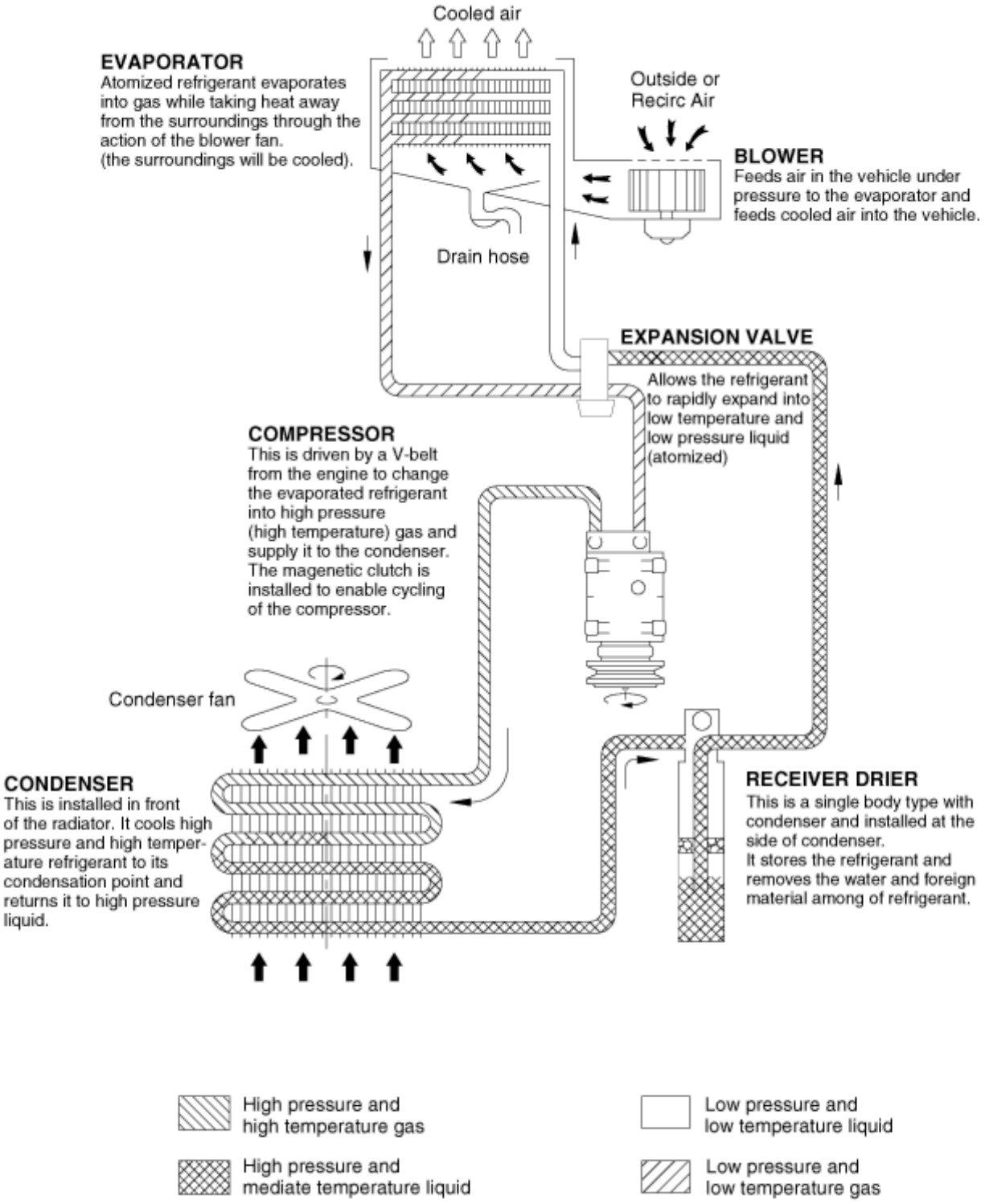
Handling Tubing And Fittings

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.

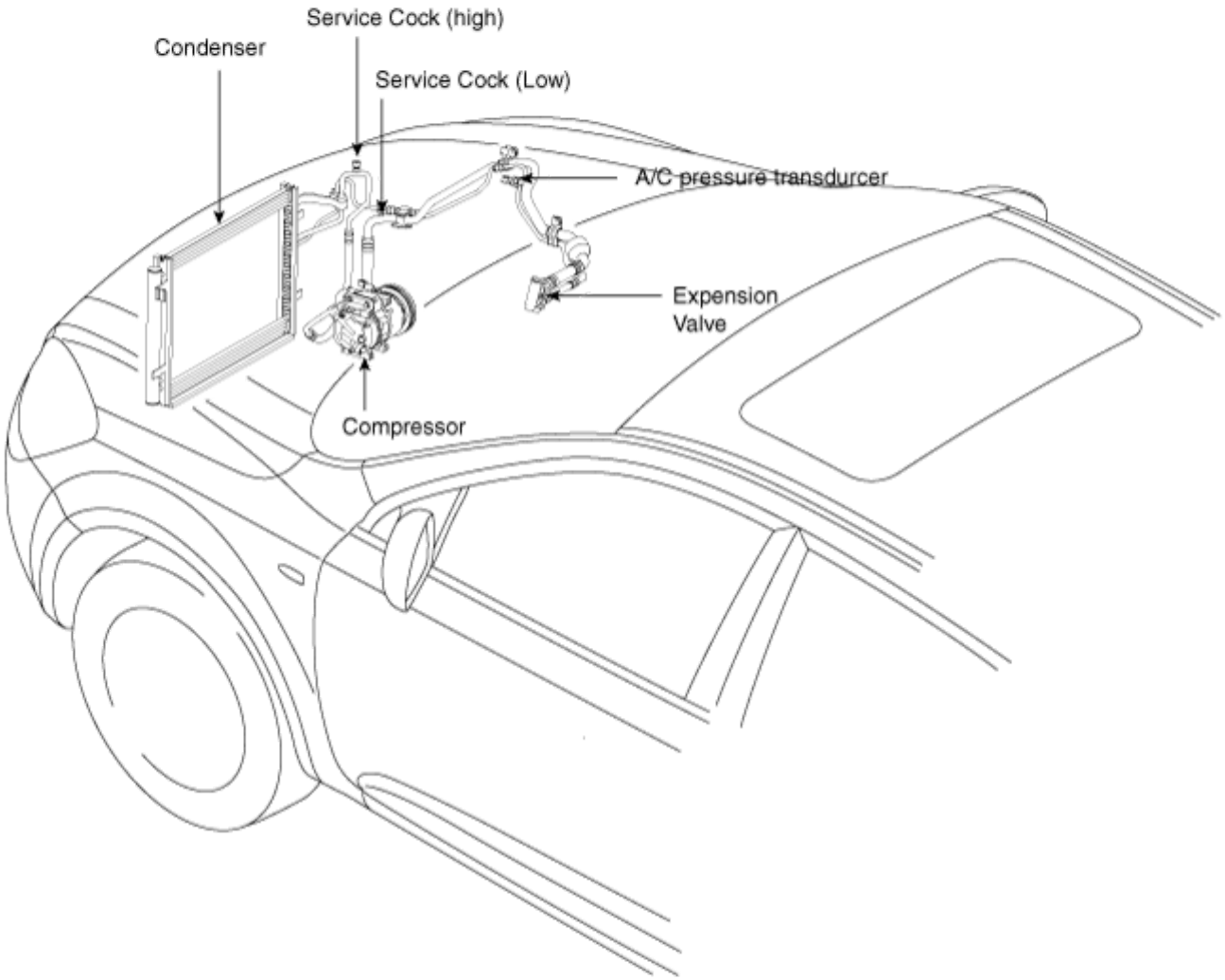
The Following Precautions Must Be Observed

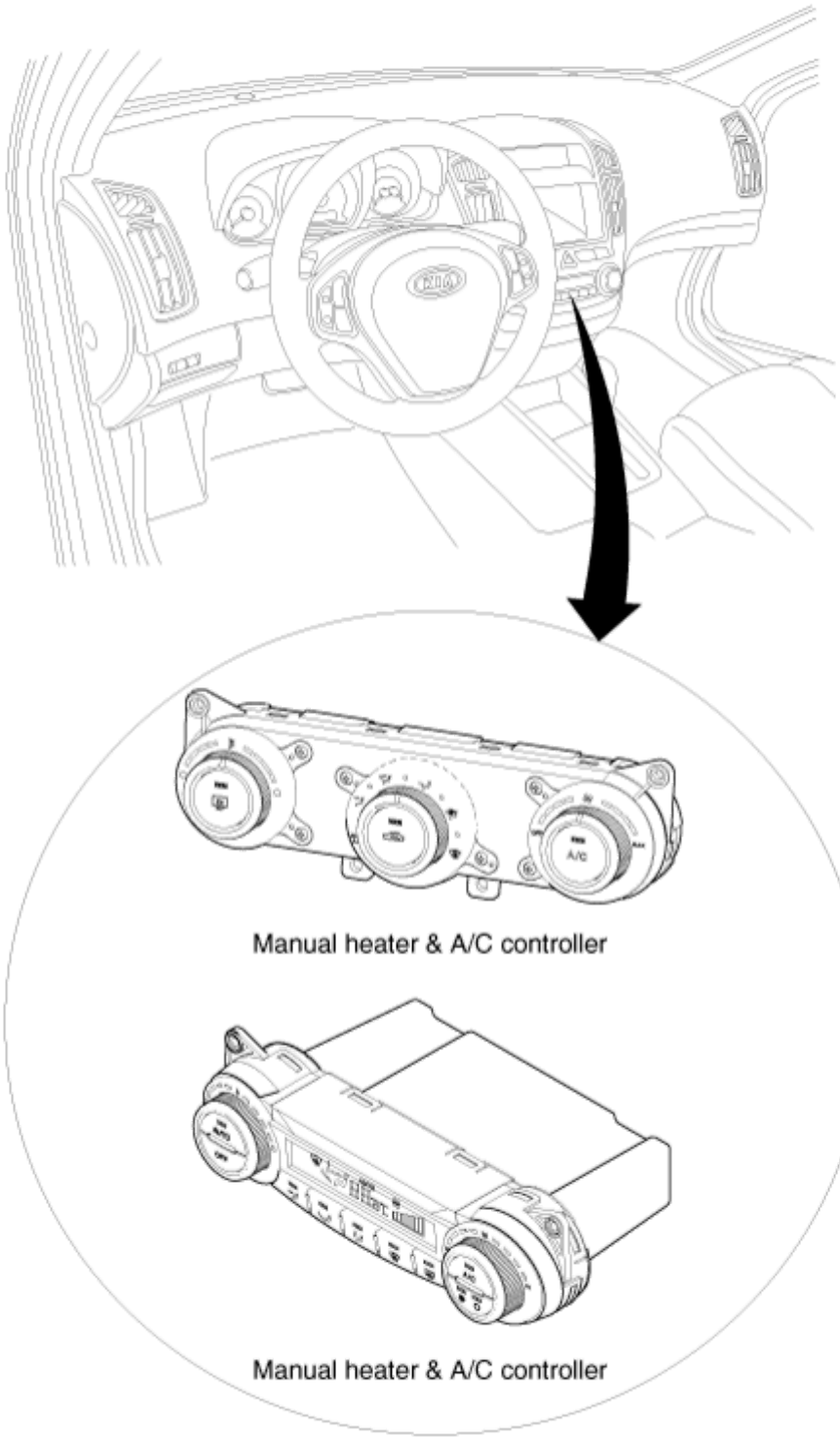
1. When it is necessary to open the refrigeration system, have everything you will need to service the system ready so the system will not be left open any longer than necessary.
2. Cap or plug all lines and fittings as soon as they are opened to prevent the entrance of dirt and moisture.
3. All lines 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.

REFRIGERATION CYCLE



COMPONENT LOCATION INDEX




Manual heater & A/C controller
Manual heater & A/C controller

REFRIGERANT SYSTEM SERVICE BASICS

Refrigerant Recovery

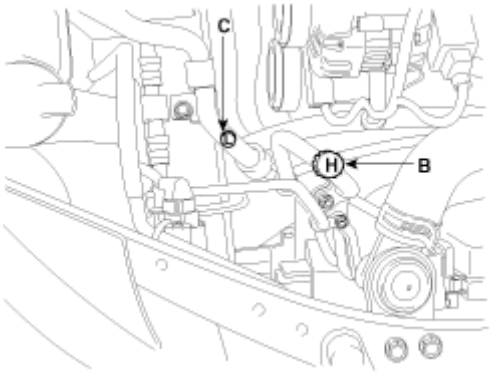
Use only service equipment that is U.L-listed and is certified to meet the requirements of SAE J2210 to remove HFC-134a(R-134a) from the air conditioning system.

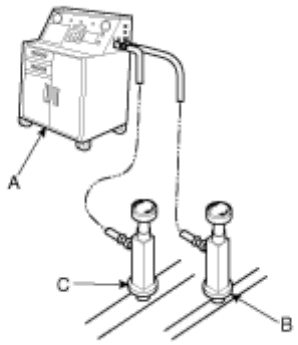
⚠ CAUTION

- 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 resuming 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.

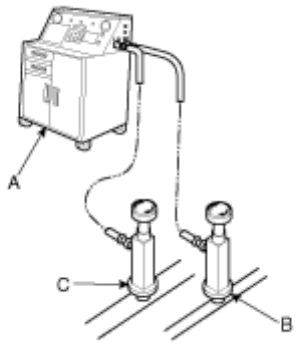
⚠ CAUTION

English ▼

- 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 resuming 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

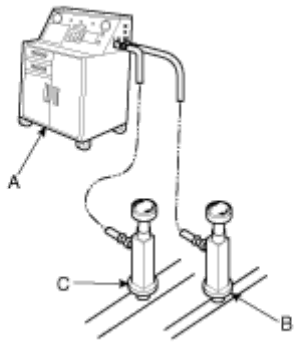
Use only service equipment that is U.L-listed and is certified to meet the requirements of SAE J2210 to remove HFC-134a(R-134a) from the air conditioning system.

⚠ 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 resuming 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 17.6 ± 0.88 (500 ± 25) of R-134a refrigerant. Do not overcharge the system the compressor will be damaged.

Refrigerant Leak Test

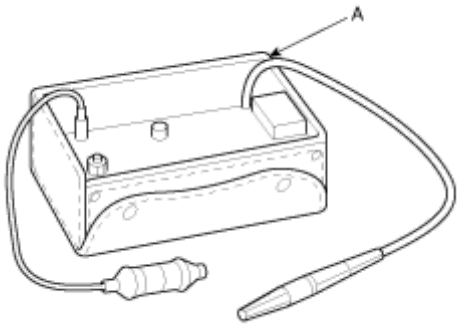
Always conduct a leak test with an electronic leak detector whenever leakage or refrigerant is suspected and when conducting service operations which are accompanied by disassembly or loosening or connection fittings.

NOTICE

In order to use the leak detector properly, read the manual supplied by the manufacturer.

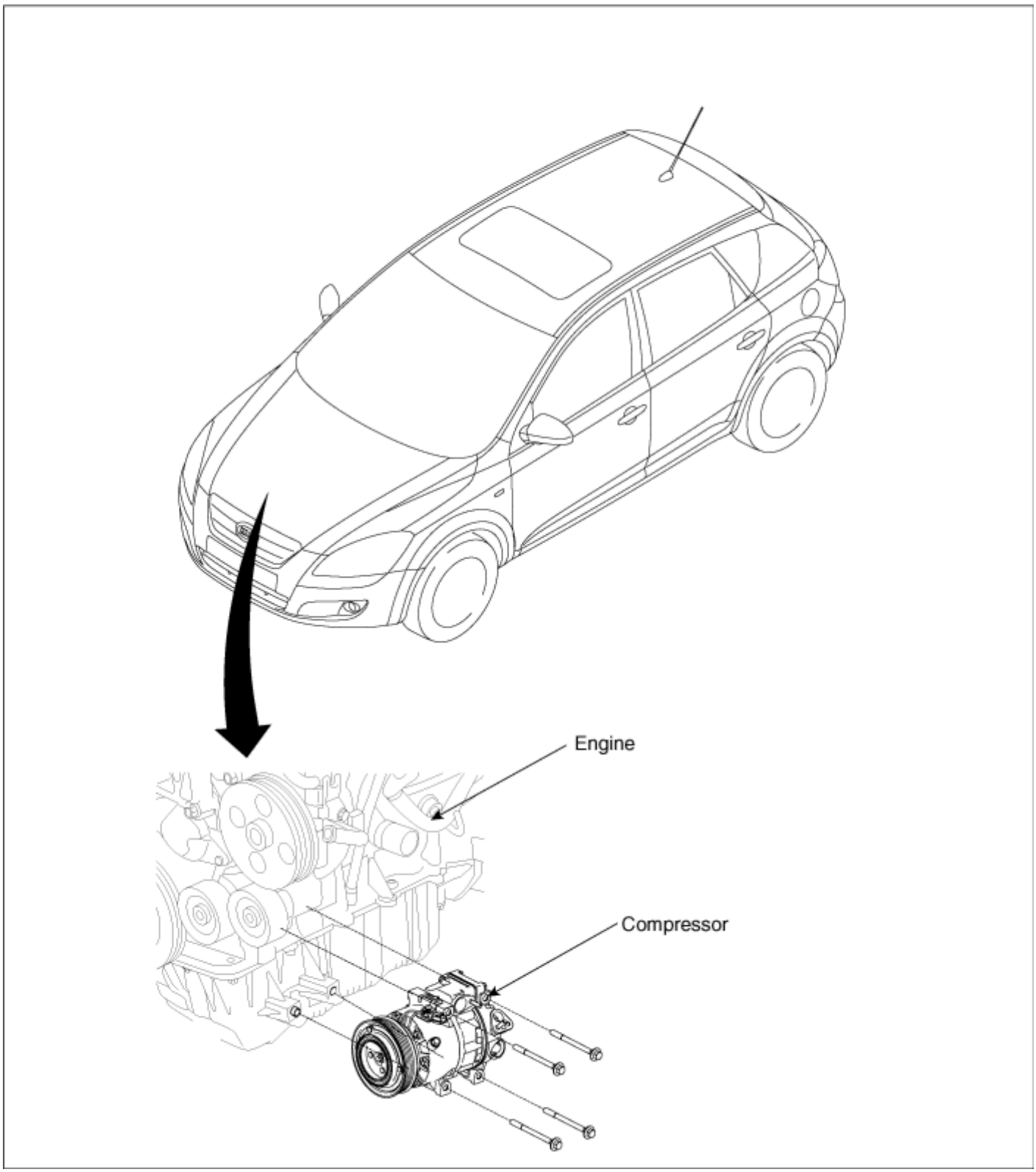
If a gas leak is detected, proceed as follows:

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.



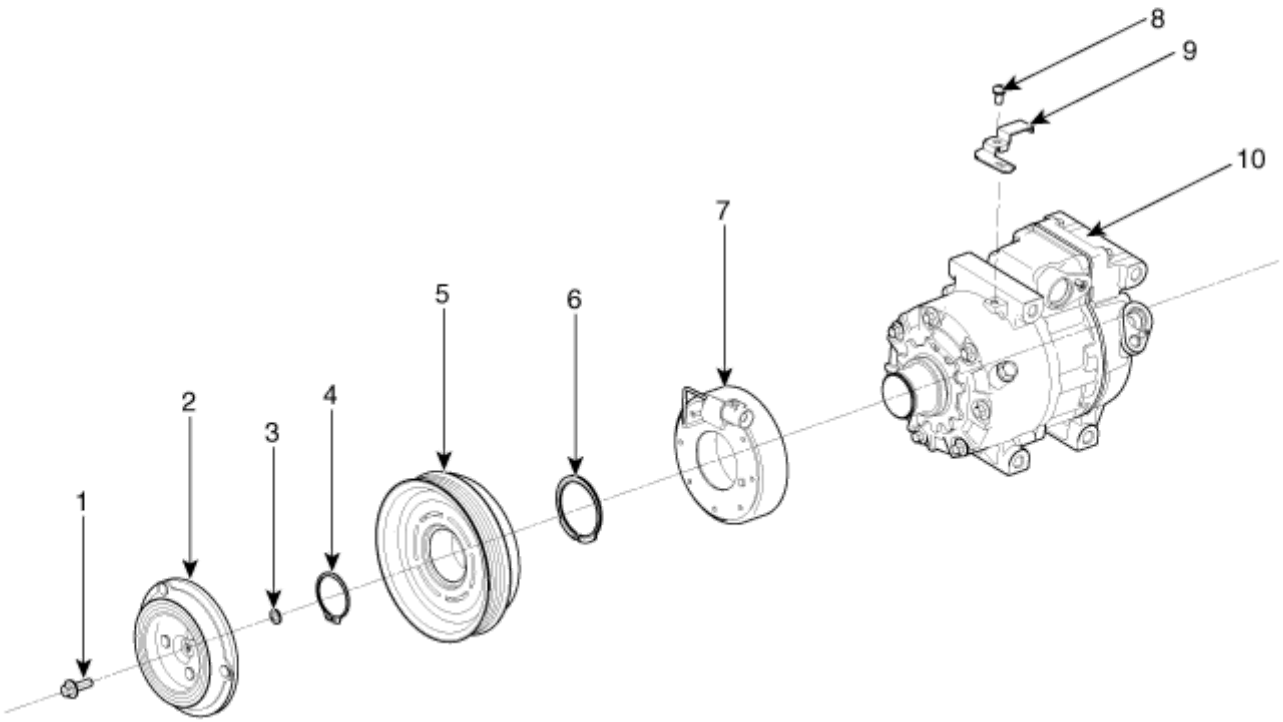
English ▼

COMPONENT LOCATION



COMPONENTS

English ▼

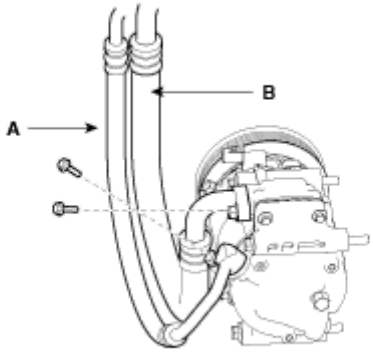


1. Bolt
2. Disc & hub assembly
3. Shim (Gap washer)
4. Retainer ring (Pulley)
5. Pulley
6. Retainer ring (Field coil)
7. Field coil
8. Screw
9. Connector bracket
10. Compressor assembly

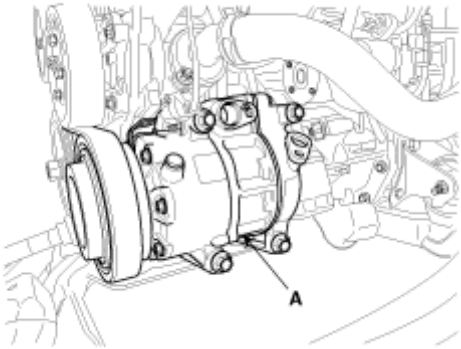
English

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 (A).

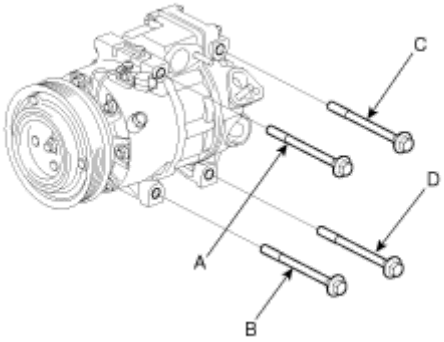


INSTALLATION

1. Make sure of the length of compressor mounting bolts, and then tighten it A→B→C→D order.

Bolt	R,U,D Engine	β Engine
A	100 mm (3.93 in.)	125 mm (4.92in.)
B	100 mm (3.93in.)	109 mm (4.29in.)
C	109 mm (4.29in.)	125 mm (4.92in.)
D	100 mm (3.93in.)	109 mm (4.29in.)

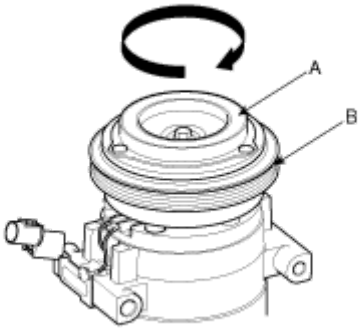
English ▼



2. Install in the reverse order of removal, and note these items.
   - 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 150cc(5.07 oz.) the result is the amount of oil you should drain from the new compressor (through the suction fitting).
   - 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.
   - To avoid contamination, do not return the oil to the container once dispensed, and never mix it with other refrigerant oils.
   - Immediately after using the oil, replace the cap on the container and seal it to avoid moisture absorption.
   - 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.
   - Adjust the drive belt.
   - 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.

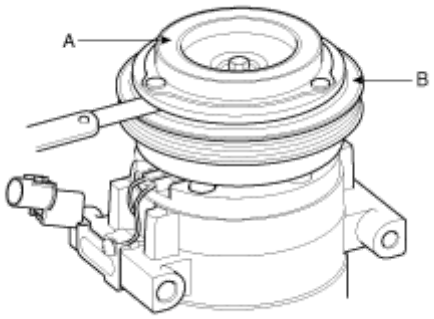


3. Measure the clearance between the pulley (B) and the disc & hub assembly (A) all the way around. If the clearance is not within specified limits, remove the disc & hub assembly and add or remove shim (gap washer) as needed to increase or decrease clearance.

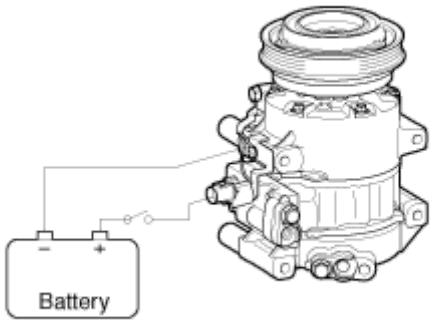
   Clearance : 0.45 ± 0.1mm (0.018 ± 0.004 in.)

NOTICE

The shims (gap washers) are available in seven thicknesses: 0.7mm, 0.8mm, 0.9mm, 1.0mm, 1.1mm, 1.2mm and 1.3mm.

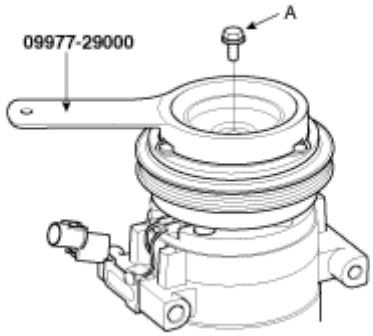


4. Check operation of the magnetic clutch.
   Connect the compressor side terminals to the battery (+) terminal and the ground battery (-) terminal to the compressor body.
   Check the magnetic clutch operating noise to determine the condition.

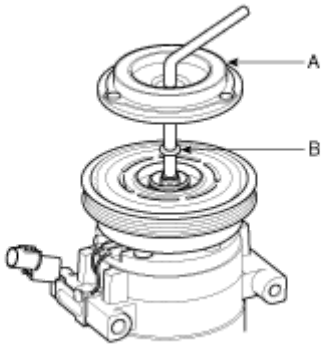


DISASSEMBLY

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, 7.37~11lb.ft)



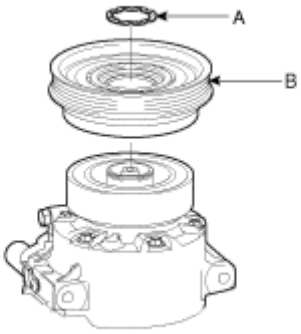
2. Remove the disc & hub assembly (A) and shim (gap washer) (B), taking care not to lose the shims. If the clutch needs adjustment, increase or decrease the number and thickness of shims as necessary, then reinstall the disc & hub assembly, and recheck its clearance (Refer to HA-20).



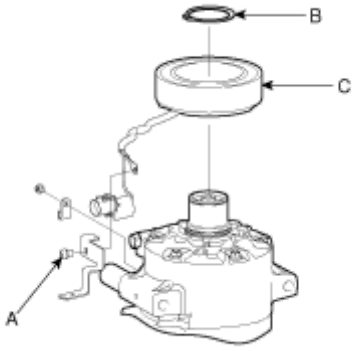
3. If you remove the field coil, remove retainer ring (A) with retainer ring pliers.

NOTICE

- 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 :
   - Clean the pulley and compressor sliding surfaces with non-petroleum solvent.
   - Install new retainer rings, and make sure they are fully seated in the groove.
   - Make sure that the pulley turns smoothly after its reassembled.

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 ± 10cc (5.07 ± 0.34 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.

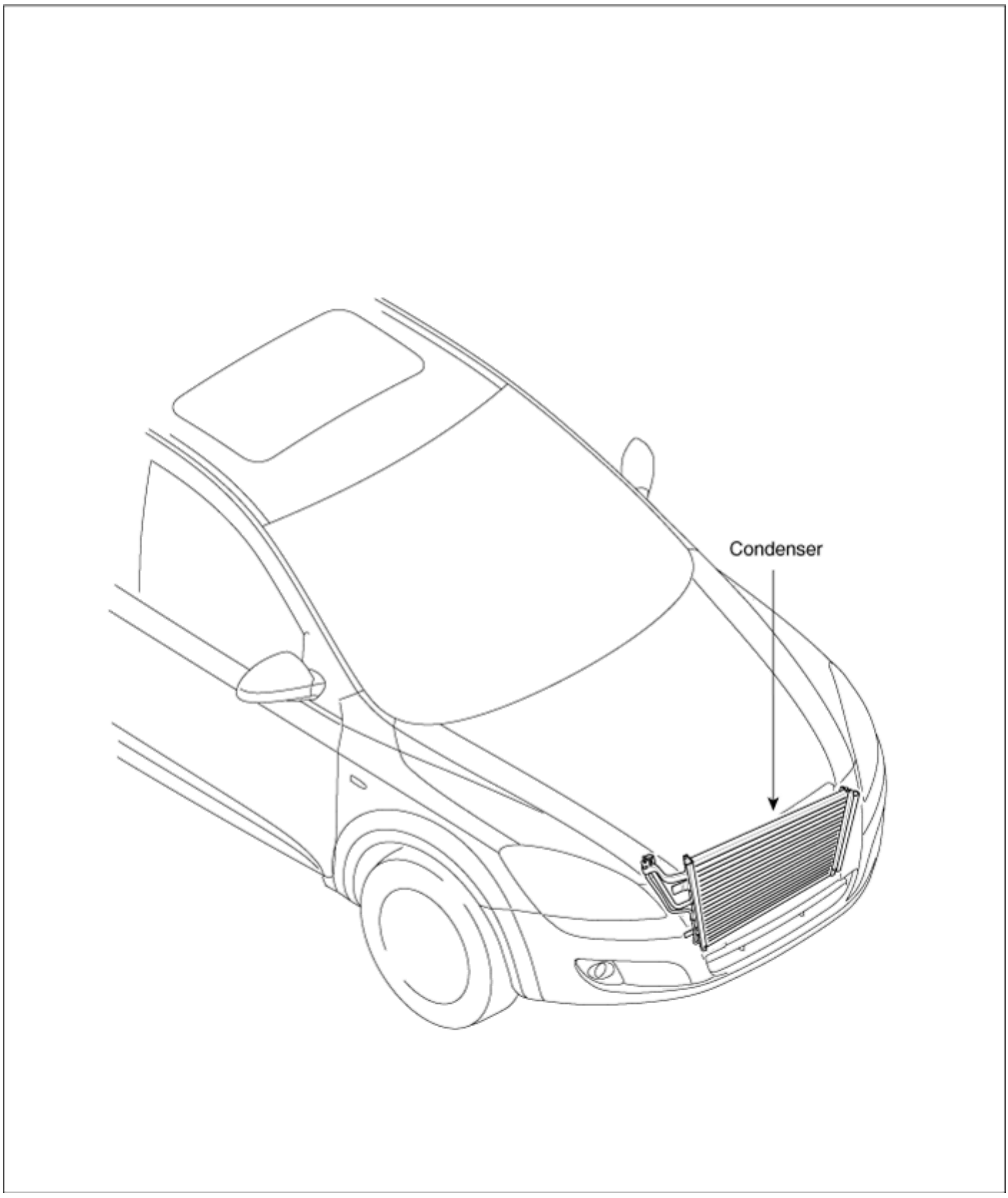
NOTICE

Even if no oil is drained from the removed compressor, don’t drain more than 50cc from new compressor.

English ▼

English ▼

COMPONENT LOCATION



English

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.

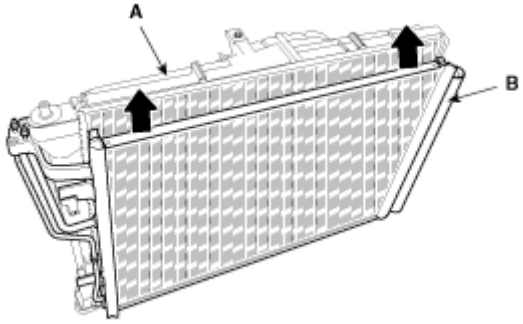
REPLACEMENT

Condenser Assembly

1. Recover the refrigerant with a recovery/ recycling/ charging station.
2. Disconnect the negative (-) battery terminal.
3. Remove 2 nuts (A), and then disconnect the discharge line and liquid line from the condenser.
   Plug or cap the lines immediately after disconnecting them to avoid moisture and dust contamination.
   TORQUE: 7.8~11.7N.m (0.8~1.2kgf.m, 5.9~8.7lb.ft)



4. Remove the radiator (A).
   (Refer to EM group - Radiator)
5. Remove 2 bolts, and then remove the condenser by lifting it up. Be careful not to damage the radiator and condenser fins when removing the condenser (B).



6. Install in the reverse order of removal, and note these items :
   - If you're installing a new condenser, add refrigerant oil ND-OIL8.
   - Replace the O-rings with new ones at each fitting, and apply a thin coat of refrigerant oil before installing them. Be

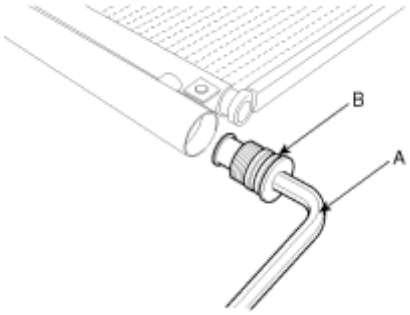
sure to use the right O-rings for R-134a to avoid leakage.

– Be careful not to damage the radiator and condenser fins when installing the condenser.

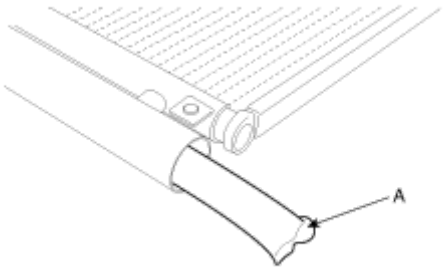
– Charge the system, and test its performance.

Desiccant

1. Remove the condenser, and then remove the bottom cap (B) with L wrench (A) from the condenser.
   TORQUE: 10~15 N.m (1.0~1.5 kgf.m, 7.23~10.84 lb.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.

NOTICE

– 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.

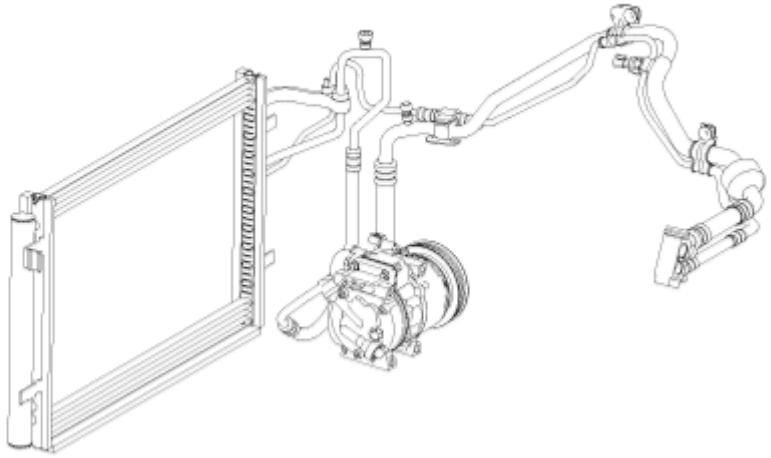
– Charge the system, and test its performance.

COMPONENT LOCATION

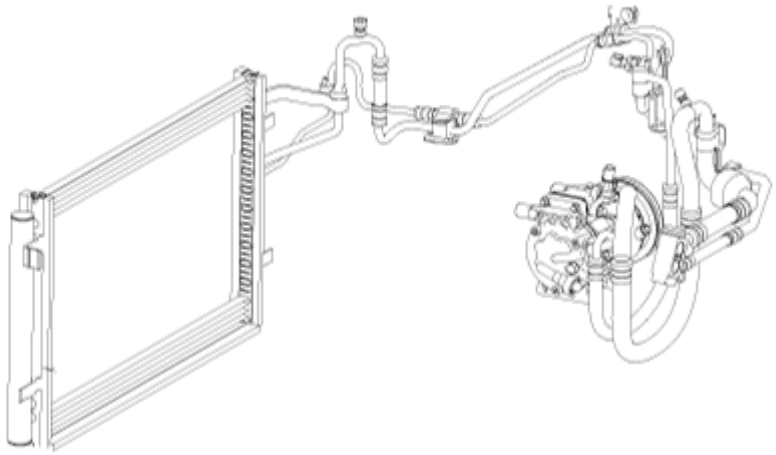
[GASOLINE]

English ▼

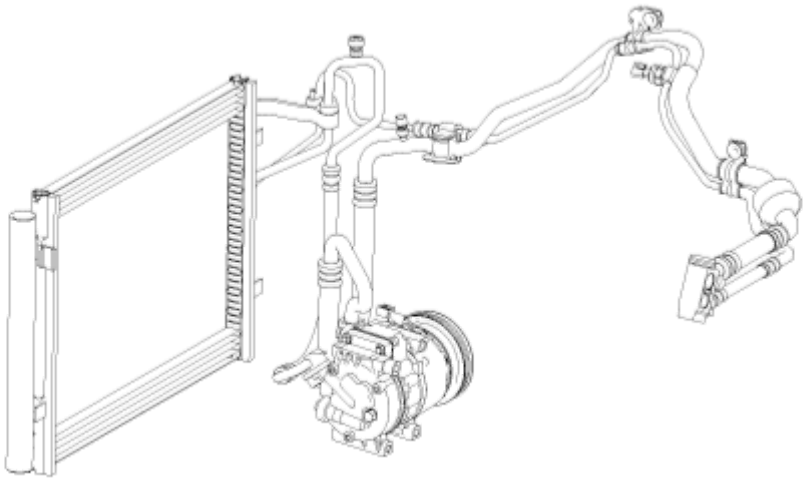
[GAMMA]



[BATA]



[U]



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	8 ~ 12	0.8~1.2	5.8 ~ 8.7
Condenser - Liquid tube			
Compressor - Discharge hose	20~30	2.0~3.0	14.4~21.6
Compressor - Suction hose			
Expansion valve - Evaporator	8 ~ 12	0.8~1.2	5.8 ~ 8.7

4. Evacuate air in refrigeration system and charge system with refrigerant.
   Specified amount : 500 ± 25g (17.6 ± 0.88 Oz)
5. Inspect for leakage of refrigerant.
   Using a gas leak detector, check for leakage of refrigerant.
6. Inspect A/C operation.

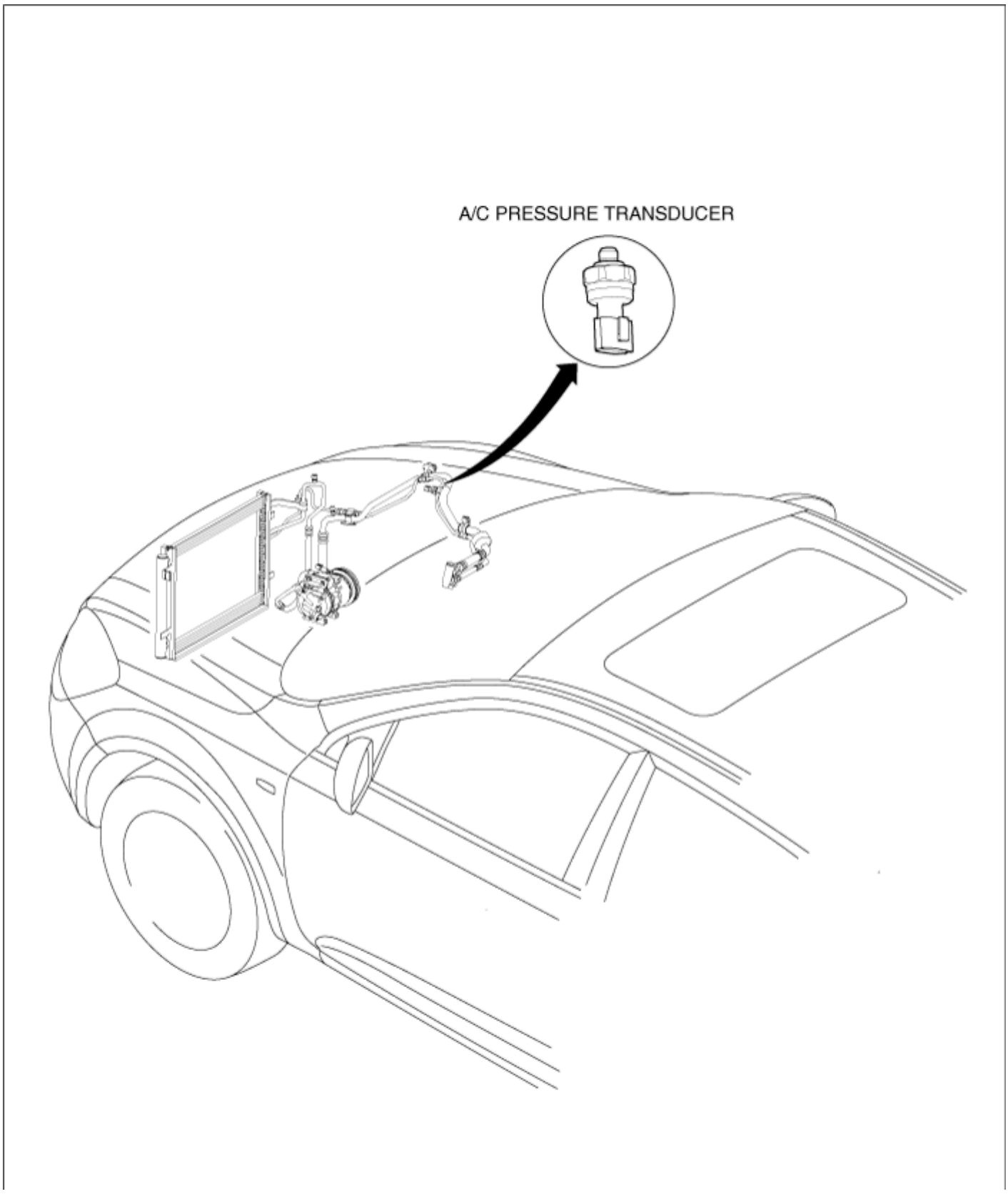
English ▼

DESCRIPTION

A/C pressure transducer convert the pressure value of high pressure line into voltage value after measure it. By converted voltage value, engine ECM controls cooling fan by operating it high speed or low speed. Engine ECM stop the operation of compressor when the temperature of refrigerant line is so high or so low irregularly to optimize air conditioning system.

English ▼

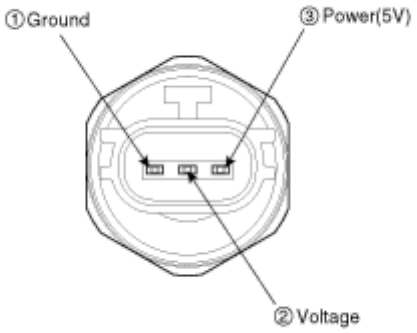
COMPONENT LOCATION



English

INSPECTION

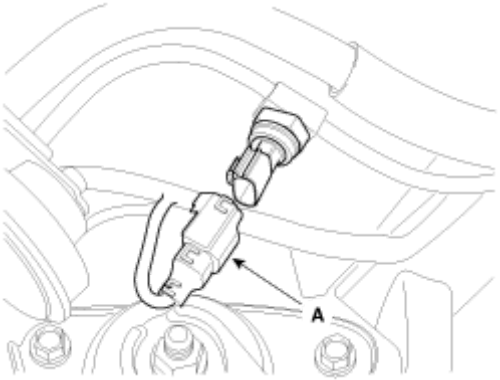
1. Measure the pressure of high pressure line by measuring voltage output between NO.1 and NO.2 terminals.



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.

English ▼

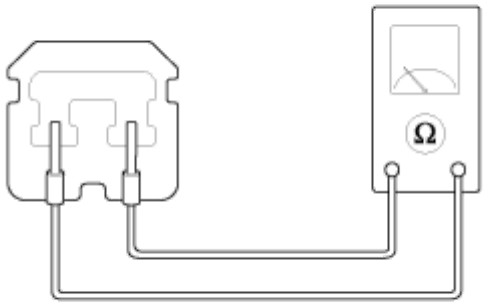
DESCRIPTION

The evaporator temperature sensor will detect the evaporator core temperature and interrupt compressor relay power in order to prevent evaporator freezing by excessive cooling.It is a negative type thermistor whose resistance is inversely proportional to temperature.

English ▼

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]

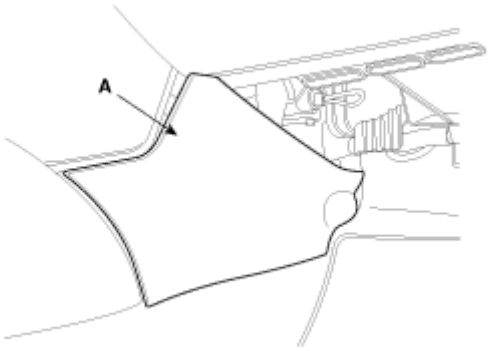
Evaporator core temperature [°C(°F)]	Resistance [kΩ]
-10(14)	43.35
0(32)	27.62
10(50)	18.07
20 (68)	12.11
30(86)	8.30
40(104)	5.81
50(122)	4.15

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.

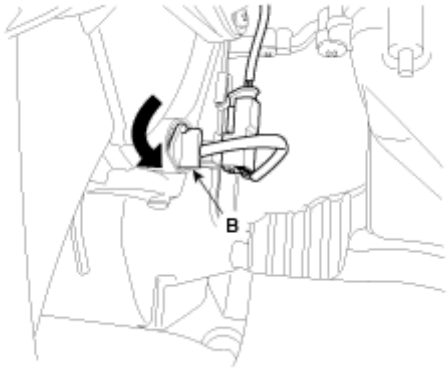
REPLACEMENT

1. Remove the crash pad lower panel (A).

English ▼



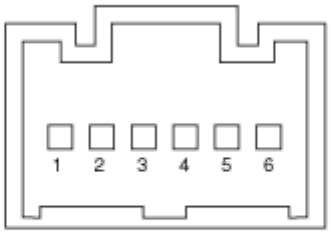
2. Remove the evaporator temperature sensor (B), by pulling it after rorating 90° in a counter clock wise direction.



3. Installation is the reverse order of removal

DESCRIPTION

1. In-car air temperature sensor is located at the crash pad.
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.
3. It perceives the inside temperature, changes the resistance value, and enters the corresponding voltage into the automatic temperature control module.
4. It will used for discharge temperature control, sensor failsafe, temperature door control, blower motor level control, and A/C auto control.



1. Motor(-)
2. Sensor ground (+)
3. Humidity sensor signal
4. In-car sensor temp. signal
5. 5V (Vcc)
6. Motor (+)

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.

[Specification]

Temperature [°C(°F)]	Resistance between terminals 2and 4 (kΩ)
-30	509.600 ± 4.0%
-15	216.100 ± 3.2%
0	97.710 ± 2.4%
15	47.130 ± 1.7%
25	30.000 ± 1.2%
35	19.590 ± 1.6%
50	10.810 ± 2.2%

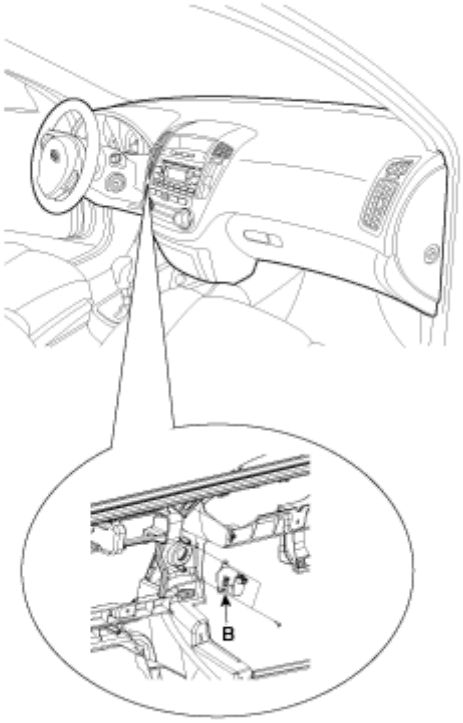
NOTICE

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. (Refer to BD group-crash pad).
3. Disconnect the connector of in-car sensor (A).Loosen the mounting 2 screws and then remove the in-car sensor.

English ▼



4. Installation is the reverse order of removal.

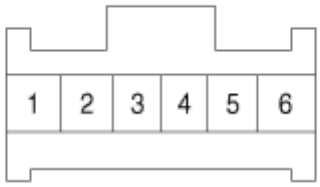
English

DESCRIPTION

1. The photo sensor (A) 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.

INSPECTION

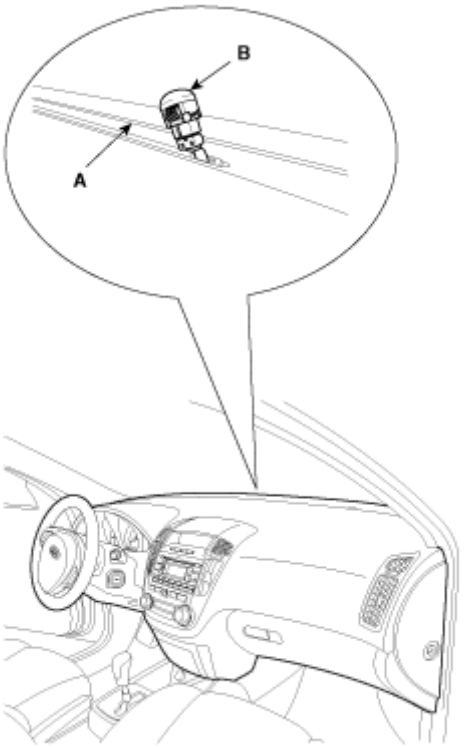
1. Ignition "ON"
2. Using the scan tool.
3. Emit intensive light toward photo sensor using a lamp, and check the output voltage change.
4. The voltage will rise with higher intensive light and reduce with lower intensive light.



1. Ground
2. 5V (VCC)
3. Signal
4. -
5. Photo sensor (+)
6. Photo sensor (-)

REPLACEMENT

1. Disconnect the negative (-) battery terminal.
2. With the (-) driver, remove the photo sensor (B) from the center of defrost nozzle (A).



3. Install in the reverse order of removal.

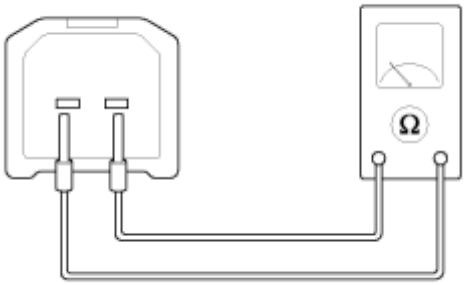
English ▼

DESCRIPTION

1. Water temperature sensor is located at the heater unit.
2. It detects coolant temperature. Its signal is used for cold engine lockout control. When the driver operates the heater before the engine is warmed up, the signal from sensor causes the heater control unit to reduce blower motor speed until coolant temperature reaches the threshold value.

INSPECTION

1. Ignition "ON"
2. Using the multi-tester, Measure resistance between terminal "1" and "2" of water temperature sensor.



[Specification]

Coolant temperature [°C(°F)]	Resistance (kΩ)	Voltage (V)
-10(14)	55.85 ± 3%	4.24 ± 3%
0(32)	32.91 ± 3%	3.83 ± 3%
10(50)	19.99 ± 3%	3.33 ± 3%
20(68)	12.51 ± 3%	2.78 ± 3%
30(86)	8.047 ± 3%	2.23 ± 3%
40(104)	5.311 ± 3%	1.73 ± 3%
50(122)	3.588 ± 3%	1.32 ± 3%
60(140)	2.476 ± 3%	0.99 ± 3%
70(158)	1.742 ±3%	0.74 ± 3%
80(176)	1.246 ± 3%	0.55 ± 3%

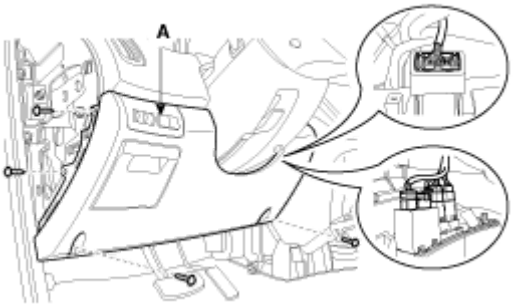
3. If the measured resistance is not specification, substitute with a known-good water temperature sensor and check for proper operation.
4. If the problem is corrected, replace the water temperature sensor.

NOTICE

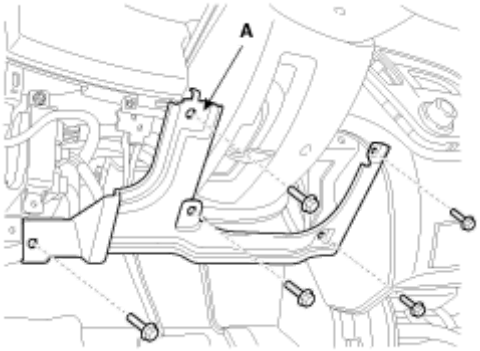
Negative type thermistor that resistance will rise with lower temperature, and reduce with higher temperature.

REPLACEMENT

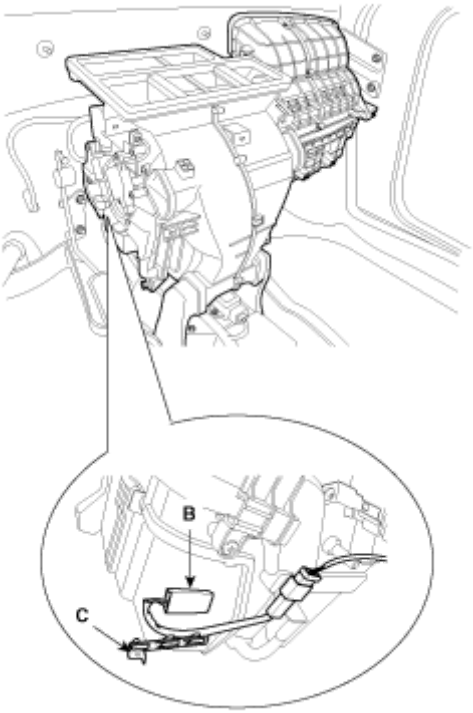
1. Disconnect the negative (-) battery terminal.
2. Remove the crashpad lower panal(A).



3. Remove the crashpad lower panal(A).



4. Pull the water temperature sensor (B) out at the heater unit with the clamp (C).



5. Installation is the reverse order of removal.

NOTICE

Apply caulk to the water temperature sensor.
Make sure that there is no air leakage

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.

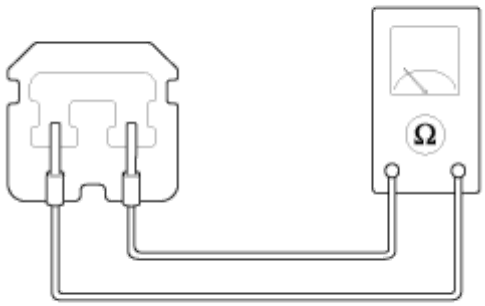
> **NOTICE**
>
> If the ambient temperature is below 0°C (32°F), the A/C compressor will be stopped.
> The compressor will be operated by manual operating.

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 1 and 2 (kΩ)
-10	158.2± 3%
0 (32)	95.1± 3%
10 (50)	58.8± 3%
20 (68)	37.3± 3%

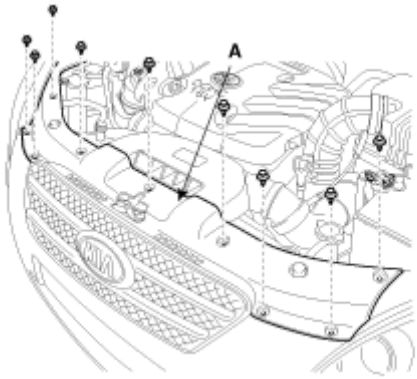


4. If the measured resistance is not specification, substitute with a known-good ambient temperature sensor and check for proper operation.
5. If the problem is corrected, replace the ambient temperature sensor.

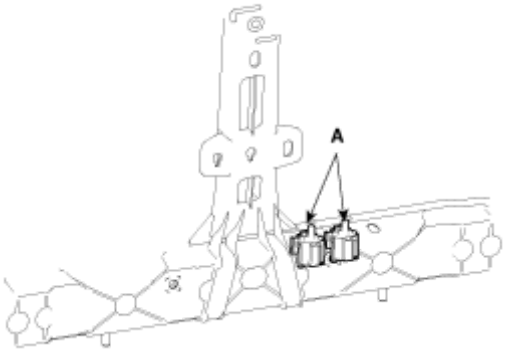
REPLACEMENT

1. Disconnect the negative (-) battery terminal.
2. Remove the radiator grill cover(A).

English ▼



3. Remove the ambient temperature sensor (A).



4. Installation is the reverse order of removal.

English ▼

DESCRIPTION

1. A.Q.S is located at center support in front of the engine radiator, and detects hazardous elements in ambient air providing output signal to control.
2. It will detect sulfurous acid gas, carbon dioxide, carbon monoxide, hydrocarbon and allergen.

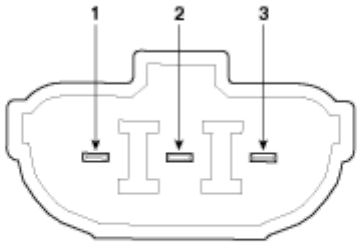
English

INSPECTION

1. Ignition "ON"
2. Using the scan tool.
3. Check the output voltage of AQS between terminals 2 and 3.

[Specification]

Condition	Output signal	Fresh/recirculation
Heating Condition (IG "ON")	2.5 ± 0.5V	Prevlous
Normal Condition	4.3 ± 0.5V	Fresh
Hazardous gas detection	0.9 ± 0.5V	Recirculation



1. IG2
2. Ground
3. Output signal

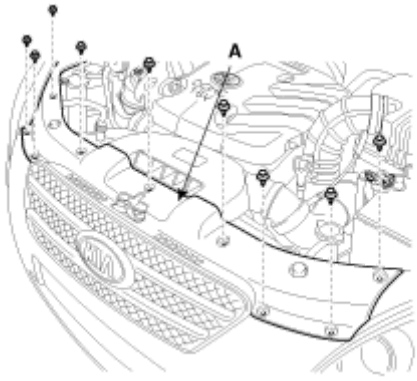
4. AQS diagnosis and fail safe
   Detect the signal without choosing the AQS switch.
   If 2.5V or more is detected for 3.5 seconds or more among 7 seconds, be judged the open of AQS signal.
   Operate as below fail safe function, while choosing AQS.
   Fail safe: Release the AQS (AQS cannot be selected), Fresh/recirculation maintains previous situation of AQS selection.

> **NOTICE**
>
> When IG is turned ON, AQS heats for 34±5 seconds, it will output below 2.5 voltage during this time.

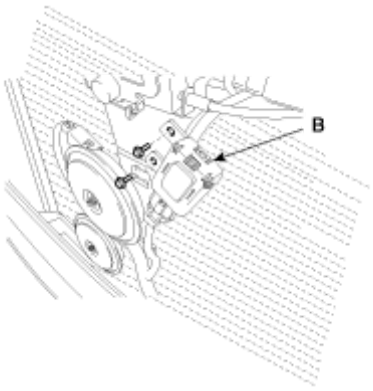
REPLACEMENT

1. Disconnect the negative (-) battery terminal.
2. Remove the radiator grill cover(A).

English ▼



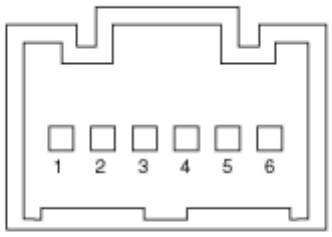
3. Remove the AQS (B) after loosening the mounting bolts (A).



4. Installation is the reverse order of removal.

DESCRIPTION

1. Humidity sensor is located at the lower crash pad and detected in-car humidity for in-car humidity control.
2. If ambient air temperature or in-car humidity is outside certain range, it will turn on A/C to control in-car humidity preventing in car fogging.
   Air conditioner operation depends on ambient temperature and humidity.



1. Motor(-)
2. Sensor ground (+)
3. Humidity sensor signal
4. In-car sensor temp. signal
5. 5V (Vcc)
6. Motor (+)

INSPECTION

1. Ignition "ON"
2. Using the scan tool.
3. Check the frequency of humidity sensor between terminals 2 and 3.

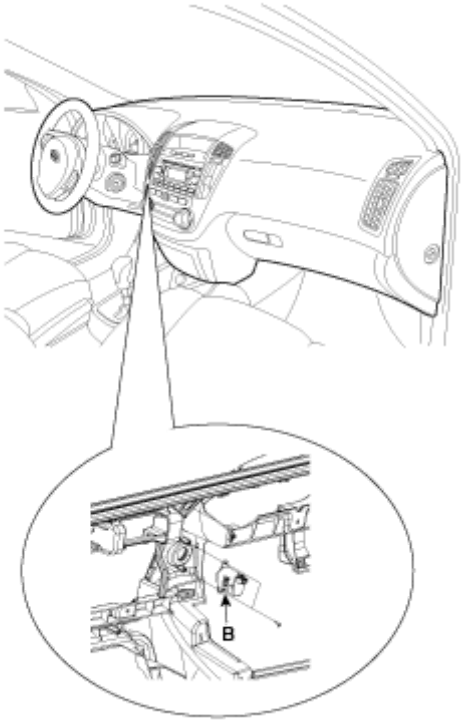
Humidity (%)	Frequency between terminals 2and 3 (Hz)
30	6976 ± 5%
50	6728 ± 5%
60	6600 ± 5%
70	6468 ± 5%
80	6330 ± 5%
90	6186 ± 5%

4. If the measured resistance is not specification, substitute with a known-good humidity sensor and check for proper operation.
5. If the problem is corrected, replace the Humidity sensor.

REPLACEMENT

1. Disconnect the negative (-) battery terminal.
2. Remove the center facia lower panel (A). (Refer to BD group - Crash pad)
3. Disconnect the humidity sensor connector
4. Disconnect the connector of humidity sensor. Loosen the mounting 2 screws and then remove the humidity sensor (B).

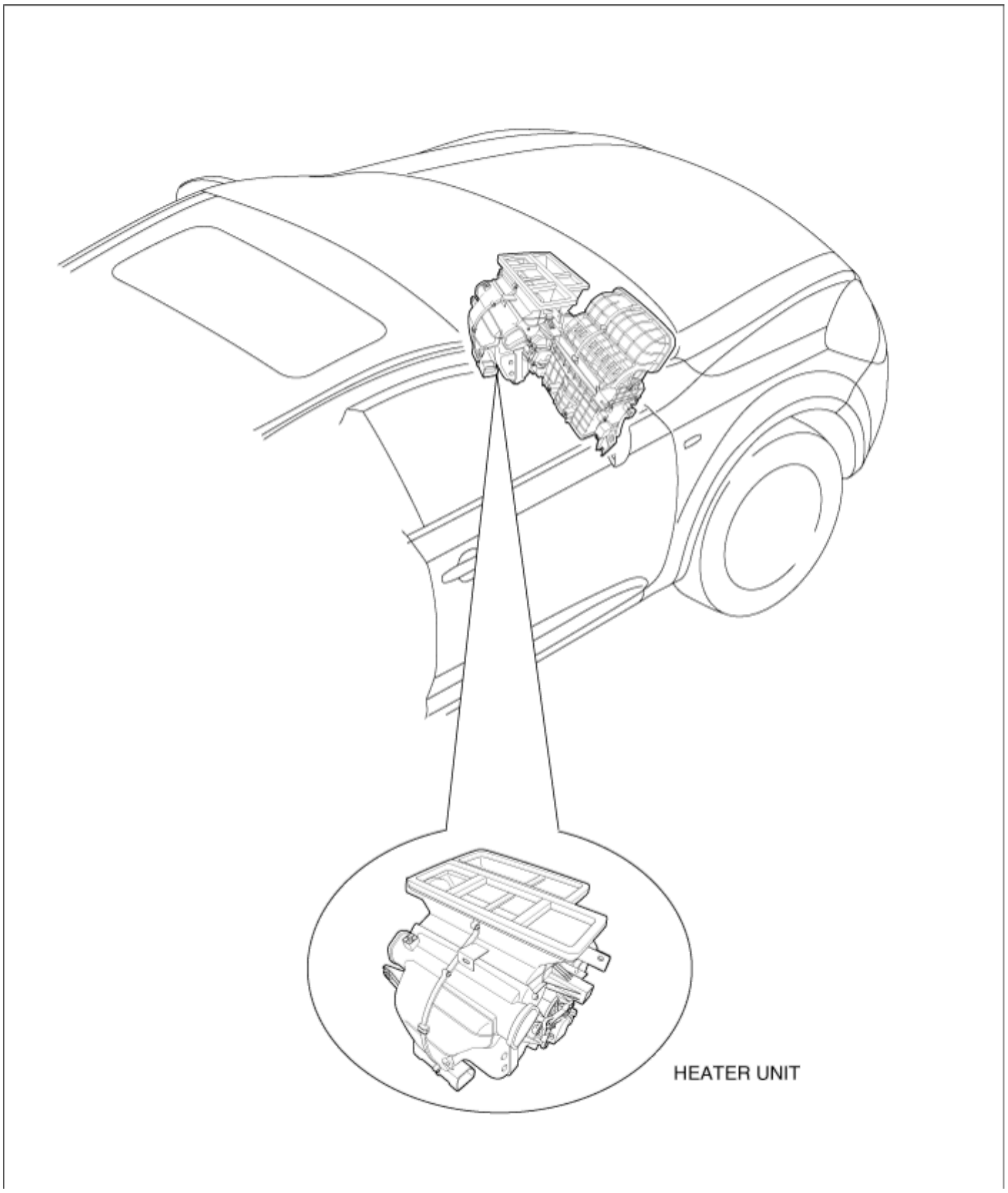
English ▼



5. Installation is the reverse order of removal.

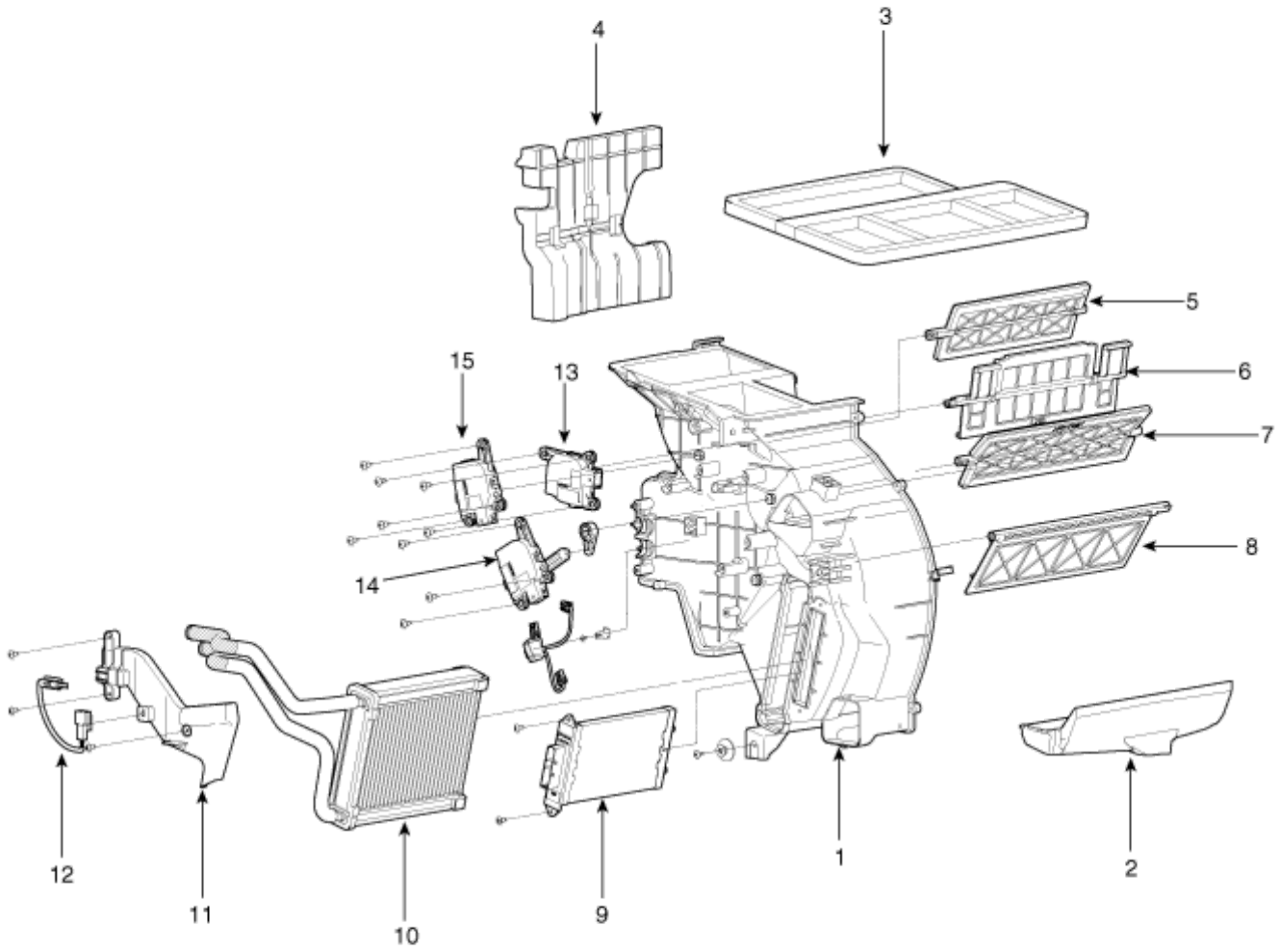
English ▼

COMPONENT LOCATION

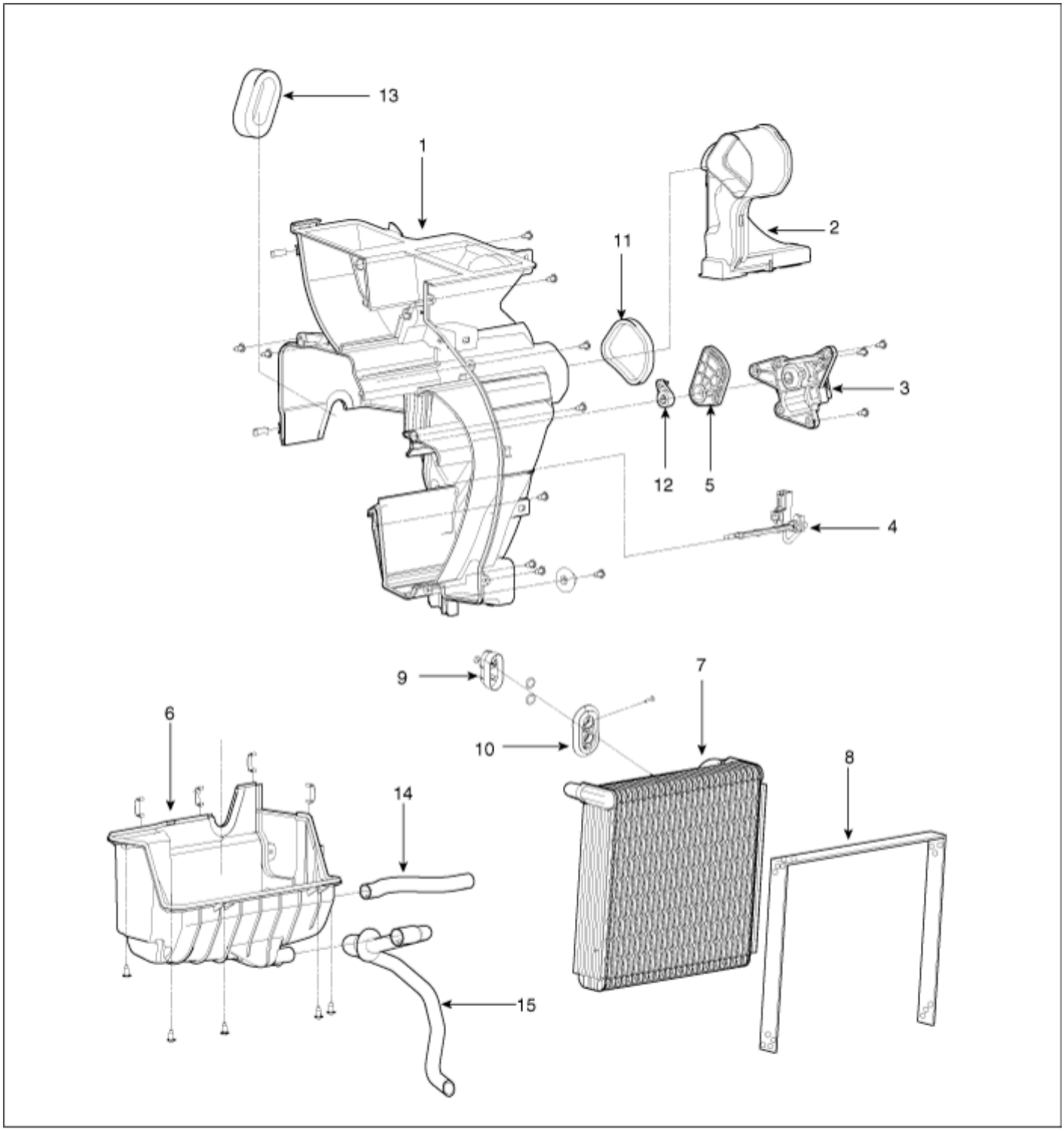


COMPONENTS

English



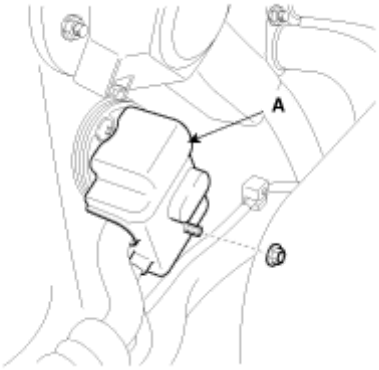
1. Heater case (L)
2. Heater Insulation lower
3. Seal duct No.1
4. Pad
5. Door asy-Def
6. Door assy - Vent
7. Door assy - Floor
8. Door assy - Temp
9. Core - PTC heater
10. Heater core
11. Heater core cover
12. Water temp sensor
13. Vent actuator
14. Floor actuator
15. Def actuator



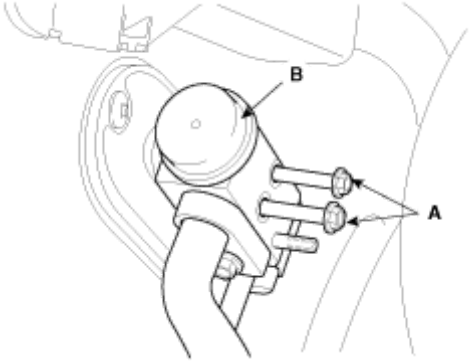
1. Heater case (R)
2. Sub duct (R)
3. Temp actutor
4. Evaporator temp sensor
5. Temp door lever
6. Evaporator case
7. Evaporator core
8. Evaporator seul
9. Evaporator cap
10. Evaporator fix braket
11. Seal
12. Temp door arm
13. Evaporator seal
14. Drain hose-blower
15. Drain hose

REPLACEMENT

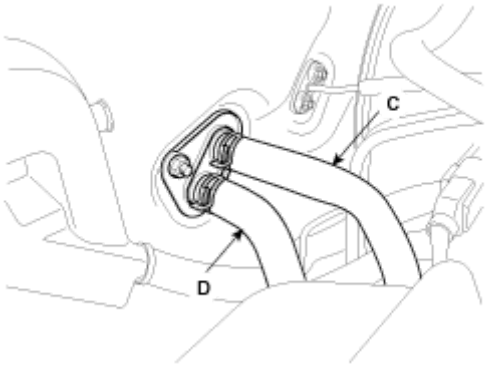
1. Disconnect the negative (-) battery terminal.
2. Recover the refrigerant with a recovery/ recycling/ charging station.
3. When the engine is cool, drain the engine coolant from the radiator.
4. Remove the expansion valve cover(A).



5. 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.



6. Disconnect the inlet (C) and outlet (D) heater hoses from the heater unit.



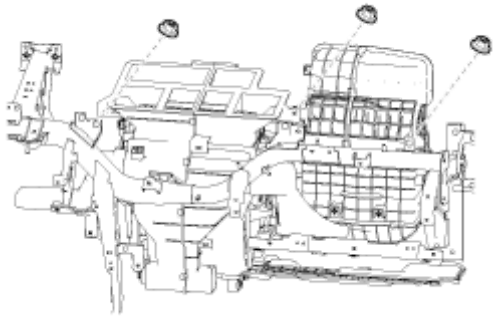
⚠ CAUTION

Engine coolant will run out when the hoses are disconnected; drain it into a clean drip pan. Be sure not to let coolant

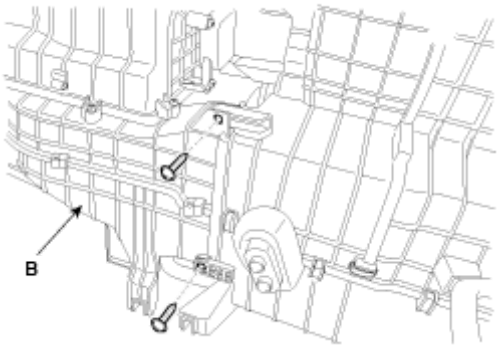
spill on electrical parts or painted surfaces. If any coolant spills, rinse it off immediately.

English ▼

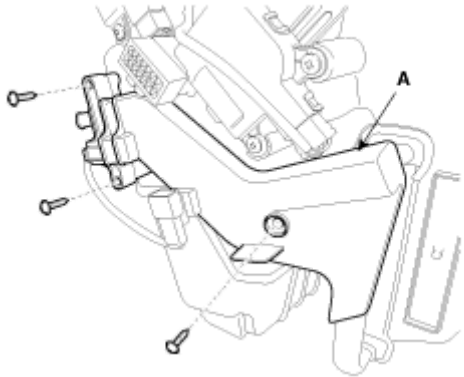
7. Remove the crash pad.
   (Refer to BD group-cresh pad)
8. Remove the cowl cross bar assembly.
   (Refer to BD group-cresh pad)
9. Disconnect the connectors from the temperature control actuator, the mode control actuator and the evaporator temperature sensor.
10. Remove the heater & blower unit after loosening 3 mounting nuts.



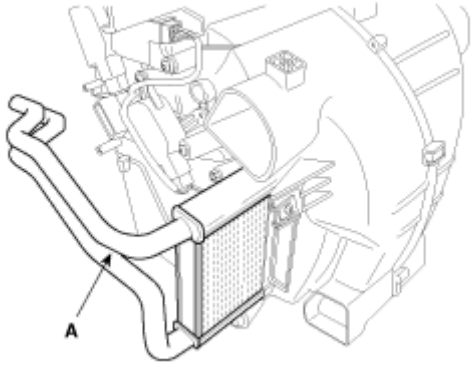
11. Remove the blower unit (B) from heater unit after loosening 3 screws.



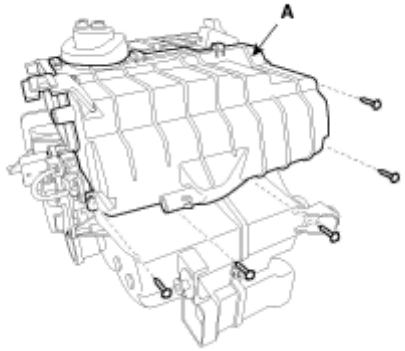
12. Remove the heater core cover (A).



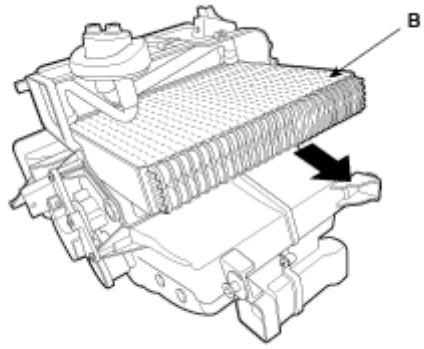
13. Be careful that the inlet and outlet pipe are not bent during heater core removal, and pull out the heater core (A).



14. Remove the heater unit lower case(A).



15. Remove the evaporator core(B).

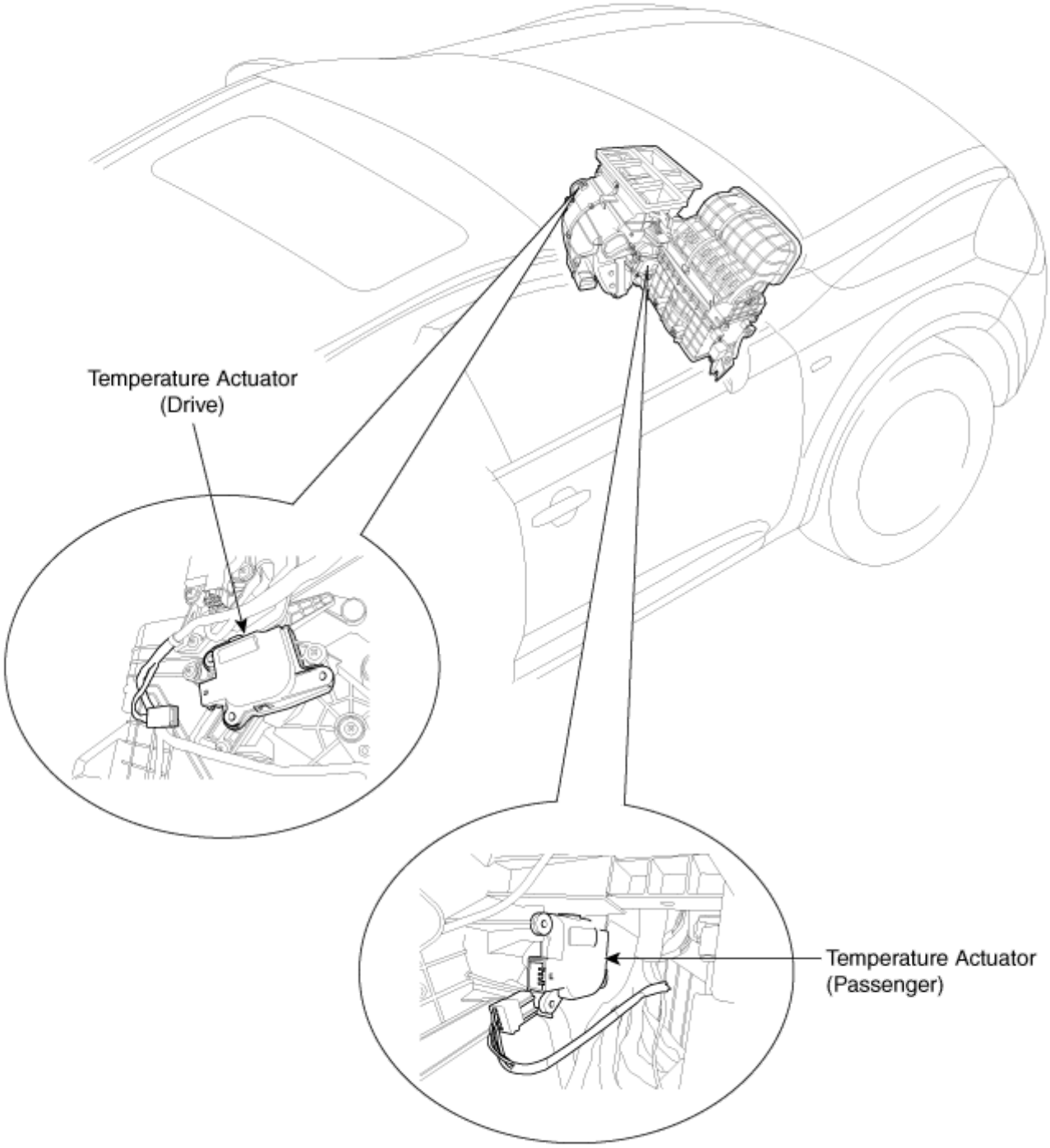


16. Install the heater core in the reverse order of removal.
17. Installation is the reverse order of removal, and note these items :
    - If you're installing a new evaporator, add refrigerant oil (ND-OIL8).
    - Replace the O-rings with new ones at each fitting, and apply a thin coat of refrigerant oil before installing them. Be sure to use the right O-rings for R-134a to avoid leakage.
    - Immediately after using the oil, replace the cap on the container, and seal it to avoid moisture absorption.
    - 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.
    - Apply sealant to the grommets.
    - Make sure that there is no air leakage.
    - Charge the system and test its performance.
    - Do not interchange the inlet and outlet heater hoses and install the hose clamps securely.

– Refill the cooling system with engine coolant.

English ▼

COMPONENT LOCATION



English ▼

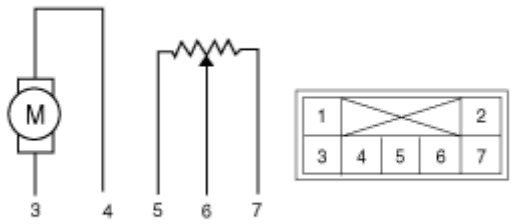
DESCRIPTION

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.

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.

   [Drive]



   1) -
   2) -
   3) Cool position
   4) 5V (Vcc)
   5) Feedback signal
   6) Senser GND
   7) Warm position

4. Check the voltage between terminals 5 and 6.

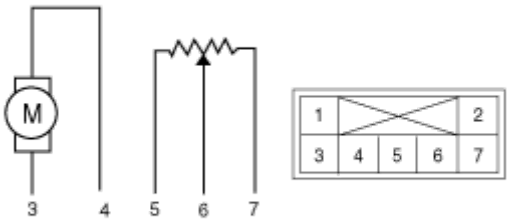
   [Specification]

Door position	Voltage (5-6)	Error detecting
Max. cooling	0.3 ± 0.15V	Low voltage : 0.1V or less
Max. heating	4.7 ± 0.15V	High voltage : 4.9V or more

   * It will feedback current position of actuator to controls.

5. If the measured voltage is not specification, substitute with a known-good temperature control actuator and check for proper operation.
6. If the problem is corrected, replace the temperature control actuator.

   [Passenger]



1) -
2) -
3) Cool position
4) 5V (Vcc)
5) Feedback signal
6) Senser GND
7) Warm position

7. Check the voltage between terminals 5 and 6.

[Specification]

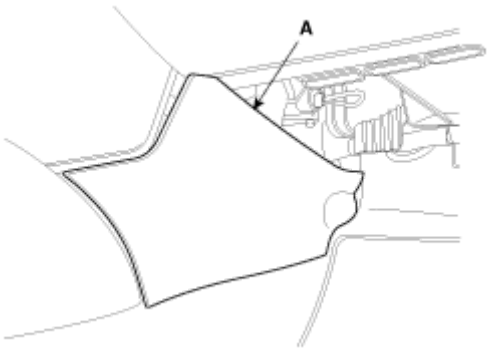
Door position	Voltage (5-6)	Error detecting
Max. cooling	0.3 ± 0.15V	Low voltage :0.1V or less
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* It will feedback current position of actuator to controls.

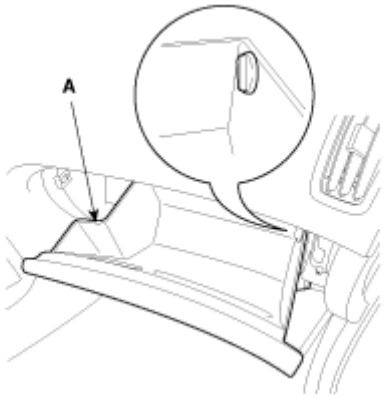
8. If the measured voltage is not specification, substitute with a known-good temperature control actuator and check for proper operation.
9. If the problem is corrected, replace the temperature control actuator.

REPLACEMENT

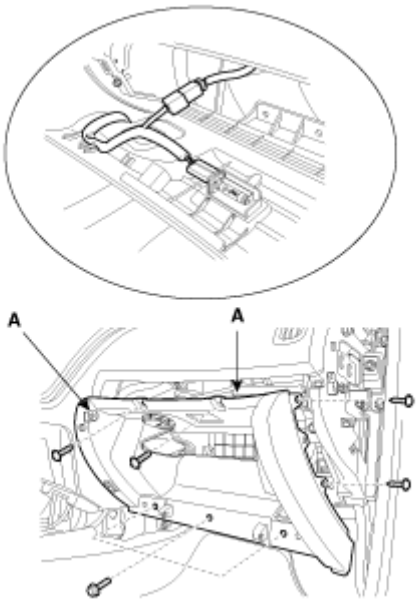
1. Disconnect the negative (-) battery terminal.
2. Remove the crush pad lower panel (A).



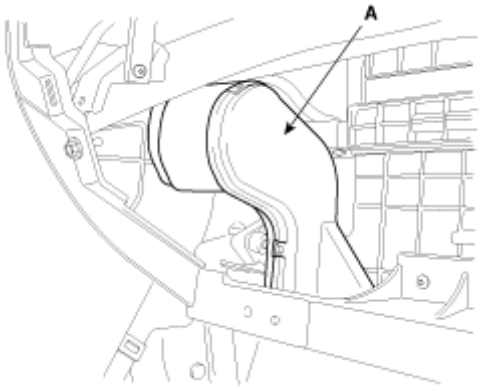
3. Disconnect the damper (B) from the glove box (A).



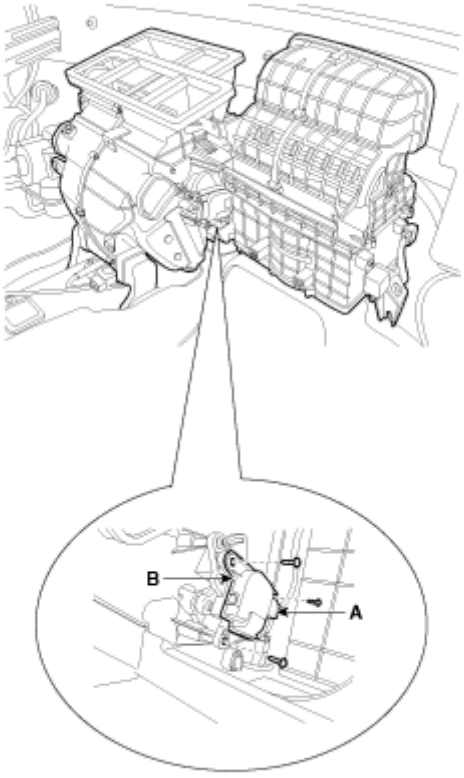
4. Remove the crash pad lower panel (A).



5. Remove the sower duct (A).



6. Disconnect the temperature control actuator connector (A).
7. Loosen the mounting screw and then remove the temperature control actuator (B).



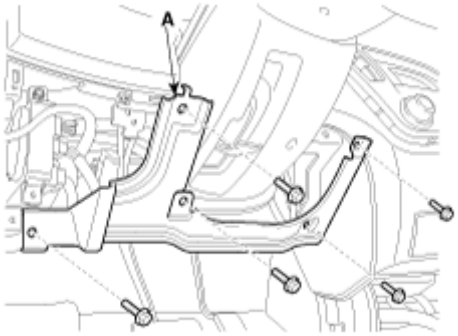
8. Remove the driver's crush pad lower panel (A). (Refer to BD group - "Crash pad")



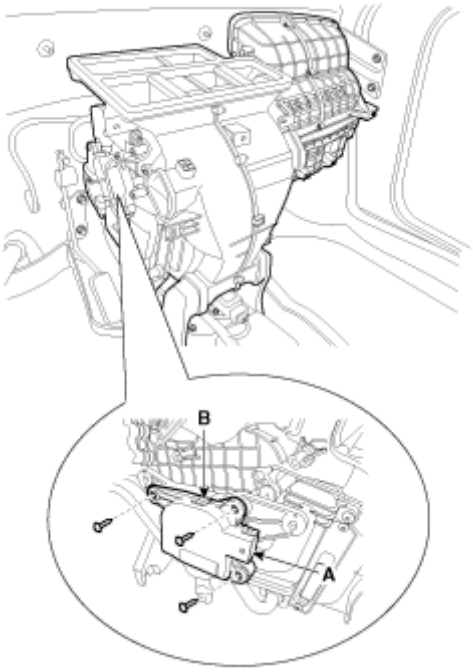




9. After loosening the mounting bolts, then remove the reinforcing panel (A).

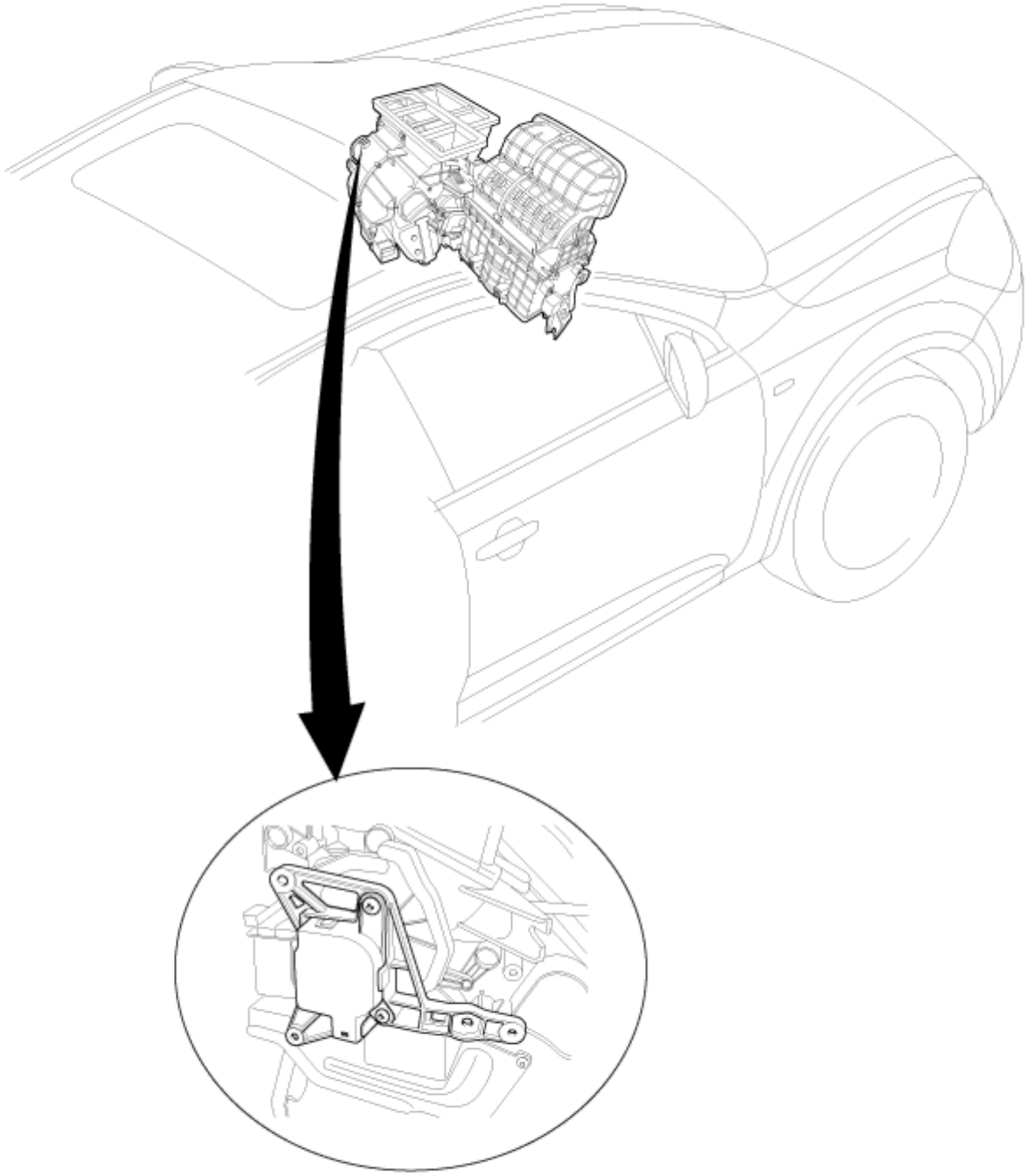


10. Disconnect the mode control actuator connector (A) after removing the air duct.
11. Loosen the mounting screws and then remove the mode control actuator (B).



12. Installation is the reverse order of removal.

COMPONENT LOCATION



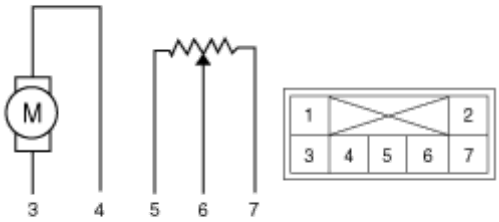
Mode Control Actuator

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.

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.



1) -
2) -
3) DEF
4) VENT
5) SENSOR GND
6) Feedback signal
7) 5V (Vcc)

5. Check the voltage between terminals 5 and 6.

Door position	Voltage (5-6)	Error detecting
Vent	0.3 ± 0.15V	Low voltage : 0.1V or less
Defrost	4.7 ± 0.15V	High voltage : 4.9V or more

It will feedback current position of actuator to controls.

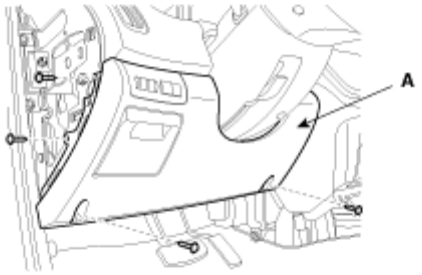
6. If the measured voltage is not specification, substitute with a known-good console temp control actuator and check for proper operation.
7. If the problem is corrected, replace the console temp control actuator.

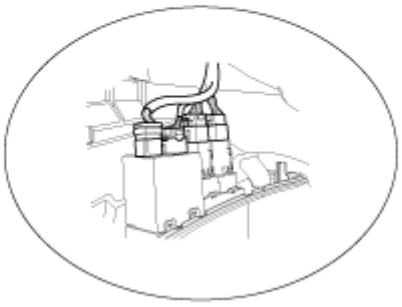
REPLACEMENT

1. Disconnect the negative (-) battery terminal.
2. Remove the driver's crush pad lower panel (A).
(Refer to BD group - "Crash pad")

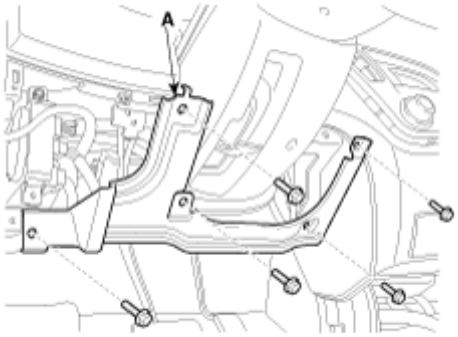
English ▼



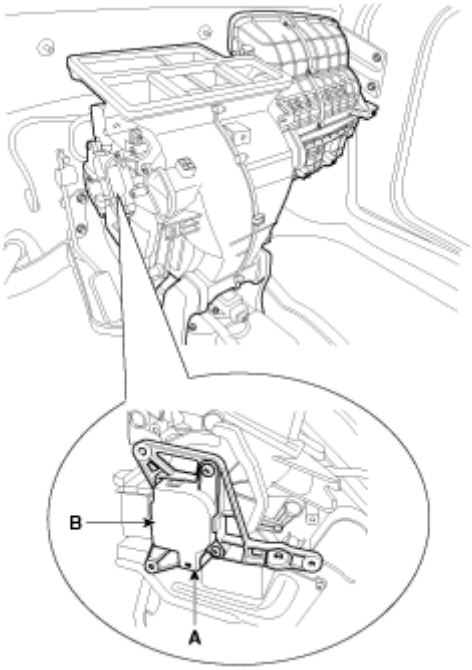




3. After loosening the mounting bolts, then remove the reinforcing panel (A).



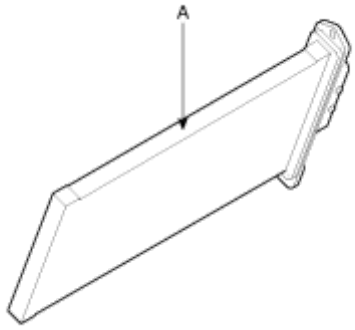
4. Disconnect the mode control actuator connector (A) after removing the air duct.
5. Loosen the mounting screws and then remove the mode control actuator (B).



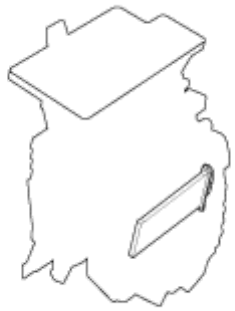
6. Installation is the reverse order of removal.

DESCRIPTION

PTC (Positive Temperature Coefficient) heater (A) is an electric heater using a PTC element as an auxiliary heating device that supplements deficiency of interior heat source in highly effective diesel engine (U engine).



An electric heater heats up the interior by directly heating the air that passes through the heater.
PTC = positive Temperature Coefficient
The name itself implies that the element has a proportional resistance change sensitive to temperature. PTC heater is installed at the exit or the backside of heater core.



OPERATION PRINCIPLE

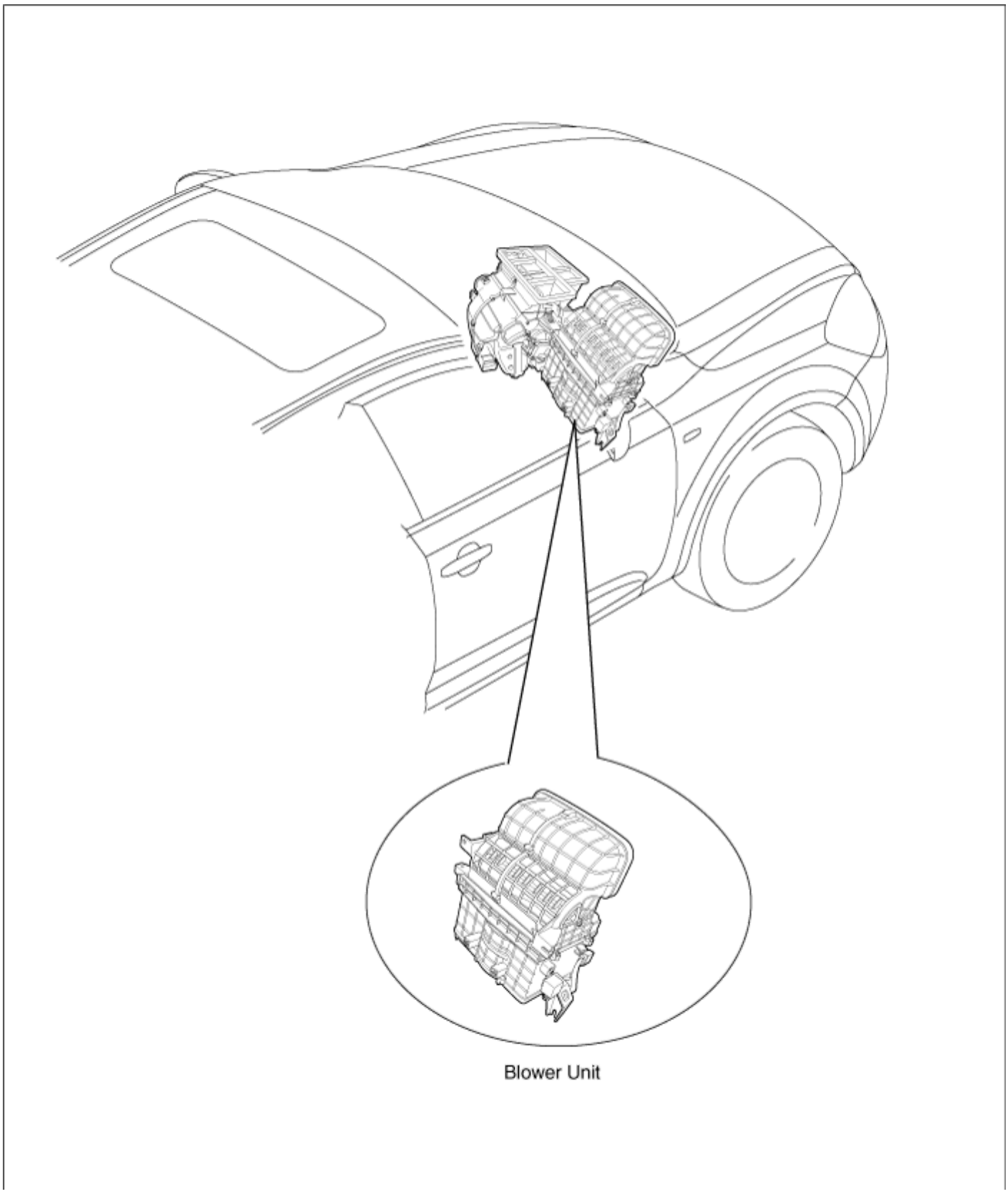
ECM outputs a PTC on signal. Operate PTC from 1st setting to 3rd setting with an interval of 15 seconds.
Heat up the air, which passes through a heater core.

OPERATION CONDITION

Judge the condition by ambient temperature is below 5°C, coolant temperature is below 70°C, and battery voltage is above 11V and engine RPM is above 700RPM.

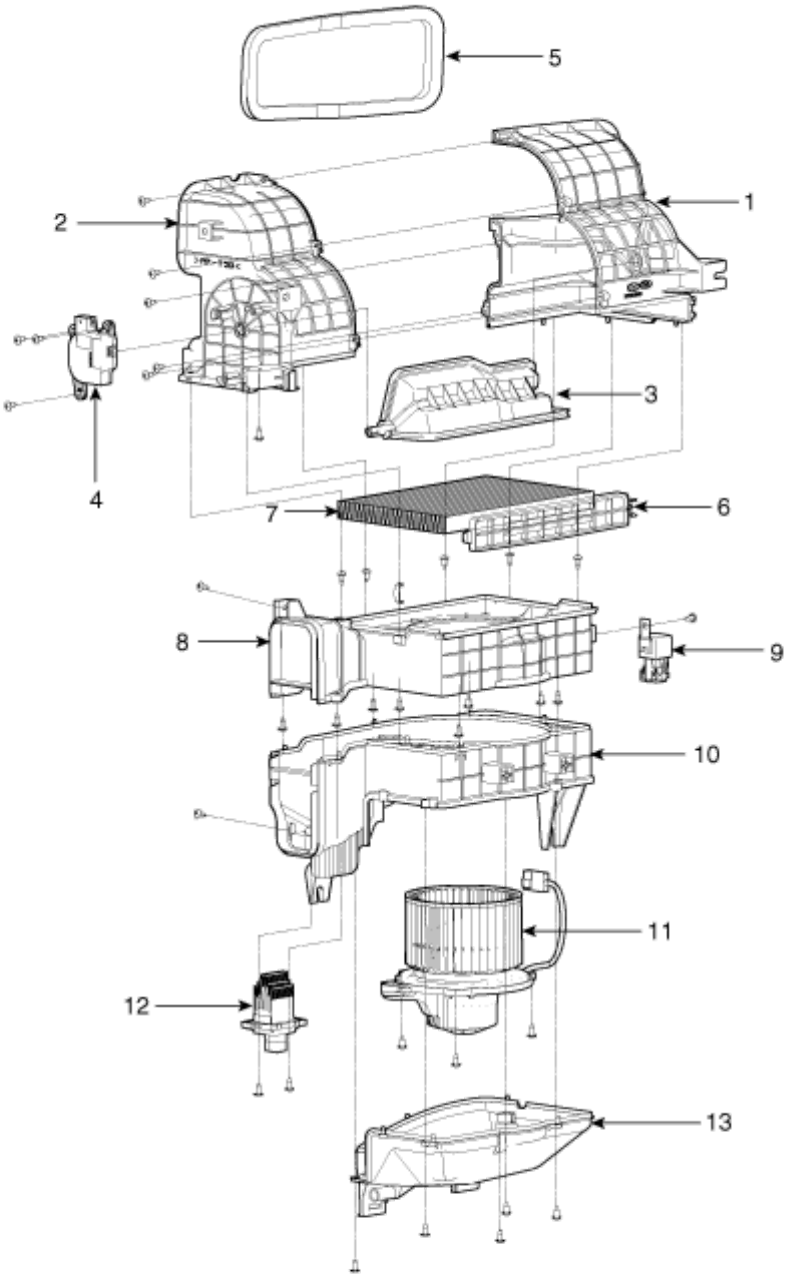
English ▼

COMPONENT LOCATION



COMPONENTS

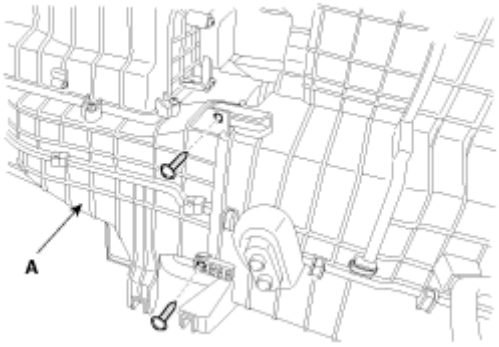
English ▼



1. Intake case (R)
2. Intake case (L)
3. Intke door
4. Intake actuator
5. Seal
6. Filter cover
7. Air filter
8. Blower upper case
9. Blower relay
10. Blower lower case
11. Blower motor
12. Power mosfet
13. Blower case

REPLACEMENT

1. Disconnect the negative (-) battery terminal.
2. Remove the crash pad.
   (Refer to BD group - Crash pad)
3. Disconnect the connectors from the intake actuator, the blower motor and power mosfet.
4. Remove the cowl cross bar assembly.
   (Refer to BD group - Crash pad)
5. Remove the blower unit (A) from the heater unit after loosening a mounting bolt and 3 screws.



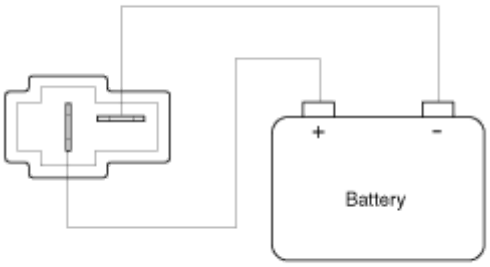
NOTICE

– Make sure that there is no air leaking out of the blower and duct joints.

6. Installation is the reverse order of removal.

INSPECTION

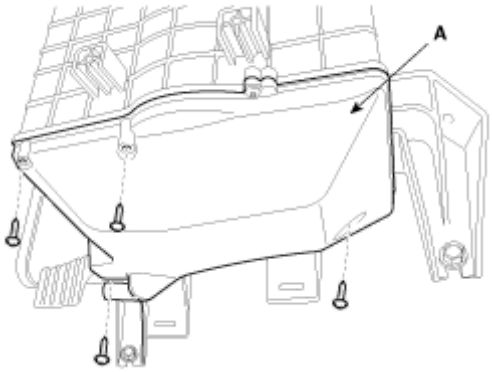
1. Connect the battery voltage and check the blower motor rotation.



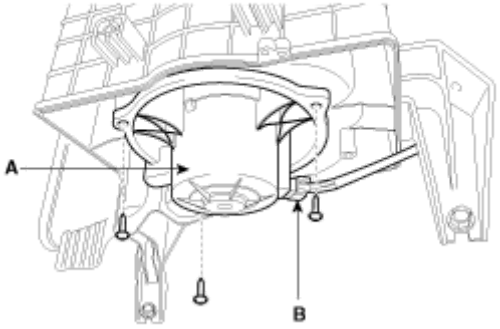
2. If the blower motor voltage is not operated well, substitute with a known-good blower motor and check for proper operation.
3. If the problem is corrected, replace the blower motor.

REPLACEMENT

1. Disconnect the negative (-) battery terminal.
2. Remove the blower motor cover(A).



3. Disconnect the connector (B) of the blower motor and then remove the blower motor (A) after loosening the mounting screws



4. Installation is the reverse order of removal.

English ▼

INSPECTION

Check for continuity between the terminals.

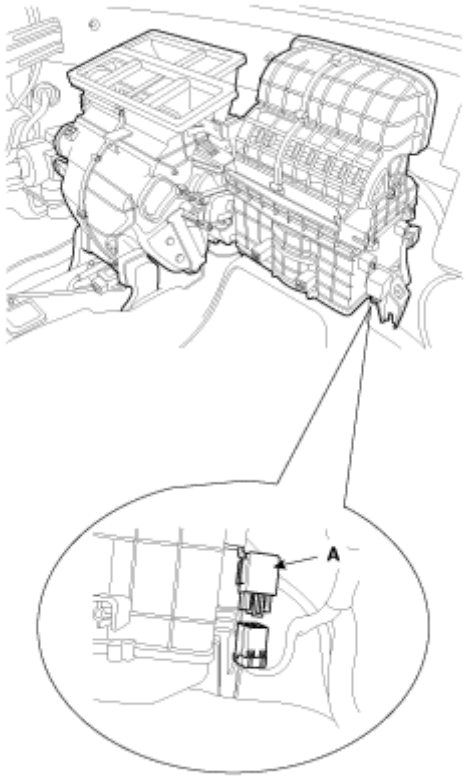
1. There should be continuity between No1 and No.4 terminals when power and ground are connected to No.2 and No.3 terminals.
2. There should be no continuity between No.1 and No.4 terminals when power is disconnected.

Terminal / Position	2	3	1	4
Disconnected	○	○		
Connected	⊖	⊕	○	○

3. If the blower motor voltage is not operated well, substitute with a known-good blower relay and check for proper operation.
4. If the problem is corrected, replace the blower relay.

REPLACEMENT

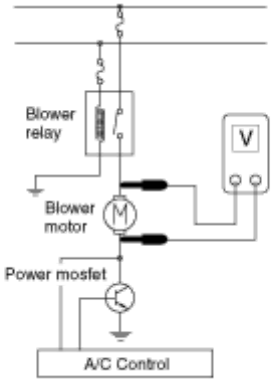
1. Disconnect the negative (-) battery terminal.
2. Disconnect the connector of the blower relay at the below blower unit.
3. Remove the blower relay (A) after loosening the mounting screw.



4. Install in the reverse order of removal.

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	Motor Voltage
	Manual	Auto
First speed	3.80±0.5	3.8±0.5
Second speed	4.29±0.5	4.9±0.5
Third speed	4.77±0.5	6.1±0.5
Forth speed	5.29±0.5	7.2±0.5
Fifth speed	5.74±0.5	8.3±0.5
Sixth speed	6.23±0.5	9.5±0.5
Seventh speed	6.71±0.5	10.6±0.5
Eighth speed	7.20±0.5	Battery (+)
Ninth speed	7.69±0.5	
Tenth speed	8.17±0.5	
Eleventh speed	8.66±0.5	
Twelf speed	9.14±0.5	
Thirteen speed	9.63±0.5	
Fourteen speed	10.11±0.5	
Fifteen speed	10.60±0.5	
Sixteenth speed	Battery (+)	

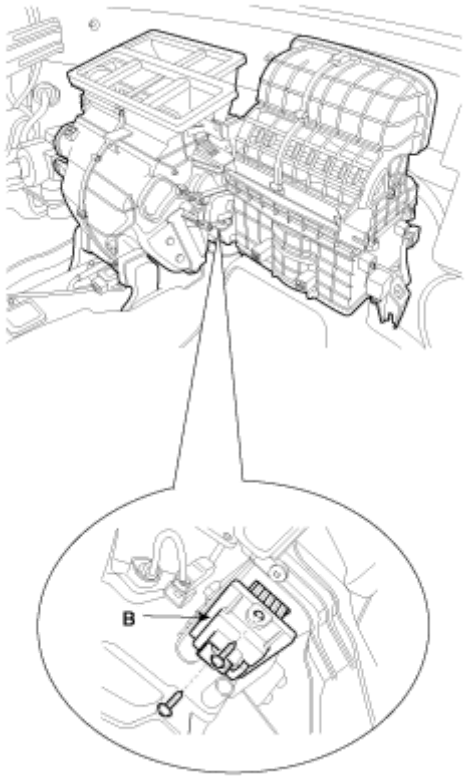
AUTO COOLING: Auto speed (4.5V~B+)
AUTO HEATING: Auto speed (4.6V~10.6V)

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

English ▼

1. Disconnect the negative (-) battery terminal.
2. Disconnect the power mosfet connector at the connecting part between heater and blower unit.
3. Remove the power mosfet (B) after loosening the mounting screws.



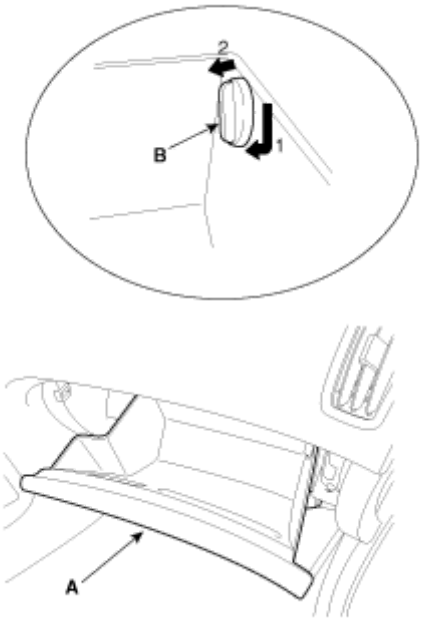
4. Installation is the reverse order of removal.

DESCRIPTION

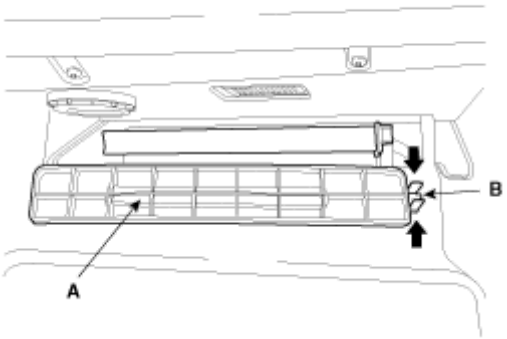
This has particle filter which eliminates foreign materials and odor. The particle filter includes odor filter as well as conventional dust filter to ensure comfortable interior environment.

REPLACEMENT

1. Open the glove box (A). Lower the glove box down completely by removing the glove box stopper (B) to the glove box.



2. Remove the filter cover (A) with pushing the knob (B).



NOTICE

In case of driving in an air-polluted area or rugged terrain, check and replace the air filter as frequently as possible.

Replacement period: 15,000 km (9320 mile)

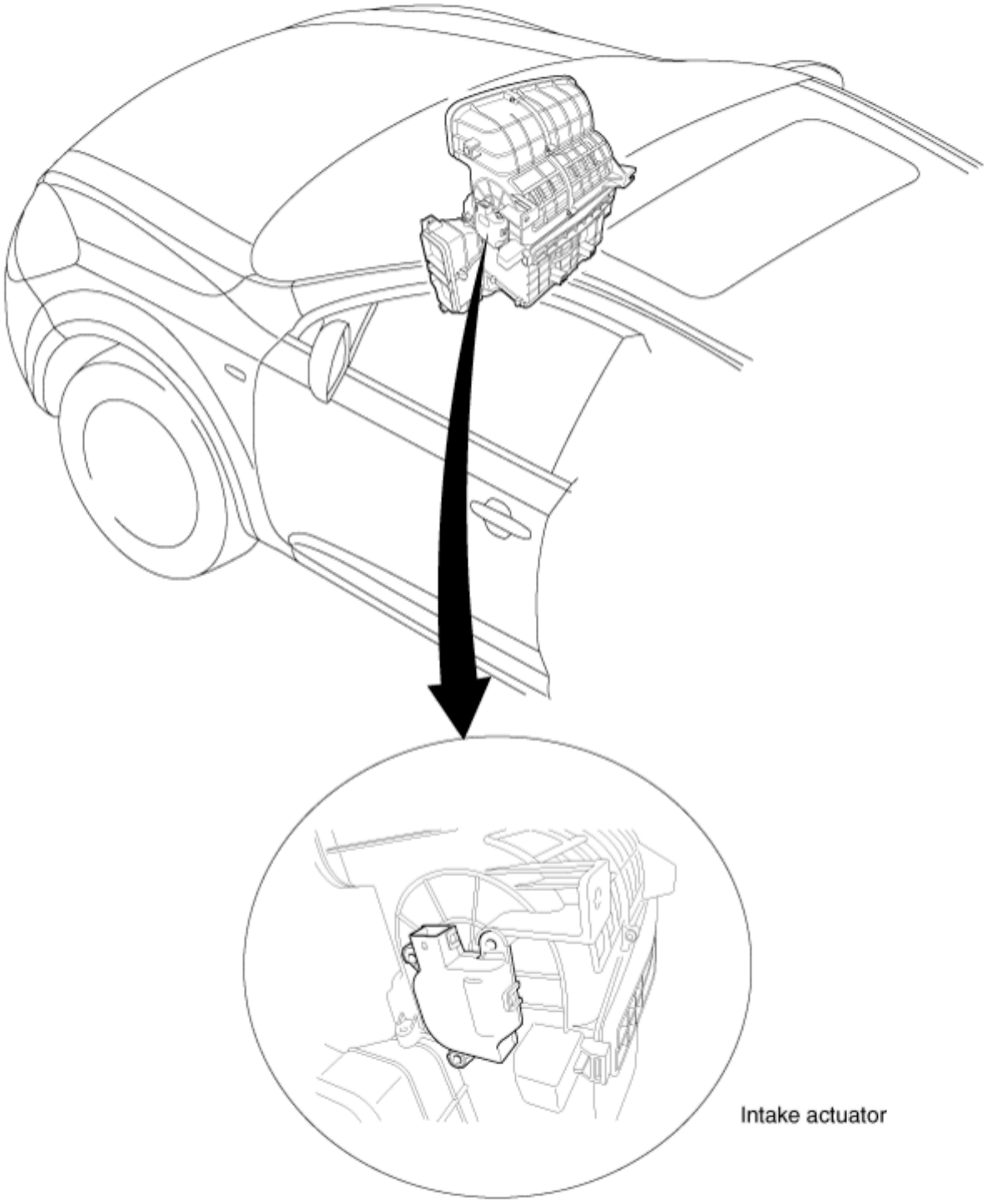
3. Installation is the reverse order of removal.

English

DESCRIPTION

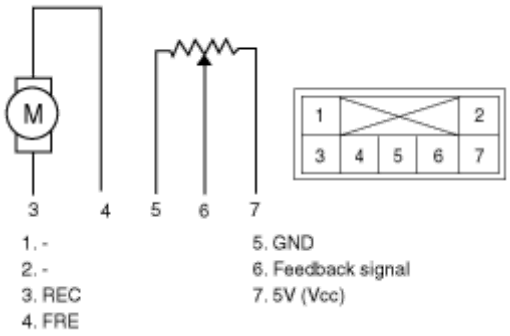
1. The intake actuator is located at the blower unit.
2. It regulates the intake door by signal from control unit.
3. Pressing the intake selection switch will shift between recirculation and fresh air modes.

COMPONENT LOCATION



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. Check the voltage between terminals 5 and 6.

Door position	Voltage (5-6)	Error detecting
Fresh	0.3 ± 0.15V	Low voltage : 0.1V or less
Recirculation	4.7 ± 0.15V	High voltage : 4.9V or more

It will feedback current position of actuator to controls.

6. If the intake actuator is not operated well, substitute with a known-good intake actuator and check for proper operation.
7. 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 (A) from the blower unit.

English ▼

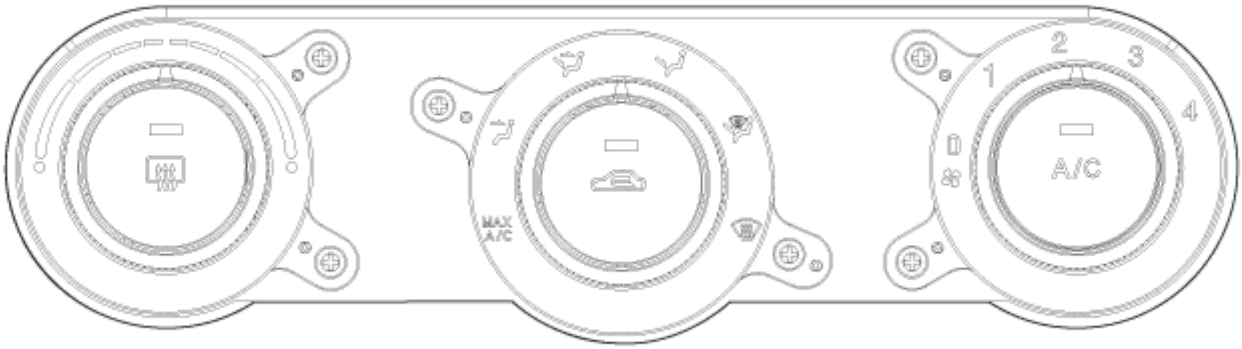


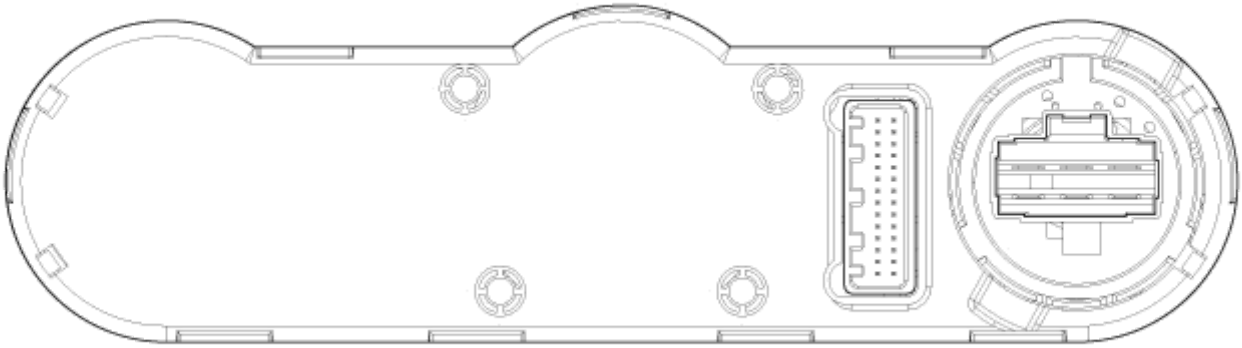
5. Installation is the reverse order of removal.

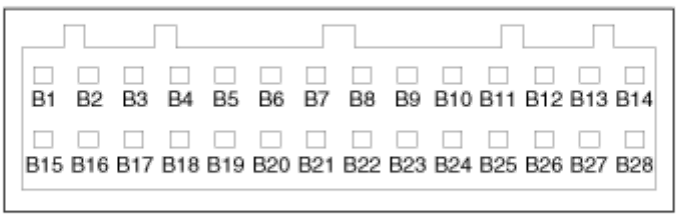
English

CONTROL PANEL

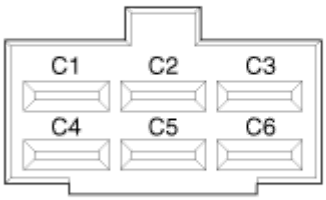
Component







Connector A



Connector B

Connector Pin Function

Connector	Pin	Function	Connector	Pin	Function

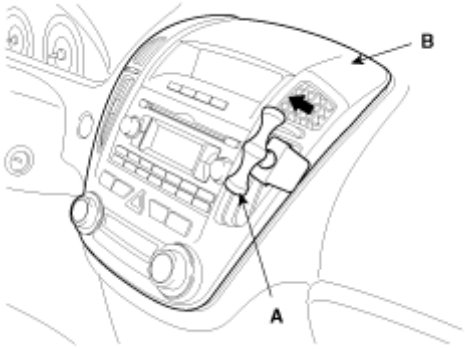
English ▼

Connector (A)	1	Tail lamp (ILL+)	Connector (B)	1	GND
	2	Battery (+)		2	M / High
	3	Rear defog S/W		3	M / LOW
	4	Mode actuator (VENT)		4	High
	5	Mode actuator (DEF)		5	Low
	6	Temp actuator (COOL)		6	-
	7	Temp actuator (WARM)			
	8	Intake actuator (FRE)			
	9	Intake actuator (REC)			
	10	HTD			
	11	Sensor REF (+5V)			
	12	Blower ON signal (-)			
	13	PTC ON signal			
	14	Rheostat(ILL-)			
	15	IGN2			
	16	Max blower ON signal			
	17	PRC relay 2			
	18	PRC relay 3			
	19	Temp actuator F/B			
	20	Mode actuator F/B			
	21	Intake actuator F/B			
	22	Evap sensor (+)			
	23	Amb sensor (+)			
	24	-			
	25	C_CAN - HIGH			
	26	C_CAN - LOW			
	27	Sensor GND			
	28	GND			

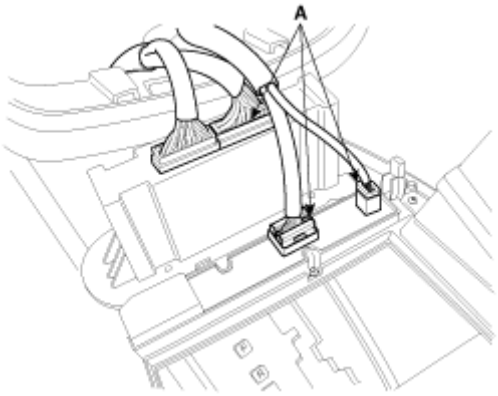
English ▼

REPLACEMENT

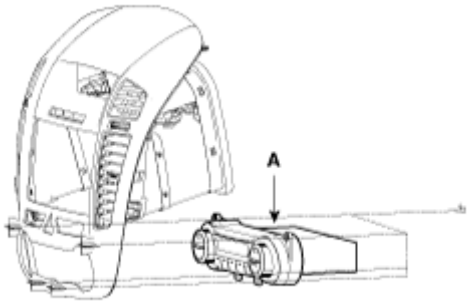
1. Disconnect the negative (-) battery terminal.
2. Put the SST (A) into the space betwen the center facia (B).



3. Disconnect the connectors (A) from the center facia.



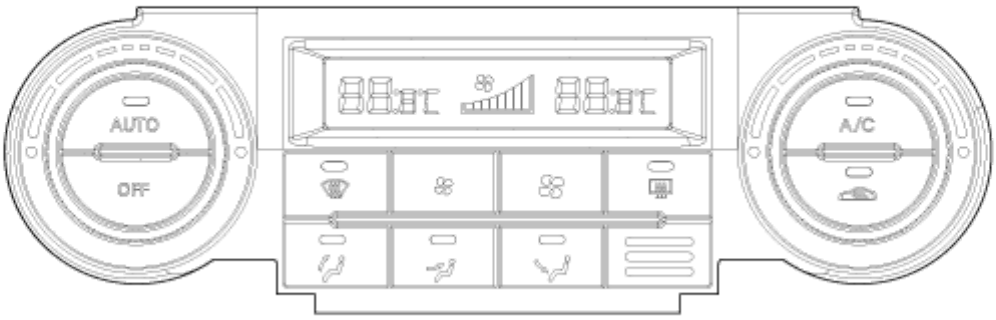
4. Remove the Heater & A/C controller (A) from center facia panel.

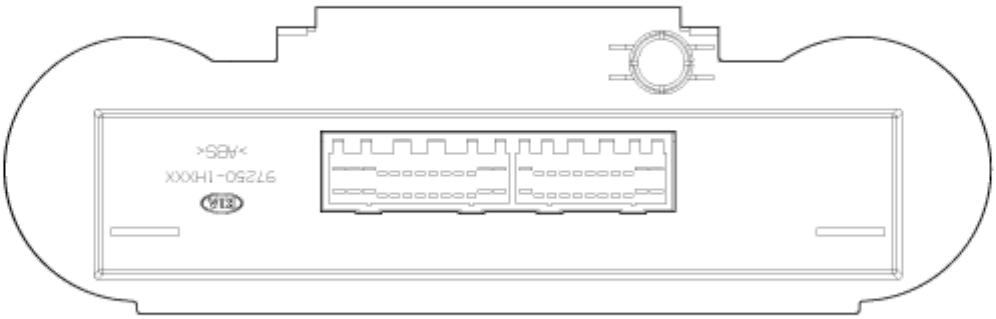


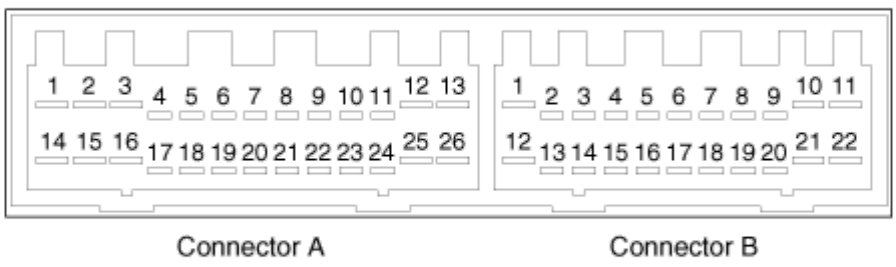
5. Installation is the reverse order of removal.

CONTROL PANEL

Component







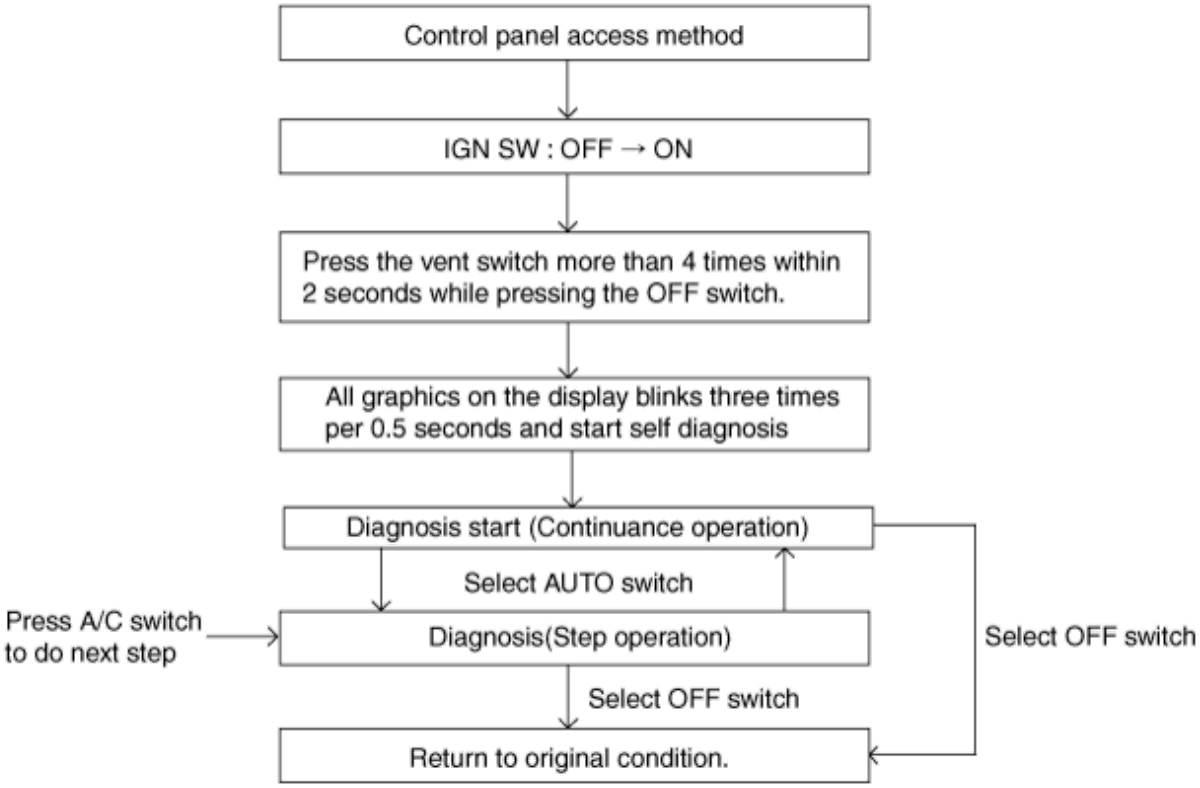
Connector Pin Function

English ▼

Connector	Pin	Function	Connector	Pin	Functi
Connector (A)	1	Tail lamp (+)	Connector (B)	1	Sensor REF (+5V)
	2	Battery (+)		2	-
	3	-		3	Ambient sensor (+)
	4	-		4	-
	5	-		5	-
	6	K-line		6	Evaporator temperature sensor (+)
	7	C_CAN - HIGH		7	-
	8	C_CNA - LOW		8	-
	9	HTD		9	FET (G)
	10	Rear defog S/W		10	FET (D)
	11	-		11	Blower motor (+)
	12	-		12	Sensor GND
	13	Rheostat		13	Temp actuator DR(cool)
	14	IG2		14	Mode actuator DR(warm)
	15	-		15	Photo sensor LEFT(-)
	16	Temp actuator PS(cool)		16	Photo sensor RIGHT(-)
	17	Temp actuator PS(warm)		17	-
	18	Temp actuator PS F/B		18	Temp actuator DR F/B
	19	Mode actuator (vent)		19	-
	20	Mode actuator (def)		20	PTC on signal
	21	Mode actuator F/B		21	PTC RLY 2 (diesel only)
	22	Intake actuator (fre)		22	PTC RLY 3 (diesel only)
	23	Intake actuator (rec)			
	24	Intake actuator F/B			
	25	GND			
	26	GND			

SELF-DIAGNOSIS

1. Self-diagnosis process



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.

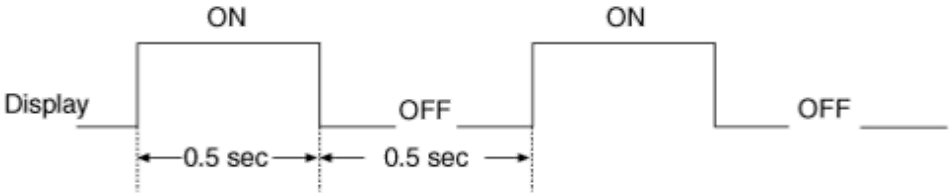
Fault code

Fault code		Fail description
Control unit	DTC	
00	-	Normal
11	B1234	In-car temperature sensor open
12	B1233	In-car temperature sensor short
13	B1238	Ambient temperature sensor open
14	B1237	Ambient temperature sensor short
17	B1242	Evaporator temperature sensor open
18	B1241	Evaporator temperature sensor short
19	B1245	Temperature control actuator feed back open
19	B1246	Temperature control actuator feed back short
20	B2406	Temperature control actuator failure
21	B1249	Mode control actuator open
21	B1250	Mode control actuator short

English ▼

22	B2409	Mode control actuator failure
25	B1208	Intake potentiometer open
25	B1209	Intake potentiometer short
26	B2408	Intake potentiometer failure

3. Fault code display
   (1) Continuance operation



   (2) Continuance operation : DTC code is more two



   (3) Step operation
      A. Nomal or one fault code is same a continuance operation.
      B. DTC code is more two.

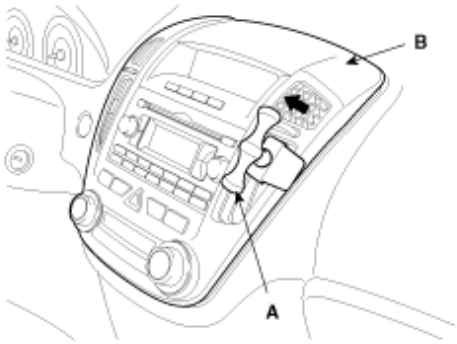


4. If fault codes are displayed during the check, Inspect malfunction causes by referring to fault codes.
5. Fail safe
   (1) Incar sensor : Control with the value of 23°C(73.4°F)
   (2) Ambient temperature sensor: Control with the value of 20°C(67°F)
   (3) Evaporator temperature sensor: Control with the value of -2°C(28.4°F)
   (4) Temperature control actuator (Air mix potentiometer):
   If temperature setting LO-24.5°C, fix at maximum cooling position.
   If temperature setting 25°C-HI, fix at maximum heating position
   (5) Mode control actuator (Direction potentiometer):
   Fix vent position, while selecting vent mode.
   Fix defrost position, while selecting all except vent mode.

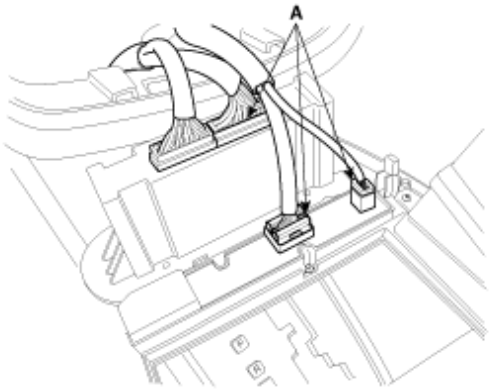
(6) Intake control actuator :
Fix fresh position, while selecting fresh mode.
Fix recirculation position, while selecting recirculation mode.

REPLACEMENT

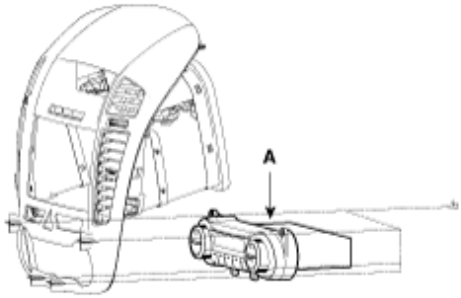
1. Disconnect the negative (-) battery terminal.
2. Put the SST (A) into the space betwen the center facia (B).



3. Disconnect the connectors (A) from the center facia.



4. Remove the Heater & A/C controller (A) after loosening 4 screws.



5. Installation is the reverse order of removal.

SPECIFICATION

Transaxle type		M6GF2
Engine type		Diesel 2.0
Gear ratio	1st	3.615
	2nd	1.794
	3rd	1.542
	4th	1.176
	5th	0.921
	6th	0.732
	Reverse	3.416
Final gear ratio		4.063/2.955

Service Standard

Items	Standard value [in(mm)]
Input shaft rear bearing end play (At 70kgf load)	0.0019T-0(0.05T-0)
1st output shaft bearing end play (At 70kgf load)	0.0019T-0.0039T(0.05T-0.10T)
2nd output shaft front bearing end play (At 70kgf load)	0.0019T-0.0039T(0.05T-0.10T)
Differential bearing end play (At 70kgf load)	0.0059T-0.0078T(0.15T-0.20T)

T: Indicate tightening of -(minus) direction of end play
L: Indicate loosening of +(plus) direction of end play

TIGHTENING TORQUE

Standard value		Nm	kgf.m	lb-ft
Oil drain plug		60-80	6.0-8.0	43.4-57.9
Oil filler plug		30-35	3.0-3.5	21.7-25.3
Shift control cable bracket on transaxle side		15-22	1.5-2.2	10.9-16.0
Rear roll support bracket bolt		60-80	6.0-8.0	43.4-57.8
Front roll support bracket bolt		60-80	6.0-8.0	43.4-57.8
Transaxle support bracket bolts		60-80	6.0-8.0	43.4-57.8
Transaxle mounting bracket bolts		60-80	6.0-8.0	43.4-57.8
Transaxle upper mounting bolts		60-80	4.3-5.5	43.4-57.8
Transaxle lower mounting bolts	to ENG. Oil pan	30-42	3.0-4.2	21.7-30.4
	to ENG. Block	60-80	6.0-8.0	43.4-57.8

WARNING

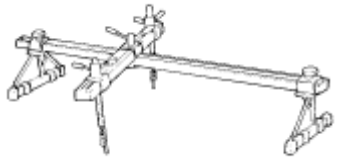
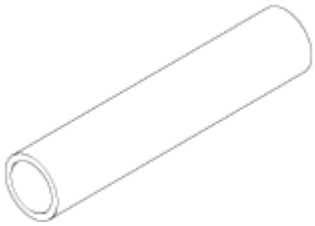
Always follow torque tightening levels. Failure to follow such levels can result in parts breaking if over-tightened or loosening if under-tightened. In either case, serious personal injury or death could result to vehicle occupants.

LUBRICATIONS

English ▼

Items	Recommnend lubricant	Quantity
Transaxle gear oil	SAE 75W/85 API GL-4 TGO-7(MS517-14) ZIC G-F TOP 75W/85 HD GEAR OIL XLS 75W/85	1.9L(2.0US qt, 1.67Imp qt)
Air bleeder	MS721-38	As requried
Transaxle housing	MS721-40 or MS721-38	As requried
Surface of release fork and bearing	Grease (CASMOLY L9508)	As requried

SPECIAL TOOL

TOOL (Number and Name)	Illustration	Use
09200-38001 Engine support fixture		Removal and installation of the transaxle
09624-38000 Crossmember supporter		Supporting of crossmember
09432-3K000 Oil seal installer		Installation of differential oil seal

English ▼

TROUBLESHOOTING

Symptom	Probable cause	Remedy
Vibration, noise	Loose or damaged transaxle and engine mounts	Tighten or replace mounts
	Inadequate shaft end play	Correct end play
	Worn or damaged gears	Replace gears
	Inadequate grade of oil	Replace with specified oil
	Low oil level	Replenish
	Inadequate engine idle speed	Adjust idle speed
Oil leakage	Broken or damaged, oil seal or O-ring	Replace control cable oil seal or O-ring
Hard shift	Faulty control cable	Replace control cable
	Poor contact or wear of synchronizer ring and gear cone	Correct or replace
	Weakened synchronizer spring	Replace synchronizer spring
	Inadequate grade of oil	Replace with specified oil
Jumps out of gear	Worn gear shift fork or broken detent pin	Replace shift fork or detent pin
	Synchronizer hub-to-sleeve spline clearance too large	Replace synchronizer hub and sleeve

SERVICE ADJUSTMENT PROCEDURE

TRANSAXLE GEAR OIL LEVEL

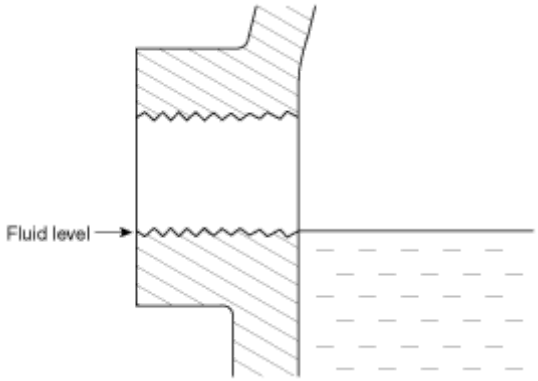
INSPECTION

Inspect each component for evidence of leakage.
Check the gear oil level by removing the filler plug.
If the oil is contaminated, it is necessary to replace it with new oil.

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.

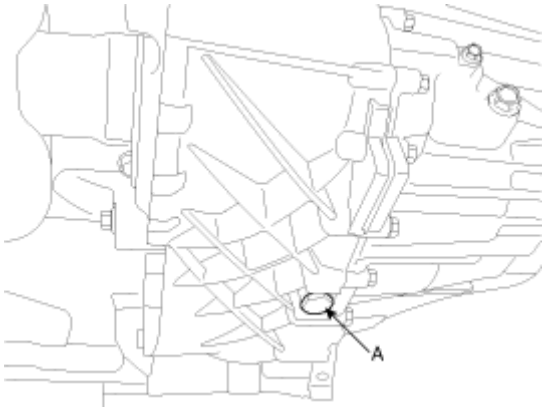


3. Install filler plug.
   Torque : 30-35Nm (3.0-3.5 kgf.m, 21.7-25.3 lb-ft)

REPLACEMENT

1. With the vehicle parked on a level surface, remove the drain plug.
2. Drain the transaxle oil after loosening the drain plug(A).

English ▼



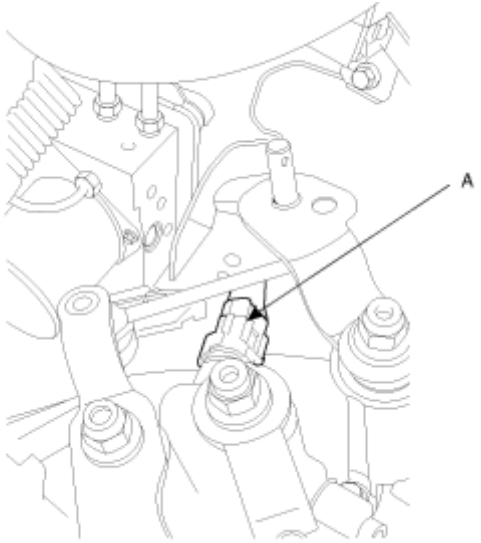
3. Install the drain plug with new washer.
   Torque : 60-80Nm (6.0-8.0 kgf.m, 43.4-57.9 lb-ft)

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: 1.9 liter (2.0 US qt, 1.67 Imp qt)

BACKUP LAMP SWITCH

INSPECTION

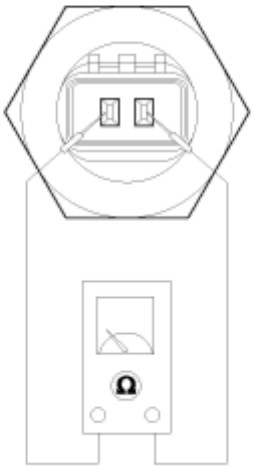
1. Disconnect the backup lamp switch(A).



2. Check the continuity between no. 1 and 2 terminals of backup lamp switch.
   When the shift lever is in reverse, there should be contunuity.

Condition	1	2
Reverse Range	●	●
Other Range		

*The back up Lamp "ON" shall keep over 0.5mm(0.02in) From ON-OFF poinrt.

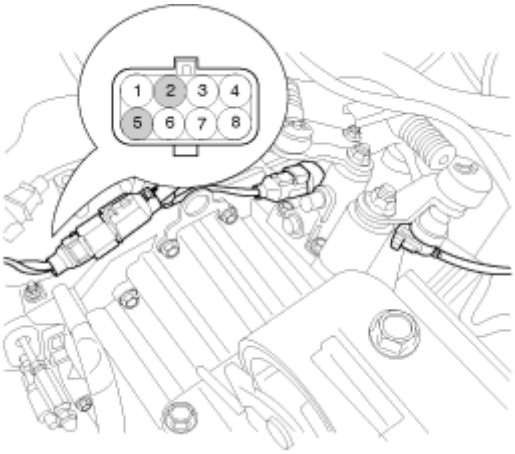


3. If necessary, repair or replace the backup lamp switch.
   Torque : 30-35Nm (3.0-3.5 kgf.m, 21.7-25.3 lb-ft)

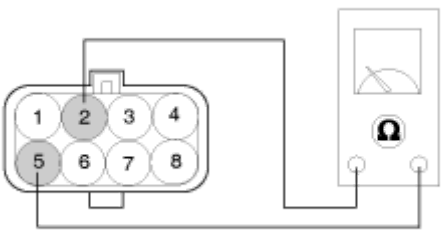
NEUTRAL SWITCH

INSPECTION

1. Disconnect the common connector (A).

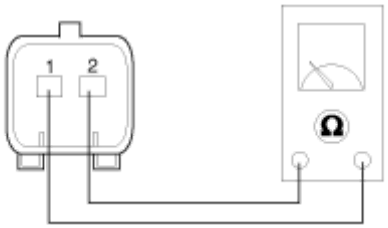


2. Check the continuity between no. 2 and 5 terminals when the shift lever is in neutral position. If there isn't continuity, go to next step.



3. Disconnect the neutral switch connector.
4. Check the continuity between no. 1 and 2 terminals of neutral switch, when the shift lever is in neutral position, there should be continuity.

Condition	1	2
Neutral	●	●
Other		

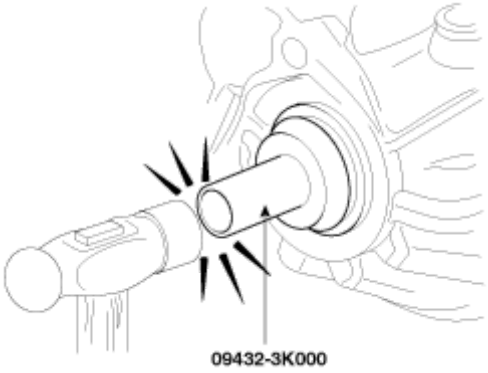


5. If necessary, repair or replace the neutral switch.
   Torque : 30-35 Nm (3.0-3.5 kgf.m, 21.7-25.3 lb-ft)

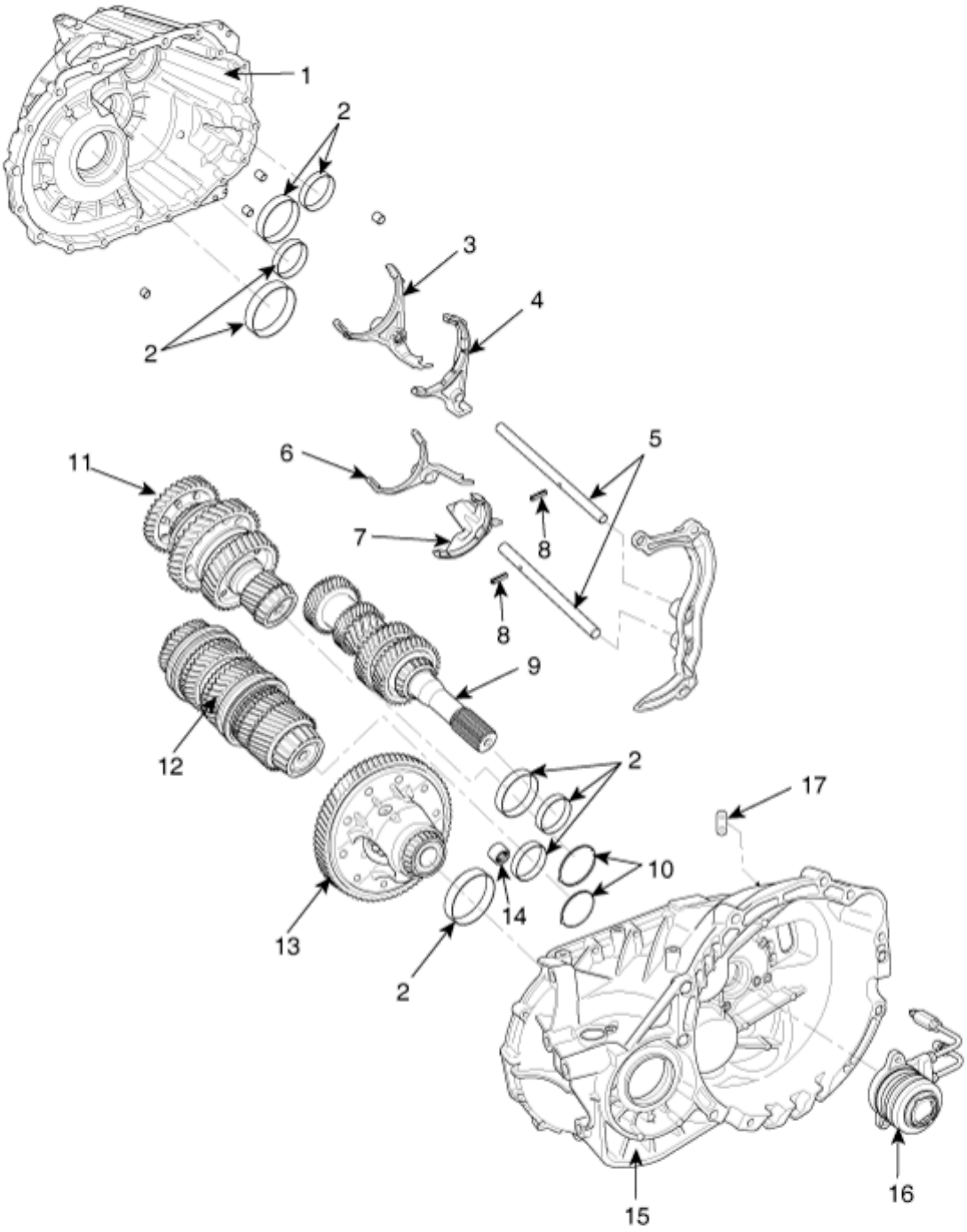
DRIVE SHAFT OIL SEAL

REPLACEMENT

1. Disconnect the drive shaft from the transaxle. (refer to Drive shaft in DS group)
2. Using a flat-tip screwdriver, remove the oil seal.
3. Using the special tool(09432-3K000), tap the drive shaft oil seal into the transaxle.



COMPONENTS



1. Transaxle case
2. Taper roller bearing outer race
3. 1st/2nd shift fork
4. Reverse shift fork
5. Shift rail
6. 3rd/4th shift fork
7. 5th/6th shift fork
8. Spring pin
9. Input shaft
10. Oil guide
11. 1st output shaft
12. 2nd output shaft
13. Differential assembly
14. Needle bearing
15. Clutch housing
16. Concentric slave cylinder assembly
17. Boot

REMOVAL

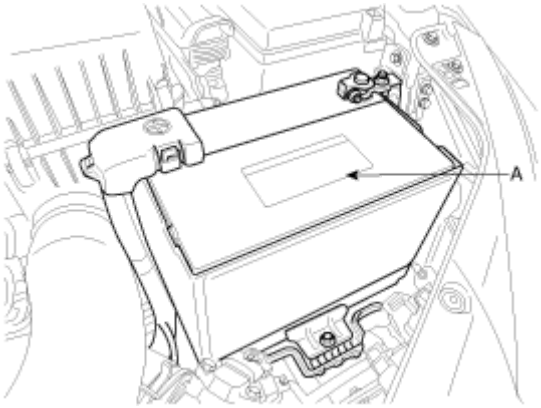
CAUTION

- Use fender covers to avoid damaging painted surfaces.
- To avoid damage, unplug the wiring connectors carefully while holding the connector portion.

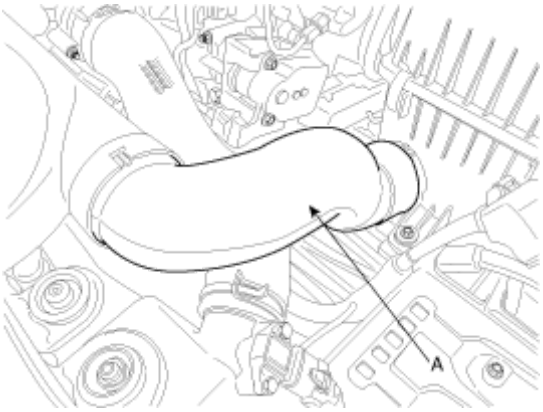
NOTICE

- Mark all wiring and hoses to avoid misconnection.

1. Remove the engine cover. (refer to Engine and Transaxle Assembly in EM group)
2. Remove the battery (A) after removing the battery terminal.

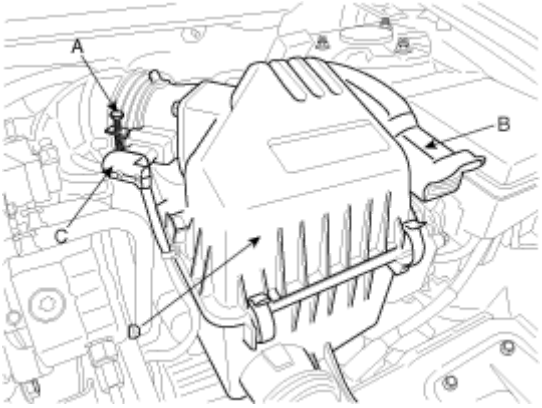


3. Disconnect the air intake hose (A).

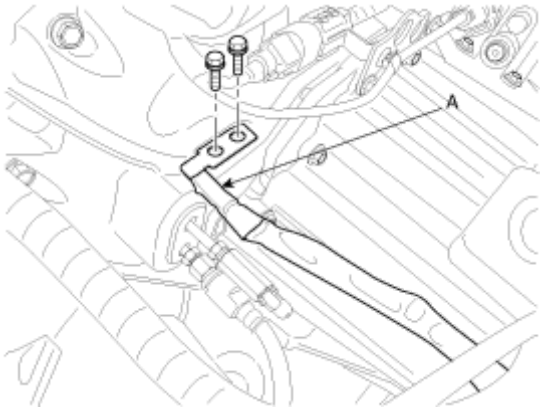


4. Remove the air cleaner assembly (D) by disconnecting the clamp (A), the PCM connector (B), and AFS connector (C).

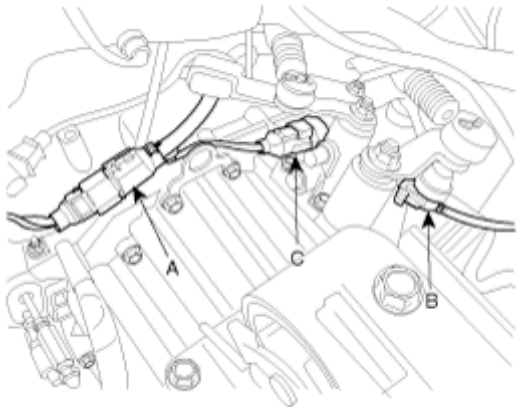
English ▼



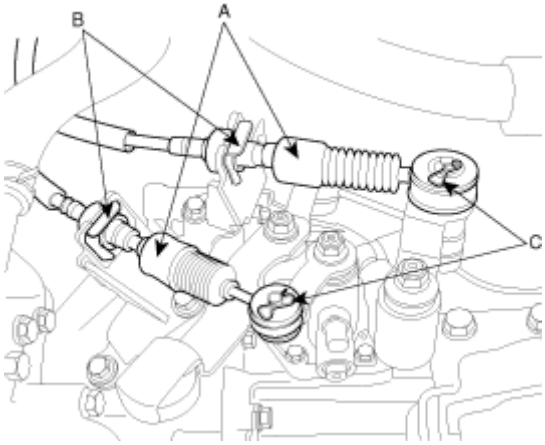
5. Remove the ground cable from transaxle (A).



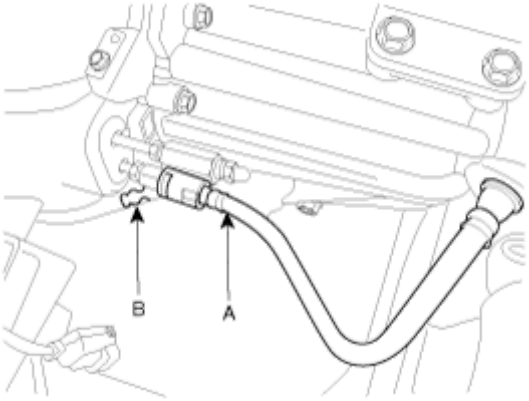
6. Disconnect the vehicle speed sensor connector (A), the back up lamp switch (B) and the neutral position switch (C).



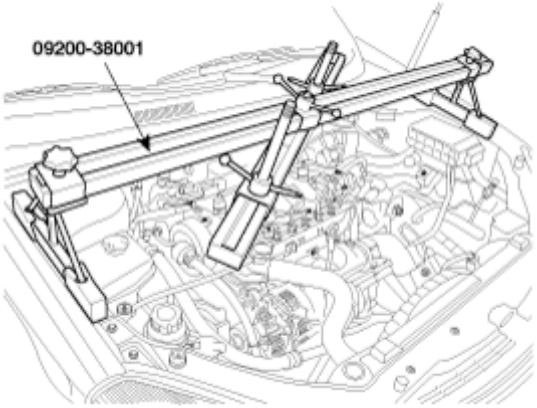
7. Remove the control cable assembly (A) by removing the snap pins (C) and clips (B).



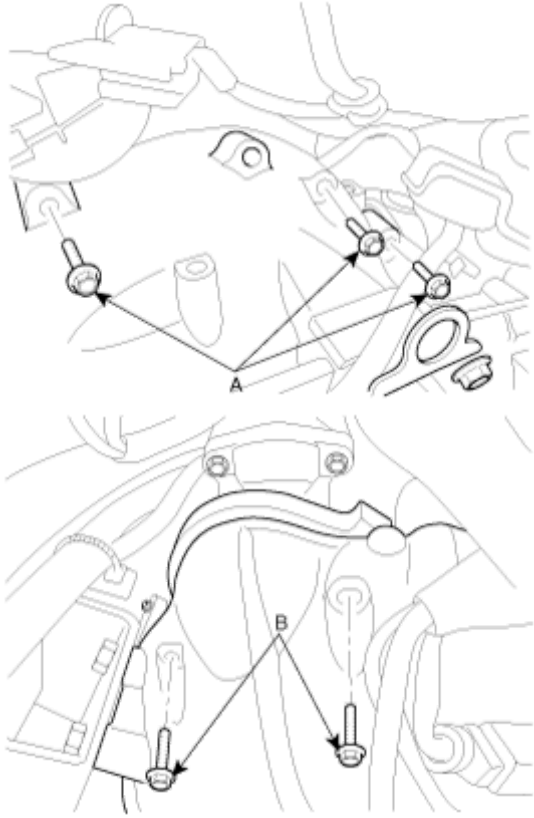
8. After removing the clip(B) with clamping the concentric slave cylinder tube, disconnect the tube(A).



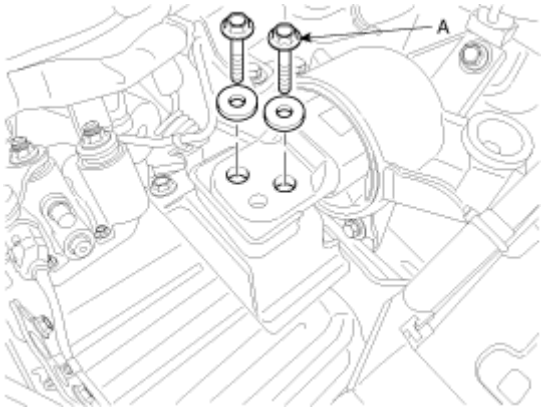
9. Using the special tool (09200-38001), support the engine assembly safely.



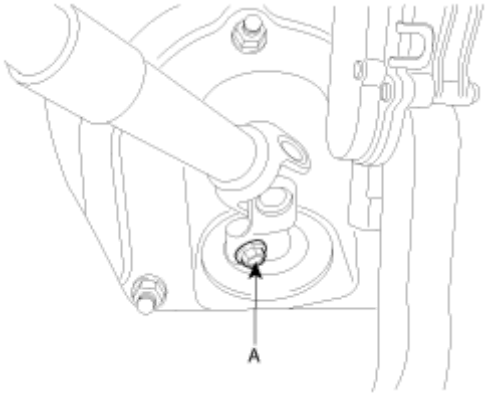
10. Remove the transaxle upper mounting bolts (A-3ea) and the starter motor mounting bolts (B-2ea).



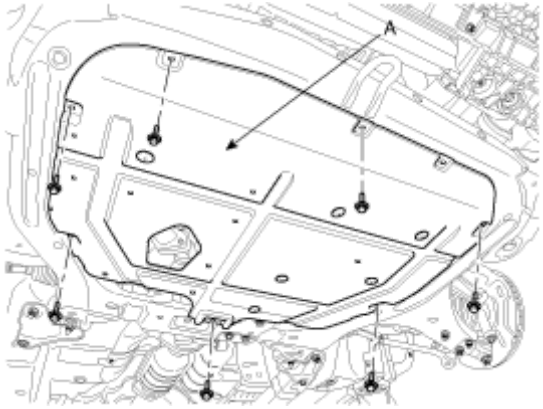
11. Remove the transaxle support bracket mounting bolts (A-2ea).



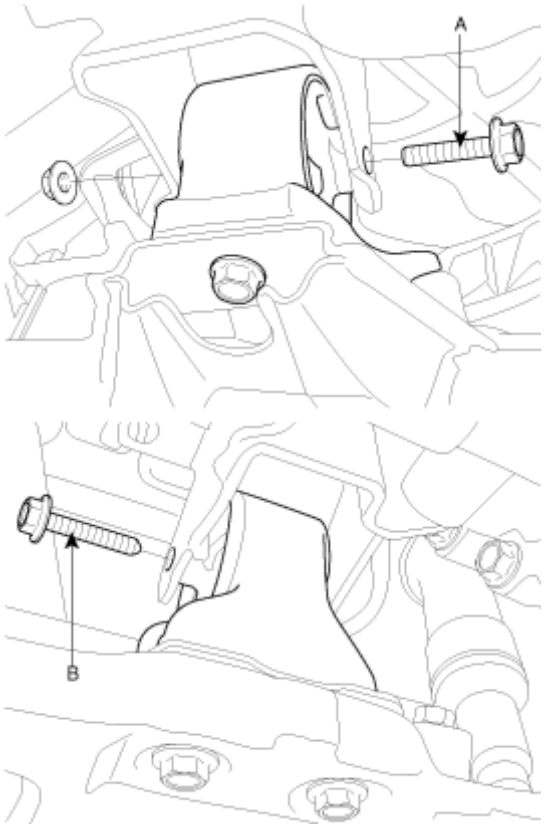
12. Remove the steering joint assembly bolt. (refer to Steering column/shaft in ST group)



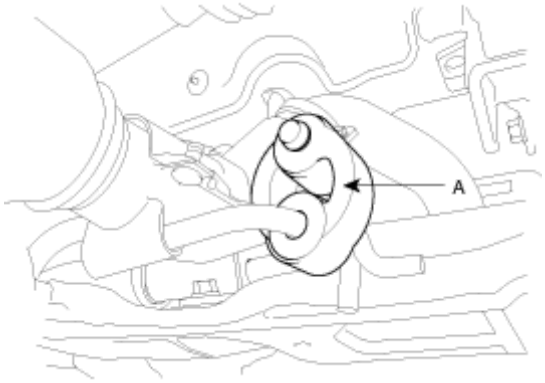
13. Lifting up the vehicle.
14. Remove the front wheels and tires. (refer to Front suspension system in SS group)
15. Remove the lower arm ball joint mounting nut, the stabilizer link mounting nut, and the tie rod end mounting nut from the front knuckles. (refer to Front suspension system in SS group)
16. Remove the under shield cover(A).



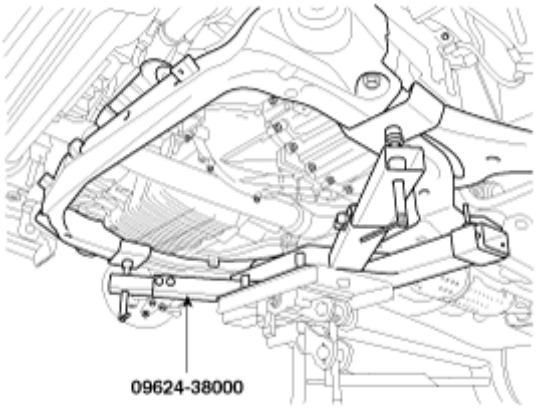
17. Remove the roll stopper mounting bolts (A,B).



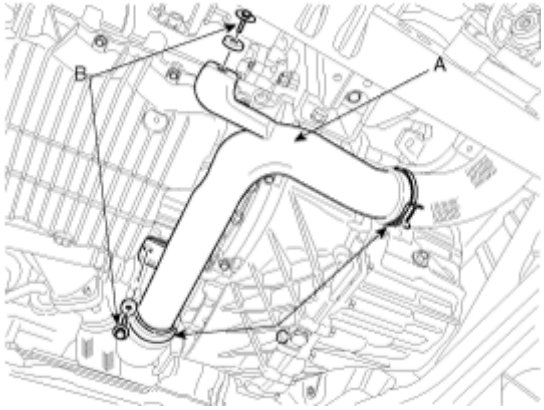
18. Disconnect the muffler hanger rubber (A).



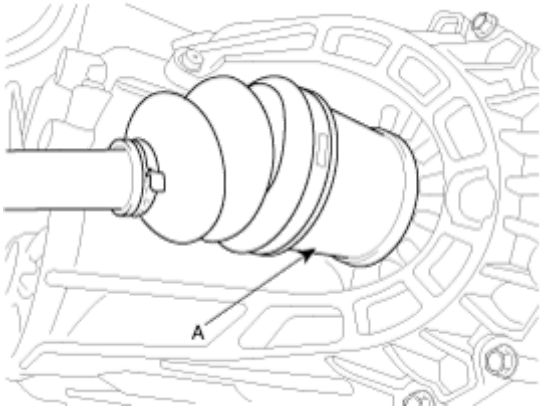
19. Supporting the sub frame (A) with a jack and the Special tool (09624-38000), remove the mounting bolts.(refer to Front Stabilizer in SS group)

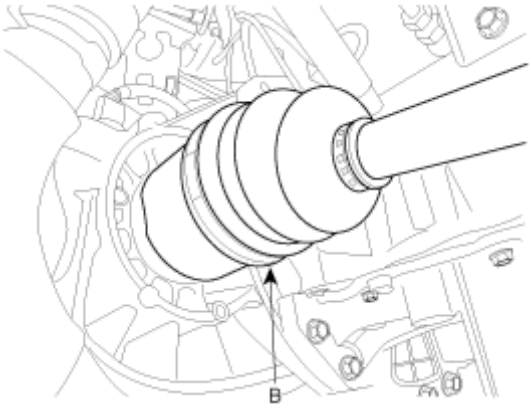


20. Remove the intercooler tube (A) by removing the two bolts (B) and loosening the clamps (C).

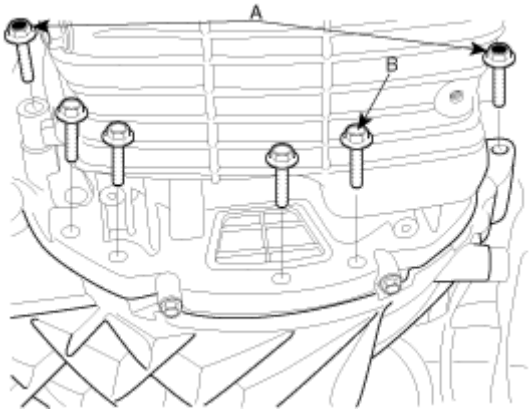


21. Disconnect the drive shafts (A,B) from the transaxle.





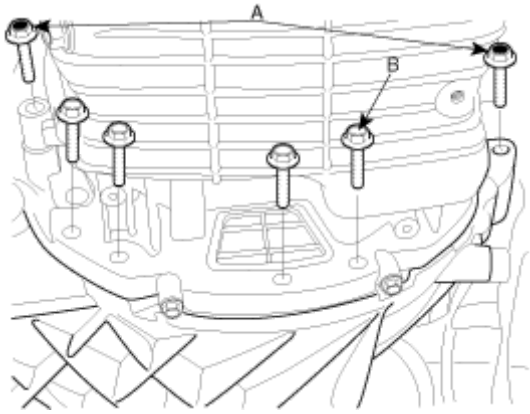
22. Supporting the transaxle with a jack, remove the transaxle lower mounting bolts(A-2ea, B-4ea).



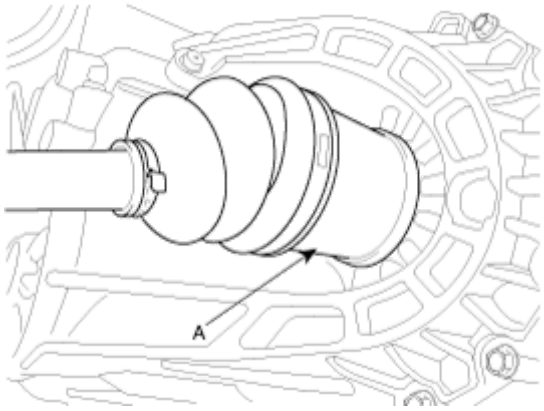
23. Lowering the jack slowly, remove the transaxle.

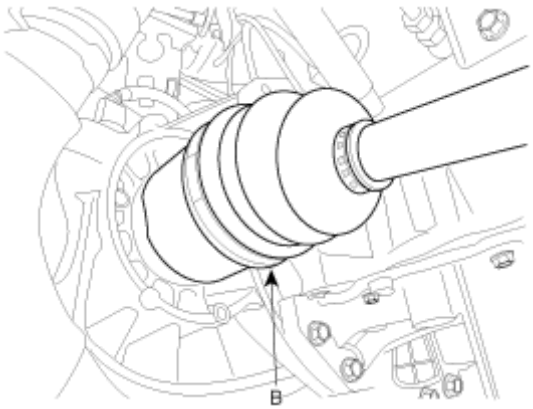
INSTALLATION

1. Install the transaxle lower mounting bolts (A-2ea,B-4ea) after fitting the transaxle assembly into the engine assembly.
   Torque :
   [A] 80-100Nm (8.0-10.0kgf.m,57.9-72.3 lb-ft)
   [B] 30-42Nm (3.0-4.2kgf.m,21.7-30.4 lb-ft)

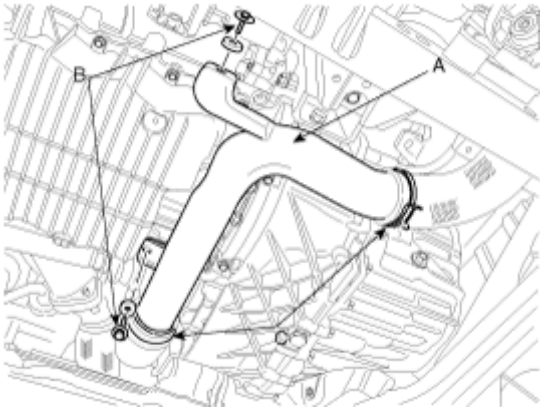


2. Connect the drive shafts(A,B) to the transaxle.

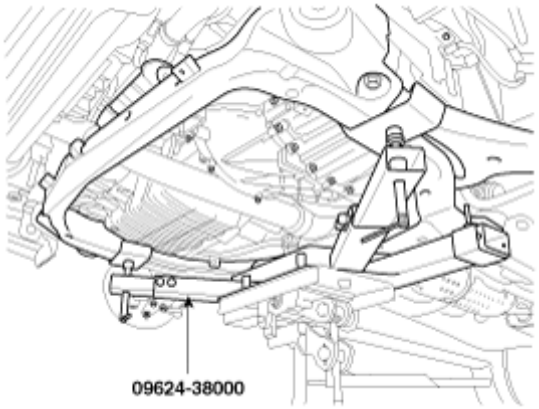




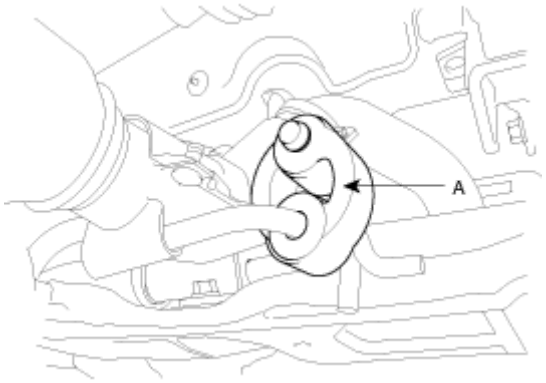
3. Install the intercooler tube (A) by installing the two bolts (B) and tightening the clamps (C).



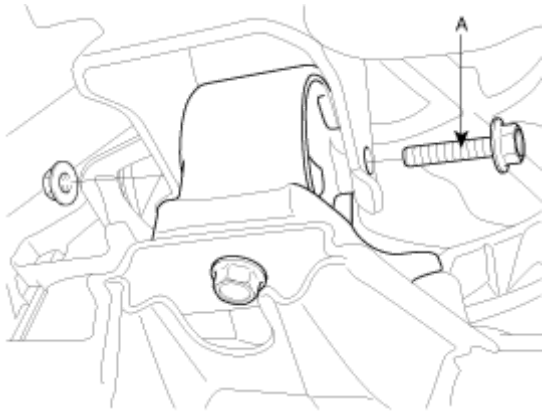
4. Supporting the sub frame(A) with a jack and the Special tool(09624-38000), install the mounting bolts. (refer to Front Stabilizer in SS group)
   Torque : 140-160Nm(14-16kgf.m,101-118 lb-ft)

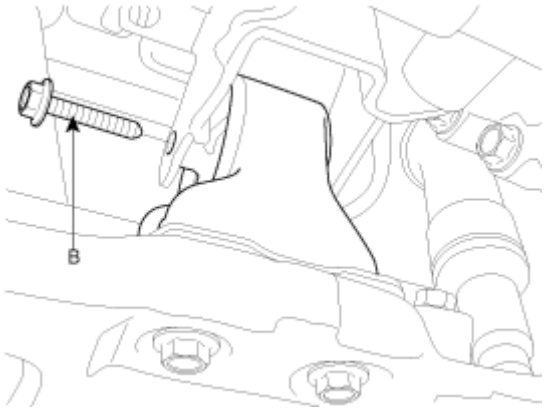


5. Install the muffler hanger rubber (A).

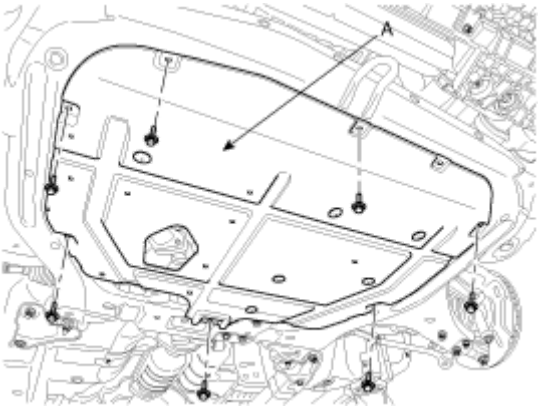


6. Install the roll stopper bracket bolts(A,B).
   Torque : 50-65Nm(5-6.5kgf.m, 36.2-47.0 lb-ft)





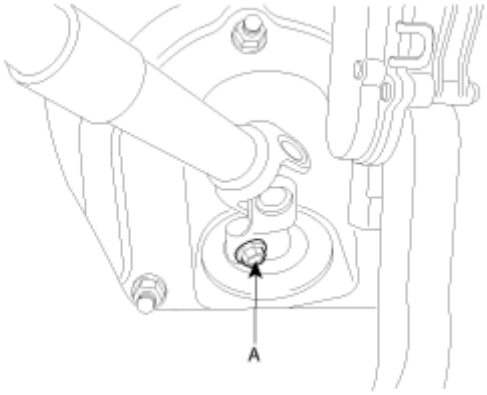
7. Install the under shield cover (A).



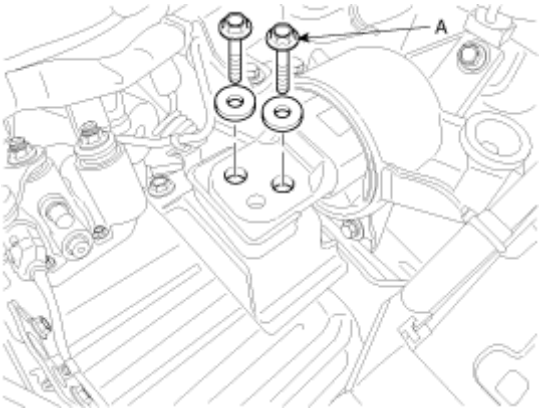
8. Install the lower arm ball joint mounting nut, the stabilizer link mounting nut, and the tie rod end mounting nut to the front knuckles. (refer to Front suspension system in SS group)

9. Install the front wheels and tires. (refer to Front suspension system in SS group)

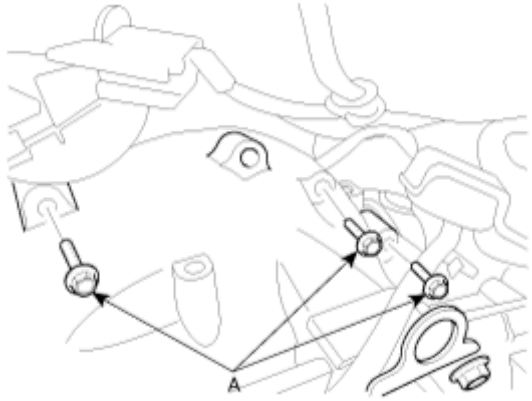
10. Install the steering joint assembly bolt (A). (refer to Steering column/shaft in ST group)
    Torque : 18-25Nm (1.8-2.5kgf.m, 13.0-18.1 lb-ft)

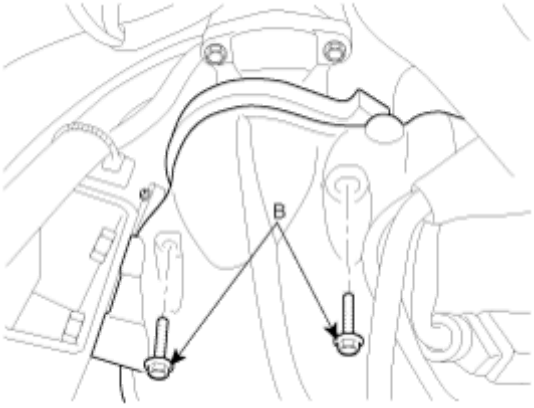


11. Install the transaxle support bracket mounting bolts (A-2ea).
    Torque : 60-80Nm (6.0-8.0kgf.m, 43.4-57.9 lb-ft)

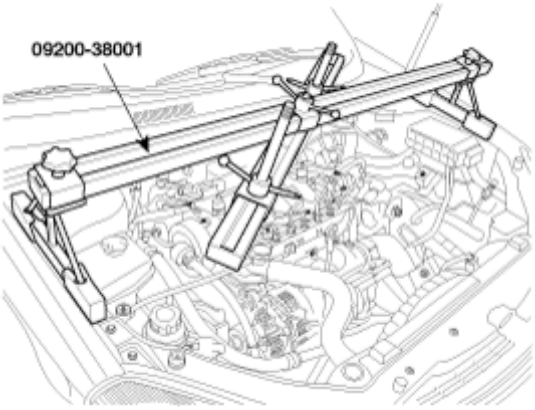


12. Install the transaxle upper mounting bolts (A-3ea) the starter motor mounting bolts. (B-2ea).
    Torque :
    [A] 43-55Nm(4.3-5.5kgf.m, 43.4-57.9 lb-ft)
    [B] 43-55Nm(4.3-5.5kgf.m, 31.1-39.8 lb-ft)

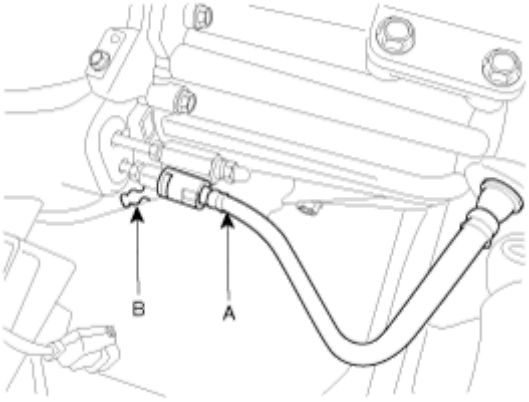




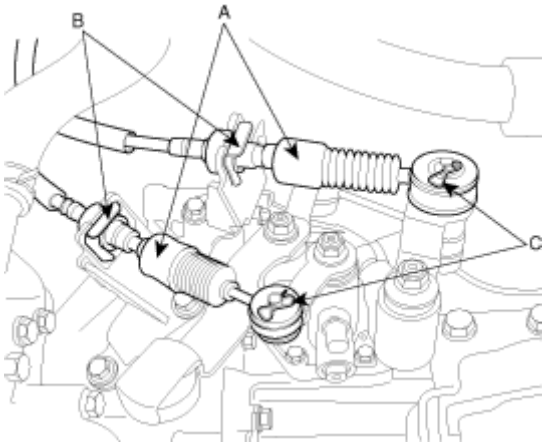
13. Remove the special tool (09200-38001).



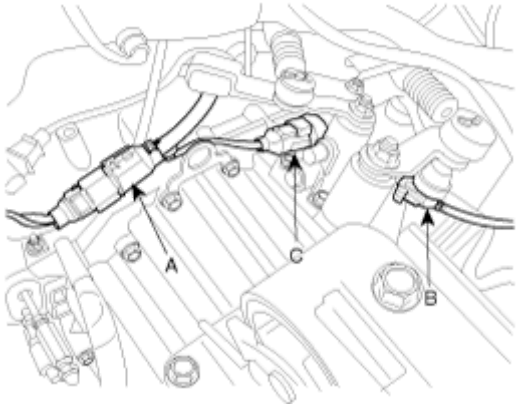
14. Connecting the concentric slave cylinder tube(A) install the clip(B).



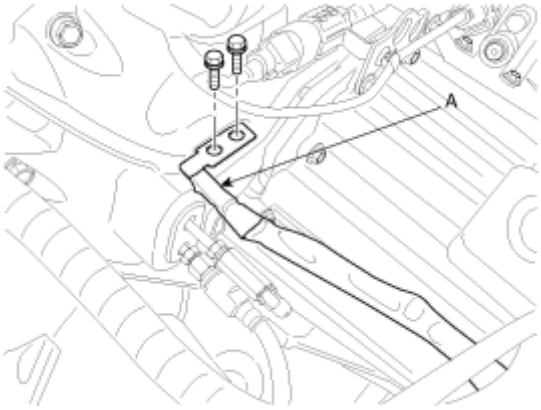
15. Install the shift cable assembly (A) by installing the clips (B) and pins (C).



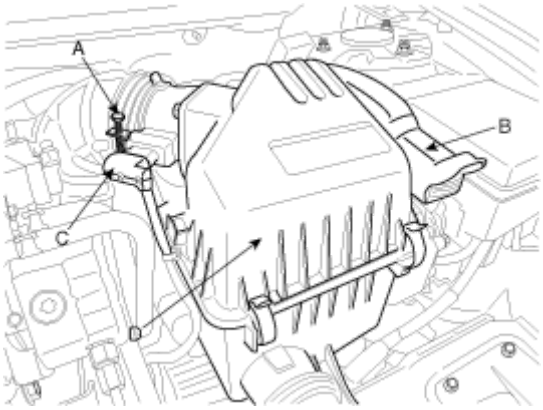
16. Connect the vehicle speed sensor connector (A), the back up lamp switch (B) and the neutral position switch (C).



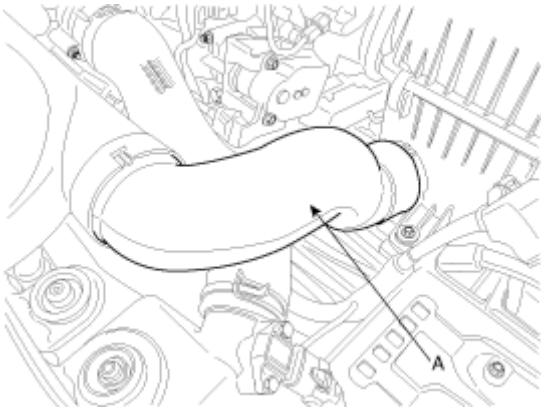
17. Install the ground cable (A) to transaxle.



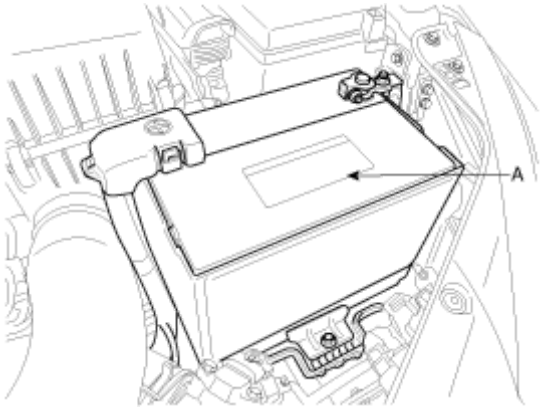
18. Install the air cleaner assembly (D) by connecting the clamp (A), the ECM connector (B), and the AFS connector (C).



19. Connect the air intake hose (A).



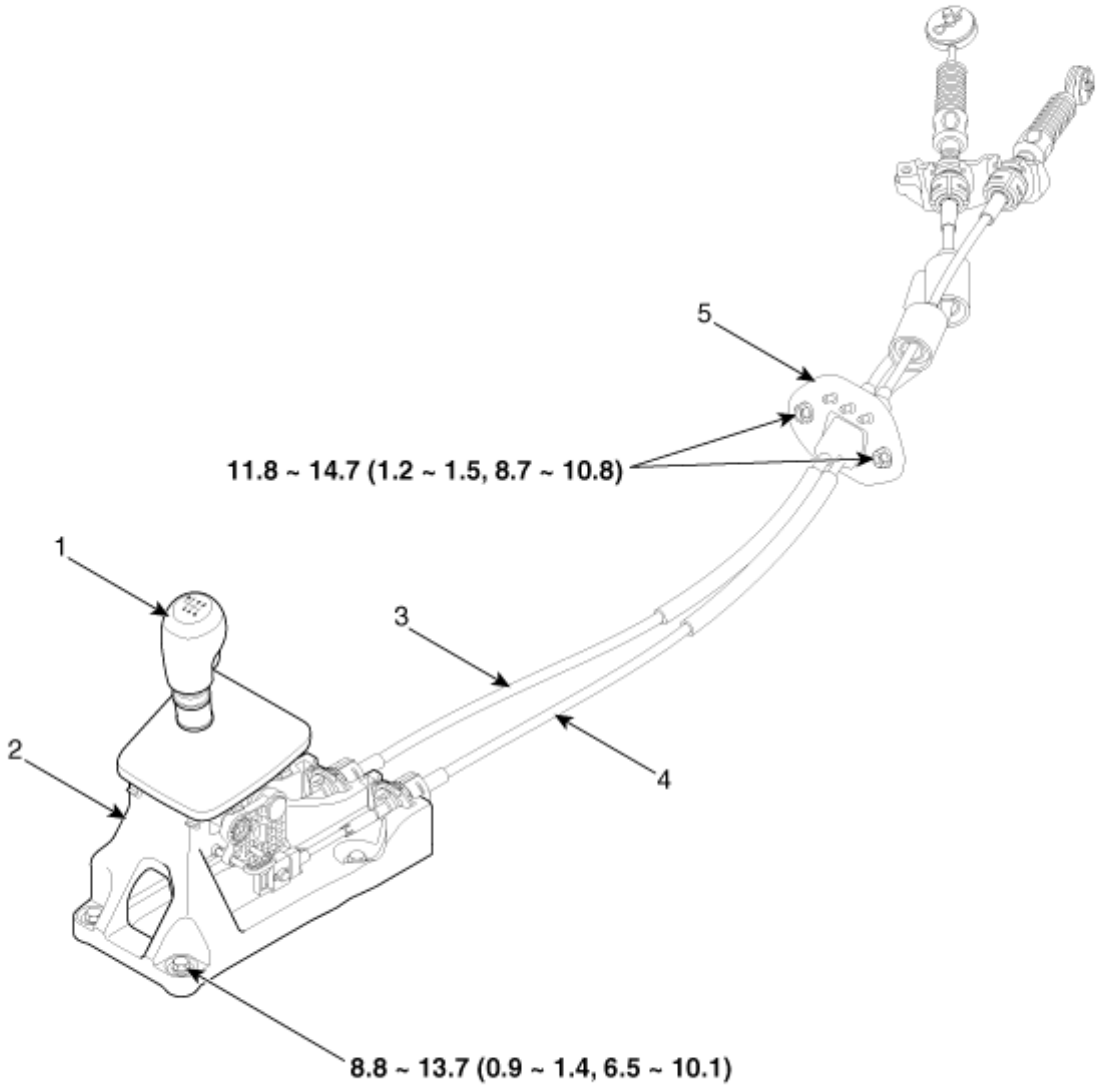
20. Install the battery (A) and the battery terminal.



21. Install the engine cover. (refer to Engine and Transaxle Assembly in EM group)

English

COMPONENTS



Torque : N.m (kgf.m, lb-ft)

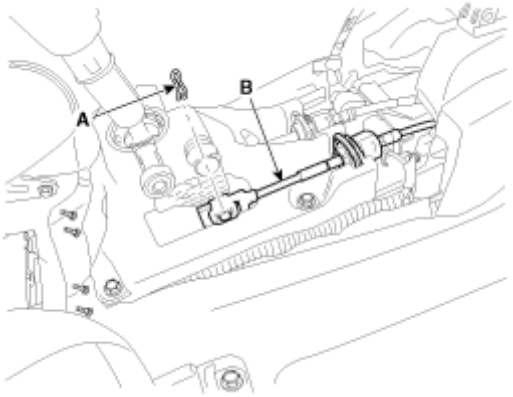
1. Shift lever knob 2. Shift lever assembly 3. Shift cable assembly	4. Select cable assembly 5. Retainer

REMOVAL

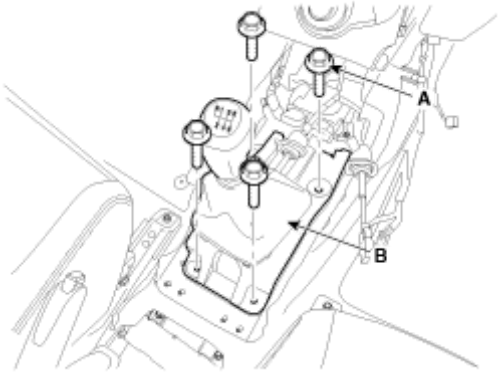
Shift Lever Assembly Replacement

1. Remove the floor console assembly.
   (Refer to "Interior(Console)" in BD group)

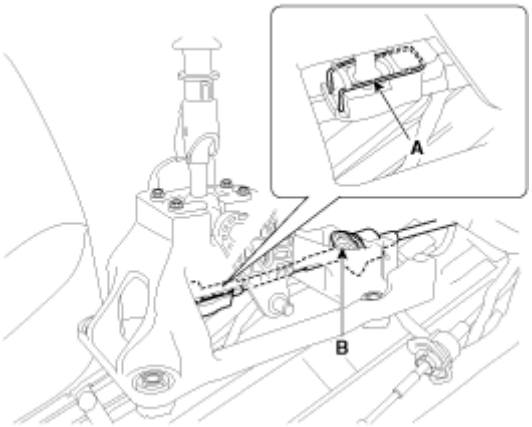
2. Remove the snap pin (A) and the select cable (B).



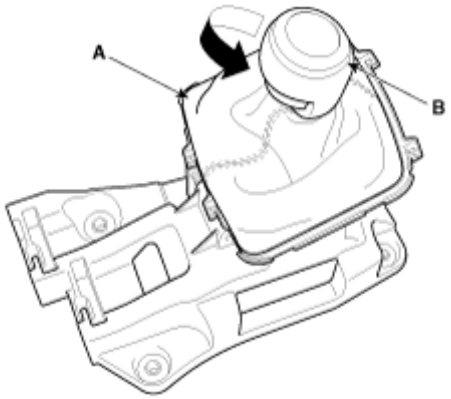
3. Remove the shift lever assembly (B) after removing shift lever assembly mounting bolts (A).
   Tightening torque:
   8.8 ~ 13.7 N.m (0.9 ~ 1.4 kgf.m, 6.5 ~ 10.1 lb-ft)



4. Remove the pin (A) after disconnect the shift cable (B).



5. Remove the boots (A) and knob (B) from the lever assembly by rotating counter-clockwise.



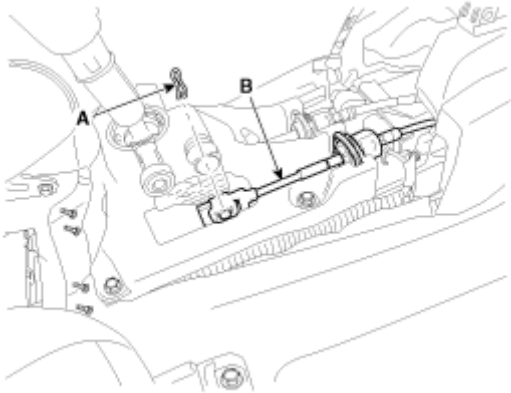


6. Installation is the reverse of removal.

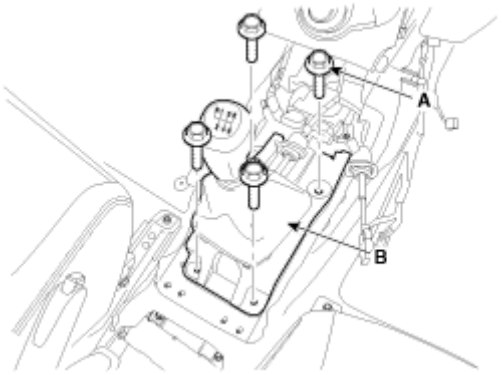
> **NOTICE**
>
> - Make sure vehicle does not roll before setting room side shift lever and T/M side manual control lever to "N" position.

Shift Cable Replacement

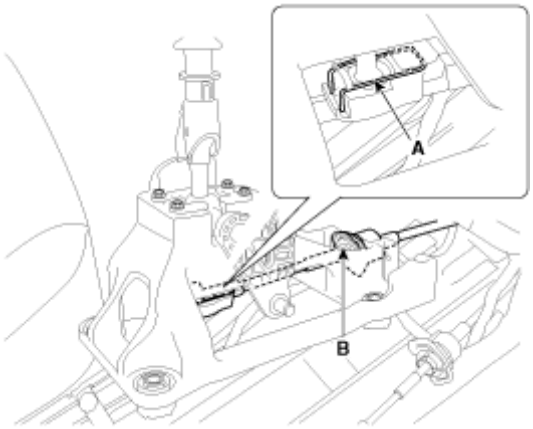
1. Remove the floor console assembly.
   (Refer to "Interior(Console)" in BD group)
2. Remove the snap pin (A) and select cable assembly (B).



3. Remove the shift lever assembly (B) after removing shift lever assembly mounting bolts (A).
   Tightening torque:
   8.8 ~ 13.7 N.m (0.9 ~ 1.4 kgf.m, 6.5 ~ 10.1 lb-ft)

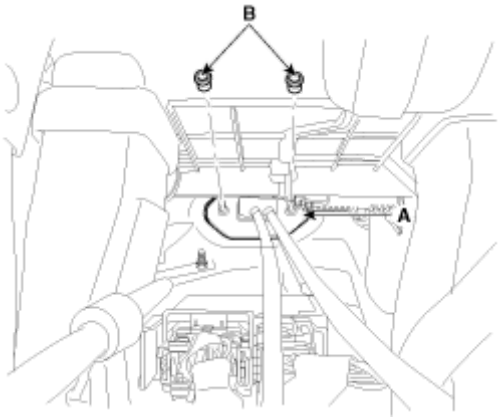


4. Remove the pin(A) after disconnect the shift cable (B).

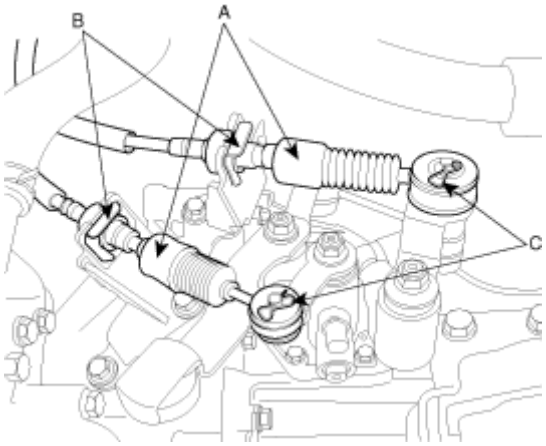


5. Remove the retainer (A) and nut (B).

   Tightening torque:
   11.7 ~ 14.7 N.m (1.2 ~ 1.5 kgf.m, 8.6 ~ 10.8 lb-ft)



6. Remove the snap pins (C) and clips (B) and then remove the shift & select cable (A).



7. Remove the shift cable and select cable at cabin room.

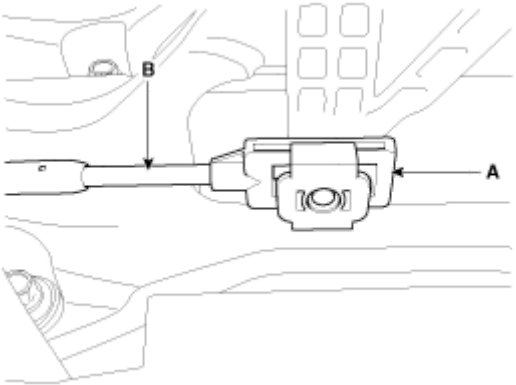
> **NOTICE**
>
> - Make sure vehicle does not roll before setting room side shift lever and T/M side manual control lever to "N" position.

INSPECTION

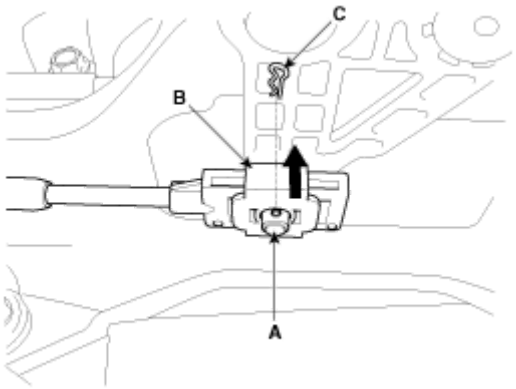
1. Check the select cable for proper operation and for damage.
2. Check the shift cable for proper operation and for damage.
3. Check the boots for damage.
4. Check the boots for wear abrasion sticking, restricted movement or damage.
5. Check for the weak or damaged spring.

INSTALLATION

1. Installation is the reverse of removal.

> **NOTICE**
>
> - Make sure vehicle does not roll before setting room side shift lever and T/M side manual control lever to "N" position.
> - Install the guide member (A) of the select cable (B).
>
> 
>

- Adjust the slide clip (B) to fit it into the select lever pin (A) and install the snap pin (C).



PRECAUTIONS

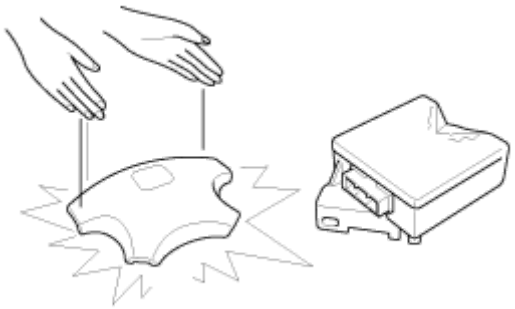
GENERAL PRECAUTIONS

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.

> **NOTICE**
>
> 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.



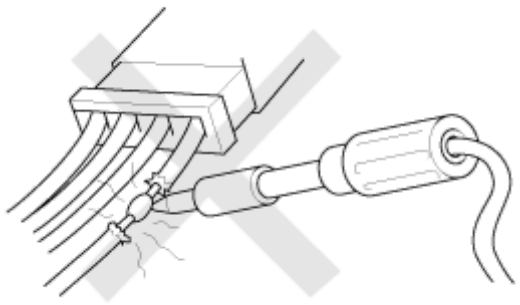
English ▼

- 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 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. The airbags could accidentally deploy and cause damage or injury.
- After a collision in which the airbags were deployed, replace the front airbags and the SRS unit. After a collision in which the side airbag was deployed, replace the side airbag, the front impact sensor and side impact sensor on the side where the side airbag deployed and the SRS unit. 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 (les30 ~ 80% relative humidity, no moisture) area.

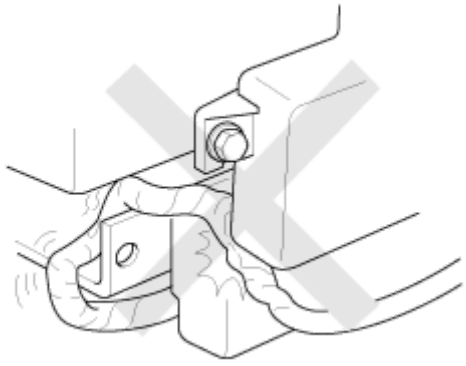
WIRING PRECAUTIONS

SRS wiring can be identified by special yellow outer covering (except the front wiring harness).
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.



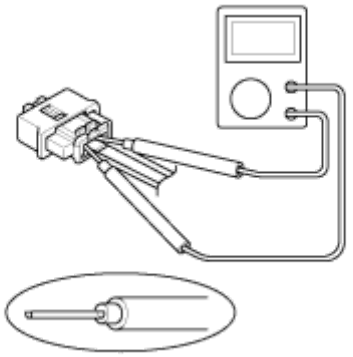
- Be sure to install the harness wires so that they are not pinched, or interfere with other parts.



- 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.

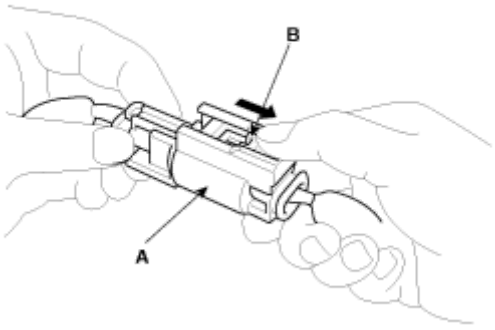


- Use a u-shaped probe. Do not insert the probe forcibly.
- Use specificed service connectors for troubleshooting.
  Using improper tools could cause an error in inspection due to poor metal contact.

AIRBAG CONNECTOR

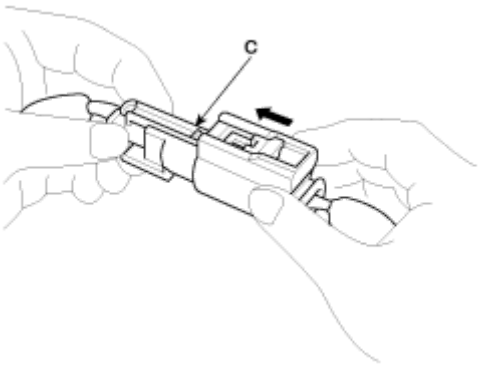
DISCONNECTING

To release the lock, pull the spring-loaded sleeve (A) and the 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.


C

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.

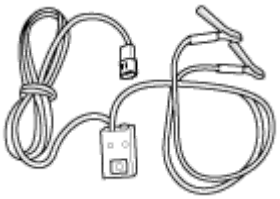
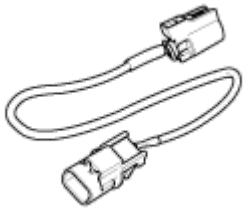
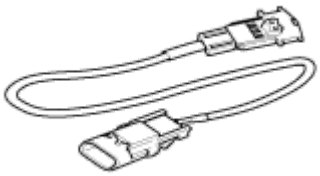
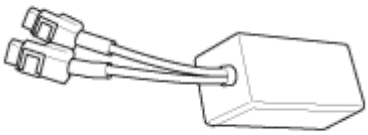
SRSCM (SRS CONTROL MODULE)

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. Safety sensor: Safety sensor is located in airbag ignition circuit. Safety sensor will operate airbag circuit at any deployment condition and release airbag circuit safely at normal driving condition. Safety sensor is a double contact electro-mechanical switch that will close detecting deceleration above certain criteria.
3. 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.
4. 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 GDS. (GDS)
5. 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.
6. Trouble code registration: Upon error occurrence in system, SRSCM will store DTC corresponding to the error. DTC can be cleared only by GDS. However, if an internal fault code is logged or if a crash is recorded the fault clearing should not happen.
7. Self diagnostic connector: Data stored in SRSCM memory will be output to GDS or other external output devices through connector located below driver side crash pad.
8. Once airbag is deployed, SRSCM should not be used again but replaced.

English ▼

SPECIAL SERVICE TOOLS

Tool(Number and Name)	Illustration	Use
Deployment tool 0957A-34100A		Airbag deployment tool
Deployment adapter 0957A-3F100		Use with deployment tool. (SAB)
Deployment adapter 0957A-38500		Use with deployment tool. (DAB, PAB, CAB, BPT)
Dummy 0957A-38200		Simulator to check the resistance of each wiring harness
Dummy adapter 0957A-3F000		Use with dummy (SAB)
Dummy adapter 0957A-2G000		Use with dummy (DAB, PAB, CAB, BPT)

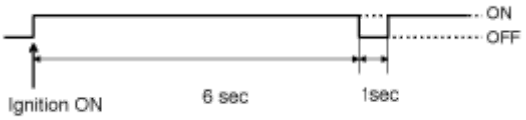
DAB : Driver Airbag
PAB : Passenger Airbag
SAB : Side Airbag
CAB : Curtain Airbag
BPT : Seat Belt Retractor Pretensioner

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.

1. Active fault or historical fault counter is greater or equal to 10



2. Normal or historical fault counter is less than 10



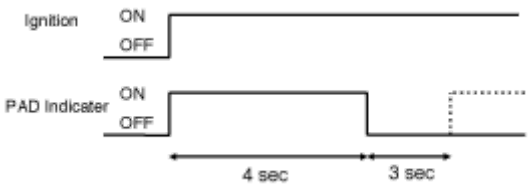
SRSCM INDEPENDENT WARNING LAMP ACTIVATION

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.

PASSENGER AIRBAG DEACTIVATION (PAD) LAMP OPERATION

The SRSCM is designed with circuitry and software to drive a PAD lamp, which is used for depowered airbag system. For the PAD indicator circuitry to function properly, both the SRSCM and PAD indicator are sourced from the ignition line. After ignition on, the PAD indicator will be turned on for 4 seconds and off for 3 seconds during the initialization phase. Thereafter the lamp will be turned on as long as the PAD switch is in the disabled position.



PASSENGER RESTRAINTS ACTIVATION WITH PAD SWITCH

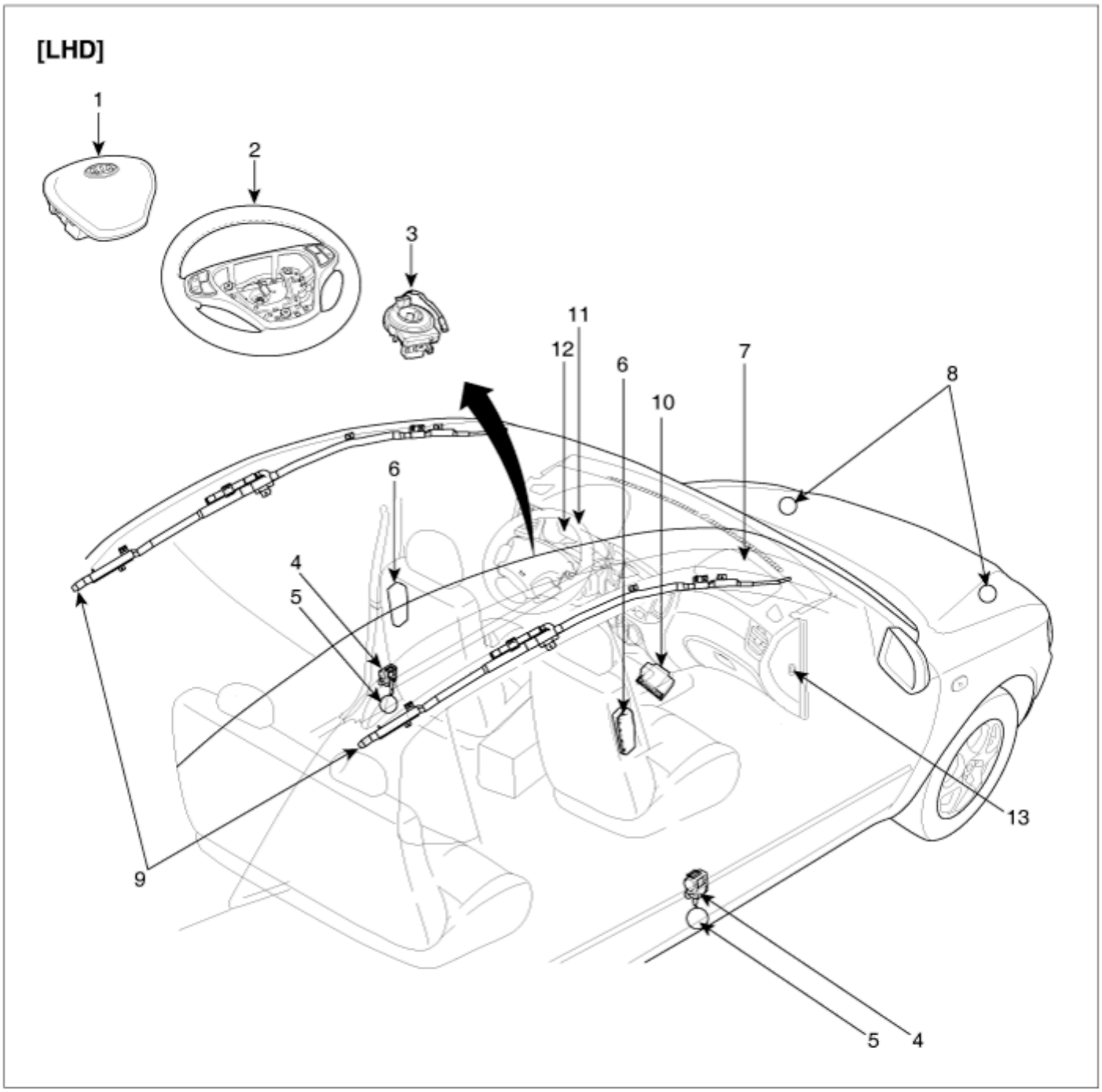
The PAD switch affects the activation of the front passenger airbag only and the switch is controlled manually. The PAD switch will be functioned as follows:

PAD Switch status	PAD Lamp	PAB
Phase-up	ON → OFF	Enabled
OFF	ON	Disabled

ON	OFF	Enabled
Fault	OFF	Enabled

English ▼

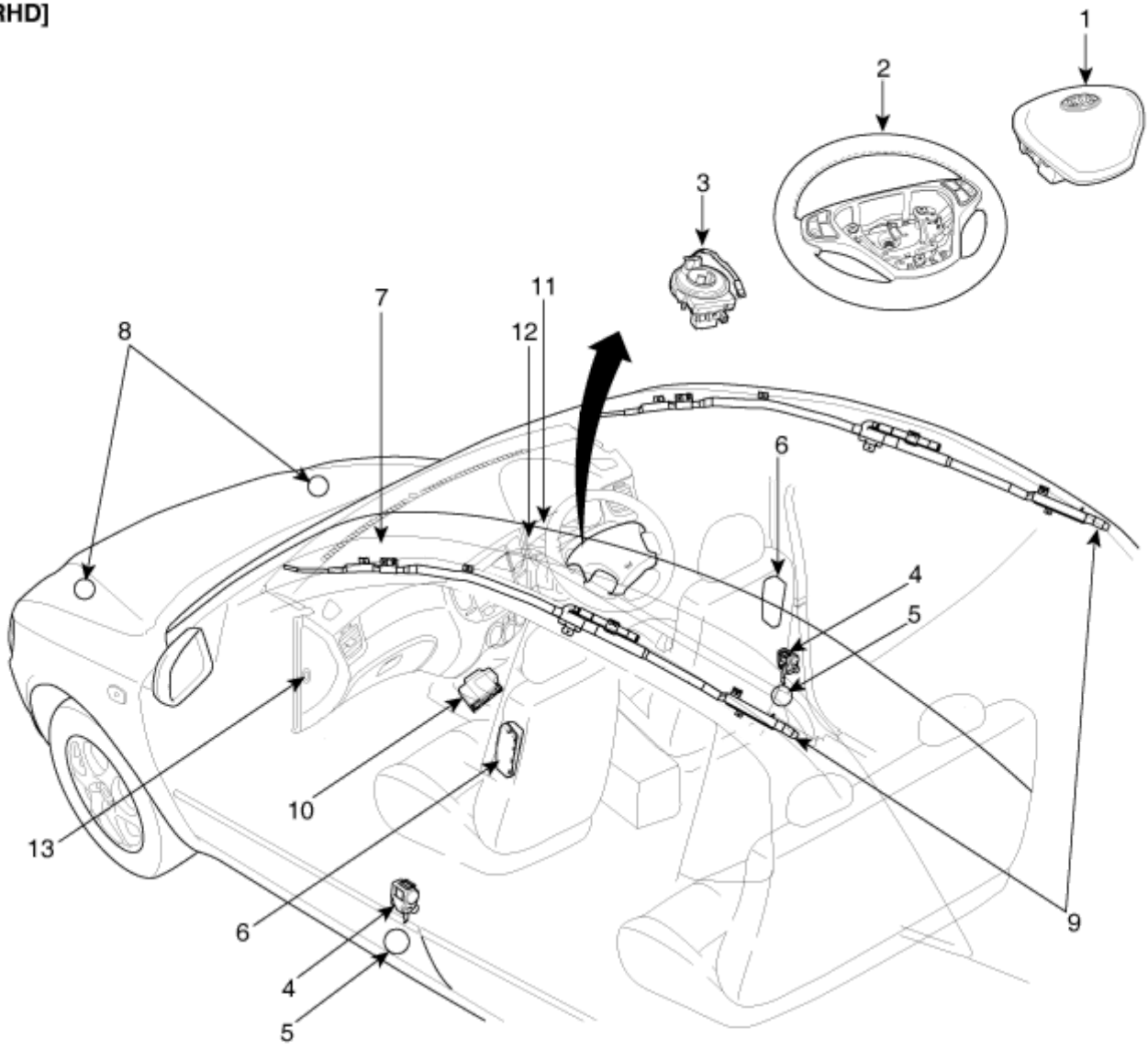
COMPONENTS



1. Driver Airbag (DAB)
2. Steering Wheel
3. Clock Spring
4. Seat Belt Pretensioner (BPT)
5. Side Impact Sensor (SIS)
6. Side Airbag (SAB)
7. Passenger Airbag (PAB)
8. Front Impact Sensor (FIS)
9. Curtain Airbag (CAB)
10. Supplemental Restraint System Control Module(SRSCM)
11. Airbag Warning Lamp
12. Passenger Airbag Deactivation (PAD) Lamp
13. PAD Switch

English ▼

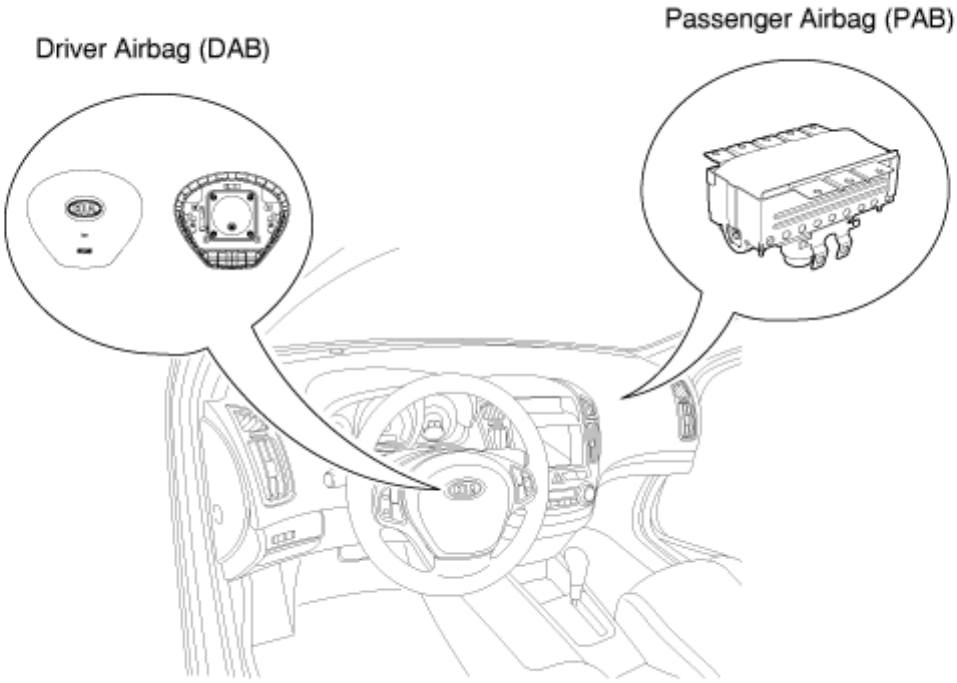
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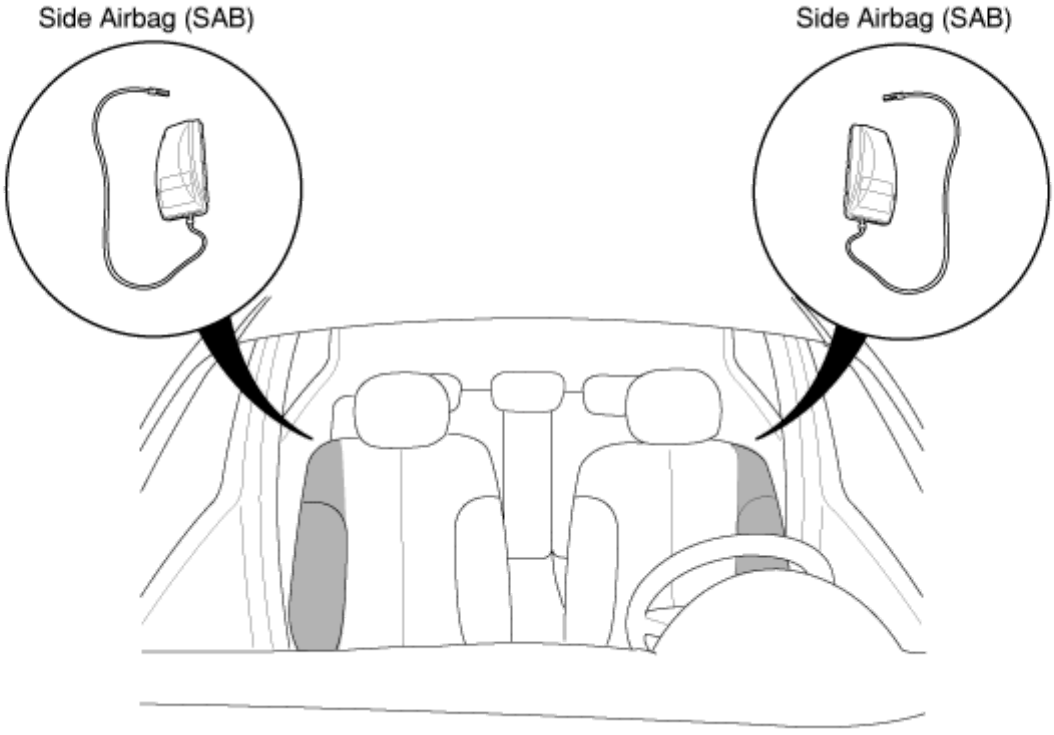
1. Driver Airbag (DAB)
2. Steering Wheel
3. Clock Spring
4. Seat Belt Pretensioner (BPT)
5. Side Impact Sensor (SIS)
6. Side Airbag (SAB)
7. Passenger Airbag (PAB)
8. Front Impact Sensor (FIS)
9. Curtain Airbag (CAB)
10. Supplemental Restraint System Control Module(SRSCM)
11. Airbag Warning Lamp
12. Passenger Airbag Deactivation (PAD) Lamp
13. PAD Switch

COMPONENTS LOCATION

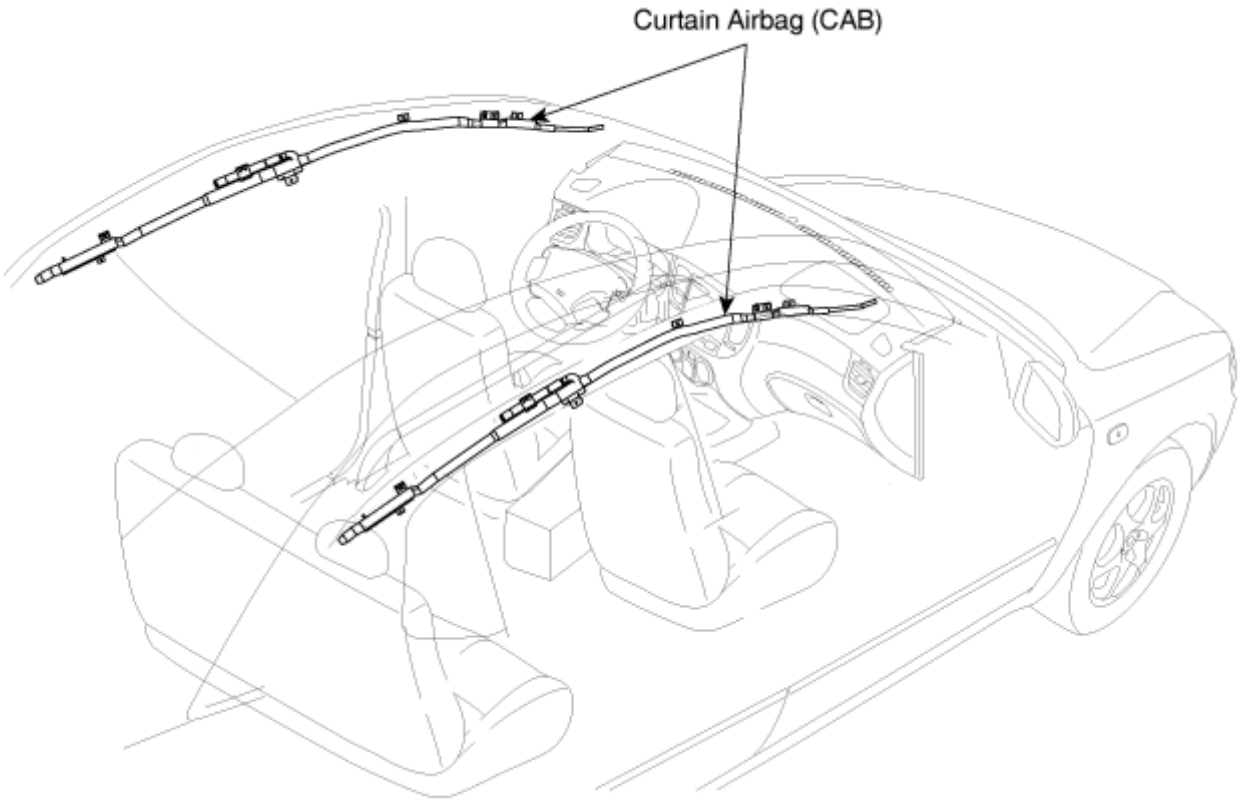
DRIVER AIRBAG (DAB) / PASSENGER AIRBAG (PAB



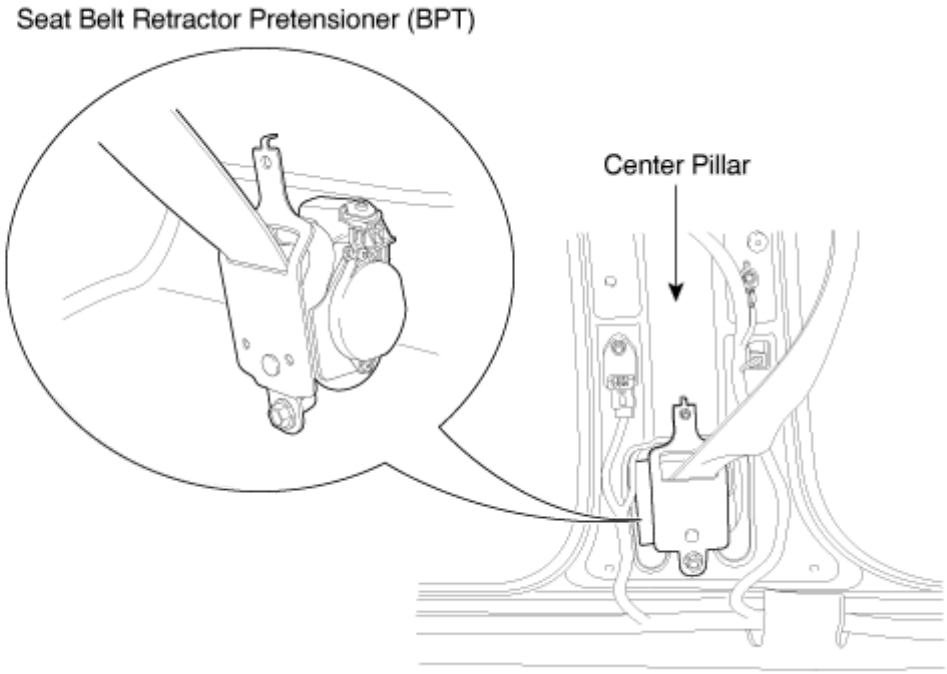
SIDE AIRBAG (SAB)



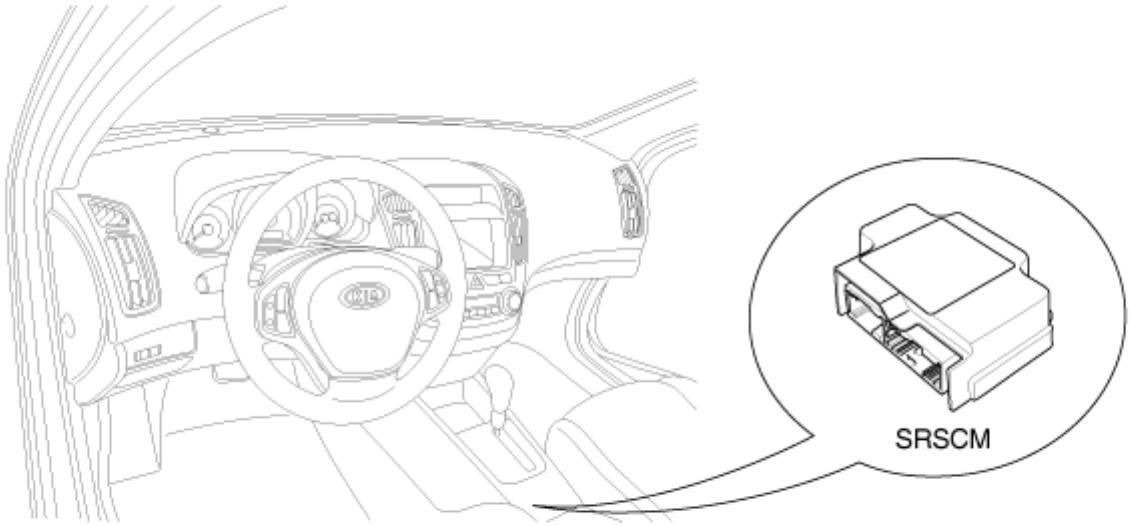
CURTAIN AIRBAG (CAB)



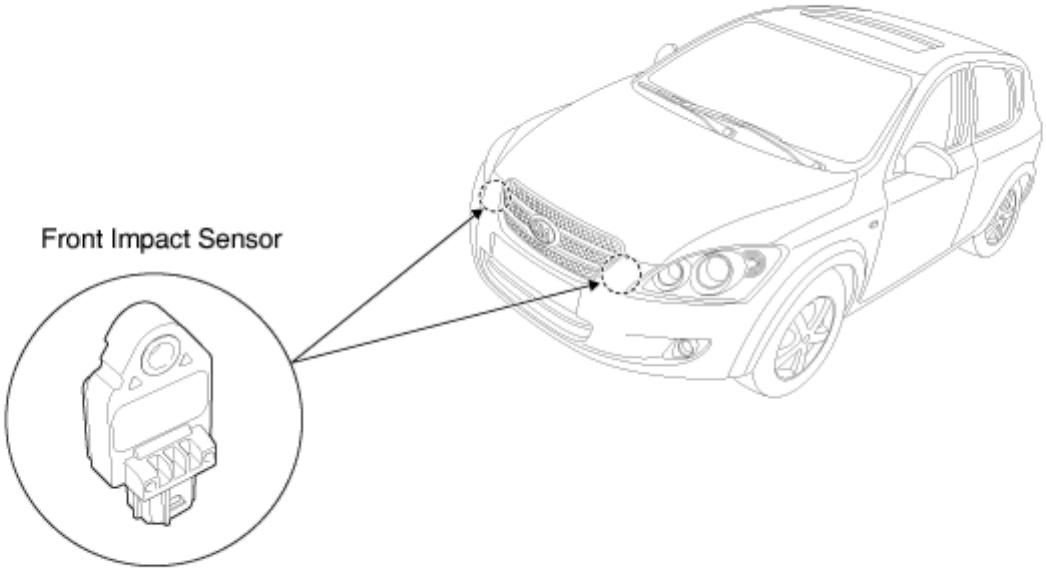
SEAT BELT RETRACTOR PRETENSIONER (BPT)



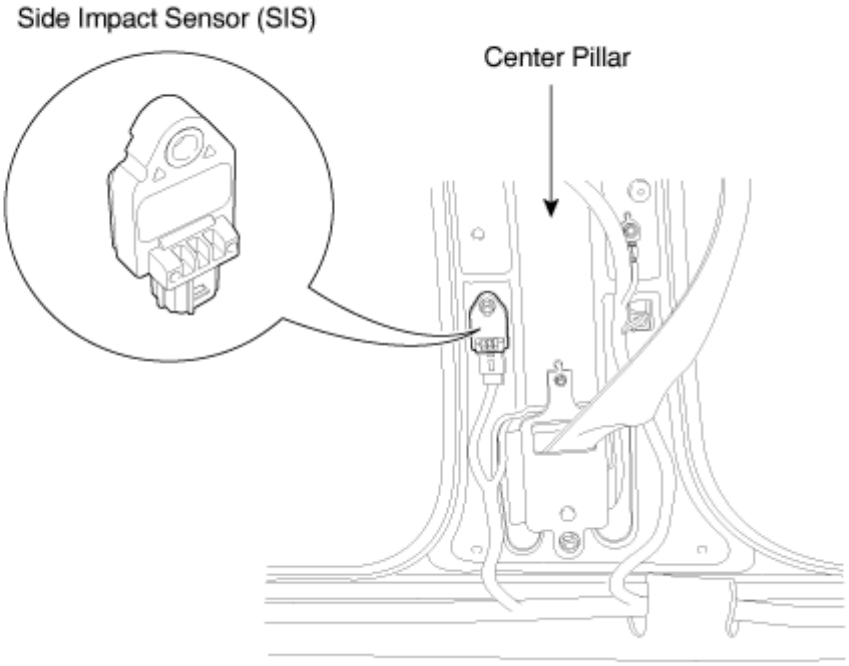
SUPPLEMENTAL RESTRAINT SYSTEM CONTROL MODULE (SRSCM)



FRONT IMPACT SENSOR (FIS)



SIDE IMPACT SENSOR (SIS)


Side Impact Sensor (SIS)
Center Pillar

COMPONENT REPLACEMENT AFTER DEPLOYMENT

NOTICE

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.

When the seat belt pretensioner(s) deployed after a collision, replace the following items.

- Seat belt pretensioner(s)
- SRSCM (if B1658 detected)
- Front impact sensors
- SRS wiring harnesses

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.

English ▼

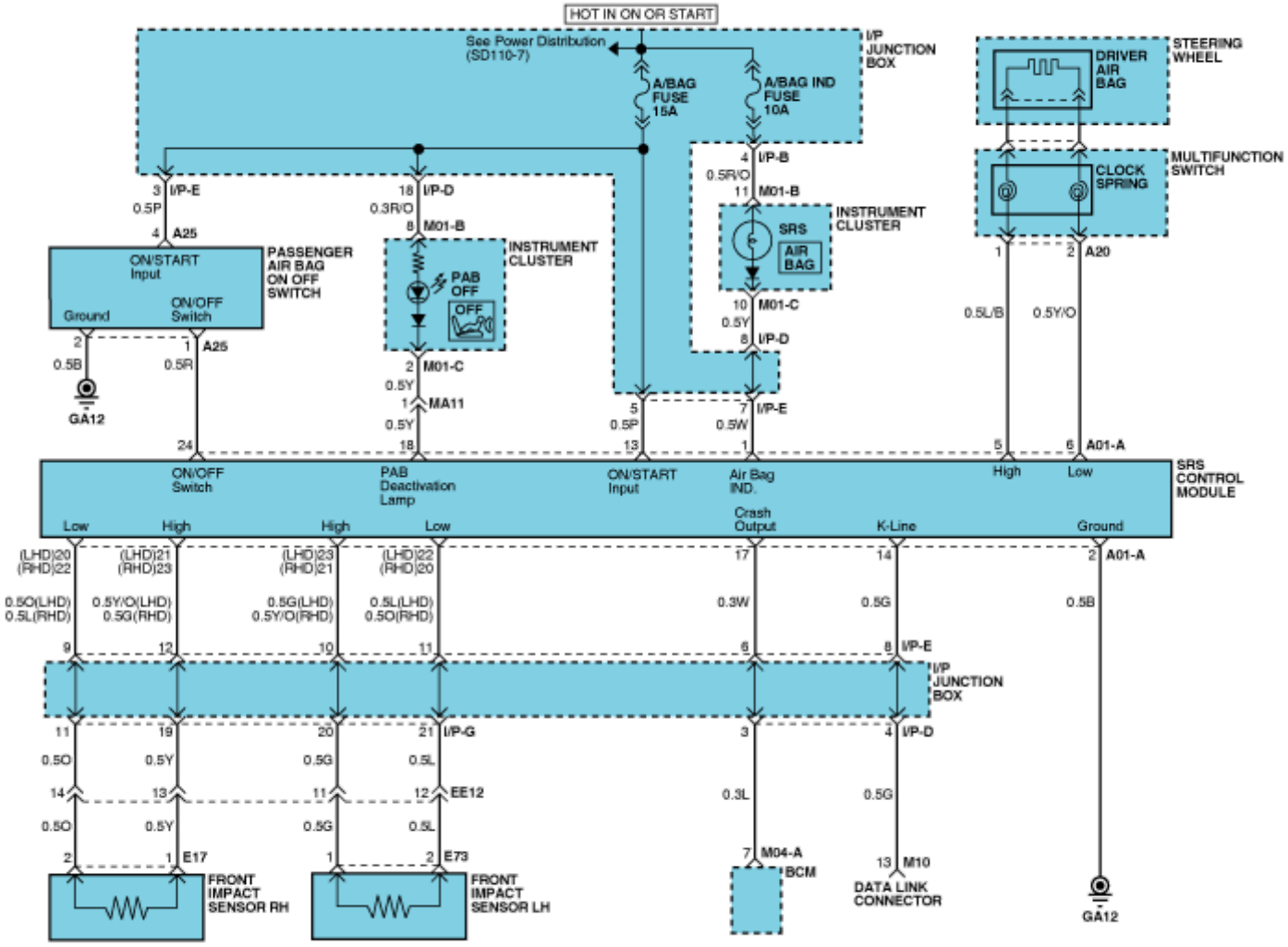
SPECIFICATION

Item	Resistance (Ω)
Driver Airbag (DAB)	1.7 ~ 2.3
Passenger Airbag (PAB)	1.7 ~ 2.3
Side Airbag (SAB)	1.7 ~ 2.3
Curtain Airbag (CAB)	1.7 ~ 2.3
Seat Belt Retractor Pretensioner (BPT)	1.8 ~ 2.5

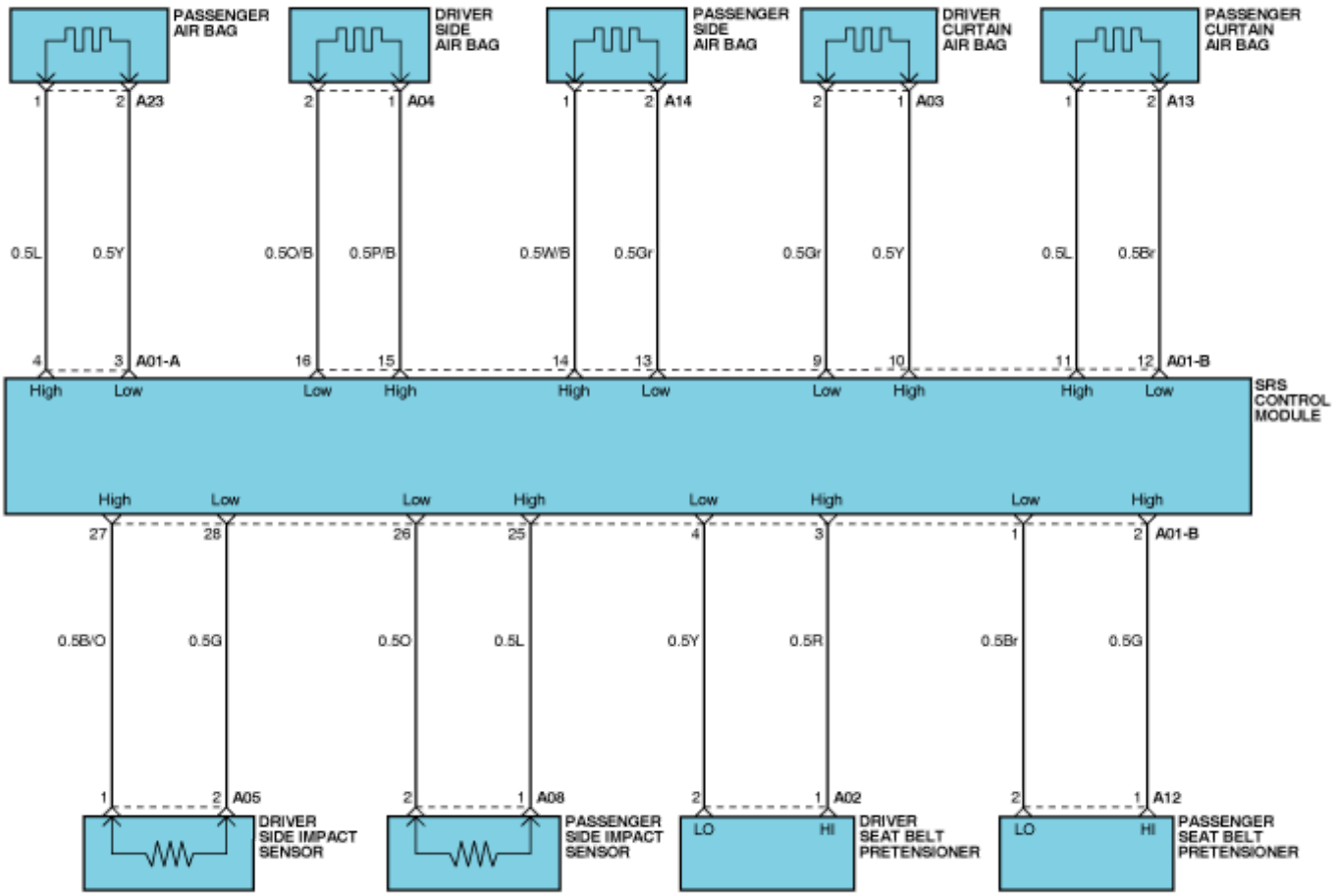
TIGHTENING TORQUES

Item	kgf·m	Nm	lb-ft
Driver Airbag (DAB)	0.8 ~ 1.1	7.8 ~ 10.8	5.8 ~ 8
Passenger Airbag (PAB)	1.8 ~ 2.7	17.2 ~ 26.5	13.0 ~ 19.5
Curtain Airbag (CAB)	0.7 ~ 0.9	6.9 ~ 8.8	5.0 ~ 6.5
Side Airbag (SAB)	0.6 ~ 0.8	6.0 ~ 8.0	4.4 ~ 5.9
Seat Belt Anchor Bolt (BPT)	4.0 ~ 5.5	39.2 ~ 53.9	28.9 ~ 39.8
SRSCM	1.0 ~ 1.4	9.5 ~ 13.6	7.0 ~ 10.0
Front Impact Sensor (FIS) Mounting Bolt	0.7 ~ 0.8	6.8 ~ 7.9	5.0 ~ 5.8
Side Impact Sensor (SIS) Mounting Bolt	0.7 ~ 0.8	6.8 ~ 7.9	5.0 ~ 5.8

CIRCUIT DIAGRAM

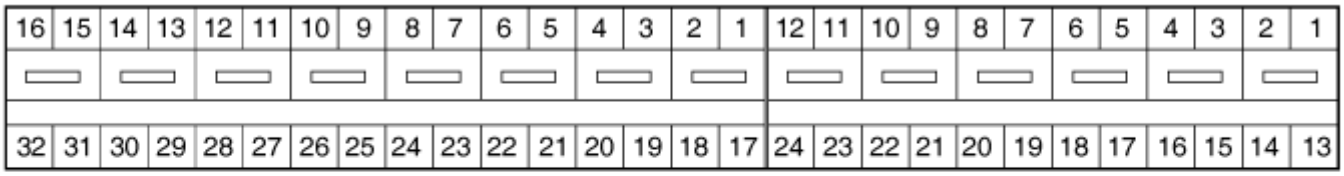


English ▼



SRSCM CONNECTOR TERMINAL

HARNESS CONNECTOR



CONNECTOR B (A01-B) CONNECTOR A (A01-A)

Shorting bar (▭) : located between the upper side and lower side pins of SRSCM connector.

Note : For short circuit check, shorting bar must be opened. Use a plastic clip as a shorting bar opener for disconnecting shorting bar

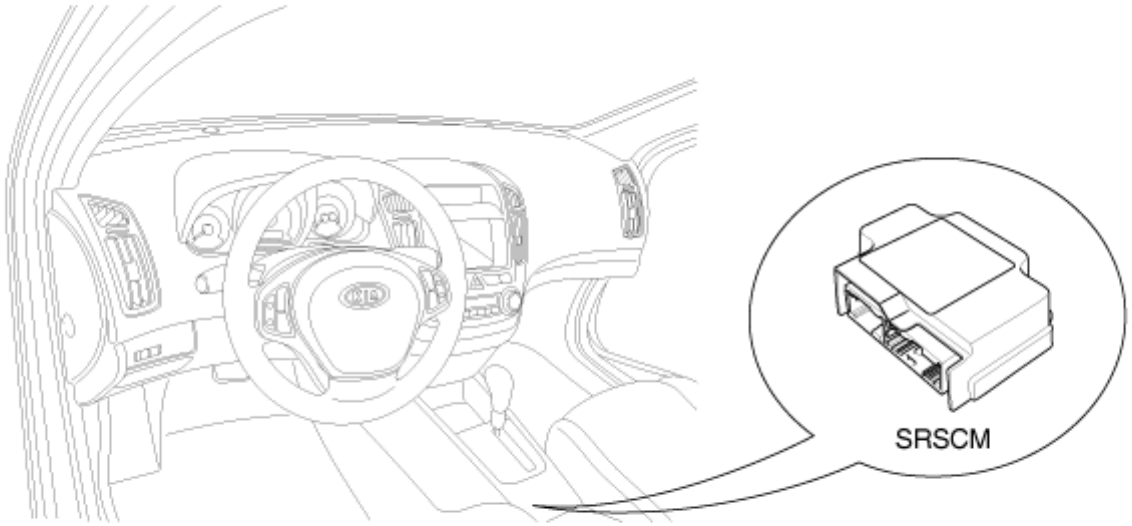
Pin	Function (Connector A)	Pin	Function (Connector B)
1	Airbag Warning Lamp	1	Seat Belt Pretensioner [Front-Passenger] Low
2	Ground	2	Seat Belt Pretensioner [Front-Passenger] High
3	Passenger Airbag Low	3	Seat Belt Pretensioner [Front-Driver] High
4	Passenger Airbag High	4	Seat Belt Pretensioner [Front-Driver] Low
5	Driver Airbag High	5	-
6	Driver Airbag Low	6	-
7	-	7	-
8	-	8	-
9	-	9	Curtain Airbag [Driver] Low
10	-	10	Curtain Airbag [Driver] High
11	-	11	Curtain Airbag [Passenger] High
12	-	12	Curtain Airbag [Passenger] Low
13	Ignition	13	Side Airbag [Front-Passenger] Low
14	K-Line Diagnostic	14	Side Airbag [Front-Passenger] High
15	-	15	Side Airbag [Front-Driver] High
16	-	16	Side Airbag [Front-Driver] Low
17	Crash Output	17	-
18	PAB Deactivation Lamp	18	-
19	-	19	-
20	Front Impact Sensor [Passenger] Low	20	-
21	Front Impact Sensor [Passenger] High	21	-
22	Front Impact Sensor [Driver] Low	22	-
23	Front Impact Sensor [Driver] High	23	-
24	PAB ON/OFF Switch	24	-
		25	Side Impact Sensor [Passenger] High
		26	Side Impact Sensor [Passenger] Low
		27	Side Impact Sensor [Driver] High
		28	Side Impact Sensor [Driver] Low
		29	-
		30	-
		31	-
		32	-

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.

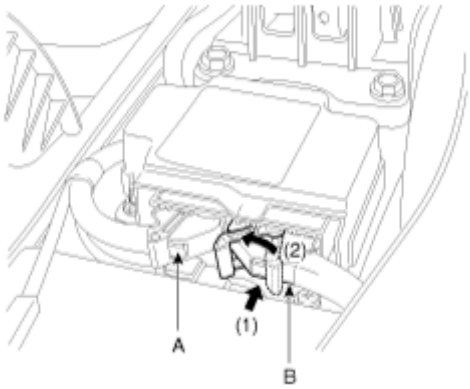
The SRSCM determines that an impact may require deployment of the pretensioners and airbags from data obtained from impact sensors and other components in conjunction with a safing function. The SRSCM will not be ready to detect a crash or to activate the restraint system devices until the signals in 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.

COMPONENTS

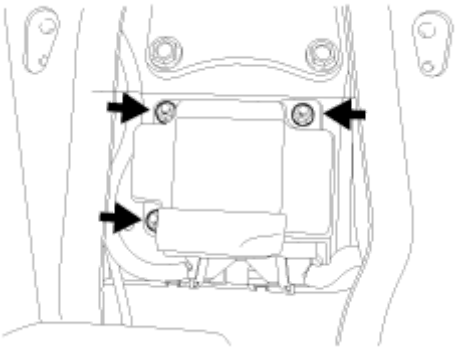


REMOVAL

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 and heater ducts. (Refer to BD group)
5. Press the lock(1), then pull back the connector lever(2) until it clicks.



6. Disconnect the SRSCM harness connector(A) and (B) from the SRSCM.
7. Remove the SRSCM mounting nuts(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 nuts.
   Tightening torque (SRSCM Mounting bolt)
   : 1.0 ~ 1.4 kgf.m (9.5 ~ 13.6 Nm, 7.0 ~ 10.0 lb.ft)

NOTICE

Use new mounting bolts when replacing the SRSCM after a collision.

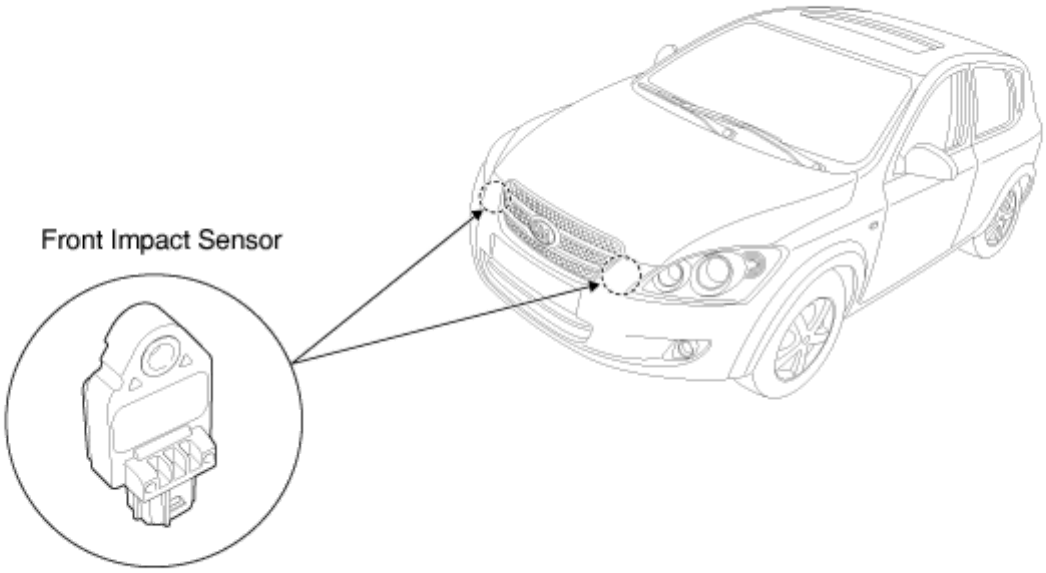
English ▼

4. Connect the SRSCM harness connector.
5. Install the heater ducts and floor console. (Refer to BD group)
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:
   - Turn the ignition switch ON; the SRS indicator light should be turned on for about six seconds and then go off.

DESCRIPTION

The front impact sensor (FIS) is installed on the upper of the side panal in 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.

COMPONENTS

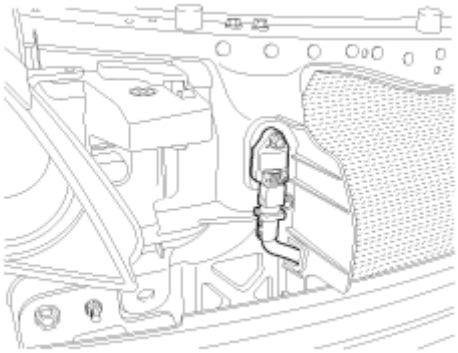


REMOVAL

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 BD group)
3. Disconnect the Front Impact Sensor connector.
4. Remove the Front Impact Sensor mounting bolt.



5. Remove the Front Impact Sensor.

INSTALLATION

CAUTION

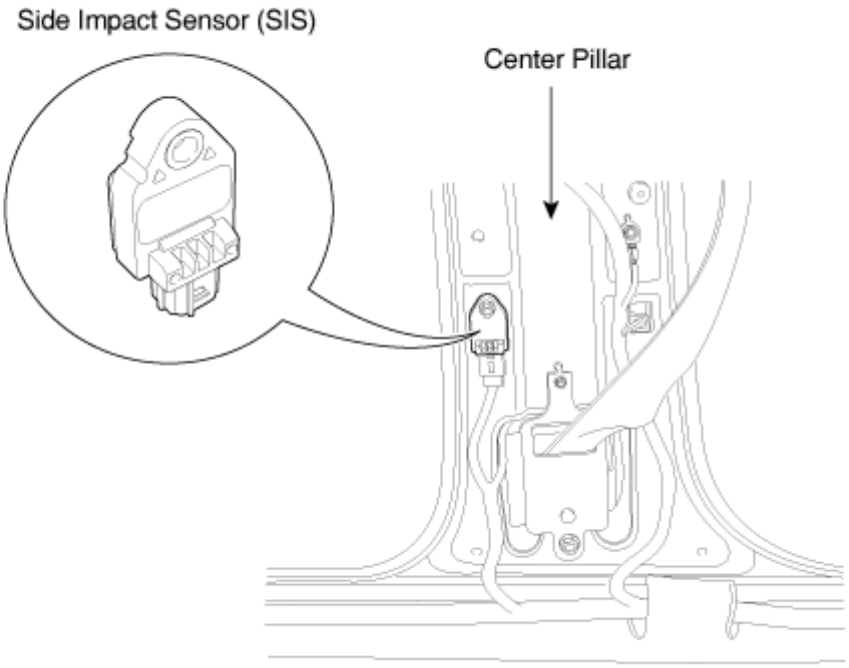
- Do not turn the ignition switch ON and do not contact the battery cable while replacing the front impact sensor.

1. Install the new Front Impact Sensor.
2. Tighten the Front Impact Sensor mounting bolt.
   Tightening torque
   : 0.7 ~ 0.8 kgf.m (6.8 ~ 7.9 Nm, 5.0 ~ 5.8 lb.ft)
3. Connect the Front Impact Sensor connector.
4. Install the front bumper.(Refer to BD group)
5. Reconnect the battery negative cable.
6. After installing the Front Impact Sensor, confirm proper system operation: Turn the ignition switch ON the SRS indicator light should be turned on for about six seconds and then go off.

DESCRIPTION

The Side Impact Sensor (SIS) system consists of two front SIS which are installed in the center pillar (LH and RH) and two rear SIS which are installed in the rear pillar (LH and RH). They are remote sensors that detect acceleration due to collision at their mounting locations. The primary purpose of the Side Impact Sensor (SIS) is to provide an indication of a collision. The Side Impact Sensor (SIS) sends acceleration data to the SRSCM.

COMPONENTS

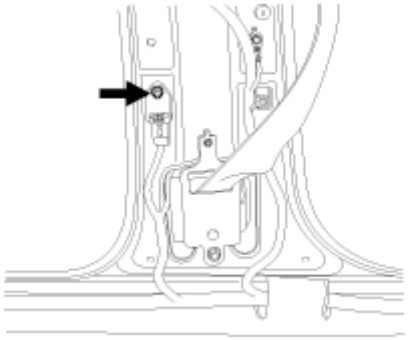


REMOVAL

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 lower anchor bolt.
3. Remove the door scuff trim. (Refer to BD group)
4. Remove the center pillar trim. (Refer to BD group)
5. Disconnect the Side Impact Sensor connector and remove the Side Impact Sensor mounting bolt.



INSTALLATION

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
   : 0.7 ~ 0.8 kgf.m (6.8 ~ 7.9 Nm, 5.0 ~ 5.8 lb.ft)
2. Install the center pillar trim. (Refer to BD group)
3. Install the door scuff trim. (Refer to BD group)
4. Install the lower anchor bolts.
5. Reconnect the battery negative cable.
6. After installing the Side Impact Sensor, confirm proper system operation: Turn the ignition switch ON, the SRS indicator light should be turned on for about six seconds and then go off.

AIRBAG DISPOSAL

SPECIAL TOOL REQUIRED

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.

DRIVER'S AIRBAG :

1. Remove the driver's airbag and install the SST(0957A-38500).
2. Install the driver's airbag on the steering wheel.

FRONT PASSENGER'S AIRBAG :

1. Remove the glove box, then disconnect the 2P connector between the front passenger's airbag and SRS main harness.
2. Install the SST(0957A-38500).

SIDE AIRBAG :

1. Disconnect the 2P connector between the side airbag and side wire harness.
2. Install the SST (0957A-3F100).

CURTAIN AIRBAG :

1. Disconnect the 2P connector between the curtain airbag and wire harness.
2. Install the SST(0957A-38500).

SEAT BELT PRETENSIONER :

1. Disconnect the 2P connector from the seat belt pretensioner.
2. Install the SST(0957A-38500).
3. Place the deployment tool at least thirty feet (10 meters) away from the airbag.
4. Connect a 12 volt battery to the tool.
5. 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)
6. Dispose of the complete airbag. No part of it can be reused. Place it in a sturdy plastic bag and seal it securely.

English ▼



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 tool is functioning properly by following the check procedure on this page.
2. Position the airbag facing up and EFD (Emergency Fastening Device) and Active Hood Actuator must be placed in piled up, at least, 5 tires, outdoors on flat ground at least thirty feet (10meters) from any obstacles or people.
3. Connect a 12 volt battery to the tool.
4. 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 deflation)
5. Dispose of the complete airbag. No parts can be reused. Place it in a sturdy plastic bag and seal it securely.

⚠ CAUTION

- When EFD and Active Hood Actuator are deployed, broken parts are exploded and scattered.
- EFD and Active Hood Actuator must be placed in the piled up 5 tires to avoid exploded broken parts.
- Technicians should wear an eye protector and extremely be cautions of exploded broken parts.

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.

DESCRIPTION

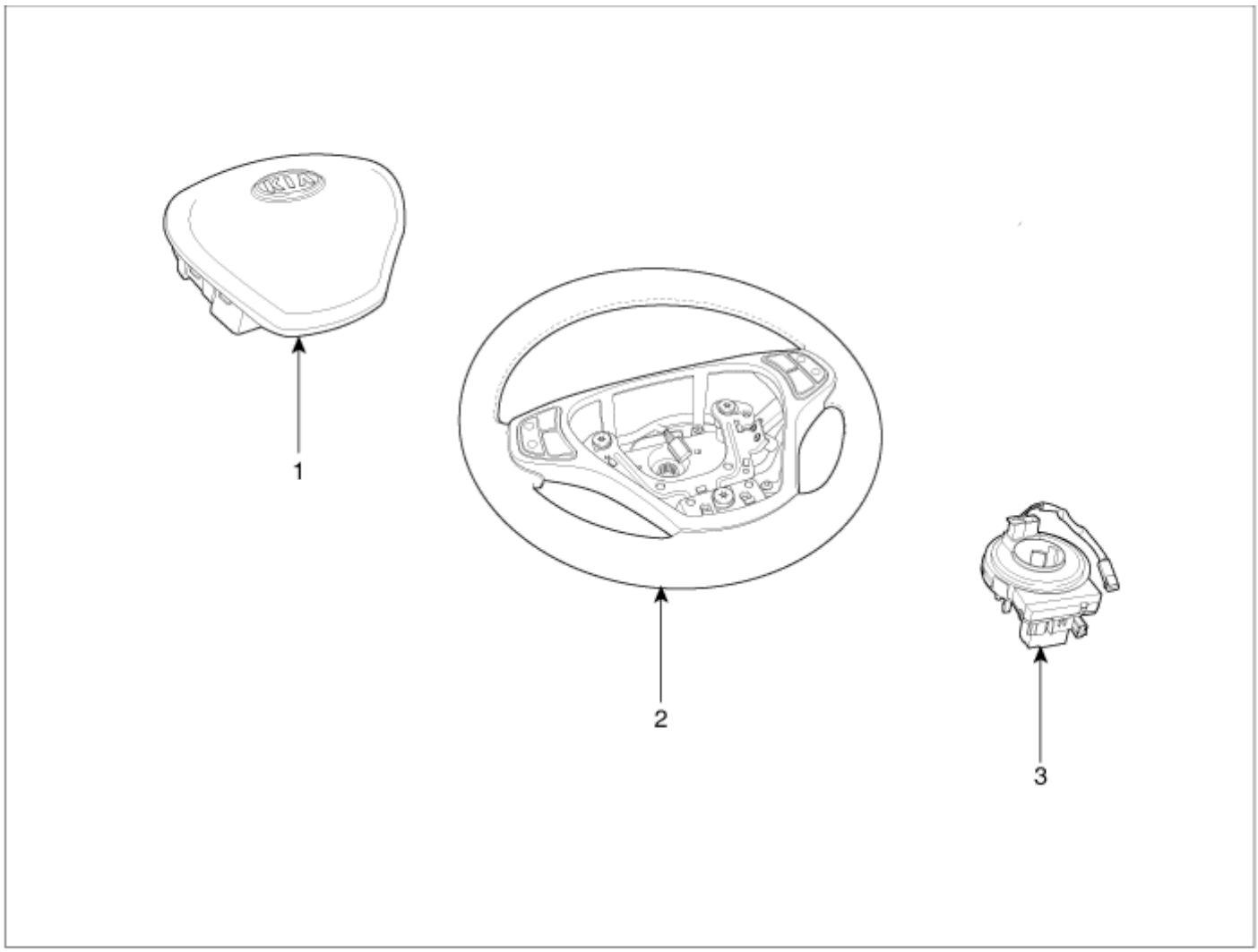
Driver Airbag (DAB) is installed in steering wheel and electrically connected to SRSCM via clockspring. It protects the driver from danger by deploying a bag when frontal crash occurs. The SRSCM determines deployment of Driver Airbag (DAB).

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.

English

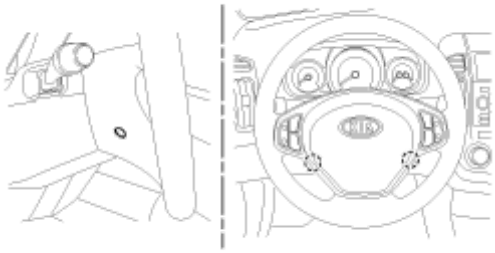
COMPONENTS



1. Clock Spring
2. Steering Wheel
3. Driver Airbag (DAB)

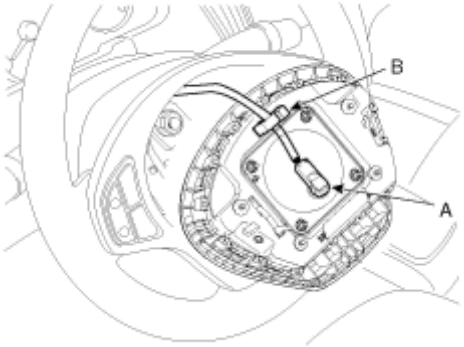
REMOVAL

1. Disconnect the battery negative cable and wait for at least three minutes before beginning work.
2. Remove the airbag module mounting bolts(2EA).

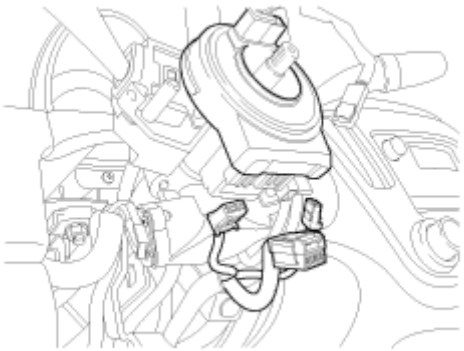


3. Release the connector locking pin, then disconnect the driver airbag module connector(A).

> **CAUTION**
>
> The removed airbag module should be stored in a clean, dry place with the pad cover face up.



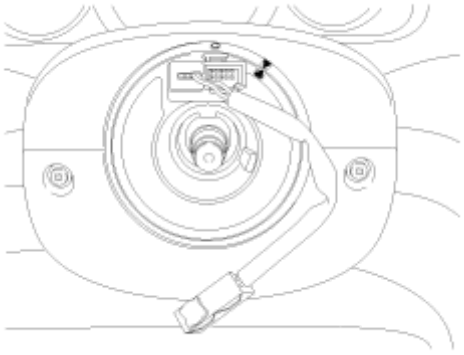
4. Remove the steering wheel and steering wheel column cover. (Refer to ST group)
5. Disconnect the clock spring and horn connector, then remove the clock spring.



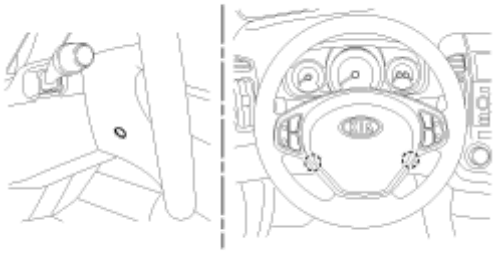
INSTALLATION

English

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 turnig 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 ST group)
6. Connect the Driver Airbag (DAB) module connector and horn connector, then install the Driver Airbag (DAB) module on the steering wheel.
7. Secure the Driver Airbag (DAB) with the new mounting bolts.
   Tightening torque (DAB Mounting Bolt)
   : 0.8 ~ 1.1 kgf.m (7.8 ~ 10.8 Nm, 5.8 ~ 8 lb.ft)



8. Connect the battery negative cable.
9. After installing the airbag, confirm proper system operation:
   - Turn the ignition switch ON; the SRS indicator light should be turned on for about six seconds and then go off.
   - Make sure horn button works.

INSPECTION

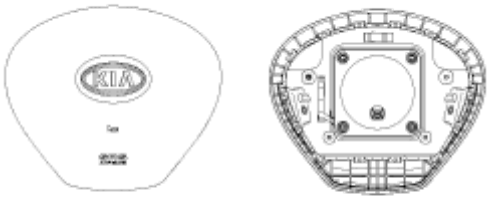
DRIVER AIRBAG (DAB)

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.

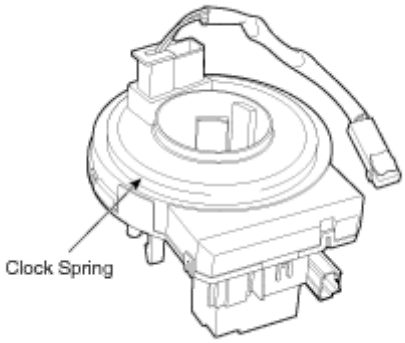


(Front View) (Rear View)

5. Install the airbag module to the steering wheel to check for fit or alignment with the wheel.

CLOCKSPRING

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.



English ▼

DESCRIPTION

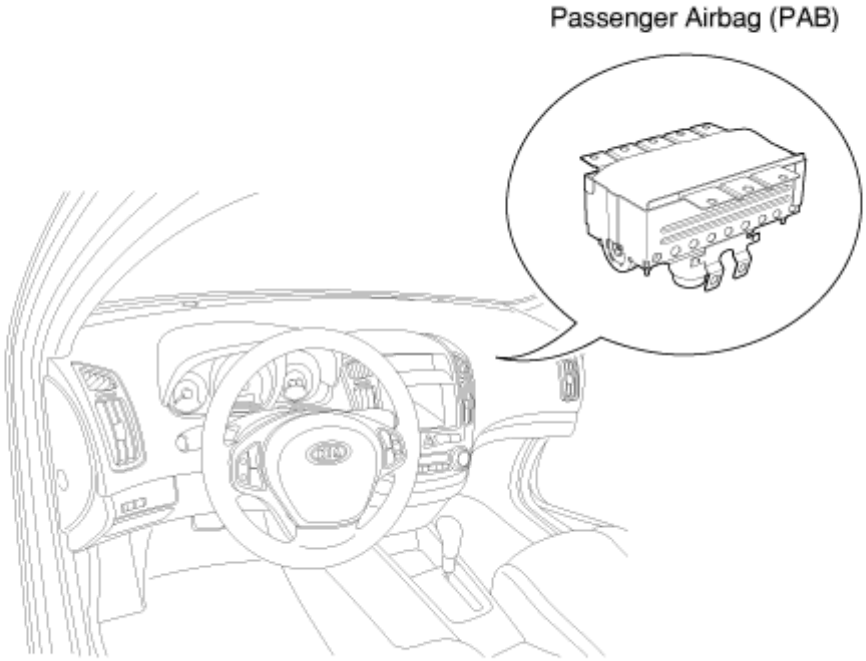
The passenger Airbag (PAB) is installed inside the crash pad and protects the front passenger in the event of a frontal crash. The SRSCM determines if and when to deploy the PAB.

⚠ 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.

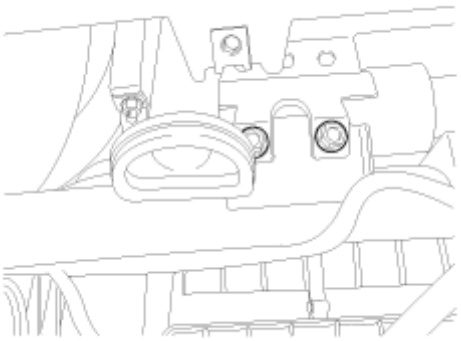
English ▼

COMPONENTS



REMOVAL

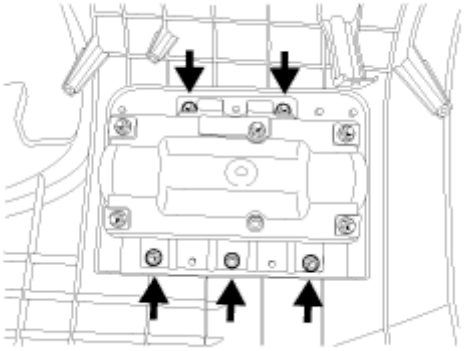
1. Disconnect the battery negative cable and wait for at least three minutes before beginning work.
2. Remove the glove box. (Refer to BD group)
3. Disconnect the PAB connector.
4. Remove the PAB mounting bolts(2EA).



5. Remove the crash pad. (Refer to BD group)

> **NOTICE**
>
> If the crash pad is damaged when the PAB is deployed, replace the damaged crash pad and PAB together.

6. Remove the heater duct from the crash pad.
7. Remove the mounting nuts(5EA) from the crash pad. Then remove the passenger airbag.



> **CAUTION**
>
> The removed airbag module should be stored in a clean and dry place with the pad cover face up.

INSTALLATION

1. Remove the ignition key from the vehicle.

English ▼

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
   : 1.8 ~ 2.7 kgf.m (17.2 ~ 26.5 N.m, 13.0 ~ 19.5 lb.ft)
4. Install the heater duct to the crash pad.
5. Install the crash pad. (Refer to BD group)
6. Tighten the PAB mounting bolt.
   Tightening torque
   : 1.8 ~ 2.7 kgf.m (17.2 ~ 26.5 N.m, 13.0 ~ 19.5 lb.ft)
7. Connect the Passenger Airbag (PAB) harness connector to the SRS main harness connector.
8. Reinstall the glove box. (Refer to BD group)
9. Reconnect the battery negative cable.
10. After installing the Passenger Airbag (PAB), confirm proper system operation:
    - Turn the ignition switch ON; the SRS indicator light should be turned on for about six seconds and then go off.

DESCRIPTION

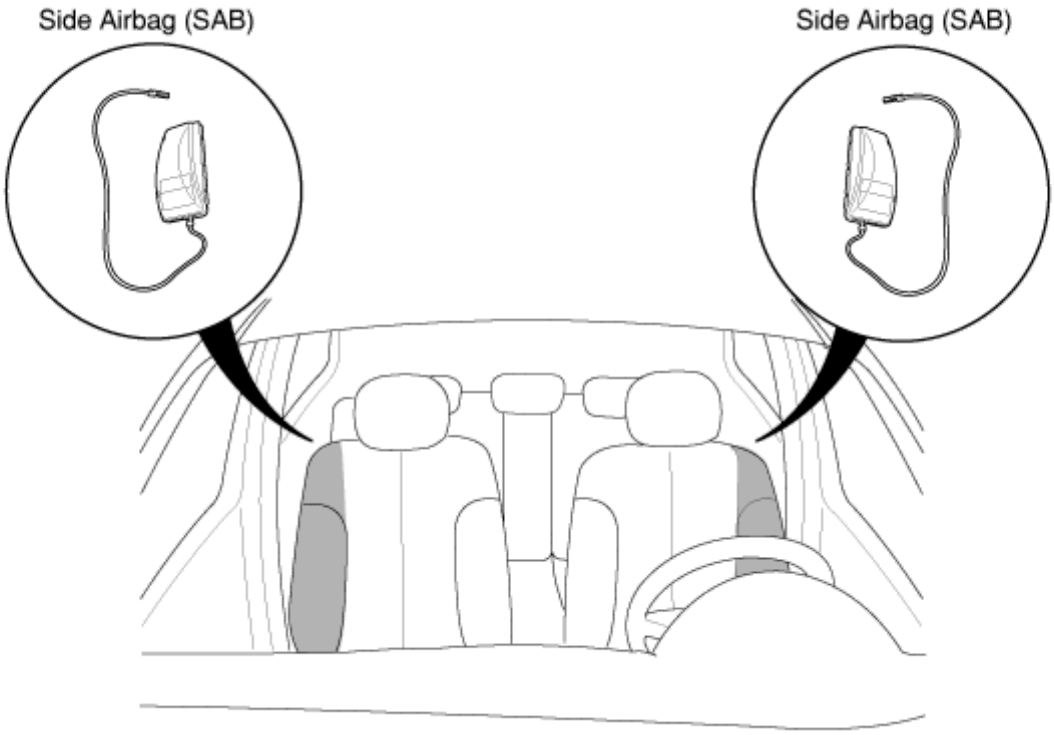
The Side Airbags (SAB) are installed inside the front seat and protect the driver and front passenger from danger when side crash occurs. The SRSCM determines deployment of side airbag by using Side Impact Sensor (SIS) signal.

⚠ 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.

English ▼

COMPONENTS



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 BD group)
3. Remove the seatback cover.(Refer to BD group)

> **NOTICE**
>
> When the side airbag depoyed after a collision, replace the seatback as an assembly.

4. Loosen the SAB mounting nuts and remove the SAB module.



INSTALLATION

> **⚠ CAUTION**
>
> Ensure that the harness is installed and routed properly to prevent damage to the wiring.

> **NOTICE**
>
> - 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 seatback cover is installed properly. Improper installation may prevent the proper deployment.

1. Remove 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 seatback frame and tighten the side airbag mounting nuts.
   Tightening torque
   : 0.6 ~ 0.8 kgf.m (6.0 ~ 8.0 Nm, 4.4 ~ 5.9 lb.ft)

English ▼



4. Install the new seatback cover.(Refer to BD group)
5. Install the seat assembly, 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 or interfering with other parts.
7. Reconnect the battery negative cable.
8. After installing the Side Airbag (SAB), confirm proper system operation:
    - Turn the ignition switch ON; the SRS indicator light should be turned on for about six seconds and then go off.

English ▼

DESCRIPTION

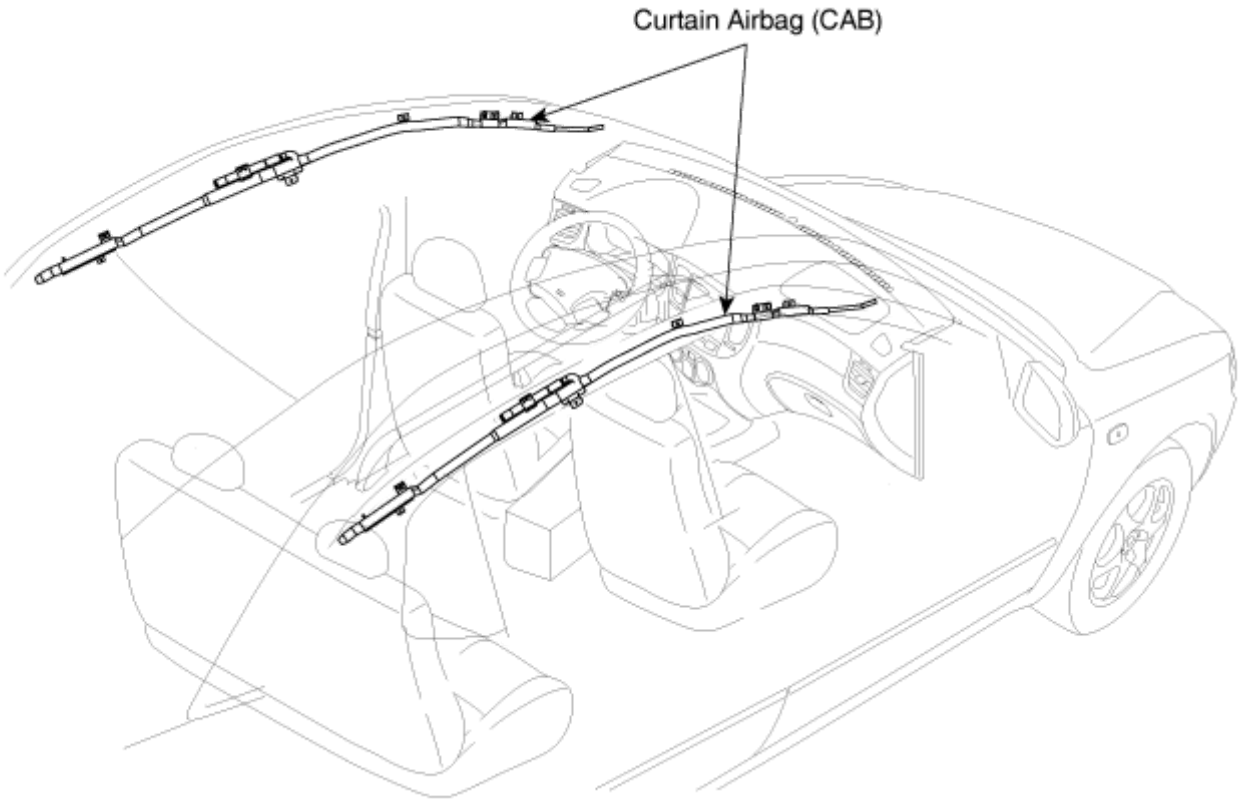
Curtain airbags are installed inside the headliner (LH and RH) and protect the driver and passenger from danger when side crash occurs. The SRSCM determines deployment of curtain airbag by using side impact sensor (SIS) signal.

⚠ 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.

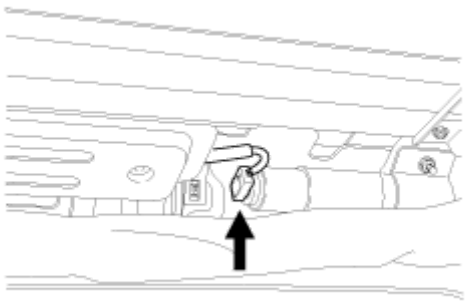
English ▼

COMPONENTS

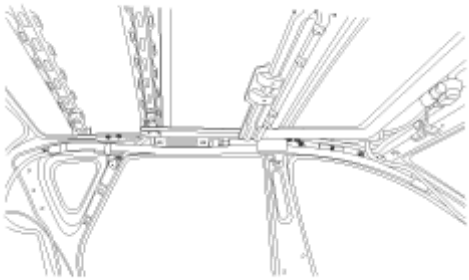


REMOVAL

1. Disconnect the battery negative cable and wait for at least 3 minutes before beginning work.
2. Remove the following parts. (Refer to BD group)
   - Rear Seat, Luggage side trim
   - Rear pillar trim, Center Pillar trim
   - Front pillar trim, Head Lining
3. Disconnect the Curtain Airbag harness connector.



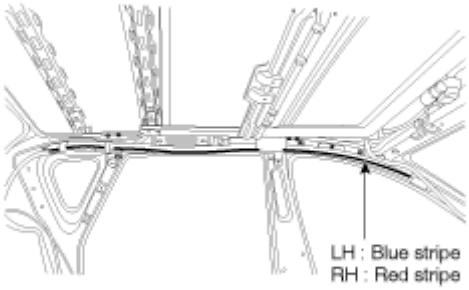
4. After loosening the mounting bolts and nuts remove the curtain airbag.



INSTALLATION

1. Remove the ignition key from the vehicle.
2. Disconnect the battery negative cable and wait for at least three minutes.
3. Install a Curtain Airbag (CAB) on the mounting bracket.
4. Tighten the CAB mounting bolts and nuts.
   Tightening torque
   : 0.7 ~ 0.9 kgf.m(6.9 ~ 8.8 Nm, 5.0 ~ 6.5 lb.ft)

English ▼



⚠ CAUTION

- Never twist the airbag module when installing it. If the module is twisted, airbag module may operate abnormally.

5. Connect the CAB connector.
6. Install the following parts. (Refer to BD group)
   - Head Lining, Rear pillar trim
   - Front pillar trim, Center pillar trim
   - Luggage side trim, Rear seat
7. Reconnect the battery negative cable.
8. After installing the Curtain Airbag (CAB), confirm proper system operation:
   - Turn the ignition switch ON; the SRS indicator light should be turned on for about six seconds and then go off.

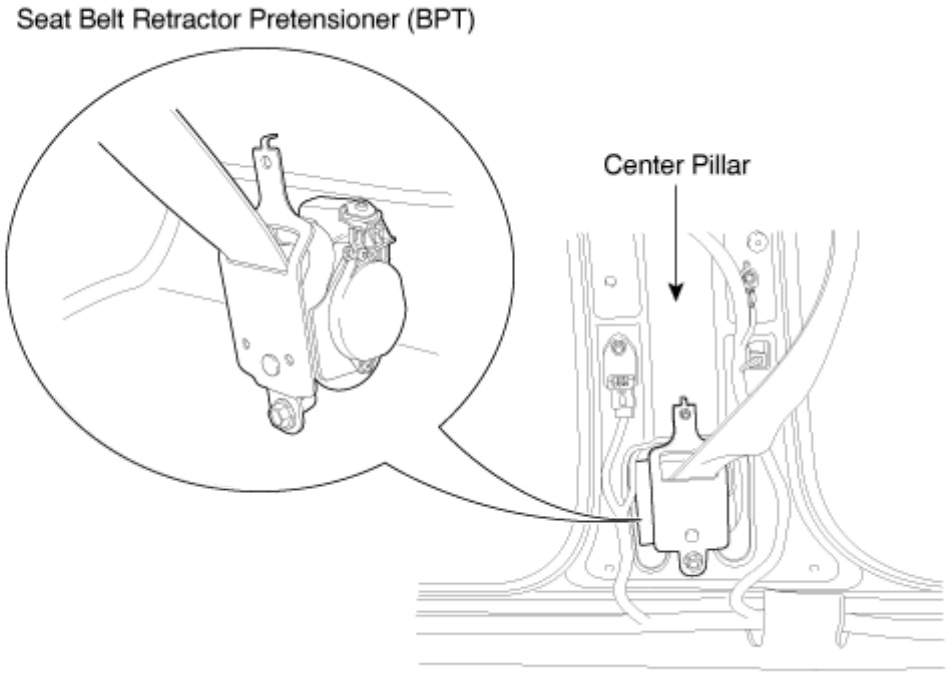
DESCRIPTION

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

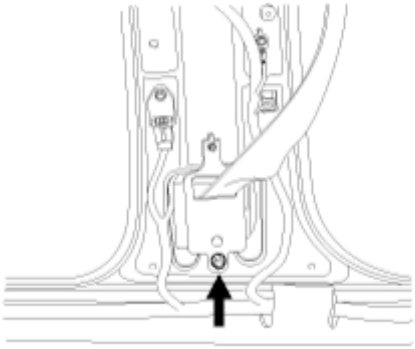
Never attempt to measure the circuit resistance of the Seat Belt Pretensioner (BPT) even if you are using the specified tester. If the circuit resistance is measured with a tester, the pretensioner will be ignited accidentally. This will result in serious personal injury.

COMPONENTS

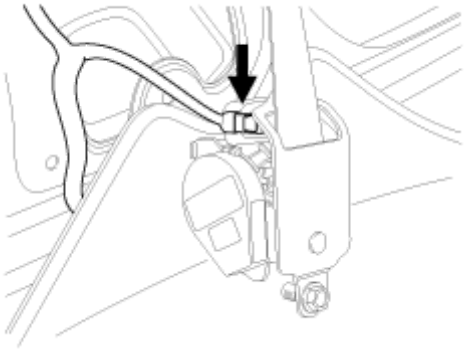


REMOVAL

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 door scuff trim. (Refer to BD group)
4. Remove the center pillar trim. (Refer to BD group)
5. Remove the upper anchor bolt.
6. Loosen the Seat Belt Pretensioner mounting bolt.



7. Disconnect the Seat Belt Pretensioner connector and remove the Seat Belt Pretensioner.



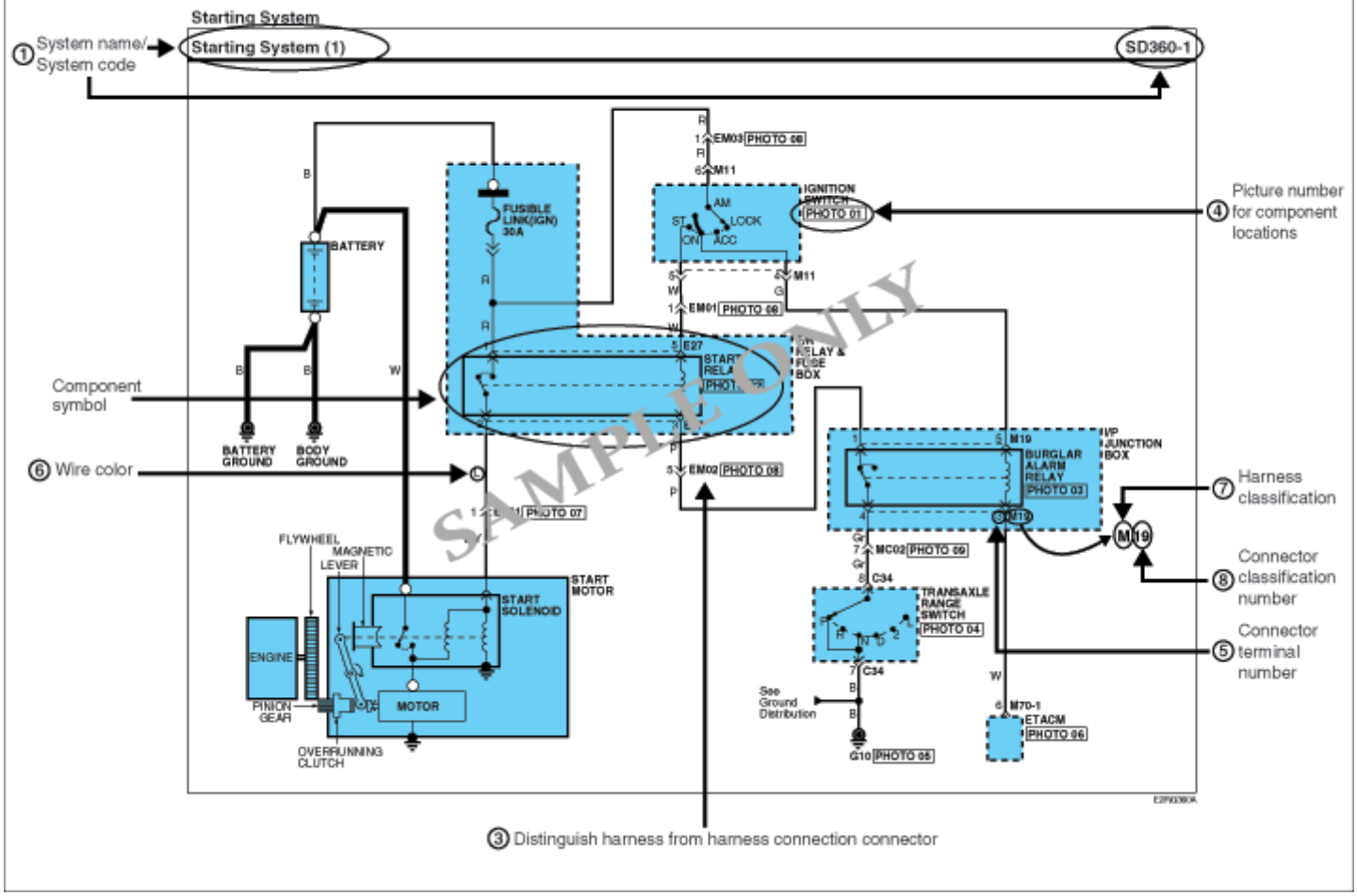
INSTALLATION

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.
5. Install the upper anchor bolts.
   Tightening torque (Seat Belt Anchor Bolt)
   : 4.0 ~ 5.5 kgf.m (39.2 ~ 53.9 Nm, 28.9 ~ 39.8 lb.ft)

English ▼

6. Install the center pillar trim.
7. Install the door scuff trim.
8. Install the lower anchor bolts.
   Tightening torque
   : 4.0 ~ 5.5 kgf.m (39.2 ~ 53.9 Nm, 28.9 ~ 39.8 lb.ft)
9. Reconnect the battery negative cable.
10. After installing the Seat Belt Pretensioner (BPT), confirm proper system operation:
    - Turn the ignition switch ON; the SRS indicator light should be turned on for about six seconds and then go off.

Introduction (1) GI-1

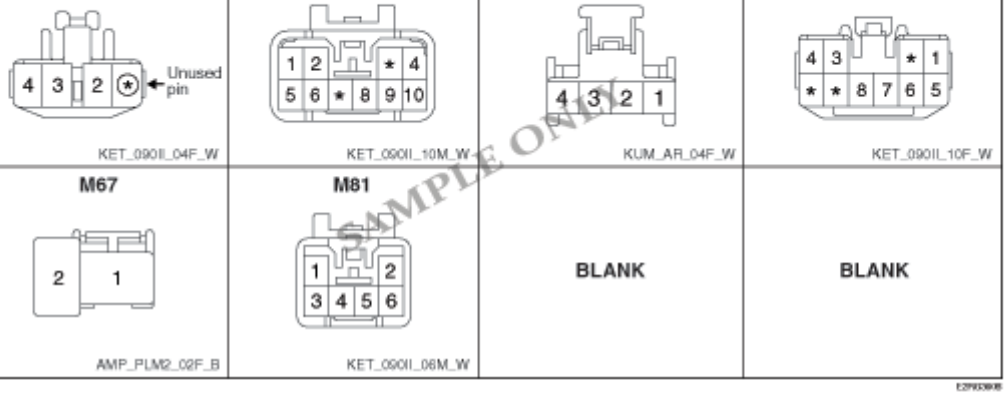


Language ▼

Starting System

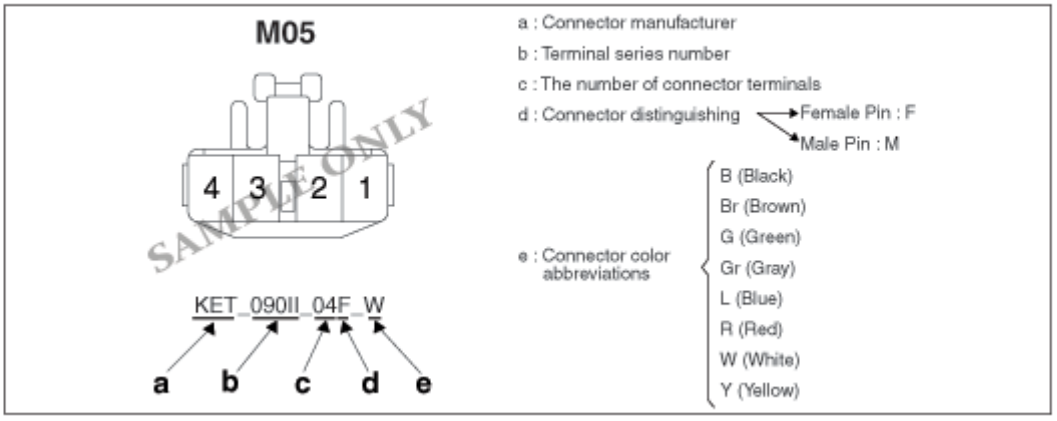
Starting System (2) SD360-2

② Connector configurations (components)



SAMPLE ONLY

Explanation of connector code



SAMPLE ONLY

① Pages by system/ Name of Schematic diagram

- Each page is consisted of circuits by system. This schematic diagram includes the path of electricity flow, connection condition for each switch, and the function of other relevant circuits at once. It is applicable to real service work.
- It is very important to understand relevant circuits exactly before troubleshooting diagnosis.
- Circuits by system depends upon part number and are indicated on schematic diagram index.

② Connector configuration (components)

- The connector figure of components in the schematic diagram by system is indicated on the last page of schematic diagram.
- It shows the front of the connector on the harness side when not to the harness connector. The terminal number on each connector can be obtained by following the pattern used in ⑤ connector view and numbering order. Unused terminals are marked with an asterisk (*).

③ Connector configurations (connection between harnesses)

- When connecting the harness with connector between harnesses, it shows female and male connectors and indicates them on the connector configurations group.

EM02

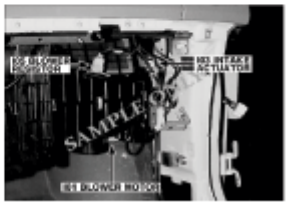


SAMPLE COPY

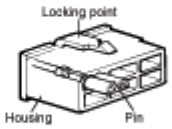
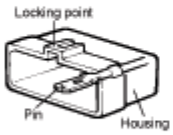
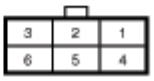
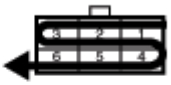
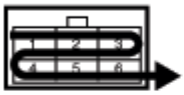
④ Component locations

- To find the components easily, a component locations diagram is indicated with "PHOTO NO" on the lower portion of the component name.
- To make it easy to distinguish connectors, the connector in the picture is indicated being installed in the vehicle.

PHOTO 03



⑤ CONNECTOR VIEW AND NUMBERING ORDER

Female	Male	Remarks
		It is not the shape of the connector housing, but the connector pin that distinguishes between male or female connectors. When numbering female and male connectors, refer to the numbering order in the following table. Some connectors may not follow this method of numbering order. For individual detailed numbering, refer to the CONNECTOR CONFIGURATIONS.
		
		Numbered in order from upper right to lower left Numbered in order from upper left to lower right

NOTE

UNLESS OTHERWISE STATED, ALL CONNECTOR VIEWS ARE FROM THE TERMINAL SIDE OF THE CONNECTOR.

⑥ WIRE COLOR ABBREVIATIONS

The following abbreviations are used to identify wire colors in the circuit schematics.

Symbol	Color of wire	Symbol	Color of wire
B	Black	O	Orange
Br	Brown	P	Pink
G	Green	R	Red
Gr	Gray	W	White
L	Blue	Y	Yellow
Lg	Light Green	Pp	Purple
T	Tan	LI	Light Blue

* Ⓨ/Ⓑ: Black stripe with yellow ground (2 colors)
  - Ⓨ: the color of background
  - Ⓑ: the color of stripe

⑦ HARNESS CLASSIFICATION

Electrical wiring connectors are classified according to the wiring parts in the Harness Layouts.

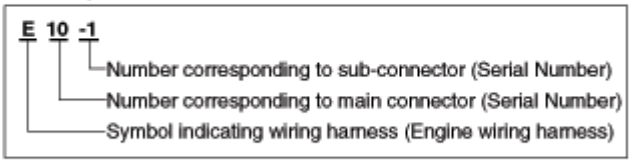
Symbol	Harness name	Location
C	Control, Ignition Coil Injector Harness	Engine Compartment
D	Door Harness	Door
E	Front, Front End Module Battery Harness	Engine Compartment
F	Floor, Console EXT. Harness	Floor
M	Main Harness	Passenger Compartment Under Crash Pad
R	Roof, Tail Gate Bumper Harness	Roof, Tail Gate
S	Seat Harness	Seat

* It depends on vehicles, it is necessary to check the harness name symbol on the harness layouts for detailed symbol.

⑧ CONNECTOR IDENTIFICATION

A connector identification symbol consists of a wiring harness location classification symbol corresponding to a wiring harness location and number corresponding to the connector.
These connector locations can be found in the HARNESS LAYOUTS.

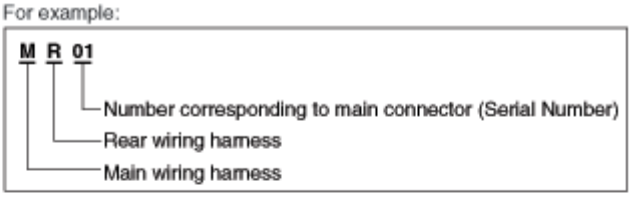
For example:



NOTE

Connectors which connect each wiring harness are represented by the following symbols.

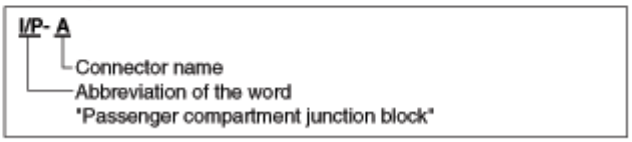
For example:



JUNCTION BLOCK IDENTIFICATION

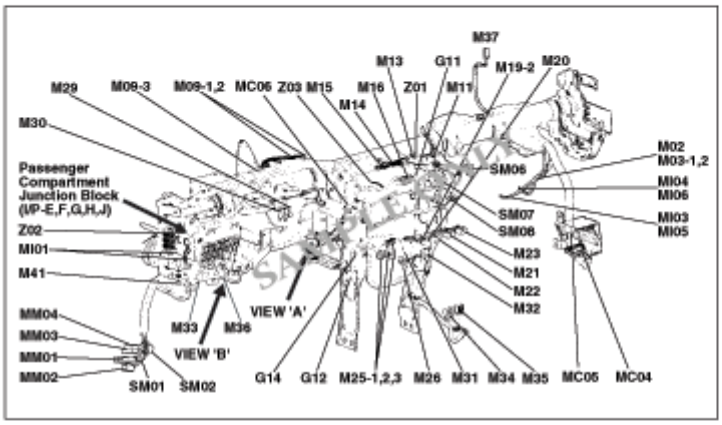
A junction block identification symbol consists of a wiring harness location classification symbol corresponding to a wiring harness location and number corresponding to the connector in the junction block.

For example:



HARNESS LAYOUTS

Harness layouts show the routing of the major wiring harnesses, the in-line connectors and the splices between the major harnesses. These layouts will make electrical troubleshooting easier.



MAIN HARNESS

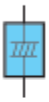
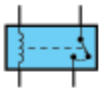
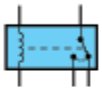
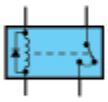
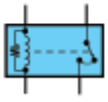
M01-1	Multifunction switch	MH01	Driver door unlock relay
M01-2	Multifunction switch	MH01	Cam time lock
M01-3	Multifunction switch (CANADA)	MH02	Auto light control module
M01-4	Multifunction switch (USA)	MH05	Power outlet
M04	Ignition switch	MH04	Pre-excitation resistor
M05	Ignition key ILL. & Door warning switch	I/P-E	Connection with PASSENGER COMPARTMENT JUNCTION BLOCK
M06	Multipurpose check connector	I/P-F	Connection with PASSENGER COMPARTMENT JUNCTION BLOCK
M07	Data link connector	I/P-G	Connection with PASSENGER COMPARTMENT JUNCTION BLOCK
M08	Joint connector	I/P-H	Connection with PASSENGER COMPARTMENT JUNCTION BLOCK
M09-1	Instrument cluster (M/O Trip)	I/P-J	Connection with PASSENGER COMPARTMENT JUNCTION BLOCK
M09-2	Instrument cluster (M/O Trip)	EI01	Connection with ENGINE harness
M09-3	Instrument cluster (M/O Trip)	EI02	Connection with ENGINE harness
M10-1	Instrument cluster (With Trip)	EI03	Connection with ENGINE harness
M10-2	Instrument cluster (With Trip)	MC04	Connection with CONTROL harness (SULEV)
M10-3	Instrument cluster (With Trip)	MC05	Connection with CONTROL harness (SULEV)
M12	Immobilizer control module	MC06	Connection with CONTROL harness (SULEV)
M16	Audio	MC07	Connection with CONTROL harness (CVVT)
M18-1	A/C control module (Auto A/C)	MC08	Connection with CONTROL harness (CVVT)
M18-2	A/C control module (Auto A/C)	MC09	Connection with CONTROL harness (CVVT)
M20	A/C control module (Manual A/C)	MI01	Connection with SWITCH EXT. harness
M21	Blower switch (Manual A/C)	MI03	Connection with A/C harness (Manual A/C)
M25-1	ETACM	MI04	Connection with A/C harness (Manual A/C)
M25-2	ETACM	MI06	Connection with A/C harness (Auto A/C)
M25-3	ETACM	MI06	Connection with A/C harness (Auto A/C)
M27	Joint connector	MM01	Connection with FLOOR harness
M30	Chime bell	MM02	Connection with FLOOR harness
M31	Cigarette lighter	MM03	Connection with FLOOR harness
M32	Door lock control module	MM07	Connection with HAZARD EXT. harness
M33	Joint connector	MM11	Connection with GLOVE BOX harness
M34	Left front seat warmer switch	G11	Ground
M35	Right front seat warmer switch	G12	Ground
M36	Joint connector	G13	Ground
M37	Photo sensor	Z01	Diode
M38	Flasher unit	Z02	Diode
M39	Hazard relay	Z04	Diode
M41	Burglar alarm relay		

SAMPLE PAGE

Section	Symbol	Meaning
COMPONENT		A solid line means the entire component is shown.
		A broken line indicates only part of the component is shown.
		This means the connector connects directly to the component.
		This indicates the connector connects to a lead (pigtail), wired directly to the component.
		This indicates a screw terminal on the component.
		This ground symbol (dot and 3 lines overlapping the component) means the housing of the component is attached to a metal part of the vehicle.
	STOP LAMP SWITCH PHOTO 63	The name of the component appears next to its upper right corner. Shows the number of pictures for component location.
CONNECTOR	Male connector M65-2 Female connector	Shows the name of each connector on the component location index for reference. Indicates the number of corresponding terminal. (Only relevant terminal on the corresponding schematic diagram).
	R YL E35 R YL	The dashed-line means each of two wires connect with same connector(E35)
WIRE	B	A wavy line means the wire is broken but is to be continued.
	Y/R	Wire insulation is yellow with a red strip.
	From C53 A To M02	Current path is continued on the same page or another page.The arrow shows the direction of current flow. You should look for the "A" in the marked position.
	R Name of Circuit	A wire connects to another circuit. The wire is shown again on that circuit which the arrow is pointing.
	Automatic Transaxle Manual Transaxle	Wire choices for options or different models are labeled and shown with a "choice" bracket like this.
SPLICES	L L	Splices are numbered and shown as a dot with circle. The exact location and connection of these splices may vary among vehicles.
GROUND	G06	This symbol means the end of the wire is attached to a metal part of the vehicle.

Section	Symbol	Meaning
SHIELD WIRE	G01	This represents RFI (Radio Frequency Interference) Shielding around a wire. The shielding is always connected to ground.
JOINT CONNECTOR		This is a connector showing the joining wires.
SHOW BOX	Power supplied at all times. IGN FUSE & RELAY BOX FIP-DS FUSE 15A	Power supplied at all times. Name Capacity
FUSE	IGN FUSE IGN FUSE & RELAY BOX FUSE 10A 15A	This means power is supplied with the ignition on position. This means the short bar connects to other fuses. Identification Current rating
POWER SOURCE		Control battery power at all times

Section	Symbol	Meaning
LAMP		Double filament
		Single filament
DIODE		Diode
		Led diode
		Zener diode
TR	C B E NPN	NPN
	C B E PNP	PNP
GENERAL COMPONENT SYMBOL		These switches move together: a dashed line shows a mechanical connection between them.
		Switch (1 contact point)
		Heater

Section	Symbol	Meaning	Section	Symbol	Meaning
GENERAL COMPONENTS SYMBOL		Sensor	GENERAL COMPONENTS SYMBOL		Condenser
		Sender			Speaker
		Injector			Horn, Buzzer, Siren, Chime Bell
		Solenoid	RELAY		Normally open contact
		Motor			This is a relay shown with no current flowing through its coil. When a current flows through coil, contact will toggle.
		Battery			Diode interior relay
					Resistance interior relay

TROUBLESHOOTING INSTRUCTIONS

TROUBLESHOOTING PROCEDURES

The following five-step troubleshooting procedure is recommended.

1. Verify the customer's complaints

Turn on all the components in the problem circuit to check the accuracy of the customer's complaints. Note the symptoms.
Do not begin disassembly or testing until you have narrowed down the probable causes.

2. Read and analyze the schematic diagram

Locate the schematic for the problem circuit. Determine how the circuit is supposed to work by tracing the current paths from the power source through the system components to ground. If you do not understand how the circuit should work, read the circuit operation text. Also check other circuits that share with the problem circuit. The name of circuits that share the same fuse, ground, or switch, for example, are referred to on each diagram. Try to operate any shared circuits you did not check in step 1. If the shared circuit works, the shared wiring is okay, and the cause must be within the wiring used only by the problem circuit.
If several circuits fail at the same time, the fuse or ground is a likely cause.

3. Inspect the circuit/ component with the problem isolated

Make a circuit test to check the diagnosis you made in step 2. Remember that a logical, simple procedure is the key to efficient troubleshooting. Narrow down the probable causes using the troubleshooting hints and system diagnosis charts. Test for the most likely cause of failure first.
Try to make tests at points that are easily accessible.

4. Repair the problem

Once the problem is found, make the necessary repairs.

5. Make sure the circuit works

Repeat the system check to be sure you have repaired the problem. If the problem was a blown fuse, be sure to test all of the circuits on that fuse.

TROUBLESHOOTING EQUIPMENT

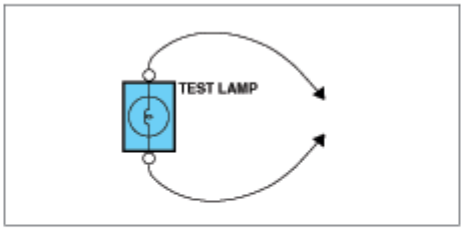
VOLTMETER AND TEST LAMP

Use a test lamp or a voltmeter on circuits without solidstate units and use a test lamp to check for voltage. A test lamp is made up of a 12-volt light bulb with a pair of leads attached. After grounding one lead, touch the other lead to various points along the circuit where voltage should be present.
When the bulb goes on, there is voltage at the point being tested.

CAUTION

A number of circuits include solid-state modules, such as the Engine Control Module(ECM), used with computer command control injection. Voltage in these circuits should be tested only with a 10-megaohm or higher impedance digital multimeter. Never use a test lamp on circuits that contain solid state modules. Damage to the modules may result.

A voltmeter can be used in place of a test lamp. While a test lamp shows whether the voltage is present or not, a voltmeter indicates how much voltage is present.



SELF-POWERED TEST LAMP AND OHMMETER

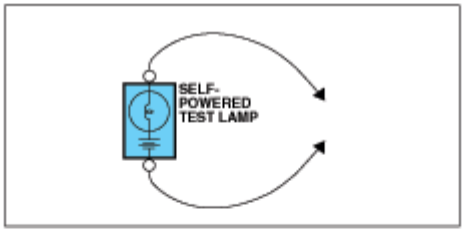
Use a self-powered test lamp or an ohmmeter to check for continuity.
The ohmmeter shows how much resistance there is between two points along a circuit. Low resistance means good continuity.

CAUTION

Never use a self-powered test lamp on circuits that contain solid state modules. Damage to these modules may result.

An ohmmeter can be used in place of a self-powered test lamp.
The ohmmeter shows how much resistance there is between two points along a circuit. Low resistance means good continuity.

Circuits which include any solid-state devices should be tested only with a 10-megaohm or higher impedance digital multimeter. When measuring resistance with a digital multimeter, the battery negative terminal should be disconnected. Otherwise, there may be incorrect readings. Diodes and solid-state devices in a circuit can make an ohmmeter give a false reading. To find out if a component is affecting a measurement, take one reading, reverse the leads and take a second reading.
If different the solid-state device is affecting the measurement.



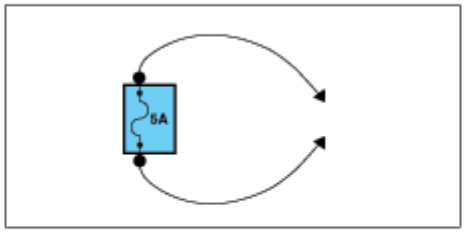
JUMPER WIRE WITH FUSE

Use a jumper wire with a fuse to by-pass an open circuit.

A jumper wire is made up of an in-line fuse holder connected to a set of test leads. This tool is available with small clamp connectors providing adaption to most connectors without damage.

CAUTION

Do not use a fuse with a higher rating than the specified fuse that protects the circuit being tested. Do not use this tool in any situation to substitute an input or output at the solid-state control module, such as ECM, TCM, etc.



SHORT FINDER

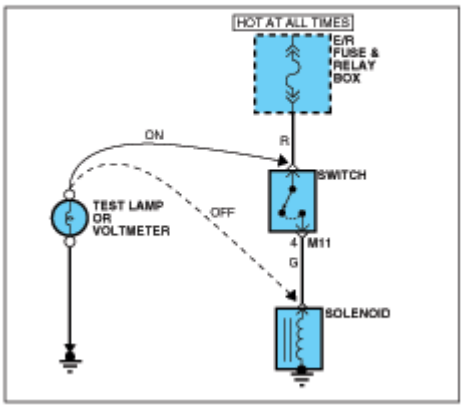
A short finder is available to locate a short to ground. The short finder creates a pulsing magnetic field in the shorted circuit and shows you the location of the short through body trim or sheet metal.

TROUBLESHOOTING TEST

1. TESTING FOR VOLTAGE

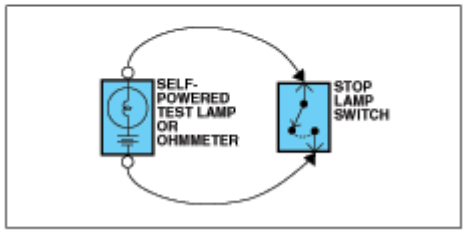
This test measures voltage in a circuit. When testing for voltage at a connector, you do not have to separate the two halves of the connector. Instead, probe the connector from the back(backprobe). Always check both sides of the connector because dirt and corrosion between its contact surfaces can cause electrical problems.

A. Connect one lead of a test lamp or voltmeter to a ground. If you are using a voltmeter, be sure it is the voltmeter's negative test lead you have connected to ground.
B. Connect the other lead of the test lamp or voltmeter to a selected test point(connector or terminal).
C. If the test lamp glows, there is voltage present. If you are using a voltmeter, note the voltage reading. A loss of more than 1 volt from specification indicates a problem.



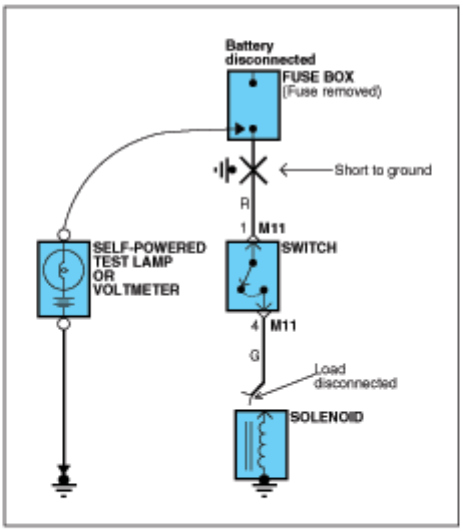
2. TESTING FOR CONTINUITY

A. Disconnect the battery negative terminal.
B. Connect one lead of a self-powered test lamp or ohmmeter to one end of the part of the circuit you wish to test. If you are using an ohmmeter, hold the leads together and adjust the ohmmeter to read zero ohms.
C. Connect the other lead to the other end.
D. If the self-power test lamp glows, there is continuity. If you are using an ohmmeter, low or zero resistance means good continuity.



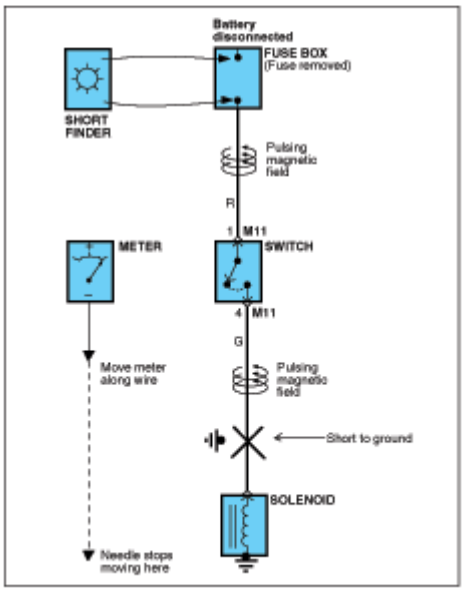
3. TESTING FOR SHORT TO GROUND

A. Disconnect the battery negative terminal.
B. Connect one lead of a self-powered test lamp or an ohmmeter to the fuse terminal on the load side.
C. Connect the other lead to a ground.
D. Beginning near the fuse block move the harness from side to side. Continue this proceedure(about six inches apart) while watching the self-powered test lamp or ohmmeter.
E. When the self-powered test lamp glows, or ohmmeter registers, there is a short to a ground in the wiring near that point.



4. TESTING FOR A SHORT WITH A SHORT FINDER

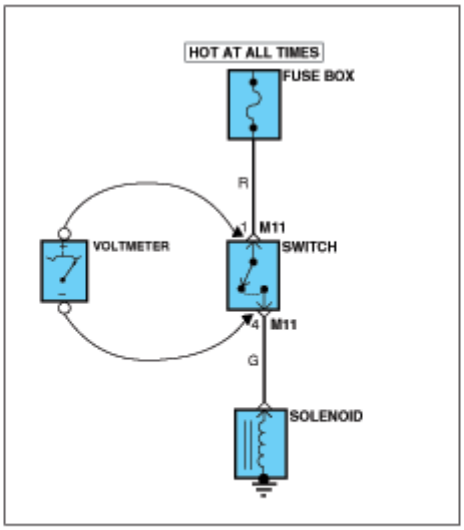
A. Remove the blown fuse. Leave the battery connected.
B. Connect the short finder across the fuse terminals.
C. Close all switches in series in the circuit that is being testing.
D. Turn on the short circuit locator. It sends pulses of current to the short. This creates a pulsing magnetic field around the wiring between the fuse box and the short.
E. Beginning at the fuse box, slowly move the short finder along the circuit wiring. The meter will show current pulses through sheet metal and body trim. As long as the meter is between the fuse and the short, the needle will move with each current pulse. Once the meter is moved past the point of the short, the needle will stop moving. Check around this area to locate the cause of the short circuit.



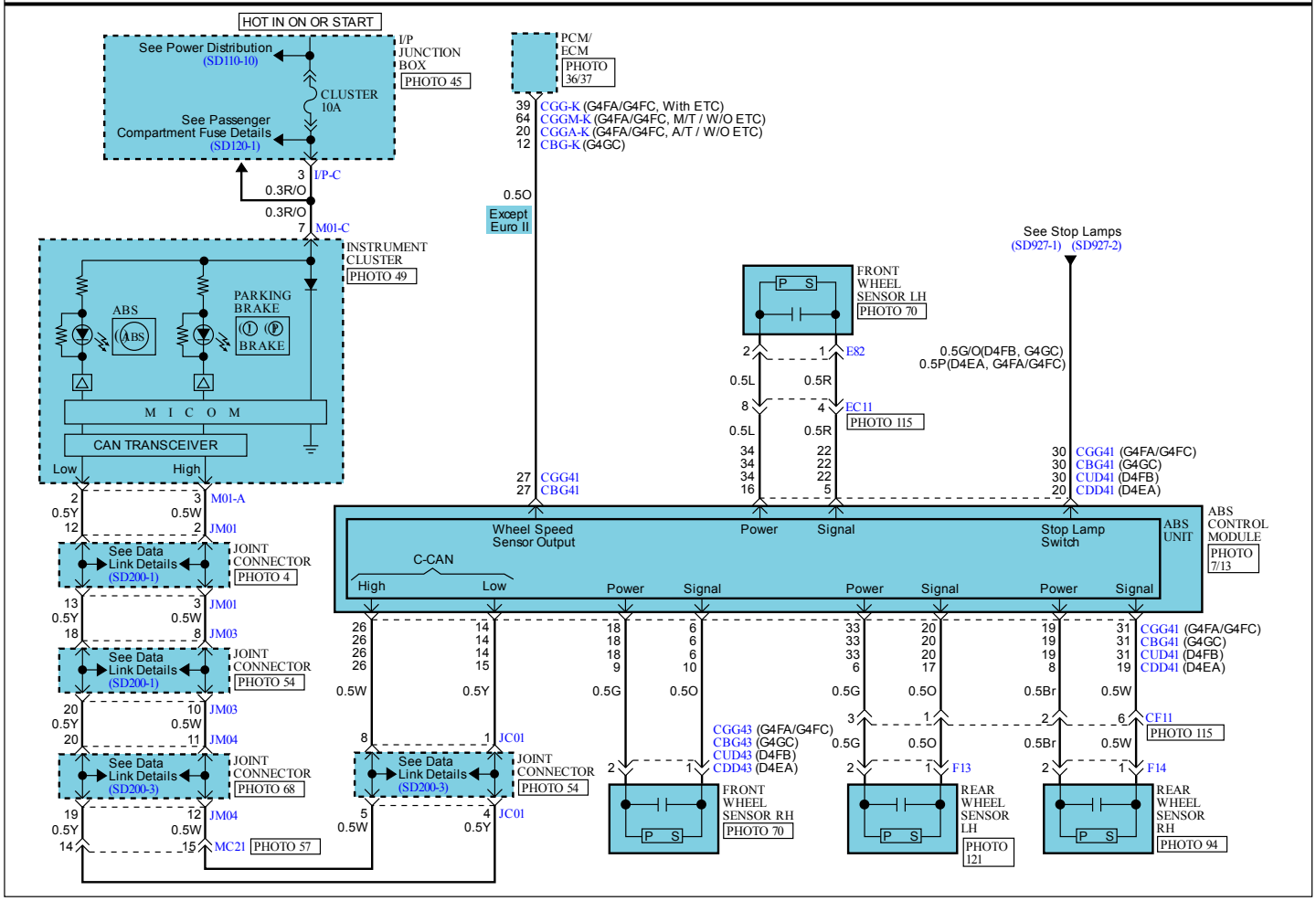
5. TESTING FOR VOLTAGE DROP

This test checks for voltage drop along a wire, or through a connection or switch.

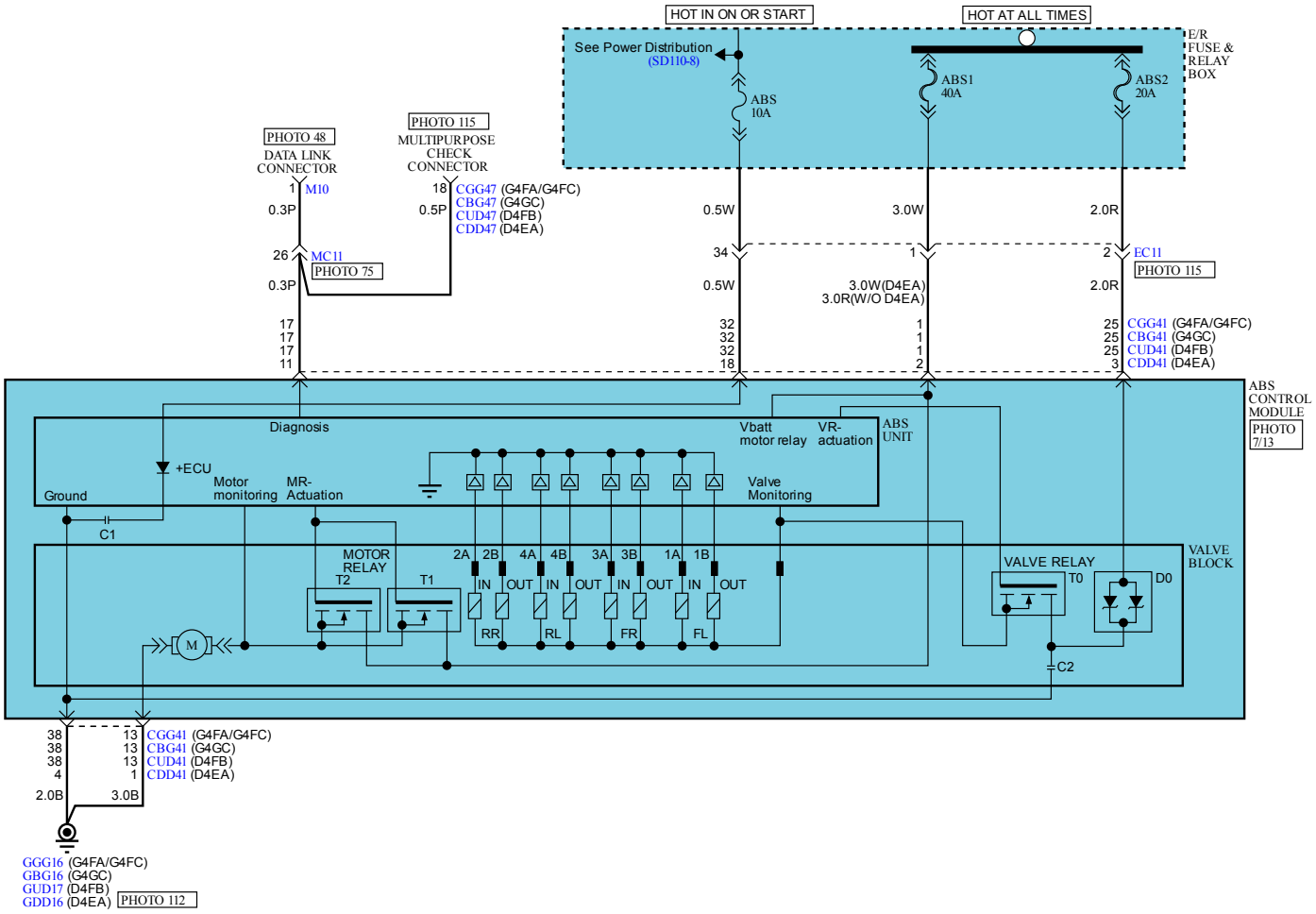
A. Connect the positive lead of a voltmeter to the end of the wire (or to the side of the connector or switch) closest to the battery.
B. Connect the negative lead to the other end of the wire. (or the other side of the connector or switch)
C. Operate the circuit.
D. The voltmeter will show the difference in voltage between the two points. A difference, or drop of more than 0.1 volts (50mV in 5V circuits), may indicate a problem. Check the circuit for loose or dirty connections.



Anti-Lock Brake System (ABS) (1) SD587-1

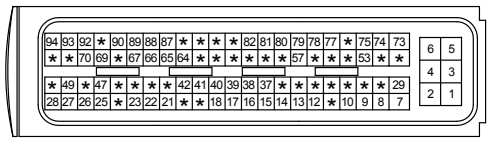


Anti-Lock Brake System (ABS) (2) SD587-2



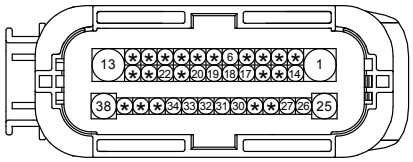
Anti-Lock Brake System (ABS) (3) SD587-3

CBG-K



AMP_ECU_94F_B

CBG41



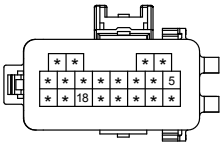
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CBG43



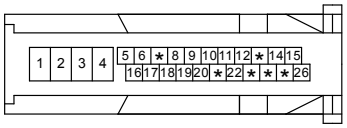
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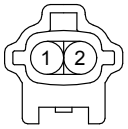
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CDD41



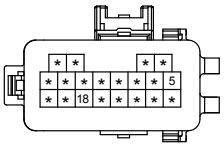
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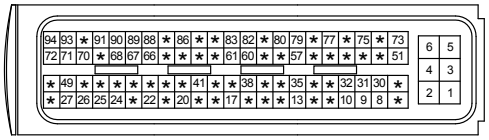
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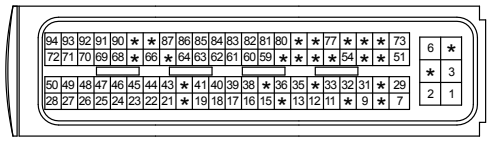
CGGA-K



AMP_ECU_94F_B

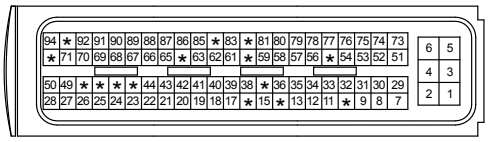
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CGGM-K



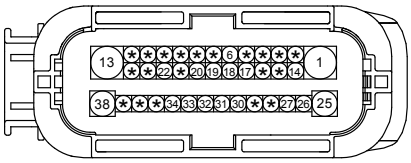
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CGG-K



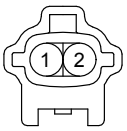
AMP_ECU_94F_B

CGG41



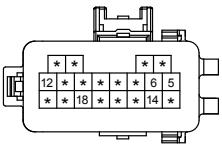
DEL_ABS_38F_B

CGG43



KET_090IIWP_02M_Gr

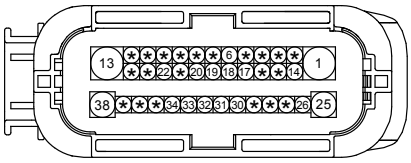
CGG47



KET_DIAG_20F_B_BRK_C

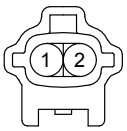
Anti-Lock Brake System (ABS) (4) SD587-4

CUD41



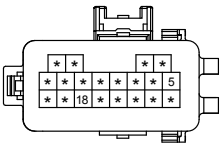
DEL_ABS_38F_B

CUD43



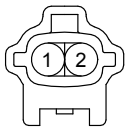
KET_090IIWP_02M_Gr

CUD47



KET_DIAG_20F_B_BRK_C

E82



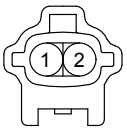
KET_090IIWP_02M_Gr

F13



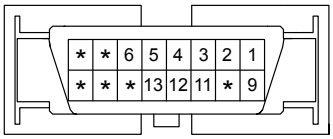
KET_090IIWP_02M_Gr

F14



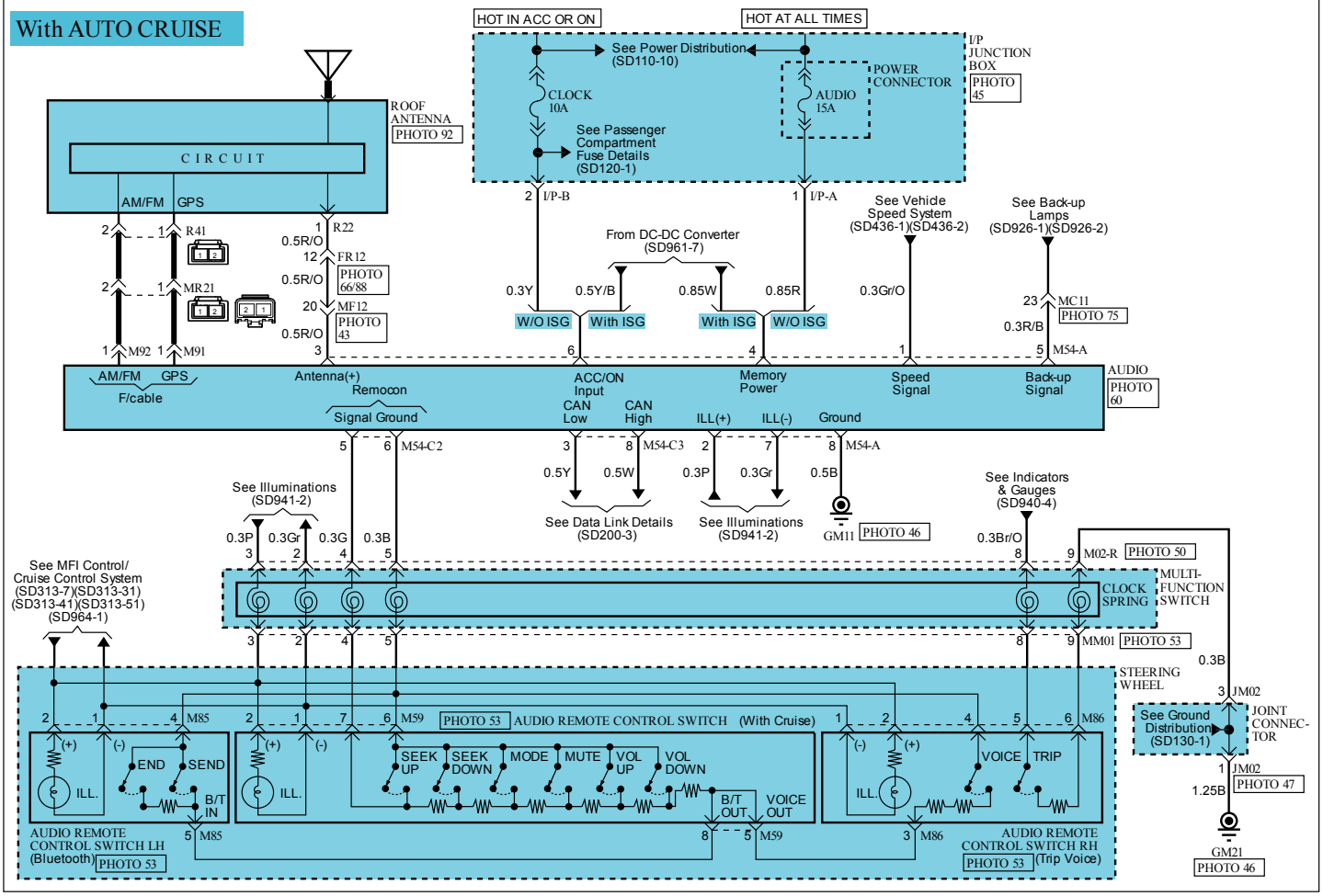
KET_090IIWP_02M_Gr

M10

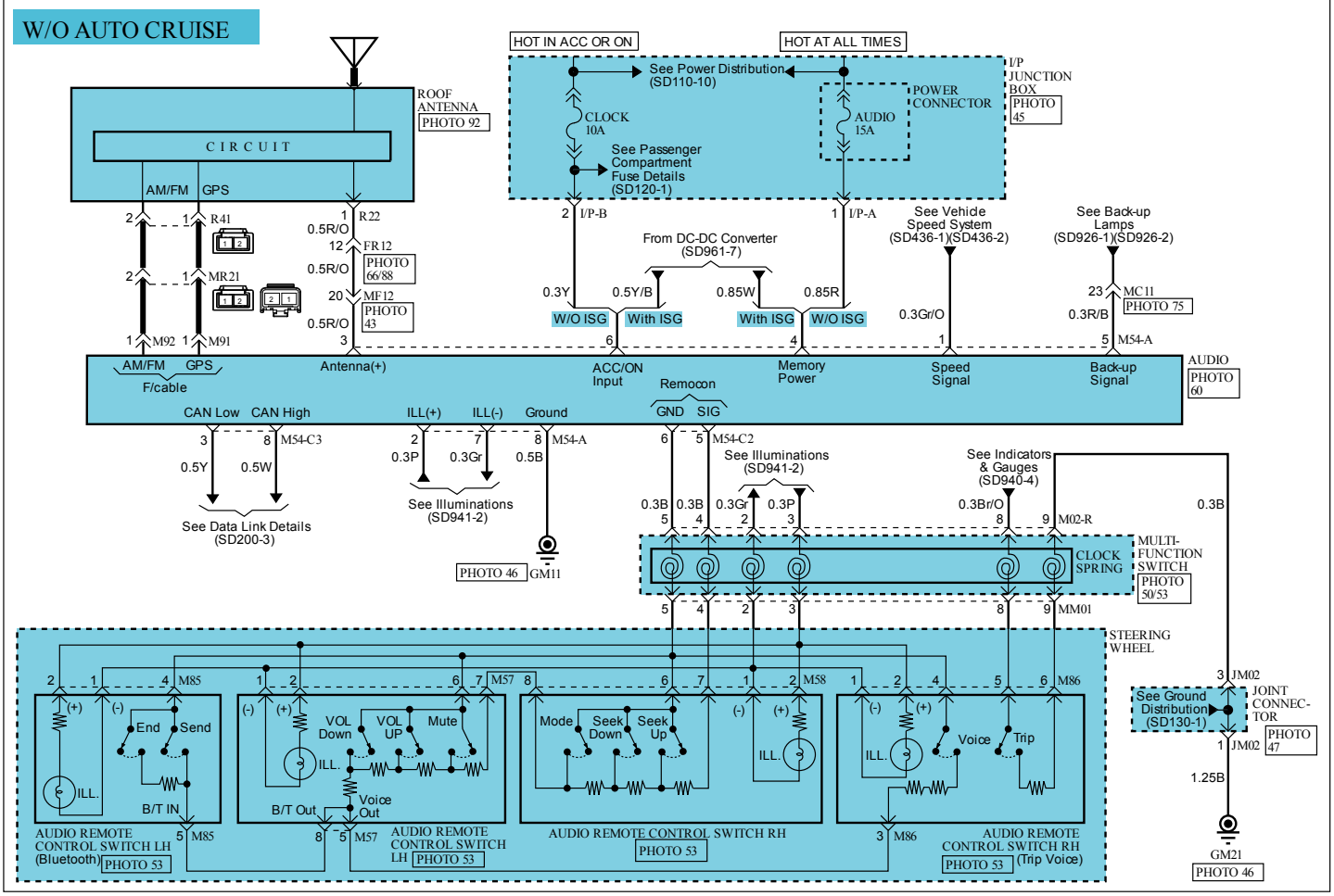


MLX_OBDII_16F_B_SIN

Audio (1) SD961-1

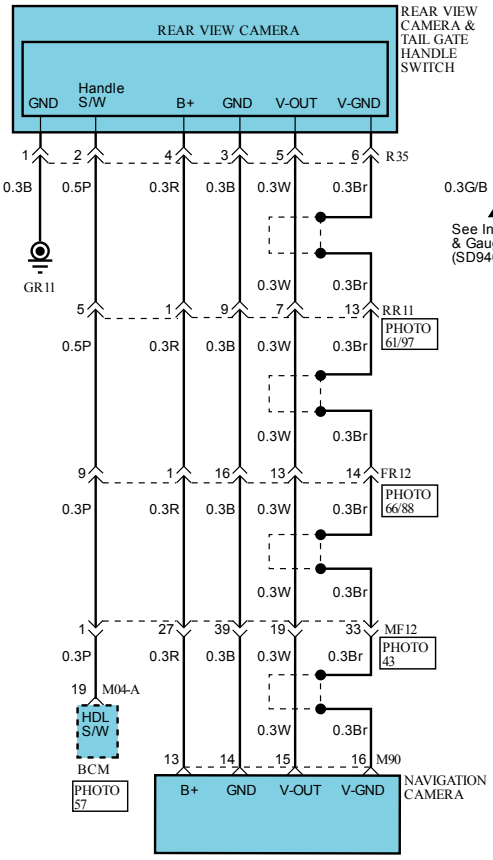


Audio (2) SD961-2

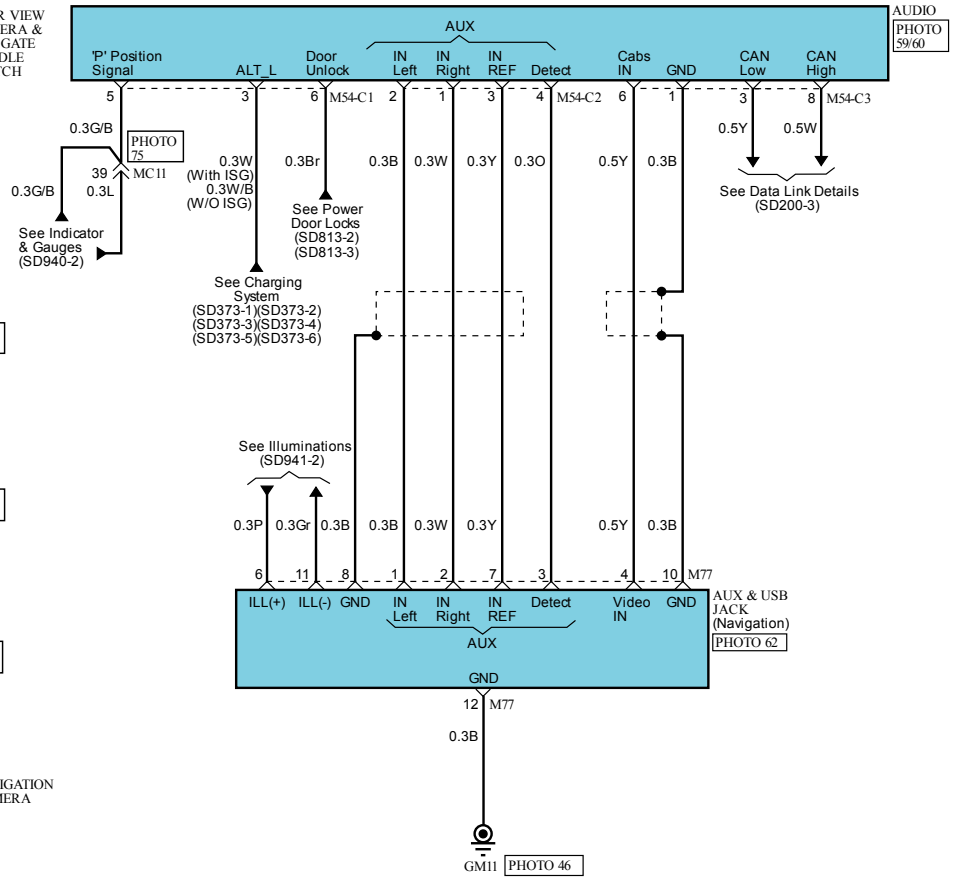


Audio (5) SD961-5

WITH NAVIGATION

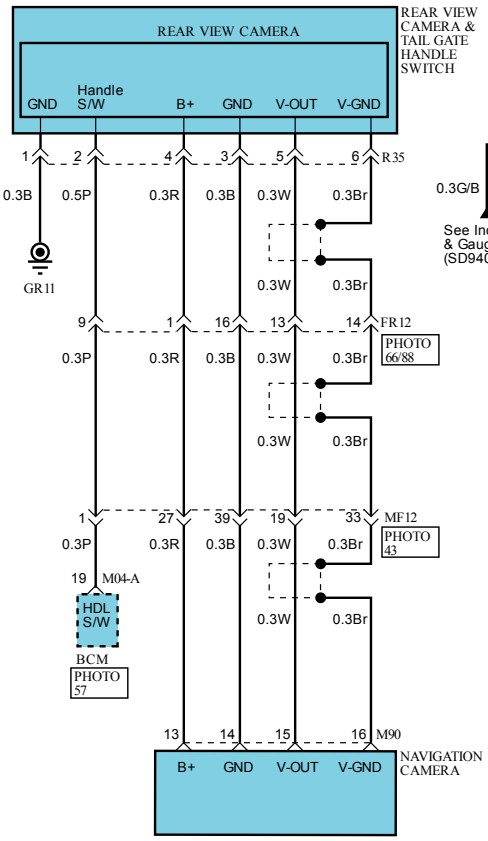


5DOOR/WAGON

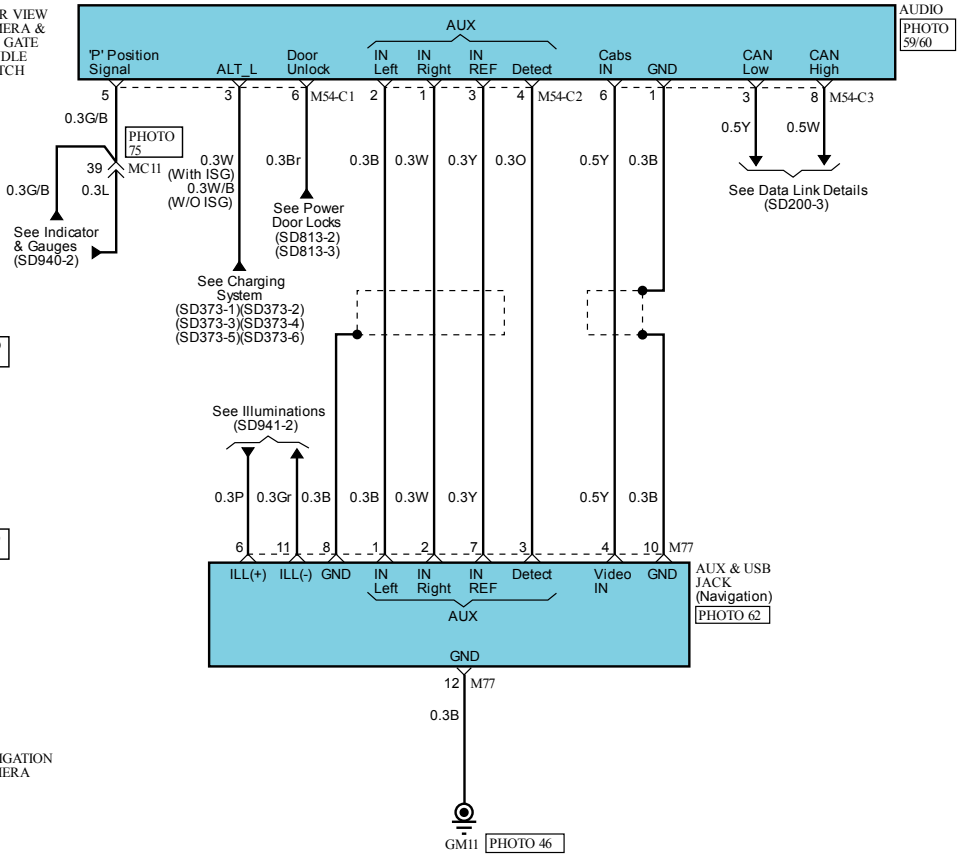


Audio (6) SD961-6

WITH NAVIGATION

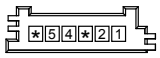


3DOOR



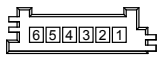
Audio (7) SD961-7

M85



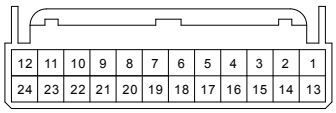
AMP 0-936289-5

M86



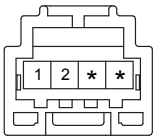
AMP 0-936289-2

M90



AMP_025_24F_W

R18



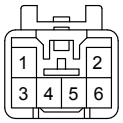
AMP_MQS_04M_B

R22



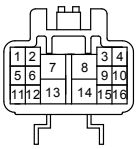
AMP_PLM1_01F_B

R35

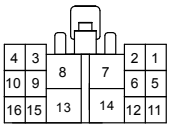


KET_090II_06M_W

FR12

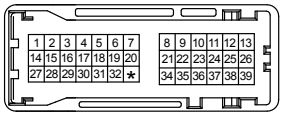


KET_1809_16M_W

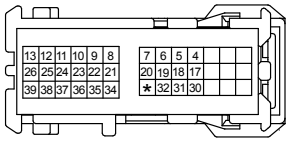


KET_1809_16F_W

MF12

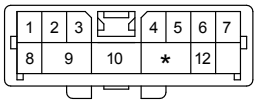


KET_LIF0409_39M_Gr

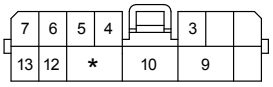


KET_LIF0409_39F_Gr

RR11

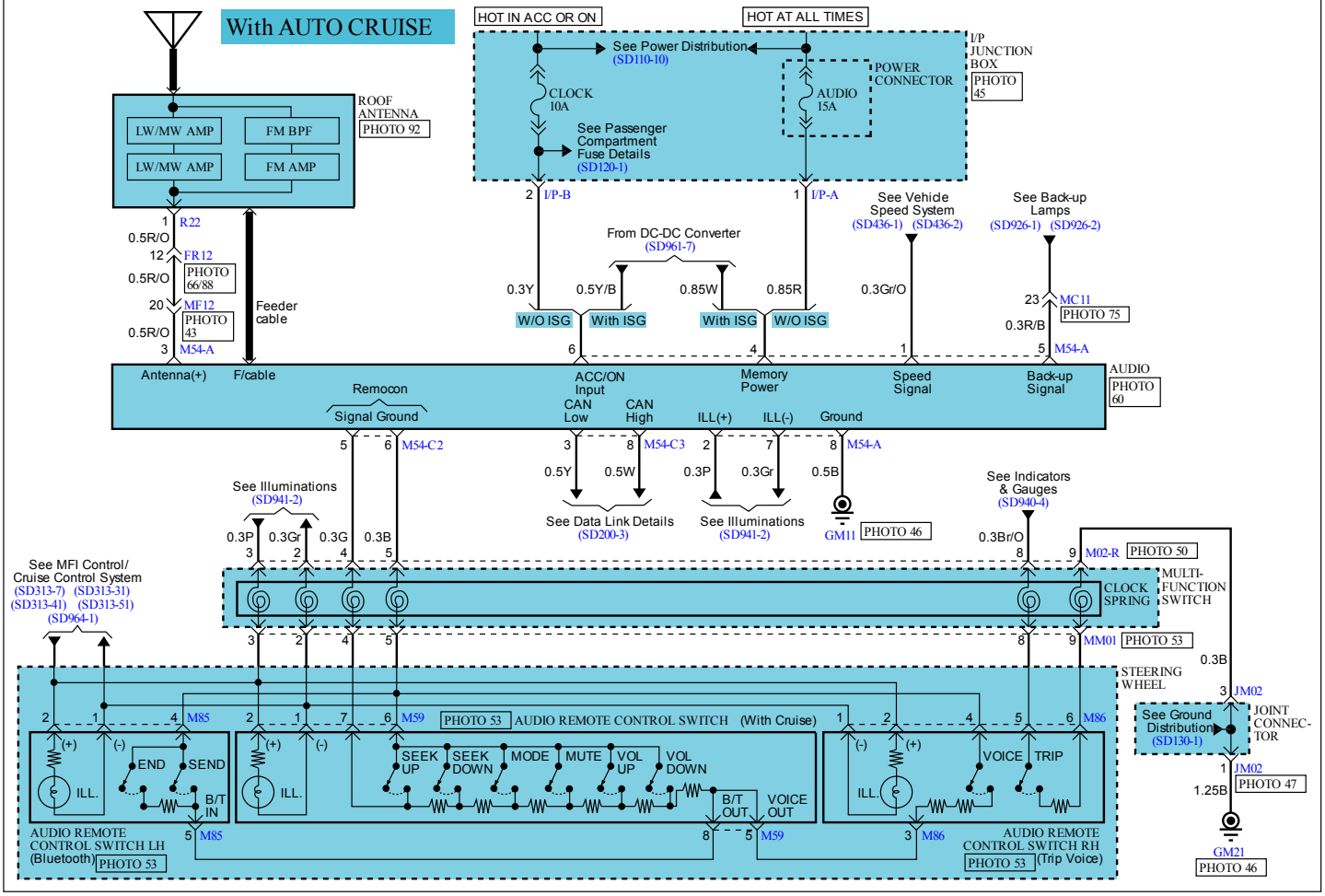


AMP_0725_13M_W

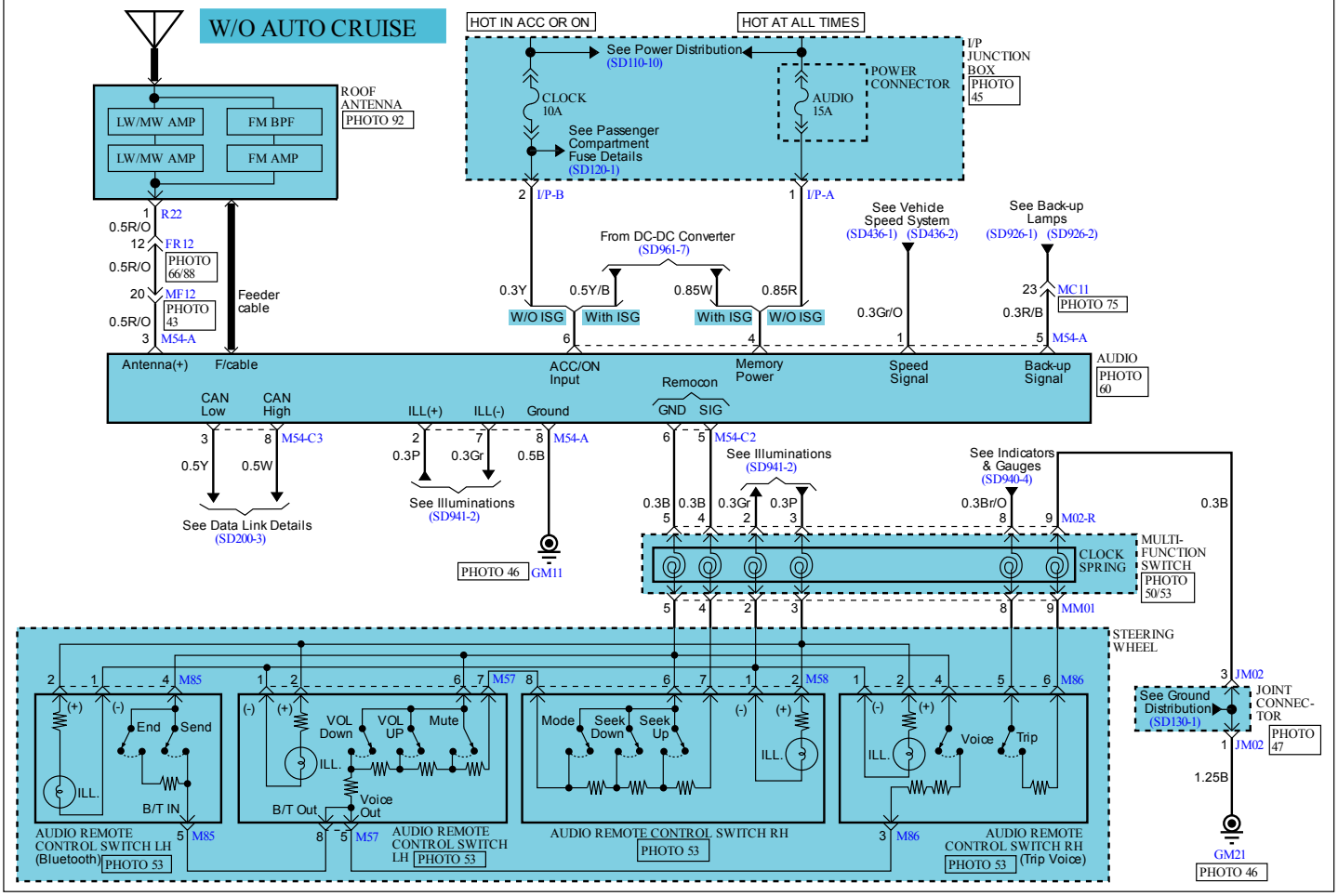


AMP_0725_13F_W

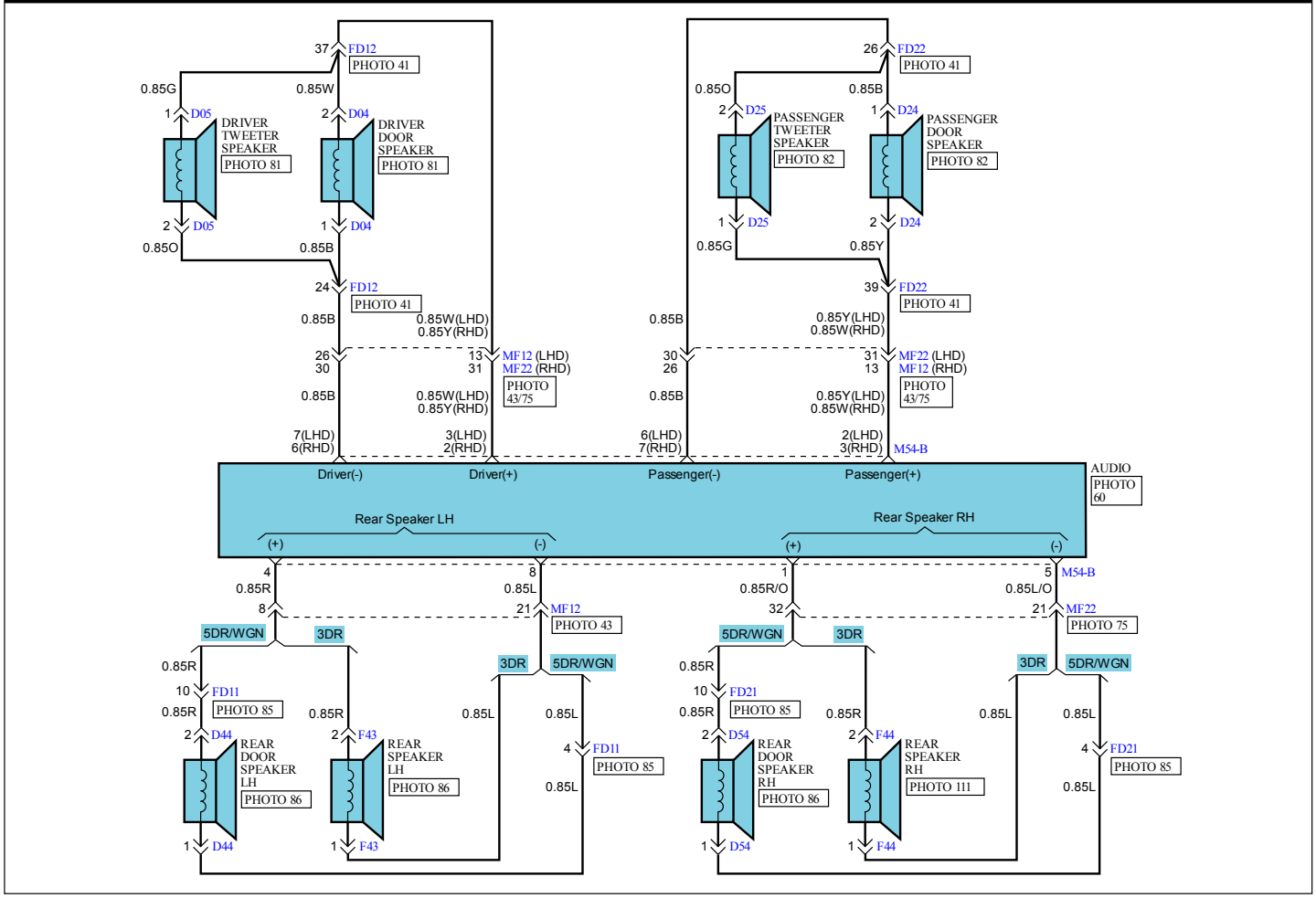
Audio (1) SD961-1



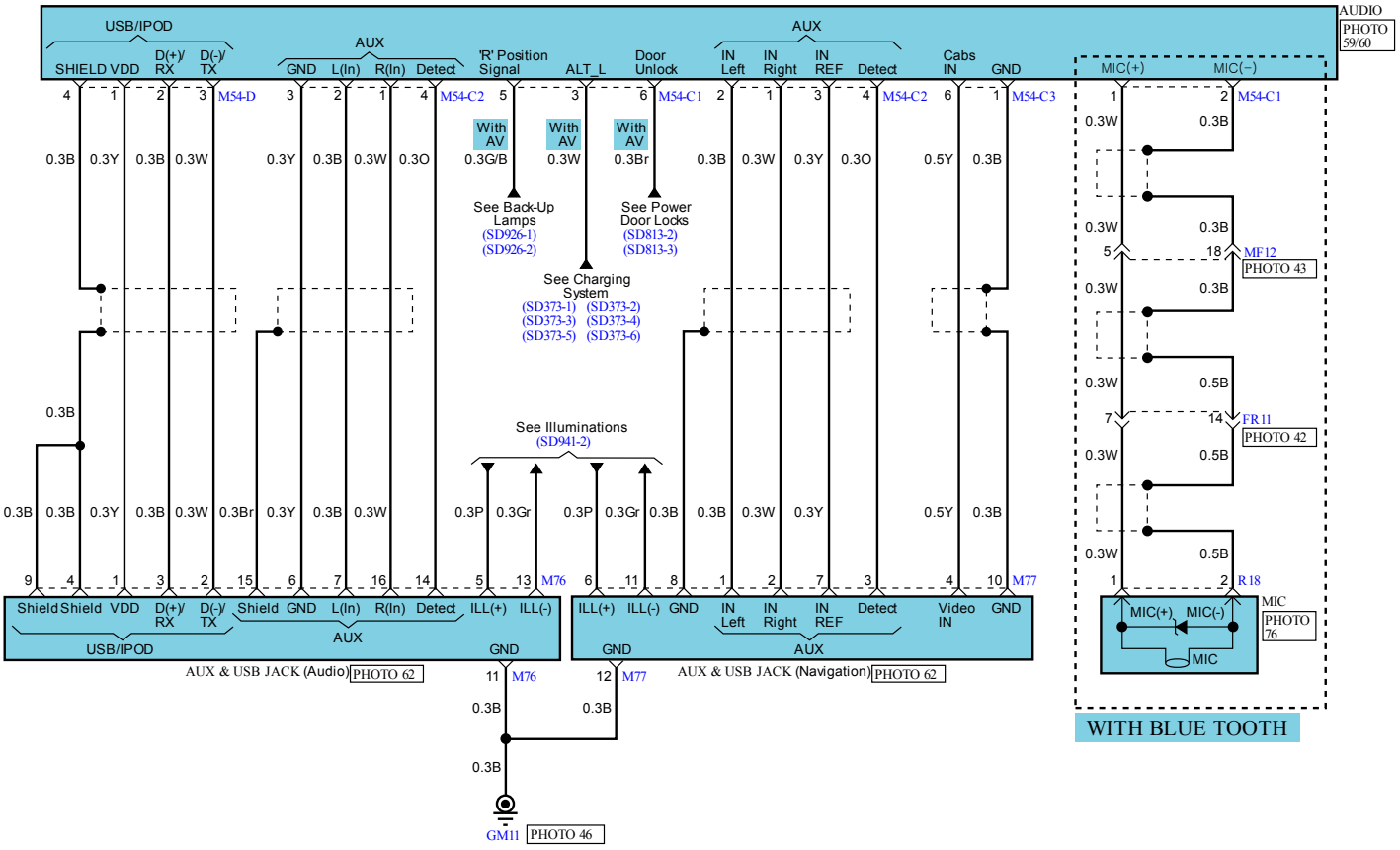
Audio (2) SD961-2



Audio (3) SD961-3

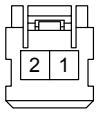


Audio (4) SD961-4



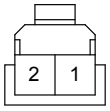
Audio (5) SD961-5

D04



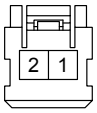
AMP_090III_02F_W

D05



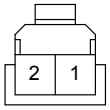
AMP_070_02F_W

D24



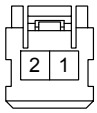
AMP_090III_02F_W

D25



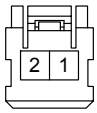
AMP_070_02F_W

D44



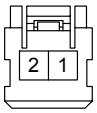
AMP_090III_02F_W

D54



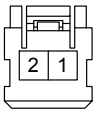
AMP_090III_02F_W

F43



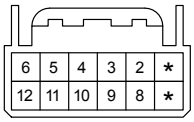
AMP_090III_02F_W

F44



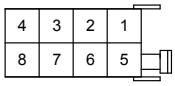
AMP_090III_02F_W

M02-R



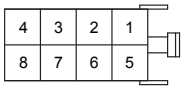
AMP_025_12F_W

M54-A



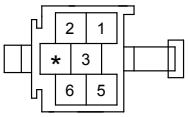
AMP_JT_08F_Gr_D2

M54-B



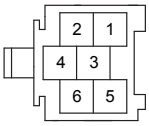
AMP_JT_08F_Br_D1

M54-C1



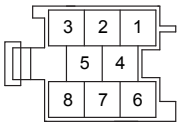
AMP_MTII_06F_Y_C1

M54-C2



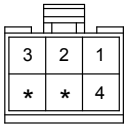
AMP_MTII_06F_G_C2

M54-C3



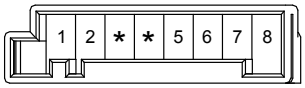
AMP_MTII_08F_L_C3

M54-D



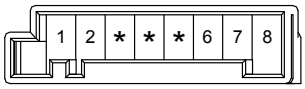
MLX_118_06F_B

M57



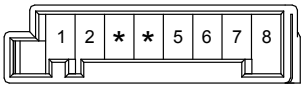
AMP 0-1743282-1

M58



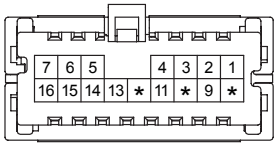
AMP 0-1743282-2

M59



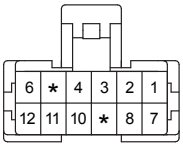
AMP 0-1743282-1

M76



KET_040II_16F

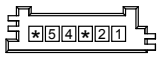
M77



KET_040SP_12F_B

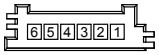
Audio (6) SD961-6

M85



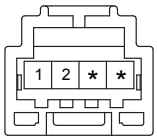
AMP 0-936289-5

M86



AMP 0-936289-2

R18



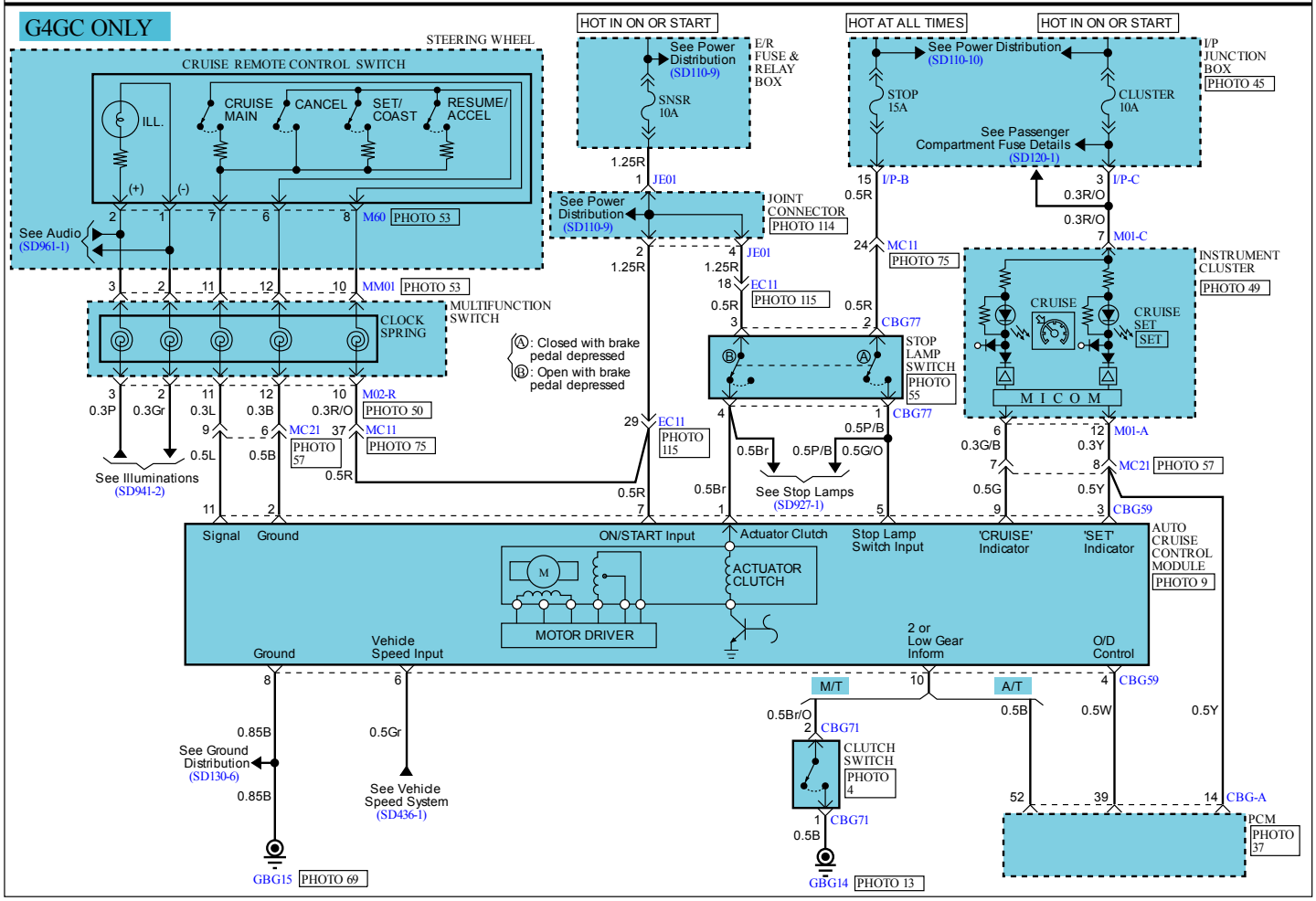
AMP_MQS_04M_B

R22



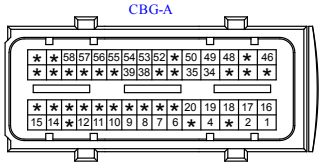
AMP_PLM1_01F_B

Auto Cruise System (1) SD964-1



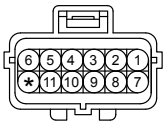
Auto Cruise System (2) SD964-2

CBG-A



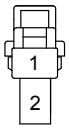
AMP_ECU_60F_B

CBG59



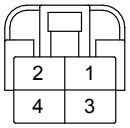
AMP_EJWP_12F_B

CBG71



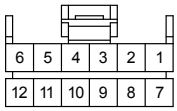
KET_250DL_02F_W

CBG77



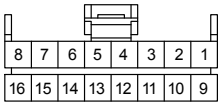
KET_250DL_04F_W

M01-A



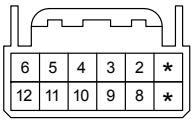
AMP_040M1_12F_B

M01-C



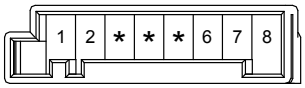
AMP_040M1_16F_B

M02-R



AMP_025_12F_W

M60



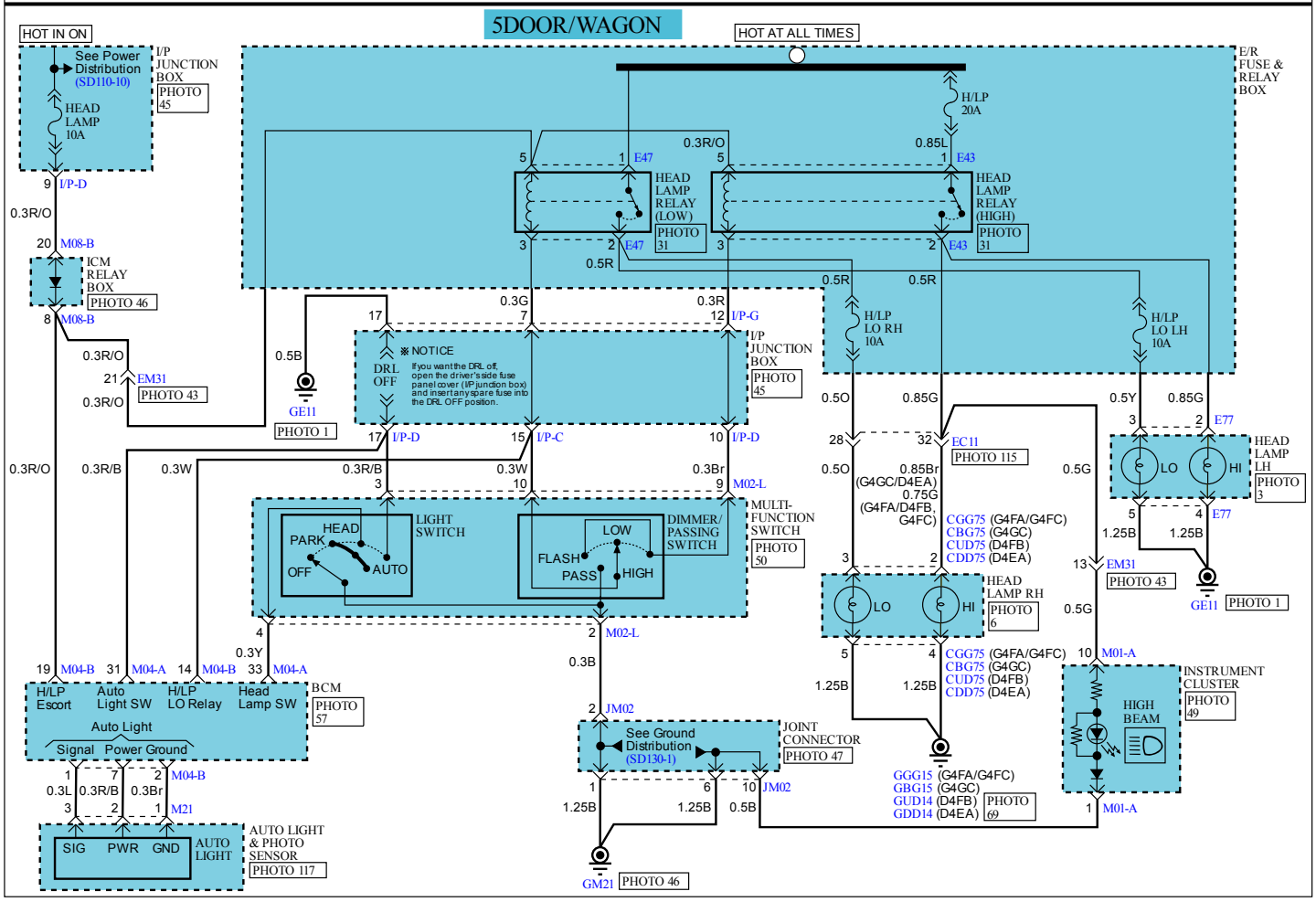
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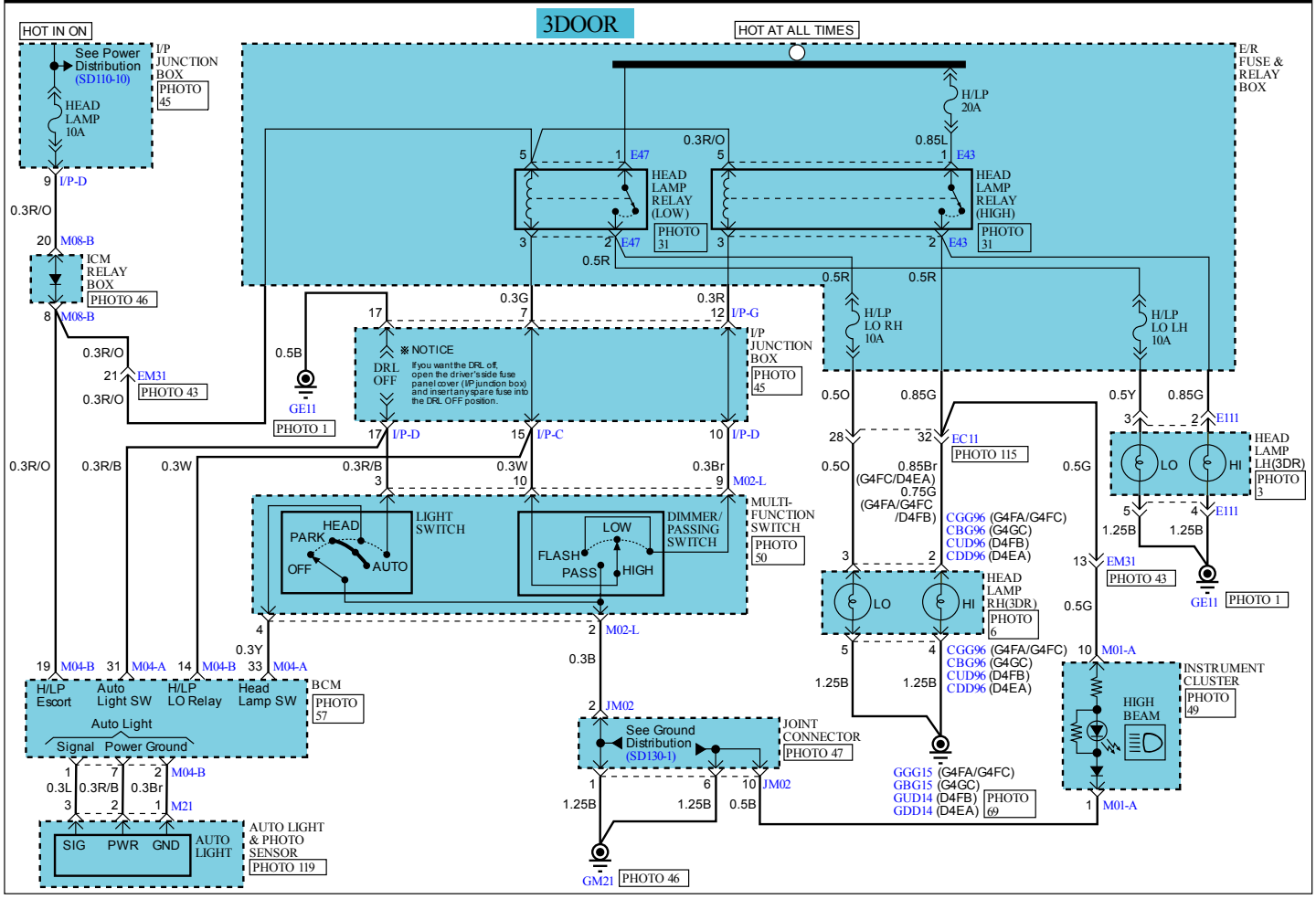
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Auto Lights (1) SD951-1



Auto Lights (2) SD951-2



Auto Lights (3) SD951-3

CBG75



KUM_090WP_06F_B

CBG96



KUM_NMWP_06F_B

CDD75



KUM_090WP_06F_B

CDD96



KUM_NMWP_06F_B

CGG75



KUM_090WP_06F_B

CGG96



KUM_NMWP_06F_B

CUD75



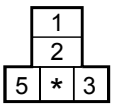
KUM_090WP_06F_B

CUD96



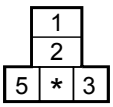
KUM_NMWP_06F_B

E43



CR05F011

E47



CR05F011

E77



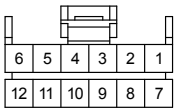
KUM_NMWP_06F_B

E111



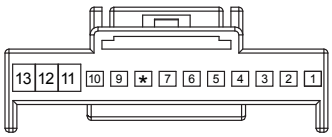
KUM_NMWP_06F_B

M01-A



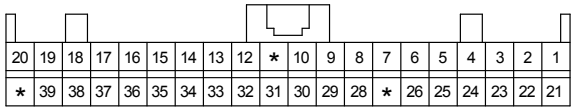
AMP_040M1_12F_B

M02-L



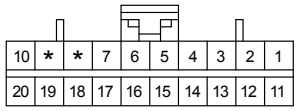
KET_0409_13F_W

M04-A



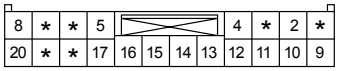
AMP_025_40F_W

M04-B



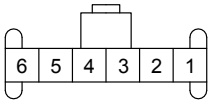
AMP_040M2_20F_B

M08-B



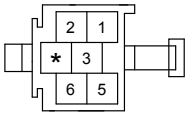
AMP_0925_20F_W

M21



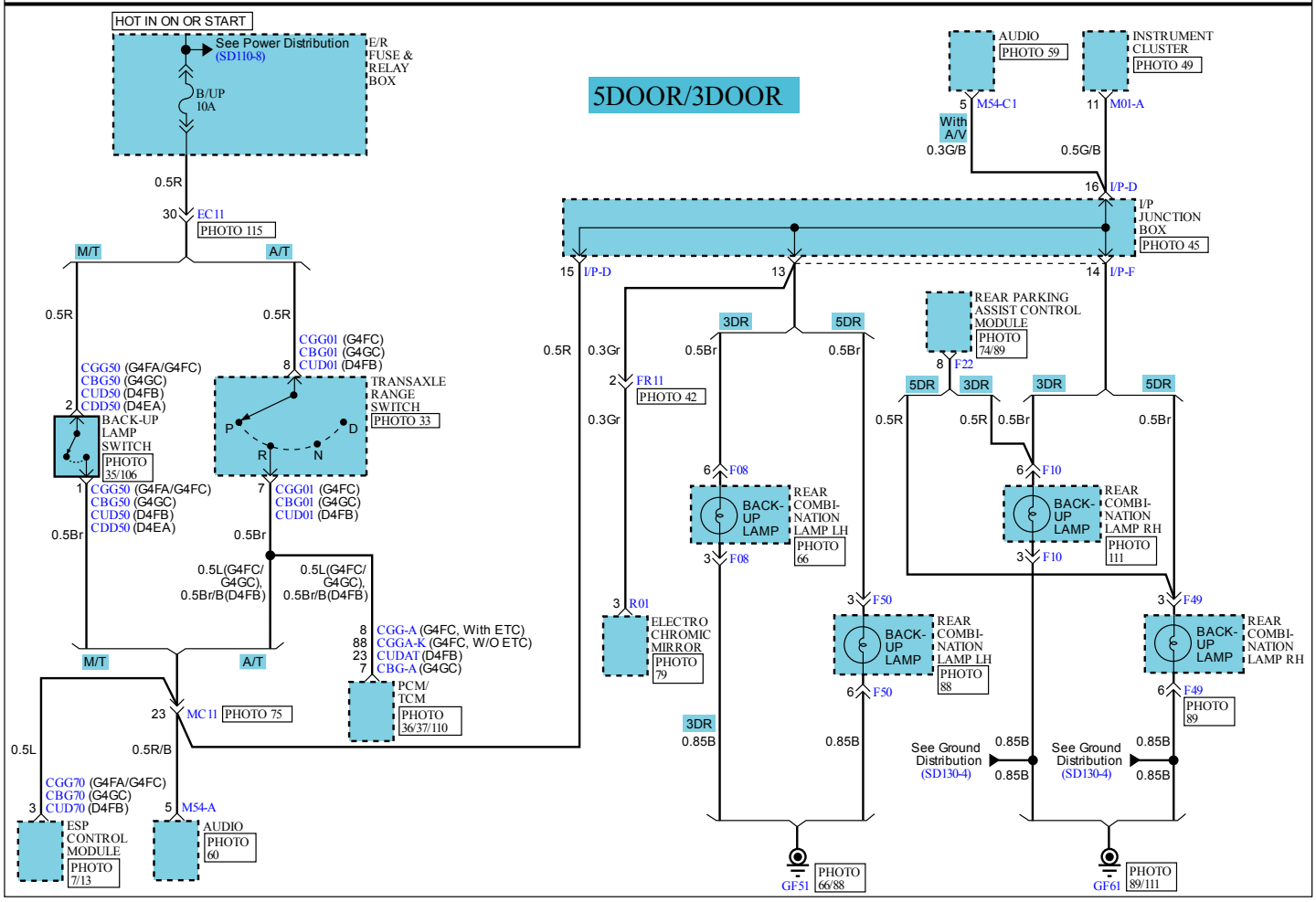
KET_91A_06F_W

M54-C1

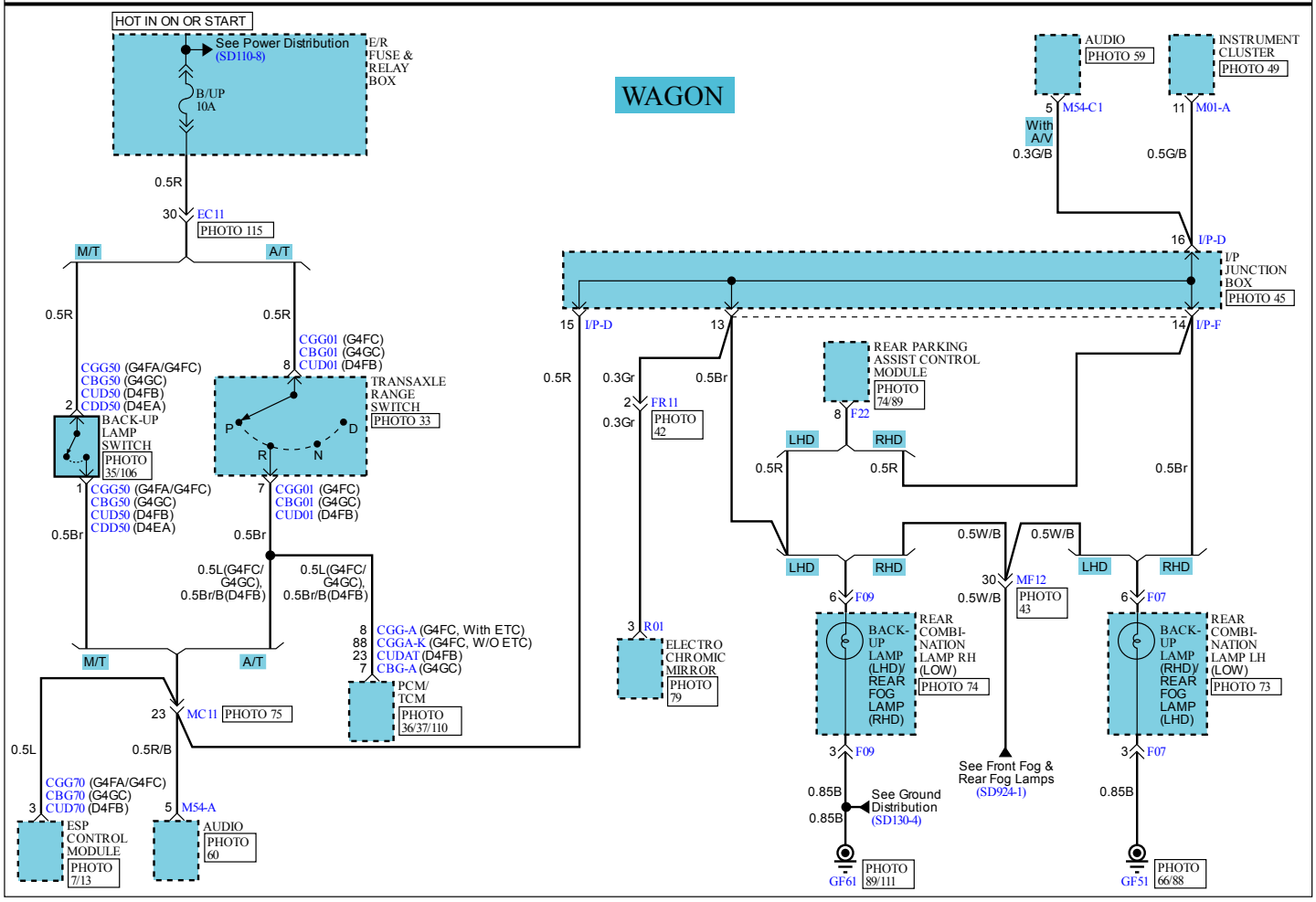


AMP_MTII_06F_Y_C1

Back-Up Lamps (1) SD926-1

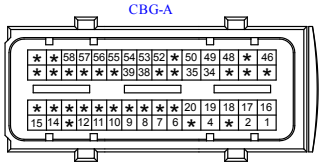


Back-Up Lamps (2) SD926-2



Back-Up Lamps (3) SD926-3

CBG-A



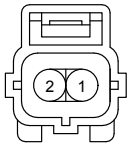
AMP_ECU_60F_B

CBG01



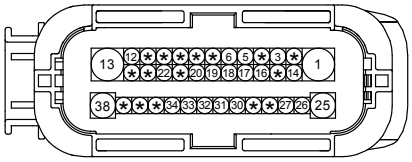
KET_SSD_10F_B_A

CBG50



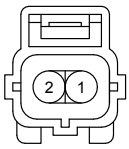
AMP_EJWP_02F_B

CBG70



DEL_ABS_38F_B_A

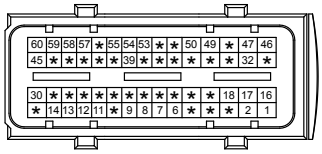
CDD50



AMP_EJWP_02F_B

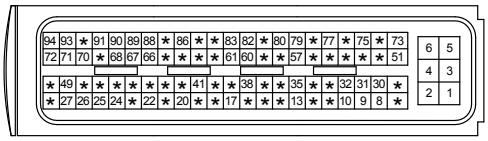
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CGG-A



AMP_ECU_60F_B

CGGA-K



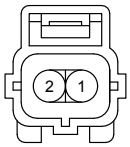
AMP_ECU_94F_B

CGG01



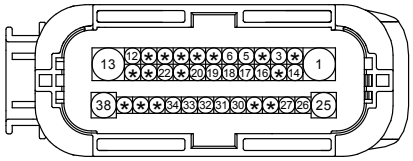
KET_SSD_10F_B_A

CGG50



AMP_EJWP_02F_B

CGG70



DEL_ABS_38F_B_A

CUDAT

6	7	8	9	10	*	12	*	14	*	*	*	18	19	20	21	22	23	24	5	4
*	*	*	*	*	*	*	*	*	*	*	36	37	*	*	*	*	*	*	3	
44	*	*	*	*	*	*	*	*	53	*	*	*	*	58	59	*	61	62		
*	*	*	*	*	*	*	*	*	*	*	74	*	*	*	78	*	*	*	2	1

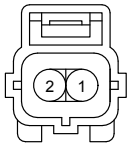
KET_ECU_81F_B_BOSCH

CUD01



KET_SSD_10F_B_A

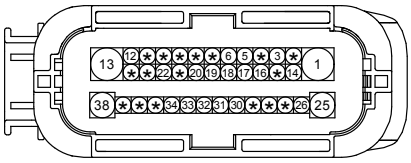
CUD50



AMP_EJWP_02F_B

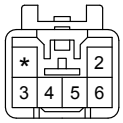
Back-Up Lamps (4) SD926-4

CUD70



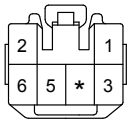
DEL_ABS_38F_B_A

F07



KET_090II_06M_W

F08



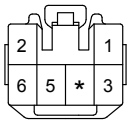
KET_090II_06F_W

F09



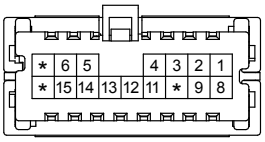
KET_090II_06M_W

F10



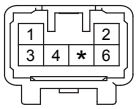
KET_090II_06F_W

F22



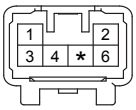
KET_040III_16F_W

F49



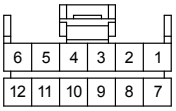
KET_090III_06M_W

F50



KET_090III_06M_W

M01-A



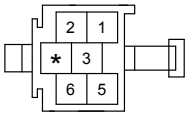
AMP_040M1_12F_B

M54-A



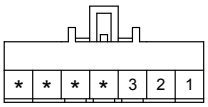
AMP_JT_08F_Gr_D2

M54-C1



AMP_MTII_06F_Y_C1

R01



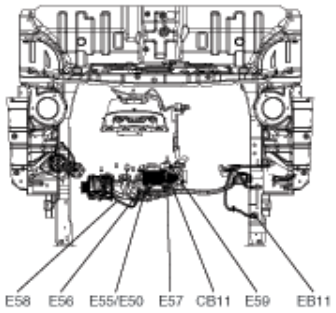
JST_JST_07F_B

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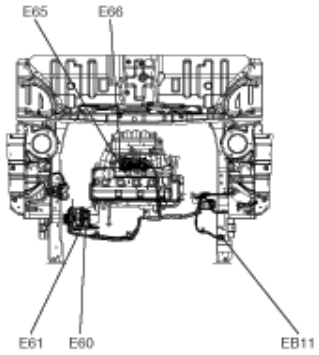
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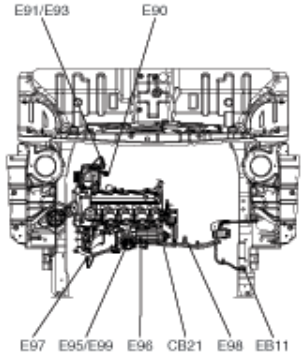
G4FA/G4FC



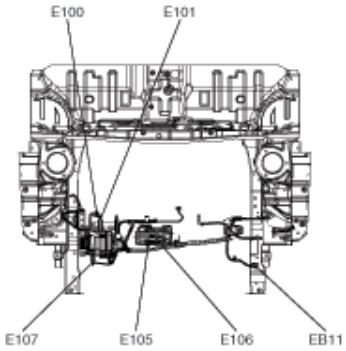
G4GC



D4FB



D4EA



BATTERY HARNESS (G4FA/G4FC)

E50	Alternator
E55	Start Motor
E56	Start Solenoid
E57	Oil Pressure Switch
E58	Neutral Switch (ISG)
E59	Start Motor (ISG)
CB11	Connection With CONTROL Harness
EB11	Connection With FRONT Harness

BATTERY HARNESS (G4GC)

E60	Alternator
E61	Alternator
E65	Start Motor
E66	Start Solenoid
EB11	Connection With FRONT Harness

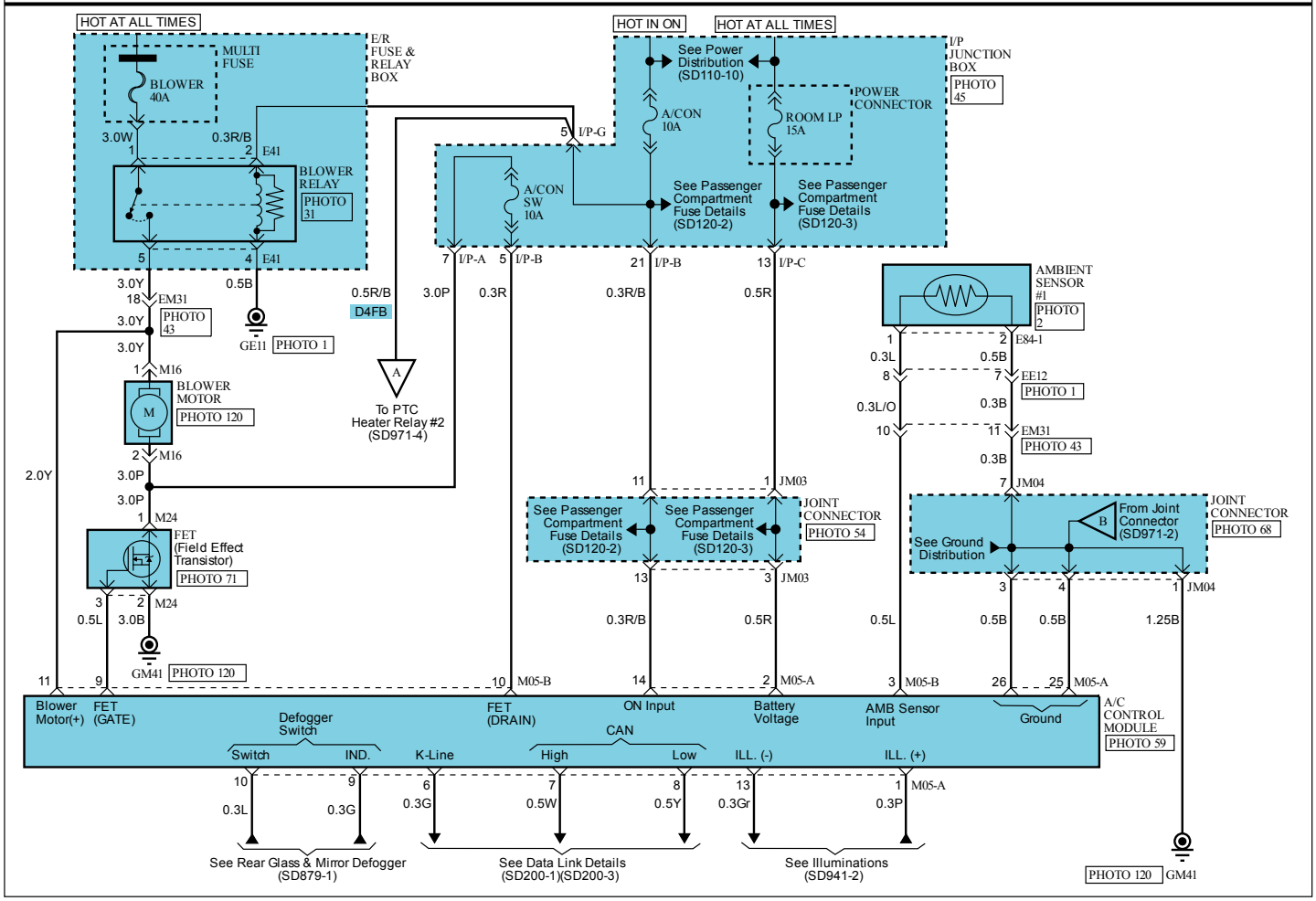
BATTERY HARNESS (D4FB)

E90	Alternator
E91	Alternator
E93	Alternator AMS
E95	Start Motor
E96	Start Solenoid
E97	A/C Compressor
E98	Neutral Switch
E99	Start Motor (ISG)
EB11	Connection With FRONT Harness
CB21	Connection With CONTROL Harness

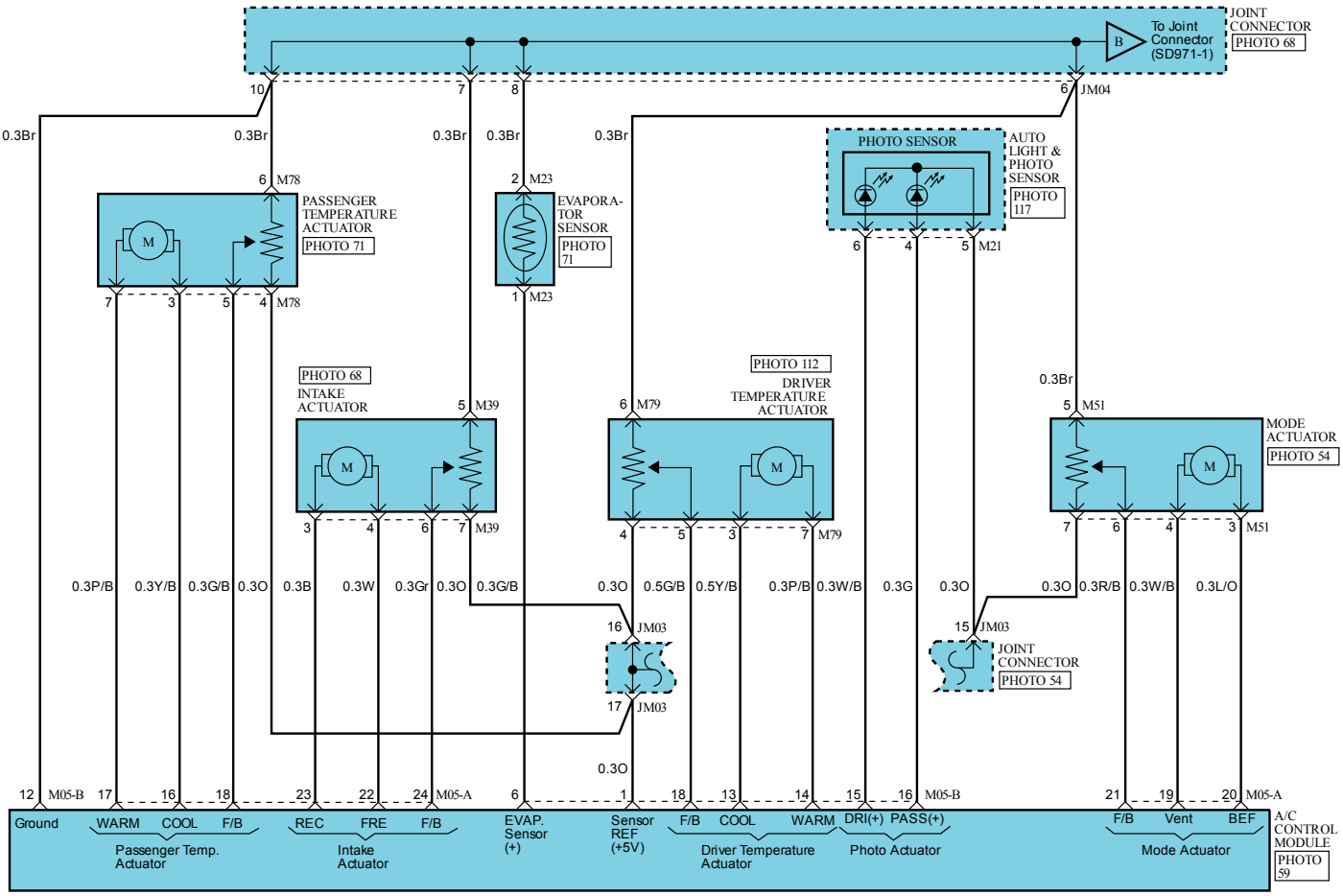
BATTERY HARNESS (D4EA)

E100	Alternator
E101	Alternator
E105	Start Motor
E106	Start Solenoid
E107	A/C Compressor
EB11	Connection With FRONT Harness

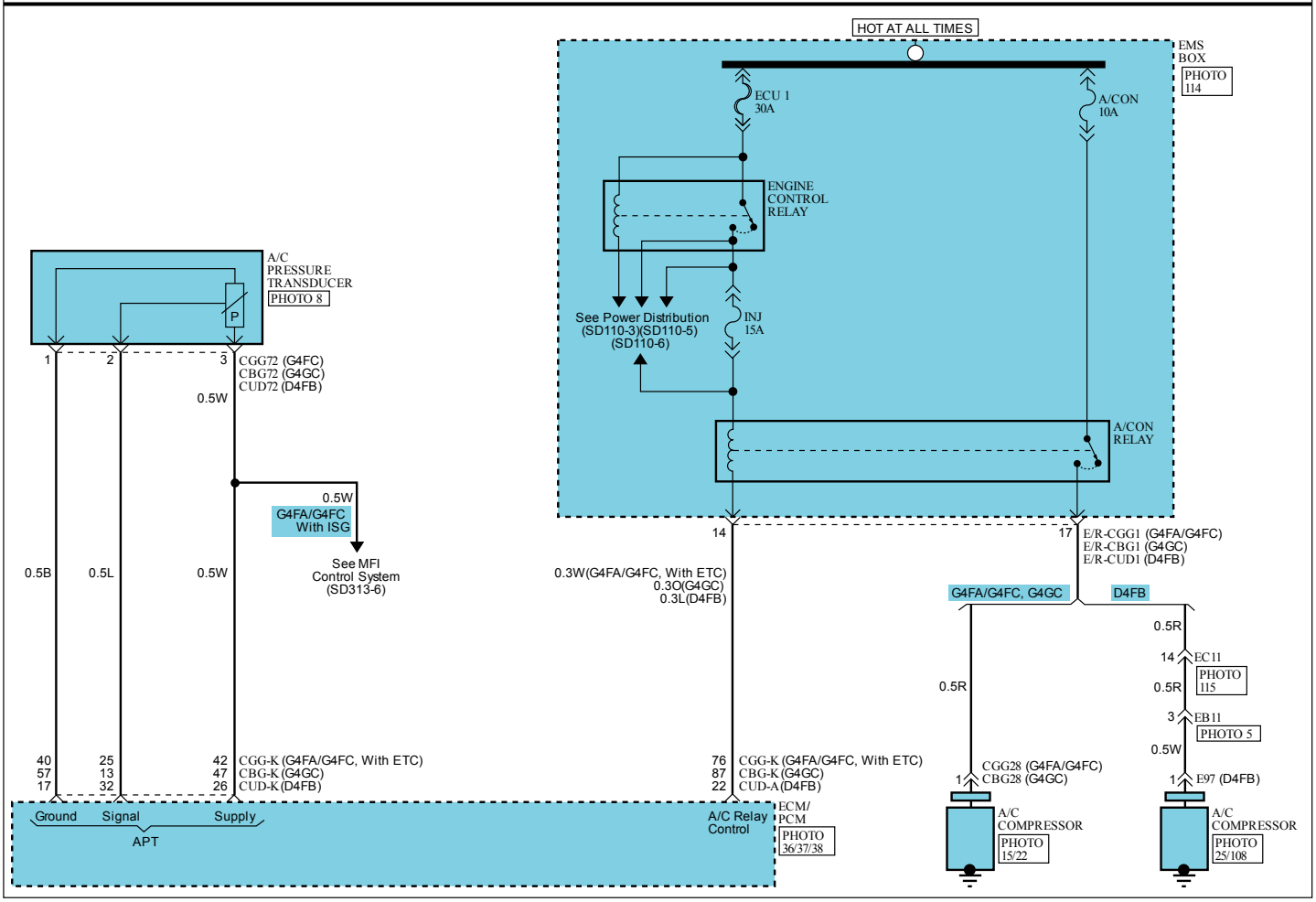
Blower & A/C Control System (Auto) (1) SD971-1



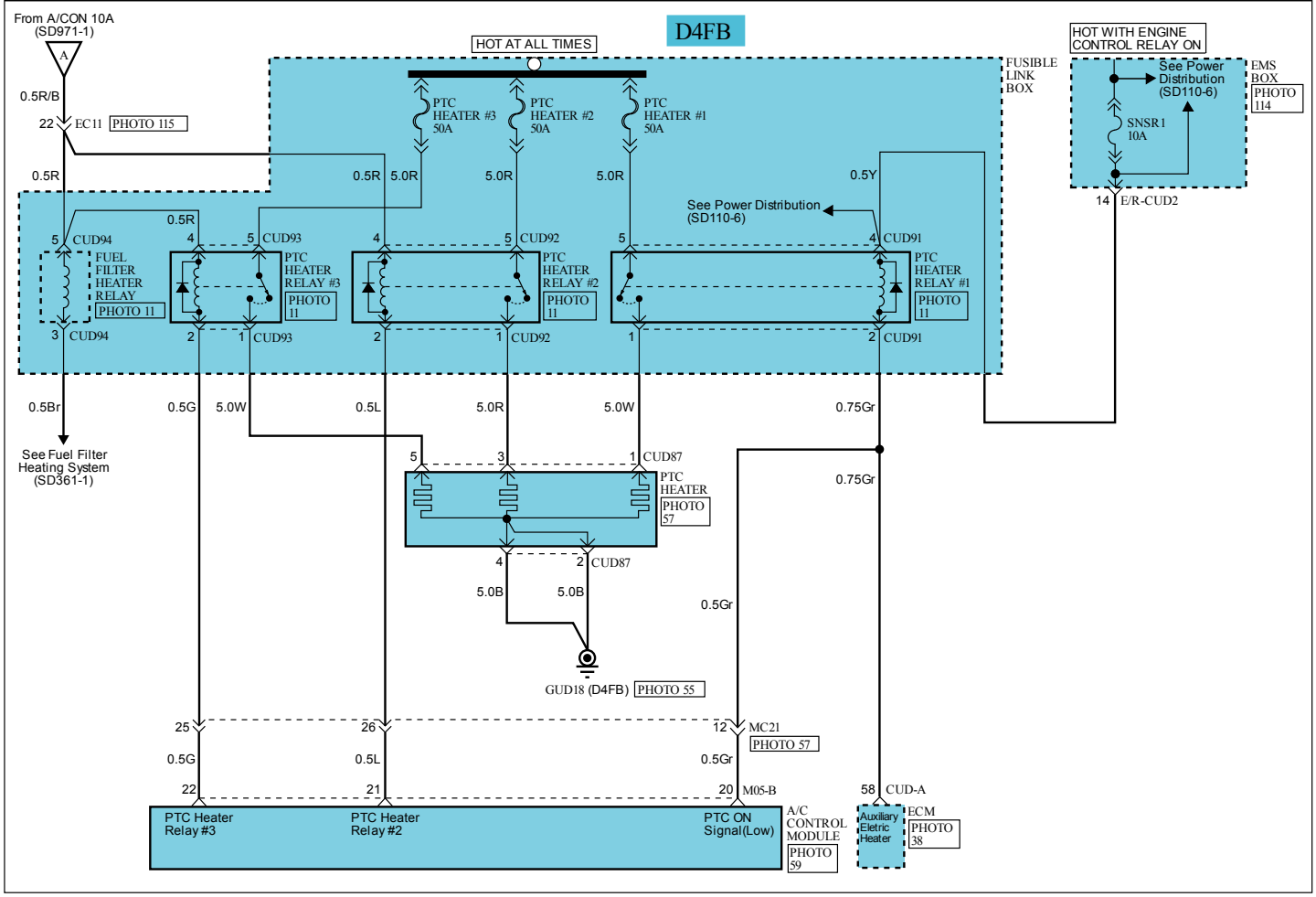
Blower & A/C Control System (Auto) (2) SD971-2



Blower & A/C Control System (Auto) (3) SD971-3

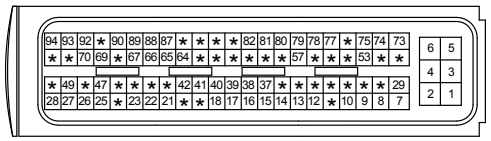


Blower & A/C Control System (Auto) (4) SD971-4



Blower & A/C Control System (Auto) (5) SD971-5

CBG-K



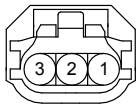
AMP_ECU_94F_B

CBG28



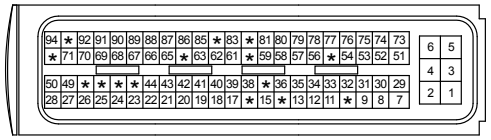
KUM_NMWP_01F_B

CBG72



KET_040WP_03F_B

CGG-K



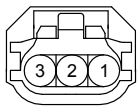
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CGG28



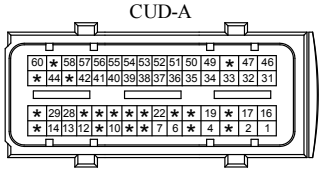
KUM_NMWP_01F_B

CGG72



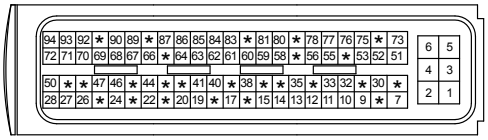
KET_040WP_03F_B

CUD-A



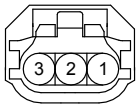
AMP_ECU_60F_B_A

CUD-K



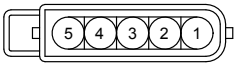
AMP_ECU_94F_B

CUD72



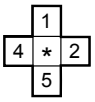
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CUD87



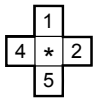
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CUD91



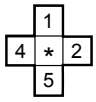
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CUD92



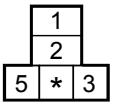
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CUD93



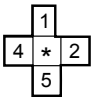
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CUD94



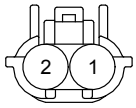
CR05F011

E41



CR05F056

E84-1



KET_SWP_02F_B

Blower & A/C Control System (Auto) (6) SD971-6

E97



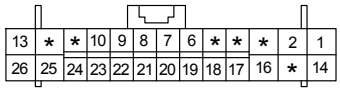
KUM_NMWP_01F_B

E107



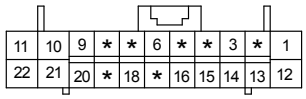
KUM_NMWP_01F_B

M05-A



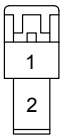
AMP_0407_26F_W_HD

M05-B



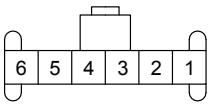
AMP_0407_22F_W_HD

M16



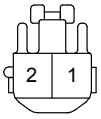
KUM_DSD_02F_W

M21



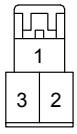
KET_91A_06F_W

M23



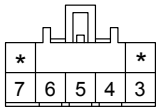
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M24



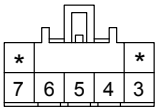
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M39



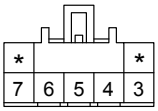
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M51



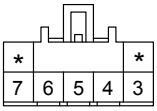
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M78



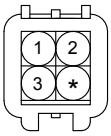
KUM_CDR_07F_W

M79



KUM_CDR_07F_W

EB11 (G4GC/D4FB)

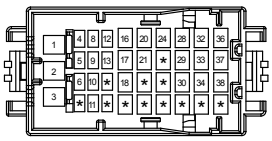


KUM_NMWP_04M_B

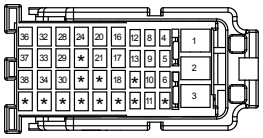


KUM_NMWP_04F_B

EC11 (G4FA/G4FC)

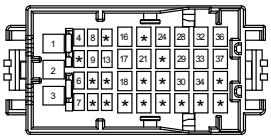


KET_0409LIF_39M_W

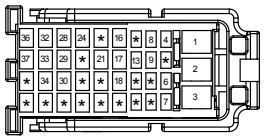


KET_0409LIF_39F_W

EC11 (G4GC)

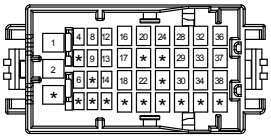


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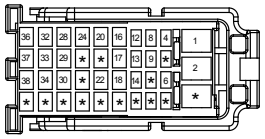


KET_0409LIF_39F_W

EC11 (D4FB)



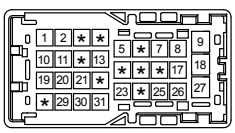
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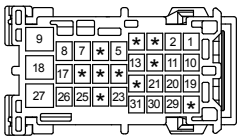
KET_0409LIF_39F_W

Blower & A/C Control System (Auto) (7) SD971-7

EM31

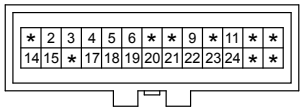


KET_LIF187_31M_W

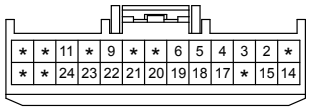


KET_LIF187_31F_W

MC21(G4FA/G4FC)

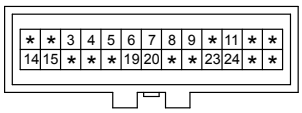


AMP_09III_26M_W

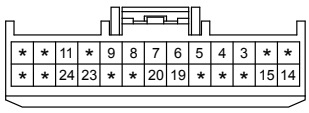


AMP_090III_26F_W

MC21(G4GC)

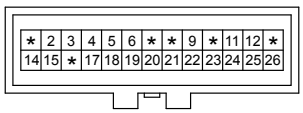


AMP_09III_26M_W

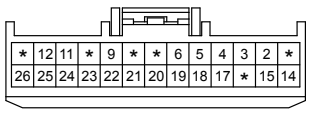


AMP_090III_26F_W

MC21(D4FB)

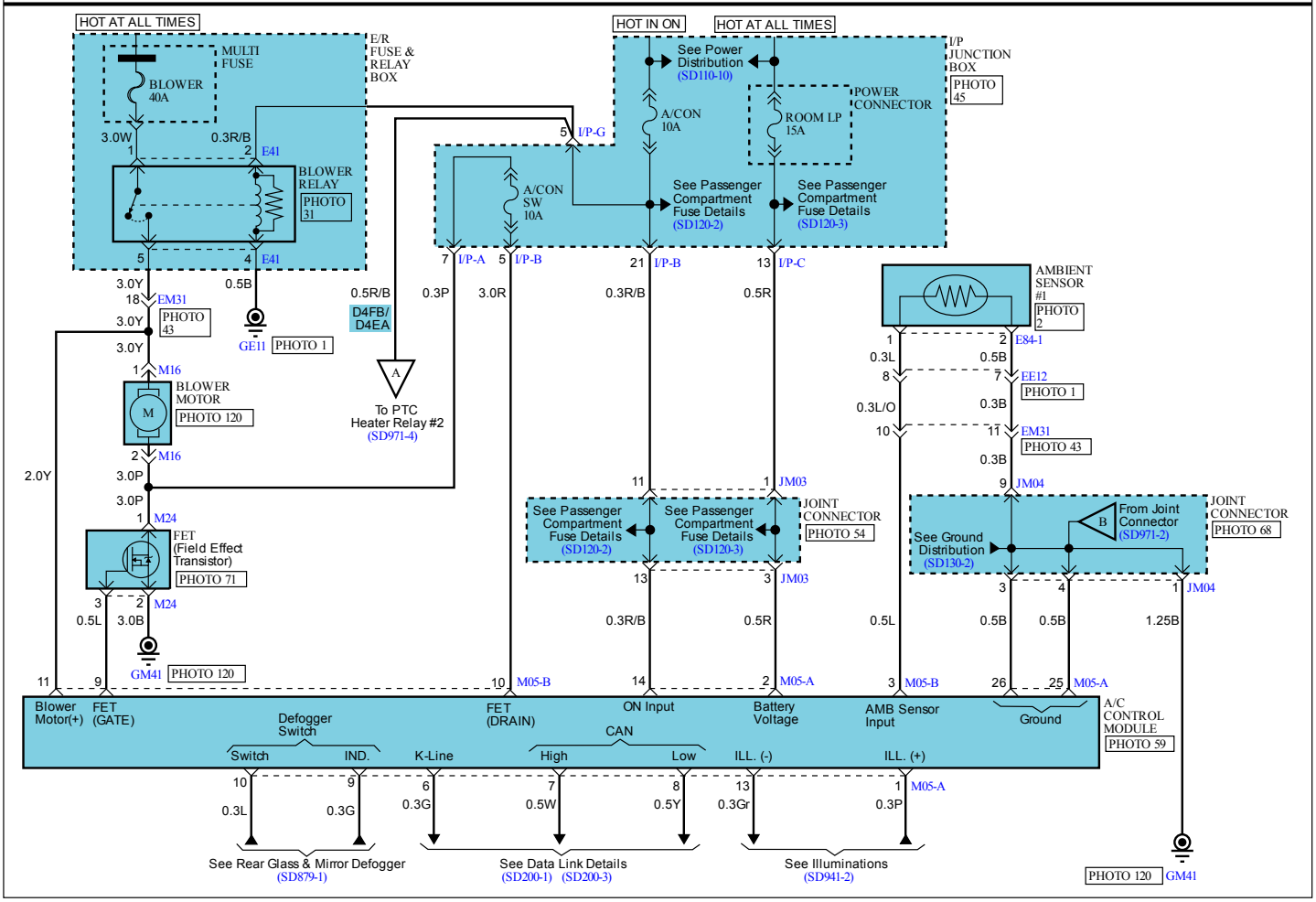


AMP_09III_26M_W

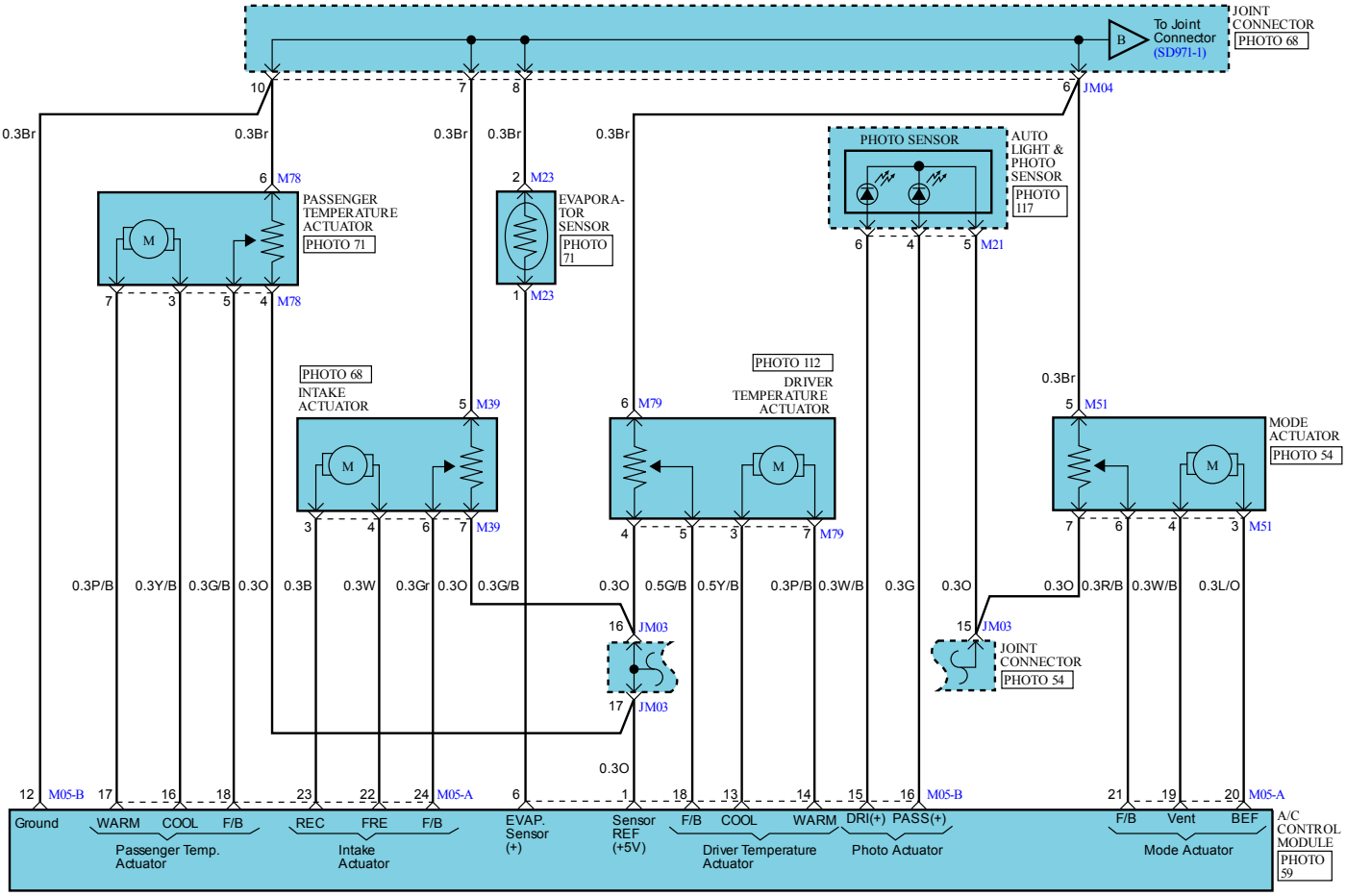


AMP_090III_26F_W

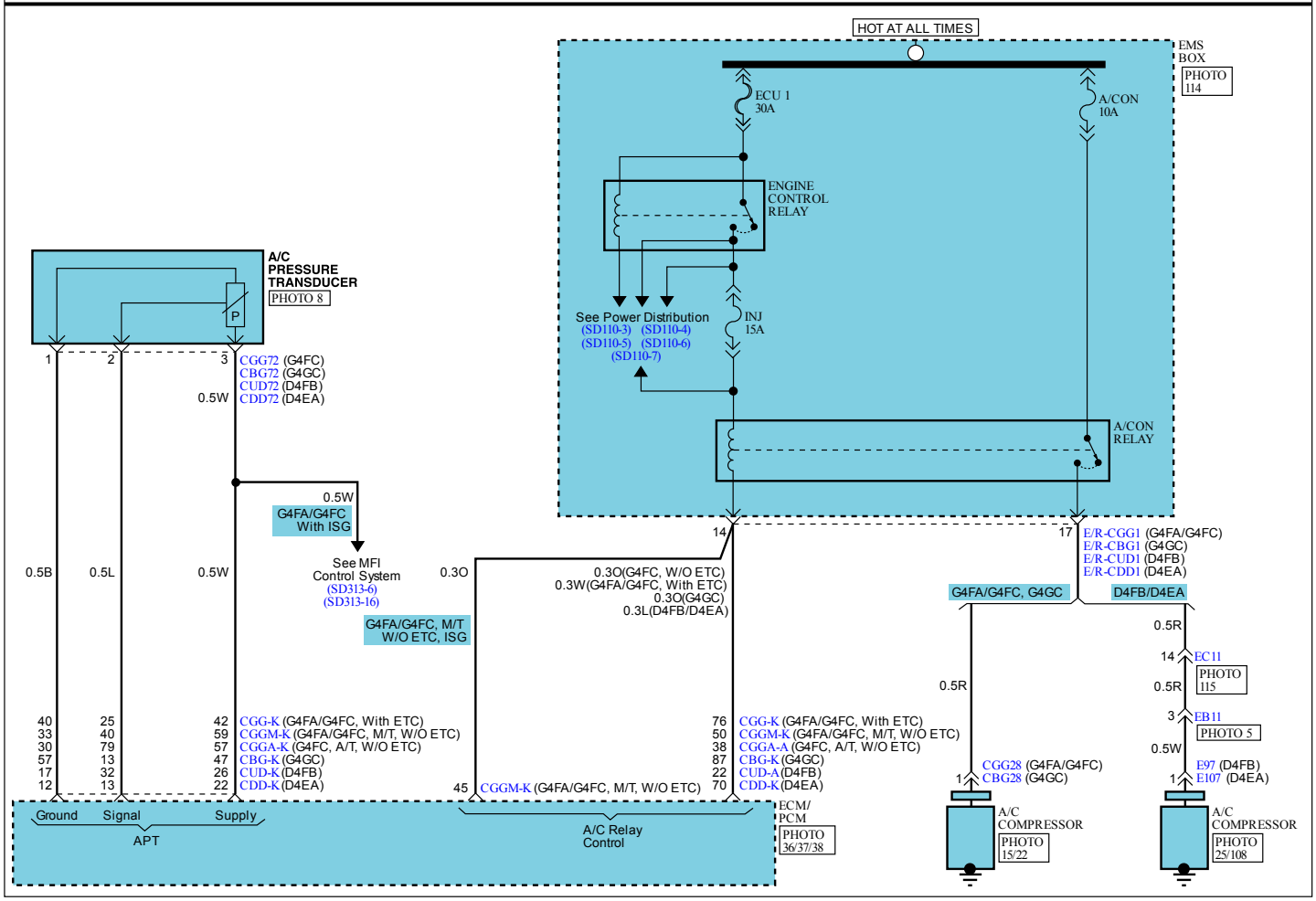
Blower & A/C Control System (Auto) (1) SD971-1



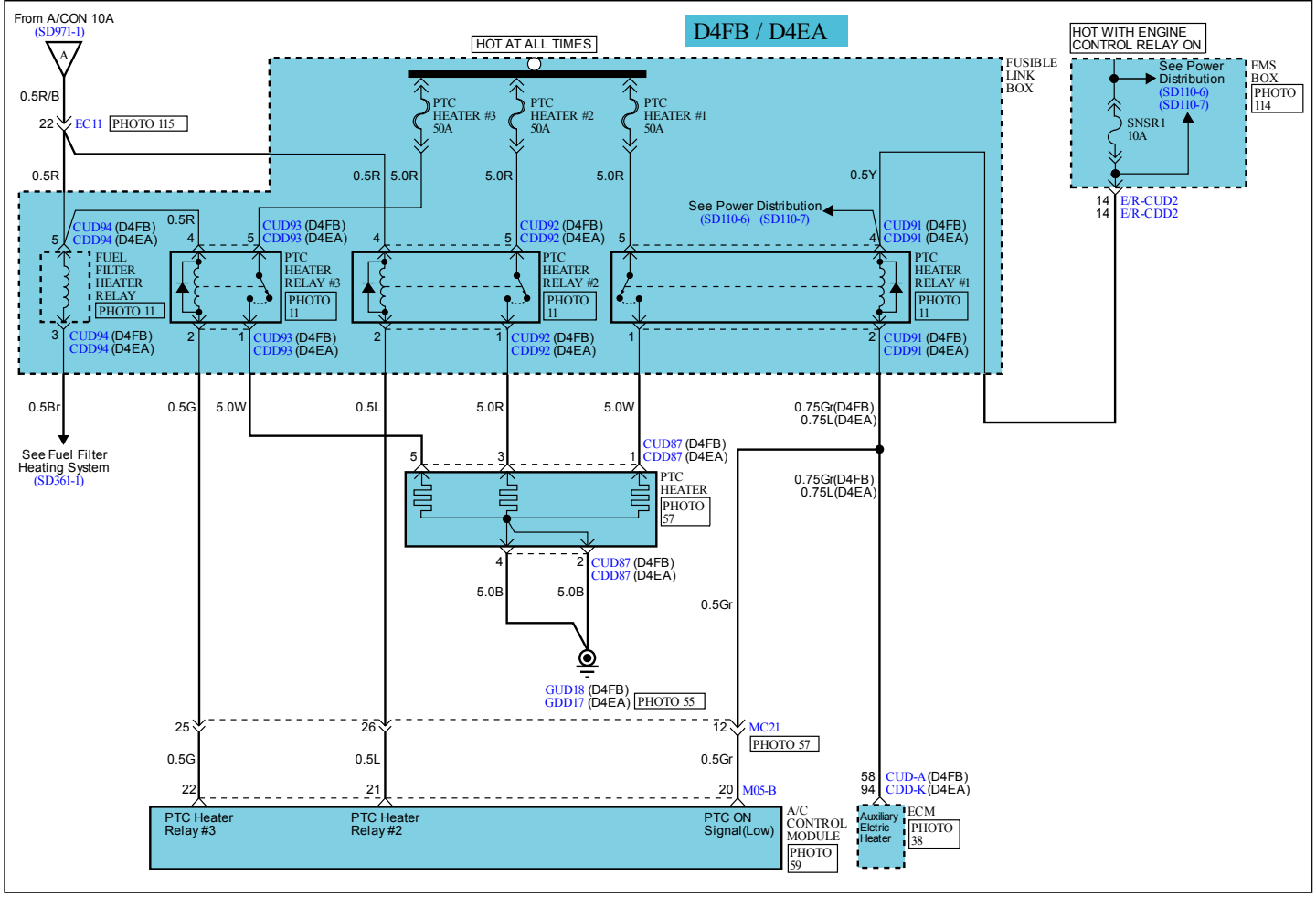
Blower & A/C Control System (Auto) (2) SD971-2



Blower & A/C Control System (Auto) (3) SD971-3

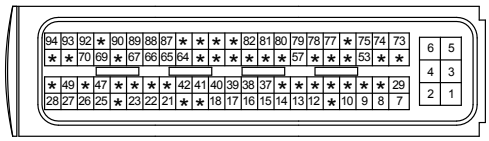


Blower & A/C Control System (Auto) (4) SD971-4



Blower & A/C Control System (Auto) (5) SD971-5

CBG-K



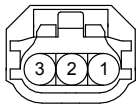
AMP_ECU_94F_B

CBG28



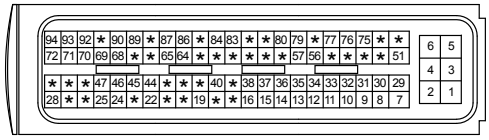
KUM_NMWP_01F_B

CBG72



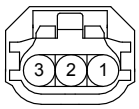
KET_040WP_03F_B

CDD-K



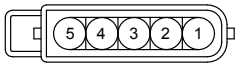
AMP_ECU_94F_B

CDD72



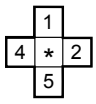
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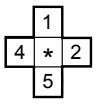
AMP_PTC_05F_B

CDD91



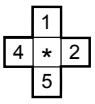
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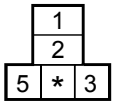
CR05F019

CDD93



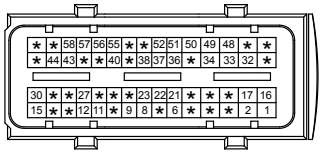
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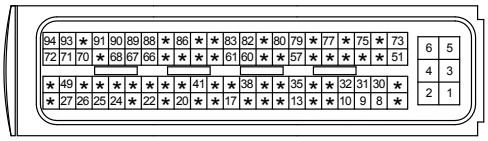
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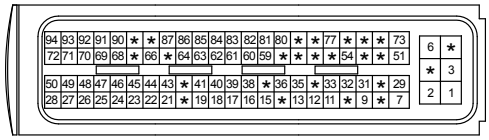
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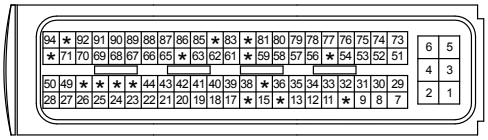
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AMP_ECU_94F_B

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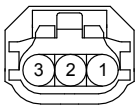
Blower & A/C Control System (Auto) (6) SD971-6

CGG28



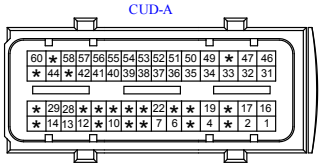
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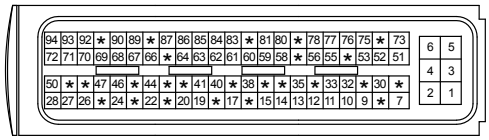
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CUD-A



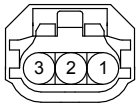
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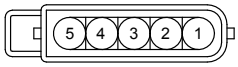
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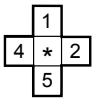
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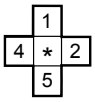
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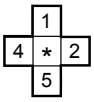
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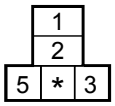
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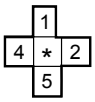
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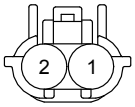
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E41



CR05F056

E84-1



KET_SWP_02F_B

E97



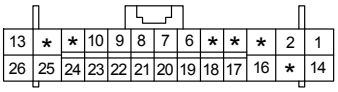
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E107



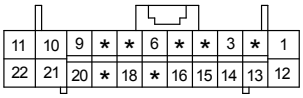
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M05-A



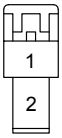
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M05-B



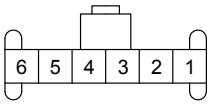
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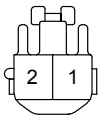
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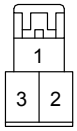
Blower & A/C Control System (Auto) (7) SD971-7

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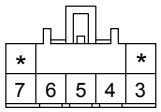
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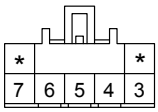
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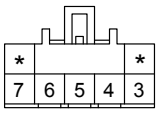
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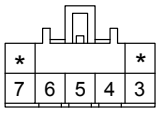
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M78



KUM_CDR_07F_W

M79

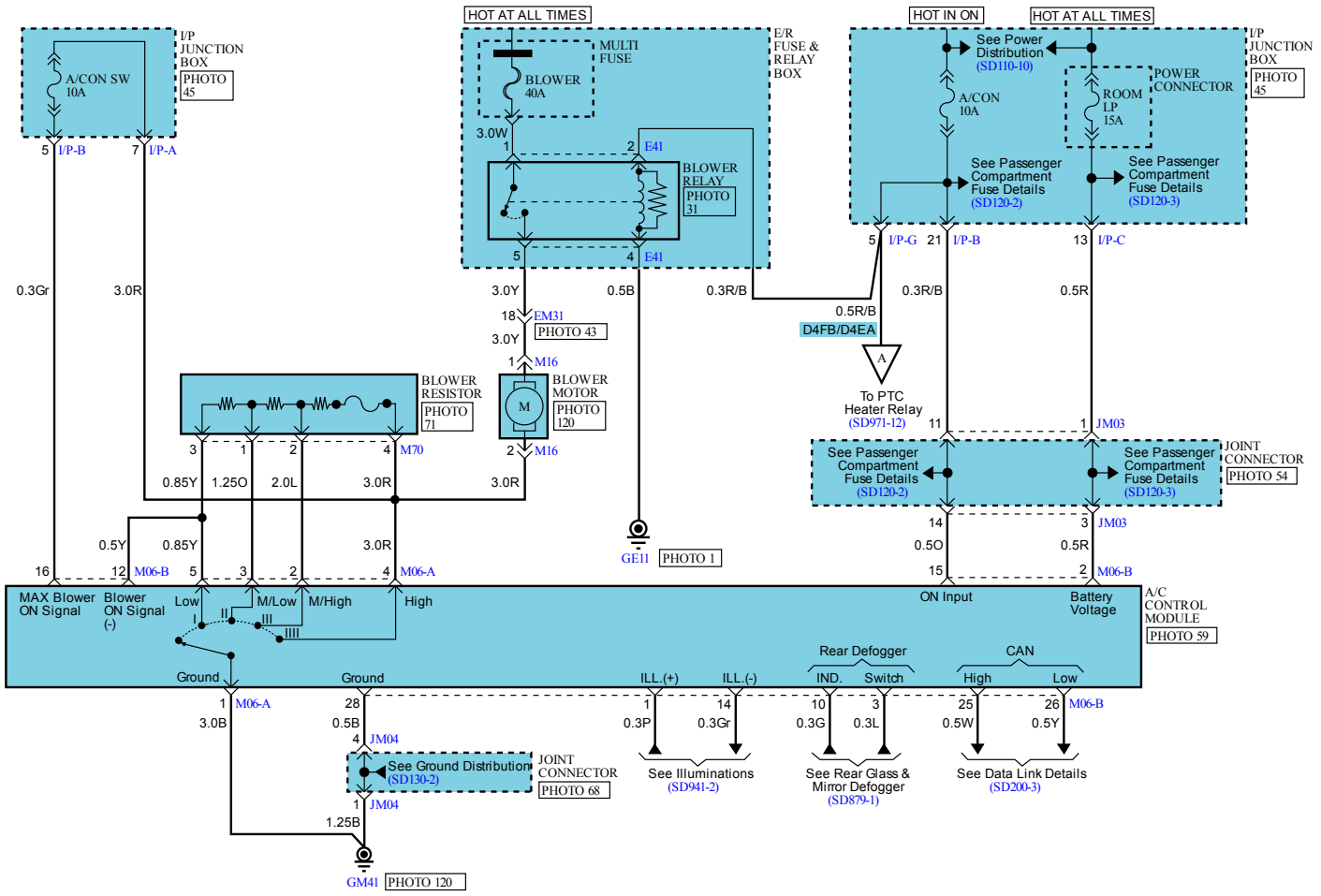


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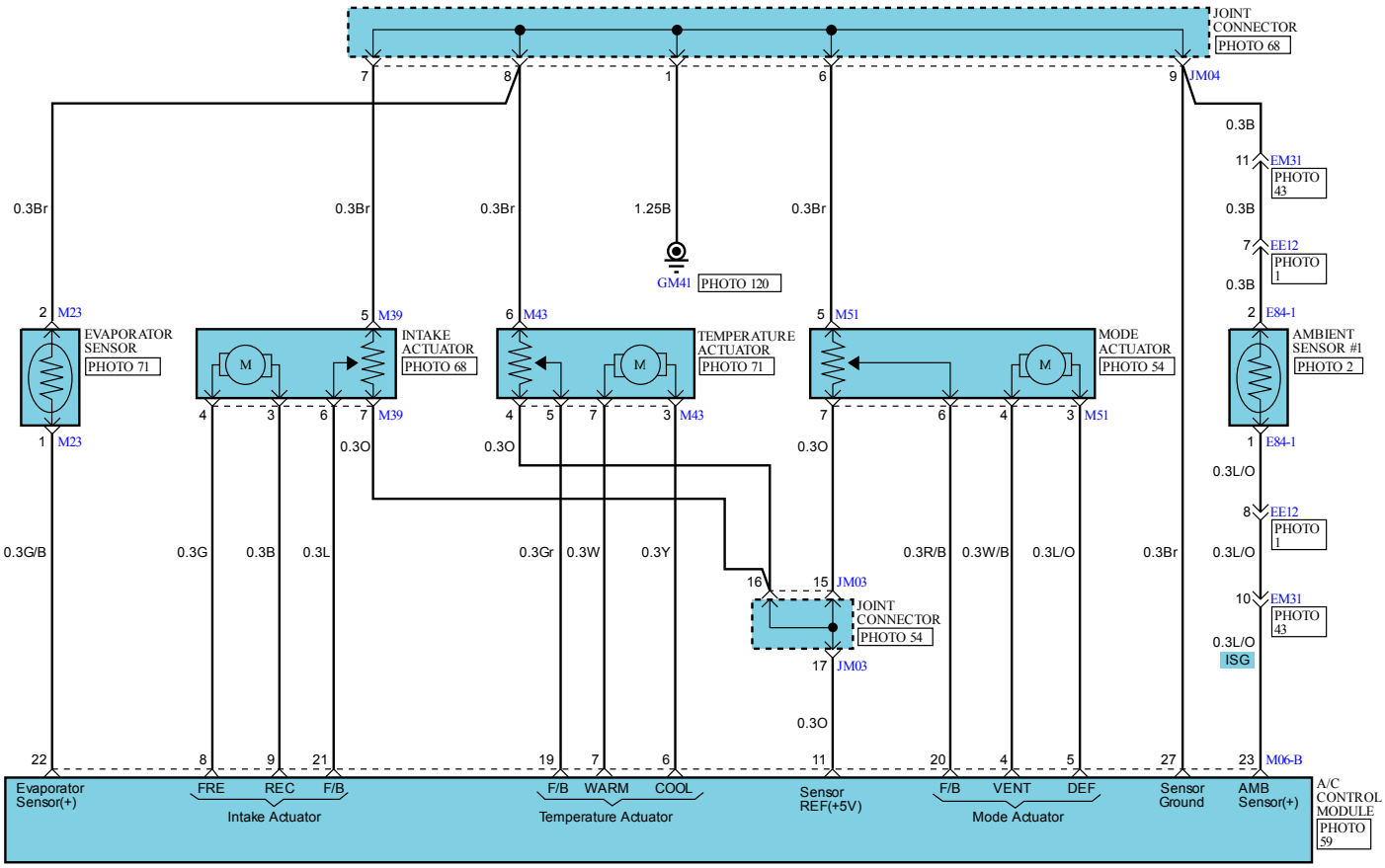
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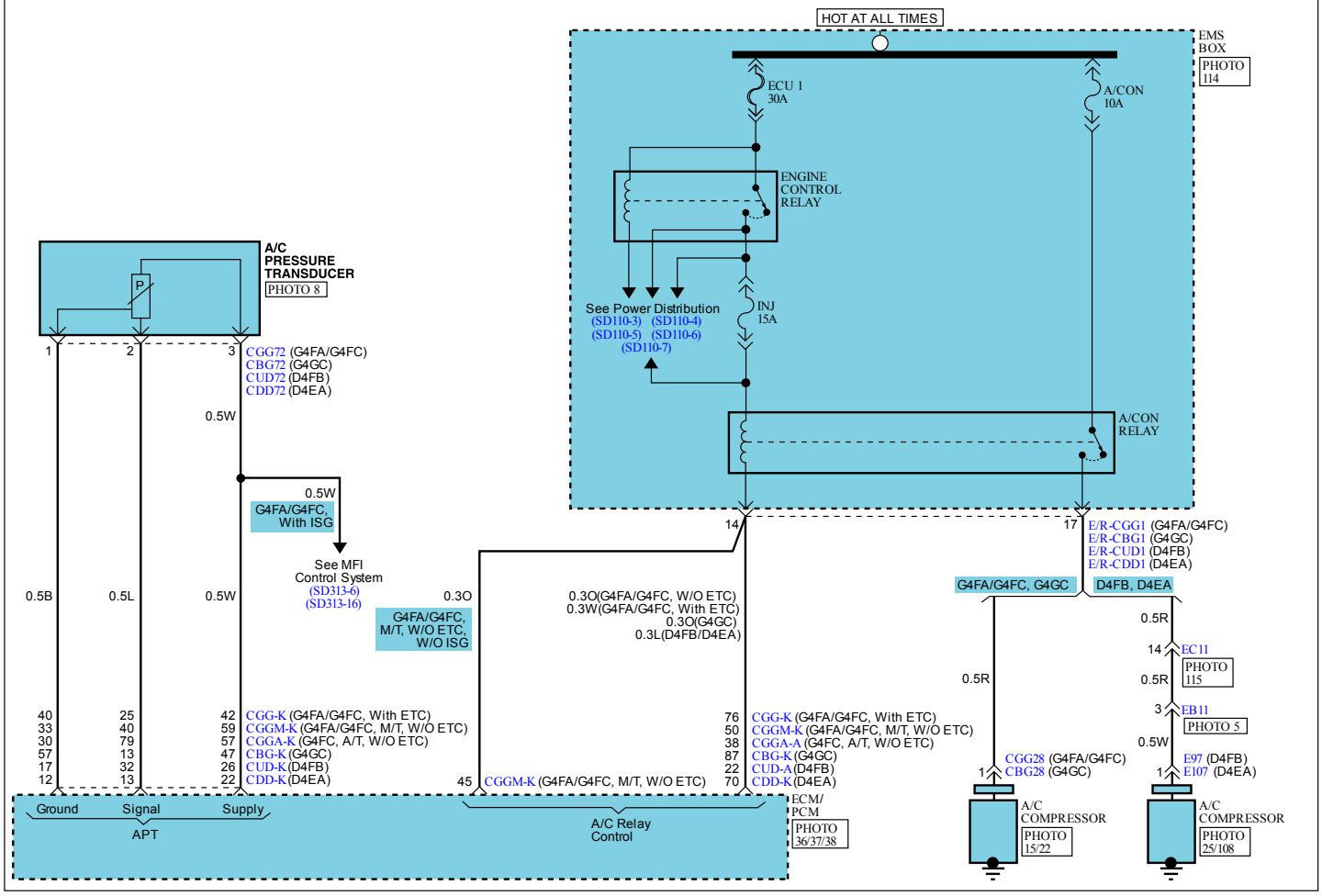
Blower & A/C Control System (Manual) (1) SD971-9



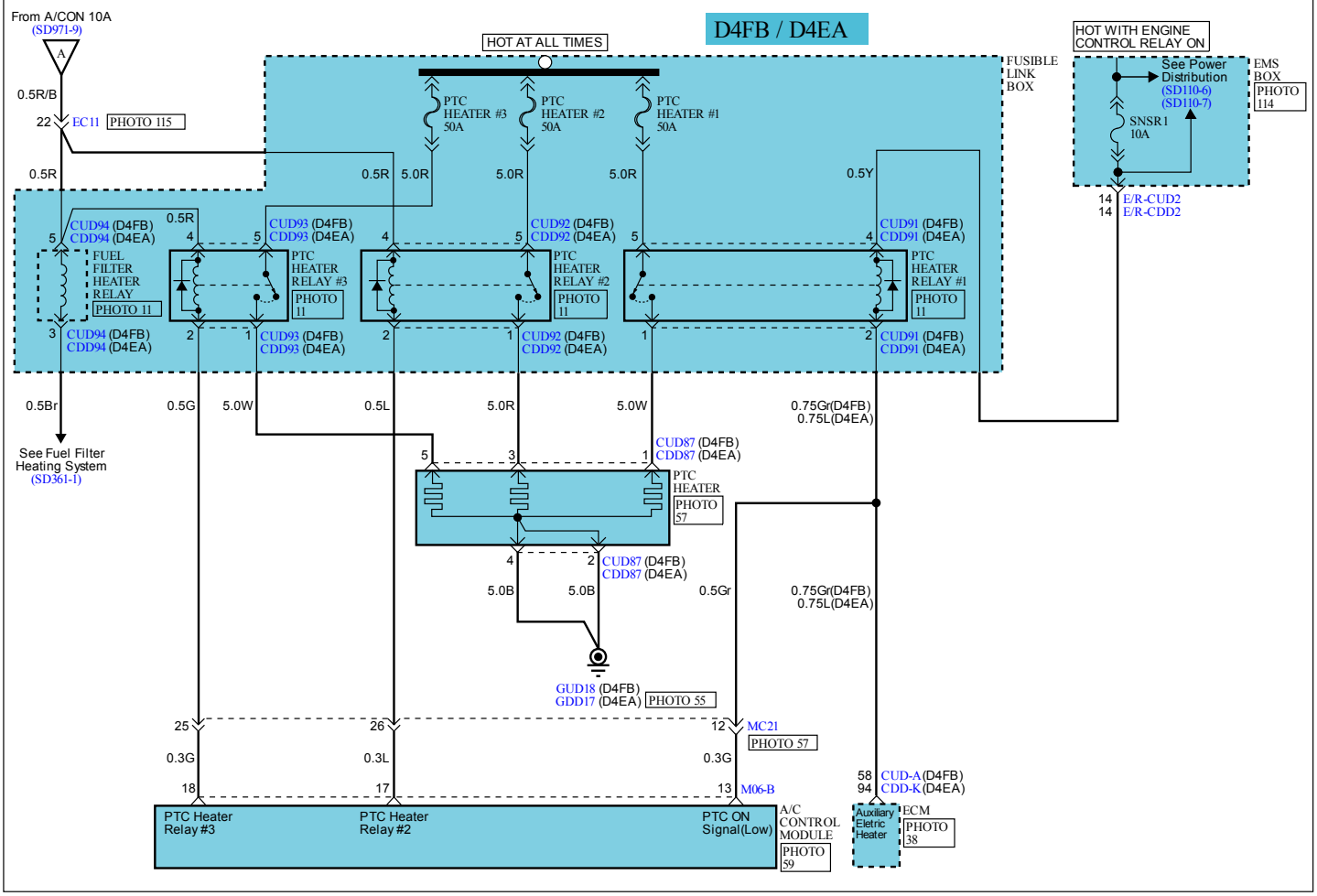
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Blower & A/C Control System (Manual) (3) SD971-11

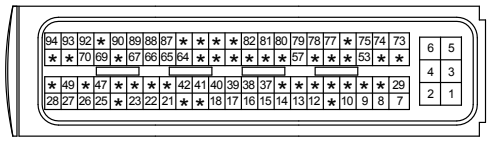


Blower & A/C Control System (Manual) (4) SD971-12



Blower & A/C Control System (Manual) (5) SD971-13

CBG-K



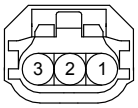
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CBG28



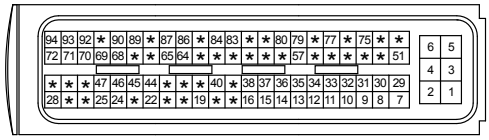
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CBG72



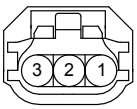
KET_040WP_03F_B

CDD-K



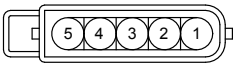
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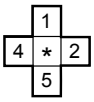
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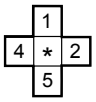
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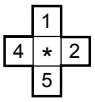
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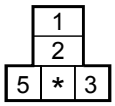
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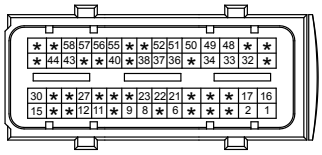
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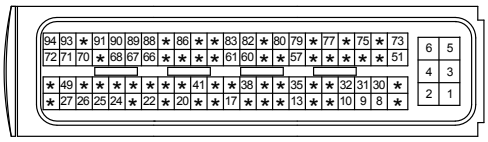
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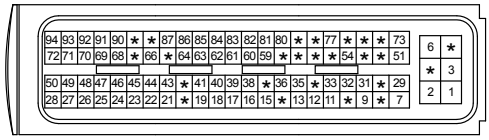
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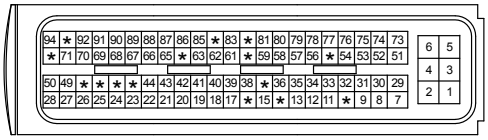
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AMP_ECU_94F_B

CGG-K



AMP_ECU_94F_B

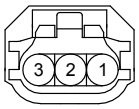
Blower & A/C Control System (Manual) (6) SD971-14

CGG28



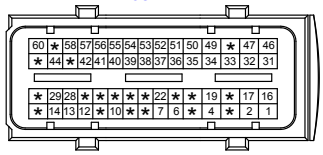
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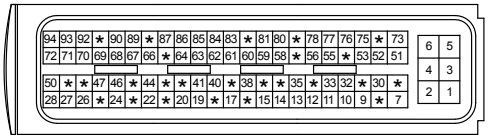
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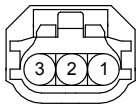
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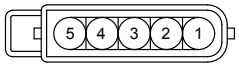
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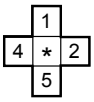
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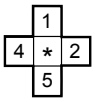
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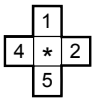
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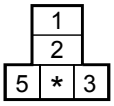
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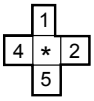
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CUD94



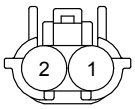
CR05F011

E41



CR05F056

E84-2



KET_SWP_02F_Gr

E97



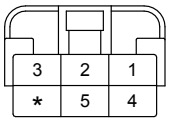
KUM_NMWP_01F_B

E107



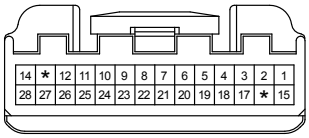
KUM_NMWP_01F_B

M06-A



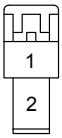
KET_250DL_06F

M06-B



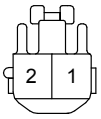
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M16



KUM_DSD_02F_W

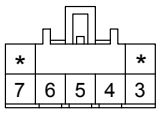
M23



KET_090II_02F_W_L

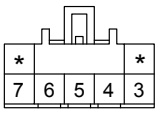
Blower & A/C Control System (Manual) (7) SD971-15

M39



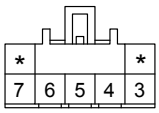
KUM_CDR_07F_L

M43



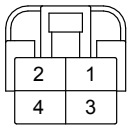
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M51



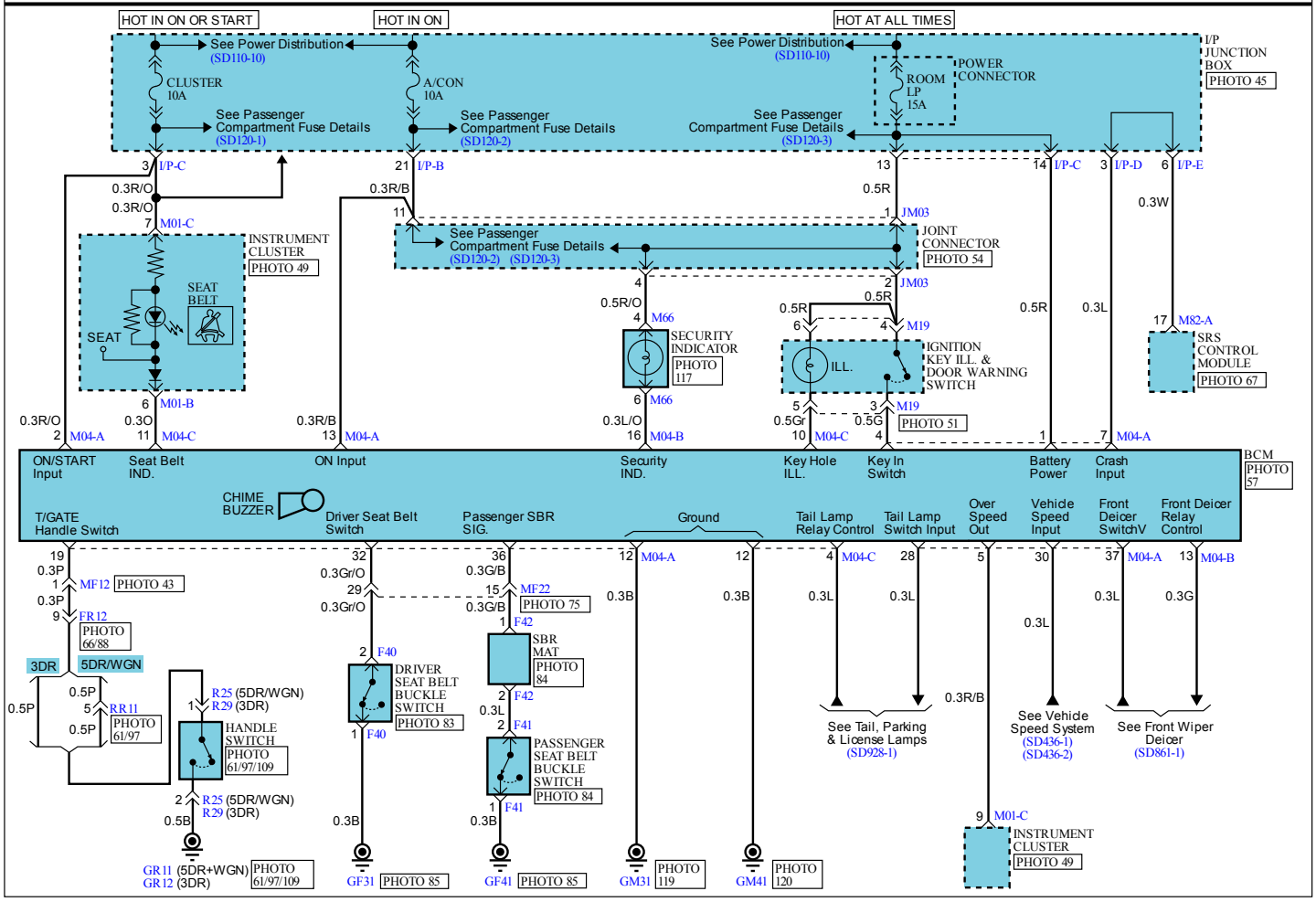
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M70

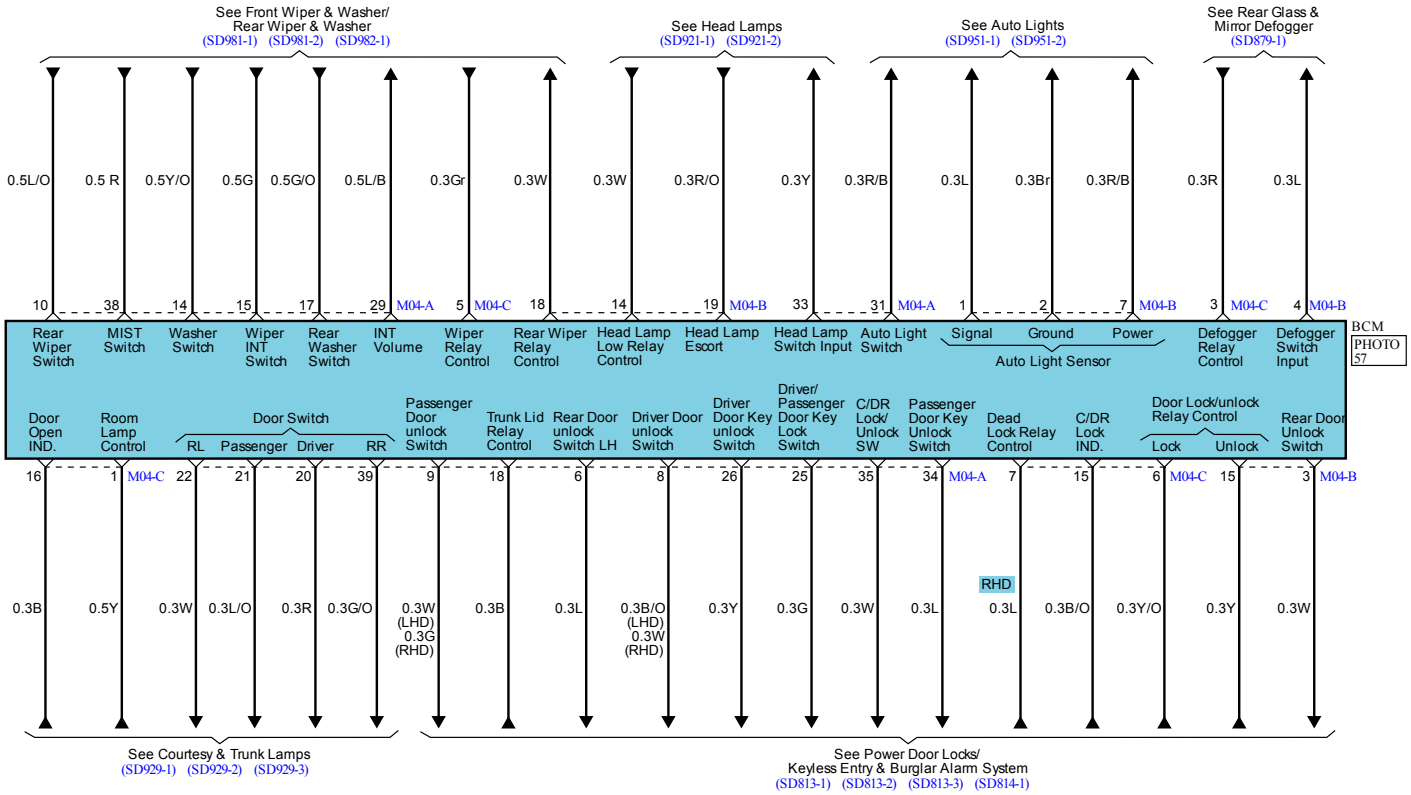


KET_250DL_04F_W

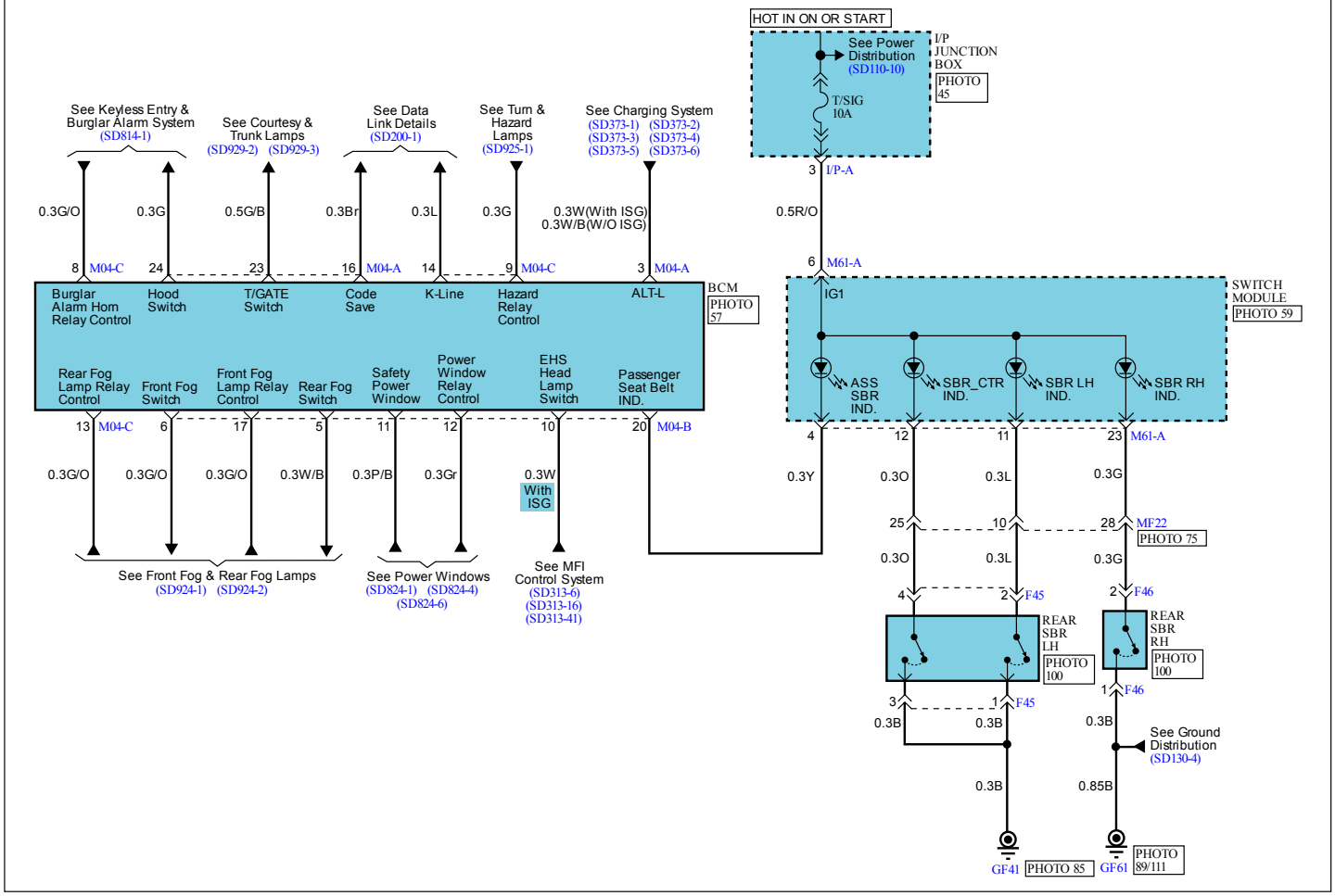
Body Control Module (BCM) System (1) SD952-1



Body Control Module (BCM) System (2) SD952-2

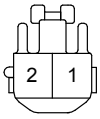


Body Control Module (BCM) System (3) SD952-3



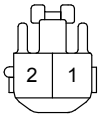
Body Control Module (BCM) System (4) SD952-4

F40



KET_090II_02F_W_T

F41



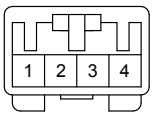
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F42



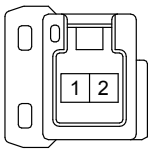
AMP_MQSWP_02F_B

F45



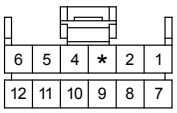
AMP_070_04M_W

F46



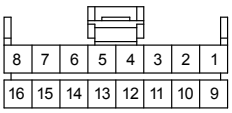
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M01-B



AMP_040M1_12F_B

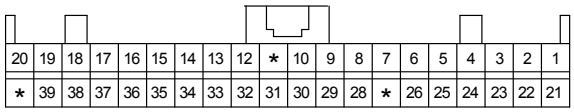
M01-C



AMP_040M1_16F_B

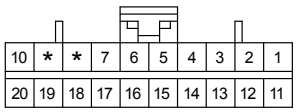
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M04-A



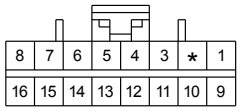
AMP_025_40F_W

M04-B



AMP_040M2_20F_B

M04-C



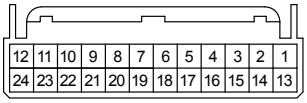
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M19



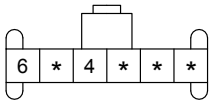
KET_090II_06M_W

M61-A



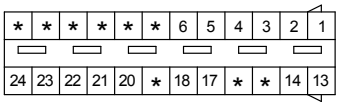
AMP_025_24F_W

M66



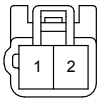
KET_91A_06F_B

M82-A



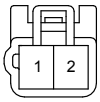
AMP_ABG_24F_B_ECU

R25



KET_090II_02M_B_R

R29

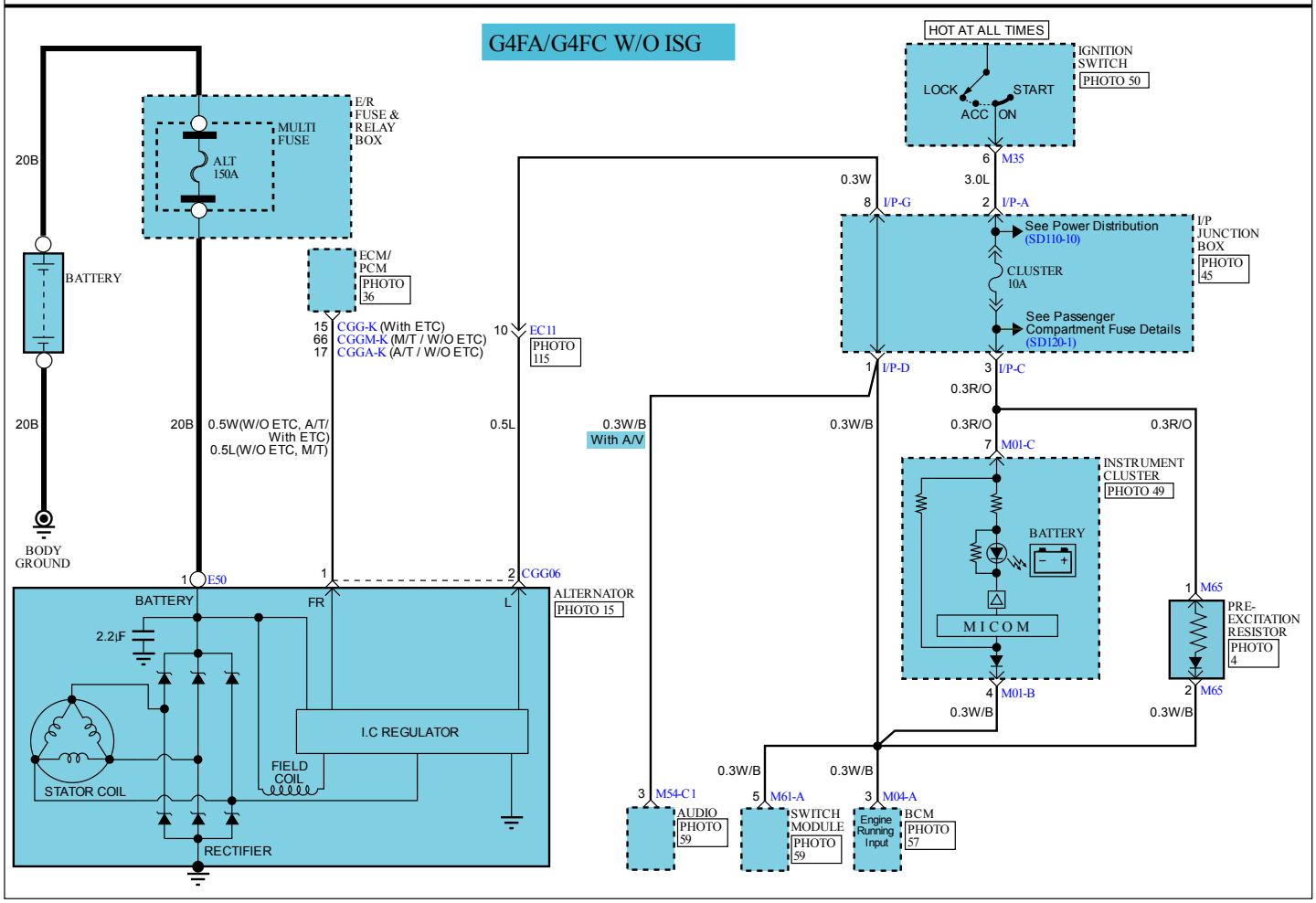


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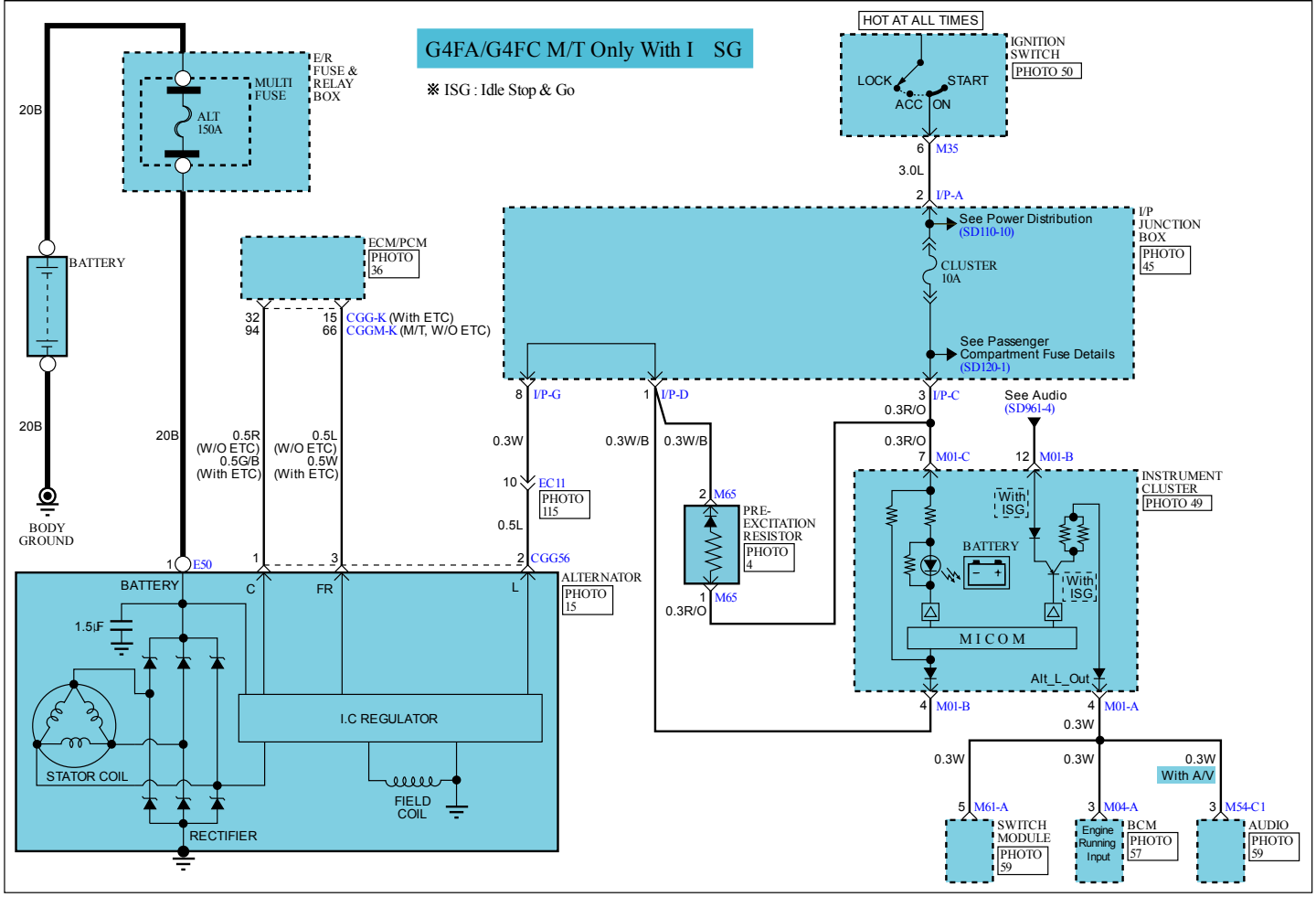
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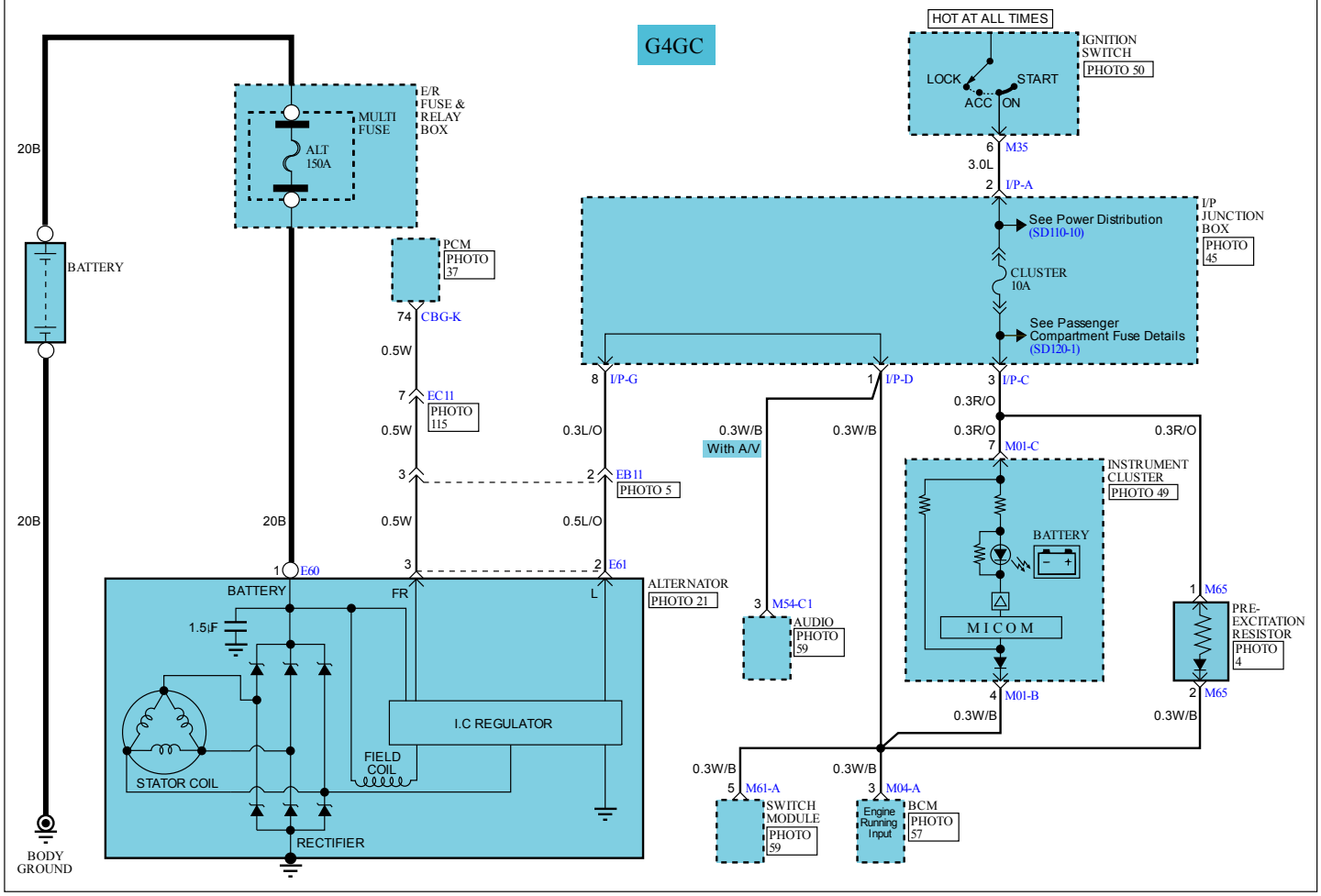
Charging System (1) SD373-1



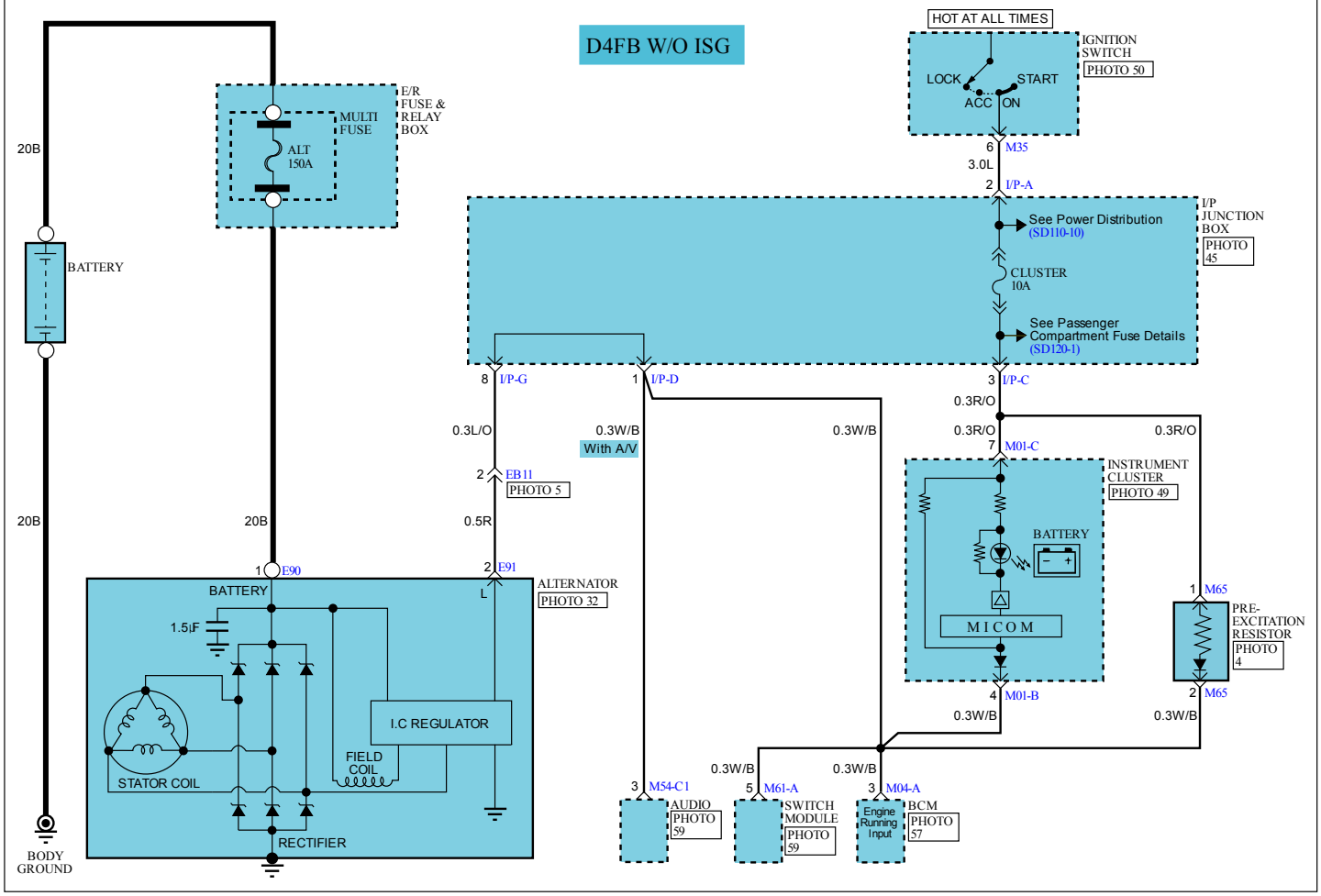
Charging System (2) SD373-2



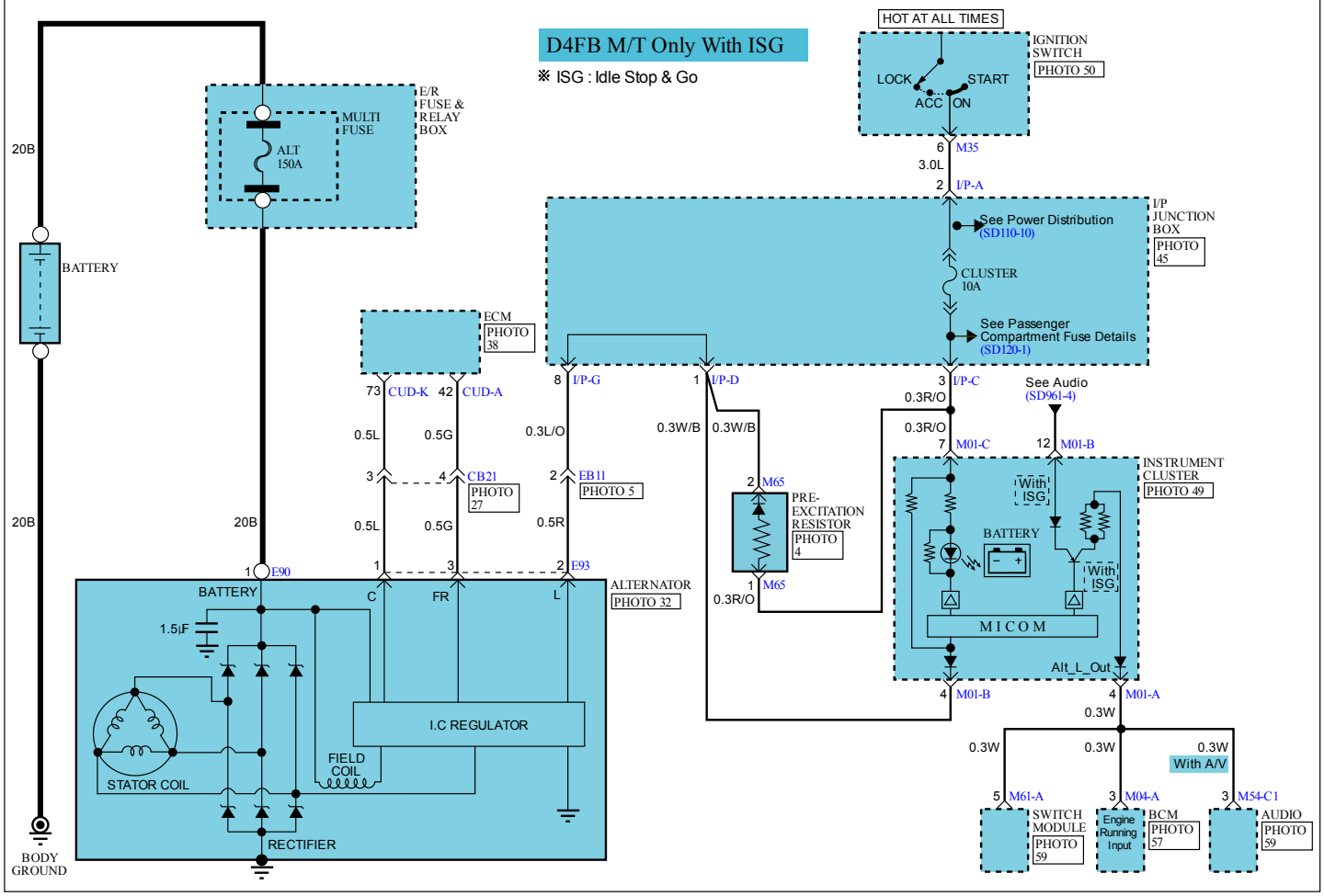
Charging System (3) SD373-3



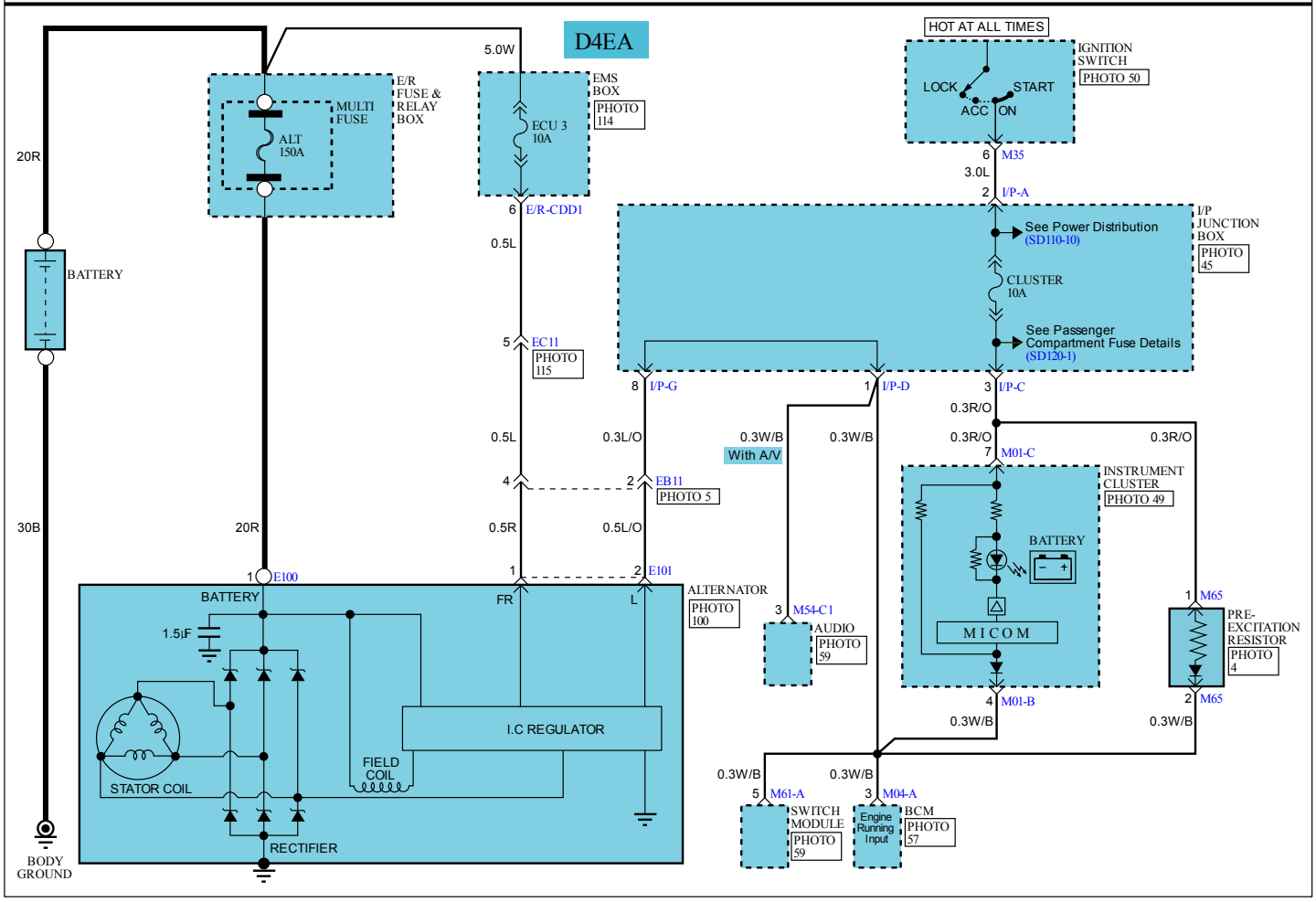
Charging System (4) SD373-4



Charging System (5) SD373-5

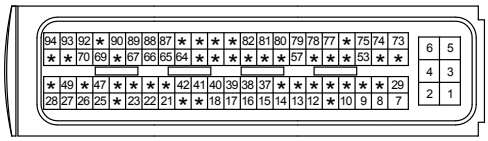


Charging System (6) SD373-6



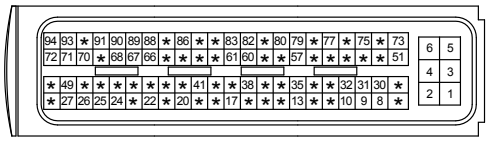
Charging System (7) SD373-7

CBG-K



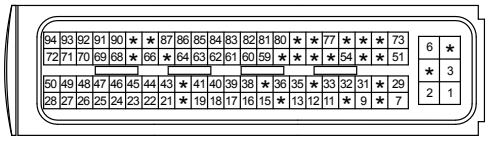
AMP_ECU_94F_B

CGGA-K



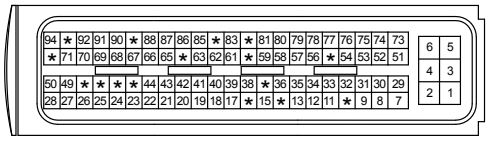
AMP_ECU_94F_B

CGGM-K



AMP_ECU_94F_B

CGG-K



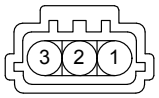
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CGG06



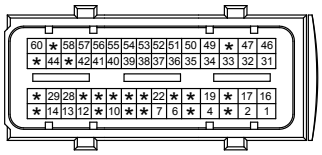
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CGG56



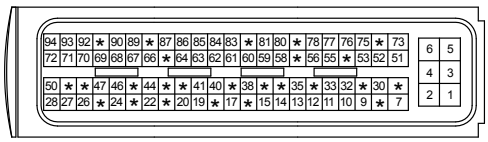
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CUD-A



AMP_ECU_60F_B_A

CUD-K



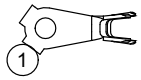
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E50



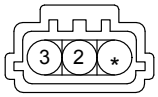
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E60



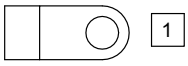
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E61



KET_090IIWP_03F

E90



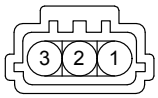
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E91



KET_58X_02F_B

E93



KET_090IIWP_03F_B

Charging System (8) SD373-8

E100



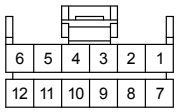
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E101



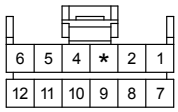
KET_58X_02F_B

M01-A



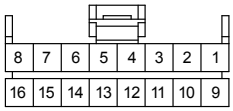
AMP_040M1_12F_B

M01-B



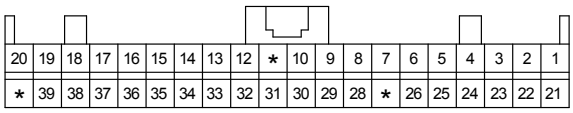
AMP_040M1_12F_B

M01-C



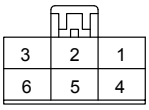
AMP_040M1_16F_B

M04-A



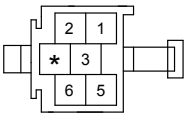
AMP_025_40F_W

M35



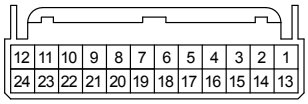
KUM_DSD_06F_W

M54-C1



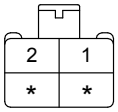
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M61-A



AMP_025_24F_W

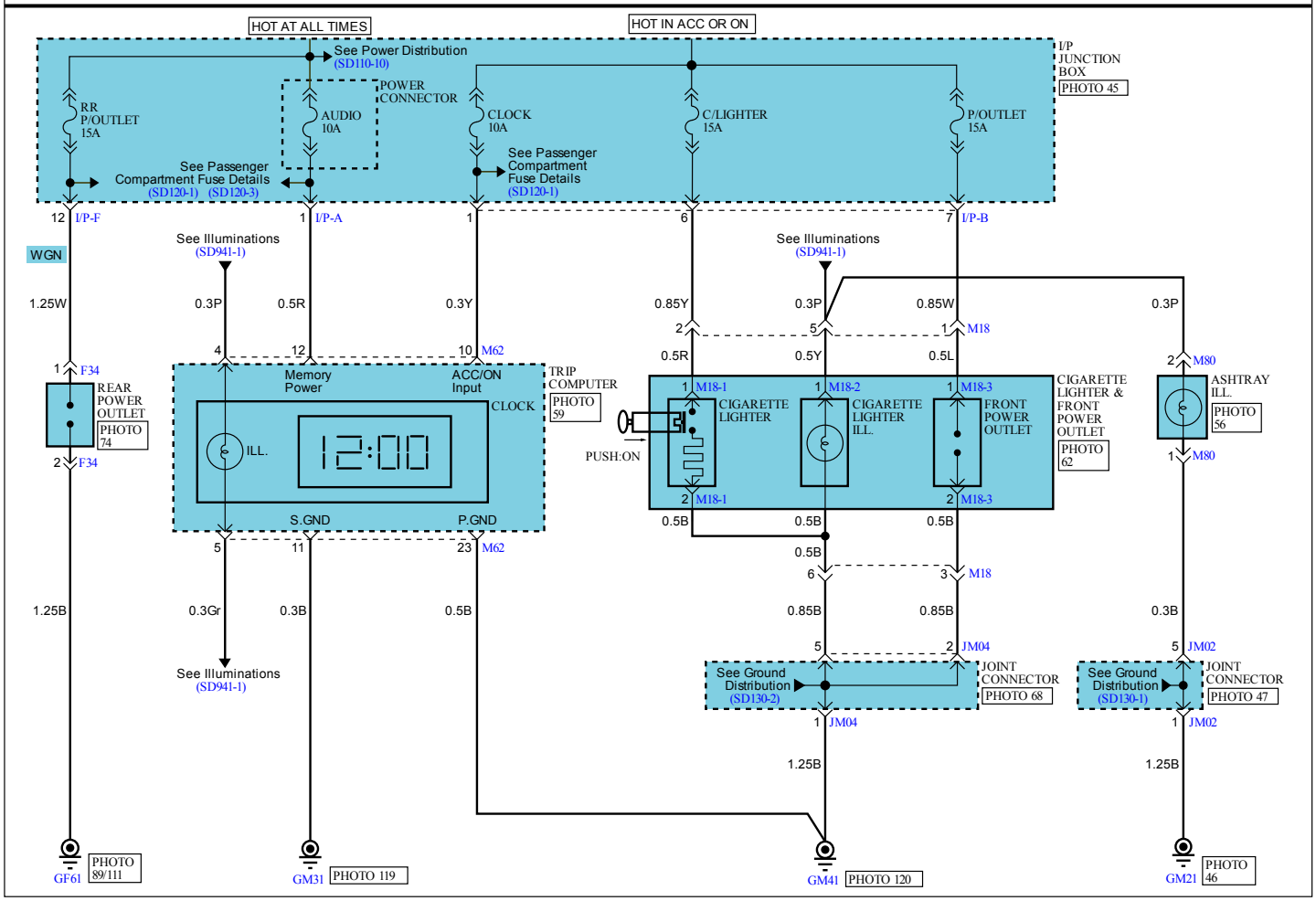
M65



KET_250_04F_B

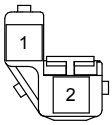
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Clock & Cigarette Lighter (Power Outlet) (1) SD945-1



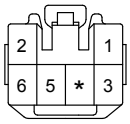
Clock & Cigarette Lighter (Power Outlet) (2) SD945-2

F34



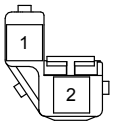
KET_2505_02F_B_CIGAR

M18



KET_090II_06F_W

M18-1



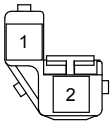
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M18-2



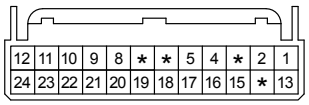
CR01F050

M18-3



KET_2505_02F_B_CIGAR

M62



AMP_025_24F_W

M80



CHT_STMTR_8T_N

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Component Locations (1)

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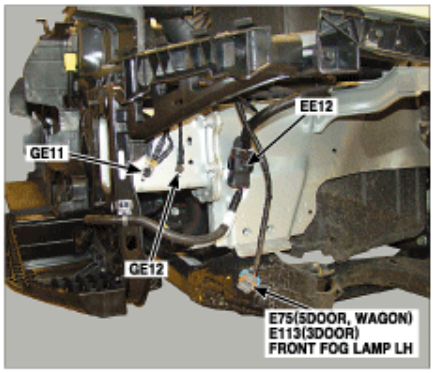


PHOTO.2

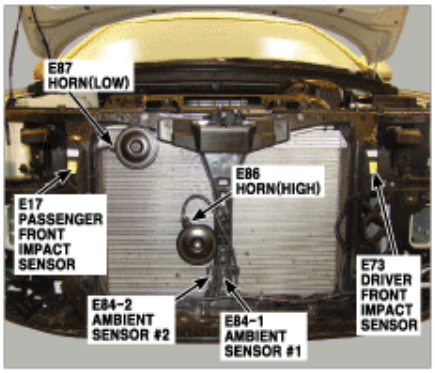


PHOTO.3

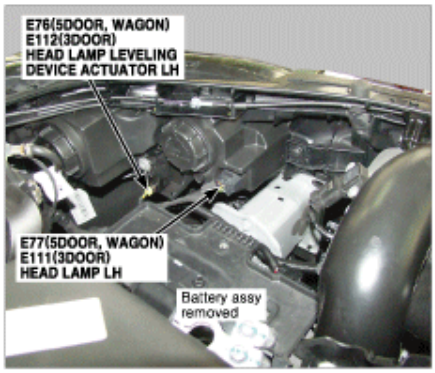


PHOTO.4

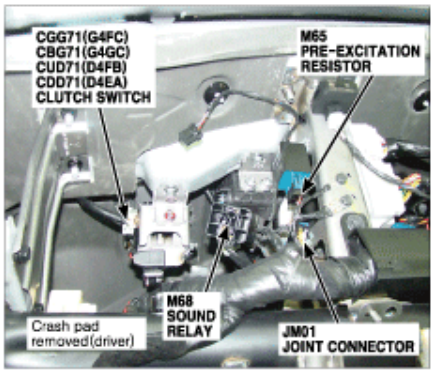


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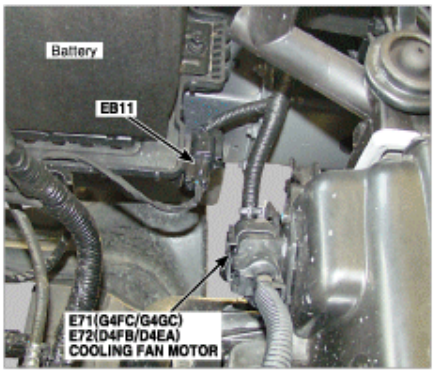
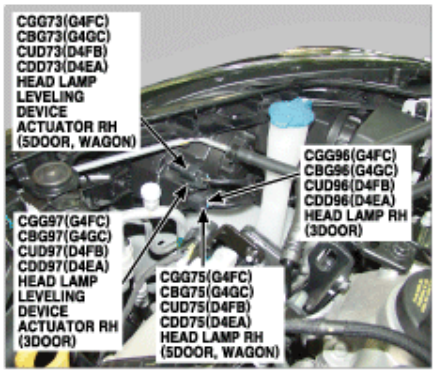


PHOTO.6



Component Locations (2)

PHOTO.7

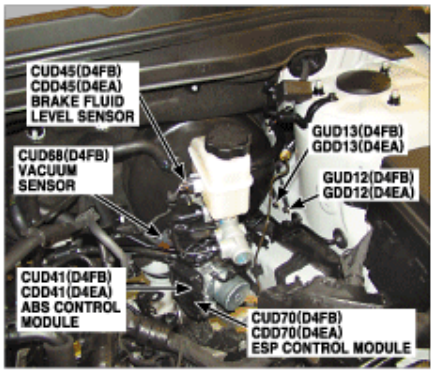


PHOTO.8

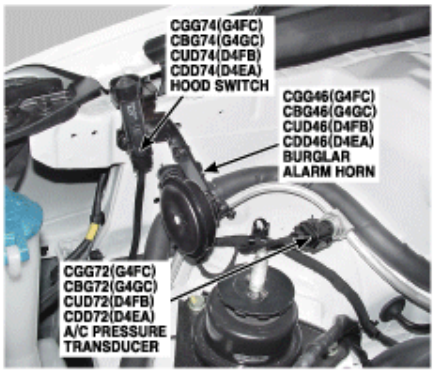


PHOTO.9

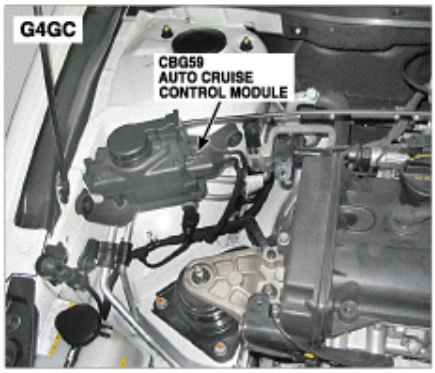


PHOTO.10

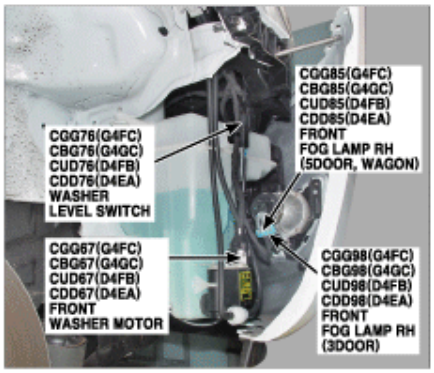


PHOTO.11

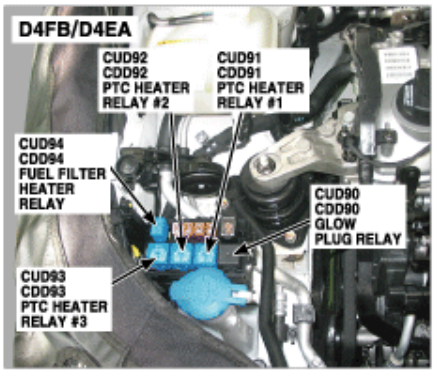
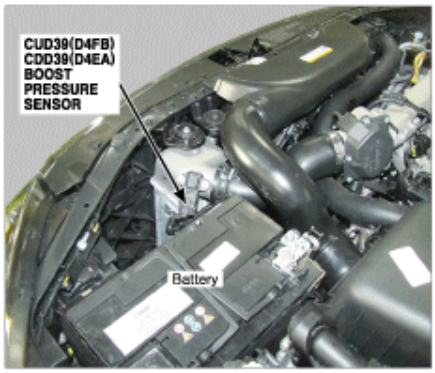


PHOTO.12



Component Locations (3)

PHOTO.13

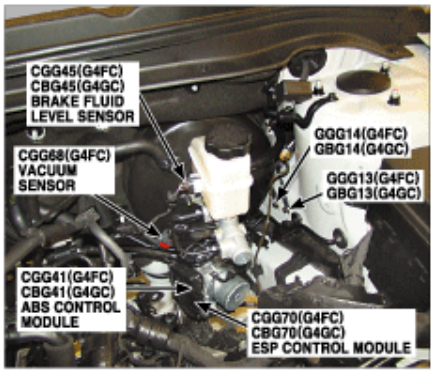


PHOTO.14

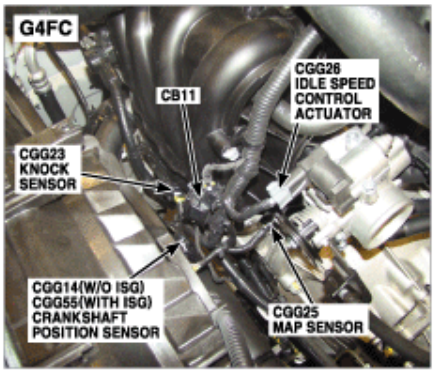


PHOTO.15

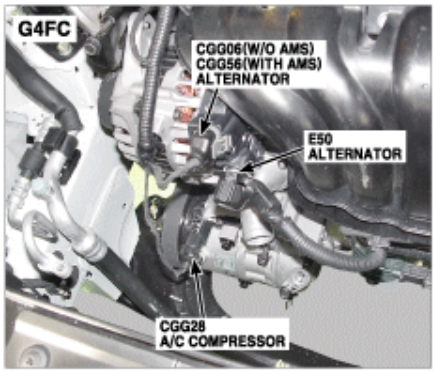


PHOTO.16

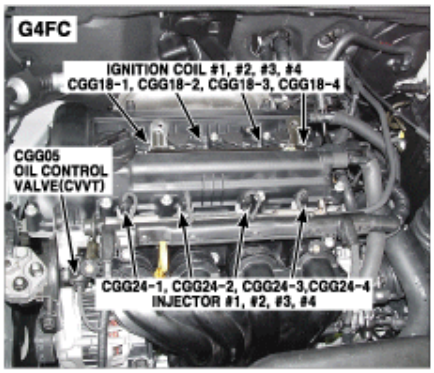


PHOTO.17

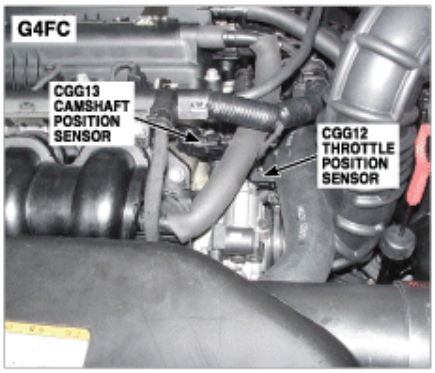
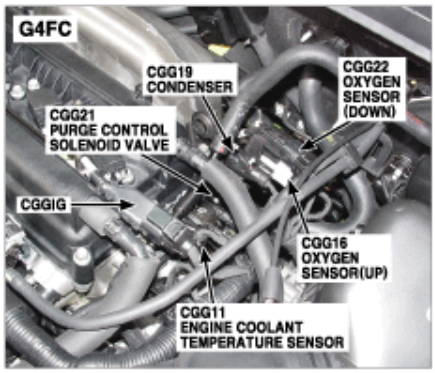


PHOTO.18



Component Locations (4)

PHOTO.19

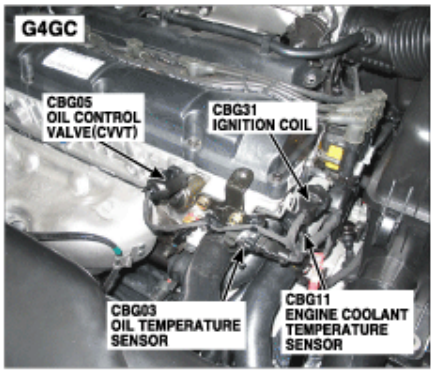


PHOTO.20

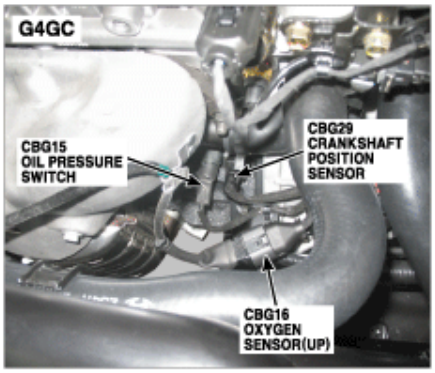


PHOTO.21

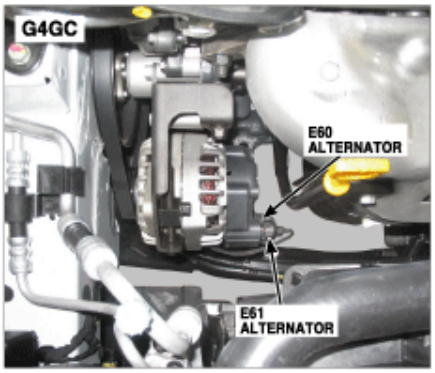


PHOTO.22

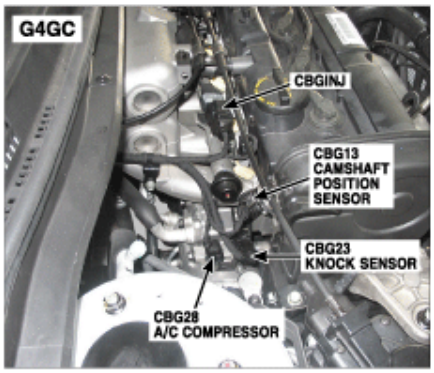


PHOTO.23

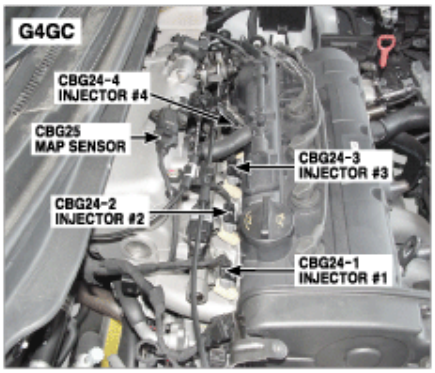


PHOTO.24

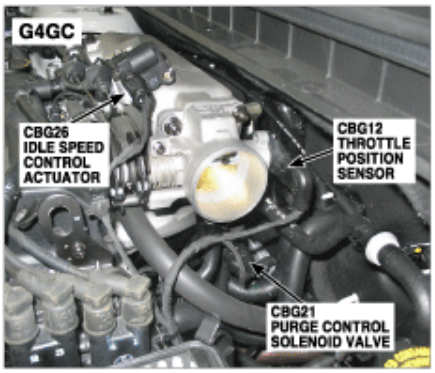


PHOTO.25

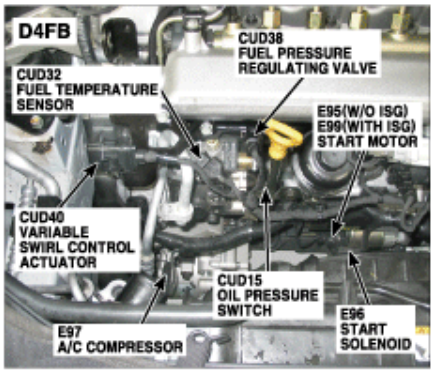


PHOTO.26

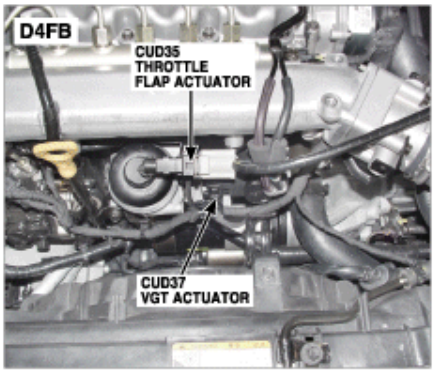


PHOTO.27

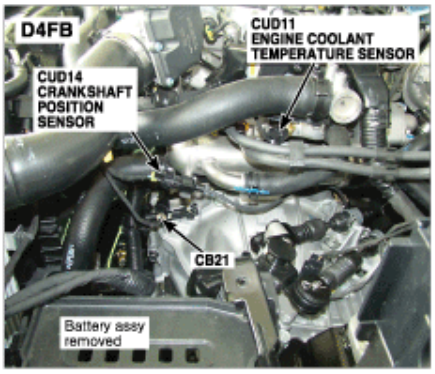


PHOTO.28

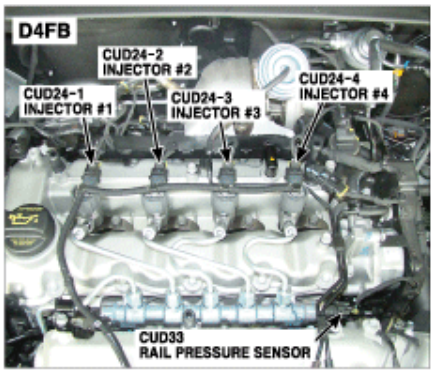


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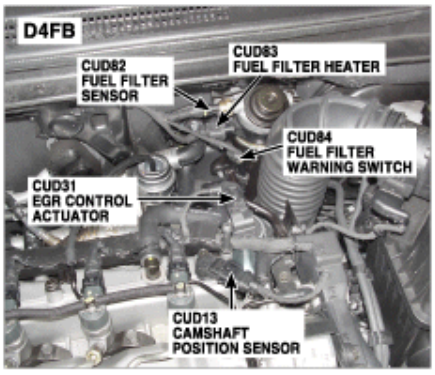
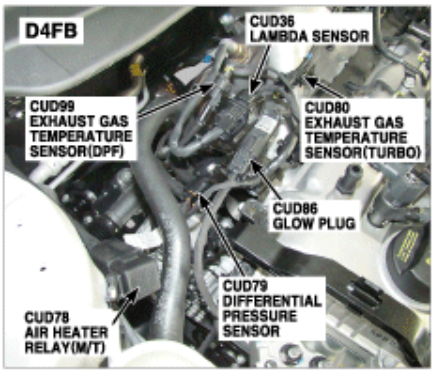


PHOTO.30



Component Locations (6)

PHOTO.31

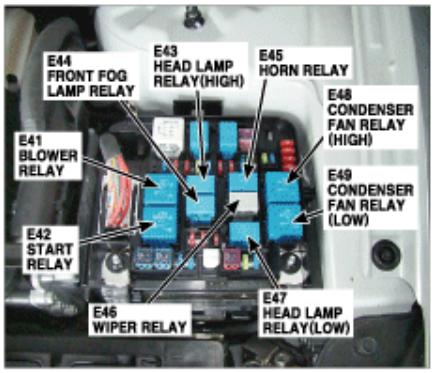


PHOTO.32

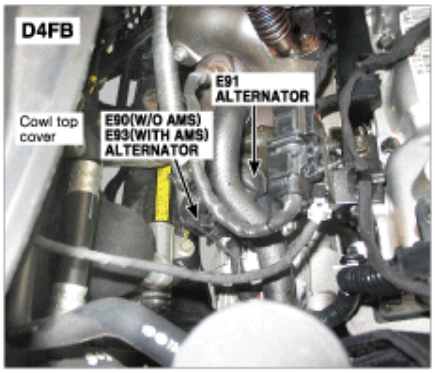


PHOTO.33

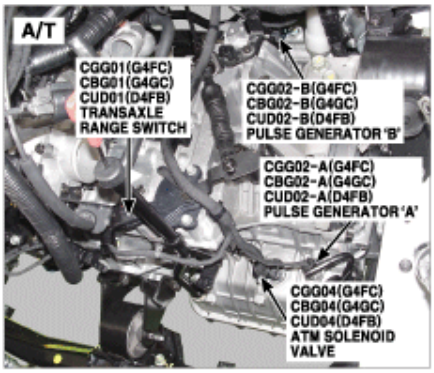


PHOTO.34

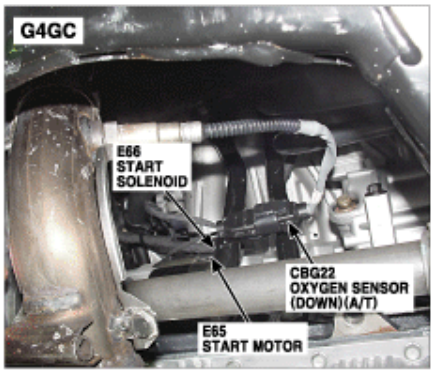


PHOTO.35

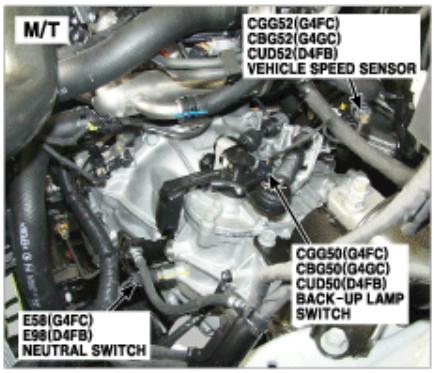


PHOTO.36

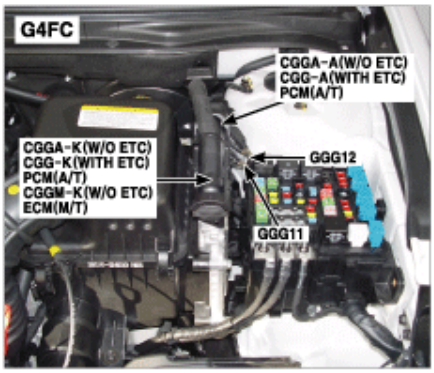


PHOTO.37

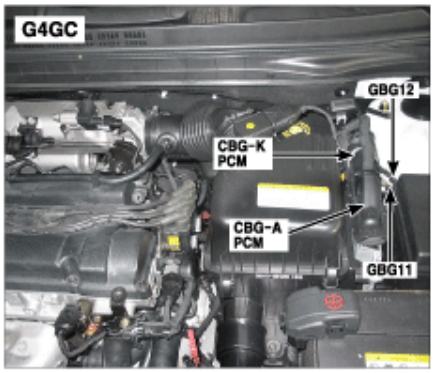


PHOTO.38

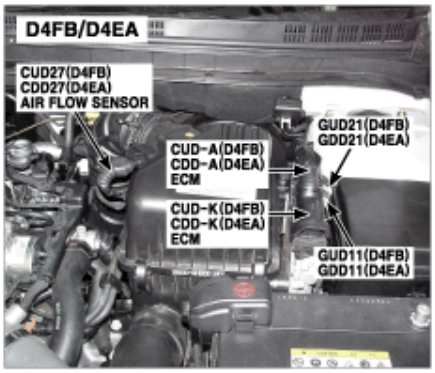


PHOTO.39

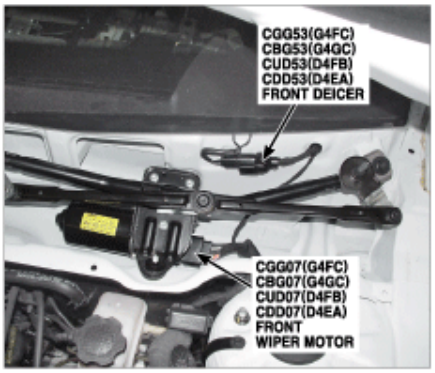


PHOTO.40



PHOTO.41

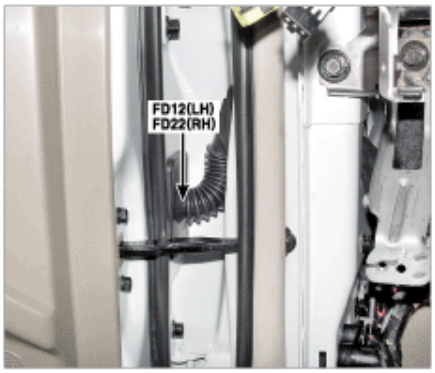


PHOTO.42

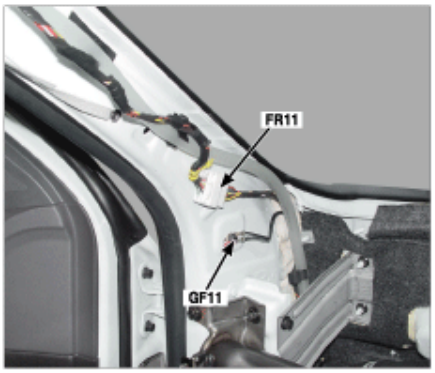


PHOTO.43

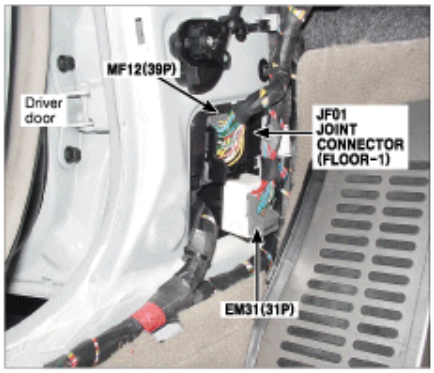


PHOTO.44



PHOTO.45

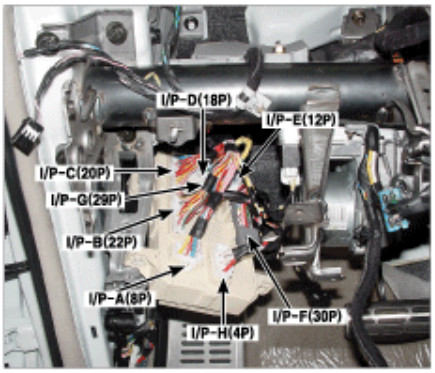


PHOTO.46

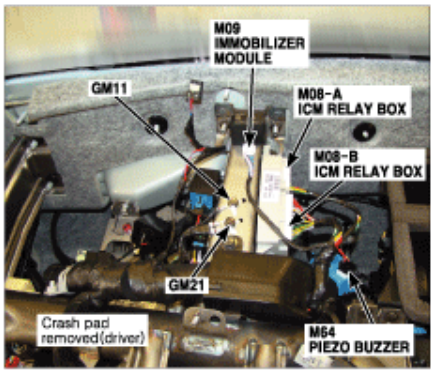


PHOTO.47

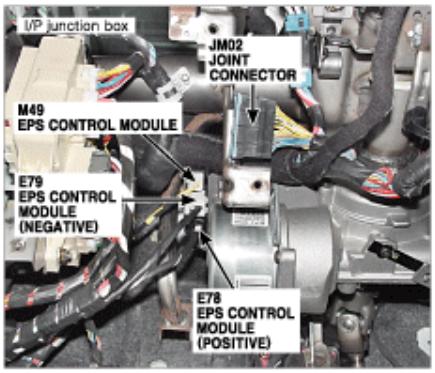
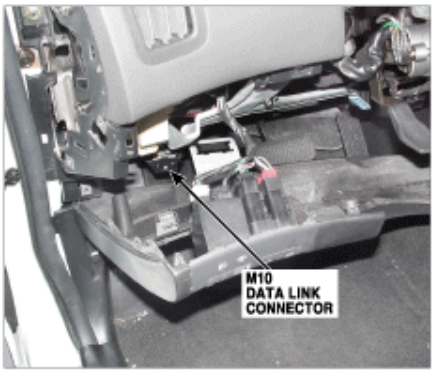


PHOTO.48



Component Locations (9)

PHOTO.49

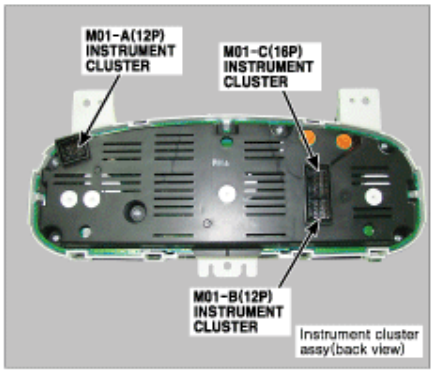


PHOTO.50

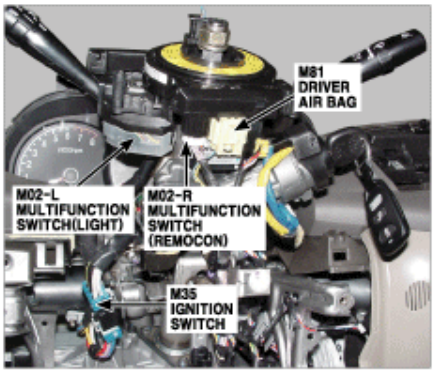


PHOTO.51

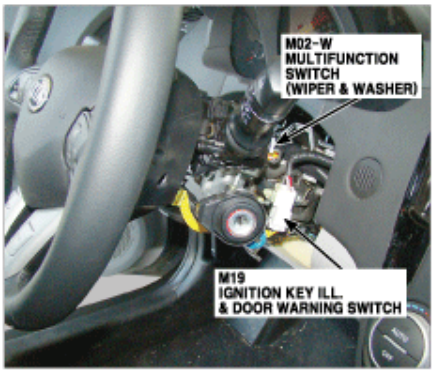


PHOTO.52

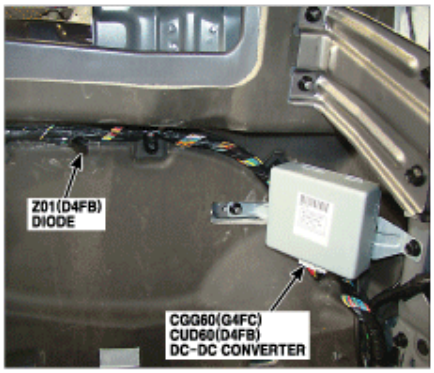


PHOTO.53

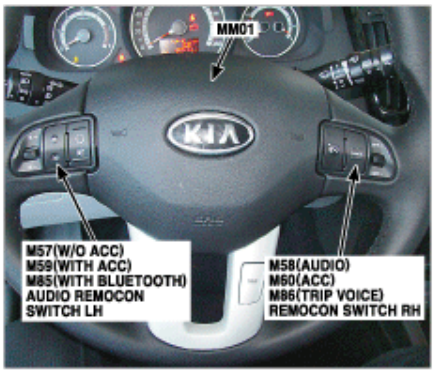


PHOTO.54

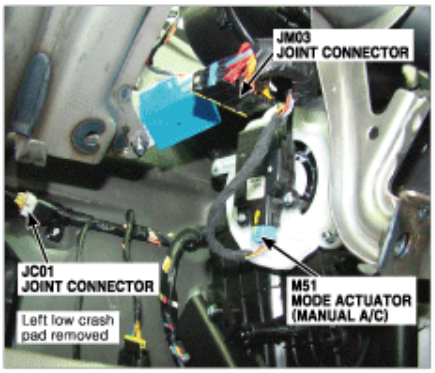


PHOTO.55

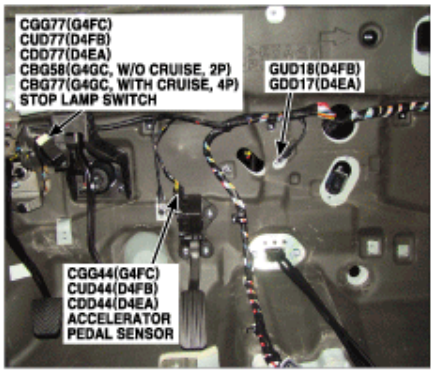


PHOTO.56



PHOTO.57

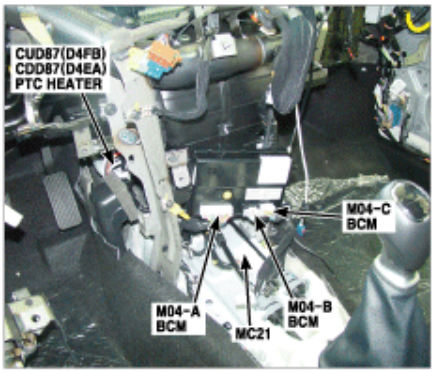


PHOTO.58

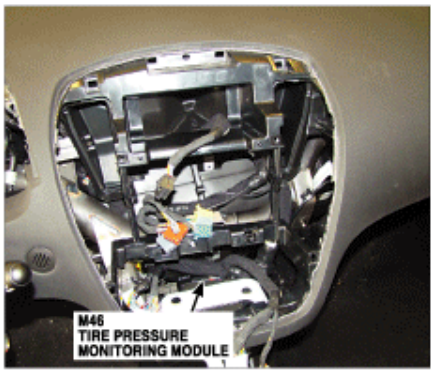


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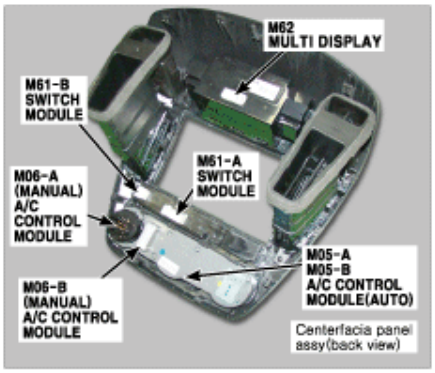


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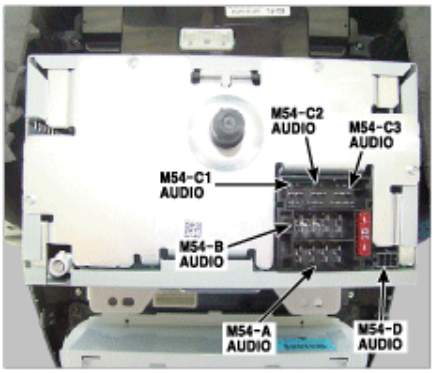


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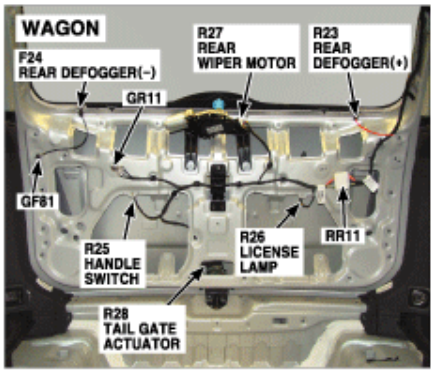


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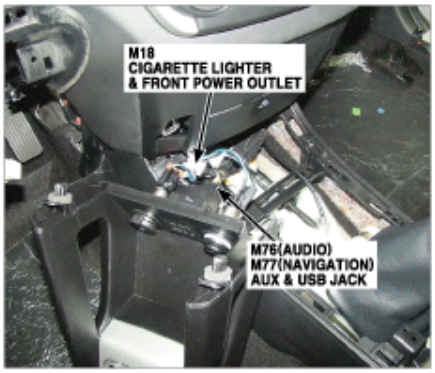


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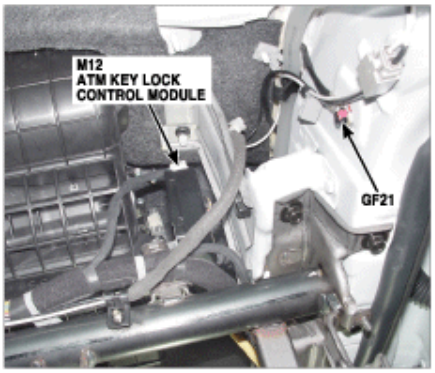


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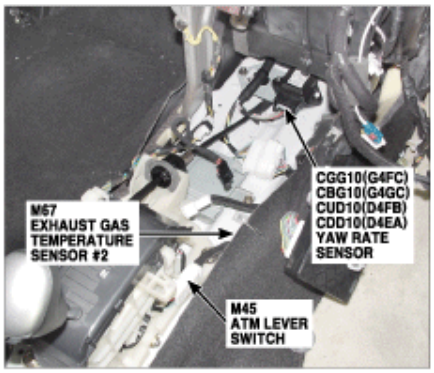


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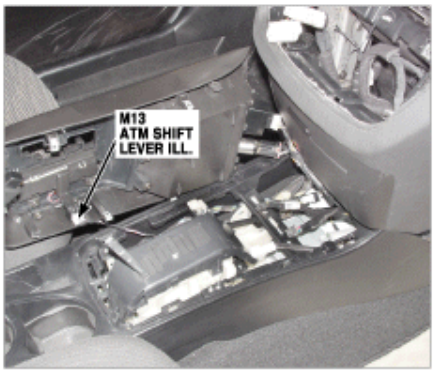


PHOTO.66

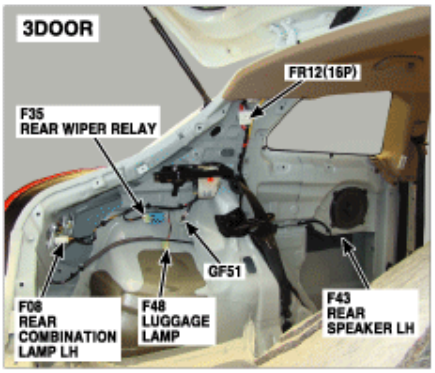


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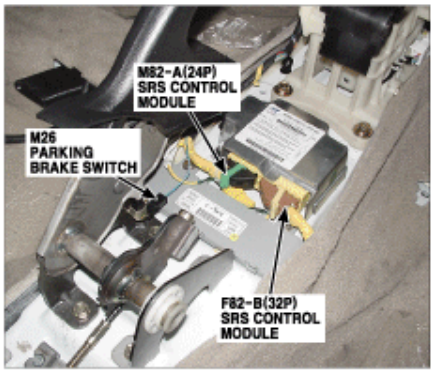


PHOTO.68

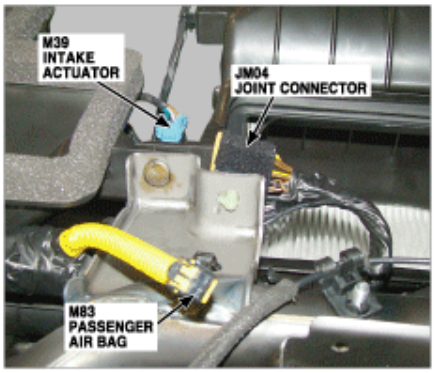


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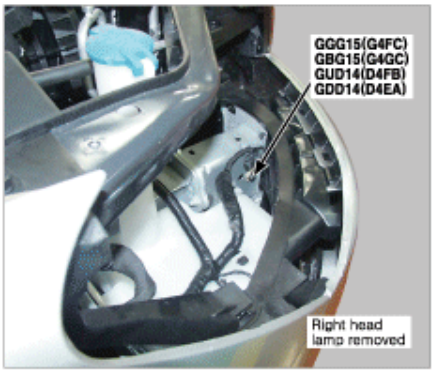


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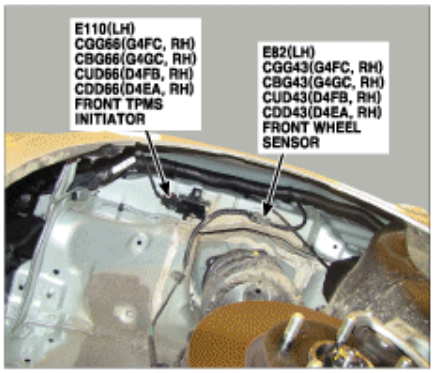


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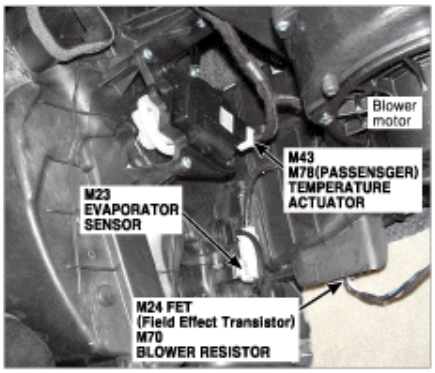


PHOTO.72



PHOTO.73

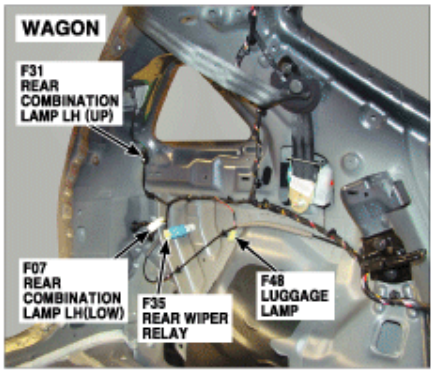


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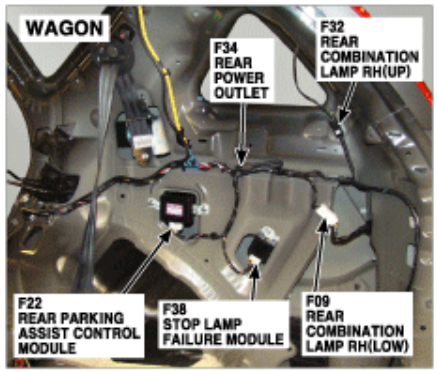


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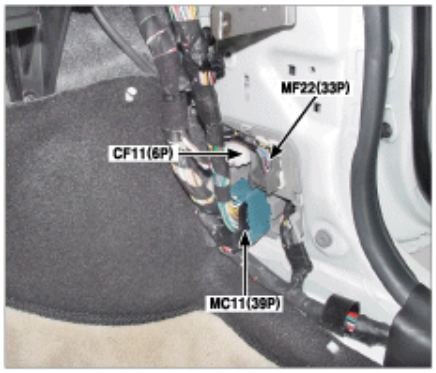


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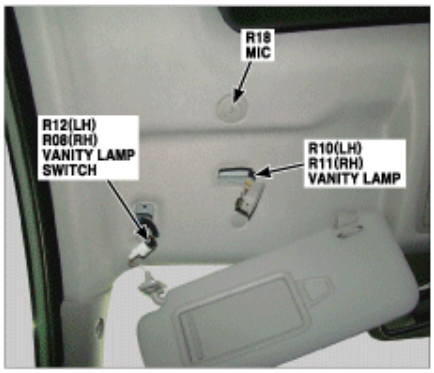


PHOTO.77



PHOTO.78

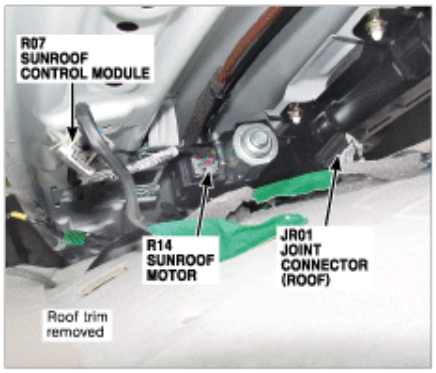


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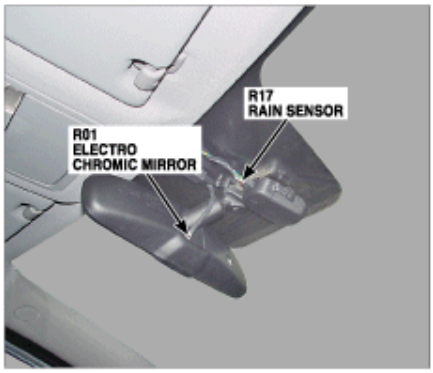


PHOTO.80

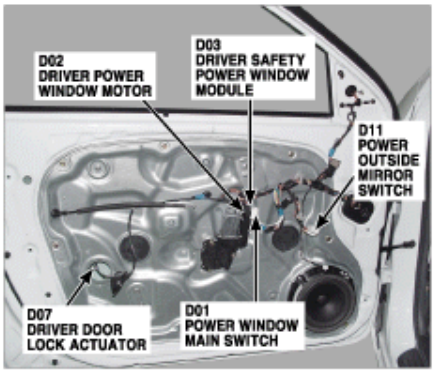


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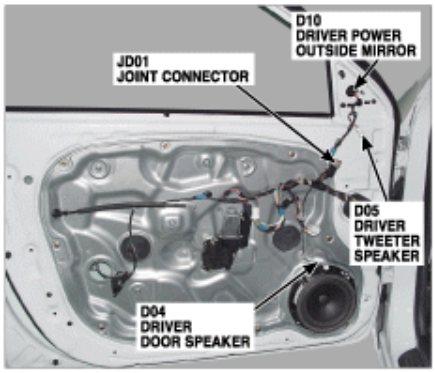


PHOTO.82

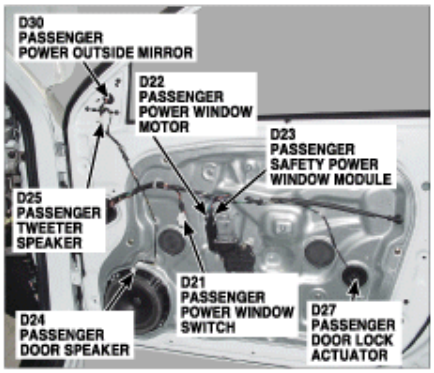


PHOTO.83

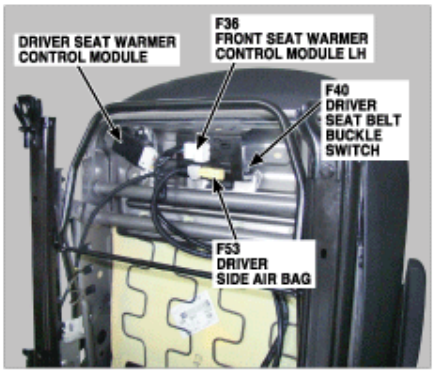


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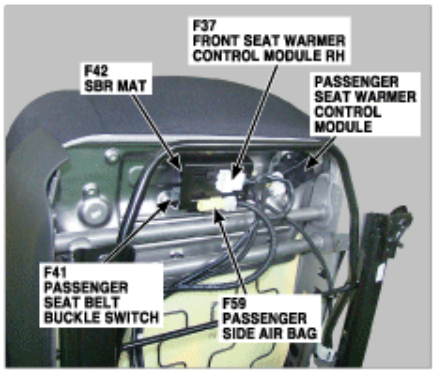


PHOTO.85

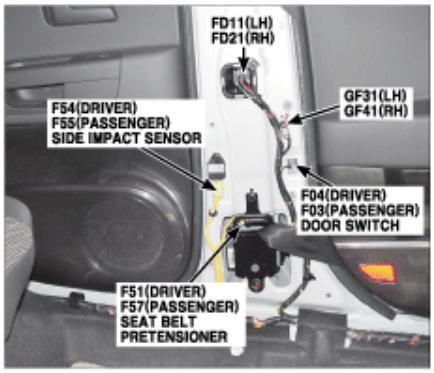


PHOTO.86

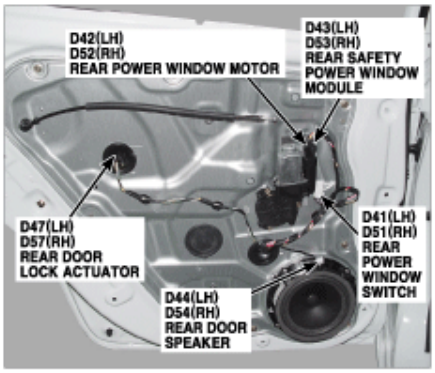


PHOTO.87



PHOTO.88

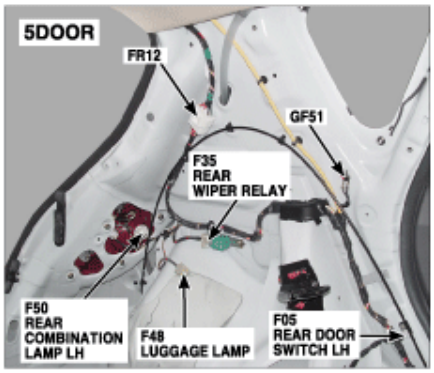


PHOTO.89

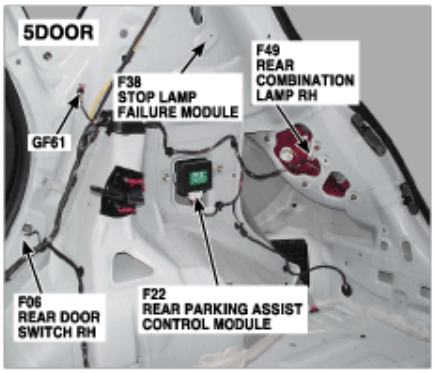


PHOTO.90

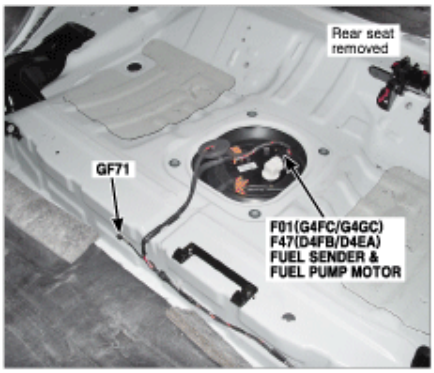


PHOTO.91



PHOTO.92

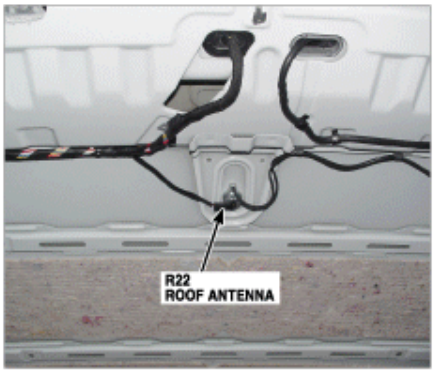


PHOTO.93



PHOTO.94

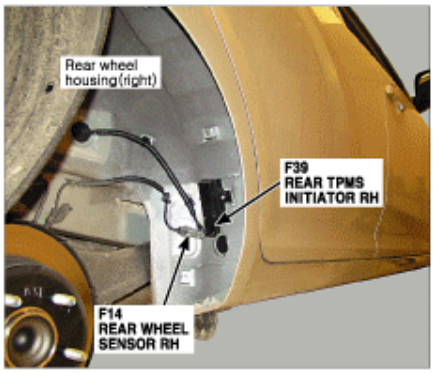


PHOTO.95

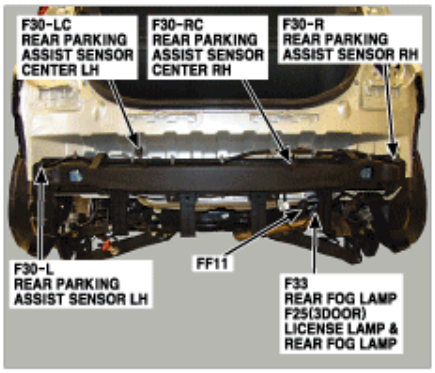


PHOTO.96

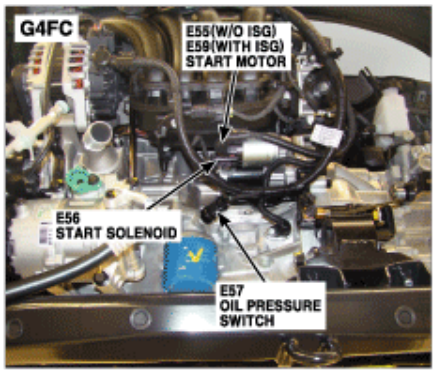


PHOTO.97

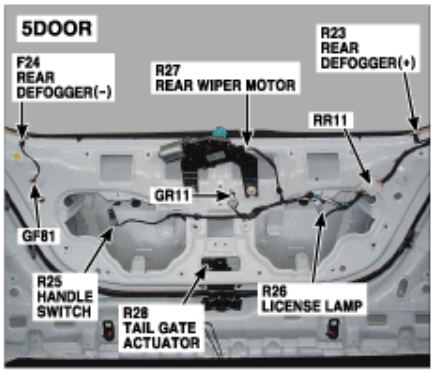


PHOTO.98

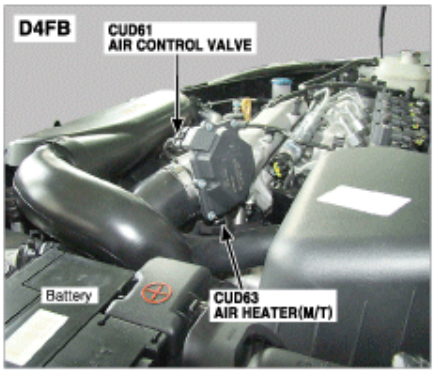


PHOTO.99



PHOTO.100

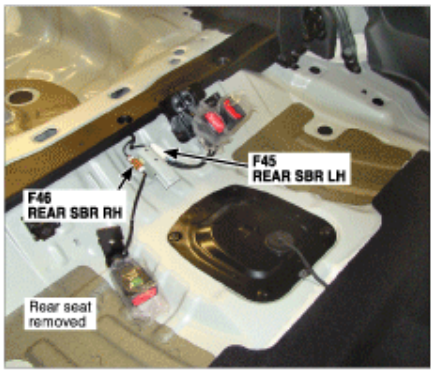


PHOTO.101

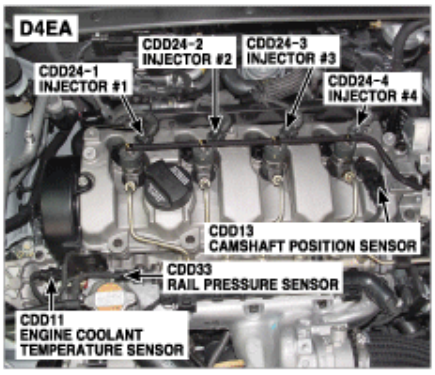


PHOTO.102

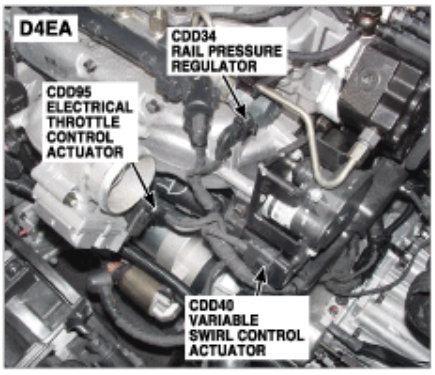


PHOTO.103

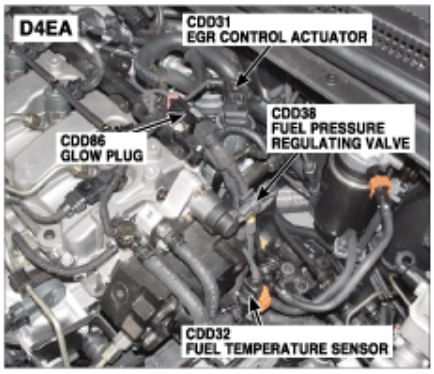


PHOTO.104

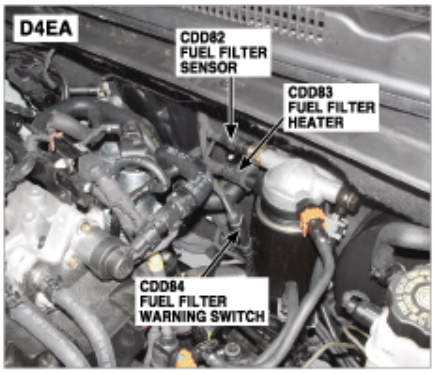


PHOTO.105

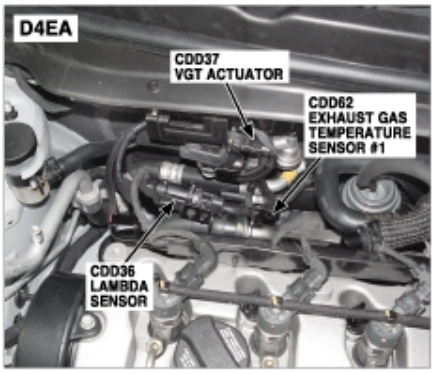


PHOTO.106

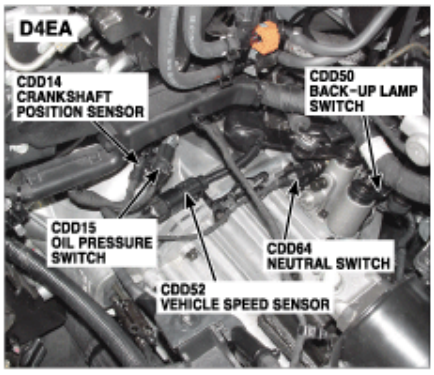


PHOTO.107

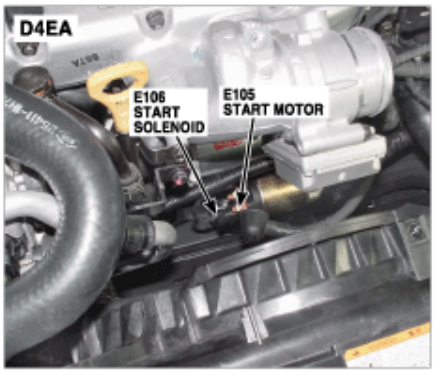


PHOTO.108

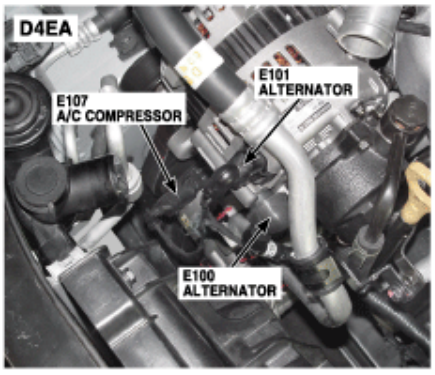


PHOTO.109

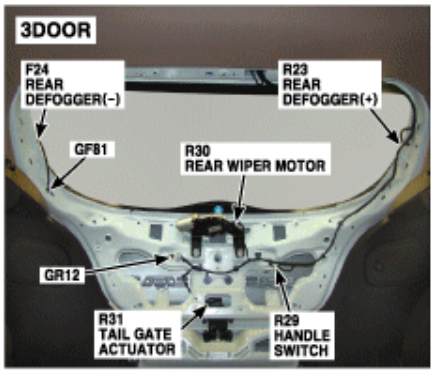


PHOTO.110

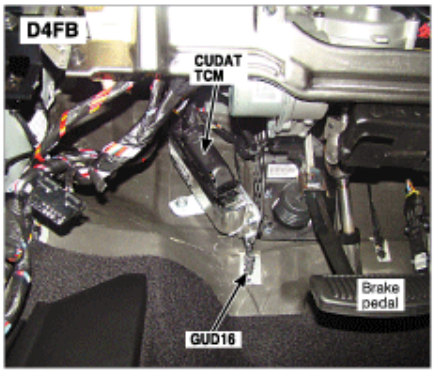


PHOTO.111

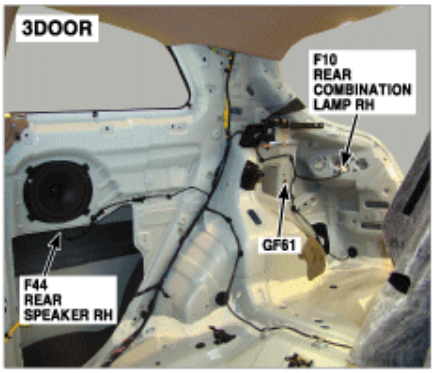


PHOTO.112

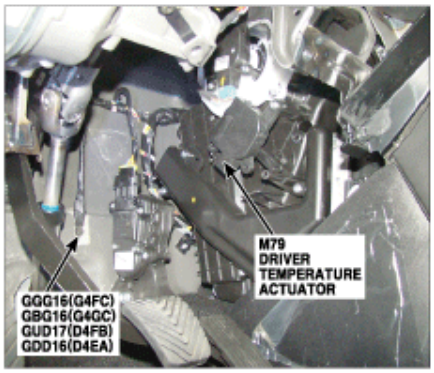


PHOTO.113

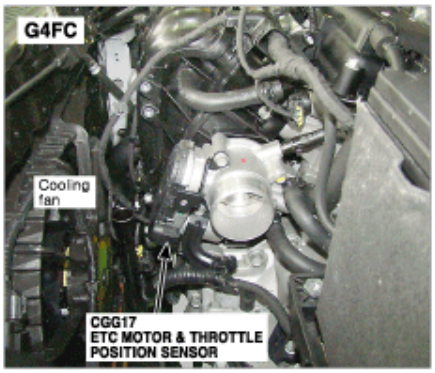
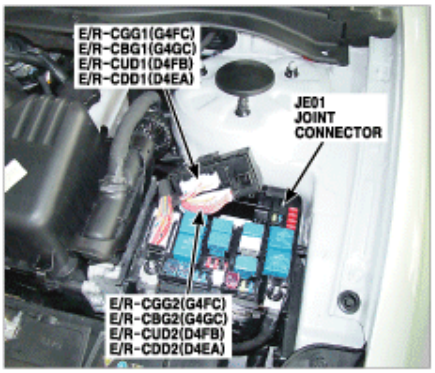


PHOTO.114



Component Locations (20)

PHOTO.115

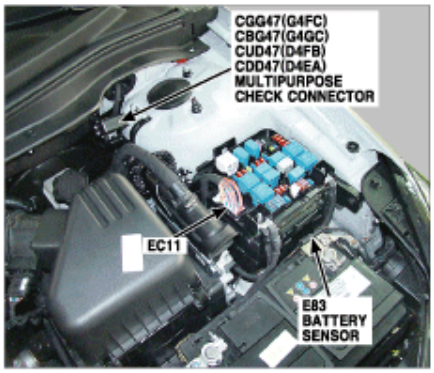


PHOTO.116

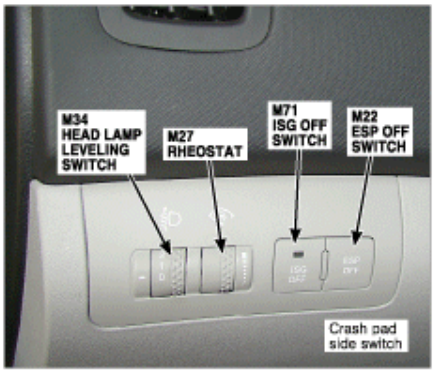


PHOTO.117

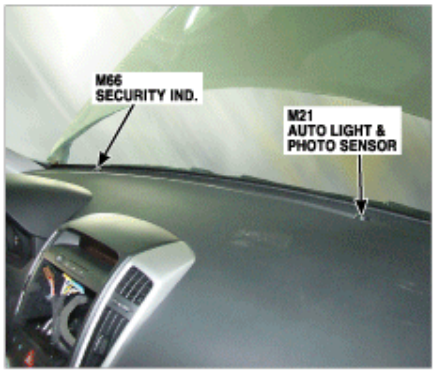


PHOTO.118

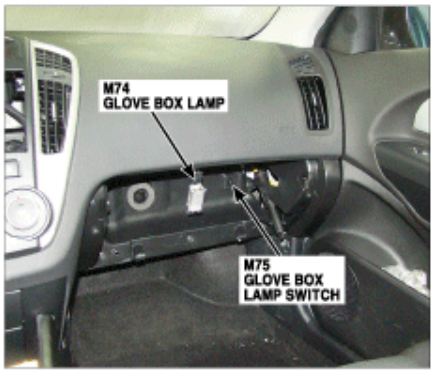


PHOTO.119

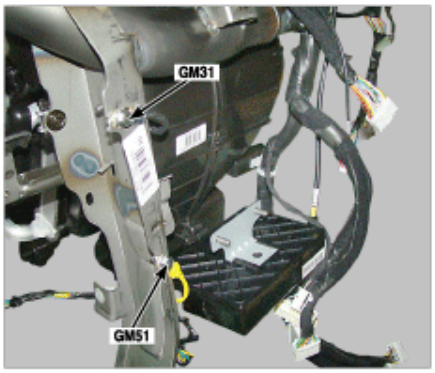


PHOTO.120

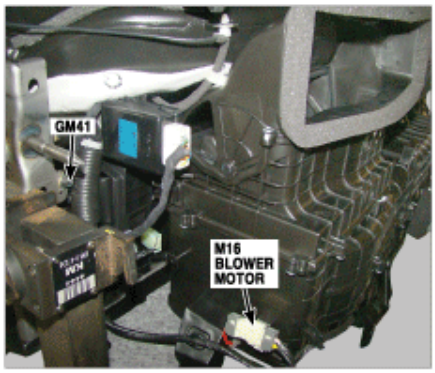


PHOTO.121

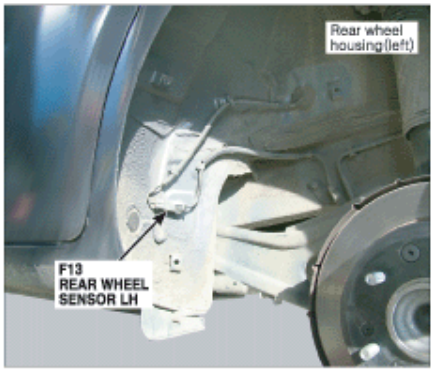
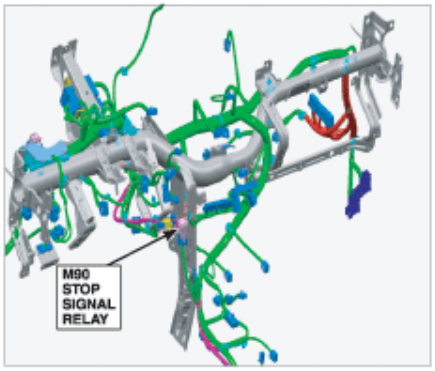


PHOTO.122



Language ▼

Harness Connectors (1)

CB11(G4FA/G4FC)



CB21(D4FB)



CBGINJ



CF11



CGGIG



EB11(G4FA/G4FC)



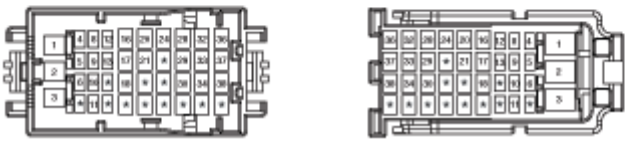
EB11(G4GC/D4FB)



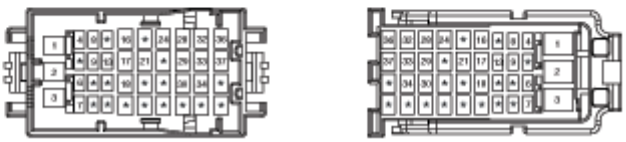
EB11(D4EA)



EC11(G4FA/G4FC)



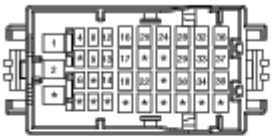
EC11(G4GC)

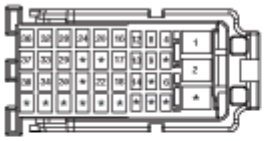


Harness Connectors (2)

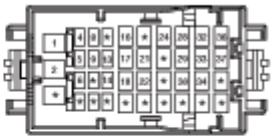
Language ▼

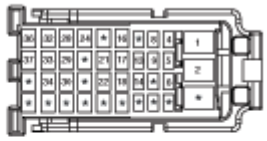
EC11(D4FB)


KET_0409LIF_39M_W


KET_0409LIF_39F_W

EC11(D4EA)


KET_0409LIF_39M_W

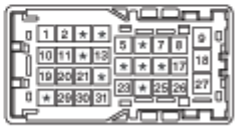

KET_0409LIF_39F_W

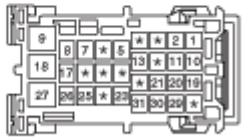
EE12


KET_SSD_16M_B

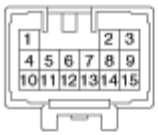

KET_SSD_16F_B

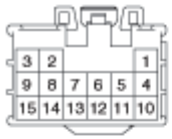
EM31


KET_LIF187_31M_W

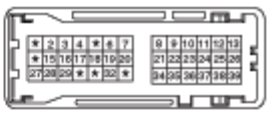

KET_LIF187_31F_W

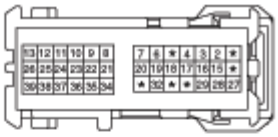
FD11


KET_090II_15M_W

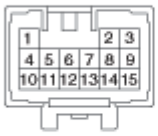

KET_090III_15F_W

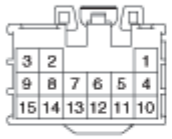
FD12


KET_LIF0409_39M_W_DR

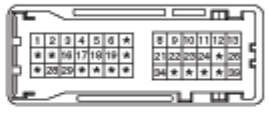

KET_LIF0409_39F_W

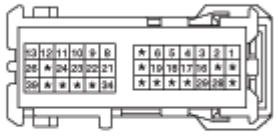
FD21


KET_090II_15M_W


KET_090III_15F_W

FD22


KET_LIF0409_39M_W_DR


KET_LIF0409_39F_W

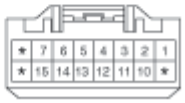
FF11


AMP_040II WP_10M_B


KET_040III WP_10F_B

FR11


AMP_090III_16M_W


AMP_090III_16F_W

FR12



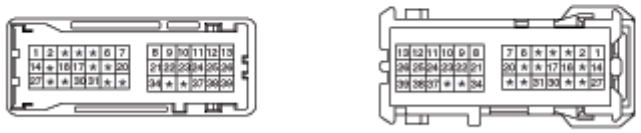
KET_1809_16M_W KET_1809_16F_W

MC11(G4FA/G4FC/D4FB)



KET_LIF0409_39M_L KET_LIF0409_39F_Gr

MC11(G4GC)



KET_LIF0409_39M_L KET_LIF0409_39F_Gr

MC11(D4EA)



KET_LIF0409_39M_L KET_LIF0409_39F_Gr

MC21(G4FA/G4FC)



AMP_090II_26M_W AMP_090II_26F_W

MC21(G4GC)



AMP_090II_26M_W AMP_090II_26F_W

MC21(D4FB)



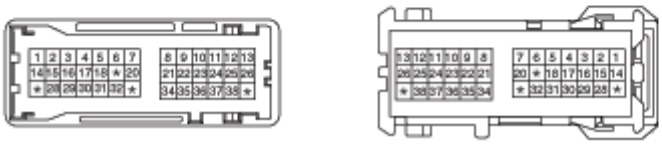
AMP_090II_26M_W AMP_090II_26F_W

MC21(D4EA)



AMP_090II_26M_W AMP_090II_26F_W

MF12



KET_LIF0409_39M_Gr KET_LIF0409_39F_Gr

MF22

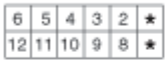


KET_LIF0409_33M_W KET_LIF0409_33F_W_C

MM01



CR12M004

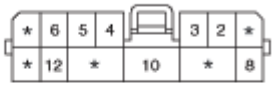


CR12F031

RR11

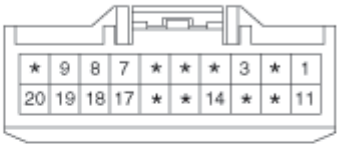


AMP_0725_13M_W



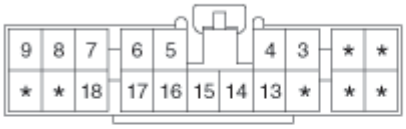
AMP_0725_13F_W

E/R-CBG1



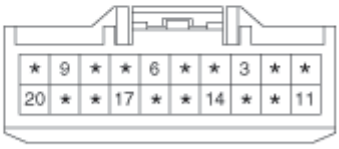
AMP_090II_20F_W

E/R-CBG2



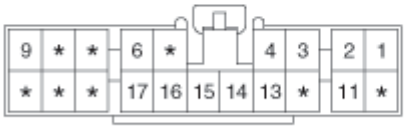
KET_090II_20F_W

E/R-CDD1



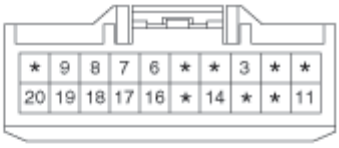
AMP_090II_20F_W

E/R-CDD2



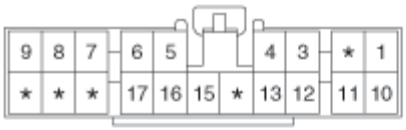
KET_090II_20F_W

E/R-CGG1



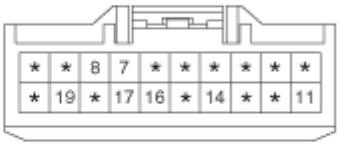
AMP_090II_20F_W

E/R-CGG2



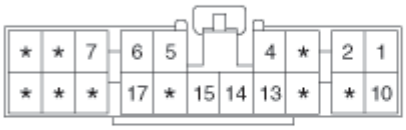
KET_090II_20F_W

E/R-CUD1



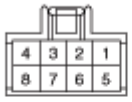
AMP_090II_20F_W

E/R-CUD2



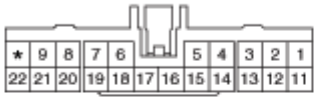
KET_090II_20F_W

I/P-A



KET_187II_08F_W

I/P-B



KET_090II_22F_B

I/P-C



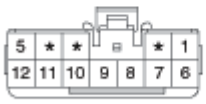
KET_090II_20F_W

I/P-D



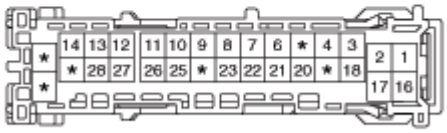
KET_090II_18F_GR

I/P-E



KET_090II_12F_W

I/P-F



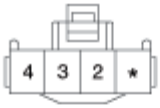
KET_LIF03187_30F_W

I/P-G



KET_1809_21F_W_A

I/P-H



KET_312II_04F_W

JC01



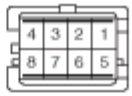
KET_070_08F_W_JCH

JD01



KET_090II_08F_W

JE01



KET_070_08F_W_JCH

JF01



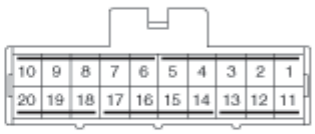
KET_090II_20F_B_JCH

JM01



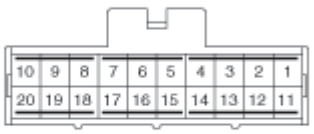
KET_090II_20F_B_JCH

JM02



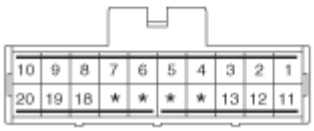
KET_090II_20F_B_JCH

JM03



KET_090II_20F_B_JCH

JM04



KET_090II_20F_B_JCH

JR01

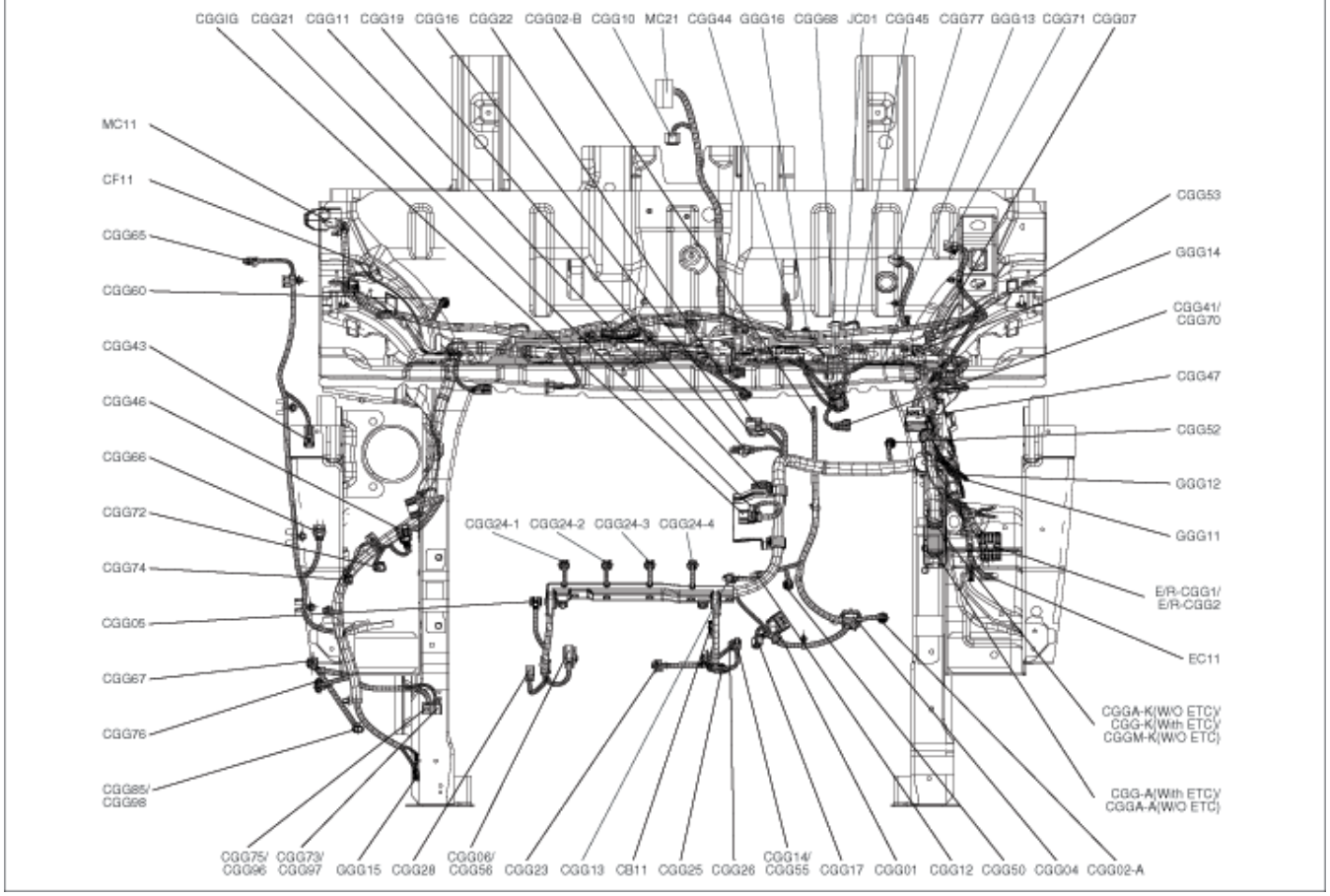


KET_090II_20F_B_JCH

BLANK

BLANK

Control Harness (G4FA/G4FC) (1)



Control Harness (G4FA/G4FC) (2)

CONTROL HARNESS

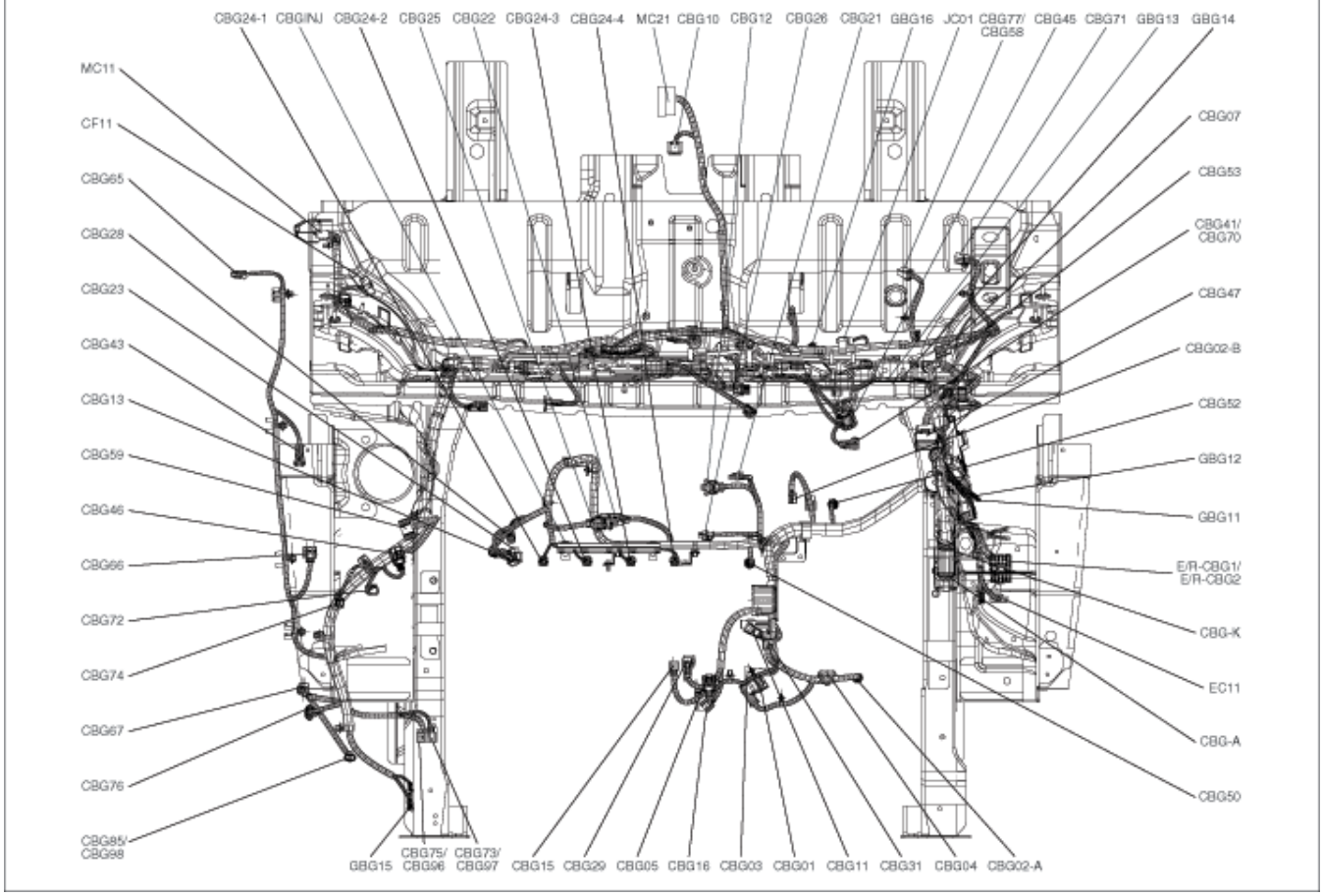
CGG01	Transaxle Range Switch
CGG02-A	Pulse Generator 'A'
CGG02-B	Pulse Generator 'B'
CGG04	ATM Solenoid Valve
CGG05	Oil Control Valve
CGG06	Alternator
CGG07	Front Wiper Motor
CGG10	Yaw Rate Sensor
CGG11	Engine Coolant Temperature Sensor
CGG12	Throttle Position Sensor
CGG13	Camshaft Position Sensor
CGG14	Crankshaft Position Sensor
CGG16	Oxygen Sensor (UP)
CGG17	ETC motor & Throttle position sensor
CGG19	Condenser
CGG21	Purge Control Solenoid Valve
CGG22	Oxygen Sensor (DOWN)
CGG23	Knock Sensor
CGG24-1	Injector #1
CGG24-2	Injector #2
CGG24-3	Injector #3
CGG24-4	Injector #4
CGG25	MAP Sensor
CGG26	Idle Speed Control Actuator
CGG28	A/C Compressor
CGG41	ABS Control Module
CGG43	Front Wheel Sensor RH
CGG44	Accelerator Pedal Sensor
CGG45	Brake Fluid Level Sensor
CGG46	Burglar Alarm Horn
CGG47	Multipurpose Check Connector
CGG50	Back-Up Lamp Switch
CGG52	Vehicle Speed Sensor
CGG53	Front Deicer
CGG55	Crankshaft Position Sensor(ISG)
CGG56	Alternator(AMS)
CGG60	DC-DC Converter
CGG65	Side Repeater Lamp RH
CGG66	Front TPMS Initiator RH
CGG67	Front Washer Motor
CGG68	Vacuum Sensor
CGG70	ESP Control Module
CGG71	Clutch Switch
CGG72	A/C Pressure Transducer
CGG73	Head Lamp Leveling Device Actuator RH
CGG74	Hood Switch
CGG75	Head Lamp RH
CGG76	Washer Level Switch
CGG77	Stop Lamp Switch
CGG85	Front Fog Lamp RH
CGG96	Head Lamp RH(3DR)
CGG97	Head Lamp Leveling Device Actuator RH(3DR)
CGG98	Front Fog Lamp RH(3DR)
CGGA-A	PCM(A/T,W/O ETC)
CGGA-K	PCM(A/T,W/O ETC)
CGG-A	PCM(A/T,With ETC)
CGGM-K	ECM(M/T,W/O ETC)
CGG-K	PCM(With ETC)
JC01	Joint Connector
E/R-CGG1	Connection With EMS BOX Harness
E/R-CGG2	Connection With EMS BOX Harness
CB11	Connection With BATTERY Harness
CF11	Connection With FLOOR Harness
CGGIG	Connection With IGNITION COIL EXT. Harness
EC11	Connection With FRONT Harness
MC11	Connection With MAIN Harness
MC21	Connection With MAIN Harness
GGG11	Ground
GGG12	Ground
GGG13	Ground
GGG14	Ground
GGG15	Ground
GGG16	Ground

IGNITION COIL EXT. HARNESS

CGG18-1	Ignition Coil #1
CGG18-2	Ignition Coil #2
CGG18-3	Ignition Coil #3
CGG18-4	Ignition Coil #4
CGGIG	Connection With CONTROL harness

Control Harness (G4GC) (1)

HL-5



Control Harness (G4GC) (2)

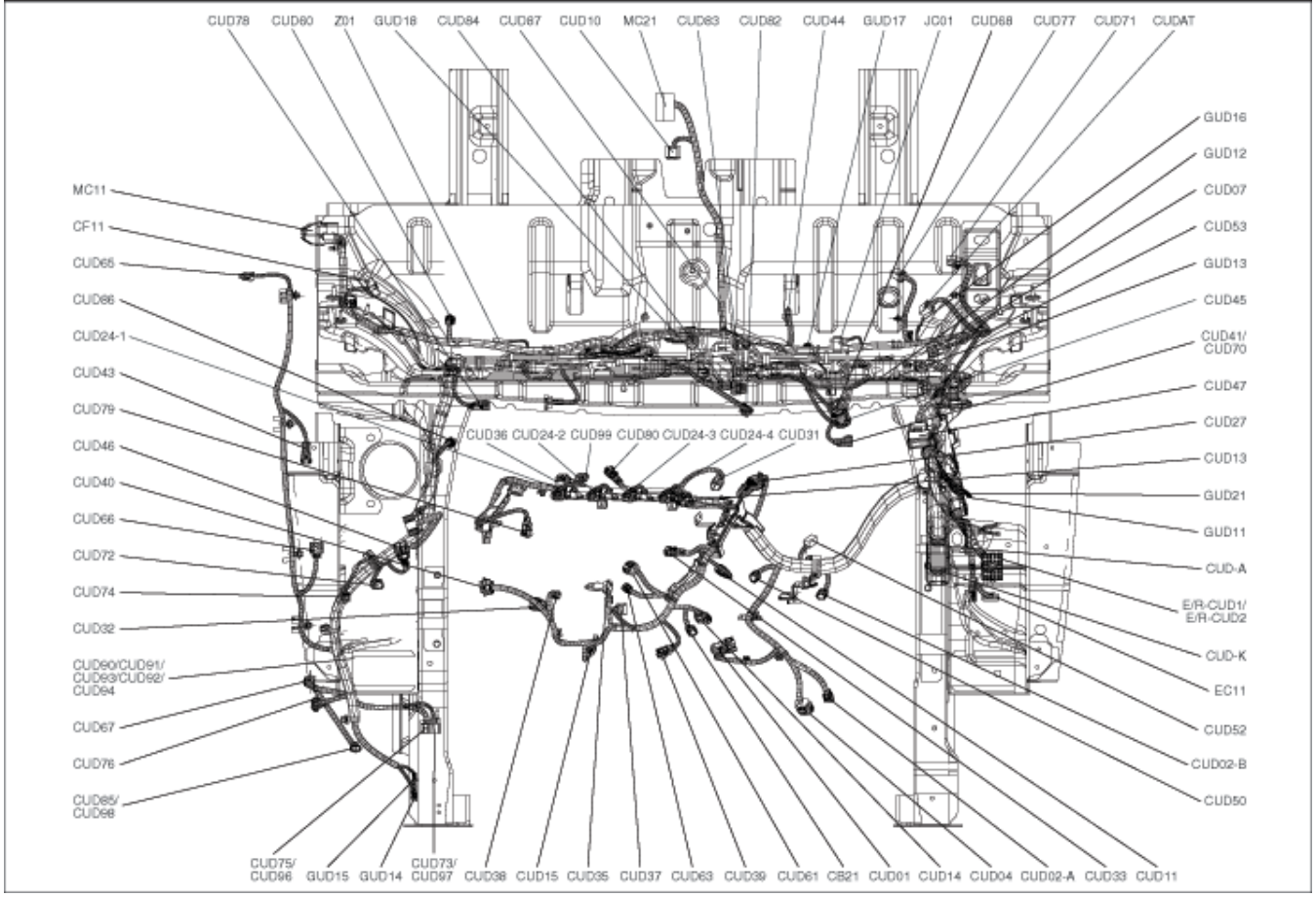
CONTROL HARNESS

CBG01	Transaxle Range Switch
CBG02-A	Pulse Generator 'A'
CBG02-B	Pulse Generator 'B'
CBG03	Oil Temperature Sensor
CBG04	ATM Solenoid Valve
CBG05	Oil Control Valve
CBG07	Front Wiper Motor
CBG10	Yaw Rate Sensor
CBG11	Engine Coolant Temperature Sensor
CBG12	Throttle Position Sensor
CBG13	Camshaft Position Sensor
CBG15	Oil Pressure Switch
CBG16	Oxygen Sensor (UP)
CBG21	Purge Control Solenoid Valve
CBG22	Oxygen Sensor (DOWN)
CBG23	Knock Sensor
CBG24-1	Injector #1
CBG25	MAP Sensor
CBG26	Idle Speed Control Actuator
CBG28	A/C Compressor
CBG29	Crankshaft Position Sensor
CBG31	Ignition Coil
CBG41	ABS Control Module
CBG43	Front Wheel Sensor RH
CBG45	Brake Fluid Level Sensor
CBG46	Burglar Alarm Horn
CBG47	Multipurpose Check Connector
CBG50	Back-Up Lamp Switch(New Mission)
CBG52	Vehicle Speed Sensor(New Mission)
CBG53	Front Deicer
CBG58	Stop Lamp Switch 2P
CBG59	Auto Cruise Control Module
CBG65	Side Repeater Lamp RH
CBG66	Front TPMS Initiator RH
CBG67	Front Washer Motor
CBG70	ESP Control Module
CBG71	Clutch Switch
CBG72	A/C Pressure Transducer
CBG73	Head Lamp Leveling Device Actuator RH
CBG74	Hood Switch
CBG75	Head Lamp RH
CBG76	Washer Level Switch
CBG77	Stop Lamp Switch
CBG85	Front Fog Lamp RH
CBG96	Head Lamp RH(3DR)
CBG97	Head Lamp Leveling Device Actuator RH(3DR)
CBG98	Front Fog Lamp RH(3DR)
CBG-A	PCM
CBG-K	PCM
JC01	Joint Connector
E/R-CBG1	Connection With EMS BOX harness
E/R-CBG2	Connection With EMS BOX harness
CBGINJ	Connection With INJECTOR EXT. harness
CF11	Connection With FLOOR harness
EC11	Connection With FRONT harness
MC11	Connection With MAIN harness
MC21	Connection With MAIN harness
GBG11	Ground
GBG12	Ground
GBG13	Ground
GBG14	Ground
GBG15	Ground
GBG16	Ground

INJECTOR EXT. HARNESS

CBG24-2	Injector #2
CBG24-3	Injector #3
CBG24-4	Injector #4
CBGINJ	Connection With CONTROL harness

Control Harness (D4FB) (1)

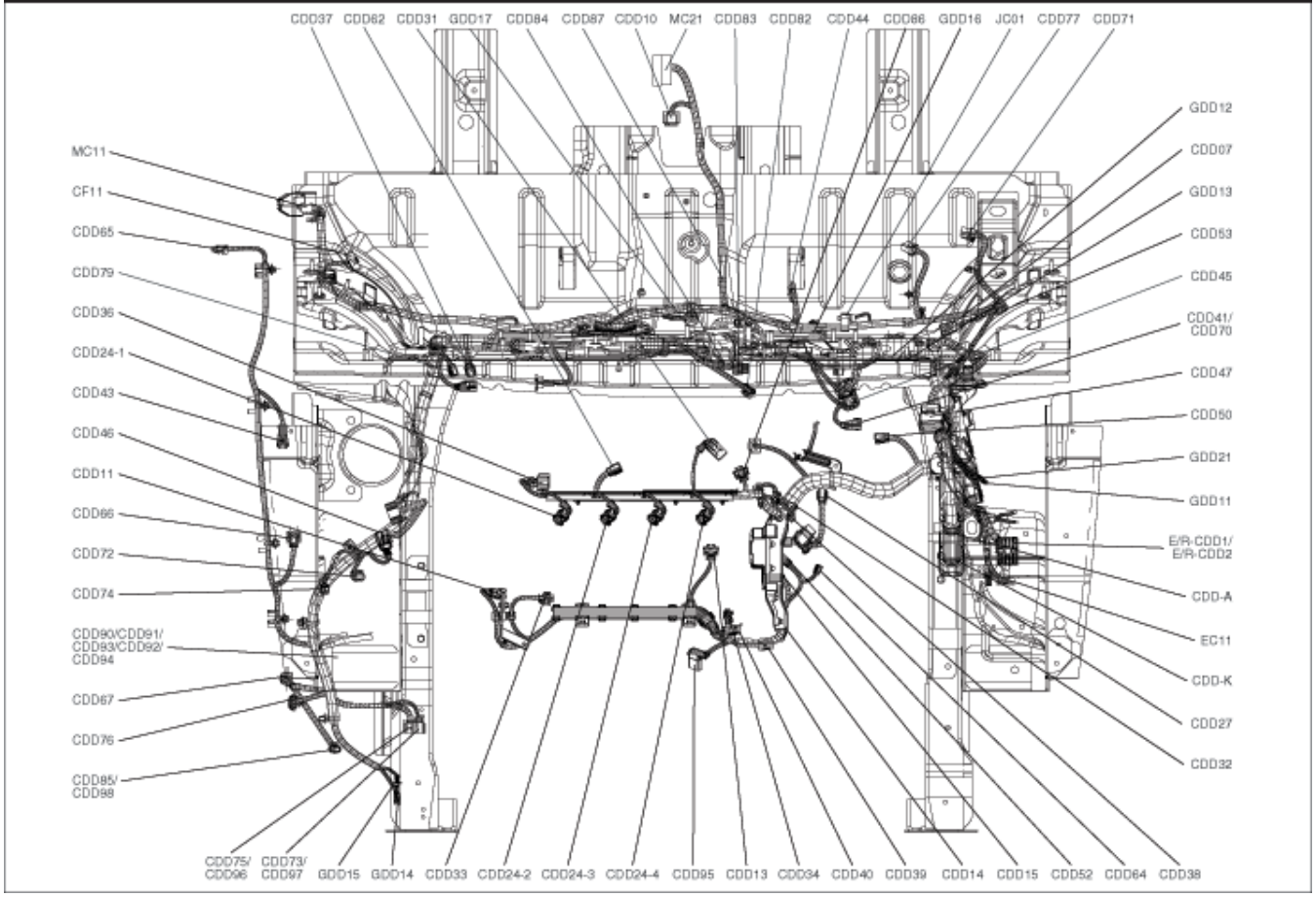


Control Harness (D4FB) (2)

CONTROL HARNESS

CUD01	Transaxle Range Switch
CUD02-A	Pulse Generator 'A'
CUD02-B	Pulse Generator 'B'
CUD04	ATM Solenoid Valve
CUD07	Front Wiper Motor
CUD10	Yaw Rate Sensor
CUD11	Engine Coolant Temperature Sensor
CUD13	Camshaft Position Sensor
CUD14	Crankshaft Position Sensor
CUD15	Oil Pressure Switch
CUD24-1	Injector #1
CUD24-2	Injector #2
CUD24-3	Injector #3
CUD24-4	Injector #4
CUD27	Air Flow Sensor
CUD31	EGR Control Actuator
CUD32	Fuel Temperature Sensor
CUD33	Rail Pressure Sensor
CUD35	Throttle Flap Actuator
CUD36	Lambda Sensor
CUD37	VGT Actuator
CUD38	Fuel Pressure Regulating Valve
CUD39	Boost Pressure Sensor
CUD40	Variable Swirl Control Actuator
CUD41	ABS Control Module
CUD43	Front Wheel Sensor RH
CUD44	Accelerator Pedal Sensor
CUD45	Brake Fluid Level Sensor
CUD46	Burglar Alarm Horn
CUD47	Multipurpose Check Connector
CUD50	Back-Up Lamp Switch(New Mission)
CUD52	Vehicle Speed Sensor(New Mission)
CUD53	Front Deicer
CUD60	DC-DC Converter
CUD61	Air Control Valve
CUD63	Air Heater
CUD65	Side Repeater Lamp RH
CUD66	Front TPMS Initiator RH
CUD67	Front Washer Motor
CUD68	Vacuum Sensor
CUD70	ESP Control Module
CUD71	Clutch Switch
CUD72	A/C Pressure Transducer
CUD73	Head Lamp Leveling Device Actuator RH
CUD74	Hood Switch
CUD75	Head Lamp RH
CUD76	Washer Level Switch
CUD77	Stop Lamp Switch
CUD78	Air Heater Relay
CUD79	Differential Pressure Sensor
CUD80	Exhaust Gas Temperature Sensor(TURBO)
CUD82	Fuel Filter Sensor
CUD83	Fuel Filter Heater
CUD84	Fuel Filter Warning Switch
CUD85	Front Fog Lamp RH
CUD86	Glow Plug
CUD87	PTC Heater
CUD90	Glow Plug Relay
CUD91	PTC Heater Relay #1
CUD92	PTC Heater Relay #2
CUD93	PTC Heater Relay #3
CUD94	Fuel Filter Heater Relay
CUD96	Head Lamp RH(3DR)
CUD97	Head Lamp Leveling Device Actuator RH(3DR)
CUD98	Front Fog Lamp RH(3DR)
CUD99	Exhaust Gas Temperature Sensor(DPF)
CUD-A	ECM
CUDAT	TCM
CUD-K	ECM
JC01	Joint Connector
E/R-CUD1	Connection With EMS BOX harness
E/R-CUD2	Connection With EMS BOX harness
CB21	Connection With BATTERY harness
CF11	Connection With FLOOR harness
EC11	Connection With FRONT harness
MC11	Connection With MAIN harness
MC21	Connection With MAIN harness
GUD11	Ground
GUD12	Ground
GUD13	Ground
GUD14	Ground
GUD16	Ground
GUD17	Ground
GUD18	Ground
GUD21	Ground
Z01	Diode(Front Wiper & Washer : With AMS)

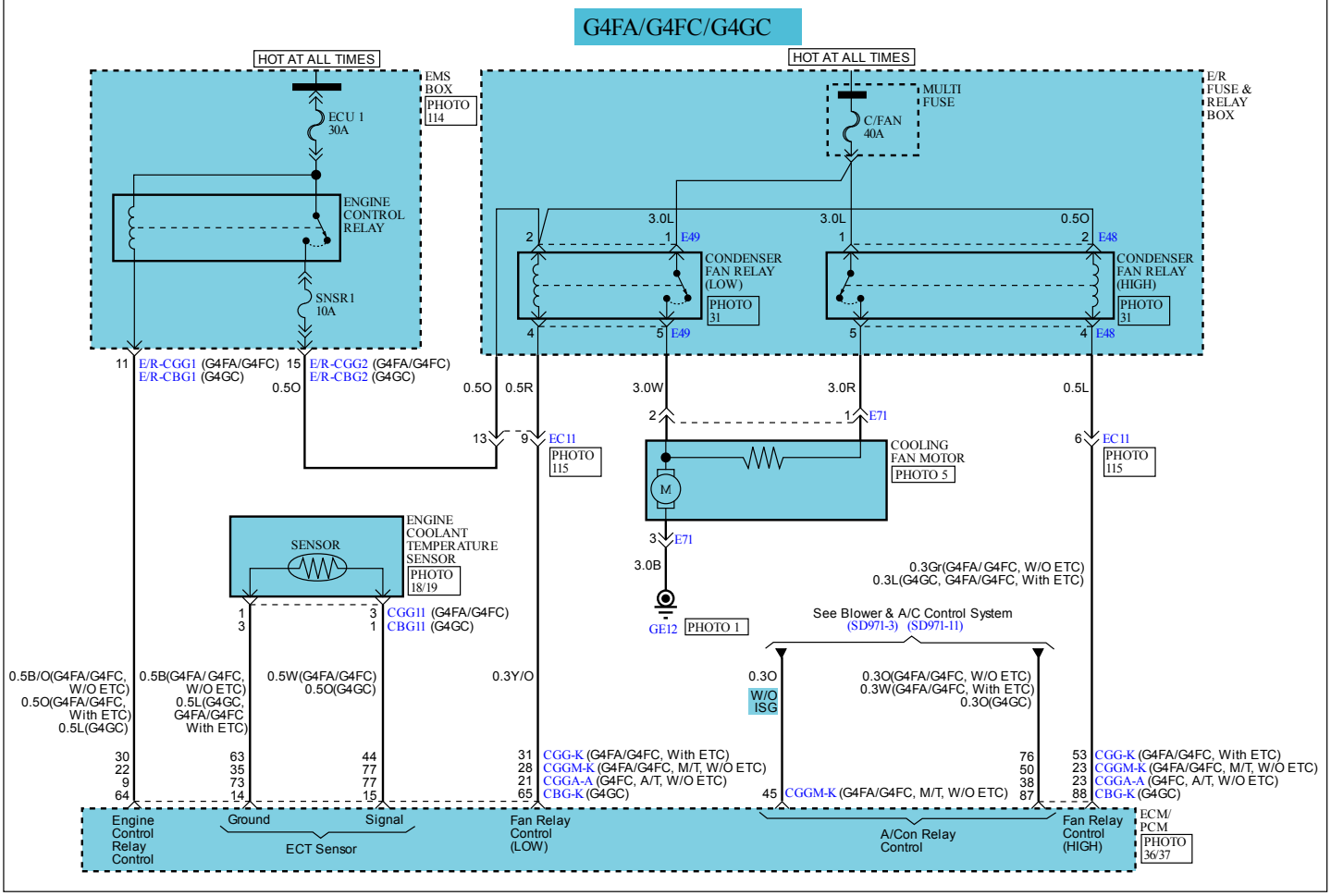
Control Harness (D4EA) (1)



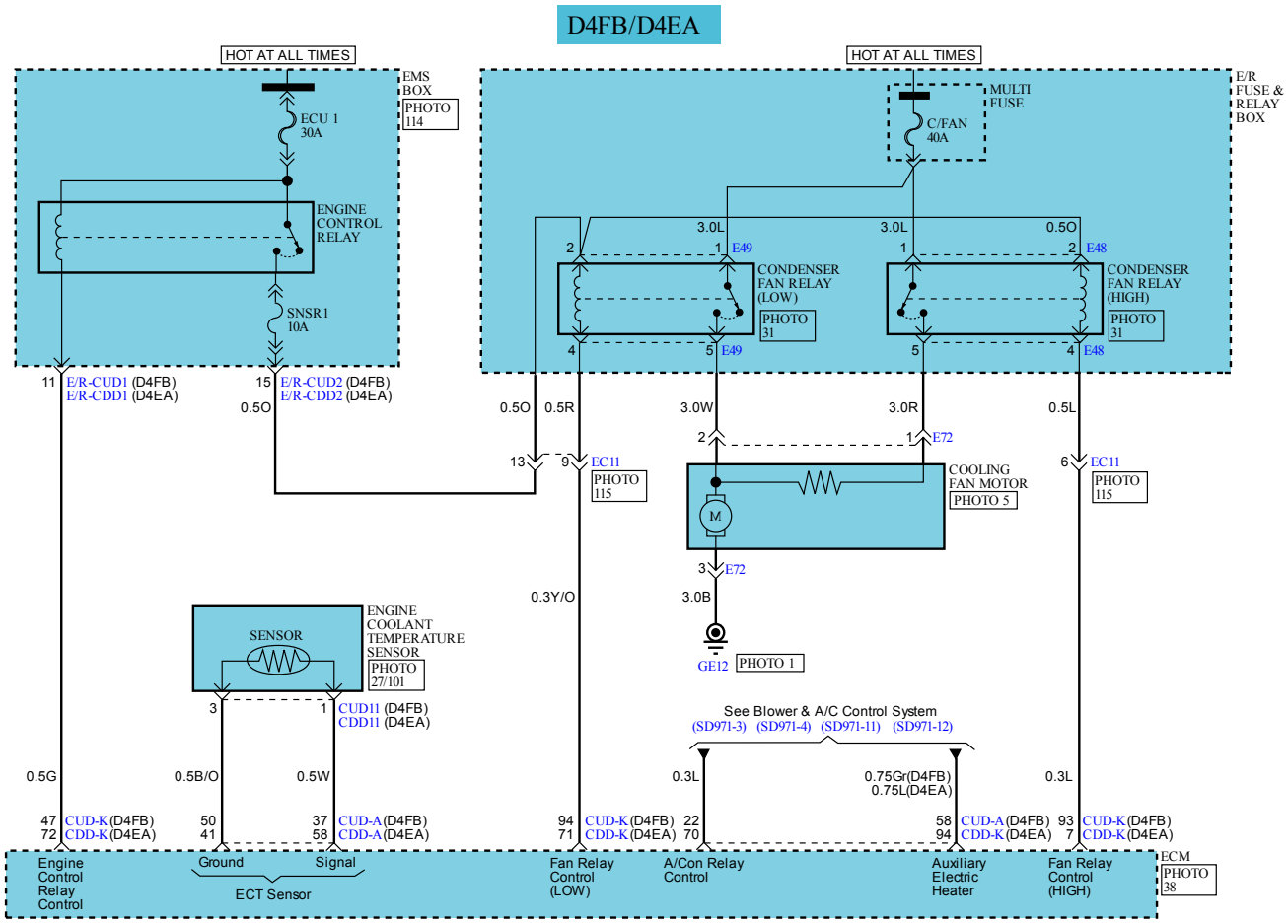
CONTROL HARNESS

CDD07	Front Wiper Motor
CDD10	Yaw Rate Sensor
CDD11	Engine Coolant Temperature Sensor
CDD13	Camshaft Position Sensor
CDD14	Crankshaft Position Sensor
CDD15	Oil Pressure Switch
CDD24-1	Injector #1
CDD24-2	Injector #2
CDD24-3	Injector #3
CDD24-4	Injector #4
CDD27	Air Flow Sensor
CDD31	EGR Control Actuator
CDD32	Fuel Temperature Sensor
CDD33	Rail Pressure Sensor
CDD34	Rail Pressure Regulator
CDD36	Lambda Sensor
CDD37	VGT Actuator
CDD38	Fuel Pressure Regulating Valve
CDD39	Boost Pressure Sensor
CDD40	Variable Swirl Control Actuator
CDD41	ABS Control Module
CDD43	Front Wheel Sensor RH
CDD44	Accelerator Pedal Sensor
CDD45	Brake Fluid Level Sensor
CDD46	Burglar Alarm Horn
CDD47	Multipurpose Check Connector
CDD50	Back-Up Lamp Switch
CDD52	Vehicle Speed Sensor(New Mission)
CDD53	Front Deicer
CDD62	Exhaust Gas Temperature Sensor #1
CDD64	Neutral Switch
CDD65	Side Repeater Lamp RH
CDD66	Front TPMS Initiator RH
CDD67	Front Washer Motor
CDD70	ESP Control Module
CDD71	Clutch Switch
CDD72	A/C Pressure Transducer
CDD73	Head Lamp Leveling Device Actuator RH
CDD74	Hood Switch
CDD75	Head Lamp RH
CDD76	Washer Level Switch
CDD77	Stop Lamp Switch
CDD79	Differential Pressure Sensor
CDD82	Fuel Filter Sensor
CDD83	Fuel Filter Heater
CDD84	Fuel Filter Warning Switch
CDD85	Front Fog Lamp RH
CDD86	Glow Plug
CDD87	PTC Heater
CDD90	Glow Plug Relay
CDD91	PTC Heater Relay #1
CDD92	PTC Heater Relay #2
CDD93	PTC Heater Relay #3
CDD94	Fuel Filter Heater Relay
CDD95	Electrical Throttle Control Actuator
CDD96	Head Lamp RH(3DR)
CDD97	Head Lamp Leveling Device Actuator RH(3DR)
CDD98	Front Fog Lamp RH(3DR)
CDD-A	ECM
CDD-K	ECM
JC01	Joint Connector
E/R-CDD1	Connection With EMS BOX harness
E/R-CDD2	Connection With EMS BOX harness
CF11	Connection With FLOOR harness
EC11	Connection With FRONT harness
MC11	Connection With MAIN harness
MC21	Connection With MAIN harness
GDD11	Ground
GDD12	Ground
GDD13	Ground
GDD14	Ground
GDD16	Ground
GDD17	Ground
GDD21	Ground

Cooling System (1) SD253-1

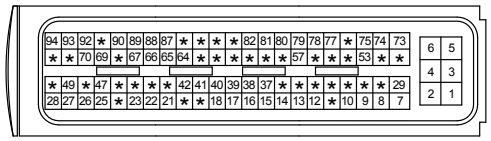


Cooling System (2) SD253-2



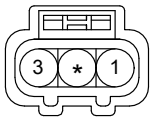
Cooling System (3) SD253-3

CBG-K



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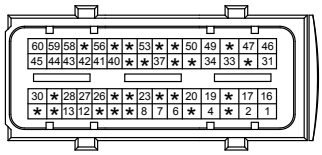
CBG11



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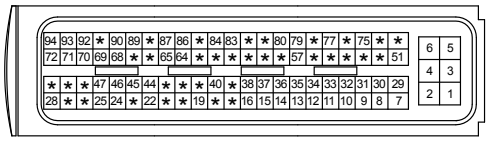
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CDD-A



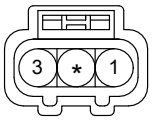
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CDD-K



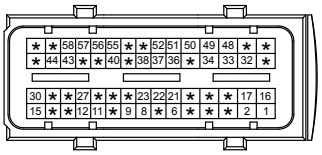
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CDD11



KUM_62Z_03F_B_WTS

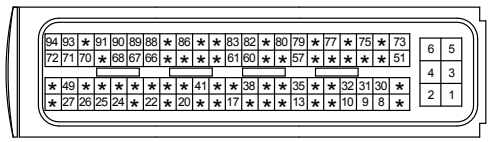
CGGA-A



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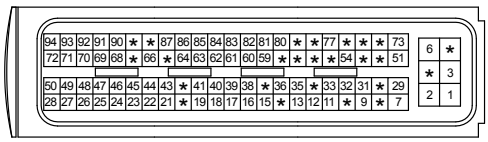
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CGGA-K



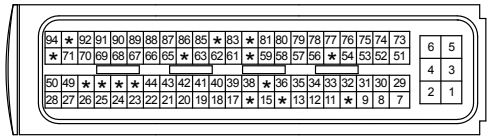
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CGGM-K



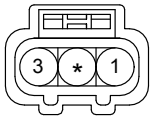
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CGG-K



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CGG11

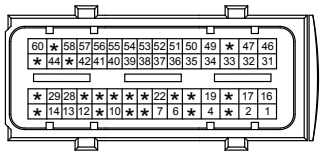


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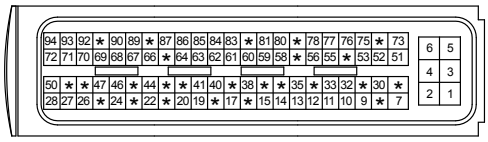
Cooling System (4) SD253-4

CUD-A



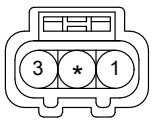
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CUD-K



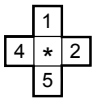
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CUD11



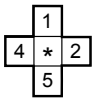
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E48



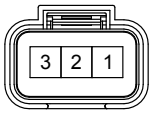
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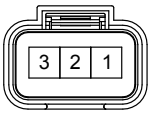
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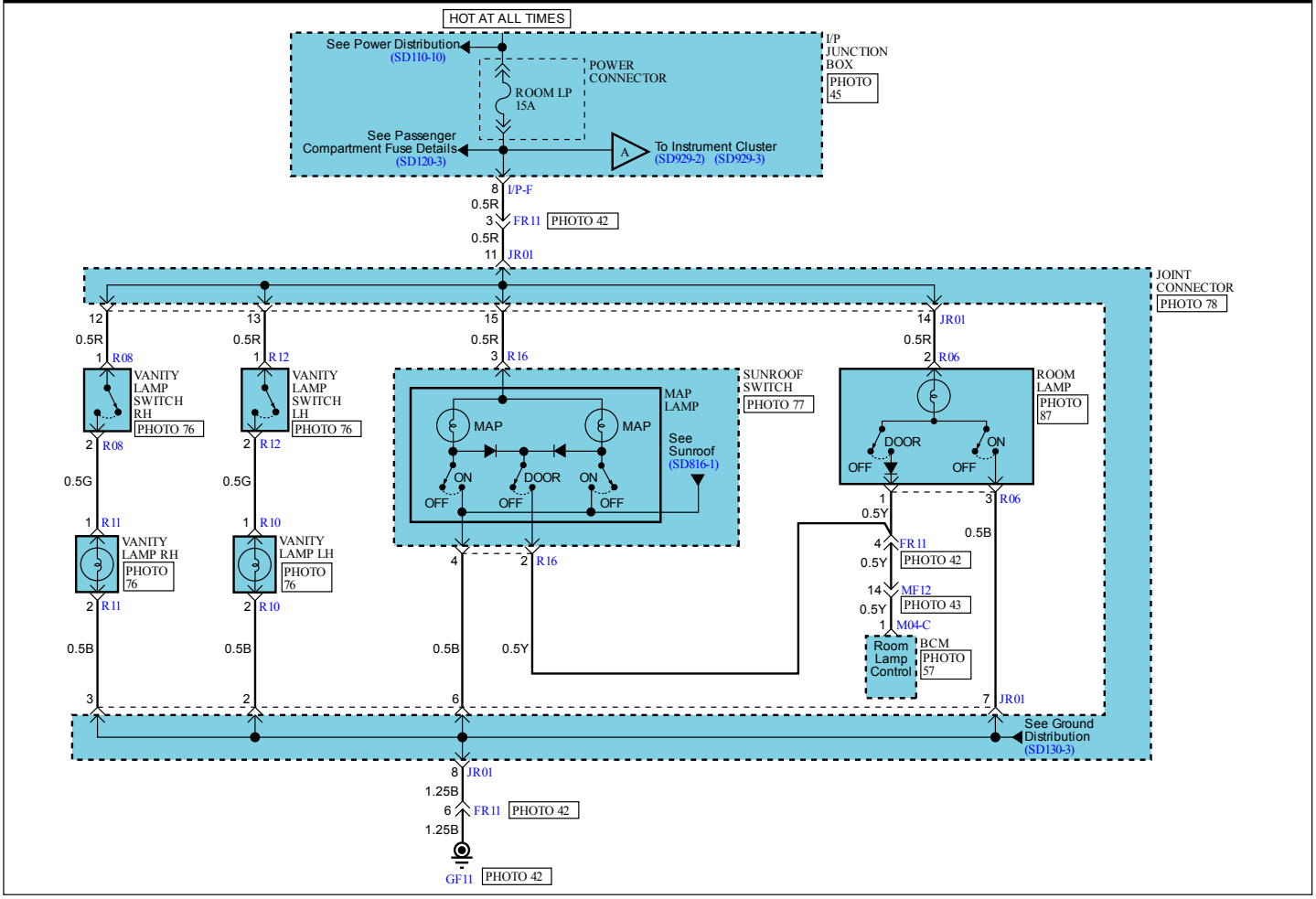
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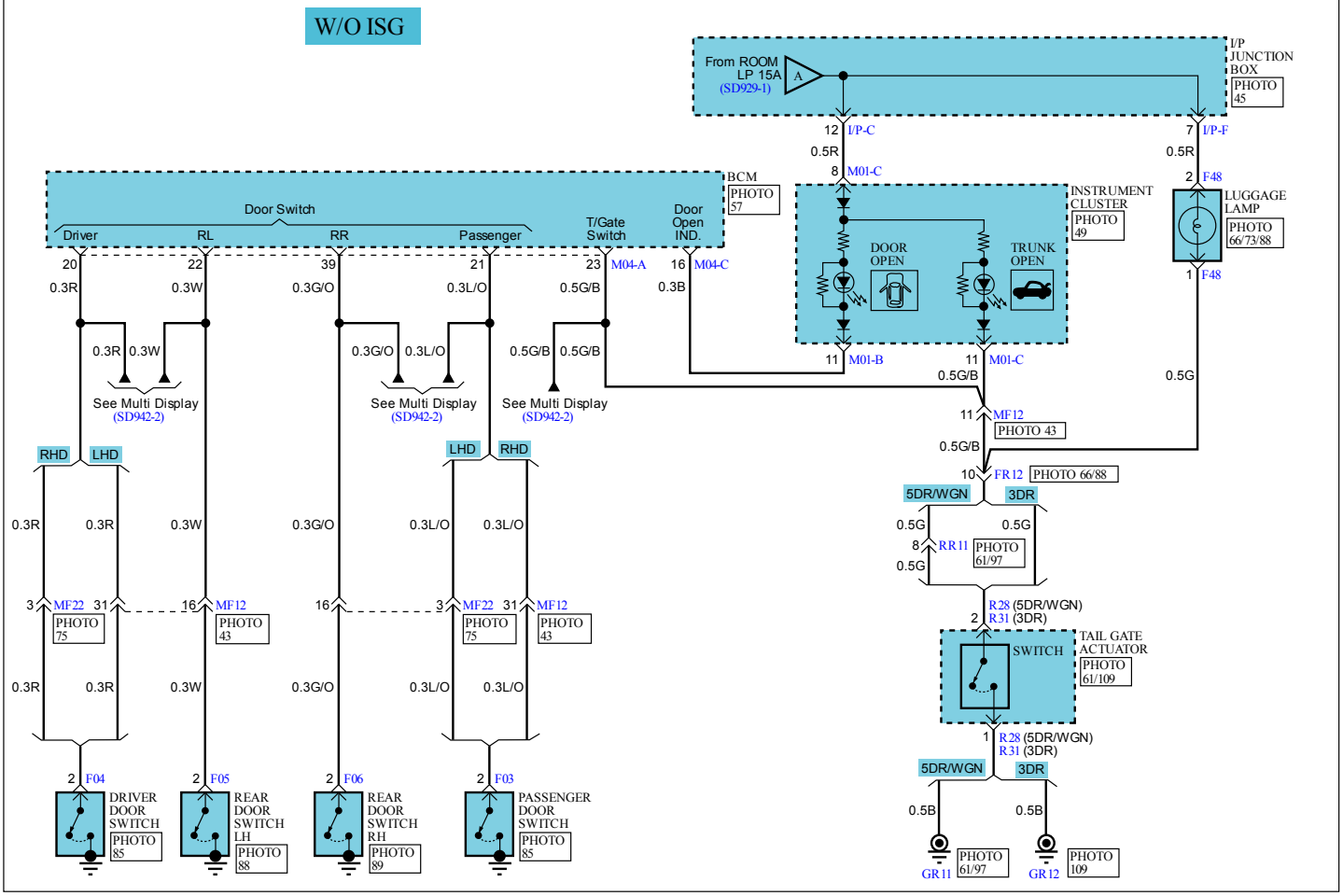
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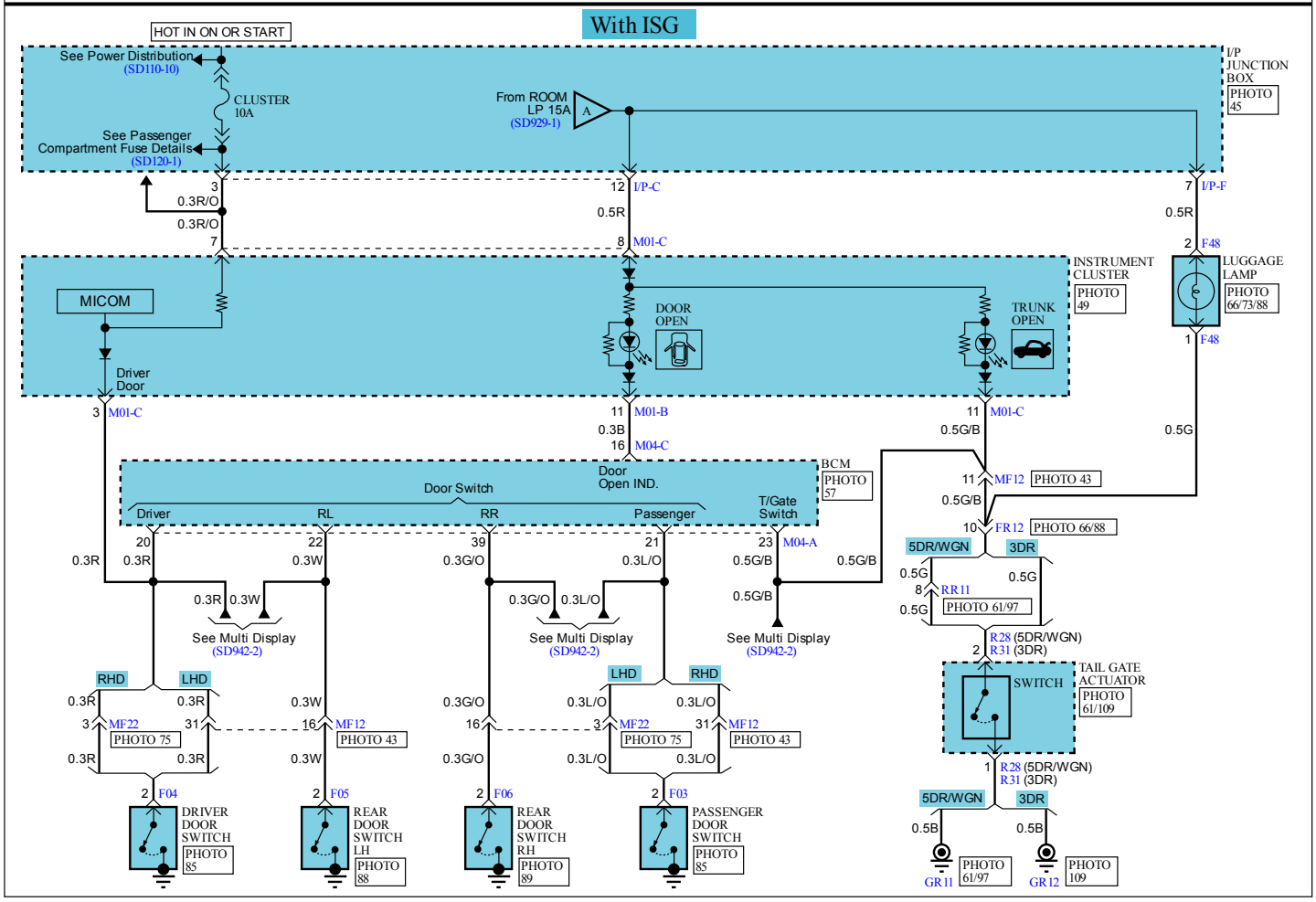
Courtesy & Trunk Lamps (1) SD929-1



Courtesy & Trunk Lamps (2) SD929-2

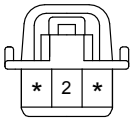


Courtesy & Trunk Lamps (3) SD929-3



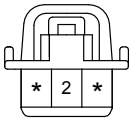
Courtesy & Trunk Lamps (4) SD929-4

F03



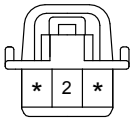
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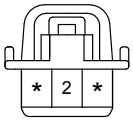
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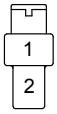
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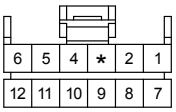
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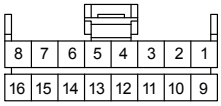
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M01-B



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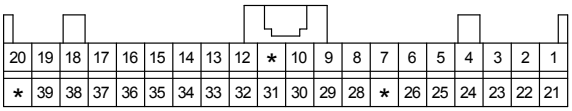
M01-C



AMP_040M1_16F_B

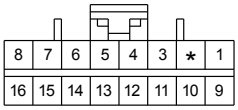
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M04-A



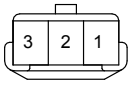
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M04-C



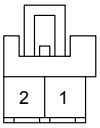
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R06



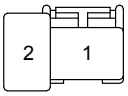
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R08



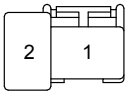
KUM_CDR_02F_B

R10



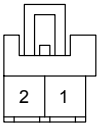
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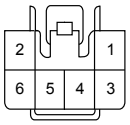
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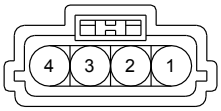
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R16



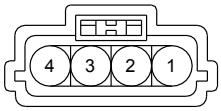
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R28



KUM_NDWP_04F_B

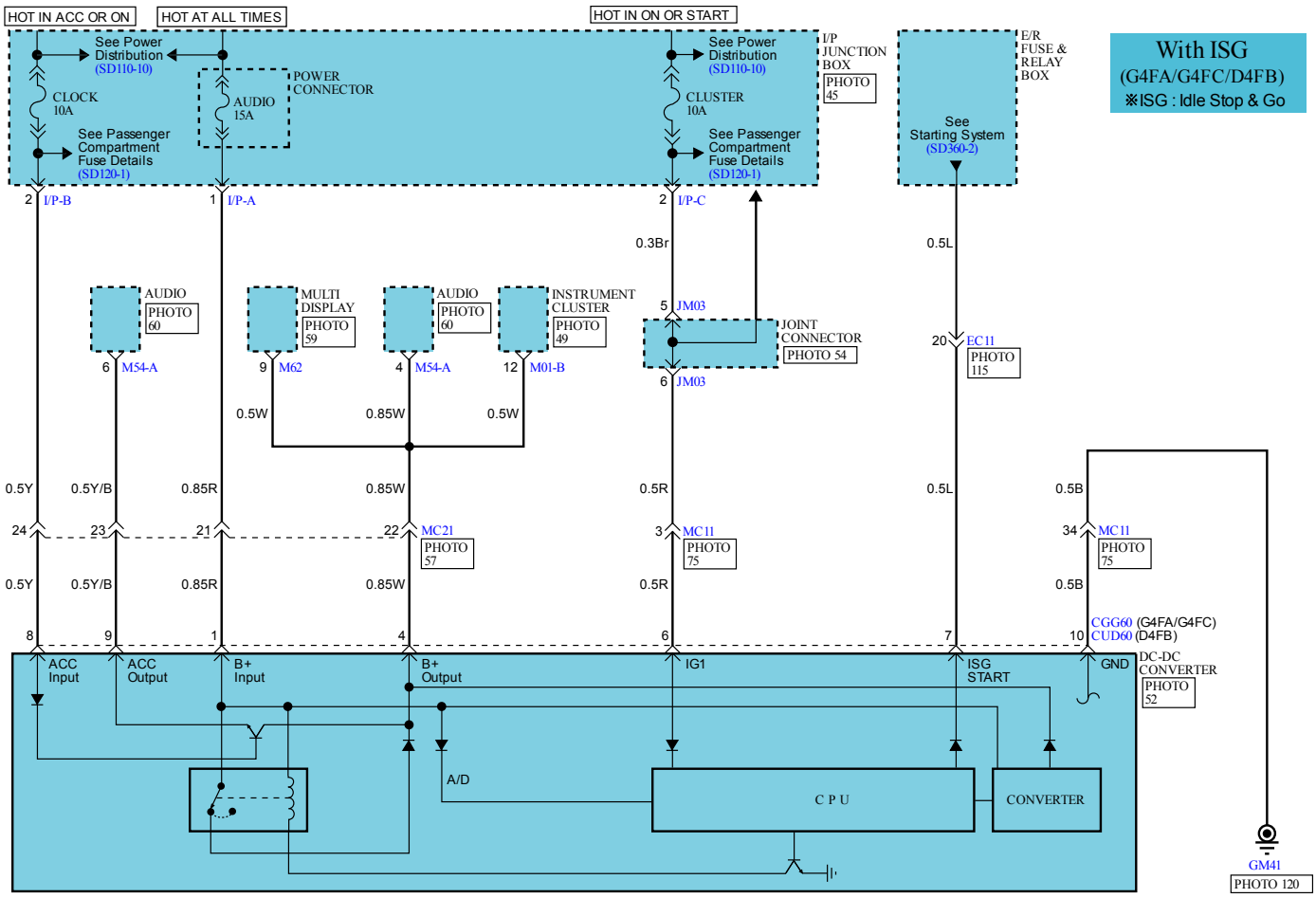
R31



KUM_NDWP_04F_B

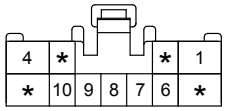
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DC-DC Converter (1) SD961-7



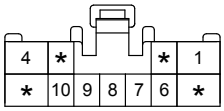
DC-DC Converter (2) SD961-8

CGG60



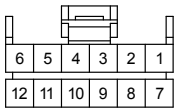
KET_1809_11F

CUD60



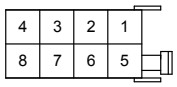
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M01-A



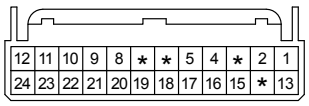
AMP_040M1_12F_B

M54-A



AMP_JT_08F_Gr_D2

M62



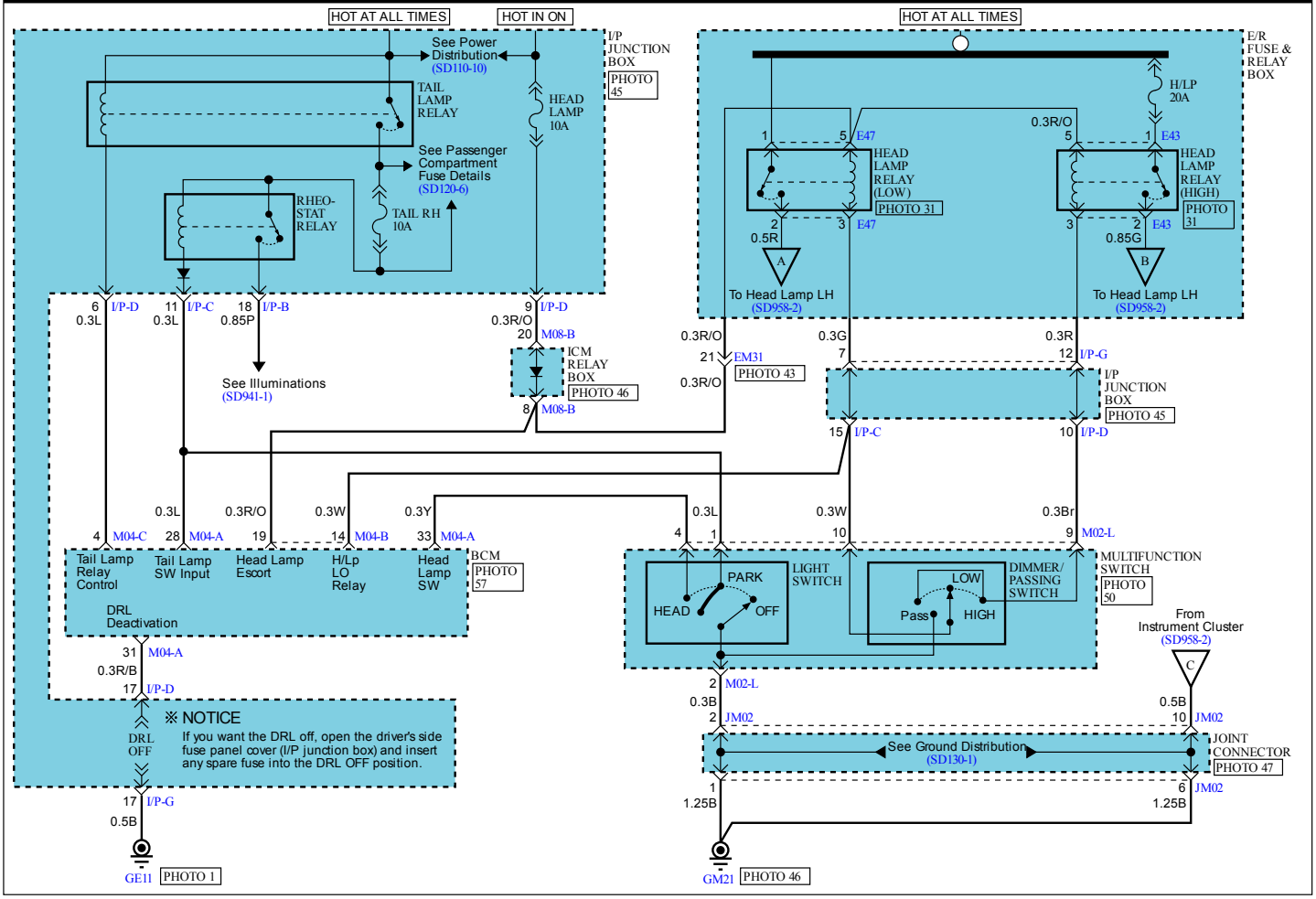
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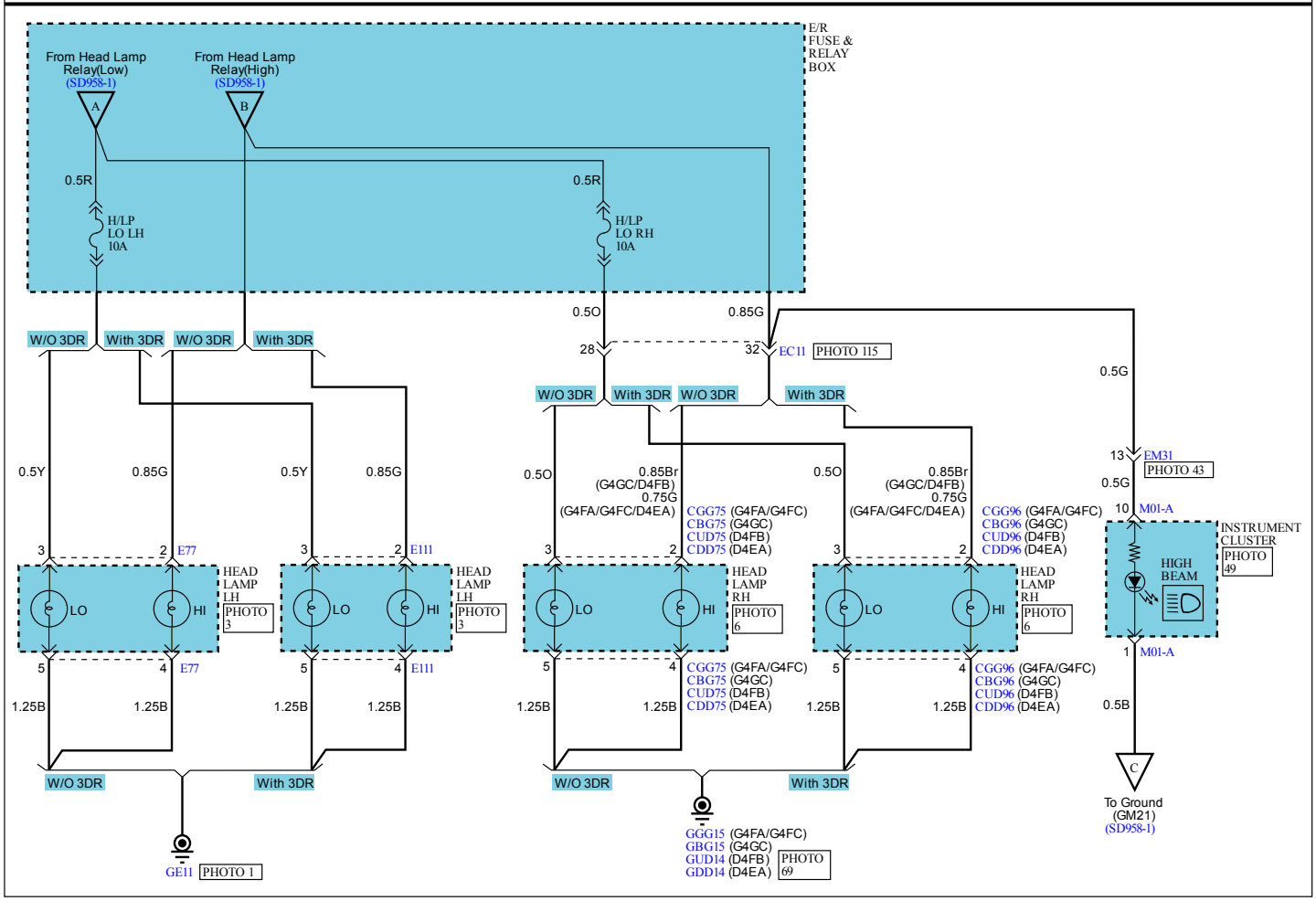
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DRL (Daytime Running Lights) (1) SD958-1



DRL (Daytime Running Lights) (2) SD958-2



DRL (Daytime Running Lights) (3) SD958-3

CBG75



KUM_090WP_06F_B

CBG96



KUM_090WP_06F_B

CDD75



KUM_090WP_06F_B

CDD96



KUM_090WP_06F_B

CGG75



KUM_090WP_06F_B

CGG96



KUM_090WP_06F_B

CUD75



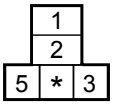
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CUD96



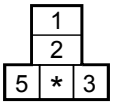
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E43



CR05F011

E47



CR05F011

E77



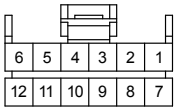
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E111



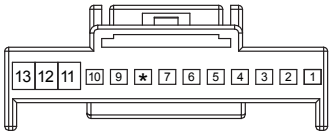
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M01-A



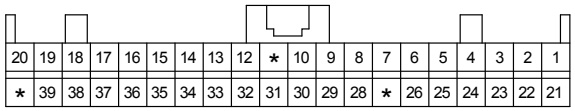
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M02-L



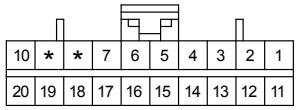
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M04-A



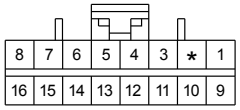
AMP_025_40F_W

M04-B



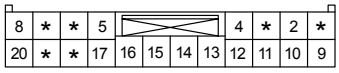
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M04-C



AMP_040M2_16F_W

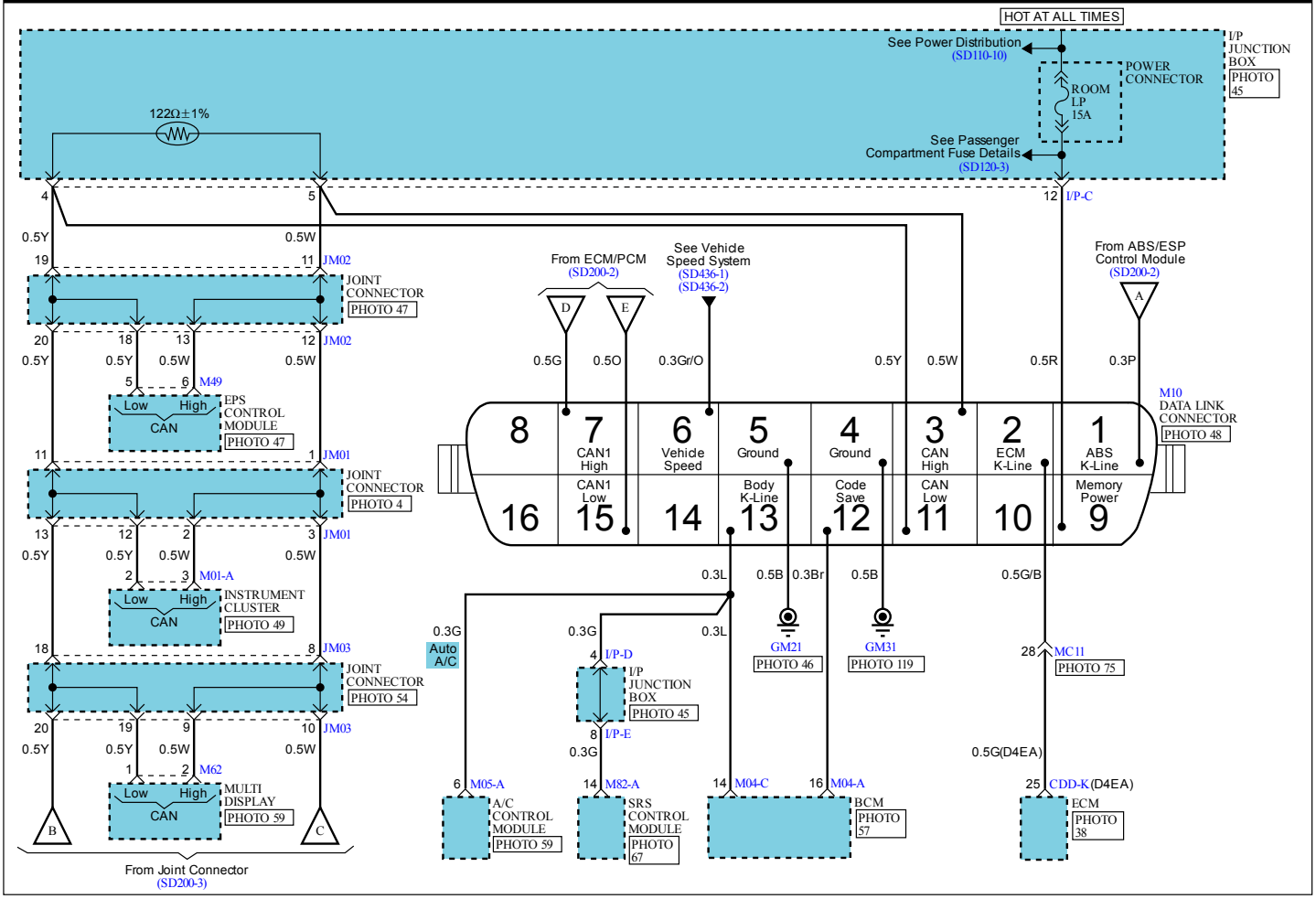
M08-B



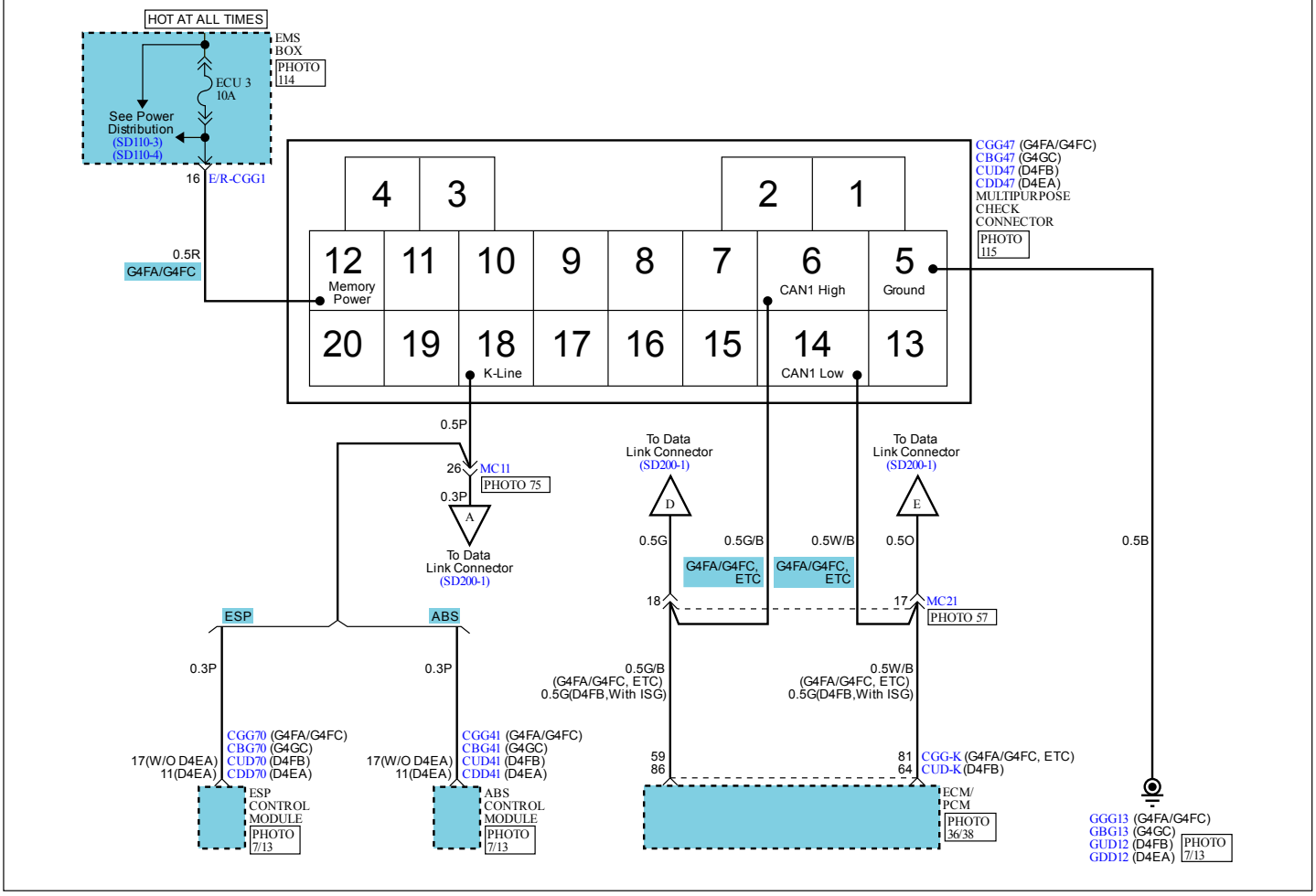
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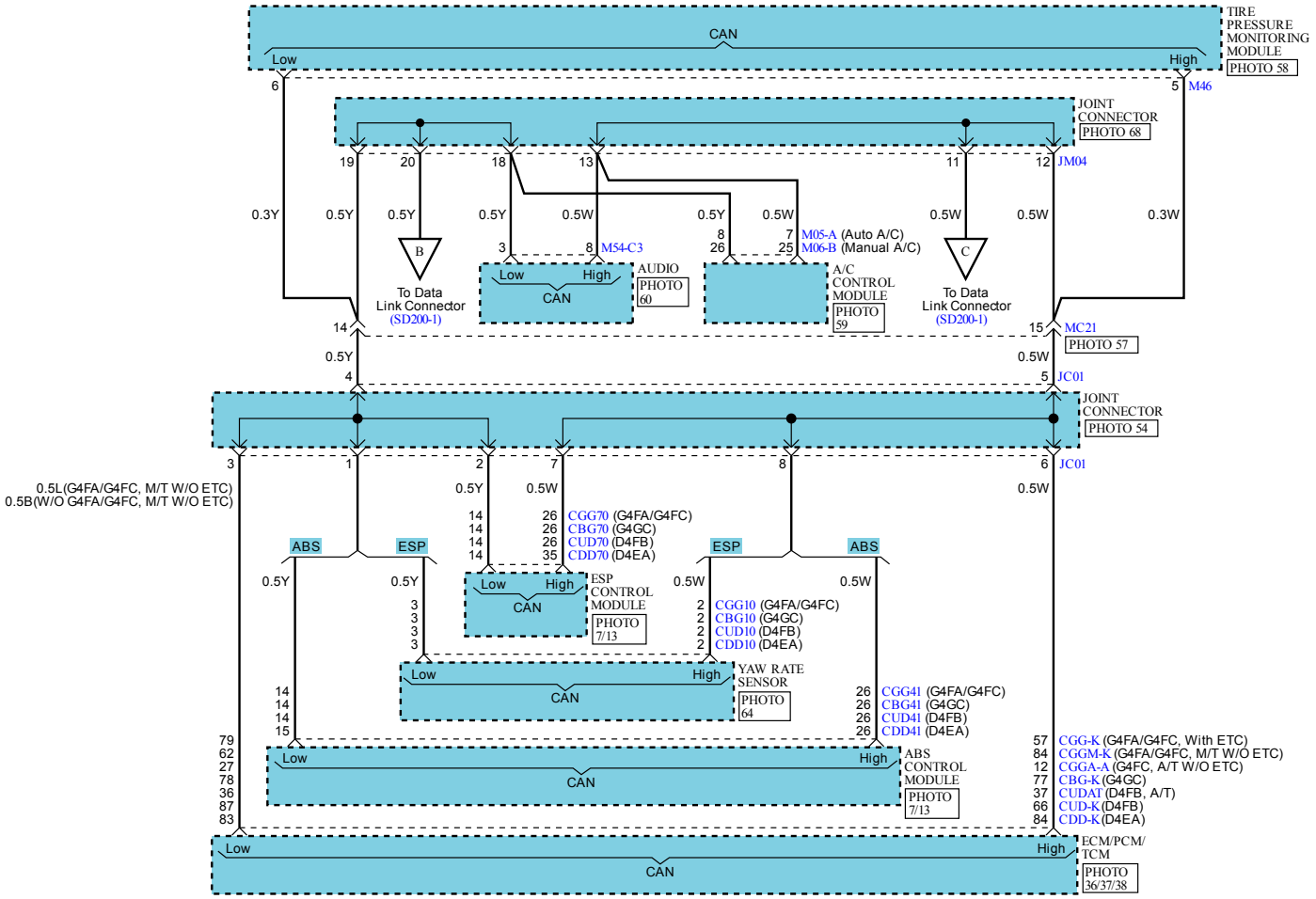
Data Link Details (1) SD200-1



Data Link Details (2) SD200-2

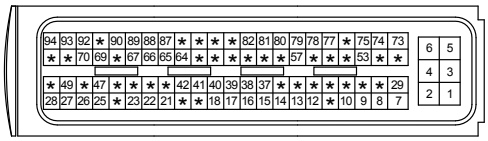


Data Link Details (3) SD200-3



Data Link Details (4) SD200-4

CBG-K



AMP_ECU_94F_B

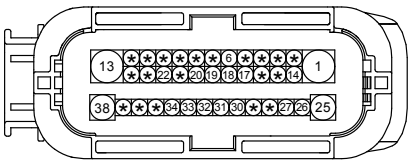
CBG10



AMP_MQSWP_04F_B

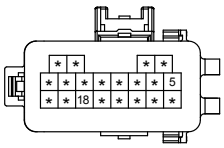
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CBG41



DEL_ABS_38F_B

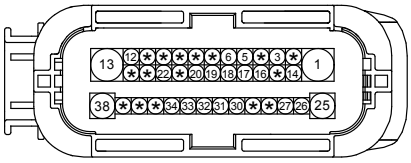
CBG47



KET_DIAG_20F_B_BRK_C

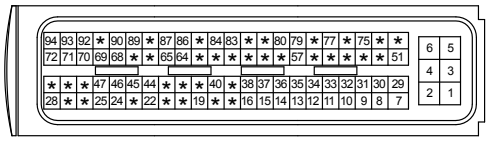
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CBG70



DEL_ABS_38F_B_A

CDD-K



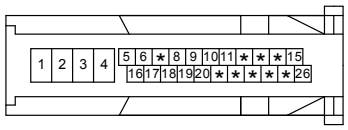
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CDD10



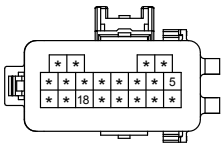
AMP_MQSWP_04F_B

CDD41



BOS_ABS_26F_B_L

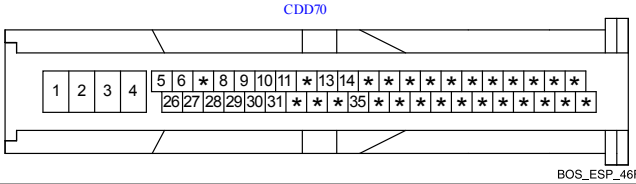
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KET_DIAG_20F_B_BRK_C

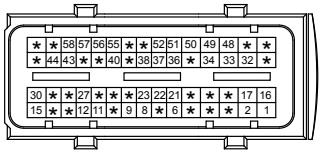
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CDD70



BOS_ESP_46F_B_L

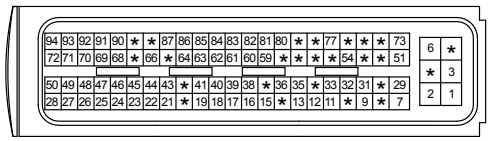
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AMP_ECU_60F_B_A

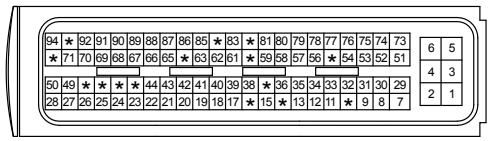
Data Link Details (5) SD200-5

CGGM-K



AMP_ECU_94F_B

CGG-K



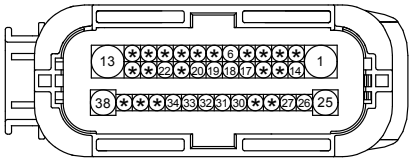
AMP_ECU_94F_B

CGG10



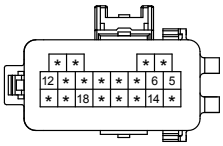
AMP_MQSWP_04F_B

CGG41



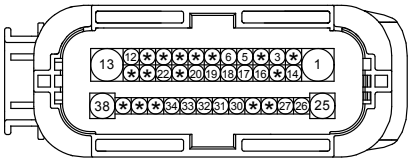
DEL_ABS_38F_B

CGG47



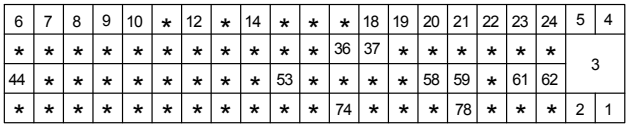
KET_DIAG_20F_B_BRK_C

CGG70



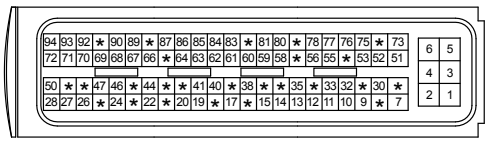
DEL_ABS_38F_B_A

CUDAT



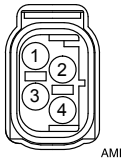
KET_ECU_81F_B_BOSCH

CUD-K



AMP_ECU_94F_B

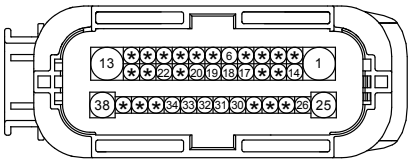
CUD10



AMP_MQSWP_04F_B

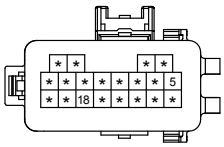
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CUD41



DEL_ABS_38F_B

CUD47

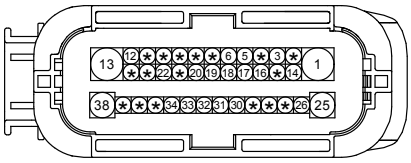


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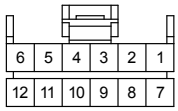
Data Link Details (6) SD200-6

CUD70



DEL_ABS_38F_B_A

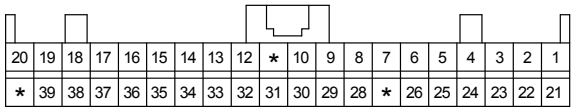
M01-A



AMP_040M1_12F_B

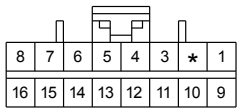
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M04-A



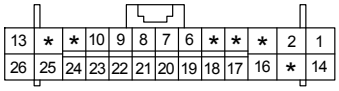
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M04-C



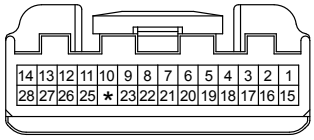
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M05-A



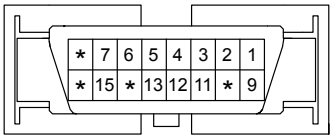
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M06-B



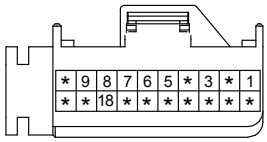
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M10



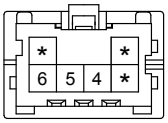
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M46



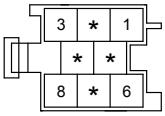
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M49



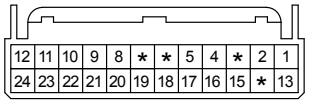
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M54-C3



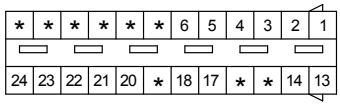
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M62



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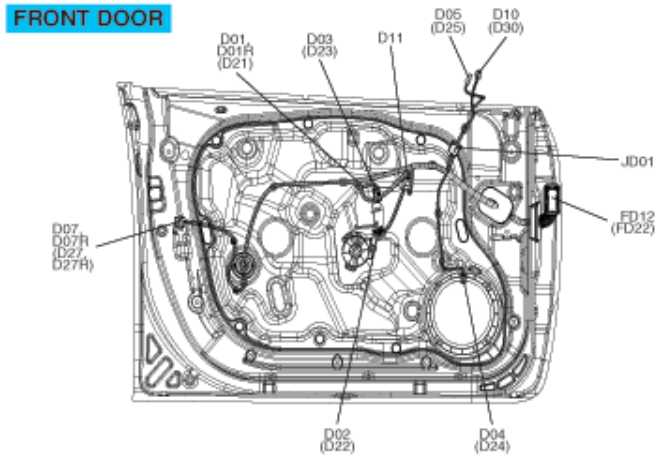
M82-A



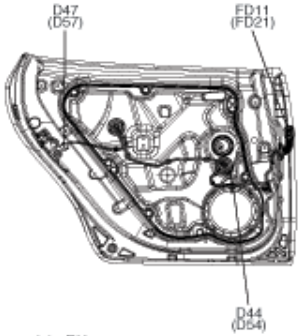
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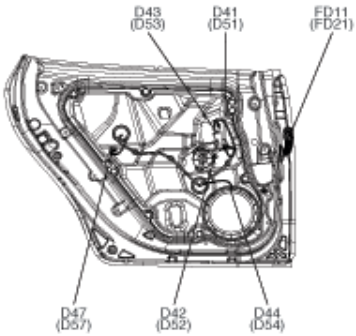
FRONT DOOR



MANUAL TYPE



ELECTRIC TYPE



( ) : RH

DRIVER DOOR HARNESS

D01	Power Window Main Switch
D01R	Power Window Main Switch (RHD)
D02	Driver Power Window Motor
D03	Driver Safety Power Window Module
D04	Driver Door Speaker
D05	Driver Tweeter Speaker
D07	Driver Door Lock Actuator (LHD)
D07R	Driver Door Lock Actuator (RHD)
D10	Driver Power Outside Mirror
D11	Power Outside Mirror Switch
JD01	Joint Connector
FD12	Connection With FLOOR Harness

PASSENGER DOOR HARNESS

D21	Passenger Power Window Switch
D22	Passenger Power Window Motor
D23	Passenger Safety Power Window Module
D24	Passenger Door Speaker
D25	Passenger Tweeter Speaker
D27	Passenger Door Lock Actuator (LHD)
D27R	Passenger Door Lock Actuator (RHD)
D30	Passenger Power Outside Mirror
FD22	Connection With FLOOR Harness

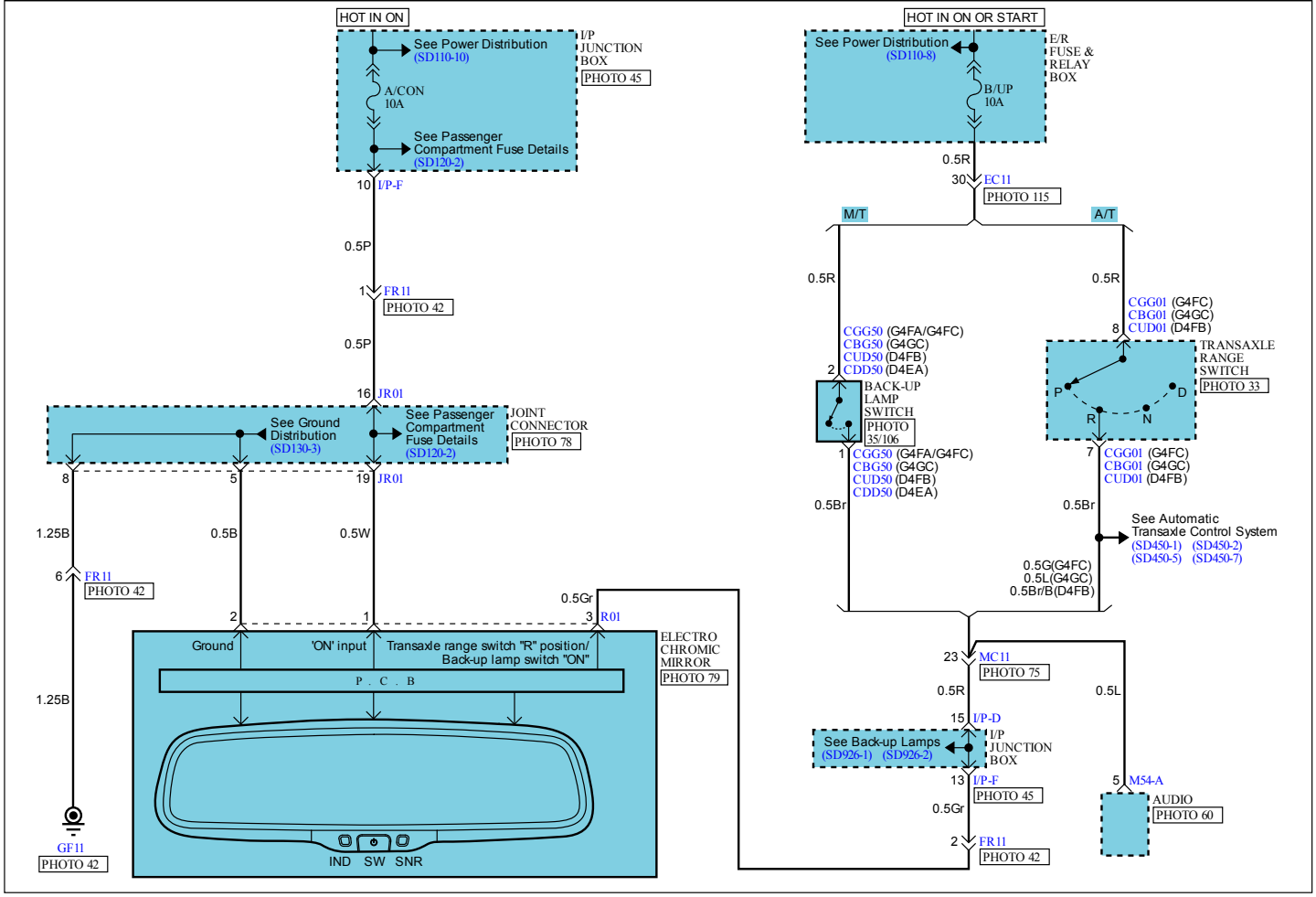
REAR DOOR LH HARNESS

D41	Rear Power Window Switch LH
D42	Rear Power Window Motor LH
D43	Rear Safety Power Window Module LH
D44	Rear Door Speaker LH
D47	Rear Door Lock Actuator LH
FD11	Connection With FLOOR Harness

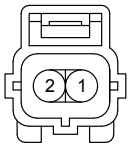
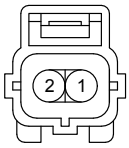
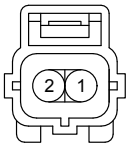
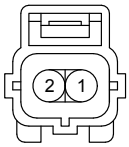
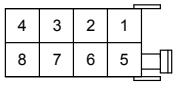
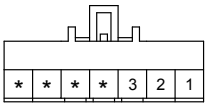
REAR DOOR RH HARNESS

D51	Rear Power Window Switch RH
D52	Rear Power Window Motor RH
D53	Rear Safety Power Window Module RH
D54	Rear Door Speaker RH
D57	Rear Door Lock Actuator RH
FD21	Connection With FLOOR Harness

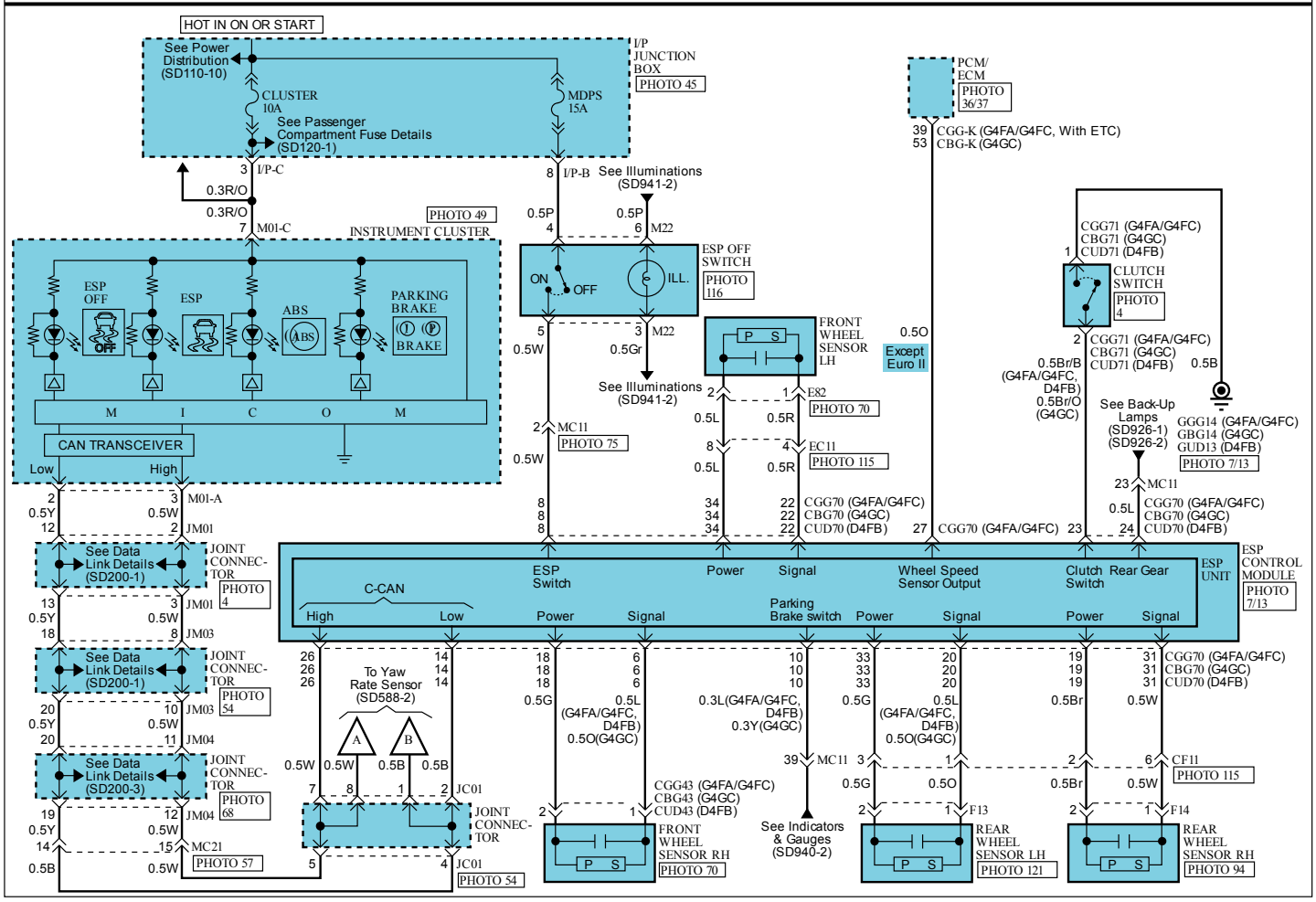
Electro Chromic Mirror (1) SD851-1



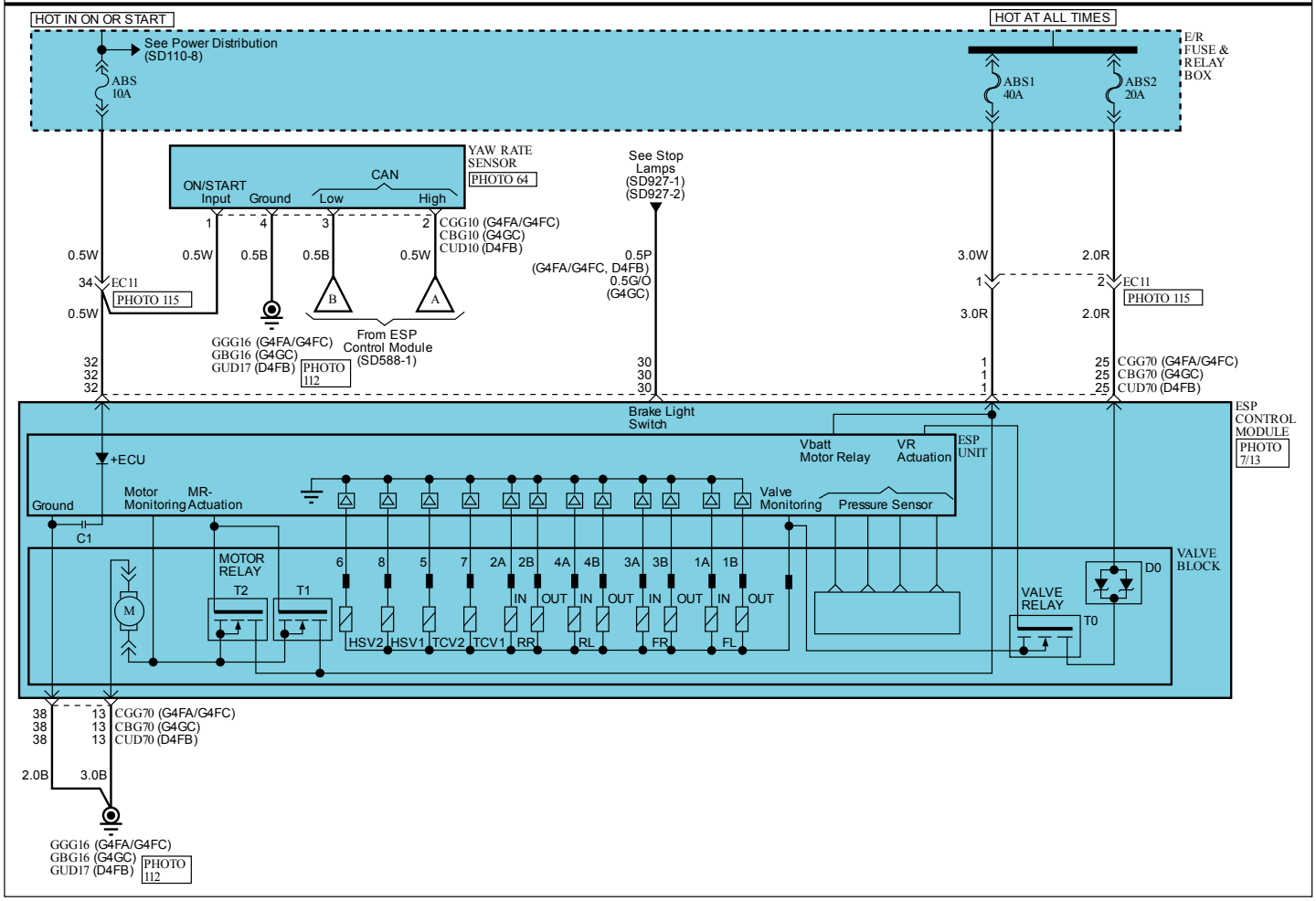
Electro Chromic Mirror (2) SD851-2

CBG01  KET_SSD_10F_B_A	CBG50  AMP_EJWP_02F_B	CDD50  AMP_EJWP_02F_B	CGG01  KET_SSD_10F_B_A
CGG50  AMP_EJWP_02F_B	CUD01  KET_SSD_10F_B_A	CUD50  AMP_EJWP_02F_B	M54-A  AMP_JT_08F_Gr_D2
R01  JST_JST_07F_B	BLANK	BLANK	BLANK

Electronic Stability Program (ESP) System (1) SD588-1

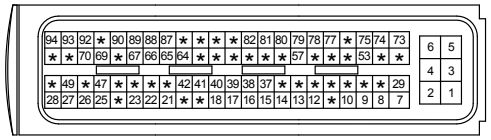


Electronic Stability Program (ESP) System (2) SD588-2



Electronic Stability Program (ESP) System (3) SD588-3

CBG-K



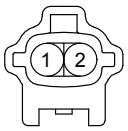
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CBG10



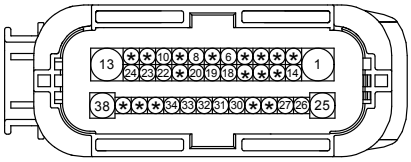
AMP_MQSWP_04F_B

CBG43



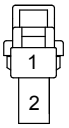
KET_090IIWP_02M_Gr

CBG70



DEL_ABS_38F_B_A

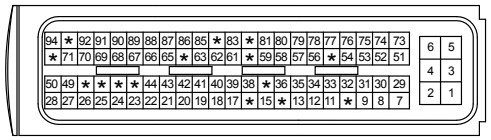
CBG71



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CGG-K



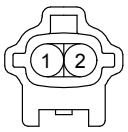
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CGG10



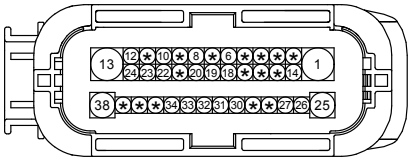
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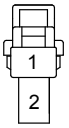
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CGG70



DEL_ABS_38F_B_A

CGG71



KET_250DL_02F_W

CUD10



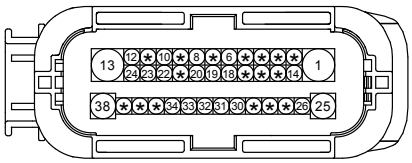
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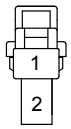
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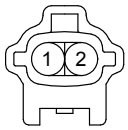
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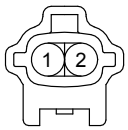
Electronic Stability Program (ESP) System (4) SD588-4

E82



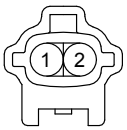
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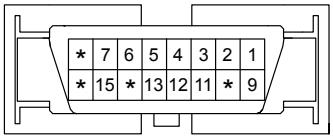
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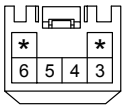
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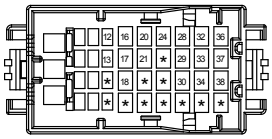
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M22

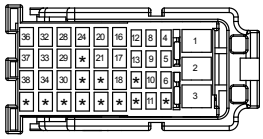


AMP_090III_06F_R_2

EC11 (G4FA/G4FC)



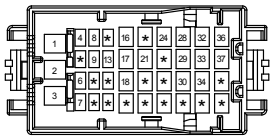
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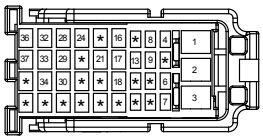
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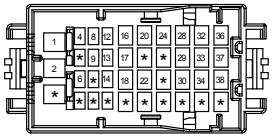


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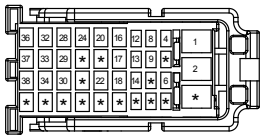


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EC11 (D4FB)

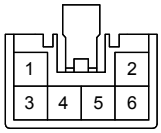


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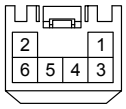


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CF11



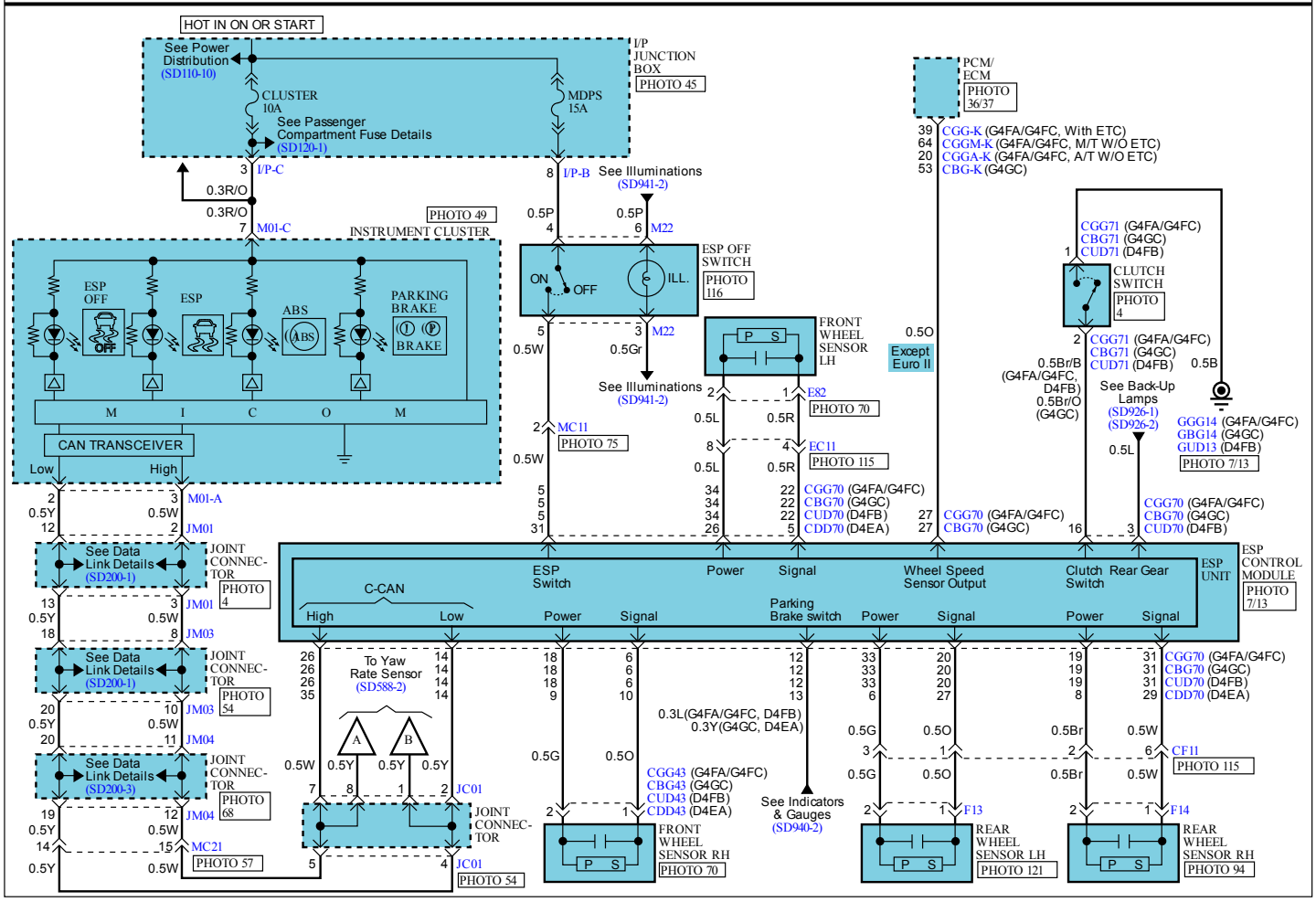
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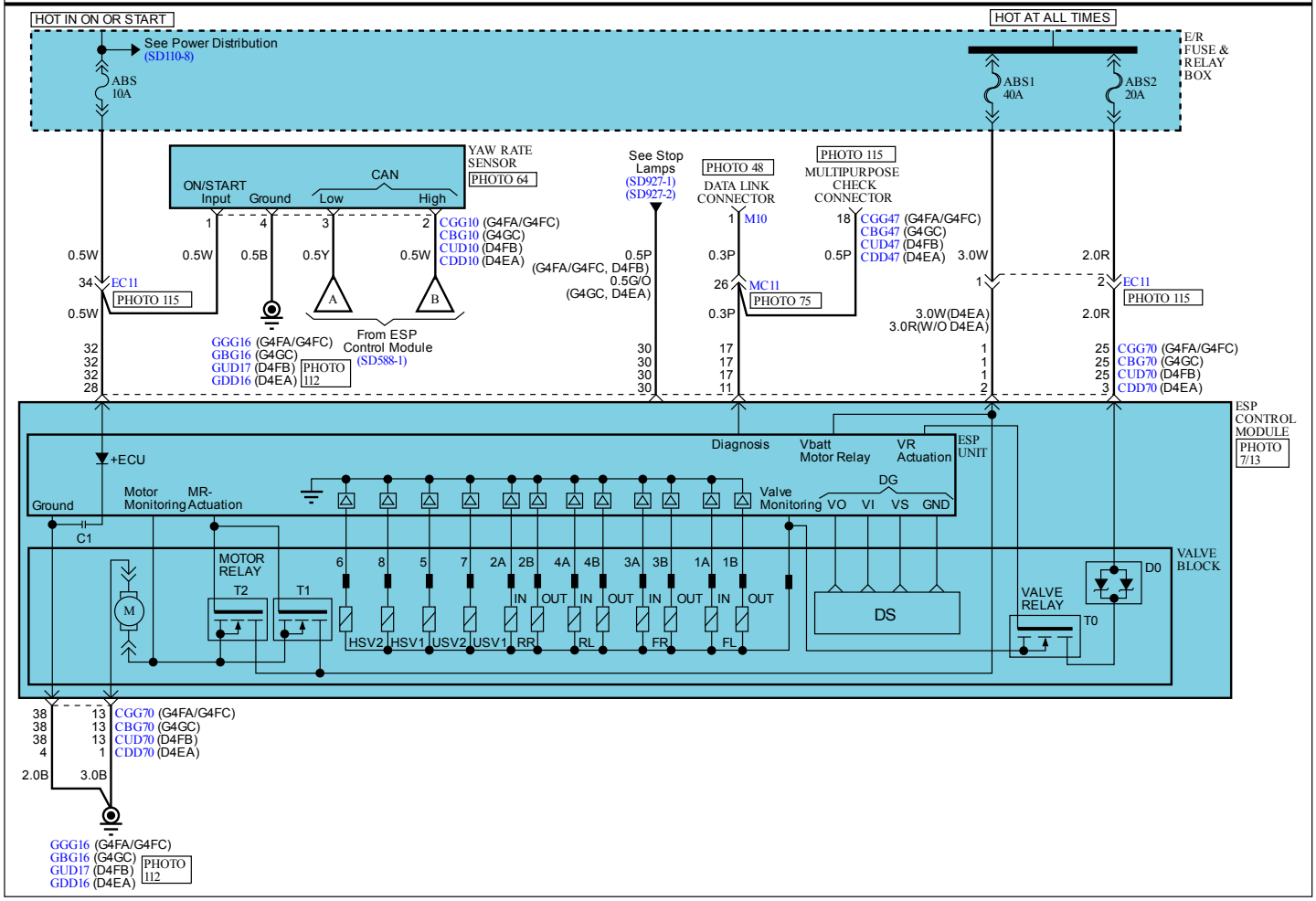
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Electronic Stability Program (ESP) System (1) SD588-1

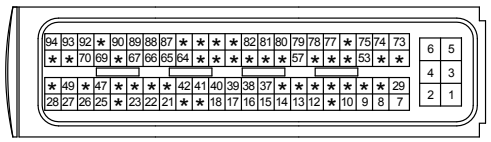


Electronic Stability Program (ESP) System (2) SD588-2



Electronic Stability Program (ESP) System (3) SD588-3

CBG-K



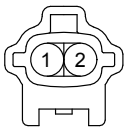
AMP_ECU_94F_B

CBG10



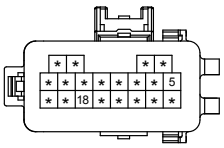
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CBG43



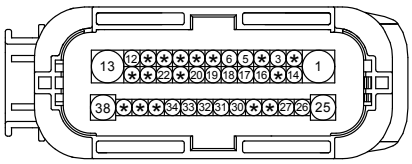
KET_090IIWP_02M_Gr

CBG47



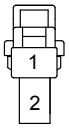
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CBG70



DEL_ABS_38F_B_A

CBG71



KET_250DL_02F_W

CDD10



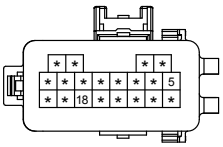
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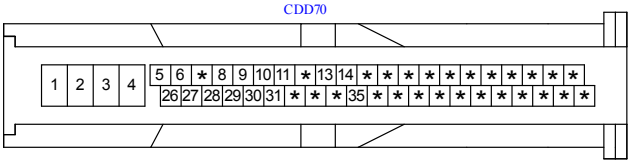
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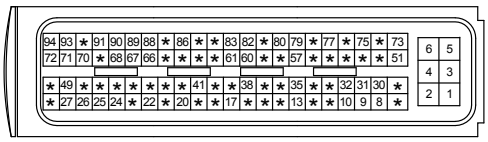
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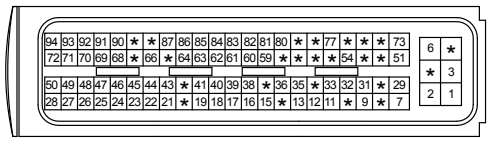
BOS_ESP_46F_B_L

CGGA-K



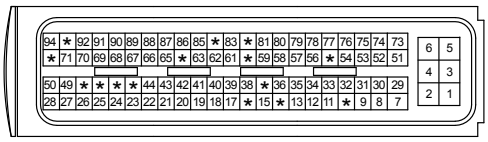
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AMP_ECU_94F_B

CGG-K



AMP_ECU_94F_B

Electronic Stability Program (ESP) System (4) SD588-4

CGG10



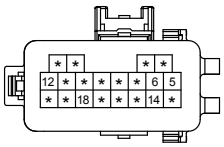
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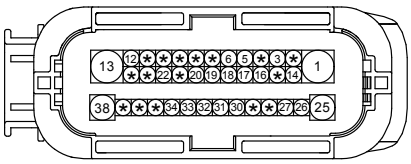
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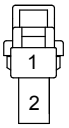
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CGG71



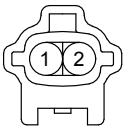
KET_250DL_02F_W

CUD10



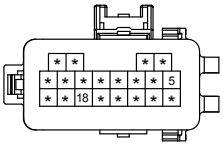
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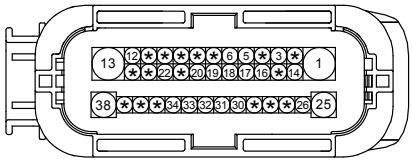
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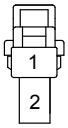
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DEL_ABS_38F_B_A

CUD71



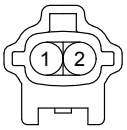
KET_250DL_02F_W

E82



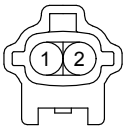
KET_090IIWP_02M_Gr

F13



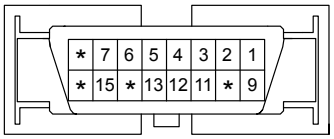
KET_090IIWP_02M_Gr

F14



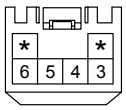
KET_090IIWP_02M_Gr

M10



MLX_OBDII_16F_B

M22

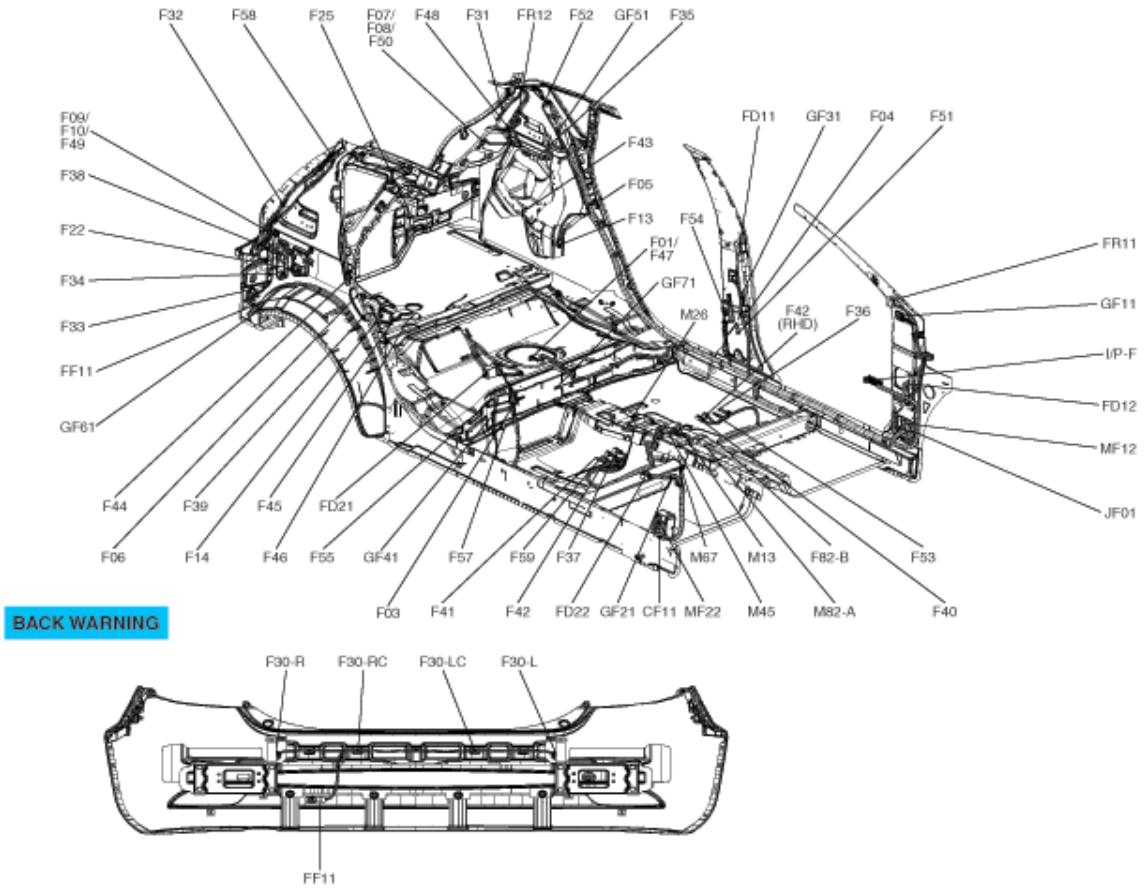


AMP_090III_06F_R_2

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Floor & Air Bag Harness (1) HL-11



FLOOR HARNESS

F01	Fuel Sender & Fuel Pump Motor (GSL)
F03	Passenger Door Switch
F04	Driver Door Switch
F05	Rear Door Switch LH
F06	Rear Door Switch RH
F07	Rear Combination Lamp LH (LOW)(Wagon)
F08	Rear Combination Lamp LH(3/5DR)
F09	Rear Combination Lamp RH (LOW)(Wagon)
F10	Rear Combination Lamp RH(3/5DR)
F13	Rear Wheel Sensor LH
F14	Rear Wheel Sensor RH
F22	Rear Parking Assist Control Module
F25	License Lamp (3DR)
F31	Rear Combination Lamp LH (UP)
F32	Rear Combination Lamp RH (UP)
F33	Rear Fog Lamp
F34	Rear Power Outlet
F35	Rear Wiper Relay
F36	Front Seat Warmer Control Module LH
F37	Front Seat Warmer Control Module RH
F38	Stop Lamp Failure Module
F39	Rear TPMS Initiator RH
F40	Driver Seat Belt Buckle Switch
F41	Passenger Seat Belt Buckle Switch
F42	SBR MAT
F43	Rear Speaker LH (3DR)
F44	Rear Speaker RH (3DR)
F45	Rear SBR LH
F46	Rear SBR RH
F47	Fuel Sender & Fuel Pump Motor (DSL)
F48	Luggage Lamp
F49	Rear Combination Lamp RH(5DR)
F50	Rear Combination Lamp LH(5DR)
F51	Driver Seat Belt Pretensioner
F52	Driver Curtain Air Bag
F53	Driver Side Air Bag
F54	Driver Side Impact Sensor
F55	Passenger Side Impact Sensor
F57	Passenger Seat Belt Pretensioner
F58	Passenger Curtain Air Bag
F59	Passenger Side Air Bag
F82-B	SRS Control Module
JF01	Joint Connector
CF11	Connection With I/P JUNCTION BOX Harness
I/P-F	Connection With I/P JUNCTION BOX Harness
FD11	Connection With DOOR Harness
FD12	Connection With DOOR Harness
FD21	Connection With DOOR Harness
FD22	Connection With DOOR Harness
FF11	Connection With BWS EXT. Harness
FR11	Connection With ROOF Harness
FR12	Connection With TAIL GATE EXT. Harness
MF12	Connection With MAIN Harness
MF22	Connection With MAIN Harness
GF11	Ground
GF21	Ground
GF31	Ground
GF41	Ground
GF51	Ground
GF61	Ground
GF71	Ground

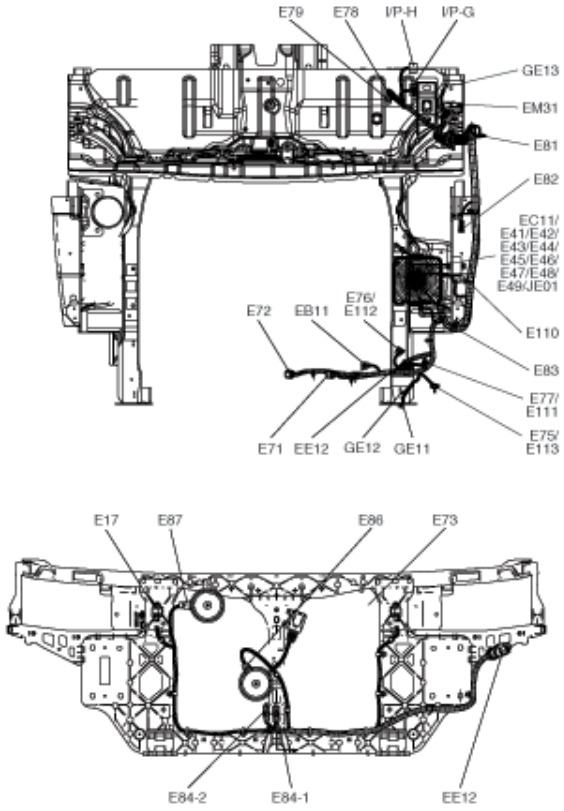
REAR HTD GROUND HARNESS

F24	Rear Defogger (-)
GF81	Ground

BWS EXT. HARNESS

F30-L	Rear Parking Assist Sensor LH
F30-R	Rear Parking Assist Sensor RH
F30-LC	Rear Parking Assist Sensor Center LH
F30-RC	Rear Parking Assist Sensor Center RH
FF11	Connection With FLOOR Harness

Front & Front End Module Harness (1)



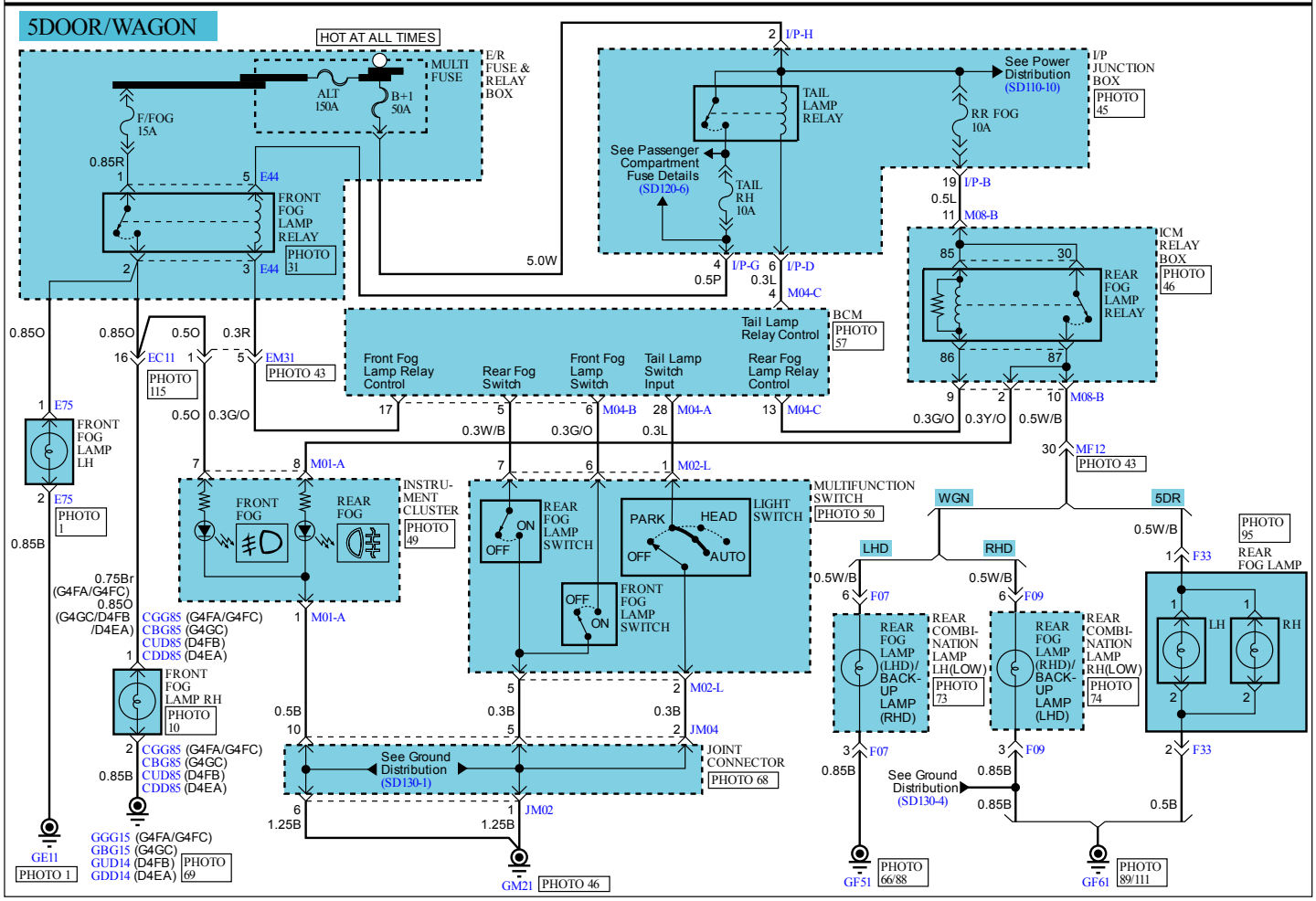
FRONT HARNESS

E41	Blower Relay
E42	Start Relay
E43	Head Lamp Relay (High)
E44	Front Fog Lamp relay
E45	Horn Relay
E46	Wiper Relay
E47	Head Lamp Relay (Low)
E48	Condenser Fan Relay (High)
E49	Condenser Fan Relay (Low)
E71	Cooling Fan Motor (GSL)
E72	Cooling Fan Motor (DSL)
E75	Front Fog Lamp LH
E76	Head Lamp Leveling Device Actuator LH
E77	Head Lamp LH
E78	EPS Control Module
E79	EPS Control Module
E81	Side Repeater Lamp LH
E82	Front Wheel Sensor LH
E83	Battery Sensor
E110	Front TPMS Initiator LH
E111	Head Lamp LH(3DR)
E112	Head Lamp Leveling Device Actuator LH(3DR)
E113	Front Fog Lamp LH(3DR)
JE01	Joint Connector
I/P-G	Connection With I/P JUNCTION BOX Harness
I/P-H	Connection With I/P JUNCTION BOX Harness
E/R-FRT	Connection With E/R JUNCTION BOX Harness
EB11	Connection With BATTERY Harness
EC11	Connection With CONTROL Harness
EE12	Connection With FRONT END MODULE Harness
EM31	Connection With MAIN Harness
GE11	Ground
GE12	Ground
GE13	Ground

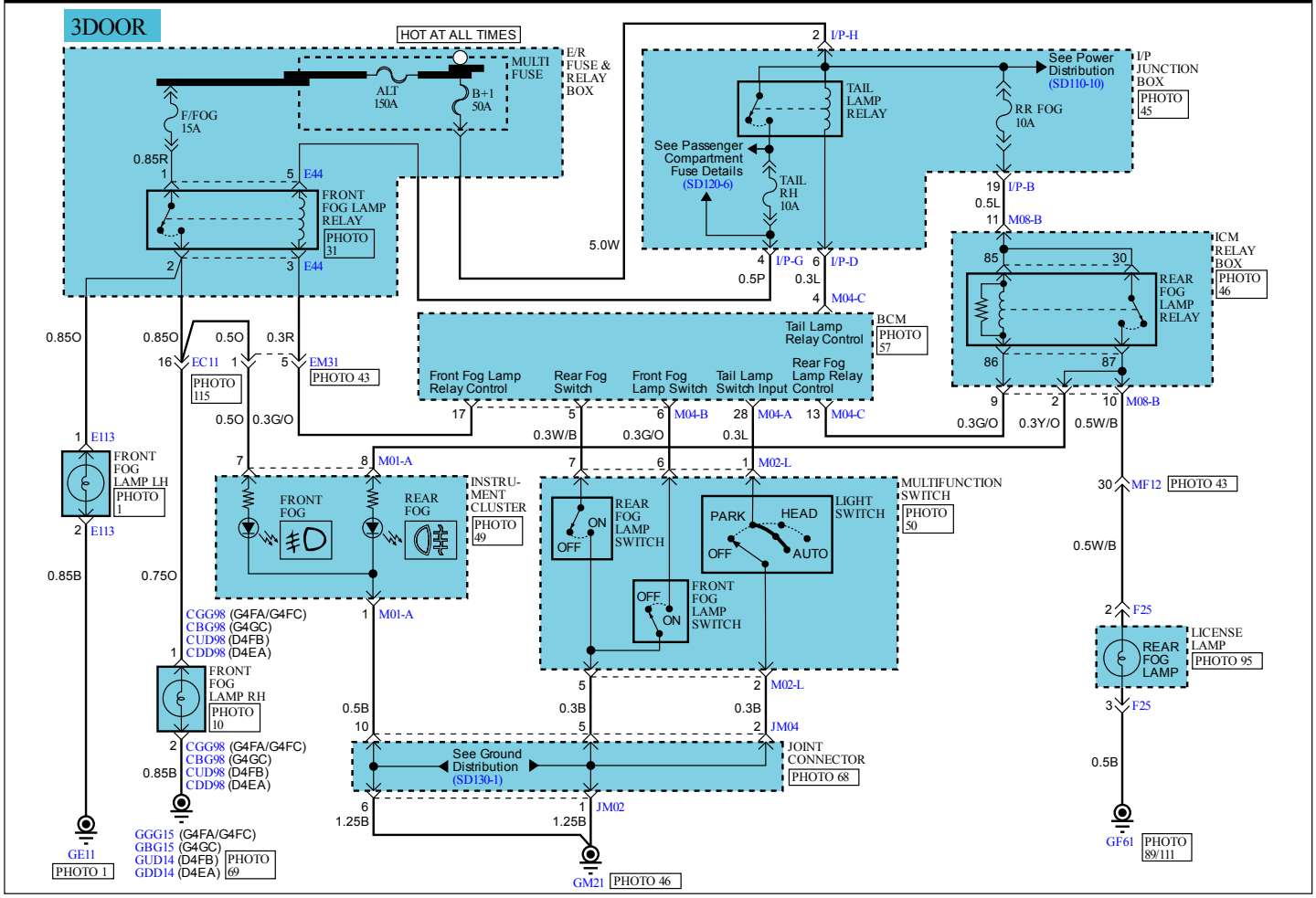
FRONT END MODULE HARNESS

E17	Front Impact Sensor RH
E73	Front Impact Sensor LH
E84-1	Ambient Sensor #1
E84-2	Ambient Sensor #2
E86	Horn (High)
E87	Horn (Low)
EE12	Connection With FRONT Harness

Front Fog & Rear Fog Lamps (1) SD924-1



Front Fog & Rear Fog Lamps (2) SD924-2



Front Fog & Rear Fog Lamps (3) SD924-3

CBG85



KET_110WP_02F_B_FOG

CBG98



PKD_280WP_02F_Gr

CDD85



KET_110WP_02F_B_FOG

CDD98



PKD_280WP_02F_Gr

CGG85



KET_110WP_02F_B_FOG

CGG98



PKD_280WP_02F_Gr

CUD85



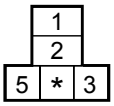
KET_110WP_02F_B_FOG

CUD98



PKD_280WP_02F_Gr

E44



CR05F011

E75



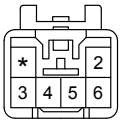
KET_110WP_02F_B_FOG

E113



PKD_280WP_02F_Gr

F07



KET_090II_06M_W

F09



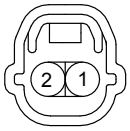
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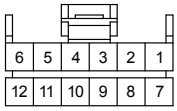
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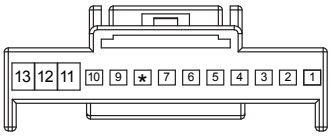
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M01-A



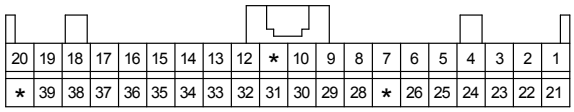
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M02-L



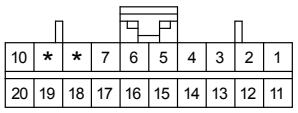
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M04-A



AMP_025_40F_W

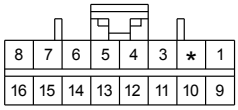
M04-B



AMP_040M2_20F_B

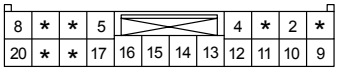
Front Fog & Rear Fog Lamps (4) SD924-4

M04-C



AMP_040M2_16F_W

M08-B

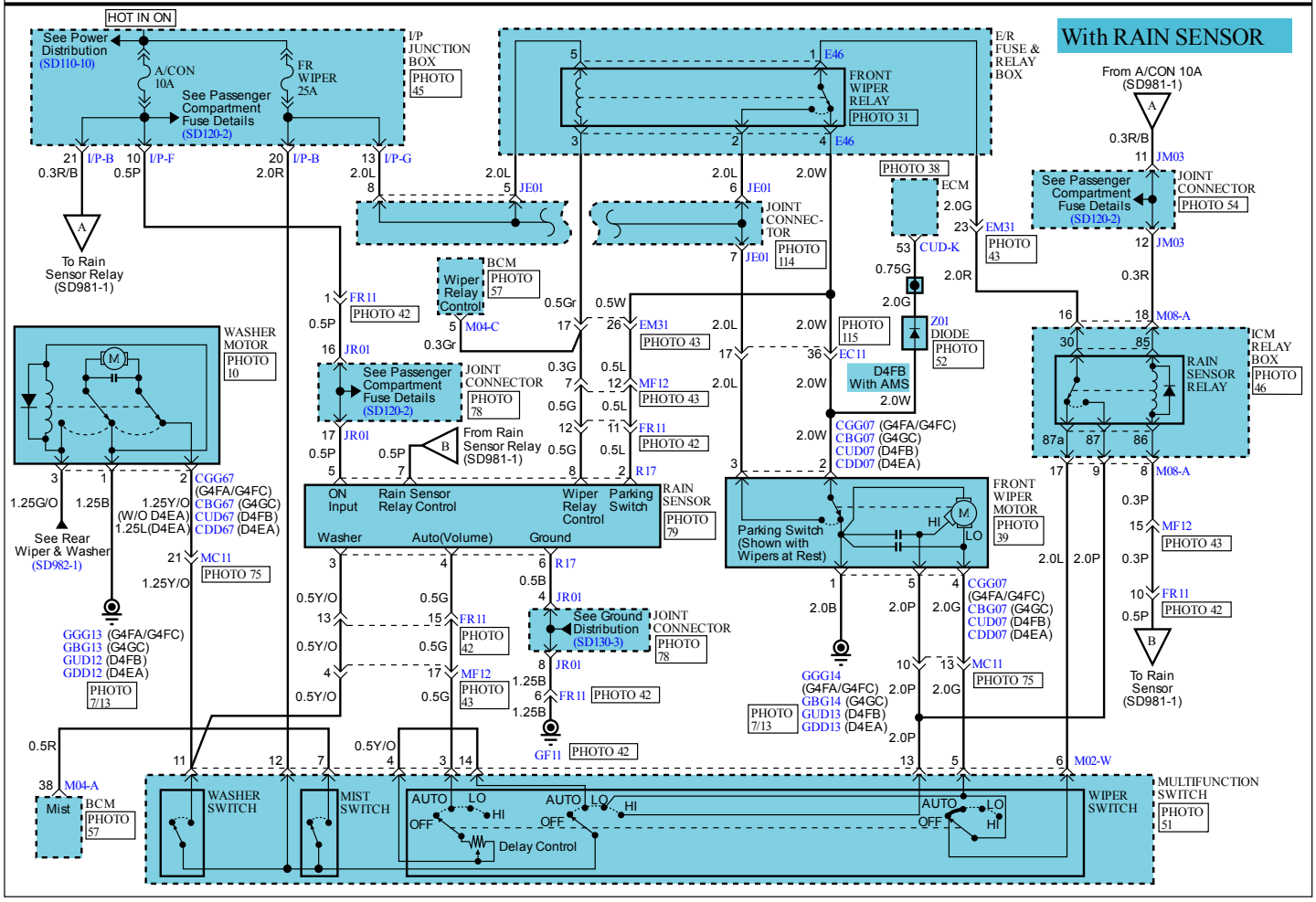


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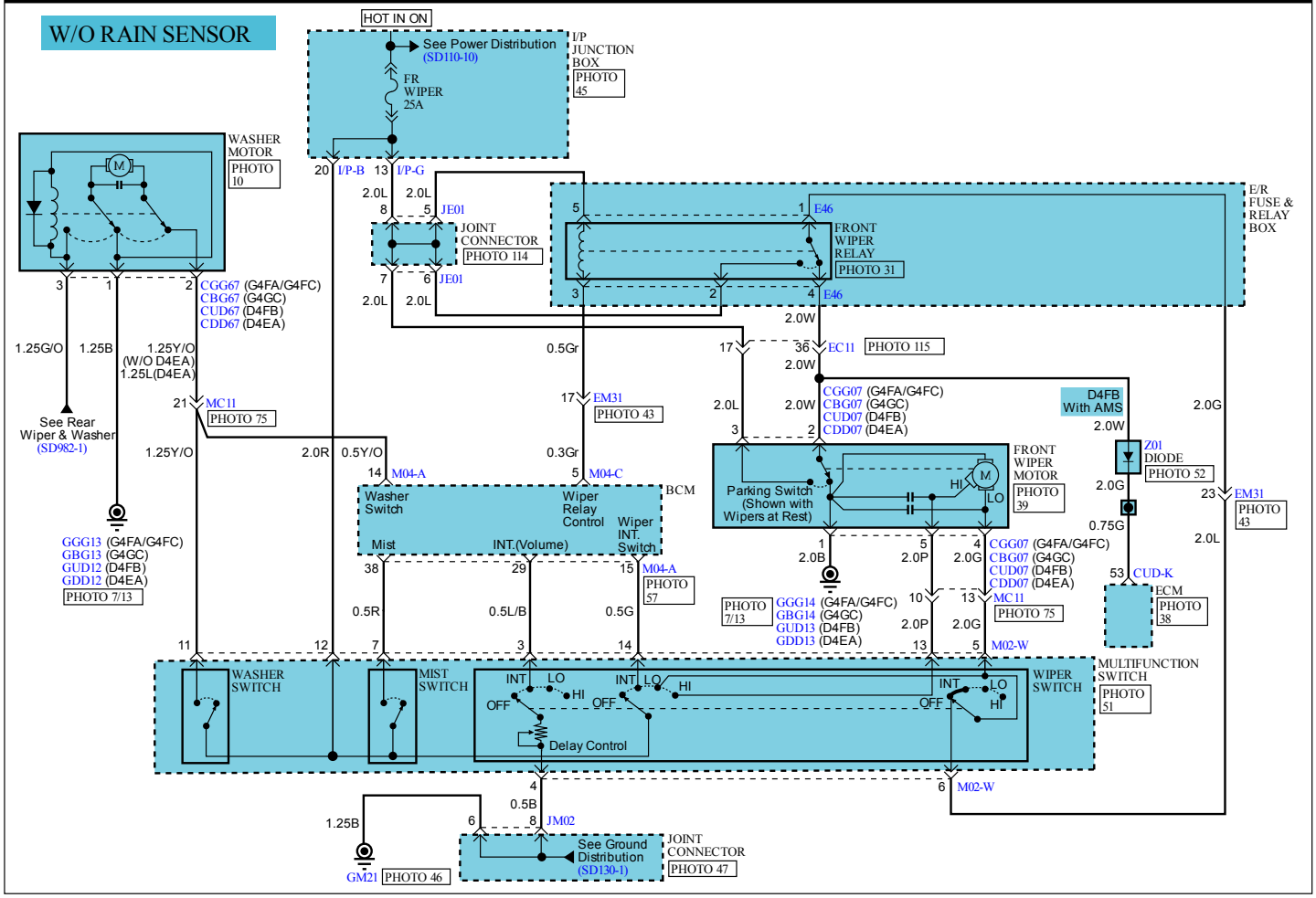
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Front Wiper & Washer (1) SD981-1

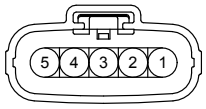


Front Wiper & Washer (2) SD981-2



Front Wiper & Washer (3) SD981-3

CBG07



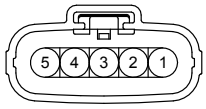
KUM_NDWP_05F_B

CBG67



KET_090IIWP_03F_B

CDD07



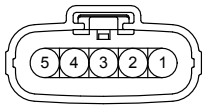
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CDD67



KET_090IIWP_03F_B

CGG07



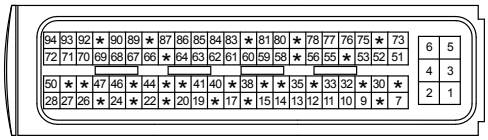
KUM_NDWP_05F_B

CGG67



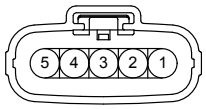
KET_090IIWP_03F_B

CUD-K



AMP_ECU_94F_B

CUD07



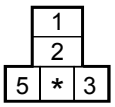
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CUD67



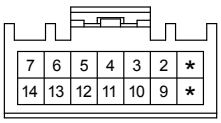
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E46



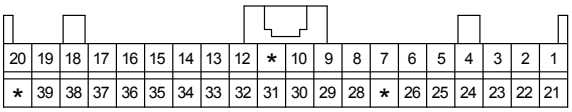
CR05F011

M02-W



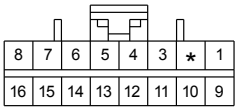
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M04-A



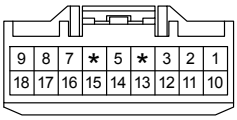
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M04-C



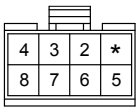
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M08-A



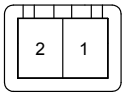
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R17



MLX_045_08F_B

Z01

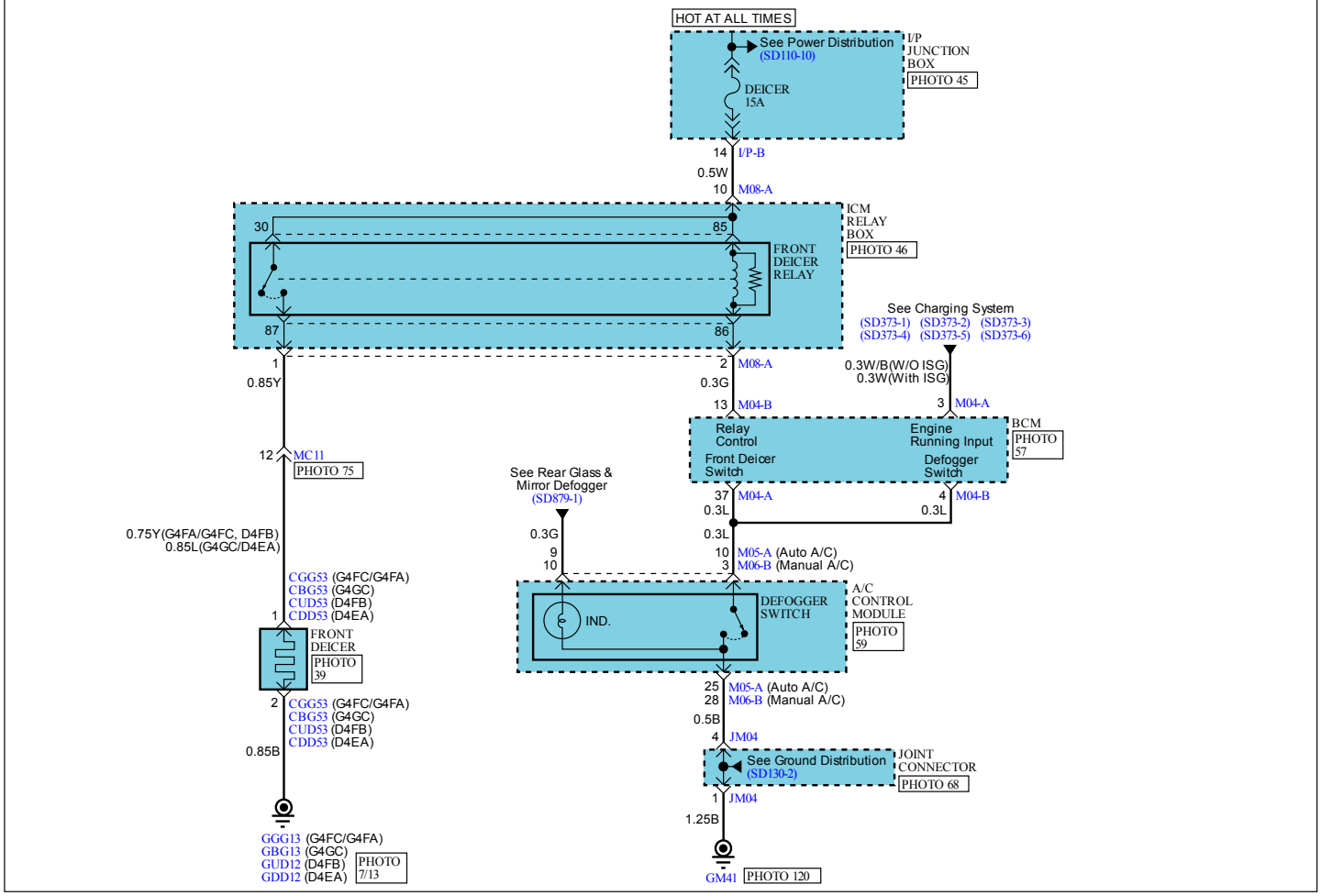


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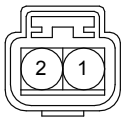
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Front Wiper Deicer (1) SD861-1



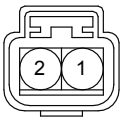
Front Wiper Deicer (2) SD861-2

CBG53



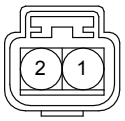
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CDD53



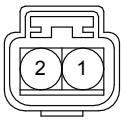
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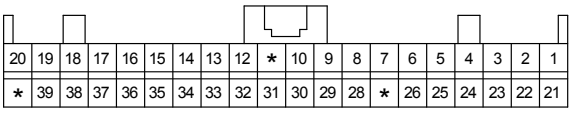
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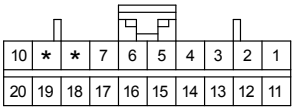
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M04-A



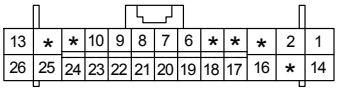
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M04-B



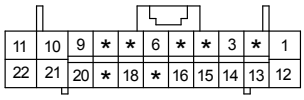
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M05-A



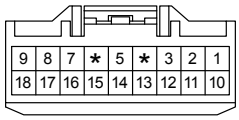
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M05-B



AMP_0407_22F_W_HD

M08-A

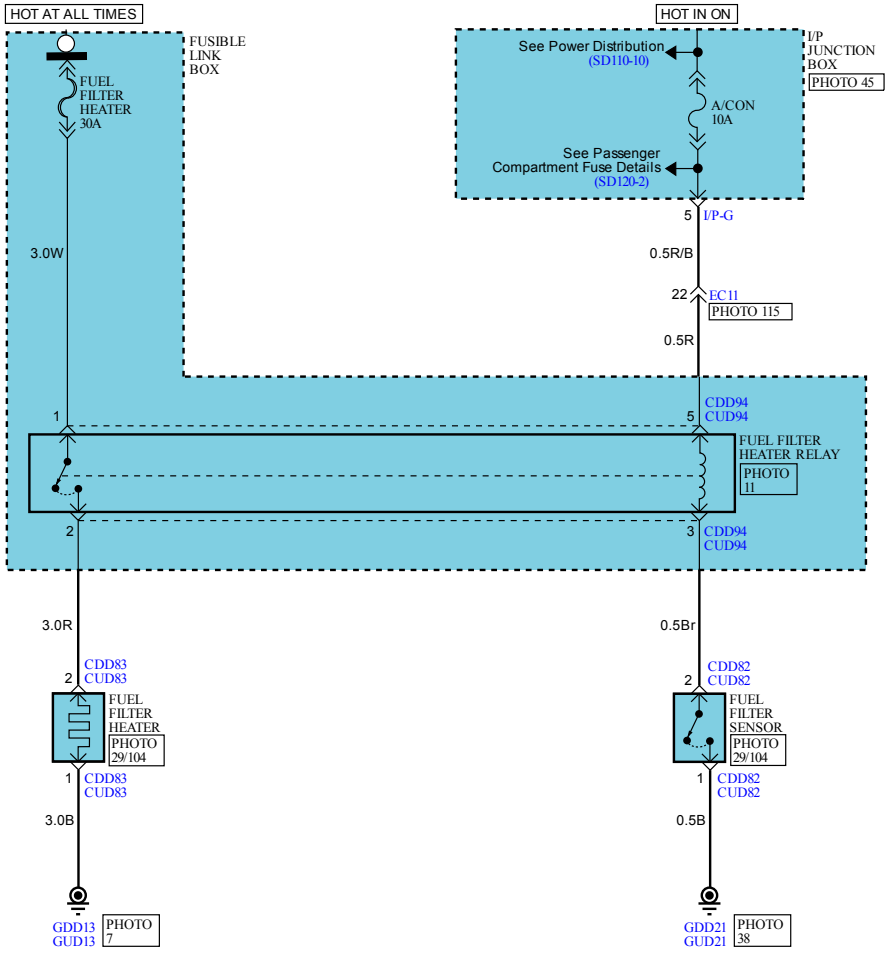


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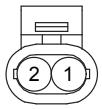
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Fuel Filter Heating System (D4FB/D4EA) (1) SD361-1



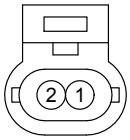
Fuel Filter Heating System (D4FB/D4EA) (2) SD361-2

CDD82



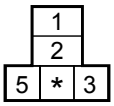
AMP_060WP_02F_B

CDD83



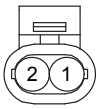
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CDD94



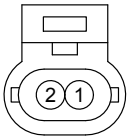
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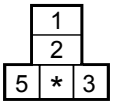
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CUD83



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CUD94



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Fuse & Relay Information (1) SD100-1

I/P JUNCTION BOX

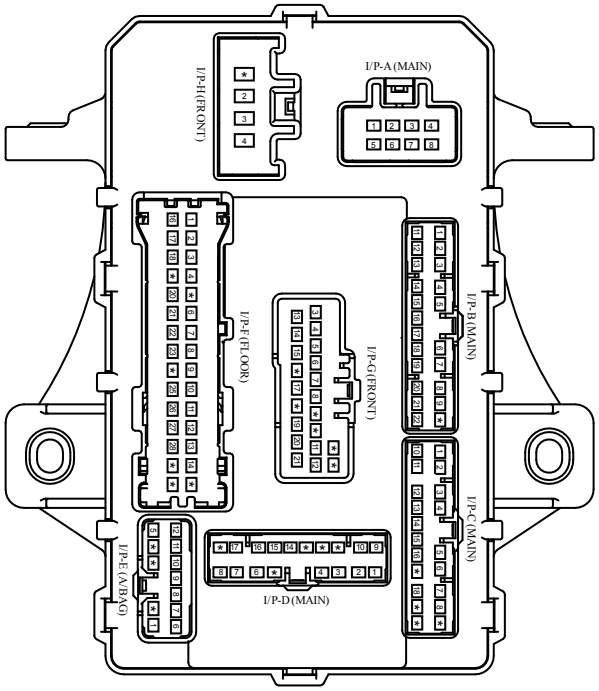
< FRONT> <REAR >

LHD

10A START	10A CLOCK	
10A A/CON SW	15A C/LIGHTER	15A P/OUTLET
10A HTD MIRR	20A DR LOCK	10A T/SIG
15A SEAT HTR	15A DEICER	10A A/BAG IND
10A A/CON	15A STOP	10A CLUSTER
10A HEAD LAMP	15A ROOM LP	15A A/BAG
25A FR WIPER	POWER CONNECTOR 15A AUDIO	15A MDPS
15A RR WIPER	15A T/LID	15A RR P/OUTLET
(DRL OFF)	25A SAFETY P/WDW RH	10A TAIL RH
10A RR FOG	25A SAFETY P/WDW LH	10A TAIL LH
25A P/WDW LH	25A P/WDW RH	

RHD

	25A P/WDW RH	25A P/WDW LH
10A TAIL LH	25A SAFETY P/WDW LH	10A RR FOG
10A TAIL RH	25A SAFETY P/WDW RH	(DRL OFF)
15A RR P/OUTLET	15A T/LID	15A RR WIPER
15A MDPS	15A AUDIO	25A FR WIPER
15A A/BAG	POWER CONNECTOR 15A ROOM LP	10A HEAD LAMP
10A CLUSTER	15A STOP	10A A/CON
10A A/BAG IND	15A DEICER	15A SEAT HTR
10A T/SIG	20A DR LOCK	10A HTD MIRR
15A P/OUTLET	15A C/LIGHTER	10A A/CON SW
	10A CLOCK	10A START



※ USE THE DESIGNATED FUSE ONLY

Fuse & Relay Information (2) SD100-2

CIRCUIT DIAGRAM

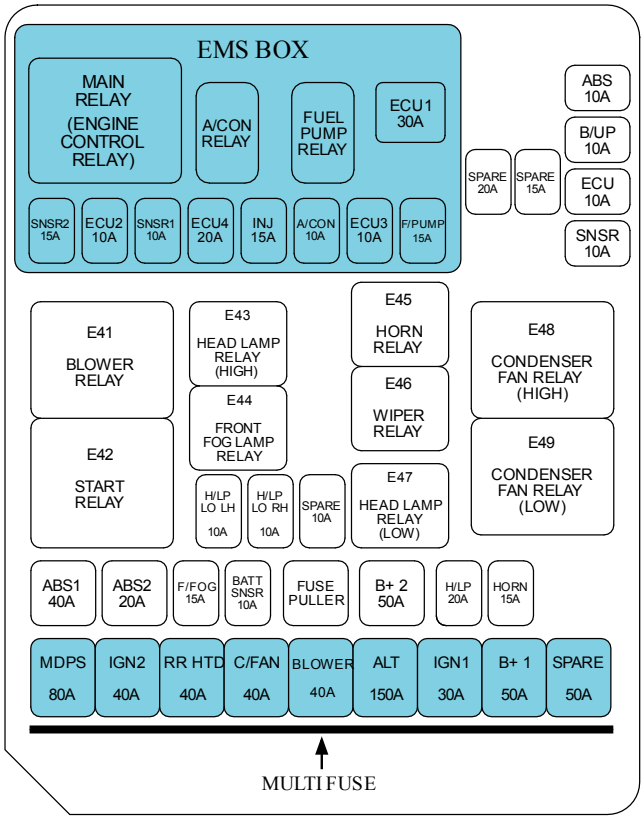
FUSE	(A)	Circuit Protected
START	10A	Start Relay, Transaxle Range Switch, ECM (G4FA/G4FC)
A/CON SW	10A	A/C Control Module, Blower Motor, FET (Field Effect Transistor), Blower Resistor
HTD MIRR	10A	A/C Control Module, ECM (G4FA/G4FC), PCM (G4FA/G4FC), Driver/Passenger Power Outside Mirror
SEAT HTR	15A	Front Seat Warmer Control Module LH/RH
A/CON	10A	A/C Control Module, Electro Chromic Mirror, Fusible Link Box (PTC Heater Relay #2/#3, Fuel Filter Heater Relay), BCM Sunroof Control Module, ICM Relay Box (Rain Sensor Relay), Rain Sensor, Blower Relay, Instrument Cluster
HEAD LAMP	10A	H/LP Lo Relay, H/LP Hi Relay, BCM
FR WIPER	25A	Multifunction Switch, Front Wiper Relay, Front Wiper Motor
RR WIPER	15A	Multifunction Switch, Rear Wiper Relay, Rear Wiper Motor
RR FOG	10A	ICM Relay Box (Rear Fog Lamp Relay)
P/WDW LH	25A	Power Window Main Switch, Rear Power Window Switch LH
CLOCK	10A	Audio, ATM Key Lock Control Module, Power Outside Mirror Switch, Trip Computer, Glove Box Lamp, DC-DC Converter, Transaxle Range Switch, PCM (G4FA/G4FC, G4GC), TCM (D4FB)
C/LIGHTER	15A	Cigarette Lighter & Front Power Outlet
DR LOCK	20A	Sunroof Control Module, ICM Relay Box (Door Unlock/Lock Relay, Dead Lock Relay (RHD))
DEICER	15A	ICM Relay Box (Front Deicer Relay)
STOP	15A	ATM Lever Switch, Stop Lamp Switch, Stop Lamp Failure Module
ROOM LP POWER CONNECTOR	15A	Luggage Lamp, Data Link Connector, Instrument Cluster (IND.), Room Lamp, Vanity Lamp Switch LH/RH, A/C Control Module BCM, Ignition Key ILL. & Door Warning Switch, Sunroof Switch, Security Indicator, Tire Pressure Monitoring Module, Piezo Buzzer
AUDIO	15A	Audio, Trip Computer, DC-DC Converter
T/LID	15A	Trunk Lid Relay, Power Outside Mirror Switch
SAFETY P/WDW RH	25A	Rear Safety Power Window Module RH, Passenger Safety Power Window Module
SAFETY P/WDW LH	25A	Driver Safety Power Window Module, Rear Safety Power Window Module LH
P/WDW RH	25A	Power Window Main Switch, Rear Power Window Switch RH, Passenger Power Window Switch
P/OUTLET	15A	Cigarette Lighter & Front Power Outlet
T/SIG	10A	Switch Module
A/BAG IND	10A	Instrument Cluster (Air Bag IND.)
CLUSTER	10A	Instrument Cluster (IND.), BCM, ATM Key Lock Control Module, Pre-Excitation Resistor, ISG Switch, Stop Lamp Failure Module Tire Pressure Monitoring Module, Trip Computer, Front Seat Warmer Control Module LH/RH
A/BAG	15A	SRS Control Module
MDPS	15A	EPS Control Module, ESP Switch
RR P/OUTLET	15A	Rear Power Outlet, Switch Module, Sound Relay
TAIL RH	15A	Rear Combination Lamp RH (UP), Head Lamp RH (W/O 3DR), Shunt Connector, E/R Fuse & Relay Box (Front Fog Lamp Relay) Rear Combination Lamp RH, Rear Combination Lamp RH (Low), Instrument Cluster, Rheostat Relay, BCM, Multifunction Switch Head Lamp RH (3DR), Rear Combination Lamp RH (5DR)
TAIL LH	10A	Head Lamp LH (W/O 3DR), License Lamp, Rear Combination Lamp LH, Rear Combination Lamp LH (UP), Rear Combination Lamp LH (Low) Rear Combination Lamp LH (5DR), Head Lamp LH (3DR)
※ (DRL OFF)	(15A)	BCM

※ NOTICE
If you want the DRL off, open the driver's side fuse panel cover (I/P junction box) and insert any spare fuse into the DRL OFF position.

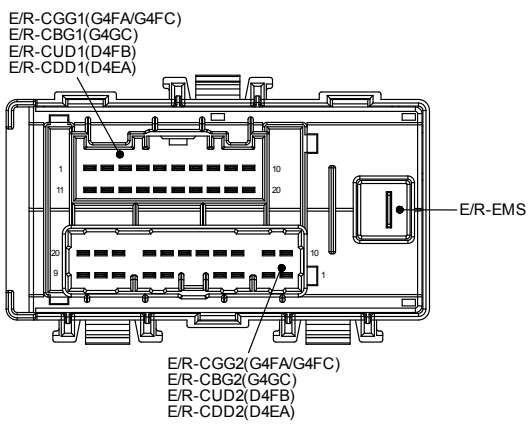
※ USE THE DESIGNATED FUSE ONLY

Fuse & Relay Information (3) SD100-3

E/R FUSE & RELAY BOX



EMS BOX (Rear)



RELAY NO.	RELAY NAME	TYPE
E41	Blower Relay	PLUG MINI
E42	Start Relay	PLUG MINI
E43	Head Lamp Relay (High)	PLUG MICRO
E44	Front Fog Lamp Relay	PLUG MICRO
E45	Horn Relay	PLUG MICRO
E46	Wiper Relay	PLUG MICRO
E47	Head Lamp Relay (Low)	PLUG MICRO
E48	Condenser Fan Relay (High)	PLUG MINI
E49	Condenser Fan Relay (Low)	PLUG MINI
EMS RLY.1	Main (Engine Control) Relay	PLUG MINI
EMS RLY.2	A/CON Relay	PLUG MICRO
EMS RLY.3	Fuel Pump Relay	PLUG MICRO

※ USE THE DESIGNATED FUSE AND RELAY ONLY

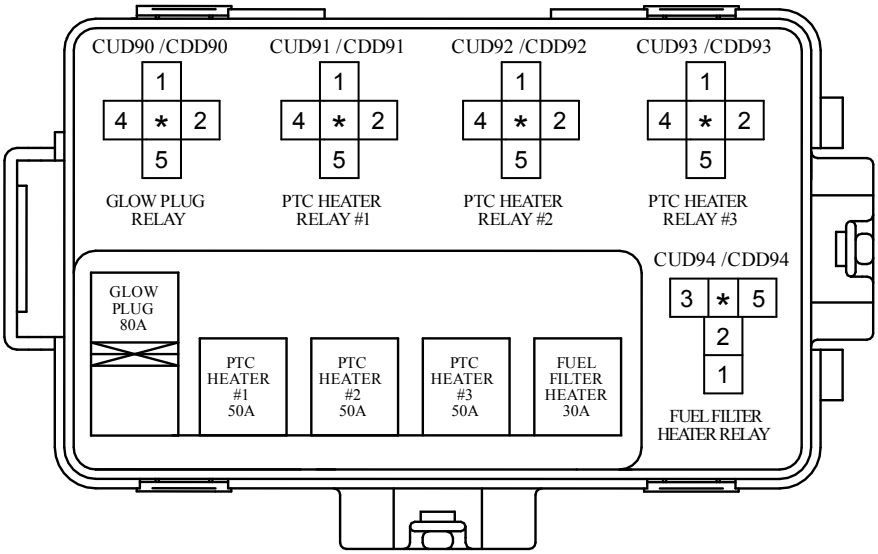
CIRCUIT

FUSE		(A)	Circuit Protected
MULTI FUSE	B+ 1	50A	I/P Junction Box (Relay - Tail Lamp, Power Window, FUSE - TAIL LH/RH 10A, P/WDW LH/RH 25A SAFETY P/WDW LH/RH 25A, RR FOG 10A)
	IGN1	30A	Ignition Switch
	ALT	150A	Alternator, Fusible Link Box (GLOW PLUG 80A, PTC HEATER #1/2/3 50A, FUEL FILTER HEATER 30A) MULTI FUSE (MDPS 80A, IGN2 40A, RR HTD 40A, C/FAN 40A, BLOWER 40A) FUSE (ABS1 40A, F/FOG 15A, ABS2 20A, BATT SNSR 10A)
	BLOWER	40A	Blower Relay
	C/FAN	40A	Condenser Fan Relay High/Low, EMS Box (FUSE - SNSR1 10A)
	RR HTD	40A	I/P Junction Box (REAR DEFOGGER RELAY, FUSE - HTD MIRR 10A)
	IGN2	40A	Start Relay, Ignition Switch
	MDPS	80A	EPS Control Module
FUSE (EMS BOX)	ECU 1	30A	Engine Control Relay, PCM (G4GC)
	F/PUMP	15A	Fuel Pump Relay (G4FA/G4FC/G4GC/D4EA)
	ECU 3	10A	TCM (D4FB),PCM (G4FC), Multipurpose Check Connector (G4FA/G4FC), Alternator (D4EA)
	A/CON	10A	A/Con Relay
	INJ	15A	A/Con Relay (G4FA/G4FC/G4GC/D4FB/D4EA), Injector #1/2/3/4 (G4FA/G4FC/G4GC), Throttle Flap Actuator (D4FB) EGR Control Actuator (D4FB), VGT Actuator (D4FB)
	ECU 4	20A	ECM (D4FB/D4EA),EGR Control Valve (D4EA), PCM (G4FC W/O ETC), ECM (G4FA/G4FC W/O ETC), Idle Speed Control Actuator
	SNSR1	10A	Condenser Fan Relay (Low), Oil Control Valve (G4GC), Idle Speed Control Actuator (G4GC), VGT Actuator (D4EA) Fusible Link Box (Glow Plug Relay, PTC Heater Relay #1)(D4FB/D4EA), Immobilizer Module (D4FB/D4EA) Fuel Pump Relay (G4FA/G4FC/G4GC/D4EA), Purge Control Solenoid Valve (G4GC), ECM(G4FA/G4FC With ETC) Electrical Throttle Control Actuator (D4EA), Air Heater Relay (D4FB)
	ECU 2	10A	PCM (G4FC With ETC/G4GC), E/R Fuse & Relay Box (Start Relay)(G4FA/G4FC), Stop Lamp Switch (D4FB/D4EA)
	SNSR2	15A	Immobilizer Module (G4FA/G4FC/G4GC), Camshaft Position Sensor (G4FA/G4FC/G4GC, D4FB/D4EA), Lambda Sensor (D4FB/D4EA) Oxygen Sensor Up/Down (G4FA/G4FC/G4GC), Crankshaft Position Sensor (G4GC), Purge Control Solenoid Valve (G4FA/G4FC) Fuel Pressure Regulating Valve (D4FB), Oil Control Valve(G4FA/G4FC)
FUSE	ABS	10A	ABS Control Module, ESP Control Module, Yaw Late Sensor
	B/UP	10A	Back-up Lamp Switch, Transaxle Range Switch (G4FC/G4GC/D4FB)
	ECU	10A	Start Relay (G4FA/G4FC-M/T W/O ETC, With ISG), Ignition Coil #1/2/3/4 (G4FA/G4FC), PCM (G4GC)
	SNSR	10A	TCM (D4FB), PCM (G4FC/G4GC), ECM (G4FA/G4FC/D4FB/D4EA), Stop Lamp Switch (G4FA/G4FC With ETC/G4GC) Fuel Filter Warning Switch (D4FB/D4EA), Pulse Generator 'A'/'B' (G4FC/G4GC/D4FB), Air Flow Sensor (D4FB/D4EA), Speed Sensor DC-DC Converter(G4FA/G4FC, D4FB), Auto Cruise Control Module(G4GC), Condenser(G4FA/G4FC), Multifunction Switch(G4GC) Pulse Generator 'B' (D4FB)
	H/LP LO RH	10A	Head Lamp RH (W/O 3DR), Head Lamp Leveling Device Actuator RH (W/O 3DR), Head Lamp Leveling Device Actuator RH (3DR) Head Lamp RH (3DR)
	H/LP LO LH	10A	Head Lamp LH (W/O 3DR), Head Lamp Leveling Device Switch, Head Lamp Leveling Actuator LH (W/O 3DR), Head Lamp LH (3DR) Head Lamp Leveling Device Actuator LH (3DR)
	HORN	15A	Horn Relay, ICM Relay Box (Burglar Alarm Relay)V
	H/LP	20A	Head Lamp Relay High
	B+ 2	50A	I/P Junction Box (FUSE - POWER CONNECTOR(AUDIO 15A, ROOM LP 15A), DEICER 15A, T/LID 15A, STOP 15A, DR LOCK 20A RR P/OUTLET 15A)
	BATT SNSR	10A	Battery Sensor
	F/FOG	5A	Front Fog Lamp Relay
	ABS2	20A	ABS Control Module, ESP Control Module
	ABS1	40A	ABS Control Module, ESP Control Module

※ USE THE DESIGNATED FUSE ONLY

FUSIBLE LINK BOX (D4FB/D4EA)

LAYOUT



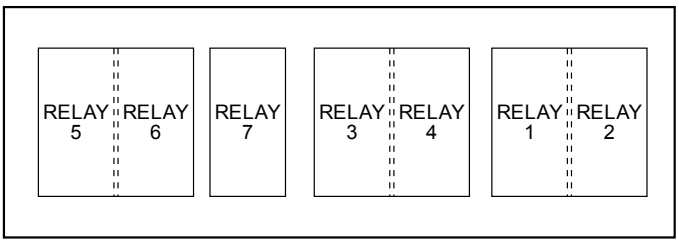
CIRCUIT DIAGRAM

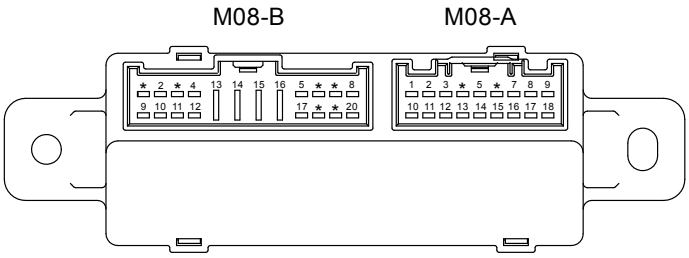
FUSE	(A)	Circuit Protected
GLOW PLUG	80A	Glow Plug Relay, Air Heater Relay (D4FB)
PTC HEATER #1	50A	PTC Heater Relay #1
PTC HEATER #2	50A	PTC Heater Relay #2
PTC HEATER #3	50A	PTC Heater Relay #3
FUEL FILTER HEATER	30A	Fuel Filter Heater Relay

※ USE THE DESIGNATED FUSE AND RELAY ONLY

ICM RELAY BOX

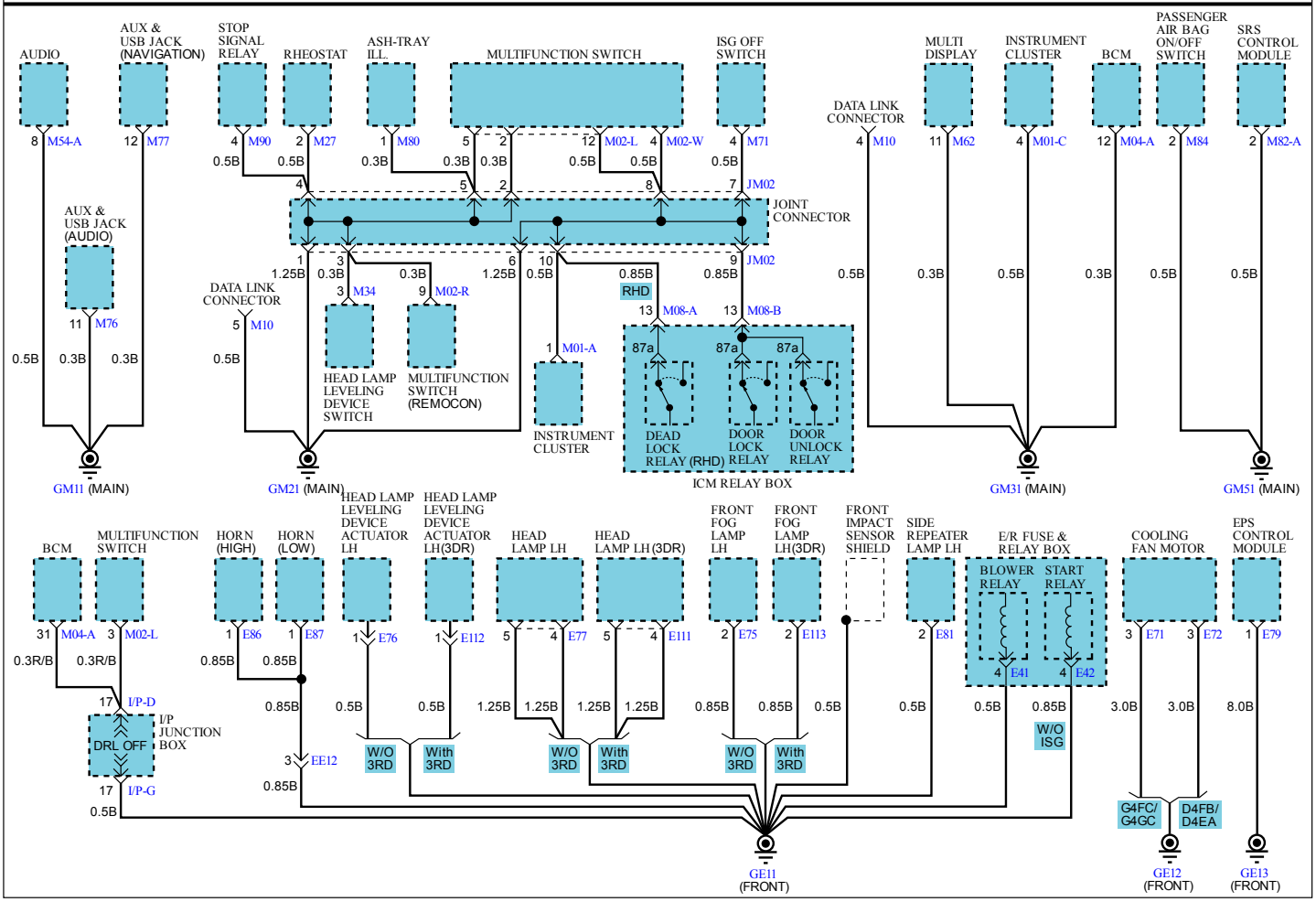
LAYOUT



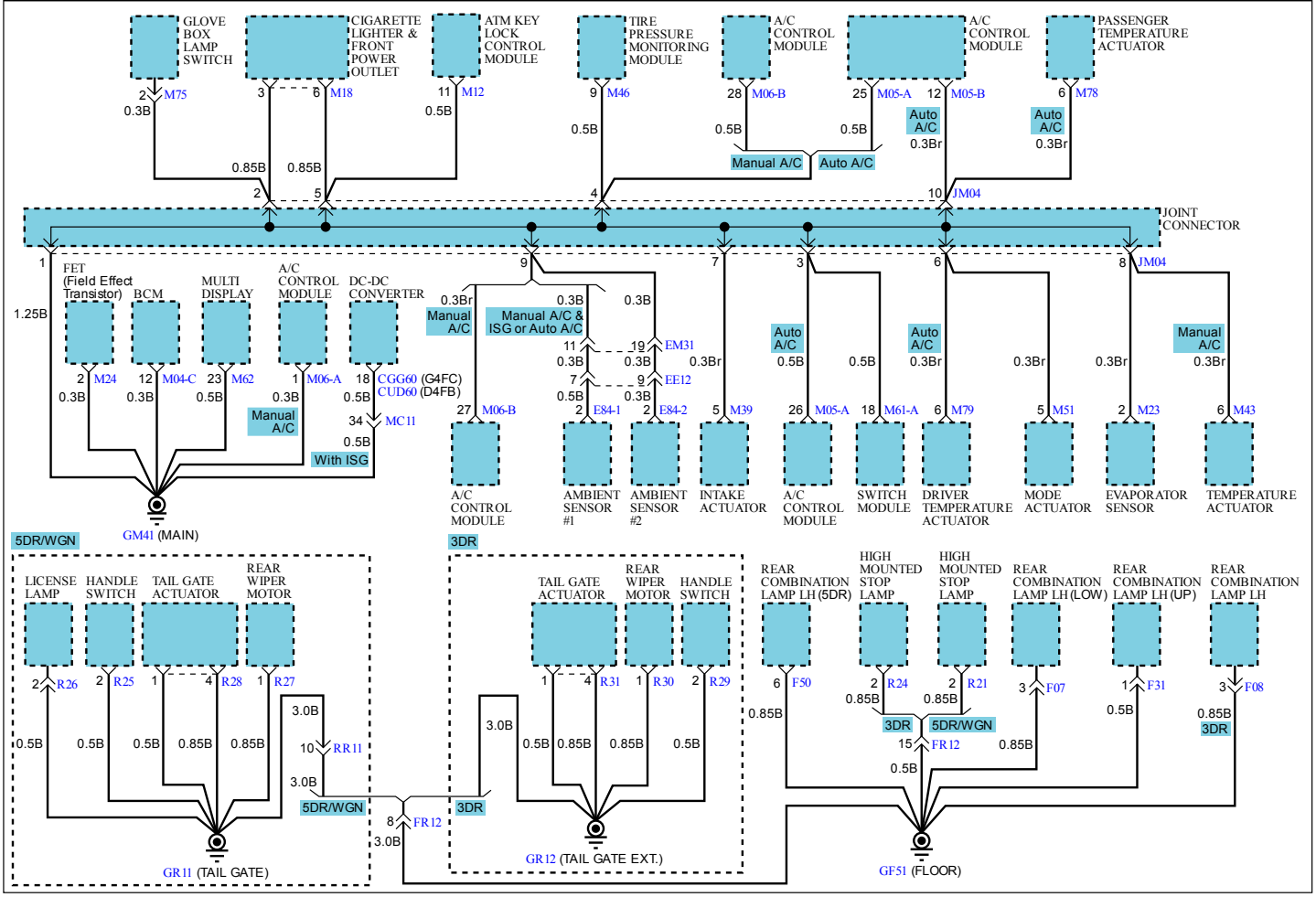


RELAY NO.	RELAY NAME
1	RAIN SENSOR RELAY
2	DEAD LOCK RELAY (RHD)
3	BURGLAR ALARM HORN RELAY
4	FRONT DEICER RELAY
5	DOOR LOCK RELAY
6	DOOR UNLOCK RELAY
7	REAR FOG LAMP RELAY

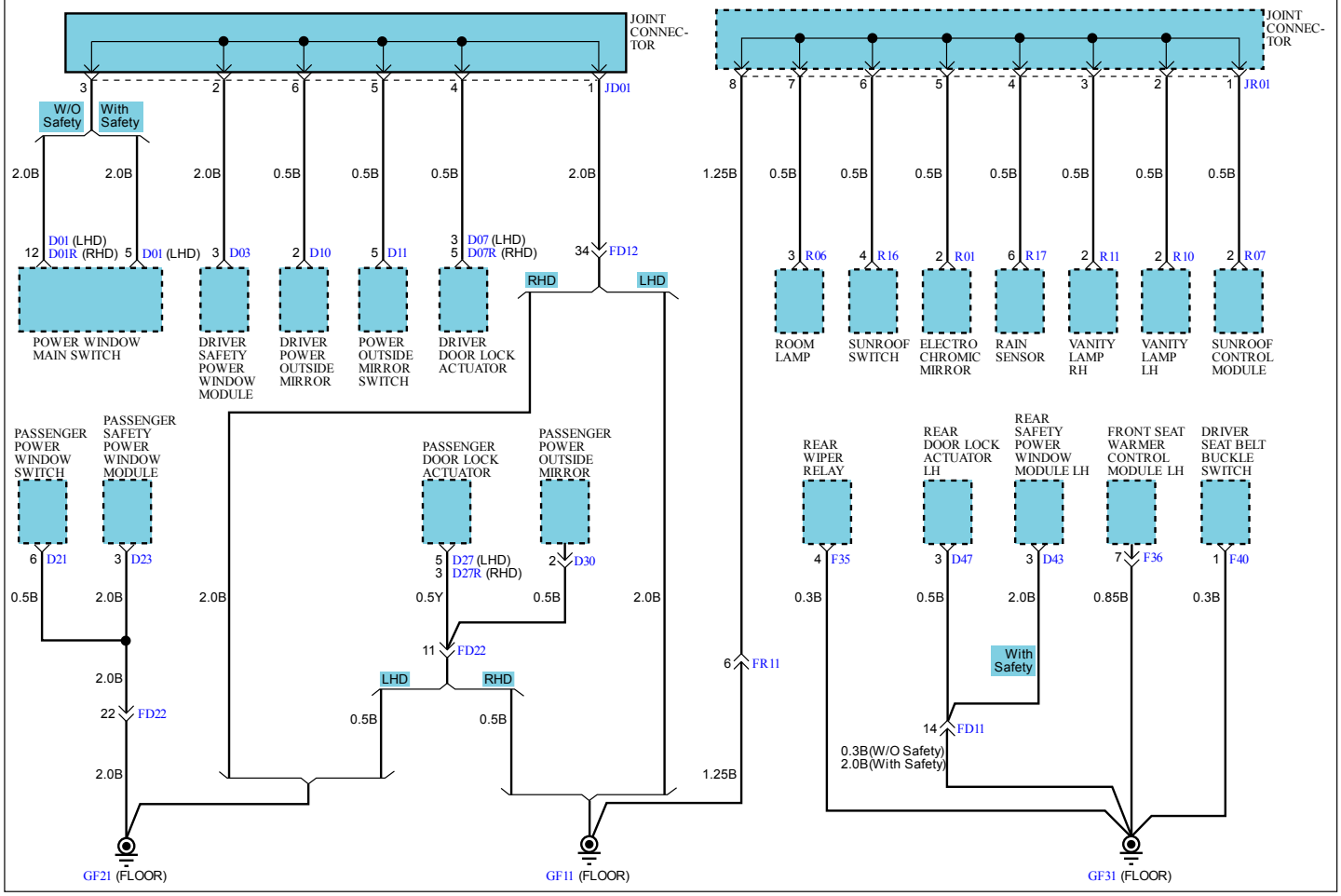
Ground Distribution (1) SD130-1



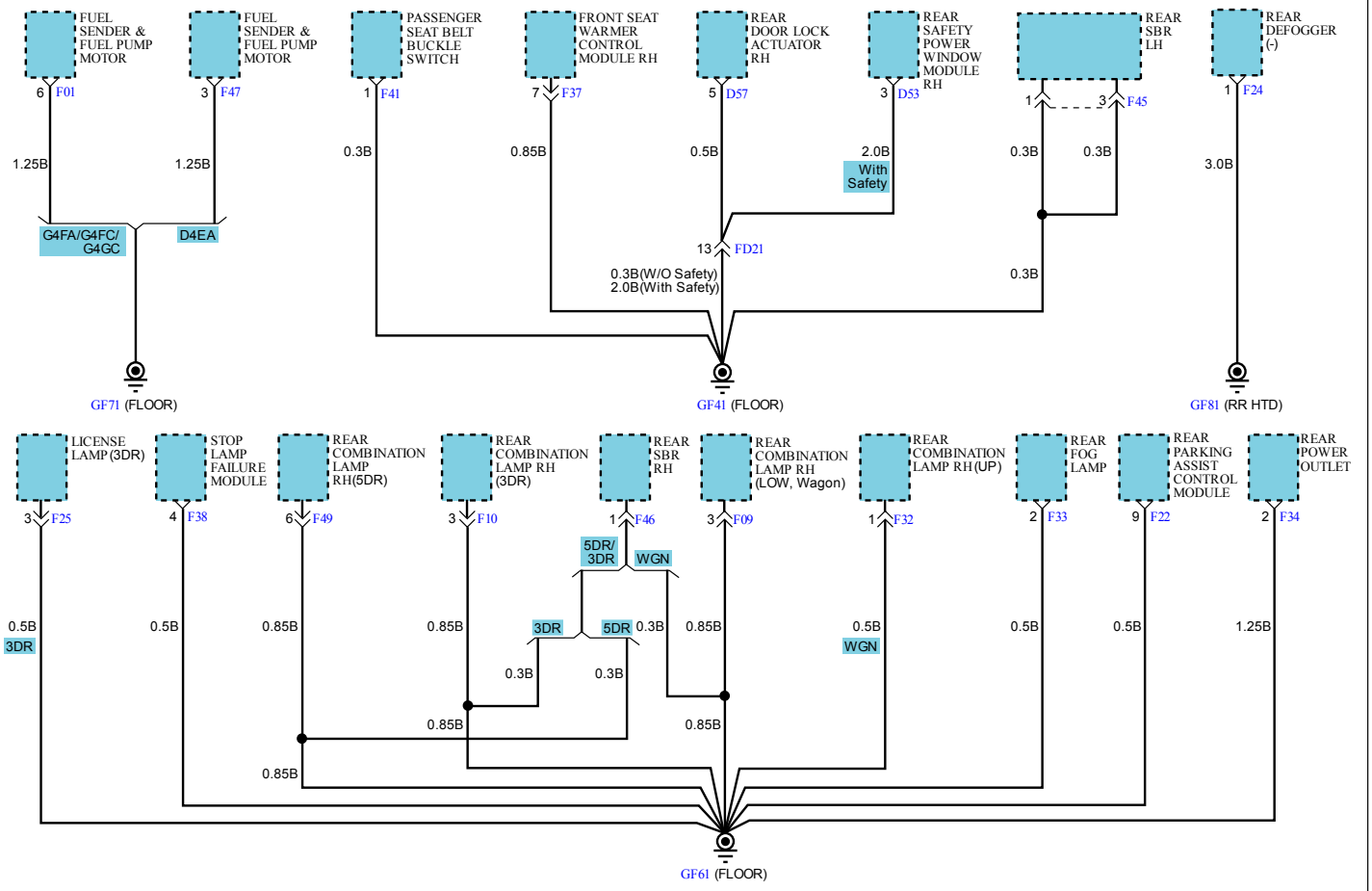
Ground Distribution (2) SD130-2



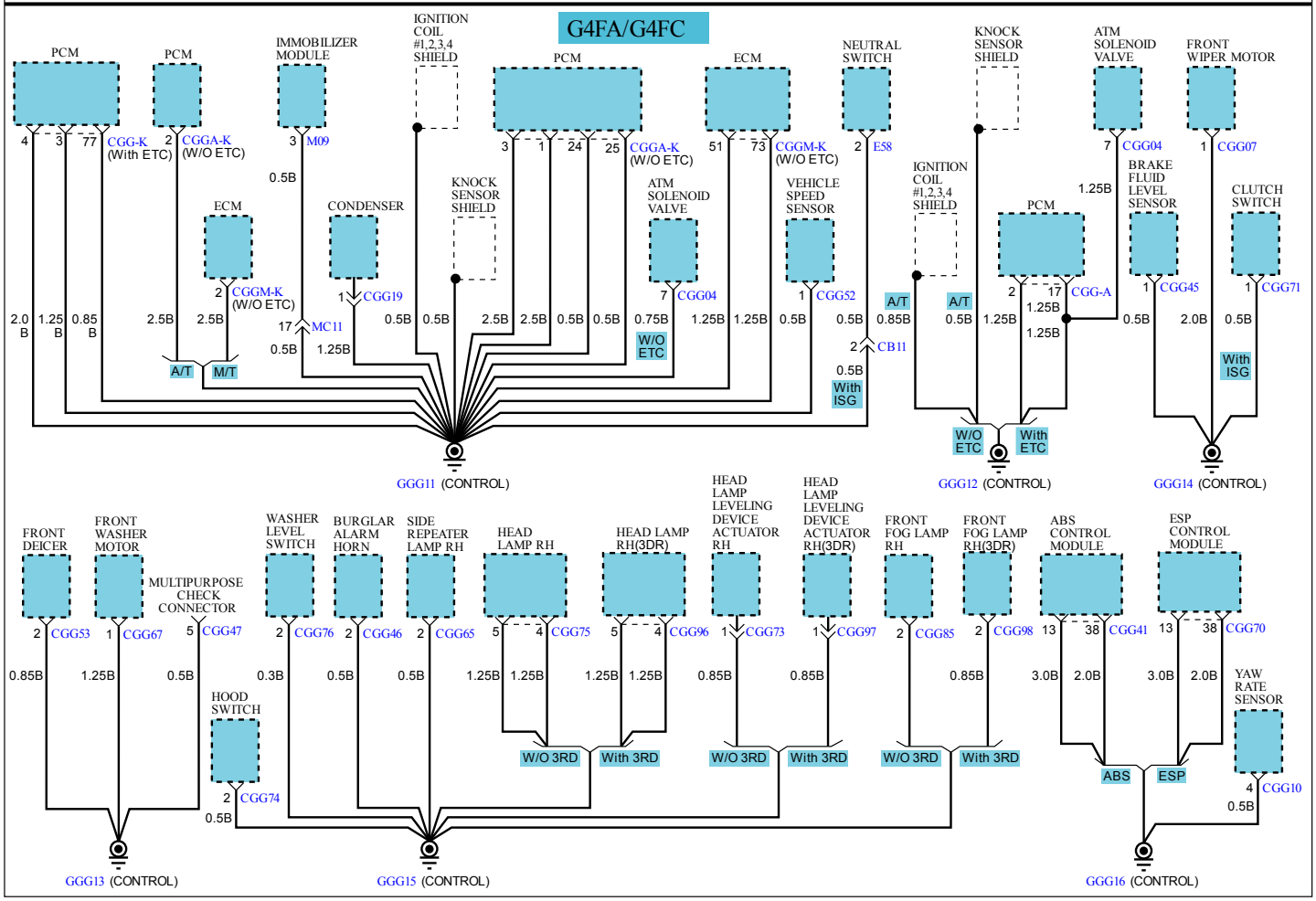
Ground Distribution (3) SD130-3



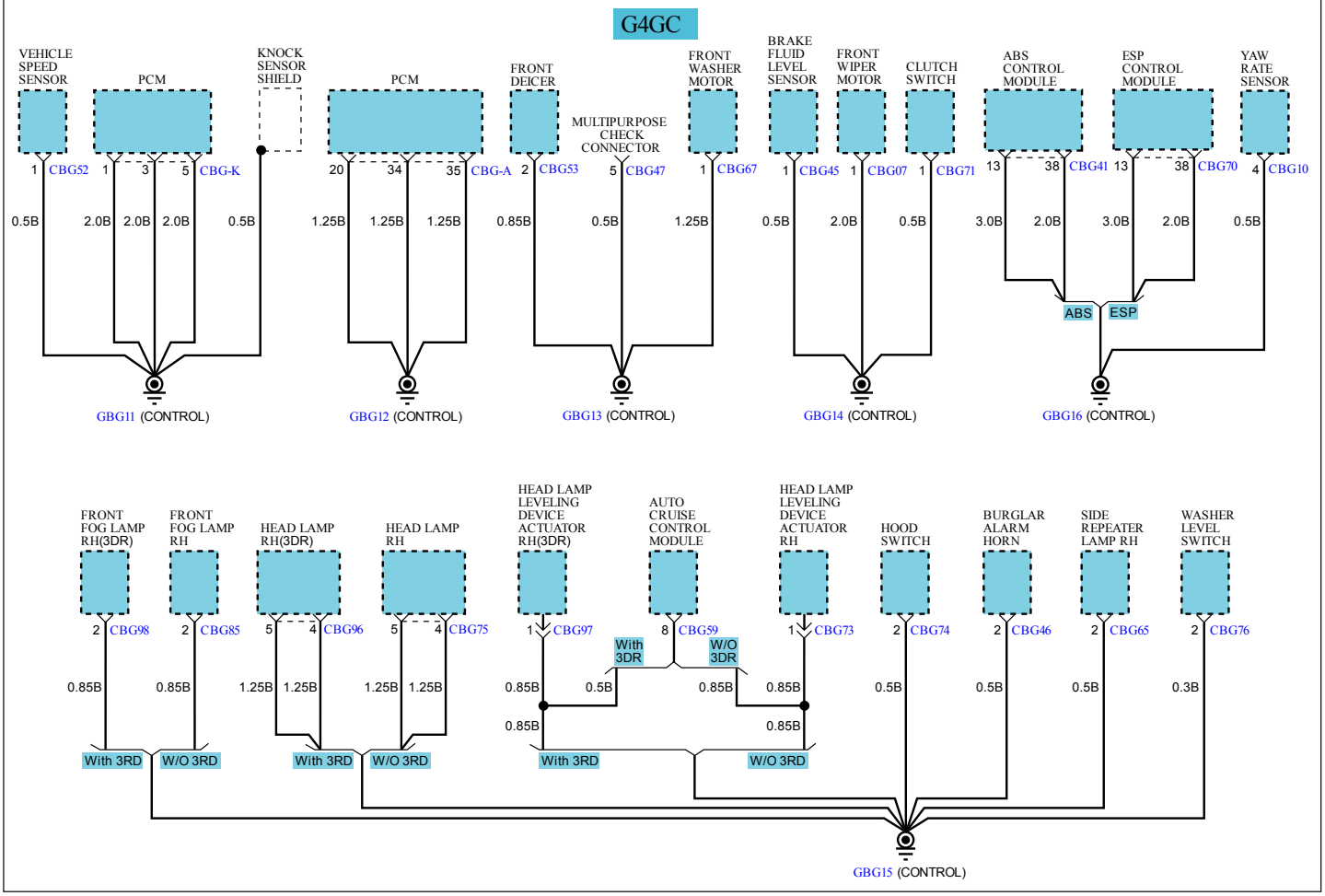
Ground Distribution (4) SD130-4



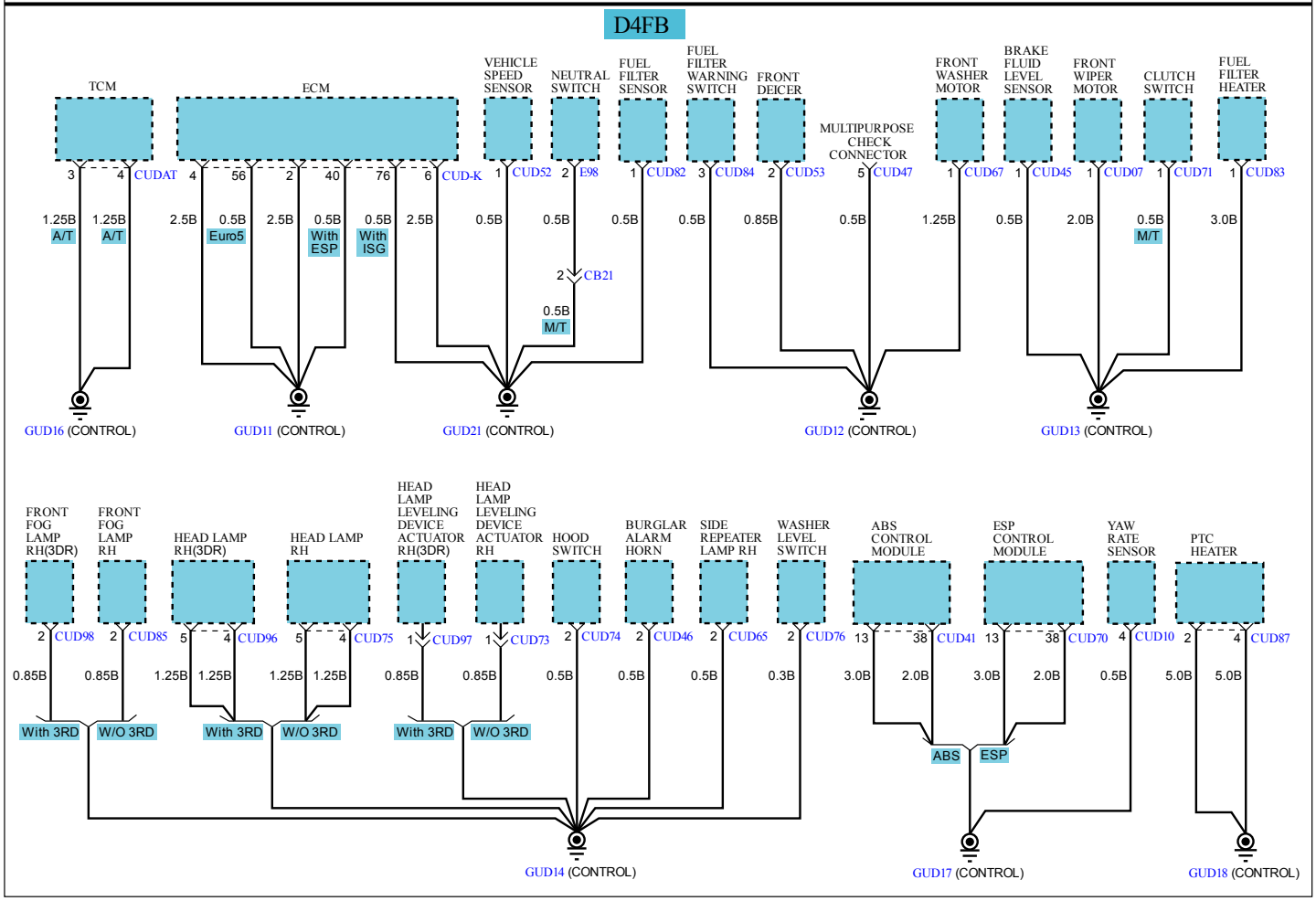
Ground Distribution (5) SD130-5



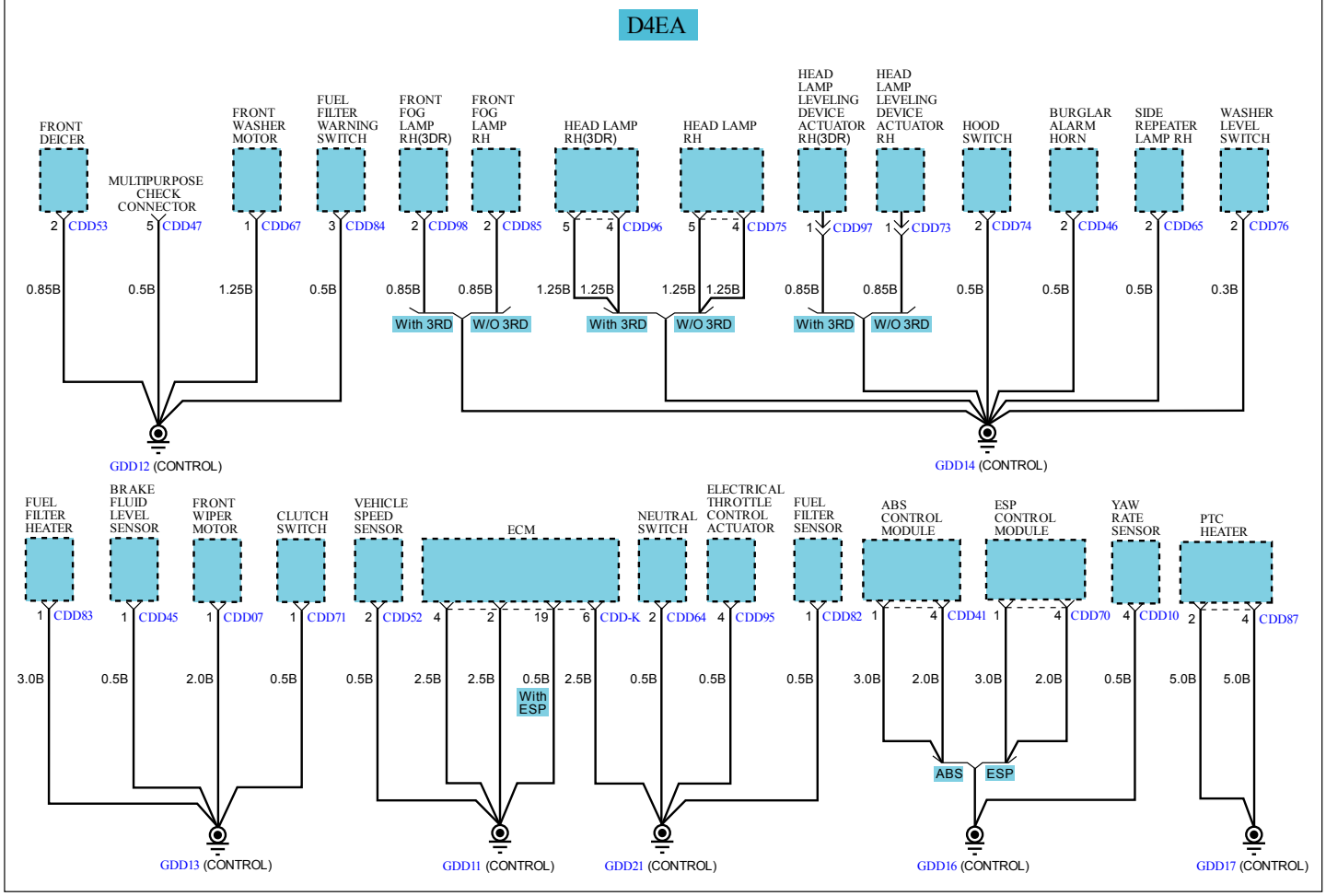
Ground Distribution (6) SD130-6



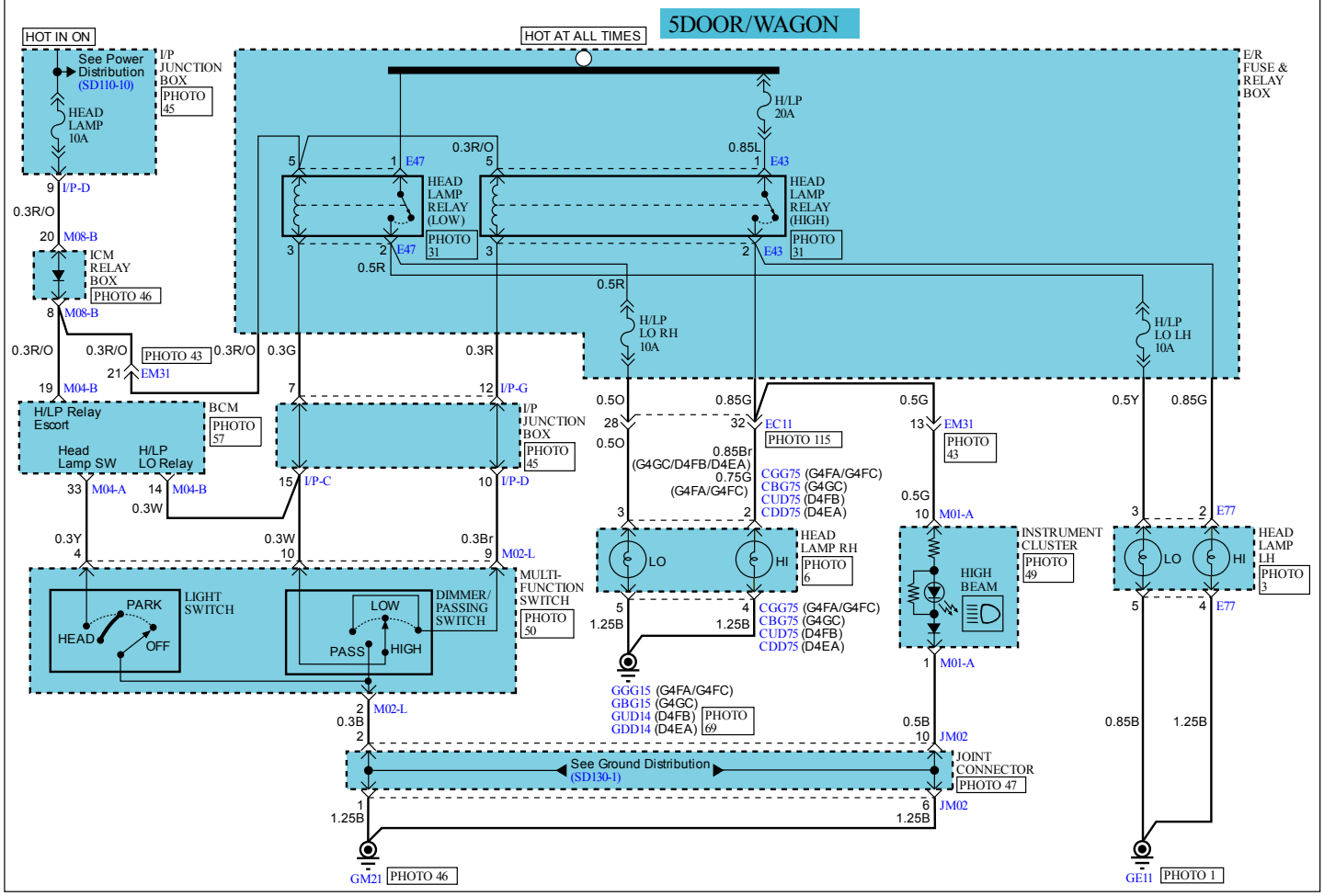
Ground Distribution (7) SD130-7



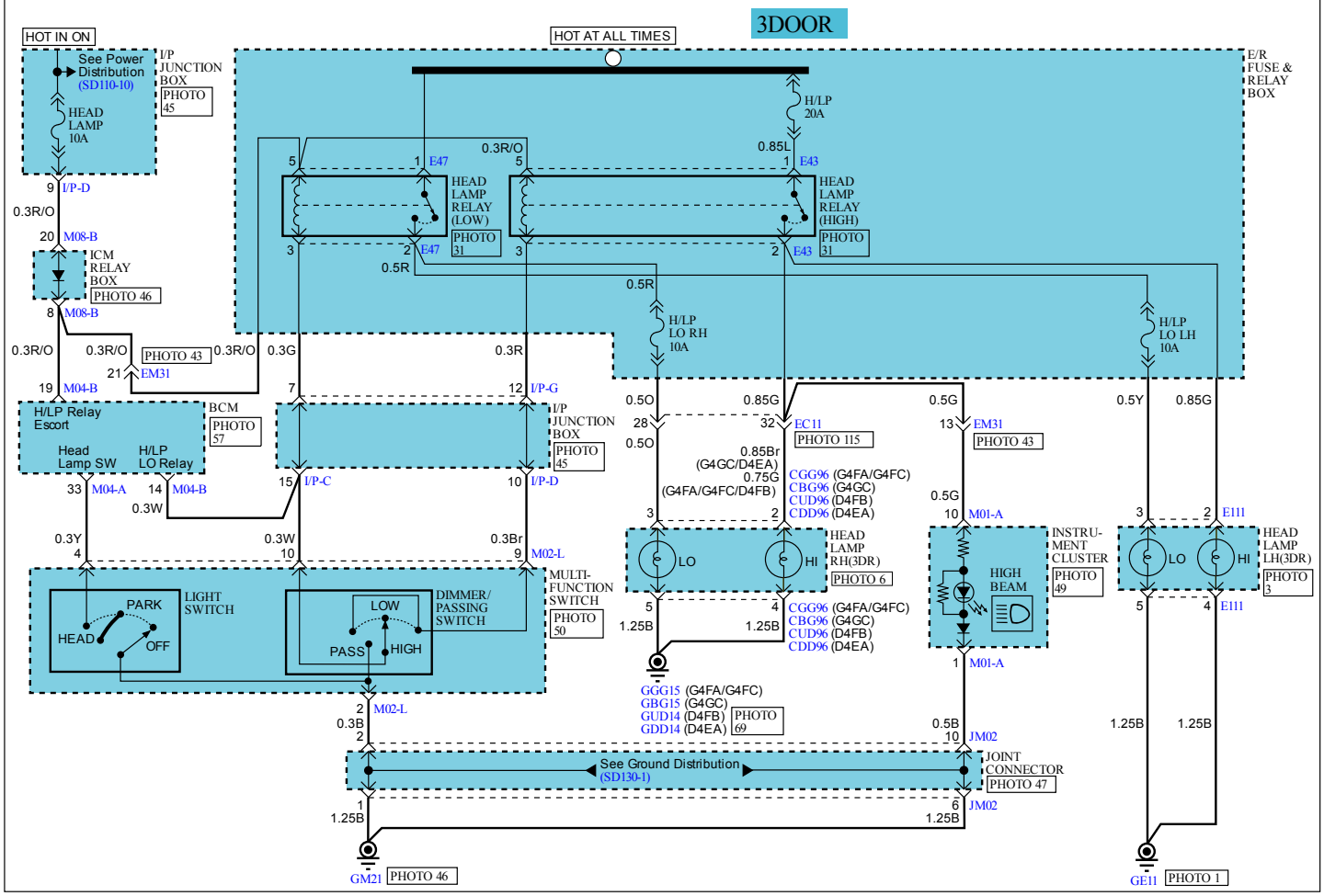
Ground Distribution (8) SD130-8



Head Lamps (1) SD921-1



Head Lamps (2) SD921-2



Head Lamps (3) SD921-3

CBG75



KUM_090WP_06F_B

CBG96



KUM_090WP_06F_B

CDD75



KUM_090WP_06F_B

CDD96



KUM_090WP_06F_B

CGG75



KUM_090WP_06F_B

CGG96



KUM_090WP_06F_B

CUD75



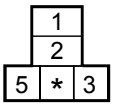
KUM_090WP_06F_B

CUD96



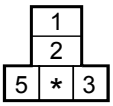
KUM_090WP_06F_B

E43



CR05F011

E47



CR05F011

E77



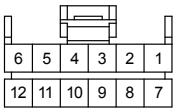
KUM_090WP_06F_B

E111



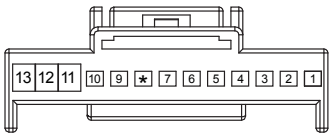
KUM_090WP_06F_B

M01-A



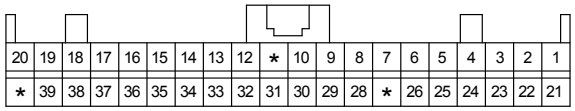
AMP_040M1_12F_B

M02-L



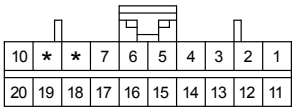
KET_0409_13F_W

M04-A



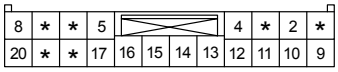
AMP_025_40F_W

M04-B



AMP_040M2_20F_B

M08-B

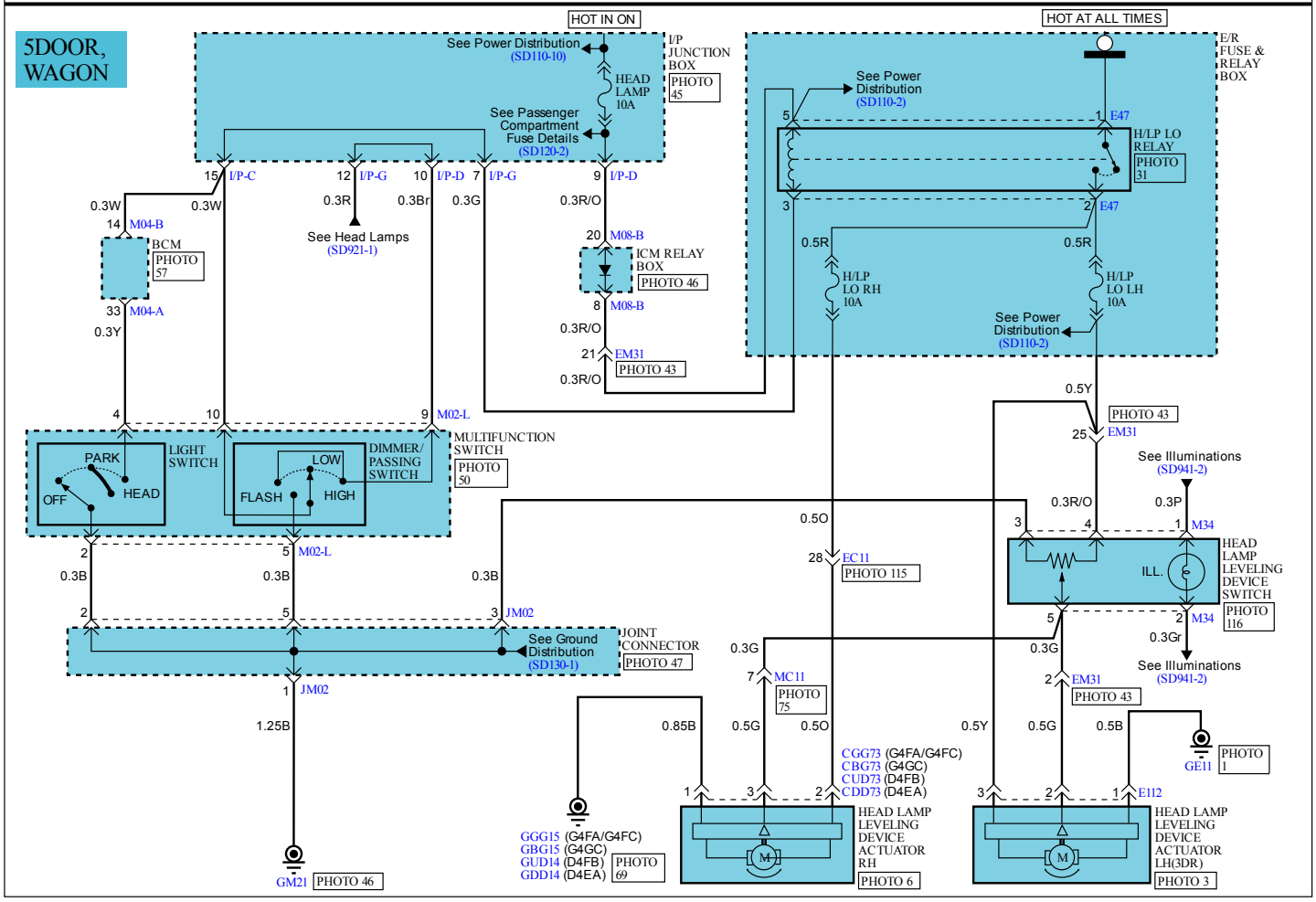


AMP_0925_20F_W

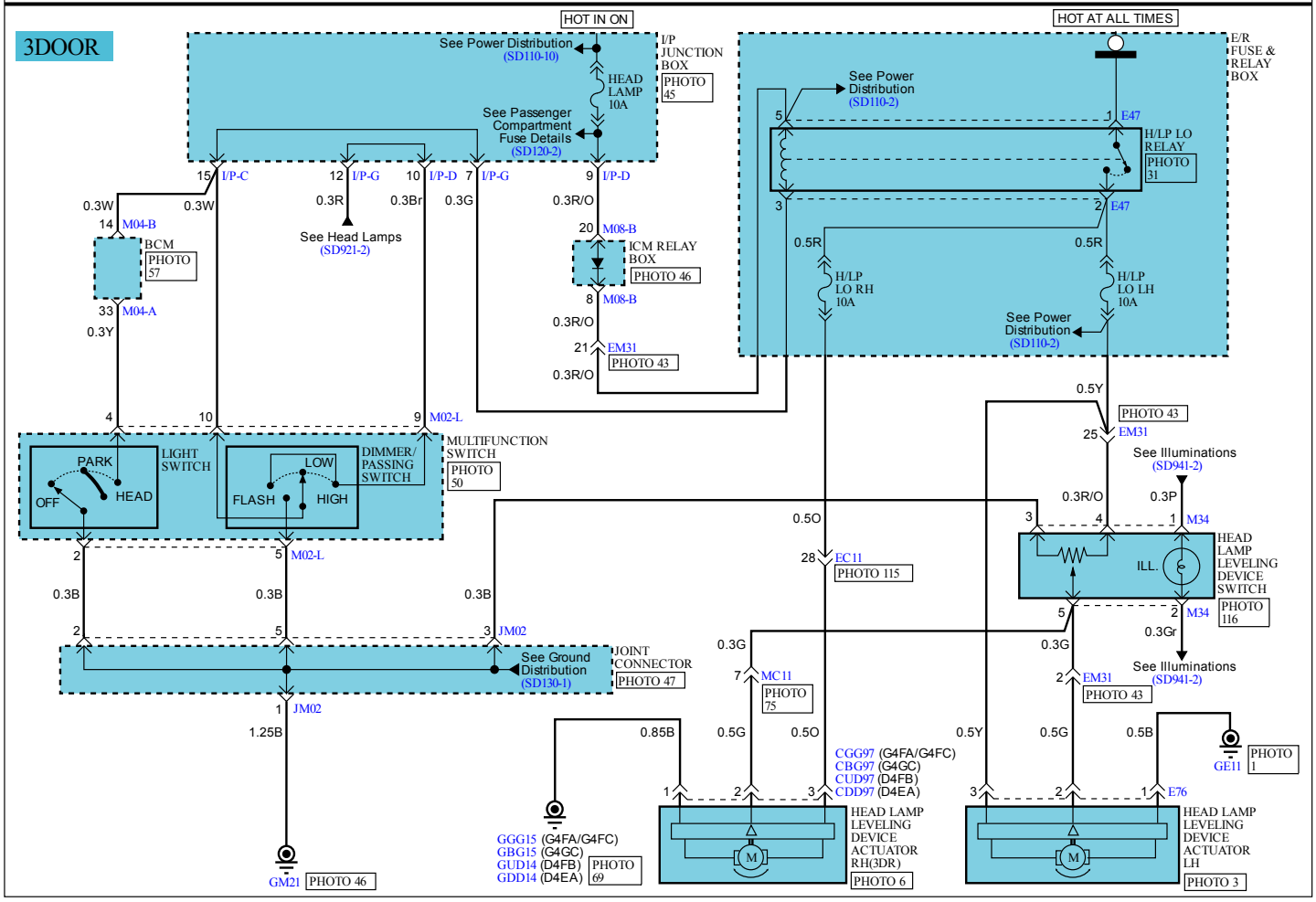
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Head Lamp Leveling Device (1) SD922-1



Head Lamp Leveling Device (2) SD922-2



Head Lamp Leveling Device (3) SD922-3

CBG73



KUM_NMWP_03F_B

CBG97



YAZ_040WP_03F_B_1

CDD73



KUM_NMWP_03F_B

CDD97



YAZ_040WP_03F_B_1

CGG73



KUM_NMWP_03F_B

CGG97



YAZ_040WP_03F_B_1

CUD73



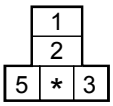
KUM_NMWP_03F_B

CUD97



YAZ_040WP_03F_B_1

E47



CR05F011

E76



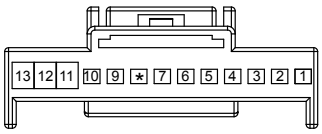
AMP_025WP_03F_B

E112



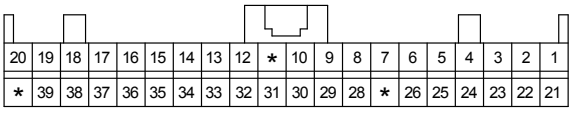
YAZ_040WP_03F_B_1

M02-L



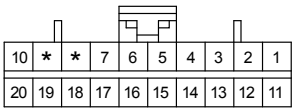
KET_0409_13F_W

M04-A



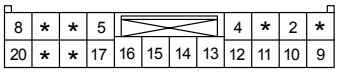
AMP_025_40F_W

M04-B



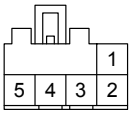
AMP_040M2_20F_B

M08-B



AMP_0925_20F_W

M34



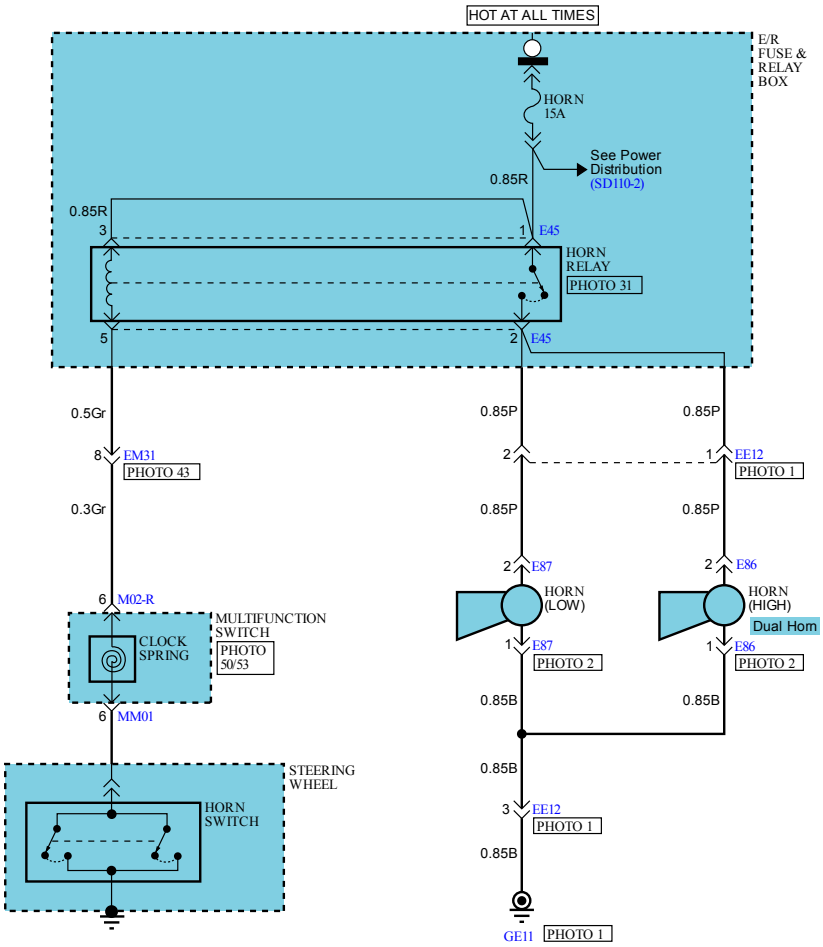
KUM_CDR_05F_W

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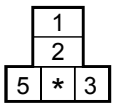
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Horns (1) SD968-1



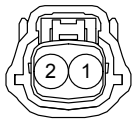
Horns (2) SD968-2

E45



CR05F011

E86



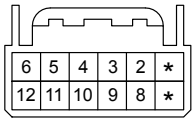
MLX_HORN_02F_B_FILT

E87



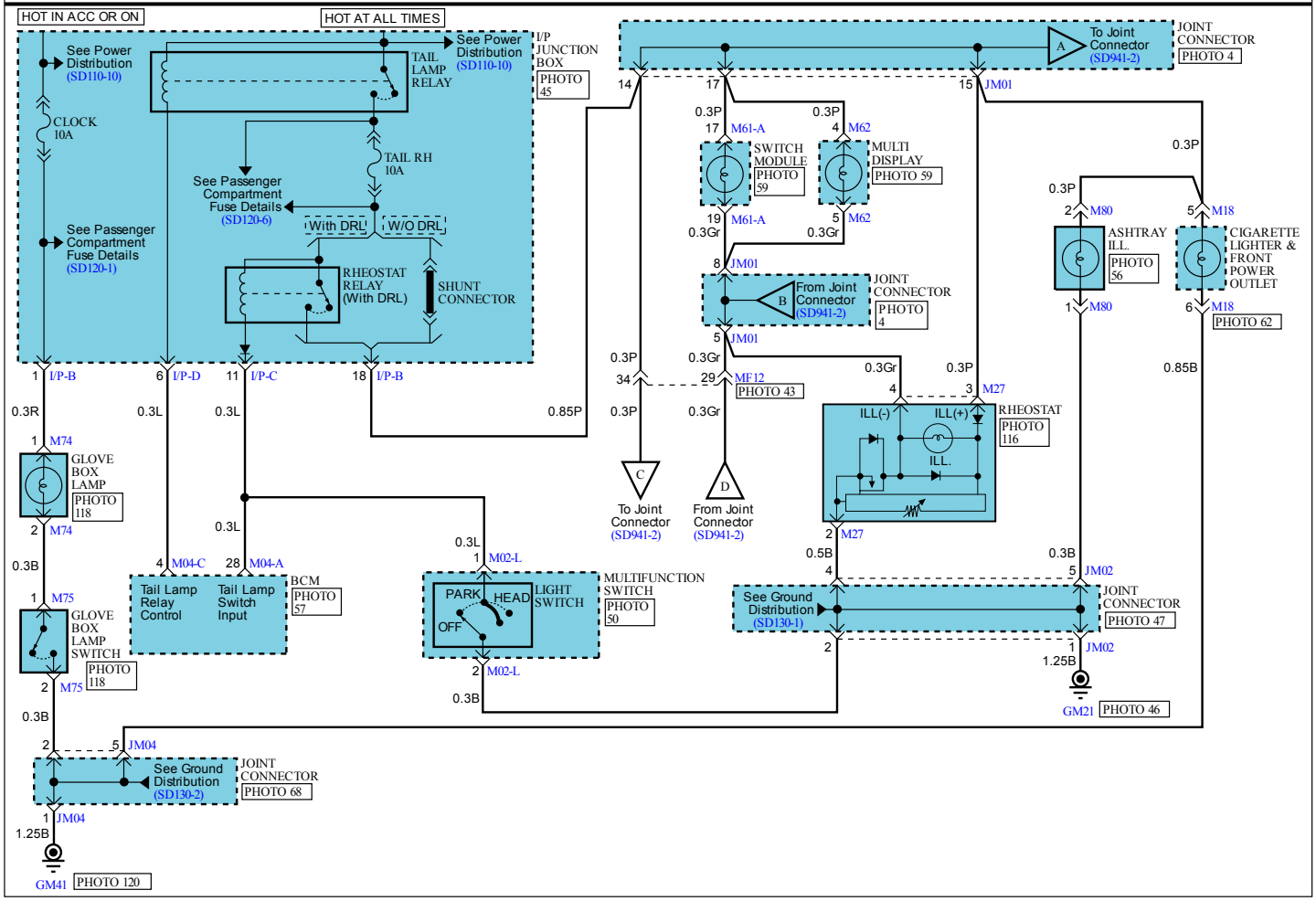
MLX_HORN_02F_B_FILT

M02-R

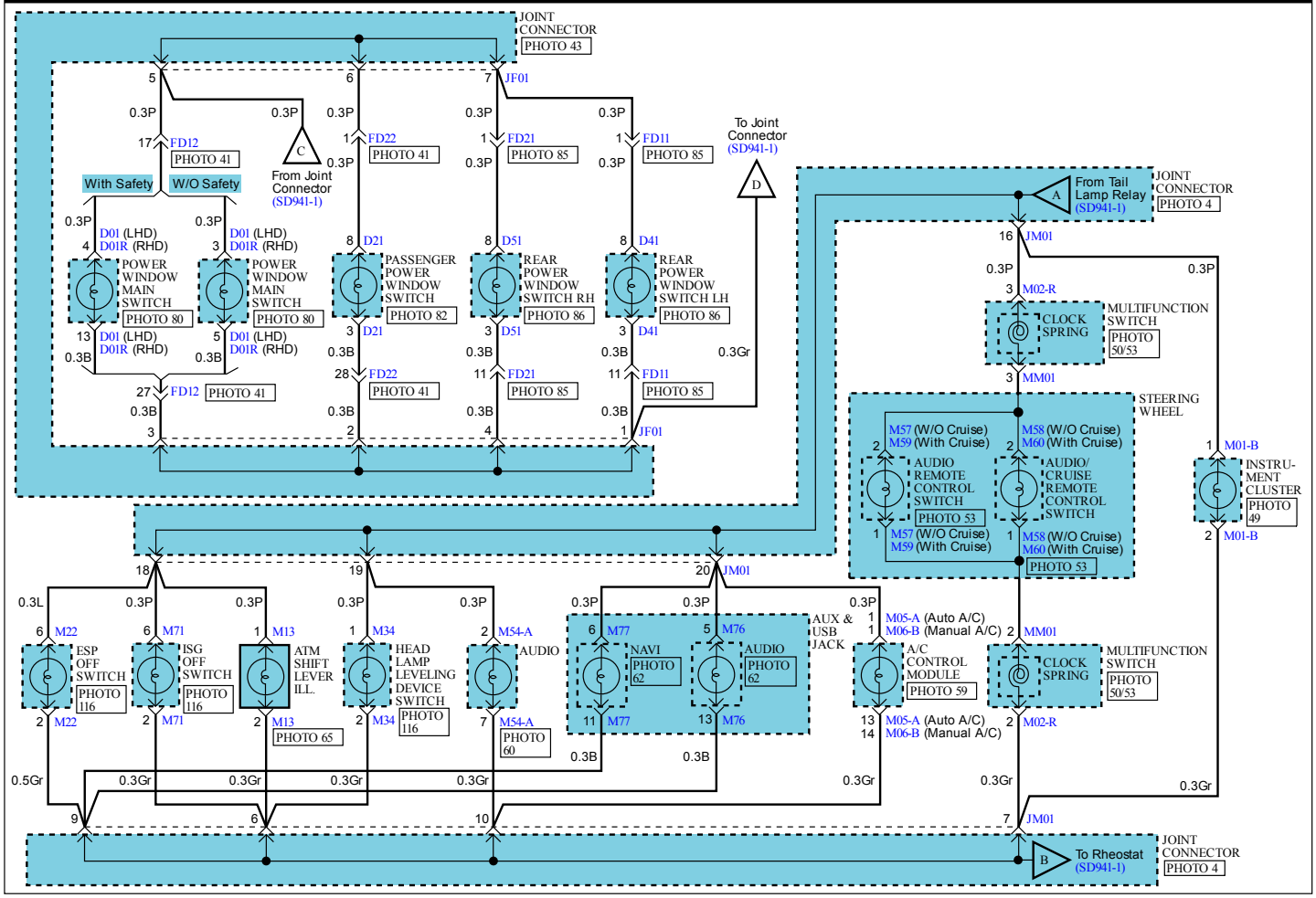


AMP_025_12F_W

Illuminations (1) SD941-1

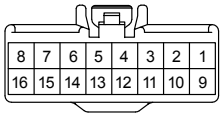


Illuminations (2) SD941-2



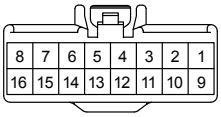
Illuminations (3) SD941-3

D01



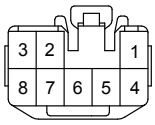
KET_090III_16F_W

D01R



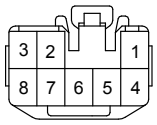
KET_090III_16F_W

D21



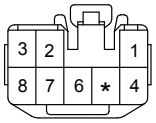
KET_090II_08F_W

D41



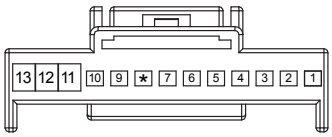
KET_090II_08F_W

D51



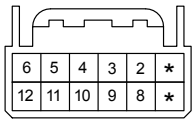
KET_090II_08F_W

M02-L



KET_0409_13F_W

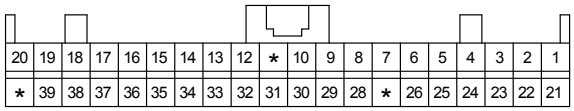
M02-R



AMP_025_12F_W

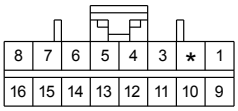
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M04-A



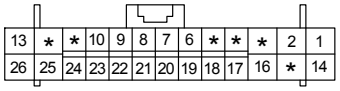
AMP_025_40F_W

M04-C



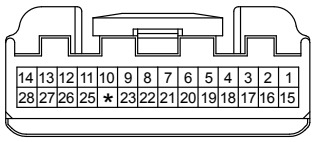
AMP_040M2_16F_W

M05-A



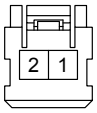
AMP_0407_26F_W_HD

M06-B



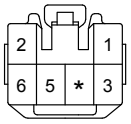
AMP_025_28F_W

M13



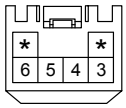
AMP_090III_02F_W

M18



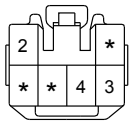
KET_090II_06F_W

M22



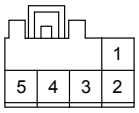
AMP_090III_06F_R_2

M27



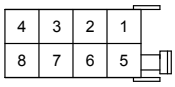
KET_090II_06F_W

M34



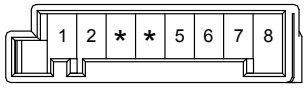
KUM_CDR_05F_W

M54-A



AMP_JT_08F_Gr_D2

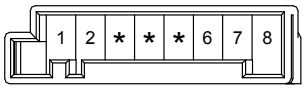
M57



AMP 0-1743282-1

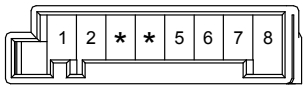
Illuminations (4) SD941-4

M58



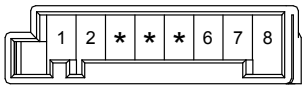
AMP 0-1743282-2

M59



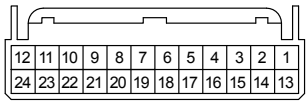
AMP 0-1743282-1

M60



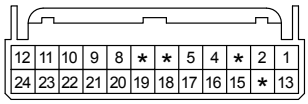
AMP 0-1743282-2

M61-A



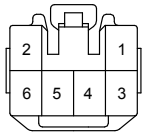
AMP_025_24F_W

M62



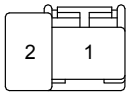
AMP_025_24F_W

M71



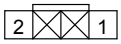
KET_090II_06F_B

M74



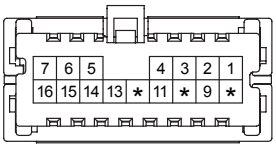
AMP_PLM2_02F_B_DL

M75



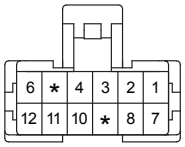
KET_187_02F_W

M76



KET_040II_16F

M77



KET_040SP_12F_B

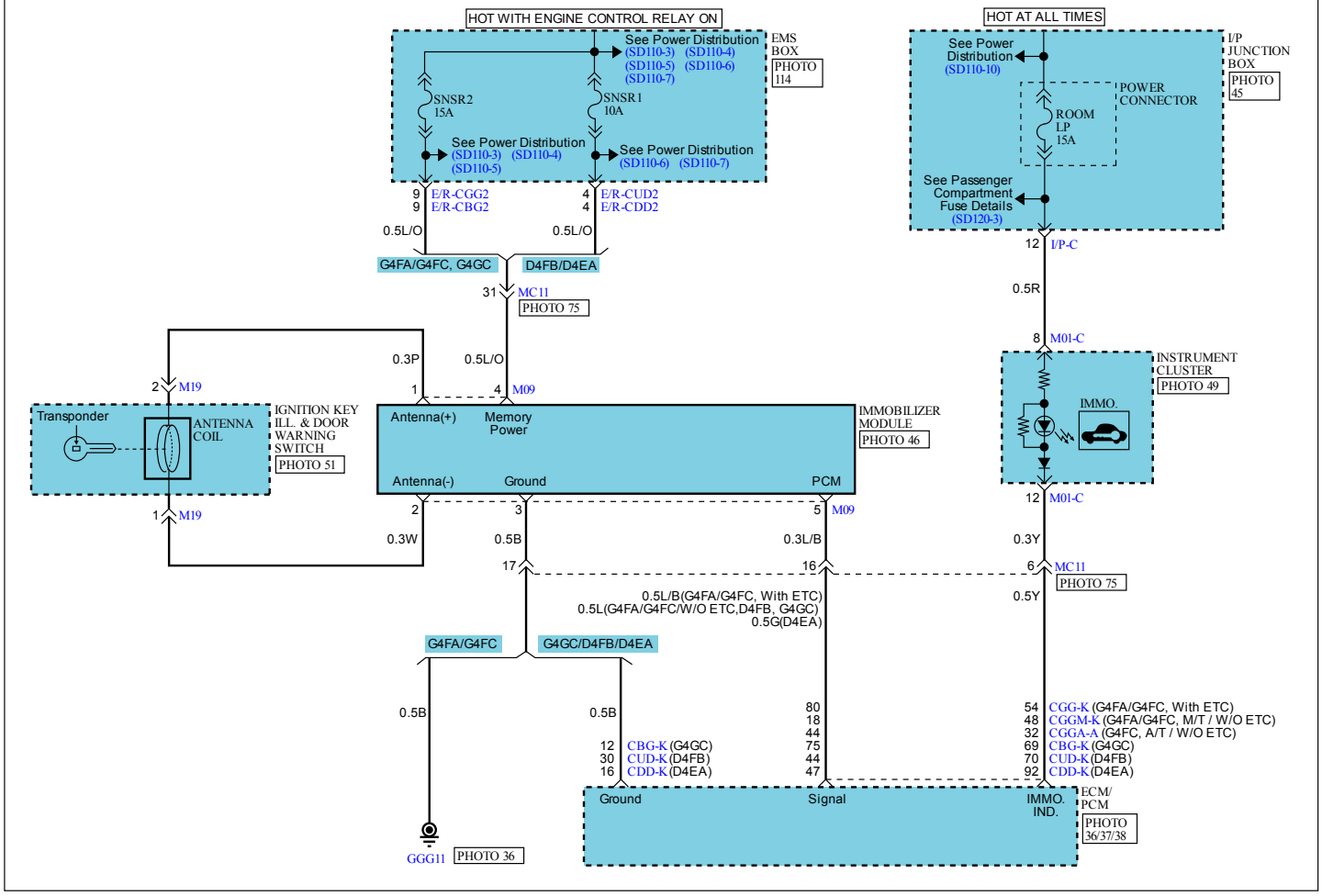
M80



KET_090III_2F_W_L

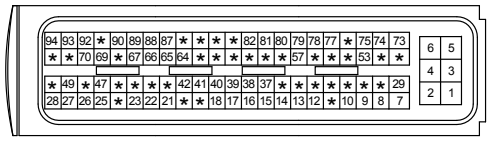
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Immobilizer System (1) SD954-1



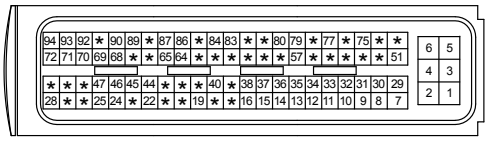
Immobilizer System (2) SD954-2

CBG-K



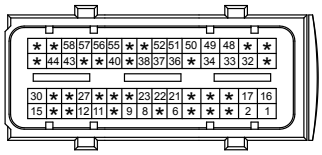
AMP_ECU_94F_B

CDD-K



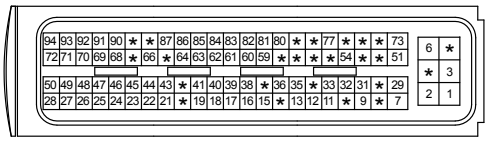
AMP_ECU_94F_B

CGGA-A



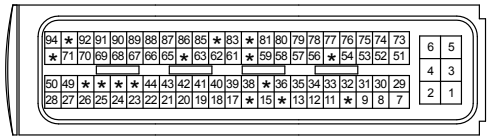
AMP_ECU_60F_B_A

CGGM-K



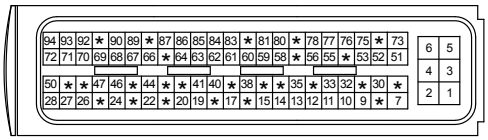
AMP_ECU_94F_B

CGG-K



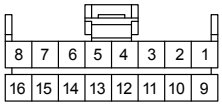
AMP_ECU_94F_B

CUD-K



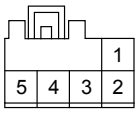
AMP_ECU_94F_B

M01-C



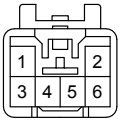
AMP_040M1_16F_B

M09



KUM_CDR_05F_W

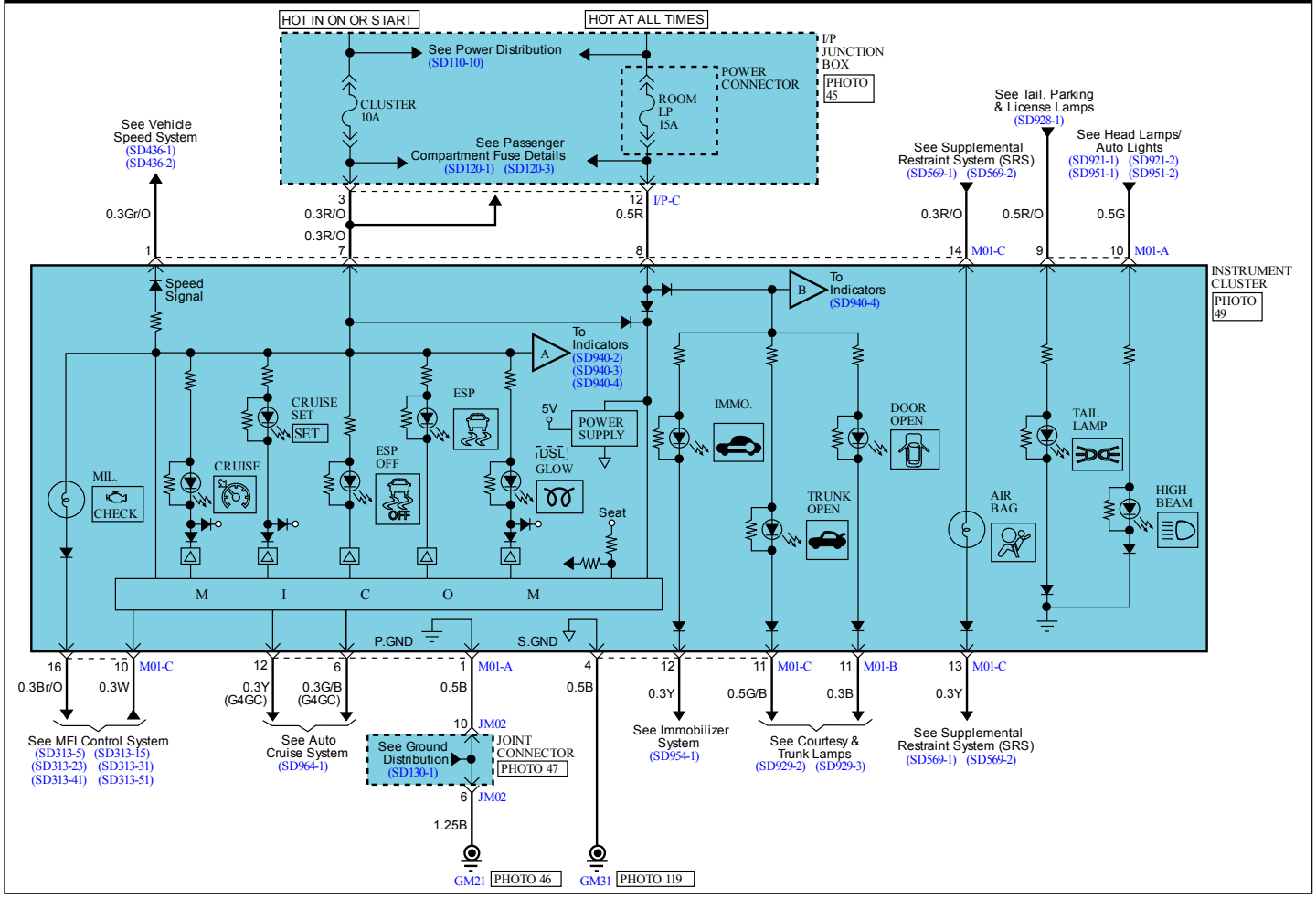
M19



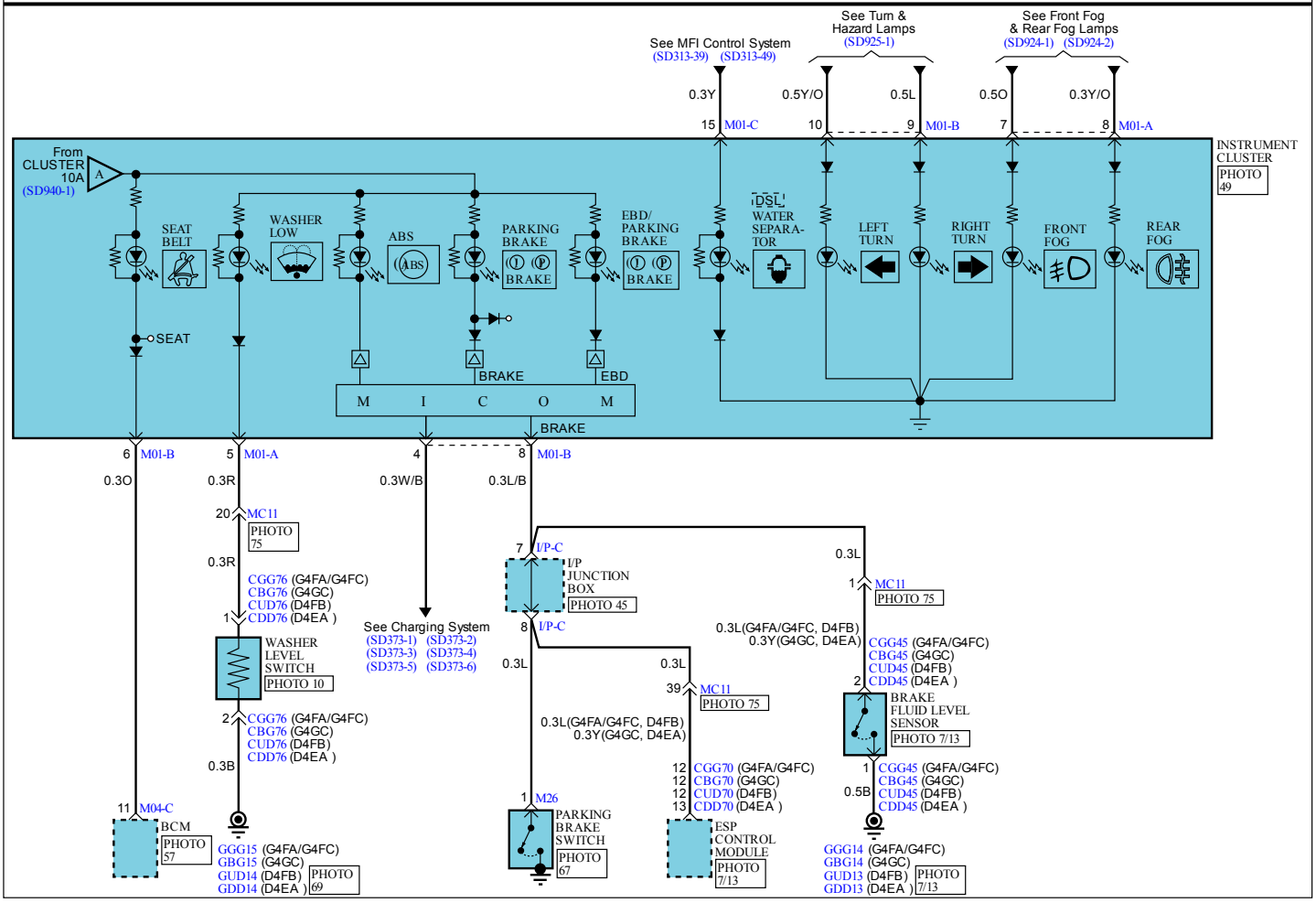
KET_090II_06M_G r

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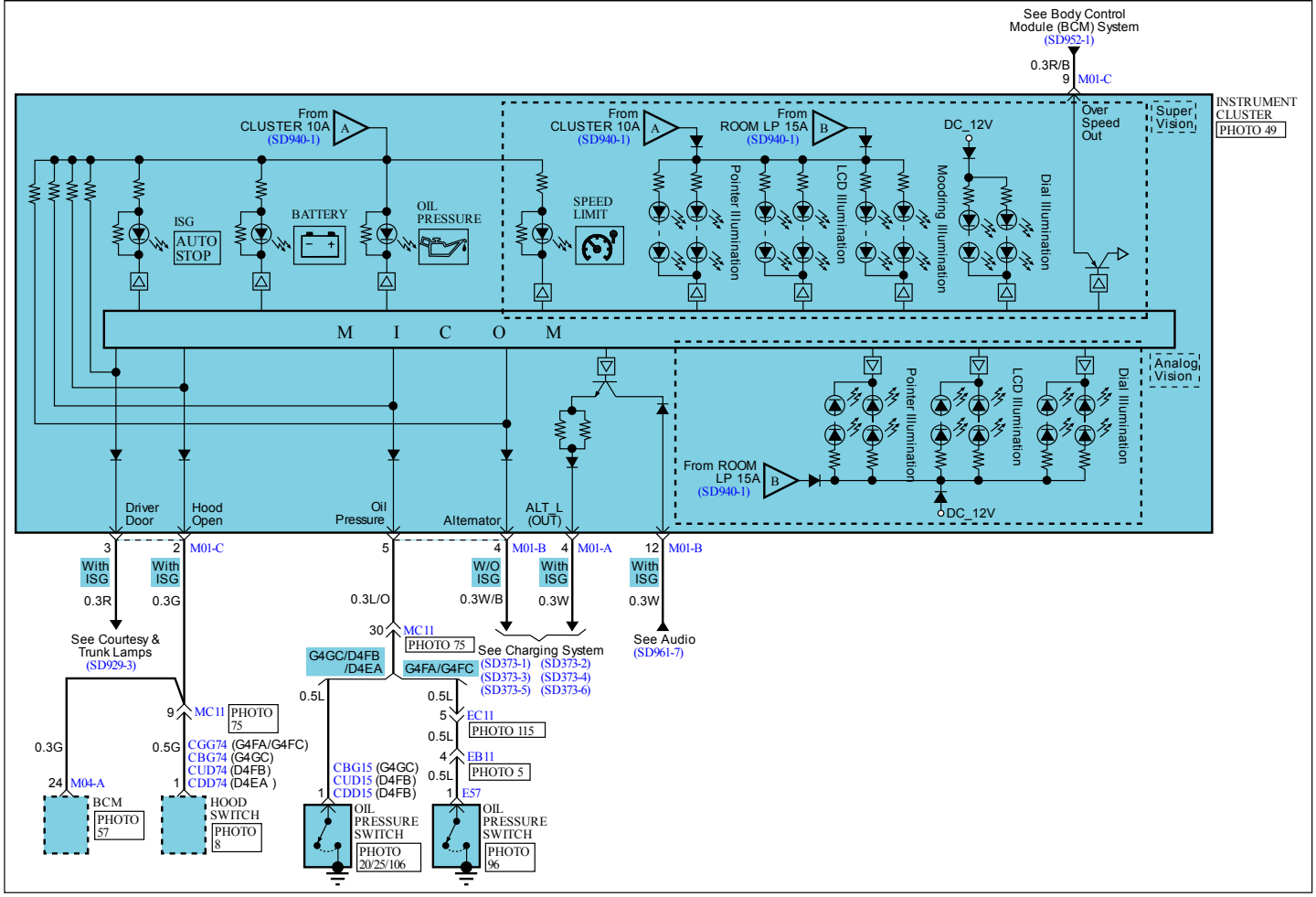
Indicators & Gauges (1) SD940-1



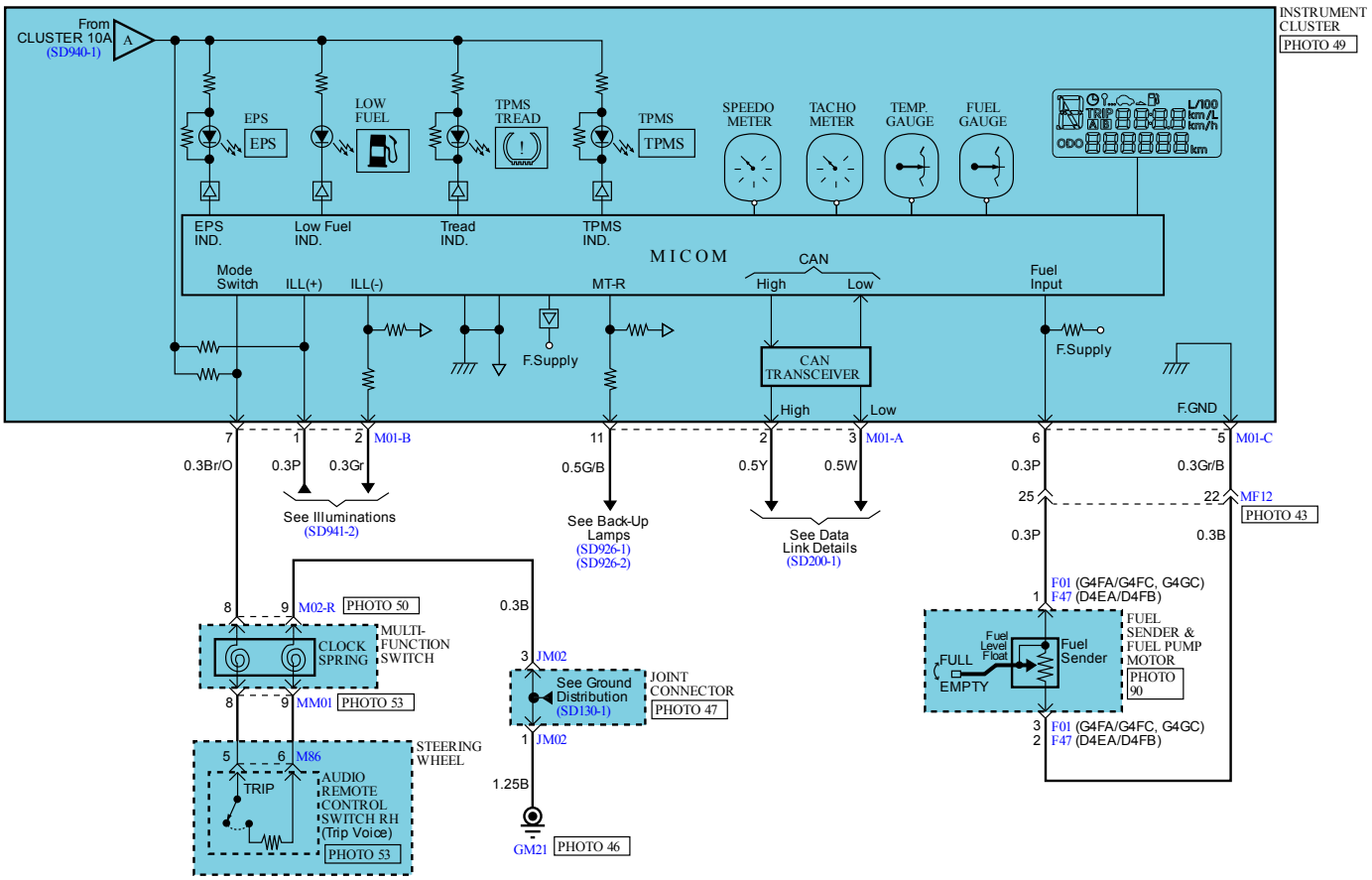
Indicators & Gauges (2) SD940-2



Indicators & Gauges (3) SD940-3



Indicators & Gauges (4) SD940-4



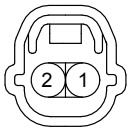
Indicators & Gauges (5) SD940-5

CBG15



AMP_PLM2_01F_B

CBG45



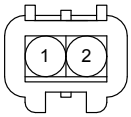
KET_SSD_02F_B

CBG74



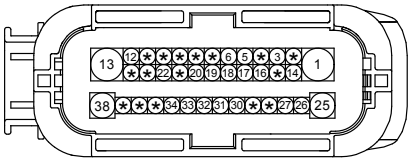
KET_090IIWP_02F_B_ASM

CBG76



KUM_NMWP_02M_B

CBG70



DEL_ABS_38F_B_A

CDD15



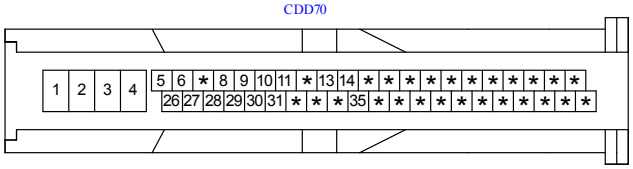
KUM_NMWP_01F_B

CDD45



KET_SSD_02F_B

CDD70



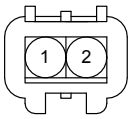
BOS_ESP_46F_B_L

CDD74



KET_090IIWP_02F_B_ASM

CDD76



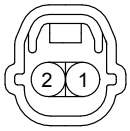
KUM_NMWP_02M_B

CUD15



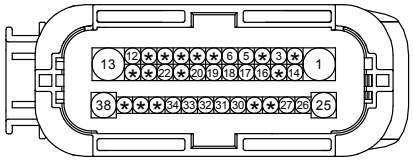
KUM_NMWP_01F_B

CGG45



KET_SSD_02F_B

CGG70



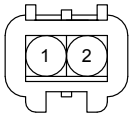
DEL_ABS_38F_B_A

CGG74



KET_090IIWP_02F_B_ASM

CGG76



KUM_NMWP_02M_B

CUD45

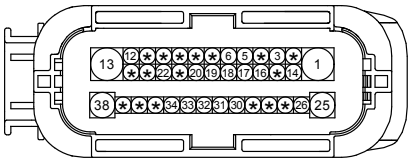


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Indicators & Gauges (6) SD940-6

CUD70



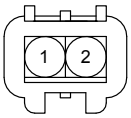
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CUD74



KET_090IIWP_02F_B_ASM

CUD76



KUM_NMWP_02M_B

E57



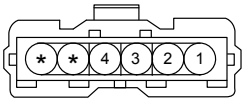
KUM_NMWP_01F_B

F01



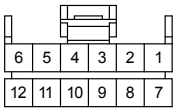
KET_090IIWP_06F_B

F47



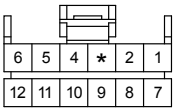
FCI_SENSOR_06F_B

M01-A



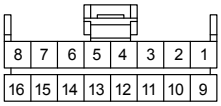
AMP_040M1_12F_B

M01-B



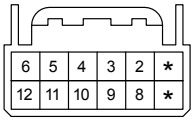
AMP_040M1_12F_B

M01-C



AMP_040M1_16F_B

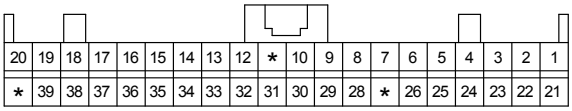
M02-R



AMP_025_12F_W

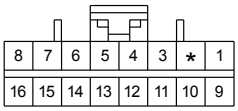
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M04-A



AMP_025_40F_W

M04-C



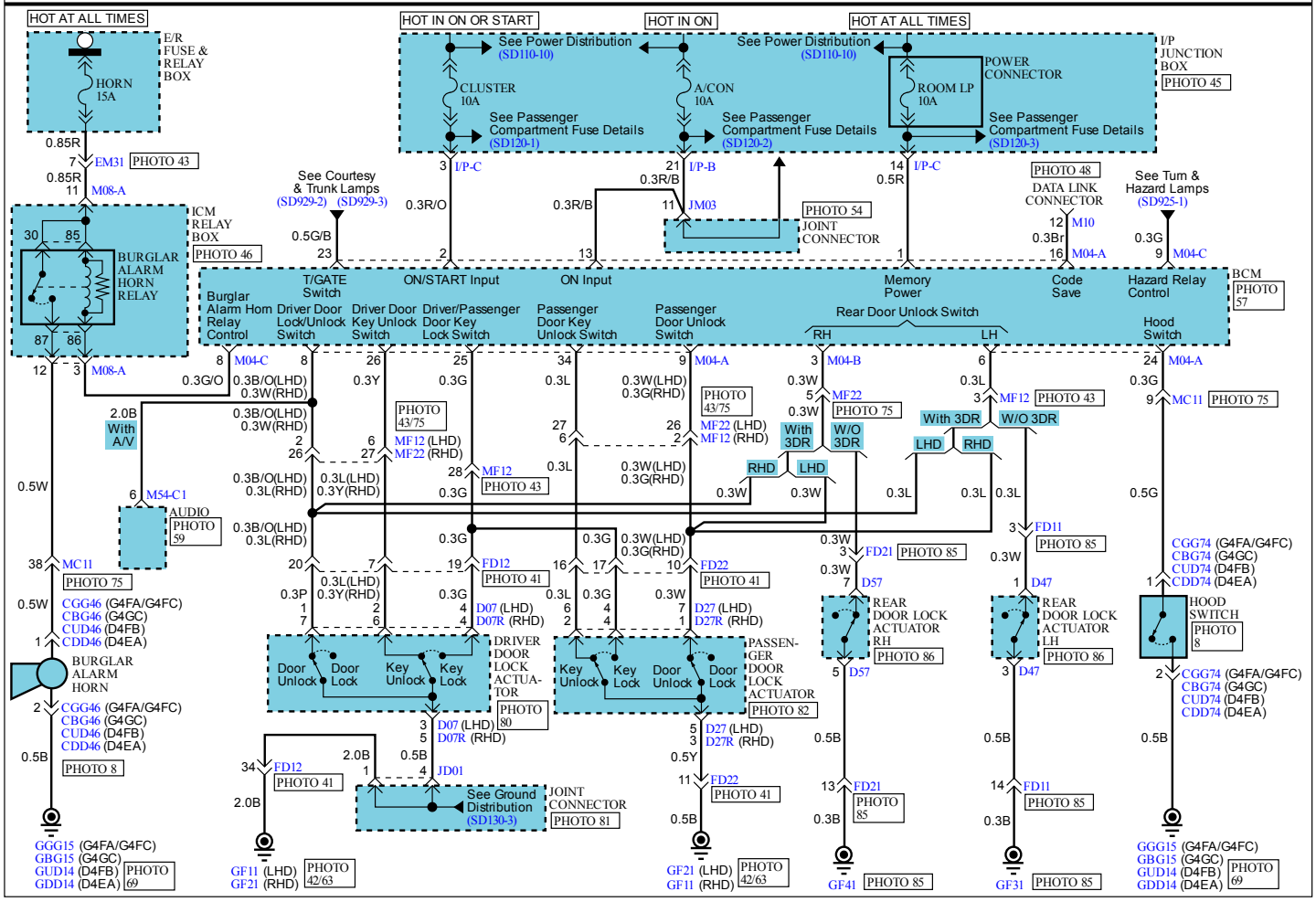
AMP_040M2_16F_W

M26



AMP_PLM1_01F_B

Keyless Entry & Burglar Alarm System (1) SD814-1



Keyless Entry & Burglar Alarm System (2) SD814-2

CBG46 / CDD46



MLX_HORN_02F_B_FILT

CBG74 / CDD74



KET_090IIWP_02F_B_ASM

CGG46



MLX_HORN_02F_B_FILT

CGG74



KET_090IIWP_02F_B_ASM

CUD46



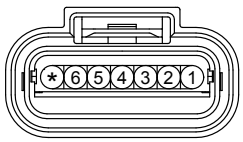
MLX_HORN_02F_B_FILT

CUD74



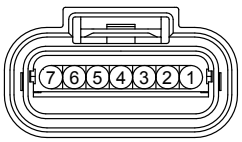
KET_090IIWP_02F_B_ASM

D07



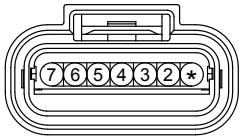
AMP_025WP_07F_B

D07R



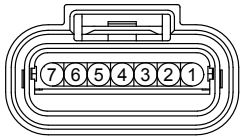
AMP_025WP_07F_B

D27



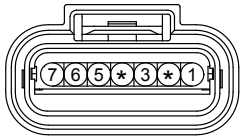
AMP_025WP_07F_B

D27R



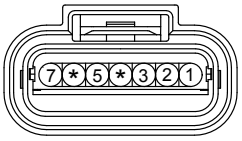
AMP_025WP_07F_B

D47



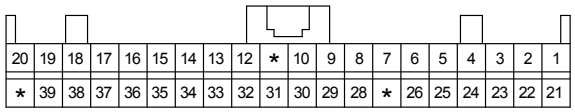
AMP_025WP_07F_B

D57



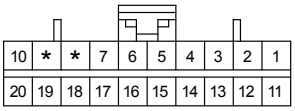
AMP_025WP_07F_B

M04-A



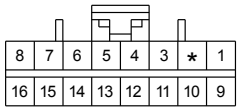
AMP_025_40F_W

M04-B



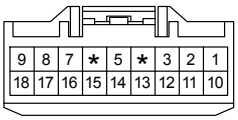
AMP_040M2_20F_B

M04-C



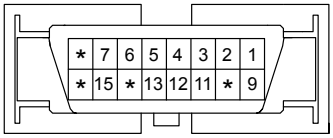
AMP_040M2_16F_W

M08-A



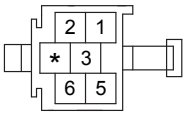
AMP_090III_18F_W

M10



MLX_OBDII_16F_B

M54-C1

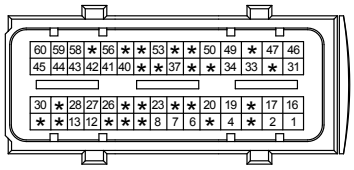


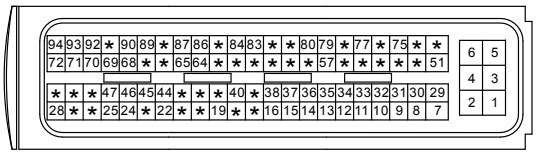
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MFI Control System (D4EA : D 2.0L) (1) SD313-45

ECM Terminal Information





CDD-A

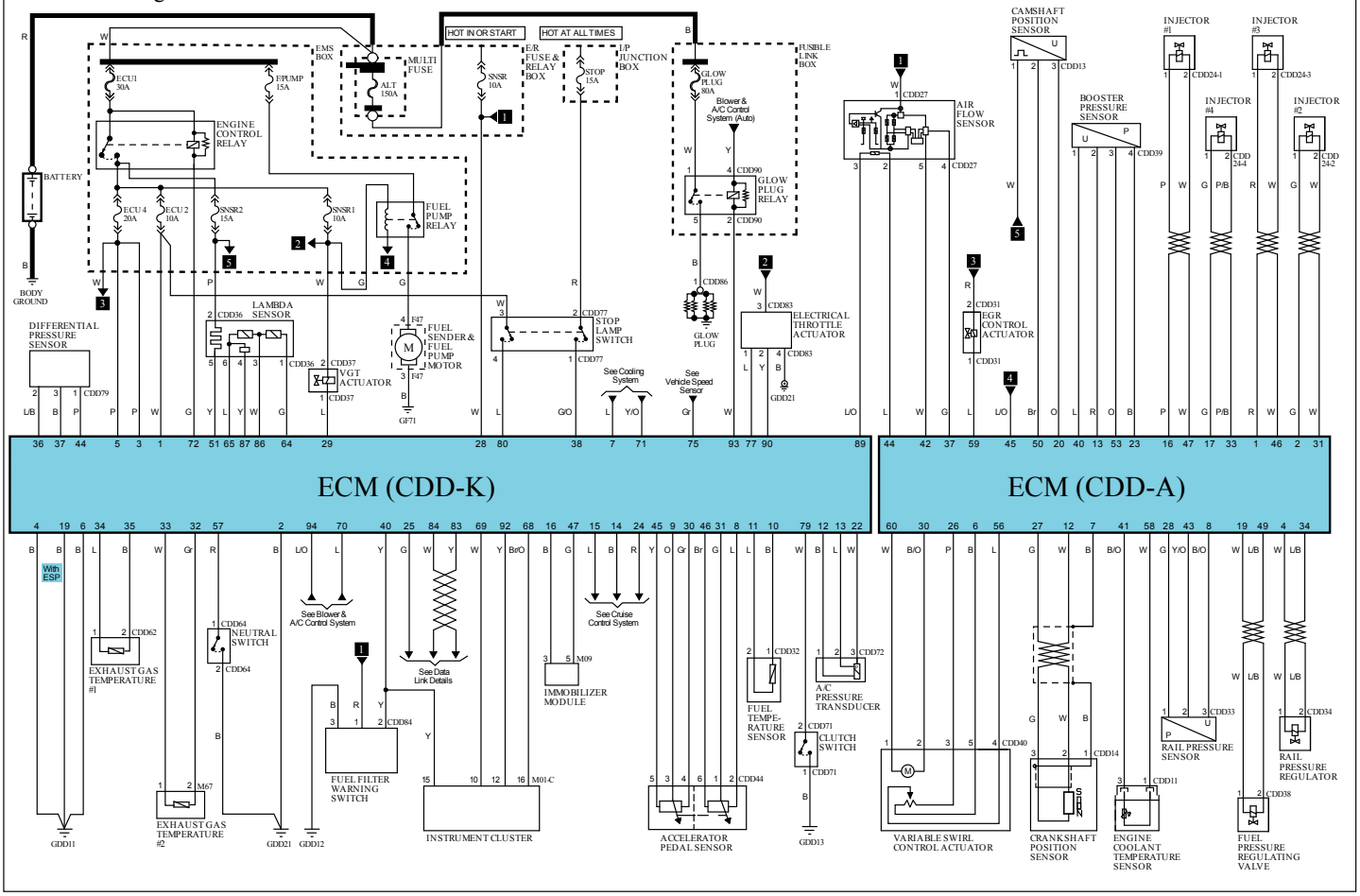
PIN	COLOR	DESCRIPTION	PIN	COLOR	DESCRIPTION
1	R	Injector #3 Control	32	-	-
2	G	Injector #2 Control	33	P/B	Injector #4 Control
3	-	-	34	L/B	Ground
4	W	Power	35	-	-
5	-	-	36	-	-
6	B	Ground	37	G	Reference Frequency
7	B	Sensor Shield	38	-	-
8	B/O	Ground	39	-	-
9	-	-	40	L	BPS Signal
10	-	-	41	B/O	Ground
11	-	-	42	W	AFS Signal
12	W	Sensor Signal	43	Y/O	Signal
13	R	Power	44	L	Ground
14	-	-	45	L/O	Fuel Pump Relay Control
15	-	-	46	W	Injector #3 Control
16	P	Injector #1 Control	47	W	Injector #1 Control
17	G	Injector #4 Control	48	-	-
18	-	-	49	L/B	Ground
19	W	Power	50	Br	Sensor Signal
20	O	Sensor Ground	51	-	-
21	-	-	52	-	-
22	-	-	53	O	BPS Temp. Signal
23	B	Ground	54	-	-
24	-	-	55	-	-
25	-	-	56	L	Feed Back Signal
26	P	Power	57	-	-
27	G	Sensor Signal	58	W	Signal
28	G	Power	59	L	EGR Actuator
29	-	-	60	W	MTR(+)
30	B/O	MTR(-)			
31	W	Injector #2 Control			

CDD-K

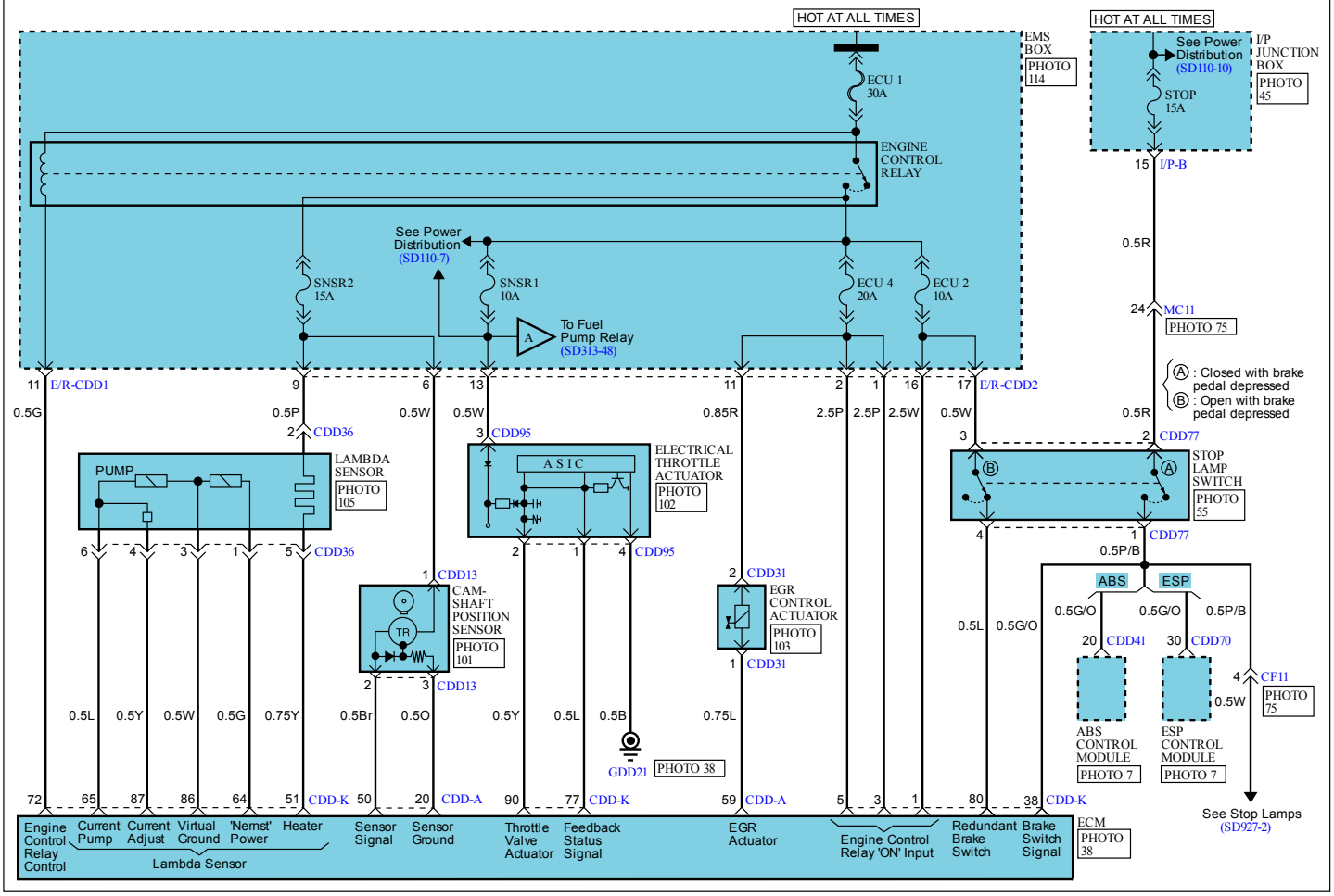
PIN	COLOR	DESCRIPTION	PIN	COLOR	DESCRIPTION	PIN	COLOR	DESCRIPTION
1	W	Engine Control Relay 'ON' Input	33	W	Ground	65	L	Lambda Sensor Current Pump
2	B	Ground	34	L	Signal	66	-	-
3	P	Engine Control Relay 'ON' Input	35	B	Ground	67	-	-
4	B	Ground	36	L/B	Signal	68	Br/O	MIL. Indicator Control
5	P	Engine Control Relay 'ON' Input	37	B	Ground	69	W	Glow Time Ind. Lamp
6	B	Ground	38	G/O	Brake Switch Signal	70	L	A/Con Relay Control
7	L	Fan Relay Control (High)	39	-	-	71	Y/O	Fan Relay Control (Low)
8	L	Ground #2	40	Y	Signal	72	G	Engine Control Relay Control
9	O	Signal #1	41	-	-	73	-	-
10	B	Ground	42	-	-	74	-	-
11	L	Signal	43	-	-	75	Gr	Vehicle Speed Input
12	B	Ground	44	P	Power	76	-	-
13	L	Signal	45	Y	Power #1	77	L	Feedback Status Signal
14	B	Cruise Ground	46	Br	Power #2	78	-	-
15	L	Cruise Switch	47	G	IMMO. Interface	79	W	Clutch Switch Signal
16	B	IMMO. Ground	48	-	-	80	L	Redundant Brake Switch
17	-	-	49	-	-	81	-	-
18	-	-	50	-	-	82	W	-
19	B	ESP/FTCS Auto Recognition	51	Y	Heater Lambda Sensor	83	L	CAN-Low
20	-	-	52	-	-	84	-	CAN-High
21	-	-	53	-	-	85	-	-
22	W	Power	54	-	-	86	W	Lambda Sensor Virtual Ground
23	-	-	55	-	-	87	Y	Lambda Sensor Current Adjust
24	R	Cruise Switch Power	56	-	-	88	-	-
25	G	K-Line	57	R	Neutral Switch	89	L/O	Temperature Output
26	-	-	58	-	-	90	Y	Throttle Valve Actuator
27	-	-	59	-	-	91	-	-
28	W	ON/START Input	60	-	-	92	Y	IMMO.IND.Lamp
29	L	VGT Actuator	61	-	-	93	W	Glow Plug Relay Control
30	Gr	Ground #1	62	-	-	94	L	Auxiliary Electric heater
31	G	Signal #2	63	-	-			
32	Gr	Signal	64	G	Lambda Sensor 'NERNST' Power			

MFI Control System (D4EA : D 2.0L) (2) SD313-46

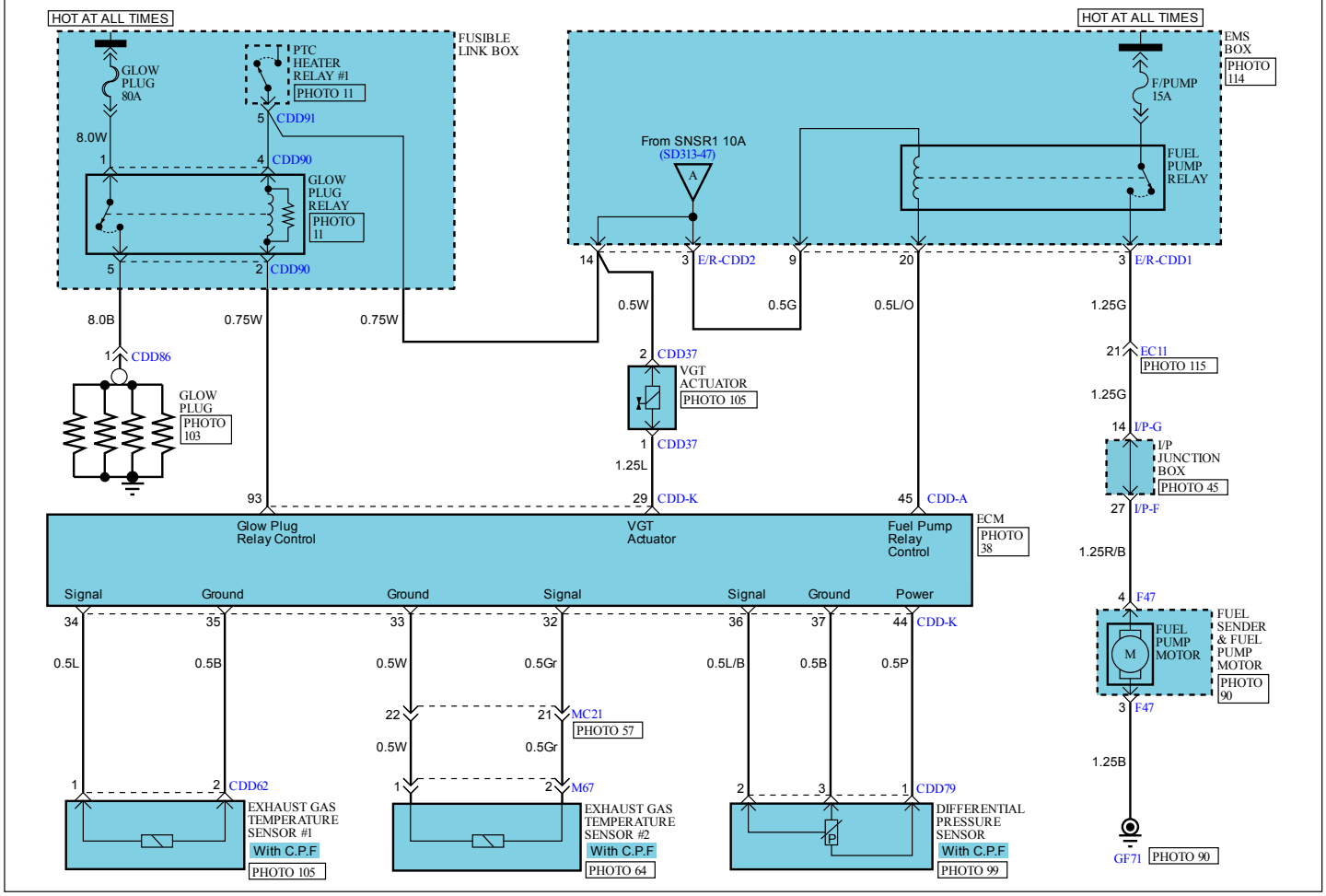
Full Circuit Diagrams



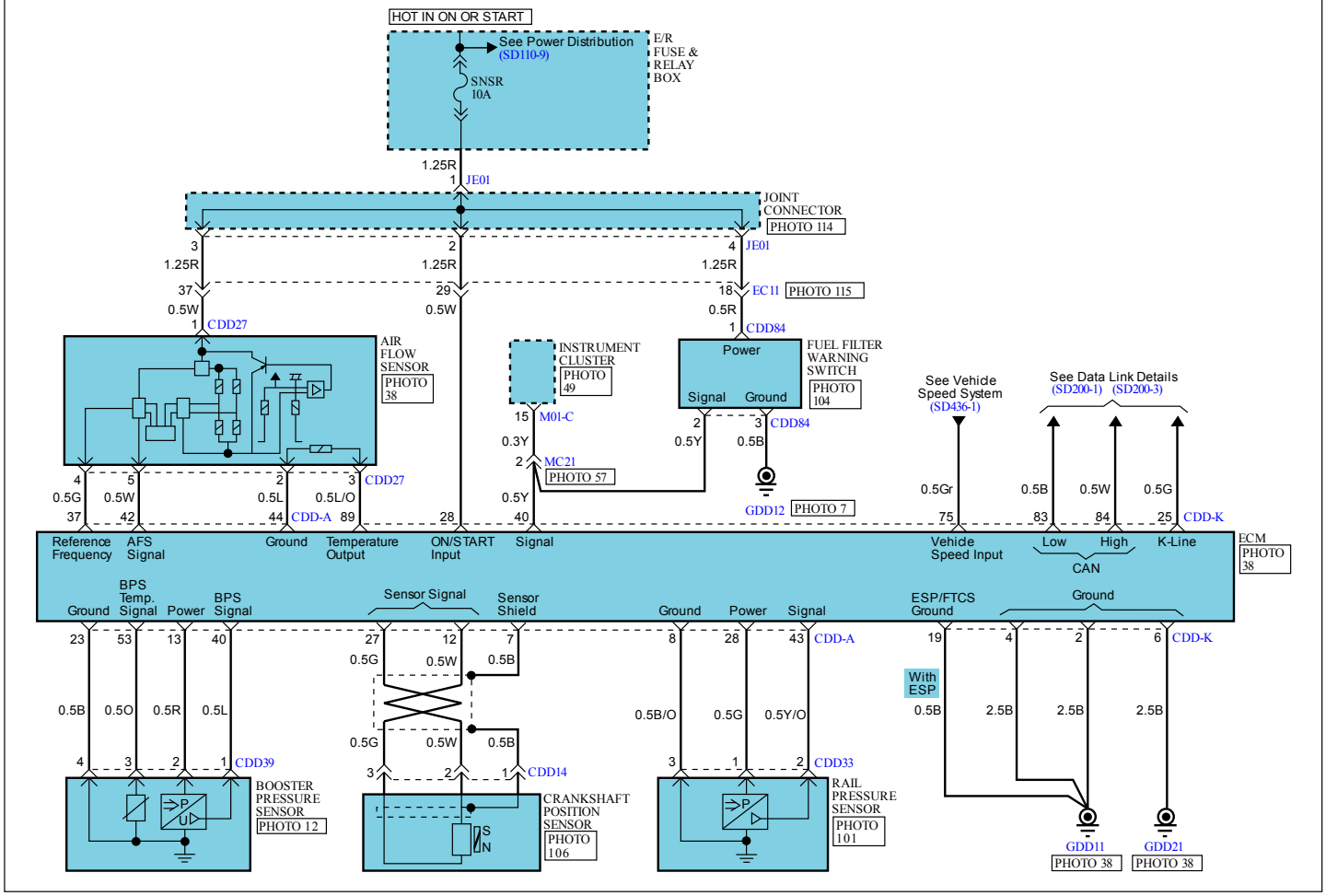
MFI Control System (D4EA : D 2.0L) (3) SD313-47



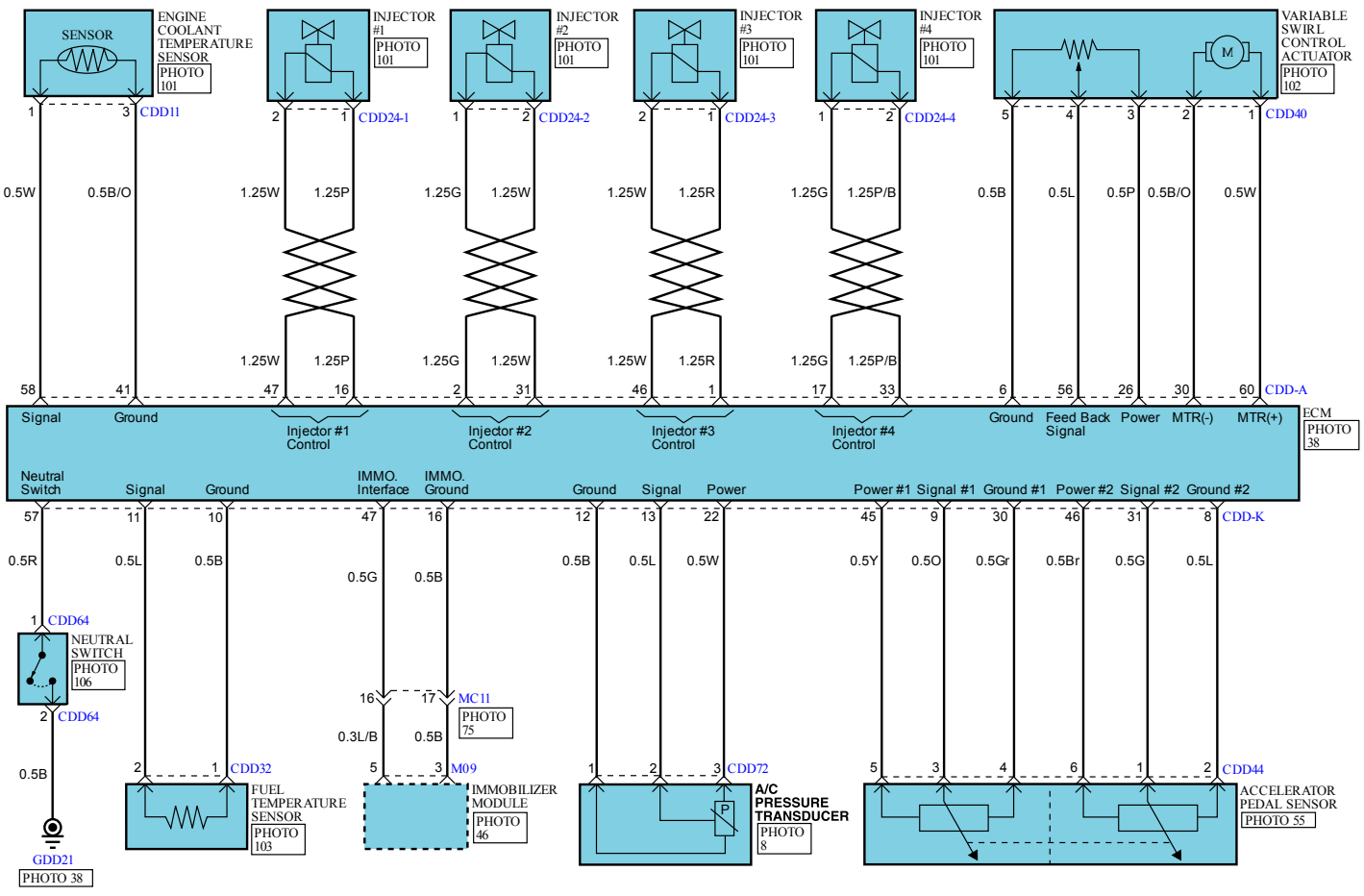
MFI Control System (D4EA : D 2.0L) (4) SD313-48



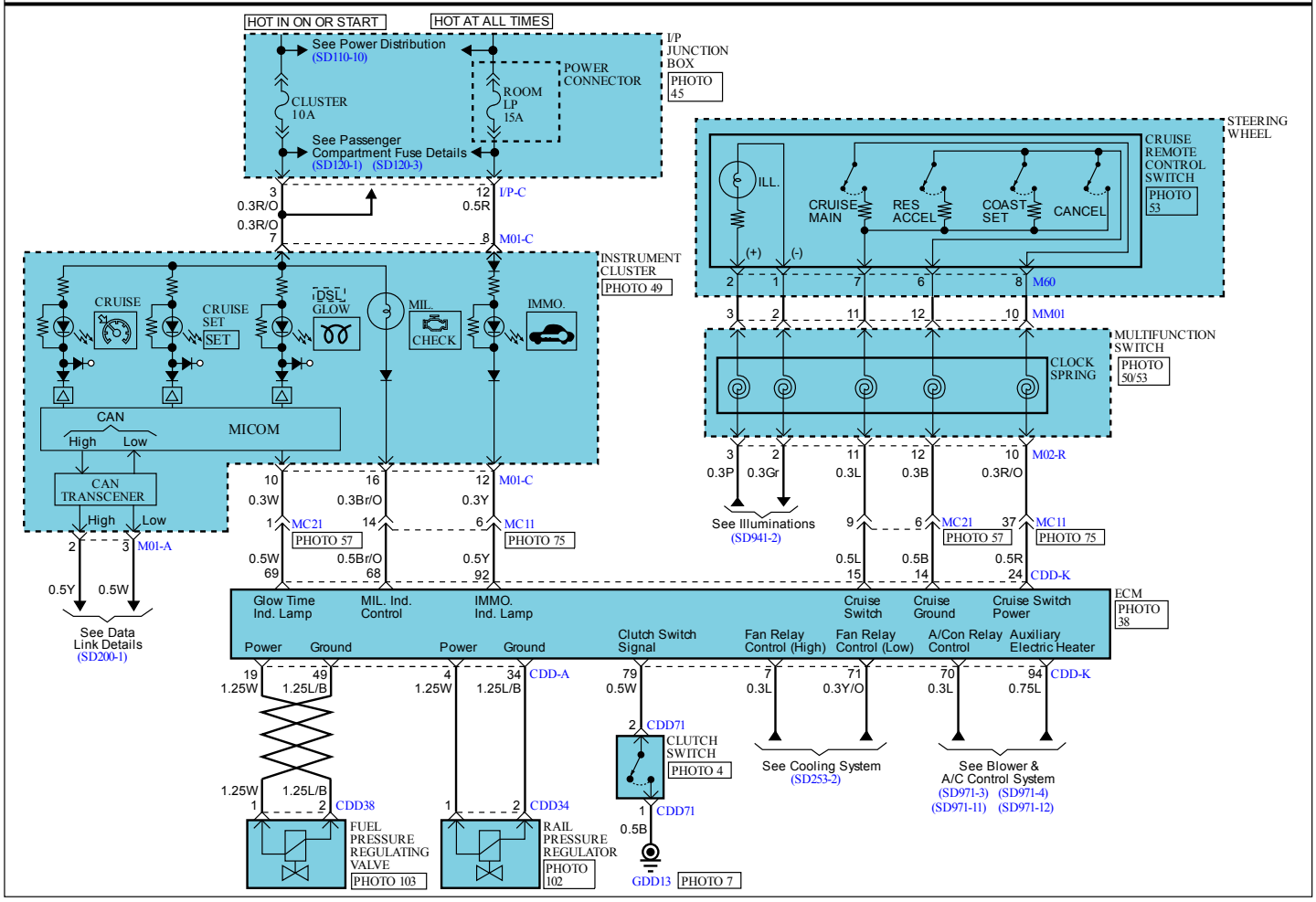
MFI Control System (D4EA : D 2.0L) (5) SD313-49



MFI Control System (D4EA : D 2.0L) (6) SD313-50

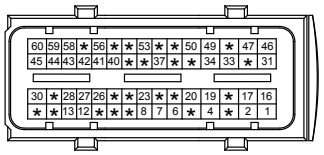


MFI Control System (D4EA : D 2.0L) (7) SD313-51



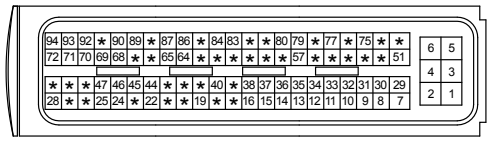
MFI Control System (D4EA : D 2.0L) (8) SD313-52

CDD-A



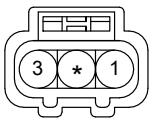
AMP_ECU_60F_B

CDD-K



AMP_ECU_94F_B

CDD11



KUM_62Z_03F_B_WTS

CDD13



AMP_JPT_03F_B_L1

CDD14



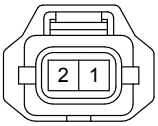
AMP_SFT_03F_B_1

CDD24-1



AMP_2.8WP_02F_B

CDD24-2



AMP_2.8WP_02F_B

CDD24-3



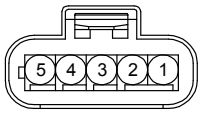
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CDD24-4



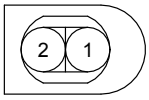
AMP_2.8WP_02F_B

CDD27



HSM_SENSOR_05F_B_1

CDD31



KST_SENSOR_02F_B_NF

CDD32



KET_SSD_02F_B

CDD33



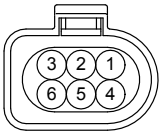
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CDD34



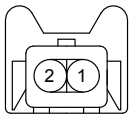
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CDD36



BSH_SENSOR_06F_B_NF

CDD37



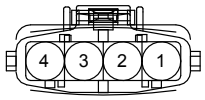
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CDD38



AMP_2.8WP_02F_B

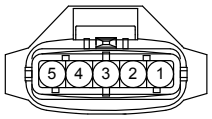
CDD39



AMP_JPT_04F_B_BOSCH

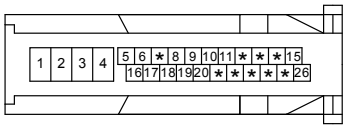
MFI Control System (D4EA : D 2.0L) (9) SD313-53

CDD40



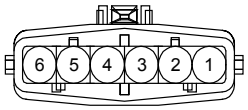
AMP_JPT_05F_B_SFT

CDD41



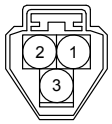
BOS_ABS_26F_B_L

CDD44



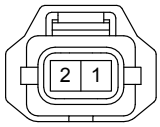
AMP_JPT_06F_B

CDD52



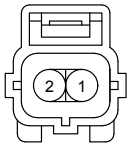
KUM_NMWP_03F_B

CDD62



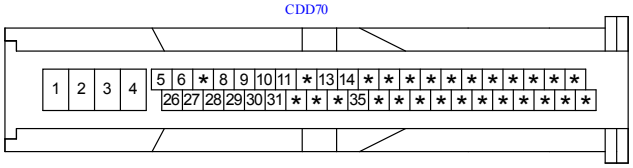
AMP_2.8WP_02F_B

CDD64



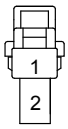
AMP_EJWP_02F_B

CDD70



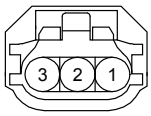
BOS_ESP_46F_B_L

CDD71



KET_250DL_02F_W

CDD72



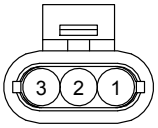
KET_040WP_03F_B

CDD79



SUM_090IIWP_03F_B

CDD84



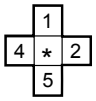
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CDD86



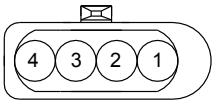
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CDD90



CR05F019

CDD95



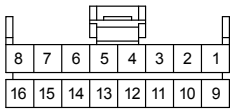
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F01



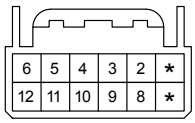
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M01-C



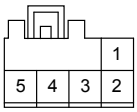
AMP_040M1_16F_B

M02-R



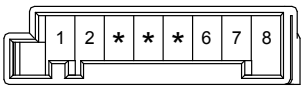
AMP_025_12F_W

M09



KUM_CDR_05F_W

M60

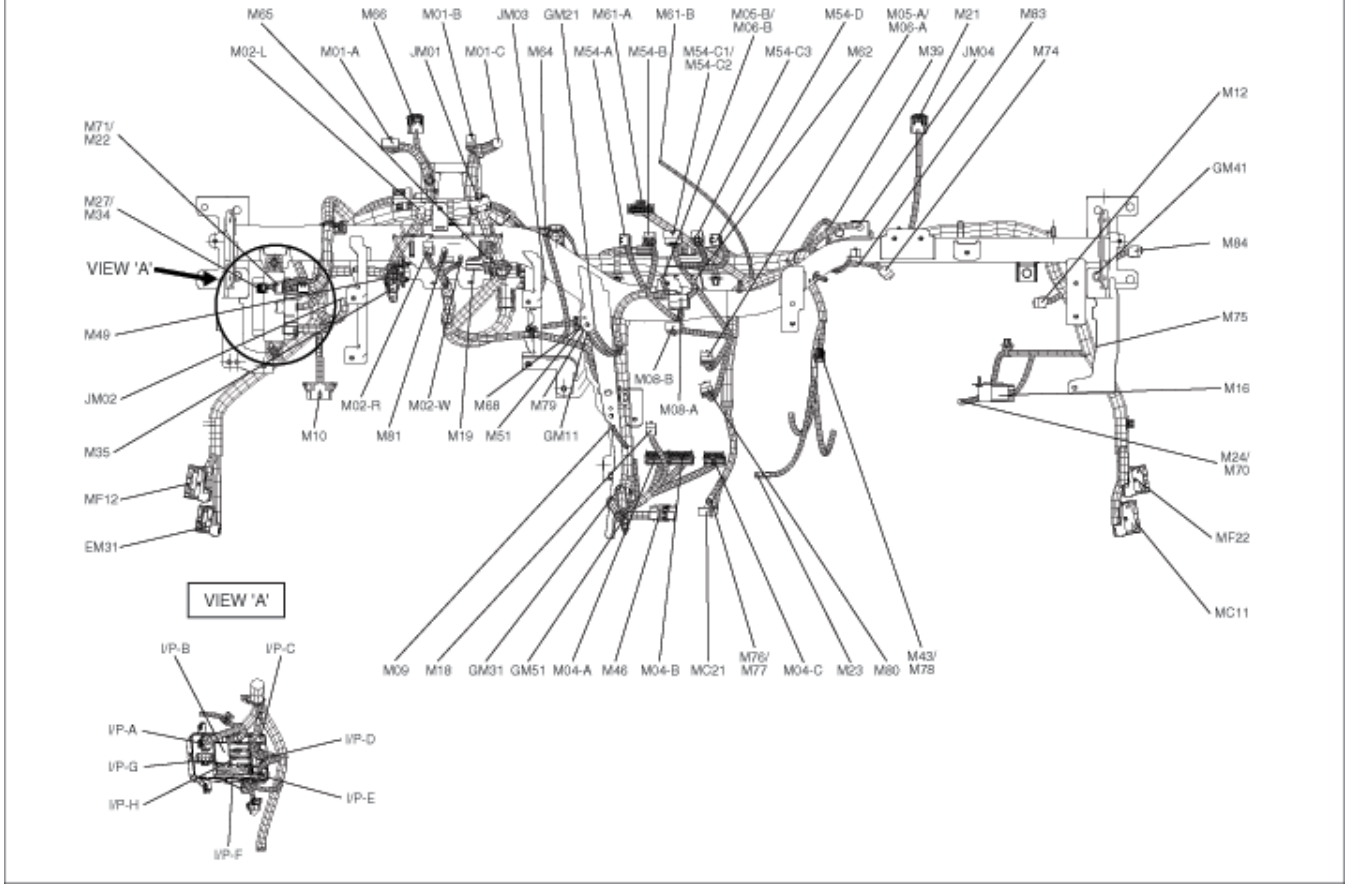


AMP 0-1743282-2

MFI Control System (D4EA : D 2.0L) (10) SD313-54

M67  SUM_SENSOR_02M_W	BLANK	BLANK	BLANK

Main Harness (1) **HL-1**



Main Harness (2) HL-2

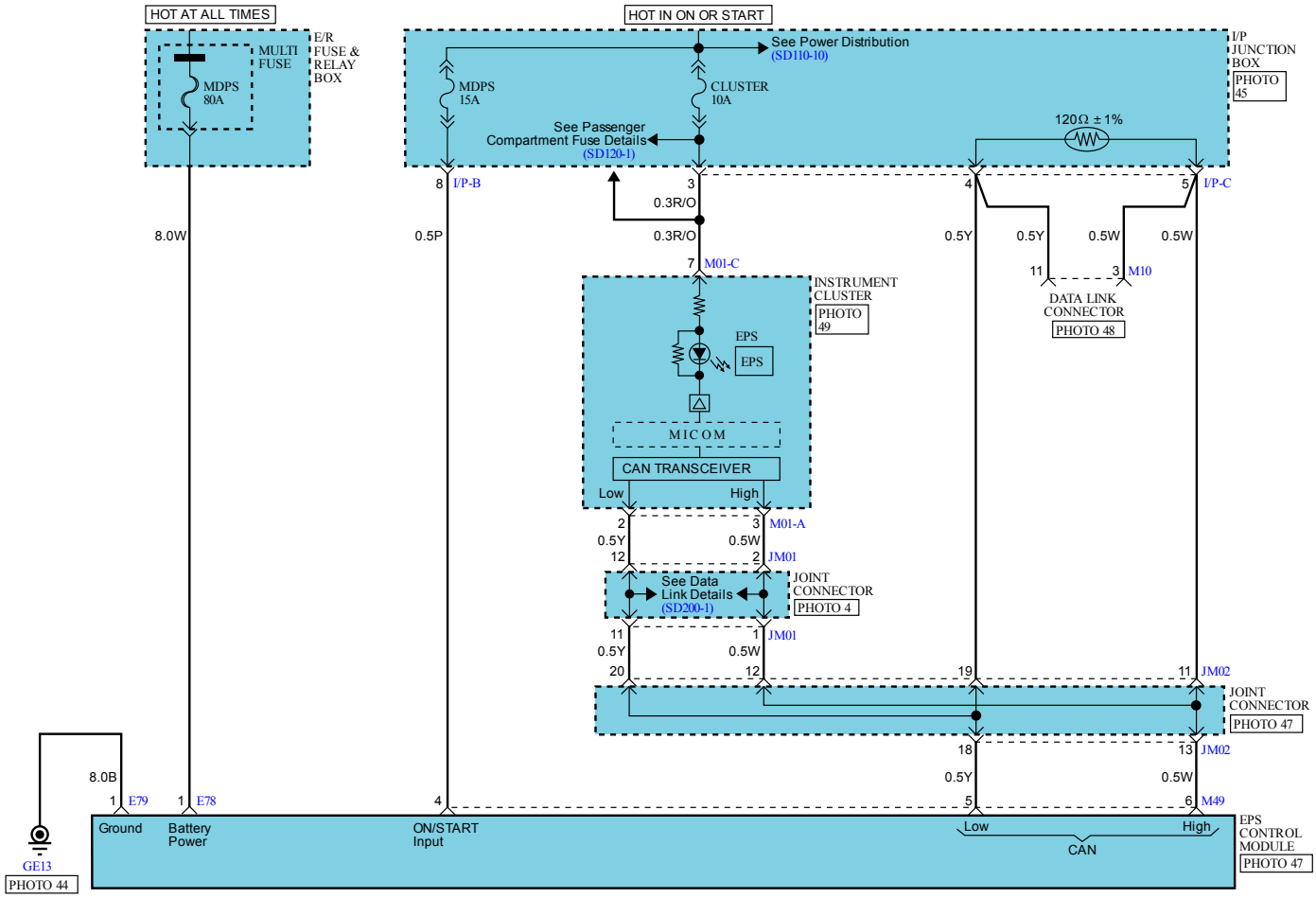
MAIN HARNESS

M01-A	Instrument Cluster
M01-B	Instrument Cluster
M01-C	Instrument Cluster
M02-L	Multifunction Switch
M02-R	Multifunction Switch (REMOCON)
M02-W	Multifunction Switch
M04-A	BCM
M04-B	BCM
M04-C	BCM
M05-A	A/C Control Module (Auto A/C)
M05-B	A/C Control Module (Auto A/C)
M06-A	A/C Control Module (Manual A/C)
M06-B	A/C Control Module (Manual A/C)
M08-A	ICM Relay Box
M08-B	ICM Relay Box
M09	Immobilizer Module
M10	Data Link Connector
M12	ATM Key Lock Control Module
M13	ATM Shift Lever ILL.
M16	Blower Motor
M18	Cigarette Lighter & Front Power Outlet
M19	Ignition Key ill. & Door Warning Switch
M21	Photo Sensor
M22	ESP Switch
M23	Evaporator Sensor
M24	FET (Field Effect Transistor)
M26	Parking Brake Switch
M27	Rheostat
M34	Head Lamp Leveling Device Switch
M35	Ignition Switch
M39	Intake Actuator
M43	Temperature Actuator
M45	ATM Lever Switch
M46	Tire Pressure Monitoring Module
M49	EPS Control Module
M51	Mode Actuator
M54-A	Audio
M54-B	Audio
M54-C1	Audio
M54-C2	Audio
M54-C3	Audio
M54-D	Audio
M61-A	Switch Module
M61-B	Switch Module
M62	Multi Display
M64	Piezo Buzzer
M65	Pre-Excitation Resistor
M66	Security Indicator
M67	Exhaust Gas Temperature Sensor #2
M68	Sound Relay
M70	Blower Resister
M71	ISG Switch
M74	Glove Box Lamp
M75	Glove Box Lamp Switch
M76	AUX & USB Jack (Audio)
M77	AUX & USB Jack (Navigation)
M78	Passenger Temperature Actuator
M79	Driver Temperature Actuator
M80	Ash-tray ILL.
M81	Driver Air Bag
M82-A	SRS Control Module
M83	Passenger Air Bag
M84	Passenger Air Bag On/Off Switch
JM01	Joint Connector
JM02	Joint Connector
JM03	Joint Connector
JM04	Joint Connector
I/P-A	Connection With I/P JUNCTION BOX Harness
I/P-B	Connection With I/P JUNCTION BOX Harness
I/P-C	Connection With I/P JUNCTION BOX Harness
I/P-D	Connection With I/P JUNCTION BOX Harness
I/P-E	Connection With I/P JUNCTION BOX Harness
EM31	Connection With FRONT Harness
MC11	Connection With CONTROL Harness
MC21	Connection With CONTROL Harness
MF12	Connection With FLOOR Harness
MF22	Connection With FLOOR Harness
GM11	Ground
GM21	Ground
GM31	Ground
GM41	Ground
GM51	Ground

STEERING HARNESS

M57	Audio Remote Control Switch LH
M58	Audio Remote Control Switch RH
M59	Audio Remote Control Switch (With Cruise)
M60	Cruise Remote Control Switch
M85	Audio Remote Control Switch LH (Bluetooth)
M86	Audio Remote Control Switch RH (Trip Voice)
MM01	Connection With Steering Remocon Harness

Motor Driven Power Steering (MDPS) System (1) SD563-1



Motor Driven Power Steering (MDPS) System (2) SD563-2

E78



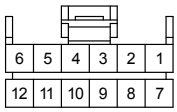
YAZ_375R_01F_B

E79



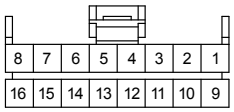
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M01-A



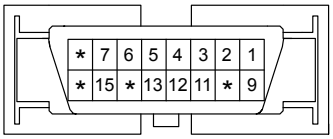
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M01-C



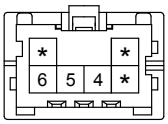
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M10



MLX_OBDII_16F_B

M49

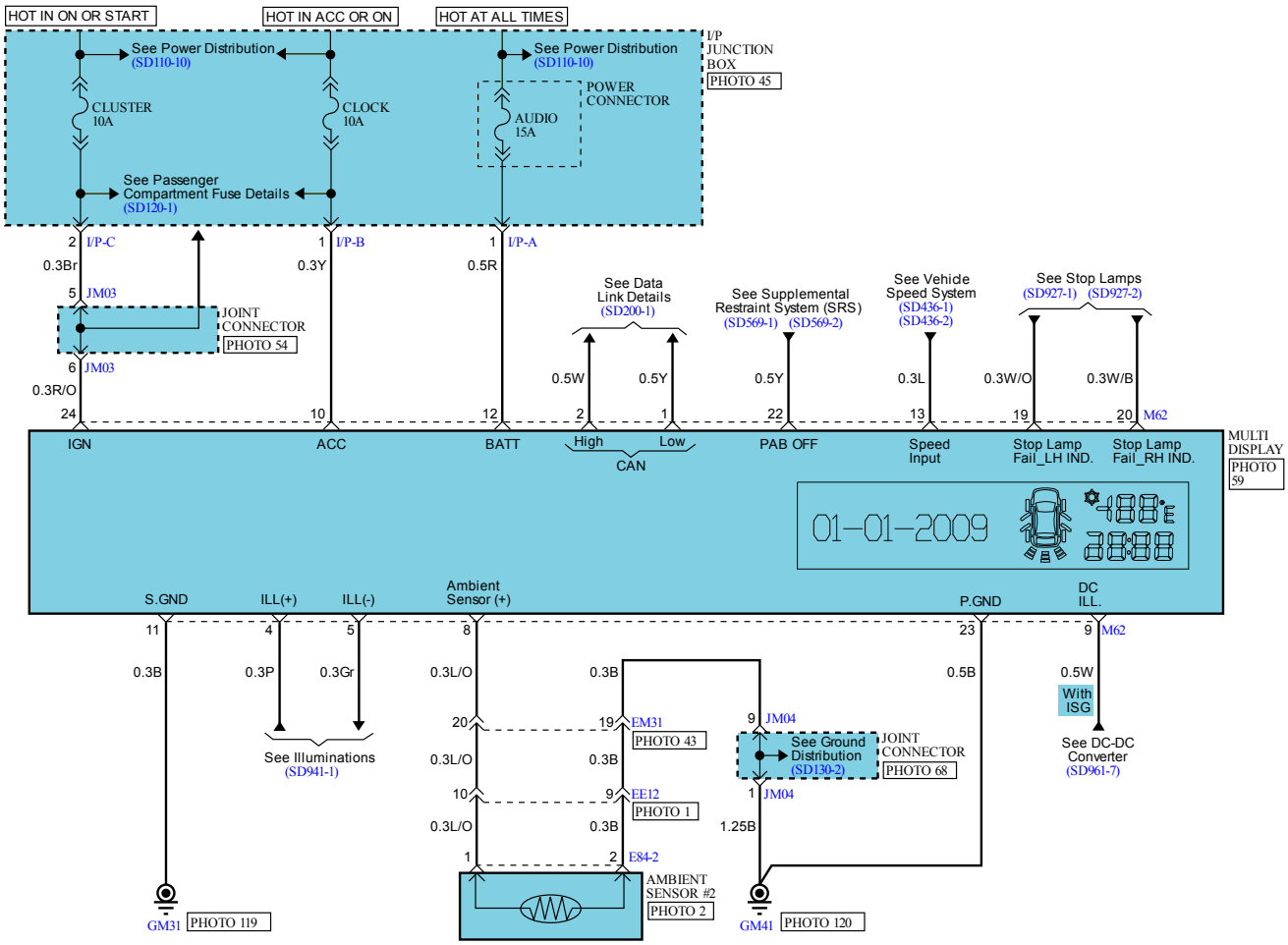


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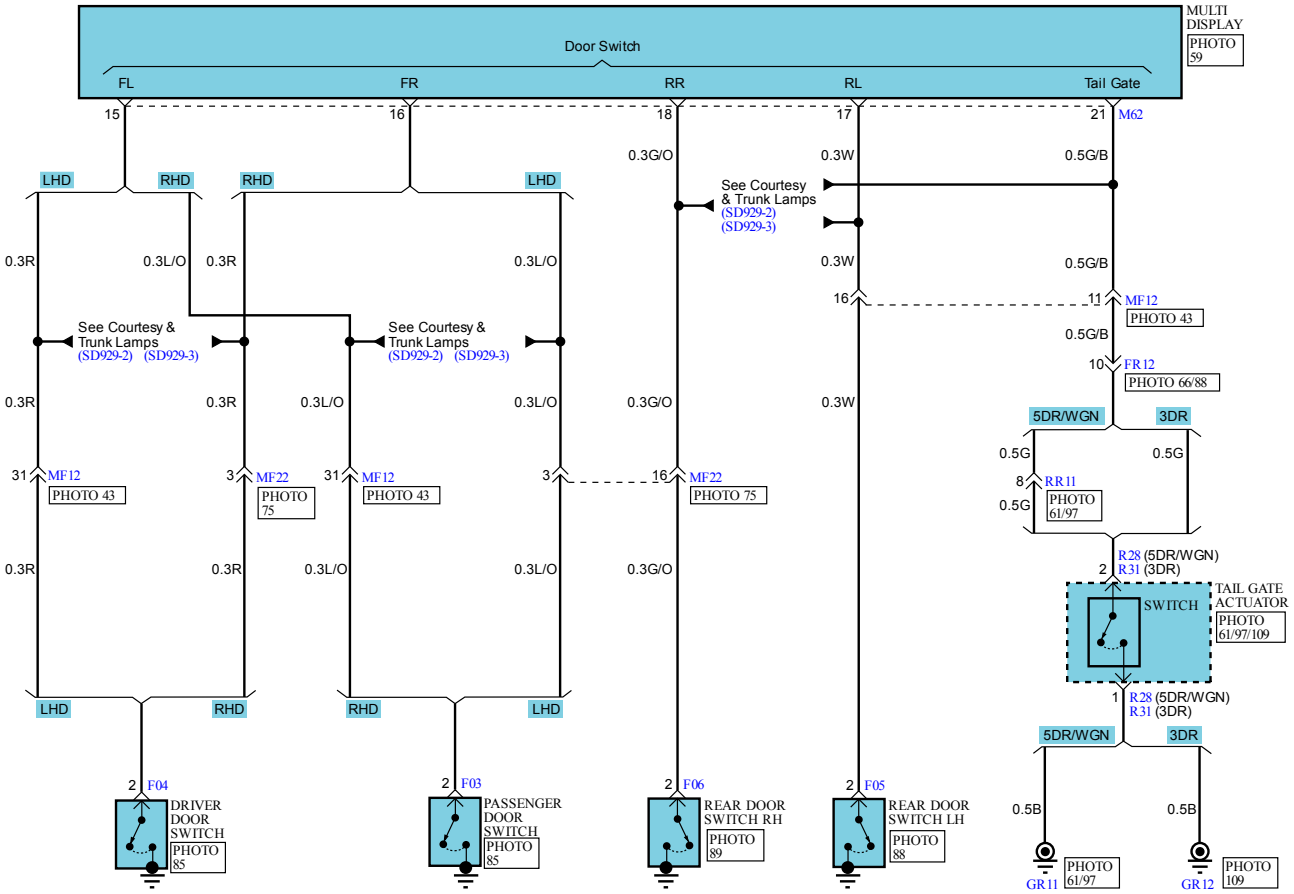
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Multi Display (1) SD942-1

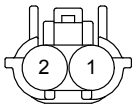


Multi Display (2) SD942-2



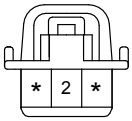
Multi Display (3) SD942-3

E84-2



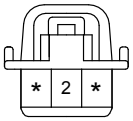
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F03



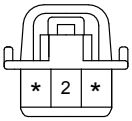
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F04



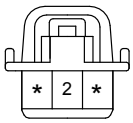
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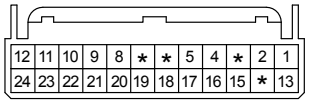
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F06



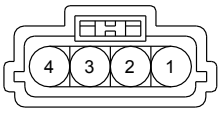
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M62



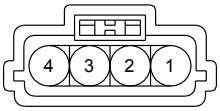
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R28



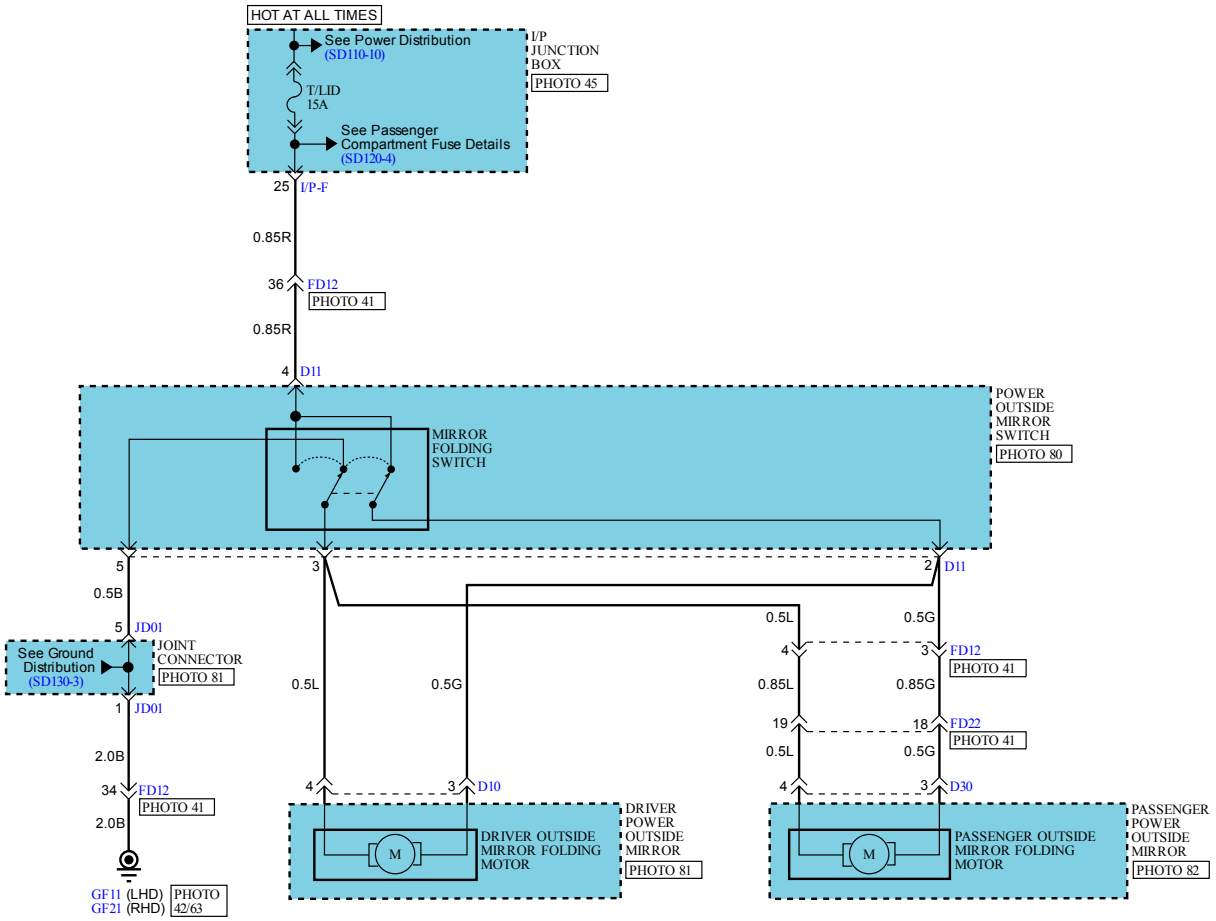
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R31

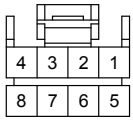
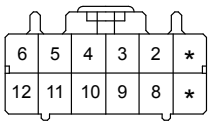
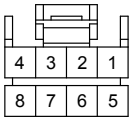


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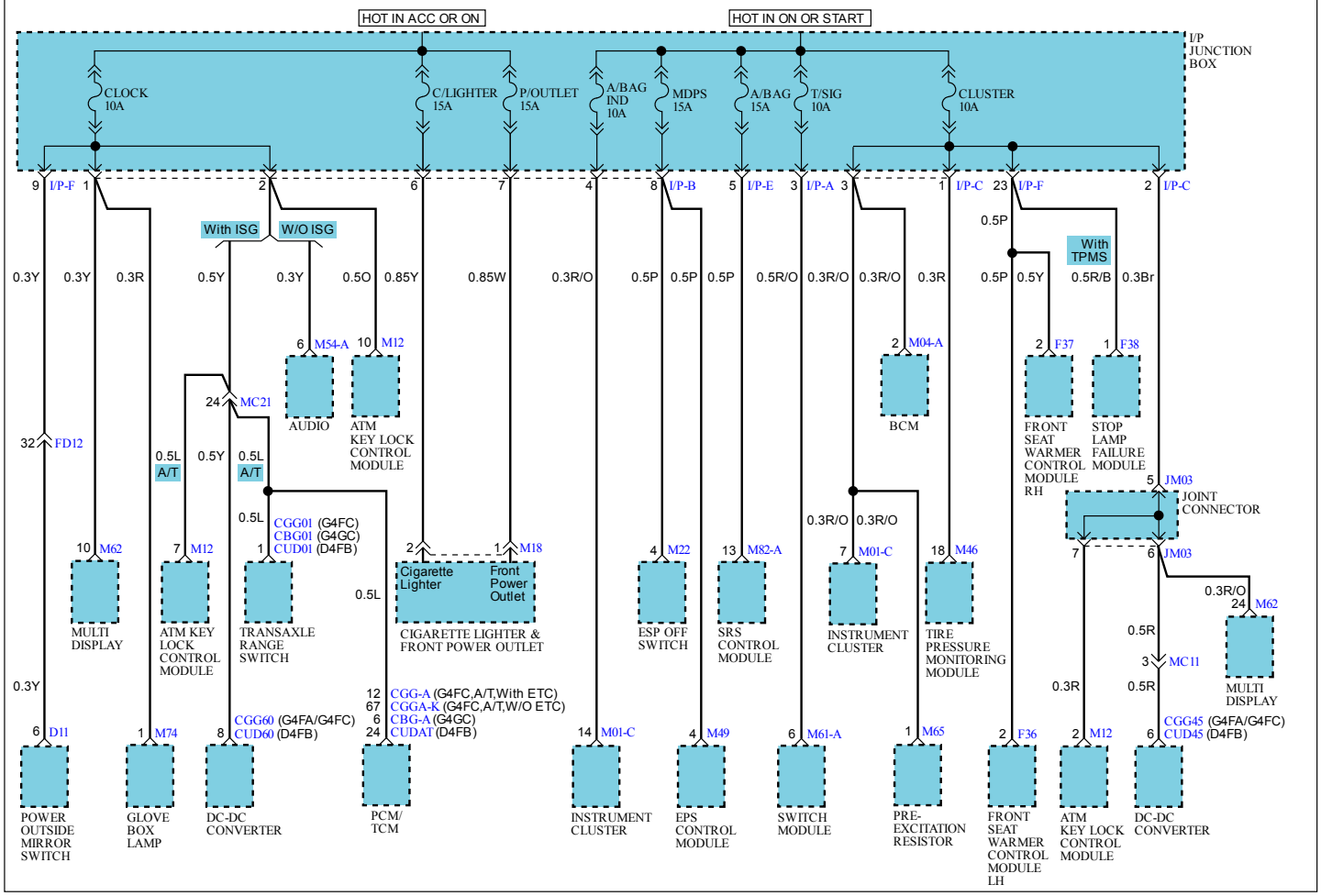
Outside Mirror Folding (1) SD878-1



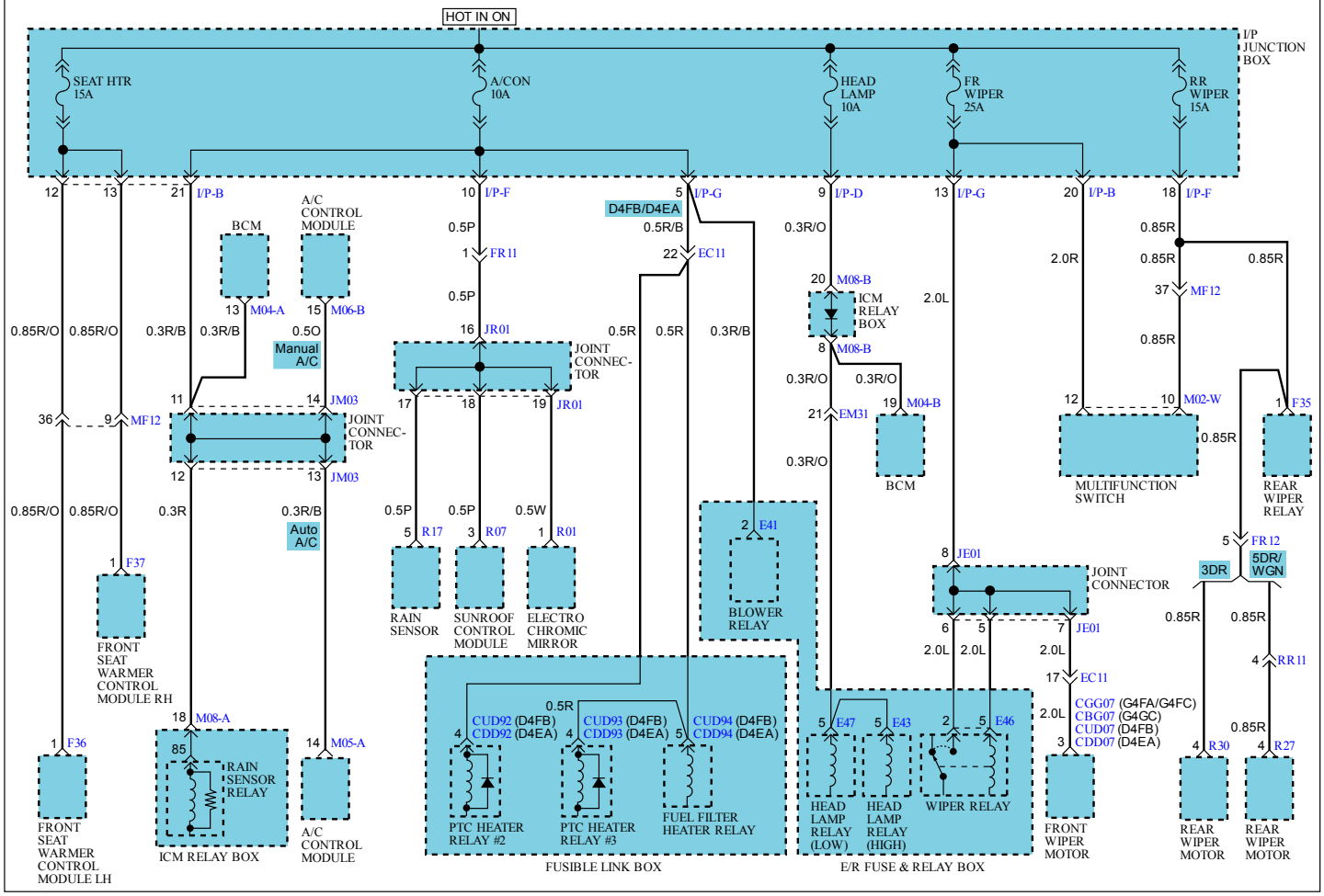
Outside Mirror Folding (2) SD878-2

D10	D11	D30	
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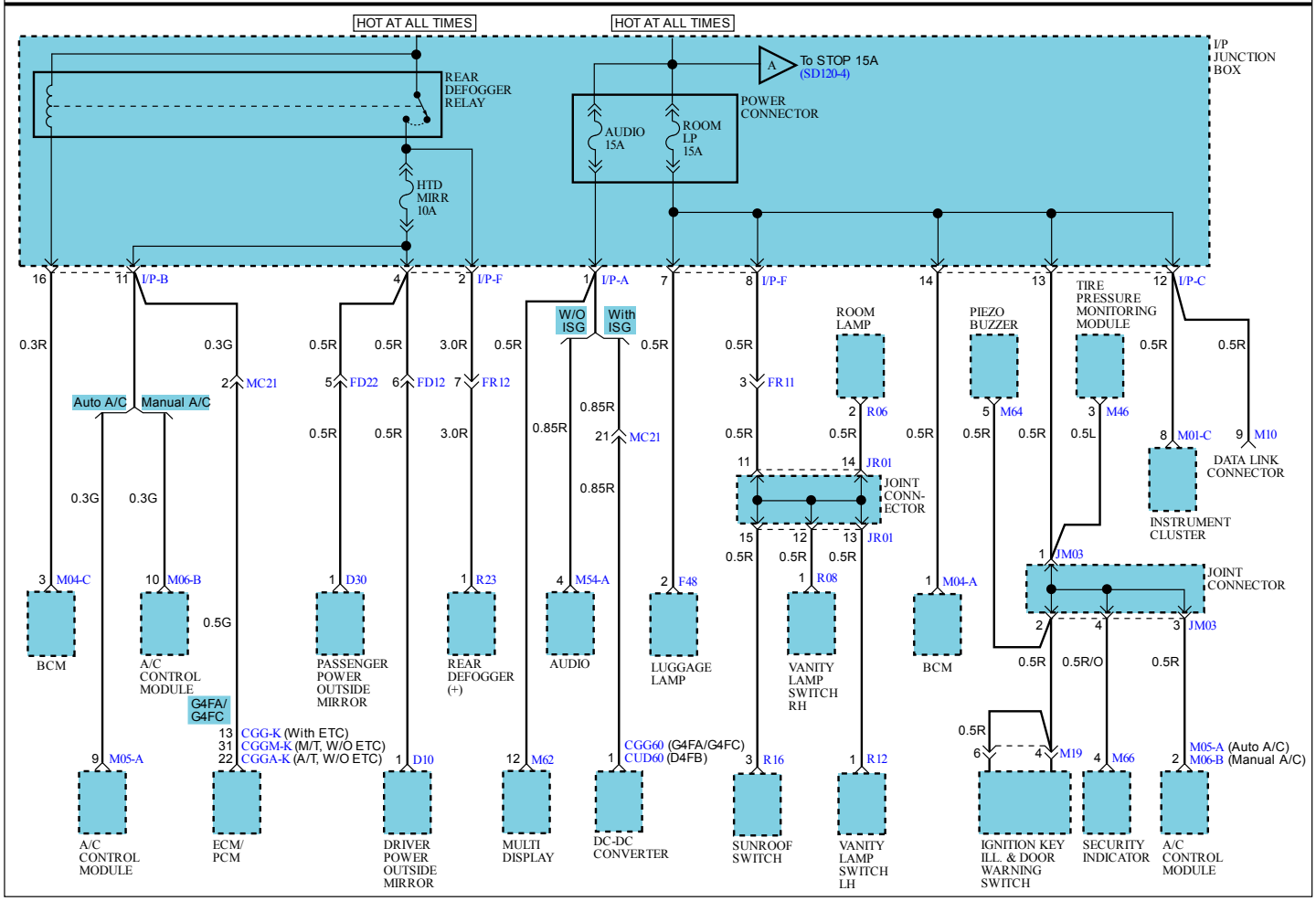
Passenger Compartment Fuse Details (1) SD120-1



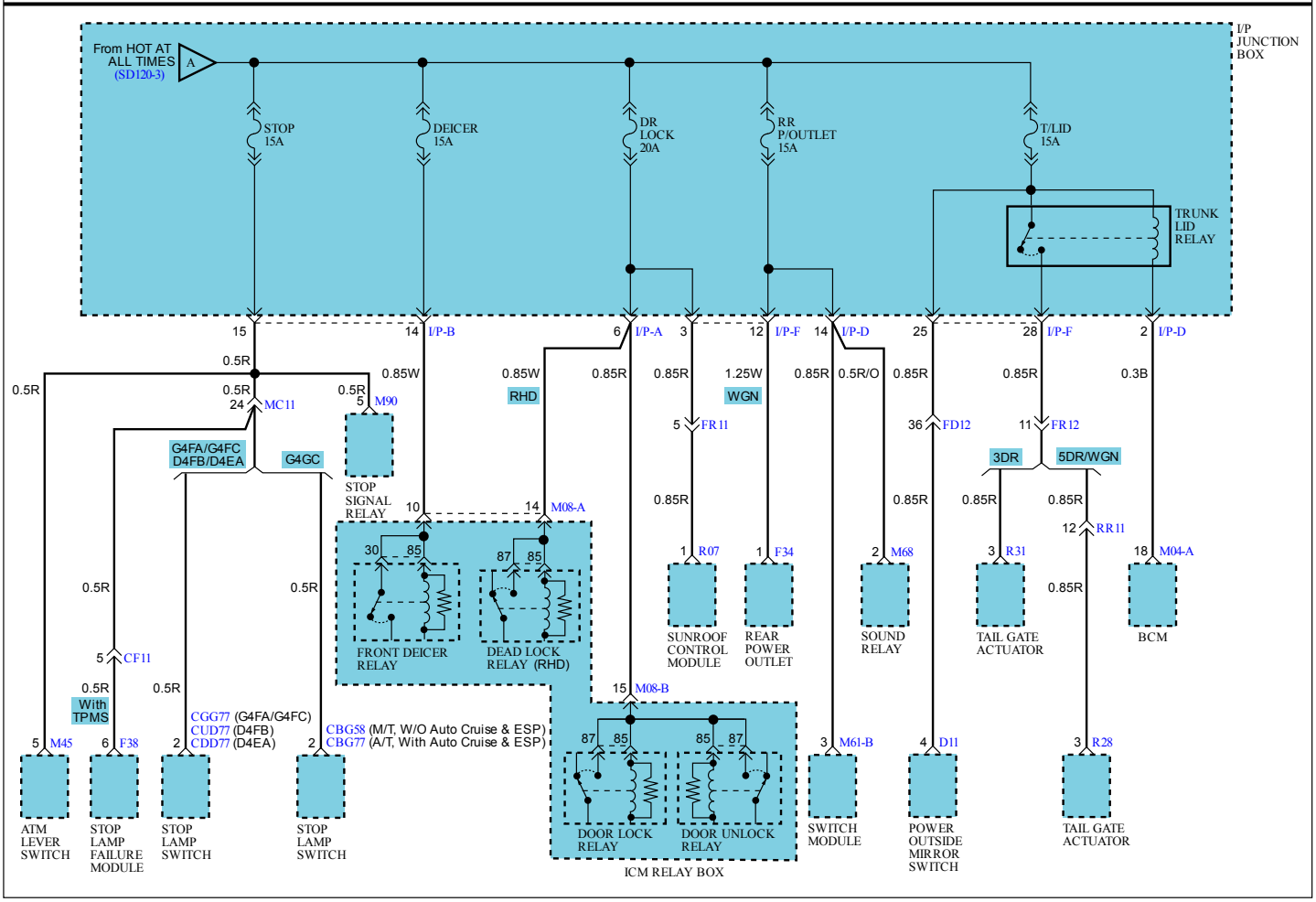
Passenger Compartment Fuse Details (2) SD120-2



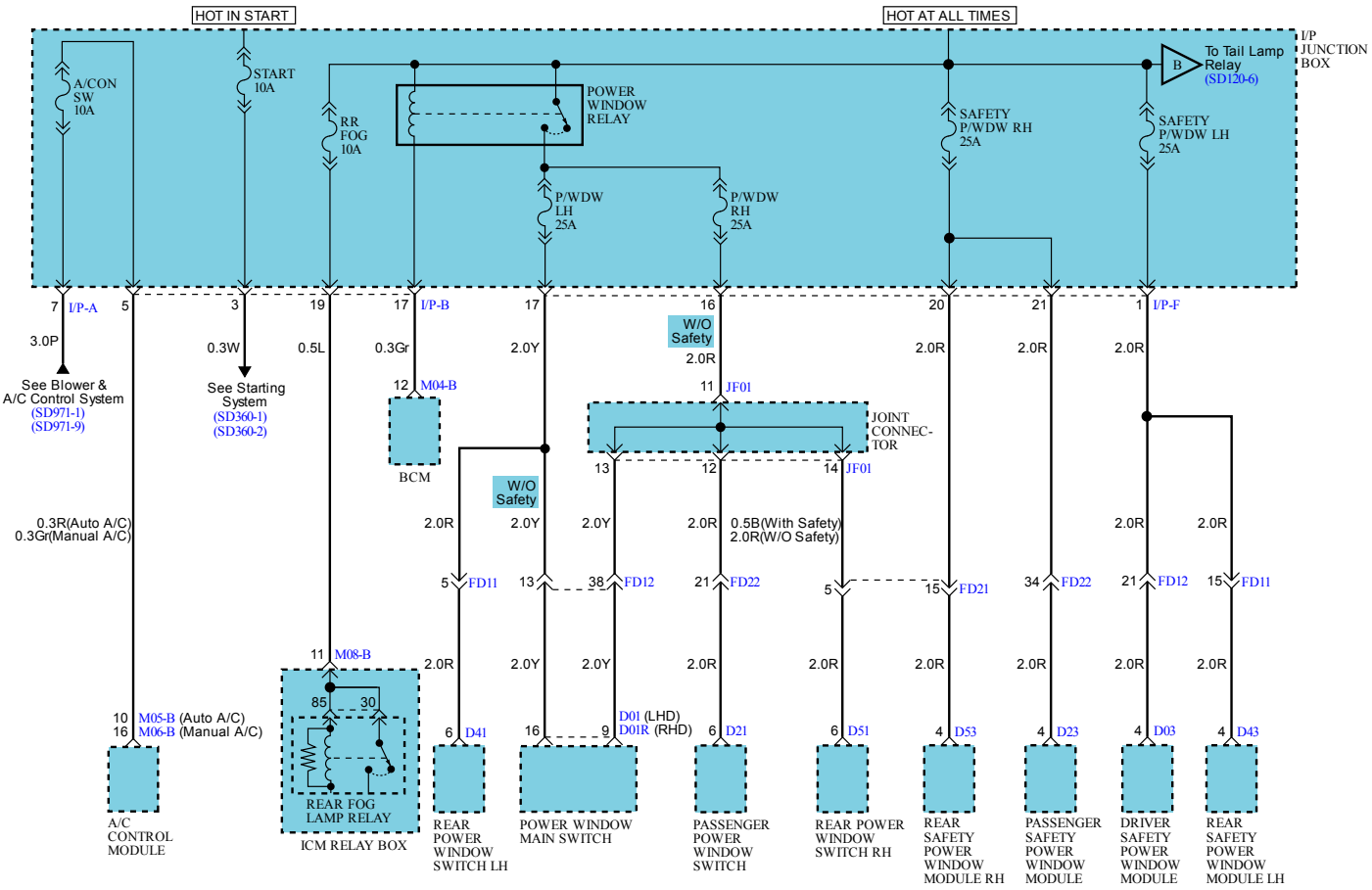
Passenger Compartment Fuse Details (3) SD120-3



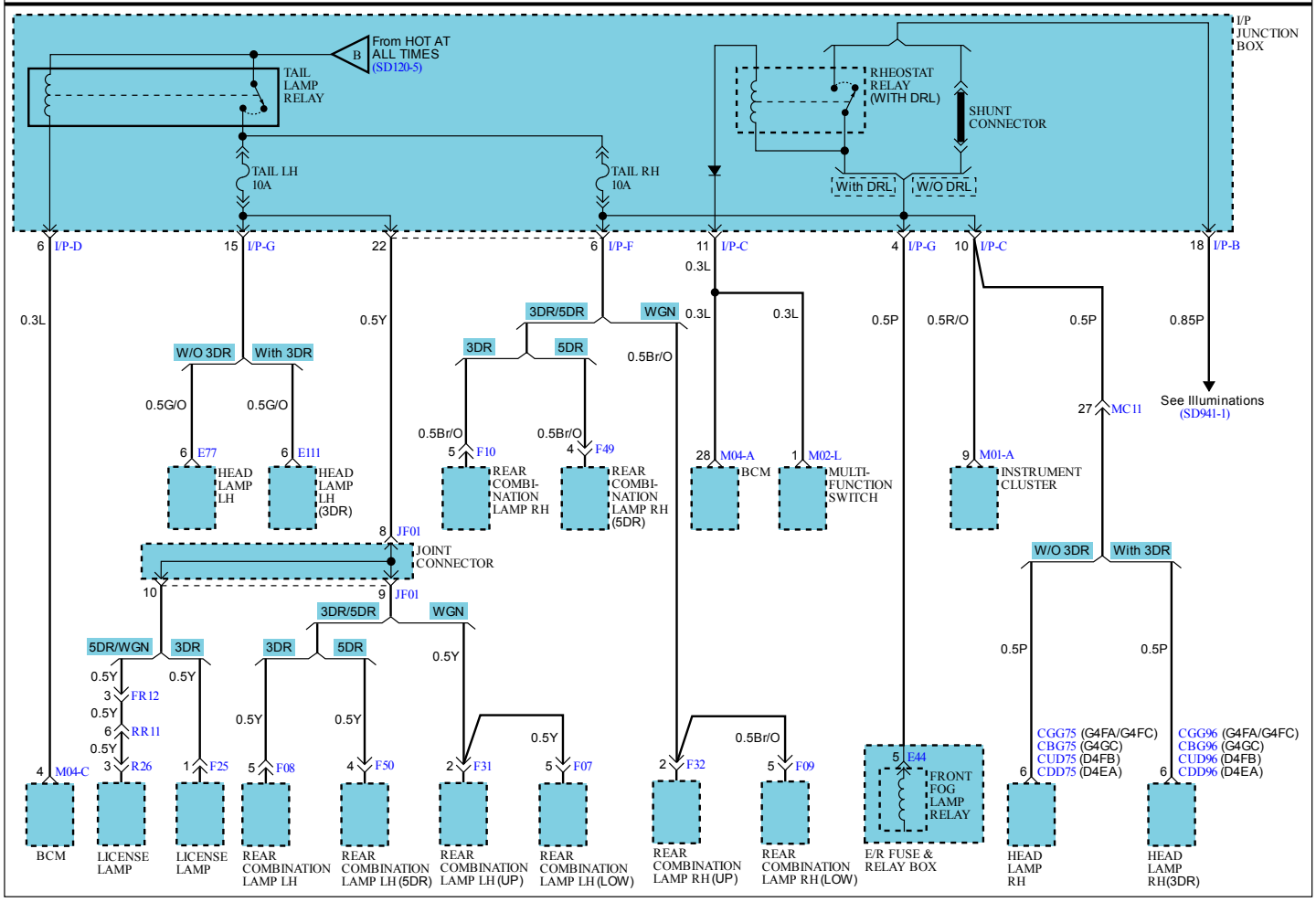
Passenger Compartment Fuse Details (4) SD120-4



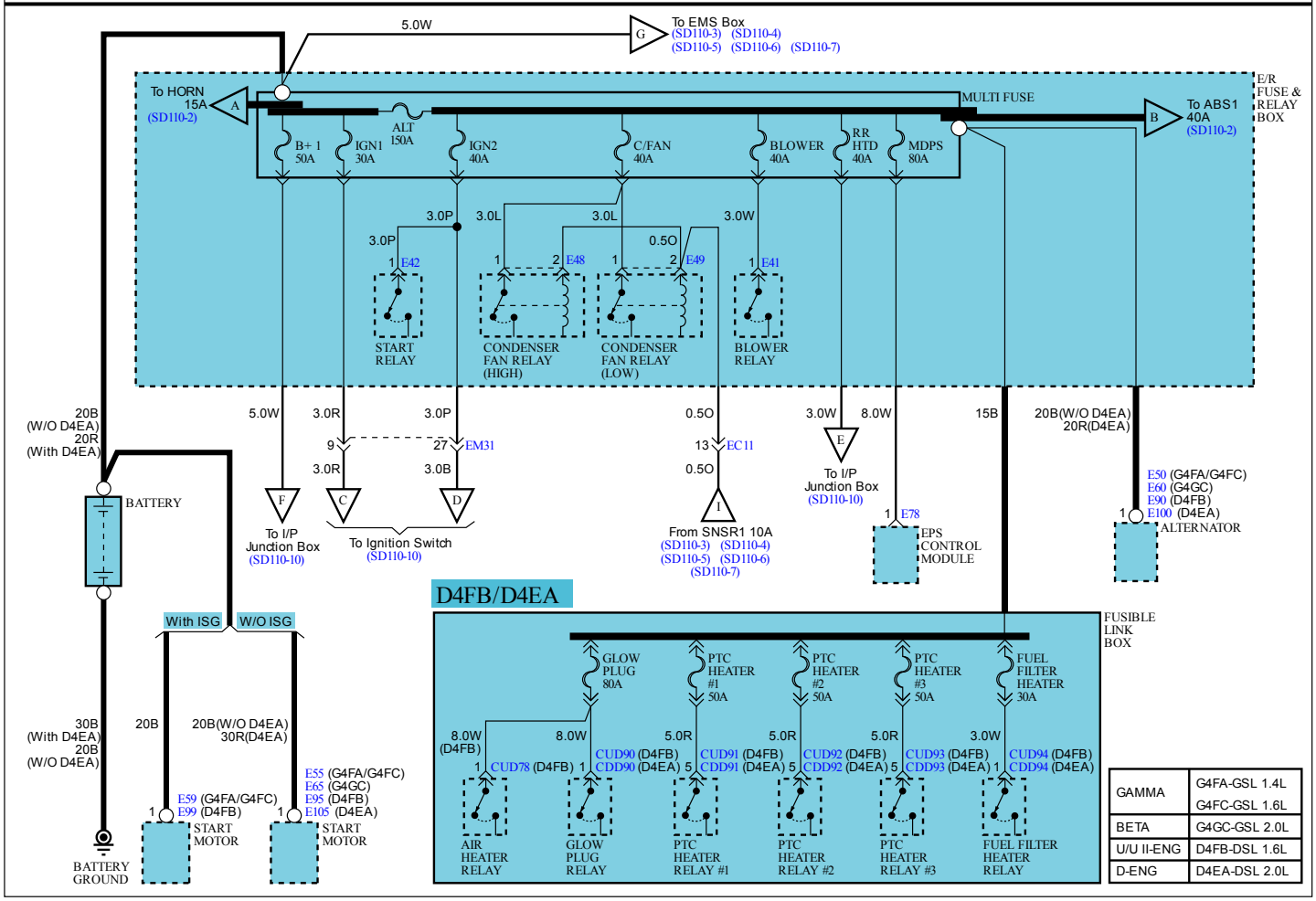
Passenger Compartment Fuse Details (5) SD120-5



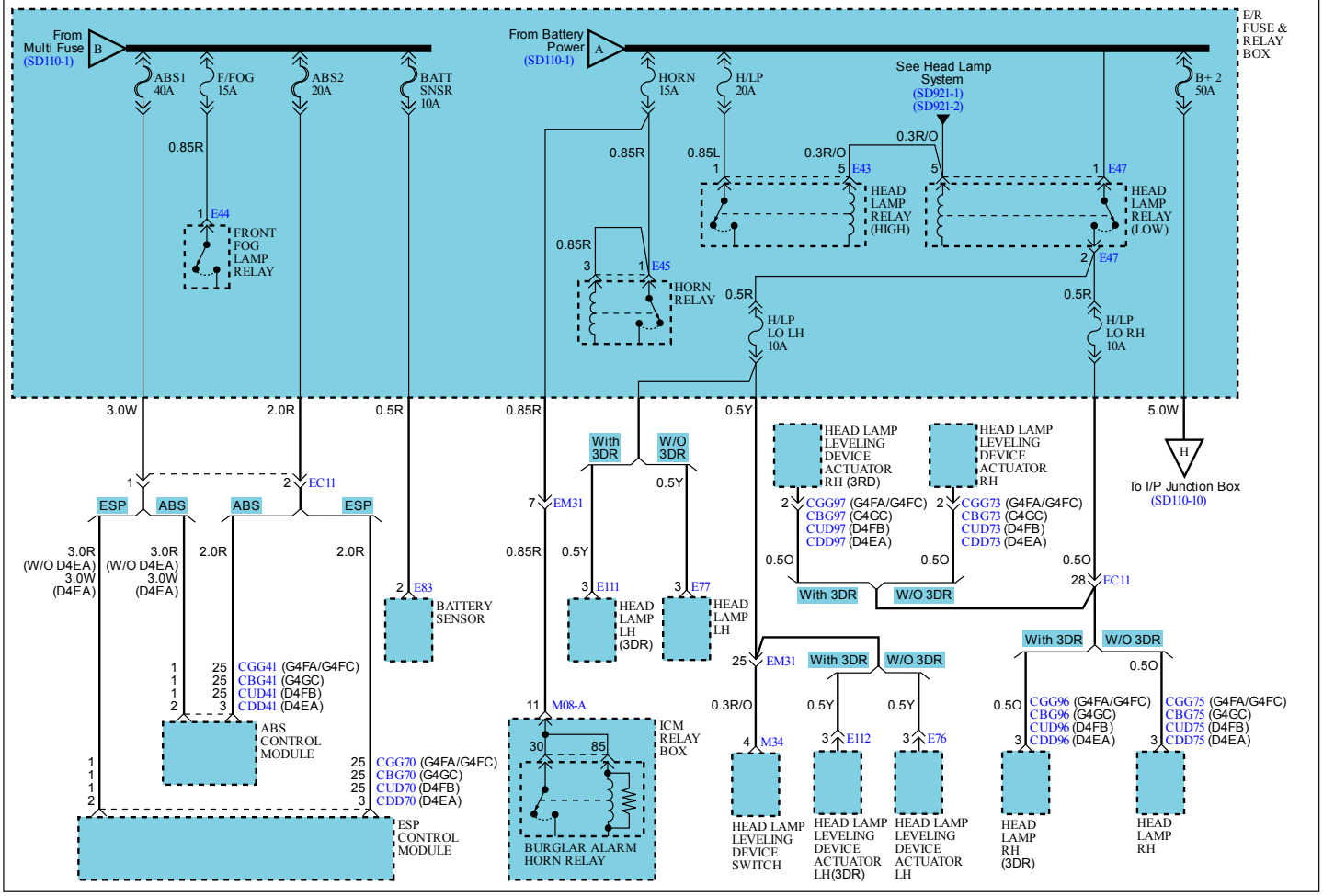
Passenger Compartment Fuse Details (6) SD120-6



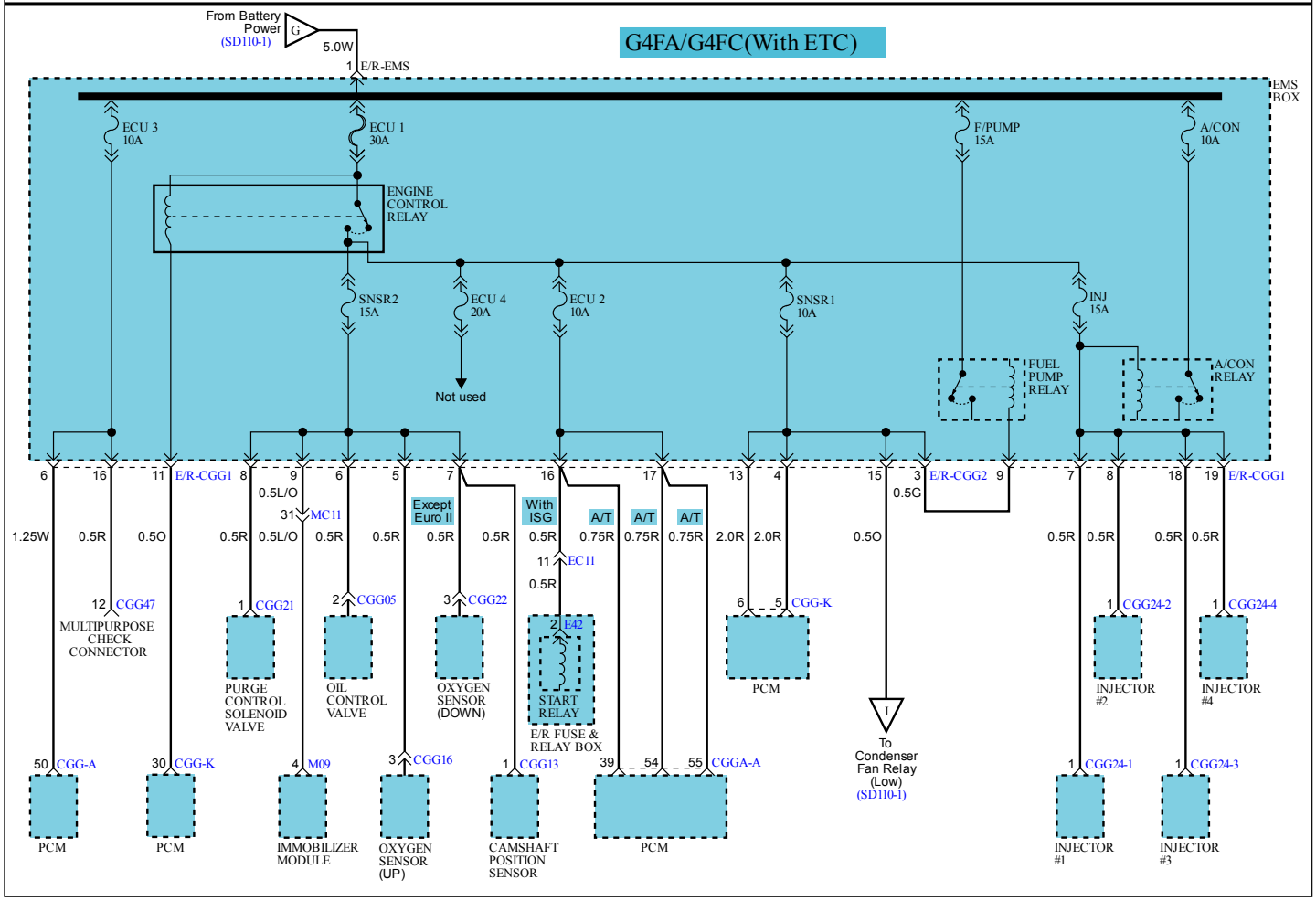
Power Distribution (1) SD110-1



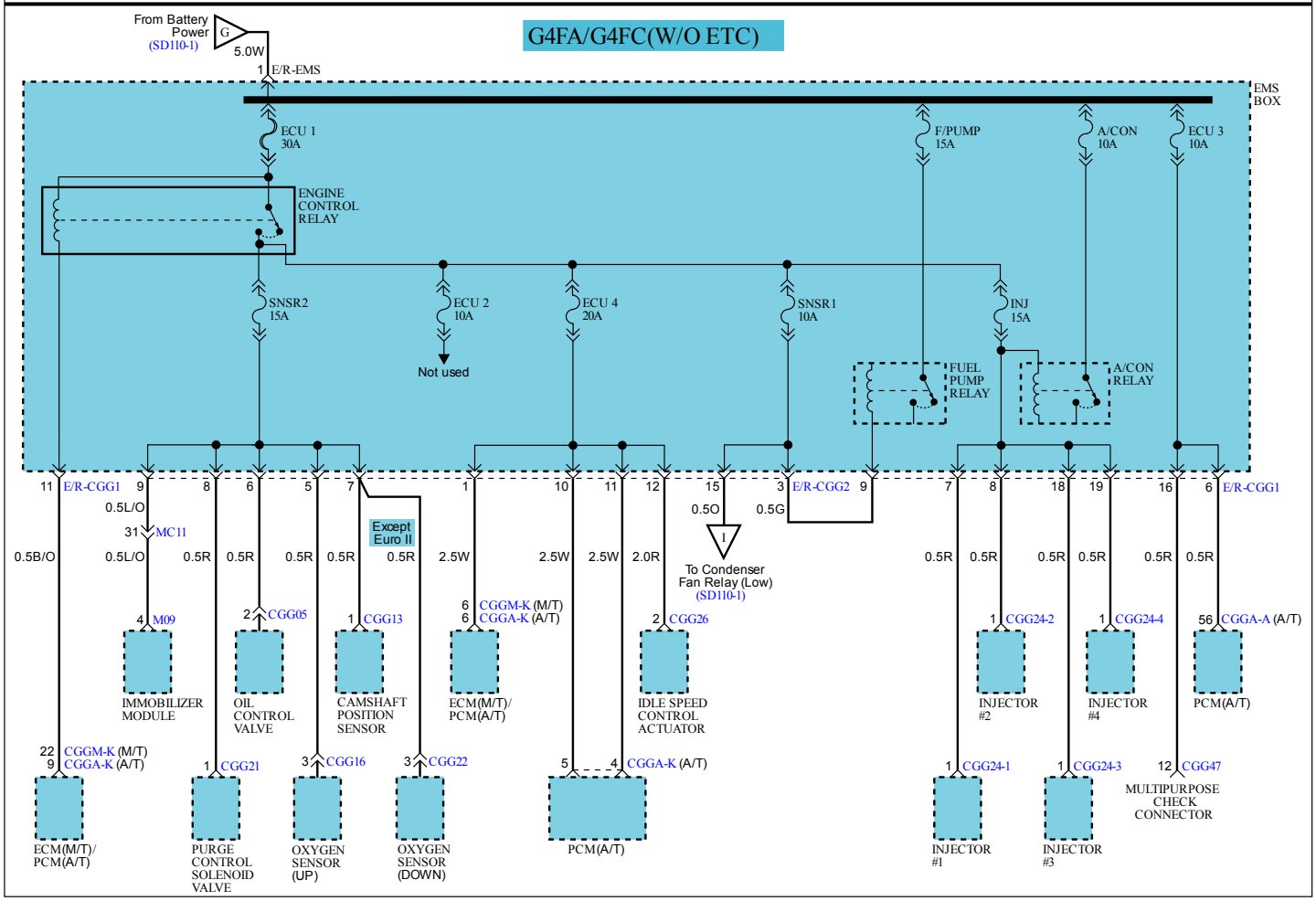
Power Distribution (2) SD110-2



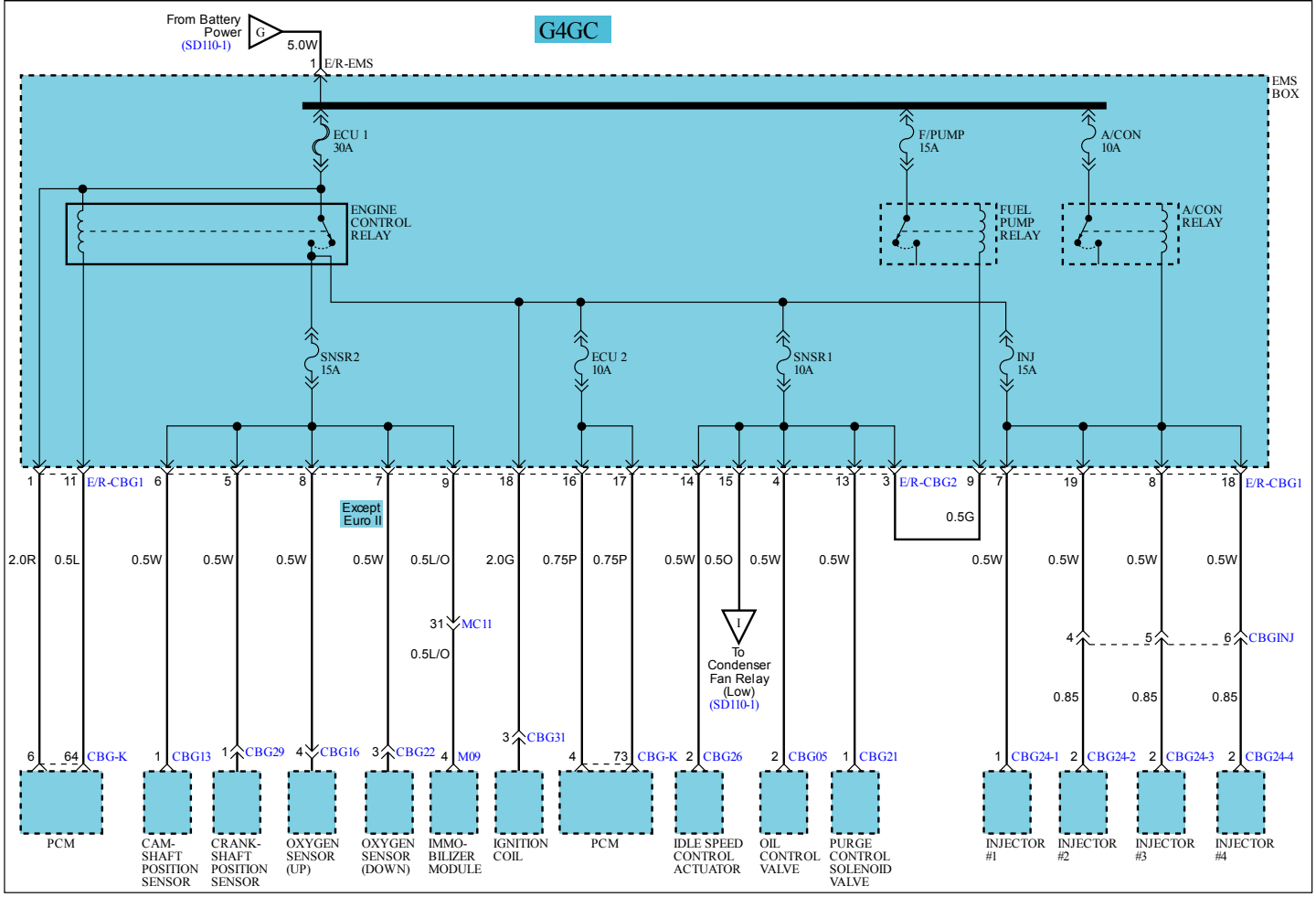
Power Distribution (3) SD110-3



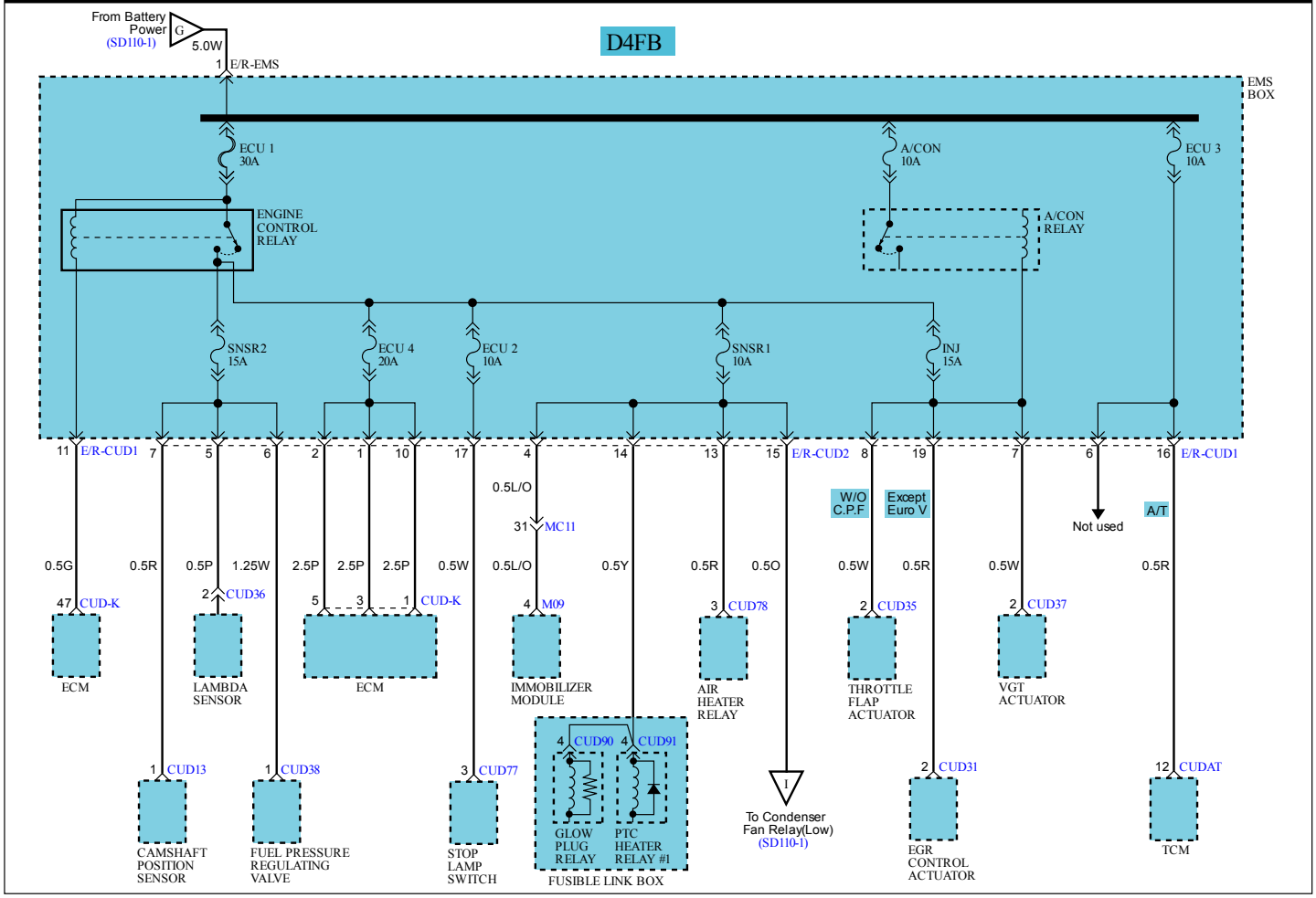
Power Distribution (4) SD110-4



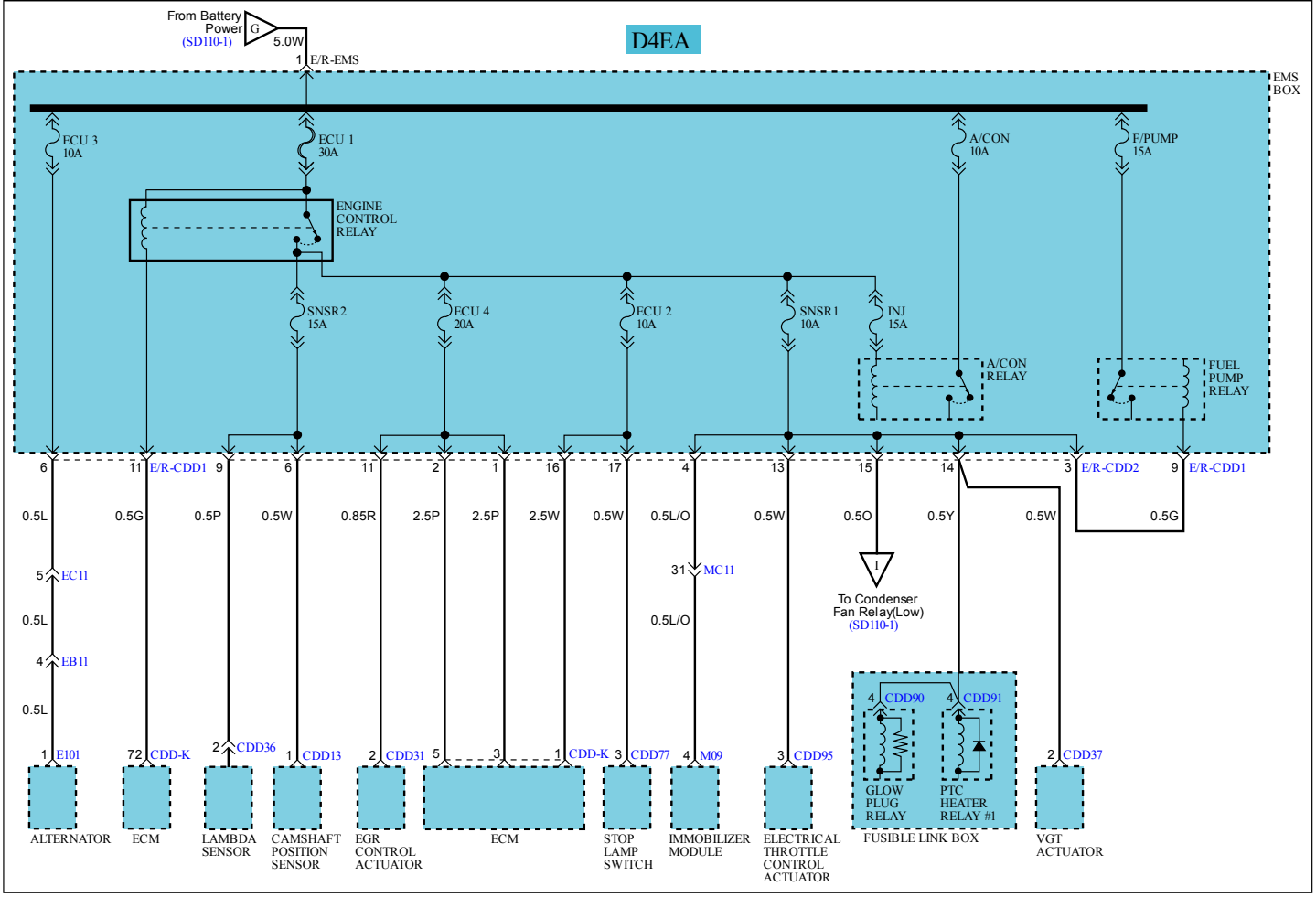
Power Distribution (5) SD110-5



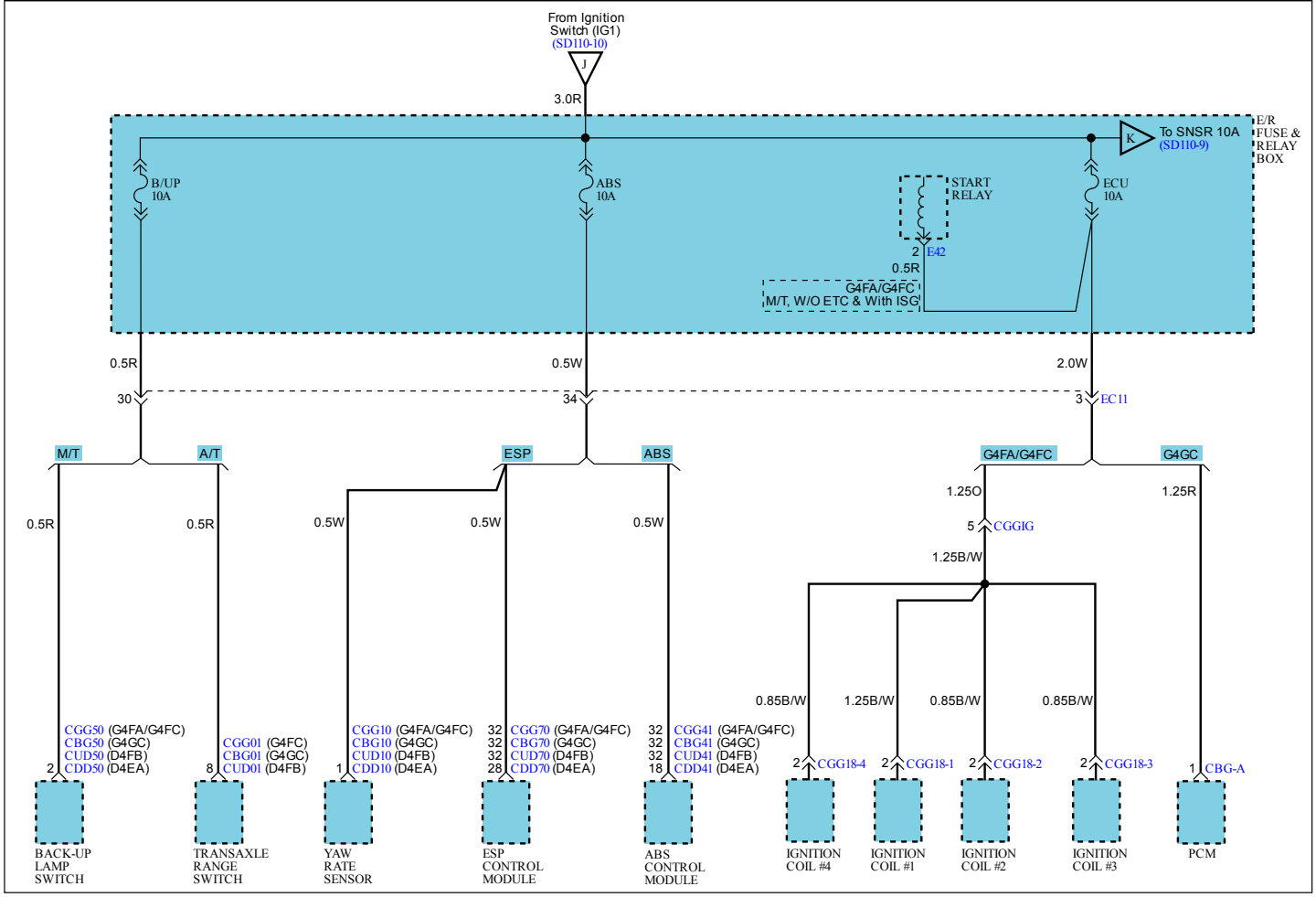
Power Distribution (6) SD110-6



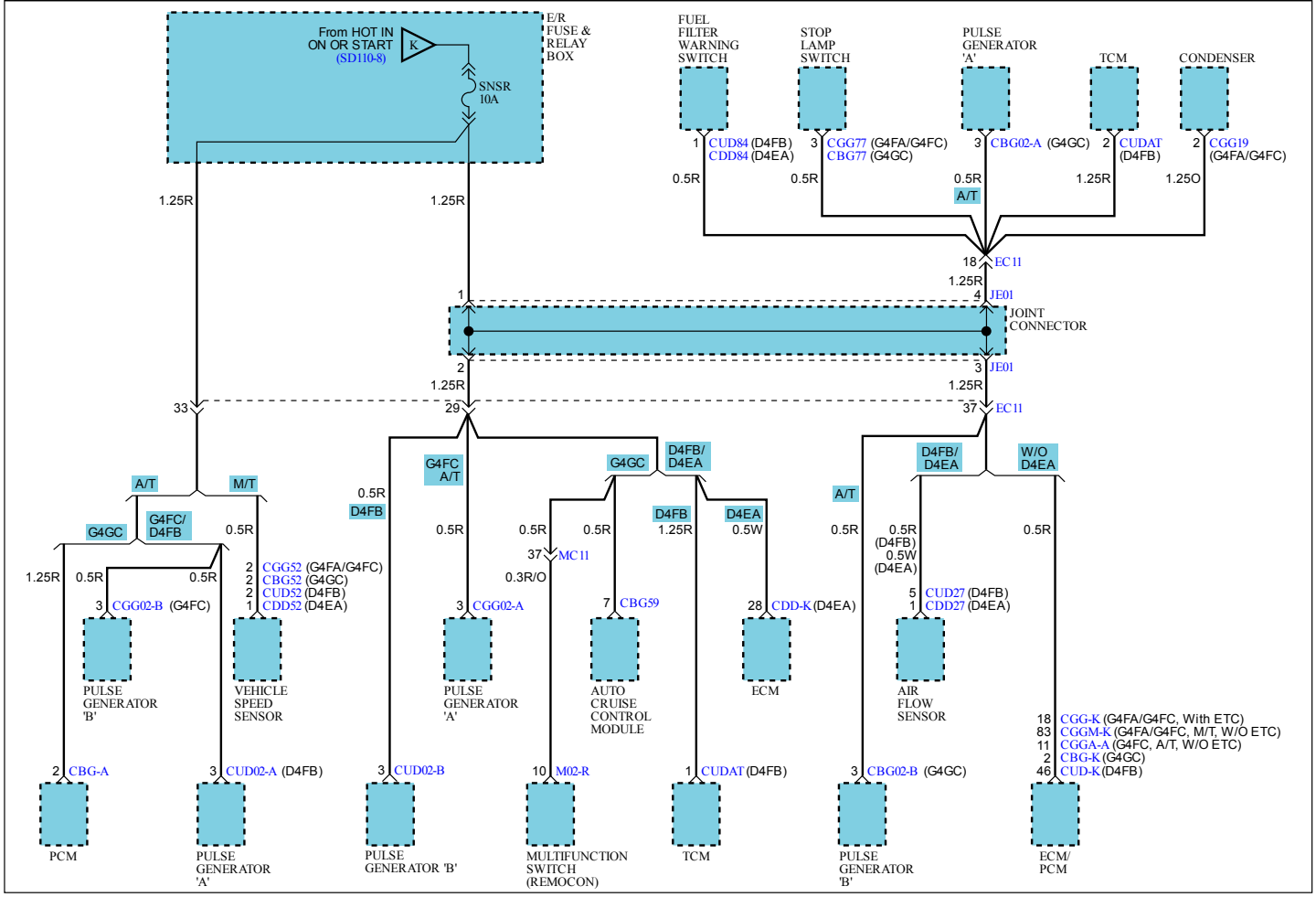
Power Distribution (7) SD110-7



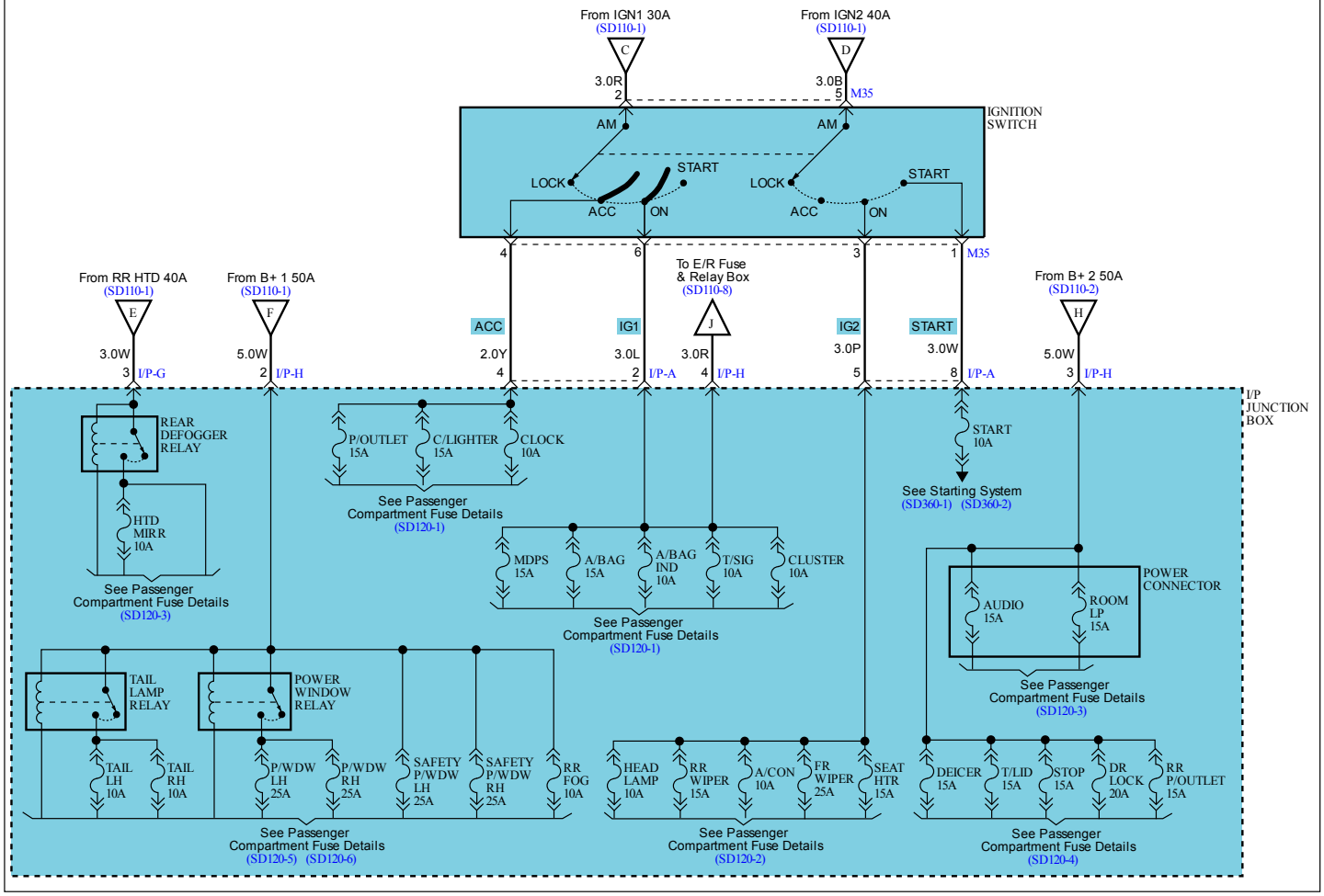
Power Distribution (8) SD110-8



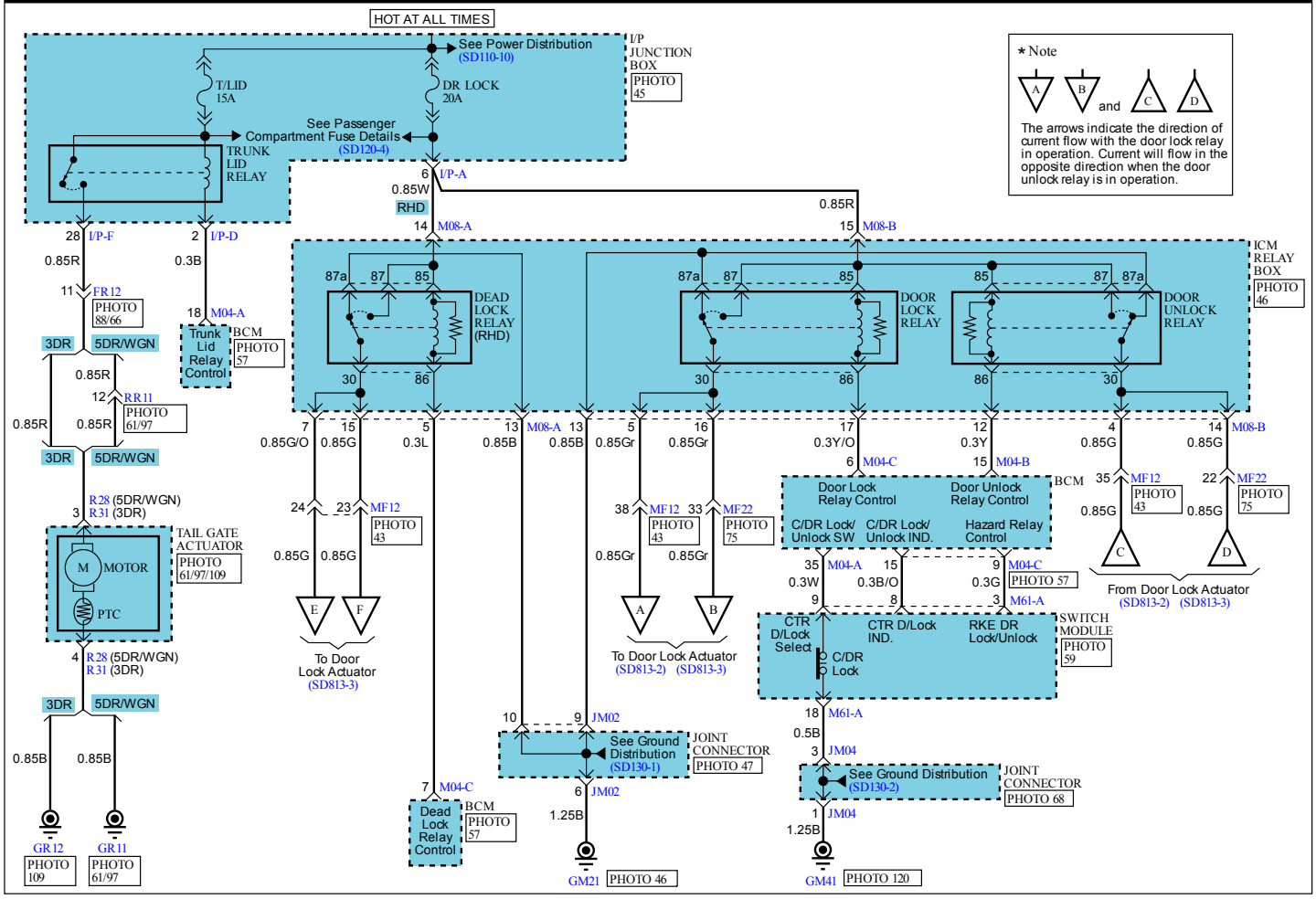
Power Distribution (9) SD110-9



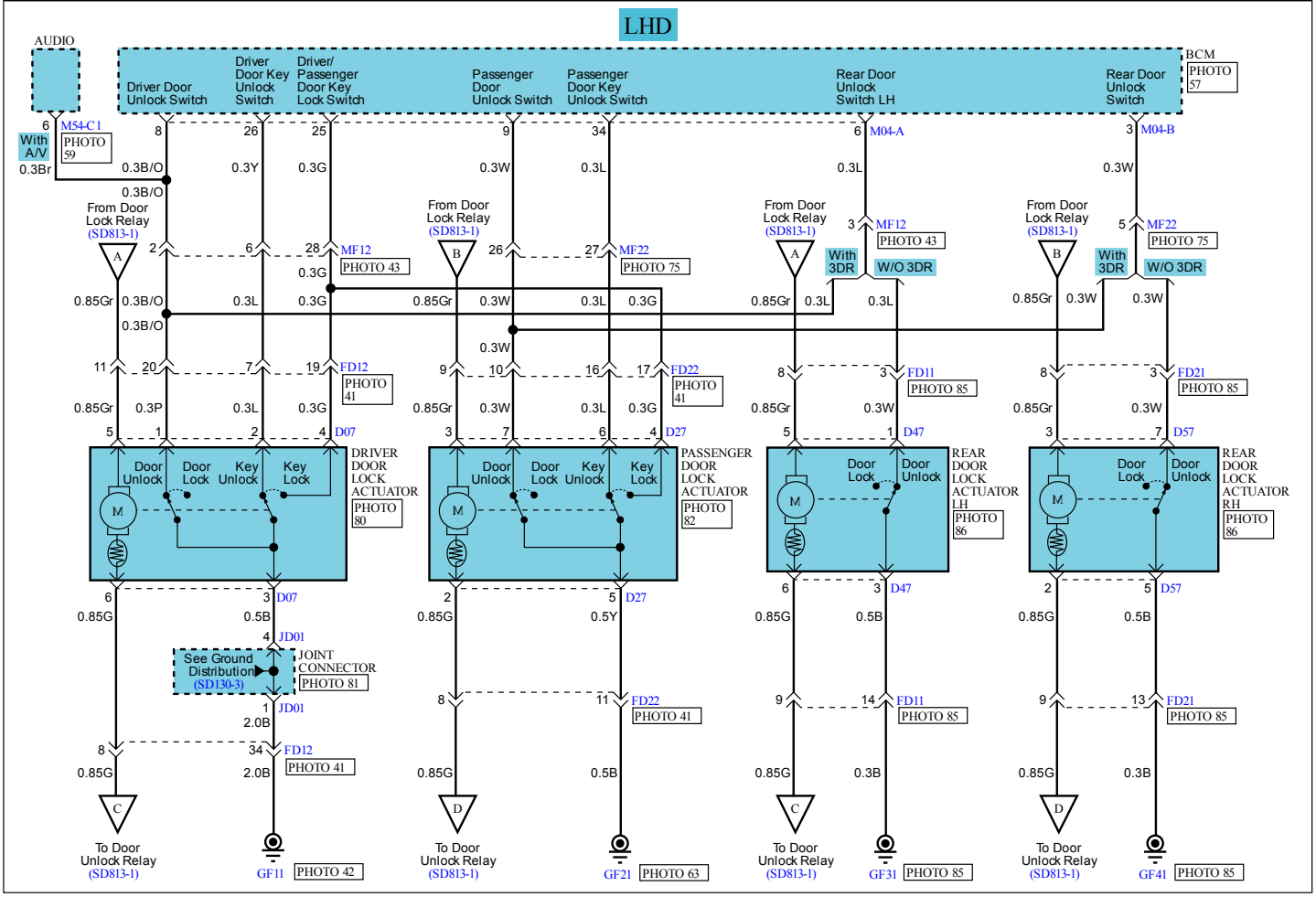
Power Distribution (10) SD110-10



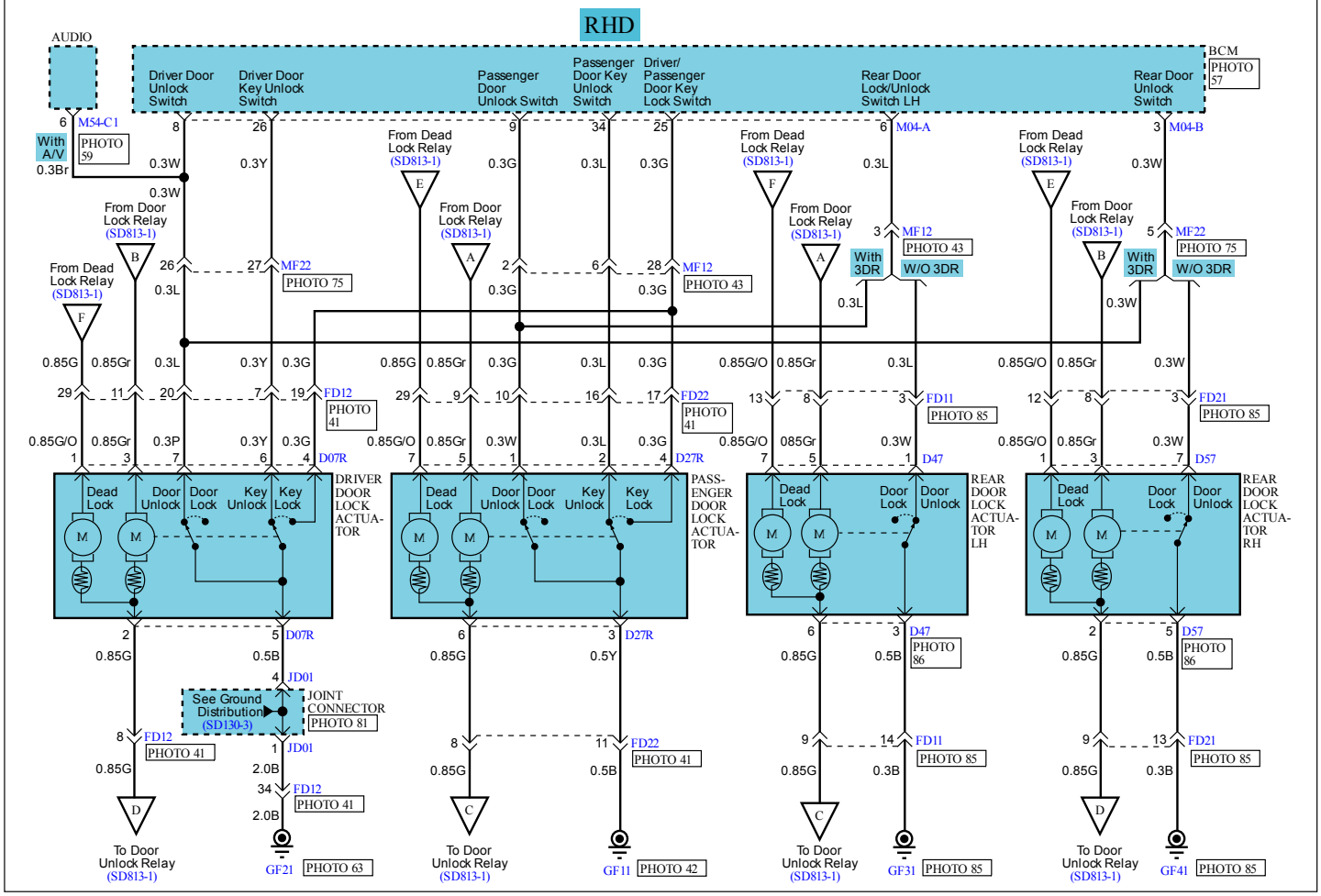
Power Door Locks (1) SD813-1



Power Door Locks (2) SD813-2

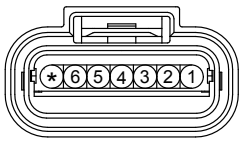


Power Door Locks (3) SD813-3



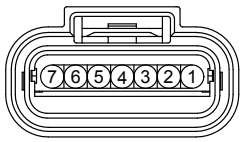
Power Door Locks (4) SD813-4

D07



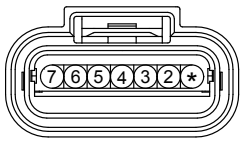
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D07R



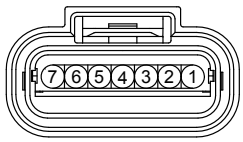
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D27



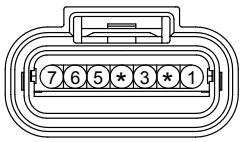
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D27R



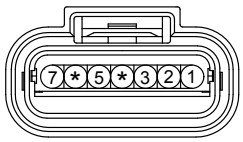
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D47



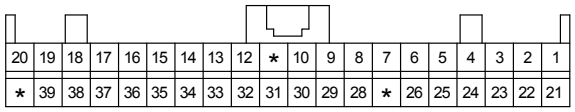
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D57



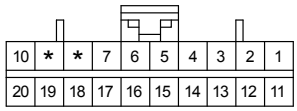
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M04-A



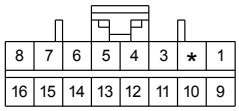
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M04-B



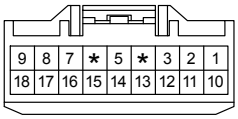
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M04-C



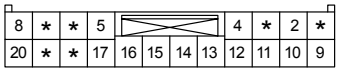
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M08-A



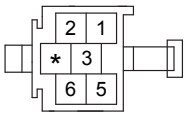
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M08-B



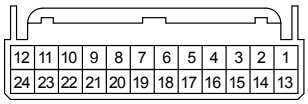
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M54-C1



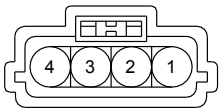
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M61-A



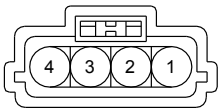
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R28



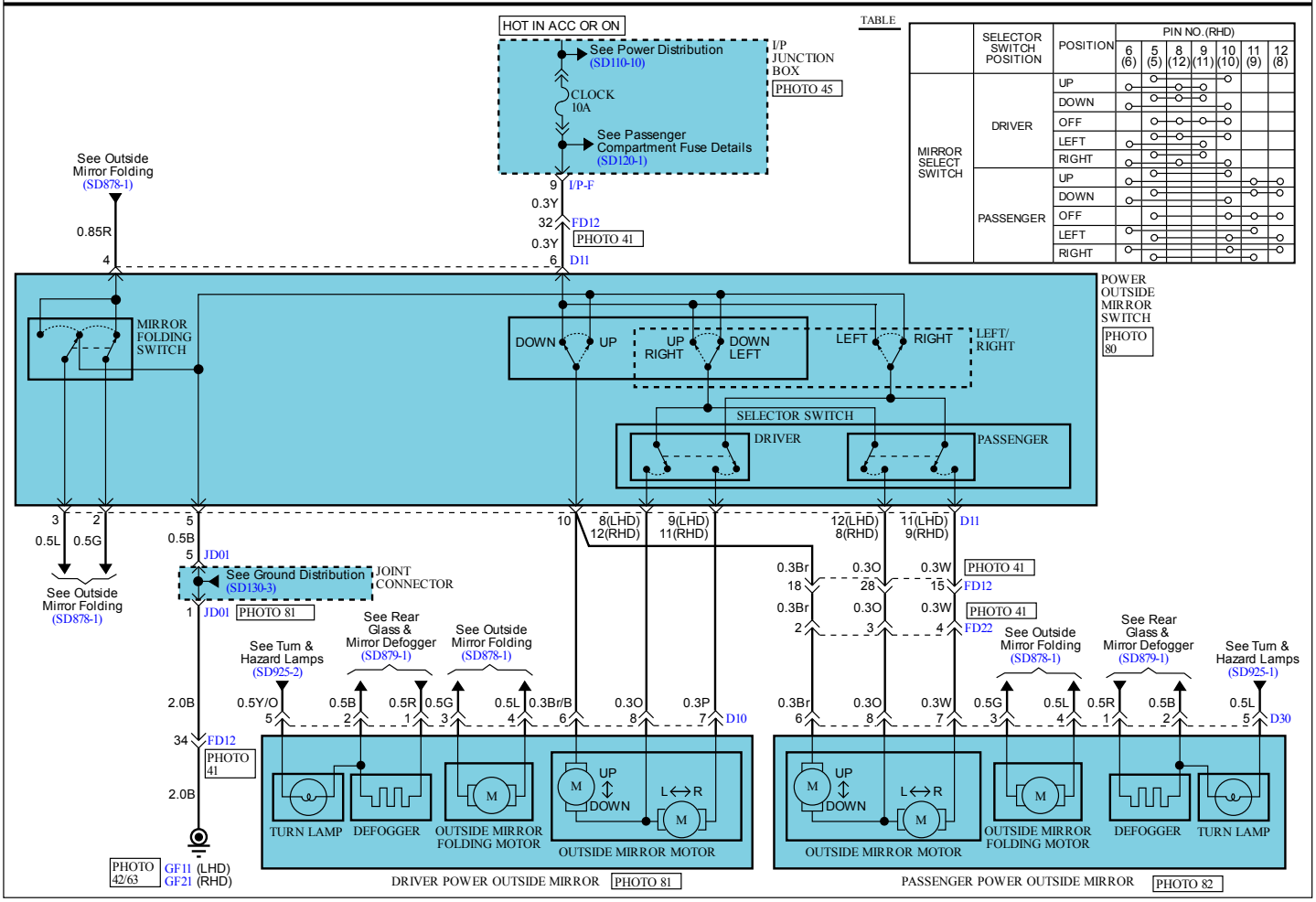
KUM_NDWP_04F_B

R31



KUM_NDWP_04F_B

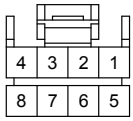
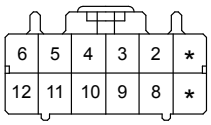
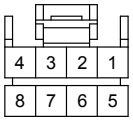
Power Outside Mirrors (1) SD876-1



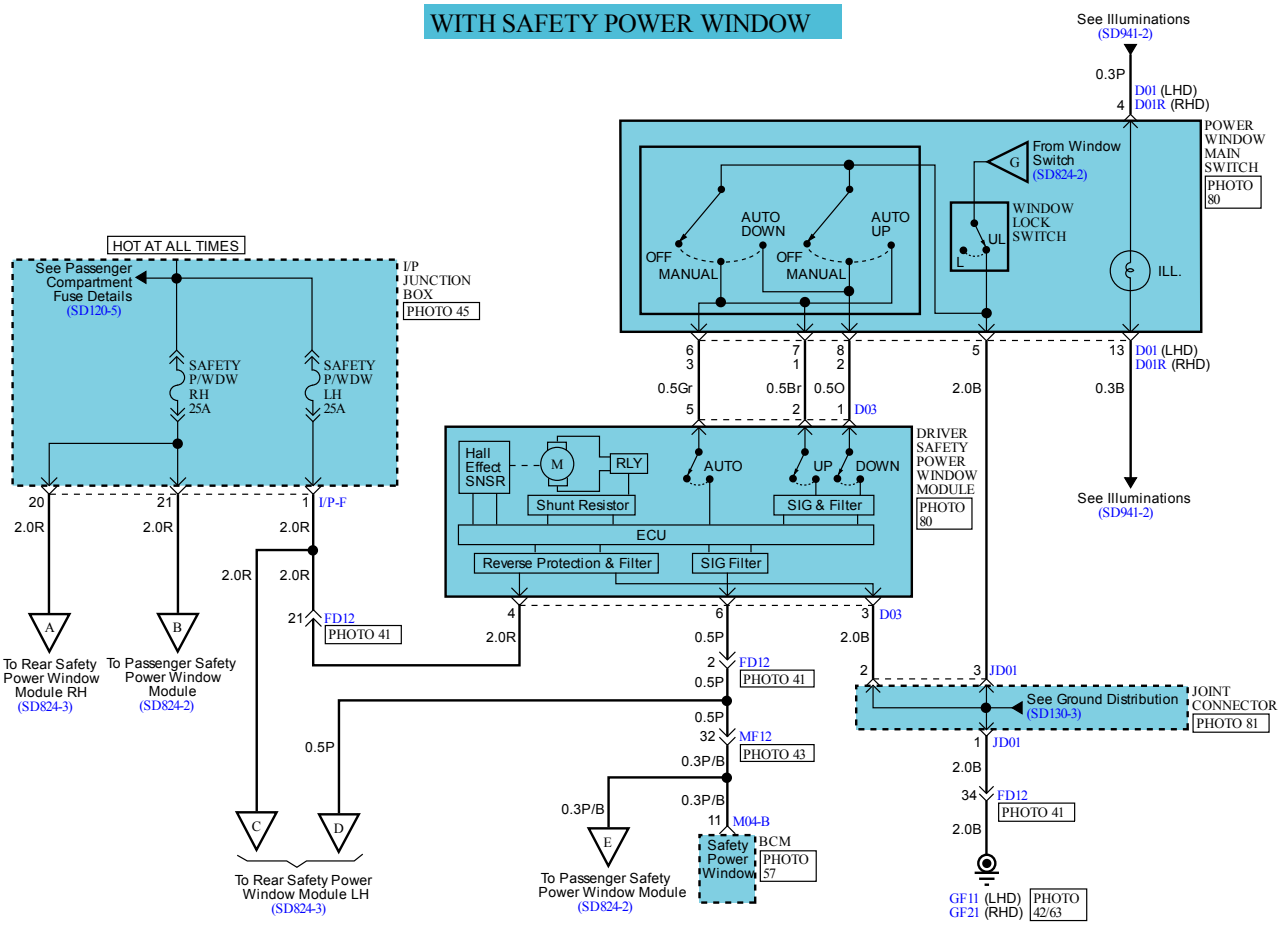
TABLE

	SELECTOR SWITCH POSITION	POSITION	PIN NO.(RHD) 6 (6)	5 (5)	8 (12)	9 (11)	10 (10)	11 (9)	12 (8)
MIRROR SELECT SWITCH	DRIVER	UP		○		○	○		
		DOWN	○			○	○		
		OFF		○		○	○		
		LEFT	○			○	○		
		RIGHT	○		○		○		
	PASSENGER	UP		○		○	○	○	○
		DOWN	○			○	○	○	○
		OFF		○		○	○	○	○
		LEFT	○			○	○	○	○
		RIGHT	○		○		○	○	○

Power Outside Mirrors (2) SD876-2

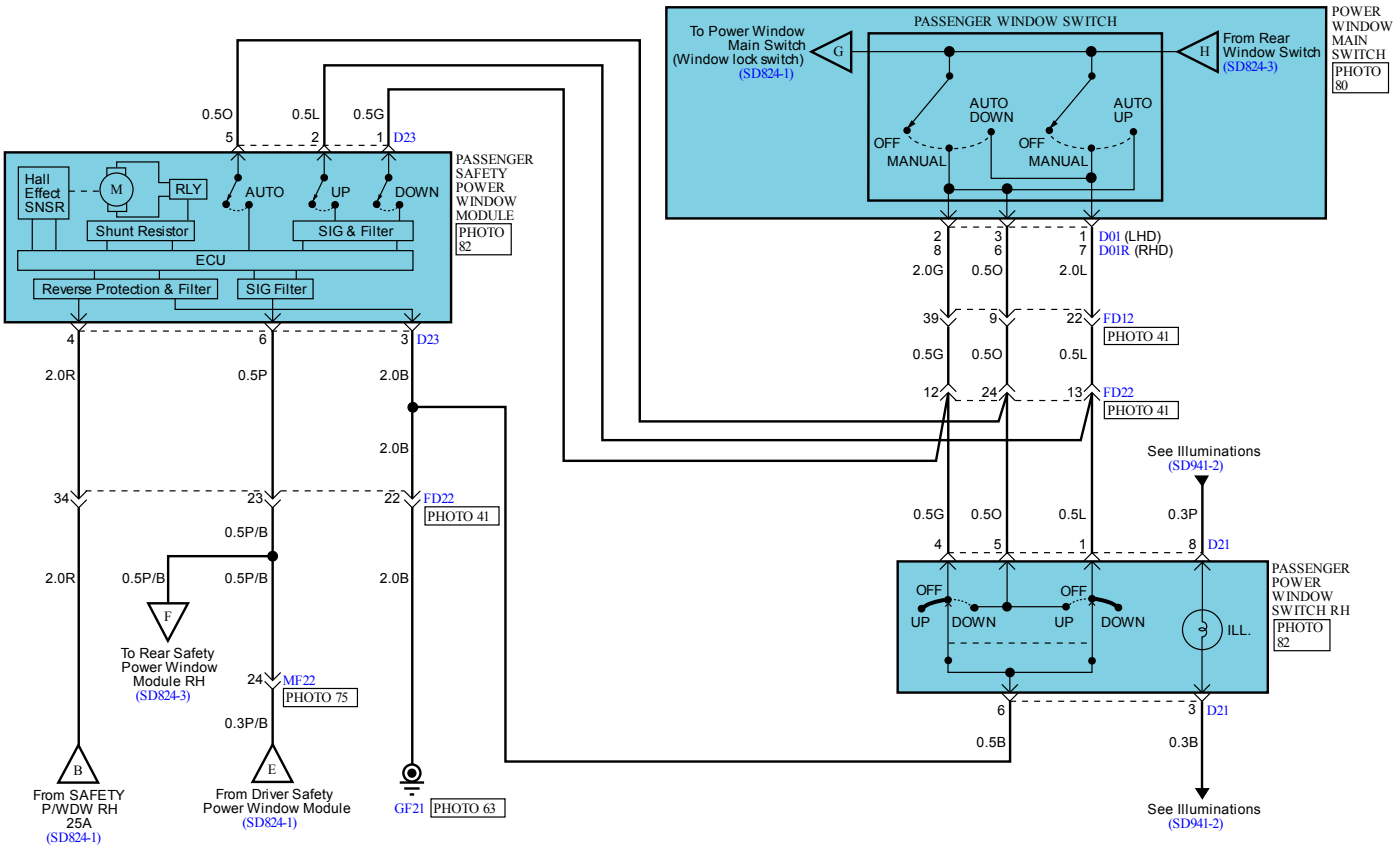
D10	D11	D30	
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Power Windows (1) SD824-1

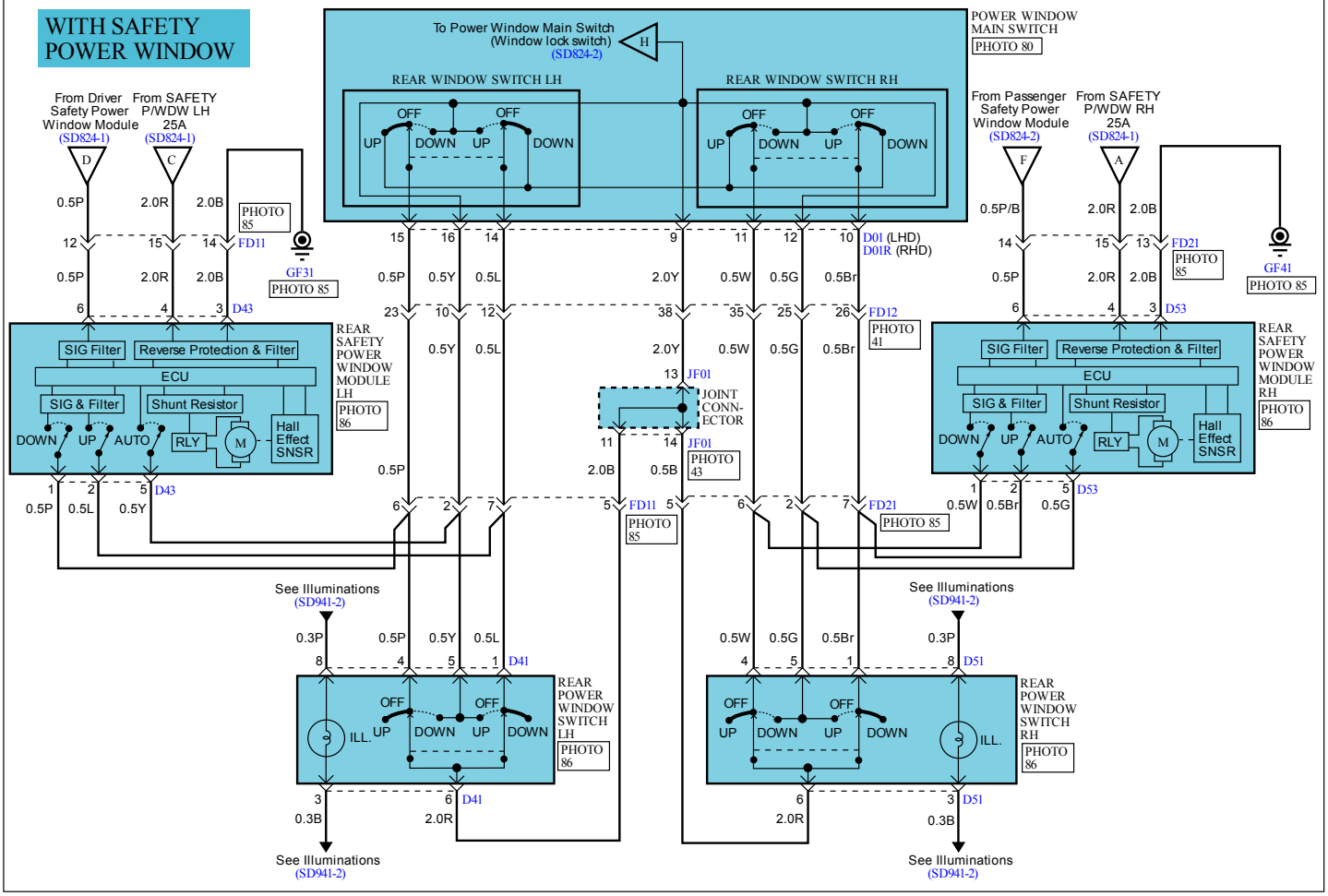


Power Windows (2) SD824-2

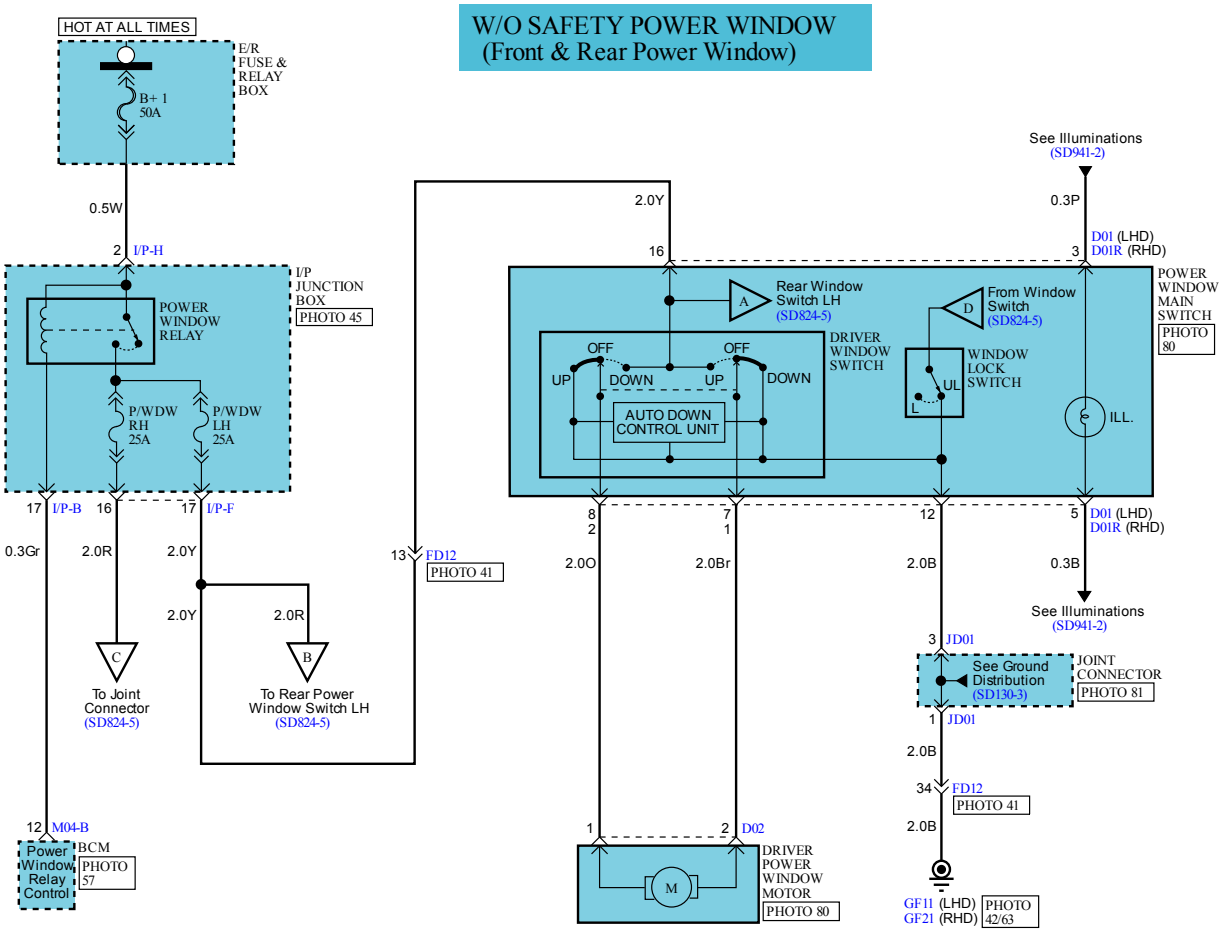
WITH SAFETY POWER WINDOW



Power Windows (3) SD824-3

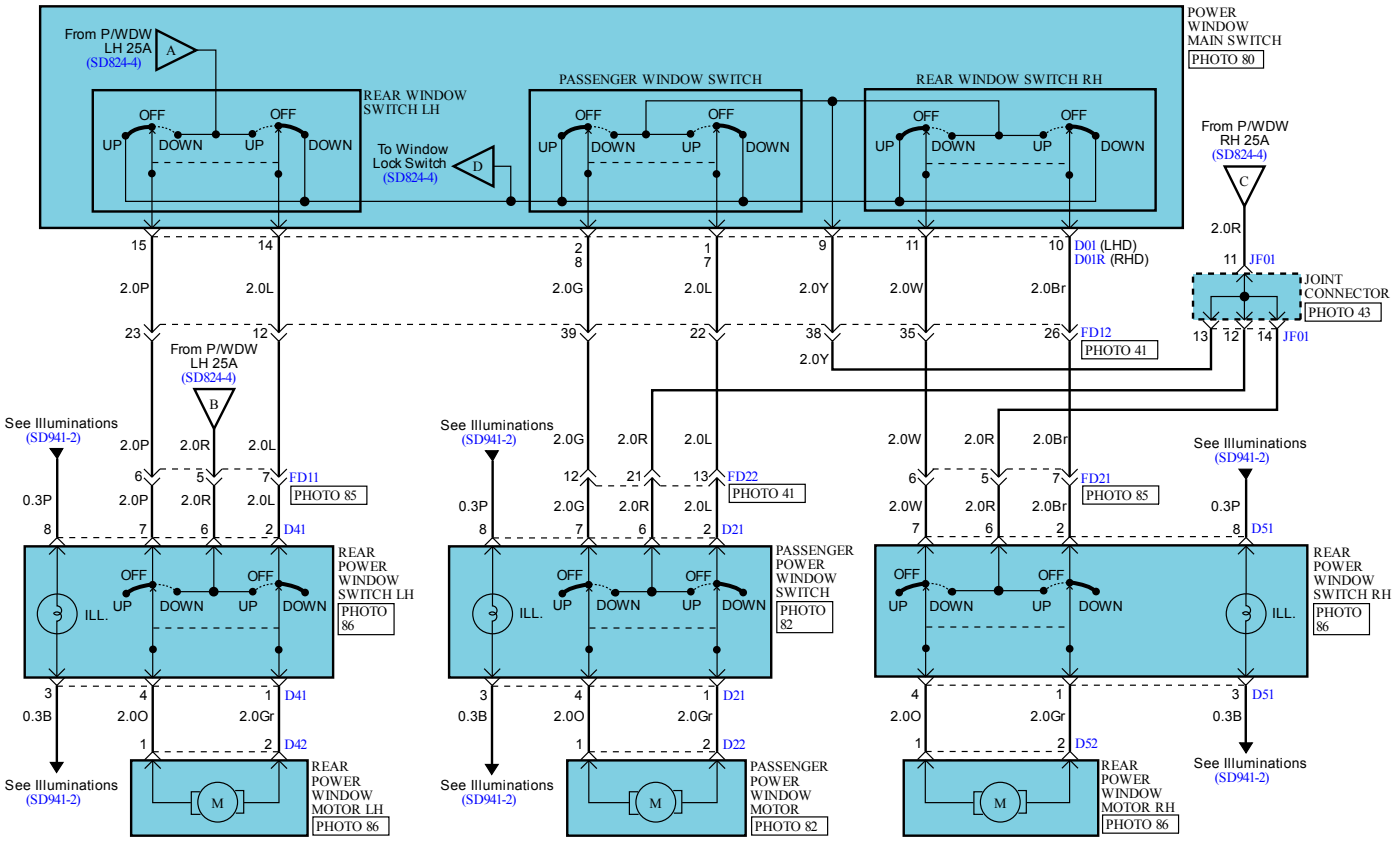


Power Windows (4) SD824-4

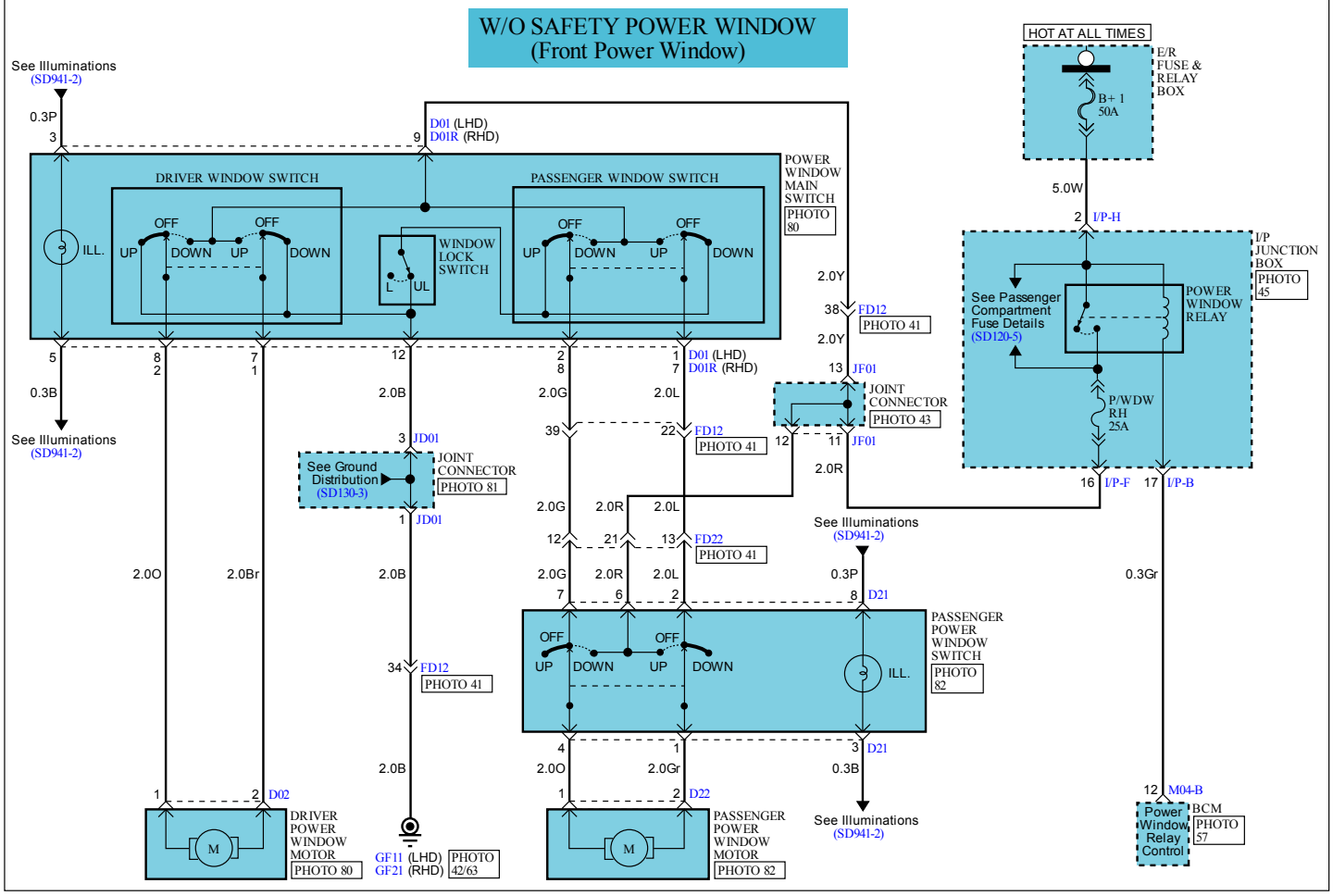


Power Windows (5) SD824-5

W/O SAFETY POWER WINDOW (Front & Rear Power Window)

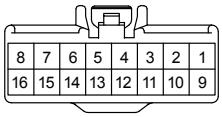


Power Windows (6) SD824-6



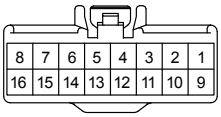
Power Windows (7) SD824-7

D01



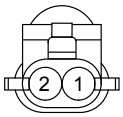
KET_090III_16F_W

D01R



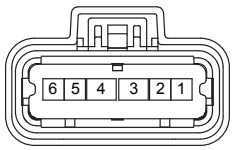
KET_090III_16F_W

D02



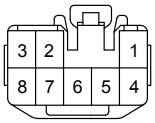
FCI_SENSOR_02F_Gr

D03



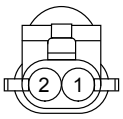
FCI_MINIWP_06F_B

D21



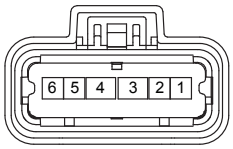
KET_090II_08F_W

D22



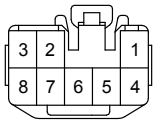
FCI_SENSOR_02F_Gr

D23



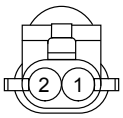
FCI_MINIWP_06F_B

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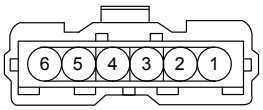
KET_090II_08F_W

D42



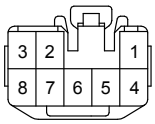
FCI_SENSOR_02F_B

D43



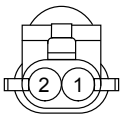
FCI_SENSOR_06F_B

D51



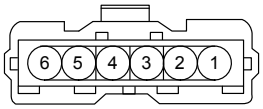
KET_090II_08F_W

D52



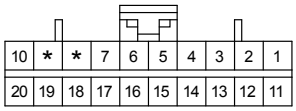
FCI_SENSOR_02F_B

D53



FCI_SENSOR_06F_B

M04-B

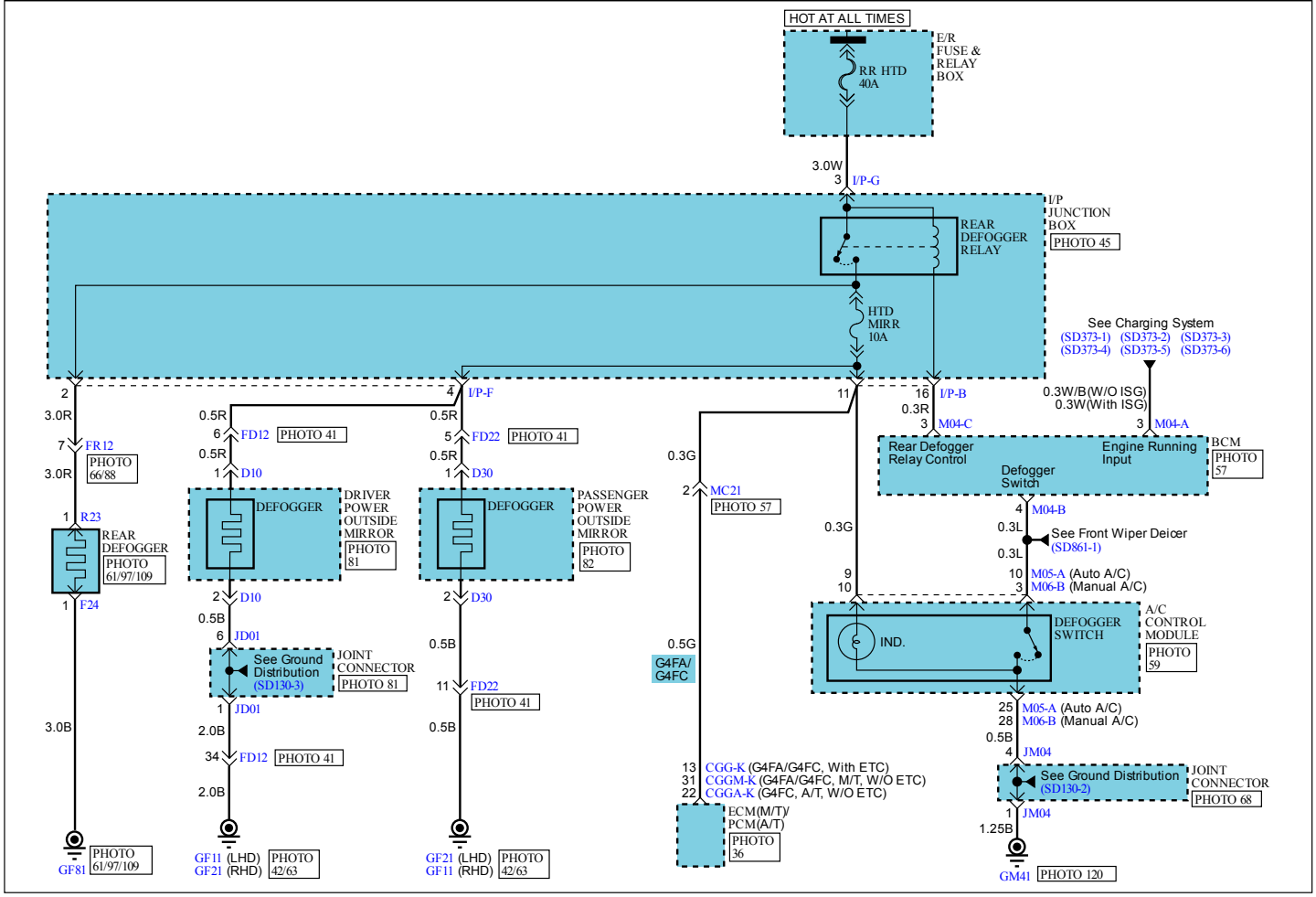


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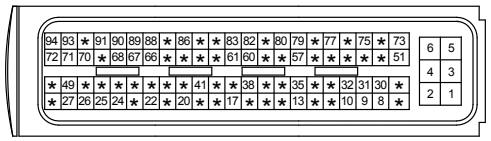
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Rear Glass & Mirror Defogger (1) SD879-1



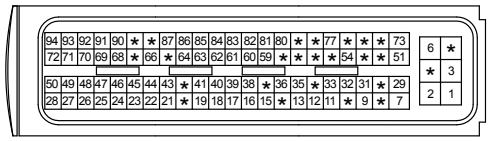
Rear Glass & Mirror Defogger (2) SD879-2

CGGA-K



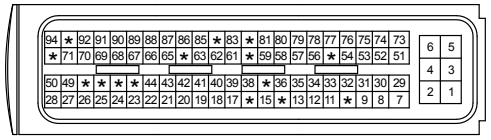
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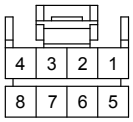
AMP_ECU_94F_B

CGG-K



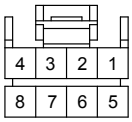
AMP_ECU_94F_B

D10



AMP_040M1_08F_B

D30



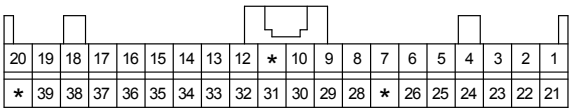
AMP_040M1_08F_B

F24



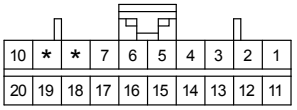
AMP_250DL_01F_B

M04-A



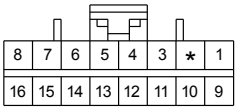
AMP_025_40F_W

M04-B



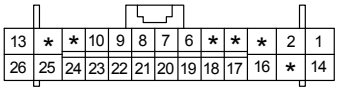
AMP_040M2_20F_B

M04-C



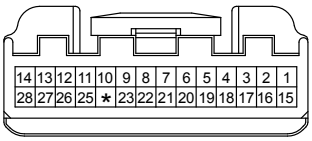
AMP_040M2_16F_W

M05-A



AMP_0407_26F_W_HD

M06-B



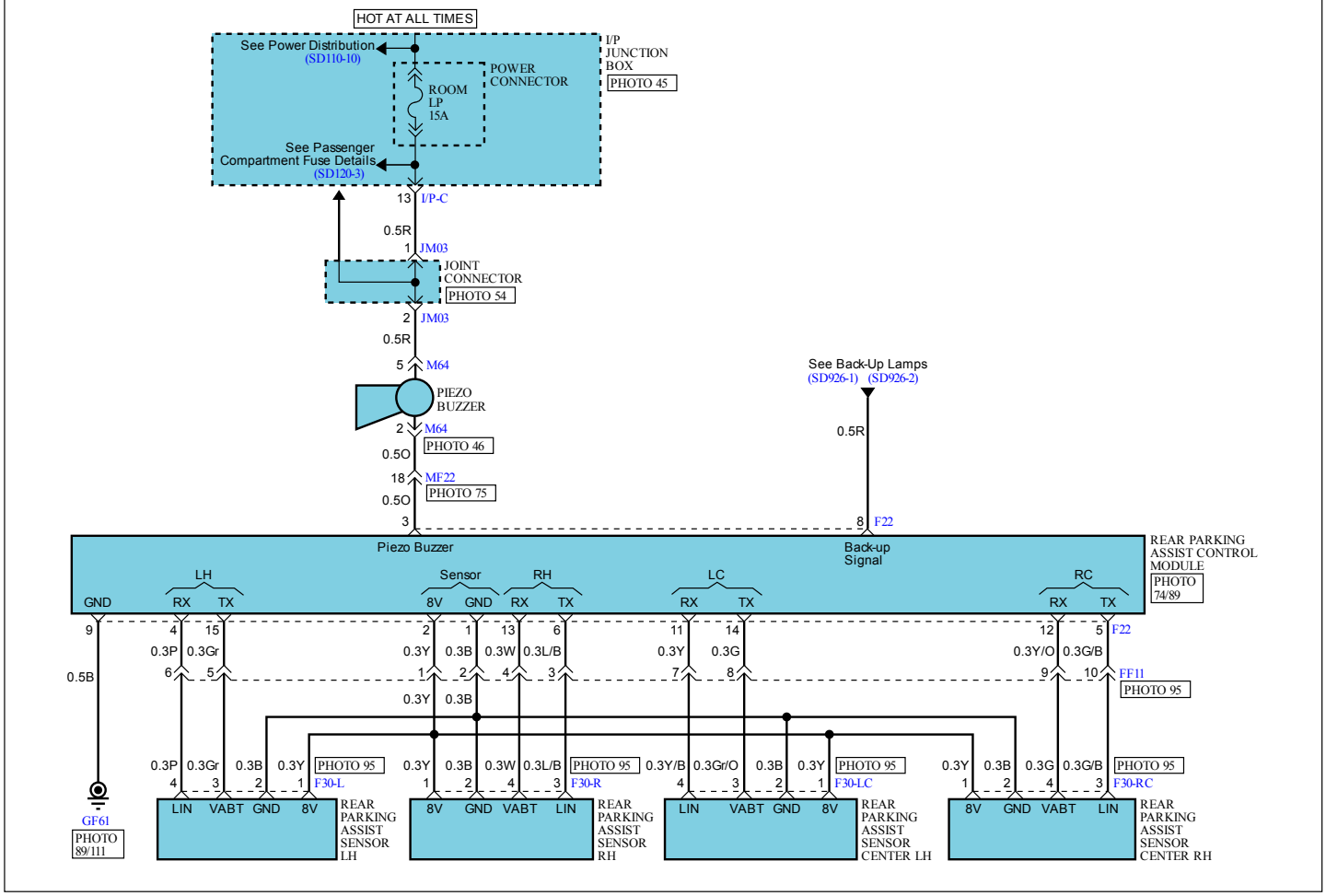
AMP_025_28F_W

R23



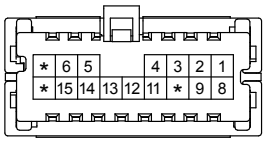
AMP_250DL_01F_B

Rear Parking Assist System (1) SD957-1



Rear Parking Assist System (2) SD957-2

F22



KET_040III_16F_W

F30-L



KET_SSD_04F_B

F30-LC



KET_SSD_04F_B

F30-R



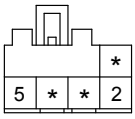
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F30-RC



KET_SSD_04F_B

M64

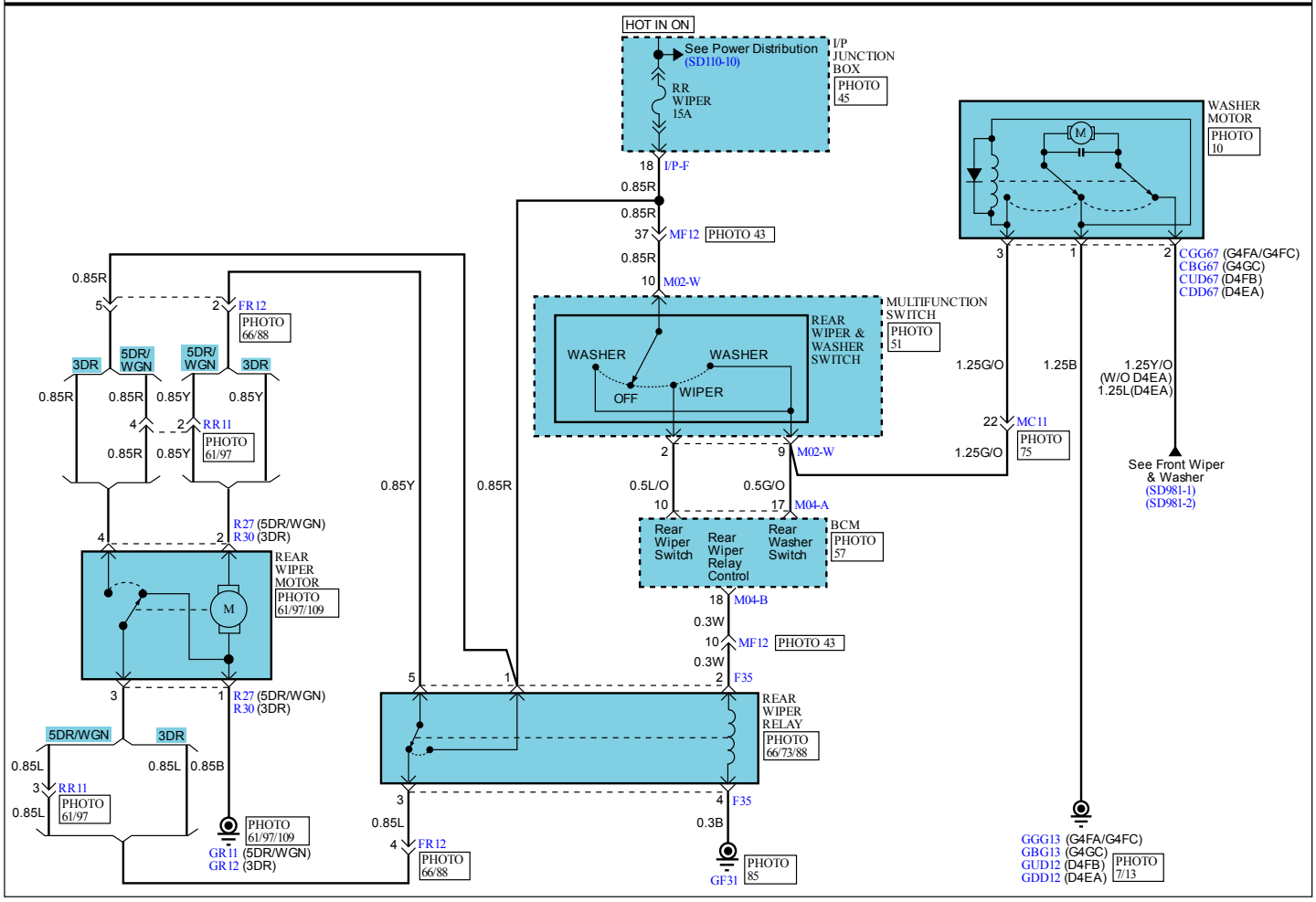


KUM_CDR_05F_W

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Rear Wiper & Washer (1) SD982-1



Rear Wiper & Washer (2) SD982-2

CBG67



KET_090IIWP_03F_B

CDD67



KET_090IIWP_03F_B

CGG67



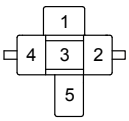
KET_090IIWP_03F_B

CUD67



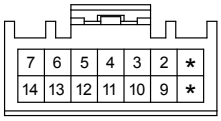
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F35



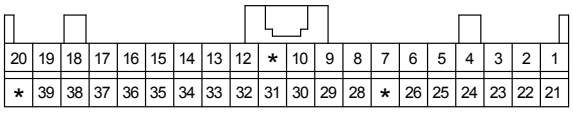
KET_250_05F_W_RLY

M02-W



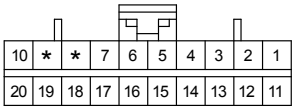
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M04-A



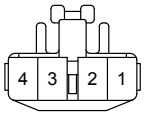
AMP_025_40F_W

M04-B



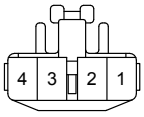
AMP_040M2_20F_B

R27



KET_090II_04F_W

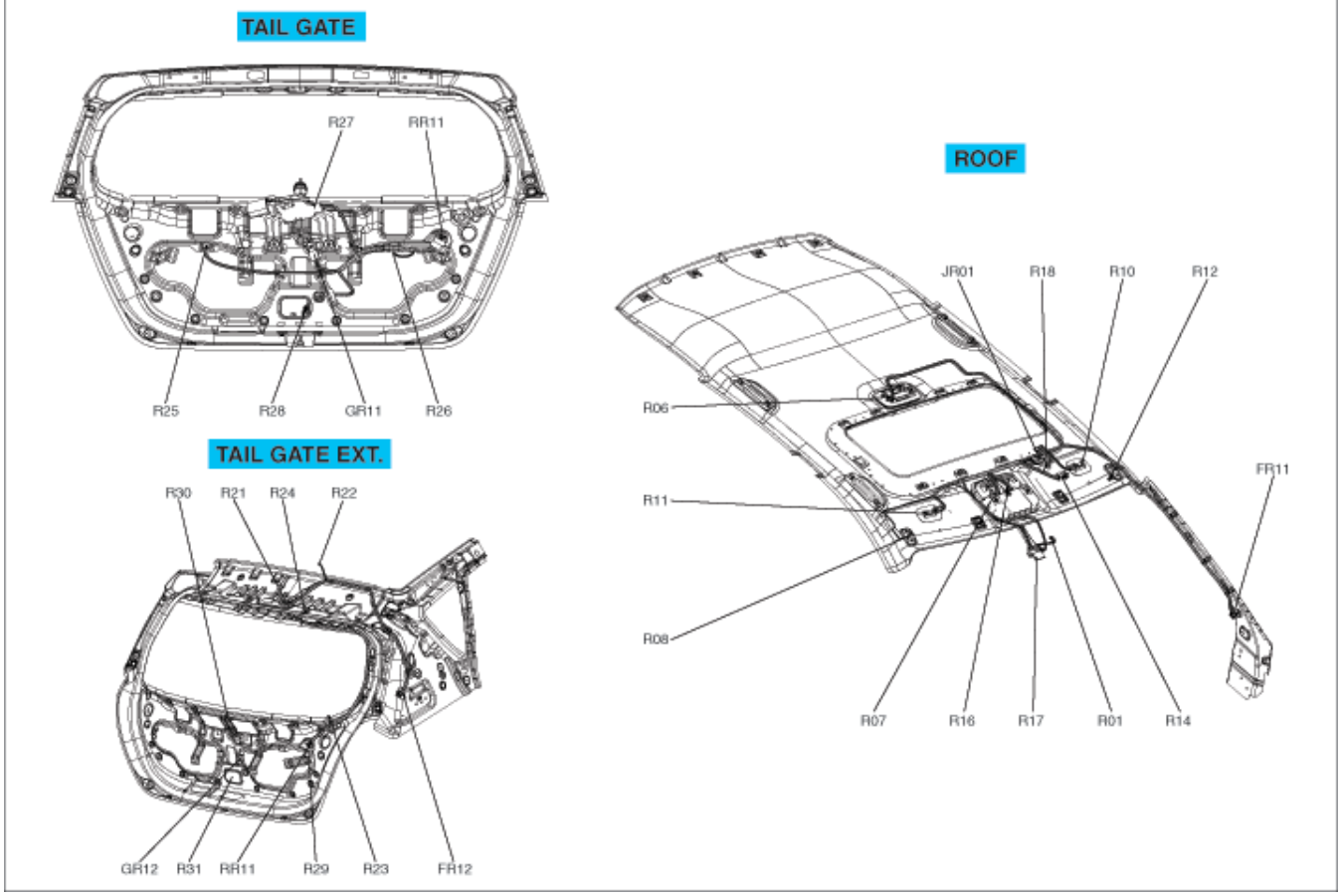
R30



KET_090II_04F_W

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Roof & Tail Gate Harness (1) HL-16



Roof & Tail Gate Harness (2)

ROOF HARNESS

R01	Electro Chromic Mirror
R06	Room Lamp
R07	Sunroof Control Module
R08	Vanity Lamp Switch RH
R10	Vanity Lamp LH
R11	Vanity Lamp RH
R12	Vanity Lamp Switch LH
R14	Sunroof Motor
R16	Sunroof Switch
R17	Rain Sensor
R18	MIC
JR01	Joint Connector
FR11	Connection With FLOOR Harness

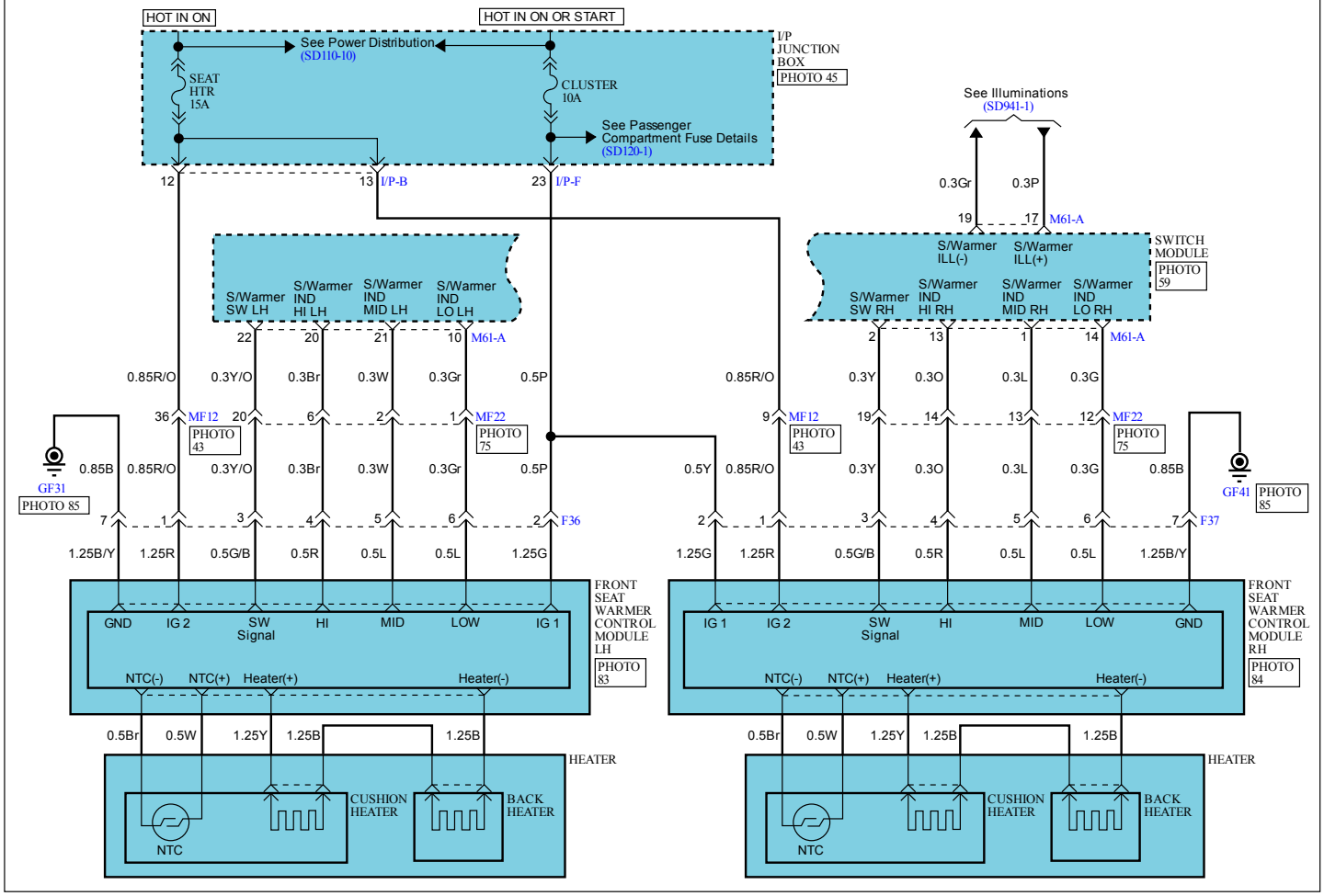
TAIL GATE HARNESS

R25	Handle Switch (Non 3DR)
R26	License Lamp
R27	Rear Wiper Motor (Non 3DR)
R28	Tail Gate Actuator (Non 3DR)
RR11	Connection With TAIL GATE EXT. Harness
GR11	Ground (Non 3DR)

TAIL GATE EXT. HARNESS

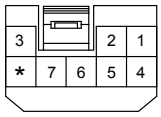
R21	High-Mounted Stop Lamp
R22	Roof Antenna
R23	Rear Defogger (+)
R24	HMS Lamp (3DR)
R29	Handle Switch (3DR)
R30	Rear Wiper Motor (3DR)
R31	Tail Gate Actuator (3DR)
FR12	Connection With FLOOR Harness
RR11	Connection With TAIL GATE Harness
GR12	Ground (3DR)

Seat Warmer (1) SD889-1



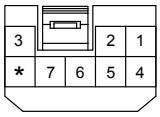
Seat Warmer (2) SD889-2

F36



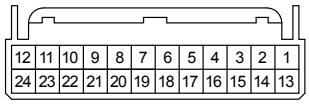
AMP_090III_08F_W

F37



AMP_090III_08F_W

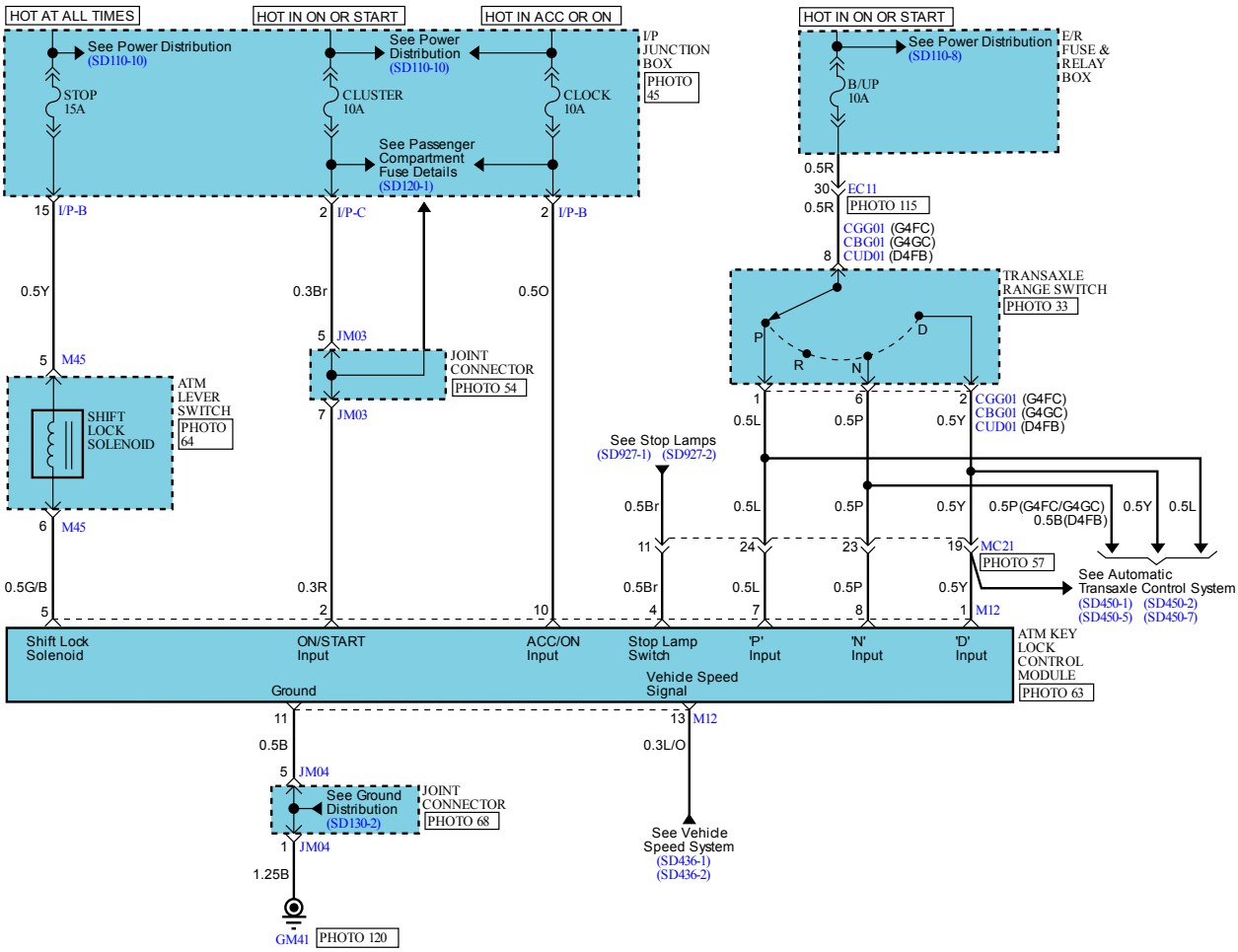
M61-A



AMP_025_24F_W

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Shift & Key Lock System (1) SD452-1



Shift & Key Lock System (2) SD452-2

CBG01



KET_SSD_10F_B_A

CGG01



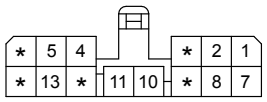
KET_SSD_10F_B_A

CUD01



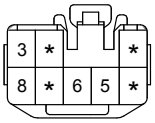
KET_SSD_10F_B_A

M12



AMP_070_14F_W

M45



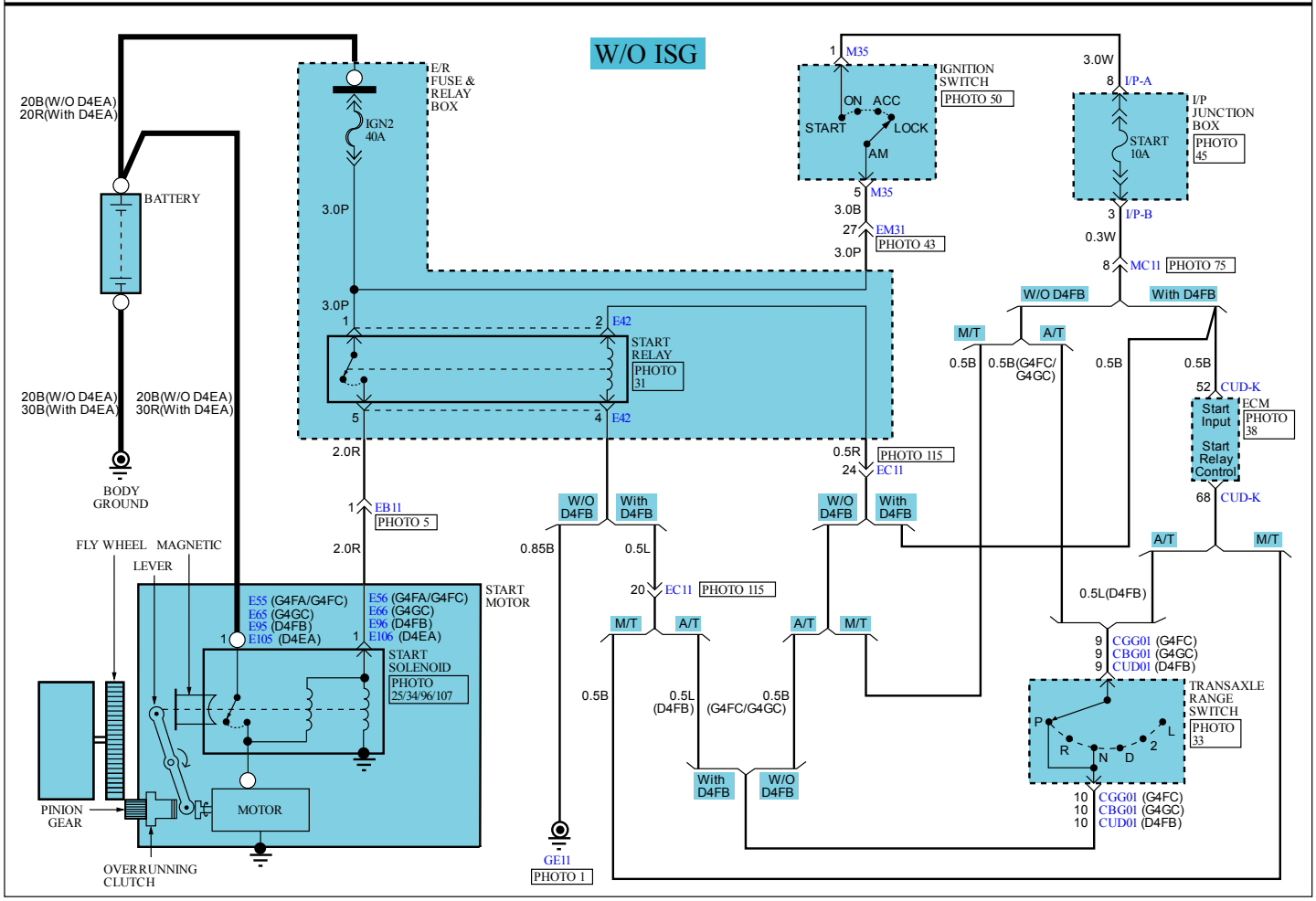
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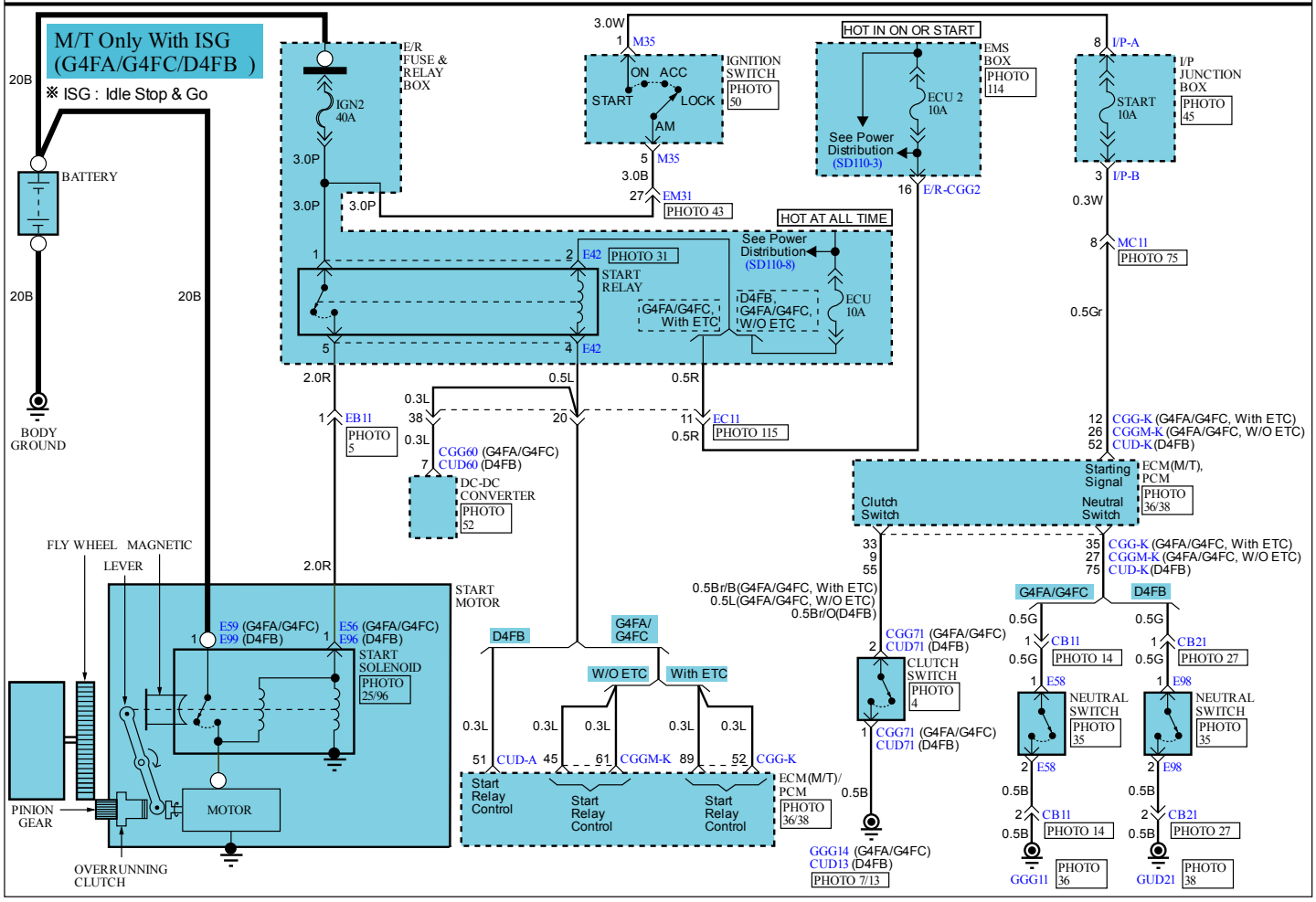
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Starting System (1) SD360-1



Starting System (2) SD360-2



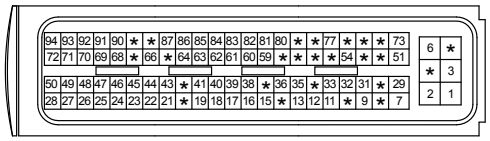
Starting System (3) SD360-3

CBG01



KET_SSD_10F_B_A

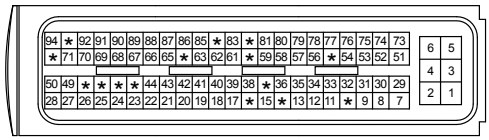
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CGG-K



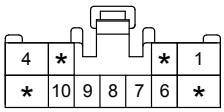
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CGG01



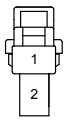
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CGG60



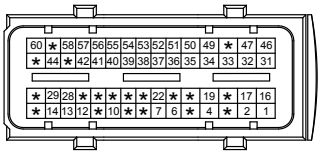
KET_1809_11F

CGG71



KET_250DL_02F_W

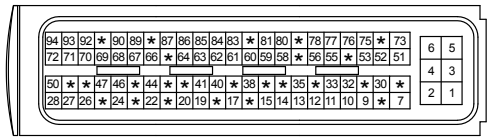
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CUD-K



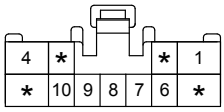
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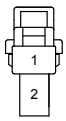
KET_SSD_10F_B_A

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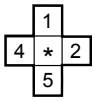
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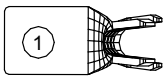
KET_250DL_02F_W

E42



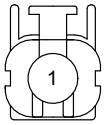
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E55



CPT_STMTR_8T_N

E56



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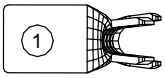
Starting System (4) SD360-4

E58



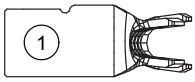
KUM_NMWP_02F_B

E59



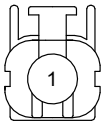
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E65



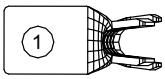
CHT_STMTR_8T_N

E66



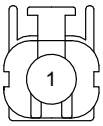
KET_58X_01F_B

E95



CPT_STMTR_8T_N

E96



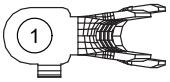
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E98



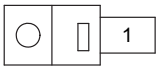
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E99



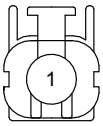
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E105



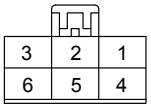
CHT_STMTR_8T_N

E106



KET_58X_01F_B

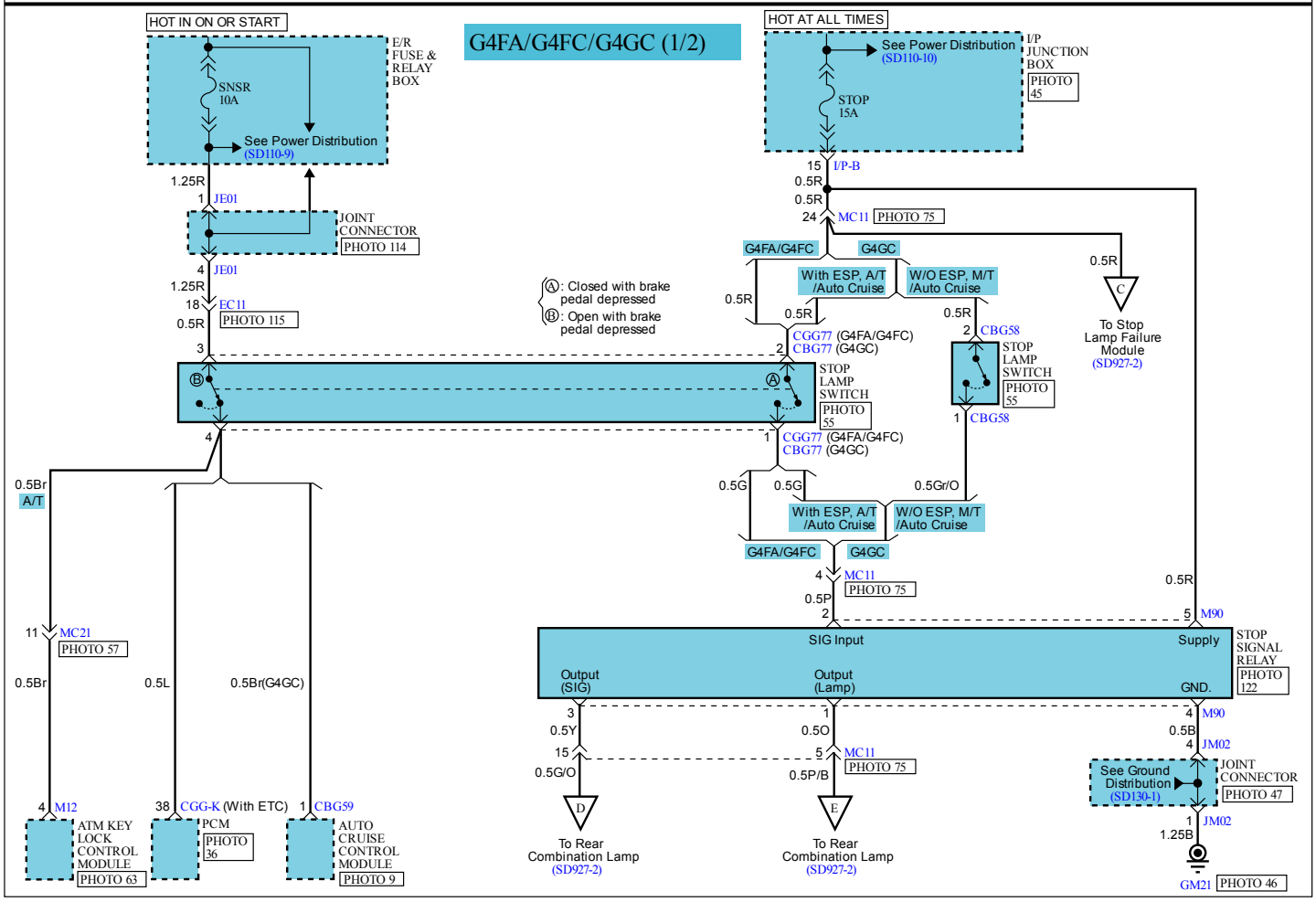
M35



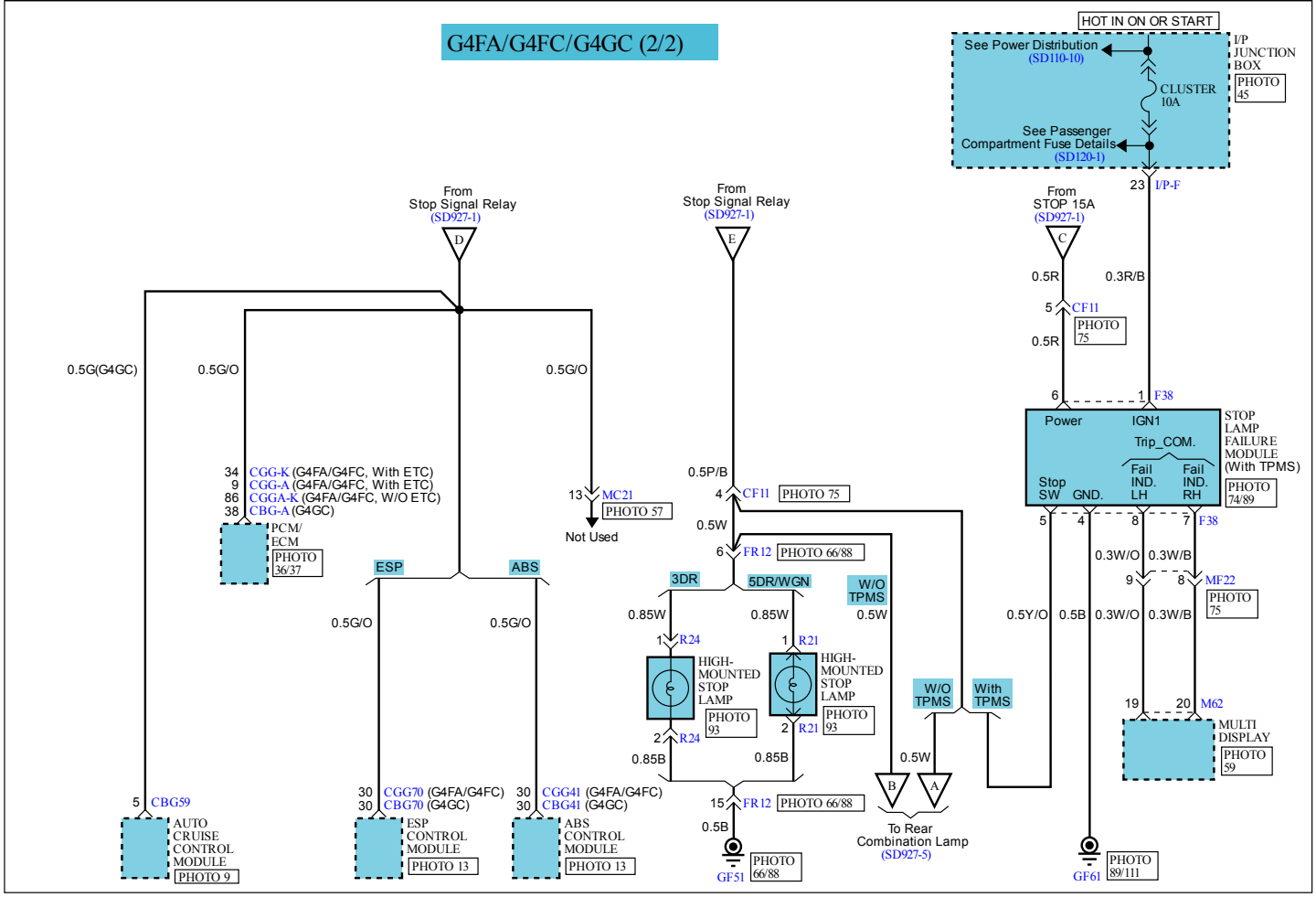
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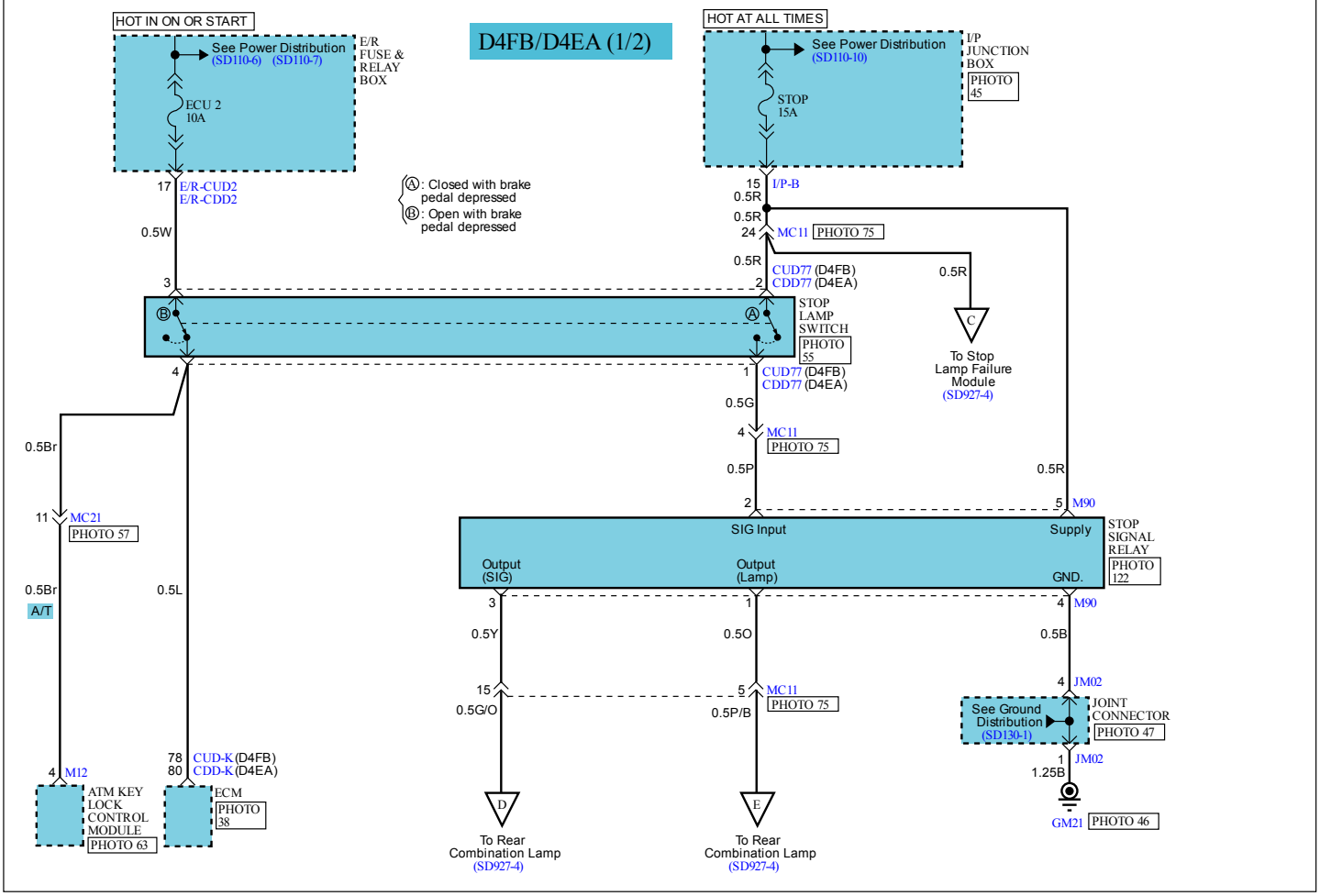
Stop Lamps (1) SD927-1



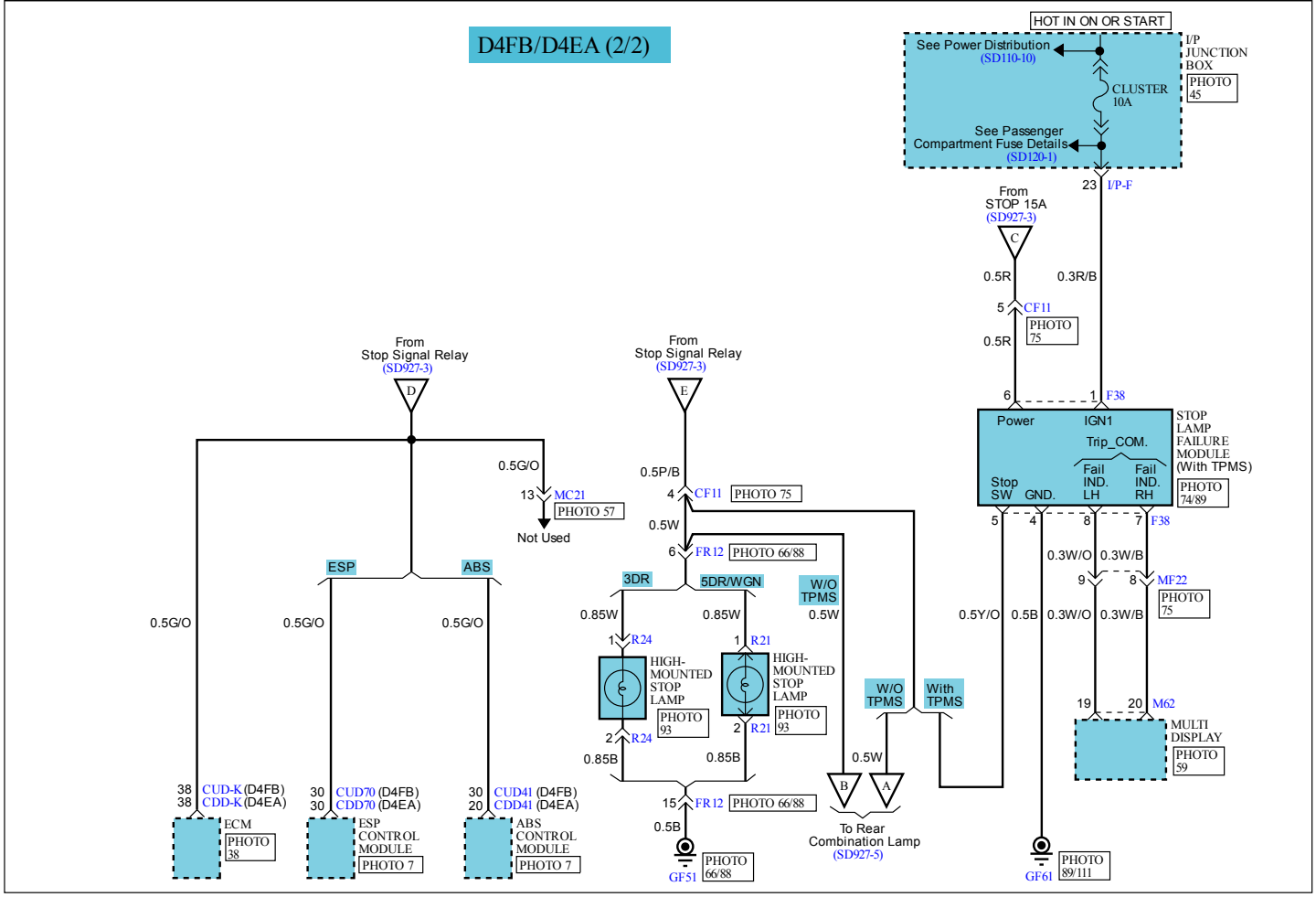
Stop Lamps (2) SD927-2



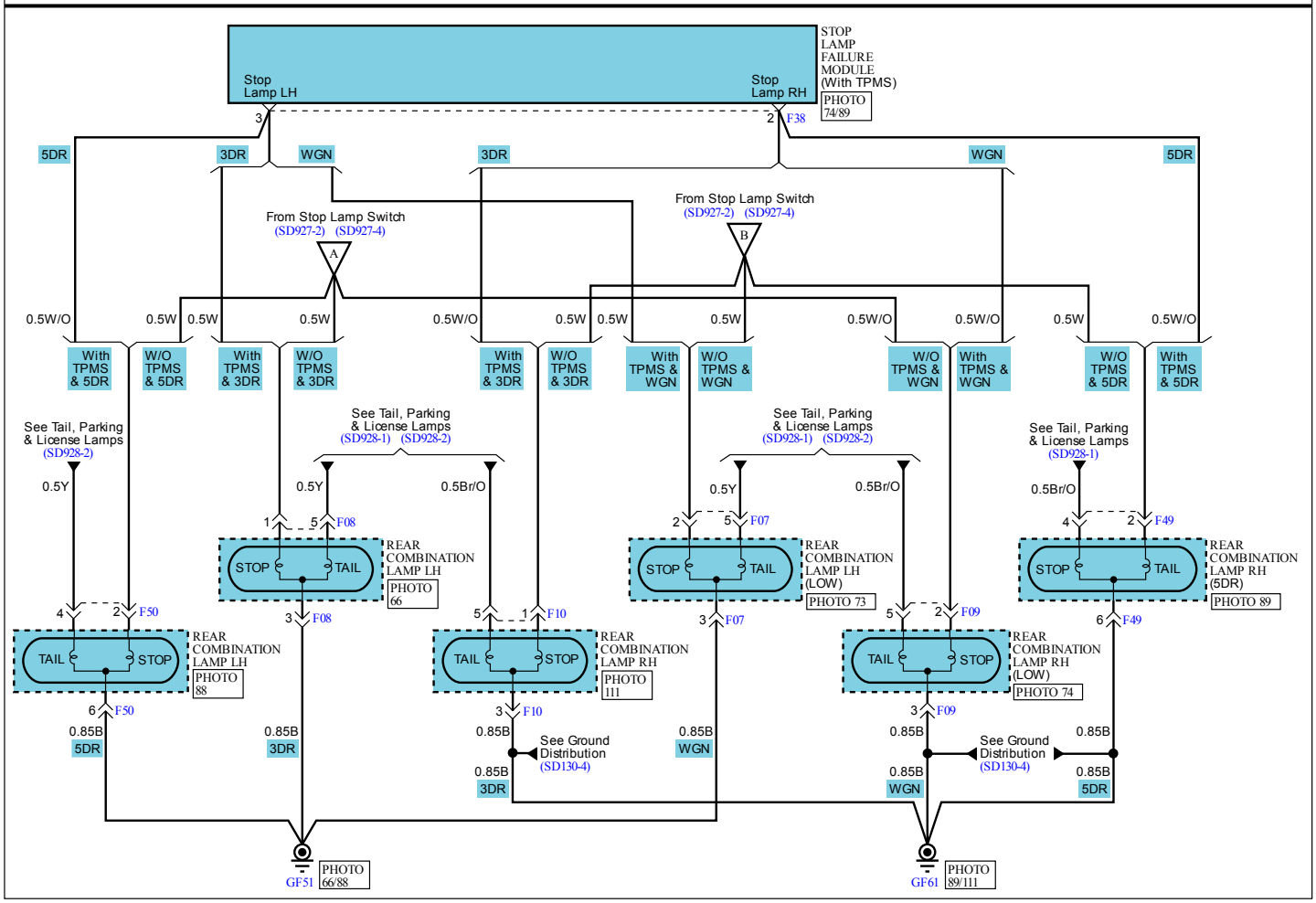
Stop Lamps (3) SD927-3



Stop Lamps (4) SD927-4

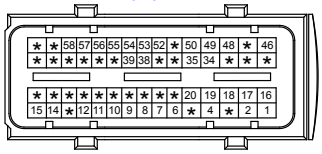


Stop Lamps (5) SD927-5



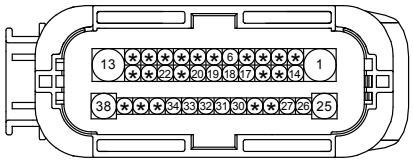
Stop Lamps (6) SD927-6

CBG-A



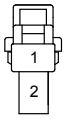
AMP_ECU_60F_B

CBG41



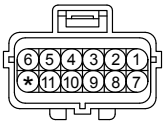
DEL_ABS_38F_B

CBG58



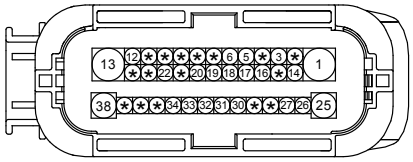
KET_250DL_02F_W

CBG59



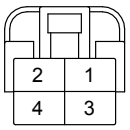
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CBG70



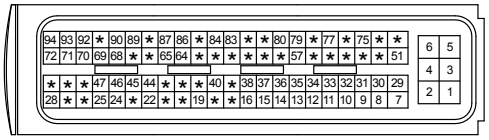
DEL_ABS_38F_B_A

CBG77



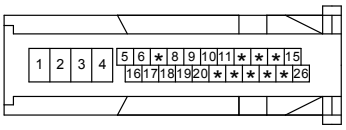
KET_250DL_04F_W

CDD-K



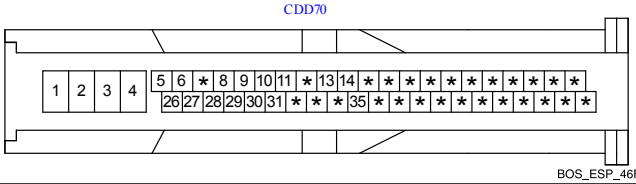
AMP_ECU_94F_B

CDD41



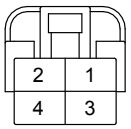
BOS_ABS_26F_B_L

CDD70



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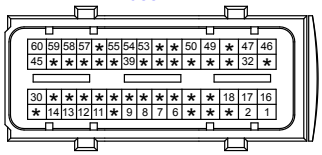
CDD77



KET_250DL_04F_W

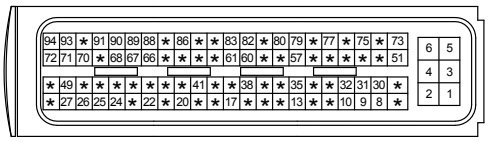
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CGG-A



AMP_ECU_60F_B

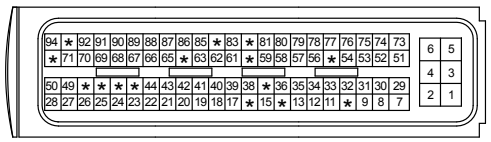
CGGA-K



AMP_ECU_94F_B

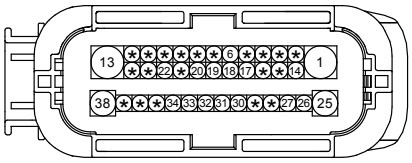
Stop Lamps (7) SD927-7

CGG-K



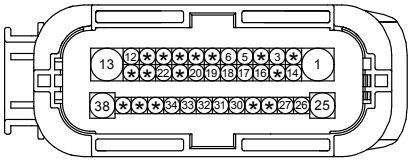
AMP_ECU_94F_B

CGG41



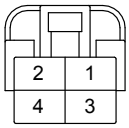
DEL_ABS_38F_B

CGG70



DEL_ABS_38F_B_A

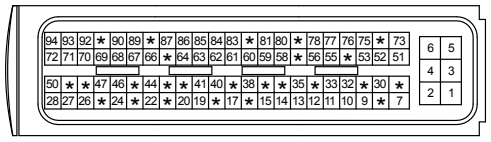
CGG77



KET_250DL_04F_W

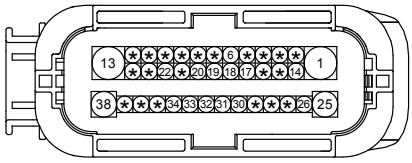
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CUD-K



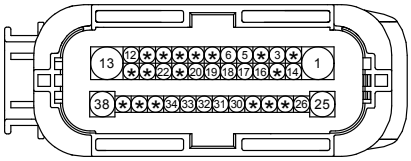
AMP_ECU_94F_B

CUD41



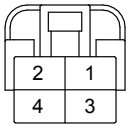
DEL_ABS_38F_B

CUD70



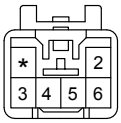
DEL_ABS_38F_B_A

CUD77



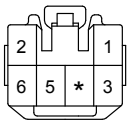
KET_250DL_04F_W

F07



KET_090II_06M_W

F08



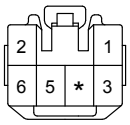
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F09



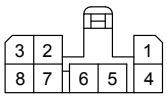
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F10



KET_090II_06F_W

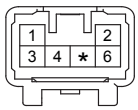
F38



AMP_070_08F_W

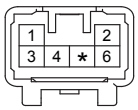
Stop Lamps (8) SD927-8

F49



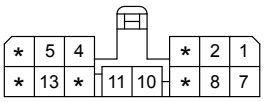
KET_090III_06M_W

F50



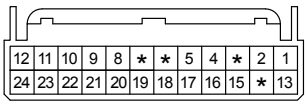
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M12



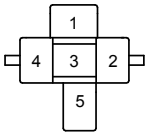
AMP_070_14F_W

M62



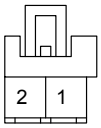
AMP_025_24F_W

M90



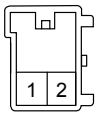
KET_250_RLY_5F_B

R21



KUM_CDR_02F_W

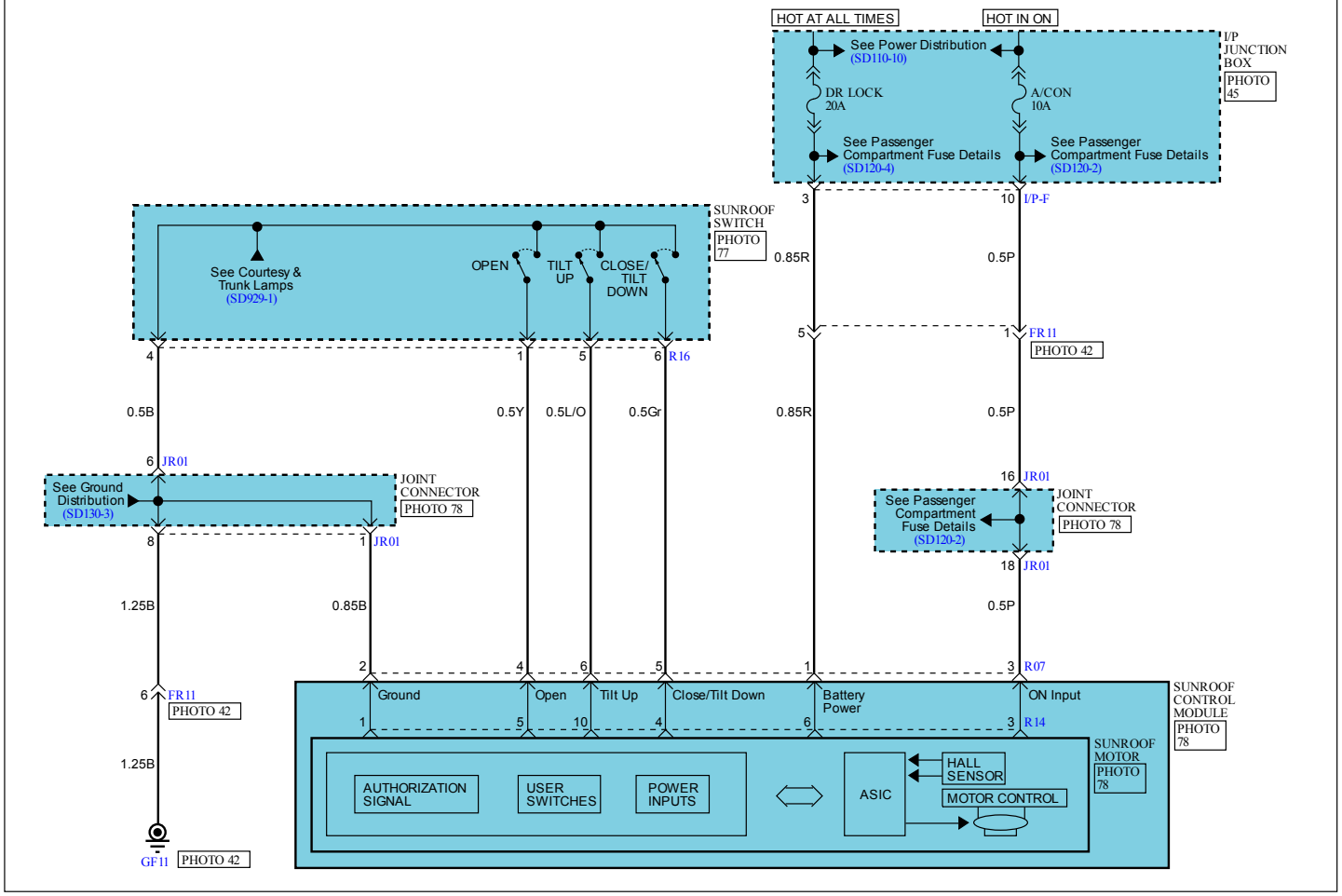
R24



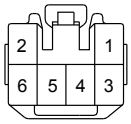
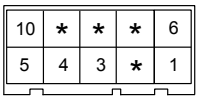
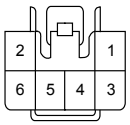
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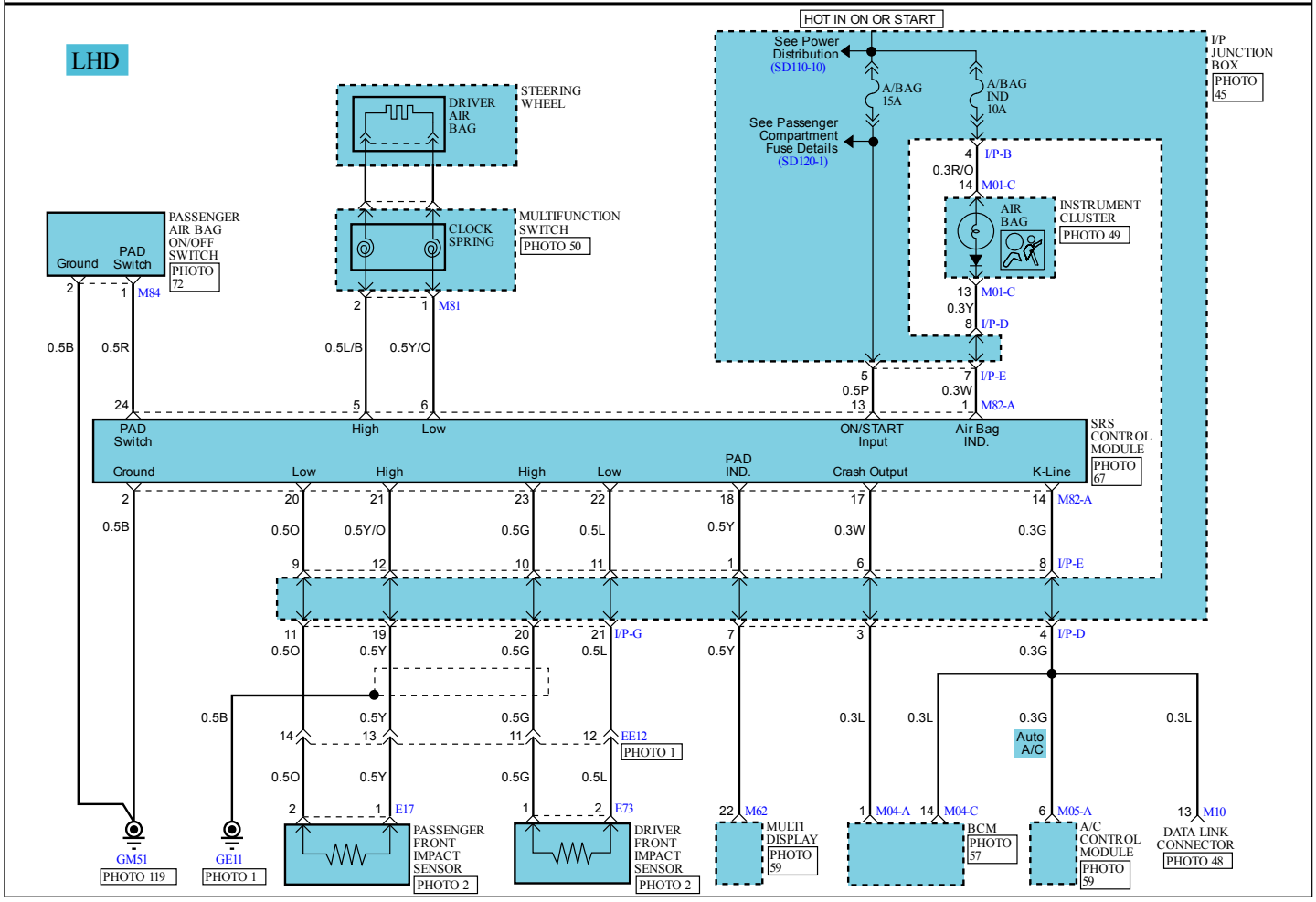
Sunroof (1) SD816-1



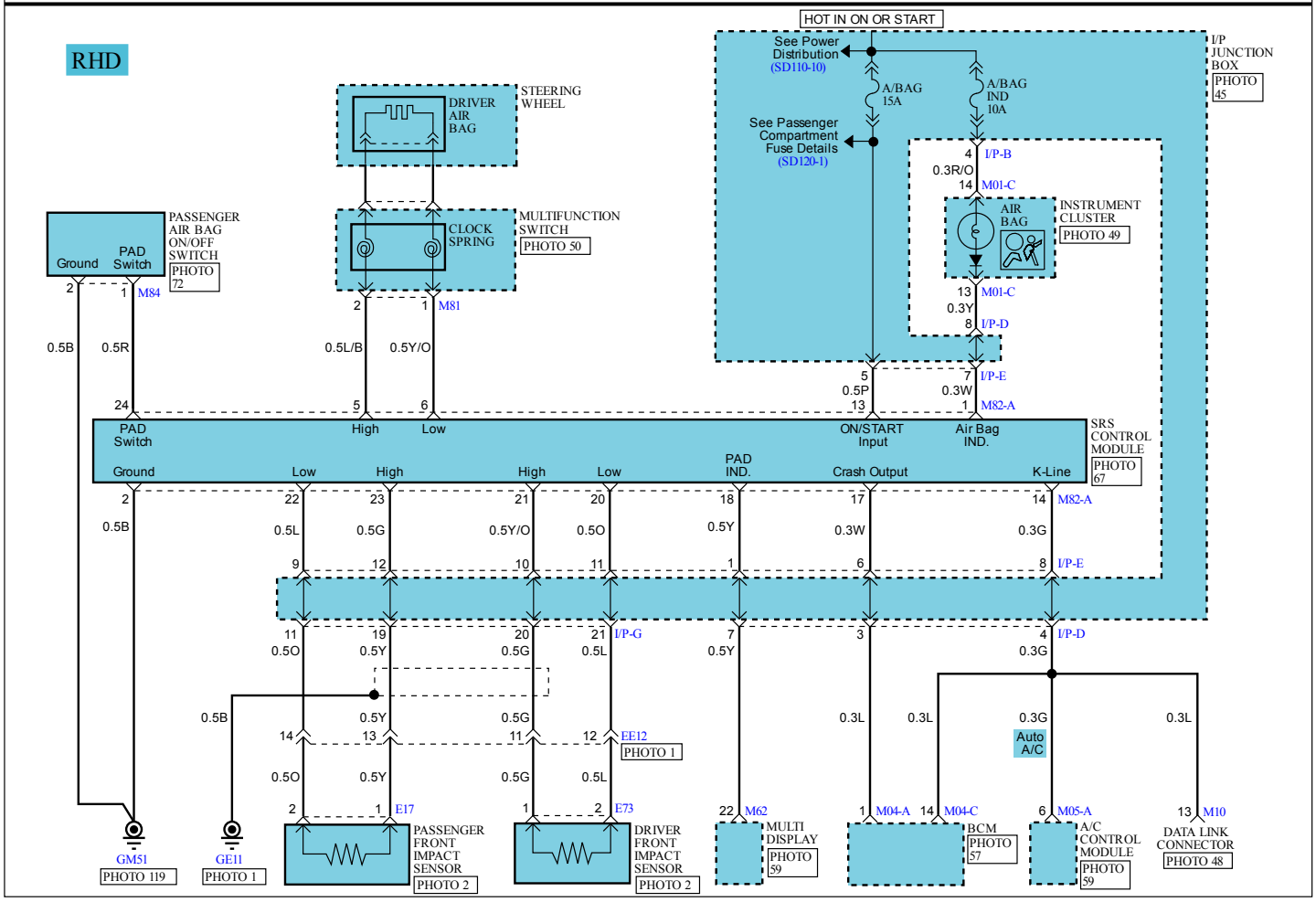
Sunroof (2) SD816-2

R07	R14	R16	
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Supplemental Restraint System (SRS) (1) SD569-1

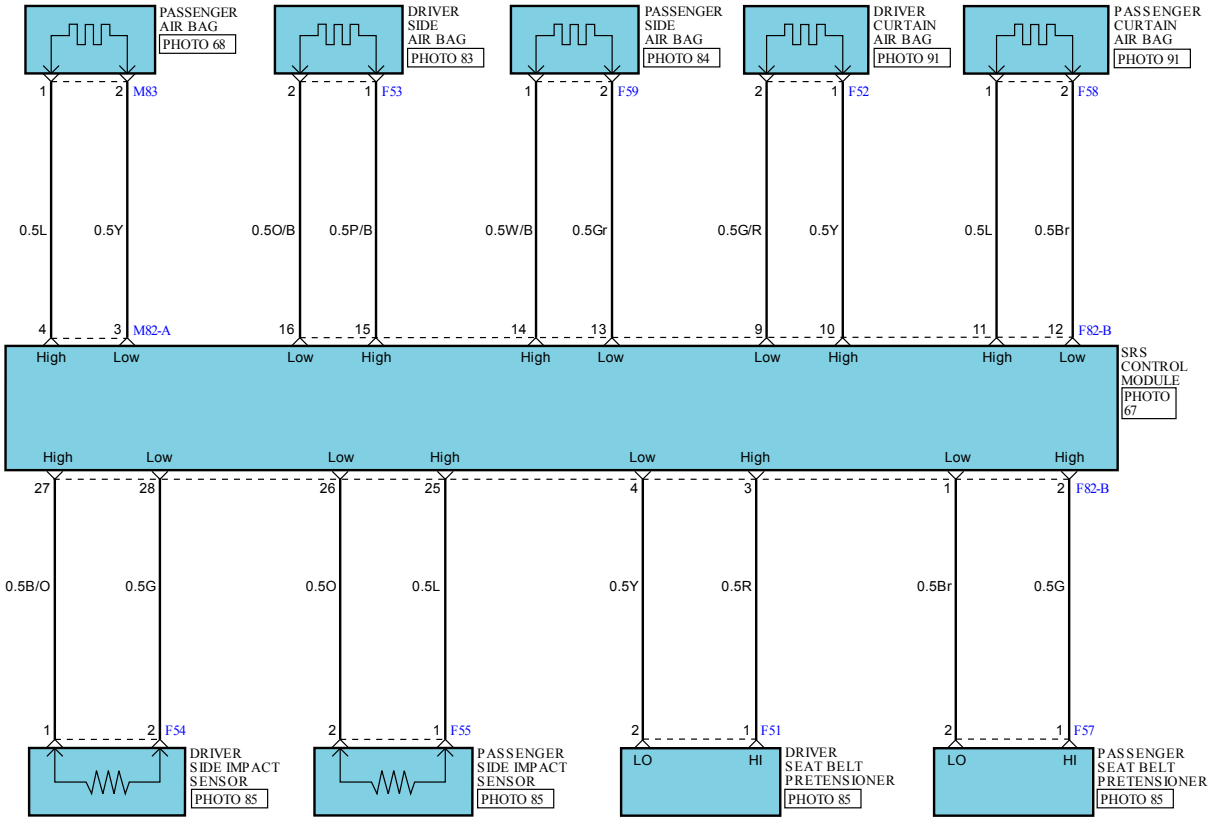


Supplemental Restraint System (SRS) (2) SD569-2



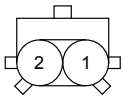
Supplemental Restraint System (SRS) (3) SD569-3

COMMON



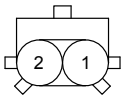
Supplemental Restraint System (SRS) (4) SD569-4

E17



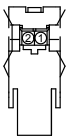
YAZ_ABG_02F_Y_GH

E73



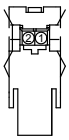
YAZ_ABG_02F_Y_GH

F51



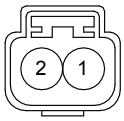
JST_SQH_02F_B

F52



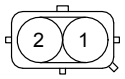
JST_SQH_02F_B

F53



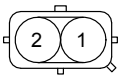
YAZ_040WP_02F_Y_GH

F54



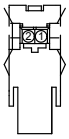
YAZ_040_02F_Y

F55



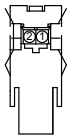
YAZ_040_02F_Y

F57



JST_SQH_02F_B

F58



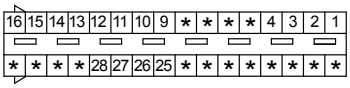
JST_SQH_02F_B

F59



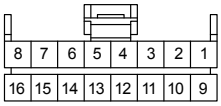
YAZ_040WP_02F_Y_GH

F82-B



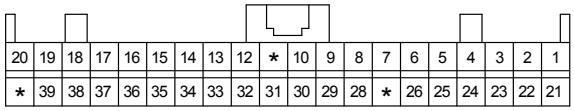
AMP_ABG_32F_B_ECU

M01-C



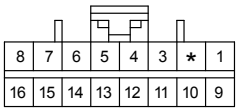
AMP_040M1_16F_B

M04-A



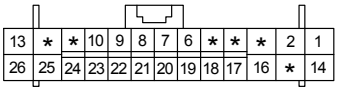
AMP_025_40F_W

M04-C



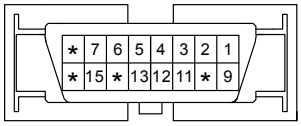
AMP_040M2_16F_W

M05-A



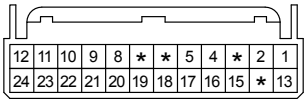
AMP_0407_26F_W_HD

M10



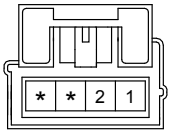
MLX_OBDII_16F_B

M62



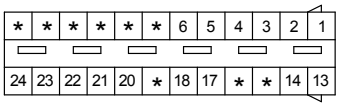
AMP_025_24F_W

M81



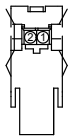
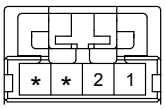
YAZ_040_04F_Y

M82-A

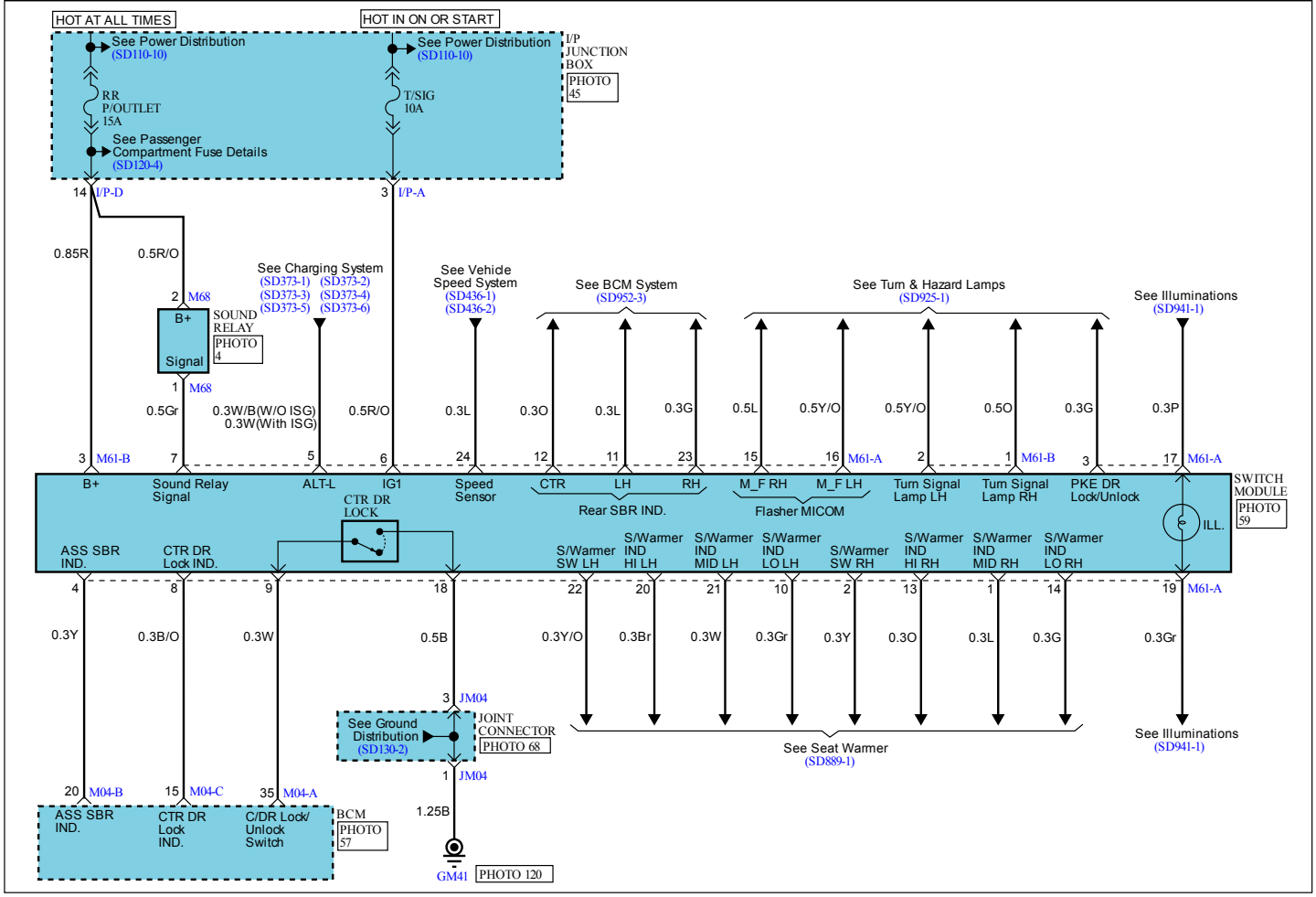


AMP_ABG_24F_B_ECU

Supplemental Restraint System (SRS) (5) SD569-5

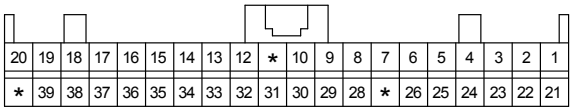
M83  JST_SQH_02F_B	M84  AMP_MQS_04F_B_040	BLANK	BLANK

Switch Module System (1) SD934-1



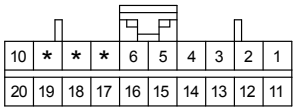
Switch Module System (2) SD934-2

M04-A



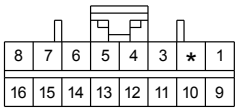
AMP_025_40F_W

M04-B



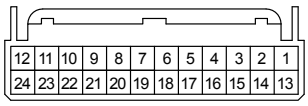
AMP_040M2_20F_B

M04-C



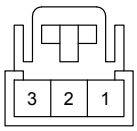
AMP_040M2_16F_W

M61-A



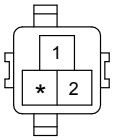
AMP_025_24F_W

M61-B



AMP_070_03F_W_HQR

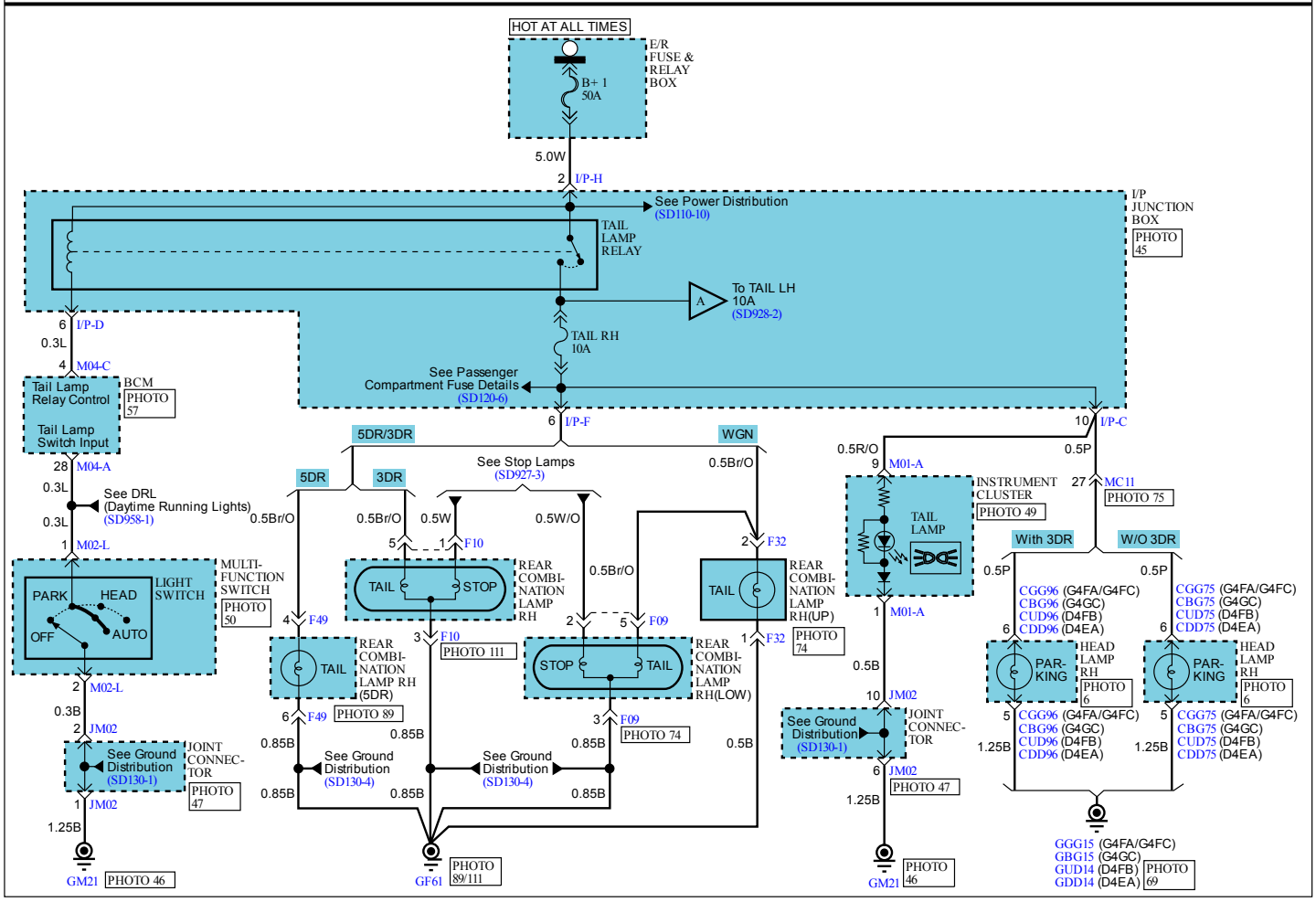
M68



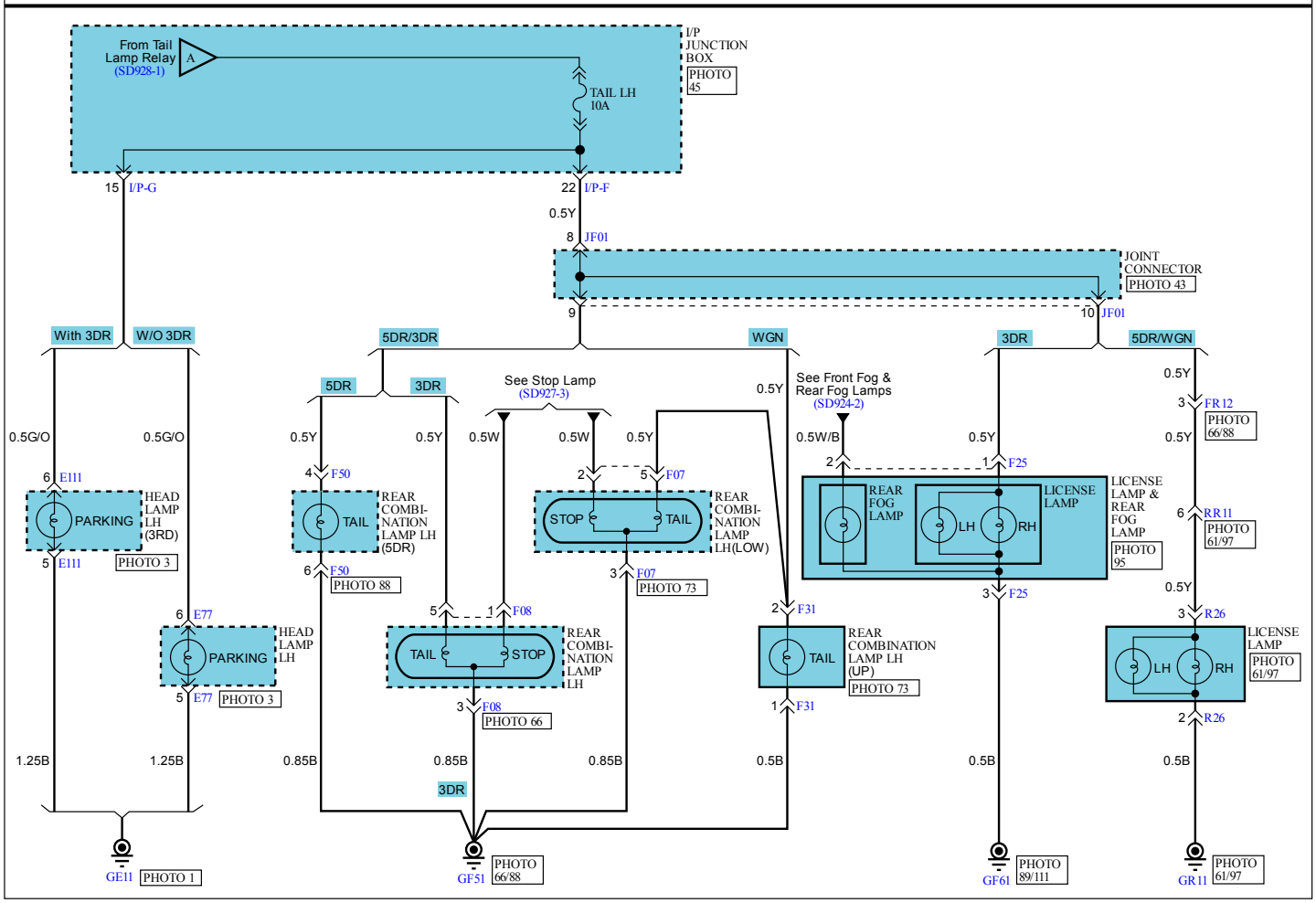
AMP_187_03F_B_RLY

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Tail, Parking & License Lamps (1) SD928-1



Tail, Parking & License Lamps (2) SD928-2



Tail, Parking & License Lamps (3) SD928-3

CBG75



KUM_090WP_06F_B

CBG96



KUM_090WP_06F_B

CDD75



KUM_090WP_06F_B

CDD96



KUM_090WP_06F_B

CGG75



KUM_090WP_06F_B

CGG96



KUM_090WP_06F_B

CUD75



KUM_090WP_06F_B

CUD96



KUM_090WP_06F_B

E77



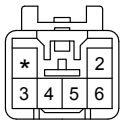
KUM_NMWP_06F_B

E111



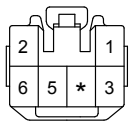
KUM_NMWP_06F_B

F07



KET_090II_06M_W

F08



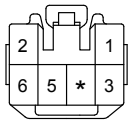
KET_090II_06F_W

F09



KET_090II_06M_W

F10



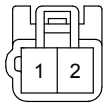
KET_090II_06F_W

F25



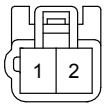
KET_SSD_03F_B_A

F31



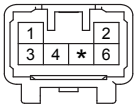
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F32



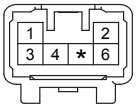
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F49



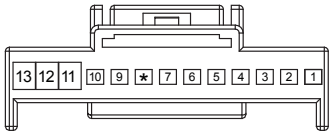
KET_090III_06M_W

F50



KET_090III_06M_W

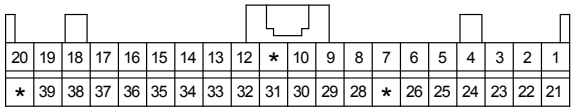
M02-L



KET_0409_13F_W

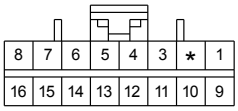
Tail, Parking & License Lamps (4) SD928-4

M04-A



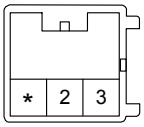
AMP_025_40F_W

M04-C



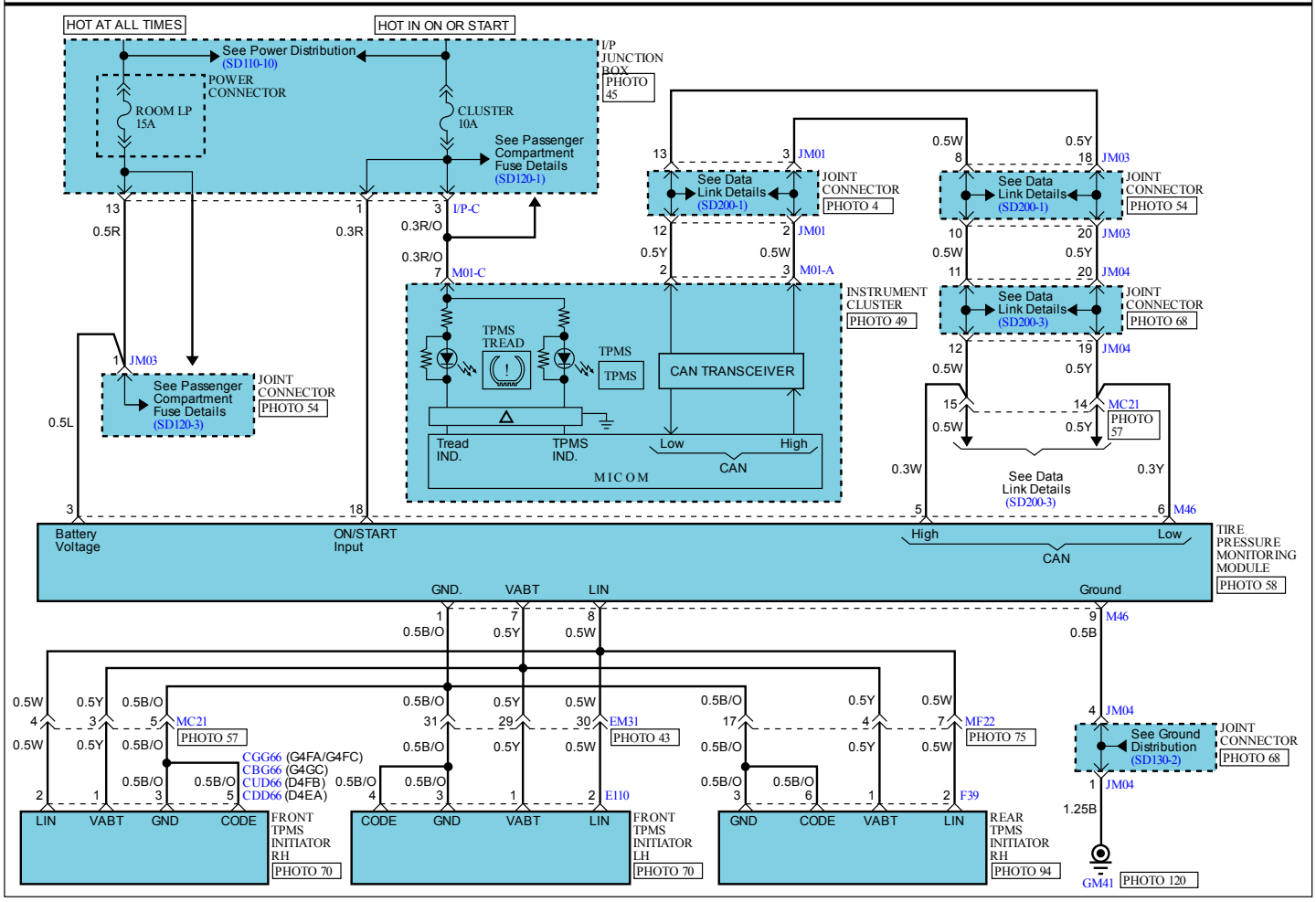
AMP_040M2_16F_W

R26



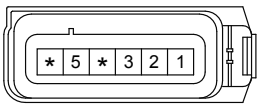
KUM_CDR_03M_B

Tire Pressure Monitoring System (TPMS) (1) SD956-1



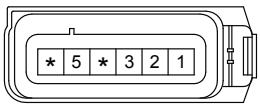
Tire Pressure Monitoring System (TPMS) (2) SD956-2

CBG66



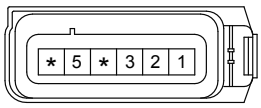
AMP_025_06F_B

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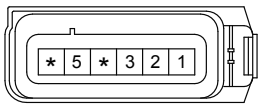
AMP_025_06F_B

CGG66



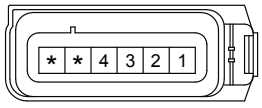
AMP_025_06F_B

CUD66



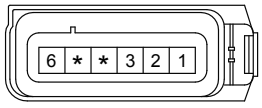
AMP_025_06F_B

E110



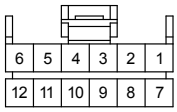
AMP_025_06F_B

F39



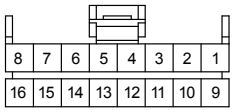
AMP_025_06F_B

M01-A



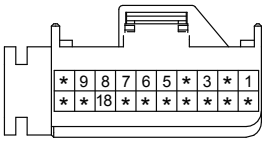
AMP_040M1_12F_B

M01-C



AMP_040M1_16F_B

M46



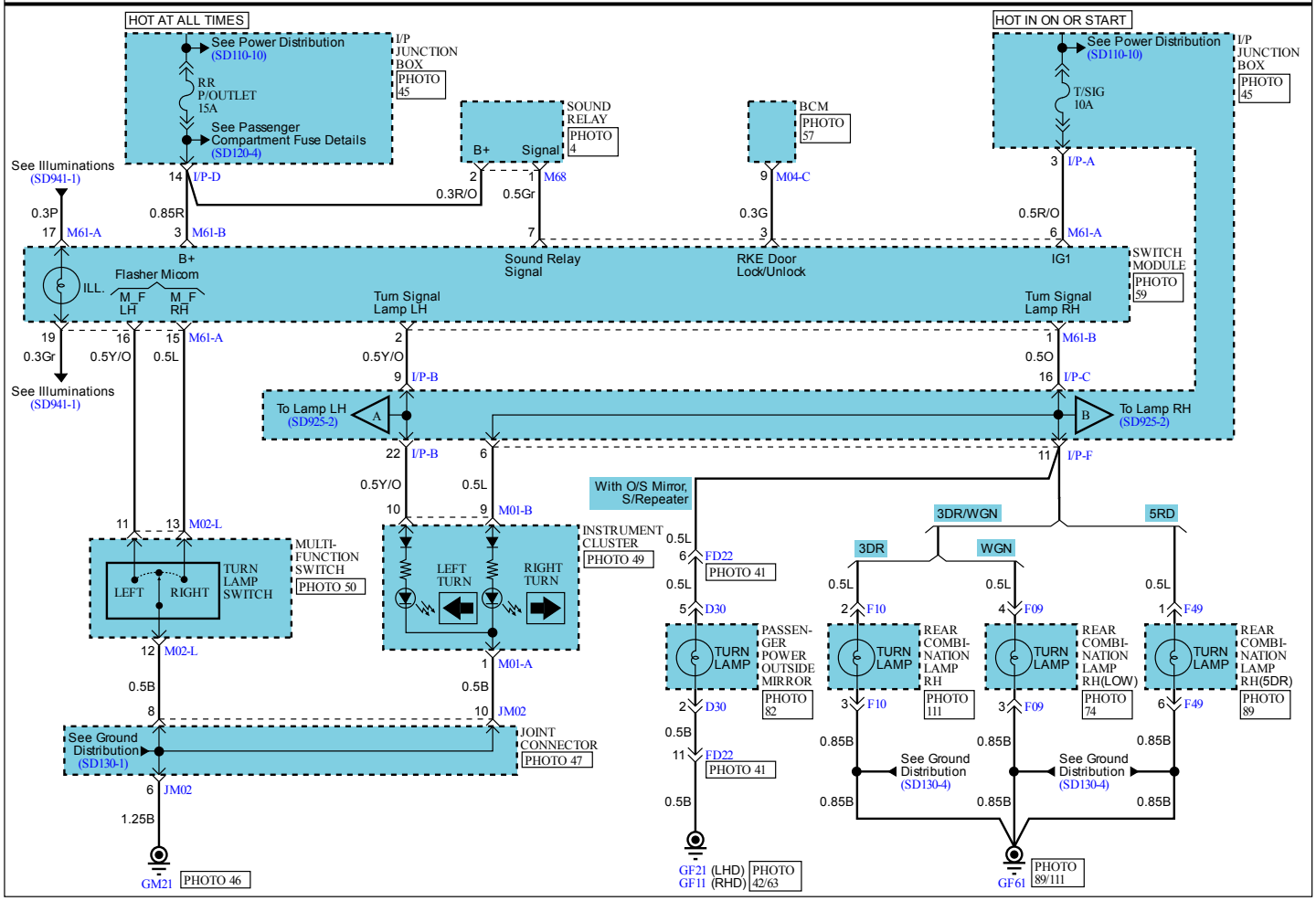
AMP_MQS_20F_B_GH

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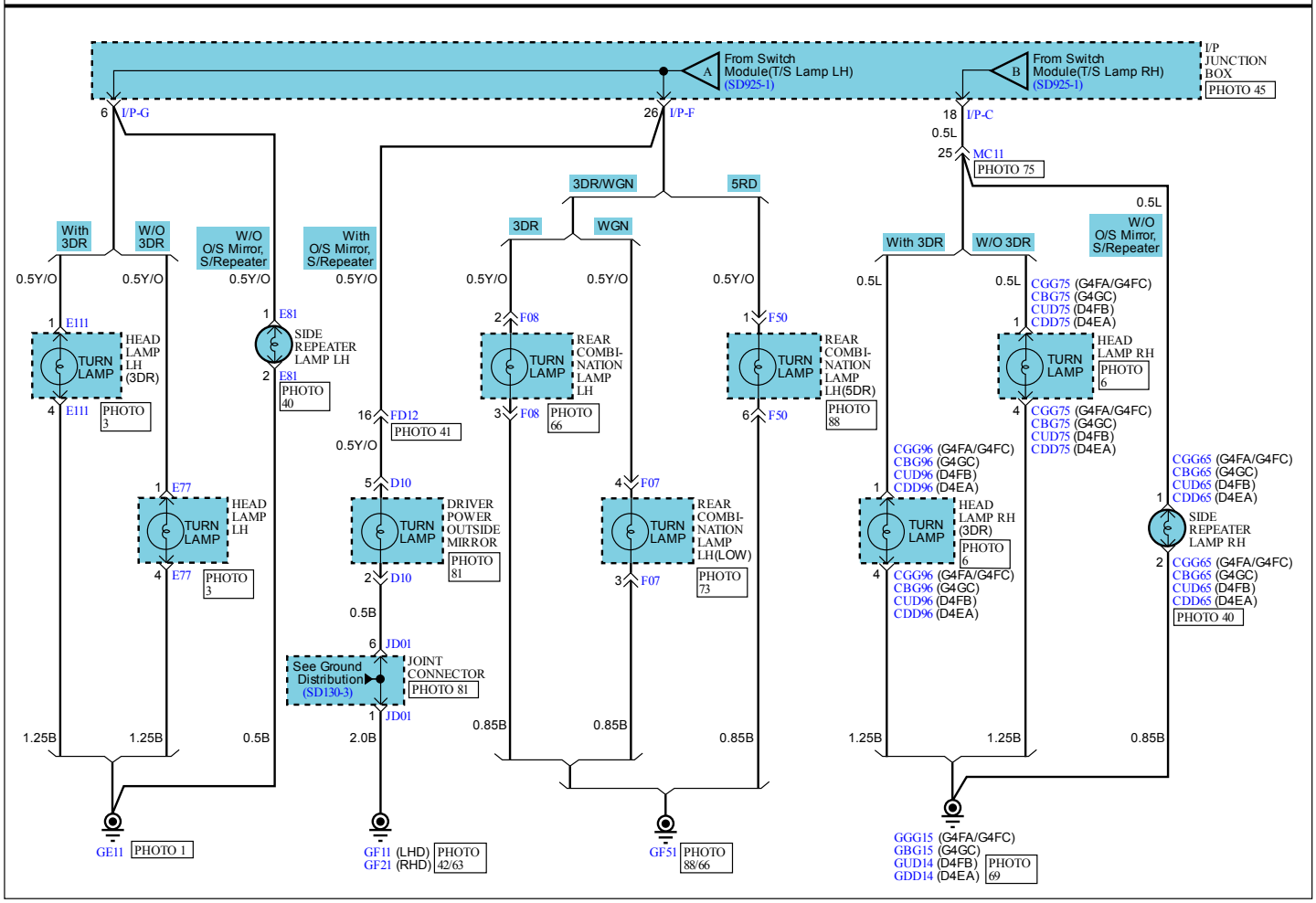
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Turn & Hazard Lamps (1) SD925-1

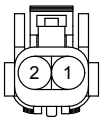


Turn & Hazard Lamps (2) SD925-2



Turn & Hazard Lamps (3) SD925-3

CBG65



KUM_62Z_02F_GR

CBG75



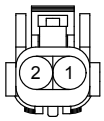
KUM_090WP_06F_B

CBG96



KUM_NMWP_06F_B

CDD65



KUM_62Z_02F_GR

CDD75



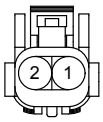
KUM_090WP_06F_B

CDD96



KUM_NMWP_06F_B

CGG65



KUM_62Z_02F_GR

CGG75



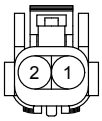
KUM_090WP_06F_B

CGG96



KUM_NMWP_06F_B

CUD65



KUM_62Z_02F_GR

CUD75



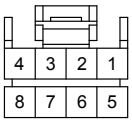
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CUD96



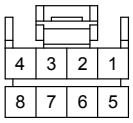
KUM_NMWP_06F_B

D10



AMP_040M1_08F_B

D30



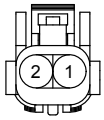
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E77



KUM_NMWP_06F_B

E81



KUM_62Z_02F_GR

E111



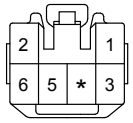
KUM_NMWP_06F_B

F07



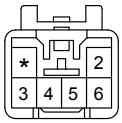
KET_090II_06M_W

F08



KET_090II_06F_W

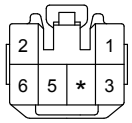
F09



KET_090II_06M_W

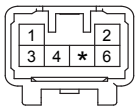
Turn & Hazard Lamps (4) SD925-4

F10



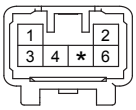
KET_090II_06F_W

F49



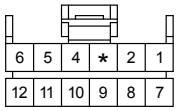
KET_090III_06M_W

F50



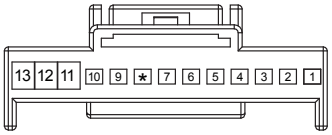
KET_090III_06M_W

M01-B



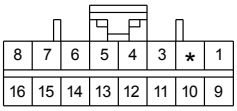
AMP_040M1_12F_B

M02-L



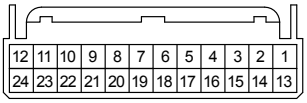
KET_0409_13F_W

M04-C



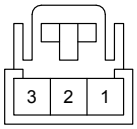
AMP_040M2_16F_W

M61-A



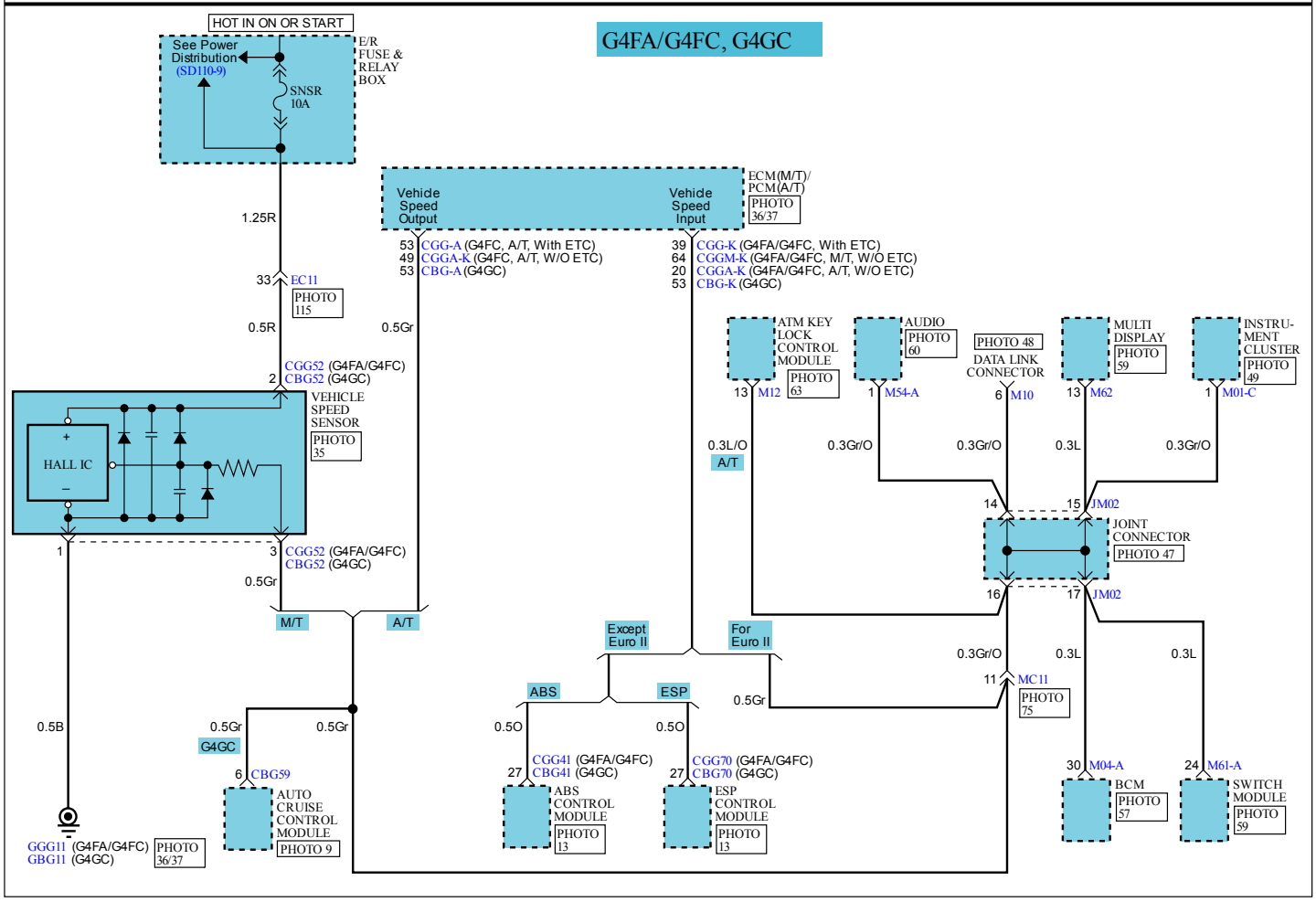
AMP_025_24F_W

M61-B

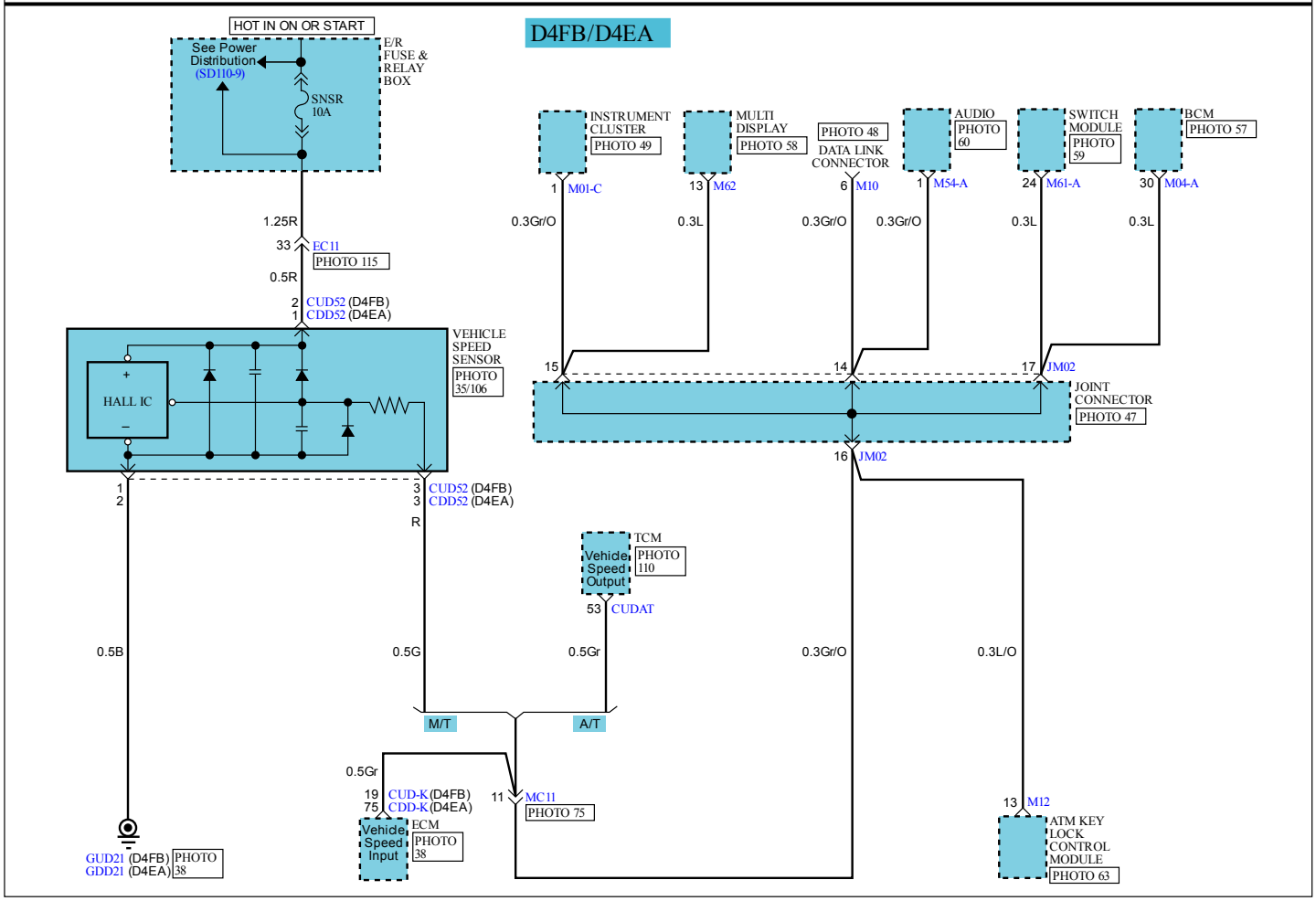


AMP_070_03F_W_HQR

Vehicle Speed System (1) SD436-1

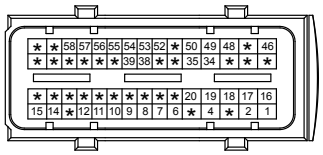


Vehicle Speed System (2) SD436-2



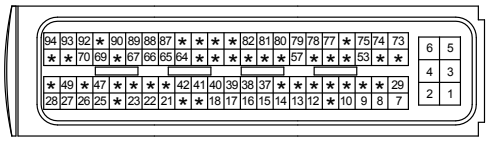
Vehicle Speed System (3) SD436-3

CBG-A



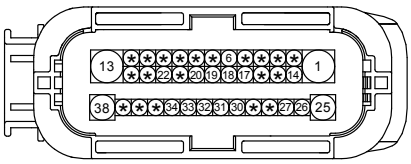
AMP_ECU_60F_B

CBG-K



AMP_ECU_94F_B

CBG41



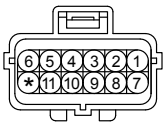
DEL_ABS_38F_B

CBG52



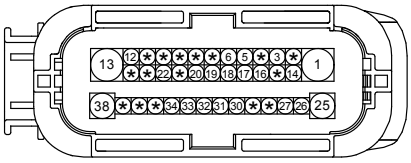
KUM_NMWP_03F_B

CBG59



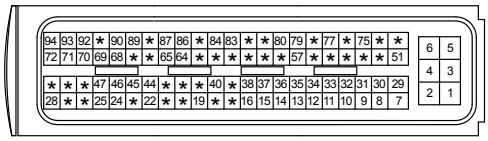
AMP_EJWP_12F_B

CBG70



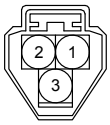
DEL_ABS_38F_B_A

CDD-K



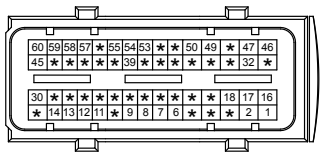
AMP_ECU_94F_B

CDD52



KUM_NMWP_03F_B

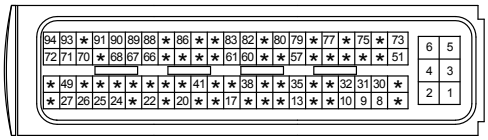
CGG-A



AMP_ECU_60F_B

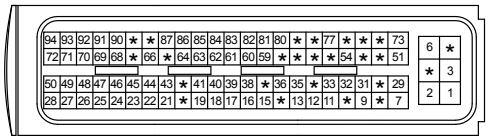
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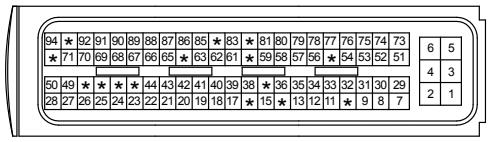
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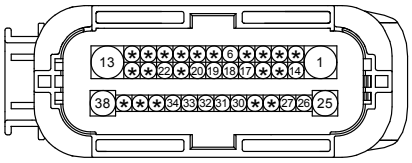
Vehicle Speed System (4) SD436-4

CGG-K



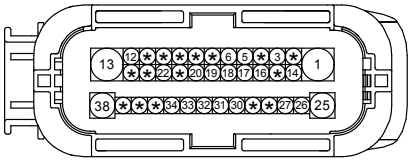
AMP_ECU_94F_B

CGG41



DEL_ABS_38F_B

CGG70



DEL_ABS_38F_B_A

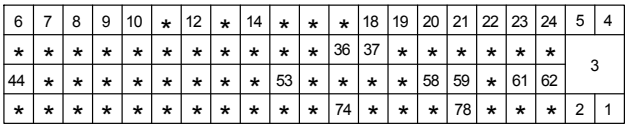
CGG52 /CUD52



KUM_NMWP_03F_B

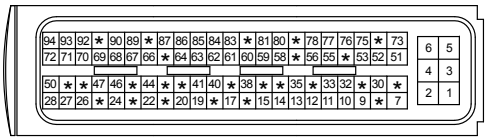
BLANK

CUDAT



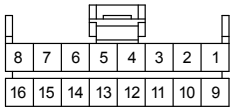
KET_ECU_81F_B_BOSCH

CUD-K



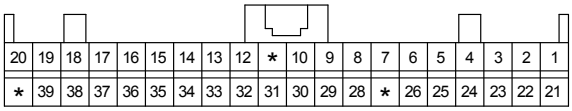
AMP_ECU_94F_B

M01-C



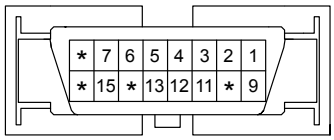
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M04-A



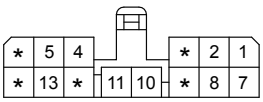
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M10



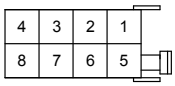
MLX_OBDII_16F_B

M12



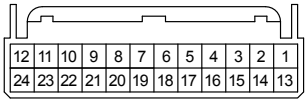
AMP_070_14F_W

M54-A



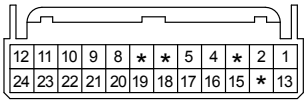
AMP_JT_08F_Gr_D2

M61-A



AMP_025_24F_W

M62



AMP_025_24F_W

GENERAL

SPECIFICATIONS

Items		Specification
Type		Electric Power Steering (Column-assist type)
Steering wheel rotation (Lock to lock)		2.69 turns and over Vehicles with D2.0 Engine or 225 tire (2.58 turns and over)
Steering gear	Type	Rack & Pinion
	Rack stroke	140mm (5.51in.) Vehicles with D2.0 Engine or 225 tire (134mm (5.28in.))

SERVICE STANDARD

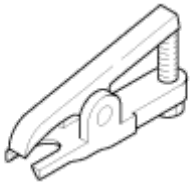
Steering wheel free play	30mm (1.18in.) and below
Tie-rod end starting torque	30kgf.cm (2.96Nm, 2.18lb-ft) and below

TIGHTENING TORQUE

Items	Tightening torque		
	Nm	kgf.m	lb-ft
Hub nuts	90 ~ 110	9.0 ~ 11.0	65 ~ 80
Steering wheel lock nut	40 ~ 50	4.0 ~ 5.0	29 ~ 36
Steering column mounting bolts and nuts	13 ~ 18	1.3 ~ 1.8	9.4 ~ 13.0
Bolt connecting universal joint to pinion	30 ~ 35	3.0 ~ 3.5	22 ~ 25
Bolt connecting steering column to universal joint	30 ~ 35	3.0 ~ 3.5	22 ~ 25
Tie-rod end castle nut	24 ~ 34	2.4 ~ 3.4	17 ~ 25
Lower arm ball joint bolts	100 ~ 120	10.0 ~ 12.0	72 ~ 87
Steering gear box mounting bolts	60 ~ 80	6.0 ~ 8.0	43 ~ 58
Stabilizer link nut	100 ~ 120	10.0 ~ 12.0	72 ~ 87
Front and Rear roll stopper bolt & nut	50 ~ 65	5.0 ~ 6.5	36 ~ 47
Rear roll stopper mounting bolts	50 ~ 65	5.0 ~ 6.5	36 ~ 47
Sub frame stay mounting bolts & nuts	45 ~ 55	4.5 ~ 5.5	33 ~ 40
Sub frame mounting bolts & nuts	160~ 180	16.0 ~ 18.0	116 ~ 130

English ▼

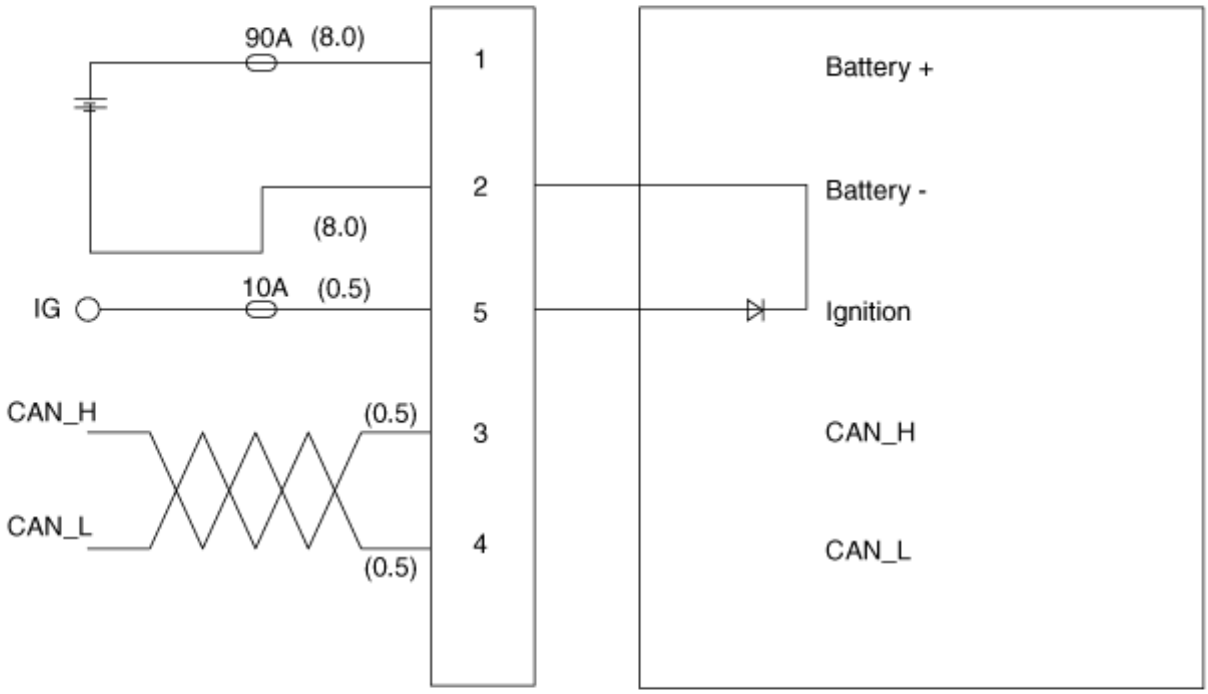
SPECIAL TOOLS

Tool (Number and Name)	Illustration	USE
09561-11001 Steering wheel puller		Removal of the steering wheel
09568-34000 Ball joint puller		Removal of the tie rod end ball joint

English ▼

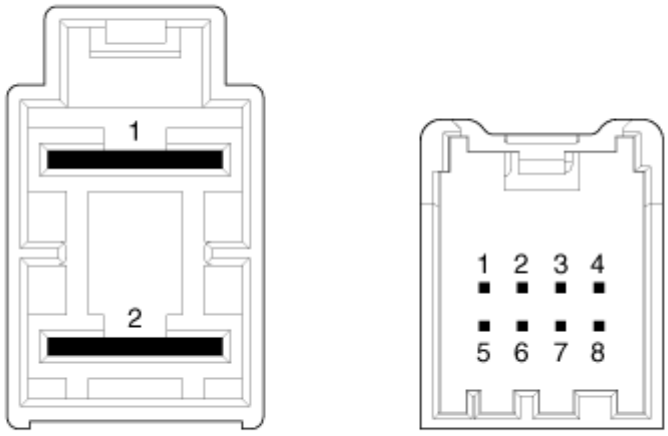
SCHEMATIC DIAGRAMS

MDPS Circuit Diagram



Harness Connector

English ▼



Connector	Pin no	Pin name
Battery	1	Battery +
	2	Battery -
Vehicle signal	1	Igntion
	2	-
	3	-
	4	-
	5	-
	6	-
	7	CAN_High
	8	CAN_Low

DESCRIPTION

EPS (Electric power steering, Column assist type) system uses an electric motor to assist the steering force and it is an engine operation independent steering system.
EPS control module controls the motor operation according to information received from the each sensor and CAN (Controller Area Network), resulting in a more precise and timely control of steering assist than conventional engine-driven hydraulic systems.
Components (Steering Angle Sensor, Torque Sensor, Fail-safe relay, etc.) of the EPS system are located inside the steering column & EPS unit assembly and the steering column & EPS unit assembly must not be disassemble to inspect or replace them.

NOTES WITH REGARD TO DIAGNOSIS

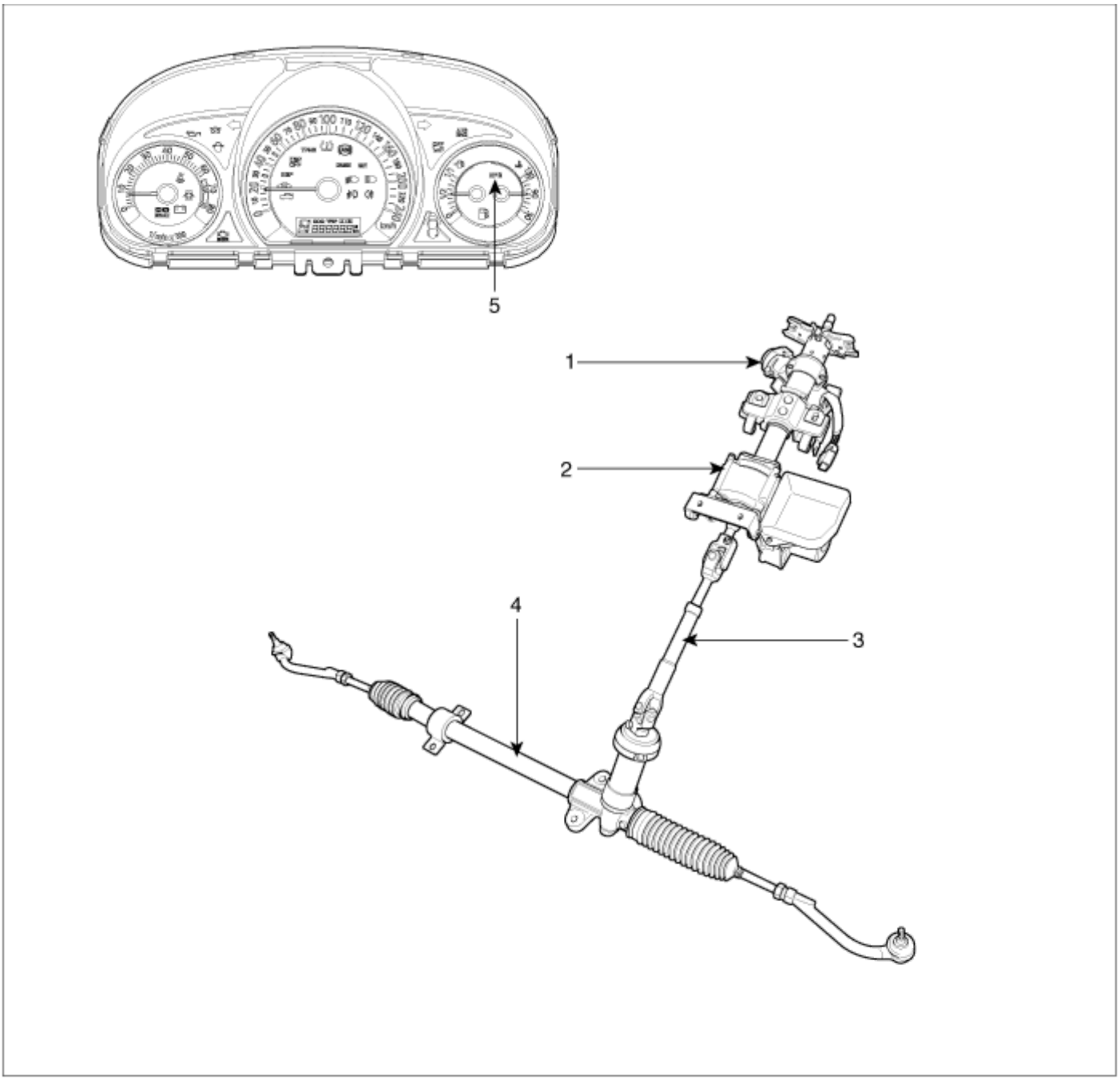
Trouble factor	Check item	Trouble symtom	Explanation	Note
Drop, impact, and overload	Motor	Abnormal noise	– Visable or unvisable damage can occur. The steering wheel could pull to one side by using the dropped parts. – Precise parts of motor/ECU are sensitive to vibration and impact. – Overload can cause unexpected damage	– Do not use the impacted EPS. – Do not overload each parts.
	ECU	Circuit damage – Wrong welding point – Broken PCB – Damaged precise parts		
	Torque sensor	Insufficient steering effort	Overload to INPUT shaft can cause malfunction of the torque sensor	– Do not impact the connecting parts (When inserting and torquing) – Use the specified tool to remove the steering wheel. (Do not hammer on it) – Do not use the impacted EPS
	Shaft	Insufficient steering effort (Uneven between LH and RH)		Do not use the impacted EPS
Pull/Dent	Harness	– Malfunction-impossible power operation – Malfunction of EPS	Disconnection between harness connecting portion and harness	Do not overload the harness
Abnormal storage temperature	Motor/ECU	Abnormal steering effort by improper operation of the motor/ECU	– Waterproof at the normal condition – Even a little moisture can cause malfunction of the precise parts of the motor/ECU	– Keep the normal temperature and proper moisture, while storaging – Avoid drowning

1. Do not impact the electronic parts, if they are dropped or impacted, replace them with new ones.
2. Avoid heat and moisture to the electronic parts.

English ▼

3. Do not contact the connect terminal to avoid deformation and static electricity.
4. Do not impact the motor and torque sensor parts, if they are dropped or impacted, replace them with new ones.
5. The connector should be disconnected or connected with IG OFF.

COMPONENTS



1. Key lock assembly
2. Steering column & EPS unit assembly
3. Universal joint assembly
4. Steering gear box
5. EPS warning lamp

GENERAL INSPECTION

After or before servicing the EPS system, perform the troubleshooting and test procedure as follows. Compare the system condition with normal condition in the table below and if abnormal symptom is detected, perform necessary remedy and inspection.

Test condition	Normal condition: Motor must not supply steering assist.		
	Symptom	Possible cause	Remedy
IG Off	Motor supplies steering assist.	ASP is not calibrated.	Perform the ASP calibration using a scan tool.
		IG power supplies	Inspect the IG power supply line.

Test condition	Normal condition: Motor must not supply steering assist, Warning lamp is illuminated.		
	Symptom	Possible cause	Remedy
IG On/Engine Off	Motor supplies steering assist.	ASP is not calibrated.	Perform the ASP calibration using a scan tool.
		EMS CAN signal is not received.	Inspect the CAN line.
	Warning lamp is not illuminated.	Cluster fault	Inspect the cluster and cluster harness

Test condition	Normal condition: Motor supplies steering assist, Warning lamp is not illuminated.		
	Symptom	Possible cause	Remedy
IG On/Engine On	Warning lamp is illuminated and Motor dose not supply steering assist.	EPS (Hot at all times) and IG power supply fault	Inspect the connector and harness for EPS (Hot at all times) and IG power supply line.
		DTC is detected by system.	Perform the self test using a scan tool and repair or replace.
	Warning lamp is illuminated and Motor supplies steering assist.	ASP is not calibrated.	Perform the ASP calibration using a scan tool.
		CAN communication between EPS and cluster is fault.	Inspect the CAN line.

ASP: Absolute Steering Position
CAN: Controller Area Network
EMS: Engine Management System

⚠ CAUTION

The following symptoms may be occurred during normal vehicle operation and if there is no EPS warning light illumination, it is not malfunction of EPS system.

- After turning the ignition switch on, the steering wheel becomes heavier while it performs EPS system diagnostics, for about 2 seconds, then it becomes normal steering condition.
- After turning the ignition switch on or off, EPS relay noise may occur but it is normal.
- When it is steered, while the vehicle is stopped or in low driving speed, motor noise may occur but it is normal operating one.

Caution when ASP (Absolute Steering Position) calibration or EPS type recognition

English ▼

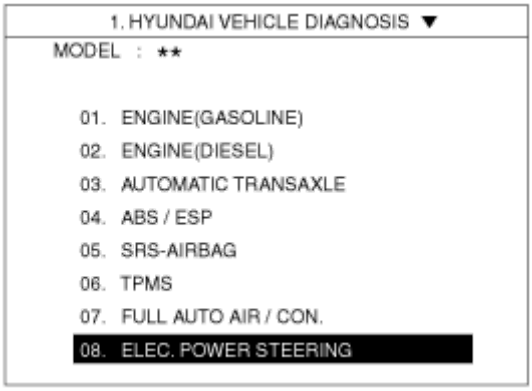
- Check if the battery is fully charged before ASP calibration or EPS type recognition.
- Be careful not to disconnect any cables connected to the vehicle or scan tool during ASP calibration or EPS type recognition.
- When the ASP calibration or EPS type recognition is completed, turn the ignition switch off and wait for several seconds, then start the engine to confirm normal operation if the vehicle.

Scan tool (Hi-Scan Pro) installation

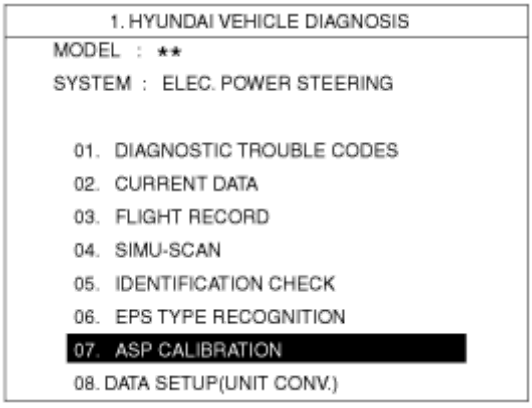
1. Attach the CAN interface module to the Hi-Scan Pro main body and securely tighten the two bolts.
2. Install the CAN interface module to the Data Link Cable and securely tighten the two bolts.

ASP calibration procedure

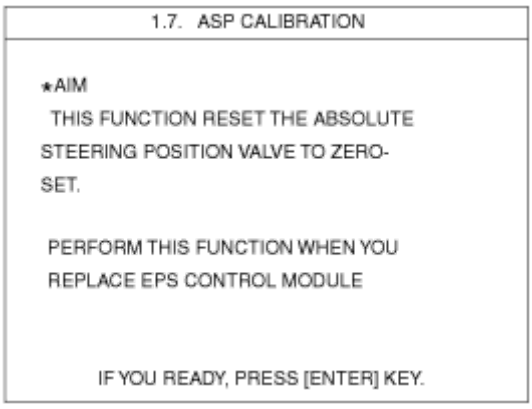
1. Plug DLC cable from a scan tool into the vehicle's data link connector located under the instrument panel on the driver's side.
2. Turn the ignition switch ON position.
3. Turn the steering wheel so that the front wheel can face straight ahead.
4. Select a model and ELECTRIC POWER STEERING.



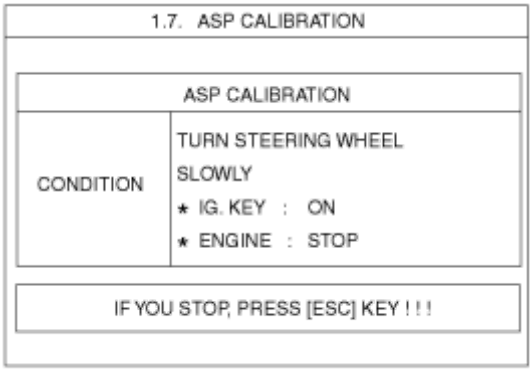
5. Select the ASP CALIBRATION and press ENTER.



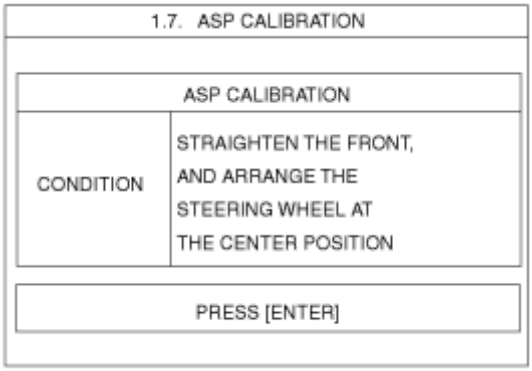
6. Check the massage on the screen and press ENTER'.



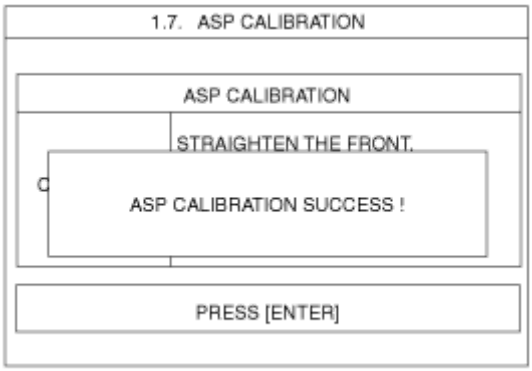
7. Confirm the vehicle condition (IG On) and then turn the steering wheel until massage changes to the next screen.



8. When the massage is displayed on the screen as follows, turn the steering wheel so that the front wheel can face straight ahead and then press ENTER.

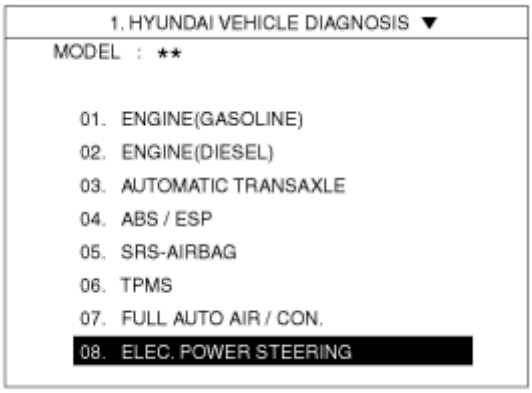


9. When the calibration is completed, the massage will be displayed on the screen as follows.

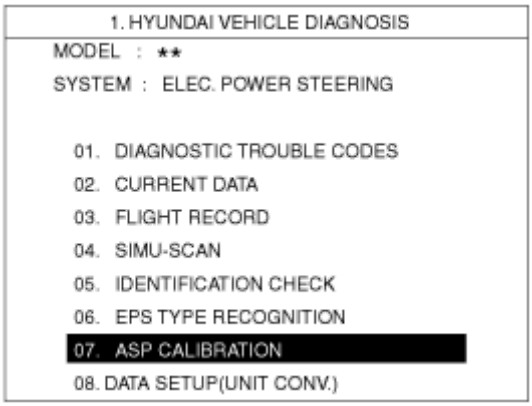


EPS type recognition procedure

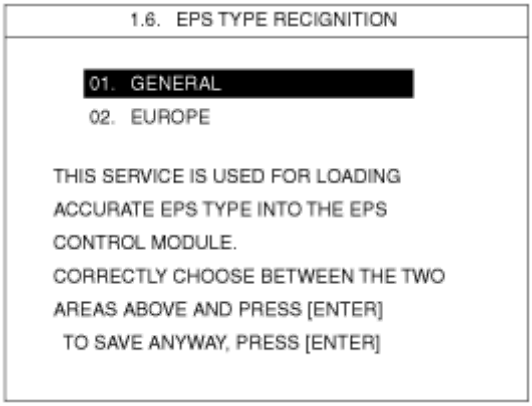
1. Plug DLC cable from a scan tool into the vehicle's data link connector located under the instrument panel on the driver's side.
2. Turn the ignition switch ON position.
3. Select a model and ELECTRIC POWER STEERING.



4. Select the EPS type recognition and press ENTER.



5. Select the affected area and press ENTER.



6. When the EPS type recognition is completed, the massage will be displayed on the screen as follows.

1.6. EPS TYPE RECIGNITION

01. GENERAL

02. EUROPE

TH

AC

COMPLETED !

PRESS [ESC] KEY.

CONTROL MODULE.

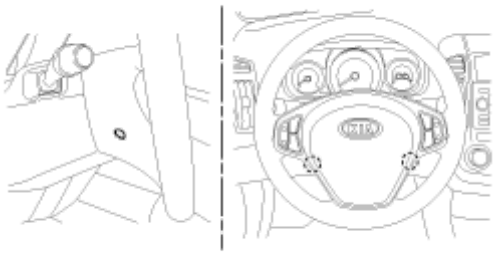
CORRECTLY CHOOSE BETWEEN THE TWO

AREAS ABOVE AND PRESS [ENTER]

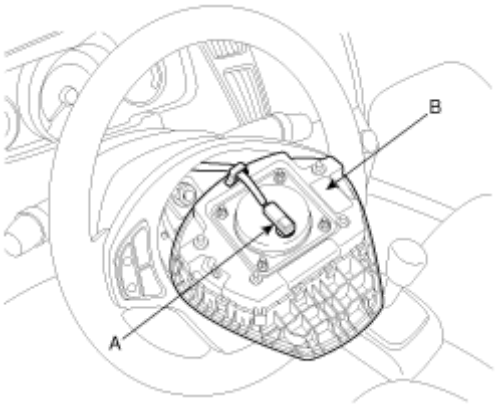
TO SAVE ANYWAY, PRESS [ENTER]

REMOVAL

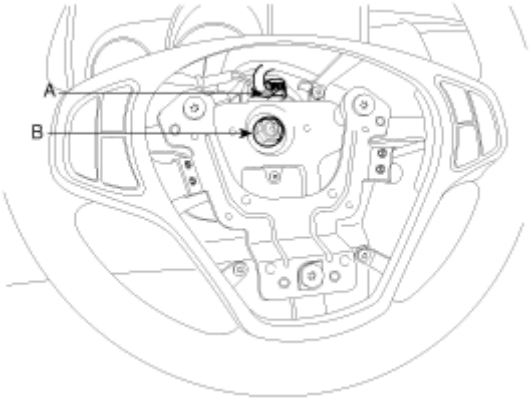
1. Disconnect the battery negative cable from the battery and then wait for 30 seconds.
2. Turn the steering wheel so that the front wheels can face straight ahead.
3. Loosen the torx bolts which are located on the both side of the steering wheel.



4. Disconnect the connector (A) from the airbag module and then remove the airbag module (B) from the steering wheel.



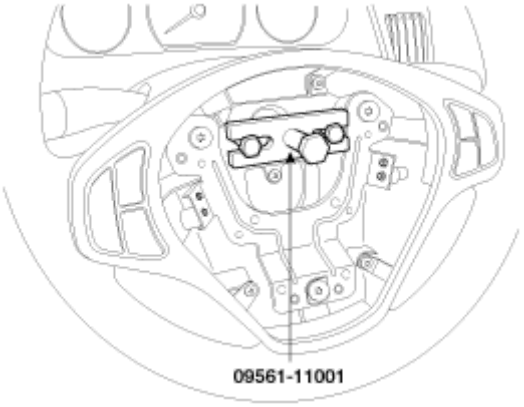
5. Disconnect the remote switch connector (A) and remove the steering wheel lock nut (B) and washer.



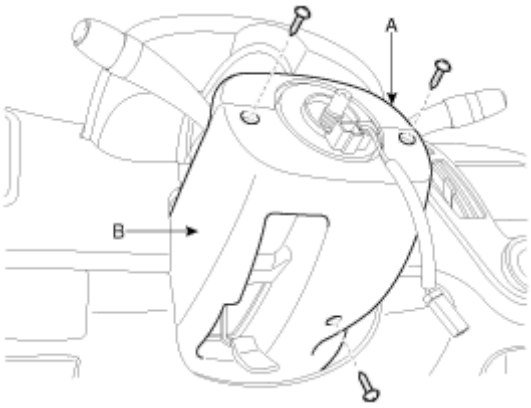
6. Remove the steering wheel from the steering column shaft by using a SST (09561-11001).

> **CAUTION**
>
> Do not hammer on the steering wheel to remove it; it may damage the steering column & EPS unit.

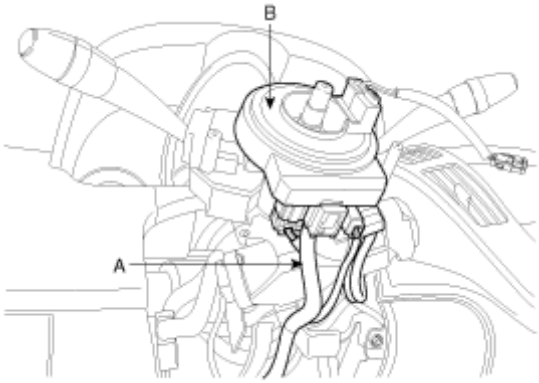
English ▼



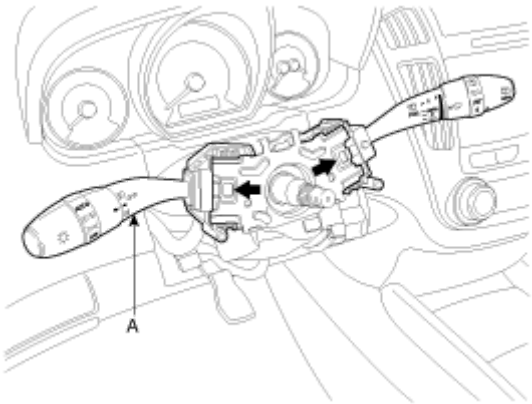
7. Remove the steering column upper (A) and lower (B) shroud.



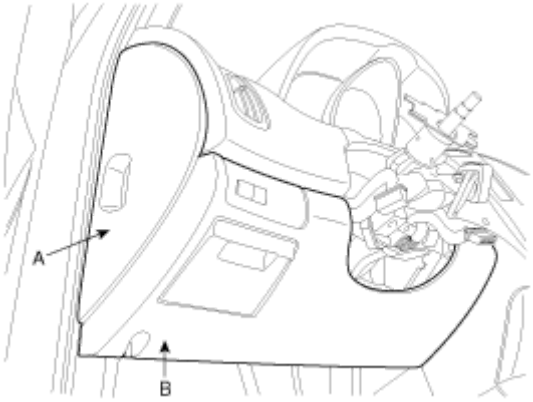
8. Disconnect the connectors (A) from the lower portion of the clock spring and then remove the clock spring (B) from the steering column shaft.



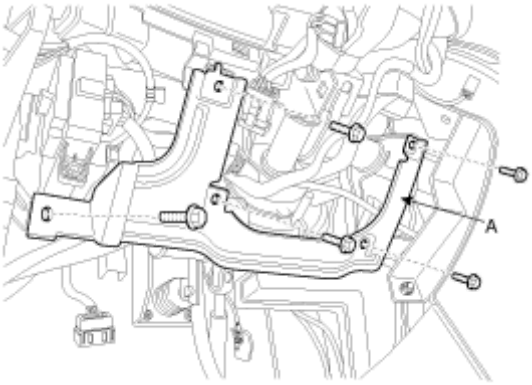
9. Remove the multifunction switches (A) from the steering column with the portion indicated by the arrow pressed.



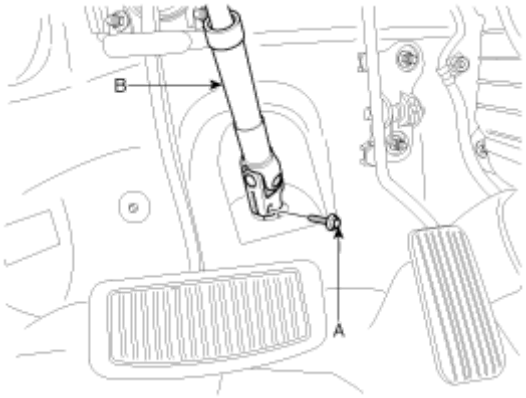
10. Remove the lower side panel (A) and crash pad (B).



11. Remove the reinforce panel (A).



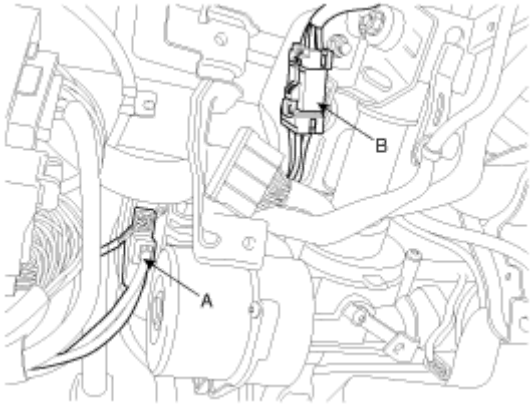
12. Loosen the bolt (A) and then disconnect the universal joint assembly (B) from the pinion of the steering gear box.

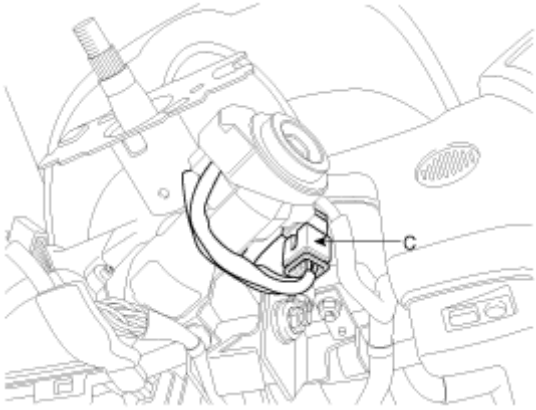


⚠ CAUTION

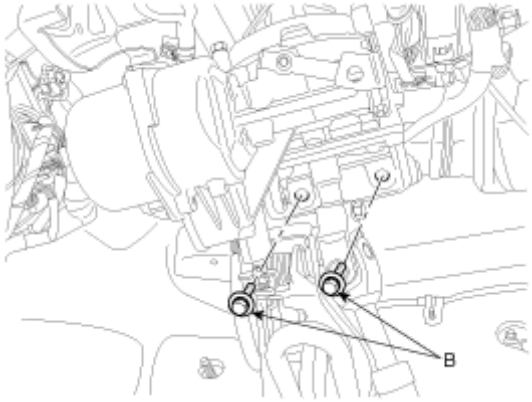
Keep the neutral-range to prevent the damage of the clock spring inner cable when you handlethe steering wheel.

13. Disconnect the connectors (A, B, C).

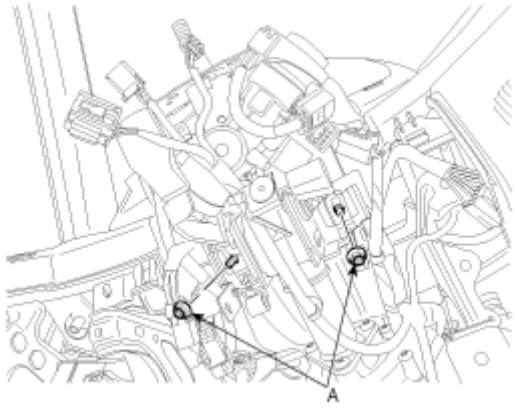


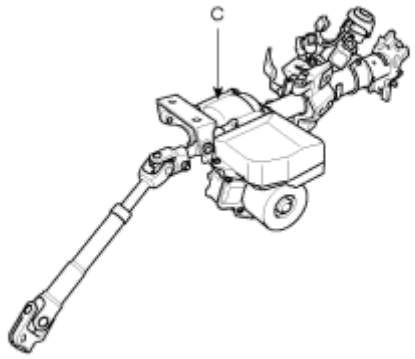


14. Remove the steering column mounting bolts (B).



15. Remove the steering column & EPS unit assembly (C) by loosening the mounting nuts (A).





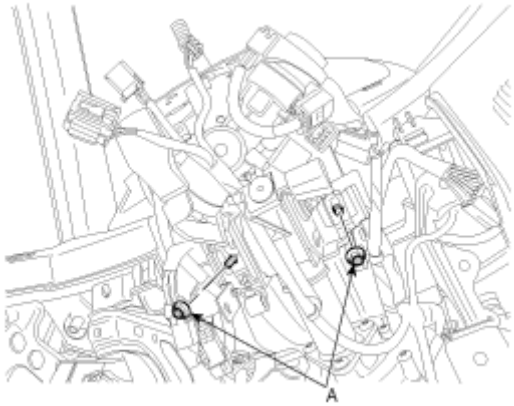
INSTALLATION

⚠ CAUTION

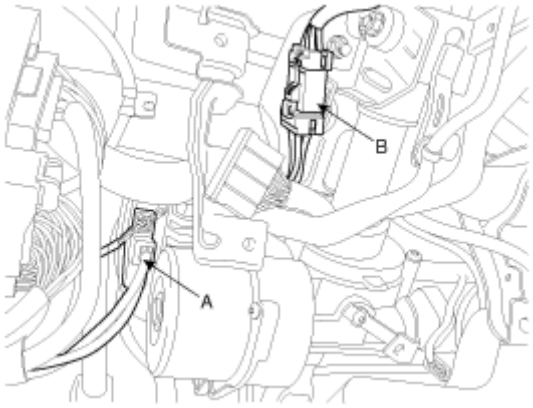
Apply the multipurpose grease to sliding surface of the each part before the installation.

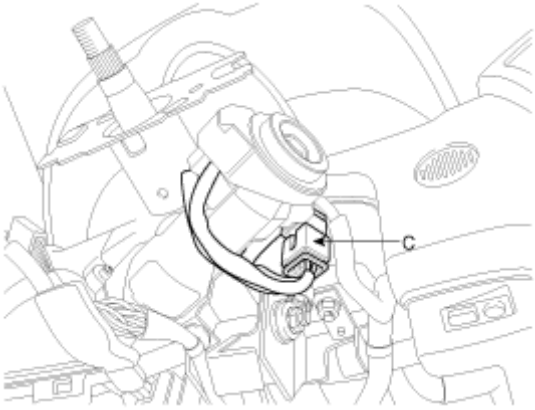
1. Install the steering column & universal joint assembly by tightening the bolts (B) and nuts (A).

   Tightening torque Nm (kgf.m, lb-ft):
   13 ~ 18 (1.3 ~ 1.8, 9.4 ~ 13.0)

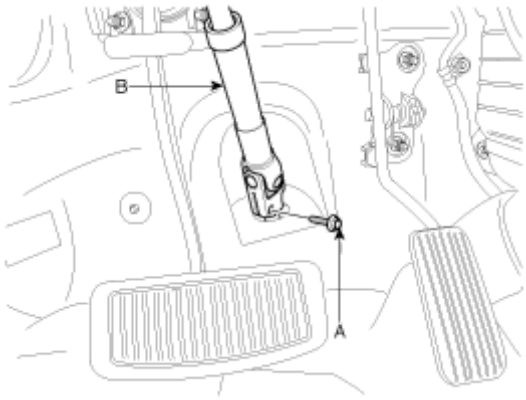


2. Connect the connectors (A, B, C).



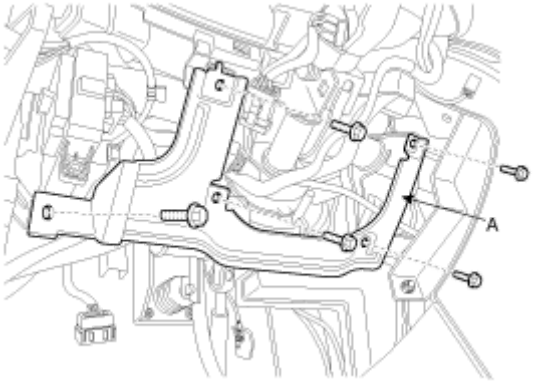


3. Connect the universal joint assembly (B) to pinion of the steering gear box and then tighten the bolt (A).
   Tightening torque Nm (kgf.m, lb-ft):
   30 ~ 35 (3.0 ~ 3.5, 22 ~ 25)

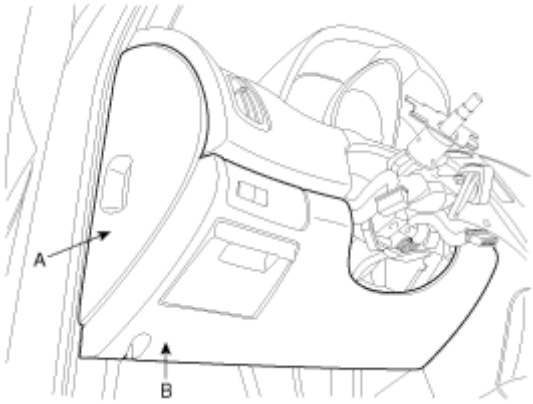


> **⚠ CAUTION**
>
> Tighten up with bolt after inserting U-joint to the steering gear pinion shaft firmly.

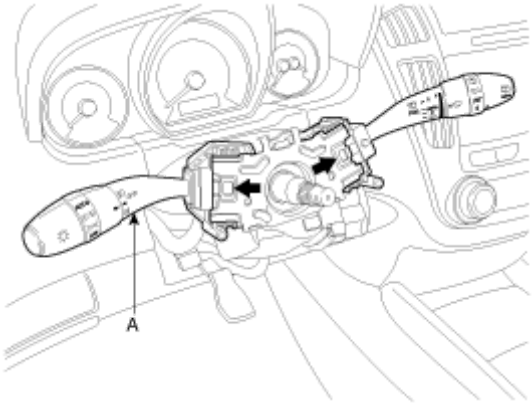
4. Install the reinforce panel (A).



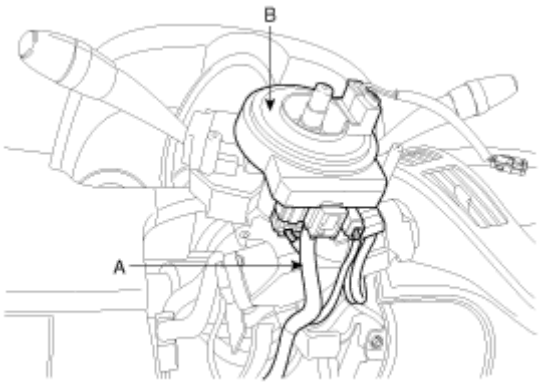
5. Install the lower crash pad (A) & side panel.



6. Install the multifunction switches (A) to steering column.



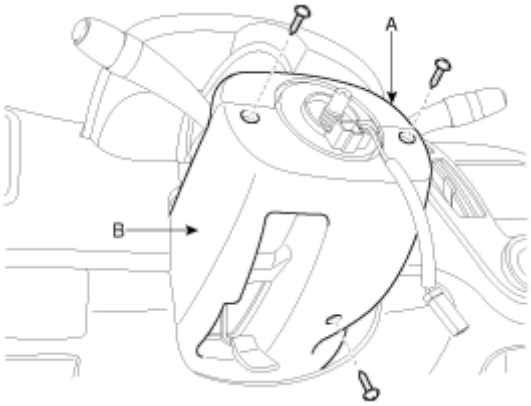
7. Install the clock spring (B) to steering column assembly and then connect the connectors (A).



⚠ CAUTION

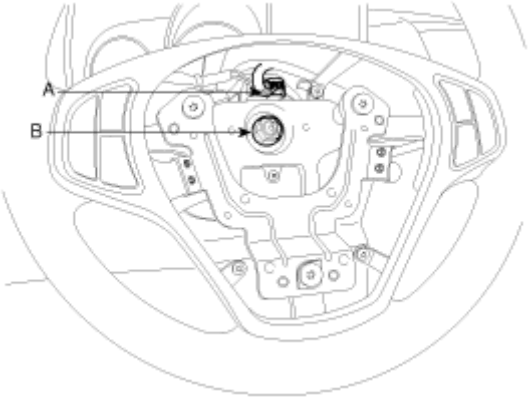
When installing the clock spring, refer the RT group to prevent the damage of clock spring inner cable.

8. Install the steering column upper (A) and lower (B) shroud.

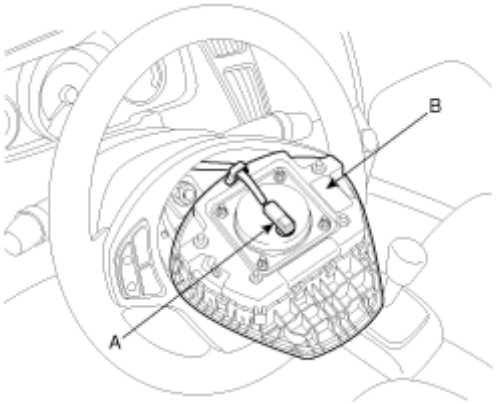


9. Connect the remote switch connector (A).

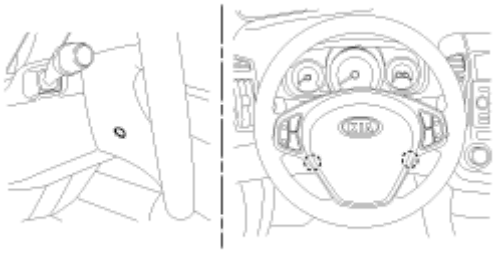
10. Install the steering wheel to the steering column shaft and then tighten the lock nut (B) and the washer together.
Tightening torque Nm (kgf.m, lb-ft):
40 ~ 50 (4.0 ~ 5.0, 29 ~ 36)



11. Connect the connector (A) to air bag module and then install the airbag module (B) to steering wheel.



12. Tighten the torx bolts which are located on the both side of the steering wheel.



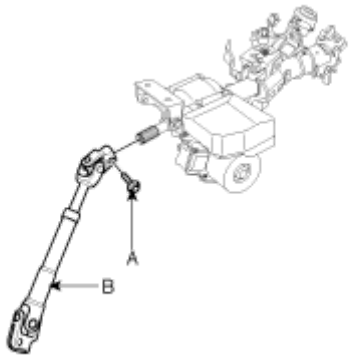
13. Connect the battery negative cable to the battery.
14. Check and adjust the front wheel alignment.
    (Refer to SS group)
15. When the steering column & EPS unit assembly is replaced, perform EPS type recognition procedure using a scan tool.
    (Refer to EPS type recognition)
16. Perform the ASP (Absolute Steering Position) calibration procedure. (Refer to ASP calibration)

> **⚠ CAUTION**
>
> If the ASP calibration procedure is not performed. EPS warning lamp will be turned on or flicker and vehicle may pull to the left or the right.

DISASSEMBLY AND REASSEMBLY

> **⚠ CAUTION**
>
> Do not disassemble the steering column & EPS unit assembly.

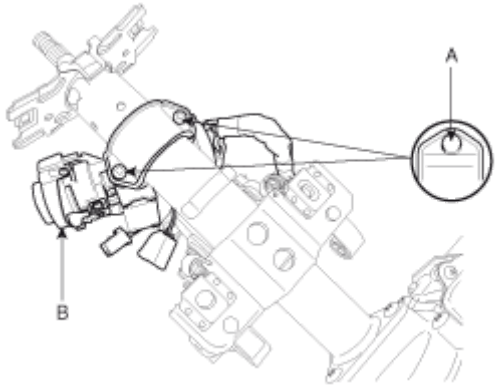
1. Loosen the bolt (A) and then disconnect the universal joint assembly (B) from the steering column assembly.
   Tightening torque Nm (kgf.m, lb-ft):
   30 ~ 35 (3.0 ~ 3.5, 22 ~ 25)



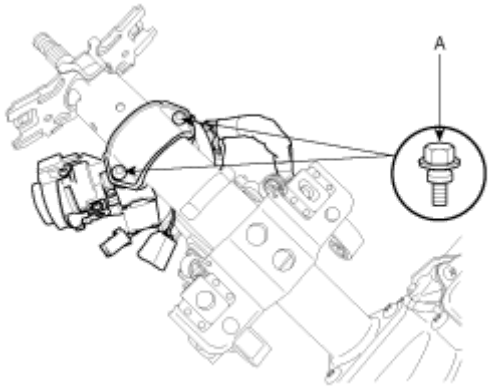
2. Make a groove the head of special bolts (A) by a punch.

> **⚠ CAUTION**
>
> Do not impact the steering column mounting bracket and EPS unit.

3. Loosen the special bolts by using screw driver and than remove the key lock assembly (B) from the steering column assembly.



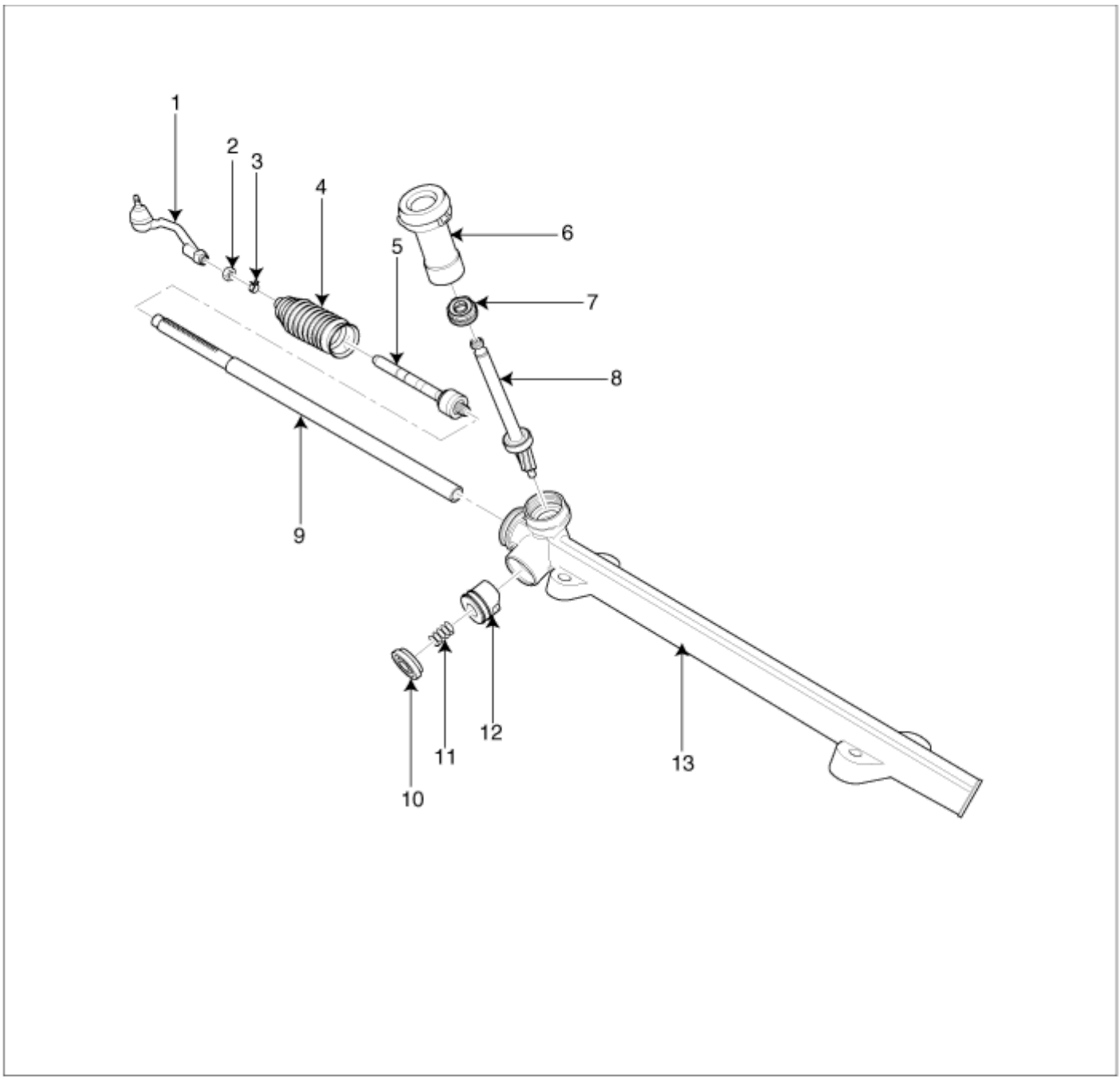
4. Reassembly is the reverse of the disassembly. When reassembling the key lock assembly, install the key lock assembly to the steering column and then tighten new special bolts until its head (A) is cut off.



INSPECTION

1. Check the steering column for damage and deformation.
2. Check the connection for play, damage and smooth operation.
3. Check the join bearing for damage and wear.
4. Check the tilt bracket for damage and cracks.
5. Check the key lock assembly for proper operation and replace it if necessary.

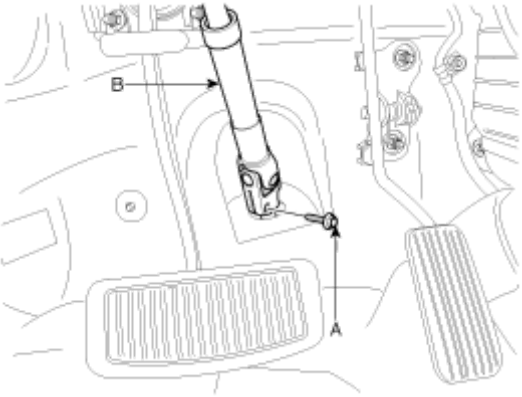
STEERING GEAR BOX



1. Tie rod end
2. Lock nut
3. Bellows clip
4. Bellows
5. Tie rod
6. Dust packing & Cap
7. Pinion plug & Oil seal
8. Pinion assembly
9. Rack bar
10. Yoke plug
11. Yoke spring
12. Support yoke assembly
13. Rack housing

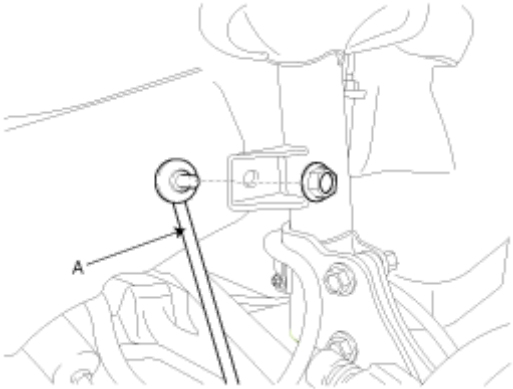
REMOVAL

1. Remove the front wheel & tire.
2. Loosen the bolt (A) and then disconnect the universal joint assembly (B) with the pinion of the steering gear box.

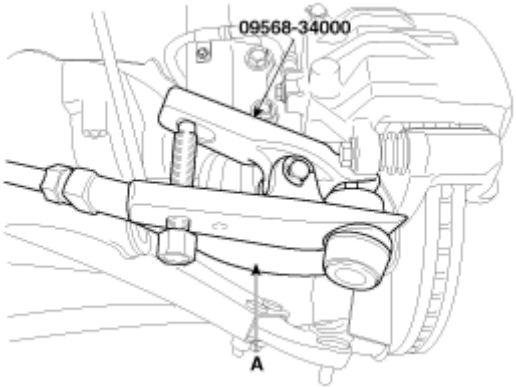


> **CAUTION**
>
> Keep the neutral-range to prevent the damage of the clock spring inner cable when you handlethe steering wheel.

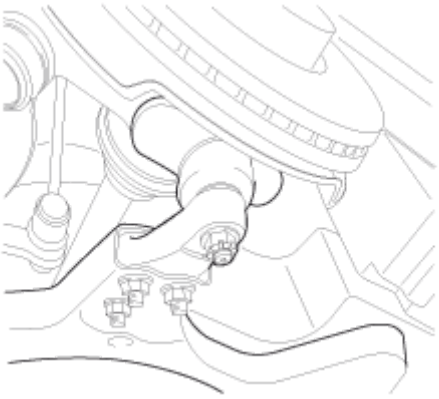
3. Disconnect the stabilizer link (A) from the front strut assembly by loosening the nut.



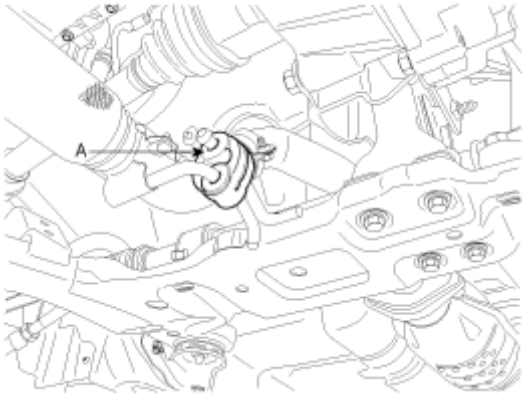
4. Remove the split pin and castle nut and then disconnect the tie rod end (A) with the knuckle by using a SST (09568-34000).



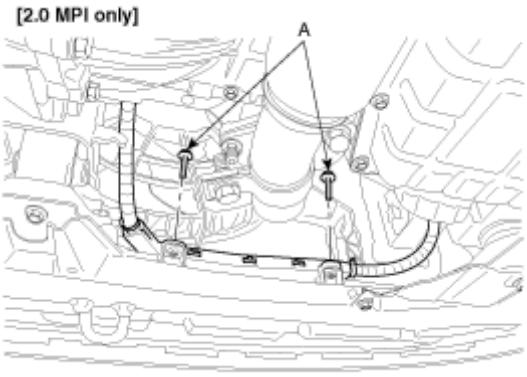
5. Connect the lower arm with the ball joint and then remove the castle nut and the split pin.



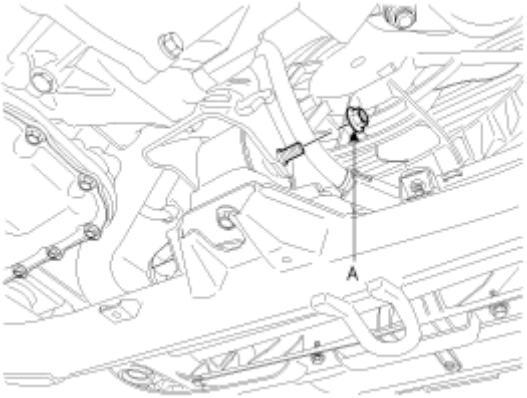
6. Remove the muffler rubber hanger (A).

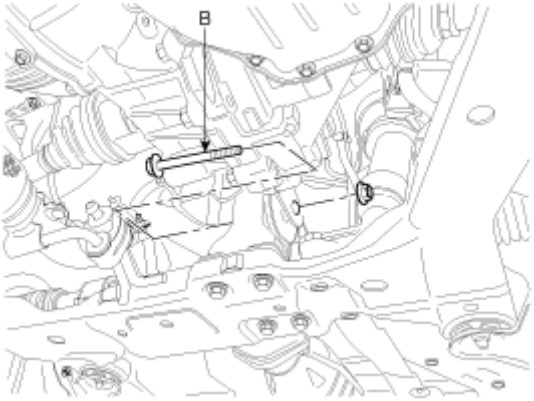


7. Loosen the wiring harness protector bolts (A).

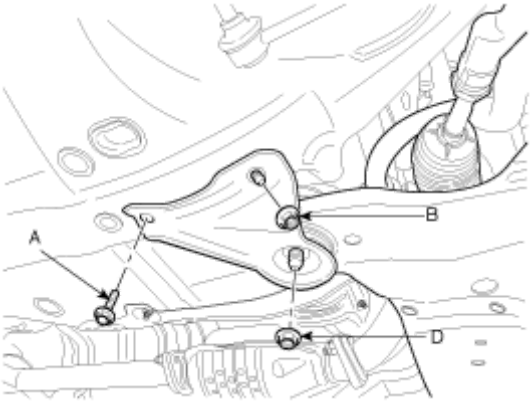


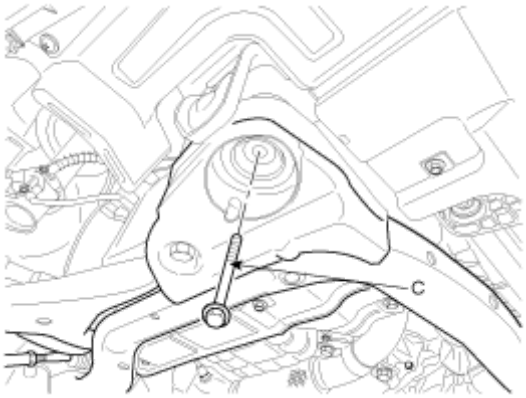
8. Remove the front and rear roll stopper bolt and nut (A, B).

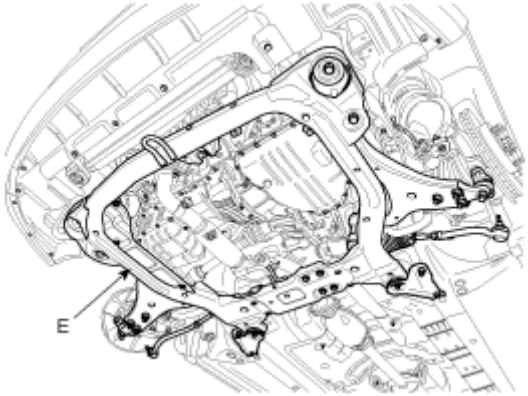




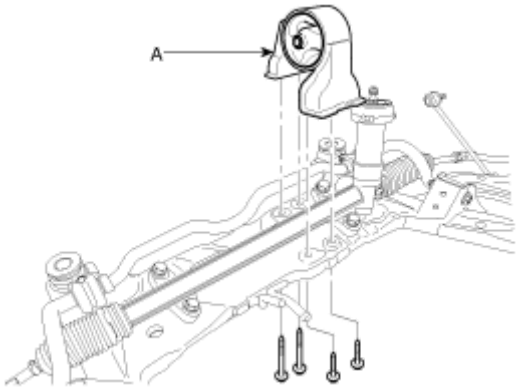
9. Remove the sub frame (E) and sub frame stay by loosening the mounting bolts (A, C) and nuts (B, D).



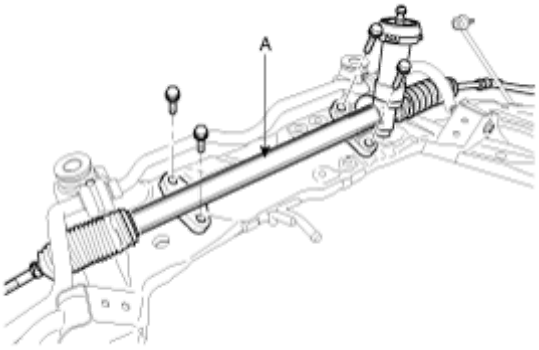




10. Remove the rear roll stopper (A) from the sub frame by loosening mounting bolts.

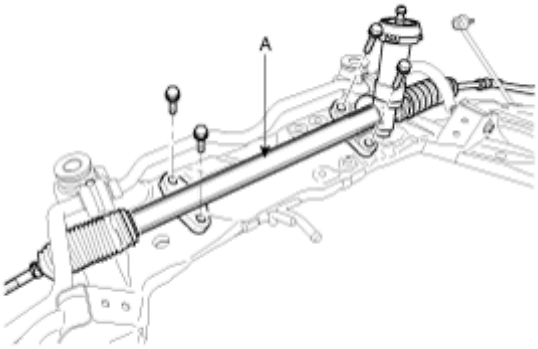


11. Remove the steering gear box (A) from the sub frame by loosening the mounting bolts.

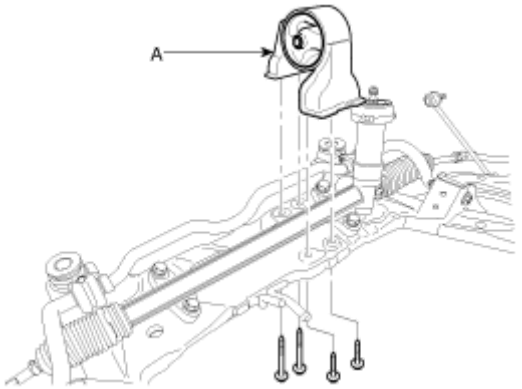


INSTALLATION

1. Install the steering gear box (A) to the sub frame by tightening the mounting bolts.
   Tightening torque Nm (kgf.m, lb-ft):
   60 ~ 80 (6.0 ~ 8.0, 43 ~ 58)



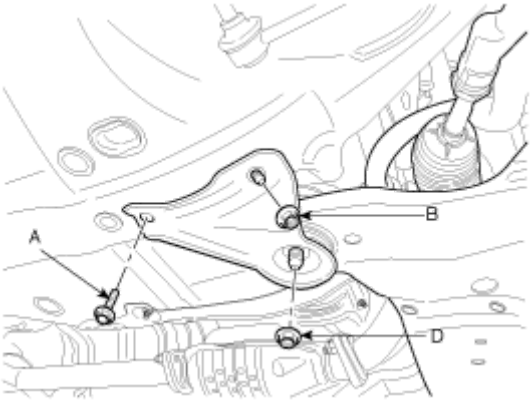
2. Install the rear roll stopper (A) to the sub frame by tightening the mounting bolts.
   Tightening torque Nm (kgf.m, lb-ft):
   50 ~ 65 (5.0 ~ 6.5, 36 ~ 47)

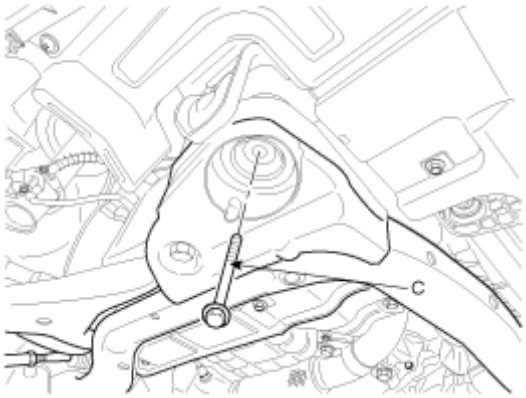


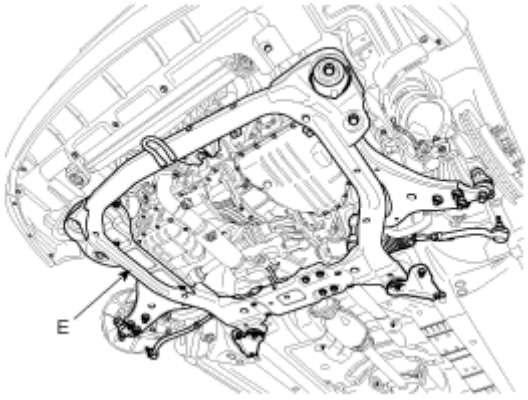
3. Install the sub frame (E) and sub frame stay by tightening the mounting bolts (A, C) and nuts (B, D).

Tightening torque Nm (kgf.m, lb-ft)

Sub frame mounting bolts (C) and nuts (D):
160 ~ 180 (16.0 ~ 18.0, 116 ~ 130)
Sub frame stay mounting bolt (A) and nut (B):
45 ~ 55 (4.5 ~ 5.5, 33 ~ 40)

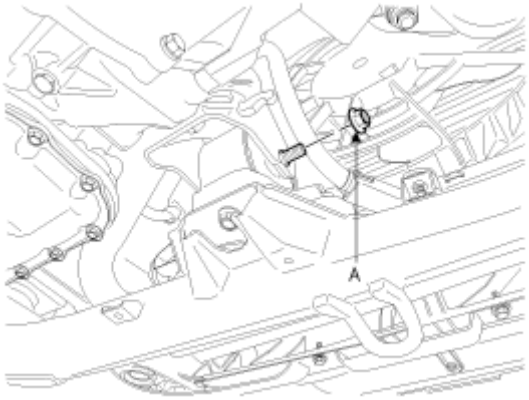


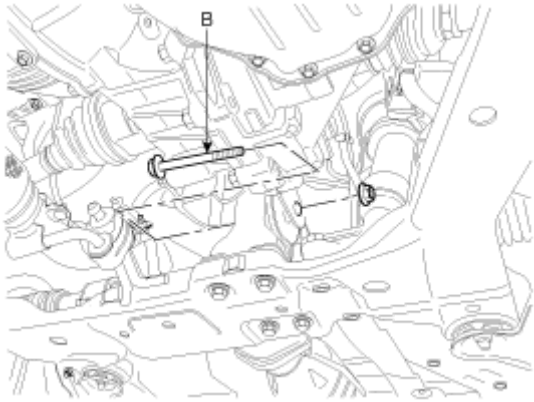




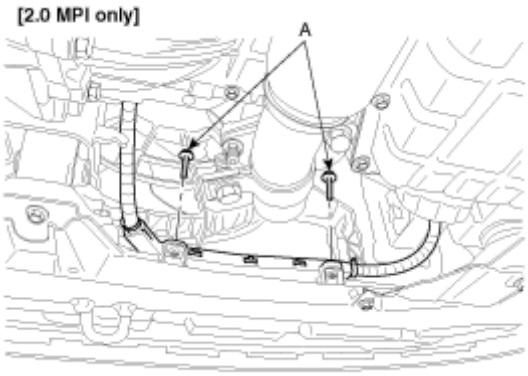
4. Tighten the front and rear roll stopper bolt and nut (A, B).

Tightening torque Nm (kgf.m, lb-ft):
50 ~ 65 (5.0 ~ 6.5, 36 ~ 47)

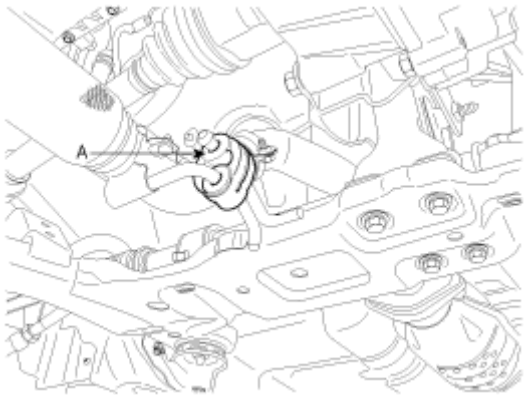




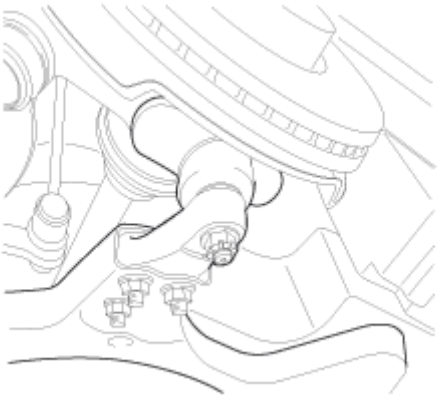
5. Install the wiring harness protector to the sub-frame by tightening the bolts (A).



6. Install the muffler rubber hanger (A).

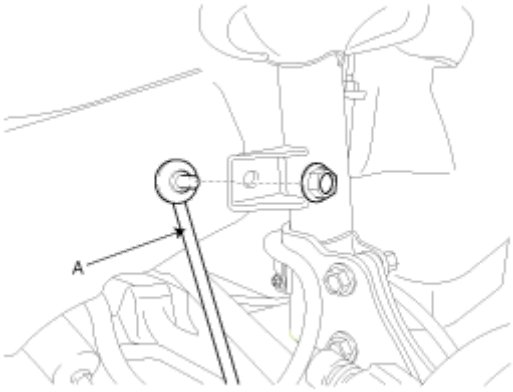


7. Connect the lower arm with the ball joint and then remove the castle nut and the split pin.

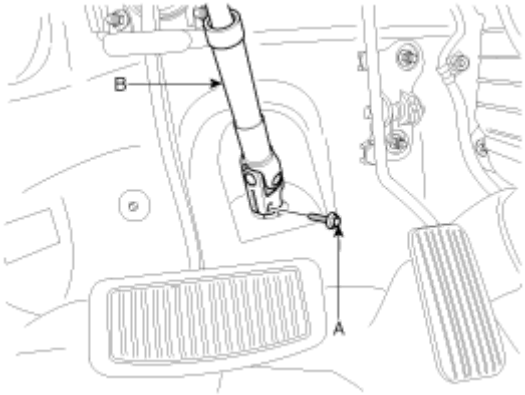


8. Connect the tie rod end with the knuckle and then install the castle nut and split pin.
   Tightening torque Nm (kgf.m, lb-ft):
   24 ~ 34 (2.4 ~3.4, 17 ~ 25)

9. Connect the stabilizer link (A) with the front strut assembly and than tighten the nut.
   Tightening torque Nm (kgf.m, lb-ft):
   100 ~ 120 (10.0 ~ 12.0, 72 ~ 87)



10. Connect the universal joint assembly (B) with the pinion of the steering gear box and then tighten the bolt (A).
    Tightening torque Nm (kgf.m, lb-ft):
    30 ~ 35 (3.0 ~ 3.5, 22 ~ 25)



> **⚠ CAUTION**
>
> Tighten up with bolt after inserting U-joint to the steering gear pinion shaft firmly.

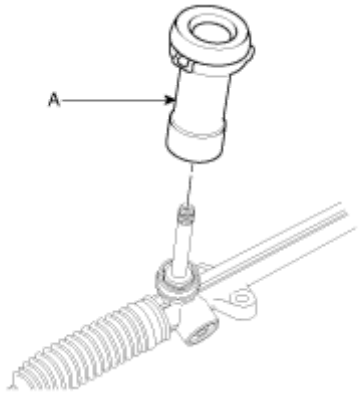
11. Install the front wheel & tire.
    Tightening torque Nm (kgf.m, lb-ft):
    90 ~ 110 (9.0 ~ 11.0, 65 ~ 80)

12. Check and adjust the front wheel alignment. (Refer to SS group)
13. Perform the ASP (Absoulte Steering Position) calibration procedure. (Refer to ASP calibration)

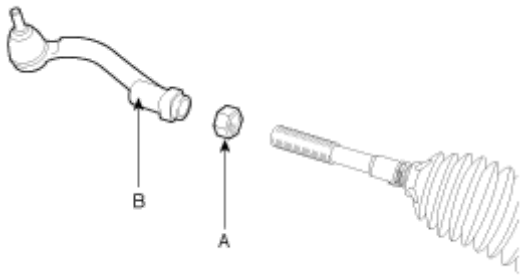
> **⚠ CAUTION**
>
> If the ASP calibration procedure is not performed, EPS warning lamp will be turned on or flicker and behicle may pull to the left or the right.

DISASSEMBLY

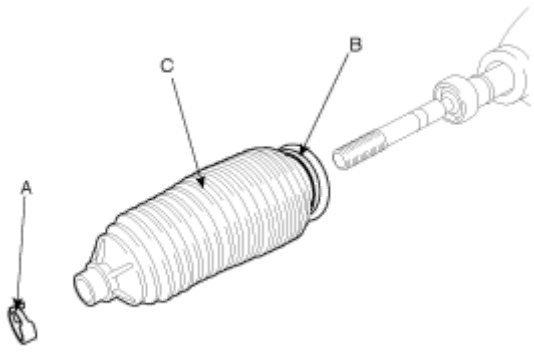
1. Remove the dust packing & cap (A) from the pinion housing.



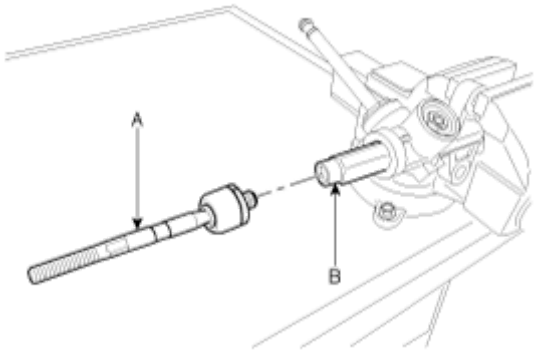
2. Loosen the lock nut and then remove the tie rod end (B) and lock nut (A) from the tie rod.



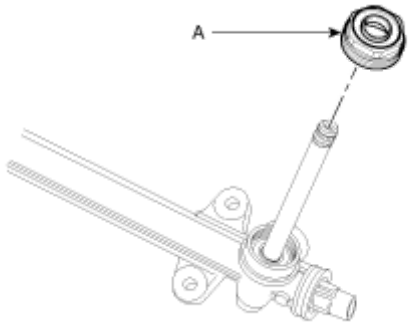
3. Remove the bellows clip (A) and band (B) and then pull the bellows (C) away from the end of the tie rod.



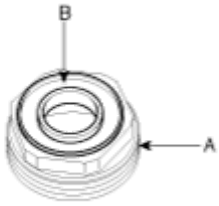
4. Remove the tie rod (B) from the rack bar (A) by unscrewing the tie rod inner ball joint.



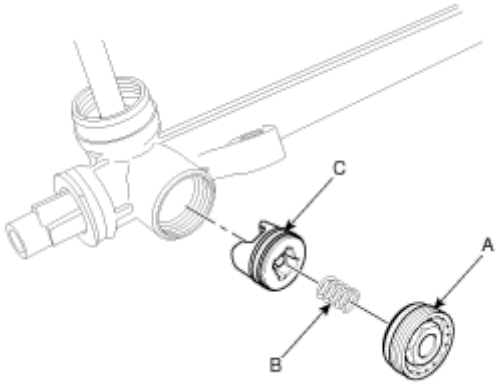
5. Remove the plug (A) from the pinion housing.



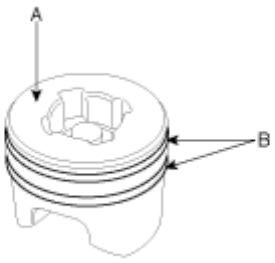
6. Remove the oil seal (B) from the plug (A).



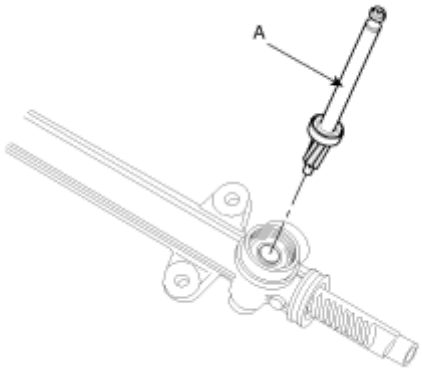
7. Remove the yoke plug (A) and spring (B) and then pull out the support yoke (C).



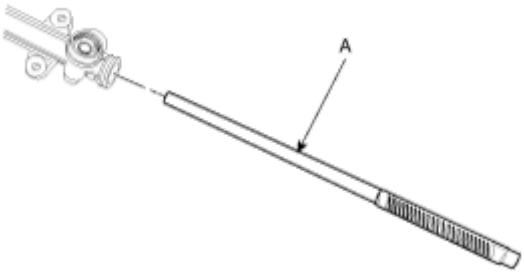
8. Remove the O-rings (B) from the support yoke assembly (A).



9. Pull the pinion assembly (A) out of the pinion housing.



10. Pull the rack bar (A) out of the rack housing.

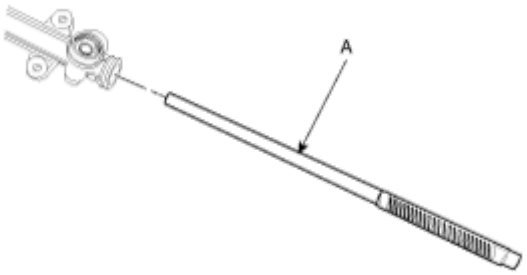


INSPECTION

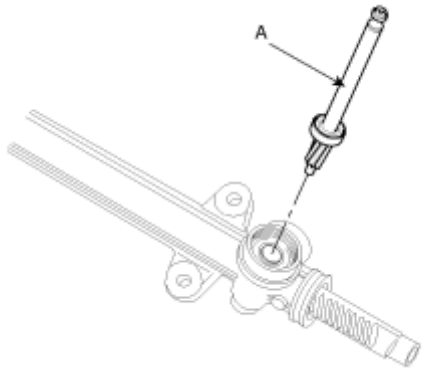
1. Rack bar
   - Check the rack gear for damage.
   - Check the rack bar for bend and deformation.
2. Pinion assembly
   - Check the pinion gear for damage.
   - Check the surface contacting the oil seal for damage.
   - Check the oil seal for damage.
3. Check the inside of rack housing for damage.
4. Check the bellows for being torn.

REASSEMBLY

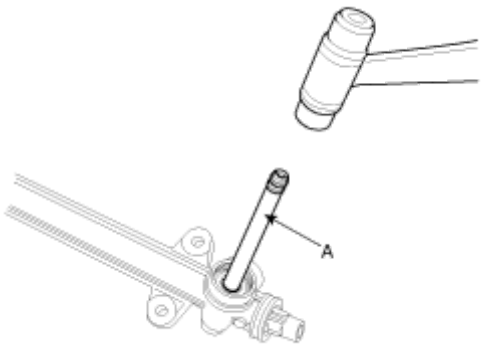
1. Apply the grease to rack gear teeth and then insert the rack bar (A) into the rack hosing.



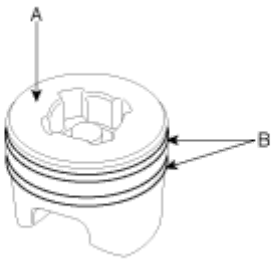
2. Insert the pinion assembly (A) into the pinion housing.



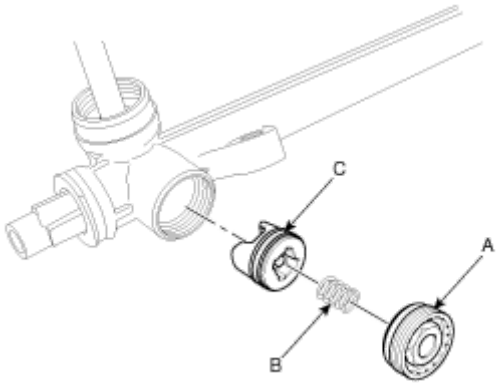
3. Tap the top of the pinion assembly with a plastic hammer to seat the pinion assembly thoroughly.



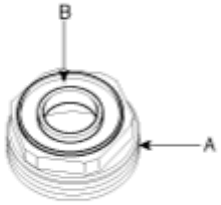
4. Assemble new O-rings (B) to support yoke (A).



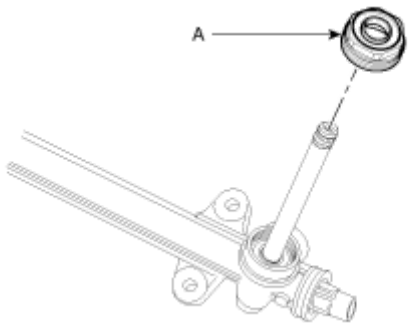
5. Insert the support yoke assembly (C) into the housing.
6. Apply the sealant to the thread of the yoke plug and then assemble the yoke plug (A) and the yoke spring (B) together.



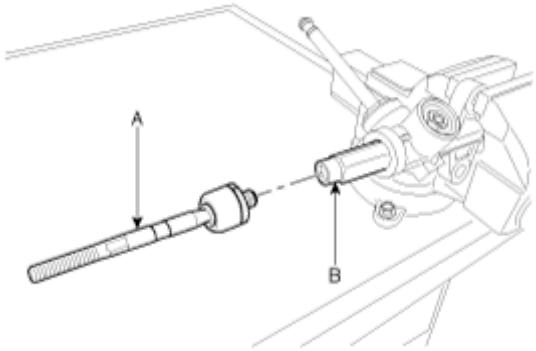
7. Apply the grease to the edge of the new oil seal (B) and then assemble it to the pinion plug (A).



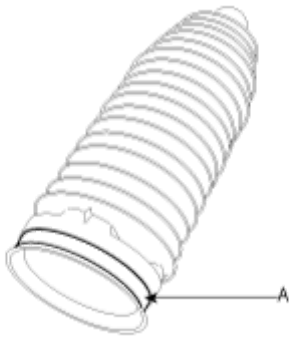
8. Apply the sealant to the thread of the plug and then assemble the pinion plug (A) to the housing.
   Tightening torque Nm (kgf.m, lb-ft):
   60 ~ 80 (6.0 ~ 8.0, 43 ~ 58)



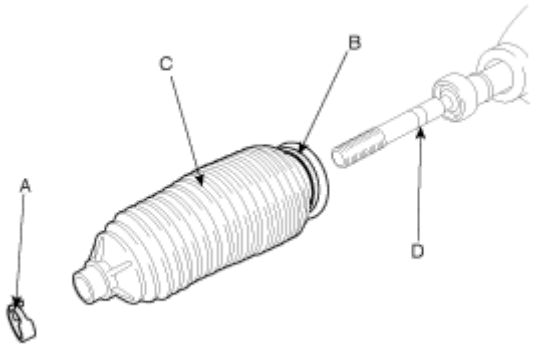
9. Apply loctite (Three bond-1374) to the thread of the tie rod inner ball joint and then assemble the tie rod (A) to the rack bar (B).
   Tightening torque Nm (kgf.m, lb-ft):
   110 ~ 130 (11.0 ~ 13.0, 65 ~ 94)



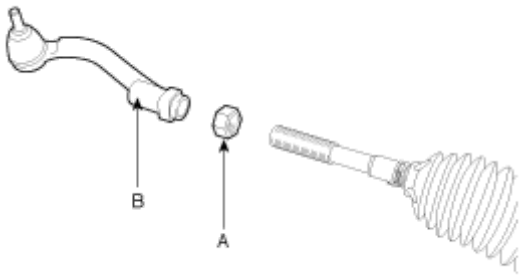
10. Assemble new bellows band (A) to the bellows.



11. Apply the grease (Kyoto Yushi-One Luber2128 to the portion (D) of the tie-rod.
12. Apply the sealant (Three bond-1141E) to the bellows mating surface of therack housing.
13. Assemble the bellows (C) to rack housing and then tighten the bellows clip (A) and band (B).



14. Assemble the lock nut (A) and tie rod end (B) to tie rod.



GENERAL

SPECIFICATIONS

FRONT SUSPENSION

Item		Specification
Suspension type		McPherson strut
Shock absorber	Type	Gas pressurized
	Stroke	15", 16" wheel: 154.2mm (6.07in.) 17" wheel: 149.0mm (5.87in.)
	I.D. color	15", 16" wheel LH: Grey, RH: Brown 17" wheel LH: Lilac, RH: Blue
Coil spring	I.D. color/ Height	White-2: 296.3mm (11.67in.) Pink-2: 301.9mm (11.89in.) Yellow-2: 309.3mm (12.18in.) Blue-2: 316.7mm (12.47in.) Brown-2: 324.1mm (12.76in.) Violet-2: 331.5mm (13.05in.)

REAR SUSPENSION

Item		Specification
Suspension type		Multi-link coil spring
Shock absorber	Type	Gas pressurized
	Stroke	15", 16" wheel: 162.6mm (6.40in.) 17" wheel: 148.4mm (5.84in.)
	I.D. color	15", 16" wheel: Yellow 17" wheel: Pink
Coil spring	I.D. color/ Height	Green-2: 309.7mm (12.19in.) Red-2: 313.6mm (12.35in.) Yellow-2: 317.6mm (12.50in.) Blue-2: 327.9mm (12.91in.) Pink-2: 331.8mm (13.06in.) Violet-2: 335.7mm (13.22in.)

WHEEL AND TIRE

Item	Specification
Tire	185/65 R15
	195/65 R15
	205/55 R16
	225/45 R17
	5.5J × 15

English ▼

Wheel		6.0J × 16
		7.0J × 17
Tire pressure	Front	2.4kg/cm² (34psi)
	Rear	2.6kg/cm² (37psi)

FRONT WHEEL ALIGNMENT

Item		Specification
Toe-in	Total	0°±0.2°
	Individual	0°±0.1°
Camber angle		-0.6°±-0.5°
Caster angle		4.43°±0.5°
King-pin angle		13.65°±0.5°

REAR WHEEL ALIGNMENT

Item		Specification
Toe-in	Total	0.1°±0.2°
	Individual	0.05°±0.1°
Camber angle		-1.15°±0.5°

TIGHTENING TORQUE

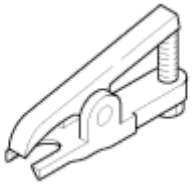
FRONT SUSPENSION

Item	Tightening torque (kgf.m)		
	Nm	Kgf.m	lb-ft
Hub nuts	90 ~ 110	9.0 ~ 11.0	65 ~ 80
Strut assembly to wheel housing penal bolts	45 ~ 60	4.5 ~ 6.0	33 ~ 43
Strut assembly to knuckle bolts	140 ~ 160	14.0 ~ 16.0	101 ~ 116
Strut assembly self locking nut	50 ~ 70	5.0 ~ 7.0	36 ~ 51
Stabilizer link to strut assembly nut	100 ~ 120	10.0 ~12.0	72 ~ 87
Lower arm to sub frame bolt & nut (Front)	140 ~ 160	14.0 ~ 16.0	101 ~ 116
Lower arm to sub frame bolt & nut (Rear)	100 ~ 120	10.0 ~ 12.0	72 ~ 87
Lower arm ball joint castle nut	80 ~ 90	8.0 ~ 9.0	58 ~ 65
Stabilizer bar to stabilizer link nut	45 ~ 55	4.5 ~ 5.5	33 ~ 40
Stabilizer bracket mounting bolts	100 ~ 120	4.5 ~ 5.5	33 ~ 40
Sub frame to body bolts and nuts	160 ~ 180	16.0 ~ 18.0	116 ~ 130
Sub frame stay mounting bolts & nut	45 ~ 55	4.5 ~ 5.5	33 ~ 40
Front & Rear roll stopper bolt & nut	50 ~ 65	5.0 ~ 6.5	36 ~ 47
Lower arm ball joint to knuckle bolts	100 ~ 120	10.0 ~ 12.0	72 ~ 87
Tie-rod end castle nut	24 ~ 34	2.4 ~ 3.4	17 ~ 25
Universal join to pinion of steering gear bolt	26 ~ 43	2.6 ~ 4.3	19 ~ 31

REAR SUSPENSION

Item	Tightening torque (kgf.m)		
	Nm	Kgf.m	lb-ft
Hub nuts	90 ~ 110	9.0 ~ 11.0	65 ~ 80
Shock absorber to wheel housing penal bolts	50 ~ 65	5.0 ~ 6.5	36 ~ 47
Shock absorber to carrier bolt& nut	140 ~ 160	14.0 ~ 16.0	101 ~ 116
Shock absorber self locking nut	20 ~ 25	2.0 ~ 2.5	14 ~ 18
Upper arm to carrier bolt & nut	100 ~ 120	10.0 ~ 12.0	72 ~ 87
Upper arm to cross member bolt	100 ~ 120	10.0 ~ 12.0	72 ~ 87
Lower arm to carrier bolt & nut	140 ~ 160	14.0 ~ 16.0	101 ~ 116
Lower arm to cross member bolt	140 ~ 160	14.0 ~ 16.0	101 ~ 116
Assist arm to carrier castle nut	45 ~ 55	4.5 ~ 5.5	33 ~ 40
Assist arm to cross member cam bolt & nut	100 ~ 120	10.0 ~ 12.0	72 ~ 87
Trailing arm to carrier bolts	35 ~ 55	3.5 ~ 5.5	25 ~ 40
Trailing arm to body bolts	140 ~ 160	14.0 ~ 16.0	101 ~ 116
Stabilizer link to trailing arm nut	45 ~ 55	4.5 ~ 5.5	33 ~ 40
Stabilizer bar to stabilizer link nut	45 ~ 55	4.5 ~ 5.5	33 ~ 40
Stabilizer bar bracket bolts	45 ~ 55	4.5 ~ 5.5	33 ~ 40

SPECIAL SERVICE TOOLS

Tool (Number and Name)	Illustration	Use
09546-26000 Strut spring compressor		Compression of coli spring
09568-34000 Ball joint puller		Remover of ball joint

TROUBLESHOOTING

Symptom	Possible cause	Remedy
Hard steering	Improper front wheel alignment Excessive turning resistance of lower arm ball joint Low tire pressure No power assist	Correct Replace Adjust Repair and replace
Poor return of steering wheel to center	Improper front wheel alignment	Correct
Poor or rough ride	Improper front wheel alignment Malfunctioning shock absorber Broken or worn stabilizer Broken or worn coil spring Worn lower arm bushing	Correct Repair or replace Replace Replace Replace the lower arm assembly
Abnormal tire wear	Improper front wheel alignment Improper tire pressure Malfunctioning shock absorber	Correct Adjust Replace
Wandering	Improper front wheel alignment Poor turning resistance of lower arm ball joint Loose or worn lower arm bushing	Correct Repair Retighten or replace
Vehicle pulls to one side	Improper front wheel alignment Excessive turning resistance of lower arm ball joint Broken or worn coil spring Bent lower arm	Correct Replace Replace Repair
Steering wheel shimmy	Improper front wheel alignment Poor turning resistance of lower arm ball joint Broken or worn stabilizer Worn lower arm bushing Malfunctioning shock absorber Broken or worn coil spring	Correct Replace Replace Replace Replace Replace
Bottoming	Broken or worn coil spring Malfunctioning shock absorber	Replace Replace

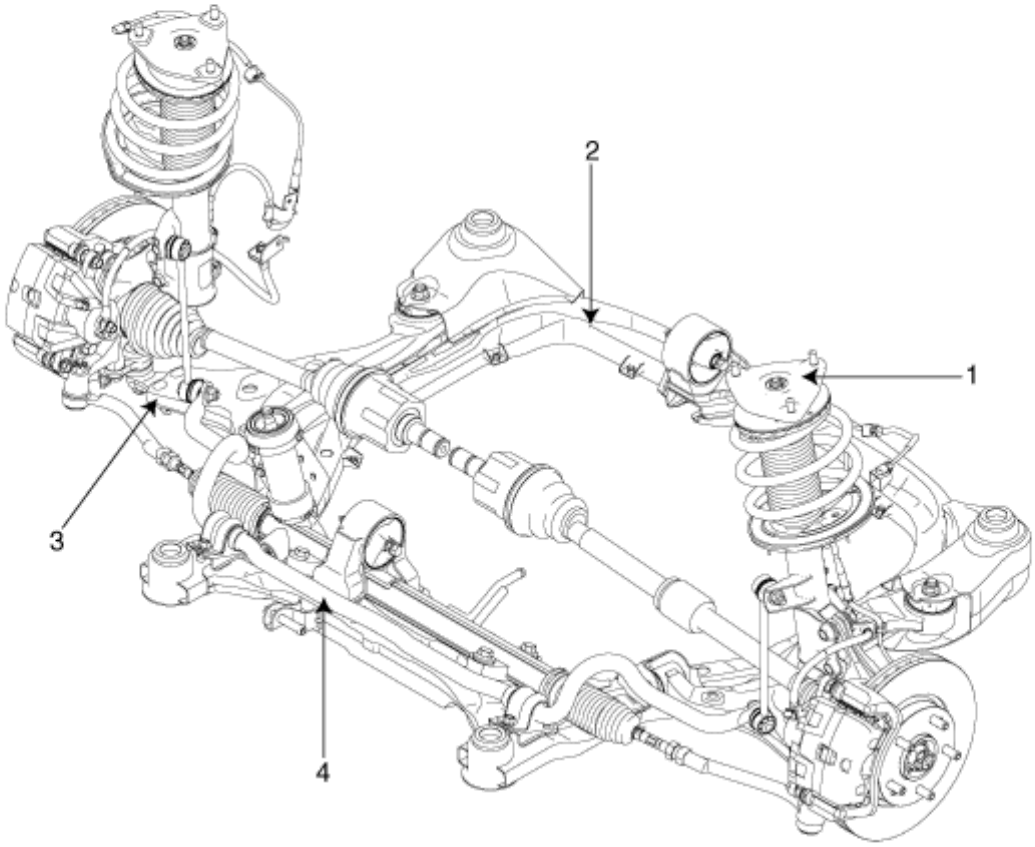
Wheel /tire noise, vibration and harshness concerns are directly related to vehicle speed and are not generally affected by acceleration, coasting or decelerating. Also, out-of-balance wheel and tires can vibrate at more than one speed. A vibration that is affected by the engine rpm, or is eliminated by placing the transmission in Neutral is not related to the tire and wheel. As a general rule, tire and wheel vibrations felt in the steering wheel are related to the front tire and wheel assemblies. Vibrations felt in the seat or floor are related to the rear tire and wheel assemblies. This can initially isolate a concern to the front or rear.
Careful attention must be paid to the tire and wheels. There are several symptoms that can be caused by damaged or worn tire and wheels. Perform a careful visual inspection of the tires and wheel assemblies. Spin the tires slowly and watch for signs of lateral or radial runout. Refer to the tire wear chart to determine the tire wear conditions and actions

WHEEL AND TIRE DIAGNOSIS		
Rapid wear at the center	Rapid wear at both shoulders	Wear at one shoulder

English ▼

		
• 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
Partial wear	Feathered edge	Wear pattern
		
• Caused by irregular burrs on brake drums	• Toe adjustment out of specification • Damaged or worn tie rods • Damaged knuckle	• Excessive toe on non-drive wheels • Lack of rotation

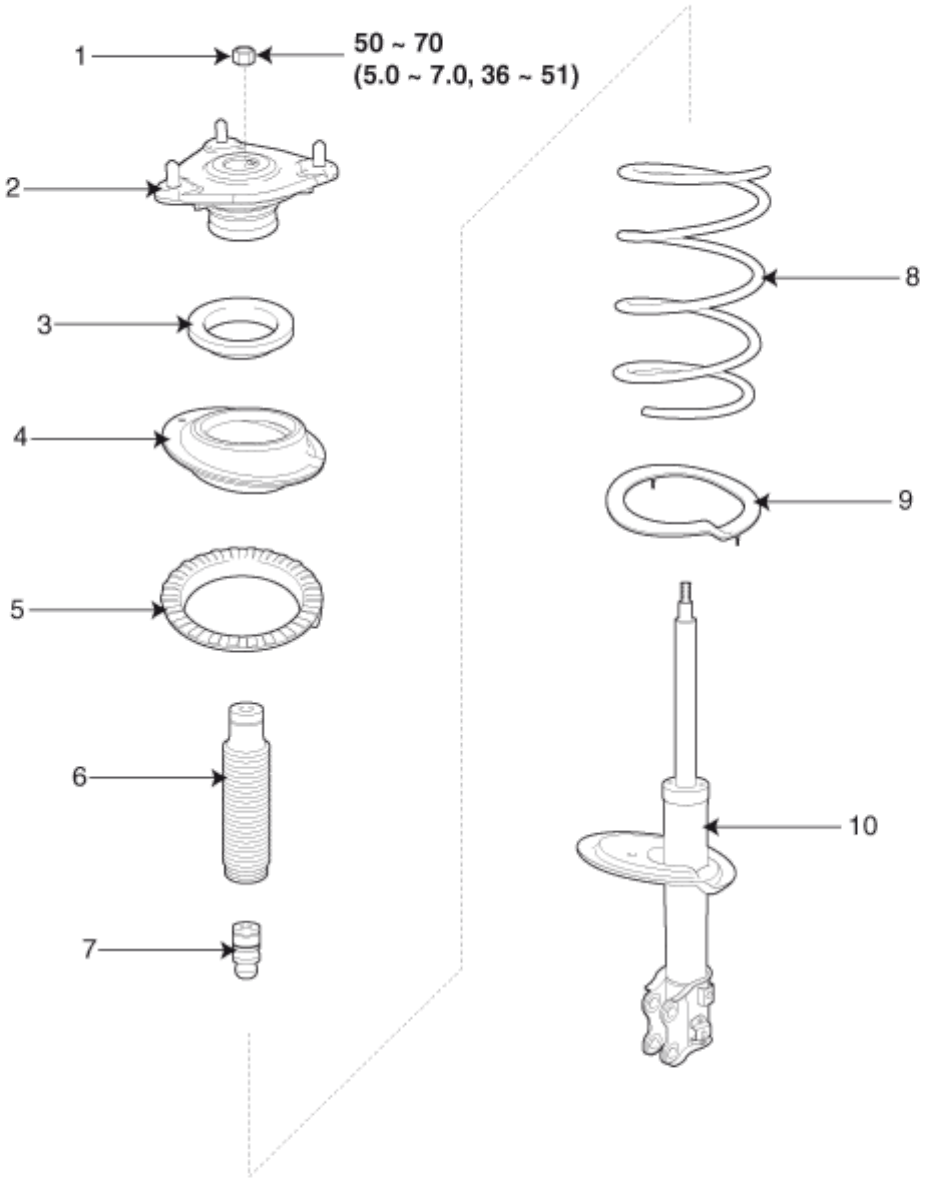
COMPONENTS



1. Front strut assembly
2. Sub frame
3. Front lower arm
4. Front stabilizer bar

English

COMPONENTS



TORQUE : Nm (kgf.m, lb-ft)

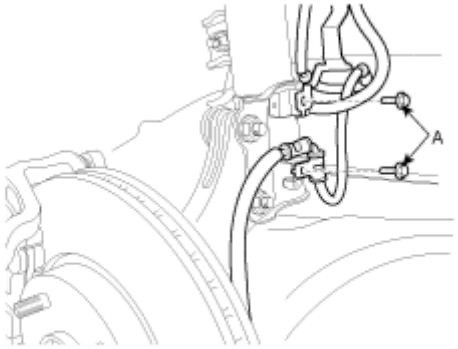
1. Self locking nut
2. Insulator assembly
3. Strut bearing
4. Spring upper seat
5. Spring upper pad
6. Dust cover
7. Bumper rubber
8. Coil spring
9. Spring lower pad
10. Shock absorber

REMOVAL

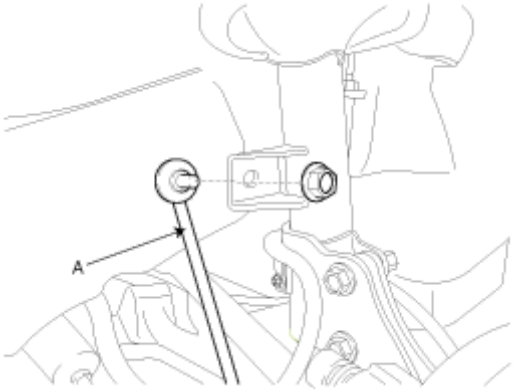
1. Remove the front wheel & tire.

> **CAUTION**
>
> Be careful not to damage to the hub bolts when removing the front wheel & tire.

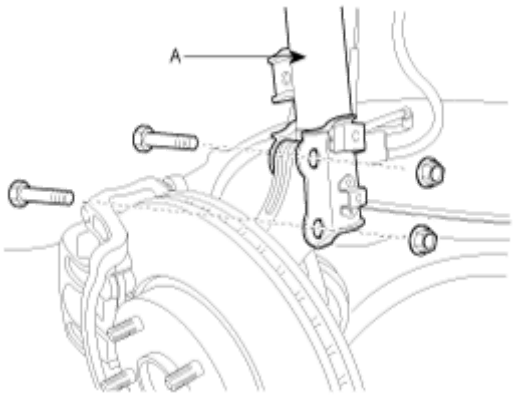
2. Remove the brake hose and the wheel speed sensor bracket from the front strut assembly by loosening the mounting bolts (A).



3. Disconnect the stabilizer link (A) with the front strut assembly after loosening the nut.



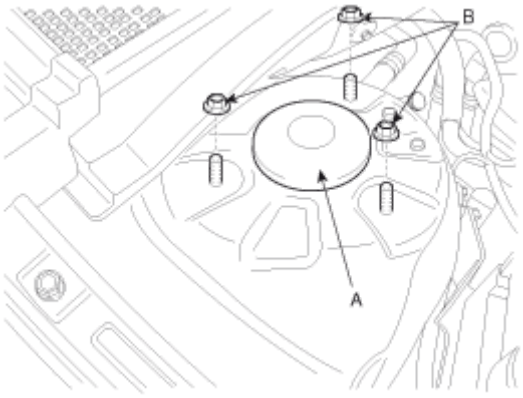
4. Disconnect the front strut assembly (A) with the knuckle by loosening the bolt & nut.



5. Remove the front strut cap (A).

6. Remove the front strut assembly from the wheel housing panel by loosening the mounting nuts (B).

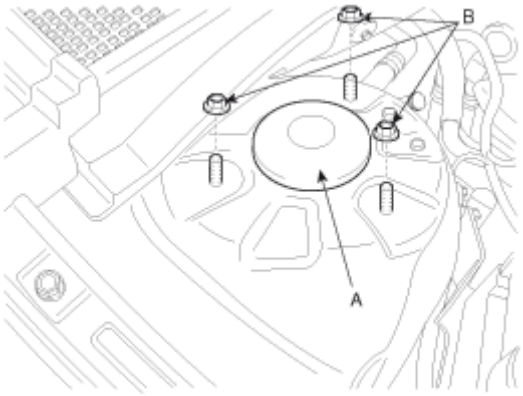
English ▼



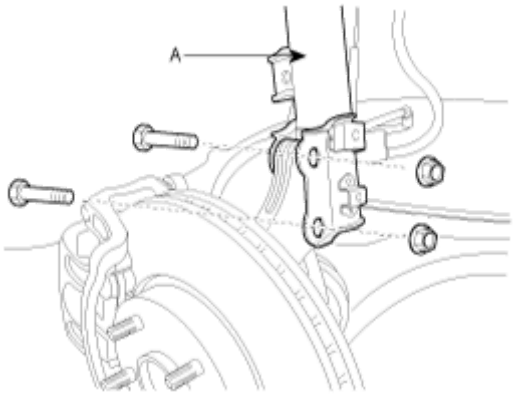
INSTALLATION

1. Install the front strut assembly to the wheel housing panel by tightening the mounting nuts (B).
   Tightening torque Nm (kgf.m, lb-ft):
   45 ~ 60 (4.5 ~ 6.0, 33 ~ 43)

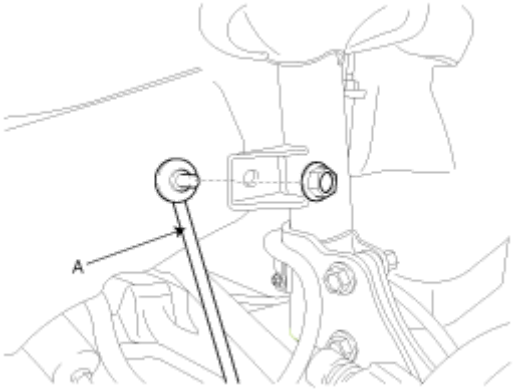
2. Install the front strut cap (A).



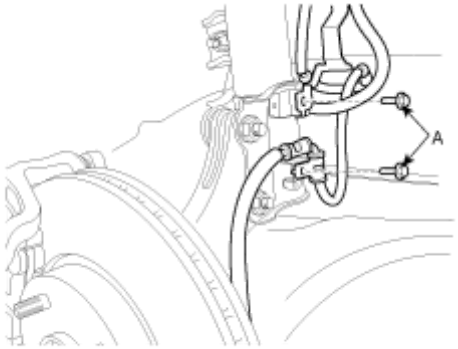
3. Connect the front strut assembly (A) with the knuckle by tightening the bolts & nuts.
   Tightening torque Nm (kgf.m, lb-ft):
   140 ~ 160 (14.0 ~ 16.0, 101 ~ 116)



4. Install the stabilizer link (A) to the front strut assembly and then tighten the nut.
   Tightening torque Nm (kgf.m, lb-ft):
   100 ~ 120 (10.0 ~ 12.0, 72 ~ 87)



5. Install the brake hose and wheel speed sensor bracket to front strut assembly by tightening the mounting bolts (A).

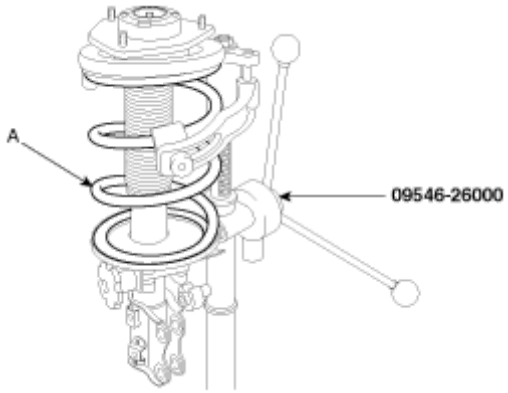


6. Install the front wheel & tire.

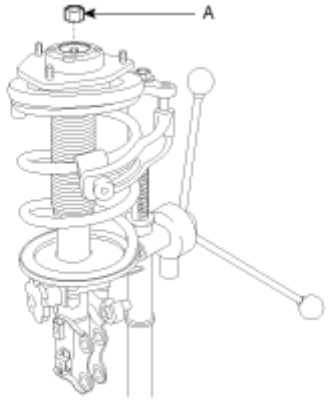
   Tightening torque Nm (kgf.m, lb-ft):
   90 ~ 110 (9.0 ~ 11.0, 65 ~ 80)

DISASSEMBLY

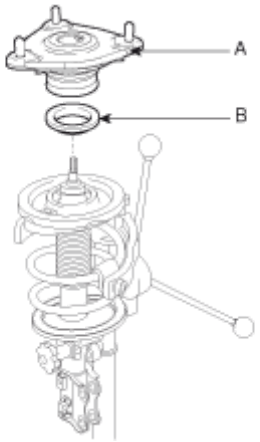
1. Compress the coil spring (A) with a SST (09546-26000). Do not compress the spring more than necessary.



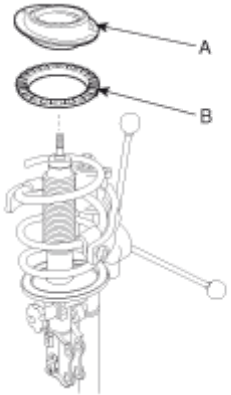
2. Loosen the self locking nut (A).



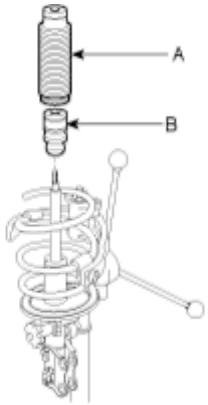
3. Remove the insulator assembly (A) and the strut bearing (B).



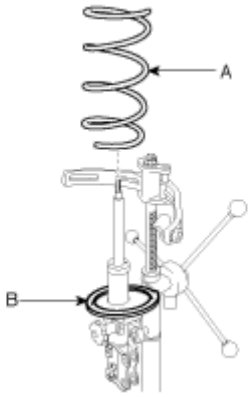
4. Remove the spring upper seat (A) and pad (B).



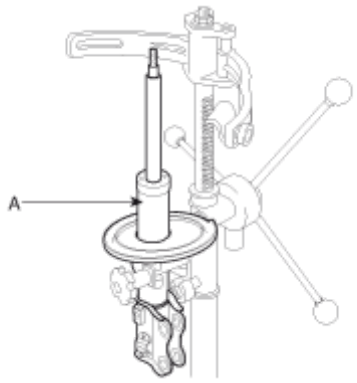
5. Remove the dust cover (A) and the bumper rubber (B).



6. Remove the coli spring (A) and the spring lower pad (B).

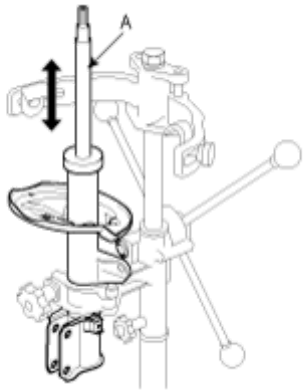


7. Remove the shock absorber (A) from the special tool.



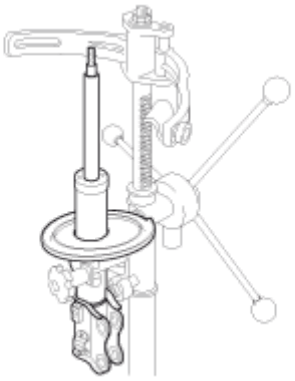
INSPECTION

1. Check the strut bearing for wear and damage.
2. Check the spring upper and lower seat for damage and deterioration.
3. Compress and extend the piston rod (A) and check that there is no abnormal resistance or unusual sound during operation.

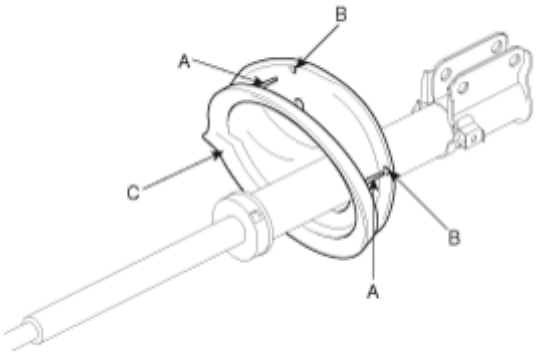


REASSEMBLY

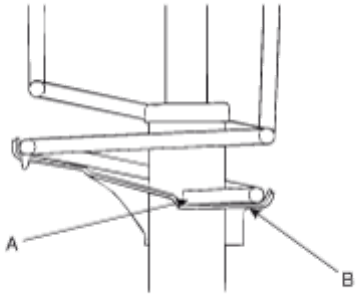
1. Install the front shock absorber to SST (09546-26000).



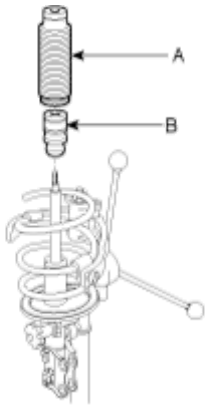
2. Install the spring lower pad (C) so that the protrusions (A) fit in the holes (B) in the spring lower seat.



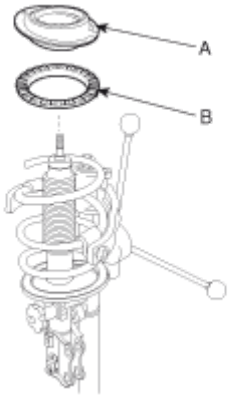
3. Put the coil spring (A) on the spring lower pad (B) correctly as illustration below.



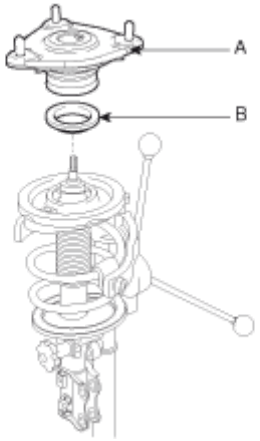
4. Install the bumper rubber (B) and the dust cover (A) to piston rod.



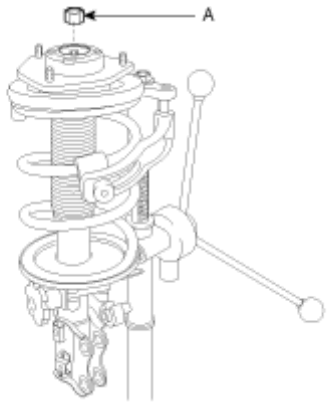
5. Install the spring upper pad (B) and seat (A).



6. Compress the coil spring with the SST.
7. Fully extend the piston rod and then install the strut bearing (B) and the insulator (A).



8. Tighten a new self locking nut (A) to the specified torque.
   Tightening torque Nm (kgf.m, lb-ft):
   50 ~ 70 (5.0 ~ 7.0, 36 ~51)



9. Remove the special service tool.

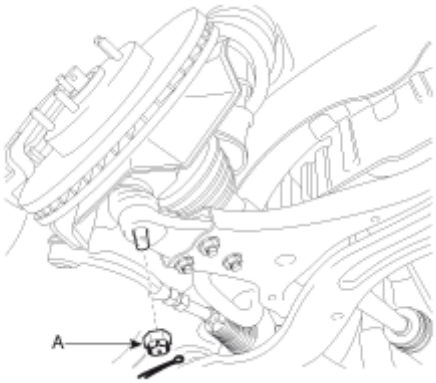
English

REMOVAL

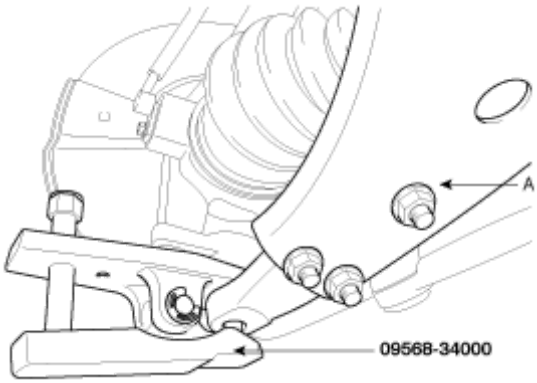
1. Remove the front wheel & tire.

> **CAUTION**
>
> Be careful not to damage to the hub bolts when removing the front wheel & tire.

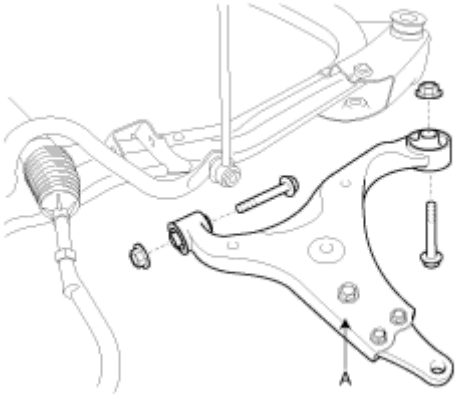
2. Remove the split pin and the castle nut (A) from the lower arm ball joint.



3. Separate the lower arm (A) from the lower arm ball joint by using SST (09568-34000).



4. Loosen the bolts and nuts and then remove the lower arm (A) from the sub frame.

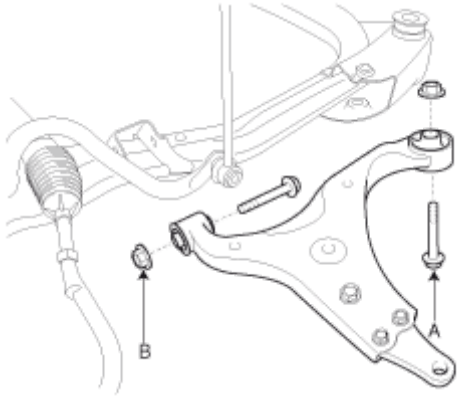


INSTALLATION

English ▼

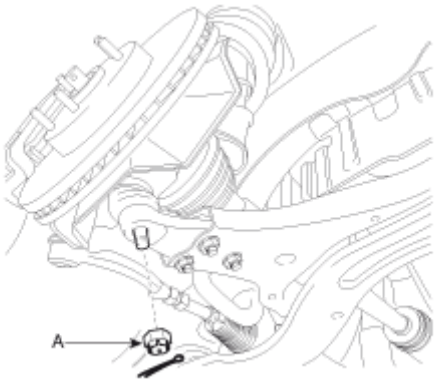
1. Install the front lower arm to the sub frame and then tighten the bolts (A, B) and nuts.

   Tightening torque Nm (kgf.m, lb-ft)
   Bolt & nut (A): 140 ~ 160 (14.0 ~ 16.0, 101 ~ 116)
   Bolt & nut (B): 100 ~ 120 (10.0 ~12.0, 72 ~ 87)



2. Connect the lower arm with the ball joint and then install the castle nut (A) and the split pin.

   Tightening torque Nm (kgf.m, lb-ft):
   80 ~ 90 (8.0 ~ 9.0, 58 ~ 65)



3. Install the front wheel & tire.

   Tightening torque Nm (kgf.m, lb-ft):
   90 ~ 110 (9.0 ~ 11.0, 65 ~ 80)

INSPECTION

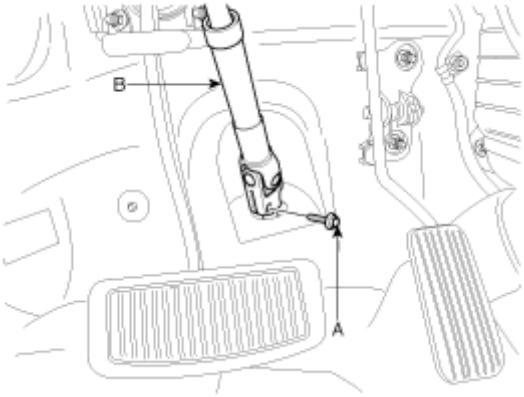
1. Check the bushing for wear and deterioration.
2. Check the lower arm for deformation.
3. Check the all bolts and nuts

REMOVAL

1. Remove the front wheel & tire.

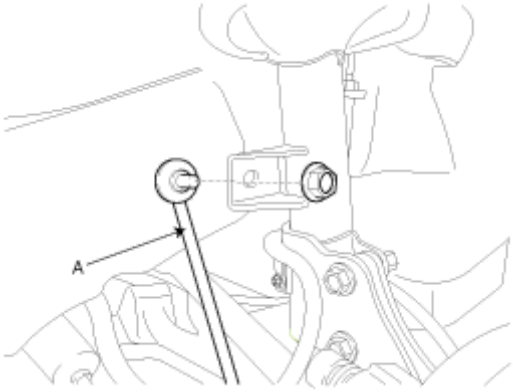
> **CAUTION**
>
> Be careful not to damage to the hub bolts when removing the front wheel & tire.

2. Loosen the bolt (A) and then disconnect the universal joint assembly (B) from the pinion of the steering gear box.



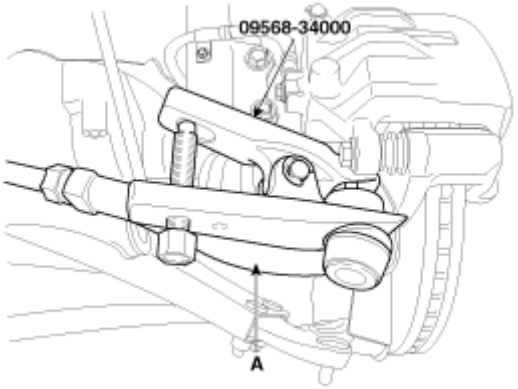
> **CAUTION**
>
> Keep the neutral-range to prevent the damage of the clock spring inner cable when you handlethe steering wheel.

3. Disconnect the stabilizer link (A) from the front strut assembly by loosening the nut.

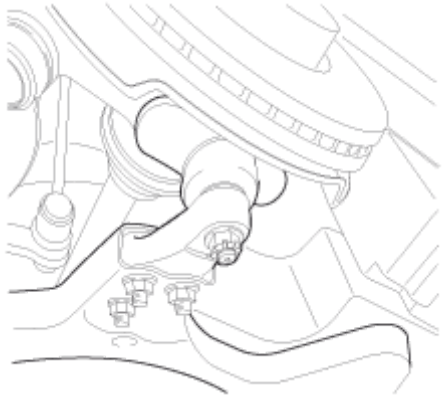


4. Remove the split pin and castle nut and then disconnect the tie rod end (A) from the front knuckle by using a SST (09568-34000).

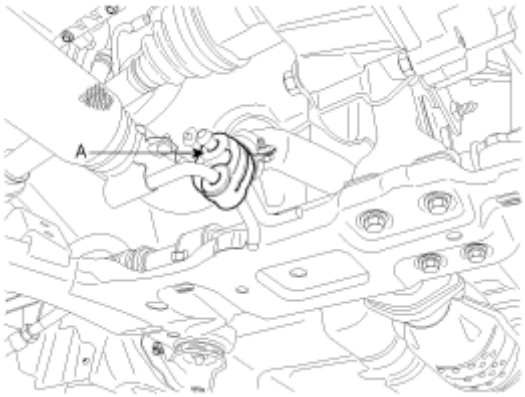
English ▼



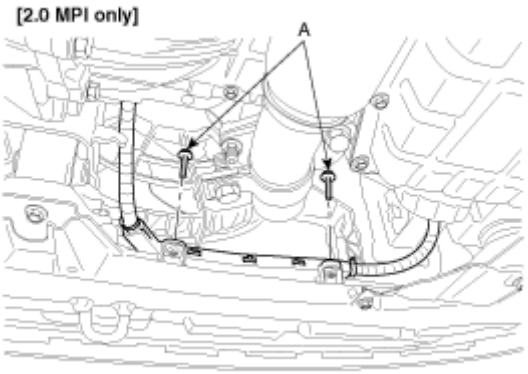
5. Connect the lower arm with the ball joint and then remove the castle nut and the split pin.



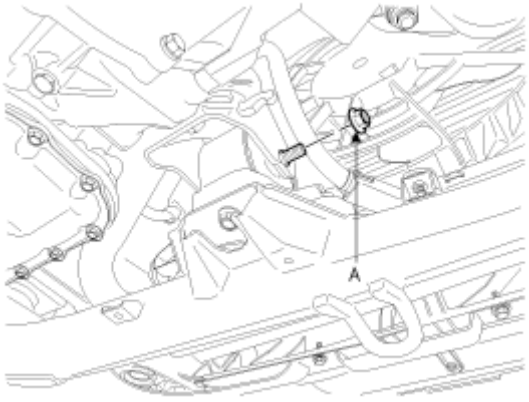
6. Remove the muffler rubber hanger (A).

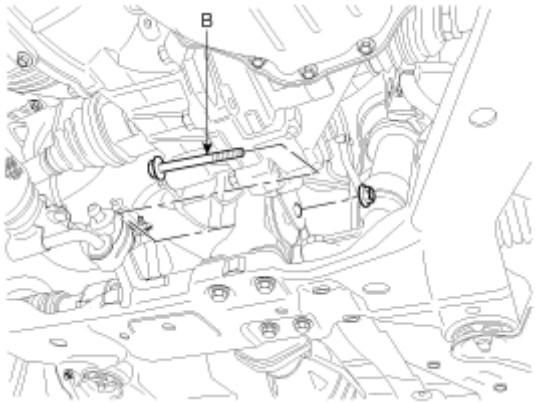


7. Loosen the wiring harness protector mounting bolts (A).

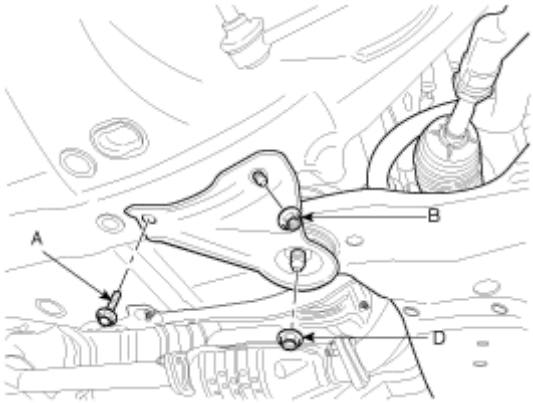


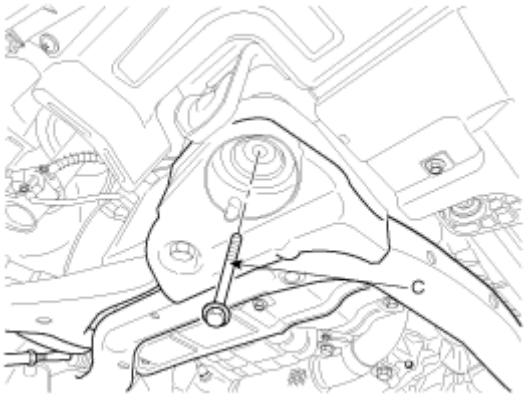
8. Remove the front and rear roll stopper bolts & nut (A, B).

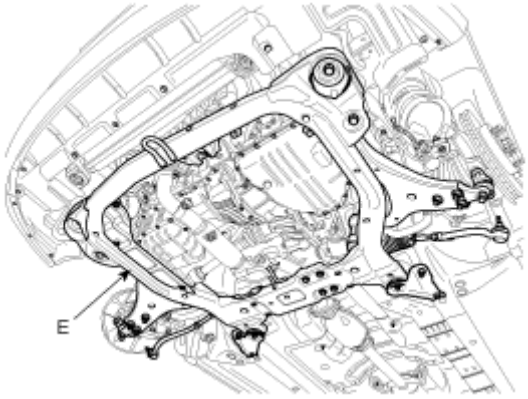




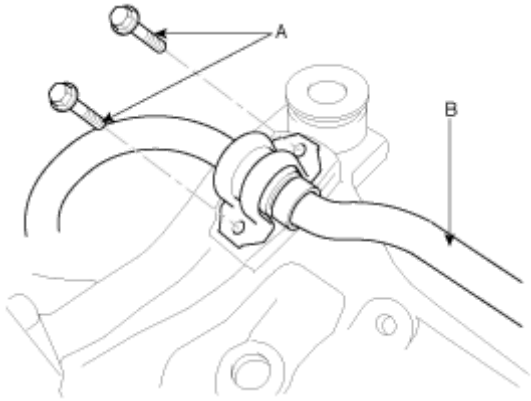
9. Remove the sub frame (E) and the sub frame stay by loosening the mounting bolts (A, C) and nuts (B, D).



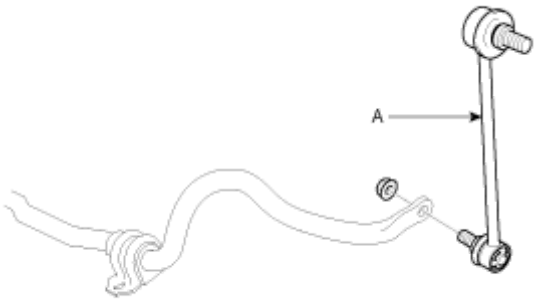




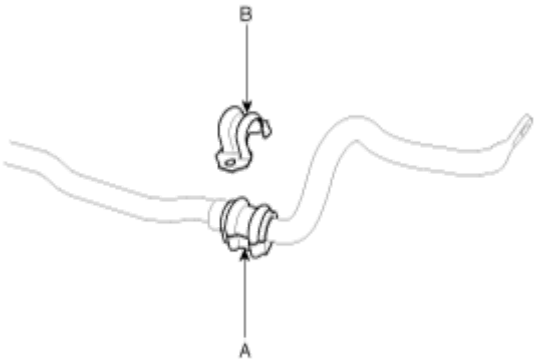
10. Remove stabilizer (B) from the sub frame by loosening the bracket mounting bolts (A).



11. Disconnect the stabilizer link (A) with the stabilizer bar by loosening the nut.

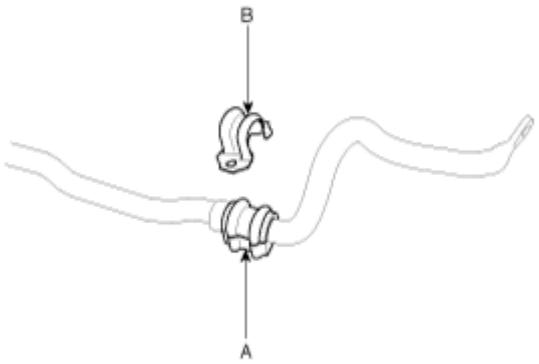


12. Remove the bushing (A) and the bracket (B) from the stabilizer bar.

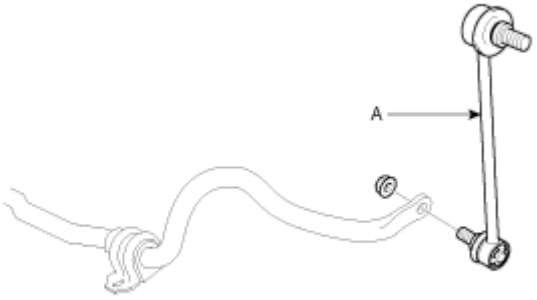


INSTALLATION

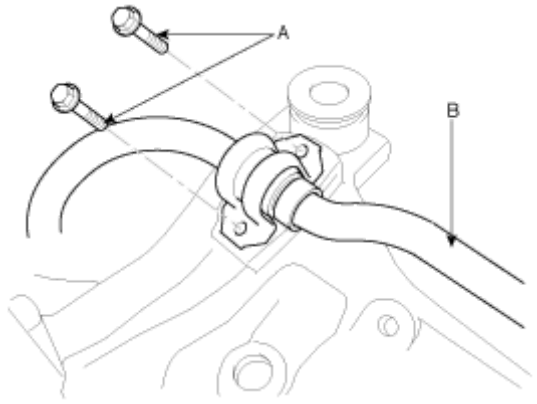
1. Install the bushing (A) and the bracket (B) to the stabilizer bar.



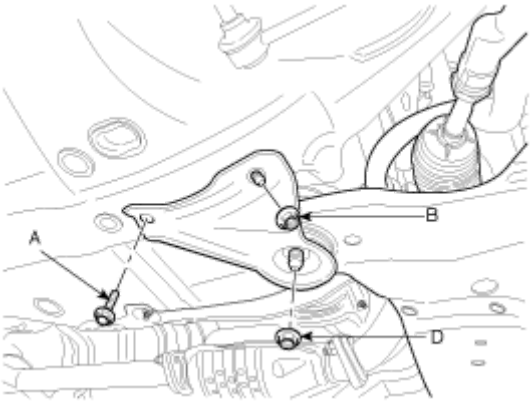
2. Connect the stabilizer link (A) with the stabilizer bar by tightening the nut.
   Tightening torque Nm (kgf.m, lb-ft):
   100~ 120 (10.0 ~ 12.0, 72 ~ 87)

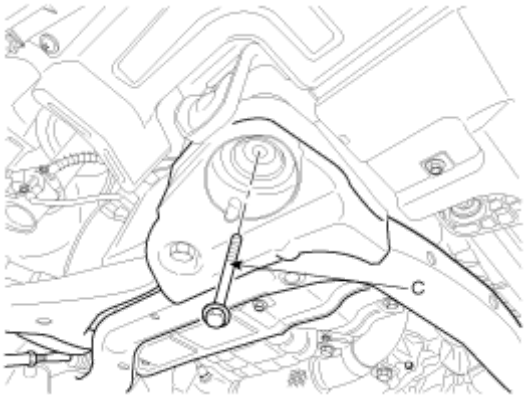


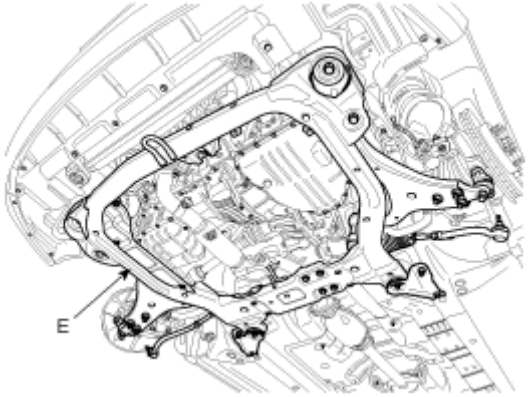
3. Install the stabilizer (B) to the sub frame by tightening the bracket mounting bolts (A).
   Tightening torque Nm (kgf.m, lb-ft):
   45 ~ 55 (4.5 ~ 5.5, 33 ~ 40)



4. Install the sub frame (E) and the sub frame stay by tightening the mounting bolts (A, C) and nuts (B, D).
   Tightening torque Nm (kgf.m, lb-ft):
   Sub fame mounting bolts (C) and nuts (D):
   160 ~ 180 (16.0 ~ 18.0, 116 ~ 130)
   Sub frame stay mounting bolts (A) and nuts (B):
   45 ~ 55 (4.5 ~ 5.5, 33 ~ 40)

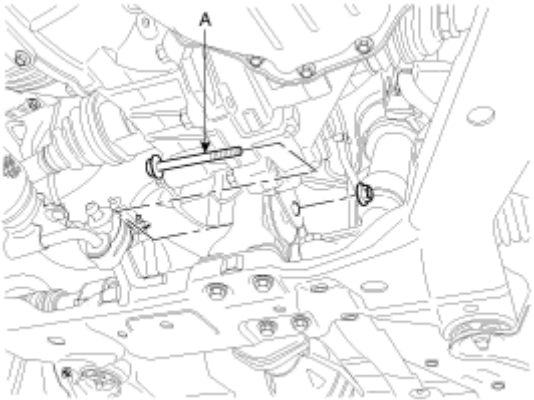






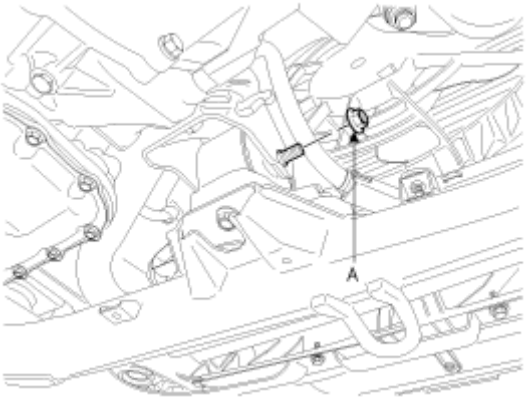
5. Tighten the rear roll stopper through bolt(A).

   Tightening torque Nm (kgf.m, lb-ft):
   50 ~ 65 (5.0 ~ 6.5, 36 ~ 47)

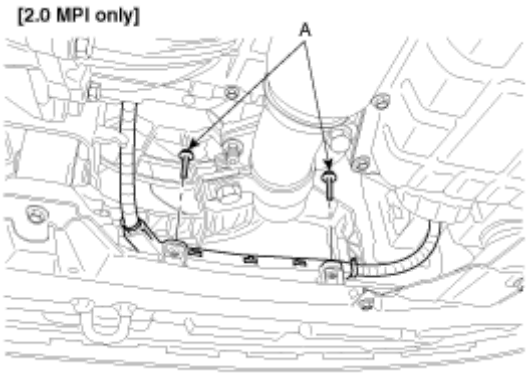


6. Tighten the front roll stopper through bolt & nut (A).

   Tightening torque Nm (kgf.m, lb-ft):
   50 ~ 65 (5.0 ~ 6.5, 36 ~ 47)



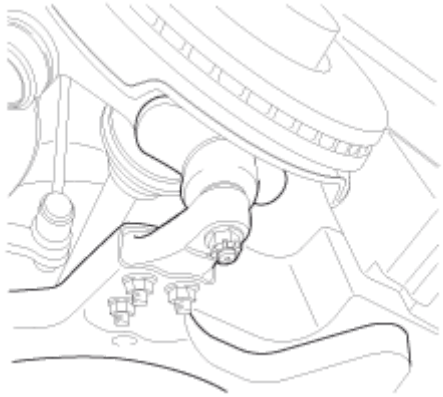
7. Install the wire harness protector to sub frame by tightening the mounting bolts (A).



8. Install the muffler rubber hanger (A).



9. Connect the lower arm with the ball joint and then remove the castle nut and the split pin.

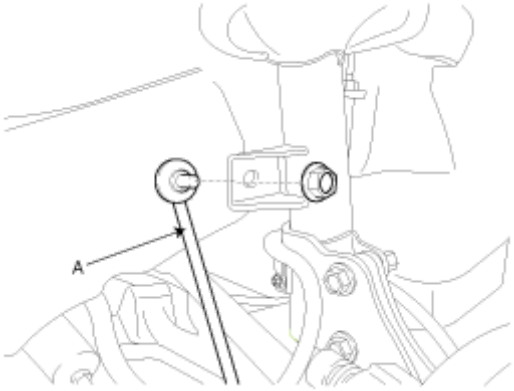


10. Connect the tie rod end with the knuckle and then install the castle nut and split pin.

    Tightening torque Nm (kgf.m, lb-ft):
    24 ~ 34 (2.4 ~3.4, 17 ~ 25)

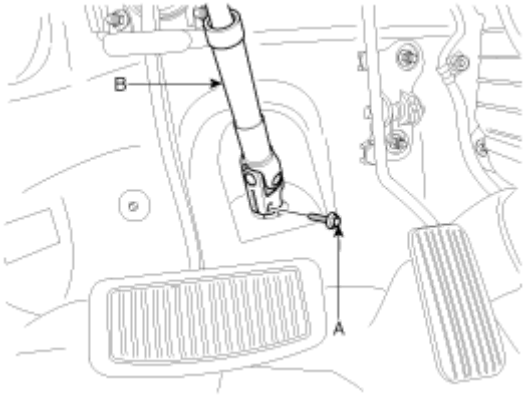
11. Connect the stabilizer link (A) with the front strut assembly and then tighten the nut.

    Tightening torque Nm (kgf.m, lb-ft):
    100 ~ 120 (10.0 ~ 12.0, 72 ~ 87)



12. Connect the universal joint assembly (B) with the pinion of the steering gear box and then tighten the bolt (A).

    Tightening torque Nm (kgf.m, lb-ft):
    30 ~ 35 (3.0 ~ 3.5, 22 ~ 25)



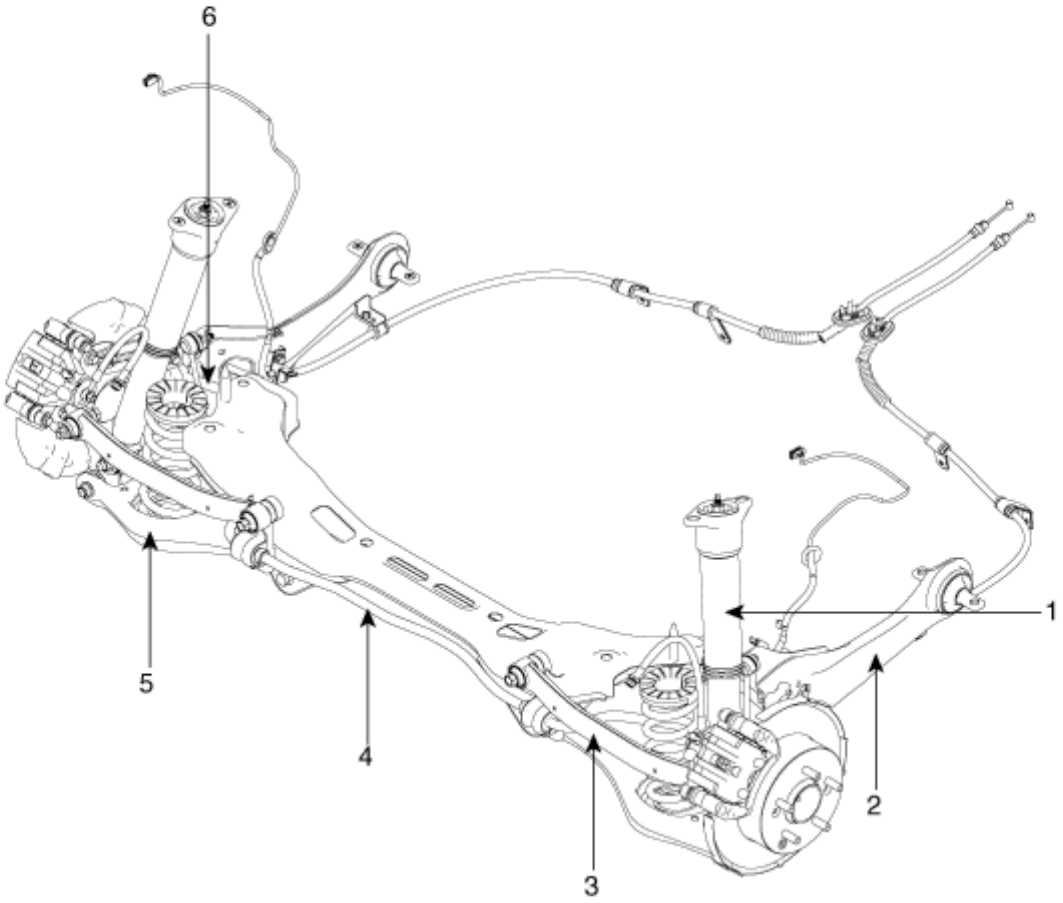
13. Install the front wheel & tire.

    Tightening torque Nm (kgf.m, lb-ft):
    90 ~ 110 (9.0 ~ 11.0, 65 ~ 80)

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.

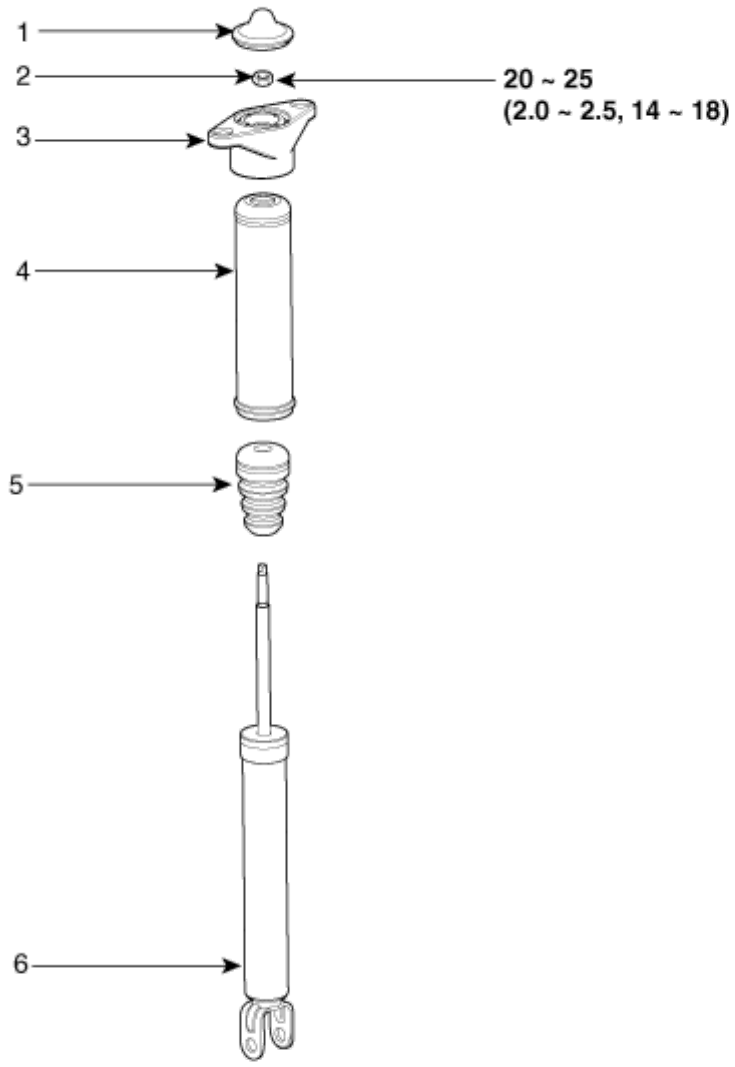
COMPONENTS



1. Rear shock absorber
2. Rear trailing arm
3. Rear upper arm
4. Rear stabilizer bar
5. Rear lower arm
6. Rear assist arm

English

COMPONENTS



TORQUE : Nm (kgf.m, lb-ft)

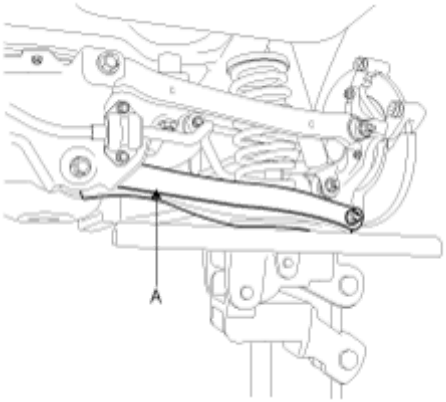
1. Insulator cover
2. Self locking nut
3. Bracket assembly
4. Dust cover
5. Bumper rubber
6. Shock absorber

REMOVAL

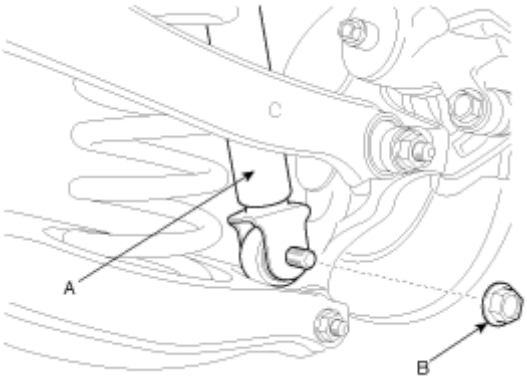
1. Remove the rear wheel & tire.

> **CAUTION**
>
> Be careful not to damage to the hub bolts when removing the rear wheel & tire.

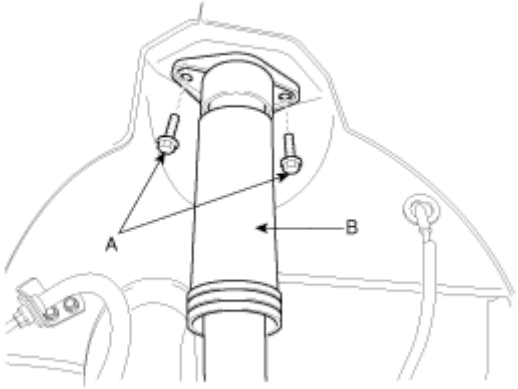
2. Support the lower portion of the rear lower arm (A) with the jack.



3. Remove the bolt & nut (B) holding the rear shock absorber (A) to the carrier assembly.



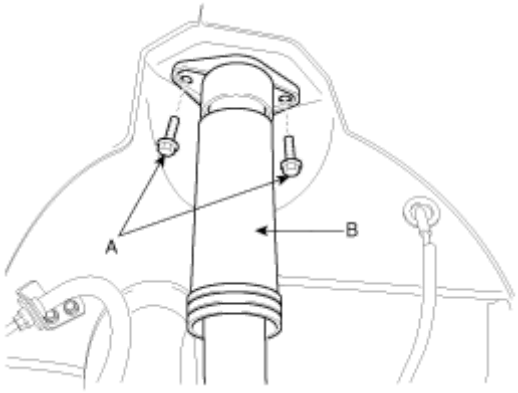
4. Remove the rear shock absorber (B) from the wheel housing by loosening the mounting bolts (A).



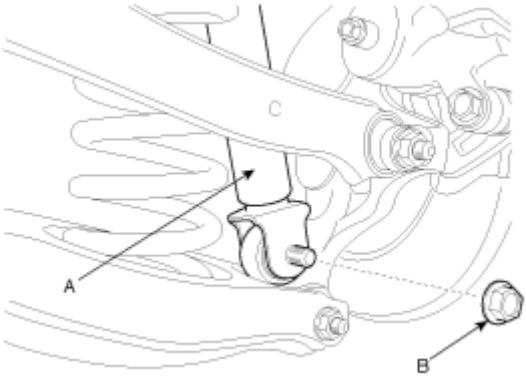
INSTALLATION

English ▼

1. Install the rear shock absorber (B) to the wheel housing penal by tightening the bracket mounting bolts (A).
   Tightening torque Nm (kgf.m, lb-ft):
   50 ~ 65 (5.0 ~ 6.5, 36 ~ 47)



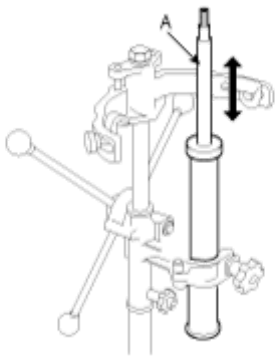
2. Connect the rear shock absorber (A) with the carrier assembly and then tighten the bolt & nut (B).
   Tightening torque Nm (kgf.m, lb-ft):
   140 ~ 160 (14.0 ~ 16.0, 101 ~ 116)



3. Install the rear wheel & tire.
   Tightening torque Nm (kgf.m, lb-ft):
   90 ~ 110 (9.0 ~ 11.0, 65 ~ 80)

INSPECTION

1. Check the rubber parts for wear and deterioration.
2. Compress and extend the piston rod (A) and check that there is no abnormal resistance or unusual sound during operation.

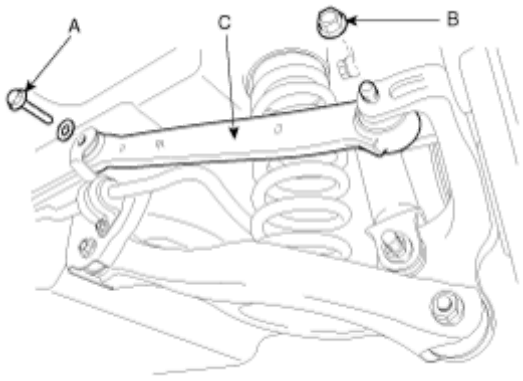


REMOVAL

1. Remove the rear wheel & tire.

> **CAUTION**
>
> Be careful not to damage to the hub bolts when removing the rear wheel & tire.

2. Remove the rear upper arm (C) by loosening the mounting bolts & nut (A, B).

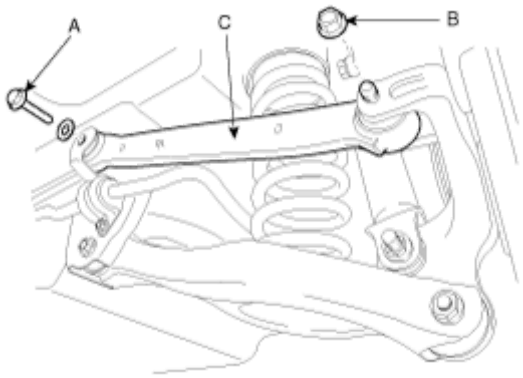


INSTALLATION

1. Install the rear upper arm (C) between the rear cross member and the carrier assembly and then tighten the mounting bolts and nut (A, B).

Tightening torque Nm (kgf.m, lb-ft)
Bolt (A): 100 ~ 120 (10.0 ~ 12.0, 72 ~ 87)
Bolt & Nut (B): 100 ~ 120 (10.0 ~ 12.0, 72 ~ 87)

> **CAUTION**
>
> Install the rear upper arm so that the letter "R" can face the rear of vehicle.



2. Install the rear wheel & tire.

Tightening torque Nm (kgf.m, lb-ft):
90 ~ 110 (9.0 ~ 11.0, 65 ~ 80)

INSPECTION

English ▼

1. Check the bushing for wear and deterioration.
2. Check the rear upper arm or damage and deformation.
3. Check for all bolts and nut.

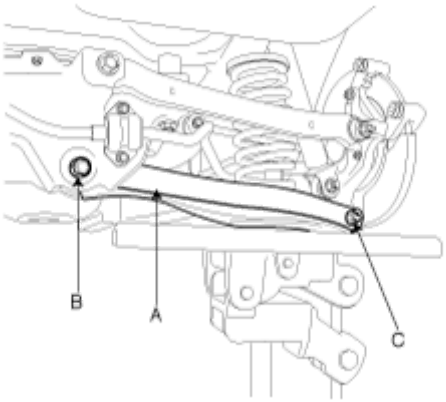
English

REMOVAL

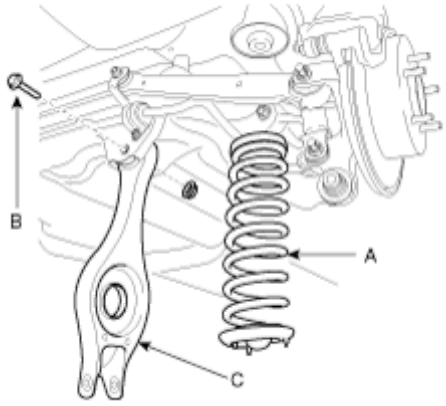
1. Remove the rear wheel & tire.

> **CAUTION**
>
> Be careful not to damage to the hub bolts when removing the rear wheel & tire.

2. Support the lower portion of the rear lower arm (A) with a jack.
3. Temporarily loosen the bolt (B) holding the cross member to the rear lower arm. Do not remove it.
4. Remove the bolt & nut (C) holding the rear lower arm to the carrier assembly.



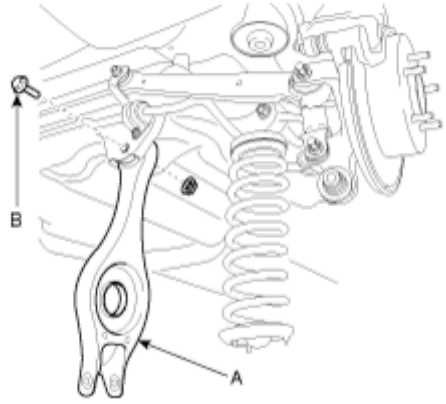
5. Lower the jack and then remove the coil spring (A) and the spring pad.
6. Remove the rear lower arm (C) from the cross member by removing the bolt (B) completely.



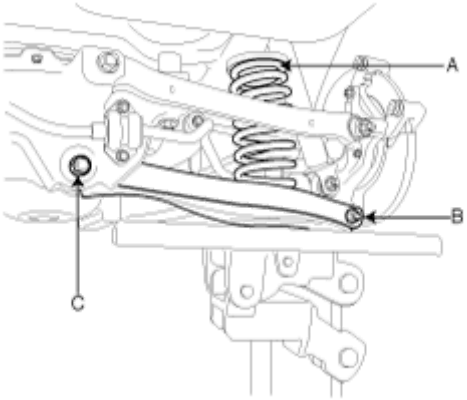
INSTALLATION

1. Connect the rear lower arm (A) with the cross member and then temporarily tighten the bolt (B).

English ▼



2. Install the coil spring (A) and support the lower portion of the rear lower arm with a jack.
3. Adjust height of the jack to place the bolt (B) holding rear lower arm and carrier assembly through the mating holes.
4. Tighten the bolt and nut (B, C) to the specified torque.
   Tightening torque Nm (kgf.m, lb-ft):
   140 ~ 160 (14.0 ~ 16.0, 101 ~ 116)



5. Install the rear wheel & tire.
   Tightening torque Nm (kgf.m, lb-ft):
   90 ~ 110 (9.0 ~ 11.0, 65 ~ 80)

INSPECTION

1. Check the bushing for wear and deterioration.
2. Check the rear lower arm for deformation.
3. Check the coil spring and spring pad for deterioration and deformation.
4. Check for all bolts and nut.

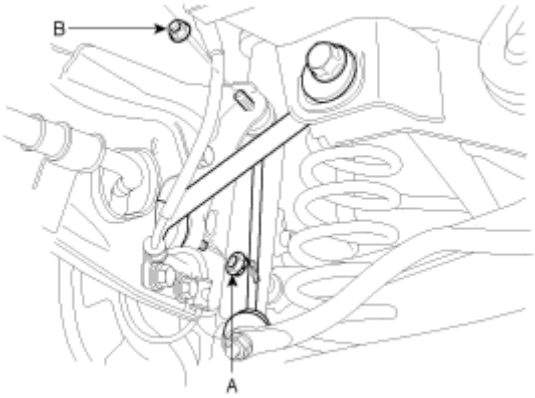
English ▼

REMOVAL

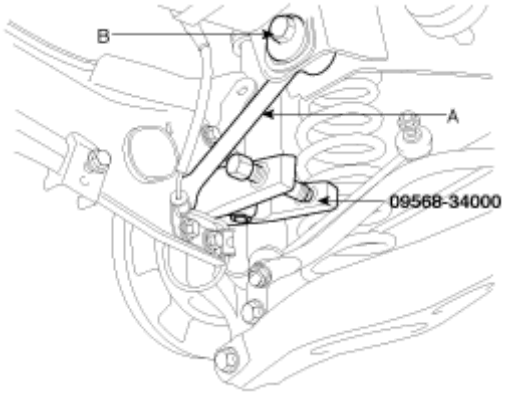
1. Remove the rear wheel & tire.

> **⚠ CAUTION**
>
> Be careful not to damage to the hub bolts when removing the rear wheel & tire.

2. Remove the split pin and castle nut (A) from the rear assist arm.
3. Disconnect the rear stabilizer link with the trailing arm by loosening the nut (B).



4. Disconnect the ball joint of the rear assist arm (A) with the carrier assembly with the SST (09568-34000).
5. Loosen the nut and then remove the cam bolt (B) rear assist arm (A) from the cross member.



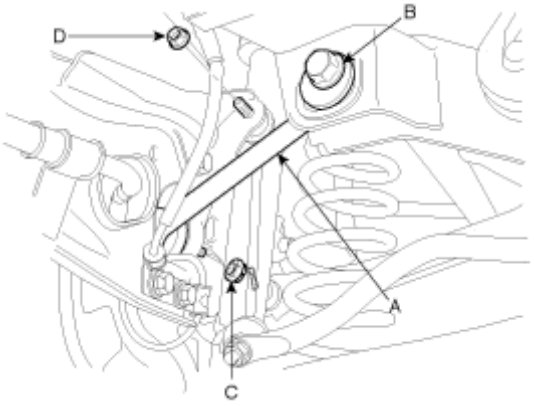
INSTALLATION

1. Install the rear assist arm (A) and the cam bolt (B) to cross member and then tighten the nut.
   Tightening torque Nm (kgf.m, lb-ft):
   100 ~ 120 (10.0 ~ 12.0, 72 ~ 87)
2. Connect the ball joint of the rear assist arm (A) with the carrier assembly.
3. Install the castle nut (C) and split pin to the ball joint of the rear assist arm.
   Tightening torque Nm (kgf.m, lb-ft):
   45 ~ 55 (4.5 ~ 5.5, 33 ~ 40)

English ▼

4. Connect the rear stabilizer link with the trailing arm and then tighten the nut (D).

   Tightening torque Nm (kgf.m, lb-ft):
   45 ~ 55 (4.5 ~ 5.5, 33 ~ 40)



5. Install the rear wheel & tire.

   Tightening torque Nm (kgf.m, lb-ft):
   90 ~ 110 (9.0 ~ 11.0, 65 ~ 80)

INSPECTION

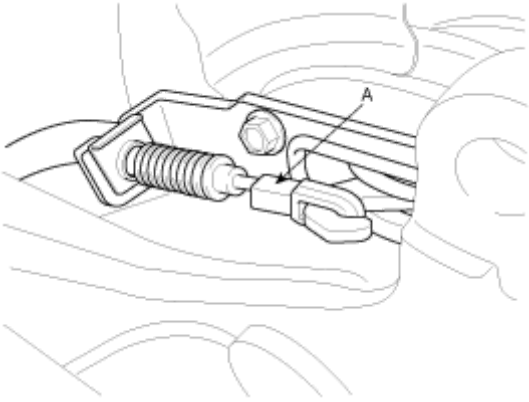
1. Check the bushing for wear and deterioration.
2. Check the rear assist arm for deformation.
3. Check the ball joint for damage.
4. Check for the all bolts, nut, and washer.

REMOVAL

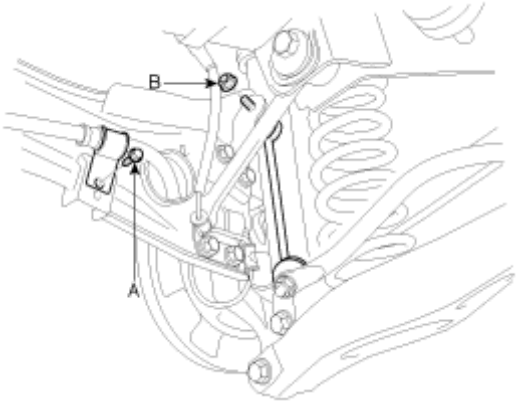
1. Remove the rear wheel & tire.

> **⚠ CAUTION**
>
> Be careful not to damage to the hub bolts when removing the rear wheel & tire.

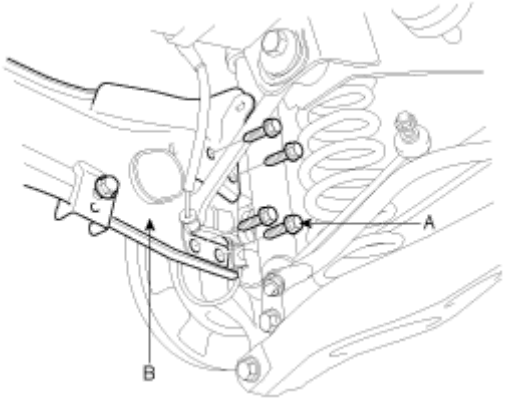
2. Disconnect the parking brake cable (A) with the rear brake assembly.



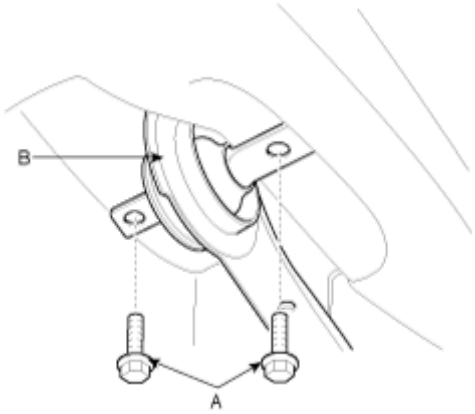
3. Remove the parking brake cable bracket from the trailing arm by loosening the mounting bolt (A).
4. Disconnect the rear stabilizer link with the trailing arm by loosening the nut (B).



5. Disconnect the trailing arm (B) with the carrier assembly by loosening mounting bolts (A).

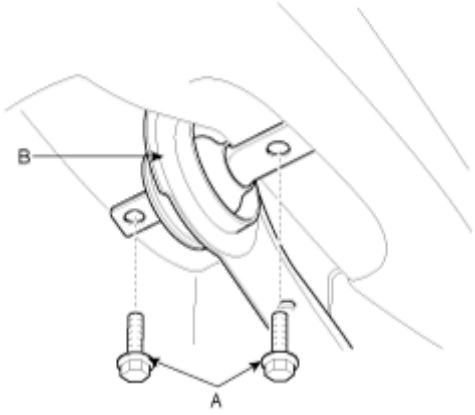


6. Remove the rear trailing arm (B) by loosening the mounting bolts (A).

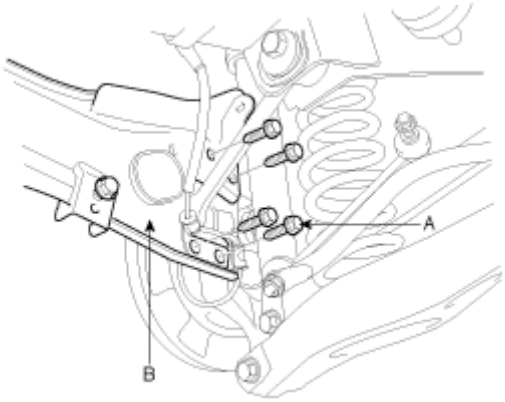


INSTLLATION

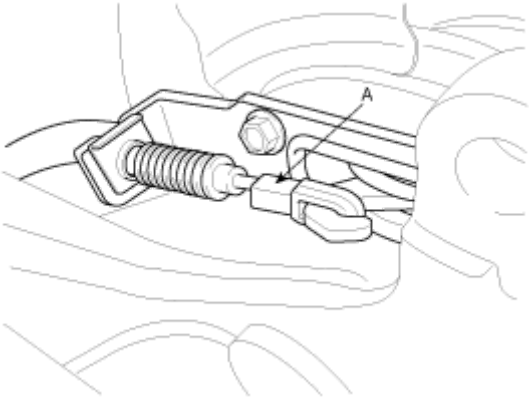
1. Install the rear trailing arm (B) to the body by tightening the mounting bolts (A).
   Tightening torque Nm (kgf.m, lb-ft):
   140 ~ 160 (14.0 ~ 16.0, 101 ~ 116)



2. Connect the trailing arm (B) with the carrier assembly by tightening the bolts (A).
   Tightening torque Nm (kgf.m, lb-ft):
   35 ~ 55 (3.5 ~ 5.5, 25 ~ 40)

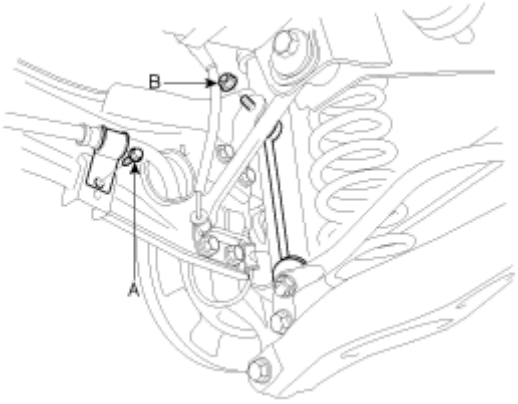


3. Connect the parking brake cable (A) with the rear brake assembly.



4. Connect the rear stabilizer link with the trailing arm and then tightening the nut (B).
   Tightening torque Nm (kgf.m, lb-ft):
   45 ~ 55 (4.5 ~ 5.5, 30 ~ 40)

5. Install the parking brake cable bracket to the trailing arm by mounting bolt (A).



6. Install the rear wheel & tire.
   Tightening torque Nm (kgf.m, lb-ft):
   90 ~ 110 (9.0 ~ 11.0, 65 ~ 80)

INSPECTION

1. Check the bushing for wear and deterioration.
2. Check the rear trailing arm for deformation.
3. Check for all bolts and nuts.

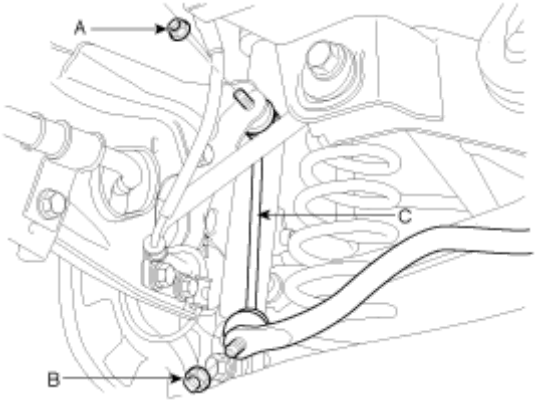
English ▼

REMOVAL

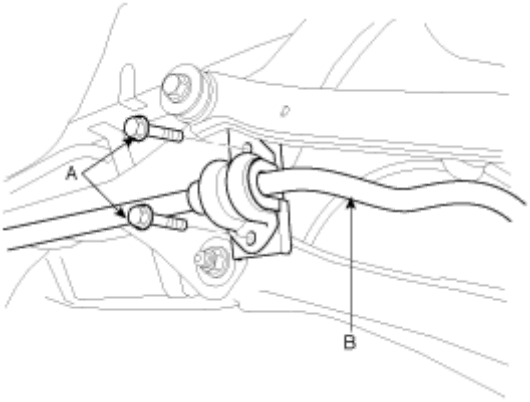
1. Remove the rear wheel & tire.

> **⚠ CAUTION**
>
> Be careful not to damage to the hub bolts when removing the rear wheel & tire.

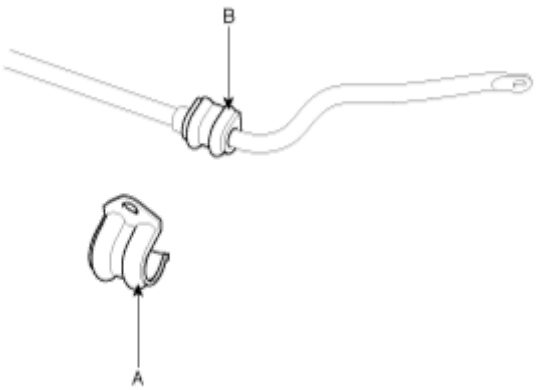
2. Remove the stabilizer link (C) by loosening the nuts (A, B).



3. Remove the rear stabilizer bar (B) from the cross member by loosening the bracket mounting bolts (A).



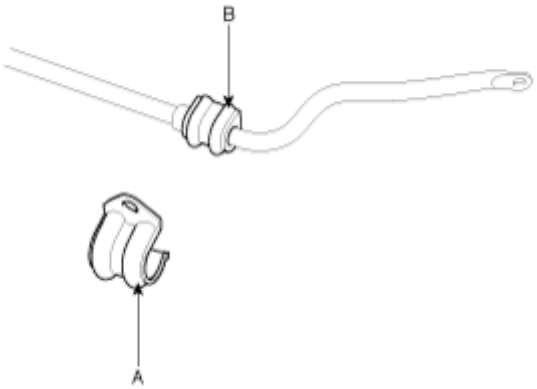
4. Remove the mounting bracket (A) and bushing (B) from the rear stabilizer bar.



INSTALLATION

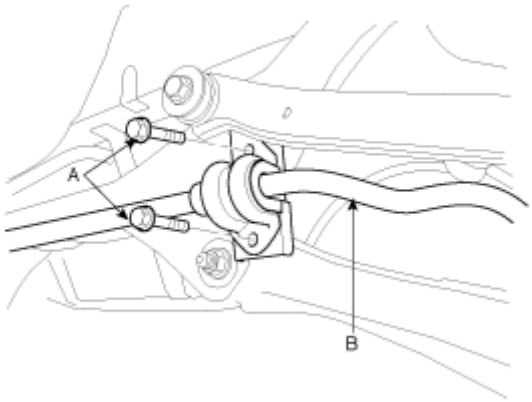
English ▼

1. Install the mounting bracket (A) and bushing (B) to the rear stabilizer bar.



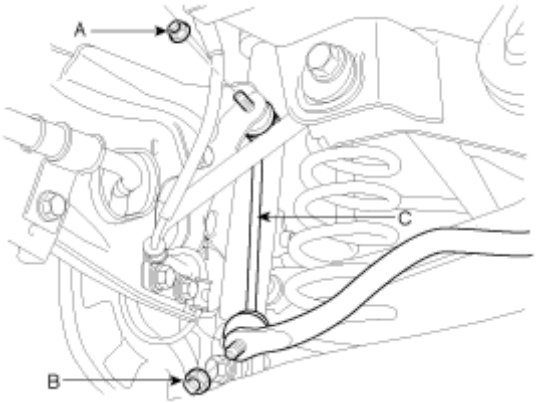
2. Install the rear stabilizer bar (B) to the cross member by tightening the bracket mounting bolts (A).

   Tightening torque Nm (kgf.m, lb-ft):
   45 ~ 55 (4.5 ~ 5.5, 33 ~ 40)



3. Connect the rear stabilizer link (C) between the rear stabilizer bar and the trailing arm and then tighten the nut (A, B).

   Tightening torque Nm (kgf.m, lb-ft):
   45 ~ 55 (4.5 ~ 5.5, 33 ~ 40)



4. Install the rear wheel & tire.

   Tightening torque Nm (kgf.m, lb-ft):
   90 ~ 110 (9.0 ~ 11.0, 65 ~ 80)

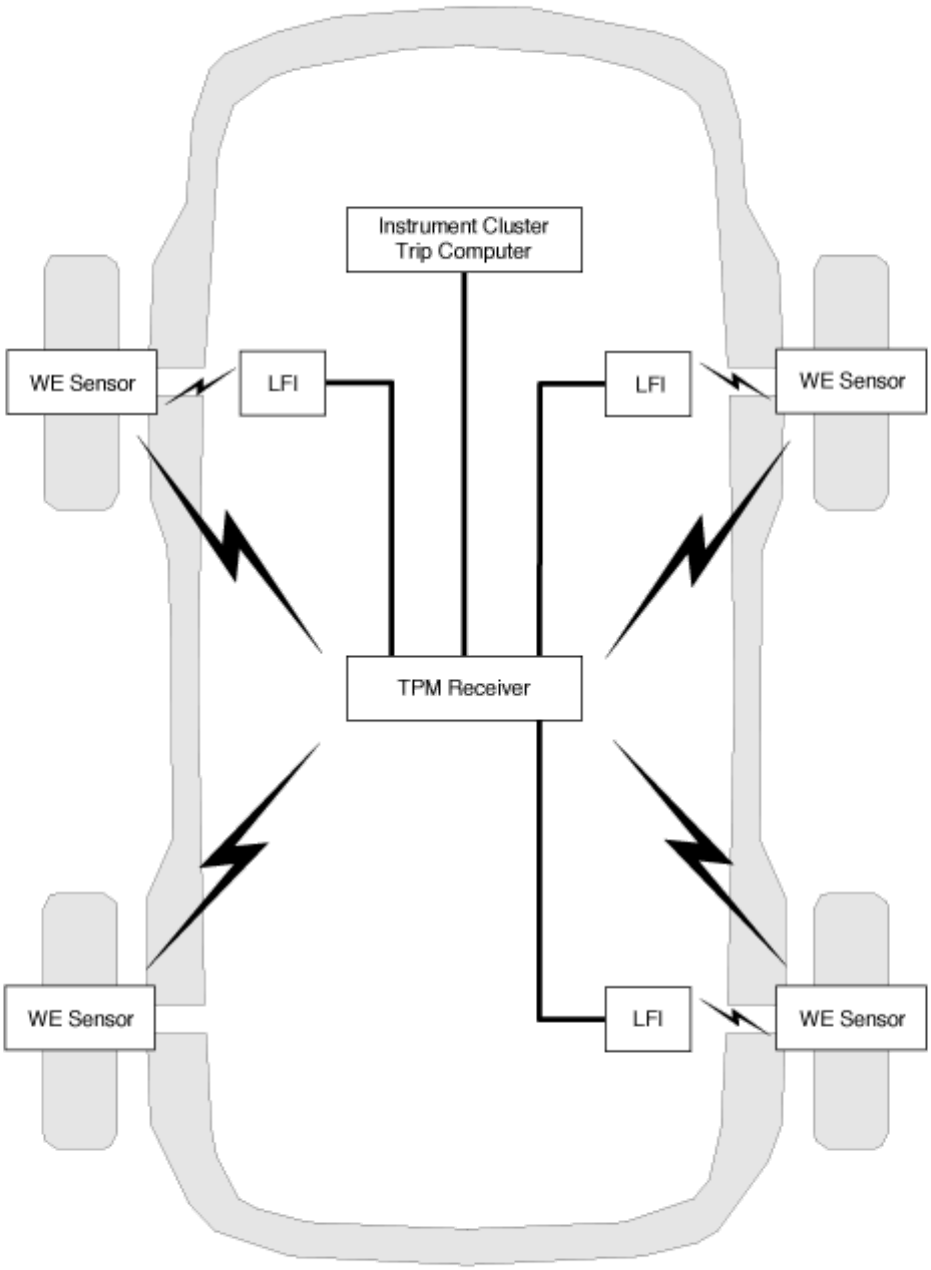
INSPECTION

1. Check the rear stabilizer bar for deformation.

2. Check the rear stabilizer link ball joint for damage.

English ▼

SCHEMTIC DIAGRAM



DESCRIPTION

1. SYSTEM DESCRIPTION

NOTICE

AL: Auto Learning
CAN: Controller Area Network
ECU: Electronic Control Unit
IC: Instrument Cluster
LF: Low Frequency
LFI: Low Frequency Initiator
MIL: Malfunction Indicator LED
RF: Radio Frequency
WE: Wheel Electronic
WU: Wheel Unit

The TPMS monitors the pressure and temperature of a vehicles tire to alert on pressure variations that may impact the driving conditions. Messages deduced from processed data are displayed at the Instrument Cluster (IC) via 2 warning lamps and 4 tire-related LEDs. In parallel, the ECU executes error evaluation on input and output signals. Pressure monitoring during parking is provided.
The ECU processes data from the WE sensor, determines the state of the tires and communicates the required warning message via the CAN line to the driver.

2. FUNCTIONAL DESCRIPTION

WARNING THRESHOLDS

Hard warning

One non temperature compensated hard warning threshold applies to front and rear axle of vehicle. If the pressure reported by the WE sensor is below the tire-specific minimum pressure then the low pressure warning telltale and the telltale indicating position of the under-inflated tire is illuminated immediately. A warning is reset when tire pressure is reported to be at 211kPa (30.6psi).

FAST PRESSURE LOSS

Fast pressure loss function is deactivated during parking and only active while driving. So it is avoided that a warning is set when the driver manually deflates the tire to a level above hard warning threshold.
Upon a rapid pressure decrease the WE emits a delta-p telegram which triggers the fast pressure loss function to start. Including the first dp-telegram the function waits for a 2nd telegram of the same wheel electronic and calculates the pressure loss rate. If the pressure drops by more than 20kPa/min, a "fast pressure loss" warning is generated and displayed with a maximum of 60s delay while driving.

INITIALIZATION

The initialization function determines which WE sensor identifier belongs to the vehicle.
The corresponding set of identifiers is stored in the ECU memory and used to determine if a received RF telegram comes from a wheel unit, which belongs to the vehicle.
Only telegrams containing known (initialized) identifiers are being supervised in the warning algorithm.
The initialization function is implemented in two independent parts: as an auto learning function and as an auto location function.

INITIALIZATION-Auto Learning

AL starts every time, the vehicle was parked long enough to change or permute wheels (19min), and is traveling again at a speed that ensures that the WE sensors are transmitting.
AL is automatically considering all WE identifiers received and extracts, based on statistical evaluation, IDs belonging to the WEs mounted on the vehicle. If new (unknown) IDs are detected, their recurrence will be tracked by AL.
Al compares the acceleration reported by the wheel unit to the vehicle speed to rule out transmissions received from neighboring vehicles traveling with different speeds.
A WE sensor identifier is assigned to the vehicle when 8 RF telegrams have been received while driving above 25km/h.

INITIALIZATION-Auto Location

English ▼

This function gives very reliable full localization information.
It relies on the physical properties of long wave emissions in the frequency range of 125 kHz. These emissions are inductively sensed in the wheel unit.
The localization consists in a classification of the WU identifiers in the following order:
0. Left Front Wheel
1. Right Front Wheel
2. Right Rear Wheel

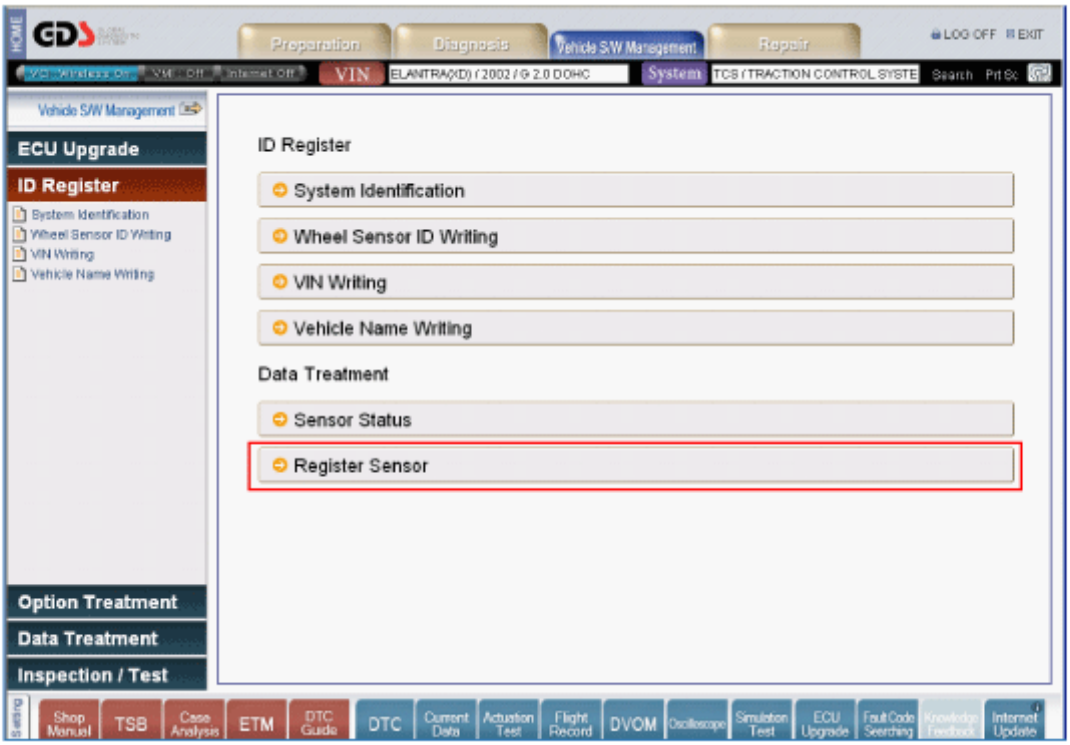
After activation of the initiators the system listens for wheel units reporting that their transmission was caused by an LF trigger signal. If such a transmission is received, the respective identifier is assigned to the triggered wheel well.
The position of the WE, which belongs to the wheel well without LF initiator, is deduced by identifying the WE sensor, that never detected LF, but assigned to the vehicle by auto learning.

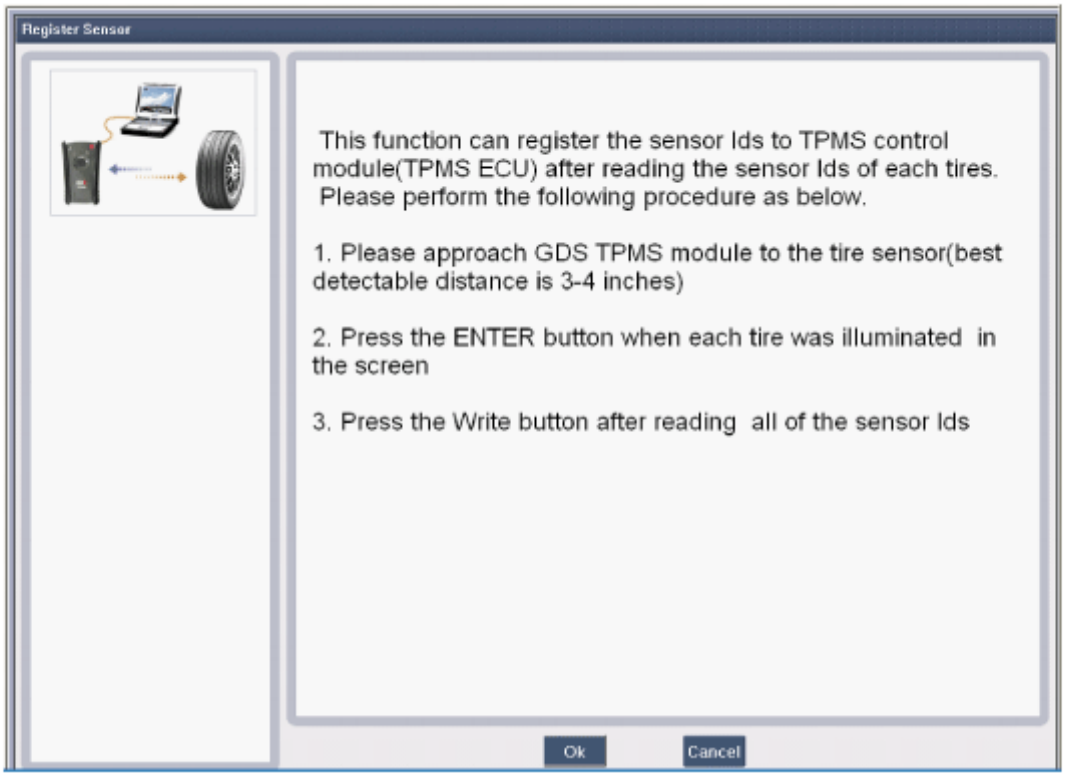
SENSOR RRGISTRAION

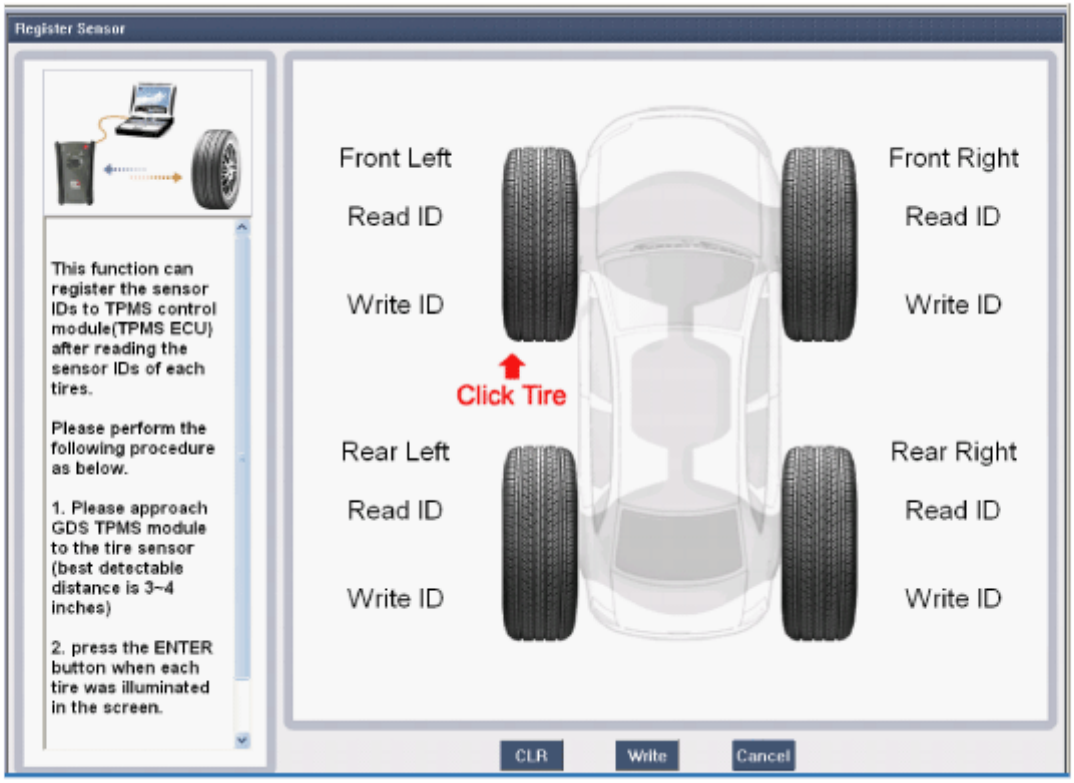
⚠ CAUTION

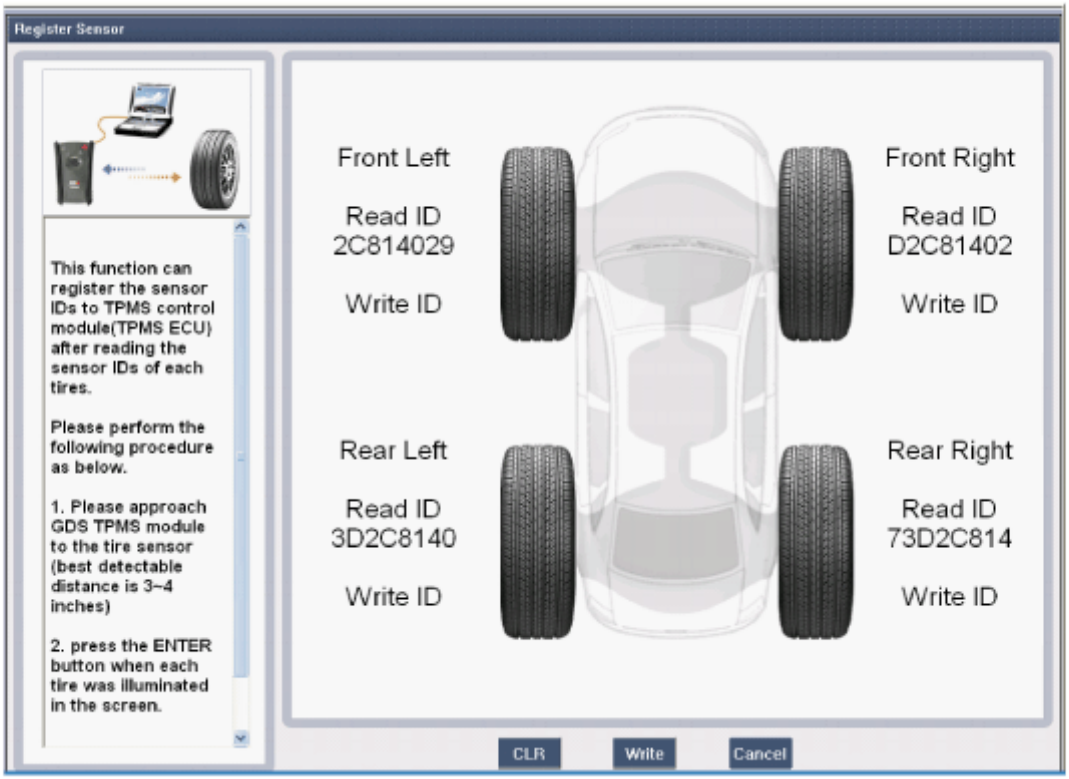
If the sensor registration procedure is not performed by GDS after replacing the TPM sensor or Receiver, TPMS is not operated.

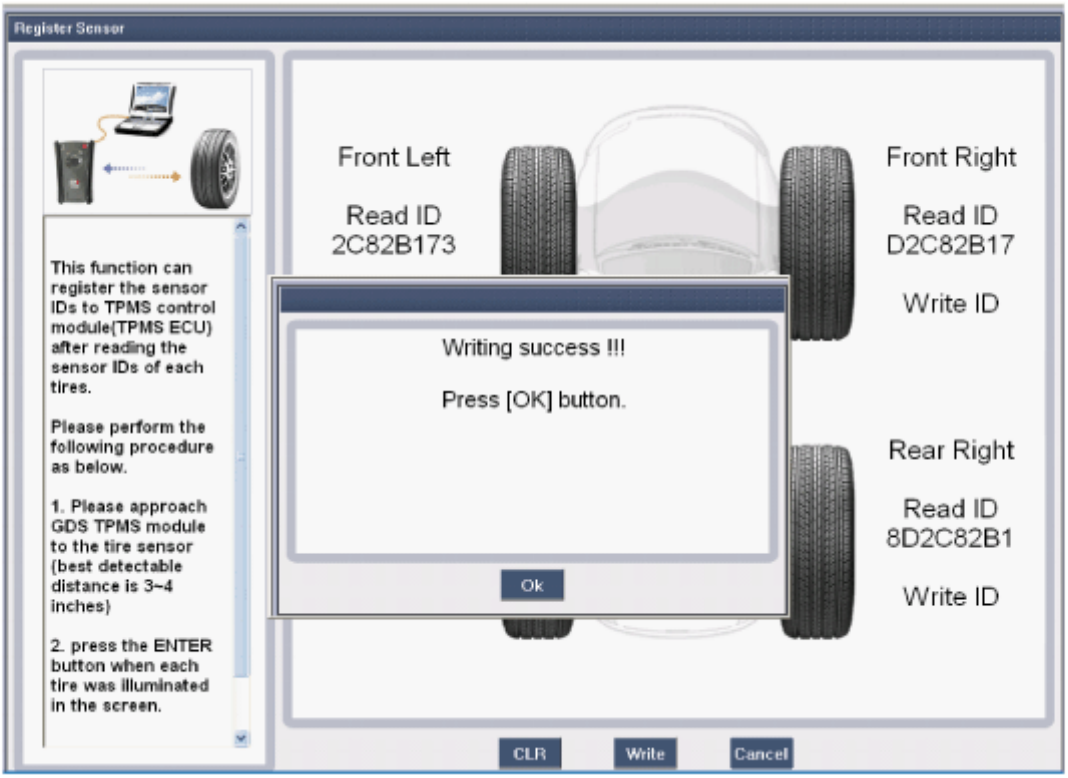
1. Install GDS (Global Diagnostic System) and GDS TPMS module to vehicle.
2. Select the model and perform the sensor registration procedure according to instruction of the GDS as follows.

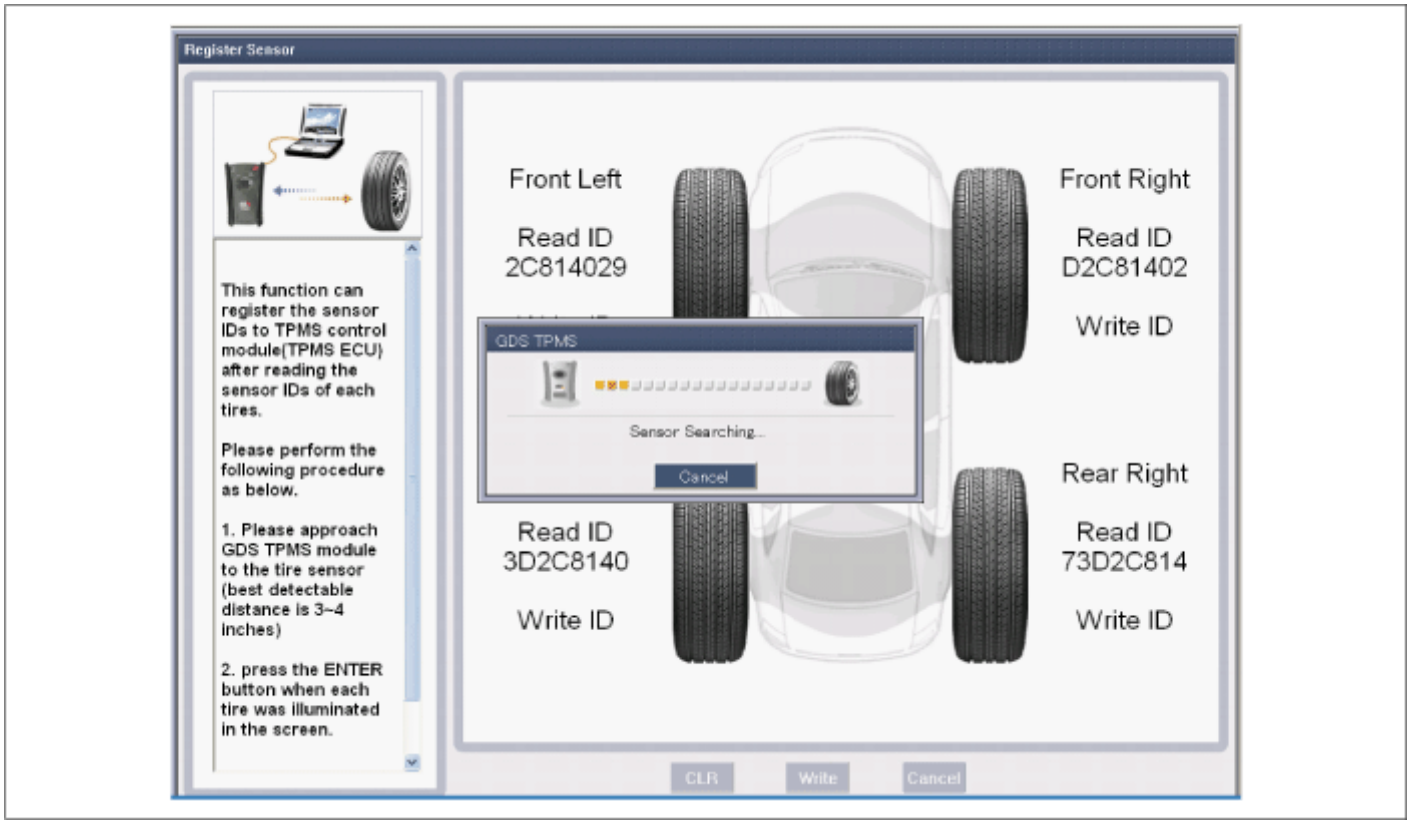


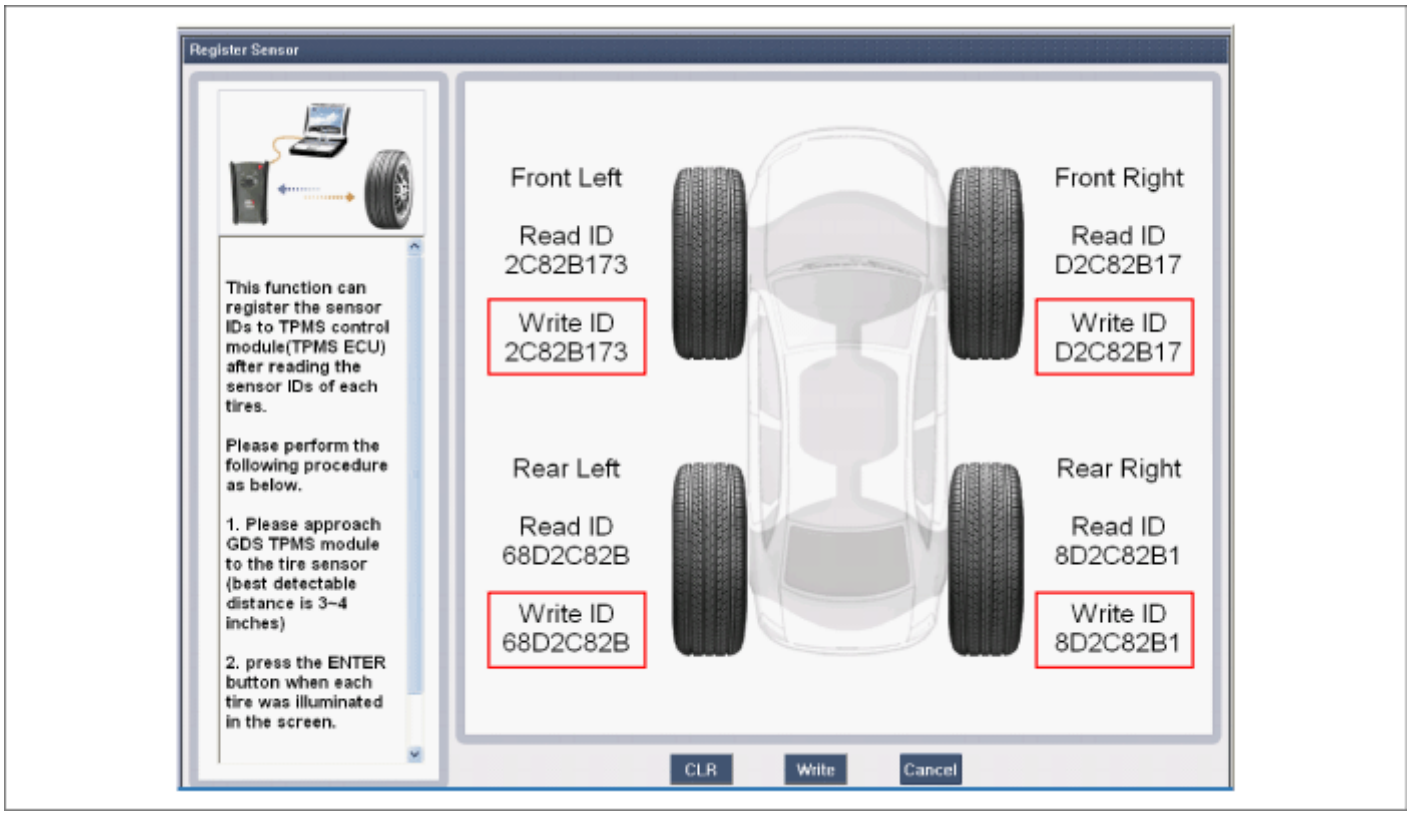

Register Sensor
This function can register the sensor Ids to TPMS control module(TPMS ECU) after reading the sensor Ids of each tires. Please perform the following procedure as below.
1. Please approach GDS TPMS module to the tire sensor(best detectable distance is 3-4 inches)
2. Press the ENTER button when each tire was illuminated in the screen
3. Press the Write button after reading all of the sensor Ids
Ok
Cancel


Register Sensor
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.
Front Left
Read ID
Write ID
Front Right
Read ID
Write ID
Click Tire
Rear Left
Read ID
Write ID
Rear Right
Read ID
Write ID
CLR
Write
Cancel


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.
Front Left
Read ID
2C814029
Write ID
Front Right
Read ID
D2C81402
Write ID
Rear Left
Read ID
3D2C8140
Write ID
Rear Right
Read ID
73D2C814
Write ID
CLR
Write
Cancel


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.
Front Left
Read ID
2C82B173
Front Right
Read ID
D2C82B17
Write ID
Writing success !!!
Press [OK] button.
Ok
Rear Right
Read ID
8D2C82B1
Write ID
CLR
Write
Cancel

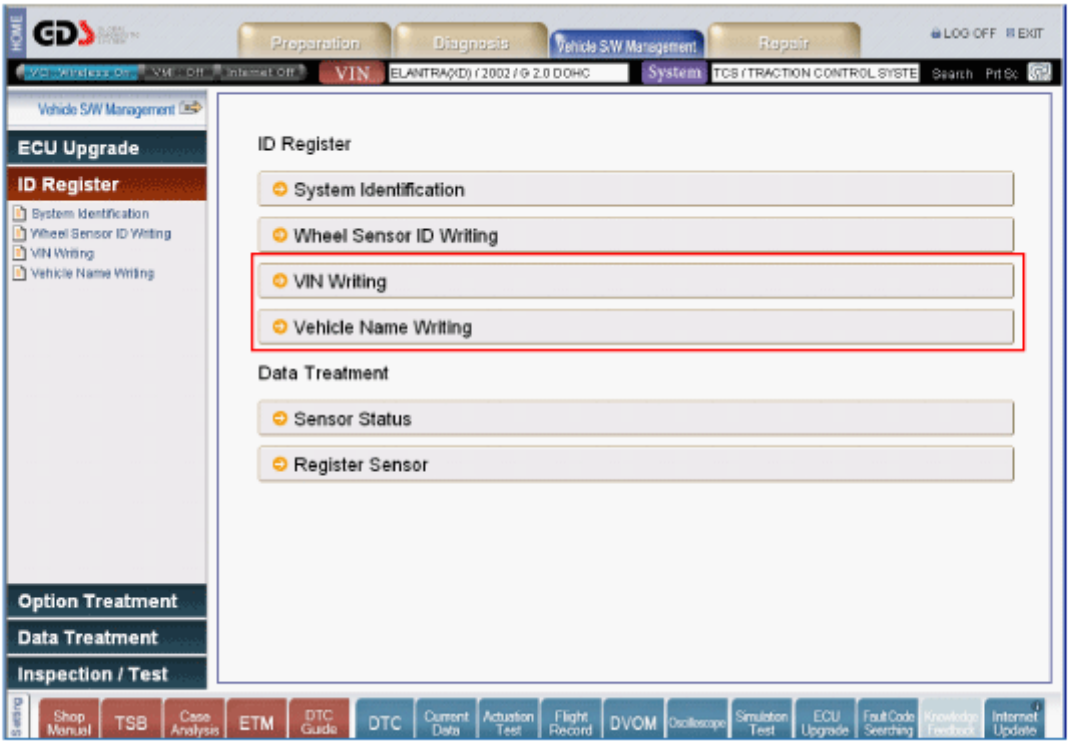


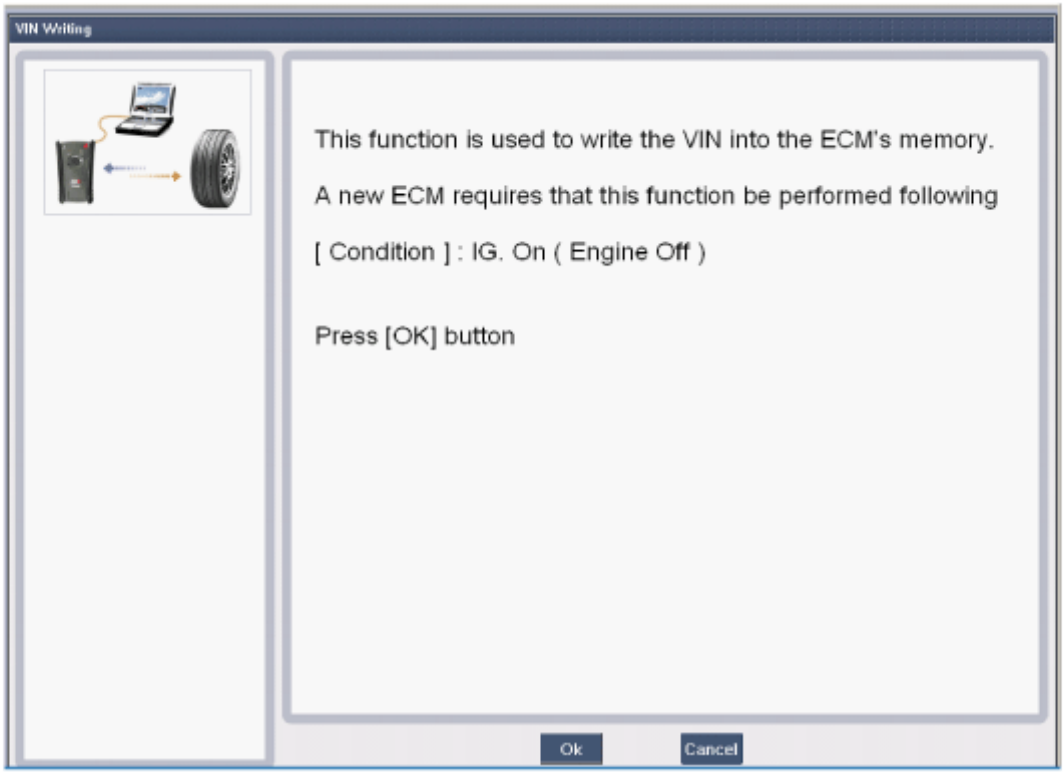


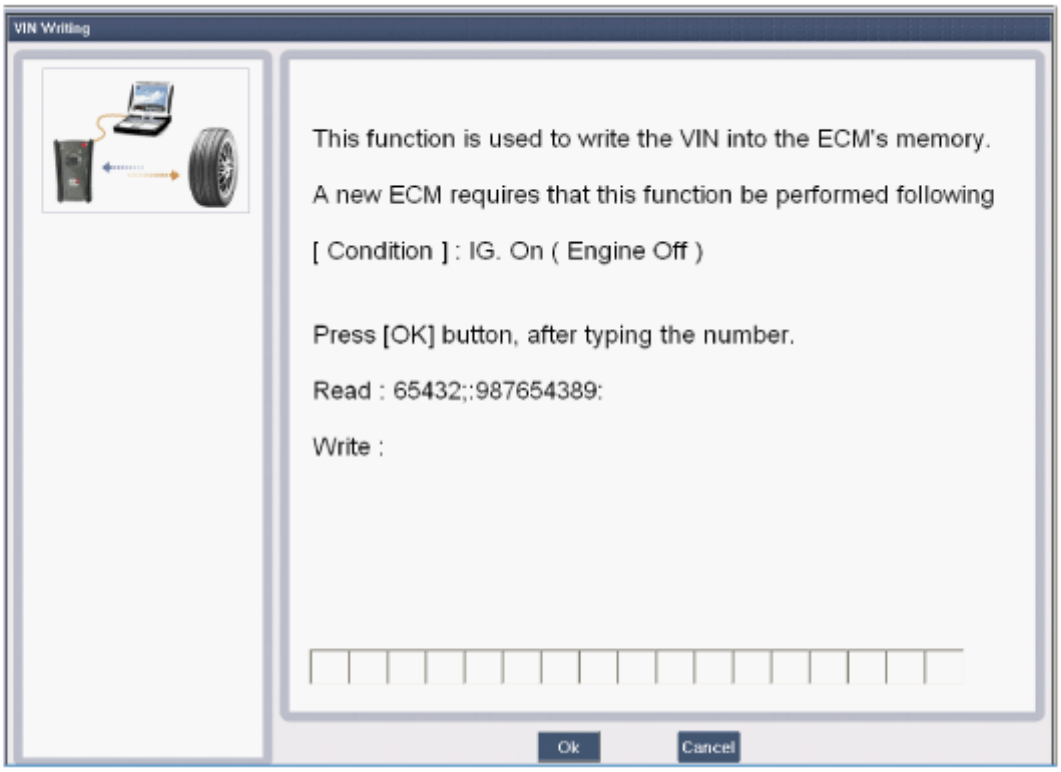
VIN AND VEHICLE NAME WRITING

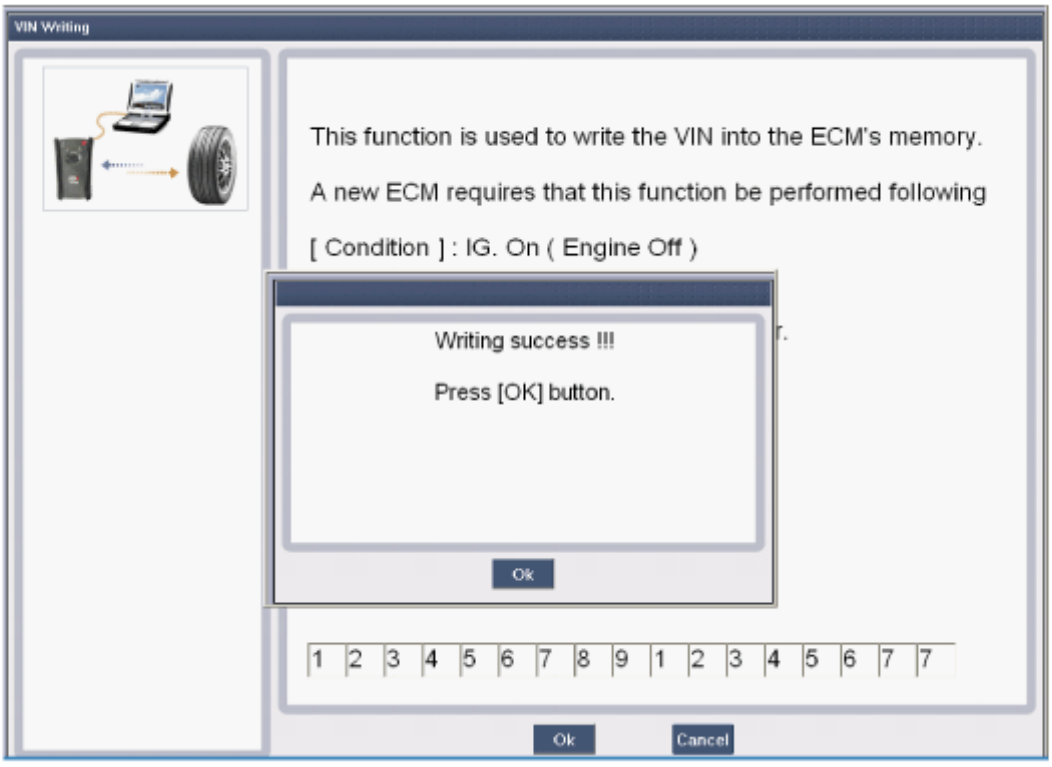
1. Install GDS (Global Diagnostic System) and GDS TPMS module to vehicle.
2. Select the model and perform the VIN and vehicle name writing procedure according to instruction of the GDS as follows.

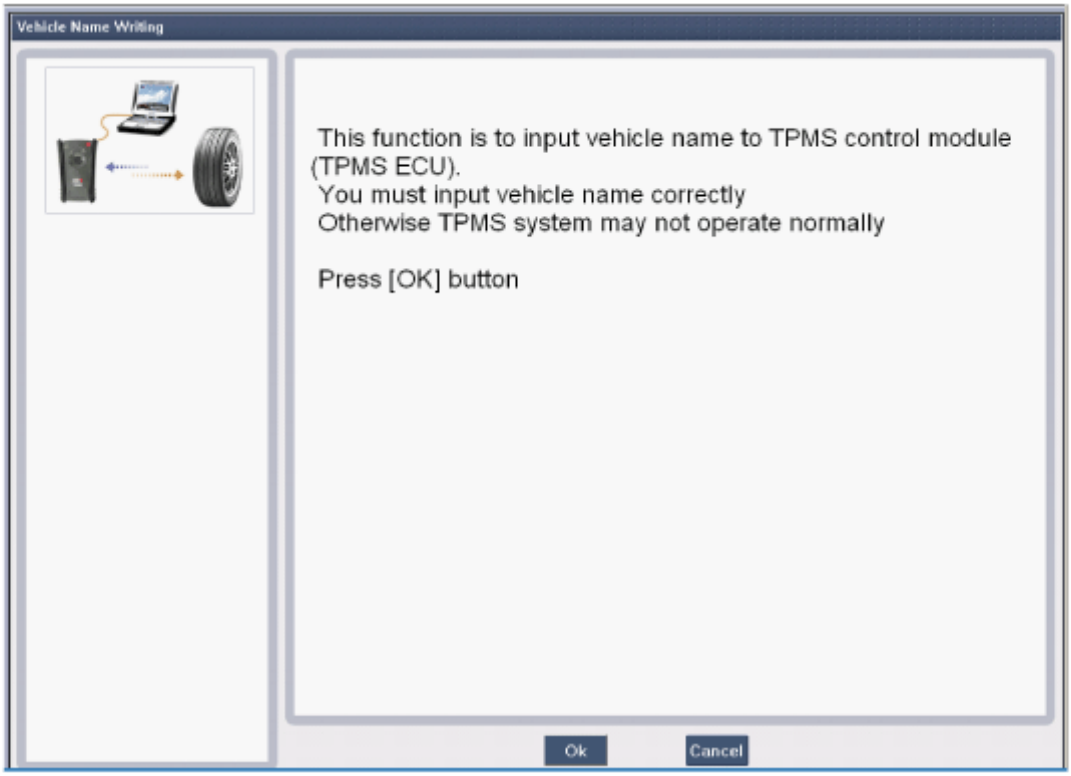
[VIN Writing]

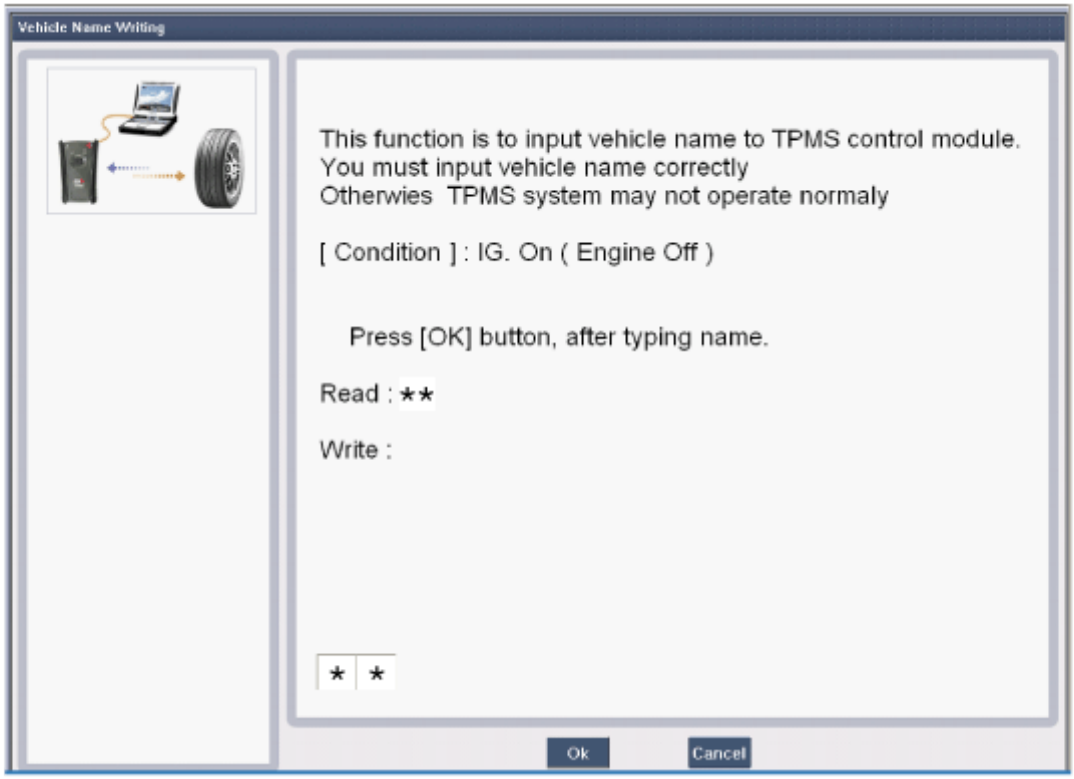

Preparation
Diagnosis
Vehicle S/W Management
Repair
LOG OFF
EXIT
VIN
ELANTRA(XD) / 2002 / G 2.0 DOHC
System
TCS (TRACTION CONTROL SYSTE
Search
Vehicle S/W Management
ECU Upgrade
ID Register
System Identification
Wheel Sensor ID Writing
VIN Writing
Vehicle Name Writing
ID Register
System Identification
Wheel Sensor ID Writing
VIN Writing
Vehicle Name Writing
Data Treatment
Sensor Status
Register Sensor
Option Treatment
Data Treatment
Inspection / Test
Shop Manual
TSB
Case Analysis
ETM
DTC Guide
DTC
Current Data
Actuation Test
Flight Record
DVOM
Oscilloscope
Simulation Test
ECU Upgrade
Fault Code Searching
Knowledge Feedback
Internet Update

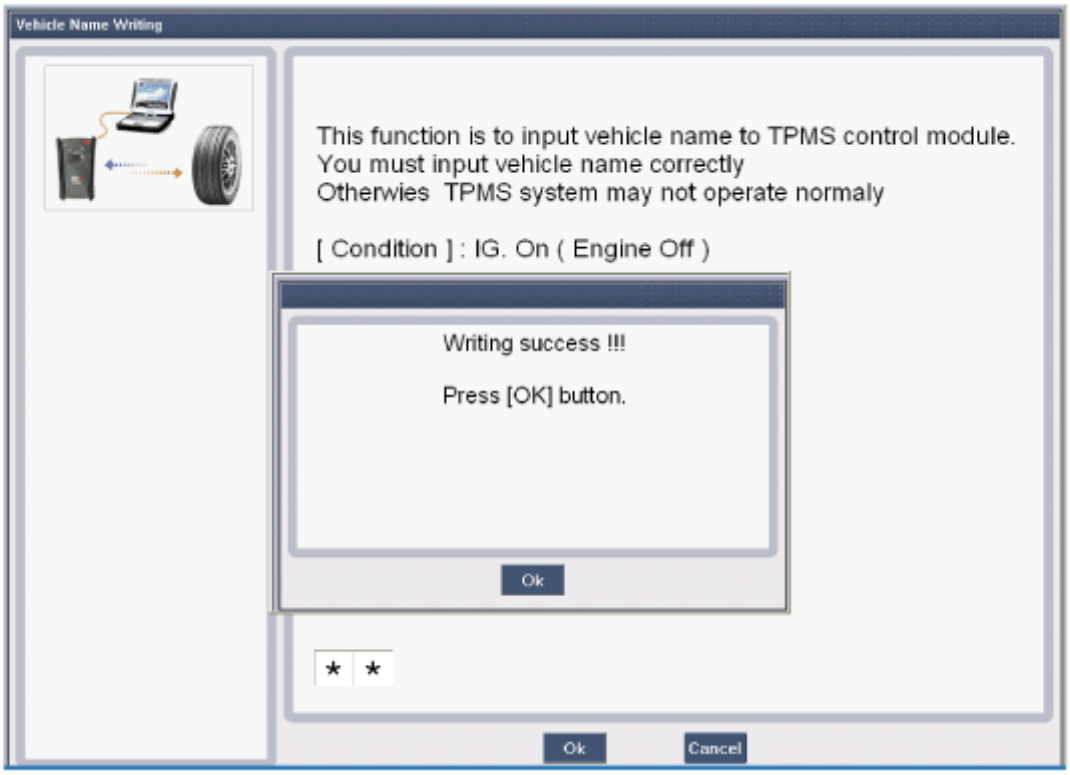

VIN Writing
This function is used to write the VIN into the ECM's memory.
A new ECM requires that this function be performed following
[Condition] : IG. On (Engine Off)
Press [OK] button
Ok
Cancel


VIN Writing
This function is used to write the VIN into the ECM's memory.
A new ECM requires that this function be performed following
[Condition] : IG. On (Engine Off)
Press [OK] button, after typing the number.
Read : 65432;:987654389:
Write :
Ok
Cancel


VIN Writing
This function is used to write the VIN into the ECM's memory.
A new ECM requires that this function be performed following
[Condition] : IG. On (Engine Off)
Writing success !!!
Press [OK] button.
Ok
1 2 3 4 5 6 7 8 9 1 2 3 4 5 6 7 7
Ok
Cancel

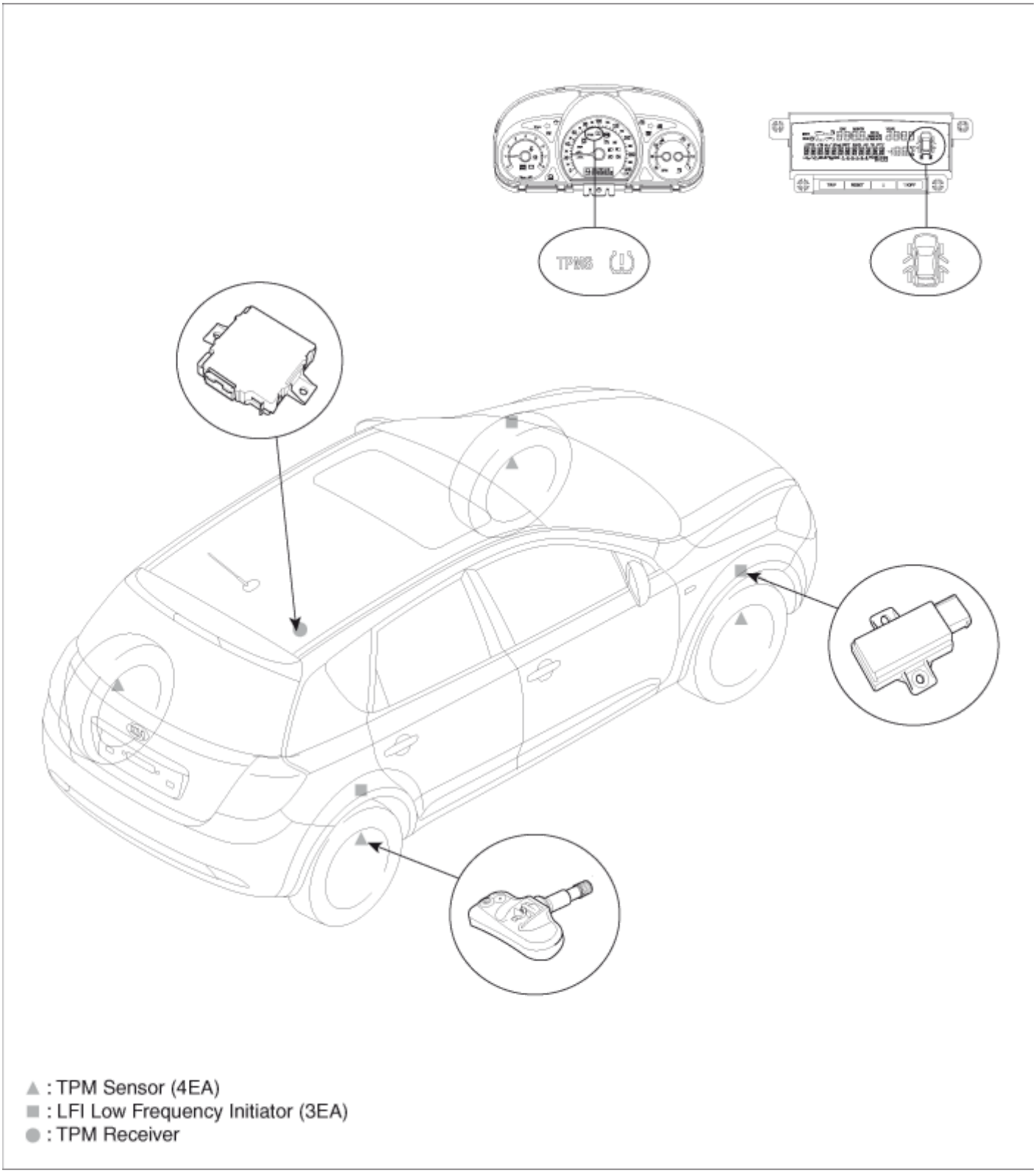

Vehicle Name Writing
This function is to input vehicle name to TPMS control module (TPMS ECU).
You must input vehicle name correctly
Otherwise TPMS system may not operate normally
Press [OK] button
Ok
Cancel


Vehicle Name Writing
This function is to input vehicle name to TPMS control module.
You must input vehicle name correctly
Otherwies TPMS system may not operate normaly
[Condition] : IG. On (Engine Off)
Press [OK] button, after typing name.
Read : **
Write :
* *
Ok
Cancel


Vehicle Name Writing
This function is to input vehicle name to TPMS control module.
You must input vehicle name correctly
Otherwies TPMS system may not operate normaly
[Condition] : IG. On (Engine Off)
Writing success !!!
Press [OK] button.
Ok
* *
Ok
Cancel

English

COMPONENTS



▲ : TPM Sensor (4EA)
■ : LFI Low Frequency Initiator (3EA)
● : TPM Receiver

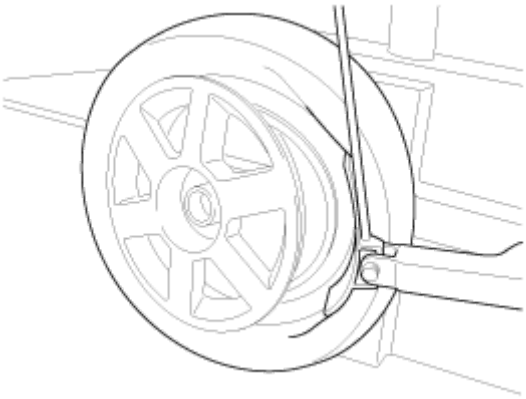
REMOVAL

REMOVING THE TIRE FROM THE RIM

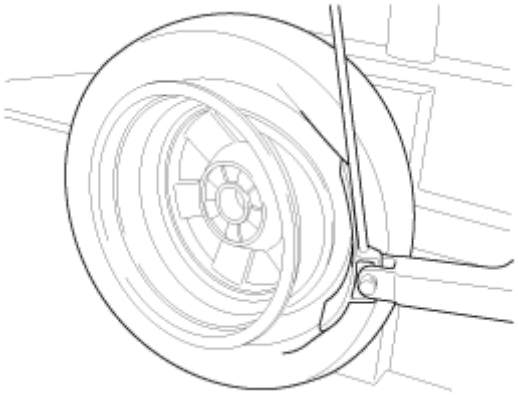
CAUTION

During all the operations on the tire, the sensor must be correctly maintained and thus it is FORBIDDEN to unscrew the nut and to force the sensor into the wheel. This could damage the sensor.

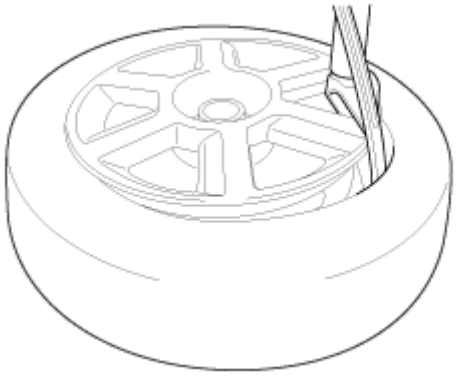
1. Take off the first side of the tire. The tool should not be used near the valve (no less than 30 cm).



2. Take off the second side of the tire. The tool should not be used near the valve (No less than 30 cm).

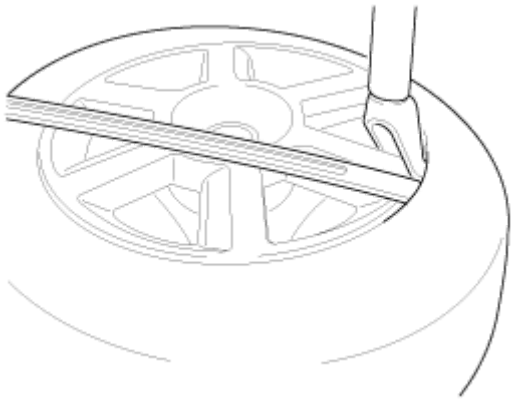


3. Dismount the first side of the tire: Place the shoe of the tool between 5 and 15 cm away from the sensor and use the tire lever as shown in the picture.

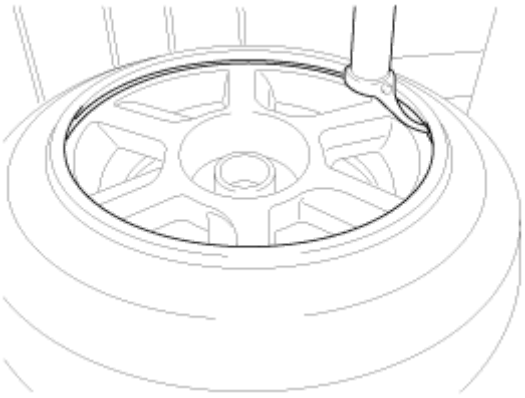


4. By using the tire lever, extract the external side wall of the tire and engage on the shoe of the machine. The lever and the

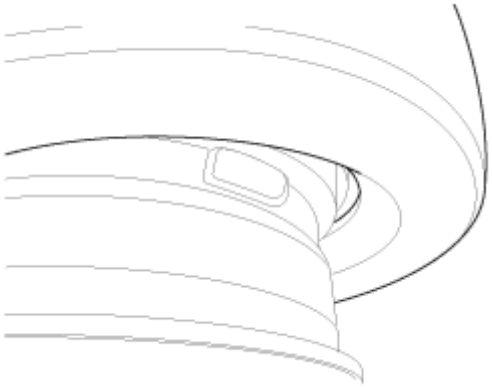
tire must not come into contact with the sensor. Then remove the lever.



5. The wheel rotation allows the complete extraction of the first side of tire.



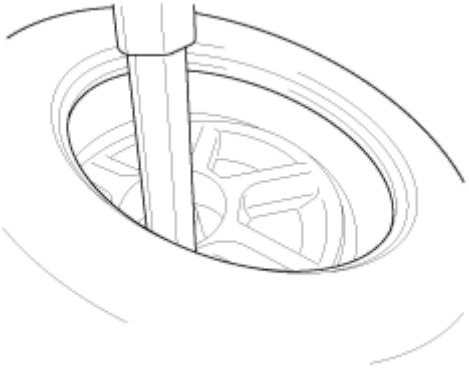
6. Raise the tire to prepare the introduction of the tire lever to aid extraction of the second side wall, the same recommendations as for the first side wall will apply.



7. By using the tire lever, extract the external side wall of the tire and engage the shoe of the machine. The lever and the tire must not come into contact with the sensor. Then remove the lever.

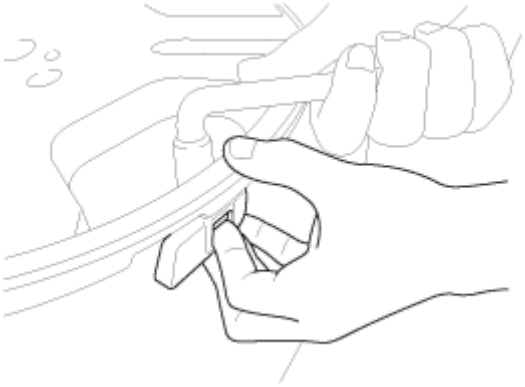


8. Extract entirely the second side wall of the tire.

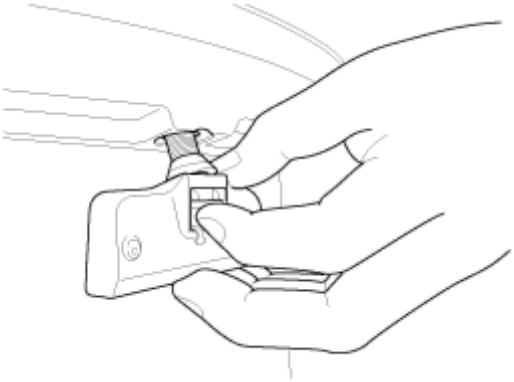


PRESSURE SENSOR REMOVING

1. While supporting the sensor unit, unscrew the nut.



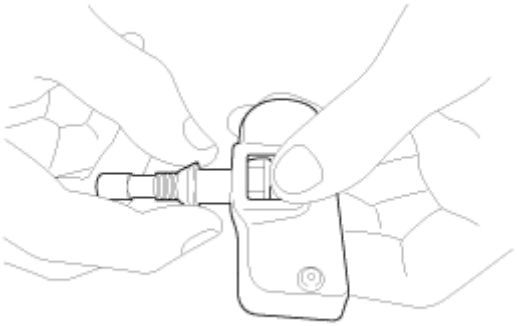
2. Remove the sensor.



INSTALLATION

SENSOR REINSTALLATION

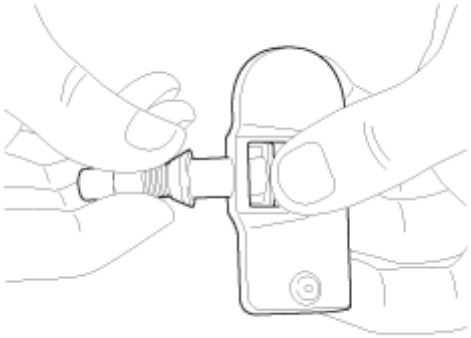
1. Hold the sensor and the seal washer, then extract it, this also extracts the seal. Take care to not damage the valve thread.



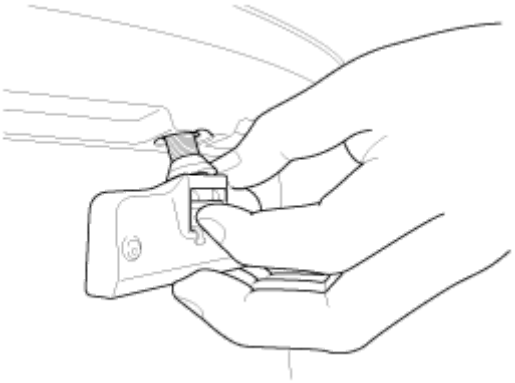
2. Clean the sensor and the valve stem holding the valve using a dry cloth as shown on the picture. Take care to support the rear of the valve with a thumb so that there is no movement of the stem.



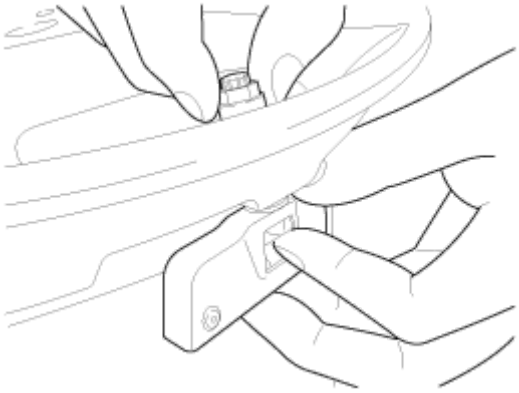
3. When removing the sensor, a new washer and seal must be used. Insert these up to the base of the sensor, making sure to secure the valve base with a thumb, as shown. Wipe the seal and threading.



4. Insert the valve, in the valve hole, without modifying the angle of the stem (retain position of delivery). The laser marking should be visible to the operator.



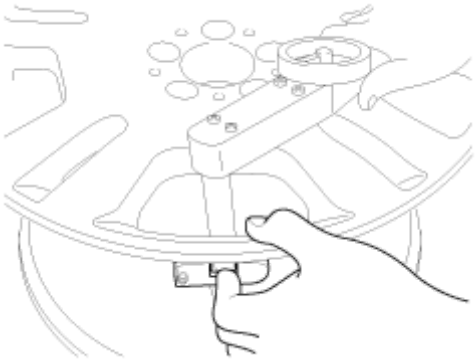
5. When the valve is completely inserted, maintain the sensor in contact with the rim (as shown on the picture), then screw manually the nut until it is in contact with the wheel (without force).



6. While maintaining the sensor contact with the rim by applying pressure to the back of the valve, slightly press on the cap towards the center of the wheel in order to adapt the angle of the valve/sensor to the profile of the rim. It is mandatory to guarantee the contact of the housing unit on the rim drop center.



7. While maintaining the sensor unit and valve in position, screw the nut with a torque wrench.
   Apply a torque of 7.5 ~ 8.5Nm (0.76 ~ 0.86kgf.m, 5.5 ~ 6.2lb-ft).
   Take care that the wrench socket is correctly inserted on the nut.



8. Check the followings.
   (1) It is normal that the seal washer becomes bent during the nut tightening.
   (2) Check that the visible part of the antenna is not damaged or broken.
   (3) The plastic bridge should neither be cracked nor broken. It is designed so that it will fracture due to an error in the assembly process (too high torque, bad positioning……). Any defect must mean the rejection of the sensor.

MOUNTING OF TIRE

⚠ CAUTION

- Before any tire mounting operation, make sure that the sensor has been correctly mounted and tightened to the rim.
- No lubricant product or any other material may partially or completely cover the air pressure inlet hole of the sensor.
- The assembly tools have to never have a collision with the sensor.
- The tire cannot be in contact with the sensor only after it is engaged in the rim and after the exceeded peak of traction. Therefore, generally at the end of the assembly.

1. Prepare the tire and fix the rim as usual.



2. Put the tire on the rim, so that the cross point of the belt with the rim is between 15 and 20 cm away from the valve (see the picture).



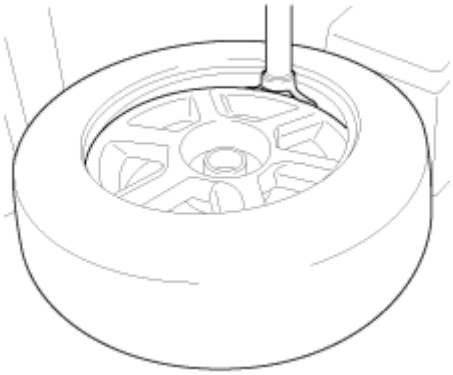
3. Engage the shoe and make sure that 20cm is maintained between the cross point and the valve. The arrow shows the direction of rotation of the wheel.



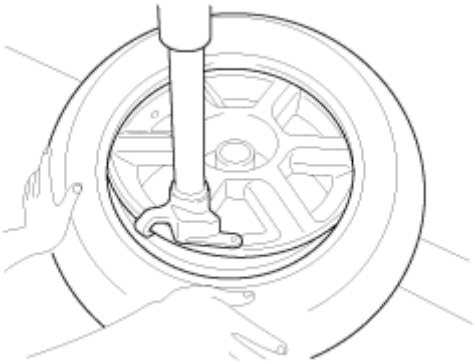
4. Turn the wheel in order to engage all the first side of the tire.

NOTICE

The standard shoes can pass over the sensor without damaging it.



5. Put the second side of the tire in position, so that the cross point of the belt with the rim is approximately 20 cm away from the valve (see the picture). The curved arrow shows the direction of rotation of the wheel.



6. Turn the wheel in order to engage all of the second side of the tire.

NOTICE

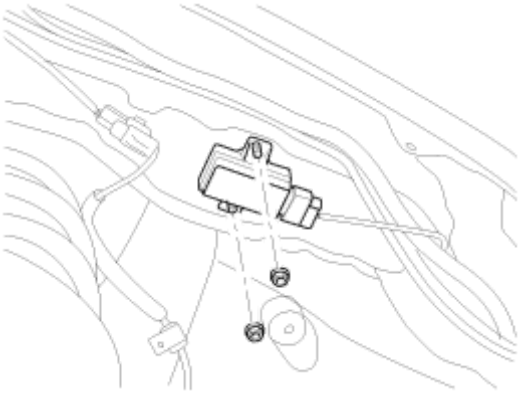
The standard shoes can pass over the sensor without damaging it.

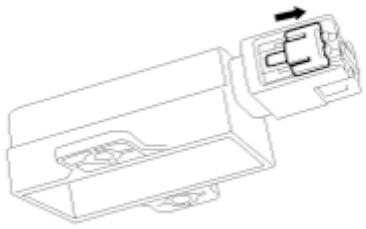


7. Perform the Register Sensor procedure.
(Refer to Register Sensor.)

REPLACEMENT

1. Disconnect the battery negative cable from the battery.
2. Remove the wheel and the wheel cover.
3. Remove the malfunctioning part and fit new part.



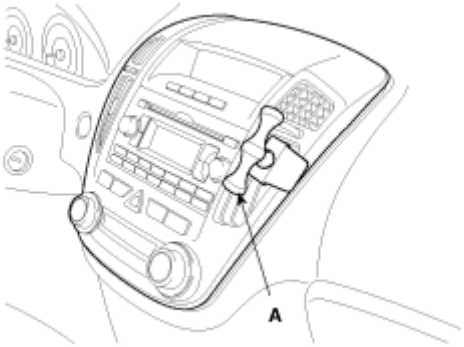


4. Reinstall the wheel and wheel cover.
5. Connect the battery negative cable to the battery.

REPLACEMENT

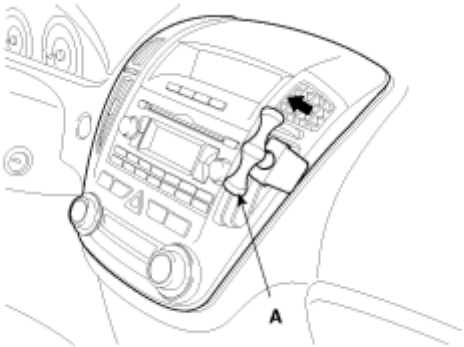
1. Disconnect the battery negative cable from the battery.
2. Put the SST (09840-1E100) (A) into the space between the center fascia and crash pad.

> **NOTICE**
>
> - Be care not to damage the center facia and crash pad.



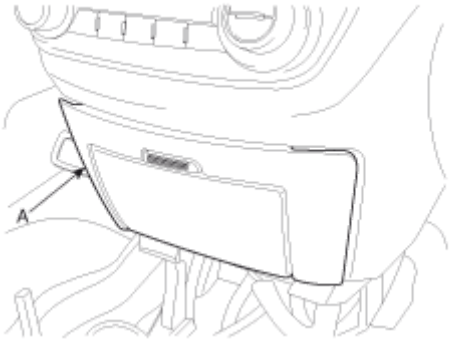
3. Separate the center facia panel from the crash pad pulling the SST (09840-1E100) (A) as shown on the photo.

> **⚠ CAUTION**
>
> - Pull the SST (09840-1E100) (A) slowly not to damage the center fascia panel.

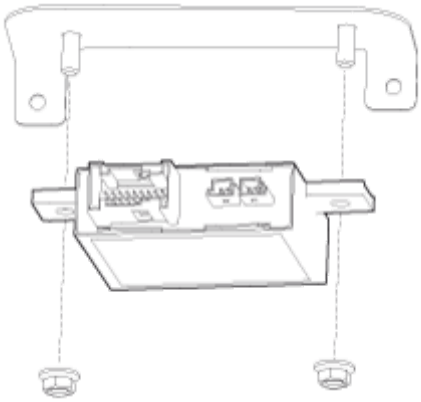


4. Pull the other side of center facia panel with the SST (09840-1E100) in the way of "step 2)".
5. Remove the center facia lower tray (A).

English ▼



6. Remove the malfunctioning part and fit new part.



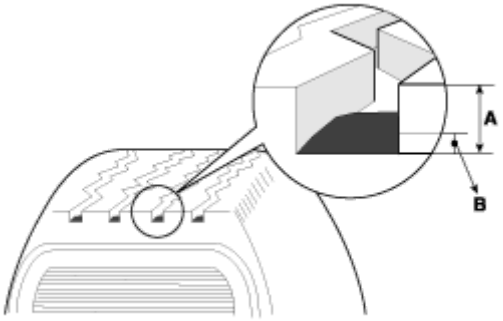
7. Reinstall the center facia lower tray.
8. Connect the battery negative cable to the battery.
9. Perform the VIN and Vehicle name writing procedure. (Refer to VIN and Vehicle name writing.)
10. Perform the sensor registration procedure.
    (Refer to Sensor registration.)

TIRE WEAR

1. Measure the tread depth of the tires.
   Tread depth [limit] : 1.6 mm (0.063 in)

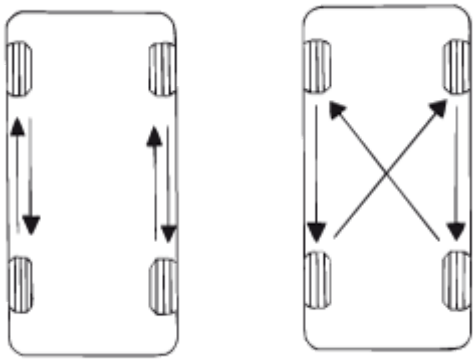
2. If the remaining tread depth (A) is less than the limit, replace the tire.

> **NOTICE**
>
> When the tread depth of the tires is less than 1.6 mm(0.063 in), the wear indicators (B) will appear.



TIRE ROTATION

Rotate the tires in the pattern illustrated.

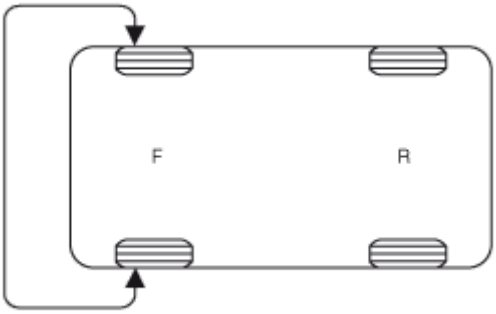


CHECKING FOR PULL AND WANDER

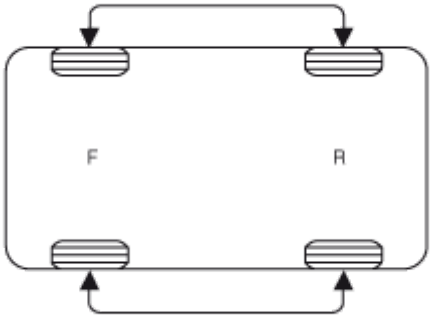
If the steering pulls to one side, rotate the tires according to the following wheel rotation procedure.

1. Rotate the front right and front left tires, and perform a road test in order to confirm vehicle stability.

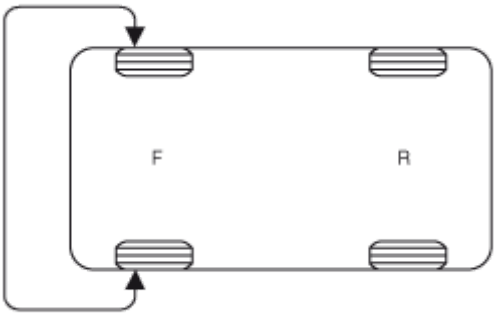
English ▼



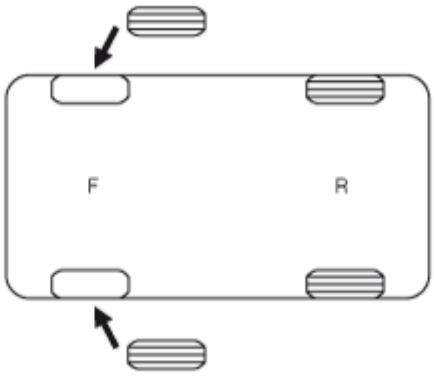
2. If the steering pulls to the opposite side, rotate the front and rear tires, and perform a road test again.



3. If the steering continues to pull to one side, rotate the front right and left tires again, and perform a road test.



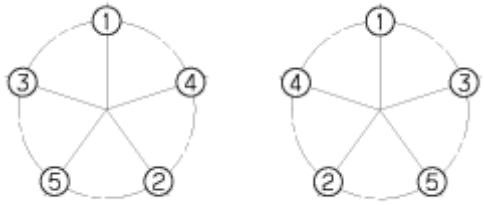
4. If the steering continues to pull to the opposite side, replace the front wheels with new ones.



HUB NUT TIGHTENING SEQUENCE

Tighten the hub nuts as follows.

Tightening torque Nm (kgf.m, lb-ft):
90 ~ 110 (9.0 ~ 11.0, 65 ~ 80)



CAUTION

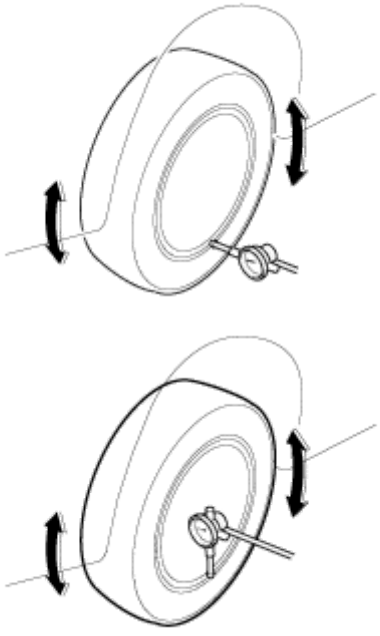
When using an impact gun, final tightening torque should be checked using a torque wrench.

Run out inspection

1. Jack up the vehicle.
2. Measure the wheel Run-out by using a dial indicator as illustration below.

Run-out	Aluminum	Steel
Radial mm(in)	Below 0.3(0.012)	Below 0.6(0.024)
Lateral mm(in)	Below 0.3(0.012)	Below 0.8(0.031)

3. If measured value exceeds the standard value, replace the wheel.

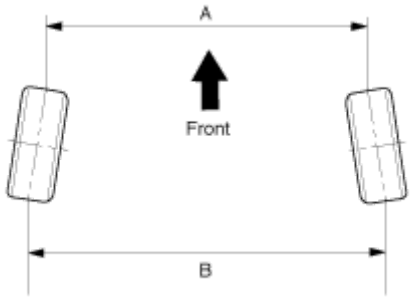


FRONT WHEEL ALIGNMENT

CAUTION

When using a commercially available computerized wheel alignment equipment to inspect the front wheel alignment, always position the vehicle 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 tires are inflated to the specified pressure.

Toe



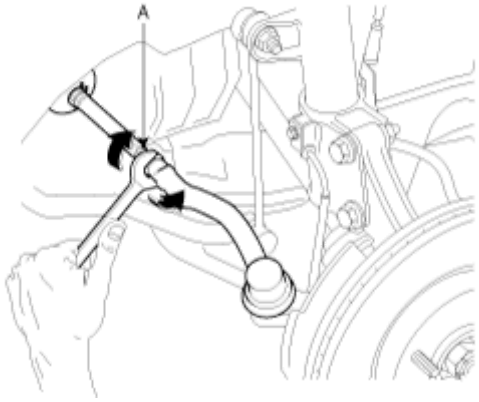
B - A > 0: Toe in (+)
B - A < 0: Toe out (-)

Toe adjustment

1. Loosen the tie rod end lock nut.
2. Remove the bellows clip to prevent the bellows from being twisted.
3. Adjust the toe by screwing or unscrewing the tie rod. Toe adjustment should be made by turning the right and left tie rods by the same amount.
   Toe-in
   Total : 0°±0.2°
   Individual : 0°±0.1°

Tie rod	Turning direction	Toe
LH (Driver's side)	Reward	Decrease (Toe in)
	Forward	Increase (Toe out)
RH	Reward	Increase (Toe out)
	Forward	Decrease (Toe in)

English ▼



4. When completing the toe adjustment, install the bellows clip and tighten the tie rod end lock nut to specified torque.
   Tightening torque Nm (kgf.m, lb-ft):
   50 ~ 55 (5.0 ~ 5.5, 36 ~ 40)

Camber and Caster

Camber and Caster are pre-set at the factory, so they do not need to be adjusted. If the camber and caster are not within the standard value, replace or repair the damaged parts and then inspect again.

Camber angle: -0.6°±-0.5°

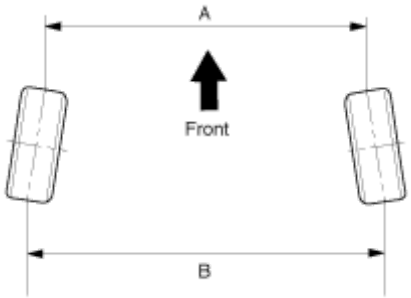
Caster angle : 4.43°±0.5°

REAR WHEEL ALIGNMENT

⚠ CAUTION

When using a commercially available computerized wheel alignment equipment to inspect the rear wheel alignment, always position the vehicle on a level surface.
Prior to inspection, make sure that the rear suspension system is in normal operating condition and that the tires are inflated to the specified pressure.

Toe

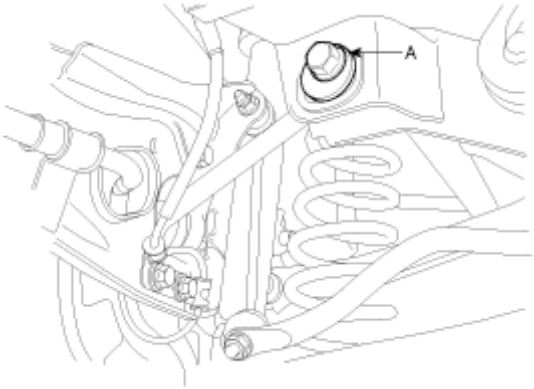


B - A > 0: Toe in (+)
B - A < 0: Toe out (-)

Toe adjustment

1. Loosen the nut holding the assist arm cam bolt (A).
2. Adjust rear toe by turning the rear assist arm cam bolt (A) clockwise or counter clockwise. Toe adjustment should be made by turning the right and left cam bolt by the same amount.
   Toe-in
   Total : 0.1°±0.2°
   Individual : 0.05°±0.1°

Cam bolt	Turning direction	Toe
LH (Driver's side)	Clockwise	Decrease (Toe in)
	Counter clockwise	Increase (Toe out)
RH	Clockwise	Increase (Toe out)
	Counter clockwise	Decrease (Toe in)



3. When completing the toe adjustment, tighten the nut to specified torque.
   Tightening torque Nm (kgf.m, lb-ft):
   100 ~ 120 (10.0 ~ 12.0, 72 ~ 87)

Camber

Camber is pre-set at the factory, so it does not need to be adjusted. If the camber is not within the standard value, replace or repair the damaged parts and then inspect again.

Camber: -1.15°±0.5°